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CONTRIBUTIONS TO OUR KNOWLEDGE OF THE BRITISH BRACONIDÆ.

No. 3.—MICROGASTERIDÆ.

BY G. T. LYLE, F.E.S.

(Continued from vol. l, p. 53.)

APANTELES. SECTION 3.

Apanteles fraternus,* Reinh.

A SMALL black species which expands but 3½–4 mm. Is particularly interesting on account of the manner in which the cocoons are arranged in a compact alveariform mass (Pl. II, fig. 2). Reinhard tells us that "the yellow-white cocoons to the number of 100 or upwards are spun together in the form of a honeycomb in a very neat manner, with the base attached to a thin twig or stem." In all the cases I have noticed, the masses of cocoons have been in an almost semicircular form caused by the parasite larvæ filling up the space between the body of the host and the twig upon which it rested. In one instance I was fortunate enough to witness the spinning of the cocoons, and it certainly seemed as if the host, a geometrical larva, encouraged the formation of the semicircular shape by accommodatingly arching its body; previous to the emergence of the parasites it had been stretched almost straight along the twig.

As mentioned above, Reinhard states that the broods consist of 100 or more individuals, but I have never seen any approaching this figure, the largest I have come across containing 53 and the smallest 29.

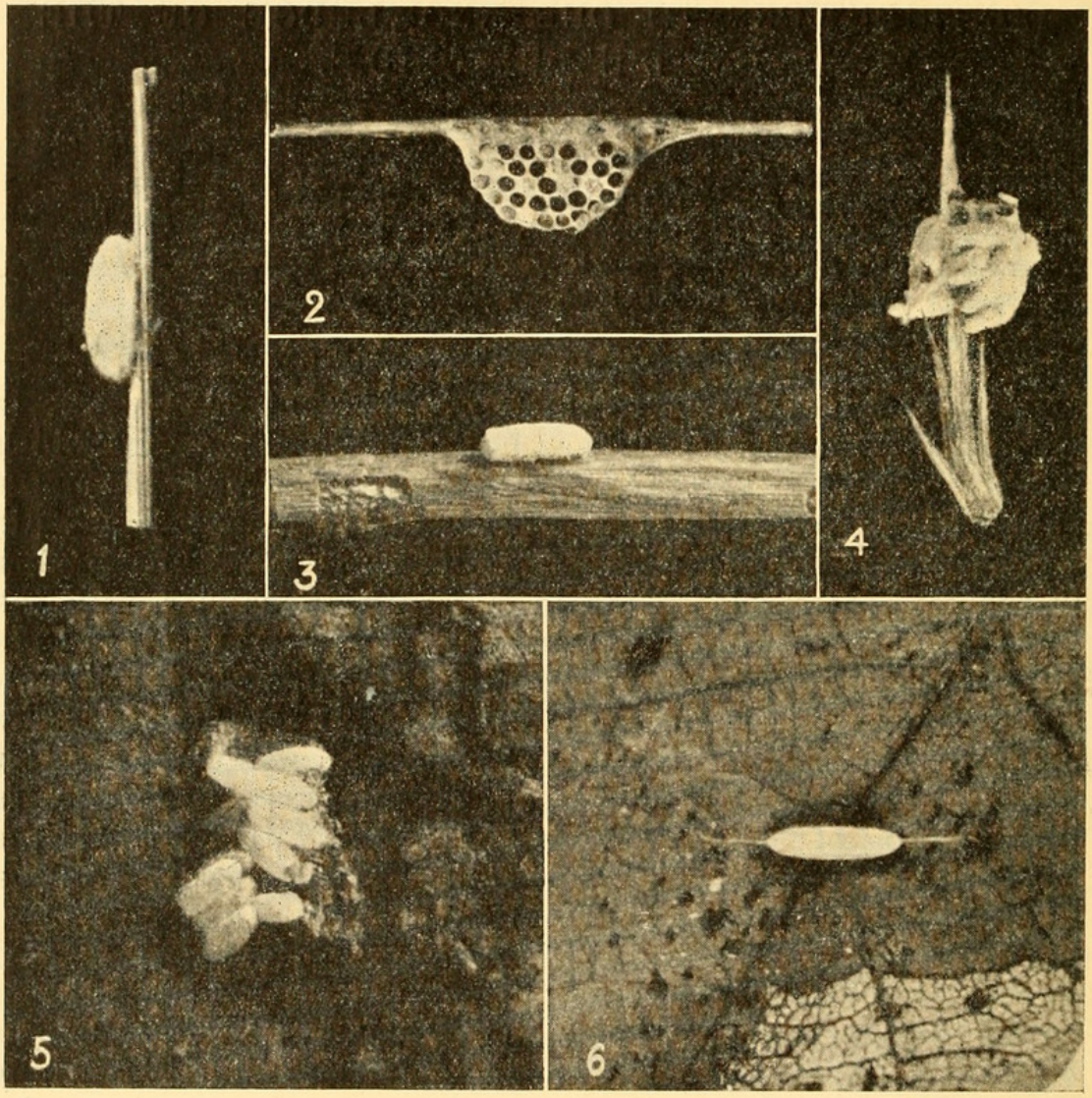
In June, 1916, I found two batches of cocoons attached to marram grass growing on the sand dunes near the entrance to Poole Harbour; in each case the host, still alive, was brooding over the "comb." Not being sure of the species of the host I searched the neighbourhood thoroughly for other caterpillars but discovered one only. This larva lived in confinement for a fortnight or so without, so far as I could judge, attempting to eat the food with which it was supplied, when it also produced a brood of the parasite. The imagines emerged from these three bundles of cocoons on July 2nd, 7th, and 17th respectively.

* 'Berl. Ent. Zeit,.' xxv, p. 47.

I believe the host to have been *Aspilates ochrearia*, from which insect Bignell reared the species in some numbers.

In Harwood's collection I have seen a brood obtained by him from a larva of *Euclidia mi*, taken at St. Osyth (October 10th,

PLATE II.



1. Cocoon of *Apanteles pinicola*. × 2½.
2. Empty cocoons of *A. fraternus*. × 2½.
3. Cocoon of *A. jugosus*. × 3.
4. Empty cocoons of *A. triangulator*. × 2½.
5. Empty cocoons of *A. lucifugus*. × 2.
6. Cocoon of *A. lautellus*. × 2½.

1914), and also two other broods from either *E. mi* or *A. ochrearia* (October 14th), taken near Colchester.

A. triangulator, Wesm.*

Very similar to the last but considerably larger, and also differing in the shape of the first abdominal segment, which

* 'Nouv. Mém. Ac. Brux.,' 1837, p. 62.

in this insect is more triangular, hence the specific name. The stigma is pale fuscous with the nervures paler, indeed, the latter are sometimes quite colourless. All the specimens I have seen expand from $5\frac{1}{2}$ to 6 mm. The cocoons are well described by Wesmael as pale-yellow, and "*réunies en un petit paquet*" (Pl. II, fig. 4).

In the New Forest these compact parcels of cocoons may often be found in June attached to *Genista anglica* and to furze, the species being commonly parasitic on larvæ of *Pseudoptera pruinata*. Major Robertson has reared it from the same host taken at Chandler's Ford, and I imagine that it will be found to be as common and generally distributed as is its host. The broods usually consist of from ten to twenty individuals.

A nearly related and, I believe, undescribed insect which forms a pure white cocoon, and which I have obtained as a solitary parasite from a larva of *Nola cucullatella*, appears to have been confused with this species (see Marshall, 'Trans. Entom. Soc.,' 1885, p. 215). Bignell gives the cocoons as "white, thick, gregarious," which also points to confusion.

A. formosus, Wesm.*

Is rendered specially interesting by its unique cocoon, first discovered by Bignell, who figured and described it in 'Trans. Devon Assoc. Sci., Lit., and Art,' 1901, xxxii, p. 661. Judging from Bignell's remarks the insect should be a fairly common parasite of the larvæ of *Ourapteryx sambucaria*. In the New Forest the Swallow-tail Moth is by no means plentiful though every spring a few of the larvæ may be beaten from honeysuckle or ivy. For quite ten seasons past I have reared all I could obtain with the idea of breeding this parasite but without success. I have also persuaded friends to send me considerable numbers of the caterpillars from at least six different localities in the country with no better result; indeed, I have never obtained a hymenopterous parasite of any sort from *O. sambucaria*.

As Marshall remarks, the cocoon somewhat resembles the pedicellate egg of a *Chrysopa*. It also bears a likeness to the pensile cocoon of a Meteorid, and one would naturally suppose that it was constructed in a similar manner, namely, by the maker first suspending itself by strands of silk from a leaf or twig and then weaving its cocoon. Bignell, however, assures us that it is not so, and states that the larva, after constructing a base, erects a peduncle, at the top of which the cocoon is fixed.

A. parallelus, sp. nov.

Black; palpi pale; belly at base testaceous; fore and middle femora, tibiæ and tarsi entirely testaceous; hind femora and tibiæ

* 'Nouv. Mém. Ac. Brux.,' 1837, p. 60.

testaceous, fuscous at apex; hind tarsi fuscous, basally paler (occasionally the hind tibiæ are also narrowly fuscous at the base), hind coxæ smooth and shining above. Wings hyaline, stigma and nervures fuscous; antennæ as long as the body. Mesothorax punctulate; scutellum smoother, with sparse punctulation; metathorax subrugulose. First segment of the abdomen more than twice as long as its median breadth, with scattered punctures, *sides parallel nearly as far as the rounded apex;* second almost as long as third with the usual impressed converging lines enclosing a fairly smooth triangular space; other segments smooth and shining; first three segments sometimes broadly edged with testaceous. Terebra subexserted (very slightly surpassing apex of abdomen). Length, 2½–3 mm.; expands 5½–7 mm.

Described from three males and one female.

The rounded and not pointed apex of the first abdominal segment will distinguish this species from all others in the section excepting *formosus;* in some specimens this segment appears almost truncate, and were it not for the exserted terebra of *A. exilis*, Hal., the insect might easily be confused with that species.

A solitary parasite, cocoon brownish-white, smooth, and very similar to that of *A. pinicola*, though not so rosy in colour. The cocoon is constructed beneath the body of the host, and is usually attached to a twig. After having voided its parasite, the host appears to be incapable of locomotion, and remains seemingly brooding over the cocoon, which position its dried body retains long after death.

Seems to be a fairly common parasite of *Hemithea strigata* (*thymiaria*), from which host I bred it on May 25th, 1911; May 14th, 1912; May 16th, 1912; and June 8th, 1914.

A. pallidipes, Rein.*

Has many times been bred as a gregarious parasite from larvæ of the genus *Plusia*. In the New Forest it appears to be uncommon; at any rate, I have obtained no specimens from the numerous larvæ of *P. gamma* and *P. chrysitis* I have reared. The rugulose metathorax easily distinguishes it from its near relatives.

A. bicolor, Nees.†

The only specimen I have seen is a female without data, formerly in Fitch's collection and now in the possession of Mr. B. Harwood. The terebra is from a quarter to one third as long as the abdomen, and there is scarcely a trace of an elbow at the point where the first abscissa of the radius joins the first intercubital nervure.

* 'Berl. Ent. Zeit.,' 1881, p. 48. † 'Mon.,' i, 181.

A. lucifugus, sp. nov.

Black; palpi pale; belly at base and legs testaceous: fore and middle coxæ chocolate-brown; hind coxæ black; hind femora sometimes very slightly infuscate at apex and sides; apical half of hind tibiæ dark; hind tarsi infuscate, with the base paler; hind coxæ above smooth and shining, wings hyaline, stigma pale fuscous, nervures mostly pale; first abscissa of radius and first intercubital nervure united in one curve without any sign of an elbow at the point of junction. Antennæ rather longer than the body. Mesothorax very finely punctulate; scutellum smooth; metathorax smooth, apically feebly acciculated in centre, laterally and apically margined by a fine raised ridge. First abdominal segment more than twice as long as its medial breadth, sides parallel for two thirds of its length, then converging to a blunt point; second as long as third, with two deeply impressed converging lines enclosing a smooth space, the centre of which is raised; other segments smooth and shining; segments 1 and 2 laterally bordered with testaceous or fusco testaceous. Terebra short, not surpassing the apex of the abdomen; spurs of middle tibiæ curved at apex. Length, 2 mm.; expands, 5 mm.

Described from nine males and three females out of a brood of thirteen, bred from a larva of either *Laspeyria flexula* or *Lithosia deplana*, probably the former, June 20th, 1911.

The neuration of the upper wing will easily distinguish this species from all others in the section with the exception of *bicolor*, which it somewhat resembles; in *bicolor*, however, the terebra is at least one fourth as long as the abdomen.

Cocoons almost smooth, pure white, and, in the only case I have observed, attached in an irregular cluster to the bark of a pine-tree, 3½ mm. in length (Pl. II, fig. 5).

A. lautellus, Marsh.*

I have seven females which I believe I am right in referring to the dark form of this species as described by Marshall. Typical specimens, with which I have never met, are said to have the first four abdominal segments testaceous. In some of mine the first three are edged with testaceous, but no more; the apex of the hind tibiæ infuscate, and in the darker specimens the hind and even middle femora edged with fuscous above and below, the hind and middle coxæ being dark also. My largest, bred from *Paramesia ferrugana*, expands 7 mm.; the smallest, from *Lithocolletis coryli*, less than 5 mm.

The cocoon is very curious, being cylindrical, smooth, white, papyraceous, and transparent; it is slung, hammock-like, by threads of silk attached to either extremity, across the larval chamber of the host. When found in the well-known chamber

* 'Trans. Entom. Soc.,' 1885, p. 219.

of *Gracillaria swederella* this is particularly noticeable (Pl. II, fig. 6).

Bred from *Paramesia ferrugana*, October 23rd, 1914; *G. swederella*, November 1st, 1915; and many times from *Lithocolletis coryli*, October 10th to November 1st; also from a species of *Lithocolletis* mining the under side of oak leaves. As a hyper-parasite, I have obtained a chalcid named by Morley, after comparison with the type in the British Museum, as *Eulophus eneugamus*, Walker.

A. callidus, Hal.*

Distinguished from *lateralis* and *vitripennis* by its dull granulate coxæ and narrow wings.

I have never captured or bred this insect, the only specimens I have seen being an ancient pair, without data, in Harwood's collection; probably they were at one time in the possession of Fitch. Is recorded by Bignell as a gregarious parasite of *Abraxas grossulariata*, but, although I have at various times reared some hundreds of the larvæ of this moth, and have obtained numerous parasites of other species, *A. callidus* has never occurred to me.

A. lateralis, Hal.†

Very similar to *vitripennis*, but differing in the rougher metathorax and also the exserted terebra, which in this species is almost half as long as the abdomen. Marshall tells us the first abdominal segment is "almost smooth," although Haliday says it is "*punctulatum*."

I have found it to be a very common parasite of *Sericoris fabricana*, preying on both spring and summer broods of that insect. Harwood has a single specimen formerly in Fitch's collection, and labelled by the latter, "Ex. *S. fabriciana* ?, 20/9/83, W.H.B.F."

The cocoon is white and similar to that of *vitripennis*; sometimes it is constructed within the well-known web made by the host; at others on the under side of a leaf of the food-plant.

A. vitripennis, Hal.‡

A rather prettily marked species, the first three segments of the abdomen being very noticeably edged with flavo testaceous; indeed, in some specimens these segments are entirely flavo testaceous above, with the exception of a central isolated black patch. Bignell tells us that this is often a gregarious parasite, which does not agree with my experience. Marshall also, in

* 'Ent. Mag.,' ii, 248.

† 'Ent. Mag.,' ii, 248. ‡ *Ibid.*

"Braconidæ d'Europe," says it is gregarious, though all the records he gives seem to point to its being solitary. In the New Forest I have found it to be a fairly common parasite of *Cleora lichenaria*, having often bred it from the larvæ of that species in April and early May. I have also a specimen obtained by Colthrup from the same host taken at Abbots Wood. In addition, I have bred it from small larvæ of *Miselia oxyacanthæ*, May 14th, 1912; *Crocallis elinguaria*, May 22nd, 1914; and *Pachys betularia*, August 2nd, 1913; also from *Eupithecia irriguata*, July 24th, 1916, and *Ephyra punctaria*, September 13th and 15th, 1911.

The cocoon is smooth and pure white in colour.

A. pinicola, sp. nov.

Black; palpi pale; tips of mandibles, belly at base, and legs rufo testaceous; hind coxæ dark; hind femora and tibiæ tipped with fuscous (in dark specimens the fore and middle tibiæ are also fuscous towards the apices); middle and hind tarsi more or less fuscous. First three segments of the abdomen laterally bordered with dull rufo testaceous. Hind coxæ above slightly granulated, otherwise smooth and shining. Wings sub-infumated, irridescent, stigma and nervures dark fuscous, all the nervures visible; antennæ as long as the body. Mesothorax and scutellum finely punctulate, shining; metathorax almost smooth, feebly acciculated at apex. Abdomen shining; first segment three times as long as medial breadth, gradually tapering from base to apex, with a smooth raised medial ridge, laterally rather coarsely punctate; second centrally raised and smooth, laterally sub-rugulose, almost as long as third; terebra short; spurs of middle tibiæ somewhat curved at apex. Length, $3\frac{1}{2}$–4 mm.; expands, 8–9 mm.

Described from eleven males and twenty-three females.

Very near *vitripennis*, though I believe it to be quite distinct. It is a larger and more robust insect, the wings are sub-infumated (in *vitripennis* they are pure hyaline), while all the outer nervures of the upper wing are plainly visible. There is much less testaceous colouring on the upper side of the abdomen; also the legs are rufo testaceous, and not flavo testaceous. In this species the transverse median vein forms with the third abscissa of the median vein an angle of 45 degrees or so; in *vitripennis* we have almost a right angle at the junction of the two veins. Also the cocoons are different.

In the New Forest a very common solitary parasite of the larvæ of *Thera variata* and *T. obeliscata* from which hosts I have bred it in numbers from May 14th to June 9th, and again from September 18th to October 16th. Major Robertson also obtains it frequently at Chandler's Ford from the same hosts. I have beaten it from Douglas fir on November 26th and 27th, and once took a specimen at ivy bloom so late as December 1st.

On September 7th, 1913, I was fortunate enough to observe the emergence of a larva of this species from its host. When first noticed the latter was resting extended on a pine needle of which it had taken a very firm grip with its anal claspers, and from its swollen and unhealthy appearance evidently contained a parasite. At 5.8 p.m. the parasite had forced its head through the dorsal surface of one of the central segments, its body then occupying practically the whole of the host between this segment and the anus. By 5.19 the parasite larva had completed its emergence, though it still retained a firm hold of its host with its anal segments and had also loosely attached itself to the caterpillar by a few threads of silk. By this time the host was hanging inert from the pine needle by its anal claspers, though still showing faint signs of life. The parasite larva now worked its way up the body of the host by a crawling motion until the pine needle was reached, to which it lightly attached the caterpillar and then commenced busily spinning its cocoon. The construction of the cocoon progressed rapidly, and at 6 p.m. the Braconid larva released its grip of the host which it apparently pushed away and caused to fall to the ground.

The larva of this species is of the usual cream colour with the parts of the mouth outlined in brown, and raised obese spiracular ridges.

Cocoon smooth, pale, with a distinct rosy tint which is often more pronounced towards one extremity (Pl. II, fig. 1). Writing of *A. vitripennis* ('Trans. Entom. Soc.,' 1885, p. 223) Marshall mentions that Raynor bred a female at Brandon from *Thera variata*, the cocoon being *accidentally* stained at one end orange red. It seems probable that he had a specimen of *A. pinicola* before him, and that the coloration of the cocoon was natural and not accidental as he supposed.

I have twice bred a species of *Astiphromma*, Thoms, as a hyper-parasite and once, September 28th, 1913, *Mesochorus fusicornis*.

A. fulvipes, Hal.*

Without doubt the commonest species of the genus ; indeed, every breeder of Lepidoptera must be well acquainted with the bunches of pure white and rather woolly cocoons which he only too frequently finds in his breeding cages. It is usually the larvæ of Noctuæ that fall victims to this parasite, and the cocoons are, as a rule, found beneath the surface of the ground.

There is a succession of generations from March to October, the winter being passed within the body of a host, probably in the egg state.

An excellent account of the larva and pupa (both very

* 'Ent. Mag.,' ii, 242.

typical) is given by Ratzeburg ('Ich. de Forst.,' i, 62), and quoted by Marshall ('Trans. Entom. Soc.,' 1885, p. 224).

Is already known to prey on nearly thirty different species of lepidoptera in this country alone, and no doubt many additional hosts will in time be recorded. I have obtained great numbers in March and April from larvæ of *Noctua xanthographa* and *Triphæna fimbria*, and in June and July I have bred it very commonly from larvæ of *Miselia oxyacanthæ*, while in the autumn I have found that the caterpillars of *Triphæna pronuba* suffer greatly from its attacks. In addition, I have reared it from the following hosts: *Triphæna orbona*, May 30th, 1909, and many other dates; *Brachionycha sphinx*, June 8th, 1912; *Stilbia anomala*, April 28th, 1909; *Agrotis strigula*, April 2nd, 1914; *Camptogramma bilineata*, April 17th, 1912, and April 24th, 1914; and *Xanthorrhoë montanata*, April 21st, 1914. I have also a brood obtained by Cockayne from *Mamestra pisi*, taken at Limber, North Lincs., and in Harwood's collection is a specimen bred from *Toxocampa craccæ*.

My largest brood (thirty-nine) was obtained from *M. oxyacanthæ*, the smallest (seven) from *X. montanata*. Both sexes are represented in each brood, the females being usually in a proportion of two to one.

BRITISH ODONATA IN 1916.

By W. J. Lucas, B.A., F.E.S.

Although the latter part of April was warm and bright, it was not till the first day of May that I saw a dragonfly, on which date a *Pyrrhosoma nymphula*, Sulz., was sighted near Beaulieu River in the New Forest. No further member of the Odonata came within my ken till the South London Natural History Society's excursion to Wisley, in Surrey, on May 20th, when two further species were met with—*Agrion puella*, Linn. (W. J. L.), and *Libellula depressa*, Linn. (H. J. Turner). On June 3rd *A. puella*, ♀, was captured on Effingham Common and *Enallagma cyathigerum*, Charp, ♀, near East Horsley—both in Surrey (W. J. L.). *Calopteryx virgo*, Linn. (L. C. E. Balcomb) and *P. nymphula* (W. J. L.) were taken, and *L. depressa* (W. J. L.) was seen in the New Forest on June 11th; while *L. depressa* was also seen (W. J. L.) near Netley Heath, in Surrey, on the occasion of the South London Society's excursion to Clandon on June 24th; but it eluded capture.

E. cyathigerum was common a few miles from King's Lynn, Norfolk, in May and June (E. A. Atmore); while *Agrion mercuriale*, Charp., was not uncommon, but extremely local, in two