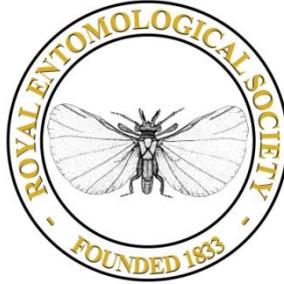


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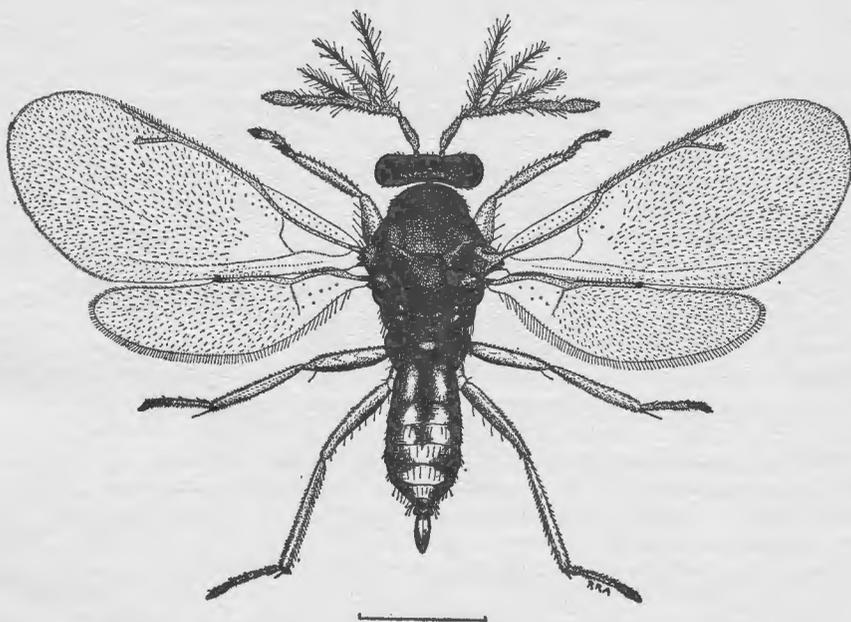
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HANDBOOKS FOR THE IDENTIFICATION OF BRITISH INSECTS



HYMENOPTERA

2. CHALCIDOIDEA SECTION (b)

By

R. R. ASKEW

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HANDBOOKS FOR THE IDENTIFICATION OF BRITISH INSECTS

The aim of this series of publications is to provide illustrated keys to the whole of the British Insects (in so far as this is possible), in ten volumes, as follows :

- | | |
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| ,, 2. Thysanura. | ,, 10. Odonata. |
| ,, 3. Protura. | ,, 11. Thysanoptera. |
| ,, 4. Collembola. | ,, 12. Neuroptera. |
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Orthoptera. | ,, 13. Mecoptera. |
| ,, 6. Plecoptera. | ,, 14. Trichoptera. |
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III. Lepidoptera.
IV. and V. Coleoptera.
VI. Hymenoptera : Symphyta and Aculeata.
VII. Hymenoptera : Ichneumonoidea.
VIII. Hymenoptera : Cynipoidea, Chalcidoidea, and Serphoidea.
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The Society is indebted to the Royal Society for a grant towards the cost of initiating this series of *Handbooks*.

A list of parts now available appears on the back cover.

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HYMENOPTERA

CHALCIDOIDEA

Elasmidae and Eulophidae (Elachertinae, Eulophinae, Euderinae)

By R. R. ASKEW

INTRODUCTION

THIS handbook covers the small family Elasmidae and introduces the very large family Eulophidae. Elasmids and Eulophids are closely allied and include some of the more specialized Chalcidoidea. The keys to families of Chalcidoidea in Volume VI Part 1 and in Volume VIII Part 2(a) of the Royal Entomological Society's *Handbooks* enable them to be recognized.

The terms used in the keys are shown in figures 1 to 5. They are, for the most part, those to be found in Richards (1956), but for the terminology of the mesoscutum, propodeum and wings, the additional terms of Graham (1959) have been employed. For the names and family groups of host species referred to in this handbook, Kloet & Hincks (1945) have been followed, except in the following groups: in the Tortricidae, Bradley & Martin (1956) and Bradley (1959) have been used, and the nomenclature of the Macrolepidoptera is that of South (1961). For the names of Agromyzidae I am indebted to Mr. G. C. D. Griffiths.

I am especially indebted to Dr. M. W. R. de V. Graham for his ready help and advice during the preparation of this work, and to Dr. Z. Bouček (Prague) for the donation or loan of specimens of species not readily obtainable in numbers in this country. My thanks also to Dr. M. F. Claridge, Mr. G. R. Gradwell, Mr. H. N. Michaelis, Mr. E. C. Pelham-Clinton, Mr. M. J. Taylor and others for giving me reared material, and to Mr. A. Brindle of the Manchester Museum and the trustees of the British Museum (Natural History) for enabling me to examine specimens in their care. Figure 14 is reproduced through the courtesy of the British Trust for Entomology.

Family ELASMIDAE

The family Elasmidae is small and best represented in the warmer parts of the world. The species are of rather uniform structure and quite distinct from any other Chalcids, though most closely allied to the family Eulophidae. They are characterized (Fig. 1) by their unusually shaped gasters, which are triangular in transverse section, their large, round and flattened hind coxae, long spiny legs with strong hairs on the hind tibiae usually arranged in a lozenge-shaped pattern, and narrow, truncated wings. The males have branched antennae, as have many Eulophidae. There are no notaulices on the mesoscutum. In Britain only three species have been discovered, all belonging to the genus *Elasmus*.

Nearly all species of Elasmidae are either primary parasites of larvae of Lepidoptera, or hyperparasites of Lepidoptera through species of Ichneumon-oidea. Case-bearing or web-spinning caterpillars are most frequently attacked. The female Elasmid paralyses the host caterpillar with a sting from her ovipositor and deposits a number of eggs, varying with the size of the caterpillar, on its surface. The elasmid larvae feed externally and their development is rapid, occupying usually only about two weeks.

The European species of *Elasmus* have been reviewed by Ferrière (1947), who separates them into two groups in his key on the basis of colour. All the British species come into the second group, none of them possessing extensive reddish markings on the head and thorax, a feature of Ferrière's first group of species.

Genus *Elasmus* Westwood

KEY TO SPECIES

- 1 Metascutellum black with the exception of the apical hyaline part (fig. 9); antennae of female short with second and third funicle segments at least as broad as long (fig. 7); fore wing less densely hairy with speculum very narrow but distinct (wings hyaline in both sexes).....**albipennis** Thomson
Rare. Berks., Oxon. (M. W. R. de V. Graham). Reared from species of Yponomeutidae, Pyraustidae, Glyphipterigidae and Tortricidae on the Continent, as either a primary or a secondary parasite.
- Metascutellum marked with yellow (fig. 8); antennae of female longer with second and third funicle segments clearly longer than broad (fig. 6); fore wing densely hairy with speculum completely obliterated.....2
- 2 Gaster more or less reddish-testaceous basally; fore wings of female infumate except apically**flabellatus** (Fonscolombe) (Fig. 1)
Rare. Surrey (J. O. Westwood), Hants. (E. C. Pelham-Clinton). The Hampshire specimens, one of which is shown in Fig. 1, were reared from Pachythelia villosella (Ochsenheimer) (Lep., Psychidae). They are somewhat atypical in that the gaster is rather long. Other psychid hosts of this species are known on the Continent.
- Gaster totally black; female fore wing scarcely infumate.....**anius** Walker
Only known from the female type specimen in the British Museum (Nat. Hist.), "England" (F. Walker). This may be merely a colour form of E. flabellatus.

Family EULOPHIDAE

(Subfamilies ELACHERTINAE, EULOPHINAE and EUDERINAE)

The family Eulophidae is very large, and about 400 species are represented in Britain. It may be conveniently divided into six subfamilies: Elachertinae, Eulophinae, Euderinae, Tetracampinae, Entedontinae and Tetrastichinae (although the Tetracampinae have recently been considered as a distinct family (Bouček, 1958)). The Elachertinae, Eulophinae and Euderinae are dealt with in this work.

During the last decade or so our knowledge of the Eulophidae, especially in the Palaearctic region, has increased enormously. Many of the species described by nineteenth-century workers such as Walker, Thomson, Ratzburg, Förster, Nees ab Esenbeck, and Zetterstedt have now been recognized, new species have been described, and life histories and host relations are becoming more clearly understood. Dr. M. W. R. de Vere Graham (Oxford) in 1959 published a key to the genera and species of British Eulophinae, Elachertinae, Euderinae and Entedontinae, and thereby established a foundation upon which further study of the British species could be based. Also

in 1959, Dr. Z. Bouček (Prague) published a key to the central European species of most genera of Eulophinae, including in it nearly all of the known British species.

Since 1959, a further three genera, *Xanthellum*, *Euplectromorpha* and *Ratzeburgiola*, and 19 more species have been recognised in Britain, but synonymy has led to the removal of four other specific names from the British list. Our fauna is now known to include 30 species of Elachertinae distributed amongst nine genera, 45 species of Eulophinae distributed amongst nine genera, and four species of Euderinae belonging to two genera.

General Biology

The Elachertinae, Eulophinae and Euderinae exhibit a variety of host relations and life histories, but they may be said to be typically ectoparasites of concealed larvae, usually of Lepidoptera, and especially of those inhabiting leaf-mines. The female Chalcid paralyses the host larva with an injection through her ovipositor, and lays one or more eggs upon it. The number of eggs laid upon a single host depends very much upon the size of the host. Species of *Olynx*, which attack the relatively small larvae of oak gall wasps, usually lay only a single egg upon each host; in contrast, as many as 57 larvae of *Sympiesis viridula* (Thomson) have been recorded (Parker & Smith, 1933) as developing upon a single larva of *Pyrausta nubilalis* Hübner (Lepidoptera). The fully grown eulophid larva is white with 13 body segments after the head, without hairs, and with weak, pointed mandibles. It usually pupates a short distance from the remains of its host, attached to the substrate by the last larval skin and with the ventral surface uppermost. Some species (e.g. of *Diglyphus*, *Cirrospilus*, *Hemiptarsenus*) inhabiting leaf-mines construct, prior to pupation, mine supports with their faecal pellets. These prevent collapse of the mine as it dries out and consequent damage to the delicate chalcid pupa. Eulophid pupae, whitish when first formed, nearly always turn brown or even black within a few hours. Most species have more than one generation during a year, overwintering as pupae, but there are many exceptions to this. For example, some *Olynx* species have only a single generation in a year, and occasionally two winters may be passed in an immature condition, the first as a larva and the second as a pupa, and at least some of the British species of *Necremnus* overwinter as adults. Species of *Cirrospilus*, *Olynx*, *Eulophus* and *Sympiesis* are known to exhibit seasonal dichroism, and in *Eulophus* this condition occurs in the pupae as well as in the adult insects (Gradwell, 1958).

Eulophus and *Euplectrus* are unusual in attacking lepidopterous caterpillars that are exposed upon leaf surfaces. *Euplectrus* species are also most exceptional in that the fully grown larvae spin flimsy, silk cocoons beneath the body of their host in which to pupate. Although this habit is common in, for example, the Braconidae, it is of rare occurrence among Chalcids. The silk is produced by the malpighian tubules of *Euplectrus*.

The species are usually oligophagous, attacking a limited range of hosts. The host ranges are defined very largely by both the ecological and the taxonomic situation of the hosts. A few species, such as *Olynx skianeurus* (Ratzeburg), are host specific; on the other hand, *Cirrospilus vittatus* Walker has an exceptionally wide range of hosts. This latter species has been

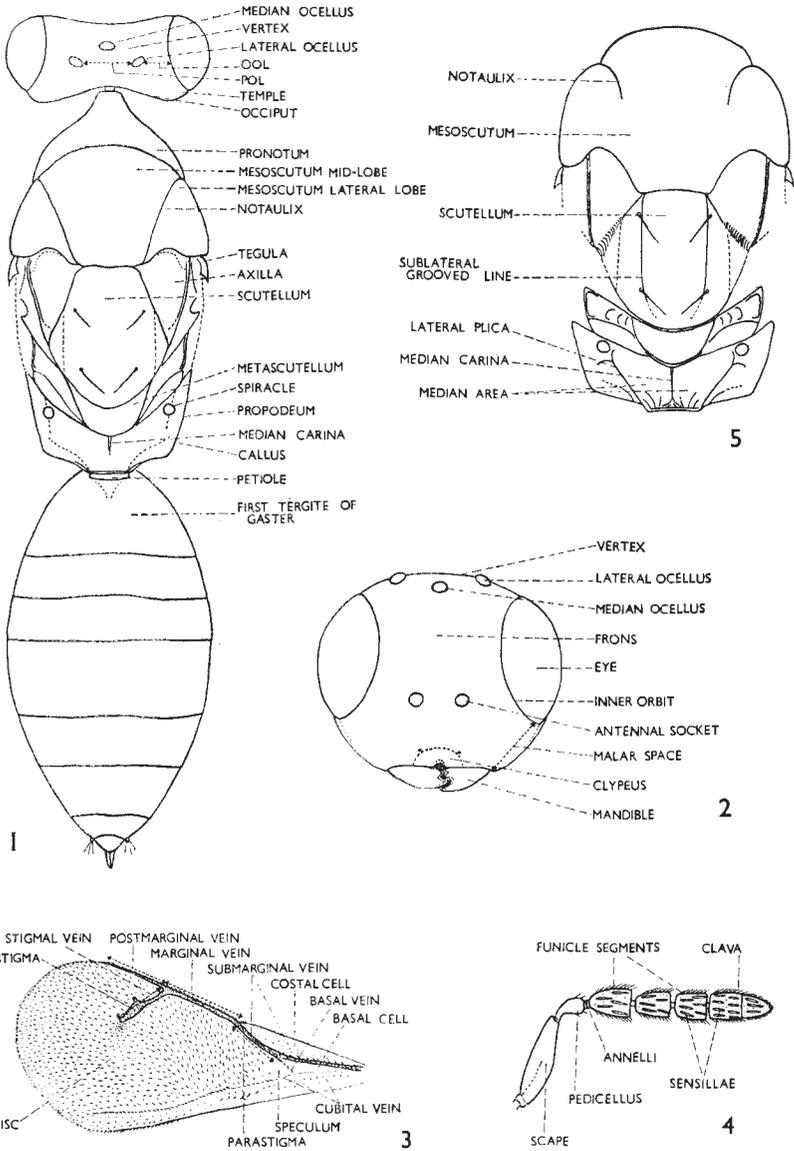
recorded as attacking lepidopterous, dipterous, coleopterous and hymenopterous leaf-mining larvae, their parasites, and even the eggs of sawflies. Other species of *Cirrospilus*, and some *Sympiesis*, are facultative hyperparasites of Lepidoptera through other parasitic Hymenoptera.

Thus the Elachertinae, Eulophinae and Euderinae are biologically diverse, and here is an excellent field for further study. The many Lepidopterists who rear moths from their immature stages frequently encounter parasitic Hymenoptera, and they are therefore in a very good position to add considerably to our knowledge. Much remains to be learnt about the biology of even some of the commonest of British species; species which may well prove to be of importance in agriculture or forestry as destroyers of insect pests. A table of host species recorded in Britain is given on page 27.

KEY TO SUBFAMILIES

- | | | |
|---|---|---|
| 1 | Macropterous | 2 |
| - | Brachypterous | 5 |
| 2 | Either the scutellum bears only two hairs and there are two hairs on the dorsal surface of the fore wing submarginal vein proximal to interception of basal vein (fig. 10) (Entedontinae), or, if not with both these characters, then either the postmarginal vein of the fore wing is rudimentary (fig. 11) or there is a distinct median grooved line on the mesoscutum (Tetrastichinae). There is usually a distinct break in the submarginal vein of the fore wing at junction with basal vein (figs. 10, 11)..... | ENTEDONTINAE, TETRASTICHINAE |
| - | The scutellum bears four hairs (figs. 1, 5); there are more than two hairs on the dorsal surface of the fore wing submarginal vein proximal to interception of basal vein (figs. 3, 12); postmarginal vein of fore wing never rudimentary and usually at least as long as stigmal vein (figs. 3, 12); there is no complete median grooved line on the mesoscutum, at most an indefinite depression or (<i>Euplectrus</i>) a raised carina; the submarginal vein of the fore wing is continuous along its anterior border (figs. 3, 12) (except sometimes in Euderinae)..... | 3 |
| 3 | Either fore wing with three distinct lines of hairs radiating from stigma (fig. 12), or antenna with some funicle segments white in female and with characteristic whorls of long hairs in male (fig. 13); notaulices complete. | EUDERINAE (p. 27) |
| - | Fore wing without distinct lines of hairs radiating from stigma; funicle without entirely white segments (except in some <i>Microlycus</i> Thomson, a genus not recorded from Britain)..... | 4 |
| 4 | Mesoscutum with notaulices complete and distinct and usually converging posteriorly (fig. 1); antennae of males not branched (except in <i>Ratzeburgiola</i>)..... | ELACHERTINAE (p. 6) |
| - | Mesoscutum with notaulices incomplete, indicated anteriorly only (fig. 5): or if traceable to posterior border of sclerite (some <i>Diglyphus</i> , <i>Sympiesis</i>), then very shallow and diverging posteriorly (figs. 47, 63); antennae of males often with two or three long branches (Fig. III)..... | EULOPHINAE (p. 15) |
| 5 | Funicle of antenna with three segments..... | TETRASTICHINAE |
| - | Funicle of antenna with four segments..... | 6 |
| 6 | Mesoscutum with incomplete notaulices; scutellum without sublateral grooved lines (fig. 1); frons not transversely furrowed..... | EULOPHINAE (some female <i>Hemiptarsenus</i> , p. 25) |
| - | Mesoscutum with complete notaulices; scutellum with two sublateral grooved lines (cf. fig. 5); frons transversely furrowed (fig. 14) | ELACHERTINAE (female <i>Xanthellum</i> , p. 8) |

The separation of the Elachertinae and Eulophinae presents some difficulties. Genera in both subfamilies exhibit parallel variation in many characters, and the only major morphological difference is the presence or absence of complete, deep notaulices. Even this character is not entirely reliable, as some species of *Diglyphus* and *Sympiesis* present a more or less



FIGS. 1-4.—*Olynx arsames* (Walker): (1) ♀, body; (2) head in frontal view; (3) ♀, fore wing; (4) ♀, antenna.

FIG. 5.—*Dicladocerus westwoodii* Westwood ♀, thorax and propodeum in dorsal view.

intermediate condition. *Ratzburgiola*, placed in the Elachertinae and having complete notaulices, shows affinities with the Eulophinae also, as its propodeum is similar to that of *Psigalio* and the males have three-

branched antennae. Nevertheless, the separation of Elachertinae and Eulophinae is useful, and it is probably largely a natural division also.

Subfamily ELACHERTINAE

KEY TO GENERA

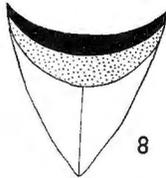
- 1 Hind tibia with two very long spurs, the longest much longer than the first tarsal segment and about half as long as entire tarsus (Fig. 11) (Tribe Euplectrini) . . . 2
- Hind tibial spurs much shorter than above, often only one clearly visible on each hind tibia (Tribe Elachertini) 3
- 2 Scutellum with two sublateral longitudinal grooves, otherwise smooth and shining **Euplectromorpha** Girault (p. 7)
- Scutellum without sublateral grooves, reticulately sculptured **Euplectrus** Westwood (p. 7)



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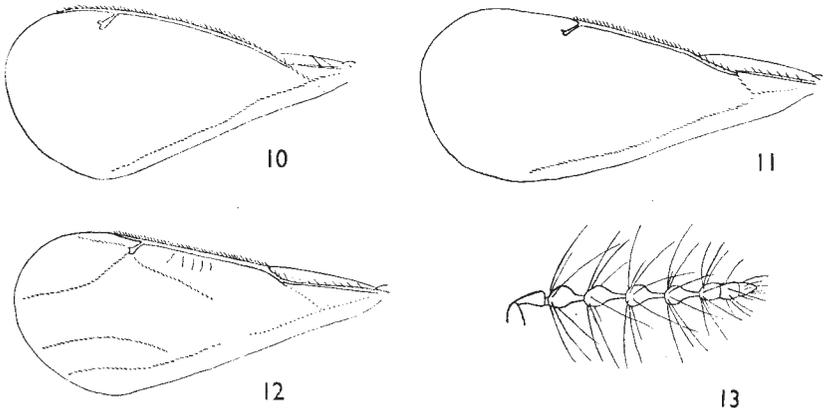


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FIGS. 6, 7.—Female antenna of: (6) *Elasmus flabellatus* (Fonscolombe); (7) *E. albipennis* Thomson.

FIGS. 8, 9.—Metascutellum of: (8) *Elasmus flabellatus* (yellow area is stippled); (9) *E. albipennis*.

- 3 Propodeum with a median lateral tooth on each side; female (fig. 14) often brachypterous, with body almost entirely testaceous and frons strongly transversely furrowed with two piceous lines running from antennal toruli almost to meet below the median ocellus; male macropterous and black, antennal flagellum broad and fusiform **Xanthellum** Erdős & Novicky (p. 8)
- Propodeum without median lateral teeth; macropterous; body with at least some dark areas; frons without transverse furrows 4
- 4 Antennal funicle with three segments in female (figs. 4, 32), four in male (figs. 33, 34); clypeus with anterior margin medially incised (fig. 2); fore wing with stigma large and oblong (fig. 3) (body without testaceous areas) . . **Olynx** Förster (p. 11)
- Antennal funicle with either two or four funicle segments in both sexes; clypeus not incised; fore wing with stigma small 5
- 5 Antennal funicle with two segments (body usually bicolored, partly metallic, partly testaceous) **Cirrospilus** Westwood (p. 12)
- Antennal funicle with four segments 6
- 6 Propodeum with a strong, transverse costula (as fig. 52); antenna of male with three branches (mesoscutum with long hairs, scutellum polished) **Ratzburgiola** Erdős (p. 11)
- Propodeum without trace of costula; antenna of male unbranched 7



FIGS. 10-12.—Fore wing, only hairs in lines indicated, of: (10) *Chrysocharis laomedon* (Walker); (11) *Aprostocetus* sp.; (12) *Euderus albitarsis* (Zetterstedt).

FIG 13.—*Astichus solutus* Förster, ♂, flagellum.

- 7 Scutellum with pair of sublateral grooved lines which curve inwards posteriorly to run parallel with posterior border of sclerite and usually join medially (figs. 15, 17) *Stenomeres* Thomson (p. 8)
- Scutellum with sublateral grooved lines indicated anteriorly only, not extending beyond posterior pair of scutellar hairs (fig. 16) (occiput not margined, head and thorax usually marked with yellow) *Miotropis* Thomson (p. 11)
- 8 Head and thorax extensively marked with reddish-yellow; occiput strongly margined (fig. 15); median carina of propodeum double, propodeum produced into a rugosely sculptured neck (fig. 15) *Stenomeres* Thomson (p. 8)
- Head and thorax entirely dark and metallic; occiput margined at most only behind ocelli; median carina of propodeum single or divided only for a very short distance anteriorly, propodeum not produced into a neck as above (fig. 17) *Elachertus* Spinola (p. 9)

Genus *Euplectromorpha* Girault

One species found in Britain *laeviscuta* (Thomson)
This species is known as British from a single male taken during August, 1958 at Hell Coppice near Oakley, Buckinghamshire (M. W. R. de V. Graham).

Readily distinguished from *Euplectrus bicolor* (Swederus) by the characters of the scutellum given in the generic key, and also by its more elongate petiole and by the absence of pale markings on the head. No hosts of *E. laeviscuta* have so far been recorded.

Genus *Euplectrus* Westwood

KEY TO SPECIES

- 1 Head entirely black; mesoscutum with complete median carina. *nigriceps* Ferrière
The holotype of this species is in Walker's collection in the British Museum (Nat. Hist.), but it lacks locality label, and the species must be regarded as doubtfully British.
- Lower part of face marked with white or yellow; mesoscutum with median carina present only in posterior half. *bicolor* (Swederus) (Fig. II)
The only certainly British species. Local, southern and midland England north to Cheshire, in deciduous woods, vi-ix. A parasite of the larvae of several species of Lepidoptera, especially Noctuidae, the biology of E. bicolor is discussed by Thomsen (1927) and Bischoff (1929).

The pale markings on *E. bicolor* are variable in extent, and Graham (1963) recognises two forms, separable only on colour characters. These are *maculiventris* Westwood, which is more extensively pale, and *intactus* Walker, which is darker.

Genus *Xanthellum* Erdős and Novicky

Only one known species.....*transsylvanicum* Erdős

The only British specimens known are four brachypterous females (fig. 14) in the Manchester Museum, reared from a case of Taleporia tubulosa (Retzius) (Lep., Tineacidae), Blean Woods, Kent, 1935 (H. W. Daltry).

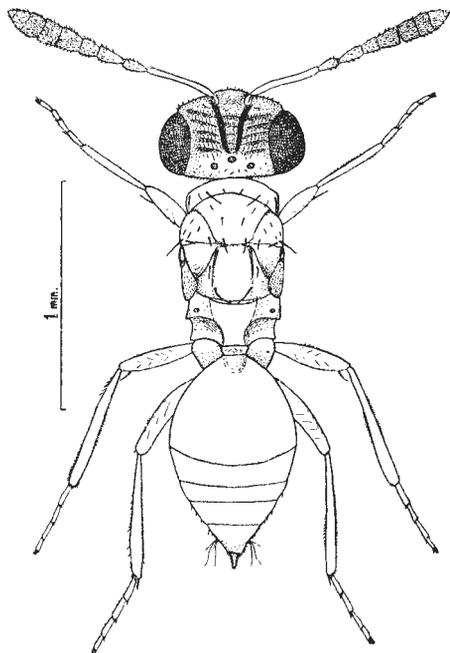


FIG. 14.—*Xanthellum transsylvanicum* Erdős, brachypterous ♀.

Genus *Stenomesius* Westwood

A single European species.....*rufescens* (Rossi)

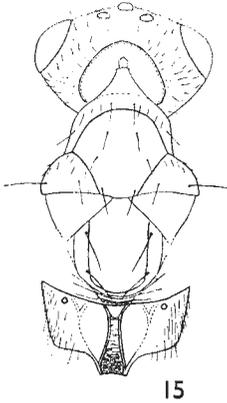
Not uncommon in deciduous woods throughout England, v-x. Reared from Cnephasia longana (Haworth) (Lep., Tortricidae) on the Continent, and released in the United States in an attempt to control this host species.

A strikingly marked species (fig. 35), not subject to much variation. The following are reddish-yellow in the female: mesoscutum, scutellum, prothorax except for mid-dorsal spot, head except for occiput and large spot about ocelli and part of temples, legs, spot anteriorly on dorsal surface of gaster, sides of thorax. Rest of body black. Occasionally dark areas on head unite so that only inner orbits and face beneath antennal sockets are pale. Fore wing with discal cloud, variable in intensity. Male has head and scutellum black, also mid-lobe of mesoscutum anteriorly; anterior femora are darkened medially, middle tibiae distally inflated and darkened.

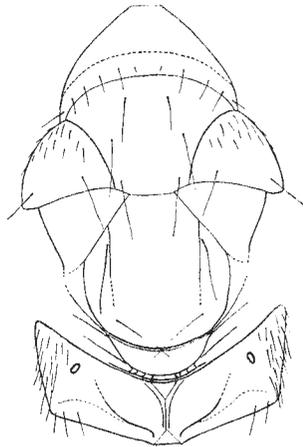
Genus *Elachertus* Spinola

KEY TO SPECIES

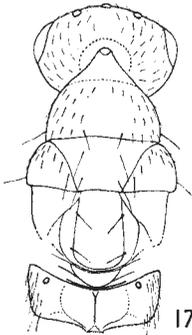
- 1 Mesoscutum with only four hairs on mid-lobe (fig. 17); (body black, antenna with first funicle segment at most as long as pedicel, mid-lobe of mesoscutum not produced backwards between axillae, notaulices converging and intercepting axillae only slightly outside their inner angles (fig. 17), petiole transverse, smooth) 2
- Mesoscutum with at least six hairs on mid-lobe (figs. 18, 19).....4



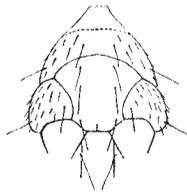
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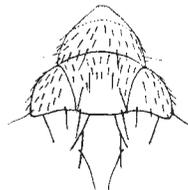
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FIG. 15.—*Stenomesius rufescens* (Rossi), head, thorax and propodeum.

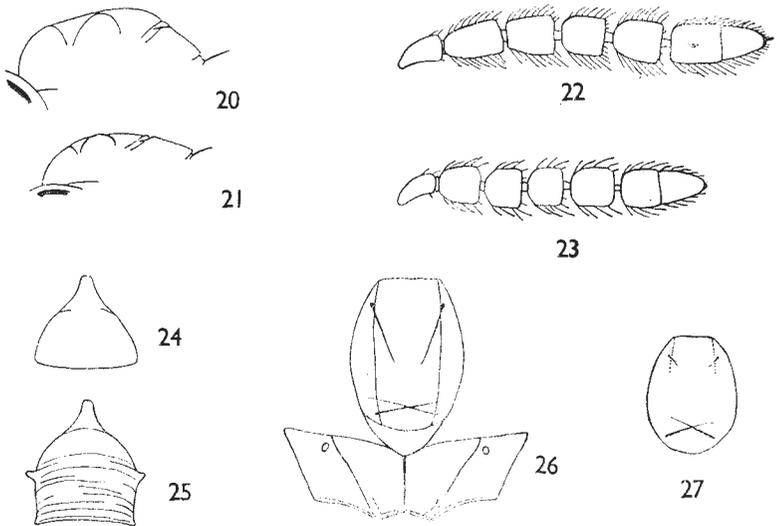
FIG. 16.—*Miotropis unipuncta* (Nees), thorax and propodeum.

FIG. 17.—*Elachertus olivaceus* (Thomson), head, thorax and propodeum.

FIGS. 18, 19.—Anterior part of thorax of: (18) *Elachertus inunctus* Nees; (19) *E. argissa* (Walker).

- 2 Scutellum entirely reticulately sculptured; gaster of female usually less than 1.5 times as long as broad.....*olivaceus* (Thomson)
Quite common in rushy areas; attacks *Coleophora* spp. (*Lep.*, *Coleophoridae*) on *Juncus*. v-ix. Males very rare.
- Scutellum mostly smooth and shining, perhaps slightly alutaceous in part; gaster of female usually more than 1.5 times as long as broad.....3

- 3 Thorax flattened dorsally (fig. 21); marginal vein of fore wing usually 3 times as long, and at least 2.5 times as long, as stigmal vein; female gaster longer than thorax and propodeum together; scape of male antenna inflated **geniculatus** (Hartig)
Parasite of Laspeyresia strobilella L. (Lep., Tortricidae) in spruce cones. Recorded in Britain only from Cumberland (H. Britten) and Perth. (W. D. Hincks) but probably more widespread.
- Thorax not dorsally flattened (fig. 20); marginal vein of fore wing at most 2.5 times as long as stigmal vein; female gaster about as long as thorax and propodeum together; scape of male antenna not inflated. **nigritulus** (Zetterstedt)
Common, rough ground, v-ix. Parasite of Tortricidae and probably other Microlepidoptera in Britain.
- 4 Petiole transverse, smooth, and more or less conical (fig. 24) 5
- Petiole at least as long as broad, parallel sided posteriorly, and this posterior portion with transverse striae (fig. 25); (mid-lobe of mesoscutum hardly produced backwards, notaulices not diverging posteriorly) 8
- 5 Mid-lobe of mesoscutum strongly produced backwards, not usually with more than eight hairs; notaulices diverging posteriorly, hind margin of mesoscutum distinctly angled where notaulices intercept it (fig. 18); body black 6
- Mid-lobe of mesoscutum not strongly produced backwards and with at least 12 hairs; notaulices at most diverging only slightly posteriorly, hind margins of mesoscutum not distinctly angled where notaulices intercept it (fig. 19); body greenish 7
- 6 Scutellum mostly smooth and shining; gaster of female more than twice as long as broad; female funicle with first segment much longer than pedicel, fourth at least as long as broad (= *florianus* Walker) **inunctus** (Nees)
Common, deciduous woods, v-ix. Attacks leaf-mining Lepidoptera, especially species of Lithocolletis (Lep., Gracillariidae).



FIGS. 20, 21.—Thorax in profile of female of: (20) *Elachertus nigritulus* (Zetterstedt); (21) *E. geniculatus* (Hartig).

FIGS. 22, 23.—Flagellum of male of: (22) *Elachertus argissa* (Walker); (23) *E. artceus* (Walker).

FIGS. 24, 25.—Petiole of female of: (24) *Elachertus inunctus* Nees; (25) *E. argissa*.

FIG. 26.—Scutellum, metanotum and propodeum of female *Cirrospilus diallus* Walker.

FIG. 27.—Scutellum of female *Cirrospilus elegantissimus* Westwood.

- Scutellum entirely reticulately sculptured; gaster of female less than twice as long as broad; female funicle with first segment only slightly longer than pedicel, fourth transverse **charondas** (Walker)
Rare. Found by Walker "near London". Berks., Bucks. (M. W. R. de V. Graham), Hants. (R. R. Askew).
- 7 Scutellum lightly sculptured, usually mostly smooth and shining; wings hyaline (= *ticida* Walker) **isadas** (Walker)
Rather rare, but widespread in the British Isles: N. Ireland, Argyll., Inverness., Moray., Glamorgan., Cumberland, Hants., Bucks., Lincs.
- Scutellum entirely and rather strongly sculptured, not shining; fore wing of female with faint discal cloud **gallicus** Erdős
Known as British from one female specimen, Oxon., 20. viii. 1954 (G. R. Gradwell).
- 8 Female gaster more than 1.4 times as long as broad; male funicle with numerous, outstanding, white hairs (fig. 22); fore coxae fuscous; head and thorax dark green to black; legs and gaster more extensively darkened than in alternate **argissa** (Walker)
Quite common in England, v-vii. Reared from Coleophora limosipennella (Duponchel) (Lep., Coleophoridae) on birch (E. G. R. Waters).
- Female gaster only slightly longer than broad; male funicle with fewer hairs, which are more decumbent (fig. 23); fore coxae nearly always testaceous; head and thorax bright green to dark green; typically nearly all of legs, and gaster basally and ventrally, testaceous, brightly so in southern specimens. . . **artaeus** (Walker)
Quite common in Scotland and northern England, apparently less common further south, v-ix. Reared from Clostera curtula (L.) (Lep., Notodontidae) and other Lepidoptera.

Genus *Ratzeburgiola* Erdős

- One species found in Britain **cristata** (Ratzeburg) *sensu* Erdős
Known in Britain from one female, vi. 1966, Studland, Dorset (R. R. Askew).

Erdős (1958) erected the genus *Ratzeburgiola* for a species which he considered to be the same as *Entedon cristatus* Ratzeburg. However, this identification may be erroneous, in which case a new name will have to be given to Erdős' species.

Genus *Miotropis* Thomson

- A single British species **unipuncta** (Nees)
Apparently widespread in England, though uncommon. Usually in marshy areas, v-viii. Reared from Coleophora species (Lep., Coleophoridae).

Coloration rather variable. In the female (fig. 36), the body is black except for the following areas which are yellow: face below antennal socket, inner orbits, sometimes pronotum posteriorly, side lobes of mesoscutum posteriorly, occasionally entire posterior half of mesoscutum, axillae partially, posterior border of scutellum, or, in pale specimens, almost entire sclerite, sometimes metascutellum, sides of thorax. The wings are hyaline. In the male, the pale colour is more restricted on the head, and the thorax is usually entirely black.

Genus *Olynx* Förster

KEY TO SPECIES

- 1 Fore wing with speculum closed below by a line of hairs (fig. 3); males with antennal hairs longer and outstanding (fig. 33) 2
- Fore wing with speculum open below (fig. 31); males with antennal hairs shorter and decumbent (fig. 34) 3
- 2 Female with first funicle segment at most only slightly longer than pedicel (fig. 4); scutellum bronze in contrast to colour of rest of thorax; fore wing of female with faint cloud below stigma (fig. 3); thorax in profile flatter . . . **arsames** (Walker)
Common on oak trees, sometimes found in open country, iv, v occasionally vi, vii. Throughout England and Wales, and in Scotland taken as far north as Inverness. Males are scarce. Parasitic upon a number of oak gall wasps.
- Female with first funicle segment distinctly longer than pedicel (fig. 32); scutellum concolourous with rest of thorax; fore wing of female with two small fuscous

marks, sometimes absent, one below stigma and the other below proximal end of marginal vein; thorax in profile more strongly arched

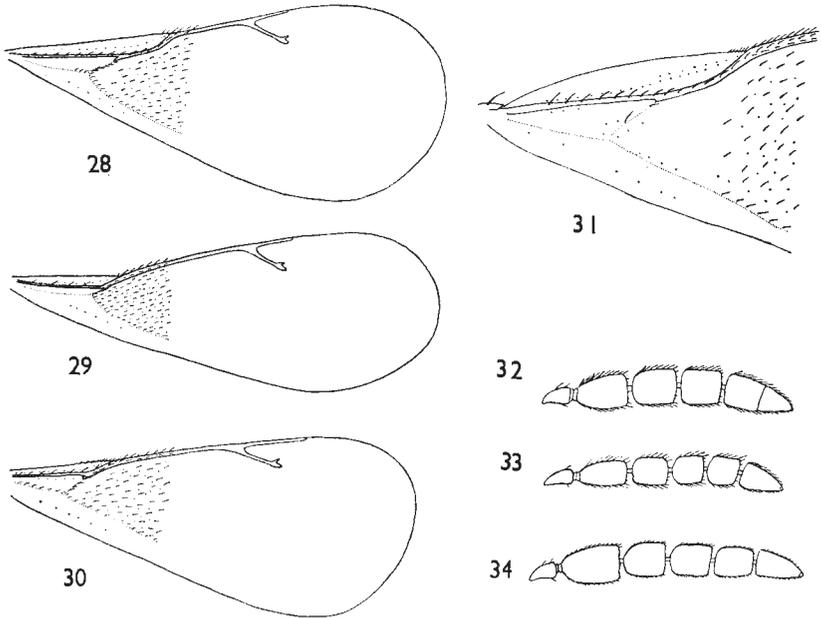
- skianeuros** (Ratzburg)
(*Hym., Cynipidae*) in most parts of Britain. Adults fly in *iv* and *v*.
- 3 Middle and hind tibiae golden yellow (length 2.4–3.4 mm., fore wing of female with two large, pronounced, fuscous marks)..... **eudoreschus** (Walker)
England north to Cheshire, on oak, iv, v. Parasite of Andricus quadrilineatus Hartig (Hym., Cynipidae). Males very rare.
- Middle and hind tibiae mostly pale yellow..... 4
- 4 Large species, length usually over 3.5 mm. (fore wing of female with two faint fuscous marks)..... **trilineata** Mayr
Rare. Recorded only from Essex, Berks., Westmorland. Parasitic upon Andricus fecundator (Hartig) (Hym., Cynipidae).
- Smaller species, length at most 2.7 mm. (the two marks on the fore wing of the female are variable in size and intensity)..... 5
- 5 Middle tibia with fuscous line on flexor aspect..... **gallarum** form **pulchra** Mayr
- Middle tibia entirely pale yellow. (= *rotundiventris* Thomson) **gallarum** (Linnaeus)
*Not common. The typical form flies in *vi* and is usually parasitic in galls of Andricus quercusramuli (L.) (Hym., Cynipidae). The overwintering generation, form pulchra, flies in *iv* and *v* and is parasitic in spangle galls of Neuroterus species (Hym., Cynipidae).*

All British species of this genus are parasites of gall-forming Cynipidae on oak. Their biology is reviewed by Askew (1961).

Genus *Cirrospilus* Westwood

KEY TO SPECIES

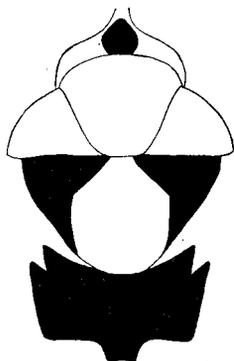
- 1 Scutellum (fig. 27) with anterior pair of hairs finer and much shorter than posterior pair, sublateral grooved lines absent or nearly so (thorax yellowish with a broad median, longitudinal greenish band (fig. 42))... **elegantissimus** Westwood
Known as British only from J. O. Westwood's unlocalised (? Surrey) type specimen. Parasitic upon leaf-mining Lepidoptera, especially Lithocolletis species (Lep., Gracillariidae).
- Scutellum (fig. 26) with all four hairs of equal length and thickness, sublateral grooved lines complete and distinct..... 2
- 2 Fore wing (figs. 28, 29) with cubital vein strongly curved anteriorly to join shortened basal vein; speculum very narrow or absent..... 3
- Fore wing (fig. 30) with cubital vein not strongly curved to join basal vein; speculum never absent..... 6
- 3 Thorax yellow with irregular, longitudinal, green-bronze stripes; fore wing speculum narrow..... 4
- Thorax and gaster wholly metallic; fore wing speculum narrow or absent..... 5
- 4 Fore wing very narrow, maximum width at most equal to length of marginal vein; scutellum longer than broad (thorax striped as in *vittatus* (below), but median dark band is of about equal width to lateral dark bands (fig. 37))
elongatus Bouček
Known as British only from a single specimen taken in Oxon. (Graham, 1963).
- Fore wing of normal shape, maximum width much greater than length of marginal vein; scutellum broader than long (thorax more or less longitudinally striped with a broad, median, green band and two narrow, lateral, green bands alternating with yellow areas (figs. 38–40))..... **vittatus** Walker
*Common and widespread in Britain, *iv*–*x*. Reared from leaf-mines of Lepidoptera, Diptera, Hymenoptera, Coleoptera; also from eggs of larch sawflies. More than one biospecies may be included here.*
- 5 Fore wing (fig. 29) very narrow, maximum width about equal to length of marginal vein; speculum absent; femora entirely yellow; thorax uniformly bright bronze-green..... **singa** Walker
*Uncommon, chiefly northern England and Scotland, marshy areas. *vi*–*viii*.*
- Fore wing (fig. 28) normal, maximum width much greater than length of marginal vein; speculum narrow; femora basally infusate; scutellum purplish, meso-



FIGS. 28-30.—Fore wing, with hairs shown only on basal third, of female of: (28) *Cirrospilus curvineurus* Askew; (29) *C. singa* Walker; (30) *C. subviolaceus* Thomson.
 FIG. 31.—Basal third of fore wing of female *Olynx euedoreschus* (Walker).
 FIGS. 32-34.—Flagellum of: (32) *Olynx skianeuros* (Ratzeburg) ♀; (33) *O. skianeuros* ♂; (34) *O. euedoreschus* ♂.

- scutum greenish **curvineurus** Askew
Rare, northern England and Wales, and Scotland, marshy areas. vii-ix. Reared from Stigmella sp. (Lep., Stigmellidae) on Salix (H. N. Michaelis).
- 6 Propodeum with complete lateral plicae (fig. 26); mid-lobe of mesoscutum with four hairs only; fore wing, speculum very narrow and closed below by a line of hairs (side lobes of mesoscutum, axillae more or less, and usually at least a spot on pronotum laterally, pale yellow, rest of thorax metallic green or bronze (fig. 41); occasionally the mid-lobe of the mesoscutum is partly or even entirely yellow or the side lobes are entirely dark)..... **diallus** Walker
Perhaps the commonest British species, widespread in England, Wales and Scotland north to Inverness. Deciduous, and especially oak, woods, v-x. Typically a parasite of Lithocolletis species (Lep., Gracillariidae), but also reared from cocoons of Braconidae (Hymenoptera).
- Propodeum without lateral plicae; mid-lobe of mesoscutum usually with at least six hairs; fore wing, speculum variable.....7
- 7 Thorax and gaster wholly metallic; female, second funicle segment of antenna quadrate (= *immaculatus* Thomson) **salatis** Walker
Very rare. Recorded from Bucks. (Graham, 1963), Glos. and Cambs. (Thorpe, 1933). A parasite of Coleophora laricella Hübner (Lep., Coleophoridae).
- Thorax with at least some pale markings; female, second funicle segment longer than broad.....8
- 8 Postmarginal vein of fore wing at least 1.3 times as long as stigmal vein (fig. 30) (thorax with a transverse yellowish band across posterior part of mesoscutum and most of scutellum)..... **subviolaceus** Thomson
Very rare. The only known British specimen is in Westwood's collection, probably from Surrey. A parasite of leaf-mining Lepidoptera, especially Lithocolletis species (Lep., Gracillariidae).

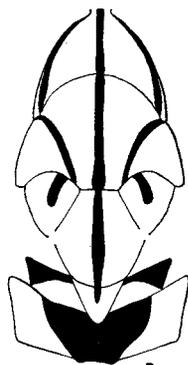
- Postmarginal vein of fore wing at most as long as stigmal vein.....9
 9 Dark parts of thorax at least slightly metallic; fore wing, speculum large and sometimes open below; female, second funicle segment of antenna only slightly



35



36



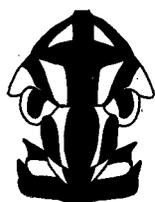
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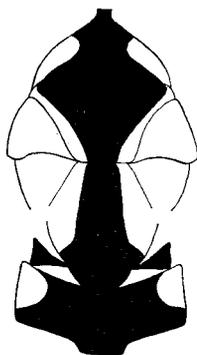
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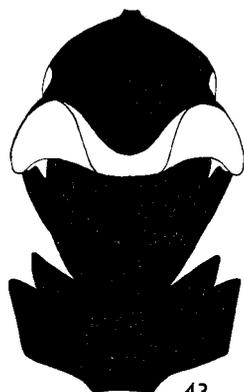
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43

FIGS. 35-43.—Thorax and propodeum, in dorsal view, of some bicoloured Elachertinae, to show the distribution of dark and light areas in typically coloured female specimens: (35) *Stenomesius rufescens* (Rossi); (36) *Miotropis unipuncta* (Nees); (37) *Cirrospilus elongatus* Bouček; (38-40) *C. vittatus* Walker; (41) *C. diallus* Walker; (42) *C. elegantissimus* Westwood; (43) *C. pictus* (Nees).

longer than broad; (thorax with a complete, transverse, pale yellow to reddish-yellow band across posterior part of mesoscutum, pronotum laterally more or less marked with the same colour, rest of mesoscutum and pronotum metallic green, scutellum and most of axillae bronze (fig. 43)).....**pictus** (Nees)

Not uncommon in England north to Yorks., v-xi. Usually parasitic upon leaf-mining Lepidoptera, but known also from weevil and sawfly mines, and occasionally from Apanteles (Hym., Braconidae) cocoons.

- Dark parts of thorax black or brown, not metallic; fore wing, speculum narrow and closed below; female, second funicle segment of antenna at least 1.5 times as long as broad; (thorax with transverse yellow band across posterior part of mesoscutum, which may be interrupted by completely dark mid-lobe, rest of thorax brown to black).....**lyncus** Walker

Rather uncommon, southern and midland England, deciduous woods, v-ix. A parasite of leaf-mining Lepidoptera, especially of Lithocolletis species (Lep., Gracillariidae).

For a comprehensive revision of the European species of this genus, Bouček (1959b) should be consulted. Papers by Delucchi (1958) and Sundby (1957) discuss the biology of some of the species.

Subfamily EULOPHINAE

KEY TO GENERA

- 1 Funicle of female with two segments (fig. 44), of male with two or three segments and without branches.....2
- Funicle of female with three or four segments (figs. 58, 59, 74, 75), of male with four or five segments and often with two or three branches (figs. 60, 61, 70, 71).....3
- 2 Clypeus with anterior margin medially incised (fig. 45); scutellum without sublateral grooved lines; gaster of female more or less round; male funicle with three segments.....**Colpoclypeus** Lucchese (p. 17)
- Clypeus with anterior margin entire; scutellum with two sublateral, longitudinal, grooved lines (figs. 47-49); gaster of female longer than broad; male funicle with two segments.....**Diglyphus** Walker (p. 16)
- 3 Antennae inserted near middle of face and scape usually reaching well above vertex (fig. 46); costal cell of fore wing very narrow; females sometimes brachypterous (female funicle four-segmented, male funicle with three branches)
Hemiptarsenus Westwood (p. 25)
- Antennae inserted at about lower level of eyes, and scape not reaching above vertex (except slightly so in *Eulophus thespius*) (e.g. fig. 45); costal cell of fore wing broader; macropterous.....4
- 4 Scutellum with two sublateral, longitudinal, grooved lines (fig. 5); male funicle with two branches (female funicle three-segmented)
Di cladocerus Westwood (p. 18)
- Scutellum without grooved lines (figs. 62, 63); male funicle with three branches (figs. 61, 70, 71) or unbranched.....5
- 5 Clypeus with anterior margin medially incised (cf. fig. 45) (propodeum with complete, though fine, median carina and lateral plicae, female funicle four-segmented, thoracic sculpture rather weak)
(= *Encopa* Graham) **Dimmockia** Ashmead (p. 22)
- Clypeus with anterior margin entire (fig. 46).....6
- 6 Mid-leg with first tarsal segment at least slightly shorter than second (fig. 67) funicle of female three-segmented (female gaster apically more or less rounded, male funicle with three branches or unbranched)
(= *Comedo* Schrank) **Eulophus** Müller (p. 23)
- Mid-leg with first tarsal segment not shorter than second; funicle of female three- or four-segmented.....7
- 7 Propodeum with complete median carina, lateral plicae, and usually also a transverse carina or costula (figs. 52, 54, 55), usually smooth, at most alutaceous; face largely smooth and shining; mid-lobe of mesoscutum anteriorly with numerous, irregularly placed, hairs (female funicle three- or four-segmented; male funicle with three long branches).....**Pnigalio** Schrank (p. 18)

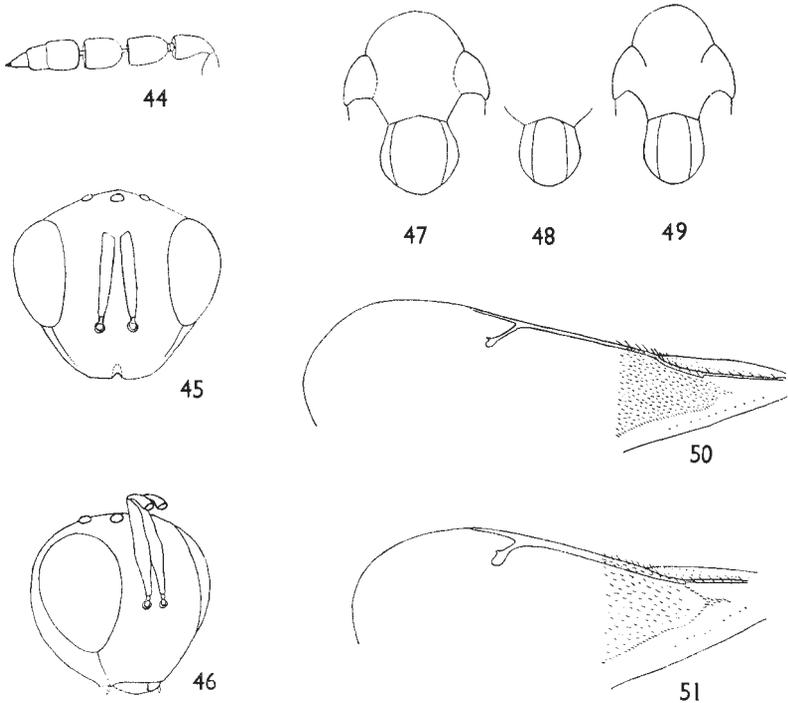
- Propodeum with median carina complete or absent, lateral plicae effaced anteriorly, costula absent, usually reticulate; face reticulate; mid-lobe of mesoscutum with hairs in two longitudinal lines.....8
- 8 Fore wing with postmarginal vein at least twice as long as stigmal vein (figs. 64, 65) (female funicle four-segmented, male funicle either five-segmented and unbranched (fig. 60), or four-segmented with three long branches (fig. 61)
Sympiesis Förster (p. 20)
- Fore wing with postmarginal vein at most 1.7 times as long as stigmal vein.....9
- 9 Female funicle four-segmented, fusiform; male funicle with first segment slightly shorter than pedicel, with three rather short branches..(**Dahlbominus** Hincks¹)
- Female funicle three-segmented, not fusiform; male funicle with first segment at least as long as pedicel, with three long branches (figs. 70, 71)
Necremnus Thomson (p. 23)

Genus **Diglyphus** Walker

KEY TO SPECIES

- 1 Speculum of fore wing (fig. 50) completely obliterated by hairs which extend with even density from basal vein to wing apex; cubital vein strongly sinuate upwards; veins flavous; median dark band of posterior tibia often divided in male
isaea (Walker)
Very common, vi-xii. A parasite mainly of species of Phytomyza and other Agromyzidae (Diptera).
- Fore wing (fig. 51) less densely hairy towards basal vein, so that at least a narrow speculum is formed; cubital vein at most only moderately sinuate; veins usually fuscous; dark band on posterior tibia, if present, undivided.....2
- 2 Tibiae and front and middle femora entirely pale; cubital vein moderately sinuate upwards to join basal vein; speculum small (scutellum more or less purple, rest of thorax greenish, marginal cilia of fore wing rather long, fore wing faintly infumate) (= *tibiscanus* Erdös) **puztensis** (Erdös)
Rare. Lancs., Cheshire (H. Britten), Berks. (M. W. R. de V. Graham).
- Femora in major part dark; cubital vein only slightly sinuate; speculum variable. .3
- 3 Tibia, entirely pale or with a dark sub-basal ring on posterior tibia only; postmarginal vein of fore wing about as long as stigmal vein; male with veins thickened and stigma large (e.g. fig. 51).....**pachyneurus** Graham
Known only from sand-dunes on the Lancs. (M. W. R. de V. Graham) and Glamorgan. (Z. Bouček) coasts.
- Tibiae predominantly dark; postmarginal vein of fore wing longer than stigmal vein; male with veins and stigma normal (except *crassinervis*).....4
- 4 Scutellum more or less round (figs. 47, 48); fore wing 2.0-2.3 times as long as broad; notaulices nearly always complete though very superficial posteriorly (fig. 47). .5
- Scutellum distinctly longer than broad (fig. 49); fore wing at least 2.5 times as long as broad; notaulices usually incomplete posteriorly (fig. 49).....6
- 5 Scape pale in basal half or more; fore wing speculum large; scutellum and meso-scutum concolourous; first funicle segment at most 1.5 times as long as broad; length of scutellum 1.7-1.9 times distance between sublateral grooved lines (fig. 48)**poppoea** Walker
Quite common. v-ix. Reared from leaf-mines of Agromyzidae (Diptera).
- Scape entirely dark; fore wing speculum small; scutellum more or less purple, rest of thorax greenish; first funicle segment at least 1.5 times as long as broad; length of scutellum 1.3 to 1.6 times distance between sublateral grooved lines fig. 47)**minocus** (Walker)
Quite common. vi-x. Reared from leaf-mines of Agromyzidae (Diptera).
- 6 Front tibiae darkened on flexor aspects only; first funicle segment at most 1.5 times as long as broad; marginal vein of fore wing 2.4 to 3.2 times as long as stigmal vein; male, marginal vein and stigma normal.....**chabrias** (Walker)
Common. vi-ix.

¹ There is no evidence that *Dahlbominus fuscipennis* (Zetterstedt) is a British insect (Hincks, 1945), although it has been reared in the laboratory in this country, in connection with the biological control of sawflies injurious to conifers in Canada. It has been found in most European countries.



FIGS. 44–45.—*Colpoclypeus florus* (Walker), female: (44) flagellum; (45) head in frontal view.

FIG. 46.—Head in frontolateral view of female *Hemiptarsenus unguicellus* (Zetterstedt).

FIGS. 47, 49.—Mesonotum and scutellum of female of: (47) *Diglyphus minoews* (Walker); (49) *D. chabrias* (Walker).

FIG. 48.—Scutellum of female *Diglyphus poppoea* Walker.

FIGS. 50, 51.—Fore wing, with hairs drawn only on basal third, of male of: (50) *Diglyphus isaea* (Walker); (51) *D. crassinervis* Erdős.

- Front tibiae with flexor and extensor aspects equally dark; first funicle segment at least 1.5 times as long as broad; marginal vein of fore wing 3.1 to 4.1 times as long as stigmal vein; male, marginal vein thickened and stigma large (fig. 51)

crassinervis Erdős

Known from Britain only from Berks., reared from teasel heads (R. R. Askew).

Genus *Colpoclypeus* Lucchese

Single European species.....*florus* (Walker)
Uncommon. Scotland, Argyll and Inverness. (R. R. Askew); Ireland, Co. Wicklow (A. W. Stelfox); England, Isle of Wight (F. Walker), Dorset (R. R. Askew), Oxon. (M. W. R. de V. Graham), Yorks. (A. Smith).

A parasite of various species of Tortricidae (Lepidoptera). For notes on its biology see Janssen (1958).

Genus *Di cladocerus* Westwood

KEY TO SPECIES

- 1 Propodeal spiracles large, almost touching anterior edge of sclerite (fig. 5); metascutellum of female entirely reticulate, though weakly so posteriorly in spring generation; last funicle segment of male distinctly expanding distally; male gaster entirely dark (body coppery or violet, tibiae dark, in spring form (*westwoodii*); body green, tibiae partly or entirely yellow, in summer form (*battis* Walker)) **westwoodii** Westwood
Quite common. The dark spring form occurs iv-vii and the more brightly coloured summer form vii-x. British hosts for summer form include Argyresthia conjugella Zeller (Lep., Plutellidae) and species of Coleophora (Lep., Coleophoridae); the overwintering form has been reared from Archips oporana (L.) (Lep., Tortricidae).
- Propodeal spiracles smaller, separated from anterior edge of sclerite by a distance about equal to their diameter (fig. 53); metascutellum of female more or less smooth posteriorly; last funicle segment of male almost cylindrical. 2
- 2 Males only known; body bright or golden-green, yellow spot at base of gaster, front and mid-femora and all tibiae yellow. **euryalus** (Haliday)
- Females only known; body bronze to green, femora dark, tibiae partly infuscate
aeneiscapus (Thomson)

Graham (1963) has suggested that *euryalus* and *aeneiscapus* might be synonymous. Both forms (or species) are apparently very rare in Britain, *euryalus* being known only from the unlocalised (?Ireland) syntypic series and *aeneiscapus* only from Inverness-shire, Scotland.

Genus *Pnigalio* Schrank

KEY TO SPECIES

- 1 Propodeum alutaceous, its median area (i.e. between lateral plicae) strongly transverse and carina and lateral plicae very fine; fore wing, marginal vein about 2.3 times as long as stigmal vein, basal cell hairy in distal two-thirds (body bronze- or blue-black, legs nearly wholly black, funicle segments of female short) **attis** (Walker)
Rare. Near London (F. Walker), Berks. (Z. Bouček).
- Propodeum with median area smoother and shining, at most only slightly transverse, median carina and lateral plicae stronger (except in small males); fore wing, marginal vein nearly three times as long as stigmal vein in female and usually also in male (except *pristiphorae* Askew), basal cell with at most a few hairs 2
- 2 Median carina of propodeum elevated into a tooth basally (fig. 55); female funicle and clava both three-segmented (fig. 58); male funicle branches with adpressed hairs; female gaster with hairs on lateral margins only of first tergite (e.g. fig. 54) 3
- Propodeum not toothed; female funicle four-segmented, clava two-segmented (fig. 59); male funicle branches with outstanding hairs; female gaster with hairs on disc of first tergite (fig. 52) (except *longulus* (Zett.), *epilobi* Bouček) 4
- 3 Mesoscutum densely hairy, hairs dark; costal cell of hind wing with complete row of hairs; median area of propodeum slightly transverse; male funicle with branches clothed in long, fine hairs; fore wing of female with marginal vein about 2.5 times as long as stigmal vein (body blue-green, legs predominantly fuscous) **pristiphorae** Askew
Described from specimens reared from Pristiphora amphibola (Förster) and P. ambigua (Fallén) (Hym., Tenthredinidae) from Cumberland, Lancs., Glos. and Surrey.
- Mesoscutum less densely hairy, hairs whitish; costal cell of hind wing bare; median area of propodeum about as broad as long; male funicle with branches clothed in short, thick hairs; fore wing of female with marginal vein at least 2.8 times as long as stigmal vein (body green, legs except coxae mostly pale)
nemati (Westwood)

A parasite in galls of sawflies of the genus Pontania (Hym., Tenthredinidae) on willows. Its biology is described by Carleton (1939) (as Eulophus tischbeinii).

- 4 Propodeum of female with costula absent or situated well before the middle of the sclerite (fig. 54), weak or absent in many males; first tergite of female gaster with hairs on lateral margins only (fig. 54).....5
- Propodeum with costula about middle (fig. 52), sometimes absent in small males; first tergite of female gaster with hairs on disc (fig. 52).....6
- 5 Propodeum without costula; female antenna with clava slightly longer than first funicle segment, fourth funicle segment longer than broad; metascutellum almost smooth; mesoscutum weakly sculptured, shining; hind wing costal cell without a line of hairs beneath; first segment of hind tarsus dark....**epilobii** Bouček
This recently described species, known on the Continent as a parasite of Mompha fulvescens (Haw.) (Lep., Cosmopterigidae) feeding on Epilobium angustifolium L. (Rosebay Willowherb), has been taken in Berks. (M. W. R. de V. Graham) and Yorks. (W. D. Hincks).
- Propodeum of female with costula well before middle (fig. 54), weak or absent in males; female antenna with clava shorter than first funicle segment, fourth funicle segment more or less quadrate; metascutellum reticulate; mesoscutum strongly sculptured, less shining; hind wing costal cell usually with an almost complete line of hairs beneath; first segment of hind tarsus pale (front tibia usually with very distinct, longitudinal, metallic streak on outer aspect)
longulus (Zetterstedt)
Common and generally distributed, deciduous woods, iv-x. A parasite of several leaf-mining Lepidoptera.
- 6 Hind tarsus of female with all segments from pale testaceous to fuscous, never white; hind tibia of female testaceous to fuscous, sometimes gradually darkening distally; fourth funicle segment of female usually about 1.5 times as long as broad (fig. 59); propodeum with at least one longish hair outside base of each lateral plica; frons rather shallowly concave (fig. 56); inner face of mid-coxa with some hairs (fore wing speculum small, female gaster 1.4 to 1.7 times as long as broad and usually shorter than thorax).....**soemius** (Walker)
Common and generally distributed, iv-x. A parasite of species of Phytomyza (Dipt., Agromyzidae) and sometimes of leaf-mining Lepidoptera.
- Hind tarsus of female with one to three basal segments usually whitish, contrasting with darker distal segments; hind tibia of female testaceous basally and blackish distally, the two colours more sharply delimited than in alternate, sometimes nearly entirely blackish; fourth funicle segment of female usually less than 1.5 times as long as broad; propodeum with at most one weak hair outside base of each lateral plica; frons more strongly concave (fig. 57); inner face of mid-coxa usually without hairs.....7
- 7 Gaster of female 1.5 to 1.8 times as long as broad, not longer than thorax and propodeum together; temples (fig. 57) shorter; thorax dorsally usually marked with purple (fore wing speculum large, ocelli larger than in the following species)
agraules (Walker)
Quite common in southern and midland England, rarer farther north. Deciduous woods, v-x. Reared from mines of Rhynchaenus (Orchestes) (Col., Curculionidae) and also from lepidopterous and saw-fly leaf-mines.
- Gaster of female usually twice as long as broad, longer than thorax and propodeum together; temples (cf. fig. 56) longer; thorax marked with purple only in some males (fore wing speculum variable).....8
- 8 Legs of female with femora and tibiae predominantly pale yellow, only slightly fuscous-marked; in males the dark coloration is more extensive; thorax green; wings hyaline; fore wing speculum large.....**phragmitis** (Erdős)
Known in Britain only from Dorset (N. M. Graham) and Yorks. (R. R. Askew). A parasite of Agromyzidae (Diptera) mining leaves of Phragmites communis Trin.
- Legs reddish-testaceous, blackish, or usually a combination of the two colours, never marked with pale yellow; thorax bronze-green or blue-green to almost black; female fore wing usually with yellowish or greyish tinge; fore wing speculum of small or moderate size.....**pectinicornis** (Linnaeus)
Common throughout Britain (especially as form lucumo) iv-xi. Usually parasitic upon Microlepidoptera, especially species of Lithocolletis (Lep., Gracillariidae).

P. pectinicornis is rather variable, and Graham (1959, 1963) recognizes two forms of it. In the nominotypical form the metapleuron usually bears

some small hairs, the fore wing speculum is of moderate size, and the legs are more extensively reddish-testaceous than in form *lucumo* Walker, which has the metapleuron bare and the fore wing speculum smaller. Other minor variants also occur, but the forms can not always be separated with certainty and it seems best at present to include them all under the one specific name.

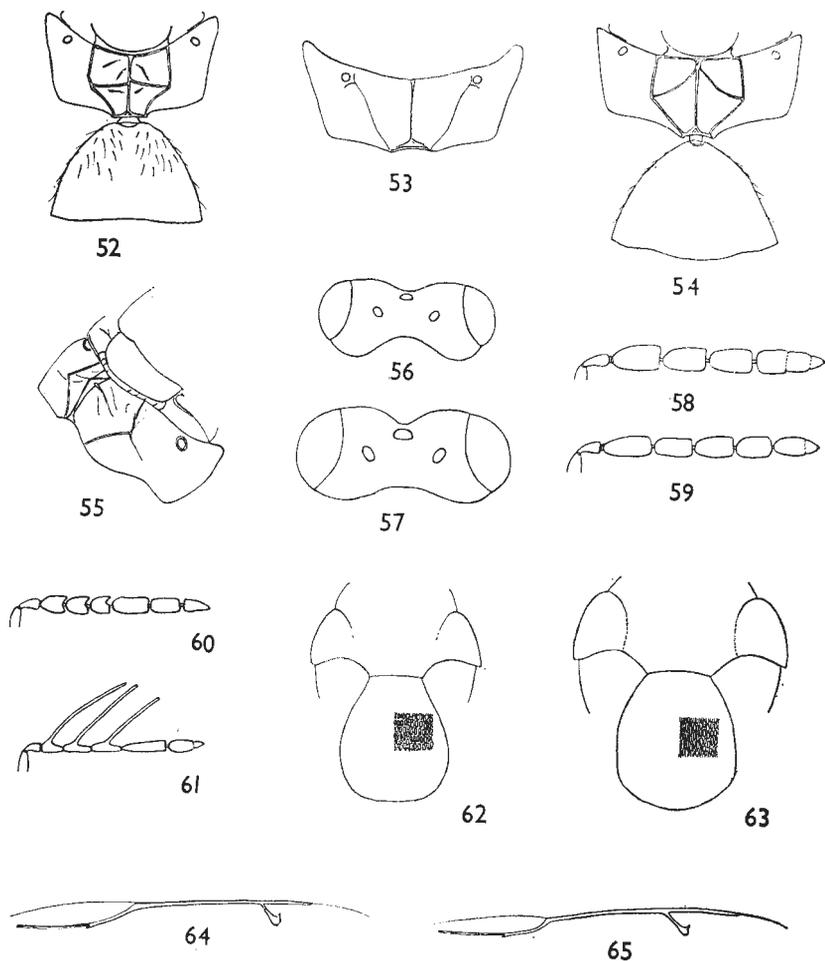
The males of species of this genus, from *agraules* and below in the key, present difficulties in determination, especially when they are small. The colour characters, which are useful in distinguishing the females, do not hold good for the males.

Genus *Sympiesis* Förster

KEY TO SPECIES

Females

- 1 Postmarginal vein of fore wing about as long as parastigma (fig. 64)..... 2
- Postmarginal vein of fore wing distinctly longer than parastigma (fig. 65)..... 3
- 2 Fore wing costal cell with at least four hairs on the upper surface apically; speculum closed below; gaster at least slightly longer than head and thorax together (head and thorax green or blue-green, variegated with violet on face and sides of thorax) **sericeicornis** (Nees)
Very common. v-x. Parasitic upon leaf-mining Lepidoptera, especially Lithocolletis (Gracillariidae) species.
- Fore wing costal cell with at most three hairs on the upper surface apically; speculum usually open below; gaster about equal in length to head and thorax together (body usually a brighter green or more bronze-green than alternate) **grahami** Erdős
Berks., Oxon. (M. W. R. de V. Graham). A parasite of species of Lithocolletis (Gracillariidae) mining Alnus, Populus and Salix. This species was first recognised as forma A of S. sericeicornis (Graham, 1963) and recently elevated to specific status by Erdős (1966).
- 3 Propodeum with sculpture fine and weak, much less coarse than on scutellum, often partly smooth and shining; if nearly as strongly sculptured as scutellum, then body is blue-black and fore wing has two clearly-defined fuscous bands.. 4
- Propodeum about as strongly sculptured as scutellum; body green or bronze; fore wing rarely (*gregori*) with two clearly-defined fuscous bands..... 6
- 4 Body blue-black; fore wing with two clearly defined fuscous bands; fourth funicle segment much broader than clava; femora black (propodeum with complete median carina) **acalle** (Walker)
Rare in Britain; Warwicks. (H. Britten), Oxon. (M. W. R. de V. Graham). Recorded on the Continent principally as a parasite of leaf-mining Lepidoptera.
- Body greenish; fore wing with at most a small fuscous streak beneath stigma; fourth funicle segment not broader than clava; femora predominantly or entirely pale..... 5
- 5 Notaulices distinct to posterior border of mesoscutum (e.g. fig. 63); face often marked with white or yellow; propodeum with median carina indistinct; gaster at most only slightly longer than rest of body; marginal vein of fore wing more than four times as long as stigmal vein (fig. 65)..... **xanthostoma** (Nees)
Quite common, especially in northern England and in Scotland. v-ix. Known as a parasite of Tortricidae and Gracillariidae (Lepidoptera) on the Continent.
- Notaulices indistinct posteriorly (cf. fig. 62); face entirely metallic; propodeum with median carina usually distinct; gaster distinctly longer than rest of body, narrow; marginal vein of fore wing less than three times as long as stigmal vein **gordius** (Walker)
Quite common in deciduous woods. Parasitises larvae of Lithocolletis (Lep., Gracillariidae) and other leaf-mining Lepidoptera.
- 6 Scutellum strigose-reticulate with very elongate areoles (fig. 63); face with numerous white hairs; median carina of propodeum absent; (body bronze, notaulices traceable to posterior edge of mesoscutum (fig. 63), fore wing yellowish and usually with a fuscous streak beneath stigma, gaster ventrally and usually dorsally marked with yellow)..... **sandanis** (Walker)



FIGS. 52, 54.—Propodeum and first gastral tergite of female of: (52) *Pnigalio pectinicornis* (Linnaeus); (54) *P. longulus* (Zetterstedt).

FIG. 53.—Propodeum of female *Dicladocerus aeneiscapus* (Thomson).

FIG. 55.—Propodeum and metanotum in dorsolateral view of female *Pnigalio pristiphorae* Askew.

FIGS. 56–57.—Head in dorsal view of female of: (56) *Pnigalio soemius* (Walker); (57) *P. agraulis* (Walker).

FIGS. 58–61.—Flagellum in outline of: (58) *Pnigalio nemati* (Westwood) ♀; (59) *P. soemius* ♀; (60) *Sympiesis sericeicornis* (Nees) ♂; (61) *S. gregori* Bouček ♂.

FIGS. 62, 63.—Part of mesoscutum and scutellum with sculpturation indicated of female of: (62) *Sympiesis gregori*; (63) *S. sandanis* (Walker).

FIGS. 64, 65.—Fore wing venation of female of: (64) *Sympiesis sericeicornis*; (65) *S. xanthostoma* (Nees).

Quite common in midland and southern England, calcareous areas. v-vii.
Host unknown.

- Scutellum reticulate with areoles not especially elongated (fig. 62); face with only a few white hairs; median carina of propodeum present.....7
- 7 Gaster about as long as rest of body, at most about 2.5 times as long as broad; fore wing hyaline; fourth funicle segment only slightly longer than broad; propodeum with median carina usually indicated incompletely (notaulices usually traceable to posterior edge of mesoscutum (cf. fig. 63); body green)

viridula (Thomson)

Quite common in midland and southern England. v-vii. Known to parasitize species of *Pyrausta* (Lep., *Pyraustidae*) and *Gortyna flavago* (Schiffermüller) (Lep., *Noctuidae*). Parker & Smith (1933) give an account of its biology.

- Gaster distinctly longer than rest of body, at least 3.0 times as long as broad; fore wing often with a small fuscous streak below stigma, and sometimes also with a discal cloud; fourth funicle segment about 1.5 times as long as broad; propodeum with median carina usually complete (notaulices obliterated posteriorly (cf. fig. 62), body green or bronze).....**gregori** Bouček

Locally common in dry areas. v-ix. Parasitic chiefly upon species of *Lithocolletis* (Lep., *Gracillariidae*).

KEY TO SPECIES

Males

- 1 Funicle with five segments, unbranched, or very occasionally, with incipient branches (fig. 60); clava of one segment; funicle segments yellowish ventrally, fuscous dorsally, the two colours usually quite sharply delimited.....2
- Funicle with four segments and three long branches (fig. 61); clava of two segments; funicle not bicoloured.....3
- 2 Fore wing costal cell with at least four hairs on the upper surface apically; speculum closed below; middle tibiae at least twelve times as long as broad
sericeicornis (Nees)
- Fore wing costal cell with at most three hairs on the upper surface apically; speculum usually open below; legs stouter than in alternate with middle tibiae about nine times as long as broad.....**grahami** Erdős
- 3 Marginal vein of fore wing about 2.5 times as long as stigmal vein; propodeum in profile gibbous (propodeum largely smooth and shining, median carina distinct, scutellum often purplish, front and mid-femora predominantly pale yellow)
gordius (Walker)
- Marginal vein of fore wing at least 3.2 times as long as stigmal vein, propodeum in profile straight.....4
- 4 Propodeum mostly smooth and shining, median carina absent or poorly defined; notaulices complete though weak posteriorly.....**xanthostoma** (Nees)
- Propodeum distinctly reticulate or median carina distinct; notaulices rarely (except *viridula*) discernable posteriorly.....5
- 5 Propodeum with complete median carina; hind tibiae apically infusate.....6
- Propodeum with median carina at most indicated anteriorly; hind tibiae usually entirely yellow.....7
- 6 Front femora entirely dark.....**acalle** (Walker)
- Front femora predominantly or entirely pale.....**gregori** Bouček
- 7 Scutellum strigose-reticulate, areoles elongate; propodeum strongly sculptured, median carina absent.....**sandanis** (Walker)
- Scutellum reticulate with more or less circular areoles; propodeum less strongly sculptured, often with a trace of median carina anteriorly.....**viridula** (Thomson)

Genus *Dimmockia* Ashmead

One British species known from females only (thorax green, legs except coxae whitish).....**brevicornis** (Erdős)

Very rare, Bucks. (M. W. R. de V. Graham). Recorded on the Continent as a parasite of *Gracillaria stigmatella* Fabricius (Lep., *Gracillariidae*).

Genus *Eulophus* Müller

KEY TO SPECIES

- 1 Legs with fourth tarsal segment about equal in length to segments two plus three (fig. 67); male gaster with two bunches of black spines laterally on last segment (fig. 66); male funicle without branches (body bronze, coxae and femora mainly metallic, tibiae testaceous)..... **thespius** Walker
Rare. Near London and the Isle of Wight (F. Walker), Yorks. (W. D. Hincks), Lancs. (R. R. Askew), Oxon. and Bucks. (M. W. R. de V. Graham); Ireland, Co. Dublin and Co. Wicklow (M. W. R. de V. Graham). There are apparently no British host records, but it has been reared on the continent from larvae of Noctuidae (Lepidoptera).
- Legs with fourth tarsal segment shorter than segments two plus three (Fig. III); male gaster without bunches of spines; male funicle with three branches..... 2
- 2 Body bronze-black or blue-black; coxae and femora mainly metallic; fore wing densely hairy; basal vein hairy; speculum more or less closed below, smaller..... **pennicornis** Nees
Fairly common and widespread in England. v-ix. Recorded in Britain as a parasite mainly of the larvae of Noctuidae (Lepidoptera).
- Body green to bluish; all femora mainly pale; fore wing not densely hairy; basal vein bare; speculum open below, large..... 3
- 3 Scutellum in profile gibbous (fig. 68); middle coxae pale; body more slender..... **abdominalis** Nees
Rare. Berks. (M. W. R. de V. Graham). Eulophus anatole Walker, which is a synonym, was found near London. Recorded on the Continent as a parasite of Geometridae, Lasiocampidae, Lymantriidae, Noctuidae, Notodontidae and Tortricidae (Lepidoptera).
- Scutellum in profile feebly convex (fig. 69); middle coxae metallic; body stouter. . . 4
- 4 Stigmal vein of fore wing nearly as long as postmarginal vein; marginal vein of fore wing of female at least four times as long as stigmal vein; front coxae nearly always at least partially dark; female antenna with third funicle segment almost quadrate..... **aeneicoxa** (Thomson)
The only known British specimens are one male and one female reared from Clostera anachoreta (Schiffermüller) (Lep., Notodontidae), Surrey, viii. 1929, and a series in the British Museum (Nat. Hist.) reared from C. pigra (Hufnagel), Kincardines., 1936.
- Stigmal vein of fore wing distinctly shorter than postmarginal vein; marginal vein of fore wing of female at most three times as long as stigmal vein; front coxae entirely pale; female antenna with third funicle segment much longer than broad..... **larvarum** (Linnaeus) (Fig. III)
Very common. There are two colour forms of this species. The summer form, which is characterized by a pale spot at the base of the gaster, occurs from vi-viii. The spring or overwintering form has an entirely dark gaster and rather larger propodeal spiracles and is usually found from iv-vi. Dr. Graham informs me that Linnaeus' types in DeGeer's collection in Stockholm are of the spring form (= ramicornis Fabricius, nigribasis Gradwell) with entirely dark gasters. In Britain, E. larvarum has been found parasitizing larvae of Lepidoptera belonging to the families Noctuidae, Notodontidae, Lymantriidae, Geometridae and Phalonidae.

Larvae of *Eulophus* are all parasites of exposed caterpillars. Pupating on the leaf surface in a circle around the dead body of their host, on their backs and heads innermost, they have been appropriately called "tombstone pupae".

Genus *Necremnus* Thomson

KEY TO SPECIES

- 1 Tibiae predominantly testaceous (body less than 2 mm. long, dull bronze-black with propodeum greenish, female gaster only slightly longer than broad, fore wing with postmarginal vein hardly longer than stigmal vein, wings rather short

and immaculate, propodeum reticulate, female antenna with first funicle segment about three times as long as broad, distinctly longer than pedicel)

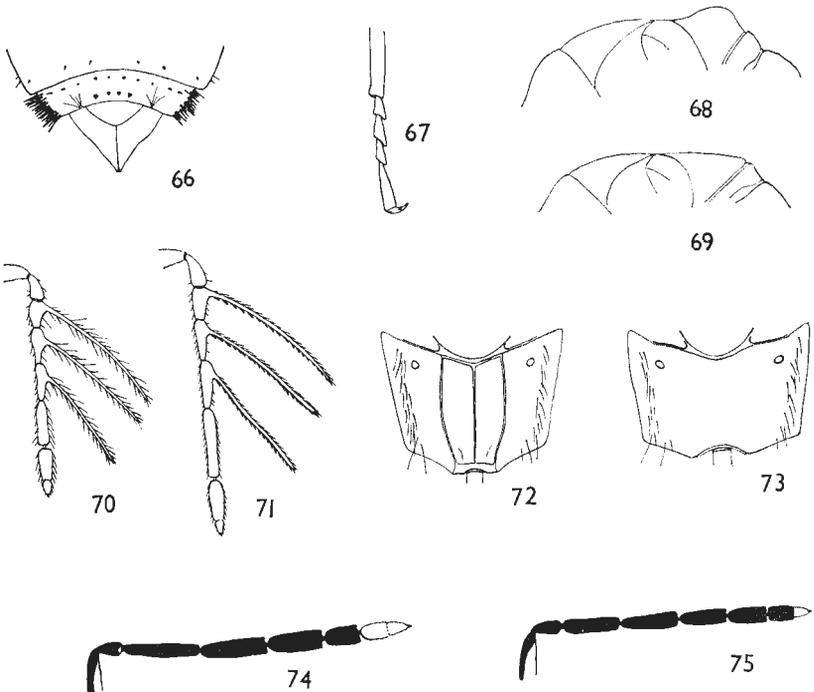
capitatus Bouček

The only known British specimens are two in the Manchester Museum, reared from a *psychid* (*Lepidoptera*) case collected in Cheshire, 1946 (B. B. Snell).

- Mid and hind tibiae entirely or mainly infuscate or metallic, if largely pale (*artynes* sometimes), then wings with fuscous clouds and gaster of female much longer than broad..... 2
- 2 Fore wing with postmarginal vein not or hardly longer than stigmal vein..... 3
- Fore wing with postmarginal vein about 1.5 times as long as stigmal vein..... 5
- 3 Propodeum weakly alutaceous; gaster of female longer than rest of body; fore wing of female nearly always with two fuscous clouds which tend to unite on disc; body bronze, bronze-green or purplish (fore wing speculum of moderate size, male funicle with fourth segment at least three times as long as broad)

cosconius (Walker)

Very common in most parts of Britain. The adult insect may be taken in any month of the year; it may be found overwintering in birds' nests, among the leaves of conifers, etc. No host is yet known.



FIGS. 66, 67.—*Eulophus thespius* Walker: (66) apex of male gaster, dorsal view; (67) mid-tarsus of female.

FIGS. 68, 69.—Thorax in profile of female of: (68) *Eulophus abdominalis* Nees; (69) *E. larvarum* (Linnaeus).

FIGS. 70, 71.—Flagellum of male of: (70) *Necremnus tidius* (Walker); (71) *N. leucarthros* (Nees).

FIGS. 72, 73.—Propodeum of female of: (72) *Hemiptarsenus unguicellus* (Zetterstedt); (73) *H. dropion* (Walker).

FIGS. 74, 75.—Flagellum, to show distribution of white areas, of female of: (74) *Hemiptarsenus dropion*; (75) *H. fulvicollis* Westwood.

- Propodeum of female reticulate; gaster of female not longer than rest of body; wings hyaline or slightly, and more or less uniformly, infumate. 4
- 4 Female gaster nearly twice as long as broad, apically acuminate; female antenna with first funicle segment distinctly longer than pedicel; fore wing speculum narrow (body blue-black with propodeum greenish). **croton** (Walker)
Rare. Near London (F. Walker), and a female which is probably this species from Ireland, Co. Down (A. W. Stelfox). Male unknown.
- Female gaster hardly longer than broad, apically rounded; female antenna with first funicle segment slightly longer than pedicel; fore wing speculum of moderate size (body violet or bronze-black, male funicle with fourth segment at most 2.5 times as long as broad). **folia** (Walker)
Not very common, southern England north to Staffords. No host is known.
- 5 Female fore wing with one or two fuscous clouds, occasionally very faint; female antenna with first funicle segment at least twice as long as pedicel, third funicle segment more than 1.5 times as long as broad; fore wing speculum of moderate size; male body greenish with long, outstanding hairs on funicle branches (*e.g.* fig. 70) 6
- Wings immaculate; female antenna with first funicle segment at most twice as long as pedicel, third funicle segment less than 1.5 times as long as broad; fore wing speculum variable; male body bronze or greenish; male funicle branches with short, stout and adpressed hairs (fig. 71), or if long and outstanding (fig. 70), then fore wing speculum very narrow. 7
- 6 Female gaster about three times as long as broad, much longer than rest of body; female fore wing with two fuscous clouds; male fore wing with stigmal and postmarginal veins forming an angle of about 30°; propodeum alutaceous; hind tibiae usually basally pale, occasionally predominantly so. **artynes** (Walker)
Local, usually on sand-dunes. Mostly v, vi and ix. No host is known.
- Female gaster about twice as long as broad, hardly longer than rest of body; female fore wing often with only one fuscous cloud (below stigma) and this may be faint; male fore wing with stigmal and postmarginal veins forming an angle approaching 45°; propodeum of female reticulate; hind tibiae usually entirely dark **metalarus** (Walker)
Not very common but known from England, Scotland and Northern Ireland, often on sand-dunes. For notes on the biology of this species as a parasite of Coleophora laricella (Hübner) (Lep., Coleophoridae) see Thorpe (1933).
- 7 Body bronze or greenish-bronze; fore wing speculum narrow; female gaster usually slightly shorter than rest of body; male funicle branches with long, thin, outstanding hairs (fig. 70). **tidius** (Walker)
Common, probably throughout Britain, and taken in every month of the year. The species overwinters as an adult in birds' nests, among dead twigs, conifers, etc. Found apparently attacking larvae of Psylliodes marcida (Illiger) (Col., Chrysomelidae) mining Cakile maritima Scop. (R. R. Askew).
- Body green; fore wing speculum quite large; female gaster usually slightly longer than rest of body; male funicle branches with very short, stout, adpressed hairs (fig. 71) **leucarthros** (Nees)
Common in most parts of Britain, the adult has been taken in every month of the year. It overwinters in conifers, birds' nests, etc. Reared from cocoons of species of Phytomomus (Col., Curculionidae).

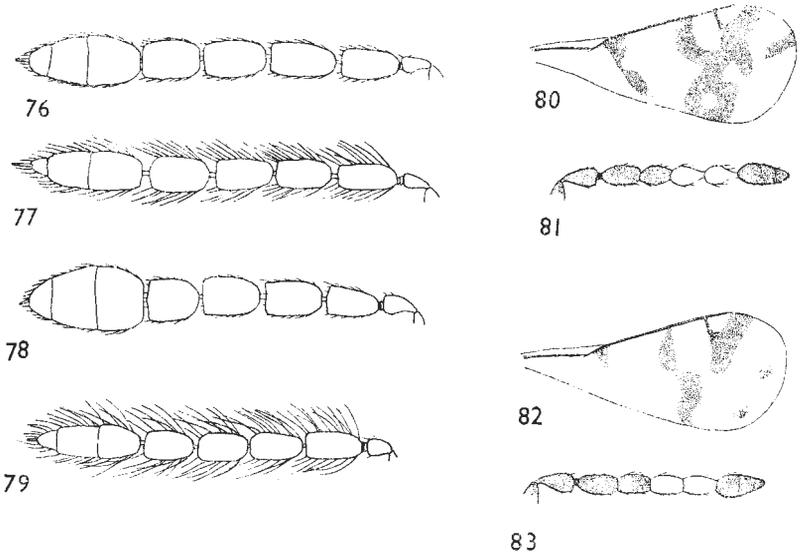
The commoner species of *Necremnus* are often to be found on windows inside houses.

Genus *Hemiptarsenus* Westwood

KEY TO SPECIES

- 1 Propodeum with plicae and median carina distinct (fig. 72) (except in small males), elevated between plicae, rugose; female clava entirely black; wings hyaline (thorax wholly metallic, cubital vein of fore wing almost straight, marginal vein of fore wing about five times as long as stigmal vein). **unguicellus** (Zetterstedt)
Abundant throughout Britain, iv-x. Reared from mines of Agromyzidae (Diptera) and Lepidoptera.

- Propodeum without plicae or carina (fig. 73), shorter, median area not elevated, evenly reticulate, alutaceous in small males; clava of female at least partly white (figs. 74, 75); females either brachypterous or with wings fuscous marked. . . . 2
- 2 Female gaster strongly alutaceous, densely hairy; female head finely sculptured, matt; female scutellum sometimes greenish, rest of thorax dark violet; male mesoscutum strigulose (female clava entirely white, female brachypterous or fore wing with three transverse fuscous bands). . . . **waterhousii** Westwood
Very rare. The type locality is Dorking. Also one female reared from Mompha (Lophoptilus) miscella (Schiff.), Streatley, Berks. (E. G. R. Waters).



FIGS. 76-79.—Antenna of: (76) *Euderus albitarsis* (Zetterstedt) ♀; (77) *E. albitarsis* ♂; (78) *E. viridis* (Thomson) ♀; (79) *E. viridis* ♂.
 FIGS. 80, 81.—*Astichus arithmeticus* (Förster): (80) fore wing; (81) flagellum of female.
 FIGS. 82, 83.—*A. solutus* Förster: (82) fore wing; (83) flagellum of female.

- Female gaster weakly alutaceous and sparsely hairy; head with weaker sculpture, shining; female thorax greenish, often with yellow or orange markings; male mesoscutum reticulate or slightly strigulose posteriorly (marginal vein of fore wing about three times as long as stigmal vein, cubital vein of fore wing moderately sinuate) 3
- 3 Female clava entirely whitish (fig. 74); scutellum longer than broad (female fore wing with two or three fuscous clouds, thorax of female marked with yellow-orange laterally, and usually also on scutellum anteriorly, axillae, and side lobes of mesoscutum) **dropion** (Walker)
Not very common but generally distributed in England. vii-ix. Reared from cocoons of Stigmella (Lep., Stigmellidae) and mines of Phytomyza (Dipt., Agromyzidae), and Lithocolletis (Lep., Gracillariidae).
- Female clava with only terminal segment whitish (fig. 75); scutellum about as long as broad, slightly longer in some males (female brachypterous or fore wing with discal fuscous cloud, thorax of female ranging from entirely metallic to almost entirely orange-yellow. **fulvicollis** Westwood
Quite common, especially in open, dry areas. Taken as far north as Inverness. v-ix. The macropterous form of the female is rare.

Subfamily EUDERINAE

KEY TO GENERA

- 1 Fore wing hyaline with three distinct lines of hairs proceeding from stigma (fig. 12); flagellum of antenna entirely dark. **Euderus** Haliday (p. 27)
- Fore wing with fuscous markings, without lines of hairs proceeding from stigma; female antenna with segments three and four of funicle whitish
Astichus Förster (p. 27)

Genus **Euderus** Haliday

KEY TO SPECIES

- 1 Female antenna with clava only slightly broader than fourth funicle segment (fig. 76); male antenna with hairs less outstanding, rather thicker and darker than in alternate (fig. 77); female gaster lanceolate; body often with violet coloration laterally; sculpture very fine and rather dull
(= *amphis* Walker) **albitarsis** (Zetterstedt)
Not uncommon, v-i.v. Reared from stems of Agrimonia infested by Hartigia xanthostoma Eversmann (Hym., Cephidae) (M. F. Claridge).
- Female antenna with clava usually distinctly broader than fourth funicle segment (fig. 78); male antenna with long, fine, white hairs which stand out from funicle to a distance that exceeds width of funicle (fig. 79); female gaster sub-ovate to lanceolate; body rarely marked with violet; sculpture with reticulations rather larger than in alternate, more shining. **viridis** (Thomson)
Not uncommon, vi-i.v. Reared from Microlepidoptera associated with rushes and grasses.

Genus **Astichus** Förster

KEY TO SPECIES

- 1 Fore wing with dark markings extended so as to enclose hyaline spots (fig. 80); female funicle segments apically constricted to form short necks (fig. 81)
arithmeticus (Förster)
Uncommon, south and midland England. Parasitic upon beetles in bracket fungi (Polyporus).
- Fore wing with dark markings in isolated bands or spots (fig. 82); female funicle segments without pronounced apical constrictions (fig. 83). . . . **solutus** Förster
Very rare. Berks. (M. W. R. de V. Graham). A parasite of Cis species (Col., Cixiidae).

BRITISH HOST RECORDS OF ELACHERTINAE, EULOPHINAE AND EUDERINAE

<i>Euplectromorpha laeviscuta</i>	—	
<i>Euplectrus bicolor</i>	<i>Orthosia gracilis</i> (Schifferrmüller)	Lep., Noctuidae
	<i>Polia nebulosa</i> (Hufnagel)	
	<i>P. hepatica</i> (Clerck)	
<i>(Euplectrus nigriceps)</i>	—	
<i>Xanthellum transsylvanicum</i>	<i>Taleporia tubulosa</i> (Retzius)	Lep., Tinacidae
<i>Stenomoesius rufescens</i>	—	
<i>Elachertus nigrifolius</i>	<i>Cnephasia chrysantheana</i> (Duponchel)	Lep., Tortricidae
	<i>?Phalonia roseana</i> (Haworth)	Lep., Phaloniidae
<i>Elachertus geniculatus</i>	<i>Laspeyresia strobilella</i> (L.)	Lep., Tortricidae
<i>Elachertus olivaceus</i>	<i>Coleophora galactaula</i> Meyrick	Lep., Coleophoridae
	<i>C. glaucicolella</i> Wood	
	<i>?C. juncicolella</i> Stainton	
<i>Elachertus charondas</i>	—	
<i>Elachertus inunctus</i>	<i>?Depressaria applana</i> (F.)	Lep., Oecophoridae
	<i>Leucoptera laburnella</i> (Stainton)	Lep., Lyonetiidae
	<i>Lithocolletis blancardella</i> (F.)	Lep., Gracillariidae
	<i>L. nicelli</i> Stainton	
	<i>L. nigrescentella</i> Logan	
	<i>?Perittia oleae</i> (Haworth)	Lep., Elachistidae

<i>Elachertus isadas</i>	—	
<i>Elachertus gallicus</i>	—	
<i>Elachertus argissa</i>	<i>Coleophora limosipennella</i> (Dup.)	Lep., Coleophoridae
<i>Elachertus artaeus</i>	<i>Clostera curtula</i> (L.)	Lep., Notodontidae
<i>Miotropis unipuncta</i>	<i>Coleophora caespitiella</i> Zeller	Lep., Coleophoridae
	<i>C. glaucicolella</i> Wood	
	<i>C. lutipennella</i> (Zeller)	
<i>Ratzeburgiola cristata</i>	—	
<i>Olynx arsames</i>	<i>Andricus curvator</i> Hartig	Hym., Cynipidae
	<i>A. inflator</i> Hartig	
	<i>A. ostreus</i> (Hartig)	
	<i>A. quadrilineatus</i> Hartig	
	<i>Neuroterus albipes</i> (Schenek)	
	<i>N. numismalis</i> f. <i>vesicator</i> (Schlechtendal)	
	<i>N. quercusbaccarum</i> (L.)	
<i>Olynx skianeuros</i>	<i>Biorhiza pallida</i> (Olivier)	
<i>Olynx gallarum</i>	<i>Andricus curvator</i> Hartig	
	<i>A. quercusramuli</i> (L.)	
	<i>Neuroterus quercusbaccarum</i> f. <i>lenticularis</i> (Olivier)	
<i>Olynx euedoreschus</i>	<i>Andricus quadrilineatus</i> Hartig	
<i>Olynx trilineata</i>	<i>Andricus fecundator</i> (Hartig)	
	? <i>Trigonaspis megaptera</i> (Panzer)	
<i>Cirrospilus elegantissimus</i>	—	
<i>Cirrospilus subviolaceus</i>	—	
<i>Cirrospilus diallus</i>	<i>Leucoptera laburnella</i> (Stainton)	Lep., Lyonetiidae
	<i>Lithocolletis harrisella</i> (L.)	Lep., Gracillariidae
	<i>L. quercifoliella</i> Zeller	
	<i>Neuroterus numismalis</i> f. <i>vesicator</i> (Schlechtendal)	Hym., Cynipidae
	Braconid sp.	Hym., Braconidae
<i>Cirrospilus lynceus</i>	—	
<i>Cirrospilus pictus</i>	<i>Coleophora laricella</i> (Hübner)	Lep., Coleophoridae
	<i>Leucoptera laburnella</i> (Stainton)	Lep., Lyonetiidae
	? <i>Lithocolletis spinolella</i> (Duponchel)	Lep., Gracillariidae
	<i>Rhynchaenus alni</i> (L.)	Col., Curculionidae
<i>Cirrospilus salatis</i>	<i>Coleophora laricella</i> (Hübner)	Lep., Coleophoridae
<i>Cirrospilus elongatus</i>	—	
<i>Cirrospilus vittatus</i>	<i>Leucoptera laburnella</i> (Stainton)	Lep., Lyonetiidae
	<i>Lithocolletis salicicolella</i> (Sircorn)	Lep., Gracillariidae
	<i>Mompha raschkiella</i> (Zeller)	Lep., Cosmopterigidae
	<i>Stigmella argentipedella</i> (Zeller)	Lep., Stigmellidae
	<i>Agromyza demejerei</i> Hendel	Dipt., Agromyzidae
	<i>Calycomyza humeralis</i> (v. Roser)	
	<i>Phytomyza atricornis</i> Meigen	
	<i>P. cytisi</i> Brischke	
	<i>Anoplonyx destructor</i> Benson	Hym., Tenthredinidae
	<i>Pristiphora laricis</i> (Hartig)	
<i>Cirrospilus singa</i>	—	
<i>Cirrospilus curvineurus</i>	<i>Stigmella</i> sp.	Lep., Stigmellidae
<i>Diglyphus isaea</i>	<i>Calycomyza humeralis</i> (v. Roser)	Dipt., Agromyzidae
	<i>Agromyza nana</i> (Meigen)	
	<i>Liriomyza fasciola</i> (Meigen)	
	? <i>L. pusio</i> (Meigen)	
	<i>Phytomyza atricornis</i> Meigen	
	<i>P. cytisi</i> Brischke	
	<i>P. vitalbae</i> Kaltenbach	
<i>Diglyphus poppoea</i>	<i>Phytomyza atricornis</i> Meigen	

<i>Diglyphus minoicus</i>	<i>Phytomyza atricornis</i> Meigen	
	<i>P. vitalbae</i> Kaltenbach	
	<i>P. cytisi</i> Brischke	
	<i>P. xylostei</i> Kaltenbach	
<i>Diglyphus chabrias</i>	—	
<i>Diglyphus crassinervis</i>	—	
<i>Diglyphus pachyneurus</i>	—	
<i>Diglyphus puzosiensis</i>	—	
<i>Colepoclypeus florus</i>	<i>Amelia paleana</i> Hübner	Lep., Tortricidae
<i>Di cladocerus westwoodii</i>	<i>Coleophora loricella</i> (Hübner)	Lep., Coleophoridae
	<i>C. virgaureae</i> Stainton	
	<i>C. caespitiella</i> Zeller	
	? <i>C. galactaula</i> Meyrick	
	<i>Archips oporana</i> (L.)	Lep., Tortricidae
	<i>Argyrotoza bergmanniana</i> (L.)	
	? <i>Gypsonoma sociana</i> (Haworth)	
	<i>Argyresthia conjugella</i> Zeller	Lep., Plutellidae
	? <i>Panaxia dominula</i> L.	Lep., Arctiidae
<i>Di cladocerus euryalus</i>	—	
<i>Pnigalio attis</i>	—	
<i>Pnigalio nemati</i>	<i>Pontania proxima</i> (Lepeletier)	Hym., Tenthredinidae
	<i>P. triandrae</i> Benson	
<i>Pnigalio pristiphorae</i>	<i>Pristiphora ambigua</i> (Fallén)	
	<i>P. amphibola</i> (Förster)	
<i>Pnigalio longulus</i>	<i>Lithocolletis viminiella</i> (Stainton)	Lep., Gracillariidae
	<i>L. quercifoliella</i> Zeller	
	<i>L. froelichiella</i> Zeller	
	<i>L. rajella</i> (L.)	
	<i>L. spinolella</i> (Duponchel)	
	<i>L. corylifoliella</i> (Haworth)	
	<i>L. blancardella</i> (F.)	
	<i>L. klemannella</i> (F.)	
	? <i>Coleophora fuscedinella</i> Zeller	Lep., Coleophoridae
	? <i>Nycteola revayana</i> (Scopoli)	Lep., Noctuidae
<i>Pnigalio epilobii</i>	—	
<i>Pnigalio soemius</i>	<i>Phytomyza atricornis</i> Meigen	Dipt., Agromyzidae
	<i>P. mitii</i> Kaltenbach	
	<i>Rhopalomyia ptarmicae</i> Vallot	Dipt., Cecidomyiidae
	<i>Chirosia</i> ? <i>parvicornis</i>	Dipt., Muscidae
	(Zetterstedt)	
	<i>Leucoptera lotella</i> (Stainton)	Lep., Lyonetiidae
	<i>L. laburnella</i> (Stainton)	
	<i>Stigmella argentipedella</i> (Zeller)	Lep., Stigmellidae
	<i>Zelleria saxifragae</i> Stainton	Lep., Yponomeutidae
<i>Pnigalio agraulis</i>	<i>Rhynchaenus fagi</i> (L.)	Col., Curculionidae
	<i>R. alni</i> (L.)	
	<i>R. rusci</i> (Herbst)	
	? <i>R. quercus</i> (L.)	
	<i>Neuroterus numismalis</i> f.	Hym., Cynipidae
	<i>vesicator</i> (Schlechtendal)	
	<i>Heterarthrus aceris</i> (MacLachlan)	Hym., Tenthredinidae
	<i>Tischeria complanella</i> (Hübner)	Lep., Lyonetiidae
	? <i>Stigmella atricapitella</i> (Haworth)	Lep., Stigmellidae
<i>Pnigalio pectinicornis</i>	<i>Lithocolletis roboris</i> Zeller	Lep., Gracillariidae
	<i>L. spinolella</i> (Duponchel)	
	<i>L. blancardella</i> (F.)	
	<i>L. corylifoliella</i> (Haworth)	
	<i>L. schrebrella</i> (F.)	
	<i>L. spinicolella</i> Zeller	
	<i>L. viminiella</i> (Stainton)	
	<i>L. nicellii</i> Stainton	
	<i>L. comparella</i> (Duponchel)	

<i>Pnigalio pectinicornis</i>	? <i>L. quinquegutella</i> Stainton	
	? <i>L. coryli</i> Nicelli	
	? <i>L. junoniella</i> Zeller	
	<i>Acrocercops omisella</i> (Stainton)	
	<i>Elachista perplexella</i> Stainton	Lep., Elachistidae
	<i>Antispila treitschkiella</i> (Fischer von Roeslerstamm)	Lep., Heliozelidae
	<i>Cerodontha phragmitidis</i> Nowakowski	Dipt., Agromyzidae
<i>Pnigalio phragmitis</i>	<i>Cerodontha phragmitidis</i> Nowakowski	
<i>Sympiesis sericeicornis</i>	<i>Lithocolletis messaniella</i> Zeller	Lep., Gracillariidae
	<i>L. sorbi</i> Frey	
	<i>L. tenerella</i> Joannis	
	<i>L. oxyacanthae</i> Frey	
	<i>L. pyrivorella</i> Bankes	
	<i>L. geniculella</i> Ragonot	
	<i>L. acerifoliella</i> Zeller	
	<i>L. spinolella</i> (Duponchel)	
	<i>L. ulmifoliella</i> (Hübner)	
	<i>L. rajella</i> (L.)	
	<i>L. corylifoliella</i> (Haworth)	
	<i>L. nicellii</i> Stainton	
	<i>L. quinnata</i> (Geoffroy)	
	<i>L. blancardella</i> (F.)	
	<i>L. faginella</i> Zeller	
	<i>L. quercifoliella</i> Zeller	
	<i>L. coryli</i> Nicelli	
	? <i>L. concomitella</i> Bankes	
	? <i>L. lantanella</i> (Schrank)	
	<i>Gracillaria elongella</i> (L.)	
<i>Epinotia sordidana</i> Hübner	Lep., Tortricidae	
? <i>Pteromalus puparum</i> (L.) (via <i>Aglais urticae</i> (L.))	Hym., Pteromalidae	
<i>Sympiesis grahami</i>	<i>Lithocolletis</i> sp.	Lep., Gracillariidae
<i>Sympiesis acalle</i>	—	
<i>Sympiesis gordius</i>	<i>Lithocolletis sorbi</i> Frey	Lep., Gracillariidae
	<i>L. geniculella</i> Ragonot	
	<i>L. corylifoliella</i> (Haworth)	
	<i>L. froelichiella</i> Zeller	
	<i>L. rajella</i> (L.)	
	<i>L. trifasciella</i> (Haworth)	
	? <i>L. ulmifoliella</i> (Hübner)	
	? <i>L. coryli</i> Nicelli	
	<i>Gortyna flavago</i> (Schiffermüller)	Lep., Noctuidae
	—	
<i>Sympiesis viridula</i>	<i>Lithocolletis quinquegutella</i> Stainton	Lep., Gracillariidae
<i>Sympiesis sandanis</i>	—	
<i>Sympiesis gregori</i>	—	
<i>Sympiesis xanthostoma</i>	—	
<i>Dimmockia brevicornis</i>	—	
<i>Eulophus thespius</i>	—	
<i>Eulophus pennicornis</i>	<i>Griposia aprilina</i> (L.)	Lep., Noctuidae
	<i>Mamestra brassica</i> (L.)	
	<i>Diataraxia oleracea</i> (L.)	
	<i>Phlogophora meticulosa</i> (L.)	
	<i>Orthosia gothica</i> (L.)	
	<i>Melanchnra persicariae</i> (L.)	
	<i>Pieris brassicae</i> (L.)	Lep., Pieridae
<i>Eulophus abdominalis</i>	—	
<i>Eulophus larvarum</i>	<i>Apatele leporina</i> (L.)	Lep., Noctuidae
	<i>A. psi</i> (L.)	
	<i>Colocasia coryli</i> (L.)	

<i>Eulophus larvarum</i>	<i>Diataraxia oleracea</i> (L.)	
	<i>Orthosia cruda</i> (Schiffermüller)	
	<i>O. stabilis</i> Schiffermüller	
	<i>Cosmia trapezina</i> (L.)	
	<i>Orgyia antiqua</i> (L.)	Lep., Lymantriidae
	<i>Lophopteryx capucina</i> (L.)	Lep., Notodontidae
	<i>L. cucullina</i> (Schiffermüller)	
	<i>Operophtera brumata</i> (L.)	Lep., Geometridae
	<i>Archicaris parthenias</i> (L.)	
	<i>Phalonia atricapitana</i> (Stephens)	Lep., Phaloniidae
<i>Eulophus aeneicoxa</i>	<i>Clostera anachoreta</i> (Schiffermüller)	Lep., Notodontidae
	<i>C. pigra</i> (Hufnagel)	
<i>Necremnus leucarthros</i>	<i>Phytonomus adpersus</i> (F.)	Col., Curculionidae
	<i>P. arator</i> (L.)	
<i>Necremnus artynes</i>	—	
<i>Necremnus metalarius</i>	<i>Coleophora laricella</i> (Hübner)	Lep., Coleophoridae
<i>Necremnus tidius</i>	? <i>Phylliodes marcida</i> (Illiger)	Col., Chrysomelidae
<i>Necremnus croton</i>	—	
<i>Necremnus capitatus</i>	Psychid	Lep., Psychidae
<i>Necremnus coscivus</i>	—	
<i>Necremnus folia</i>	—	
<i>Hemiptarsenus fulvicollis</i>	—	
<i>Hemiptarsenus dropion</i>	<i>Phytomyza atricornis</i> Meigen	Dipt., Agromyzidae
	<i>Stigmella aeneofasciella</i> Herrich-Schaeffer	Lep., Stigmellidae
	<i>S. cryptella</i> (Stainton)	
	? <i>Elachista stabilella</i> Frey	Lep., Elachistidae
	<i>Cerodontha pygmaea</i> (Meigen)	Dipt., Agromyzidae
	? <i>C. iraeos</i> (Robineau-Desvoidy)	
<i>Hemiptarsenus waterhousii</i>	<i>Elachista megerlella</i> (Hübner)	Lep., Elachistidae
	<i>Mompha miscella</i> (Schiffermüller)	Lep., Cosmopterigidae
<i>Euderus albitarsis</i>	<i>Hartigia xanthostoma</i> Eversmann	Hym., Cephidae
<i>Euderus viridis</i>	<i>Glyphipteryx cramerella</i> (F.)	Lep., Glyphipterigidae
	<i>Coleophora galactaula</i> Meyrick	Lep., Coleophoridae
<i>Astichus arithmeticus</i>	<i>Sphindus dubius</i> (Gyllenhal)	Col., Sphindidae
<i>Astichus solutus</i>	—	

The records presented in the table above are nearly all of specimens examined by the author, although previously published records are also included when there is no evident reason to doubt their authenticity. Several of the host names have been taken from data labels on museum material, and although it is believed that most of them are correct, the possibility of error cannot be excluded. When rearing a potential host, it is all too easy to include with it, inadvertently, the odd specimen of another species. This list should therefore be regarded with some degree of caution. As more hosts become known it will be possible, eventually, to state the host relations of these Chalcids in terms of their host's ecology or taxonomic affinity.

(For list of references see p. 35.)

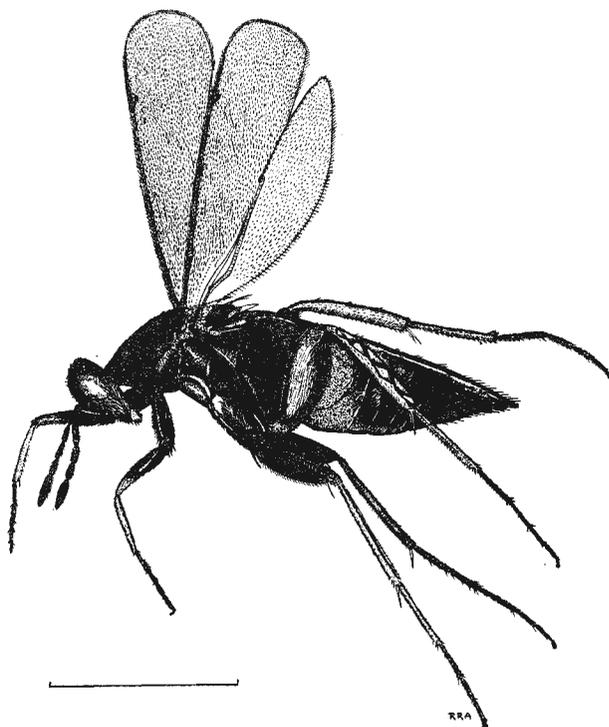


FIG I.—*Elasmus flabellatus*, female. Scale line = 1.0 mm.

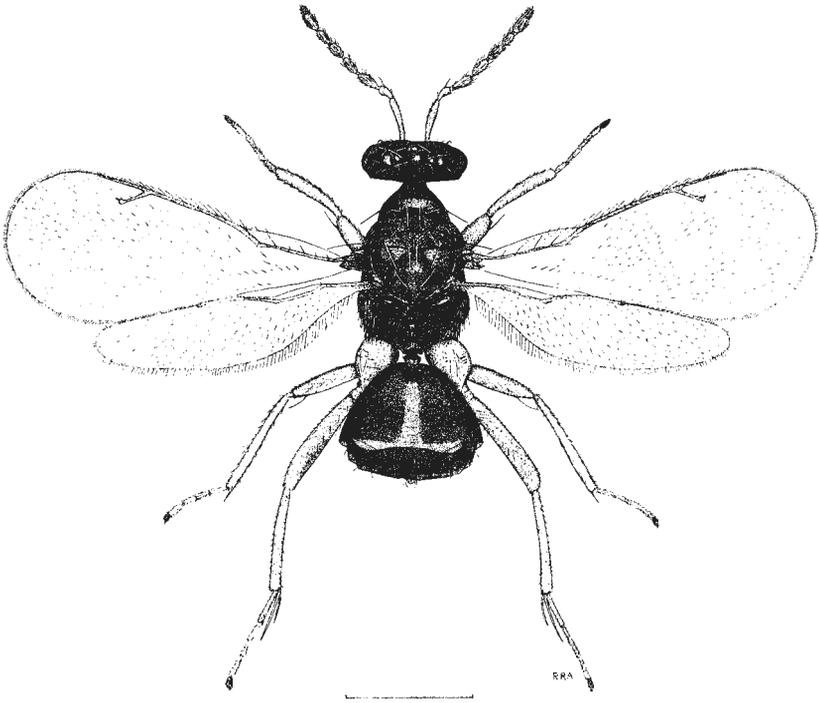


FIG. II.—*Euplectrus bicolor* f. *intactus*, female. Scale line = 1.0 mm.

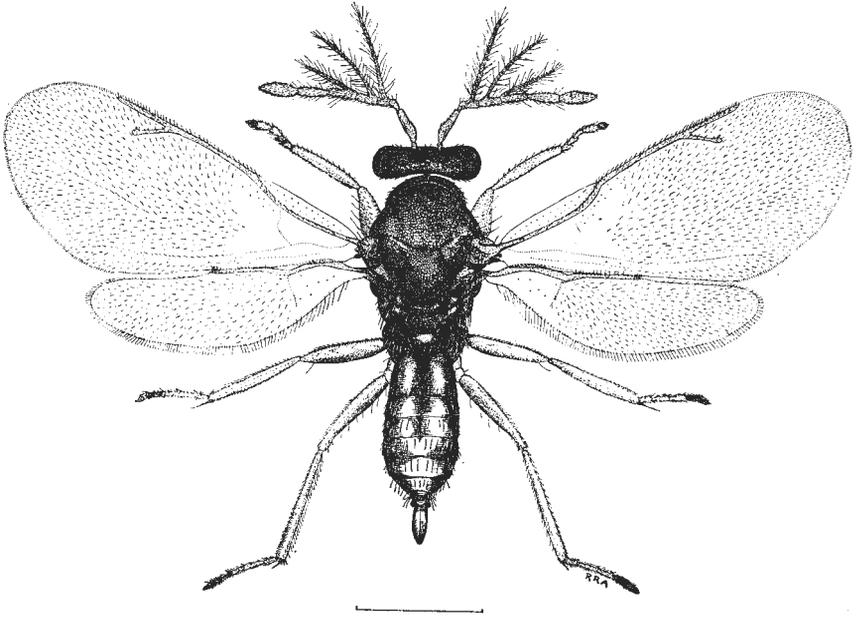


FIG. III.—*Eulophus larvarum*, male. Scale line = 1.0 mm.

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