REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

**Leaf-Hoppers and their
Natural Enemies**

(*INTRODUCTION*)

By ^{Robert C. L. Perkins} R. C. L. PERKINS

HONOLULU, H. T.
MAY 1, 1906

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LETTER OF TRANSMITTAL.

Honolulu, T. H., April 3rd, 1906.

To the Committee on Experiment Station, H. S. P. A., Honolulu, T. H.

Gentlemen:—I herewith submit for publication the Introduction to the Bulletin on "Leaf-Hoppers and Their Natural Enemies," and also an index to this Bulletin. The latter has been prepared by Mr. G. W. Kirkaldy. Although the material dealing with the subject of Leaf-Hoppers is far from being completely worked out, and new material is from time to time being accumulated, yet I have thought it advisable to close Bulletin I, which has now reached a length of more than 500 pages. At the same time, considering the practical and scientific value of such work, I hope that the subject will be continued in another Bulletin.

Yours obediently,

R. C. L. PERKINS.

Director of Division of Entomology.

TO
ALBERT KOEBELE,
THIS RECORD OF HIS RECENT FIELD-WORK,
IS DEDICATED
BY HIS COLLEAGUES,
THE AUTHORS.

GENERAL ACCOUNT OF WORK DONE IN AUSTRALIA, FIJI AND THE UNITED STATES.

The material on which this Bulletin, entitled "Leaf-Hoppers and Their Natural Enemies," is based, has been derived from various localities and sources, which are herewith specified.

(1). In 1903 Mr. Koebele made extensive observations on this subject in North America, chiefly in the states of Ohio and California, and sent a large amount of living material to the Hawaiian Islands.

(2). In 1904 Mr. Koebele accompanied by the writer visited Australia and a still larger collection of leaf-hoppers and their enemies was made in that country.

(3). In the early months of 1905, after I returned to these islands, Mr. Koebele spent a short time in Fiji, continuing Australian studies.

(4). For several years the sugar-cane and some other leaf-hoppers and their enemies have been under close observation in the Hawaiian Islands, and a collection of these has been made.

I will now make some remarks on these various expeditions, showing what was achieved in each case.

KOEBELE'S MISSION TO THE UNITED STATES.

Mr. Koebele's researches in Ohio in 1903 were primarily undertaken on information kindly given him by Dr. L. O. Howard, of the Department of Agriculture. A short time previously Mr. Otto H. Swezey had discovered that certain leaf-hoppers in that State were attacked by Hymenopterous parasites, and Mr. Koebele was notified of this fact by the chief of the entomological staff at Washington. Mr. Koebele's investigations resulted in the discovery of many such parasites, belonging to the family Dryinidae. The appearance of these parasites is well exemplified by the "Fairchild parasite" (*Echthrodolpha fairchildii*) of the cane leaf-hopper, now so familiar to most Hawaiian cane-planters.

In addition to these Dryinidae, the little Mymarid egg-parasite of *Liburnia* (*Anagnus columbi*) was discovered, and also the common presence of the minute Stylopids of the genus *Elenchus* and others. Finally there was procured a single puparium of a

Dipterous parasite, from which no mature insect was bred, but it unquestionably belonged to a species of *Pipunculus*.

The immediate and actual results of Mr. Koebele's consignments of North American insects were on the whole disappointing. Neither from a purely scientific point of view, however, nor from a practical standpoint, was this material done justice to. I wish to lay particular stress on this point, because it shows at once the frequent value of work of a highly technical nature for practical purposes, even though it may be largely incomprehensible to any save an entomologist, and even to any save an advanced student of entomology. When Mr. Koebele's living specimens came to hand, I was fairly well acquainted with the published facts already known about these leaf-hopper parasites. This published information, however, was of the most meagre description, apparently only three or four of the great numbers of known species having been bred or having had their habits studied. Further, of those which had been bred, in most cases only a few individuals had been reared and information as to diversity or uniformity of habits was almost wanting. In one case only, one of these parasites had been recorded as attacking two species of leaf-hopper, and those so utterly different in all points of structure, as to lead one to suppose that the Dryinidae might be indiscriminate in their choice of host. I refer to the case of *Labco typhlocybae* and *Dryinus ormenidis* discussed in this Bulletin on pp. 485 and 492. We now know that, in reality, these parasites generally are most particular as to their choice of host, and those which attack leaf-hoppers of the Delphacid group, to which our cane-hopper belongs, do not even extend their attacks to species outside this group, still less will they attack such different hoppers as are included in the great Jassid series. Now the living material sent to me by Koebele from North America included parasites of many small leaf-hoppers, belonging to most diverse groups, many of which would never have attacked our cane-hopper, as their structure plainly shows. It was not until I was in Australia and had leisure to examine Australian parasites with some care that I discovered the microscopic characters, which are always found in those species which attack leaf-hoppers of the Delphacid group, as opposed to those preying on Jassids. For want of this knowledge, Mr. Koebele's material from North America was, as I have said, not done full justice to from a practical point of view; much time being wasted on parasites that never would have attacked our cane leaf-hopper. Still at least two

species of imported North American Dryinidae did attack our cane pest, and were reared on these in captivity, and their offspring liberated in the cane-fields, but neither of these has as yet shown up at large.

That Mr. Koebele's North American material has not been done justice to from a purely scientific point of view is due to the fact that the practical end in view, namely, to establish the parasites, naturally outweighed the former. There are ten North American species described or referred to in Pt. I of this Bulletin, but the number really collected and sent by Mr. Koebele was unquestionably considerably larger. With the exception of one or two species sent in great numbers by him, no individuals were killed by me as specimens for study. Some were turned loose in cane-fields, infested with leaf-hopper, and some were placed in large cages on growing cane plants similarly affected. The preserved material therefore chiefly consists of specimens that died a natural death in these cages, and which happened to be found subsequently, together with a few examples that emerged and died on the way to the islands, and, again, of a few examples collected and mounted by Koebele himself in Ohio and California.

From another point of view Mr. Koebele's work in Ohio and California was of great value, for it was extensive enough to show what kind of natural enemies of leaf-hopper might be looked for in other countries. In fact it was these prior investigations in North America that led him at once to investigate the eggs of the cane leaf-hopper in Australia for internal parasites and to at once discover their presence on this investigation.

MISSION OF KOEBELE AND PERKINS TO AUSTRALIA.

We reached Sydney in May, the weather being cold and on our first arrival very wet, so that little entomological work was done there. Mr. Koebele, however, wished to visit some of the orange orchards in the vicinity, with which he had become well acquainted on some of his earlier missions. A number of species of living ladybirds were accordingly collected and shipped to Honolulu. Being too far south for cane, not much attention was paid to leaf-hoppers, but the presence of hymenopterous parasites was demonstrated by the discovery of Dryinid sacs on the larvae of common Jassids.

Early in June we arrived at Brisbane, and on the first cane that we saw, a few plants in the public gardens, we at once ob-

served the presence of the cane leaf-hopper. A short stay of about ten days gave ample proof of the existence in Australia of a considerable variety of Hymenopterous parasites of leaf-hoppers, of Dipterous parasites of the genus *Pipunculus*, and of Stylopidae parasites of the genus *Elenchus*.

At Bundaberg, about twelve hours by rail north of Brisbane, we spent another ten days in June. Here is an extensive cane district with our leaf-hopper everywhere present, but never in numbers such as we are accustomed to in these islands. In fact we never saw the hoppers nearly as numerous as they are on our least affected plantations. From eggs collected here Mr. Koebele soon bred out specimens of the Mymarid parasites he had felt so confident of finding.

From our observations on the habits of the cane leaf-hopper in these islands, it seemed probable that in tropical Australia this species would be in its greatest numbers in the colder months, so after a brief stay in Bundaberg, we proceeded north to Cairns, which place we reached at the beginning of July. This plan seemed very expedient, for by retreating gradually towards the south, as the hot season advanced, we hoped to prolong the season during which natural enemies for the cane leaf-hopper could be obtained. It appeared likely that effective work could only be done at Cairns for a month or two, since without a reasonably large supply of hoppers, it was evident that the parasites could not be found in sufficient numbers for shipment. This indeed proved to be the case, and by the end of August, leaf-hoppers and their eggs had become so scarce in the cane-fields, that we came south again to Bundaberg. At Bundaberg we made a long stay on this occasion, regularly sending off consignments of parasites, until here too, owing partly to the season and partly to the harvesting of the crop, the locality became unprofitable. After a short stay in Brisbane, at the end of the year, I returned to Honolulu, while Mr. Koebele proceeded to Sydney, where his attention was largely given to collecting beneficial insects for pests other than leaf-hopper. On the return journey Mr. Koebele spent one month in Fiji, the enemies of the cane-hopper in those islands being mostly similar to those already found in Australia. A fine consignment of the Chalcid egg-parasite (*Ootetrastichus*) of leaf-hopper was most important, as it enabled us to establish that important species without any doubt.

MODE OF SENDING OVER PARASITES.

During the earlier part of our Australian trip all beneficial insects sent from Cairns were placed in cold storage. The fact that the coast steamers generally failed to make close connection with those leaving Brisbane or Sydney for Honolulu, and the necessity for reshipment and removal from the cool chamber, made it a matter of great difficulty to get any insects over alive. Of some predaceous species, however, such as certain ladybirds and some others, a small percentage of some species survived their long journey. These were packed in the way usually adopted by Mr. Koebele, in specially made wooden boxes nearly filled with slightly damped *Sphagnum* moss. The sides and bottoms are dove-tailed and hold well together in spite of the great dampness of the cool chamber. These boxes are made in three sizes, nesting within each other, the largest $4 \times 3\frac{1}{2} \times 2\frac{1}{2}$ inches, the smaller $3\frac{3}{8} \times 2\frac{3}{8} \times 2\frac{1}{8}$ inches. When filled each is securely bound with strong string and the whole made up in one parcel for shipment, being wrapped in several sheets of stout packing paper. '

With the very minute and delicate egg-parasites of the Eulophid and Mymarid families, which we were most anxious to get established in the islands, various methods were used. The cuttings of the midrib of cane-leaf containing eggs of leaf-hopper were made as short a time as possible before the steamer sailed. That they contained numerous parasites was certain from the samples we always retained to be sure on this point. Though these samples were always very small compared with the amount sent, yet we never failed to breed many parasites. Some of the cuttings were packed in the wooden boxes above described with moss, some in similar boxes with powdered charcoal, and some in tin boxes. It does not appear, however, that from the four consignments sent from Cairns, which must have included great numbers of parasitized eggs, that any of these parasites reached Honolulu alive.

Our subsequent consignments, from Bundaberg, were more successful, as was natural, the ports of departure of the Honolulu steamers being so much nearer. Cuttings of cane leaves containing leaf-hopper eggs sent from here produced both Eulophid and Mymarid parasites on arrival in Honolulu, and in fact some individuals of most of the Bundaberg species, that we desired to establish, reached the islands alive. Thus two of the Dryinid parasites of *Siphanta* (a *Paradryinus* and a *Neodryinus*)

were bred in numbers in Honolulu, and liberated for the purpose of attacking the introduced pest *Siphanta acuta*. Further, two of the small wingless species of the Dryinid family, belonging to the *Gonatopus* group, were likewise successfully imported, and one of these was successfully bred up in captivity on the cane leaf-hopper. A Proctotrupid parasite (*Aphanomerus pusillus*) that destroys the eggs of the *Siphanta* above mentioned, was also successfully imported, and is now well established at large in the islands and is already destroying a large percentage of the eggs of that leaf-hopper. All these were sent over from Bundaberg in cold-storage, the Dryinidae as larvae in the cocoon or pupae. Although eventually egg-parasites of the cane leaf-hopper were obtained from sections of leaf containing the eggs, sent in cold storage, yet it was, as has been shown, only after many attempts had proved unsuccessful. At one time it seemed as if the prolonged cold temperature of (supposedly) *from 40°-45° F. was fatal to every parasite, and so far as we know, it was so in the case of all those sent from Cairns, but not always to those from the less distant Bundaberg. This led me to suggest that we should have some special cages made, somewhat similar to those Mr. Koebele had previously employed in shipping stylopized leaf-hoppers from North America, in which living cane could be grown and the cages themselves sent on the open deck, allowing the delicate egg-parasites to emerge and reproduce in transit. For minute and delicate parasites, inhabitants only of tropical countries, there is very little doubt in my mind that this method of transportation surpasses all others. In fact the two first cages sent in this way, each stocked with a different species of Mymarid, both yielded parasites after their arrival in Honolulu. These cages were built very strongly and with considerable care, special precautions being taken by simple devices that everything fitted compactly and that light was entirely excluded at all joints and that escape of any insects would be impossible. The adjoining figure shows the construction. The top and front are both hinged, so as to be capable of being fully opened out; in the back and front are cut openings of 9 inches by 11; these openings being covered on the inside with fine strong white muslin fastened with shellac, and on the outside, as a protection, with a sheet of strongly perforated zinc, which itself is still further protected by transverse wooden bars. Although in such a cage the light is necessarily largely cut off, yet grass or cane plants will grow therein for weeks, though the leaves may become chlorotic. As a mat-

* A temperature of 28°-32° for two weeks was fatal to every egg of the leaf-hopper and to the parasites.

ter of fact, we chiefly used pieces of cane-stem planted in almost pure white sand, for these will root and the eyes sprout quite successfully under such conditions. A removable zinc tray fit-

ting the bottom of the cage holds the sand or soil. For the journey this tray was securely fastened down by a couple of small nails.

HANDLING OF BENEFICIAL INSECTS AFTER ARRIVAL.

The successful handling of the various parasites and predaceous insects after their arrival was of course all important. The latter are generally of a much hardier nature than the former and any one at all accustomed to raising broods of insects can successfully propagate such creatures as ladybirds in captivity, provided that their proper food is procurable and climatic conditions permit. It is clear that for practical purposes the discovery of a parasite of an injurious insect counts for little (except for such scientific value as it may have) unless it can be

transported alive to the country where it is needed, and again the discovery and successful transportation alike count for nothing economically, unless it can be established at large after its arrival. It is no doubt in many cases decidedly more easy to discover natural enemies of an insect pest than it is to establish them in a new and distant country. We have heard some, who profess to be in favor of the repression of injurious insects by means of natural enemies, talk of the discovery of a parasite, as though the fact of this discovery were all important, whereas

we must repeat that unless the parasite can be successfully introduced and established and duly performs its share of work in controlling the pest, the discovery is of insignificant importance. Further, cases where a single natural enemy is alone sufficient to keep down an injurious insect are rare and exceptional, and few pests are to be kept down in this way. As a rule, it is a complex of causes that keeps an insect in check, often the joint attack of various parasites and predators, and it may be various diseases and other conditions combined. Only in exceptional cases can the economic entomologist hope to succeed with a single parasite, as any practical field worker must

know. When beneficial insects, parasitic or predaceous, have been successfully imported, no methods by which they may be successfully established should be neglected. Predaceous insects are generally comparatively large and hardy, and can be safely liberated where their food is abundant. Parasites on the other hand are often excessively minute and delicate and may require the most careful handling. As a rule should some species that it is desirable to establish be received in any num-

bers, it is always safer to divide them, and adopt various methods. It may be safely said that in nearly all cases (unless climatic conditions are altogether unfavorable) half the specimens received should be at once liberated in a suitable locality. Some minute Chalcids and other parasites are very easily bred in captivity, but this is by no means always the case. In rearing insects in captivity in tropical countries, there is one absolute essential, which is perfect isolation from ants and other carnivorous creatures. Several years ago, I had built for this purpose a small house isolated from the ground, the supports rest-

ing in water or water covered with a layer of kerosene oil. Similar houses are in use at our Experimental Station (see fig. of exterior, page viii, and on page ix one corner of interior with cages). It is necessary to take care that grass and weeds do not grow up so as to form a connection with the house; and, as will be noticed in the figure, the steps are built separately, and do not actually touch the house. The sides of these houses are covered with copper wire and in stormy weather blinds of thick white canvas can be let down for shelter from the rain, or on other days as a screen from excessive sun. The wire-mesh is fine enough to prevent the escape of a moderate-sized lady-bird. The earth used for plants in these houses is soaked in boiling water to kill ants and other injurious insects that may be present in any stage, and the wooden tubs, in which the plants are grown, are similarly treated. These tubs of Japanese make (manufactured as containers of the Japanese drink "saki") often afford hiding places to centipedes, cockroaches, ants and other most undesirable insects. On one occasion some years ago, in one night I lost a whole brood of about sixty individuals of a beneficial insect, that I wished to establish, from the attack of a small centipede accidentally carried into a house in a saki-tub, that had not been treated with boiling water. These saki tubs, as shown in the adjoining figure, are excellent for growing cane or other plants, which can be covered with a cap of fine muslin, fastened on a light bamboo-frame with shellac varnish. Either by a small door or a mere hole, which can be closed with a plug of cotton, the injurious insects and their parasites can readily be turned into such a cage and allowed to breed there.

In establishing the minute parasites that destroy the eggs of leafhoppers the following procedure was adopted. I will take the case of *Paranagrus optabilis*, whose life-history I have de-

tailed in Pt. VI of this Bulletin, as the same treatment was given to all the other minute parasites. Eight examples of the *Paranagrus* were bred from Queensland cage between January 17th and 30th. Four were liberated in the Experiment Station grounds, four were transferred to a glass-jar containing a young growing cane, in the leaves of which leaf-hopper eggs had previously been deposited. The jar used was a large glass battery-jar (the size is well shown in the adjoining figure by comparison with an ordinary garden trowel lying against it) containing very young cane plants. Round the jar near the top is bound

a band of cotton or other material, on which rests the cap formed of muslin fastened over a fine bamboo framework with shellac.

These caps are remarkably convenient for handling delicate parasites. When one wishes to collect from the jar, by wrapping the whole in a black cloth and leaving only the top of the cap uncovered, after first dislodging the parasites from the plants by striking the jar with the bare hand, these will at once fly to the top of the muslin cap. The cap is then removed and laid on its side, the closed end or top being held towards the light, and the parasites can be collected in glass tubes with the utmost ease as they seek to escape at that end.

At the end of three weeks the first brood of parasites began to appear, and in all 47 individuals, all females, were obtained. Half of these were liberated, the rest being used to stock a number of new breeding jars similar to the one described. From these a very large number of individuals were reared, and these were treated in various ways.

Some were 'sleeved' out in the fields on growing cane much punctured with hopper. These muslin sleeves stretched on light bamboo framework are shown in the adjoining figures, the parasites being introduced through a small hole at the lower end, by means of a glass tube. A plug of cotton closes the hole, after they have been turned in; while in wet weather a cap of water-

proof cloth can be fastened over the upper part of the sleeve to afford shelter.

In the breeding-houses large colonies were now raised on larger cane-plants in the saki tubs already mentioned; and other

still larger ones in the open field beneath light portable cages, which could be placed over several entire well-grown cane-plants, and were of sufficient size to allow one to enter and examine the condition of affairs within, and to make cuttings for further distribution. These large light cages were further

screened on the windward side by a strip of heavy white canvas, to break the force of the wind. All these methods were entirely successful, not only with the Mymarids, but also with the more sturdy egg-parasite of the genus *Ootetrastichus*.

While the parasites were still comparatively scarce and not easily obtainable in numbers for distribution, they were sent out in colonies, in the glass battery-jars already figured, to such plantations as stood in most immediate need. To the various plantation agents was left the choice, as to which of their plantations should be first supplied.

Subsequently as the cane in the experiment station became well stocked with parasites, it was only necessary to take cuttings of the midribs of cane leaves well filled with eggs and send them to the plantations in a very simple form of cage. Prior experiments had proved that from such leaves parasites would continue to emerge daily for at least two weeks after the cuttings were made. All that it was necessary for the recipient to do was to hang the cage in a suitable spot, the large number of parasites that would emerge from each cage making it almost impossible to fail in establishing them. The emergence of numbers of individuals day after day rendered the occurrence of unfavorable weather (which is so frequently a cause of failure in establishing beneficial insects, when liberated at one time as adults) a matter of small account.

EFFECT OF VARIOUS NATURAL ENEMIES IN CONTROLLING LEAF-HOPPER.

Having dealt with the introduction, propagation and distribution of the several parasites, we will now consider the practical effect of these and other natural enemies in diminishing the leaf-hopper pest. There are yet in Australia and Fiji, as can be seen by the student of the various Parts of this Bulletin, a number of other natural enemies of leaf-hoppers, which, introduced, would certainly attack our cane leaf-hopper, though either we did not attempt to introduce these, or were unsuccessful in the attempt. I have already, in my last annual Report to the Committee on the Experiment Station, stated what parasites we especially desired to import and the reasons for this, but for the sake of completeness, I here make some repetition. Thus in choosing what natural enemies it was desired to introduce, we had to consider: (1) their effectiveness or importance as destroyers of the pests; (2) the possibility of successful transportation; (3) the probability of their thriving in a new country; (4) the rapidity of their increase, when established. On the first two heads, there is nothing special to remark, but the third was a matter of great importance. When one considers the excessive difference in climate between many of the plantations, the extremes being shown by one where cane is grown on the windward side at an elevation of about 1500 or more feet, with its excessive rainfall, and one nearly at sea level on the dry leeward side, where cane can exist only by constant irrigation, it is obvious that comparatively few species of insects can be expected to thrive equally well under such diverse conditions. Consequently we had need primarily of parasites of wide-spread range in their own country, not such as were of local occurrence only.

The fourth consideration, that is the rate of increase, was to us of the greatest importance, since we had to deal with a pest already established for years, and that had no doubt reached its average numerical maximum throughout the islands. In this the little Mymarid egg-parasites of the genera *Anagrus* and *Paranagrus* excel. They complete their life cycle in about three weeks in these islands, and apparently breed at the same rate, or nearly so, at all seasons of the year. Further they are largely parthenogenetic, the male sex being only produced at rare intervals.

The Tetrastichine egg-parasite (*Ootetrastichus*) on the other hand is a comparatively slow breeder, taking fully twice as long as a Mymarid to complete its life-cycle or longer still. It however probably produces twice as many eggs as the other and is, so far as is known, entirely parthenogenetic, no male having ever been seen. If we judge the effectiveness of the two parasites merely on rate of increase (reckoning the life cycles as 20 and 40 days respectively), and suppose that the Mymarid produces 20, the Tetrastichine 40 female young, at the end of six months the latter will have produced four thousand and ninety-six million descendants, but the Mymarid in the same time will produce more by one million times. In reality no case is of this simple nature, the habits and constitution of the parasites have to be considered. Thus the Mymarid is much more delicate than the other, and liable to be decimated by storms, but it lays its eggs within a very short time of emergence, while in *Ootetrastichus* the period of egg-laying is extended over weeks. The latter, besides its robust nature, has this advantage, that each individual is bred at the expense of *the whole contents* of an egg-chamber of the leaf-hopper, while of the Mymarid each individual is bred at the expense of only a single egg.

If we consider the effectiveness of the four egg-parasites, *Paranagrus optabilis*, *P. perforator*, *Anagrus frequens*, and *Ootetrastichus beatus*, in areas where all are well established, we must rate the first-named as *at present* by far the most effective. As I have previously pointed out, this species is capable by itself of destroying about 50 per cent of the cane-hopper's eggs and *Anagrus frequens* and *P. perforator*, extraordinarily numerous as they appear, where seen alone, are but as isolated examples in the crowd, where all are well established in one spot. The *Ootetrastichus* slowly but steadily increases in numbers, and on many plantations I expect that it will ultimately be the most efficient of all parasites. I do not think that it can show its full value till 1908, for each harvesting of the cane crop is necessarily a very great setback to its natural increase. *Anagrus frequens*, under which name are probably more than one species, or at least one or two distinct races of a single species, although it appears at a disadvantage, when in company with *Paranagrus optabilis*, is nevertheless a most abundant parasite. In Part VI of this Bulletin I have compared the habits of the two and need not refer to the matter here, but I may say that as many as eighty or a hundred exit holes of the *Anagrus* have been counted in a single cane-leaf, so that its great utility is unquestion-

able. *P. perforator*, common in Fiji, attacking eggs of hopper laid in thick stems of grass, more rarely those in cane, will probably gradually wander away from the cane-fields to attack the eggs of native hoppers, that are laid in stems and twigs, as it now chiefly attacks the cane-hopper eggs when these are laid in the stems.

Nor must it be forgotten, what valuable aid these egg-parasites receive in the control of leaf-hopper from other insects parasitic and predaceous, native or introduced. In fact, had there existed previously no restraint to the multiplication of the pest, no one who has paid the least attention to such matters can doubt that it would some time since have become impossible to raise any crop of sugar-cane in the islands. The reason why these natural enemies have not alone got the upper hand of the hopper is due to various causes. In the first place, a number of the parasites such as the Dryinid *Echthrodelpix fairchildii* and the parasitic flies of the genus *Pipunculus* are of local occurrence, and in many places cannot (for climatic or other unknown reasons) maintain their existence. This was well shown by the behavior of the first-named, which was distributed in thousands by the entomologists and the Plantation managers themselves to all the districts in the islands, but in many places did not thrive. Such, too, is the case with the predaceous black earwig (*Chelisoches morio*) which, a natural immigrant to the islands and no doubt acclimatised centuries ago, is found on comparatively few plantations. Other natural enemies are themselves periodically decimated by parasites, as is the case with the introduced green cricket (*Xiphidium varipenne*), which has its own egg-parasite (*Paraphelinus*). Other enemies like the common lady-bird (*Coccinella repanda*) introduced by Koebele years ago for other purposes, prey on young leaf-hoppers, in default of more favorite food, and this valuable predator too is itself subject to parasitic attack by the common Braconid (*Centistes*). At present the whole number of parasites and predaceous insects that attack cane leaf-hopper to such an extent as to render their services worth noting is considerable, as the following summary shows.

The most valuable are the four egg-parasites, which there is every reason to hope will become still more effective with reasonable time, one (*Ootetrastichus*) having as yet had no chance to show its full effectiveness.

The two *Pipunculus* flies (*P. juvator* and *terryi*) are restricted to certain localities and are native species, which have trans-

ferred their attacks from native Delphacids to the cane leaf-hopper.

The ubiquitous lady-bird (*Coccinella repanda*) is valuable as a destroyer of leaf-hopper, though originally imported by Koebele to destroy *Aphis*. It is hoped that other lady-birds, especially *Ucrania strigula* (= *U. lincola* of Pt. VII) may become established and do good work, as in Australia and Fiji, whence they were imported.

The earwig *Chelisoches morio* is a local species, but no doubt useful where it exists in numbers.

The green cricket (*Niphidium varipenne*) is very valuable, but is most unfortunately heavily attacked at certain seasons by an egg-parasite.

The Dryinid *Echthrodelpfax fairchildii* is locally valuable. At certain seasons in suitable, but limited, localities, it destroys a considerable percentage of hoppers. Its services are underestimated, because for a large part of the year it lies as a dormant larva in the cocoon, and parasitized hoppers at such a time are naturally hardly to be found.

There are many other natural enemies of more or less importance, e. g. the various predaceous Hemiptera, and the several lace-wing flies (Chrysopinae).

In addition to these insect enemies, we must mention the two fungous diseases of hoppers (amounting locally and at certain seasons to epidemics) which, long previously known to kill the native leaf-hoppers, have become transferred to the introduced pest. We also found one or more fungous diseases attacking leaf-hopper eggs in Fiji and Australia in all localities. With material imported from these countries, I easily infected eggs of the cane leaf-hopper under cover, and subsequently established the fungus at large in the field. As it was most probable that parasitized and healthy hopper eggs would be affected alike by the disease, and consequently many of the egg-parasites would be destroyed, it became a subject of discussion whether we should attempt to establish the fungus or not. As, however, throughout Australia, the fungus and parasite both attacked the eggs, Mr. Koebele was of opinion that we should try and establish the same conditions here. Consequently with the first cages sent to the plantations the cane cuttings and the cane itself were well sprayed with water containing spores of the fungous disease, so that these would be certainly carried abroad by the emerging hoppers and parasites. I imagine there is no doubt as to this disease becoming established in all suitable localities.

The question that one will now ask is: Are these parasitic and predaceous enemies combined sufficient to prevent any further serious damage from leaf-hopper? Though a natural one, it is hardly yet a fair question. The leaf-hopper was in numbers sufficiently great as to be injurious in 1900, and spread and increased greatly since that time. The distribution of imported natural enemies began about a year ago. Some of the best of these have been distributed much more recently still. To serve fifty or more plantations, many of great acreage and occupying many miles of country, with introduced parasites, must naturally take considerable time. One of our most important parasites, if it thrives here as in Fiji, as I have already pointed out, is at present hardly to be reckoned with. It should be of decided value next year, of much more the year after. It is merely a question of natural increase, for that it thrives here at large as well as in captivity is already proven. When one considers the enormous monetary loss, considering the size of these islands, that has been occasioned by the leaf-hopper, I do not think one should cease to seek natural enemies against the pest, until it is absolutely proven a pest no longer, however strong one's hopes may be that the present enemies are sufficient to cope with it. I have been told on the best authority and by those most interested, that the loss to these islands caused by the cane leaf-hopper since its first noticeable appearance in 1900 to the present time may be reckoned at millions of dollars, and one is justified in taking every precaution, where so much is at stake.

ON THE NECESSITY OF FURTHER DISTRIBUTION OF PARASITES IN THE CANE-FIELDS.

Owing to the manner in which cane is cultivated in these islands, the entomologist working along the lines that have been adopted to control the leaf-hopper pest, meets with a serious obstacle such as is not encountered in dealing with insects injurious to our other vegetation. I refer here to the universal custom of burning off 'the trash' over great acreages, after the crop has been harvested. I have been told that on the Colonial Sugar Refining Company's estates in Australia no such burning off is allowed. If this is correct, it may help to account for the insignificant numbers of our cane-leaf hopper there, as well as of several other insects of the same group.

which are fortunately not known in our cane fields. As, however, burning of trash is an established fact here, it becomes necessary to see what steps can be taken to provide against this serious disadvantage. I will first show whereof this disadvantage consists. The parasitic enemies of the leaf-hopper are mostly delicate and minute creatures, not accustomed to take prolonged flights. Their wings serve well to bear them from plant to plant, but for further distribution they are dependent on air-currents. If when a field of cane is cut the wind blows towards another cane field, no doubt some or many parasites will reach it, but if otherwise, probably none will do so. In burning over a field it is quite certain that almost every parasite yet present will be destroyed, but the adult leaf-hoppers on the other hand are well able to take care of themselves. When as an experiment, a patch of about nine acres of cane, so heavily attacked by leaf-hopper as to be useless, was set on fire all around to destroy these, it was noticed that the adult hoppers rose from the cane in a cloud and spread to other fields; so this plan for destroying them was of no value. I have in an earlier publication shown how quickly the leaf-hoppers spread to new fields of very young cane, and with what regularity they distribute themselves over the young plants. It cannot be hoped that the parasites will (except under rare and fortuitous circumstances, such as constant favorable winds) spread themselves in like manner, and in the same time. Yet it is essential that the parasites should be on the spot when the leaf-hopper *begins to lay* in order to secure proper control. If the supply of laying hoppers at the beginning of the great breeding season is very small, it means that there is not time for the attack to become serious before that season is over. It is when the hopper is least abundant, that one wants to be assured that it is being attacked by all possible enemies. When a field is already seriously injured and swarming with hoppers, not much immediate help can be given for obvious reasons. It will be easier to prevent such a condition than to find a remedy. If one could provide that in each large area of cleared land, ready for planting, there should be in the middle a small patch of some variety of cane most susceptible to the attack of leaf-hoppers, that this cane should be kept well stocked with these, and with a variety of parasites and predaceous insects, and itself be of sufficient growth to afford good shelter to all these, the condition from an entomological standpoint would be ideal. This patch of cane, being already of suitable age and growth

and stocked as aforesaid, at the time the much younger cane of the rest of the field began to be infested with hoppers, would daily be distributing thousands of natural enemies, that should control these. Although such a plan or modification of it might be adopted on some plantations, on others (at least such as are under irrigation) it would either be difficult, or altogether impracticable. Only in the case of some fields of long ratoons would the matter be very simple, when a small area of the original ratoon growth in each field could be left uncut, and if well supplied with hoppers and their natural enemies would serve later on to stock the rest of the field. Unfortunately, owing to the fact that ratoons are (except in unusual cases) not severely attacked as compared with plant-cane, this matter becomes one of minor importance. Otherwise, in the majority of cases, owing to the clearing of large areas and the burning of trash, it is probable that new fields will have to be supplied by cages similar to those already used. Two things will be absolutely necessary: (1) that the new fields be well supplied with parasites; (2) that they be stocked immediately the hoppers enter them and commence laying. This plan, though less satisfactory than would be the other method, is nevertheless simple, and does not call for much expenditure of time, nor for skilled labour. The one thing necessary to be positively ascertained is that the spot whence the cuttings for distribution are taken is well supplied with *all* the kinds of parasites that it is desired to establish in new fields. It is now well known to us that *all* these destroyers are not yet established in *all parts* of all plantations, and therefore at present unless an entomologist previously test samples from the spot, whence distribution is to be made, it is quite likely that some of the most valuable parasites will not be taken to the new fields. If a sample be submitted to the entomologists, it can be passed as fit to supply all necessary parasites to new fields, or if not, cages of the deficient species can always be supplied from the cane in the grounds of the Experiment Station in Honolulu. As the parasites are continually spreading and increasing, such expert examination will at the most be necessary for a year or two: for it is perfectly certain that by that time all the species will be so general that it will be quite impossible to take any extensive sample of cane-leaves that bear eggs of leaf-hopper, which will not contain all. Such in fact is now the case in the cane at the Experiment Station. To sum up, the clearing of all cane from large acreages is a decided obstacle to the complete success of natural enemies

of leaf-hopper, and the burning of trash aggravates the difficulty. As an offset to these conditions new fields should be supplied artificially with natural enemies, and they should be supplied as soon as any leaf-hoppers enter them. Of course future observation may prove this distribution unnecessary, but for the present it should be adopted.

LIST OF PARASITES AND THEIR HOSTS.

Below are listed the parasites and hyperparasites treated of in detail in the various parts of this Bulletin. In many cases it is not possible at present to give the exact host of each parasite, even though the latter was bred. In the first place, of the great number of species of leaf-hoppers collected by us in Australia, only about half are yet described, and in the second, many of the parasites were obtained only from nymphs, which, in the present state of knowledge, even the special student of Homoptera will probably be at a loss to refer with certainty to their proper species. The name "Liburnia," often cited below as a host, must be regarded in a very wide sense, somewhat as in Edwards' "British Homoptera," where it includes a number of recognized European genera. Applied to the Australian forms in the list below, it is likewise a composite genus, the components of which do not however, at least as a rule, agree with those in the work just mentioned. In this list of hosts, the leaf-hoppers have mostly been determined by Mr. Kirkaldy, but for the reasons given, comparatively few are referred to specifically. Consequently it is not necessary, nor advisable, at present to make a second list, giving first place to the hosts, though I hope that this may be done, when the working out of the Homoptera is completed. In the case of the Dryinidae I have listed all the species dealt with in this Bulletin, since only seven of the 65 have not been bred, and attention is thus called to those species about which information is wanted.

HYMENOPTEROUS PARASITES.

FAM. DRYINIDAE.

<i>Parasite</i>	<i>Host.</i>
<i>Pseudogonatopus</i>	
<i>kurandae</i>	Liburnia sp. nymph and adult.
<i>juncetorum</i>	Liburnia and other Delphacids, nymphs and adults.

<i>Parasite</i>	<i>Host</i>
palustris	Various Delphacids allied to Liburnia, nymphs and adults.
saccharetorum	Perkinsiella saccharicida, nymph and adult.
dichromus	Liburnia spp. nymphs and adults.
americanus	Liburnia sp.
opacus	Liburnia sp. (near Chloriona).
stenocrani	Stenocranus dorsalis, nymph.
melanacrias	Delphacid near Stenocranus.
kiefferi	Vanua vitiensis probably.
perkinsi	Various Delphacids allied to Liburnia, nymphs.
Haplogonatopus	
apicalis	Liburnia and other Delphacids.
moestus	Hadeodelphax, nymph.
brevicornis	Liburnia sp. (near Chloriona).
americanus	Liburnia spp.
vitiensis	Delphacid near Stenocranus.
Paragonatopus	
nigricans	Liburnia or allied forms.
Gonatopus	
australiae	Deltocephalus and other Jassids, nymphs and adults.
koebelei	Athysanus sp.
Neogonatopus	
ombrodes	Deltocephalus sayi.
erythrodes	Deltocephalus?
obscurissimus	Deltocephalus?
pulcherrimus	Nephotettix plebeius adult.
dubiosus	Deltocephalus, Nephotettix and other Jassids.
brunnescens	Athysanus curtisii.
pallidiceps	Athysanus sp.
vitiensis	Euleimonios sp.; also from Deltocephalus nymph.
Epigonatopus	
solitarius	Not bred.
fallax	Not bred.
Pachygonatopus	
melanias	Euleimonios and Athysanus, adults.

<i>Parasite</i>	<i>Host</i>
<i>Chalcogonatopus</i>	
<i>gigas</i>	<i>Tartessus syrtidis</i> , nymph.
<i>optabilis</i>	<i>Deltocephalus</i> , nymph, and <i>Nephrotetix</i> , adult.
<i>decoratus</i>	<i>Phrynophyes</i> .
<i>pseudochromus</i>	<i>Phlepsius</i> .
<i>Echthrodelpfax</i>	
<i>fairchildii</i>	<i>Perkinsiella saccharicida</i> , <i>Aloha ipomoeae</i> , etc., nymphs.
<i>nigricollis</i>	Various small Delphacids, <i>Hadeodelphax</i> , forms allied to <i>Liburnia</i> , etc., nymphs.
<i>bifasciatus</i>	<i>Liburnia</i> and allied forms, nymphs.
<i>Dryinus</i>	
<i>ormenidis</i>	<i>Ormenis pruinosa</i> and <i>septentrionalis</i> , nymphs.
<i>Neodryinus</i>	
<i>koebelei</i>	<i>Colgar peracutus</i> nymph.
<i>nelsoni</i>	<i>Colgar peracutus</i> nymph.
<i>raptor</i>	<i>Siphanta</i> , <i>Sephena</i> , <i>Aphanophantia</i> , <i>Privesa</i> , <i>Scolypopa</i> , <i>Massila</i> , <i>Gaetulia</i> , nymphs.
<i>Paradryinus</i>	
<i>koebelei</i>	<i>Colgar</i> , <i>Siphanta</i> , <i>Massila</i> , <i>Aphanophantia</i> (?) nymphs.
<i>venator</i>	<i>Privesa</i> , <i>Massila</i> and <i>Siphanta</i> nymphs.
<i>threnodes</i>	<i>Siphanta</i> and <i>Colgar</i> , nymphs.
<i>gigas</i>	Not bred.
<i>leptias</i>	<i>Hasta hastata</i> , nymph.
<i>varipes</i>	<i>Siphanta</i> , nymph.
<i>Chlorodryinus</i>	
<i>pallidus</i>	Nymph of (probably) <i>Siphanta</i> .
<i>pseudophanes</i>	Not bred.
<i>Thaumatomydryinus</i>	
<i>koebelei</i>	Young nymph of <i>Siphanta</i> .
<i>Eukoebeleia</i>	
<i>mirabilis</i>	<i>Bruchomorpha</i> , nymph, and both short and long-winged adult.

<i>Parasite</i>	<i>Host</i>
<i>Neochelognus</i>	
typicus	Not bred.
nitidus	Eurinoscopus spp.
leiosomus	Eurinoscopus sp. nymph.
dimidiatus	Eurinoscopus sp. nymph.
nigricornis	Eutettix sp. nymph and adult.
destructor	Eurinoscopus, nymph and adult.
cognatus	Idiocerus or Macropsis? nymph.
parvulus	Euleimonios? adult.
coriaceus	Euleimonios adult.
pallidicornis	Deltocephalus? nymph.
ignotus	Not bred.
<i>Prosanteon</i>	
chelognoides	Tartessus (?) nymph.
melanostigmus	Not bred.
<i>Paranteon</i>	
myrmecophilus	Ipo spp. nymphs and adults.

FAM. PLATYGASTERIDAE.

<i>Aphanomerus</i>	
bicolor	Eggs of Eurybrachyine Fulgorids.
niger	Eggs of Eurybrachyine Fulgorids.
rufescens	Eggs of Siphanta or allied genera.
pusillus	Eggs of Siphanta.

FAM. MYMARIDAE.

<i>Ooctonus</i>	
australensis	Eggs of Tettigonia (albida or parthaon).
<i>Gonatocerus</i>	
cingulatus	Eggs of Tettigonia albida.
<i>Alaptus</i>	
immaturus	Eggs of Psocid feeding on fungus growing on honeydew excreted by leaf-hoppers.
<i>Polynema</i>	
reduvioli	Eggs of Reduviolus blackburni.
<i>Anagrus</i>	
frequens	Eggs of Liburnia or allied Delphacids.
columbi	Eggs of Liburnia.
<i>Paranagrus</i>	
optabilis	Eggs of Perkinsiella saccharicida.
perforator	Eggs of various genera of Delphacids.

FAM. ENCYRTIDAE.

<i>Parasite</i>	<i>Host</i>
Meniscocephalus eximius	Eurinoscopus sp.
Fulgoridicida dichroma	Eggs of Eurybrachyine Fulgorid.
Neocladia howardi	Eurinoscopus sp., nymphs and adult.
Echthrodryinus destructor	Neodryinus, Paradyrinus, etc., larvae.
Echthrobaeccha injuriosa	Baccha siphanticida (puparium).
Ectopiognatha minor major	Eggs of Siphanta. Eggs of Platybrachys?
Echthrogonatopus exitiosus	Many species of the Gonatopus group of Dryinidae, larvae.
pachycephalus	One or more of the Gonatopus group of Dryinidae, larvae.
Helegonatopus pseudophanes	One or more of the Gonatopus group of Dryinidae, larvae.
Chalceerinys eximia	Neogonatopus and probably allied genera, larvae.
Saronotum australiae americanum	Pseudogonatopus dichromus, larva. Pseudogonatopus, larva.
Cheiloneurus swezeyi gonatopodis chlorodryini	Dryinus ormenidis, larva. Pseudogonatopus, Echthrodelphax, lar- vae. Chlorodryinus pallidus larva.
Anastatus pipunculi	Pipunculus cinerascens, also Paradyri- nus.

FAM. EULOPHIDAE.

<i>Parasite</i>	<i>Host</i>
Ootetrastichus beatus	Eggs of Perkinsiella saccharicida and vitiensis.
Paraphelinus xiphidii	Eggs of Xiphidium varipenne.

FAM. TRICHOGRAMMIDAE.

Pterygogramma acuminata	Eggs of Tartessus syrtidis.
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COLEOPTEROUS PARASITES.

FAM. STYLOPIDAE.

Halictophagus schwarzii	Agallia (?) sp. adult.
americanus	Agallia 4-notata, adult.
australensis	Tettigonia parthaon; and a species, pos- sibly the same, attacks T. albida and others; adults.
phaeodes	Hecalus immaculatus, adult.
stenodes	Paradorydium menalus, adult.
Megalechthrus tryoni	Platybrachys or allied forms, adult.
Elenchus tenuicornis	Liburnia various species, also various other Delphacid genera e.g. Hadeo- delphax, nymphs and adults.
Deinelenchus australensis	Platybrachys or allied forms, adult.

N. B. In Australia stylopized examples of Phlepsius?, Eutet-
tix, and nymphs of Deltocephalus were also found, bearing male
puparia of the parasite.

DIPTEROUS PARASITES.

FAM. PIPUNCULIDAE.

Pipunculus cruciator	Hecalus immaculatus, mature and nymph, also Tartessus nymph.
eucalypti	Rhotidus sp. nymph.
erinyis	Eurinoscopus nymph.

<i>Parasite</i>	<i>Host</i>
hylaesus	Eurinoscopus adult and nymph.
comitans	Athysanus.
cinerascens	Probably on Privesa, nymph; the puparia of the parasite being found commonly on trees affected by these hoppers.
beneficiens	Various common Jassids, adult and nymphal, Phrynophyes, Deltocephalus, Athysanus.
helluo	Colgar peracutus nymph also nymphs of Gaetulia chrysopoides.
koebelei	Thaumatoscopus and Vulturinus, nymph.
monas	Deltocephalus (?) nymph.
picrodes	Tartessus sp.
anthracias	Thamnotettix (?), adult.
xanthocnemis	Liburnia or allied form, adult.
synadelphus	Deltocephalus nymph.
pseudophanes	Hecalus immaculatus.
juvator	Aloha spp., Perkinsiella saccharicida.
oahuensis	Aloha ipomoeae.
terryi	Not bred, but in company with Perkinsiella, no doubt by transference from Aloha or some other native Delphacid.

FAM. SYRPHIDAE.

Baccha	
siphanticida	Preying on nymphs of Colgar, Siphanta, and Jamella.

LEPIDOPTEROUS PARASITES.

FAM. EPIPYROPIDAE.

Heteropsyche	
poecilochroma	Eurybrachyine Fulgorid.
melanochroma	Supposedly on many genera of Jassids and Fulgorids, but it is not certain that the moths were really all one species.

<i>Parasite</i>	<i>Host</i>
micromorpha	Thanatodictya hebe.
dyscrita	Aphanophantia cuscucida.
stenomorpha	See remarks under H. melanochroma above.
Agamopsyche	
threnodes	Stenocranus, Perkinsiella, and other Delphacid genera, long and short-winged adults.
Palaeopsyche	
melanias	On a commonplace Agalline (?) found on terminal shoots of a Terminalia. No examples of this hopper seem to have been kept apart.

SUMMARY OF CONTENTS OF THIS BULLETIN.

In Parts I and X of this Bulletin the Dryinidae are discussed, their habits and structures being detailed. It is specially shown that those forms which attack Jassids, while often superficially resembling others parasitic on Delphacids, always differ essentially in the structure of the chelae from the latter. Consequently the same species or rather the same genus does not attack both of these indiscriminately. The nature of the larval sac is explained, and a similar sac is shown to exist outside the group in an anomalous insect (possibly allied to *Embolemus*) parasitic on Orthoptera. It may be added that this is also the case with some European Belytidae, which also form larval sacs on small Jassids. The economic value of Dryinidae is discussed, and the effect of hyperparasites on their utility. Some species reproduce parthenogenetically, though males occur. Sixty-two new species and fifteen new genera are described; the majority being bred specimens.

Part II deals with the parasitic Lepidoptera of the Family Epipyropidae. Their habits are given and the remarkable form of the young larva is described. One species is parthenogenetic, and no male of this is known. Six new species are described in three new genera, all having been bred from larvae.

In Part III the Stylopidae are discussed, their habits, the effect of their attack on their hosts, the frequent occurrence of a parasitic fungus in connection with their attack, the structure

of larvae and adults, and their classification being detailed. Two new genera and a subgenus (*nom. provocc.*) are described, and eight new species.

Part IV deals with the *Pipunculidae*; their habits, the form of the larvae and puparia, and the classification of the numerous species. Thirty-two new species are described; the full description of one species, however, is omitted and will be found in Pt. X. All belong to the genus *Pipunculus*, and half the whole number of species were bred.

In Part V, some predaceous enemies of leaf-hoppers are considered. The complete life-history of the earwig *Chelisoches morio*, is given, and a detailed account of the lacewing-fly, *Chrysopa microphya*, its eggs, larvae and pupa case. Two remarkable leaf-hopper-eating Syrphidae are described as new species of the genus *Baccha*.

Part VI gives an account of the Mymaridae, their habits (the life-history of *Paranagrus optabilis* being detailed) and their classification. In addition, some egg-parasites of the Proctotrupoid family Platygasteridae are dealt with. Parthenogenesis is shown to be usual in some Mymarids. Twelve new species and two new genera (one in each of the two families) are described, all being bred.

In Part VII a variety of predaceous enemies of leaf-hoppers is considered, the life-history and habits of the Locustid *Xiphidium varipenne*, being very fully given, as well as the variation in length of the tegmina. The life-histories and habits of the Coccinellidae, *Callineda testudinaria*, *Coccinella repanda*, *I'crania frenata* and *I'. strigula* (under the name *I'. lincola*) are detailed; also those of the Hemiptera *Zelus peregrinus*, *Reduvius blackburni*, *Triphleps persequens* and *Physopleurella mundulus*, wholly or in part. *Xiphidium varipenne* is described as a new species.

Part VIII deals with Chalcids of the families Encyrtidae, Eulophidae and Trichogrammidae, and contains remarks on habits, classification and parthenogenesis. Thirteen new genera and nineteen new species are described, all bred, some being direct, others secondary parasites.

Part IX is devoted to leaf-hoppers themselves; their habits, and what is known of their life-histories is referred to or described. The life-history of the sugar-cane leaf-hopper is given in detail, and the various stages are described. The varying condition of the flight-organs of leaf-hoppers is discussed at length. Their systematic position and classification is very fully dealt with, a survey of previous systems being given, and a criti-

cism of these systems follows. The external structure of Homoptera is discussed at length, particular attention being paid to neuration, a synonymy of the varied terms used by different authors being given. Two hundred and thirteen new species are described, and eighty-four new genera.

Part X is supplementary to Pt. I and IV, and gives figures of structures, etc., discussed in Part I, which is without plates.

CONCLUDING REMARKS.

In the early part of this Bulletin I have referred to Mr. Koebele's work in North America in the summer of 1903. As I have pointed out, he was successful in finding there at least two species of parasites, which readily attacked the cane leaf-hopper in our cages, and broods were raised on these, and liberated in numbers in the cane fields. One of these was the species described by me as *Haplogonatopus americanus*; the other was raised in smaller numbers and none were preserved, but it was almost certainly a *Pseudogonatopus*. A great deal of time was spent in a vain endeavour to establish the Stylopid, *Elenchus*, which would most likely have proved a useful parasite, and we are now again trying by every means to introduce it from Fiji, where it attacks the Vitian cane-hopper. As to the Dryinids above mentioned, I have hopes that they may yet prove to be established, for it cannot be expected that they would increase at nearly so rapid a rate as the Mymarid egg-parasites. During the past fifteen years I have paid great attention to the rate of increase of insects imported into these islands, and collected statistics on this subject. I find that even with very prolific insects, of which several or many individuals have been introduced, it is rarely that they can be found by an entomologist for at least three years. I am now of course speaking of insects accidentally imported with plants, not those beneficial ones, which are specially reared under cover for economic purposes and distributed again and again in large numbers to many localities. I will take as an instance the Locustid, *Xiphidium vari-penne*, because it is a species specially considered in this Bulletin, although it is not one of the several species, of which I know the exact date of importation. In November, 1892, a hard day's work produced two specimens of this cricket in the lower part of the Pauoa Valley; in 1893 and 1894 it was not seen. In 1895 I revisited the exact locality mentioned, and found a good many young crickets and a few old ones. In 1896 it had

extended its range down into the gardens in Honolulu, but was still far from numerous. By 1900, however, it had spread all over Oahu and also reached parts of the other islands, and in many places was in incredible numbers. That is to say, a hardy and prolific insect introduced probably some years previously to 1892 took at least five years to spread over a limited area, and to become at all noticeable, but having reached this point, in the next three years it increased to such excessive numbers, that it attracted the attention of many who pay little attention to such matters, owing to the fact of its frequently swarming round the lights in houses. I have digressed to this extent to show how impossible it is to secure immediate results with every kind of imported beneficial insect, and also how important it is in choosing one's species to consider which can most quickly produce visible results.

From Australia and Fiji the following egg-parasites were imported: *Anagnus* (two species, or two races of one species), *Paranagnus optabilis* and *P. perforator* (the latter possibly including two species or races), *Ootetrastichus beatus*. The two lady-birds (constant inhabitants of cane-fields in Australia) *Uerania strigula* and *U. frenata* were raised in large numbers and widely distributed over the islands; so too was *Callinecta testudinaria*, a ready devourer of leaf-hopper in captivity, but which, I fear, will forsake the cane-fields for forest trees. *Pseudogonatopus dichromus* though not yet established, no doubt could be, since it was bred on the cane leaf-hopper in captivity. Enemies of leaf-hopper that might have been established with good results but which failed (not, I think, because they could not under any circumstances be established, but merely from mischance) were the parasitic moth *Agamopsyche*, a specific enemy of the cane leaf-hopper, the predaceous Syrphid fly *Baccha*, and some other predaceous insects, which may after all prove to be established, the time since their liberation in my opinion being too short to allow of any certainty on this point.

Although the prime object of the six months mission to Australia, undertaken by Koebele and myself, was the study of leaf-hoppers and their natural enemies, yet it must be remembered that while we were together a great deal of our time was given to various entomological studies, both to other insects injurious to cane and their natural enemies, and also to insects injurious to other vegetation. After my return to Honolulu, Mr. Koebele, I believe, turned his attention still more to pests other than leaf-hopper. Throughout the period of our Australian mission

large numbers of beneficial insects not mentioned at all in this Bulletin, were collected and sent to Honolulu for the benefit of general agriculture. To publish details of all this work in full would require much time and space, and in fact a Bulletin as large or larger than the present one. We already know that some of these beneficial insects, parasitic and predaceous, are successfully established, although as yet very little special investigation of the matter has been made. I think that the introduction of almost any one of the species, that we know to have become established, would fully justify our mission.

There remains the pleasant task of thanking all those who have assisted us in our endeavour to control one of the worst insect pests these islands have yet seen. Our thanks are chiefly due to the Agents and Managers of Plantations in these islands, who have done everything possible to help us and taken much interest in our work. Especial thanks are due to Messrs. Wm. G. Irwin & Co., Ltd., and Theo. H. Davies & Co., Ltd. who by their kind offices, as representatives of the steamship lines between Honolulu and the Australian Colonies, and by letters to the officials of other steamship companies in Australia and Fiji, did much to secure for us a careful and successful transportation of the living insects. To Dr. Kottman, of the Colonial Sugar Refining Co., who on previous missions also has aided Mr. Koebele, we were indebted for letters to the Managers or owners of many sugar estates throughout Queensland and in New South Wales, and we regret that from pressure of work we were able to visit so few of these. Mr. Alexander Craw, Superintendent of Entomology under the Board of Commissioners of Agriculture and Forestry of this Territory, has given us his assistance in the handling of the beneficial insects imported, a work in which he has had a very great experience. He also, previously, as Horticultural Quarantine officer and Deputy Commissioner of the State of California, took charge of and forwarded to us the living insects despatched from Ohio by Mr. Koebele in 1903, and assisted us in like manner on former occasions. Without his expert handling, it is probable that many of these insects would have died while awaiting shipment to Honolulu. To many others, whom it is impossible to name severally, we are indebted for aid rendered, both in Australia and the United States.

REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

**Leaf-Hoppers and their
Natural Enemies**

(PT. I. DRYINIDAE)

By R. C. L. PERKINS

HONOLULU, H. T.
MAY 27, 1905

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HONOLULU, H. T.
MAY, 1905

LETTER OF TRANSMITTAL

To the Experiment Station Committee, Hawaiian Sugar Planters' Association.

Honolulu, T. H., April 18, 1905.

Gentlemen: I herewith submit for publication the first part of a bulletin entitled "Leaf-hoppers and their natural enemies." It will need about eight additional parts of varying length to complete this study.

Yours obediently,

R. C. L. PERKINS,
Director, Division of Entomology.

INTRODUCTORY REMARKS

The parasites considered in this Bulletin all belong to the Dryinidae, a family of insects which, so far as is known, confine their attacks to certain groups of the Homopterous Rhynchota, popularly known as leaf-hoppers. The material which has been studied is chiefly from two sources: (1) the species observed and collected by Mr. Koebele and myself in Queensland from June till the end of December, 1904, and (2) some of the species sent to these islands from Ohio and California by Mr. Koebele in 1903; to which may be added two species peculiar to these islands. With regard to the parasites sent from Ohio and California, those which I have described below by no means include all the species sent by Mr. Koebele, and probably few or none of the rarer ones are represented. This is due to the fact that unless a considerable number of individuals were sent, I was unwilling to lose the chance of establishing a species in these islands by killing specimens for purposes of study. I now regret this fact, as had I made a critical study of these insects at that time, I should have found out what I now know, that many of the parasites sent by Mr. Koebele would not have been the least likely to accomplish the object for which they were sent, that is to attack the sugar cane leaf-hopper, since their structure is in certain respects quite different from that of those which attack leaf-hoppers of that group. From want of this knowledge much time and trouble were wasted in attempting the impossible; while several species sent, which were quite likely to attack the cane-hopper and to become established, suffered accordingly for want of attention, when this should have been entirely centered on them. The material for study that has passed through my hands, dead or alive, has been very large. Mr. Koebele sent to Honolulu from Ohio and California (but far the greater part from the former State) some three thousand cocoons, which produced several genera and many species. During the time these were being received, I bred many thousands of the Hawaiian *Echthrodelpax* for distribution in localities from which it was absent. In the six months spent in Australia, we reared a still greater number of species. Indeed when one considers that

Mr. Koebele's work in the United States was practically confined to two small areas; that nearly all our material from Australia was secured in two limited areas in Queensland, while we know that the Dryinidae are common and generally distributed in the tropics and temperate regions alike, and even occur naturally in Oceanic islands like Hawaii, it is clear that from an insignificant family with few species, this will in time become one of importance, comprising many genera and hosts of species. Particularly in Australia would the student reap a rich harvest, for it must be remembered that we were investigating these insects only during six months, and of this time only a fraction was specially devoted to them. Moreover, most of our work was done in cultivated districts, where cane is grown, or on land periodically burnt over, and greatly changed from its natural conditions, in fact such places as the entomologist bent on purely scientific research would naturally avoid. It is a remarkable fact that the student, and of course more particularly the collector of leaf-hoppers, should so rarely have noticed these parasites. One would suppose it almost impossible to collect Homoptera for a single day and not notice the conspicuous presence of the larval sac of some of the Dryinidae. They are, too, so extremely easy to breed in confinement, even under most unnatural conditions, such as in a small glass vial, that it is surprising how few have been recorded as bred.

A list of some of the later writings on this family is given below, but I have not thought it necessary to refer to those of Westwood, Walker and the old writers. References to these will be found in Ashmead's Monograph of the North American Proctotrupidae. The latter work I have studied very carefully in drawing up the characters of my new genera, and since most of the North American genera are unknown to me, and European material has not been procurable at all, I have been greatly indebted for information concerning these to the Monograph mentioned above, which includes most of the European genera.

Since that work was published, Dr. Ashmead has entirely changed his views as to the systematic position of the Dryinidae, placing them now with the true wasps, and altogether apart from the Proctotrupids. I regret that I am not at all able to follow the learned American hymenopterist in his latest views on the classification of the wasps, nor with some of his views as to the structure of certain Dryinidae, nor with his conclusions as to the significance of their chelate tarsi. These points will be discussed below.

Since the greater part of this Bulletin was written, we have received a recent paper on the raptorial front legs of the Dryinidae by Dr. J. J. Kieffer, in which figures and descriptions of these are given. The figures illustrating the present Bulletin will be published later, with those illustrating other leaf-hopper parasites.

GENERAL ACCOUNT OF THE DRYINIDAE.

LIFE HISTORY OF *ECHTHRODELPHAX* AS TYPICAL OF THE DRYINIDAE.

When in 1903 for the purpose of distribution in the cane-fields many hundreds of *Echthrodelpfax* were kept in a cage with glass sides and large enough to contain a fair-sized growing plant of sugar cane, on which large flocks of the larvae of the cane leaf-hopper were feeding, the habits of the parasite could be studied to great advantage. By having a cage thus well stocked with the parasites, one can insure the fact that at almost any time individuals may be seen in the act of catching their prey. In such a cage, on one occasion, I counted over thirty parasites on a single cane stem each one simultaneously engaged in stinging the young hopper it had seized. When the hoppers were excreting an abundance of honey-dew, the parasites fed freely on this, but if not, some sweet liquid was supplied in place of it. Without liquid food, in a hot locality the parasites die very quickly, and the cage was freely sprinkled with water each day to advantage. Pairing of the sexes is of short duration and after copulation the male frequently never moves again, and in general dies very quickly. To watch the female parasite stalking, catching and stinging its prey, is a most interesting sight. The prey is sought on foot, for while most of the Dryinidae are most active and rapid runners, they are but poor performers on the wing. In most of the winged forms, these organs are unduly short and in *Echthrodelpfax* serve hardly more than to transport it from one cane plant to another as occasion demands. As soon as the parasite becomes aware of the presence of its prey, it usually comes to a standstill, while still at a short distance; it assumes a rigid attitude comparable with that of a dog pointing game; the antennae are laid back behind the head; frequently it sidles round the hopper to gain a more advantageous position for the attack. The hoppers often show manifest uneasiness on the approach of the parasite and they

hasten to remove themselves to a distance, as the latter comes to a point. In this case they are again followed up, and the performance may be repeated several times. In some cases through too great deliberation in attack the prey is entirely lost, as it moves away into concealment and the parasite fails to trace it up. Deliberate as it often is in making the attack, yet, when made, the stroke is marvelously rapid. So quickly indeed are the front legs thrown out and withdrawn that the hopper, which just now was at a distance, in an instant appears contiguous to the parasite, as if attracted by some unseen force. One pair of pincers usually grips the neck of the prey the other frequently clasps the pair of hind legs in the neighborhood of their long jumping spurs, or the abdomen towards the apex. If the hopper is unusually large and strong compared with its enemy, it not rarely manages to make its leap, and both fall to the ground together. Never however was the latter seen to relinquish its hold on the former. Its prey firmly secured and frequently held more or less crosswise to itself, the parasite now curls round the abdomen and thrusts its sting into the side of the hopper, beneath one of the wing lobes in the case of *Echthrodelpfax*, and in various other positions in the case of other parasites, and the egg is deposited. The laying of the egg is again a very deliberate undertaking and the sting may remain inserted for a couple of minutes or more. Finally the sting is withdrawn, the front leg that grasps the hopper's neck is extended, the chelae or pincers fly open and the hopper is sometimes roughly jerked to a distance, sometimes more gently deposited on the plant. While grasping the hopper and inserting the sting, the parasite has been seen in some cases to freely use its mandibles on the neck in process of malaxation. After the operation, the victim usually appears weak and dazed, sometimes even lying inert on the ground, but sooner or later and sometimes very quickly, it recovers and starts feeding as if nothing had happened. Occasionally after capture, the prey is released without being stung, and it is probable that hoppers so released have already been stung by an earlier captor. Under unnatural conditions, such as in the confinement of a small jar or glass tube, and probably under pressure of hunger, the hoppers are frequently killed outright, and to some extent devoured. The position of insertion of the sting is apparently not always the same, this being sometimes inserted beneath the wing-lobe, and sometimes in the ventral side of the body, but the larval sac in either case appears beneath the wing-lobe. After the egg has been

deposited, it is not for some time that the characteristic larval sac becomes evident externally. In the case of *Echthrodclphax*, I could distinguish the larval sac, having the appearance of a minute transparent vesicle, at the end of four days with the naked eye. In the case of a California species of *Haplogonatopus*, the period was not less than a week. On one occasion three cane leaf-hoppers were placed in a large glass jar with the *Haplogonatopus*, and two of them were seen to be quickly seized and stung. The next day the parasite was removed to another cage. At the end of six days, when the hoppers were examined, no sign of the larval parasite was noted, even with the aid of a weak lens, and it was supposed that they were unaffected. However on the ninth day, when they were again examined, the parasitic larvae were of considerable size, and obvious to the naked eye. The third hopper of the above produced no parasite and probably was not stung. As soon as the larval sac becomes visible, it is usually but a short time, a few days or a week before the larva becomes mature. The length of time no doubt varies somewhat according to the species, and according to climatic conditions.

The larva of the *Echthrodclphax fairchildii* while still attached to the hopper, appears as a small, nearly circular, impressed, black object, adherent to the young leaf-hopper. The latter seems hardly to be inconvenienced by the parasite, remaining as active and plump as the non-parasitized individuals. It is always the immature hopper that is attacked and a single hopper may sustain one or two parasites. They are generally fixed beneath the lobes, which develop into the tegmina or upper wings, one on each side of the body, if two be present; they are, however, sometimes found beneath the true wings.

After a time, however, (always shortly before the full growth of the parasitic larva) the hopper becomes sluggish and then entirely stationary. This may happen either shortly before or not till some time after the black shell-like covering or larval sac of the parasite splits by a longitudinal (mediodorsal) fissure and exposes the back of the white maggot within. This torpidity of the leaf-hopper and the splitting of the covering of the parasite is the outward sign of a change of habits in the latter (being coincident with a moult and change of form of the parasite). From this time until the hopper dies and the maggot finally quits hold of its prey the sight as examined under a lens forms one of the most repulsive sights that natural history can afford.

Soon after the splitting of the black covering and the exposure of the white maggot, a conspicuous change takes place in the color of the latter, it becoming pink or reddish. The maggot, which has hitherto fed delicately without doing any vital injury to its host, now proceeds to ingest the contents of the hopper in an indiscriminate manner, and the change in color is clearly due to this. If removed at this time from the hopper it is seen to have very mobile and hard (chitinized) mouth parts, while the thin and collapsed black covering still adheres some distance behind the head. Growth is extremely rapid and the simultaneous shrinking of the hopper, as its contents are absorbed by the parasite, enhances this effect. Thus when the splitting of the black covering takes place the hopper may be three or four times the size of the parasite, when the latter is full fed the proportions may be exactly reversed. The removal of the contents of the hopper can be easily seen through parts of the cuticle. Generally early in the proceedings the soft contents of one or both eyes and of the head are seen to be in rapid motion, like a boiling fluid; suddenly all the pigment is removed from one eye (usually the one on the opposite side to the parasite) and it becomes an opaque white spot, then the other is often similarly destroyed, or sometimes both more or less simultaneously.

Finally the maggot, when it has finished feeding, withdraws its head, and may then sometimes be seen busily engaged in applying sticky matter from its mouth to its body. Its surface is strongly adhesive and when it quits its prey, it is able (though of course quite legless) to crawl freely over any surface, however smooth. Soon it spins a neat white cocoon, from which it emerges as an active winged insect in about 18 days.

GENERAL HABITS OF DRYINIDAE.

In Australia, the small apterous forms of the *Gonatopus* type are essentially attached to the Jassidae and Fulgoridae, that feed on grasses and low herbage, and this was also the case with the many American species sent to Hawaii by Mr. Koebele. On the other hand, the Hawaiian apterous species are essentially arboreal, but it must be remembered that in Hawaii practically all the native Homoptera are attached to forest trees, the few that live on grasses being Jassids or Fulgorids almost certainly introduced, the Hawaiian fauna being altogether of a special nature. *Echthrodelpfax* is also connected with grass-eating Fulgorids, or at least with those affecting low plants. The most

minute species of *Neochelogyne* attack small graminivorous Jassids. The larval sac of these small robust insects is placed ventrally on the hopper behind the posterior legs, or on the side of the neck. Most of the species of this genus, however, attack tree Jassids, and the larval sac is attached behind the posterior coxae on the ventral surface of the body. Naturally all these insects are at times met with in the adult state by sweeping grasses, but not in any considerable numbers. The apterous insects of the *Gonatopus* group can be found in some numbers by special searching about the roots of grasses in Australia, especially on sandy banks, similar to those on which I used to take *Gonatopus* itself in some numbers twenty years ago in England. The tree-frequenting winged forms are only taken rarely and singly, by beating branches of trees or shrubs, even in places where the dryinized hoppers are quite abundant, and where the mature insects can be obtained in numbers by breeding. *Paranteon* no doubt has special habits; for the sluggish hopper, that it affects, forms flocks of greater or less extent, and excreting much honey-dew, is invariably covered with swarms of ants, usually a moderate-sized species of the Formicidae. The *Paranteon* bears some slight resemblance to the ant in appearance, and this resemblance is enhanced by its actions. If a number of the parasites be bred together in a glass vial, they may be seen gathered in pairs, standing sub-erect on their four hind legs, face to face, stroking one another, licking each other's mouth, soliciting food. Now the ants, that attend the hoppers, themselves behave in similar fashion, and it is most probable that they actually feed the *Paranteon*, which unless it were on friendly terms with the ants could never approach the hoppers to lay its eggs in these. It is only necessary to touch a twig on which a colony of the hoppers rest, to see how assiduous are the ants in protecting the colony from any interference. Further, it would be interesting to note what happens to the full-grown larva of the parasite, which must emerge from its sac amongst a swarm of carnivorous ants, that are always prepared to kill and carry off any weaker insect, that falls in their way. Most probably not only are the larvae not harmed by the ants, but they may be carried down by them to their underground nest, and pupate therein. In captivity the larva forms its cocoon well beneath the soil.

All the species of the Dryinidae, which have the front legs abnormally lengthened in the females, when resting, place these in a characteristic position. The knee-joints on either side rise

high above the pronotum and often are brought together so as to form a complete angular arch over the thorax. In walking, the abnormally developed claw of the chelae is always folded back on the fifth joint of the tarsus, and is not used except specially for grasping its prey. In the comparatively slender, winged insects of the genera *Neodryinus*, *Paradryinus* and *Chlorodryinus*, the abdomen of the females is recurved or bent on its apical part, and is always kept in this position when the insects rest, and generally when hunting their prey; and this is also the case with the large apterous *Chalcogonatopus*. When at rest they have a most extraordinary appearance for they sit sub-erect on their tail (i. e. the recurved apex of the abdomen), supported otherwise by only the two hinder pair of legs, the front pair being held in the position already described, the tarsi usually somewhat inclined, and free from the surface on which the others rest. On the other hand, the slender, winged *Echthrodelphax*, and the small wingless insects of the *Gonatopus* group, whether resting or running, hold the body segments straight, and only in the act of stinging their prey are these bent or recurved.

The short-legged, stout insects with large stigma to the front wings naturally do not exhibit the peculiarities that are shown by the species of the above named genera. Many of them, moreover, seem to be better endowed with powers of flight, the sexual disparity is much less, the males are more hardy, and, in the case of *Paranteon* at least, copulation may take place many times, in striking contrast with the feeble male of *Echthrodelphax*, which frequently drops dead within a few minutes after the act.

Although in some cases a species of the Dryinidae will attack more than one species of leaf-hopper, and indeed sometimes parasitizes species of different genera, yet in the latter case these genera always belong to the same group of hoppers. In no case have we ever found one to attack a Jassid or Fulgorid indiscriminately. Indeed from a study of structure we should suppose such a case to be impossible. Riley however is said to have bred *Labco typhlocybae* from a *Typhlocyba*, whereas this species of which the female was described as *Dryinus ormenidis*, is well known to be a common parasite of the Fulgorid genus *Ormenis*, and it might be well to confirm Riley's unique instance. Also in need of confirmation is Lichtenstein's *Gonatopus ptinorum*, said to be parasite on the beetle *Ptinus fur*. •

Like other parasitic Hymenoptera some of the Dryinidae are

able to reproduce their kind parthenogenetically, and probably frequently do so in a state of nature. In one case that was noticed, that of a species of *Pseudogonatopus*, of the offspring thus produced only one in forty was of the male sex.

THE ECONOMIC VALUE OF DRYINIDAE.

The parasites of the group now under consideration have until lately been considered as more or less rare insects, and therefore it is of interest to consider the extent of their economic value. A fairly true estimate of this value can be made by carefully watching some common species of leaf-hopper, which is subject to their attacks, over a considerable period of time. It must be understood that the following remarks apply to species, which are found in countries where the winters are not cold enough to put a cessation to insect activity. If we keep watch on a species of hopper from the time when its numbers are at a minimum, it will usually be observed that the individuals become more and more numerous with each generation. At first the parasite is also very scarce, or for a time may not be observed at all, but it likewise increases in number with the increase of the hopper, so that both frequently attain their greatest abundance at the same time. In the case of a common Australian species of grass eating *Liburnia* and the *Pseudogonatopus* parasitic on it, which were observed for about three consecutive months, the visibly parasitized individuals, when the hoppers were most abundant, amounted to as high as 50 per cent of the whole. Many individual hoppers carried two to four, some even six parasites. Adults and all the earlier instars were attacked alike. This statement however would give a very inaccurate idea of the true value of the parasite. Firstly, many of the apparently sound hoppers were affected by the parasite, which had not yet shown externally; secondly, an enormous proportion of them were in the young stages and incapable of breeding, and, for days or weeks to come, were liable to be parasitized before they could reach maturity. It will not therefore be surprising to learn that a few weeks after the parasites were at their maximum, the hoppers from their numerical maximum fell suddenly away to a minimum, being represented, in places where they had swarmed previously, by only scattered specimens.

It might have been expected that now the parasite would have been swarming in the locality, where so many dryinized hoppers had lately existed, the more so as, on account of their

wingless condition, they would not be likely to stray far away from their birth place. This however was not the case, for just as the parasite reaches its maximum in numbers, at the same time as the hopper, so do the hyperparasites at the same time as the parasite. When the *Pseudogonatopus* was at its greatest numbers, the hyperparasites were noticed in the field in considerably greater numbers still. Of course it must also be remembered that in many cases the destruction done by the Dryinid parasite is supplemented by the work of other parasitic or predaceous insects. With the most successful hoppers (by which I mean those, which are most numerous in individuals), it would appear that at their numerical maximum, they exhibit signs of becoming a highly destructive pest, but just at this point (at any rate in normal seasons), they suddenly, owing to the attacks of parasites or predators, fall away to about their numerical minimum.

To take another instance, a common species of *Siphanta* was observed in numbers in Northern Queensland in various localities, but not so numerous as a rule as to be considered injurious to any considerable extent. On the other hand, under unnatural conditions, it showed itself capable of doing the greatest damage, for an isolated colony established on a bush in the town of Cairns where its natural enemies had little chance of finding it, had so injured the bush that the owner cut away and destroyed a large portion of it. At Townsville, on an isolated row of trees, the same species had evidently increased to great numbers prior to our visit, as could be easily seen by the appearance of the affected trees, and the empty larval skins of the *Siphanta*. In this case, however, the parasites had already discovered their prey, and we saw few of the latter, but the cocoons, mostly empty, of a *Neodryinus* were so numerous, that as many as 32 were picked off a single fig-leaf! Egg parasites were also at work on the few patches of eggs that we found. Indeed in most cases, it will no doubt be found that the work of the Dryinidae, admirable as it is, to a greater or less extent is supplemented by that of other predaceous and parasitic insects. In fighting a leaf-hopper pest by the importation of parasites or predators, it will no doubt be generally found necessary to make a selection of carefully chosen enemies rather than to rely on a single specific enemy, though the latter might in some cases be perfectly successful, provided its hyperparasites be carefully excluded and that none likely to attack it already exist in the country to which it is imported.

How hardly the Dryinid parasites are at times pressed by their various hyperparasites, we often observed. To cite one instance, from about fifty cocoons of several species of parasites, obtained from grass-eating Liburniae at Redlynch near Cairns, one solitary male *Echthrodelpfax* alone emerged, all the rest being hyperparasitized, and similar observations were made in several localities.

In estimating the value of the Dryinidae we should note the fact that, so far as is known, a dryinized leaf-hopper may be counted as a dead hopper. In no case is it probable that it would be capable of reproduction after being stung by the parasite, and usually it dies at the moment of emergence of the larva of the latter. In one instance a very large nymph of a *Siphanta*, bearing a larva of a *Paradryinus*, after the latter left it, had sufficient strength to moult, and produced a crippled mature insect, which quickly died; but this case was quite unique. Nymphs of leaf-hoppers bearing a parasite never attempt to moult. On the other hand, where a Dryinid attacks mature leaf-hoppers, these may of course have already deposited their eggs, but such cases are probably few.

MATURE LARVAE OF DRYINIDAE.

On leaving the host, the full-grown larva* is of elongate-ovate form, pointed anteriorly when extended, the anterior segments being much narrower than the posterior, the head more or less retractile and like the mouth parts, usually very mobile. The cuticle is microscopically rugulose or corrugated, sometimes quite bare as in some *Neodryinus* and *Paradryinus*, but in *Pseudogonatopus* (at least in some species), there are several longitudinal rows of very short and widely separated bristles and a row of latero-subventral ones on each side are more developed, placed on tubercles more developed than the others. In *Neochelognus destructor* the segments are circularly ridged and the ridges set with minute tubercles placed close together, each tubercle bearing a longish hair.

The chitinization of the head varies in different genera or species, but conspicuous always are the large mandibles. In some *Neodryinus* and *Paradryinus* these appear to have an oblique cutting edge, which is crenulate or denticulate. In *Neochelognus* they appear to be simple and simply pointed at

*The larva of *Gonatopus* has been fully described by Mik (see bibliographic list).

the apex, and at rest the tips pass one another. The upper lip or labrum is very broadly rounded or truncate at the apex and there ciliated, and often the mandibles are largely concealed beneath it. The lower lip apically is usually strongly bent upwards at an angle with the lower surface of the head. The mouth opening is large and only partially closed by the large mandibles and the maxillae, which lie beneath them. There is a single-jointed (faint indications of a secondary division may sometimes be noticed) maxillary palp, bearing a few microscopical hairs at its apex, or sometimes one more conspicuous spinose hair and some shorter ones. The head is sparingly set with hairs or bristles which differ with the species, and these distinctions possibly yield characters of generic importance.

All the larvae known are very active and most of them crawl about quickly on their emergence from the sac, in search of a proper place for spinning their cocoons. Some however like *Neodryinus* pupate on, or close to, the spot at which they issue from the host. They show many differences in colour, according to the species, the majority being white or pinkish. Some however are brown and others light green. It is noteworthy that a light green larva may issue from the sac on a brown coloured Jassid, while another species from a light green Jassid may not be green at all. These colour distinctions are, I believe, constant for a species.

COCOONS OF DRYINIDAE.

The larvae of all the known species spin a compact silken cocoon, which often consists of two parts, an inner adapted to the form of the larva and an outer and wider covering. The species of *Neodryinus* further elaborate this by fixing over it a roof, formed of the greater part of the larval sac. Many of the cocoons are highly characteristic of the genus or species, and though in some the details of shape, etc., are not absolutely constant, yet in many cases the species can be immediately distinguished by an examination of the cocoons, provided that these are formed on similar substances. When found on very different surfaces there may naturally be considerable difference exhibited by cocoons even of one species. The cocoon of *Paradryinus* is elongate and cylindrical and often found on the surface of green leaves. Under these conditions the cocoon of *P. threnodes* is densely studded with round patches of epidermis stripped off from the leaf surface; that of *P. koebelii* is less densely covered, with more

elongated fragments; while *P. venator* also uses roundish fragments, but the cocoon is more carinated.

The cocoon of *Chlorodryinus* is long, narrow and cylindrical and no fragments of leaf substance are woven into the surface. That of *Neodryinus* is ovate and the upper and lower walls of the marginal part are strengthened with great numbers of vertical pillars. In addition as above mentioned, the larger part of the ruptured larval sac is removed from the hopper and attached as a roof over the cocoon. This sac being of the usual circular form, when ruptured by the escaping larva, gapes open like a bivalve shell, as do those of all other Dryinidae known to us. These two valves are stretched wide open over its cocoon by the mature *Neodryinus* larva, and so fastened, the whole forming a subovate or subreniform roof over just so much of the whole cocoon as covers the insect within. Of what use to the genus this extra shelter may be, we cannot conjecture. It certainly does not make the cocoon less conspicuous, as do the fragments from the surface on which it pupates that of *Paradryinus*, nor yet does it keep out the spores of fungi to which both genera and some others are very liable. All the known hyperparasites attack the larva before the cocoon is made and not afterwards, so they do not enter into the question.

The cocoons of the short-legged genera, with large ovate stigma to the front wings are almost certainly under natural conditions subterranean. They are of shorter, wider form than those of the more highly evolved group of genera; in fact, often nearly round, and are covered with particles of the soil or debris amongst which they are formed, so as to be most difficult to detect by sight.

LARVAL SAC OF DRYINIDAE.

The larval sac of the Dryinidae is of circular form, the sides being more or less compressed according to the species. The colour is frequently uniform, but in some species it is more or less, or even conspicuously, variegated. Towards the point of attachment the surface is often nearly smooth and sometimes shining, but externally more or less rugulose sculptured. This sculpture is sometimes so well-marked and the pattern so regular, that under a strong lens the surface of the sac presents a really beautiful appearance. In some species the external rugulose portion bears short, stiff, erect, bristles. The larval sac is formed of the skin of the curled up larva together with one or

more of the adherent skins of its earlier ecdyses. After a careful examination of the sacs of a large number of species, it would appear that the full number of larval moults is four (or possibly even five) but in some species the number may be reduced. At least in the case of a species of *Neodryinus* that was most closely investigated the number of ecdyses cannot be less than four (including that from larval to pupal condition) as is evident from an examination of the sac. In this genus the sac is partially removed to form a cover for the cocoon when the larva leaves its host. This cover is subovate or reniform and consists of two distinct larval skins attached to one another, longitudinally fissured at the moults and spread out valve-like, the smaller surrounded by the larger. Each of these skins is pierced by nine spiracles of which one (at the one end of the series) is indistinct in the larger skin. Besides these, one still smaller skin is left beneath the wing-lobe of the host and this is also distinctly pierced by a series of spiracles. It is possible that there is yet another smaller skin more internally placed, though this was not observed. Therefore there are at least four and possibly five moults in this species.

POSITION OF THE LARVAL SAC.

In dryinized Homoptera there is great diversity in the position of the larval sac. The position may vary in the case of a single species, or in different species of a genus, or it may be absolutely constant, and not only in a species, but apparently in all the species of a genus.

In most of the species of *Neochelogyne* the larval sac is ventral, and lies immediately behind the posterior coxa; in *N. coriaceus*, however, it is placed at the side of the neck. In *Parantcon* the larval sac is placed either dorsally or ventrally on any abdominal segment, as many as six or eight on a single individual; more rarely it has been found beneath the thorax, at the insertion of the hind coxae or on the prothorax laterally or beneath. In *Pseudogonatopus* the sac is always dorsal or dorso-lateral on the abdomen and several sacs may be found on one Delphacid. In *P. stenocrani* on the nymph of *Stenocranus dorsalis* the sac stands up erect like a wheel in the middle line between the wing-pads, giving it a most extraordinary appearance. All the species of *Echthrodelpfax*, *Paradryinus*, *Thaumato-dryinus* and *Neodryinus* have the larval sac placed beneath one

or the other wing lobe without variation. In *Eukoebelia*, the sacs are abdominal, variously placed, often several on one host.

ABNORMAL LENGTH OF TIME SPENT IN THE COCOON.

Considering the whole number of species of Dryinidae known to us, the average length of time spent from the period of spinning the cocoon to the emergence of the mature insect, would be from two to five weeks. Consequently as the egg state and the larval stages are known to be of short duration, many generations can be produced in a year. There comes a time however when, owing to the absence of the host in a suitable stage of development for the parasite that attacks it, or for other reasons, the Dryinid itself has to assume a lengthy resting period. So far as our observations go, this resting stage in the case of the parasite always takes place when the larva has spun its cocoon and before pupation. No doubt in countries with cold winters many pass the winter months in this stage; and in warm countries this quiescent condition is liable to be assumed at any season. During the summer months in Hawaii, occasional larvae of *Echthrodelpax* assume this torpidity in the cocoon, remaining in this condition for months, though perfectly healthy; and in some of the winter months the number that remain as larvae, when others (collected at the same time and treated in the same manner) emerge after the usual period, may amount to not less than 25 per cent. There is reason to suppose that not only a lowering of temperature, but that dryness even with increased temperature, may in some cases cause this torpidity. About 2,000 cocoons of *Dryinus*, sent to Hawaii from North America by Mr. Koebele, in the early part of November, produced in Honolulu two males a few weeks after arrival, and one male a month after these. The rest remained as torpid and shrunken larvae in the cocoons for five months after they had been collected. They were then taken to a cooler and damper locality, and all that were not killed by hyperparasites produced mature insects of both sexes in a short time. A number of curious cases were noticed in Queensland. For example, a larva of a *Paradryinus* that spun up on Oct. 1st, was still in the larval state, and, as evidenced by occasional movement, alive on Dec. 12th, though much shrunken. It was then killed and preserved. Larvae of this same *Paradryinus* that formed their cocoons in

numbers on Nov. 22nd, had all emerged as perfect insects before Dec. 12th. The cause of the retardation in development is not clear in this case, but that it may under certain conditions be of an advantage to the species is evident. This would especially be the case in a country subject to long droughts, when vegetation of many kinds is dried up for long periods together, during which the hosts of these parasites must almost cease to exist in a proper stage of development for their attack. It may also be of use against the attack of hyperparasites, if, as it appears, these have not the same habit of lying dormant, except of course during winter in cold countries.

COMPARATIVE STUDY OF GENERIC CHARACTERS OF DRYINIDAE.

(a). *The Mouth-parts.*

The mouth-parts have been largely used in the classification of the *Dryinidae* by other writers, and they are largely employed in this paper for generic differentiation, as I am convinced of their importance. Obviously the series of genera here considered may be divided into two groups (1) those with short maxillary palpi, always less than 6-jointed, and two-jointed labial palpi; (2) those with long or moderately long 6-jointed maxillary palpi, and with three-jointed labial palpi. If however, the number of joints of the palpi in several genera (not accessible to me) as given by Ashmead is correct, then this division will no longer be of the natural character it appears to be, when based on the species and genera herewith described. The only case where it may be necessary to reconsider the generic value of the number of joints in the maxillary palpi is that of *Gonatopus* (if indeed my species is truly that genus) and *Neogonatopus*. Excepting in the number of these joints, *G. australiae* and *N. dubiosus* are practically identical, and might be the same species; but in all other cases, where I have used them to distinguish allied genera, the maxillary palpi are essentially different. The maxillary palpi in the *Dryinidae* are from two-jointed to six-jointed. In all the genera with narrow elongate stigma to the front wings and with perfectly chelate, long front legs, these palpi consist of a basal part and an apical, distinguished by a natural geniculation at their meeting. The basal part consists of one or two joints; it two-jointed, the first is extremely short and sometimes even

obscure. As however it is so certainly homologous in all genera, though better developed in some than in others, it must certainly be counted in all where visibly present, or in none.

It appears to me after a comparative study of the base of the palpi in other Hymenoptera, that what I here count as the basal joint is sometimes considered a true joint by authors, sometimes as a 'palpiger' or process of the maxilla. In the Dryinidae in many forms there can be no doubt that it is a true moveable joint (as can easily be seen by watching a species under the microscope, as it recovers from narcosis), and I must repeat that it is obviously homologous throughout all those genera, in which it can be at all distinguished. I have drawn the palpi of most of the genera with the aid of the camera lucida to show the basal joints, but owing to our isolation these figures cannot be reproduced before the final part of this Bulletin is completed. I may add that it does not appear that the validity of any of the genera described by me would be affected in any case. Thus it is true that leaving out this basal joint my *Chalcogonatopus* would have 5-jointed maxillary palps, which is said to be the character of *Gonatopus* proper, but then the latter has 2-jointed, the former three-jointed labial palpi.

In *Paragonatopus*, *Haplogonatopus* and *Epigonatopus* only, this short basal joint is apparently absent; and there is therefore only a single joint before the geniculation in these genera; which also agree in having only a single elongate apical one beyond the geniculation.

The less specialized forms with large ovate stigma *Parantcon*, *Prosanteon* and *Neochelogyne* agree in having six-jointed maxillary palpi, as also do *Neodryinus*, *Chlorodryinus* and *Paradryinus*; and all these genera have three-jointed labial palpi. With these latter genera, and in my opinion related to *Neodryinus*, though apterous, and with the thoracic structure of *Gonatopus*, must be included *Chalcogonatopus*, with its similar labial and maxillary palpi. On the other hand, *Echthrodelphe* with its short maxillary and labial palpi resembles *Pseudogonatopus* and is obviously allied to this. Indeed I should consider that the latter and the allied apterous genera have been derived from some such form as the Australian *Echthrodelphe*, while *Chalcogonatopus* has arrived at a similar general structure, quite independently, from some such form as the Australian *Neodryinus*; the apterous condition having been accompanied with similar and remarkable changes in the thorax in each case.

The mandibles in all the species examined by me are tridentate or quadridentate. The genera with largely stigmated wings have the mandibles 4-dentate in both sexes alike, but excepting the anomalous *Eukocbelcia*, all the others, where the sexes are known, have 4-dentate mandibles in the female, 3-dentate in the male.

Tabulating these results, we find:

- A. Mandibles of male and female with four teeth; maxillary palpi 6-jointed, labial palpi three-jointed.....
.....*Neochelögynus*, *Prosantcon*, *Parantcon*.
- B. Mandibles of male 3-dentate; of female 4-dentate, maxillary palpi, 6-jointed, labial three-jointed.....
.....*Neodryinus*, *Paradryinus*, *Chlorodryinus* (probably *Thaumatodryinus*, and *Chalcogonatopus*.
- C. Mandibles of male 3-dentate; of female four-dentate; maxillary palpi less than six-jointed; labial palpi 2-jointed.
.....*Pseudogonatopus*, *Paragonatopus*, *Haplogonatopus*, *Gonatopus*, *Neogonatopus*, *Pachygonatopus* and *Echthrodelpax*.

So far as the Australian, American and Hawaiian material at my disposal is concerned, this is a quite natural division or classification of the genera, but the characters given by Ashmead for others, which I have not seen, will, if correct, upset this most natural arrangement. Thus the largely-stigmated genera *Antcon* and *Chelögynus* would, one would have expected, have three-jointed labial palpi and 6-jointed maxillary. In *Dryinus* with its 6-jointed maxillary palpi one would look for 3-jointed labial palps, like *Neodryinus*; and in fact *Dryinus ormenidis* Ashm. has them so, as well as quadridentate mandibles, and therefore does not enter the genus *Dryinus* at all as characterized in the Monograph of the N. A. Proctotrypidæ.

Unfortunately I have not been able to investigate the males of many genera, but all those examined by me resemble the females in the number of joints of the labial and maxillary palpi, though frequently differing somewhat in the character of these joints. Should it prove that the males in the difficult series of forms resembling *Gonatopus* always agree with their females in palpal characters, their separation will be greatly facilitated.

(b). *The thoracic segments.*

If we take one of the more primitive chelate forms such as *Neochelögynus* and *Parantcon*, the thorax does not present any

striking peculiarities. The pronotum varies in length, but its hind angles always attain the tegulae; the usual divisions remain distinct, with well defined sutures. The thorax of the males throughout the whole family in general resembles that of these females. That the males should remain in this comparatively primitive condition may at first sight seem anomalous, but it is not really so, when one considers that the great modification of parts in the females of the highly evolved forms is obviously entirely in connection with the habit of seizing and holding their prey, and not in any way due to sexual causes, such as would influence the other sex.

Turning to one of the most specialized winged forms, such as *Neodryinus*, we observe profound modifications of the thorax and of the front legs, the latter being lengthened in all their parts in a highly abnormal manner. The pronotum is remarkably elongate and further extension forwards (even to an increase of one-third the total length) is given by the development and dorsal position of other of the prothoracic elements. The pronotum itself is much narrowed behind and unusually mobile, but in spite of its great length the posterolateral angles fail to reach, and are often very remote from the tegulae.

In the apterous forms such as *Pseudogonatopus* the thoracic sclerites attain the greatest modification of all. Here the mesonotum is reduced to a small narrow bridge between the pronotum and propodeum. Ashmead (Mon. Proct. p. 82) evidently mistook the pronotum of *Gonatopus* for the mesonotum, when he says "the latter" (i. e. mesothorax) "elongate and humped at the middle and separated from the metathorax by a strong constriction." This strong constriction is the mesonotum itself; and the great sclerite in front of it (often separated by an impression into two lobes) as is easily seen by comparing it with *Neodryinus* and other winged genera, is the mobile pronotum. The small, narrow, true mesonotum is usually without division, but in some forms of these apterous insects there is a very distinct posterior or scutellar division; and in some cases the mesonotum and its scutellum can easily be removed entire from the pronotum and propodeum. In some of these apterous forms, the lateral and sternal elements of the mesonotum become entirely fused with the propodeum, and no sutures at all remain by which the divisions may be distinguished.

(c). *The raptorial front legs.*

If we exclude a few genera of comparatively unspecialized, or

primitive form, the most striking character of the Dryinidae is the remarkable raptorial front tarsi of the females. These consist of the usual five joints, of which the fifth is always (and generally very greatly) abnormal, and together with one of the claws, which is always extraordinarily developed, forms a seizing and holding apparatus somewhat similar to that of a lobster's 'claw.'

In most of the forms one or two preceding joints are likewise somewhat modified, being more or less produced at the base beneath into a lamellate process.

In two of the genera here characterized, *Prosantcon* and *Parantcon*, the chelae are in their least specialized form, and the fifth tarsal joint is hardly abnormal, except that at the base it extends beneath the short preceding joint, and that the vestiture is somewhat modified. The strongly curved claw is simple, except for a tooth or angulation at or near the base beneath, and at rest is folded back on the fifth joint.

In all the genera with chelate tarsi the pulvillus is well-developed, the second claw is either quite small, or apparently in many forms altogether wanting; the great chelar claw being always folded back on the fifth tarsal joint when the insect walks or rests, and only extended when it is in the act of seizing the prey.

In *Neochelogyus* the chelae have advanced a stage in development. Not only is the armature or vestiture of the fifth joint often more perfect, but the point of articulation of the fourth has advanced far along the fifth, to almost, or beyond, the middle of the whole length of this joint. In consequence of this change in the point of articulation, the chelae are somewhat moveable, though still incapable of perfect forward extension. The claw of the chelae remains of the same form as in the just named genera.

In the higher genera the chelae are far more perfect. The articulation of the fourth is pushed forward nearly to the apex of the greatly elongated fifth, which lies beneath it when at rest; or, expressed in another way, there may be said to be a long free basal backward process to the fifth, the extremity of which forms with the tip of the developed claw the apex of the chelae, when these are extended. Thus when the chelae are in action the apparent apex of the fifth tarsal joint is morphologically its extreme base.

In all the higher forms dealt with in this paper the fifth tarsal joint, though differing in minor details, is in most respects similar. It is bent and somewhat dilated at its basal free extremity

and there very densely armed with the curious lamellate denticles or spines, which are so striking a character of the chelae generally. Its articulation with the fourth is of such a character as to afford extreme mobility and there is also an extremely perfect articulation between it and the great claw, allowing the most rapid closing and opening of this claw.

The claw itself, forming the one-half of the chelae, is worthy of careful study. In *Pseudogonatopus*, *Paragonatopus* and *Haplogonatopus*, of the apterous forms, it is, except for the bent tip, nearly straight and sub-parallel-sided, and always well armed with the lamellate denticles beneath. It has always in addition a minute, but quite distinct, tooth on its lower side, very close to the tip.

In *Gonatopus*, *Neogonatopus*, *Epigonatopus*, *Pachygonatopus* and *Chalcogonatopus* on the other hand, this claw is more curved, subdilated basally, with its lower edge on that part sharp and slightly convexly curved and the lamellate denticles are altogether absent or very inconspicuous and ill-developed.

Echthrodelpfax, *Neodryinus*, *Paradryinus*, *Chlorodryinus*, and *Thaumatodryinus* in all essential respects resemble *Pseudogonatopus* and the two allied apterous genera.

Thus the genera with chelate tarsi form three groups:

(1). The chelae imperfectly extensile, the claw strong and nearly evenly curved, the lower edge nearly evenly concave; not armed beneath, except sometimes with a basal angulation or projection carrying a seta. The surface of the claw has a microscopic, longitudinal rugulose sculpture.

(2). The chelae are perfectly extensile, the claw is long, slender and less evenly curved, the curvature being chiefly on the apical third or half. The claw is subdilated basally, its lower edge not forming an even curve, but it is slightly convexly rounded on the basal half; lamellate denticles are altogether wanting or are very few and ill developed and more like mere setae, and there is no distinct microscopic tooth close to the apex. An almost imperceptible angulation is sometimes seen further back from the apex of the claw under strong magnification.

(3). The chelae are perfectly extensile; the claw long and slender and well armed beneath with lamellate denticles and with a small but quite distinct tooth near the apex; it is nearly straight and parallel-sided except that the tip is bent, and its lower margin on the basal half is not at all convexly curved, nor is the claw on that part subdilated.

Of the species considered in this paper the only real exception

to the above division is the remarkable new form called *Eukoebeleia*. This might form a separate division, having the chelar claw more curved, and armed apparently rather with serrations beneath, than with the ordinary lamellate structures, while the modified fifth tarsal joint also utterly lacks the usual armature and instead of being dilated at the extremity of its process is here narrowed into a curved hook.

As any one acquainted with the structure of the *Dryinidae* might guess from the abnormal character of this insect, its host is of a very special form, being none other than the anomalous *Bruchomorpha*.

Returning to the three primary divisions, it should be remarked that under the first are included all the forms with short, stout front legs and with large ovate stigma to the front wings and all the many species bred are absolutely confined to leafhoppers of the Jassid family, whether arboreal or subterrestrial.

Under the second are included only apterous species of *Gonatopus* and the four genera named above in connection with it, and all these are parasitic on Jassids, whether arboreal or subterrestrial.

The third, comprises all the other genera, of all of which we have bred species, and these are attached solely to Fulgorid leafhoppers either arboreal, or subterrestrial (i. e. graminivorous).

It is interesting to note that the first division which consists of the most primitive forms of *Dryinidae* are attached only to the less specialized *Jassidae*, while the varied and highly evolved forms included under the third are restricted to the highly specialized *Fulgoridae*, the second section containing comparatively a few highly evolved but always apterous forms that still remain attached to the *Jassidae*. Further it will be noted that the chelar claw of the first and second divisions comprising parasites of Jassids only, is always of different form and differently armed from those of the third, which are parasites of Fulgorids. and as far as our researches go, a Jassid parasite can immediately be distinguished from that of a Fulgorid by an examination of the claw alone.

THE NATURAL POSITION OF THE DRYINIDAE.

The *Dryinidae* are treated by Ashmead in his later classifications as a sub-family of the *Bethylidae*, the latter being included in the super-family *Vespoidea*. In placing the insects in the *Aculeate* series he reverts to Haliday's classification of 1839,

while in his Monograph of the North American Proctotrupidae (1893) he agreed with Westwood and Forster in placing them in the Proctotrupids, seeing a relationship with the Ceraphroninae, which are still left in the Proctotrupidae.

The super-family Vespoidea of Ashmead appears to me an unnatural assemblage of forms, and by no means comparable with, or equivalent to, the very natural series comprised under the Apoidea and Sphegoidea. It is very doubtful whether the old classification into Anthophila, Fossores and Diploptera is any way improved by the severance of one main division of the Fossores and by its addition to the Diploptera, to which are also added the Bethylidae, Dryinidae and Chrysididae, etc., to form a super-family.

If we examine the characters laid down for the separation of the super-family Vespoidea, we find that this depends on the fact of the "pronotum extending back to the tegulae, or the latter absent." Yet in great numbers of winged female Dryinids the pronotum does not extend back to these, and in great numbers of the Chrysididae the hind angles of the pronotum not only do not attain, but are quite remarkably distant from, the tegulae.

As therefore the Bethylidae (incl. Dryinidae) and the Chrysididae do not fall naturally into one great super-family with the Vespidae, and can only be placed therein by disregarding the characters assigned to the Vespoidea, it seems to me better to recognize this fact. Of course by employing alternatives, such as the character of the abdominal segments, etc., for the Chrysididae and the chelate tarsi of the Dryinidae, these families might be made to fit in the Vespoid series, or anywhere else for that matter, yet such a procedure will hardly carry conviction to the majority of hymenopterists.

To me the Dryinidae together with the allied Bethylidae and the small and little known sub-family Emboleminae* of Ashmead (which may probably be merged in one or other of these) constitute a natural group, synthetic between the old Fossorial series of the Aculeata and the true Proctotrupidae; while the Chrysididae also constitute a group apart, which cannot be rightly merged in the Bethylid series, nor yet in the Aculeata.

Dr. Ashmead considers the Dryinidae as "evidently an ancient phylogenetic type of the order, the chelate anterior tarsi in the

* My knowledge of this sub-family is acquired from Ashmead's standard work on the Proctotrupids of North America, and from an undescribed insect which I refer to this group, though its structures will necessitate changes in the characters assigned to the Emboleminae. The larva is an external parasite of small crickets of the genus *Trigonidium* or allied forms, and like the Dryinidae leaves the several larval skins behind, as a ruptured sac, after the penultimate larval ecdysis.

females being found in no other group along the Hymenoptera" (Mon. N. A. Proct. p. 81). I am unable to see in what possible way the remarkable and highly evolved form of the front legs can in any way affect this matter, for, surely, it has no phylogenetic significance, being in no way homologous with the chelate legs of other orders of insects. Moreover, in existing species of the Dryinidae we can clearly see how the highly modified chelate tarsus of such a form as *Dryinus* or *Gonatopus* has arisen within the limits of the family from the simple non-chelate tarsus of such a form as *Aphelopus*. It is from these simple forms that the affinities of the Dryinidae must be judged.

SYSTEMATIC ACCOUNT OF THE DRYINIDAE.

The following list comprises all the species specially considered in this paper, and I may add that the species first described in each new genus is to be considered as the type of that genus. It will be observed that the generic characters are all drawn up from female examples, although I have added a short table of characters that distinguish the males in a considerable number of genera. Similarly in only a few cases are the males of the various species described, in fact only in those cases, where there is no doubt whatever that they are rightly assigned to their partners. Where one sex only is described, it is always the female; where both sexes are described, that of the male always follows the description of the female. Had I cared to describe males, which cannot at present be certainly associated with their females, the list of new species would have been greatly increased, but it would have served no useful purpose to do this, since in many cases the males of species, most distinct in the other sex, are hardly separable specifically.

In the list, all species marked with an asterisk have had the mouth parts dissected and examined in balsam; others have had them, totally or partially dissected out, and examined dry; while some from their very close relationship to other species I have not thought it necessary to examine thus minutely.

PSEUDOGONATOPUS, g. nov.

1. <i>P. kurandae</i> , sp. nov.*	* 6. <i>P. americanus</i> , sp. nov.*
2. <i>P. juncetorum</i> , sp. nov.	7. <i>P. opacus</i> , sp. nov.
3. <i>P. palustris</i> , sp. nov.*	8. <i>P. stenocrani</i> , sp. nov.*
4. <i>P. saccharetorum</i> , sp. nov.	var. <i>dubiosus</i> , var. nov.
5. <i>P. dichromus</i> , sp. nov.*	

HAPLOGONATOPUS, g. nov.

9. *H. apicalis*, sp. nov.* 11. *H. americanus*, sp. nov.*
 10. *H. moestus*, sp. nov.

PARAGONATOPUS, g. nov.

12. *P. nigricans*, sp. nov.*

GONATOPUS Ljung.

13. *G. australiae*, sp. nov.*

NEOGONATOPUS, g. nov.

14. *N. ombrodes*, sp. nov.* 18. *N. dubiosus*, sp. nov.
 15. *N. erythrodes*, sp. nov.* 19. *N. brunnescens*, sp. nov.
 16. *N. obscurissimus*, sp. nov. 20. *N. pallidiceps*, sp. nov.
 17. *N. pulcherrimus*, sp. nov.

EPIGONATOPUS, g. nov.

21. *E. solitarius*, sp. nov.*

PACHYGONATOPUS, gen. nov.

22. *P. melanias*, sp. nov.*

CHALCOGONATOPUS, g. nov.

23. *C. gigas*, sp. nov.* 25. *C. decoratus*, sp. nov.*
 24. *C. optabilis*, sp. nov.*

EUGONATOPUS, subg. nov.

26. *E. pseudochromus*, sp. nov.*

ECHTHRODELPHAX, Perk.

27. *E. fairchildi*, Perk.* 29. *E. bifasciatus*, sp. nov.
 28. *E. nigricollis*, sp. nov.

NEOGONATOPUS, g. nov.

30. *N. koebelei*, sp. nov.* 32. *N. raptor*, sp. nov.
 31. *N. nelsoni*, sp. nov. var. *umbrata*, var. nov.

PARADRYINUS, g. nov.

33. <i>P. koebelei</i> , sp. nov.*	36. <i>P. gigas</i> , sp. nov.
34. <i>P. venator</i> , sp. nov.*	37. <i>P. leptias</i> , sp. nov.
35. <i>P. threnodes</i> , sp. nov.	38. <i>P. varipes</i> , sp. nov.

CHLORODRYINUS, g. nov.

39. *C. pallidus*, sp. nov.

THAUMATO-DRYINUS, g. nov.

40. *T. koebelei*, sp. nov.

EUKOEBELEIA, gen. nov.

41. *E. mirabilis*, sp. nov.*

NEOCHELOGYNUS, g. nov.

42. <i>N. typicus</i> , sp. nov.	47. <i>N. destructor</i> , sp. nov.*
43. <i>N. nitidus</i> , sp. nov.	48. <i>N. cognatus</i> , sp. nov.
44. <i>N. leiosomus</i> , sp. nov.	49. <i>N. parvulus</i> , sp. nov.
45. <i>N. dimidiatus</i> , sp. nov.	50. <i>N. coriaceus</i> , sp. nov.
46. <i>N. nigricornis</i> , sp. nov.*	51. <i>N. pallidicornis</i> , sp. nov.

PROSANTEON, g. nov.

52. *P. chelogynoides*, sp. nov.*

PARANTEON, g. nov.

53. *P. myrmecophilus*, sp. nov.*

SYNOPSIS OF GENERA OF DRYINIDAE.

Females.

1. (41) Tarsi of front legs with the fifth joint always more or less modified and with one claw greatly developed and capable of closing back on the fifth joint, so as to form more or less perfect chelae or pincers.
2. (18) Mesonotum forming a narrow bridge or stalk between the large pronotum and propodeum. Species wingless.

3. (4) Maxillary palpi 5-jointed..... *Gonatopus Ljungh.*
4. (3) Maxillary palpi not 5-jointed.
5. (10) Chelar claw armed conspicuously with special denticles similar to those on the fifth tarsal joint beneath, its lower margin nearly straight on the basal half, not with a sharp subconvex edge.
6. (9) Pronotum with a conspicuous transverse impression before the middle, dividing it into a shorter anterior and longer posterior lobe.
7. (8) Maxillary palpi 4-jointed.....*Pseudogonatopus*
8. (7) Maxillary palpi 2-jointed..... *Paragonatopus.*
9. (6) Pronotum without a distinct transverse impression (maxillary palpi 2-jointed).....*Haplogonatopus.*
10. (5) Chelar claw more curved, usually with few or no denticles beneath, or at most with very inconspicuous ones, which are absent from the apical part, the lower edge on the more basal part slightly convexly curved, so that the claw is much less parallel-sided than that of the preceding three genera.
11. (16) Maxillary palpi not 6-jointed.
12. (15) Anterior trochanters very long, with a longish thin basal stalk; head above very distinctly concave from eye to eye.
13. (14) Maxillary palpi 4-jointed..... *Neogonatopus.*
14. (13) Maxillary palpi 2-jointed.....*Epigonatopus.*
15. (12) Anterior trochanters stout, not very elongate, widening from the base, so that there is no long narrow basal portion; head above not distinctly concave from eye to eye. (Maxillary palpi 3-jointed, the basal excessively small).....*Pachygonatopus.*
16. (11) Maxillary palpi 6-jointed.....*Chalcogonatopus.*
- 17-a. (17-b.) A distinct suture or impression extending forwards from the middle coxae and dividing the propodeum from the mesothoracic elements.....
.....*Chalcogonatopus s. s.*
- 17-b. (17-a.) (b) No such suture visible, the propodeal and mesothoracic elements fused laterally.....
.....subg. *Eugonatopus.*
18. (2) Mesonotum of ordinary form, species fully winged or with rudimentary wings.
19. (28) Posterior lateral angles of the pronotum not nearly attaining the tegulae.

20. (21) Maxillary palpi very short, 4-jointed, basal joint very small, the entire palpi capable of being concealed within the buccal cavity; parapsidal furrows very distinct, meeting posteriorly so as to enclose a narrow elongate triangular area. . . *Echthrodolphax* P.
21. (20) Maxillary palpi long and conspicuous reaching back at least beyond the middle of the head, if laid at full length along the middle line, and generally reaching to its hind-margin or behind this.
22. (25) Vertex of head slightly concave or impressed, never convex.
23. (24) Labial palpi 2-jointed, mandibles 3-dentate, (sec. Ashmead (Mon. Proctotryp.) *Dryinus* Latr.
24. (23) Labial palpi 3-jointed, mandibles 4-dentate, parapsidal furrows entirely wanting. *Neodryinus*.
25. (22) Vertex of head not impressed or concave.
26. (27) Occipital concavity well and distinctly margined even at the sides. *Paradryinus*.
27. (26) Occipital concavity with a very faint margin behind the ocelli, which fails at the sides . . *Chlorodryinus*.
28. (19) Pronotum attaining the tegulae posteriorly.
29. (32) Stigma elongate and narrow, generally lanceolate, not wide and ovate, or the wings are abbreviated and rudimentary.
30. (31) Wings fully developed, antennae extremely long and thin, filiform, head short on the vertex, more than twice as wide as long. *Thaumtodryinus*.
31. (30) Wings minute, rudimentary (mandibles 3-dentate, maxillary palpi 6-jointed, eyes conspicuously hairy) *Eukoebelcia*.
32. (29) Stigma large of ovate or subovate form, and the wings fully developed.
33. (36) Fourth joint of front tarsi elongate, much longer than the third, and articulated to the fifth at a distance from the true apex (or insertion of the pulvillus) of $\frac{1}{2}$ to $\frac{1}{3}$ the length of the whole joint.
34. (35) Maxillary palpi 5-jointed; propodeum long, rounded posteriorly (sec. Ashmead Mon. Proct.) *Chelogyne* Hal.
35. (34) Maxillary palpi 6-jointed. *Neochelogyne*.

36. (33) Fourth joint of front tarsi small and short, not differing much from the third, and articulated far from the true apex of the fifth, so that the latter is almost normal being only slightly produced beneath in front of its articulation with the fourth.
37. (38) Maxillary palpi 4-jointed, labial palpi 2-jointed, mandibles 3-dentate (sec. Ashmead Mon. Proct.).....*Anteon Jur.*
38. (37) Maxillary palpi 6-jointed, labial palpi 3-jointed, mandibles 4-dentate.
39. (40) Antennal joints widening more or less towards the apex of the antennae; propodeum bounded by a raised line at the truncature and with a definite median area on its posterior face....*Prosanteon.*
40. (39) Antennae simply filiform, not at all widening towards apex; propodeum without the above characters....*Paranteon.*
41. (1) Tarsi of front legs simple, not chelate.
42. (43) Apterous; maxillary palpi 4-jointed (sec. Ashmead Mon. Proct.).....*Mystrophorus* Forst.
43. (42) Winged; maxillary palpi 5-jointed (sec. Ashmead Mon. Proct.).....*Aphelopus* Dalm

Males.

1. (14) Stigma not large and ovate or subovate, but narrow lanceolate; mandibles with three teeth.
2. (5) Maxillary palpi very short and inconspicuous, labial palpi two-jointed.
3. (4) Antennae sometimes long, but never extremely thin and filiform; the head not incrassate.....*Gonatopus* (and most of the allied genera).
4. (3) Antennae extremely thin and long, the head incrassate.....*Echthrodelpax.*
5. (2) Maxillary palpi long and conspicuous, reaching at least to the posterior margin of the head, if laid straight back; labial palpi three-jointed.
6. (9) Ocelli in a slightly curved line on the vertex, the front ocellus, at most, a very little in front of the posterior pair.

7. (8) Basal cells not indicated by distinct nervures.....*Chalcogonatopus*.
8. (7) Basal cells distinct, even though the neuration be pallid.*Neodryinus*.
9. (6) Ocelli in a well-marked triangle, the front one well in advance of the posterior.
10. (11) Eyes not hairy.....*Chlorodryinus*.
11. (10) Eyes distinctly hairy.
12. (13) Antennae with long flagellar joints, the third not less than four times as long as wide.....*Paradryinus*.
13. (12) Antennae with short flagellar joints, the third not or hardly twice as long as its greatest width.....*Eukocbelea*.
14. (1) Stigma large, ovate or subovate, mandibles with four teeth.
15. (16) Antennae with short flagellar joints, which are not twice as long as wide.....*Neochelogyne*.
16. (15) Antennae with elongate moniliform joints, which are contracted at base and apex and fully twice as long as wide.....*Paranteon*.

PSEUDOGONATOPUS, gen. nov.

Apterous, general form that of *Gonatopus*, the mesonotum very small and narrow, forming a stalk between the large pronotum and propodeum.

Vertex of head quite deeply concave, third joint of antennae much longer than the fourth; labial palpi two-jointed, maxillary palpi four-jointed (counting the extremely short basal joint) with two joints beyond the geniculation; mandibles with four teeth, the two inner minute. Front legs with very long, clavate trochanters, which have a long thin basal portion; fourth tarsal joint very long, several times as long as the preceding joint; claw of chelae armed beneath with special denticles similar to those beneath the modified fifth tarsal joint, bent near the apex and the lower edge with a small anteapical tooth, otherwise nearly straight and subparallel-sided, the lower margin on the basal half nearly straight, not convexly curved. Pronotum with a deep transverse impression before the middle.

Synopsis of Species of PSEUDOGONATOPUS.

1. (8) Propodeum without conspicuous pilosity.
2. (5) Propodeum ferruginous or testaceous.
3. (4) Propodeum shining, third joint of antennae not longer than the scape..... *P. dichromus*.
4. (3) Propodeum not shining; third joint of antennae longer than the scape..... *P. americanus*.
5. (2) Propodeum black (with very dense coriaceous or microscopically rugulose sculpture).
6. (7) Intermediate and posterior femora and tibiae dark, black or piceous..... *P. opacus*.
7. (6) Intermediate and posterior femora and tibiae pale, yellowish brown to testaceous.
- 7a. (7b) Tip of antennae conspicuously pale. *P. stenocrani*.
- 7b. (7a) Tip of antennae black..... *P. dubiosus*, var. *praec*.
8. (1) Propodeum with conspicuous pilosity.
9. (10) Propodeal elevation strongly channeled in the middle and prominent on either side of the channel..... *P. junctorum*.
10. (9) Propodeum behind the spiracles at most a little flattened or concave, not fissured so as to form two prominences.
11. (12) Propodeum in dorsal aspect with prominent anterior lateral angles..... *P. kurandae*.
12. (11) Propodeum without prominent anterior lateral angles.
13. (14) Mesonotum conspicuously pallid... *P. saccharetorum*.
14. (13) Mesonotum not conspicuously pallid, concolorous with the rest of the thorax or nearly so *P. palustris*.

1. *Pseudogonatopus kurandae*, sp. nov.

Brown, the abdomen black or nearly so, the face, the propodeum in front and posteriorly above the petiole, pale yellowish brown or testaceous; the two basal and the apical antennal joint quite pale, tibiae and tarsi testaceous, the front tibiae more or less brown.

Head smooth, shining, posteriorly with fine and rather long hairs, third antennal joint long and slender, fully twice as long as the second, longer than the scape and much longer than the

fourth, which is greatly longer than the fifth, the latter fully twice as long as its greatest width. Pronotum very smooth and shining and with a few short hairs; propodeum smooth and shining on the anterior pale-coloured portion, behind the spiracles flattened or faintly impressed, posteriorly transversely rugose and sparsely clothed with long fine hairs; in dorsal aspect with prominent anterior lateral angles. Abdomen smooth, shining, with longish pale hairs. Length about 3 mm.

Hab. Kuranda, Queensland; bred.

2. *Pseudogonatopus juncetorum*, sp. nov.

Closely allied to the preceding and perhaps more closely to the next following species. Almost like *P. kurandae* in colour since the mesonotum is conspicuously pallid except at the base and apex, as in that species. The propodeum however, is without the prominent anterior angles and of a slightly different shape, nor does it altogether in this respect agree with *P. palustris*. From the latter it is readily distinguished by its colour, and it is perhaps a larger insect. Length about 3 mm.

Hab. Childers, Queensland; bred.

3. *Pseudogonatopus palustris*, sp. nov.

Piceous or castaneous, abdomen black or nearly so, two basal joints of the antennae and the apical one, as well as the face below the antennae, pale. Tibiae and tarsi more or less testaceous or brownish yellow.

In structure, sculpture and clothing almost like *P. kurandae* but differs in the rather different shape of the propodeum, which is less evidently flattened behind the spiracles and in dorsal aspect its lateral anterior angles are rounded off or effaced. The mesonotum is not conspicuously pale, the whole thorax being concolorous or nearly so. Length 2.5-3 mm.

Hab. Brisbane and Bundaberg, Queensland; bred.

4. *Pseudogonatopus saccharetorum*, sp. nov.

Brown or more or less piceous (the abdomen darkest) and shining. Antennae paler than in any of the preceding, sometimes with all the joints pale yellowish brown, the second and the apical then being still paler, or with the intermediate joints more or less infusate.

Allied to the preceding several species, with which it agrees in sculpture, clothing, etc., but the propodeum is much more abruptly raised into a hump-like form, its profile forming a much stronger curve, and the summit of the hump is quite deeply fissured in the middle to form a prominence on either side. Length about 3 mm.

Hab. Hambledon, near Cairns; bred.

5. *Pseudogonatopus dichromus*, sp. nov.

Testaceous or rufotestaceous, the abdomen black or piceous, except just behind the petiole, where it is more or less pale. Antennae black, the two basal joints and the apical one more or less distinctly pale.

Head more or less shining and without definite sculpture; second joint of the antennae twice as long as wide, third joint much longer than the second, which is hardly as long as the fourth, seventh, eighth and ninth a little longer than wide. Pronotum shining, smooth, impunctate, or nearly so; propodeum shining and smooth in front; posteriorly transversely strigose, not pilose. Abdomen shining, impunctate. Length 2-3 mm.

Male. Black, the face below the antennae mostly pale, legs and antennae obscure black or fuscous, base of posterior and intermediate tibiae and their tarsi often quite pallid.

Head above the antennae very densely and finely punctate or coriaceous; second joint of the antennae ovate, short, hardly as long as the scape and very distinctly shorter than the third. Mesonotum with the parapsidal furrows obsolete or extremely faint, clothed with very short pubescence when not rubbed, very finely and indefinitely punctured; propodeum, to a large extent at least, smooth and shining, and with a shallow median longitudinal impression in front. Wings with the stigma rather light fuscous, the basal cells not defined by coloured nervures.

Hab. Redlynch near Cairns and Bundaberg, Queensland; bred.

6. *Pseudogonatopus americanus*, sp. nov.

Ferruginous, the vertex of the head dark brown or blackish, as also the abdomen, except near the base and at the apex; the face, mandibles (except the teeth) and legs testaceous. Antennae black, the two basal and more or less of the third joint, pale. Legs, with the femora especially, more or less discoloured, brownish.

Vertex of head only slightly shining; third joint of antennae very long and slender, more than twice as long as the second, the apical joint black or almost so. Pronotum not very shining, and like other parts of the thorax more or less suffused or marked with black; mesonotum in the middle paler than the rest of the thorax; propodeum very strongly raised or convex, the surface dull, but with hardly visible sculpture on the middle behind the spiracle, posteriorly transversely strigose. Abdomen smooth impunctate, apparently glabrous. Length 3-3.5 mm.

Hab. Columbus, Ohio, U. S. A. (Koebele).

Pseudogonatopus opacus, sp. nov.

Black or pitchy, the face below the antennae, the two basal joints of these more or less, the anterior tibiae and tarsi, testaceous. The posterior tarsi and part of the apical joint of the antennae more or less, pale-coloured.

Dull, the head densely and minutely sculptured, appearing punctured, as also the whole of the thorax, even the posterior face of the propodeum with this sculpture instead of the usual transverse rugosity, and without evident pilosity. Abdomen smooth and shining and bearing short pale hairs. Length 2-3 mm.

Var. a. (?immature) Paler, more pitchy than black with the hind and middle tarsi quite pale and the apical joint of the antennae much more distinctly so than in the type.

Hab. Bundaberg and Brisbane, Queensland; bred.

8. *Pseudogonatopus stenocrani*, sp. nov.

Vertex of head dark, face and occiput pale, varying from ferruginous to yellowish white. Antennae with the two basal, sometimes the third, the apical, and one or two of the preceding joints more obscurely, pale. Pronotum ferruginous or brown, often more or less suffused or marked with black; propodeum black; legs testaceous, the front femora and tibiae especially, more or less dark brown.

Head and pronotum with extremely fine hardly visible punctures, or surface sculpture; the propodeum with extremely dense microscopic sculpture, appearing like fine and dense puncturation, but due really to reticulation of the surface as in the preceding species. In profile the propodeum is not at all abruptly

humped and posteriorly bears at most a few short and inconspicuous hairs. Length 2-3 mm.

Hab. Ohio, U. S. A. (Koebele).

P. stenocrani var. *dubiosus* var. nov.

Like the typical form in structure but without the pale tips to the antennae.

Hab. Ohio, U. S. A. (Koebele).

HAPLOGONATOPUS, gen. nov.

Mandibles, maxillary and labial palpi, and the front legs practically as in the preceding genus, but the pronotum is very different, not being divided into a transverse anterior and elevated posterior portion, being quite simply convex, and the head is much more deeply concave.

Synopsis of Species of HAPLOGONATOPUS.

1. (4) Thorax for the most part dark-coloured or black.
2. (3) Apical joint of the antennae and the mesonotum largely, pale.....*H. apicalis*.
3. (2) Apical joint of the antennae and the mesonotum dark*H. moestus*.
4. (1) Thorax ferruginous or testaceous, at most a little infusate*H. americanus*.

1. *Haplogonatopus apicalis*, sp. nov.

Black or more or less pitchy, the face on its lower half, the two basal, and sometimes the third antennal joint more or less, the apical joint, and sometimes more or less of the preceding, the mesonotum for the most part, and the legs (which are, however, often largely brown), pale, yellow to testaceous. Pronotum and propodeum posteriorly sometimes brown.

Antennae with the third joint long and slender, about twice as long as the second, the head above with scarcely visible sculpture. Pronotum very smooth, shining; mesonotum conspicuously pale; propodeum in front of the spiracles very finely transversely rugulose, behind these smooth and shining, posteriorly more or less distinctly transversely rugulose and without evident

pilosity. Abdomen smooth, shining, glabrous. Length 2-2.5 mm.

Hab. Bundaberg and Childers, Queensland; bred.

2. *Haplogonatopus moestus*, sp. nov.

Apparently identical structurally with the preceding, but the apical joint of the antennae is not pale, nor does the mesonotum differ greatly from the rest of the thorax in colour, and consequently the two forms are very easily distinguished by colour characters, which appear to be of specific importance.

Hab. The Mulgrave near Cairns, Queensland; bred.

3. *Haplogonatopus americanus*, sp. nov.

Ferruginous to testaceous in colour, the abdomen black, or obscurely pallid, changing much during life in some individuals. The antennae black, the apical joint and the two or three basal ones pale. Head generally brown on the vertex, parts of the thorax also sometimes more or less darkened.

Head with scarcely visible sculpture; pronotum shining, the transverse impression just perceptible at least at the sides in some examples, very minutely, in fact hardly perceptibly, punctured; propodeum dull, with microscopic surface rugulosity, and not at all pilose. Abdomen smooth, glabrous. Length about 2.5 mm.

Hab. Columbus, Ohio, U. S. A. (Koebele and Swezey). Mr. Swezey was of the opinion that this species was *Gonatopus bicolor* Ashmead, but that species has the "metathorax smooth, polished." I have bred about 150 females of *H. americanus* without apparent variation.

PARAGONATOPUS, gen. nov.

Head evidently, but only lightly, concave on the vertex; third joint of antennae very long (about twice as long as the fourth in the typical species). Mandibles 4-dentate, maxillary palpi only two-jointed, one elongate joint beyond the geniculation and apparently only one before this, the extremely short basal joint, that is present in allied genera, being apparently absent. Trochanters of front legs, as well as the tarsi and claw of chelae and the form of the pronotum, etc., as in the preceding genus.

Paragonatopus nigricans, sp. nov.

Black, the face below the antennae pale, the vertex of the head usually brown, sometimes piceous or nearly black, two basal joints of the antennae entirely or largely, the third sometimes more or less, pale. Legs generally to a large extent obscure brown or piceous, all the tarsi and trochanters and the hind tibiae pale yellowish brown or testaceous, but the legs vary in colour.

Head above more or less shining, and hardly perceptibly sculptured; the antennae slender, the third joint thin and elongate, about three times as long as the second, and almost twice as long as the fourth. Pronotum shining, its posterior lobe finely punctured, the propodeum finely transversely rugose in front and posteriorly, between these parts smoother, and usually finely punctured, sometimes impunctate, not pilose. Abdomen smooth, shining, almost or quite glabrous. Length 2.5-3 mm.

Hab. Bundaberg, Queensland; bred.

? GONATOPUS Ljungh.

Mandibles 4-dentate, maxillary palpi five-jointed, the basal joint extremely short and with three joints beyond the geniculation, labial palpi two-jointed. Vertex of head deeply concave; antennae with the third joint long, slender, from one-third to one-half longer than the fourth.

Pronotum deeply impressed, so as to be divided into a transverse anterior and elongate narrow posterior lobe. Front legs with trochanters very long, clavate, with long thin basal stalk; fourth tarsal joint very long, differing not much in length from the basal one, chelar claw curved, subdilated on its basal portion, and with the lower edge slightly convexly curved, and these armed at most with a few very inconspicuous denticles or spinose hairs.

Gonatopus australiac, sp. nov.

Black, the head, the thorax excepting the propodeum, brown or ferruginous. The face generally paler than the vertex of the head, the front lobe of the pronotum sometimes dark, propodeum rarely more or less of an obscure reddish black. Scape of antennae in front quite pale, the following two joints, or one of them, sometimes more or less so, the apical joint black, the legs with pale tibiae and tarsi, the femora generally largely brown or dark.

Head very deeply concave above, smooth and shining and fringed behind with longish hairs; the antennae slender, with long thin third joint, about one and a half times as long as the fourth. Pronotum smooth and shining; mesonotum rugulose; propodeum shining, transversely rugose behind, and thinly clothed with long pale hairs. Abdomen smooth and shining, at the base with some erect pale hairs, elsewhere glabrous. Length 2-3 mm.

Hab. Bundaberg, Queensland; bred.

NEOGONATOPUS, gen. nov.

Differs from Gonatopus, as characterized above, only by the 4-jointed maxillary palpi, there being two not three joints beyond the geniculation.

Synopsis of Species.

1. (4) Propodeum without hairs, and entirely black.
2. (3) Head, neck, and anterior margin of pronotum ferruginous, or pale yellowish brown; rest of thorax and abdomen deep black. *N. pallidiceps*.
3. (2) Head above dark brown or blackish, or largely suffused with dark colour. *N. ombrodes*.
4. (1) Propodeum with distinct erect hairs; sometimes ferruginous, wholly or in part.
5. (6) Whole thorax ferruginous; tip of antennae white.
. *N. pulcherrimus*.
6. (5) Propodeum at least (and sometimes most of the thorax) more or less dark; tip of antennae not white.
7. (8) Propodeum dark brown, generally paler anteriorly; head above only lightly concave. . . *N. brunnescens*.
8. (7) Propodeum black; head above strongly concave.
9. (10) Whole pronotum and the neck in front of this clear ferruginous; propodeum dull, with very dense sculpture. *N. erythrodes*.
10. (9) Pronotum mostly black, piceous, or dark brown; if in part it is rather distinctly red or ferruginous, then the propodeum is polished and very shining.
11. (12) Abdomen on its basal face with conspicuous erect hairs; propodeum highly polished. . . *N. dubiosus*.
12. (11) Abdomen on its basal face without long erect hairs; propodeum not highly polished. . *N. obscurissimus*.

1. *Neogonatopus ombrodes*, sp. nov.

Black, the vertex of the head, and the pronotum (more or less) often piceous or brown; face and occiput yellow or ferruginous; basal two, and sometimes the third joint of the antennae more or less, pale; legs pale yellowish brown or testaceous, in parts often dark brown, variable in colour.

Head rather long, very much longer than half its width, and owing to a very minute puncturation or surface sculpture little, or not at all, shining; third joint of antennae long and slender, twice as long as the second. Pronotum with close and very fine punctures or surface sculpture; propodeum dull and very densely sculptured, appearing punctate, but probably with dense microscopical reticulate sculpture of the surface, which is hairless, or almost so. Abdomen smooth, shining, glabrous, no longish hairs basally. Length 3-3.5 mm.

Hab. Columbus, Ohio, U. S. A. (Koebele).

2. *Neogonatopus erythrodes*, sp. nov.

Ferruginous, the propodeum black, the abdomen probably black when the insect first emerges, but becoming testaceous more or less suffused with black or brown, as it grows older; head above more or less dark, the antennae black, with the three basal joints pale. All the legs yellowish-brown, or testaceous.

Head above somewhat shining, not nearly twice as wide as long; pronotum shining and with a very fine indefinite puncturation; propodeum dull, having the same dense sculpture as in the preceding species, but with the whole of the posterior face distinctly transversely rugose, and bearing scanty but distinct, erect hairs. Abdomen smooth, shining, shortly pilose. Length about 3 mm.

Hab. Columbus, Ohio, U. S. A. (Koebele).

3. *Neogonatopus obscurissimus*, sp. nov.

Black, in parts (especially the pronotum, mesonotum and some of the leg joints) dark brown or piceous. Basal two and more or less of the third joint of the antennae, as well as all the tarsi, and more or less of the hind tibiae and femora, pale, yellowish or testaceous.

Head shining and with a sparse fringe of hairs posteriorly; pronotum smooth and shining, hardly perceptibly sculptured; pro-

podeum in some aspects somewhat shining in some parts, above with minute dense surface sculpture, and posteriorly finely transversely rugose, and bearing evident, longish, erect hairs. Abdomen very smooth and shining, sparsely pilose. Length about 3 mm.

Hab. Columbus, Ohio, U. S. A. (Koebele).

4. *Neogonatopus pulcherrimus*, sp. nov.

Ferruginous, the abdomen black. Antennae black with the three basal, and the fourth joint more or less, testaceous, the apical one white.

Head above very smooth and shining, and fringed posteriorly; the antennae thick, the joints from the fourth on being unusually short and wide. Pronotum very smooth, and shining, the mesonotum less narrow than usual; the propodeum smooth and shining, very conspicuously pilose, and on the posterior face finely transversely rugose. Abdomen smooth, shining, at the base conspicuously pilose. Length about 3 mm.

Hab. Bundaberg, Queensland; bred.

5. *Neogonatopus dubiosus*, sp. nov.

Black, shining, head above usually dark brown or brown, the face paler; basal or two basal antennal joints pale, as also the greater part of the legs; posterior lobe of the pronotum and the mesonotum nearly always dark, black or pitchy.

Form, sculpture and clothing identical with that of *Gonatopus australiac* but with the pronotum and mesonotum nearly always, if not invariably, less red, and with only two joints beyond the geniculation of the maxillary palpi. Length 2.5-3 mm.

Hab. Bundaberg, Queensland; bred.

6. *N. brunnescens*, sp. nov.

Largely brown or yellowish-brown, the abdomen sometimes black or dark brown, sometimes sordid testaceous, variable, no doubt changing colour with age; propodeum posteriorly dark brown or pitchy. Basal two joints of the antennae and the third less clearly, as well as all the legs, pale-coloured.

Head in front view very little concave on the vertex, smooth and shining above; propodeum more or less smooth and shining, sparsely clothed with erect and not very long, bristly hairs, which

extend on to the mesonotum, but are easily abraded. Abdomen smooth, shining, sparsely pilose, if not abraded. Length 2.5-3 mm.

The much less deeply concave head distinguishes this species from any other here described in this genus.

Hab. Ohio, U. S. A. (Koebele): bred.

7. *N. pallidiceps*, sp. nov.

Head, apical margin of the pronotum, and the neck in front of it, the three basal antennal joints, and all the legs, pale, yellow or ferruginous.

Head smooth, shining; pronotum also smooth and shining and extremely finely punctured; propodeum a little shining in some aspects, the whole dorsal surface with minute surface sculpture and with a few short microscopic hairs; posteriorly very finely transversely rugose. Abdomen deep black, smooth and shining. Length about 2.5 mm.

Hab. Alameda, California, U. S. A.; bred.

EPIGONATOPUS, gen. nov.

Front legs and pronotum as in the two preceding genera, but the maxillary palpi quite different, two-jointed, one long acuminate joint beyond the geniculation.

Epigonatopus solitarius, sp. nov.

Thorax ferruginous, abdomen for the most part black, legs, two basal, and more or less of the third joint of the antennae, as well as the whole face, pale, yellowish or testaceous. Front femora (except at the apex) at least, and sometimes other parts of the legs, dark brown, black or piceous. Vertex of head dark.

Head above, smooth and shining, and without definite sculpture. Pronotum smooth, minutely punctured, and more or less longitudinally rugulose; propodeum at most somewhat shining about, or before, the middle; in front with rugulose surface, and posteriorly quite distinctly, but finely transversely rugose, not pilose. Abdomen smooth, shining, without hairs. Length about 3 mm.

Hab. Bundaberg, Queensland; captured, not bred.

PACHYGONATOPUS, gen. nov.

Head with the vertex incrassate, a little impressed in the mid-

dle; in front aspect not evidently concave from the one eye-margin to the other; mandibles 4-dentate; maxillary palpi 3-jointed, the basal joint excessively short, a single elongate joint beyond the geniculation. Anterior trochanters not very elongate, clavate, thickening from close to the base, and not with a long slender stalk like all the preceding genera. Otherwise the front legs are much as in the three preceding genera, which this genus resembles also in other respects.

Pachygonatopus melanias, sp. nov.

Black, the face below the antennae, the two basal joints of these (which are however darker above), all the tibiae and tarsi, but especially the front pair, pale.

Head above, very shining, with some indefinite impressions, and a median distinct one extending forwards from the front ocellus; the face above the antennae dull and very densely and minutely sculptured. Pronotum very shining, and with indefinite puncturation; propodeum shining, the surface sculpture very delicate, appearing like dense minute puncturation, not transversely rugose, nor pilose posteriorly. Abdomen smooth and shining. Length 2-2.5 mm.

Hab. Bundaberg and Rockhampton, Queensland; bred.

CHALCOGONATOPUS, gen. nov.

Apterous, head concave above, the antennae slender and elongate, with long, thin third joint. Mandibles quadridentate; maxillary palpi with six joints, labial palpi three-jointed. Pronotum deeply, transversely impressed before the middle, to form a short wider anterior and a narrow, long, elevated, posterior division; the whole thorax in fact formed much as in *Gonatopus* and its allies. Fourth joint of anterior tarsi very long about equal to the basal one, chelar claw as in *Gonatopus*. Thorax laterally with a very distinct groove or suture running forwards from the middle coxae and marking off the propodeal and mesothoracic elements.

EUGONATOPUS subgen. nov.

A very distinct subgenus of the above, having the joints of the flagellum of the antennae less long and slender, and the propodeal and mesothoracic elements, at the sides of the thorax posteriorly, completely fused.

1. *Chalcogonatopus gigas* sp. nov.

Black, slightly aeneous, especially the abdomen, the whole body and the legs clothed with conspicuous erect hairs. Clypeus, mandibles, two basal joints of the antennae, the front tarsi except the basal joint, the front coxae and trochanters, the middle and posterior tarsi, more or less pale, yellowish or testaceous. Sometimes other parts of the legs are pale, the species being variable.

Antennae long and slender, the fourth joint much longer than the scape, the sixth three or four times as long as wide, the third conspicuously longer than the fourth. Head dull, with extremely dense, minute puncturation or surface rugulosity; the thorax with similar sculpture, the propodeum in front and posteriorly with transverse rugosity also. Abdomen very dull and with feeble scattered punctures, from which the erect hairs arise. Length 5-7 mm.

Hab. Bundaberg, Queensland; bred.

2. *Chalcogonatopus optabilis* sp. nov.

Nigroaeneous, with white pubescence, the face below the antennae, the two basal joints of the antennae, the front tibiae and tarsi, and the posterior and intermediate tarsi more or less, pale-coloured, yellowish or testaceous.

Head for the most part smooth and shining above, but near the hind-margin of the eye densely punctulate; the antennae long and slender, none of the flagellar joints being less than twice as long as wide, the scape hardly as long as the fourth antennal joint, and the third much longer than the latter. Thorax pubescent, dull, or hardly shining; the pronotum indefinitely punctured; the propodeum with excessively fine transverse rugulosity, when seen under a compound microscope, and visible with a strong lens. Abdomen with rather short, white, appressed hairs. Legs without erect hairs. Length 3-4 mm.

Hab. Bundaberg, Queensland; bred.

3. *Chalcogonatopus decoratus*, sp. nov.

Like the preceding in the nigroaeneous colour, but with the antennae rather less slender, the scape, being as long as the fourth joint. The clothing is quite different, consisting of grey tomentosity, whereas in the preceding, especially on the abdomen, the individual hairs are very apparent. The pronotum is red at the sides and posteriorly, and bears a distinct median

carina; the fine sculpture of the propodeum is extremely dense. The abdomen is extremely densely and minutely punctured. Length about 3 mm.

Hab. Bundaberg, Queensland; bred.

4. *Chalcogonatopus* (*Eugonatopus*) *pseudochromus*, sp. nov.

Ferruginous or more or less testaceous, the propodeum, and head above, black or dark; basal two joints of antennae quite pale, the following less clearly so, the rest black or fuscous.

Antennae less slender than in any of the preceding, scape as long as the fourth joint, seventh, eighth and ninth not twice as long as wide. Head dull, appearing densely and minutely punctate, the pronotum with very similar sculpture; the propodeum in front and posteriorly finely transversely rugose, in the middle sculptured like the head, not pilose nor pubescent; at the sides without any suture or impression dividing off the mesopleural region. Abdomen smooth, without pubescence or pilosity, the base black, and elsewhere more or less stained with fuscous. Legs neither pilose nor pubescent. Length about 4 mm.

Hab. Columbus, Ohio. (Koebele).

ECHTHRODELPHAX P.

(Bull. I., Div. Ent., Board Agr. & For., Territory of Hawaii).

Head above concave or impressed, and the face in front view strongly transverse, of triangular shape, and very similar to that of *Neodryinus*. Ocelli in a triangle of very elongate isosceles form, the front one very distant from the two basal ones, which are near together. Maxillary palpi short, four-jointed, labial palpi two-jointed. Mandibles quadridentate. The mouth parts in fact are practically as in *Pseudo-gonatopus*, as also is the pronotum, which has a distinct transverse impression. Mesonotum wider than the pronotum, shaped like that of *Neodryinus*, and with no resemblance to that of *Gonatopus* etc., the parapsidal furrows quite distinct, enclosing a very narrow, median, elongate, triangular area. Wings fully developed, and with the usual neuration of the group. Front legs and chelae practically as in *Pseudogonatopus*.

Male with the short palpi of *Pseudogonatopus*, etc., but the extremely long, thin, filiform antennae and the subincrassate head will easily distinguish it generically, as also from any of the other allied genera with apterous females.

Table of species of ECHTHRODELPHAX.

1. (4) Thorax entirely, or all but the pronotum, black; wings without transverse bands.
2. (3) Pronotum yellow.....*E. fairchildii* P.
3. (2) Pronotum black.....*E. nigricollis*.
4. (1) Thorax flavous or ferruginous; wings with two bands
.....*E. bifasciatus*.

1. *Echthrodelphax fairchildii* P.

Male. Black, the mandibles, the scape, and often the second joint of the antennae and the legs, pale.

Antennae very long and thin, the third and fourth joints subequal, as also the following ones; scape about equal to the second joint, and these two together subequal to the third. Head with shining areas varying in different aspects. Mesonotum shining, feebly punctured, with distinct furrows enclosing a triangular space. Propodeum with reticulate rugulosity, the meshwork not very dense. Abdomen black or pitchy, shining and smooth.

The female has already been sufficiently well described.

Hab. Hawaiian Islands; formerly on Kauai and Oahu only, but has now been established on the other islands for economic reasons.

2. *Echthrodelphax nigricollis* sp. nov.

Face, occiput, basal two and several apical joints of the antennae, a median abdominal band (often discoloured after death) and the legs, pale, yellow or testaceous. Form, size and sculpture almost as in *E. fairchildii*, but distinguished at a glance by the entirely black pronotum, and the reticulation of the propodeum is apparently more dense. Length 2-2.5 mm.

Hab. Cairns, Queensland; bred.

3. *Echthrodelphax bifasciatus*, sp. nov.

Testaceous or ferruginous, abdomen black at the extreme base; wings with a transverse, dark, narrow band at the apex of the basal cells and a dark cloud or band beneath the basal portion of the radial nervure.

Antennae less slender than in the two preceding species. Head above smooth and shining. Front lobe of pronotum smooth and shining, the posterior dull, and with excessively dense and minute microscopic sculptures; mesonotum smooth and shining;

propodeum dull, very densely rugulose in front and with regular transverse wrinkles behind. Abdomen smooth and shining. Length 2-2.5 mm.

NOTE.—I have not been able to make dissections of the mouth-parts of this species, but I believe it has five-jointed maxillary palpi and does not properly belong to the genus *Echthrodelphax*.

Hab. Bundaberg and Childers, Queensland; bred.

NEODRYINUS gen. nov.

Head in dorsal aspect strongly transverse, with the vertex more or less concave; in front view, of triangular shape and strongly transverse. Ocelli in an equilateral triangle. Mandibles quadridentate, the apical tooth much the longest, the two innermost very small, the second distinctly larger than these. Maxillary palpi six-jointed, the basal joint very short, the third and following joints elongate, the third thicker than the three slender joints that follow; when laid back along the middle line of the head beneath they extend at least more than half its length. Labial palpi three-jointed. Antennae with the five terminal joints somewhat thicker than the preceding ones, so as to be subclavate, the third joint much the longest, much longer than the fourth, and not less than twice as long as the scape. Pronotum elongate, deeply transversely impressed before the middle, in front conspicuously emarginate, and with the posterior angles not nearly attaining the tegulae. Mesonotum without parapsidal furrows. Postscutellum exceedingly short in the middle. Propodeum very long, subequal in length to the mesothorax and scutellum together. Legs much as in *Dryinus* Latr. the front pair being much extended, with the trochanters very elongate, many times longer than the intermediate ones, curved and clavate, the stalk long and thin; the fourth joint of the tarsi very long, third moderately long and with a basal lamella beneath, bearing spinose hairs (there are rudiments of these structures on the preceding joint); fifth, seen from above, from its basal articulation to the true apex (or point of attachment of the pulvillus) extremely short, subquadrate, but produced beneath basally into a long process, which at rest extends back to the base of the third joint, and is bent and dilated at the tip, the chelar claw greatly developed, about as long as the fifth joint with its basal prolongation, denticulate or spinulose beneath, and with a minute tooth near the apex. Front wings with two distinct basal cells and narrow elongate stigma.

Synopsis of species of NEODRYINUS.

Females.

1. (2) Head above more or less shining. *N. koebelci*.
2. (1) Head above opaque.
3. (4) Antennae black or almost so, except the four apical joints, and the front of the scape. *N. nelsoni*.
4. (3) Antennae for the most, or a large part, pale, the sixth joint alone being somewhat infuscate in most examples, sometimes those adjoining this also dark. *N. raptor*.

1. *Neodryinus koebelci*, sp. nov.

Black, apex of clypeus and mandibles on the apical half (excepting the teeth) whitish or pale yellow, as also is the scape of the antennae beneath; the rest of the antennae clear testaceous. Posterior and intermediate tarsi (except the dark claw-joint) and the anterior coxae and trochanters more or less testaceous; intermediate tibiae, and front tibiae and tarsi often brown or testaceous; posterior tibiae sometimes brown or piceous; claw of chelae pale yellow or white.

Face with silvery pubescence, head longitudinally rugose and more or less shining. Anterior and posterior divisions of the pronotum subobliquely or subconcentrically rugose. Mesonotum not shining, densely reticulately rugose; the propodeum not shining, densely reticulately rugose; the propodeum strongly rugose, the numerous longitudinal wrinkles connected by transverse ones so as to form a network, not less dense than that of the mesonotum. Wings pale at the base, then with a transverse smoky band extending a little beyond the apex of the second basal cell; a second smoky transverse band, with its basal side oblique outwardly, is narrower, and on the upper side starts from about the middle of the stigma; between the two bands the wing is white; beyond the second apically, it is faintly smoky. Abdomen shining, black, impunctate. Length 4-6 mm.

Male. Black, apex of mandibles and the two basal joints of the antennae beneath (more or less) ferruginous, or testaceous; front tibiae and tarsi and intermediate and posterior tarsi testaceous, apical joints of the latter more or less infuscate. Head in front, and mesonotum dull, with dense and minute surface sculpture, and clothed with short hairs; the latter still more finely

sculptured than the head, the surface appearing exceedingly minutely granulated; postscutellum more or less shining in certain aspects; propodeum with close irregular or reticulate rugulosity. Abdomen smooth, shining, with very feeble indefinite punctures, and clothed with excessively short erect hairs. Stigma dark brown usually concolorous or nearly so.

Hab. Bundaberg and Townsville, Queensland. Bred.

2. *Neodryinus nelsoni*, sp. nov.

Rather like the preceding, but readily distinguished by the antennae, the flagellar joints being black, except the four apical ones. The front tarsi are black or piceous with the chelar claw pale, whitish. The legs generally are darker, sometimes all black, or with posterior tarsi reddish. The bands of the wings are rather darker, and the sculpture of the pronotum different, the posterior division of the pronotum being excessively finely rugulose, while the sculpture of the anterior division rather resembles that of the posterior division of *N. koebelci*. Moreover, the surface of the head is quite dull, not more or less shining. Length as in the preceding.

Hab. Nelson on the Mulgrave, Queensland. Bred.

3. *Neodryinus raptor*, sp. nov.

Extremely close to *N. nelsoni*, but often superficially more like *N. koebelci*, since the antennae are often almost entirely pale, though shorter. The sixth joint however is never so clear as in the latter, and is often clouded or even black, as also frequently are some of the adjoining joints. Structurally the species resembles *N. nelsoni* and is abundantly distinct from *N. koebelci*. Length 3.5-5 mm.

Male. Differs from *N. koebelci* in the colour of the stigma, which is quite pale in the middle, this part contrasting very strongly with the dark margins; the intermediate and posterior tarsi are paler, almost white on the basal joint, and therefore there is a stronger contrast between this part and the dark fuscous or blackish apical joints. The basal joints of the antennae are darker beneath (or in front), being entirely black, or almost so.

N. raptor var *umbratus*, var. nov.

The second, third, and fourth antennal joints remain more or

less dull red; the middle of the third and apex of the fourth being dark, otherwise as above. This variety or species comes nearest to *N. nelsoni*.

Hab. Bundaberg and Brisbane, Queensland. Bred.

PARADRYINUS gen. nov.

Head not concave on the vertex, and straightly (or nearly so) and distinctly margined behind the ocelli, the margin continued definitely downwards around the occipital concavity; in front view the head is triangular, and but little or not at all transverse, with the vertex slightly convex. The ocelli in a triangle, about equidistant one from another. Mandibles quadridentate, the apical tooth longest, the other three rather strong, decidedly better developed than those of *Neodryinus*. Maxillary palpi six-jointed, the four terminal joints elongated, the first of these stouter than the others and the tips reaching back to at least behind the middle and even as far as the hind margin of the head beneath. Labial palpi three-jointed. Antennae not much different from those of *Neodryinus*, the third joint being very elongate, hardly less and sometimes more than twice as long as the fourth. Pronotum long, convex, transversely constricted at the base, as long or longer than the mesonotum, its hind angles not attaining the tegulae, its anterior margin subtruncate, never distinctly emarginate as in *Neodryinus*. Mesonotum extremely convex in profile, rising up strongly and abruptly from the pronotum, in most species so strongly longitudinally rugose as to render difficult the detection of the parapsidal furrows, which, however, are present, and widely separated even at the hind margin of the mesonotum, when they are traced so far. Postscutellum of moderate length. Propodeum very long, about equal in length to the mesonotum, scutellum and postscutellum. Front legs as in *Neodryinus* but the trochanters somewhat less elongate, the basal joint of the front tarsi distinctly longer than the fourth, and the anteapical tooth of the chelar claw rather stronger.

Synopsis of species of PARADRYINUS.

Females.

1. (4) Middle and hind tibiae at the base, and the base of at least the basal joint of their tarsi, pale whitish.
2. (3) Head above, pronotum and mesonotum largely, ferruginous; sometimes however more or less clouded.....*P. koebeleri*.

3. (2) Head above, pronotum except laterally and posteriorly, and the mesonotum, black or dark coloured...
..... *P. varipes*.
4. (1) Middle and hind tibiae without a pale whitish basal ring.
5. (6) Third joint of antennae uniformly ferruginous.....
..... *P. venator*.
6. (5) Third joint wholly or in part dark.
7. (8) Mesonotum between the parapsides much smoother and more shining than without these. ... *P. leptias*.
8. (7) Mesonotum uniformly sculptured, or almost so.
9. (10) Antennae except the second joint and base of third almost wholly ferruginous; mesonotum irregularly rugose..... *P. gigas*.
10. (9) Antennae almost wholly black; mesonotum very regularly longitudinally rugose..... *P. threnodes*.

1. *Paradryinus koebeleni*, sp. nov.

Female. Head and thorax ferruginous, more or less clouded with blackish or fuscous, propodeum usually entirely black. Abdomen ferruginous, generally more or less largely obscured with brown, fuscous, or piceous suffusion. Legs ferruginous, tibiae sometimes dark brown or nearly black, the base of the intermediate and posterior pair, and of one or two of their tarsal joints, white. Antennae testaceous or ferruginous, more or less infusate, the scape white in front; apex of clypeus and the mandibles more or less whitish.

Head with a very dense and distinct surface rugulosity or rugulose punctuation, and with a distinct median carina extending about two-thirds of the distance from the front ocellus to the base of the clypeus; the latter emarginate at the apex. Pronotum somewhat strongly subconcentrically rugose, the mesonotum more strongly longitudinally rugose; propodeum reticulately rugose. Thorax with some sparse short hairs; abdomen smooth, shining, glabrous. Wings with a wide fuscous band across the middle of the basal cells, a narrow oblique one external to the transverse median and basal nervures and entering the apex of the first basal cell; these two bands connected below; a wide band with its inner margin oblique arises beneath the stigma and extends to near the apex of the marginal cell leaving the tip of the wings white. Length 4.5-6 mm.

Male. Black, mandibles and legs testaceous or yellow. Antennae with the scape, and some of the joints of the flagellum,

yellow; the true colour of these masked by the dark covering of short black hairs. Head and mesonotum dull, clothed with short erect hairs, and with a dense obscure rugulose or rugulosely punctate sculpture; propodeum irregularly or reticulately rugose. Abdomen shining, with a thin pubescence, and very indefinite, fine puncturation. Neuration mostly dark brown.

Hab. Bundaberg, Queensland; bred in large numbers.

2. *Paradryinus venator*, sp. nov.

The sculpture is similar to that of the preceding species, all the species of the genus, being subject to variability in intensity of sculpture.

Black, the clypeus and mandibles more or less, the sides and posterior margin of the pronotum, ferruginous. Legs darker than in the preceding species, often largely blackish or piceous, and with no basal white rings to the hind and intermediate tibiae and tarsi. Abdomen black. Wings banded as in *P. koebelei*. Antennae with the three basal and the basal part of the fourth joint ferruginous, the rest black, except that the apical joint may be more or less pale. Length 9 mm. but variable.

Male. Extremely like that of *N. koebelei*, but with the antennae slightly, but constantly, shorter and with only the two basal joints pale.

Hab. Bundaberg, Queensland; bred in numbers.

3. *Paradryinus threnodes*.

Extremely like the preceding in form and sculpture, but very distinct in general appearance, the clypeus and mandibles being entirely dark, or only for a small part pale, the pronotum at most only obscurely pale at the sides, and black along the upturned hind margin; the legs black, the front tibiae in part piceous or ferruginous, posterior and intermediate tarsi more or less ferruginous. Antennae black, apical joint more or less pale, the scape generally pitchy beneath. Length about 5-6 mm.

Hab. The Mulgrave near Cairns and Bundaberg, Queensland. Bred.

4. *Paradryinus gigas*, sp. nov.

Apex of clypeus, a spot at the base of the scape of antennae beneath, the second and third joints of the posterior and middle tarsi as well as the chelar claw, more or less whitish or cream-coloured.

The scape, the apical part of the third and all the following antennal joints, the mandibles more or less, the legs, and the basal segment of the abdomen, ferruginous; the front coxae above, and the front femora posteriorly, dark. Of the dark bands on the wings, the apical one is more restricted and less definite apically than that of the preceding species.

Head finely, but distinctly, longitudinally rugose; the pronotum with the subconcentric rugosity of *N. koebeli*, etc., but with the sculpture relatively finer, and the surface clothed with grey pubescence; mesonotum with a dense, irregularly rugose sculpture, as also the scutellum; propodeum reticulately rugose. Abdomen with the two basal segments smooth and shining, the following grey with appressed pubescence and densely and very finely punctate. Length about 10 mm.

Hab. Bundaberg, Queensland. A single specimen captured.

5. *Paradryinus leptias* sp. nov.

Black, the clypeus apically, the cheeks adjoining it and the mandibles, the front tibiae beneath, the front trochanters in front, the middle and hind tarsi (which however are largely infuscate) and the tip of abdomen, testaceous. Basal joint of antennae beneath, as also the apical angles of the emarginate clypeus, whitish; the second joint, and a narrow ring at the junction of third and fourth, and of the fourth and fifth, and the whole of the four apical joints, testaceous. Wings banded as in the preceding species, but with the basal and median of the three transverse smoky bands more confluent.

Head dull, very densely and minutely sculptured, appearing coriaceous, with very faint evidence of longitudinal rugulosity. Pronotum piceous or obscure ferruginous along its posterior margin, on the highly convex disc, shining, smooth, with hardly visible punctures; mesonotum dull, with dense surface sculpture, between the subparallel parapsidal furrows much smoother, and more or less shining; propodeum reticulately rugose. Abdomen smooth, shining, impunctate, second segment obscurely reddish at the sides. Length about 5 mm.

Hab. Near Cairns, a single female bred.

6. *Paradryinus varipes*, sp. nov.

Black, the two basal joints of the antennae, the face below these, the lateral and posterior margins of the pronotum more

or less pale, yellow, testaceous, or ferruginous; the rest of the antennae fuscous, somewhat testaceous in parts. Legs for the most part piceous, but the base of the middle and hind tibiae with a conspicuous white ring, and their tarsi white at the base. Abdomen piceous black. Sculpture of thorax very like that of *F. kocbelei*, of a similar nature, but considerably finer throughout. Length about 5 mm.

Male. Black, the two basal joints of antennae rufo-piceous, the legs pale, the posterior femora and tibiae largely dark, blackish or piceous, the intermediate also obscured in a lesser degree, the tarsi nearly white, the base of hind tibiae also pallid.

Head with a very dense, minute, coriaceous sculpture; mesonotum somewhat shining in some aspects, with an excessively minute surface sculpture and some very ill-defined fine punctures, propodeum reticulately rugose. Abdomen piceous black, shining.

Hab. On the Mulgrave near Cairns, Queensland. The male was bred, but the female captured. I believe they are rightly mated.

CHLORODRYINUS gen. nov.

Like *Paradryinus* in most respects, but differs in the fact that the extremely delicate margin of the vertex posteriorly fails towards the sides, not being continued distinctly round the sides of the occipital concavity. The maxillary palpi are very long and extended back, when fully extended along the middle line, well behind the posterior margin of the head beneath. Pronotum in profile with evenly convex outline, not of the humped form of *Paradryinus*. The mesonotum is gently convex in profile, the parapsidal furrows are distinct, crenulate, subconvergent, and fail before attaining the hind margin. Basal joint of front tarsi longer than the fourth.

Chlorodryinus pallidus, sp. nov.

Testaceous, except a spot at the extreme base of the abdomen. The body is however subject to some post-mortem discoloration. Head dull, with extremely dense and minute sculpture, hardly perceptible, except under a very strong lens. Antennae very long and slender, the third joint about twice as long as the first and second together.

Pronotum smooth and shining, the dorsal outline in profile forming a regular curve. Mesonotum dull, with very dense min-

ute coriaceous sculpture both between and outside the parapsidal furrows; propodeum densely rugose. Abdomen smooth and shining, glabrous. Wings unbanded, nervures pale, yellow, stigma pallid. Length 4-5 mm.

Male. Black, mandibles, two basal joints of antennae, and all the legs pale, yellow or ferruginous. Head exceedingly densely, minutely and evenly, punctulate or coriaceous; mesonotum with a similar, but less even, sculpture; propodeum irregularly or reticulately rugose; abdomen smooth, shining, with only indefinite puncturation. Stigma pallid.

Hab. Kuranda and the Mulgrave, Queensland. Bred.

THAUMATODRYINUS gen. nov.

Agrees with *Neodryinus* and other genera in the structure of the front legs but differs greatly in other characters. Head in front view very strongly transverse, subquadrangular, the cheeks at the base of the mandibles sharply and prominently angled, the vertex strongly convex and subtumid. In dorsal aspect the head is very strongly transverse, more than twice as wide as long, the ocelli being placed in a nearly equilateral triangle. Mandibles with three strong teeth and a small inner one. Maxillary palpi extremely long, extending back far behind the head. Antennae filiform, very long and slender, as long or a little longer than the entire insect; third joint a little longer than the thick scape; fourth subequal to or a little longer than the third; fifth and sixth subequal, distinctly longer than the fourth, each of these two with a minute black tubercle before the middle, bearing a few very fine long hairs, quite different from the general pubescence; seventh with a similarly clothed tubercle at the middle; eighth much shorter than the seventh and with a similar tubercle near the contracted apex; ninth as the preceding, but shorter; tenth with a tubercle at the middle and another at the apex and strongly constricted after the first tubercle; all these tubercles bearing hairs as already described. Pronotum about as long as wide, or as the mesonotum, in profile rising strongly upwards, and this curve continued by the mesonotum, its hind angles attaining the tegulae. Parapsidal furrows fine and feeble, but quite evident, subconvergent, but still widely separated at the base. Propodeum rather long, about as long as wide.

Thaumatomdryinus koebelei, sp. nov.

Flavo-ferruginous, the petiole black, the fifth and all the fol-

lowing joints of the antennae dark. The stigma and base of radial nervure, fuscous.

Head dull, with very dense and minute, coriaceous sculpture, the clypeus smooth and shining; mesonotum dull or almost so, with sculpture similar to that of the head; scutellum somewhat shining and obscurely punctured; propodeum densely reticulately rugulose. Abdomen smooth, shining, without definite sculpture. Length about 4 mm.

Hab. Near Cairns, Queensland. Bred.

EUKOEBELEIA, gen. nov.

Head large, convex on the vertex, the sides converging behind the eyes, the latter hairy, the ocelli in a nearly equilateral triangle; the mandibles 3-dentate; the antennae with the third joint about twice as long as the second, and distinctly longer than the third. Maxillary palpi 6-jointed, labial palpi 3-jointed. Pronotum transverse, attaining the tegulae with its hind angles; mesonotum with fine, but distinct, parapsidal furrows, which are subconvergent, but still widely separated at the hind margin; propodeum short, about as long on the dorsum as the scutellum, sharply truncate, its posterior face twice as long as the dorsal. Front legs not very long, but perfectly chelate, the fourth tarsal joint very elongate, though shorter than the basal one; fifth joint with its free extremity, which forms with one claw the tip of the chelae, not dilated and armed in the usual manner, but forming a simple curved hook; the chelar claw beneath serrately dentate. Abdomen with distinct pedicel, which is longer than wide. Wings minute, rudimentary, reaching only to the base of the abdomen, pointed at the apex.

Eukoebelcia mirabilis, sp. nov.

Dull red, the abdomen, antennae except two or three basal joints, and the propodeum black. Mandibles and legs for the most part yellowish-brown or testaceous, abdominal pedicel also pale.

Head and thorax excessively densely, minutely punctate, or coriaceous; the latter very distinctly pilose. The propodeum on the dorsal surface rugose; posteriorly, with the surface finely sculptured or granulated, and subareolate. Abdomen very smooth and shining. Length 2.5-3 mm.

Hab. Ohio, U. S. A. (Koebele); bred and captured.

NEOCHELOGYNUS gen. nov.

Of robust form. Front legs with chelate anterior tarsi, but the chelae less perfect than those of any of the preceding genera, and the legs are short, not unusually lengthened, with the femora very stout and the trochanters short.

Head subincrassate, convex, the ocelli in an isosceles triangle, much widest at the base; antennae becoming more or less wide towards the apex. Maxillary palpi six-jointed, labial palpi three-jointed. Pronotum shorter than, or scarcely subequal in length to, the mesonotum, its hind angles attaining the tegulae; mesonotum without parapsidal furrows or with these only just visible at the extreme front; propodeum as wide as long, or still shorter. Anterior tarsi with the fourth joint longish, much longer than the preceding, and about equal in length to the fifth from its basal articulation to the pulvillus, the backward prolongation of the fifth longer than the length of this joint from its basal articulation to the apex; so that the articulation is situated at about one-third of the whole length of the joint. Front wings with the radius short and straight, terminated in a knob or small thickening, or bent near the extremity. Abdomen with the basal segment greatly raised from the petiole, the basal face being on a plane strongly inclined to the dorsal surface.

Synopsis of species of NEOCHELOGYNUS.

1. (8) Wings with one or more dark clouds or bands.
2. (3) Front wings with only one smoky cloud extending beneath the stigma and marginal cell... *N. typicus*
3. (2) Front wings with cloud or band as above, and with a second band at the apex of the basal cells.
4. (5) Propodeum for a large part smooth and shining posteriorly *N. leiosomus*.
5. (4) Propodeum posteriorly at most slightly shining, the surface everywhere rugulose or finely rugose.
6. (7) Propodeum with the surface finely transversely and regularly rugose posteriorly..... *N. nitidus*.
7. (6) Propodeum with the posterior surface excessively finely rugulose..... *N. dimidiatus*.
8. (1) Wings without smoky bands or clouds.
8. (10) Antennae black..... *N. nigricornis*.
10. (9) Antennae with the scape at least pale.
11. (12) Antennae entirely pale..... *N. pallidicornis*.
12. (11) Antennae largely black or fuscous.

13. (16) Head in front with extremely dense minute sculpture appearing coriaceous or punctulate.
14. (15) Propodeum with posterior median area defined.*N. parvulus.*
15. (14) Propodeum with no definite median area.*N. coriaceus.*
16. (13) Head in front with reticulate rugose sculpture, probably due to a very shallow coarse puncturation.
17. (18) Propodeum with posterior median area dull, coriaceous; flagellum of antennae mostly black.*N. destructor.*
18. (17) Propodeum with the median area smoother, hardly opaque; flagellum of antennae paler, more fuscous.*N. cognatus.*

1. *Neochclogynus typicus*, sp. nov.

Black, all the legs, except the apical joint which is darker, the antennae except the three or four apical joints, and the mandibles, ferruginous.

Head with sparse grey hairs, the face closely, shallowly rugosely punctured, on the vertex more sparsely. Mandibles strongly quadridentate. Ocelli placed more or less in foveae; third joint of antennae elongate, distinctly longer than the fourth, which is longer and much more slender than the 5th, the latter considerably longer than broad, as also are all the following: Pronotum with the hind margin smooth, in front of this with large shallow punctures; mesonotum very sparsely, finely punctured, smooth and shining, the parapsides indicated by excessively short consute lines near the anterior margin; scutellum and postscutellum impunctate or nearly. Propodeum, seen from in front, bounded by a raised line posteriorly, which is bent forwards in the middle, the surface rugose; posteriorly with a median area evidently, though not strongly defined, by raised lines; this area being smooth and shiny except on its upper portion. Abdomen smooth, impunctate; basal tooth of the chelar claw with a very long seta reaching to the apex of the claw. Wings with the nervures strong, yellow, as also the stigma which is infuscate on its margins, the radius also dark. A vague transverse cloud lies beneath the stigma and marginal cell, occupying also part of the latter. Length about 4.5 mm.

Hab. Bundaberg; one female captured.

2. *Neochelogynus nitidus*, sp. nov.

Black, mandibles except the teeth, and the antennae except the four apical joints, which are nearly entirely dark, ferruginous; the preceding joints more or less dark. Front legs brownish, paler in front, hind legs nearly entirely black or piceous. Head with the surface shining, much narrowed behind the eyes to the occiput, the face closely, coarsely and shallowly rugose—punctate; the antennae with the scape about as long as the two following joints together, third joint distinctly longer than fourth, fourth much more slender than fifth, which is nearly twice as long as wide at the apex. Pronotum and mesonotum smooth, shining, sparsely and finely punctured. Propodeum rugose in front and with a raised line as in the preceding; its posterior face with the median area subobsoletely defined, the surface quite finely, transversely rugose. Abdomen smooth, shining, the basal segment very narrow, of elongate, triangular form. Wings with a large dark cloud, with the inner side oblique, occupying most of the apical portion of the wing, from near the base of the dark stigma; a second narrow dark band crosses the wing along the region of the apex of the basal cells. Length about 4 mm.

Hab. Bundaberg, Queensland; one female captured.

3. *Neochelogynus leiosomus*, sp. nov.

Black, mandibles and five basal joints of the antennae ferruginous; front legs testaceous more or less brown, hind and middle legs nearly entirely black or piceous.

Head shining, its sides strongly convergent behind the eyes, the face shining, with coarse but extremely shallow punctures, nearly effaced and more or less running into one another, so as to be rugose; median carina fine but distinct. Antennae almost as in *N. nitidus*. Pronotum for the most part, the mesonotum, scutellum and postscutellum shining and very smooth; the mesonotum very sparsely, finely punctured. Propodeum rugose, seen from in front with the raised line, which is produced forward in the middle, distinct; posteriorly for the most part smooth and shining, the middle area distinguishable in certain aspects, but the raised lines, which bound it, are largely obsolete. Basal abdominal segment elongate-triangular. Wings with two dark bands similar to those of the preceding species, stigma brown. Length about 4 mm.

Hab. Bundaberg, Queensland; one female bred.

4. *Neochelogyne dimidiatus*, sp. nov.

Black, the mandibles and the antennae except the four terminal joints, ferruginous; two or three joints preceding the four terminal, more or less dark in part. Front legs testaceous, more or less brown posteriorly; middle and hind legs nearly black, except the apices of the tarsal joints.

Head shining, and with coarse, shallow, subconfluent punctures; the antennae formed much as in the preceding species. Mesonotum very smooth and shining, with very sparse fine punctures; the pronotum in front with ill-defined, coarse, puncturation. Propodeum seen from in front with the usual raised line, which is however not very definite; in front of this line, finely rugose; on the posterior face still more finely sculptured, rugulose, a little shining in some aspects, the posterior median area not defined. Abdomen narrow, subcompressed, the basal segment elongate triangular. Wings as in the preceding. Length 3.5 mm.

Hab. Bundaberg, Queensland; one female bred.

5. *Neochelogyne nigricornis*, sp. nov.

Black, the front tibiae and all the tarsi testaceous, the rest of the legs brown or darkish.

Head dull or almost so, with very dense and fine rugose sculpture; antennae with the second joint long, about equal to the third, the joints becoming wider very gradually from the third, so that the fifth is not abruptly wider than the fourth; 6th, 7th and 8th joints subequal, wide, but very evidently longer than broad. Pronotum in front sculptured like the head, posteriorly more or less smooth and shining; mesonotum with extremely fine microscopic rugulosity of the surface, which prevents it from being very shining, and with a few fine and feeble punctures; in very minute examples, sometimes quite smooth and impunctate. Propodeum in front rugose, the dorsal surface posteriorly bounded by the usual raised line, sometimes broken in the middle, and not very distinct, owing to the general rugosity of the surface; posteriorly the surface with dense and fine granular or rugulose sculpture, the median area not marked out by raised lines. Wings without dark bands, neuration and stigma pale, yellow. Length 2-3.5 mm.

Hab. Bundaberg, Queensland; bred.

6. *Neochelogyus destructor*, sp. nov.

Black, the mandibles except the teeth, the two basal joints of the antennae and sometimes the third more or less, all the legs, excepting usually the front femora, ferruginous.

Female. Head with reticulate, rugose sculpture, due probably to the confluence of coarse and very shallow punctures. Antennae with the second joint fully as long as the third, fifth at its widest, much wider than the fourth, and like the sixth not much longer than its greatest width. Pronotum somewhat longitudinally rugose; the mesonotum very finely and indefinitely, sparsely punctate; propodeum with the dorsal surface short, rugose, well marked off posteriorly by a distinct raised line; posteriorly its surface dull, rugulose or granulate, the median area very distinctly marked by clear raised lines. Wings clear, venation and stigma pale, yellow. Length 2.5-3.5 mm.

Male. Black, legs, mandibles and one or more of the basal joints of the antennae, ferruginous; usually several joints of the flagellum are more or less pale, becoming from the first more or less darkened to the apical joints, which are quite black.

Head in front with the sculpture as in the female, but much feebler and more obsolete; antennae with short, moniliform joints of subequal length, except the scape, which equals the two following together. Pronotum very short, entirely concealed, if the head be laid back; mesonotum smooth, hardly perceptibly punctured, or impunctate; propodeum finely rugose, the posterior median area, which is quite definite, coriaceous, dull. Postmarginal nervure dark and the stigma with dark margin.

Hab. Bundaberg, Queensland; bred.

7. *Neochelogyus cognatus*, sp. nov.

Differs from the preceding as follows:

The basal two joints of the antennae are clear ferruginous, the following two or three more or less sordidly so and the rest fuscous. All the legs entirely pale. The pronotum is to a large extent smooth and shining, the mesonotum very smooth with a few scattered punctures; the propodeum posteriorly within the median area is much smoother, and hardly opaque. Length about 3 mm.

Hab. Bundaberg, Queensland; bred.

8. *Neochellogynus parvulus*, sp. nov.

Black, the legs, mandibles, except the teeth, basal two joints of antennae, ferruginous or testaceous; the rest of the antennal joints fuscous or blackish; the middle and posterior femora more or less brown.

Head in front extremely finely and closely punctulate or coriaceous; antennae with the fifth joint not abruptly wider than the fourth, the second subequal to the third in length. Pronotum dull, rugulose, except along the posterior margin, the mesonotum very smooth and shining, and, like the scutellum, impunctate or nearly so; the propodeum with the dorsal face as long as scutellum and postscutellum together, and rather strongly rugose, with distinct raised line posteriorly; its posterior face dull, finely rugulose or coriaceous, and with the median area defined. Stigma dark. Length about 2 mm.

Hab. Bundaberg, Queensland, captured; and Cairns, Queensland, bred.

9. *Neochellogynus coriaceus*, sp. nov.

Black, the scape of the antennae, mandibles for the most part, and all the legs (except the more or less brown posterior and intermediate femora and the apical joints of the tarsi) ferruginous or testaceous. Most of the joints of the flagellum of the antennae more or less obscurely testaceous beneath.

Face with excessively, dense, minute surface granulation and traces of obsolete fine punctures; second joint of the antennae about equal to the third but stouter; 6th, 7th and 8th a little, but quite distinctly, longer than wide. Pronotum and mesonotum dull (except the smooth posterior margin of the former) with the same excessively dense sculpture as the face; scutellum smooth, shining; propodeum quite short on the dorsal surface and rugose, the raised line quite distinct seen from in front; on the posterior face dull and with sculpture like that of the mesonotum with no median area defined. Abdomen smooth, shining. Neuration pale, stigma with darker margin. Length 2 mm.

Hab. Redlynch, near Cairns, bred.

10. *Neochellogynus pallidicornis*, sp. nov.

Black, the antennae, all the legs and the mandibles, pale, yellowish; the teeth of the latter ferruginous. Face shining, smooth,

with only feeble indefinite punctuation. Pronotum as long as the mesonotum and with microscopic coriaceous sculpture; the mesonotum and scutellum smooth, shining, impunctate or nearly so; propodeum, seen from in front, reticulately rugose and bounded by the usual raised line; posteriorly dull, very finely, microscopically granulate, and with the median area perceptibly marked out, but only feebly defined. Abdomen smooth, shining. Wings with pale nervures, stigma and radius brown or fuscous. Length hardly 2 mm.

Bab. Bundaberg, Queensland; bred.

PROSANTEON, gen. nov.

Head in front with coarse shallow puncturation, the vertex convex, the antennae with the joints becoming wider towards the apex of the flagellum, the widest hardly longer than wide; scape fully as long as the two following joints together. Mandibles quadridentate. Maxillary palpi six-jointed, labial three-jointed. Pronotum very short in dorsal aspect, being strongly deflected from behind forwards; mesonotum with the parapsidal furrows very widely separated and failing about the middle; propodeum with very well marked posterior median area. Front tarsi quite different from those of any of the preceding genera, and resembling *Paranteon*; fourth joint very small and short, not differing greatly from the third, fifth a nearly normal claw-joint, but with a very short, free, basal production beneath, which underlies the short fourth joint.

Prosanteon chelogynoides, sp. nov.

Black, the mandibles for the most part, the scape of the antennae, and all the legs nearly wholly, pale, yellow or testaceous, second joint of the antennae obscurely pale, the third very slightly so; posterior coxae black.

Head somewhat shining and with very shallow, coarse, close punctures, so that it appears feebly reticulately rugose; fifth joint of antennae a little wider than the fourth, the widening of the joints of the flagellum being very gradual. Mesonotum very smooth, shining, finely and sparsely punctured, propodeum with its dorsal surface at least as long as the scutellum, reticulately rugose and bounded by the usual raised line; its posterior face with the median area somewhat shining and very distinctly marked by raised lines, outside which it is dull and densely and finely

sculptured. Wings with pale yellow neuration and stigma. Length about 3 mm.

Hab. Bundaberg, Queensland; bred.

PARANTEON gen nov.

Of robust form. Head in dorsal aspect transverse, the vertex convex, maxillary palpi 6-jointed, labial three-jointed. Antennae simple, pubescent, and with longish hairs beneath, both on the scape and the flagellum, all the joints of the latter elongate, the scape as long as the two following joints together, the fourth longer than the third, but none of the flagellar joints differ much in length. Pronotum short, evidently shorter than the mesonotum, narrowed anteriorly; the mesonotum convex, with short, widely separated parapsidal furrows; the propodeum very short, subvertical from close to its anterior margin. Front legs imperfectly chelate, the chelae being incapable of extension, the fifth joint subnormal, elongate and with only a very short free basal prolongation beneath the fourth, the chelar claw closing on it and being of about the same length and without denticles beneath; fourth joint short, subnormal, hardly longer than the preceding. Front wings with large subovate stigma. Basal segment of the abdomen with strongly marked anterior and dorsal surfaces, the former abruptly inclined to the latter and much longer than it.

Paranteon myrmecophilus, sp. nov.

Black, the head, most of the thorax and basal joint of antennae ferruginous, the postscutellum and propodeum generally black or piceous, front legs more or less brown or pitchy.

Head shining and with rather indefinite punctuation, tending to rugosity; mesonotum somewhat shining, decidedly more finely punctured than the head, and the punctures not very definite; dorsal face of propodeum very short along the middle line, not longer than the post scutellum, with very fine granulate or coriaceous sculpture and the posterior raised line obsolete or wanting; posterior face shining, excessively feebly and indefinitely rugulose, and with no median area defined. Wings with neuration and stigma dark fuscous, a faint oblique cloud beneath the stigma. Length 3-4 mm.

Male. Entirely black except the front tibiae and tarsi. Face wide, subtransverse, smooth and shining, with large shallow

remote punctures; antennae submoniliform and elongate with the second joint pyriform shorter than the third; 3rd, 4th, 5th and 6th subequal, elongate, and with conspicuous, erect hairs which are as long as the width of either of these joints. Mesonotum very smooth and shining and with very few punctures; propodeum rugose in front, on its posterior face in the middle smooth and shining, but without a median area defined by raised lines. Wings very clear, the subcostal nervure and stigma dark, the median, basal and transverse median nervures quite pallid.

Hab. Bundaberg and Brisbane, Queensland; bred.

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ERRATA.

The following corrections are necessary in my papers on Dryinidae:
Bull. I, p. 39, 40.

The genera *Haplogonatopus* and *Paragonatopus* must be transposed, otherwise the word "preceding" in the generic characters will lead to serious error.

Bull. IV, p. 9.

Line 1 & 2. "*mimus*" and "*mimoides*" belong to *Neogonatopus* on the preceding page.

In table of Dryinidae under heading 3 after "beneath", insert "or at least with a row of well-developed sublamellate denticles".

Headings 10 and 11 should read: .

- 10 (11) Pronotum divided by a distinct transverse impression.....
..... *Paragonatopus*.
11 (10) Pronotum not so divided *Haplogonatopus*.

Bull. IV, p. 14, line 15; for "distinct spinules not lamellate" read "distinct sublamellate denticles."

R. C. L. P.

REPORT OF WORK
OF THE
EXPERIMENT STATION

OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

**Leaf-Hoppers and their
Natural Enemies**

(PT. II. *EPIPYROPIDÆ*)
Lepidoptera

BY R. C. L. PERKINS

HONOLULU, H. T.
JUNE 3, 1905

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JUNE, 1905

LETTER OF TRANSMITTAL

Honolulu, T. H., May 22nd, 1905.

To the Experiment Station Committee, Hawaiian Sugar Planters' Association.

Gentlemen:—I herewith submit for publication the second part of a bulletin entitled "Leaf-hoppers and Their Natural Enemies."

Yours obediently,

R. C. L. PERKINS,

Director, Division of Entomology.

INTRODUCTORY REMARKS

The first record of caterpillars parasitic upon Homoptera was that of Bowring in 1850, who discovered a Coccus-like insect on the back of one of the lantern flies, *Pyrops candelaria*, at Hong Kong. Subsequently the moth was bred, and Westwood described it as a new genus and species of the family Arctiidae, under the name of *Epipyrops anomala*. He likewise described the caterpillar and the pupa of the same insect. Since Westwood's time other species of *Epipyrops* have been noticed in Japan and North and Central America, but as the references to these are given below in the bibliographic list it is not necessary to specially refer to them here.

When Mr. Koebele and myself arrived at Cairns in Northern Queensland and started a systematic investigation of the enemies of leaf-hoppers, these parasitic caterpillars naturally came under our observation at the very beginning of our researches. Although so far as I know no record of their occurrence in Australia has yet been published, yet their presence was not unknown to some of the Australian entomologists. Mr. F. P. Dodd, a dealer in entomological specimens, had bred one or two species, though the most casual inspection was sufficient to show me that these were neither of the two species we had found in abundance at Cairns at that time. Mr. Henry Tryon, the Government Entomologist for Queensland, had long since found the curious cocoon of these moths in that State. In fact, they are very common insects. In the case of certain species of Delphacid leaf-hoppers at Cairns, a large percentage carried one or more of the parasitic caterpillars. Another species of the parasites affected a commonplace Jassid that lives on the leaves and shoots of a species of *Terminalia*, and the number of cocoons formed on the leaves was almost incredible. As Mr. Koebele's notes well express it, they were "in millions," and at a glance gave the leaves somewhat the appearance of being badly affected with a *Pulvinaria*, or some such scale-insect. Species also occurred at Bundaberg, and after I left Australia, Mr. Koebele found them

in profusion around Sydney, where nearly a score of hoppers were found to be affected. It is therefore probable that they will be found commonly throughout Australia, and that the species are fairly numerous.

GENERAL ACCOUNT OF THE LIFE HISTORY OF EPIPYROPIDAE.

The following account is mainly taken from the study of the species I call *Agamopsyche threnodes*, it being parasitic on the sugar cane leaf-hopper and a few more or less closely allied Delphacids. This is the only species known to us, of which numbers were obtained, which is obviously parthenogenetic, no male at all having been bred. The female is sluggish, and generally commences to lay very soon after emergence. The eggs were invariably fertile, very numerous, disc-like, of small size, and laid in large numbers in a batch. In nature they were found deposited on dead grass leaves, on which the cocoons were also collected. The development of the embryo could be watched through the thin egg-shell. The imago was not studied in the field, but I bred a number of specimens of a Sydney species from cocoons sent to Honolulu by Koebele, after my own return. These were kept in a large cage over growing cane and in every way reminded me strongly of a species of *Fumica*, with which I was very well acquainted many years ago, when I confined my attention to the Lepidoptera. It was to the characters of *Fumica* that I turned, when working out the material here considered, feeling sure that the resemblance was more than superficial, and the investigation has satisfied me that such is really the case. The superficial appearance of the larva in most of its stages is admirably described by Bowering in the words "a Coccus-like insect," for the larva, and also to some extent the cocoon, of many species greatly resembles certain mealy bugs in superficial appearance. In the well-grown larva of *Agamopsyche* the head is extremely small, and retractile; the mandibles minute and usually wholly, or almost wholly, concealed beneath the labrum; and the labium is produced into a spine-like process or spinneret, directed downwards. The larva is able to let itself hang down by a silken thread, and when freed from its host was often seen to do this. The head bears a number of longish bristles, the body a few inconspicuous ones. The eyes are distinct and set on a darkly pigmented area, and so placed together on the head as

to superficially resemble a simple form of compound eye on each side. The thoracic legs have a small and very sharp claw, which is abruptly bent backwards. Segmentation is deep and conspicuous, the cuticle corrugated and in life more or less thickly covered with a floury efflorescence. The third, fourth, fifth and sixth abdominal segments bear very short prolegs, which, however, are capable of further protrusion than is usually observed in preserved specimens. They are furnished with a regular circlet of hooks to the number of about 20 in large and 12 or 14 in smaller larvae. An additional terminal pair of legs or claspers very closely approximated, are imperfect, being armed with hooks only along the front side. In some species of *Heteropsyche* the hooks are much more numerous, 40 or 50 to each proleg.

One or more larvae may be seen on a single hopper, but, in some cases at least, it appears that only one of these is able to become mature. The moults take place on the hoppers' back, and one or more cast skins were frequently noticed thereon. In the case of *Agamopsyche* the caterpillars were found only on mature Delphacids. They affect both short and long winged forms alike, and either sex of the hopper. In most cases at least the parasite (unless resting or moulting) has the head turned towards the tip of the abdomen of the host. Although in many of the hoppers, that were found affected, there is no waxy excretion, such as the parasitic caterpillars have been supposed to feed on, yet it is probable that these feed largely on the sweet liquid excretion or honey-dew, which is abundantly produced at all times. This opens up the question as to whether the parasite is or is not fatal to the host. Koebele from observations made at Sydney believed that the hoppers died soon after the parasite quitted them. In some cases at least with *Agamopsyche* at Cairns, death followed quickly on the withdrawal of the full-fed caterpillar. Even immediately after this event in some specimens of a Delphacid, a collapse or distortion of the dorsal sclerites of the abdomen was obvious, and healthy hoppers included in the same jar as parasitized ones outlived the latter. It would however be premature to say that a mature hopper bearing these parasites is incapable of laying fertile eggs. In the case of species other than *Agamopsyche*, the caterpillars were observed on nymphs as well as on mature hoppers. Should the nymphs moult, it would appear probable that the parasitic caterpillar would be also discarded, but it is quite possible that the drain on the strength of the host is sufficient to prevent moulting, as is

always the case with the dryinized leaf-hoppers considered in Pt. 1 of this Bulletin.

It is, however, the first stage or instar of the caterpillar that is most interesting, not only on account of its utter dissimilarity in appearance, when compared with the later stages, but because it considerably resembles in general appearance that first larval stage of some parasitic insects of other Orders, which more or less resembles the primitive form of insects included in the Aptera.

The newly hatched larva is very minute, in shape subcampodeiform, very long and slender, and tapering to the caudal extremity. The head and thoracic segments together form about half the whole length of the larva, and are much more bulky than the rest. The head is large and remarkable for the great, ovate, black-pigmented eye on either side, and for the character of the labium, which in lateral view is often seen forming a large downward continuation of the head, of more or less triangular shape, its pointed lower extremity being armed with a long sharp spine or spinneret. It is not, however, always thus extruded, but can be withdrawn beneath the head so as not to be seen in lateral aspect. On either side of this, on the under surface of the head, and projecting nearly straight downwards, is a longish palp-like organ with slightly dilated base, which probably carries a sense organ. Its position would suggest that it is palpal rather than antennal. The segmentation is very distinct, the thoracic legs are large and in reality very elongate for a caterpillar, if they are expanded; but in dead specimens the joints are usually folded up on one another. There are two longish joints followed by an indistinct small piece resembling an empodium, over which is a long curved spinose bristle. The second to the seventh abdominal segments inclusive bear very long ambulatory bristles, set on projections or pseudopodia; the penultimate and apical segments have shorter ones, and the apex of the abdomen two excessively long and fine downward curved hairs.

The cocoons of the Epipyropidae are white, and have a mealy appearance in most cases, as have the larvae. They exhibit much variety of form, being usually more or less ornamented with carinae or outstanding lamellae, and though there may be individual variation, yet in many cases those of different species are quite distinct. Those of the genus *Heteropsyche* are more ornamental than those of *Agamopsyche* and *Palacopsyche*, as far as the species we collected are concerned. One extremely beautiful cocoon collected by Koebele is rosette-like, being

nearly round, and with three tall vertical lamellae concentrically arranged about the more solid round centre, which itself has a central depression. The moth from this was unfortunately not bred. When the moths hatch the pupa case always remains largely emergent from the cocoon, but its posterior segments are never freed, at least under natural conditions, whether the moth produced be male or female.

CLASSIFICATION.

The parasitic moths of the genus *Epipyrops* have been placed in various families by different authors. Westwood as already mentioned assigned the typical genus to the Arctiidae, but neither the neurulation nor the structure of the legs will admit of such a position. Sir George Hampson has suggested placing it in the *Heterogeneidae* (*Limacodidae*) but the neurulation and other structural points, as well as the larval prolegs, exclude it. Dyar who made a critical examination of an indifferent specimen from N. America, concluded that it was a "Tineoid form not referable to the Tineidae proper." This is practically the conclusion I have myself arrived at after a careful examination of the three genera here characterized, though I much regret that I have not been able to examine *Epipyrops* itself. Briefly I consider these insects to form a distinct family most nearly related to *Fumea* and *Taleporia* of the *Tineidae* and to the *Psychidae* of the *Psychina*.

Epipyropidae, fam. nov.

Head and thorax mostly with appressed scales, sometimes more or less hairy; eyes small and widely separated in front, ocelli wanting, palpi wanting (said to be present but minute in *Epipyrops*). Antennae one-half or less, with very long ciliated bipectinations in the male, much shorter ones, not ciliated, in the female. Thorax with appressed scales or more or less hairy; legs smoothish, not hairy, middle spurs absent, apical spurs at most represented by extremely minute spines. Forewings with 1a (often absent), 1b and 1c separate; 1b sometimes furcate at base, vein 8 to tip of wing, always very closely approximated to 7 at the base, or with 7 out of it. In the Australian species here described, the cell is divided into three parts by two indistinct longitudinal veins and the apex of the cell is closed only by in-

distinct or obsolete discocellulars. Hindwings with vein 8 (and 7 if present) free to the base not connected with cell.

The mouth parts are so degraded that it is hard to homologize the existing structures with those of an ordinary Tineid. The slight projection densely covered with scales and visible just below the clypeus, is seen, if denuded, to be a single piece with emarginate apex, divided by a suture from a basal portion, which occupies the middle of the head beneath. This structure resembles a simple labium in many insects, but its position seems that of the base of the proboscis of ordinary moths. The labrum lies in the deep emargination of the clypeus, and no other mouth-parts are present.

SYNOPSIS OF GENERA.

1. (2) Cell of hindwings emitting only 4 veins, (vein 4 absent) 7 free to base.....*Palaeopsyche*
2. (1) Cell of hindwings emitting 5 veins (vein 4 present) 7 absent.
3. (4) Forewings with vein 7 out of 8 near the apex.....*Agamopsyche*
4. (3) Forewings with veins 7 and 8 basally approximated but distinct.....*Heteropsyche*

Palaeopsyche, gen. nov.

Forewings with 2 very distinct internal veins, vein 2 rising from cell far beyond the middle, widely separated from 3, being about as distinct from it as 3 is from 4; 7 and 8 very closely approximated at base, the cell apparently open at the apex, being only closed by obsolescent veins; vein 12 free. Posterior wings with only 6 veins in addition to the internal, vein 4 being absent; apex of cell an acute angle giving rise to vein 5 only; 7 and 8 free to the base. (Pl. fig. 3.)

Palaeopsyche melanias, sp. nov.

Male and female, 7-8.5 mm. Head and thorax black, somewhat hairy, antennae more or less pale, black or dark at the points of origin of the pectinations. Antennae in the male with 9 very long bipectinations, and the apex bifid to form a tenth, the longest pectination about half as long as the whole antenna;

DESCRIPTION OF FIGURES.

1. Neuration of fore and hind wing of *Heteropsyche* (female).
2. The same of *Agamopsyche* (female). Hind wing partly wanting.
3. The same of *Palaeopsyche* (male).

a short basal pectination, apparently sometimes absent. Antennae of female with much shorter bipectinations than those of the male, the longest of these twice as long as the space between itself and the next following. Anterior wings dull black, purple-tinged in some lights, shorter and broader in the male, more pointed and with very oblique termen in the female; cilia black or blackish fuscous. Hind wings dark fuscous, greyish tinged, cilia long, dark fuscous. Abdomen black, no pale anal tufts in female.

HAB. Cairns, Queensland; abundant on a Jassid on Terminalia.

Heteropsyche, gen. nov.

Differs from *Palaeopsyche* in that vein 9 of forewings is absent, vein 4 of hindwings is present, 7 being absent. (Pl. fig. 1). Type *H. melanochroma*.

The species of this genus are closely allied and difficult. The material at my disposal consists mostly of specimens that were allowed to die a natural death, since we wished to obtain eggs to send to the islands for economic purposes. They are therefore much abraded and practically useless for study of characters other than structural. However, either one or two examples of each species were killed while in fresh condition, and these served for the following descriptions. For the separation of the species, I have in the table used chiefly the number of pectinations of the male antennae, which appear constant in all the examples of the one species that was examined in numbers, in which I counted them. Apart from this, however, all differ in details of coloration. Koebele under number 2358 records that he found 2 species of *Epipyrops* on some 17 species of leaf-hoppers, Jassid and Fulgorid. I think it probable that had material of these been saved in good condition, there would have proved to have been several species of the moths under this number.

SYNOPSIS OF SPECIES.

MALES.

1. (4) Antennae with 12 pectinations on the inner side, not counting one formed by the bifid apex.
2. (3) Forewings more or less variegated; cilia of hind wings mostly white.....*H. poecilochroma*

3. (2) Forewings almost uniform blackish or blackish fuscous, cilia of hindwings dark *H. melanochroma*
4. (1) Antennae with less than 12 pectinations on the inner side, excluding one formed by the bifid apex.
5. (6) Forewings maculately greyish and blackish; antennae with 10 bipectinations, not counting the bifid apex. *H. micromorpha*
6. (5) Forewings greyish fuscous indefinitely sprinkled or suffused with dark, antennae with 11 bipectinations (excluding that formed by the bifid apex) . . . *H. dyscrita*

1. *Heteropsyche poecilochroma*, sp. nov.

Male; expanse about 10 mm. Head and thorax greyish fuscous, antennae with 11 lateral bipectinations, an additional basal pectination apparently unpaired, or at least with the other of the pair scarcely visible, and the bifid apex of the antenna forming an additional pair of short pectinations; basal joint with a tuft beneath. Inner pectinations blackish with paler spots or lines, outer pale with dark tips. Forewings greyish fuscous strigulated with dark and brownish fuscous, and along the costa with black so as to have an ill-defined maculate appearance; termen slightly bowed, very oblique, dorsal margin strongly rounded; cilia dark fuscous. Hindwings dark fuscous somewhat brownish tinged, cilia except at their base white.

HAB. On the Mulgrave near Cairns, bred from a Fulgorid. (Koebele's number 2294).

2. *Heteropsyche melanochroma*, sp. nov.

Male and female; expanse about 10 mm. Head, thorax and abdomen black, or blackish fuscous. Antennae in the male with 12 bipectinations (in addition to those formed by the bifid apex) and a basal tuft beneath. Pectinations in the female very short. Forewings dull, nearly uniform, blackish fuscous or black, faintly purple tinged in some lights; hindwings blackish fuscous, hairy towards dorsum, cilia blackish fuscous.

HAB. Sydney, N. S. W. Very abundant according to Mr. Koebele. His Number 2358, which no doubt included more than one species. Said to have been bred from various Fulgorids and Jassids.

3. *Heteropsyche micromorpha*, sp. nov.

Male; expanse about 7 mm. Head and thorax dark fuscous, greyish tinged, abdomen blacker. Antennae with 10 bipectinations in addition to the bifid apex, and with a basal tuft beneath. Forewings greyish and dark blackish fuscous so arranged that the grey parts form many small roundish spots, along that costa partly blackish, cilia blackish fuscous. Hindwings blackish fuscous, cilia grey-tinged.

Hab. Sydney, N. S. W. (Koebele's number 2352) bred from a peculiar Fulgorid on fern.

4. *Heteropsyche dyscrita*, sp. nov.

Male; expanse about 9 mm. Head greyish fuscous, thorax darker, antennae with 11 bipectinations (excluding those formed by the bifid apex) and with a basal tuft beneath. Forewings greyish fuscous, indefinitely sprinkled and suffused with dark fuscous, but not so as to be definitely marked or maculate; cilia dark fuscous more or less grey-tinged at the tips. Hindwings uniform dark fuscous, cilia paler, grey-tinged.

Hab. Sydney, N. S. W. (Koebele's number 2366). Another specimen under this number looked like quite another species, but was too worn for identification. On minute Fulgorid on *Cuscuta*.

5. *Heteropsyche stenomorpha*, sp. nov.

Female; small and with narrow front wings, expanse about 8 mm. the termen very oblique, the dorsum strongly rounded. Antennal pectinations very short, the longest hardly longer than the joint that bears them. Forewings black or blackish fuscous rather roughly scaled, the cilia dark; hindwings like the front, but rather more finely scaled.

Hab. Sydney, N. S. W. (Koebele's number 2358). Might be a depauperated form of *H. melanochroma*, which bears the same number, but more probably is distinct.

Agamopsyche, gen. nov.

Differs from *Heteropsyche* in that vein 7 of forewings is out of 8 near the tip of the wing, and in the female the antennae are

much more longly bipectinated. From *Palaeopsyche* it differs in the absence of vein 9 of forewings and vein 7 of hindwings. (Pl. fig. 2).

Agamopsyche threnodes, sp. nov.

Female, length 6-8 mm. Head and thorax blackish fuscous. Antennae with rather long pectinations, the longest much longer than the space between itself and the next following. Forewings, long and narrow, deep black or blackish fuscous, generally with a purplish reflection, and with some obscure and variable small whitish spots; cilia greyish or greyish fuscous, conspicuously paler than the wing. Hind wings black or blackish fuscous, cilia greyish fuscous.

Hab. Cairns on Delphacids, abundant.

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REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

**Leaf - Hoppers and their
Natural Enemies**

(*PT. III. STYLOPIDÆ*)

BY R. C. L. PERKINS

HONOLULU, H. T.
AUGUST 8, 1905

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LETTER OF TRANSMITTAL

Honolulu, T. H., July 14th, 1905.

Special Committee on Experiment Station,

H. S. P. A., Honolulu, T. H.

Gentlemen:

I, herewith, submit for publication the third part of the Bulletin on "Leaf-Hoppers and Their Natural Enemies."

Yours obediently,

R. C. L. PERKINS,

Director, Division of Entomology.

GENERAL REMARKS ON THE STYLOPIDAE.

The Stylopidae or Strepsiptera are minute insects of great interest on account of their anomalous structure and their remarkable parasitic habits. Even now, though they are common insects, their structures have been very imperfectly examined, and the most diverse opinions have been expressed as to their natural affinities. Sir Sydney Saunders, who monographed the group in 1872, divided them into two groups on account of their habits, viz: the Hymenopterobiae parasitic on bees, wasps, and ants, and Homopterobiae parasitic on Homoptera. The latter group was made to contain Westwood's genus *Colacina*, parasitic on a leaf-hopper from Borneo, and I believe never yet characterized. Since that time, Mr. Edward Saunders, in 1892, discovered the long known genus *Elenchus*, the host of which had been the subject of various erroneous conjectures, to be parasitic on a small leaf-hopper of the genus *Liburnia*. Two years ago Mr. Koebele bred this same insect in quantities from *Liburnia* in the State of Ohio, and subsequently in California, while in Australia we found the same to be very common in every locality which we investigated, and to attack not only *Liburnia*, but several other genera of Delphacid leaf-hoppers. Finally, Mr. Koebele, after my return to Hawaii, when he proceeded to Fiji, at once discovered *Elenchus* there in numbers, attacking various Delphacids, and we had previously found the females and male puparia in leaf-hoppers sent from those islands for our inspection. Otherwise outside Europe, a species of this genus had been collected in numbers in Mauritius by Templeton some seventy years ago. Nor is it only the Homopterous Rhynchota that are attacked, for Sharp has recorded a case of a Stylopid attacking a Pentatomid bug of the genus *Chrysocoris* from East Asia, and I had the pleasure of examining this interesting specimen, when I was last in Cambridge. We failed to find any Australian Pentatomid stylopidized, though we examined considerable numbers, but as owing to pressure of other matters we were unable to make any really extensive search, it is quite probable that such will be found there. At least not only are many Fulgoridae and Jassidae affected with these parasites at all points investigated, from Sydney in New

South Wales to Cairns in Northern Queensland, but so too are the Aculeate Hymenoptera, both the Vespidae (Polistes, etc.) and many Fossores, such as the common, house-frequenting *Pelopocus* of the Sphegidae, the Bembecidae, Stizidae, and no doubt many others.

It is but rarely that any of the male Stylopidae are met with on the wing, and consequently they appear to be rarely well represented in collections of Coleoptera; but they are so easily bred and in reality so common everywhere that our want of knowledge of their habits and structure is astonishing, when we consider how remarkable these are. On account of their larger size, the Stylopidae that are parasitic on bees and wasps, are in some ways more suitable for study than those on Homoptera. My experience of the bee parasites has been far more extensive than with the Rhynchotal ones, as I have found them everywhere in England, very abundant in bees in California, common in Arizona, and Mexico, casually noticed them at Washington and rather commonly in *Halictus* at Montreal. To their occurrence in Australia, I have already referred. In spite of this, it is doubtful whether any museum in the world possesses a collection of even a few hundred specimens of these parasites, such as would adequately illustrate the various sub-families, genera, and species.

With regard to the species parasitic in bees such as *Andrena*, in order to obtain the male parasites freely, I have found it necessary to note one fact in countries, which have a cool winter. It is known that sometimes in the case of *Andrena*, and probably generally, the male *Stylops*, like the bee it infests, is fully developed, even in midwinter, and only awaits the emergence of its host in the spring to issue from its body. Therefore the first appearance of the bees in the spring should be watched for, and their first appearance in the morning, since the *Stylops* will often emerge at the very moment that the bee first comes from its burrow into the sunlight. Later on the majority of the bees bear only female parasites, or the empty puparia of males. Notable exceptions are indeed known to these facts but nevertheless they are generally true of the genus *Stylops* itself, when parasitic on the spring species of *Andrena* in colder countries, and it is these species that are chiefly affected. On the other hand, fossorial Hymenoptera and wasps may retain the male puparia of *Xenos* and its allies unhatched for days and even weeks after capture, and in the case of the Fossores it is sometimes difficult to keep the hosts alive till the parasites

emerge. With the parasites of Jassid leaf-hoppers, emergence from the puparia sometimes does not take place for a week or more after capture, but these leaf-hoppers are more easily kept alive in captivity than most of the Fossorial Hymenoptera.

EFFECT OF ATTACK OF STYLOPIDAE ON THEIR HOSTS.

The external and internal effects of stylopization on the hosts have been studied by various hymenopterists in the case of the typical genus *Stylops*, but they still require much closer further examination. In 1891 I showed that males of certain species of bees bearing the females of *Stylops* were apparently perfectly capable of reproduction. I have fully verified these observations subsequently. Piffard has recorded the fact of a styloped male bee copulating, and I have myself since noticed similar cases, but in this respect the most remarkable case observed by me was that of the male of a leaf-hopper, a large species of *Tettigonia* bearing two great male puparia and two mature female parasites, which was in copula with a female carrying three or four parasites. Female bees of the genus *Halictus* infested with *Stylops* hibernate like healthy individuals. On the other hand, Theobald examining other species of *Andrena* came to a conclusion almost opposite to my own, which may have been due to the fact that the species investigated by us were different. I suspect however that it was largely due to two causes: (1) that he chiefly examined bees containing, or that had contained, male *Stylops*, the effect of which is much more severe on the host than is the female parasite; (2) he examined material in alcohol, and it is quite possible that, in the process of pickling, the contents of the *vesiculae seminales* were lost, as I have shown this may happen on contact with water, or possibly by the pressure of other parts on contraction in the alcohol. All my specimens were freshly caught ones, dissected under anaesthetics, and only after the whole genital system had been removed entire, glands, ducts and armature, were the bees placed in alcohol for the examination of other organs. It is obviously perfectly impossible that, in the species to which my paper refers, the germ cells were destroyed in the larva of the bee as Theobald says we should expect to be the case.

In the case of styloped leaf-hoppers, I should judge that the effects are a good deal the same as in styloped bees, from such observations as we were able to make on the former. (1) The

male parasite injures the host more than the female, causing generally a considerable and often large distortion of the body. (2) Both male and female hoppers will copulate though very badly parasitized. (3) Death usually follows after the emergence of a male Stylopoid, sometimes immediately, sometimes in a few hours, but sometimes not for some days in the case of especially robust hoppers, as also is the case with some wasps. (4) The much more fatal effect of the male parasite is not altogether due to the fact that the puparium is much larger (as to its protruded portion) than the mature female, and also usually more chitinized on its hidden segments, but it is largely due to the fact that, when the mature Stylopoid emerges, the cap of the puparium being burst open and often altogether removed, a great opening extending far into the interior of the body of the host freely admits both light and air to the *viscera*, and this clearly produces most injurious and often rapidly fatal results. Possibly too it may be that the male parasite, so far more highly developed than the female, requires for its perfection to draw more heavily for nutriment on its host. Again in the case of leaf-hoppers, at least at certain seasons, no sooner does the male parasite emerge, than a fungous disease at once starts its attack in the opening thus made, the results of which are absolutely deadly. Sometimes, but much more rarely, one will find the fungus has developed at the point of protrusion of the female parasite. This fungous disease seems to be a constant concomitant of Stylopoid attack on leaf-hoppers, both in America, Australia and Fiji. I have dealt with this question of the effect of the parasite at some length, because strenuous efforts were made to introduce *Elenchus* into these islands (it is to be feared unsuccessfully so far) for economic reasons, and it would be essential in my opinion to bring both the parasites and the concomitant fungus above mentioned to secure the best results. As, in Fiji, *Elenchus* attacks a species of *Perkinsiella* closely allied to our sugar-cane leaf-hopper, it could probably be much more easily imported from those islands than elsewhere.

THE GENERA *HALICTOPHAGUS* AND *ELENCHUS*.

The genus *Halictophagus*.

The literature accessible to me that deals with this genus is deficient, and I do not know whether this parasitic insect has been actually bred from the bee genus *Halictus* or whether its assignment to these common bees is altogether based on con-

jecture, as it was when Westwood wrote his "Introduction." On examination of the Australian Stylopidae that infest Jassids, it is evident that these are so extremely close to *Halictophagus* as figured by Westwood that I have left one of these species in that genus and have made a new subgenus for the reception of another. I incline to believe that *Halictophagus*, which appears to be very little known, and hardly noticed since J. C. Dale captured the type of the genus in 1832, and again took it in the same county (Dorset) in England in 1840, is really a Jassid parasite, and could be easily bred in numbers by any one who would investigate some of the Jassids in that country, *Agallia*, *Tettigonia*, or some such common form, being likely to prove its hosts. I am further led to believe its connection with *Halictus* is entirely suppositions because Mr. C. W. Dale, the son of the above named entomologist, writing 60 years after the type was obtained, says "*Halictophagus* is supposed to be a parasite of *Halictus*, *Elenchus* of *Prosopis*." We know the latter assignment of host and parasite to be incorrect, and probably the former is also. The Australian species of *Halictophagus* and of which males are known are confined to Jassids, but females of a quite distinct species found on large Fulgorids are in my opinion also allied, and belong to the same group.

The genus *Elenchus*.

So far as our observations have gone, these being confined to a single species, *Elenchus* attacks only Delphacid leafhoppers, and of these only such as feed on Gramineaceous plants, not those found on shrubs or trees. I see no reason, after the examination of dry and alcoholic material and specimens preserved in balsam, to specifically separate the Australian examples from the American (the latter from Ohio and California) nor either of these from the Vitian. Again I refer all these to the British *Elenchus tenuicornis*. Other species of *Elenchus* have been described from Mauritius and Britain, but whether these are all distinct, I feel some doubts. Dried specimens of these insects become more or less distorted or shrivelled, so that examples of one species though taken together often exhibit apparent differences from these causes. Mounted in balsam, slight differences in position often give a very different appearance to various structures, e. g., the antennae, genitalia, etc. Next to fresh specimens those preserved in alcohol are most suitable for study. Throughout Koebele's notes this species is referred to under the name *Colacina* Westw. on the

authority of Mr. E. A. Schwartz but I cannot think that *Colacina* and *Elenchus* are identical. At any rate this is true *Elenchus*, and it does not seem likely that Westwood would have so forgotten this genus, which he knew well in 1840, as to make a new one for the same insect years afterwards. Mr. Koebele found in Ohio, at the same time as *Elenchus*, that a Jassid (*Agallia*) was also affected by a Stylopid parasite. On a slide are some mutilated specimens in balsam of the male parasites, which he found stuck to the glass in the tubes in which these *Agallia* were kept alive. I cannot see any difference whatever between these males and the *Elenchus* bred from *Liburnia*, but on examination of the dead *Agallia*, I find female Stylopids of a character so utterly different from that of *Elenchus*, that I imagine a *Liburnia* must have been accidentally included, from which the males in question emerged. Moreover the larvae from these females are different from those of *Elenchus*. I think it probable that the male of these females will prove to be a *Halictophagus*, but Mr. Koebele's well known accuracy and his opinion that the males sent came from *Agallia*, make further investigation necessary. By this I mean it is necessary to investigate *Agallia*, to prove whether it is at any time attacked by *Elenchus*. That these female Stylopids found in *Agallia* do not belong to that genus needs no investigation, and there is no possibility of their belonging to the males supposed to have been bred from the same leaf-hoppers; indeed there is no reason to doubt that they belong to the Halictophaginae.

THE LARVAE OF STYLOPIDAE.

The larvae of Stylopidae when they emerge from the brood-chamber of the female are often called triungulins, but very inappropriately so, since they entirely lack the very structures for which the name triungulin has been applied to the first instar of larval *Meloe* and other beetles. The larvae of Stylopids parasitic on Homoptera are much smaller and more difficult to study than are some of the wasp-parasites, and I have therefore figured in ventral view a larva of one of the latter (which is allied to *Xenos*) for comparison. This larva (Pl. IV, 5) when highly magnified is like *Lepisma* in general appearance and otherwise is chiefly remarkable for the great pigmented eye-spots around the lenses, and the structure of the elongate legs. The first two pairs of these terminate in the rounded pad noticed by writers on larval Stylops, but the hinder pair bear in place of this a long fine spine or seta, from which, near the extremity, there arises a finer and strongly curved one.

The young larva of *Elenchus* (Pl. IV, 3 and 4) in general resembles this, the legs being long, the eye spots large, and the pair of apical abdominal setae very long. All the legs however terminate in a long curved spine or seta, the two anterior pairs not differing much from the posterior. The ventral surface is much depressed, the dorsal convex. Each abdominal segment has a minute seta at the side, and on either side close to the middle line is an additional row of setae.

In the Australian subgenus *Bruesia* the larva (Pl. IV, 1 and 2) is larger than that of *Elenchus*, generally more parallel-sided, but both it and *Elenchus* are subject to considerable variation in shape according to the retraction or otherwise of the body segments. It also appears to differ from *Elenchus* in the arrangement of the setae of the ventral surface, but the claws of the legs are of a somewhat similar character, and unlike those of *Xenos* and the other hymenopterous parasites.

Newport's figure of the larva of *Stylops* reproduced in The Cambridge Natural History, if it be correct, would show that genus to be utterly unlike any of those here considered, no trace of the great eye spots being shown and the many jointed feet are utterly foreign to the species I have examined. Indeed I should not have recognized it as a Stylopid larva at all after my recent study of these.

THE PUPARIA OF STYLOPIDAE.

The puparium of a male Stylopid, that is to say the exserted portion, generally bears a great resemblance to the adult female except for the fact that it is rounded instead of flattened. In many cases the tubercles or depressions with which the apex is furnished closely resemble those in the female. As the male Stylopid becomes mature its head can be seen within the exserted apex of the somewhat transparent puparium, and this fact, combined with the great similarity between this part of the puparium and the exserted end of the female, would have satisfied me that in the latter it was the head end exserted, and not the tail as Meinert supposed, even if it had not been conclusively settled by the position of the ganglia in *Xenos*. Saunders has figured the adult *Elenchus* escaping from the puparium ventral side upwards—we have frequently watched the same insect issuing in this manner—and remarks that *Xenos* does the same, but that *Stylops* and *Hylecthrus* are said to emerge in reversed position. The puparia of all the Stylopids examined by us, on the emergence of the mature insect, split open by the

regular dehiscence of an apical cap. The pupa itself, as it approaches maturity, is more or less visible through the shell. It appears to me of a decidedly Coleopterous type, and when the mature insect emerges the pupal skin is shed as the most delicate of pellicles.

SOME RELATIONS OF PARASITE AND HOST.

In the case of *Xenos* parasitic on wasps of the genus *Polistes*, Hubbard noted the marked hostility of the host towards the parasite. Brues did not observe this with his specimens, and suggests that this was due to the fact that no females of the *Xenos* were present in the wasps that he studied, and consequently that the males of the parasite did not approach these for the purpose of pairing. This is very probably the true explanation of the difference in the wasps' behaviour in the two cases, in confirmation of which one may cite the old and often quoted observation of J. C. Dale: "Putting two bees (*Andrena labialis*) under a glass in the sun two Stylops were produced: the bees seemed uneasy and went up towards them, but evidently with caution, as if to fight; and moving their antennae towards them, retreated. I once thought the bee attempted to seize it; but the oddest thing was to see the Stylops get on the body of the bee and ride about, the latter using every effort to throw his rider." This certainly seems to point to the conclusion arrived at by Brues, the *Andrena* in question probably bearing a female specimen of the parasite. In the case of leaf-hoppers, we did not notice any sign of disturbance on the part of the host at the presence of the male parasites, nor did we ever see copulation take place, though we often had many male and female *Elenchus* in the same jar. It will probably prove that the remarkable mandibles of many male Stylopids are for the purpose of holding on to the host during the pairing of the sexes. In general it would appear that these organs are less remarkable in the parasites that attack leaf-hoppers, than in those that occur in bees and wasps, in fact in some of the former class they are small and of very simple form.

In the case of *Polistes* there is, according to Brues, a well-marked tendency for all the parasites in one wasp to develop the same sex. This is also notably the case with some of the Stylopids affecting the Fossorial Hymenoptera, but with those attacking leaf-hoppers it is often quite otherwise, and it is of the commonest occurrence to find male and female parasites in the same individual hopper.

It is perhaps worthy of notice that the male puparia of the species of *Halictophagus* parasitic on Jassids, pierce the dorsum or even the venter of the abdomen of these leaf-hoppers, but the head of the female is always, or nearly always, thrust through the pleura. On the contrary in *Elenchus* and *Deinlenchus*, parasitic on Fulgorids, the male puparium (as well as the head of the female parasite) is exerted from the pleural region only.

In the case of the *Halictophaginae* we found only mature leaf-hoppers to contain mature female parasites and puparia; but in the case of *Elenchus tenuicornis* the nymph or adult Delphacids will alike produce mature parasites of either sex.

CLASSIFICATION.

The differences between the various forms here considered are so great, that if the Stylopidae are considered as a family of Coleoptera, they must represent three sub-families; or if these parasites be treated as a separate Order, Strepsiptera, they might even form three families. The marked differences in the head, legs, and thoracic sclerites being probably sufficient to warrant the higher division. They may be distinguished as follows:

1. Tarsi 4-jointed	Stylopinae.
2. Tarsi 3-jointed	Halictophaginae
3. Tarsi 2-jointed	Elenchinae

As personally I consider the Stylopidae to be a Coleopterous family, the divisions here are treated as sub-families.

The first of these divisions is capable of further subdivision, of a character in my opinion more than merely generic, but it is not necessary to enter into these minor distinctions here. The family will, naturally, be placed next to the Mordellidae (incl. Rhipiphoridae).

The measurements and descriptions of the female Stylopidae are made from the head, as it appears when the animal is imbedded in its host; for the variation in the length of the exerted portion in different individuals is very small.

Female Elenchinae are (so far as the species collected by us are concerned) easily distinguished from Halictophaginae by the absence of the median apical plate and other apical structures, and the presence of discal areas in front of the brood-chamber opening.

LIST OF SPECIES OF STYLOPIDAE HERE CON- SIDERED.

STYLOPIDINAE.

Gen.? sp. nov. near *Xenos*.

HALICTOPHAGINAE.

Halictophagus.

H. schwarzii, sp. nov.

H. americanus, sp. nov.

subg. *Bruesia*, subg. nov.

B. australensis, sp. nov.

B. phacodes, sp. nov.

B. stenodes, sp. nov.

Megalechthrus, gen. nov.

M. tryoni, sp. nov.

FLENCHINAE.

Elenchus.

E. tenuicornis, Curt.

Deinelenchus, gen. nov.

D. australensis, sp. nov.

GENERAL STRUCTURE OF STYLOPIDAE.

As the position of Stylopidae as a whole amongst the Insecta has been a cause of much discussion and disagreement, so the character of various structures has also been diversely interpreted. There is no question that the mouth-parts are of an abnormal character, and difficult to study, but that there should have been differences of opinion as to the thoracic sclerites and their appendages is not so easily understood. Even in the minute *Elenchus*, by far the most difficult of the Stylopidae to dissect, the prothorax and mesothorax can easily be separated entire, each in the form of a complete ring, exhibiting notal, pleural, and sternal portions, well marked, the former sclerite bearing the front legs, the meso-thoracic, in addition to the middle pair of legs, having the ladle-shaped elytra attached to the sides.

The mouth parts of *Elenchus* and its other characters have been elaborately discussed by Eaton, but the figure given by him is an unfortunate one, owing to the position in which it was drawn; for of the part which he considers the *ligula*, the extremity approximate to the labium is not visible at all. Nev-

ertheless, had I examined no other Stylopid than *Elenchus*, I might possibly have agreed with his interpretation of the mouth parts, but the examination of a species of a genus allied to *Xenos*, and more especially a close study of the head of a species of the subgenus *Brucsia* (hereafter described) and of a species of *Halictophagus*, leads me to favor a different interpretation. The delicate transverse band on the under side of the head I agree in considering labium, the two-jointed organ on either side of it being probably the labial palpi. The part called ligula by Eaton requires close study being in many Stylopidae bent at an angle, to form two planes; when the upper part is seen in full surface view, the lower part meeting it at a strong angle slopes very strongly backwards from the point of meeting. This structure might be called an epistome, but it is possible that the lower part is really the labrum or upper lip, the position of which it occupies. Between the apex of the lip and the labium approximated to it, is the closed, or obsolescent oral aperture. The so-called mandibles are probably rightly so called. Adopting Eaton's interpretation the oral aperture of *Elenchus* is bounded by and in fact leads into the frontal process, but this seems to me certainly erroneous. According to the view here suggested by me, the mouth parts of the Stylopidae are not so extremely remarkable. The difficulty of studying the insect is not only due to the small size and delicate structure, but also to the fact that the sides of the face within the eyes have sharp protuberant edges, so that this part is more or less deeply excavated, the other structures being partly or wholly immersed, and further obscured by the mandibles and palpi. In *Brucsia australensis* however, and *Halictophagus schwarzii*, the face is much more open, and after dissecting off the mandibles and palpi the parts can be studied with comparative ease. It was therefore found advisable to carefully examine these before coming to any decision as to the mouth-parts of *Elenchus*. In Pl. I, fig. 1, is a diagrammatic view of the front of the head, simplified from what is actually seen in *Brucsia* and *Halictophagus*, as I interpret it, actual figures of these being given on the same plate, fig. 2 and 5. The parts indicated by the letters b and d together represent what I have already called epistome, of which however, the lower portion (d) may be labral; e is the labium, and the closed, or at least obsolescent, oral opening is the slit between d and e. For the rest, the other parts are sufficiently explained in the description of the figures, but special attention must be called to the foramen (c) at or near the junction of b and d. This exists in *Elenchus*, *Halic-*

tophagus, *Brucsia* and in the species examined of a genus allied to *Xenos*, in fact in all the male Stylopids considered in this paper, and as it furnishes an easy means of identifying homologous parts of the face, it is of great importance.

If we now consider the parts of the face in *Elenchus* as compared with *Brucsia* the most striking difference noticed at once is the fact that the part immediately above the *foramen* (which corresponds to b in the diagrammatic figure) appears to end above in a free edge and not to be sutured to the frontal process. It is this edge that Eaton considers the apex of the *ligula*, and the cavity between it and the frontal process as the oral opening. I believe however that this edge is not the real extremity of this plate but is due only to a sharp bend therein. We are therefore left with two alternatives: if we consider with Eaton that there is a great *ligula*, then in *Brucsia* and *Halictophagus schwarzi* the apex of the ligula is not free, but continuous with the frontal process, and not even divided therefrom by a distinct suture; or if we adopt the interpretation that I favor, we shall consider the same part as epistome, or epistome and labrum, though in some genera its basal (upper) margin is deeply imbedded in the excavated front of the head. A strong immersion of the clypeus beneath the level of the front, or of labrum beneath the clypeus, is by no means unfamiliar in other orders of mandibulate insects. In a species of a genus allied to *Xenos*, the head of which is figured on Plate I, fig. 4, it will be seen that the epistomal portion lies entirely immersed beneath the prominent edges of the sides of the face. As to the division of the lower part of the face into epistome and labrum, both in a dry specimen of *Brucsia* and in one mounted in balsam, I think I can detect faint sutures, marking off a labrum from the epistome, and I suspect that the foramen always marks the division between these.

THE THORACIC SEGMENTS.

The pro- and meso-thorax appear to be always small and ring-like, and one or both of these are immersed in the posterior concavity of the head (Pl. I, fig. 3), and on superficial examination may even appear to be part of this.

In some figures of Stylopidae the top of the head is represented as much more solid than it really is, the pronotum probably having been considered as part of the vertex. The meta-thorax differs greatly in the arrangements of its parts in different genera. In *Elenchus* (Pl. II, fig. 11) the posterior of the four

anterior lobes, which may be called the scutellum, is semilunar, and extremely small compared with the great triangular anterior lobe, not penetrating forwards between the lateral lobes. The post-scutellum also is unusually short.

In *Halictophagus* and *Brucsia*, (Pl. II, fig. 9) the scutellum is triangular, but much smaller than the anterior lobe, penetrating somewhat between the lateral lobes, the post-scutellum being very elongate. In a genus allied to *Xenos* there is a great triangular scutellum, produced far forwards between the lateral lobes and longer than the anterior lobe (Pl. II, fig. 10). It is clear that the structure of the thorax will prove of great use in the classification of Stylopidae. The great differences between the tarsi of the several subfamilies are shown in Pl. II, figs. 6, 7 and 8, and also the wings of *Elenchus*, *Brucsia* and ? *Halictophagus* on the same plate (figs. 1, 2, 3), so that it is not necessary to refer further to these.

DESCRIPTIONS OF GENERA AND SPECIES.

Brucsia n. subg. (of *Halictophagus*).

Head very deeply concave behind, seen from above consisting only of a narrow rim supporting the eyes, and produced considerably in front of these to form the tip of the blunt and wide frontal projection, at the sides of which the antennae are inserted. That which appears to be the top of the head on superficial inspection, is in reality the dorsum of the pro- and mesothorax, which in their natural position are deeply immersed within the posterior concavity of the head, which they more or less fill up. Antennae with the two basal joints simple, the following excessively short, being produced laterally into an elongate and thin lamina, the first and fifth (or last) of these laminae being larger than the others and capable of enclosing them in a fan-like fashion. Mandibles very short compared with those of other Stylopids, their tips not reaching one another, simply pointed. Labial palpi very large, the second joint foliaceous half as wide as long, pilose, subacuminate at the apex. Scutellar portion of metanotum moderately large, penetrating somewhat between the lateral lobes of its anterior portion, triangular, and very different from the small semilunar scutellum of *Elenchus*; the post scutellum very elongate, twice as long as wide, or appearing still longer in dry specimens, covering several of the basal abdominal segments. Elytra clavate or ladle-shaped in well-preserved specimens. Wings smoky hyaline,

neuration black, very distinct. Tibiae dilated apically, and grooved or hollowed above for the partial reception of the three-jointed tarsi, when these are drawn up.

1. *Halictophagus (Brucsia) australensis*, sp. nov.

Black or blackish fuscous, the thorax paler, piceous or brownish, the lamellate joints of the antennae also paler, yellowish or sordid testaceous. Wings smoky hyaline, with slight but evident iridescence, the neuration strong, black. Apical abdominal segment with its genital process concave above and much produced, towards the base with an upright tongue-shaped, pilose organ; in lateral view the sides are slightly convergent to the apex, which is armed with a recurved hook, the tip of which is itself bent upwards; in front of the origin of this uncus the process has a small deep emargination. The apical ventral segment is triangular and produced at the apex. The abdomen is clothed with a very delicate cinereous pubescence. Expanse about 4 mm.

Female. Head yellow or brownish yellow, distinctly rounded at the sides, with a distinct anterior median area (or plate) marked out, and slightly produced; tuberculate on either side of this area in front. The opening of the brood-chamber is behind the middle of the exposed part of the head, the surface between this opening and the apex subconvex. Length about $\frac{1}{3}$ mm.

(Plate I, figs. 3, 5 and 9; Plate II, figs. 1, 7, 9 and 12; Pl. III, fig. 8 and 9.)

Hab. Cairns, Queensland, parasitic on a very common and conspicuous species of *Tettigonia*, many parasitized examples being taken by us. (No. 2238).

2. *Halictophagus (Brucsia) phacodes*, sp. nov.

Female. Head broader than long, brown, more yellowish in front and darker behind the opening of the brood chamber, strongly rounded at the sides, the anterior median area defined and slightly produced, tuberculate on either side of this area in front; the surface slightly convex between the opening of the brood-chamber and the apex. Length about $\frac{1}{4}$ mm.

(Plate III, fig. 3).

Hab. Cairns, Queensland; one female specimen parasitic on a common green flat-headed Jassine of the genus *Hecalus*.

3. *Halictophagus (Bruesia) stenodes*, sp. nov.

Female. Head narrow, subelongate, sides not strongly rounded, more parallel-sided, piceous, shining, opening of the brood-chamber near the middle of the head, the surface slightly convex. Otherwise agreeing generally with the preceding. Length about $\frac{1}{4}$ mm.

(Plate III, fig. 2).

Hab. Cairns, Queensland. One female, parasitic on a small seed-like brown Jassine of the genus *Paradorydium*. I also took one bearing a male puparium.

? *Halictophagus* Curtis.

The species, which I provisionally assign to this genus, differs from the male of the subgenus *Bruesia* in that the five apical antennal joints are not all of thin laminate form throughout, but the basal ones of these are of more normal form, and the branches are less thinly laminate. The face, as far as I have been able to examine it, appears to be of simple form, the middle part not much separated from the lateral elements, nor deeply immersed beneath the latter, and the palpi to be much more slender than in *Bruesia*. The general form of the metathorax, tarsi, and genital segment is the same as in that subgenus.

The unique specimen described was originally mounted on a slide in balsam and much distorted, the prothorax and front legs being so displaced as to overlie and conceal the head, while one crumpled wing concealed the body. It was therefore removed from the balsam, cleaned, and relaxed, so far as was possible; the one wing was removed and the prothorax was put more or less into its proper place.

It is most probable that this insect is not true *Halictophagus*, but possibly it may be included in *Bruesia*, when the latter ranks, as I have little doubt it will, as a good genus. In Westwood's figure of *Halictophagus*, the metathorax is very different, as also is the terminal abdominal segment, in which the Australian forms closely resemble one another. In the antennae however the present species is intermediate between *Halictophagus* and *Bruesia*. (See Westwood Int. Mod. Class. Ins. II, fig. 94, 10 and 14).

4. *Halictophagus? schwarzi*, sp. nov.

Black, clothed with extremely delicate sericeous pubescence,

which is cinereous in some parts; the extreme tip of the abdomen testaceous; metathorax more or less obscurely pale in some parts, at least along some of the sutures. Antennae blackish, third and fourth joint short, subtriangular, with one of the apical angles produced into a long branch, fifth and sixth joints shorter than the preceding, more ring-like, but produced into similar branches; seventh joint lamellate throughout. Wings subhyaline, slightly smoky and iridescent, the nervures very distinct, blackish. Expanse 3 mm.

(Plate I, fig. 2 and 7; Pl. II, fig. 2).

Hab. Mittagong, New South Wales, bred from a common Bythoscopine Jassid, *Agallia* or an allied genus, found on *Mela-leuca* (Koebele 2356). I have named this after Mr. E. A. Schwartz, who was interested in the Stylopids discovered in Ohio by Mr. Koebele, and has often placed his knowledge at Mr. Koebele's service.

5. *Halictophagus* (?) *americanus*, sp. nov.

Female. Dark brown or picceous, suboblong, the anterior median area distinct in apical view, but generally hardly visible in surface view, owing to its position on the apex of the head, which is bent at an angle to the outer surface; tuberculate on either side of this area; the whole disc of the head deeply impressed so as to form a great cavity leading into the opening of the brood-chamber. Length about $\frac{1}{6}$ mm.

It is, I should think, almost impossible that this female can be congeneric with those I have assigned to the subgenus *Bruesia*. It would not be surprising to find that this is really the female of *Halictophagus* proper, though we have no proof that such is the case. As the parasite is so common in Ohio on the Jassid *Agallia 4-notata* it is to be hoped that the entomologists of that state will quickly decide his question.

(Plate III, fig. 6).

Hab. Columbus, Ohio; taken abundantly by Mr. Koebele, (No. 2191).

Megalechthrus, gen nov.

Female. Head ovate, moderately elongate, the opening of the brood-chamber near the middle or rather in front of it, the small anterior median area distinct, a little produced in front, and tuberculate on either side of this area in front. This large form appears to be allied to *Bruesia* and *Halictophagus*, but is

I think distinct generically from these, by its long, ovate form and great size.

Megalcchthrus tryoni, sp. nov.

Female. Head ovate, moderately elongate, yellow or brownish yellow, shining when clean, but often dull from the excretion of its host, more strongly convex behind the orifice of the brood-chamber than in front of it.

Male puparium brown or pitchy, unicolorous or nearly so. Length about $\frac{2}{3}$ mm.

(Plate III, fig. 5.)

Hab. Cairns and I think noticed in other localities in Queensland. Unfortunately we did not breed the male, not having time to pay any particular attention to this parasite, though we frequently noticed Fulgorids of the genus *Platybrachys*, or its allies, to be affected by it. I have named the species after Mr. Henry Tryon the Government Entomologist of Queensland, whose wide general knowledge of the fauna of that State is so well-known to all.

Elenchus, Curt.

The characters of this genus have been elaborately drawn up by Eaton and it is not necessary to repeat these. I have already stated wherein I differ from him in the interpretation of the mouth parts. Briefly what he considers to be the ligula I consider to be epistome or epistome and labrum, the oral aperture of his description being merely a deep concavity beneath the frontal projection. Although what he considers to be the third and fourth antennal joints are unquestionably morphologically so, yet it appears that at the point of their divergence these may be connected by a thin submembranous portion and not perfectly free. Further he remarks that the wings are "well represented by previous authors," but Westwood's figure of these is quite unlike any specimen I have seen, in neuration, and the same remark applies to the metathoracic acutellum.

Elenchus tenuicornis, Kirb.

Female. Head brownish or pitchy, opening of the brood-chamber far behind the middle and very large, no anterior median area and tubercles defined, but with a faint round spot just in front of the brood-chamber orifice on each side of the middle line. Length $\frac{1}{6}$ mm.

Male. Apparent slenderness of the antennal joints varying much according to aspect and from shrinkage. Metathorax paler in some than other; in balsam specimens becoming much paler with age.

(Pl. I, fig. 6 and 8; Pl. II, fig. 3, 4, 5, 6, 11 and 12; Pl. III, fig. 4.)

Hab. Columbus, Ohio, and Alameda, California, or *Liburnia lutulenta* in abundance (Koebele). Everywhere abundant in Queensland on *Liburnia* and other Delphacids, and also in Fiji.

Deinclenchus, gen. nov.

Female. Head nearly circular, very wide, the anterior margin simply and widely rounded, with no defined anterior median area, and without evident tubercles in front. Between the opening of the brood-chamber and the anterior margin there are two distinct areas marked out by impressed lines, which run backwards to the brood-chamber orifice as deep grooves on either side of a smooth slightly raised tubercle. Opening of the brood-chamber bisecting the head in surface view.

This insect is much larger than *Elenchus* and seems to me evidently allied to that genus, by the absence of a definite anterior median area and the presence of those on the disc, between the anterior margin of the head and the orifice of the brood-chamber. Still it can hardly be generically identical.

Deinclenchus australensis, sp. nov.

*Female. Head brownish in front of and yellow behind the brood-chamber orifice. The discal areas between the latter and the apical margin somewhat fan-shaped, and themselves divided by very fine grooves. Sometimes in apical view of the head two round faint spots can be seen, but there is no definite median area, nor tubercles. Length and breadth each about $\frac{2}{3}$ mm.

Male puparium dark brown with a pale ring at the base of its protruded portion.

(Pl. II, fig. 7.)

Hab. Cairns and Brisbane, Queensland; on a Fulgorid (*Platybrachys* or allied genus). Koebele's No. 2254.

OBS. At various places during the six months that Mr. Koebele and myself were together in Australia, we found isolated individuals of leaf-hoppers, containing male puparia of *Stylo-*

* For characters of male see supplementary note, p. 108.

pids, which had already hatched, or from which we bred no imago. These would comprise some four or five species of *Jasids* not mentioned in the foregoing account, the comma, *Tettigonia albida*, a *Deltocephalus*? a *Phlepsius*? and one or more *Bythoscopines* being among these. No doubt the parasites attached to some of these will prove to be different from those here described, and yet many other new ones remain to be discovered.

SUPPLEMENTARY NOTE.

After completing the above account of the *Stylopidae* and sending it to press, it occurred to me that by sacrificing the few male puparia that we preserved, mature pupae of the two genera *Megalechthrus* and *Deinelenchus* (which are characterized on females) might be obtained in such condition as to allow some male characters to be determined. These puparia were therefore opened and the contents examined; most of them were empty, the male *Stylopids* having emerged, but in two cases I obtained very immature and dried up pupae of *Megalechthrus*. No details of structure could be made out sufficiently accurately from these, but I believe the rudiments of the antennae contained 7 joints, five being foliaceous, and this would confirm its position in the *Halictophaginae*.

From puparia of *Deinelenchus* I obtained no pupae, but in one was a mature dry male of *D. australensis*, amply confirming its position in the *Elenchinae* and the validity of the genus. I here add the generic characters of the male, and a specific description.

Deinelenchus (male char.)

Like *Elenchus* in most respects e. g. in the structure of the tarsi and antennae, but very much larger, and with the second antennal joint, seen from above, very short and transverse, the basal one elongate. Frontal process much blunter and less prominent than in *Elenchus*. As in that genus, the face is deeply excavated, but it is much more open, not triangular, but with the sharp edge of the front and sides forming a great semi-circle, or rather more. The palpi are two-jointed sparsely pilose, the second joint narrower than the first and in the form of a curved blade. The large size and wide excavation of the face of this genus renders it much easier to examine structurally

than *Elenchus*, and the structure seems to me to greatly favor the interpretation of the mouth-parts, that I have adopted. The edge, which, in *Elenchus*, Eaton supposed to be the apex of the ligula, is in *Deinelenchus* easily seen to be no free edge at all, but is due to a bend perhaps augmented by a ridge in the part I have called epistome. The post-scutellum of the metathorax is longer than in *Elenchus*.

D. australensis.

Male. Piceous, perhaps blacker in mature specimens; the sides and scutellum of the metathorax pale, its anterior lobe and postscutellum dark. Legs with the femora pale, the tibiae dark, fuscous. Elytra for the most part blackish, the wings (not spread) apparently quite smoky, with a slight iridescence, the neuration black. Expanse probably about 4.5-5. mm.

Hab. Cairns, Queensland; extracted from a puparium in the abdomen of a female of a large Fulgorid of, or allied to, the genus *Platybrachys*.

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An extensive bibliographic list is given by Brues and as his paper is cited below, it is not necessary to refer to the titles that are therein listed. I merely refer to one or two, which he has passed over.

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DESCRIPTION OF PLATES.

I.

- Fig. 1. Diagrammatic figure of head of Stylopid; a frontal process, b and d epistome or epistome and labrum, c foramen, e labium, f palpus, g mandible, h sides of face along inner orbits, i eye, j antenna.
- " 2. Head of *Halictophagus schwarzii* front view.
- " 3. Dorsal view of head and front part of thorax of *Bruesia australensis*; a pronotum, b. mesonotum.
- " 4. Head of sp. nov., gen. ?, near *Xenos*; front view.
- " 5. Head of *Bruesia australensis*, front view.
- " 6. The same of *Elenchus tenuicornis*.
- " 7. Antenna of *Halictophagus schwarzii*.
- " 8. The same of *Elenchus tenuicornis*.
- " 9. The same of *Bruesia australensis*.

II.

- " 1. Wing of *Bruesia*.
- " 2. The same of *Halictophagus schwarzii*.
- " 3. The same of *Elenchus*.
- " 4. Elytron of *Elenchus*, lateral view.
- " 5. The same from above.
- " 6. Tarsus of *Elenchus*.
- " 7. The same of *Bruesia*.
- " 8. The same of genus near *Xenos*.
- " 9. Metanotum of *Bruesia*.
- " 10. The same of genus near *Xenos*.
- " 11. The same of *Elenchus*.
- " 12. Terminal segment of *Bruesia*.
- " 13. The same of *Elenchus*.

III.

- " 1. Ventral view of abdomen of a Fulgorid (*Platybrachys* or allied genus) showing female parasites and male puparia.
- " 2. Head of female of *Bruesia stenodes*.
- " 3. The same of *Bruesia phacodes*.
- " 4. The same of *Elenchus tenuicornis*.
- " 5. The same of *Megalechthrus tryoni*.
- " 6. The same of *Halictophagus? americanus*.

III

- " 7. The same of *Deinelenchus australensis*.
- " 8. The same of *Brucsia australensis* removed and mounted in balsam.
- " 9. The same not removed from the host.

IV.

- " 1. Larva of *Brucsia australensis*, lateral view.
- " 2. The same in dorsal aspect.
- " 3. Larva of *Elenchus*, ventral view.
- " 4. The same in dorsal aspect.
- " 5. Ventral view of sp. nov. gen? allied to *Xenos*.

PLATE I.

PLATE II.

PLATE III.

W.C.

PLATE IV.

REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

**Leaf-Hoppers and their
Natural Enemies**
(*PT. IV. PIPUNCULIDÆ*)

BY R. C. L. PERKINS

HONOLULU, H. T.
SEPTEMBER 9, 1905

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SEPTEMBER, 1905

LETTER OF TRANSMITTAL.

To Special Committee on Experiment Station, Hawaiian Sugar
Planters' Association, Honolulu, T. H.

Gentlemen:—I herewith submit for publication Part IV of
Bulletin I. This deals with the two-winged flies parasitic on
leaf-hoppers, thirty-four species of these parasites being here
enumerated, and thirty-one of these described as new.

Yours obediently,

R. C. L. PERKINS,
Director, Division of Entomology.

Honolulu, T. H., August 11th, 1905.

GENERAL REMARKS ON THE PIPUNCULIDAE.

The Pipunculidae are a very distinct family of small and obscure flies, which in their habits, so far as these are known, all agree in the fact that they are parasites of the Homopterous Rhynchota. There are but few genera in this family, the great majority of the species being referred to the genus *Pipunculus*, as are all the new species described in this paper.

Verrall in his "British Flies" (Syrphidae, etc.) published in 1901 gives the known species of *Pipunculus* as nearly 50 European, about 8 North American, 1 Brazilian, 8 South African, 6 Central American, and 2 Chinese. He also mentions New Guinea as a habitat. About the same time three new species were described by Grimshaw from the Hawaiian Islands, making a total of about 80 species for the genus. It is probable that at the most not more than one in ten existing species has been collected, for while the genus appears to be ubiquitous in distribution, its members are too unattractive in appearance and too fragile to have been much sought after in the tropics, and further I am quite satisfied that many of the species will not be easily obtained except by breeding them. The latter statement applies particularly to some species that attack arboreal leaf-hoppers.

As a matter of fact it appears that extremely few of the many known species have been bred, or at least of very few has the fact been recorded. Of the 26 species found by us in Australia, 15 were bred from the leaf-hoppers themselves, and one from collected pupae, the host being unknown to us.

Inconspicuous as the flies are when seen in a collection, even more so are they in life, for when on the wing most of them appear even smaller than they really are. Some of the Australian species under favorable circumstances occur in prodigious numbers. In the dry bed of a stream near Cairns at the end of August there were small patches of green grass at intervals, when the surrounding country was dried up. On these patches of grass large flocks of various small Tassid and Fulgorid leaf-hoppers were feeding, and, in search of the former, countless numbers of a species of *Pipunculus* (*P. beneficiens*) were passing

from patch to patch in endless procession, threading their way amongst the grass stems. At any time an insect net could be thrown over half a dozen specimens at once, as they moved along. In similar abundance Mr. Koebele found the same species on some sandhills near Bundaberg, on an occasion when I was not with him. Many of the grass-loving species fly very low and irregularly amongst the grass, as if making a close scrutiny on all sides as they pass along.

On another occasion in a wood at Bundaberg, where a species of *Siphanta* was breeding in large numbers on *Ficus* and other trees, *P. helluo* was literally swarming, buzzing round every twig, even in the deep shade of the trees. The nymphs of this *Siphanta* are always concealed beneath the leaves, feeding on the under surface, and when making particular scrutiny of these, the fly would be seen to hover and poise itself like an ordinary Syrphid, giving up its usual, more erratic and irregular flight. The latter was quite similar to that of a hymenopterous parasite of the genus *Chalcis*, which, seeking caterpillars on the same trees at the same time, was as common as the fly; in fact these two very different parasites were not very easily distinguishable when on the wing. Owing to the position of the nymphs of the *Siphanta* I was not able to see the fly actually sting these, but several times one was observed to make a dart beneath a leaf, where the young leaf-hoppers congregated. By collecting some of these nymphs, the *Pipunculus* was easily bred in confinement. Dr. F. Jenkinson of Cambridge in 1903 published an account of the attack of *Verrallia*, a genus allied to *Pipunculus*, on frog-hoppers (Ent. Monthly Mag. XXXIX (1903) p. 222) and I herewith give in full this interesting note:

"I suppose the oviposition of *Pipunculidae* has been recorded somewhere, but I have not seen it described; although the form of the ovipositor and the strong legs and claws (sometimes at least larger in the female) enable us to guess what must take place. Noting *V. aucta* to be common in my garden on the morning of July 5th, I determined to watch them as they busily beat over every inch of the herbage. I sometimes had four in view at one time. Frog-hoppers being as scarce as *Verrallia* was common (perhaps these facts are not entirely unconnected with each other), I occasionally caught one and put it in the *Verrallia's* path, with complete success. As soon as a *Verrallia* saw a frog-hopper it poised itself in the air (like a kestrel hovering, but with a certain intensity perceptible in its motionless-

ness), and if the position of its victim was favourable, it pounced upon it immediately. Then the frog-hopper hopped; in some cases the fly lost it; in some cases the fly reappeared instantly from the place to which the frog-hopper hopped. In one case I saw the frog-hopper land with the fly still on its back; I caught both, without waiting, as perhaps I should have done. If the position was unfavourable, or stems got in the way (e. g. *Geranium Robertianum*), the fly would circle round with its head towards the victim, like a male *Dolichopus*, seeking a point from which to pounce. On several occasions it failed to get a hold. Once a fly pounced on a frog-hopper *which did not hop*; the fly immediately left it. Another came up and looked at it, but went away without touching it. Was the frog-hopper already entertaining an egg, or was it a male, or for some reason unsuitable? *Chalarus* is common in my garden, but I have not been able to see anything of its oviposition.

"These observations are crude and inconclusive on several points; but I send them on the chance that others who can afford the time will complete them. The flies are still common, and the frog-hoppers now less scarce."

Verrall remarks that he considers the Pipunculidae to be the most exquisite fliers that exist in Diptera. However true this may be of the European, I do not think it can be said of the Australian or Hawaiian species, which cannot compare in power and beauty of flight with many Syrphidae or other flies; indeed to cite but one instance they are vastly inferior to the Australian species of *Baccha* in this respect. It is certain however, that on capture they often exhibit to the full their power of hovering within the meshes of the net, where more sturdy species, which while free can remain poised and motionless in the air or dart forward with speed that baffles the vision, would under like circumstances beat wildly against the sides in their endeavour to escape.

The Pipunculidae are known to affect various families of Homoptera, the spittle-insects or Cercopidae, as well as the Jassidae and Fulgoridae, and perhaps the Cicadidae, being subject to their attacks. It is not known whether in any case the same species of parasite will attack leaf-hoppers of more than one family, e. g. Fulgoridae and Jassidae. In this connection, however, one may mention the fact that the resemblance between such species as *P. helluo* and *P. Koebeli* is extreme, both structurally and superficially, although the former is parasitic

on *Siphanta* and the latter on a Jassid somewhat allied to *Penthimia*. The fact that the two flies are so extremely similar while the hosts are so utterly unlike leads me to suspect that species of *Pipunculus* may be found that attack species of either family of leaf-hoppers indiscriminately. However this may be, it is certain that some of these flies will attack very different species of leaf-hoppers within the limits of a family. For example that most common Australian species *P. benchiciens* was bred from nymphs of three or four very different Jassids, and *P. cruciator* from two widely different genera, of the same family. It may also be noted that nymphs and adult leaf-hoppers are both subject to attack.

In Australia all the species of *Pipunculus*, that we bred, were from Jassidae, excepting two, one of which (*P. helluo*) is a parasite, as above mentioned, on *Siphanta* and allied genera, while the other (*P. xanthocnemis*) attacks a species of *Liburnia*. The Hawaiian species here described are probably all attached to Delphacine Fulgorids. Three of the five most certainly are, since one of the latter has been bred by Mr. O. H. Swezey, and the other two are found in company with the same leaf-hoppers, in places where Jassids are quite absent.

There is, so far as I know, no means of telling with absolute certainty whether a living leaf-hopper contains a larva of *Pipunculus* or not. In some species of a green colour, when the parasitic larva becomes large, the green of the hopper is not infrequently changed to a sickly yellow, or even dark discoloration may be seen, but in most cases a slight sickly appearance, evidenced by indescribably minute differences in its superficial appearance, or by its more lethargic movements, alone inform one, or at least lead one to suspect, that the leaf-hopper is parasitized. Practically it is not difficult to detect parasitized individuals, when one is familiar with the species of leaf-hopper that is infested. If a green Jassid containing a large *Pipunculus* larva be placed in alcohol, so that the colouring matter is largely removed, and greater transparency is attained, it is sometimes possible to see the parasitic larva quite plainly through the cuticle of its host. The head of the larva appears to be always turned towards the head of the leaf-hopper, and generally the parasite fills up by far the greater part of the abdomen of its host. Such a specimen, a species of *Hecalus* containing a larva of *P. cruciator*, is figured on Pl. VII, fig. 1.

When the larva of the *Pipunculus* quits its host, it usually

escapes at the junction of the metathorax and abdomen, either below or above, the segments of the leaf-hopper being ruptured at that point. (Pl. VII, fig. 2). In the case of a *P. xanthocnemis*, however, the larva escaped from the *Liburnia* by a roundish hole in the mid-dorsal line, at about the middle of the length of the abdomen. This hole of exit is irregular, and has the appearance of having been gnawed, but I did not notice whether the larva that emerged was different from the usual type.

After escaping from its host, the larva as a rule buries itself beneath the soil, or beneath rubbish that lies on the surface; but in some species it pupates on the leaves of the tree or bush, on which the leaf-hopper was feeding, as in a case mentioned below, and in another recorded by Ott, who bred a *Pipunculus* from a puparium found on *Ribes*.

One peculiar feature in some species of *Pipunculus* is the fact that the surface of the abdomen often bears a number of depressions, frequently variable and of irregular form. Some species, such as *P. beneficiens*, appear to always have these on one or more of the segments and they are not due to post-mortem changes, as one might suppose without the examination of freshly caught specimens, but occur in every individual, at least of the male sex, though so variable in number and form. Indeed as a general rule they appear to be more commonly found, or are more developed, in the males than the females, and sometimes may even be said to produce a distortion of the body. Whether it is to some such examples that Verrall refers, when he says that he suspects the flies are themselves subject to parasites I do not know, but it is certain that the irregularities of surface mentioned above are not due to this cause, since they are found in every example of some common species, though only occasionally in others. *Pipunculus*, however, is subject to the attack of a Chalcidid parasite of the family Encyrtidae, of which I bred a species from the puparium of *P. cinerascens*, but whether the subterranean species are likewise attacked it may be very hard to prove, unless the parasite stings the larva of the *Pipunculus*, while still within the leaf-hopper. This I suspect is not the case, or we should probably have bred some of the Chalcids from the numerous species of *Pipunculus* that we reared from the larvae. The puparium of *P. cinerascens* being freely exposed on the surface of the leaves, would naturally be liable to be attacked, and is probably stung at that time. At least it is noteworthy that the one species with exposed pupa-

rium, and the only one of which puparia were collected, yielded a parasite, while the 15 species bred from larvae, but of which no puparia were collected, since all are subterranean, yielded no parasite.

I have begun these introductory remarks by saying that the Pipunculidae are small and obscure flies. I may conclude them by saying that this in no wise detracts from the interest awakened by their peculiarities of structure and habits. The enormous eyes, the almost unique mobility of the head, which is balanced on an acute point, and which reminds one of the similar mobility of the head in the keen-eyed dragon flies, leads one to suppose that vision plays a much more important part in seeking out the prey than do the other senses, while in those other parasites of leaf-hoppers, the Dryinidae, it is obviously by other senses than vision that their prey is chiefly hunted. One may further notice the large laminate pulvilli and slender elongate claws of the feet, (which remind one of these parts in some of the parasitic Conopidae), and especially the recurved, hard and strong sting of the females, which is always exerted.

LARVA AND PUPARIUM OF *PIPUNCULUS*.

The larva of *Pipunculus* is an acephalous maggot, pointed in front and elongate when extended, but capable of great contraction, by which means and by rolling movements it is able to make sufficient progression to enable it to find a suitable spot for pupation. The cuticle in the two species examined is corrugated or transversely furrowed, so that the true segmentation is with difficulty made out. The larva is amphipneustic, the anterior stigmata being small but distinct; the posterior spiracular area dark-coloured and very distinct, the spiracles or stigmatic scars being placed anteriorly and closely approximated, and the processes or tubercles, made conspicuous by their pale colour, situated at the sides. The mouth is a simple opening at the anterior extremity and without definitely chitinized parts, but internally by dissection a pair of more or less triangular and pointed, dark, chitinized pieces may be obtained. It is possible that these are sometimes extruded, but it is not the case with any of the preserved specimens I have examined. The anterior stigmata are placed a little behind the mouth opening. Larvae of about one-third the size of full-grown individuals do not differ materially from the latter, but only in size and shape, be-

ing frequently much more contracted or even almost globular. (For. fig. of larva, see Pl. VII, fig. 10, 10a, 10b).

The puparium is formed by the hardening of the larval cuticle, which becomes black, brown, or red in colour. In some species its surface has a dense and regular coriaceous, granular, or rugulose sculpture, most conspicuous in the case of *P. cinerascens*. In some puparia there is no difficulty in distinguishing the anterior stigmata of the larva, though they are extremely minute, but in others I fail to see them after the closest examination. Further back, however, on the dorsum there can be seen on each side a fine and minute process, apparently part of the puparium, in reality not so, but connected with the delicate cuticle of the enclosed pupa and merely perforating the puparium. When the fly emerges it frequently happens that one or other of these processes is dragged back through the hole in the puparium, but remains attached to the empty pellicle of the pupa. (Pl. VII, fig. 6).

The dark posterior stigmatic area is in many species deeply depressed, in others hardly at all, and bears one or more small tubercles on either side, in fact it bears much similarity to the same part in the larva. When the fly bursts from the puparium, the latter appears to be always ruptured along the same lines, in all the species we have examined, viz: along the front and hind margin of the dorsal segment, which bears the anterior processes, and along the hind margin of the ventral segment corresponding with this.

In the case of one species of *Pipunculus*, however, although the fly itself (*P. cinerascens*) is not very remarkable, the larval habits are unlike those of any of the other species, which infest arboreal leaf-hoppers, since this larva does not fall to the ground, and pupate beneath the soil, but forms its puparium in the open on the surface of living leaves. This puparium is very different from the subterranean ones, for instead of the minute anterior processes, are a pair of relatively enormous blunt ones, on the tip of each of which is a fine spine-like process. It is not quite clear to me whether the whole blunt process represents the minute one of subterranean species, and really belongs to the pupa, and not to the puparium; or whether the small apical spine-like piece alone represents these. Posteriorly the stigmatic area is large and deep, and instead of one or two minute tubercles on each side, there are three, the upper one being very large and conspicuous, the lowest one well separated from the upper two.

(For figures of puparia see Pl. VII, fig. 3, 4, 5, 5a, 5b, 6, 7, 8 and 9).

CLASSIFICATION.

Verrall divides the British species of *Pipunculus*, which are fair representatives of the European forms, into five groups. Three of these have a pigmented stigma and are divided as follows:

- I. Abdomen quite dull, not even the margins shining, femora without any ciliation or pubescence behind.
- II. Abdomen partly shining; femora ciliate or pubescent at least behind the middle pair; thorax and scutellum with dense but short pubescence.
- III. Thorax and scutellum practically bare, as well as the femora; the abdomen considerably shining.

The other groups are without a pigmented stigma and are separated thus:

- IV. Small or discal cross-vein far before the middle of the discal cell, eyes frequently not quite touching on the frons in the male.
- V. Small cross-vein placed at or about the middle of the discal cell.

Both the Australian and Hawaiian species known to me divide into stigmated and non-stigmated sections, but the further division into groups on the characters used by Verrall is not very satisfactory, if indeed possible, with the species here considered. In the following table I have therefore used other characters for the groups.

Wings with a pigmented stigma.

Stigma not bounded by a cross-vein at the base.

Third antennal joint sharply pointed at the tip, usually acuminate produced.

Basal abdominal segment with some black bristles on each side.....I

Basal abdominal segment with no trace of such bristles, and if pubescent, then the hairs similar to the general clothingII

Third antennal joint rounded at tip, or at least not acute, and never acuminate produced.....III

Stigma bounded by a distinct cross-vein at the base.....IV

Wings without a pigmented stigma.

Small or discal cross-vein far before the middle of the discal cell V

Small cross-vein at or near the middle of the discal cell. . VI

One species in group VI is known in which the basal segment is entirely without lateral bristles; group IV is represented by a solitary minute species (though possibly the pair described are two, and not the sexes of one, species); while Group I contains several species in which the stigma is greatly lengthened, as compared with the fourth costal segment, somewhat resembling *Chalarus* and *Terrallia* in this respect; and some of these have the basal antennal joints rather more than usually bristly, though less so than in the latter genus. In other respects they are like ordinary *Pipunculus*. The Hawaiian species that are here described as new, belong to Group I; the double row of short spinules on the femora beneath are unusually well developed in these, as also are the marginal bristles of the scutellum and those on the basal abdominal segment; the bristles or fringe of hairs on the middle femora posteriorly are long and distinct in some males, but much less developed, and represented by soft hairs in such females, as are known.

LIST OF SPECIES OF *PIPUNCULUS* HERE DESCRIBED.

A. Australian species.

- *1 *P. cruciator*, sp. nov.
- *2 *P. cucalypti*, sp. nov.
- *3 *P. crinys*, sp. nov.
- *4 *P. hylæus*, sp. nov.
- 5 *P. fallax*, sp. nov.
- 6 *P. dolichostigmus*, sp. nov.
- 7 *P. lamellifer*, sp. nov.
- *8 *P. comitans*, sp. nov.
- 9 *P. agamus*, sp. nov.
- *10 *P. cinerascens*, sp. nov.
- *11 *P. beneficiens*, sp. nov.
- *12 *P. helluo*, sp. nov.
- *13 *P. Koebelci*, sp. nov.
- *14 *P. monas*, sp. nov.
- *15 *P. picrodes*, sp. nov.
- *16 *P. anthracias*, sp. nov.
- 17 *P. crypsichalcus*, sp. nov.
- 18 *P. microdes*, sp. nov.

- 19 *P. homocophanes*, sp. nov.
 *20 *P. xanthocnemis*, sp. nov.
 21 *P. heterostigmus*, sp. nov.
 22 *P. leimonias*, sp. nov.
 23 *P. epichalcus*, sp. nov.
 *24 *P. synadelphus*, sp. nov.
 *25 *P. pseudophanes*, sp. nov.
 26 *P. nyctias*, sp. nov.

B. Hawaiian species.

- *27 *P. juvator*, sp. nov.
 28 *P. oahuensis*, sp. nov.
 29 *P. terryi*, sp. nov.
 30 *P. swaczeyi*, sp. nov.
 31 *P. hawaiiensis*, sp. nov.

All species marked with an asterisk have been bred.

SYNOPSIS OF SPECIES.

In this table 1-9 deal with individuals of both sexes; after the latter number the table becomes double, 11-41 dealing with males only, 43-60 with the females.

A. Australian species.

1	(10)	Wings without a pigmented stigma.	
2	(9)	Small cross-vein at or near the middle of the upper side of discal cell.	
3	(8)	Basal abdominal segment with a short line of black bristles laterally.	
4	(5)	Abdomen shining, deep-black, with a distinct clothing of shortish black hairs conspicuous at the sides of the segments (female unknown).....	<i>leimonias</i> .
5	(4)	Abdomen more or less greenish-black or metallic, and with at most, excessively short, inconspicuous hairs.	
6	(7)	Larger, abdomen of male with the fifth segment without evident grey tomentum, and without short black hairs, tarsi black or piceous above; female, tarsi dark above	<i>epichalcus</i> .
7	(6)	Smaller, abdomen of male with the fifth segment more or less covered with grey tomentum, and having very short but distinct suberect hairs, tarsi more or less yellow (a little variable); female tarsi always for the most part yellow.....	<i>synadelphus</i> .

- 8 (3) Basal abdominal segment without black bristles laterally. (Abdomen dull metallic green or at least submetallic, tarsi apparently variable, either black or dark above or yellowish.).....*pseudophanes*.
- 9 (2) Small cross-vein far before the middle of the upper side of the discal cell (Abdomen shining, blue-black) *nyctias*.
- 10 (1) Wings with a pigmented stigma.
- 11 (42) Males.
- 12 (13) Stigma enclosed by a cross-vein at the base.....
.....*heterostigmus*.
- 13 (12) Stigma not enclosed at base.
- 14 (15) Legs, except coxae and the apical joint of tarsi, yellow, unicolorous or nearly so.....*xanthocnemis*.
- 15 (14) Legs more or less black or dark, at least on the femora.
- 16 (37) Antennae with the third joint always acutely pointed at apex, usually acuminate produced.
- 17 (26) Wings with the third and fourth costal segments subequal, or with the fourth never much shorter than third, sometimes the fourth is the longer.
- 18 (21) Basal abdominal segment at the sides with a short line of distinct black bristles, which are obviously different from any other hairs on the abdomen.
- 19 (20) Thorax and abdomen with fuscous tomentum; hypopygium above with a deep narrow channel on the right side.*cruciator*.
- 20 (19) Thorax and abdomen mostly black or blackish, the latter with whitish lateral tomentose spots; hypopygium on the right side at the tip with a more or less ovate dull area of peculiar texture....*cucalypti*.
- 21 (18) Basal abdominal segment without any special bristles at the sides; if hairy, then the hairs are similar to the general clothing.
- 22 (23) Whole body with pale erect soft hairs, which are long and conspicuous.....*cutrichodes*.
- 23 (22) Body not so clothed; hairs, where present, short and inconspicuous.
- 24 (25) Scutellum with a marginal fringe of fine, but quite distinct hairs; abdomen for the most part blackish on the dorsum, the surface not concealed under dense tomentum.*beneficiens*.

- 25 (24) Scutellum with a few excessively short hairs on margin, which are hardly visible; abdomen with dense fuscous tomentum on the dorsum over a large part of the surface.
- 25a (25b) Posterior tibiae dark except at extreme base; abdomen with the second and following segments black at the base, and with rather indistinct pale apical bands, narrowed or interrupted at the middle. *monas*.
- 25b (25a) Posterior tibiae entirely pale or partly infusate; abdomen with dark fuscous tomentum, not banded above.
- 25c (25d) Posterior tibiae almost uniformly yellowish. *kocbelci*.
- 25d (25c) Posterior tibiae more or less infusate in parts. *helluo*.
- 26 (17) Wings with the third costal segment much longer than the fourth, sometimes twice as long.
- 27 (28) Whole body nearly uniformly covered with cinereous tomentum. *cinerascens*.
- 28 (27) Body not so clothed; more or less variegated with black and grey or whitish tomentum.
- 29 (30) Tarsal joints black above. *hylacus*.
- 30 (29) Tarsal joints pale, except the apical joint.
- 31 (34) Larger and robust species (length over 4 mm.) apical margin of scutellum fringed with some longish and very distinct hairs.
- 32 (33) Hypopygium with a thin outstanding rounded lamella. *fallax*.
- 33 (32) Hypopygium with an elongate, dull area marked out, but no strong lamella. *dolichostigmus*.
- 34 (31) Smaller species (length under 4 mm.) apical margin of the scutellum with only a few very short fine hairs, easily overlooked.
- 35 (36) Hypopygium with a thin lamella strongly outstanding. *lamellifer*.
- 36 (35) Hypopygium with an elongate channel or impression, but without a strong lemella. *comitans*.
- 37 (16) Antennae with the third joint not sharply pointed at apex, nor acuminate produced.
- 38 (39) Abdomen except towards the base entirely shining, somewhat aeneous, and not variegated with tomentum. *crypsiohalcus*.
- 39 (38) Abdomen more or less variegated with pale and dark bands or spots.

- 40 (41) Antennae with pale third joint; basal abdominal segment entirely black above, or almost so... *microdes*.
- 41 (40) Antennae with the third joint dark; basal abdominal segment with a pale apical band of tomentum....
..... *homocophanes*.
- 42 (11) Females.
- 43 (44) Stigma closed at base by a transverse vein.....
..... *hctcrostigmus*.
- 44 (43) Stigma not so closed at base.
- 45 (58) Antennae with the third joint more or less produced acutely at the apex, often strongly acuminate.
- 46 (53) Basal abdominal segment with a line of black bristles on either side, distinct from hairs of the general surface, if such be present.
- 47 (48) Tarsi black or dark above..... *crinys*.
- 48 (47) Tarsi except apical joint pale.
- 49 (52) Face between ocelli and antennae almost entirely hidden by a dense covering of tomentum.
- 50 (51) Almost the whole body evenly covered with cinereous tomentum, ovipositor straight or nearly so....
..... *cinerasceus*
- 51 (50) Thorax and a large part of abdomen with fuscous tomentum; ovipositor distinctly curved from base to apex. *cruciator*.
- 52 (49) Face between the ocelli and antennae bare and shining, except close to the antennae..... *agamus*.
- 53 (46) Basal segment of abdomen without a lateral line of distinct black bristles.
- 54 (55) Whole body with a conspicuous clothing of fine, erect, pale and rather long hairs..... *eutrichodes*.
- 55 (54) Body not so clothed.
- 56 (57) Abdomen black, more or less shining and sparsely tomentose. *beneficiens*.
- 57 (56) Abdomen covered with dark fuscous tomentum with grey lateral spots.
- 57a (57b) Second abdominal segment with an entire basal band of whitish-grey tomentum..... *picrodes*.
- 57b (57a) Second segment without such a band.
- 57c (57d) Posterior tibiae almost uniform yellowish, not infusate in middle; ovipositor longer..... *kochblei*
- 57d (57c) Posterior tibiae more or less infusate about the middle; ovipositor shorter..... *helluo*.

- 58 (45) Antennae with the third joint more or less rounded and not acutely produced at the apex.
 59 (60) Legs except the coxae clear yellow.....*xanthocnemis*.
 60 (59) Legs largely black, or dark brown.....*anthracias*.

B. Hawaiian species.

- 1 (2) Wings without a pigmented stigma.....*rotundipennis*, Grimsh.
 2 (1) Wings with a pigmented stigma.
 3 (6) Posterior tibiae with some specially developed bristles on the median dilatation outwardly.
 4 (5) Legs except the coxae entirely pale, yellow.....*hawaiiensis*.
 5 (4) Legs largely black on the femora, and the tarsi also dark*oahuensis*.
 6 (3) Posterior tibiae without special bristles on the median dilatation outwardly.
 7 (8) Legs except coxae entirely pale, yellow.....*swezeyi*.
 8 (7) Legs with the femora at least more or less black or fuscous.
 9 (12) Hind legs with a more or less distinct median dark band on the tibiae.
 10 (11) Third joint of antennae, and tarsi pale.....*molokaiensis*, Grimsh.
 11 (10) Third joint of antennae, and tarsi dark.....*nigrotarsatus*, Grimsh.
 12 (9) Hind legs without a median dark band on tibiae, sometimes darkened towards base and apex, but the middle always pale.
 13 (14) Abdomen of male for the most part deep-black or blue-black, femora of the female black above for the most part, the base and apex for a short distance yellow.*juvator*.
 14 (13) Abdomen of male for the most part blackish-fuscous, with a slight aeneous tint in some aspects; femora of the female to a large extent yellow, somewhat infusate, but not black, on the apical half...*terryi*.

DESCRIPTION OF SPECIES.

In the descriptions of the species not much stress need be placed on the exact colours of the pale tomentose spots or bands, whether whitish, greyish, or slightly flavescent as they are hard to discriminate and not constant. The same may be said of the measurements, which vary much in some species and are subject to error owing to contraction or curvature of the body after death.

A. Australian Species.

1. *P. cruciator*, sp. nov.

Head black; between the ocelli and antennae, and the face below these, almost entirely covered with white tomentum in the female, as is the whole front and face in the male; posteriorly with fuscous tomentum, becoming grey at the sides, and finely ciliated. Antennae with the two basal joints black or piceous; the third yellow, sometimes sordid or obscured, in the male pointed at the tip, in the female more strongly and acuminate produced. In the latter sex even the basal antennal joints are sometimes yellowish, though possibly only in immature examples.

Thorax above covered with fuscous tomentum, greyer on the metathorax and pleura; scutellum with a sparse marginal fringe of very short fine hairs; halteres yellow, blackish or fuscous at base. Wings subinfusate, stigma yellowish brown, third and fourth costal segments subequal. Legs with the coxae, femora, the apical joint of tarsi, and tips of claws, black or dark; the rest of tarsi, the trochanters, the apex and usually the base of femora, as well as the tibiae yellow; the latter often more or less darkened or brownish in parts. The hairs on the legs are extremely short, and placed in rows.

Abdomen covered with fuscous tomentum, more or less grey or yellowish grey on the apical margins of the segments, or at least on the sides of some of the apical segments in the male; in the female the abdomen usually has a distinct pattern, the grey tomentum on the third, fourth and fifth segments, forming a wedge-shaped lateral mark, leaving a large triangular fuscous area on the disc, the second segment being grey with a fuscous discal spot. Basal segment with a line of 3-5 con-

spicuous black bristles on each side. Hypopygium of male deeply channeled on the right side, and shortly and finely pilose; at the tip with a large fovea or impression. Ovipositor distinctly curved from base to tip. Length 3.25-5 mm. (Pl. V, fig. 126, VII, fig. 1, 6, 7.)

HAB. Cairns district, on the coast and in the mountains; bred several times from a species of *Heccalus*, (Koebele's specimens are numbered 2268) and also by Mr. Koebele from a very different Jassid nymph (No. 2275).

2. *P. eucalypti*, sp. nov.

Male: Head in front, and face, with glistening white tomentum; behind the eyes in the middle with dark, at the sides with whitish. Antennae dark, black or blackish; third joint pitchy, pointed at the apex, but hardly produced.

Thorax dull black, with thin fuscous tomentum, in front laterally, the metanotum, and the pleura, with white or greyish white; the scutellum with fine marginal hairs, which are quite easily seen, being considerably longer than the few that are on the disc. Wings nearly clear, neuration dark, stigma brown, third and fourth costal segments subequal, posterior cross-vein very oblique, its upper extremity about opposite the apex of the second longitudinal; halteres largely pale, dark basally. Legs black or pitchy, knee-joints pale, tarsi above yellow or yellowish brown, but sometimes appearing dark from the many short, black hairs; tibiae more or less brownish or yellowish.

Abdomen black, with some fuscous tomentum, and with whitish lateral tomentose spots, as well as an apical band on the basal segment; the latter with the usual lateral row of bristles; all the segments with shortish hairs, very distinctly outstanding from the side of each; hypopygium with a subovate or subtriangular apical area, very dull, and of different texture from that of the rest of the segment. Length 4 mm. (Pl. V, fig. 4.)

HAB. Bundaberg; one male bred from the nymph of a Jassid on *Eucalyptus* by Mr. Koebele (2297); by a slip of the pen recorded in his notes (under this number) as being bred from a Fulgorid.

3. *P. crinys*, sp. nov.

Female; head black, bare for about half the distance from the ocelli to the antenna, the face and front being covered with

white, glistening tomentum; posteriorly with whitish tomentum at the sides, in the middle more fuscous. Antennae black or dark, the third joint acuminate, blackish or pitchy, evidently, though not very strongly, produced at the apex.

Thorax dull black, sparsely covered with fuscous tomentum, in front laterally and on the pleura with whitish grey tomentum, with which the metathorax is also covered; scutellum with a few very fine marginal hairs, not at all conspicuous; halteres blackish. Wings with the neuration, except at the base, where it is paler, black or nearly so; stigma distinct but rather pale, about as long as the fourth costal segment; small or discal cross-vein opposite apex of auxiliary; second longitudinal vein terminating nearly opposite, or a little beyond, the upper extremity of the posterior cross-vein. Legs black, the knee-joints, pulvilli and claws (except apically) pale, the tarsi black or at least dark above, but paler beneath, the hairs of the legs and feet black.

Abdomen more or less transversely wrinkled, black, with wedge-shaped marks of whitish grey tomentum on the third, fourth and fifth segments; first and second with whitish grey tomentum, the disc of the latter being black, sixth nearly entirely covered; basal segment with a few black tristles on each side. Ovipositor straight. Length 3.75 mm.

HAB. Bundaberg, Queensland; bred from a common Jassid on *Melaleuca*.

4. *P. hylacus*, sp. nov.

Male: Head in front and face with dense white tomentum; posteriorly behind the eyes with dark in the middle and whitish at the sides. Antennae black, the third joint pitchy black, acute at the tip, but hardly produced.

Thorax dull black, with sparse fuscous tomentum, in front at the sides and on the pleura with whitish, as also on the metanotum; scutellum with a few very short and fine, hardly perceptible, marginal hairs; halteres sordid fuscous. Wings hyaline, hardly smoky, neuration dark, stigma pale, brownish-yellow, third costal segment about twice as long as the fourth, upper extremity of posterior cross-vein nearly opposite (or a little before) the termination of second longitudinal. Legs black, base of tibiae yellowish, the hind tibiae with some hairs outwardly about the middle, which, though short, are longer than the general clothing.

Abdomen black, transversely wrinkled, the apical margins of the segments paler and more shining in some aspects, and with whitish tomentum, especially laterally; basal segment with distinct lateral bristles, second with a few short hairs; hypopygium with sparse and very short hairs, more or less impressed at the base towards the right side, and also with a terminal impression. Length 3.5-4 mm. (Pl. V, fig. 7, Pl. VII, fig. 8.)

HAB. Bundaberg, Queensland; bred from two species of Jassids, Mr. Koebele's specimen, numbered 2321, being reared from a very different species of leaf-hopper from one which yielded me the same fly.

5. *P. dolichostigmus*, sp. nov.

Male; front and face with silvery grey or whitish tomentum, as also the head posteriorly. Antennae pitchy black, the third joint paler, but sordid, distinctly produced acuminate at the apex.

Thorax black, with fuscous tomentum, at the sides in front and on the pleura more grey, the metanotum covered with whitish; scutellum with sparse hairs, those on the hind margin twice as long as those on the disc; halteres sordidly pale, black at the base. Wings with the neuration blackish, paler at base, stigma pale brown, about twice as long as the fourth costal segment, small cross-vein about opposite the apex of the auxiliary vein, posterior cross-vein very oblique, its upper extremity about opposite the apex of the second longitudinal vein. Legs with the coxae black, trochanters (more or less), apex and base of femora, tibiae for the most part, tarsi except the apical joint, yellow; posterior tibiae about the middle at the thickening with two or three longish hairs outwardly.

Abdomen with very short suberect hairs; the second, third, fourth and fifth segments deep black at base, with greyish tomentum apically, as on the whole of the basal segment, which has a transverse row of 8 or 10 black bristles at the sides; the second segment at the sides with some weak black hairs; hairs on the abdomen mostly pale. Hypopygium with a narrow elongate area, the surface of which is dull and of peculiar texture. Length 4.75 mm.

HAB. Bundaberg, Queensland. One example captured.

6. *P. fallax*, sp. nov.

In all respects like the preceding, but with the hypopygium bearing a prominent thin lamella, the edge of which, seen in profile, is rounded. Length 4.75 mm.

HAB. Bundaberg, Queensland. One male captured.

7. *P. lamellifer*, sp. nov.

Male; head in front and face with glistening whitish tomentum, as also posteriorly at the sides, between which it is more fuscous. Antennae with the third joint distinctly and sharply acuminate produced, and piceous or obscurely pale.

Thorax covered with fuscous tomentum, at the extreme front generally with some more or less evident pale tomentose spots, the pleura with greyish, the metanotum covered with whitish tomentum, the scutellum with some very inconspicuous and short hairs. Wings fuscous tinted, third costal segment considerably longer than the fourth, the small cross-vein rather beyond the apex of the auxiliary. Legs black or pitchy, knee-joints and tarsi yellowish, the apical joints of the latter dark, tibiae for the most part brownish above.

Abdomen with blackish tomentum forming great subtriangular discal markings, the rest of the surface being occupied by grey or whitish tomentose lateral spots; basal segment with whitish or grey tomentose band, and with a distinct lateral line of black bristles on each side; hypopygium with a large, outstanding, thin lamella. Length 3 mm. (Pl. VI, fig. 2.)

HAB. Cairns district; coast and mountains.

8. *P. comitans*, sp. nov.

Like the preceding in almost all respects, but the hypopygium has an elongate cleft or depression, instead of the thin outstanding lamella.

HAB. Cairns district, in the same localities as the preceding. One specimen (2283) was bred by Mr. Koebele from the male of a Jassid living on grass, and I obtained one from a female Jassid of probably the same species.

9. *P. agamus*, sp. nov.

Female; head black, shining and bare in front of the ocelli,

the face and front being covered with glistening white tomentum, antennae with the third joint strongly and very sharply, acuminate produced, its colour piceous or obscurely pale.

Mesonotum covered with fuscous tomentum, at the sides in front (more or less) and the pleura and metanotum with whitish grey; scutellum with some very short and indistinct hairs; halteres pale, dark at base. Wings nearly clear, third costal segment generally distinctly longer than the fourth, but a little variable; small cross-vein rather beyond the apex of the auxiliary; posterior cross-vein very oblique, its upper extremity beyond the apex of the second longitudinal; stigma pale brown. Legs dark, the knees and tarsi (except the apical joint) yellow, the tibiae largely dark or brown.

Abdomen with dark fuscous tomentum, and lateral spots of greyish white, the basal segment with a lateral line of distinct black bristles, and with a band of whitish tomentum; ovipositor straight, longer and slenderer than in most Australian species. Length 2.5-3 mm.

HAB. Cairns district, with the two preceding. Without doubt it is the female sex of one of these, but as it differs in important characters from both, and it is impossible to associate it specially with either, I have temporarily given it another name.

10. *P. cinerascens*, sp. nov.

Head in front, and the face covered with dense glistening whitish tomentum; posteriorly at the sides with whitish, in the middle with darker grey. In the female the dense tomentum of the face extends back to the ocelli. Third joint of the antennae yellow, and very strongly acuminate produced at the apex.

Thorax with slate-coloured tomentum; in front laterally, the pleura and the metanotum with whitish; the scutellum with some very fine, short and inconspicuous hairs; halteres yellow, dark at base. Wings extremely clear, neuration dark, stigma pale brown, third costal segment much longer than the fourth, upper extremity of the posterior cross-vein about opposite the apex of the second longitudinal. Legs black, femora and tibiae with pale tomentum, knee-joints and tarsi (except the apical joint) yellow, tibiae largely brownish or darkened.

Abdomen nearly uniformly covered with whitish slate-coloured tomentum, the basal segment with a line on each side of several longish and distinct black bristles; hypopygium of male

with a large apical impression on the right side; ovipositor of the female nearly straight and not very long. Length 3 mm. (Pl. V, fig. 2, VII, fig. 4 and 9.)

HAB. Bundaberg, Queensland; bred freely from puparia on the leaves of *Melaleuca*.

11. *P. beneficens*, sp. nov.

Head with the front and face covered with glistening white tomentum, in the female black, bare and shining in front of the ocelli, posteriorly with greyish white tomentum on each side and fuscous between. Antennae black or piceous, the third joint acuminate and strongly produced at the apex, variable in colour usually more or less yellowish, but sometimes wholly dark or wholly yellow, in the female often of the latter colour, but even in this sex it is sometimes dark.

Thorax with thin fuscous tomentum, in front laterally and the pleura more or less grey, the metanotum with denser grey or whitish tomentum; the scutellum with extremely fine marginal hairs, the surface more or less shining, in some aspects at least; halteres pale, dark at base. Legs black, tip of femora, the tibiae and tarsi (except the apical joint) yellow, the tibiae more or less black or infuscate in part. Wings in the male distinctly smoky, clearer in the female, neuration blackish, paler towards base of wing, stigma distinct, obscure brown, about as long as the fourth costal segment, small cross-vein opposite the apex of the auxiliary, and at about the basal third of the upper side of the discal cell.

Abdomen black, often somewhat shining in the male, and clothed with short sparse hairs, at the sides with greyish white tomentum, which in fresh specimens also forms a band on the basal segment; some or most of the segments generally with depressions of varying form and often irregular; hypopygium large, with a transverse basal impression and with a shining hairless lobe on the right side, which extends beneath to the genital armature itself. In the female the abdomen is generally like that of the male, black and more or less shining, with white tomentum laterally, and more or less evidently on the dorsum of the first or of the two basal segments, the surface usually with few or no depressions, the ovipositor straight; basal segment in both sexes with no trace of a line of bristles laterally. Length 2.25-3.25 mm. (Pl. V, fig. 3; VI, fig. 3.)

HAB. Common throughout Queensland; bred from a Jassid, 2291, by Mr. Koebele, and by myself from very different species.

12. *P. helluo*, sp. nov.

Head with the front and face covered with glittering white, or whitish, tomentum, behind the eyes with grey at the sides, and between with dark fuscous. Antennae black or piceous, third joint acuminate produced at the apex and apparently always dark in colour. Mesothorax with rather dense fuscous tomentum; at the sides in front and the pleura with grey or whitish; the metanotum densely covered with whitish tomentum; scutellum with a few hairs, so short and fine, as to be seen with difficulty; halteres yellowish-brown or testaceous, dark at base. Wings somewhat smoky, clearer in the female, the neuration black or very dark brown, paler at the base, stigma obscure brown, subequal to the fourth costal segment, or rather shorter, small cross-vein opposite the apex of the auxiliary. Legs black or pitchy, the apex of femora, the tibiae (which, however, are more or less dark or infusate in parts) the tarsi (except the apical joint) yellow or yellowish.

Abdomen with dense and even, dark fuscous tomentum, and greyish wedge-shaped lateral tomentose spots, the basal segment more or less evidently grey-banded, and with no line of bristles on each side; the dorsum often with more or less evident, and often irregular, impressions on one or more segments, the surface not noticeably pilose; hypopygium of the male large, with sparse and very short, inconspicuous hairs, somewhat shining in some aspects, impressed (often irregularly) at the base, and with a distinct lateral lobe on the right side, which is not covered with tomentum. Ovipositor of female straight or nearly so. Length 2.5-3.5 mm.

HAB. Bundaberg, Queensland, bred from nymphs of *Siphanta* sp. on several occasions. Mr. Koebele bred this species from another genus of Poecilopterine Fulgorids, found on *Ricinocarpus* at Sydney, N. S. W. (No. 2362); his number for Bundaberg was 2326.

13. *P. Koebelei*, sp. nov.

This species agrees in almost every way with *P. helluo*, but I have no doubt it is distinct in spite of the extraordinary re-

semblance between the two, since in the male the small hairless lobe on the right-side of the great hypopygium in this species is subtomentose, the hind tibiae are almost uniform yellowish in both sexes, not brownish or infusate in the middle, and the ovipositor of the female is very decidedly longer. Antennae dark, but the third joint more or less pale in the female, at least apically. Length 2.75-3.5 mm. (Pl. VII, fig. 5.)

HAB. Sydney, New South Wales, Nos. 2373 and 2395 of Koebele, who bred it from a Jassid found on the sandhills.

14. *P. monas*, sp. nov.

Male; head in front, and face with white tomentum; posteriorly with fuscous, more greyish laterally; antennae black, third joint acuminate produced, dark, but with paler tip.

Mesonotum covered with fuscous tomentum, and with two whitish spots in front, the pleura and metanotum whitish tomentose; scutellum with excessively minute, hardly visible hairs; wings slightly smoky, stigma as long as the fourth costal segment, small or discal cross-vein about opposite the termination of the auxiliary, and far before the middle of the discal cell; legs black, extreme tip of femora and the base of tibiae yellowish, front and middle tarsi black or dark above, the posterior apparently more or less pale.

Abdomen dull, basal segment black, with a distinct apical pale tomentose band, and with no trace of bristles laterally, the following segments black basally, but with pale apical bands, widest at the sides, and either narrowed or interrupted in the middle. Hypopygium large, sparsely tomentose, and with the surface shining, and with a very few excessively short (almost invisible) hairs. Length 3 mm.

HAB. Bundaberg, Queensland; one male bred by Mr. Koebele (2333) from a common Jassid. Very distinct in its group by the dark tibiae and abdominal pattern.

15. *P. picrodes*, sp. nov.

Female; general appearance and structure as in the two preceding species, but of larger size, the lateral grey tomentose spots of the abdomen large and distinct, though hardly visible on the dorsum, basal segment with the grey tomentose apical band narrower than in the female of *P. Koebelei*, and the second

segment with a distinct and entire basal band, which occupies half the segment or more and is narrowed at the middle. Posterior tibiae yellow, hardly darkened in the middle, except beneath. Third joint of the antennae clear yellow, not at all infuscate even basally. Ovipositor moderate, probably relatively longer than in *P. helluo*, shorter than in *P. Koebelci*. Length 3.5 mm.

HAB. Sydney, N. S. W.; bred from a Jassid on *Leptospermum* (Koebele No. 2351).

16. *P. anthracias*, sp. nov.

Female. Head in front and the face black, with little or no tomentum, the face extremely narrow, the inner margins of the eyes nearly touching, much closer together below than above the antennae; the latter dark, blackish or dark fuscous, the third joint in side view rounded at the apex, not acuminate; behind the eyes the head has fuscous tomentum, greyish at the sides.

Thorax thinly covered with fuscous tomentum, and somewhat shining; at the sides in front and on the pleura with whitish, the metanotum densely covered with the same; scutellum with very sparse, fine, inconspicuous hairs. Wings distinctly smoky, neuration blackish, paler at base, stigma brown, subequal to, or a little shorter than, the fourth costal segment, the posterior cross-vein before the apex of the second longitudinal. Legs black or piceous, knees pale, tarsi sometimes yellow, but generally more or less obscure, or fuscous, above; tibiae for the most part brownish or fuscous.

Abdomen with the two first and basal part of the third segment densely covered with whitish tomentum, the rest shining black, with sparse short hairs; basal segment on each side with a short row of a few distinct black bristles; ovipositor straight. Length 2-2.5 mm. (Pl. V, fig. 9.)

HAB. Kuranda, and Cairns, Queensland; one was bred by Mr. Koebele from (?) *Thamnotettix* (No. 2339), the others were captured specimens.

17. *P. crypsichalcus*, sp. nov.

Male: face below the antennae excessively narrow, black and hardly tomentose, the front with whitish tomentum, as also the

head posteriorly at the sides. Antennae with the third joint yellow, not sharply pointed at the apex.

Thorax shining, blackish aeneous, with some whitish tomentum at the sides in front and on the pleura, more densely tomentose on the metanotum; scutellum with extremely fine, short marginal hairs; halteres pale in the middle, dark at base, and more or less so on the apical portion. Wings distinctly clouded, stigma dark brown, not reaching back to the apex of the auxiliary vein, third costal segment as long as the fourth, small, cross-vein well beyond the apex of the auxiliary, the upper extremity of the posterior cross-vein a little before the apex of the first longitudinal. Legs black or dark; the apex of femora, the tibiae and tarsi (except the apical joint) yellow or pale, the tibiae more or less darkened with brown or fuscous.

Abdomen shining, aeneous, more piceous or brownish towards the base, blacker apically, the basal segment and the second (more or less) clothed with grey tomentum; hypopygium twisted to the right, impressed at the base, and with a definite area or impression at the tip, within which the surface appears to be paler in colour. Length 2.5 mm.

HAB. Kuranda, near Cairns, N. Queensland.

18. *P. microdes*, sp. nov.

Male: head with the eye-margins touching for about half the distance from the ocelli to the antennae, the front and face black, with little or no pale tomentum, space between the eyes beneath the antennae extremely narrow; head posteriorly with fuscous tomentum, becoming whitish at the sides. Antennae with the third joint pale, not at all acute at the tip.

Thorax somewhat shining, and covered, but not densely, with fuscous tomentum the metathorax densely clothed with grey; scutellum with a few short and extremely fine marginal hairs. Halteres pale, dark at base. Wings somewhat smoky, third costal segment as long as, or rather longer than, the fourth; posterior cross-vein hardly oblique, its upper extremity before the termination of the second longitudinal. Legs with the trochanters, base and apex of femora, tibiae and tarsi nearly entirely, yellow.

Abdomen deep black on the three basal segments, the second and third with lateral spots of grey tomentum, two following segments in some aspects smooth and shining, somewhat metal-

lic, but seen, in some views, to bear a thin covering of pale tomentum; basal segment at the sides apparently with only one or two bristles, which are not easily seen. Hypopygium impressed at the base and bent to the right, the tip with a large distinct impression. Length 2 mm. (Pl. V, fig. 5.)

HAB. Kuranda, near Cairns, N. Queensland.

19. *P. homocophanes*, sp. nov.

Male: front of head and face black, the surface not concealed by pale tomentum, but nearly bare; posteriorly the head is dark, but greyish tomentose at the sides. Antennae with the third joint dark, not acutely pointed at the apex.

Thorax with fuscous tomentum, more greyish at the sides in front, and on the pleura, denser and grey on the metanotum; scutellum at the most with a few excessively short fine hairs, very indistinct; halteres pale, dark at base. Wings subinfusate, venuration black, stigma brown, third and fourth costal segments not differing much in length, upper extremity of posterior cross-vein before the apex of the second longitudinal. Legs pitchy, knee joints and tarsi paler, brownish or brownish yellow.

Abdomen deep black, with pale lateral spots, which on some segments unite to form apical bands; fifth segment shining in some aspects, as probably are the other parts occupied by pale spots, if the tomentum be removed; basal segment on each side with about three black, longish bristles; hypopygium bent to the right and the tip with a large impression. Length 2.5 mm.

HAB. Kuranda, near Cairns, N. Queensland.

20 *P. xanthocnemis*, sp. nov.

Head in front and the face with white or greyish white tomentum; in the female for half the distance from the ocelli to the antennae black, bare and shining; posteriorly fuscous in the middle, grey laterally. Antennae with the third joint yellow, not sharply pointed at the tip, nor at all produced.

Thorax somewhat shining, nigroaeneous, beneath a thin covering of fuscous tomentum, metanotum much more densely clothed with greyish white; scutellum with extremely short and fine marginal hairs; halteres pale, dark at base. Wings hardly clouded, third costal segment in the male distinctly longer than the fourth, but in the female the difference in length is less, and

in one specimen the fourth is fully as long as the third; posterior cross-vein oblique, its upper extremity about opposite the apex of the first longitudinal. Legs, except the coxae, nearly uniformly clear yellow.

Abdomen black, bare and shining in the male, and more or less aeneous, the first segment with more or less distinct tomentum; in the female more tomentose, especially the first two segments, and sometimes hardly aeneous; basal segment with a short lateral line of a few black bristles. Length 2-3.25 mm. (Pl. V, fig. 8.)

HAB. Cairns district and Bundaberg; bred from a *Liburnia*.

21. *P. heterostigmus*, sp. nov.

Head with the front and face in the male with whitish tomentum; in the female the tomentum between the ocelli and antennae is divided by a shining and bare, black carina; face beneath the antennae extremely narrow; head posteriorly with fuscous tomentum becoming whitish towards the sides. Antennae with the apical joint somewhat pointed at the tip, but not sharp, nor produced, yellow in the female, sordid or pitchy in the male.

Thorax with fuscous tomentum in the male, greyish or whitish fuscous in the female; on the metathorax with dense white covering. Halteres yellow, dark at the base. Wings with dark venation, stigma yellowish brown, and enclosed on the basal side by a strong cross-vein third costal segment considerably longer than the fourth, posterior cross-vein before the apex of the second longitudinal. Legs for the most part yellowish in the female, but the femora are largely darkened above and at the sides; in the male the legs are altogether darker, the trochanters, knee-joints and tarsi mostly yellowish, the tibiae for some part more brown.

Abdomen sparingly tomentose, and without pattern; on the basal segments more or less pallid, brownish or yellowish, but darker posteriorly the apex being blackish; basal segment with two or three bristles on each side. Length about 2 mm. (Pl. V, fig. 10.)

HAB. Redlynch and Kuranda near Cairns. A single male and female in each case, taken from boughs of trees, so that it probably attacks arboreal leaf-hoppers.

22. *P. synadelphus*, sp. nov.

Black, with always more or less of an aeneous tinge, and generally very distinct dull brassy. Front of head and face with dense white tomentum; in the female the space between the eyes in front of the ocelli is rather shining and conspicuously impressed, and bears very little tomentum compared with the front. Antennae with the third joint acuminate, and more or less pale apically.

Thorax with not very dense fuscous tomentum, and with a pale spot on each side in front; the metanotum with dense whitish grey tomentum; scutellum with at most a few hardly visible hairs; halteres yellow, black at base. Wings clear, third costal segment very short, not stigmated; small cross-vein beyond the apex of the first longitudinal, at or rather beyond the middle of the upper side of discal cell; posterior cross-vein very oblique, its upper extremity beyond the apex of the second longitudinal. Legs black, knees and tarsi pale.

Abdomen with a band of tomentum on the basal segment, and with a line of distinct black bristles on each side; elsewhere sparsely tomentose, and with very short black hairs, which are quite easily seen; hypopygium of male somewhat tomentose and with sparse and excessively short hairs, which are less conspicuous than those on the preceding segment; ovipositor of female straight and slender. Length 25-3 mm. (Pl. VI, fig. 4.)

HAB. Bundaberg, Queensland, common; also at Cairns, and Mr. Koebele bred one specimen from a Jassid taken on grass at Childers (2319).

23. *P. epichalcus*, sp. nov.

Aeneous, the abdomen in the female more or less copper-coloured; front and face with greyish or white tomentum, which in the female extends back to the ocelli; posteriorly the head at the sides has whitish tomentum; antennae dark with the third joint acuminate, and at the most only sordidly pale.

Thorax with a pale spot on each side in front, and with whitish (or subflavescent) tomentum on the pleura and sides of the metanotum, elsewhere hardly tomentose; scutellum with a few scarcely visible hairs; halteres pale, dark at base. Wings hyaline, hardly infusate, third costal segment very short, not stigmated, small cross-vein near the middle of the upper side of the discal cell and beyond the apex of the first longitudinal; pos-

terior cross-vein oblique, its upper extremity beyond the termination of the second longitudinal. Legs black, tip of femora and base of tibiae yellow, tarsi dark above, black or piceous.

Abdomen of the male sometimes more or less shining, generally duller in the female, basal segment with a band of white tomentum, and with a few black bristles on each side, elsewhere nearly bare. Hypopygium of the male with a great impression at the tip; ovipositor of the female very slightly curved. Length 3.25-3.5 mm.

HAB. Cairns, Queensland; two or three specimens captured, but not bred.

24. *P. pseudophanes*, sp. nov.

In almost every respect like the preceding, but less brightly aeneous, and at once distinguished by the fact that the basal abdominal segment is without the line of black bristles on each side. The legs in this species appear to vary in colour, the tarsi being generally black or brown above, but in one specimen they are yellow. Length 3.25-3.75 mm.

HAB. Cairns, Queensland; on the coast and in the mountains; one example was bred from the same Jassid (a species of *Hecalus*) as *P. cruciator*.

25. *P. leimonias*, sp. nov.

Male; front of head, and face with white tomentum, as also the head posteriorly at the sides; third joint of antennae strongly acuminate, blackish or pitchy.

Thorax very thinly tomentose, with a pale spot on each side in front; the metanotum more densely covered with whitish tomentum, especially at the sides; halteres whitish, black on the basal half; mesonotum and scutellum with short and fine but quite noticeable erect hairs. Wings nearly clear, third costal segment very short, and not stigmated; small cross-vein near the middle of the upper side of discal cell, and beyond the apex of the first longitudinal vein; upper extremity of posterior cross-vein beyond the termination of the second longitudinal. Legs black, knee joints yellow, tarsi black or pitchy above.

Abdomen blue-black, sparsely but quite conspicuously clothed with short black hairs; basal segment without a band of pale tomentum, but with the bristles well developed on each side; hypopygium with greyish-fuscons tomentum, impressed or channeled. Length 3 mm.

HAB. Brisbane, Queensland.

26. *P. nyctias*, sp. nov.

Deep black, or blue-black; front, face, and head at the sides posteriorly with dense white tomentum; antennae with pale third joint, acuminate at apex.

Thorax more or less shining, and thinly clothed with fuscous tomentum, that on the metanotum white, and dense at the sides; scutellum with scarcely visible hairs; a pale spot on either side of the thorax in front. Wings subinfusate, but darker in some examples than in others, third costal segment very short, and not stigmated; fourth costal segment also short, but longer than the third; small cross-vein about opposite the extremity of the first longitudinal, and considerably before the middle of the upper side of the discal cell; upper extremity of posterior cross-vein far beyond the apex of the second longitudinal. Legs black, apex of femora, tarsi, and tibiae yellow, the latter more or less dark in the middle, trochanters sometimes more or less pale.

Abdomen blue-black, shining; the basal segment with whitish or grey tomentum, and a line of black bristles on each side; elsewhere the abdomen with sparse and very short dark hairs, most noticeable towards the apex; hypopygium of male with a large cleft or impression, ovipositor relatively long. Length 2.5-2.75 mm. (Pl. VI, fig. 5.)

HAB. Cairns and Bundaberg, Queensland.

B. Hawaiian Species.

27. *P. juvator*, sp. nov.

Black, the face and front with whitish, or grey tomentum, more obscure and fuscous in some examples, head shining and bare in front of the ocelli in the female; antennae very variable in colour, entirely black, or with the third joint, which is acuminate produced, piceous, sordid yellow or even entirely clear yellow rarely of the latter colour in the male, the tendency being to a paler colour in the female, in which, however, the antennae are sometimes entirely dark.

Thorax dark, more or less shining, and sparsely clothed with fuscous tomentum, the metanotum more densely with whitish or grey; the scutellum with a marginal series of distinct longish bristles; halteres pale, dark at base; wings blackish smoky in the male, clear in the female, stigma brown, small cross-vein about opposite, or a little beyond the apex of the auxiliary, and well

before the middle of the discal cell; posterior cross-vein very oblique. Legs with coxae and femora black, the latter more or less distinctly yellow at base and apex, and beneath with two rows of short spines or spinose hairs at least on the apical part; tibiae yellow, sometimes darker towards the base and on the apical portion, but yellow in the middle, the posterior pair with no specially long hairs on the dilatation; tarsi nearly always black, brown, or fuscous above in the male, sometimes black in the female but often largely yellow, as is rarely the case in the former sex.

Abdomen in the male deep black or bluish black, shining (at least apically) and bearing short black hairs; the basal segment with a band of grey tomentum, and a transverse row of long black bristles at the sides; in the female the abdomen is distinctly covered with grey tomentum, most densely on the apical portion of the first segment, and bears short and sparse, but quite evident, dark hairs. Length 3-4.75 mm. (Pl. VI, fig. 1; VII, fig. 10, 10a, 10b.)

HAB. Hawaii generally; now common in the cane-fields. This is the species referred to me in my Bulletin "The leaf-hopper of the sugar cane" as occurring at Olaa. It has also been found on Oahu by Mr. Swezey, but has not been taken in the cane-fields of this island.

28. *P. oahuensis*, sp. nov.

This appears to me to agree in nearly all important structures with the preceding, as well as in superficial appearance with certain of its varieties. In *P. oahuensis* the tarsi are dark in both sexes, the tibiae yellow and unbanded, the third antennal joint is yellow, or at least pale, in both sexes, but usually sordidly so in the male. The wings in the latter sex are quite smoky, in the female clear. The dilatation of the posterior tibiae outwardly bears some specially long black bristles, which differ from the general clothing of the legs, and this fact readily separates the species from the preceding. The ovipositor is very short and strong. Length 3.75-4.5 mm.

HAB. Mountains of Oahu.

29. *P. terryi*, sp. nov.

Front and face covered with white or whitish tomentum; third joint of antennae yellow or ferruginous, acuminate.

Thorax with very distinct, and not very sparse, clothing of fuscous or brown tomentum, pleura and metanotum with grey; marginal series of black bristles on the scutellum quite well developed; halteres dark at base, and sometimes also infusate apically. Wings in the male rather lightly infusate, clear in the female, the stigma shorter than the long fourth costal segment, small cross-vein nearly opposite termination of auxiliary, and considerably before the middle of the discal cell; posterior cross-vein very oblique. Legs with the coxae dark, the trochanters, base of femora widely and the apex more narrowly, the whole of the tibiae and sometimes nearly the whole of the tarsi, yellow, but the latter sometimes dark or obscured above; posterior femora banded with black or fuscous on the apical half.

Abdomen in the male black and shining towards the apex, fuscous-blackish on the second and following segments; in some aspects nearly entirely shining and slightly aeneous, clothed with quite distinct, but sparse hairs; basal segment banded with grey tomentum, the black lateral bristles well developed. Abdomen of the female with the surface densely covered with fuscous tomentum, sometimes paler along the apical margins of the segments, as also on the basal one, and quite conspicuously pilose; ovipositor straight, pale, of moderate length and thickness. Length 2.75-4 mm.

HAB. Kauai in the cane fields; but only found by Mr. F. W. Terry in one locality. It is closely allied to *P. juvator*, but most decidedly a distinct species.

30. *P. swezeyi*, sp. nov.

Male; front and face with whitish tomentum; third joint of the antennae acuminate and produced at apex, yellow.

Thorax somewhat shining, sparsely clothed with fuscous tomentum, the pleura and metanotum with grey; scutellum with longish marginal series of bristles; halteres pale, more or less infusate at base and apex; wings smoky, stigma brown and about as long as the fourth costal segment; small cross-vein nearly opposite (a little beyond) the termination of the auxiliary; posterior cross-vein very oblique, its upper extremity about opposite the termination of the second longitudinal; legs with the coxae and apical joint of the tarsi black, all the rest clear yellow, the small spines beneath the femora, the hairs on these and on the tibiae and tarsi, black.

Abdomen nigroaeneous, and rather shining, with sparse and

short, dark hairs; basal segment with the lateral bristles well developed, and more or less evidence of a grey apical tomentose band, possibly partly worn off in the specimen described; genitalia yellowish apically. Length 4 mm.

HAB. Oahu, Honolulu; a specimen taken in the mountains by Mr. O. H. Swezey. It is a most distinct species, possibly parasitic on the common little green Delphacid that frequents the *Freycinetia*.

31. *P. hawaiiensis*, sp. nov.

Very closely allied to *P. swezeyi*, from which it differs as follows: the basal joints of the antennae are ferruginous, as seen laterally, not dark brown or piceous; the mesonotum is very distinctly covered with greyish tomentum at the sides in front as also is the scutellum; the small cross-vein is rather nearer the base of the discal cell, and the wings are of a more yellow tint.

Abdomen fuscous, and distinctly aeneous, the basal segment and sides of the others with grey tomentum, the surface hardly shining, except towards the apex of the body. Legs as in the preceding, but the posterior tibiae with two or three specially developed bristles on the median dilatation outwardly. Length 4 mm.

HAB. Hawaii; one specimen taken some years ago in a gulch in the Hamakua district.

32. *P. molokaiensis* Grimsh.

P. molokaiensis Grimshaw, Fauna Hawaiiensis Vol. III, Pt. 1, p. 17.

HAB. Molokai; it was common in the forest in 1893 but I only took two or three specimens.

33. *P. nigrotarsatus* Grimsh.

P. nigrotarsatus Grimshaw, loc. cit. p. 18.

HAB. Kona, Hawaii, 4000 feet. I have some suspicion that this may be identical with *P. juvator* described above, but none of the specimens of the latter seem to quite agree with it.

34. *P. rotundipennis* Grimsh.

P. rotundipennis Grimshaw, loc. cit. supra.

HAB. Kilauea, Hawaii, 1896.

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DESCRIPTION OF PLATES.

Plate V.

1. *P. cruciator*, female.
2. *P. cinerascens*, antenna viewed from the side outwardly.
3. *P. beneficiens* do
4. *P. cucalypti* do
5. *P. microdes* do
6. *P. cruciator* do
7. *P. hylaeus* do
8. *P. xanthocnemis* do
9. *P. anthracias* do
10. *P. heterostigmus* do

Plate VI.

1. *P. jurvator* wing
2. *P. lamcllifer* do
3. *P. beneficiens* do
4. *P. synadelphus* do
5. *P. nyctias* do

Plate VII.

1. *Hecalus* sp. containing larva of *P. cruciator*.
2. do after escape of the full grown larva.
3. Common type of *Pipunculus* puparium.
4. Puparium of *P. cinerascens*.
5. Puparium of *P. Koebelei* after emergence of fly; 5a the segment bearing the dorsal stigmatic processes or "horns;" 5b one of the processes more highly magnified.
6. Puparium of *P. cruciator* the horn-bearing segment removed showing the "horns" attached to the empty pupal skin.
7. Posterior stigmatic area of *P. cruciator*.
8. do *P. hylaeus*.
9. do *P. cinerascens*.
10. Larva of *P. jurvator*; 10a posterior stigmatic area of the same in dorsal aspect; 10b the same in apical view.

PLATE V.

PLATE VI.

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PLATE VII.

REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

**Leaf-Hoppers and their
Natural Enemies**
(*PT. V. FORFICULIDAE, SYRPHIDAE,
AND HEMEROBIIDAE*)

By F. W. TERRY

HONOLULU, H. T.
NOVEMBER 13, 1905

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LETTER OF TRANSMITTAL.

Honolulu, T. H., October 23, 1905.

To the Committee on Experiment Station, H. S. P. A.; Honolulu, T. H.

Gentlemen :—I, herewith, submit for publication the fifth part of the Bulletin on "Leaf-Hoppers and Their Natural Enemies."

This part has been prepared by Mr. F. W. Terry, Assistant Entomologist of this Division, and deals with some of the predaceous enemies of leaf-hoppers.

Yours obediently,

R. C. L. PERKINS,

Director, Division of Entomology.

GENERAL REMARKS ON EARWIGS.

The Forficulidae or Earwigs are as a group very easily distinguished from any other families of the Orthoptera, but much diversity of opinion appears to exist as to their true affinities. Many authors still consider them a distinct order, Dermaptera or Euplexoptera; but the most general acceptation appears to be that they are merely a somewhat aberrant family of the Orthoptera. Their distribution throughout the world is very general, some species having a very wide range, owing no doubt to their secretive habits and facility of transportation. The warmer regions of the globe appear to be much more productive of species than the temperate zones. The total number of species recorded appears to be slightly over 500, these being included in 52 genera. Although practically omnivorous, the vegetarian habits of some of the Forficulidae are well known, and owing to the predilection of the common European species (*Forficula auricularia*) for the foliage of Dahlias and other favorite garden plants, this insect is very unpopular with the careful horticulturist.

Instances of damages to so important a crop as hops, are also recorded, but such cases appear to be rare. Several observations on their insectivorous diet are also recorded, the forceps being used to hold the unfortunate victim, whilst it is devoured at leisure. The economic value of *F. auricularia* in destroying the larvae and pupae of the Tortricid moth, *Cochylis ambiguella* (so destructive to grape vines in Europe) has also been observed, and also the destruction of other injurious insects. In New South Wales and Queensland, a small earwig, *Spongiphora* sp. (?) was observed in great numbers in the cane-fields, feeding upon leaf-hoppers and other insects, by Messrs. Perkins and Koebele. The maternal solicitude exhibited by the female for her eggs and newly hatched young has been recorded by numerous observers. Much diversity of opinion has been expressed by observers as to the use of the forceps; they have been observed to aid in the folding and unfolding of the wings, and in the raising of the tegmina preparatory to flight. From personal observation we know that they are important aids to feeding, de-

fense, aggression, and titillation on the part of the male preparatory to copulation. One S. American species (*Sphingolabis lincaris*) is stated to cause much annoyance and painful wounds with its forceps, "leaving double puncture marks on the skin."

But few parasites have been observed or recorded; Lucas obtained a yellow parasitic worm, which he suggests is a Nematelminthid (*Mermis* sp.), from a specimen of *Forficula auricularia*, the abdomen of which was much swollen. Two Tachinids are recorded; Rodzianko stating that *Roeselia antiqua* was bred from an East European species, *Forficula tomis*, and Fischer records another fly, *Tachina setipennis* from *Forficula* sp.

Of the eight species known to be established on these islands, the five following have been observed in the cane fields:

1. *Anisolabis annulipes*, Lucas. Common generally.
2. *Labia pygidiata*, Dube. Common locally.
3. *Labia* sp. Not common.
4. *Labidura* sp. Not common.
5. *Chelisothes morio*, Fab. Common in the wet districts.

Of these *Chelisothes morio* and *Anisolabis annulipes* are of considerable economic importance and have therefore been particularly studied.

CHELISOCHES MORIO.

(1) General Remarks.

Of the species in these islands, this fine Forficulid is certainly the most important economically. It has a wide distribution in the islands of the Pacific Ocean, and is recorded from Tahiti, Fiji, Hawaii, New Guinea, Java, Sumatra, Celebes, Philippines, Batchian, India and Ceylon.

It is an extremely active species, especially during the larval period, and appears to be diurnal, running over the leaves in search of insect food during the hottest part of the day. The adults will readily take to flight, the unfolding of the wings being a very rapid process and quite independent of the forceps, the writer never having seen them used either to assist in the folding or unfolding process. Wet localities seem to suit it best, since it abounds in the moist mountain ridges and valleys, and

also in many of the elevated and wetter plantations. It is scarce in the dry and irrigated cane areas. Its predatory habits on leaf-hopper have been observed by several people. Young hoppers are seized and devoured without the aid of the forceps, but these organs frequently assist in holding an adult hopper whilst it is eaten at leisure. An examination of numerous crops invariably revealed only insect remains, often entirely leaf-hopper. Those bred in captivity showed during all instars a marked preference for insect diet.

(2) The abdominal plates.

The much-discussed fused dorsal, and missing ventral abdominal plates, are well represented in the female of this species. The (presumably) 8th and 9th tergites are very narrow (still more so in *Anisolabis annulipes*) and fused on to the large 10th. The (presumably) 8th and 9th sternites are much reduced; the 8th is almost entirely membranous except for the anterior chitinized angles; the 9th still remains chitinized laterally, these areas forming thin laminae; the 10th consists of a pair of strongly chitinized plates, each with an inner articulation to permit defaecation. In *Anisolabis annulipes* these ventral plates (except the 10th) appear to have entirely disappeared (Pl. IX, fig. 5.)

In the male *Chelisoches*, only the 10th sternite is discernable, represented by a pair of strongly chitinized plates. There appears to be no trace of the 8th and 9th sternites the whole membranous area being extremely delicate. The 8th and 9th tergites are normally developed and not fused. Pl. IX, fig. 6.

There is still one sternite to be accounted for in both sexes (presumably the 1st). No trace of its early fusion with the metasternum could be found.

(3) The development of the antennal joints.

The increase of the antennal joints at each instar appears to be perfectly constant, since large numbers in all stages were examined. The additions at each ecdysis arise from the segmentation of joint 3. Upon hatching the antenna consists of eight joints; at the first ecdysis this number is increased to twelve, the additional four arising from joint 3, thus the 4th joint becomes the 8th. At the second ecdysis the additional

four again arise from joint 3, the previous four being thus pushed forward, the original 4th joint now becomes the 12th. At the third ecdysis only three additional joints are gained, and at the fourth (last) only one, so that the original 4th now becomes the 16th.

				4 th ecdysis	5 th ecdysis (adult)	
20					8	20
19				8	7	19
18			3 rd ecdysis	7	6	18
17				6	5	17
16			8	5	4	16
15		2 nd ecdysis	7	4	3 ^d	15
14			6	3 ^d	3 ^c	14
13			5	3 ^c	3 ^b	13
12		8	4	3 ^b	3 ^a	12
11	1 st ecdysis	7	3 ^d	3 ^a	3 ^h	11
10		6	3 ^c	3 ^h	3 ^g	10
9		5	3 ^b	3 ^g	3 ^f	9
8	8	4	3 ^a	3 ^f	3 ^e	8
7	7	3 ^d	3 ^h	3 ^e	3 ^m	7
6	6	3 ^c	3 ^g	3 ^m	3 ^k	6
5	5	3 ^b	3 ^f	3 ^k	3 ⁱ	5
4	4	3 ^a	3 ^e	3 ⁱ	3 ⁿ	4
3	3	3	3	3	3	3
2	2	2	2	2	2	2
1	1	1	1	1	1	1

It is possible that the adult insect sometimes possesses more than twenty joints, but that appears to be the maximum, out of a large series that were examined.

(4) Description of all stages from egg to adult.

The Egg.

The eggs are deposited in a heap usually in the leaf sheaths of various large-leaved succulent plants such as *Canna* and sugarcane, and are placed sufficiently far down to afford ample protection from the sun or enemies, the mother keeping continuous guard during the incubation period and for several days after the hatching of the young. She is most assiduous in her attentions to her ova, removing them carefully with the mandibles and palpi and constantly rearranging the batch. This maternal solicitude has been frequently observed in various species of earwigs and other insects; not infrequently however if disturbed, she will devour the entire lot. These batches consist of from about 40 to 60 eggs, the average number being about 45. Upon deposition, they are of an ivory whiteness and broadly oval, measuring about 1 mm. x 0.75 mm. (Pl. VIII, fig. 1.) As development proceeds and the surrounding moisture is absorbed, the elastic egg-membrane allows a very considerable increase in size to occur during the next few days. So that on the 5th or 6th day, (i. e.,) just previous to hatching) they are fully twice their original bulk, measuring 1.50 mm. x 1 mm. At this stage the embryo can be distinctly discerned in ovo, the abdomen being curved forward so that the forceps lie against the ventral surface. (Pl. VIII, fig. 2.) No trace of segmentation in the forceps of the embryo can be detected in this species.

First Larval Instar.

The larvae emerge about the 6th day and are at first of a pale ivory white; pigmentation rapidly develops, the eyes, head, apical antennal joints and femora assume a pale bluish grey coloration, which rapidly darkens and extends over those portions of the body surface which are destined to become black. At this instar the dimensions are as follows:

Antennae 2.50 mm.

Head and body 3-3.50 mm.

Forceps 1 mm.

The general facies even at the 1st instar is remarkably like that of the adult—this is still more apparent in *Anisolabis*—the chief difference apart from the absence of tegmina and wings,

being the relatively larger head, smaller forceps and the reduced antennal segmentation: head broadly cordate, dark brown, eyes black, antennae with eight joints, sparsely covered with short stout hairs, and 2nd joint short, one-fourth the length of the 3rd, which is the longest, 4th to 8th about equal, terminal joint conical, brown, the basal joints yellow, gradually darkening, the apical dark brown. Pronotum subquadrate, narrower than head, angles rounded, testaceous, posterior margin being slightly emarginate. Mesonotum quadrate, equal in width and length to the pronotum, angles rounded, testaceous, with a median pale infusate transverse band which extends to the episterna. Metanotum posteriorly slightly wider than the preceeding and shorter, distinctly emarginate, yellowish brown. Abdomen, campodeiform, dorsal segments ten, the 1st visible; ventral segments eight, no trace of 9th and 10th visible, testaceous, the sides with dark brown bands, widening and darkening antero-posteriorly and uniting at about the 7th segment. Forceps slender, nearly straight, no trace of segmentation, bases testaceous, reddening apically, with stout hairs sparsely distributed. Legs stout, testaceous, basal halves of the femora smoky brown, tarsus 3-jointed, second joint very short with a distinct lobe which is about one-third the length of the 3rd joint.

Plate VIII fig. 3.

Second Larval Instar.

At about the 6th day (after hatching) the 1st ecdysis occurs. The dimensions at this instar are as follows:

Antennae 4 mm.

Head and body 5-6 mm.

Forceps 1.25 mm.

The general facies is very similar to that of the previous instar; the chief change being seen in the additional joints of the antennae. The following variations from the previous instar are to be observed: As regards the darkened areas, these are much darker. Head blackish brown. Antennae with twelve joints the additional four arising between the 3rd and 4th joints from the segmentation of joint 3; the basal even testaceous; the newly formed 4th to 7th shorter than those succeeding them; 8th and 9th dark brown, 10th (sometimes 9th or none) whitish; 11th and 12th very dark brown, terminal conical. Pronotum quadrate, as wide as head, yellow testaceous. Mesonotum, blackish brown, except the posterior margin, which is testa-

ceous. Metanotum, more emarginate, testaceous with lateral infuscation. Abdomen, 1st segment testaceous, the rest uniformly blackish brown, ten segments dorsally, only eight visible ventrally. Forceps, more curved apically, a few rudimentary teeth present along the basal inner edge, castaneous. Legs, basal halves of the femora blackish brown; lobe of the 2nd tarsal joint similar to the previous instar. (Plate VIII fig. 4.)

Third Larval Instar.

At about the 17th day the 2nd ecdysis occurs. The dimensions at this instar are as follows:

Antennae 6 mm.

Head and body 7-8 mm.

Forceps 2 mm.

The general facies still resembles that of the very young larva. The dark brown areas of the previous instar have now become black, or nearly so.

The following changes are to be observed: Head black. Antennae with sixteen joints, the additional four arising between the 3rd and 4th joints, again being produced from segment 3; the basal three testaceous, the newly formed 4th to 7th joints shorter than those succeeding them, (thus resembling their predecessors in the previous instar,) dark testaceous, the rest black except usually the 12th and 13th (sometimes only one of these), whitish. Pronotum black. Mesonotum black, slightly wider than the pronotum. Metanotum, rather wider posteriorly than the mesonotum, black, except along the posterior emargination, which is whitish testaceous. Abdomen,—first dorsal segment partially hidden by the rudimentary wing lobes, darkly infuscate, the rest black. Forceps, dark castaneous, several minute teeth present along the basal inner edge, the curvature similar to that of the previous instar. Legs,—basal halves of the femora blackish, the apical halves and the tibiae, infuscate; lobe of the 2nd tarsal joint about half the length of the third joint. (Plate VIII fig. 5.)

Fourth Larval Instar.

At about the 30th day the 3rd ecdysis occurs: The dimensions at this instar are:

Antennae 10 mm.

Head and body 12-13 mm.

Forceps, 4-4.25 mm.

The general facies now more closely resembles that of the adult.

The following are the principal variations from the previous instar:

Head, intense black. Antennae with nineteen joints, the additional three have again arisen from segment 3, but this is not so apparent as in the earlier instars, owing to the excessive pigmentation; the shorter form of the extra ones however, is still traceable. The entire antenna black, except usually the 14th and 15th joints, whitish, but this colour is extremely variable at this stage ranging from the 12th to the 16th joint. The antennae often vary in this respect in the same individual and not infrequently the white only occurs on a portion of a joint. Pronotum quadrate, anterior angles square, the posterior rounded, intense black, posterior margin whitish. Mesonotum intense black, distinctly wider than pronotum, the undeveloped tegmina distinctly visible beneath the metanotal plates. Metanotum somewhat broader than mesonotum, posterior edge deeply emarginate, caused by the immature wings which are now distinctly visible beneath, forming a pair of well-developed metanotal plates. Metanotum, intense black, except for a whitish semi-lunar area on the inner margin of each lobe. Abdomen, ten dorsal segments, the 1st entirely hidden by the metanotal plates, (this segment has already become somewhat dechitinized,) the rest black; the 2nd segment is also partially covered by the metanotal plates. Forceps, similar in form to the previous instar, several minute teeth present along the inner margins, black. Legs,—femora relatively longer than in the previous instar, basal halves black, apical halves and tibiae darkly infusate, tarsi testaceous, lobe of 2nd tarsal joint more than half the length of the 3rd joint. (Plate VIII, fig. 6.)

The Adult.

The last ecdysis occurs at about the 50th day and some 4 days elapse before the final black coloration is attained.

The adults vary very considerably in size; the following being the range of dimensions observed:

	Males.	females.
Antennae	11 mm.	11 mm.
Head and body.....	12-17 mm.	13-18 mm.
Forceps	4-7.25 mm.	4-7 mm.

Besides the very considerable increase in size, a very decided change is visible structurally, the tegmina have become much longer and are freely articulate at their bases; beneath them are the true flight-wings which are large and membranous. The forceps have also assumed a relatively greater development.

Head shining black; antennae with at least twenty joints, black, except usually the 13th and 14th joints which are whitish or pale testaceous (the distribution of these pale joints is extremely variable even on the same individual); the three basal segments semi-glabrous, the rest pubescent, the basal considerably the largest and much thickened, the 2nd very short, the 3rd-5th shortish, the rest increasingly longer and slender. Pronotum broader than head, shining black, anterior margin straight, angulate; the posterior margin rounded. Tegmina long, shining black, sometimes with an aeneous reflection, in the male reaching nearly to 2nd abdominal segment, in the female somewhat shorter. Wings large, when folded in the male reaching nearly to the 3rd abdominal segment; in the female somewhat less.

Abdomen flattened, finely granulated, shining black, sometimes with an aeneous reflection; in the male ten dorsal segments, the posterior segment large, hind margin straight, tuberculated and folded, impressed in the middle, eight visible ventrally; in the female ten dorsal segments (8th and 9th very narrow and fused to the 10th), the posterior segment large, (less square than that of the male), posterior margin straight, tuberculated and folded, impressed in the middle; six segments visible ventrally, (the hidden 7th and 8th membranous. Folds of scent-glands on 4th segment distinct. Forceps long, flattened, in the male larger and more strongly incurved than those of the female, the inner margin irregularly crenulate, with a jagged dilation and a prominent bifid tooth basally. (Another form occurs on these islands in which the basal dilation is reduced, and distinct teeth extend two-thirds of the entire length; in the female the incurvature is less pronounced, the inner margin is crenulate and devoid of teeth. Pygidium more prominent in female than male. Legs, black, stout, tarsi yellowish, lobe of 2nd tarsal joint nearly two-thirds the length of the 3rd joint. (Plate IX fig. 1 and 2.)

ANISOLABIS ANNULIPES, Luc. (Pl. IX fig. 3.)

This inconspicuous earwig has a wide distribution both in tropical and temperate zones.

Like the more conspicuous *Chelisoches morio*, it is omnivorous, but prefers insect food, often feeding almost exclusively on the cane leaf-hopper, as an examination of several crops has proved. It is nocturnal, remaining hidden down in the leaf sheaths or under trash and stones where the female may often be found zealously guarding her eggs. This species is interesting structurally since it is one of the most completely apterous forms of the family.

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HEMEROBIIDAE.

(*Chrysopinae*.)

The predaceous habits of the peculiar larvae of the Lace-wing flies are familiar to many. They feed chiefly upon Aphidae (plant-lice,) but various other injurious insects fall a prey to their voracity. The soft-bodied larvae of many species amply protect themselves by carrying various material and the general debris of their victims upon their backs, the dried skins, etc., of the latter being carefully packed between and upon the stout curved bristles of the lace-wing larva. The bodies of these larvae are usually much distended at about their middle, becoming rapidly attenuated posteriorly. The head is broad and depressed; the mandibles long and sickle-shaped. There is no true mouth, the fluids of the victims being sucked up through a groove which extends along each mandible.

The following four species of lace-wings have been observed in the cane-fields, feeding upon Aphidae and young leaf-hoppers. The first three are native species. The larvae of *Anomalochrysa* are often brilliantly colored, for example green with pink or crimson markings, and do not carry foreign matter upon their backs. The most beneficial and generally distributed species is *Chrysopa microphya*, a more detailed account of which is given below.

Anomalochrysa deceptor, Perk.

HAB. Oahu, Maui and Hawaii, but so far only found in the cane-fields on the latter island.

Anomalochrysa raphidioides, Perk.

HAB. Hawaii, found in the cane fields of that island.

Anomaiochrysa gayi? Perk.

HAB. Hawaii, found in the cane-fields of that island.

Chrysopa microphya, McLachl.

HAB. All the islands and in all cane-fields.

GENERAL REMARKS ON *CHRYSOPA MICROPHYA*,

McLachl.

This small lace-wing fly is probably an introduced species but has undoubtedly been established on these islands for many years.

The stalked eggs are usually laid upon the under surface of a leaf or upon a branch, generally singly, sometimes in groups of 3 or 4. The larva upon hatching remains for a short time resting upon the empty egg. As soon as it leaves the egg-stalk it seeks eagerly for small particles of dirt, exuviae, etc., to place upon its back; should an *Aphis* or young hopper be encountered during the search, it is seized and after being sucked dry, the empty skin is placed upon the young larva's back. Those bred in captivity became full-fed in about 15 days, the adults emerging about 10 days later. The larvae are most voracious feeders and besides attacking young cane-leaf-hoppers have been observed to thrust their long mandibles into the imbedded hopper-eggs and suck them.

The oviposition has been described as follows: the female having selected a suitable locality, presses the tip of the protruded abdomen upon the leaf surface and exudes a viscid fluid (probably of a similar nature to silk) and then raises the abdomen, drawing out the viscous deposit into a thread, still attached to the abdomen; having proceeded thus, the egg is then extruded and attached to the extremity of this thread or egg-stalk.

The egg is oval, length about .75 mm., bright green, becoming yellowish as development proceeds; it is borne upon an extremely delicate hair-like stalk, 4-5 mm. in length.

The adult larva is about 5 mm. long. Head, across the eyes broader than long, depressed, pale greenish-testaceous, with four pairs of blackish longitudinal bands, the median pair one-third the length of the head, starting from the inner bases of the mandibles, convergent posteriorly; the extra-median pair broader, and extending from the mandibular bases to the back of the head, convergent posteriorly; the lateral pair narrow, and extending from the back of the eyes to the back of the head, the extra-lateral pair short and extending posteriorly from the sides of the eyes, this band is divided just behind the eyes, uniting shortly after. Eyes prominent, black. Mandibles, sickle-shaped, longer than the head, widely remote at their bases, testaceous, ferruginous apically.

The thoracic segments distinct from abdominal. Prothorax, broader than the head, widening anteroposteriorly, bearing anterolaterally a pair of tubercles with radiating recurved bristles. Mesothorax, much broader than prothorax, the narrow constricted portion in front appearing to belong to the former, width more than twice the length, bearing antero-laterally a pair of tubercles bearing radiating recurved bristles. Metathorax, broader than the mesothorax. Width more than three times that of the length, bearing laterally a pair of tubercles with radiating recurved bristles. Legs moderate, whitish-testaceous.

Abdomen napiform, seven-segmented, each segment with a pair of lateral tubercles bearing bristles.

The general body coloring is pale greenish-testaceous with paired and irregular mottling of brown, the thoracic tubercles are whitish-testaceous and much larger than those of the abdomen, the latter being of the general body coloring, pale greenish-testaceous.

Pupa case nearly globular, about 2 mm. long, formed of closely-spun whitish silk, and usually covered with insect remains, etc.

Unfortunately the pupa of this beneficial insect is attacked by an Ichneumonid parasite, which at certain times and places becomes quite numerous.

The adult Lace-wing has been described by McLachlan as follows:

"Chrysopa microphya, n. sp."

"Body yellowish testaceous ("bright green" in life.) Head polished; palpi, antennae, and legs concolorous with the body; basal joint of antennae strongly bulbous; claws dilated internally at the base.

Abdomen apparently having a blackish band on either side, in which are yellow (or greenish) spots; clothed with rather long, but not dense hairs.. In the male it is terminated by a broad oval superior plate, concave beneath, and ventrally by a much shorter nearly semicircular plate.

Wings vitreous, slightly iridescent, ovate, subobtusely; venation strong, open; longitudinal nervures greenish, transverse and graduate nervures mostly blackish, the costal nervures pale at either end, the whole set with rather long black hairs; pterostigmatic region elongate (very long and somewhat dilated in posterior wings of male), greenish; subcosta becoming con-

fluent with the costa before the apex; partition nervule of the third cubital cell extending beyond the nervule above it (the cellule oval); six and eight nervules in the two gradate series in the anterior wings of the male, and four and five (or six) in those of the female (in the pair before me;) fifteen to seventeen antepterostigmatic nervules.

Length of body 6 millim; expanse, male 20 millim., female 22 millim.

One of the smallest species and, in some respects, aberrant, the condition of the subcosta showing analogy with *Hypochrysa*, and the formation of the apex of the abdomen with *Anomalochrysa*; but as there are only two series of gradate nervules it cannot be located in the latter genus."

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SYRPHIDAE.

The economic value of the larvae of certain members of this Dipterous family are well known, their aphidivorous habits making them of great benefit in destroying vast numbers of plant-lice. The larvae of one of the following species of *Baccha* were found in considerable numbers, feeding upon young leaf-hoppers in Queensland.

Baccha siphanticida, sp. nov.

Male: face retreating around epistoma, antennal prominence and frontal tubercle moderate but well defined, shining black, with whitish pubescence and greyish hairs on the sides of the frontal tubercle and epistoma; vertical triangle shining black; back of head whitish with greyish ciliation; antennae dull yellow, 3rd joint broadly oval, about as long as deep, arista bare, apically dark, pale at the base. Thorax and scutellum shining, aeneous, sparsely covered with short dark hairs and very finely punctate; scutellum fringed with brownish hairs, meso- and sternopleura with sparse testaceous pubescence and hairs, golden aeneous.

Abdomen, two and one half times the length of the thorax, the general facies spatulate, blackish brown, shining, destitute of marking, the specimen appearing somewhat immature. Second segment cylindrical and very slender; 3rd segment rather shorter and of the same width basally, but rapidly widening apically; 4th segment long, widest at its middle; 5th segment very short, narrowing considerably at its apex, hairs brownish, quite long, especially at the base. Legs testaceous, coxae and trochanters infusate, the distal halves of the hind femora (except the knees) and tibiae infusate. Wings hyaline, iridescent, subcostal cell infusate, a faint transverse infuscation across the dividing point of the 2nd and 3rd longitudinal veins, and extending to the lower cross vein, also a faint transverse infuscation at the apices of the marginal and submarginal cells, with a central nonfusate oval spot within this area. Alulae large, squamae pale yellow. Halteres yellow. Length 8.25 mm.; wing expanse 14.75 mm.

Female: face retreating as in male, steely, greyish hairs with whitish pubescence extending to sides of epistoma. Vertex steely, destitute of pubescence, with dark hairs. Frons with dark hairs and laterally a narrow band of whitish pubescence; antennal prominence and central tubercle destitute of pubescence; on the outside base of the antenna in one female, is a sub-semi-lunar purplish-violet area, the other specimen showing no trace of this; back of head more densely pubescent than in the male; antennae similar to male, 3rd joint rather less broadly ovate. Thorax and pleura blackish-aeneous or steely, scutellum acneous fringed with grayish hairs, the mesonotum and scutellum finely punctate and clothed with short, whitish suberect hairs, with darker hairs on front of thorax. Meso- and sternopleura with dense whitish tomentum and hairs, mesopleura with a whitish yellow spot on its posterior margin. Abdomen; the general facies similar to that of the male but rather stouter, about three times as long as the thorax, black or steely and finely punctate, with numerous hairs distributed over the surface, these hairs are dark dorsally, whitish and more abundant laterally, and at the base are very long; at the base of the 4th segment are a pair of lateral sub-scalene-triangular, pale yellow patches, clothed with whitish hairs. Wings hyaline, with the following infuscation: The basal, costal and 2nd costal cells, the sub-costal cell (very dark), the basal half and apex of the marginal cell, the extreme base and apex of the sub-marginal cell, the middle of the upper basal cell, the bases and apical and

middle of the middle and lower basal cells, the bases of the 2nd and 3rd posterior cells and the wing base. Alulae and squamae as in the male, halteres orange, legs similar to the male but owing to the greater maturity, brighter yellow, and the infuscation blackish. Length 11.75; expanse 19 mm.

HAB. Queensland, Cairns and Kuranda, (Koebele 2250) The larvae were observed in abundance around Cairns by Messrs. Koebele and Perkins, and were found to be feeding upon larvae and nymphs of Poecilopterine Fulgorids of the genus *Siphanta*. Many of the puparia were observed to be parasitized by a Chalcid. On one occasion great numbers of the adults were seen in one locality, hovering at a considerable height above the ground.

The following is a brief description of the puparium: Pyriform bulbous anteriorly, attenuated posteriorly, coriaceous, at the posterior extremity a respiratory tube, about one-fifth of the length of the puparium, with a very short apical bifurcation, upon which opens the paired stigmata. General coloration dirty brown and blackish, with pale ill-defined bands arising in pairs from the median dorsal area. Length, 5 mm. length of tube 1 mm. Respiratory tube testaceous.

Baccha monobia, sp. nov.

Male: This species closely resembles the preceeding; the chief difference being that of color. Antennal prominence more pronounced than in the male of *B. siphanticida*, with a similar, but more vivid purplish-violet patch than that of the female of that species; antennae, dark orange. Thorax and scutellum, purplish-aeneous, with golden reflection anteriorly, clothed with short brownish hairs, scutellum fringed with dark hairs; sides of pronotum, the meso- and sternopleuron golden aeneous, with orange pubescence and hairs, pteropleuron brilliant golden with purplish marginal reflection. Abdomen, three times the length of the thorax, purplish-black, without markings, with whitish hairs, very long on the sides at base. Wings infusate, iridescent, with still darker infuscation distributed as in the female of *B. siphanticida*. Alulae large. Legs, brownish, coxae and trochanters blackish, hind femora and tibiae darkly infusate, knees paler. Length 9.50; expanse 17 mm.

HAB. Kuranda, Queensland; one male taken whilst hovering around a *Siphanta* colony.

PARTIAL BIOLOGICAL BIBLIOGRAPHY OF *BACCHA*.

1. Osten Sacken, Baron "Entomologische Notizen," Stettin. Ent. Zeit. XXIII, 412 (1862.)
Refers to earlier records of habits of *Baccha*- spp., especially Coccidivorous forms.
2. Williston, S. W. "Synopsis of the North American Syrphidae," Bull. U. S. Mus. 31: 269-83 (1886.)
Larvae aphidophagous, provided with well-developed hooklets.
3. Verrall, G. H. "British Flies" VIII, 455-9 (1901.)
Larvae feed on Aphidae or Coccidae.

DESCRIPTION OF PLATES.

Plate VIII.

1. Eggs of *Chelisothes morio*.
2. Embryo of the same in ovo.
3. Larva of the same 1st instar.
4. The same 2nd instar.
5. The same 3rd instar.
6. The same 4th instar.

Plate IX.

1. Adult female of *C. morio*.
2. Adult male of *C. morio*.
3. Adult female of *Anisolabis annulipes*.
4. Adult male forceps of the same.
5. Ventral surface of the distal portion of the abdomen of the female of *C. morio*. The large ventral plate (sternite 7) has been removed. *a*, cut edge of the 7th sternite; *b*, chitinized anterior angle of the 8th sternite; *c*, anus; *f*, articular portion of the 10th sternite; (the articulation allows the free passage of faecal matter; *g*, 10th sternite; *h*, 10th tergite; *i*, thinly chitinized plate of the 9th sternite; *k*, 9th tergite; *l*, 8th tergite; *m*, 7th abdominal stigma; *n*, genital aperture.
6. Ventral surface of the distal portion of the abdomen of a male of *C. morio*. The terminal ventral plate (sternite 9) has been removed.

a, penis (in situ); *b*, 10th tergite; *c*, 10th sternite; *d*, anus.

Plate. X.

1. Egg and newly hatched larva of *Chrysopa microphya*, McLachl.
2. Adult larva of the same.
3. Cocoon with the pupal skin of the same.
4. Adult female of the same.
5. *Baccha siphanticida*, (female.)
6. Puparium of the same.
7. Spiracular tube of the same, (much enlarged.)
8. Side view of the head of the same.

PLATE VIII.

5
x 9

6
x 9

PLATE IX.

REPORT OF WORK
OF THE
EXPERIMENT STATION

OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

**Leaf-Hoppers and their
Natural Enemies**

(*PT. VI. MYMARIDAE, PLATYGASTERIDAE*)

BY R. C. L. PERKINS

HONOLULU, H. T.
NOVEMBER 13, 1905

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LETTER OF TRANSMITTAL.

Honolulu, T. H., October 23, 1905.

To the Committee on Experiment Station, H. S. P. A., Honolulu, T. H.

Gentlemen:—I, herewith, submit for publication the sixth part of the Bulletin on "Leaf-Hoppers and Their Natural Enemies," which deals with some of the parasites that destroy the eggs of leaf-hoppers.

Yours obediently,

R. C. L. PERKINS,
Director, Division of Entomology.

INTRODUCTORY REMARKS ON THE MYMARIDAE

The Mymaridae are a family of excessively minute insects, and authorities are not agreed as to the position that it should occupy in the great groups of Hymenoptera. Almost all the known species are parasitic in the eggs of other insects. Those species with which I am personally acquainted always emerge singly from the egg that they have destroyed, but others are bred in some numbers from a single egg. Probably they attack the eggs of almost all orders of insects, as I have bred them from those of Lepidoptera, of Rhynchota, Homopterous and Hemipterous, and also of Neuroptera, and they likewise destroy those of Coleoptera. Some are recorded as having been bred from scale-insects and plant-lice. Of the species hitherto described, in comparatively few cases, are the hosts known, and it is safe to say that all the species hitherto collected by Entomologists do not amount to one in hundreds, that exist. Some of the larger species may be obtained in numbers with the sweeping net by anyone with good eyesight, and others are frequently seen in plenty running on glass windows, especially those of hot-houses in cold countries, as the English collectors observed three-quarters of a century ago. The majority of the species that exist, however, are not likely to be met with, except by breeding them, for many are so minute, that except by chance they cannot be collected in the field. Some species do not exceed one-third of a millimeter in length and others are said to be even smaller, while the pallid color of many of the minute species renders them almost invisible to the naked eye.

The long and very slender wings, fringed with long hairs, are one of the most striking characteristics of the family, and with these delicate organs of flight some even of the smallest species can fly better than might have been expected. Many of them have a frequent habit of rising slowly and vertically upwards on the wing, and as they cannot withstand a moderately strong current of air, this habit must lead to a much quicker and wider distribution of the species than could ever be attained by their own unaided powers of flight. The legs of most species are

long and some of them, especially a species of *Alaptus* that I have studied, can run with astonishing rapidity.

Even though they be unacquainted with the Mymaridae themselves, most entomologists know that the family contains most of the very few parasitic Hymenoptera that are known to enter the water of their own accord. Some of these species swim by means of their wings, others of their legs, and they are parasitic in the eggs of insects that are wholly or partly aquatic, such as dragon-flies,* water-bugs and water-beetles.

During the past six months I have bred many thousands of several species of those Mymaridae, that are parasitic in the eggs of leaf-hoppers, in order to distribute them to the different sugar plantations troubled with the pest. Consequently I have had many opportunities of observing their habits, which while alike in most respects, yet differ somewhat in detail.

GENERAL ACCOUNT OF *PARANAGRUS OPTABILIS*.

Though not one of the smallest, since it measures about $\frac{3}{4}$ mm. this species is of very slender and delicate form, and has long fringes to both front and hind wings. It has that habit of rising slowly upwards on the wing, often with more or less spiral flight, that I have already alluded to. In captivity it is quite easily seen as it runs actively about on the leaves of the cane plants continually touching their surface with the tip of its antennae. On arriving at a fresh scar, marking the place where a leaf-hopper has laid its eggs, it thoroughly investigates this with the characteristic dilated club-joint of the antennae. After this investigation it sometimes passes on, but at others it proceeds to thrust the tip of the ovipositor into the egg chamber of the leaf-hopper, still keeping the tips of the antennae in touch with the surface. (Pl. XIII fig. 3.) Since the antennae are directed vertically (or nearly so) downwards, and are relatively of great length, in order to bring their tips in contact with the surface of the leaf the parasite is obliged to raise itself high on its two front pair of legs, and consequently assumes a characteristic position during oviposition. The ovipositor, when freed from its sheaths and in action, forms a strong angle with the lower surface of the abdomen, in some cases approaching a right angle. When the scar, that marks an egg-chamber, is after investigation passed by, though it is evidently recent,

* In these remarks the genus *Prestwichia* is included, since it has generally been assigned to the Mymaridae (but erroneously) and its habits have been specially studied.

and the parasite almost immediately proceeds to investigate another, and to lay therein, it is probable that the eggs in the first one have been already parasitized, though of course it may be simply that the egg of the leaf-hopper has advanced beyond a proper stage of development for being parasitized. In eggs examined I found no advanced stage of development of the leaf-hopper embryo, when they contained a larva of the parasite. However this may be, a suitable egg-chamber having been found, the ovipositor is kept inserted for a considerable time, sometimes for several minutes. Both in the preliminary examination of the egg-chamber and during the process of oviposition, the parasite may sometimes be seen by a very rapid turn through half a complete revolution, to exactly reverse its position, and this sometimes takes place more than once. Chalcids of other families, with habits similar to the Mymarids, behave in precisely the same way, and are even more rapid in their movements, so that these can only be appreciated by our eyes owing to the change of position, the head and tail end of the parasite having as it were, changed places instantaneously. The number of eggs of leaf-hopper in a single chamber varies from one to twelve or more, six or eight being common, and all these eggs may be stung, or some may escape. I have not examined the egg of the parasite which presumably is thrust into the leaf-hopper's egg, and in that case is likely to be hardly or not at all visible amongst the opaque contents of the latter. The mature larva is the usual apodous grub, and it may be seen performing its curious rotatory movements amongst the fluid contents of the egg that contains it. It has also a habit at times of violently throwing forward its anterior segments, so that the head of a half grown larva, which reaches to the middle of the hopper's egg, will, at its greatest extension, nearly attain the operculum. According to authors in *Polynema*, there is a very remarkable second form or '*Histriobdella*' stage of the larva. I have not yet observed this in *Paranagrus*, but the third form (as figured by me) greatly resembles that of *Polynema*. The smallest larve examined by me measured $\frac{6}{16}$ mm., the largest $\frac{13}{16}$ mm. so that the main growth must be in this stage. Except in size the smallest and largest larvae did not noticeably differ.

The head of the larva has a quite remarkable armature as is represented under very high magnification on Pl. XIII, fig. 5 and 5a, from a half grown example extracted from the egg of its host. The pupa almost or quite fills this egg (excluding the opercular portion) and before it is fully developed is generally

very easily distinguishable in form, by the pigmented, sometimes deep crimson-colored, granular contents, which mark out different areas. (Pl. XIII fig. 4.) Shortly before hatching, the pupa appears more uniformly yellow, owing to the color of the adult insect, shining through the thin, translucent pellicle. In about twenty days from oviposition the adult parasite emerges from the egg-chamber of the leaf-hopper.

In this and other species of *Paranagrus* the winged parasite escapes through the scar made by the leaf-hopper; but some species of *Anagrus*, parasitic on the same eggs, and very similar in general appearance to those of the above named genus, never do so, but always gnaw a distinct round hole, in order to leave the egg-chamber. Such too is the habit of *Polynema reduzioli*, which often emerges at quite a distance from the free extremity of the imbedded egg, in which it was bred. (Pl. XIII, fig. 7.)

The habits of the two egg-parasites that are commonly found together in the cane fields are also in some other respects strongly contrasted. The *Paranagrus* has a particular liking for the egg-chambers placed at the bases of the mid-ribs (where in fact they are most numerous) though it will attack those in any situation. The *Anagrus* on the other hand greatly prefers those on the higher parts of the mid-rib and more particularly on the edges of this, where the lamina of the leaf joins it. Very rarely does it attack the eggs at the base or in the centre of the mid-rib, unless in the case of very young cane leaves.

The species of *Anagrus* and *Paranagrus* here dealt with are habitually parthenogenetic, the males only appearing at intervals, and then in very small numbers, as compared with the females. In breeding a species of the latter genus continuously from January to September, a fresh brood appearing every three weeks, it was not until the middle of the latter month that the first males appeared. During the time specified very many thousands of individuals were examined, and the males, it should be added, can easily be distinguished from the females by anyone familiar with the species, without the aid of a lens. The case of the *Anagrus* is similar, as far as the species we have studied are concerned. One may in fact regard the species of these two genera as far advanced on the road towards perfect parthenogenesis.

CLASSIFICATION.

Haliday, who perhaps studied these atoms of insects more carefully than other hymenopterists, as early as 1833, assigned

them to the Chalcidoid series, and Ashmead, the latest writer whose works I have used, agrees with him. On the other hand such famous entomologists as Westwood, Foerster and Thomson all agree in placing them in the Proctotrupoid family; and I believe that this great difference in opinion is a true indication of the anomalous character of the Mymaridae. While they cannot, judging from the forms that I have studied for the purposes of this paper, be possibly included amongst the Proctotrupoids, it must be admitted that, if they be referred to the Chalcidoid series, they form an unusually distinct family in the latter. In fact they are probably more distinct from any family in this series, than is any other of its families, from that to which it is most nearly allied. Unfortunately in the literature accessible to me the structural characters of the genera are for the most part merely given in dichotomous tables, and therein characterized in such very brief fashion, that I cannot determine with certainty whether the species here described really belong to the genera, to which the tables assign them, or not. None of these tables make mention of characters, which I believe to be of great importance for purposes of generic division.

The family Mymaridae has been divided into two sub-families according to the number of the tarsal joints, and each of these is further divided into two 'tribes' according to the nature of the basal articulation of the abdomen. For purposes of identification of genera these divisions are convenient; as a natural classification their value appears to me very dubious. The variability in the number of tarsal joints in those families of the Chalcidoid series, which are most nearly allied to the Mymaridae, is known to all students of parasitic Hymenoptera to be of inferior value, this number in some cases differing even in the sexes of one species. It is quite probable that the nature of the articulation of the abdomen, and possibly the differences in the structure of the thorax, will prove of much greater importance than the number of tarsal joints.

To me, by far the most remarkable character in the Mymarids, that I have studied, is the extraordinary difference in the relation of the base of the abdomen to the posterior end of the thorax, even in species that resemble one another in their general habits. In the species that I describe under the genera *Anagrus*, *Paranagrus* and *Alaptus* the abdomen is truly sessile, adapted at the base to the thorax, the rigidity being further increased by the great thoracic mesophragma, which penetrates well back into the abdomen. Forms that I refer to *Ooctonus*, *Polynema* etc.,

on the other hand have a mobile, pedicellate abdomen and in these and petiolate forms, the very structure prohibits the presence of such a mesophragma in the abdominal segments. Yet in spite of these profound differences we find insects of the first class ovipositing in the eggs of leaf-hoppers laid in the leaves of cane or grass; those of the second doing precisely the same, as well as piercing the eggs of Heteroptera, imbedded in a similar manner in the cane leaf. It does not appear to me improbable that, when a special study is made of the peculiarities of the Mymaridae, and this study is based on a rich and well prepared collection, the group will prove to be of more than family rank and itself to contain some very distinct families.

The Mymaridae, or at least such as I have studied in connection with this paper, appear to me to be most nearly allied to certain of the Eulophidae. Some of the latter have to a large extent the same structure of the thorax as the Mymarids, and in this point amongst others the latter at once differ from any true Proctotrupids known to me. It is further a somewhat remarkable fact that various Mymarids of very different groups have a pattern and arrangement of markings identical with that of certain Eulophidae. The wings are of the most characteristic form, and are very different from those of the egg-parasites of the family *Trichogrammidae*, from which I exclude Ashmead's sub-family *Oligositinae*, believing it will be sooner or later associated with the Eulophidae in spite of the three-jointed tarsi. In the presence of a great mesophragma extending far into the abdomen, the sessile-bodied Mymarids agree with many Eulophids and Trichogrammids, indeed in some of the latter this structure is enormously developed and extends almost to the apex of the body.

Ashmead who has published the latest classification of the Chalcidoid families, and has probably spent more time on this study than anyone living and whose views are therefore worthy of the most careful consideration, gives as the leading characters to define the Mymaridae:

"Hind wings exceedingly narrow, linear, pedunculate at base; ovipositor issuing from beneath just anterior to tip of abdomen; antennae without a ring-joint, the scape rather small, short, compressed:"

All the species considered here agree with this definition in two particulars (1) the hind-wings are narrow and pedunculate, (2) the antennae have no ring-joint. In other respects the characters do not agree with any of my species. Thus the ovi-

positor issues from close to the base of the abdomen in all of these, and is in all respects similar to that of many species of Eulophidae or of other Chalcid families. ((See Pl. XIII fig. 3 and fig. 6.) Further the scape of the antennae is always slender and elongate, except in a very few males. I am therefore led to ask myself whether there are species of Mymaridae with the structure of the ovipositor as described by Foerster and Ashmead, and which would partly account for the fact that several of the greatest of entomologists placed the group in the Proctotrupids, with which in this respect they were thought to nearly (though not exactly) agree, and if so, whether the family is really a natural one. It is certainly remarkable that, whereas in other respects my species and genera fall readily into the subfamilies and tribes, that have been suggested, yet they do not agree in the structure of antennae nor in the ovipositor with the family characters.

An important character requiring further study is the structure of the mesonotum. In some species this appears to be formed much as in many Eulophidae, the axillae being produced forwards acutely into the parapsides. In others I can detect no marked forward extension of the axillar pieces. In all the species specially examined by me, this forward extension is correlated with a sessile abdomen and does not occur in the pedicellate and subpetiolate forms.

In conclusion the species which I have most particularly studied, viz: those here described under the genera *Anagrus*, *Paranagrus*, *Gonatocerus* and *Alaptus* appear to me to be most nearly allied to certain Eulophidae, though differing greatly from these in the structure of wings and antennae, and further, amongst themselves present differential characters of perhaps even family value.

LIST OF MYMARIDAE HERE DESCRIBED.

1. *Ooctonus australensis*, sp. nov.
2. *Polynena* (?) *reduzioli*, sp. nov.
3. *Gonatocerus cingulatus*, sp. nov.
4. *Alaptus immaturus*, sp. nov.
5. *Anagrus frequens*, sp. nov.
6. *Anagrus columbi*, sp. nov.
- Paranagrus*, gen. nov.
7. *Paranagrus optabilis*, sp. nov. et typ. gen.
8. *Paranagrus perforator*, sp. nov.

TABLE OF GENERA AND SPECIES HERE CONSIDERED.

1	(6)	Abdomen sessile, with a wide thoracic mesophragma extending well into it; front wings very narrow, the apical cilia much longer than their width.	
2	(3)	Tarsi 5-jointed (antennae of male 10-jointed; of female 8-jointed).....	<i>Alaptus immaturus.</i>
3	(2)	Tarsi 4-jointed (antennae of male 13, of female 9-jointed.)	
4	(5)	Third antennal joint elongate almost as long as the fourth	<i>Paranagrus.</i>
		Ovipositor only slightly exerted behind the body.	
		.....	<i>P. optabilis.</i>
		Ovipositor exerted behind the body for a length equal to that of the 4 joints of the hind tarsi together.	
		.....	<i>P. perforator.</i>
5	(4)	Third antennal joint very short, much shorter than fourth.....	<i>Anagrus.</i>
		Front wings with a distinct bare longitudinal line on lower half.....	<i>A. frequens.</i>
		Front wings more evenly hairy (Pl. XIII fig. 8 & 8a.)	
		.....	<i>A. columbi.</i>
6	(1)	Abdomen pedicellate or subpetiolate, and without a mesophragma extending back into it; front wings with the apical fringe short, much shorter than the width of the wings.	
7	(8)	Tarsi 5-jointed; antennae of female 11-jointed.	
		Abdomen pedicellate.....	<i>Ooctonus australensis.</i>
		Abdomen not pedicellate.....	<i>Gonatocerus cingulatus.</i>
8	(7)	Tarsi 4-jointed, antennae of female 9-jointed.	
		Abdomen pedicellate.....	<i>Polynema reduzioli.</i>

DESCRIPTION OF GENERA AND SPECIES.

In the following descriptions important structural characters are generally given under the generic names, owing to the fact that I do not feel sure that the species are always placed in the right genera, for reasons that I have already stated. The neuration does not differ greatly in these genera, being much as in the *Paranagrus* figured, though in some forms the sub-marginal

vein is longer relatively to the marginal. The latter is of much the same form in all and can hardly be called punctiform in any.

Ooctonus Hal.

Male antennae with 13 joints, the scape flattened and short, the second joint very small and roundish, the following ones subequally elongate, flattened and wide, but not so wide as long. Antennae of female 11-jointed; scape very long, set on an elongate pedicel, so as to appear obsoletely 2-jointed, and as long as the three following joints together; club as long as the five preceding joints together. Posterior ocelli wide apart, perhaps placed close to the eye margins, the collapse of the head in dried specimens making it impossible to ascertain this point. Scutellum large and elongate, longer than the mesonotum; the axillae encroaching little or not at all on the scapulae; propodeum with two raised lines or longitudinal carinae. Tarsi 5-jointed. Apical cilia of front wings short, many times shorter than the greatest width of the wing. Abdomen pedicellate. (For figures of antennae see Pl. XIII fig. 2; the lower two antennae representing male and female of this genus.)

Ooctonus australensis, sp. nov.

Black, shining, antennae of the male black, of the female with the scape mostly pale yellowish-brown, the second joint also more or less brownish, the following three blackish, the sixth also dark but less so than the preceding, 7th, 8th and 9th white, 10th much wider than the 9th and black, club black. Legs brownish yellow or testaceous, posterior tibiae more or less darkened. Abdomen pedicellate, brownish black or piceous. Length $1\frac{5}{8}$ mm.

Hab: Cairns, Queensland; two examples extracted from eggs of a conspicuous *Tettigonia* common in the cane fields.

Gonatocerus, Nees.

Female: Antennae 11-jointed, the scape elongate, about equal to the next three joints together, second joint widened, much wider on its flat surface than the following; flagellar joints not differing greatly in length, the basal ones being, however, rather shorter than the following; club as long or longer than the three preceding. Front wings with short apical cilia, several times

shorter than the greatest width of the wing; axillae of mesonotum not encroaching on the parapsides; tarsi 5-jointed; posterior ocelli remote from the eye margins; abdomen subsessile. (Plate XIII fig. 2; uppermost antenna represents that of female of this genus; fig. 6 abdomen of the female.)

Gonatocerus cingulatus, sp. nov.

Female: Yellow; the face, the whole of the flagellum of the antennae, two adjacent spots on the front of the mesonotum which do not reach back to the middle, one on the anterior angle of the scapulae, another on each side adjoining the tegulae and a median one between these, the propodeum, the meso- and metoppleura, the hind coxae, all the tibiae, the tarsi above, two bands near the middle of the abdomen (appearing as one very broad, one in contracted specimens) and the sheaths of the ovipositor dark, black or blackish fuscous. The scape and second joint of the antennae and the front and middle coxae are more or less dark on their margins. Front tibiae with distinct, small, stout spines, placed remotely and in line. Length $1\frac{3}{4}$ mm.

Hab. Brisbane, Queensland; bred from the eggs of a *Tettigonia* on sugar cane (Koebele No. 2241.)

Polynema, Hal.

The single species here described under this genus has a shorter marginal vein than any of the others dealt with in this paper, but it is less punctiform than in some other species, that I have examined.

Polynema reduzioli, sp. nov.

Third and ten following joints in the male elongate, subequal, in the female the third, fourth and fifth are very slender and elongate the following three much shorter and wider, the club about as long as the three preceding together. The fringe at the apex of the front wings is much shorter than the greatest width of these. The basal joint of the hind tarsi is very long, subequal to the other three joints together.

Black and smooth, except for very fine microscopic sculpture, the three basal joints of the antennae in both sexes, all the legs, except the apical joints of the tarsi, and the abdominal pedicel are yellow, or brownish yellow. The pedicel is elongate, and

about equal in length to the hind coxae. The surface of the wings is uniformly clothed with short dark hairs. Length 1 mm.

Hab: Hawaiian Islands; parasitic in eggs of *Reduviolus blackburni*.

N. B.—A second species closely allied to this, but differing slightly in color, and with a shorter marginal vein has probably similar habits, as also *P. hawaiiensis* described by Ashmead. (Faun. Haw. Vol. 1, p. 332.) which agrees in nearly all structural points with the one here described. These two species are usually bred from leaves covered with *Aphis* and might easily be supposed to be parasitic on plant-lice by a careless investigator.

Alaptus, Hal.

Antennae of female 8-jointed, the scape elongate, the second joint dilated and much wider than the following, third slender, elongate, rather shorter than the fourth, 5th, 6th, and 7th, increasing in width, club nearly as long as the four preceding. Antennae of male 10-jointed, the scape elongate, second wider than the following, third elongate, but shorter than the fourth, which is subequal to the following joints. Posterior ocelli close to the eye-margins, the three forming a triangle with extremely wide base. Tarsi 5-jointed. Abdomen sessile. (Plate XII, fig. 5; antennae of female in two aspects and that of the male.)

Alaptus immaturus, sp. nov.

Female: Pallid ochreous, the head sordid and also the thorax along its posterior margin; abdominal segments with obscure sub-quadrate, lateral, blackish or sordid spots. Antennae with two basal joints pale, the rest dark. Length $\frac{3}{4}$ mm.

Hab: Bundaberg, Queensland, bred from cane leaves containing leaf-hopper eggs, but I do not feel sure that it is parasitic on these.

Anagrus, Hal.

Ocelli in a subequilateral triangle, and close together, the posterior very remote from the eyes; antennae of female 9-jointed, scape long, second joint widened, third very short, the fourth and following equal, club about equal to two preceding. Antennae of male filiform 13-jointed, second joint dilated, third also wide on its flat face and short, much shorter than the following, all the other joints subequal. Axillae produced forwards into

the scapular region of the mesonotum; tarsi 4-jointed, wings with long apical cilia, much longer than the greatest width of the wing. Abdomen sessile, ovipositor a little exerted. (Plate XII, fig. 4 and 6; antennae.)

Anagrus frequens, sp. nov.

Female: Orange red or reddish yellow, the occiput for a large part, the antennae except the two basal joints, two contiguous or subcontiguous large marks on the front of the mesonotum, one on the anterior end of each of the scapulae, one on the axillae, two or three of the basal abdominal segments more or less, as well as their lateral margins very narrowly, and the sheaths of the ovipositor, dark, blackish or fuscous. Wings hairy, but with a long bare area on the lower side of the apical half. Ovipositor very little exerted.

Male generally like the female apart from the structural differences in the antennae as stated above, and in the usual abdominal characters. Markings as in the female, probably more pronounced as a rule, but similarly situated, the abdomen apically dark above. Length $\frac{5}{8}$ mm.

Hab: Queensland: bred from eggs of Delphacids. An apparently slightly different race inhabits Fiji, but I cannot separate it specifically.

Anagrus columbi, sp. nov.

Apparently almost identical with the preceding in form and structure, but at once distinguished by the fact that the hairs on the apical part of the front wing are of more general distribution and do not leave the large bare space noticeable in *A. frequens*. In specimens mounted in balsam in 1903, the color characters are as follows: Luteous, head sordid or smoky yellow, antennae with three basal joints yellow (but the scape is somewhat darkened in part) the rest fuscous. Mesonotum yellowish fuscous, the parapsides darker in front, the axillae also infuscate. Abdomen sordid yellowish. In life the markings are very probably almost identical with those of *A. frequens*, but whether the general color is as red as in that species, it is impossible to say. Length $\frac{5}{8}$ mm.

Hab: Columbus, Ohio (Koebele, No. 2320) bred from eggs of *Liburnia* on grass.

Paranagrus, gen. nov.

Like *Anagrus*, but more slender and elongate, and with the third joint of the antennae in the female elongate, not much shorter than the following and quite slender. Otherwise as in the preceding genus. Ovipositor either slightly or strongly exerted behind the abdomen. Antennae of male 13-jointed, as in *Anagrus*, but with the third joint slender and elongate, as in the female. (Plate XII, fig. 1 and 2.)

Paranagrus optabilis, sp. nov.

Male; flavous, head more or less sordid or smoky; a large elongate subtriangular spot on either side of the middle line of mesonotum, the apex of these spots reaching nearly to the scutellum; a spot usually triangular on the parapsides, and one on the axillae, dark; abdomen with at least the apical segments more or less dark, blackish or fuscous; all the joints of the flagellum smoky or fuscous.

Female, like the male, but with the thoracic markings generally much fainter, though occupying the same positions; spots on the axillae sometimes not discernable, the abdomen not dark on the apical segments. Length $\frac{3}{4}$ mm.

Hab: Queensland; bred in all localities from the eggs of *Perkinsiella saccharicida*. A very similar form inhabits Fiji, but the material is insufficient to determine whether they are specifically identical.

Paranagrus perforator, sp. nov.

Female; yellow or orange red; head subinfusate, the whole of the flagellum of the antennae, two long triangular spots on the mesonotum, nearly or quite reaching the scutellum, one on the front angles of each of the parapsides, another on each of the axillae, an interrupted band on the first abdominal segment, and an entire one on the second and third, the lateral margins of at least some of the apical segments, and the sheaths of the ovipositor, dark, blackish or piceous. Ovipositor extending well behind the abdomen, for a length equal to that of all the joints of one of the hind tarsi taken together. Length $\frac{2}{3}$ mm.

Hab: Fiji; bred from eggs of Delphacid leaf-hoppers.

PROCTOTRUPOIDEA.

In the course of our investigation of the parasites of leaf-hopper, several species of an anomalous form belonging to the Proctotrupoid series were bred. These species, I believe, form a genus not yet described, which at present is best located in the Platygasteridae, in the group which contains the genus *Inostemma*, Hal. In some respects they remind one of the well-known egg-parasites of the genus *Baeus* and its allies, in the Scelionidae; in others of the likewise anomalous genus *Baconura* of Foerster. They too are egg-parasites, attacking those leaf-hoppers' eggs, which are not imbedded in the tissues of plants, but such as are entirely external. The eggs that we found to be attacked by them, were those of such conspicuous leaf-hoppers, as are included in the genera *Siphanta*, *Platybrachys*, etc., and of others allied to these. These parasites are of very great economic value in Australia and without their aid, vegetation in many localities would suffer very greatly from leaf-hoppers of the genus *Siphanta*, which indeed are, as it is, quite capable of doing damage under certain conditions in that country. In many places, however, we found that from every egg in nearly every egg-mass that we collected, we bred one or other of these parasites, and further we saw them in extraordinary numbers crawling over and ovipositing in eggs in the field.

They always escape by gnawing a roundish hole in the egg, so that it is very easy to distinguish between the egg-masses from which parasites have escaped and those from which young leaf-hoppers have emerged. (Pl. XI, fig. 2, 3 and 7.) We were not able to pay very much attention to the eggs of such leaf-hoppers as those mentioned above, so that I anticipate that great numbers of species of these parasites are to be found in Australia, and probably they are represented by similar or cognate forms in other countries. The parasites themselves, when bred from eggs of such species of leaf-hoppers as cover their eggs with white mealy powder, are frequently so disguised by the adherence of this same substance, that unless it be carefully cleaned off, their proper structure and appearance cannot be made out.

GENUS AND SPECIES HERE DESCRIBED.

Aphanomcrus, gen. nov.

1. *Aphanomcrus bicolor*, sp. nov. et typ. gen.

2. *Aphanomerus niger*, sp. nov.
3. *Aphanomerus rufescens*, sp. nov.
4. *Aphanomerus pusillus*, sp. nov.

These species may be easily separated by the distinctions given in the table below. I may add there is another species very closely allied to *A. rufescens*, represented by a single example, which I have not thought it advisable to describe at present.

1.	(6)	Thorax black.	
2.	(5)	Abdomen largely or entirely ferruginous.	
3.	(4)	Larger; abdomen wholly ferruginous.	<i>A. bicolor</i>
4.	(3)	Smaller; abdomen dark at least on the apical part.	<i>A. rufescens</i> .
5.	(2)	Abdomen almost entirely black.	<i>A. niger</i>
6.	(1)	Thorax yellow or ferruginous.	<i>A. pusillus</i> .

Aphanomerus, gen. nov.

Moderately or quite robust, the head transverse, and very strongly inflexed, the ocelli very widely separated from one another, the anterior one placed very far forwards. Antennae 7-jointed in the female; 8-jointed in the male, the club solid and one-jointed in both sexes. Maxillary palpi two-jointed, labial one-jointed; mandibles bidentate. Pronotum very little visible in some aspects; the parapsidal furrows of the mesonotum fine, but evident, and widely separated even at the base; post scutellum more or less prominent in the middle. Legs with uneven claws, the one being much longer than the other. Wings with the submarginal vein terminating in a round knob in the field of the wing, and not reaching the costa, the basal nervure more or less obsolescent, the basal cell incomplete, but its position marked by a darker streak in the position of the median vein. Abdomen with longitudinal wrinkles or costae at the base. (Plate XI, fig. 1, 4, 5, 6, 8 and 9.)

Aphanomerus bicolor, sp. nov.

Black, the abdomen ferruginous, the antennae, legs and tegulae paler, more testaceous, the club of the antennae in the female largely dark.

Head and thorax opaque or subopaque, the mesonotum and scutellum with minute microscopic sculpture and punctuation, so that it appears coriaceous under a lens, clothed with minute gray pubescence, and with longer gray hairs at the posterior

angles of the thorax. Abdomen with a series of short longitudinal costae or wrinkles at the base, and pubescent at the sides near these, the four apical segments with short grey pubescence, the large segment preceding them being smooth and glabrous. Length $1\frac{1}{8}$ mm. (Pl. XI, fig. 1 and 4.)

Hab: Queensland; common. From one batch of eggs, Koebele (No. 2293) bred 48 parasites and 7 young hoppers. As in the other species, only one parasite emerges from each egg.

Aphanomerus niger, sp. nov.

Black, the legs and antennae for the most part yellow or ferruginous, the club of the latter infusate in the female, the tip of the abdomen ferruginous, as well as the apical margins, very narrowly, of the second and following segments.

Thorax dull, appearing coriaceous from the dense minute sculpture, consisting of fine punctures and rugulosity of the surface, and clothed with very fine gray pubescence. Abdomen at the base with the usual row of costae and externally to these pubescent, and with very delicate microscopic rugulosity, the second segment smooth, shining and glabrous, the terminal ones slightly pubescent. Length $1\frac{3}{4}$ mm.

Hab: Bundaberg, Queensland; male and female bred from eggs of a Fulgorid on *Melaleuca* by Mr. Koebele. The specimens are unnumbered and the eggs are those of a species of *Platybrachys* or some allied form.

Aphanomerus rufescens, sp. nov.

Black, the abdomen ferruginous except at the apex and on the lateral margins, which are more or less dark; antennae and legs testaceous or yellowish, the club of the former more or less dark in the female, while in the male the dark color of the abdomen is extended further towards the base.

Head, and thorax above, subopaque or at least not very shining, with microscopic sculpture, and clothed with fine gray pubescence, the pleura for the most part smooth and much more shining, the propodeum about the insertion of the abdomen more or less pale colored, or piceous. Abdomen with longitudinal costae at the base and pubescent on either side of these; the following great segment glabrous and impunctate. Length $\frac{7}{8}$ mm. (Plate XI, fig. 6.)

Hab: Cairns, Queensland; bred from egg-masses of Fulgorids.

Some specimens bred by Koebele are numbered 2276 erroneously, his note under that number referring to other insects.

Aphanomerus pusillus, sp. nov.

Yellowish or ferruginous, the head in the female black or dark, and the club of its antennae somewhat obscured.

Mesonotum opaque or nearly so, with dense and very fine microscopic sculpture, and minute pale pubescence, much as in the other species of the genus, the pleura smooth and shining. Abdomen with the base costate, the following large segment very smooth and shining, the rest finely pubescent. Length $\frac{7}{8}$ mm. (Plate XI, fig. 5.)

Hab: Queensland; very abundant in the eggs of *Siphanta*, and allied forms.

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DESCRIPTION OF PLATES.

Plate XI.

1. *Aphanomerus bicolor*.
2. Eggs of *Siphanta* sp. from each of which an example of *Aphanomerus pusillus* emerged.
3. Eggs of a Fulgorid, probably a species of *Platybrachys*, from which *A. bicolor* was bred. Only a few eggs are figured, but of the whole mass 48 produced parasites, and from 7 young hoppers emerged; a few others contained dead parasites.
4. *A. bicolor*; male and female antennae.
5. *A. pusillus*; male and female antennae.
6. *A. rufescens*; female antenna.
7. Eggs of a species of leaf-hopper allied to *Siphanta* all parasitized by *A. rufescens*.
8. Maxillary palpus of *A. bicolor*.
9. Claw-joint of tarsus of the same, showing the unequal claws.

Plate XII.

1. *Paranagrus optabilis*.
2. Antenna of female and male of the same.
3. & 3a. Antennae of male and female *Polynema reduzioli*.
4. Antenna of female *Anagrus columbi*, in two aspects.
5. Antenna of female in two aspects, and antenna of the male, of *Alaptus immaturus*.
6. Antenna of male and female of *Anagrus frequens*.

Plate XIII.

2. Antenna of female *Gonatocerus cingulatus* above; of female and male *Ooctonus australensis* below.
3. *Paranagrus optabilis* female, ovipositing in the eggs of *Perkinsiella*, which are imbedded in the leaf, and further hidden beneath a white mealy covering.
4. Pupa of *Paranagrus* within the egg of *Perkinsiella*.
5. Larva of the same; the egg contents had been partly removed in order that the larva might be rendered more visible, and they are not figured in the upper part of the hopper's egg.
- 5a. Head extremity of the larva of the same.

6. Abdomen of *Gonatoccrus cingulatus* showing the insertion of ovipositor at its base.
7. Upper extremity of eggs of *Reduziolus blackburni* and the exit holes of the parasite (*Polynema reduzioli*) in the surface of the cane-leaf.
8. & 8a. Diagrammatic of disposition of hairs on the surface of front wing of *Anagrus frequens* and *A. columbi*.

Perkins del.

PLATE XI.

3a

4

5

6

Perkins del.

Perkins del.

REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

**Leaf-Hoppers and their
Natural Enemies**
(*PT. VII. ORTHOPTERA, COLEOPTERA
HEMIPTERA*)

BY O. H. SWEZEY

HONOLULU, H. T.
DECEMBER 30, 1905

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INTRODUCTORY REMARKS.

Since the cane leaf-hopper has become so abundant in the Hawaiian Islands, certain predaceous insects have taken to feeding upon them and have likewise increased in abundance; so that they are now found as constant inhabitants of the cane-fields wherever leaf-hoppers are abundant, and are of no little value in helping to check the increase of the latter.

Of the insects treated in this Part the grasshopper (*Xiphidium*) is by far of the most importance. It is not indigenous to the Islands, but from whence it came is not known. Its introduction was accidental about 15 years ago. There are many species of this genus in all parts of the world. I have seen no mention of any species being insectivorous, they being chiefly grass feeders. It is not unlikely that our species has developed its partial insectivorous habit since its introduction here, and since the increase of the leaf-hoppers to such an abundant food-supply.

The bugs (Hemiptera) treated of, with the exception of *Zelus peregrinus*, are native to the islands, and have become adapted to a leaf-hopper diet by reason of the fact that this pest furnishes a convenient and bountiful food supply. They are not feeding exclusively upon this new source of food, but may be found as well in their former habitats feeding upon their original prey.

The ladybugs treated of are primarily *Aphis* feeders, and have all been introduced from Australia. When found in cane-fields there is no doubt but that they have been especially attracted by the cane *Aphis*, which is usually more or less present in fields of young cane. *Coccinella repanda*, the ladybug which has been the longest introduced, is very common in all parts of all the islands; when in cane fields, it also preys upon young leaf-hoppers, especially when its food-supply of *Aphis* is scarce or has become exhausted. It is very probable that the recently introduced species will do the same when they have become established and generally distributed, and that they will be a valuable addition to the present force of predaceous insects preying upon the leaf-hopper pest.

Heretofore the life history of none of the insects herein treated has been studied. In the observations recorded in this paper, a number of new and interesting facts pertaining to life history have been brought out.

ORTHOPTERA.

LOCUSTIDAE.

Xiphidium varipenne, sp. nov. (Pl. XIV.)

(1). Distribution.

This insect, described below, has been present in these Islands (Oahu at least) for about 15 years. It was recorded by Brunner as *X. fuscum* in 1895. It was also collected by Schauinsland in 1896-97, and published under the same name by Alfken. It must have been introduced at Honolulu, and did not get spread far from there for several years, as Perkins says concerning it in *Fauna Hawaiensis*, II, p. 14, 1899, "Only in and around Honolulu." The fact of its depositing its eggs beneath the leaf-sheaths of sugar cane makes it easy of distribution in "seed" cane, and probably accounts for its present distribution to all of the islands. It is at present very generally distributed, in fact, it might be said that they are everywhere: lowlands, valleys and mountains, gardens, pastures, and cane-fields. It is called by different names in different localities: Longhorned Grasshopper, Red-tailed Grasshopper, Brown-tailed Grasshopper, and Green Cricket being names commonly used.

(2). Feeding Habits.

Being a grasshopper of the family Locustidae, it would naturally be taken for a grass and foliage feeder, as are the majority of the grasshoppers; but observation proves it to be largely insectivorous. Whether they have always been so, may not be determined; but recently, their being abundant in sugar cane-fields and that, too, where but little evidence is seen of their having eaten cane, has led to investigation by the entomologists, and planters as well, with the result that this grasshopper is found to feed to a large extent upon sugar cane leafhoppers and other insects. They probably catch the adult leafhoppers mostly by lying in wait till a leaf-hopper approaches or alights near. In one instance an adult leaf-hopper was seen to alight immediately in front of an adult grasshopper; the latter

pounced upon it instantly, securing it by means of the mandibles, and it was soon eaten. They have the habit of lurking about the axils of the upper leaves, or the crown of the cane stalk just where the leaf-hoppers congregate in large numbers in young cane, and it is easy for the grasshoppers to capture an abundance of their prey, especially the young leaf-hoppers. When confined in a breeding cage with growing cane for several days, very little eating of the cane was done; but when leaf-hoppers were introduced they were at once devoured.

Young grasshoppers were bred from the egg to maturity, being fed entirely upon leaf-hoppers and aphids. Very young grasshoppers were seen to capture and eat nymphs of leaf-hoppers of nearly their own size.

Freshly hatched grasshoppers, fed with tender *manihot* grass, died after 5 days, without having eaten a particle. Other freshly hatched grasshoppers were tried upon tender cane leaves. They died after 6 days without having eaten anything. Young grasshoppers have been seen eating the blossoms of Canna, Lantana, and other plants, so that they are not entirely insectivorous. In eating Lantana blossoms they ate through the tube of the corolla at the place where the stamens are located inside, apparently to obtain the pollen.

The eating of cane done by this insect is of no consequence. It occasionally does some ragged eating of the younger leaves near the tip. In cane-fields, I have observed them feeding to a large extent upon the leaves of *Honohono*, and the flowers of various kinds of weeds; and I have also seen them eating the seed capsules and young seeds of *Canna indica* to a considerable extent. They were very numerous in a patch of this plant growing in Makiki Valley, above the H. S. P. A. Experiment Station grounds. Examination of crops of adults and nearly full-grown nymphs collected in this patch and vicinity showed that 8.82% contained insect remains, and 91.18% contained vegetation.

Examination of the crops of a large number of grasshoppers collected on Mt. Tantalus, by Mr. W. M. Giffard, Nov. 6, 1904, gave the following results:

21.2% contained insect remains, of which 6.6% contained only insects, 14.6% contained both insects and vegetation, 78.6% contained vegetation only.

A number of grasshoppers caught in a cane-field where there were plenty of leaf-hoppers, were examined, and the crops of 30% of them contained fragments of leaf-hopper. On examination of crops of grasshoppers gathered in cane at H. S. P. A.

Experiment Station grounds, 33.3% were found to contain insect remains; leaf-hopper fragments were found in 15.5%; 15.5% contained vegetation; 40% empty.

Examination of their crops does not prove to what extent they eat leaf-hoppers, for they do not always swallow the hard parts of these. Often in the breeding cage they were seen to chew up leaf-hoppers, and reject them after sucking the blood and juices. However, from these examinations, and field and insectary observations, it is certain that this grasshopper is very extensively insectivorous, and that when present in cane-fields, leaf-hoppers form the chief part of its diet, and it therefore should be classed as a beneficial insect, and a highly valuable enemy of the leaf-hopper.

(3). Egg Parasite.

In March, 1905, parasitized eggs of this grasshopper were discovered in cane on H. S. P. A. Experiment Station grounds, and a pale yellow Chalcid parasite was bred from them. The number bred, ranged from 9 to 14 per *Xiphidium* egg, and in one instance a whole cluster of 10 eggs had been parasitized; in another case 13 eggs were parasitized. All the parasites in an egg usually issued from the same hole, (Pl. XIV, fig. 11), the first one to mature probably gnawing a hole out, and the others taking advantage of the opening already made. This tiny round hole is often made through the enclosing sheath of the cane leaf as well, where the eggs are quite tightly enclosed by the latter. Parasitized eggs were examined from which the parasites had not yet emerged. They are a bluish black in color. Larvae were found in some, and pupae in others. The pupae were not enclosed in individual cocoons.

Adult parasites were placed with fresh grasshopper eggs, in which they were soon seen ovipositing. In one case adult parasites emerged in 25 days; in others 22-24 days; in one 20 days; another 31 days; giving a range of from 20 to 31 days for the life cycle.

The shortness of life cycle compared with the length of life cycle of the host (3 months) gives the parasite the advantage, and it is likely that this grasshopper may become reduced in numbers more rapidly than it has increased since its appearance a few years ago. In fact, it has been reported as rapidly disappearing recently in the Kohala District, Ewa Plantation, and some others. This is undoubtedly due to this parasite, though its presence there has not been ascertained. The grasshoppers

have similarly become scarce in the cane of the Experiment Station grounds, during the past summer.

Perhaps this parasite is more or less generally distributed. The writer has found it common where the grasshoppers were abundant on Hilo grass and *Canna indica* up Makiki Valley, about one mile from the Experiment Station grounds.

On a trip to the sugar plantations of Maui, in October, this parasite was found to be very rare, and the grasshopper exceedingly abundant everywhere. In the examination of 300 grasshopper eggs, in a cane-field at Lahaina, only one parasitized egg was found. From this 7 parasites issued.

Mr. Terry found that the parasite was present at Koloa, Kauai, April, 1905; and also reports that the grasshoppers are decreasing in other places on that island.

(4). Life History.

The eggs of *X. varipenne* are 5 mm. long and nearly 1 mm. in greatest diameter, blunt at one end and pointed at the other, which is the one where the head of the embryo appears. They are slightly testaceous in color at first, but become greenish as the embryo approaches time of hatching.

The eggs are laid in clusters of from 2 to 15, side by side, obliquely inserted beneath the leaf-sheaths of cane leaves (Pl. XIV, fig. 11), also those of *Canna indica*, and probably other plants. Their presence can often be noticed by a slight outward bulging of the leaf-sheath. The eggs are inserted with the anterior end outermost. They hatch in about 5 weeks. In one case, adults were placed in a breeding cage, March 28, and young grasshoppers appeared on the 35th day. In another observation, eggs laid April 6th hatched May 14th—a period of 38 days. Eggs gathered June 27th hatched through a period of 16 to 29 days, being in various stages of embryonic growth when gathered. In hatching, the egg splits on one side at the anterior end, about $\frac{1}{3}$ length, but not extending quite to the tip.

The nymphs in all stages are green, with the dorsal, brown, pale-edged stripe of the adult. (Pl. XIV, fig. 2.)

Those bred to maturity molted 6 times (one individual 7 times), counting the final change to maturity. The molts were at intervals of 6-23 days as follows:

First molt	6-11 days.
Second "	7-23 "
Third "	9-12 "
Fourth "	8 "
Fifth "	9 "
Matured	20 , "

Record of one individual.

Hatched	June 1.		
First molt	" 7	First Stage	6 days.
Second "	" 30	Second "	23 "
Third "	July 9th	Third "	9 "
Fourth "	" 17th	Fourth "	8 "
Fifth "	" 26th	Fifth "	9 "
Matured	Aug. 15th	Sixth "	20 "

Total 75 days.

One individual matured in 111 days: (embryonic period 38 days,
nymphal period 73 days.)

	Body	Wings	Ovipositor
Measurements: Just Hatched	4 mm.	.....	.....
First Instar	4-5 "	.....	.....
Second "	6-8 "	.....	1 mm.
Third "	10 "	.....	2 mm.
Fourth "	11-13 "	1-2 mm.	4.5-5 mm.
Fifth "	14-15 mm.	1-3 "	10-11 mm.
Sixth "	15 "	4 "	11-12 mm.

The ovipositor makes its appearance in the second instar (1 mm.), increasing in length with succeeding stadia, but its development is not uniform per instar.

The teeth of male cerci appear in fourth instar, being very small, on inner side, near the apex; in fifth instar they are larger and about the middle of inner side.

(5). Description.

Xiphidium varipenne, sp. nov.

Bright green; fastigium reddish brown and a dorsal stripe of the same color extending backwards the whole length of the body; from the fastigium it widens to the width of the pronotum when it reaches the posterior margin of the latter; a whitish line borders this stripe on either side, sometimes obscure on the abdomen, sometimes yellowish; on either side of the abdomen of female a brownish stripe outside of the whitish line, often red-

dish, fainter behind; abdomen of male beyond the fourth segment bright yellowish brown. Eyes brown. Ocellus white. Antennae greenish, ringed with brown, outer part entirely brown, large basal segment with brownish spots. Mandibles black on biting edges; palpi green, more intense at the enlarged tips. Tiny brownish dots on face. Larger brownish dots on sides of pronotum, and all the femora and tibiae. Knees of posterior femora dark brown, tarsi slightly browned.

Fastigium, viewed from in front, with lateral margins distinctly diverging upwards. Posterior margin of lateral lobes of pronotum nearly straight, slightly concave; callus narrow, slightly convex; two slender prosternal spines. Anterior and intermediate tibiae with six (occasionally 7) pairs of brownish spines on under side. Posterior femora with 2 to 4 (occasionally none, only one, or as high as five) short black spines on their lower outer carinae; genicular lobes bispinose on each side. Posterior tibiae with two rows of 22-32 spines on upper side, 5 to 12 spines on under side, approximately in pairs; 2 movable spurs on each side beneath at apex, and very near the apex an additional spur on each side, the one on the outer side the larger.

Tegmina and wings nearly transparent; veins in long tegmina greenish, in short tegmina reddish in female and greenish in male. Cerci of male obtuse, depressed towards the apex, on the basal third a downward and forward projecting tooth on the inner side. Ovipositor brown, 11-13 mm.

Measurements : Body		Hind Femora	Tegmina	Antennae	Ovipositor
Male... ..	15-19 mm.	12.5-14.5 mm.	6-18 mm.	45-60 mm.	.....
Female	15-19 "	13-15.5 mm.	4.5-20 mm.	45-60 mm.	11-13 mm.

(6). Variation.

The following tables show the variation in length of tegmina, the measurements being in millimeters:

Females.

Body	Tegmina	Body	Tegmina	Body	Tegmina	Body	Tegmina
15	4.5	16.5	6	15	6	17	7
16	4.5	17	6	15	6	18	7
17	4.75	17.75	6	17	6	17	7.25
17	4.75	16.5	6	17	6	16.5	7.5
16	5	16	6	16	6	17	8
17	5	16.25	6	16.5	6.25	16	8.5
16.5	5	17	6	17	6.25	18	10
18	5	19	6	18	6.5	18	11
16	5	16	6	18	6.5	18	12
17	5	18.75	6	19	6.5	18	12
16.5	5	17	6	17	6.5	19	13
15	5	17	6	18.5	6.5	16	15.5
17	5	17	6	18	6.5	18	17
15	5	18	6	17.75	6.5	17	17
14	5	17	6	17	6.5	18	17
17	5	16	6	19	6.5	17.5	17.5
15.5	5	18	6	19	6.5	18	17.5
14	5.25	16	6	18	6.5	17	18
19	5.5	16	6	16	6.5	19	18
16.5	5.5	16	6	18.25	6.75	17	18
16	5.5	17	6	17	7	18	18.25
16	5.5	17.5	6	17.5	7	17	19
14.5	5.5	18	6	19	7	18	20
16	5.75	16	6	18	7	.....	.....
16	5.75	.....	.....	.....	.....	.....	.....

Males.

Body	Tegmina	Body	Tegmina	Body	Tegmina	Body	Tegmina
17	6	16	7	17.75	8	17	8
16.5	6	16	7	16	8	17	8
17	6.25	16	7	17	8	16	8.5
15.5	6.25	16	7	18	8	17	8.5
16	6.5	15.5	7.25	16	8	16.5	8.5
17.5	6.5	15.25	7.25	16	8	16.5	8.5
16	6.5	15.25	7.25	17	8	17.5	9
15	6.5	17	7.5	17	8	17	9
16.5	7	17.25	7.5	16.5	8	17	9
17.5	7	17	7.5	16	8	17	9
15	7	17.5	7.5	18	8	17	9
16.5	7	16	7.5	18	8	17	9.25
16	7	16	7.5	17	8	17	10
18	7	15	7.5	16.5	8	16	10.5
18	7	17	7.5	17	8	16.5	11.5
17.5	7	18	7.5	17.5	8	17.5	14.5
15.5	7	16	7.5	17	8	16.75	16
16	7	16	7.5	18	8	17	16
17	7	16.5	7.5	19	8	18.5	17
16.5	7	17	7.5	16	8	16	17
17.5	7	17.5	8	17	8	19	17
17	7	16	8	18	8	16	17
16.5	7	18.5	8	17	8	16.5	17.25
17	7	17	8	17	8	17.25	17.25
16.5	7	17	8	17	8	17	18

Specimens for the above tables were collected in Makiki Valley, Honolulu, March, 1905.

These tables show the range of variation in length of tegmina, and that the length of tegmina is not in accordance with variations in size of the body of the insect. It also shows proportionate number of specimens having the different lengths of tegmina. It is seen that specimens with short tegmina are much the most numerous in this particular locality; whereas, Mr. Perkins states that when first it became common around Honolulu about 5 years ago, there were no short-winged forms.

In the females, when the tegmina are 4.5-6.5 mm. long they extend over 3 or 4 segments of the abdomen, and the wings are slightly shorter; when tegmina are 7.5 mm. long they extend over 6 segments of the abdomen, and the wings are 1.5 mm. shorter; when the tegmina are 12 mm. long they extend about to the tip of the abdomen, and the wings are 2 mm. shorter; when the tegmina are 17-18 mm. long they extend beyond the tip of the abdomen reaching about to the apex of the femora, and the wings extend about 4-5 mm. beyond the tegmina, about to the tip of the ovipositor.

Series of tegmina of adult females, in outline, x $5\frac{1}{2}$.

In the males, when the tegmina are 6.5-8.5 mm. long, they extend over 5 to 7 segments of the abdomen, and the wings are .25-1 mm. shorter; when the tegmina are 10.5 mm. long, they extend over 8 segments of the abdomen, and the wings are about 1 mm. shorter; when the tegmina are 11.5 mm. long, they reach the tip of the abdomen, and the wings are about the same length; when the tegmina are 17 mm. long they extend to the apex of the femora, and the wings are 4 mm. longer.

Observations were taken in different months of the year to determine whether the season made any difference in the length of tegmina. The following table shows the percentages of the different forms as they occurred in Makiki Valley, about one mile above the Station:

1905

	TEGMINA	March	July 12	Aug. 7	Sept. 20	Nov. 15
Short-winged form	(male 6-10.5 mm. (female 4.5-8.5 "	89 % 81.5	91.2 % 85.5	89.2 % 85.7	94. % 88.	92. % 82.
Intermediate	(male 11.5-14.5 " (female 10-13 "	2 5.1	1.1 4.5	3.1 2.4	2. 4.	2. 2.
Long-winged form	(male 16-18 " (female 15.5-20 "	9 13.4	7.7 9.	7.7 11.9	4. 8.	6. 16.

From this, there is obviously no apparent seasonal variation.

Observations in the cane-fields of the Station grounds were not in accord with this, however. In March, 1905, they were nearly all the shortwinged form; but in August, there were none but the long-winged form. They were quite scarce at this time, however, only 25 adult specimens being seen in a half-hour search. In September the condition was similar. Of 36 adults seen in a half-hour search there was but one of the short-winged form.

The following table shows that the proportion of long and short-winged forms varies considerably in different localities:

	Iao Valley, Wailuku, Maui, Sept. 30, 1905	Kipahulu, Maui, Oct. 9, 1905	Pacific Heights, Honolulu, Oct. 28, 1905	U. S. P. A. Ex. Station, Honolulu, Nov. 10, 1905
Short-winged form.....	18%	16%	87%	.....
Intermediate.....	2%	2%	2%	.....
Long-winged form.....	80%	82%	11%	100%

There is no described species which varies so much in length of tegmina as ours does. In Redtenbacher's Monograph of the Conocephalidae, the long-winged species of *Xiphidium* are separated specifically from the short-winged species. It seems probable that many of the species described as short-winged, may be but short-winged forms of the long-winged species, or vice versa.

In the United States five species of *Xiphidium* have been observed to have dimorphism in the wings.

X. ensiferum Scudder, Usually short-winged; "long-winged forms are found occasionally"°

X. nigropleurum Bruner, "Tegmina are usually abbreviated." "An occasional specimen is to be found in which the wings are fully developed."°

X. strictum Scudder, "Dimorphic, the long-winged forms, however, being very scarce."**

X. attenuatum Scudder, Dimorphic, but only short-winged forms mentioned for Minnesota.° Both forms in Indiana, about equally abundant in the northern part, only the short-winged form in the southern part of State.**

X. saltans Scudder, Usually short-winged. "A long-winged pair August 9, 1903."***

I have found no mention of intermediate forms in connection with the dimorphism of these species.

Blatchley † says of the Genus *Xiphidium*, "Variations in length of wings seem to be abrupt with no intervening forms. There are long-winged and short-winged forms of the same species, but none with the wings of medium length. Four of our eight species are thus dimorphic as regards the length of the wings, the short-winged individuals, as far as my observation goes, far outnumbering those with the wings fully developed."

From my table of measurements it will be seen that there is a small proportion of individuals of *X. varipenne* which have wings of medium lengths. I am of the opinion that intermediate forms may yet be found in other species; and further, that more of the species may be found to be dimorphic as regards wings.

Our species was referred to *X. fuscum* Fab. by Brunner, "Orthoptera of the Sandwich Islands," P. Z. S., London, p. 894, 1895. The same name is used by Perkins, Fauna Hawaiiensis,

° Luger, Bull. 55, Minn. Ag. Exp. Station, pp. 331, 2, 3, 1897.

** Blatchley, 27th An. Rep. Dep. Geol. and Nat. Resources, pp. 379, 381, 1902.

*** Walker, Can. Ent. XXXVI, p. 340, 1904.

† Orthoptera of Indiana, 27th An. Rep. of Geol. and Nat. Resources, p. 371, 1902.

II, p. 14, 1899. It is the *Xiphidion fuscus* (Fab.) mentioned by Kirkaldy in "A Preliminary List of the Insects of Economic Importance Recorded from the Hawaiian Islands," The Hawaiian Forester and Agriculturist, I, p. 184, 1904. It differs from descriptions of *X. fuscum*, however, in the following respects: the posterior margin of the lateral lobes of the prothorax are more nearly straight, not "strongly sinuate;" cerci of male are obtuse, not "acuminate," and the teeth are differently placed (Pl. XIV, figs. 8, 9); subgenital plate of male is truncate, and not "slightly triangularly emarginate." *X. fuscum* is an European species and less likely to have reached these islands than some species from the western coast of North America, or from Asia or Australia. Our species differs from all described species from Asia and Australia. It comes nearer to *X. spinosum* Morse, (Can. Ent., XXXIII, p. 201, 1901), occurring in California. It differs from the latter species, however, by its coloration, being green, not "testaceous;" the spines on under side of posterior femora are not "strong;" the antennae are much longer; and the ovipositor is much longer, in fact our species is quite distinctly larger in all measurements. At present the original habitat of our species is a matter of considerable doubt.

Described from numerous specimens collected in Honolulu and elsewhere in the Hawaiian Islands.

Xiphidium latifrons Redtenbacher.

Redtenbacher, Monographie der Conocephaliden, ° p. 212, 1891.

What appears to be this species was collected at Bundaberg, Australia, by Mr. Perkins. It agrees with Redtenbacher's description except that it is the long-winged form; whereas, he described it as being only short-winged.

Another closely related *Xiphidium* was collected by Mr. Perkins. These species swarmed in some cane fields of Australia.

° Reprint from Verh. der k. k. Zool. Bot. Ges. Wien, pp. 315-562, 1891.

X. latifrons on p. 526 of this publication.

COLEOPTERA.

COCCINELLIDAE.

Callineda testudinaria, Mulsant.* (Pl. XV, figs. 1-4.)

Two specimens of this species of Ladybug, collected at Bundaberg, Queensland, Australia, by Messrs. Koebele and Perkins, and received at the Experiment Station, Dec. 6, 1904, survived. These proved to be a male and a female, and egg-laying began Dec. 15th and continued for several weeks till the death of the female. 944 eggs were produced. These hatched, and the larvae were reared to maturity. Some were sent out to sugar plantations, while others were retained for breeding. They have been breeding with some interruptions at the Station and from time to time lots of 25-50, or more, have been sent out to the plantations to start colonies of them in the cane-fields. Many plantations have been supplied already, and others will be as soon as they are bred in sufficient numbers.

In confinement this Ladybug is a very voracious feeder upon leaf-hoppers and all species of *Aphis*; and, as is usual with the ladybugs, both larvae and adults are equally voracious. A nearly full-grown larva, in confinement, was observed to eat 15 cane *Aphids* in 6 minutes; and in 24 hours had eaten 140 *Aphids*. Another larva ate 17 cane *Aphids* in 9 minutes; and 153 *Aphids* in 24 hours. A third larva ate 5 *Aphids* in 2 minutes, and 100 in 24 hours. A full-grown larva, fed upon leaf-hoppers, ate an adult and 22 medium-sized nymphs in 24 hours. The *Aphids* were eaten in entirety; but the leaf-hoppers were chewed up, their juices sucked, and the hard parts rejected. The larvae are very cannibalistic, eating those of their own size even, when other food is scarce. They, as well as adults, will also eat the eggs of their own species. In a cluster of eggs, if some hatch before others, the larvae are likely to eat the other eggs or such larvae as hatch later.

It is hoped that this species will be helpful in the cane-fields against the leaf-hopper. Being larger than *Coccinella repanda*,

* Crotch, *Coccinellidae*, p. 161; Froggatt, *Agric. Gaz.*, N. S. W., XIII., p. 900.

it should be more effective than the latter, when it becomes as abundant and as generally distributed.

As seen from the number of eggs laid by the original female, they are very prolific and should increase rapidly in the cane-fields when they once get a start. They cling very tenaciously to objects when jarred or blown by the wind.

This ladybug may be easily distinguished by its large size, and striking markings. It is larger than our other ladybugs. It measures 5-6.5 mm. long by 4.5-5.5 wide, and is very convex. The color is a shining light yellow with black markings on the prothorax and the elytra. Those on the elytra mark them off into 5 trapezoidal areas on each elytron, somewhat resembling the plates on the back of a turtle; hence, the name "testudinaria." These black markings vary in intensity and extent; often they are distinct and perfect bands, marking off the 5 areas, but usually some of the markings are absent on the posterior part, or faint, or reduced to elongate spots.

Life History.

In the insectary, adults began copulating 7 to 20 days after reaching maturity, usually about 10 days, and egg-laying began the same day or the day following. The eggs are bright yellow, 1.5 mm. long, cylindrical, tapering at the ends, and are placed on end in clusters on the surface of leaves usually in a somewhat hidden place, as where the margin is dried and curled under. (Pl. XV. fig. 2.) The clusters contain from 9 to 64 eggs, or an average of about 30, and a cluster is deposited every day, or nearly so. One female was observed to deposit a cluster of 32 eggs in 15 minutes; another female deposited 49 eggs in 23 minutes. This is at a rate of about 2 per minute. Records of the number laid by individual females are as follows:

Egg-Laying Period.	Number of Eggs Laid.
Dec. 15th, 1904 to Feb. 1905.....	944
March 22, 1905 to April 28, 1905.....	632
May 31, 1905 to July 24, 1905.....	591

This shows the egg-laying period to be from 5 to 10 weeks. In each case the females laid eggs up to the time of their death, but there were fewer eggs per cluster towards the end. In the third case the female had been laying eggs for a few weeks before any record was taken. It is not unlikely that the egg-laying period would be somewhat longer when the insects are in a state of freedom.

In breeding this Ladybug, it was observed that copulation took place frequently; in fact, a pair kept in a tube by themselves

were observed to copulate almost daily, or after each deposition of a cluster of eggs. The thought arose as to whether this frequent copulation was necessary for the hatching of the eggs, for with insects one copulation is the rule, even with the queen honey bee which lays eggs for a period of two or three years.

To ascertain if such frequent copulation was necessary, a female which had been laying eggs several weeks, having a male present, and copulation occurring frequently, was placed by herself. Egg-laying continued as before, with the following result :

May	31,	35	eggs; hatched.
June	1,	33	" "
"	2,	32	" "
"	3,	23	" "
"	4,	23	" "
"	6,	11	" "
"	7,	30	" "
"	8,	20	" "
"	10,	7	" "
"	11,	24	" "
"	12,	8	" "
"	13,	22	" "
"	15,	20	" "
"	16,	6	" "
"	17,	5	" "
"	18,	15	" "
"	26,	8	" "
"	27-8,	26	" "
"	29,	29	" "
"	30,	21	" "
July	2,	7	destroyed.
"	3,	12	hatched.
"	4-5,	59	"
"	8,	7	"
"	9,	7	"
"	10,	2	destroyed.
"	12,	25	hatched.
"	14,	18	"
"	15,	6	destroyed.
"	17,	26	only a few hatched.
"	20,	11	" " "
"	21,	10	" " "
"	24,	3	failed to hatch.
"	25,	Died.	

Total 591 eggs.

It will be seen that she continued laying eggs for fifty-five days, until her death occurred; and that the eggs hatched, up to about the last ten days of her life when only a few hatched of those laid.

This experiment proves that the frequent copulation which had been observed during the egg-laying period was not necessary.

The eggs hatch in 3 to 6 days, usually in 4 days. The larvae molt 3 times before pupating, at intervals of 2 days and there are 5 to 6 days between the 3rd molt and pupation. In the first three stages the larvae are black. There are four rows of spiny tubercles on the back, after the third molt the head is dull yellow; broad sides of the pronotum light yellow, also the four tubercles of the first abdominal segment and the two dorsal tubercles of the 4th, 5th and 6th abdominal segments. The two dorsal tubercles on the 4th and 5th segments are often yellow after the second molt. As the larva approaches full growth it becomes lighter colored, somewhat yellowish, from the stretching of the skin between the black portions of the segments. This is especially so if the larva is very well fed. Size full grown is 11 mm. and this is attained in about 11-13 days, according to the abundance of food supply. (Pl. XV, fig. 3.)

The fullgrown larva suspends itself by the posterior end in some sheltered place, and in a day or two molts again and the pupa is formed. (Pl. XV, fig. 4.) It is about 5 mm. long by 3.5 mm. wide; light brownish yellow with black markings as follows: a pair of triangular spots on prothorax, their bases at posterior margin, often irregular lines extending from their apices to the anterior margin of prothorax; dorsum of mesothorax with 2 roundish spots at posterior margin, from these, 2 black stripes, widening posteriorly, extend backwards across the metathorax; a black line along the inner edge of the wing pads, another line parallel to it a short distance from the margin, often these lines are contiguous; a pair of black markings on each of segments 3, 4, 5 and 6 of the abdomen; those of segments 4, 5 and 6 are triangular with their bases at the posterior margin of the segments; those on the 3rd segment are quite irregular in shape longer transversely; sometimes a pair of small spots on 2nd segment.

The pupal stage lasts for 4 to 6 days, during which the adult is developing and when this is accomplished the pupa splits on the dorsal median line and the adult crawls forth. It is soft

and white at first, but remaining quiet, in a few hours it becomes hardened and its normal coloration appears.

The following is a summary of the life history:

Embryonic Period	4 days
Larval Period	11-13 days
Pupal Period.....	4-6 days
From maturity until egg-laying begins.....	7-20 days
From deposition of egg till ready to lay eggs again.	25-43 days
Egg-laying period about two months.	

There is practically about a brood per month, throughout the year.

HAB. Southern Queensland, Bundaberg and Brisbane, Australia, on *Aphis* of *Ficus*.

Coccinella repanda, Thunb.* (Pl. XV, figs. 5-7.)

This ladybug was introduced from Australia several years ago. and is now distributed over all the islands. It is very abundant in many places, and feeds upon all species of *Aphis*. It is found in the mountains, in the valleys, in gardens, orchards and grounds, and in sugar cane-fields. Although an *aphis* feeder, in cane fields it feeds to a considerable extent upon young leafhoppers, especially at times when cane *Aphis* is scarce.

This species is of medium size, 5.5 mm. long by 4.5 broad and very convex. It is recognized by the color of the elytra, being orange-red (often paler) with 9 irregular black spots, and a black line in the middle of the back, produced by the black margins of the elytra where they come together. The prothorax is black on posterior portion; anterior portion yellowish, boundary line between is irregular. Head yellowish, with black eyes.

(1). Life History.

The eggs are yellow, often very pale, 1 mm. long. They are deposited on end, on the under side of leaves and other sheltered places, in clusters of from 2 to 18, 10 or 12 being the usual number. They hatch in 3 or 4 days; the larvae are black with white markings. They grow rapidly and molt 4 times, including the molt which takes place at pupation. The interval between molts is 1 to 2 days, and the whole larval period is 8 to 9 days, depending upon abundance of food supply.

The full-grown larvae are 8 mm. long. (Pl. XV, fig. 6.) They

* Crotch, *Coccinellidae*, p. 117; Froggatt, *Agric. Gaz. N. S. W.*, XIII., p. 899.

are nearly black with a bluish tinge. There are four longitudinal rows of short tubercles on the abdomen. The prothorax has a yellowish posterior margin; and there is a light yellow patch in the middle of both meso- and metanotum, a smaller one at each side of the metanotum. The first segment of abdomen has a light yellow spot in middle and two spots on each side; the fourth segment has yellow patches including 4 tubercles thus producing a nearly complete yellow band; segments, 4, 5, and 6 and sometimes 7 are yellow on the lateral edges. Very similar markings are present on the younger larvae, but are white instead of yellow.

The full-grown larva suspends itself by the posterior end in some secluded place and after hanging curled up for 1 to 2 days a molt occurs, and the pupa is formed, which is yellowish in color with roundish black spots as follows: 2 on the prothorax; 2 on metathorax, and one on the wing pad at each side of these, making a transverse row of 4 spots; 4 on the 3rd abdominal segment; 2 on the 4th abdominal segment. Length of pupa 4.5 mm. (Pl. XV, fig. 7.)

The pupal period is 3 to 4 days. The adults emerge by a dorsal splitting of pupal skin. Some reared in the insectary were observed in copulation 7 days after becoming adults, and eggs were deposited on the following day, giving a period of 23 days from deposition of eggs to the maturity of adults and another generation of eggs deposited.

HAB. China; India; Malay; Singapore; Java; Bali; Flores; Triton Bay; Queensland and N. S. W., Australia; Tasmania; New Caledonia.

(2). Parasite.

Unfortunately a parasite (*Centistes americana*) preys upon this ladybug at some seasons of the year, reducing its numbers, and thus diminishing its effectiveness. This is the same ladybug parasite which is found in the United States, and Mr. Perkins found it in Australia, also, preying upon such species as *Verania lineola*, *V. frenata*, etc.

Verania frenata, Erichs.* (Pl. XV, figs. 8-19.)

This is a medium ladybug (4.5 mm. by 3.5 mm.) introduced from Queensland, Australia, December, 1904. Of the shipment

* Crotch, Coccinellidae, p. 175; Froggatt, Agric. Gaz. N. S. W., XIII., p. 901.

received, 14 were alive. From these, breeding has been going on with some interruptions, and colonies of adults have been sent to some of the sugar plantations. This is an *Aphis* feeder, but also ate young leaf-hoppers in insectary, and no doubt would feed upon them, especially the smaller nymphs, when cane *Aphis* became scarce in the cane-fields. In Queensland, Mr. Perkins found them abundant in grass and cane-fields, feeding on *Aphis*. It may be identified by its tawny yellow color, with the posterior portion of prothorax black; the elytra with broad black margins where they come together in the median line, and an elongate z-shaped black mark in the middle of each.

Life History.

The eggs are bright yellow, 1.25 mm. long, deposited on end, in clusters of 8 to 13 on underside of leaves, or other sheltered places. They hatch in 3 to 6 days, usually 4; the larvae molt 3 times before attaining full growth, at intervals of 2 to 4 days between molts, and about 6 to 7 days between the third molt and pupation; the whole larval period ranges from 15 days to 28 days or an average of about 19 or 20 days.

The full-grown larva (Pl. XV, fig. 9) is 7.5 mm. in length. It is without tubercles, slightly hairy, dark purplish brown, nearly black on dorsal side, with a white streak along the back, composed of large dorsal spots on each segment, beginning with the mesothoracic and terminating on the seventh abdominal segment; the dorsal spot on the fourth abdominal segment is three times as broad as the spots on adjacent segments; a lateral white line on each side, composed of spots on the edges of the segments terminating at the sixth abdominal segment, an additional white spot just above this line on mesothoracic and first and fourth abdominal segments; a median dorsal line on prothorax, widening posteriorly. These markings are not so pronounced in younger larvae.

The pupa (Pl. XV, fig. 10) is about 4 mm. long, suspended in some sheltered place. It is tawny yellow with a pair of black markings on anterior margin of prothorax, another pair on the posterior margin, also a pair on the mesothorax; inner margins of wing-pads black, faint traces of two brownish dorsal streaks on the abdomen. A spine on each lateral edge of the 3rd, 4th, 5th and 6th abdominal segments. The pupal period is 3 to 9 days, usually 4 to 5.

The summary of the life history is as follows:

Egg period 3 to 6 days.

Larval period 15 to 28 days.

Pupal period 3 to 9 days.

Egg to maturity 21 to 43 days.

HAB. Malayan Islands; Queensland, New South Wales, Australia; Tasmania; Balade, New Caledonia.

Verania lincola, Fabr.* (Pl. XV, fig. 11.)

This species was collected in Queensland and New South Wales, Aus., by Messrs. Perkins and Koebele. Several shipments of it were received at the Experiment Station during 1904. Some were liberated directly on Oahu Plantation. In a shipment received October 4, only one pair were alive, and they were retained for breeding. Their progeny were liberated on Oahu Plantation, and the plantation of Hawaiian Agricultural Co., Pahala, Hawaii, before they had increased to large numbers.

It is primarily an *Aphis* feeder, but ate young leaf-hoppers in confinement, and no doubt would do so in the cane-fields when *Aphids* were not readily obtainable. In Australia, they were found feeding on *Aphis* in grass and cane-fields.

In size this species is about 4 mm. long by 3 mm. wide. It is of a dull yellow color with four black spots on prothorax, 2 near the middle and two larger at the posterior margin, and 3 longitudinal black lines on the elytra, i. e., one formed by the black margin of the elytra, where they come together in the median line, and a black line near the middle of each elytron, nearer the outer margin and nearly concentric with it, sometimes terminating without reaching the margin; when it does reach the margin, it is at the inner margin a little distance from the apex.

Life History.

Eggs are yellow, laid on end, in clusters of 6 to 17, on under surface of leaves or other sheltered places; clusters deposited at intervals of 2 to 5 days.

Eggs hatch in 3 to 6 days.

Larvae full grown in 13 to 31 days.

Pupal period 4 to 8 days.

Eggs to maturity 20 to 45 days.

* Crotch, Coccinellidae, p. 176; Froggatt, Agric. Gaz. N. S. W., XIII., p. 901.

Adults were about two weeks old when copulation was first observed; egg-laying began the same or the following day.

Full-grown larvae are very similar to those of *Verania fre-nata*; but at the time of writing no specimens are obtainable, so the exact distinctions cannot be given.

HAB. Southern Queensland, Northern New South Wales, Australia; Fiji.

Verania sp. (Pl. XV, fig. 12.)

A few of this species were collected in cane-fields at Condong, N. S. W., Australia, Dec. 1904. But one individual reached Honolulu alive, and it eventually died without laying any eggs.

Size 4.5 mm. long, by 4 mm. wide; color same as *V. lincolna* with heavier black markings and additional shorter black line on each elytron between those present on *lincolna*.

MALACHIIDAE.

Collops quadrimaculatus Fabr.

Collected by Mr. Koebele, at Columbus, Ohio, Oct. 1903; feeding upon grass-feeding leaf-hoppers. This beetle is about 3.5 mm. long; is red with 4 bluish black spots on the elytra.

Another beetle of the same family (Malachiidae) was collected by Mr. Koebele, at Alameda, California, feeding upon grass-feeding leaf-hoppers. This is a black beetle with orange lateral margins to the prothorax; length about 5 mm.

HEMIPTERA.

REDUVIIDAE.

Zelus peregrinus Kirkaldy.* (Pl. XVI, figs. 1, 3.)

This insect was first known in the islands in 1897. It is not known from whence it came, as it is not known elsewhere. It first appeared in Honolulu, and has now spread to all of the islands, being very common in many places. It is a predaceous bug in all stages of its life, and is most commonly found upon fruit trees and shrubbery which are infested with Aphis, and in sugar cane-fields, where it feeds largely upon leaf-hoppers. When

* "Hemiptera," Fauna Hawaïensis, III., pt. II., p. 149, 1902.

found upon fruit trees, it is usually preying upon Ladybugs which in turn were preying upon Aphis or Scale Insects, hence in this case *Zelus* should most certainly be considered an injurious insect. It also feeds upon Ladybugs and other beneficial insects in cane-fields, to some extent; but the number of leaf-hoppers consumed by it more than offsets the injury done by its eating an occasional Ladybug.

The nymphs of *Zelus*, when they hatch in a favorable place on the sheltered and secluded underside of a cane leaf, where young leaf-hoppers congregate, are in the habit of remaining in such place till they are grown to maturity, not seeking other locations unless their food supply of young leaf-hoppers becomes exhausted. I have often observed this in the cane at the Experiment Station.

An example of their voracity is shown by the following observation: 17 adult leaf-hoppers were confined with an adult female *Zelus*, and within 24 hours she had eaten 14 of them. This same female ate flies of various species; ladybugs, young and adult; spiders; nymphs of her own species; and, in fact, one day ate the adult male which was confined with her; in another instance a full grown nymph ate an adult which had just molted and was still soft and unprotected.

Life History.

Eggs are cylindrical, a little more than 1 mm. in length. They are laid in columnar masses of 20 to 40 eggs. (Pl. XVI, fig. 2) They are brown in color and covered with a sticky substance, the tops whitish with a depression in the center and a raised fringe at the periphery. During her life a female must lay several hundred eggs. Below is the record of one captured in the sugar cane at the Experiment Station, and fed in confinement till she died 39 days later.

May 29th,	42 eggs,	hatched June 8th.
June 4th,	19 eggs,	hatched June 13th.
June 12th,	34 eggs,	hatched June 20th.
June 21st,	18 eggs,	hatched June 30th.
June 23rd,	31 eggs,	hatched July 3rd.
June 26th,	42 eggs,	hatched July 6th.
June 29th,	44 eggs,	hatched July 9th.
July 3rd,	39 eggs,	hatched July 12th.
	269 eggs.	
July 7th,	she died.	

From this, it is seen that egg masses were produced at intervals of 2 to 9 days, or an average of 5 days. The eggs hatched in 8 to 10 days.

The nymphs molt 5 times including the final change to maturity. The following is the record of one lot bred in insectary:

	Length of Periods	Measurements
May 29th—Eggs deposited	Egg period 10 days	
June 8th—Eggs hatched	1st stage 5 days	1st stage 2 mm.
June 13th—1st molt	2nd stage 5 days	2nd stage 3.5 "
June 18th—2nd molt	3rd stage 5-8 days	3rd stage 5 "
June 23-26—3rd molt	4th stage 5-7 days	4th stage 6 "
June 28-July 3—4th molt	5th stage 9 days	5th stage 10.5 "
July 7-12—5th molt (matured)	Whole nymphal period 29-34 days	Adult 14 "

The nymphs are more or less sticky in all stages. The abdomen is rather ovate in shape and somewhat flattened above; in the younger stages it is much tilted up behind. Eyes red; legs white, ringed and spotted with black; stages 1 and 2 have black spines at tip of abdomen. 3, 4 and 5 have the spines also on the sides of the abdominal segments, increasing in size from before backwards. Full grown nymph is of a light bluish green color, with some reddish yellow markings on dorsum, segmentally arranged. (Pl. XVI, fig. 3.)

One female from the above lot (matured July 7th) deposited an egg-mass of 45 eggs July 23rd; or about two weeks after reaching maturity. This gives a period of 55 days from laying of eggs till the young have matured and themselves laying eggs, or about 2 months, which would give 6 broods per year, providing their development was as rapid at all times of the year. Probably their development would not be so rapid during the cooler months of the year—November to March.

Reduviolus blackburni, White.* (Plate XVIII, figs. 1-4.)

This pale, grayish colored native bug is generally distributed throughout the sugar cane districts. Adults and nymphs prey upon cane-aphis and young leaf-hoppers.

* "Hemiptera," Fauna Hawaiiensis, III, pt. II, p. 155, 1902.

Life History.

Eggs were discovered inserted in the midrib of a cane-leaf, in a cane field at the Experiment Station. The position of the eggs inside the leaf is shown in Fig. 3, Plate XVII. These eggs failed to hatch; in fact, proved to be parasitized by a black mymarid, *Polynema reduvioli*, one parasite to each egg. Mr. Terry has found *Reduviolus* eggs badly parasitized in the plantations of Kauai, also.

A female in confinement deposited 15 eggs, singly, in an irregular row in a cane-leaf. Two of these hatched in 10 and 11 days respectively. The nymphs were slender, of a pale yellow color. They molted 5 times at intervals of about 5 days (3-7), and matured in 24 days.

A darker colored species of *Reduvius* is common in cane fields on Hawaii, and has similar habits to *R. blackburni*.

ANTHOCORIDAE.

Triphleps persequens, White.* (Pl. XVI, fig. 7.)

This little bug is very common in cane-fields, and also on any plants infested with *Aphis*. In all stages, they feed especially upon *Aphis*, but they also eat some of the younger nymphs of the leaf-hopper.

Life History.

The eggs are not known, but are probably deposited on the surface of a leaf similarly to *Physopleurella mundulus*. From some material under observation, (leaves infested with Aphis), a nymph hatched July 18th. It was yellowish in color; very active, running about; fed upon aphis; matured August 1st. Nymphal period 14 days.

Physoplocurella mundulus, White.** (Pl. XVI, figs. 4-6.)

This bug is a little larger than *Triphleps persequens*. It is of a light brown color.

Generally distributed in sugar cane districts. Has habits similar to *Triphleps*; being larger, it undoubtedly preys to a greater extent upon young leaf-hoppers, though primarily its food is probably Aphids and Psocids. Both adults and nymphs were

* "Hemiptera," Fauna Hawaiiensis, III, pt. II, p. 125, 1902.

* * * * * p. 126, 1902.

found on Orange trees, where they were undoubtedly feeding upon Psocids, for they were lurking about the nests of the Psocids.

Life History.

The eggs (Pl. XVI, fig. 5) are .6 mm. long, yellowish, with a raised collar or crown at anterior end, laid flat on a leaf, singly, in secluded place. Some were found under the web or nest of Psocids on Orange leaves. A few laid in confinement hatched in 4 to 5 days. The nymphs (Pl. XVI, fig. 6) are reddish in color and of very lively habits, though keeping secluded generally. I have not as yet bred any to maturity, but their nymphal period is probably about the same as *Triphleps persequens*, i. e., 14 days.

CIMICIDAE.

Occhalia grisca, Bur.* (Pl. XVIII, figs. 5-7.)

Nymphs and adults of this large native bug were found feeding on cane leaf-hoppers in the more elevated parts of sugar plantations on Hawaii, especially where they were near forests, as at Olaa, Pahala, and Naalehu. They feed on larvae of *Omiodes accepta*, also.

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EXPLANATION OF PLATES.

Plate XIV.

1. *Xiphidium varipenne*, female, x 2.
2. " " female nymph, x 2.
- 3-7 and 3a-7a. *Xiphidium varipenne*, dorsal and lateral views respectively of the thorax of the nymphal stages, to show the development of the wings.

8. *X. varipenne*, cerci of male, x 5.
9. *X. fuscum*, cerci of male, x 5. (From Girard, *Traite D'Entomologie*, Plate 62, Fig. 7.)
10. *X. varipenne*, fastigium viewed from in front, x 5.
11. " eggs, nat. size. Showing their location where inserted beneath leaf-sheath of sugar cane. The tiny holes in several of them are where parasites have emerged.

Plate XV. (All figures x 5.)

1. *Callineda testudinaria*.
2. " " cluster of eggs on leaf.
3. " " larva.
4. " " pupa.
5. *Coccinella repanda*.
6. " " larva.
7. " " pupa.
8. *Verania frenata*.
9. " " larva.
10. " " pupa.
11. *Verania lineola*.
12. *Verania* sp.

Plate XVI.

1. *Zelus peregrinus*, x 4.
2. " " nymph, x 4.
3. " " cluster of eggs, x 5.
4. *Physopleurella mundulus*, x 20.
5. " " nymph x 20.
6. and 6a. *Physopleurella mundulus*, eggs on surface of leaf x 15.
7. *Triphleps persequens*, x 20.

Plate XVII. (All figures x 5.)

1. *Reduviolus blackburni*.
2. " " surface of leaf showing external appearance of eggs which are inserted; the tiny holes at the side of several, are where parasites have emerged.
3. *R. blackburni*, section of leaf showing inserted eggs.
4. *R. blackburni*, nymph.
5. *Oechalia griseus*.
6. " " prothorax of another specimen showing variation in the spines at the posterior angles.
7. *O. griseus*, nymph.

2 x 5

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7

5

9

10

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11

12

all

will

PLATE XVII.

REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

**Leaf-Hoppers and their
Natural Enemies**
(*PT. VIII. ENCYRTIDAE, EULOPHIDAE,
TRICHOGRAMMIDAE*)

BY R. C. L. PERKINS

HONOLULU, H. T.
JANUARY 6, 1906

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JANUARY, 1906

LETTER OF TRANSMITTAL.

Honolulu, T. H., December 1, 1905.

To the Committee on Experiment Station, H. S. P. A., Honolulu, T. H.

Gentlemen:—I, herewith, submit for publication the eighth part of the Bulletin on "Leaf-Hoppers and Their Natural Enemies," which deals with the Chalcid flies which are parasitic on the leaf-hoppers themselves, or on some of the insects that destroy them.

Yours obediently,

R. C. L. PERKINS,
Director, Division of Entomology.

GENERAL REMARKS.

The present paper deals with such members of the great Chalcidoid series as are connected with leaf-hoppers, but excludes the Mymaridae, which have been treated of already in Part VI. of this Bulletin. I had intended to include all the species that were bred by us during our studies of leaf-hoppers in Australia, and further to describe the few species of Ichneumon flies that were connected with certain of the natural enemies of Homoptera, but these and a few of the Chalcids I have decided to leave at present undescribed. Of some of these the material for study is inadequate, and of others the habits were not sufficiently closely examined as to warrant their inclusion in this study. Further, to any one acquainted with the difficulties presented by these most extensive series of insects, and with the fact that most of the species that we obtained, belong to some of the largest and most difficult families in these series, while no semblance of a classified reference collection exists in the Hawaiian Islands, it will not be surprising that I have refrained from dealing with a few of the most obscure and difficult forms. Most of these, however, I shall refer to incidentally in the following remarks:

HABITS OF THE PARASITES HERE CONSIDERED.

We may divide the Chalcid parasites connected with leaf-hoppers into five classes according to their habits.

(1). Direct enemies of leaf-hoppers or primary parasites, i. e., those which attack these in one stage or another, from the egg to the adult.

(2). Species beneficial to leaf-hoppers, or secondary parasites, i. e., those which destroy the direct enemies or primary parasites.

(3). Species which are indirectly enemies of leaf-hoppers, or tertiary parasites, since they destroy the secondary parasites.

(4). Species which are beneficial to leaf-hoppers, since they are parasites of predatory insects that destroy leaf-hoppers.

(5). Species which are indirect enemies of leaf-hopper since they destroy the preceding.

In the first of these divisions if we exclude egg-parasites,

both Mymarid and those of other families, only two primary Chalcid parasites of leaf-hoppers are known to us. These form two new and remarkable genera in the Encyrtidae and both are parasites of Jassids, in fact were bred from the same species, the one, *Meniscocephalus*, being remarkable on account of its sculpture; the other, *Noccladia*, for the fine six-branched antennae of the male and the foliaceous dilated hind legs of the female. The latter was bred from nymphs and mature specimens of the Jassid it attacks, the larva filling up the abdomen of the leaf-hopper, much as does that of a *Pipunculus* fly. The Chalcid larva, however, pupates within its host, not emerging when full fed, as does that of the parasitic fly. The mature insect escapes by rupture of the abdomen where it is attached to the thorax, just as does the larva of *Pipunculus*.

No doubt the egg-parasites of leaf-hoppers will prove to be numerous represented amongst the Encyrtidae, on future investigation. The eggs of *Siphanta* and allied genera, and those of *Platybrachys* and its allies, in fact such eggs as are not imbedded in the tissues of leaf or stem, are very subject to their attacks. Here belong the parasites described under the generic names *Fulgoridicida* and *Ectopiognatha*, and one or two other obscure and very minute species, which I have not yet adequately investigated. Apart from the Encyrtinae another egg-parasite was obtained, the species forming a new genus of the Trichogrammidae. This is a very valuable insect in that it destroys the eggs of a common Jassid, which frequents the Eucalyptus trees in Australia. It will be remembered that it has long been known that the eggs of the buffalo tree-hopper (*Cercsa bubalus*) are destroyed by a parasite of this family.

Throughout Australia and Fiji the eggs of the sugar-cane leaf-hopper are destroyed by the Tetrastichine genus, *Ootetrastichus*, hereafter described. This parasite differs in its habits from the species of *Anagrus* and *Paranagrus* of the Mymaridae, in that a single parasitic larva destroys all the eggs contained in an egg-chamber, instead of each individual being developed at the expense of only a single egg. To escape from the egg-chamber, the adult parasite gnaws a round hole for its exit, much like that made by *Anagrus frequens*, excepting that it is larger. As the number of eggs deposited by the leaf-hopper in the egg-chamber varies much, so the size of the parasites is likewise very variable, some individuals being twice the bulk of others.

On one occasion in company with the *Ootetrastichus* a single

specimen of a form allied to *Oligosita* was bred by Koebele. This might be either an egg parasite of the leaf-hopper, or a secondary parasite, the latter, I suspect, being the case.

Turning to the second division, the hyperparasites or secondary parasites of leaf-hoppers, most important of these are the parasites of the Dryinidae. These comprise six distinct genera, *Echthrodryinus*, *Echthrogonatopus*, *Helegonatopus*, *Chalcocrinys*, *Cheiloneurus* and *Saronotum*. I have already in Part I of this Bulletin stated the importance of these hyperparasites, in limiting the value of the Dryinidae. In the case of the first five genera named above, several individuals (frequently about half a dozen) are bred from a single host, but in the case of *Saronotum*, only a single parasite is bred at the expense of the Dryinid. This hyperparasite emerges from the Dryinid larva soon after its cocoon is formed, then continues to feed on the body for some days. The others, on the other hand, appear to emerge simultaneously, and full fed, as soon as the cocoon of their host is completed. None of these hyperparasites will oviposit in the larva of the Dryinid after the cocoon is formed, but the larva of the latter is stung, while still attached to the leaf-hopper.

The discovery of parasites on Dryinidae was made by Swezey, who obtained *Cheiloneurus swezeyi* from the cocoons of *Dryinus ormenidis* in North America. Subsequently from cocoons of the same species sent here by Koebele at least a thousand examples of this hyperparasite were bred. Ashmead on the ground that theoretically *Cheiloneurus* should be the parasite of some scale-insect, in describing the species remarked that "some mistake has been made" by Swezey, but it is he himself who is mistaken. *Cheiloneurus* is a very common parasite of Dryinidae in Australia as well as in America. *C. swezeyi* is a particularly interesting species from the fact that the female is dimorphic, being either fully winged or wingless. The latter form far outnumbers the winged in the individuals bred by me, and both were represented in Swezey's few specimens. There is no modification of the thorax in the wingless examples, which, but for the absence of these organs, quite resemble the others, though perhaps they may be of slightly smaller size on the average. We did not discover any wingless examples of the Australian species.

The only other secondary parasite of leaf-hoppers that is known to me, is likewise an Encyrtid, but belongs to the Eupelminae, while all the others belong to the Encyrtinae. It was bred from the puparium of the parasitic fly, *Pipunculus cinerascens*, and is described below as a new species of *Anastatus*. Only

a single individual was bred, which emerged on the first of January, 1905, in the neighborhood of the Fiji Islands, when I was returning to Honolulu, the puparium, from which it was bred, having been collected three weeks or a month previously. This parasite escaped by a roundish hole gnawed in the top of the puparium, and did not cause the usual deniscence of the latter, which always takes place along definite lines, when the fly emerges.

Of the third division of parasites or tertiary parasites of leaf-hoppers I have only to cite here a single species. This is a minute species of the Eulophidae, bred from the cocoons of Dryinids, parasitized by *Helegonatopus*. Only one example of this appears to have been preserved, and its condition is such that its exact position cannot be determined without additional specimens. It was bred from material sent to the islands from Ohio by Koebele.

The fourth division contains the parasites of insects that habitually prey on leaf-hoppers. Here we include the parasites of leafhopper-eating ladybirds, of the lace-wing flies (Chrysopinae) and of the hover-flies of the genus *Baccha*, as well as those of the voracious crickets of the genus *Xiphidium*, and with these may be noticed one or two species that possibly belong to the fifth division. To the parasites of the ladybirds no very special attention was paid, and they are not included in the descriptive part of this paper. Throughout Queensland we met with that common and widely spread enemy of ladybirds, the Braconid, *Centistes americana*, attacking species both of *Coccinella* and *Verania*, and what was new and interesting to us, it was also bred from a very different ladybird, the blue *Orcus ovalis*, a species most abnormal in its habits for that genus, since it feeds on fungi growing on cane leaves and grasses. Such habits are known in certain other Coccinellids but totally foreign to those of the other species of *Orcus*, which are all carnivorous. The Braconid parasite, as is well known, attacks the mature ladybird, and I have given some account of its habits in these islands in an earlier bulletin. In Australia, ladybird larvae were further infested with two species of Encyrtidae, allied to *Homalotylus*, but apparently distinct generically from that, and from one another. In the same vials with these, various other parasites emerged, supposed at the time to be secondary parasites, or possibly some of them primary ones, of the ladybirds. Amongst these was a species of the remarkable genus *Euryischia* and a Pteromalid near to and perhaps identical with the genus *Ophelo-*

sia. As the same care was not taken in isolating the parasitized ladybirds, as was given to all our other insects, the true relationship of these parasites and some others must remain doubtful. It is noteworthy that *Euryischia* was originally bred from *Lestophonus*, the dipterous parasite of *Icerya*, and *Ophelosia* as a direct parasite of that scale, while ours were supposedly bred from *Orcus* and *Verania* parasitized by other Chalcids. It would seem probably therefore that in reality some scale-insects (though hardly possibly the conspicuous *Icerya*) were accidentally included with the ladybirds mentioned, and some of these may have been further infested with parasitic Diptera. The original assignment of *Ophelosia* and *Euryischia* was no doubt made after careful study, whereas no special precautions were taken with my parasitized *Orcus* and *Verania*, as I have said.

It may be remarked that here are only mentioned such parasites as were connected with those ladybirds we wished to introduce into the islands, to prey on leaf-hopper. Other ladybirds were noticed to be excessively parasitized by quite other parasites but these are without the scope of this Bulletin.

As parasites of some of the other predaceous insects, we must notice the egg-parasite of the long-horned cricket (*Xiphidium varipenne*). I have separated this generically from the well-known genus *Aphelinus* on account of the antennal disparity in the sexes, the position of the ocelli, and some other differences. It is interesting to note that *Aphelinus locustarum* of Giraud was bred from eggs of *Xiphidium fuscum* in Europe, but whether it is generically the same as ours I do not know, as I have not the original description. Excepting these two cases, all or nearly all the Aphelininae, of which the habits are certainly known, are parasitic on scale insects (Coccidae) plant-lice (Aphididae) or Aleurodidae.

The lace-wing flies (Chrysopinae) are, as is well-known, subject to the attacks of various parasites. We may here refer to two Ichneumons, a Cryptid bred from the cocoons of a remarkable Australian lace-wing, which apparently feeds only on the nymphs of *Siphanta* and its allies; and another ichneumon of the same group, that attacks the Hawaiian *Chrysopa microphya*. In addition to these the stalkless eggs of the endemic Hawaiian genus *Anomalochrysa* are destroyed by a minute Trichogrammid, allied to *Pentarthron*.

PARTHENOGENESIS.

In Part VI of this Bulletin I have remarked on the general occurrence of parthenogenesis in the Mymarid parasites of the genera *Anagrus* and *Paranagrus*, which 'attack leaf-hoppers' eggs. The same phenomenon is still more apparent in the egg-parasite of the genus *Ootetrastichus*. The complete life cycle of the type of this genus is about 6 weeks, or twice as long as that of the Mymarids. I bred colonies of it from numerous parents for a period of about 8 months, but without ever obtaining a single male specimen. Specimens bred by us in Australia from egg-chambers of leaf-hopper were all females, and many reared from the same, collected by Koebele in Fiji, yielded only this sex. All specimens so far bred from Hawaiian leaf-hoppers, the parasite being now fully established in these islands, are females. It will be observed that these facts are in some respects directly opposed to those observed by Dr. Adler in the case of *Pteromalus*, since he remarks that in general the virgin females gave birth ordinarily to males only. In the Mymarids and in *Ootetrastichus* the virgin females gave birth ordinarily to females only, and in the case of the latter the other sex has not yet been seen by us, in observations extending over a year and a half. I may further remark that in the parasites of Dryinidae, *Chciloncirus*, *Echthrogonatopus* and others, the number of males falls far short of the females, when extensive rearings are made.

CLASSIFICATION.

The greater number of species described in this paper belong to the family Encyrtidae, and to the very extensive subfamily Encyrtinae. Australia is remarkably rich in Encyrtids, though comparatively few species have been described thence. In the classification of his tribe Encyrtina, Thomson, whose keen appreciation of minute structural characters is familiar to all who have used his works, employed the structure of the mandibles for the further division of this tribe. Ashmead in his recent classification of the Encyrtinae follows Thomson, separating the genera into tribes, based mainly on these same mandibular differences. So far as the Australian species are concerned I have not been so fortunate as to be able to appreciate these structures at the value assigned to them by the Swedish and American hymenopterists, and I have had considerable doubt as to whether the minute distinctions given are really applicable to

the Australian forms. The difficulties that I have encountered may be realized by any one who will examine the figures of mandibles given by me and my descriptions of other structural characters in the genera here described, and then compare them with the characters given in Ashmead's tables of tribes. Such forms as *Meniscoccephalus* and *Fulgoriidcida*, which have no trace of a third mandibular tooth and would therefore fall in the tribe called Ectromini, have short stout mandibles, shorter and stouter than in many tridentate species, and do not agree in other characters with the Ectromini. Again such genera as *Echthrodryinus*, *Echthrobaccha*, and *Ectopiognatha* are difficult to place, the apex of the mandibles being very different from the ordinary tridentate form, and probably cannot be considered as having more than two real teeth. The difficulty of seeing clearly the mandibular structure is, as Ashmead observes, considerable, and no proper examination can be made in many species, without either opening the jaws, or dissecting them off. In all the species here described except one, in which the mandibles were opened, I have dissected off these appendages (generally from several individuals of each genus) and examined them in various positions as dry objects, as well as mounted in glycerine and balsam. In *Echthrogonatopus*, *Helegonatopus*, *Chalccrinys* and *Chiloncurus* they are nearly alike, and it was not necessary to figure all these. All the figures were drawn under the high magnification of about 240, excluding those of one or two of the large species. The palpi furnish excellent characters in some cases, but I have not been able to examine them in all the genera. The posterior tibiae in *Neocladia* have two distinct calcaria, the shorter being easily visible with a lens. With the possible exception of this genus, I believe all the other Encyrtinae here described should be placed in Ashmead's tribe Mirini, though, as stated, some have only two mandibular teeth, others two more or less distinct ones and rudiments of one or even two internal to these. Cameron has noted a rudimentary second calcar on the posterior tibiae of one of the Mirini, and I have observed a very short one in one or two Australian species, but not I think in any of those described in this paper.

The other parasites present no difficulty as to the place they should occupy. The genus *Ootetrastichus* comes in the tribe Tetrastichini, amongst the genera that have no mesonotal grooved line, but appears to be very distinct from any of these.

SPECIES AND GENERA HERE DESCRIBED OR
NAMED.

ENCYRTIDAE.

ENCYRTINAE.

Meniscocephalus gen. nov.

M. eximius sp. nov.

Fulgoridicida gen. nov.

F. dichroma sp. nov.

Neocladia gen. nov.

N. howardi sp. nov.

Echthrobaccha gen. nov.

E. injuriosa sp. nov.

Echthrodryinus gen. nov.

E. destructor sp. nov.

Ectopiognatha gen. nov.

E. minor sp. nov. et typ. gen.*E. major* sp. nov.

Echthrogonatopus gen. nov.

E. pachycephalus sp. nov.

Helegonatopus gen. nov.

H. pseudophanes sp. nov.

Chalcerinys gen. nov.

C. crinia sp. nov.

Saronotum gen. nov.

S. australiac sp. nov. et typ. gen.*S. americanum* sp. nov.

Cheiloneurus West.

C. szeczyi Ashm.*C. gonatopodis* sp. nov.*C. cnlorodryini* sp. nov.

EUPELMINAE.

Anastatus Motsch.

A. pipunculi sp. nov.

EULOPHIDAE.

TETRASTICHINAE.

Ootetrastichus gen. nov.

O. flavescens sp. nov.

APHELININAE.

Paraphelinus gen. nov.

P. xiphidii sp. nov.

TRICHOGRAMMIDAE.

Pterygogramma gen. nov.

P. acuminata sp. nov.

DESCRIPTION OF GENERA AND SPECIES.

Meniscocephalus gen. nov.

Robust; the head menisciform, the eyes widely separated in front, the ocelli in a triangle with extremely wide base, the posterior ones close to or touching the eye-margins, the sculpture consisting of very large deep punctures. Mandibles short, wide, and with two teeth at the apex. Antennae in the female short and stout, inserted far below the middle of the face, the funicular joints short, and becoming wider towards the club, clothed with short bristly-black hairs; in the male the six funicular joints are subelongate and equal, each constricted in the middle, and bearing above and below the constriction a whorl of long hairs, the pedicel being much shorter than one of these joints; the club on the other hand is one and a half times as long. In the male sex they are inserted much nearer the middle of the face. The mesonotum is about as long as the scutellum and bears appressed white setae; the axillae meet inwardly in the female but not in the male, the propodeum is clothed with conspicuous silvery hairs. Wings without a pattern in either sex, the marginal vein very short (rather longer in the male) the stigmal moderate, the post marginal not (or hardly) developed. Abdomen short and wide, depressed above, subtriangular, the ovipositor slightly exerted, the male genital armature almost entirely so.

For structural characters see Plate XVIII, fig. 7-9.

Meniscocephalus cximius sp. nov.

Head dark blue, the great punctures metallic green, the antennae yellowish, more or less sordid, largely owing to the dense clothing of setae, the club paler than the rest. In the male the antennae, except the scape, are entirely infuscate. Mesonotum dark purplish, opaque, or subopaque, punctured like the head, but not so deeply and coarsely; the scutellum very dull, the axillae touching inwardly in the female, well separated in the male, mesopleura blue, opaque. All the tarsi and the tips of the middle tibiae pale, white or yellowish. Abdomen shining blue across the base. Length about 2 mm.

HAB: Bundaberg, Queensland. An internal parasite of a Jassid.

Fulgoridicida gen. nov.

Head very wide, the hairy eyes extremely large, so that the part between them is very narrow, not more than one-third as wide as one of these; the ocelli are in the form of an isosceles triangle, considerably less wide at the base than high, and the posterior ones are close to the eye-margins. The surface of the front is dull, with excessively minute, dense sculpture. Antennae slender, with simple scape, pedicel longer than the first funicle joint, the funicle itself with six, mostly elongate, joints, the club as long or longer than the three last of these. Mandibles distinctly bidentate at apex, the palpi not examined. Thorax dull, with excessively dense minute sculpture, the axillae touching inwardly. Wings without pattern, hairy, and with very short fringe, a more or less distinct, very narrow, transverse, oblique line extending back from near the marginal vein, the latter very short, the stigmal moderately long, the post marginal not much developed. Abdomen subtriangular, wide, depressed, foveated on each side towards base, the fovea bearing short bristles; the ovipositor shortly exerted.

Male differs by the much more widely separated eyes, the space between these being about equal to the width of one of them; by the elongate funicle joints, mostly twice as long as wide, bearing conspicuous, shortish hairs, the pedicel much shorter than the first funicle joint, the club about equal to the two preceding. The head itself is much more decidedly menisciform, the ocelli are placed in the position of the angles of an almost equilateral triangle. Plate XX, fig. 3.

Fulgoridicida dichroma sp. nov.

Head dull black, scape of the antennae yellowish, or brownish yellow, the rest sordid. Thorax opaque, black with slight greenish or bluish tinge, tip of scutellum more brightly blue or green in some aspects; mesepisternum more or less brownish or piceous; legs yellow, the anterior femora more or less brown or dark. Abdomen of male very short and wide, blackish; that of the female yellow or brownish, dark apically and along the sides to near the base. Antennae of male sordid yellowish, the elongate funicle joints subequal, the pedicel much shorter than the first of these, and apparently darker than the other joints. Length $1\frac{1}{4}$ mm.

HAB: Cairns Queensland; bred from eggs of a species of *Platybrachys* or allied genus.

Necoladia gen. nov.

Head transverse, menisciform, inflexed, bearing coarse shallow punctures, the space between the eyes wide, the ocelli in a triangle much widest at base, the posterior ones being rather near to the eye-margins, only about half as far from these as from the anterior ocellus. Maxillary palpi long, 4-jointed, the first and third sub-equal, the second much longer than either of these, the fourth curved and very elongate, much longer than the second, and clothed with long hairs. Mandibles broad and apparently simply pointed in one aspect, but in others seem to have three microscopic teeth at apex. Antennae in front view of head inserted well below the middle; those of the female simple, the scape long and slender, the pedicel rather shorter than the first of the six funicle joints, which when seen at their widest, gradually decrease in length and increase in width to the sixth, which is transverse, the club oval rather longer than the two preceding joints; the scrobes short and rather indefinite. Pronotum widely rounded in front; mesonotum about as long as the axillae (which meet inwardly) and the scutellum, the latter much deflexed apically. Wings with a pattern in the female (but uniformly clear in the male) the stigmal vein long, the marginal very short, the post marginal longish in the female, and rather longer still in the male. Middle tibiae armed at the apex with denticles as also are the inner margins of the tarsi; posterior femora on the lower side, the posterior tibiae and basal joint of tarsi on the upper side foliaceously dilated, the tibiae with two distinct spurs. Abdomen small and generally distorted after drying, the ovipositor when exerted short and recurved like that of a *Pipunculus* fly. The male differs chiefly in its clear wings, much less dilated hind legs and the six long branches of the antennae, which are inserted higher up on the head.

Plate XVIII, fig. 1-6 and fig. 10.

Necoladia howardi sp. nov.

Black with various metallic reflections, the antennae with the scape ferruginous, the rest more or less obscure, becoming black or dark fuscous towards the tip, as are the branches in the male. Front and middle legs more or less yellowish-brown in the female, the middle tibiae darker, the base of their tarsi being pale, the tips blackish. Posterior legs dark, the apex of the femora white. In the male the legs are darker, but both sexes vary

in this respect. Wings in the female with the apical half fuscous, paler near the tip, and containing two white spots, opposite one another, the upper placed just beyond the stigmal vein, while there is a narrow transverse fuscous band before the middle of the wing, and a more or less evident longitudinal one, extending from near the base along the lower margin of the wing. Head dull, green or purplish, and with large shallow punctures, the lower parts of the face often more shining, the mouth-parts pale. Thorax somewhat shining, distinctly but not brightly metallic, clothed with short black hairs, with indefinite surface sculpture, and excessively fine puncturation; scutellum above very dull, densely sculptured, the decurved apex smooth and shining. Abdomen black, purplish at base. Length 2-5 mm.

HAB: Bundaberg, Queensland; an internal parasite of a common Jassid. Named for Dr. L. O. Howard, who, some time since, published a very lucid paper on the Encyrtines with branched antennae, and a most interesting account of the biology of the Chalcididae. Koebele's number for this species is 2322.

Echthrodryinus gen. nov.

Head much wider than the anterior part of mesonotum, its outline subsemicircular, the space between the great eyes very narrow, not more (where narrowest) than half as wide as one of these; the posterior ocelli close to the eye-margins, and much more remote from the anterior one than from one another, the face inflexed. Eyes clothed with very short pale hairs. Mandibles with two small, but distinct, and more or less acute teeth, and an inner apical truncation with its angle sub-rectangular, but not forming a distinct tooth. Antennae inserted near the mouth, the scrobes elongate and convergent above, the scape simple, the six funicle joints short, and not differing much in length, but the apical ones wider than the basal; the club with three subequal joints, and as long as the three or four preceding joints of the funicle; the pedicel elongate, as long, or longer than, the two first joints of the funicle, but not much thickened. Maxillary palpi short, the second and third joint extremely short, the fourth distinctly longer than either of these. Face between the anterior ocellus and the great facial impression nearly smooth, but with some sparse and very faint punctures. Mesonotum finely punctured and somewhat shining, the scutellum excessively densely sculptured except at apex, the axillae meeting inwardly. Wings with a very short marginal fringe,

the marginal vein very short, the stigmal longish and clavate, the post-marginal indistinct and little developed. An oblique, hairless, transverse line, narrow above, extending from or near the marginal vein, is easily seen. Abdomen short, triangular, about as long as the thorax, concave above, the ovipositor very slightly exerted, the hypopygium not prominent. The general appearance of this genus is rather similar to that of *Parencyrtus* Ashm.

Male differs greatly from the female in the comparatively small and widely separated eyes, the ocelli in an almost equilateral triangle, and the very dense surface sculpture of the head, and the more hairy antennae, with small club-joint; the mesonotum, scutellum and head are similarly dull and densely sculptured.

Plate XIX, fig. 4.

Echthrodryinus destructor sp. nov.

Head black, the mesonotum blue, metallic, in some aspects shining, very finely punctured, and clothed with short black hairs; scutellum dull at base and with very dense microscopic sculpture, its apex in some aspects shining and brilliantly green or blue, and with some longish dark hairs; thorax beneath, and pleura black, not or hardly metallic; abdomen brightly metallic green on the basal portion. Wings hyaline, without markings, uniformly hairy, except at base, venation obscure brownish, or brownish yellow. Antennae sordid-yellowish, clothed with short hairs. The whole of all the legs pale, yellowish. Length 1 mm.

HAB: Queensland, widely distributed; parasitic on larvae of *Ncodryinus*, *Paradryinus* etc. Koebele's number 2232, under which are also placed specimens of the genus *Echthrogonatopus* and *Chalcerinys*.

Echthrobaccha gen. nov.

In general appearance very like the preceding genus, but the head is perhaps rather more menisciform; the front between the eye-margins is much wider, the width, in a front view of the head, through or near the anterior ocellus is about equal to the width of one of the eyes. The system of large punctures on the head is much more distinct and the punctures larger, though not dense, and becoming sparser towards the facial impression. The

maxillary palpi are longer, the terminal joint much more elongate. The ocelli are more nearly in the position of the angles of an equilateral triangle, the posterior ones being well-separated from one another, but not much distant from the eye-margins. In the wings the marginal vein is rather longer. The mandibles do not differ much from those of *Echthrodryinus*, nor can the antennae be considered to present generic distinctions.

Plate XIX, fig. 2.

Echthrobaccha injuriosa sp. nov.

Head black, faintly metallic, with evident large, but shallow, punctures scattered over the front, and most numerous about the ocelli; funicle joints of antennae increasing slightly and gradually in width from the second to the sixth. Mesonotum quite shining in some aspects, finely but distinctly punctured, and clothed with short dark hairs, its colour black with greenish metallic tint. Scutellum dark at base, and finely punctured; it is clothed with short hairs, and in addition bears a few erect, long ones, the apical portion is in certain aspects shining and brilliant metallic green in colour. Mesopleura black with purplish lustre. Wings hyaline and for the most part uniformly clothed with very short dark hairs; a wedge-shaped, transversely-oblique, hairless line does not reach the marginal vein. Abdomen triangular, with purplish metallic lustre. Antennae sordidly yellowish, the club generally entirely dark. All the tibiae and tarsi yellow, the front and hind femora generally largely black or dark. Length 1.25 mm.

HAB: Cairns, Queensland; parasitic on *Baccha*.

Ectopiognatha, gen. nov.

Head moderate, lower part of face much inflexed, frontal space between the eyes moderately wide, probably about as wide as one of these organs, the collapsed state of which renders exact measurements uncertain. Short pale hairs are present on the eyes, but are difficult to see owing to the condition of these being as above stated. The front has a dense microscopic sculpture and more or less evident traces of faint sparse punctures. Ocelli apparently in a subequilateral triangle, the posterior near to, but not touching, the eye-margins. Mandibles broad, with two distinct but minute teeth, and two inner angulations (or still more minute teeth?), the maxillary palpi very

short, four-jointed. Antennae with dilated scape, elongate pedicel, 6-jointed funicle, and elongate, ovate club, as long as the three or four preceding joints; second and third funicle joints small and short. Mesonotum with excessively fine surface sculpture and very feeble scattered punctures, which bear distinct hairs, the axillae not touching inwardly. Wings with short marginal fringe, without markings, evenly hairy, except on a basal portion, where the hairs are sparse, an oblique bare line running from the marginal vein being perceptible. Marginal vein very short, stigmal moderate, post-marginal little developed.

Abdomen short, subtriangular, depressed above, and on each side towards the base with a fovea, which bears very long setae, often so closely appressed as to be only visible on careful examination. Ovipositor not, or scarcely, exerted.

Plate XIX, fig. 6.

Ectopiognatha minor, sp. nov.

Head metallic green, the dilated scape of antennae black, the rest pale yellowish, except the apical half of club, which is dark; the mesonotum brilliantly metallic green or brassy, pilose, shining, the scutellum usually darker, more coppery; the mesopleura shining purplish; legs almost entirely whitish, or tinged with yellow. Abdomen yellowish, bordered with dark. Length .75 mm.

HAB: Cairns, Townsville, and elsewhere in Queensland; bred from eggs of *Siphanta*. Koebele's number 2251.

Ectopiognatha major, sp. nov.

Head in front coppery, more brassy above, dull, with dense minute sculpture, the scape of the antennae black, the rest pale, the apical part of club subinfusate. Mesonotum slightly shining in some aspects, very faintly sculptured, blue-black; scutellum dull, hardly metallic, except at tip, where in some views it is shining coppery. Legs pale, whitish. Abdomen yellowish, with a dark border. Length .75 mm.

HAB: Cairns; Queensland; a single example bred from the same batch of eggs that produced the pair of *Fulgoridicida dichroma*.

Echthrogonatopus gen. nov.

Head shaped much as in *Echthrodryinus*, the face inflexed, the eyes large, the space, where least, between them, much less than the width of one of these; face between the eyes with very minute surface sculpture, the lateral ocelli near the eye margins, the eyes themselves sparsely hairy, the hairs not very easily seen. Antennae inserted far below the middle of face, scrobes elongate, scape simple, elongate, and funicle six-jointed, the funicle joints wide and short, the club large and about as long as the funicle, the pedicel about as long as the three basal funicular joints. Mandibles distinctly tridentate, the maxillary palpi moderately long, 4-jointed, the apical joint the longest, the labial palpi with three short joints, which together are about half as long as the maxillary. Mesonotum with short white decumbent hairs or setae: the axillae touching, or nearly touching, inwardly. The scutellum has a very dense sculpture and is extremely dull for the most part, and contrasts strongly with the metallic and finely punctured mesonotum. The wings have an obliquely transverse, hairless line (sometimes incomplete or interrupted) extending from the stigmal vein, which is short and clavate, the post marginal vein also very short, the marginal always longer than the stigmal, sometimes two or three times as long, marginal fringe short.

Male differs in its much smaller eyes so that the front between these is consequently wide, wider than one of the eyes. The face is metallic like the mesonotum, the antennae are much more elongate than those of the female, the pedicel subequal to the first of the six funicle joints, all of which are elongate; the club subequal to the two preceding.

This genus is here made to include two species, which, however, according to the views of Foerster and Ashmead would be generically separated, owing to the difference in the shape of the head, the length of the marginal vein and the position of the ocelli.

Plate XX, fig. 1 and 2.

Echthrogonatopus exitiosus, sp. nov.

Female: head with greenish or other metallic lustre, the front microscopically sculptured, rougher about the ocelli, and with traces of larger, shallow punctures. Antennae black, the club wide, flattened, subequal to the funicle. Mesonotum somewhat

shining-aeneous in some aspects, finely punctate and bearing depressed white hairs; the scutellum black, dull, but with the extreme apex conspicuously metallic in some views; mesopleura purplish-black. Abdomen shining, brassy, coppery or purplish metallic on the basal part, black apically; the legs pale, yellowish.

Male in addition to the generic characters differs from the female in the pale colour of the scape, the other antennal joints being more or less sordid and bearing long hairs directed apically. Length $\frac{7}{8}$ mm.

HAB: Queensland generally; Brisbane, Cairns, Bundaberg; parasitic on *Gonatopus* and allied genera.

Echthrogonatopus pachycephalus, sp. nov.

General appearance quite like the preceding, but the head is rather strongly incrassate, the space between the great eyes extremely long and narrow, the ocelli forming an isosceles triangle, twice as high as its basal width, and the marginal vein is shorter and thicker.

Head with very dense and fine microscopic sculpture and with evidence of a few large, but very feeble, punctures in the region of the ocelli, the antennae yellowish or testaceous, not differing much in structure from those of the preceding. Mesonotum aeneous, shining, and with very dense sculpture. Legs pale yellowish. Abdomen shining metallic green at the base, elsewhere purplish black. Length $\frac{2}{3}$ mm. Male not known.

HAB: Ohio, U. S. A.; bred from cocoons of *Gonatopus* or some allied form, collected by Koebele.

Heclegonatopus, gen. nov.

In general appearance and structure excessively like *Echthrogonatopus exitiosus*, but the male differs at once by the funicle having only five joints, which are very elongate, the pedicel being much shorter than the first of these; the female by the small club, only about as long as two or three preceding joints; and both sexes by the longer stigmal vein and short marginal, the latter being not or hardly longer than the former.

Plate XX, fig. 4.

Helegonatopus pseudophanes, sp. nov.

Head black, dull, with slight bluish or purplish tint, the front with excessively minute surface sculpture and some faint larger punctures in the region of the ocelli. Antennae for the most part sordid testaceous or fuscous, the funicle joints sub-elongate. Mesonotum brassy or greenish, shining in some aspects, and with the clothing of white hairs as in the preceding species; scutellum much as in *E. exitiosus*, and with the apex very brightly metallic in some aspects; mesopleura deep black or faintly purple-tinged. Legs entirely pale, yellowish. Two basal abdominal segments bright metallic green, the rest black or purplish-black. Length 1 mm.

This description is made from the female, as I have seen only one male, which was not in good condition, but enabled me to make out the antennal character described under the genus.

HAB: Ohio, U. S. A.; bred from cocoons of *Gonatopus* or allied forms, sent by Mr. Koebele.

Chalccrinys, gen. nov.

Plate XIX, fig. 1.

Differs from either of the two preceding genera in the metallic scutellum which is nearly similar in sculpture to the mesonotum, the former not being conspicuously dull and dark compared with the latter; the wings have an exceedingly short marginal vein, a longish stigmal, and the post marginal hardly developed. In the male the antennal structure is quite different from that of either *Echthrogonatopus* or *Helegonatopus*, from the latter in the six-jointed funicle, from the former in the very short pedicel, greatly shorter than the large basal joint of the funicle, and from either by the peculiarly former scape, as figured (Pl. XIX, fig. 5.) The antennae of the female much resemble those of *Helegonatopus* and are utterly different from those of *Echthrogonatopus*. The front between the eyes in the female is wider than in either of these genera, and in the male is very wide, the eyes being quite small compared with those of the female. The mandibles are tri-dentate, with the inner tooth smaller; the palpi I have not been able to examine. The axillae appear to be slightly separated. The eyes are sparsely hairy.

Plate. XIX, fig. 5.

Chalcerinys crimia, sp. nov.

Metallic green, or in parts brassy-yellowish, the mesopleura and abdomen black, at most slightly metallic, antennae yellowish or testaceous, more or less sordid, legs yellow except tips of tarsi. Head densely and minutely sculptured, and with evident traces of larger, very feeble punctures; posterior ocelli nearer to the eye-margins than to one another. Thorax with very dense, minute sculpture, the mesonotum and scutellum with similar and inconspicuous pale pubescence, the scutellum smoother and more shining apically. Abdomen subtriangular, depressed above. Male like the female, but with the eyes very widely separated and with long antennae, the scape, and first joint of funicle distinctly marked with black, the club slender and elongate, dark, the pedicel small, dark coloured or largely so. Length $\frac{3}{4}$ to 1 mm.

HAB: Sydney, N. S. W., Childers and Bundaberg, Queensland; parasitic on small wingless Dryinidae of the genus *Gonatopus* or its allies.

Saronotum, gen. nov.

Of rather slender and elongate form; head in front view sub-elongate with the eyes of moderate size and diverging apically, the front with dense microscopic sculpture of the surface and sometimes with very faint punctures in addition. Ocelli in an isosceles triangle, the posterior near to the eye-margins and also nearer to one another than is either to the anterior ocellus. Antennae with simple elongate scape, and gradually clavate to the apex, the pedicel and basal funicle joints much less wide than the apical ones, the club small, the pedicel shorter than the first joint of funicle. Mandibles tridentate. Maxillary palpi with very long apical joint, subequal to the other three joints together. Labial palpi short, the middle joint extremely short. Mesonotum with appressed pubescence, the scutellum with erect tuft of bristles. Wings infusate on more than the apical half, the submarginal vein much decurved before reaching the marginal, the latter long, the stigmal rather short, the postmarginal little developed. The basal third of the wings is nearly bare and from the marginal vein a very narrow, oblique, bare line runs back into this portion. Hind legs long and slender. Abdomen rather elongate, pointed at the apex, depressed above, the ovipositor not (or hardly perceptibly) exerted. Male not known.

Appears to me to be allied to the species of *Cheiloncureus*, that are parasitic on Dryinids, but the elongate form and the ovate or subelongate head, as viewed from the front, will readily separate it.

Saronotum australiac, sp. nov.

Head dull, submetallic, the face below the antennae and the scape testaceous or ferruginous. Mesonotum somewhat shining, aeneous, clothed with appressed, short, white hairs; scutellum yellow, the parapsides browner; propodeum very smooth and shining, brassy; mesopleura purple, metapleura with white hairs. Legs brownish-yellow or testaceous, the middle and posterior tibiae and the posterior femora dark, blackish or piceous for the most part. Abdomen shining brassy at the base, the rest brown. Wings with a small basal cloud, and one over more than the apical half, leaving, however, the extreme tip and two minute obscure spots (one at the tip of the marginal vein, the other nearly opposite this) more or less whitish. Length $1\frac{3}{4}$ mm.

HAB: Bundaberg, Queensland; parasitic on *Pseudogonatopus*.

Saronotum americanum, sp. nov.

Extremely like the preceeding, but distinguished at once by the dark parapsides and anterior part of the scutellum. Head piceous black and very faintly metallic, face above the antennae with the shallow punctures quite noticeable, and more numerous than in the preceding; scape of antennae and face below the antennae brownish. Mesonotum somewhat shining in some aspects, but the surface generally appearing dull from the dense clothing of white hairs; scutellum ferruginous, dark along the anterior margin, as also are the parapsides; mesopleura, propodeum, legs and wings as in *S. australiac*.

HAB: Ohio, U. S. A.; probably rare as only one example was bred from the many Dryinid cocoons sent by Koebele.

Cheiloncureus Westwood.

Cheiloncureus swezeyi Ashmead.

Cheiloncureus swezeyi Ashmead, Ent. News. Philad. XIV, p. 193.

HAB: North America; a very common parasite of *Dryinus ormenidis*, Ashm. Hundreds if not thousands of specimens emerged from the cocoons of that species, collected by Mr. Koebele in Ohio and elsewhere.

Cheiloncirus gonatopodis, sp. nov.

Ferruginous or yellow, the club of the antennae, and usually the basal part of the hind tibiae, blackish or infuscate. Ocelli placed on a submetallic area and forming a triangle with narrow base, but hardly twice as high as wide at the base. Eyes with a very few, short and indistinct hairs. Scape of the antennae very slender, cylindrical. Mesonotum with a basal transverse blue band, which is silvery from the clothing of white setae, that it bears; propodeum at the sides dark. Wings infuscate on more than the basal half, except that the tips and around the margins they are nearly hyaline; a darker transverse mark, bearing long black setae, is placed near the base of the marginal vein. Abdomen dark at the tip and also so marked on each side at the extreme base; behind the latter marks there are on each side of the body some very long black setae. Length 1 mm. (Plate XIV, fig. 3.)

HAB. Queensland, generally distributed; Cairns, Kuranda, Bundaberg, Childers; parasitic on *Pseudogonatopus*, *Echthrophax*, etc. Koebele's number 2264.

Cheiloncirus chlorodryini, sp. nov.

Very like *C. gonatopodis* and *C. szezeyi* in general appearance, but may be at once known from the former by the absence of the metallic hind-margin to the mesonotum, which however has the same silvery clothing.

Scape of antennae well rounded on the lower side and distinctly dilated. Eyes in a front view of the head strongly converging anteriorly, so that the space between them is, where least, excessively narrow, not very much wider than an ocellus. The ocelli are placed in the form of an excessively elongate triangle, the anterior one being extraordinarily remote from the posterior. The hairs on the eyes are excessively short, but numerous. The scape of the antennae is yellowish, its lower margin dark; the pedicel and funicle entirely white, the club black. The wings are as in *C. gonatopodis*. Length $1\frac{1}{2}$ mm.

HAB: Kuranda, Queensland; taken out of the cocoons of *Chlorodryinus*.

Anastatus Motsch.

The single species here described agrees very well in most respects with *Anastatus* reared from the eggs of Locustidae. The outer calcar of the posterior tibiae is minute compared with the inner, but nevertheless quite visible without the use of a compound microscope. The eyes are collapsed, and I cannot be sure whether they are bare or hairy, but I believe the former to be the case. We should therefore place this insect, following Ashmead's tables, in the genus *Calosoter* Walk. and far from *Anastatus*, but in these tables there is confusion as regards the condition of the eyes, *Solindenia*, a form with very large, hairy eyes, being placed in the bare-eyed group, and again in those tables there is confusion as to the condition of the axillae. Cameron remarks not only that his genus *Solindenia* has hairy eyes, but also that European *Calosoter* has the same, and that the middle tarsi of the latter are not setose. For the present, therefore, I refer this hyperparasite of leaf-hopper to the common genus *Anastatus*, to which at least it is closely allied.

Plate XX, fig. 5.

Anastatus pipunculi, sp. nov.

Head and face reddish purple, the vertex with short black hairs; the face with white, short, but conspicuous, pubescence; the surface dull, rough with indefinite sculpture. Antennae subclavate, entirely dark, metallic in some aspects. Eyes divergent anteriorly, the ocelli in a triangle much widest at the base, the posterior near the eye-margins. Thorax blackish-purple, the mesonotal ridges, sharp, parallel, the clothing white and conspicuous and, like the sculpture, very similar to that of the face. Wings fuscous, hairy, a hyaline, hairless, narrow, slightly curved, transverse band beneath the marginal vein, and a clear space at the base of the wing. Stigmal vein long, but less so than the postmarginal. Tarsi more or less yellowish-brown, the posterior darker, nearly the whole of the hind legs being blackish as is the greater part of the middle and front tibiae, their femora also being largely dark brown or blackish. Abdomen purplish black, depressed on the basal two-thirds, and with a transverse subbasal white band; the three segments following this subequal in length. Ovipositor hardly exerted. Length 2 mm. when scarcely fully extended.

HAB: Bundaberg, Queensland; parasitic on *Pipunculus cinerascens*.

Ootetrastichus, sp. nov.

Head strongly transverse, fully as wide as, or wider than, the thorax, where this is widest, the ocelli in a slightly curved line (or extremely wide triangle) the posterior being very much more distant from one another than is either from the anterior. Antennae with seven distinct joints and a ring-joint, which under high powers of the microscope appears composite, as if compounded of two or three fused joints; the scape slender and long, the pedicel elongate, the first funicle joint very long, narrowed on its apical part, the two next funicle joints shorter than the first, but elongate; the next joint is shorter and wider and, in some aspects at least, appears to belong to the club, as its apex is closely applied to the base of the apical antennal joint; the latter is without any distinct divisions, and is probably the true club. Mesonotum without a grooved line; the scutellum with four, two dorsal and parallel, each placed just within the setigerous tubercles, the other two lateral. Wings evenly hairy, marginal vein fully as long or rather longer than the submarginal, and three or four times as long as the stigmal, the apical fringe longish and continued round the costa to the marginal vein, and on the opposite margin half-way to the base. Abdomen longer than the head and thorax, depressed above, acuminate, the ovipositor slightly exerted.

Plate XX, fig. 8.

Ootetrastichus beatus, sp. nov.

Pale yellow or greenish yellow with the following parts dark fuscous or black: Two subcontiguous spots on the mesonotum in front, extending on to the pronotum and there connected. One at each posterior hind angle of the pronotum. The anterior angles of the parapsides and of the anteriorly-produced axillae, a line and one or two obscure marks near the tegulae; four microscopic setigerous dots on the scutellum, one pair of which are before the middle, the other pair at the hind margin; propodeum towards the sides, four or five pair of lateral dorsal spots on the abdomen (a pair to a segment), the ovipositor and the tip of the tarsi. In certain lights these dark spots show metallic green reflections. Thorax above with very fine microscopic longitudinal rugulosity; basal abdominal segments with two or three setigerous dots on each side, the apical ones with a complete transverse row. A long sinuate seta on each side of the abdomen near the tip, which is sparsely pilose. The markings

are subject to slight variations only. Length variable, generally about 1 mm.

HAB: Queensland generally, also Fiji; on leaf-hoppers' eggs. Koebele's number 2230.

Paraphclinus, gen. nov.

Like *Aphclinus* in most respects, but differs from the rather numerous species known to me in the narrower, more elongate wings, the apex of the stigmal vein being situated just about the middle of their length, and in the generally more slender and elongate body, the abdomen twice or more than twice as long as its greatest width and somewhat acuminate. The ocelli are placed in the form of a very wide triangle, the posterior ones close to the eye margins. The antennae are 6-jointed and dissimilar in the sexes; in the female the club longer than the three preceding funicle joints, the first of these very short, the second also short but longer than wide, the third about twice as long as the preceding and subequal to half the club, the pedicel elongate. Male with elongate pedicel, followed by two extremely short joints, almost like ring-joints, the following (or third funicular) joint very elongate much more so than in the female, not very much shorter than the elongate club, which is not very different from that of the female.

Plate XX, fig. 6.

Paraphclinus xiphidii, sp. nov.

Yellow, the head more ferruginous, the abdomen at the sides with indefinite dark lateral spots, one on each side of the segments, which are subequal in length; mesothorax with a row of setae on either side of the middle line, parallel to one another; two in a line on each side of the scutellum, wider apart than those on the mesothorax; a few other setae on the thorax exterior to those already mentioned; clear oblique hairless line of front wings very distinct, extreme base of wing also nude, the apical fringe not very short. Described from specimens in balsam. Length 1 mm. or more.

HAB: Hawaiian islands; parasitic in eggs of *Xiphidium varipenne* Swezey.

Pterygogramma, gen. nov.

Head strongly transverse, ocelli in a triangle with very wide base, the posterior ones touching the eye-margins. Antennae apparently six-jointed, counting an extremely short ring-joint, the three terminal joints apparently form a widely dilated but pointed club, the terminal joint in some aspects almost spinose in appearance; pedicel widely ovate, the scape also apparently somewhat dilated. Owing to the thinly laminate character of the joints, the antennae are subject to much distortion. Scutellum rather less long than the mesonotum; the metanotum pointed posteriorly and produced over the base of abdomen; the latter elongate and acuminate, twice as long as the thorax, and apparently laterally compressed somewhat like some Mymaridae; the ovipositor exerted for a length nearly equal to the hind tarsi. Wings with the lines of hairs rather confused, and about 7 or 8 in number, the apical fringe not very long.

Plate XX, fig. 7.

Pterygogramma acuminata, sp. nov.

Head and mesonotum ferruginous, or brownish, the latter with a pair of fuscous marks in front; scutellum, and rest of thorax above, pale yellow; abdomen black. Wings more or less fuscous on the basal half, the dark colour tending to form three dark areas. Tarsi and the tibiae more or less pale yellow, the femora for the most part blackish or infusate, the middle and posterior pair pale at base and apex. Length $\frac{3}{4}$ mm. The specimens were badly preserved and mounted in balsam.

HAB: Bundaberg, Queensland; bred from eggs of Jassid embedded in twigs of Eucalyptus. Koebele's number 2298.

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DESCRIPTION OF PLATES.

Plate XVIII.

1. *Ncocladia howardi*, female.
2. Mandible of the same in two aspects.
3. Maxillary palpus.
4. Antenna of male.
5. Hind leg of female and male.
6. Part of middle leg of female.
7. *Meniscoccephalus eximius*, wing.
8. Mandible of the same.
9. Antenna of female of the same.
10. Part of neurulation of *Ncocladia* male, very greatly magnified.

Plate XIX.

1. *Saronotum australiae*, wing, antenna, maxillary and labial palpus, and mandible; all from female specimen.
2. *Echthrobaccha injuriosa*, wing, maxillary palp, mandible and antenna of female.
3. *Cheiloncureus gonatopodis*, antenna, maxillary palp, mandible, and part of neurulation of female.
4. *Echthrodryinus destructor*, maxillary palp, mandible, funicle and club of antenna, and part neurulation of female; antenna of male.
5. *Chalcerinys eximia*, wing, antenna, and part neurulation of female; whole antenna of male, and scape and pedicel in a different position.
6. *Ectopiognatha minor*, wing, part neurulation, mandible, maxillary palpus, and antenna of female.

Plate XX.

1. *Echthrogonatopus exitosus*, antenna of male and female; wing, part neurulation more enlarged, mandible, maxillary and labial palpus of female.
2. *Echthrogonatopus pachycephalus*, antenna, part of neurulation, and head of female; the head of *E. exitosus* figured alongside for comparison.
3. *Fulgoridicida dichroma*, antenna, part neurulation, and mandible of female.
4. *Helegonatopus pseudophanes*, antenna of male and female, and part neurulation of latter.
5. *Anastatus pipunculi*, antenna, wing and posterior calcaria of female.
6. *Paraphelinus xiphidii*, wing and male and female antenna.
7. *Pterygogramma acuminata*, wing and antenna of female.
8. *Ootetrastichus beatus*, antenna in two positions and wing of female.

Perkins del.

Perkins del.

Perkins del.

REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

**Leaf-Hoppers and their
Natural Enemies**
(*PT. IX. LEAF-HOPPERS—HEMIPTERA*)

By ^{George} G. W. KIRKALDY

HONOLULU, H. T.
FEBRUARY 3, 1906

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FEBRUARY, 1906

LETTER OF TRANSMITTAL.

Honolulu, T. H., January 17th, 1906.

To the Committee on Experiment Station, H. S. P. A., Honolulu, T. H.:

Gentlemen:—I, herewith, submit for publication the ninth part of the Bulletin on "Leaf-Hoppers and Their Natural Enemies," which deals with the Leaf-Hoppers themselves, and has been prepared by Mr. G. W. Kirkaldy, Assistant Entomologist of this Division.

Yours obediently,

R. C. L. PERKINS,
Director, Division of Entomology.

GENERAL INTRODUCTION.

The Hemiptera, or Rhynchota, are readily distinguished from all other orders of insects by the structure of the mouth, which consists of a grooved sheath, usually in the form of an elongate proboscis, in which lie enclosed four setae; in some respects the Order is perhaps the most isolated of all true insects, and is certainly in many more, one of the most interesting.

As Dr. Sharp has very truly said, "there is probably no order of insects that is so directly connected with the welfare of the human race as the Hemiptera; indeed, if anything were to exterminate the enemies of Hemiptera, we ourselves should probably be starved in the course of a few months."

It is not alone the exhaustion consequent upon the rapid draining of the plant's juices by the Hemipteron's almost microscopic mouth-setae, that is so deleterious; it is the addition of the horde of fungus spores which often subsequently attack the wounded surface, and quickly multiplying, penetrate into the tissues of the plant, causing decay and death.

Here should be noted a common error among entomologists who are not specialists in Hemiptera. The proboscis-like rostrum (*labium*) probably *never* penetrates the tissues, neither vegetable nor animal, unless these be already lacerated by the setae; it is simply a sheath to protect the delicate piercing organs, and more or less of a fulcrum to steady their operations.

Such injurious Hemiptera as the Chinchbug (*Blissus leucopterus*) the Bed-bug (*Clinocoris lectularius*) the Cotton Stainer (*Dysdercus suturellus*), the Coffee-blight (*Helopeltis antonii*), the Plantlice (*Aphidac*), the White flies (*Aleyrodidae*) and the Mealy bugs and Scales (*Coccidac*), are household names and to these must be added the Sugar-cane Leaf-hopper (*Perkinsiella saccharicida*).

Six hundred million dollars would be an exceedingly conservative estimate of the values of the damage occasioned all over the world each year by the depredations of the Hemiptera, taking everything into consideration.

And one cause of this devastation is the extraordinary rapidity of increase, which were it not for restraining parasites and predators, would in a year or two leave not a single green leaf on the earth. Osborn estimates that in North America, one-

fourth, if not one-half, of all the grass growing annually is destroyed by leaf-hoppers.

The calculations of Reaumur and Huxley regarding the increase of parthenogenetic Aphidae are classic; Reaumur thought that one Aphid might be the mother of 5,904,900,000 in one month, while Huxley supposed that the tenth brood alone of a single Aphid—if *all the members survived*—would contain more ponderable substance than half a million of stout men. Buckton, however, shows that this is much underestimated and calculates that at the expiration of 300 days, the progeny of one Aphid (each Aphid producing 20 only) would be the 15th. power of 210, which is the almost inconceivable number of 17,000,000,000,000,000,000,000,000,000! and this, I believe, is really considerably underestimated.

In comparison with these stupendous figures, the generation of the cane leaf-hopper sinks into insignificance, but taken by itself is sufficiently serious.

It is very difficult to base calculations on this extraordinarily variable insect in respect of the number of eggs deposited, and the length of time taken for their metamorphoses, but supposing each hopper to lay only 50 eggs, (the sexes to be about equal) and there to be but 6 broods in the year, then the undisturbed progeny of one impregnated female would amount in one year to very little less than 500,000,000.

As an offset to this, there are but few beneficial Hemiptera. The predaceous Reduviidae often attack our friends and foes indiscriminately, for example it seems a matter of indifference to *Zelus peregrinus* whether it seizes the destructive *Perkinsella* or the friendly *Coccinella*. Certain Coccidae exude merchantable wax and others provide formerly important dyes, while certain waterbugs furnish food for game and cage-birds or even to some races of man, but the total value is insignificant.

BIOLOGICAL SURVEY.

(a) LIFE HISTORIES OF HOPPERS.

Compared with the Life Histories of Hymenoptera, Diptera, and certain Coleoptera, for example, those of the leaf-hoppers are, as a rule, of small interest.

The outward form, at least, is generally, in the nymphal instars, very similar to that of the adult, the latter differing principally in maturation of the organs of flight and reproduction, together with an increase in the number of tarsal segments, and modifications, mostly slight, in the form of the head.

There is also comparatively little scope for multifariousness in the *habits* of the leaf-hoppers. Some are abnormal, others live among grasses and lowly herbage; some in dry pastures, others in reedy margins of lakes and streams. Many are attended more or less assiduously by ants, a few are found actually associated with the latter in their nests, though their role there is unknown. Some are solitary, other herd in flocks, among the most curious of the latter being such genera of the Derbinae as *Philadelphica* and *Sardis* which sit on the undersurface of leaves in ordered rows with their elongate tegmina raised perpendicularly over the back.

The different superfamilies may be easily recognized apart, in the nymphal instars as in the adult state. The Fulgoroidea are extraordinarily sensorized, the head being almost always furnished with many specialized sensory pits, these often occurring also on the nota, tegminal pads and even on the abdomen. I believe that the number and disposition of these organs will prove of great value in future classification. The genae, antennae, etc., are much as in the adult.

In the other superfamilies the pits are apparently entirely absent, though there are sometimes simple, scattered piligerous pits on the abdomen. The Cicadoidea have the anterior femora greatly thickened and spinose. The nymphal Tetigonioidea partake of the general characteristics of the adults, tho in the Membracidae, many nymphal forms are very strongly granulate. These granulations, however, not being pierced or piliferous. (Pl. XXIV, figs. 10-12.)

(1). Tetigoniioidea.

Tetigoniidae: Osborn and Ball are the only authors who have paid much attention to the metamorphoses of this family, having worked out in part many of the North American graminicolous species.

The ova seem to be always elongated, subcylindric, and are deposited on the stems under the leaf-sheaths or in the leaves of the food-plants.

Omitting of course the usual development of the tarsi from two segments to three, of the nota and flight organs, and the genitalia, the *Tetigoniidae* seem to alter exceedingly slightly during their metamorphoses, the head being the principal seat of change. In many forms in which the head is short and more or less transverse in the adult, it is considerably produced and sometimes more or less foliaceous in the nymphs; I would instance *Epipsychidion epipyropis* (Pl. XXIII fig. 6) from Australia, bred up by Koebele and Perkins.

In *Xerophloca viridis*, the nymphal vertex is more angulate anteriorly, while in *Euacanthus acuminatus* the almost rectangular, adult vertex is very strongly produced before the eyes in the nymph, being as long as wide, anteriorly rounded and distinctly hairy.

The complete metamorphoses of the dimorphic *Dorycephalus platyrhynchus* are described and figured by Osborn and Ball, the lengthening and changes in form of the head being shown.

In some *Agalliinae* the nymphs seem to foreshadow those of the *Membracidae*. *Agallia 4-punctata* and *A. novella* (as figured by Osborn and Ball) have the tergites in profile serrate, and the former has two subhorizontal, apically truncate, capital processes, while the adults in *Pediopsis* have the vertex deeply angulately emarginate basally, this being truncate in the nymphs. The nymphs, moreover, of certain American and Australian forms are quite hairy.

The metamorphoses (partially or complete) are shown by Osborn and Ball of the following *Tetigoniids* of interest to workers of the Australian fauna, viz: *Parabolocratus viridis*, *Phrynor-morphus (Athysanus) obtutus*, *Deltocephalus abbreviatus* and other species, *Platymetopius cinereus*, *Idiocerus alternatus* and other species, *Lonatura catalina*, *Driotura robusta*, *Phlepsius nebulosus*, etc.

The following nymphs of Australian forms are now figured; viz: *Tetigonia parthaon*, *Epipsychidion epipyropis*, *Rhotidus flavomaculatus*, *Stenocotis planiuscula*.

The colour and pattern of many nymphs is quite different from that of the adults, and will undoubtedly prove a valuable aid in the identification of many closely allied species.

Membracidæ: The metamorphoses of this bizarre family are but little known, though the American *Ceresa bubalus* has been more or less worked out.

The eggs are placed in small compound groups, arranged in two nearly parallel or slightly curved slits in the twigs of certain trees, the number in each slit varying from six to twelve, while there may be as many as ten slits filled. These eggs have been figured by Riley and by Marlatt and copied into various works. According to Buckton (Pl. 49 fig. 6C) "*Oxyrhachis lignicola*" deposits its eggs in grooves in the bark of leguminosae.

Nymphal stages have been figured by Riley, Green, Buckton, Scheller and others; these differ from the adults by the absence, either wholly or in part, of the pronotal hood, while the tergites are often furnished with long filaments or with spinose projections. The caudal end of the abdomen is also, in certain forms, furnished with a retractile process, which will be briefly discussed when considering the relations of leaf-hoppers to ants.

Of Australian species, Goding has figured *Zanophara tasmaniae*, *Sextius depressus* and an unknown nymph of probably the same genus as a specimen collected at Kuranda; it probably refers to a new genus in the neighborhood of *Hypsoprora* Stal, and is now figured to display the characteristic granulation of membracid nymphs. (Pl. XXIV fig. 11 and 12.)

A second specimen, also from Kuranda (fig. 10) is undoubtedly membracine, but can scarcely refer to any described genus. It measures 7 mill by 5 mill, is flat and strongly foliaceous and strongly granulate in patches. The basal half of the vertex is porrect, very transverse, being 4 to $4\frac{1}{2}$ times as wide as one of the dorsally-situated eyes, very deeply roundly emarginate in the middle so that the vertex is very nearly linear. It is also deeply emarginate (but less so) submedianly; it is about three times as wide as long at its longest point. The anterior half of the vertex is perpendicular, the disk deeply excavate, transverse, strongly granulate, spinose behind the eyes. The flat face is of course overshadowed by the underside of the vertex. The figure shows the remarkable general appearance.

In the *Cercopidæ* the nymphal instars of some genera are well known to every one in Temperate Zones, owing to their habit of establishing themselves on the stem or leaf of some herb or tree, and enveloping themselves in their own frothy secretion

(see for example De Geer, more recently Porter and Fabre, also for curious American forms, Ball.) The name of "Cuckoo Spit," applied to these forms in Europe, dates from classic times, when it was believed that the insects were born from the saliva of cuckoos; the French "Crachat de Grenouille" indicates credence in another supposed origin. The adults are termed "Frog-hoppers" in England. The nymphs and adults of *Philagra parva* swarm in Australia on *Casuarina* trees, the former enveloping themselves in froth after the manner of *Cercopis*. The nymph of the Madagascan *Ptyelus goudoti* Bennett, possesses the power of discharging clear water in such considerable quantities as to resemble light rain, this activity being naturally greater at noon-tide. Goudot estimated that some seventy individuals could emit a quart in an hour and a half.

It has been stated (see, for example, Amyot & Serville) that the nymphs are thus enveloped to guard them from carnivorous insects; on the contrary, DeGeer notes, what has been often observed since, viz: that these nymphs are frequently ravished from their spume by small Fossorial Hymenoptera, while Birds are also said to prey upon them. The froth in reality serves to protect their soft bodies from the heat of the sun, as when taken from this cover and not allowed moisture with which to re-envelope themselves, they soon shrivel up and perish.

Certain Australian forms, however, construct calcareous cases of helicoidal or serpulideous form and attach them to twigs; usually of *Eucalyptus*. These cases were discussed twenty years ago by Ratte since when nothing original has been published on them.

The case is fixed to a twig from two to seven feet above the ground, generally a little or immediately above the insertion of a leaf; and its opening is turned upwards. The shape varies according to genus and species. Some figured by Ratte are actually helicoidal, from this they uncoil till forms are found which are quite or almost straight, though tapering, the widening from the base of course corresponding to the growth of the nymphs. *Polychactophyes* Kirkaldy has larger, coarser tubes, somewhat stalactitic in ornamentation, while those of *Pectinariophyes* Kirkaldy are smaller and more delicate. The position of the larva within is reversed, the head being placed downwards, (Ratte says that the helicoidal form is an exception,) so that the anus is found at the mouth of the tube. Under cover of the case, at the basal end of which is a slit, the nymph sucks the sap of the tree; occasionally it moves backwards and emits a

drop of clear liquid at the mouth of the tube which is habitually half or nearly full of this liquid, the production being increased in warm weather. Eucalypti are rich in calcium compounds and the lime of the shell is evidently derived from the sap of the tree. Ratte roughly calculated a proportion of 75 per cent of carbonate of lime, the insoluble remains being considered as chitinous matter. In the nymph, two of the tergites (apparently 2nd and 3rd in the forms I have seen) are curiously modified, being much enlarged and more strongly chitinized than the rest of the abdomen, there is a longitudinal false suture. This structure acts as an operculum. (Pl. XXIII figs. 12 and 13.)

Ratte describes them all under the generic name *Ptychus*, but I cannot place them there and moreover at least four genera are required for their reception. *Polychaetophyes* and *Pectinariophyes* are described later on.

The nymphs of the Sinhalese *Machacrota guttigera* Westwood, construct tubes fixed to the twigs of *Adansonia digitata*, liquid exuding drop by drop from the mouth of the tube.

(2) Fulgoroidea.

As previously mentioned the nymphs in this superfamily are extraordinarily richly endowed with special sensory organs, i. e., large, punctured, granules. I have refrained from discussing the grouping of these organs in the various subfamilies, as my material is as yet insufficient.

Fulgoridac: The nymphs in the family seem to resemble the adults very strongly, but the stages have not been worked out. *Pyrops* has been figured by Burmeister.*

Asiracidac: I have observed the metamorphoses more or less completely of several species, but only outline them here, as later on, I hope to be able to compare all the stages in a number of forms. The study of the nymphal instars will, it is evident, be a great aid in the natural classification of this difficult group.

Perkinsiella saccharicida.

(Pl. XXVI, figs. 1-5.)

Copulation takes place at night, the adult hoppers, most of which lie still or hidden by day, emerging in crowds from their concealment at or shortly before dark.

* Townsend has noted the oviposition of the Cixiine *Oecleus*, (*Psyche* 1892 VI, 353) and Osborn has related the life-habits of the root-inhabiting Cixiine *Myndus radialis* (*Ohio Nat.* 1903 IV, 43.)

"The eggs are laid in a chamber formed by the ovipositor of the female in the tissues of the leaf or in the stem of the cane. The ovipositor is held at right angles to the ventral surface, and its point of attachment just behind the posterior legs is very clearly seen when the tip is inserted into the tissues of the leaf. The number of eggs contained in one of these chambers varies considerably. Lately in Hamakua district I carefully opened some hundreds of these chambers and found the number of eggs in each to be from one to twelve in number. That end of the eggs which is nearest the external surface is the head of the future leaf-hopper and the red pigment spots, which form the eyes of the newly-emerged insect, are conspicuous at some distance behind the narrow apical extremity of the egg before it hatches. In the leaves the eggs are deposited on either surface of the thicker parts, and being of elongate form, they usually reach about half way through the tissues. The scar is always visible and is often covered with a little whitish excretion.* The apex or head of the eggs is generally just about level with the surface of the leaf, but sometimes they even protrude a little from the orifice of the chamber. The young emerge perpendicularly, head first, sometimes two together from the chamber, and as they emerge, the appendages at first apparently stuck to the body become free, and the little insect is at once active, and may be seen to perform peculiar sidling or retrograde movements similar to those of older ones or of the adult. As a number of individuals generally hatch from a single chamber, and as the chambers are extremely numerous in a single leaf, very many being sometimes present in a square inch of surface, and as also in stripped cane thousands of these chambers may be present in a single stick, the total number of leaf-hoppers that can, and sometimes do, emerge from a single stick and its crown of leaves is almost incredible.

"The young when they hatch are of sociable nature and gregarious and especially congregate at the base of the leaves, and this habit is also largely retained by the adults, which often also form large flocks in the seclusion of the youngest leaves of the crown. It is in the immature stages while growth is proceeding that the chief damage to the cane is done and the great excretion of the honey-dew takes place." (Perkins.)

The first nymphal instar is conspicuous on account of the

* The secretion is very feeble compared with that of the Antillean *Stenocranus saccharivora* (Westwood), or some of the North American species investigated by Swezey.
G. W. K.

produced head. The vertex is a trifle longer than wide, extending well in front of the eyes and wider between them than an eye. I cannot trace any transverse or discal keels. On the frons there are *two keels* (which do not meet on the vertex or elsewhere), which are rounded convexly. These do not unite at the apical margin of the frons, nor do they meet the lateral keels there. The frons exterior to these submedian keels is wide and covered with sensory organs. The second segment of the antennae is large and stout but short. I cannot trace any sensory organs. The tarsi are bisegmentate, the posterior pair being provided each with a small mobile spur.

The second and third instars are not remarkable, except that the spur lengthens, the head shortens and the usual changes take place in the thorax. The fourth instar is very close to the adult, except that the body is still covered with sensory organs and the submedian keels are still separate, not uniting at the apical margin of the frons. In this instar, the sensory organs on the antennae are very conspicuous.

That the study of the nymphal instars will prove very helpful to a knowledge of the adults, may be inferred from the genera *Peregrinus* and *Phacalastor*. The only conspicuous difference between *Peregrinus maidis* (the "Corn-hopper") and *Phacalastor pseudomaidis* (the "false Corn-hopper") is that in the former the tegmina are plain, in the latter the veins are very strongly and closely granulated. However, in the former the nymphs are smooth and unicolorous (yellow), in the latter they are granulate and are whitish, spotted and banded with dark brown. Unfortunately, nymphs of the other species of the genus were not obtainable to determine whether these characters are generic or only specific.

Mr. Ballou kindly sent me eggs, nymphs and imagines of *Stenocranus saccharivora* (too late for study in time to incorporate with this part); the ova are deposited in sugar cane after the fashion of *Perkinsiella*, but are somewhat densely covered with white flocculence, as are the nymphs and the adults.

Eutropistidae. Under the name *Dictyophora pallida*, Cotes has figured some of the stages of an *Eutropistid*. Probably a new genus is required, as *Cicada pallida* is not a *Dictyophorine*. Cotes refers it to subfam. "*Eurybrachydinae*."

The eggs are laid along the natural hollow of the midrib of sugar cane (not inserted, as in the *Asiracidae*) in masses, each cluster containing from three to thirty eggs; these are thickly

covered with flocculence. The nymphs have elongate heads, but feebly so compared with the adult.

In the *Poekillopteridae*, Swezey has partially worked out the life-history of the North American *Ormenis septentrionalis*, while the allied *Siphanta acuta* has been partially worked out by myself in these islands.

In the Sinhalese *Phromnia marginella* (Fabr.), the eggs are laid in considerable numbers in the bark of the twigs of *Elacodendron* and are apparently thickly covered with flocculent matter. The nymphs cluster like sheep* on the plant and thickly covered by the white flocculent matter. This is by no means true wax, as it consists of fibrous matter, which does not melt, but decomposes when heated and does not dissolve in naphtha. This flocculence is very characteristic of the Fulgoroidea, being more or less present in almost all (all?) forms. In some (*Cixius* etc.) it forms a short broad appendage to the body; in *Phromnia*, *Phenax*, *Lystra* and others it is long, even enormously long, as much as 5 inches in *Phenax auricoma*, both in nymphs and adults. Sharp states (Insects II 576) that this "wax" is used by the Chinese for candles and other purposes and is said to be much esteemed in India. He is however, merely repeating an old tale, the error of which was exploded by Cotes in 1893. The Indian flocculence is not commercially esteemed, and the Chinese wax is manufactured from Coccids of the genera *Ceroplastes* and *Eri-cerus*. The metamorphoses of *Phromnia* have been figured in part by Cotes.

The as yet small and little known sub-family *Amphiscepinæ* (*Acanaloniinæ*) seems to be a development of the *Poekillopterinae* (*Flatinae*) in the direction of disintegration of the tegminal venation; the posterior tibiae are spineless (or at least only bristly) in the adult, but Swezey, who has partly worked out the life-history of the North American *Amphiscepa bivittata*, has discovered an interesting fact, viz: that the nymphs have three spines on the posterior tibiae like the typical *Poekillopterinae*. *Amphiscepa*, however, was placed by Stål in the *Issinae*.**

(b) FLIGHT ORGANS.

Leaf-Hoppers seem, as a rule, to be nocturnal, flying and feeding at that time. The power of flight, however, may be said

*The natives of Garhwal in India "eat the sugary secretion and call the insect *Dhaberi*, i. e. "sheep," on account of their habit of clustering together and jumping away when disturbed." (Cotes, p. 97)

**The life history of the remarkable *Bruchomorpha oculata* is recorded as having been related by Ubler in the *Standard Nat. Hist.* 11, 234.

to be, as a whole and comparatively speaking, feeble; although doubtless capable at times of extended flight, particularly when aided or compelled by the wind, as a rule they seem to prefer, by day, at least, to trust to their legs for locomotion, as indeed is implied by their popular name. "On certain occasions, however, they have been seen flying in one direction in the day time in such numbers as to form a migratory swarm, quite like that which occurs in the case of certain locusts, dragon-flies, butterflies and other insects." "It would appear from observations made, that these leaf-hopper migrations are largely due to the fact that the food supply in the place whence they originate has become exhausted or impoverished by the number of the insects." (Perkins.)

The maximum amplitude, in comparison with the size of the body, is attained by the Poekillopteridae, which however, are but feeble flyers; actual extent is greatest among the Fulgoridae, which likewise are not distinguished for powerful flight. In many Issidae and other forms, tegmina are fully developed, but are corneous and often convex, while the wings are also often rudimentary. Perhaps the most remarkable tegmina are found in certain Derbidae, (*Philadelphica* &c) in which they are very elongate and narrow.

In this group is developed very largely the remarkable and little understood phenomenon of pterygo-polymorphism; that is to say that in the same species there may be two or more forms of tegmina and wings—sometimes a sexual di- or polymorphism, sometimes not—from completeness to great reduction or almost entire absence. It is especially encountered in the Asiracidae and in the Tetigoniid *Phrynomorphus* and its allies; in the Heteroptera it occurs extensively in the Gerridae and Nabidae.

Among Hemipterists, the subject has been discussed at some length by John Sahlberg (1871 pp. 19-23) and O. M. Renter (1875).

The North American and Australian forms have as yet been too slightly investigated; nor am I aware of the exact proportions in the palaearctic forms, but Sahlberg states that 70 out of the 263 Scandinavian Leaf-hoppers (in 1870) are pterygo dimorphic, that is, more than one-fourth.

In most of the dimorphic Heteroptera (and in speaking now of the "poly-" or "dimorphism," I am alluding only to the poly- or dimorphism of the organs of flight) the thorax is somewhat profoundly modified, by the reduction of the organs of flight, owing doubtless to the degeneration of the supporting mus-

cles. In the leaf-hoppers on the other hand there seems little difference in this respect, probably due to the fact that the thoracic muscles are already somewhat feeble and little adapted for strong flight.

In polymorphism there are two well marked forms, the extremes, that is, of *macropterism* and *brachypterism*, as well as numerous *intermediate* forms sometimes.

In older times, it was supposed that the brachypterous (or apterous) forms were sexually immature, and later, when macropterous and apterous forms were observed in copulation, it was supposed that they were nymphs capable of procreation. These apterous or brachypterous forms have been reared from ordinary nymphs and are completely mature as regards their sexual apparatus.

The genus *Perkinsiella* affords a good example. There are 4 known species, closely allied but abundantly distinct. Two occur in Australia (one also in Hawaii) one in Viti, one in Java; the first three have been abundantly investigated by Koebele and Perkins, the fourth by Breddin.

(1) *saccharicida* Kirkaldy: the males always macropterous, the female is di- (or more or less poly-) morphic.

(2) *graminicida* Kirkaldy: as far as known the male is always macropterous, the female brachypterous.

(3) *vitiensis* Kirkaldy: both sexes are dimorphic pterygially.

(4) *vastatrix* Breddin: similar to *vitiensis*.

It has been supposed by Flor and Sahlberg that this polymorphism is caused by climatic influence. These authors believe that this inability to develop properly the tegmina and wings, does not exist embryonically in the egg, but depends on accidental conditions, such as the nourishment of the nymphs, and above all on the state of the climate during their development. Sahlberg adds that the feeble development of the organs of flight is altogether due to the greater development of the other organs of motion, i. e., the legs. Reuter believes, however, that the increase in number of polymorphic species as one proceeds northwards in Europe depends probably on many other causes, independent of climatic influence. Thus only eight species of Auchenorrhynchi live in Lapland on trees or bushes, and these species are always monomorphic.

Reuter makes the following observations:

(1) Dimorphic forms are found even in the tropics.

(2) Short-winged individuals are observed most frequently among insects whose legs are well developed and constructed

for leaping or running very quickly; thus dimorphism is strongly represented among Orthoptera and Auchenorrhynchous Siphonata; and indeed in the Miridae, the great part of the dimorphic species have thickened posterior legs, as is also the case with the femora in the Anthocoridae.

(3) There are a great number of instances where the female alone is dimorphic, but never a one where the male alone is so. In such cases the female very often has the femora more thickened than are those of the male—[among Heteropterous Miridae.]

(4) Most dimorphic species live on herbs or near the roots of such like.

(5) On the contrary, no dimorphic species live on trees or bushes.

(6) In some cases, dimorphism depends so obviously on the manner of living of the species that it cannot be caused by the climate, for example, in certain Myrmecophilous species.

(7) Not a single dimorphic species has been found among the numerous fossil Orthoptera and Hemiptera.

Reuter therefore concludes:

(1) The macropterous is the primitive form and the brachypterous forms are only produced in a more advanced period by "natural selection"; the existence of a macropterous form of a species usually brachypterous must be regarded as *reversion*.

(2) The reduction of the flight-organs is probably produced by diverse causes; in certain Myrmecophanous Miridae, it evidently depends on the manner of living of the species and "mimicry"; the Anthocorid *Myrmecodobia coleoptrata* mimics *Alexia pilifera*, a little Coleopteron. [It should be noted however that many Formicicolous insects do not at all resemble their hosts or jailors.]

(3) Many species have lived in localities where they have not been obliged to resort to flight, because instead of trees and bushes they have lived on the ground or among herbs, thus using their legs more often. Consequently in successive generations, the latter are continually developed more strongly, while the muscles of flight by lack of usage are generally enfeebled and atrophied, the tegmina and wings thus becoming as much shortened as the legs are developed and thickened, by the law of "reciprocal influence."

(4) The male, as the active sex, has been obliged to avail himself of his organs of flight, and exercise his muscles; this is why this sex, in many species, has, by heredity, the tegmina and

wings developed, while the female is dimorphic and rarely macropterous.

Reuter divides polymorphic forms into two kinds—I reproduce his classification, but not his polysyllabic nomenclature:

(1 and 2) Trimorphic and dimorphic forms, the latter subdivided into

(a) Female only dimorphic, e. g. *Perkinsiella saccharicida*.

(aa) Both sexes dimorphic, divided into

(b) Male dimorphic in a different manner to the female, e. g. *Euindella speciosa*.

(bb) Sexes equally dimorphic, e. g. *Peregrinus maidis*.

Reuter further divides the forms according to degree of shortening, as follows:

(1) Brachypterous form has the tegmina either a little shorter than, the same length as, or a little longer than, the abdomen, and the apical cells most often moderately developed.

(2) Tegmina at least a third shorter than the abdomen, and much shorter than those of the macropterous forms; apical cells short, obsolescent, or absent; wings rudimentary or wanting. This section contains the majority of forms.

The term brachypterous ranges through "micropterous" from "brachypterous" to "apterous."

In comment on the above, it may be noted—

(1) That in the tropics there are certainly many dimorphic leaf-hoppers arboreal.

(2) There seems to be no difference, in leaf-hoppers, in the structure of the legs in different forms of the same species.

(3) The effect of climate is very problematical, but it is likely that in the tropics, brachypterous forms appear in the colder season. As Perkins has well remarked:

"One point in connection with this flightless forms is worthy of notice. Although the insect has not been with us for study for a sufficiently long time for us to speak with certainty on the point, yet, so far, the worst attacks of leaf-hopper have always followed or been partly coincident with the production of these flightless females, that is to say during the colder months of the year, or in the early summer. In the course of my recent tour of investigation through Hamakua to Olaa, I did not find a single example of the short-winged form, while in the winter months from some plantations not less than fifty per cent of the adults sent were of this form. This fact and some observations that I have made on other Hawaiian species, lead me to

believe that the flightless leaf-hoppers are more prolific than the fully winged specimens."

In connection with this, it is worth noting that both in *Perkinsiella saccharicida* and *graminicida* e. g., the brachypterous females have distinctly larger and fatter abdomens which appear at least to contain many more ova.

(c) MATERNAL AFFECTION.

The maternal solicitude, which has rendered so celebrated certain Earwigs, Centipedes, Cimicidae, and other Arthropods, finds expression also in a Membracid, *Entylia sinuata*, the details of which have been related by Miss Murtfeldt. The remarkable point is that the hopper, usually so shy, leaping away at the first alarm, refused to move when touched, while guarding her offspring.

(d) STRIDULATION.

The Stridulation of the Cicadoidea was known to the Greeks, and doubtless was investigated by many a philosopher before Xenarchos. The other Auchenorrhynchi have always been supposed to be silent; but *Perkinsiella saccharicida* has been distinctly, and often, heard to stridulate by the Entomologists of this station, though specially modified organs have not yet been discovered. As the tegmina, even in the brachypterous forms, are observed synchronously to jerk up and down, this may have some connection with the phenomenon.

(e) THE RELATIONS BETWEEN LEAF-HOPPERS AND ANTS.

The relations between ants and other insects are extremely complicated and little understood.

That herds of Aphidae are kept in temperate zones by ants, and tended in the most remarkable manner, is too well known to be further dwelt upon; in the tropics, where as a rule Aphidae are very rare, their place is taken by other insects, among them certain Coccidae (i. e., Mealybugs), Leaf-hoppers, etc. Spix and Martius, Beske, Lund, Hardwicke, Guilding, Swainson and Belt have recorded observations on this point, though they were doubted by Sharp. Green however, has recently reobserved the phenomenon in Ceylon. He says: "I have frequently watched the larvae of various species of *Centrotus* being assiduously attended by ants. The larvae are gregarious, usually frequenting the succulent shoots of plants, and have an extensile organ at

the extremity of the body, from which the coveted fluid is emitted. This organ is distinctly 3-segmented. The small terminal segment was of a crimson color; the penultimate segment black, with a broad white median band; and the basal segment (of the extensile part) white. When the insect is undisturbed this organ is withdrawn into the long conical segment which apparently terminates the body, but is extruded immediately upon application by the attendant ants."

Green calls this form a *Centrotus*, Buckton naming it *C. nectaris* but apparently it does not belong to that genus.

In Hawaii, although ants often kill considerable numbers of young *Perkinsiella*, on the other hand they appear to protect them from their enemies, at a later stage, so that they (the ants) can enjoy the honey dew excreted from the hoppers.

It may be noted that Goding states that species of *Tragopa* (a Membracid) live in the ground in the nests of the ants, while a curious new Issine, (*Myrmecophyrne formiceticola*) was discovered under a stone in an ants' nest by Mr. Perkins. Further, it has been known, and occasionally noted, that the remarkable Tetigoniophanous Fulgoroid *Tetigometra lacta* is found in similar situations to *Tragopa*.

SYSTEMATIC POSITION AND CLASSIFICATION OF LEAF-HOPPERS.

(a) SURVEY OF PREVIOUS SYSTEMS.

"Leaf-hopper" is a convenient, non-technical term to express the Auchenorrhynchi, excluding the Cicadidae.*

As regards the structure of the mouth parts the components of the order Hemiptera (or Rhynchota) are perhaps the most isolated of true insects; they form two sub-orders, viz.: the *Heteroptera* (or "bugs" proper), and the *Siphonata* (or Homoptera), the latter embracing two well marked groups, *Auchenorrhynchi* and *Sternorrhynchi*, based on the method of articulation of the labium.

The former contains Cicadids and Leaf-hoppers; the latter, Lerp insects, Plantlice, Scalebugs, etc. The Cicadidae are not included in the general term "Leaf-hoppers" and will not be noticed except for purposes of comparison, the Australian forms having recently been monographed by Goding and Froggatt.

The first systematic disposition of any noteworthiness was that of Stål (1858, Stettiner Ent. Zeit., XIX, 233), in which he recognizes 5 families, Fulgorina, Cercopina, Cicadina, Membracina and Jassina, differentiated as follows:

1. Middle coxae elongate, articulated remote from each other. Tegmina with tegulae.....(1) *Fulgorina*.
- 1a. Middle coxae, short, conical, approximate. Tegulae absent. 2.
2. Posterior coxae short, conical, not laterally dilated; tibiae cylindric. 3.
- 2a. Posterior coxae transverse, dilated up to the lateral margins of the sterna; tibiae (at least the posterior pair) angled. (4 and 5) *Membracina* & *Jassina*, distinguished by the generally relative difference in the shape of the genae, and the spinoseness of the femora, also the attachment of the head onto the prothorax, etc.

* The Chermoidae (Psyllidae) are "leaf-hoppers" in a sense, but belong to another group (Sternorrhynchi), and are sometimes called popularly "Jumping Plant Lice."

- 3. Anterior femora unarmed, not thickened; scutellum moderate or small; an arolium (*empodium*) between the claws; 2 ocelli.(2) *Cercopina*.
- 3b. Anterior femora thickened, spinose beneath; scutellum very large; 3 ocelli; no arolia.....(3) *Cicadina*.

In 1866 Stal. reduced this to 4 families only, Stridulantia Cercopida, Jassida and Fulgorida. His three subfamilies of Cercopida are those recognized by later authors, but are not natural; his Jassida form 7 subfamilies of which 6 are Membracine while his Fulgorida are divided into 13 subfamilies.

I reproduce (translated) Stal's tables of Fulgoridae in their entirety, as I shall refer to them later in some detail.

- I. Anal area of wings reticulate; keel separating frons from gena continued onto the sides of the clypeus. *Fulgorida* Stal.
- II. Anal area very rarely reticulate, clypeus in this case convex, lacking lateral keels.
 - A. Posterior tibiae lacking an apical, mobile spur.
 - a. Frons wide, transverse or almost as long as wide, produced on each side into a distinct angle; anterior legs compressed, more or less dilated; anal area of wings sometimes reticulate. *Eurybrachydida* Stal.
 - aa. Lateral margins of the frons not angulate; legs mostly simple; anal area of wings never reticulate.
 - b. Clavus very rarely granulate, apex acuminate, rarely somewhat obtuse, distinctly closed, the two veins united far (or very far) from the apex (sometimes nevertheless after the middle) of the clavus; costa very rarely dilated; tegmina sometimes abbreviate or the clavus and corium fused.
 - c. Vena clavi (anal vein) not reaching the apex, running into the commissure near the apex; tegmina sometimes abbreviate or the clavus and corium fused, lateral margins of clypeus in this case keeled.
 - d. Frontal ocellus absent, lateral margins of clypeus always keeled or acute..... *Dictyophorida* Stal.
 - dd. Ocelli always three, one at the apex of the frons; frontal ocellus very rarely lacking, in this case the sides of the clypeus are convex, wanting a keel..... *Cixiida* Stal.
 - cc. Vena clavi continued to the very apex of the clavus or united near the apex with the claval suture; tegmina sometimes abbreviate or lacking veins or the clavus and corium fused, lateral margins of the clypeus in this case not carinate.

1. Head narrower than pronotum; sides of the clypeus keeled; last segment of rostrum elongate; pronotum angulately emarginate at the base; tegmina internally widened beyond the clavus; first segment of posterior tarsi elongate..... *Achilida* Stal.
2. Head narrower than pronotum; sides of the clypeus not carinate or with an obtuse keel; pronotum most usually angulately emarginate at the base, very rarely roundly sinuate, tricarinate, lateral keels diverging, most often reaching the base; commissure straight or rounded after the clavus, costa sometimes dilated, costal membrane transversely veined; first segment of posterior tarsi elongate... *Tropiduchida* Stal.
3. Head most often narrower than the pronotum; sides of the clypeus sometimes carinate; rostrum with the last segment short or very short; pronotum posteriorly angulately emarginate, not keeled or with one obsolescent one; costa simple; posterior tibiae most often unarmed, rarely spinose; first segment of posterior tarsi elongate. *Derbida* Stal.
4. Head narrower than pronotum, sides of clypeus keeled; rostrum short, thick, last segment very short; pronotum truncate basally, disk carinate or tuberculate; first segment of posterior tarsi strong, less long. *Lophophida* Stal.
5. Head not or little narrower than pronotum; clypeus most often convex, lateral margins very rarely with a keel, pronotum truncate basally, rarely widely roundly sinuate, without a median keel or with an obsolescent one; scutellum short, rarely twice as long as the pronotum; tegmina coriaceous or subcorneous, rarely vitreous, very rarely flat, more or less convex, sometimes very much abbreviated; first segment of posterior tarsi short or mediocre, very rarely elongate..... *Issida* Stal.
6. Head wide or very wide, sometimes somewhat narrower than the pronotum; sides of the pronotum most often lacking a keel; pronotum posteriorly roundly sinuate, lacking keels or with an obsolescent median one; scutellum very large, costa dilated, costal membrane transversely veined or reticulate; posterior tibiae spinose; first segment of posterior tarsi short or rather short..... *Ricaniida* Stal.
7. Head a little narrower than pronotum; clypeus lacking lateral keels; pronotum subtruncate at the base or lightly and widely roundly-sinuate, not keeled or obsolescently so; scutellum large, at least three times as long as pronotum; tegmina very greatly decumbent; posterior tibiae spineless. *Acanonida* Stal.

- bb. Clavus strewn with granules, apex sometimes subacute and closed, sometimes very obtuse and widely open, the two veins separated throughout their entire length or united near the apex; costa dilated, costal membrane transversely veined; claval suture distinct.....*Flatida* Stal.
- B. Posterior tibiae with a mobile spur at the apex.....*Delphacida* Stal.

The Cercopidae are divided by him as follows:

- I. Anterior margin of pronotum straight; eyes equally long and wide.....*Cercopida* Stal.
- II. Anterior margin of pronotum rounded or angled; eyes most often transverse.
- A. Scutellum flat, triangular.....*Aphrophorida* Stal.
- B. Scutellum strongly elevated, compressed posteriorly, armed with a long apical spine.....*Machaerotida* Stal.

The Tetigoniidae were studied only very superficially by Stal.

In 1875 was commenced the posthumous publication of Fieber's "Cicadines d'Europe." In an analytical table he divided the European Auchenorrhynchi into 8 families, Membracida, Cicadaea, Fulgorida, Cercopida, Ulopida, Paropida, Scarida and Jassida, the last four being part of the Jassida of other authors.

In 1888 Ashmead divided the Auchenorrhynchi into 6 families: Cicadidae, Fulgoridae, Membracidae, Cercopidae, Bythoscopidae and Jassidae, and the next year separated the Fulgoridae into 6 subfamilies, Acanoniinae, Flatinae, Ricaniinae, Issiinae, Caloscelinae, Dictiopharinae, the Cixiinae being further described into Achilini, Tropiduchini, Derbini and Cixiini. This work was little more than a misleading adaptation of Stal, and was disfigured by many misprints in the rendering of previous generic names.

In 1890 appeared the most important work yet published on the classification of Homoptera; this was, however, presented in Danish and remained sealed to many workers till translated into English by the present writer (1903). Hansen founds his divisions on the characters especially of the antennae and legs, and recognizes four families, Stridulantia, Cercopidae, Jassidae (including Membracidae) and Fulgoridae. Hansen's table of families is now reproduced, from my translation, in its entirety and will be referred to in the course of this paper.

A. Second segment of peduncle of the antennae without sensory organs, flagellum with several or many foveae. Intermediate coxae with the intro-basal angles a little remote in

ter se; coxal abduction somewhat small. Metasternum either entirely chitinous, or with two median sized membranous areas. Posterior coxae mobile, trochantins apparent; posterior trochanters a little or not wider than the femora; a flexion only possible between trochanter and femur; posterior femora without a "yellow spot" on the upper surface. Pleura of third to eighth abdominal segments entirely located on the lower side, formed of a larger exterior chitinous plate, and of an interior narrower area, partly membranous or evanescent. First pair of abdominal spiracles placed either laterally or ventrally. Third to eighth pairs placed ventrally, looking downwards. Tegulae always absent.

a. Three ocelli.

Flagellum consisting of five (or four?) elongate segments; sensory foveae very numerous in the two basal segments of the flagellum (some even found in the other segments. Conspicuous part of the mesonotum very large. Anterior femora very different from the intermediate pair (always considerably incrassate.) No empodium. Second pair of abdominal spiracles placed in a transverse ventral furrow, looking anteriorly and medianly; third to seventh pairs placed in the sternites, not in the pleura. Stridular organ present in the male. Antennae always placed in deep pits in front of the eyes under the anterior margin of the vertex. Tegmina unarmed beneath. Anterior margin of the wings a little curved towards the base, unarmed. Metasternum entirely chitinous. Posterior scarcely wider than the intermediate coxae, never reaching to the lateral margin of the thorax. Posterior femora simple, posterior tibiae cylindrical..

.....I. *Stridulantia* (i. e. *Cicadidae*).

b. Ocelli two or none. Flagellum composed of either numerous segments, or of an inflated basal segment and a very slender "seta"; some sensory foveae present, never numerous. Conspicuous part of the mesonotum median-sized, or small or absent. Anterior femora scarcely different from the second pair (most often not incrassate.) A large empodium present. Second pair of abdominal spiracles placed laterally, looking exteriorly or partly upwards. Third to eighth pairs placed in the pleura. No stridular organ.

a. Flagellum composed of a large subpyriform basal segment, and a very slender "seta"—generally subarticulate; basal segment with some sensory organs, "seta" without them. Tegmina with a carina towards the base on the lower surface. Anterior margin of wings towards the base with a triangular plate, which is furnished on the exterior margin with some hooks. Me-

metasternum somewhat long, with two medium sized membranous areas. Posterior coxae scarcely wider than the intermediate pair, not reaching to the lateral margin of the thorax.

Posterior femora towards the base on the upper surface with a wider transverse keel. Empodium thicker, beneath with two chitinous spinose strips, the free margin a little or scarcely emarginate. Eyes always placed on the vertex towards the base. Antennae always placed in deeper pits in front of the eyes under the anterior margin of the vertex. Intermediate coxae with a strong meracanthus. Posterior tibiae cylindrical, each with a single process, or with two conical larger processes on the outer surface.....2. *Cercopidae*.

b. Flagellum always composed of numerous segments; basal part longer, formed either of some (2-6) segments, or transversely furcate furnished with some scattered sensory pits; distal part divided into many segments, at least in part. Tegmina beneath not carinate. Anterior margin of the wings without a triangular plate, sometimes somewhat convex. Metasternum short, entirely chitinous. Posterior coxae much wider than the intermediate pair, extending as far as to the lateral margin of the thorax. Posterior femora simple at the base. Empodium thinner beneath, without apparent chitinous spines; free margin profoundly incised medianly. Ocelli sometimes on the vertex, sometimes on the front, occasionally evanescent. Antennae usually inserted in front of the eyes, sometimes under the eyes. Intermediate coxae somewhat rarely with a meracanthus. Posterior tibiae very often prismatic or foliaceous, very rarely almost cylindrical, generally seriatly spinulose, very rarely unarmed.3. *Jassidae*.

B. Second segment of the peduncle with many or very many peculiar (composite) sensory organs; flagellum with a single larger sensory organ on the pyriform basal segment. Intermediate coxae with the intero-basal angles considerably or very distant inter se; coxal abduction well developed. Metasternum almost entirely membranous, and this thin cuticle is extended outwards to the lateral parts of the metathorax, which is inflected somewhat on the lower side of the body. Posterior coxae immobile, their exterior part coalesced with the metathorax; trochantins absent. Trochanters very much stouter than the posterior femora; both an abduction and flexion possible between trochanter and femur. Posterior femora with a "yellow spot" near the base on the upper surface. Pleura of the third to eighth segments largely or altogether situated laterally, either

altogether membranous, or with a large upper area in large part or altogether membranous, and a lower plate chitinous. First pair of abdominal spiracles situated dorsally within the exterior produced part of the metanotum. Third to eighth pairs situated essentially laterally, and in large part or altogether turning outwards.

Ocelli more rarely evanescent, more often two at the sides of the head in front of the antennae; sometimes a third ocellus is found on the lower margin of the front near the base of the clypeus.

Antennae inserted under the eyes; flagellum composed of a thicker basal segment and a very slender "seta," either articulate or altogether divided into numerous segments. Tegula almost always present. Empodium coalesced with the claws throughout a shorter distance, and at most through two-thirds of a length of the claws; free margin a little emarginate or simple. Second pair of abdominal spiracles dorsal, somewhat remote from the lateral margin.....4. *Fulgoridae*.

Two years later, Van Duzee considered that the North American Cicadina were composed of nine families, *Cicadidae*, *Membracidae*, *Fulgoridae*, *Cercopidae*, *Ulopidae*, *Ledridae*, *Bythoscopidae*, *Tettigonidae* and *Jassidae*, the last five being collected into a super-family, *Jassoidea*. The *Tettigonidae* were divided into *Tettigonina* and *Gyponina*; the *Jassidae* into *Acocephalina*, *Jassina* (*Dorydini*, *Deltocephalini*, *Atliysanini*, *Jassini* and *Cicadulini*) and *Typhlocybina*.

I shall refer later, to Van Duzee's classification of the *Jassoidea*, so that I now reproduce the characters for reference. It should however be noted, in fairness to Van Duzee, that he expressly restricts his classification to the North American Fauna; at the same time, the main points of his scheme are largely in use.

Superfamily *Jassoidea*.

- "Ocelli on the face below the anterior edge of the head.
.....Family *Bythoscopidae*.
- Ocelli on the disc of the vertex.....Family *Tettigomidae*.
- Ocelli on or near the anterior edge of the head, or wanting.
.....Family *Jassidae*.

Family *Tettigonidae*.

- Front large, prominent, strongly convex, cheeks long and narrow, anterior edge of the head obtuse, or rounded.
.....Subfamily *Tettigonida* Berg.

Front flat, or slightly convex; more or less impressed across the base beneath the prominent and acute, or rounded and overhanging anterior edge of the head; cheeks at least moderately expanded. Subfamily *Gyponina* Stal.

Family *Jassidae*.

Ocelli placed superiorly close to the anterior edge of the head. Subfamily *Acocephalina*.

Ocelli on the anterior edge of the head, or wanting. (a.)

a. First sector of the elytra forked near its base, the inner branch generally united to the second sector by one or two transverse nervures, usually one or both branches of the first sector are again forked, forming two or three antiapical areoles; supernumerary cell present in the wings; ocelli present. Subfamily *Jassina*.

First sector of the elytra forked close to its base, thus forming apparently three sectors, which run straight and undivided to the angular nervures separating the four apical areoles; no transverse nervures between the first and second sectors; wings without a supernumerary cell; ocelli usually wanting. Subfamily *Typhiocybina*.

Tribes of the *Jassina*.

Anterior edge of the head thin and sharp, or more or less foliaceous. *Dorydini*.

Anterior edge of the head sometimes acute, but generally obtuse or rounded, never thin and foliaceous. (a.)

a. Elytra with two transverse nervures between the first and second sectors of the corium. *Deltoccephalini*.

Elytra with but one transverse nervure between the first and second sectors of the corium. (b).

b. Elytra without a series of antiapical areoles, or with but one formed by the forking of the outer branch of the first sector, vertex subquadrate, hind and lateral margins elevated, before feebly arcuated, with the edge strongly rounded, or produced and tumid before with an obtuse apex. *Jassini*.

Elytra with a series (generally three) of antiapical areoles. (c.)

c. Outer branch of the first sector of the elytra with two forks evident. *Athysanini*.

Outer branch of the first sector of the elytra with its outer fork obsolete, or nearly so; anterior edge of the head well rounded, vertex but little if at all longer on the middle than next the eye. *Cicadulini*.

In 1895 Osborn announced his views on the Phylogeny of the Auchenorrhynchi as follows:

"The other division (i. e. Auchenorrhynchi) beginning with those forms which have the most generalized condition of wing venation and body structure, would commence with the Cicadidae and follow the ascending order which is given in the current systems. It is true that the Cicadidae are themselves a specialized group, particularly in the forms possessing musical organs, but in their approach to the Psyllidae in wing venation and structure of the head and thorax they seem on the whole to present more generalized characters than can be found in any of the other families of the Homoptera.

"The Membracidae, except in extremely specialized pronotum, are easily seen to be related to the Cicadidae and naturally take their position next to them. The Fulgoridae, while possessing specializations of the head, are in thoracic structure and venation more generalized than the remaining families, and while possessing many highly differentiated sub-groups, may very probably be interposed between the preceding families and the Jassoid division. The Cercopidae in development of scutellum and in texture of elytra, as well as in the specialization of the tibiae, show characters of rather high rank, and, if placed as subordinate to the Jassoidea, they must at least be considered as a branch of nearly equal or parallel rank. The Jassoidea, separable into Bythoscopidae and Jassidae proper, may, on the whole, be considered as the most highly organized of the series, and as somewhat equivalent branches, the Bythoscopidae being in some respects extremely specialized, while the Jassidae are subdivided into nearly equal branches, Jassinae and Tettigoniinae."

(b) SYSTEM ADOPTED.

The following is the classification I adopt here for the Auchenorrhynchi, showing also their position with regard to other Hemiptera, proceeding from the more primitive to the more specialized.

Group 1—*AUCHENORHYNCHI* Amyot & Serville.

Super-family 1—*CICADOIDEA*.

Family 1—*CICADIDAE*.

Super-family 2—*TETIGONIOIDEA*.

Family 1—*TETIGONIIDAE* (=super-family Jassoidea, Van Duzee.)

- Sub-family 1—Tetigoniinae.
 2—Iassinae.
 3—Agalliinae.
 4—Penthimiinae.
 5—Eupteryginae.
 6—Ledrinae.
 7—Stenocotinae.
 8—Kahavaluinae.
 (9—Megophthalminae (?).)

Family 2—MEMBRACIDAE.

3—CERCOPIDAE.

Super-family 3—*FULGOROIDEA*.

Family 1—FULGORIDAE.

- Sub-family 1—Cixiinae.
 2—Dictyophorinae.
 3—Fulgorinae.

Family 2—ASIRACIDAE (=subfam. Delphacida Stal.)

3—ACHILIDAE.

4—EUTROPISTIDAE (=Tropiduchida Stal.)

5—DERBIDAE.

6—LOPHOPIDAE.

7—ISSIDAE.

- Sub-family 1—Issinae.
 2—Eurybrachyinae.
 3—Tetigometrinae.

Family 8—POEKKILOPTERIDAE.

- Sub-family 1—Ricaniinae.
 2—Poekillopterinae. (=Flatida Stal.)
 3—Amphiscepinae (=Acanaloniida Stal.)

(Families 3-6 are probably conventional, as will be discussed later.)

Group 2—*STERNORHYNCHI* Am. & Serv.

- Super-family 1—*CHERMOIDEA*.
 2—*APHOIDEA*.
 3—*ALEYRODOIDEA*.
 4—*COCCOIDEA*.

The principal points that (largely following Hansen and opposing Osborn, Van Duzee and others) I wish to insist upon very firmly, are:

1. The low estate of the Cicadoidea as a whole.

2. The slight degree of specialization of the Tetigonioidea in almost every point.

3. The Membracidae are only Tetigonioidea, highly specialized as to the pronotum.

4. The high degree of specialization of the Fulgoroidea and their great differentiation in every way from the other superfamilies.

I especially mark the last heading, as Osborn, in particular, who has so extended a knowledge of the Homoptera, emphatically places the typical Tetigonioidea at the head of the Auchenorhynchi.

(c) THE OUTER FRAMEWORK OF LEAF-HOPPERS.

Before proceeding further with this inquiry, I propose to discuss some part of the outer framework of the leaf-hoppers, and I make no apology for doing this at some length because firstly, almost every second author uses a different horismology, and secondly, the only comparatively recent discussions (I have not taken into consideration Spinola's extensive "Essay on the Fulgoridae" which was published 66 years ago) on the value, for taxonomic purposes, as a whole, of various organs in the Homoptera, are those of Hansen and Osborn, the latter also being only too brief.

In Leaf-hoppers, the head appears to be composed of 2 main sclerites, the *epicranium* and the *clypeus*; at one time I thought it possible that the '*frons*' of authors might be really the clypeus of other orders, the '*clypeus*' really the labrum and the '*labrum*' really the *epipharynx*, but the fact that in typical Cixiinae, there is an ocellus at the apex of the '*frons*' seems to dispose of this at once, at least no one has ever supposed that there could be an ocellus on the clypeus. The structure of the head-capsule (*epicranium*) is, and has always so far proved, enigmatical and very little help in its elucidation is obtainable from text books. The horismology of Hemipterists is certainly not homologous with that of workers in other orders. In Fulgoroidea there are usually considered to be 3 conventional areas, viz: Vertex, frons and genae; (lorae and tempora being added in Tetigonioidea.) In other insects the vertex is that part of the head which is bounded anteriorly by an imaginary line when the insect is in a horizontal situation, the frons being the remainder, mediolongitudinally, as far as the clypeus; thus the extent of the vertex is purely conventional and depends upon the degree of declivity

of the head. In the Auchenorrhynchi, the head is always more or less declivous and bent under; and *at*, or *near*, the angulation or midst of the rounding, there is almost always a transverse keel, or false suture; or on either side of an imaginary line, the quality of the sculpturing is different, so that as a rule it is practicable to consider that there are 2 nameable and distinguishable areas, which are called '*vertex*' and '*frons*', not, however, strictly homologous to the '*vertex*' and '*frons*' in other orders, though, like them, strictly terms of convenience and not designations of separate sclerites; that they really are one sclerite may, apart from embryological evidence, be inferred from the position of the ocelli,—in many Tetigonioidea the 2 ocelli are close to the base of the vertex—while in some Fulgoroidea, two are on the genae, an extra ocellus being present right on the apical margin of the frons.

It follows, therefore, that the vertex may be partly ventral, or contrariwise the frons may be partly dorsal. The first contingency occurs among the Agalliinae, where the ocelli are often found far on the ventral aspect of the head; the latter occurs in certain Fulgoroidea, in which the vertex is very short, (in many Fulgoroids in which the vertex and frons are confused, I suspect that the former is entirely absent, as in some, it is represented merely by a linear section,) and apparently also in some Cercopids. Van Duzee uses the term "face" to designate the ventral aspect of the head, including the ventral part of vertex, the frons, genae, etc. Stal occasionally seems to follow the practice of workers in other orders, but this author rarely explained his horismology and is frequently very obscure. Edwards distinguishes a 'forehead' between the crown (vertex) and face.

The frons is rarely anastomosed with the clypeus. Sometimes it is so, discally, being sometimes then sutured off laterally.

The genae are the lateral parts of the head, sometimes placed actually laterally (*Fulgoroidea*) or ventrolaterally (*Tetigonioidea*), and are usually separated from the frons and vertex by keels or false sutures. Owing to the peculiar structure of the head in the Fulgoroidea the tempora do not seem to be separable; in the Tetigonioidea they are usually seen as narrow strips extending from the antennal scrobes to the posterior margin of the front, sometimes onto the lateral parts of the vertex; they are very conspicuous in *Tartessus*. The lorae are two small plates usually more or less crescentiform, lying between the clypeus and the genae, separable from them by false sutures and present only in the Tetigonioidea; they correspond with the juga in certain He-

teroptera. In the Cercopidae there is often a falsely-sutured-off antero-median piece (resembling somewhat in *appearance* the Heteropterous *tylus*) which coalesces posteriorly with the disk of the vertex and anteriorly fuses more or less with the frons, though usually separated by a keel; whether this is really part of the vertex or is a part of the frons pushed up, is uncertain. In some Fulgoroidea (most Cixiinae) there are 3 ocelli, two in the usual Fulgoroid position (i. e. at the more or less flat sides of the head, close to the antennae) and one at the anterior margin of the frons, adjoining the clypeus. In the Tetigoniioidea they may be almost anywhere on the vertex, sometimes close to the base. (Tetigoniinae etc.), sometimes near, or on, the anterior margin of the head (Iassinae etc.), sometimes again at the extreme apical margin of the vertex, close to the frons (Agalliinae.) In Stenocotinae & Kahavaluinae, they are situated at the bottom of elongate furrows on, or near, the anterior margin of the vertex. Often they are obviously functionless, though rudimentarily present, rarely entirely wanting. The work of the ocelli is enigmatical. In the Fulgoroidea, their position is practically uniform, though their usefulness must be sadly circumscribed by the surrounding elevated keels. It is evident that in the Tetigoniioidea the position of the ocelli is of great importance for systematic purposes—for it is obvious that the directions and extent over which an insect can see, must influence its life very greatly. It is unnecessary to dwell on this subject, but it is evident that the visuality or light perception or whatever their use may be, must be very different in *Tetigonia* where the ocelli are placed on the disk of the vertex, near the base and turning a little outwards, to *Agallia* where they are far on the disk of the face; and sufficiently different in *Phrymomorphus* where they are small and flattish and placed on the smooth anterior margin of the vertex, to *Aphrodcs* where they are near the anterior margin (but on the disk,) this genus being carinate anteriorly, the disk being a little sunk.

In his celebrated studies, Hansen has laid great stress, and rightly so, on the form of the antennae and on the structure of their sensory organs. I much regret that I have not had sufficient time to continue Hansen's researches very far, but I have done so sufficiently to convince myself of their great value. Their characteristics in the various super-families etc. are sufficiently displayed in Hansen's table, quoted previously.

Of the Thorax I need not speak, except to point out that while usually of ordinary structure in the Tetigoniioidea (with the

exception of the remarkable Membracidae.) the pronotum is considerably modified in the Derbidae, and in very many Fulgoroidea is arched or rounded strongly anteriorly and most frequently more or less deeply emarginate posteriorly. The scutellum is nearly always 1-5 carinate in the Fulgoroidea, rarely carinate in the Tetigoniidae and Cercopidae. It should be noted that by "thorax," Stal means "pronotum" only.

In certain forms of Derbidae (*Philadelphica* etc.) in which the flight organs are very peculiar, the scutellum has lost its characteristic triangular shape, with sharply limited margins and has more the appearance of that sclerite in the Cicadoidea.

It is so difficult to be sure of seeing correctly the empodia of the tarsi, that I have omitted any notice of them.

The venation in Siphonata is very difficult to homologize with other orders; it can at least be done only by embryological studies. At the present time, the nomenclatures of Stal, Fieber, Edwards, Westwood, etc., are used somewhat indiscriminately and loosely. I have collated these and other systems as far as feasible (being guided largely by Comstock & Needham) and have drawn diagrams to show the venation of various types. In *Scolypopa australis*, a Fulgoroid of the subfamily Ricaninae there are 8 veins given off by, or near, the basal cell of the corium, 5 from the apical margin (Nos. 3 to 7) and 3 from the base, or near it (Nos. 1, 2 and 8). In order they are costal, subcostal, radial, subradial, median, submedian, cubital, sutural. In the clavus there are two, viz.: anal and axillary. In most forms the subradial and submedian appear only as forkings of the radial and median.

The costal vein, *as a rule*, is present only near the base and is lost later on in the subcostal which is usually, except near the base, the marginal vein; in such a case the costal is usually not on a plane with the rest of the tegmen. In the Poekillopteridae and a few others, the costal vein is complete, though sometimes subobsolescent as a thick vein. In the Cicadoidea, the subcostal and radial (and largely the obsolescent costal) are fused more or less.

The three main veins proceeding from the apical margin of the basal cell appear always to be (from the exterior inwards), radial, median, cubital. These three are almost always easily recognizable, though in most Tetigonioids and Asiracids the first two have a somewhat long common stem, the medioradial; on the other hand, in Ricaninae we have 5 veins, here adding a subradial and a submedian. The sutural vein appears some-

times on one side, sometimes on the other, of the claval suture and is of little account.

Synonymy of Venation in Tegmina of Leaf-hoppers.

1. *Costal*.
2. *Subcostal*=radius *Spinola*=costa (p) of many authors.
3. *Radial*=cubitus *Spinola*=mediastinal *Westwood*.
=Upper branch of cubital *Sahlberg*=1st. sector *Fieber*.
4. *Subradial*, usually present as a fork of the radial, or entirely absent.
5. *Median*=1st. discodal *Spinola*=postcostal *Westwood*.
=exterior branch of exterior ulnar *Stal.*=lower branch of cubital *Sahlberg*=2nd. sector *Fieber*.
6. *Submedian*=interior branch of exterior ulnar *Stal.*; usually present as a fork of the median.
7. *Cubital*=2nd. discoidal *Spinola*=median *Westwood*.
=interior ulnar *Stal.*=3rd. sector *Fieber*.
=brachial *Edwards*.
8. *Sutural*=postcubital *Spinola*=anal *Westwood*=1st. anal C. & N.
9. *Anal*=claval *Stal.*=2nd. anal C. & N.
10. *Axillary*=3rd. anal.

Cells (or Areas) of Tegmina.

1. *Costal* (often absent=costal membrane *Stal.*
2. *Subcostal*=costal cell *Stal* (p). In some forms where the costal vein is rudimentary, this is often termed the costal cell.
3. *Radial*=subcostal *Melichar*, *Edwards*, etc.
4. *Subradial*.
5. *Median*=basal *Edwards*.
6. *Submedian*.
7. *Cubital*=brachial *Edwards*.
8. *Basal cell*.

The marginal cells from the apex of the subcostal to the apex of the clavus, are called "apical cells"; basal of these to the basal cell, between the subcostal and the cubital, are the "discoidals," some of which may be "subapical" (or "anteapical").

Wings.

The relations of the wing-veins and cells are very obscure and they have been little used in classification, except as regards the presence of the submarginal vein and the supernumerary cell.

Four types are figured somewhat diagrammatically, viz., Tetigoniine, Eupterygine, Agalline and Asiracid.

- (1) *Costal*, absent or merged.
- (2) *Subcostal*.
- (3) *Radial*=first sector *Fieber*=costal *Signoret*.
- (4) *Median*=second sector *Fieber*=upper radial *Signoret*.
- (5) *Cubital*=third sector *Fieber*=lower radial *Signoret*.
- (6) *First anal*=Radiating nerves *Fieber*.
- (7) *Second anal*.

[The Claval suture (pliant suture *Fieber*) usually comes here.]

- (8) *Axillary*, or third anal=Claval.
- (9) *Submarginal*=peripheric nervure *Fieber*.

The only cell necessary to specify is

- (a) *Supernumerary cell*, often absent; it is formed by the forking of the radial.

It is unnecessary to dilate on the legs. As the popular name implies, they are saltatorial in construction, and so great is the velocity of the leap in some forms (*Oncometopia* and other Tetigoniinae) that they have gained the name of "Sharpshooters."

In the Asiracidae, one of the spines which fringe the apex of the tibiae, has in each posterior pair, become greatly enlarged, often enormously so, and mobile, being set with "teeth" on its outer edge; this is very characteristic of all instars. Curiously enough, the Asiracidae are by no means the champion jumpers, being surpassed both in length of leap and in velocity, by Tetigonioids and Fulgoroids of less leg development and destitute of a mobile spur.

It seems necessary to state that the "apex" or "apical margin" of any section, is that part of it farthest from the junction of thorax and abdomen; contrariwise, the "base" or "basal margin" is the part nearest. Most authors erroneously speak of the basal angle of the scutellum as its apex; to avoid confusion, it is better to refer to it as the "posterior angle." Further, the part of the frons adjoining the clypeus is its apical margin and the top of the head is (typically) the base of the frons and apical margin of the vertex.

(d) CRITICISM OF PREVIOUS SYSTEMS.

After this short and very imperfect survey of the external structure and the life history of the leaf-hoppers, I propose to comment very briefly on the lines of classification laid down by the Masters in Hemiptera, cited near the beginning of this paper.

Unfortunately, owing to my almost entire lack of material for comparison,* I have been unable to accomplish much in the way of constructive criticism. These notes are solely intended to show how previous work must perhaps be modified in the light of this fresh material from countries so little known (as regards the Auchenorchynchi) as Eastern Australia and Viti.

And what an extraordinarily rich fauna of Leaf-hoppers there must be in Australia and the Southern Polynesian Islands! Messrs. Koebele and Perkins collected but a few months at the worst season of the year in the very places that an Entomologist, not collecting for such an economic purpose, would avoid on account of their barrenness.

Yet, these few months have produced nearly 500 species, almost all new. It is probably not too much to say that the Australian Region (in the widest extent of the name) is supporting today a leaf-hopper fauna of 10,000 species. It must be especially rich in Derbidae, Achilidae, Tetigoniidae, etc.

The region moreover demands the attention of Hemipterists, since it appears to possess the oldest existing fauna in the world. It is well known that the classification in all other orders of insects had to be considerably modified when the Australian fauna began to be worked out, and it will certainly be the case also with the Hemiptera. Goding and Froggatt have recently tackled the work in earnest, and it is to be hoped that extensive collections will be reaped before it is too late.

I must maintain the four leading points enunciated on p. 296 as being established by a study of the imago and of the nymphal instars in every detail of structure.

(1) The highly sensorized condition of the antennae in the adult and of almost the whole body of the nymphal instars, the presence of tegulae, the remarkable carination of the head and nota, and the disposition of the parts of the former, the richly

* I am indebted to my colleague, Mr. O. H. Swezey, for allowing me access to his collections of Ohio Fulgoroids, and to my friend Mr. E. P. Van Duzee for several examples of Tetigonioid and Asiracid genera; to Mr. Ballou for *Stenocranus saccharivora*; and to Dr. Melichar for a few Sinhalese forms; otherwise beyond my own collectings, I have been compelled to rely on the written word.

variegated and harmonious colouring in many instances, and the diversity of cephalic form, seem indubitably to point to the pre-eminence and isolation of the Fulgoroidea. It is also worthy of notice that (as pointed out in Part I of this Bulletin) their Dryinid parasites are of a higher estate than those of the Tetigonioidae.

(2) Contrariwise, the humble condition of the last named, proved by their imperfectly sensorized state, both in adults and nymphs; the absence of tegulae, the (usually) smooth, plebeian head of feeble differentiation, and the (usually) dull coloring. The only exceptions almost are the Membracidae, highly specialized and diversified in their prothoracic structure, nevertheless lowly as a whole; the often gaudily colored Cercopidae, which also have remarkable nymphal habits, and a few Tetigoniid forms such as *Stenocotis* and *Kahavalu*.

(3) The Cicadoidea, highly specialized in one direction, are as a whole very low.

(4) The Membracidae are fundamentally, as shown by Hansen, essentially Tetigonioid.

With regard to the subdivision of the families I regret that lack of time prevents my lingering long.

(1). *Stal's Classification of the Fulgoroidea.*

There is no doubt that Hansen's divisions by the characters of the antennae, are sound; at the same time, especially when dealing with novel uniques, it is often exceedingly difficult to determine just what is the form of the antennal sensory organs. I think the following are natural divisions:

(1) *Fulgoridae*, with subfamilies Fulgorinae, Dictyophorinae and Cixiinae, corresponding to Stal's Fulgorida, Dictyopharida and Cixiida; at the same time it is difficult to separate the last two, except by general facies.

(2) *Poekillopteridae*, with subfamilies Ricaniinae, Poekillopterinae and Amphiscepinac, corresponding to Stal's Ricaniida, Flatida and Acanoniida.

(3) *Issidae*, with subfamilies Issinae, Eurybrachyinae, and Tetigometrinae, corresponding to Stal's Issida and Eurybrachydida. Stal separates these widely, but I think their closely allied nature is established; the Issinae, via *Amphiscepa*, come very close to the Poekillopteridae. The Tetigometrinae should perhaps even form a family by themselves. They do not, I think, establish any link between the Fulgoroidea and Tetigonioidae, but, on the contrary, are very highly modified.

(4) We now have a heterogeneous mass, which I temporarily rank into families, viz., Achilidae, Eutropistidae, Derbidae and Lophopidae. These are almost certainly artificial. The character that separates them from the Fulgoridae is that the anal vein of the clavus runs into the commissure in the latter, while it runs into the apex of the clavus in the four families mentioned just before. This may seem a trivial character, but it was insisted upon by Stål, and is certainly correlated with other good characters; unfortunately in Achilidae and Eutropistidae, it is difficult to determine the character of the antennal sensory organs, though in some of the latter, they seem Fulgorid. Although laid down by Stål, he himself has erred in assigning certain genera correctly, as have Melichar and other authors, for instance *Lamenia* is certainly not a Derbid, though it might be an Achilid were it not for the claval venation. I have placed it temporarily in the Cixiinae, where it perhaps looks uncomfortable. Ashmead and Swezey locate it in the Poekillopterinae, but the clavus shows no trace of granulation and the venation is of a different type.

Many of the Eutropistidae have a close resemblance to Dictyophorinae but, as I believe, this is false. In the former, the costal vein is present in its entirety, and the costal cell is multivenose transversely; in the latter, the costal vein is short, merging in the subcostal, and the subcostal cell (which is the marginal) is plain.*

The Derbidae are most probably a mixture; the typical forms have a plain clavus, but the majority have the anal vein very strongly sensorized; here too are some of the most extraordinary antennae in the Homoptera.

The only conclusion to be gained from a consideration of the Australian Fulgoroidea is that they need a great deal more study, especially on the venation and antennae, and more especially on the earlier stages.

(2) Van Duzee's classification of Tetigoniidae (his Jassoidae).

(1) I do not think, after studying *Tartessus* and allied genera, that the "Bythoscopidae" really form even a subfamily; indeed it is very difficult to draw sharp lines of distinction all through

* My recently published *Peggioga formosa* (the manuscript, however, finished in 1903) from Lefu, is stated to be allied to *Dictyophora*; it is, however, probably an Eutropistid. I have no specimens here for re-examination. *Astorga* also, although placed in the Dictyophorinae, has a well-developed costal vein.

the Tetigoniidae. The family seems discerptible somewhat on the following lines:

{ Iassinæ	Eupteryginae	{ Stenocotinae
{ Penthimiinae		{ Ledrinae
{ Tetigoniinae		
{ Agalliinae		
{ Kahavaluinae		Ulopinae (? Membracidae)
{ ? Megophthalmiinae		

The Penthimiinae, Tetigoniinae, Agalliinae and Eupteryginae being all derived from Iassinæ by various routes; Stenocotinae from the same via perhaps *Tartessus* or allied form; Ledrinae possibly from *Dorycephalus* or allied forms.*

Although convenient for grouping the North American forms, Van Duzee's results do not seem to me to be natural.

The most primitive known form would seem to be some ally of *Phrynomorphus*; from this there are many evident offshoots. For example through *Thamnotettix* we arrive at *Metriostoles* and its allies without any break, so that Van Duzee's "*Cicadulini*" are difficult to define sharply for a world fauna. The Eupterygine series would seem to be a logical continuation, the tegmina and wings being greatly and increasingly degraded; in all known forms but one, the radial, median, and cubital veins reach the apical cells without forking en route, and the venation is usually so degraded that it is difficult or impossible to trace the basal half of these veins at all. The discovery of *Ancono*, undoubtedly an Eupterygine, shows the more primitive forking of the medioradial (which unite again towards the apex) and displays the untenability of deriving the Eupteryginae from the Macrostelinae.

The separation of the "Dorydini" is not I think scientific; elongation of the head springs up independently manywhere; for example *Phrynophyes* and *Giffardia* from *Phrynomorphus*; *Hecalus* and its allies from *Thomsonia* or allies; *Cephalclaus* from near *Dorycephalus* which arises elsewhere.

The value of the transverse vein near the base of the tegmen between the radial and median veins was hotly criticized by Osborn and Ball, who denied it even specific value, but I have seen no public retraction by Van Duzee. The following groups seem more or less well circumscribed:

(1) *Iassinæ*, corresponding to the *Jassina* of Van Duzee, a

* It is possible, especially after a consideration of the nymphs, that the Stenocotinae are an offshoot from the Ledrinae.

huge heterogenous group, drifting into the Agalliinae via *Tartessus* and *Epithalamium*, and into the Tetigoniinae via *Macroceratogonia*.

(2) *Acocephalina* of Van Duzee (not the Acocephalidae of Edwards) should, I think, be included in the above; or if not, they would be separable* by the dorsal position of the ocelli, the degeneration of the organs of flight appearing of comparatively little account. *Eupelir* I would place here, but *Platymetopius* and its allies are certainly *Phrynomorphine*.

(3) *Eupteryginac*, despite *Ancono*, are a well marked group.

(4) *Penthimiinae* (Gyponina of Van Duzee) have very little to do with the Tetigoniinae except that the ocelli are dorsal.

(5) *Tetigoniinae* correspond to the Tettigonida of Van Duzee; they probably include the curious *Macroceratogonia*.

(6) *Agalliinae* (Bythoscopida, Van Duzee) are difficult, as I have said before, to separate sharply from Jassinae.

(7) *Ledrinae* are well marked, but have something of the appearance of *Dorycephalus*, except that the ocelli are dorsal; *Ledra* is an extreme form.

(8) *Stenocotinae* are exclusively Australian, allied to *Ledrinae* but the ocelli are placed in separate grooves on the top of the rather thin head.

(9) *Kahavaluinae*, monotypical, strongly recalling certain membracine characters, ocelli placed somewhat as in *Stenocotinae*, but head not thin. Legs very feebly bristly.

(10) The *Megophthalminae* are possibly to be placed here.

(11) The *Ulopinac* are probably membracid.

(3) *Osborn's views on Phylogeny.*

I cannot conceive on what grounds the learned Professor considers the Tetigoniidae to be so highly organized. He instances the structure of the pronotum, head, scutellum and tibiae, etc., in the other families, but is silent as regards the special virtues of the Jassids.

To me the Tetigoniidae (and especially *Phrynomorphus*, *Deltocephalus*, etc.), seem far the most primitive of Leaf-hoppers. Their head, thorax, legs and genital segments seem to be of the most ordinary, common type that one could find in the larger orders of Insecta. The tegmina and wings are also very simple, though this is perhaps the simplicity of degradation.

* Under the name of Aphrodinae.

The Membracidae are little related to the Cicadidae, except perhaps more or less superficially in venation and are closely allied to the Tetigoniidae in all essentials; they have however acquired a perpendicularly situated vertex and a remarkably specialized pronotum.

What Osborn means by special development of scutellum in Cercopidae, I do not know, as this is far more highly developed in size, presence of keels, etc., in many Fulgoroids. The Cercopidae are plainly Jassoids specialized in the direction of degradation of flight organs, etc., but with more complicated genitalia.

It is the Fulgoroids which are certainly far and away ahead of all the other Auchenorrhynchi. In the adult state and far more so in the nymphal instars, the average Fulgoroid is a mass of sensory organs. The antennae are crowded with them (*Swezeyia* and *Phantasmatocera* in particular) and of very high degree of special organization. (In the other superfamilies they are sparse, minute, and of a simple character.)

The vertex in some adult forms (Achilidae, Derbidae, etc.), is throng with them (much more so in the nymphs). In the nymphs the nota are also crowded with them, and the tegmina in the adults, along the veins. Some Tetigonioids have granulate tegminal veins, but this is very common in, e. g., many Cixiinae in the Fulgoroids, while the anal vein of the clavus in most Derbidae is crowded with them. In Poekillopterinae, the clavus, on veins and in between, is throng, characteristically of the subfamily, with granulations, though these latter may not be sensory; in this subfamily, the tegmina are often very minutely and closely granulate in between the reticulations.

The pronotum, contrary to Osborn's opinion, is specialized in Achilidae, Derbidae, etc., in a way not reached even in *Stenocotis* among the Tetigoniidae. (Of course the Membracidae are excepted in this.)

In the other superfamilies, the head is of a most ordinary description, the ocelli placed, either dorsally or ventrally, somewhere on the vertex between the eyes; in the Stenocotinae and *Kahavalu*, they are in little grooves on the anterior margin of the head. In the Fulgoroidea the head is almost always remarkably keeled, there seeming in some forms to be a keel wherever one can be placed; the side of the head is flattened and it is there that the ocelli are placed, close to the eyes and antennae. Finally, the genitalia are very much the most specialized in the Fulgoroidea.

In the discussion on Osborn's paper, Ashmead briefly presented his views; he is certainly more correct in his order of Cicadidae, Jassidae, Membracidae, Fulgoridae (he omits Cercopidae), but he derives these from the Sternorhynchi, believing that the Coccidae are the lowest, root-stock!

(4) *Summary.*

(1) The Fulgoroidea are enormously the most specialized, highly organized and differentiated, of the Auchenorhynchi, the Cixiinae possibly being the most primitive types, though in some respects the Derbidae are:

(2) The most primitive existing forms of Siphonata seem to be the Cicadoidea, but

(3) The Tetigonioidae seem to have arisen separately.

(4) Of the Tetigonioidae the *Phrynomorphus* forms seem to be the most generalized; Agalliinae are specialized a little in the extreme declivity of the vertex and frons, and ventral position of the ocelli; they also tend to spinoseness of the tibiae, culminating in the Cercopiform Eurymelini.

(5) The Membracidae are highly specialized in the pronotum, but are otherwise very low.

(6) The Cercopidae are perhaps as a whole the culmination of the Tetigonioidae.

LIST OF NEW GENERA AND SPECIES
COLLECTED BY KOEBELE AND PERKINS IN
QUEENSLAND, NEW SOUTH WALES AND VITI.

Fam. Tetigoniidae. (Australian Species.)

1. *Tetigonia koebeleri* sp. nov.
2. *T. pasiphae* sp. nov.
3. *T. parthaon* sp. nov.
4. *T. pettimolua* sp. nov.
5. *T. anemolua* sp. nov.
6. *Macrocratogonia* gen. nov., *aurea* sp. nov.
7. *Tharra* gen. nov., *labena* sp. nov.
8. *Phrynomorphus longinquus* sp. nov.
9. *P. taedius* sp. nov.
10. *P. fatigandus* sp. nov.
11. *Phrynophyes* gen. nov., *phrynophyes* sp. nov.
12. *P. parvula* sp. nov.
13. *Anemolua* gen. nov., *lanuala* sp. nov.
14. *Anemochrea* gen. nov., *mitis* sp. nov.
15. *Deltocephalus* (?) *perparvus* sp. nov.
16. *Nephotettix plebeius* sp. nov.
17. *N. contemptus* sp. nov.
18. *Scaphoides pristidens* sp. nov.
19. *Euleimonios* gen. nov., *demittendus* sp. nov.
20. *Kosmiopelix* gen. nov., *varicolor* sp. nov.
21. *Dryadomorpha* gen. nov., *pallida* sp. nov.
22. *Giffardia* gen. nov., *dolichocephala* sp. nov.
23. *Hecalus immaculatus* sp. nov.
24. *Paradorydium menalus* sp. nov.
25. *P. pseudolyricen* sp. nov.
26. *Dorycephalus ianthæ* sp. nov.
27. *D. subreticulatus* sp. nov.
28. *D. trilineatus* sp. nov.
29. *Tartessus syrtidis* sp. nov.
- 29a. *Myrmecophryne* gen. nov., *formiceticola* sp. nov.
30. *Pettya* gen. nov., *anemolua* sp. nov.
31. *Nesosteles* gen. nov., *glauca* sp. nov.

32. *N. sanguinescens* sp. nov.
33. *N. sordidior* sp. nov.
34. *N. tacdia* sp. nov.
35. *Thaumatoscopus* gen. nov., *galeatus* sp. nov.
36. *Vulturinus* gen. nov., *vulturinus* sp. nov.
37. *Ectopiocephalus* gen. nov., *vanduzeei* sp. nov.
38. *Epipsychidion* gen. nov., *epipyropis* sp. nov.
39. *Eurinoscopus* gen. nov., *lentiginosus* sp. nov.
40. *E. sontiastes* sp. nov.
41. *E. soboles* sp. nov.
42. *E. dryas* sp. nov.
43. *E. pelias* sp. nov.
44. *E. molestia* sp. nov.
45. *E. pelamys* sp. nov.
46. *Pedioscopus* gen. nov., *philenor* sp. nov.
47. *P. polydoros* sp. nov.
48. *P. agenor* sp. nov.
49. *Ipo* gen. nov., *ambita* sp. nov.
50. *I. conferta* sp. nov.
51. *I. honiala* sp. nov.
52. *I. acgrota* sp. nov.
53. *Idiocerus ipo* sp. nov.
54. *Eurymeloides hyacinthus* sp. nov.
55. *E. cumulosus* sp. nov.
56. *E. bicinctellus* sp. nov.
57. *E. ornatus* sp. nov.
58. *E. rubricinctosus* sp. nov.
59. *E. lentiginosus* sp. nov.
60. *Eurymela rubrolimbata* sp. nov.
61. *E. plebeia* sp. nov.
62. *E. lubra* sp. nov.
63. *Ancono* gen. nov., *pulcherrima* sp. nov.
64. *Kahaono* gen. nov., *hanuala* sp. nov.
65. *Dikraneura* gen. nov., *honiala* sp. nov.
66. *D. ancala* sp. nov.
67. *Cicadula histrionica* sp. nov.
68. *Eupteryx haematoptilus* sp. nov.
69. *Empoa australensis* sp. nov.
70. *Erythroneura melanogaster* sp. nov.
71. *E. lubra* sp. nov.
72. *E. honiloo* sp. nov.
73. *E. ipoloo* sp. nov.
74. *E. honiala* sp. nov.
75. *Rhotidus ingens* sp. nov.

- 76. *R. informis* sp. nov.
- 77. *R. flavomaculatus* sp. nov.
- 78. *R. monstrum* sp. nov.
- 79. *R. ledropsiformis* sp. nov.
- 80. *R. horrendus* sp. nov.
- 81. *R. viridescens* sp. nov.
- 82. *Smicrocotis* gen. nov., *obscura* sp. nov.
- 83. *Kyphocotis* gen. nov., *tessellata* sp. nov.
- 84. *Kahatvalu* gen. nov., *gemma* sp. nov.

(Vitian Species.)

- 85. *Nesosteles* gen. nov., *hebe* sp. nov.
- 86. *Cicadula vitiensis* sp. nov.

Fam. Membracidae (Australian).

- 87. *Gelastorrhachis* gen. nov., *diadema* sp. nov.
- 88. *G. clavata* sp. nov.
- 89. *Sarantus nobilis* sp. nov.
- 90. *Sextius assimilis* sp. nov.
- 91. *S. longinotum* sp. nov.
- 92. *S. kurandae* sp. nov.
- 93. *Acanthuchus dromedarius* sp. nov.
- 94. *A. obtusus* sp. nov.
- 95. *Centrotypus hospes* sp. nov.

Fam. Cercopidae (Australian).

- 96. *Euryaulax* gen. nov., *callitettigoides* sp. nov.
- 97. *Aufidellus* gen. nov., *australensis* sp. nov.
- 98. *Aufiterna* gen. nov., *ptycloides* sp. nov.
- 99. *Pctyllis* gen. nov., *australensis* sp. nov.
- 100. *Eurycercopsis* gen. nov., *nigrofasciata* sp. nov.
- 101. *Polychactophyes* gen. nov., *serpulidia* sp. nov.
- 102. *P. acqualior* sp. nov.
- 103. *Pectinariophyes* gen. nov., *pectinaria* sp. nov.
- 104. *Anyllis* gen. nov., *leiala* sp. nov.

Fam. Fulgoridae (Australian).

- 105. *Eurystheus perkinsi* sp. nov.
- 106. *Eurinopsyche* gen. nov., (type *obscurata* Fabr.)
- 107. *Thanatodictya* gen. nov., (type *praeferata* Distant).

- 108. *Lucinda* subgen. nov., *lucindae* sp. nov.
- 109. *Niculda* subgen. nov., *anadyomene* sp. nov.
- 110. *T.* (*N.*) *hebe* sp. nov.
- 111. *I.* (*N.*) *psyche* sp. nov.
- 112. *Hasta* gen. nov., *hastata* sp. nov.
- 113. *H. paupera* sp. nov.
- 114. *Astorga* gen. nov., *saccharicida* sp. nov.
- 115. *Solonaima* gen. nov., *solonaima* sp. nov.
- 116. *Oliarus* *lacrtes* sp. nov.
- 117. *O. kampaspe* sp. nov.
- 118. *O. talunia* sp. nov.
- 119. *O. asaica* sp. nov.
- 120. *O. felis* sp. nov.
- 121. *O. alexanor* sp. nov.
- 122. *O. lubra* sp. nov.
- 123. *O. sponsa* sp. nov.
- 124. *O. phelia* sp. nov.
- 125. *Carolus* gen. nov., *crispus* sp. nov.
- 126. *Gelastocephalus* gen. nov., *ornithoides* sp. nov.
- 127. *Calamister* gen. nov., *obscurus* sp. nov.
- 128. *Lamenia* *kulia* sp. nov.
- 129. *L. hiva* sp. nov.
- 130. *Perkinsiella* *graminicida* sp. nov.
- 131. *Phacalastor* gen. nov., *pseudomaidis* sp. nov. (and Viti.)
- 132. *P. kobelei* sp. nov.
- 133. *Stenocranus* *agamopsyche* sp. nov.
- 134. *Hadcodelphax* gen. nov., *pluto* sp. nov.
- 135. *Gelastodelphax* gen. nov., *histrionicus* sp. nov.
- 136. *Smicrotatodelphax* gen. nov., *perkinsi* sp. nov.
- 137. *Ectopiopterygodelphax* gen. nov., *crimius* sp. nov.

(Vitian species.)

- 138. *Perkinsiella* *vitiensis* sp. nov.

(See also No. 131.)

Fam. Eutropistidae (Australian).

- 139. *Ossa* *venusta* sp. nov.
- 140. *O. formosa* sp. nov.
- 141. *Peltodictya* gen. nov., *kurandae* sp. nov.
- 142. *Rhinodictya* gen. nov., *quacsitrix* sp. nov.

(Vitian).

- 143. *Vanua* gen. nov., *vitiensis* sp. nov.

Fam. Achilidae (Australian).

- 144. *Aristyllis* gen. nov., *aristyllis* sp. nov.
- 145. *A. omphale* sp. nov.
- 146. *A. adippe* sp. nov.
- 147. *Benella* gen. nov., *aliena* sp. nov.
- 148. *Pyrrhyllis* gen. nov., *pyrrhyllis* sp. nov.
- 149. *Majella* gen. nov., *majella* sp. nov.
- 150. *Phenelia* gen. nov., *elidipteroides* sp. nov.
- 151. *Eurynomeus* gen. nov., *australiae* sp. nov.
- 152. *Argelcusa* gen. nov., *kurandae* sp. nov.
- 153. *Cythna* gen. nov., *laon* sp. nov.
- 154. *Salemina* gen. nov., *francescophila*, sp. nov.
- 155. *Francesca* gen. nov., *Saleminophila* sp. nov.
- 156. *Ancipo* gen. nov., *diva* sp. nov.

Fam. Derbidae (Australian.)

- 157. *Nisia grandiceps* sp. nov.
- 158. *Phaenocura froggatti* sp. nov.
- 159. *P. pallida* sp. nov.
- 160. *Basilcocephalus* gen. nov., *thaumatonotus* sp. nov.
- 161. *Thyrocephalus* gen. nov., *leucopterus* sp. nov.
- 162. *Phantasmotocera* gen. nov., *arborca* sp. nov.
- 163. *Heronax* gen. nov., *parnassius* sp. nov.
- 164. *H. saccharivora* sp. nov.
- 165. *Philadelphica* gen. nov., *pandani* sp. nov.
- 166. *Sardis* gen. nov., (type *maculosa*.)
- 167. *Kaha* gen. nov., *perfecta* sp. nov.
- 168. *Rhotana chrysonoc* sp. nov.
- 169. *R. haematoneura* sp. nov.

(Vitian.)

- 170. *Suva* gen. nov., *koebelci* sp. nov.
- 171. *Phaciocephalus* gen. nov., *vitiensis* sp. nov.
- 172. *Szczeyia* gen. nov., *lyricen* sp. nov.
- 173. *Phantasmotocera* gen. nov., *vitiensis* sp. nov.
- 174. *Lecu* gen. nov., *viticusis* sp. nov.
- 175. *Pyrrhoncura* gen. nov., *saccharicida* sp. nov.

Fam. Issidae (Australian.)

- 176. *Issus vulturinus* sp. nov.
- 177. *I. sidnicus* sp. nov.

- 178. *I. ridicularius* sp. nov.
- 179. *I. elongatulus* sp. nov.
- 180. *Lollius* gen. nov., *angustifrons* sp. nov.
- 181. *L. acutipennis* sp. nov.
- 182. *Sarnus lucindae* sp. nov.
- 183. *Lipocallia* gen. nov., *australensis* sp. nov.
- 184. *Glastissus* gen. nov., *albolineatus* sp. nov.
- 185. *G. histrionicus* sp. nov.
- 186. *G. suffusus* sp. nov.
- 187. *Platybrachys oculata* sp. nov.
- 188. *P. chlorocephala* sp. nov.
- 189. *Olonia picca* sp. nov.
- 190. *Dardus immaculatus* sp. nov.
- 191. *Euronotobrachys* gen. nov., *arcuata* sp. nov.
- 192. *E. plana* sp. nov.
- 193. *Gelastopsis* gen. nov., *insignis* sp. nov.

Fam. Poekillopteridae (Australian.)

- 194. *Siphanta galeata* sp. nov.
- 195. *S. acutipennis* sp. nov.
- 196. *S. breviceps* sp. nov.
- 197. *S. toga* sp. nov.
- 198. *S. lucindae* sp. nov.
- 199. *S. subgranulosa* sp. nov.
- 200. *S. granulata* sp. nov.
- 201. *S. sidnica* sp. nov.
- 202. *Euryphantia* gen. nov., *cinerascens* sp. nov.
- 203. *Sephena rubida* sp. nov.
- 204. *S. hyacintha* sp. nov.
- 205. *S. cinerea* sp. nov.
- 206. *S. argus* sp. nov.
- 207. *Jamella* gen. nov., *australiac* sp. nov.
- 208. *Massila walkeri* sp. nov.
- 209. *M. sidnica* sp. nov.
- 210. *Mimophantia australensis* sp. nov.
- 211. *Aphanophantia* gen. nov., *cuscuticida* sp. nov.
- 212. *Scolypopa kurandae* sp. nov.
- 213. *Epithalamium* gen. nov., *aziola* sp. nov.

The following new specific names are also proposed incidentally:

- Eupteryx melichari* for *picta* Mel.
- Aglena ornatula* for *ornata* Walker.

LIST OF PREVIOUSLY KNOWN SPECIES COLLECTED BY KOEBELE AND PERKINS SO FAR AS WORKED OUT.

Family Tetigoniidae.

- 214. See 29a.
- 215. *Tetigonia albida* (Walker).
- 216. *Eutettix sellata* (Uhler).
- 217. *Nephotettix nigropicta* (Stal).
- 218. *Thomsonia arcuatus* (Motshulsky).
- 219. *T. lincolatus* (Motshulsky).
- 220. *T. kirschbaumii* (Stal).
- 221. *Cephalclaus brunneus* (Waterhouse).
- 222. *Stenocotis planiuscula* (Stal).

Fam. Membracidae.

- 223. *Zanophara* (?) *tasmaniae* (Fairmaire).
- 224. *Z.* (?) *vitta* (Walker).
- 225. *Terentius concolor* (Stal).
- 226. *Dingkana borealis* (Goding).
- 227. *Sextius bipunctata* (Fabricius).
- 228. *S.* *virescens* (Fairmaire).

Fam. Cercopidae.

- 229. *Philagra parva* (Donovan).

Fam. Fulgoridae.

- 230. *Eurinopsyche obscurata* (Fabricius).
- 231. *Desudaba danae* (Gerstaecker).
- 232. *Thanatodictya praeferrata* (Distant).

Fam. Asiracidae.

- 233. *Perkinsiella saccharicida* Kirkaldy.
- 234. *Peregrinus maidis* (Ashmead).

Fam. Derbidae.

- 235. *Nisia atrovenosus* (Lethierry).
- 236. *Sardis maculosa* (Krueger).

Fam. Issidae.

237. *Platybrachys sicca* (Walker).
 238. *Dardus abbreviata* (Guerin).

Fam. Poekillopteridae.

239. *Privesa aphrophoroides* (Walker).
 240. *Scolypopa australis* (Walker).
 241. *Gactulia chrysopoides* (Walker).
 242. *Neomelicharia furtiva* (Melichar).
 243. *Siphanta acuta* (Walker).
 244. *S. granulicollis* (Stal).
 245. *Colgar peracuta* (Melichar).

DESCRIPTIONS OF GENERA AND SPECIES, ETC.

Of the localities investigated by Messrs. Koebele and Perkins, or otherwise referred to;

Cairns is on the coast of northeast Queensland, at the south end of Trinity Bay;

Redlynch, *Nelson* and *Kuranda* are more or less unimportant places nearby, the *Baron* River flowing into Trinity Bay a few miles north of Cairns;

Lucinda Point is some way to the south;

Bundaberg is near the coast opposite Great Sandy Island;

Brisbane and *Sydney*, the capitals of Queensland and New South Wales respectively;

Parramatta, a western suburb of the latter, and *Mittagong*, an elevated town a little to the south;

Cape North is the most northern point of Queensland;

Palmerston is a coast district around Keppel Bay (or it may be the northwest district of Northern South Australia.)

Peak Down is an inland district between Drummond Range and Peak Range.

Rockhampton is near the coast at Keppel Bay.

Sandy Cape is the northern point of Great Sandy Island.

Gayndah is inland some distance about the same longitude as the south of Great Sandy Island.

(vi-xii)=June to December, 1904.

(i-iii)=January to March, 1905.

Family 1 Tetigoniidae.

Subfamily 1. Tetigoniinae.

Tribe 1 *Tetigoniini*.

This is equivalent to the *Tetigoniinae* of most authors, some 40 genera are now recognized, but the limits of some of these are not sharply defined.

Elongate, head produced in front of the eyes (apically rounded or triangular, sometimes irregularly linear). Frons usually more or less convex, often much inflated; rarely flattened or even a trifle concave. Genae long and narrow between the eyes and the frons, broadening a little posteriorly. Clypeus broad, generally at least $\frac{2}{3}$ of width of frons. Lorae small, laterally covered largely by clypeus. Rostrum short. Ocelli distinct, situated on the crown between the eyes below their anterior margin. Venation simple, often indistinct. In the type of the tribe, (the palaearctic *Tetigonia viridis* (Linn)) the two claval veins run separately into the commissure (aberrations occur); there are discoidal, 3 subapical, and 5 apical cell. A transverse vein stands on the cubital, varying in position a little even in the same individual, being sometimes basal of the median fork, sometimes apical. In many species of the typical genus this transverse vein is absent. Appendix present. In the wing there is no supernumerary cell. The other *Tetigoniini* do not differ greatly from this type, though sometimes the venation is more or less reticulate. Three Australian species have been described and I now add 6 more, all belonging to the typical genus:

Tetigonia Geoffroy.

Tetigonia Geoffroy, 1762, Hist. abregée Ins., I, 429. Kirkaldy, 1900, Entomologist, XXXIII, 262.

Tettigonia Latreille; Ball, 1903, Iowa Ac. Sci., 15-28, Pl. III-V. (nec Linn).

Cicadella Gray, 1832, Griffith's Anim. Kingdom, XV, 226.

Tettigoniella Jacobi, 1904, Zool. Jahrb. Syst., XIX, 778.

Antennal ledge small, scarcely visible dorsally. Head and pronotum horizontal, vertex produced before the eyes, usually obtusely rounded; frons swollen; Pronotum not twice as long as scutellum, posterior margin slightly emarginate. Tegmina broad, covering the tergites, not reticulate; with (usually) 5 discoidal (3 subapical) and 6 apical cells.

The headquarters of this cosmopolitan genus are in Central and South America.

The Australian species of *Tetigonia* are readily separable by color and size:

1. Length more than 15 mill. 7 *coerulescens* (Fabr.)
- 1a. Length under 15 mill. 2
2. Ground color pale. 3
- 2a. Ground color dark. 7
3. Ground color distinctly yellowish. 4
- 3a. Ground color pale greenish-grey, or greyish-white, or pale cinereous. 6
4. Tegmina immaculate. 5
- 4a. Claval commissure blackish-brown. 4 *parthaon* sp. nov.
5. Vertex 4 times as broad as long. (sec. Walker)
- 8 *quadrata* (Walker)
- 5a. Vertex not more than one-half wider than long.
- 3 *pasiphae* sp. nov.
6. A central dark longitudinal stripe down the head, pronotum, scutellum and commissure. 2 *perkinsi* sp. nov.
- 6a. Above mentioned stripe absent. 1 *albida* (Walker).
7. Black with orange red markings. 6 *anemolua* sp. nov.
- 7a. Dark metallic bluish-green with ochraceous markings.
- 5 *pettimolua* sp. nov.
- N. B. 9 *albomarginata* (Sign.) not included.

1. *albida* (Walker.)

Tetigonia albida, Walker, 1851, List. Hom., 767, (nec. Walker, 777); Signoret, 1853, Ann. Soc. Ent., France, (3) I, 663, Pl. 21 f. 3; Melichar, 1903, Hom. Ceylon, 157 (*).

This species varies a little in size and pattern. One example in my collection, from Ceylon, has a typical right clavus, but in the left, the axillary vein joins the middle of the anal vein.

Hab: Queensland, Cairns (vii-viii), Nelson (vii) and Bundaberg (ix-xii) on sugar cane and various grasses; also occurs in Ceylon (my collection), Bombay (Melichar), Celebes (Breddin), Philippines (Stal), West and South Africa (Stal), and Madagascar (my collection).

kochelei, sp. nov.

Slender; pale testaceous; margin connecting vertex and frons

* This is not, as Melichar states (l. c.—) *pallida* Walker 776, which on the contrary = *albida* Walker 777 = *nigrifascia* Walker, an American species. The Sicilian var. *pallida* Walker (781) of *Aglena ornata* requires a new name, for which I propose *ornatula*.

ornamented with 3 ocellated spots (black, narrowly encircled with yellow). Vertex with a black median somewhat rounded stripe extending along pronotum, scutellum and claval commissure. Frons with a longitudinal submedian dark brown line on each side with downwardly curved subparallel transverse lines proceeding to the lateral margins, nearly reaching the genae. Clypeus with a longitudinal pale brownish line; lorae almost entirely pale brownish and there is a stripe of same color on genae. Ocelli redbrown. Mesonotum ornamented sublaterally with a black stripe (on each side) which shows faintly through the overlying pronotum. Underside stramineous. Posterior femora and tibiae longitudinally lined with blackish. Tegminal veins brown, basal half of cubital blackish, rather smudged.

Shape of vertex not very dissimilar to that of *T. albida* but the eyes are larger and wider in proportion and the ocelli are smaller. Head and eyes distinctly wider than pronotum which is longer than the vertex. Clypeus somewhat angulate in profile. Frons moderately swollen. Pronotum finely striate transversely, anteriorly with an obtuse angular impressed line subparallel with the arched anterior margin. Tegmina with 5 discoidals (3 subapical) and 5 apical cells.

Length $6\frac{1}{2}$ mill.

Hab: Queensland, Cairns (viii) only one female, unfortunately, of this distinct species.

3. *pasiphac* sp. nov.

Pale luteous; eyes, ocelli and 2 small spots near anterior margin of scutellum, blackish. Tegmina creamy yellow with darker veins; wings milky with pale yellowish veins. Ocelli pale greenishbrown. Leg hairs pale.

Vertex as long as or a trifle longer than the pronotum, rounded apically; frons swollen, flattened medianly. Clypeus subangulate. Pronotum punctured. Tegmina with 5 discoidal (3 subapical) and 5 apical cells.

Male unknown.

Female: last abdominal sternite slightly roundly emarginate, medianly truncate; pygofer about $4\frac{1}{2}$ times as long as the last, narrowing posteriorly, sides not rounded posteriorly; in profile, apex narrowly rounded.

Female. Length $12\frac{3}{4}$ mill.

Hab: Queensland, Cairns (viii), arboreal.

In one specimen, the sternites are orange-yellow.

4. *parthaon*, sp. nov. (Pl. XXIII, fig. 1-3).

Same size and form as *T. pasiphae* but differently patterned, and frons a little more swollen.

Head, pronotum, scutellum, tegmina and underside pale yellowish, more or less tinged with orange. Eyes, 2 spots at base of pronotum, 2 at anterior margin of scutellum, claval commissure, etc., blackish. Ocelli pale greenish brown. Wings milky, veins more or less orange-yellow. Leg hairs pale. Abdomen orange. Membrane internally smoky.

Male: Last abdominal sternite truncate, plates a little more than twice as long as above; basal half broad, roundly narrowing, then more rapidly so towards the middle line of the abdomen, apices acute, fringed with soft hairs; pygofers much longer than plates.

Female: Pygofers longer and narrower than in *T. pasiphae*, about 3 times as long as last sternite, which is roundly emarginate; pygofers widen out a little before middle, then narrow rapidly; posteriorly narrowly truncate in profile

Length 10-10½ mill.

Hab: Queensland, Cairns (viii), Kuranda (viii), on *Saccharum officinale* and grasses.

The nymph of this form is figured on Pl. XXIII, fig. 3.

5. *pettimolua*, sp. nov.

Pale ochraceous, with the following markings blackish tinged more or less with metallic greenish or bluish—on the anterior margin of the head—3 rather blotchy spots, and 2 at the base; the lateral margins of the pronotum and 2 spots at the apical margin; at the base a blotch which is somewhat of the conventional figure of a bat with out-stretched wings, the "head" touching the intero-posterior angles of the anterior spots. Scutellum with 3 anterior spots. Frons with 2 submedian longitudinal stripes, sometimes meeting posteriorly; these are shortly pectinate, representing the usual striations on the *Tetigonia*-frons, but the lateral parts of the striations are pale ochraceous, concolorous with the ground color of the face. Tegmina dark metallic green, costal cell opaque whitish (or pale yellowish) narrowly bordered with black. Abdominal tergites mostly bluish-black. Anterior and intermediate tibiae and tarsi dark.

Male: Penultimate sternite roundly emarginate, ultimate truncate, plates formed much as in *T. parthaon* but about 3 times

as long as last sternite, more elongate apically and there curving upwards (towards the dorsum), plentifully fringed with soft long white hairs.

Female: Last sternite roundly emarginate, laterally angulate, pygofers about $2\frac{3}{4}$ times as wide as the above, medianly swollen, apically roundly subtruncate in profile; furnished with short black hairs.

Length $6\frac{1}{2}$ -7 mill.

Hab: New South Wales, Sydney (i-ii).

N. B. The dark colouring sometimes encroaches in a smudged manner more or less on the pale.

6. *ancmolua*, sp. nov.

Basal half of vertex, pronotum, scutellum, tegmina etc., black, the latter more or less translucent apicoexteriorly. Apical half of vertex posterior margin very narrowly, a broad, slightly, arched transverse band across middle of pronotum (sometimes narrower and interrupted in the middle, the clavus (except the interior area)—reddish castaneous or dark orange red. Underside pallid except the mesoternum. Abdominal tergites black.

Male: Sternites more or less (generally more) black. Pygofers rather short, rounded, acute apically, about $2\frac{1}{2}$ to 3 times as long as last sternite which is somewhat roundly emarginate.

Female: Sternites pallid except part of the ovipositor. Pygofers about 5 times as long as last sternite, an oblique keel on each side starting from exterobasal angle and meeting in the middle at a little more than one-third of the length; not rounded laterally, furnished with white hairs. Last segment truncate, slightly notched medianly.

Length $4\frac{1}{4}$ -5 mill.

Hab: Queensland, Kuranda (viii), arboreal.

7. *coerulescens* (Fabricius.)

Cicada coerulescens Fabricius 1803 Syst. Rhyng. 74.

Aulacizes dives Walker 1851 List. Hom. 791.

Tettigonia caerulescens Signoret 672 Pl. 21, fig. 16.

Hab: Australia.

8. *quadrata* (Walker.)

Tettigonia quadrata Walker 1851 List. Hom. 781.

Hab: Tasmania.

9. *albomarginata* (Signoret.)

Tettigonia albomarginata Signoret 1853 Ann. Soc. Ent. France.

(3) I, Pl. 10 fig. 4.

These three species are unknown to me, and I regret also that Signoret's descriptions remain unknown to me, as his 'Essai' was unpurchasable. The same author describes *Tettigonia varicolor*, 1852 op. c. II, 15, Pl. 1, fig. 15 from Honolulu, most probably in error, as no *Tettigonia* is now known here and a not inconsiderable part of Signoret's collection is notoriously labelled incorrectly.

Tribe 2 *Macroceratogoniini*.

Instituted for a single, new, genus *Macroceratogonia* which has the general facies of the first tribe and also of the third, but a very different head structure. The vertex is subhorizontal, flat, subquadrangularly produced before the eyes, wider apically than at the base; ocelli on the vertex anterior to the apical margin of the eyes. Antennal seta enormously long.

Macroceratogonia, gen. nov.

Pronotum, clavus, etc., finely punctured. Head slightly declivous; vertex at base less than $\frac{1}{2}$ the width of pronotum apically; lateral margins keeled, diverging somewhat sinuately, the vertex being thus wider at apex than at base and nearly as long as wide; apical margin slightly rounded; basal $\frac{3}{4}$ narrowly sulcate, anterior fourth transversely somewhat sinuately impressed; immediately below the impression and a little nearer to the middle line than to the lateral margins are the conspicuous ocelli. The crown is separated from the frons by a narrow, well marked, continuous channel. The antennae are situated almost at the antero-lateral angles, first segment small, rounded bulbous, second small cylindric, seta enormously long, much longer than the entire body. Frons narrow, and curves from the insertion of the antennae; clypeus elongate, parallelsided: lorae curved exteriorly, not reaching the apical margin of the face, extending basally beyond the clypeus. Pronotum rounded anteriorly, lateral margins posteriorly divergent, postero-lateral angles rounded, posterior margin subtruncate. Tegmina with 2 discoidal and 2 subapical cells, the exterior discoidal be-

ing undivided up to the apical cells. Appendix present. Wings with supernumerary cell. Legs typically Tetigonian.

14. *aurca*, sp. nov. (Pl. XXII, figs. 6-7.)

Pale golden yellow, tegminal appendix and underside paler. Eyes dark, and a small dark spot at base of appendix.

Length 9 mill.

Hab: Queensland, Kuranda (viii), arboreal.

Two females only. I would have included this remarkable genus in the Tetigoniini but it would have made too many exceptions in otherwise fairly sharply defined group-characters.

Subfam. 2. Iassinae.

Tribe 1. *Iassini*.

Vertex subquadrate, its sides and posterior margin elevated; frons elongate, narrow; clypeus wider posteriorly than at its base; ocelli on the curve of the head; usually only one subapical cell (but in *Tharra* Kirkaldy, the exterior discoidal is divided by a transverse vein thus forming another subapical); wings with a supernumerary cell. There are apparently 6 genera in this tribe viz: *Iassus* Fabricius (= *Coelidia* Germar and *Davidna* Walker), *Terulia* Stal, *Petalopoda* Spangberg, *Tinobregmus* Van Duzee, *Tharra* Kirkaldy and *Palicus* Stal; the latter, which is an African genus, I do not know; *Tharra* is Australian, the rest American.

Tharra, gen. nov.

Differs from *Iassus* Fabr. by the possession of 2 subapical cells and the absence of transverse veins in the clavus. From *Terulia* it differs by the subapical cells and by the straight anterior tibiae.

Vertex flat, longer than wide, slightly declivious with regard to the pronotum, abruptly elevated at the lateral margins, the sides being at right angles to the disk,* which is very narrowly sulcate longitudinally up to the apical margin of the eyes and is produced a little, widened just apical to the eyes and rounded obtusely.

Eyes large, a little oblique; ocelli a little nearer to the lateral margins than the middle of the vertex. Frons elongate, nar-

* This is probably a tribal character, as stated above, but as Spangberg's figures do not show this clearly, I have mentioned it again in the generic characters.

row and gradually narrowing posteriorly. Clypeus quadrangular, a little longer than wide, distinctly wider at apex than at base; lorae small, not reaching to the apex of the face; genae narrow. Antennal seta long. Rostrum reaching to intermediate coxae, distinctly wider at the apex than at the base. Pronotum transverse, much wider than head and eyes, arched anteriorly, lateral margins rather short, posterior margin straight. Scutellum about as long as the pronotum. Clavus without transverse veins. Corium with 2 discoidal, 2 subapical and 5 apical cells. Anterior femora, anterior tibiae and intermediate femora subequal in length, slender, straight; intermediate tibiae about $\frac{1}{5}$ longer than anterior tibiae and about as long as posterior femora; posterior tibiae twice as long as intermediate tibiae; posterior femora reaching as far as, or beyond the apex of abdomen.

1. *labena*, sp. nov.

Vertex sordid testaceous; frons blackish, rest of face, sterna basal half of abdomen beneath, legs (except as undermentioned) etc., more or less pale luteous. Eyes, apical half of abdomen beneath, genital valve (female), apical half of posterior tibiae, posterior tarsi and all the claws, blackish. Pronotum and anterior half of scutellum sordid purplishbrown, posterior half of scutellum sordid yellowish. Tegmina yellowish translucent, veins crimson; an irregular spot at extreme base of corium, a spot near apex of costal cell, and about the apical half of each of the apical cells, etc., blackish. Wings dark smoky.

Female: Valve covered thickly with long, curling, rather coarse, white hairs.

Length $5\frac{1}{3}$ mill., width at base of pronotum $1\frac{1}{4}$ mill.

Hab: Queensland, Kuranda (viii), arboreal.

Unfortunately only one female of this interesting form. It has a distinctly Fulgorid look about it, and Mr. Perkins informs me that it also appears so in life.

Tribe 2. *Cephalelini*.

Phrynomorphus Curtis.

Phrynomorphus Curtis, 1833, Ent. Mag. I, 194.

Athysanus Burmeister, 1838, Gen. Ins. Jassus; Edwards, 1896, Hem. Hom. Brit. 136 Pl. II, fig. 10, etc.

This genus is extremely closely allied to *Deltocephalus*, the only difference I can find being that the vertex in the latter is usually more angulate and there are 5 discoidal cells instead of 4 as in *Phrynomorphus*, and in the latter there is usually only one transverse vein standing on the cubital.

The species are all obscure and of very ordinary appearance. I have indicated their uninteresting nature by the specific names bestowed on them.

1. *longinquus* sp. nov.

Vertex broad, about as long as wide between the eyes, apically rounded (a little angularly, this being accentuated by the pattern), disk depressed in the middle. Frons broad, laterally rounded, apical margin slightly emarginate, about $3\frac{1}{4}$ times as wide between the eyes as at apex. Temples linear. Ocelli on a level with the disk of the vertex before the upper margin of the eyes. Clypeus wider than lorae, genae extero-laterally posteriorly strongly angulate. Pronotum short, more than twice as broad as long, lateral margins obsolescent, posterior margin truncate, posterolateral angles obsolete. Tegmina short, without appendix, not or scarcely reaching to apex of abdomen, 3 discoidals (2 subapical) and 5 minute apical cells. Pale cinereo-testaceous, frons with close transverse dark lines radiating from each side of the central pallid line, continued a little over to the vertex, these latter being subconcentrically angulate (these lines are often more or less obsolescent.) Tegminal nervures a little paler than the ground colour, apically somewhat obscurely broken up by darker colour. Abdominal tergites more or less dark. Mesopleura with some more or less cloudy spots. Hairs on legs etc., black.

Male: 6th sternite obtusangularly emarginate, 7th slightly convex apically. Valves a little more than twice as long as 7th medianly, nearly as wide as long, lateral margins somewhat sinuate, posterior angle irregularly rounded.

Female: Pygofer brownish in the middle spotted with pallid. Little distinctive about them.

Length: $3\frac{3}{4}$ mill; width across eyes $1\frac{1}{3}$ - $1\frac{1}{2}$ mill.

Hab: New South Wales, Sydney (i-ii), Mittagong (i).

2. *tadius*, sp. nov.

Of similar size and general appearance to the preceding but differs as follows:

Vertex shorter than wide, slightly angulately rounded apically. Frons a little flatter, temples wider. Clypeus scarcely wider than lorae, genae less angulate. Pronotum with short but noticeable lateral margins. Coloring very similar but vertex, pronotum and scutellum with only obscure scattered pale-brown mottlings. Underside darker, anterior femora striped transversely with black. This seems to approach *Phlepsius* in some ways.

Length: $3\frac{3}{4}$ mill.

Hab: Queensland, Bundaberg (xi).

3. *fatigandus*, sp. nov.

Very similar specifically to *Phrynophyes indignus* but smaller and the frons immaculate, legs pallid. Vertex between the eyes about two-thirds of length of exterolateral margin of an eye.

Male: Propleura with black disk; lateral margins of sternites narrowly blackish; tergites pale orange-brown. Tegmina reaching beyond apex of abdomen.

Female: 7th sternite slightly emarginate, pygofer 4-5 times as long as seventh sternite, ovipositor one-third longer than pygofer, extending beyond apex of tegmina.

Length, male $4\frac{7}{8}$; female $5\frac{1}{8}$ mill.

Hab: Queensland, Cairns, Kuranda (viii) on grass.

Phrynophyes gen. nov.

Probably an offshoot from *Phrynomorphus*: it has much of the facies of *Lonatura*.

Head produced triangularly in front, longer than the width between the eyes, also a little wider between the eyes than the width of an eye. Eyes large, included in the curve of the head. Lateral margins of pronotum short (but noticeable), not carinate. Tegmina abbreviated, venation somewhat obscure, 2 veins standing on cubital close together, rest of venation typically *Phrynomorphoid*, except that the clavus is reticulate. Type *P. phrynophyes*.

1. *phrynophyes*, sp. nov.

(Pl. XXIV, figs. 7-8.)

Pale cinereotestaceous (? metallic greenish grey when alive), frons pale brownish with somewhat feeble radiating lines from

a wide, middle, immaculate area. Underside pale marked with brownish black. Veins of tegmina mostly whitish. Tergites laterally marked with black. Ocelli either absent, or present on one side. Frons convex basally, flattening gradually towards the truncate apex. Clypeus sub-parallel-sided, broader than the lorae. Genae scarcely angular posteriorly. Pronotum shorter than the vertex. Tegmina with 3 or 4 discoidal, and 5 apical cells.

Female: 7th sternite very obtusangulately emarginate; pygofer long and narrow, 5 to 6 times as long as 7th sternite; ovipositor about one third longer than pygofer. Tegmina not nearly reaching apex of abdomen.

Length nearly 6 mill.

Hab: Queensland, Bundaberg, on grass (ix-xii); a specimen from Brisbane (xi) may be distinct.

2. *parvula*, sp. nov.

(Pl. XXII, figs. 1-3.)

When alive, metallic green, but fades after death to a shiny testaceous; tegmina and tergites more or less greyish metallic. Face pale sordid brownish, legs more or less marked with brown.

Female: elongate, tapering anteriorly and posteriorly. Vertex about 3 times as long as wide between the eyes, anteriorly acuminate, somewhat ascendant. Frons 5-hedral, long-diamond shaped, with a fifth side anteriorly, about as wide as clypeus, which is a trifle wider than the lorae; the latter do not quite reach the posterior margin of the genae. Tegmina very short truncate. Ultimate segment roundly produced, pygofer elongate, narrow, largely exposing the very long ovipositor.

Length 6½ mill; width about 1 mill.

Hab: Queensland, Bundaberg (ix-xii), on grasses.

There is also a single male from Bundaberg (xi) which probably belongs to this. Head acute anteriorly, more or less porrect, about one-half, or a little more, longer than wide between the eyes.

Length 4 mill.

Female nymphs are very similar to the adults.

I think it is this species that has been described by Buckton as a Membracid (!!) under the name of *Philya parvula* (1901 Mon. Membr. p. 57, Pl. 8, fig. 4.)

Anemolua gen. nov.

Vertex slightly convex and a little declivous; about one-half longer than wide between the eyes. Eyes large, each much wider than the vertex at the base, interolateral margin divergent towards the apex; vertex rounded in front of eyes, the latter forming part of the curve of the head. Vertex impressed at the base, sulcate mediolongitudinally. Frons elongate, about two thirds longer than wide at base, lateral margins somewhat straight, gradually narrowing towards the apical margin, which is scarcely wider than base of clypeus. Antennae elongate. Clypeus much longer than wide, widening slightly apically, lorae small, scarcely reaching further posteriorly than half the length of the clypeus; genae not angulate exterolaterally posteriorly. Pronotum slightly arched anteriorly, roundly emarginate posteriorly, lightly carinate longitudinally, lateral margins obsolescent. Scutellum shorter than wide. Tegmina reticulate, fundamentally 4 or 5 discoidals. Posterior legs elongate.

I placed this at first near *Iassus* and *Terulia* but the venation is very different, and the vertex is, if anything, *below* the dorsal level of the eyes.

1. *hannala* sp. nov.

Testaceous; vertex with a black impressed spot near the base on each side of the sulcation.

Frons and clypeus pale brownish. Pleura and legs more or less blackish. Pronotum and scutellum marked with whitish. Tegmina brownish, veins and some blotches on costa etc. whitish; sometimes a blackish blotch near middle of tegmina.

Length $3\frac{3}{4}$ - $5\frac{1}{8}$ mill.

Female: abdomen longer than tegmina; last segment roundly emarginate, pygofer about four times as long as the latter, ovipositor very long.

Hab: Queensland, Cairns (viii), arboreal.

Anemochrca gen. nov.

Closely allied to *Anemolua* but differs as follows:

Vertex almost as long in front of apical margin of eyes as behind, acuteangled apically; frons elongate suboval; Clypeus parallelsided. Lateral margins of pronotum short, but noticeable, not carinate, posterior margin truncate. Apical cells of

tegmina strongly marked off, not reticulate. Venation of wings (which are very short) obscure.

1. *mitis* sp. nov.

(Pl. XXII, figs. 8-9.)

Dark brownish testaceous. Vertex blackish brown with two narrow transverse pallid lines, one midway between apex and apical margin of eyes and the other a little posterior to the apical margin of eyes. Face greyish, frons laterally with 8 or 9 somewhat remotely placed brownish transverse lines. Pleura and most of sternites (except genitalia) blackish. Tegmina with whitish veins, apical cells brownish-black posteriorly. Legs more or less pale brownish. Basal half of abdomen above, and a median line on rest of tergites, black.

Length 3-4½ mill.

Hab: New South Wales, Sydney (i-ii), Mittagong (i), Parramatta (i).

Var: Vertex somewhat pale; with apex, a bar between or above eyes, and a broken bar near base, blackish-brown.

The nymphs are not remarkable.

Deltocephalus Burmeister.

Deltocephalus Burm. 1838 Gen. Ins. Jassus subg. 3.

1. (?) *perparvus*, sp. nov.

Pale yellowish testaceous. Eyes blackish grey. A minute black spot at side of last tergite, and two almost contiguous black-brown spots on the preceding tergite. Sternites and pleurites spotted with blackish brown. Vertex distinctly longer medianly than at eyes, triangularly rounded in front, margin in front of eyes straight; vertex somewhat flat, a large rounded depression on each side of the middle line. Clypeus as wide anteriorly as frons posteriorly, which very gradually widens at clypeus, extending anteriorly beyond base of clypeus, posteriorly nearly touching margin of genae. Pronotum short, scarcely twice as broad as long, anteriorly arched, posteriorly slightly emarginate, sides very short. Tegmina short, reaching only to half the length of the abdomen, without appendix; venation very

obscure, but I think there are five discoidals. Clavus nearly as large as the apically rounded corium. Wings minute.

Length $2\frac{1}{3}$ mill.

Hab: New South Wales, Mittagong (i), Sydney (ii).

Eutettix Van Duzee.

Eutettix Van Duzee, 1892 Psyche, VI, 307; T. Amer. E. S., XIX, 300.

1. *sellata* (Uhler.)

Thamnotettix sellata Uhler, 1896, P. U. S. N. Mus., XIX, 294. *Eutettix sellatus* Matsumura, 1902, Termesz. fuzetek, XXV, 331, fig. 12; Melichar, 1903, Hom. Ceylon, 189.

Hab: Queensland, Kuranda (viii), Cairns (viii), Nelson (vii), Bundaberg, (ix-xii) on Sandhills, arboreal, (Koebele's No. 2299), also from Japan (Uhler), Ceylon (Kirkaldy), Papua, Java and Africa (Melichar), etc.

2 sp. nov.

Hab: Queensland, Cairns, Nelson, Bundaberg, on *Melaleuca*.

Nephotettix Matsumura.

Nephotettix Mats., 1902, Termesz. fuzetek, XXV, 356 and 378; Melichar, 1903, Hom. Ceylon 1902.

Melichar has confused *Selenocephalus cincticeps* Uhler from Japan (destructive to *Oryza sativa*) with a Sinhalese species which he identifies with *Pediopsis apicalis* and *P. nigromaculatus* Motschulsky. *N. apicalis* however differs from *cincticeps* as will be shown later, while a Madagascan species is closely allied also. I think that (*Cicada*) *bipunctata* Fabr. (= *Thamnotettix bipunctata* Stal) should replace the name *apicalis*, while (T) *nigropicta* Stal should replace *cincticeps* Uhler.

1. *plebeius* sp. nov.

Pale testaceous; a blackish transverse stripe on the vertex extending from eye to eye, immediately below the ocelli, not curving parallel with anterior margin but nearly straight across. Frons pale testaceous from the base of the clypeus long-triangularly to base of frons; on each side of this to lateral margins

of frons about 8 parallel, transverse blackish lines on each side (sutures of clypeus, etc., sometimes infuscate.) Pronotum sub-anteriorly with a somewhat feeble, arched, repeatedly broken blackish transverse line extending from side to side. Scutellum with usually 2 pale brownish specks about the middle. Tegmina hyaline pale cinereous, nervures brownish. Bristles on legs blackish brown.

Vertex twice as wide as long, rounded apically; frons broad, not widening from basal margin to antennal articulation, about two and a quarter times as wide as the base of the clypeus; clypeus a little broader than lorae; temples very narrow. Pronotum longer than the head, posterior margin truncate. First apical cell basally in a line with the base of the exterior sub-apical cell and much longer than it; second apical cell 5-hedral, sides more or less straight (except the apical margin).

Male valve about three-fourths of the length of the 7th, abdominal sternite (which is apically truncate) and about one-third of the length of the plates which are furnished with bristly hairs. Pygofers about the same length as, or a little longer than the plates, furnished with bristly hairs.

Female: 7th, sternite about twice as long as the 6th, longitudinally sulcate and apically notched in the middle to admit base of sawcase; pygofers about 4 times as long as 7th, sternite, furnished with granules which emit short bristly hairs; ovipositor longer than the pygofers.

Length (male) $4\frac{1}{2}$ - $5\frac{1}{2}$ mill; (female) $5\frac{1}{2}$ - $5\frac{1}{2}$ mill.

Hab: Queensland, Cairns (vii-viii), Bundaberg (ix-xii), Redlynch (vii), Lucinda Point (vii), on grasses; Koebele 2296 on sand-hills (ix), New South Wales, Sydney (i), Parramatta (i), probably introduced.

2. *contemptus* sp. nov.

Testaceous, the vertex with a curved blackish brown line anteriorly, parallel with the anterior margin; frons with a brownish black line close to basal margin and parallel with it; clypeus more or less brownish. Pronotum more or less clouded with greyish. Tegmina pale yellowish hyaline; apical veins brownish; wings smoky. Abdominal tergites more or less blackish on the disk, laterally more or less pallid.

Vertex a little more produced perhaps than in *plebeius*, frons narrowing suddenly soon after its basal margin as far as antennae, then narrowing gradually to clypeus, which is sublinear,

much narrower than the lorae. First apical cell short, shorter than the 1st. subapical; second apical cell semi-circular.

Male unknown.

Female: 7th. sternite scutiform, carinate longitudinally, angularly rounded behind, the posterior angle very slightly produced again. Pygofers yellowish rufescent (with golden yellow hairs), shorter than the rufescent ovipositor.

Length: (female), $5\frac{1}{4}$ mill.

Hab: New South Wales, Sydney (i-ii).

A much slenderer species than *N. plebcus*, with different venation and different markings on the head.

3. *N. nigropicta* (Stal.)

Thamnotettix nigropicta Stal, 1871, O. V. A. F. 740.

Hab: Queensland, Cairns, on grasses. (Also from Philippines, China and Japan).

This species is closely allied to *N. bipunctata* (Fabr.)

Scaphoideus Uhler.

Scaphoideus Uhler, 1891 Trans., Maryland Ac. Sci. I, 33; Osborn, 1900, J. Cincinnati Soc., N. H., XIX 187.

Distributed through America, Japan and Oriental Region and I now describe a species from Australia.

1. *pristidens*, sp. nov.

Testaceous, more or less tinged with pink or yellow; vertex with two black spots at anterior margin and two irregular ochraceous brown spots just posterior. Frons anteriorly with about five transverse black lines (sometimes more or less interrupted). Pronotum more or less blotched laterally. Scutellum with two basal pinkish brown spots. There is a white median line from apical margin of vertex to posterior angle of scutellum. Tegminal picturation not cruciate, testaceous, veins brown, cells more or less fuscate; clavus with 3 large white spots contiguous to the commissure. Posterior legs and anterior and intermediate tibiae and tarsi spotted or ringed with black. Abdominal sternites more or less striped transversely with black. Vertex somewhat flat with a transverse impressed line; edges subacute; longer than wide, anteriorly triangular, acuteangled, lorae contiguous with posterior margin of genae.

Venation of corium very similar to that of *S. ochraceous* Osborn; outer claval vein hooked, and vein with a cross vein about its middle length.

Length: $4\frac{1}{2}$ - $5\frac{1}{2}$ mill.

Hab: Queensland, Cairns (viii).

N. B. The coloring and pattern is sometimes obscure.

The genus *Aphrodes* and its allies appear to be descended from some form very near *Phrynomorphus*, the ocelli being placed a little more dorsally and the tegmina being semicoriaceous and often much abbreviated, appendix always wanting; the wings have an incomplete submarginal vein. These characters which are simply due to the degradation of the flight organs and which may, and do, arise in any group of winged insects, have been used to form a family, viz.: Acocephalidae, though they are really scarcely sufficient to form a tribe.

Four genera showing these characters are known, viz.:

1. *Aphrodes* Curtis (= *Acuccephalus* Germar = *Acocephalus* Burmeister = *Pholetaera* Zetterstedt = *Anoscopus* Kirschb).
2. *Stroggylocephalus* Flor (= *Strongyloccephalus* Fieb).
3. *Kosmiopelix* Kirkaldy and
4. *Xestocephalus* Van Duzee, this last probably not really belonging here.

Kosmiopelix gen. nov.

Differs from *Aphrodes* by the differently shaped, foliaceous head, from *Eupelix* Germar by the eyes not being enclosed by the sides of the crown.

Head triangular, more or less porrect, specifically variable in this respect; foliaceous. Crown flattish, longer than wide between the eyes, from three to four times as long as pronotum, lateral margins in front of eyes slightly sinuate, apical fourth subspatulate. Frons oblongoval, twice as long as wide; genae at antennal sockets about three-fourths of the width of the clypeus which is parallel-sided, a little wider than lorae, the latter not quite touching posterior margin of genae. Eyes large, forming part of the curve of the head, not enclosed by lateral margin of crown. Ocelli on the disk of the crown just above anterior margin of the eyes, a little nearer lateral margins than the middle line. Pronotum transverse, about three times as wide as long, slightly arched anteriorly, very obtuseangularly emarginate posteriorly; lateral margins short. Tegmina coriaceous, abbreviated, reaching little beyond base of abdomen.

posteriorly truncate, venation obscure; wings minute, venation obscure, submarginal vein absent. Legs normal.

1. *varicolor* sp. nov. (Pl. XXIII figs. 7-8.)

Typically: head, pronotum and scutellum pallid testaceous, marked with brownish black. Tegmina shining blackish brown, posterior margin widely milky white. Abdominal tergites shining blackish brown, except the white genital segment. Legs black and white, more or less mottled.

The species varies considerably in color and pattern, however, like its congeners, independent of sex. The general color may be pale testaceous, abdominal tergites pale yellowish brown, no clear markings, or in the other direction, like the type, but pronotum milk white and a milk white band across.

Length: $2\frac{7}{8}$ - $3\frac{1}{2}$ mill.

Hab: Queensland, Bundaberg (ix-xii).

There is nothing notable about the nymph.

Dryadomorpha, gen. nov.

Superficially somewhat like *Cephalius*, but the ocelli are frontal and the face is shaped differently etc. Vertex acutely produced in front of the eyes, a little longer than wide at the base, slightly concave, basal half sulcate longitudinally; longitudinally finely striate; anterior margin of head acute. A sensory depression close to each eye near the base. Eyes large, not forming part of the curve of the head. Ocelli very small, immediately in front of the acute margin of the head, nearly midway between eye and apex of vertex. Face angularly convex, diamond shaped, frons elongate, subconstricted at the antennal articulations. Clypeus fused with frons, widening out posteriorly, posterior margin slightly notched in the middle, reaching beyond posterior margin of genae. Lorae wider than the clypeus anteriorly, not nearly touching posterior margin of genae. Posterolateral margin of face oblique, not angulate almost direct between eye and clypeus. Antennae long, reaching at least beyond last sternite. Pronotum finely striate transversely, anteriorly arched, lateral margins evanescent. Scutellum a trifle wider than long. The venation of tegmina and wings is so feeble that I have not been able to interpret it; it seems to be Phrynomorphoid.

1. *pallida*, sp. nov. (Pl. XXXII figs. 12-14.)

Pale golden yellow. Eyes brownish red.

Male: unknown.

Female: last sternite short, posterior margins slightly notched; pygofers marked with a groove on each side.

Length, 7 mill.

Hab: Queensland, Bundaberg, (ix-xii).

Only one female unfortunately of this interesting form.

Giffardia, gen. nov.

Superficially allied to *Dorycephalus* etc., but is probably an offshoot from some form near *Phrynomorphus*.

Head elongate, tapering; vertex longer than wide across the eyes, about 5 (male) 6 (female) (This is not absolutely constant) times as long as wide between eyes at base, prolongation elongate-triangular, flat, porrect or slightly declivous towards the apex, longitudinally carinate. Frons elongate, a little more than four times as long as wide between antennae. Clypeus a trifle wider at apex than at base, a little wider than the lorae which do not nearly touch its posterior margin. Eyes large, elongate, suboblique, not included in the curve of the head. ocelli small, on the anterior margin of the head, a little remote from the eyes. Antennae elongate, socketted at about one-third of the length of the eyes. Pronotum arched anteriorly pronotum and scutellum longitudinally carinate. Tegminal venation simple, 4 discoidals and 5 apical; wing venation normal. Posterior femora swollen a little at apex, with two hooks.

1. *dolichocephala*, sp. nov. (Pl. XXII, figs. 4 and 5.)

More or less pale yellowish testaceous, a longitudinal brownish line from apex of vertex to posterior margin of scutellum, the keel on these parts being often pale and the brown line more or less interrupted, sometimes irregularly widened, on the vertex. On each of the genae is a thin brown smudged line, uniting anteriorly on the frons. Tegminal veins whitish, whole internal margin smoky, as also two small spots, one on each side of the 2nd apical vein. Leg hairs pale.

Male: Tegmina extending beyond apex of abdomen.

Female: Tegmina not extending to apex of abdomen.

Length: (male) $5\frac{1}{2}$ - $6\frac{1}{2}$, (female) $8\frac{1}{4}$ mill.

Hab: Queensland, Cairns (vii-viii) Kuranda, (viii) on grasses.
The nymphs do not apparently differ from the adult in any important non-instaral characters.

Reuteriella Signoret.

Reuteria Signoret 1879, A. S. E. France (5) IX, 51 and 1880 op. c., X 45. (preocc.)

Reuteriella Signoret 1880 op. c., 365.

1. *flavescens* (Signoret.)

Reuteria flavescens Signoret 1880, op. c., 46 pl. 1, fig. 40.

Hab: Tasmania.

Thomsonia Signoret.

Thomsonia Signoret 1879 op. c., IX 51.

Thomsoniella Signoret 1880 op. c., X 52.

1. *arcuatus* (Motshulsky.)

Acocephalus arcuatus Motshulsky, 1859 Etudes Entom. VIII, 115; and 1863 Bull. Soc. Imp. Moscou XXXVI, 2 p. 100 (Sec. Melichar.)

Tetigonia kalidasa Kirkaldy, 1900 Entom. XXXIII, 294.

Thomsoniella arcuta Melichar, 1903 Hom. Ceylon 172.

This seems to me rather a *Parabolocratus* than a *Thomsonia*.

Hab: Queensland; Cairns (vii-viii), Kuranda (vii) Ceylon (my collection.)

2. *lincolatus* (Motsh.)

Platymetopius lineolatus Motshulsky 1859 Etudes Entom. VIII, 114 (Sec. Melichar.)

Deltocephalus rubrolineatus Motshulsky, 1863 Bull. Soc. Imp. Moscou XXXVI, 2, p. 98 (Sec. Melichar.)

Thomsoniella porrecta Melichar 1903 Hom. Ceylon 173.

Walker's description of *Acocephalus porrectus* does not seem to apply to this.

Hab: Queensland Cairns (viii); Ceylon (my coll.)

This too seems to belong to *Parabolocratus* rather than to *Thomsonia*.

3. *kirschbaumii* (Stal.)

Hecalus kirschbaumii Stal 1871, O. V. A. F., 737.

Thomsoniella kirschbaumii (sic!) Signorea 1880 A. S. S. F. (5) X. 52, Pl. 1, f. 44.

T. kirschbaumii Melichar, 1903 Hom. Ceylon 171.

Hab: Queensland, Cairns (vii-viii); Ceylon (my coll.); India (Signoret); Philippines (Stal.)

Hecalus Stal.

Hecalus Stal, 1864, A. S. E., France (4), IV, 65; Signoret, 1879, op. c., IX, 61 and 226.

1. *pallescens* Stal.

Hecalus pallescens Stal, 1864, op. c., (4), IV, 65; Signoret, 1879, op. c., (5), IX, 270, Pl. 7, fig. 24.

I have not seen this species, which may be a trifle larger than *H. immaculatus*; it apparently has the head only slightly foliaceous (while in *H. immaculatus*, it is somewhat widely so); there is a black spot at the apex of the clavus and 4 longitudinal brown bands on the tergites. The tegmina reach nearly to apex of abdomen.

Female: Length 10 mill.

2. *immaculatus*, sp. nov. (Pl. VII figs. 1-2.)

Very similar to the preceding, but the head is a little longer and broader, and the whole insect is pale greenish, shading off a little darker or lighter, but immaculate. All the examples collected have the tegmina not reaching as far as the apical margin of the (apparent) second tergite.

Female: sheath rosy.

Hab: Queensland, Cairns (vii-viii), Kuranda (viii) on grasses.

Cephalclaus Percheron.

Cephalclaus Percheron, 1832, Mag. Zool., II, Pl. 48; Burmeister, 1838, Gen. Ins., (No. 4) Pl., Signoret, 1879, A. S. E. France (5), IX, 50 and 259.

Dorydium Burmeister, 1835, Handb. Ent., II, 106; Kirby, 1894, T. E. S. London, 412.

1. *brunneus* Waterhouse. (Pl. XXIV, f. 5-6.)

Cephalelus brunneus, G. B. Waterhouse, 1839, T. E. S. London, II, 195.

Hab: New South Wales, Sydney, (i, also Waterhouse).*

2. *marginatus*, Waterhouse.

C. marginatus, Waterh., l. c.

Hab: King George's Sound.

I cannot identify this satisfactorily; I think two forms are confused. The nymphs in this genus are in all stages very similar to the adults.

Paradorydium Kirkaldy.

Dorydium Burmeister, 1838, Gen. Ins., (No. 5); and 1839, Handb. Ent., II, 1006; Signoret, 1879, A. S. E., France, (5), IX, 261. Pl. VII, figs. 21-2.

Paradorydium Kirkaldy, 1901, Entom. XXXIV 339.

1. *menalus* sp. nov.

Testaceous, or more or less rosy, or more or less tinged with ferruginous, veins paler. Head, pronotum and scutellum obscurely and smudgily flecked with blackish brown, the punctures being darkish. Sterna and sternites usually more or less tinged with pinkish. Elongate fusiform; head about as long as nota and tegmina together, gradually converging towards apex which is angularly rounded; sides acutely carinate for at least the anterior two thirds. Head, pronotum and scutellum finely and closely punctured, clavus lightly punctured. Vertex, pronotum and scutellum longitudinally carinate. Frons very strongly carinate, a little swollen near the clypeus. Pronotum with two sublateral keels on each side, a little more obsolescent than the median one, basal margin slightly angulately emarginate. Tegmina longer than abdomen.

Length: 10½ (male); 12 female) mill; width about ¾ mill.

Hab: Queensland, Cairns (viii), Nelson (vii), Kuranda (viii.)

The head as seen in profile is much longer and flatter than in any other species known to me. The males are smaller than the other sex, and the vertex inclines a little to be spatulate apically.

* Kirby says that *C. marginatus* and *brunneus* do not belong to *Cephalelus*; the description of the latter, however, at least, agrees very well with forms of *Cephalelus* before me.

2. *pseudolyricen* sp. nov.

Smaller than the preceding and the capital process shorter and more spatulate, the female being more narrowed at the middle of the process. Testaceous, minutely and closely punctured and spotted with brown, apex of process dark brown; two black spots on anterior margin of scutellum near antero-lateral angle. Tegmina pale yellowish brown, lateral margins pallid. Sterna (except laterally) and abdomen (more or less) blackish. Capital process somewhat ascendant apically, about $2\frac{1}{2}$ times as long as the width of the head basally. Tegmina longer than abdomen, with the nota about two-thirds to seven-eighths longer than the head.

Length: $5\frac{3}{4}$ (male), $8\frac{1}{4}$ (female) mill.

Hab: Queensland, Brisbane (xi), Bundaberg (ix-xii.)

3. ? *foveolatum* (Signoret).

Dorydium (?) *foveolatum* Signoret, 1880, A. S. E. France (5), X, 144. Pl. I, f. 39.

Hab: West Australia (Signoret).

Dorycephalus Kush.

Dorycephalus Kushakevitsh, 1866, Trud'i Russk. IV, 102; Signoret, 1879, A. S. E. France (5), IX, 265.

1. *ianthe* sp. nov.

Testaceous with a ferruginous tinge on the head. Abdomen mostly black above, punctured very finely and closely with golden yellow. Head nearly twice as long as wide, about four times as long as the pronotum.

Length: $6\frac{3}{4}$ mill.

Hab: Queensland; Bundaberg (ix-xii).

2. *subreticulatus* sp. nov.

Allied to the preceding but darker; the head narrows more towards the anterior margin and is more acute there. Pale testaceous, very closely and finely punctured and freckled with brownish and golden-yellow. Tegmina with brownish veins.

Head nearly one-half longer than wide, $3\frac{1}{2}$ times as wide as pronotum. Tegmina subreticulate.

Length: $6\frac{1}{2}$ mill.

Hab: New South Wales, Sydney (ii).

3. *trilincatus* sp. nov.

Somewhat similar to the last named; a dark brown line from anterior margin of head to posterior angle of scutellum (divided on vertex by pale median carina); lateral margins of tegmina broadly blackish brown, narrowing a little apically, the margins pale.

Length: 6 mill.

Hab: New South Wales.

Tartessus Stal.

Tartessus Stal, 1865, O. V. A. F., XXII, 156; Signoret, 1880, A. S. E. France, 347.

This is a characteristic Australian genus, though it stretches into the Philippines, Malays, etc. It must be very rich in species as Signoret admits 14, and I have a number before me unworked. They seem all to be arboreal.

1. *syrtidis* sp. nov. (Pl. XXIV, fig. 9).

Pronotum and scutellum clear yellowish. Head testaceous, the top broadly black transversely, lengthening on the tempora; there is a broad curved black stripe at the base of the genae, beneath the eyes, reaching the frontal sutures at the antennal scrobes. The frons has a pattern (figured) in black and the apex of clypeus and of lorae, etc., are the same color. Eyes brown. Sterna (mostly), sternites basally, sternopleurites entirely, posterior femora mostly, genital segments (except lateral margin of plate in male, narrowly pale), black or blackish; rest of underside mostly testaceous. Tegmina subhyaline, pale ferruginous with a lilac iridescence; a transverse median hyaline stripe and a large hyaline, marginal spot towards the apex of the subapical transverse veins, blackish; and a spot near the apex of the costal cell blackish ferruginous. Wings hyaline, veins black. Vertex scarcely prominent in front of eyes, very greatly rounded. Eyes large, reaching posteriorly to about half of the length

of the pronotum. Ocelli much nearer the eyes than the middle line.

Length: (Female) 9 mill.

Hab: Queensland, Bundaberg (xi on sandhills; bred from *Eucalyptus*).

Tribe *Macrostelini*.

(=Cicadulini V. D.)

Under this name it is convenient to separate forms with shorter vertex and simpler venation, usually with only one subapical cell; at the same time it is probably not a natural division. It probably embraces (1) *Balclutha* Kirkaldy, (2) *Macrosteles* Fieber, (=Cicadula Edwards=Limotettix Woodworth, etc.), (3) *Coryphachus* Puton, (4) *Grypotes* Fieber, (5) *Aconura* Lethierry, (6) *Eulcimonios* Kirkaldy (=Limotettix J. Sahlb.), and some new genera. *Limotettix* Sahlb., is a mixture of *Phrynomorphus* and *Thamnotettix*. Most, if not all, of these forms are grass-feeders.

Eulcimonios gen. nov.

Jas. Edwards has separated off as a genus (not recognized by Puton) those forms in which the lateral margins of the pronotum are obsolescent and are not (or very obsolescently) keeled. Unfortunately he has used for this the name *Limotettix* (an orthographical monstrosity.) J. Sahlb., the type forms of which are partly *Phrynomorphus*, partly *Deltocephalus*.

The Edwardsian species seem to be worthy of at least subgeneric rank and I think that the future will accord a full title.

1. *demittendus* sp. nov.

Vertex testaceous tinged with brown; 4 brownish specks on apical margin, 2 on basal margin. Pronotum and scutellum testaceous tinged with green. Tegmina greenish, or pale greenish testaceous, apically and costally colorless, veins pale greenish testaceous. Frons pallid rufescent with narrow obsolescent brownish radiating lines from very near the middle line. Vertex angularly rounded in front, about one-half longer medianly than next to the eyes. Lorae very large, almost circular, about 3 times as wide as the clypeus. Tegmina with 4 discoidals and 5 apicals.

Length: $3\frac{1}{2}$ mill.

Hab: New South Wales, Sydney (i).

Pettya gen. nov.

Elongate; vertex more than twice as wide as long dorsally, anteriorly rounded, bent over in front and extending ventrally about as far as antennal scrobes; demarcation from frons not very distinct; posteriorly above tumidly raised, posterior margin much more so than the apical margin of pronotum. Head distinctly wider than pronotum anteriorly. Clypeus oval, about as wide as frons apically. Pronotum large, reticulate, almost as long as wide, about two and a half times as long as vertex dorsally, strongly arched anteriorly, lateral margins long, not carinate, posterior margin subtruncate. Tegmina with two discoidal (1 subapical) and 4 apicals. Wings without submarginal vein.

1. *anemolua* sp. nov. (Pl. XXXII, fig. 10).

Head pale luteous; frons and clypeus with an orange tint, genae testaceous, eyes grey. Pronotum and scutellum greyish white, the former closely reticulate with greyish-brown. Tegmina and wings milk-white hyaline, tegminal costa pale yellow. Tergites black, one or two segments partly pale; beneath pallid, more or less black laterally. Legs orange yellow.

Length: 6 mill, width $1\frac{1}{8}$ mill.

Hab: Queensland, Cairns (viii).

Nesosteles gen. nov.

Allied to *Macrosteles* but the radial is not obsolescent and the wing venation is different. There are a number of species represented in the collection, out of which I have had time briefly to describe 5 only.

Type *hebe*.

1. *hebe* sp. nov. (Pl. XXXII, fig. 8).

Head pale sordid testaceous. Pronotum and scutellum whitish testaceous, with a faint brownish longitudinal median line on the former (and sometimes two obsolescent submedian lines). Underside, legs, etc., pallid. Tegmina whitish-grey, subhyaline, veins white; wings milky white, veins more or less smoky. Mesonotum and tergites blackish, genital segments more or less pale.

Length: 4 mill.

Hab: Viti Isles (viii).

2. *glauca* sp. nov.

Closely allied to the former, but smaller and more yellowish. Pale yellowish testaceous, with a tinge of grey; sterna, legs, etc. paler. Tegmina and wings pale milky subhyaline. Abdomen pale sordid yellowish, more or less black discally.

Length: $3\frac{1}{2}$ mill.

Hab: Cairns (viii), Koebele's No. 2259; and I think 2292 is either this, or a very closely allied species.

3. *sanguinescens*, sp. nov. (Pl. XXXII, fig. 9).

General color dark crimson-red. Head testaceous (or yellowish testaceous or pinkish); vertex with three narrow crimson longitudinal lines, the lateral ones with a very short transverse line at their apices. Face testaceous, frons with pale red-brown, obliquely transverse parallel lines on each side of the middle. Pronotum testaceous or pinkish with a narrow median longitudinal crimson line, two sublateral outwardly-curved lines of same color and three crimson spots on anterior margin and one in posterior angle, this and the middle anterior one sometimes united: these spots often darker. Tegmina crimson red, varying obscurely suffused with brownish, veins white and very conspicuous: Costal and intero-apical cells hyaline, some of the latter more or less smoky. Wing veins darkish. Propleura, sterna etc., abdomen mostly (except the sanguineous lateral margins and genital segments) black. Legs mostly pallid.

Female: Plate testaceous; last segment deeply acutely notched.

Length $4\frac{3}{4}$ -5 mill.

Hab: Queensland, Brisbane (vi), Bundaberg (ix-xii.)

4. *sordidior* sp. nov.

Closely allied to the last, but a trifle smaller, and color different, the sanguineous being paler and browner, while the frons is not striped.

Female: last segment very slightly roundly emarginate.

Length $4\frac{1}{2}$ mill.

Hab: Queensland, Brisbane (vi.)

5. *taedia* sp. nov.

Sordid lemon yellow, vertex with two black spots near the anterior margin; frons discally black, clypeus smoky. Scutellum dark brownish. Commissural cell of clavus, basal part of costal cell and apical half of tegmina smoky. Abdomen basally black.

Length $4\frac{1}{4}$ mill.

Hab: Queensland, Kuranda (viii.)

This will probably form the type of a new genus.

Subfamily Agalliinae.

(Bythoscopidae of many authors.)

I have retained this subfamily for the sake of convenience but I cannot see any good characters by which it can be separated from the Iassinae, especially from such forms as *Tartessus* etc., the position of the ocelli being so slightly different.

The nomenclature is horribly confused, all authors up to 1900 (when I pointed the fact out) having ignored Lewis' fixation of *lanio* as the type of *Bythoscopus*.

The following is the synonymy of several vexed genera:

1. *Bythoscopus* Germar, type *lanio* (Linn.) Lewis.
Macropsis auct. nec Lewis.
Batrachomorphus Lewis, type *irrorata* (= *microcephala*)
Stragania Stal. (placed by Fowler among the *Gyponinae*!)
Pachyopsis Uhler.
Gargaropsis Fowler.
2. *Oncopsis* Burmeister, type *flavicollis* (Linn.) Westwood,
Macropsis (B) Lewis.
Bythoscopus auctt.
3. *Macropsis* (A) Lewis, type *virescens* (Fabr.) Westwood.
 subg. *Pediopsis* Burmeister, type *tiliae* Burm.

Tribe Agalliini.

Epipsychidion gen. nov.

Forms a sort of link between the Agalliinae proper, and the Iassinae as represented by *Tartessus*; it is here placed in the former as the ocelli are ventral though not very distinctly.

Vertex dorsally very short, anteriorly obtuse-angled, pos-

teriorly rotundately-emarginate (apex of emargination nearly reaching as far as anterior margin of eyes), obliquely striate on each side of the middle. Ocelli inserted on the vertex ventrally, immediately below the top of the head. Antennae inserted under a shallow ledge, but lying in a rather deep groove. Pronotum subhemispherical, transversely striate. Scutellum transverse. Tegmina punctured, especially on the clavus; 5 discoidals (of which two are subapical) and 5 apical cells.

1. *epipyropis* sp. nov. (Pl. XXIII figs. 4-6.)

Pale cinereotestaceous, sordid testaceous beneath. Pronotum with 3 distinct, narrow, longitudinal black lines, which continue anteriorly and posteriorly on to vertex and scutellum (the middle one much thickened on the vertex and scutellum and trifurcating anteriorwards on the pronotum.) Clypeus etc., blackish brown, frons obscurely and sparsely marked with brown. Anterior intermediate femora annulated with dark brown. Tegmina with veins white, dark brown and black. Abdomen brownish-testaceous, a blackish brown median line on last tergite.

Male unknown.

Female: Ovipositor extending beyond tegmina, pygofer elongate, but not so long as the above.

Length

Hab: New South Wales, Sydney (i-ii Koebele's No. 2373). arboreal.

Vars: In some examples, the black lines are fainter and are bordered with yellowish brown.

The nymph (fig. 6) has a remarkably elongate head.

Eurinoscopus, gen. nov.

The Australian representative of *Bythoscopus* Germ., Kirk., from which it differs by the venation; the latter has the median discoidal undivided, so that there are only two small subapical cells, while in the former there are three well defined small subapical cells also in *Bythoscopus* there is only one transverse vein standing on the cubital, in *Eurinoscopus* there are two.

There are two sections, viz:

1. Tegmina pale yellowish cinerous (sometimes tinged with green or rose), with blackish granulations on the veins.

2. Tegmina greenish or pale yellowish green, without granulations.

Section 1.

1. *lentiginosus* sp. nov. (type.)

Vertex and pronotum pale greenish, minutely spotted with black, the latter also smokily clouded through its entire length in the middle. Scutellum pale castaneous, with four dark spots on the anterior margin (or the two middle ones may coalesce and extend to the posterior angle.) The rounded frons is blackish, except the lateral margins which are very narrowly pale, and there are two small black spots at the sides of the antennal scrobes below the ledges. Rest of the underside pallid, pleura and base of the genital segments dark, the remainder of the latter minutely spotted with black. Tegmina subhyaline, pale cinereous yellow, (base sometimes more or less black.) Apices or intermediate femora and of posterior femora and tibiae black. Sternites pallid testaceous, greenish or reddish.

Frons convex, lorae large. Pronotum much more convex than in the European *B. microcephala*, and anteriorly declivous, anterior margin more arched, lateral margins shorter; tegmina reaching well beyond apex of abdomen.

Male: Last segment truncate, pygofers very short, valve elongate (the tip black), nearly as long as pygofers.

Female: Last segment subtruncate, very slightly sinuate, pygofers granulate.

Length: $4\frac{1}{8}$ mill.

Hab: Queensland, Kuranda (viii), Nelson (vii).

2. *sontiates* sp. nov.

Sparsely freckled, otherwise little related to *lentiginosus*, being more elongate and narrowed. Pale testaceous, more or less tinged with pink or greenish or yellowish green, a longitudinal narrow testaceous line on vertex, pronotum and scutellum. Ocelli red. Frons and lorae much as in the type.

Males rather smaller and darker.

Female: Last pleurite very slightly obtusely produced in the middle, pygofers longer than in the type, with short bristly hairs.

Length: $4\frac{1}{8}$ - $5\frac{1}{4}$ mill.

Hab: Queensland, Kuranda (viii).

3. *soboles* sp. nov.

Very close to the last, but larger and the anterior margin of vertex (dorsally) wider and not so rounded; frons flatter. Lateral margins of pronotum more parallel.

Length: $6\frac{7}{8}$ mill.

Hab: Queensland, Kuranda (viii).

4. *dryas* sp. nov.

Allied to *E. sontiastes*, but less elongate and frons flatter.

Pale testaceous, corium lightly granulate with brown.

Male: Plates elongate hemispherical, not as long as the pygofer.

Female: last segment obtusangularly emarginate, laterally produced acuminate.

Length: $4\frac{3}{8}$ - $5\frac{1}{8}$ mill.

Hab: Queensland, Bundaberg (ix-xii).

Section 2.

The species of this section are unsatisfactory; they are all immaculate greenish or testaceous and present only trifling differences that can be characterized.

5. *pelias* sp. nov.

General form of *B. dryas*, but a little more elongate.

Greenish; head and scutellum often yellowish; underside more or less testaceous. Frons convex, though not so much so as in the type. Inner apical cell and appendix colorless.

Male ventral segments similar to those of *B. dryas*.

Female: last segment slightly roundly emarginate, laterally produced acuminate, pygofer elongate.

Length: 4½-6 mill.

Hab: New South Wales, Sydney (i-ii), Mittagong (i).

6. *molestia* sp. nov.

Allied to the last, but narrowed and more elongate; vertex distinctly, though obtusely, angulately rotundate in front; in the middle more than one-half longer than at eyes which extend laterally very slightly beyond the pronotum. Frons nearly as

convex as in the type. There are 3 transverse veins standing on the cubital.

Female: last segment not produced acuminate laterally.

Length: 5 mill.

Hab: Queensland, Kuranda (viii).

7. *pelamys*, sp. nov.

The largest of the Australian species. Similar to *B. pelias* but larger and more elongate.

Testaceous. Frons fairly convex, vertex dorsally short, wide, little wider medianly than at the side.

Female: last segment with a short acute lateral spine.

Length: $6\frac{1}{8}$ - $6\frac{3}{8}$ mill.

Hab: New South Wales, Sydney (i).

Pedioscopus gen. nov.

Allied to *Idiocerus* Lewis, but differs by having no subapical cells. There is a tegminal appendix, and the supernumerary cell of the wing is present. In the males the antennae are simple. Frons convex, anterolateral margins rounded. Type *philenor*.

1. *philenor* sp. nov.

Head and pronotum pale greyish-yellow, frons (except narrowly laterally, pallid), clypeus, lorae, small spot at antennal scrobes, etc., blackish. Pronotum with 2 large rounded black spot. Tegmina hyaline, basal half tinged with yellowish; costa, a longitudinal streak down the middle, the principal veins, more or less, smoky. Apex of anterior tibiae and anterior tarsi black.

Male: apex of valve black.

Length: 4 mill.

Hab: Queensland, Cairns (viii).

2. *polydoros* sp. nov.

Larger than the type and differently patterned. Pale olivaceous, paler beneath, four black spots on vertex, the larger pair (which are a trifle less than their own diameter from the eyes) visible from above. Frons with 8-10 small spots. Pronotum with two sublateral blackish wedgelike spots close to anterior margin. Scutellum with two wedgelike black spots on anterior margin close to anterolateral margin, and two small round black

spots on the middle, one on each side of central line. The spots on vertex, pronotum and the wedges on scutellum are in line Tegmina immaculate. A black spot on propleuron.

Female: Ovipositor black, valve much longer than in *P. agnor*, being as long as the rest of the body.

Length: 4 mill.

Hab: Queensland, Nelson (vii).

3. *agnor* sp. nov.

Size and coloring of the type, except as below, and may possibly be the female of that species. Vertex with two black spots nearer the eye than their own diameter and visible from above. Frons with two similar sized spots at its extreme base and nearer together than are the vertical spots; a small spot at the scrobes and the clypeus, black. Pronotum with 2 big black spots (and sometimes a line at the posterior margin). Sterna, a spot on propleuron, etc., black. Anterior tibiae concolorous.

Female: ovipositor black.

Length: 4 mill.

Hab: Queensland, Cairns (viii).

Tribe *Eurymelini*.

Confined to Australia, the species congregate on *Eucalyptus* where they "bore into the green bark...the sap exudes, dies and falls to the ground, sometimes in great quantities," (Ann. Mag. Nat. Hist., XV, 35, (1845).

There are only two genera known, one forming two subgenera:

1. Tegmina with simple venation and with an appendix; wings with normal venation. Vertex and frons forming one single curve, in profile. Posterior tibiae with a double row of spines. Last abdominal sternite composed of two parts which overlap posteriorly but are separated anteriorly; they reach the lateral margins of the abdomen. 1. *Eurymeloides* Ashmead.

1a. Tegminal venation reticulate apically; wings with two veins inside the supernumerary cell. Vertex and frons forming two or three curves in profile. Posterior tibiae with two strong spines. 2. *Eurymela* Lep. & Serv.

1b. Last abdominal sternite formed as in *Eurymeloides*.

2a. *Eurymelops*, subg. nov.

1c. Last abdominal sternite consisting of two similar plates, which however do not nearly reach the lateral margins of the abdomen.

2b. *Eurymela*, in sp.

Eurymeloides, Ashmead.

Eurymela Div. B. Signoret.

Eurymeloides Ashmead, 1889, Ent. Amer., V, 126.

Ashmead has founded this genus in the most improper manner, viz.: in one line of description, without mention of species. The venation both of tegmina and wings is often very irregular. Usually there is one vein standing on the cubital, sometimes two, sometimes none at all, in the same species. Sometimes the transverse apical veins are incomplete, a cell thus reaching from the first forking of the median to the apex of the tegmen.

1. *hyacinthus* sp. nov.

Black; eyes pale castaneous. Posterior margin of pronotum, a small spot (of varying size) on clavus, a larger (though still small) spot on corium about the apex of the basal third, and a more or less narrow wedge-shaped band of varying thickness and extent (sometimes reaching clavus, sometimes not) on corium at a level with apex of clavus, white. Tegminal ground color dark metallic purple, wings dark smoky. Posterior part of scutellum (or only the lateral margins very narrowly) ochraceous. Lateral margins of frons, lateral margins of lorae and interior margins of genae, coxae, sternites (excluding genitalia), tergites broadly postero-laterally, and middle two-thirds of basal segment of posterior tarsi—whitish testaceous.

Length: 10½-12 mill.

Hab: Queensland, Cairns (vii-viii), Nelson (vii), Kuranda.

Var: A narrow longitudinal stripe on vertex and two small spots near anterior margin of pronotum, ochraceous.

Nymph. No chitinous spines on the legs, only short, feeble hairs. Vertex, two spots on pronotum, the ground color of nota and abdomen above castaneous; frons, lorae, clypeus, rostrum, sternites, black. Genae pallid. Nota and terga marked with black.

2. *cumulosus* sp. nov.

Head, pronotum and scutellum blackish brown, speckled with testaceous; posterior two-thirds of genae and exterior half of

lorae, whitish, more or less punctured finely with brownish red. Tegmina blackish brown, a white blotch near the base (with a black speck in the middle), an irregular stripe near the apex and one or two small spots near the commissure. Wings smoky, veins black. Legs black, coxae, base of femora, base of spines on posterior tibiae, and basal four-fifths of 1st. segment of posterior tarsi, whitish. Abdomen pale yellowish, genital segments black. Penultimate sternite obtusangularly emarginate, pygofers rather short and stout.

Length: $8\frac{1}{2}$ mill.

Hab: Queensland, Brisbane (vi).

Var: I have in my own collection, some forms from Queensland, which I can only refer to this species; the head and pronotum are more irrorated with testaceous. Scutellum ochraceous irrorated with black, the anterolateral angles black. The tegminal veins are pinkish where they cross over the whitish fasciae. Abdomen sanguineous, genital segment black.

3. *bicinctellus*, sp. nov.

Closely allied to *E. bicincta* (Erichson). Shining black; posterior three-fourths of genae, exterior half of lorae, the coxae, basal three-fourths of femora, base of tibial spines, basal two-thirds of 1st. segment of posterior tarsi, testaceous. Posterior margin of pronotum very narrowly, an oblique stripe from about middle of costa to middle of lateral margin of scutellum, and another band (narrowing internally) near apex of tegmina, white. Wings smoky, veins black.

Male: Sternites black, posterior margin of each narrowly testaceous, last segment with a large testaceous triangle. Genital segment black.

Female: Sternites pale testaceous, genital segment black. Last segment very short, almost concealed by previous one, apically sinuate, medianly notched.

Var: Dark parts of head, pronotum and scutellum more or less, or entirely, castaneous.

Length: $6\frac{1}{2}$ - $7\frac{1}{4}$ mill.

Hab: Queensland (my collection), New South Wales, Mittagong (i).

4. *ornatus*, sp. nov.

Allied to *E. cumulosus*. Head and pronotum dark brown mottled with whitish. Exterior half of lorae whitish. Scutellum

pale castaneous, with a broad central stripe (becoming obscure anteriorly) and the anterolateral angles blackish. Pleura black, propleura bordered narrowly exteriorly with whitish. Sterna, coxae, basal part of femora, tibial spines basally, basal three-fourths of 1st. segment of posterior tarsi, sternites (except some black markings) testaceous. Tegmina, purplish black, picturation as in *E. bicinctellus* but broader and the basal stripe more transverse, reaching only to about one-third of costal length. Wings as in *E. bicinctellus*.

Male: Genital segment more elongate dorsally than in *E. bicinctellus*.

Length: $8\frac{3}{4}$ mill.

Hab: Queensland, Cairns (viii).

5. *rubrivenosus*, sp. nov.

Head, pronotum and scutellum pale castaneous, freckled with yellow. Clypeus, lorae and underside yellow; tibiae and tarsi more or less castaneous. Tegmina subhyaline yellowish, the cells more or less obscurely clouded with brownish, veins sanguineous, also most of clavus. Wings smoky, veins black.

Female: Last segment notched sublaterally; pygofers elongate.

Length: $5\frac{3}{4}$ mill.

Hab: New South Wales, Mittagong (i).

6. *lentiginosus*, sp. nov.

Very closely allied to the preceding but much narrower posteriorly, more triangular in form. Head and pronotum more or less marked with black. Tegmina yellowish cinereous, more or less infusate towards the apex, with a few translucent, colorless markings; principal veins sometimes pale sanguineous.

Length: $5-5\frac{3}{8}$ mill.

Hab: Queensland, Brisbane (vi).

7. *pulchra* (Signoret).

Eurymela pulchra Signoret op. c., 508, Pl. 17, f. 10.

Hab: Victoria, Bacchus Marsh (my collection).

The following species of *Eurymeloides*, described from Australia, are unknown to me:

8. *Eurymela lincata* Signoret, 509, fig. 11.

9. *E. adspersa* Signoret, 510, fig. 2.
 10. *E. ocellata* Signoret, 511, fig. 13.
 11. *E. punctata* Signoret, 511.
 12. *E. trifasciata* Signoret, 512, fig. 14.
 13. *E. porriginosa*, Signoret, 512.
 14. *E. bicincta* Erichson, 1842, Wiegmann's Archiv., VIII.
286. (The type of the genus).

Eurymela Lep. and Serv.

Eurymela Lep. Serv., 1825, Enc. Meth., X, 603.

Eurymela Div A., Signoret, 1850, A. S. E. France, (2), IX, 497.

subg. 1. *Eurymclops*, nov.

1 *rubrovittata*, Am. & Serv.

Eurymela rubrovittata Am. Serv., 1843, Hem. 555, Pl. 10, fig. 4.

Hab: Victoria, Bacchus Marsh (my collection).

2. *bicolor*, Burmeister.

Eurymela bicolor Burm, (1837?) Gen. Ins., *Eurymela* No. 1. Signoret, 1850, A. S. E. F., 503, Pl. 17, f. 9.

I do not know this species.

subgenus, *Eurymela* in spec.

3. *rubrolimbata*, sp. nov.

Allied to *E. bicolor*. Black or blackish; posterior margin of genae more or less widely pale reddish. Trochanters, basal half of femora (or almost all posterior femora), tibiae (mostly), claval commissure and costal margin (both narrowly) reddish. Tegmina purplish black, a stripe across middle of clavus, and a subcontiguous one across the corium, also a broader one nearer the apex, white.

Male: last sternite slightly roundly emarginate, genital segment somewhat elongate.

Female: penultimate sternite obtusangularly emarginate, last sternite truncate.

Var: Posterior half of pronotum lemon yellow, encroaching medianly on black anterior half.

Length: $9\frac{1}{2}$ - $9\frac{3}{4}$ mill.

Hab: New South Wales, Mittagong (i).

4. *plebeia* sp, nov.

Allied to *E. fenestrata*. Castaneous or orange; vertex with a short stripe on each side of the base of the frons, 2 spots on pronotum (sometimes absent, sometimes much enlarged), 3 spots at apical margin and at posterior angle (sometimes concurrent), apex of femora, the tibiae and tarsi (except the white basal three-fourths of basal segment of posterior tarsi), propleura more or less, etc., black. Genae and lorae testaceous. Tegmina purplish or purplish black, sometimes with a greenish glint, lateral margins narrowly ochraceous, widening basally, internal margins more or less widely coppery; a white spot near costal margin at about third of its length, and another one nearer apex, also a speck on clavus (sometimes absent.) Wings smoky black with purple glint; veins black. Abdomen more or less tinged with sanguineous.

Male: Genital segment black.

Female: Genital segment orange, apex and last segment (plates) blackish.

Length $12\frac{1}{2}$ mill.

Hab: Victoria, Bacchus Marsh (my collection).

5. *lubra*, sp. nov.

Allied to *E. distincta*, from which it apparently differs principally by the red abdomen, etc.

Head, pronotum, scutellum, tegmina, etc., metallic purplish black; genae and exterior half of lorae testaceous. Abdomen above and the whole of the underside sanguineous, except part of propleura, apex of femora, the tibiae and tarsi (except the pale basal three-fourths of 1st segment of posterior tarsi) which are black. A spot near the base of tegmina and a little one (contiguous) on clavus, and one near apex of tegmina—white.

Male: Genital segment black, more or less sordid ochraceous laterally.

Female: Genital segment sanguineous; last segment (plates) and apex of genital segment, black.

Length 13 - $14\frac{1}{2}$ mill.

Hab: Victoria, Bacchus Marsh (my collection).

The following species belonging to the typical subgenus have also been described from Australia:

6. *ruficollis* Burm. (1837?) Gen. Ins., Eurymela No. 3.
7. *erythrocnemis* Burm., l. c., No. 4.
8. *marmorata* Burm. l. c., No. 5 (= *Bythoscopus nigroaeneus* Walker.)
9. *maura* (*Cicada*) Fabricius 1775 Syst. Ent., 686.
10. *fenestrata* Lep. Serv. 1825, Enc. Meth., X, 604.
11. *discoidalis* Signoret 1850 A. S. E. France (2) VII, 505.
12. *distincta* Signoret op. c. 506 (= *speculum* Walker, 1851, List. 641.)
13. *vicina* Signoret, l. c.,
14. *generosa* Stal, 1865 O. V. A. F., XXII, 156.
15. *rubrofasciata* Stal, l. c.

The following have been also described under *Eurymela*, their generic position being uncertain from the description:

1. *lignosa* Walker, 1858 Suppl., 166.
2. *latifascia* Walker 1851 List. 639.
3. *basalis* Walker op. c., 640.
4. *suffusa* Walker, l. c.
5. *discifera* Walker op. c. 641.
6. *terminalis* Walker op. c., 642.
6. *livida* Walker l. c.
7. *semifascia* Walker op. c., 643.
8. *decisa* Walker l. c.
9. *varia* Walker op. c., 644.
10. *atra* Walker op. c., 645.
11. *lacta* White, Eyre Exped. I. 433 Pl. IV, f. 3 (I have not seen description of this.)
12. *amplicincta* Walker 1858. Ins. Saund. Hom. 84.
13. *suffusa* op. c., 83.
14. *perpusilla* l. c.

Subfam. Eupteryginae.

This subfamily seems to be a natural development of the Macrosteline Tetigoniids in the direction of simplification and degeneration of the venation, the radial, median and cubital veins appear to spring altogether almost at the base itself of the tegmen and continue (as a rule) undivided right up to the transverse apical veins; the only exception known is the new genus *Aneono*, which from its general facies and structure must be included in this subfamily; at the same time the venation is quite different.

In many, perhaps a majority of the forms, the tegminal venation is scarcely visible much basal of the transverse apical veins. The wing-venation seems to be most primitive in *Alebra*, *Erythroneura* representing some of the more degraded forms.

Little is known of their habits or metamorphoses, beyond the names of the food plants etc., except in the case of *Erythroneura comes*, which has been worked out, especially by Slingerland. Judging from his figures, the nymphs differ but little in general appearance from the adult.

Cicadula flavescens (Fabr.) has a very wide range and while feeding on many shrubs and herbs in Europe, is also very destructive to the Tea-plant in India. J. Sahlberg gives brief descriptions in various genera.

So far as I am aware, no Eupteryginae have previously been recorded from Australia and only 26 specimens were collected by Messrs. Koebele and Perkins; these form two new genera and fourteen new species, one of the latter being from the Viti Isles. There are none in Hawaii. The Eupteryginae are as a whole the daintiest of all the Tetigonioidea, a character well upheld by those about to be described.

The nomenclature of the genera is very confused, partly owing to the former persistent ignoring by European authors of *Eupteryx* Curtis, and the subsequent arrangement by which *Eupteryx* and its synonym *Typhlocyba* were kept separate. No less than six names proposed were preoccupied, while the pedants also amused themselves by altering two others.

In Jan. 1833 (not 1832 as usually cited), Curtis created (Ent. Mag. 1, 192) *Eupteryx* for *E. picta* Fabr. (= *atropunctata* Goeze), describing *hortensis* at the same time. Later in the year (before Easter) Germar erected *Typhlocyba* with 5 species, 4 of these belonging to *Eupteryx*; in 1833 Burmeister described in *Typhlocyba* 3 species, all of them belonging to *Eupteryx*, while *quercus* (Germar's 5th species) is only mentioned among 7 others as ((*ferner gehoerend hierher.*" For *Typhlocyba* Puton, Edwards, etc., *Erythroneura* should be employed.

In 1838 (not 1840 as usually cited) Zetterstedt erected *Cicadula* for 23 species; in 1866 Fieber fixed *quatuor-punctata* Fall. and *fens-trata* H. S. (i. e. species of *Thamnotettix*) as types, but as neither of these was mentioned by Zetterstedt, this application is invalid. In 1871 J. Sahlberg made *smaragdula* the type (of the 4 species cited by Sahlberg in his typical division, *smaragdula* was the only one mentioned by Zetterstedt.) *Cicadula* therefore, as Sahlberg states, replaces *Kybos* Fieber, while for *Cica-*

dula Puton etc., should be employed *Macrosteles* Fieber.

The following table shows the affinities of the genera:

(*Motschulskyia* Kirkaldy = *Conometopus* Motschulsky, is not included.)

1	Median and cubital veins united by a short stalk basally and apically.....	1	<i>Ancono</i> gen. nov.
1a	Corial veins not forked.....	2	
2	Membranal appendix present.....	3	
2a	Appendix absent.....	4	
3	Complete submarginal wing vein.....		
	2	<i>Alebra</i> Fieber (= <i>Compsus</i> Fieber)	
3a	Wing with obsolescent submarginal vein (Sec. Baker)...		
	3	<i>Protalebra</i> Baker (X)	
4	Complete submarginal wing-vein.....	5	
4a	No submarginal wing-vein.....	9	
5	Three apical wing cells (Sec. Baker)....	4	<i>Eualebra</i> Baker
5a	Two apical wing cells.....	6	
5b	One apical wing cell.....	8	
6	Third wing vein forked.....	7	
6a	Third wing vein simple.....	7	<i>Cicadula</i> Zetterstedt
7	At least two of the apical cells of tegment springing from the transverse veins.....	5	<i>Dikrancura</i> Hardy
	(subgenus 1 <i>Erythria</i> Fieber = <i>Notus</i> Fieber.)		
7a	Only one of the apical cells springing from the transverse veins.....	6	<i>Kahaono</i> gen. nov.
8	Face of the usual type.....	8	<i>Empoasca</i> Walsh
8a.	Frons narrowing basally, meeting at the base in an acute angle; medianly carinate; lorae very elongate..		
	9	<i>Hcliona</i> Melichar	
9	First two wing-veins subparallel.....		
	10	<i>Eupteryx</i> Curtis, (= <i>Typhlocyba</i> Germar)	
9a	First two wing-veins confluent towards apex.....	10	
10	Second apical cell pedicellate, third irregular.....		
	..11	<i>Empoa</i> Fitch (= <i>Typhlocyba</i> Puton = <i>Anomia</i> Fieber.)	
10a	Second apical cell not pedicellate, third oblong.....		
	..12	<i>Erythroncra</i> Fitch (= <i>Zygina</i> Fieber = <i>Idia</i> Fieber.)	

Ancono gen. nov.

Differs from all other Eupteryginae by the venation of the tegmina, which is best explained by the figures. It is remark-

* It is a pity that Baker has applied the misleading term '*Protalebra*' to this genus, as it is evidently a derivative of that genus or some ally not a precursor.

able not only for the distinctness of the veins at the base of the tegmina but for their forkings and anastomosings, thus connecting the last described tribe with the typical Eupteryginae.

Head sub-foliaceous, produced in front of the eyes, roundly arched. Ocelli probably functionless, but vestiges large, dorsal, close to the anterior margin, nearer to one another than to the eyes. Apex of first segment of antennae reaching to lateral margin of head. Vertex long and narrow. Tegmina without an appendix. The radial vein seems to lose itself in the costal; the median and cubital have a short common stem and unite again in a short stem just basal of the apical cells. There is a discoidal cell. The median and cubital are the most distinct of the veins. (Pl. XXII, fig. 12, and Pl. XXXI, figs. 2 and 3).

1. *pulcherrima* sp. nov.

Vertex and pronotum bright orange yellow, the former tinged with pink, and with a broadish longitudinal pallid stripe, anterior (dorsal) margin also more or less pallid narrowly. Pronotum with a narrow longitudinal stripe, a dot on each side on this anteriorly, and a ♀ and ? laterally about the middle, pallid. Posterior margin very narrowly pallid. Scutellum reddish, posterior lobe blackish with two white spots. Basal two-thirds (or more) of tegmina rich crimson, darker on the clavus exteriorly; wedge on the clavus and the part of the corium between the cubital and median veins hyaline and somewhat infumate; 2 short wavy whitish lines on clavus and 2 white marks on corium, one (with a black spot at its apex) close to apex of clavus, the other at apex of area between median and cubital veins. Apical third of tegmina hyaline, more or less tinged with yellowish. Wings milkwhite, veins pale yellow. Under-side pale testaceous or yellowish; frons more or less tinged with orange; basal sternites of abdomen more or less blackish.

Vertex between the eyes two-fifths wider than medianly long, base roundly emarginate. Pronotum transverse, subquadrangular, same length as head, posterior margin almost straight. Scutellum as wide as vertex between eyes and as long as pronotum, acuminate produced posteriorly, transversely sulcate near the posterior angle.

Female: Sheath at least 7 times as long as the ultimate abdominal sternite (which is sinuately excavate), with short white bristly hairs.

Length 3-3 $\frac{1}{8}$ mill.

Hab: New South Wales, Sydney (i) Queensland, Bundaberg (ix-xii).

The clavus is much darker (red-black) in the Bundaberg specimens. One of the Sydney specimens is the type.

Dikraneura Hardy.

Dikraneura Hardy 1850 Tr. Tyneside Field Club 1 423.

Dicraneura Gillette 1898 P. U. S. N. Mus, XX 715.

1. *honiala*, sp. nov.

Superficially not unlike *D. flavipennis* (Zett.), but with a more elongate crown, etc.

Head, pronotum, scutellum and general ventral aspect, immaculate pale brownish-yellow; eyes blackish grey. Tegmina pale golden yellow, shining; a black spot at the apex as in *D. unipuncta* (Gillette), but ringed around with whitish, 1st apical cell whitish narrowly ringed with brownish; a small oblique brownish black line from costa inwards at about the middle. Wing-veins pallid. Legs immaculate pale yellow, hairs whitish.

Vertex subconvex, elongate triangular, longer than the pronotum, posteriorly roundly emarginate. Pronotum posteriorly truncate. Venation of tegmina very similar to that of *D. unipuncta* as figured by Gillette, except that the corial veins are entire and distinct and that the first apical cell is 5-sided rather than 3. Alar venation more like that of *D. carneola* (Stal) as figured by Gillette, but the submarginal vein is entire and unbroken.

Female: Ovipositor and pygofers longer than the rest of the abdomen.

Length 3 $\frac{3}{4}$ mill.

Hab: Queensland, Kuranda (viii).

2. *aneala* sp. nov.

Vertex, frons, pronotum and scutellum orange brown, the two latter obscurely so. Eyes blackish, genae etc., mostly dark. Tegmina pale greenish yellow, apical cells dilute smoky. Wing-veins brownish. Abdomen striped transversely black and grey. Genital segments palid. Legs with pale hairs.

Tegminal venation similar to that of the preceding, except that the 1st apical cell is 4 sided (the basal margin being slightly

obtuse angled), the interior margin almost as long as the apical margin, the costal and interior margins being subparallel. Alar venation as in *D. unipuncta*.

Female: Last sternite somewhat deeply roundly biemarginate.

Length 3 mill.

Hab: New South Wales, Sydney (ii).

Kahaono gen. nov.

Allied to *Dikrancura* Hardy, but the apical cells of the tegmina arranged more as in *Ancono* Kirkaldy. Head produced before eyes a little inflatedly, rounded apically. Head and eyes wider than pronotum, the latter arched anteriorly, one-half longer than the head. Tegmina without appendix; only one longitudinal apical vein emitted from the transverse apical veinlets, this forking into three at about its middle, thus forming 4 apical cells. Wings with submarginal vein entire, though faintly marked apicosuperiorly; third vein forked; 2 apical cells.

1. *hanuuala*, sp. nov.

Head, pronotum and scutellum sordid testaceous; underside and legs pallid. Tegmina subhyaline, milky; clavus more or less clouded with pale brownish, a milky spot towards the apex; corium more or less clouded with pale brownish basally, a brownish curved line running to apex and giving out 3 brownish lines costally and 2 or 3 clavally, at more or less regular intervals.

Length: $3\frac{1}{2}$ mill.

Hab: Queensland, Brisbane (vi).

Cicadula, Zett.

Cicadula Zetterstedt, 1838, Ins. Lapp., 296; J. Sahlberg, 1871. Not. faun. Fenn., (2), IX, 158.

Kybos & *Chlorita*, Fieber, etc.

The following species belong by the venation to the group *Chlorita* as figured by Fieber, (1866).

1. *histrionica*, sp. nov.

Head pale lemon yellow, vertex almost entirely occupied by 2 large subcontiguous subquadrangular blackish spots. Prono-

tum blackish, lateral margins and sides pale lemon yellow. Scutellum blackish. Sterna, sternites and tergites pale lemon yellow, a spot about the middle and most of the posterior half of the latter (including genital segments) blackish; genital segments beneath greenish, apical $\frac{2}{3}$ of pygofer black. Tegmina pale yellow, apical $\frac{2}{3}$ of clavus, a patch near the middle of the corium and the exteroapical third of corium, blackish. Wing veins brownish.

Female: Valve deeply narrowly notched, posteriorly rounded on each side of this; pygofer long and narrow.

Length: $2\frac{1}{2}$ mill.

Hab: Queensland, Bundaberg (ix-xii).

2. *vitiensis*, sp. nov.

Lemon yellow, more or less suffused with greenish; vertex castaneous, or sordid yellowish; frons sordid yellowish, a blackish line at anterior margin of head between the eyes and another narrower, curved one near base of frons. Tegmina lemon yellow, suffused with green or with orange, with a brownish black line from apex of clavus to costa curving a little downwards, veins apical to this the same color, first apical vein thickened as regards the color. Underside, large, etc., pale greenish. With veins more or less brownish.

Length: 3 mill.

Hab: Viti Isles (iii).

Eupteryx, Curtis.

Eupteryx, Curtis, 1833, Ent. Mag., I, 192.

The tegmina are unfortunately a little mutilated, but I think the following species may be placed here.

1. *haematoptilus*, sp. nov. (Pl. XXXI, fig. 6.)

Head, pronotum, genital segments, etc., dark, immaculate, blood red, little paler beneath. Eyes black. Scutellum pale luteous. Tegmina subhyaline, more or less tinged with reddish yellow; costal area, apical three-fifths of clavus, a narrow transverse fascia at apical veins, and almost all the veins, more or less blood red; a blackish red spot at the apex of the costal area; the base of the 4th apical area very narrowly, and the apex of the apical areas more or less, infumate. Abdominal tergites

blackish, more or less pale reddish in the middle. Underneath (except as above mentioned) and legs pale testaceous. Saw black. Vertex a little narrower at base than an eye, hemispheric, slightly convex, length and breadth equal (measured as far as the ocelli), lateral margins straight, very slightly divergent. Frons very convex, narrowly elongate. Ocellar rudiments large. Pronotum about as wide as head and eyes, lateral margins short. Tegmina elongate, evenly rounded at the apex. Venation on colored part of tegmina very indistinct, there are 4 apical cells the apical parts of 3 corial cells. A diagrammatic sketch of a tegmen is appended, showing that the venation is not similar to any other described *Eupteryx*. Apart from this the species is easily recognized by the coloring and by the big eyes.

Female: Genital segment at least 4 times as long ventrally as the white, ultimate abdominal segment, which is apically truncate.

Length: 4 mill.

Hab: Queensland, Redlynch (vii).

N. B. For *Eupteryx picta* Melichar, (nec Fabricius, Curtis), a Sinhalese species, I propose the name *Eupteryx melichari*, n.n.

Empoa Fitch.

Empoa Fitch, 1851. Hom. N. Y. Cab., 63.

Typhlocyba auctt.

Gillette has evidently wrongly identified *Typhlocyba commissuralis* Stal which belongs to *Cicadula* (typical subg.=*Kybos* Fieber) and has a quite different wing venation to *Typhlocyba* Gillette (i. e. *Empoa*).

E. australensis, sp. nov.

From very like that of *E. rosae* (Linn.) but the head is less angular apically and the pronotal sides shorter. Vertex pale sanguineous with a long line (widening basally) and two irregular wedges near the apical margin (more or less irregularly), a longitudinal line (narrower apically) and the posterior margin), greyish. Scutellum white, a pale orange square on basal two-thirds, apical third with a blackish longitudinal line and a black spot on posterior angle. Tegmina orange, crimson, cinerous, dark brownish and whitish. Basal half of clavus, pale orange with a white spot; apical half whitish, extreme apex faintly

orange. Basal third of corium whitish, extreme base sanguineous and orange. Middle third more or less crimson, a whitish spot at its apex; apical cells whitish, the veins and the transverse veins pale cinereous. Underside more or less dark brownish, face paler. Pronotum a trifle longer than the head. Tegmina with four apical cells, the third being sub-parallel-sided and oblong. Basal of the apical cells, the veins are more or less obsolescent. Wing venation as in *E. rosae*.

Length: (female) $3\frac{1}{4}$ mill.

Hab: Queensland, Brisbane (vi).

Erythroncura Fitch.

Erythroncura Fitch, 1851, *Hom. N. Y. Cab.*, 62.

Zygina Fieber, etc.

Typhlocyba (part) auctt.

1. *melanogaster*, sp. nov.

Head sordid-brown, darkening at the anterior margin of vertex, the posterior margin paler. Pronotum creamy, the posterior third (produced medianly forward) greyish; anterolaterally a curved black line on each side. Scutellum more or less sordid yellowish, anterolateral angles widely black. Tegmina subhyaline. Clavus and costal cell pale yellowish brown. Wings iridescent, veins pale brown. Legs pallid. Abdomen black. Vertex about as wide as an eye.

Length: 3 mill.

Hab: New South Wales, Sydney (i.)

2. *lubra* sp. nov.

Pale yellowish, rather sordid; rostrum pale ferruginous. Tergites (except genital segment and narrowly laterally) black. Tegmina hyaline milky, veins pale yellow. Vertex at base wider than an eye.

Length: 3 mill.

Hab: New South Wales, Sydney (i.)

The following three species are typical *Zygina*, having only 3 apical cells to the tegmen.

3. *honiloo* sp. nov.

Pale golden yellow. Eyes blackish. Tegmina apically, etc., more or less hyaline, veins of wings pale yellowish. Head convex, anteriorly rounded, shorter than pronotum. Tegminal veins all distinct.

Male: I think the valve is absent, but the genitalia in the 4 males seen are shrivelled.

Length: $2\frac{1}{2}$ mill.

Hab: Queensland, Bundaberg (ix-xii)

4. *ipoloo* sp. nov.

Pale yellowish cinerous, paler beneath; eyes, and a large spot on the anterior margin of vertex, black, the latter irregularly encircled by a faint brown halo; a transverse brown stripe, widening medianly, on the pronotum close to the posterior margin. Scutellum and rest of pronotum more or less sordid. Tegmina hyaline, costally smoky; wing veins smoky. Abdomen (except the pallid genital segments) more or less pale sordid brownish (male) or brownish black (female). Vertex roundly triangular, about same length as pronotum.

Length: $2\frac{1}{2}$ mill.

Hab: Queensland, Cairns (viii.)

5. *honiala* sp. nov.

Allied to *E. honiloo* but paler and head rounder and blunter. Testaceous, veins pale orange; costal vein more or less pale orange sanguineous.

Length: 3 mill.

Hab: New South Wales, Sydney (i).

Gen. (?) sp. nov.

The wings in both specimens are too far mutilated to fix the genus of this small yellowish form from Sydney (1).

Subfamily Ledrinae.

Characterized by the ocelli being placed on the disk of the vertex; the subfoliaceous or foliaceous posterior tibiae which are tricarinate, and armed anteriorly with strong spines; and

the flat (often concave beneath), foliaceous head. All the forms seem to be arboreal.

Ledra Fabricius.

Ledra Fabricius, 1803, Syst. Rhyng., 24.

A number of Australian species have been described, none having however been collected in the imago state by Koebele and Perkins, though nymphs and several species seem to belong here; they resemble the adults somewhat except that they lack the auriform processes on the pronotum.

The following are described from Australia:

1. *Fulgora planirostris* Donovan. (= *Ledra caudata* Walker = *L. valida* Walker, etc.)
2. *L. brevis* Walker. (= *L. australis* Walker.)
- ? 3. *L. brevifrons* Walker.
- ? 4. *L. concolor* Walker.
- ? 5. *L. teliformis* Walker.
- ? 6. *L. navicula* Walker.
- ? 7. *L. cuspidata* Walker.

Rhotidus Walker.

Rhotidus Walker 1862 Journ. Ent., I, 318.

= *Rhothidus* Stal, 1865 O. V. A. F., XXII, 157.

This must be rich in species in Australia as Stal has described four and Walker one, while I now diagnose 6 more, none of which can I identify with the former. All the individuals collected by Koebele and Perkins are females and none of them are vaginate, as indicated by Stal and Walker. Ocelli about as far from the eyes as from one another, situated just above apical margin of eyes.

ingens sp. nov. (Pl. XXXI, fig. 8.)

Head-form intermediate between that of *Ledropsis glauca* Mel., & *stali* Mel; posterior margin of pronotum even less sinuate than in *L. fuscipennis* Mel.

Yellowish cinereous, paler beneath. Eyes dark, ocelli red. Closely and obsolescently irrorate with pallid yellowish. Closely and strongly punctured. Vertex longer than wide, slightly carinate longitudinally, sloping down on each side of this, apical margin narrowly angulate. Rostrum not reaching to base of

mesosternum. Anterior margin of pronotum rounded, posterior margin almost truncate at scutellum. Posterior tibiae 4-spined.

Length 12 mill.

Hab: Queensland, Bundaberg (xi.)

2. *informis* sp. nov. (Pl. XXXI fig. 9.)

Very similar to *R. ingens* but vertex shorter and more pointed apically.

Length: 10 mill.

Hab: Queensland, Nelson (vii.)

3. *flavomaculatus* sp. nov. (Pl. XXIV, figs. 1-4.)

Very similar in shape to *R. ingens* but not quite so large or broad.

Orange-brown, closely spotted all over vertex, pronotum, scutellum and tegmina with yellowish. Underside testaceous, reddening a little on frons laterally. Abdomen above more or less suffused with sanguineous.

Length: 12 mill.

Hab: Queensland, Bundaberg (xi.)

A nymph with greatly elongate head (Koebele's No. 2297) probably belongs to this.

monstrum, sp. nov. (Pl. XXXI, figs. 5 and 10.)

Similar to *B. flavomaculatus* but much narrower and the tegmina are suffused with rosy, and not spotted with yellow.

Length: $10\frac{3}{4}$ mill.

Hab: Queensland, Nelson (vii), Cairns (viii.)

Nymphs are dirty brown, obscurely marked with black.

5. *ledropsiformis*, sp. nov. (Pl. XXXI, fig. 11.)

Similar to *R. informis*, the head being shorter and a little less acute.

Length: $8\frac{3}{4}$ mill.

Hab: Queensland, Brisbane (xi.)

6. *horrendus*, sp. nov. (Pl. XXXI fig. 13.)

Pale olive brown, mottled on head and pronotum with pale olive green. Scutellum pale grœenish. Vertex shorter than pronotum, former obtusely angulate.

Length: $6\frac{1}{2}$ mill.

Hab: Queensland, Kuranda (viii.)

7. *viridescens*, sp. nov. (Pl. XXXI, fig. 12.)

Dull green, head tinged with yellowish, pronotum and tegmina more or less obscurely mottled with yellow. Vertex about the same length as the pronotum or a trifle longer, apically rounded.

Length: $7\frac{1}{4}$ mill.

Hab: New South Wales, Sydney (ii.)

A nymph from Mittagong (1) closely resembles this.

Other described species are:

8. *R. cuneatus* Walker 1862 Journ. Ent. 1, 319, Pl. XV, fig. 5, (not "6" as in text.) Queensland, Moreton Bay.

9. *Rhothidus navicula* Stal. 1865 O. V. A. F. XXII, 157.

10. *R. convivus* Stal. l. c., Moreton Bay.

11. *R. leucostictus* Stal. l. c., N. Australia.

12. *R. breviceps* Stal. l. c., S. Australia.

Subfam. Stenocotinae.

This subfamily is characterized by the peculiar shape of the vertex and by the ocelli being placed in cavities on the anterior margin (viewed dorsally) of the head; the posterior tibiae are quadricarinate with 6 strong spiniferous spurs on the outer margin, shortly but strongly spined on the upper margin, and feebly bristled on the others.

Stal includes this in his heterogeneous *Ledrina*, the typical form of which however has the ocelli on the disk of the vertex. To the Stenocotinae belong *Stenocotis* Stal., and two new genera, viz: *Smicrocotis* and *Kyphocotis*; the general venation is that of *Ledra*.

1. Scutellum plane.....2

1a. Scutellum acutely cristate.....3 *Kyphocotis*, gen. nov.

2. Vertex somewhat re-curved.....2 *Smicrocotis*, gen. nov.

2a. Vertex plane.....1 *Stenocotis*, Stal.

All the forms are arboreal.

Stenocotis Stal.

Lcdra (part) Walker 1851 List. 809-30.

Stenocotis Stal. 1854 O. V. A. F. XI, 254; and 1856. op. c., XIII, 67, (type *subvittata* Stal.)

Head short, flat, horizontal, anterior margin obtuse-angularly produced, acute, carinate, the keel forking on each side of the middle and reuniting nearer the eyes, thus enclosing a short, narrow, suboval area in the middle of each anterolateral margin, in which the ocelli are placed. Posterior margin angularly emarginate, the middle of the pronotum anteriorly much anterior to the apical margin of the eyes. Eyes oblique, reniform, longer than wide, extending laterally farther than the pronotum. Vertex longitudinally striate, pronotum transversely so, but anteriorly sublongitudinally. Scutellum transversely striate. Frons slightly convex, antennal ridges not deep, lorae and clypeus elongate. Pronotum about as long as wide, much longer than the vertex medianly, flat in front, raised posteriorly, lateral margins straight, subparallel, posterior margin obtusely emarginate. Tegmina extending farther posteriorly than the abdomen in the male, not so far in the female; clavus with the usual veins and also with some transverse veins connecting axillary with commissure and one connecting anal with the suture near the apex. In the corium, the medioradial forks near the base, the median being joined almost immediately to the cubital by a transverse vein. There are 5 discoidals of which two are subbasal and 3 subapical. There are a number (at least 10?) of apical cells, all much longer than wide, in some species many of them forked and many divided transversely. Tibiae dilated.

A number of species have been described by Stal and Walker, but there are probably several synonyms among them, as the sexes are apparently dissimilar. The specimens collected by Koebele and Perkins seem to belong to *S. planiuscula* Stal. made.

1. *planiuscula* Stal. (Pl. XXV, figs. 3-8.)

Stenocotis planiuscula Stal. 1854 O. V. A. F., XI, 254.

Nymph: In my own collection, I have 3 examples, from Victoria, of nymphs that I doubtfully refer to the same species; they at least belong to this genus. The whole insect is very flat, the head is enormously arched, the anterior margin of the vertex being roundly angular. Just above the eye, it is deeply emarginate, forming a spine. Vertex longitudinally sulcate, base obtusangu-

larly emarginate. The frons apically and apicolaterally somewhat widely foliaceous, rostrum reaching to apex of posterior coxae.

The other described forms, all from Australia, are:

2. *Ledra corticalis* Walker, 1851, List. 814.
3. *L. ferruginea* Walker op. c., 817 (Tasmania.)
4. *L. depressa* Walker, l. c., (Tasmania, South Australia)
(=*Stenocotis subvittata* Stal. 1854 O. V. A. F., XI, 254.
(=*Ledra declinata* Walker 1858 Suppl., 250.)
5. *Ledra varia* Walker, 1851, List, 819 (Tasmania.)
5. *L. costalis* Walker, op. c., 821.
7. *L. claudenda* Walker, 1858, Suppl., 359 (Queensland.)

Smicrocotis gen. nov.

Allied to the preceding, but the head is somewhat recurved, the frons more convex and the striation on head and pronotum much coarser, the venation different, etc.

Vertex very narrow, the basal margin not so emarginate as in *Stenocotis*, apical margin only slightly arched, recurved, the longitudinal (suboblique) striations very coarse; ocellar grooves shorter and rounder; frons more convex, antennal ridges thicker. Pronotal striations coarser. Tegmina with 5 discoidals (2 basal and 3 subapical; the latter quite different.)

1. *obscura*, sp. nov.

Dark brown, irrorated with black (which forms several more or less distinct longitudinal lines on the pronotum.) Frons basally blackish brown. Tegmina pallid, mottled closely with brown and brownish black.

Length: 10 mill.

Hab: Queensland, Cairns (viii.)

Nymph: (?belonging to this genus.) Head produced in front, then diverging rapidly posteriorly, longitudinally carinate, spinosely produced just above the eye. Posterolateral angle of pronotum spinose.

Hab: New South Wales, Sydney (ii.)

Kyphocotis, gen. nov.

Closely allied to *Stenocotis* but the posterior three-fifths of the scutellum are elevated in a narrow, acute crest, which in profile is more or less rounded.

(1. *tessellata*, sp. nov. (Pl. XXV, figs. 1-2.)

Dark brown, more or less tessellated and marmorated with pale golden and pale brown; apico-exterior third of tegmina subhyaline, more or less cinerous. Femora annulated with black. Vertex a little recurved, very narrow.

Male unknown.

Female valve as in *Stenocotis*.

Length: 12 mill.

Hab: Queensland, Bundaberg (xi.)

Subfam. Kahavaluinae.

Kahavalu, gen. nov.

This seems somewhat near *Ulopa* Fall (a Membracid) on the one hand and *Megophthalmus* Curtis, on the other. It is distinguished by the ocelli being each in a groove on the rounded anterior margin of the vertex; the pronotum very slightly sinuate posteriorly, not carinate and no process; scutellum free. Head pronotum, scutellum, clavus etc., deeply and closely punctured, making them rugose, a shining point at the bottom of each puncture. Vertex short, transverse, flattened, except at the lateral angles. Eyes large, not forming part of the curve of the head. At the anterior margin of vertex there are two elongate grooves, reaching almost to the eye laterally, but not touching medianly. At the extreme interior part of each of these is an ocellus. Frons rather narrow, elongate, slightly convex, lateral margins gently rounded; antennae in a deep groove near the base. Clypeus not carinate.

1. *gemma*, sp. nov.

Black; the punctures with a sparkling point at the bottom. Cells of the tegmina hyaline.

Hab: New South Wales, Sydney (i).

Length: $2\frac{7}{8}$ mill.

Fam. 2. Membracidae.

This family which contains, or rather consists of, forms that are among the most bizarre of all the Hemiptera, was briefly tabulated generically by Stal in 1868. The Australian forms were well monographed by Goding two years ago, but unfortunately

about the same time, Buckton published a large work, entitled "A monograph of the Membracidae."* which is simply an unsystematized account of the forms he had seen and is in many parts a needless and costly re-hash of Fowlers' work in the 'Biologia Centrali-Americana.'

With very few exceptions, all the Australian Membracids appear to be Centrotine. The family is, as pointed out by Stal and later by Hansen, certainly Tetigonioid (probably via forms related to the *Agallinae*, via *Acthalion*) and the majority of authors are assuredly wrong in placing them between Fulgoridae and Cicadidae (with neither of which families have they any connection, except that they are all trimerous) and removing them from the vicinity of the Tetigoniodea, their rightful position. There is a single (introduced) Hawaiian species, probably a *Centrotypus*. The males are often appreciably smaller than their females.

I have determined 8 genera and 16 species, of which, I suppose one genus and nine species to be undescribed; there are also a number of small species, probably near *Centrotypus*, that I cannot satisfactorily identify generically at present and have left undone until further opportunity for work or some material for comparison is at hand. The Centrotinae are very difficult to work out, and the difficulties have not been lessened by Buckton's work.

Gclastorrhachis gen. nov.

Allied to *Eutryonia* Goding**, but differs by the following characters:

Pronotum much less widened posteriorly and is mediolongitudinally *strongly carinate* throughout its entire length (including processes), not sulcate; anterior process much more highly elevated and differently shaped, posterior process about as long in *Eutryonia* but follows the curve of the tegmina and its tip is contiguous with them. Venation different. Type *diadema*.

There are two species:

1. Lateral forking of the anterior process of the pronotum extending beyond the rest of the width of the insect.....
.....*diadema*, sp. nov.
2. Pronotal process bulbous at its tip, lateral processes small.....*clavata*, sp. nov.

* I am much indebted to Mr. D. L. Van Dine for procuring me the loan of this work, from the library of the Division of Entomology at Washington. Since the above was in print, I have learnt of the death, at an advanced age, of Mr. Buckton, and consequently have modified my original remarks on his work.

** 1933 P. Linn. S. N. S. W., XXVIII, 6 Pl. 1, fs. 10 and 11 (not 22 which refers apparently to *Eufrenchia*). The venation of f. 26 does not accord with that of f. 10.

1. *diadema*, sp. nov. (Pl. XXX, figs. 2 and 3.)

Furnished with yellow pubescence; piceous brown, anterior process of pronotum and posterior half of posterior process threaded with reddish; pronotal keels mostly reddish; anterior half of posterior process pale flavous. Beneath blackish, legs pale yellowish fulvous. Tegmina ferruginous, paler apically; clavus more or less hyaline, iridescent medianly, a small hyaline spot near the apex.

Length: (female) 5 mill; height $4\frac{3}{4}$ mill; width across processes, 2 mill.

Hab: Queensland, Kuranda (viii) on a tropical tree.

2. *clavata*, sp. nov. (Pl. XXX, figs. 4-5.)

Color as in *G. diadema* but legs ferruginous. Pronotal process slightly bulbous at the tip, with a short acute spine on each side of the bulbous part.

Length: (female) 5 mill; height 4 mill; width across processes $1\frac{1}{4}$ mill.

Hab: Queensland; Kuranda (viii.)

Zanophara Kirkaldy.

=*Dannus* Stal 1866 Hem. Afr. IV, 87; Goding 1903 P. Linn. Soc. N. S. W. XXVIII, 30; Buckton (par?)

=? *Ceraon* Buckton 1903 Mon. Membrac, 228.

=*Zanophara* Kirkaldy 1904, Entom. XXXVII, 279.

1. (?) *tasmaniae* (Fairmaire).

Centrotus tasmaniae Fairmaire 1846 Ann. S. E. France, IV, 513, Pl. 3, f. 15.

Dannus tasmaniae Goding 31 pl. 1, fs. 6 and 20 (tegmen and nymph).

? *Centruchoides tasmaniae* Buckton 1903 Mon. Membr. 227 pl. 227, pl. 1, f. 6.

A single female from New South Wales, Mittagong (1), arboreal, which I refer somewhat doubtfully to this; Fairmaire's type was from Tasmania. Buckton's *Centruchoides tasmaniae* sp. nov., from Victoria is either this or a new species of slightly paler color.

2. (?) *vitta* (Walker).

Centrotus vitta Walker 1851 List. Hom. 626.

Damnus vitta Goding, 32 Pl. 1, f. 25 (Tegmen).

? *D. decisus* (part) Buckton 225, pl. 1, f. 1.

A single example from Queensland, Bundaberg (IX-XII), which is probably this; the ocelli are however practically equidistant, a little more remote from one another if anything, while Goding says they are much nearer in *C. vitta*. This is also arboreal.

Buckton's *Ceraon* is perhaps identical with Stal's preoccupied genus *Damnus* and my *Zanophara*; his *Damnus* is a mixed assemblage, one species of which possibly belongs to *Ceraon*.

Sarantus Stal.

Sarantus Stal 1863 Tr. E. S. London (3) I, 592.

1. *nobilis*, sp. nov.

Pitchy, with yellowish pubescence; veins of tegmina apically and legs dark ferruginous; eyes yellowish. Tegmina vitreous with a slight yellowish tinge. Horns very sharp, bases remote, subperpendicular, directed slightly forward and outward, posterior process flat. Two subapicals elongate, the outer very little shorter than the inner.

Length: (female), 9 mill.

Hab: Queensland, Cairns (viii.)

Differs from *S. wallacci* Stal, by the legs not being pallidly annulate and the horns more perpendicular and shorter.

Terentius Stal.

Terentius Stal 1886 Hem. Afr. IV 87.

1. *convexus* Stal.

T. convexus Stal. 1869 O. V. A. F. p. 286.

Hab: Queensland, Kuranda (viii), Cairns (viii) arboreal.

N. B.: Tarsi pale sordid flavous.

Dingkana Goding.

Dingkana Goding 1903 P. Linn. S. N. S. W. XXVIII, 8.

1. *borealis* Goding.

D. borealis Goding op. c. 9, pl. 1, f. 21 (tegmen).

Hab: Queensland, Cairns (viii), Nelson (viii), Kuranda (viii) arboreal.

The venation is variable, even in the tegmina of the same individual; the third subapical cell is sometimes divided, and there may be also two or more small supplementary cells.

Sextius Stal.

Sextius Stal 1866 Hem. Afr. IV, 88.

A genus of greenish forms, with the apical parts of the tegmina reticulate. The males are as a rule smaller, and the pronotal horns less developed. All the species are *Encalyptus*-feeders.

The following species are all, I think, good, but difficult to define verbally. The following key may help to their identification:

1. No basal cross vein (sec. Goding).....*depressus* Goding.
 - 1a. A basal cross vein.....2.
 2. Pronotum more or less swollen near the anterior margin*kurandae*, sp. nov.
 - (2a). Pronotum anteriorly practically flat medianly.....3.
 - (3). Posterior process extending beyond tegmina.....*longinotum* sp. nov.
 - (3a). Posterior process not extending as far as apex of tegmina.*bipunctata* (Fabr).
 - (4a). Tegmina immaculate.5.
 - (5). Horns feebly developed.....*bipunctata* vars.
 - (5a). Horns well developed.....6.
 - (6). Horns and pronotum between them dark, pronotum anteriorly pale, tegmina sparsely marked with black. .
.....*assimilis* sp. nov.
 - (6a). Horns and pronotum anteriorly dark, tegmina immaculate.*virescens* (Fairm.)
- N. B. *Sextius virescens* Buckton 228, Pl. 31, f. 3, is impossible to determine, being probably a mixed species.

1. *depressus* Goding.

S. depressus Goding 12, Pl. 1, f. 24 (nymph).

Recorded from Queensland, West Australia, and several local-

ities in New South Wales. This species is distinguished by the absence of a cross vein near the base of the tegmen. I have not seen it.

2. *bipunctata* (Fabricius).

Membracis bipunctata Fabr. 1775 Syst. Ent. 677.

Sextius bipunctata Goding 12.

I think I have identified this correctly from a single specimen from Queensland, Cairns (viii); Fabricius' type was doubtless discolored. There are also specimens from Cairns (viii) and Kuranda (viii) apparently identical except that the black spots are absent. Also other specimens from Cairns (viii) and Bundaberg (II) which I place at present with this species, but which have the lateral horns turned a little forwards.

Length: (female) $7\frac{1}{2}$ - $7\frac{3}{4}$ mill; width across horns $2\frac{1}{4}$ - $3\frac{1}{4}$ mill.

What are probably the males (Cairns viii), are only $5\frac{1}{2}$ mill long, with less developed horns.

3. *virescens* (Fairmaire).

Centrotus virescens Fairmaire 1846 Ann. S. E. France IV. 515.

= *Ceresa suffusa* Walker 1851 List, 530.

= *Sextius virescens* Goding, Pl. I, f. 2 (tegmen).

Some examples from New South Wales, Sydney (i-ii), apparently belong to var. *suffusa*.

Length: $6\frac{1}{2}$ mill; width $3\frac{1}{2}$ - $3\frac{3}{4}$ mill.

I do not think that *S. depressus* is distinct from this.

4. *assimilis* sp. nov.

Close to *S. virescens* but a little larger and broader, the horns are distinctly more elongate and less blunt and are less arched before the downward turn near their apex. The horns, and the pronotum between them, are dark, but while in *S. virescens* the same thing occurs, in that case the whole of the pronotum anteriorly is dark, while in *S. assimilis* it is only a band, the anterior part being pale. In *S. virescens* also the tegmina are immaculate, in *S. assimilis* the veins are more or less sparsely marked with black.

Length: (female) $7\frac{1}{2}$ mill; width $4\frac{1}{4}$ mill

Hab: New South Wales, Sydney (i).

5. *longinotum* sp. nov.

Allied to *S. virescens*, but the posterior process extends slightly beyond the apex of the tegmina; in all other species it is not extended as far. The horns as in *S. virescens* but less blunt and not turned backwards so much. The reticulation of the tegmina extends partly into the subapical cells. The pronotum between the horns (including them) is dark, the rest anteriorly being pale.

Length: (female) 6½ mill width 3¼ mill.

Hab: Queensland, Nelson (viii).

6. *kurandae*, sp. nov.

Allied to the immaculate form of *S. bipunctata* but much slenderer, the horns a trifle less pronounced, the anterior margin of the pronotum (viewed in front) narrowly, somewhat deeply impressed, the pronotum immediately posterior to this medianly swollen a little (practically flat in the other species). The tegminal reticulation extends into the subapical cells.

Length: (female), 6½ mill width 2½ mill.

Hab: Queensland, Kuranda (viii.)

Acanthuchus Stal 1866 Hem. Afr. IV, 87; *Acanthucus* Goding 6 and 13.

1. *dromedarius* sp. nov.

Allied to *A. kershawi* God., but the horns are larger and the clavus not entirely opaque, etc. Dark ferruginous, with bright yellow pubescence. Eyes yellow. Tegmina subhyaline, yellowish apically; costal cell, base of radial cell and of clavus opaque ferruginous with yellowish pubescence, veins yellowish ferruginous with yellowish pubescence. Legs yellowish and ferruginous. Pronotal horns large, extending beyond lateral margin of body. Disk posterior to this is roundly obtusangulately elevated and again elevated roundly at about the middle of the tegmen (not touching the latter in the middle); posterior process does not nearly reach the apex of the tegmina. Two subapical cells, the exterior nearly circular, not nearly reaching exterior margin of tegmen; third apical elongate.

Length: 4¼-4½ mill; width 2¾ mill.

Hab: Queensland, Cairns (viii.)

2. *obtusius*, sp. nov.

Allied to the preceding, but the posterior process distinctly angular, not so broad. Dark ferruginous, with pale yellowish-

grey pubescence; base of tegmen and the entire costal cell, veins, etc., more or less dark ferruginous. Horns rather larger at the bases more contiguous, posterior process not so elevated posteriorly. Exterior subapical cell subhemispherical; base of third apical cell curved inwards on the outer side.

Length: (female) $4\frac{1}{2}$ mill, width, 3 mill.

Hab: New South Wales, Sydney (i).

Centrotypus Stal.

Centrotypus Stal 1866, Hem. Afr., IV, 88; Goding 26.

I think this genus runs gradually into *Acanthuchus* and that *Sertorius* is a synonym also.

1. *hospes*, sp. nov.

Black with yellowish pubescence. Scutellar tufts prominent, pale yellow. Tegmina vitreous, veins dark, or pale, ferruginous. Legs more or less ferruginous, intermediate and posterior tibiae with apical half yellowish. Horns slight, acuminate turned directly outward, very slightly upward and backward, bases remote. Exterior subapical cell elongate, suboval.

Length: 8 mill, width, $4\frac{3}{4}$ mill.

Hab: New South Wales, Sydney (i).

The following Membracidae, not included in Goding's Monograph, have been recorded from Australia. Their identification is doubtful without access to the types.

1. *Philya parvula* Buckton 1901, Mon. 57, Pl. 8, fig. 4, is I think, my *Phrynomorphyes parvula*, a Tetigoniine, and has nothing to do with *Philya*.

2. *Oxyrhachis neglectus* Buckton 1903 Mon. 224, Pl. 49, fig. 5. South Australia. Probably not an *Oxyrhachis*.

3. *Daunus succisus* Buckton 226, Pl. L, fig. 3. South Australia. Not a *Daunus*.

4. *Ceraon tumescens* Buckton 229, Pl. 51, fig. 1. Tasmania.

5. *C. contortus* Buckton 229, Pl. 51, fig. 2. Tasmania (?).

6. *Pterosticta rubrilinea* Buckton 230, Pl. 51, fig. 4.

7. *P. spreata* l. c., fig. 5.

8. *P. rubridorsata* l. c., fig. 6.

9. *P. xantha* Buckton 231, fig. 7.

10. *P. interposita* l. c., Pl. 52, fig. 1.

11. *Ibiceps falcatus* Buckton 239, Pl. 54, fig. 6.

16. *Sphacrocentrus luteus* Buckton 244, Pl. 56, fig. 6. All seven from S. Australia. Probab'ly not a *Sphacrocentrus*, possibly an *Acanthuchus*.

Family 3 Cercopidae.

I have not had sufficient material before me to make many researches on this comparatively small family, of which I now describe 8 new genera, and 9 new species. I think however that Stal's subfamilies are founded on characters of convenience, not of real scientific value, for example: *Aufiterna* has the anterior margin of the pronotum straight, but it seems to me to belong really nearer *Polychætophyes*, *Ptychus*, etc. Moreover in some genera the anterior margin of the pronotum is so slightly curved, as to be almost straight.

Cercopidae are apparently not of very extensive occurrence on the Australian Continent, their headquarters lying in Central and South America and in the Oriental Region and the Malayan portion of the Australian; they have members however in every Zoological Subregion except the Hawaiian.

As is the case with many other of the older Hemipterous genera, *Cercopis* Fabricius has been employed at different times for many diverse forms. Stal (1860, Svensk. Vet. Akad. Handl., 8 no. 1, p. 11), fixes *carnifex* Fabr. as the type; it had however already been fixed as "*spumaria* Linn." by Latreille. *C. carnifex* is an Australian species unknown to me, and I do not even know to what genus it now belongs. Stal, in the work above cited, alters his *Cercopis* of the "Hemiptera Africana" (1866) to "*Cosmoscarta*," but does not redefine *Cercopis* (Fabr.) Stal: later, he adds *ferruginea* (Walker) from an unknown locality.

C. 'spumaria Linn.', moreover, is not definitely known. Horvath (1899 Revue d'Entom. XVII (for 1898) 275) examined the Linnean types and found the first specimen to be *Aphrophora chui* (Fallen), the second *Philænus spumaria* Auct., and concludes that the former fits the Linnean d'agnosis better, as that notes "habitat in Salice." This however is not stating the case quite accurately; Linne writes (1758 Systema Naturæ Ed. X, 437.) "Habitat in Europæ Plantis variis, frequens in Salice viminali, latitans intra spumam." but as *spumaria* of later Catalogues never is found on *Salix*, I think Horvath's view must be sustained; this is the view also of Germar, Dufour, Burmeister, Rambur, Amyot and Serville, etc.

The following synonymy will elucidate this:

Genus 1. *Cercopis* Fabricius 1775, Latreille, etc.

=*Aphrophora* Germar, 1818.

type *Cicada spumaria* Linn., Latr., =*Cicada alni* Fallen.

Genus 2. *Philacnus* Stal 1864.

=*Cercopis* Kirkaldy 1901.

type *Cicada leucophthalma*, Linn., =*spumaria graminis*

DeGeer, =*spumaria* of most later authors.

It may be noted here that authors refer constantly to *Aphrophora salicis* DeGeer. There is no such species; DeGeer described a form as *Cicada spumaria salicis*, an inadmissible term, and the species should be known as *Cercopis rustica* Fabricius.

There are 3 conventional subfamilies as follows:

- (1). Rhinaulacinae (=Cercopinae of some authors) with about 25 genera.
- (2). Cercopinae (=Aphrophorinae of some authors) with about 36 genera, and
- (3). Machaerotinae, with 2 genera.

(Of *Embolonia* Provancher 1889, I have not seen the description and it is not mentioned by Goding or Ball.) These subfamilies are separable as follows:

1. Anterior margin of pronotum straight.....*Rhinaulacinae*.
- 1a. Anterior margin of pronotum rounded or angulate.....2.
2. Scutellum flat, triangular.....*Cercopinae*.
- 2a. Scutellum strongly elevated, armed with a long apical spine.
.....*Machaerotinae*.

But as noted above, this is a classification of convenience.

Subfam. Rhinaulacinae.

Euryaulax, gen. nov.

General appearance of *Phymatostetha* Stal. Vertex declivous, flat, longitudinally sulcate exterior to the ocelli, the sulci being parallel and the space between being about equal to that between a sulcus and the nearest eye; the middle lobe is divided by a transverse sulcus into two parts, the anterior being about half the length of the posterior (*).

The vertex is also narrowly, transversely impressed close to the posterior margin. The entire anterior (dorsal) margin of the head is strongly, acutely, carinate. The frons is pitted at its base and is strongly swollen, transversely striate, somewhat deep-

* It is possible that this middle lobe of the vertex is really a dorsal part of the frons.

ly and widely longitudinally impressed for at least two-thirds of its length, the sides of the impression forming slight but noticeable keels. Pronotum with 2 submedian lachriform impression near the anterior margin; posterior lobe obsolescently sulcate longitudinally. Scutellum also medianly impressed. The characters of venation, etc., are much those of *Tomaspis* Am. Serv. Legs normal. Antennae reaching laterally to about the intero-lateral margins of the eyes.

E. callitctigoides, sp. nov.

Head, anterior half of pronotum, scutellum, shoulders and a transverse fascia on tegmina, underside, etc., sanguineous, posterior half of pronotum, eyes, tegmina (except as above), antennae, tarsi, anterior tibiae (except basally) and the apical parts of posterior tibiae, etc., black or blackish.

Length: (Female) $7\frac{1}{2}$, (male) $8\frac{1}{2}$ mill.

Hab: Queensland, Cairns (male, viii), Kuranda (female viii.)

The subapical red band on the tegmina is broader in the female than in the male.

Aufidellus, gen. nov.

Apparently close to *Aufidus* Stal, but the pronotum posteriorly is almost evenly rounded and the costal margin is not arched basally.

1. *australensis*, sp. nov.

Yellowish-brown with pale yellowish pubescence. A small spot at the antero-interior angle of the lateral lobes of the vertex, the posterior margin of the vertex, as far as and including the ocelli, the posterior margin of the pronotum narrowly, lateral margins of scutellum narrowly, a transverse band at nearly one-third of the length of the tegmina, the tegmina veins mostly (except the costa), antennal peduncle, lateral margins of abdomen more or less, wing veins mostly, etc., black. Basal third of tegmina subcoriaceous, punctured, yellowish brown, rest hyaline. Middle lobe of vertex a little wider anteriorly than posteriorly, wider than lateral lobe, not sulcate transversely. Frons widely and somewhat deeply channelled (male) somewhat shallowly (female). Posterior tibiae with one spine about the middle. Tegmina with 2 discoidals, 4 apical areas and a stigma.

Length: (Male) $6\frac{1}{4}$ - $6\frac{1}{2}$ mill.; (female) 7 mill.

Hab: Queensland, Kuranda (viii), Cairns (viii.)

Aufiterna, gen. nov.

Allied to *Aufidus* but tegmina more coriaceous and venation different. Pronotum anteriorly with 2 naked callose spots. Posterior margin emarginate, while it is truncate in *Aufidus*. In the tegmina there are 3 discoidals (subapical), 4 apicals well-marked, while there are another 5 small cells marked off on the costal cell. There is a narrow appendix. This genus seems to me more allied to *Polychaetophyes* and other Cercopine genera than to most Rhinaulacine forms.

1. *ptycloides*, sp. nov.

Brownish testaceous, with paler pubescence; ocelli red. Apical half of tegmina hyaline. Beneath testaceous, lateral margins of abdomen more or less sanguineous. On the costa about the middle of the wing and extending inwards a little is a dark-brown smudge.

Length: 5-5½ mill.

Hab: Queensland, Kuranda (viii.)

Petyllis, gen. nov.

Allied to *Aufiterna* but vertex short, frons more tumid and more lightly channelled, laterally strongly striate transversely. Pronotum with 8 naked callous spots in a line near the anterior margin, lightly and narrowly sulcate medio-longitudinally. Tegmina coriaceous, 3 discoidal (subapical, and 4 apical) costa with many cells anteriorly), two of the apical veins forking near the apex.

1. *australensis*.

Brownish testaceous, with yellowish pubescence. Apical part of vertex and basal part of frons black, rest of vertex reddish; ocelli reddish. Pronotum tinged in places with reddish. Tegmina with 2 faint, somewhat broad whitish transverse bands. Wing nervures pallid.

Length: 7¾ mill.

Hab: New South Wales, Mittagong (i).

The following forms have been recorded from the Australian Continent, but are unknown to me.

Gen. *Tomaspis* Amyot & Serville 1843 Hemipteres 560.

1. *Tricophora maculata*, Walker 1851 List. Hom. 673, W. Australia.

2. *T. inconstans*, Walker l. c.

Gen. *Cosmoscarta* Stal 1869 K. Svensk Akad. Handl., 88 No. 1, p. 11.

1. *C. australis* Butler 1874 List. Ent., 251, Pl. VIII, fig. 12. (= *Cercopis urvillei*, Walker); also from New Guinea.

Gen. uncertain?

1. *Cercopis carnifex*, Fabricius 1775 Syst. Ent., 688.

2. *Cercopis mirabilis*, Blanchard (in error?).

Subfam. Cercopinae.

Eurycercopis, gen. nov.

Head flat or slightly concave, triangularly produced in front, apex rounded (lateral lobes acute apically, not reaching nearly as far as median lobe), a little longer than pronotum medianly. Eyes much longer than broad, a little oblique. Ocelli obsolete, their rudiments about as far from one another as from the eyes. Frons elongate, convex, first segment of rostrum longer than the second. Vertex and pronotum not carinate, or at least very obsolescently, frons not carinate nor sulcate (or not noticeably so.) Pronotum 5 (or 7) sided, anterior margin rounded, very short (and slightly diverging) posterior to the eyes; posterolateral margins roundly emarginate, posterior margin deeply, almost rectangularly emarginate. Scutellum longer than wide. Tegmina convex, costal margin rounded, apex angularly rounded, apex angularly rounded; corium without a membrane, clavus apically acuminate. Wings with supernumerary cell, anal vein forked near the base. Posterior tibiae bispinose.

1. *nigrofasciata*, sp. nov.

Brown or yellowish brown, closely and finely pubescent (yellowish.) Frons blackish brown. Pronotum, scutellum and tegmina with more or less regular small black spots. Basal third of corium more or less blackish (except at extreme base), and a blackish fascia a little apical of the middle exteriorly to commissure of clavus; another fascia nearer the apex, broken in the middle. Legs more or less blackish brown.

Length: $8\frac{1}{4}$ mill.

Hab: Queensland, Nelson (vii.)

This is evidently closely allied to *Liorhina* Stal, but the ocelli in the latter are functional, the tegmina more reflexed, the wing venuration a little different, pronotum less emarginate posteriorly, etc. Stal has drawn the anterior margin of the pronotum incorrectly—making it truncate, whereas it is arched.

Philagra, Stal.

Philagra, Stal 1862 Trans. E. S. London (3) I, 592; and 1866 Hem. Afr. IV, 68; Matsumura 1903 J. Sapporo Agr. coll., II, 21.

Chalepus Walker 1851 List. Hom., 731.

Distinguished from all the other Cercopidae by the acuminate produced head.

1. *parva* (Donovan).

Fulgora parva Don., 1805 Ins. New Holl., Hem. Pl. I, f. 2.

=*Chalepus teliferus* Walker 1851 List. Hom. 731.

=*Rhaphirhinus* (?) *parvus* Walker, id. cit., 805.

=*Chalepus pugionatus* Stal. 1854 O. V. A. F., XII, 251.

=*Philagra parvus* Stal. 1866 Berlin Ent. Zeit., X, 386.

Hab: Queensland, Kuranda (viii), Nelson (vii), Bundaberg (ix-x), and Brisbane (vi); on *Casuarina*; also recorded from New South Wales.

The males are a little smaller than the females (males, $8\frac{3}{4}$ - $10\frac{3}{4}$; female, 11-12 mill. long). The two males from Kuranda have the cephalic prolongations a little more turned up, and may be specifically distinct. The colours and patterns are very fairly constant. The species, as noted in the introduction, is a froth-producer in the nymph stages.

Polychaetophyes, gen. nov.

Allied to *Hindola* Kirkaldy. Vertex almost vertical, very short, transverse. Ocelli much nearer to one another than to the eyes. Frons perpendicular (at apex) to the vertex, at base about one-third of the width of the vertex, broadening out a little towards the middle tumid, somewhat lightly roundly impressed near the base (as seen ventrally, (the actual basal part is on the dorsal part of the head.) Antennal peduncle short and small, antennal ridges somewhat deep. Clypeus reaching to apex of anterior coxae. Rostrum reaching beyond base of middle coxae. Pronotum roundly declivous, transversely striate, wider than head and eyes, posterior margin deeply roundly excavated in the middle. Scutellum much longer than wide, posteriorly acuminate pro-

duced. Tegmina subhyaline, strongly punctured especially on clavus, with scattered granules on the veins, apical margin of clavus *obliquely truncate* (or, if the claval appendix be not counted, *acute*, not acuminate), membrane (and clavus apically) with an appendix. Wings with the anal vein forked near the base. Legs very short, especially the posterior femora; posterior tibiae with one long, acuminate spine about the middle of outside edge and one tiny subbasal acute spine.

1. *serpulidia*, sp. nov. (Pl. XXXIII, figs. 12 and 13. Pl.

XXVII, fig. 9. Pl. XXX, fig. 9.

Pale yellowish brown suffused with reddish. Pronotum yellowish with greenish and reddish tinges. Scutellum reddish, obscurely pallid in the middle and posteriorly. Anterior and interior legs more or less dark, posterior legs more or less pale. Tegmina subhyaline, colorless; basal third of corium and clavus and apex of clavus dark brownish (more or less ruddy), apical fourth yellowish brown. Granulations dark brown. Pronotum very lightly carinate longitudinally; much wider than head and eyes. Scutellum shallowly channelled along its anterior three-fourths, posterior fourth carinate.

Length: $6\frac{3}{4}$ -8 mill.

Hab: Queensland, Bundaberg (xi.)

There is also a female (8 mill.) from the same locality and time of capture, which differs only by having an almost continuous fascia across the tegmen instead of the short wedge at the apex of the clavus. A bred specimen (2306 K) is immature, but there is little doubt that it is referable to this species. The nymph-cases are whitish, often tinged with purplish-red. (Pl. XXXIII, f. 12 and 13). (No. 2306 consists of seven on a single twig). They are elongate-subconical, more or less porrect, or with a slight curve, widening gradually from the base.

Length when full grown 11-16 mill., width at mouth $3-3\frac{1}{2}$ mill.

See the introduction for remarks on these cases.

2. *acqualior*, sp. nov.

Similar to *P. serpulidia* but pronotum smaller and very little wider than head and eyes; pronotum punctured (not striate). Tegmina punctured but veins not granulate. Dorsal part of frons more swollen, wider anteriorly.

Yellowish brown, frons with black, transverse subparallel lines. Legs, etc., more or less black. Clavus and corium basal-

ly coriaceous, apically more membranaceous, medianly colorless (except veins).

Length: 7 mill.

Hab: Queensland, Bundaberg (xi.)

Pectinariophyes, gen. nov.

Closely allied to *Polychactophyes*, but with the posterior margin of the head raised, pronotum much less declivous, also much longer in proportion to the head. Ocelli farther apart, frons more swollen.

1. *pectinaria*, sp. nov. (Pl. XXVII, fig. 8.)

Yellowish, vertex tinged with red. Eyes dark. Frons transversely lined narrowly with blackish. Posteriorly legs more or less dark. Pronotum but little wider than head and eyes, punctured, scarcely striate. Scutellum flat, not carinate or channelled. Tegmina punctured, not granulate.

Length: 5 mill.

Hab: Queensland, Bundaberg (xi, bred, Koebele's No. 2307).

One specimen, unfortunately rather immature. It has been described only to connect with the pretty nymph cases which smaller and slenderer than those of *Polychactophyes*, smoother in texture, and of much finer workmanship. They are pale-yellowish brown and are fastened to twigs by twos and threes.

Length: 13 mill.; width of mouth, about 2 mill.

Anyllis, gen. nov.

Distinguished by the interior vein of the wings being furcate posterior to the middle, and by the anterior margin of the pronotum being obtusangulately produced a little.

Vertex transverse, slightly concave, longitudinomedianly carinate, subangulately rounded anteriorly. Ocelli a little nearer to the base than to the apex, about three times as far from the eyes as from one another. Frons and clypeus strongly carinate, the former narrow and little swollen, the carina strongly raised. Rostrum reaching to about posterior coxae. Posterior tibiae with one strong spine. Pronotum longitudinally carinate, about twice as long as vertex, scarcely wider than head and eyes, elevated posteriorly, posterior margin somewhat

deeply emarginate. Tegmina subcoriaceous, 3 discoidals, costally with many veins, apical vein forked and reforked.

1. *leiala*, sp. nov.

Cinereous; with pale yellow pubescence; vertex and pronotum anteriorly with whitish markings, ocelli pale reddish. Tegmina mottled more or less with whitish, rather faintly. Head, pronotum, tegmina, etc., punctured.

Length: $6\frac{1}{2}$ - $6\frac{3}{4}$ mill.

Hab: Queensland, Kuranda (viii P).

Bathyllus Stal.

Bathyllus Stal. 1866 Hem. Afric., 68.

1. *albigutta* (Walker).

Lepyronia albigutta Walker 1858, List. Hom. Suppl., 191.

L. mocrens Stal. 1854 O. V. A. F., XI, 251.

I somewhat doubtfully refer two individuals in my own collection, to this genus and species, but Stal. says that the anterior angle is acute, in these it is distinctly rounded.

The following Cercopinae have been recorded from Australia but are unknown to me:

Gen. *Hindola* Kirkaldy, 1900, Entom. XXXIII, p. 243.

1. *Aphrophora compacta* Walker, 1851, List. Hom., 701 (= *A. semiflava* Walker, 1858, Suppl. 187.)

2. *Lepyronia* (?) *australiae* Walker 1851 List. 727 (= *Aphrophora admittens* Walker 1858, Suppl. 345 = *A.* (?) *arcolata* Walker l. c.)

3. *Carystus reticulatus* Spangberg 1878, O. V. A. F., XXXIV No. 9, p. 12.

4. *C. stali* Spangb., l. c.

5. *C. sorurculus* Spangb., l. c.

6. *C. mutabilis* Spangb., op. c., 13.

Gen. *Uncertain*?

1. *Aphrophora albicincta* Erichson, 1842, Archiv. Ent., I, 285.

2. *A. bifrons* Walker 1851 List, 702.

3. *Lepyronia convexa* Walker 1851 op. c., 726.

Subfam. 3. Machaerotinae.

The following form, unknown to me, has been described from Australia.

Gen. *Macherota* Burmeister 1835, Handb. Ent. II, 127 and 128.

1. *M. pugionata* Stal. 1865, O. V. A. F., XXII, 154.

Fam. Fulgoridae.

Subfamily Fulgorinae.

Distinguished by the reticulation of the anal area of the wings; the clypeus is carinate laterally. A large number of the forms are brightly colored, while the same or others are remarkable for the extraordinary shape of the head. In the Australian genera at least, the radial, median and brachial veins issue separately from the apical margin of the basal cell. These forms are apparently poorly represented in Australia, only 3 genera and 11 species being known; of these 1 genus and 3 species are now added.

1. Head produced in front, longer than the nota.....2.

1a. Head very little prominent before eyes, shorter than the nota together.....3 *Dcsudaba* Walker.

2. Costal margin arched; vertex wider than eye, prolongation strongly narrowed anteriorly.....1 *Eurystheus* Stal.

• 2a. Costal margins subparallel in repose; vertex not wider than an eye, prolongation not narrowed anteriorly.....
.....2 *Eurinopsche*, gen. nov.

Eurystheus Stal.

Eurystheus Stal, 1862 Berlin. Ent. Zeit VI, 303.

Although described in 1862, this genus was not included by Stal in 1866 in his table of genera in the "*Hemiptera Africana*."

1. *dilatata* (Westwood).

Fulgora dilatata Westwood 1842 Trans. Linn. Soc. London XVIII, 146, Pl. XII, figs. 8 and 9.

Length: 15½ mill.

Hab: Western Australia, Swan River.

This species and *Eurinopsche obscurata* were included by Walker in his new genus *Prolepta*, but are not congeneric with his type *P. apicalis* from the Philippines.

2. *perkinsi* sp. nov.

Close to *E. dilatata*, but cannot be that species, as it is much larger, the vertex longer and not tapering during the apical two-thirds, about as long as the thorax and abdomen together. The specks on the tegmina are smaller and not ocelliform, are at least twice as numerous, the apical part of the tegmina being well sprinkled. The coloring is that of *E. dilatata*, but the tegminal markings are, as a whole, paler. In profile the serrations of the head are flatter and shallower.

Length: 27 mill.

Hab: Queensland, Bundaberg (xi), bred; arboreal.

Eurinopsyche, gen. nov.

The type of this was one of the original species of *Eurystheus*, but can scarcely be included therein. It differs more particularly by the different form of the head, the vertex at base being narrower than an eye. Tegmina decumbent (in *Eurystheus* they are subtectiform), costa scarcely arched. Pronotum with sub-lateral subtransverse arched keels.

1. *obscurata* (Fabr.)

Fulgora obscurata Fabricius 1781 Spec. Ins. II, 315; Westwood 145, Pl. 12, f. 7.

Length: 20½-21 mill.

Hab: Queensland, Bundaberg (xi), Brisbane (vi), arboreal.

There is a nymph of an allied form, in which the cephalic prolongation is sensibly widened anteriorly. This nymph, like all those of this sub-family, is liberally endowed with sensory organs. The vertex has them literally everywhere it is possible to crowd them; on the ventral part of the prolongation there are none and only a few on the frons proper; none on the clypeus. They are sparser, but still numerous, all over the nota, tergites and even on the tegminal pads.

Length: 11 mill, width 4½ mill.

Hab: Brisbane (xi).

From Sydney (i), there are two specimens, in which the head is much longer than in any of the other forms and is spatulate anteriorly. The spatulate part is crowded with sensory organs, but there are comparatively few others on the head. Those on the nota and abdomen much as in the Brisbane forms.

Length: $8\frac{1}{2}$ mill, width 2 mill. Pl. XXIX, fig. 11.

These nymphs appear to belong to undescribed species (and possibly genera).

Koebele's No. for this is the same as for *Thanatodictya hebe*, but this nymph scarcely belongs to a Dictyophorine, it probably only means that the same parasite attacks both.

Desudaba Walker.

Desudaba Walker 1858 Suppl., p. 58.

Mctanira Stal. 1863 Stettiner Ent. Zeit. XXIV, p. 236.

There are 6 species of this genus, Australian and Papuan, which may be separated as follows:

1. Wings basally with a reddish or yellow spot.....2.
- 1a. Wings basally with a bluish or greenish spot.....5.
2. Head, pronotum and scutellum blackish.....3.
- 2a. Head, etc., more or less olivaceous...3 *danae* (Gerstaecker).
3. Frontal process reaching to base of vertex....6 *circe* (Stal.)
- 3a. Frontal process reaching to about middle of vertex.....4.
4. No red spots on tegmina.....1 *psittacus* (Walker).
- 4a. Red spots on tegmina.....2 *maculata* Distant.
5. Abdomen black, marked with green basally; ground color of tegmina basally red-brown, spotted with yellow (Papua)4 *scylla* Distant.
- 5a. Abdomen black, with 3 greenish fasciae (sometimes broken into 4 spots), sternites apically greenish; basal ground color of tegmina dark crimson, no yellow spots.....5 *aulica* Stal.

1. *psittacus* Walker.

D. psittacus Walker, 1858, Suppl., 59.

Mctanira thisbe Stal. 1863, Stettiner Ent. Zeit. XXIV, 236.

Length: 16 mill.

Hab: Queensland, Brisbane (my coll); recorded from Moreton Bay (Walker and Stal.)

2. *maculata* Distant.

D. maculata Distant 1892 T. E. S. London, 277.

Hab: Queensland, Peak Downs.

3. *danae* (Gerst).

Metanira danae Gerstaecker 1895 Mt. Nat. Ver. Neu-Vorpommern XXVII, 24.

Hab: Queensland (Gerst); Bundaberg (11 P). on wild and cultivated *Citrus*.

5. *aulica* Stal.

D. aulica Stal. 1869 Berlin. Ent. Zeit. XIII, 241.

Hab: Queensland; Cairns; also Rockhampton (Stal), arbo-real.

6. *circe* (Stal.)

Metanira circe Stal. 1863 Stettiner Ent. Zeit. XXIV, 237.

Hab: Lizard Island.

N. B.—There are two Lizard Islands, one off Queensland, the other near Lefu. This might well be either.

Subfamily Dictyophorinae.

Antennae very much as in Fulgorinae. Rostrum with last segment sufficiently long. Radial and cubital veins with a common, short stem; anal vein running into commissure; no transverse veins in the costal cell. Anal area of wings not reticulate.

1. Clavus with a transverse vein.....1 *Cajeta* Stal.
- 1a. Clavus without transverse vein.....2.
2. Tegmen with a veined costal cell; posterior margin of pronotum truncate.....4 *Astorga*, gen. nov.
- 2a. Tegmen without costal cell; posterior margin of pronotum angularly marginate.2.
3. Color testaceous marked with blackish brown. Lateral margins of pronotum distinctly rounded.....
-2 *Thanatodictya* gen. nov.
- 3a. Color greenish; lateral margins of pronotum straight or slightly concave.....3 *Hasta* gen. nov.

Cajeta Stal.

Cajeta Stal 1886 Hem. Afr. IV, 150.

1. *singularis* Stal.

C. singularis Stal. 1866 Berlin Ent. Zeit., X, 391.

Hab: "North Australia." (Probably Queensland).

Thanatodictya, gen. nov.

Allied to *Dictyophora* Germar. Head very elongate, narrow; lateral margins of vertex subparallel, slightly broadened and obtuse-angulate at the apex; as seen in profile the head is straight and correct, eyes touching pronotum. Vertex bordered on each side by a keel, and there is a median keel which is usually subobsolete except about the basal fifth and the extreme apex. Frons 5-carinate, including the lateral margins. Clypeus tricarinate. Second antennal segment small, globular.

Tegmina hyaline, apical third subreticulate. Legs simple, posterior tibiae 4-spined.

1. Tegmina with a broad, entire, longitudinal, dark stripe; vertex basally only slightly nodulose (subgen. *Lucinda* nov....
.....2 *lucindae* sp. nov.
- 1a. Tegmina colorless, except the dark apical third, or less...2.
2. Vertex not nodulose basally; head porrect; Stigma pallid, composed of 5 or 6 cells; length over 14 mill.....
.....1 *pracferrata* (Distant).
- 2a. Vertex strongly nodulose at base (stigma darker) (subgenus *Niculda* nov., type *anadyomene*).....3.
3. Stigma with 3 or 4 inconspicuous transverse veins; head somewhat ascending; length under 10 mill.....
.....3 *anadyomene*, sp. nov.
- 3a. Stigma composed of 2 cells; head porrect.....4.
4. Darker; length 11 mill.....4 *hebe* sp. nov.
- 4a. Paler; length 9 mill.....5 *psyche* sp. nov.

Subgenus *Thanatodictya* nov.1. *pracferrata* (Distant).

Dictyophora pracferrata Distant 1892 Trans. Ent. Soc. London, 279.

Length: 12-15 mill.

Hab: Queensland, Bundaberg (ix-xii), reported from Peak Downs by Distant.

Subgenus *Lucinda* nov.2. *lucindae* sp. nov.

Testaceous, keels of head in front of eyes black; lateral margins of pronotum and scutellum (exterior to keels) and abdo-

men mostly, blackish brown. Tegmina hyaline, veins pallid, a longitudinal blackish brown entire stripe broadening apically. Legs brownish testaceous, narrowly striped with blackish brown.

Length: 10-12 mill.

Hab: Queensland, Lucinda Point (vii) on rushes.

Subgenus *Niculda* nov.

3. *anadyomene* sp. nov.

Blackish or blackish brown; head testaceous or stramineous, except the apex, keels in front of the eyes and frontal area between submedian keels; base of vertex and disk of pronotum pale brownish testaceous, a longitudinal ivory white stripe on mesonotum extending to posterior angle. Under side pale, sordid, testaceous, marked with black. Tegmina and wings hyaline, colorless, veins pale brownish, apically many of them whitish; 2 black smudges, one from apex of suture to apex of tegmen broadly, the other on the stigma, etc. Head slightly ascending, about as long as the notum and abdomen together.

Length: $6\frac{1}{2}$ mill to apex of abdomen; $7\frac{1}{2}$ - $9\frac{1}{2}$ mill to apex of tegmina.

Hab: Bundaberg (ix-xii), Brisbane (xi), arboreal.

4. *hebe*, sp. nov. (Pl. XXIX, fig. 10).

More or less sordid ferrugineous. Keels on head black in front of eyes. Pronotum with a longitudinal ivory white line broadening out on the scutellum, the posterior angle being entirely ivory white. Lateral margins of the ventral part of the pronotum, lateral margins of mesopleura, etc., ivory white. Lateral margins of the ventral part of the pronotum, lateral margins of mesopleura, etc., ivory white. Tegmina colorless, hyaline; veins, stigma and a smudge from apex of claval suture obliquely to apex of tegmen, blackish or brownish black. Abdomen marked with black.

Length: 11 mill.

Hab: New South Wales, Sydney (ii).

5. *psyche* sp. nov.

Allied to the preceding but smaller and paler. Head nearly as long as the rest of the body. Pale greenish grey, disk of ver-

tex (on either side of the central keel) and vertex apically, blackish brown. Scutellum pale brownish testaceous with a central ivory white line, which does not quite reach the ivory white posterior angle. Tegmina hyaline, colorless, veins and stigma pale brown, an apical smudge similar to that in the preceding species, but paler. Some of the short transverse veins in the apical part of the tegmen narrowly ivory white.

Length: $8\frac{1}{2}$ -9 mill.

Hab: New South Wales, Mittagong (i).

The following species are unknown to me:

6. *Dictyophora bifasciata* Distant 1892 Tr. E. S. London, 279 from Peak Downs, apparently closely allied to *T. lucinda*, but the sternites are ochraceous.

7. *D. insignis* Distant l. c. from same locality. Probably allied to *T. anadyomene* but the coloration appears to be different.

Hasta, gen. nov.

Allied to *Thanatodictya*, but head and pronotum differently formed. In the latter the lateral margins of pronotum are convex, in the present genus they are straight or a little concave. Head slightly ascending, somewhat tapering. Central keels of vertex and frons entire. Eyes small, elongate. Lateral margins of scutellum more rounded basally. Tegmina with apical cells and with many transverse veins; costal cell without transverse veins; stigma composed of three cells. Posterior tibiae 3-spinose.

There are two species:

1. Head about as long as nota and abdomen together; veins green; length 18-19 mill. *hastata* sp. nov.
2. Head about as long as pronotum and mesonotum together; veins of wings blackish brown; length $11\frac{1}{2}$ mill.
..... *paupera* sp. nov.

1. *hastata* sp. nov.

Immaculate grass-green, keels of scutellum tinged with blue. Tegmina and wings hyaline, colorless, veins green. Brachial vein forked nearer to the base than the cubital, which is forked nearer to the base than the radial. Subcosta apically very narrowly brownish.

Length: 18-19 mill.

Hab: Queensland, Cairns (viii) on grass.

2. *paupera* sp. nov.

Immaculate green, of a yellower hue than the preceding. Veins of wings blackish brown.

Differs from *H. hastata* by the vertex being only about as long as the pronotum and mesonotum. Eyes more prominent. The radial is forked nearer the base than is the cubital, this nearer the base than the brachial.

Length: 11½ mill.

Hab: Queensland, Cairns (viii) on grass.

Astorga, gen. nov.

Not closely related to any other Dictyophorine; has a little the appearance of a long nosed *Elasmoscelis*, but the anal vein runs into the commissure.

Vertex narrow, about twice as long as broad, extending well in front of prominent eyes which do not extend laterally so far as the pronotum; carinate medianly the keel extending to posterior margin of scutellum. Frons ventrally curved as seen in profile; long and narrow and depressed along the middle, many times longer than wide; not carinate medianly; dorsally it caps the vertex and is about half the length of the latter, truncate, not carinate. Ocelli very small. Antennae small, second segment cylindric, about twice as long as wide. Pronotum medianly about two-thirds the length of the vertex, tricarinate, posterior margin truncate. Scutellum about two and one-half times as long as pronotum, tricarinate. Tegmina flat, or slightly tectiform, costa roundly arched, narrowing apically, apical margin obliquely sub-truncate. Costal cell wider at maximum than the sub-costal cell, the former with transverse veins; radial forked at about one-fourth of length of tegmina, median a little before middle, cubital about the middle, no subapical line. Anterior femora dilated.

I have placed this among the Dictyophorinae because of the general fundamental structure, and that of the antennae. The venation is typically Dictyophorine, but there is a costal cell with transverse veins.

1. *saccharicida*, sp. nov. (Pl. XXVIII, figs. 10-13.)

Brownish testaceous; head paler, abdomen mostly darker; frons laterally and dorsally marked with short brownish lines.

Tegmina pale brownish yellow, a brownish smudge on costal membrane and costal cell, also on apical margin (except extreme apex) with subparallel darker stripes, and two longer ones near apex across tegmen, also one or two small irregular specks on disk of corium and clavus. Wings pale smoky, veins pale brown. Legs lined with brownish.

Length: $7\frac{1}{2}$ – $8\frac{3}{4}$ mill.

Hab: Queensland, Cairns (vii-viii) on sugar cane and grasses

Subfamily 3. Cixiinae.

Apical part of tegmen not reticulate, much fewer cells than in Dictyophorinae. Radial and median veins approximate at base, remote from cubital. No subcostal cell. (Usually three ocelli.) Anal vein running into commissure.

It is difficult to differentiate this subfamily from the Dictyophorinae by words, but they can hardly be confused. As a rule the latter are much more elongate and the apical parts of the tegmen reticulate or with many apical cells.

1. Antennae minute.....	2
1a. Antennae elongate, distinctly visible beyond the lateral margins of the head.....	1. <i>Solonaima</i> gen. nov.
2. Scutellum with 5 keels, 3 ocelli present....	2 <i>Oliarus</i> Stal.
2a. Scutellum with 3 keels, 2 ocelli only.....	3
3. Head produced well in front of eyes, vertex elongate....	4
3a. Head little or not produced in front of eyes, vertex transverse.....	5. <i>Calamister</i> gen. nov.
4. Tegmina of the usual <i>Cixius</i> form..	3. <i>Carolus</i> gen. nov.
4a. Tegmina in repose (as seen dorsally) very strongly narrowed apically.....	4. <i>Gelastoccephalus</i> gen. nov.
- (*Lamenia* Stal is not included in this table.)

1. *Solonaima*, gen. nov.

Apparently allied to *Brixia* Stal, but the antennae are longer and more cylindric; frons lightly carinate, etc.

Head and eyes much narrower than pronotum; lateral margins of the deeply concave vertex convergent postero-anteriorly, anterior margin truncate, posterior margin deeply emarginate. Frons with an apical ocellus; roundly curved as seen in profile, the disk deeply concave, very narrowly almost to apical margin (ventral) eyes, then widening a little, medianly slightly carinate.

Part of the frons is visible dorsally owing to short vertex. Clypeus elongate, carinate laterally. Eyes deeply excavated beneath. First segment of antennae cylindric, reaching nearly or quite to lateral margin of frons; second longer than first, cylindric, reaching well beyond base of clypeus. Posterior legs elongate, tibiatae spineless.

1. *solonaima*, sp. nov.

More or less pale fulvotestaceous; eyes and first segment of antennae black, as also tergites more or less. Sternites more or less sordid. Tegminal veins pale and darker brown, not granulate nor piliferous.

Length: (male), 6-6½ mill.

Hab: Queensland, Cairns (viii.)

Oliarus Stal.

Oliarus Stal. 1862 Berlin Ent. Zeit. VI, 306; Kirkaldy 1902 Faun. Haw. III, 119.

An almost cosmopolitan genus, very rich in species. None have up to the present been described from Australia, but 9 are now brought forward here.

In all the Australian forms known, the cubital is forked nearer the base than is the radial.

1. Axillary vein of clavus running into anal vein, basal of the middle of the latter.....2.
- 1a. Axillary running into anal at, or apical of, the middle of the latter.....5.
2. Axillary very short, not quite half (taken always from its curving or angulation at the commissure) the length of the stalk of the anal.....1. *laertes* sp. nov.
- 2a. Axillary long, more than half the length of the stalk of the anal.....3.
3. Tegminal veins more or less thickly granulate.....4.
- 3a. Tegminal veins not (or obsolescently granulate).....2. *kampaspe*, sp. nov.
4. Head and scutellum pale, veins pallied, granulate with brownish-black.....3. *tahunia*, sp. nov.
- 4a. Head and scutellum black and castaneous, veins dark.....4. *asaica*, sp. nov.
5. Vertex short and broad, the forking taking place near the apex.....5. *felis*, sp. nov.

- 5a. Vertex longer, forking about the middle.....6.
 6. Species less than 5 mill. long; vertex long and narrow,
 much narrower at base than at eye..6. *alexanor*, sp. nov.
 6a. Species more than 6 mill. long; vertex wider, scarcely or
 not narrower at base than an eye.....7.
 7. $8\frac{1}{2}$ mill long; veins not granulate.....9. *lubra*, sp. nov.
 7a. $6\frac{1}{2}$ mill long.....8.
 8. Tegminal veins granulate.....7. *sponsa*, sp. nov.
 8a. Tegminal veins not granulate.....8. *phelia*, sp. nov.

1. *laertes*, sp. nov.

Blackish, keels more or less ferruginous. Pronotum otherwise entirely black. Veins brownish, base of apical cells narrowly infusate, stigma dark. Tibiae and tarsi more or less ferruginous.

Vertex elongate, twice as long as broad, much narrower than an eye. Rostrum reaching to posterior coxae. Tegmina granulated, very lightly piliferous. Auxillary vein running into anal, scarcely apical of the posterior angle of the scutellum; that is at about one-fourth of its length, consequently the axillary is much shorter than the basal part of the anal and is in the same straight line as the apical part of the anal, the basal part of the anal being much curved. Posterior tibiae with a median spine and one near the base, also two tiny basal spines.

Length: $5\frac{1}{2}$ mill.

Hab: New South Wales, Mittagong (i).

2. *kampaspe*, sp. nov.

Close to *O. alexanor* but larger and not granulated, claval venation different. Tegminal veins dark and pale brownish, bases of apical cells infusate.

Length: $5\frac{1}{3}$ mill.

Hab: Queensland, Kuranda (viii).

3. *talunia*, sp. nov.

Pale testaceous, lateral margins of scutellum and the space between sublateral and median keels, browner. Apices of apical veins and the bases of apical cells rather widely infusate. Ver-

tex long and narrow, acutangularly apically. Veins strongly granulate, scantily piliferous.

Length: 5 mill.

Hab: Queensland, Cairns (viii).

4. *asaica*, sp. nov.

Head, scutellum within lateral keels and some marks on pronotum, blackish ferruginous; keels on head, etc., ochraceous. Apical half of frons ferruginous, also keels on scutellum. Scutellum outside lateral keels, apical segment of rostrum, sternites etc., ferruginous; femora sordid ferruginous, tibiae paler. Tegmina hyaline, veins dark brown and pale brown; stigma brown; bases of apical cells thickened, darked. Similar in proportions to *O. lubra*, but much smaller; the lateral margins of the vertex fork nearer to the apical margin than to the middle and there is a tiny transverse keel uniting the two oblique keels just posterior to the apical margins; the frontal fork is very close to the posterior margin of the frons. Vertex much narrower than in *O. lubra*, and the lateral margins posteriorly less divergent. Rostrum reaching beyond middle of posterior coxae. Posterior femora with a strong median spine and two small ones nearer base (basal one obsolescent). Tegmina more granulate, slightly piliferous.

Length: 7 mill.

Hab: New South Wales, Sydney (i).

5. *felis*, sp. nov.

Blackish, keels of head and pronotum more or less pallid. Keels of scutellum obscurely blackish ferruginous. Vertex broad. Vertex at base a little wider than median length, wider than an eye. Tegmina lightly granulate and lightly piliferous. Axillary vein joining anal about midway between posterior angle of scutellum and apex of clavus, shorter than basal part of anal. Tibiae with a basal and a median spine.

Length: 4 mill.

Hab: Queensland, Cairns (viii).

6. *alexanor*, sp. nov.

Blackish, keels more or less yellow on head and pronotum, more or less ferruginous on scutellum. Basal two-thirds of

tegmina pale, darkly granulated, apical third darker, bases of apical cells infusate. Legs pallid.

Tegmina minutely but closely granulated, not piliferous. Posterior tibiae with one spine a little basal of the middle, and an obsolescent basal one.

Length: 5 mill.

Hab: Queensland, Cairns (viii).

7. *sponsa*, sp. nov.

Ferrugineotestaceous, more or less pale. Veins of tegmina and stigma sordid stramineous; stigma internally, apical veins etc., brownish, the bases of apical cells a little thickened. Head, granulations, etc., as in *O. lubra*, except that the forking is a trifle nearer to the middle. Costa arched slightly, very obtuse angularly close to base.

Length: (male), $6\frac{3}{4}$ mill.

Hab: Queensland, Cairns (viii).

8. *phelia*, sp. nov.

Pale yellowish ferruginous, pronotum pallid, scutellum more or less blackish, tegmina as in *O. asaica*, except that the apical veins are more infusate apically. Tergites more or less marked with blackish. Head as in *O. asaica*, except that the vertical forking occurs about the middle. Rostrum reaching to about intermediate coxae. Tegmina not (or scarcely) granulate, not piliferous. Posterior tibiae with two small spines on basal half (basal one obsolescent.)

Length: $6\frac{1}{4}$ - $6\frac{1}{2}$ mill.

Hab: Queensland, Kuranda (viii), Nelson (vii).

Var: Blackish ferruginous; keels of vertex and frons pale ferruginous. Pronotum pallid, two streaks on scutellum ferruginous.

9. *lubra*, sp. nov.

Head and legs ochraceous; the apex of the vertex, the three cells between vertex and frons, clypeus, sterna (mostly), the scutellum between the median and submedian keels and outside the lateral keels etc., blackish. Pronotum yellowish, more or less fuscate. Scutellum between submedian and lateral keels, and the keels themselves, ferruginous. Sternites mostly yellowish. Teg-

mina hyaline, veins and stigma yellowish-brown and brown; stigma internally brownish. The bases of the apical cells a little infusate. Veins of tegmina feebly and very minutely granulate; not piliferous.

Vertex about as wide as an eye, appears longer than wide, though the basal width is actually greater than the median length, with the base deeply acutangularly emarginate, medianly carinate slightly, and a sublateral carina on each side starting from lateral margin at about one-third of its length and proceeding towards middle of anterior but turning off just before it reaches there, meeting the anterior margin at right angles. Frons forked about middle of anterior lobes. Rostrum reaching to about midway between intermediate and posterior coxae. Submedian keels of scutellum very slightly rounded externally. Costa straight, not or scarcely arched. Axillary vein running into anal at about its middle, and shorter than the basal part of the anal. Posterior femora with two small spines on basal half.

Length: (male), $8\frac{1}{2}$; (female), $8\frac{1}{2}$ - $9\frac{1}{4}$ mill; width, $2\frac{1}{3}$ mill.

Hab: Queensland, Bundaberg (ix-xii), Brisbane (xi).

Carolus, gen. nov.

Like *Cixius* in appearance, with longer head.

Vertex triangular, extending well in front of eyes, a little rounded at tip, longer than wide, disk much hollowed out, carinate medianly, lateral margins acute, subvertical. Frons and clypeus sublanceolate, the former subnodulose near the base, carinate medianly; clypeus carinate medianly and laterally; no frontal ocellus. Pronotum truncate apically in the middle, posteriorly deeply rectangularly emarginate. Scutellum strongly tricarinate. Radial and cubital veins forked about the same place, i. e., a little nearer the base than the middle of the tegmen. Tibiae not spinose.

1. *crispus*, sp. nov.

Head, pronotum and underside more or less pale sordid ferruginous (sterna and sternites partly darker.) Scutellum ferruginous, laterally darker. Tegmina hyaline, veins yellowish-testaceous, thickly granulated with blackish, strongly but shortly piliferous.

Length: (male), $6\frac{3}{4}$ mill.

Hab: New South Wales, Sydney (i.)

Gelastocephalus, gen. nov.

Allied to *Carolus*, but the tegmina in repose as seen dorsally, are almost linear posteriorly.

Head and eyes narrower than pronotum. Vertex elongate, somewhat ascendant, the disk depressed, the lateral keels acute, converging anteriorly straightly, strongly prominent in front, nearly twice as long as wide, anterior angle acute, slightly rounded; posterior margin roundly emarginate. Eyes longer than broad, extending laterally as far as anterior margin of pronotum.

Frons and clypeus medianly fused, spindle-shaped, the former strongly carinate laterally, the keels suddenly curving around to the thorax a little apical of the middle of the fused segments. Ocelli small but distinct, the frontal one absent. Clypeus angulate; not carinate laterally. Antennae small, not inserted near clypeus.

Pronotum almost linear, anterior margin very highly angularly arched, lateral margins short, diverging; posterior margin deeply, acutangularly emarginate. Scutellum diamond-shaped tricarinate.

In repose the tegmina (as seen dorsally) are arched laterally posterior to the shoulders, apical half very strongly narrowed. Legs short, anterior femora slightly longer than tibiae, posterior tibiae spineless, first segment of tarsi longer than 2nd and 3rd together.

1. *ornithoides*, sp. nov. (Pl. XXXII, figs. 6-7).

Head and pronotum pale ferruginous; scutellum, apex of clypeus, sterna (mostly), abdomen etc., black. Clavus pale fulvous, rest of tegmina cinerous; apical third, a blotch about the middle and most of the costal margin between these dark brownish. Corium strongly and closely granulate with dark brown, not (or very shortly and scantily) pilose. Femora and tibiae dark brown, tarsi pallid.

Length: male, 5 mill.

Hab: New South Wales, Sydney (i).

Calamister, gen. nov.

Vertex transverse, disk depressed, not carinate medianly, apically rounded, very slightly produced before the eyes. Frons widening out apically, medianly carinate, no frontal ocellus. Cly-

peus rather obsoletely carinate laterally. Scutellum tricarinate. Venation as in *Carolus*. Tibiae not spinose.

1. *obscurus*, sp. nov.

Testaceous, vertex a little darker. Tegminal veins pale brownish, lightly granulate, slightly piliferous.

Length: 5 mill.

Hab: Queensland, Bundaberg (ix-xii.)

Lamenia, Stal.

Lamenia Stal 1859 Eugenie Resa Zool. 277 Pl. IV, fig. 5; Ashmead 1889 Ent. Amer., V, 4; Melichar 1905 Wein. Ent. Zeit. XXIV, 285.

Herpis Stal 1860 K. Svensk. Vet. Akad. Handl., XIII, No. 6, p. 8.

Stal placed this among his *Derbida*, while Ashmead locates it in his subfamily *Flatinae* between *Siphanta* and *Amphiscepa*. It appears to me to be a *Cixiine*; it cannot be placed among the *Derbidae* because the anal vein of the tegmina runs into the commissure and it cannot be a "Flatid," first on account of the venation, and secondly because there is no trace of intervenal (or any) granulation. It might be located in the *Achilidae* were it not for the course of the anal vein.

It has a very wide distribution; i. e., well over the American continents, Polynesia, Africa, etc.

1. *kulia*, sp. nov. (Pl. XXI, fig. 4.)

Differs from *L. vulgaris* (Fitch),* by the frons being much more declivous and the lateral margins distinctly, sinuately, widened apically (in *fitchi* they are nearly parallel.) It differs from *L. caliginea*, *orba*, *pallidovenosa*, *fimbricola*, etc., by the colour and from *lugubrina* by the form of the frons.

Vertex and pronotum sordid brownish, frons and clypeus sordid ferruginous. Scutellum polished black. Tegmina subhyaline, dark smoky, with a blue tinge. Legs pale. Abdomen more or less blackish.

Vertex very short, transverse, anteriorly roundly truncate; frons with lateral margins sinuate, apically widened.

*The only species I have seen, kindly lent me for examination by my colleague, Mr. Swezey.

Length 3 mill to apex of abdomen, $4\frac{3}{4}$ -5 mill to apex of tegmina.

Hab: Queensland, Cairns (vii-viii), Nelson (vii) on grass.

2. *hiva*, sp, nov.

Allied to the preceding but the vertex is wider, as wide as or wider than an eye; the frons wider and shorter, angulate laterally just posterior to apical margin, strongly carinate medianly. Pronotum lutescent.

Length: $5\frac{1}{2}$ mill.

Hab: Queensland, Bundaberg, (ix-xii type), Cairns (viii), Kuranda (viii) on grass.

The following supposed Cixiines are unknown to me, viz:

1. *Cixius laevifrons* Walker 1858 Ins. Saund., 43.

2. *Prosops pedisequus* Buckton 1893 Vict. Nat. X, 49.

Fam. Asiracidae.

Perkinsiella, Kirkaldy.

Perkinsiella, Kirkaldy, 1903, Entomologist XXXVI, 179.

Head short, scarcely extending beyond apical margin of eyes; vertex about as wide as an eye, transverse, 7-sided, divided by median keel into two 5-sided areas, somewhat deeply and roundly impressed; posterior margin truncate. Eyes reniform, oblique, latero-posteriorly extending to about half the length of the pronotum. The two apices of the vertex each give forth a keel, these unite near the top of the head at about three-fourths of the length of eyes (as seen from below), thence continuing to the apical margin of the flattish frons which is slightly emarginate; lateral keels of the frons straight (except at their base where they curve around meeting the 2 small basal forks of the median keel), subparallel (very slightly convergent towards the apex) and contiguous to the inner margin of the eyes. Lateral keels of genae meeting lateral keels of frons at an acute angle at the apical margin. All these keels are narrow, but well marked. Frons about the same width or a little narrower than an eye. Clypeus 3-carinate.

Antennae with 1st segment flattened, apically dilated, triangular; 2nd segment longer than first, flattened more or less, a trifle narrower at apex than at base. Pronotum transverse,

widely emarginate obtuse-angularly at base, 3-carinate, lateral keels arising at the apical margin close to the eyes, diverging slightly almost to posterior margin, and ending just before it, a trifle anterior to this, they are carried on laterally under the eyes by a series of small, raised pustules. Scutellum longer than the pronotum, 3-carinate, the middle keel entire, lateral margins of posterior prolongation straight. Anterior and intermediate legs simple, not dilated. Posterior tibiae longer than tarsi with 2 lateral and 4 apical spines; first tarsal segment longer than the others together. Tibial spur three-fourths of the length of the tibia, with about 40 spinelets. Species dimorphic or monomorphic.

1. Frons more or less uniformly pale brownish, with transverse whitish dots both basally and apically. (Male with subcostal, median and apical cells, dark smoky. Female narrowly suffused by smoky on each side of 2nd-5th apical veins.).....4 *vastatrix* (Breddin).
- 1a. Frons basally dark brown, apically whitish, the former only with transverse whitish dots.....2.
2. Males (all longwinged)*.....3.
- 2a. Females.5.
3. Scutellum laterally broadly dark brown.....
.....1 *saccharicida* Kirkaldy.
- 3a. Scutellum concolorous.4.
4. Antennae shorter, granulations stronger and dark.....
.....2 *graminicida* sp. nov.
- 4a. Anterior longer, granulations feebler and paler.....
.....3 *vitiensis* sp. nov.
5. Longwinged forms.7.
6. Tegmina almost immaculate, some of the apical veins lightly suffusedly infuscate.....3 *vitiensis* sp. nov.
- 6a. Median cell sometimes smoky, also 5th and 6th apical cells (except small hyaline spots at apex).....
.....1 *saccharicida* Kirkaldy.
7. Antennae longer and stouter, tegminal granules comparatively feeble and paler.....1 *saccharicida* Kirkaldy.
- 7a. Antennae shorter and less stout, tegminal granules darker.....2 *graminicida* sp. nov.

* Since this was in proof, Mr. Muir has written from Viti that *P. vitiensis* is dimorphic in both sexes.

1. *saccharida* Kirkaldy. (Pl. XXVI; Pl. XXVII, figs. 1-5).

Perkinsiella saccharicida Kirkaldy 1903 Entom. XXXVI, 179; Perkins 1903 Bull. 1, Comm. Agr. Hawaii; Van Dine 1904 Bull. Hawaii U. S. Agr. Exp. Sta. 5.

Testaceous, lateral margins of pronotum and scutellum dark brown, basal half of frons and most of the clypeus light brown, the former with 2 or 3 short narrow interrupted transverse pale lines near the base. A large black spot on anterior coxae, intermediate coxae and mesopleura each; abdomen black variegated with testaceous. Apex of first segment of antennae black, second segment brownish. Tegmina hyaline, commissure whitish. Anterior and intermediate tibiae annulate with blackish.

Male always macropterous; the 5th and 6th (and sometimes the 4th) apical cells dark smoky, the stripe being sometimes continued very narrowly to the base of the tegmen. Genital segments mostly black.

Female dimorphic (with intermediate forms); longwinged form with the tegminal stripe usually broader on the corium; short winged form much stouter, with hyaline tegmina, a short narrow black line close to apex of clavus. Genital segments pale.

Length: 5-5½ mill (macropterous); 4 mill (brachypterous).

Hab: Wherever sugar cane is grown in Queensland, New South Wales, and Hawaiian Islands. (Koebele No. 2230). (See also the Introduction). Also on grasses and sedges.

2. *graminicida* sp. nov.

Closely allied to the preceding, but a little smaller. The tegminal veins are more thickly granulate especially in the female. Antennae a little shorter and less stout. Pronotum and scutellum scarcely darkened laterally.

Male always macropterous; exterior half of 5th and 6th apical cells smoky, also apices of apical veins, etc.

Female always brachypterous.

Length: (Male) 5 mill; (female) 4 mill.

Hab: Queensland, Cairns (vii-viii, Koebele's No. 2240), on grasses.

3. *vitiensis*, sp. nov.

Closely allied to the typical species, but pronotum and scutellum not darkened laterally.

Male macropterous; third to 6th apical cells smoky (except a small hyaline spot on each, near apex), also around 2nd and 3rd apical veins.

Female macropterous; tegmina immaculate except that the apical parts of 4th to 6th apical cells are more or less smoky.

Length: $4\frac{3}{4}$ (male), $5\frac{1}{8}$ -8 mill (female).

Hab: Viti, Levuka, on sugar cane (III, Koebele's No. 2346).*

4. *vastatrix* (Breddin.)

Dicranotropis vastatrix Breddin 1896 Deutsch. Ent. Zeit. 107; Zehntner 1897 Arch. Java Suiker V., p. ? (Sep. p. 25); Krueger 1899 Das Zuckerrohr und seine Kultur p. 312, Pl. XIV, f. 1. c.; Busse 1904 Arb. Biol. Abt. Land. Kais. Ges. Amt., IV, 319-422. Plates I-II, etc.

Hab: Java, on Sugar Cane. (Breddin and my collection); also reported from German East Africa on *Andropogon sorghum* by Melichar (1905).

Peregrinus, Kirkaldy.

Peregrinus Kirkaldy 1904 Entom. XXXVII, 175.

Dicranotropis Van Duzee 1897 Bull. Buffalo Soc. N. H., V, 228 (nec Fieber).

1. *maidis* (Ashmead).

Delphax sp., Tyron 1889 Rep. Insect & fungus pests Queensland I, 193-6.

Delphax maidis Ashmead 1890 Psyche V, 323; textfigs.

Dicranotropis maidis Van Duzee 1897 Bull. Buffalo Soc. Nat. Sci., V, 240.

Peregrinus maidis Kirkaldy 1904 Entom., XXXVII, 176.

Testaceous, often tinged with orange, carinae paler; the apical three-fourths of the frons, the clypeus, first segment of the antennae and the second (except upper side of basal half), smoky brownish; lateral margins of scutellum dark brown. Femora dark brown.

Males dimorphic. Abdomen black; genital segments and laterally, paler. Longwinged form with tegmina hyaline, sometimes tinged with yellowish; costal, median and radial veins pale yellow, cubital and apical veins smoky, the latter suffusedly; fifth

* Mr. Muir has recently found brachypterous forms of both sexes.

to 7th apical cells apically smoky with a small hyaline spot on each, a black spot at apex of costal cell and a short black line at apex of clavus. Shortwinged form with hyaline tegmina, tinged with yellow, apex blackish brown, as also apex of clavus.

Females dimorphic, similar to the male.

Length: 4-5 mill. (macropt.), $3\frac{1}{3}$ mill (brachypt.)

Hab: All through Queensland (Koebele's No. 2240) on *Zea mais*, *Cynodon dactylon* and *Bromus unioloides* (sec. Tryon); also in Hawaii on *Zea mais* and *Sorghum vulgare* (and occasionally on *Saccharum officinale*); Viti (iii). Florida and Texas.

The nymphs are pale orange yellow, immaculate except that there are small brownish rings around the spiracles.

Phacalastor, gen. nov.

Very close to *Peregrinus*, differing principally by the tegminal veins being very strongly granulate. Type *pseudomaidis*.

1. Apical veins of tegmina suffusedly infusate.....
.....*pseudomaidis*, sp. nov.
2. Apical part of tegmina with a dark semi-circular smudge, across tegmina and curving along the interoapical margin.....*koebelei*, sp. nov.

1. *pseudomaidis*, sp. nov.

Very close to *Peregrinus maidis*, but the tegmina are strongly granulate with dark brown, and the nymphs are whitish, banded and spotted with dark brown.

Frons and antennae dark smoky brown, with a double (somewhat interrupted) line across the middle of the former. Femora smoky, apically black, tibiae pale annulated with black.

Males macropterous; genital segment black.

Females dimorphic; genital segment pale, a little infusate. The shortwinged form has hyaline tegmina, with a large black spot apically.

Length: $3\frac{1}{3}$ -4 mill (macropt.); $2\frac{1}{2}$ mill (brachypt.)

Hab: Queensland, Cairns (vii-viii) on grasses, casually on sugar cane (Koebele's No. 2236).

2. *koebelei*, sp. nov.

Allied to the typical species, but larger and stouter, posterior margin of pronotum less emarginate; tegminal granules much

larger and darker. Pronotum and scutellum darker. Frons blackish brown with many pale yellowish specks, base of clypeus pale. Anterior coxae and a round spot on mesopleura dead black; anterior and intermediate legs brownish black, more or less annulate with pallid; posterior legs more or less pale. Tegmina hyaline with bright black granules, the transverse apical line suffusedly blackish brown, the color continuing curvedly from apex of clavus to exteroapical angle, forming a rough semi-circle; second and third apical veins suffusedly brownish black. Abdomen mostly black except anus, etc.

Male genital segments black.

Female genital segments black, ovipositor pale.

Length: $3\frac{3}{4}$ - $4\frac{1}{8}$ mill (always longwinged).

Hab: Queensland, Cairns (vii-viii, Koebele's No. 2248), on grasses.

Stenocranus, Fieber.

Stenocranus Fieber 1866 Verh. Zool. bot. Ges. Wien XVI, 519, Pl. VIII, f. 3.

1. *agamopsyche*, sp. nov.

Differs from *S. saccharivora* (Westwood) by the much shorter, anteriorly rounded (dorsally) head, and by the color; from the other species, by the immaculate tegmina of which only the apices of the apical veins are dotted with dark brown; there is also a very short, narrow line at the apex of the clavus; the other species (except *saccharivora*) have a longitudinal smoky smear on the tegmina.

Testaceous; frons and clypeus, between the keels, black. Tegmina pale cinereo flavous, marked as above. Tergites testaceous with a sublateral suffused blackish stripe longitudinally on each side. The eyes are distinctly more rounded than in the species with striped tegmina, and are shorter in proportion to their width.

Length: 5-6 mill.

Hab: Queensland, Cairns (vii-viii, Koebele's No. 2242), on grasses and sedges.

2. *saccharivora*, (Westwood.)

Delphax saccharivora Westwood 1833 Mag. Nat. Hist., VI, 413 figs. 54a-c.

Stenocranus (?) *saccharivorus*, Van Duzee 1897 Bull. Buffalo Soc. V, 232.

Mr. Ballou of the West Indian Dep. of Agriculture has recently sent me specimens of this in all stages, enabling me to confirm Van Duzee's doubtful reference to *Stenocranus*, but too late to present a detailed study in this paper. The egg-slits are much more profusely covered with waxy substance than in *Perkinsiella*, approaching more, so my colleague Mr. Swezey informs me, to the condition of certain North American forms. The delicate pale green, immaculate adult cannot be mistaken for any other species; the head in profile is long and acute anteriorly. It is stated by Ballou (1905 West Indian Bull., VI, 41) to be of little importance as a pest in the Antilles, though formerly, some 70 years ago, it was, according to Westwood, Johnstone and others, exceedingly destructive in certain of the islands.

Hadcodephax, gen. nov.

Allied to *Stenocranus* but differing by the form of the head, the venation, etc.

Dorsally the head is elongate, subquadrangular, extending well beyond the apical margin of the eyes; near the anterior margin of the eyes (but a little below) the lateral keels bifurcate at an acute angle, the inner keels meeting acuminate a little beyond the apex of the vertex; the latter is keeled medianly as far as the apical margin (dorsally) of the eyes, where it forks on each side at an obtuse angle meeting the inner forks of the lateral keels. Head much narrower than the pronotum. Eyes longer than broad, suboblique. Ventrally, the frons is somewhat narrow, widening a little apical of the eyes; lateral keels sinuate; these, with the median keel, strongly marked. No forking visible on frons. Antennae short. Clypeus tricarinate. Pronotum tricarinate, laterally straightly divergent, ending just before posterior margin. Scutellum tricarinate. Tegmina with about 9 apical areas, the base of the fourth not reaching as far basal as that of the third, the third not as far as the second, the second not as far as the first, the first not as far as the fifth. Posterior tibiae and tarsi about equally long.

1. *pluto*, sp. nov.

Blackish piceous; antennae and legs testaceous. Tegmina dark smoky, first and second apical cells and apex of costal cell,

hyaline; commissure whitish, with a black spot near apex of clavus.

Length: $4\frac{1}{4}$ mill.

Hab: Queensland, Cairns (vii-viii, Koebele's No. 2247).

Gclastodelphax, gen. nov.

Somewhat allied to *Peregrinus* Kirkaldy. Head dorsally scarcely extending anteriorly beyond the eyes. Vertex transverse, lateral keels forking, the inner forking forming two acutangled apices; beyond that there is a smooth area, on which keels are obsolescent. The frons has a central keel; the lateral converging anteriorly, the lateral ones are subparallel, meeting keels of genae at an acute angle; antennae slender, second segment reaching well beyond base of clypeus, which continue on to the scutellum. Tegmina very short. Posterior tibiae much longer than tarsi, spur with nearly 50 teeth.

1. *histrionicus*, sp. nov.

Vertex smoky brown; clypeus yellowish testaceous; frons, antennae, sterna, legs and tegmina yellowish, the last named being broadly black basally, this continuing on to mesopleura. Pronotum, scutellum and basal half of abdomen whitish testaceous, a broad black band across the middle above; apical of this, pale red brown, becoming paler and more sordid apically. Sternites apically pale red brown. Genital segment mostly black. Tegmina reaching to a little beyond middle of body, apically truncate.

Length: (male), $2\frac{1}{2}$ mill.

Hab: Queensland, Bundaberg, on Sandhills (x).

Smicrotatodelphax, gen. nov.

Somewhat allied to *Delphacinus*, but the head and eyes are larger proportionately, the antennae and the frons different. The type is the smallest Fulgorid known to me.

Head, especially the eyes, very large, the latter extending laterally as far as the base of the tegmina, and posteriorly nearly touching the base of the pronotum. Vertex with lateral keels forking at about one-third of the length of the head (dorsally), meeting acutely on the top of the head, continuing to apex of frons as a single keel. Antennae reaching beyond base of clypeus. Pronotum tricarinate, the lateral keels straight, diverging

posteriorly, but practically reaching the posterior margin of pronotum. Scutellum transverse, with 3 somewhat obscure keels. Tegmina not nearly reaching apical margin of abdomen, rounded apically. Tibial spur with about 13 teeth.

1. *perkinsi*, sp. nov.

Testaceous, frons embrowned, eyes black. Tegmina hyaline. Tergites hyaline. Tergites basally more or less pale orange brown, apex more or less black.

Length: (males), $1\frac{1}{2}$ mill.

Hab: Queensland, Cairns.

Ectopiopterygodelphax, gen. nov.

Distinguished by the large, polished, convex pellet of chitin in the middle of the tegmina. The form of the head is different from that of any other Asiracid known to me.

Vertex long triangular, longer than pronotum, and longer than its own width at base; lateral margins carinate, meeting anteriorly in a slightly rounded acute angle, well beyond the apical margin of the eyes; median keel present but no other keels dorsally. Posterior margin of vertex slightly roundly emarginate. Eyes longer than wide, head and eyes wider than the length of the vertex. Frons suboval, lateral margins rounded; median keel strong and entire; lateral keels acute, starting from lateral keel of vertex at a lower (inverted) elevation than the middle keel, so that for at least the basal half of the length of the frons, the middle keel is strongly visible in profile; lateral keels apically remote from middle keel; apical margin of frons truncate. Genae narrow. Clypeus tricarinate. Antennae very short. Pronotum anteriorly rounded, posterior margin lightly emarginate, lateral keels remote anteriorly from middle keel (practically a continuation of the head keels.) Scutellum with 3 entire keels. Tibial spur short, with a large number of pale, translucent, ill-defined teeth.

1. *eximius*, sp. nov.

Pale green, faintly marked, mostly in interrupted longitudinal lines, with brown. Apex of frons, clypeus, genae (partly), sterna and abdomen, black. Tegmina subhyaline, pale brown; a large spot near the base a wide band across the middle of the corium

(almost encircling the black pellet), and 3 large spots at apex of costal cell and on the basal apical-cells.

Length: $3\frac{1}{2}$ mill.

Hab: Queensland, Cairns (vii).

Family Eutropistidae.

(=*Tropiduchida* Stal.)

I am a little uncertain as to the constituents of this; the antennal structure is often very obscure and I have not been able to examine it in some forms as I would wish. The subcostal cell is present and the costal cell usually provided with transverse veins; the anal vein runs into the apical angle of the clavus. The last segment of the rostrum is moderately long.

Monopsis Spinola, which Stal places in his *Tropiduchida*, appears to me to belong to the Dictyophorinae.

Australian and Vitian Genera.

1. Subcostal cell absent or exceedingly narrow. 1. *Ossa* Motshulsky
- 1a. Subcostal cell present, costal cell with many transverse veins 2.
2. Head at least twice as long as wide. . 5. *Rhinodictya* gen. nov.
- 2a. Head little, if at all, longer than wide. 3.
3. Frons with an oblique keel on each side between median and lateral keels. 4. *Vanua* gen. nov.
- 3a. No oblique keels. 4.
4. Vertex transverse; apical area of tegmen large. 3. *Pcltodictya* gen. nov.
- 4a. Vertex elongate, longer than wide; apical area very narrow. 2. *Daradar* Walker.

Ossa Motshulsky.

Ossa Motsh., 1863 Bull. Soc. Nat. Moscou XXXVI, 2: 106; Melichar 1903 Hom. Ceylon 49.

Both the species hereinafter described, have the head more elongate than in the Sinhalese *O. dimidiata*.

1. Six red specks on vertex arranged longitudinally in 2 rows; length less than 7 mill. *venusta* sp. nov.

2. Six red* specks on vertex arranged longitudinally in 3 rows, (middle row sometimes obsolescent); length over 7 mill. *formosa* sp. nov.

1. *venusta* sp. nov.

Pale greenish testaceous; vertex with six crimson specks, 3 on each side of the median keel, in a longitudinal row; lateral keels of scutellum more or less crimson, also a speck at the interobasal angle of clavus and a speck on the commissure about the middle. Leg spines black. Vertex about $\frac{1}{2}$ to $\frac{3}{4}$ longer than broad, well produced in front of eyes, rounded anteriorly. Frons suboval, about twice as long as wide.

Length: $6\frac{1}{2}$ - $6\frac{3}{4}$ mill.

Hab: Queensland, Cairns (viii), Kuranda (viii), arboreal.

2. *formosa* sp. nov.

Closely allied to the preceding but larger. There are six specks also on the vertex, but they are orange red and are arranged longitudinally in 3 rows of two each, the outer not being parallel but following the curve of the head, the middle two are on the carina (sometimes obsolescent) and are placed a little posterior to the corresponding lateral specks. The tegmina are speckled with crimson as follows: one each side on the commissure a little basal of its middle, and one or two at the anterior angle and 2 or 3 exteriorly—on the subapical line.

Length: $7\frac{1}{8}$ - $7\frac{1}{4}$ mill.

Hab: Queensland, Bundaberg (ix-xii, i), Brisbane (xi), arboreal.

There is nothing remarkable, apparently, about the nymphal instars.

Daradar Walker.

Daradar Walker 1857 J. P. Linn S. London I, 85.

A beautiful nymph from Viti (iii) belongs, I think, to this genus.

Peltodictya, gen. nov.

Allied closely to *Epora* Walker, but the apical area of the tegmina is much longer, and there are two very distinct, though sinuate, subapical lines.

Vertex about twice as broad as long, extending a little in front of the eyes, rounded anteriorly, rectangularly emarginate

posteriorly, strongly carinate medianly. Eyes prominent, but not extending laterally nearly as far as the pronotum. Frons more than twice as long as broad, strongly carinate medianly. Pronotum deeply acutangularly emarginate, with a strong median keel, and a lateral oblique one on each side. Scutellum longer than vertex and pronotum together, with 3 strong keels, the lateral ones sinuate, uniting anteriorly with the median. Radial and median veins nearly approximate at base, the former forking somewhat near the base, outer branch re'orking; median not forked; cubital forked a little nearer the apex than the radial. Costal cell with about 12 simple crossveins; subcostal cell present. A large number of apical cells and about 8 sub-apicals. Tibiae with 3 spines.

(I do not think *Epora* Melichar is the same as *Epora* Walker, or as *Peltodictya*, as Melichar does not show even one clear sub-apical line.)

1. *kurandae*, sp. nov.

Grass green. Eyes and genital segments partly brownish. Veins lightly and shortly piligerous.

Length: 11 $\frac{3}{4}$ mill.

Hab: Queensland, Kuranda (viii) on grass.

Vania, gen. nov.

Allied to the last described, but with only one at all regular subapical line, and the frons has oblique keels.

Vertex anteriorly rounded, transverse, extending a little in front of eyes, medianly carinate on the basal two-thirds; posteriorly acutely emarginate. Frons about twice as long as wide, medianly keeled on the basal three-fourths. Clypeus carinate medianly, the keel (at the apical margin of frons) proceeding straight on each side of median keel for more than half of frontal length, not quite reaching lateral keels. Clypeus keeled laterally. Pronotum wider posteriorly than head, carinate medianly, lateral keels curved convergingly, meeting anteriorly in an acute angle; anteriorly nearly on a level with anterior margin of eyes, posteriorly deeply acutely emarginate. Scutellum about as long as vertex and pronotum together, tricarinate; the lateral keels meeting anteriorly. Tegmina elongate, costal cell broadened posteriorly, with some 18 or 19 simple transverse veins; subcostal cell present. Radial forked near base, cubital forked close to it, a little nearer apical margin; median

vein simple. Apical third of tegmina subreticulate. Tibiae with 3 spines.

1. *vitiensis*, sp. nov. (Pl. XXVII, figs. 7-9.)

Pale greenish testaceous; tegmina hyaline, veins more or less greenish testaceous.

Length: 10-11 mill.

Hab: Viti Isls. (iii), arboreal.

Nymphs: The vertex is angular anteriorly, and angulately emarginate posteriorly. The pronotum is acute-angled anteriorly, reaching almost to apical margin of eyes, posteriorly emarginate. Whole insect medianly carinate from apex of vertex to apex of abdomen. Ventrally, the frons is nearly twice as long as wide, carinate laterally and medianly, the latter keel not reaching anterior margin, and at visible base of frons sending out forks at right angles which curve around and meet again at apex of frons. The transverse space between this basal keel and the anterior margin of the vertex, is dorsal and is rounded anteriorly (as seen dorsally). It is crowded with sensory organs, and lightly keeled medianly. The space between lateral and sublateral keels on frons is also provided (much less thickly) with sensory organs. Eyes prominent. Nota and tegminal pads with a few sensory organs.

Pale greenish testaceous, a crimson stripe (or keel) from apex of vertex to apex of abdomen, broadening suffusedly as a rule about the middle of each part. A black spot at interoposterior angle of tegminal pad.

Length: 5 mill. (Pl. XXVII, figs. 6-7).

Rhinodictya, gen. nov.

Has a considerable superficial resemblance to *Hasta paupera*.

Head slightly ascending. Vertex about as long as pronotum and scutellum together, angularly emarginate at base, a lateral keel on each side and a median. Frons with a lateral keel on each side and a median, also a curved submedian keel on each side, becoming obsolete on the basal half. Pronotum tricarinate, angularly rounded anteriorly, deeply rectangularly emarginate posteriorly. Scutellum short, tricarinate, the lateral keels rounded, meeting anteriorly. Costa arched, costal cell with about 18 transverse veins; subcostal cell present, stigma absent. Apical fourth of tegmina reticulate, no definite sub-

apical line. (Basal venation as in *Peltodictya*). Posterior tibiae with three spines.

1. *quaesitrix* sp. nov.

Pale yellowish green, paler beneath. Tegmina hyaline, veins pale yellowish green.

Length: 11-12 mill.

Hab: Queensland, Cairns (viii) on grass.

Family Achilidae.

The antennae in the Australian genera are small and inconspicuous.

1. Tegmina entirely bright red.....1 *Achilus* Kirby.
- 1a. Tegmina, if reddish, only so on the costal cell and the veins. 2.
2. Frons strongly impressed transversely; not or very obsolescently carinate. (A white band on the face).....2 *Aristyllis* gen. nov.
- 2a. Frons not impressed transversely; more or less strongly carinate medianly.3.
3. Apical cells of tegmina all (or all except one or two) not longer than wide.....10 *Salemina* gen. nov.
- 3a. Apical cells of varying length.....4.
4. Vertex very transverse (not carinate medianly, and 2 white bands on the face).....4 *Pyrrhyllis* gen. nov.
- 4a. Vertex not transverse, or if so, very slightly.....5.
5. Vertex obsolescently carinate medianly, somewhat deeply rotundately impressed in the middle..11 *Francesca* gen. nov.
- 5a. Vertex strongly carinate medianly; not impressed (or if so, longitudinally or very slightly, between median and lateral keels)6.
6. Lateral keels of frons meeting at its base and forming an angle there.5 *Majella* gen. nov.
- 6a. Lateral keels of frons not meeting at its base, which is more or less widely truncate (or slightly angularly emarginate).7.
7. Vertex basally practically truncate, except at extreme lateral margins.8.
- 7a. Vertex basally distinctly angulately emarginate.....9.
8. Vertex wider at base than long medianly.....7 *Eurynomeus* gen. nov.
- 8a. Vertex distinctly longer than wide....6 *Phenelia* gen. nov.

9. Tegmina smooth, not granulate; veins thin and prominent, not granulate. Face with two transverse white bands.....3 *Benella* gen. nov.
- 9a. Tegmina granulate on the costal cell and sparsely elsewhere, veins stout and prominent, granulate; frons not banded.9.
10. Head produced distinctly in front of the eyes.....8 *Argelcusa* gen. nov.
- 10a. Head not or very slightly produced....9 *Cythna* gen. nov.
- Ancipo* is not included in this table.

Achilus Kirby.

Achilus Kirby, 1818, T. Linn. Soc. London, XII. 474.

Achilius Spinola, 1839, Ann. S. E. France, VIII, 320.

Achillus Am. and Serv., 1843, Hemipteres, 524.

1. *flammeus* Kirby.

Achilus flammeus Kirby, op. cit. supra 475, Pl. XXIII, f. 13.

Hab: "Australia" (Coll. Kirkaldy.)

Aristyllis gen. nov.

Vertex slightly declivous, more or less confused with the frons; the lateral margins fork, about their middle, (as seen dorsally), the inner keels meeting at an angle on the anterior margin (as seen dorsally), carinate medianly, posterior margin emarginate angulately. Frons obsolescently carinate medianly, the apical half excavated horseshoe-shaped. Clypeus more strongly carinate medianly, carinate (as also frons) laterally. A white opaque band across face. Eyes large, each about as wide as vertex. Ocelli distinct. Pronotum short, wider than head, tricarinate. Scutellum tricarinate. Tegminal venation as figured (all the Australian genera are very similar, differing principally in the relative proportions of the apical cells), not granulate. Legs spineless, or with one spine. Type *A. aristyllis*.

This genus is apparently *Plectoderes* Fowler (in part); I say "in part," because Fowler's genus is obviously heterogeneous. In *Plectoderes* Spin., the head is stated (and figured) to be fully as wide as the pronotum; in all the Australian Achilinae, the head is distinctly, often very much, narrower.

1. Scutellum anteriorly black; a white wedge across the middle of the clavus and a white stripe across costal cell.
.....2 *omphale* Kirkaldy.
- 1a. Scutellum uniform dark or pale ferruginous; no white stripes on tegmina.....2.
2. Scutellum dark ferruginous; a large bluish black spot near apex of costal cell.....1 *aristyllis* Kirkaldy.
- 2a. Scutellum pale ferruginous; costal cell slightly infusate.
.....3 *adippe* Kirkaldy.

1. *aristyllis*, sp. nov.

Head gradually shading from brownish ferruginous at base of vertex (and also on apical half of clypeus) to black near apex of frons. Eyes and scutellum dark ferruginous. Anterior half of pronotum blackish, posterior half whitish. Sterna, rostrum and legs mostly testaceous, anterior femora black, the base and a band near the apex, pale. Abdomen mostly black. Tegmina subhyaline brownish-yellow, a tiny white speck about middle of commissure, the basal margin, a spot at base of costal cell, apical half of costal cell, and a spot about the middle of the clavus, blackish, with a metallic-blue glint; some of the veins sanguinescent. Rostrum reaching just beyond posterior coxae. Apical angles of vertical disk acute. Tibiae spineless.

Length: $4\frac{1}{2}$ mill to apex of abdomen; $5\frac{3}{4}$ - $6\frac{1}{2}$ to apex of tegmina.

Hab: Queensland, Kuranda (viii), Cairns (viii).

2. *omphale*, sp. nov.

Differs from the typical species by being shorter and broader and differently colored; vertex shorter.

Vertex, pronotum anteriorly in the middle, apex of clavus, pale ferruginous. Frons, clypeus, pronotum anterolaterally, anterior and posterior third of scutellum, sterna, abdomen, etc., black or blackish. Middle third of scutellum bright ferruginous, posterior margin of pronotum testaceous. Tegmina hyaline, pale yellowish brown, basal margin narrowly, a spot near middle of costal area, and a stripe across the clavus (nearer apex than base), opaque white; apex of costal cell more or less sanguineous, a large metallic bluish-black spot just basal of this. Anterior legs and intermediate and posterior femora more or less black, anterior femora not pallidly banded posteriorly, in-

intermediate and posterior tibiae and tarsi widely pallid, at least apically. Frons banded as in the type. Vertex shorter than in the type, the apical angle of the disk rectangular; rostrum reaching to apex of posterior coxae.

Length: 4 mill to apex of abdomen; $5\frac{1}{2}$ to apex of tegmina.

Hab: Queensland, Nelson (vii).

3. *adippe*, sp. nov.

Pale ferruginous, base and middle of frons blackish brown, banded with white as in the preceding species. Sterna and legs pale. Abdomen more or less marked with black. Tegmina pale yellowish hyaline, veins mostly darker, costal cell dark apically. Structure of head similar to the type. Legs not spinose.

Length: (male) $5\frac{1}{8}$ mill.

Hab: Queensland, Cairns (viii).

Benella, gen. nov.

Characters of *Aristyllis*, but frons not excavated.

1. *aliena*, sp. nov.

Pale ferrugineous, face with two transverse white bands. Pronotum testaceous; tegmina hyaline, costal cell more or less infusate; veins more or less pale sanguineous. Legs etc. pale, anterior and intermediate tibiae annulate with dark brown. Abdomen dark brownish black, posterior margin of each segment narrowly pale. Posterior tibiae with a spine.

Length: 3 mill to apex of abdomen; $4\frac{3}{4}$ to apex of tegmina.

Hab: New South Wales, Sydney (i).

Pyrhyllis, gen. nov.

Allied to the preceding, but the vertex is very transverse and the frons is not impressed transversely; from *Phrygia* Stal it is apparently distinguished by the presence of a distinct keel separating vertex and frons.

Vertex not prominent, but more or less arched anteriorly, not reaching anteriorly as far as the eyes; very transverse, emarginate posteriorly. Frons a little convex, carinate median-

ly and laterally, as also clypeus. Face with two transverse white bands.

1. *pyrrhyllis*, sp. nov.

Pale yellowish testaceous, more or less pallidly infuscate. Scutellum infuscate between the keels. Abdomen mostly blackish. Tegmina hyaline, pale smoky, basal veins dark brownish, costa and apical veins sanguineous. Vertex rather obscurely keeled medianly.

Length: 3 mill to apex of abdomen; $4\frac{1}{2}$ to apex of tegmina.

Hab: Queensland, Bundaberg (xi).

Majella, gen. nov.

Distinguished from any of the other Australian Genera, by the lateral keels of the frons meeting in an angle at the base, and the genae being subfoliaceous and dorsally prominent. General appearance of *Phenelia*, but the veins are strongly granulate, and the apical third of tegmen is more or less declivous. Posterior tibiae with a spine.

1. *majella*, sp. nov.

Pale cinereous or testaceous, a thin short dark brown line on vertex anteriorly on either side of median keel. Scutellum suffused with fulvescent, posterior part of keels pale yellowish. Tegminal veins mostly darker, thickly granulate all over, granules mostly pale; apex of clavus sanguineous with a large bluish-black spot; base of first apical cell sanguineous. Abdomen mostly brownish black. The lateral margins of the vertex converge slightly, but do not meet anteriorly. Frons posteriorly somewhat excavate, the lateral margins there being broad and subvertical.

Length: (male) 4; (female) $4\frac{7}{8}$ -5 mill.

Hab: Queensland, Nelson (vii), Cairns (viii).

Phenelia, gen. nov.

Allied to *Elidiptera* Spin., but differs by the vertex being strongly carinate in the middle, posterior tibiae not spinose, etc.*

* *Elidiptera* Walker (not *Elidiptera* Spin., as Melichar states in his "Mon. Flatiden") is a synonym of *Phalaenomorpha* Am. Serv. (*Flatoides* Guérin, Melichar.)

Vertex longer than wide, produced before the eyes, lateral margins straight, slightly converging anteriorly, anterior and posterior margins truncate, strongly carinate medianly. Frons and clypeus as in *E. advena* Spin., except that the former is not so far produced basally. Pronotum and scutellum tricarinate. Tegmina in form similar to *E. advena*, but not quite so arched at the shoulder, not at all granulate; radial and cubital forked at about one-third of the length of the tegmen.

1. *clidipteroides*, sp. nov.

Head, pronotum, sterna and legs, yellowish testaceous, a little browner on vertex. Scutellum dark ferruginous. Tegmina hyaline, tinged with cinereous; keels of scutellum and basal veins of tegmina more or less obscurely sanguineous, apical and subapical veins, apex of costal cell and the entire apical cell adjoining, bright sanguineous; the base of that apical cell, bluish black. Abdomen mostly black.

Length: $2\frac{1}{2}$ mill to apex of abdomen, $4\frac{1}{2}$ to apex of tegmina.

Hab: Queensland, Cairns (vii-viii).

Eurynomeus, gen. nov.

Apparently somewhat allied to *Phrygia* Stal. Vertex slightly declivous, scarcely produced before eyes, subtruncate anteriorly, not shorter than wide; about one-half longer than the pronotum, medianly carinate, this keel extending to posterior angle of scutellum, though obsolescent on pronotum. Frons a little longer than wide, median keel extending to apex of clypeus, which is not very distinctly sutured off from frons. Pronotum posteriorly obtusangulately emarginate. Scutellum tricarinate. Tegmina not granulate, radial and cubital forked basally of the middle at about the same place. Posterior tibiae with a spine.

1. *australiae*, sp. nov.

Stramineous; a line on either side of median keel of vertex and a rectangular spot on each side of frons at base, a spot on mesopleura externally, black, lateral margins of pronotum and scutellum brownish. Tegmina hyaline, costa, etc., colorless, most of the rest pale smoky, a spot at the exteroapical angle and two or three veins between it and the costal cell, brownish. Tergites sordid yellowish, more or less lined with orange.

Length: 3 mill to apex of abdomen; $4\frac{3}{4}$ to apex of tegmina.
 Hab: Queensland, Cairns (vii).

Argeleusa, gen. nov.

Allied to *Francesca* but with different head-form. Vertex longer than wide, distinctly produced in front of the eyes, rounded anteriorly. Frons elongate, lateral margins sinuate, concavely rounded basally, convexly rounded and widened apically; base narrow, obtuse-angulately emarginate. Tegminal veins, costal cell etc. granulate, veins thick and prominent. Tibiae obscurely spined near the base.

1. *kurandae*, sp. nov.

Pale olive brown, paler beneath. Vertex with four longitudinal blackish brown lines, frons and clypeus minutely mottled with brownish. Pronotum with a short blackish-brown line on each side of median keel and 5 spots of same color from thence to lateral margins. Scutellum between lateral keels minutely mottled with brownish, with 4 small, more or less distinctly ocellated spots, 2 anteriorly and 2 posteriorly. Tegmina hyaline, pale cinereous, veins pale brownish and white variegated, spotted with brownish especially on clavus costal cell and apical parts. Anterior and intermediate legs banded with pale brown. Abdomen more or less dark brownish.

Length: $5\frac{1}{2}$ mill.

Hab: Queensland, Kuranda (viii).

Cythna, gen. nov.

Differs from the last by the head being scarcely if at all produced before the eyes. The lateral keels of the vertex fork just before their middle, the outer forks diverging a trifle, the inner rounding gradually and meeting the median keel at the apical margin. Frons nearly as broad apically as long, narrowing a little towards the base. Tegmina granulate, apical third more or less declivous.

1. *laon*, sp. nov.

More or less pale ferrugineo-testaceous, vertex and scutellum more or less blackish about the keels. Scutellum also suf-

fused with dark brown. Tegmina subhyaline, cinereous, mottled and granulate with blackish brown.

Length: $4\frac{1}{2}$ - $4\frac{3}{4}$ mill.

Hab: Queensland, Cairns (viii).

I think another specimen ($4\frac{1}{4}$ mill) from Kuranda (viii) belongs to this.

Salemina, gen. nov.

Vertex slightly declivous, convex, somewhat obscurely carinate medianly, sinuately rounded anteriorly. Frons elongate, lateral margins sub-parallel, slightly divergent posteriorly, carinate medianly. Tegminal veins thick, prominent, not granulate, apical cells short, the 3 middle ones scarcely longer than wide. Posterior tibiae with an obscure spine.

1. *francescophila*, sp. nov.

Cinereo-testaceous. Frons and scutellum very finely and somewhat closely speckled with dark brown. Pronotum tuberculate latero-posteriorly with blackish brown. Tegmina hyaline, cinereous, more or less finely marmorate with brown, veins on apical third whitish. Costa and apical margin of clavus, more or less closely spotted with blackish brown. Anterior and intermediate legs pallid, annulated with blackish brown.

Length: 5 mill.

Hab: Queensland, Cairns (viii).

Francesca, gen. nov.

Distinguished by the somewhat deep, circular impression on the middle of the vertex. Vertex longer than wide, produced a little in front of the eyes, the lateral margins forking near apex, making the apical margins tridentate, the median angle being acute. Pronotum with an impressed point on each side of middle keel, almost rectangularly emarginate posteriorly. Scutellum diamond shaped, much longer than the other genera.

1. *salaminophila*, sp. nov.

Sordid testaceous, frons laterally with a row of blackish brown spots. Posteriorly three-fifths of the disk of scutellum dark brown, lateral parts of scutellum (exterior to keels) with a large thin blackish brown subtriangular ocellus. Tegmina hyaline.

thickly spotted and smudged with brownish cinereous; veins on apical third white. Legs pallid, anterior and intermediate tibiae annulate with black. Abdomen brown, posterior margin of each segment narrowly pallid-sanguineous.

Length: 6 mill.

Hab: Queensland, Lucinda point (vii).

Aneipo, gen. nov.

Vertex with disk transverse, depressed, apically a little angulate, produced in front of the subrotundate eyes; basally roundly emarginate; lateral keels highly elevated, diverging a little posteriorly and continuing beyond base of disk. Frons widening apically, this part foliaceous and subvertical, acute, the disk medianly keeled. Clypeus laterally carinate curvedly, subfoliaceous. Pronotum much wider than the head, tricarinate, the lateral keels uniting anteriorly, the pronotum produced triangularly in the middle anteriorly. Scutellum tricarinate. Tegmina broad, rounded apically; costal cell broad, not transversely veined; radial and median veins approximating at base, the former forked about one-fifth of the length of the tegmina; cubital forking immediately basally of the forking of the outer radial. Apical cells short. Anterior femora and tibiae about equally long, posterior tibiae with one strong spine.

1. *diva*, sp. nov.

Bright pale yellow; pronotum (except laterally), clavus (except apical fourth and a spot near posterior angle of scutellum) and a stripe near apical margin of tegmina widening anteriorly, sanguineous. Scutellum brownish; sterna testaceous. Tegmina (especially costally) speckled with blackish brown. Wings milky white. Abdomen bright pale green.

Length: 6½ mill to apex of abdomen, 11 mill to apex of tegmina.

Hab: Queensland, Kuranda (viii).

Fam. Derbidae.

1. Head (more or less) and anal vein of clavus (strongly) granulate.....(Subfamily Kermesinae) 2.
- 1a. Anal vein not granulate (last segment of rostrum much shorter than the penultimate, widened, often annuliform).....(Subfamily Derbinae) 7.

2. Last segment of rostrum fairly long.....3.
- 2a. Last segment of rostrum subannuliform, conspicuously short6.
3. Head strongly carinate longitudinally in the middle.....1. *Phaconeura*, gen. nov.
- 3a. Head not carinate medianly.....4.
4. Lateral carinate of the head narrow and acute, sensory organs less conspicuous; pronotum not extending laterally farther than the antennae, not so far as the tegulae.....5.
- 4a. Lateral carinae broader and flattened, sensory organs conspicuous, pronotum extending laterally much farther than the antennae, farther than the tegulae.....4. *Phaciocephalus*, gen. nov.
5. Lateral carinae of frons (ventrally) parallel; vertex linear, widening out triangularly laterally.....2. *Nisia* Melichar.
- 5a. Lateral carinae narrowing basally (ventrally); vertex linear entirely.....3. *Suva*, gen. nov.
6. Pronotum laterally foliaceous, sinuate, recurved, laterally almost enclosing antennae. Vertex triangular.....5. *Basileocephalus*, gen. nov.
- 6a. Pronotum more or less normal, vertex truncate apically.....6. *Thyrocephalus*, gen. nov.
7. Antennae more than three times as long as wide.....8.
- 7a. Antennae not twice as long as wide.....10.
8. Antennae more or less flattened, with very conspicuous sensory organs.....9.
- 8a. Antennae subcylindric, sensory organs indistinct.....9. *Heronax*, gen. nov.
9. Head strongly elongate, curved and recurved, subascendant, length greater than that of nota.7. *Svescyia*, gen. nov.
- 9a. Head foliaceous but not longer than nota, not recurved...8. *Phantasmatocera*, gen. nov.
10. Head wider than pronotum....10. *Philadelphcia*, gen. nov.
- 10a. Head narrower than pronotum.....11.
11. Tegmina elongate, narrow, nearly three times as long as wide.....11. *Sardis*, gen. nov.
- 11a. Tegmina not more than twice as long as wide.....12.
12. Lateral margins of frons practically contiguous between the eyes.....13.
- 12a. Lateral margins of frons not nearly contiguous between the eyes.....14.
13. Vertex extending far beyond the eyes. 12. *Kaha*, gen. nov.

- 13a. Vertex extending but little beyond the eyes. 13. *Levu*, gen. nov.
 14. Lateral margins of head noticeably sensorized. 14. *Pyrrhoneura*, gen. nov.
 14a. Lateral margins of head indistinctly sensorized. 15. *Rhotana*, Walker.

Nisia Melichar.

Nisia Melichar, 1903 Hom. Ceylon 53.

This genus seems to be but slightly differentiated from *Kermesia* Melichar. The last segment of the rostrum in both is not very short.

1. *atrovenosus* (Lethierry.)

Meenoplus atrovenosus Lethierry Ann. Mus. Genova. XXVI, 466.

Nisia atrovenosa Melichar 1903 Hom. Ceylon 53.

Hab: Queensland, Cairns (viii), Lucinda Point (vii); Viti Isles (iii); on grasses and sedges; also from Ceylon (my collection), Nias, Gunun, Sitol (Lethierry).

2. *grandiceps*, sp. nov.

Allied to the last, but larger; the lateral margins of the head more highly raised. Head and nota sordid brownish testaceous, with a paler median line from apical margin of clypeus to posterior margin of scutellum.

Length: $2\frac{1}{2}$ -3 mill to apex of abdomen; $4\frac{3}{4}$ -5 mill to apex of tegmina.

Hab: Queensland, Kuranda and Cairns (viii) on grasses and sedges.

Phaenocura, gen. nov.

Differs from *Nisia* by the head being strongly carinate longitudinally in the middle, and by the lateral margins being less elevated above the disk.

1. *froggatti*, sp. nov. (Pl. XXIX, figs. ³⁻⁴5-6).

Piceous, tegmina paler, hyaline. Lateral margins and keels of head, pronotum and scutellum, clypeus, rostrum and legs,

veins, tegminal granules, posterior margins of tergites etc., yellowish testaceous.

Length: $2\frac{1}{2}$ mill to apex of abdomen, 4 mill to apex of tegmina.

Hab: New South Wales, Sydney (i).

1. *pallida*, sp. nov.

Differs from the type (*froggatti*), in being bigger and different in color.

Testaceous, scutellum (excluding keels) etc., fuscous. Abdomen blackish, except part of genital segment. Tegmina subhyaline milky, iridescent; veins whitish.

Length: $4\frac{1}{2}$ mill to apex of tegmina.

Hab: Queensland, Bundaberg (xi).

Suva, gen. nov.

Closely allied to *Nisia*, but the lateral margins of the frons are not parallel. In *Nisia*, the vertex proper consists of a very narrow, linear strip, which widens out triangularly at the lateral margins; in *Suva*, this widening is absent, and the tegmina are narrower and more elonate.

1. *kobelci*, sp. nov.

Orange yellow, darker or redder on scutellum and sterna, legs paler. Eyes black. Tegmina subopaque creamy, veins pale orange yellow; clavus (except sutural cell) dark or redder, orange; a longitudinal entire submedian dark brown band, widening a little apically, on the tegmina and another along the commissure apical of the claval apex.

Length: $4-4\frac{3}{4}$ mill.

Hab: Viti Isles (iii).

Phacioccephalus, gen. nov.

Closely allied to *Suva*, but distinguished by the characters in the table.

1. *vitiensis*, sp. nov.

Sordid yellowish testaceous, lateral margins of scutellum broadly black, this continuing onto the tegmina in a broad me-

dian band, into which, near its middle, enters a narrow stripe arising near the extrobasal angle of tegmen. The ground color of tegmina is creamy, veins pale yellow. Legs pale sordid testaceous, apex of each segment narrowly black. Eyes and abdomen blackish.

Length: $4\frac{3}{4}$ mill.

Hab: Viti Isles (iii).

Basilcocephalus, gen. nov.

Distinguished by the remarkable form of the pronotum. Head produced distinctly in front of eyes, vertex indistinctly separated from frons, the former elongate triangular, disk concave, the anterior converging lateral margins blunt, strewn thickly with sensory organs. Frons narrow, but the acute lateral margins not nearly contiguous. Clypeus rather longer than the head, stringly tricarinate. Antennae articulated remote from the genae, short, somewhat globose. Pronotum transverse, much wider than the head, medianly carinate, laterally foliaceous, recurved, practically enclosing the antennae except from in front. Scutellum polished, obsolescently carinate. Tegmina elongate, narrow. Tegulae subfoliaceous.

1. *thaumatonotus*, sp. nov.

More or less pale fulvotestaceous, a black spot on anterior ambulacra. Tegmina subhyaline, pale pinkish white, costal cell whitish, veins coralline, 2 or 3 more or less entire, narrow, dark brown longitudinal stripes on tegmina. Genital segment dark.

Length: 3 mill to apex of abdomen, $6\frac{1}{4}$ to apex of tegmina.

Hab: Queensland, Kuranda (viii).

Thyrocephalus, gen. nov.

Vertex a little longer than wide, produced in front of eyes, middle of the disk sunken, lateral margins widely flat and raised, strewn with sensory organs, converging slightly not meeting anteriorly, anterior margin truncate, posterior margin acute, elevated, truncate (the lateral margins are produced a little posteriorly beyond the base) posterolateral angles acute. Frons narrow, lateral margins acute, strongly elevated vertically, wider apically than basally, a little constricted medianly. Antennae short, rather smoothly subglobose. Pronotum wider than head,

roundly rectangular posteriorly, somewhat obsolescently tricarinate, scutellum obsolescently 5-carinate. Tegulae extending laterally farther than pronotum. Costa granulate.

1. *leucopterus*, sp. nov. (Pl. XXIX, figs. 6-7).

Head, pronotum, legs etc., pale testaceous, frons more or less sordid. Scutellum pale yellow. Abdomen blackish posterior margin of each segment narrowly pallid. Tegmina and wings subopaque milky, apex of costal cell infuscate.

Length: $3-3\frac{1}{2}$ mill to apex of abdomen, 5-6 to apex of tegmina.

Hab: Queensland, Cairns (viii), on grasses.

Swezeyia, gen. nov.

Vertex produced far in front of eyes, ascendant, somewhat recurved, narrowed in front of eyes and then gradually widened, subspatulate; deeply rectangularly emarginate basally, the angle of the emargination being on a level with the anterior margin of the eyes. Frons subconstricted at the eyes, widening out a little basally. Antennae elongate, flattened, about twice as long as an eye, set on each side of its disk with a raised mass of sensory organs. Clypeus obsolescently tricarinate. Pronotum acutangularly emarginate.

1. *lyricen*, sp. nov. (Pl. XXX, f. 10).

Pale yellowish, head and pronotum more testaceous. Antennal sensory organs dark gray. Eyes black. Pronotum sublaterally with a dark grey spot. Tegmina hyaline, greyish longitudinal stripe down the middle, some of the veins sanguineous.

Length: $2\frac{1}{2}$ mill to apex of abdomen, $5\frac{1}{4}$ to apex of tegmina.

Hab: Viti Isles (iii).

Phantasmatocera, gen. nov.

Head elongate, extending well in front of eyes, frons and vertex confused; disk depressed, lateral margins highly elevated, subacute, converging towards anterior margin of head, but not contiguous either there or ventrally. Antennae much as in *Swezeyia*, but not so long nor quite so conspicuous. Pronotum acutangularly emarginate. Scutellum and clypeus obsolescently carinate. Tegmina narrow, elongate. Type *arborca*.

1. *arborca*, sp. nov.

Testaceous, a broad dark brown stripe laterally on genae through eyes to posterolateral angle of scutellum. Eyes and clypeus blackish brown. Tegmina hyaline, milky, a somewhat faint mediolongitudinal smoky stripe; some veins sanguineous, some yellowish.

Length: $2\frac{1}{4}$ mill to apex of abdomen, 5 to apex of tegmina.

Hab: Queensland, Kuranda (viii) on trees.

2. *vitiensis*, sp. nov. (Pl. XXVIII, figs. 1-3).

Closely allied to the type but the vertex is broader and not so convergent anteriorly; also the ventral part of the frons is practically parallel throughout, while in *arborca* it is narrower at the eyes, widening a little apically and basally. The eyes are also set closer to the clypeus and the antennae are shorter.

Pale yellowish, disk of head more testaceous; lateral stripe on head and nota as in *arborca*. Tegmina as in the latter, but the median stripe darker and more distinct.

Length: 5 mill.

Hab: Viti Isles (iii).

There are two or three other species from Cairns, etc., with different head structure but in imperfect condition for describing.

Heronax, gen. nov.

Allied to *Patara* Westwood* but the venation is different.

Head produced in front of eyes, vertex triangular, disk excavate, wider at base than an eye; there is no transverse carina dividing vertex from frons, but the latter is suddenly more shallow and the lateral keels are almost contiguous. Antennae articulated close to clypeus, second segment subcylindric, elongate, about three-fourths the length of the frons, not (or very slightly) sinuate apically. Scutellum with one (3?) obscure keel. Type *parnassius*.

1. *parnassius*, sp. nov.

Whitish testaceous, more or less sordidly infuscate. Tegmina with brownish spots on the costal cell, an irregular brownish

* The figure of the antenna of *Patara* in the *Biologia Centrali Americana* Hom. II (Pl. 9, f. 9 a) is obviously incorrect; Westwood says "Articulo primo annuliformi," as of course one would expect.

band across tegmina (not costal cell) medianly, and the veins (at least partly) widely infusate. Tibiae annulated with blackish brown.

Disk of vertex deeply excavated, lateral margins narrowly flat. Apical of the eyes the frons widens out triangularly but is not so wide apically as the base of the ecarinate clypeus.

Length: $3\frac{1}{4}$ mill to apex of abdomen, 7 to apex of tegmen.

Hab: Queensland, Kuranda (viii) on trees.

2. *saccharivora*, sp. nov.

Allied to the type but the apical veins are mostly sanguineous, and the tegminal pattern is pale, and more broken. Lateral margins of frons contiguous throughout, and dorsally the head is much narrower and but narrowly excavated.

Length as in the type.

Hab: Queensland, Cairns (vii-viii) on *Saccharum officinale*.

Philadelphica, gen. nov.

Distinguished by the big, wide eyes which extend laterally beyond the pronotum. Of the general appearance of *Zoraida* Kirkaldy.

Scutellum roundly declivous, head roundly perpendicular. Vertex and frons confused, consisting of a strongly elevated keel on each side and a very narrow area between, narrowing still more anteriorly. Eyes very large, very transverse, extending laterally slightly beyond lateral margins of pronotum. Antennae with second segment short, subglobular, a little wider apically than at base. Clypeus longer than the epicranium, strongly keeled medianly, more lightly sublaterally. Rostrum extending beyond posterior coxae. Scutellum tricarinate. Tegmina very elongate, venation dissimilar to any other genus. Posterior tibiae with one small spine, a little apical of the middle.

1. *pandani*, sp. nov. (Pl. XXI, fig. 3, and XXIX, figs. 8-9).

Head, median keel of clypeus, pronotum, keels of scutellum, disk of metanotum, legs, etc., whitish. A large lateral wedge on pronotum, interior half of eye, clypeus, etc., vermilion. Scutellum and metanotum (except as above) orange. Tegmina and wings pale brownish, hyaline, costal cell broadly pallid, clavus and base of corium more or less smoky, veins dark brown, the

short transverse veins and exterior part sometimes of the others, broadly infusate. Abdomen sordid testaceous, more or less marked with brownish.

Length: $3\frac{1}{2}$ -4 mill to apex of abdomen; $9\frac{1}{2}$ to apex of tegmina.

Hab: Queensland, Cairns (viii) on *Pandanus*.

Sardis, gen. nov.

Allied to *Phenice* Westwood, but the tegmina are narrower basally, more elongate, and dilated apical to the clavus, head differently formed etc.

Scutellum strongly roundly declivous, pronotum vertical and head strongly bent under. Vertex short, separated by a smooth, confused line from the frons (of which the lateral margins are subcontiguous,) produced triangularly a little anteriorly, at base narrower than one of the transverse eyes. Antennae articulated close to exterolateral margin of genae and close to clypeus, which is as long as the epicranium and heavily carinate laterally. Pronotum deeply rectangularly emarginate. Scutellum strongly keeled in the middle.

1. *maculosa*, (Krueger). (Pl. XXVIII, figs. 4-6).

Phenice maculosa Krueger (?1897) Ber. Veruchsst. Zuckerr. West Java II, 243; and 1899 Das Zuckerrohr und seine Kultur 313; Zehnter 1897 Arch. Java Suikerind V. p. ? (Sep. 25).

Hab: Queensland, Cairns (viii), on *Saccharum officinale* and *Pandanus*. Originally recorded from Java.

Kruger (whose original work I have not seen) attributes it to Westwood, but I cannot trace any description by the latter.

Kaha, gen. nov.

Head produced more than their length in front of the eyes; vertex of frons somewhat confused, the former excavated as far as anterior margin of eyes, lateral margins acute and converging, meeting at anterior margin of eyes, continuing thence (somewhat nutantly) practically contiguous, as far as clypeus. Antennae large but short, with enormous sensory organs, giving the antennae a coralloid appearance. Pronotum carinate medianly, rectangularly emarginate, laterally subfoliaceous.

1. *perfecta*, sp. nov.

Testaceous, more or less infusate; pronotum and scutellum pale castaneous, polished. Underside more or less sordid testaceous, abdomen blackish, posterior-margin of each segment pallid. Tegmina hyaline, more or less infusate, costal cell apically chequered sanguineous and white; veins on apical half of tegmina sanguineous.

Lenth: 5 mill.

Hab: Queensland, Cairns (viii). "

Lern, gen. nov.

Apparently related closely to *Paricana* Walker as figured in J. Linn. Soc. Zool. I, Pl. 8, fig. 1 (which however has apparently no connection with the generic description), but the apical veins are not forked close to the margin, etc.

Vertex and frons confused, extending well in front of the eyes disk greatly depressed, very narrow, long triangular, lateral margins acute and converging, meeting close to anterior margin of eyes, contiguous till past the eyes and then widening a little apically. Clypeus basally depressed. Eyes prominent, much wider than vertex. Pronotum deeply rectangularly emarginate. Tegmina narrow, elongate.

1. *vitiensis*, sp. nov.

Stramineous, eyes black. Tegmina milky white, subopaque, apical veins pale yellow, apical margin subsanguineous.

Length: $4\frac{1}{4}$ mill.

Hab: Viti Isles (iii).

Pyrrhoneura, gen. nov.

Vertex and frons confused, extending anteriorly before eyes, disk concave. Lateral margins acute, vertically elevated, dorsally they are thickly sensorized and converge straightly, not quite meeting anteriorly, posteriorly a little emarginate; ventrally they are elongate, narrow, a little wider apically. Antennae small, not articulated near clypeus. Ocelli present. Pronotum deeply angularly emarginate. Scutellum tricarinate.

1. *saccharicida*, sp. nov.

Vertex and frons yellowish testaceous, more or less suffused with sanguineous. Antennae clypeus and legs pale testaceous. Pronotum and scutellum sordid ferrugineous, laterally more or less suffused with sanguineous. Tegmina dark smoky, basally darkening more a large irregular blotch on the middle internally, the basal half of costal cell and 2 spots apical of this, 2 large spots on apical section, etc., white. Nearly all the veins bright sanguineous. Wings white with a large black spot almost covering apical half. Sternites blackish brown, posterior margin of each segment narrowly sanguineous.

Length: $3\frac{1}{4}$ mill to apex of abdomen, 5 to apex of tegmina.

Hab: Viti Isles, Rarawai Mills (iii), on *Saccharum officinale*. (Koebele's No. 2375.)

Rhotana, Walker.

Rhotana Walker 1857 J. Proc. Linn. Soc. London I, 160 (description only); Melichar 1903 Hom. Ceylon 61.

Genestia Stal 1858 O. V. A. F. XV, 450.

Walker's figure of the type (Pl. 8, fig. 2) has nothing to do with his description. Melichar has figured *R. vitriceps* (Stal.)

1. *chrysonoc*, sp. nov.

Differs from the three Sinhalese species and probably from the Bornean (from which it differs abundantly otherwise) by the short head which does not extend half the length of an eye beyond anterior margin of eyes. Pale luteous (metanotum and base of abdomen sanguineous in fresh example), rostrum, sterna, legs etc., paler. Tegmina and wings hyaline, iridescent; veins testaceous, faintly infumate broadly on each side of most of the transverse veins of the tegmina. Four tiny black specks on the radial vein. The subapical line is a little more irregular than in *R. vitriceps*.

Length: $2\frac{1}{2}$ mill to apex of abdomen, $4\frac{1}{2}$ - $4\frac{3}{4}$ to apex of tegmina.

Hab: Queensland, Kuranda (viii), arboreal.

2. *haematoneura*, sp. nov.

Ventral part of frons, smaller and narrower, less elevated laterally, etc.

Pale yellowish testaceous, scutellum more or less infusate basally. Tegmina hyaline, largely clouded with brownish, veins sanguineous. Tergites infusate.

Length: 5 mill.

Hab: Queensland, Kuranda (viii), arboreal.

Fam. Issidae.

There are two main divisions, characterized by the lateral form of the frons; this is however really not a sharp differentiation, *Gedrosia* Stal seeming to connect them. The Issinae have the lateral margins of the frons straight, or more or less rounded, while the Eurybrachyinae have them strongly, often acutely angulate. The former, moreover, are usually dull in hue, while the latter often have richly variegated tegmina and sometimes brightly colored wings. The aberrant genera *Tetigomctra* Latreille and *Hilda* Kirkaldy should perhaps not be included in this family.

Subfamily Issinae.

Of this group some 60 genera have been erected, though many are still little known. It is not represented in the Hawaiian archipelago, but for Australia I record 6 genera and 13 species, of which 5 and 11 respectively are new. The Australian genera may be separated as follows:

1. Tegmina abbreviated, clavus not sutured off from corium (posterior tibia with one spine).....6 *Gclastissus* gen. nov.
- 1a. Tegmina complete, clavus sutured off.....2.
2. Tibiae with one spine; (tegmina tectiform).....5 *Lipocallia* gen. nov.
- 2a. Tibiae with 2 spines.....3.
3. Wings rudimentary.4.
- 3a. Wings complete, not incised apically.....5.
4. Vertex flattish; cubital vein simple, median and radial veins forked near the base.....4 *Hystropterum* Am. Serv.
- 4a. Vertex concave; radial vein forked near the base, cubital and median veins forked the middle of the tegmina; (first segment of posterior tarsi very short).....3 *Sarnus* Stla.
5. Abdomen cylindrical; appearance Poekillopteroid.....2 *Lollius* Stal.
- 5a. Abdomen depressed; appearance Cercopoid..1 *Issus* Fabr.

Issus Fabricius.

Issus Fabricius 1803 Syst. Rhyng., 99; Melichar 1896 Cic. Mittel-Eur. 40, Pl. III, figs. 22-5.

The following three species very probably will not be referred ultimately to the genus *Issus*, as the frons and clypeus do not altogether lie in the same plane. They cannot be *Ulixes* Stal., as in that genus the scutellum is said to be twice as long as the pronotum.

1. *vulturinus*, sp. nov.

Vertex, pronotum and scutellum testaceous of various degrees of sordidness; frons and clypeus sordid brown. Tegmina dirty brownish, a transverse band (a little basal of the middle), the commissure, etc., dirty whitish. Legs dirty brownish, paler in places. Beneath sordid. Wings dark smoky. Vertex slightly transverse (apical margin very obtusely angulate), narrower than an eye. Frons with a round sublateral carina, and also a median longitudinal one, both slight but noticeable; posterolateral angles rounded, posterior margin roundly emarginate; outside the round carina are small granules. Eyes, in profile, occupying nearly the whole of the head as far as the antennae. Pronotum granulate, medianly carinate. Tegmina about 3 times as wide (max.) as head and eyes together; veins strong, with numerous strong transverse veinlets (including costa and clavus). Cubital and median veins forked at about the middle.

Male: Pygofers black, polished, short, acute.

Length: 6 mill., maximum width 3 mill.

Hab: Queensland, Brisbane (vi), arboreal.

2. *sidnicus*, sp. nov.

Allied to the previous species, but smaller. The colorings and picturation are practically the same except that within the round carina of the frons, the color is castaneous, suffused with blackish on the disk, and there is a short, transverse, whitish stripe in the middle. Vertex about as wide as an eye, a trifle more transverse than in *vulturinus*; scutellum scarcely longer than the pronotum. Frons longer than wide, more swollen medianly and more granulate outside the round carina, lateral margins less divergent. Cubital vein forked a little nearer the apex than the median.

Male: Pygofers similar to the previous.

Length: 5½ mill.

Hab: New South Wales, Sydney (i), arboreal.

3. *ridicularius*, sp. nov. (Pl. XXXI, f. 4).

Somewhat allied to *T. sidnicus*, but scarcely congeneric. Sordid testaceous, base of frons, apex of clypeus etc. dark. Abdomen, legs, etc., more or less obscurely and sparsely marked with brownish within the reticulations, exterior veins more or less greenish, or blackish. Vertex and eyes rather flatter and a little wider. Head and eyes as wide as, or a trifle wider than, the pronotum; costal margin more evenly rounded. Frons flatter, lateral keels straight, posterior keel obsolescent. Pronotum not granulate. Median and cubital veins forked at about the same place.

Male: Pygofer as in the previous species.

Female: Last segment almost linear, pygofer pale brownish, short, broad, the two together almost equilateral.

Length: About 6 mill.

Hab: Queensland, Cairns (viii), Bundaberg (ix-xii), arboreal. The Bundaberg specimen is the type.

4. *elongatulus*, sp. nov.

Scarcely congeneric with the three preceding.

Pale greyish cinereous, vertex and pronotum a little marked or suffused with green. Veins pale olive brown. Elongate, narrower; head, pronotum and scutellum not, or scarcely, granulate. Anterior margin of vertex truncately carinate, anterior to this (dorsally) is visible a small, rounded, part of the frons. Frons a little wider posteriorly than anteriorly, furnished with a circular carina and a medio-longitudinal straight one; posterolateral frontal angles rounded. Tegmina narrow, elongate, not so reticulate as in the preceding species, costa little widened, the radial vein forks almost immediately after its inception, the outer branch sinuate; the median vein forks apical of the middle, outer branch reforking; the cubital forks about the middle.

Length: $5\frac{1}{2}$ -6 mill., width $2-2\frac{1}{3}$ mill.

Hab: Queensland, Cairns (viii), arboreal.

Lollius Stal.

Lollius Stal 1866 Hem. Afr. IV, p. 209; and 1870 O. V. A. F., p. 763.

Stal states that the pronotum ("thorax" as he invariably terms it) is truncate; in the two species described, it is widely rounded.

1. *australicus*, Stal.

Lollius australicus Stal 1870, O. V. A. F., 763.

Hab: Queensland, Moreton Bay.

Unknown to me.

2. *angustifrons*, sp. nov.

Distinguished from *L. australicus* by the elongate frons; (in that species it is "almost as wide as long.") Greyish testaceous, vertex, lateral margins of frons (spotted with testaceous), markings on clypeus, etc., middle part of pronotum and of scutellum, extreme base of clavus, some obscure, small, markings on tegmina (especially on apical and costal margins), some more or less obscure markings on legs and abdomen—blackish. Under-side yellowish testaceous, frontal carinae pale ferruginous. Tegminal veins more or less closely speckled with sanguineous. Wings pale smoky. Vertex a little longer than wide; lateral margins of vertex and frons acutely elevated vertically; on the front within these are 3 carinae united basally acutangularly, diverging a little posteriorly and roundly uniting again. Frons nearly twice as long as wide, wider posteriorly than anteriorly. Rostrum reaching to posterior coxae. Upper apical angle of tegmina about right angled.

Length: 8 mill., height in profile about $4\frac{1}{2}$ mill.

Hab: Queensland, Bundaberg (xi), arboreal.

3. *acutipennis*, sp. nov.

Closely allied to *L. angustifrons*, but smaller, and the upper apical angle of tegmina distinctly acute and more prominent; the anterior carina of vertex truncate, and more pronounced (it is feeble and excavately angulate in *L. angustifrons*). The veins are not, or very scarcely, marked with sanguineous.

Length: $5\frac{1}{3}$ mill., height $3\frac{2}{3}$ mill.

Hab: Queensland, Kuranda (Type viii), Nelson (vi), arboreal.

Hysteropterum, Am. Serv.

Hysteropterum Amvot & Serville, 1843, Hemipteres, 519.

1. *H. dorsale* Walker, 1851, List. Hom., 375.

2. *H. truncatellum* Walker op. c., 377.

Unknown to me; as Stal does not mention them, I presume they are rightly placed in the above genus.

Sarnus Stal.

Sarnus Stal., 1886, Hem. Afr., IV, 204.

The type is stated by Stal (Berlin. Ent. Zeit., X, 392) to be *Issus decipiens* Spin., a species the description of which is unknown to me. One specimen was collected, which I refer to this genus.

1. *lucindae*, sp. nov.

Head pale ferruginous, somewhat obscurely speckled and granulate with pale yellowish; pronotum and scutellum sordid brownish, anterior two-thirds of latter pale yellowish brown. Tergites more or less black, genital segments pale, sternites sordid brownish. Tegmina pale cinereous, veins brownish, a brownish smudge across middle and a brownish spot on costal margin near apex. Legs pale, strongly and widely annulate with black. Vertex transverse, a little wider than an eye, anteriorly widely obtuseangled, posteriorly widely obtuse angularly emarginate. Frons flat, with an obscure circular keel, granulate between this and the base. Pronotum granulate, scutellum little longer than the pronotum, smooth, with a deep puncture on each side. Tegmina narrow, elongate, subcoriaceous, costal margin close to base, then widened roundly; veins strong.

Length: $3\frac{1}{2}$ mill.

Hab: Queensland, Lucinda Point (vii), probably arboreal.

Lipocallia, gen. nov.

Allied to *Necethus* Stal but the tegmina are subcoriaceous, lateral carinae of the frons are as well developed as the median, the costal area is reticulate, etc.

Vertex transverse, almost linear, truncate apically. Frons quadrangular, perpendicular; lateral margins slightly sinuate, narrowing a little just basal of the clypeus, with 2 lateral curved carinae (forming an oval) and a longitudinal median one, all of equal strength. Pronotum very transverse, slightly arched anteriorly, slightly roundedly emarginate posteriorly, medianly carinate longitudinally. Scutellum nearly 3 times as long as pronotum. Tegmina tectiform, covering body completely. Corium more or less convex, costal area dilated, a little sinuate.

Tegmina closely reticulate, more minutely costally, apical margin roundly obliquely truncate.

1. *australensis*, sp. nov.

Head, pronotum, etc., testaceous, very closely and finely mottled with dark brown. Tegmina whitish testaceous, many of the reticulations wholly or partly brownish. Legs mostly blackish brown. Tergites black and white alternately. Genital segments black.

Length: $3\frac{1}{2}$ mill., height $2\frac{1}{4}$ mill.

Hab: New South Wales, Sydney (i-ii), arboreal.

There is sometimes a more or less obscure blackish band across the middle of the tegmina.

Gelastissus, gen. nov.

Somewhat allied to *Peltonotellus* Puton. Vertex flat or slightly concave, posteriorly truncate. Eyes very large, extending practically as far as the base of the pronotum. Frons at about right angles to the vertex, narrow, elongate, strongly and elevatedly carinate medianly with a lateral keel on each side, and a more or less obscure, sometimes obsolescent, curved keel on each side between the others, forming an elongate oval. Pronotum transverse, anterior and posterior margin truncate, medianly carinate, also a carina on each side close to the eye. Scutellum about twice as long as pronotum, tricarinate. Tegmina strongly abbreviate, venation obscure, clavus not sutured off, radial, cubital and brachial veins apparently all joined close to base. Legs simple. Type *albolincatus*.

The three Australian species are easily separable as follows: (It is possible that 2 and 3 are not congeneric with the first):

1. Blackish brown, with an entire, white longitudinal line.
.....1 *albolincatus*.
- 1a. Tergites apically sanguineous.....2.
2. Tegmina opaque, blackish.....2 *histrionicus*.
- 2a. Tegmina translucent, pallid.....3 *suffusus*.

1. *albolincatus*, sp. nov. (Pl. XXIX figs. 1-2.)

Blackish, more or less shining; a white longitudinal stripe from apex of vertex to apex of abdomen and a lateral stripe of same color from apex of propleura to apex of abdomen. Genae,

clypeus laterally, legs, abdomen partly, pale testaceous.

Vertex flat, twice as long as pronotum, obtusangulate and a little prominent apically. Tegmina opaque, reaching to about one-half of the length from base of pronotum to apex of abdomen.

Length: $3\frac{1}{4}$ mill.

Hab: Queensland, Cairns (vii-viii), Koebele's No. 2257, from grasses on damp ground.

2. *histrionicus*, sp. nov.

Vertex, pronotum and scutellum brownish piceous; frons, carina of clypeus, tegmina etc., shining black; sides of clypeus, genae, underside more or less, legs, etc., testaceous. Tergites mostly testaceous, 3 apical segments pale sanguineous.

Smaller and more elongate than *G. albolineatus*, vertex more concave, shorter, scarcely longer than pronotum, not produced in front of eyes, apically subtruncate. Tegmina opaque, more rounded costally, reaching to about two-thirds of the length from base of pronotum to apex of abdomen.

Length: $2\frac{1}{2}$ mill.

Hab: Queensland, Cairns (viii, No. 2272), from grasses on dry ground.

3. *suffusus*, sp. nov.

Closely allied to *G. histrionicus* but I do not think it is an immaturely coloured form of that species.

Pale testaceous; vertex, pronotum and scutellum more or less suffused with pale sanguineous. Tegmina shining, translucent. Tergites pale yellow testaceous, base and 3 apical segments pale sanguineous.

Length: $2\frac{1}{2}$ mill.

Hab: Queensland, Cairns (viii), probably on grasses.

N. B.—I do not possess the description of the following species, but suppose that it belongs to the Issinae:

I. *Allecloplasis darwini* G. B. Waterhouse 1839 T. E. S. London II.

Subfam. Eurybrachyinae.

Of this group some 20 genera have been proposed; they are unknown in Hawaii, but 7 genera and 25 species are recorded from Australia, of these 3 and 5 respectively are now described as new.

The Australian genera may be separated as follows: They all belong to the sub-group with closed clavus:

1. Antennae reaching plainly beyond eyes.....2.
- 1a. Antennae not reaching as far.....3.
2. Frons transverse, angulate laterally.....4. *Dardus* Stal.
- 2a. Frons scarcely wider than long, roundly ampliate on each side1. *Gedrosia* Stal.
3. Pronotum and scutellum together about as wide as long2. *Platybrachys* Stal.
- 3a. Pronotum and scutellum together, wider than long.....4.
4. Frons strongly carinate and excavate.....6. *Gelastopsis*, gen. nov.
- 4a. Frons flat or only slightly rugose; lightly carinate.....5.
5. Tegmina elongate, narrow....5. *Euronotobrachys*, gen. nov.
- 5a. Tegmina shorter, broader.....3. *Olonia* Stal.

The Australian Eurybrachyini are probably all *Eucalyptus*-feeders; *Euronotobrachys arcuata* was found always in grass, but it had probably been blown or fallen from *Eucalyptus*.

Gedrosia Stal.

Gedrosia Stal 1862 O. V. A. F. XIX 448.

1. *Eurybrachys varia* Walker 1851, List. Hom. 394.

Unknown to me.

Platybrachys Stal.

Platybrachys Stal 1859 Eugenie's Resa. Ins. 280, and 1861 K. Vet. Ak. Handl. 3 No. 6, p. 67 and 1862, O. V. A. F. XIX 448.

A large number of Australian species have been described, none of which however have I been able to identify. In the first work cited, Stal figures the type, but the structure of the head and of the clavus are not like any Australian forms I have seen; in the second work the genus is included among the forms with open apex to clavus; in the third (one year later) among those with closed apex! In the forms about to be described the clavus is closed, but is not acute. The genus is badly in need of revision.

1. *oculata*, sp. nov.

Head testaceous, sometimes tinged with olive brown; pronotum and scutellum sordid castaneous, abdomen mostly black; anterior and intermediate legs castaneous, except the black,

foliaceous part of the anterior tibiae; posterior legs black. Tegmina reddish castaneous, apical margin narrowly smoky, a small black spot near the apex, with three tiny white specks enclosed, and a narrow testaceous line from this spot to costal margin, (or there may be two or three black spots, each encircling white specks, or there may be no white specks; apical margin often more broadly dark.) Wings dark smoky. Vertex rather less than twice as broad as long.

Length: 11-12½ mill.

Hab: Queensland, Cairns (viii), Nelson (vii), Brisbane (vi).

2. *chlorocephala*, sp. nov.

Similar to *P. oculata* but head pale bright green, an additional black spot on tegmina, about middle of costa; posterior legs sordid brownish. Vertex more than three times as wide as long.

Length: 12 mill.

Nab: New South Wales, Sydney (ii).

3. *sicca*, (Walker).

Eurybrachys sicca Walker, 1851, List. Hom., 384.

E. rubiginca Walker op. c., 386.

E. semisicca Walker op. c., 387.

An example from Queensland, Cairns (viii) and some from Bundaberg (xi) seem to be var. *rubiginca*, but Walker's descriptions are too unsatisfactory for certain determination. It is probably not congeneric with *P. oculatus*.

The following species have been described from Australia:

4. *Eurybrachys decemmacula* Walker, 1851, List., 389.

(=*Aphana lanifera* Stal., 1854, O. V. A. F., 244, type of genus, figured in Eugenie's Resa. Ins. Pl. IV, f. 8).

Hab: New South Wales, Sydney.

5. *E. maculipennis*, LeGuillou, 1841, Rev. Zool. 261.

(The description is unknown to me.)

6. *E. sera* Walker List., 385=*semilimpida* Walker, 387.

Queensland (?), Port Essington.

7. *E. leucostigma* Walker, 388.

8. *E. decisa* Walker, 389.

9. *E. sanguiflua* Walker, 1858, suppl. 330.

10. *P. signata*, Distant, 1892, Tr. E. S., London, 281.

11. *P. insignis*, Distant, op. c. 282.

12. *P. acrata*, Distant, op. c. (Also from Samoa).
13. *P. lugubris* Stal, 1863, Stett. Ent. Zeit., XXIV, 249. Queensland, Moreton Bay.
14. *P. vidua* Stal l. c., (same locality).
15. *P. acgrota* Stal op. c., 250.

Olonia Stal.

Olonia Stal., 1862, O. V. A. F., 488.

1. *picea*, sp. nov.

Distinguished from *O. rubicunda* Stal. by the shorter vertex; from *O. transversa*, by the absence of conspicuous markings on head and pronotum and by the different coloring of tegmina; from *O. apicalis*, by the absence of curved furrow and row of impressions on vertex, etc.

Piceous; sterna, abdomen and basal half of posterior femora, sanguineous. Tegmina piceous, the disk ferruginous more or less darkened in places, a short white stripe near the apex (sometimes obsolescent). Wings dark smoky.

Vertex and eyes a trifle wider than pronotum, the first named about four times as wide as long; frons irregularly longitudinally rugulose.

Male: Genital segment dark.

Female: Genital segment pale; a large white spot on costa, anteriorly.

Length: (male) 7-7 $\frac{1}{4}$; (female) 7 $\frac{1}{2}$ -8 mill.

Hab: Queensland, Cairns (vii-viii).

The following three species have been described from Australia:

2. *Eurybrachys rubicunda* Walker, 1851, List. Hom., 391; Queensland, Sandy Cape.
3. *E. apicalis* Walker, op. c., 393; Northwest Coast.
4. *E. transversa* Walker, 1858, Suppl., 96; Queensland, Moreton Bay.
5. *O. viridiventris* Stal 1863 Stett. E. Zeit., XXIV, 250; Queensland, Moreton Bay.

Dardus Stal.

Dardus Stal., 1859, Eugenie's Resa Ins., 279; and 1861, K. Vet. A. K. Handl. 3, No. 6; 67 and 1862, O. V. A. F., 488.

1. *immaculatus*, sp. nov.

Piceous, immaculate. Carinae on head, pronotum, etc., and veins (mostly) dark castaneous. Pleura, abdomen and posterior femora sanguineous; rest of legs obscurely marked with pale brown.

Lateral angles of frons much more produced than in Stal's figure of *D. abbreviata*.

Length: $5\frac{3}{8}$ mill.

Hab: Queensland, Brisbane (vi).

2. *abbreviata* (Guerin).

Eurybrachys abbreviata Guerin, 1838, Voy. Coquille, 190.

E. lacta White, Eyre's Expd. Austral. Appendix, 433, Pl. 4. f. 3.

E. rufiventris Stal., 1858, O. V. A. F., 191. (Figured in Eugenie's Resa. Ins., Pl. IV, f. 7.)

Hab: New South Wales, Sydney (ii).

The curious nymph is figured on Pl. XXIX fig. 5.

The following species have also been described:

3. *Eurybrachys bufo* Walker, 1851, List. Hom., 393.

4. *Dardus albomaculatus* Distant, 1892 Trans. Ent. Soc. London 282.

5. *D. obscurus* Distant, op. c. 283.

Euronotobrachys, gen. nov.

Allied to *Olonia* Stal. Somewhat of the form of *Nicidus* Stal, but the tegmina and wings are shorter and the clavus is apically acuminate and closed, the wings are also broader basally. Antennae short. Scutellum with three carinae. Anterior tibiae with three spines. Type *E. arcuata*.

The two species are separable thus:

1. Vertex a little more than twice as long as wide;
Length: 8 mill. 1 *arcuata* sp. nov.
2. Vertex more than three times as long as wide;
Length: $10\frac{1}{2}$ mill. 2 *plana* sp. nov.

1. *arcuata*, sp. nov.

Pale yellowish ferruginous, marked with blackish brown, the frons freckled with dirty brown. Sterna and abdomen sangu-

ineous. Tegmina pale ferruginous, irregularly and sordidly spotted with blackish brown, especially apically; costa near apical angle and the apical margin (except extreme) hyaline a pale yellowish transverse band near base. Wings dark smoky. Legs black, obscurely and sparsely marked with yellowish brown.

Vertex a little more than twice as long as wide, longitudinally striate, roundly arched anteriorly. Face wider than long, acut-angulate laterally, a transverse round-oval carina on the disk. Tegmina postero-apically almost rectangular, posterior angle extending further out than the rounded anteroapical angle.

Length: 8 mill.

Hab: Queensland, Cairns (vii-viii).

2. *plana*, sp. nov.

Ferruginous, irrorated with black, a black blotch on the middle of the clavus; tegmina irregularly and undulatingly striped narrowly longitudinally, etc., with black, a hyaline transverse line near apex; veins mostly ferruginous. Face and legs black, the former minutely and obscurely marked with testaceous, the latter with ferruginous. Sterna and abdomen sanguineous.

Larger than the preceding, the vertex wider (more than three times as wide as long) and less arched. Frons not so angular laterally, about as wide as long, with a rounded carina. Tegmina rounded apically.

Length: 10½ mill.

Hab: Queensland (viii).

Gelastopsis, gen. nov.

Of the general form of *Euronotobrachys* but with a very different frontal structure and longer antennae; allied to *Dardus* but with different frontal and tegminal form.

Dorsal part of head a little irregularly arched anteriorly, below this a sinuately arched carina; the space thus enclosed about three times as wide as long. Head and eyes a little wider than pronotum. Frons transverse, much wider than long; lateral angles roundly acute. It is divided transversely into two areas of different color and texture—the anterior area has a large rounded carina and a straight median one, all these being thickened and deepened, the depths being longitudinally striate. The anterior margin of the posterior area is boldly sinuate; sub-

laterally the disk is transversely carinate. Pronotum broader than length of pronotum and scutellum, the latter tri-carinate. Costa strongly arched basally, the rest of the tegmina being parallel sided, upper apical angle rounded, not extending quite so far as the subrectangular lower apical angle. Anterior and intermediate tibiae and tarsi dilated, posterior tibiae trispinose.

1. *insignis*, sp. nov.

Vertex, pronotum and scutellum yellowish brown, marked with brownish black; anterior area of frons black, posterior area yellowish, variegated with brownish. Clypeus reddish variegated with yellowish. Meso and metasterna and abdomen sanguineous, the last named more or less black dorsally. Tegmina ferruginous, costally and apically blackish; a line near base of corium, another close to anterior margin of tegmina and a shorter one on costa a little basal of the last named, pale yellowish; also various more or less obscure yellowish spots. Veins ferruginous, apically more or less blackish. Wings dark smoky black. Anterior and intermediate legs blackish brown, variegated with ferruginous; posterior femora sanguineous; tibiae ferruginous.

Length: $8\frac{1}{2}$ -9 mill.

Hab: Queensland, Brisbane (vi).

The following is unknown to me:

1. *Lyncilia nobilis* Stal 1863, Stett. Ent. Zeit., XXIV 248.
Lizard Island.

Fam. Poekillopteridae.

This family consists of three subfamilies separable as follows:

1. Clavus granulate; posterior tibiae with one to three spines. 3 *Poekillopterinae*.
- 1a. Clavus not granulate. 2.
2. Posterior tibiae with 2 to 4 spines. 1 *Ricaniinae*.
- 2a. Posterior tibiae spineless. 2 *Amphiscepinae*.

Subfamily Ricaniinae.

Very little material in this group was collected; it is not known in Hawaii, but 11 genera and 18 species are recorded from Australia, one new species being now described. The group has been monographed recently by Melichar

Euricania Melichar.

Euricania Melichar 1898 Ann. Mus. Wien. XIII, 204 and 258.

A genus of 11 species from New Guinea and adjacent islands, Viti, China, Japan and India.

1. *tristicula* (Stal).

Ricania tristicula Stal, 1865, O. V. A. F., XX, 163.

Euricania tristicula Melichar, op. cit. supra 265, Pl. XI, figs. 7 and 20 and Pl. XIII, f. 14.

Privesa Stal.

Privesa Stal, 1861 K. Vet. Ak. Handl. 3 No. 6, p. 70 Melichar 1898, op. c. supra 282.

A widely distributed palaeotropical genus of 9 species.

1. *aphrophoroides* (Walker).

Dechitus aphrophoroides Walker 1862 J. Ent. 1, 311 Pl. XV, f. 7.

Hab: Queensland, Moreton Bay (Walker); Bundaberg (ix-xii), Brisbane (vi and xi).

Exceedingly common.

Another species has been recorded from Australia, viz.: *P. cruta* Melichar, p. 284, Pl. XII, f. 4 and Pl. XIII, f. 9, from Queensland, Cape York, Moreton Bay and Gayndah (not Gayndak as Melichar quotes).

Scolypopa Stal.

Scolypopa Stal, 1859 Berlin, Ent. Zeit. III, 325; Melichar, p. 278.

An Australian, Oceanian and Madagascan genus. Melichar (p. 278) says: "Apicalrand nur halb so lang wie die Sutura Clavi." In this he is obviously wrong and has more correctly expressed it on page 205 "Kaum laenger."

1. *australis* (Walker). (Pl. XXI, f. 1).

Pochazia australis Walker, 1851 List. 430; Froggatt 1900 Agr. Gaz. N. S. W., XI, 650; Pl. (no number), fig. 6; T. W. Kirk,

1903, Eleventh Rep. Agr., New Zealand, 437; text-figs. 1-4.

Scolypopa australis Melichar, p. 278, Pl. XI, f. 24.

Hab: Queensland, Bundaberg (ix-xii); Moreton Bay (Melichar); New South Wales, Sydney (i); New Zealand, Palmerston North (my collection), etc.; Viti (Froggatt).

Commonly distributed on several plants, especially "Passion fruit vines" and ferns; it is somewhat of a pest.

2. *kurandae*, sp. nov.

Not very closely allied to any other species.

Brown; eyes pale reddish striped narrowly sub-concentrically with violet brown. Mesonotum blackish, carinae red brown. Beneath pale yellowish. Tegmina dark brown, a few of the nervures paler; one or two short, more or less obscure, darker transverse fasciae, a whitish triangular spot on the costal membrane; costal membrane and apical margin blackish.

Frons with five distinct carinae, the sublateral keels being much more distinct than in *A. australis*. Rostrum short, scarcely reaching to intermediate coxae.

Length: 8 mill.

Hab: Queensland, Kuranda (viii); one example on a dwarf *Casuarina* in a rocky, wind-swept place on the banks of the Baron River.

3. *scutata* Stal.

S. scutata Stal. 1859, Berlin Ent. Zeit. III, 26; Melichar 280, Pl. XI, f. 28.

Unknown to me.

Gactulia Stal.

Gactulia Stal, 1864 Stett. Ent. Zeit. XXV, 54; Melichar 327. Probably cosmo-tropical.

1. *chrysopoides* (Walker).

Ricania chrysopoides Walker, 1862, J. Ent. I, 312.

Allied to *G. nigrovenosa* Mel., but differing by the form of the vertex which is wider than long, and by the color. I have little doubt as to the correctness of the determination, though Walker describes the vertex as 'transverse quadrate'; it is, in fact, obtuseangulate anteriorly and correspondingly emarginate posteriorly.

Hab: New South Wales, Sydney (i).

Epithalamium, gen. nov.

Differs from *Armacia* Stal by the radial vein not being forked near the base.

The tegmina are broad, nearly as broad as long, and rounded apically; the radial vein is joined to a refurcation of the median by a slight, transverse vein, a little basal of the middle; apical of this the radial forks, the outer branch being joined almost immediately by a slight, transverse vein to the exterior subapical cell (which is curved and encroaches on the costal cell apically). The median vein forks at about a third the length of the tegmen. There is a fairly regular subapical line, and two very irregular transverse lines basal of this.

1. *aziola*, sp. nov.

Head, pronotum and scutellum pale ferruginous; underside and the legs paler. Tegmina hyaline, veins blackish brown, pale ferruginous and whitish; costal cell (the transverse veins pale), basal half and a spot at apex of subcostal, basal cell, clavus, a long spot about the middle of the tegmina, apical margin broadly (except a small hyaline spot at the apex of some of the cells), and a narrow oblique band nearer to the apex than the middle, broadening and darkening costally, more or less dark smoky. Wings hyaline, marginally smoky. Abdomen basally black.

Length: About $5\frac{1}{2}$ mill.

Hab: New South Wales, Sydney. (Koebele's No. 2367).

Unfortunately only a single, stylopized, female of this pretty Ricaniine.

The following Ricaniinae are Australian:

Ricania Germar.

1. *confusa* Melichar 220 and 227; Queensland.

Ricanoptera Melichar.

1. *extensa* Mel., 254 and 255.

2. *patricia* Mel., 264 and 257. Queensland.

3. *prominula* Schmidt 1905 Stett. E. Zeit., LXVI 180, Queensland.

Plestia Stal.

1. *Ricania marginata* Montrouzier, 1861, Ann. S. E. France, (4) I, 73; figured by Melichar; Pl. XIII, f. 17 and Pl. XIV, f. 1; (also from *Viti* and *Lefu*).

Nogodina Stal.

Cixius pallidipennis Guerin, 1838, Coquille II, 189; figured by Melichar, Pl. XIV, f. 4.

New South Wales, Port Jackson; (also from Vanikoro, Amboina, etc.)

Salona Stal.

1. *Cixius panorpaeipennis* Guerin, 1838, Coquille, 190; figured by Melichar, Pl. XIII, f. 2.

New South Wales, Port Jackson; Tasmania.

Pucina Stal.

Cixius pellucidus Guerin, 1838, Coquille, 189; and 1844 Icon. R. Anim. 358, Pl. 58, f. 4.

(Recorded also, probably in error, from India and Java).

Also the following of uncertain generic position:

1. *Flatoides aperiens* Walker, 1858, Suppl., 103; Viti; Nauai.

2. *Flatoides stipatus* Walker, 1851, List, 411.

The second group, Amphiscepinae, is not found in the Australasian regions.

Subf. Poekilopterinae.

This group of, usually, greenish or variegated, Fulgoroidea, is probably fairly well represented in Australia, although only 11 Genera and 22 Species have, up to the present been recorded. 2 Genera and 17 Species are now added, and this number could have been materially increased by the examination of my own collection, which, however, has not been possible. The subfamily under the name of "Family Flatidae" has been monographed by Melichar (1902 Ann. Nat. Mus., Wien. XVI, 178-258 and XVII, 1-253, Pls. 1-9).

All the Australian forms have short antennae.

Neomelicharia Kirkaldy.

Neomelicharia Kirkaldy, 1903, Entom. XXXVI, 79.

Colgar Melichar, XVII, 107, (nec Kirkaldy).

A genus of insular forms, ranging from Java to Papua.

1. *furtiva* (Melichar).

? *Colgar furtiva* Mel. 115.

This applies fairly well to Melichar's description, except that it is a quarter smaller, and the middle heel of the mesonotum is

obsolescent. The third segment of each of the tarsi is blackish, while the apical margin and apical third of the costal and commissural margins are smoky, the tibiae apically more or less so.

Length: 15 $\frac{1}{4}$ mill.

Hab: Queensland, Cairns (viii); Melichar records it from Papua.

2. ? *atomaria* (Walker).

This form, from Tasmania, is unknown to me.

Siphanta Stal.

Siphanta Stal, 1866, Hem. Afr. IV, 238; Melichar, 36.

Melichar has noted two species from Australia, Schmidt added one last year, and I have now added eight, but it is probable that there are more, even in the material I have examined, as the species appear to run very close. They are difficult to characterize, as the only differences seem to be small, but constant, points. Mr. Perkins tells me, however, that they are quite distinct in the field.

1. *galeata*, sp. nov. (Pl. XXXII, fig. 11).

Distinguished from the other *Siphantas* by the narrow, elongate vertex, etc.

Bright green (fading to yellowish green partly or wholly), greenish testaceous beneath; apical margin of tegmina and anterior margin of vertex narrowly sanguineous. Vertex longer than pronotum, lateral margins roundly converging in a rounded acute angle. The eyes are much more prominent and the pronotum more prominent anterolaterally than in *S. acuta*. Tegmina very thickly set with small reddish brown granules, leaving one small, naked spot of varying extent in the middle of each reticulation. Reticulations very large; apical margin subtruncate obliquely, sutural angle acutely produced.

Length: 9-11 mill.

Hab: Queensland, Cairns (vii-viii), Nelson (vii).

2. *acuta* (Walker). (Pl. XXI, f. 2).

Pocilloptera acuta Walker, 1851, List. Hom., 448.

Siphanta acuta Melichar, 37, Pl. 3, fig. 13.

The sutural angle is more acute in some examples than in others. The vertex is usually roundly angulate, sometimes it is distinctly angulate. It is to be noted that in examination, the insect must be kept horizontal, as the further the head is tilted, the more angulate the vertex becomes to the view.

Hab: Queensland, Bundaberg (xi); New South Wales, Sydney (i-ii); introduced into the Hawaiian Islands. Melichar records it, possibly in error, from Tasmania also.

3. *acutipennis*, sp. nov.

Closely allied to *S. acuta*, but the reticulations are less granulate, and different in form; the sutural angle more acute. Vertex more elongate and more truncate anteriorly, lateral margins more parallel. Disk of wings immaculate, except that sometimes there are one or two tiny red specks.

Length: $10\frac{1}{2}$ mill.

Hab: Queensland, Cairns (vi), Nelson (vii).

4. *breviceps*, sp. nov.

Allied to *S. acutipennis*, but the vertex is shorter than the pronotum (or at least not longer) and rounded anteriorly. Bright grass green, granules of corium rather closer and more numerous than in *S. acuta*.

Length: $8\frac{1}{2}$ mill.

Hab: Queensland, Bundaberg (vi).

5. *toga*, sp. nov.

Probably of same general form as *S. patruelis* Stal,* but the vertex is longer and the pattern different. Grass green, paler beneath; a yellow longitudinal oblique stripe on the tegmina. Apex of vertex, tibiae more or less sanguineous.

Vertex and pronotum about the same length, the first named forming a right angle anteriorly. Tegmina about three-fourth longer than wide, subparallel after the basal fourth, apical angles rounded, not prominent.

Length: $9-9\frac{1}{2}$ mill.

Hab: Queensland, Cairns (vii), Nelson (vii), Bundaberg (vi).

The yellowish stripe is sometimes more or less blended with

*Stal states Manila as habitat of *patruelis*; Melichar, who seems to have examined the type, says 'Java'.

the ground color of the tegmina. This species is strongly granulate all over head pronotum, scutellum, clavus, etc., with scattered ones on corium; the taller are reddish brown, those on the clavus blackish brown.

6. *lucindae*, sp. nov.

Size and form of *Sephenia cinerica*; apparently close to *S. granulicollis* (Stal.) but larger and the color different; vertex anteriorly angulate. Orange yellow, paler beneath; head more or less suffused with sanguineous; commissure and apical margin sanguineous, the latter chequered with the ground color; tegminal granulations black.

Vertex anteriorly obtusangulate, scarcely extending beyond the eyes, nearly twice as broad as long. Corium (excluding the margins) with about fifteen granulations.

Length: 6 mill.

Hab: Queensland, Lucinda Point (vii).

7. *granulicollis* (Stal.)

Pocilloptera granulicollis Stal, 1859, Eugenes Resa, Ins. 282.

Siphanta granulicollis Melichar, 38.

Like *S. lucindae* but narrower, colored differently. With twice as many granulations on the corium (excluding the margins).

Length: $5\frac{1}{2}$ - $6\frac{1}{2}$; (Melichar says 5, Stal 4!)

Hab: Queensland, Cairns (viii).

Melichar records also from Sydney.

8. *subgranulosa*, sp. nov.

Closely allied to *S. granulicollis*, but granulations as in *S. lucindae*.

Length: $6\frac{1}{2}$ -8 mill.

Hab: Queensland, Cairns (vii).

9. *granulata*, sp. nov.

Close to *S. lucindae*, but differently colored, and granulated as in *S. granulicollis*.

Pale brownish cinereous; head, pronotum and scutellum more or less suffused with sanguineous or orange; commissure and

apical margin of tegmina more or less sanguineous. Tegmina with a faint violet tinge; costa pallid.

Length: $6\frac{1}{8}$ mill.

Hab: Queensland, Cairns (vii).

10. *rubra* Schmidt.

Siphanta rubra Schmidt, 1904, Stett. E. Zeit., 64, p. 358.

Hab: Queensland.

Unknown to me.

Euryphantia, gen. nov.

Vertex flat, laterally carinate, the keels extending fairly straight to a little above the eyes, then diverging, meeting apically in a rounded obtuse angle; with eyes narrower than the pronotum. Lateral margins of frons sinuate, widened out roundedly towards the apex with three internal carinae, the lateral two of these meeting (on a higher, as seen in profile, level than the exterolateral carinae) at the apex with the median carina in an acute angle, rounded exteriorly. Ocelli very distinct. Antennae very small, scarcely extending laterally to half the width of eye as seen from below. Clypeus not carinate. Vertex carinate medially, the keel extending through pronotum and mesonotum, the latter with sublateral keels which unite posteriorly, the median being obsolescent a trifle anterior to this. Pronotum granulate; tegmina elongate, subparallel, irregularly reticulate especially apically, apical margin obliquely subtruncate; apical angle rounded, extending a little further than the sutural angle. The cubital vein is the only one forked in the basal half of the tegmen, the forking taking place at about the basal third of the tegmen. There are a few veins in the clavus, but scarcely transverse. Costal cell about the same width throughout and open apically; thickly set with tiny granulations, as is also almost the whole of the tegmen, except the exterior claval area, and the two corial areas adjoining it. No regular subapical transverse line. Posterior tibiae with one spine.

1. *cinerascens*, sp. nov.

More or less cinereous, the mesonotum brownish. Tegmina subhyaline, pale cinereous, reticulations tinged with brownish. Granulations brownish. Ocelli red.

Length: $8\frac{3}{4}$ mill.

Hab: Queensland, Bundaberg (vi).

Sephena Melichar.*Sephena* Mel., XVI, 197.

A genus of forms from Papua and neighboring islands.

1. *rubida*, sp. nov.

Vertex and frons dark purplish-brown, keels yellowish brown. Pronotum and scutellum yellowish brown, keels of the latter ferruginous. Tegmina pale rosy brown with mealy bloom, and some darker spots. Wings milky white, veins brownish black. Legs yellowish brown.

General form of *Paratella umbrimargo*.Length: $7\frac{1}{2}$ mill.

Hab: New South Wales, Sydney (i-ii).

Although this and the following have the characters of *Sephena* assigned by Melichar, they have more the appearance of *Paratella*.

2. *hyacintha*, sp. nov.

Blackish, keels of head yellowish brown. Tegmina opaque, bluish black; costa more or less dirty yellowish. Legs yellowish brown.

Length: 7-9 mill.

Hab: Queensland, Cairns (vii-viii), Brisbane (vi).

3. *cinerea*, sp. nov.

Smaller and narrower than *S. rubida*, vertex narrower. Pale brownish cinereous, immaculate. Eyes reddish.

Length: $6\frac{1}{2}$ mill.

Hab: New South Wales, Sydney (i-ii).

4. *argus*, sp. nov.

Form and size of the preceding.

Head, pronotum and scutellum pitchy; keels of vertex ochraceous. Eyes reddish. Tegmina brownish with a faint violet tinge, spotted and granulate with violet brown.

Length: 7 mill.

Hab: Queensland, Cairns (viii).

Colgar Kirkaldy.

Colgar Kirkaldy, 1900, Entomologist. XXXIII 242.

Cromna Melichar, XVII, 59 (nec Walker).

A genus from Australia and the neighboring isles.

1. *peracuta* Melichar.

? *Cromna peracuta* Walker, 1858, List. Hom. Suppl., 120.

Cromna peracuta, Mel. 62.

Hab: Queensland, Bundaberg (vi), also recorded by Melichar from New South Wales and Aru Isle.

2. *frontalis* Melichar.

Cromna frontalis, Mel. 59.

Melichar records this from Queensland: Rockhampton (and Palmerston County—? Queensland or North South Australia).

Mimophantia Matsumura.

Mimophantia Mats., 1900, Ent. Nachr. XXVI, 212; Melichar, XVII, 17.

A single species has been described from Japan.

1. *australensis*, sp. nov.

A little smaller than *M. maritima*; the vertex is about one-half longer than pronotum, which is not so acute anterolaterally, and the points do not extend beyond the eyes laterally. Sutural angle not so acuminate. Sternites blackish brown; posterior margins pale.

Length: $4\frac{1}{8}$ -5 mill.

Hab: Queensland, Cairns (vii-viii) on grass, Kuranda (viii). Bundaberg (ix-xii).

Aphanophantia, gen. nov.

In Melichar's tables, this runs down to *Gyaria* but differs by the frons being carinate, and not much longer than wide. Head and pronotum subporrect, not declivous as in *Gyaria*, vertex a little longer than pronotum, conical, rectangularly prominent anteriorly, truncate posteriorly. Pronotum roundly, widely

emarginate posteriorly, scutellum with a double keel medianly and a lateral one each side. Pronotum and scutellum feebly carinate. Tegmina subcoriaceous, little longer than wide, posteriorly roundly obliquely truncate; reticulate; costal cell generally broader than sub-costal cell, with many simple transverse veins. Wings rudimentary.

1. *cuscuticida*, sp. nov.

Pale testaceous or pale cinereous, tegmina a little smudged in places sometimes, with pale sordid brownish; nerves whitish. Abdomen blackish brown, posterior margins of segments pallid.

Length: 2-2½ mill.

Hab: New South Wales, Sydney (ii) on *Cuscuta* grass.

Massila Walker.

Massila Walker 1862, Journ. Ent. I, 314.

Allied to *Anidora* Mel., but with differently formed tegmina, etc.

Vertex very short, transverse, apically subtruncate, scarcely extending beyond the eyes. Frons vertical, laterally rounded, medianly carinate, width and length about equal, lateral keels strongly elevated. Clypeus set somewhat deeply into the frons, medianly carinate. Antennae very short. Ocelli distinct. Pronotum simple, wider than head and eyes, anteriorly truncate in the middle, posterior margin roundly excavate. Mesonotum longer than head and pronotum together. Tegmina elongate, more than twice as long as broad, irregularly reticulate; interior margin of clavus strongly arched, basal $\frac{2}{3}$ of costal margin arched, the apical third straight and subparallel with opposite margin of tegmina, apical margin subtruncate; no subapical line. Costal cell narrow. Posterior tibiae with one spine. Type *sicca* Walker.

There are two species very closely allied.

1. Cubital clearly forked near the middle, subradial also clearly forked a little nearer the apex.....*sidnica*, sp. nov.

1a. Subradial indistinctly forked.....*walkeri*, sp. nov.

1. *walkeri*, sp. nov.

Agrees fairly well with the description of *M. sicca*, except that the transverse veins in the tegmina, specks in the reticulations,

claval granules (at least in part) are pale sanguineous; this is so conspicuous that Walker could hardly have had this species before him when describing *sicca*, unless he had alcoholic material.

Length: 7 mill.

Hab: Queensland, Brisbane (vi), Bundaberg (ix-xii).

2. *sidnica*, sp. nov.

Very close to the last but smaller and more reticulate. The characters in the key also seem to distinguish it.

Length: 6 mill.

Hab: New South Wales, Sydney (i-ii).

Of the two species previously described, *M. sicca* has already been referred to. *M. unicolor* Walker (1862 Journ. Ent. 1, 315) does not seem to belong to the genus.

Jamella, gen. nov.

Belongs to the Phalaenomorphini, but does not seem to be closely related to any other genus.

Vertex short, three to four times as wide as long, subtruncate anteriorly, carinate medianly. Eyes prominent. Frons a little longer than wide, at about right angles to the declivous pronotum, basal half carinate medianly. Second segment of antennae much wider apically than basally, obliquely truncate apically. Pronotum anteriorly truncate, narrower there than the vertex, anterior margin almost on a line with the anterior margin of the eyes, lateral margins highly sinuate, posterior margin subrotundately emarginate, somewhat obsolescently tricarinate. Scutellum with three keels, the lateral ones sinuate. Tegmina subhorizontal, overlapping apically. Costa a little arched near the base, costal rather wider than sub-costal cell; radial vein forked near the base, cubital forked a little nearer the apex; no subapical line. Tibiae with one spine.

1. *australiac*, sp. nov.

Testaceous; tegmina pale cinereo-testaceous, veins, cross-veins and tiny specks in many of the cells pale brownish, sometimes with a reddish tinge.

Length: 9-9½ mill.

Hab: Queensland, Cairns (viii).

The following have also been recorded from Australia and Viti:

Aflata Mel.

1. *stali* Mel. p. 8, Pl. VII, fig. 3. *S. Australia.*

Microflata Mel.

1. *stictica* Mel. 10 Pl. V, fig. 2.

Euphanta Mel.

1. *acuminata* Mel. 39 *Viti, Ovalau.*
 2. *ruficeps* Mel. 39.
 3. *munda* (Walker) Mel. 39 *S. Australia.*
 4. *luridicosta* Schmidt 1904 Stett. Ent. Zeit., 359. *Queensland.*
 5. *rubromarginata* Schmidt, op. c., 360.

Paratella Mel.

1. *nirvosa* (Walker) Mel. 121. *Queensland.*
 2. *fusconigra* Mel. 121 "
 3. *fumaria* Mel. 122. *New South Wales.*
 4. *modesta* Mel. 122. *Queensland.* (Also from New Zealand, probably a mistake.)

Dascalina Mel.

1. *acgrota* Mel. 155, Pl. VII, fig. 6. *Queensland.*
 2. *reversa* Mel. 155, fig. 15. "
 3. *alternans* Mel. 155, fig. 15. "
 4. *contorta* Mel. 156, Pl. IX, fig. 8. "

Addendum.

The original manuscript containing the descriptions of the following forms having been lost, and therefore omitted in the proper place, these are now added:

Fam. Tetigoniidae.

Subfamily Iassinae.

Tribe *Cephalclini*.

Myrmecophryne, gen. nov.

This should probably be placed near *Graphocraerus*, Thompson; it has somewhat the appearance of *Xestocephalus*, Van Duzee.

Oval. Vertex transverse, declivous; rounded in front, as viewed dorsally (eyes forming part of the curve), but actually slightly emarginate. Frons short, laterally rounded, very declivous to vertex, slightly convex. Clypeus little longer than broad, parallel-sided; genae rather long. Pronotum transverse, lateral margins rather short, not carinate. Posterior tibiae flattened, rather elongate. Tegmina broad, laterally rounded, venation rather obscure, apparently not unlike that of *Graphocracerus*; wings like *Graphocracerus*.

1. *formiceticola*, sp. nov.

Piceous; vertex with a short longitudinal line on each side close to the middle, a short transverse line nearer the lateral margins, about 3 specks near the anterior margin, testaceous. Pronotum with about 12 specks and scutellum with 4, testaceous. Tegmina subopaque piceous, with brownish testaceous subhyaline spots. Abdomen piceous, legs sordid testaceous.

Male: Frons sordid testaceous.

Female: Frons piceous variegated with testaceous.

Length: (male) 2; (female) $2\frac{1}{4}$ mill.

Hab: Queensland, Bundaberg, Sandhills, in an ant's nest (x).

Subfamily *Penthimiinae*.

This subfamily (*Gyponidae* or *Scaridae* of some authors) is usually considered to be closely allied to the *Tetigoniinae*, but I suspect that this view is due mainly to the ocelli being dorsal.

Thaumatoscopus, gen. nov.

Allied to *Gypona* Germar; somewhat of the form of *Lcdropsis*, but more fragile, and shorter. Head a trifle narrower than the anterior margin of pronotum; vertex transverse, foliaceous, protruded well in front of eyes, very thin in profile. Ocelli small, discal, situated just above the imaginary line joining anterior margin of eyes. Pronotum transverse, lightly transversely striate, middle three-fifths of anterior margin truncate, posterior margin only a slightly sinuate. Scutellum transverse, lightly transversely striate.

1. *galcatus*, sp. nov. (Pl. XXX, fig. 8.)

Luteotestaceous; foliaceous part of frons orangered; the rest, as well as the basal two-thirds of genae and the base of clypeus

and of lorae, black; rest of face, the rostrum, anterior and intermediate legs, testaceous. Prosternum and 4 spots on the apical margin of the scutellum, black. Tegmina pale luteotestaceous, more or less hyaline, veins opaque, pale luteous. Wings dark smoky. Abdomen yellowish, more or less suffused discally with brownish, sparingly marked with black. Posterior femora and tibiae mostly black.

Vertex and venation figured.

Female: Last segment transverse, apically bisinuate, the short median prolongation very minutely notched.

Length: 7 mill., breadth $2\frac{3}{4}$ mill.

Hab: Queensland, Cairns (viii).

Vulturinus, gen. nov.

Closely allied to *Thaumatoscopus*, but head only slightly foliaceous anteriorly; cells of tegmina irrorate. Type *vulturinus*.

1. *vulturinus*, sp. nov.

Pale orange, somewhat sordid, the pronotum somewhat suffused with olivaceous. Scutellum with anterior angles and a short slender median transverse line, olivaceous. Foliaceous part of vertex, a spot on the disk and the lateral margins, of the genae, etc., orange; rest of sterna, sternites, etc., testaceous. Tegmina subhyaline costally, milky subopaque inwardly, veins brown and yellowish, cubital area with many short transverse veins, inner discoidal and the two inner subapicals closely irrorate; clavus irrorate. Wings dark smoky. Vertex similar in shape to *Thaumatoscopus*, but shorter.

Female: Last segment transverse, bisinuate, slightly produced obtusely in the middle, last sternopleural segment toothed intero-laterally near the base. Ovipositor black.

Length: $4\frac{1}{2}$ mill.

Hab: Queensland, Cairns (viii).

Ectopioccephalus, gen. nov.

This remarkable genus is readily distinguished by the exceedingly declivous pronotum, and the structure of the vertical head. It is Cercopoid in appearance. Vertex apical, slightly convex, transverse, head dorsally anteriorly with (what is probably) a large part of the frons visible, forming a suboval plate in the

same plane as the vertex. Ocelli immediately basal of this, much nearer the eyes than to one another. Frons excavate as in the other genera, but the head not at all foliaceous. Pronotum roundly declivous, anterior margin rounded in front, posterior margin roundly emarginate medianly. Tegminal venation obscure, subreticulate; with an appendix.

1. *vanduzeei*, sp. nov. (Pl. XXX, figs. 6-7.)

Bluish black; vertex, pronotum and scutellum polished; beneath dull black. The whole surface more or less covered with red powder, doubtless similar to the white flocculence of the Fulgoroidea. The dorsal part of the frons, eyes, and small false-ocellar spots on vertex, etc., are certainly red, and possibly other parts, but it is impracticable (in the unique type) to determine what is colour, what powder.

Length: $6\frac{3}{4}$ mill.

Hab: Queensland, Bundaberg (xi).

Subfamily Agalliinae.

Ipo, gen. nov.

Distinguished from *Idiocerus* by the quite different venation, especially the constitution of the discoidal cells and the presence of 5 apicals; there are also transverse veinlets towards the apex of the subcostal (marginal) cell, and there are 2 transverse veins standing on the cubital. The antennal ridges also extend only about one-half of the distance from frons to eye, and are shallow.

Very little of the vertex can be seen dorsally, and the eyes are prominent, not forming part of the curve of the head; the apical margin of the vertex is ventral and is emarginate roundly, to admit the base of the diamond-shaped frons; ocelli placed a little laterally, right against the frons, close to the apical margin of the vertex. Frons with a very slight, ovate swelling in the center, from base to apex. Clypeus oblong, longer than wide, lorae rhomboid, about as wide or a little wider, each, than clypeus, slightly rounded posteriorly exterolaterally. Rostrum about twice as long as clypeus. Antennae socketted on a level with the posterior margin of the eyes, simple in both sexes. Vertex and pronotum transversely, finely, but a little irregularly, aciculate-punctate. Head and eyes distinctly wider than

pronotum, the latter transverse, roundly declivous anteriorly, lateral margins obsolescent, anterior and posterior margins meeting acutely. Costal margin arched; clavus punctured. Membrane with an appendix. Wings with supernumerary cell. Posterior tibiae deeply grooved, with a row of about 7 strong setiferous spines. Type *ambita*.

1. *ambita*, sp. nov.

Head and pronotum pale testaceous, the vertex and pronotum strongly clouded with blackish brown, without definite spots. Scutellum pale castaneous. Underside and the tergites pallid, pleural region more or less crimson. Tibiae, tarsi and apical parts of femora more or less blackish brown. Tegmina hyaline, basal fourth clouded with black, two narrow transverse stripes and apex of corium blackish-brown.

Male: Valve in profile elongate, rounded apically. Frons clouded also with black. Clypeus black.

Female: Last abdominal segment more or less straight medianly; valve long, depressed in a wedge shaped manner at the base.

Length: (male) $7\frac{1}{2}$; (female) $9\frac{1}{2}$ mill; breadth across eyes $4\frac{1}{4}$ -5 mill.

Hab: Queensland (one male in my collection), Bundaberg (3 females).

2. *conferta*, sp. nov. (Pl. XXII, figs. 10-11).

Smaller than the type, tegmina not narrowed so suddenly apically, and the interior subapical cell very short. Pleural region not reddish. Frons, clypeus, etc., concolorous, pallid in both sexes; a narrow longitudinal pale line on head and pronotum. Tegmina dark, mottled with whitish, with a broad undulating discolorous band from nearly the middle of the subcosta to lateral margins of scutellum; exteroapical third hyaline, veins black. Scutellum with anterolateral angles broadly dark.

Male and female: Valve rounder and shorter than in *I. ambita*.

Length: $6\frac{1}{4}$ mill.

Hab: Queensland (my collection), Brisbane (xi), Bundaberg (ix-xii), Koebele's No. 2300.

The nymph has spineless legs.

3. *honiala*, sp. nov.

Smaller than *I. conferta*, the head and eyes only slightly wider than pronotum; tegmina narrow and not so rounded subcostally, venation more irregular. Frons, etc., pallid, median part of the former clouded with blackish brown, lorae and clypeus each with a dark median mark, and the genae smudged with black. Tegmina brownish hyaline, more or less colourless apically; there is a curved whitish fascia on the basal half from basal angle to nearly half the length of the subcosta, the curve not nearly touching the length of the subcosta, the curve not nearly touching the commissure; veins partly whitish. Lorae each about twice as wide as the clypeus and well rounded exterolaterally. Genital segments on the plan of *I. conferta*.

Length: $5\frac{1}{2}$ - $5\frac{3}{4}$ mill.

Hab: Queensland, Brisbane (vi).

4. *aegrota*, sp. nov.

About the same size as *I. honiala*, but the eyes are larger and more prominent, especially laterally; tegmina more narrowed apically; lorae not so rounded exteriorly, little wider than the clypeus.

Pale testaceous; vertex, pronotum and scutellum more or less clouded with brownish, no definite markings. Tegmina hyaline, more or less tinged with yellowish, more or less obscurely clouded with brownish and with an ill-defined whitish fascia near the base.

Length: 6 mill.

Hab: Queensland, Cairns (viii).

Idiocerus, Lewis.

Idiocerus Lewis 1835 T. E. S. London, I, 47, Pl. VIII, fig. 2.

Van Duzee 1894 T. Amer. E. S. XXI, 260; Edwards

1896 Hem. Hom. Brit. Isl., 97, Pl. I, f. 31, Pl. XXI and

XIII, figs. 1-6; Pl. XXIX, f. 1; Osborn & Ball 1889 P.

Davenport A. N. S. VII, 124-38, Pl. III.

Bythoscopus subg. *Idiocerus* Burm. (1838?) Gen. Ins.

Bythoscopus, figs. 5, 6.

1. *ipo*, sp. nov.

About the size and form of *I. nigroclypeatus*, Mel.

Bright greenish or greenish yellow, immaculate. Pronotum

(except lateral margins), scutellum, axillary cell of clavus, commissure, etc., crimson. Eyes black. Tegmina hyaline, tinged with greenish basally and exteriorly; veins greenish. Pleural region, etc., pale yellowish. Clypeus broad, fairly parallel-sided.

Female: Last segment very obtusangularly emarginate, valve pale yellowish, transverse, apically truncate, sides rounded. Ovipositor crimson.

Length: $4\frac{1}{8}$ mill.

Hab: Queensland, Brisbane (vi).

The following are species of Tetigoniidae described from Australia, but unrecognizable by their descriptions:

1. *Coclidia australis* Walker 1851 List. 856, referred to *Bythoscopus* auct. by Stal.
2. *Bythoscopus rivularis* Walker op. c., 865=*dorsalis* Walker op. c., 867=*repletus* Walker 1858 Suppl. 267.
3. *B. fulvus* Walker 1851 List. 866=*latifrons* 869.
4. *B. anguliferus* Walker, op. c., 868.
5. *B. transversus* Walker, op. c., 869.
6. *B. luridus* Walker, op. c., 870.
7. *B. cupreus*, Walker, op. c., 871.
8. *B. australis*, Walker, op. c., 872.
9. *B. obliquus* Walker, 1858 Suppl., 267.
10. *B. abscondens*, Walker, l. c.
11. *B. punctivena*, Walker 1858 Ins. Saund. Hom. 104.
12. *B. multistriga*, Walker, op. c., 105.
13. *B. signifrons*, Walker, op. c., 106.
14. *B. testaceus*, Walker 1852 List. 1163.
15. *Scaris australis*, Walker 1858 Suppl. 267.
16. *Iassus detractus*, Walker, op. c., 271.
17. *Gypona nigra*, Walker 1862, J. Ent., I, 319.
18. *Trocnada dorsigera*, Walker 1858 Ins. Saund. Hom. 104.
19. *Albelterus incarnatus*, Stal 1865 O. V. A. F., XXII, 158.
20. *Rubria (Petaloccephala) sanguinea* Stal. l. c.
21. *R. carnosus*, Stal, op. c., 159.
22. *Macroceps fasciatus*, Signoret 1880 A. S. E. France (5) X, 364. Pl. 10, f. 89.
23. *Ledromorpha vaginata*, Stal 1864 op. c., (4), IV, 68.
24. *L. planirostris* (Don.)—sec. Stal. (This has been previously referred to under "*Ledra*").
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Description of Plates.

Plate XXI.

1. Tegmen of *Scolypopa australis*.
2. The same of *Siphanta acuta*.
3. The same of *Philadelphieia pandani*.
4. The same of *Lamenia kulia*.

Plate XXII.

1. *Phrynophyses parvula*, female.
2. The same in profile.
3. Face of the same.
4. *Giffardia dolichocephala*, female.
5. Face of the same.
6. *Macrocratogonia aurea*, female.
7. Face of the same.
8. *Anemochrea mitis*, female.
9. Face of the same.
10. *Ipo conferta*.
11. Face of the same.
12. *Ancono pulcherrima*.

Plate XXIII.

1. *Tetigonia parthaon*.
2. Face of same.
3. Nymph of same.
4. *Epipsychidion epihyropis*.
5. Face of same.
6. Nymph of same.
7. *Kosmioplex varicolor*.
8. Face of same.
9. *Thaumatoscopus galeatus*.
10. Face of same.
11. Head of same in profile.

12. *Polychaetophyes serpulidia*, nymph skin in profile.
13. "Operculum" of the same.

Plate XXIV.

1. *Rhotidus flavomaculatus*, female.
2. Face of the same.
3. Nymph of the same.
4. Face of the same.
5. *Cephalclaus brunneus*.
6. Face of the same.
7. *Phrynoophyes phrynoophyes*, female.
8. Face of the same.
9. *Tartessus syrtidis*, face.
10. Nymph of unknown membracid.
11. Nymph of another unknown membracid.
12. Face of same.

Plate XXV.

1. *Kyphocotis tessellata*.
2. The same in profile.
3. *Stenocotis planiuscula*, female.
4. Female of probably the same species.
5. Nymph of probably the same species.
6. Face of No. 3.
7. Apical sternites of the same.
8. The same of No. 4 in profile.

Pl. XXVI.

1. Ova of *Perkinsiella saccharicida* in situ, those at the sides being shown somewhat in profile and in section.
2. The same isolated.
3. *Perkinsiella saccharicida*, nymph of first instar.
4. The same, second instar.
5. The same, third instar.
6. The same, fourth instar.
7. Face of the same.
8. Adult female of same, brachypterous form.

Pl. XXVII.

1. Adult male of *Perkinsiella saccharicida*.
2. Face of same.
3. Genital segments of same.
4. Adult female of same, macropterous form.
5. Genital segments of same.
6. Nymph of *Vanua vitiensis*.
7. Face of same.
8. Nymphcase of *Pectinariophyes pectinaria*.
9. The same of *Polychactophyes serpulidia*.

Pl. XXVIII.

1. *Phantasmatocera vitiensis*, head, etc.
2. The same in profile.
3. Tegmen of the same.
4. *Sardis maculosa*, head, etc.
5. Face of the same.
6. Tegmen of the same.
7. *Vanua vitiensis*, head, etc.
8. Face of same.
9. Tegmen of same.
10. *Astorga saccharicida*, head, etc.
11. The same in profile.
12. Face of the same.
13. Tegmen of the same.

Plate XXIX.

1. *Gelastissus albolineatus*.
2. Head of same in profile.
3. *Phaenocera froggatti*.
4. Face of same.
5. *Dardus abbreviatus*; nymph.
6. *Thyrocephalus leucopterus*, head and nota.
7. Face of same.
8. *Philadelphicus pandani*, head and nota.
9. Face of same.
10. *Thanatodictya hebe*.
11. Nymph of an allied form.

Pl. XXX.

1. *Tetigonia pasiphac*, vertex.
2. *Gelastorrhachis diadema*, pronotum from in front.
3. The same in profile.
4. *G. clavata*, pronotum from in front.
5. The same in profile.
6. *Ectopiocephalus vanduzeei*, vertex.
7. Head of the same in profile.
8. *Thaumatoscopus galeatus*, head, etc.
9. *Polychaetophyes serpulidia*, head, etc., in profile (slightly tilted).
10. *Szewczyia lyricea*, head, etc., in profile.

Plate XXXI.

1. *Thaumatoscopus galeatus*, tegmen.
2. *Ancono pulcherrima*, the same, (only the veins that are certainly visible are portrayed).
3. The same, more or less restored; the venation is so obscure in parts that it is difficult to determine it correctly.
4. *Issus ridicularius*, tegmen.
5. *Rhotidus monstrum*, the same.
6. *Eupteryx haematoptilus*, the same.
7. *Nesosteles hebe*, the same.
8. *Rhotidus ingens*, vertex.
9. *R. informis*, the same.
10. *R. monstrum*, the same.
11. *R. ledropsiformis*, the same.
12. *R. viridescens*, the same.
13. *R. horrendus*, the same.

Plate XXXII.

1. Wing of a Tetigoniine.
2. The same of an Eupterygine. N. B. '10' is really the submarginal, the wing having undergone degeneration apically.
3. Wing of an Agalliine.
4. The same of an Asiracid.

5. Claval and corial membranous appendages in *Polychaetophyes serpulidia*.
6. *Gelastoccephalus ornithoides*, head and nota.
7. The same in profile.
8. *Nesosteles hebe*, head and pronotum.
9. *N. sanguinescens*, the same.
10. *Pettya anemolua*, the same.
11. *Siphanta galeata*, the same.
12. *Dryadomorpha pallida*, the same.
13. The same in profile.
14. The same in profile, dorsally tilted.
(In 12-17, *a*=sensory pit, *b*=ocellus).

2

5

III

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PLATE XXVI.

PLATE XXVII.

3 x 14

6 x 8

9 x 8

13 x 20

PLATE XXIX.

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REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

**Leaf-Hoppers and their
Natural Enemies**

(PT. X. DRYINIDAE, PIPUNCULIDAE)

Supplementary

BY R. C. L. PERKINS

HONOLULU, H. T.
MARCH 1, 1906

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1. *Journal of the American Medical Association*, 2000; 283: 2689-2694.

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Supplementary

BY R. C. L. PERKINS

HONOLULU, H. T.
MARCH, 1906

LETTER OF TRANSMITTAL.

Honolulu, T. H., January 17th, 1906.

To the Committee on Experiment Station, H. S. P. A., Honolulu, T. H.

Gentlemen:—I herewith submit for publication the tenth part of the Bulletin on "Leaf-Hoppers and Their Natural Enemies," which is chiefly supplementary to the first part, and deals with observations made and material collected by Mr. Koebele in Australia and Fiji. This material was not available until the first part of the Bulletin had already been completed.

Yours obediently,

R. C. L. PERKINS,
Director, Division of Entomology.

INTRODUCTORY REMARKS.

In Part I of this bulletin I detailed the habits of some Dryinidae, and described a large number of species, obtained partly as the results of Mr. Koebele's investigations in 'N. America, and more especially, through our researches in Queensland, from June to December, 1904. I now have to record the additional material that Mr. Koebele secured after my return to Honolulu, when he was continuing his researches for a few months in New South Wales and Fiji. In my introductory remarks on the Dryinidae I was only able to merely mention a recent paper by Dr. J. J. Kieffer on these insects, but as this paper throws light on some obscure points, and corrects several errors of older observers, I shall allude to these matters below, as well as making corrections of some clerical errors in my former paper. I also add a full description of that very distinct parasitic fly *Pipunculus cutrichodes*. In Part IV of this bulletin this species was omitted in the list of species on p. 131, and no detailed description was given subsequently, but both sexes were merely briefly characterized in the "Synopsis of Species" on p. 133 and 135.

As the first part of this bulletin dealing with the chief part of our material, was altogether without figures, I have now made drawings of many of the important structures therein described.

GENERAL REMARKS.

The number of new species of Dryinidae obtained in New South Wales and Fiji was not large, four from the former State, and the same number from the islands; in addition to which I describe two new species from Queensland. It should be mentioned that of the species already described from Bundaberg, Queensland, which is well outside the tropics, several were afterwards found by Mr. Koebele at Sydney, such species as *Paradryinus koebelei* and *Neodryinus raptor* being common there. At Sydney both of these frequently attack Fulgorids of much smaller size than those which are found infested at Bundaberg. Consequently the Sydney specimens are of very small size as compared with the Queensland examples, but do not otherwise noticeably differ.

I have referred to the facts that a *Gonatopus* is said to have been bred from the beetle *Ptinus fur*, a statement so remarkable, as to need verification. Dr. Kieffer in the paper I have cited tells us that this so-called *Gonatopus* probably belongs to the genus *Cephalonomia* of the Bethyilidae. He also states that the genus *Mystrophorus* has chelate tarsi in the female, Foerster having mistaken his specimens for this sex, when really they were males. In my synopsis of genera in Pt. 1, p. 33 of this Bulletin *Mystrophorus* will therefore have to be removed from the neighborhood of *Anteon*, which will remain as the sole representative of that section of Dryinidae, of which the species have simple front legs in both sexes.

I have still left undescribed the greater number of male Dryinidae obtained by us. It might be supposed that as nearly all our male specimens were bred, there would be no difficulty in determining the species to which these belong. This, however, is by no means the case, for most of the graminivorous Delphacids and Jassids, from which these parasites are obtained, are liable to be attacked by two or three different species, and as males and females of the parasites are not reared from a single individual hopper, but only one or other sex, the difficulty of pairing the sexes is hardly lessened by the fact that the specimens are bred. The matter is really quite complicated, for a Dryinid sometimes attacks many species of leaf-hoppers, and a given leaf-hopper may be attacked by a number of distinct species of these parasites, even when all are collected in the self-same locality. Occasionally even an individual hopper is attacked by two, or even three, species of Dryinid parasites, these usually belonging to at least two genera. It is quite common also to obtain Stylopid and Dryinid parasites from a single specimen of the host, and *Pipunculus* is sometimes associated with one or other of these, but usually with the latter.

Nearly all these difficult males belong to what was once called the genus *Labco*. Ashmead shrewdly conjectured that *Labco* was the male of *Gonatopus*, (*sensu lat.*) a conjecture partially correct. In *Labco*, however, he included male *Dryinus*, as well as *Gonatopus*, although the latter are at once distinguished by their short maxillary palpi, etc., etc. As colonies of *Gonatopus* and its allies can easily be raised in confinement, there is no doubt but that the sexes will ultimately be correctly associated and the generic characters of the males properly established. In my opinion the structure of the palpi, the condition of the parapsides of the mesonotum, and the antennal joints, will be of most use for this purpose. Such, however, is rather the work of a

resident entomologist than of those on a temporary mission, and I do not feel disposed to create a number of new species on males of so-called *Labco*, when many of these would ultimately fall as synonymous with species that I have already described from the other sex.

Additional material received from Koebele has shown no exception to the general rule that a species of Dryinid does not attack Fulgorid and Jassid indiscriminately. *Labco typhlocybae* remains a most peculiar exception*, especially as the female (described originally as *Dryinus ormenidis*) of this species, of which I received some two thousand cocoons, is apparently attached only to certain species of one special group of the Fulgoridae. In my former paper I have remarked that the comparatively primitive forms of Dryinidae, having the stigma large and ovate, attack Jassids only. I have now met with a single exception to this rule. At Sydney on January 23rd, 1905, Koebele found an adult male of the Fulgorid, *Gactulia chrysopoides*, a species frequently attacked in its nymphal condition by species of *Neodryinus* and *Paradryinus*, bearing beneath the body at the insertion of the hind coxae, the black sac of a Dryinid. The sculpture of the sac itself and likewise its position is so similar to that of *Neochellogynus* that I can hardly doubt that it belongs to this or some allied genus. Unfortunately the mature parasite was not bred.

I may say that the new species here described from Fiji and New South Wales, the fauna in each case being largely distinct from that of Queensland, fall admirably into the genera previously characterized by me. I have some doubts as to the value of my genus *Neodryinus*, as, having obtained Latreille's description of *Dryinus*, I find that this gives 3 joints to the labial palpi like the former, and four teeth to the mandibles. *Dryinus*, however, as interpreted by various hymenopterists, is, in my opinion, a composite genus, and I can not include such forms as *Dryinus americanus* Ashm. and the European *D. tarraconensis* Marshall, which have distinct and parallel parapsidal furrows, in the same genus as *D. ormenidis*, Ashm. and my several species of *Neodryinus*, which are without such furrows, because I attach the highest importance to the condition of the parapsides in the classification of the Dryinidae.

As most of the figures that I have drawn refer to Pt. I of this Bulletin rather than to the present, and necessarily no reference

* I have now reason to believe that this is not a true exception, on which matter see my remarks under *Dryinus* below.

to figures was given in that part, I have given the description of the plates at considerable length, when necessary.

SYSTEMATIC.

LIST OF GENERA AND SPECIES HERE DESCRIBED OR DISCUSSED.

The species marked with an asterisk have had the mouth-parts dissected out and mounted in balsam or glycerine.

DRYINIDAE.

Pseudogonatopus.

* *P. melanacrias*, sp. nov.

* *P. kiefferi*, sp. nov.

P. perkinsi Ashm.

Haplogonatopus.

* *H. vitiensis*, sp. nov.

H. brevicornis, sp. nov.

Gonatopus.

* *G. koebelci*, sp. nov.

Neogonatopus.

* *N. vitiensis*, sp. nov.

Epigonatopus.

* *E. fallax*, sp. nov.

Neodryinus.

Dryinus.

D. ormenidis Ashm.

Chlorodryinus.

C. pseudophanes, sp. nov.

Neochelogyne.

N. ignotus, sp. nov.

Prosanteon.

P. melanostigmus, sp. nov.

PIPUNCULIDAE.

Pipunculus cutrichodes, sp. nov.

DESCRIPTIONS OF SPECIES.

Pseudogonatopus.

On page 35 of Pt. I, in the Synopsis of Species of this genus, the names *P. junctorum* and *P. saccharorum* should be transposed.

Pseudogonatopus perkinsi, Ashm.

Gonatopus perkinsi, Ashmead, Faun. Haw. Vol. I, pt. III, p. 293.

Hab: Molokai, Maui, Hawaii, widely distributed, but not abundant. I have found the larval sac on Delphacids on *Pipturus* on the Island of Hawaii. There is little doubt that *Labco hawaiiensis* Ashm. is the male, as I have taken this *Pseudogonatopus* in the same spot as the other.

Pseudogonatopus melanacrias, sp. nov.

Black, the face, the legs and the basal three antennal joints, pale, yellow or yellowish; the front femora more or less dark, the intermediate and posterior ones sometimes to a less degree darkened, the antennal joints, excepting the first three, black or at least dark, the apical joint not pale. Thorax generally entirely black, except the lateral and posterior margins of the pronotum, which are yellow or ferruginous. In one example the posterior lobe of the pronotum and the middle of the propodeum are more or less of a dark brown or pitchy colour. Head above dark brown or castaneous.

Antennae slender, the third joint long, twice as long as the fourth; top of the head shining and smooth, and moderately deeply concave. Pronotum with deep transverse furrow or constriction, the surface smooth and shining. Mesonotum very narrow, the propodeum long, the lateral anterior angles effaced, finely transversely rugose in front and posteriorly, and between these areas smooth and shining. The thorax is without clothing of erect hairs. The abdomen is smooth and shining and more or less yellow or brown just behind the petiole. Length 3 mm.

Hab: Suva, Fiji; bred from Delphacid on the grass *Zoysia pungens*.

Pseudogonatopus kiefferi, sp. nov.

Head above, and abdomen black; the thorax and legs ferruginous, the latter partly dark or black, especially the coxae, the middle and hind tibiae at the apex, and the tarsi on their apical joints. Lower part of face pale; antennae with the second, third and fourth joints, and the base of the fifth more obscurely, ferruginous, the apical joint yellowish, the scape yellowish or white, dark above.

Head very dull, with dense fine puncturation, the third antennal joint very long, nearly twice as long as the fourth, and three times as long as the second. Pronotum shining, with some sparse indefinite punctures; the propodeum dull, and coarsely rugose over its whole surface, the anterior lateral angles distinct, not so rounded off as to be effaced. The propodeal rugosity is transverse in front, then becomes more irregular and somewhat longitudinal, while posteriorly it is again regularly transverse. There is no erect pilosity, and the legs have only a very short and inconspicuous pubescence. The abdomen is smooth, shining and glabrous. Length 4.5 mm.

This large and beautiful species is distinguished from any other described by me by the very strong sculpture of the propodeum.

Hab: Suva, Fiji; bred from a cocoon collected by Koebele on a tree, on which many examples of a Fulgorid, *Vanua viticensis*, were noticed.

Haplogonatopus.

In Pt. 1, page 39, line 10 from the top, for 'preceding' should be read 'following.' The mouth-parts of *Haplogonatopus* are similar to those of *Paragonatopus*, not *Pseudogonatopus*. The above correction was overlooked, when a rearrangement of the genera was made before publication.

Haplogonatopus viticensis, sp. nov.

Black, but in parts, especially the thorax, dark brown, the legs obscure yellowish brown; two basal joints of the antennae and the third more or less at its base, yellow, the face and mandibles also yellowish, the teeth of the latter dark.

Head very deeply concave, black above, and with a very dense minute puncturation or sculpture rendering the surface dull. Antennae with the third joint less than twice as long as the fourth, the apical one only obscurely pallid at the tip. Pronotum dark brown, smooth and shining, the transverse furrow very obsolete; the mesonotum dull, rather paler than the pronotum, the propodeum bare, transversely rugose in front and posteriorly, and between these parts smooth and shining on the dorsum, the anterior lateral angles effaced. Abdomen black smooth and shining. Length $2\frac{1}{2}$ mm.

Hab: Suva, Fiji; one female from a Delphacid on *Zoysia pungens* (Koebele 2377). Bred with *Pseudogonatopus melanacrias*, which it considerably resembles superficially.

Haplogonatopus brevicornis, sp. nov.

Head and thorax dark brown or castaneous, the mesothorax and posterior part of propodeum paler, more yellowish brown; the face, two basal antennal joints, the third more or less, and the apical one, yellow or brownish yellow. Legs brownish fuscous, yellower in parts, the tarsi except the apical joints paler yellow. Abdomen black.

Head deeply concave, smooth and shining, the antennae short, the third joint about twice as long as the second, the seventh hardly longer than wide. Thorax smooth and shining, glabrous, and without evident sculpture, the propodeum strongly convexly raised, and very smooth on its anterior portion in front of the spiracles, posteriorly without transverse rugulosity, at most with very feeble indefinite sculpture. Legs without noticeable hairs. Length 2 mm.

This species is obviously distinct from *H. apicalis* by the smooth shining propodeum, apart from many other characters. Only a single specimen was bred, and, owing to the manner in which it is carded, I have not dissected the palpi, but it is probably rightly referred to *Haplogonatopus*. The variegated larval sac is like that of *H. apicalis*.

Hab: Tweed River, Queensland side. Koebele 2232.

Gonatopus koebelei, sp. nov.

Shining brown, abdomen and apical half of the antennae black, the legs for the most part paler than the thorax, the basal dilatation of the hind femora and their extreme tips noticeably darker than the part between.

Head above deeply concave, smooth and shining; second joint of antennae slender and quite elongate, the third longest of all and very greatly longer than the fourth. Thorax ferruginous brown, nearly unicolorous, or the mesonotum a little paler; mesonotum and propodeum with fine and long hairs, the latter finely transversely rugose posteriorly, elsewhere smooth and shining like the pronotum. Legs clothed with fine, longish hairs. Abdomen shining black, or slightly brownish-tinged, very sparsely pilose. Length 3 mm.

This is a true *Gonatopus* with 5-jointed maxillary palpi, three distinct joints beyond the geniculation.

Hab. Paramatta, Sydney, N. S. W.; bred from a Jassid (Koebele 2369).

Neogonatopus vitiensis, sp. nov.

Black, the lower part of face, the mandibles, except the reddish teeth, and the three basal antennal joints, yellow, the scape darker above. Front legs with the trochanters entirely pale or marked with fuscous, the femora black or dark brown and pale at the tips, tibiae dark above, the tarsi pale, yellow or brownish yellow. Middle and hind legs prettily variegated with dark and yellow, the trochanters, tip of femora and middle of tibiae being pale, the tarsi brownish, blacker towards the apex.

Head very little concave above, the surface not much shining, the microscopic sculpture excessively fine. Whole thorax sparingly clothed with short erect grey hairs; the pronotum more or less shining, the rest of the thorax duller, and densely minutely punctate or shagreened; the propodeum elongate and not at all abruptly raised in the spiracular region. Front trochanters unusually short and robust, not with the usual long stalk. Abdomen smooth and shining and very sparsely pilose. Length 3-3.5 mm.

This interesting species in the structure of the trochanters and the shape of the head approaches the genus *Pachygonatopus*.

Hab: Suva, Fiji; bred from a small Jassid on grass (Koebele 2378).

Epigonatopus fallax, sp. nov.

Black, the clypeus more or less yellowish, the mandibles white with red teeth, three basal antennal joints yellow; the abdomen behind the petiole slightly brownish or pitchy. Legs with the apices of the coxae, the trochanters for the most part, the apical thin part of the femora, except the tips of the hind ones, yellow; front tibiae and tarsi testaceous, middle and hind tibiae dark at base and tips and paler between, the tarsi fuscous. The superficial appearance of this species owing to its black colour and variegated legs is very like that of *Neogonatopus vitiensis*.

Head deeply concave, and the surface shining, the third antennal joint long and very slender, one and a half times as long as the fourth. Pronotum smooth and shining, the rest of the

thorax duller, propodeum elongate and not very high, very finely transversely rugulose at the sides and posteriorly, and without clothing of erect hairs. Legs not noticeably hairy. Length 3 mm.

This species differs greatly in superficial appearance from *E. solitarius*, which has a ferruginous thorax, but structurally it is rather closely allied.

Hab: Mittagong, N. S. W.: collected in grass, January 18th, 1905, by Koebele.

Neodryinus.

This name in the list of species, on page 29 of Pt. 1, three lines from the bottom, is by error printed as *Neogonatopus*.

Dryinus Latr.

The generic characters of female *Dryinus*, as given by different authors, disagree so in such essential points, that without specimens or an adequate description of the type species, I cannot fix these characters. Latreille in his characterization of the genus in 1809 clearly confounded characters peculiar to *Gonatopus* with those of *Dryinus*. His original description in 1805 is not accessible to me. Marshall in his paper describing *D. tarraconensis* gives no characters of use to me, but the figure of this insect is useful for generic purposes. Haliday shows well the distinction between the mouth-parts of *Dryinus* and *Gonatopus*. I herewith give some of the diverse characterizations of *Dryinus* as given by different authors.

Latreille, 1809.

Mandibles 4-dentate.

Maxillary palpi 5-jointed.

Labial 3-jointed or with 2 distinct.

Parapsides ?

Marshall, 1868.

Characters of mouth-parts entirely omitted.

Parapsidal furrows distinct in figure and parallel.

Haliday, 1833.

Maxillary palpi 6-jointed.

Other characters not mentioned.

Ashmead, 1893.

Mandibles 3-dentate.

Maxillary palpi 6-jointed.

Labial palpi 2-jointed.

Parallel parapsidal furrows figured on plate.

True Characters of *Dryinus ormenidis* Ashmead.

Mandibles 4-dentate.
 Maxillary palpi 6-jointed.
 Labial palpi 3-jointed.
 No distinct parapsidal furrows.

Dryinus ormenidis Ashm.

Dryinus ormenidis Ashmead, (female); Ent. News, XIV, p. 192.

Labco typhlocybae Ashmead, (male); loc. cit.; not *Labco typhlocybae* Ashm. Mon. Proct. N. A. p. 89.

Swezey bred a number of males and females, determined as above by Ashmead, from cocoons obtained from the Fulgorid, *Ormenis pruinosa*. He rightly concluded that they were sexes of one species, as was subsequently confirmed by breeding hundreds of both sexes from cocoons sent from N. America by Koebele. Copulation was observed on many occasions. The males retained by Swezey do not in any way agree in the structure of the antennae with Ashmead's description of these parts in the original example of *Labco typhlocybae*, bred by Riley from a *Typhlocyba* on *Celtis*. If that description is correct, it is not only utterly impossible that the type of *L. typhlocybae* can belong to the same species as the male of *Dryinus ormenidis*, but further, it cannot be placed in the same genus in my opinion.

Ashmead's description of type
 of *Labco typhlocybae*.

"Antennae 10-jointed";
 "the pedicel is more than
 twice as long as the scape;
 the first flagellar joint is two-
 thirds the length of pedicel;
 the fourth and fifth equal and
 a little longer than the first."

Description of three males in
 Swezey's collection.

The scape is stout and as
 long or longer than the pedi-
 cel, not shorter; the first flag-
 ellar joint is very long, about
 equal to the scape and pedicel
 together, and distinctly long-
 er than the following joints
 of the flagellum.

Chlorodryinus pseudophanes, sp. nov.

Black, the antennae, the margins of the pronotum (more wide-
 ly at the sides posteriorly) and for the most part the front legs,

the tarsi, and the apical compressed abdominal segment, ferruginous. Scape of antennae in front and the clypeus marked with yellow, the mandibles yellow with red teeth. Wings with a transverse smoky band through the basal cells and a large ante-

Head in front dull and very densely punctured. Pronotum pubescent, shining, somewhat rugosely punctured; mesonotum quite dull, except the smooth anterior constriction, very densely sculptured, being finely granulate or shagreened; scutellum somewhat shining and punctured; propodeum with fine and close rugose reticulation. Abdomen smooth and shining. Length 4 mm.

Agrees well generically with *Chlorodryinus pallidus* in the incompletely margined head, the simple pronotum, the incomplete parapsidal furrows, etc., and only its superficial appearance is that of a *Paradryinus*.

Hab: Brisbane, Queensland; a single female was captured by Koebele on low bushes.

Neochelogyus ignotus, sp. nov.

Black, scape of antennae and front legs yellow or ferruginous, second and third joints of antennae obscurely reddish, the rest black. Middle and hind femora and tibiae more or less brown or dark-coloured, the tarsi except the apical joint pale yellow; the mandibles pale.

Head large, densely rugose or rugosely punctate, but the sculpture is not coarse, and is still finer on the front, which is clothed with silvery hairs. Pronotum rugose; mesonotum shining and sparsely punctate; the scutellum and post-scutellum smooth and shining; propodeum finely irregularly rugose, the posterior median area well defined, somewhat smoother, dull and rugulose. Wings with the stigma and radius fuscous, the rest of the neuration pale. Abdomen black, shining and impunctate. Length 3 mm.

This species in the sculpture of the head (which is much finer than in most of the allied species) agrees with *N. nigricornis*, the black antennae of the latter serving at once to distinguish it.

Hab: Sydney, N. S. W.; collected Feb. 2nd, 1905, by Koebele.

Prosautcon melanostigmus, sp. nov.

Black, the mandibles and scape of the antennae ferruginous, the front tibiae and front and middle tarsi pale ferruginous or

yellowish, anterior femora and the intermediate and posterior femora and tibiae mostly dark, black or pitchy, hind tarsi dark above. Wings hyaline, stigma dark fuscous.

Head rugose from the coarse shallow puncturation, as also is the pronotum; mesonotum smooth and shining, with a few fine punctures; propodeum finely irregularly rugose, its posterior median are a well defined, smoother, and in certain aspects slightly shining. Length 3 mm.

Distinguished at once from *P. chelogyuoides* by the dark stigma and the colour of the legs.

Hab: Mittagong, N. S. W.; collected on *McLalluca*, January 18th, 1905, by Koebele.

PIPUNCULIDAE.

Pipunculus cutrichodes, sp. nov.

- Head black, with the front and face covered with glistening white tomentum, posteriorly with greyish white at the sides, and fuscous in the middle. In the female the head between the eyes in front of the ocelli is shining black. Antennae black, third joint yellow (sometimes somewhat clouded) and distinctly acuminate produced at the apex. Thorax pilose, and clothed with fuscous tomentum, at the sides in front and on the pleura whitish; scutellum with long, fine, erect hairs; metanotum with dense whitish tomentum. Halteres yellow, dark at base. Legs black or piceous, tip of femora, tibiae, and tarsi yellow; the tibiae more or less infuscate or blackish, as also the apical tarsal joint. Abdomen black, shining, clothed with outstanding conspicuous longish pubescence, the first segment with a whitish tomentose band; the second in the female generally noticeably whitish, as also all the other segments at the sides in both sexes; the basal segment is without any row of black bristles at the sides; hypopygium less clothed than the other segments in the male (but similarly in the female) and more or less impressed at the base, with a smooth lateral lobe on the right side. Ovipositor straight and rather short. Wings distinctly smoky, stigma obscure brown, about as long as the fourth costal segment; venation black or dark brown, more or less pale at the base. Length 3-3½ mm.

Hab: Cairns district, Queensland. Not common.

DESCRIPTION OF PLATES.

Plate XXXIII.

1. *Eukoebelia mirabilis*, female.
2. *Bruchomorpha* sp?, containing the ruptured larval sac of *Eukoebelia*. Several sacs are often found on a single hopper, and both nymphs and adults (long- and short-winged alike) are affected.
3. *Phryuophryes* sp.; the left tegmen and rudimentary wing are displaced and show the empty sac, from which *Chalcogonatopus decoratus* was bred.
4. Nymph of *Tartessus*? in a much collapsed state, from the sac on which was bred a female *Prosantcon checlogynoides*.

Plate XXXIV.

1. *Eurinoscopus* sp., nymph in ventral aspect, showing the empty larval sac of a *Ncochclogynus destructor*, inserted in the usual position behind the posterior coxae.
2. *Eulcimonios* sp. with empty larval sac of *Ncochclogynus coriaceus* inserted in the neck.
3. *Athysanus curtisii*, with empty sac of *Ncogonatopus brunescens* placed on the abdomen. The left tegmen is somewhat displaced by the parasite.
4. *Liburnia* sp. nymph, shrunk and distorted, bearing two empty sacs of *Haplogonatopus americanus*.
5. *Colgar peracutus*, nymph much shrunk, with empty sac of *Paradryinus koebelci* beneath the left tegmen.
6. *Perkinsiella saccharicida*, nymph much collapsed and distorted, bearing two empty sacs of *Pseudogonatopus dichromus*. This hopper is an Hawaiian example, that was infected by a parasite imported from Australia, where it attacked small graminicolous *Liburnia*.
7. *Stenocranus dorsalis*, nymph with empty sac of *Pseudogonatopus stenocrani*, attached between the bases of the tegmental pads.
8. *Privesa aphorphoroides*? nymph much shrunk, and with the long fan-like caudal filaments removed, bearing two sacs of *Paradryinus tenator*, one beneath the tegmental, the other beneath the alar pad. In life the beautiful fan-like filaments are turned back over the body, the parasitic sacs are only seen when the tail is depressed.

9. *Deltoccephalus* sp., nymph shrunken and distorted, bearing an empty larval sac of *Neogonatopus dubiosus*.

Plate XXXV.

1. *Idiocerus*, nymph with the abdomen much shrunken, and bearing an empty sac of *Neochelogyne cognatus*.
2. *Perkinsiella saccharicida*, nymph with sac of *Echthrodelpax fairchildii* under the left tegmen.
3. *Ipo conferta* nymph, much shrunken and collapsed, bearing six empty sacs of *Paranteon myrmecophilus*. One of the sacs is not visible in the dorsal aspect of the hopper.
4. *Neodryinus raptor*, cocoon, subdiagrammatic. The two larval skins which are pierced by 8 distinct spiracles on each side, and form nearly the whole of the sac, are spread out as a roof over the middle part of the cocoon. This middle part contains the pupa, the large outer part of the cocoon serving for attachment to the leaf surface.
5. *Neodryinus koebelci* cocoon. The inner of the two skins is not pierced by evident spiracles, while those on the outer skin are but seven in number on each side, the three stigmata, at one end of each series, being much larger than the others. For the rest the cocoon is like that of *N. raptor*.
6. *Paradryinus threnodes*, empty cocoon, the insect having escaped by cutting out a cap, as seen at one end. The cocoon is densely studded with rounded portions, gnawed from the leaf-surface.
7. *Paradryinus koebelci*, empty cocoon; the patches of leaf-substance are less thickly strewn, and are of more elongate form.
8. *Neochelogyne destructor*; the subterranean cocoon is covered with particles of sand, so that the silken basis cannot be seen; the insect has emerged from the hole at one end of the cocoon, the cap having been entirely detached.
9. *Prosantcon chelogyneoides*, female; chelae and adjoining tarsal joints.
10. *Thaumtodryinus koebelci*; chelae and the three preceding tarsal joints. The two teeth before the apex of the chelar claw, and the single lamellate spine near the tip, as well as the two kinds (long and short) of lamellae, placed alternately, on the fifth tarsal joint, are very remarkable in this genus, and were not noticed in my original description.

PLATE XXXVI.

1. *Paradryinus*; six-jointed maxillary and three-jointed labial palpi.
2. *Ncodryinus koebelei*; six-jointed maxillary and three-jointed labial palpi.
3. *Prosanteon chelognoides*; showing similar parts.
4. *Chalcogonatopus gigas*, showing the same.
5. *Neochelognus nigricornis*; maxillary palpus with 6-joints.
6. *Enkoebeleia mirabilis*; maxillary palpus with six, labial with three joints.
7. *Paranteon myrmecophilus*, showing the same.
8. *Gonatopus australiae*; five-jointed maxillary palpus.
9. *Pseudogonatopus americanus*; four-jointed maxillary palpus.
10. *Neogonatopus dubiosus*; four-jointed maxillary palpus.
11. *Haplogonatopus americanus*; two-jointed maxillary, and two aspects of the two-jointed labial palpus.
12. *Epigonatopus solitarius*; two-jointed maxillary palpus.
13. *Echthrodelpax fairchildii*; four-jointed maxillary palpus.
14. *Paragonatopus nigricans*; two-jointed maxillary palpus.
15. *Pachygonatopus melanias*; three-jointed maxillary palpus.

All the above figures are drawn with *camera lucida* from dissections mounted in balsam or glycerine; the very short basal joint of the maxillary palpus in some cases is not very distinct. The labial palpus of all the forms of which the maxillary palpi are represented by fig. 8-15, is very short and two-jointed, and is drawn only in the case of *Haplogonatopus* (fig. 11).

Plate XXXVII.

1. *Gonatopus australiae*, chelae.
2. *Pseudogonatopus dichromus*, chelae and preceding tarsal joints.
3. *Epigonatopus solitarius*, chelae.
4. *Paragonatopus nigricans*, chelae.
5. *Chalcogonatopus gigas*, chelae.
6. *Haplogonatopus americanus*, chelae.
7. *Pachygonatopus melanias*, chelae.
8. *Echthrodelpax nigricollis*, chelae.
9. *Neogonatopus titiensis*, chelae and preceding tarsal joints.

It will be observed that fig. 1, 3, 5, 7, 9, show the similarity between the chelae of the forms of *Gonatopus*, *sensu*

lat., which preys on Jassids, while fig. 2, 4, 6, 8, show these parts in parasites of *Gonatopus*-like appearance, which prey on Fulgoroids, and which are also very similar to one another, but markedly distinct from those above mentioned. The new genera into which I have divided the old *Gonatopus* are easily determined by examination of these chelae, together with the mouth-parts figured on Pl. XXXVI, fig. 8-15.

10. *Paradryinus koebelei*, chelae and preceding tarsal joints.
11. *Neochelogyus*, chelae and two preceding tarsal joints.
12. *Neodryinus koebelei*, chelae, and three preceding tarsal joints.
13. *Paranteon myrmecophilus*, chelae and three preceding tarsal joints.
14. *Eukoebeleia mirabilis*, chelae. The single lamellate spine at the tip of the process of the fifth tarsal joint may be compared with that in the same position on the chelae of *Thaumatomyrus*.
15. *Paradryinus koebelei*; pronotum in profile, showing its very irregular outline.
16. *Chlorodryinus pallidus*; pronotum with almost regularly convex outline.
17. *Paradryinus*; mesonotum showing the parapsidal furrows.
18. *Chlorodryinus*; mesonotum showing the same.
19. *Echthrodelpax*; mesonotum showing the same.
20. *Neochelogyus*; mesonotum showing the same.

All the figures are drawn from female examples.

PLATE XXXVIII.

1. *Paradryinus koebelei*, showing the mode of disposition of the long front legs, when at rest. The body is supported on a part of the dorsum of the abdomen, which alone touches the surface on which the creature rests. In the case of the example figured the center of gravity is far in advance of the point of contact between the abdomen and the resting surface, but equilibrium is maintained by the grip of the claws of the middle and hind feet. The legs of the left side only are figured, those on the right side holding similar positions. In different species there is some variation in the positions assumed at rest, but the following genera, *Neodryinus*, *Paradryinus*, *Chlorodryinus*, *Thaumatomyrus*, and *Chalcogonatopus*, all rest on the recurved abdomen with the body suberect, or oblique, and

the front legs free, while the rest of the forms described by me assume a normal horizontal position when resting.

2. Head of *Echthrodelpfax nigricollis*, male, showing its incrassate form.
3. Head of *Paragonctopus nigricans*, male, showing the usual form in this sex of *Gonatopus sensu lat.*
4. Arrangement of ocelli in *Neodryinus*, male.
5. Arrangement of ocelli in *Paradryinus*, male.
6. Ocelli of *Echthrodelpfax*, female.
7. Antenna of female of *Parantcon*.
8. Antenna of female *Necochelegynus*.
9. Pedicel and two first funicle joints of female of *Thaumatomyrus koebele*.
10. Two apical antennal joints of the same, still more highly magnified.
11. Antenna of male of *Echthrodelpfax nigricollis*, showing its extremely slender form, a generic character.
12. Antenna of male of *Paragonatopus nigricans*, showing the less slender form of those organs in this and most of the genera formerly included in *Gonatopus*. This and the preceding figure are drawn under similar magnification.

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ERRATA.

It is requested that these corrections, when important, be made in the text. It will be observed that, owing to deficiencies of the press, accents on foreign words are entirely omitted.

Page 29, line 25, for "*Neogonatopus*" read "*Neodryinus*."

Page 35, line 19, for "*P. junctorum*" read "*P. saccharorum*."

Page 35, line 26, for "*P. saccharorum*" read "*P. junctorum*"

Page 39, line 10, for "preceding" read "following."

Page 69, line 1, for "Girard" read "Giard."

Page 164, line 15th from top, for "Dube" read "Dubr."

Page 166, diagram, for "ecdysis" read "instar."

Page 168, line 4th from top, for "and 2nd joint" read "the 2nd joint."

Page 168, line 6th from bottom, for "even testaceous" read "seven testaceous."

Page 176, line 4th from bottom, for "nercules" read "nervules" for "graduate" read "gradate."

Page 176, line 5th from bottom, for "nercules" read "nervures."

Page 180, line 8th from bottom, between "b" and "e" insert "c, membranous area representing the 8th sternite; d, posterior chitinized emargination of the 8th sternite;"

Page 229, line 3rd from bottom, for figs. "8-19" read "8-10."

Page 231, line 8, for "*lineola*, Fabr," read "*strigula* (Boisd.)"

Page 232, line 8, for "*Verania* sp." read "*Verania furcifera* (Guerin.)" We are indebted to Rev. T. Blackburn for these identifications.

Page 232, line 26, for figs. "1, 3" read "1-3."

Page 233, line 25, for "fig. 2," read "fig. 3."

Page 234, line 23, for "fig. 3," read "fig. 2."

Page 234, line 32, for Plate "xviii," read "xvii."

Page 236, line 5, for fig. "5," read "6, 6a."

Page 236, line 9, for fig. "6," read "5."

Page 236, line 15, delete, and read "*Oechalia griseus* (Burm.) *Pl. xvii, figs. 5-7."

Page 248, after line 18, add "*E. exiliosus* sp. nov. et typ. gen."

Page 250, line 15, for "oblique line" read "oblique bare line."

Page 271, line 20, for "probocis," read "proboscis."

Page 273, line 12, for "abnormal," read "arboreal."

Page 273, line 4th from bottom, for "tho" read "though."

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Introduction, R. C. L. PERKINS, pp. i-xxxii. (May 1st, 1906.)

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Part 2, R. C. L. PERKINS "Epipyropidae, Lepidoptera," pp. 71-85, 3 figs. (June 3, 1905.)

Part 3, R. C. L. PERKINS "Stylopidae," pp. 86-111, Plates i-iv. (Aug. 8, 1905.)

Part 4, R. C. L. PERKINS "Pipunculidae," pp. 119-57, Plates v-vii. (Sept. 9, 1905.)

Part 5, F. W. TERRY "Forficulidae, Syrphidae and Hemerobiidae," pp. 159-81, Plates viii-x (Nov. 13, 1905.)

Part 6, R. C. L. PERKINS "Mymaridae, Platygasteridae," pp. 183-205, Plates xi-xiii (Nov. 13, 1905.)

Part 7, O. H. SWEZEY "Orthoptera, Coleoptera, Hemiptera," pp. 207-38, Plates xiv-xvii. (Dec. 30, 1905.)

Part 8, R. C. L. PERKINS "Encyrtidae, Eulophidae, Trichogrammatidae," pp. 239-67, Plates xviii-xx (Jan. 6, 1906.)

Part 9, G. W. KIRKALDY, "Leaf-hoppers (Hemiptera)," pp. 269-479, Plates xxi-xxxii. (Feb. 3, 1906.)

Part 10, R. C. L. PERKINS "Dryinidae, Pipunculidae, Supplementary," pp. 481-99, Pls. xxxiii-xxxviii (March 1, 1906.)

G. W. KIRKALDY "Index," pp. 503-8. (May 1st, 1906.)

REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

Leaf-Hoppers—Supplement
(HEMIPTERA)

BY G. W. KIRKALDY

HONOLULU, H. T.
SEPTEMBER, 1907

LETTER OF TRANSMITTAL.

To the Experiment Station Committee of the Hawaiian Sugar
Planters' Association, Honolulu, T. H.

Gentlemen:—I, herewith, submit for publication Bulletin III
of the Division of Entomology. This has been prepared by Mr.
G. W. Kirkaldy, and is supplementary to and completes Bulletin I.

Yours obediently,

R. C. L. PERKINS,
Director, Division of Entomology.

Honolulu, T. H., April 29th, 1907.

ADDENDA.

- P. 11: *Tartessus iphis* sp. n.
Fulturnus vaccors sp. n.
- P. 12: *Siphanta sensilis* sp. n.
Nesopompe (subg. n. of *Cixius*).
Nesochlamys g. n.
N. vitiensis sp. n.
- P. 13: A number of spp. of "Delphax" have been misplaced,
also "*P*" *dilpa* should be "*D*."

INTRODUCTION.

In the present memoir, the determination and description of the Leafhoppers collected by Prof. Koebele and Dr. Perkins, and partially discussed in the ninth part of Bulletin I, are now completed,— together with those found by Mr. Muir in the Fiji Isles, as well as two interesting forms from China.

In the former contribution, 85 genera and 212 species were erected as new, while 58 genera (and subgenera), and 175 species (and varieties) are now added, a total of 143 genera and 387 species, making a considerable increase in our knowledge of Australo-Fijian Leafhoppers, as almost all of the new forms are from these countries. At the same time, it must be insisted that these form but a small proportion of the total Leafhopper Fauna of the Countries mentioned.

The Australasian (*) Region seems to embrace four sub-regions:

1. The AUSTROMALAYAN (or Papuan), including that of the same name of Wallace, but extending to include the tropical forest of Queensland, New Caledonia and adjacent islands as far as the Fijian Archipelago.
2. The EURONOTIAN (or Bassian), including the Southeastern third of Australia and Tasmania.
3. The MAORIAN, including New Zealand and adjacent islands.
4. The WESTRALIAN, or West Australia.

Nothing is known of the indigenous Hemiptera of Tahiti, Samoa, the Tuamotus, &c., but they are probably a mixture of various faunas. The Hawaiian Archipelago forms an unattached subregion of great antiquity. From the little that is known of them, the Carolines and Marshalls and perhaps the Mariannes, belong to the Austromalayan.

* I prefer this name of Huxley's to the usual "Australian" of authors. It is very confusing to term the whole Region 'Australian,' as one can then not understand readily whether the mainland, or the region as a whole, is intended.

I think therefore that Wallace's "Polynesian" Subregion should be rejected.

Celebes is usually included in the Papuan, but is perhaps, at present, best regarded as an unattached subregion.

The Fijian Isles seem to have a well marked affinity with New Guinea and the neighboring groups, or with the first of the following Australian.

The Australian Continent seems to possess four principal faunas:

1. The tropical forest, an impoverished extension of the Austromalayan, little known, and producing such forms as *Neomelicharia*, *Ancipo* and some fine Derbidae.

2. Eucalyptus-Forest, characterized by *Eurymela*, *Eurinopsyche* and *Platybrachys*. This is typical of the Euronotian.

3. Western Australia, which stands apart from the others.

4. Grass-lands and coast lands, probably typical in another way of the Euronotian, and characterized by common-place *Deltocephalus* and *Asiracidæ*.

In the habitats, "K" stands for Prof. Koebele, "P" for Dr. Perkins, and "M" for Mr. Muir.

Mr. Muir's researches in Fiji were confined to Viti Levu. *Suva* is on Suva Bay in the Southeastern part; *Nasua* on the river of the same name in the South-central; *Rewa*, on the Rewa river, a little east from Suva, and *Ba* (=Mba) on the Ba River in the northwest.

An expression of appreciation is due to Mr. W. E. Chambers, who has enriched this memoir with more than three hundred figures. No work on Hemiptera has previously appeared, in which such careful and detailed drawings of genitalia are given, affording characters which are the final arbiters of "species" in certain groups.

BIOLOGIC NOTES.

STRIDULATION.

In my first memoir (p. 285) it was stated that though *Permsiella saccharicida* had often been heard to stridulate distinctly, by the Entomologists of this Station, researches on the phenomenon had not yet been made.

On his return from Fiji, Mr. Muir handed me the following notes, upon which it is scarcely necessary to enlarge:

"One hot, still morning, when collecting in Fiji, my attention was attracted to a small palm, from which a distinct noise of insects stridulating proceeded. I found the underside of the leaves covered with hundreds of a small red leafhopper (*Muiria stridula* Pl. 20 figs. 10-13). Their tegmina and wings were erected above the back and occasionally gave one or two rapid movements; sometimes the abdomen was jerked up and down. I recognized it as similar to one I had taken in Natal some years ago, in which the wings were exceedingly small and used entirely as stridulating organs. Upon examination I found the wings in the present species were likewise used for that purpose. The tegmina are about 6 mill. long, whilst the wings are only half a millimetre, the anal lobe being larger than the rest of the wing, thickened and corrugated on the hind margin of the upper side.

"The costal margin is turned over and catches into a fold along the margin of the tegmina; by this means it moves with the tegmina. The corrugated surface is opposed to the anterior angles of the abdomen where there are several white bristles situated.

"In another, (*Proutista mocsta* Pl. 20 figs. 8-9) from Java, the tegmina are about $5\frac{1}{2}$ mill. long and the wings 3 mill., the anal area larger in proportion to the rest of the wing and corrugated on the upper side.

"In another, (*Pyrrhoncurea saccharicida* Pl. 20 figs. 6-7), from Fiji, the tegmina are about 4 mill. long and the wings 3 mill. the broad edge of the anal area being corrugated. The corrugations thin out gradually on each side, and one can see that

they are only a prolongation and intensification of the minute corrugations that border the hind margin of the wing from the end of the costal margin to the base of the wing.

"In another, (*Lyricea imthurui*, Pl. 20 figs. 3-5), from Fiji, the proportional size of the tegmina to the wings is more normal, about $7\frac{1}{2}$ to $5\frac{1}{2}$, and the anal areas of the latter are normal, bearing a strongly corrugated patch near the basal edge.

"Upon examining the anal area of the wing of *Perkinsiella saccharicida*, an enlarging of the corrugation along the basal portion of the edge can be seen. I am in doubt if this could be the means by which they produce the sound."

(Pl. 20 figs. 1-2 represents the wings of *Pyrrhoneura citharista*). Mr. Muir, also, before leaving for the Orient, left me some mounts of tegmina and wings, from which Pl. 20 figs. 1-9 have been made.

I have examined a considerable amount of material and find the stridulatory area developed as follows:

In most of the Derbidae and in some Asiracidae, this structure is present, in both sexes. I cannot find it in any other Auchenorrhynchi, nor in those Asiracids in which the wings are rudimentary.

Since my last memoir, Froggatt has published "Australian Insects" (1907), in which there are short biologic notes on several Homoptera.

CLASSIFICATION.

I have nothing to add to my general remarks on the distinctness of the Fulgoroidea, and their high place in the system. I think however that the Cicadoidea and Tetigonioidea should be merged, for although the former are less allied to any of the families of the latter, than these are among themselves, yet the general structure is fundamentally similar.

The system of the Auchenorrhynchi now adopted is as follows:

Superfam. 1 Cicadoidea

Fam. 1 Cicadidae

Fam. 2 Cercopidae

Subfam. 1 Cercopinae

2 Machaerotinae

Fam. 3 Tetigoniidae (embracing 10 provisional tribes, viz.: Ledrini, Stenocotini, Eurymelini, Phrynomorphini, Eupterygini, Cephalellini, Iassini, Macroceratogoniini, Penthimini and Tetigoniini).

Fam. 4 Membracidae

Superfam. 2 Fulgoroidea

Fam. 1 Poekillopteridae

Subfam. 1 Lophopinae

Subfam. 2 Tropiduchinae

(Tribes Tropiduchini and Tambiniini)

Subfam. 3 Ricaniinae

(Tribes Ricaniini and Bladinini)

Subfam. 4 Poekillopterinae

(Tribes Poekillopterini and Phalaenomorphini)

Subfam. 5 Tenginae

Fam. 2 Issidae

Subfam. 1 Issinae

(Tribes Caliscelini, Issini)

Subfam. 2 Amphiscepinae

Subfam. 3 Eurybrachyinae

Fam. 3 Tetigometridae

Fam. 4 Fulgoridae

Subfam. 1 Cixiinae

(Tribes Cixiini, Achilini, Dictyophorini)

Subfam. 2 Fulgorinae

(Tribes Fulgorini, Omalocephalini, Aphaenini)

Fam. 5 Asiracidae

Fam. 6 Derbidae

(Tribes Derbini, Nisiini).

This is however merely tentative, as our knowledge of most groups is still extremely superficial, and nothing satisfactory can be done, till the nymphal instars of many species are described and figured.

There is no need to furnish characters again, separating the Fulgoroidea from the Cicadoidea, and the various families, and other divisions, are separated tabularly further on in their several places.

In my horismology, I have substituted "brachial" for "cubital," for the name of the third main vein arising from the apex of the basal cell, as there can be no doubt what "brachial" is, while there is much difference of opinion as to what "cubital" is. Melichar for instance, terming "cubital" what I call "basal stem of the radiomedian."

LIST OF SPECIES.

The following are the new or notable genera and species etc., described in the following pages: (*) signifies that the nymphs are noted or figured.)

Fam. Cicadidae.	<i>Eogypona</i> *
<i>Cicadetta tympanistria</i> , sp. n.	<i>Rhotidus</i> * <i>stali</i> (n. n.)
Fam. Cercopidae	<i>Idiocerus kisseis</i> , sp. n.
<i>Nesaphrestes</i> , g. n.	<i>I. nymphias</i> , sp. n.
<i>N. dreptias</i> , sp. n. *	<i>I. oreias</i> , sp. n.
<i>N. ptysmatophilus</i> , sp. n.	<i>I. orodemnias</i> , sp. n.
<i>Nesaphrogeneia</i> , g. n.	<i>I. xantho</i> , sp. n.
<i>N. vitiensis</i> , sp. n.	<i>I. hyleorais</i> , sp. n.
Fam. Tetigoniidae	<i>I. cupido</i> , sp. n.
<i>Stenocotis dimorpha</i> , sp. n.	<i>I. napais</i> , sp. n.
<i>S. reticulata</i> , sp. n.	<i>I. aulonias</i> , sp. n.
<i>Smicrocotis sidnica</i> , sp. n.	<i>I. nereias</i> , sp. n.

- Eurymelias*, g.n. (*hyacinthus*)
Ipo pompais, sp. n.
Macropsis oeroe, sp. n.
M. thymele, sp. n.
M. thya, sp. n.
M. thoantias, sp. n.
Alseis, g. n.
A. osborni, sp. n.
Epipsychidion epihyropis
Oncopsis bulli, sp. n.
Aceratagallia, g. n.
 (*sanguinolentus*)
Agalliopsis, g. n. (*novellus*)
Eurinoscopus hamadryas, sp. n.
Hybrasil, g. n.
H. brani, sp. n.
Dryadomorpha lotophagorum,
 sp. n.
Tortor, g. n.
T. daulias, sp. n. *
Tartessus idyia, sp. n.
T. itonias, sp. n.
T. issa, sp. n.
T. io, sp. n.
T. iambe, sp. n.
T. ianthe, sp. n.
T. ianassa, sp. n.
T. ianeira, sp. n.
T. iokaste, sp. n.
Iberia, g. n. (*bolivari*)
Thymbris, g. n.
T. inachis, sp. n.
T. iphianassa, sp. n.
Putoniessa, g. n.
P. dignissima, sp. n.
Xestocephalus vitiensis, sp. n.
X. pallidiceps, sp. n.
X. p. var. *contortuplicatus*, n.
X. p. var. *decemnotatus*, n.
X. australensis, sp. n.
X. purpurascens, sp. n.
X. sidnicus, sp. n.
Eutettix melaleucac, sp. n.
Deltoccephalus lotis, sp. n.
D. polemon, sp. n.
D. histrionicus, sp. n.
D. lucindae, sp. n.
Conosanus chlorippe, sp. n.
C. hospes *
Soracte, g. n.
S. apollonos, sp. n.
Nephotettix eurytus, sp. n.
Limotettix filicicola, sp. n.
L. tachyporias, sp. n.
L. capitatus, sp. n.
Thamnophryne, g. n.
T. nysias, sp. n.
Driotura aristarche, sp. n.
Allygus lotophagorum, sp. n.
Lonatura austrina, sp. n.
Nesosteles dryas, sp. n.
N. aurantiigera, sp. n.
N. phryne, sp. n.
N. chloe, sp. n.
Apheliona, g. n. (*bioculata*)
Cicadula hyadas, sp. n.
C. euryphaessa, sp. n.
C. vitiensis.
Erythroneura sidnica, sp. n.
E. doris, sp. n.
E. lalage, sp. n.
E. leucothoc, sp. n.
E. rezwana, sp. n. *
Dialecticopteryx, g. n.
D. australica, sp. n.
Paradorydium brighami, sp. n.
 (subg. *Deltodorydium*, n.)
P. ovidii, sp. n.
Tharra kalypho, sp. n.
T. ogygia, sp. n.
T. kassiphone, sp. n.
T. nausikaa, sp. n.

- T.* sp? *
Muirella, g. n.
M. oxyomma, sp. n.
Vulturinus vulturinus
V. vulturina, sp. n.
V. virgidemia, sp. n.
V. vanduzeei, sp. n.
V. vultuosus, sp. n.
V. vaudulcis, sp. n. *
V. vappa, sp. n.
Leucopepla, g. n.
 (*bituberculata*)
Syringophora, g. n. (*brevis*)
Cymbalopus, g. n.
 (*bigibbosa*)
 Fam. Membracidae
Zanophara leda, sp. n.
Z. albovittata, sp. n.
Acanthuchus iasis, sp. n.
A. euryone, sp. n.
A. eurynomus, sp. n.
 Fam. Poecillopteridae
Eodryas, g. n. (*melichari*)
Dolia, g. n. (*walkeri*)
Astorga saccharicida *
Siphanta granulicollis
S. acuta *
Thanatochlams, g. n.
T. tristis, sp. n.
 Fam. Issidae
Apsadaroptyx, g. n.
 (*elongatulus*)
Phaeopteryx, g. n.
P. sidnicus *
Orinda, g. n. (*lucindae*)
Chlamydoptyx, g. n.
C. eurobium, sp. n.
Tylana dyakana, sp. n.
 Fam. Fulgoridae
Oliarus lilinoc, sp. n.
O. tasmani
O. lubra var. *vitiensis* n.
O. saccharicola, sp. n.
U. melanesica, sp. n.
Urvillea, g. n.
Nesocharis, g. n.
N. kalypto, sp. n.
Myndus vitiensis, sp. n.
Leirioessa, g. n.
L. tortricomorpha, sp. n.
L. vitiensis, sp. n.
Leptochlamys, g. n.
L. compressa, sp. n.
Dysthecatias, g. n.
D. beecheyi, sp. n.
D. b. var. *fuscata*, n.
Australoma, g. n.
A. austrina, sp. n.
Quirosia, g. n.
Q. vitiensis, sp. n.
Phenelia sub. *Nephelia*, n.
F. (N.) *bicuneata*, sp. n.
F. (N.) *tristis*, sp. n.
Callinesia, g. n.
C. pulchra, sp. n.
C. ornata, sp. n.
C. venusta, sp. n.
C. pusilla, sp. n.
Callichlamys, g. n.
C. muiri, sp. n.
C. undulata, sp. n.
 Fam. Asiracidae
Ugyops vitiensis, sp. n.
Melanesia, g. n.
M. pacifica, sp. n.
M. p. var. *strigata*, n.
Criomorphus australiae, sp. n.
Dicranotropis anderida, sp. n.
D. aristoxenus, sp. n.
D. muiri, sp. n.
Purohita arundinacea
Leimonodite, g. n. (*beckeri*)
Perkinsiella sinensis, sp. n.
P. pseudomaidis *

- P. graminicida* *
P. saccharicida *
P. viticensis *
Hadeodelphax persephone, sp. n.
H. pluto var. *pallidior*, n.
D. dryope, sp. n.
D. ochrias, sp. n.
D. matanitu, sp. n.
D. disonymos, sp. n.
D. hyas, sp. n.
D. granor, sp. n.
D. kolophon, sp. n.
D. kaha, sp. n.
D. anemonias, sp. n.
D. pylaon, sp. n.
D. albostristriatus, sp. n.
Tropidocephala dryas, sp. n.
T. hamadryas, sp. n.
Anectopia, g. n.
A. mandane, sp. n.
A. igerna, sp. n.
Haplodelphax, g. n.
H. iuncicola, sp. n.
H. naias, sp. n.
H. curonotianus, sp. n.
Megamelus proserpina, sp. n.
M. persephone, sp. n.
M. sponsa, sp. n.
"Delphax" thyestes, sp. n.
D. ordovix, sp. n.
D. parysatis, sp. n.
D. ostorius, sp. n.
D. lazulis, sp. n.
D. leimonias, sp. n.
D. astyanax, sp. n.
D. algebra, sp. n.
P. dilpa, sp. n.
- Proctrosydne*, g. n.
P. arborea, sp. n.
Stenocranus pacificus, sp. n.
S. agamopsycha, *
Saccharosydne, g. n.
S. saccharivora *
 Fam. Derbidae
Sura koebele
Basilcocephalus thaumatonotus
Phaciocephalus nesogonias,
 sp. n.
P. nesodreptias, sp. n.
P. miltodias, sp. n.
P. pullatus, sp. n.
P. minyrias, sp. n.
Thyrocephalus leucopterus
Rhotana halosydne, sp. n.
Niphadodite, g. n.
N. insulicola, sp. n.
Pyrhoneura saccharicida
P. citharista, sp. n.
P. (Nesoneura subg. n.)
P. (N.) viticensis, sp. nov.
Nesocore, g. n.
N. fidicina, sp. n. *
I. yricen, g. n.
L. imthurni, sp. n.
Protista lumholtzi
Nesoniphas, g. n.
N. insignissima, sp. n.
Philadelphcia pandani
Muiria, g. n.
M. stridula, sp. n.
Phantasmatoecra arborea
Nesophantasma, g. n. (*viticensis*)
Stoezeyia lyricea
Sikaiana nesiope, sp. n.

Superfamily CICADOIDEA.

This, after renewed investigation, appears to include the Tetigonioidae, thus embracing four families, which are distinguishable in the imago state as follows:

1. Three subcontiguous ocelli; sensory organs on the two basal segments of antennal flagellum very numerous; fore femora incrassate; no arolia; abdomen in the males with a sonorous apparatus on each side; venation very characteristic, tegmen typically with 5 "discoïdals" and 8 apical veins, which occupy its greater part.....1 Cicadidae

1a Two ocelli, sometimes functionless; only a few sensory organs on the basal segments of antennal flagellum; fore femora rarely incrassate; arolia large.....(2)

2 Antennal flagellum composed of a large subpyriform basal segment and a slender seta; hind tibiae with one or two strong spines..... 2 Cercopidae

2a Antennal flagellum composed of numerous segments; hind tibiae unarmed; or if spined, almost always with more than 2 strong spines; usually seriatly bristly.....(3)

3 Genae more or less dilated; pronotum never prolonged backwards 3 Tetigoniidae

3a Genae not or scarcely dilated; pronotum prolonged backwards in a process (except in a few forms of dubious position) 4 Membracidae

The ova are usually, (perhaps always), in all these families, inserted in slits made in twigs or leaves.

The families may be distinguished in the nymphal stages (or at least the ultimate) temporarily as follows: (there are never any ocelli, nor are there special sensory organs on the antennae, head or abdomen, etc.):

1 Frons with very numerous, closely set bristles in the middle; antennae with about 9 segments, decreasing in size from the basal one. Fore femora enormously incrassate, with one or more large spines beneath; fore tibiae raptorial, with spines or large tubercles beneath; fore tarsi with 2 segments, the first annuliform, arising at about two-thirds of the length of the tibia and directed backwards, second segment long, slender, cylindric, with 2 uneven claws. Fore coxae not shorter than femora. No arolia. Middle and hind tarsi with 2 segments, first very short1 Cicadidae

1a Frons not bristly. Fore femora rarely incrassate, not spined beneath; fore tibiae not raptorial; fore tarsi bisegmentate, of varying proportions, the basal segment arising from the apex of the tibia; 2 subeven claws. Fore coxae shorter, generally very

much shorter, than femora. Arolia present. Middle and hind tarsi never foliaceous (except the head and perhaps the legs....)(3)

2 Dorsal surface more or less closely granulated, of very varying form, often foliaceous.....3 Membracidae.

2a Dorsal surface not granulate. General form of the adult, never foliaceous (except the head and perhaps the legs....)(3)

3 Legs not spined or bristly. Antennae with 7 to 9 well marked, subcylindric, segments4 Cercopidae

3a Legs nearly always bristly. Antennae usually nearly as in the adults2 Tetigoniidae

The Cicadidae are on the whole the most primitive of the Cica-doidea, despite the specialization of the sonorous organs in the males. Their undeserved elevation to the front of the Homoptera is due to the latter circumstance and to their, usually, larger size. Their primitiveness is displayed in their general form, and especially in the structure of the antennae in all stages, approaching in this the Heteroptera. The three other families are rather more closely allied among themselves than to the Cicadidae; in the nymphs, the antennae of the Cercopidae approach the condition of the Cicadidae, but are perhaps a little more specialized in the adults than they are in the adult Tetigoniidae. In the latter, the legs are almost always more specialized than in the Cercopidae, which, on the whole, may be accorded the lower rank. The Membracidae are simply specialized Tetigoniidae, by way, probably of forms like *Agallia*.

Most authors persist in estimating the Membracidae as a very distinct group. Fowler (1894 Biol. Centr. Amer. Hom., II, p. 1) says, for example, "The Membracidae, as a whole, form one of the most distinct and unmistakable groups of all insects." How little this is the case is shown by the fact that today the systematic position of *Ulopa*, *Aethalion* and others is disputed, while Fowler himself referred the Eurymeline *Gargaropsis* (a synonym actually of *Bythoscopus*) to the Membracidae. A little, fantastic, development of the pronotum and minor changes in the head and legs are almost all that are necessary to change an *Oncopsis* into a Membracid. The earlier nymphs of such Membracids as *Entylia* are essentially Tetigoniine in form and structure.

It may be useful to repeat that these 4 families, Cicadidae, Cercopidae, Tetigoniidae and Membracidae are closely related, and that it is very absurd to separate the first from the other three, as do most authors, by the Fulgoroidea; while still more absurd

is the usual order of Cicadidae, Membracidae, Fulgoroidea, Cercopidae, Tetigoniidae.

Cicadidae.

The Cicadidae have been divided by Distant into three sub-families, characterized by the tympanal coverings, but the divisions do not seem natural, the Cicadidae being in fact remarkably homogeneous.

(A). Australian Species.

As previously remarked, the Australian Cicadidae were discussed by Goding & Froggatt (1904 P. Linn. Soc. N. S. Wales XXIX, 561-670, Pls. XVIII-XIX) ; since then a number of supposedly new genera and species have been described by Distant and enumerated in his "Synonymic Catalogue of Homoptera. Part I Cicadidae" (1906, pp. 1-207). The Australian forms added since Goding & Froggatt's Monograph are as follows:

- 1 *Macrotristria nigronervosa* Distant 1904 A. M. N. H. (7) XIV 329..... Queensland
- 2 *Cicada graminea* op. c. 428..... Queensland
- 3 *Dundubia vaginata* (Fabr.) [= *mannifera* Stal]
(*Tettigonia vaginata* Fabr., 1787 Mant. Ins. II 266), said to be from Australia as well as India and the Malayan Region, but doubtfully correctly.
- 4 *Abrieta elseyi* Distant 1905 A. M. N. H. (7) XVI, 281
..... North Australia.
- 5 *A. castanea* op. c., 27..... North Australia.
- 6 *A. burgessi* op. c., 28..... Queensland.
- 7 *Burbunga inornata* op. c., 29..... W. Australia.
- 8 *Gudanga boulayi* op. c., 208..... do.
- 9 *Cicadetta waterhousei* (*Melampsalta*) op. c., 271.....
..... S. Australia.
10. *C. lactea* (M) l. c..... Victoria.
- 11 *C. issoides* (M) op. c., 272.....
..... New South Wales, W. Australia.
- 12 *C. montrouzieri* (*Birrima*) op. c., XVII 388
..... New South Wales.
- 13 *Pauropsalta stigmatica* 1905, op. c., XVI, 273.. S. Australia.
- 14 *P. dameli* l. c. .

- 15 *Urabunana segmentaria* op. c., 274. Queensland.
 16 *Cyclochila virrens* 1906 Entom., XXXIX 148. . Queensland.
N. B. C. australasiae var. *spreta* God. & Frogg. was omitted in Mr. Distant's Catalogue.

(b). Fijian Species.*

Only four species have been noted by Distant, and I can add only 3, (2 from my own collection), one of which, however, is new.

- 1 *Cyclochila australasiae* (*Tettigonia*) Donovan 1805 Ins. New Holland, Hem. Pl. 2, f. 1; a large male, expanding 120 mm. (in my collection). (**)
- 2 *Macrotristria angularis* (*Cicada*) Germar 1834 Rev. Ent. II, 68; a large male, expanding 131 mm., with dark ferruginous frons (in my collection). (**)
- 3 *Cicada kuruduadua* Distant 1881 Tr. E. S. London 645; Waterhouse 1882 Aid ident. Ins. I, Pl. C.
- 4 *Sawda* (?) *vitiensis* Distant 1906 Entom XXXIX, 12. (*Sawda* is probably not distinct from *Cosmopsaltria*).
- 5 *Dicropyga distans* (*Dundubia*) Walker 1858 List. Hom. Suppl. 10 (= *subfascia* (*Dundubia*) op. c., 11), recorded from Ovalau by Walker; 2 males and 1 female, the largest expanding 92 mill., taken at Rewa (March) by Mr. Muir.
- 6 *D. stuarti* (*Cosmopsaltria*) Distant 1882 Pr. Zool S. London 125 Pl. VII, f. 2;

Mr. Muir has taken 2 males at Rewa (March), which differ from Distant's descriptions as follows; they are 37 mill. long to the apex of the tegmen and expand 72 mill. being thus much larger; the frons is not so much produced basally as in Distant's figure, and (as somewhat shown in Distant's figure) the opercula do not nearly reach two-thirds of the length of the abdomen. Further, judging again by the figure, the opercula are less divergent during their first half, interiorly, and then more obliquely rounded.

* I employed the terms "Viti" and "Vitian" in my first memoir, but Dr. Brigham assures me that "Fiji" and "Fijian" are the correct terms to use.

** Mr. Froggatt, who has examined these specimens, doubts very much that they came from Fiji.

Cicadetta Kolenati.

This is a large genus of about one hundred described species, about three-fifths belonging to the Australasian Region. The following species is the first recorded from the Fiji Isles, and is the seventh Fijian Cicadid.

1. *tympanistria* sp. nov.

Pl. I, figs. 1-3.

Male. Ochreous; ocelli narrowly and incompletely margined with black. Eyes dark purplish brown. Pronotum with a median stripe and the hind margin yellow; six wedge-shaped black spots, the lateral ones rather irregular. Mesonotum a little embrowned, with 3 irregular black suffusions, the middle one somewhat dumb-bell shaped, with an incomplete yellowish-brown line down its middle; tufted posteriorly with golden yellow hair. Cruciform elevation yellow, the ends of the arms more or less fuscous. Metanotum yellow. Tegmina and wings milky hyaline, venation dark fuscous except the costal, subcostal, and sutural veins of the former which are yellowish green. The base and sides of the first tergite black, rest of this, the 2nd and 3rd (the latter narrowly dark apically) and basal half of 4th, yellow, the rest more or less fuscous. The whole of the underside luteous except as follows: antennal whip more or less fuscous; labium, tibiae and tarsi greyish-yellow; spines on fore femora black-tipped; sides of first sternite widely fuscous; apical three-fourths of abdomen purplish fuscous. Vertex rather flat, scarcely prominent before the eyes, about as wide between the eyes as the width of an eye. Frons rather narrow, scarcely as wide at base as the tempora together. Labium reaching just beyond middle coxae. Pronotum widening sublaterally posteriorly, not toothed laterally. Fore femora with three spines, the 1st the longest. Opercula oblique, narrow, at least twice as long as wide, subconstricted medianly externally, not reaching to the apical margin of the first sternite. Metasternum produced medianly in a small subvertical plate. Medioradial stalk elongate, completely fused, about as long as its first inferior branch; first apical cell a little longer than the second. Pygopher elongate, transversely striate.

Length to apex of abdomen 11 mill., expense of tegmina 30 mill.

Hab. Fiji, Rewa. (M).

The colouring, venation and opercula separate this from any *Cicadetta* known to me. It has an additional peculiarity in that the membranal appendix to tegmina and wings is of the slightest possible description, being visible only where the cells in meeting apically are very slightly notched.

Cercopidae.

The nymphs have, in all the forms I have seen, spineless and bristleless legs.

Since my first memoir, I have acquired a copy of Westwood's "Notice of a tube-making Homopterous insect from Ceylon" (Tr. E. S. London 1886 pp. 329-33. Pl. VIII), from which the systematic position of the remarkable *Machacrota* is recognizable. It is evidently closely allied to *Polychactophyes* and *Pectinariophyes*. I cannot recollect the exact appearance of *Hindola*, of which I have now no specimens for reference. This is the same as the preoccupied *Carystus* of Stal, and I do not think that the Swedish author would have placed *Carystus* and *Machacrota* in different subfamilies if the former had been the same as *Polychactophyes*. I cannot recognize Stal's subfamilies, the characters he uses to differentiate the 'Cercopinae' from the 'Aphrophorinae' being to me of little value for that purpose. Two subfamilies are here accepted, and are separable as follows:

- 1 Subcostal vein of wing forked about the middle (or basal of that), so that there is a "supernumerary" cell. [Pl. I, fig. 4]. Nymphs, so far as known, living in their own frothy secretion. *Cercopinae*.
- 2 Subcostal vein not forked, so that there is no supernumerary cell; veins united near the apical margin. [Pl. I, fig. 5]. Nymphs forming calcareous cases. *Machacrotinac*.

Cercopinae.

The Australian and Fijian genera are disposable as follows, more for convenience than as an expression of their relationships:

- 1 Anterior margin of pronotum rounded. (2)

- 1a Anterior margin of pronotum straight.....(6)
 2 Head strongly narrowed near the base, elongate, subascendant.5 *Philagra*
 2a Head not longer than wide across the eyes, not suddenly narrowed.(3)
 3 Tegmina very convex, little longer than broad..4 *Bathyllus*.
 3a Tegmina little convex, at least twice as long as broad..(4)
 4 Vertex and pronotum carinate.....1 *Cercopis*.
 [=*Aphrophora*].
 4a Vertex and pronotum not carinate.....(5)
 5 Tegmina with level surface, pubescent, not punctured..... 2 *Eurycercopis*.
 5a Tegmina irregularly raised and depressed, not pubescent, but very closely punctured.....3 *Nesaphrestes*.
 6 Ocelli nearer to one another than to the eyes.....(7)
 6a Ocelli not nearer to one another than to the eyes..... 11 *Cosmoscarta*.
 7 Frons sulcate.(8)
 7a Frons not sulcate.....(11)
 8 Posterior margin of pronotum medianly truncate..... 7 *Aufidellus*.
 8a Posterior margin of pronotum emarginate.....(9)
 9 Pronotum somewhat hairy, with 8 callous spots along the anterior margin.8 *Pctyllis*.
 9a Pronotum with not more than two callous spots.....(10)
 10 Tegmina subopaque, pale, yellowish-brown, veins broad and clearly marked.9 *Aufiterna*.
 10a Tegmina opaque, coriaceous, black and red, veins narrower, more obscure.10 *Euryaulax*.
 11 Scutellum longer than wide.....
 12 *Tomaspis* (two Walkerian species).
 11a Scutellum equilateral13 *Nesaphrogeneria*

Nesaphrestes gen. nov.

Allied to *Clorvia*, but the clypeus is longitudinally carinate, generally strongly, and the tegmina are much narrower. I have no examples of *Clorvia* now to examine, but comparing with the rather poor figure of *C. birarensis*, Kirkaldy (in Tr. E. S. London 1905, Pl. XVII, f. 3,) the pronotum in *Nesaphrestes* is acute-angularly emarginate posteriorly, also the brachial vein of the wing forks between the cross-vein and the apex, (not at the cross-vein), and there are 4 apical cells in the teg-

men. Also allied to *Eurycceropsis*, but the tegmina are unevenly impressed (principally longitudinally and along the subcosta), and are finely and closely punctured. Type *muiri*. There are two species, distinguished by the size, colour, &c.

1. *dreptias* sp. nov.

Vertex, pronotum and scutellum pale yellowish-brown, suffused and transversely barred, brokenly and irregularly, with darkish fuscous, or irregularly suffused; posterior angle of scutellum pale yellowish-brown. Frons ventrally pale yellowish-brown, with curved concentric dark fuscous lines radiating from a median pale yellow line and practically attaining the lateral margins. Apical third of frons, the clypeus, lora coxae, sterna in part laterally, apical segment of labium pleurites, &c., blackish. Tegmina coriaceous, fuscous, darker on the corium, a spot on the extero-lateral margins near the apex, and the apical and subapical veins, whitish. Fore and middle femora blackish-brown, pale at the apex, hind femora blackish brown; tibiae dark fuscous, annulate or marked with brownish-testaceous.

Female. Pygophor pale beneath, ovipositor dark.

Length 8-9½ mill.

Hab. Viti Levu, Rewa (March, Muir's No. 165), on a native tree "in the bush."

Nymphs pale testaceous, hind tibiae polished, spineless. Probably live in their own secretion.

2. *ptysmatophilus* sp. nov.

Brownish-ochraceous; face, pro- and mesosterna laterally, and tergites mostly, blackish; antennae ochraceous; sometimes a faint pattern of radiating lines on frons towards the lateral margins. Tegminal veins pale yellowish or yellowish-fuscous. Exterior half of basal third of corium suddenly and angularly narrowing on the middle third of exterior margin, blackish, a fuscous spot in the fourth apical cell. Legs yellowish-testaceous, fore and middle femora dorsally blackish-brown in the middle, fore and middle tibiae blackish-brown apically and basally.

Male. Sternites blackish, genital segments ochraceous.

Female. Pygophor ochraceous, ovipositor blackish.

Length (male) 5½-(female) 7¼ mill.

Hab. Viti Levu, Rewa (Mar.-Apr., M.).

Nesaphrogeneria gen. nov.

Allied to *Locris*, but is very feebly, if at all, carinate on the frons, and the pronotum is angularly emarginate at the base medianly. The head dorsally is much more obtusely and roundly angulate anteriorly. Pronotum and tegmina rugosely-punctured, apical three-fourths of the former and the head strongly declivous. Wing venation similar to that of *L. vestigans* and *amauroptera* as figured by Breddin.

1. *vitiensis* sp. nov.

Head, pronotum anteriorly, scutellum and body beneath, pale yellowish-brown; base of frons ventrally, antennae, last segment of labium dorsally, &c., dark fuscous or blackish-brown. Ocelli rubid. Rest of pronotum pale yellow. Tegmina pale yellowish-brown suffused with rosy, especially laterally and apically, with short, yellowish pubescence (especially on clavus); veins rosy, at least the lateral and apical ones; wing-veins dark fuscous. Legs pale yellowish-testaceous, tibiae more or less fuscous in part. Sternites more or less fuscate.

Length $5\frac{1}{3}$ mill.

Hab. Viti Levu, Rewa (Feb., Mar., M.)

Machaerotinae.

At the moment of going to press, I have received the first part of the 68th Vol. of the Stettiner Ent. Zeit., containing a review of this subfamily (*). The Australian genera may be disposed as follows:

- 1 Scutellum not sulcate; without an appendage.....(2)
 - 1a Scutellum sulcate with an appendage...3 *Pachymachaerota*.
 - 2 Vertex almost perpendicular, very short. Nymph cases elongate, subconical, more or less porrect, gradually widening from the base.....1 *Polychactophyes*.
 - 2a Posterior margin of head raised. Ocelli farther apart. Frons more swollen. Pronotum less declivous, and longer in proportion to head. Nymph cases smoother and slenderer2 *Pectinariophyes*.
- The first two have been omitted by Schmidt. In *Pachymachaerota* he places *Machaerota pugionata* and *signoretti* (=|| *pugionata* Sign.).

* E. Schmidt "Monographie der Subfamilie Machaerotinae Stal.....," pp. 165-200, figs. 1-8 (May, 1907.)

Tetigoniidae.

Further investigation has convinced me that the subfamilies proposed in my former memoir cannot stand. Search has failed to reveal any sharply limited characters to form subfamilies. There is complete gradation from *Tetigonia* to *Eurymela* in the position of the ocelli and in the form of the leg spines. *Eurymela* is remarkably Cercopoid, especially apparently as regards the spines of the hind tibiae, but there is a fundamental difference. The spines in the Cercopidae are apparently solid, direct projections from the leg, and have no value for springing purposes, while in *Eurymela* and other allied forms, in which there are strongly developed, solid-looking spines, each of these always emits a hollow bristle, which is of value for springing in proportion to its length and to the number on the leg. The bristles in the more typical Tetigoniidae are also hollow and not direct productions of the leg, but socketed. The difference between the spines of *Tetigonia* and *Eurymela* is that in the former, the socket is small, the bristle long; in *Eurymela* the socket is large and the bristle short. [Pl. XI, figs. 18-20.]

For convenience, the following tribes based on habitus, are temporarily retained. I do not feel certain that, compared with the divisions of the Fulgoroid families, the Cicadoidea ought not to be divided into 2 families, Cicadidae and Tetigoniidae, the latter forming three subfamilies, Tetigoniinae, Cercopinae and Membracinae, but such a question is of minor importance, so long as the relative values of the divisions are understood.

- 1 Legs always more or less spiny or strongly bristly....(2)
- 1a Legs unarmed or feebly bristly.....(10)
- 2 Ocelli on the dorsal part of the head, distinctly away from its anterior margin.....(3)
- 2a Ocelli (if present) on the margin between vertex and frons; or dorsally, practically contiguous with the margin; or on the ventral side of the head.....(6)
- 3 Spines on the hind tibiae usually feeble except on one edge where they are strong, with rather short bristles. Stout forms, the head usually more or less laminate.....1 Ledrini
- 3a Bristles on the hind tibiae strong and long, not spinose. (4)
- 4 Exterior discoidal area of tegmen undivided up to the apical cells; ocelli on the vertex anterior to the apical margin of the eyes 8 Macroceratogoniini
- 4a Exterior discoidal area divided, so as to form an apical cell (5)

- 5 Elongate forms; ocelli basal of the anterior margin of the eyes, on the vertex.....10 Tetigoniini
- 5a Stouter forms; ocelli apical of the anterior margin of the eyes, on the vertex (Gyponidae auctt)9 Penthimini
- 6 Vertex raised perpendicularly at the sides and base. Exterior discoidal area of tegmen undivided to the apical cells 7 Iassini
- 6a Vertex not raised at the sides and base. Exterior discoidal area divided (in the long winged forms at least).....(7)
- 7 Head exceedingly declivous; ocelli on the vertex ventral of the bend of the head; spines and bristles on hind tibiae somewhat diverse in different forms..... (Bythoscopidae auctt) 3 Eurymelini
- 7a Vertex usually more or less porrect; ocelli (if present) on the angular margin of the head.....(8)
- 8 Radial, median and brachial veins very obscure basally, (apparently springing independently from the basal cell or uniting close to it, except *Ancono* and *Dialecticopteryx*); ocelli absent or feeble.....5 Eupterygini
- 8a Venation normal (except in short winged forms, or if obscure, then so all over); ocelli on the angular margin of the head, or touching it dorsally, rarely obsolescent.....(9)
- 9 Vertex strongly emarginate basally, ocelli in pits on the angular margin; legs spiny.....2 Stenocotini
- 9a Vertex rarely much emarginate basally, ocelli never in pits, (or if so, then the legs bristly, not spiny) . . .4 Phrynomorphini
- 10 Head laminate or at least elongately produced. Venation degraded6 Cephalini (restr.)
- 10a Head never elongately produced, never laminate..... (incl. Kahavaluinae) 11 Megophthalmiini

Tribe Ledrini.

This tribe is nearly always characterized as having a foliaceous pronotum, owing to the fact that *Ledra* is the only European genus and that the tribe is not represented in North America. It is characterized by the more specialized legs and by the dorsal position of the ocelli, but is not altogether natural. Some forms, e. g., *Rhotidus*, have a very close resemblance to Phrynomorphine genera such as *Amnidion*, but are distinguished by the position of the ocelli.

Provisional Table of Genera.

1a	Head broadly laminate.....	(3)
2	Claval suture obsolete.....	1 <i>Sichaea</i>
2a	Claval suture distinct	2 <i>Titia</i>
3	Pronotum with the lateral margins acute-angulately projecting	(4)
3a	Pronotum not as above.....	(5)
4	Pronotum anteriorly in the middle and head, perpendicularly declivous	3 <i>Proranus</i>
4a	Pronotum and head a little declivous.....	4 <i>Tituria</i>
5	Eyes exteriorly margined by part of the vertex.....	5 <i>Betsileonas</i>
5a	Eyes not margined exteriorly.....	(6)
6	Hind tibiae dilated	(7)
6a	Hind tibiae cylindric.....	(10)
7	Pronotum with a compressed auriform process sublaterally	6 <i>Ledra</i>
7a	Pronotum normal	(8)
8	Vertex anteriorly truncate, basally with 2 flat, remote tubercles	7 <i>Oclasma</i>
8a	Vertex not truncate, without the tubercles	(9)
9	Pronotum declivous	8 <i>Platyhymna</i>
9a	Pronotum not declivous	9 <i>Ledromorpha</i>
10	Tegmina short	10 <i>Dusuna</i>
10a	Tegmina normal	(11)
11	Tegmina reticulate apically	(12)
11a	Tegmina not reticulate	13 <i>Ledropsis</i>
	14 <i>Confucius</i> , 15 <i>Rhotidus</i> , 16 <i>Rubria</i> .	
12	Pronotum laminately ridged	11 <i>Jukaruka</i>
12a	Pronotum not ridged	12 <i>Camptelasmus</i>

Distant has overlooked the fact that *Petaloccephala* is a synonym of *Camptelasmus*.

In the "Homoptera-Fauna von Ceylon," Melichar refers *Gypsona striata* Kirby to *Sica* (= *Krisna*), and *G. prasina* Walker to *Acropona*, both Phrynomorphine genera. I cannot now refer to the types, which are presumably in the British Museum, but it was on a cotype of the former and a compared example of the latter, that I founded my genus *Eogypsona* (1901 Entom. XXXIV, 38, inexplicably treated by Melichar as unpublished!) apparently a synonym of *Camptelasmus* (= *Petaloccephala*), previously having renamed *G. striata*, "kirbyi," and *G. prasina*, "walkeri," on

account of their preoccupation.

Moreover, I do not think Melichar has correctly referred *Ledropsis*. I have not seen the types, but I believe that *Rhotidus* and *Rubria* are synonymous with this, or very closely allied. The nymphs of *Eogypona* (= ? *Camptelasmus*) and *Rhotidus* (= ? *Ledropsis*) are very different. The former are very flat, laminately foliaceous, and exceedingly thin, while the latter are not unlike the adults.

Rhotidus (= ? *Ledropsis*).

The female ultimate sternite is very similar in all the species described by me. The posterior margin is slightly sinuate, with a small median notch which is almost obsolete in *ledropsiformis*. In *viridescens*, and *informis* it is obtuse-angled or somewhat rounded; in *horrendus* it is similar but more acute; in *monstrum*, *ingens* and *flavomaculatus* it is distinctly rounded.

Distant has described (1907 A. S. E. Belg. LI) :

13. *aequalis* op. cit. 193. Queensland, and has transferred here *Ledra teliformis*, *navicula* and *cuspidata* Walker. This preoccupies the "*Rhothidus navicula*" of Stal, from Queensland, which is obviously not that of Walker; for the Stalian species, I propose the name of *stali*.

Ledropsis

Distant has described :

1. *froggatti* op. cit., 192. New South Wales

Distant has also described :

Jukaruka (g. n.) *typica* op. cit. 190. Queensland

In the list of unknown Australian forms, I omitted *Rubria sidnica* (*Xerophloea*) Stal 1859 Eugenie's Resa. Ins. 288(Sydney.)

Tribe Stenocotini.

This tribe differs from the Ledrini only in the position of the ocelli, which are situated in elongate pits on the margin connecting the vertex and the frons, and by the great emargination of the vertex basally. I know only three genera, all Australian, which have been analyzed on p. 368 of my former memoir.

Stenocotis (*).1. *dimorpha* sp. nov.

Stenocotis planiuscula Kirkaldy 1906 Bull. H. S. P. A. Ent. I, Pl. XXV, figs. 4 and 8 (=male, net of Stal.).

Male. Whitish, tessellated with pale ferruginous and blackish-brown; frons pale with a longitudinal blackish median stripe widening out sometimes apically, sometimes basally. Underside and legs mostly black (hind tibiae sometimes brownish). Genital segments partly dark, partly pale. Tegmina hyaline, with the veins blackish and white alternately; the basal fourth blackish, closely spotted with testaceous and with some larger white markings; there is also a transverse dark band just apical of the middle. The apical veins are not reticulate.

Female. Pinkish-brown and yellowish-brown tessellated, or brownish and dark fuscous tessellated. Underside yellowish testaceous, nearly unicolorous. Tegmina nearly unicolorous (within range of ferruginous and yellowish) with semireticulate apical part. Ultimate sternite produced medianly, the produced part rounded posteriorly. Ovipositor much longer than the long pygophor which indeed extends distinctly beyond apex of tegmina.

Length 15 (male); 22-3 mill. (female).

Hab. Queensland, Bundaberg (Nov.) As it is just possible that these sexes do not belong to the same species, the male is selected as type.

N. B. In my former bulletin, p. 476, in the explanation of Pl. XXV, f. 4, for "female" read "male."

2. *reticulata* sp. nov.

Stenocotis planiuscula Kirkaldy, l. c., figs. 3, 6 and 7 (=female).

Females: like those of *S. dimorpha*, but with a slender longitudinal median blackish line on vertex; tegmina more reticu-

* Since this was in proof, I have received the 6th part of the A. S. E. Belg. LI (July 3, 1907) containing Distant's "Contributions to a Knowledge of the Ledrinac" (pp. 185-97.) He disputes my citation of *S. vittata* (=depressa Walker) and proffers instead *S. planiuscula*. I cannot accept this. In 1854 Stal founded *Stenocotis* for 2 species, *planiuscula* and *subvittata*. No type was mentioned and no comparison was made between the species. In 1856 Stal redescribed the genus and redescribed *subvittata*, figuring it. I hold that this fixes the type as *subvittata*; if not, *subvittata* is then the type, because I was the next author to deal with the genus and fixed it. The argument put forward by Distant, that *planiuscula* is the type because the first species mentioned by Stal, is worthless and inconsistent with Distant's own method in other cases. I was aware that Stal had cited *subvittata* as a synonym of *depressa* and quoted it as such on the next page, overlooked by Distant.

late apically. Pygophor almost as long as ovipositor, which is not longer than the tegmina.

Length 20 mill.

Hab. Queensland, Brisbane (June).

Distant has recently described.

S. nigrescens op. cit. 194, Queensland.

Smicrocotis.

1. *obscura*

Female ultimate sternite nearly truncate; pygophor almost as long as the ovipositor which scarcely extends beyond apex of tegmina.

2. *sidnica* sp. nov.

Similar to the type, but the vertex is very short, ascendant, rounded apically. Frons not longitudinally carinate in the middle. Pronotum not carinate. Testaceous (with a green tinge) tessellated with yellowish, pinkish-brown and blackish-brown. Face and sterna pale ferruginous-brown tessellated with blackish-brown and spotted with testaceous. Scutellum testaceous, tessellated with pinkish-brown. Tegmina hyaline tinged with cinereous, more or less feebly tessellated with dark and pale brown, veins pale ferruginous-brown, infusate in parts, not reticulate. Legs subsanguineous, spotted with testaceous, femora more or less marked with blackish brown. Abdomen below blackish brown (except the apical margins very narrowly).

Length (male) $7\frac{1}{2}$ mill.

Hab. New South Wales, Sydney, (Jan., K.).

This may be the male of one of the following species, but the non-carinate pronotum probably separates it.

Distant has described:

3. *pallescens* op. cit. 195, New South Wales.

4. *infusata* l. c., Queensland.

5. *projecta* op. cit. 196, New South Wales.

Kyphocotis.

1. *tessellata.*

Female: ultimate segment like that of *Stenocotis dimorpha*, ovipositor extending somewhat beyond pygophor and a little beyond apex of tegmina.

Distant has described:

2. *fasciata* op. cit. 196, Queensland.
3. *parva* op. cit. 197, Queensland.

Tribe Eurymelini.

Although there is no sharply-drawn character separating this from the Phrynomorphini, it is convenient to reserve it for those forms in which the ocelli are actually ventral, that is apical, of the angulation of the head. It is in some of these forms that the frons is strongly demarcated from the vertex, though of course the "suture" is a false one and really only a deep impression in the chitin. At first I thought that this would prove a divisional character, but unfortunately it is only specific.

Provisional Table of Genera.

Trocnada and *Eurymeloides* are too vaguely diagnosed to admit of insertion. *Igeria* is probably near *Pediopsis*, but I do not now know the nature of the striation on the pronotum.

Strongylomma and *Melicharella* are known only by their descriptions.

1	Ocelli absent	1	<i>Strongylomma</i>
1a	Ocelli present	(2)	
2	Tegmen with an appendix	(3)	
2a	Tegminal appendix absent, or if present, very minute and the head dorsally wider in the middle than at the sides (i. e. <i>Batracomorphus</i>)	(6)	
3	Tegmina hyaline; appendix entire	(4)	
3a	Tegmina coriaceous, or at least the veins very strong; appendix not reaching beyond about half the length of the apical cells	(5)	
4	At least one subapical cell in the tegmen	2	<i>Idiocerus</i>
4a	No subapical cells	3	<i>Pedioscopus</i>
5	Tegmina coriaceous, mostly dark with a white or coloured pattern, venation feeble	5	<i>Eurymelias</i>
	(= <i>Eurymeloides</i> Kirkaldy 1906, apparently not of Ashmead (*), type <i>hyacinthus</i> (Kirkaldy))		
5a	Tegmina subhyaline, dingily coloured, veins strong. . . .	4	<i>Ipo</i>

* Ashmead says "a double row of very weak spines," and cites no type.

- 6 A keel between the dorsal and ventral parts of the head6 *Melicharella*
- 6a No such keel(7)
- 7 Pronotum strongly striate obliquely(8)
- 7a Pronotum transversely striate, if at all (**).....(9)
- 8 Anterior margin of dorsal part of head almost rectangular; face flattish. (type *virescens*).....7 *Macropsis*
- 8a Anterior margin rounded; face convex (type *tiliae*)....
.....8 *Pediopsis*
- 9 Ocelli immediately at the base of the ventral part of the head9 *Epipsychidion*
- 9a Ocelli well on the ventral part.....(10)
- 10 Tegmina reticulate apically. Frons angulate in profile, as also clypeus. Hind tibiae with 2 or 3 strong spines. Last ordinary sternite (female) bipartite.....(11)
- 10a Tegmina not reticulate apically. Frons not angulate in profile, nor clypeus. Hind tibiae multispinulose. Last ordinary sternite (female) not divided.....(12)
- 11 Last ordinary sternite (female) reaching the lateral margins of the abdomen.....10 *Eurymelops*
- 11a Last sternite not nearly reaching the lateral margins.....
.....11 *Eurymela*
- 12 Lora not nearly touching the apical margin of the clypeus (13)
- 12a Lora practically touching the apical margin.....(14)
- 13 Frons separated basally; legs more or less specialized....
..... 12 *Alseis*
- 13a Frons not separated basally; legs normal.....
.....13 *Oncopsis*. (= *Bythoscopus* auctt; type *flavicollis*).
- 14 Frons separated basally. Antennae inserted in a feeble cavity, their bases free.....(15)
- 14a Frons not separated basally. Antennae inserted in a deep cavity, beneath a ledge.....(17)
- 15 Pronotum transversely striate; nymphs not horned nor dorsally serrate. (type *sanguinolentus* Provancher).....
.....14 (***) *Aceratagallia*
- 15a Pronotum not striate; nymphs horned and serrate...(16)
- 16 Posterior margin of vertex regularly curved, the vertex being obsolescent behind the eyes. Nymph with two anterior

** Sometimes, in *Oncopsis*, the striation becomes a little oblique anteriorly.

*** These characters were pointed out and used for divisional purposes by Osborn and Ball in their treatment of *Agallia*. They are good genera, in my opinion.

- projections on the head. (type *consobrina* Curtis=*puncticeps* Germ.)..... 15 (***) *Agallia*
- 16a Posterior margin of vertex emarginate, but margining the eyes behind. Nymph with the entire posterior margin of the vertex elevated, truncate as seen dorsally. (type *novellus* Say) 16 (***) *Agalliopsis*
- 17 Clypeus fused with frons.....(18)
- 17a Clypeus not fused with frons.....(19)
- 18 Face longer than wide.....17 *Nehela*
- 18a Face wider (between the eyes) than long..... 18 *Thalattoscopus*
- 19 Pronotum reaching beyond the anterior margin of the eyes, first two wing veins apparently not confluent.....(23)
- 19a Pronotum not reaching as far as the middle of the eyes, first two wing veins confluent towards the apex.....(20)
- 20 Head dorsally wider in the middle than at the sides; a minute appendix close to apex of clavus....19 *Batracomorphus*
- 20a Head dorsally at least as wide at the sides as in the middle (21)
- 21 Two subapical cells in the tegmen.....(22)
- 21a Three subapical cells..... 21 *Eurinoscopus*
- 22 Lateral keel of pronotum not reaching the eye, but curving far down onto the pleura. Head scarcely narrower than pronotum. Clypeus strongly convex, very broad at base, suddenly strongly narrowed beyond the middle to the rounded apex.... 20 *Straganiopsis*
- 22a Characters not as above (= *Macropsis* auctt., type *lanio*.) 22 *Bythoscopus*
- 23 Head dorsally angulate anteriorly, and angulately emarginate posteriorly. Pronotum sinuate posteriorly. Face about as long as wide between the eyes.....23 *Stonasla*
- 23a Head anteriorly lightly rounded. Pronotum truncate between the scutellar angles. Face much wider than long.... 24 *Macrocephs*

Idiocerus.

The venation in this large genus is very variable. The eleven Australian species are separable as follows:

- I Head spotted(2)

*** These characters were pointed out and used for divisional purposes by Osborn and Ball in their treatment of *Agallia*. They are good genera, in my opinion.

- 1a Head immaculate (4)
 2 Vertex with 2 spots (3)
 2a Vertex with 4 spots 1 *kisseis*
 3 Tegmina hyaline tinged with greyish or greenish; veins
 of corium sanguineous 2 *nymphias*
 3a Tegmina brownish fuscous, with two or three large trans-
 lucent spots medianly 3 *orcias*
 4 Tegmina with a dark spot at junction of clavus and mem-
 brane and another at the apex of the basal part of the subcostal
 cell 4 *orodemnias*
 4a Tegmina with a longitudinal fuscous stripe (5)
 4b Tegmina immaculate (6)
 5 General colouring yellowish or orange 5 *xantho*
 5a General colouring creamy grey, sometimes rosy
 6 *hylecorais*
 6 Tegminal veins clear; some at least sanguineous (7)
 6a Tegminal veins more obscurely indicated; testaceous or
 pale greenish (8)
 7 More or less suffused with deep rosy, veins concolorous
 7 *cupido*
 7a Veins mostly clear green, some of the apical ones sangui-
 neous 8 *ipo*
 8 Length over 6 mill. 9 *napais*
 8a Length over 5 mill. 10 *aulonias*
 8b Length 4 mill 11 *nercias*

I. *kisseis* sp. nov.

Head pale testaceous, vertex with 4 black spots, the larger pair visible dorsally and nearer the eye than their own diameter: apical of these a smaller pair, a little nearer together; between these 4 the vertex is sometimes suffused with rosy, the tint encroaching a little dorsally also. Pronotum greyish-rosy. Scutellum rosy with 3 testaceous spots, 2 anteriorly subcontiguous and one posterior. Tegmina pale olive testaceous, more or less greenish-iridescent, a little smoky at the base internally. Clypeus laterally sinuate, broader apically than at the base.

Male: tergites and valve more or less rosy, the latter transverse, sinuate.

Female: pygophorae long, but much shorter than the ovipositor. Length $5\frac{1}{2}$ mill.

Hab. Queensland, Kuranda (Aug., P.).

N. B. The rosy hue may be entirely absent.

2. *nymphias* sp. nov.

Greyish testaceous, vertex ventrally with 2 small spots anteriorly, almost concealed by pronotum. Scutellum with 2 small wedge-like spots anteriorly, partly concealed by the pronotum. Veins of corium sanguineous (sometimes brownish).

Length $3\frac{1}{2}$ mill.

Hab. New South Wales, Sydney (Jan., K.), Mittagong (Jan., K.), Koebele's No. 2356, on *McLaleuca*.

3. *oreias* sp. nov.

Differs from the preceding by the brownish fuscous tegmina which have 2 larger and one smaller translucent spots at the middle in a transverse row, the innermost being on the clavus.

Length $3\frac{1}{2}$ mill.

Hab. New South Wales, Mittagong (Jan., K.), in poor condition.

4. *orodennias* sp. nov.

Form of *xantho*, but the base of the pronotum is slightly emarginate. Head, pronotum, scutellum and sterna greenish testaceous, much discoloured, especially on the head. Tegmina hyaline cinereous, a blackish or dark fuscous spot at junction of clavus, corium and membrane, and another at the apex of the basal part of the subcostal cell; veins greenish testaceous, partly suffused with dark fuscous. Legs greenish testaceous. Tergites dark fuscous at least laterally.

Female: last sternite subtruncate, pygophor pale reddish-brown, ovipositor dark.

Length $4\frac{1}{2}$ mill.

Hab. Queensland, Kuranda (Aug., P.).

5. *xantho* sp. nov.

Head, pronotum, scutellum and sternites yellow or orange-yellow. Sterna and legs yellowish testaceous. Tegmina hyaline, subiridescent, tinged with cinereous, a darkish fuscous longitudinal stripe down the middle of the tegmen and a fuscous spot at the apex of the clavus.

Female: last sternite subtruncate.

Length $4\frac{1}{4}$ mill.

Hab. Queensland, Kuranda (Aug., P.).

6 *hylcorais* sp. nov.

Pl. II, figs. 1-2.

Like *aulonias*, but smaller and narrower; a somewhat elongate zigzag smoky line down the middle of the tegmina.

Female: last sternite subtruncate, slightly notched in the middle.

Length $4\frac{7}{8}$ mill.

Hab. Queensland, Bundaberg (Sept.-Dec., K.).

7 *cupido* sp. nov.

Form of *xantho*. Head, pronotum, scutellum and underside pale yellowish often suffused with rosy. Tegmina pale yellowish testaceous suffused with rosy, veins rosy; subcostal cell, apical cells, apex of subapical cells and appendix, hyaline.

Length 3 mill.

Hab. New South Wales, Sydney (Jan.-Feb., K.).

9 *napais* sp. nov.

Pale testaceous, more or less tinged with green, immaculate. Eyes reddish-black. Tegmina hyaline, subcostal etc. greenish.

Male: pygophor long, narrow, apically acute, turned outwards a little.

Length $6\frac{1}{2}$ mill.

Hab. Queensland, Bundaberg (Nov., P.).

10 *aulonias* sp. nov.

Close to *kisseis*, but pale creamy-grey in general colour, though it may be more or less rosy or reddish. There are no head spots.

Male: valve triangularly notched in the middle; pygophor broader than in the last, ovipositor not so long as in the last.

Length $5\frac{1}{8}$ mill.

Hab. Queensland, Cairns (Aug., P.); Bundaberg (Sept.-Dec., K.).

11 *nercias* sp. nov.

Pale greyish-yellow, more or less suffused with orange, subiridescent. Eyes fuscous. Head and eyes much wider than, and strongly decumbent on, the pronotum, vertex dorsally about as

wide in the middle as at the eyes, gently rounded anteriorly. Frons rounded in profile, clypeus wider apically than at the base. Tegminal veins very feeble.

Female: last sternite slightly emarginate roundly.

Length $3\frac{3}{4}$ mill.

Hab. New South Wales, Sydney (Jan.-Feb), Parramatta (Jan. K).

12—sp. nov.

One immaturely coloured example from Mittagong (Jan. K) of a new species.

Ipo.

1. *ambita*.

Posterolateral margins of frons straight, ocelli at about the middle of each side; lora and clypeus touching the reflexed hind margin of the genae. First subapical cell longer than the second. All these details are very similar in *I. conferta*.

3. *honiata*.

Posterolateral margins of frons sinuate.

4. *aegrota*.

Posterolateral margins of frons straight.

5. *pompais*, sp. nov.

Form of *I. conferta* but smaller and paler. Pale testaceous, strongly, minutely and closely spotted with brownish fuscous; frons (and usually a thin longitudinal line from frons to base of pronotum) pale testaceous. Scutellum pale ferruginous, anterolateral angles dark fuscous. Tegmina hyaline tinged with cinereous, suffused and mottled with light and dark fuscous; an undulating transverse narrow whitish stripe near the middle; extra-apical part of tegmina almost immaculate, one or two whitish spots near the commissure. Beneath brownish testaceous. Head nearly truncate anteriorly. Eyes projecting laterally distinctly farther than the pronotum.

Male: last segment roundly emarginate, pygophor subconstricted near the base.

Length 5 mill., breadth $2\frac{1}{2}$ mill.

Hab. Queensland, Nelson (July P).

Macropsis.

Macropsis Lewis 1835 T. E. S. London I. 49 (div. A.)
 = *Pediopsis* auctt. (part).

The four Australian species may be separated as follows:

- 1 Only two subapical cells (the third being merged in one of the apicals)1 *ocroc*
- 1a Three regular subapicals(2)
- 2 Tegmina pale, unornamented.....2 *thymele*
- 2a Tegmina with many dark markings.....(3)
- 3 Face evenly rounded; pronotum immaculate except for the punctuation4 *thoantias*
- 3a Face unevenly raised in parts; pronotum with a sublateral dark line3 *thya*

1. *ocroc*, sp. nov.

Head, pronotum and scutellum pale ochraceous, closely and finely punctured with purplish-brown. Tegmina hyaline, pale yellow brown, veins (except the subcostal) dark fuscous, multi-annulate with whitish, apical cells and tergites more or less fuscate. Sternites paler. There are only 2 subapical cells; the 1st apical is very small and the second is long, touching the base of the first subapical. (This is a constant character in 8 specimens).

Length $3\frac{1}{2}$ mill.

Hab. Queensland, Kuranda (Aug., P.), Nelson (July P.).

2. *thymele*, sp. nov.

Close to the last but the punctures are fainter, and the anterior half of the pronotum is lightly keeled or at least there is a smooth line there. Tegmina pale yellowish hyaline, nervures weaker, concolorous, a fuscous speck at apex of sutural cell, another at apex of clavus; a transverse vein in the subcostal, and the 1st subapical vein, &c., fuscous. There are three subapical cells.

Length 4 mill.

Hab. Queensland, Bundaberg (Sept. -Dec. K).

3. *thya*, sp. nov.

Resembles the first, but more ornate and there is an entire smooth line on the pronotum. The face, unlike the 3 others, in which it is regularly rounded, is unevenly raised or ridged in

parts. Pronotum with a curved broken longitudinal blackish-brown sublateral line. Tegmina hyaline, strongly punctured with fuscous, the punctures rendering the clavus and base of corium opaque; an irregular band across the tegmina and the apical sixth dark greyish-fuscous, veins fuscous multiannulate with whitish. Legs testaceous closely speckled with fuscous, tibiae multiannulate with whitish. There are 3 subapical cells.

Length $3\frac{1}{2}$ mill.

Hab. Queensland, Kuranda (Aug.P).

4. *thoantias*, sp. nov.

Resembles the last, but the face is not ridged and the pronotum is immaculate with dark punctures. Tegminal pattern more obscure, a dark line across the base. There are 3 subapical cells.

Length $3\frac{1}{2}$ mill.

Hab. New South Wales, Sydney (Jan. K).

Epipsychidion.

According to the horismology now used, the tegmina have 3 subapical and 4 apical cells, and the subcostal is divided apically by an oblique vein.

1. *epipyropis*.

(Bull. I p. 346, Pl. XXIII, figs. 4-6.)

Female. The second subapical cell extends further apically than the others. Last sternite truncate. The figure of the adult (fig. 4) does not show the crossveins.

Male. What is probably the male of this species has a rounded head, a little longer at the eyes than in the middle. Pale yellowish testaceous, mottled and spotted rather obscurely with pale brownish cinereous, veins not annulate. Vertex and pronotum without black lines, but with traces of pale longitudinal lines. Last sternite roundly emarginate, plates elongate.

Length (males) $5\frac{1}{4}$ (females) $6\frac{1}{2}$ mill.

Bred from nymphs on *Leptospermum*.

Alseis gen. nov.

Vertex very declivous, dorsally very short, wider laterally than in the middle; eyes touching the base of the tegmina. Frons

subceval, basally extending beyond the apical margin of the vertex; antennal ridges straight, entire, nearly as wide as frons. Vertex and pronotum transversely striate. Ocelli on a line with the insertion of the antennae and the base of the frons, not touching the latter.

I. *osborni*, sp. nov.

Whitish-testaceous, very finely mottled with brown, spotted with dark fuscous, a large suffused fuscous inverted arrow on anterior part of pronotum. Tegmina irregularly mottled and spotted with fuscous. Fore and middle legs blackish-brown, obscurely spotted with pallid; hind legs fuscous, obscurely marked with darkish.

Length (female) $8\frac{3}{4}$ mill.

Hab. Queensland, Brisbane (June P), Kuranda (July P).

Oncopsis.

Oncopsis Burmeister 1838 Gen. Ins. I, Bythoscopus, 3rd page.
=*Bythoscopus* auctt.

I. *balli*, sp. nov.

Bright yellow, closely punctured with brown on head and pronotum. There is a laevigate horse-shoe mark on the face near the clypeus, broken at the base, and there are 2 smooth pits nearer the base of the face. There is also a small smooth area on the pronotum on each side anteriorly, and the striation is fine and somewhat reticulate. The scutellum is punctured closely only on the disk. Apical margins of clypeus and genae, marks on legs, sterna, &c., blackish. Tegmina cinereous hyaline, a blackish smudge near the base, veins strong, yellowish brown, sometimes blackened.

The head is not visible dorsally, except close to the prominent eyes, nor is the anterior margin of the pronotum visible.

Length 5 mill.

Hab. Queensland, Bundaberg (Sept.-Dec. K.).

I have great pleasure in naming the last two species after Professors Osborn and Ball, whose work, conjointly or separate, on the Homoptera, especially the genera *Deltocephalus*, *Agallia*, &c., forms a model for future research.

Eurinoscopus.

The Australo-Fijian species may be disposed as follows. This is a very difficult genus and I have been unable to deal satisfactorily with several specimens, including Muir's Nos. 112 and 157; the latter were off native trees and were heavily stylpized.

- 1 Pronotum and tegmina freckled with brown.....(2)
- 1a Pronotum, at least, immaculate.....(4)
- 2 Face spotted with black, tegmina strongly freckled....
.....1 *lentiginosus* (Pl. II, figs. 7-8)
- 2a Head immaculate, tegmina more faintly freckled....(3)
- 3 Smaller, darker, frons less flat, &c.....2 *sontiates*
- 3a Larger, paler, frons flatter3 *soboles*
- 4 Tegmina cinereous, punctured with brown..8 *hamadryas*
- 4a Tegmina yellowish or green(5)
- 5 Tegmina with brown freckles.....4 *dryas*
- 5a Tegmina not freckled(6)
- 6 Uniform pale brownish yellow7 *pelamys*
- 6a Bright green, head and scutellum, &c., often yellowish (7)
- 7 Head dorsally as wide laterally as in the middle..5 *pelias*
- 7a Head dorsally distinctly wider in the middle than laterally
.....6 *molestia*

8. *hamadryas*, sp. nov.

Cinereous, lora and clypeus often infusate. Pronotum usually clouded with fuscous, the posterior angle usually broadly blackish. Tegmina with fuscous veins and obscure fuscous puncturation. Legs more or less fuscous.

Length $4\frac{1}{4}$ - $4\frac{1}{2}$ mill.

Hab. Viti Levu, Rewa (March & Nov. M).

Tribe Phrynomorphini.

The genera in this are very hard to limit and define, and they are not always altogether natural. It is probable that future classifications will be based largely upon nymphal characters. A number of groups may be formed, but cannot be altogether satisfactorily limited, for instance, the genera with the anterior margin of the vertex deeply and completely channelled transversely, merge gradually into those with simple head; these again merge into those with foliaceous or acute anterior margin of the vertex.

The venation is also often irregular, the characterization of the *Deltocephalus-Phrynomorphus-Thamnotettix* group being in especial confusion. The extra-Oceanian material at hand for comparison being entirely inadequate, I have preferred not to make more new genera than could be helped; at the same time it is doubtful whether the recognized authorities on Cicadoidea (for instance, Osborn, Ball, Van Duzee, or Melichar) would accept the generic positions I have assigned to some of the species, or would agree among themselves. The difficulty of sharply limiting these genera is evident from the synonymy of several species, according to these various authors, during the past twenty years, ex. gr. *Deltocephalus osborni*, *Athysanus seminudus*, *Lamotettix striola*, and *Thamnotettix striatula*.

The study of the Phrynomorphini is not lightly to be undertaken, but, more necessarily perhaps than in any other Cicadoid group, the known species of the world must be revised by some competent Hemipterist. It would be an immense advance in the knowledge of the group, if Osborn & Ball, whose studies on the North American forms have formed a model for future work, would undertake this task. The nymphs usually present very important specific characters, as these authors have shown, but in some genera at least, the number, colour, and disposition of the abdominal bristly hairs is specifically very valuable, a character neglected up to the present.

Stegelytra.

It is evident that two quite different genera are confused under this name; they may be separated as follows:

(a) Vertex anteriorly rounded, angulate in profile; pronotum anteriorly arched, posteriorly slightly emarginate. Tegmina with 2 subapical cells *Stegelytra* (type *alticeps*.)

(b) Vertex anteriorly subangulate, almost porrect in profile; pronotum anteriorly truncate or subtruncate between the eyes, posteriorly truncate between the scutellar angles. Tegmina with 4 subapicals, apicals reticulate..... *Iberia* nov. (type *bolivari*).

Thomsonia,

3. *kirschbaumii*.

Add to localities: Bundaberg (Sept.-Dec., K.).

Hybrasil gen. nov.

Closely allied to *Thomsonia*. Head strongly and completely channelled on top, clypeus somewhat constricted at base. Pronotum regularly roundly arched anteriorly. Tegmina with 2 subapical cells and 5 apicals, the first being in a line with the subapicals, the fifth very large. Valve present in the male.

1. *brani*, sp. nov.

(Pl. II, fig. 18).

Male: vertex, pronotum, scutellum, antennae, legs and pleurites pale yellowish green, including the channel on the top of the head; frons and a very narrow border on the vertex basal of the channel, sterna and abdomen, black. Tegmina pale smoky-yellowish, hyaline, with a median smoky smudge down the middle; veins more or less suffused with fuscous, except the pallid subcostal, radial and claval veins. Wings smoky, veins dark. Valve very short, plates pale, together triangular, then suddenly acuminate and produced apically, not as long as pygophor.

Female: head entirely pale yellow, except for 2 narrow black lines on either side of the channel. Underside pale yellow. Tegmina less fuscate than in the male. Seventh segment truncate, pygophor broad, not as long as ovipositor.

Length (male) $4\frac{1}{2}$ (female) 6 mill.

Hab. Viti Levu, Rewa (Mar. Muir).

Dryadomorpha.

In the unique type of *D. pallida*, it was not possible to interpret the obscure venation, but apparently there were no cross veins in the subcostal. Mr. Muir has collected a species at Rewa which I place here. The venation is somewhat like that of *Flatymetopius*; there are two discoidals, the medians being nearly twice as long as the exterior and extending beyond it basally and apically; there are 5 or 6 cross veins towards the apex of the subcostal, and 5 apical cells and an appendix. The wing cells are also peculiar.

2. *lotophagorum*, sp. nov.

Greenish-yellow, head and pronotum more or less mottled with light fuscous, some more regular, rather darker, spots on the

lateral margin of the vertex anteriorly and on the lateral margins of the frons. Tegmina pale yellowish hyaline; interior half, obliquely, of membrane, and the appendix, pale smoky; apical vein sordid whitish; three dark fuscous spots on the commissure; apex of last apical cell acute, with a smoky spot. Legs pale brownish testaceous, speckled with black granules. Sternites greyish-fuscous. Lateral margins of pronotum acuminate behind the eyes.

Male: last segment very slightly roundedly emarginate.

Female: last segment obtuse-angulately emarginate medianly; pygophor rather swollen laterally in the middle, flattish.

Length 6-7 mill.

Hab. Viti Levu, Rewa (Mar.-Apr. Muir).

Tortor gen. nov.

Probably allied to *Dryadomorpha*; the vertex is however not depressed and is more rounded anteriorly.

Vertex flattish, slightly raised towards the middle from the lateral margins, about as long as wide across the small eyes, lateral margins converging anteriorly, apical margin roundly angulate. Frons concave, raised laterally, clypeus more or less fused, lora minute. In profile the head is thin, the lateral margins are flattened, narrowing apicalwards; ocelli very indistinct rudiments on this flattened part, at about half the length of the head. Pronotum transverse, about three-fourths the length of the vertex, longer than the scutellum. Tegmina elongate, subcoriaceous, veins very indistinct; the radial appears to be undivided almost till the apex of the tegmina, while the median is joined to cubital at least 5 or 6 times by short, transverse veins.

1. *daulias*, sp. nov.

Pale golden yellow. Eyes greyish.

Length 9 mill.

Hab. Queensland, Bundaberg (Sept.-Dec.).

The nymphs are not remarkable, being in general form and colour like the adults.

Tartessus.

This is evidently a large genus, as 15 species are now known from Australia alone. The forms described form three groups:

(a) Veins of tegmen dark multiannulate with white; *T. ianassa*.

(b) Veins unicolorous yellowish or brownish, sometimes more or less fuscate, divided into:

(c) face wholly, or in large part, blackish; *T. io*, *iphis*, and *fulvus* (part).

(cc) face wholly, or in greater part, pale; *T. ianeira*, *ianthe*, *iambe*, *io*, *iphis*, *issa*, *itonias*, *idyia* and *fulvus* (part).

1. *fulvus*.

Bythoscopus fulvus Walker 1851 List. Hom. 866

Tartessus australicus Spangberg 1878 O. V. A. F. XXXV, 1.

T. fulvus Signoret 1880 A. S. E. France 348 Pl. 9 fig. 74.

var. *T. syrtidis* Kirkaldy 1906 Bull. H. S. P. A. Ent. I, 341 Pl. 24 f. 9.

This is a variable species; a single female from New South Wales, Sydney (Jan.) seems to agree with Signoret's description and figures, except that the eyes in Signoret's figure of the insect, are represented as not very decumbent on the pronotum and far from contiguous with the base of the tegmina. Beside this there are 4 males (not females, as wrongly stated in the description) of the var. *syrtidis*, a series of males and females very like the type, but differing in the colouring of pronotum, &c., (i. e., the presence of 5 or 6 brown spots along the anterior margin) and in the colour and pattern of the frons; it is unnecessary to bestow on them a varietal name. The figure of the face (l. c., Pl. 24, f. 9) of var. *syrtidis* gives a false impression (and refers rather to the type) as the whole of the face is black except narrow lines on the frons, and the antennae. The venation varies very little, sometimes there are 2 or 3 crossveins in the sutural area, sometimes these are absent. Subcostal cell divided by a somewhat oblique transverse vein about the middle, a little variable, of the first subapical (sometimes by 2 close together.) The 3 subapical cells extend apically about equally far.

Hab. New South Wales, Sydney (Jan.); Queensland, Cairns (Aug.).

var. *syrtidis*, Bundaberg (type, Oct.) Cairns (July) and Sydney (Jan.) bred from *Eucalyptus*, on Sandhills.

The genitalia appear identical in these forms, nevertheless I should have retained *syrtidis* as a good species, had not Dr. Perkins taken a male with a female of the second variety and a male

of the second variety with a typical female *fulvus*. It is exceedingly common, and is one of the few leafhoppers that can be considered as a pest of *Eucalyptus*. It is parasitized extensively in the ova-stage by *Pterygogramma acuminata* and as an nymph by *Chalcogonatopus gigas*. Nymphs of this or an allied form are parasitized by *Prosantcon chelognoides* and *Pipunculus picrodes* and *cruciator*.

2. *idylia*, sp. nov.

Black; base of vertex and basal half of posterolateral margin of scutellum, pale yellow; a narrow line on the genae contiguous with the lateral margin of the frons, a similar one on the pronotum contiguous with the posterior margin of the eyes, a tiny wedge at anterolateral angles of scutellum, pale ferruginous; labium, fore and middle legs (except basal two-thirds or more of femora) testaceous. Tegmina subhyaline, tinged with ferruginous, veins (somewhat suffusedly in most of them), median third or more of subcostal cell, blackish; basal two thirds of antesubcostal cell, whitish subhyaline. Vertex rounded apically, strongly striate transversely, formed as in *T. fulvus*, but a little more prominent anteriorly. Eyes as in *T. fulvus*. Frons basally strongly striate transversely, apically aciculate punctate. Genae with the apical margin less oblique than in *T. fulvus*, and clypeus shorter than in that species. Tegminal venation much as in *T. flavipes* but the cross-vein on the brachial near the base, and that towards the apex of the subcostal cell, are straight, not oblique; there are no cross veins in the clavus. Second subapical cell extending apically beyond the others.

Male: genital segments apparently much as in *T. pulchellus* but in all the specimens they are rather shrivelled.

Length $5\frac{1}{2}$ mill.

Hab. Queensland, Nelson (July) type, Cairns (Aug.).

3. *itonias*, sp. nov.

Apparently allied to *T. pulchellus*, but differing by the form of the genitalia and by the vertex being obtuse-angular. Face immaculate, borders of the pieces rather more obscure, lateral margin of frons fairly straight. Sterna and sternites testaceous. Venation similar to *pulchellus*, but the median (inner discoidal) cell is longer, the crossvein in the subcostal straight; the first

subapical cell is very wide apically, consequently the apical part of the subcostal is very narrow and acute; subapical cells extending about equally far apically.

Length (male) $8\frac{3}{4}$ mill.

Hab. Queensland, Cairns and Kuranda (Aug.).

4. *issa*, sp. nov.

Superficially like the preceding but the vertex is roundly angulate and wider at the eyes than in the middle. Appendix to tegmina about as large, faintly smoky narrowly bordered inwardly with hyaline. Subcostal cell much wider and is subparallel beyond the transverse vein, apical margin oblique. Subapical cells extending about equally far apically.

Male: tegmina slightly suffused, veins partly dark. Genital segment not unlike *T. flavipes*, but slenderer and more elongate.

Female: tegmina not suffused, veins pale. Genital segments elongate, slightly, obtuse-angularly produced in the middle; pygophor elongate, but much shorter than the ovipositor.

Length 6 (male) $8\frac{1}{2}$ (female) mill.

Hab. Queensland, Nelson (July) Kuranda and Cairns (Aug.).

In a female from Kuranda the crossvein at the base of the inner subapical vein is absent on both tegmina.

5. *iphis*, sp. nov.

Male: vertex luteous, suffused (except basally) with sanguineous. Frons pale luteous suffused with sanguineous, a curved blackish band contiguous to the apical margin of the basal part of the frons; median third of length suffused with fuscous, with curved concentric fuscous lines extending over the yellowish-red ground colour. Genae (excluding a part of the apical margin very narrowly), clypeus and lora blackish. Pronotum and scutellum (except posterior third of latter which is paler) orange-yellow. Tegmina pinkish brown, veins somewhat fuscate, some of them dark fuscous; commissure blackish; apex of apical cells (except the first sometimes) and the appendix, smoky. Sterna and sternites blackish or subsanguineous. Fore and middle legs testaceous, hind pair blackish. Head rounded in front, frons basally and pronotum strongly striate transversely, frons aciculate. Crossvein on brachial sometimes absent; second subapical cell extending beyond at least the third; subapical crossvein oblique.

Female: like the male, but the vertex (excluding the pale greenish or luteous basal margin) is bright redbrown; face black except a small redbrown line on the genae on each side of the frons. Sterna and sternites mostly blackish. Pronotum and anterior two-thirds of the scutellum bright redbrown. Legs testaceous; fore coxae and hind coxae and femora blackish, hind tibiae subapically more or less widely fulvous or pallid. Tegmina dull ferruginous, hyaline subapically, marked as in the male. Last abdominal segment produced, apically subangular, ovipositor a little longer than the pygophor.

Length (male) 7, (female) $7\frac{1}{2}$ mill.

Hab. Queensland, Nelson (July, type) Kuranda and Cairns (Aug.).

6. *io*, sp. nov.

Allied to *T. iphis*, but more robust and with different colour and pattern.

Head, pronotum and scutellum sordid yellowish, frons with a longitudinal submedian dark fuscous fascia (uniting basally acutangularly) with transverse, curved fasciae; sutures very narrowly, base of genae around insertion of antennae, clypeus apicolaterally, sterna and sternites mostly, dark fuscous or blackish. Tegmina pale ferruginous; hyaline, sublacteous on subcostal cell apical of the crossvein, and across the tegmina interiorly in the middle; veins mostly dark fuscous. Legs testaceous, base of femora (and the hind tibiae more or less) fuscous. Vertex scarcely rounded, wider at the eyes than in the middle. Frons elongate, lateral margins sinuate; clypeus strongly carinate. Pronotum strongly striate. Crossvein on brachial nearly straight, on subcostal oblique. Second subapical cell extending apically beyond the others.

Female: genital segments black, much as in *T. fulvus*, but last sternite more acute apically.

Length (male) $6\frac{1}{2}$ (female) $7\frac{1}{4}$ mill.

Hab. New South Wales, Mittagong (Jan. K).

7. *iambc*, sp. nov.

Allied to the last, but stouter and not so elongate; paler, tegmina milky cinereous, immaculate, except an obscure fuscous spot in some of the cells, veins fuscous, apex of tegmina

infusate. Second subapical cell extending beyond the others apically; crossvein on brachial, nearly straight, in subcostal cell, oblique.

Male: pygophor pale ferrugineo-testaceous, with blackish bristles; plates elongate, apically acute.

Female: pygophor coloured as in the male, formed as in *T. io*, but not nearly so acutely or far produced in the middle.

Length 6-7 mill.

Hab. New South Wales, Mittagong (Jan. K).

This might be confused with *T. io*, but the stouter form and different genital segment abundantly distinguish it.

8. *ianthe*, sp. nov.

Pale sordid yellowish; vertex, pronotum and anterior two-thirds of scutellum closely spotted with pale yellowish, these spots being clearly but not deeply punctured. Face pale yellowish, obscurely marked with brownish. Pronotum and scutellum fuscate (sometimes the former on the disk only). Tegmina pale yellowish hyaline, immaculate, basal veins pale, apical ones subferruginous, appendix fuscate. Sterna and sternites mostly pale. Tergites blackish along the middle, pale laterally. Head rounded, nearly as long in the middle as laterally. Crossveins on brachial vein and in subcostal cell, straight; subapical cells extending apically about equally far, or the third not quite so far as the others; subcostal cell apical of the crossvein subparallel laterally, apically oblique.

Male: valve practically obsolete, plates not unlike *flavipes*.

Female: genital segments fulvescent above, varyingly coloured beneath; last sternite strongly produced, apically acute, strongly carinate longitudinally, pygophor elongate (with yellowish bristles), about as long as the ovipositor.

Length (male) 8- (female) 11 mill.

Hab. Queensland, Brisbane (June), Cairns (July-Aug.).

9. *ianassa*, sp. nov.

Female: form of the last, but vertex more emarginate basally without being more produced anteriorly. Head, pronotum and scutellum marmorate with yellowish-white, pale yellowish-brown and brownish, paler on frons. Legs pale, femora and tibiae annulate with brownish. Tegmina yellowish brown, veins

concolorous, crossveins suffused with dark fuscous; longitudinal veins (except subcostal and commissure), multiannulate with dark fuscous, appendix fuscate. Crossveins on brachial vein and in subcostal cell, oblique, the apical part of the subcostal apically elongate and acute, reaching nearly to the apex of tegmina; second subapical cell extending apically farther than the rest. Last sternite nearly truncate, pygophor elongate (with brownish ferruginous bristles), about as long as the ovipositor.

Male: narrower than the other sex. Pronotum not marinate, brownish yellow with pale, subpunctate spots. Face nearly immaculate (except base of frons), legs almost so. Genital segments not unlike those of *Sarpestus specularis* in form, except that the apical margin of the last sternite is wider.

Length (male) 8- (female) 9½ mill.

Hab. Queensland, Cairns (July-Aug.).

10. *iancira*, sp. nov.

Allied to *T. iambc*. Pale yellowish brown, scutellum often tinged with ferruginous. Second subapical cell extending apically beyond the others. Crossveins on brachial and in subcostal fairly straight.

Male: sterna and sternites somewhat fuscate; face almost immaculate; genital segments not unlike those of *T. subniger*.

Females Frons with a submedian pale fuscous longitudinal line with transverse striae. Sterna and sternites pale; last sternite produced, apically acute-angled, pygophor elongate with yellowish-brown bristles.

Length 7 mill.

Hab. New South Wales, Sydney (Jan.-Feb. K), Parramatta (Jan. K).

11. *iokaste*, sp. nov.

Not unlike *T. ianthc*, but smaller, tegmina more pointed apically, head more angulate, &c. Pale sordid yellowish-brown, obscurely suffused here and there with green and sanguineous. Pronotum obscurely spotted. Veins sometimes dark fuscous, sometimes subferruginous. Vertex obtuse-angular anteriorly, longer at eyes than in the middle. Vertex, base of frons, and pronotum transversely striate. Second subapical cell extend-

ing apically a little beyond the others. Crossveins on brachial vein nearly straight, oblique in the subcostal cell.

Male as in *T. ianassa*.

Female: last sternite straight apically, medianly rather deeply notched; ovipositor long, a little longer than pygophor.

Length 8 mill.

Hab. Queensland, Cairns and Kuranda (Aug.).

The following four species, unknown to me, have been described from Australia:

12 *T. subniger* Signoret, 1880, A. S. E. France (5) X 350, Pl. IV, f. 75 (*male genitalia*).

13 *T. sahlbergii* Signoret, op. c., 351, Pl. IX, f. 76.

14 *T. flavipes* Spangberg; Signoret 1880 op. c., 360, Pl. X, f. 85 (Tasmania).

15 *T. pulchellus* Spangberg; Signoret 1880 op. c., 362 Pl. X, f. 87.

Thymbris gen. nov.

Allied to *Tartessus*, but the vertex is convex and although sharp anteriorly, is not channelled as in the latter. Head and eyes wider than the pronotum; ocelli nearly as far from apex of dorsal part of head as from eyes, on the extreme margin of the head just on the dorsal side, but owing to the declivity of the vertex, is not visible when the insect is horizontal. Eyes not touching base of tegmina. Vertex and pronotum striate transversely. Tegmina narrowed posteriorly, without an appendix.

1. *inachis*, sp. nov.

Pl. II, figs. 19-20.

Female: vertex, pronotum, scutellum and tegmina whitish testaceous mottled with brownish. Beneath obscure testaceous. Veins dull ferruginous-brown, multiannulate with whitish. Fore and middle femora and tibiae annulate dorsally with brownish. Vertex nearly rectangular medianly, longer than at the eyes. Frons elongate, tempora wide, antennal ridges strong. Labium reaching to the base of the middle coxae. Second sub-apical cell extending apically well beyond the others. Transverse veins on brachial and in subcostal cell, oblique, apical

part of the latter apically acute-angled. Last sternite truncate, transverse, pygophor flattened basally, reaching a little beyond apex of tegmina, not so long as ovipositor.

Male: (of this species?) Head slightly roundly-angulate anteriorly, a little wider at eyes than in the middle. Last segment roundly emarginate, valves about twice as long, elongate triangular.

Length (male) 8- (female) $11\frac{1}{2}$ mill.

Hab. Queensland, Brisbane (Nov., type), Bundaberg (Sept.-Dec., males, female).

2. *iphianassa*, sp. nov.

Male: allied to the last, but differs as follows:

Extreme base of frons pale yellowish white, bordered apically with blackish, narrowly. Tegmina not mottled, immaculate, veins more sparingly annulate with whitish. Legs not annulate. Vertex distinctly angulate, a little wider in the middle than at the eyes. Labium reaching to apex of middle trochanter. Last sternite dark fuscous, truncate, about one-fourth or one-fifth of the length of the pygophor, which widens out a little apically.

Length $8\frac{1}{2}$ mill.

Hab. New South Wales, Sydney (Jan.)

Putonicissa, gen. nov.

Vertex very short, rather longer at the eyes than medianly; margin between this and frons angulate, but the top is actually thickened and a little flattened, an obscure transverse, ventral keel at about the middle of the eyes, apparently forming the limit. The ocelli are on this thickened and flattened part, about as in *Thymbris*, and although ventral in aspect, are I think, on the "vertex." Frons narrow, elongate. Tempora wide, antennal ridges rather strong. Vertex and pronotum transversely striate. *Clypeus and genae strongly angulate, the apical part declivous.* Venation as in *Thymbris*, but the apical part of the subcostal cell is longer and reaches the apical margin of the tegmen.

1. *dignissima*, sp. nov.

Pale greyish cinereous mottled with fuscous. Face pale testaceous, frons and clypeus mostly dark fuscous, with pale

specks. Tegmina hyaline, tinged with cinereous, mottled with light and dark fuscous; veins brownish, crossveins mostly whitish. Femora blackish, at least basally and dorsally, fore and middle tibiae annulated with dark fuscous at least dorsally. Sternites dark fuscous, apically bordered with testaceous, narrowly.

Length $8\frac{1}{2}$ - $9\frac{1}{2}$ mill.

Hab. New South Wales: Mittagong (Jan. K).

This form is a complete link between the "Jassidae" and the "Bythoscopidae" and points the way to the Stenocotinae. It is a melancholy satisfaction to name this in honour of the venerable Dr. Puton, on whom affliction has fallen so heavily.

Xestocephalus.

Xestocephalus Van Duzee 1892 Tr. Amer. Ent. Soc. XIX 298.

A genus noted from America, Ceylon and Japan; I now add two species from Australia and three from Fiji.

Van Duzee has placed it near *Aphrodes*, but he has I think been led astray by the degradation of the wing-venation, which could surely arise independently. Its place seems to me to be near *Phrynomorphus*.

1. *vitiensis*, sp. nov.

Pale yellowish brown, eyes dark fuscous. Tegmina irregularly, brokenly fuscomarmorate, 2 dark spots on the subcostal vein, one near the base and one near the apex of the clavus; one or two of the apical veins suffused at their apices. Wings hyaline, iridescent, veins pale yellowish brown. Subapical cells of tegmen all quadrilateral or 5-hedral, none triangular, the interior cell a little the smallest, exterior slightly smaller than the middle one. Submarginal wing-vein absent on the first fold of the wing.

Female: 7th segment obtuse-angularly emarginate; pygophor rather short, nearly as long as the ovipositor, with pale bristles.

Length 5 mill.

Hab. Viti Levu, Rewa (Mar., Muir).

2. *pallidiceps*, sp. nov.

Yellowish-brown, paler beneath. Tegmina yellowish hyaline, faintly marked with pale cinereo-fuscous, the exterior fourth

with 2 or 3 darker transverse lines and the apical margin pale smoky. Wings hyaline, faintly smoky, veins pale.

Male: last segment apparently roundly emarginate, valve scarcely apparent, plates elongate with concolorous bristles.

Length $2\frac{1}{8}$ mill.

Hab. Viti Levu, Rewa (Mar., Muir).

contortuplicatus var. nov.

Like the type, but there is a double line of warm brown from mid-vertex to mid-scutellum, lateral contortuplicate lines of the same colour on pronotum and two blackish brown transverse lines on anterior margin of head. Tegmina rather more marmorate.

Hab. Viti Levu, Rewa (Mar.-Apr., Muir).

decemnotatus var. nov.

Pronotum with 10 white spots. Tegmina as in *contortuplicatus*.

Hab. Viti Levu, Rewa (Apr., Muir).

These varieties may prove to be good species, but I have seen only a single example of each.

3. *australensis*, sp. nov.

Like the last, but larger and yellower; tegmina with sparse brownish markings.

Length $3\frac{1}{2}$ mill.

Hab. Queensland, Kuranda and Cairns (Aug. P).

4. *purpurascens*, sp. nov.

Head and eyes pitchy brown with a purple tinge, inner orbits narrowly pale. Ocelli pale, very conspicuous. Pronotum and scutellum dark ferruginous brown with a purple glint. Tegmina warm brown with a purple glint, a few irregular pale spots and specks, not corresponding on opposite tegmina. Wings pale smoky, veins fuscous. Labium and fore coxae pale, rest of legs mostly pale fuscous, hind tibiae purplish pitchy. Sterna sordid testaceous. Abdomen purplish pitchy.

Female: pygophor with yellowish brown bristles; last segment notched in the middle.

Length 3 mill.

Hab. Viti Levu, Rewa (Apr., Muir).

5. *siduicus*, sp. nov.

Blackish-brown; legs pale brownish-testaceous, the hind tibiae with a blackish apical annulus and the apical half of the first and the whole of the second segment of the hind tarsi blackish. Tegmina fuscohyaline, veins blackish, 2 or 3 thin, curved transverse, fuscous lines on the apical fourth of the tegmina. Ocelli orange-brown. Vertex roundly angular in front, one-half longer in the middle than at the eyes.

Length (male) $3\frac{1}{4}$ mill.

Hab. New South Wales, Sydney (Jan., K.).

Eutettix.1. *sellata*.

Matsumura (1905 Tr. Sapporo N. H. S., I, 20), thinks this is a synonym of *Acocephalus discigutta* Walker, a hazardous proposal without seeing the type. Walker's species was from Borneo, and Matsumura has added China and the Philippines.

2. *melaleucae*, sp. nov.

Whitish (tinged with yellowish sometimes on vertex and scutellum), minutely speckled with dark fuscous. Tegmina with most of the veins pale yellowish-brown on head, face, nota, tegmina and legs, the apical ones darker, part of the apex narrowly suffused. Lora remote from the apical margin of the genae. Vertex more rounded and a little shorter than in *E. sellata*, nearly twice as wide as the length. Claval veins united near the base by a cross vein, the anal vein slightly curved, meeting the commissure at an acute angle.

Male: valve short, transverse.

Female: apical margin of last sternite sublaterally emarginate, also minutely emarginate medianly. Pygopher about 3 times as long as last sternite, bristly, widened a little near the base, but narrowing at the base.

Length $4\frac{1}{2}$ mill.

Hab. Queensland, Cairns (July), Nelson (July), Bundaberg (Sept.-Dec.) on *Melaleuca*.

Nephotettix.

All palaeogæic species.

1 Head and nota not green.....(2)

- 1a Greenish-yellow; males usually with a black spot on the corium4 *apicalis*
 2 Tegmina pale yellowish green grey.....1 *curytus*
 2a Tegmina not tinged with green.....3
 3 Blackish line on vertex straight (or very obtusely-angulate)2 *plebeius*
 3a Blackish line on vertex arched parallel with the anterior margin3 *contemptus*

curytus, sp. nov.

Pl. II, figs. 5-6.

Yellowish testaceous, browner beneath. Tegmina pale yellowish green grey, subopaque, immaculate; membrane subhyaline, pale yellowish, smoky. Vertex a little shorter than the pronotum, about as wide as the eyes together, disk depressed, anteriorly obtusely rounded, a little tumid medianly, a very narrow straight transverse channel between the ocelli. Tempora wide; clypeus a little narrower at base than the apex of the frons, a little constricted immediately apical, thence widening more to the apex. Genae sinuate apically, scarcely angulate laterally, apex of lora practically contiguous with the apical margin of the genae.

Length $5\frac{1}{2}$ mill.

Hab: New South Wales, Mittagong (Jan.) one rather damaged female.

2. *plebeius*.

Pl. II, figs. 3-4.

Hab: add Viti Levu, Rewa (Mar., Muir).

4. *apicalis*.

Pl. II, figs. 11-13.

- =*Cicada bipunctata* Fabr. 1803 Syst Rhyng.....
(nec. Scopoli 1763.) (=male.)
 =*Pediopsis apicalis* Motschulsky 1859 Etud. Ent. 110.....
(=female.)
 =*P. nigromaculatus* Motsch. op. c., 111 (=male.)
 =*T. nigropicta* Stal 1870 O. V. A. F., XXVII 740 (=male).

=*Selenoccephalus cincticeps* Uhler 1896 P. U. S. N. Mus., XIX, 292.

Hab: Queensland, (Cairns), Philippines, Riukiu, Formosa. China, Cochin China, Japan, the Malays, (Borneo, etc.), India, Ceylon, Madagascar, German East Africa, Egypt and Morocco on *Oryza sativa* and grasses.

On page 331 (of my former bulletin) I remarked that several species had been confused and indeed, if all the forms before me are one species only, it is very variable. Usually the tegmina are immaculate in the female, and with a large blackish blotch on the corium in the male; sometimes however the tegmina are immaculate in the male, there being gradations between. The genital segments are pale in the female, black in the male; they are however, partly pale in the immaculate males. There is usually a transverse, entire, black line between the ocelli; sometimes this is absent, as in 2 Sinhalese females in my own collection, but it is always present in the long Australian series before me. The frons varies from almost entirely piceous to almost entirely testaceous. The vertex is usually obtusely rounded, it is sometimes however, distinctly angulate.

Soracte gen. nov.

Probably nearest to *Platymetopius*, but the head is not so elongate, the tempora much narrower, the clypeus wider, the lateral margins of pronotum obsolescent and the venation different.

Vertex produced in front of the eyes, apically obtuse-angled, but not quite so long as the maximum width, disk somewhat depressed. Angulate in profile, the ocelli (which are large but flat and probably not functional) close to the eyes on the sharp margin itself. Frons broad, slightly narrowing apically, lateral margins feebly rounded, tempora almost obsolete. Genae sinuate, lora remote from their apical margin. Clypeus broad, narrower than the apex of the frons. Pronotum a little shorter than the vertex, finely striate transversely, acute-angled laterally. Scutellum wider than long. Claval suture longer than the membrane, the latter with an appendix.

1. *apollonos*, sp. nov.

Brownish-olivaceous; anterior margin of vertex, an upright cross on the same, the lower limb dividing into 2 almost contiguous limbs, 4 longitudinal lines (a submedian and a sub-

lateral on each side) and a median T-shaped line on pronotum, 7 spots on scutellum (2 with an olivaceous speck each in the middle); a median line and numerous concentric, curved, transverse lines on frons; genae, clypeus, and lora (except some olivaceous-brown markings), pale yellowish-testaceous. Abdomen beneath mostly dark olivaceous brown. Tegmina subhyaline, tinged with olivaceous, veins widely colourless, margined narrowly with dark olive brown, sometimes a little suffused, especially the middle apical cell.

Female: last sternite roundly emarginate, the sides bluntly prominent. Pygopher elongate, narrow, with blackish bristles. Length $4\frac{3}{8}$ mill.

Hab: Queensland, Cairns, (Aug., one female.)

Deltoccephalus.

This seems to be characterized by a long, pointed vertex, frons longer than wide, tempora narrow, often obsolete basally, venation more complex.

2. *lotis*, sp. nov.

Vertex piceous with a thin median longitudinal testaceous line, basal half testaceous with two big piceous spots, a short transverse testaceous line on middle of apical half. Face piceous, frons with curved concentric lines on each side of the middle, irregular apically. Legs mostly piceous, fore and middle tibiae testaceous, suffused irregularly with piceous. Tegmina testaceous subopaque, with narrow piceous margins to the veins on both sides. Abdomen above piceous with about 5 rows of testaceous spots, below mostly piceous. Greatest width of vertex about the same as the length, vertex flattish, nearly rectangular apically, a little depressed basally. Vertex and frons acute-angled in profile. Tegmina reaching to about half the length of the insect, obliquely transverse apically.

Length $3\frac{5}{8}$ mill.

Hab. New South Wales, Mittagong (Jan. K.) one female.

3. *D. polemon*, sp. nov.

Closely allied to *D. sylvestris* Osb. & Ball, but venation and genital segments different.

Vertex testaceous, with a faint olivaceo-fuscous stripe on each side of the median line, terminating apically in a fuscous speck. Face piceous, frons with 5 or 6 thin, concentric, curved.

inwardly abbreviated pale yellowish-brown lines. Pronotum testaceous, with 3 longitudinal pale olive-fusca stripes on each side, the innermost broad and continuing on to the scutellum. Tegmina dilute yellowish cinereous, veins whitish testaceous, narrowly and irregularly margined with fuscous, apical cells mostly dark fuscous, the first and second apical veins whitish. Sterna and abdomen mostly dark fuscous or piceous, marked with pallid.

Male: valve short, triangular; plates little longer than the valve, the two taken together deeply emarginate angularly in the middle; pygophor more than twice as long medianly as the plates.

Female: last sternite roundly emarginate, bluntly angulate at the sides; apex of pygophor pale, with particoloured bristles (yellow and dark fuscous.)

Length $3\frac{1}{2}$ mill.

Hab. Queensland, Cairns, (Aug.)

Sometimes the vertex and pronotum appear as though pale olive-fusca with pale lines.

4. *histrionicus*, sp. nov.

Vertex, pronotum and scutellum yellowish creamy, underside and tergites with a brownish tinge; anterior margin of head with two intersecting black curves; anterior two-thirds of pronotum (except laterally) suffused with ferruginous, a broken, angular, fuscous line at the base of this suffusion. Scutellum with a ferruginous spot at each anterolateral angle. Tegmina pale creamy whitish, tinged with ferruginous along the corial half of the clavus and on most of the apical half of the corium; subcostal cell yellowish creamy with the following dark fuscous markings, viz: a St. Andrew's Cross on the basal two-thirds (the basal right and apical left limbs being irregular) subcostal cell with 3 elongate spots, the third uniting with the St. Andrew's Cross; on the apical third there is an oblique sinuate line from near the apex of the clavus to near the apex of the subcostal, then curving round the apical margin, nearly reaching its starting point and enclosing a large spot. Wings hyaline, veins pale.

Female: last segment slightly notched medianly, pygophor yellowish, apically marked with black.

Length $3\frac{1}{4}$ mill.

Hab. Viti Levu (Mar. Muir's No. 143), on a native tree in the bush.

5. *lucindae*, sp. nov.

Male: white tinged with yellowish brown; frons with a dark suffused radiating pattern visible dorsally as 2 oblongs and 2 specks on the anterior margin of the vertex; margins of face brown. Pronotum and scutellum obscurely mottled. Legs annulate. Tegmina much as in *Conosanus hospes*. Abdomen beneath pale medianly, dark laterally. Valve pale, very large, semicircular, nearly as long as the plates, which are apparently about as long as the pygophor.

Female: (of this?) darker and more suffused. Abdomen below dark fuscous. Last segment deeply roundly excavate, pygophor dark speckled with pale, a little longer than the ovipositor.

Length (male) $3\frac{7}{8}$ (female) 5 mill.

Hab. Queensland, Lucinda (July K).

6. *flavidiventris*.

Jassus (*Deltocephalus*) *flavidiventris* Stal 1859 Eugenie's Resa Ins. 294.

I do not know this species, laconically described from Sydney.

I agree with Van Duzee that his *Deltocephalus osborni* belongs to this genus and not to *Phrynomorphus*, as is indeed apparently the case with all the species placed by Osborn & Ball in *Comellus*.

Phrynophyes.

Phrynomorphus fatigandus cannot be placed in *Phrynomorphus* as restricted, it is nearer *Phrynophyes*. The elongate frons, vertex longer than wide and acuteangled apically, remove it from *Phrynomorphus* (even *sens. lat.*), while the venation is too simple for *Deltocephalus*. It has the characters somewhat of *Stirellus* but is very different from *S. curtisii*, the only species I have for examination; moreover *Stirellus* seems to merge gradually into *Deltocephalus*.

Dritotura.

Dritotura O. & B., 1898, Proc. Davenport Ac. Nat. Sc. VII, 87.

1. *aristarche*, sp. nov.

Pl. II, figs. 9-10.

Probably allied to *D. robusta* O. & B., but the head is longer and more angulate, and the tegminal reticulation coarser.

Male: vertex whitish-testaceous, heavily barred with piceous, frons whitish-testaceous, with curved concentric lines, which are much broader than the interstitial paleness; genae, clypeus and lora whitish-testaceous with a large dark fuscous spot on each. Anterior half of pronotum dark fuscous with a few tiny testaceous markings, posterior half whitish. Tegmina fuscous, veins margined both sides with piceous, apical margin broadly whitish. Fore and middle femora piceous, multi-annulate with testaceous, hind femora testaceous with irregular, longitudinal, fuscous stripes. Abdomen piceous with 4 or 5 rows of tiny testaceous specks, last tergite with the apical margin whitish-testaceous.

Female: head testaceous, suffused with pale fuscous. Vertex not quite as long as wide, angulate, a large dark fuscous spot on each side of the middle near the base, and interior to these a short dark fuscous line on each side a little anterior. Pronotum whitish, anterior half testaceous with fuscous markings. Tegmina whitish varying to fuscous with white apical margin. Abdomen above fuscous and whitish testaceous, almost irrorate. Abdomen below dark fuscous with a few testaceous markings. Frons brownish testaceous with dark fuscous curved concentric lines not touching medianly. Genae, lora and clypeus brownish testaceous, each with a fuscous spot. Legs as in the male.

Length 2 (male) to $2\frac{1}{2}$ (female) mill.

Hab. New South Wales, Mittagong (Jan.).

Phrynomorphus.

This genus, in its most restricted sense, seems to be strictly synonymous with *Athysanus* Burmeister; the genus (for my purposes) has a transverse vertex, which is not longer than the pronotum, frons wide, wider at base than long, wide tempora and simple venation. The males have a valve. *P. taedius* is, I think, the only species of those I described in the first memoir that may be considered to belong here (*sens. strict.*)

In the subgenus *Conosanus*, with different head form, may perhaps be placed the following:

2. *longinquus*.3. *hospes*.

Pl. I, figs. 13-17.

Deltoccephalus hospes Kirkaldy 1904 Entom. 177

Originally described as an immigrant into Hawaii, it is now recorded from the whole of Eastern Australia (at least) and the lowlands of Fiji.

The *ova* are not remarkable, being of the usual Phrynomorphine type of Grass-feeder and are inserted in the usual way in the leaves of *Cynodon dactylon* (the "Dog's tooth grass" of England, and the "Maniania" of the Hawaiians).

The *last nymphal instar* (Pl. I., f. 13) is of the form of the adult, pale testaceous, with 4 olive-brown longitudinal lines, the 2 lateral terminating anteriorly at the eyes. There are about 24 black bristly hairs, 3 on almost each segment, arranged in 3 longitudinal rows, one submedian, one sublateral and one lateral. The anterior margin of the vertex is narrowly white with faint fuscous marks and a very narrow anterior line of fuscous. Frons with fuscous transverse lines from a pale central line, on the basal third. Clypeus faintly fuscous; labium black-tipped, reaching to the fore trochanters. Femora brokenly banded with dark fuscous or blackish, tibiae and tarsi dark fuscous or blackish at base of some of the bristles (especially the larger ones). The 2 or 3 apical abdominal segments laterally fuscous. Eyes greenish. Antennal flagellum reaching to about the middle coxa.

The *other nymphal instars* do not differ appreciably except that the frons is pale.

4. *chlorippe*, sp. nov.

Very similar in appearance to *Deltoccephalus abdominalis* (Fabr.).

Bright yellow, tegminal veins concolorous. Frons pale brownish, obscurely suffused with darker tint, and with slender, concentric, curved, dark fuscous lines. Genae, lora, clypeus, &c., pallid, the last named a little fuscate medianly. Metanotum, sterna, (mostly) and basal half of abdomen above and beneath (except the lateral margins) blackish. Basal half of fore and middle femora blackish, hind femora dorsally black (except apex), hind tibiae longitudinally lined with black. Vertex triangular, as long in front of the eyes as behind, wider than long,

sulculate entirely, flat. Ocelli remote from the eyes. Frons longer than wide, with a small tubercle at the base medianly, a little wider apically than the clypeus basally; lora nearly touching the genae apically; tempora narrow. Tegmina short, without appendix; not reaching apex of abdomen, apically rounded, only one subapical cell.

Female: last segment produced a little triangularly (very obtusely) in the middle; the pale brownish ovipositor is much longer than the elongate pygophor.

Length $3\frac{1}{3}$ mill.

Hab. Queensland, Bundaberg (Sept.-Dec., Koebele).

Vars: the frons varies from piceous to pallid. This is a pretty little species and rare.

Thamnophryne, gen. nov.

Differs from its allies by the minutely but deeply, completely, punctured pronotum; otherwise differs from *Thamnotettix* by the very short lateral margins of the pronotum.

1. *nysias*, sp. nov.

Head pale brownish-testaceous; vertex irregularly suffused with fuscous; frons with a few concentric curved fuscous lines which are often much abbreviated towards the middle of the frons, often almost obsolete. Base of genae (around the antennae) dark fuscous. Pronotum dark fuscous, yellowish-brown laterally, comparatively thickly, but irregularly, punctured with yellowish-brown. Tegmina milky hyaline, veins dark fuscous, many of them more or less suffused, especially the crossveins at the apex of the subcostal cell, and the apical veins apically. Many of the cells with a more or less elongate fuscous spot in the middle, the brachial cell with two. Legs testaceous, hind tibiae with blackish spots at the base of the bristles. Sterna and abdomen below mostly dark fuscous. Vertex short, rounded, apically, forming a curve with the eyes which are rather wider than the maximum width of the vertex. Frons longer than wide, tempora very narrow, almost obsolete. Clypeus as wide basally as the frons apically, constricted a little just apical of the base, widening as much towards the apex.

Male: genital segments strongly tufted.

Length $4\frac{1}{2}$ mill.

Hab. New South Wales: Mittagong (Jan.)

A male example from Queensland, Bundaberg, with the tegmina more suffused with olivaceous, and the genital segments not tufted, may form another species.

Lonatura.

Lonatura Osborn & Ball 1898 P. Davenport Ac. Sci., VII 83.

1. *austrina*, sp. nov.

Closely allied to *L. catalina* (which I presume to be the type), but the head is distinctly longer and the tegmina only reach to the base of the genital segment. Head, pronotum and scutellum pale yellowish, the frons with a pale ferruginous radiating pattern. Tegmina pale olive-green, the veins a little yellow, a broad smoky apical band. Abdomen black, the last segment white, pygophor white and black. Legs yellowish brown soiled with fuscous.

Length $1\frac{1}{2}$ mill.

Hab. New South Wales, Sydney (Feb., K.); Queensland, Bundaberg (Sept.-Dec. P).

This tiny species is allied to *L. catalina* by the venation, but there is apparently no appendix; and to *L. megalopa* by the frons being longer and basally more angular and by being patterned, also the lora are remote from the apex of the clypeus.

Allygus.

Allygus Fieber 1875 Rev. Mag. Zool. (3) III, 410.

1. *lotophagorum*, sp. nov.

Yellowish-testaceous, marbled with olive-brown on pronotum. Vertex with a mark and 6 spots in olive brown. Ocelli orange-red, very conspicuous. Frons yellowish-testaceous, strongly and broadly marked with a black radiating pattern. Genae yellow, margined apically with black and a median black spot. Clypeus and lora black, the former with 2 short pale lines, the latter with a pale spot each. Tegmina milky hyaline, closely marbled with olive-brown, but in parts only, so that there are 3 milky spots along the commissure on the clavus, and 5 or 6 on the corium, the latter less distinct; nodal veins suffused. Legs black with pale bristles, apical half of fore femora black, the

fore and middle tibiae spotted with the same, all the tarsi partly pale. Abdomen mostly black.

Male: genital pieces narrowly margined apically with whitish-testaceous and with white bristles.

Female: pygophor black, with white specks and white bristles on the apical half.

Length 3 mill.

Hab. Viti Levu, Rewa (Mch.-Apr., M), Ba (Jan., M.). A pretty little species.

Limotettix.

On reconsideration, I think I have made a mistake in sinking this name. The whole affair is in a great muddle, hinging largely on the equally muddled *Cicadula*, of which the type is really, as ascertained in my former memoir, *smaragdula*. Sahlberg's *Limotettix* was heterogeneous: apart from one or two disputed species, variously assigned to *Phrynomorphus*, *Deltoccephalus* &c., (all prior genera), it is comprised of two main sections, (1)=a section of the *Thamnotettix* of Puton's Catalogue (1899) and (2)=*Macrosteles* Fieber (= *Cicadula* Puton). As Woodworth has declared the type to be *quadrinotata* (Fabr.) i. e. of the species of the first section, and as Edwards (1896) also uses it in the same sense, it is perhaps proper to keep it so, with *Euleimonios* as a synonym.

2. *filicicola*, sp. nov.

Pale luteous, paler beneath, pronotum tinged with brown. Anterolateral margins of vertex broadly black (meeting angulately at apex). Pronotum with 4 dark fuscous lines, the two middle of which continue on to the scutellum. Tegmina with a nearly entire, dark fuscous, longitudinal median line, 2nd to 4th apical cells hyaline, veins dark, apical margin of the first suffused and a spot in the middle of the cell. Wings hyaline, veins fuscous. Abdomen above more or less fuscous.

Male: genital segments short, concolorous.

Female: last segment apically black, roundly emarginate; pygophors pale brownish ferruginous, elongate; ovipositor black, much longer than the pygophors.

Length (male) 3 (female) $3\frac{1}{8}$ mill.

Hab. Viti Levu, (Nov. Muir's No. 15), Rewa (Apr. M.), on tree-ferns.

3. *tachyporias*, sp. nov.

Superficially somewhat like the last.

Pale yellowish, tergites and the underside paler. Frons basally and the lateral angles of pronotum blackish brown. Tegmina hyaline with an entire longitudinal, blackish brown median stripe. Vertex rounded (slightly angulate) extending in front of eyes, a trifle longer than wide at base.

Male: 7th segment subtruncate; valve narrow, semicircular; plates pointed, lateral margin sinuate, scarcely as long as pygophor.

Female: 7th segment very slightly produced in the middle.

Length $3\frac{7}{8}$ (male) 4 (female) mill.

Hab. Queensland, Bundaberg (Sept.-Dec. K.).

4. *capitatus*, sp. nov.

Head, pronotum and scutellum pale yellowish brown; vertex with 2 large metallic blue black spots; face tinged with ferruginous; a blackish spot on each side just apical of the antennal scrobes. Tegmina hyaline, faintly smoky, except the subcostal and the 3rd and 4th apical cells. Wings hyaline, veins pale fuscous. Legs pale yellowish brown. Underneath dark fuscous or blackish brown. External subapical cell longer than the interior.

Female: 7th segment roundly produced; pygophors fuscous with shortish yellow brown bristly hairs; ovipositor black.

Length 3 mill.

Hab. Queensland, Cairns, (Aug. P.).

*Pettya*1. *anemolua*.

The wingvein is like that of *Balclutha*, except that there is no submarginal vein.

Nesosteles

The first two wings veins are confluent towards the apex. The genus is very close to *Balclutha*.

1. *hebe*.

Add: Viti Levu, Rewa (Mar., Apr., M.) and Navua (Feb. M), and I think the same species is at Bundaberg (Sept.-Dec.),

Cairns (July) and Lucinda Point (July) in Queensland, but these species are difficult to separate.

2. *glauca*.

The vertex is shorter than in *N. hebe*, more convex and not finish with the pronotum. I think this also occurs at Kuranda.

6. *dryas* sp. nov.

Allied to *N. sordidior*, but smaller and paler. Head testaceous, more or less suffused with pale orange-brown, a short longitudinal suture and a lateral impression, reddish-brown. Pronotum creamy, with 3 thin orange-brown longitudinal lines continued (more widely) on to the scutellum. Tegmina creamy, veins white, the first two apical veins margined with fuscous. Wings milky hyaline, veins on the apical third mostly fuscous. Sterna, legs, and sternites creamy with a tinge of brown. Tergites black, last segment pale.

Male: Pygophor pale.

Female: last segment sinuately angularly emarginate, lateral angles acute; pygophor elongate.

Length $4\frac{1}{2}$ mill.

Hab. Queensland, Redlynch (July), Cairns (July, Aug.). Bundaberg (Sept.-Dec.).

7. *aurantiigera*, sp. nov.

Head, pronotum and scutellum pale greenish-yellow. Tegmina and legs orange-red, the former with conspicuous whitish-veins, the apical cells hyaline. Wings milky. Tergites fuscous, hind margin of the segments pale yellowish. Vertex rounded in front, less than half the length of the pronotum, about as long medianly as at the eyes.

Length 4 mill.

Hab. Queensland, Cairns (Aug., P.).

The two following species probably do not belong to *Nesosoteles*, but as some of the species of that genus approach *Balcitha* (of which I knew only one species), I prefer, for the present, to include these two in *Nesosoteles*.

8. *phryne*, sp. nov.

Creamy testaceous, basal four-fifths of abdomen dark fuscous. Tegmina hyaline milky, veins creamy. Wings hyaline, veins on apical half pale fuscous. This differs from typical *Nesosoteles* by the radial vein being scarcely obsolescent, and by the vertex being as long as wide between the eyes, nearly as long as the pronotum, angularly produced, nearly twice as long in the middle as at the eyes.

Length 4 mill.

Hab. New South Wales, Mittagong (Jan., K).

9. *chloe*, sp. nov.

Bright-green. Tegmina hyaline, veins green. Wings and wing-veins hyaline. Vertex roundly angulate anteriorly, a little shorter proportionately than in *N. phryne*.

Length 4 mill.

Hab. Queensland, Kuranda (Aug., P.); New South Wales, Sydney (Feb., K).

Euterygini.

Further study has necessitated the reduction of this group from subfamily to tribe. I am unable as yet to give a circumscribed diagnosis, owing to the inclusion of *Ancono* and *Dialecticopteryx*, but have not seen a specimen of any form where the basal part of the tegminal venation is clearly interpretable; apparently, however, the 3 main veins either spring together out of the basal cell, or the radial and median have a short stalk. (*) There seem to be four apical tegminal-cells, but often the first is obsolescent or even entirely absent. *Ancono* and *Dialecticopteryx* belong here by habitus, but have peculiar venation. The following table seems to bear a closer approximation to the natural affinities of the forms than that in my first memoir.

- 1 The 3 main veins of the tegmen running separately to the apical cells, or only joined quite close to the base... (2)
- 1a Median and cubital veins united by a stalk apically... (13)
- 2 Face of the usual type (3)
- 2a Frons closed basally (12)
- 3 Three apical wing cells [Group A] (4)

* Woodworth's figure of an Euterygine tegmen (1906, Techn. bull. Univ. California Ent. 1 f. 61, is unlike any I have seen.

- 3a Two apical wing cells [Group B] (**).....(6)
 3b One apical wing cell [Group C] (**).....(11)
 4 Tegminal appendix present.....(5)
 4a Tegminal appendix absent, submarginal wingvein present
 (10)
 5 Submarginal wingvein present.....1 *Alebra*
 5a Submarginal wingvein absent.....2 *Protalebra*
 6 Submarginal wing vein present; third apical wingvein forked
 (7)
 6a Submarginal wingvein absent.....(9)
 7 At least two of the apical cells of the tegmen arising from
 the transverse veins(8)
 7a Only one of the apical cells arising directly from the transverse
 veins5 *Kahaono*
 8 Body long and slender3 *Dikrancura*
 8a Body short and robust.....4 *Erythria*
 9 First two wing veins subparallel.....6 *Eupteryx*
 9a First two wing veins confluent towards the apex.....
 7 *Erythroncure* (= *Empoa*)
 10 Vertex twice as long as pronotum.....8 *Nirvana*
 10a Vertex shorter than pronotum9 *Eualebra*
 11 Submarginal wing vein present.10 *Cicadula* (= *Empoasca*)
 11a Submarginal wing vein absent.....11 *Typhlocybella*
 12 Vertex wider than an eye, not produced anteriorly, forming
 a curve with the eyes; frons not twice as long as
 maximum width12 *Apheliona*
 (type *Heliona biocula* Melichar)
 12a Vertex narrower basally than an eye, angularly produced
 anteriorly; frons elognate, more than 3 times as long as
 maximum width; lora elongate.....13 *Heliona*
 13 Vertex not produced in front of eyes; radial and median
 with a common apical stalk14 *Dialecticopteryx*
 13a Vertex triangularly produced; cubital and median with a
 common apical stalk15 *Aneono*

It appears to me that a form with three apical wing cells and a tegminal appendix represents the most generalized, degradation to two and then to one wing cell results in Groups B and C, the former first having a submarginal wing vein, then losing that.

** Not counting the supernumerary cell.

Alebra seems to represent very fairly the more primitive forms and I imagine it more likely that *Protalebra* has been developed from a form like *Alebra* than *vice versa*. *Alebra*-like forms by losing the submarginal vein that is to say, the apical margins of the apical veins, develop into *Zygma*, *Eupteryx*, etc. I have no specimens now of *Nirvana* for examination, but judging from Melichar's figures, it is very likely to be an Eupterygine genus.

Cicadula.

2. *vitiensis*.

Line 9 of description, for "with" read "wing."

Hab. Viti Levu, Rewa (Feb. Mar. Nov. & Dec., M.).

One example is pale yellowish-green (instead of lemon-yellow) and the legs are green (instead of pale greenish); this, no doubt, is the colour when alive. The last segment of the female is practically truncate apically. The ocelli are fairly well pronounced and lie within the pale oblong, bordered by the two dark transverse lines, on the top of the head.

3. *hyadas* sp. nov.

Pale lemon yellow, paler beneath. Eyes greyish-black. Tegmina milky, a short dark fuscous line on the apical margin at the basal internal angle and a greyish fuscous spot at the apex of the tegmen. Wings milky, veins partly fuscous. Vertex about as long as the scutellum, shorter than the pronotum, nearly twice as long medianly as at the eyes, angularly rounded in front.

Female: ovipositor black.

Length $3\frac{1}{8}$ mill.

Hab. Viti Levu, Rewa (Dec., M.).

4. *euryphaessa* sp. nov.

Allied to *C. rufa* (Melichar), but the head is longer, pronotum shorter, legs pale, etc. Bright scarlet; vertex pale testaceous with a mediolongitudinal suffused scarlet stripe, which forks at the base of the frons and extends all over the face suffusedly (sometimes the red stripe is obsolete at the fork, the frons then being entirely pale, only the genae and the clypeus, etc., red.) Apical third of tegmina hyaline, iridescent, veins there pale yellowish. Wings hyaline, iridescent, basal veins pale sanguineous.

Tergites mostly sanguineous. Underside and legs pale testaceous, the former sometimes a little suffusedly sanguineous. Vertex longitudinally sulcate, anteriorly somewhat swollen, longer than wide, roundly produced before the eyes. Pronotum scarcely wider than the head and only about one-half of its length, shorter than the scutellum, scarcely emarginate posteriorly, lateral margins short. Tegminal venation that of *C. rufa*, except that the interior branch of the first apical vein is curved.

Female: last sternite very slightly sinuate, the pale part longer than wide.

Length $2\frac{1}{2}$ mill.

Hab. Viti Levu, Rewa (Mar.-Apr.) Navua (Feb. Muir's No. 53) on a native tree, also on *Saccharum officinarum*.

There is a purplish bloom on one example, giving it a superficial resemblance to *Erythroneura doris*.

Erythroneura.

6. *sidnica*, sp. nov.

Pale yellowish, immaculate, paler beneath. Head shaped as in *E. dentata* (Gillette), but more rounded and the eyes more decumbent on the pronotum, which is posteriorly slightly emarginate.

Length abt. 3 mill.

Hab. New South Wales, Sydney (Jan.-Feb., K.).

In bad condition.

7. *doris* sp. nov.

Distinguished by the large pronotum and minute scutellum, as well as by the colour.

Head, pronotum, sterna, legs, etc., pale testaceous. Pronotum laterally from antero-lateral angle of the scutellum to the intero-posterior angle of the eye, dark fuscous. Scutellum testaceous tinged with pale purplish blue. Tegmina pale sanguineous, tinged with violaceous, basal two-thirds of subcostal and subradial cells purplish, apical third of tegmina hyaline, veins pale sanguineous. Wings hyaline, iridescent, tinged with fuscous, veins dark. Abdomen dark fuscous. Vertex wider than long, extending nearly as far in front of the smallish eyes as basally, angularly rounded apically. Pronotum large, a little wider than the head,

and longer than the vertex, about one-half wider than long, lateral margins long, anterior and posterior margins subparallel. Scutellum minute, not one-half the length of the pronotum.

Length (female) $2\frac{1}{3}$ mill.

Hab. Viti Levu, Rewa (Apr., Muir).

8. *lalage*, sp. nov.

Allied to the last, but head shaped differently, scutellum longer and different colour. Head, sterna and legs pale testaceous, the vertex with a large dark fuscous spot arising close to the base and extending on to the frons nearly as far apically as in line with the insertion of the antennae. Pronotum anteriorly obscure purple, posteriorly dark fuscous, an obscure fuscotestaceous line mediolongitudinally, extending on to the obscure-purplish scutellum. Abdomen dark fuscous. Tegmina and wings as in *E. doris*. Eyes a little larger; vertex more rounded on the anterolateral margins, wider than long. Pronotum as in *doris*, but a little shorter and the anterior margin a little arched. Scutellum at least three fourths of the length of the pronotum.

Female: base of genital segment obscurely pale.

Length $2\frac{1}{3}$ mill.

Hab. Viti Levu, Rewa (Apr., Muir, 1 female).

9. *leucothoe*, sp. nov.

May be regarded as a "*Zygina*," although there are three subparallel apical veins, the first diverging a little outwards, and being a direct continuation of the radial, more approaching *Dikraneura* from which it differs only by the absence of the submarginal. Pale whitish testaceous; tegmina milky white, (a large opaque area occupying middle third of subcostal cell), veins concolorous; a blood-red spot at the base of the second apical vein and a tiny blood-red speck at the apex of the clavus. Vertex produced well in front of the eyes, about as long as wide, roundly angulate. Pronotum anteriorly rounded, about as long as the vertex and a trifle longer than the scutellum. Eyes not nearly touching base of tegmina. Radial and median veins apparently unite at about the apical margin of the basal third of the tegmen.

Length (female) 2 mill.

Hab. Viti Levu, Navua (Feb., Muir).

10. *rewana*, sp. nov.

Yellowish-brown, paler beneath, pronotum somewhat sordid, abdomen blackish. Tegmina smoky hyaline; clavus, sutural cell of corium and subcostal cell, pale yellow smoky in parts; veins pale yellow; a dark smoky spot at apex of tegmen. Wings smoky hyaline, veins smoky. Vertex somewhat convex, roundly prominent in front of eyes, but not so long as wide. Four apical cells to the tegmen, the first very small.

Length $2\frac{1}{3}$ - $2\frac{1}{2}$ mill.

Hab. Viti Levu, Rewa (Mar. & Dec. M.).

The yellow is apt to fade and become obscure.

Nymph: The ultimate stage (as far as can be judged from the empty skin) is brownish-yellow. Head produced in front of eyes at least as far as the length of the rather long eyes beyond them. Antennal peduncle elongate and conspicuous, flagellum much longer than the body. There are a large number of erect capitate hairs disposed as follows: 6 on the lateral and anterior margin of the vertex 4 on the pronotum, 8 submedian and 6 lateral on the abdominal tergites, also a number on the meso and metanotum, tegminal pads and legs.

Dialecticopteryx, gen. nov.

An aberrant genus, distinguished by the peculiar venation of tegmina and wings.

Vertex transverse, declivous, anteriorly rounded, not (or scarcely) prominent in front of eyes, longitudinally sulcate, posteriorly marginate and raised from the pronotum. Pronotum transverse, little longer than the vertex, lateral margins short, carinate. Scutellum longer than wide, about as long as the pronotum. Tegmina (Pl. 1, fig. 7) sparsely punctured, venation obscure; the radial and median are united at the base, fork soon after, but keep very close together till a little basal of the apical calls when they reunite; cubital obsolete basally, only appearing a little basal of the apical cells. The radiomedial re forks apical of the subapical line, thus forming a triangular cell; there are 2 quadrilinear cells interior of this (perhaps more if the apical veins fork). No veins in the clavus and no appendix. The extreme apex of the wing is unfortunately broken but enough remains to show its peculiar character (see Pl. 1 fig. 6). This genus shows some relationship to *Nesosteles*, etc.

1. *australica*, sp. nov.

Pl. 1. figs. 6-7.

Orange-yellow, legs paler; 2 large bluish-black round spots on the vertex and a smaller one on the frons. Pronotum with an inverted blue-black V, connecting on the scutellum with an inverted A. Tegmina milky white, subcostal vein basally, radial, median and commissure suffusedly smoky, extreme margins of tegmen here narrowly black; radiomedial (apical) and continuation of the commissure apical of the clavus, smoky but not suffused. Wings hyaline, iridescent, veins pale fuscous partly.

Male: plates long, triangular taken together.

Female: 7th sternite triangularly produced, pygophor yellowish brown, ovipositor dark fuscous.

Length $4\frac{1}{2}$ mill.

Hab. Queensland, Bundaberg (Sept.-Dec., K.).

Tribe *Cephalelini*.

This is only a small part of the tribe of this name in my first memoir. It is restricted to those forms in which the tibiae are very feebly bristly; owing to a degradation of the flight organs, the tegminal and wing venations are usually much reduced. Incidentally the head is usually greatly elongate and foliaceous or subfoliaceous.

Cephalelus, *Dorycephalus*, *Paradorydium*, and others not known to me in nature, as *Dorydiella*, belong to this tribe.

Paradorydium.4. *brighami*, sp. nov.

Distinguished from the other species by the short vertex.

Pale yellowish, closely punctured with light brownish, the punctures being closer and darker on the basal half of the pronotum. Head close around insertion of antennae, the labium, sterna, etc., dark fuscous. Sternites (except the last segment which with the genital segments is pallid) infuscate. Fore femora ringed with fuscous. Vertex acute anteriorly, lateral margins straight, Frons anterior to the antennae diamond-shaped, then the lateral margins parallel, the insertion of the antennae about on a line with the apical margin of the eyes (instead of distinctly nearer the ante-

rior angle of the head); apical margin of clypeus minutely notched, extending apically distinctly beyond the apical margin of the genae.

Male: vertex nearly twice as long as pronotum; maximum width greater than median length.

Female: vertex about twice and a half as long as the pronotum; maximum width less than median length.

Length $3\frac{1}{2}$ mill.

Hab. New South Wales, Mittagong (Jan., K.).

This species, (which I name in honour of Dr. W. T. Brigham, Director of the Bernice Pauahi Bishop Museum in Honolulu, whose "Index to the Islands of the Pacific" (1900 Mem. Bishop Mus. I, 1-172) is of such great value to the student of Pacific Faunas), seems very distinct from such *Paradorydia* as *lanceolatum*, *foveolatum*, etc., but I can see no generic differences beyond the much shorter head. On this and the straight lateral margins of the vertex, I found a new subgenus *Deltodorydium*.

5. *ovidii* sp. nov.

Allied to the last, but the head more elongate, the head and pronotum forming two-fifths of the entire length, and the lateral margins are concavely curved, the species thus falling into the typical subgenus. It differs from *P. foveolatum* Sign., by the much less spatulate head and less pointed tegmina.

Length (female) 5 mill.

Hab. New South Wales, Mittagong (Jan.).

Dorycephalus.

3. *trilineatus*.

The exact habitat was "New South Wales, Sydney (Jan., K.)."

Tribe *Iassini*.

Van Duzee includes this as a tribe of his Jassina, but it is far more distinct from his 'Deltoccephalini' than these are from his 'Subfamily Acocephalina.' The Iassinae are characterized by the vertex being perpendicularly raised at the sides and base, the latter being practically truncate between the eyes, and distinctly narrower there than the apical margin of the scutellum. Head and eyes distinctly narrower than the pronotum. Frons

elongate. Wings with a supernumerary cell. There is only one subapical cell in the tegmen (*). The ocelli are well-marked and are on, or near, the apical margin of the vertex and are visible dorsally. In the 3 genera known to me, the vertex is obliquely striate, the pronotum finely granulate and the scutellum very finely punctured. The female genital segments are of the usual Tetigoniine type, but the male plates are very long and of characteristic appearance; the valve is wanting.

The structure of the head, of the venation and of the male plates distinguish this group very thoroughly. *Macroceratogonia* has some affinity with these forms, but only females are known at present; the interior discoidal cell is also divided by a transverse vein in both the specimens I have seen. It has also great affinity with the Tetigoniini and Penthimiini, but must at present be relegated to a provisional tribe by itself.

Eight genera of Iassini are known.

1	Vertex more than twice as long as wide, triangular produced	3	<i>Muirella</i>
1a	Vertex not longer than wide.....	(2)	
2	Fore femora and tibiae foliaceous.....	8	<i>Gabrita</i> (= <i>Petalopoda</i>)**
2a	Femora simple	(3)	
3	Pronotum keeled	7	<i>Thagrius</i>
3a	Pronotum not keeled	(4)	
4	Vertex expanded posteriorly behind the eyes; ocelli near the apical margin of the vertex; anterior and posterior margins of the pronotum subparallel.....	5	<i>Tinobregmus</i>
4a	Vertex not expanded behind the eyes.....	(5)	
5	Ocelli near the eyes; anterior margin of pronotum rounded	(6)	
5a	Ocelli remote from the eyes; anterior margin of pronotum straight	6	<i>Neocaelidia</i>
6	Scutellum much shorter than pronotum.....	4	<i>Palicus</i>
6a	Scutellum not shorter than pronotum.....	(7)	
7	Anterior tibiae curved	3	<i>Terulia</i>
7a	Anterior tibiae straight	(8)	
8	Frons rather flat, distinctly sutured; tempora wide but short; antennae inserted near the intero-posterior angles of the eyes	1	<i>Iassus</i>

* It is true there are two in *Tharra labena*, but in the unique type of this, the exterior discoidal cell is divided apical of its middle by a short transverse vein, which is absent in the other species of the genus.

** There is nothing in the descriptions of these to keep them apart.

- 8a Frons raised, less distinctly sutured, tempora narrow and very short, antennae inserted near the intero-anterior angles of the eyes2 *Tharra*

Tharra.

I separated this (Bull. I p. 324) from *Iassus* by the possession of two subapical cells and the absence of transverse veins in the clavus; the latter is of no value and the former is, I am inclined to believe, accidental. It is possibly only a group of *Iassus*, but for the present may be separated by the characters given in the key. Typical *Iassus* also seems to have the apical margin of the vertex forming more or less of a curve with the eyes. The only species of *Iassus* I have seen is represented by a pair of *I. olitorius* Say, kindly given me by my friend, Mr. Van Duzee.

In *Tharra labena*, *kassiphone*, etc., the median and brachial veins are generally united by a straight cross vein at their bases, this being united to the radial by an outwardly inclined oblique vein; but in *T. kalypto* and *ogygia* there is usually a common longitudinal stalk for the median and brachial, which is united to the radial by the oblique vein. This however is not constant and moreover sometimes the stalk vanishes, and the median and brachial unite at an angle.

In all the species, the frons is not, or only faintly, medianly keeled and the clypeus is not ampliate, though often a little widened, apically.

The species (all Australian and Fijian up to the present) may be disposed as follows:

- 1 Vertex distinctly narrower at the base than at the anterior margin of the eyes, not flush with the eyes, lateral margins gradually divergent. Anterior and middle legs bright orange yellow..... 5 *kassiphone*
- 1a Vertex little wider (if at all) at anterior margin of eyes than basally, flush with the eyes, lateral margins parallel or subparallel as far as the anterior margins of the latter. Legs pallid or black2
- 2 Part of vertex produced before eyes not more than a third of the length of the basal part3
- 2a Part of vertex produced before eyes about two-thirds of the length of the basal part4 *nausikaa*
- 3 Tegminal veins bright sanguineous1 *labena*

- 3a Tegminal veins pallid, sometimes faintly sanguineous....4
 4 Tegmina yellowish brown; head and pronotum more or less orange brown2 *ogygia*
 4a Tegmina pale testaceous, a pale fuscous band across the middle3 *kalypto*
lassus detractus Walker, from Tasmania, is not included.

1. *labena*.

I have little doubt that the division of the discoidal, in the unique specimen, is an aberration. This single example is a male, not a female. The last segment is deeply, minutely, roundly emarginate and the plates (not 'valve') are elongate, and covered with long, curling, rather coarse, white hairs.

2. *kalypto* sp. nov.

Pale yellowish testaceous, a little paler beneath, vertex slightly embrowned. Tegmina hyaline with colourless veins (sometimes very narrowly margined with pale greyish fuscous), an irregular pale greyish fuscous band across the tegmen, sometimes other small suffusions. Tibiae apically and tarsi fuscous. Tergites more or less fuscous discally. Vertex much as in the type, perhaps a trifle wider; frons also in the type, but a little flatter, clypeus scarcely so broad apically.

Female: last segment roundly, a little angularly, produced, angularly emarginate narrowly, but sufficiently deeply, posteriorly; medianly carinate; the fuscous ovipositor is longer than the pygophor.

Length $6\frac{1}{4}$ - $6\frac{1}{2}$ mill.

Hab. Viti Levu, Rewa (Apr., Muir).

3. *ogygia* sp. nov.

Form of the last; cheeks a little marginate interiorly. Yellowish brown, paler beneath, more or less suffused with rosy on head and pronotum. Tegmina yellowish brown, veins concolorous, or slightly tinged with sanguineous, apical cells apically (sometimes medianly but obscurely) fuscous. Apical half of hind tibiae dorsally fuscous. Tergites more or less fuscous discally.

Male plates elongate, with short pale yellowish grey bristly hairs.

Female genital segments much as in the last.

Length (male) $\frac{1}{2}$ (female) 6 mill.

Hab. Viti Levu, Rewa (Mar.-Apr., Muir).

4. *kassiphonæ* sp. nov.

Male: shining black; lateral margins of vertex, very narrowly (and ending at the apical margin of vertex), antennal peduncle, and labium, pale yellowish. Tegmina very dark fuscous, basally opaque black, shining. Fore and middle legs (except the somewhat fuscous coxae and claws) bright orange yellow; hind tibiae pale at extreme apex. Appendix to tegmina pale. Wings dark fuscous, veins black. Vertex distinctly narrower at the base than between the apical margins of the eyes, not flush with the eyes at the former, diverging regularly towards their apical margin, scarcely one third extended in front of the latter. Antennae inserted at about the middle of the interior margin of the eyes (ventrally), tempora short, very narrow. Plates much as in *T. labena*, but the hairs shorter and yellower.

Var. Clypeus, and apical margin, very narrowly, of genae, pale.

Female. Larger than the male; a longitudinal elongate-oval, pale yellow line on the vertex, not attaining (as a rule) the apical margin or the base; genae (except a trifle fuscous here and there sparsely) and clypeus pale yellow, as also sometimes the extreme base of the lorac. Tegmina with the subcostal vein right around to the apex of the tegmina, a long oval spot near the base of the subcostal cell and a long suboval stripe exteroapically on the same, a small spot near the apex of clypeus and another at the base of the tegminal appendix, pale yellowish brown. Fore and middle femora, tibiae and tarsi etc., bright orange-yellow, hind legs mostly blackish, at least dorsally. Genital segment as in *T. kalypto*, but scarcely emarginate medianly.

Var. Sides of pronotum pale yellowish, narrowly.

Length (male) 5 (female) 6 mill.

Hab. Viti Levu, Rewa (Mar., Apr., Dec., Muir).

5. *nausikaa* sp. nov.

Similar to the last, but less polished, fore and middle legs pale yellowish, the yellow of the head and pronotum browner, the head longer, etc.

Male: black, with a strong, entire, wide, longitudinal pale yellowish-brown, continued to the posterior angle of the scutellum, the pale lateral margins of the head widening a little in front of the eyes and meeting in a curve at the base of the frons;

apical half of clypeus, the labium, fore and middle legs (except the more or less fuscous coxae and claws) pale; hind femora dark, tibiae more or less pale, at least ventrally. Tegmina dark fuscous, subcostal cells up to the oblique vein (except extreme base), a spot close to apex of subcostal cell, apical of the oblique vein, a spot at base of appendix, etc., pale. Vertex very little wider at anterior margin of eyes than at base, the latter practically flush with the eyes, lateral margins subparallel as far as anterior margins of eyes, then suddenly diverging. Vertex anteriorly roundly angulate, nearly as long in front of eyes as behind their anterior margin; frons rather narrower apically.

Vars. face entirely blackish or mostly pale; there are sometimes 3 pale lines on the pronotum. Tegminal veins varying from black to pale yellowish-brown, the latter sometimes a little tinged with sanguineous. Tegmina varyingly spotted with pale yellowish brown. Scutellum sometimes immaculate, sometimes posterior third pale.

Female larger than the male, and usually of the paler vars.

Extreme var. (male and female), *pallidor* nov. is pale cinereous above, with only scattered fuscous spots on the tegmina, four fuscous lines on the pronotum, etc.

Length (male) $4\frac{1}{2}$ -(female) $5\frac{1}{2}$ mill.

Hab. Viti Levu, Rewa, (Feb., Apr., Nov., Muir), Navua, (Feb., Sept., Muir); Muir's No. 201 is an example of the less typical forms.

6. ———, sp?

Pl. II, fig. 14-15.

Only the nymph known so far.

Yellowish-white. Apical half of vertex; all the face except a median longitudinal stripe in the middle, reaching the clypeus but not the vertex; pronotum, tegminal pad, apical margin laterally of metanotum: two stripes down the abdomen, not quite reaching posterior margin, joined basally and apically, extending at these points to the lateral margins; apical half (except extreme) of femora, basal third (except extreme) of hind tibiae; sanguineous. Claws and arolia fuscous.

Hab. Viti Levu, Rewa (Apr., M.).

Muirella gen. nov.

Vertex flat, elongate, a little declivous, and somewhat sloping laterally, about twice and one half as long as wide at the truncate base, lateral margins parallel for about three-fourths of their length, then diverging outwardly to a little beyond the anterior margin of the eyes, then converging strongly, forming a roundly acute angle. In profile the head is subconical. Ocelli lateral, a trifle nearer to the eyes than to the top of the head, visible dorsally. Frons elongate, about twice and a half as long as wide at antennal scrobes, a little wider just basal of this, narrowing apically and basally, basally acutely triangular, apically subtruncate. Tempora very short and narrow. Genae deeply impressed roundly in the middle. Clypeus not produced beyond the apical margin of the genae, about twice as long as wide, strongly carinate on the basal half, a little wider than the lora which do not touch the posterior margin of the genae. Labium reaching to anterior margin of fore trochanters. Antennae inserted anterior to the middle of the eyes (viewed in profile), the eyes extending posteriorly beyond the apical margin of the frons (thus separating this genus from the others) and decumbent nearly one-half, on the pronotum dorsally; seta long, more than half the length of the body. Pronotum transverse, lateral margins fairly long, somewhat feebly carinate; posterior margin obtuse-angularly emarginate. Scutellum wider than long. Tegmina with one subapical and 4 apical cells; the subcostal cell obliquely divided near the apex by a fork of the *radial*¹. Wing with a supernumerary cell, which however does not nearly reach the apical margin of the wing, the next of the apical cells being thus short and broad.

1. *oxyomma* sp. nov.

Pl. II, fig. 21-2.

Male, whitish testaceous (sometimes pale yellowish brown), usually more or less suffused rosily. Face usually with a transverse blackish band from eye to eye near the base (lora and clypeus, etc., often more or less fuscous). Prosterna, pleura partly, a spot on fore coxae, etc., blackish. Abdomen mostly blackish. Tegmina with the clavus, basal half of corium (except subcostal cell) and a bifid band near the apex dark fuscous or blackish (opaque basally), the rest yellowish brown. Veins bright sanguineous. Wings dark fuscous, iridescent, veins black. Hind

femora more or less blackish. Plates long, with long pale greyish hairs.

Female: abdomen yellowish testaceous, partly suffused with fuscous. Tegmina yellowish brown, an oblique dark fuscous band at base of apical third, a more obscure one basal of that; apical margin narrowly smoky, veins bright sanguineous. Hind femora pale. 7th sternite sinuate, minutely obtuse-angled in the middle.

Length (male) 6- (female) $6\frac{1}{4}$ mill.

Hab. Viti Levu, Rewa (Mar., the unique male, type, and females) and Navua (Feb.) (Muir's Nos. 116 and 203).

Nymph: pale whitish testaceous, fuscate on pronotum and scutellum, sparsely so on tergites; some sparse orange-red marks on the head. Vertex, pronotum and scutellum carinate, the first much of the appearance it has in the adult. Tergites with one submedian and one lateral row of piliferous, punctured granules. (Pl. I. figs. 10-12).

I have pleasure in dedicating this genus and species to my friend and colleague.

Tribe Penthiniini.

(=Gyponidae auctt.)

I can find no good characters to separate this tribe. It runs into the Tetigeniini via *Ezacanthus*, into the Phrynomorphini via *Errhomenellus* and *Chiasmus*; its forms are usually less elongate, and the ocelli are usually on the disk of the vertex, but situated in front of a line drawn between the anterior margin of the eyes; this is however not the case in some species at present attributed to *Gypona*.

The following genera are I believe all that have been described:

- 1 The head dorsally with a large suboval area separated off anteriorly by a deeply impressed line. . . . 1 *Ectopiocephalus*
- 1a Head dorsally without a part separated off. (2)
- 2 Tegmina very short, venation obscure. (3)
- 2a Tegmina reaching at least as far as the base of the genital segment, fully formed (4)
- 3 Clypeus extending well beyond the apical margin of the genae, longer than half the length of the frons.
- 2 *Errhomenellus*
- 3a Clypeus extending only as far as the apical margin of the genae, not longer than half the frons 3 *Chiasmus*

- 4 Pronotum prolonged posteriorly (more or less as in the Cercopidae) or at least distinctively longer than wide (5)
- 4a Pronotum wider than long.....(7)
- 5 Pronotum medianly truncate behind..... 4 *Signoretia*
- 5a Pronotum angularly emarginate behind.....(6)
- 6 Vertex gently rounded in front; frons subquadrate, truncate basally 5 *Bathysmatophorus*
- 6a Vertex subangular in front; frons longoval, produced basally 6 *Xerophloca*
- 7 Frons with a keel down the middle.....7 *Evacanthus*
- 7a Frons without a longitudinal keel.....(8)
- 8 Tegmen without an appendix(9)
- 8a Tegmen with an appendix(10)
- 9 Ocelli indistinct8 *Aglena*
- 9a Ocelli distinct9 *Uzelina*
- 10 Tegmina apically subsinuate truncate.....10 *Jafar*
- 10a Tegmina apically more or less rotundate.....(11)
- 11 Pronotum extending farther laterally than the tegmina, which arch outwards beyond the subparallel basal fifth 11 *Penthimia*
- 11a Pronotum not extending farther laterally than the tegmina, which arch outwards from the base, if at all.....(12)
- 12 Scutellum distinctly wider than the head..12 *Penthimidia*
- 12a Scutellum not wider than the head.....(13)
- 13 Anterior margin of vertex in profile acute or subacute; frons basally excavated(14)
- 13a Vertex not acute in profile, sometimes bluntly keeled; frons not excavated(15)
- 14 Head laminate; tegmina hyaline13 *Thaumatoscopus*
- 14a Head scarcely foliaceous; declivous; tegmina with numerous ramose "false" veins.....14 *Vulturinus*
- 15 Vertex declivous, sufficiently elongate.....15 *Gypsona*
- 15a Vertex very short, forming one curve with the frons..(16)
- 16 Pronotum transversely striate.....16 *Scaris*
- 16a Pronotum not striate17 *Zinneca*
18. *Ncodartus*, I do not know.

Vulturinus.

Differs from *Thaumatoscopus* principally as follows: vertex more declivous; clavus and the subcostal cells with numerous transverse veins and usually the entire tegmen with numerous

incomplete veins. There seem to be 8 good species in the Koebele-Perkins material, separable as follows:

- 1 Margin of head between vertex and frons, acute; anterior part of head laminate (2)
- 1a Head anteriorly sublamineate, anterior margin thickened (4)
- 2 Length over $5\frac{1}{4}$ mill. 3 *virgidemia*
- 2a Length under 5 mill. (3)
- 3 Vertex a little longer than pronotum. 1 *vulturinus*
- 3a Vertex not longer than pronotum 2 *volutumna*
- 4 Vertex ivory white, very sparingly speckled with pale brown 4 *vanduseei*
- 4a Vertex ivory white, with a basal fascia of pale brown specks (5)
- 4b Vertex dark, very closely speckled with pale yellowish. . (6)
- 5 Larger, broader 5 *vaccors*
- 5a Smaller, more parallelsided 6 *vultuosus*
- 6 Broader and paler 8 *vappa*
- 6a Narrower and darker 7 *vaeduleis*

Div. 1. Margin of head between vertex and frons acute, foliaceous.

1. *vulturinus*.

Head, pronotum and scutellum yellowish-brown, pronotum more or less infusate. Eyes dark, ocelli reddish. Foliaceous part of frons and 2 spots on genae on each side, orange-red, rest of face and the prosternum black (or the frons may be entirely orange-red or entirely black except a narrow basal line). Underside testaceous. Tegmina sordid whitish, mottled with greenish brown or pale greenish or bluish-black, veins brownish yellow.

Vertex longer than pronotum, wider between the eyes than long, distinctly reflexed anteriorly, lateral margins of vertex in front of eyes short but very distinctly curved outwards before joining the arched anterior margin. Hind legs usually more or less dark.

Male: last segment truncate, a little shorter than the short pygophors.

Female: last segment slightly sinuate, a little produced medianly and laterally; pygophors about $2\frac{1}{2}$ times as long as last segment, slightly shorter than ovipositor.

Length (male) 4-4 $\frac{1}{4}$ mill; (female) 4 $\frac{1}{2}$ -4 $\frac{3}{4}$ mill.

Hab. Queensland, Cairns (Aug., P.); Kuranda (Aug., P.).

2. *volutumna* sp. nov.

Closely allied to *V. vulturinus*, but vertex a little shorter, not longer than pronotum, strongly impressed transversely in the middle, basal part declivous, apical part slightly recurved, almost porrect instead of declivous as in *V. vulturinus*.

Vertex strongly, pronotum sparingly, mottled with blackish brown; scutellum marked with same colour. Tegmina heavily smudged with black. Underside black except the non-foliaceous part of frons and the basal margin (narrowly) of the foliaceous part, sordid orange. Anterior legs and bristles on the others, yellowish testaceous.

Female. Genital segment much as in *V. vulturinus*.

Length $4\frac{1}{3}$ mill.

Hab. Queensland, Kuranda, (Aug., P.).

3. *virgidemia* sp. nov.

Vertex, frons, clypeus, pronotum and scutellum castaneous, more or less clouded with blackish. Genae, lora, sterna, &c.. more or less black. Tegmina yellowish testaceous, apically a little hyaline and more dilute, veins blackish brown, the colouring being more or less blotchy; the clavus subirrorate; the cells are mostly more or less marked with blackish-brown. Wings smoky, veins black. Fore legs pale, other legs more or less fulvous, longitudinally striped with black. Sternites yellowish brown, marked with darker brown.

Vertex about, or a little more than, twice as wide as long, rounded anteriorly parallel to posterior margin, extended laterally in front of the eyes about as far as posteriorly.

Female: last segment produced a little medianly, pygophors longer than ovipositor.

Length $5\frac{1}{3}$ mill.

Hab. Queensland, Kuranda (Aug., P.).

Div. 2. Margin of head blunt, subfoliaceous.

4. *vanduzeei* sp. nov.

Allied to *V. vulturinus*, but the margin of the head is not acute anteriorly, and the anterior margin immediately in front of the eyes is not (or not noticeably) divergent, before curving upwards and inwards.

Vertex, pronotum, and scutellum ivory white, more or less tinged with greenish, the vertex with a few scattered brownish

specks; pronotum obscurely mottled with greenish brown, sometimes with a whitening medio-transversely. Face black except for a few redbrown marks and the ivory-white basal margin. Sterna and pleura black (except for the more or less pale exterior half of propleura). Tegmina ivory white tinged with green, veins and in complete veins brownish. Fore legs pale, others mostly blackish; bristles pale. Sternites and genital segment pale or dark varyingly.

Male: pygophors a little more than twice as long as last segment which is bisinuate.

Length $4-4\frac{1}{2}$ mill.

Hab. New South Wales, Sydney (Jan., K.).

The nymphs are not specially remarkable.

5. *vaccors* sp. nov.

Allied to the last, but the basal margin (except extreme part) with a transverse band of minute brownish reticulations. Pronotum mottled with palebrown, with a well defined undulating ivorywhite median fascia.

Male: genitalia much like those of the preceding species.

Length $4\frac{1}{4}$ mill.

Hab. Queensland, Bundaberg (Sept., Dec., K.).

6. *vultuosus*, sp. nov.

Very close to *V. vaccors*, but smaller, narrower and darker. Vertex a little shorter. Pronotum with a well marked white fascia and some black marks as well as the pale brown mottlings.

Female: last segment with 2 tiny median notches.

Length $3\frac{3}{4}-4$ mill.

Hab. Queensland, Cairns (Aug., P.); Nelson (July, P.); Kuranda (Aug., P.).

7. *vacdulcis* sp. nov.

Black; vertex, pronotum and scutellum thickly speckled with pale yellowish brown. Frons margined basally with yellowish. Tegmina pale yellowish brown heavily veined and marked with black; apex of costal cell and of the adjoining subapical white, spotshaped. Fore legs and bristles, &c., of the others, more

or less pale. Vertex not longer than pronotum, rounded in front.

Length 3-3 $\frac{1}{4}$ mill.

Hab. Queensland; Cairns (Aug., P.); Bundaberg (Sept.-Dec.); New South Wales, Sydney (Jan.-Feb., K.).

Nymph: Vertex laterally spinose just above the eyes.

8. *vappa* sp. nov.

Very close to *I. caudulcis*, but paler and broader. Tegmina with a large colourless patch on the costa, &c.; apical parts largely colourless.

Length 4 mill.

Hab. New South Wales, Sydney (Jan.-Feb., K.).

Tribe Tetigoniini.

In the Tetigoniini, the male genital segments are of simple form. The last abdominal is probably the seventh. The pygophor is sometimes not visible ventrally, being covered over by the "Plates", which are not visible dorsally, except between and below the pygophor; apical of the 7th segment, there is dorsally a small semicircular plate, and ventrally a small triangular plate, which is called the "Valve"; both these may be altogether absent and their absence or presence is probably of generic value; for example, taking the careful figures in Ball's Monograph of the North American Tetigoniini, I find that the *valve* is present in *Draculacephala* and *Helochara*, absent in *Dicrocephala*, *Tetigonia*, *Homalodisca*, *Aulacizes*, and *Oncometopia*. I am not sure that the *Plates* may not be absent sometimes.

In the females, the 7th segment is the last abdominal, the 8th is absent ventrally and only lateral margins can be seen, basally at the sides, the 9th is divided and is generally shorter than the ovipositor; the 7th is usually narrower than the preceding tergites and is very mobile, being lifted up from the apex, at right angles, so that the ovipositor can have free play.

Tetigonia.

There is no male valve in this genus (or if so, it is concealed).

1. *albida*.

Add Viti Levu, Rewa (Apr., Muir).

2. *koebelci*.

The 7th segment (female) triangularly (sides somewhat rounded) produced, the 8th segment attaining laterally about half the length of the pygophor, which has sparse dark hairs along by the ovipositor and at the apex, and very slightly exceeds the ovipositor in length.

5 and 9. *albomarginata*.

Tettigonia albomarginata Signoret 1853 A. S. E. France (3) I, 347, Pl. X, f. 4.

Tettigonia pttimolua Kirkaldy 1906 Bull. Ent. H. S. P. A., I, 321.

At the time of writing my description, Signoret's 'Revue' was unpurchasable, and I did not imagine that this species would be described as '*albomarginata*;' I have since been able to acquire, for the Station, Signoret's work and to identify Signoret's species. The colour of the tegmina, as indeed Signoret figures them, is dark metallic green, not plumbeous-black, as he writes. The species was found by Koebele on *Saccharum officinarum*.

7. *coerulescens*.

For Signoret's reference, read: *coerulescens* Sign., 1853 A. S. E. France, (3), I, 672, Pl. XXI, f. 16.

The vertex is subangulate, and the species is probably not a true *Tettigonia*. It is not *coerulescens*.

The genera of this tribe may be temporarily disposed as follows:

- 1 Juga porrect, straight or slightly deflexed at the apex, distinctly interrupting the lateral curve of the vertex; fore tibiae distinctly sulcate or flat, sometimes dilated.....(2)
- 1a Juga suddenly deflexed or noticeably curved from the base, never interrupting the lateral curve of the vertex; fore tibiae subcylindric (rarely otherwise).....(26)
- 2 Pronotum distinctly sexangular (or more), lateral angles distinct; tegmina completely covering the sides of the abdomen(3)
- 2a Pronotum transverse, quadrangular; rarely feebly hexangular (in which case the lateral angles are rotundate); tegmina often exposing the sides of the abdomen.....(8)
- 3 Pronotum normal; head not shorter than the pronotum.(4)

- 3a Pronotum crested or tuberculate or carinate. Head shorter than the pronotum.....(6)
- 4 Vertex sulcate longitudinally without an articulated appendix; fore tibiae a little dilated.....(5)
- 4a Vertex not sulcate, longitudinally, but with an articulated, elongate apical appendix; fore tibiae not dilated.....
.....1 *Dicstostemma*
- 5 Vertex prolonged filiformly; ocelli about as far from one another as from an eye; antennae short. Tegmina reticulate apically.....2 *Bascarrhinus*
- 5a Vertex not prolonged filiformly; ocelli about twice as far from another as from an eye; tegmina not reticulate.3 *Cicrus*
- 6 Pronotum crested.....4 *Zyzsa*
- 6a Pronotum not crested(7)
- 7 Pronotum with 2, compressed, diverging horn-like appendages5 *Zyszogeton*
- 7a Pronotum with 2 crescentiform tubercles.....
.....6 *Leucopclepla* (type *Tettigonia bituberculata* Sign.)
- 8 Vertex triangular, strongly narrowed, with a filiform, non-articulated, apical process.....(9)
- 8a Vertex rounded apically (or if triangular, then not produced)(12)
- 8b Vertex triangular, with a subfoliaceous (or foliaceous?) process which curves back so as almost to touch the pronotum7 *Wolfella*.*
- 9 Vertex not gradually passing into the apical process, which is much narrower than the apex of the vertex proper; fore tibiae dilated.....10 *Rhaphirhinus*
- 9a Vertex gradually merging into the apical process; fore tibiae scarcely, if at all, dilated.....(10)
- 10 Vertical prolongation widening a little apically, not sulcate, truncate; vertex indistinctly sulcate.....
.....11 *Syringophora* (type *Tettigonia brevis* Walker).
- 10a Vertical prolongation narrowing to the apex, sulcate; vertex distinctly sulcate.....(11)
- 11 Pronotum posteriorly truncate.....12 *Acrobelus*
- 11a Pronotum posteriorly emarginate..... 13 *Catorthorhinus*
- 12 Fore tibiae flat or sulcate.....(13)
- 13a Vertex longitudinally sulcate; pronotum nearly always distinctly narrowed in front; hind margin of propleura distinctly rounded or produced.....(18)

* 8 *Splonia* and 9 *Propetes* seem to be allied here, but I have not the description of the former and do not know either in nature.

- 14 Frons obtusely prominent, not longitudinally impressed; vertex not longer than its width between the eyes. (15)
- 14a Frons nearly straight in profile; vertex longer than its width between the eyes. (16)
- 15 Clavus with 2 veins (sometimes united in the middle for a short space). 14 *Oncometopia*
- 15a Clavus with one vein, which forks close to the apex and to the base. 15 *Dichrophleps*
- 16 Vertex not shorter than the pronotum; frons lightly convex, not gibbous; clavus with 2 veins uniting medianly. (17)
- 16a Vertex shorter than the pronotum; frons fairly convex or gibbous basally; claval veins distant. 16 *Cyrtodisca*
- 17 Vertex triangular, apex narrowly rounded, sensibly narrowed up to the apex in profile. 17 *Phera*
- 17a Vertex wider apically, semicircularly rounded there, sensibly narrowed in profile, with the apex obtuse. 18 *Homalodisca*
- 18 Fore tibiae simple. (19)
- 18a Fore tibiae dilated. (22)
- 19 Clypeus strongly elevated, gibbous, angulate in profile. (20)
- 19a Clypeus convex, but not angulately gibbous, in profile. 19 *Anlacizes*
- 20 Pronotum and scutellum about equally long. (21)
- 21a Pronotum narrowed anteriorly, scarcely impressed anteriorly. 22 *Amblydisca*
- 22 Tegmina apically rounded. 23 *Proconia*
- 22a Tegmina widely truncate apically. (23)
- 23 Fore tibiae moderately dilated; ocelli strongly distant. 24 *Acrocampsia*
- 23a Fore tibiae enormously roundly dilated; ocelli rather nearer to one another than to the eyes. 25 *Cymbalopus* (type *Tettigonia bigibbosa* Sign.)
- 24 Vertex much longer than pronotum, depressed, not sulcuate, lateral margins bidentate. 26 *Ochrostacta* (type *diadema* Burm.)
- 24a Vertex not (or scarcely) longer than the not (or scarcely) transverse pronotum, lateral margins not dentate (juga slightly prominent near the eyes). (25)
- 25 One vein in the clavus. 27 *Pherodes*
- 25a Two veins in the clavus. 28 *Acrogonia*
- 26 Tegmina hairy. 29 *Trichogonia*
- 26a Tegmina not hairy. (27)

- 27 Tegmina apically reticulate; vertex mostly longer than the pronotum.....30 *Acopsis* (= *Dracunculacephala*.)
 27a Tegmina not, or only very slightly, reticulate. Vertex rarely as long as the pronotum.....(28)
 28 Fore tibiae incrassate and compressed31 *Lissoscarta*.^{*}
 28a Fore tibiae not incrassate or compressed.....(29)
 29 Vertex obtusely rounded anteriorly, not sulcate, frons inflated; tegmina rounded apically, rarely slightly truncate.(30)
 29a Vertex flat, sulcate, forming an acute angle with the lightly convex front; tegminally apically truncate or sinuate truncate 33 *Diedrocephala*
 30 Wings deeply fissured at the anal area which forms a dilated lobe. Vertex wider than pronotum.....34 *Dilobopterus*
 30a Wings normal.....(31)
 31 Second segment of antennae very long.....35 *Poochara*
 31a Second segment of antennae short.....36 *Tetigonia*.^{**}

Tribe Megophthalmmini.

The Megophthalmmini contain apparently three genera, viz: *Megophthalmus*, *Paropulopa* and *Kahavalu*.

Membracidae.

Since the publication of my first Memoir, I have acquired a copy of Fairmaire's "Revue de la Tribu des Membracides" ^{***}, which has thrown a little light on one or two points. There still remain, however, several species which I suppose belong to *Centrotypus*, but cannot determine satisfactorily at present.

Zanophara.

1. *leda* sp. nov.

= *Z. tasmaniac* (?) Kirkaldy (nec Fairm.).

Differs from *Z. tasmaniac* (Fairm., God.) as follows:

Head concolorous with pronotum, reddish-pitchy. Tegmina basally, subcostal cell, clavus, veins, &c., opaque reddish-pitchy, apically subhyaline, yellowish-ferruginous. Legs reddish-

^{*} 32 *Sphaeropogonia* apparently is allied to this.

^{**} With subgenera *Amblysearta* (type *modesta* Fabr.) and *Pocloscarta* (type *cardinalis* Fabr.) : 37 *Conogonia* and 38 *Sphinctogonia* are allied to *Tetigonia*. *Phereurhinus* I do not know.

^{***} 1846, A. S. E. France, (2) iv, 235-320 & 479-531, Pls. 3-7.

pitchy. Ocelli a trifle nearer to one another than to the eyes. Both angles of the apex of the pronotal horns acute, the exterior one more so, the horn distinctly longer and slenderer.

Female: abdomen beneath reddish-pitchy.

Length $8\frac{3}{4}$ mill.

Hab. New South Wales, Mittagong (Jan.) arboreal.

2. *albovittata* sp. nov.

=*Z. vitta* (?) Walker, Kirkaldy.

Differs from *vitta* (Walk., God.) as follows:

Median keel of pronotum pitchy basally. Tegmina basally, anal cell of clavus apically, subcostal cell, a stripe (entire, not bifurcate) along the middle of the corium, &c., smoky ferruginous, veins ferruginous. Ocelli practically equidistant from one another and eyes.

[Third apical cell with a transverse venule on one tegmen.]

Length 6 mill.

Hab. Queensland, Bundaberg (Sept.-Dec., K.).

Acanthuchus.

As Goding remarks, the differences between *Centrotypus* & *Scrtorius* seem to be very feeble. In addition, I cannot draw any dividing line between these and *Acanthuchus*.

1. *iasis* sp. nov.

Differs from *Centrotypus occidentalis* and *minutus* by the small first "discoidal," and the upwardly elevated, not small, horns.

Reddish-pitchy, pronotal keel blacker on the disk. Tegmina ferruginous, basal veins reddish-pitchy, apically ferruginous. Tibiae, tarsi and apices of femora yellow-ferruginous. Ocelli a trifle nearer one another than to the eyes, yellow brown. Horns placed much as in *Zanophara leda*, but acute and turned outwards and upwards. Pronotal process reaches to apex of tegmina.

Length 5-5 $\frac{3}{4}$ mill.

Hab. Queensland, Kuranda (Aug., type), Cairns (Aug.)

2. *curyone* sp. nov.

Allied to the last, but less elongate and more robust. Redder, the pronotal keel concolorous, process ferruginous. Ocelli dis-

tinctly nearer to the eyes than to one another, yellow brown. Tibiae and tarsi reddish pitchy. Tegmina vitreous, scarcely tinted, base and subcostal cell opaque, ferruginous; third apical cell elongate, narrow, interior side curving a little towards the exterior; first discoidal hemisphaerical, two-thirds the length of the first. Horns a little farther apart basally than in *A. iasis*, and a little shorter and blunter. The venation in some examples is irregular.

Length 5 mill.

Hab. New South Wales, Sydney (Feb.).

3. *curynomus* sp. nov.

Fairly close to the last, but the horns are shorter and more depressed. Interior margin of third apical cell straight; first discoidal cell smaller, about half as long as the second. Legs less *yellowish*-ferruginous.

Length 5 mill.

Hab. Queensland, Bundaberg (Sept.-Dec.)

4. ? *bispinus* Stal.

In the absence of species for comparison, several forms are temporarily determined as above. It seems as much a *Centrotypus* as an *Acanthuchus*.

Hab. Queensland, Cairns (July-Aug.), Brisbane (Nov.)

CLASSIFICATION OF THE FULGOROIDEA.

Stal's classification of 1866, followed almost entirely by authors since that date, although separating the various groups fairly well, places the last *seven* in a parallel series, with more or less overlapping characters, an obviously unnatural arrangement. So many of the Fulgoroid genera are unknown to me in nature, however, that I am prevented from any thorough-going revision and can only offer some hints.

Hansen has laid great stress on the structure of the antennal sensory organs. My own researches confirm this, but at present I do not think it is practicable. Selected forms display the characters very sharply, but in a large number, it is impossible to see anything definite at a magnification of 188 diameters, and it is impracticable to focus a compound microscope nearer, without dissection, in the case of such minute antennae as those of

many Achilini, Ricaniinae, &c., and many forms are still known only as uniques.

I have therefore used the venation principally, especially the condition of the costal vein.

I have given little value to one of Stal's principal characters, viz: the running of the anal vein into the commissure or into the apex of the clavus, as all intermediate stages are present and it separates obvious allies.

The arrangement of sensory organs on the nymphs will probably be of great value, but from lack of certain definite material I cannot elaborate certain clues I seem to have found.

The following is an *attempt* at a more natural grouping:

Fam. 1. Poekillopteridae.

Costal vein fully developed, costal area nearly always with cross veins (*). Pronotum nearly always truncate behind. Subapical transverse line or lines on tegmina. (†)

Subfamily 1. Lophopinac.

Head narrower than pronotum; labium short, stout, the last segment short. (The antennal sensory organs appear to have an encircling of a few upright spines). Pronotum basally truncate. Costal vein fully developed, costal area with cross veins. No properly defined subapical transverse line or lines on the tegmen. Clavus not granulate. Hind tibiae spinose. First segment of hind tarsi short and stout.

Embraces 12 genera, the 7 established or confirmed by Stal, as well as *Astorga*, *Brixioides*, *Bisma*, *Jivatma* and *Pitambara*. Distant describes species in *Scrida* and *Zamila*, appearing to have overlooked the fact that Stal has cited *Zamila* as a synonym of *Pyrilla*, and stated that *Scrida* was not to be distinguished from *Lophops*. The structure of the head and the venation exclude *Kusuma*, *I'arma* and *Padanda* placed here by Distant.

Subfam. 2. Tropiduchinae.

Clavus not granulate. Pronotum tricarinate, emarginate behind. Hind tibiae spinose, first segment of hind tarsi usually somewhat long.

* Except *Ossa*, *Tambinia*, and etc.

† Except the *Lophopinac*.

Tribe 1. Tambiniini.

Costal area very narrow, not veined transversely. *Isporisa*, *Colgorma*, *Ossa*, *Tambinia* and perhaps *Paricana*, &c.

Tribe 2. Tropiduchini.

Costal area broad, veined transversely. *Kusuma*, *Varma* and *Baruna* (the two first placed by Distant among the Lophopidae to which they have no resemblance, superficial or otherwise); *Conna*, *Elica*, *Rhotala*, *Daradar*, *Ficarasa* and *Epora*; *Stacota*, and *Tropiduchus*, *Eodryas* (*), *Peltodictya*, *Vanua*, *Rhinodictya* and *Peggioga*, and *Plegmatoptera*, (the latter placed by Stål in the Dictyophorini!).

Subfam. 3. Ricaniinae.

Clavus not granulate. Pronotum unicarinate, emarginate behind. Hind tibiae spinose, first segment of hind tarsi usually rather short.

Tribe 1. Bladinini (=Nogodini auctt.)

Frons not wider than long, lateral margins of clypeus keeled. This runs very close to certain Tropiduchini.

Tribe 2. Ricaniini.

Frons not longer than wide, lateral margins of clypeus keeled.

Subfam. 4. Poekillopterinae.

Clavus granulate; hind tibiae spinose. Cross veins in costal area, and unusually a transverse line on the apical part of the tegmen.

Tribe 1. Poekillopterini (=Flatinae).

Tribe 2. Phalaenomorphini (=Flatoidinae).

Family 2. Issidae.

Costal vein usually developed, tegmina often coriaceous and reduced; clavus not granulate. Sensory organs on antennae not surrounded by spines.

* New name for *Epora* Mel, 1903 nec Walker, 1857, which is allied to *Kusuma* (Distant.) Melichar has described and figured it; type *melichari*

Subfam. 1. Amphiscepinae.

Costal vein apparently not developed, tegmina Poekillopteriform, much reticulated as a rule. Hind tibiae not spinose. Frons not angulate laterally. There are only about 5 genera in this little group, *Amphiscepa* (= *Acanalonia*), *Chlorochara*, *Thiscia*, *Philatis* and *Parathiscia*.

Subfam. 2. Issinae.

Costal vein fully developed, or if not then the tegmen more or less coriaceous, with reduced venation. Hind tibiae spinose. Frons not angulate laterally.

This large group of nearly 80 genera runs very close to the Amphiscepinae on the one hand and to the Poekillopterinae on the other.

Subfam. 3. Eurybrachyinae.

Costal vein rarely not developed. Hind tibiae spinose. Frons angulate laterally (except *Gedrosia*). Tegmina usually coloured and opaque. Distant has placed an intrusive 'd' in this name: and places the group next to the Fulgorinae, probably because the tegmina are coloured.

Family 3. Tetigometridae.

This small family is usually placed among the Issinae. It differs from all the preceding by the segmented antennal bristle, the peculiar form of the antennal sensory organs and the general Tetigonioid appearance.

Brachyiceps, *Hilda*, *Egropa*, *Eurychila*, *Mitriccephalus* and *Tetigometra*.

Family 4. Fulgoridae.

Claval vein not granulate; costal vein not developed. Hind tibiae nearly always spinose, without a mobile spur. Sensory lobes present on antennae, bristle not segmented.

Subfam. 1. Cixiinae.

Anal vein of wing not reticulate.

Tribe 1. Cixiini.

Often 3 ocelli. Tegmina not reticulate apically, the anal vein runs into the commissure.

Tribe 2. Achilini.

Doubtfully distinct from Cixiini and only retained for convenience. Two ocelli always; the anal vein runs into the apex of the clavus. *Chroncha*, *Kirbyana* and *Melandera* placed in the 'Cixiinae' by Distant, do not agree with his characters, but belong here. *Kinnara* and *Paruselia* perhaps belong here.

Tribe 3. Dictyophorini.

Not easily distinguished from the preceding by words, but of different habitus. Tegmina usually reticulate apically.

Augila (placed by Distant in the Issinae), *Leusaba* and *Monopsis* (placed by Distant in the Tropiciduchinae) belong here. In *Leusaba*, the anal vein runs into the apex of the clavus.

Subfam. 2. Fulgorinae.

Anal area of wings reticulate. Tribes Fulgorini, Aphanini and Onalocephalini.

Fam. 5. Asiracidae.

Hind tibiae with a mobile spur; antennal sensory lobes absent, bristle segmented; costal vein not developed, clavus not granulate.

Fam. 6. Derbidae.

Clavus granulate (except in a few forms); anal area of wings (in most forms) with a stridulatory area. Hind tibiae without a mobile spur. Antennae often very remarkable, bristle not segmented. Costal vein not developed. Last segment of labium rarely otherwise than annuliform.

Vckunta, placed by Distant in the Achilinae, is a Derbid.

"*Hieracia*" *walkeri* Sign., is very evidently not a *Hieracia* at all. I am of the opinion that it forms a group near there somewhat intermediate between Issinae and Tropiciduchinae, together with *Karna*, *Amfortas*, *Hieracia*, *Grynna*, as well as *Flavina* and *Nilalohita*, (the two latter placed by Distant in the Issinae) and perhaps *Padanda* (of Distant's Lophopidae!). Signoret's species forms the new genus *Dolia*, distinguished from *Hieracia* by the

greater number of tibial spines. It seems to be near *Flavina*, but the face is very different; it seems also near *Nilalohita*, but the clypeus is differently formed. Type *walkeri* Sign.

There seem to be therefore, in the Fulgoroidea, four principal types:

1. The Poekillopteroid, in which the costal vein is well developed. While such forms as *Lophops* and *Flata* seem little allied, yet the Ricaniinae form a link which it is hard to break.

2. The Issoid, in which the costal vein is usually developed. I think the Amphiscepinae (including *Acanalonia*, &c.) clearly belong here and not to the Poekillopteridae. *Tonga* is a remarkable form of uncertain affinities; I placed it at first among the Poekillopteridae. The Tetigometridae form a distinct family of apparently "degraded" Issidae.

3. The Fulgoridae have the costal vein obsolescent except basally. The Asiracidae are apparently developed from forms like *Oliarus*, but their many peculiarities render their separation necessary.

4. The Derbidae are probably polyphyletic, *Nisia*, *Lamenia* and some other forms approaching the Cixiini and Achilini.

The first and second groups apparently oviposit on the outer surface of leaves, while the third make an incision in the leaf or stem and place the eggs inside. Of the Derbidae, no eggs have, I believe, been found in nature.

Mr. Distant has recently criticized parts of my former memoir, relating to the Fulgoroidea, in the A. M. N. H. (7) XIX, 395-416 (1907)*. Those acquainted with Mr. Distant's works will, I am sure, wonder that Mr. Distant should complain of incomplete and rudimentary descriptions in other workers. I have considered his synonymical propositions in their several places. I may point out here however that Mr. Distant has so "carefully studied" my memoir, that he has misunderstood the scope of the entire work, the nature of which is plainly indicated even on the title page of the parts.

Poekillopteridae.

Lophopinae.

- *Astorga*.

Stal (1866 Hem. Afr. IV) places the "Lophopida" among those groups in which the anal vein runs into the apex of the clavus

* See my reply op. cit., later.

or into the sutura clavi. Melichar (1903 Hom. Ceylon) incorrectly characterizes it as "Head and eyes together as wide as the pronotum" (added to Stal's character of the anal vein running into the claval suture), although he includes therein *Elasmoscelis radians* and *platypoda* in which the head is much narrower than the pronotum. *Astorga* bears a very close general resemblance to *Lophops*, but the anal vein clearly runs into the commissure: however, it is best located in the Lophopinae at present. It may be distinguished from *Lophops* by the form of the tegmen.

1. *saccharicida*.

On Pl. XXVIII, f. 11, of my former contribution, an ocellus should have been depicted between the apex of the antennae and the anterior margin of the eye, a little inwards; a nymph of this species is figured on Pl. I, figs. 8-9.

I do not regard *Kusuma*, *Varma* and *Padanda* of Distant as Lophopid.

Tropiduchinae.

The following are new figured:

Rhinodictya quacsitrix, Pl. IX, figs. 12-13.

Peltodictya kurandae Pl. VIII, figs. 3-4.

Distant (1907 A. M. N. H. (7) XIX, 416) cites *Peltodictya* as synonymous with *Ficarasa* Walker. In the latter, however, the apical cells of the tegmina are reticulate, while there are no cross veinlets at all in *Peltodictya* from the apical margin right up to the subapical line.

It may be useful to point out that Mr. Distant's correction of the misprint in the reference to the figures of *Vanua vitiensis* is itself incorrect. As mentioned in the 'Errata' at the commencement of the volume, *Vanua vitiensis* adult is figured Pl. XXVIII, figs. 7-9 and the nymph on Pl. XXVII, figs. 6-7.

The following have been described as Tropiduchinae:

Ficarasa australasiae Distant 1907, op. c., 287, Queensland (very probably belongs to my genus *Peltodictya*).

Magia subocellata Distant, op. c., 288, do.

I regard the following genera as Tropiduchine:

Plegmatoptera, placed in the Dictyphorinae by Stal.

Kusuma and *Varma*, placed by Distant in the Lophopinae. I do not regard the following genera as belonging to this sub-

family, viz: *Leusaba*, *Hiracia*, *Karna* and *Paruzelia*. I also follow Ashmead and Swezey in placing *Monopsis* Spinola (= *Nonopsis* Distant) among the Dictyphorinae; it certainly is not Trogiduchine as Distant pretends. (See A. M. N. H. (7) XVIII, 356).

Ricaniinae.

Euricania.

tristicula.

Hab. Viti Levu, (Mar., K.), Rewa (Dec., Apr., M.).

Plestia.

1. *marginata*.

Plestia do. (Montr.) Melichar 1898 Ann. Mus. Wien. XIII, 294, Pl. XII, f. 17; Pl. XIV, f. 1.

Hab. Viti Levu, Rewa (Feb.-Apr., M.).

The parts described in previous descriptions as yellow, are pale opaque green, in fresh examples.

Gaetulia.

Distant (p. 394) states that the head is considerably narrower than the pronotum. This is incorrect as a generic character, for in *G. chrysopoides*, the eyes project very slightly beyond the pronotum; Distant's figure (203) also scarcely bears out his diagnosis, moreover the clypeus is *not* carinate, as indeed Stal also states.

Poekillopterinae.

Siphanta.

The Australian species may be disposed as follows:

1. Vertex distinctly longer than wide.....1 *galcata*
- 1a. Vertex not longer than wide.....2
2. Vertex scarcely (if at all) wider than long; species 8 mm. long (or more).....3
- 2a. Vertex nearly (or quite) twice as wide as long; [tegmen with dark scattered granules]; species not more than 8 mm. long.7
3. Reddish (or blackish) granules on tegmen, especially on clavus.4

- 3a. No reddish (or blackish) granules on tegmen (*).....6
 4. Vertex angulate, sutural angle of tegmen rounded.....5
 4a. Vertex rounded, sutural angle acute.....2 *acutipennis*
 5. Vertex longer than pronotum, frons scarcely longer than wide (typically with a yellow stripe on tegmen).....3 *toga*
 5a. Vertex and pronotum equally long, frons twice as long as wide.3a *patruelis*
 6. Anterior margin of pronotum entire (truncate or rounded) 4 *acuta*
 6a. Anterior margin of pronotum notched minutely in the middle 5 *breviceps*
 7. Species under 6 mm. long6 *granulicollis*
 7a. Species 6 mm. or over8
 8. Colour of tegmina pinkish testaceous.....8 *granulata*
 8a. Colour of tegmina orange yellowish.....7 *lucindae*
 8b. Colour of tegmina greenish or yellowish green.....9
 9. Granules on cerium few, small and inconspicuous; pronotum without a red line; disk of scutellum with one green line9 *subgranulosa*
 9a. Granules large and conspicuous, pronotum with a red longitudinal line, disk of scutellum with three green lines.... 10 *sensilis*
 N. B. *rubra* Schmidt remains unrecognizable to me.

1. *galeata*.

Pl. V, fig. 3 & Pl. VI, figs. 3-4.

2. *acutipennis*.

Pl. III, fig. 1 & Pl. VI, figs. 1-2.

The reddish and blackish granules on the tegmen, as well as some usually conspicuous crimson spots, distinguish this at once from *S. acuta*.

3. *toga*

Pl. III, fig. 3 & Pl. VII, fig. 11.

The Bundaberg record should be deleted, and on p. 455 line 3, for "tatter" read "latter."

* This does not refer to the exceedingly minute greenish, yellowish or brownish granules numerous in each (or most) of the reticulations on the tegmen.

4. *acuta*.

Pl. III, figs. 2 & 4: Pl. VI, figs. 13-14.

This species is also a little variable as regards the apical margin of the tegmen. In some examples it is slightly but distinctly concavely emarginate, in others slightly convex, and it varies a little as regards the prominence of the sutural angle. The ova in situ and the last nymphal instar are figured on Pl. VI, figs. 17-20.

5. *breviceps*.

Pl. III, fig. 2.

Allied to *acuta*, not to *acutipennis*.

6. *granulicollis*.

Pl. IV, fig. 2 & Pl. VI, figs. 7-8.

The vertex, in what I suppose to be this species, is usually obtuse-angled, but varies from that to being distinctly rounded. The scutellum is shorter than in the other species, the disk is typically brownish-red with one longitudinal green stripe.

Length: 5 to 5½ mill.

Hab. New South Wales, Sydney (Jan.-Feb.) Mittagong (Jan.)

The *S. minuta* of Melichar is perhaps a variety of this, introduced into Saint Helena. In all the species of *Siphanta* I have seen, the apical margin of the tegmen is always spotted with crimson, though sometimes extremely faintly, as probably is the case with *S. minuta*.

7. *lucindae*.

Pl. IV, fig. 3 & Pl. VI, figs. 5-6.

8. *granulata*.

Pl. IV, fig. 4.

Very close to the last, but yellower, and more granulate on the corium.

9. *subgranulosa*.

(=*granulicollis* Kirkaldy olim, nec Stal)

Pl. V, fig. 1 & Pl. VI, f. 12.

Hab. Queensland, Cairns (July-Aug., P.), Bundaberg (June P.). This possibly = *S. rubra* Schmidt.

10. *sensilis*, sp. nov.

Pl. IV, fig. 1, & Pl. VI, figs. 15-16.

Allied to *granulicollis*, but larger, the corium with more granules which are also larger individually. Pronotum green with one red stripe. Disk of scutellum brownishred with three green stripes.

Length 6 to 6½ mill.

Hab. Queensland, Cairns (July-Aug.).

Thanatochlamys gen. nov.

Allied to *Siphanta*, but the vertex is short, narrow, flattish but a little swollen along the middle, very slightly ascendant, not granulate. Frons elongate, with 5 strong keels. Clypeus not, or obtusely, keeled at the side. Pronotum granulate, strongly keeled medianly. Scutellum shining, not granulate, flattish though a little inclined to be swollen anteriorly. Venation different, angles of tegmina not prominent. Tibiae with one spine.

1. *tristis* sp. nov.

Pl. V, fig. 4 & Pl. VI, figs. 9-10.

Vertex and pronotum olivaceous with paler keels and granules. Frons and scutellum fuscous with paler keels. Clypeus, legs, abdomen beneath, etc., fuscotestaceous. Clavus olivaceous with blackish granules, corium dark fuscous with paler veins and blackish granules basal two thirds of exterior margin paler.

Length 7¾ mill.

Hab. Queensland, Cairns (July).

Phantiopsis.

Phantiopsis Melichar 1905 Ann. Mus. Hung. III, 474.

=*Aphanophantia* Kirkaldy 1906, op. c., 458.

1. *australiaca*.

Pl. VII, figs. 4-6.

Phantiopsis australiaca Mel., l. c., 475.

=*Aphanophantia cuscuticida* Kirk., l. c., 459.

Issidae.

This family contains three subfamilies:

- 1 Face not laterally angulate.....(2)
- 1a Face laterally angulate..... 3 Eurybrachyinae
- 2 Hind tibiae with a spine or spines.....1 Issinae
- 2a Hind tibiae spineless in adults (but spinose in nymphs)....
..... 2 Amphiscepinae

Issinae.

The following table is amended from the first memoir:

- 1 Tegmina reaching at least to apex of abdomen, clavus sutured off from corium(2)
- 1a Tegmina in the form of narrow, elongate straps, reaching far beyond the apex of the abdomen; wings rudimentary; hind tibiae with two spines.....10 *Alleloplasis*
- 1b Tegmina abbreviated, clavus not sutured off from corium; wings rudimentary; hind tibiae with one spine.....
..... 9 *Gelastissus*
- 2 Wings reaching at least to apex of abdomen.....(3)
- 2a Wings absent or rudimentary.....(6)
- 3 Appearance Cercopoid; wings deeply incised apically...(4)
- 3a Appearance Poekillopteroid; wings not incised apically....
..... 4 *Tylana*
- 4 Frons longitudinally carinate, sometimes feebly; inner fork of radial vein practically forming a straight line with the basal stalk of the vein(5)
- 4a Frons polished, not carinate; inner fork of radial forming an obtuse angle inwardly, with the basal stalk of the vein....
..... 3 *Phaeopteryx*
- 5 Tegmina less than $2\frac{1}{2}$ times as long as broad, inner fork of radial vein not reforking till just basal of the apical margin
..... 1 *Chlamydopteryx*
- 5a Tegmina over 3 times as long as broad, inner fork of radial reforking well basal of the apex of the clavus.....
..... 2 *Apsadaropteryx*
- 6 Hind tibiae with 1 spine5 *Lipocallia*
- 6a Hind tibiae with 2 spines.....(7)
- 7 Hind margin of pronotum straight.....(8)
- 7a Hind margin of pronotum widely emarginate....6 *Bilbilis*
- 8 Frons basally truncate, with a keel along the middle.....
..... 7 *Hysteropterum*

- 8a Frons medianly emarginate at base, with a median and a circular keel 8 *Orinda*

Chlamydopteryx gen. nov.

Allied to *Sarima* Mel., but the venation is different. Head and pronotum not at all flush. Circular keel of frons continuous and the apico-lateral part of frons a little lobate. Frons granulate around the keel. Fore tibiae somewhat widened. Type *vulturinus*.

1. *vulturinus*.

Pl. VII, figs. 15-16.

Issus vulturinus Kirkaldy.

2. *ridicularius*.

Pl. VII, figs. 12-14.

Issus ridicularius Kirkaldy.

In both these species, part of the frons is visible dorsally, the base of the rounded basal carina being visible above as a straight keel; vertex almost truncate basally. The outer branch of the radial vein is strongly arched basally. In *C. ridicularius*, the clypeus is striate, a character however probably not very important.

5. *eurobium* sp. nov.

Allied to the last, but the colour is browner. Vertex more transverse, the apical margin almost truncate, frontal keels very feeble. Outer branch of radial angularly bent near the base, as seen from above.

Male: pygophor as in *C. ridicularius*.

Length 5 mill.

Hab. Queensland, Cairns (August).

Apsadaropteryx gen. nov.

Allied to *Sarima*, but the subcircular keel of the frons is continuous except at the apical margin and the clypeus is slightly striate; the veins of the tegmen are strongly marked and the inner fork of the radial vein re forks well basal of the apex of the clavus. Fore legs not widened.

1. *elongatulus*.

Pl. VII, figs. 9-10.

Issus elongatulus Kirkaldy, l. c.*Phacopteryx* gen. nov.

Differs from the above by the exterior branch of the radial vein being almost rectangularly bent near its base; the subcostal cell apical of this bending is very narrow, with numerous transverse veins. Frons broader than long, convex medianly, no keels except the transverse basal one, but the lateral margins are flat, posterior margin emarginate. Base and lateral margins of frons, the pronotum, &c., strongly granulate.

1. *sidnicus*.

Pl. VII, figs. 20-1.

The nymph of this is figured (figs. 17-19).

Orinda gen. nov.

Allied to *Hysteropterum*, but the frons basally is emarginate with acute lateral angles, and the venation is quite different. Vertex transverse, truncate apically and basally. Costal margin roundly dilated at the base, then subconstricted. Wings rudimentary.

1. *lucindae*.*Sarnus lucindae* Kirkaldy, op. c., 440.*Tylana*.

Tylana (Stal) Melichar 1906 Abh. Zool. bot. Ges. Wien III (pt. 4) p. 198.

1. *acutipennis*.

Pl. VII, figs. 1-3.

Lollius acutipennis Kirk.

This is not *Tylana acutipennis* Mel., which is differently coloured and has the submedian frontal keels uniting with the median

well apical of the base of the frons (and not almost at the base) and more arched laterally. (*)

2. *angustifrons*.

Lollius angustifrons Kirkaldy.

Tylana conspurcata Melichar, l. c., 203.

Of unrecorded Australian forms, I now add *Bilbilis modestum* Stal, from "North Australia" and New South Wales.

Mr. Muir did not collect any Issinae in Fiji, but the following are noted by Melichar:

Tylana intrusa Melichar, and *T. orientalis* Mel., from Ovalau, and *T. piccus* (Walker) from Viti Levu, the last named also from Aru and Papua. The Genus *Tylana* has an interesting distribution viz.: North America (1 sp.), Borneo (1 sp.), Celebes (2 sp.), Papua and neighboring isles (6 sp.), New Caledonia and Lifu (3 sp.), Australia (2 sp.), Fiji (3 sp.), Samoa (1 sp.), and the Mascarene Isles (2 sp.).

In Bulletin IV of this division (1907), I described one new Issine from North America, and doubtedly identified another. I have been able since to confirm these by Melichar's Monograph, *Bruchomorpha mormo* being allied to *B. pallidipes* Stal, but quite unicolorous, except part of the legs, as described. *Picumna ovatipennis* may be confirmed.

Eurybrachyinae.

I must leave my former notes in the same unsatisfactory state, as I still do not know what Stal meant to define precisely by his genus *Platybrachys*.

Recently (1906 A. M. N. H. (7) XVIII) Distant has described one genus and 3 species from Queensland, as new. *Yarrana* 206, seems to differ from *Dardus* Stal, only by the much longer tegmina.

1 *sinuata* 207; Queensland, Townsville, Karanda (sic!) and Cairns.

2 *continuata* 207; Queensland, Townsville.

Olonia Stal.

6 *marginata* 206; Queensland.

Distant (1907 op. c., XIX, 415) very confidently synonymizes *Dardus immaculatus* Kirkaldy with *D. obscurus* Distant. The

* For *Tylana acutipennis* Mel., which is a Bornean species, I propose the name *T. dyakana*.

latter however has the face and legs pale sanguineous, while in the former the face is uniformly dark brown (except for some pale and clypeal specks), and the hind femora only are sanguineous, the rest of the legs being piceous except as indicated in my description.

Fulgoridae.

Cixiinae.

Distant, following Melichar, places *Kirbyana* in the "Cixiinae," despite the fact that the anal vein reaches the apex of the clavus, that there are only two ocelli and that the clypeus is laterally carinate, a combination of characters which according to Distant himself, would place the genus in the "Achilinae." He also places the genus *Kinnara* in the "Achilinae," but there are three ocelli here and the anal vein scarcely reaches the apex of the clavus; it therefore belongs to the "Cixiinae."

Tribe Cixiini.

The Australo-Fijian genera fall into groups as follows:

1	Antennae elongate, distinctly visible beyond the lateral margins of the head	4	<i>Solonaima</i>
1a	Antennae minute	(2)	
2	Scutellum with 5 keels	(3)	
2a	Scutellum with 3 keels	(4)	
3	Vertex extending but little beyond the eyes, face not foliaceous	1	<i>Oliarus</i>
3a	Vertex extending well beyond the eyes, face subfoliaceous laterally	2	<i>Urvillea</i>
4	Frons with 3 distinct ocelli	(5)	
4a	Frons with 2 ocelli	(6)	
5	Tegmina widely rounded towards the apex	6	<i>Leiriocessa</i>
5a	Tegmina long and narrow	5	<i>Myndus</i>
6	Head produced in front of eyes, vertex elongate.....	(7)	
6a	Head scarcely produced, vertex not elongate.....	(10)	
7	Tegmina of usual <i>Cixius</i> -form.....	(8)	
7a	Tegmina (as seen dorsally) strongly compressed	(9)	
8	Tegmina not granulate.....	3	<i>Nesocharis</i>
8a	Tegmina strongly granulate	7	<i>Carolus</i>

- 9 Genae very clearly separated posteriorly, lateral margin of frons remote from eyes, ocelli and antennae..... 8 *Gelastocephalus*
- 9a Genae much narrowed posteriorly, lateral margin of frons close to eyes, ocelli and antennae 9 *Nesochlamys*
- 10 Head dorsally doubly carinate transversely. . 10 *Leptochlamys*
- 10a Head not carinate transversely below the front margin. . (11)
- 11 Tegmina of usual *Cirius*-form..... 11 *Calamister*
- 11a Tegmina strongly compressed (as seen dorsally)..... (12)
- 12 Base of vertex slightly emarginate..... 12 *Australoma*
- 12a Base of vertex truncate (13)
- 13 Pronotal emargination anteriorly nearly touching base of vertex 13 *Dysthectias*
- 13a Pronotal emargination not nearly touching base of vertex.. 14 *Quirosia*

Oliarus.

Four species are now added, 3 from Fiji, and 1 from Queensland. I regret that I have not had time to study the genitalia of the species, as these present good characters. The following table comprehends the 12 Australo-Fijian species now known.

- 1 Apices of the first and second segments of the hind tibiae each with about twenty small spines which do not (or at least only one or two of them) extend beyond the apical margin of the segment (subgenus *Nesopompe* nov.).. (2)
- 1a Apices of these segments with from 5 to 8 (according to the species) larger spines which mostly extend well beyond the apical margin of the segment (*Oliarus* sens. str.).. (3)
- 2 Tegmina hyaline (type of subgenus)..... 11 *felis*
- 2a Tegmina hyaline, the apical fourth smoky. . . 12 *saccharicola*
- 3 Axillary vein of tegmen running into anal vein, basal of the middle of the latter (4)
- 3a Axillary running into anal at, or apical of, the middle of the latter (8)
- 4 Axillary very short, not quite half (taken from its curving or angulation at the commissure) the length of the stalk of the anal 1 *laertes*
- 4a Axillary long, more than half the length of the stalk of the anal (5)
- 5 Tegminal veins more or less thickly granulate (6)
- 5a Tegminal veins not, or obsolescently, granulate. . 2 *kampaspe*

- 6 Veins basal of the membrane dark.....3 *asaica*
 6a Veins basal of the membrane pale, with dark granules..(7)
 7 Head and scutellum pale4 *talunia*
 7a Head and scutellum black and castaneous.....5 *lilinoe*
 8 Vertex much narrower at the base than an eye.....(9)
 8a Vertex scarcely, or not, narrower at the base than an eye
 (10)
 9 Lateral margins of vertex forked at the anterior margin of
 the eyes, so that the anterolateral margins of vertex do
 not reach the apical margin and are connected therewith
 by 2 very short, parallel, keels6 *tasmani*
 9a Lateral margins of vertex forked well below the anterior
 margins of the eyes, the inner margins meeting acutely
 below the anterior margin of the head dorsally and con-
 tinuing thereto7 *alexanor*
 10 Tegminal veins granulate9 *sponsa*
 10a Tegminal veins not granulate11
 11 Tegminal cross veins thickened, but not widely suffused..
 9 *lubra*
 11a Tegminal cross veins strongly and widely suffused.....
 10 *rhelia**

5. *lilinoe* sp. nov.

Like a large, dark *talunia*, but the venation is different. Differs from *O. laertes* by the veins of the tegmen basal of the membrane being pale (with dark granules), not dark, consequently the dark hue of the suffused cross veins shows up more prominently; also by the greater length of the axillary vein. It is allied to *O. asaica*, but is much smaller, the tegmina are paler and the vertex is much narrower. Frons and clypeus dark fuscous, median keel and lateral margins pale ochraceous. Scutellum dark fuscous; the median keel, the lateral keels and the space between them, and the extreme lateral margins ferruginous.

Length $5\frac{3}{4}$ mill.

Hab. Queensland, Cairns (July, P.).

6. *tasmani* sp. nov.

Allied to *O. alexanor*, but the head form is different and the tegminal granules feebler. Blackish, keels dark ferruginous,

* Distant has recently described two species, *O. dingkana* and *O. lubra* from Queensland (1907 A. M. N. II. (7) XIX, 282), but it is not possible to identify them from the descriptions. N. B. Since the above was in proof, Distant has renamed his *lubra*, "*incerta*," an excellent name judging by his description.

frons ferruginous, sometimes suffused with fuscous. Pronotum pale, lateral margins fuscous. Tegmina hyaline, veins mostly pale with fairly closely set but not prominent fuscous granules. Subcostal vein yellowish fuscous; stigma dark fuscous; apical veins and subapical transverse veins suffusedly dark fuscous. Wings hyaline, veins dark fuscous. Legs bright yellow, obscurely annulated with fuscous. Vertex as in *O. alexanor*, but the lateral margins are forked at the anterior margin of the eyes, so that the anterolateral margins of vertex do not reach the apical margin and are connected therewith by 2 very short parallel keels. Labium reaches the hind coxae. There are 6 spines each on the apex of the 1st and 2nd segments of the hind tarsi.

Male: sterna and abdomen more or less piceous, hooks, &c., pale.

Length (male) $5\frac{1}{2}$ (female) $6\frac{1}{8}$ mill.

Hab. Viti Levu, Rewa (Mar., Muir).

The scutellum is sometimes ferruginous between the keels.

The species is named after Tasman, who discovered the Fijian archipelago.

9. *lubra*.

Pl. VIII, figs. 7-9.

A rather smaller race, the males measuring as little as 6 mill. has been found in Viti Levu by Muir (No. 7) in Ba (Jan.), Rewa (Mar.-May) and Navua (Feb.) on Breadfruit, (*Artocarpus incisa*); they may be termed var. *vitiensis*.

10. *phelia*.

Pl. VIII, figs. 10-12.

11. *felis*.

Pl. VIII, figs. 5-6.

12. *saccharicola* sp. nov.

Allied to *O. felis* but distinguished by the smoky apical fourth of the tegmina.

Blackish; keels of vertex, lateral keels of frons and clypeus, legs, &c., pallid; hind femora more or less fuscous; keels of scutellum (usually) and median keel of frons ferruginous. Pro-

notum pale, lateral margins fuscous. Tegmina milky hyaline, apical fourth smoky, veins of basal two-thirds pale, not granulate, veins of apical third darker, with dark fuscous granules. Wings smoky hyaline, veins fuscous. Abdomen more or less blackish.

Length (male) $4\frac{1}{2}$ mill.

Hab. Viti Levu (Muir No. 81), Rewa (Dec., M.), on *Saccharum officinarum*.

Urvillea gen. nov.

The characters of *Oliarus*, but the vertex extends well beyond the eyes; frons and clypeus apparently fused but there is an ocellus in the middle of the facial keel; the face is ampliate and foliaceous in the middle laterally. Tegmina not granulate. Superficially like *Occlus* but the posterior femora are spined, and the venation is Oliarine. This genus the type of which is *U. melanesica*, is named after the celebrated traveller Dumont d'Urville, who made the first chart of the Fijian group.

1. *melanesica*, sp. nov.

Black; head keels (blackened at anterior margin), the foliaceous part of the face, labium (except the blackish fourth segment), legs (except the tarsi which are partly dark), tegulae, &c., yellow or brownish-yellow, lateral margins fuscous. Scutellar keels dark ferruginous. Tegmina hyaline, veins on basal two-thirds brownish-yellow, subcostal and those on apical third dark fuscous; cross veins a little suffused, apical margin narrowly smoky, stigma dark fuscous. Vertex parallelsided, nearly four times as long as the basal width extending in profile nearly one-half the length of an eye in front of the latter. First segment of hind tarsi with 6 teeth apically, second with 5. Labium reaching to hind trochanters.

Length (male) 7- (female) 8 mill.

Hab. Viti Levu, Rewa (Mar.- Nov., M.).

Nesocharis, gen. nov.

Apparently not very closely related to any known Cixiine. It differs from *Cirius* by the venation and the simple legs. From *Occlus* it differs by the basal cell emitting 3 veins.

Vertex excavated, posterior margin acute angularly emarginate. Face elongate diamond-shaped (flat), more than twice as long as wide, widest about the antennae, subconstricted at the

frontoclypeal suture which is a little obsolescent; no vertical fossettes. Pronotum acute-angularly emarginate posteriorly. Scutellum with three straight keels. Subcostal margin of tegmina sinuate near the base and also a little apical of the middle. Internal cell of clavus granulate.

1. *kalypto*, sp. nov.

(Text figure 1).

Black; head keels (anteriorly blackened), face, antennae, pronotum, sterna and legs whitish. Tegmina hyaline tinged with yellowish, subcostal vein near the base and from the stigma apically, radial vein and its forkings, stigma, apex antero-obliquely, claval vein apically &c., smoky often a little suffusedly. Vertex extending a little in front of eyes, lateral keels somewhat convergent anteriorly, forking about the apical margin of the eyes. Labium reaching nearly to apex of hind femora.

Length (female) $4\frac{1}{2}$ mill.

Hab. Vitj Levu, Rewa (Mar. M.).

Solonaima solonaima.

Pl. VIII, fs. 13-15.

Myndus.

Myndus Stal. 1862, Berlin Ent. Zeit. VI.

A North American genus, the Japanese species described by Uhler being, according to Matsumura, an *Oliarus*. The species now described is possibly not a true *Myndus*, but agrees in all apparent essentials.

1. *vitensis* sp. nov.

Blackish; vertex soiled brownish-yellow, pronotum whitish; keels and lateral margins of scutellum sordid ferruginous. Tegmina sordid hyaline, basal veins pale, subcostal vein and apical third with veins dark fuscous suffusedly, and with 2 curved dark

fuscous streaks. Sterna and legs sordid brownish yellow. Abdomen blackish brown. Vertex with lateral margins slightly converging apically, extending a little in front of the eyes. Frons as broad as long, lateral margins strongly reflexed.

Length (female) $3\frac{7}{8}$ mill.

Hab. Viti Levu, Navua (Feb., M.).

Leiriocessa gen. nov.

Apparently allied to *Brixia*, but the vertex is broader than an eye and well produced anteriorly. Antennae not exerted, second segment globular. Pronotum of very different structure. Tegmina apically rounded, distinctly widening towards the apex. Hind tibiae with 3 larger and sometimes one or two smaller spines. Type *tortricomorpha*.

1. *tortricomorpha* sp. nov.

Pl. XXVII, figs. 9-21.

Fusco-testaceous, irregularly suffused with fuscous. Disk of scutellum tinged with ferruginous, a pale line down the middle, darker fuscous outside the lateral keels. Ocelli ruby-red. Tegmina subhyaline, veins pale with dark granules and an ashy fuscous band, etc., as in the figure.

Length of body, $4\frac{1}{2}$ mill; expanse of tegmina nearly 11 mill.

Hab. Queensland, Cairns (Aug.), Kuranda (Aug.)

2. *vitiensis* sp. nov.

Differs from the above by the more elongate and differently patterned tegmina.

Head, pronotum and scutellum sordid piceofuscous, underside and antennae pale, 3rd ocellus rubid. Fore and middle femora fuscopiceous (except the extreme apex and base), tibiae of the same suffused with fuscopiceous. Tegmina hyaline tinged with cinereous, veins cinereous whitish, basal half with blackish-brown granules, apical half not granulate (except a few inwardly); two or three blackish-brown markings near the base and a transverse band across the corium a little basal of the middle. Wings milky hyaline, veins pallid. Labium reaches well beyond hind coxae.

Length $5\frac{3}{4}$ mill.

Hab. Viti Levu, (Mar., Muir's No. 142), on a native tree in the bush.

Leptochlamys gen. nov.

Somewhat allied to *Calamister*, but the head is different and the tegmina are strongly compressed.

Vertex transverse, scarcely extending so far as the anterior margin of the eyes, part of the frons visible dorsally. Head laterally strongly carinate (a little foliaceous on the frons), frons and clypeus strongly keeled medianly, vertex strongly keeled anteriorly transversely, and there is a transverse keel between this and the base but no longitudinal keel. Antennae very short. Ocelli present. Pronotum deeply emarginate posteriorly. Scutellum with 3 keels.

compressa sp. nov.

Pl. VIII, figs. 1-2.

Brownish testaceous, a little browner on the scutellum. Beneath testaceous. Tegmina subhyaline testaceous, veins mostly concolorous (except the darker marginal), feebly granulate, apex of subcostal cell and adjacent apical cells, interoapical (rounded) angle, etc., smoky.

Length $4\frac{1}{4}$ -5 mill.

Hab. Queensland, Cairns (July), Kuranda (Aug.)

Dysthectias gen. nov.

Allied to *Leptochlamys* but the vertex is only slightly transverse and extends beyond the eyes anteriorly; there is only one cross keel between vertex and frons. Vertex truncate behind, the pronotum almost rectangularly emarginate, nearly touching base of vertex. Frons apically angularly emarginate, 3rd ocellus absent. Tegminal veins strongly granulate, the granules piliferous.

1. *beccheyi* sp. nov.

Pale testaceous; face (and scutellum except the keels and the apical fourth) irregularly suffused with pale purplish-brown, and four lateral spots at union of frons and vertex. Posterior angle of scutellum whitish. Tegmina hyaline milky, veins whitish with pale hairs, the cross-veins on apical half suffusedly fuscous; tegmina strongly and prominently granulate with dark

fuscous, an oblique dark fuscous band on apical half and several short irregular markings; apical veins subsuffused. Legs pale, with brown annulations.

Female: abdomen short, tegmina extending about as far beyond the abdomen as the length of the hopper.

Var. *fuscata*, nov.

Like the type, but scutellum not suffused with fuscous; tegmina much darker and suffused all over with fuscous.

Length $5\frac{1}{2}$ mill.

Hab. Viti Levu, Rewa (Mar., Muir).

Named after Captain William Beechey who voyaged in the Pacific in the "Blossom."

Australoma gen. nov.

Somewhat like *Kinnara* (which is a Cixiine, not an Achilid), but there is no third ocellus, the pronotum is more deeply emarginate, and the scutellum, much longer; the venation different, etc. Vertex nearly square, margins elevated, disk greatly depressed, basal margin slightly emarginate. Frons shaped much as in *Kinnara*, but a little wider basally. Tegmina vertical. Hind tibiae spineless.

1. *austrina* sp. nov.

Pl. VIII, figs. 16-18.

Testaceous, tinged with ferruginous, paler beneath. Ocelli ruby-red. Tegmina hyaline, veins pale with brown granules, a few dark marks near the edge of the tegmen, as shown in the figure.

Length 5 mill.

Hab. Queensland, Kuranda (Aug.)

Quirosia gen. nov.

Allied to *Australoma* but the vertex is much smaller and narrower, anteriorly is angular, and has two small pit-like depressions anteriorly, base truncate. Frons as in *Dysthectias*. Tegminal venation not importantly different from that of *Australoma*.

Named in honor of P. F. de Quiros, voyager in the Pacific.

1. *vitiensis* sp. nov.

Sordid testaceous. Tegmina hyaline, tinged with sordid yellowish, veins and stigma paler, granules on anal vein dark. Wings hyaline, veins fuscous.

Length 5 mill.

Hab. Viti Levu, Rewa (Mar., M.).

Nesochlamys gen. nov.

Differs from *Gelastoccephalus* by the quite different head and by the not so strongly compressed tegmina. Frons acutely carinate medianly.

1. *vitiensis* sp. nov.

Fuscous, the head keels yellowish. Clypeus, labium and legs whitish. Pronotum and scutellum dark fuscous, the hind angle of the latter minutely white. Clavus yellowish-brown, the apex fuscous, rest of tegmen dark fuscous or blackish except a semi-circular spot near the apex, from the subcostal margin to the middle of the tegmen. Abdomen mostly dark fuscous.

Length $3\frac{3}{4}$ - $4\frac{1}{2}$ mill.

Hab. Viti Levu, Rewa (Mar. Apr. Nov., M.), Navua (Feb., M.).

The following have also been described from Australia:

Brixia migratoria Distant 1907 A. M. N. H., (7) XIX, 279, Queensland.

Cixius merula Distant, op. cit., 284. Queensland.

Achilini.

As stated elsewhere, I regard *Kinnara* as a Cixiine; *Vekunta* is certainly an Issine and has nothing to do with Achilini.

Mr. Muir has collected 2 genera and 8 species in Fiji.

The following table will separate the Australo-Fijian genera:

1	Pronotum produced apically as far as the apical margin of the eyes; subcostal cell dilated; length 11 mill.	14 <i>Ancipo</i>
1a	Pronotum not produced apically nearly as far as the apical margin of the eyes; subcostal cell not dilated; length not over 7 mill.	(2)
2	Frons strongly impressed transversely; not (or very obsolescently) carinate; an opaque white band on the face.	13 <i>Aristyllis</i>

- 2a Frons not transversely impressed; more or less strongly carinate medianly(3)
- 3 Lateral keels of frons meeting at its base and forming an angle there.(4)
- 3a Lateral keels of frons not meeting directly at its base, which is more or less widely truncate (or slightly produced laterally) (5)
- 4 Vertex not longer than the eyes; genae foliaceous; eyes not nearly touching the lateral margins.....12 *Majella*
- 4a Vertex longer than the eyes, genae not foliaceous; eyes practically touching lateral margins.....11 *Callichlamys*
- 5 Vertex longitudinally impressed, with a further circular impression in the middle.....10 *Francesca*
- 5a Vertex often longitudinally impressed (entirely, or between the keels) but not further impressed circularly.....(6)
- 6 Two opaque white bands across the face.....(7)
- 6a Face not banded.....(8)
- 7 Vertex not carinate medianly, very transverse, apical margin not nearly touching apical margin of head dorsally and not connected therewith by keels.....9 *Pyrrhyllis*
- 7a Vertex carinate medianly, not transverse, apex touching the apical margin of the head dorsally.....8 *Benella*
- 8 Vertex transverse.7 *Achilus*
- 8a Vertex not transverse.....(9)
- 9 3 to 4 middle apical cells of tegmina distinctly longer than wide. (10)
- 9a 3 to 4 middle apical cells of tegmina not (or scarcely) longer than wide6 *Salemina*
- 10 Frons basally slightly angularly produced laterally..... 5 *Argelcusa*
- 10a Frons basally truncate (or if very slightly produced angularly at the sides, then also similarly in the middle)..(11)
- 11 Vertex very lightly impressed longitudinally on each side of the middle keel, which is strong.....(12)
- 11a Vertex deeply impressed longitudinally, not (or feebly) keeled.4 *Callinesia*
- 12 Lateral keels of vertex anterolaterally obtuse angled..... 3 *Eurynomeus*
- 12a Lateral keels of vertex meeting anteriorly acutely or roundly-acutely. (13)
- 13 Apical cells of tegmina distinctly declivous, tegminal veins granulate.2 *Cythna*

- 13a Apical cells not (or very slightly) declivous, tegminal veins not granulate.1 *Phenelia*

Phenelia.

Mr. Muir has collected two species which I place provisionally here. *Phenelia* seems to form two subgenera:

- 1 Vertical keels very strong, intracarinal areas very narrow; lateral keels of vertex meeting acutely.....
(a) *Phenelia* sens. str., type *clidipteroides*
 1a Vertical keels feebler, intracarinal areas wide; lateral keels meeting roundly-acutely anteriorly. (b) *Nephelia*, type *bicuncata*.

The two species of *Nephelia*, are easily separable by the colour:

- 1 Tegminal veins pallid.....2 *bicuncata*
 1a Tegminal veins blackish.....3 *tristis*

2. *bicuncata* sp. nov.

Male. Brownish-yellow, abdomen and body beneath paler. Tegmina yellowish hyaline with 2 subopaque yellowish wedges, very narrowly bordered with fuscous, near the apex of the subcostal cell and a blackish-brown speck in the second apical cell; veins pale except the stem and inner fork of the radial vein, the claval veins, &c., which are yellowish-brown. Vertex about $2\frac{1}{2}$ times as long as the pronotum, produced before the eyes.

Length $3\frac{7}{8}$ mill.

Hab. Viti Levu, Rewa (Mar., M.).

3. *tristis*, sp. nov.

Male: form of the last, but the vertex shorter, scarcely produced in front of the eyes. Pitchy, paler below. Tegmina dark smoky, with 2 black-bordered white wedges near the apex of the subcostal cell.

Length $3\frac{1}{8}$ mill.

Hab. Viti Levu, Rewa (Apr., M.).

Eurynomeus.

This may possibly be the genus *Tangina*, but the frons is laterally sinuate and the radial vein is forked apically. I am inclined to think Melichar's figures faulty.

1. *australiac*.

Pl. IX, figs. 7-8.

Callinesia gen. nov.

This genus is very close to *Phenelia* and *Eurynomeus*, but is distinguished by the structure of the vertex as stated in the analytical table of the Achiline genera. A black spot always present on the mesopleura. Type *pulchra*. The four species—all from Fiji—are separable thus:

1	Clavus and corium bright red striped with yellow...	1	<i>pulchra</i>
1a	No bright red stripes on the tegmen.....	(2)	
2	Clavus and corium yellowish with pale brownish stripes; clypeus pale.....	(3)	
2a	Clavus and corium greenish yellow with silver-grey or brownish stripes; clypeus black	2	<i>ornata</i>
3	Clavus and corium yellow with broad pale fawn bands.....		
	.....	3	<i>venusta</i>
3a	Clavus and corium yellowish with narrow orange brown lines	4	<i>pusilla</i>

1. *pulchra* sp. nov.

Pl. IX, fig. 17.

Yellow, legs and beneath paler; junction of vertex and frons with a black horseshoe, a black dot on the vertex laterally. Eyes black. Pronotum with a sanguineous spot anteriorly. Scutellum with an angulate sanguineous stripe which passes over on to the base of the tegmina, which are sanguineous with the following bright yellow marks; a broad basal stripe, running from the middle of the basal margin to the subcostal margin; an elongate straight spot from commissure (at posterior angle of scutellum) half way across the tegmen; an oblique entire median stripe running subparallel to the basal margin, and 3 lateral or sublateral spots apical of that, the apical one at least being margined interiorly with fuscous. Apical and subapical cells hyaline (some of the outer ones suffused sanguineously) with sanguineous veins. Vertex deeply impressed, middle keel obsolescent. Labium reaching to middle coxae.

Length $4\frac{1}{2}$ mill.

Hab. Viti Levu, Rewa (Mar.-Apr.).

2. *ornata* sp. nov.

Fulvescent or yellowish testaceous, the head marked as in *C. pulchra*. Eyes and clypeus black. Posterior two-thirds of scu-

tellum intracarinally black (or silvery grey.) Tegmina fulvescent or yellowish, with fulvous veins, an oblique silvery grey (or brownish) oblique band near the base and a large spot of the same colour near the middle exteriorly. Apical cells smoky silvery. Wings partly smoky, partly margined very narrowly with sanguineous, veins smoky. Sternites black, pleurites margined with sanguineous. Head as in *C. pulchra*.

Length $4\frac{1}{2}$ - $4\frac{7}{8}$ mill.

Hab. Viti Levu, Rewa (Mar.-Apr., Muir).

3. *venusta* sp. nov.

Ivory coloured, vertex with a tiny black streak on each side of the middle keel anteriorly and a black speck on the gena close to the eye. Eyes reddish or pinkish. Pronotum with one and scutellum with 3, orange brown spots on each side of the middle keel. Tegmina with two more or less well formed pale fawn transverse bands and one or two lines; one or two blackish lines on and beyond the subcostal cell apically. Wings hyaline, veins blood-red. Vertex a little less deeply impressed than in the preceding, middle keel clearer.

Length 4 - $4\frac{1}{2}$ mill.

Hab. Viti Levu, Rewa (Mar., Muir).

4. *pusilla* sp. nov.

Orange testaceous, paler beneath; vertex with a black V anteriorly, and 3 black specks on the gena. Eyes red. Pronotum with an orange-brown spot on each side; scutellum with 2 interrupted narrow transverse orange-brown lines. Basal half of tegmen pale yellow with a transverse hyaline band and about five undulating orange-brown transverse lines. Apical half of tegmen smoky hyaline, veins whitish, some a little tinged with blood-red. Subcostal cell basally yellow, apically hyaline with 2 yellow wedges, basally bordered with black very narrowly. Wings hyaline, veins very pale sanguineous. Head as in *C. pulchra*.

Length 4 mill.

Hab. Viti Levu, Rewa (Mar., Muir).

Francesca.

Francesca salemminophila is now figured. (Pl. VII, figs. 18-19.)

Callichlamys gen. nov.

Apparently allied to *Cnidus* by the elongate-oval eyes; has somewhat the appearance of *Pseudohelicoptera*.

Vertex narrowing gently towards the rounded apex, flattened along the entire length and medianly carinate. Eyes elongate oval, not as long as the vertex and decumbent on the pronotum. Frons sinuate laterally, medianly carinate; clypeus small, labium reaching to about the base of the middle coxae. Pronotum anteriorly subtruncate, posteriorly angularly emarginate. Pronotum and scutellum tricarinate. The radial vein forks a trifle nearer to the base than the brachial; subapical cells present; apical cells elongate. Hind femora with a small spine.

There are two species:

- 1 Vertex more than twice as long as an eye.....1 *muiri*.
 1a Vertex scarcely longer than an eye.....2 *undulata*

1. *muiri* sp. nov.

Pl. IX, fig. 20.

Sordid whitish, vertex with 2 subcontiguous dark fuscous lines on the apical half, clypeus fuscate. Pronotum and scutellum rosily suffused discally. Tegmina hyaline, tinged with yellow, suffused with sanguineous especially on the subcostal and radical cells and clavus, also on the apical half of the apical cells; veins sanguineous; the nodal veins fuscous, the basal one bordered with yellow and a dark fuscous spot at the base of the second apical cell.

Length $4\frac{7}{8}$ - $5\frac{1}{2}$ mill.

Hab. Viti Levu, Rewa (Mar.-Apr., Muir's No. 204).

2. *undulata* sp. nov.

Male: head, pronotum and scutellum pale yellow; 2 subcontiguous blackish elongate narrow spots (sometimes merging) close to apex of vertex; clypeus brownish; 2 brown spots on pronotum; 4 brown spots (2 in a row each side of middle line) on scutellum between lateral keels, scutellum laterally brownish. Tegmina whitish, very narrowly margined at least apically with dark sanguineous, with about 4 oblique, partly a little obscure, interrupted, brown rows of stripes; subcostal cell with 2 yellow wedges near the apex, margined with brown. Apical cells

smoky, veins partly pale. Legs mostly yellowish-white. Sternites black.

Length 4 mill.

Hab. Viti Levu, Rewa (Mar., M.).

Aristyllis.

The following species are now figured:

A. aristyllis, Pl. IX, figs. 3-4.

A. omphale, Pl. IX, figs. 1-2.

A. adippe, Pl. IX, figs. 5-6 (the type is a little immature, consequently the frontal structure is a little obscure).

Ancipo.

Ancipo Kirkaldy.

=*Tudca* Distant op. c., 290.

1. *diva*.

A. diva Kirkaldy.

=*T. picturata* Distant, l. c.

The following have been described as Achilinae:

Mahuna conspersa Distant 1907, op. c., 290 Queensland.

Oureca doddi Dist., op. c., 292, do.

Talaloa pallescens Dist., op. c., 295, do.

Dictyophorini.

Distant has recently described the following:

Dictyophara (sic!) *prognatha* 1906 A. M. N. H. (7) XVIII, 352, Queensland. He also (probably incorrectly) confirms a species of Walker's in the same genus, viz:

D. concolor Walker 1851 List 322; Distant l. c., North Australia, Queensland and South Australia.

Distant, following Stal, incorrectly places *Leusaba* in the Tropiduchinae; the absence of a well developed costal vein, however, and the running of the anal vein into the commissure just basal of the apex of the clavus, places this genus in the Dictyophorinae. The genus *Augila* placed by Stal and Distant in the Issinae, certainly has no place there; it probably belongs to the Dictyophorinae.

In the A. M. N. H. (7), XIX, 415, Distant boldly synonymizes *Thanatodictya lucindae* Kirk. with *Dictyophora bifasciata* Dist., and

T. anadyomene Kirk. with *D. insignis* Dist., but he rather unfairly omits to mention that the likelihood of these synonyms was indicated by me at the same time. I think the latter pair are likely to be united, though they could not be from Distant's description. In the case of the former, *D. bifasciata* is said to have ochraceous sternites, while in *T. lucindae*, they are almost black, in both sexes and in a good series. For the present, therefore, I decline to accept Distant's synonym. In any case, the reference of these forms to the genus *Dictyophora* (or *Dictyophara* as Distant incorrectly cites it) is absurd.

Fulgorinae.

Eurystheus perkinsi.

This species was taken on a species of *Casuarina*.

Eurinopsyche.

I unfortunately said (p. 389) that the tegmina are decumbent; on the contrary they are scarcely tectiform, it is the tegmina in *Eurystheus* that are subdecumbent. *E. obscurata* was taken from "Queensland native plum."

Three new species have since been described from Australia by Distant, who has indeed included them in *Eurystheus*, but as he compares them with *E. dilatata*, it is to be presumed they belong to *Eurinopsyche*.

2. *doddi* Distant 1903 A. M. N. H. (7) XVIII, 19 (Queensland.)

3. *clementi* l. c. (West Australia.)

4. *pallescens* op. c., 20 (West Australia.)

Distant has also (26-9) described from Australia two supposedly new genera with three species, viz:

1. *Galcla parva* (West Australia.)

2. *G. abdominalis* (Colony not stated.)

3. *Erilla turucri* (Queensland.)

N. B. *Desudaba maculata* and the other species in Distant's paper cited (390 etc.), were published 1893 (Jan.), not 1892 (Dec.).

On Pl. VII, figs. 7-8, a nymph of a Fulgorine is figured. The adult is unknown. In fig. 8 the sublateral keels are shown a little too strongly and the anterior sensory organs have been omitted.

Asiracidae.

The most obvious character of this family is the *mobile* spur at the base of the hind tibiae. Its most primitive form is probably seen in *Ugyops*, *Asiraca*, &c., in which it is awlshaped, the margins not serrate or dentate. There are two further types, as mentioned further on.

The Asiracidae probably—almost certainly—are derived from Cixiinae, but the mobile spur and the nature of the antennal sensory organs necessitate the maintenance of a special family for them.

Head.

In all known Asiracid nymphs, the frons has two keels down the middle, and the entire head is studded with sensory pustules. In the adult *Achorotile*, both these characters obtain, and this genus is therefore reasonably considered to be the most primitive known Asiracid. The first step of importance in the development of the family is in the fusion, almost wholly or in part, of the median keels of the frons; in some forms, they are completely fused almost to the connecting keels, in others, only as far back as the apical margin of the eyes. *Laccocara* has the nymphal pustules, but has partially fused frontal keels. These are the only two Asiracid genera known to me which have punctured pustules in the adults. Of other head characters, the most obvious is the form of the antennae; in the majority of forms, the first segment is short and cylindrical or annuliform, the segment being subcylindrical and not, or not noticeably, furnished with sensory organs; in others they are varyingly flattened and dilated, elongate, and so forth.

The clypeus is sometimes carinate, sometimes not. The genal keel sometimes meets the frontal keel acutely at the apical margin, sometimes does not meet it. In one form, *Paranda*, the vertex is smoothly rounded in front, not (or feebly) carinate, and this must perhaps be regarded as a more or less degraded form.

Thorax.

Great stress has been placed on the lateral keels of the pronotum, two categories being supposed, viz.:

1. Lateral keels straight, meeting the hind margin,
2. Lateral keels curved, not meeting the hind margin.

Very often however the keels fork *near* the hind margin, one fork reaching the hind margin while the other curves outwards. The scutellum of the mesonotum may be 1, 3, 4 or 5 keeled; this is useful for generic separation.

Venation.

The venation is of comparatively little importance, as it is often very variable, especially in the apical cells. The brachial and radial are nearly always forked near the subapical line. The median vein continues direct to the apical margin of the tegmen in *Asiraca*, *Conomelus*, *Criomorphus*, *Tropidocephala* and *Metropis*, but ends at the subapical line in *Jassidaeus*, *Delphacodes* and its allies. The wings have (generally in the long-winged forms at least) a small stridulatory area. (See "Introduction.")

Legs.

The legs afford good characters.

In *Asiraca*, and *Phyllodinus*, the fore pair are dilated, in other genera, however, they are cylindric.

A good character is afforded by the mobile spur of the hind tibiae, which has not up to the present been fully utilized. There are three principal forms:

(1) probably the original, in which it is simple, awl-shaped, not provided with a fringe of teeth, but only one apical tooth. This occurs in *Asiraca*, *Melanesia* and *Ugyops*.

(2) the usual form; large, bilaminar, with a row of many, very feeble, minute teeth; the species are probable grass-feeders.

(3) solid, subcylindrical, elongate, narrow and strongly compressed, with a row of a few, large, strong teeth. This form is that of all the endemic Hawaiian species, but otherwise only known to me in *Proteropsydne*, an Australian genus.

As the Hawaiian forms are all arboreal, this may be the characteristic spur of arboreal species.

Genitalia.

The genitalia in the male are the final test of a species and even afford generic criteria.

(a) Male genital segments.

The terminal segment in the male is in the form of a chitinous cylinder, whose profile often affords good specific characters; this is the pygophor. On looking at this from behind, it is seen to be divided into two parts, a smaller dorsal cavity, the anal tube; and a larger ventral one, the genital tube.

The anal tube contains the mobile anal style,* while the genital tube contains the following:

(1) the mobile genital styles which are articulated near the ventral margin, being situated more or less horizontally on looking into the tube.

(2) the oedeagus, which is situated about the middle of the pygophor and is more or less vertical on looking into the tube, so that the pygophor must be tilted to observe the former properly. It is perforated by the muscular, protrusible, penis;

(3) the lateral margins of the pygophor are often thickened and dilated and also interiorly produced into hooks or spines. There are also hooks or spines close to, or proceeding from, the wall between the anal tube and the genital tube, and also on the posterior margin of the pygophor.

The following is a partial synonymy of the parts:

1 Pygophor=Pygofer Edwards=*Afterträger* Fieber=*Ullvar appendix* Signoret=*Hypopygium* Kolenati.

2 Anal Tube=*Anterior part of the segment* Sharp=*Afterrohr* Melichar..

3 Anal Style=*Rectal cauda* Sharp=*Afterstielchen* Fieber. This is the termination of the alimentary canal.

4 Diaphragm=*The transverse deflected wall separating the anal tube from the genital tube* (Sharp).

5 Oedeagus=*Porte penis* Fieber=*Penisträger* Melichar. This is the "part of the male organs through which pass the membranous structures connected with the ejaculatory duct."

6 Genital Styles=*Lateral accessory pieces* Sharp=*Styli* and *Griffel* Fieber=*Cerci* of some authors.

7 Ventral Margin of Pygophor=*Posterior edge of segment*=*Lip* Sharp.

The various hooks are not specially named.

* This has sometimes been omitted in the drawings.

In almost all the species hereafter described, the male pygophor is briefly described, but the figures should also be referred to. In connection with both descriptions and figures, it must be remembered that the pygophor is not always, or even often, straightly truncate apically, that the different pieces do not necessarily lie in the same plane, and, moreover, that they are partly mobile. Consequently when comparing with suspected specimens, the latter should be carefully examined from several points of view. The figures have almost all been drawn when the genital styles, usually the most important part, are as flat to the eye, as possible.

(b) Female Genitalia.

I have not specially studied these, and have not used them in the descriptions, but they appear to present slight specific differences in the lengths of the segments.

The Australo-Fijian Genera may be disposed as follows:

- 1 Tibial spur awl-shaped, with concave sides, and one (apical) spine (2)
- 1a Tibial spur bilaminar, or at least tectiform, with several feeble spines on the lower edge (3)
- 1b Tibial spur subcultrate, solid, elongate, strongly compressed with 8 strong spines 3 *Proterosydne*
- 2 Antennae very long, second segment one half longer than the first, frontal keels uniting about the middle of the frons 1 *Ugyops*
- 2a Antennae shorter, with the second segment 3 times longer than the first, frontal keels uniting close to the base of the frons 2 *Melanesia*
- 3 Antennae cylindric: male pygophor not spined on the ventral margin (4)
- 3a First segment of antennae flattened and much widened apically; male pygophor with 2 spines on the ventral margin 7 *Perkinsiella*
- 4 Frons with 2 outwardly rounded keels, uniting at base and apex (if at all) 4 *Criomorphus*
- 4a Frons with 2 keels uniting not apical of the lower margin of the eyes (5)
- 5 Head dorsally at least twice as long as wide (6)
- 5a Head dorsally less than twice as long as wide (8)
- 6 Hind margin of head sinuate 8 *Stenocranus*
- 6a Hind margin of head truncate (7)

- 7 No connecting (transverse or oblique) keels on vertex.... 10 *Tropidocephala*
- 7a Transverse or oblique submedian keels on the vertex.... 9 *Hadcodelphax*
- 8 Frontal keels uniting apical of one-fourth of the length of the eyes frontally (9)
- 8a Frontal keels uniting not apical of that..... (11)
- 9 Head rounded anteriorly, keels on frons very feeble.... 11 *Ancctopia*
- 9a Head with strong keels (10)
- 10 Lateral keels of pronotum straight, or curving very slightly inwards, reaching the posterior-margin; male pygophor without spines on the ventral wall of the anal tube.... 5 *Peregrinus*
- 10a Lateral keels curving outwards under the eyes; male pygophor with spines on the ventral wall of the anal tube 6 *Dicranotropis*
- 11 Lateral margin of vertex roundly arched, not carinate, meeting anteriorly roundedly, the central dorsal area long triangular, strongly keeled 12 *Haplodelphax*
- 11a Lateral margins of vertex more or less straight and keeled (12)
- 12 Male pygophor with the ventral margin deeply emarginate 3 or 4 times..... 15 *Mcgamclus*
- 12a Male pygophor not emarginate on the ventral margin more than once 13 *Gelas-*
todelphax, 14 *Smicrotatodelphax* and 16 *Delphacodes*

Ugyops.

Ugyops Guerin 1834 Voy. Belanger Zool. IV 477.

This genus is distributed over the Oriental Region and one species was described from Ponape in the Carolines; a new species is now added from Fiji.

1. *viticusis*, sp. nov.

Pale sordid stramineous, suffused in places with a rosy hue, apical half of second segment of antennae infuscate. Keels of head and scutellum very narrowly dark. Pronotum discally fuscous. Tegmina hyaline, tinged with a smoky hue in parts, subcostal vein pale, other veins dark fuscous, occasionally annulate with yellowish white; apical cells sparsely fuscous in parts,

especially apically; claval veins irregularly suffused. Wing hyaline, veins blackish brown, apical margin fuscate. Tergites marked with fuscous. Vertex deeply emarginate, the truncate base being apical of the middle of the eyes (dorsally). Frons much as in Stal's figure of *U. kinbergi*, but the central keels are not so prominent basally and are less distant; the lateral margins are more evenly rounded towards the clypeus which is clearly sutured off from the frons. Second segment of antennae one-half longer than the first. Labium long, reaching to about the hind coxae. Tibial spur awl-shaped with 3 hollow sides, only one (an apical) spine.

Female: pygophor pale yellowish; ovipositor apically fuscous, about as long as the nota and the rest of the abdomen.

Length $9\frac{3}{4}$ mill.

Hab. Viti Levu (No. 133 Muir Mar. '06) arboreal.

Melanesia, gen. nov.

Head dorsally a little longer than wide, vertex transverse, irregularly shaped, with two fairly deep but obscurely defined foveae; frons about twice and a half as long as wide, apically and basally truncate, a single filiform keel forking close to the base, lateral margins widening a little towards the apex but narrowing slightly at the apical margin. Genae not carinate. Labium reaching beyond the fore coxae. Antennae long and reaching to about the middle of the clypeus, somewhat flattened, with few circular sensory organs, but many short bristles; second segment three times as long as the first; which is rather wider apically than basally. Pronotum very transverse, lateral keels curving under the eyes. Scutellum four times as long as the pronotum, with 5 keels. Tegmina with the radial vein forking much closer to the base than the brachial, reforked basal of the subapical transverse line; somewhat apical of the middle, the tegmina are bent in and there is a cross vein which cuts across the longitudinal ones, turning off obliquely towards the apex about the middle and turning off again, close to the apex of the clavus, into the commissure. Tegmina closely and finely granulated both on and between the shortly piliferous veins; there are 10 apical veins, 4th and 5th reforking, 7, 8, and 9 having a common base. Hind tibiae longer than the tarsi, with a basal spine and another basal of the middle; spur much as in *Ugyops*; basal segment of hind tarsi much longer than the other two together.

1. *pacifica*, sp. nov.

Pl. XVII, figs. 13-14.

Vertex, pronotum and scutellum yellowish fuscous, keels a little darker; face yellowish, lateral keels very narrowly blackish-brown; antennae, labium legs, sterna, &c., brownish-yellow, the fore and middle tibiae obscurely biannulate with fuscous; apices of first and second segments of hind tarsi, more or less dark. Tegmina brownish-yellow, a small dark spot about the middle of the clavus; apical margin dark and often the subcostal also.

Male: sternites more or less ferruginous; last segment deeply rotundately emarginate; pygophor elongate, very sinuate in profile; anal tube elongately produced in a horizontal direction. Genitalia styles contiguous inwardly for a third of their length, then curving outwards and recurving, apices acute, nearly contiguous. The entire male pygophor is very peculiar and very difficult to describe, but the figures show clearly the salient characters.

Female: sternites yellowish-brown, sutured with black, few last segments deeply acute-angularly emarginate, ovipositor dark, much longer than pygophor.

Var. *strigata* nov.

Female: a broad blackish-brown stripe down the tegmen from base to apex, slightly outside the middle.

Length $6\frac{1}{4}$ - $6\frac{1}{2}$ mill.

Hab. Fiji (March, Muir's Nos. 111, 114 and 145), Navua (Feb. M), Rewa (March M), arboreal.

Purohita Distant.

1906 Faun. Ind., Rh. III, 465 & 470.

This genus must be placed in the neighborhood of *Asiraca* on account of the structure of the antennae and tibial spur, though the latter shows some alliance with *Perkinsiella* &c. The hopper has a close superficial resemblance to *Oliarus*.

1. *arundinacca* Distant.

1907 E. M. M., XLIII, 10.

I am obliged to Messrs. Mann and Antrim for specimens of this pretty little hopper. Beyond the greater length of the sec-

ond segment of the antennae, it differs from *P. cervina* by the radial and brachial veins of the tegmen being forked at about the same distance from its base, while in *P. cervina* the radial is forked much nearer the base. I still further supplement Distant's superficial descriptions by figures of the male genitalia; male pygophor of irregular shape, very deeply and elongately emarginate ventrally; the anal tube forms a kind of hood, covering over the genital stytes, which are acutely elongate. (Pl. XV, figs. 6-8).

Proterosydne, gen. nov.

Distinguished by the absence of connecting keels on the vertex, the very large eyes, and the peculiar tibial spur.

Vertex subtriangular (the anterior and posterior halves of the lateral margins very obtuse angled, so that, although the vertex is really 5-hedral, it may be said to be triangular), with no median or connecting keels; lateral keels not quite contiguous apically, almost enclosing an elongate exceedingly narrow space before uniting about the apical margin (frontally) of the eyes. Between the apex of the vertex and this forking, the head is highly polished and the keels rather obscure, otherwise the keels are all well marked. The median keel reaches the apical margin of the frons, which is a little emarginate roundedly. Vertex deeply concave, about as long as wide and does not extend as far anteriorly as the eyes, thus displaying a rounded frontal margin. Frons rather narrow, elongate, subparallelsided, slightly rounded exteriorly. Middle keel of genae meets lateral margins of frons at an acute angle at the apical margin of the frons; clypeus rather feebly tricarinate. Head not decumbent on the pronotum anterolaterally. Eyes very large, about as wide as vertex, longer than wide. Antennae subcylindric, long, reaching almost to apex of clypeus, second segment scarcely more than twice as long as the first, a little wider apically than basally, flagellum much longer than peduncle. Pronotum longer than vertex, narrower apically than the vertex basally, strongly tricarinate, lateral keels straight, reaching posterior margin, not contiguous anteriorly; posterior margin slightly, obtuse-angularly, emarginate posteriorly. Scutellum with anterior three-fourths of disk roundly convex and polished, posterior fourth flat, rather obscurely tricarinate, middle keel not reaching the flat part. Tegmina (brachypterous form only known) granulate, reaching be-

yond apical margin of last pleurite. Wings rudimentary, reaching very little beyond base of metanotum. Hind tibiae with 2 spines (1 basal), nearly one-half longer than tarsi; spur solid, elongate, narrow, with 8 spines. First segment of hind tarsi longer than the others together.

1. *arborca* sp. nov.

Pl. XVIII, figs. 11-12.

Basal part of vertex, the clypeus, pronotum, scutellum antero-laterally and basally, metanotum, sterna, legs, etc., pale yellow-brown. Apical part of vertex, basal two-thirds of frons, a large round spot on disk of scutellum, polished black. Antennae pale brown, second segment more or less infusate. Apical third of frons whitish. Tegmina hyaline, basal half tinged with yellowish-brown, a large hyaline spot in the middle (with a short, dark, transverse stripe at base), which, when the tegmina are closed, discloses the tiny, opaque white wings. Tergites blackish, basally reddish testaceous, apically with a pale yellow-brown, elongate wedge; apical margin of last three tergites sanguineous.

Female: sternites pale brown, ovipositor blackish. Last tergite longer than the proceeding segment, apically roundly produced. Length $2\frac{1}{2}$ mill.

Hab. Queensland, (Koebele 2302).

Only a single female, unfortunately, of this very distinct form.

Criomorphus.

Criomorphus Curtis 1833 Ent. Mag I, 195.

Stiroma Fieber 1866 Verh. Zool. bot. Ges. Wien XVI (?=subgen.)

Ditropis Kirschbaum 1868 Jahrb. Nass. Ver. Nat. XXI-XXII, p. 11.

Eurybregma Scott 1875 E. M. M. XII, 92.

A somewhat heterogeneous assemblage, some of the forms of which seem not far from being directly in the line of descent of *Dicranotropis*. The pygophor is destitute of spines or hooks on the ventral margin.

1. *australiae* sp. nov.

Differs from most of the other species included in *Criomorphus* by the frontal keels being separated, though close together,

during their entire length; the antennae reach beyond the base of the clypeus. Dark fuscous or pitchy, frons and legs a little paler, the former with 5 or 6 tiny paler spots on each side; clypeal keels and lateral keels of frons, antennae, markings on legs, &c., brownish testaceous. Tegmina hyaline.

Male: pygophor pitchy.

Length $3\frac{1}{2}$ mill.

Hab. Queensland, Brisbane (Nov., P.).

Peregrinus.

Peregrinus Kirkaldy 1904 Entom. XXXVII, 175 and 1906 Bull. H. S. P. A. Ent. I, 407.

=*Pundaluoya* (pt.) Distant 1906 F. B. I, III, 467.

This genus agrees with *Dicranotropis* in the forking of the front, in the antennae, in the non-contiguity of the frontal and genal keels apically, in the ocelli not nearly touching the lateral keel of the frons, but being situated close to or touching the eyes, and in the form of the tibial spur. It differs chiefly in the tegminal and alar venation in the macropterous forms, and in the lateral keels of the pronotum which practically reach the hind margin and curve inwards here rather than outwards. The second and third apical veins have a common stalk, the latter being re-forked. The pygophor has no spines or hooks on the ventral margin in the males, nor on the ventral wall of the anal tube.

✓ I. *maidis*.

Pl. XII, figs. 7-8 & Pl. X, f. 14.

This has further been recorded from the Antilles by Ballou, from Ceylon (under the names of *Liburnia psylloides* and *Pundaluoya simplicia*) by Distant, and Mr. Muir has taken it from grass in Fiji, Rewa (Mar.-Apr.-Nov., No. 6). Mr. Van Deventer has sent it to me from Java.

Dicranotropis.

In the males, the ventral margin of the pygophor is without hooks, but there are some on the ventral wall of the anal tube.

The 5 Australasio-Oriental species known to me may be disposed as follows:

(a) Longwinged forms:

- 1 Tegmina maculate (2)
 1a Tegmina practically immaculate (3)
 2 Tegmina strongly granulate, apically with a semicircular stripe and 2 short, straight stripes 3 *koebeleri*
 2a Tegmina feebly granulate, apically with a straight stripe..... 4 *muiri*
 3 Apical veins dark, slightly infusate 1 *anderida*
 3a Apical veins pale 2 *aristoxenus*

(b) Shortwinged forms.

- 1 Tegminal veins pale, not granulate 1 *anderida*
 1a Tegminal veins with large, dark granules (2)
 2 Frons apparently concolorously fuscotestaceous, fore tibiae black (?) 5 *nigropunctatus*
 a Frons blackish brown with pale yellowish specks; fore tibiae brownish black, pallidly annulate 3 *koebeleri*

Many of the European genera seem to be but little differentiated from *Criomorphus*, for ex., in the form of the frons, *Dicranotropis hamata* seems much nearer to *Delphacodes* than it does to *Dicranotropis beckeri*. (*)

anderida sp. nov.

Differs, beyond the points already mentioned, from any other *Dicranotropis*, by the head keels not being bordered at all with blackish, except *D. nigropunctata* Melichar, which has dark genae and dark lateral parts to the nota, &c. Orange brown, the keels of vertex and nota, and the parts exterior to the lateral keels of the nota mostly, pale yellowish testaceous. Frontal keels very narrowly bordered with pale yellowish orange, frontal specks the same colour. Antennae pale orange testaceous, apex of first segment dark fuscous. Tegmina pale yellowish hyaline, veins of basal two thirds mostly pale, of apical cells fuscous somewhat suffusedly. Frons elongate, narrower, subparallel, a little constricted basally, forked a little basal of the apical margin of the eyes. Tegminal veins very feebly granulate.

* I propose a new genus for this last species, viz.: *Leimonodite*, characterized by the frontal keels being separate till nearly the apical margin. From *Criomorphus* it differs by the longer and narrower frons, whose median keels are stalked apically. If this genus cannot be sustained, then *Delphacodes*, *Criomorphus*, *Dicranotropis* and several others, must be thrown together.

Shortwinged form: tegmina much as in *D. hamata*, the apical cells, or at least one of them, fuscous.

Female: abdomen more or less infusate laterally.

Length $2\frac{1}{2}$ (brachypterus), $4\frac{1}{8}$ (macropterus) mill.

Hab. Queensland, Cairns (Aug., P.), Redlynch (July, P.), Brisbane (June, P.); Fiji, Rewa (Muir's No. 160, Mar.-Apr.), Ba (Jan., M.), Navua (Feb., M), on grass. I have seen females only.

2. *aristoxenus*, sp. nov.

Very close to the last, but a little smaller and coloured differently.

Pale yellowish testaceous, without orange colouration and the frons not (at least noticeably) maculate.

Tegmina pale yellow hyaline, veins uniformly pale testaceous, not granulate. Lateral margins of frons very slightly more rounded laterally and more constricted basally.

Length $3\frac{1}{2}$ mill.

Hab. Queensland, Cairns (Aug., P.).

I have seen females, only, of this also.

3. *D. koebeli* (Kirkaldy).

Pl. VIII, figs. 9-10 & Pl. XVII, figs. 8-9.

Phacalastor koebeli Kirkaldy 1906 Bull. H. S. P. A. Ent. I, 408.

Since my original description, I have seen a shortwinged female.

Dark fuscous; keels, spots on frons, second segment of antennae, intermediate and hind legs more or less, &c., yellowish testaceous. Tegmina cinereous (granulations dark fuscous), reaching to about half the length of the abdomen, apically rounded. The male pygophor is subtrotundate viewed end-on, the ventral margin projecting acutely in profile.

Length $2\frac{1}{3}$ mill.

Hab. Fiji (March, K.).

4. *muiri* sp. nov.

Pl. XII, figs. 4-6.

Pale cinereo-testaceous, metanotum posteriorly yellow. Sternites blackish, laterally variegated with yellowish-brown, medianly sub-

sanguineous. Genital segments pale. Tegmina hyaline, veins whitish; second longitudinal apical cell smoky, apices of apical veins infusate, also a short fuscous line near apex of commissure. Keels of frons forked about the middle of the eyes.

Male: pygophor beneath very deeply emarginate basally. Anal tube with a strong spine on each side overlooking the genital tube. Genital style elongate reaching from end to end. The oedeagus is remarkably long and is subhorizontal.

Length $4\frac{1}{2}$ mill.

Hab. China, Wei Chou (Sept.).

I have great pleasure in naming this species after its discoverer.

Perkinsiella.

Perkinsiella Kirkaldy 1903 Entom. XXXVI, 179 and 1906 Bull. H. S. P. A. Ent. I, 404.

Phacalastor Kirkaldy op. c., 408. (part)

A derivative of *Dicranotropis* from which (& *Peregrinus*) it differs by the antennae being flattened and dilated, the apical margin of the first segment being much broader than the base; the genal and frontal keels meet acutely apically. The venation, and the form of the head and pronotum are similar to those of *Dicranotropis*. In the male the ventral margin of the pygophor has two hooks or spines of varying length and form, according to the species. The males of the six species known to me are easily distinguishable by the form of the pygophor, otherwise the species may be separated as follows: (*)

1	Frons with a more or less uniform ground colour, with transverse pale dots, &c.....	(2)
1a	Frons basally brownish, apically whitish, the two areas well contrasted, the former with pale dots.....	(3)
2	Frons pale brownish, with whitish dots basally and apically	5 <i>vastatrix</i>
2a	Frons piceous with brownish-yellow transverse dots, &c.	1 <i>pseudomaidis</i>
3	Males	(4)
3a	Females	(7)

* *Perkinsiella* is also closely related to the American *Stobaera*, but in the latter the head is distinctly narrower than the pronotum and the pygophor has no spines on the ventral margin in the male.

- 4 Scutellum laterally broadly dark brown (5)
 4a Scutellum concolorous (6)
 5 Tegmina feebly granulate 3 *saccharicida*
 5a Tegmina strongly granulate 6 *sinensis*
 6 Antennae shorter, granulation dark and stronger.....
 2 *graminicida*
 6a Antennae longer, granulations paler and feebler... 4 *vitiensis*
 7 Longwinged forms (8)
 7a Shortwinged forms (9)
 8 Tegmina almost immaculate, some of the apical veins lightly
 suffusedly infusate 4 *vitiensis*
 8a Median cell sometimes smoky, also 5th and 6th apical cells
 (except small hyaline spots at apex)..... 3 *saccharicida*
 9 Antennae longer and stouter, tegminal granules compara-
 tively feeble and paler 3 *saccharicida*
 9a Antennae shorter and less stout, tegminal granules stronger
 and darker 2 *graminicida*

Table of known *nymphs* of the genus *Perkinsiella*.

- I Ground colour of frons darkish-brown with white marks;
 a dark brown stripe across the base of the tegminal and
 wing pads, apex of tegminal pad dark brown.....
 1 *pseudomaidis*
 1a Frons dark basally with pale marks, pale apically; tegmina
 not striped transversely as above (2)
 2 A conspicuous black spot at apex of abdomen on each side;
 tibial spur fuscous 2 *graminicida*
 2a No spot (or very inconspicuously) at apex of abdomen on
 each side; tibial spur pale (3)
 3 Base of 1st segment of hind tarsi brown; clypeus blackish-
 brown 4 *vitiensis*
 3a First segment of hind tarsi entirely pale; clypeus pale fus-
 cous 3 *saccharicida*

The *nymph* of *sinensis* is not yet known; that of *vastatrix* has been briefly described by Breddin, but not so as to be included in the table.

1. *pseudomaidis*.

Pl. XII, figs. 1-3.

Phacalastor pseudomaidis Kirkaldy 1. c.

This species tends to connect typical *Perkinsiella* with *Dicranotropis*, but still has the widened antennae. Mr. Muir has now

taken it in Fiji (Mar., Muir's No. 131), on *Saccharum officinarum*. The male pygophor has two, somewhat short, ventral spines, and in profile the ventral margin is acutely produced.

The genital styles are somewhat twisted. The ventral wall of the anal tube has 4 spines, the dorsal being longer than the ventral. The contents of the pygophor have been drawn from a specimen in which they were not in repose.

2. *graminicida*.

Pl. XII, figs. 14-15.

The male pygophor has two very short spines on the "lip," and two long curved tusks from the ventral side of the anal tube. The genital styles are apically bispinose and the oedeagus is rather small.

3. *saccharicida*.

Pl. VIII, figs. 5-8, Pl. XII, figs. 11-13.

Dr. Van Deventer has kindly sent me examples from Java. In Pl. 17, fs. 1 and 4 of my former memoir, the obscure median keel of the scutellum was omitted.

The male pygophor has two broad spines, acuminate apically, on the "lip," and two upward curved tusks on the ventral side of the anal tube. The genital styles are broad and rather flat, bispinose apically. The oedeagus is rather long and has a triangular process on the middle of the "back."

4. *vitiensis*.

Pl. XII, figs. 9-10.

The "lip" spines in this are slender and very long. The genital styles are medianly branched, as well as bispinose apically. The oedeagus is long and broad. The spines on the anal tube are bifid.

5. *vastatrix*.

Pl. X, figs. 12-13.

Dr. Van Deventer has sent me a male of this from Java, where however it is apparently not the commonest species, this being

P. saccharicida. (*) The male just mentioned agrees with Bred-din's description, whereas the one sent me years ago by the latter was a *Dicranotropis*, not agreeing with his description. The females then sent by Dr. Breddin were true *vastatrix*. The spines on the "lip" are very long and broad in profile. The genital styles are very remarkable, being much branched and apparently somewhat basin-like. The oedeagus seems to emerge much nearer the anal tube than usual. The spines from the latter are triangular and rather broad basally.

6. *sinensis* sp. nov.

Pl. X, figs. 14-15.

Male (macropterus): differs from *saccharicida* by the strongly granulate tegmina and the genitalia. The clypeus is mostly dark brown. The paler and darker hues are brighter and more contrasted. The pygophor has long tusklike spines on the "lip," the genital styles are curiously twisted with a crumpled spine apically, the oedeagus is not unlike that of *vitiensis*, but rather shorter. The spines on the anal tube are long and slender.

Female (brachypterus): tegmina with pale veins strongly granulate with dark brown; a dark brown spot at the base of the apical cells in the middle and one at the apex of the clavus.

Length (male) $4\frac{5}{8}$ (female) $3\frac{1}{4}$ mill.

Hab. China: Wei Chou (Sept., Muir).

Stenocranus.

=? *Sogata* Distant 1903 Faun. Ind. Rh. III, 465 and 471, f. 258.

1. *agamopsyche*.

Pl. XI, figs. 1-4, and Pl. XVII, figs 6-7.

This species is nearest to *dorsalis* (Fitch). The radial vein forks nearer to the base than the brachial, and there are 8 apical cells, the 4th and 7th being pedicellate.

The male pygophor is emarginate subdorsally and the outline is sinuate. The anal tube has an acute tooth on either side.

* See Kirkaldy "Descriptions et remarques sur quelques Homopteres..... vivant [s] sur la canne a sucre" A. S. E. Belg., L I, 123-7 (1907).

The genital styles are large and of peculiar form. The oedeagus seems to be double, or at least to have two hook-like processes.

The nymph is figured on Pl. XI, figs. 3-4.

2. *pacificus* sp. nov.

Pl. XV, figs. 4-5.

Pale yellow, a broad whitish median line down the middle from head anteriorly to hind margin of scutellum very narrowly bordered with orange-yellow. Frons, between the rather broad whitish keels, fuscous, this being visible dorsally. Mesopleuron with a black dot. Tegmina hyaline, tinged with yellow, veins pale yellow, fuscous at the apices of the apical veins. Eyes red-brown. Head much shorter than in *S. agamopsyche*, dorsally very slightly longer than the pronotum medially.

Male: pygophor yellow, emarginate ventrally.

Profile sinuate. Anal tube prominent, with a downwardly directed spine on each side far down. Genital styles contiguous at base, diverging thence, spined apically. Oedeagus elongate, subascendant, with a recurved process near the apex.

Female: pygophor yellow, ovipositor sheath paler.

Length (male) 4, (female) $4\frac{7}{8}$ mill.

Hab. Viti Levu, Rewa (Mar., M.), Navua (Feb., M.), Ba (Jan., M.), (Muir's Nos. 54 and 140), on *Saccharum officinarum* and grass.

Saccharosydne, gen. nov.

Closely allied to *Stenocranus*, but whereas, in the latter the radial vein forks nearer to the base than does the brachial, in *Saccharosydne* the reverse is the case, the radial fork in the latter being very short. There are 7 apical cells, the 4th being pedicellate. The head dorsally is very similar to that of *Stenocranus*, but is angular in profile, the latter being rounded. In profile, the head is very similar in appearance to that of *Tropidoccephala*, but the latter is at once separated by the absence of cross keels on the vertex. Tibial spur broad, usual type with many small teeth. Type *saccharivora* (Westwood).

1. *saccharivora*.

Aphis sacchari (p.) Anon., 1833 Mag. Nat. Hist., VI 407, f. 54b. [incorrect]—not described.

Delphax saccharivora Westwood, op. cit. 409, figs. 54a and c [incorrect]; and 1834 op. cit., VII 496 and 610; Ballou 1905 W. I. Bull., VI. 41.

Stenocranus (?) *saccharivorus* Van Duzee 1897 Bull., Buffalo Soc., V, 232 and 1907 op. cit.

S. saccharivora Kirkaldy 1906 Bull. Ent. H. S. P. A., I, 409.

This species was originally confused with an *Aphis* (probably *A. sacchari* Zehntn., but I have not seen specimens).

It is easily recognized by its immaculate pale green colour; spur-spines, &c., black spur with 18-20 spines.

The nymphs differ but little from the adult, excepting the usual manner, and have 2 parallel keels on the frons, close together and not uniting.

Hadeodelphax.

There are at least two Australasian species:

- 1 Head in profile extending almost or quite the length of the eye in front of the latter.....1 *pluto*
- 1a Head in profile scarcely as much as half of the length of the eye, in front of the latter2 *persephone*

1. *pluto*.

Pl. XVII, fig. 12.

Macropterous form: the posterior angle of the scutellum is white, and the median keel of the pronotum is sometimes pale.

Male: pygophor sinuately rounded viewed from the end. The genital styles are recurved and broadly bifid at their ends.

Length (brach.) $3\frac{1}{2}$, (macr.) $4\frac{1}{4}$ mill.

Hab. Queensland, Cairns, (July-Aug., P.), Lucinda Point (July, P.); Fiji, (Feb., K.), Navua (Feb., M.), Ba (Jan., M.), Rewa (Apr. and Dec., M.).

var. *pallidior* nov.

I hesitate to describe this as a species, as I have seen only females, and *H. pluto* is certainly subject to natural decoloration.

Macropterous form: Testaceous, frons piceous brown, more or less paler laterally; pronotum obscurely marked with pale brown and scutellum with an obscure longitudinal stripe on each

side of the middle. Tegmina faintly smoky, hyaline, veins mostly dark, first and second apical cells more or less colourless, fifth to eighth more or less dark smoky. Sterna paler than in the type.

Brachypterous form: Pale brownish testaceous, paler beneath; tegmina narrowly smoky apically, commissure whitish, brown near the apex of clavus.

Length (brach.) $2\frac{3}{4}$, (macr.) 4 mill.

Hab. Queensland, Cairns (Aug., P.); Fiji, (March, K.), Ba (Jan., M.), Rewa (Apr. and Dec., M.).

2. *persephone* sp. nov.

Pl. XVII, figs. 10-11.

Black; vertex, frontal keels dorsally, keels of pronotum and sides of the latter, central keel and posterior angle of scutellum, commissure (interrupted in the middle), whitish. Antennae and legs whitish or whitish testaceous. Tegmina dark smoky, first and second apical cells and the apex of the subcostal cell, hyaline, veins blackish-brown; wings hyaline, veins blackish-brown. The pronotum and scutellum are often more or less decolored (sometimes there are 2 black specks on apical margin of vertex). The vertex proper (basal compartment) does not extend anteriorly so far as the apical margin of the eyes.

Male: genital segments dark brownish. Inside margin of pygophor sinuate. The oedeagus serrate marginally. The genital styles are very irregular in form.

Female: genital segments dark brownish, ovipositor-sheath paler.

Length (brach.) 3, (macr.) $3\frac{1}{2}$ -4 mill.

Hab. Queensland, Cairns (July-Aug., P.).

Tropidocephala.

Tropidocephala Stal. 1853 O. V. A. F., XI 226 (type *flaviceps*).

Nephropsia A. Costa 1862 Ann. Mus. Zool. Napol. I 76 (type *elegans*).

Conicoda Matsumura 1900 Ent. Nachr., XXVI 258 (type *graminea*).

Orchesma Melichar 1903 Hom. Ceylon 94 (type *marginipunctata*).

Ectopiopterygodelpha Kir'kaldy 1906 Bull. H. S. P. A. Ent. I, 412. (type *ciximius*.)

Smara Distant 1906 Faun. Ind. Rh. III, 478, (type *festiva*).

I think these are all synonymous. Tibiae apically with 5 short, black, equal spines as viewed ventrally; spur short, broad, a little concave on one side, without teeth.

Male: pygophor with one spine on or near the lip in the middle.

There are about a dozen species, distributed from Southern Europe to South Africa and to Australia and Japan. The three Australian forms may be differentiated as follows: (in all three, the tegminal veins are granulate and more or less hairy).

- 1 Nodule near the apex of median vein conspicuous, much larger than the one near the apex of radial, the median nodule split into two small ones which are not contiguous. Tegmina more or less dark with hyaline spots.....(2)
- 1a The brachial nodules seem a little uncertain. Tegmina pale, concolorous. Nodules are small, not very conspicuous....
..... 3 *hamadryas*
- 2 Vertex about twice as long as pronotum, clavus dark smoky..... 2 *dryas*
- 2a Vertex little longer than pronotum. Clavus dark smoky but widely pale greenish along the sutural margin. 1 *cximius*

1. *cximius* (Kirkaldy).

Pl. XII, figs. 5-7, and Pl. XVII, figs. 15-16.

Add: Clavus more or less widely pale greenish along the sutural margin. Tegmina granulated with whitish, with short, stiff hairs. Genae black, clypeus pale. Antennae pale, marked with black.

The male pygophor is figured (Pl. XVII, figs. 15-16), but neither the artist nor myself has been quite able to make out the structure and I think the interior is partly filled with excretion. I have not had sufficient material for dissection. The lateral margins of the pygophor are greatly sinuate, being produced about the middle and also very curiously towards the dorsum. There is one rather blunt spine near the lip. The genital styles are slender and curve inwards somewhat. There are also two smaller spines dorsal of these, which seem to be appendages of the oedeagus.

Length $3\frac{1}{2}$ -4 mill.

Hab. Queensland, Cairns (July-Aug., P.).

2. *dryas* sp. nov.

Pl. XII, figs. 1-4, and Pl. XVII, figs. 4-5.

Allied to *eximius*, but differs as follows:

Frons dark apically and basally, clypeus pale. Pronotum with a black spot at the side (sometimes obscurely indicated in *eximius*). Clavus concolorous, dark smoky. Vertex about twice as long as pronotum, frons narrower than in *eximius*, longer and curved in profile.

The male pygophor is very different in appearance from that of *T. eximius*, though the generic character of the single ventral spine is present. The form is more oblong, the sides sinuate and rather bluntly toothed laterally on the ventral margin. The genital styles are very long and curve twistingly near their apex.

The oedeagus seems to arise near the anal tube, and is long and slender, and a little curved.

Length $3\frac{1}{2}$ -4 mill.

Hab. Queensland, Cairns (July-Aug.), Bundaberg (Sept.-Dec.), Kuranda (Aug.).

3. *hamadryas* sp. nov.

Head formed as in *dryas*, but colour different and instead of the large dark median nodule, there are 2 non-contiguous, much smaller, pale ones. It is a rather hairier species. Pale greenish, a thin black line on either side of the median keel of the vertex apically. Antennae pale green, annulated with black. Tegmina hyaline, the smoky pattern much as in *dryas*, but very faint; a few scattered darker specks on the apical third. Legs pale testaceous.

Female: genital segment testaceous.

Length $4\frac{1}{4}$ mill.

Hab. Queensland, Cairns (Aug.).

Anectopia, gen. nov.

Closely allied to *Eurysa* Fieber, but the veins of the tegmina in the long-winged form are more complicated apically and the bracial is forked apically.

Head dorsally transverse, not extending apically beyond the eyes; vertex transverse, its two compartments each having a puncture in the middle. Frons broad, median keel almost abso-

lete (*mandanc*) or clearer (*igerna*). Antennae scarcely reaching to apical margin of frons, second segment about twice as long as the short first. Pronotum shorter and a little wider than the head, lateral keels turning more or less outwards; there is a puncture on each side of the middle keel. Tibial spur broad at base, foliaceous, with about 40 small, closely-set teeth.

1. *mandanc* sp. nov.

Pl. XI, figs. 11-13 and 17; Pl. XIV, figs. 4-6.

Long-winged form. Vertex, genae, pronotum, antennae, legs, etc., more or less dark testaceous; frons and clypeus dark fuscous, the former gradually deepening to black towards the apex. Sterna, scutellum and abdomen, very dark fuscous or blackish, except the base of the abdomen above (as also most of the metanotum) and abdomen below partly, orange sanguineous. Tegmina hyaline, second apical vein suffusedly, and 5th and 6th (and apex of 4th) apical cells, fuscous; tegminal veins pale, feebly granulate.

Short-winged female. Ovoid, the whole surface shining. Vertex, antennae, frons, pronotum, scutellum, sterna, legs, etc., testaceous more or less tinged with fuscous. Tegmina more or less dark fuscous, subopaque, a little paler internally. Abdomen blackish and fuscotestaceous. Tegmina somewhat convex, not quite reaching so far as the base of the genital segment, apically rounded.

Short-winged male like the long-winged form of the same sex, but the frons paler fuscous; tegmina subopaque, pitchy, not reaching to the apex of the abdomen.

Male pygophor, lip produced suberectly, margin doubly notched close to that point. Genital styles broad at the base, narrowing apically, the apex being acute. The oedeagus is horizontal, projecting between the blunt ventral projections of the anal tube.

Length male, female (macr.) 4, male (brach.) 2 mill.

Hab: Queensland, Cairns (July-Aug.), Kuranda (Aug.).

2. *igerna* sp. nov.

Dark fuscous or blackish-brown; frons a little paler. Antennae fusco-testaceous; legs testaceous.

Similar to the genotype, but the frontal keel is distinctly more pronounced, though the frons is still highly polished, and the tegmina are much shorter and less convex.

Length $1\frac{7}{8}$ mill.

Hab: Queensland, Bundaberg.

Only a single female unfortunately.

Haplodelphax gen. nov.

Allied to *Megamelus*; characterized by the structure of the vertex and by the radial vein not being forked.

Head dorsally longer than wide, produced in front of the eyes, apically rounded, the lateral and anterolateral keels being just interior to the apparent margins; within this is a keeled triangle, the acute anterior angle touching the anterior margin of the head; there is also a median keel which forks a little anterior of the middle, the short branches meeting the sides of the triangle a little anterior of its middle. Frons nearly twice as long as wide, lateral margins gently rounded; there is a strong median keel which meets the base without forking; apical margin angulate; basally a little of the vertex is visible laterally. Antennae short, subcylindric, not reaching apex of clypeus, second segment about twice as long as the first. Genae triangular, the apex blunt, that is to say, the median keels do not touch the lateral keels of the frons apically. Clypeus tricarinate. Pronotum tricarinate, lateral keels fairly straight, diverging posteriorly, usually not quite reaching the posterior margin. Scutellum tricarinate. Dimorphic as regards the tegmina; with the brachial vein in the long-winged form, forking close to the subapical line, the radial not forked; there are 6 apical cells, the first small, sometimes divided. Tibiae apically with 5 spines of irregular size; spur of usual form, with 10 spines. First segment of hind tarsi longer than second and third together.

There are two species, of which I have seen only females. *H. iuncicola* is the genotype. The brachypterous forms may be separated as follows:

1	Tergites yellowish, faintly marked with pale brown.....	1 <i>iuncicola</i>
1a	Tergites brownish, marked with black and yellowish.....	2 <i>naias</i>
1b	Tergites immaculate yellowish.....	3 <i>euronotianus</i>

1. *iuncicola* sp. nov.

Pl. XII, figs. 8-9.

Brownish testaceous, frons with scattered yellower specks. Tegmina hyaline, veins brownish or pale yellowish; wing veins dark brown. Tergites yellowish, obscurely spotted submedianly, in a row, with pale brown, in the short-winged form; in the macropterous form, the tergites are more or less suffused with blackish-brown. Tegmina not granulate, not piliferous.

Female ovipositor black.

Length: $3\frac{1}{2}$ (macropterous), $2\frac{7}{8}$ mill (brachypterous).

Hab: Queensland, Childers (Koebele's No. 2264 in part, on *Juncus*) Bundaberg (Sept.-Dec.).

2. *naias* sp. nov.

The *brachypterous females* differ from those of the genotype, by being darker. The tergites are brown with a very narrow yellowish median line; there is a submedian and a lateral stripe on each segment, both being narrow and black, and the former is bordered internally by a narrow yellowish stripe, and externally on the apical three tergites by a similar one, etc.

Length: 3 mill.

Hab: Sydney, New South Wales (Jan., K.).

3. *curnotianus* sp. nov.

Separable from *H. naias* by the smaller size, paler colour and longer vertex.

Pale yellow, immaculate. Eyes grey-black. Head dorsally one-half longer than wide between the eyes (in *naias* it is only between $\frac{1}{3}$ and $\frac{1}{4}$).

Female ovipositor sheath greyish fuscous.

Length 3 mill (brach.)

Hab: New South Wales, Sydney (Feb., K.).

I have seen females only.

*Gclastodelphax.*1. *histrionicus*.

Pl. XVI, figs. 1-3 and Pl. XVIII fig. 16.

The male pygophor is very remarkable. The lip is strongly produced on each side, and there are two smaller projections

between these. The genital styles are elongate and bent at the apex. The oedeagus is horizontal and is subcultrate with, apparently, a long projection from one side.

Smicrotatodelphax.

1. *perkinsi*.

Pl. XVI, figs. 14-15 and Pl. XVIII fig. 14.

The male pygophor is roundly angular at the lip, and curvedly produced in a somewhat hollow manner dorsally at the sides. The genital styles bear some little resemblance to those of *Perkinsiella saccharicida*, but are more attenuated at the base and thickened inwardly there.

Megamelus.

I have temporarily retained this group as distinct from *Dcl-phacodes*. The species included have the head distinctly produced before the eyes, the junction of the frontal keels almost on the top of the head, the pronotal keels not turning upwards, the first segment of the hind tarsi longer than the other two together. They have a common facies of a broad median longitudinal pale stripe, and dark lateral margins.

It seems to be a generic character that the ventral margin of the male pygophor is deeply emarginate 3 or 4 times; it is so at least in *M. notula*, *persephone* and *proscerpina*.

1. *proscerpina* sp. nov.

Pl. X, figs. 5-7 and Pl. XII, figs. 19-21.

Blackish fuscous with a broad, pale, ivory white band from apex of vertex to apex of abdomen, usually interrupted broadly on the middle of the abdomen, the pale colour of the abdomen is also rather yellower. Frontal keels paler fuscous. Sterna and sternites largely blackish fuscous; labium, antennae and legs pale, the antennae tinged with brownish; fore tarsi and first segment of hind tarsi blackish fuscous. Tegmina subhyaline, blackish fuscous, paler internally and exteriorly, greater part of commissure ivory white. Wing veins blackish fuscous. Antennal segments subequal. Tegminal veins not or scarcely granulate,

Male: the anal tube has two strong spines proceeding from the ventral wall in the middle; the pygophor is deeply quadri-emarginate on the ventral margin. Genital styles broad at the base, tapering and curving towards the apex; oedeagus rather small.

Length 4 mill.

Hab: Fiji, Suva (Mar., K.).

persephone sp. nov.

Pl. XIV, figs. 7-9.

This is scarcely separable except by the genitalia, from *proserpina*, but whereas all the specimens of the former I have seen are macropterous, the present species is known to me only in its brachypterous form. The tegmina extend to about half the length of the abdomen; truncate apically, slightly obliquely.

The *male* pygophor is 5 times emarginate apically, the central production being emarginate to allow the egress of the elongate oedeagus, which is widely bifid basally, the projections being slender and acute. The anal spines are not very dissimilar to those in *proserpina*, but are longer and more divergent apically. The genital styles are somewhat like those of *proserpina*.

Length: $2\frac{7}{8}$ mill.

Hab: Queensland, Cairns (July-Aug.).

3. *sponsa* sp. nov.

Pl. X, figs. 8-9.

Pale ferruginous, a broad ivory white stripe from apex of head (dorsally) to apex of abdomen. Beneath pale ferruginotestaceous, legs testaceous, frons medianly rather broadly ivory white. Tegmina subhyaline, tinged with yellowish, subcosta and commissure, ivory whitish. Head slightly produced in front of eyes. Antennae reaching well beyond base of clypeus, first segment nearly as long as the second. Tegmina reaching a little beyond apex of abdomen, but membrane scarcely formed.

Length $3\frac{1}{3}$ mill.

Hab. Queensland, Cairns (July).

I have seen only brachypterous females.

"*Delphax*"

- Kelisia* Fieber, l. c. type *guttula* (Germ.)
Chloriona, Fieber, l. c. type *unicolor* (H.-S.)
Delphax Fieber, op. c., 520, (nec Fabr.)
Delphacinus Fieber, l. c. type *mesomelas* (Beh.)
Delphacodes Fieber, op. c., 524 type *mulsanti* Fieb.
Liburnia auctt. nec Stal.
Chlorionidea Loew 1885 Verh. Zool. bot. Ges. Wien XXXV
 356 type *flava* Loew.
Delphax Fieber, op. c., 520 (nec Fabr.)
Delphacissa Kirkaldy 1906 Entom. type *uncinata*.
Sogata Distant 1906 Faun. Ind. Rhynch. III, 465, type *dohertyi*
 Dist.
Nilaparvata Distant l. c. type *greeni* Dist.

The above citation does not mean that I consider all these groups to form one genus, but simply that I cannot yet arrange the Australian and Fijian species under them, on the characters proposed for them. One difficulty lies in the large proportion of forms known only in a brachypterous state. Then again I place little reliance on many trusted characters.

Distant has used the length of the head, both dorsally and ventrally, as a principal character; this I cannot admit. The fact that the head is longer than wide dorsally as opposed to not longer than wide, if unaccompanied by other strong characters, is to me of no generic value. The same, in perhaps a rather less degree, with the frons, and also in this case as regards the contour. The comparative length of the cylindric antennae is also, within certain limits, not I think, of generic value.

Great stress is laid on the lateral keels of the pronotum, except by Distant, who disregards them. This seems to me a somewhat variable character and in any case a very difficult one to appreciate. In a few forms these keels are no doubt sharply separable into two categories, viz: (1) those which are straight, scarcely divergent posteriorly and reach the posterior margin of the pronotum, and (2) those which curve under the eyes and never reach the posterior margin. There are a large number of forms however which are intermediate, which proceed straightly in fact but fork not far from the posterior margin and proceed obscurely in two directions, under the eyes and obscurely to the posterior margin. There are also intermediate

forms between the two. Moreover in forms in which these keels curve under the eyes in long-winged forms, there seems to be a tendency towards a straightening of the keels in the short-winged forms. The venation is of comparatively small value. The relative proportion of the first segment of the hind tarsi to the other two together is used as a character of high importance by many authors, but I cannot so regard it.

The characters which appear to me to be of generic value in this section, lie in the genitalia and the tibial spur, though I am not prepared, without the examination of a large series of European and American forms, to formulate genera based on them.

I have therefore thought it best to include all the Australo-Fijian species belonging to these "genera", in '*Delphax*', thereby obviating future synonymic difficulties, as *Delphax* is a synonym and has no generic value. It should be noted also that '*Liburnia*' often used for *Delphacodes*, is a strict synonym of *Embolophphora*.

The Australo-Fijian species of this complex are disposed artificially as follows:

- 1 Head, pronotum and scutellum fuscous or black with a more or less sharply contrasted pale longitudinal stripe..(2)
- 1a Head, &c., without such a stripe.....(7)
- 2 Ground colour of head, pronotum and scutellum flavo-fuscous (3)
- 2a The same blackish-brown.....(6)
- 3 Long-winged forms: tegmina with internal half of membrane smoky (4)
- 3a Short-winged forms.(5)
- 4 Narrower and longer, keels more pronounced..13 *geranor*
- 4a Broader and stouter, keels less pronounced....12 *kolophon*
- 5 Tegmina dark apically, with separate round black spot at apex.14 *kaha*
- 5a Tegmina dark apically, without separate round black spot. 15 *leimonias*
- 6 Long-winged form: tegmina more or less hyaline:
 - A. Head dorsally not longer than wide....16 *anemonias*
 - AA. Head dorsally distinctly longer than wide..22 *eupompe*
- 6a Short-winged form: tegmina dark, with a narrow white border.17 *pylaon*
- 7 Frons yellowish, pale fuscous, or subsanguineous, practically concolorous.(8)

- 7a Frons with the lateral keels paler than the ground colour. (11)
- 8 Frons dull yellowish or testaceous. (9)
- 8a Frons shining, fuscous or subsanguineous. (10)
- 9 Hind margin of pronotum widely angulately emarginate. 3 *parysatis*
- 9a Hind margin truncate. 2 *ordovix*
- 10 Middle keel on face, especially on clypeus, paler than the ground colour. 9 *hyas*
- 10a Middle keel concolorous with the disk. 10 *disonymos*
- 11 Ground colour of frons pale yellow. (12)
- 11a Ground colour dark yellow. (15)
- 12 Tegmina blackish. 8 *matanitu*
- 12a Tegmina yellowish hyaline. (13)
- 13 Head dorsally longer than wide. 11 *ochrias*
- 13a Head dorsally not longer than wide. (14)
- 14 Male: pygophor blackish. 7 *lazulis*
- 14a Male: pygophor yellowish. 6 *dryope*
- 15 Head distinctly produced in front of the eyes. (16)
- 15a Head not, or scarcely, produced in front of the eyes. (18)
- 16 Tegmina dark fuscous, whitish opaque apically. 5 *albotristriatus*
- 16a Tegmina hyaline or cinereous or fuscous, immaculate. (17)
- 17 Frons long and narrow, lightly and gradually narrowing basally; lateral keels of pronotum not curved under the eyes, but reaching posterior margin of pronotum. 4 *ostorius*
- 17a Lateral margins of frons slightly sinuate, a trifle broader apically than basally; lateral keels of pronotum curving outward, not reaching posterior margin of pronotum. 1 *thyeses*
- 18 Long-winged forms. (19)
- 18a Short-winged forms. (20)
- 19 Scutellum black. 19 *astyanax*
- 19a Scutellum with the hind angle white. 18 *puella*
- 20 Apical margin of tegmen very narrowly white. (21)
- 20a Apical margin not continuously white. 20 *algebra*
- 20b Apical margin rather broadly white. 17 *astyanax*
- 21 Tegmina deep fuscous. 21 *dilpa*
- 21a Tegmina pale, partly smoky. 18 *puella*

1. *thyes* sp. nov.

Pl. X, figs. 12-13.

Fuscous or blackish-brown, head and keels yellowish fuscous. Antennae and legs fuscous. Pronotum and scutellum dirty yellowish-grey, middle keel and posterolateral margins of the latter sometimes very narrowly pale, two obscure pale longitudinal stripes.

Head dorsally longer than wide, produced a little in front of the eyes, vertex with a keel down the middle. Frons a little broader apically than basally, keels distinct, but filiform. Antennae reaching beyond the base of the clypeus, segments nearly subequal in length. Pronotum with lateral keels fairly straight but very divergent, not reaching the hind margin, but continuing parallel with it in the form of 2 or 3 granules, hind margin very obtuse-angularly emarginate. Tibial spur with about 16 well developed spines, first segment of hind tarsi longer than the other two.

Long-winged form: Scutellum about twice as long as pronotum. Tegmina hyaline cinereous, with 7 apical cells, generally unforked (this varying in the same individual), veins feebly granulate, pale yellowish fuscous.

Short-winged form: Scutellum shorter than pronotum. Tegmina reaching to about one-half of the length of the body, hyaline cinereous, apical margin subrescensiformly pale with a dark fuscous spot (this may be obscurely marked); not quite contiguous apically, apical margin subtruncate, a little rounded.

Length 3 (brach.)-4½ (macr.) mill.

Hab. Queensland. Bundaberg (Nov.), Brisbane (June).

Only females have been seen.

This species does not fit into any described genus, being perhaps partly *Chloriona*, partly *Delphacissa*.

2. *ordovix* sp. nov.

This short-winged form is similar in appearance to that of *D. thyes*, but the vertex is shorter and narrower, the frons yellowish fuscous, concolorous, polished and shining, parallelsided, the keels filiform and not prominent. First antennal segment about three-fourths the length of the second. Lateral keels of pronotum curved under the eyes. Tegmina apically rounded, shining, obscure yellowish fuscous, apex of clavus with a dark

spot. Tibial spur with about 30 minute spines; first segment of hind tarsi longer than the other two.

Length 3 mill

Hab. Queensland, Brisbane (June, No. 2264 in part.).

I have seen only one female.

This species is apparently a *Delphacodes*.

3. *parysatis* sp. nov.

Pl. X, figs. 10-11.

Allied to the last, but the legs, &c., are testaceous, and the pleura are not noticeably marked or spotted. Head dorsally scarcely as long as broad. Pronotal keels as in *thyes*tes. Tibiae and tarsi as in *ordovix*.

Long-winged form: tegmina hyaline tinged with yellow, apical veins infusate and a small dark lanceolate spot near the apex of the clavus. Scutellum about two and a half times as long as the pronotum which is obtuse-angularly emarginate.

Short-winged form: allied to that of *ordovix* but the legs &c., are testaceous, and the pleura are not noticeably spotted or marked. Pronotum about as long as scutellum.

Length (Macr.) $4\frac{3}{4}$, (brach.) $3\frac{1}{2}$ mill.

Hab. Queensland, Cairns (Aug.).

Only females, unfortunately, of this species which is more or less a *Delphacodes*.

4. *ostorius* sp. nov.

Pl. XVI, figs. 10-11.

Head dorsally longer than broad. Vertex with a keel down the middle. Scutellum about twice as long as pronotum. Tibial spur with about 23 spines, hind tarsi as in the last.

Long-winged male: Dark fuscous or blackish brown, with pale keels, legs, etc. Tegmina dark fuscous, subhyaline, immaculate, with 7 apical cells, the third apical vein being also forked, veins very feebly granulate.

Short-winged female: Similar in appearance to *D. thyestes*, but the frons is long and narrow, slightly and gradually narrowing basally. Lateral keels of pronotum not curved under the eyes, but reaching posterior margin of pronotum. Tegmina immaculate, apically broadly rounded, reaching to about one-half of

the entire length of the insect. First antennal segment about one-half of the length of the second.

Male pygophor rounded at the end, the dorsal margin produced at each side, the produced part flattened and bent over at the end. The genital styles are compressed, the apices somewhat acute and bent.

Length $2\frac{3}{4}$ (brach.) 4 (macr.) mill.

Hab. Queensland, Cairns (Aug., 2264 in part).

5. *albotristriatus* sp. nov.

Pl. XX, figs. 15 and XIV, figs. 1-3.

Shortwinged form allied to *thyestes*.

Dark fuscous, or blackish, a little less dark on the vertex. Eyes castaneous or fuscocastaneous. Antennae, keels on frons and clypeus, legs, etc., fuscotestaceous. Pronotum (except ventrally), posterolateral margins of scutellum, subcostal vein, apical margin of tegmina broadly, last two or three tergites, etc., opaque whitish.

Keels all strong, even on the clypeus. Head dorsally longer than wide, produced a little in front; frons widening curvedly towards the apex but narrowing very slightly at the apical margin. Pronotal keels divergent, not curving under the eyes and not reaching the hind margin. Scutellum shorter than pronotum. Tegmina nearly square, extending to about half the length of the abdomen, subtruncate apically and contiguous along the commissure. Tibial spur with about 16 well developed spines, tarsi as in the last.

Male pygophor apically rotundate oval, the rim thickened about the anal third and produced there in a short spine. Genital styles broad, bifid apically.

Length $2\frac{1}{4}$ $2\frac{3}{4}$ mill.

Hab. Queensland, Brisbane and Bundaberg (Nov.).

I have seen males only.

6. *dryope* sp. nov.

Pl. XVI, figs. 12-13.

Somewhat like *D. osborni*.

Yellowish testaceous, frontal and clypeal keels whitish-yellow. the former very narrowly bordered internally with dark fuscous. (in the males the keels are less broad and less whitish). Pro-

notal keels whitish yellow, a dark fuscous spot on each side anteriorly. Scutellum medio-longitudinally pale with a pale brownish-yellow sinuate line on either side. Underneath pale testaceous, a fuscous spot on each mesopleuron. Tegmina hyaline, veins pale except the apical ones, which are fuscous. Lateral margin of frons subparallel, slightly narrowed basally, a little more so in the male than in the female, keels rather flattened. Antennae not reaching beyond base of clypeus, second segment nearly twice as long as the first. Pronotum as in *osborni*. Tibial spur with about 27 spines. Tegmina with 8 or 9 apical cells, the 4th, 7th being pedicellate.

Male pygophor pale yellowish; subrotundate viewed end-on, the lateral margins thickened and produced into a short spine near the anal tube. Anal tube with a elongate, strong, downward directed tooth from its ventral wall on each side, and about 5 tiny spines between oedeagus subhorizontal, elongate. Genital styles divergent, apically bifid.

Female abdomen beneath more or less fuscous.

Length (brach.) $2\frac{1}{2}$ (macr.) $4\frac{1}{2}$ mill; both sexes are dimorphic.

Hab. Queensland, Cairns (Aug.) Redlynch (July) Kuranda (Aug.); Fiji, Rewa (Dec., Muir).

1. *lazulis* sp. nov.

Pl. XVIII, figs. 1-3.

I can distinguish this from the last described only by the rather smaller size, by the blackish pygophor in the male and different genitalia in that sex. I think the females would be very hard to tell apart from those of *dryope*. I have seen only brachypterous forms.

Male pygophor blackish, subrotundate viewed end-on, the lateral margins somewhat sinuate; anal tube with a projection on each side, pointing downwards. Genital styles not unlike those of *dryope*, but the outer apical angle blunter.

Length $1\frac{7}{8}$ mill.

Hab. Queensland, Cairns (Aug.), Redlynch (July).

8. *matanitu* sp. nov.

Pl. XVI, figs. 4-5; & Pl. XVIII, fig. 15.

Pale brownish-yellow, or yellowish-testaceous, keels of frons slightly paler.

Tegmina black. Head dorsally scarcely extended before the eyes. Pronotal keels curvedly divergent. Spur with 15 or 16 spines.

Male: pygophor in profile greatly emarginate ventrally. Genital styles divergent, the apices truncate and thickened.

Length 2 mill. (brachypterous).

Hab. Viti Levu, Rewa (Dec., M.), Ba (Jan., M.), Navua (Feb., M.).

The vertical cross keels are obscure and are not shown on fig. 15 of Pl. XVIII.

9. *hyas*, sp. nov.

Somewhat like *dryope*, but the keels of the frons are only very slightly lighter than the pale ochraceous disk; antennae not reaching to base of clypeus. Tegmina hyaline, veins pale yellow, tending to pale fuscous on the membrane, granules pale fuscous. Spur with 22 spines.

Male: pale ochraceous; tergites broadly fuscous medio-transversely, orange basally. Sternites more or less dark fuscous partially, pygophor suffused with fuscous beneath.

Female: almost uniform, more or less pale ochraceous.

Length $3\frac{1}{2}$ mill.

Hab. Queensland, Redlynch (July), Kuranda (Aug.).

10. *disonymos* sp. nov.

Pl. XVIII, fig. 4.

Allied to the last. Pale yellowish testaceous. Head very slightly produced before the eyes; lateral margins of frons subparallel, slightly narrowed basally, keels flattish. Antennae not reaching beyond base of clypeus. Lateral keels of pronotum curving outwards. Tegmina with 6 unforked apical cells. Spur with 16 spines.

Male: pygophor rounded, subtransverse viewed end on. The genital styles are elongate, gradually widening a little towards the apex, where they are truncate.

Length $3\frac{3}{4}$ mill.

Hab. Fiji, Rewa (male, Apr., M.), Suva (female Mar., K.).

11. *ochrias* sp. nov.

Has the head form of *Chloriona*.

Ochraceous or testaceous. Sterna, legs, etc., paler, a narrow somewhat paler median line down the tergites (and in the macropterous form, the space between the lateral keels of pronotum and scutellum is paler). Antennae not reaching to apex of frons, first segment scarcely longer than wide.

Long-winged forms: veins feebly granulate.

Short-winged forms: tegmina narrowly rounded, reaching to about half the space between the tegulae and the apex of the abdomen.

Length $3\frac{1}{2}$ (macr.), $2\frac{1}{2}$ mill. (brach.).

Hab. New South Wales, Sydney (Jan., Koebele's No. 2232), Fiji (Mar., K.), Rewa (Mar., M.).

Koebele & Perkins collected one imperfect macropterous and 15 brachypterous adults and 3 nymphs, all females. The type is a macropterous female from Fiji, taken later by Muir.

To this species probably also belong some forms in which the ochraceous is replaced (as is sometimes the case in other ochraceous species) by orange-sanguineous or sanguineous.

Hab. Queensland, Bundaberg (Sept.-Nov.), Brisbane (June) Cairns (Aug.).

12. *kolophon* sp. nov.

Pl. XV, figs. 9-11.

Testaceous, somewhat paler on pronotum and scutellum medially; frons, between lateral keels and central keel, sometimes pale fuscous. Pronotum and scutellum more or less fuscous exterior to the lateral keels.

Tegmina hyaline, veins pale; interior two-fifths smoky, the veins on this fuscous; subcostal vein smoky, commissure whitish. Antennae not reaching to apical margin of frons, second segment twice as long as the first.

Male. Tergites, including pygophor, dark fuscous or blackish-brown, a transverse yellowish-brown, or orange, sanguineous band near the base. Sterna and sternites mostly dark fuscous, the latter basally yellowish-brown, with a spot or two laterally. Pygophor subrotundate, viewed end on, the outline sinuate. Anal tube with 2 elongate spines from the middle, directed downwards,

almost embracing the upwardly directed oedeagus. Genital styles broad basally, subconstricted just before their bifurcation, the forks being long and acute.

Female. Sterna and abdomen pale yellowish-orange; tegmina not so smoky as in the male. Pronotum and scutellum scarcely fuscous laterally.

Length 3 mill.

Hab. Queensland, Redlynch (July), Cairns (Aug.), Kuranda (Aug.).

The keels are not very prominent.

13. *geranor*, sp. nov.

Pl. XVI, fig. 3.

Superficially like *kolopohn*, but narrower and longer, keels more pronounced, etc.; median longitudinal stripe from head to scutellum whiter. Frons intercarinally fuscous. The male genitalia are also very different.

Male: pygophor rather elongate viewed end-on, and thickened inwardly at the sides. The anal tube has a lateral spine on each side directed downwards and apparently 2 downwardly and outwardly directed spines between the above. Oedeagus of remarkable form (shown in the figure). Lip produced somewhat in the middle. Genital styles contiguous longitudinally at base, diverging their lateral margins angulate in the middle, apically truncate, the apical angles on each side being acute.

Length $3\frac{1}{3}$ mill.

Hab. Queensland, Cairns (July).

14. *kaha* sp. nov.

Pl. XVI, figs. 8-9.

Dark brownish-black, a whitish median stripe on head dorsally, pronotum and scutellum. Commissure basally the same. Frontal keels, antennae, legs, spots on pleurites, etc., yellowish testaceous. Tergites orange-yellow, more or less marked with fuscous, especially lateral. Spur with 15 teeth. Pronotum with lateral keels curvedly divergent.

Long-winged: tegmina milky hyaline and dark fuscous (as shown in figure).

Short-winged: tegmina fuscous, commissure whitish, a black spot on apical margin of tegmina.

Male: pygophor with sinuate outline. Lip produced. Anal tube without spines. Oedeagus with a curious angularly bent appendage. Genital styles rather small, obliquely truncate basally, nearly touching apically.

Length 3 (Mar.), 2 (brach.) mill.

Hab. Queensland, Kuranda (Aug.).

15. *leimonias* sp. nov.

Short-winged form: closely allied to the last, but tegmina dark fuscous subhyaline, apically opaque, margins ivory-white, broken in places by the dark tint. Median keel of frons and clypeus ivory-white. Tergites dark fuscous, medianly white.

Length $2\frac{1}{3}$ mill.

Hab. Queensland, Cairns (Aug.).

I have only seen females.

16. *anemonias* sp. nov.

Pl. X, figs. 1-2 and Pl. XVI, figs. 1-2.

Dark brownish black. Head dorsally, pronotum and scutellum with a broad median, ivory-white stripe. Commissure and frontal clypeal keels narrowly, lateral and posterior margins of the ventral part of the pronotum, tegulae, etc., white. First segment of the antennae blackish brown, second dark fuscous. Lateral keels of pronotum and scutellum narrowly obscurely ferruginous. Tegmina hyaline, veins pale fuscous except the very pale subcosta, outer fork of radial, etc. Femora more or less dark fuscous, tibiae and tarsi testaceous. Pleurites bordered pallidly, more or less. Head not extending anteriorly in front of eyes. Lateral keels of pronotum curvedly divergent. Spur with 19 spines.

Male pygophor apically truncate in profile. Oedeagus horizontally projecting near the anal tube. Genital styles broadening towards the apex, which is truncate, inner margins irregularly sinuate.

Length $3\frac{1}{2}$ mill.

Hab. Queensland, Redlynch (July), Cairns (July-Aug.), Kuranda (Aug.).

17. *D. pylaon* sp. nov.

Pl. XV, figs. 12-14.

Close to the last, but the lateral keels straightly divergent, and spur with 19 spines.

Long-winged form (male) tegmina much shorter. Ground color of pronotum and scutellum paler fuscous, lateral keels white; the mesosterna bordered exteriorly with white.

Short-winged form (female of same species?) ; blackish-brown, lateral keels of pronotum white. Tegmina subhyaline, dark fuscous, rather broadly (comparatively) bordered exteriorly from exterobasal angle to interobasal angle with ivory-white. Tergites with a median line of ivory white and a lateral and two sublateral, similar (but more broken up) lines.

Male pygophor triemarginate towards, and at the ventral margin. Genital styles widening out towards their apex, which is subtruncate, the angles rather rounded, the inner margins on the apical half, irregularly sinuate. Oedeagus arising close to the ventral wall of the anal tube and bending outwards and downwards a little over the genital styles. There are no spines on the anal tube ventrally.

Length $2\frac{1}{2}$ (macr.), $2\frac{1}{4}$ (brach.) mill.

Hab. Queensland, Cairns (July), Brisbane (June).

18. *puella*.

Pl. XV, figs. 1-3.

Liburnia puella Van Duzee; Forbes and Hart 1900 Bull. Illinois Agr. Sta. 60 p. 416. Pl. 1, f. 2.

Hab. Queensland, Cairns (Aug.), Redlynch (July); Fiji, Suva (Mar., K.).

Also from North America, New Jersey, New York, Iowa and Mississippi (Van Duzee), Ohio, Kentucky (Swezey), Illinois (Forbes & Hart), on grass, grains and sugar beet.

The basal segment of the antennae varies from testaceous to blackish. The middle keel of the frons in the Australasian individuals is usually blackish, though sometimes paler fuscous; the Americans are usually whitish. The spur has about 20 spines.

Male pygophor oval; anal tube cleft ventrally, with 2 diverging spines. Oedeagus a little swollen apically. Genital styles small and laterally arched, nearly meeting apically. This species is very close to *albicollis*, but is a little larger, the posterior angle

of the scutellum white, the frons is coloured differently and the male pygophor different. I am indebted to my friend Mr. Van Duzee for a pair of his *puella*. *

19. *astyanax* sp. nov.

Pl. X, fig. 20; Pl. XIV, figs. 13-15. **

Closely allied to *D. puella*, but smaller, the genae and scutellum entirely black, and the lateral margins of the frons more rounded laterally. In the short-winged form, the tegmina are subtruncate, and broadly margined with white apically. Spur with about 14 spines.

Male pygophor exceedingly remarkable. The anal tube is elevated and shaped somewhat like a square hood. The lateral margins of the pygophor close to the anal tube project acutely and somewhat curvedly. Genital styles truncate apically, the angles being acute and prominent. The oedeagus has a crown of 4 long spines (or is apically elongately quadrifid in other words). Length about $1\frac{7}{8}$ (brach.), $2\frac{1}{4}$ (macr.) mill.

Hab. New South Wales, Mittagong (Jan., K.).

20. *algebra* sp. nov.

Pl. X, figs. 16-17; Pl. XV, figs. 15-16.

Closely allied to *D. puella* but (in the short-winged forms at least) the tegmina are deeply fuscous and more opaque; basal half of commissure and a tiny spot near the apex internally whitish. The median keel of the frons is rather thick and whitish, and the lateral keels of the pronotum are straight and reach the hind margin. Spur with 33 spines.

Male pygophor suboval, broadly produced near the anal tube, which has 2 projections from the ventral wall. The genital styles are widened and truncate apically, the outer angles rounded, the inner acutely produced.

Length $1\frac{7}{8}$ mill (brachypterous form only known).

Hab. Queensland, Kuranda (Aug.), Cairns (July-Aug.).

* Dr. Melichar kindly sent me some years ago a male of the Sinhalese *albicollis* Motschoulsky, the male pygophor of which is figured Pl. 14 figs. 10-12. It is subrotundate viewed end on and has a flat projection on each side near the anal tube, turning a little outwards and very conspicuous in profile. The anal tube has no spinose projections. The oedeagus is apparently short. Genital styles less arched than in *puella* and dilated apically, being shortly bifid, the angles acute.

** Pl. 10 f. 20 is not quite accurate, the lateral margins of the vertex should be more concave.

21. *dilpa*, gen. nov.

Pl. X, figs. 18-19; Pl. XVI, figs. 6-7.

Short-winged form similar to *algebra*, but the white apical margin of the tegmina is very narrow, and the male genitalia are very different.

Male pygophor suboval, margins sinuate. Oedeagus horizontal, elongate. Genital styles inwardly curved, the apices truncate, angles prominent and acute, or subacute.

Length $1\frac{1}{2}$ mill.

Hab. New South Wales, Mittagong (Jan., K.).

The vertex in Pl. X, fig. 18 is a little too prominent.

22. *eupompe* sp. nov.

Pl. X, figs. 3-4; Pl. XII, figs. 16-18.

Superficially like a *Megamclus*, but the male pygophor is not of the *Megamclus*-type. Perhaps a *Kelisia*.

Dark fuscous or blackish; vertex, antennae, pronotum and scutellum, between the lateral keels, legs, commissure, yellowish-white.

Tegmina dark fuscous, first and second, and the outer part of 3rd and 4th, apical cells, a little paler. Veins closely but flatly granulate. Frons laterally acute and subreflexed, gradually narrowing towards the base; the central keel strong but rather flat; antennae short, first segment scarcely half the length of the short second. There are 9 apical cells, 4 and 7 being pedicellate. Tibial spur with 13 spines.

Male pygophor somewhat diamond-shaped, and is thickened internally at the middle laterally, anal tube with 2 median, strong, straight spines, between which arises the upward and outwardly directed oedeagus. The genital styles are divergent, elongate, acute, not bifid.

Length 3 mill.

Hab. New South Wales, Sydney (Jan.); Queensland, Cairns (Aug.), Bundaberg (Nov.); Fiji, Suva (Mar., K.).

The cross keels on the vertex in Pl. X, fig. 3 were inadvertently omitted.

Derbidae.

This family contains the most delicate and remarkable forms of the Fulgoroidea, or even of the Auchenorrhynchi. While such forms as *Nisia* and *Philadelphica* seem to have little in common, there are numerous intermediate forms which render sharp groupal separation difficult. There seem to be two main subfamilies, viz: (1) Nisiinae, represented by *Nisia* in which the last segment of the labium is comparatively elongate, and the anal vein of the clavus strongly granulate, and (2) Derbinae represented by *Philadelphica*, in which the last segment of the labium is annuliform, generally a little wider apically than basally, and the anal vein not granulate, the latter division being much more numerous in genera and species. Unfortunately in the genera *Thyrocephalus*, *Basileocephalus* and *Phaciocephalus*, we have a small intermediate group in which the anal vein is granulate and the last segment of the labium annuliform.

In the following table of Australo-Fijian genera, I have endeavoured to include those recently described by Distant. As the latter mentions the shortness of the apical segment of the labium as a character of the (sub-) family in the Oriental forms, (he includes *Nisia* in which it is comparatively elongate!), I have supposed that his Australian genera have the same character.

1	Last segment of labium somewhat elongate, (anal vein and head granulate)	(2)
1a	Last segment of labium annuliform	(4)
2	Head strongly carinate along the middle....	3 <i>Phaconeura</i>
2a	Head not medianly carinate	(3)
3	Lateral keels of frons parallel	1 <i>Nisia</i>
3a	Lateral keels of frons narrowing basally as seen from below	2 <i>Suva</i>
4	Anal vein of tegmen granulate (*).....	(5)
4a	Anal vein simple (*).....	(7)
5	Pronotum more or less normal; vertex anteriorly truncate	6 <i>Thyrocephalus</i>
5a	Pronotum laterally laminate, sinuate, recurved, partly enclosing antennae; vertex not truncate anteriorly....	(6)

(*) Distant has not mentioned in any of his descriptions a most important character, viz.: The granulation of the claval veins and of the head, etc., so that I have arranged his genera under the second division, except *Urabinna*, in which his artist seems to have recognized the importance of the claval granulation, and which is only a synonym of *Basileocephalus*.

- 6 Lateral keels of frons continuing acutely to apical margin 4 *Basileocephalus*
- 6a Lateral keels of frons flattening out apically 5 *Phaciocephalus*
- 7 Antennae not projecting beyond the anterior margin of the head (in profile or dorsally) (8)
- 7a Antennae projecting beyond the anterior margin of the head (23)
- 8 Antennae scarcely more than twice as long as wide.... (9)
- 8a Antennae more than three times as long as wide.... (20)
- 9 Wings developed (10)
- 9a Wings rudimentary 19 *Muiria*
- 10 Head narrower than pronotum (11)
- 10a Head wider than pronotum..... 18 *Philadelphiea*
- 11 Subcostal vein of tegmen simple (12)
- 11a Subcostal vein of tegmen granulate 17 *Nesoniphas*
- 12 Tegmina broader and less elongate, or if elongate then strongly widening apically; wings longer in proportion (13)
- 12a Tegmina narrow and elongate; wings much shorter.... 16 *Proutista*
- 13 Vertex transverse, apically truncate, separated from frons by a transverse keel, scarcely extending before the eyes 7 *Lamenia*
- 13a Vertex more or less elongate, distinctly not transverse. (14)
- 14 Vertex elongate, apically truncate, tegmina widening very strongly towards the apex 15 *Lyriceu*
- 14a Vertex with lateral margins acute and parallel, not separated from the frons by a cross keel..... 8 *Rhotana*
- 14b Vertex elongate, angulate, extending in front of the eyes (15)
- 15 Antennae not (or very feebly) tuberculate (16)
- 15a Antennae subrotundate, strongly tuberculate.... 13 *Kaha*
- 16 Head sublinearly elongate as seen dorsally, more than four times as long as an eye..... 14 *Vivaha*
- 16a Head not as above (17)
- 17 Lateral margins of vertex narrowly (or not) reflexed, closer at base, feebly sensorized (18)
- 17a Lateral margins of vertex more reflexed, well separated at base, usually strongly sensorized (19)
- 18 Antennae short 9 *Levu*

- 18a Antennae elongate, flattened and compressed, elongate-oval
in profile10 *Niphadodite*
- 19 Genae simple11 *Pyrrhoneura*
- 19a Genae with a small subrotundate, laminate appendage....
.....12 *Nesocore*
- 20 Antennae, subcylidric, granulations feeble....20 *Heronax*
- 20a Antennae more or less flattened, with very conspicuous gra-
nulations (21)
- 21 Head not longer than the nota, lateral margins of vertex
not sinuate21 *Nesophantasma*
- 21a Head longer than the nota, lateral margins of vertex sinuate
..... (22)
- 22 Head in profile only slightly ascendant, only slightly sinuate,
broad 22 *Phantasmatocera*
- 22a Head in profile curved and recurved, subascendant, narrow
..... 23 *Stvezeyia*
- 23 Wings very little shorter than the tegmina, vertex elongate
..... 24 *Kuranda*
- 23a Tegmina twice as long as the wings, head comparatively
short (24)
- 24 Antennae cylindric; tegmina subparallel, apically subob-
liquely truncate25 *Zoraida*
- 24a Second segment of antennae deeply constricted near the
apex (*); tegmina widening at the middle, apically sub-
angulately rounded26 *Sikaiana*

Nisia.

1. *atrovenosus.*

Add: Fiji, Rewa (March-Apr., M.), Ba (Jan., M.), Navua (Feb., M.). Melichar has also recorded it from Abyssinia, Haro-Bussar (1904 Verh. Zool. bot. Ges. Wien LIV 34) and Distant from the Indian mainland (Faun. Ind. Rh. III, 309, fig. 150).

Suva.

The tegminal venation is very similar to that of *Nisia*, but there are two obliquely transverse veins in the subcostal cell (in the apical half), the median apical vein is forked (though this would probably vary in a long series, as it does in *Nisia*), and the lower apical part of the tegmen is more venose, more as in *Kermesia*. The head is depicted on Pl. IX, figs. 14-16.

* Distant erroneously treats this as two segments.

Basileocephalus.*Basileocephalus* Kirkaldy.=*Urabunna* Distant 1907, op. c., 414.

The care with which Mr. Distant has really studied my descriptions, is shown by his appreciation of my genus *Basileocephalus*. Although I specially remarked on the curious laminate recurved lateral margins of the pronotum, Mr. Distant supposes that this genus is closely allied to his *Sikaiana*, in which the pronotum bears no conceivable resemblance to such a description, while the latter fits that of his *Urabunna*. Mr. Distant has neglected to notice the sensory organs on the vertex and the granulated anal vein of the clavus, though the latter character has been noticed and included by his acute artist.

1. *thaumatonotus*.

Pl. IX, figs. 9-11, and Pl. XIX, fig. 20.

B. thaumatonotus Kirkaldy.=*U. lineata* Distant, l. c., fig. 7.

I imagine Distant's species to be a synonym of the above, but he does not mention that the tegminal veins are noticeably coral-red.

Phaciocephalus.

I inadvertently placed this genus among those with the last segment of the labium fairly long; it is, however, subannuliform.

The venation of the tegmen and wing is shown in the text figure attached (No. 3).

The six species, all Fijian, are separable as follows:

- 1 Tegmina with red or orange markings.....(2)
- 1a Tegmina not marked with red or orange.....(3)
- 2 Inner half of tegmen reddish with 2 long yellowish spots on the margin; tegmen not at all smoky.....4 *miltodias*
- 2a Inner half of tegmen reddish, the inner margin creamy (sometimes interrupted by the ground colour close to the apex of the clavus), this inner half largely smoky, especially apically3 *nesodreptias*
- 3 Tegmen creamy with a greyish brown longitudinal stripe (4)
- 3a Tegmina whitish with the veins greyish-black and broadly marked 6 *minyrias*
- 3b Tegmina pitchy, subcostal cell yellowish white..... *pullatus*
- 4 Tegmen with the greyish black stripe not connected with the commissure by a dark cross-streak.....1 *vitiensis*
- 4a Tegmen with the dark stripe connected with the commissure by a dark cross streak *nesogonias*

1. *vitiensis*.

Pl. XIX, figs. 12-14.*

Mr. Muir has taken specimens (measuring up to 6 mill. long) in Fiji, Suva (No. 110), arboreal.

2. *nesogonias*, sp. nov.

Head and pronotum creamy, a little darker laterally. Scutellum dark blackish-brown, sometimes paler medianly. Tegmina milky, a broad, blackish-brown stripe down the tegmen, forking close to the base, also broadly touching the sutural margin at the middle and at the apical part. Wings milky, veins dark. Legs pale, apices of segments blackish.

Length 5 mill.

Hab. Fiji, Rewa. (Mar., Apr., Nov., Muir).

3. *nesodreptias* sp. nov.

Head and middle fourth (longitudinally) of pronotum, legs, sternites, &c., yellowish white, sterna tinged with orange. Rest of pronotum and the scutellum orange-red. Tegmina yellowish-

* On Pl. 19 f. 12, the sublateral keels of the vertex are not clearly shown.

white, with an orange-red stripe much as in *P. nesogonias*, the veins on this part being blood-red.

Length 5 mill.

Hab. Fiji, Rewa (Mar. & Nov., Muir).

Var: The orange on the tegmina narrower and bordered exteriorly with smoky, or almost replaced by it. Pronotum with two blackish-brown spots and scutellum with two to four antero-laterally. The orange hue may be crimson.

4. *miltodias* sp. nov.

Pl. XIX, fig. 20.

Whitish yellow, pronotum laterally, scutellum (except sometimes medianly), orange-sanguineous. Pattern of tegmina as in *P. nesogonias*, but the colouring different, the blackish being replaced by orange sanguineous. Legs yellowish-white, apices very narrowly dark.

Length $4\frac{1}{2}$ mill.

Hab. Fiji, Rewa (Mar. & Apr., Muir No. 137), arboreal.

The sulcate median part of the vertex is not shown.

5. *pullatus* sp. nov.

Head and pronotum brownish-yellow; vertex sordid, lateral margins very narrowly dark fuscous. Scutellum piceous. Tegmina piceofuscous, basally opaque, subcostal cell (except basally) yellowish, apical margin very narrowly sanguineous. Wings smoky hyaline, veins dark. Forelegs dark fuscous, the others brownish-yellow.

Length 6 mill.

Hab. Fiji, Rewa (Mar. Muir's Nos. 128 and 132), aboreal.

6. *minyrias* sp. nov.

Head pale fuscous of various tints, pronotum whitish; sterna and legs soiled whitish; scutellum orange fuscous, with 3 large brown wedges. Tegmina milky, the veins thickly blackish-brown, except the whitish basal two thirds of the subcostal cell.

Length $5\frac{1}{2}$ mill.

Hab. Fiji, Rewa (Apr.).

*Thyrocephalus.*1. *leucopterus*.

Pl. XVIII, fig. 8.

(See also text fig. 2 on p. 166).

Lamenia.

In my last memoir, I placed this doubtfully among the Cixiinae; it should however, I think, be placed here, although somewhat aberrant.

Rhotana.

I now add a Fijian species, which may be distinguished from the Australian forms as follows:

1	Veins of tegmina pale yellow (*)	1	<i>chrysonoc</i>
1a	Veins sanguineous	.....	(2)
2	Tegmina largely dark smoky	3	<i>haematoneura</i>
2a	Tegmina hyaline	3	<i>halosydne</i>

3. *halosydne* sp. nov.

Similar in structure to the two previous species. Whitish testaceous. Eyes brownish. Tegmina hyaline testaceous, immaculate, veins on basal fourth pale, on the rest bright sanguineous. Wings hyaline, veins sanguineous.

Length $5\frac{1}{8}$ mill.

Hab. Fiji., Rewa (Apr.. M.).

* Since this was in proof, Distant has published descriptions of five species as new, all apparently allied to *chrysonoc*, but as the length of the head is not stated, they cannot be determined without seeing the types. They are as follows:

ramentosa p. 409, *transversa*, p. 410, *opalina*, p. 410, *septemmaculata* p. 410, and *quadrimaculata* p. 411.

*Levu.*I. *vitiensis*.

Add: Fiji, Rewa (Mar., Apr., Dec., M.).

Niphadodite, gen. nov.

Allied to *Pyrrhoneura* but differs by the form of the antennae. Also somewhat similar to *Heronax*, but differs by the form of the antennae.

Lateral margins of vertex widely separated at the base, converging anteriorly, forming an acute angle. Frontal keels almost contiguous throughout, except just at their apices. *Clypeus* basally acute, extending laterally as far as, or farther than, the outside part of the antennal insertion. Antennae elongate, extending nearly as far as the head anteriorly, flattened and compressed, elongate oval in profile; head in profile extending anteriorly nearly twice as far as an eye's length. Tegmina not unlike those of *Heronax*, but obtuse-angularly produced beyond the clavus, somewhat as in *Lyricen*. Type *insulicola*.

I. *insulicola* sp. nov.

Yellowish-testaceous, paler beneath. Eyes greyish-black. Last segment of labium and the metanotum greyish fuscous. Tegmina subhyaline, yellowish testaceous, veins in part tinged with pale orange. Apical cells partly faint smoky, and a few scattered fuscous spots on the rest of the tegmina. Labium reaching to about the middle of the abdomen.

Length $7\frac{1}{2}$ mill.

Hab. Viti Levu, (Mar. Muir's No. 130), arboreal.

Pyrrhoneura.

Pyrrhoneura Kirkaldy 1906.

Makula Distant, op c., 408.

I. *saccharicida*.

(fig. annexed, of tegmen, No. 4).

Add: Fiji, Rewa (Mar., Apr., Nov., Dec., Muir's No. 48) "common on certain native trees in the Bush and at times very common on Sugar Cane, turning the leaves yellow in streaks where they feed."

The stridulatory area is figured on Pl. XX, figs. 6-7.

2. *citharista* sp. nov.

The lateral margins of the vertex are rather more widely reflexed than in the type species. Testaceous, posterior angle of scutellum brown, genae partly suffusedly with rosy. Tegmina cinereotestaceous, veins concolorous, two transverse bands of grey-brown, at their base and on the basal third, the latter dividing into two at the radial vein, the lower branch (which is actually a spot on the subcostal cell) curving apical-wards and dividing into two bands which proceed irregularly to the apical parts of the tegmen. Wings hyaline, veins partly fuscous, a longitudinal fuscous stripe on the apical third near the middle.

Length 5 mill. to apex of closed tegmina.

Hab. Fiji, (March, Muir's No. 106,) arboreal.

The stridulatory area is figured on Pl. XX, figs. 1-2.

3. *ornata*.

Makula ornata Distant, l. c., fig. 5.

Hab. Queensland.

This differs from the preceding two species by having apparently a few more veins at the lower apical part, and usually in the Vitian forms, there is a cross vein in the first wing cell, but this is sometimes absent in *P. citharista*. The eyes are also a little farther from the dorsal margin of the genae in *P. ornata*.

Nesoncura subgenus nov.

Close to typical *Pyrrhoncure*, but the eyes are placed more as in *P. ornata* and the head in profile is subangulate anteriorly, while it is distinctly more elongate dorsally, being medianly extended farther in front of the eyes than with them.

4. *vitiensis* sp. nov.

Testaceous; the eyes and a small spot on each frontal keel at its base and the same at its apex, sides of pronotum narrowly, basal half of subcostal cell, blackish. Tegminal veins white, an ob-

lique, very obtusely angulate, band across the outer half of the apical half, part of the apical margin apical of the claval apex, and some obscure elongate spots more in the centre of the tegmen, fuscous.

Length $4\frac{3}{4}$ mill. to apex of closed tegmina.

Hab. Viti Levu, Rewa (Apr., M.).

Nesocore, gen. nov.

Superficially somewhat like *Phaciocephalus* but the antennae are more elongate, obliquely subtruncate apically, and the lateral keels of the frons continue sharply to the apical margin.

From *Pyrrhoneura* it differs (as also from other genera) principally by the possession of what appears to be a small, subrotundate laminate appendix to the genae, on each side, roughly at right angles to the genae themselves.

1. *fidicina* sp. nov.

Testaceous; the vertex with a pink tinge, lateral margins of frontal keels dark at least basally; lateral margins of nota, the abdomen above basally, &c., pale fuscous. Genal lamina milky white. Tegmina hyaline, a pale fuscous streak along the interior half, a conspicuous blackish speck near the apex, apical margin narrowly dark, part of some of the veins near the apex sanguineous. Wings milky hyaline, some of the veins fuscous.

Length 6 mill.

Hab. Viti Levu, Rewa (Mar., Apr., Muir's Nos. 151-4), under bark of an old tree much attacked by fungus.

Nymphs dark fuscous, the legs and sensory organs paler.

(Pl. XVIII, figs. 9-10).

Vivaha.

Vivaha Distant 1906 Faun. Ind. Rhynch. III 395, fig. 148.

1. *saniosa*.

V. saniosa Dist., 1907 A. M. N. H. (7) XIX 405.

Hab. Queensland.

Lyricen, gen. nov.

Vertex elongate, narrow, well produced in front of the eyes, posterior margin scarcely posterior to the anterior margin of the

eyes, apically narrowly truncate, longitudinally impressed, keeled medianly somewhat feebly; the head not impressed at the junction of vertex and frons and so separating them. Frons elongate, longitudinally impressed, basally constricted, apically truncate. Antennae short, subcylindric, subbifid apically, surrounded by a lobe of the pronotum. Pronotum deeply angulately emarginate in the middle; scutellum elongate, diamond-shaped. Tegmina elongate, apically amplified and rounded.

1. *imthurni* sp. nov.

Pls. XIX, figs. 1-3 and Pl. XX, figs. 3-5.

Fuscous, grading to blackish in parts especially on the basal two-thirds of the scutellum; keels, foliaceous part of pronotum, &c., pale brownish-yellow. Scutellum with a yellowish line down the middle, broadening a little at the posterior angle. Legs testaceous, fore and middle femora faintly fuscous apically, hind femora faintly fuscous, annulated with testaceous; fore and middle tibiae fuscous apically. Abdomen dark fuscous, marked with sanguineous and testaceous. Tegmina cinereo-testaceous, veins concolorous, margined irregularly with fuscous, some of the apical cells mostly fuscous, apical margin very narrowly blood-red.

Length of body 4 mill., to apex of tegmina 9 mill., widest breadth of tegmen 5 mill., narrowest about 3 mill.

Hab. Viti Levu, Rewa (Mar., Apr., Nov., M.).

The male genitalia are figured on Pl. XIX, figs. 1-3.

In accordance with a request from Mr. Muir, I name this interesting form after His Excellency Sir E. F. im Thurn, Governor of Fiji, a zealous naturalist and well known traveller, who afforded Mr. Muir great facilities and showed him much kindness during his researches in the Fiji Isles.

Proutista.

Proutista Kirkaldy 1906 Entom. XXXVII 279.

=||*Assamia* Buckton 1896 Ind. Mus. Notes W. p. 1.

=*Sardis* Kirkaldy 1906 Bull. Ent. H. S. P. A. I 426.

=*Phenice* Distant 1906 Fam. Ind., Rh. III 295 (not Westwood).

Distant cites *fritillaris* (Boh.) as the type of *Phenice*, but the true type is *fasciolata* (Boh.). I am aware that Westwood considered that the first species in a genus should as a rule be the

type, but he explicitly stated that this was only the case when other reasons were absent (*). Now, *Derbe fritillaris* Boh. is the first species described, but *D. fasciolata* is figured and the figures taken as the basis of the generic description. I therefore maintain that *fasciolata* is the type of *Phenice* and it certainly not a *Phenice* in a Distantian sense.

1. *lumholtzi* Kirkaldy.

Pl. XIX, figs. 6-8.

Sardis maculosa Kirkaldy 1906 Pl. 28, figs. 4-6 (not *Phenice maculosa* Krueger)**

Proutista lumholtzi Kirkaldy 1907 A. S. E. Belg., LI, 126.

Head and pronotum testaceous, a speck at the base of the frons and another on the clypeus, and some suffusions apically on the pronotum, blackish brown. Mesonotum castaneous; a median keel, a rough W in the middle, and the hind margin medianly, testaceous. Metanotum dark, whitish medianly. Legs testaceous; fore coxae, apex of tibiae, &c., blackish. Abdomen testaceous and blackish confused. Tegmina hyaline, marked with blackish brown less closely than in *moesta*.

Length $7\frac{1}{2}$, expanse of tegmina 15 mill.

Hab. Queensland, Cairns (Aug., P. & K.) on *Saccharum officinarum*.

The remarkable male genitalia are figured (Pl. XIX, figs. 6-8).

2. *australis*.

Phenice australis Distant, op. c., 397.

Hab. Queensland. Unknown to me.

Nesoniphas, gen. nov.

Vertex and pronotum raised and swollen vertically, the lateral margins of the vertex (as seen dorsally) rounded and apically produced linearly between and beyond the eyes which are very large. Frons linear, narrowly channelled medianly, widened and

* "I do not here insist upon the necessity of placing a typical species at the head of a genusbut I do insist that where an author does not state the particular species which he regards as the type of his genus, we are bound to suppose that he would place it at the head of his genus." Westwood, April 1837 Mag. Nat. Hist. n. s., I, 170.

** Through the courtesy of Dr. Van Deventer, I have examined some Javanese examples of *Proutista moesta* (= *maculosa*), a species different from the Australian one. The stridulating area of *moesta* is figured on Pl. XX, figs. 8-9.

flattened apically. Antennae very short. In profile the head and pronotum are about equally raised but there is a deep cleft between the two down to their meeting place. Pronotum posteriorly emarginate in the middle, scutellum flat, not carinate.

1. *insignissima* sp. nov.

Pl. XIX, figs. 10-11.

Whitish testaceous, whiter above; frons margined with fuscous. Ocellus black. Eye dorsally with an interior black line which is continued on to the pronotum laterally. Tegmina milky hyaline, a dark fuscous line on the basal half of the subcostal vein, the tegmina also spotted elongately with greyish, veins white. Wings white, veins concolorous.

Length 5 mill.

Hab. Viti Levu, (Muir No. 55), Rewa Mar.-Dec.), on *Zingiber scrubet* (wild ginger).

Philadelphica.

1. *pandani*.

The male genitalia are figured Pl. XIX, fig. 9.

Muiria gen. nov.

Distinguished from other *Derbidae* by the rudimentary wings. Head and pronotum vertical, vertex very small, triangular, and produced linearly anteriorly, projecting well beyond anterior margin of eyes, the latter being subcontiguous at about half their length. Frons linear, acute. Antennae elongate, first segment subannulate but prominent, second four times as long as maximum width, about equal in length to the fore femora, obliquely truncate apically, the flagellum arising at the short end of the truncation. Pronotum very narrow, deeply emarginate angularly. Scutellum rather feebly tricarinate.

1. *stridula* sp. nov.

Pl. XIX, f. 4-5 and Pl. XX, figs. 10-13.

Sanguineous; legs and genital segments (in part) paler; antennae testaceous. Tegmina hyaline, veins pale fuscous, costal and subcostal veins, apical margin, &c., sanguineous.

Length of body 2 mill., to apex to tegmen $5\frac{1}{2}$ mill.

Hab. Viti Levu, Rewa (Mar., Muir's No. 159), off a low, native palm.

I have much pleasure in naming this remarkable genus after my friend Mr. Muir. His interesting remarks on the stridulation will be found on p. 7.

Pl. XX, fig. 13 does not depict the vertex quite accurately being too broad basally and not excavated. The scutellum of the mesonotum should be represented as feebly tricarinate.

Heronax Kirkaldy.

=*Fenuahala* Distant, op. c., 412.

1. *parnassius*.

H. parnassius Kirkaldy.

F. infuscata Dist., l. c., fig. 6.

I think this synonymy is correct.

2. *rubrinervis*.

F. rubrinervis Dist., op. c., 413.

Hab. Queensland, Cairns.

3. *saccharivora*.

H. saccharivora Kirkaldy.

4. *juno*.

F. juno Dist., l. c.

Hab. Queensland, Kuranda.

This is evidently very close to *saccharivora*, but the colouring, as mentioned by Distant, seems a little different.

5. *pallesceus*.

F. pallesceus Dist., l. c.

Hab. Queensland.

*Phantasmatocera.**Phantasmatocera* Kirkaldy.= *Arunta* Distant, op. c., 406.1. *arborea*.*P. arborea* Kirkaldy.*A. rubrovenosa* Distant, l. c., fig. 3.

Distant has led himself astray by not noticing that it was not the generic type that was figured, but a second species, which in fact is not congeneric.

Nesophantasma gen. nov.

Differs from *Phantasmatocera* by the shorter head, whose lateral margins are only slightly sinuate, and by other structures well seen in the respective figures; by the shorter antennae which do not reach in profile to the apex of the eyes; the tegmina more rounded at the apex, and the apical areas larger and less in number. Type *vitiensis*.

1. *vitiensis*.*Phantasmatocera vitiensis* Kirk., Pl. XXVIII, figs. 1-3.*Swezeyia*.1. *lyricen*.

Pl. XIX, figs. 15-19.

Mr. Muir has taken this in Viti Levu, Rewa (March).

Kuranda.*Kuranda* Dist., op. c., 407.1. *notata*.*K. notata* Dist., l. c., fig. 4.

Hab. Queensland.

Not unlike *Niphadodite* except that the antennae are very different.

Zoraida.

|| *Thracia* Westwood 1841 A. M. N. H., VI 478.

Zoraida Kirkaldy 1900 Entom., 242.

Distant has described five species as belonging to this genus. from Queensland, viz. :—

- 1 *cynoptera* p. 401.
- 2 *cupoccila*, p. 402.
- 3 *consanguinea*, l. c.
- 4 *cydista*, l. c.
- 5 *picta*, p. 403.

Sikaiana.

Sikaiana Distant, op. c., 399.

1. *nesiope* sp. nov.

Pl. XVIII, fig. 13 (tegmen).

Testaceous, eyes black. Antennae fuscous. Tegmina milky, two or three sanguineous specks on the costal margin, veins concolorous, very delicately marked with fuscous. Wings milky, veins concolorous, one or two fuscous specks.

Length $1\frac{1}{2}$ mill to apex of body, $4\frac{3}{4}$ mill. to apex of tegmina.

Hab. Viti Levu, Rewa (Apr., Muir No. 167; 1 example in bad condition.

It seems close to *S. hyalinata* Dist. but it is smaller, the general hue of the venation is milky-white and the tegminal pattern is different. Distant has described two Australian species, *S. hyalinata* p. 399, fig. 1., and *S. maculosa*, l. c., Queensland.

DESCRIPTION OF PLATES.

Plate I.

1. *Cicadetta tympanistria*.
2. Male genitalia of the same, in profile.
3. Operculum of the same.
4. *Philagra parva*, wing, (a little diagrammatic).
5. *Polychactophyes serpulidia*, wing (do.).
6. *Dialectopteryx australica*, wing (the dotted lines show the restored parts).
7. The same, tegmen (do.).
8. *Astorga saccharicida*, nymph.
9. The same in profile.
10. *Muirella oxyomma*, nymph.
11. The same in profile.
12. Face of the same.
13. *Conosanus hospes*, nymph.
14. Long-winged adult of the same.
15. Short-winged adult.
16. Tegmen of long-winged form.
17. Tegmen of short-winged form.

Plate II.

1. *Idiocrus hylcorais*, vertex.
2. Face of the same.
3. *Nephotettix plebeius*, vertex &c.
4. Face of the same.
5. *N. curytus*, vertex &c.
6. Face of the same.
7. *Eurinoscopus lentiginosus*, vertex &c.
8. Face of the same.
9. *Driotura aristarche*.
10. Face of the same.
11. *Nephotettix apicalis*, tegmen.
13. Face of the same.
14. *Tharra* sp., nymph in profile.

15. Dorsal view of the same.
16. *T. nausikaa*.
17. Face of the same.
18. *Hybrasil brani*, vertex &c.
19. *Thymbris inachis*, female.
20. Face of the same.
21. *Muirella oxyomma*.
22. Face of the same.

Plate III.

1. *Siphanta acutipennis*.
2. *S. acuta*.
3. *S. toga*.
4. *S. acuta* (var.).

Plate IV.

1. *Siphanta sensilis*.
2. *S. granulicollis*.
3. *S. lucindae*.
4. *S. granulata*.

Plate V.

1. *Siphanta subgranulosa*.
2. *S. breviceps*.
3. *S. galeata*.
4. *Thanatochlamys tristis*.

Plate VI.

1. *Siphanta acutipennis*, vertex &c.
2. Face of the same.
3. *S. galeata*, vertex &c.
4. Face of the same.
5. *S. lucindae*, vertex &c.
6. Face of the same.
7. *S. granulicollis* (var.) vertex &c.
8. Face of the same.
9. *Thanatochlamys tristis*, vertex &c.
10. Face of the same.

11. *Siphanta granulicollis*, vertex &c.
(N. B.—The median keels are omitted).
12. *S. subgranulosa*, vertex &c.
13. *S. acuta*, the same.
14. Face of the same.
15. *S. sensilis*, vertex &c.
16. Face of the same.
17. *S. acuta*, last nymphal instar.
18. Face of the same.
19. The same in profile.
20. The same, egg-mass in situ.

Plate VII.

1. *Tylana acutipennis*, tegmen.
2. Vertex &c. of the same.
3. Face of the same.
4. *Phantiopsis australiaca*.
5. Vertex &c. of the same.
6. Face of the same.
7. Nymph of an unknown Fulgorine.
8. Face of the same.
9. *Apsadaropteryx elongatulus*.
10. Face of the same.
11. *Siphanta toga*, vertex &c.
12. *Chlamydopteryx ridicularius*, vertex &c.
13. Face of the same.
14. Tegmen of the same.
15. *C. vulturinus*.
16. Face of the same.
17. *Phaeopteryx sidnicus*, nymph.
18. Face of the same.
19. The same in profile.
20. The same, adult.
21. Face of the same.

Plate VIII.

1. *Leptochlamys compressa*, vertex &c.
2. Face of the same.
3. *Peltodictya kurandae*

4. Face of the same.
5. *Oliarus felis*, vertex &c.
6. Face of the same.
7. *O. lubra*, vertex &c.
8. Face of the same.
9. Tegmen of the same.
10. *O. phelia*, vertex &c.
11. Face of the same.
12. Tegmen of the same.
13. *Solonaima solonaima*, vertex &c.
14. Face of the same.
15. Tegmen of the same.
16. *Australoma austrina*, vertex &c.
17. Face of the same.
18. Tegmen of the same.
19. *Leirioessa tortricomorpha*, vertex &c.
20. Face of the same.
21. Tegmen of the same.

Plate IX.

1. *Aristyllis omphale*, vertex &c.
2. Face of the same.
3. *A. aristyllis*, vertex &c.
4. Face of the same.
5. *A. adippe*, vertex &c.
6. Face of the same.
7. *Eurynomeus australiae*, vertex &c.
8. Face of the same.
9. *Basileocephalus thaumatonotus*, vertex &c.
10. Face of the same.
11. The same in profile.
12. *Rhinodictya quaesitrix*.
13. Face of the same.
14. *Sura koebeleri*, vertex &c.
15. Face of the same.
16. The same in profile.
17. *Callinesia pulchra*.
18. *Francesca salemminophila*.
19. Face of the same.
20. *Callichlamys muiri*.
21. Face of the same.

Plate X.

1. *Delphax anemonias*, vertex &c.
2. Face of the same.
3. *D. cupompe*, vertex &c.
4. Face of the same.
5. *Megamelus proserpina*, vertex &c.
6. Tegmen of the same.
7. Aberrantly veined tegmen of the same.
8. *M. sponsa*, vertex &c.
9. Face of the same.
10. *Delphax parysatis*.
11. Face of the same.
12. *D. thyestes*.
13. Face of the same.
14. *Peregrinus maidis*.
15. *D. albotristriatus*.
16. *D. algebra*.
17. Face of the same.
18. *D. dilpa* (N. B.—The vertex is too much produced).
19. Face of the same.
20. *D. astyanax*.

Plate XI.

1. *Stenocranus agamopsyche*, vertex &c.
2. Face of the same.
3. Face of the same, nymphal instar.
4. Nymph of the same.
5. *Perkinsiella saccharicida*, face.
6. Profile of the same.
7. Antenna of the same.
8. Hind tibial and tarsus of the same.
9. *Dicranotropis koebelei*, face.
10. Hind tibia and tarsus of the same.
11. *Anectopia mandane*, brachypterous form.
12. Face of the same.
13. Profile of the same.
14. *Dicranotropis pseudomaidis*.
15. Nymph of the same.
16. Face of the same.
17. *Anectopia mandane*, macropterous form.

18. Hind tibia and tarsus of *Tetigonia parthaon*.
19. The same of *Eurymelias hyacinthus*.
20. The same of *Philagra parva*.

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1. *Tropidocephala dryas*, vertex &c.
2. Face of the same.
3. The same in profile.
4. Hind leg of the same.
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6. Face of the same.
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8. *Haplodelphax iuncicola*, vertex &c.
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10. *Haplodelphax pluto*, vertex &c.
11. Face of the same.
12. *Perkinsiella vastatrix*, male pygophor (end on).
13. The same (three-quarter view).
14. *P. sinensis*, the same (end on).
15. The same (three-quarter view).
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17. The same (three-quarter view).
18. The same in profile.
19. *Megamelus proserpina*, the same (end on).
20. The same (three-quarter view).
21. The same in profile.

Plate XIII.

Male pygophors of Asiracidae, in two or three views.

- 1-3. *Perkinsiella pseudomaidis*.
- 4-6. *Dicranotropis muiri*.
- 7-8. *Peregrinus maidis*.
- 9-10. *Perkinsiella vitiensis*.
- 11-13. *P. saccharicida*.
- 14-5. *P. graminicida*.

Plate XIV.

The same as the preceding:

- 1-3. *Delphax albostrigatus*.
- 4-6. *Anectopia mandane*.

- 7-9. *Megamelus persephone*.
 10-12. *Delphax albicollis*.
 13-15. *D. astyanax*.

Plate XV.

The same as the preceding:

- 1-3. *Delphax puella*.
 4-5. *Stenocranus pacificus*.
 6-8. *Purohita arundinacea*.
 9-11. *Delphax kolophon*.
 12-14. *D. pylaon*.
 15-16. *D. algebra*.

Plate XVI.

The same as the preceding:

- 1-2. *Delphax anemonias*.
 3. *D. geranor*.
 4-5. *D. matanitu*.
 6-7. *D. dilpa*.
 8-9. *D. kaha*.
 10-11. *D. ostorius*.
 12-13. *D. dryope*.
 14-15. *Smicrotatodelphax perkinsi*.

Plate XVII.

Of the same nature as the preceding.

- 1-3. *Gelastodelphax histrionicus*.
 4-5. *Tropidocephala dryas*.
 6-7. *Stenocranus agamopsyche*.
 8-9. *Dicranotropis koebele*.
 10-11. *Hadeodelphax persephone*.
 12. *H. pluto*.
 13-14. *Melanesia pacifica*.
 15-6. *Tropidocephala eximius*.

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- 1-3. *Delphax lazulis*, male pygopher.
 4. *D. disonymos*, the same.
 5. *Lyricen imthurni*, profile.
 6. Head and nota of the same.

7. Face of the same.
8. *Thyrocephalus leucopterus*, tegmen.
9. *Nesocore fidicina*, nymph.
10. Face of the same.
11. *Proterosydne arborea*.
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- 4-5. *Muiria stridula*, the same.
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14. Face of the same.
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16. Face of the same.
17. The same in profile.
18. Antenna.
19. The same enlarged.
20. *Phaciocephalus miltodias*

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2. The same, stridulatory area.
3. *Lyricen imthurni*, wing.
4. Stridulatory area of the same.
5. Variant venation of No. 3.
6. *Pyrrhoneura saccharicida*, wing.
7. Stridulatory area of the same.
8. *Proutista moesta*, wing.
9. Stridulatory area of the same.
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PLATE III.

PLATE IV.

PLATE V.

PLATE IX.

PLATE XI.

PLATE XII.

1 x 77

2

3

4 x 62

5

6

13
x 75

7 x 60

8

9

14

10 x 82

11

12

15

1
x 90

4
x 60

6
x 102

2

3
x 67

5

7

8
x 70

9

10
x 70

11

Wol

12 x 61

13

14
x 85

15

PLATE XX.

REPORT OF WORK
OF THE
EXPERIMENT STATION
OF THE
HAWAIIAN SUGAR PLANTERS' ASSOCIATION

Parasites of Leaf-Hoppers

By R. C. L. PERKINS

Leaf-Hoppers

By C. W. KIRKALDY

HONOLULU, T. H.
MAY 1, 1907

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REPORT OF WORK
OF THE
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Parasites of Leaf-Hoppers

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HONOLULU, T. H.
MAY 1, 1907

LETTER OF TRANSMITTAL.

To the Experiment Station Committee of the Hawaiian Sugar
Planters' Association, Honolulu, T. H.

Gentlemen:—I, herewith, submit for publication Bulletin IV
of the Division of Entomology. This is based almost entirely on
the parasites and leaf-hoppers recently collected and studied by
Mr. Koebele in Arizona. It has been prepared by Mr. Kirkaldy
and myself.

Yours obediently,

R. C. L. PERKINS,
Director, Division of Entomology.

Honolulu, T. H., April 3rd, 1907.

GENERAL REMARKS ON PARASITES OF LEAF-HOPPERS.

In Bulletin I of the Division of Entomology an extensive account of leaf-hoppers and their natural enemies was prepared by the members of the staff, and in Bulletin II some additional observations were recorded by Mr. F. Muir, who visited Fiji, for the purpose of investigating leaf-hoppers and other insects in that group. In the present Bulletin a large number of parasites observed and collected by Mr. Koebele, chiefly in Arizona, are recorded, as well as such of their hosts as can be at present determined. A considerable amount of material, consisting of leaf-hoppers themselves, left over from Mr. Koebele's and my own expedition to Australia and from Mr. Muir's to Fiji has also been worked out and is ready for publication. In addition to these collections my work on the parasites of leaf-hoppers has been greatly aided by other specimens received from Mr. Koebele. In the summer of 1905 he visited Germany on a vacation trip, and during this vacation was so good as to collect for me a considerable amount of European material. These European specimens have been of the greatest service in working out the American species, and enable me to correct a number of errors in my former papers on the Dryinidae. Mr. Koebele not only sent over specimens of these and other parasites bred or captured by himself, but also a number of cocoons and puparia, that he had obtained there. It was very satisfactory to breed here, in these islands, species of European *Gonatopus*, *Chellogynus*, *Anteon* and others of the Dryinidae, as well as species of *Pipunculus* with *Terrallia aucta* and *villosa* of the Diptera, and to be able to examine all these alive. In addition to Mr. Koebele's consignments I have also examined some material recently received from China, collected by Mr. Muir. It will therefore be seen that the work done on the subject of leaf-hoppers, and their enemies, both in the field and study, has been of a very extensive character and it is possible to come to some general conclusions, as to what enemies keep the countless species of leaf-hoppers—all of which are potentially injurious—in check, throughout a large part of the world. One is at once struck with the fact, that whether in Europe, Asia, Australia or America, the parasites or predators

that destroy leaf-hoppers, in each country belong mostly to the same groups. Egg-parasites are everywhere present. *Anagrus* of the Mymaridae attacks the eggs of the Delphacidae alike in Europe, America, Australia, Fiji and China, and even the species hardly differ in these countries; while *Paranagrus* has been found in Fiji, Australia and China, and *Ootetrastichus* of the Chalcid flies in the same countries. Other Mymarids of several genera attack the Jassid hoppers, some of which are also periodically decimated by the excessively minute Chalcids of the family Trichogrammidae, both in America and Australia. These latter likewise destroy the eggs of the allied Membracidae. Such Fulgorids as lay their eggs on the surface of plants have different egg-parasites. In Australia they are attacked by Proctotrupids, and also by Encyrtidae of the Chalcid group, but in other countries their enemies have not been investigated. A foremost place amongst beneficial insects must be assigned to all these egg-parasites, as by destroying the egg they kill the hopper before it arrives at a stage, when it can do injury. Of the other Hymenoptera, Dryinidae are no doubt ubiquitous throughout the world, and they attack many species of hoppers both in the Fulgorid and Jassid groups, and have also been reported as attacking Membracids. Cercopidae are, so far as is known, not attacked by them, but the young of these are, as is well-known to every field-worker, a favorite prey of various Fossorial Hymenoptera, e. g. *Harpactus* and *Gorytes*. The Fossors likewise yield species that prey on Jassids; amongst the minute Crabronidae, for instance, we have found the cells of the European *Crossocerus gonager* Lep. filled with a species of *Typhlocyba* that infests beech trees. In these islands, one may see a Mimesid (*Nesomimesa hawaiiensis*) hawking for various species of Fulgorid leaf-hoppers, but these are not its usual prey, which consists of certain Linnobiine Diptera. It is interesting to note that its attempt to seize the Fulgorids is usually a failure. As all the other known Hawaiian species of *Nesomimesa* prey on the Diptera mentioned, it would appear as if it were comparatively recently turning its attention to the Homoptera. The singular head-structure of the female wasp probably aids it in some way in capturing the flies, while ineffective for holding the other prey. The Dipterous Pipunculidae are also ubiquitous, and attack both Jassids and Fulgorids of various groups, alike. On the whole they appear to chiefly parasitize Jassids, but the Hawaiian species, so far as is known, are all parasitic on Fulgorids, in fact on Delphacids only.

The Stylopidae parasitize very diverse groups both in the Jassid and Fulgorid series. The little *Elenchus* seems to attack the Delphacidae in all localities, where these have been specially examined, and the specific characters of these parasites seem to be almost if not quite identical in widely separated countries; at least there is very little if any real difference between *Elenchus tenuicornis* of Europe and the examples found in Australia, Viti, and North America, that I refer to it. It is proper to state in this connection that one of the species of *Liburnia* attacked by *Elenchus* is found to be itself common to both Australia and North America and it would not be surprising to find that it also inhabits Europe, where, in any case, there are very closely allied species.

The Chalcids seem rarely to attack hoppers, after they leave the egg, but in Australia are two fine species of Encyrtidae, *Meniscocephalus crinitus* and *Neocladia howardi*, which are bred from nymphs or adults of a Jassid (*Eurinoscopus*), and recently Mr. Muir has bred the latter parasite from quite another Jassid in China. Recently from a Jassid nymph in Arizona Mr. Koebele bred another distinct form of Encyrtid, described in this bulletin under the name *Thysanomastix Koebelei*. This species differs in habits from the others above mentioned, in the fact that several of the parasites emerged from a single host, and it is remarkable that the latter (*Oncometopia lateralis*) survived its injuries for several days after their emergence, when one considers the size of the parasites.

Of predaceous insects it may be noticed in passing that the larvae of various Malachiid beetles, both in America and Europe, destroy the Delphacid hoppers that live on grasses, and some of them appear to be very voracious, so that on one occasion, Mr. Koebele had many parasitized leaf-hoppers destroyed by these beetle larvae, accidentally included in his breeding jars.

Of the parasites enumerated in this Bulletin, it was not attempted to introduce any into the Hawaiian islands, excepting the minute egg-parasite, *Trichogramma heliocharae*. An attempt was made to breed this on the eggs of *Perkinsiella*, but, as Mr. Koebele and myself had expected, without success. I was, however, able to establish it at large on the eggs of a common introduced Jassid, and have, since it was liberated some six or nine months ago, frequently met with it. The fact that Jassid leaf-hoppers abound in cane fields of other countries whence cane has frequently been imported into these islands, while in the event of any of these showing up here, we have practically no natural enemies which would destroy them, made it worth while to establish the *Tricho-*

gramma here. It is a very effective enemy of its proper host, for though I bred scores of the parasites from the leaf-hopper eggs sent here from California, not one single leaf-hopper emerged, and Mr. Koebele had just the same experience in that State.

SYSTEMATIC ACCOUNT.

New species and genera of Hymenoptera here described.

DRYINIDAE.

<i>Apterodryinus</i> gen. nov.	<i>Pseudogonatopus</i> Perk.
<i>torvus</i> sp. nov.	<i>arizonicus</i> sp. nov.
<i>Chalcogonatopus</i> Perk.	<i>autoxenobius</i> sp. nov.
<i>leptias</i> sp. nov.	<i>Ncodryinus</i> Perk.
<i>paraleptias</i> sp. nov.	<i>arizonicus</i> sp. nov.
<i>euprepes</i> sp. nov.	<i>dubiosus</i> sp. nov.
<i>euprepoides</i> sp. nov.	<i>Paradryinus</i> Perk.
<i>argyrias</i> sp. nov.	<i>mexicanus</i> sp. nov.
<i>rapax</i> sp. nov.	<i>Hesperodryinus</i> gen. nov.
<i>frequens</i> sp. nov.	<i>amphiscapae</i> sp. nov.
<i>solitarius</i> sp. nov.	<i>arizonicus</i> sp. nov.
<i>echo</i> sp. nov.	<i>audax</i> sp. nov.
<i>herbarum</i> sp. nov.	<i>Perodryinus</i> gen. nov.
<i>xestocephalus</i> sp. nov.	<i>amoenus</i> sp. nov.
<i>unicus</i> sp. nov.	<i>Eukoebeleia</i> Perk.
<i>simulator</i> sp. nov.	<i>arizonica</i> sp. nov.
<i>koebelei</i> sp. nov.	<i>Deinodryinus</i> gen. nov.
<i>perdebilis</i> sp. nov.	<i>paradoxus</i> sp. nov.
<i>Eucamptonyx</i> gen. nov.	<i>quercicola</i> sp. nov.
<i>testaceus</i> sp. nov.	<i>Chelogyne</i> Hal.
<i>Agonatopus</i> gen. nov.	<i>lusus</i> sp. nov.
<i>pallidicornis</i> sp. nov.	<i>funestus</i> sp. nov.
var. <i>dubiosus</i> var. nov.	<i>melanacrias</i> sp. nov.
<i>ferrugineus</i> sp. nov.	<i>Anteon</i> Jur.
<i>picescens</i> sp. nov.	<i>arizonensis</i> sp. nov.
<i>ininitidus</i> sp. nov.	<i>Aphelopus</i> Dalm.
<i>heterothorax</i> sp. nov.	<i>arizonicus</i> sp. nov.
<i>Agonatopoides</i> gen. nov.	<i>viduus</i> sp. nov.
<i>synchronus</i> sp. nov.	<i>pucherrimus</i> sp. nov.
<i>Neogonatopus</i> Perk.	<i>microleucus</i> sp. nov.

minus sp. nov.
mimoides sp. nov.
Gonatopus Ljung.
haplothorax sp. nov.

ENCYRTIDAE.
Thysanomastix gen. nov.
koebelei sp. nov.
TRICHOGRAMMIDAE.
Trichogramma West.
helocharac sp. nov.

DRYINIDAE.

Table of some genera of Dryinidae.

1	(48)	Tarsi of the front legs always with the fifth joint more or less modified, and with one claw unusually developed, and so articulated with the fifth joint as to be capable of closing back on this, and with it forming more or less perfect chelae or pincers.
2	(23)	Mesonotum forming a narrow bridge or stalk between the large pronotum and the propodeum; species entirely wingless.
3	(12)	Chelar claw armed with well-developed lamellate denticles of the same nature as those on the fifth tarsal joint beneath, and with a tooth* on its lower edge near the apex (Fulgorid parasites).
4	(7)	Labial palpi three-jointed.
5	(6)	Maxillary palpi six-jointed <i>Apterodryinus</i> .
6	(5)	Maxillary palpi five-jointed <i>Eucamptonyx</i> .
7	(4)	Labial palpi two-jointed.
8	(9)	Maxillary palpi four-jointed <i>Pseudogonatopus</i> .
9	(8)	Maxillary palpi two-jointed.
10	(11)	Pronotum divided by a distinct transverse.....
		<i>Paragonatopus</i> .
10	(11)	Pronotum divided by a distinct transverse impression
12	(3)	Chelar claw not armed with well developed lamellate denticles, but almost unarmed, or with small pointed spinules or spinose hairs projecting between two ridges, which appear as a convex edge, when the claw is viewed laterally; very rarely with an ante-apical tooth near the tip (Jassid parasites).
13	(16)	Labial palpi three-jointed.
14	(15)	Maxillary palpi six-jointed <i>Chalcogonatopus</i> .
15	(14)	Maxillary palpi five-jointed <i>Igonatopus</i> .
16	(13)	Labial palpi two-jointed.
17	(20)	Maxillary palpi four or five-jointed.

* This tooth is absent in *Eucamptonyx*.

- 18 (19) Maxillary palpi five-jointed *Gonatopus*.
 19 (18) Maxillary palpi four-jointed *Neogonatopus*.
 20 (17) Maxillary palpi two or three jointed.
 21 (22) Maxillary palpi three-jointed; head not distinctly
 concave above *Pachygonatopus*.
 22 (21) Maxillary palpi two-jointed; head concave.....
 Epigonatopus.
 23 (2) Mesonotum wide, not forming a narrow stalk, species
 winged or with rudimentary wings.
 24 (25) Front wings with a parastigma, radius complete,
 reaching the tip of the wing *Lonchodryinus*.
 25 (24) Front wings without the above characters.
 26 (37) Posterior lateral angles of the pronotum not attaining
 the tegulae.
 27 (28) Maxillary palpi very short, four-jointed; labial palpi
 two-jointed; (parapsidal furrows distinct, but fine,
 meeting posteriorly and enclosing a narrow triangular
 area) *Echthrodclphax*.
 28 (27) Maxillary palpi long and conspicuous, often extending
 to or behind the posterior margin of the head beneath,
 six-jointed; the labial palpi three-jointed.
 29 (30) Postscutellum extremely short, transversely linear,
 vertex of head not convex, generally more or less con-
 cave *Ncodryinus* (?=*Dryinus*)
 30 (29) Postscutellum, well developed, usually about half as
 long as the scutellum, vertex of head convex.
 31 (32) Head posteriorly acutely wedge-shaped, its hind mar-
 gin well rounded, posterior ocelli placed far behind
 the hind margins of the eyes *Hesperodryinus*.
 32 (31) Head posteriorly not acutely wedge-shaped, nor well-
 rounded behind, but straightly transversely margined
 or nearly so; posterior ocelli usually almost on a line
 with the hind margins of the eyes (if placed behind
 these the vertex is straightly margined posteriorly).
 33 (36) Chelae long, the chelar claw being well developed.
 34 (35) Vertex distinctly margined posteriorly and the margin
 continued round the occiput *Paradryinus*.
 35 (34) Vertex indistinctly margined, the margins failing to-
 wards the sides *Cholorodryinus*.
 36 (33) Chelae very short, the chelar claw simply a strong
 spine, with dilated base for articulation *Pcodryinus*.
 37 (26) Lateral angles of pronotum attaining the tegulae.

- 38 (39) Antennae extremely long and filiform, the third joint subequal to, or somewhat *shorter* than, the fourth, which is more than twelve times as long as wide
..... *Thaumtodryinus*.
- 39 (38) Antennae without the above characters.
- 40 (41) Eyes hairy; mandibles tridentate, or with an excessively minute fourth tooth intercalated between the first and second, abdomen with a short but distinct pedicel, reaching to apex of hind coxae.....
..... *Eukocbleia* (?=*Bocchus*)
- 41 (40) Eyes not hairy; mandibles with four well-developed teeth, abdomen petiolate or subpetiolate, but not pedicellate.
- 42 (43) Fourth tarsal joint of front legs very long and slender, twice as long as that part of the fifth which lies between its articulation with the fourth and its true apex, i. e., not less than twice as long as the fifth excluding its basal process; stigma narrowly elongate-ovate, the radius long, bent or angulated at about the middle of its length.....*Dcinodryinus*.
- 43 (42) Fourth tarsal joint of front legs at most about as long as the fifth, excluding its backward basal process, sometimes much shorter still; stigma more widely ovate, sometimes very large, the radius in many species hardly continued beyond its bend or angulation.
- 44 (45) Fourth joint of front tarsi elongate, much longer than the third, and articulated to the fifth at, or not far from, the middle of the whole length of this joint, including the backward process.....
.....*Chclogynus* (= *Neochclogynus*)
- 45 (44) Fourth joint of front tarsi small, and articulated to the fifth near to its free extremity, much nearer to this than to the apex of the joint; or in other words the backward process of the fifth is very short, much less than half the length of the whole joint.
- 46 (47) Antennae becoming wider towards the apex; the propodeum bounded by a raised line at the truncation, and generally with a more or less defined median area on its posterior face.....*Antcon* (= *Prosantcon*)
- 47 (46) Antennae simply filiform, propodeum without the above characters.....*Parantcon*.
- 48 (1) Tarsi of front legs normal not chelate....*Aphelopus*.

On the genera of Dryinidae allied to *Gonatopus*.

In my former papers (Bull. I Pt. 1 and 10) I divided the insects that are usually assigned to *Gonatopus* into a number of new genera. It is with some reluctance that one breaks up a genus of insects so similar in general form and strikingly distinct from any other, but there are very good reasons for this division. In the first place my studies have convinced me that the species assigned to *Gonatopus* have been derived from winged forms, which would themselves universally be assigned to distinct genera, and that the great superficial resemblance of species differing in most important characters is due to convergence from similarity of habits and does not indicate their true phylogeny.

Further, it is obvious that the genus *Gonatopus* (s. l.) is a difficult one, and the difficulties are such as will be likely to increase, as species are added to it. Obviously the species are extremely numerous. In a few limited localities, and these by no means rich, as compared with some now known to us, Mr. Koebele and myself were able in a short time to collect some thirty-five new species. Most are of limited range or local. The species in Sydney, N. S. W. are generally different from those found at Brisbane and Bundaberg, Queensland, and the species in Arizona are certainly mostly distinct from the Californian. The genus, in its wide sense, appears to be ubiquitous, and even occurs naturally in such remote oceanic islands as the Hawaiian group, while it is well represented in the Viti islands.

Recently in an area of a few square miles in Arizona Mr. Koebele bred and collected at least twenty-five species in a short time. These facts, and the consideration that many species have been described by others from caught specimens, lead me to estimate the number of species of *Gonatopus* (s. l.) at fully one thousand, and probably several times this number may eventually be found. I therefore believe that students of the Dryinidae will sooner or later be very glad to adopt in the main the characters employed by me for the division of the genus *Gonatopus*, although to examine the mouth-parts accurately requires a considerable amount of labor, and a trifling amount of skill, if the specimens are to be dissected without material injury.

I have still thought it better at present to neglect the classification of the males, and have avoided describing numbers of possibly new species in this sex, the names of many of which would have to be eventually sunk as synonyms. Whether it will be easy to find generic characters for the comparatively unspecialized males

—characters, I mean, to correspond with those given by me for the females—I cannot at present state. In some cases I know the mouth parts of the males and females agree entirely in the number of joints of the palpi. At any rate at present the matter is not of much importance, nor will it become so until most of the species are bred. In field collecting few males of *Gonatopus* (s. l.) are ever met with. In Mr. Koebele's collection from Arizona there are few or no captured males, though he bred a number of examples of some species. Further in some, and probably in many species, males are very difficult to obtain even by breeding; perhaps in some this sex does not exist. For economic purposes, we have bred brood after brood of a Vitian *Haplogonatopus* and have distributed the females in numbers to many plantations to help in controlling the sugar cane leaf-hopper, but in all this time only two or three males have ever been bred. In many species, when bred, the males appear to be of such weak and delicate constitution, that one doubts whether, except under particularly favorable circumstances, they can take any part in the propagation of their species.

In dividing *Gonatopus* I first separate the species into those which parasitize Jassids and those which attack Fulgorids. This can be done with the greatest ease by examining the chelae of the front legs, when one has become familiar with their structure, which I have elsewhere described. Each of these groups is then divided into numerous genera on the number of joints in the palpi, the labial palpi being always formed of two or three joints, the maxillary having from two to six. In my opinion the genera with three-jointed labial palpi are essentially different from those with two joints and this remark applies to both females and males. The use of the number of joints in the palpi for the subdivision of *Gonatopus* appears to me exactly comparable with that in the genus of wasps *Synagris*, but it is more necessary in the former on account of the much greater number of species that exist. The main facts concerning *Synagris* (s. l.) can be found in the works of de Saussure by those interested.

Considerable caution is necessary in dealing with the specific value of color, and even of sculpture, in specimens of the *Gonatopus* group. As I have elsewhere stated, in some species, in which when freshly emerged the abdomen is black, after they have lived some days or weeks, the color becomes entirely ferruginous. Others in which the abdomen is ferruginous, after a week or two become black in color. The color of the antennae and of the thorax and legs is variable in many species, and even the sculp-

ture is far from constant. Cameron in dealing with the Central American species has long since allowed considerable variability in the Dyrinidae in most of these respects, and from the fine collections and many bred specimens, I have handled, I can fully confirm his opinion.

Apterodryinus gen. nov.

General form as in *Gonatopus* and its allies, mandibles with four teeth, maxillary palpi 6-jointed, labial 3-jointed. Pronotum distinctly emarginate in front, no distinct transverse impression or constriction, strongly compressed into an acute raised median carina posteriorly; mesopleura forming a raised outstanding line separating them from the propodeum. Fourth tarsal joint of front legs, about as long as the first; fifth seen in profile nearly parallel sided for the most part, very little curved on the lower edge, chelar claw with a regular row of distinct spinules (not lamellate) reaching well beyond the middle from the base and with a very distinct anteapical tooth. This genus is a derivative of some such winged form as I have called *Neodryinus*, the thorax becoming modified, as in the other wingless forms included in *Gonatopus* s. l.

Apterodryinus torvus n. sp.

Black, the front of the scape and the mandibles except the teeth, white; the clypeus round the margins, sometimes a mark above this, usually a broad line along the inner orbits, which bears dense silvery pubescence, yellowish or brownish yellow; apical two joints of antennae generally clear testaceous or yellow, sometimes only the apical joint pale, sometimes one or more of those preceding the two apical ones are pale, though generally more or less sordid, but the three last may be concolorous. Tarsi brown, rarely dark brown, stalk of anterior trochanters sometimes pale, posterior femora sometimes with the thin apical part except at the tip yellow, sometimes obscurely pale, or entirely black.

Head moderately strongly transverse, evidently concave above between the eyes, very densely evenly punctate, or shagreened, antennae decidedly slenderer in some examples than in others, in one, carefully measured, the third joint was one and two-thirds the length of the fourth, the latter rather more than three times as long as its greatest width. Pronotum sculptured like the head, smooth in front of the middle about its lateral margins; propodeum in profile strongly rounded, but not at all abruptly raised,

generally smoother, and sometimes shining, on the disc, clothed with scanty, short, pale hairs, finely transversely rugose in front, at the sides, and posteriorly, the wrinkles stronger and more extended in some examples than in others. Front trochanters with a longish thin stalk, chelar claw slender, nearly parallel-sided, moderately curved. The lamellate denticles of the fifth tarsal joint beneath form two rows closely set together. Abdomen polished and very sparsely hairy, except the declivous basal part which is very finely rugulose, and bears more abundant grey pubescence. Length 4-4.5 mm.

HAB. Nogales, Arizona; on weeds in September; two specimens were bred in Honolulu from larvae obtained by Mr. Koebele and sent me in cocoons. The vials containing them were numbered 2511 and 2481. Under the latter number and from the same host, Koebele himself bred male and female of *Hesperodryinus arizonicus*, the host being the same. The species is no doubt parasitic on various Poecilopterine Fulgorids having been bred from *Mistharnophantia sonora* and the Issid, *Amphiscepa immaculata*.

Chalcogonatopus Perk.

When I characterized this genus in Bulletin I, p. 46, I knew only three Australian and one American species and formed a subgenus (*Eugonatopus*) for the latter. The generic characters there given require slight alteration, as in some of the species now described the head is not concave above, and there are some intermediate forms between *Chalcogonatopus* proper and its subgenus, so that the latter is no longer necessary.

In the table of species *C. perdebilis* is omitted, as the specimens were overlooked until after it had been completed, but the following diagnosis will distinguish it from any other: Testaceous, abdominal petiole black, hind femora variegate, being paler on the thin than on the basal thick part, the tips darkened; fifth tarsal joint beneath with a short row of denticles, which occupies only about half the length between the articular cavity and the terminal hook; size small 2.5-3.25 mm.

Tables of species of *Chalcogonatopus*.

- 1 (22) Pronotum in dorsal aspect very conspicuously divided into a transverse anterior, and an elevated longer posterior lobe; in profile the dorsal outline is consequently very irregular in nearly all the species.

- 2 (3) Abdomen with very conspicuous clothing of decumbent silvery hairs*C. argyrias*.
- 3 (2) Abdomen at most with very sparse clothing of short inconspicuous hairs; or if the hairs are long and conspicuous, they are erect.
- 4 (11) Trochanters very long and with a thin basal stalk, at least nearly as long as the thickened apical part.
- 5 (6) Pronotum very distinctly emarginate in the middle of its anterior margin*C. leptias*.
- 6 (5) Pronotum not distinctly emarginate in front.
- 7 (8) Head and pronotum largely black or very dark in color*C. paraleptias*.
- 8 (7) Head and pronotum bright brown or ferruginous.
- 9 (10) Front femora and tibiae clear testaceous. .*C. euprepes*.
- 10 (9) Front femora and tibiae mostly pitchy..*C. euprepoides*.
- 11 (4) Trochanters not very long, dilating from, or close to, the base, so that there is no long slender basal stalk.
- 12 (13) Whole insect with clothing of fine, long, erect, pale hairs, those on the middle and hind femora and tibiae long like the thoracic hair.....*C. rapax*.
- 13 (12) Whole insect not so clothed, the middle and hind femora and tibiae with at most very short and generally inconspicuous hairs.
- 14 (19) Posterior femora concolorous, except that the tips are sometimes dark.
- 15 (16) Fifth tarsal joint beneath with only a very short row of elongate hyaline lamellar denticles, this row beginning beyond the middle of the length of the joint from its base*C. frequens*.
- 16 (15) Fifth tarsal joint beneath with row of lamellate denticles very long and reaching to, or almost to, the articular concavity.
- 17 (18) Head scarcely concave above, very dull, and excessively densely sculptured, third joint of antennae only about twice as long as the second; propodeum and abdomen reddish*C. solitarius*.
- 18 (17) Head very distinctly concave above, sculpture indistinct, nearly effaced, third antennal joint more than twice as long as the second; propodeum and abdomen black *C. echo*.
- 19 (14) Posterior femora with the apical thin part conspicuously pallid (as compared with the basal incrassate part) being pale yellow or whitish.

- 20 (21) Vertex of head dull, appearing very densely, minuteiy punctate or shagreened all over *C. herbarum*.
 21 (20) Vertex shining, almost smooth. *C. xestocephalus*.
 22 (1) Pronotum in dorsal aspect not conspicuously divided into a transverse anterior and an elevated posterior lobe, at most with a feeble or obsolete impressed line dividing these; in strict lateral view the dorsal outline is at most only faintly indented at that point, or in some species it even forms a regular curve throughout.
 23 (24) Posterior femora darkened at tips; 6 apical joints of antennae dark, black or blackish. *C. unicus*.
 24 (23) Posterior femora not dark at tips; antennae not colored as above.
 25 (26) Antennae pale, joints 7 and 8 dark, the two apical ones clear yellowish-testaceous *C. koebelci*.
 26 (25) Antennae pale, but with the four apical joints black, or suffused with black *C. simulator*.

1. *Chalcogonatopus leptias* sp. nov.

Black, the mandibles except the teeth, the face below the antennae, a line along the inner orbits above these, and the scape in front, yellow. The antennae, except the apical three joints and sometimes more or less of the one preceding these, which are black, clear yellowish testaceous. Front legs with the apex of the coxae, the trochanters, apex of femora, tibiae and tarsi yellow or brownish yellow, some parts being darker than others, the femora dark brown or piceous; middle femora, tibiae and tarsi yellow, or in parts light brownish yellow, the incrassate part of the femora dark, their extreme tips slightly darkened.

Head strongly concave above, smoother and more shining in front of the anterior ocellus, behind which it is quite dull, with densely roughened surface. Antennae quite slender, the third joint one and a half times the length of the fourth, the latter nearly six times as long as its width at apex. Pronotum with well marked transverse furrow, the front division smooth and shining, distinctly emarginate in the middle in front, the posterior division very densely punctate; mesonotal constriction narrow, longer than wide, densely sculptured and with a tendency to a median carination; propodeum distinctly pilose, narrow, elongate-ovate, smooth and shining on the disc, finely transversely rugose posteriorly. Front legs very slender and elongate, as compared with *C. frequens* and others, the femora being relatively much less strongly

dilated basally, trochanters very long, having a long thin basal part, about as long as the stouter apical half; first and fourth tarsal joints not differing much in length, the chelae very long and slender; the fifth tarsal joint beneath with long rows of lamellate denticles, the denticles becoming longer and more distant from one another towards the articulation of the claw; in lateral aspect the sides of this joint are almost parallel, and nearly straight, except of course at the modified apex; chelar claw curved on its apical third, its lower edge on basal part slightly curved. Abdomen dull, clothed with sparse white hairs, the surface having a very minute and close, longitudinal rugulosity. Length 3.5—4.5 mm.

HAB. Nogales, Arizona; on weeds and grass in August.

2. *Chalcogonatopus paraleptias* sp. nov.

Form and general appearance that of *C. leptias*, the legs and chelae being similar. The clypeus however is only pale round the edges, the antennae have the fifth and sixth joints clear yellow, the two or three following these sordid or obscurely yellowish, the fourth also more or less sordidly pale, scape and second joint dark brown above, the third black. The anterior margin of the pronotum is not distinctly emarginate in the middle, it is more or less pale at the sides, as also is the mesonotal constriction; the front femora and tibiae are dark, black or nearly so, and the first two tarsal joints are dark pitchy. The hind and middle femora are black or pitchy on the dilated part, yellow on the slender apical portion, but the tip of this is conspicuously dark in the hind legs; the tibiae are brown, the tarsi clear pale brownish yellow.

HAB. Nogales, Arizona; on oak in August.

3. *Chalcogonatopus euprepes* sp. nov.

A narrow slender species like *C. leptias* and *paraleptias* in form, the front legs very long, the trochanters with long basal stalk, and the chelae as in those species.

Head, pronotum and mesonotal constriction bright brown; mandibles except the teeth, the front of the scape, and a line on the inner orbits, yellowish-white, the latter covered with glittering silver hairs. Antennae clear yellow, the three apical joints infusate, the last being the blackest. Front legs clear testaceous, the trochanters paler, the basal joint of the tarsi (excepting its apex) alone dark; middle legs similarly coloured, but the coxae

with a dark spot outwardly, the femora with a dark line above on the dilated portion; hind legs like middle, but the tips of the femora distinctly darker than the pale preceding part, tibiae somewhat darkened at base and apex.

Head deeply concave, more shining and smoother in front of the anterior ocellus than behind; third antennal joint one and two-thirds the length of the fourth, the latter five times as long as its apical width, or rather more. Front lobe of pronotum not noticeably emarginate in front, smooth and shining, except at the sides, the posterior lobe duller, minutely and closely punctured, smoother posteriorly; propodeum sparsely and shortly pilose, in front and at the sides and posteriorly dull, and with fine transverse wrinkles, but with a smooth and shining area on the disc. Abdomen dull, the surface with excessively fine longitudinal rugulose sculpture, and bearing some sparse, short, pale hairs. Length 4 mm.

HAB. Nogales, Arizona; a single example was taken off oak on Sept. 2nd, 1906.

Var. a. Like the type in structure but the fifth, sixth, and seventh joints of the antennae are only very sordidly yellowish, while the prothorax at the sides, and the mesonotal constriction, are more conspicuously yellowish. This individual is larger than the type. Length 4.5 mm.

HAB. Nogales, Arizona; taken on oak, Aug. 1906.

4. *Chalcogonatopus cuprepoides* sp. nov.

Same form and structure as the preceding, of which it might be a variety. It differs however too greatly in colour to be considered identical unless connecting links be found.

Scape of antennae dark posteriorly, third joint also more or less sordid except at base and apex, following three joints clear yellow, seventh somewhat sordid, the three following dark, but more or less yellow-tinged. Front coxae with a dark spot, the front femora and tibiae dark brown, or piceous behind or above, as also the whole of the basal tarsal joint, a dark line on the chelar process of the fifth tarsal joint above near the extremity. Middle and hind legs with the coxae black, except the extreme apices; the thickened part of femora and their apices, the hind tibiae for the most part, and the base of the middle ones all dark. Otherwise the colouration is like that of the preceding. Length 3.5 mm.

HAB. Nogales, Arizona; one example on oak.

5. *Chalcogonatopus argyrias* sp. nov.

Yellowish-brown or ferruginous, the abdomen and four apical joints of the antennae black. Slender apical part of all the femora pallid yellow; base of middle and hind tibiae widely blackish, the apices of the latter widely brownish, darker than the middle part.

Head long and concave on the vertex, its length in dorsal aspect along the middle line about equal to that of a line drawn from eye-margin to eye-margin through the front ocellus, and as long as one and a half times the distance between the eyes at the extreme front of the vertex; in front of the anterior ocellus the surface is manifestly smoother than posteriorly, and is less dull. Third joint of antennae equal to one and two-thirds of the fourth, the latter four times the length of its apical width. Pronotum with distinct transverse furrow, the surface for the most part not much shining, being finely and feebly punctured; mesonotal constriction narrow and elongate, the propodeum distinctly pilose, finely punctured and more or less shining on the disc, posteriorly (and at the sides more or less) transversely rugose. Legs with only short hairs, the front ones long and slender, but the thin stalk of the trochanters is less elongate than in the four preceding species, though it is distinct; first and fourth tarsal joints subequal, fifth beneath with a row of close-set regular denticles beginning at only about the middle of the length of the whole joint from its articulating cavity; between the latter and the series of denticles only some setae and one or two isolated denticles not belonging to that series are present. The abdomen is dull with dense surface sculpture and bears also large feebly impressed punctures. It is conspicuously clothed with appressed silvery hairs. Length about 3.5 mm.

HAB. Nogales, Arizona; on weeds in September.

6. *Chalcogonatopus rapax* sp. nov.

Head, prothorax and mesothorax ferruginous, the abdomen and propodeum black, the latter reddish on the disc in front; scape of antennae in front, and the mandibles except the teeth, which are reddish, yellow, side-pieces of the pronotum with black border above, the anterior margin of the pronotum black in the middle. Front legs ferruginous, the femora and tibiae being more or less obscured in parts, the basal tarsal joint darker than these, the following joints clearer and more yellow. Middle and hind tibiae blackish, the femora dark above, but yellowish

brown or ferruginous below, the tarsi clear yellowish-testaceous, with the basal joint darker brown.

Antennae long and slender, slightly longer than the whole thorax, all the joints elongate, the very long third joint being one and two-thirds the length of the fourth, the latter above five times as long as wide, the penultimate joint fully twice as long as its greatest width; only the scape pale-coloured. Head conspicuously concave above, dull, with excessively dense minute puncturation; raised median line extending forward from the front ocellus, distinct. Pronotum with very minute close punctures, the transverse sulcature deep, the anterior of the two divisions so formed, not half as long as the posterior one; mesonotal constriction slender, elongate, about twice as long as its greatest width, densely minutely punctate or shagreened, posteriorly with some fine transverse wrinkles; the whole thorax with conspicuous, scattered, erect, pale hairs. Front legs with the basal and fourth tarsal joints nearly equal, chelae of the usual type of Jassid parasites, the lamellate denticles of fifth tarsal joint well-developed nearly reaching the articular cavity; the claw moderately curved with some widely separated, pointed denticles projecting from the median groove between the ridges. All the legs are conspicuously, but not densely, clothed with pale erect hairs. Abdomen very dull, impunctate, clothed with longish erect sparse hairs like those on the thorax. Length 5.5 mm.

HAB. Nogales, Arizona; larva pupated from parasitized Jassid nymph on willow 14.IX.06; bred 20.XI.06; number 2480.

7. *Chalcogonatopus frequens* sp. nov.

Ferruginous, the apical abdominal segments sometimes darker brown or blackish, posterior and intermediate femora concolorous throughout, not black apically, antennae more or less pale on the basal joints, the first three generally yellow, but sometimes only the second is distinctly yellow, the scape and third joint being brown, the fourth and following may also be obscurely yellowish, the apical joints being black. Abdominal petiole always black.

Head dull, with close minute puncturation, the antennae slender and of moderate length, no joint being transverse, the third joint one and two-thirds the length of the fourth, the penultimate one and a half times as long as its width. Pronotum smooth and shining, with very sparse, short, erect hairs in fresh examples, mesonotal constriction longer than broad, propodeum

variable in sculpture, dull and with close sculpture very distinct in some, in others with the surface smoother and shining, posteriorly with some excessively fine transverse wrinkles. The surface is always pilose, the hairs being short, sparse and fine, but erect or suberect. Front legs with the first and fourth tarsal joints not differing much in length, the chelar claw very strongly curved; row of lamellate denticles of fifth tarsal joint occupying only a short ridge, which begins about the middle of the length of the joint from the articulation of the claw, and is not one-third of the whole length of the joint beneath; outside there is a row of a few shorter and stouter teeth, variable in number, one or two of which are placed nearer to the articulating cavity, while starting from the apex of this cavity there is a sharp raised ridge. As usual, setae are present in addition to the denticles, and there is the usual cluster of the latter on the curved tip. Abdomen smooth and shining. Length 2.5—4 mm.

This species varies considerably in size as the above measurements show. The depth of colour also varies. In sculpture it does not vary much, except that the propodeum is distinctly shining in some examples, dull in others, and there are intermediate conditions. The form and armature of the chelae is alike in specimens exhibiting the above variations.

HAB. Nogales, Arizona; a fine series was captured on weeds at the end of August and in September.

8. *Chalcogonatopus solitarius* sp. nov.

Dull, reddish brown, the several apical joints of the antennae black, the three basal joints clear ferruginous, the two or three following more or less obscurely pale; abdominal petiole black; basal joint of front tarsi concolorous with the tibiae or almost so; posterior femora concolorous (at most a little darker at extreme apex), their apical part not being pale yellow.

Head very little concave above, the eyes not very strongly convergent towards the front, dull, with excessively dense and fine rough sculpture, which under the microscope appears to be formed of a mixture of rugulosity and the usual dense puncturation. Antennae shortish, the third joint equal to one and a half times the length of the fourth, the latter subequal to the second, and hardly more than twice as long as wide at apex: penultimate joint scarcely longer than wide. Pronotum dull and closely punctate in front of the transverse furrow, and also immediately behind this, where is a somewhat flattened area, the posterior lobe being broader than in most species, and smooth and shining

on its posterior part; mesonotal constriction short, as wide or wider than long; propodeum shortly pilose, as is the pronotum, dull, with dense minute puncturation or surface sculpture, posteriorly transversely rugose, a very faint median impressed line on the disc. Front legs stout, the femora very strongly dilated, the trochanters dilating from the base and so without a distinct basal stalk. Abdomen with sparse pale hairs, the apical margins of the segments paler than the ground color. Length 4 mm.

HAB. Nogales, Arizona; one female collected from weeds in September.

9. *Chalcogonatopus echo* sp. nov.

Head, pronotum and legs ferruginous or testaceous, two basal and more or less of the third joint of the antennae yellow, rest of thorax and abdomen black, pronotum more or less darkened at the sides, posterior tibiae darker apically.

Head moderately, but distinctly, concave above, the surface hardly shining, the sculpture being extremely minute; antennae long and slender, all the joints elongate, the third one and two-thirds the length of the fourth, the latter being about four times as long as its apical width. Thorax long and slender, formed much as in *C. rapax*, and with sparse, pale, erect hairs; the pronotum densely and finely punctured, somewhat shining in front of the transverse sulcature, the propodeum quite dull and very densely and evenly sculptured, with only a few fine transverse wrinkles just above the base of the abdomen. Front legs very similar throughout to those of *C. rapax* (but clothed with only a few short and inconspicuous hairs) the trochanters dilating from close to the base and without a long thin stalk and the chelae also similar. Abdomen with scattered erect hairs, in some aspects the surface having a slightly metallic lustre. Length 4 mm.

HAB. Nogales, Arizona; collected on weeds in September.

10. *Chalcogonatopus herbarum* sp. nov.

Yellowish-red to brownish or dark red, the abdominal petiole black, four to six of the basal joints of the antennae, usually ferruginous or yellowish, the fourth, fifth and sixth generally dark above, sometimes all but the basal two joints are dark, though in this case the third to the fifth are usually more or less reddish-tinged at least beneath. Middle and hind femora with

a pale yellow or whitish band between the middle and the apex, which is black or dark, the apices of the tibiae also dark.

Head distinctly, but not strongly, concave above, dull, with excessively minute close sculpture. Antennae moderately long all the joints being elongate, the penultimate being at least one and a half times as long as its greatest width, the third joint one and two-thirds the length of the fourth. The pronotum is smooth and shining, but is punctate, the transverse division very distinct, the mesonotal constriction moderately elongate. There are a few short hairs on the thorax above, and the usual long ones just behind the mesothoracic constriction beneath. The propodeum is dull, with very fine sculpture on the disc near the spiracles, the whole posterior surface regularly transversely rugose, the wrinkles finer in some examples than in others, and in front of the spiracles and laterally the surface is also rugose. Legs formed as in *C. frequens* and others, at most with very short and inconspicuous hairs; first and fifth tarsal joints of front legs subequal, or with the latter slightly the longer, the lamellate denticles in a long row, the trochanters with short basal stalk. Abdomen shining, smooth, with hardly perceptible sculpture. Length 4.5 mm.

HAB. Nogales, Arizona; a series of specimens taken on weeds in August and September.

11. *Chalcogonatopus xestocephalus* sp. nov.

Extremely like *C. herbarum*, the chelae being similarly formed, the lamellate denticles reaching to, or almost to, the basal articulating cavity of the fifth joint beneath. The legs have a similar pattern, the thin apical part of the femora being conspicuously paler (whitish yellow) than the basal part, and with dark tips; the posterior tibiae also darkened at the apex. Trochanters of front legs dilating from close to the base, there being no long thin stalk.

Head, thorax, legs (except as noted above) and the base of the abdomen behind the petiole brown, in some parts darker in some more yellowish; mandibles except teeth, and the scape beneath pale yellow. Four basal antennal joints ferruginous or testaceous, the fourth more or less darkened, the following also obscurely pale, the apical joints black. Abdomen except near the base black. Head slightly concave, with the sculpture of the surface so feeble that it is shining, and bears also some sparse and excessively feeble punctures. Pronotum smooth and polished

above, but at the sides, especially posteriorly, it is dull and densely sculptured. Propodeum with a faint impressed median line on the disc, where the surface is dull, or at least very little shining, posteriorly and at the sides it is very conspicuously transversely rugose; it is distinctly pilose, though the hairs are short and sparse. Abdomen smooth and shining, with very sparse pale hairs, most noticeable on the basal declivous portion, the punctures very remote and feeble, but some of them rather large; behind the petiole the abdomen is brown at the base, and the apical margins of its intermediate segments and the compressed apex, are more or less obscurely ferruginous. Length 4 mm.

HAB. Nogales, Arizona; one female on weeds in September.

12. *Chalcogonatopus unicus* sp. nov.

Ferruginous, the six apical joints of the antennae black, or nearly so, the one preceding these obscurely pale, the rest pale, the two basal joints being clearer than the third. Apices of middle and hind femora and of the tibiae blackish, basal joint of anterior tarsi dark brown. Petiole of abdomen black.

Head distinctly concave above, very dull, the sculpture, which may be considered as either a very dense fine puncturation, or a close microscopic reticulation of the surface, very even throughout the vertex and front. Antennae longer than those of *C. solitarius*, the third joint being much more than twice as long as the second, the fourth rather more than three times as long as wide at the apex. Pronotum punctate in front, pubescent, more shining posteriorly, transverse furrow very feeble, obsolescent, so that in lateral aspect, the outline of the pronotum is not much interrupted thereby, the posterior lobe also being somewhat compressed into a subcarinate form; propodeum dull, pilose, densely and finely punctulate on the disc, posteriorly with a few very fine transverse wrinkles. Lamellate denticles of fifth tarsal joint of front legs reaching to the articulatory cavity, the trochanters dilating from close to the base, so that there is no distinct slender basal stalk. Abdomen with sparse pale hairs, the surface dull or hardly shining, its sculpture being quite distinct, though extremely fine, in addition to which sparse feeble punctures are easily seen. Length about 4 mm.

HAB. Nogales, Arizona; a single example taken on weeds in September.

13. *Chalcogonatopus simulator* sp. nov.

Ferruginous, abdominal petiole, four apical joints of the antennae, and the mandibular teeth black or dark.

Head dull, appearing very densely and minutely punctate, or shagreened; third joint of antennae nearly four times as long as the second, the fourth about four times as long as its greatest width. Pronotum not or hardly at all shining, but minutely and closely punctured, the posterior part very little raised, the transverse division being obsolete; propodeum very dull, sparsely but distinctly pilose, very densely punctate or granulated on the disc; posteriorly with distinct transverse wrinkles. Chelar claw extremely strongly curved, its lower edge strongly curved towards the base, first and fourth joints of front tarsi not differing much in length. Abdomen smooth and shining along the apical margins of the segments, duller and closely sculptured elsewhere on the intermediate segments, clothed with very sparse pale hairs. Length 5-5.5 mm.

This species is allied to the following, *C. koebelei*, with which in most respects it agrees in structure. It is easily distinguished by its smaller size, differently colored antennae and by the propodeum being more strongly rounded above, as seen in profile, rising up more strongly from the mesonotal constriction.

HAB. Nogales, Arizona; collected on weeds in September.

14. *Chalcogonatopus koebelei*, sp. nov.

Ferruginous, seventh and eighth joints of antennae, black or suffused with blackish, the sixth also generally more or less suffused; abdominal petiole black; teeth of mandibles dark red or brown. Thin portion of femora concolorous with the basal dilated part.

Head strongly concave above, dull or almost so, with very dense minute puncturation or granular appearance; third antennal joint four times the length of the second; penultimate joint elongate, about twice as long as wide. Pronotum simple, no trace of a transverse impressed line or furrow, densely sculptured like the head in front, but posteriorly smoother and more shining; mesonotal constriction and propodeum with similar dense sculpture and dull, the latter very long-ovate, the sides gradually narrowing in front to the width of the mesonotal constriction; the whole thorax sparsely but distinctly pilose. Front trochanters dilating from close to the base, so that there is no elongate basal

stalk, first and fourth tarsal joints subequal; fifth with two long rows of lamellate denticles beneath, of which, as in various other species, one row extends further back than the other, its denticles nearly reaching the articular cavity, towards which they are set more widely apart from one another; the other row shorter. Chelar claw very strongly curved. Legs thinly pilose, the hairs on the posterior tibiae as long as these are thick. Abdomen shining and smoother along the apical margins of the intermediate segments, which elsewhere are densely minutely sculptured, and bear also some feeble largish punctures, from which the sparse hairs spring. Length 6 mm.

Hab. Nogales, Arizona; in August on oak.

15. *Chalcogonatopus perdebilis* sp. nov.

Testaceous, the abdominal petiole black, the antennae yellow or testaceous, but towards the apex they become more or less smoky, even strongly so in some specimens. Hind and middle femora distinctly variegate, paler on the thin apical part than on the basal, and the extreme tips darkened.

Head not very strongly transverse, deeply concave, and with the surface smooth and shining, the space between the eyes anteriorly much shorter than the length of the head along the median dorsal line. Antennae with the fourth joint longer than the second, and three or more times longer than its greatest width. Pronotum behind the transverse groove closely punctate or sculptured, and not shining, the mesonotal constriction dull, elongate; the propodeum more or less shining on the disc, posteriorly rugose, and with some short hairs. Front legs with the first and fourth joints of the tarsi not differing much in length, the fifth beneath with a short row of lamellate denticles occupying about half the length of the underside of the joint between the articular cavity and the terminal curved portion or hook, the denticle nearest the articular cavity much the longest, chelar claw slender, moderately curved. Abdomen shining and smooth. Length 2.5-3.2 mm.

This description is mainly drawn up from the type specimen. Of the several examples seen none seem quite identical in sculpture, form, etc., and it is possible that there is more than one species before me. One of these appears to have longer antennae and legs, the front trochanters with longer and thinner stalk and two minute projecting angles just behind the mesonotal constriction. The propodeum may be little, or not at all, shining.

The material is not sufficient for an understanding of the limits between variation and specific distinction.

HAB. Nogales, Arizona; collected from weeds in September.

Eucamptonyx gen. nov.

General form as in *Gonatopus*; mandibles with four teeth, maxillary palpi 6-jointed, labial 3-jointed; pronotum with strong transverse constriction; front trochanters long, with basal thin stalk, chelar claw nearly straight and parallel-sided for most of its length, towards the apex suddenly and strongly bent, this bent part flattened, beneath armed with well-developed lamellate denticles, but without an antepical tooth.

Not related to *Apterodryinus*, but rather to *Agonatopoides*, which has only 5-jointed maxillary palpi and the chelar claw normal for a parasite on Delphacids.

Eucamptonyx testaceus sp. nov.

Testaceous or ferruginous, the head being darker than the abdomen and legs, the abdominal petiole black, the apical six joints of the antennae being infusate or sordid on the left side, but much less so on the right in the unique specimen.

Head above very strongly transverse, twice as wide as long in the middle, the eyes extremely wide apart in front, the surface dull, very densely punctate, distinctly concave. Antennae slender, the third joint about one and a half times the length of the fourth, the latter four times as long as its apical width or rather more. Front lobe of pronotum shining, the posterior one subcarinate, densely sculptured like the head, the mesonotal constriction elongate, the propodeum very strongly rounded above, smooth or hardly sculptured on the disc, finely transversely rugose behind; front legs with the fourth tarsal joint subequal to the first, or not much shorter, fifth with the lamellate denticles not nearly reaching the articular concavity, the chelar claw with four or five lamellate denticles. Abdomen smooth, but scarcely shining, with hardly visible surface sculpture even under a very strong lens. Length nearly 4 mm.

HAB. Nogales, Arizona; a single specimen taken on weeds in August.

Agonatopus gen. nov.

Distinguished from *Chalcogonatopus* by having only five joints to the maxillary palpi, two before and three beyond the geniculation.

Table of species of *Agonatopus*.

1	(8)	Pronotum with strong constriction, dividing it into two lobes, the posterior not compressed, cariniform.
2	(5)	Lamellate denticles of fifth joint of front tarsi beneath not reaching back to the articular cavity.
3	(4)	Abdomen ferruginous or testaceous... <i>A. pallidicornis</i> .
4	(3)	Abdomen mostly black... <i>A. pallidicornis</i> var. <i>dubiosus</i> .
5	(2)	Lamellate denticles of front tarsi almost reaching the articular cavity of the fifth joint beneath.
6	(7)	Insect almost wholly ferruginous... <i>A. ferrugineus</i> .
7	(6)	Insect largely dark brown and black... <i>A. picescens</i> .
8	(1)	Pronotum compressed into a median carina on the posterior part, which is only faintly separated from the anterior <i>A. heterothorax</i> .

A. innitidus was bred after the construction of this table, where it would be placed with *A. pallidicornis* var. *dubiosus*, from which the dull abdomen would at once separate it.

I. *Agonatopus pallidicornis* sp. nov.

Yellowish-brown or testaceous, the abdominal petiole black, tips of the front femora, the thin part of the hind and intermediate ones pale yellow, the tips of the two latter being slightly, but noticeably, darkened. Mandibles yellow, the teeth dark, reddish or brown. Antennae concolorous or almost so, sometimes subinfusate apically, but never black. Head distinctly concave, long above, not at all strongly transverse, compared with many other forms, the inner margin of the eyes strongly convergent anteriorly, the surface shining, the sculpture being extremely feeble. Antennae with the third joint rather less than twice the length of the fourth, the latter about four times as long as its greatest width. Pronotum with strong transverse constriction; behind which it is very smooth and shining; mesonotal constriction dull, longish; propodeum elongate, almost evenly curved above in profile, the sculpture on the disc very fine, the surface in some examples being somewhat shining there, but not

always; posteriorly, transversely rugose, the hairs very sparse, in some examples only one or two being visible, but these are no doubt more or less abraded. Anterior legs with the basal thin stalk of the trochanters not long, basal and fourth tarsal joint not differing much in length, the lamellate denticles on the fifth joint beneath not nearly reaching the articular cavity, the denticle nearest to this being twice the size of those at the other end of the row, but the setae, which are fine and long, extend back to the cavity. Abdomen nearly smooth, bearing a very few short hairs, and some excessively faint, obsolete punctures. Length 4-4.5 mm.

Agonatopus pallidicornis var. *dubiosus*.

Like a small example of the above in structure, the third and apical joint of the antennae being somewhat darkened or infusate, the abdomen shining black, pale only immediately behind the petiole, and on the compressed apical segment. Length 3 mm.

HAB. Nogales, Arizona; on weeds in September.

2. *Agonatopus ferrugineus* sp. nov.

In form and color like *A. pallidicornis*, but readily distinguished by the black apical joints of the antennae, of which the first two joints are always and the third usually, entirely pale, while one or two of the following may be concolorous with these. Front tarsi generally more or less dark or infusate, the basal joint being usually largely or entirely pale. The head appears to vary in intensity of sculpture, but this is not strong enough to prevent the surface being somewhat shining, at least in most examples. Structurally this species may be at once separated from the preceding by the armature of the chelae, the fifth tarsal joint having its lamellate denticles reaching nearly to the articulatory cavity, the head is decidedly more transverse, and in fresh specimens the propodeum is probably more pilose, but easily abraded. The sculpture of the latter seems to vary similarly in each species. Length 4-5 mm.

HAB. Nogales, Arizona; on weeds and grass in August and September.

3. *Agonatopus picescens* sp. nov.

Like the preceding in structure, but differs greatly in color. Head dark brown, pronotum and mesonotal constriction paler

than the head, propodeum black, red-tinged on the disc. Abdomen black, brownish just behind the petiole and on the compressed apical segment. Legs dark-brown or pitchy, but the tarsi for the most part and the trochanters, the front tibiae inwardly, the middle of the posterior and intermediate tibiae are paler, yellowish or testaceous. Mandibles, except the teeth, the thin part of the hind and middle femora, except the dark apices, pale yellow. Two basal joints of antennae yellowish brown, but the scape is darker above, the third also brownish, the rest black. Length 4 mm.

This will probably prove to be an extreme color variety of the preceding and there will be intermediate conditions in coloration. I can see no structural distinction.

HAB. Nogales, Arizona; on grass in August.

4. *Agonatopus inuitidus* sp. nov.

Testaceous, the abdomen black, as also the antennae except the basal joint and the second, the latter partly infuscate; front tarsi to a large extent sordid; propodeum brownish, darker than the pronotum, tips of the front and middle femora white, the posterior ones widely white at apex, middle and hind tibiae black at base, and the latter also at the extreme apex.

A slender species, the head not strongly transverse, dull, with excessively fine close sculpture, hardly visible; antennae slender, the second joint elongate, as long as the fourth, the third much longer than these, the eighth about twice as long as wide. Whole thorax appearing densely punctate, from the nature of the surface sculpture, mesonotal constriction long and slender, the mesopleura well separated from the other elements of the thorax, the propodeum strongly and nearly evenly rounded above when viewed in profile, and clothed with sparse pubescence. Front legs with the trochanters long, and with long thin basal stalk, first and fourth tarsal joints subequal; lamellae of fifth joint extending throughout its length to the articulating cavity beneath, chelar claw slender and lightly curved. Abdomen dull, coriaceous, or microscopically shagreened, bearing sparse short pale hairs. Length 2.5 mm.

HAB. Nogales, Arizona; larva on a very small Jassid found on grass (the larval sac on abdomen, and very large), pupated on the first of October (Koebele under No. 2506); parasite emerged in Honolulu on March 3rd, 1907. The species is very distinct from anything else in the genus by its color combined

with the sculpture of the abdomen. The maxillary palpi have the three terminal joints unusually short.

5. *Agonatopus heterothorax* sp. nov.

Black, the three basal joints of the antennae brown, the second paler, the scape whitish in front. Clypeus and mandibles (except the teeth) testaceous or yellowish, the former dark on the disc. Pronotum along the sides, and the front coxae beneath, brownish. The legs are largely dark colored, or nearly black, the anterior femora and the thin part of the middle and hind ones more brownish-pitchy, as also the hind tibiae in the middle, the tarsi of middle and hind legs mostly paler, sordid yellowish, the chelar claw yellow. Abdomen brownish-tinged near the base.

Head moderately strongly transverse, lightly concave above, dull with the appearance of very dense puncturation or shagreening, due to excessively dense reticulate surface rugulosity, as seen under high powers of the microscope. Mesonotal constriction and propodeum similarly sculptured and dull. Third antennal joint equal to the fourth and fifth together, the fourth about two and a half times the length of its greatest width. Pronotum ovate, well rounded in front and at the sides, the transverse impressed line hardly visible, in front of this line sculptured like the head, as also at the sides, but shining in the middle behind it, where it is compressed and cariniform. Head and thorax with short pale pubescence, the propodeum posteriorly with very little evidence of transverse wrinkles. Front trochanters short and stout, dilating at once from the base, the femora very robust, first and fourth tarsal joints subequal, the fifth beneath with very long row of close-set hyaline lamellate denticles, which reach to to articular cavity and convergent with these towards the free extremity of the joint is a second row of about 7 or 8 stronger and more hyaline denticles, which are set wide apart from one another. Chelar claw moderately curved, with the usual armature of Jassid parasites. Abdomen dull, with very minute reticulate rugulosity of the surface, pilose, and with very faint, sparse punctures. Length about 4 mm.

This species has no relationship with any of the preceding, and will, no doubt, subsequently be separated generically.

HAB. Nogales, Arizona; a single female was bred in Honolulu on January 17th, 1907 from a cocoon obtained from a large dark Jassid nymph found on grass, the larval sac being placed on the underside of the abdomen (2495).

Agonatopoides gen. nov.

General form of *Gonatopus*, the labial palpi three-jointed, the maxillary palpi five-jointed, there being three joints beyond the geniculation, front legs with chelae armed for catching Fulgorids, the chelar claw having well-developed lamellate denticles, and a minute but distinct tooth near the apex.

Agonatopoides synchronus sp. nov.

Ferruginous or testaceous, the abdominal petiole black, the antennae infusate after the two basal joints, those towards the apex more yellow-tinged than the intermediate ones.

Head concave between the eyes, the surface nearly smooth and somewhat shining, the sculpture being very indistinct. Antennae slender, the third joint about twice as long as the fourth, which is more than three times as long as its greatest width at the apex. Pronotum with fine close puncturation or sculpture, which is not very definite; mesonotal constriction dull and narrow; the propodeum long-ovate, its upper edge in profile very slightly curved, till it is rounded off at the posterior declivous portion, in no wise rising at all abruptly from the mesonotum. The sculpture on the disc is very fine and in some examples evanescent, posteriorly there are very fine transverse wrinkles and few or no hairs are present. The abdomen is hardly visibly sculptured. Trochanters of front legs rather long and slender, there being a distinct, thin basal stalk, the first tarsal joint is as long or rather longer than the fourth, the fifth has two rows of convergent lamellate denticles, those nearest the articular cavity being the longest, and not far distant from the cavity; chelar claw with six or eight denticles. Length 4 mm.

HAB. Nogales, Arizona; collected on weeds and bred (2473) from a Delphacid, *Cochise apacheanus*, nymph and adult, found on grass.

Neogonatopus Perk.

- 1 (2) Chelar claw with a tooth near the apex....*N. minus*.
- 2 (1) Chelar claw without such a tooth.....*N. mimoides*.

1. *Neogonatopus minus* sp. nov.

Ferruginous or testaceous, abdominal petiole black, abdomen often darker than the thorax or brown, the first two and usually

the third joint of the antennae altogether or for the most part, clear testaceous, the rest black or nearly so; mandibular teeth dark.

Head strongly transverse, distinctly impressed along the middle line; in front of the ocelli smooth and shining, but behind these dull and with dense minute sculpture; antennae shortish and stout, the fourth joint being only as long as the second and hardly twice as long as its greatest width at apex, the third joint rather more than one and a half times the length of the fourth. Pronotum shining, smooth or almost so, the lobes very distinctly divided, mesonotal constriction dull and rather short, propodeum very feebly sculptured on the disc and sometimes dull, but usually more or less shining, posteriorly transversely rugose, with short and very sparse erect hairs. Front legs with the chelar claw with a minute tooth close to the apex beneath, the trochanters dilating from close to the base; fourth tarsal joint shorter than the first, the fifth with the modified free extremity much less hooked than is usual in Jassid parasites, the lamellate denticles not reaching back to the articular cavity but towards this replaced by bristles. Abdomen nearly smooth, with scattered hairs. Length 2.5-3 mm.

This species, resembling in color so many others of allied genera from Arizona, is distinguished by the sculpture of the head, the short antennae and the chelae. The latter more nearly resemble those of a Fulgorid parasite than is the case in any species known to me of the *Gonatopus* s.l. group. However, even had it not been bred, it would have been placed, as certainly a Jassid parasite, by any one familiar with the various forms of the chelae.

HAB. Nogales, Arizona; collected on weeds and bred from Jassids (numbers 2448 and 2448-b.).

2. *Neogonatopus mimoides* sp. nov.

Ferruginous or testaceous, the petiole black, the mandibles pale yellow with dark teeth. Thin part of posterior and middle femora distinctly paler than the dilated basal part, the tips darkened. Antennae with the three basal joints pale, the rest black or nearly so. Except for the slightly variegated color of the legs almost like the preceding, but more slender and elongate and very distinct by many points of structure.

Head not very strongly transverse, the eyes much closer together in front than those of *N. minus*, distinctly concave, and

the surface smooth and shining, with at most a very indefinite sculpture. Antennae slender and longer than in *N. mimus*, the fourth joint longer than the second, and about three times as long as its greatest width, the third one and two-thirds the length of the fourth. Pronotum with well-marked transverse constriction, shining, very minutely punctate, or sculptured, and with sparse short hairs; mesonotal constriction longish, the sides forming an almost regular outline with those of the propodeum, the latter narrow, in no wise strongly or abruptly raised in front of the spiracles, closely and minutely punctured or shagreened on the disc, posteriorly transversely rugulose, sparsely pilose. Front trochanters dilating from close to the base, the first and fourth tarsal joints subequal, the fifth with long row of lamellate denticles beneath, chelar claw moderately curved, of the usual structure of Jassid parasites, there being no anteapical tooth. Abdomen smooth, shining, sparsely, but distinctly, pilose. Length 3 mm.

HAB. Nogales, Arizona; on weeds in September.

Gonatopus Ljung.

The single species described differs from those I have examined from Europe and Australia in the simple, undivided pronotum.

Gonatopus haplothorax sp. nov.

Testaceous or ferruginous, the abdominal petiole black, the abdominal segments with some pale yellow or whitish bands or maculae, rarely absent. Antennae with 3-5 basal joints pale, the apical ones being black. Legs not variegate.

Head rather strongly transverse, somewhat concave, being more deeply impressed in the middle, nearly smooth and shining in front of the ocelli, but posteriorly dull and minutely and densely punctured. Antennae longish, fourth joint much longer than the second, about four times as long as its apical width. Pronotum simply convex, not transversely divided, finely punctured and subpubescent in front, posteriorly smoother and shining. Propodeum long, ovate, narrowing gradually into the mesonotal constriction, in profile rising gently from this and not at all abrupt, densely minutely sculptured and with quite evident, but short, white pubescence. Front trochanters stout, thickened from the base; lamellate denticles in a long even row on the

lower edge of the fifth joint of tarsi, and reaching to, or almost to, the articulating cavity, chelar claw moderately curved. Abdomen smooth, not or hardly sculptured, in fresh specimens with sparse pale hairs. Length about 3 mm.

One example has no evident pale markings on the abdomen, but probably this is chiefly due to post mortem changes of color. The above species will, I suspect, be subsequently and properly separated from *Gonatopus*, as a distinct genus, but as in some of the allied genera intermediate conditions between a simple and a transversely divided pronotum are found, for the present it may be associated with the Jassid parasites, that have a five-jointed maxillary and two-jointed labial palpus. Length 3.5 mm.

HAB. Nogales, Arizona; collected from weeds in August and September.

Pseudogonatopus Perk.

- 1 (2) General color black*P. autoxenobius*.
- 2 (1) Testaceous, the abdominal petiole black. .*P. arizonicus*.

1. *Pseudogonatopus arizonicus* sp. nov.

Testaceous or ferruginous, abdomen sometimes brownish, the petiole black, the apical seven joints of the antennae darkly infuscate or blackish, mandibular teeth dark.

Head distinctly concave above, narrow between the eyes anteriorly, the distance between their margins anteriorly being much less than the length of the head dorsally along the middle line, the surface nearly smooth and more or less shining, but duller and more sculptured behind the line of the ocelli; antennae quite distinctly clavate, the fourth joint rather longer than the second and more than three times as long as its greatest width, the third being about one and two-thirds the length of the fourth. Pronotum distinctly transversely divided, on the posterior part closely and finely punctured, mesonotal constriction longish, behind which the thorax is strongly widened; propodeum strongly convex, rising quite abruptly from the mesonotum, as seen in profile, very densely and finely sculptured, dull or almost so, transversely rugulose posteriorly, without pilosity; front trochanters long and rather slender, first tarsal joint somewhat longer than the fourth, the fifth with the usual two rows of lamellate denticles, convergent towards the tip, the one row longer than the other, chelar claw with only about four denticles, and

with a distinct tooth near the apex. Abdomen nearly smooth and very sparsely pilose. Length 2.5-3 mm.

HAB. Nogales, Arizona; bred from nymph and adult of the Delphacid (*Stobacra* sp?) numbers 2475 and 2452.

2. *Pseudogonatopus autoxenobius* sp. nov.

Black, face yellow or brownish yellow, occiput also brown, as also the pronotum, more or less, posteriorly; two basal joints of antennae pale, abdomen more or less brown in parts, at least apically and near the base; the femora are black or pitchy, the thin part of the middle and hind ones pale, tibiae brown, varying in depth of colour in different parts, tarsi paler, yellowish; the trochanters are pale, the front ones slightly embrowned, the front coxae light brown with a dark mark.

Head very strongly transverse, densely punctate or shagreened, strongly concave, the antennae slender, the fourth joint much longer than the second, about four times as long as its greatest width, the third more than one and a half times the length of the fourth. Pronotum strongly divided transversely, densely punctate or shagreened, considerably more strongly sculptured than the head, the mesonotal constriction elongate, behind which is a sutural transverse line; the propodeum dull, very densely sculptured all over, appearing punctate or shagreened, posteriorly also transversely wrinkled, and without hairs. Anterior trochanters with a longish basal stalk, which is, however, not very well marked, fourth tarsal joint long, but less so than the first, lamellate denticles of fifth in two long and dense rows, of which one reaches to the articular cavity, the chelar claw with four or five lamellate denticles and a distinct anteapical tooth. Abdomen smooth, without sculpture, but not very shining. Length with abdomen extended 4.5 mm.

HAB. Nogales, Arizona; bred from the same Delphacid, an adult, (*Stobacra* sp.) as the preceding; number 2463.

Neodryinus.

I have retained this name for the present in my table of genera, though it may be synonymous with *Dryinus*, of which I have not a satisfactory description, nor any authentic European examples for comparison. It is certain that *Dryinus ormenidis* Ashm. comes very near to my *Neodryinus*, but in that species, if the thorax be viewed from in front, the position of the parapsides is

distinguishable, though the furrows are almost effaced. In *Neodryinus* proper there is no trace of these furrows. The very remarkable habit of the larva of *Neodryinus* in covering its cocoon with the ruptured larval sac, which it removes from the leaf-hopper, is not found in any other genus of Dryinidae, nor does it occur in the case of *D. ormenidis*. To the Australian species of *Neodryinus*, I now add two new species from Arizona. One of these was bred, and its cocoon greatly resembles those of the Australian species, as also does the mature insect. *Dryinus alticola* and *D. maculicornis* of Cameron, from Central America, are, I suspect, closely allied to these Arizona species.

1. *Neodryinus arizonicus* sp. nov.

Black, the hind and middle tarsi, the fourth, fifth and more or less of the apical part of third joint of the antennae, clear testaceous or ferruginous; scape of antennae dark fuscous, yellowish beneath. Front femora inwardly with a rufescent line on the apical part and continued throughout the length of the tibiae. Front tarsi more or less brown, the chelar claw whitish. Wings pale at the extreme base, then with a wide transverse smoky band, reaching apically to the transverse median vein, a second oblique fascia or spot reaches about half across the wing, arising beneath the apical half of the stigma.

Head strongly transverse, hardly concave on the vertex, the ocelli in a triangle with the basal side widest, the surface dull, or almost so, and with a fine, close reticulation of wrinkles. Antennae with the third joint almost twice as long as the fourth, the latter about four times as long as its greatest width. Pronotum with a strongly raised posterior portion, in front of which the sculpture consists of very fine and close oblique striae on each side. Mesonotum more longitudinally rugose, but not regularly; propodeum with stronger longitudinal wrinkles, but more or less connected transversely so as to form reticulation. Lamellae of fifth tarsal joint elongate, closely set together, and reaching, or almost reaching, the articulatory cavity, the chelar claw curved, not armed with lamellate denticles, but with at most a few bristles, and a small angle or obscure tooth close to the apex. Abdomen smooth, shining, impunctate. Length 4—5 mm.

HAB. Nogales, Arizona; bred (no. 2450) from nymphs of *Ormenis septentrionalis* on Oak.

2. *Ncodryinus dubiosus* sp. nov.

This may be a variety of the preceding, and possibly will be found to be parasitic on another species of Fulgorid. It differs from *N. arizonicus* in having the first, third, fourth and fifth joints of the antennae ferruginous, the sixth is also partly reddish, the small second joint being dark brown. The front femora are more extensively reddish brown, the tibiae almost entirely so, the middle femora are reddish at the tips, the posterior ones more widely so, the base of the hind tibiae being of the same colour. The reticulate rugosity of the head is stronger and the surface appears to be rather more shining.

HAB. Nogales, Arizona: a single female was captured on an oak tree in August.

Paradryinus Perk.

The species here described agrees, on the whole, with the Australian species in its generic characters.

Paradryinus mexicanus sp. nov.

Ferruginous, the head of a rather redder colour than the abdomen, legs, &c.; mesonotum, propodeum and mesopleura black, as also the abdomen on its apical half or more and the petiole; middle and hind tibiae, and the hind femora inwardly, brownish; apex of abdomen ferruginous.

Head convex on the vertex, seen from in front the hind margin almost straightly transverse, dull, with very dense puncturation or shagreening; antennae with very slender third joint, which is about one and a three-quarters the length of the fourth; the latter about seven times as long as wide, the following being somewhat wider than this. Pronotum rather strongly rounded laterally, compressed at the sides posteriorly, transversely constricted at the apex, raised on its hinder portion, but not strongly; the surface is dull, the sculpture excessively fine, hardly visible under a strong lens, and much finer than that of the head. Mesonotum dull, except the polished neck, which may be concealed beneath the pronotum, the surface very minutely shagreened, the parapsidal furrows fine, slightly convergent posteriorly almost reaching the hind margin; propodeum very densely reticulately rugose. Wings with an infuscation in the basal cells, extending a little beyond the transverse median vein apically, and a second one

originating beneath the stigma and in the radial cell and forming a transverse fascia. First joint of front tarsi very long about twice as long as the elongated fourth, second very small, third larger than this but still small, the fourth being much longer than the preceding two together. Abdomen smooth and without definite sculpture. Length 4 mm.

HAB. Mexico (? Pazcuaro).

Hesperodryinus gen. nov.

This new genus is proposed for three slender and elongate species, evidently allied to *Paradryinus*. All are of a ferruginous or testaceous colour, with short, but functional, wings, which are banded. The head is of peculiar form, being acutely wedge-shaped posteriorly, the hind margin when the head lies back, resting over a considerable part of the pronotum and entirely concealing the prolongation of the prothorax in front of the pronotum. Consequently, when seen from in front, the hind margin of the head is well rounded and extended far back behind the eyes, the posterior ocelli being placed well behind an imaginary line joining the hind margins of the eyes. In *Paradryinus*, when the head is viewed from in front, the hind margin is nearly straightly transverse and the posterior ocelli generally about on a line with the hind margin of the eyes. The pronotum is strongly compressed at the sides posteriorly, so that it is there bluntly cariniform, its sculpture and that of the head is very dense and minute, the surface being quite dull. Otherwise the genus greatly resembles *Paradryinus*, the maxillary palpi with four long joints beyond the geniculation, the two basal ones, as usual, less distinctly divided, the basal apparently less chitinized and perhaps more or less fused to the maxilla. Labial palpi three-jointed, the apical one very long and cylindrical. The front legs are formed much as in *Paradryinus*, but are rather stouter; the second joint of the tarsus is very small, the third much longer, but still much shorter than the fourth; the chelar claw of one species differs remarkably in structure from that of the others; the lamellate denticles of the fourth joint are well developed and reach or nearly reach back to the articular cavity.

The males of two species are known, and these may be easily distinguished from those of *Paradryinus* by the eyes having comparatively few and short hairs, hardly noticeable under a strong lens, and by the much less conspicuously hairy antennae. In both species the femora and tibiae are black, while in all the

known males of *Paradryinus* the legs are ferruginous or testaceous. Type of genus *H. arizonicus*.

Table of species of *Hesperodryinus*.

1	(2)	Chelar claw in lateral view nearly parallel sided, hardly curved except at the tip, near which is a distinct prominent tooth	<i>H. amphiscepac</i> .
2	(1)	Chelar claw well curved, and without a tooth near the apex.	
3	(4)	Propodeum rather finely reticulately rugose about the middle dorsally, on each side of this with minute shagreening or surface sculpture. . .	<i>H. arizonicus</i> .
4	(3)	Propodeum with strong longitudinal wrinkles all over its upper surface	<i>H. andax</i> .

1. *Hesperodryinus amphiscepac* sp. nov. *

Ferruginous, abdominal petiole black, the apical segments often more or less infusate. Three basal joints of antennae concolorous with the head, the fourth and fifth white or whitish with a dark line, or the usually dark part may be concolorous with the preceding joints, following joints dark or sordid, the apical one usually paler.

Head dull, excessively finely and closely sculptured; second joint of antennae about half as long as the fourth, the third twice as long as the latter, dull and microscopically sculptured like the head, without any transverse division, but strongly compressed at the sides so as to be bluntly cariniform on its posterior half or two-thirds. Mesonotum more or less finely and sometimes vaguely longitudinally rugose, the surface minutely granulate or coriaceous, the parapsidal furrows easily seen when the thorax is viewed from in front; scutellum minutely punctate or shagreened; propodeum reticulately rugose, but at the sides with dense minute surface sculpture only, about as long as the mesonotum and the two scutella together. Front trochanters short and stout, lamellae of fifth tarsal joint in a long line extending to, or nearly to, the articulating cavity; this line of denticles appears to consist of two rows or more, which are more or less confused; chelar claw with the denticles more spinose, and set further apart, the ante-apical tooth distinct. Abdomen smooth, without any definite sculpture. Neuration mostly pale, yellowish, the transverse nervures being more or less dark, and with a dark transverse cloud along them, a second transverse cloud extends across the wing

from about the middle of the stigma, but fades out before the tip, stigma yellowish or fuscous, white on the basal part. Length 4-6 mm.

Male black, the front tibiae rufescent, the extreme tips of all the femora also pale, basal joint of middle and hind tarsi and the second more or less, white. Head, mesonotum, and scutellum all similarly sculptured, and pubescent, the sculpture appearing as a dense rugosity or rugose puncturation; scape of antennae about as long as the fourth joint, the second ovate, the third rather more than one and a half times the length of the fourth, and fully three times as long as wide. Towards the apex of the antennae the joints become gradually more slender. Parapsidal furrows indistinct, but, if examined from the front, they can be traced as converging lines to the hind-margin of the mesonotum, where they are still widely separated; propodeum strongly rugose. Wings with the stigma blackish fuscous, the radius angulated before the middle and reaching only about half way from its base to the tip of the wing. Abdomen ovate, very finely punctured, and clothed with short hairs, basal segment angularly bent about the middle, its basal face impressed. Length 3 mm.

HAB. Nogales, Arizona; collected on grass and bred from nymphs of *Amphiscepa bivittata*. The larval sac is placed beneath the tegmen or wing; number 2446.

2. *Hesperodryinus arizonicus* sp. nov.

Colour, form, size and for the most part the sculpture, as in the preceding species, fourth and fifth antennal joints entirely white or with a dark line, the antennae no doubt varying in colour, as they do in *H. amphiscepa*; propodeum with loose reticulate rugosity about the middle of the dorsum. Chelae quite unlike those of *H. amphiscepa*, the fifth joint with a curved edge beneath, bearing the lamellate denticles, the chelar claw well and almost evenly curved, its lower edge on the basal half somewhat serrate and with a few spinose bristles and with no trace of a tooth near the apex.

HAB. Nogales, Arizona; bred from the nymphs of *Mistharnophantia sonora*; the larval sac is black and placed beneath the wing or tegmen. I cannot certainly decide whether the males under the number 2481, belong to this species wholly or in part, or to the preceding. They do not agree altogether in details amongst themselves and the possibility of either species of the parasite attacking both of the hosts is so great, that the male I

have assigned to *H. amphiscepae* may really belong to *H. arizonicus*.

3. *Hesperodryinus audax* sp. nov.

Colour, form, and sculpture generally, almost as in the preceding two species. This is, however, of larger size, the third antennal joint is black, pale only at the tip; the mesonotum is regularly and closely longitudinally rugose, the propodeum is also strongly longitudinally wrinkled, with very little reticulation, at least on the dorsal surface. Chelae formed and armed almost as in *H. arizonicus*; just beyond the most apical of the spinose bristles there is a slight elevation of the lower edge of the chelar claw, hardly to be considered as a tooth. Length 8 mm.

HAB. Nogales, Arizona; one example was captured on an oak tree.

Perodryinus gen. nov.

General form and structure of *Paradryinus*, but with the front tarsi very different. The basal joint is long and slender, as long as the four following together, the second small, the third and fourth subequal, the backward process of the fifth reaching to the base of the fourth, and densely armed with lamellate denticles; the chelar claw a simple spine with dilated base for articulation, the chelae being extremely short. Pronotum longer than the mesonotum, compressed posteriorly, but without a transverse division; mesonotum without parapsidal furrows, with dense rugose-punctate or reticulate sculpture.

Male like that of *Paradryinus* but the eyes are bare, there are no parapsidal furrows, the radius is short, falls far short of the wing margin, and is bent at about its middle.

Perodryinus amoenus sp. nov.

Black, antennae, the clypeus, the pronotum and the legs ferruginous, the antennae subinfusate apically. The mandibles except the teeth, the basal half of the posterior tibiae, the basal joint more or less of the middle and hind tarsi, whitish; tips of hind femora black.

Head and mesonotum very densely rugose-punctate or reticulate; third antennal joint long, twice as long as the fourth. Pronotum rugulose and with pale pubescence; scutellum rather smoother than the mesonotum, the propodeum shining, reticulate-

rugose, much less closely sculptured than the mesonotum, posteriorly with a raised line or carina on each side of the middle. Wings clear hyaline, stigma yellow at base, dark fuscous on apical part, costal and sub-costal nervures dark, as also the transverse ones, the latter subinfusate, and a rather narrow infusate band crosses the wing from about the middle of the stigma. Abdomen glabrous and shining, the whole thorax having short grey pubescence. Length 4 mm.

Male black, the two basal joints of the antennae, the front and middle legs except the coxae, yellowish brown or testaceous. Hind tibiae pale on basal half, the tarsi still paler. Antennae attenuated towards the apex, the third joint about one and a half times the length of the fourth, the joints (except as previously noted) blackish, but tinged with yellow. Thorax sculptured like the same parts in the female, the abdomen shining, very finely indefinitely punctured, and impressed at the base. Wings hyaline, costal, sub-costal and radial veins dark, stigma dark fuscous except at base. Length 3 mm.

HAB. Nogales, Arizona; bred from nymphs of *Amphiscepa bivittata*. The number attached is 2426, clearly an error, for 2446, under which number it is mentioned that two parasites were bred, viz.: the present one and *Hesperodryinus amphiscepa*. The larval sac, placed beneath the wing, is variegate, dark fuscous and yellowish.

Eukocheleia Perk.

This name is practically a duplication of *Eukocheleia* already in use. I do not think it advisable to suggest any substitute at present, because I have some doubt whether the genus is not synonymous with *Bocchus* of Ashmead. As, however, the characters of the mouth-parts, as given for *Bocchus*, are quite different from those of my two species of *Eukocheleia*, and further the description of the tarsal generic characters does not agree, while Dr. Ashmead's characterization is confirmed by Brues, I must consider the two genera distinct. The fact that the following species is fully winged will require some modification of the original generic characters, as given by me.

Eukocheleia arizonica sp. nov.

Generally like *E. mirabilis*, the tarsal structure similar, but the wings are well-developed and there is an infusate transverse fascia, narrowed below, placed beneath the radial vein.

Black, the trochanters, the front tibiae and all the tarsi pale, yellowish brown to testaceous. Two basal joints of antennae clear yellowish (the apical joint is wanting in the example described). Mandibles yellowish, the teeth dark, the inner one considerably smaller than the two well-developed outer ones. Legs except as above described, pitchy to black, the middle and front femora being lighter than the hind ones.

Head and thorax very densely and evenly shagreened, dull, the scutellum more shining, the propodeum distinctly areolated, and the surface rugose. Abdomen ovate, very smooth and polished.

The sculpture of this species is almost as in *E. mirabilis*, the dense surface sculpture of head and mesonotum giving them the appearance of being closely and evenly punctured. The raised lines on the propodeum are stronger in *E. arizonica*, and the areolation therefore more definite. The postscutellum is as feebly developed in the winged as in the subapterous species. Length 3 mm.

HAB. Nogales, Arizona; one female collected on weeds in September. Many parasitized *Bruchomorpha* were found on grass in this locality, at the same time, but from the cocoons obtained (no. 2483) no adults have as yet emerged.

Dcinodryinus gen. nov.

Head and thorax of large size, much more robust than the abdomen; head greatly produced behind the eyes, the sides there being convergent, the vertex strongly and straightly margined; ocelli in an equilateral triangle or almost so, and placed far in front of the posterior margin, distant from it by more than the length of the triangle that they form; vertex slightly convex or at least not at all impressed; mandibles with four strong teeth; maxillary palpi six-jointed, labial three-jointed, third antennal joint at least one and a half times the length of the fourth. Pronotum elongate, hardly rounded at sides, transversely impressed in front, its lateral posterior angles attaining the tegulae; mesonotum and scutellum together about as long as the pronotum, the former with deep, subconvergent parapsidal furrows, which fail before reaching the hind margin; propodeum moderately long, not at all areolated. Front legs with extremely stout femora, the first tarsal joint rather short, much shorter than the fourth, the second minute, transverse, the third much longer than this and not very much shorter than the first, the fifth very long and slender. Chelae well developed, freely extensible, row of lamellate

denticles of fifth tarsal joint long, the chelar claw simply curved, with oblique grooves on each side of its lower edge, and without any subapical tooth, the whole being evidently adapted for catching Jassids. Stigma of front wings long, narrowly ovate, radius bent or angulate near the middle, where the (almost obliterated) transverse cubitus would originate. In the two species known the wings are bifasciate.

The male in this genus is very different superficially, being much smaller, black, with clear wings, but in many respects resembles the female. The head is more transverse, less produced behind the eyes, but otherwise rather similar, the ocelli being remote from the hind margin. The pronotum is as usual not or hardly visible in dorsal aspect and there are the other usual sexual differences. The most important characters appear to be the bare eyes, and the clothing of the antennae, these bearing long curved hairs, several times as long as the width of the elongate joints, the hairs tending to form whorls. The scape is clothed like the following joints, but the hairs on the apical ones become shorter, and the tenth joint has quite short ones. The posterior ocelli are distant, each from the nearest eye-margin by a space greater than that which lies between them. The mesonotal parapsides are like those of the female.

This is a remarkable genus and appears to me to be intermediate in character between the sections of Dryinidae with large ovate stigma and those with a narrow elongate one. It is, however, to be associated with the former section and comes near to *Chelogyne*.

Table of Species.

1	(2)	Head in front densely and more or less rugulose
punctured	<i>D. paradoxus</i>
2	(1)	Head in front for the most part with fine sparse
punctures	<i>D. quercicola</i>

1. *Deinodryinus paradoxus* sp. nov.

Ferruginous, extreme base of abdomen black, apical two or three joints of the antennae black or blackish, and one or two of the preceding joints sometimes subinfusate.

Head with feebly impressed, coarse, rugose punctures on the vertex, between the antennae and the front ocellus the sculpture is finer and dense, more or less rugulose punctate. Third joint of antennae one and a half times the length of the fourth or

rather more, the latter three or more times as long as wide, fifth wider than the fourth, but of nearly equal length. Pronotum irregularly punctured, the punctures of unequal size; mesonotum smooth and shining, very sparsely punctured, the suture between it and the almost or quite impunctate scutellum, deep and consute; propodeum finely transversely rugose, pilose, and subimpressed medially on its posterior portion. Legs shortly, but distinctly, pilose; the tarsi pallid; wings distinctly, but not deeply bifasciate, the stigma yellow. Abdomen smooth and polished, impunctate or almost so. Length about 5 mm.

Male black, the antennae, clypeus for the most part, mandibles except the teeth, antennae, front and middle tibiae testaceous or ferruginous, apical joint of antennae more or less black, the tarsi pale, whitish. Head coarsely rugose-punctate, pilose like the thorax; the antennae with all the joints elongate and for the most part not differing much in length, the apical joint acuminate and one and a half times the length of the preceding, the third four times as long as broad. Mesonotum and scutellum shining, sparsely punctured, propodeum short, irregularly rugose, or with close reticulation. Wings hyaline, stigma blackish. Abdomen small and narrow, subclavate. Length about 4 mm.

HAB. Nogales, Arizona; collected on oak and cocoons obtained in August and September; the female bred in October (2466). I bred male and female (under the same number) in Honolulu at the end of February from cocoons obtained in September at Nogales. It is parasitic on a large green Jassid on Oak.

2. *Dcinodryinus quercicola* sp. nov.

Form, size and colour like that of the preceding species, from which it is easily distinguished by the colour of the antennae, the fourth to the tenth joints being dark, black or blackish, though the more basal of these are yellow-tinged, the third joint is also more or less infusate. The extreme apex of the middle tibiae, the extreme base and apex of the hind ones, and the extreme base of the hind tarsi, are dark.

The general sculpture is for the most part like that of *D. paradoxus*, but that of the head is quite different, since its surface is smooth with only very fine and scattered punctures, and in no-wise rugose. Only for a very short space, immediately above the antennae, is the sculpture dense and somewhat as in the preceding species.

HAB. Nogales, Arizona; a single example was captured beneath an oak tree in September.

Chelogynus Hal.

Neochelogyne of Bull. I is synonymous with this, as a comparison of European species shows, and the characters of the mouth parts are as described by me under that name. It is at once separable from *Anteon* by the partially extensile chelae and the different position of the articulation of the fourth and fifth tarsal joints, to which this mobility is due. *Chelogynus* at present includes insects with great differences in structure and will unquestionably be itself broken up.

Table of Species described.

1	(2)	Apical joint only of the antennae dark.	<i>C. lusus.</i>
2	(1)	More than one antennal joint dark.	
3	(4)	Coxae mostly dark, pronotum with some transverse rugulosity	<i>C. funestus.</i>
4	(3)	Coxae altogether pale	<i>C. melanacrias</i>

1. *Chelogynus funestus* sp. nov.

Black, the basal joints (usually about four) of the antennae ferruginous, the apical ones black. Some of the basal joints may be more or less darkened, the number of those that are red is not constant and the red often gradually merge into the dark apical ones. The front femora are sometimes pale, but may be nearly black, the middle and hind ones are generally black or at least pitchy-brown, and their tibiae are also dark, but noticeably pale on the basal part to a greater or less extent; hind coxae always black or dark, except that the extreme apex may be pale. Mandibles yellow, the teeth dark; neuration yellow, stigma dark fuscous.

Head and face quite dull, very densely and minutely shagreened or rugulose, the antennae with the flagellum subclavate, the scape about as long as the three following joints together, second joint subequal to third, which is slightly longer than the fourth, the fifth decidedly wider than the preceding, but none of the flagellar joints are transverse. Pronotum with some extremely fine transverse rugulosity; the mesonotum more or less shining, at least never dull like the head, and with at most a few

very shallow punctures; scutellum shining and smooth, propodeum truncate, rugose, the truncation bounded by a raised line, posteriorly densely minutely shagreened and without any definite area. Fifth tarsal joint with well-developed lamellate denticles in two rows and with series of long setae at the side, chelar claw with long seta on the subbasal angle beneath. Abdomen smooth and shining. Length 2.5 mm.

Male black, anterior tibiae and tarsi testaceous, the middle and hind tarsi also more or less pale or brown, otherwise the legs nearly wholly black. Neuration brown, stigma dark brown or blackish fuscous. Head sculptured as in the female, and with faint traces of feeble punctures; antennae as long as the head and thorax, the scape fully as long as the two next joints, which do not differ much in length, the flagellum being submoniliform, with the joints nearly similar, clothed with hairs not shorter than their width; none of the joints are as wide as long. Mesonotum more shining than the head, with very feeble surface sculpture and traces of hardly visible punctures, scutellum polished; propodeum as in the female. Abdomen smooth and polished. Length 2 mm.

HAB. Tucson, Arizona: bred from nymphs of a *Jassid* found on a small bush (no. 2420) and probably the same species, with the legs paler generally, the posterior femora brown with black apices, was bred (no. 2461) and captured at Nogales. Mr. Koebele's note states that the host and probably the parasite from Nogales are the same as his Tucson specimens. The variation is considerable, and the description of the male and female is primarily based on two specimens bred from one individual of the hopper.

2. *Chelogynus melanacrias* sp. nov.

Black, mandibles (except the teeth) whitish, antennae clear testaceous on the basal joints, the four apical ones being black (at least above) one or two of those preceding these generally subinfusate. Legs concolorous with the basal antennal joints, even the coxae entirely pale, the tips of the tarsi and the apices of the hind femora black or dark fuscous, the apical part of the hind tibiae sometimes infusate.

Head dull, densely and minutely shagreened, the antennae with the second, third and fourth joints differing very little in length, the third being a little longer than the fourth, the fifth and following wider than the latter, the seventh rather longer than its greatest width. Pronotum somewhat transversely rugulose anteriorly,

the mesonotum less densely sculptured and less dull than the head, and with only very feeble sparse punctures; scutellum polished; propodeum rugose before the truncation, posteriorly dull, with very dense and fine close rugulosity and generally some fine transverse wrinkles, but without any defined area. Lamellate denticles of chelae much as in the preceding. Stigma blackish fuscous, otherwise the neurations pale, except the radius. Abdomen smooth and shining. Length 2-2.5 mm.

HAB. Nogales, Arizona; captured on weeds in September.

3. *Chelogynus lusus* sp. nov.

Black, the mandibles (except the teeth) whitish, the antennae except the apical joint concolorous and testaceous, legs concolorous with these, but the hind femora are to a large extent black or blackish (the base being paler) and the apical part of the hind tibiae is also dark.

Head dull, densely minutely shagreened and with sparse traces of obsolete punctures. Antennae formed much as in the preceding, the apical joint alone dark. Pronotum very densely sculptured like the head, and dull, and I cannot detect any trace of the transverse rugulosity observable in the two preceding species. Mesonotum dull with very fine surface sculpture, and a few nearly effaced punctures; scutellum polished; propodeum as in the preceding. Stigma blackish fuscous, radius also dark, otherwise the nervures are pallid. Chelae much as in the preceding. Abdomen smooth and shining. Length 2 mm.

HAB. Tucson, Arizona; bred from the same species of hopper and at the same time as *C. funestus*, of which it might be a sport, but the colour characters are very different and the sculpture also differs (no. 2420).

Anteon Jur.

The single species, which I refer to this genus, is congeneric with examples I have examined from Germany, having a similar structure of the chelae, and my *Prosanteon* from Australia is synonymous with it. In the European, Australian and American species the mouth-parts are as given by me in my characterization of *Prosanteon* in Bulletin I of this Station, and not as given by Ashmead in his Monograph of the Proctotrupidae and later writings. I consider the genus quite distinct from *Chelogynus* on account of the non-extensile chelae, the fourth tarsal joint being

short and articulated to the fifth much further from the apex of the latter.

Anteon arizonensis sp. nov.

Black, the mandibles (except the teeth) yellow, the antennae, except the subinfusate apical joint, and the legs, testaceous; the middle coxae have a basal dark spot, the hind ones are black except at the apex, the middle femora have a dark line beneath and the posterior ones are dark brown or pitchy except at the extreme base and apex; stigma blackish fuscous, the radius also dark, the rest of nervures pale yellow.

Head shining, closely subrugosely punctured, but sparsely punctate about the ocelli, the antennae with the second and fourth joints subequal, the third considerably longer than the latter, the seventh, eighth and ninth wider than this, and short, being not much longer than wide. Pronotum finely rugulose; the mesonotum polished, with a few punctures in front, the furrows very short; scutellum impunctate; propodeum rugose and bounded posteriorly by a raised line, posteriorly dull and shagreened towards the sides, the median area, defined by very fine raised lines, smoother and somewhat shining. Abdomen smooth and polished. Fifth tarsal joint with fine bristles beneath, those near the articulatory cavity longest, the other extremity of the joint having short spinose ones. Length 2.5 mm.

The male of this species is smaller, under 2 mm. long, black, with whitish mandibles, the front and middle tibiae and tarsi testaceous, the rest of the legs to a large extent blackish or sordid, the knee-joints of the hind legs noticeably pale. The antennae have the basal four joints black, after which they shade into testaceous, the apical joints being clear or almost so.

Head somewhat shining, with somewhat coarse and indefinite puncturation, vaguely channeled in front of the anterior ocellus; scape of antennae about equal to the two following joints together, the second ovate, but longer than wide, about as long as those following, which do not differ much in length, the whole being somewhat moniliform-filiform, the hairs somewhat curved and in general about as long as the width of the joints. Mesonotum shining, with punctures like those of the head, but much more sparse, scutellum and postscutellum polished and impunctate, propodeum closely rugose, posteriorly smoother hardly more than shagreened even at the sides, the median area being defined by very fine lines, but quite observable on careful inspection. Abdomen smooth and polished.

HAB. Nogales, Arizona; bred from a medium sized, rather scarce Jassid nymph, on willow (no. 2467). Mr. Koebele remarks that the parasite is hard to raise.

Aphelopus Dalm.

In a male specimen of this genus dissected by me the maxillary palpi are very long and five-jointed, the first four joints subequally elongate, the second much stouter than the third, the fifth nearly one and a half times the length of the preceding. I cannot detect any division of the long first-joint, such as forms the basal one in *Anteon* and other genera, and the labial palpi are only two-jointed, with the second one elongate-oval and much more developed than the first.

The larval sac of *Aphelopus* is easily distinguished from those of the other Dryinids by its elongate form, which resembles that of Emboleminae, and probably the genus would be better referred to that subfamily, which forms similar sacs on Orthoptera and has simple tarsi, if it be considered distinct from the Dryininae. A yellow Belytid also was bred from similar elongate sacs on Typhlocybines, sent over to me from Germany by Koebele. It is very curious that these small Typhlocybines can be as readily seized and parasitized by the non-chelate *Aphelopus* as by the rather imperfectly chelate *Chelogynus* or the perfectly chelate and highly evolved *Pachygonatopus*. Many Typhlocybine Jassids were found parasitized by *Aphelopus* in Germany by Koebele, but either the larvae died on the way to Honolulu or the climate of the islands proved fatal, for the cocoons yielded no mature insects. The latter are difficult to sex; in some examples, which are certainly males, the abdomen in dry specimens is so compressed as to be laminate; but this is, I believe, due to post mortem collapse of the abdomen. In others the females are similarly compressed. In one species, of which males and females were both bred, the face of the former is largely white, in the latter black, and in other two species, which from the antennae I judge to be males, the face is conspicuously ornamented with white. Ashmead, however, describes a species in which the white preponderates in the female sex, so that the sexes cannot be determined off-hand by the facial coloration.

Synopsis of species of *Aphelopus*.

- 1 (2) Head with the mandibles alone white.
 A. arizonicus (female)

- 2 (1) Head with white facial markings.
 3 (4) Clypeus alone white *A. microleucus*.
 4 (3) More than the clypeus white.
 5 (6) White facial markings extending a little above the antennae *A. viduus*.
 6 (5) White facial markings extending at least as far as the anterior ocellus, along the eye-margins.
 7 (8) Mesonotum entirely black *A. arizonicus* (male)
 8 (7) Mesonotum white externally to the parapsidal furrows *A. pulcherrimus*

1. *Aphelopus arizonicus* sp. nov.

Black, the mandibles except the teeth pale yellow, the basal two joints of the antennae yellow or yellowish brown; front and middle legs except the apices of the tarsi, the hind coxae, trochanters, and basal joint of tarsus, testaceous; the hind femora and tibiae black or pitchy; stigma blackish fuscous, the radius curved.

Head and mesonotum dull, densely minutely shagreened, the parapsidal furrows of the latter distinct, strongly convergent posteriorly, visible behind the middle of the mesonotum, but not reaching the posterior margin. Antennae subclavate, the 3rd, 4th and 5th joints slender, elongate and subequal, the seventh, eighth and ninth much wider than these, but none of them as wide as long, apical joint one and a half times the length of the preceding; scutellum decidedly more shining than the mesonotum; propodeum finely reticulately rugose, posteriorly with a large smoother and shining area defined by raised lines. Abdomen smooth and shining. Length 2 mm.

Male like the female in sculpture, but the two basal joints of the antennae are darker brown, the face below is yellow, with the yellow colour continued upwards along the inner orbits to the height of the anterior ocellus, the legs, except the tips of the tarsi, are entirely clear testaceous; the stigma is pallid brown, with darker margin. Antennae more elongate and less noticeably subclavate, the eighth and ninth joints short, hardly twice as long as wide, and shorter than the fourth and fifth. Propodeum not shining posteriorly.

HAB. Nogales, Arizona; bred from a species of *Dikraneura*? (no. 2454).

2. *Aphelopus viduus* sp. nov.

Male, black, the lower part of the face and the mandibles, except the teeth, pale yellow or cream-coloured, this colouring reaching about half way from the mandibles to the anterior ocellus and not being noticeably carried upwards along the inner orbits. Front and middle legs pale yellow, the tarsi for the most part infuscate, the hind femora tibiae and tarsi pitchy.

Head and mesonotum dull, densely shagreened and the latter with the parapsidal furrows distinct and like those of *A. arizonicus*. Antennae long, slender and filiform, the first two joints dark brown or pitchy, but with the extreme base of the scape yellow, third joint rather shorter than the fourth, which is shorter than the fifth, seventh and eighth almost equal, slender, longer than the fourth or fifth and more than twice as long as wide, tenth joint very slender and elongate. Scutellum, at least posteriorly, and the postscutellum smoother than the mesonotum, the propodeum reticulately rugose, a posterior area being defined by raised lines and smoother. Abdomen smooth and shining, stigma dark brown. Length about 2 mm.

HAB. Nogales, Arizona; collected on weeds in September.

3. *Aphelopus pulcherrimus* sp. nov.

Black, the whole face creamy white, this colour reaching almost to the anterior ocellus and at the sides is continued upwards as far as the posterior ocelli along the orbits, the outer orbits being also of the same colour; scape of antennae and all the legs whitish or pale yellow; also the whole of the mesonotum is cream-coloured exteriorly to the parapsidal furrows, and likewise the whole thorax beneath and the pleural portion. Antennae, except the scape, testaceous; wings with brown stigma.

Head and thorax sculptured as in the two preceding species, posterior area of metanotum dull, minutely shagreened. Antennae with the second and third joints shortish, not differing much in length, but the fourth is rather longer than the third, and subequal to the fifth. Abdomen smooth and shining. Length 1.5 mm.

Owing to their delicate nature the antennal joints have more or less collapsed and I cannot exactly make out the true shape of some of them, nor am I certain of the sex of the single example.

HAB. Nogales, Arizona; bred from a species of *Typhlocyba* (*Zygina*) no. 2455.

4. *Aphelopus microleucus* sp. nov.

Male, black, the clypeus and mandibles (except the red teeth) white, the two basal joints of the antennae dark brown or pitchy, all the coxae and trochanters pale yellowish-white or white, the front legs testaceous, but the femora are somewhat sordid and the tarsi except the basal joint infusate; middle legs (except as above noted) still more darkly sordid and the hind legs almost black; stigma blackish fuscous.

Sculpture of head and mesonotum as in all the preceding, but the parapsidal furrows are effaced; propodeum reticulately rugose, this sculpture extending on to its posterior face also, where, however, there is a small smoother area. Antennae simple, filiform, first three joints subequal, shortish, not much longer than wide, the third on its wide face subtriangular, fourth and following nearly parallel-sided, the fifth, sixth, seventh subequal and longer and more slender than the fourth; seventh and eighth twice as long as wide, or more. Abdomen smooth and shining. Length under 2 mm.

HAB. Nogales, Arizona; bred from a species of *Typhlocyba* (*Zygina*) no. 2456.

ENCYRTIDAE.

A remarkable Encyrtid was bred from larvae feeding internally in the body of a Jassid (*Oucometopia lateralis*) several parasites emerging from the host, which after their emergence lived for a week.

Following Ashmead's classification this species belongs to the tribe Encyrtini and I have felt some doubts whether it might not be referred to Mayr's genus *Prionomastix*, but the frons is so very wide that I have been obliged to consider it as a new one, and it is quite possible that in reality it is not at all allied to the other, which is unknown to me.

Thysanomastix gen. nov.

Head strongly concave behind, the ocelli in a triangle with very wide base, but though so widely separated, the posterior ones are as far removed from the eye-margins as from one another, the frons being very broad. Head in front view widely subtriangular, strongly convex, the antennae inserted high up near the middle, the space between the eye and base of mandible about as long as

the eye, the labrum exposed, the clypeus not defined, there being only an impression or fovea on each side just above the labrum. Mandibles truncate, one of the apical angles being more acute than the other, which is followed by minute microscopic indentation, but there are no true teeth, and the edge under high powers of the microscope is very finely serrulate. Antennae elongate, the scape long, clavate, extending above the vertex by about half its whole length, which is equal to that of the following two or three joints, the pedicel subtriangular about equal to the second joint of funicle, the first funicle joint very long, about five times as long as wide, and with the second clothed on one side with conspicuous erect hairs, which are curved and dilated apically, with acute tips; rest of antennae with inconspicuous subappressed hairs, the third to the sixth joints of the funicle not differing much in length, being barely one-third as long as the first, but wider than this, club not evidently segmented, rather small, subequal to the three preceding joints only. Thorax with the acute tips of the axillae meeting inwardly, the scutellum very convex, compressed, so as to be obscurely carinate in the middle, the propodeum sparsely pilose at the sides. Wings with dark markings, the venation very difficult to see in part, but the marginal vein is short, the stigmal moderately long, very oblique (i. e. more longitudinal than transverse), the postmarginal as long as the stigmal or a little longer. Hind tibiae apparently with no trace of a second spur, the calcar of the middle legs not so long as the first tarsal joint. Ovipositor not prominent.

Thysanomastix koebelei sp. nov.

Dark brown, inclining to black in parts, antennae except the scape black or nearly so, abdomen also very dark or black, with the faintest trace of metallic tinge in some aspects; the insect generally being not at all metallic.

Head somewhat shining, there being a microscopic surface sculpture and some very feeble fine punctures, most noticeable on the front, about the eyes. Mesonotum slightly shining, clothed with short pale hairs, and having a feeble indefinite puncturation; scutellum with sparse longish hairs at the apex, where it extends over the propodeum, which is smooth and shining on the convex, or somewhat protuberant, sides. Wings mostly hairless on about the basal half; two-thirds from the base of this lvaline portion apically is a narrow transverse dark bar, densely hairy, extending from the submarginal vein, but not touching the costa, nor reach-

ing the opposite margin; apical portion of wing hairy and largely occupied by a large blackish fuscous cloud, the stigmal, marginal and postmarginal veins still blacker, but the postmarginal appears to extend a little beyond this black area. Abdomen as long as the thorax, but much smaller in bulk, shining, depressed above, as is usual in dead Encyrtids, this being a usual post mortem change. Length 1.5 mm.

HAB. Nogales, Arizona; bred, no. 2444.

Saronotum Perk.

This hyperparasite was bred (no. 2448b) from the cocoon of *Neogonatopus mimus* and appears to be almost or quite identical with the Australian form. I am therefore inclined to think that *Saronotum americanum* and *S. australiae* are one species, my original example of the former being merely a variation of the latter. Mr. Koebele captured what might be the male of *Saronotum*. It has longer antennae and only rudimentary wings and differs in other characters, such as are probably only sexual. Other instances of Chalcids that are parasitic on other Hymenoptera having flightless males and fully winged females are known to me, but I should hesitate to describe the specimen in question as a male of *Saronotum* without further evidence.

EULOPHIDAE.

When in Australia, the possibility of the Tetrastichine, *Ootetrastichus beatus*, being hyperparasitic at once suggested itself to us, but the idea was discarded. Later on, breeding of the species in confinement for several generations made it appear certain that it was a primary egg-parasite, and not bred at the expense of the Mymarids. Subsequently Dr. L. O. Howard called my attention to the fact that theoretically it ought to be a hyperparasite. Ashmead has recently described certain Tetrastichines as being parasitic on Mymaridae, but without valid proof of the relationship. Accordingly I carried out some further experiments with *Ootetrastichus beatus*, raising cane-plants indoors in covered glass jars, then introducing leaf-hoppers and finally specimens of the parasite. In the two jars employed, every leaf-hopper egg that was laid in the leaves was destroyed by the *Ootetrastichus*. When young the larva lives within one of the hopper's eggs, like a Mymarid, but later on emerges and destroys the other eggs in the egg-chamber; then usually bores a gallery for some length

in the midrib of the leaf, and pupates at the end of this. Whether the Chalcid would spare or pass by eggs parasitized by the Mymarids is uncertain, but it certainly readily destroys unparasitized eggs of the leaf-hopper.

TRICHOGRAMMIDÆ.

Trichogramma helocharae sp. nov.

Yellow, or in life more or less green; head with a black transverse line on the occiput; thorax with slight dark markings, the chief of these in dorsal aspect of the insect being a marginal line on each side in front of the tegulae, a spot on each side just behind them, the front and hind suture of the scutellum more or less, and a spot at the hind angles of the propodeum. The pleura are considerably more infuscate or blackish-marked than the dorsum. Abdominal segments with a dark latero-marginal line more or less distinct. Wings with the marginal vein infuscate and a dark spot (including the stigmal vein) extends from it about half across the wing. Four or five of the hair lines are more distinct than others, those between the more distinct ones being mostly somewhat confused and indefinite, or only short.

Antennae with the scape about equal to the pedicel and funicle together, the pedicel twice as long as the two funicle joints together, the first of the latter longer than the second and sometimes showing signs of transverse division near the base, as if to form a second ring-joint, club longer than the pedicel, ring-joint and funicle joints together. Length .6 mm.

HAB. Alameda, California, and elsewhere in that state; bred from eggs of *Helochara communis*, no. 2440.

STYLOPIDÆ (Coleoptera)

In Arizona at Nogales Koebele bred males of *Halictophagus* from three species of leaf-hoppers, of which two belong to the Jassidae and one to the Delphacidae. The parasites themselves are very closely allied to and greatly resemble the Australian (and ? Vitian) *Halictophagus schwarzi*, but can be distinguished by the characters of the genital segments, though these are quite similar in general plan to those of the Australian species. I may note that this is the first time *Halictophagus* has been bred from a Delphacid, the common parasite of which is *Elenchus*. I should add also that since my former paper on the Stylopidae was writ-

ten, I have found the latter genus to freely attack arboreal Delphacids as well as the graminivorous species. The species found most numerously stylotized in Arizona was *Oncometopia lateralis* in the nymphal stages (no. 2445); the second Jassid affected by *Halictophagus* was *Ceratagallia bigeloviae* no. 2522; the Delphacid that yielded the parasite is a species of *Stobacra* no. 2525.

EPIPYROPIDAE (Lepidoptera)

Mr. Koebele found *Epipyrops barberiana* Dyar very commonly in Arizona affecting Issine, Amphiscepine, and Poecilopterine leaf-hoppers. This species differs very greatly in neuration from the Australian forms, though like them superficially. In the hind wings, veins 1a, 1b and 1c are well developed and veins 2-8 are all present. In the Australian genera one of the veins 2-8 is always absent and of these forms only *Palacopsycha* has all the veins from 1-12 in the forewings. The cocoon of this moth is very similar to those of some Australian species, and has similar erect processes or lamellae on the dorsum, these processes being variable in number or form, as in the others.

PIPUNCULIDAE (Diptera)

In Arizona at Nogales a parasitized Jassid (no. 2469) was found, from which a *Pipunculus* larva emerged and pupated on the twenty-ninth of September and yielded the fly on the twenty-ninth of October. It is a large species, quite resembling the Australian species of Div. I (Bull. I. p. 130) in all characters, except that the third antennal joint is hardly perceptibly produced at the apex, though somewhat pointed there. A second species of *Pipunculus* (female) quite distinct from this and belonging to my Section II of the Australian species was bred from *Amphiscyfa bivittata*, no. 2447. It differs from any of these in having the third antennal joint only slightly produced at the apex, though acute. Koebele also procured other puparia of Pipunculidae, but from these no flies have emerged. In my introductory remarks, I have already recorded the breeding in Honolulu of the European *Terrallia aucta* and *villosa* from German puparia, as well as species of *Pipunculus*, all from Jassids. Koebele found the latter very common in meadows in Germany and many species were obtained.

HEMIPTERA HOMOPTERA.

BY G. W. KIRKALDY.

The few Hemiptera discussed in the following pages were collected merely on account of their being the hosts of certain parasites and were indeed not always in the best condition for describing, being parasitized by Dryinidae, and often dried up.

The thirteen specimens belong to twelve species, eleven genera, and five families. Two genera and seven species are apparently new to science.

The species are as follows:

- 1 *Gypona ramosa* sp. nov.
- 2 *Oncometopia lateralis* (Fabr.)
- 3 *Ceratagallia bigeloviae* (Baker)
- 4 *Poblicia thanatophana* sp. nov.
- 5 *Scolops cockerelli* (Fowler)
- 6 *Oliarus pima* sp. nov.
- 7 *Cochise apacheanus* g. and sp. nov.
- 8 *Amphiscepa bivittata* (Say)
- 9 *A. immaculata* sp. nov.
- 10 *Bruchomorpha mormo* sp. nov.
- 11 *Picumna ovatipennis* (Walker) ?
- 12 *Mistharnophantia sonorana* g. and sp. nov.

TETIGONIIDAE.

Gypona Germar.1. *ramosa* sp. nov.

Allied to *G. marmorata* Fowler, as regards the position of the ocelli, the condition of the head and tegmina, &c.

Pale green, or greenish-testaceous; vertex with a short, narrow, longitudinal, brownish-yellow line on each side from the ocelli almost to the apical margin. Ocelli brownish-yellow. Pronotum with a transverse, sinuate pale fuscous line, also a blackish dot in the middle on each side below the eyes. Tegmina greenish testaceous, subhyaline, reticulate, all the areas ramose; veins green, margined narrowly with yellowish-testaceous; outer margin yellowish-testaceous, apical margin from apex of clavus to a corresponding point on the opposite side, very narrowly blackish.

Vertex transverse, produced nearly as far in front of the eyes in the middle as its basal length, subangulate, a little shorter than the pronotum, longitudinally sulcate in the middle. Ocelli placed in the middle of the vertex, about as far from the eyes as from one another. Head in profile, acute anteriorly and sublaminate. Tegmina apically acute, without appendix.

Female: ultimate segment somewhat deeply bisinuate, the central projection also notched.

Length $8\frac{1}{8}$ mill.

HAB. Arizona, Nogales; (Koebele's no. 2466).

The only specimen before me is carded, but the metapleura appear to be lobately ampliate (not at all in the same plane as the subventral pleurites), a character I do not find mentioned in descriptions of the genus.

Oncometopia Stal.

1. *lateralis* (Fabr.).

O. lateralis (Fabr.) Ball 1902 P. Iowa Ac. VIII, 45.

This species is distributed "from the Mackenzie River and Nova Scotia south throughout the whole continent, and to northern South America at least."

HAB. Arizona, Nogales (Koebele's no. 2445, August).

Ceratagallia Kirkaldy.

1 *bigeloviae* (Baker).

Agallia bigeloviae Baker, 1896 Psyche VII, suppl. 26.

A. bigelovia Osborn & Ball, 1898 Proc. Davenport Ac. Sci. VII, 62.

Previously described from New Mexico, Mexico and California baja. The single specimen is distorted by parasitization, but I think the determination is correct.

HAB. Arizona, Nogales; (Koebele's no. 2457).

FULGORIDAE.

Poblicia Stal.

1 *thanatophana* sp. nov.

Allied to *P. pallidoconspersa* Distant, but the head is partly pale and the tegmina are colored and conspersed differently.

Black; apical margin of vertex and basal margin of frons, testaceous. Sterna and legs minutely speckled with white, the latter with a few larger white spots, also the bases of the lateral spines on the tibiae. Subcostal cell and apical third of tegmina with numerous (mostly transverse) minute hyaline spots. Wings apically hyaline, veins blackish, apical margin narrowly smoky, basal third opaque black, base pale blue. Abdomen laterally, and above (except basally), red, the pleurites spotted with black.

Length 14 mill. to apex of tegmina, closed.

HAB. Arizona, Nogales; (Koebele's no. 2519).

Scolops Schaum

Scolops Schaum 1850 Ersch. & Grub., Cycl., Art. Fulg.

Ornithissus Fowler 1904 B. C. A., Hom. II, 114.

Fowler has redescribed *Scolops* and wrongly placed it in the Issidae.

1 *cockerelli* (Fowler).

Ornithissus cockerelli Fowler op. c., 122, Pl. 12, f. 14.

Previously recorded from Juarez on the northern frontier of Mexico. Fowler has omitted mention of the fuscous marks on the tegmina, but figures some.

HAB. Arizona, Nogales; (Koebele's no. 2487 Sept.).

Oliarus Stal.

1 *pima* sp. nov.

Blackish, keels of head and pronotum more or less ferruginous. Pronotum (except laterally), tegulae, antennae, the lateral extension apicalwards of the frons, etc., ferruginotestaceous. Tegmina hyaline, veins dark-brown, closely and minutely studded with blackish granules, some of which bear black hairs; subcostal vein ferruginotestaceous, narrowly bordered within with black; stigma black, whitish basally; there is a black spot, or rather suffusion, at the first forking of the brachial vein, and there is some brownish suffusion on parts of the apical third, both of cells and veins. Penultimate segment of rostrum, tibiae and tarsi, posterior margin of sternites, etc., dark ferruginous.

Vertex longer than wide, feebly carinate medianly, scarcely extending in front of the eyes; lateral margins forking at about three-fourths of the length of the eyes, the inner forks connected

with frons by short longitudinal keels before meeting, the fosses thus being pyriform, rather large, and partly visible dorsally. The frons is much shorter than the clypeus medianly, but is produced laterally nearly as far apically as the middle length of the frons, the apical margin thus being deeply emarginate apically in a rounded manner. Axillary vein of clavus, taken from its curving at the commissure, about three-fourths of the length of the stalk of the anal, running into the anal, basal of the middle of the latter. Brachial vein forked distinctly nearer the base than is the radial. Stigma narrow, elongate triangular. First and second segments of hind tarsi each with 5 uneven, rather large spines.

Length 8 mill.

HAB. Arizona, Nogales; (Koebele's no. 2518 Sept.).

Fam. ASIRACIDAE.

Cochise gen. nov.

Vertex very transverse, keels obsolescent, impressed transversely on the basal margin, about one-fifth wider than an eye; with the eyes very distinctly wider than the pronotum. Frons medianly impressed transversely by a deep line, the basal part with 2 widely separated keels (a puncture between them in the middle), uniting on the middle of the apical part, which narrows concavely towards the apex, where it is truncate. Genae almost obsolete. Antennae arising almost at the exterior apical ocular angle, flattened and carinately foliaceous, one-third longer than the maximum width of the frons, first segment wider apically than basally, second five-eighths longer than the first. Clypeus rather swollen, carinate medianly. Pronotum scarcely longer medianly than the head, hind margin obtuse-angularly emarginate, median keel entire, a puncture on each side; lateral keels distant apically and basally, arising anteriorly at the interior margin of the eye, curving at an acute angle near the hind margin to meet the eye again, enclosing a puncture. Scutellum with the lateral keels obsolescent. Legs simple. Tegmina with the radial forked a trifle nearer the base than is the brachial; 7 apical cells; the second and third apical veins have a common base, the third reforking near the apex. Hind tibiae with a small spine near the base, four uneven, large spines at the apex; the spur large and broad, three-sided, each side flat not foliaceous, there are a number of very minute spines, scarcely visible, on one edge. The

first segment of the hind tarsi is longer than the others together and has about 6 spines.

I *apacheanus* sp. nov.

Yellowish, browner on the frons. Clypeus and longitudinal lines on the fore and middle legs dark fuscous, hind legs testaceous. Metanotum and tergites subsanguineous. Tegmina hyaline testaceous, veins and granules concolorous; an elongate spot at apex of clavus, the inner margin broadly of apical third of tegmen, curving around to apex and a long suffused smudge on second apical vein, dark fuscous, but although the veins on these suffused parts are fuscous, the granules remain testaceous.

Pygophor long and narrow, lateral margins parallel.

Length 5 mill.

HAB. Arizona, Nogales; (Koebele's no. 2478).

Unfortunately only a single female, in bad condition owing to parasitization, of this interesting form. It is allied to *Perkinsiella* Kirkaldy and *Aracopus* Spinola, but is very different from anything hitherto described.

ISSIDAE.

Bruchomorpha Newman.

I *mormo* sp. nov.

Black, partly with a brassy gleam. Legs yellowish, coxae and femora partly at least suffused with blackish. Vertex sublinear. Frons not very long, not extending outwards farther than the abdomen, in profile. Head nearly one-half higher than its width at the base between the eyes; sublateral keels of frons enclosing an oval, curved but not sinuate laterally. Punctuation much as in *B. oculata* Newman (probably generic). Tegmina formed much as in the latter species, or a trifle shorter, truncate apically, venation almost obsolete.

Length (female) 3 mill.

HAB. Arizona, Nogales; (Koebele's no. 2483).

The coloring agrees with the laconic description of *B. nasuta* Stal, but the frons is apparently much shorter.

Picumna Stal.

1 ? *ovatifennis* (Walker).

? *P. ovatifennis* (Walker) Fowler 1905 B. C. A. Hom. II 123, Pl. XII. f. 29.

A single male may be this, but seems to have a longer vertex and scutellum. Fowler gives no structural details and has confused at least two species, for his var. (f. 30) is certainly not conspecific.

HAB. Arizona, Nogales; (Koebele's no. 2524);

Amphiscepa Germar.

Melichar, in his monograph, does not clearly differentiate between this and *Acanalonia* Spinola, which I believe to be synonymous.

1 *bivittata* (Say).

HAB. Arizona, Nogales; (Koebele, Sept.). Widely distributed from Canada to Mexico.

2 *immaculata* sp. nov.

Brownish-yellow, tegmina and legs greenish, wings milkwhite with fuscous veins. Head dorsally twice as broad as long, gently rounded anteriorly, the vertex sublinear, separated from the frons by a transverse keel. Frons apically subrectangularly (a little acutely) emarginate, not nearly so deeply, however, as in *A. bivittata*. No median keel on the frons, lateral margins acutely keeled, fairly straight for over half the length. Scutellum with 2 sublateral keels, but no trace of a middle one. Costal margin of tegmina arched.

Length $6\frac{1}{2}$ mill.

HAB. Arizona, Nogales; (Koebele).

Distinguished from any other "*Amphiscepa*" by the absence of stripes or spots, and from any "*Acanalonia*" by the short head and absence of a middle keel.

*POEKILLOPTERIDAE.**Mistharnophantia* gen. nov.

Vertex transverse, about as wide as the eyes together, subtruncate apically, carinate in the middle, lateral margins sub-

parallel, scarcely extending before the eyes. Frons medianly keeled, and (with the exception of narrow, laterally rounded, lateral margins which are a continuation of the lateral margins of the vertex) raised, sloping flatly backwards and upwards, a part of the base, nearly as long as the vertex, being visible dorsally in front of the latter. This dorsal part of the frons is semicircular and impressed entirely within the margins, and, as implied above, is narrower than the vertex. Antennae small. Pronotum transverse, wider and a little shorter than the head, roundly arched anteriorly, slightly emarginate posteriorly. Scutellum bicarinate. Tegmina strongly decumbent, medianly convex, reaching posteriorly much farther than the abdomen. Costal cell broad, with cross veins; the radial and median springing from a common, short stalk, close to the brachial, but soon forking, the radial almost immediately reforking. The venation is rather obscure and ill-defined in places. There is no proper subapical line. The costal vein runs almost at right angles to the body, then curves roundly to form the apical margin, almost at right angles again, meeting the commissure at, apparently, a very acute angle. Wings rudimentary (?). Hind tibiae with one spine.

I *sonorana* sp. nov.

Brownish testaceous; a broad, dark fuscous stripe running from apex of head (dorsally) to hind margin of scutellum. Tegmina opaque, coriaceous, pale brownish yellow, veins partly concolorous, partly dark fuscous.

Length about $3\frac{7}{8}$ mill.

HAB. Arizona, Nogales; (Koebele's no. 2498).

Only one specimen in bad condition, unfortunately, of this curious form; it is parasitized.

It is very Issine in appearance, but the granulation of the clavus and the structure of the head proclaim it to be Poekillopterine. It is probably allied to *Hypancyus* Fowler, which that author places, apparently incorrectly, in the Issinae.

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On Some New Species of Leaf-Hopper
(Perkinsiella) on Sugar Cane.

BY F. MUIR

HONOLULU, HAWAII.
DECEMBER 16, 1910.

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LETTER OF TRANSMITTAL.

To the Experiment Station Committee of the
Hawaiian Sugar Planters' Association,
Honolulu, Hawaii.

Dear Sirs: I herewith submit for publication, as Bulletin No. 9 of the Entomological Series, a paper prepared by Mr. F. Muir, entitled: "On Some New Species of Leaf-Hopper (*Perkinsiella*) on Sugar Cane."

Yours very truly,

C. F. ECKART,

Director.

Honolulu, Hawaii, October 19, 1910.

ON SOME NEW SPECIES OF LEAF-HOPPER (PERKINSIELLA) ON SUGAR CANE.

PERKINSIELLA Kirkaldy.

This genus was erected by Kirkaldy for *saccharicida* in 1903. It differs from *Dicranotropis* in the first joint of antennae being broader at the apex than at the base and both joints somewhat flattened, not cylindrical, also in the presence of two spines on ventral margin of pygophor. The genus is particularly attached to sugar cane (*Saccharum officinarum*), only occasionally going on to other grasses. The thirteen known species are distributed in the following manner:—

New Guinea 6, Amboina 3, Ceram 1, Java 4, Borneo 3, Australia 2, Fiji 2, Hawaiian Islands 1 (introduced), China 1.

From this it appears that it is a Malayan genus with its center in New Guinea. Considering the amount of sugar cane taken from island to island in native boats, it is surprising that some of these species have such a restricted range.

The males are best distinguished by the genitalia, otherwise the species may be separated as follows:

1. Frons concolorous. 2
Frons darker between eyes than below. 5
2. Vertex, pronotum, and scutellum lighter than frons and clypeus. *fuscifrons*
Vertex, pronotum, and scutellum not lighter than frons and clypeus. 3
3. Veins on tegmina apparently white, sparsely granulated. *vastatrix*
Veins on tegmina apparently dark, closely granulated. 4
4. Median, radial, and cubital cells clear; longitudinal markings on femora very faint. *amboinensis*
Median, radial, and cubital cells dark; longitudinal markings on femora plainer. *lalokensis*

5. Spur on hind leg same color as tibia.	6	
Spur on hind leg darker than tibia.	9	
6. Tegmina divided into two longitudinal parts by the median, 5th cubital, and all cells posterior to them (including clavus) being dark; all anterior clear.		<i>bicoloris</i>
Tegmina not so colored.	7	
7. Pattern on tegmina formed by brown and yellow on clear cells.		<i>variegata</i>
Pattern on tegmina formed by brown on clear cells (no yellow)	8	
8. Pattern on tegmina on 5 and 6 apical cells, granules on veins pallid and fine.		<i>saccharicida</i>
Pattern on tegmina on 6 and at each end of 5 apical cells, making curved pattern; granules on veins dark and coarse.		<i>sinensis</i>
9. Scutellum concolorous.	10	
Lateral parts of scutellum darker than middle.	11	
10. Tegmina almost immaculate, some of apical veins lightly infuscate; granules inconspicuous and very sparse.		<i>vitiensis</i>
Tegmina with granulation darker and coarser (all females brachypterous).		<i>graminicida</i>
11. Antennae concolorous, dark.		<i>papnensis</i>
Antennae not concolorous.	12	
12. Head and thorax light, veins on tegmina sparsely and finely granulated.		<i>pallidula</i>
Head and thorax dark, granules on tegminal veins closer and coarser.		<i>rattlei</i>

1. *saccharicida* Kirkaldy, 1903, Entom. XXXVI., 179.

I have one male specimen from Viti Levu, Fiji, probably imported from Queensland with cane. It is possible that New Guinea species will eventually be recorded from the same locality, as much sugar cane has been imported direct from that locality.

2. *vitiensis* Kirkaldy, 1906, Bull. H. S. P. A. Ent. I, 406.

3. *graminicida* Kirkaldy, 1906, Bull. H. S. P. A. Ent. I., 406.

4. *sinensis* Kirkaldy, 1907, Bull. H. S. P. A. Ent. III., 138.

I have one macropterous female specimen from Telok Ayer, West Borneo, that agrees with the Chinese males, except that the dark mark runs down apical cell 6 instead of 5.

5. *pallidula* sp. nov.

Female macropterous. Antennae, frons between eyes, clypeus, lateral edges of pronotum, and scutellum, light brown; frons below eyes, vertex, pronotum, and scutellum between lateral keels, and rest of thorax and legs yellowish. Pleural spot very faint. Anterior and intermediate tarsi, band on anterior and intermediate femora, and spur, blackish. Abdomen, yellowish. Tegmina, hyaline; clavus, light brown; dorsum, white with dark spot before end of anal vein; dark brown at base and near apex of 5, and greater part of 6 and 7 apical cells, leaving a light spot near apex of these cells; veins, light, sparsely studded with brown granules. Length of female 3 mm, 4 mm.*

Habitat, Pontianak, Borneo, on sugar cane. This comes near to *P. sinensis*, but I have specified it, as it is much more uniform and light in color. The presence of a dark band on the femora, and not longitudinal marks, and the black spur distinguish it. The granules on veins are less distinct than in *sinensis*, but more so than in *saccharicida*.

6. *rattlei* sp. nov. (Fig. 1.)

*First measurement front of vertex to end of abdomen, second measurement to end of tegmina.

Male macropterous. Head, antennae, and thorax, brown; frons between eyes, clypeus, lateral edges, pronotum, scutellum, and distal part first antennal joint, darker; keels and spots on frons, lighter. Anterior and intermediate tarsi, band on tibiae and spur, dark; also longitudinal marks on femora, pleural spot, plain. Dorsum, inner margin or edge of clavus, abdomen, black with brown markings along sides. Tegmina, hyaline, suffused with light brown. Radial and median cells, dark brown, running into central part of subcostal cell. Apical cells 2 to 8, dark brown with light spots in 2 to 4 and 6 to 7, also in radial and median. Veins closely granulated. Anal tube with claw-like, curved spine; genital styles, large antler-like, reaching beyond middle of pygophor, basal part thick and slightly concave, with small protuberance in middle, distal part flattish provided with blunt prong on outer side and apex drawn out into two flat prongs. Ventral spines, thin, smooth, cone-shaped, curved, touching in center, but not at base or tips.

Female macropterous, somewhat lighter in color than male, especially the abdomen. Dark marks on tegmina confined to along the apical veins, especially the distal part, and along base of 5 to 6 apical cells. Length, female, 4.5 mm, 6 mm; male broken.

Habitat, Laloki River, British New Guinea, on sugar cane.

This species comes near to *lalokensis* and *amboinensis*, but the light frons below the eyes makes it easy to distinguish.

7. bicoloris sp. nov.

Female macropterous. Antennae, frons between eyes, clypeus, lateral margins of pronotum, and scutellum, piceous brown, with light spots on frons; frons between eyes and apex of clypeus, white, with dark sub-apical line across former; vertex and pronotum and scutellum between lateral keels, yellowish. Legs, light; posterior and intermediate tarsi and band on tibiae, piceous, with longitudinal markings on femora. Pleural dark spot, plain. Abdomen, dark, marked with light brown. Tegmina, hyaline; dark on clavus; median, discoidal and 5 to 6 apical cells, dark along 1 to 4 apical veins. Veins finely granulate. Only females taken, length 3 mm, 5 mm.

Habitat, Laloki River, British New Guinea, on sugar cane.

8. *variegata* sp. nov. (Fig. 2.)

Male macropterous. Vertex, pronotum, and scutellum, yellowish brown, broadly whitish along keels; antennae, frons between eyes, and clypeus brown, former with light spots; frons below eyes and apex of clypeus, white. Legs, white; anterior and intermediate tarsi and band on tibia, dark; dark longitudinal mark on femora; spur, light. Pleural spot, small. Abdomen, piceous, marked with brown. Tegmina, hyaline; yellowish between dorsum and axillary veins and across distal part of subcostal cell; between anal and axillary veins, basal half of median and spreading into radial, 5 to 8 apical cells, also along apical vein 2 to 4, dark brown; white spot at edge of 5 to 7 and across middle of 5 apical cells. Veins, light, granules exceedingly fine and sparse. Anal spines curved, pointing distally. Genital styles large, reaching past middle of pygophor, horn-shaped and twisted, without any lateral prongs. Ventral spines large, reaching about to middle of pygophor, sub-cylindrical and rounded at ends, swollen about middle, from which point they divaricate. The pattern on wings and large ventral spines distinguishes this species.

Female macropterous, similar to male, except the abdomen, which is lighter. Length: male 2.5 mm, 4 mm; female, 3.5 mm, 5 mm.

Habitat, Laloki River, British New Guinea, on sugar cane.

9. *papuensis* sp. nov.

Female macropterous. Antennae, frons between eyes, clypeus, lateral edges of pronotum and scutellum, black, with light spots on frons between eyes; frons below eyes and apex of clypeus, white; sub-apical dark marks between keels on frons; vertex, pronotum, and scutellum, yellowish between white keels. Legs, whitish; anterior and intermediate tarsi, band on tibiae, and spur, black; dark longitudinal marks on femora. Large black pleural spot. Abdomen, black. Tegmina, hyaline, suffused with brown on clavus; dorsum, white; black dot at end of anal vein; apical cells 5 to 8, and running into discoidal and median cells, dark brown, also along apical veins 1 to 4; white spot at apex of 5 to 8, and center of 5, apical. Veins, thickly studded with dark granules.

This is a very distinctly contrasted species represented only by a female. Length, 3.5 mm, 6mm.

Habitat, Laloki River, British New Guinea, on sugar cane.

10. *vastatrix* (Breddin).

I have specimens of both sexes of this species from Java, West Borneo, Amboina, Piroe (Ceram), and Laloki River (British New Guinea). There is a distinct darkening of the wing pattern as we pass eastward.

The spine on anal tube is bifurcate.

11. *lalokensis* sp. nov. (Fig. 3.)

Males macropterous. Head, antennae, thorax, and legs, brown, with small lighter spots on frons. Apex of first antennal joint, black. Lateral margins of pronotum and scutellum, dark. Large, black pleural spot. Anterior and intermediate tarsi, and apex of tibiae, banded with black. Tegmina, hyaline, suffused with brown. Dorsum, white to end of clavus; black spot on apex of anal vein. Apical cells 4 to 8, and along apical veins 1 to 3, dark brown, continuing into distal part of radial, median, and inner discoidal cells; light spot in distal cells 6 to 8. Veins, dark, finely granulated. Anal tube large, with a pair of straight, somewhat bulbous spines reaching beyond middle of pygophor. Genital styles, broad, flat-tish, distal end cut off square, outer edge giving out blunt prong half way down and inner edge small blunt knob. Ventral spines, thin, touching from base to tip.

Female dimorphic, macropterous forms similar to male, excepting abdomen which is lighter; brachypterous forms lighter with the spot at apex of anal vein and a spot at end of radial cell. Length, males 3 mm, 5 mm; females, 5 mm, 6 mm; brachypterous females 4.5 mm, 4 mm.

Habitat, Laloki River, British New Guinea, on sugar cane.

12. *amboinensis* sp. nov. (Figs. 4 and 5.)

Males macropterous, markings on head and thorax similar to *lalokensis*, but lighter, especially the legs. Tegmina, brownish hyaline. Apical cells 4 to 7 and base of 3 dark, also along apical

veins 2 to 3, light spot in apical cells 4 to 7. Dorsum, whitish to end of clavus, spot at end of anal vein, faint. Veins, dark, finely granulated.

Pygophor approaching *lalokensis*, anal tube with a pair of curved, claw-like spines pointing distally. Genital styles, broad, flattish; distal end and prong on outer edge less square than in *lalokensis*. Ventral spines, thin, diverging near apex.

Female macropterous; tegmina often slightly darker than male; light spot in apical cell 4 sometimes missing. Length, male, 3 mm, 4.5 mm; female, 4 mm, 6 mm.

Habitat, Island of Amboina, on sugar cane.

13. *fuscifrons* sp. nov.

Pronotum and scutellum, light brown, darker on lateral edges, keels whitish. Vertex and frons, brown, slightly lighter between eyes than below; keels, small spots on frons, and a line across apex, whitish; clypeus darker than frons. Front and intermediate tarsi and bands on tibiae, dark; femora, dark. Black pleural spot. Tegmina, hyaline, yellowish between axillary vein and dorsum; dark spot at end of anal vein; dark along tips of apical veins; base of apical cell 5 and across apical cell 6. Only females taken. Length, 2.5 mm, 4 mm.

Habitat, Island of Amboina, on sugar cane.

The frons and clypeus darkening towards the apex, together with the light dorsal and dark ventral aspect, distinguishes this species.

PHACALASTOR.

Phacalastor pseudomaidis Kirkaldy, 1906, Bull. H. S. P. A. Ent. I. 408, was placed by its author in the genus *Perkinsiella* (1907 Bull., H. S. P. A. Ent. III., 136, Plate XIII., Figs. 1-2) on account of the pair of ventral spines, but the specimen examined and figured had the oedeagus abnormally extruded and laying on the prolongation of the ventral edge of the pygophor, the two spines seen belong to the oedeagus. This pygophor is of the same type as *P. koebeli* Kirkaldy, so I place them together again in that genus.

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**On Some New Species of
Leaf-Hoppers**

BY G. W. KIRKALDY AND F. MUIR

HONOLULU, HAWAII
JANUARY, 1913

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JANUARY, 1913

LETTER OF TRANSMITTAL.

To the Experiment Station Committee of the
Hawaiian Sugar Planters' Association,
Honolulu, Hawaii.

DEAR SIRs:—I herewith submit for publication as Bulletin No. 12, of the Entomological Series, a collection of notes by the late Mr. G. W. Kirkaldy and by Mr. F. Muir, entitled: "On Some New Species of Leaf-Hoppers."

Yours very truly,

C. F. ECKART,
Director.

This Bulletin consists of descriptions of some of the new species of Fulgoroidea in the collection of the Hawaiian Sugar Planters' Experiment Station, collected by Mr. Koebele and myself during our investigations abroad.

The first part is from manuscript notes left by the late Mr. G. W. Kirkaldy. The delay in publishing these descriptions is to be regretted, as some of the names may now be synonyms, but the illness and sudden death of Mr. F. W. Terry, who had the disposing of the library and papers of his former friend and colleague, has been the cause of the delay, and now the doubly sad task falls to me. I publish Kirkaldy's notes as he left them, uncorrected, as my present knowledge of some of the families he deals with is not sufficient to allow me to correct his work.

The second part is by myself, with a few of Kirkaldy's descriptions incorporated. It deals only with the family Derbidae.

F. M.

PART I.

By the Late G. W. KIRKALDY.

FAMILY *CICADIDAE*.

(The following are not arranged phylogenetically.)

Cicada pontianaka Distant.

Hab. Borneo, Pontianak Muir. Previously recorded also from the Malay Peninsula, Sumatra, Java, and Sulu. The two males before me agree generally with Distant's figures and descriptions, except that either they differ a little as regards the pygophor, or else his figures are bad.

Platypleura canescens (Walker).

Hab. Larat (Muir). Previously also from Sumatra, Banda, Timor Laut, and Aru.

P. nobilis (Germar).

Hab. Borneo, Telok Ayer (Muir). Previously from India, Assam, Java, and Sumatra.

P. lyricen sp. nov.

Male and female closely allied to *ciliaris* (Linneus). Pale greenish-ochraceous; vertex with a large median piceous suffusion which is continued to the margins by broad lines as follows: two lateral on each side (the second actually on the fastigia), and five basal, so that the vertex seems to be piceous with about six marginal pale areas; frons more or less piceous basally, some markings on legs, the tarsi, apex of labium, etc., blackish. Pronotum with a blackish line down the middle reaching to the anterior margin of the hind reflected part, and two or three short oblique lines on each side of this. Mesonotal markings much as in *ciliaris*, anterior half or so of the urotergites dark piceous, the last two or three segments mostly so. Urotergites more or less clouded with fuscous. Tegmina whitish tinged with fawn, with pale golden-yellow pubescence; veins pale yellow, green and red; clavus and base of corium dark, a fuscous oblique band from the exterior margin to the apex of the clavus, on basal third; the middle third and a little apical of that has a number of dark

(thinly margined) rings in two or three rows (which in one doubtful female are almost absent), the apical margin is irregularly fuscous. Wings dark orange-brown, marked much as in *ciliaris*, but much more strongly and clearly cut, with blackish brown.

Structurally this species differs from *ciliaris* in the male by the opercula being remote inwardly, the inner margin, in fact, not extending quite so far inwardly as the hind coxae; they are transverse, and the spine of the hind coxae is long and acute. The male pygophor is bluntly carinate beneath down the middle, apically truncate, very slightly emarginate, broadly sulcate, this sulcation widening in the middle.

Length 9-12 mm.; width of pronotum $10\frac{1}{2}$ -11 mm.; expanse of tegmina 60-67mm.

Hab. Ambonia (Muir).

Bacturia conciva (Stal).

Hab. Amboina and Larat (Muir). Previously from Papua and almost all the Austromalayan Islands. Doubtfully distinct from *B. exhausta* (Guérin)

Sciroptera splendidula (Fabricius).

Hab. Java, Pekalongan, Borneo, Moewong (Muir). Previously recorded from throughout the Oriental region, except the Philippines. The examples before me are intermediate between *splendidula* and *crocea*; they differ from the latter, to which they are more immediately referable, by the immaculate black head, the pale bronzy-fuscous tegmina, with the cells medially paler.

Huechys vidua (A. White).

Hab. Borneo, Moewong (Muir). Previously from the Malay Peninsula.

H. sanguinolenta (Fabricius).

Hab. Macao (Muir). Distributed over almost the whole Oriental region as well as Sumbawa and Timor Laut.

Prasia elegans sp. nov.

Female bright yellowish-green; the apical margin of the head dorsally, narrowly, the base of the vertex, its posterolateral angles broadly, a large portwine glass-shaped mark on the mesonotum,

all the mesonotal margins narrowly (excluding the basal elevation), and two submedian wedges, velvety-blackish. The head dorsally with sparse, short, black hairs. Abdomen above brownish-orange basally and laterally (irregularly) blackish. A silvery pubescent spot basolaterally and a percurrent stripe of silvery pubescence across the fifth urotergite. Beneath blackish with sparing pubescence of mixed silvery and pale golden pubescence. Fore and middle coxae dark crimson, margined narrowly with black, femora black with a broad red stripe inwardly; tibiae and tarsi crimson. Hind legs yellowish testaceous, femora and coxae more or less sanguineous. Tegmina hyaline, basal half of subcostal and radical veins on basal fifth yellow, shading to green up to about the middle, the rest black. Wings hyaline, subcostal and the base green, rest black.

Head dorsally slightly longer than wide between the eyes, vertex produced a little in front of the eyes, apical margin, where not interrupted by the frons, truncate; dorsal part of frons nearly or quite as long as the vertex medially, the latter deeply rotundately emarginate to receive it, anterolateral angles of the middle part of the vertex acute, prominent. Pronotum as long as, or slightly longer than, the head.

Length 15 mm.; width of base of pronotum 6 mm; expanse of wings 46 mm.

Habitat, West Borneo (Muir).

Cosmopsaltria alticola Distant.

Hab. Borneo, Pontianak (Muir).

Variety *Pontianaka* nov. This agrees generally with Distant's description, except that the apical veins have each an infuscate spot near the apex.

C. spinosa (Fabricius).

Hab. Borneo, Pontianak (Muir). The basal sides of the first, second, third, fourth, fifth, and seventh apical cells are infuscate, and the male opercula extend nearly to the apical margin of the fifth urosternite, not of the fourth, as figured by Distant, otherwise these examples accord.

C. duarum (Walker).

Hab. Borneo, Pontianak (Muir). Previously also from the Malay Peninsula.

Leptopsaltria pryori Distant.

Hab. Borneo, Telok Ayer (Muir).

Pomponia imperatoria (Westwood).

Hab. Borneo, Telok Ayer (Muir). Previously also from Malay Peninsula, Java, and Sarawak.

FAMILY CERCOPIDAE.

Subfamily Machacrotinae.

I consider that the *Machacrotinae* are simply *Cercopidae* with simplified venation, both of tegmina and wings, and with more or less produced nota; they are a side branch of the *Cercopidae*, and in no way a link between them and the *Membracidae*, which are a development of the *Tetigoniidae* (or "*Jassidae*") and lie right on the other side of the latter. The *Membracidae* are simply *Tetigoniids* with modified face and legs, and with a more or less ornamental nota. This development is merely analogical between the *Machacrotinae* and *Membracidae*, and in no way homological, as in the former it is mesonotal, in the latter pronotal!

Pectinariophyes Kirkaldy.

The hind tibiae are bispinose, but the basal one is minute.

Polychaetophyes Kirkaldy.

This genus is very close to *Machacropsis* Melichar, and may prove identical. The head, however, is much shorter and broader, and very much more declivous, the face is broader and shorter, the scutellum is scarcely, or not at all, grooved mediolongitudinally, and the apical cells of the tegmen are four or more, though two or more of these are small.

Machacrota moluccana sp. nov.

Apparently allied to *M. ensifera* Burmeister, but the scutellum is tricarinate, its process much more arched, and the pronotum is not striped. Purplish piceous; the pronotum browner along the posterolateral margin, and the scutellum with a short whitish longitudinal streak basally on each side; the process is brownish-yellow. The face is unicolorous, but has thin, lateral, silvery, radiating lines. Fore and middle legs brownish-yellow; hind legs brownish-piceous. Sterna and base of abdomen beneath partly pale. Tegmina yellowish-hyaline, veins brownish-yellow, the costa and subcosta darker for the greatest part of their length. Wings hyaline, veins blackish-brown. Vertex scarcely, though very nearly, as long as in *ensifera*, rounded anteriorly, rather longer than wide between the eyes (or at least as long). Vena-

tion of clavus much as in *ensifera*. The rest of tegmen agrees fairly well with that of *ensifera* as figured by Schmidt, though not by Distant. The scutellum is more arched and the posterior margin is vertical and nearly as long as the distance between it and the pronotum; it is strongly compressed and tricarinate along the top, the lateral keels being evanescent anteriorly, the middle one evanescent posteriorly; the process is arched and rounded, the posterior being deflected. Head and pronotum slightly carinate longitudinally.

Length to apex of abdomen $6\frac{1}{2}$ mm.; to apex of process in straight line $9\frac{1}{2}$ mm.; to apex of closed tegmina $8\frac{3}{4}$ mm.

Habitat Amboina (Muir, Nov., 1907).

FAMILY FULGORIDAE.

The type of the genus *Fulgora* has been wrongly determined by all recent authors. The genus was erected by Linneus in 1767 (Syst. Nat. (Ed. 12) I 703), and the type was fixed by Sulzer in 1776 (Abgek. Gesch. Ins. 85), as *eurofaca* Linneus. This being the earliest genus, the superfamily and family take their names from it. For *Fulgora* auctt. (type *laternaria* Linneus), the name *Laternaria* Stal 1866 should be used. The subfamily formerly known as "*Fulgorinae*" should be known as *Lystrinae*.

Subfamily *Lystrinae*.

Cyrpoptus suavis Stal.

Habitat Mexico, Cuernavaca (Koebele). The males are as figured in the "Biologia," but the females have the orange-yellow of the tegmina and wings replaced by sanguineous; the head, pronotum and scutellum are pale reddish-brown and the tergites dark orange-brown, in the latter sex.

Birdantis sp.

A somewhat immature specimen from Amboina (Muir), may be *delibuta* Stal (from Ternate), but I can not obtain the description; it is not *deccens* or *pallescens*. If this specimen is, as I suppose, a *Birdantis*, then Stal was right in supposing that it ought to be placed in his "54" division, as the "claval vein" runs into the commissure before the apex of the clavus.

Scamandra merope sp. nov.

Apparently near *S. hecuba*, but differently colored. The upper surface dark greenish-brown; metanotum and underside, with

legs, mostly blackish-brown, the femora very obscurely spotted with brown. Tegmina bright red-brown on basal three-fifths, rest yellowish-brown; an irregular, non-continuous blackish fascia across the tegmina just basal of the division; there are also one or two obscure spots on the basal part. Veins mostly concolorous with the ground color; the costal vein, basal cell, etc., blackish. Wings scarlet; a basal spot bluish-black; apical third continuous with hind margin and anal area, yellowish-brown, paling gradually to anal area. The red discal color is bordered apically with blackish. Two large spots on the vertex; the scutellum; abdomen above especially basally; some specks on the gastrophleures; and the tegmina largely, as well as some specks on the wings, covered with a cretaceous exudation. The frons is longer than wide, and there is a rather obscure sublateral keel (on each side), and an obscure median one only extending about one-third of the length. Apical half of clypeus keeled.

Length 18 mm.; expanse 53 mm.

Hab., Telok Ayer and Pekalongan (Muir).

Eurinopsyche arborea sp. nov.

Differs from *obscurata* by the size of the eyes, which in the latter are small, but in *arborea* occupy almost the whole height of the head in profile. The head is rather shorter than the abdomen, and the labium extends to the apex of the latter.

Length $20\frac{1}{2}$ -21 mm.

Hab.: Queensland, Brisbane, and Bundaberg (Perkins); arboreal.

Subfamily *Fulgorinae* (= *Dictyophorinae* Oliv.)

Udugama splendens (Germar).

I refer to this species some examples from Macao (Muir; also in my collection from J. C. W. Kershaw). It has also been recorded from India, Ceylon, Burma, Philippines, and Java. The sexes are somewhat dissimilar in size and color. The examples before me may take the varietal name *tibialis*, the fore and middle tibiae being distinctly bi- or triangulate with brownish, a character not apparently mentioned in any descriptions of the typical form. Melichar adds *Dictyophora indiana* Walker as a synonym, a name which Distant ignores.

Electryone gen. nov.

Differs from *Putala* Melichar by the vertex being regularly narrowed towards the apex, while in *Putala* it is suddenly narrowed before the eyes; the hind margin of the pronotum is ob-

tuse-angularly emarginate, while in the latter it is somewhat rounded; the scutellum is rather flattish, while in *Putala* it is convex. Type *macaonica*.

E. macaonica sp. nov.

In appearance very similar to *Putala maculata* Distant, which apparently belongs to this genus, but differs as follows:

Vertex much shorter, scarcely longer in front of the eyes than the rest of the vertex, and more rounded apically; the radial vein very distinctly forked a little nearer the apex than is the medial vein; otherwise the venation is very similar; tegmina apically more fuscate. * Frons much shorter, basal of the eye scarcely longer than a half of the rest; there are three keels (within the lateral keels), one median and two submedian, the latter meeting basally subroundedly.† Coxae and apical third of front tibiae dark piceous.

Length 8 mm. to apex of abdomen, 10 mm. to apex of tegmina.

Hab.: Macao (Muir; also in my collection from Kershaw).

Miasa smaragdilinea (Walker).

Hab.: Borneo, Moewong (Muir). Previously recorded from Tenasserim and Malacca. The examples agree fairly well with Distant's redescription and figure (1906 Faun. Ind. Rh., III. 248, f. 108), except that the frons is unicolorously ochraceous, and the clypeal band, etc., are creamy white. Beneath, the abdomen is orange-brown, the apical margins of the segments narrowly greenish, the lateral margins dark fuscous; the pygophor more or less dark fuscous.

Acarua sp.

Hab.: Borneo, Moewong (Muir). Probably new, but unfortunately I have not seen some of the Stalian descriptions in this genus.

Fulgora Linneus (= *Dictyophora* Germar).

This genus is decidedly heterogeneous and badly in need of revision. *Nersia* Stal is not, as Distant says, synonymous with *Dictyophora* (i. e., *Fulgora*), *bovina* may be taken as its type.

F. herbida (Walker).

Hab.: Mexico; Cuernavaca (Koebele). The two specimens agree very fairly with Walker's description, but not so well with

† Distant's figure must be faulty, as it shows only two keels within the lateral ones.

Distant's figure in the "Biologia," as the mesonotum is actually greenish; the stigma, moreover, is not represented in the figure and the venation does not quite correspond. For these two specimens, I found the subgenus *Cuernavaca*, separable from *Fulgora* (type *europaea*) as follows:

Vertex scarcely extended before the eyes, the lateral keels meeting roundedly in front; the middle keel visible only near the base. Pronotum very obscurely keeled, anterolateral margins somewhat rounded. The lateral keels of the scutellum are arched outwardly. The frons scarcely extends backwards from the eyes and is somewhat rounded basally; the lateral margins diverge towards the apex, but narrow again just before it; the sublateral keels form an elongate oval, not touching the other margins at any point, the middle keel being percurrent within them. Clypeus feebly carinate. Tegmina much less reticulate; stigma four-celled. As in *Fulgora*, the hind coxae are acutely spined; the hind femora are four-spined; the labium reaches to the hind trochanters.

In the following species the hind margin of the pronotum is minutely, but very distinctly, notched in the middle, whereas in *F. europa* it is notched almost imperceptibly.

Fulgora nercides sp. nov.

Belongs to, or near, the typical subgenus. Head green, the vertex between the lateral keels, the dorsal part of the genae and the middle keel (suffusedly) of the frons, red. Clypeus yellow, the basal half of the keel red. Underside yellowish. Pronotum and scutellum reddish (or sometimes sordid yellowish-green), the keels (suffusedly on pronotum) green. The main veins of the hyaline tegmina are more or less orange-yellow, those on the apical third yellowish-fuscon, the rest greenish. Legs yellowish-red, greenish on coxae and at base of femora; extreme apex of femora, apex of tibiae and apical segment of tarsi, blackish. Vertex not quite so long as the scutellum, ascending a little in front of the eyes at about 45 degrees, the lateral keels arched outwards at first to a little beyond the eyes, thence converging acuminate, so that part of the obliquely-lying genae is clearly visible dorsally; at the extreme apex, a part of the frons is also visible dorsally. The frons is very elongate, the lateral margins strongly narrowed towards the base, and slightly widened at the apical margin; medial and lateral keels of frons and clypeus strong, but the submedian keels of the former are obsolete on the apical half; the lateral keels are not visible, ventrally, at the base itself. The hind femora have five spines; hind tibiae about two and a half times longer than the femora. Antennae small, but larger than in

europaea, second segment subglobose, apically oblique, the flagellum not arising from the apex.

Length 13 mm. to apex of abdomen; 17 mm. to apex of tegmina.

Hab.: Amboina (Muir); Borneo, Telok Ayer (Muir).

F. glaucides sp. nov.

Superficially not unlike *F. nercides*, but the head is much less ascendant, and there are eight femoral spines.

Head and prothorax green, rest of the thorax and abdomen more or less yellowish, mostly rather pale. A percurrent stripe from base of pronotum to apex of vertex, another from base of frons to apical margin, another from anterior angle of genae to base of propleura (interrupted by the eye), a sublateral oblique (more obscure) stripe on pronotum, sanguineous. Scutellum more or less suffused with green. Middle keel of clypeus pale sanguineous. Costal vein fuscate, tinged with sanguineous at base; other veins more or less greenish on basal third, shading into tawny on middle third, and into fuscous on apical third, but all a little intermixed. Coxae, femora, and hind tibiae, greenish; fore femora and hind tibiae more or less tinged with brownish on apical half or so (varyingly). Head very little ascendant, about as long as the scutellum, $3\frac{1}{2}$ -4 times as long as width between the eyes; lateral margins subparallel to about a little in front of the anterior margin of the eyes, thence acutely converging; the rounded outline of the obliquely lying genae is visible dorsally; also the actual apex is rounded, owing to part of the frons being visible. The frons is very similar to that of *nercides*, except that it is a little less elongate, and more rounded anteriorly, and not so elongate after the disappearance of the genal keels. Apical venation much as in *nercides*. Hind tibiae about 3 times as long as the femora, with eight spines, the five basal small but distinct, the three apical large.

Length 12 mm. to apex of abdomen, 17 mm. to apex of tegmina.

Hab.: Borneo, Telok Ayer (Muir).

F. borneides sp. nov.

Scarcely separable from *F. europaea* by color and pattern. Structurally it may be separated as follows:

Vertex slightly longer, and the lateral margins almost straight, less acute apically; the genal margins as seen dorsally are more arched outwardly. The claval veins unite in the same line as the forking of the brachial, instead of distinctly basal of it; the cells formed by the forking of the main veins are distinctly longer,

and the tegmina themselves are much longer; also the apical third is less reticulated. Frons rather longer and narrower, more rounded basally, apical margin very slightly narrower than base of clypeus. Antennae a little more globose.

Length 10 mm. to apex of abdomen, 16 mm. to apex of tegmina.

Hab.: Borneo, Moewong (Muir).

Amboina gen. nov.

Superficially like a long-headed *Hasta*, but distinguished, from all the old-world *Fulgorini* near the typical genus, by the lack of a stigma, and the comparatively long antennae.

The general characters are those of *Hasta*, but it differs as follows: The head anteriorly widens but a little at the apex; it is distinctly narrowed and constricted between the eyes. The eyes are comparatively large and prominent and well rounded exteriorly. The antennae, though short, are yet not of the microscopical size usual in this division, but are distinctly visible from above. The pronotum is much longer medially, being about half the length of the scutellum. The frons is five-carinate, the submedian keels being obsolete between the base of the clypeus and the constriction. The clypeus is very obscurely keeled. The labium reaches the hind trochanters, the third segment being much longer than the fourth. Tegmina more closely reticulated on the apical third, more as in typical *Fulgora*; stigma lacking, but there are about eight suboblique veins on the apical third of the exterior area. The legs are all long and slender, the hind tibiae being more than three times as long as the femora; the latter have five spines, but the basal one is very obscure. Fore femora spineless. Abdomen elongate. Type *moluccana*.

A. moluccana sp. nov.

Male grass green, shading off in parts into pale yellowish-green; metasternum whitish; lateral margins of vertex very narrowly sanguineous. Head nearly twice as long as the pronotum and scutellum.

Length 19-19½ mm.

Hab.: Amboina (Muir).

Orodictya gen. nov.

Differs from *Thanatodictya* as follows: the elongate vertex is not sulcate (the lateral keels being obsolescent) except between the eyes. The disks transversely rugulose, as also beneath and laterally. (The middle keel is apparently only between the eyes as in *Thanatodictya*.) The vertical process is very slightly en-

larged at the tip where it is rounded. The five frontal keels are all percurrent. Eyes elongate, not rounded laterally. Hind tibiae with seven to nine spines. Lateral keels of pronotum obsolescent. Apical margin or tegmina broadly multireticulate.

Superficially rather like *Acarua* Stal, but the front is not angulately amplified; the pronotum is rather deeply emarginate, the fore tibiae are not at all dilated and the hind tibiae are at least quadrispinose apical of the middle.

O. monticola sp. nov.

Pale olivaceous-brown. Keels most greenish (or pale yellowish). Beneath pale yellowish, tinted in parts with greenish or brownish. Fourth segment of labium blackish. Legs very pale greenish, apical one-third of the whole tibiae darker green, basal two-thirds yellowish, apex of hind tibiae and the hind pairs, reddish. Tegmina hyaline, veins dark crimson red (except the green costal). On the apical one-third of tegmen, the crossveins are infuscate, and the apical margin from near the claval apex to the base of the stigma, is broadly (irregularly) reddish ferruginous. The stigma has five or six cells, but is rather confused apically. Wing veins blackish, the apical margin infuscate. Length from tip of head to apex of closed tegmina 22 mill., length of head $5\frac{1}{2}$ mill.

Hab.: Borneo, Moewong (Muir).

RICANIINAE.

Armacia hyalinata (Donovan).

Hab.: Amboina (Muir). Previously also from New South Wales, Papua, Solomon Islands and Ternate.

Ricania speculum (Walker).

Hab.: Borneo, Pontianak, and Telok Ayer (Muir). Previously also from India, Assam, Ceylon, Burma, Tenasserim, Oriental China, Philippine Islands, and Java. Melichar adds (but perhaps through mistaken synonymy) Waigiu, Flores, Singapur, Siam and Sumatra.

Ricania moluccana sp. nov.

Sooty; labium and legs yellowish-brown, femora, apices of tibiae, etc., dark fuscous. Abdomen piceous. Tegmina dark smoky, partly with a purplish submetallic glint; a small round purplish metallic spot near the middle of the corium, a series of yellow specks at the end of each costal veinlet as far as the stigma,

also a series of smaller byaline specks along the apical margin. Vertex very transverse. Keels of pronotum, scutellum and frons very distinct. Four veins arise from the basal cell, the radial and subradial running parallel. Shape of tegmina much as in *decorata*, but the apical margin rather longer and the hind margin rather shorter in proportion.

Length of body 4 mill.; expanse of tegmina 14 mill.

Hab.: Amboina (Muir).

This appears to belong to *Ricanoptera*, which I can regard only as a subgenus of *Ricania*.

Ricania indicata Melichar.

Hab. Amboina (Muir). Also previously recorded from Ke and Timor Deli.

Ricania stigmatica var. *borneensis* nov.

Hab.: Borneo, Telok Ayer (Muir). It has no white stigmal spot. *R. stigmatica* was recorded from Java.

Ricania laratica sp. nov.

Apparently near *crimia*. Head pitchy brown, vertex and genae partly browner. Pronotum, scutellum, pro- and mesosternum sooty. Tegmina dark smoky, veins blackish, a pale ocellate stigmal spot, and a white wedge-shaped spot on the costal margin near the apex, and another similar one near the apex on the apical margin. A small obscure hyaline speck about the middle. The basal third of the costal margin speckled with yellowish. Abdomen more or less brownish-pitchy. Legs brownish-yellow, more or less dark fuscous on femora and apex of tibiae. The tegmina are sprinkled more or less with greenish-yellow.

Length of body 6 mill.; expanse about 18 mill.

Hab.: Larat (Muir).

The three specimens before me are practically identical. The keels are well marked, the submedian ones on the scutellum being rounded from the apical margin instead of being sinuate, as in *indicata*.

Pochazia fuscata (Fabr.).

Hab.: West Borneo, Telok Ayer (Muir). Previously from India, Burma, Tenasserim, Malay Peninsula, Sumatra, and Java.

Sassula dyakana sp. nov.

This species differs from *sororcula* by the radial vein not being forked; from *osmyloides* by the different venation.

The spotting of the vertex and nota is not unlike that of *sororcula*; the frons has three short, dark, lanceolate lines at the base between the four keels; there is also a dark spot on each side (inside the lateral keels), near the antennae, and another at the apex of each submedian keel just apical of the basal margin; there is no other specking or spotting on the frons, which is distinctly wider and shorter apically of the antennae than in *osmyloides*, and the lateral margins are more sinuate. The costal area is distinctly wider than the subcostal area; there are two spots on the subcostal area near the base. The venation of the corium is very much like that of *sororcula*.

Length 10 mill.; expanse of tegmina 33 mill.

Hab.: Borneo, Telok Ayer (Muir).

Gaetulia nigrovenosa Melichar.

Hab.: Java (Muir). Previously recorded from India, Assam and Tenasserim.

Nurunderia chrysopoides = *Gaetulia chrysopoides* Kirkaldy.

Distant has (1909 A. M. N. H. (8) IV.337) erected the genus *Nurunderia* for this species.

Mindura obscura (Fabr.) = *sundana* Kirkaldy.

Hab.: Amboina (Muir). Previously found in Java and South India.

Nogodina pallidipennis (Guérin).

Hab.: Amboina (Muir). Previously also from New South Wales and Vanikoro.

FLATINAE.

Amphiscepa bivittata (Say).

Hab.: Mexico, Morelos (Koebele). Previously recorded also from Canada and the United States.

Amphiscepa immaculata Kirkaldy.

Hab.: Mexico, Orizaba. Previously from South Arizona.

Neomelicharia guttulata (Stal).

Hab.: Amboina (Muir). Previously known from Buru.

The ground color of the tegmina may be milky or yellowish-green. The anteroapical angle of the tegmina is often black, as also a spot at the apical angle of the clavus and another near base

of the same interiorly. The pattern is exceedingly variable. The forms which have milky-white tegmina (this does not appear to be a post-mortem change) may be called var. *lactealis*.

Neomelicharia ocellifera (Walker).

Hab.: Ambonia (Muir). Previously known also from Ceram and Java.

Colgar chlorospilus (Walker).

Hab.: Amboina (Muir), with vars. *decolor*, etc. Previously reported from Papua and Birara.

Colgar laraticus sp. nov.

Green, paler beneath, scutellum yellower. A rather broad stripe from apex of vertex to apex of metanotum, all the margins of the tegmina (except the extreme base of the costal), fore and middle tibiae, the frontal keels very narrowly basally, etc., bright crimson; tegmina otherwise immaculate. Vertex very slightly longer than pronotum, rather more sharply keeled than in the other species of this genus (as also on pronotum and scutellum), thus approaching *Phyllyphanta*. Frons with three keels, much as in *chlorospilus*. Anteroapical angle of tegmina acute, posteroapical angle rectangular, slightly rounded.

Length of body 7 mill.; expanse of tegmina about 18 mill.

Hab.: Larat (Muir).

In immature individuals, the red is replaced by pale orange. It is possible that this is only a var. of *surrecta*, which I do not know.

Colgar granulatus sp. nov.

Very similar to *laraticus*, but the tegmina are distinctly broader, especially basally; the red stripe is absent, only the apex of the head being a little reddish. The red margination of the tegmina is very narrow and obscure. The ground color of the tegmina is yellowish-green, the veins being suffusedly greener, and especially on the apical half being excessively minutely granulated with purplish-brown.

Length of body 8 mill.; expanse of tegmina 20-21 mill.

Hab.: Larat (Muir).

Colgar surrectus (Melichar).

Hab.: Larat (Muir).

Phyllyphanta producta (Spinola).

Hab.: Borneo, Telok Ayer (Muir). Previously known from Sumatra, Banguay, Java, Celebes, and Cochin China.

Salurnis kershawi sp. nov.

Head, pronotum and scutellum pale orange-brown, the disk of the pronotum and of the scutellum pale greenish-yellow, the former with a red-brown stripe down each side of the middle, the latter with an outwardly curved submedian pale brown stripe, meeting apically and basally. A broad fuscous stripe down the middle of the vertex, a fuscous spot at middle of the apical margin of pronotum and of scutellum. Sterna and abdomen pale, the latter more or less yellowish above. Tegmina pale yellowish-green, the veins suffusedly pale fuscous, the commissural margin suffusedly so. Wings milky white. Legs testaceous, tarsi, fore tibiae, etc., pale yellowish-brown. Vertex about half as long as the pronotum, scarcely half as long as the width of the head between the eyes. Anterior margin of pronotum rounded, subtruncate in the middle. Tegmina costally strongly arched, apical angle rounded, posteroapical angle acute, prominent. No sensory granules on corium.

Length of body 7 mill.; expanse of tegmina 19 mill.

Hab.: Macao (Muir; also in my collection from J. C. W. Kershaw).

There are two sublateral, outwardly arched, keels on scutellum, and between these, on each side of the middle, a more obscure one. This species is very similar to *marginellus*, but is yellower, and the vertex distinctly shorter, and the pronotal keels more distant. It seems to lead the way to *Siphanta*.

Salurnis marginellus (Guerin).

Hab.: Borneo, Telok Ayer (Muir). Previously recorded also from India, Tenasserim, Malacca, Cochin China, Shanghai, Kiang-Sin, and Nicobar Islands.

Siphanta javana sp. nov.

This has the characters of *acuta* (Walker), but is distinctly smaller with the anteroapical angle of the tegmina less prominent, and is distinguishable at once by the numerous tubercles on the tegmen. It is smaller than *acutipennis* Kirkaldy and has a distinctly shorter vertex. It is separable from *patruelis*, the other Javan species, by the rounded vertex and narrower frons.

Length 5 mill.; expanse of tegmina about 18 mill.

Hab.: Java, Pekalongan (Muir).

Mimophantia maritima Matsumura.

Hab.: Amboina (Muir). I cannot see any difference of importance between these Moluccan specimens and the descriptions of those from Japan.

Phyllodryas gen. nov.

Vertex very short, its apical margin touching the apical margin of the pronotum in the middle. Frons about as long as wide, lateral margins rounded, acute, reflexed; with a median keel which is not quite percurrent apically. Pronotum not, or very obscurely, carinate. Scutellum with three very obscure keels. Tegmina scarcely twice as long as their middle width, outer fork of the brachial vein joined to the inner fork of the median by two or three short, transverse veins; a regular, transverse, subapical line close to the apical margin, apical angles well rounded. Hind tibiae with one spine. Type *calamantina*.

This genus has some resemblance to *Paratella*, which, however, has no subapical line and has different venation; it differs from *Hilavrita* by the unispinose hind tibiae; from *Petrusa* by the tegmina having one subapical line; and from *Tejasa* by the presence of a number of transverse lines basal of the subapical line. From all these, moreover, it differs by the presence of a few veins in the clavus, but does not come near any of the other genera thus characterized. It has considerable resemblance to *Odyra truncata*? Distant (not Melichar), but has only one subapical line; Distant figures none, in the supposed Linnean species, but says that it might well be placed in *Cryptoflata*, i. e., *Flata* Fabr., but the latter has more than one subapical line, according to its founder, though not according to Distant, and has two femoral spines.

Melichar's species has evidently, from the description, nothing to do with the supposed Linnean type, the shape of the tegmina alone showing this, and may be renamed *melichari*.

Phyllodryas calamina sp. nov.

Male and female pale greenish or testaceous; tegmina creamy, apical margin (apical of the submarginal line) and the commissural margin in part, pale yellowish fuscous.

Length of body 5 mill.; expanse of tegmina 17 mill.

Hab.: Borneo, Telok Ayer (Muir).

Nephesa rosca (Spinola).

Hab.: Borneo, Telok Ayer (Muir).

Nephesa aurora sp. nov.

Pale brownish-testaceous; apical margin of the second segment of the antennae, third segment of the hind tarsi, etc., fuscous. Tegmina pale rosy, the apical margin and the apical half of the hind margin, pale orange-brown; wings milky. Vertex very short and transverse, the rounded frons partly visible dorsally. Middle keel of pronotum very obscure. Tegmina elongate, apical margin very oblique, apical angles rather prominent, rounded.

Length of the body 12 mill.; expanse of the tegmina 53 mill.; lengths of the fore, apical and hind margins, respectively, of the tegmina, about 25, 13 and 18 mill.

Hab.: Amboina (Muir).

Nephesa coromandelica (Spinola).

Hab.: Borneo, Telok Ayer (Muir). Previously known from Java. The South Indian record is perhaps incorrect.

Hansenia kirbyi Melichar.

Hab.: Borneo, Pontianak (Muir). Previously known from Ceylon. Distant (1906 Faun. Ind. III. 411) synonymizes this with *glauca* (Kirby), apparently incorrectly.

Ormenis dolobrata Fowler.

Hab.: Mexico, Morelos (Koebele).

Ormenis plebeia sp. nov.

This species has the general appearance of *dolobrata*, but differs as follows:

The vertex is distinctly narrower and the eyes smaller; the frons is much less narrowed towards the apex and is scarcely a fourth narrower at the apex than at the base (instead of about one-half); the frontal keels are very obscure, and instead of being truncate, the apical margin of the frons is slightly emarginate. In *dolobrata* the hind margin of the pronotum is obtuse-angulately emarginate; in *plebeia* it is roundly so, and the hind angle of the scutellum is much less elongate and prominent. The pronotum and scutellum are pitchy-brown, the head paler, frontal keels yellowish-brown. In the tegmina the pale spot is much less clear and the apical third is rather more closely reticulate. The clavus is distinctly more strongly granulate. Legs browner.

Lengths of body $6\frac{1}{2}$ mill.; to apex of tegmina 9 mill.

Hab.: Mexico, Cuernavaca (Koebele).

ISSINAE.

Hemisphaerius Schaum.

This genus is in a very unsatisfactory state, despite the revisions of Butler and Melichar. These revisions have been made practically entirely on color and pattern, which are, judging from the material before me, somewhat variable, certainly rendering invalid Melichar's preliminary divisions of dark and pale forms. At the same time I have made a new species on color and pattern, as I have not the necessary material in other species to form an opinion as to what structures are valuable for specific purposes.

Hemisphaerius moluccanus sp. nov.

Male and female not very shining. Vertex, basal margin of frons, a transverse stripe on the frons at the apical margin, antennae, pronotum, scutellum, legs, etc., ochraceous. Clypeus and rest of frons, genae, and most of the abdomen beneath, dark piceous. Tegmina ochraceous, very closely lined irregularly longitudinally (and shortly furcately) and specked with pale greenish. Vertex more than twice as wide as its length, not longer (scarcely as long) than an eye, with two pits.

Length to apex of tegmina 4 mill.

Hab.: Amboina (Muir).

Hemisphaerius javensis Melichar.

Hab.: Larat (Muir). Previously recorded from Java. One example is suffused with rosy. This species also varies as follows. The tegmina from uniform pale green to piceous, there being intermediate forms. The frons from immaculate green to blackish with a pale green transverse stripe at the apical margin.

The nymph is like the adult, except that the hind tibiae are rather dilated; the clypeus is pale green.

The nymph has a double row of oblique granules on the pronotum, the apical the longer. The large development of the tegmina makes the hopper very wide. The hind tibiae are flattened and widened and have one median spine.

The coloring is pale greenish, yellower on head and pronotum, the urotergites very closely specked with brown. Legs brownish-yellow, femora more or less infusate. Sternopleurites mostly fuscate.

Hemisphaerius tristis Stal var. *lineatalis* nov.

Hab.: Amboina (Muir). The type was from Batchian.

This agrees with the description of *tristis*, as far as it goes.

except that the pronotum is almost entirely ochraceous (this varies somewhat), and there is a generally percurrent ochraceous line down the scutellum.

Gelastissus albolineatus Kirkaldy.

Hab.: Amboina. Previously from Queensland.

G. histrionicus Kirkaldy.

Hab.: Amboina. Previously from Queensland.

G. suffusus Kirkaldy is merely a variety of this; one of the Amboina specimens has the apical parts of the tegmina piceous.

Lollius furcifer Stal.

Hab.: Amboina (Muir). Previously from Timor, Batchian, Ke, Solomons, Fiji, and the Nicobars.

Thacbena stali, Melichar.

The type of this genus, which Melichar could not trace, was fixed by Stal as *retractus* (Walker). The present species differs from that, by the frons being much longer than broad, while the head pronotum, frons, etc., are the same color, viz., reddish-ochreous. From *T. stali* Melichar (typical) it differs only by the lateral margin of the vertex diverging emarginately, roundly, towards the base which is wider than the apical margin. It is slightly wider at base than long.

Hab.: Borneo, Moewong (Muir). Previously from Singapore.

Capclopterus bimaculatum Melichar.

Hab.: Amboina (Muir). Papua.

Aphelonema vespertina sp. nov.

Allied to *A. rugosa* (Ball), but the clypeus has no pale median line, and the vertex proper is roundly triangular.

Pale yellowish-testaceous, lateral margins of the vertex proper, of the pronotum, and of the flat part of the scutellum, pale piceous, the sloping sides of the scutellum dark piceous. Frons slightly clouded with fuscous on its flat disk, outside the circular keel it is almost entirely dark piceous, as also are the genae between the eyes and antennae, and clypeus (except at extreme base). Tegmina pale, laterally indefinitely pale fuscous, venation white. Urotergites medially pale olivaceous, a very narrow white undulating line separating this from the dark piceous hue

which suffuses most of the lateral part, especially towards the middle. The median part might be flecked with pale purplish-red. Beneath dark piceous with a few irregular yellow spots; coxae mostly dark piceous; tibiae with dark piceous bands, etc.; antennae black. The pustules are pale and well marked on the frons outside the circular keel, and on the pronotum, scutellum, and urotergites laterally. The vertex is as long as the pronotum, and is roundly triangular, the parts of the frons outside the circular keel being thus visible from above. Tegmina are formed much like those of *rugosa*. The outer keels of the frons form a circle, which does not touch the clypeus, but touches the vertex.

Length 3.5 mill.

Hab.: Mexico, Chapultepec (Koebele).

Bruchomorpha dorsata Fitch.

Hab.: Mexico, Morelos, Cuernavaca (Koebele). Previously recorded from all over the United States.

The nymphs have very much the same form and coloring, except that the face is declivous.

Bruchomorpha mexicana sp. nov.

Pale yellowish-cinereous; vertex with four not perfectly defined blackish spots; frons pustulate, irregularly, blackish outside the oval keel, and of the same suffusion laterally and basally inside it; Genae mostly blackish; hind margin pale; pronotum very thickly pustulate and slightly clouded. Disk of scutellum slightly fuscous towards the hind angle; oblique sides thickly pustulate and more or less blackish-brown. Tegmina pale brownish-olivaceous, veinings pale. Urotergites thickly blotched and spotted with blackish-brown. Sterna pale brownish-yellow, most of the ambulae of the middle legs black. Urosternites pale brownish-yellow, laterally blackish, this almost meeting basally. Legs pale brownish-yellow, irregularly marked with dark fuscous. Labium the same ground color, extreme apex dark.

The frontal keels are very strongly marked, the curved keels forming an oval, truncate basally, and roundly acute apically, the whole not so elongate apically as in *dorsata*. The frons is almost horizontal to the vertex, and the clypeus is apically horizontal to the frons, which is about one-half longer than its basal width. The tegmina are formed much as in *pallidipes*.

Length of female 3 mill., breadth 1.75 mill.

Hab.: Mexico, Cuernavaca (Koebele). Very different to any other *Bruchomorpha*.

Hysteropterum montezuma sp. nov.

Differs from *H. montanum* by the much shorter vertex, the angulate (or at least medially deflected) clypeus, the color, etc.

Testaceous, irregularly and obscurely, clouded more darkly. On the frons there are two transverse, obscurely indicated, pale bands, the rest minutely and thickly speckled. Tegmina greyish-testaceous, a broad blackish wedge from hind angle of scutellum to near the costal margin, as the base, the third angle about the middle of the tegmen a little inward; the two third angles (on each tegmen) are joined by an obscurely indicated dark, sinuate, transverse bands. The rest of the tegmen is closely speckled more darkly. Abdomen and legs yellowish-testaceous, irregularly marked with black. Although the vertex is short, yet the frons is distinctly longer than wide, and there is a median percurrent keel which thickens in the clypeus. Pronotum nearly twice as long as the head. Scutellum rather obscurely tricarinate.

Length 4.25 mill.; breadth 2.8 mill.

Hab.: Mexico, Cuernavaca and Yantepec (Koebele).

PART II.

By F. MUIR.

DERBIDAE.

INTRODUCTION.

HABITS.

The species described in this Bulletin (except a few specially indicated) were collected during the time I was in Fiji and the Malay Archipelago, investigating insects injurious to sugar-cane.

Many species of this family are to be found in great numbers on sugar-cane, but only in the adult stage; the young and eggs I have never found on this host-plant. I am not acquainted with any record of the life-history of any species of this family, and I have never come across the eggs, but I have taken the nymphs of several species, all having similar facies and habitat. All these nymphs were living in rotten tree trunks, were dark in color, flattened horizontally, with wide faces, even in such forms as *Zoraida*; both in appearance and habitat they are similar to many species of *Oliarus*, but the females do not possess the large wax-plate at the end of the abdomen. Although the adults of some species collect in such numbers in cane fields, where they are very conspicuous on account of the habit they have of often sitting near together, in Indian-file, with their long wings over their backs, yet they never do any considerable damage; this must be attributed to the habit of the young of not feeding on sugar cane, for if they did their number, which is much greater than that of the adults, would cause considerable damage.

Another strange feature of these swarms of Derbidae is that they generally consist of only one sex and at such times it is very difficult to find the opposite sex.

That this interesting family of leaf-hoppers has been greatly neglected is shown by the fact that we know so little about their life histories and that I, although only collecting them incidentally, have been able to add 16 genera and 96 species to it. My collection is by no means representative as, confined to the cultivated areas by my special work, I collected but little in the natural forest where these forms are most numerous and diversified.

None of this family exists in the Hawaiian Islands, and even if one or more species should ever become established here, the fact of the young living in rotten timber would confine them to very limited areas.

CLASSIFICATION.

Among the characters which Stal ascribes to this family, the short, or very short, apical segment of labium is the most distinctive. *Nisia*, *Surca* and *Phaenocarpa* all possess a long apical labial segment; many of the species of these genera also possess a median facial ocellus and a large wax plate at the end of the female abdomen, characters which belong to the *Cixiinae*; the neurulation of their tegmina is also very different from any Derbid. For these reasons I exclude them from the family *Derbidae*, but, inconsistently, have included them in this Bulletin because several of our greatest authorities on Homoptera have considered them as Derbids. There is no doubt that *Kermesia* is closely allied to these three genera and will also have to be removed from the *Derbidae*, although, according to Distant, it has a minute apical joint to the labium.

I have used the neurulation of the tegmina for dividing the family into groups, and again for redividing the groups; it thus becomes necessary to use a more definite nomenclature than is usual with many workers in Homoptera. The terminology of Comstock and Needham has been employed as it is the one that is most generally known. To make sure of the different systems of nerves I have followed the development of the tracheal system in the tegmina of the nymph of several groups of Homoptera. The contention that without studying the development it is sometimes difficult, or impossible, to decide to which group the vein belongs, is no argument against the use of this system, as the same disadvantage is attached to any system. When we do know the development of a greater number of forms, I believe we shall be able to divide the Fulgoroidea into better defined and more numerous families. I have not used the neurulation of the wings, as in so many forms they are so covered with waxy secretions that only by taking them off and cleaning them can the neurulation be seen with any certainty, an operation that many workers would not perform with many of the small, delicate species, which are at present so rare in collections. Next to the tegmina the head and thorax present the best characters. In many forms there is a well-developed process below the antenna, the *subantennal process*, either in the form of a deep keel or plate, or a more or less spatulate organ. The best character on the pronotum is the absence or presence of the "shoulder keel"; this is a large carina, or flange, running from the anterior margin behind the eyes to the hind margin, with which it often amalgamates, forming, together with the lateral edges, which are some-

times curled forward, a "post-antennal chamber." The shortness of the pronotum is oftentimes more apparent than real, on account of the median portion standing nearly perpendicular, being bent in the middle and fitted into the emargination of the vertex. The absence or presence of carinae on pronotum or scutellum is a very uncertain character, as many small light-colored species appear to have carinae on account of the three dark longitudinal marks, indicating the attachment of the thoracic muscles.

For specific distinction it is necessary to compare the genital armature in certain groups. The present study shows that very few species have a wide distribution among the Malay Islands, but certain of the species are difficult to separate except by the genitalia.

The family can be divided into four groups:

1. Tegmina exceptionally long and narrow, wings less than half the length of tegmina, sometimes very minute. .Group III
Tegmina not long and narrow, wings more than half the length of tegmina.....2
2. Cubital veins not reaching to hind margin of tegmen, but ending in the extended claval vein; third claval cell open, extending along hind margin to last apical median cell....
.....Group II
Cubital veins ending in hind margin of tegmen, third claval cell closed, not extending to last apical median cell.....3
3. Cubitus simple or furcate, not running into first median sectorGroup I
Cubitus with three or more branches (or the cubitus connected with the first median sector, forming an angular or diamond-shape cell).....Group IV

The first, or *Cenchrea*, group is a natural one, and the forms included in it are closely allied; in many of the genera the systems of neururation are all separated from the base of the tegmina, such forms being the most generalized of the *Derbidae*. *Phacioccephalus miltodias* and *P. pullatus* are of interest as showing the commencement of the modification which distinguishes group two, namely, the opening of the third claval cell and the failure of the cubital veins to directly reach the posterior margin. (Pl. I f. 22, Pl. III f. 16.)

The second, or *Otiocerus*, group is also a homogeneous one and follows naturally after group one; it contains some of the most fantastically shaped insects of the family, such as *Swezcya*

with its bizarre shaped head, and *Megatropis*, with its wonderful, separate head-keels.

The third group is distinctly divided into two subgroups, the relationship between them being very indistinct and uncertain. The *Sikiana* subgroup consists of delicate little creatures, with wings apparently wholly devoted to sound production; the *Zoraida* subgroup also has very small wings with large anal areas, devoted to sound production, but never so greatly reduced as in the *Sikiana* section. It is among the *Zoraida* section that the most conspicuous forms of the family are to be found, and from whence the forms generally chosen to illustrate the family are taken. Among the genera of this section *Zeugma* stands apart as possessing both shoulder keels and subantennal processes and demonstrates the uselessness of the structure of head and thorax for primary divisions. *Diostrombus* and *Comma* are the two forms which approach nearest to the *Sikiana* section.

The last group is not a natural one; it consists of *Derbe* and *Mysidia*, which approach the *Zoraida* section of group three, the *Rhotana* section, which is somewhat aberrant, and the Nisian genera, which are not true Derbids. There is a touch of irony in the fact that *Derbe*, the type genus of the family, is not truly characteristic of any of the main groups. By discarding *Nisia* and its allies, and placing *Derbe* and *Mysidia* in the *Zoraida* group, the small *Rhotana* group could remain unattached.

Unfortunately there are certain genera of which the descriptions are not complete enough to enable me to include them in my tables. Working in a place away from large collections and libraries, one is dependent upon one's friends more fortunately situated. My thanks are due to the United States National Museum for sending me specimens for examination, and to Mr. W. L. Distant of the British Museum, for specimens, answers to many questions and much valuable information.

Roban and Pekalongan are in Java, Telok Ayer, Pontianak and Mowong in Borneo, and Laloki in British New Guinea.

When working with small and delicate insects like this family I use a Greenough binocular, as a single hand-lens is not suitable to recognize carinae, etc.

The measurements are from front of head to end of pygophor, not including the genital styles, and from base to apex of one tegmen.

GROUP I.

1. Subcosta and radia separate from near base of tegmen (subcostal cell long) 2
Subcosta and radia contiguous to middle or beyond middle of tegmen (subcostal cell short) 8
2. Subantennal process absent or very small 3
Subantennal process well developed 7
3. Shoulder keels absent, or only slightly developed 4
Shoulder keels well developed 5
4. In profile face and vertex angular; lateral keels of face not contiguous *Goncokara*
In profile face and vertex rounded; lateral keels of face contiguous to near apex *Cyclokara*
5. Vertex wide, length subequal to width of base 6
Vertex narrow, much longer than wide *Basileocephalus*
6. Face with central, longitudinal keel *Syntames*
Face without central longitudinal keel *Phacioccephalus*
7. Face distinctly centrally keeled *Eocenchrea*
Face not centrally keeled *Cedusa*
8. Media forking from radia one-third from base of tegmen **Cenchrea*, **Herpis?* **Persis?*
Media and radia separate from very near base 9
9. Subantennal process present 10
Subantennal process absent 11
10. Vertex and face in profile forming a curve. . *Cyclometopum*
In profile head angular at junction of face and vertex...
..... **Lamenia*, *Thyrocephalus*
11. Vertex and face narrow, subparallel, apex of face narrower than base of clypeus **Dazemaria*
Vertex about as broad as long, apex of face as wide as base of clypeus 12
12. Clypeus triangular, medianally and laterally keeled
..... *Vckunta*
Clypeus moderately convex and centrally keeled
..... **Parandenina*

Goncokara gen. nov.Type, *pullum*.

Pronotum wider than head. Vertex wider at base than long, base with fine keel, obtusely angularly emarginate; narrowing evenly but slightly to the truncate apex; sides very broadly keeled,

* Indicates in this and the following tables that I have not seen specimens of the genus.

studded with wax pits; face and vertex distinctly separated by transverse keel; face slightly narrowed in middle, widening at base, sides deeply keeled, keels with wax pits; clypeus flattened, tricarinate, the lateral ones joining the facial keels; a very small subantennal process; male antennae with second joint globular, a little longer than wide, slightly enlarged toward apex, female antenna smaller and not so globular; pronotum short, broadly angularly emarginate behind, shoulder keels very small; scutellum longer than broad, tricarinate, the lateral carinae fading out on basal half; tegmina fairly short and broad, neuration near to *Cedusa*; granulate on first claval vein and costa. The head and thorax of this is as in *Vekunta*, but the tegmina is very different.

(1) *G. pullum* sp. nov. (♂ ♀).

Pls. I fig. 21 and II fig. 6.

Vertex, abdomen and notum fuscous brown, face, clypeus, rostrum, legs, and ventral side of thorax lighter brown; tegmina fuscous brown, a small yellowish-white stripe across the apex of costal cell, tips of apical veins whitish; wings fuscous, dark-veined.

Length of body 3 mm.; tegmen 4 mm.

Habitat, Telok Ayer.

Cyclokara gen. nov.

Type, *C. girdlestoni*.

In profile vertex and face forming continuous curve, eyes large, round, slightly emarginate below, antennae small, cylindrical, not reaching to edge of gena, about twice as long as broad; no subantennal process. Vertex small, acutely triangular, base angularly emarginate and keeled, laterally finely keeled; face very narrow, slightly broadening apically below eyes, sides finely keeled, keels contiguous to near apex; clypeus tricarinate; pronotum of medium length, broadly and roundly emarginate behind, medianly keeled, shoulder keels nearly obsolete, a fine transverse carina from middle to the posterior end of shoulder keel; scutellum tricarinate, broader than long, rounded anteriorly, lateral angles behind middle, posterior margin subangular; apex of hind tibiae with one large spine on outer and a group or four to five spines on inner side. Tegmina long, apically pointed, second cubitus vein branched, first median sector arising well beyond middle, costa distinctly granulated along basal third. The shape and neuration of this tegmina distinguishes this genus; it comes into the *Basilcocephalus* group.

(1) *girdlestoni* (♂) sp. nov.

Pls. II fig. 13, III fig. 4.

Head, thorax, and legs yellowish tinged with red, abdomen red, brightest above, with a black mark in middle of dorsum; genital styles yellow on basal third, black on apical two-thirds; tegmina fuscous, red-veined, a black mark over base of radio-apical and first three medio-apical cells; wings uniformly fuscous, red-veined.

Length, body 2 mm., tegmen 4.5 mm.

Habitat: Mowong. I take the pleasure of naming this little insect after Mr. L. Girdlestone, to whom I am indebted for many kindnesses during my stay at his house at Mowong.

(2) *fulvum* (♂) sp. nov.

Head, thorax, legs, and abdomen dirty yellow, a small black triangular mark on dorsum and a small black dot on each side of abdomen, genital styles pale yellow, eyes deep chocolate brown; tegmina hyaline, opaque with waxy secretion, yellow-veined, irregularly marked with fuscous at base of subcostal cell, continuing over apex of radial cell to hind margin and to apex, all apical cells more or less fuscous, being darkest on the cross-veins from subcostal to third radial vein; wings fuscous, dark-veined.

Length of body 2.2 mm.; tegmen 4.5 mm.

Habitat: Mowong.

Phaciocephalus Kirk.(1) *flavocollaris* sp. nov. (♂).

Differs from *vitiensis* by its slightly shorter pronotum and less pronounced scutegial carinae. Head, pronotum, tegulae, and legs reddish-yellow; scutellum and the sides of abdomen tinged with red, anal tube fuscous, genital armature yellowish, last tarsus and labial joint fuscous; tegmina fuscous brown, darker at base, veins slightly darkened, a dirty white, transparent spot on costal border at end of costal cell.

Length, body 3.5 mm.; tegmen 5 mm.

Habitat: Tuloc Ayer.

(2) *rattlei* sp. nov. (♂ ♀).

Vertex a little longer than type; tegmina as in *pullatus*. Head, body, thorax, legs, and tegmina yellow inclined to salmon; posterior half of tegmina, including clavus, more distinctly salmon, a small fuscous mark at end of subcosta, with a reddish mark be-

hind it, the fuscous mark sometimes running into the salmon-colored streak, making it fuscous; wings white and white-veined. Lateral edges of genital claspers subparallel to near tip, where it becomes spatulate and rounded.

Length, body 4 mm.; tegmen 6 mm.

Habitat: Laloki.

I take the pleasure of naming this pretty little insect after Mr. F. Rattle, with whom I lived during my two visits to the Laloki district of Papua.

(3) *concolor* sp. nov. (♂).

Vertex and tegmen as in *pullatus*. Like the proceeding, but uniformly light reddish-yellow. Besides the absence of the color on the inner half of the tegmen, the male genital claspers separate this species, being longer, widest about one-third from base, where it is produced into an obtuse point on upper edge, and then narrowed to a fine, upward-turned point at the apex.

Length of body 4 mm.; tegmen 6 mm.

Habitat: Laloki.

(4) *funbris* sp. nov. (♂ ♀).

Vertex perceptibly shorter than wide; tegmen peculiar in having the first medial sector forked from near its base. Dorsal aspect dark fuscous brown, ventral aspect and legs yellowish-brown; tegmina and wings fuscous, dark-veined. The whole insect, including wings and tegmina, generally covered with flocculent waxy secretion. Genital claspers short, produced into curved, pointed process on upper distal corner, and into a short round process on lower distal corner.

Length of body 3.7 mm.; tegmen 6 mm.

Habitat: Larat.

Cedusa, Fowler.

Biol. Centr. Amer. Rhyn., vol. I, p. 112, Pl. 11, Fig. 28.

(1) *C. funesta* (type), Fowler, t. c. p. 112.

(2) *C. venosa*, Fowler, t. c. p. 112.

(3) *C. vulgaris* (Fitch).

Pocilloptera vulgaris. Fitch, 1857, Cat. N. Y. Insects.

Lamenia vulgaris. Uhler 1884 and others.

(4) *C. kulia* (Kirk).

Lamenia kulia, Kirk., H. S. P. A. Ent. Bull. 1, p. 400. This species has the face wider at apex than in *vulgaris*.

(5) *C. borneensis* sp. nov. (♂).

Light brown, inclining to yellow on ventral side. Tips of rostrum fuscous; dorsum of abdomen dark brown; eye castaneous; tegmina yellowish, slightly fuscous over apical half, veins slightly darker; wings light yellowish with slightly darker veins. Ventral edge of pygophor truncate, lateral edges slightly convexly curved; and segment about twice as long as broad, parallel sided, rounded at apex, anus on basal third; styles subquadrate, ventral edge slightly convexly curved, apical edge turned slightly inward, a strong inwardly curved spine on dorsal apical corner.

Length 2 mm.; tegmen 3.5.

Habitat: Teloc Ayer.

This species agrees in neuration and structure of head with *C. kulia*, the only other species at present known from the Malays.

Stal figured his type of *Lamenia* on Plate IV of "Eugenies Resa" in a very careful manner; the neuration is quite distinct and plainly shows that the subcosta and radia are joined, and that the vertex is longer than broad. It is very near to *Thyrocephalus*, Kirk., but until I can examine *L. caliginosa* I keep them distinct. *L. vulgaris* can be placed in *Cedusa*, the other American forms I have not examined, *L. kulia* also belongs to this genus.

I am not acquainted with *Herpis*, which Stal synonymized with *Lamenia*. It is possible that it does not agree with my restricted *Lamenia* but with *Cedusa*, in which case these forms will have to be placed under *Herpis*.

Eocenchrea gen. nov.

Type *E. maorica* Kirk.

In profile vertex and face gradually curved, very slight angulation at junction of vertex and face. Vertex about half as long as broad, base and apex nearly truncate, slightly narrowed at apex, excavate in middle, transverse keel separating vertex from face; face laterally angulate and broadest about one-fourth from apex, then narrowing to apex, lateral keels deep, distinct median carina; large subantennal process from angle of face to back of gena; antennae oval, small; lateral ocellus beneath eye; clypeus large, flattened, tricarinate, lateral carinae large; pronotum short, shoulder keels very small; scutellum as long as broad, lateral

angles about middle, indistinctly tricarinate, especially the lateral ones. Tegmen with long subcostal cell, four median sectors, the first furcate.

Cenchrea dorsalis, West., has a very short subcostal cell and the media arises from the radia about one-third from the base of the tegmina; the figure of this species also shows an antennal chamber formed by the pronotum (shoulder keels being large and the subantennal process absent); therefore *maorica* cannot be included with *dorsalis*. *Lamenia hiva* Kirk. agrees with *maorica*, but the facial keels are not so deep. The presence of the median facial keel also divides this genus from *Cenchrea* or *Lamenia*.

(1) *Eocenchrea maorica* (Kirk.).

Cenchrea maorica Kirk. Proc. Haw. Ent. Soc. II. 2. p. 80.

(2) *Eocenchrea hiva* Kirk.

Lamenia hiva Kirk. H. S. P. A. Ent. Bull. I. p. 404.

I'ekunta. Dist.

Temesa, Melich. Hom. Faun. Ceylon. p. 40 Nom. praeocc.

I'ekunta, Dist. Faun. Brit. Ind. Rhyn. III p. 287. n. nom.*

This genus was placed by Melichar among the Cixiidae, but was considered by Kirkaldy to be a Derbid. My two species, which conform to Melichar's generic characters and have a similar tegminal neurulation, possess a short apical labial joint. The absence of a distinct subantennal process separates this genus from *Thyrocephalus*.

(1) *hyalina* sp. nov. (♂).

Pl. I fig. 7.

Pale yellow; lateral third of scutellum fuscous, darkest on hind margins; dorsum of abdomen fuscous; a round black spot on mesopleura, another on metapleura; tegmina hyaline, tinged with light fuscous-yellow on distal half; dark fuscous over costa, along hind margin a narrow mark from radial cross-vein to apex, apical edge and veins fuscous; wings hyaline, light-veined. Genital style narrow for basal third, then roundly widened to near the truncate apex; one-third from base there is a short thick bilobed process, with small hooks on the lobes and near base, also a small curved spine a little way beyond this process.

Length of body 3.3 mm.; tegmen 4.4 mm.

Habitat: Java.

* In Mr. Distant's description of this genus I think "face" in the first line should read "vertex" and "vertex" in the fourth line "face."

(3) *badia* sp. nov. (♂ ♀).

Face slightly wider than in *hyalina* and keels not so deep. Dark brown, inclining to black on dorsum; legs, rostrum and antennae yellowish, except the last tarsal and labial joints, which are dark; tegmina dark brown, a small yellowish patch at end of costal cell, reaching from costa to media, with a dark spot in the middle of it; wings brown, dark-veined.

Length of body 2.4 mm.; tegmen 3.8 mm.

Lamenia Stal.

Eugenies Resa, p. 277. Pl. IV fig. 5-5b.

Type *Delphax caliginca* Stal. Öfv. af. K. Vet- Ak. Förh. 1854, p. 246.

Habitat: Taiti.

For reasons stated under *Cedusa*, I have separated this species from such forms as *Lamenia vulgaris*. I consider it likely that *Thyrocephalus* Kirk. will eventually be sunk into this genus.

Thyrocephalus Kirk.

H. S. P. A. Ent. Bull. I. 429. Bull. III 169, text fig. 2.

The type of this genus (*leucopterus*), owing to a defective specimen, was characterized as having a 5-carinate scutellum and so illustrated; it has only a central carina. The tegmen figured in Bull. III has the first cubitus vein abnormally approaching the media (media-cross vein very small), another specimen has it absolutely touching. This genus is near to Stal's *Lamenia* and may be eventually synonymized therewith.

(1) *T. flavo-monile* sp. nov. (♂ ♀).

Pronotum, head, legs and ventral side of thorax and abdomen yellow, scutellum dark brown, distal portion of facial keels, clypeus, mark on metapleura, anterior and middle tibiae and upper portion of abdomen fuscous; tegmina hyaline, slightly opaque, brown veined, the brown spreading out broad toward base of veins, filling most of the clavus; wings hyaline, brown-veined. Tegmina, wings and body covered with white flocculent waxy secretion. Genital style with fairly long, pointed and curved apex; anal segment narrowly rounded at apex.

Length of body 4.6 mm.; tegmen 4.7 mm.

Habitat: Amboina, Ceram, and Larat.

The nymph of this species has a broad face, the sides outwardly curved, narrowest at apex and base, a wide area, about a fourth, along each side being beset with wax pits.

(2) *T. flavo-maculatus* sp. nov. (♂ ♀).

Pl. I fig. 1.

Head, thorax, abdomen and tegmina black or brownish black; legs yellowish, last tarsal and labial joint and two bands on front tibiae fuscous; a yellow spot tinged with red on costa at end of costal cell, wings fuscous, dark-veined; base of tegmina and wings reddish; genial style long, narrow, curved at tip and pointed, apex of anal tube sharply pointed, sides of pygophor produced into a curved point.

Length of body 3 mm.; tegmen 4.6 mm.

Habitat: Laloki.

(3) *T. laratensis* sp. nov. (♂).

Pl. I fig. 3.

Similar to *flavomaculatus*, but yellow spot on tegmina smaller. The genitalia shows that this is quite distinct from *flavomaculatus*; the genital style is longer, thinner and more curved at apex; the anal segment bluntly rounded at apex and the side of the pygophor bluntly produced.

Length of body 2.6 mm.; tegmen 4 mm.

Habitat: Larat.

(4) *T. pseudolaratensis* sp. nov. (♂).

Pl. I figs. 2, 24.

This species is like *laratensis* except for the genitalia, the apex of anal tube being emarginate and the apex of genital style thin and curved.

Length of body 2.8 mm.; tegmen 4.3 mm.

Habitat: Amboina.

(5) *T. croccus* sp. nov. (♂).

Saffron color; pronotum, vertex and tegulae lighter than scutellum; legs lighter than body; last tarsal joint and apex of tibia blackish; face (especially the keels) and dorsus of abdomen fuscous; eyes dark brown; tegmina hyaline, veins pale yellow, the whole thickly covered with waxy secretions, making it opaquely white, subcostal and first and second medial apical cells fuscous; wings white, light veined. Anal tube flattened toward apex, curved downward and emarginate at apex, sides of pygophor ob-

tusely angularly produced, the apex pointed; genital styles straight along lower edge, pointed at apex which is outwardly curved, a spine-like process situated on inner side near base.

Length of body 3.6 mm.; tegmen 4.8 mm.

Habitat: Teloc Ayer.

(6) *T. fuscorostratus* sp. nov. (♂ ♀).

Vertex slightly shorter than in *croccus*, making angle between face and vertex slightly greater; keels on face not so large. Head and thorax dark yellow, facial keels, front of clypeus, margin of tegulae, last labial joint fuscous; abdomen dorsally dark, ventrally light; tegmina hyaline, yellowish, a long triangular fuscous mark in second radial and radio-apical cells, the distal portion of last medial and two cubital veins fuscous, slightly fuscous on base of costa and along claval veins; wings slightly fuscous, dark veined. This species is near *croccus*, but the genitalia is distinct, the genital claspers being slightly narrower and the apex of anal segment rounded, with a large downward pointing spine on each side near apex.

Length of abdomen 3 mm.; tegmen 4.6 mm.

Habitat: Telok Ayer.

(7) *T. vitreus* sp. nov. (♂).

Facial keels fairly deep, perceptibly converging about middle. Light yellow, facial keels, dorsum of abdomen and last labial joint fuscous; a round black spot on metapleura; tegmina vitreous, claval and distal ends of cubital veins smoky; wings smoky vitreous, dark-veined. Anal segment rounded at apex; genital styles slightly spatulate at end, rounded at apex.

Length of body 2.5 mm.; tegmen 3.8 mm.

Habitat: Roban, Java.

(8) *T. pseudotypicus* sp. nov. (♂).

Pl. I fig. 5.

Head, pronotum, legs and abdomen testaceous, face (especially keels) fuscous; abdomen dorsally blackish; tegmina hyaline, opaquely white through wax secretion, a fuscous mark in apical subcostal and first apical median cells. This species is very close to the type of the genus (*leucopterus*), but the genitalia is very distinct. A genital style of each is figured as that is the more easily observed part of this structure, but the penis presents more marked differences.

Length of body 3 mm.; tegmina 4 mm.

Habitat: Teloc Ayer.

(9) *T. obscurus* sp. nov. (♂).

Pl. I fig. 6.

Only by the genitalia am I able to distinguish this species from *leucopterus* with any certainty. The anal tube is pointed at apex, the genital clasper is figured.

Length of body 2.5 mm.; tegmen 3.5 mm.

Habitat: Teloc Ayer.

(10) *T. fullawayi* sp. nov. (♂).

Brown; keels of face and vertex and subantennal process lighter brown, antennae, borders of pronotum, legs (except front and middle coxae, which are brown) and metasterna yellow, front and apices of middle tibiae fuscous, pleurae of abdomen yellowish, hind margins of abdominal segments reddish; tegmina brown, costal border and a large spot at end of costa yellow; wings fuscous brown with dark veins; both tegmina and wings more or less covered with white waxy secretion.

Male pygophor truncate on ventral edge, slightly and roundly produced at sides; length of anal segment slightly more than twice the breadth, anus slightly before middle. Widest slightly beyond anus, narrowing to the rounded apex, lateral edges on basal half turned down, roundly produced about middle. Genital styles long and narrow, reaching beyond end of anal segment, apex turned inward and upward, ending in a fine spine; upper edge straight, lower edge straight to near curve where there is a small angular projection; two small projections on inner side near base.

Length 2.7 mm.; tegmen 4.4 mm.

Hab.: Island of Guam. Mr. D. T. Fullaway's collection, no. 1219.

This comes nearest to *laratensis*, but is easily distinguished by the styles being narrower and not drawn out into such long spines at apices and the sides rounded and not so much produced, also by the downward-turned lateral edges of the anal segment being larger.

Cyclometopum gen. nov.

Type *amboinense*.

Vertex and face in profile forming a continuous curve; subantennal process large, circular, attached to gena beneath the antenna; antennae subovate, not reaching to middle of eye; lateral ocelli present; vertex slightly broader at base than long, slightly narrowed at apex, base widely angularly emarginate, with narrow

keel, sides with broad keels beset with wax pits; transverse keel dividing face from vertex; face subparallel with large lateral keels beset with wax pits on inner side; clypeus broad at base, tricarinate, lateral carinae very distinct, wider apart at base than keels of face. Pronotum short, widely angularly emarginate behind, shoulder keels very small; scutellum as long as broad, lateral angles about middle, distinctly tricarinate. Tegmina very near to *Thyrocephalus*, the radial cross-vein very short, media with two sectors, cubitus furcate.

This genus is separated from *Thyrocephalus* by the rounded profile of the head and the circular subantennal process.

(1) *C. amboinense* (♂) sp. nov.

Pls. I fig. 25, II fig. 12.

Shiny black, the tip of clypeus, labium and legs yellowish.

Tegmina and wings black, a minute red spot at end of subcostal cell.

Ventral edge of pygophor truncate, lateral edges sinuous, anal segment about three times the length of the width of base, anus a little beyond middle, in profile it is swollen, apex angularly emarginate forming two downward-pointing points; styles long, narrow, subparallel sided, reaching to end of anal segment, dorsal edge slightly curved, ventral edge with small rounded projection about a third from apex, apex forming an inwardly turned point.

Length 2.8 mm.; tegmen 3.6 mm.

Habitat: Amboina.

GROUP II.

1. Media not arising from radia, or arising before forking of subcosta and radia..... 2
Media not separating from radia until after forking of subcosta and radia.....28
2. First median sector arising before apical third of tegmen.. 3
Median sectors confined to apical third or tegmen, first cubitus often joining second, enclosing second cubital cell†22
3. Forking of subcosta and radia at or before the middle of tegmen (subcostal cell long)..... 4
Forking of subcosta and radia beyond the middle of tegmen (subcostal cell short).....19

† In *Robigus* the first median sector is before the apical third, but it comes into this group.

4. Antennae with first joint well developed and flattened...
..... *Patara**
- Antennae with first joint very small..... 5
5. Antennae pectinated *Deradanda**
- Antennae not pectinated 6
6. Genae without subantennal processes..... 7
- Genae with subantennal processes13
7. Vertex extending well beyond eyes, in profile more or less
angular between vertex and face..... 8
- Vertex and face forming curve, not angular or greatly
extending in front of eyes..... *Pyrrhoncura*
8. Antennae reaching to anterior margin of head or beyond
..... *Kuranda*§, *Anotia*†
- Antennae not reaching to anterior margin of head..... 9
9. Antennae having one or more "palpiform" appendages at
base *Otiocerus*§§
- Antennae without such appendages.....10
10. Face not spatulate at base11
- Face spatulate at base.....12
11. Vertex curved and recurved in profile *Kampulokara*
- Vertex straight or with only one curve ♀ *Phantasmatocera*
12. Vertex slightly narrowed before apex but keels never
touching ♂ *Phantasmatocera*
- Keels of vertex meeting about two-thirds from apex.....
..... *Szczecia*
13. With distinct shoulder keels16
- With no, or very light, shoulder keels.....14
14. Head round in profile, vertex not ascending..... *Nesocora*
- Head in profile with vertex ascending.....15
15. In profile with vertex ascending and curved backward...
..... *Nesoniphas*
- In profile vertex slightly ascending but not curved back-
ward *Nesoncura*
16. Subantennal process spatulate, attached to gena by slender
stalk17
- Subantennal process not spatulate, attached to gena by
broad base18

§ *Archia* is placed by Distant near to *Kuranda*.

† My knowledge of *Anotia* is too limited for me to give a character constant in all the species. *Amalopota* differs from both *Anotia* and *Kuranda* by possessing ocelli.

§§ *O. rubescens* Fowler, is not an *Otiocerus* but the figure and description does not allow me to place it with accuracy.

Triopsis Sign. and *Aulacocephala* Montr. are stated to be allied to *Otiocerus*.

17. Face produced well in front of eyes, antennae small with sensory organs very large *Kaha*
 Face not greatly produced in front of eyes, antennae larger and sensory organs not very large *Nesokaha*
18. Vertex truncate at apex, keels on vertex and face not contiguous *Lyricen*
 Vertex acutely angular at apex, keels meeting at apex of vertex, contiguous on face to near apex..... *Paralyricen*
19. In profile face not forming angle with vertex..... *Makula**
 In profile face forming an angle with vertex..... 20
20. In profile face very strongly curved, especially on apical half *Eosaccharissa*
 In profile face not so strongly curved..... 21
21. Vertex "angularly widened between eyes"..... *Tapoosa**
 Vertex "conically rounded anteriorly"..... *Kamendaka*
 Vertex with "its apex angulated"..... *Chaprina**
22. Head projecting in front of eyes twice the length of scutellum *Vivaha**
 Head not so greatly produced..... 23
23. In profile head produced to an acute angle at point of meeting of vertex and face..... *Interramma**
 In profile vertex and face not acutely angular..... 24
24. Antennae large, flat and broad..... *Leptalcocera*
 Antennae cylindrical 25
25. Antennae long, reaching to anterior margin of head,
 *Deribia**
 Antennae not reaching to anterior margin of head..... 26
26. Vertex very acutely angular, base narrow, head much narrower than pronotum *Nicerta*
 Vertex not acutely angular..... 27
27. Vertex truncate at apex, broad at base, head nearly as wide as pronotum *Megatropis*
 Head distinctly narrower than pronotum, lateral margins of pronotum amplified, costal margin broken by a raised portion at end of costal cell..... *Robigus**
28. Subantennal process present..... *Necocyclomctopum*
 Subantennal process absent 29
29. Antennae distinctly longer than face..... *Platocera*
 Antennae not larger than face.....
 Heronax, **Niphadodite*, **Phra*†

† The type of this genus is not in the H. S. P. A. collection and the description does not allow me to locate it with any certainty.

‡ Distant refers this genus to *Fenuahala* (*Heronax*). My knowledge of it does not permit me to define it.

Pyrrhoncurea, Kirk.

H. S. P. A. Ent. Bull. I 434.

The absence of a subantennal process separates this genus from *Nesocora*, and the circular shape of vertex and face in profile distinguishes it from the females of *Phantasmatocera*.

(1) *P. immaculata* sp. nov. (♂ ♀).

Pl. III f. 5.

In profile vertex and face round, subparallel to the margin of the eye. Stramineous; slightly fuscous across the base of face; tegmina hyaline, slightly opaque with waxy secretion, veins yellowish; wings white, light-veined.

Hind margin of last abdominal segment produced angularly in middle, with a pair of contiguous, blunt, downward-pointing processes at apex. Male pygophor slightly emarginate on ventral edge, rounded slightly on the sides, with a small angular projection from the inside; anal segment long, with anus at apex, a small downward-turned, truncate process beyond anus; a little before middle the sides produced into small angles; styles as long as anal segment, curved along the lower edge, sinuous along upper edge, apex turned upward.

Length 2.5 mm.; tegmen 4 mm.

Hab.: Amboina.

(2) *P. rubida* sp. nov. (♂).

The keels on face contiguous on basal half, thus being nearer to *citharista* than *saccharicida*. Dark red; facial keels, labium and legs yellowish; tegmina uniformly fuscous with red veins, wings higher fuscous with red veins; both wings and tegmina opaque with waxy secretion.

Length 2 mm.; tegmen 3.4 mm.

Habitat: Rewa, Fiji.

Kampulokara gen. nov.

Type *cacnosum*.

Head slightly narrower than pronotum. In profile vertex curved and recurved; face sinuous; pointed at junction of vertex and face; antennae cylindrical, set low down on gena, reaching to top of eye; eye round, slightly emarginate below. Base of vertex wide, roundly emarginate, without keel; sides with wide keels beset with wax pits, vertex narrowing towards apex, which is slightly emarginate; face slightly widening to apex, keels shal-

low at base, deepening toward apex; clypeus tricarinate, median one obscure; pronotum short, sinuously, angularly emarginate behind; scutellum a little longer than wide, lateral angles slightly behind middle; central carina obscure; lateral carinae well elevated in middle, appearing as two small, longish tubercles. Tegmina differing from *Phantasmatocera* in having the first median section forked and the cubitus simple. This genus comes near to *Szczecia* and *Phantasmatocera*.

(1) *D. caenosum* sp. nov. (♀).

Pl. II fig. 4, 4a, Pl. III fig. 7.

Stramineous, fuscous mark across gena, lateral portion of pronotum and scutellum, eye black; tegmina and wings hyaline, opaquely white with waxy secretion, white-veined; radia, media and cubitus tinged with black, slightly fuscous in clavus.

Length of body 2.5 mm.; tegmen 3.8 mm.

Habitat: Larat.

Phantasmatocera, Kirk.

H. S. P. A. Ent. Bull. I 430. Bull. III 177.

Arunta Distant, A. M. N. H. (7) XIX 406.

Nesophantasma Kirk. Ent. Bull. III 177.

Kirkaldy erected this genus for two species, *arborca* (type) and *vitiensis*; subsequently he erected a new genus, *Nesophantasma*, for the latter species.. I now have two species which agree with *Phantasmatocera*, all the specimens being males, and nine species which agree with *Nesophantasma*, all the specimens being females, two of which agree in all details, except the shape of the head, to *P. arborca* and *P. nigromaculata*. The two species, *laloakensis* and *papucensis*, are only represented by females and the shape of the head is intermediate. I believe that this is a genus with slight sexual dimorphism in the shape of the head and that Kirkaldy was correct in his original decision, which I revert to.

(1) *P. arborca* Kirk. (♂ ♀).

Pl. I f. 10-a.

Arunta rubrovenosa, Dist. A. M. N. H. (7) XIX 406.

(♀) The marking agree with the male. Vertex very slightly narrowing toward apex, sides very slightly sinuous, face subparallel sided, antennae reaching slightly beyond eyes, smaller than in male; posterior margin of last ventral abdominal segment widely angular, the apex produced into two small points, turned somewhat ventrally, in profile angular near base.

(1) *P. nigromaculata* (♂ ♀), sp. nov.

(♂) Face not quite so spatulate at base as in type, antennae longer and flatter, reaching to front of head. Stramineous, a broad fuscous band from base of face, through eye, sides of pronotum and scutellum; clypeus, antennae and apical portion of face fuscous, posterior ventral portions of abdomen fuscous; tegmina opaquely white with waxy secretion, with nine or ten black spots as follows: one in clavus, base of media, middle of cubitus, end of cubitus, base of three median sectors and at base of third apical median cell, the dots spreading out along nerves in some cases; wings hyaline, light-veined, opaquely white with waxy secretion.

(♀) Slightly lighter in color than male; antennae reaching in length beyond eyes; vertex very slightly sinuate along sides, face nearly parallel sided. Posterior margin of last ventral plate roundly produced in middle, finely cleft in center.

Length of abdomen 2 mm.; tegmen 3.7 mm.

Habitat: Larat.

(3) *P. lalokensis* sp. nov. (♀).

Pl. I f. 17.

Vertex narrowing slightly toward apex, face subparallel sided; antennae reaching slightly beyond eyes. In coloration body and head as in *nigromaculata*. Tegmina hyaline, opaquely white with fuscous secretion, veins in apical half tinged with red, fuscous in base of clavus, two spots in cubital cell, fuscous along the sides of media and spreading into apex of subcostal cell, black spot at base of third, and fuscous in last two apical, median cells; wings hyaline, opaquely white with waxy secretion, veins in middle wing red. Hind margin of last abdominal segment widely angular, the apex finely cleft.

Length of body 3 mm.; tegmen 4 mm.

Habitat: Laloki.

(4) *P. papuana* sp. nov. (♀).

Pl. I f. 16.

Sides of vertex more sinuous than in *lalokensis*, face narrower. Color as in *lalokensis*, but darker, the whole abdomen being dark fuscous. Tegmina as in *lalokensis*, but the fuscousness much less

diffused. Hind margin of last abdominal segment drawn out into a long broad process in middle, with two rounded contiguous points at apex.

Length of body 2.7 mm.; tegmen 4.2 mm.

Habitat: Laloki.

(5) *P. zitiensis* Kirk. (♀).

Pl. I f. 15.

Phantasmatocera zitiensis, Kirk. H. S. P. A. Ent. Bull. I.

Nesophantasma zitiensis, Kirk. H. S. P. A. Ent. Bull. III.

Vertex shorter than in last four species, very slightly narrowed toward apex; lateral margins of face subparallel; very slightly narrowed toward apex; profile of head squarer than in *arborca*, antennae reaching slightly beyond eyes, yellowish. Hind margin of last ventral abdominal plate gradually produced medianly, the apex forming two rounded lobes.

(6) *P. unopunctata* sp. nov. (♀).

Pl. I fig. 12.

In profile head slightly longer, narrower and more ascending than *zitiensis*. Stramineous, faint fuscous mark on gena through eye to lateral angle of scutellum; clypeus and ventral portions of abdomen not fuscous; antennae reaching slightly beyond eye, yellowish; tegminae opaquely white from waxy secretion; veins reddish, especially on apical half, a fuscous mark running longitudinally through tegmen, darkest at base; a black spot at base of second and third apical median cells. Hind margin of last ventral abdominal segment angular, the apex angularly emarginate.

The male I associate with this species has the head very greatly produced, the keels of vertex meeting together before the expanded apex, thus approaching the genus *Swezeyia*; the antennae reach beyond eyes and have the sense organs along the edges dark; the coloration is the same as the female. Male pygophor with a small, angular, lateral projection, anal segment about twice as long as broad, widest at base, truncate at end, anus situated at apex; styles long, reaching slightly beyond anal segment, broadened and curved at apex, with a small emargination on dorsal edge near apex.

Length of body 2.6 mm.; tegmen 4 mm.

Habitat: Amboina.

(7) *P. pallidocornis* sp. nov. (♀).

Pl. I f. 13.

In profile head approaching *vitiensis*, but narrowed anteriorly. Stramineous, antennae of same color, mark on gena to scutellum indistinct; tegmina hyaline, opaque with waxy secretions, two fuscous marks in cubital cell, along sides of media and apex of sectors, apical cells cloudy, black spot at base of second and third apical median cells. Hind margin of last ventral abdominal plate like *vitiensis*, but not so much produced.

Length of body 2.3 mm.; tegmen 3.3 mm.

Habitat: Larat.

(8) *P. pseudopalidocornis* sp. nov. (♀).

Pl. I f. 14.

I have specimens from Queensland which I can only distinguish from *palidocornis* with certainty by the last ventral abdominal plate, which is more roundly produced, narrower, and the ventral lobes (sheaths) narrower.

Length 2.4 mm.; tegmen 3.5 mm.

Habitat: Queensland.

(9) *P. nigricornis* sp. nov. (♀).

Pl. I fig. 9.

In profile head between *unopunctata* and *pallidocornis*. Stramineous, the dark mark on gena, through eye, to lateral angles of scutellum, plain; antennae dark, beset with darker sense organs; tegmina hyaline, opaquely white with waxy secretions, tinged with yellow on basal half, veins yellowish, anterior half of media and bases of sectors blackish, small black spot at base of second and third apical median cells; wings opaquely white, yellow-veined. Hind margin of last abdominal ventral plate produced in middle angularly, the apex produced into two contiguous, pointed processes, standing out at an angle to surface of plate.

Length 2.3 mm.; tegmen 3.5 mm.

Habitat: Larat.

(10) *P. pseudonigricornis* sp. nov. (♀).

Pl. I f. 8.

This differs from *nigricornis* in having the central half of the last ventral abdominal plate steeply produced and angularly emarginate at the apex.

Length 2.4 mm.; tegmen 3.8 mm.

Habitat: Larat.

(11) *P. ambigua* sp. nov. (♀).

Pl. I fig. 11.

Head in profile near to *vitiensis*, but slightly shorter and broader. Stramineous, fuscous mark on gena, through eye, to lateral angle of scutellum; antenna light, with darker sense organs; tegmina hyaline, slightly clouded and partly opaque with waxy secretion, distal portion of radial, median and cubital systems red, fuscous in clavus, dark spot at base of second and third apical radial cells. Wings opaquely white, reddish veined. Hind margin of last abdominal plate fairly steeply produced in middle, roundly bilobed at apex.

Length of abdomen 2.4 mm.; tegmen 3.5 mm.

Habitat: Larat.

Swezeyia, Kirk.

H. S. P. A. Ent. Bull. I, 430.

(1) *S. laratica* sp. nov. (♂).

Pls. I ff19, 19a, III f. 11.

This species differs from the type (*lyricen*) in having the anterior part of the head in lateral view broader and not upwardly curved; it stands between *S. lyricen* and *Phantasmatocera*. Considering the great range of the shape of head in allied genera, I do not consider it advisable to generically separate this species, although it differs so considerably from *S. lyricen*. Head, thorax, legs and abdomen stramineous, a fuscous mark across gena, through eye and sides of pronotum, and scutellum; tegmina hyaline, opaquely white with waxy secretion, infuscate down center and on apical cells, a dark mark at base of third apical median cell; wings hyaline, white-veined.

Length of body 2 mm.; tegmen 3 mm.

Habitat: Larat.

Nesocora, Kirk.

H. S. P. A. Ent. Bull. III 172.

(1) *N. crocca* sp. nov. (♂).

Keels on face not contiguous. Saffron, keels of face and dorsum of abdomen fuscous; tegmina hyaline, opaque with waxy secretion; centrally irregularly suffused over greater portion with fuscous, veins yellowish red; wings fuscous, dark-veined.

Length of abdomen 2.3 mm.; tegmen 3.7 mm.

Habitat: Fiji, on sugar cane.

(2) *N. coccinea* sp. nov. (♂).

Keels of face contiguous to near apex (in *fidicina* Kirk. they are not contiguous) scarlet, antennae, clypeus, legs and genital style yellowish; tegmina fuscous hyaline, scarlet-veined, except basal half of subcostal, radia, and radial cross vein, which are white, a dark spot at base of third apical-median cell.

Length of abdomen 2.6 mm.; tegmen 3.8 mm.

I include this species in the genus, although it has the facial keels contiguous.

Nesoncura, Kirk.

Subgenus of *Pyrrhoneura*, H. S. P. A. Ent. Bull. III p. 171.

The presence of a sub-antennal process, and the shape of head in profile, separates this as a genus from *Pyrrhoneura*.

Nesokaha gen. nov.Type *pirocensis*.

In profile angulate at junction of vertex and face, vertex slightly convex, base of face very slightly concave, then evenly and convexly curved to apex; vertex triangular, roundly and shallowly emarginate at base, which is without keel; sides slightly longer than base, with deep keels meeting at apex, studded with wax pits along edges; face very narrow, keels contiguous to near apex; clypeus rounded, tricarinate at base; antennae about twice as long as broad, sense organs well elevated above surface; sub-antennal process spatulate, with narrow stalk; gena beneath eyes twice as broad as in front of eyes; pronotum fairly short, angularly emarginate behind, shoulder keels well developed; scutellum about as long as broad, lateral angles about middle, tricarinate on anterior half. Tegmina pointed at apex and amplified beyond clavus, venuration as in *Kaha*, but with two more apical median veins.

(1) *N. pirocensis* sp. nov. (♀).

Pls. II f. 7, III f. 13.

Head and thorax dorsally reddish brown, ventrally yellowish, including antennae and legs. Tegmina opaquely fuscous, red veined, which are brightest towards apex of tegmina: some light and more transparent spots in clavus, cubital and median cells, wings fuscous, dark-veined.

Length of body 2.6 mm.; tegmen 4.5 mm.

Habitat: Piroe, Ceram.

Kaha, Kirkaldy.(1) *K. extrema* sp. nov. (♀).

Reddish brown, upper portion of face reddish brown, lower portion white, semitransparent; tegmina hyaline, fuscous, red-veined, lighter across clavus and middle of median cell; a series of five small, triangular, white marks through apical portion of costal cell, a black mark over bases of second and third apical median cell, wings fuscous, red-veined.

Length of body 2.7 mm.; tegmen 3.7 mm.

Habitat: Amboina.

(2) *K. media* sp. nov. (♀).

Pl. II f. 11.

Head as in *extrema*, but processes on antennae not so long. Reddish brown; genae semitransparent, dark round lower portion of eye, extending as three angular markings to edge of face; clypeus and legs lighter; light streak down middle of scutellum; tegmina fuscous, markings as in *extrema* but darker, wings fuscous, red-veined.

Length of body 3 mm.; tegmen 6 mm.

Habitat: Mowong.

(3) *K. ceramensis* sp. nov. (♂).

Agreeing in structure with type (*perfecta*), head in lateral view not extending so far as in *media*. Upper half of face black, lower half transparent; clypeus and apex of face black, antennae light yellow; pronotum and scutellum reddish-brown with broad yellowish mark over keels; legs and genital styles yellowish, abdomen fuscous; tegmina and wings as in *media*.

Length of body 1.8 mm.; tegmen 3 mm.

Habitat: Ceram.

Paralyricen gen. nov.Type *jepsoni*.

Head in profile projecting in front of eye, subovate in outline; antennae short, elongate ovate, about twice as long as broad; subantennal flange large, stretching from back of gena to near facial keels; eye broader than deep, emarginate on lower edge. Vertex projecting beyond eyes, narrow, acutely angular, hind margin roundly emarginate with fine shallow keel, sides evenly converging to apex where the deep lateral keels meet; face very narrow, keels contiguous from base to near apex; clypeus slightly

longer than face, flattened, distinctly tricarinate; pronotum very short, perpendicular in middle, shoulder keels very large, forming very complete antennal chamber, posteriorly deeply angularly emarginate in middle; scutellum slightly longer than wide, the lateral angles slightly behind middle, without carinae or with three very obscure carinae (three light marks on some specimens look superficially like distinct carinae). Tegmina as in *Lyricen*, a little broader in proportion to length. *Lyricen* differs from this genus in having a subparallel-sided vertex with a truncate apex, lateral keels of face never contiguous, face widening from vertex to below eyes, then subparallel; clypeus conspicuously flattened on sides, long and narrow in front, distinctly tricarinate.

(1) *P. jepsoni* sp. nov. (♂ ♀).

Pls. II f. 10, III f. 9.

Head, body and legs light yellow, fuscous on gena in front of the dark brown eye; tegmina and wings hyaline with white veins, sometimes suffused with fuscous over apical cells, both opaquely white with waxy secretion. Hind margin of last abdominal ventral plate of female angularly produced, the side of the produced portion being evenly and concavely curved and starting from the lateral angles of the plate. Male genital styles narrow, sinuous, subparallel sided, rounded at apex.

Length of body 3 mm.; tegmen 5 mm.

Habitat: Fiji. I take the pleasure of naming this little insect after Mr. F. Jepson of Fiji.

(2) *P. knowlesi* (♂).

Head, body and legs reddish-yellow, three distinct carinae on scutellum, tegmina yellowish hyaline with darker veins, wings hyaline with yellowish veins; tegmina and wings slightly opaque with waxy secretion. Male genital styles evenly curved along edge, roundly expanded on apical two-thirds of upper edge, with a small round emargination about middle, apex pointed.

Length of body 2.5 mm.; tegmen 5 mm.

Habitat: Fiji. I take the pleasure of naming this little insect after Mr. C. H. Knowles of Suva.

Eosaccharissa Kirkaldy.

An. Soc. Ent. Belg. LI. 126.

Type *E. javana* Kirk.

I cannot find the type of this genus among Kirkaldy's collec-

tion, but my specimens of *javana* were taken in Java on sugar-cane and conform to his description. I have recharacterized the genus and figured the head of *laratica*.

In profile vertex flat, projecting slightly beyond base of face; face curved slightly at base, more strongly at apex; vertex angular, sides with wide, slightly curved keels, beset with wax pits, base roundly shallowly emarginate, unkeeled; face between eyes narrow (keels contiguous), thence widening; antennae less than the length of an eye, largest at apex; clypeus rounded, laterally carinate at base; pronotum short, deeply angularly emarginate behind; shoulder keels very small; scutellum longer than broad, lateral angles behind middle, tricarinate. This genus differs from *Kamendaka* in having its vertex projecting slightly beyond base of face and the apex of face strongly curved.

(1) *E. javana* (♂ ♀).

Habitat: Pekalongan, Roban, Piroe and Amboina, on sugar-cane.

(2) *E. laratica* sp. nov. (♂).

Pl. I f. 18.

Stramineous, fuscous on gena round ocellus and on dorsum of abdomen; eyes dark castaneous; tegmina hyaline, opaquely white with waxy secretion, apical portion of veins yellowish, light yellow spot in clavus, another at base of radia, a band from apex of clavus to base of first median sector, a spot in middle of costal and subcostal cells, all more or less obscured by waxy secretion; wings hyaline, opaquely white with waxy secretion, dark-veined.

Length 3 mm.; tegmen 3.8 mm.

Habitat: Larat, on sugar-cane.

(3) *E. obscura* sp. nov. (♀).

Stramineous, fuscous on clypeus, ventral portion of thorax and abdomen; front tarsi and marks on tibiae and femora fuscous; tegmina hyaline, opaquely white with waxy secretion, veins yellowish, a light yellowish mark over base of radial and medial cells, apical half of tegmina suffusely light yellow, first and second median apical cells fuscous; wings hyaline, opaquely white with waxy secretion, dark-veined.

Length: 2.5 mm.; tegmen 3.8 mm.

Habitat: Larat, on sugar-cane.

It is possible that this is the female of *laratica*.

(4) *E. sordida* (♂) sp. nov.

Antennae smaller than in *laratica*. Stramineous, legs lighter; fuscous band across gena to the castaneous eye; tegmina dirty brown, lighter along costal and apical margin, veins slightly darker; wings fuscous, dark-veined; wings and tegmina opaque with waxy secretion.

Length 2 mm.; tegmen 3.5 mm.

Habitat: Pekalongan, on sugar-cane.

Kamendaka, Distant.

Faun. Brit. Ind. Rhyn. III p. 310.

(1) *K. australis* sp. nov. (♀).

In profile vertex slightly ascending, keels on face contiguous basal two-thirds; tegmina pointed at region of first three apical median veins, otherwise agrees structurally with description of type. Stramineous, reddish on vertex and on clypeus; eyes reddish-brown; tegmina hyaline slightly opaquely white with waxy secretion, veins yellowish, irregular stramineous markings from costa across base of radial cell to hind margin, broad along the hind margin and over the apical portion of radial cell, fuscous in subcostal, radial-apical, second, third and fifth median apical cells and two black spots in costal cell; wings hyaline, white-veined, opaquely white with waxy secretion.

Length 2.5 mm.; tegmen 4.0 mm.

Habitat: Cairns, on sugar-cane. (Perkins and Koebele coll.)

(2) *K. javana* sp. nov. (♂).

In profile vertex slightly shorter than *australis*. Face very narrow but keels not contiguous. Stramineous; dorsum of abdomen slightly fuscous, eye castaneous, tegmina hyaline tinged with yellow, which is mostly confined to posterior half, a round black dot in third median apical cell.

Length 2 mm.; tegmen 3 mm.

Habitat: Java, on sugar cane.

(3) *K. versicolor* sp. nov. (♂).

Vertex slightly more ascending than in *australis*, angulation of vertex with face more acute, face very narrow but keels not contiguous.

Stramineous; dorsum of abdomen fuscous also across anterior coxae; tegminae hyaline, opaquely white with waxy secretion, yellow-veined, irregular stramineous, markings in base of claval, middle of medial, middle of costal, and radial cells, apex of

medial and claval cells, also across apical portion of tegmina, black marks in two of the radial-apical and two of the medial-apical cells and some irregular fuscous markings on the stramineous bands.

Length 2 mm.; tegmen 3.3 mm.

Habitat: Amboina, on sugar-cane.

(4) *K. amboinensis* sp. nov. (♂ ♀).

Pale yellow; in male the dorsal surface of abdomen fuscous; vertex and basal portion of facial keels fuscous, reddish patch on gena between base of face and eye; tegmina hyaline, opaquely white with waxy secretion, veins yellowish, a fuscous mark through middle of costal and apex of radial and medial cells, a dark spot in apex of clavus.

Length 3 mm.; tegmen 4.6 mm.

Habitat: Amboina, on sugar-cane.

This species is somewhat like *spectra* Dist., but the first and second median sectors arise very near together, and the apex of the tegmina are angularly produced from first to fourth apical median veins.

Nicerta, Walker.

Jour. Lin. Soc. London I 159, pl. 8, figs. 5-5a.

(1) *N. cruenta* sp. nov. (♀).

In profile head conically produced in front, slightly ascending. Head much narrower than pronotum; vertex long and narrow, base roundly emarginate, without keel, sides deeply keeled, meeting at apex; face very narrow, composed of contiguous keels which do not part at apex; clypeus shorter than face, well rounded, without carinae, labium shorter than clypeus, reaching to hind coxae; antennae cylindrical, slightly constricted in middle, extending slightly beyond eyes. Tegmina long and narrow, costal, radial and median cells long, extending along two-thirds of the tegmen, forking of cubitus beyond middle, three median sectors in apical fourth of tegmina.

Yellow, eye reddish-brown, red streak across gena, genae around antennae and antennae tinged with red, an irregular blood-red streak across base of tegmina, another across middle of clavus to cubitus, through middle of costa to media, two small

spots on basal half of costa, a spot at base of first median sector, and several small red marks in apical cells; wings hyaline, opaque with waxy secretions, yellow-veined.

Length 3.7 mm.; tegmen 6 mm.

Habitat: Amboina.

This appears to come near to *N. fervens*, Walker.

Megatropis nov. gen.

Type *coccincolinea*.

In profile head semicircular to oblong, gena wide or very wide in front of eye. Head slightly narrower than pronotum, vertex broad at base, roundly emarginate, without keel, apex truncate, half the width of base, sides straight, evenly converging to apex, with deep keels, beset along edge with wax pits; face narrow, parallel sided to apex, keels of vertex continued down sides of face, the edge of the keels sometimes touch one another but are not contiguous at their bases; clypeus shorter than face, wide at base and rounded, very obscurely tricarinate; labium (beyond clypeus) half as long as clypeus. Antennae cylindrical, simple, with a round projection, or a distinct prong, at base, distally notched or slightly bilobed where arista is articulated; pronotum very narrow, shallowly and widely emarginate behind, median portion fitting into the emarginate vertex; scutellum slightly broader than long, lateral angles a little before middle, anteriorly rounded, posteriorly angular. Tegmina about four times longer than broad; subcosta and radia forking before the middle, cubitus forking about same distance from base, three median sectors in apical third of tegmen, end of clavus beyond middle of tegmen.

I separate this genus from *Nicerta* on the width of the head, vertex and face, also on the nature of the facial keels. It may represent some species of Walker's *Interamma*, but as I am unable to recognize his forms I shall consider Melichar's *I. rubrofasciata* as the representative of that genus. Of the genus *Deribia* I only know *D. (Anotia) coccinea* Guer. through Cuvier's Iconog. and Girard's Trait. d'Ent.

(1) *M. coccincolinea* sp. nov. (♂ ♀).

Fig. Pls. II f. 2, III f. 14.

Uniformly very pale yellow, eyes dark brown, a tinge of red on gena in front of eye; tegmina hyaline, opaquely white with waxy secretion, a crimson line from base to apex through middle

of tegmen, anterior apical margin tinged with red; wings hyaline opaquely white with waxy secretion. Antenna reaching slightly beyond eye, cylindrical, slightly constricted in middle, without any projection or fork at base.

Length 3.8 mm.; tegmen 6 mm.

Habitat: Mowong.

(3) *M. immaculata* sp. nov. (♀).

Structurally agreeing with type. Pale yellow, eyes brown, gena tinged with red before eye, tegmina and wings hyaline, opaquely white with waxy secretion, tegmina tinged with yellow, yellow-veined. Hind margin of last ventral abdominal plate roundly and bluntly produced.

Length 3.3 mm.; tegmen 5.4 mm.

Habitat: Amboina: Teloc Ayer.

(3) *M. pallida* sp. nov. (♂ ♀).

Antennae a little longer than head, a very short prong, or big tubercle, projecting from the base. Hind margin of last ventral plate of female angularly produced, centrally depressed or lipped (like on a jug). General facies as in *immaculata*.

Length 3 mm.; tegmen 5 mm.

Habitat: Teloc Ayer.

(4) *M. flexicornis* sp. nov. (♂).

This has the general facies of the last two, but the prong of the antennae is nearly as long as the main branch, the two forming a horse-shoe-shaped organ. The genitalia separates it from the male *pallida*, the genital styles being narrower and the anal tube produced into a blunt, ventral, median process.

Length 3 mm.; tegmen 5 mm.

Habitat: Pontianak.

(5) *M. rubella* sp. nov. (♀).

Head much more produced in front than in the type, prong of antennae two-thirds the size of main branch, lying alongside of it. Vertex, upper portion of gena, middle of pronotum and scutellum, tinged with scarlet. Hind margin of last ventral plate roundly produced.

Length 4 mm.; tegmen broken.

Habitat: Amboina.

Only one specimen with tegmina in bad condition.

Leptaleocera gen nov.Type *coccinea*.

In profile vertex and face forming two curves; eyes long and narrow, the hind margin being deeply emarginate; edge of face subparallel to edge of eye. Vertex narrow and angular, base roundly emarginate, without keel; sides with very deep keels meeting at apex; face linear, keels contiguous right up to apex; clypeus about as long as face, rounded, obscurely carinate in middle, no lateral carinae; labium short, about one-third the length of clypeus; antennae large, flat, thin, slightly thickened round edges; pronotum very short, projecting well into excavated vertex; scutellum about as long as broad, rounded anteriorly, obtusely angular behind, lateral angles behind middle, no carinae. Tegmina long and narrow, subcosta and radia forking well beyond middle, subcostal cell small, cubitus forking before middle, four median sectors in apical third of tegmina, last one very small.

(1) *L. coccinea* sp. nov. (♂).

Pls. II f. 5, III f. 15.

Thorax, legs and abdomen reddish-yellow, eyes black; tegmina and wings scarlet, some darker and more opaque spots in cells between end of clavus and subcostal cell, also in apical median cells.

Habitat: Teloc Ayer.

Length of body 3.7 mm.; tegmen, 5.4 mm.

Heronax, Kirkaldy.

H. S. P. A. Ent. Bull. I 431.

Fenuahala, Distant. A.M.N.H. (7), XIX 411.

(1) *H. parnassius* Kirk. (♀).

This species, which is the type of the genus, has the base of face slightly convex, the point of junction of face and vertex angulate in profile. Hind margin of last abdominal ventral plate of female obtusely angular, the sides of the production starting from lateral margin, slightly sinuous, apex finely pointed and turned upward, finely grooved from apex to near basal margin, the anterior styles long and finely pointed. Until I know the shape of the last abdominal ventral plate and the profile of the head of *H. (Fenuahala) infuscata* Distant, I cannot accept Kirkaldy's synonymy of it with *parnassius*.

(2) *H. saccharivora* Kirk. (♀).

This species has the vertex somewhat elevated but there is no angulation between vertex and face; the last abdominal ventral plate produced angularly in middle half, without groove down middle; anterior genital styles shorter and not so pointed as in *parnassius*.

(3) *H. lalokensis* sp. nov. (♂ ♀).

Head in profile with vertex and face forming one curve, antennae nearly as long as head, broad, flattened. Male genital styles about three times as long as broad, subparallel sided, slightly angular in middle, apex with small, curved point, anal segment with a downward curved point at apex; sides of pygophor acutely angularly produced. The last abdominal ventral plate of female with hind margin widely angularly produced, with a deep medial groove down apical third. Stramineous; tegmina and wings hyaline with yellow veins, subopaque with waxy secretion; two circular broad yellowish bands across tegmina, the first passing over the median crossvein and the other over the bases of second and third median sectors; irregular yellowish spots in apical cells and on basal third.

Length 2.3 mm.; tegmen 5.4 mm.

Habitat: Laloki.

Platocera gen. nov.Type *annulipes*.

In profile head conically projecting at junction of vertex and face; vertex ascending, face gradually curved; gena at middle of face about half the width of an eye. Vertex narrow, acutely angular, base roundly excavate, not keeled, keels along lateral margins deep, meeting at apex, beset with wax pits; face very narrow, keels contiguous to near apex; clypeus large, rounded, obscurely tricarinate; antennae very large, flat, thin, subequal in width throughout, truncate at apex, conspicuously angularly bent at base, forming a disk-like base at right angles to distal portion; pronotum very short, no shoulder keels; scutellum distinctly shorter than broad, lateral angles situated behind middle, without carinae. Neuration of tegmina near *Herona*, first median sector leaving media at junction of media and radia. *Niphadodite* Kirk. was founded upon a unique which is missing from the collection. It appears to be near this genus, especially to *nigrofrons*.

(1) *P. annulipes* sp. nov. (♂).

Pls. II f. 9, III f. 3.

Stramineous, fuscous along sides of face and apex of clypeus; front and middle legs with two black rings on tibiae, and a black streak down femora, hind legs with apex of femora black; apex of labium black; tegmina hyaline with yellowish veins, a broken fuscous mark across tegmina about middle of clavus and another, less broken, at first median sector; a series of fuscous marks in costal cell, apical veins fuscous.

Length 2.3 mm.; tegmen 3.7 mm.

Habitat: Amboina.

(2) *P. nigrifrons* sp. nov. (♂).

Antennae not quite so large as *annulipes*, narrowed at base and apex, the basal disc not being so large, appearing more as a swelling at base; media with four sectors. Face, antennae, clypeus, ventral aspects of thorax and abdomen and sides of pronotum and scutellum fuscous, legs, vertex, median portion of pronotum and scutellum and dorsal aspect of abdomen fuscous yellow. Tegmina hyaline, slightly opaque with waxy secretion, yellowish veins spotted with black, the black spreading into cell in clavus, and at base of second median sector; wings hyaline with yellowish veins, slight opaque with waxy secretion.

Length 2.3 mm.; tegmen 5.4 mm.

Habitat: Larat.

Neocyclometopum gen. nov.

Type *sordidum*.

In profile vertex and face rounded, the apical portion of face being slightly flattened; subantennal flange rising from round the base of antennae, large and foliaceous; antenna subtriangular, just reaching to eye. Vertex acutely triangular, base fairly broad, roundly, shallowly emarginate, without keel; lateral keels deep, obscurely beset with wax pits, converging towards apex and continuing down face, where they are contiguous for some distance; clypeus slightly larger than face, flattened, especially at sides, obscurely tricarinate; pronotum very short, perpendicular in middle, widely, angularly emarginate behind, boulder keels large; scutellum about as wide as long, lateral angles well behind middle, without carinae. Tegmina near to *Platocera*, but with four median sectors, the median cross-vein joining media slightly before the forking of radia and media.

(1) *N. sordidum* sp. nov. (♂).

Pl. II fig. 3.

Antennae flattened, subtriangular, attached to head at one of the angles, the edge grooved, appearing as if the antenna was composed of two plates. Dirty yellow, genae, antennae, clypeus and lateral portions of pronotum fuscous, scutellum fuscous with three indistinct yellowish longitudinal marks, ventral aspect of abdomen fuscous; genital styles yellow; tegmina hyaline, with irregular markings along veins, several fuscous spots in costal cell; wings dirty hyaline, dark veined; both tegmina and wings semiopaque with waxy secretions.

Length 3 mm.; tegmen 6 mm.

Habitat: Larat.

(2) *N. borncocnsis* sp. nov. (♂ ♀).

In profile gena not so wide as in *sordida*, face not so flat in profile, antennae conical, widest at base, a little longer than wide. Fuscous yellow, face, antennae, legs and basal ventral portion of abdomen fuscous; tegmina and wings hyaline, yellow-veined, slightly opaque with waxy secretion, tegmina reddish along costa.

Length 2.5 mm.; tegmen 5 mm.

Habitat: Mowong.

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14. Face longer than clypeus; five median sectors, first furcate *Phenice**
Clypeus longer than face15
15. Media with five or six unbranched sectors..... *Proutista*
Media with six sectors, the third furcate..... *Paraproutista*

Sikaiana Distant.

A. M. N. H. (7) XIX p. 398.

Mr. Distant suggests that this genus may be allied to *Basilcocephalus*, but apart from the tegmina, which places it in a different section of the *Derbidae*, the pronotum alone would separate it very distinctly. *Muiria* and *Lecomelicharia* are very closely allied to it. None of the species that I place in this genus have carinae on the clypeus.

(1) *S. fulva* sp. nov. (♀).

Head, thorax and abdomen light stramineous fuscously mottled, legs lighter; tegmina vitreous, iridescent, costa red, broken up into minute spots by small patches of wax; veins brown, red towards apex, a small brown streak across extreme base, another across costa and radial cells a little higher up, a larger mark through middle of costal and radial, and apex of median, cells,

continued as a hairstreak to hind margin, a hairstreak through costal and radial cells near apex, apical veins bordered with fuscous brown, leaving white spots in middle of cells; wings very short reaching hind margin of second abdominal segment, truncate at apex, large anal area with stridulating surface.

Length 1.5 mm.; tegmen 3.4 mm.

Habitat: Larat.

(2) *S. straminea* sp. nov. (♂ ♀).

Head, thorax and abdomen stramineous, eyes dark castaneous; tegmina hyaline slightly opaque; veins yellowish, costa and apex of subcosta, radia and media reddish, irregularly and faintly fuscous along veins; wings reaching nearly to end of abdomen, costa with apical half emarginate causing angulation in middle, apically pointed; anal area large with stridulating surface.

Length 1.5 mm.; tegmen 3.8 mm.

Habitat: Larat.

(3) *S. caenosa* sp. nov. (♀).

Thorax, legs and dorsal surface of abdomen dirty yellow, head, antennae and ventral surface of abdomen darker, eyes dark castaneous; tegmina hyaline, iridescent, veins yellowish, fuscous spot at base of first median sector, a small one near base of media and another on second cubital vein; wings about three fourth length of abdomen, costa strongly angular a little before middle, apical half narrow, apex rounded, anal area large, with stridulating surface.

Length 1.5 mm.; tegmen 3.8 mm.

Habitat: Larat.

(4) *S. nigrimaculata* sp. nov. (♀).

Dirty yellow; head, pronotum and three longitudinal marks on scutellum lighter, abdomen with darker brown markings, eyes castaneous; tegmina hyaline, slightly opaque, a round black spot at base of first median sector, wings a little longer than abdomen, costa slightly angular one third from base, apical portion as broad as base, apex subtruncate with black spot in middle of apical area.

Length 1.5 mm.; tegmen 3.8 mm.

Habitat: Larat.

(5) [*S. clymene* sp. nov. (Kirk.)

Pale luteous, the antennae and the mesonotum laterally rather darker. Beneath, and the legs, testaceous, extreme apex of the hind tibiae blackish; extreme apex of the antennae fuscous. Tegmina hyaline, iridescent, veins pale yellow, three percurrent transverse, ashy yellowish, narrow bands (two on the basal third, one just apical of the middle), also two not extending to the middle of the tegmina interiorly (between two and three, and three and the apex), the radial and median veins are also the same color on their apical two-thirds, and the apical veins are all more or less similarly suffused; costal vein pale, speckled closely with sanguineous. Wings hyaline, veins yellowish.

Length $1\frac{1}{2}$ mm.; expanse about 10 mm.

Habitat: Larat (Muir).

G. W. K.]

Loemelicharia gen. nov.

Type *rufovittata*.

Head in profile with vertex flattened and face curved, face projecting very slightly in front of eyes, gena of equal width all round eyes, eyes large, reaching to apex of face, deeply emarginate behind; antennae large, slightly flattened, constricted about middle, indented at side of apex where the arista arises. Vertex triangular, base nearly as wide as length, angularly emarginate, keeled; sides keeled, keels meeting at apex; face very narrow, keels contiguous to apex, clypeus short, broad, rounded, without keels; labium very short; pronotum long, roundly, broadly and shallowly emarginate behind, with median carina; scutellum distinctly shorter than broad, lateral angles well behind middle, hind margin very broadly angular. Tegmina near to *Sikaiana*, but the median basal cell is very narrow and reaches to middle of tegmina or beyond, the median cross-vein parallel to media, and the subcostal cell is absent; wing very small, with stridulating surfaces on anal areas. In the male genitalia the dorsolateral margin of the pygophor extending as two large, broad spines, much longer than the genital styles.

I have taken the liberty of naming this genus after Dr. Leopold Melichar.

(1) *L. rufovittata* sp. nov. (♂ ♀).

Head, thorax and abdomen bright red; legs, posterior edge of scutellum and post scutellum yellowish; tegmina vitreous; iridescent, costal, radial and median cells red, apical veins red, api-

cal portion of tegmina black, continuing along media as narrow black mark to median cross-vein, a black mark at the forks of cubitus; wings red, very minute, not reaching to hind margin of second abdominal segment, triangular in shape, with large stridulating anal area. In this species the narrow median cell extends two-thirds from base of tegmen.

Length 2 mm.; tegmen 5 mm.

Habitat: Larat.

(2) *L. fuscovittata* sp. nov. (♀).

Pl. III f. 12.

Head, antennae, scutellum, abdomen and anterior half of pronotum fuscous, posterior half of pronotum and the postscutellum yellowish, legs yellowish; tegmina hyaline, iridescent, a fuscous band from base, along costa, covering the costal, radial and median cells, and extending round to past the second cubital vein; apical veins red; wings fuscous, in shape and size as in *rufovittata*.

Length 2 mm.; tegmen 5 mm.

Habitat: Larat.

Zeugma Westwood.

This has a neuration near to *Zoraida*, the cubitus having four veins and the media eight sectors, the first, furcate, sector being joined to cubitus, the cross-veins of cubitus and first two media sectors contiguous at end after which they are a short distance apart (gradate), subcosta and radia separate from a little before middle of tegmina, subcostal cell narrow, radia with five small branches in upper fourth of tegmina; the face and vertex forming one curve, broad and parallel sided; antennae pyriform, pointed end forming apex, and attached to head by the side and not by the center of larger basal end; subantennal process present, narrow, attached more behind than under antenna; pronotum long, shallowly and roundly emarginate behind, shoulder keels large and, together with subantennal processes, form distinct postantennal cavities. This is the only genus of this group which possesses subantennal processes and shoulder keels.

Z. monticola sp. nov. Kirk.

[Head, pronotum, sterna and legs orange-yellow, the two latter more obscurely; a small spot at the base of the tegmina and another close to the hind angle of the mesonotum, blackish; labium, abdomen (mostly), basal and apical third in fore and of

middle tibiae, apex of hind tibiae, third segment of tarsi, etc., more or less fuscous. Tegmina hyaline, tinged with cinereous, a fuscous line covering cubital and median cross veins, another over media and a third through subcostal cell to apex, a black line over apical cross veins.

Length 4.5 mm.; tegmen 9 mm.

Hab.: Parit Buntar (Malay Peninsula), Mowong and Peka-longan (Muir).

This may possibly be Westwood's *Z. vittata*, the locality of which is unknown, but he omits all mention of the conspicuous spots at the base of the tegmina and on the mesonotum; and the antennae are shaped quite differently, so much so, in fact, that if I did not think Westwood's description and figure of them (the antennae) erroneous, I should have founded a new genus on that character alone.

G. W. K.]

The pygophor produced on ventral edge into a small median rounded projection, the side into a broadly triangular plate, with pointed apex reaching nearly to apex of genital style; anal tube large, slightly longer than genital styles, anus about one-third from base, apex angularly emarginate; genital styles long and narrow, slightly broader at base than at apex, apex with sharp point turned upward and inward. Hind margin of last abdominal plate of female evenly and widely emarginate in middle, the lateral portion of margin being slightly raised above median portion.

Zoraida Kirk.

Thracia Westwood, preoc.

This genus apparently has four or five cubital veins, and four sectors to the media; the first sector, which has two branches, appearing as belonging to the cubitus.

(1) *Zor. superba* sp. nov. (♂).

Antennae longer than face, cylindrical, sense organs small, light-colored. Posterior median edge of pygophor produced into small triangular plate, a little longer than width of base, sides produced into small angles, not half as long as genital style; anal tube very long, reaching beyond styles, anus about one-third from base, apex wide, deeply, angularly emarginate; basal fourth of genital styles narrow, apical three-fourths wider, convex outside, apex truncate with an inwardly curved spine on lower apical angle.

Head, thorax and abdomen reddish-brown, keels yellowish, pronotum and abdomen beset with small light-colored tubercles.

legs and genital organs yellowish; tegmina uniformly brown except the narrow costal, subcostal and basal half of radial cells which are light yellow, veins reddish, the three veins entering truncate apex with a faint dark spot at base of the small whitish tips, cross veins slightly fuscous; wings reaching to first median sector, fuscous, reddish-veined.

Length 5 mm.; tegmen 13 mm.

Habitat: Laloki.

(2) [*Zor. sylvicola* sp. nov. Kirk.

Head and appendages, sterna, sternites, and legs, orange-yellow, the fore and middle tibiae and tarsi more or less fuscous, except at the extreme base. Nota pale piceous, the pronotum and keels of mesonotum darker, the mesonotum paler, the elevated margin of the mesonotum, metanotal keels, etc., pale. Urotergites, pygophor, etc., black. Tegmina and wings hyaline; veins dark brown or black; costal, subcostal, radial, and median veins (but not the forks of the latter), suffusedly sooty, the suffusing broadening near the apical margin, so as to occupy nearly one-third of it. Some of the other veins are sometimes a little suffused. Pronotum scarcely granulate. Antennae cylindrical, sense organs medium sized, light colored.

Length 3 mm.; tegmen 11.5 mm.

Habitat: Telok Ayer (Muir).

G. W. K.]

Ventral edge of pygophor angularly produced in middle, base of produced part narrower than length; sides broadly, angularly produced, the rounded apices reaching about the middle of anal tube; anal tube slightly longer than broad, anus near base, apex roundly truncate; styles not reaching to end of anal tube, ovately spatulate, slightly convex on upper side. Last abdominal ventral plate of female slightly wider than long, hind margin broadly, angularly produced from sides to middle; and tube about as broad as long, anus near base, sides convexly curved, apex deeply, angularly emarginate.

(3) *Zor. pseudosylvicola* sp. nov. (♀).

Yellow, light on ventral side, inclining to brown on dorsal side, especially on abdomen. Tegmina hyaline, brown-veined, the tips of the four veins entering apical margin colorless, subcostal and radial cells brown. This is the same coloring as in *sylvicola* but lighter.

The median fourth of the posterior edge of last ventral plate

produced into a broad, bluntly-pointed process, its width at base about half its length; anal tubes not reaching to end of styles, lanceolate, anus near base. The production on last segment and shape of anal tube separates this species from *sylvicola*.

Length 3 mm.; tegmen 11.5 mm.

Habitat: Telok Ayer.

(4) [*Zor. insulicola* sp. nov. Kirk. (♂ ♀).

Head and nota brownish-testaceous, keels paler. Antennae, sterna (mostly), legs, etc., pale yellowish-testaceous; antennae cylindrical with closely set brown-ringed sensory organs. Pronotum with many pale granules. Mesonotum smudged with fuscous near the base. Abdomen brownish-testaceous, closely speckled above with purplish-brown or black. Tegmina with fine cubital veins, hyaline, so closely suffused with fuliginous that they have the aspect of being fuliginous, minutely spotted with hyaline (principally along the veins); apical half of costal parts clearer, nevertheless spotted with fuliginous; veins crimson. Wings hyaline, veins fuscous. Sometimes the tegmina are more or less maculate with black at the base, along the costal area, and apically.

Length 4.25 mm.; tegmen 10 mm.

Habitat: Amboina (Muir).

G. W. K.]

Ventral edge of pygophor cordately produced in middle the pointed end apical, and, in lateral view, base swollen; sides very slightly and roundly produced; anal tube of medium length, anus behind middle, in dorsal view sides to anus parallel, then gradually tapering to pointed apex, which is curved downward, in lateral view of even width to turned down apical portion, which is thin; genital styles not quite as long as anal tube, narrow at base, the broader apical three-fourths with sinuous, parallel edges, apex rounded; last ventral abdominal plate of female longer than broad, moderately angularly produced from sides to middle; anal tube small, little longer than broad, anus near base, gradually narrowed to bluntly-pointed apex, beset with long hairs along edge.

(5) *Zor. cydista* Distant.

A. M. N. H. (7) XIX 402.

Two females from Laloki which agree with the description; the white of postscutellum and dorso-central abdominal mark is due to waxy secretion. Antennae cylindrical with fine light-colored sense organs. Last ventral abdominal plate longer than broad, gradually and slightly produced in middle; anal tube

reaching about half way along styles, little longer than broad, ovate in outline, anus near base, with a small process from middle of previous dorsal plate projecting over base.

One male from Amboina also agrees with these, but the yellow is more reddish, the markings on tegmina lighter and the antennae slightly longer and more slender. Ventral median edge of pygophor obtusely angularly produced, sides angularly produced as far as middle of anal tube, the ventral edge of angulation about twice the length of the dorsal edge; styles somewhat hatchet-shaped, base narrow, upper edge straight, apex broadly truncate, ventral edge deeply and roundly emarginate at base, with a deep cleft half-way along the broad apical part; anal tube reaching to end of styles, narrow, bluntly rounded at apex, anus about middle.

(6) *Zor. fuliginosa*, sp. nov. (♀).

Antennae long, cylindrical, beset with small, light-colored sense organs. Length of anal segment about twice the width of the base, narrowed on distal half, apex roundly pointed, anus near base, a small truncate, median process from anterior dorsal plate projecting over base; last ventral abdominal plate slightly and evenly produced; the lateral portion of the anterior styles produced into an acute point. Fuliginous, pronotum and abdomen lightly irrorate, keels of head and scutellum and the legs yellowish tegmina fuliginous, dark-veined, except costa, distal half of subcosta, radia and apical tips of median veins, which are yellowish-white; three small white dots in basal half of costal cell, the apical half along with subcostal cell and tips of extreme apical cells white, a minute black dot near ends of radial and first three median veins, all the veins more or less irrorated with white spots along side; wings fuliginous, dark veined. This species comes near *Z. consanguinea* Distant.

Length 4 mm.; tegmen 10.8 mm.

Habitat: Laloki.

(7) *Zor. lalokensis* sp. nov. (♀)

Hind margin of last abdominal ventral plate exceedingly slightly and evenly produced (nearly truncate), plate longer than wide, a transverse depression two-thirds from base, the basal two-thirds convex in middle; a small round process projecting from last dorsal plate over base of anal tube; anal segment ovate, reaching half-way along styles, anus near base; antennae cylindrical, thickly beset with large sense organs. Stramineous, eyes

brown, antenna brown, sense organs darker, legs slightly infusate, ventral part of abdomen, especially the posterior plate, dark fuscous; tegmina and wings hyaline, brown-veined, costal, subcostal and radial cells fuscous yellow.

Length 4.4 mm.; tegmen 12.25 mm.

Habitat: Laloki.

(8) *Zor. laratae* sp. nov. (♂ ♀?).

Medio-ventral edge of pygophor produced into small turbinate-shaped process; sides nearly straight; anal segment very long, narrow, with angularly emarginate apex, the apical third turned down, forming less than a right angle with basal two-thirds, anus in middle of basal, unbent portion; styles long and narrow, not quite reaching to bend in anal segment, irregularly spatulate, apex truncate and bent inward, a small conical projection near the base of the lower edge. Antennae long, slightly flattened, with small sense organs. Stramineous, brown eyes, abdominal segments with a few red spots on dorsum, slightly infusate at base of scutellum; tegmina and wings hyaline, with fuscous yellow veins, costal, subcostal and basal portion of radial cells yellowish, the extreme tips of radial and first three median veins colorless with small spots where the color ceases, a dark mark covering cross-vein in radial cell near apex. I have a female from Amboina slightly lighter in color. In it the last abdominal plate is subtruncate (slightly convex); anal segment slightly longer than broad, broadly rounded at tip, with the anus at base.

Length 3 mm.; tegmen 9.5 mm.

Habitat: Larat; Amboina?

(9) *Zor. javanica* Westwood (♂ ♀).

Medio-ventral edge of pygophor produced into a lanceolate process; sides truncate; anal segment very long, apex acutely pointed, apical third turned down at right angles to basal two-thirds, straight basal portion narrowest at base, with anus in its middle, genital style subspatulate, lower basal edge turned inward, formed into a two-lobed process, apex of right style subtruncate, with the upper corner produced into a long, curved spine, left style with apical spine small and apex more rounded. Antenna as long as head and thorax, cylindrical, thickly studded with small sense organs.

The female I associate with this male has the stramineous portion light salmon red and the fuscous portion much darker, the tegmina and veins also more fuscous. Hind margin of last ab-

dominal segment broader than long; anal segment broadest slightly beyond base, pointed at apex, sides curved, anus near base, the previous segment being produced in middle over the base of anal tube into a small rounded process. Two specimens from Roban, Java.

Peggiopsis gen. nov.

Type *rufus*.

Antennae longer than head and thorax together, flat, upper edge of apex slightly emarginate where seta situated, narrowed at base, margins thicker than disk; vertex and face perceptibly below the level of the eyes, which are round and bulging; clypeus longer than face, narrow, tricarinate. Pronotum and scutellum as in *Zoraida*, the scutellum being distinctly tricarinate. Cubitus furcate, media with five sectors, the first furcate and joined to the cubitus, its base appearing as median cross-vein. Hind tibiae with a minute basal, large sub-apical and one large and three small apical spines. This genus appears to be very near to *Peggia* Kirk. (*Nebrissa* Stal), but the round bulging eyes, sunken face and the distinct tricarinate scutellum distinctly separates it.

(1) *P. rufa* sp. nov. (♂ ♀).

Light red, eyes and tips of genital styles black; tegmina and wings hyaline with reddish-brown veins, costal and lower portion of radial cells yellowish, the narrow subcostal cell fuscous. Vento-median edge of pygophor produced into a truncate-tipped process, the base nearly twice as broad as tip, the sides slightly sinuous, the base in profile gibbous; anal segment as long as styles, subspatulate, the base being constricted below anus; genital styles very narrow at base, gradually widening to the nearly truncate apex, the upper corner of which is produced into a small rounded process which is turned inward, near the base of upper edge there is a small spine.

Female with last abdominal plate longer than broad, hind margin broadly, angularly produced; between the plate and the genital styles there projects a small conical-shaped plate; anal segment nearly as wide as long, ovate in outline, with a small emargination at apex, anus situated at base. The one female specimen from Amboina has a much deeper emargination at apex of anal segment, and the small ventral plate between last segment and styles is more pointed. I expect the male will show it to be a distinct species.

Length 3.6 mm.; tegmen 9.8 mm.

Habitat: Piroe, Amboina.

Proutista Kirkaldy.

[Mr. Distant has persisted in synonymizing this with *Phenice*, but the two are different. In *Proutista* the clypeus is distinctly longer than the frons; while in *Phenice* the frons is longer than the clypeus, or, at least, not shorter; and the venation of the wing is much simpler in the Aethiopian genus than in the Australasio-Oriental one. Formerly I was willing to adopt Mr. Distant's views, as I have never seen a *Phenice*, and it was possible that the figures of Boheman and Westwood might be somewhat inaccurate, but Mr. Distant's own figures, in the "Fauna of India" and "Insecta Transvaaliensia," drawn by the same careful artist in each case, of "*Phenice moesta*" and of "*Phenice abdominalis*," show that I was justified in my original contention that *Proutista* is not a synonym of *Phenice*. G. W. K.]

Until I can examine African specimens of *Phenice* I shall retain the genus *Proutista*. It is very distinct from allied genera (excluding *Phenice* which I have not examined) in the reduction of the female genital styles, which are represented by minute tubercles. In this genus the cubitus has two branches and the media five or six simple sectors, the median cross-vein being near base of first sector so that the cubitus appears as three veined and the media to have but four sectors.* Hind tibiae without basal and submedian spine. There is a large group of species of similar facies to *moesta* and *humholtzi* which will only be finally straightened out by a study of the genitalia. Some of the following species may prove to be synonymous, but I must leave it to those who have the original types to describe or figure the genital organs.

(1) *P. humholtzi* Kirk.

A. S. E. Belg. (1907) LI 126.

Medio-ventral edge of pygophor produced into a parallelogramical process, longer than broad, the sides and apex being slightly concave, in profile the base projecting; lateral edges slightly rounded; anal segment long, bent downward at rightangles before the middle, the basal, straight portion subparallelsided, length about three times the breadth, anns one-third from base, the distal bent portion forming a long, finely-pointed spine; styles projecting to bend in anal segment, breadth slightly more than half the length, margins rounded, apex produced into a finely-pointed, in-

* Westwood's figure of *Phenice fasciolata* shows five median sectors, the first furcate; the costa, subcosta and general shape of tegmina also differ in these two genera.

wardly-turned spine, on upper margin near base there is another small spine. Last abdominal plate of female in profile excavate in middle, the medio-basal portion produced into strong, short spine, the posterior edge produced regularly in middle.

Habitat: Queensland and Amboina, on sugar-cane.

(2) *P. gemina* sp. nov. (♂).

Similar in markings to *lumholtzi*, the dark markings on tegmina slightly more expansive. Anal segment very small, length about twice the breadth, basal two-thirds parallelsided, then pointed, anus situated in distal third; ventral edge of pygophor truncate; styles reaching slightly beyond anal segment, irregularly diamond-shaped, the broadest part nearest the base, apex forming a small inwardly-curved point. The genitalia differs so greatly from *lumholtzi* that there can be no confusion between them.

Length 2.3 mm.; tegmen 6 mm.

(3) *P. koebelei* sp. nov. (♂).

This has the same markings and general appearance as *gemina*, but the genitalia is very distinct.

Ventral edge of pygophor truncate; lateral edges between style and anal segment produced into triangular plates (subequilateral); anal segment small, projecting very slightly beyond apices of lateral triangular edges, cylindrical, anus situated at apex; styles slightly longer than broad, broadly rounded at apex, upper edge irregularly produced, a small spine on lower edge of apex.

Length 2.5 mm.; tegmen 6 mm.

Habitat: Queensland. Coll. Koebele No. 2270.

I take the pleasure of naming this species after Mr. A. Koebele.

(4) *P. moesta* Westw.

Specimens from Malay Peninsula, Java, Pontianak, Makassar and Amboina agree with the description of this species. The male genitalia are identical in all these specimens. Ventral edge of pygophor truncate, lateral edges slightly curved; anal segment long, bent at less than a rightangle a little beyond middle, straight basal portion with curved sides, broadest about middle, where anus is situated, bent portion narrow, pointed; style reaching to bend in anal segment, length a little more than twice the breadth, edges subparallel, apex drawn out in fine point which is turned inwards, the upper edge near base produced into a small angular process.

(5) *P. javensis* sp. nov. (♂ ♀).

Yellowish-brown; antennae, keels on face and clypeus, middle of pronotum and scutellum, legs and genitalia lighter yellow; tegmina hyaline with yellowish veins, fuscous brown over subcostal and radial cells, four or five small dark marks through costal cell, bases of cubitus and radial sectors fuscous, fuscous over median cell, extending into clavus, a dark mark at apex of cubital veins and at end of each radial sectors, fuscous on each side of gradate cross-veins of media; wings hyaline, with fuscous markings over veins. Ventral and lateral edges of pygophor truncate; anal segment about as long as styles, the apical third turned down at right angles to basal portion, which is about twice as long as broad, with the anus about the middle, the apical third narrow, pointed at apex; styles projecting about one-fourth beyond bend of anal tube, narrow, edges subparallel at base, narrowing toward the blunt, round apex, the apical third being cylindrical. Last ventral abdominal plate of female short, a deep, longitudinal depression down the middle, the posterior edges forming two crescent-shaped ridges below the very small genital styles, anal segment minute.

Length 2.5 mm.; tegmen 7 mm.

Habitat: Java.

(6) *P. perkinsi* sp. nov. (♀).

Light brown; face, middle and lateral edges of pronotum, median line on scutellum and sides of abdomen light yellow, dark dorsal portion of abdomen spotted with light yellow, labium and tarsi dark brown; tegmina subhyaline, costa, subcosta and base of media and cubital veins yellowish, rest brown, subcostal and radial cells light fuscous brown, extending at base into clavus, also over apical half of cubitus, tips of median sectors and gradate median cross-veins bordered with fuscous; last ventral abdominal plate angularly produced, apex deeply but narrowly emarginate, deeply, longitudinally depressed along middle and sides, leaving two keels between the depressions, anal segment and genital styles excessively small.

Length 2.7 mm.; tegmen 7.7 mm.

Habitat: Queensland. Coll. Messrs. Perkins and Koebele.

I take the pleasure of naming this insect after Dr. R. C. L. Perkins.

(7) [*P. calypso* sp. nov. Kirk. (♂ ♀).

Pale luteous, more or less suffused with orange; beneath testaceous; sterna and abdomen basally more or less suffused with orange; antennae, labium and legs testaceous; labium and fourth

segment of labium, etc., black: apex of hind tibiae, second and third segments of the tarsi, dark fuscous. Tegmina hyaline; radial and median veins, and veins on basal third testaceous, rest fuscous, spotted with fuscous. Wings hyaline, veins fuscous.

Length 2.7 mm.; tegmen 6.3 mm.

Habitat: Larat (Muir).

G. W. K.]

Medio-ventral edge of pygophor produced into small angular process, about twice as long as the base is broad; lateral edges rounded; anal segment medium size, constricted slightly before middle, anus situated in middle, bluntly rounded on apex; styles large, in lateral view somewhat boatshaped, the upper edge being nearly straight and produced into a rounded point, the bottom edge rounded, curving up to point, the inner edge of the rounded point being drawn out into a short sharp inwardly turned point. Anal tube of female very small, genital area below tube large and swollen, embossed across middle, genital style exceedingly small, lateral edges of last abdominal segment straight, ventral plate depressed along the middle near posterior border, the edges of the depression slightly projecting behind. In this species the first median sector approaches the cubitus and appears as if belonging to that system, the median cross-vein being very small.

(8) *P. straminea* sp. nov. (♀).

Stramineous; tarsi and tip of labium fuscous, dorso-lateral portion of abdomen brown, spotted with lighter dots; tegmina and wings subhyaline, veins dark brown. Basal median portion of last abdominal ventral plate produced into a blunt point, posterior edge into two flattened processes; lateral edge of last segment produced into a small triangular piece. The two median processes on the last ventral plate are very distinctive.

Length 3 mm.; tegmen 5.8 mm.

Habitat: Laloki.

(9) *P. lurida* sp. nov. (♀).

Stramineous; tips of clypeus, labium, tarsi and hind tibiae fuscous, abdominal segments slightly fuscous; tegmina subhyaline, covered with waxy secretion, veins yellowish, cross-veins fuscous, several narrow brown marks through costal cell, apices of veins fuscous, which slightly extends into the cells; wings subhyaline with brown veins; lateral margins of last abdominal segment produced into a flattened spine with a rounded apex, reaching to end of genital segment; ventral edge not produced.

Length 3 mm.; tegmen 7.7 mm.

Habitat: Laloki.

The approximation of the first median sector to the cubital system is very conspicuous in this species.

(10) *P. lutea* sp. nov. (♂).

Stramineous, dorso-lateral reddish marks down pronotum and scutellum and on pleurae, clypeus and labium fuscous, median keel on clypeus and facial keels yellowish, sides of abdomen fuscous; tegmina light fuscous brown with a broad hyaline patch down apical half, gradate median cross-veins fuscous, small marginal white marks between veins; wings fuscous, yellowish-veined, fuscous cross-veins. Ventral edge of pygophor produced into a small, median, spatulate process; lateral edges sinuous, produced into a small triangular plate beside anal segment; anal segment long, narrow, basal half parallel-sided, apical half thinning to fine point, anus about a third from base; styles reaching to end of anal segment, widened on upper basal half, gradually thinning to fine point at apex which is turned inward.

Length 3 mm.; tegmen 7.7 mm.

Habitat: Laloki.

Paraproutista gen. nov.

Type *ceramensis*.

This genus differs from *Proutista* in the neurulation of the tegmina, the cubitus being two branched and the media having six sectors, the third being furcate, the first three angular near their bases, the first one appearing to belong to the cubitus. Hind tibiae with basal, submedian and apical spine, also several smaller apical spines. Female genital styles exceedingly small.

(1) *Par. ceramensis* sp. nov. (♂ ♀).

Pl. III f. 2.

Dark brown; keels on face, antenna, legs, lateral edges and middle of pronotum, keels and posterior edge of scutellum yellowish, a few yellowish spots on abdomen; tips of labium, tarsi and tibiae fuscous; tegmina hyaline greatly suffused with fuscous, veins brown, the subcostal, radial and median cells fuscous, extending across middle of cubitus and fourth and fifth median sectors to posterior border, cubital veins and median sectors irregularly bordered and spotted with fuscous, dark marks in costal cell breaking it up into spots.

Anal segment very small, rounded, shorter than the width of the base, anus at apex; lateral edges of pygophor produced angularly; ventral edge broadly angular; styles attached well within

pygopher, little longer than broad, rounded along lower edge and at apex, a small depression along upper edge, with a small angular projection pointing outward near apex. Genital area of female flattened, anal tube very small, styles abortive.

Length: 8 mm.; tegmen 9 mm.

Habitat: Piroe; Laloki.

(2) [*Par. ismene* sp. nov. (Kirk.).

Brownish-yellow; clypeus, labium, pronotum (except down the middle), abdomen in part, brownish piceous; frons, antennae, legs, testaceous; apex of hind tibiae, second and third segments of tarsi, darker blackish. Tegmina dark fuliginous, veins bright sanguineous, hyaline spots all along the costal area on the clavus and along the inferior margin. Wings fuliginous, veins dark fuscous with hyaline spots; hind margin of mesonotum and urotergites basally in part clear luteous. The head-keels are fairly separated basally; third segment of labium short; pronotum not, or scarcely, granulate. Mesonotum greatly declivous, carinae distinct. Abdomen variable beneath, sometimes sanguineous.

Length 3 mm.; tegmen 7.7 mm.

Habitat: Borneo, Moewong (Muir).

G. W. K.]

This species stood under *Proutista* in Kirkaldy's manuscript. Ventral edge of pygophor truncate, with a small conical elevation at each corner; lateral edges slightly and roundly produced; anal segment long, anus situated in basal third, which is parallel-sided, apical two-thirds narrow, cylindrical, pointed; length of styles about twice the breadth, straight on the lower edge, bluntly pointed at apex, the basal part of upper edge produced at right angles to main portion. Last abdominal ventral plate of female longer than broad, hind margin produced in middle into angular projection, reaching well beyond end of body, in profile concave in middle, base globose; anal segment very small; styles abortive.

(3) [*Par. antigone* sp. nov. (♂) Kirk.

Castaneous, the keels and the pronotum medially yellower, the clypeus and the abdomen more or less suffused with sanguineous. Pronotum laterally more or less olivaceous, with pale yellowish granules. Antennae, sterna and legs testaceous, leg spines tipped with black, but the tarsi are scarcely at all fuscous; labium and fourth segment of labium fuscous. Tegmina dark fuliginous, bluish-brown basally; costal, subcostal, radial, and median veins,

almost entirely dark sanguineous, other veins dark fuscous, in places bluish-black, a few scattered hyaline spots. Hind tibiae with two distinct spines, one at the base. Wings fuliginous, veins black. Clypeal keels very distinct.

Length 3.8 mm.; tegmen 9.0 mm.

Habitat: Telok Ayer (Muir).

G. W. K.]

This species stood under *Proutista* in Kirkaldy's manuscript.

Ventral edge of pygophor truncate; lateral edge sinuous, produced into small triangular plate beside the anal segment; anal segment broad on basal two-thirds, the apical third tapering to fine point, anus about middle; styles nearly square, not reaching to apex of anal segment, lower edge straight, apical edge slightly concave, upper edge produced into a large curved process on basal half.

(4) *Par. media* sp. nov. (♂).

Pl. III f. 1.

Light brown; legs, labium and antennae yellowish, pronotum and abdomen with many small yellowish granules; tegmina hyaline, costa, subcosta and radia red, cubitus and median sectors brown; costal, subcostal and radial cells fuscous, costal having a series of white spots, radial with three large ones in upper half, fusciness spreading over apex to tip of fifth median sector; wings hyaline, reddish-brown veins, basally fuscous. Anal segment long, tapering to a point, anus one-third from base; lateral edges of pygophor slightly and roundly produced; ventral edge truncate; styles broadly angular, not reaching to apex of anal segment, lower edge straight, upper edge sinuous, the apex produced into an inwardly-curved spine.

The neuration of this species is of interest, and is perhaps of generic value; the angulation at the base of the first three sectors is very acute and sends a spur backward to join the preceding one, this causes the cubital to appear six-veined, the media to have but three sectors, and as if there were four cross-veins between the median and cubital systems.

Length 4.6 mm.; tegmen 9 mm.

Habitat: Piroe.

(5) *Par. coccinovenosa* sp. nov. (♂♀).

Clypeus crimson with fuscous apex, head and thorax brownish-yellow, the legs, keels of face and scutellum and antennae lighter, abdomen crimson; tegmina and wings pale brown with crimson

veins, a series of white spots along costal margin, reaching to first median vein. Ventral edge of pygophor truncate; sides narrowly and angularly produced, the apex reaching about middle of anal tube; length of anal segment about three times the width of base, subparallel-sided to near the pointed apex, anus situated in middle; styles as long as the anal segment, the lower edge sinuously rounded on basal half, then concavely curved to the inwardly-turned apex, the upper edge rounded on basal half, then convexly curved to inturned apex. Female styles abortive, a small triangular plate on each side of the minute anal segment.

Length 3 mm.; tegmen 7.3 mm.

Habitat: Malay Peninsula.

Diostrombus Uhler.

Proc. Nat. Mus. U. S. 1896, p. 283.

Drona. Distant. Faun. Brit. India. Rhynchota III p. 305.

Through the kindness of the authorities of the National Museum, Washington, I have been able to examine a female cotype of this genus, and cannot separate it from Distant's *Drona*. The figure of *D. carnosus* (Fauna British India, Fig. 146) I believe to be of a female, and the description of the type of *Diostrombus* appears to be from a female; the male is not likely to possess the forceps-like processes arising from the posterior edge of the pregenital ventral plate.

(1) *D. pennatus* Distant.

Faun. Brit. India. Rhynchota III p. 306.

I have one female specimen from Java that agrees in all the specific characters with this species; the keels on vertex and face are not nearly so well defined as in *carnosus* or *politus*, and the "forceps" on last ventral plate are much smaller than in the type species.

GROUP IV.

1. Radial and median basal cells subequal in length, ending same distance from base of tegmen..... 2
- Radial and median basal cells not ending same distance from base of tegmen, unequal in length..... 6
2. Face strongly carinate along middle *Phaenocera* 3
- Face not carinate along middle..... 3
3. Lateral margins of face convex..... *Sura* 4
- Lateral margins of face not convex..... 4

4. 7 (or 9)* medio-cubito-apical veins 5
5 (or 7)* medio-cubito-apical veins *Nisia*
5. Face not very narrow, parallel-sided.....**Kermesia*
Face very narrow, widening at apex.....**Alara*
6. Veins of cubitus running straight to hind margin..... 7
Veins of cubitus irregular, forming one or more angular
cells, sometimes in conjunction with first median sec-
tor 8
7. Cubitus 3-4 veined *Mysidia*
Cubitus 10-11 veined *Derbe*
8. Lateral keels of face contiguous to near apex.....10
Lateral keels of face not contiguous, face not linear.... 9
9. Vertex narrow, about twice as long as broad; in dorsal
view keels of face projecting about half the length of
eyes *Dichotropis*
Vertex as long as broad; in dorsal view keels of face
projecting about the length of eyes..... *Decora**
10. No triangular cell at base of first median sector (or radial
cross-vein)12
Triangular cell present at base of first median sector (or
radial cross-vein)11
11. Shoulder keels well developed..... *Lezu*
Shoulder keels not developed *Rhotana*, *Genestia**
12. Face longer than clypeus, eyes reaching below middle of
genae *Sumangala**
- Face not longer than clypeus, eyes confined to upper por-
tion of genae *Mecynorhynchus*

Nisia Melichar.

N. atrovirens Leth.

There are specimens from Borneo and Piroe which I cannot separate from this species. I am unable to separate this generically from *Mecynoplus albosignatus*.

Sura Kirkaldy.

Text figures 3 and 3a in H. S. P. A. Ent. Bull. III p. 166 are of *S. koebele* Kirk., not *Phacioccephalus*; it has one more apical vein than *Nisia*.

Phaenocura Kirkaldy.

(1) *P. laratica* sp. nov. (♂ ♀).

Dirty yellow, abdomen, including genital styles, dark fuscous; tegmina hyaline, broadly bordered with fuscous, the fusciness

* Depends upon whether the first forked vein be considered as radial or median.

being chiefly along second clavial vein, over all the cubital and costal cells, and over all apical veins, leaving the media veins and center of tegmina clearer. Median ocellus present, although small and difficult to see in some specimens.

Length of body 2 mm.; tegmen 2.7 mm.

Habitat: Larat.

There is a single specimen of female in which there is no fusciness on tegmina and which differs slightly in the pregenital segment.

Mecynorhynchus nov. gen.

Type *kershawii*.

Head in profile semicircular, eye in upper half near to vertex, gena in front of eye narrow, below eye broad. Antennae cylindrical, about twice as long as broad, situated on lower part of gena; subantennal processes large, from apex of facial keels to back of gena. Vertex very small, acutely angular, angularly emarginate at base, sides with keels which meet at apex; face very narrow from base to well below eyes, then widening to junction with subantennal processes, thence slightly narrowing to apex, keels large, contiguous to well below eyes; clypeus very long and pointed, the apex reaching third coxae, lateral carinae large, median obscure; labium long, reaching to end of abdomen, distal joint minute; pronotum very short, vertical in middle and fitting into emargination of vertex, hind margin acutely angularly emarginate in middle, shoulder keels large; scutellum broader than long, anterior margin rounded, the rounded lateral angles about middle, posterior median portion angular, without carinae, but a pair of slight grooves run down the anterior third. Tegmina fairly broad, the venation differs from *Rhotana* in having the subcostal and radial cells longer and broader, the costa evenly curved, not sinuate, the absence of the small triangular cell at the base of first median sector.

M. kershawii sp. nov. (♂).

Pls. II f.f. 1-1a, Pl. III f. 10.

Head and legs stramineous, vertex and face tinged with claret red, eyes brown, pronotum and scutellum fuscous claret, tegmina fuscous, red along costa, veins darker, red at apex. Male genital styles very short, spatulate.

Length of body 2 mm.; tegmen 3.4 mm.

Habitat: Mowong.

I take the pleasure of naming this pretty little insect after my friend Mr. J. C. Kershaw.

Rhotana Walker.

J. Linn. Soc. Zool. 1 160.

R. latipennis Walker.

My specimens from Teloc Ayer agree both with Walker's short description and his figures. Shoulder keels slightly developed; subantennal processes large, stretching from the apex of the facial keels, of which they appear to be continuations, to back of gena. *Rhotana vitriceps* Stal does not appear to be congeneric with *latipennis*.

Genestia Stal.

Ofr. Vet. Akad. Forh. XV p. 450 (1858).

The type of this genus, *vitriceps*, cannot be placed in *Rhotana*, but as I only know it by the description and Melichar's figure I cannot separate it with certainty. The neuration of the tegmina, as shown in Melichar's figure, differs considerably from *R. latipennis* Walk.

Dichotropis gen. nov.

Type *amboinensis*.

In profile vertex and face curved, without angulation where they meet; gena in front of eye about half the width of eye, eye about twice as broad as deep, shallowly emarginate on lower border; subantennal process large, the base stretching from facial keels to back of gena; antennae small, barely reaching to eyes, pyriform, the narrow end apical. Vertex small, not reaching to anterior margin of eye, about twice as long as broad, base very slightly broader than apex, acutely angularly emarginate, without keel, sides straight, slightly converging toward apex, keeled, a transverse keel dividing apex from face; face gradually broadening from base to about one-fourth from apex, where the sides are angular and slightly narrowed to apex, lateral keels deep; clypeus about as long as face, distinctly tricarinate, lateral carinae continuous with lateral facial keels. Pronotum very short, hind margin angularly emarginate in middle, shoulder keels large. Scutellum as long as broad, lateral angles slightly before middle, tricarinate. Tegmina having wider radial cell than *Rhotana*, practically the same as *Levu*.

This genus is near to *Decora* Bierm.

- (1) *D. amboinensis* sp. nov. (♂ ♀).

Pls. I f. 20, III f. 6.

Stramineous, abdomen slightly fuscous; tegmina and wings hyaline, slightly opaque with waxy secretion, veins yellowish, a fuscous mark on hind margin a little beyond clavus.

Length of body 2.3 mm.; tegmen 4 mm.

Habitat: Amboina (♂ ♀), Larat (♂) and Laloki (♀).

- (2) *D. chrysonoe* Kirkaldy.

Rhotana chrysonoe Kirk. H. S. P. A. Ent. Bull. I, 435.

- (3) *D. haematoncurea* Kirkaldy.

Rhotano haematoncurea Kirk. H. S. P. A. Ent. Bull. I, 435.

Lœvu Kirk.

H. S. P. A. Ent. Bull. I, 434.

Walker's error in numbering the figures on his plate caused Kirkaldy to refer this to *Paricana*; it is related to *Rhotana*, from which it differs in the shorter pronotum, angularly emarginate behind, and the greater development of the shoulder keels, characters which I do not think will hold good with the increase of specific forms.

- (1) *L. viticensis* Kirkaldy.

- (2) *L. halosydne* (Kirkaldy).

Rhotana halosydne Kirk. H. S. P. A. Ent. Bull. III, 169. This is typical of *Lœvu* and if the genus is retained must be placed therein.

- (3) *L. amboinensis* sp. nov. (♀).

Stramineous, eyes castaneous; tergmina and wings hyaline, subopaque with waxy secretion, veins yellowish; tegmina with fuscous mark from media to cubitus across median cross vein, and another a little beyond to hind margin, a small dark spot at apical fork of radia and media. The structure of head and thorax and neurulation of tegmina is typical of genus.

Length of body 2 mm.; tegmen 3.5 mm.

Habitat: Amboina.

- (4) *L. sufflava* sp. nov. (♀).

Yellowish, reddish along keels of face; tegmina hyaline, subopaque with waxy secretion, veins on basal half white, on apical

half slightly infusate, a black mark at apical fork of media. The emargination of pronotum is not so deep or so angular as in the type and the branch of cubitus is missing.

Length of body 2.2 mm.; tegmen 4.6 mm.

Habitat: Mowong.

(5) *L. rubra* sp. n. (♀).

This differs from the type in having the vertex slightly flattened, the junction of face and vertex being angular; the pronotum is less angularly and deeply emarginate behind and the tegmina differ in the cubital veins.

Red; the legs and tip of abdomen somewhat paler; tegmina hyaline, red-veined, slightly fuscous along clavus veins; wings hyaline, reddish-veined.

Length of body 2 mm.; tegmen 3.5 mm.

Habitat: Amboina.

(6) *L. laratica* sp. nov. (♂ ♀).

In structure of head and neurulation of tegmina this agrees with *rubra*.

Stramineous; keels on face and a spot on gena in front of eye red; tegmina hyaline, veins yellowish, cells besides veins infusate, especially the transverse veins from radia to cubitus.

Length of body 1.5 mm.; tegmen 3 mm.

Habitat: Larat.

DESCRIPTION OF PLATES.

PLATE I.

1. *Thyrocephalus flavomaculatus*, lateral view of pygophor.
2. " *pseudolaratensis*, " " " "
3. " *laratensis*, " " " "
4. " *leucopterus*, external view of left genital style.
5. " *pseudotypicus*, external view of left genital style.
6. " *obscurus*, external view of left genital style.
7. *Ickmota hyalina*, internal view of left genital style.
8. *Phantasmatocera pseudonigricornis*, ventral view of last abdominal segment of ♀.
9. " *nigricornis*, ventral view of last abdominal segment of ♀.
10. " *arborca*, ventral view of last abdominal segment of ♀.
11. " *laratensis*, ventral view of last abdominal segment of ♀.
12. " *unopunctata*, ventral view of last abdominal segment of ♀.
13. " *pallidocornis*, ventral view of last abdominal segment of ♀.
14. " *pseudopallidocornis*, ventral view of last abdominal segment of ♀.
15. " *vitiensis*, ventral view of last abdominal segment of ♀.
16. " *papuana*, ventral view of last abdominal segment of ♀.
17. " *lalokensis*, ventral view of last abdominal segment of ♀.
18. *Eosaccharissa laratica*, lateral view of head.
19. *Steczeyia laratica*, dorsal view of head and thorax.
- 19a. " " lateral " " " " "
20. *Dichotropis amboinensis*, front view of head.
21. *Gonco kara pullum*, tegmen.
22. *Phaciocephalus miltodias*, tegmen.
23. *Basilcocephalus thaumatonotus*, tegmen.
24. *Thyrocephalus laratensis*, tegmen.
25. *Cyclometopum amboinensis*, tegmen.

Plate I.

PLATE II.

1. *Mecynorhynchus kershaui*, front view of head.
- 1a. " " lateral " " "
2. *Megatropis coccincolinea*, " " " "
3. *Neocyclometopum sordidum*, " " " "
4. *Kampulokara caenosum*, front view of head.
- 4a. " " lateral " " "
5. *Leptalcocera coccinea*, " " " "
6. *Goncokara pullum*, " " " "
7. *Nesokara pirocensis*, " " " "
8. *Eocenchrea maorica*, front view of head.
9. *Platocera annulipes*, lateral " " "
10. *Paralyricn jepsoni*, " " " "
11. *Kaha media*, " " " "
12. *Cyclometopum amboinensis*, lateral view of head.
13. *Cyclokara girdlestoni*, " " " "

Plate II.

PLATE III.

1. *Paraproutista media*, tegmen.
2. " *ceramensis*, tegmen.
3. *Platocera annulipes* "
4. *Cyclokara girdlestoni*, "
5. *Pyrrhoncurea immaculata*, "
6. *Dichotropis amboinensis*, "
7. *Kampulokara caenosum*, "
8. *Eocenchrea maorica*, "
9. *Paralyricen jepsoni*, "
10. *Mecynorhynchus kershawii*, "
11. *Swezeyia laratica*, "
12. *Leomechicharia fuscovittata* "
13. *Nesokaha pirocensis*, "
14. *Megatropis coccineolinea*, "
15. *Leptalcocera coccinea*, "
- 16.. *Phaciocephalus pullatus*, "

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Plate III.

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