OBSERVATIONS ON THE DIPTEROUS FAMILY TANYDERIDAE.

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(*Communicated by I. M. Mackerras.*)

(Plates v–vi; One Text-figure.)

[Read 21st May, 1930.]

In the present paper, I wish to discuss two distinct subjects, first, to give a preliminary description of the immature stages of the family Tanyderidae, and second, to describe a new species of *Radinoderus* from the Dorrigo Plateau of New South Wales.

The recent discovery of the immature stages of the Tanyderidae is a matter of very great interest to students of the Order, since this was the sole remaining family of lower Orthorrhapha whose larva had baffled discovery to the present time. It seems entirely fitting that the first discussion of the early stages of this archaic family should be published in Australia, despite the fact that the species in question is a North American one, *Protoplasa fitchii* (Osten-Sacken). Australasia is the great centre of distribution of the family, more than one-half of the species so far discovered being from this region (Alexander, 1928*b*). Now that the larval habitat is known and we have an idea of the general appearance of the larva, it seems certain that the early stages of some one of the larger and more showy Australian or New Zealand species will be discovered.

The scantiness of larval, and especially of pupal, material has rendered it inadvisable to consider details of structure at this time. The majority of the larvae in my possession, together with the pupae, will be given to Professor J. Speed Rogers of the University of Florida, Gainesville, for more detailed consideration and dissection, especially of the head-capsule which has been but superficially treated in the present account. One additional larva has been deposited in each of the collections of the British Museum and United States National Museum.

The Immature Stages of the Tanyderidae.

Protoplasa fitchii was long considered to be one of the rarest of North American Diptera (Alexander, 1919, 1920). In 1928, Dr. G. C. Crampton (Crampton, 1929), while collecting in the Gaspé Peninsula of Eastern Quebec, Canada, encountered a large swarm of flies and was amazed to find that they pertained to the present very uncommon species. In his opinion, there were thousands of individuals about and nearly two hundred specimens were secured by passing the net through the swarm a few times.

It was due to the influence of the above discovery that Dr. Crampton and I, in June, 1929, undertook a 2,000-mile motor trip to the Gaspé country and, after a detailed search, finally discovered the early stages of the fly. The entire credit for the finding of the larva and rearing through to the adult condition of *Protoplasa*

is due to Dr. Crampton, in the first place to his initial discovery of the species in numbers and later to his kind interest in returning to the place the succeeding year.

In 1920, a most remarkable dipterous larva was described (Alexander, 1920) that was referred with but little question to *Protoplasa*. All the characters of this larva seemed to fit in so well with our presumed knowledge of the genus, that it came as a distinct shock to find that the true larva of *Protoplasa* was an entirely different creature. Paradoxical as it may sound, the erroneous larva referred here in 1920 still seems closer to what might be expected of the larvae of the Tanyderidae, based on a knowledge of the related families Psychodidae and Ptychopteridae, than does the weird creature that is now settled beyond question. The 1920 larva still remains unknown and much discussion has now arisen as to its correct position in the Diptera. One naturally turns to the Anisopodid subfamily, Axymyiinae, the type of which, *Axymyia furcata* McAtee, was described from this identical region, but Mr. Edwards and I both hesitate to place the larva in question in this section of the Orthorrhapha. Mr. Edwards is inclined to believe that it will be found to belong to the Bruchomyiine Psychodidae (Alexander, 1928*a*), such as *Nemopalpus*, although the members of the group have not yet been discovered nearer than Peru. I myself cannot but feel the possibility that there still exists at Washington a Psychodoid Dipteron different from any yet discovered.

The Washington larva above discussed was found in saturated logs on the banks of the Potomac River, indicating an aquatic or amphibious life. This supposition was substantiated by the associated insects occurring in the same log (Alexander, 1920). When Dr. Crampton and I finally arrived at the River Pabos, Gaspé, on the afternoon of 19th June, 1929, we at once began a critical survey of all saturated logs, stranded and imbedded in the earth at the stream margin, in a search for the particular type of larva we had in mind. After a long search that produced numerous insects and other animals, but nothing that could possibly be considered as being *Protoplasa*, we turned our attention to the water and, after a time, discovered the larva that finally proved to belong to this fly. After some hours of back-breaking sifting of sandy gravel at the water's margin, amid swarms of black flies, *Simulium*, and punkies, *Culicoides*, we finally secured a total of nine larvae, two of which were placed in rearing and eventually yielded one pupa and an emerged adult female, together with her cast pupal skin. The total duration of the pupal stage is not more than 9 days and presumably from two to three days less than this.

The west branch of the River Pabos, three miles west of Chandler, is a shallow, pebbly to stony bottomed stream where the tides from the Bay of Chaleurs are slightly felt, although the water of the stream at this point is strictly fresh. The river here is about 120 feet wide, without evident rapids or riffles, crossed by an ancient wooden bridge (not iron, as stated by Crampton, 1929) with wooden railings. An island in the river supports the central pier of the bridge. A scanty woody vegetation lines the banks of the stream, this being chiefly alder, balsam poplar and spruce. On the eastern bank, the trees are somewhat taller and more dense, including white birch, spruce and balsam fir. The larvae were found on the west bank a few yards north of the bridge. They occurred in the sand under shallow water but, like the associated *Eriocera*, they undoubtedly migrate to drier soil when ready to pupate.

Associated with the larvae of *Protoplasa* were larvae of a large species of the crane-fly genus *Eriocera*; larvae and abundant pupae of a new species of *Eriocera*, *E. gaspensis* Alexander; and a few larvae of a Tipuline crane-fly.

On 21st June, when a short distance east of Matapedia, Gaspé, 140 miles west of Chandler, Dr. Crampton and I again encountered great swarms of adult *Protoplasa* flying at dusk near a small stream and secured some two hundred additional specimens. At this time, the swarms were in close proximity to large swarms of a Tipulid, *Eriocera longicornis* (Walker).

Description of the Stages.

Larva.—Body eucephalous, terete; lateral spiracles on prothorax and abdominal segment eight; no creeping welts on body; caudal end of abdomen with six long filaments, of which one pair are borne near the caudal ends of two elongate anal pseudopods, the latter terminating in a circlet of short outer crotchets and a central group of long slender chotchets; four simple anal gills.

Pupa.—Appearance very much like a Hexatomine Tipulid; head surmounted by a high bispinous crest; pronotal breathing horns relatively small, smooth, equal in size; leg-sheaths lying side by side, the fore pair shortest, the hind pair longest; venation showing clearly on wing-pads; abdominal segments with a tuberculate armature, chiefly near the posterior margins of the segments.

Larva.—Length to end of longest filaments, 17–18 mm. Filaments alone, 4·5–5 mm. Greatest diameter of body, 1·5 mm. General coloration dirty white, the head-capsule and spiracles blackened.

Body (Plate v, fig. 1) eucephalous; segments terete or nearly so, those of the thoracic segments a little more dilated than those of the abdomen.

Head (Plate v, figs. 2 and 3) a compact, heavily chitinized capsule. Clypeus transverse, the margin with four lobes, the lateral pair each with two pale setae arising from the lower surface; intermediate lobes each with a single seta. Antennae distinct, three-segmented; basal segment widest; second segment longest, cylindrical; terminal segment reduced in size. What appear to be epipharyngeal structures appear as two large pale lobes densely cushioned with yellow setae. Both labial and maxillary palpi reduced in size.

Prothorax longer than the remaining thoracic segments, divided by a constriction into two rings; on posterior ring at mid-height of body with a small spiracle; mesothorax a little longer and thicker than the metathorax, on dorsal surface divided into two rings by a weak constriction that becomes obsolete on the sides, the ventral margin entire. Nine apparent abdominal segments that gradually increase in length and decrease in diameter from the first to the last; abdominal segments with a narrow basal constriction or ring and a much longer posterior portion that is weakly subdivided into annuli.

Penultimate or eighth abdominal segment (Plate v, fig. 4) with a small spiracle on side shortly before caudal margin; immediately caudad of the spiracle arises a long pale filament that is slightly longer than any of those on the terminal segment. Ninth abdominal segment with the ventral lateral angles produced into long slender anal pseudopods (Plate v, fig. 5), each terminating in two sets of crotchet-like structures, including a marginal series of short curved hooks and a central group of about eighteen long slender rods that are slightly curved at their tips. Just before apex of pseudopod on dorsal face arises a long slender filament. Each dorsal lateral portion of the ninth segment with a long filament

that is a little stouter at base but somewhat shorter than the filaments of the penultimate segment. From the disk between these six elongate filaments arise four short simple anal gills.

Chaetotaxy: Prothorax with a group of about five small setae on lateral aspect of basal ring, with an additional seta on posterior ring some distance before the spiracle. A further group of small setae on ventral surface. On the mesothorax and metathorax, a group of three setae, two large and one smaller intermediate one placed in an oblique straight line on anterior ring; on ventral surface, setae about as on prothorax and still small, placed on slightly tumid swellings that cannot be considered as being creeping welts. Very small and weak setae on dorsal aspect of posterior ring of all thoracic segments, these gradually increasing in size on outer segments. On the abdominal segments the arrangement of setae is about the same, the dorsal series remaining small and inconspicuous, lacking on segment eight; the lateral series are arranged, one on basal ring, two on posterior ring; ventral setae of posterior ring becoming large and more conspicuous, arranged more or less definitely in pairs but with no indication of creeping welts.

Pupa.—Male, length, 8·5–9 mm. Greatest width, dextro-sinistral, about 1·5–1·6 mm. Greatest depth, dorso-ventral, 1·6–1·8 mm. General appearance of pupa about as figured (Plate vi, fig. 1), the abdomen of this specimen more or less shrunken.

Head (Plate vi, figs. 3 and 4) surmounted by a high, bispinous crest, the two terminal points directed cephalad and strongly ventrad; dorsal surface of these horns with a basal spinous protuberance, together with a long appressed seta lying further distad. Dorsal region of head behind the cephalic horns with four conspicuous tubercles that bear long setae. Sheath of labrum at base with a large median spine directed ventrad and two slightly smaller lateral spines directed ventrad and caudad (Plate vi, figs. 1 and 3). Sheaths of maxillary palpi very stout, five-segmented, directed laterad and thence cephalad. Labial sheath very large, bilobed. Ventral aspect of head between the antennal sheaths and the labrum and overlying the eyes of the developing adult within a transverse row of four tubercles that bear long delicate setae.

Pronotum (Plate vi, figs. 1 and 4) extensive, finely transversely wrinkled. Pronotal breathing-horns (Plate vi, fig. 2) each appearing as a relatively small, smooth structure, slightly sinuous, gradually narrowed to a terminal point, both horns of equal size and quite symmetrical. Mesonotum nearly smooth, gibbous, with a more or less distinct median depression, best defined at anterior end; a weak callosity above wing-root provided with two small setae. All leg-pads lying side-by-side, the fore (inner) pair shortest, ending shortly before the penultimate segment of the middle legs, which, in turn, end about opposite the termination of the third segment of the hind (outer) pair of legs. Wing-pads showing the essential features of venation of the family, Sc simple; R five-branched, M four-branched; Cu simple; a single anal vein, with a second curved into the axilla. Metanotum narrow, smooth, with a large seta on either side; sheath of halteres chiefly concealed beneath the wing-pad.

Abdominal tergites just before caudal margins with a transverse row of tubercles of various sizes and shapes, these terminating in long to short setae; the rows number between twenty-five and thirty such tubercles on tergites three and four, being somewhat reduced in number on the more basal segments, rapidly decreasing in number on the outer segments, there being only about six on

the seventh tergite, but these all large and powerful. Each cephalic lateral angle of the tergite with two additional tubercles, these more approximated on the basal segments, becoming slightly more separated on the outer segments. Pleurites with a single powerful setiferous tubercle on basal portion, together with a transverse group on posterior ring, consisting of two tubercles with a smaller tripartite or quadripartite tubercle between, the lateral tubercles becoming larger and more powerful on the outer segments. Sternites with a transverse swelling on either side near caudal margin, each bearing a tiny lateral seta and a powerful inner tubercle bearing a long seta (Plate vi, fig. 5); a transverse row of very tiny setae on basal portion of the sternites beyond the termination of the wing-pad, these becoming somewhat larger and more conspicuous on the outer segments. Eighth segment with a lateral finger-like lobe, directed caudad. Genital sheaths of both sexes about as figured (male, Plate vi, fig. 1; female, Plate vi, fig. 5).

Nepionotype (type larva).—River Pabos, Gaspé, Quebec, 19th June, 1929, in collection of Professor Rogers.

Neanotype (type pupa).—Reared from larvae from type locality, transformed at Amherst, killed 30th June, 1929.

Paratype larvae and one pupal skin.

Affinities.

The larva of *Protoplasa* is so distinct from that of all other families of Diptera that a comparison is scarcely needed. On the other hand, the pupa is so exceedingly like a Hexatomine Tipulid, such as *Eriocera*, that no features are available for definition of the family in this stage, other than the venation of the pupal wing-pads and the details of structure of the mouth-parts.

For many years the Tanyderidae were placed with the Ptychopteridae and the relationship admittedly exists, though probably not as close as was believed before the discovery of the early stages. It was formerly believed that the immature stages of the Tanyderidae, when discovered, would conform in their chief essentials with those of the Psychodidae and the Ptychopteridae, such as the possession of an anal breathing-tube, a character of all families of Psychodoid Diptera. The Tanyderidae depart from all these related families in a totally different arrangement of spiracles, these being placed laterally on the prothorax and eighth abdominal segment, and so deviating from the normal arrangement of spiracles in amphipneustic respiration. Similarly the body pseudopods or creeping welts, that might well be pre-supposed from the taxonomic arrangement of the groups, do not occur. The long anal pseudopods are rather like those of the Chironomidae.

I am supplying a tentative arrangement of the larvae of the Orthorrhaphous Diptera to show the position of the Tanyderidae therein:

1. Body eucephalous; or the posterior portion of the head-capsule with deep longitudinal incisions; mandibles moving horizontally or obliquely; labium usually well-developed (larvae frequently peripneustic). (Orthorrhapha Nematocera) ... 2
   Body not eucephalous, the head being more or less retractile or lacking (Heteroneuridae); labial plate not developed; mandibles moving vertically; (larvae normally amphipneustic; very rarely metapneustic or peripneustic, i.e., some Dolichopodidae). (Orthorrhapha Brachycera; Cyclorrhapha) 19
2. Head-capsule incomplete behind, retractile 3
   Head-capsule complete, immovable, i.e., body eucephalous 4

3. Larvae peripneustic; usually with a "breast-bone", a chitinized plate on ventral surface of second thoracic segment (mainly phytophagous, mostly gall-makers; a few in decaying wood, bulbs, fungi; a few zoophagous) ..... CECIDOMYIIDAE (ITONIDIDAE).
   Larvae metapneustic or apneustic, i.e., *Antocha*; no "breast-bone"; never gall-makers (habits very various, mostly in wet earth or decaying wood) ..... TIPULIDAE
4. Body cylindrical, with the spiracles small, lateral in position on sides of prothorax and eighth abdominal segment; six long filaments at caudal end of body, one pair borne by long anal pseudopods; (aquatic) ..... TANYDERIDAE
   Characters not as above 5
5. Body depressed; abdominal segments one to seven with conspicuous lateral outgrowths, at outer end of each with a ventral sucking-disk armed with concentric rows of crochets; antennae long, unequally biramous; (larvae aquatic, in mountain streams, clinging to stones by pseudopods) ..... DEUTEROPHLEBIIDAE
   Characters not as above 6
6. Body depressed, the head-capsule complete but permanently retracted within thorax; body constricted into six primary divisions, each with a median ventral sucking disk, with a tuft of gill-filaments on either side; (aquatic) .... BLEPHAROCERIDAE
   Characters not as above 7
7. Thoracic segments fused into a complex mass, without pseudopods; in most genera with an anal respiratory funnel; when lacking, as in Anophelinae and some Chaoborinae, the first statement holds; (aquatic) ..... CULICIDAE
   Thoracic segments not so fused; if conspicuously dilated or extended, provided with a median prothoracic pseudopod 8
8. Posterior spiracles borne at apex of a breathing-tube that is at least one-half as long as body; two anal gills; (aquatic or semi-aquatic) ..... PTYCHOPTERIDAE
   Posterior spiracles borne at apex of a very short tube or sessile; gills four in number or lacking 9
9. Body amphipneustic or with conspicuous anal gills 10
   Body peripneustic, metapneustic or apneustic 13
10. No median pseudopod on prothorax 11
    A median ventral pseudopod on prothorax 12
11. Body segments simple; in cases, with paired pseudopods on either abdominal segments one and two, or on the former alone; form in life U-shaped; (aquatic or semi-aquatic) ..... DIXIDAE
    Characters not as above; body segments divided by false constrictions; (decaying vegetable matter) ..... ANISOPODIDAE
12. Thorax much distended; labial plate with only four to seven teeth, these capable of being directed caudad; antennae retractile ..... CHIRONOMIDAE (Tanypinae)
    Thorax not dilated; labial plate, when with distinct teeth, these exceeding seven in number and directed cephalad; antennae non-retractile ..... CHIRONOMIDAE (Chironominae); ORPHNEPHILIDAE
13. Body metapneustic or apneustic 14
    Body peripneustic 16
14. Body very elongate, slender, tapering toward both ends, terminal segment with about eight setae; (aquatic, movements snake-like, *Palpomyia, Culicoides*, etc.) ..... CHIRONOMIDAE (Ceratopogoninae)
    Larva not long and snake-like 15
15. Body without pseudopods; segments with transverse constrictions; some or all of the dorsal segments with narrow, chitinized transverse bands or plates; or the terminal segment produced into a very short tube; (habits various, in decaying vegetable matter or aquatic) ..... PSYCHODIDAE
    Body stout, armed with numerous setae, some of which are flattened and lanceolate; segments without secondary constrictions or chitinized plates; (terrestrial, in dung, beneath bark, or in water-soaked logs, *Forcipomyia, Ceratopogon*, etc.) ..... CHIRONOMIDAE (Ceratopogoninae)
16. Abdominal spiracles rudimentary but evident; body clavate, the caudal end strongly enlarged and bearing a sucking-disk with which larva adheres to habitat; mouth with fans; (aquatic) ..... SIMULIIDAE
    Abdominal spiracles distinct; other characters not as above; (terrestrial) 17

17. Antennae elongate; body with conspicuous setae; arranged in transverse rows .. 18
Antennae short and inconspicuous; body without conspicuous setae; (generally fungicolous, some in decaying vegetable matter) ..... MYCETOPHILIDAE
18. Posterior spiracles elevated on long stalk-like processes, the lateral spiracles on shorter stalks; (in dung and other decaying matter) ..... SCATOPSIDAE
Spiracles sessile, the posterior pair large, on dorsal surface of ninth abdominal segment; prothoracic spiracle larger than others of lateral series; (soil) ..... BIBIONIDAE
19. Maxillae well-developed, the palpi distinct; mandibles normally sickle-shaped, not protruded far beyond the apices of the maxillae, often not extending one-half this distance; antennae well-developed, placed on a chitinized dorsal plate. (Orthorrhapha Brachycera) 20
Maxillae poorly developel, the palpi visible only in a few scattered groups; mandibles short and hook-like, usually capable of protrusion far beyond the tips of the maxillae when the latter are developed; antennae poorly developed or lacking, when present placed upon a membranous surface ..... (Cyclorrhapha)
20. Body elongate, elliptical, strongly flattened, with a slight dorso-median carina, the body with only nine apparent segments, excluding the head; metathorax elongate and apparently including also the first abdominal segment; (amphipneustic; posterior spiracles distant; pupa in last larval skin; six elongate appendages on thorax and two others on last abdominal segment; earth or beneath basal leaves of rosette plants; Lundbeck considers to be Orthorrhaphous, de Meijere Cyclorrhaphous) ..... LONCHOPTERIDAE
Characters not as above 21
21. Posterior spiracles approximated, situated within a terminal or subterminal cleft or chamber and usually concealed; body more or less shagreened or longitudinally striated 22
Posterior spiracles rather widely separated, situated on the apparent apical segment, or upon the penultimate or antepenultimate segment; body not shagreened or striated 23
22. Body depressed, spindle-shaped, the surface finely shagreened; head little, if any, retractile; spiracular fissure transverse; (earth, animal nests, under bark, decaying vegetable or animal matter; pupa in last larval skin) .. STRATIOMYIIDAE
Body cylindrical to pyriform, the abdominal segments with a girdle of pseudopods on each segment; body-integument usually longitudinally striated, sometimes irregularly roughened; head retractile; spiracular fissure vertical; (aquatic or semi-aquatic; pupa free) ..... TABANIDAE
23. Posterior spiracles upon the apparent apical segment 24
Posterior spiracles upon the penultimate or antepenultimate segment 30
24. Apical abdominal segment heavily chitinized, blackened 25
Apical abdominal segment not heavily chitinized or blackened 26
25. Thoracic segments not chitinized dorsally; apical plate very large, the spiracles vertically elongated, the lobes surrounding the disk small, widely separated; (earth, rarely under bark) ..... COENOMYIIDAE
Prothorax and mesothorax chitinized dorsally; apical chitinized plate rather small, spiracles circular, the paired surrounding lobes large, fused basally, each with a number of long setae; (beneath bark) ..... XYLOPHAGIDAE
26. Posterior spiracles not in an apical transverse cleft 27
Posterior spiracles widely separated, situated in an apical transverse cleft; head very small, retractile; (internal parasites of Coleopterous larvae) .... NEMESTRINIDAE
27. Apical abdominal segment terminating in two elongate processes that are fringed with delicate elongate setae; abdomen with paired ventral pseudopods and fleshy dorsal and lateral appendages; (aquatic, *Atherix*) ..... LEPTIDAE, in part
Apical abdominal segment not as above, the pseudopods and other appendages lacking or approximately so 28
28. Apical abdominal segment terminating in four or five short, pointed glabrous lobes or two fleshy lips; head-skeleton with a large arched dorsal plate, the longitudinal rods being articulated upon a horizontal plane; (terrestrial, *Leptis, Chrysopila*, etc.) ..... LEPTIDAE, in part
Apical abdominal segment not as above; or the head-skeleton without an arched dorsal plate, the longitudinal rods articulated with the labial plate at right angles or nearly so, in profile appearing bent 29

29. Larva oval in outline, the smaller cephalic end marked off by a strong constriction; body integument smooth and viscid so particles of dirt adhere; abdomen with seven pairs of pad-like areas on venter of segments two to eight; spiracles not surrounded by lobes; (parasitic on spiders; the newly-hatched larva is more elongate-oval, the body with conspicuous palmate scales and with two conspicuous caudal setae) ..... CYRTIDAE (ACROCERIDAE)

Body slender, cylindrical; spiracular disk surrounded by small fleshy lobes; abdominal segments with a ventral transverse creeping welt; ventral lobes of spiracular disk larger than dorsal pair; (fleshy lobes lacking in *Neurigona*; body amphipneustic except in *Thrypticus* which is peripneustic; habits various, under bark, in wet earth; aquatic; burrowing in stems of palustral grasses) ..... DOLICHOPODIDAE; EMPIDIDAE

30. Posterior spiracles placed on antepenultimate abdominal segment; six basal abdominal segments subdivided by false constrictions to appear as twelve; body very long and slender 31

Posterior spiracles placed on the penultimate abdominal segment; abdominal segments all simple, undivided; body not excessively elongate 32

31. Posterior median plate of head-capsule spatulate at apex; (in earth and wood) ..... THEREVIDAE

Posterior median plate of head-capsule not dilated at apex; (usually in houses, beneath carpets) ..... SCENOPINIDAE

32. Penultimate abdominal segment longer than the ultimate, with a transverse impression near the end to give the superficial appearance of two distinct segments; last segment terminating in a sharp ridge with a median point; (in decaying wood, predaceous on wood-boring Coleoptera) ..... MYDAIDAE

Penultimate abdominal segment shorter than the ultimate, or, if longer, without a transverse impression as described above; ultimate segment not as described.. 33

33. Thoracic segments each with two long setae, one on either side on ventro-lateral margin; apical segment with from six to eight long setae; penultimate abdominal segment usually shorter than the ultimate; body in life straight; (in wood or soil, predaceous) ..... ASILIDAE

Thoracic segments, and apical segment of abdomen, without conspicuous setae; penultimate segment distinctly longer than the ultimate; body in life usually arcuate; (habits various, predaceous, parasitic or inquilinous) ... BOMBYLIIDAE

I cannot attempt at this time to give a key to the Orthorrhaphous pupae. The pupa of the Tanyderidae may be separated from the allied groups by the following simple key:

1. One of the pronotal breathing horns enormously elongated, much longer than the body, the other horn very short and abortive ..... PTYCHOPTERIDAE

Breathing horns short, or, if elongated (in a few Tipulinae), not longer than the body and the disproportion in size not conspicuous 2

2. Tarsal sheaths lying side by side, parallel 3

Tarsal sheaths overlying one another in pairs ..... TRICHOCERIDAE

3. Wing-sheath showing radius as being five-branched ..... TANYDERIDAE

Wing-sheath with radius reduced, with not more than four branches reaching the margin ..... TIPULIDAE

A NEW SPECIES OF RADINODERUS FROM THE DORRIGO PLATEAU.

The new species described herewith was included in a large and interesting series of crane-flies received from my friend, Mr. W. Heron, from the Dorrigo Plateau of New South Wales. The type specimen is preserved in my collection through the kind interest of the collector.

RADINODERUS DORRIGENSIS, n. sp.

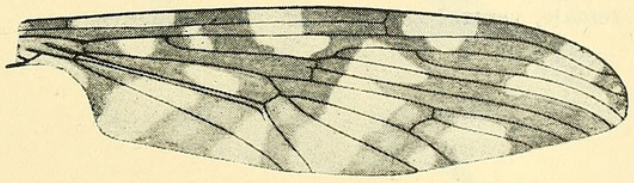
General coloration dark-brown; antennae 20-segmented, the scape black, the flagellum yellow; femora yellow, with a very broad black ring at near mid-length; tips of femora and bases of tibiae more narrowly blackened; wings whitish

with a dark brown pattern that is arranged in the form of two X-shaped areas that are confluent at the outer ends of cells C and Sc, the more basal one extensively connected with the darkened areas around the arculus in cells R and M.

♀. Length about 25 mm.; wing 18·5 mm.

Rostrum and palpi black. Antennae 20-segmented; scape black, the flagellum yellow, the incisures of the basal segments weakly darkened, the outer segments clearer yellow, the terminal two segments more dusky; first flagellar segment about one-third longer than the second; succeeding segments of nearly equal length, cylindrical, the last segment shorter. Head and cervical sclerites black or brownish-black, discoloured.

Anterior mesonotum light-brown, the disk almost covered by black stripes, the median stripe especially wide; scutellum obscure yellow, margined with dark-brown and including a median line of the same colour; postnotum dark. Pleura dark-brown; variegated with obscure brownish-yellow on the sternopleurite and cephalic portion of the pteropleurite. Halteres dusky at base, the outer half of the stem light-yellow, the knobs dark-brown. Legs with the coxae and trochanters dark; femora yellow, all with a very broad black ring at near mid-length, this including approximately two-fifths of the extent of the segment; tips of femora broadly blackened; tibiae yellow, the bases broadly blackened, the amount a little greater than the femoral tips; remainder of legs pale yellow. Wings (Text-fig. 1) whitish with a heavy dark-brown pattern, this appearing as



Text-fig. 1.—Wing of *Radinoderus dorrigensis*, n. sp.; holotype ♀.

two X-shaped areas that are joined in the outer end of cells C and Sc; the basal area is further connected with an extensive marking in the prearcular and arcular regions by rays in the radial and medial fields; veins yellow, dark-brown in the patterned areas. Venation: As compared with *terrae-reginae*, the following differences are most evident—R longer; Rs more arcuated at origin; R_1 less upturned at tip; R_{2+3} shorter; cell M_4 narrower at margin; cell 2nd A narrower.

Abdomen dark-brown, both sternites and tergites variegated laterally near base with conspicuous yellow areas; genital segment black.

Hab.—New South Wales

Holotype ♀, Brooklana, Eastern Dorrigo, altitude about 2,000 feet, 10th February, 1929 (W. Heron).

Radinoderus dorrigensis is closest to *R. terrae-reginae* (Alexander), differing in the number of antennal segments (20 instead of 24), the conspicuous black medial rings on all femora, and details of the wing-pattern and venation.

References Cited.

A complete bibliography of the Tanyderidae has been given in an earlier paper by the writer (Proc. Linn. Soc. N.S.W., liii, 1928, 373-374).

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EXPLANATION OF PLATES V-VI.

Plate v.

Larva of *Protoplasa fitchii*.

1.—Entire larva, lateral aspect.
2.—Head-capsule, diagrammatic, dorsal aspect.
3.—Head-capsule, diagrammatic, lateral aspect.
4.—Caudal end, lateral aspect.
5.—Caudal end, ventral aspect, with further enlargements of anal pseudopod and crotchets.

Plate vi.

Pupa of *Protoplasa fitchii*.

1.—Entire pupa, male, lateral aspect.
2.—Pronotal breathing horn.
3.—Head, male, ventral aspect.
4.—Head, male, dorsal aspect.
5.—Genital sheaths, female, ventral aspect.