and the first abdominal segment very distinctly punctured. Bingham states that the first segment of *fuscipennis* is wholly impunctate, but Smith describes a few distant fine punctures. In our species they are very distinct, and quite large at the sides.

Xylocopa grandiceps, Cameron.

Singapore (Baker). I examined Cameron's type in the British Museum, and noted: Large, with much red hair on thorax and tarsi. The size given by Cameron is 20 mm., evidently an error for 30 mm.

Mesotrichia flavonigrescens, Smith.

A female from the Island of Penang (Baker) is Cameron's *Xylocopa malayana*, which Meade-Waldo determined to be identical with Smith's *flavonigrescens*, based on the male.

Mesotrichia confusa, Pérez.

Male. Island of Penang (Baker 9079).

Mesotrichia cæruleiformis, Meade-Waldo.

Male. Singapore (Baker 9081). This very distinct species was described from Borneo in 1914.

CONTRIBUTIONS TO OUR KNOWLEDGE OF THE BRITISH BRACONIDÆ.

No. 3.—Microgasteridæ.

By G. T. Lyle, F.E.S.

(Continued from vol. l, p. 201.)

Genus 4.—*Diolcogaster*, Ashmead.*

Ashmead erected this genus to receive those species of *Microgaster* having the second abdominal segment impressed with two parallel longitudinal lines. The appearance of this segment renders it easy to distinguish the few British representatives from those of other very closely related genera, though the prominent longitudinal medial carina on the metathorax, mentioned by the author, is not developed in two of our three species.

Marginatus, Nees.†

As described by Marshall‡ and Ruthe,§ this insect has a strongly carinated metathorax, though Nees, in his original description, does not mention the character. The first abdominal segment in the male is three times as long as its medial breadth and attenuated from base to apex; in the female it is said to be much broader. I have seen only a single specimen, taken by

* 'Proc. U.S. Nat. Mus.,' xxiii, p. 132.
† 'Mon.,' i, p. 169.
‡ 'Trans. Entom. Soc.,' 1885, p. 244.
§ 'Berl. ent. Zeit.,' 1860, p. 155.

Dr. D. Sharp at Dartford many years ago and now in the Cambridge University Museum. The only specimen known to have been bred was obtained by Bignell from a larva of *Larentia viridaria*.

Marshall, who first described the male, afterwards expressed doubt as to the correctness of his association of the sexes, and certainly the wide difference in the shape of the first abdominal segment seems to point to distinction.

Calceatus, Hal.*

Is easily distinguished from the last by the absence of a longitudinal carina on the metathorax—indeed, in this species, in place of a carina, there is usually a depression. The areolet is open outwardly, though a magnification of two or three diameters will often show a distinct trace of the second transverse cubitus.

A common insect in the New Forest, where I have very frequently bred it, as a solitary parasite, from larvæ of *Thera variata* and *T. obliscata*, in May and October, in company with *Apanteles pinicola*. Major Robertson has also obtained it commonly from the same hosts at Chandlers Ford.

Cocoon bright straw colour, usually placed at the extreme tip of a pine needle. This position is determined by the host which, before the parasite larva emerges from near the anal extremity, takes up a position, facing inwards, along a pine needle. My experience in breeding this species seems to show that in numbers the males considerably exceed the females.

Circumvectus, sp. nov.

Black, palpi flavescent, lateral margins of first, and sometimes second abdominal segment and legs, with exception of hind coxæ, hind tarsi and tips of fore and middle tarsi, testaceous (occasionally the hind tibiæ are dark at apex). Wings hyaline, slightly clouded at tips; stigma dark fuscous, nervures fuscous or testaceous; antennæ black, longer than body. Mesothorax finely punctulate, scutellum more sparsely so; metathorax punctulate, centrally irregularly striolate, in some specimens showing signs of a longitudinal medial carina. Abdomen shining, segment one longer than broad, sides almost parallel, rounded behind, almost smooth; two as long as three with two shallow, parallel, longitudinal depressions, between which is an obtuse central ridge, suturiform articulation concave posteriorly; three smooth, often centrally slightly striolate and showing a trace of a longitudinal medial channel. Hind coxæ large punctulate. Terebra short, scarcely reaching apex of abdomen. Spurs of hind tibiæ pale, slightly longer than half the metatarsus. Length, 3–3½ mm., expands 7–7½ mm.

Described from six males and two females. Very similar in appearance to *D. calceatus*, but easily distinguished therefrom by the absence of a longitudinal depression on the metathorax

* 'Ent. Mag.,' ii, p. 241.

and the colour of the legs, etc.; also the cocoons are particularly dissimilar. From *D. marginatus* it differs in having the metathorax and first abdominal segment much smoother, etc.

Cocoon smooth, thick, dark chocolate brown in colour, pointed and wrinkled from end to end, though occasionally this last character is scarcely noticeable.

The larva is dirty yellowish white, with the divisions between the segments appearing darker, minutely punctate, parts of the mouth outlined in brown; length, 4½ mm. It emerges from the centre of the dorsal surface of the host where the cocoon is constructed in an upright position and firmly fixed to the body of the caterpillar (Fig. 1). The unfortunate host lives for several days after the emergence of the parasite larva, and carries its strange howdah about so long as power of motion is retained, and even death does not sever the connection. I have obtained, perhaps, twenty of these cocoons at various times, but have never known the imagines to emerge naturally therefrom. When I have cut open the cocoons, some twelve months after their construction, I have invariably found the imagines to be perfectly developed but quite dried up, having evidently been dead some time. It can scarcely be through lack of moisture that the insects have failed to emerge, as I have tried keeping the cocoons on damp sand during the winter. A suggestion has been made to me that a different result might have been obtained had I allowed the cocoons to remain attached to the dead bodies of the hosts. Up to the present, however, no opportunity of testing this has occurred. Always a solitary parasite, I have once obtained it, somewhat doubtfully, from a larva of *Brephos parthenias*, and many times from larvæ of *Lobophora carpinata*. Twice I have bred the hyperparasite *Astiphrommus plagiatus*, and once (July, 1910) *Mesochorus confusus*, these insects apparently having had no difficulty in gnawing their way through the hard cocoons.

Genus 5.—*Microgaster*, Latreille.

This genus was formerly co-extensive with the family, but has been at various times denuded and will bear still further dismemberment, for, as Marshall very correctly observes ('Trans. Entom. Soc.,' 1885, p. 238), it contains some of "the largest and most typical forms (Marshall's, Section 1) artificially associated, in consequence of the completeness of the second cubital areolet, with an inferior group (Section 2) which might even be made a separate genus with as much propriety as *Apanteles*." Marshall's two groups are very distinct, and it is to be regretted that Thomson did not extend his genus *Hygroplitis* to cover all the species in Section 1, for it seems an anomaly that such a species, for instance, as *M. tibialis*, though placed in a different genus to the nearly related *Hygroplitis rugulosus*, should be associated

with such dissimilar insects as *M. minutus* and *M. alvearius*; apparently Thomson did not know *tibialis*, *globatus*, *subcompletus*, etc. There can be little doubt that all the species are parasites of *lepidoptera*, the records of Reinhard and Ratzeburg of *Bombus terrestris* and *Nematus septemtreonalis* as hosts never having been confirmed.

I have been very fortunate in that Mr. B. S. Harwood has sent me for examination many specimens now in his possession which formerly belonged to E. A. Fitch; among these I have been much interested to find several of Marshall's types, bearing labels in his writing, together with many other specimens from Peter Cameron's collection with similar labels. Mr. Claude Morley has very kindly compared one of these labels with others in his own collection, and tells me there can be no doubt as to the handwriting being that of Marshall. How Cameron's insects came to be in Fitch's store-boxes I do not know, though, of course, it is possible that the latter purchased them; however, they were never embodied in the Fitch collection which is now in the Essex Museum at Stratford.

Alvearius, Fab.*

A small species, bright testaceous in colour, preying gregariously on larvæ of *geometræ*. The cocoons are constructed in a similar manner to those of *Apanteles fraternus*—namely, in a regular, honeycomb-like mass attached to a twig (Fig. 7). Bignell reared a brood of seventy, and I have in my collection one of seventy-nine, the latter obtained from a larva of *Hemerophila abruptaria* at Canonbury, London, N., by W. G. Pether. When the size of the host is considered, it seems marvellous how so many parasite larvæ can accommodate themselves within its body. I have seen a brood obtained from a larva of *Boarmia gemmaria*, taken at Ravenscourt Park, W., and Colthrup has found the cocoons on ivy at East Dulwich. Marshall records it from *B. gemmaria* and *Rumia luteolata*, Bignell from *B. repandata*. I may mention that I have reared very considerable numbers of the larvæ of these lepidoptera in the New Forest without meeting with the parasite.

Minutus, Rein.†

The smallest species in the genus, expanding 5 mm. at the most. In many specimens the second cubital cell is quite open outwardly as in *Apanteles*, but in others a distinct trace of the closing nervure is visible.

Described by Reinhard from two specimens, and first bred by Bignell who raised a brood of thirty from a larva of *Cleora glabraria*. It has since been proved to be a common parasite of

* 'Fab. E.S. Suppl.,' 232.

† 'Berl. ent. Zeit.,' 1880, p. 357.

this lepidopteron, and probably its range is co-extensive with that of its host.

We have here another instance where the gregarious cocoons take a honeycomb formation, and Marshall tells us that the "comb" is similar in shape to that of *M. alvearius*, but to me this seems scarcely correct, for in all the cases I have noticed the cake of cocoons has been almost circular in shape, and, instead of being firmly fastened to a twig, very loosely attached to the strands of the hosts' food plant *Usnea barbata* (Fig. 4). I have reared many broods in the New Forest, varying from nine to twenty-two individuals, all from larvæ of *C. glabraria*, and have a brood from North Somerset obtained from the same host. The transformation from full-fed larva to imago usually occupies fourteen days or so, the insects emerging from their cocoons in May or early June.

Connexus, Nees.*

By far the commonest species in the genus, large broods being constantly obtained from larvæ of *Porthesia similis*, whose urticating hairs are certainly no protection against attack by *Braconidæ;* also recorded by Morley from *Bombyx neustria*. Cocoons white with a satiny sheen, constructed within the cocoon of the host; the parasite larvæ do not evacuate the host until the latter is apparently on the point of pupating. Care must be taken in handling these cocoons, for the brittle hairs of the host which adhere to them are liable to be transferred to the fingers, and so accidentally to the eyes or lips, causing considerable irritation if not actual pain. Colthrup has sent me numerous broods from Eastbourne and Abbots Wood, and I have found the species particularly plentiful on the Gog Magog Hills near Cambridge, quite half the larvæ of *P. similis* taken by me in that locality having produced the parasite; the species has never occurred to me in the New Forest. Usually the broods consist of some twenty individuals; the largest I have numbers twenty-five, the smallest sixteen. From thirty to thirty-seven days is the period passed within the cocoon. All the insects in a brood do not emerge at the same time; indeed, I have known more than a week to elapse between the emergence of the first and the last. Hyperparasites are frequently obtained from the cocoons; this I have frequently noticed in the Abbots Wood examples; one large batch of cocoons from that neighbourhood, given to me by Colthrup, produced only a single *M. connexus*, the places of the others having been taken by hyperparasites; while quite half the cocoons of another brood yielded, in the following May, almost eleven months after the construction of

* 'Mon.,' i, p. 174.

the cocoons, a small black *Pteromalus*. Another common hyperparasite, also from Abbots Wood, is *Pezomachus agilis*.

Dorsalis, Nees.*

Not hitherto noticed as British, and I am slightly doubtful in referring to the species, a single female taken at angelica blossom in the New Forest in late August, 1914. This insect agrees well with Marshall's description,† and also with that of Wesmael,‡ excepting that the abdomen is not quite so noticeably testaceous as mentioned by them, and there is not a distinct longitudinal carina on the metathorax; there is, however, very pronounced striolation which might easily take the form of a carina in a well-marked specimen. The sides of the second cubital areolet are not thickened, and the cell is open outwardly, there being only a faint indication of the closing nervure.

This is not the *M. dorsalis* of Spinola,§ which is a synonym of *Microplitis ocellatæ*, Bouche.

Tiro, Rein.||

A small compact species, at first sight greatly resembling an *Apanteles*. The inner angle of the stigma is yellowish, the areolet practically complete, and the first abdominal segment broader than in any of the preceding species. It is, perhaps, nearest to *M. suffoliciensis*, Morley.

I captured a male on the Gog Magog Hills, Cambridge, on August 8th, 1917.

Suffoliciensis, Marl.¶

Very distinct and easily recognised from Morley's description. It shows no very close relationship to any other Microgaster known to me; in the female the first abdominal segment is broad, and narrowed from the middle to the truncate apex, while the second segment is scarcely more than one-fourth the length of the third. Morley described the species from a specimen bred from a larva of *Nothris verbascella* taken in Suffolk, and he has very kindly sent me for examination three females and one male bred from continental *N. verbascella* and *Hastula hyerana*. The cocoons accompanying these insects are somewhat similar to that of *M. crassicornis*.

Subcompletus, Nees.**

Considerable confusion exists regarding this species. Nees, in the original description, tells us the terebra is two-thirds the

* 'Mon. Aff.,' i, p. 170.
† 'Brac. Europe,' etc., iv, p. 526.
‡ 'Nouv. Mem. Ac. Brux.,' 1837, p. 37.
§ 'Ins. Lig.,' iii, p. 151.
|| 'Berl. ent. Zeit.,' 1880, p. 357.
¶ 'E. M. M.,' 1902, p. 4.
** 'Mon.,' i, p. 165.

length of the abdomen, in which he is followed by Wesmael and Ruthe, but Marshall says it may be either one-third or three-quarters the length of the abdomen. Such a wide variation can scarcely be possible in a single species, and for a time I imagined a printer's error might be responsible for the difference, and that "one-third" should be "two-thirds"; lately, however, I have seen a number of specimens, probably from Cameron's collection, all labelled "*M. subcompletus*" in Marshall's writing, and in these the terebra is scarcely one-third the length of the abdomen. It is difficult to believe that they can be the true *subcompletus* of Nees, and, were it not that they have the stigma concolorous and not pale at the base, they might easily be taken for *sticticus*, Ruthe.

Of this form with a short terebra I took a pair in the New Forest at angelica bloom in early August, 1916, and swept several from low herbage on chalk hills near Cambridge in July and August, 1917.

*Globatus.**

A common species with the wings varying from dusky to almost pure hyaline. In all the female specimens I have seen the terebra has been rather less than half as long as the abdomen. Marshall considered it to be always a solitary parasite but Ruthe speaks of it as gregarious. I have obtained a brood of fourteen from a New Forest larva of *Vanessa atalanta*, and have also a brood from the same host, taken at Farnham by Colthrup. Harwood has frequently bred it as a solitary parasite from young larvæ of *V. atalanta* at Colchester, and has also reared broods from the full-fed caterpillar of that butterfly. Morley also records it from the same host. I have carefully compared the solitary parasites with others from broods and can detect no difference excepting that the former are rather larger. Cocoons white and somewhat woolly; the loose outer cover is easily removed which leaves a thin, smooth, and slightly glossy inner cocoon, this may account for the discrepancies between the descriptions of various authors.

Tibialis, Nees.†

Very variable, both in size and coloration. Marshall doubted if it could be distinct from *globatus*, and certainly the principal difference appears to be merely in the colour of the legs; I must admit that I have never met with any of the intermediate forms he mentions, though, at first sight, *M. crassicornis* might be taken for a light *tibialis* or dark *globatus*, it is, however, easily distinguished by the antennæ. Haliday treated some of the varieties as separate species, viz. *messorius*, *meridianus*, and *luctuosus*, and it seems to me still open to question that he

* 'Mon.,' i, p. 163.
† 'Mon.,' i, p. 168.

was not correct in so doing; a study of the genetalia is badly needed here.

Fairly common though rarely bred, Morley tells us it is "very common" with him. Harwood has taken several at Colchester and I have found it near Cambridge, though never in the New Forest. The only cocoon I have seen accompanies a continental specimen in Morley's collection, it is white, rather woolly and similar to that of *M. globatus*. Bignell gives the cocoon as "white, papyraceous," which agrees better with that of the next species.

Crassicornis, Ruthe.*

This is the *M. spmolæ* of Haliday but not of Nees and Wesmael. There is no doubt it has frequently been confused with *tibialis* to which it bears a great resemblance, though a glance at the antennæ will at once determine its distinction, the three penultimate joints being quite as broad as long, which is not so in *tibialis* and *globatus*.

A common solitary parasite of larvæ of *Eupethecia denotata* (*campanulata*). In September, 1912, Major Robertson gave me several "stung" larvæ of this lepidopteron, taken by himself at Limpley Stoke, Bath; from these emerged microgaster larvæ which remained within their cocoons during the winter, the imagines emerging the following May (5th to 11th). Harwood has eight females bred from the same host taken at Newbury, and also possesses two females and one male obtained many years ago at Glenlyon by Cameron; these three insects are no doubt some of the specimens metioned by Marshall ('Trans. Entom. Soc.,' 1885, p. 259), unfortunately, they have suffered greatly from the attacks of mites.

Cocoon white, thin, smooth, transparent, with a medial band of a denser texture.

(To be continued.)

NOTES AND OBSERVATIONS.

Food-plant of the Larva of Hyria muricata.—In a previous number of the 'Entomologist' (vol. xlviii, p. 197) I recorded the fact that the food-plant of the larva of *Hyria auroraria* in Great Britain was probably the Marsh Cinquefoil (*Comarum palustre*). Mr. W. Holland has since confirmed this supposition by finding larvæ of this moth in Suffolk in May, 1917, feeding on *Comarum palustre*, which he reared to maturity. As Mr. Holland points out, *H. auroraria* is very local on the bogs where it is found, a fact explained by the sparse distribution of the food-plant in the areas where it grows.—N. Charles Rothschild; Arundel House, Kensington Palace Gardens West, London, March 9th, 1918.

* 'Berl. Ent. Zeit.,' 1860, p. 124.