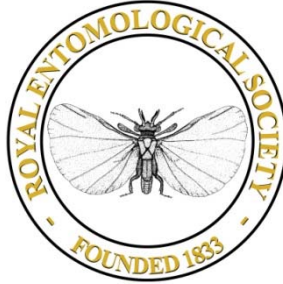


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HANDBOOKS FOR THE IDENTIFICATION OF BRITISH INSECTS

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HANDBOOKS FOR THE IDENTIFICATION OF BRITISH INSECTS



HYMENOPTERA

2. CHALCIDOIDEA. SECTION (a)

By

Ch. FERRIÈRE and G. J. KERRICH.

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A list of parts now available appears on the back cover

ACCESSION_NO 607

Ferriere Ch and Kerrich G J

HYMENOPTERA: CHALCIDOIDEA

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HYMENOPTERA

CHALCIDOIDEA

AGAONTIDAE, LEUCOSPIDAE, CHALCIDIDAE, EUCHARITIDAE,
PERILAMPIDAE, CLEONYMIDAE AND THYSANIDAE

by CH. FERRIÈRE AND G. J. KERRICH

INTRODUCTION

THE Chalcidoidea (Chalcid flies) form one of the largest superfamilies of the Hymenoptera, and are distributed in almost all parts of the world. Almost 2300 world genera and about 25,000 world species have been described. Although for Europe alone the totals are about 450 genera and 5000 species, our knowledge of nearly all of these remained very backward up to the present decade, for few entomologists were interested in them despite their great importance.

Actually, British entomologists were prominent as pioneers in the study of the Chalcids in the middle of the last century. Curtis in 1826-32, Westwood in 1832-74, Haliday in 1833-62 and, above all, Walker in 1832-72 described the greatest number of European species named up to the present day. But there the matter rested: these authors' collections were scarcely studied any more, and the species were mostly not interpreted by continental authors who wrote treatises on these insects. The most notable of these continental authors were Dalman, Boheman and Thomson in Sweden, Nees and Esenbeck, Ratzeburg and Förster in Germany, Mayr and Ruschka in Austria, Fonscolombe in France, Mercet in Spain, and Spinola, Rondani and Masi in Italy.

Now, however, there is a great resurgence of interest in Chalcidoidea, both in Britain and in continental Europe, and the present quarter-century should see our knowledge of the species quite transformed.

Soon after the commencement of the Royal Entomological Society's scheme for publishing *Handbooks* of British Insects, Ferrière wrote to Kerrich to propose collaboration in producing at least one fascicle on the Chalcids, his principal idea being that the elucidation of the British species would enable the, mostly prior, British authors' names to be applied correctly in the writing of continental works.

Ferrière already had manuscript keys to the European Chalcidoid families and genera, and in many cases also the species, and these keys formed the starting point for the present work. Kerrich re-studied the species, largely from the material in the British Museum (Natural History) and the Oxford University Museum, and the keys now published are adapted to accord with his findings. Some of the work was done in fuller detail than would be suitable for inclusion in this series and in connection with considerable continental

material, and this has already been published elsewhere (Kerrich and Graham, 1957 ; Kerrich, 1958). The key to families has been continually revised by both authors, and it is hoped that it now forms a satisfactory practical key : moreover, since a key to families is used to the greatest extent by comparative beginners, it is not thought superfluous to provide an alternative to that already published by Richards (1956).

The figures in the section on the key to families and on the Chalcididae (with one exception) have been drawn by Ferrière, those on the Perilampidae, Cleonymidae (with four exceptions) and Thysanidae by Kerrich. The five illustrations of whole insects numbered in Roman figures (pages 33 to 36) were drawn by the distinguished entomological artist, Mr. Arthur Smith. Figures 36-47 (Perilampidae), and most of figures 48-71 and figure V (Cleonymidae) have been renumbered and reproduced by courtesy of the editors of *Opuscula Entomologica*, Lund, and of the Society for British Entomology.

GENERAL BIOLOGY AND ECONOMIC IMPORTANCE (Ch. F.)

The Chalcids are mostly of small size, and do not readily attract attention ; but, examined under a lens, they often reveal splendid metallic tints which would enable them to rival the beauty of the Chrysidids were they larger. Moreover, they exhibit a variety of form which is captivating to those who undertake their study. For their systematic position and details of their general morphology we refer to the introductory volume on Hymenoptera in this series (Richards, 1956).

From the point of view of their biology, the Chalcids are particularly interesting, but this is a subject that must be treated briefly in these *Hand-books*. A general review of the biology of insect parasites was given by Imms (1931), while more detailed information, classified to insect families, is given in the book by Clausen (1940).

Although numerous genera and species use plant food, the vast majority of Chalcids are parasites or, more strictly, parasitoids, since their hosts do not survive the completion of their larval feeding. The eggs may be laid, by means of an ovipositor, either externally on the skin of the host larva or pupa, or internally, within the body of the host pupa, larva or egg. Accordingly, the resultant larvae are external feeders (ectoparasites) or internal feeders (endoparasites). In general, hosts which live hidden in the interior of vegetable tissues or are hidden in cocoons are attacked by ectoparasites, while free-living hosts tend more to be attacked by endoparasites ; but there are many exceptions, and a single host may be attacked by both an ecto- and an endoparasite, as well as by more than one of either.

Some parasites are solitary, *i.e.* a single egg is laid in the host ; others are gregarious, in which case the relatively small adult lays more than one, often many, eggs within the same host, which is sufficiently large to nourish all these progeny (but see the exception mentioned below).

Superparasitism is the parasitization of a single host by more than one individual of the same host species. This may arise from the normal gregarious habit, or may, on the other hand, be due to successive attacks on the same host by different individuals. The attack on one individual host by two or more parasite species is known as multiparasitism. Except with gregarious

parasites, the host cannot usually nourish more than one ; and in such cases the earlier hatching or more powerful larva survives at the expense of the other. The feeding of one parasite on another is known as hyperparasitism, and many species and genera are normally or always hyperparasites.

As in other Hymenoptera, the sex of an individual depends on fertilization, those eggs which have received sperm from the spermatheca developing into females and those that have not developing into males. This is known as haplo-diploidy, that is to say the males are haploid, having n chromosomes, and the females are diploid with $2n$. After reduction-division the ovarian eggs are haploid, and give rise to diploid females if fertilized and to haploid males if not. But numerous cases are also known of theletokous parthenogenesis, in which unfertilized eggs give rise to female offspring, and males are often unknown. In such cases reduction-division does not take place, and the ovarian eggs remain diploid.

Embryonic development in the egg generally takes place as in other Hymenoptera : the pronucleus, whether fertilized or not, divides progressively until the secondary nuclei, after reaching the periphery of the egg, become surrounded with cytoplasm and thus form the blastoderm, the first outline of the embryo. This, then, develops in the amnion.

In some Encyrtidae parasitizing Lepidoptera, however, the embryonic development is more complex. The pronucleus divides a number of times, and then daughter cells form around each of the secondary nuclei, and these develop until the egg is filled. Each daughter cell develops into an embryo within an amniotic membrane. This phenomenon is known as polyembryony, and results in a single parasite egg giving rise to a number of offspring. This number ranges from a few dozen up to about a thousand in the case of *Litomastix truncatellus* Dalm., a parasite of a large moth larva. All these individuals, arising from a single egg, are necessarily of the same sex. The same phenomenon occurs in some species of the Braconid genus *Macrocentrus*.

The larvae are mostly of the type usual among the petiolate Hymenoptera, right from their emergence from the egg. The Eucharitidae and Perilampidae are exceptional in having a first-stage planidium larva, of the type occurring also in certain Coleoptera. These larvae emerge in most cases from eggs laid on leaves or twigs ; they are more or less mobile, but await the arrival of a suitable host to which to attach themselves. In the case of the Eucharitidae these are ants, in the case of Perilampidae Lepidoptera, sawflies or Chrysopids according to the species. Some Perilampidae are obligate hyperparasites : the eggs, laid on leaves, are swallowed by caterpillars, and this causes the emergence of the larvae which develop at the expense of any Tachinid or Ichneumonoid larva which that caterpillar may contain.

Chalcids use almost all orders of insects as hosts. Some species are host-specific or confined to certain host genera, others are more polyphagous ; but even in the case of the more polyphagous parasites, there is often a kind of specialization, e.g. in the type of situation in which the host is found.

Host records, where known, will be given for all species treated in the *Handbooks*. In general it may be stated that the immature stages of insects with complete metamorphosis are the hosts most generally used, and the enemies of Lepidoptera, Diptera, Coleoptera and Hymenoptera are very numerous among almost all Chalcidoid families. Among the Neuroptera it

is the green lace-wings (Chrysopidae) that are most parasitized, and those by Perilampidae, Encyrtidae and Eulophidae; ant-lions (Myrmelionids) are attacked by Chalcidids of the genus *Hybothorax*.

However there are also very many parasites of Homoptera, especially among the Encyrtidae and Aphelinidae. Heteroptera are much less frequently parasitized; but eggs of various bugs are attacked by Pteromalidae (*Acroclisoides*, *Coruna*), Eupelmidae (*Anastatus*), Encyrtidae (*Ooencyrtus*, *Tetracnemella*), Trichogrammatidae (*Abbella*) and Mymaridae. Orthoptera, too, are most attacked in the egg stage: from the eggs of cockroaches, Mantids and the larger grasshoppers especially, one may rear parasites belonging to several Chalcid families. Thrips (Thysanoptera) have enemies among the Eulophidae (*Thriposoma*, *Dasyscapus*, *Epomphale*, *Cryptomphale*, *Thripocetenus*, *Thripobius*, *Tetrastichus*) and the Trichogrammatidae (*Megaphragma*). Even Arachnida have Chalcidoid enemies: spiders' eggs are eaten by larvae of Eurytomidae (*Bruchophagus*), Pteromalidae (*Erupteromalus*), Eupelmidae (*Arachnophaga*), Encyrtidae (*Amira*) and Eulophidae (*Pseudacrias*), and Acari serve as hosts for Encyrtidae (*Ixodiphagus*) and Eulophidae (*Tetrastichus*).

Although the vast majority of Chalcids are parasites, there are also many phytophagous forms. Agaontidae and Torymidae of the subfamily Idarninae develop in figs, while Eupelmidae of the subfamily Tanaostigminae and Pteromalidae of the tribe Brachyscelidiphagini are all gall-formers in the manner of the best-known Cynipidae. Numerous Torymidae, Eurytomidae and Eulophidae live in plant seeds or twigs; but these are mostly closely related to entomophagous forms, and in some genera it is difficult to tell which species are plant-feeding and which parasitic. Some of these phytophagous forms are attacked by closely related parasites.

Many Chalcidoids are parasites of noxious insects of importance in agriculture and forestry, and contribute to the maintenance of a natural equilibrium which the activities of man have often tended to destroy. This is of particular importance in relation to harmful insects which have become transported from one country to another and, under favourable conditions, multiply rapidly in the absence of their natural enemies.

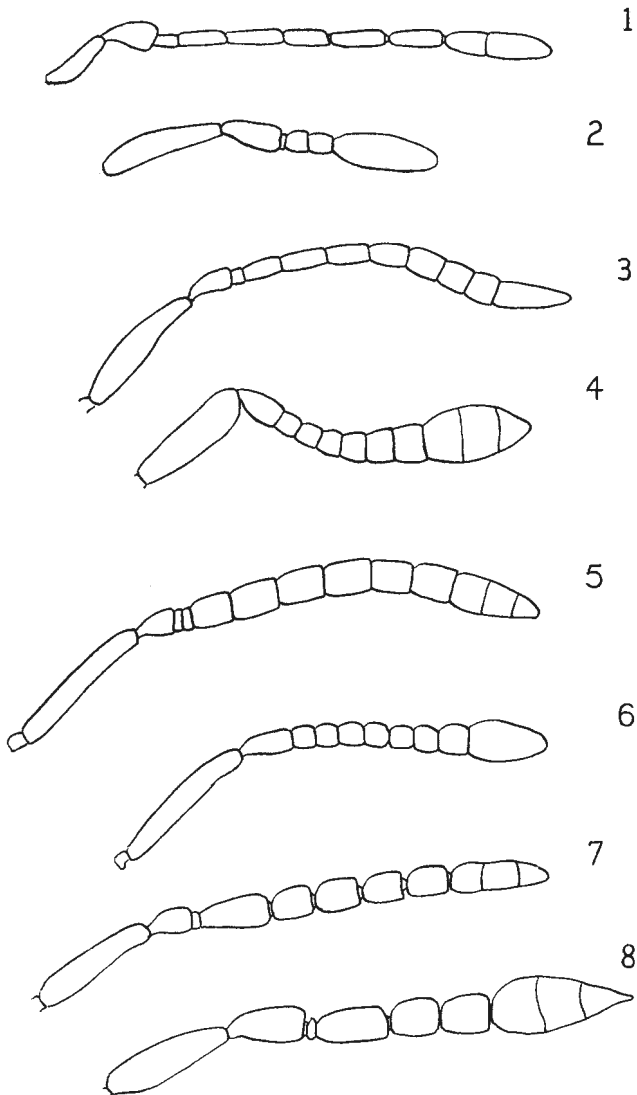
For many years, parasites and predators have been sought in various countries, and introduced to others for the biological control of such insects. Following the example of the U.S.A., the British Commonwealth organized an Institute of Biological Control which, centred at Farnham Royal before the war, has studied the parasites of many noxious insects. It is thus that thousands of parasites of such pests as the Lepidoptera *Rhyacionia buoliana* (Schiff.), *Plutella maculipennis* (Curtis), *Cydia pomonella* (L.), *Laspeyresia molesta* Busck, *Coleophora laricella* (Hübner.), the Hymenoptera *Cephus pygmaeus* (L.) and species of *Diprion*, the Diptera *Phytomyza ilicis* (Curtis) and others, from Britain and the Continent, have been reared at Farnham Royal, determined through the Commonwealth Institute of Entomology at the British Museum, and sent to various parts of the Commonwealth, particularly Canada. Conversely, American parasites have been introduced to Britain, the best known being the Aphelinid, *Encarsia formosa* Gahan, which is established in greenhouses for the control of the white fly, *Trialeurodes vaporariorum* (Wstw.). The Commonwealth Institute of Biological Control is now centred in Ottawa, and maintains a number of out-

stations in various parts of the world for the study of parasites, particularly Diptera and Hymenoptera.

But the taking of a species from one country and establishing it in another is not the sole aspect of biological control. It is also of importance that there should be a detailed study of the systematics and ecology of the indigenous species. These often play an important role in the maintenance of natural equilibrium, a role that is often very imperfectly understood, and which may be thwarted by the application of chemical treatment just at the time the parasites are most vulnerable. The questions of the validity of species and of biological races are important for both pure and applied science. It is hoped that these *Handbooks* will contribute to a better understanding of the British species involved.

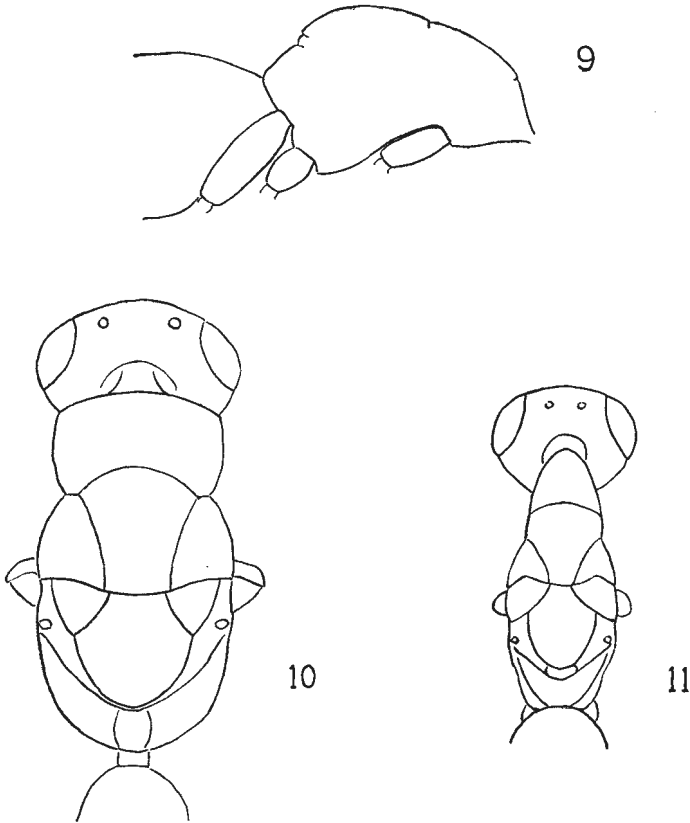
PRACTICAL KEY TO FAMILIES
OF BRITISH CHALCIDOIDEA

- 1 Wings narrow and with long marginal cilia; the hind pair linear, parallel-sided (fig. 20) 2
- Wings generally broad, the hind pair not linear (Figs. I-V and figs. 16-19) 3
- 2 Tarsi 4- or 5-segmented: antennae elongate and slender, 8-13-segmented, without annelli (fig. 1): fore wings with venation reduced, the radius always undeveloped MYMARIDAE
- Tarsi 3-segmented: antennae rather short, 7-segmented, with scape almost half the total length and with an annellus: fore wings of female with the usual Chalcid venation, including the radius, distinct; male brachypterous
TRICHOGRAMMATIDAE (part), gen. *Prestwichia*
- 3 Hind coxae very elongate, several times length of fore coxae, generally ridged above (fig. 9): (radial vein short, the stigma close to the marginal vein (fig. 16))
TORYMIDAE
- Hind coxae less elongate, more or less oval, or large and rounded (e.g. figs. 36, 37) .. 4
- 4 Hind femora greatly thickened, usually with a row of teeth below, and hind tibiae decidedly curved (e.g. Figs. I, II and figs. 23-29) CHALCIDIDAE (p. 11)
- Hind femora but little thickened, their tibiae scarcely curved (e.g. Figs. III, IV, V) . 5
- 5 Mid-tibia with a strong spur used for jumping (figs. 12, 79): mesopleura in most forms undivided 6
- Mid-tibia with normal spur: mesopleura normally divided 9
- 6 Scutellum, together with axillae, forming a parallel-sided, strongly transverse band: metanotum large, triangular, propodeum V-shaped, and gaster not basally constricted (fig. 78, p. 31): antennae with not more than 4 funicle segments which are very small, almost annelliform, and with club relatively large (fig. 77): small, shining, brownish-black insects with strongly spiny legs (fig. 79): (marginal vein not short (fig. 75)) THYSANIDAE (p. 30)
- Not as above 7
- 7 Axillae produced distinctly forward of the anterior margin of the scutellum: antennae with 8 or fewer segments and marginal vein not short (fig. 18): small or rather small Chalcids APHELINIDAE
- Anterior margin of axillae continuing more or less in line with that of scutellum: if the marginal vein is not short the antennae are more than 8-segmented and the insects are of moderate size 8
- 8 Antennae with annellus and 7-segmented funicle, or rarely with 8-segmented funicle and no annellus (fig. 3): marginal vein long: notaulices more or less distinct, at least in winged forms EUPELMIDAE
- Antennae without annellus and with 6 or fewer funicle segments (fig. 4): marginal vein short: notaulices absent, or sometimes weakly indicated ENCYRTIDAE
- 9 Fore tibiae with spur large and curved (fig. 14): tarsi 5-segmented: antennae 10-13-segmented, or 8-11 if the club is undivided (figs. 5-7 and Fig. V) 10
- Fore tibiae with spur generally short and straight (fig. 13); tarsi 4-, seldom 5- or 3-segmented: antennae 3-10-segmented (figs. 8 and 2) 19



FIGS. 1-8.—Right antenna of: (1) *Anaphoidea declinata* Soyka, fam. Mymaridae; (2) *Trichogramma evanescens* Wstw., fam. Trichogrammatidae; (3) *Eupelmus atropurpureus* Dalm., fam. Eupelmidae; (4) *Microterys lunatus* Dalm., fam. Encyrtidae; (5) *Pteromalus variabilis* Ratz., fam. Pteromalidae; (6) *Spalangia erythromera* Först., Pteromalidae subfam. Spalangiinae; (7) *Eurytoma mayri* Ashm., fam Eurytomidae; (8) *Tetrastichus tineivorus* Ferr., fam. Eulophidae.

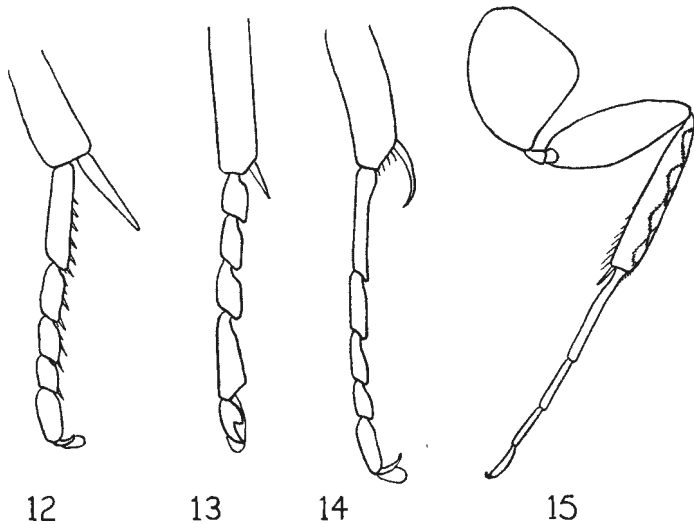
- 10 Pronotum strongly developed, more or less parallel-sided or narrowed anteriorly (e.g. figs. 10, 70 and Fig. V).....11
 - Pronotum short, strongly transverse (Figs. III, IV, exceptionally as Fig. 11)...16
 11 Pronotum elongate, somewhat triangular, narrowed anteriorly (fig. 70 and Fig. V):
 (notaulices generally strongly developed, often very strong and percurrent:
 gaster seldom distinctly petiolate: wings without a tuft of bristles at base of



FIGS. 9-11.—(9) Thorax, coxae and base of abdomen, in dextralateral view, of *Torymus cultriventris* Ratz., fam. Torymidae; (10) head, thorax and base of abdomen, seen from above, of *Eurytoma appendigaster* Boh., fam. Eurytomidae, to illustrate especially the shape of the pronotum; (11) the same of *Platynocheilus erichsonii* Wstw., an aberrant genus of Eulophidae.

- marginal vein: head downwardly-directed in the normal manner: subcostal vein running unbroken to marginal (figs. 63, 64, 71): antennae with annellus and 7-segmented funicle, or with 2 or 3 annelli and fewer funicle segments: hind tibiae with 2 spurs).....CLEONYMIDAE (p. 21)
 - Pronotum rectangular or trapezoidal, parallel-sided or but little narrowed anteriorly; if somewhat elongate and narrowed, then the notaulices are short and weakly developed: (gaster more or less petiolate).....12
 12 Head often forwardly-directed, with antennae inserted at fore margin: antennae without annellus and with 7-segmented funicle (fig. 6): hind tibiae with 1 spur: body black.....PTEROMALIDAE, SPALANGIINAE

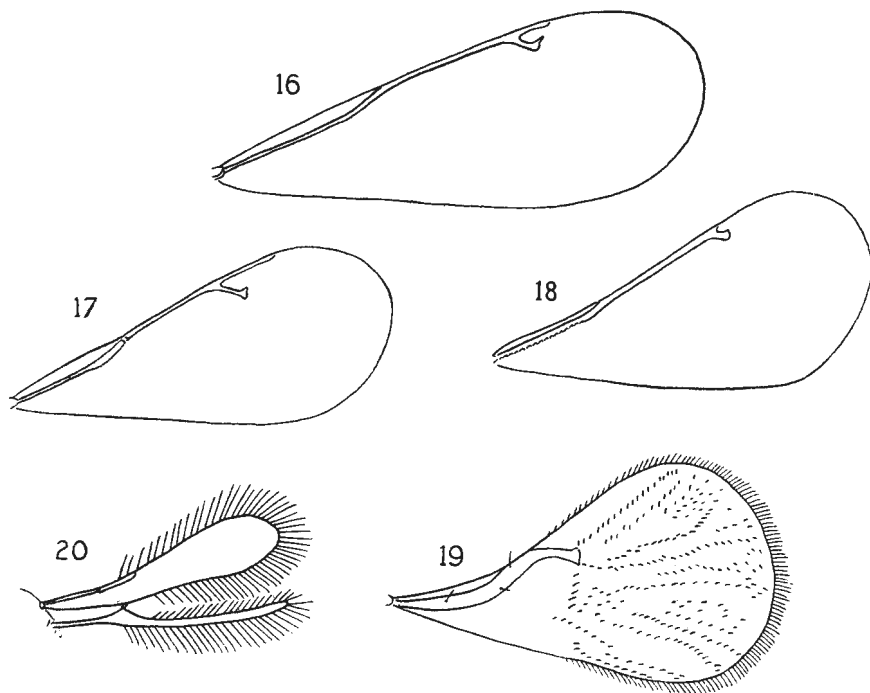
- Head downwardly-directed in the normal manner, with antennae generally inserted distinctly above clypeus : the other characters of alternate not in combination . . . 13
- 13 Fore wings with tuft of bristles at base of marginal vein : antennae very seldom with annellus, never so in brachypterous forms . . . PTEROMALIDAE, CEROCEPHALINAE
- Fore wings without such tuft of bristles : antennae with 1 or 2 annelli 14
- 14 Body metallic coloured, green or blue : thorax above finely punctate or with close reticulation (as in many Pteromalidae) : gaster not compressed : antennae with 2 annelli and 6-segmented funicle (as in fig. 5)
PTEROMALIDAE, SPHEGIGASTERINAE (part)
- Body black or blackish, or sometimes yellowish or parti-coloured : thorax above generally much more coarsely reticulate : gaster usually laterally compressed : antennae with 1 annellus 15



FIGS. 12-15.—(12) Mid-tibia and tarsus of *Litomastix truncatellus* Dalm., fam. Encyrtidae ; (13) fore tibia and tarsus of *Eulophus larvarum* L., fam. Eulophidae ; (14) the same of *Dibrachys cavus* Walk., fam. Pteromalidae ; (15) hind leg of *Elasmus albipennis* Thoms., fam. Elasmidae.

- 15 Antennae with funicle 7-segmented : fore wing with stigma greatly enlarged, usually deeper than long, with marginal very little thickened and with postmarginal long : ovipositor very strongly exerted . . . TORYMIDAE, MEGASTIGMINAE
- Antennae with funicle 5- or 4-segmented (fig. 7) : fore wing with stigma not notably enlarged, with marginal sometimes thickened and with postmarginal not long : ovipositor not strongly exerted EURYTOMIDAE
- 16 Thorax strongly convex (figs. 36-37, p. 19) : antennae with 7-segmented funicle. 17
- Thorax of normal proportions : antennae with 6 or fewer funicle segments . . . 18
- 17 Antennae without annellus : mandibles sickle-shaped : radius very weakly developed : gaster with a large tergite beyond petiole, almost covering those following (Fig. III) EUCHARITIDAE (p. 17)
- Antennae with annellus : mandibles of normal form : radius normally developed : gaster with 2 large tergites beyond petiole, almost covering those following (Fig. IV) PERILAMPIDAE (p. 18)
- 18 Fore tibia with spur large and curved (fig. 14) : subcostal vein running unbroken to marginal : tarsi 5-segmented in both sexes : generally stouter Chalcids of moderate size PTEROMALIDAE

- Fore tibiae with spur straight (as in fig. 13): subcostal vein broken: tarsi 5-segmented in female, 4-segmented in male: generally slender, small-sized Chalcids EULOPHIDAE, TETRACAMPINI
- 19 Hind coxae very large, broad and flattened: mid and hind femora broad and flattened; legs elongate and spiny, the hind tibiae often with stout hairs arranged in lozenge-shaped pattern (fig. 15).....ELASMIDAE
- Legs of normal form; in particular, the hind legs not as in alternate.....20



FIGS. 16-19.—Right fore wing of: (16) *Torymus cultriventris* Ratz., fam. Torymidae; (17) *Prigalio longulus* Zett., fam. Eulophidae; (18) *Cocophagus scutellaris* Dalm., fam. Aphelinidae; (19) *Trichogramma evanescens* Wstw., fam. Trichogrammatidae.

FIG. 20.—Fore and hind wings of *Anaphoidea declinata* Soyka, fam. Mymaridae.

- 20 Tarsi 3-segmented: generally minute insects, of length less than 1 mm., with wings short and broad, bearing hairs often arranged in longitudinal rows (fig. 19)
 TRICHOGRAMMATIDAE
- Tarsi 4-, sometimes 5-segmented: generally distinctly larger insects.....21
- 21 Mid-tibia with spur strong and stout: fore wings with submarginal vein running rather close and almost parallel to costal margin (fig. 18): (body shorter and stouter: tarsi 5-segmented in the majority of genera, including those most frequently found)..... APHELINIDAE
- Mid-tibia with spur short and slender: fore wings with submarginal vein running further from costal margin, leaving the costal cell broader and not nearly parallel-sided (fig. 17): (body more or less elongate: tarsi 4-segmented except in female Tetracampini)EULOPHIDAE

Family AGAONTIDAE

The Agaontidae (Fig Insects) are very peculiar Chalcids. They are rather lightly sclerotized insects, with the head more or less flattened and forwardly-directed, and the gaster attached very broadly to the propodeum ; the fore and hind legs are stout, their femora being much longer than their tibiae, but the mid-legs in most forms are slender. The head in the female has a broad, deep median furrow reaching the posterior margin, and in the male has often a deep excavation in which the antennae lie.

In other Chalcids, by contrast, when any legs are stout, the femora are not longer than their tibiae ; and if the head is more or less flattened and forwardly-directed (Spalangiinae), it has no such broad furrow or excavation, and the insect is more strongly sclerotized and has the gaster distinctly petiolate.

The fig insects lay their eggs and cause galls in the ovaries of the form of fig to which they are attached. The male bites a hole in the gall and fertilizes the female that has developed within it. The better known species of the Mediterranean region is *Blastophaga psenes* L. This develops on a wild form of *Ficus carica* L., which has male and female flowers and is known as the caprifig. Branches of the caprifig are hung in trees of the Smyrna Fig, which has female flowers only, and the emergent females pollinate the cultivated plant.

Agaontidae do not occur in Britain ; the figs cultivated here are of forms not requiring caprification.

Associated with the fig insects, either as inquilines or parasites, are the Idarninae, a subfamily of the Torymidae. The females are distinguished from the Toryminae by having the radius long ; the ovipositor is long, and the gaster is usually depressed but, if compressed, then the hypopygium is large and outstanding. The males are apterous and are extremely similar to the males of their hosts, but can be distinguished by having femora not longer than their tibiae.

Family LEUCOSPIDAE

The Leucospidae are closely related to the Chalcididae, and share with them the generally large or rather large size, the stout body form with strong sculpture, and, in particular, the form of the hind femora and tibiae. They differ most notably in having the ovipositor folded over the dorsum, which is partly grooved for its reception, and in having the fore wings longitudinally folded when at rest, as in the Vespidae.

In number of world species this family is small. Eight species of the genus *Leucospis* occur in the western Palaearctic Region, and these are black and bright yellow coloured like many wasps. The best known is *L. gigas* Fabr., a parasite of the bee, *Megachile muraria* Retz. ; but probably the commonest European species is the smaller *L. dorsigera* Fabr. It is scarcely conceivable that either of these could occur in Britain and have eluded observation.

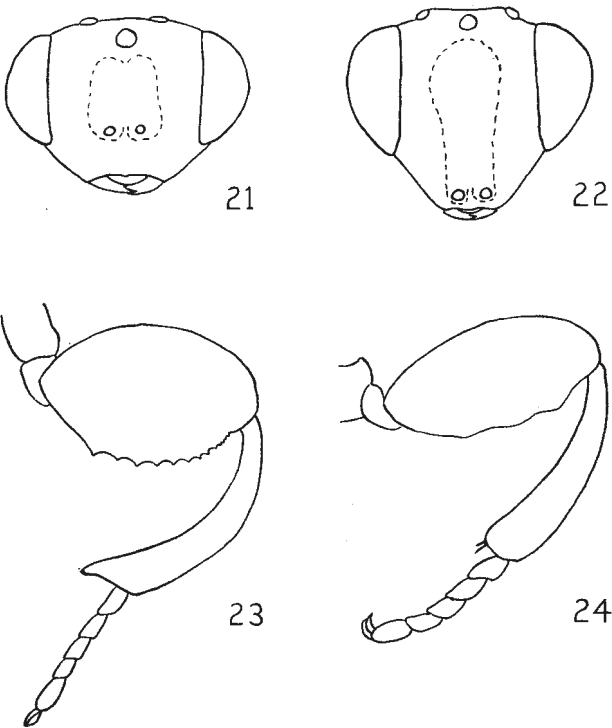
Family CHALCIDIDAE

The Chalcididae are of generally large or rather large size, of stout body form with strong sculpture, having the hind femora greatly swollen and the hind tibiae correspondingly curved (Figs. I and II). In colour they are generally black, often varied with yellow, whitish or red, especially on the legs. The species are parasites emerging from pupae, more often of Lepidoptera or Diptera, but sometimes from Hymenoptera or Coleoptera.

This family is on the fringe of its distribution in Great Britain. In parts of Europe that are significantly warmer the number of genera and species occurring is very much greater, particularly in the Haltichellinae, though all four known European Chalcidinae are listed as British.

KEY TO SUBFAMILIES

- 1 Hind tibia rather truncate at apex, with the normal 2 spurs (fig. 24): antennae inserted a short way above clypeus, closely flanking the plate-like interantennal keel (fig. 22): (gaster short-petiolate).....HALTICHELLINAE
- Hind tibia, at apex, produced into a strong spine, with or without a spur (fig. 23): antennae inserted about in middle of face, and also wider apart (fig. 21).....2



FIGS. 21-24.—Head, in facial view, of: (21) *Brachymeria minuta* (L.) and (22) *Haltichella rufipes* (Oliv.). Hind leg of: (23) *Brachymeria minuta* (L.) and (24) *Haltichella rufipes* (Oliv.).

- 2 Gaster short-petiolate, with petiolar segment, as seen from above, strongly transverse : (hind coxae rather short and stout, very much shorter than gaster without petiole).....BRACHYMERIINAE
 - Gaster long-petiolate, with petiolar segment longer than broad : (hind coxae decidedly elongate, about as long as gaster without petiole).....CHALCIDINAE

The subfamilies not occurring in Great Britain are the Dirhininae and Epitraninae. The Dirhininae have species occurring in southern Europe, but do not approach our shores. These parasites of Diptera have the frons very strongly bicornute : the hind tibia is as in *Brachymeria* but the petiolar segment is clearly visible, though generally broader than long, and there is no postmarginal vein. The Epitraninae (= Chalcitellinae) is a small subfamily unrepresented in Europe. They are nearest related to the Chalcidinae, but have the antennae inserted low on the face.

Of recent years we have become very well served with literature for the identification of the species of the western Palaearctic Region. Masi (1951) published an excellent revision of the western Palaearctic species of *Brachymeria*, Steffan (1951-53) good, critical, well-illustrated keys to the French species of Haltichellinae, and Bouček (1952a) a revision of the European species of the whole family, written in English and with 150 figures, to which a few additions and corrections have since been made (1955, 1956a).

Subfamily CHALCIDINAE

KEY TO GENERA

- Mid-tibia without an apical spur (a very weak one present in some tropical species) : female hypopygium narrow but very distinct, extending about to apex of gaster : hind femora with a large tooth below, strong in female, followed by 8-16 rather small teeth (figs. 25-28) ; petiole about twice as long as broad, extending well beyond mid-point of hind coxae.....*Chalcis* Fabricius (p. 12)
 Mid-tibia with a distinct apical spur : female hypopygium inconspicuous : hind femora with about 25 quite small teeth on a lobe following the basal tooth (fig. 29) : petiole much less than twice as long as broad, not reaching mid-point of hind coxae.....*Spilochalcis* Thomson (p. 14)

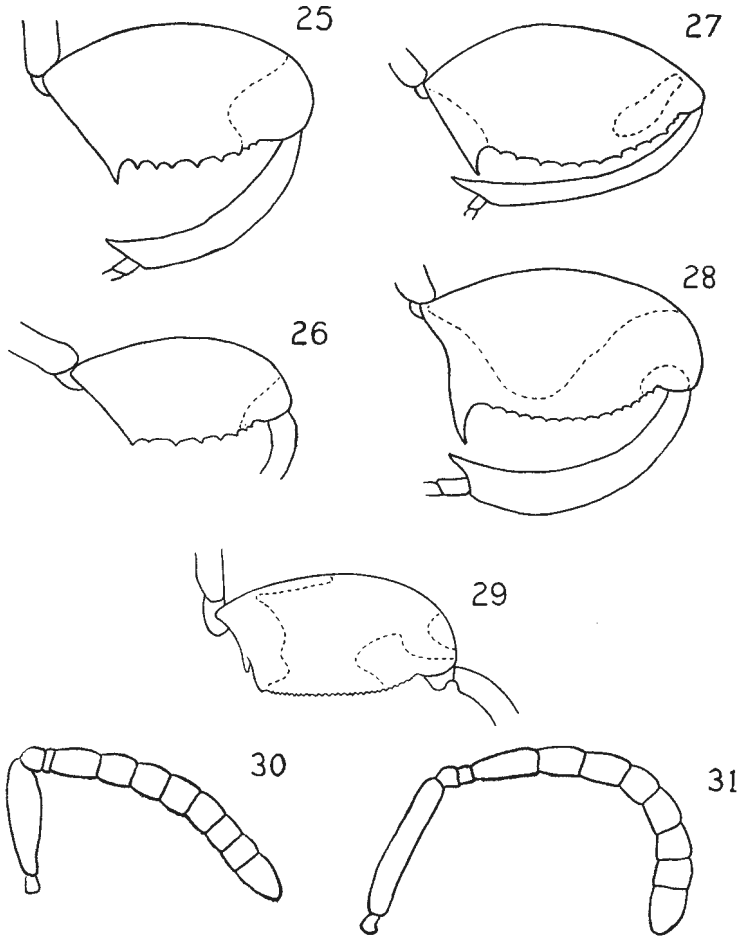
Genus *Chalcis* Fabricius

KEY TO SPECIES

- 1 Antennae not clavate (fig. 30) : mesoscutum reticulate-rugose, with few punctures well separated : fore and mid-femora much more strongly clavate than in alternate : hind femur with no inner basal tooth, but only a tubercle in that position ; with 7-8 teeth beneath, the first large in female only : hind femur largely rufous, black at apex, and with a subapical pale spot below (figs. 25-26)
sipes Linnaeus
England: widespread. Ireland (A. W. Stelfox).
 - Antennae clavate (fig. 31) : mesoscutum reticulate in regions of mid-line and notaulices but with many punctures well separated : fore and mid-femora much less strongly clavate : hind femur with a strong inner basal tooth ; with more teeth beneath than in alternate (figs. 27-28).....2
 2 Inter-antennal keel sharp : hind femur beneath with first tooth very large in both sexes, followed by 10-12 small teeth : hind femur black, with one pale yellow mark below which includes the large tooth, and another on each side near apex (fig. 27) : petiole black.....*biguttata* Spinola (Fig. 1)
(= *melanaris* Dalman)

Kent, Essex.

- Inter-antennal keel blunt : hind femur beneath with first tooth very large in female, in male distinctly larger than the others but not very large, followed by 13-15 small teeth : hind femur yellow, with a large blackish mark above and a small one at apex (fig. 28) : petiole yellow.....*myrifex* Sulzer
Said to have been found near London (Curtis): E. Yorks., Kelsey Hill, ex Stratiomyis larva (T. Stainforth).



Figs. 25-29.—Left hind femur, etc. of : (25) *Chalcis sispes* (L.) female and (26) male ; (27) *Chalcis biguttata* Spin. female ; (28) *Chalcis myrifex* Sulz. female ; (29) *Spilochalcis xanthostigma* Dalm. female.
 Figs. 30-31.—Right antenna of : (30) *Chalcis sispes* (L.) (not clavate) and (31) *Chalcis myrifex* Sulz. (clavate).

The above three species are the only ones known in Europe, though nine species are known in America north of Mexico. In the tropics the genus is apparently confined to high altitudes. The species parasitize Stratiomyid larvae.

Genus *Spilochalcis* Thomson

A single European species..... *S. xanthostigma* Dalman
 Inter-antennal keel with a strong, upwardly-directed tooth: pair of conspicuous flavous marks on mesoscutum and another on scutellum: hind femora blackish-brown, profusely yellow-marked (fig. 29).

Parasite of the sawfly genus Arge.

A J. F. Stephens specimen in the British Museum collection is reputedly British: this record is confirmed by 1 ♂, Norfolk, Kings Lynn, vii. 1913 (Atmore), in coll. of C. Morley.

This genus is very rich in species in tropical America.

Subfamily BRACHYMERIINAE

The single European genus *Brachymeria* is represented in almost all parts of the world where the summer temperature is not less than it is in southern England. It is very rich in species, of which about a dozen occur in Europe. They are reared mainly from pupae of Lepidoptera and puparia of Diptera. The remaining world genera are few in number and not rich in species.

Genus *Brachymeria* (Westwood MSS.) Stephens

The only certainly British species..... *B. minuta* Linnaeus (Fig. II)

It has been found in Yorkshire (W. D. Hincks), Suffolk (Morley, 1936), Cambs., Wicken Fen (H. St. J. K. Donisthorpe), Gloucestershire (H. Britten) and S. Wales (H. M. Hallett), and to the south of this line right down to W. Cornwall (O. W. Richards). Has been reared from Sarcophagidae.

B. minuta was described as *Vespa minuta* by Linnaeus, but normal specimens are larger than many other species of this genus.

B. vicina Walk. occurs in northern France, and has now been found in Jersey by O. W. Richards, in the first half of August, 1946. It should be looked for in favourable localities in southernmost England, but may be difficult to separate from dwarf specimens of *minuta* L.

Two specimens of *B. intermedia* (Nees) var. *scirropoda* Först. have been incorporated in the collection of British chalcids of the British Museum (Natural History). They are labelled "Farnham Royal, England, 6.vi.32". Dr. W. R. Thompson writes, however, that these might quite well have been of continental origin, and that the occurrence of the species in Britain must be regarded as doubtful.

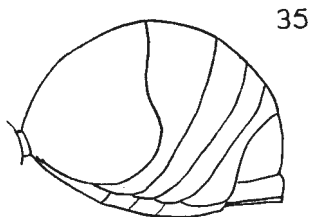
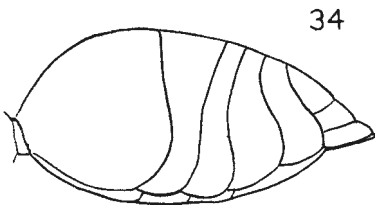
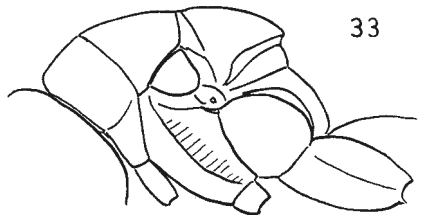
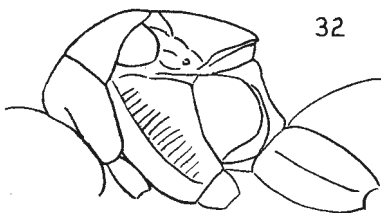
In the same collection a space has been provided for *B. femorata* Panz. Two specimens of this species have been found, without any data, in an old collection of reputedly British insects in Manchester; but they may very well have been imported with vegetables from southern Europe.

A species on the British list is *B. flavipes* Fabr., recorded by Stephens (1829). Ruschka (1922) stated that *flavipes* Fabr. was a South American species, while *flavipes* Panz. came from the West Indies; but he gave no differences between them. The male type of *B. annulipes* Walk. from St. Vincent has been arranged in the British Museum collection under the name *flavipes* Panz., and the unique female type of *pendator* Walk. from St. Domingo may very well be the same species.

It is likely that a West Indian species might be imported with bananas, as has been, indeed, an undetermined species in the Hope Department, Oxford. Actually, however, the Stephens specimens labelled as *flavipes* in the British Museum collection are all referable to *minuta* L.

KEY TO THESE SPECIES

- 1 Gaster in side view pointed behind (fig. 34); having second large tergite smooth and impunctate near mid-line, or with one irregular transverse row of punctures dorsally: antennal flagellum (except in *flavipes* Panz.) subfusiform: (both mandibles bidentate: hind femora not yellow at base).....2
- Gaster in side view rounded behind (fig. 35); having second large tergite distinctly punctate in middle: antennal flagellum subcylindrical: (gena with a distinct keel from below eye to hind margin of head: second flagellar segment not transverse in female).....4



Figs. 32-33.—Thorax, in sinistro-lateral view, of: (32) *Brachymeria minuta* (L.) and (33) *B. vicina* (Walker).

Figs. 34-35.—Gaster, in sinistro-lateral view, of: (34) *Brachymeria minuta* (L.) and (35) *B. intermedia* (Nees).

- 2 Body normally stramineous-hairy: head (Fig. II): gena with keel from upper mandibular articulation forked below eye, sometimes sending off a pre-orbital carina, and always continuing strongly to hind margin of head (thus cutting off a defined malar area): second flagellar segment transverse: epicnemial carina not lobed or dentate medially, but a longitudinal pit runs to it from a median tooth situated further forward on prepectus: propodeum appearing "dentate" behind spiracle, if viewed at an angle.....3
- Body more strongly silver-hairy: head shorter, and much more strongly narrowed behind eyes: gena with strong keel from upper mandibular articulation to bottom of eye, but with no keel from that point or near it to hind margin of head: second flagellar segment distinctly longer than broad: epicnemial carina (in type of *pendator* Walk.) strongly raised medially into a slightly emarginate lobe, and

- a median tooth present further forward on prepectus : propodeum scarcely "dentate" behind spiracle : (thorax of form described for *minuta* L. : scutellum not or weakly bilobed at apex)..... **flavipes** Panzer
- 3 Thorax high beyond mid-point of mesoscutum, *i.e.* in side view the general contour falls more steeply from beyond middle of scutellum (fig. 32) : scutellum usually quite distinctly bilobed at apex : hind femora more elongate, normally more sparsely punctate and shining ; merging through a very narrow band of red to the yellow apical mark : malar area quadrangular, more or less distinctly angled below eye, and pre-orbital carina distinct : (generally a larger insect, of length about 5-6 mm., but smaller specimens occur)..... **minuta** Linnaeus
- Thorax low beyond mid-point of mesoscutum, *i.e.* in side view the general contour falls more gradually from about that point (fig. 33) : scutellum not or scarcely bilobed at apex : hind femora less elongate, normally more closely punctate and not so shining ; merging to the yellow apical mark through a more distinct band of red (which in some Mediterranean specimens becomes quite broad) : malar area triangular, scarcely angled below eye, and pre-orbital carina not distinct : (smaller than the normal-sized *minuta* L., *i.e.* length about 3-4 mm.)
vicina Walker
- 4 Second large tergite of gaster, near mid-line, for the most part coarsely punctate, the punctures often separated by less than their own diameters : right mandible with a minute middle tooth : scutellum strongly and sharply bilobed at apex : epicnemial carina sharply bilobed medially : propodeum appearing dentate behind spiracle, if viewed at an angle : hind femora yellow at base and apex : second flagellar segment transverse in male..... **femorata** Panzer
- Second large tergite of gaster much more finely punctate above : right mandible clearly tridentate : scutellum weakly bilobed at apex : epicnemial carina more or less bluntly bilobed medially : propodeum scarcely dentate behind spiracle : hind femora not yellow at base : second flagellar segment longer than broad in both sexes : (hind tibiae dark-marked in middle in var. *scirropoda* Först.)
intermedia (Nees)

Subfamily HALTICHELLINAE

KEY TO GENERA

- 1 Marginal vein contiguous with wing margin : postmarginal vein distinct (tribe Haltichellini)..... 2
- Marginal vein separated from wing margin : postmarginal vein absent, or very thin and colourless (tribe Hybothoracini)..... 3
- 2 Head with a pair of sharp pre-orbital keels : scutellum produced into a pair of strong teeth, each about a fifth or sixth the length of the whole sclerite : large tergite of gaster with a pair of sharp keels at base, longitudinally rugose between them : hind femur sinuate beneath, with no sharp tooth or lobe
Haltichella Spinola (p. 16)
- Head with no sharp pre-orbital keels : scutellum terminating in a pair of small, upturned lobes or teeth, very much less than a sixth the length of the sclerite : large tergite of gaster without such keels and rugae : hind femur with a sharp tooth or lobe, about in middle, beneath..... **Hockeria** Walker (p. 17)
- 3 Propodeum falling steeply behind, or with a pair of extremely strong lateral projections which run clearly beyond the base of the gaster.. (other European genera)
- Propodeum not falling steeply behind, nor with such strong lateral projections. . . . 4
- 4 Large tergite of gaster with basal impression bounded by a pair of sharp keels
Euchalcidia Masi (p. 17)
- Large tergite of gaster with basal impression not thus bounded
Invreia Masi (p. 17)

Genus **Haltichella** Spinola

A single European species **H. rufipes** Olivier
(= *armata* Panzer)

Black : all tarsi red, also tibiae at apex and knees, sometimes legs more extensively so.

England S.E. to Cambs., scarce. Host unknown.

Genus **Hockeria** Walker

This genus has not been introduced to the British fauna but should be sought, especially in warm localities in southernmost England. *H. unicolor* Walk. is known to us from Guernsey, and *H. inopinata* Bouček (previously recorded as *bifasciata* Walk.) from South Sweden. Several other European species are known.

Genus **Euchalcidia** Masi

One species has been imported with senna pods, breeding as a parasite of *Pachymerus* (= *Caryoborus*) *pallidus* Oliv. (Col., Bruchidae). . . **E. caryobori** Hanna
Black, antennae and legs in large part red.

A single native European species of this genus is known.

Genus **Invreia** Masi

Only one species known from England. **I. subaenea** Masi
Black, with gaster beneath, and antennae and legs to some extent paler. Thorax coarsely punctate dorsally, and in this species it is for the most part smooth and shining on the interspaces.

Dorset, Portland, 1 ♀, Dale coll.

Less surprising as a British find would have been *I. subarmata* Först., which is now known to us from southerly (not extreme southern) Sweden. In *subarmata* the antennae are relatively somewhat longer, and the thoracic dorsum is not shining, but has the interspaces between the punctures finely reticulate-shagreened throughout. Four other European species are known.

Family EUCHARITIDAE

So far as is known, the species of this family develop exclusively as parasites of ants. The eggs are laid, usually in masses, on leaves or in buds, etc., often at some distance from an ants' nest. The first stage larva is an active planidium which, in known cases, attaches itself to a worker ant, and thus gets carried to the nest. There it attaches itself to almost any sized larva, but waits till this attains the "prepupal" stage before proceeding with its development.

A single species has been claimed as British. . . **Eucharis adscendens** Fabricius (Fig. III)
Mainly metallic green in colour, with paler parts of legs and segmental margins of gaster testaceous, and antennae blackish.

It was J. F. Stephens (1846, p. 5) who recorded it from near Swansea. One Stephens specimen is in the collection of the British Museum and another in the Hope Department, Oxford. The latter is labelled "One of the 4 specimens taken by Dr. Leach in a wood near Swansea". Since recorded from Tuddenham Fen (6.v. 1907) by C. Morley (Trans. Suffolk Nat. Soc. 1936): but the specimen is not to be found in that author's collection. Information on the biology of the species has recently been published by Bouček (1956b).

Family PERILAMPIDAE

Apart from the Brachyscelidiphagini, which are now placed in the Pteromalidae, this family is exclusively parasitic. As in Eucharitidae, the eggs are laid on foliage, and the first stage larva is an active planidium. In species that are primary parasites, the planidium attaches itself to the host in any larval stage, but waits till this becomes a "prepupa" before proceeding with its development. The planidium of a hyperparasitic species bores into the host caterpillar and then into the Ichneumonoid or Tachinid larva which the host may contain. It waits till the primary parasite has attained the "prepupal" or pupal stage, and then feeds as an ectoparasite on it, within the shelter of the cocoon or puparium.

The known world genera and species are few in number: the species have perhaps attained their greatest multiplicity in North America. Seven species are now recorded as British.

For the identification of continental specimens and for further information, reference should be made to the revision of the *Perilampus* species of France by Steffan (1952), the keys to the Perilampidae of Czechoslovakia by Bouček (1956c), and the systematic notes by Kerrich (1958).

The key to species of *Perilampus* that follows was written, and the figures drawn, while the paper of Steffan (1952) on the species of France was still in preparation. The authors were working on the genus at the same time, unknown to each other, and used mainly different characters for separating the species: therefore, the two keys are largely complementary, and it has been thought useful to publish the British key almost without alteration, except that two important characters given by Steffan have been added. It should be noted that in *Perilampus tristis* Mayr the postspiracular sclerite (see Richards, 1956) is closely fused with the pronotum: the lower part of the suture between the two, which is difficult to trace, is represented by the dotted line in Steffan's figure 4.

The aggregate of *Perilampus laevifrons* Dalman was separated by Bouček into a complex of three species; but Kerrich concluded that these were sibling species, which could not be recognized as distinct in western and northern Europe.

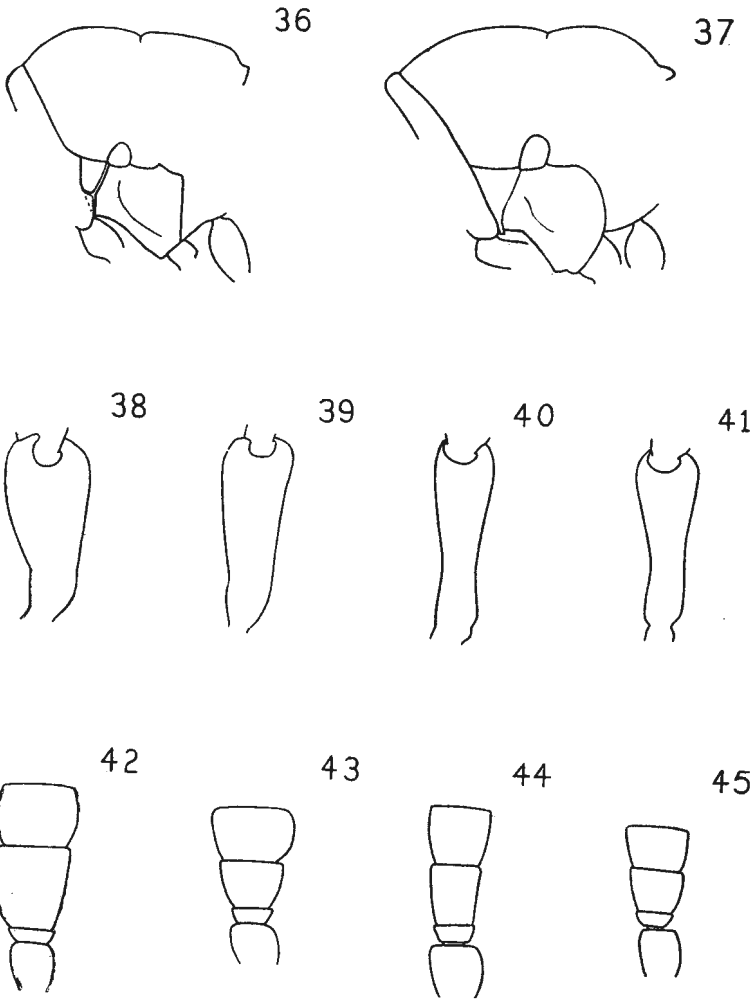
Kerrich gave a revised key to three species of *Chrysolampus*, two of which have been found in Britain. The key is reproduced here in full, so that the third species may not be confused with the other two, should it later be found with us.

KEY TO GENERA

Gaster sessile, with petiolar segment very short: marginal vein about half length of costal cell, and not twice length of postmarginal (Fig. IV): face with a supra-clypeal area flanked by strong but not sharp furrows: right mandible tridentate: pronotum, in dorsal view, short and strongly transverse (Fig. IV), immovably articulated with mesonotum: (thorax dorsally very coarsely punctate or reticulate, with a strongly contrasting smoother area flanking each notaulix)

Perilampus Latreille (p. 20)

Gaster clearly petiolate, with petiolar segment distinctly longer than broad: marginal vein about two-thirds length of costal cell, and quite twice length of postmarginal; face without such defined supra-clypeal area: both mandibles bidentate: pronotum, in dorsal view, much more elongate (figs. 46-47), movably articulated with mesonotum: (thorax, in British species, more or less finely striate-reticulate, the striations arranged transversely, with only scattered, superficial punctures and with no such contrasting area). . ***Chrysolampus*** Spinola (p. 20)



FIGS. 36-37.—Part of thorax, in sinistro-lateral view, of: (36) *Perilampus tristis* Mayr and (37) *P. ruficornis* (Fabricius).

FIGS. 38-41.—Right antennal scape of male, seen from beneath, of: (38-39) different forms of *Perilampus laevifrons* Dalman aggregate; (40) *P. ruficornis* (Fabricius) and (41) *P. tristis* Mayr.

FIGS. 42-45.—Pedicellus and first three flagellar segments of right antenna, seen from above, of: *Perilampus aeneus* (Rossi) male (42) and female (44); *P. ruficornis* (Fabricius) male (43) and female (45).

Genus *Perilampus* Latreille

KEY TO SPECIES

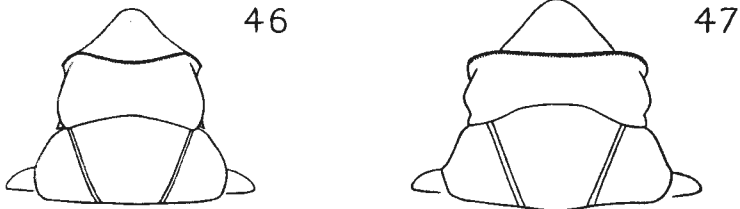
- 1 Lower face striate between eyes, supraclypeal area and clypeus, usually strongly so: scutellum with upper apical row of alveoli clearly visible from above: propodeum reticulate-rugose, with no area except just-a-coxal at all smooth: whole face brassy-green: (pterostigma with uncus).....**micans** Dalman
England S. Reared from larvae of Lyctus spp.
- Lower face not thus striate but smooth and sparsely punctate: scutellum with neither apical row of alveoli visible from above: propodeum with a pair of areae between median area and spiracular sulcus smooth or feebly sculptured: whole face not brassy-green.....2
- 2 Frons with carinae or strong folds running between median and lateral ocelli, stronger in male: between lateral ocellus and top of eye is a smooth band bearing only minute or superficial punctures: if scape of male, seen from beneath, is notably expanded (fig. 41), the body is black.....3
- Frons with such carinae or folds absent or very weak: head between lateral ocellus and top of eye more or less rugose-punctate: scape of male, seen from beneath, decidedly expanded (e.g. figs. 38-39) and body not black....**laevifrons** Dalman agg.
England S. to Yorks. (W. J. Fordham) and Cheshire (H. Brütten). Much the commonest species in northern Europe. Has been reared from Chrysopidae.
- 3 Body black or feebly bronzed, the legs in part with dull greenish reflections: postspiracular sclerite fused with the pronotum below: prepectus not distinctly marked off from pectus but running almost straight down to hind margin, which is strongly raised and shallowly emarginate (fig. 36): (antennae less stout than in *laevifrons* and *ruficornis*: scutellum more convex and coarsely reticulate than in *laevifrons*, less so than in *aeneus*: pterostigma without uncus)....**tristis** Mayr
Hunts., Monkswood, 1837 (Dale coll.). Reared on Continent from cocoons of Ichneumonidae and Braconidae.
- Body metallic green and other brighter colours: postspiracular sclerite separated from pronotum by a distinct and complete suture: prepectus separated by a distinct angulation from the pectus, which has the hind margin deeply emarginate or incised and not strongly raised (fig. 37): scape of male, seen from beneath, not notably expanded (fig. 40).....4
- 4 Pterostigma more rounded, without distinct uncus: thorax not red-coppery or bronzy above: mesoscutum between notaulices closely reticulate: in each sex respectively the postannellus, seen from above, more contracted to base and the following segment more transverse, distinctly transverse in female (figs. 43 and 45).....**ruficornis** (Fabricius)
England, southerly. Reared from puparia of Tachinidae, from cocoons of Meteorus (Braconidae) and from cocoon of Rogas circumscriptus Nees (Braconidae) (G. T. Lyle).
- Pterostigma with distinct uncus: thorax red-coppery or bronzy above: mesoscutum between notaulices very coarsely punctate or loosely reticulate, with distinct shining interspaces (Fig. IV): in each sex respectively the postannellus, seen from above, less contracted to base and the following segment less transverse, about quadrate in female (figs. 42 and 44).....**aeneus** (Rossi)
(= *italicus* Fabricius)
England S. to Suffolk (C. G. Nurse). Reared from the Tenthredinid sawfly genus Athalia in England by O. W. Richards, in Italy by G. Martelli.

Genus *Chrysolampus* Spinola

KEY TO SPECIES

- 1 Pronotal collar longer and less broad (e.g. fig. 46): mesoscutum finely transversely striate-reticulate, the striations weakly raised: propodeum between basal pits and spiracles more weakly yet quite distinctly sculptured, not shining: (propodeum without distinct diagonal rugosities).....**thanae** (Walker)
England, southerly: rare.

- Pronotal collar shorter and broader (*e.g.* fig. 47) : mesoscutum more coarsely transversely striate-reticulate, the striations more strongly raised : (propodeum between basal pits and spiracles obsoletely sculptured, shining).....2
- 2 Mesoscutum with striation more even and generally arranged more regularly : propodeum with some quite strong diagonal rugosities emitted from median carina : petiolar segment about twice length of its middle breadth in both sexes : fore wing, at least in female, weakly but distinctly infusate below marginal vein.....**ruftarsis** (Förster)
Berks., Wytham Wood (M. W. R. de V. Graham).



FIGS. 46-47.—Pronotum, mesoscutum and tegulae of: (46) *Chrysolampus thenae* (Walker) male and (47) *C. ruftarsis* (Förster) female.

- Mesoscutum with striations arranged in a two-crested wave in anterior part and with some distinctly more outstanding in posterior part : propodeum without distinct diagonal rugosities : petiolar segment about one and a half times length of its middle breadth in female, about twice such length in male : fore wing hyaline.....**shurik** (Nikol'skaya)
Sweden, Austria, Czechoslovakia, Poland, U.S.S.R.

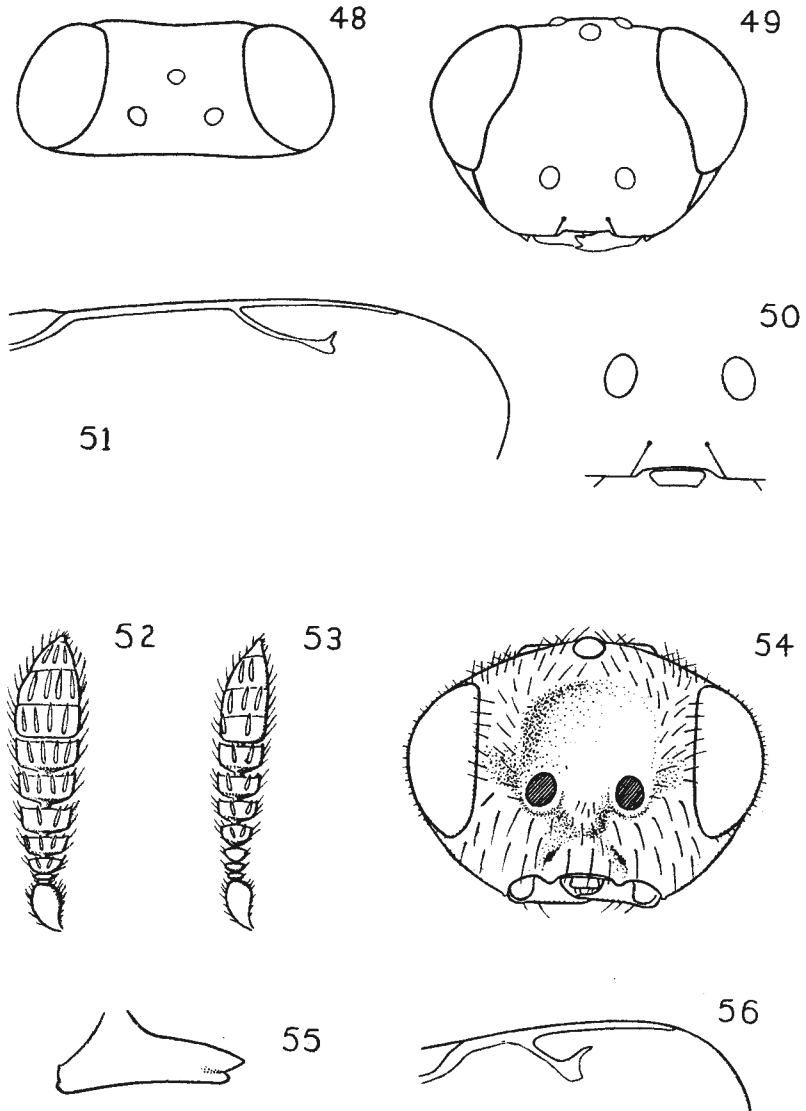
Family CLEONYMIDAE

The British species of this family are mostly moderate to rather large sized Chalcids, generally of elongate form. As a representative, *Gastracanthus pulcherrimus* Westwood is depicted in the present fascicle (Fig. V). So far as is known, the British species are parasites of Coleoptera attached directly or indirectly to wood, *i.e.* feeding in living or dead timber, under bark, or in large tree fungi ; but the host relations of *Micradelus* and *Cea* are not known. A taxonomic study of the British species has been made by Kerrich and Graham (1957), and reference should be made to that paper for further information.

During the present decade, the opinion has been gaining ground that the Cleonymidae should be merged with the Pteromalidae, and, indeed, its separation proved the most troublesome problem in the construction of the practical key to families. However, the several groups of genera were held to constitute a distinct classificatory category for over 70 years, and the superficial character on which they were aggregated should lead to ready recognition in most cases. In consequence, they are included here as a contribution to the prime purpose of these *Handbooks*, which is to enable British entomologists to identify British insect species. Their integration with the Pteromalidae may be left for someone able to undertake a radical revision of the classification of that large family.

KEY TO GENERA

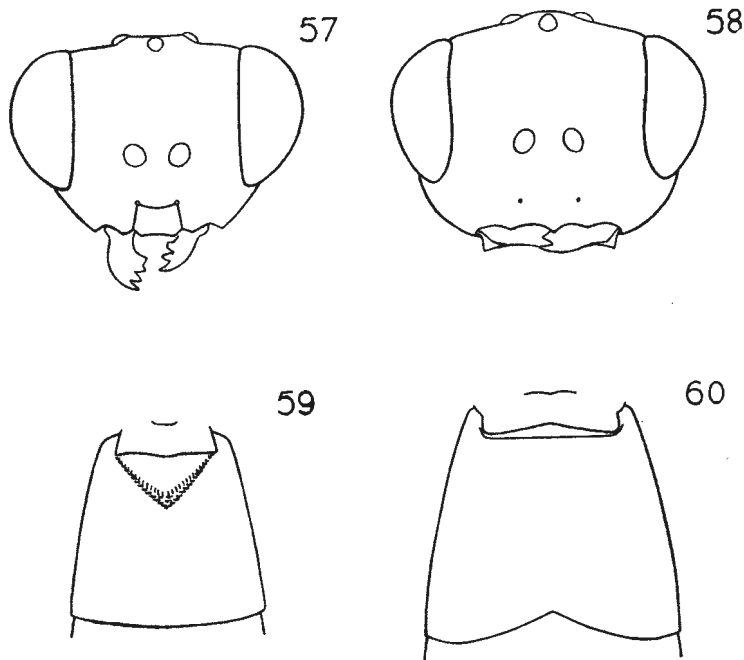
- 1 Eyes strongly hairy, in facial view strongly divergent and emarginate (fig. 49) : mid-tibial spur about three-quarters length of corresponding metatarsus : antennae with one annellus, which in female is large, with 7-segmented funicle, the last segment of which in female bears a strong finger-like process, and with club solid : (body form stout : head (figs. 48-49) : labrum free (fig. 50) : fore wing with marginal of normal length, with radial rather long, distinctly curved, and emitted at a very acute angle (fig. 51))..... **Cleonymus** Latreille (p. 25)
- Eyes, in facial view, not strongly divergent and emarginate nor, except in *Micradelus* Walk., strongly hairy : mid-tibial spur not more than about half length of corresponding metatarsus : antennae with 2 or 3 annelli, 6, 5 or 4 funicle segments, of which the last bears no finger-like projection, and a distinctly 3-segmented club 2
- 2 Eyes strongly hairy and labrum free (as in *Cleonymus* Latr., fig. 54) : antennae stout, with formula 11253 (female) or 11343 (male) (figs. 52-53) : wing with marginal vein only about as long as radial (fig. 56) : mandibles bidentate (fig. 55) : small, rotund insects with pronotum not distinctly elongate ; black, with fine reticulate sculpture, not shining..... **Micradelus** Walker (p. 25)
- Eyes not strongly hairy nor labrum free : antennae with formula 11263 or 11353 : wing with marginal vein distinctly longer than radial, e.g. Fig. V : more elongate, mostly larger insects, generally distinctly shining, and metallic green at least in part 3
- 3 Antennae slender and elongate, with 3 annelli and 5 funicle segments : mandibles slender, bidentate : no malar groove : brachypterous or macropterous ; if macropterous, then having wings long and slender, with marginal vein more than twice length of radial, and with marginal cilia very long, those of hind wing almost as long as the greatest wing breadth..... 4
- Antennae with 2 annelli and 6 funicle segments, generally stouter (e.g. Fig. V) mandibles large and broad, tri- or quadridentate (e.g. fig. 57) : hind wing with marginal cilia of more normal length : (antennae not inserted very near mouth : ovipositor not strongly exerted)..... 5
- 4 Mesopleura and metapleura almost in same plane : antennae inserted a short distance above mouth : female gaster with tergites fairly broadly emarginate at apex : ovipositor slender, exerted by about two-thirds length of gaster : metascutellum normal : funicle segments in both sexes subcylindrical, more than twice as long as broad, and with a covering of short, rather closely adpressed hairs..... **Cea** Walker (p. 25)
- Mesopleura strongly overhanging metapleura : antennae inserted nearer mid-way between mouth and eyes : female gaster with tergites not emarginate at apex : ovipositor stouter, exerted by about one-third length of gaster or less : metascutellum very strongly developed : funicle segments of female subcylindrical, less than twice as long as broad, and with a covering of short, rather closely adpressed hairs ; of male longer, each with a basal node bearing a whorl of about 6 long hairs..... **Spalangiopecta** Masi (p. 25)
- 5 Antennae inserted rather high on face, with scape at rest extending well above top of head : mesoscutum having notaulices incompletely sharp in about anterior two-thirds, thereafter absent or, at most, extremely superficial : propodeum strongly produced above base of hind coxae, appearing rugose throughout on account of strongly upstanding reticulation ; in about basal half almost horizontal and with median keel strong, but distinctly declived beyond this : female gaster with first large tergite much the largest, very broadly rounded behind : (postspiracular sclerite with no delimited area before the tegulae : scutellum normally with a frenal furrow)..... **Panstenon** Walker (p. 26)
- Antennae inserted less high on face, with scape at rest not extending well above top of head : mesoscutum having notaulices more or less distinctly percurrent, usually strong throughout : propodeum scarcely produced beyond base of hind coxae, not thus angled in middle and generally shining in part : female gaster with first large tergite not or not much the largest : macropterous insects, having wings of normal proportion, with marginal vein not twice length of radial (e.g. Fig. V)..... 6



FIGS. 48-51.—*Cleonymus depressus* (Fabricius): (48) head of female, viewed from above; (49) the same, in facial view; (50) lower face, clypeus and labrum; (51) part of right fore wing.

FIGS. 52-56.—*Micradelus rotundus* Walker: (52) pedicellus and flagellum of female; (53) the same, of male; (54) head of male in facial view; (55) right mandible; (56) part of right fore wing.

- 6 Clypeus apically edentate (fig. 57) : postspiracular sclerite larger, having no sharply delimited triangular area before the tegulae : female gaster having first large tergite not apically excised (fig. 59 and Fig. V).....7
- Clypeus apically dentate (fig. 58) : postspiracular sclerite rather smaller, having a sharply delimited triangular area before the tegulae : female gaster having the first large tergite medially excised at apex (fig. 60) : (scutellum having a distinct frenal furrow in the normal position (e.g. fig. 70 and Fig. V)).....9



FIGS. 57-58.—Head of female in facial view of : (57) *Gastracanthus pulcherrimus* Westwood and (58) *Trigonoderus filatus* Walker.

FIGS. 59-60.—Petiolar segment (partly covered) and first large tergite of : (59) *Platygerrhus ductilis* (Walker) female and (60) *Plutothrix scenicus* (Walker) female.

- 7 Scutellum without frenal furrow in the normal position : (prepectus without a median shield : antennal flagellum of male bearing rather short, scarcely outstanding hairs : cheeks sharply narrowed to mouth in the British species, about as in fig. 57).....**Platygerrhus** Thomson (p. 30)
- Scutellum with frenal furrow in the normal position.....8
- 8 Pronotum less elongate, about half as long as its greatest breadth or less (fig. 70) : prepectus without a median shield behind the fore coxae : female gaster with first to third large tergites neither apically sinuate nor medially produced : flagellar segments of male almost regularly cylindrical, narrowed at base, and not with conspicuous rugose sculpture ; bearing rather short, scarcely outstanding hairs : (cheeks decidedly rounded) : petiolar segment of female strongly transverse (figs. 69, 70) : fore wings hyaline).....**Janssoniella** Kerrich (p. 30)
- Pronotum especially elongate, clearly more than half as long as its greatest breadth (Fig. V) : prepectus with a median shield behind the fore coxae, marked off by a transcostate furrow : female gaster with first to third large tergites (especially

- the first) apically sinuate and medially produced (Fig. V) : flagellar segments of male irregularly swollen and with conspicuous rugose sculpture, bearing rather long, strongly outstanding hairs : (in the British species cheeks sharply narrowed to mouth (fig. 57), gaster distinctly petiolate, the petiolar segment not strongly transverse even in female, and fore wings maculate (Fig. V) except in smaller males and occasional small females).....**Gastracanthus** Westwood (p. 29)
- 9 Fore wings with speculum outside basal vein undeveloped or very incomplete : costal cell of hind wing in basal half with a band of hairs that is complete or almost so : prosternum with median sulcus absent or weak : mesepisternum divided by a diagonal furrow (*i.e.* this furrow goes across the sculptured part of the mesopleuron) : pronotal collar usually not sharply margined : male with antennal flagellum short-hairy.....**Trigonoderus** Westwood (p. 26)
- Fore wings with speculum outside basal vein fully developed : costal cell of hind wing in basal half almost bare, or with a row of hairs decidedly incomplete : prosternum with median sulcus strong : mesepisternum not thus divided (*i.e.* the mesopleuron may have a furrow just below the smooth part but not across the sculptured part) : pronotal collar usually sharply margined : male with antennal flagellum long-hairy.....**Plutothrix** Förster (p. 27)

Genus **Cleonymus** Latreille

KEY TO SPECIES

- Species with conspicuous bronzy to brassy reflections on head and thorax : annellus of female and first funicle segment of both sexes about quadrate : petiolar segment of male about two-thirds length of its greatest breadth : female gaster with fifth large tergite a little longer than its apical breadth.....**depressus** (Fabricius)
England S. to Suffolk (C. Morley), sometimes taken in numbers. Reared from Molorchus minor L. (Col., Cerambycidae) by E. A. J. Duffy.
- Species without conspicuous bronzy to brassy reflections on head and thorax : annellus and first funicle segment much broader than long : petiolar segment of male about half length of its greatest breadth : female gaster with fifth large tergite much shorter than its apical breadth.....**obscurus** Walker
England, near London. France, Sweden. Very scarce. Reared from Scolytus scolytus Fabr. (Col., Scolytidae).

Genus **Micradelus** Walker

- A single British species.....**M. rotundus** Walker
Taken by F. Walker in southern England. Generally very scarce, but once taken in some numbers in Sweden.
The only other known species is recorded from a single specimen from Lapland.

Genus **Cea** (Haliday MS.) Walker

- A single British species.....**C. pulicaris** Walker
Taken in Ireland by Haliday both in the brachypterous form, and also in the macropterous form described under the synonymous name C. irene Walker: macropterous form taken in England, Dorset and Essex, by C. D. Day. Known in Sweden and Czechoslovakia.

Genus **Spalangiopelta** Masi

Unknown in Britain, but should be sought here, since several species are known in Western Europe. For treatment of this and the above genus, see Bouček (1952b).

Genus **Panstenon** Walker(= *Caudonia* Walker)

KEY TO SPECIES

Pronotal collar weakly margined anteriorly : mesoscutum with notaulices fine, not consute : scutellum with frenal groove weak ; malar space about half length of an eye : costal cell of fore wing about 20 times length of its greatest breadth, its lower surface with a row of hairs which is single except towards apex of the cell : gaster metallic, or at most indistinctly pale in middle : length 1.7-2.6 mm. **oxylus** (Walker)

England S. to Cambs., not uncommon. Attached to graminaceous plants.

Pronotal collar sharply margined : mesoscutum with notaulices strong, consute : scutellum with frenal groove strong : malar space about three-quarters length of an eye : costal cell of fore wing about 12 times length of its greatest breadth, with a row of hairs which becomes double in distal half of the cell : gaster broadly red in middle : length 3.3 mm. **agylla** (Walker)

Scotland, near Edinburgh (J. C. Dale).

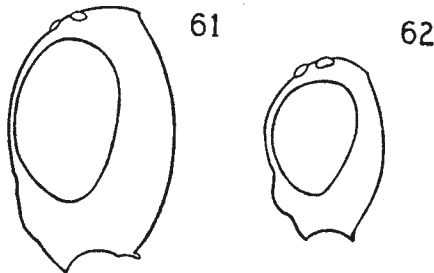
Genus **Trigonoderus** Westwood

KEY TO SPECIES

(Females)

- 1 Head in side view shorter, with eyes perhaps one and a half times as long as broad (fig. 61) : pronotum shorter, rather sharply margined : propodeum longer, the median keel traversed by short transverse keels : wings bifasciate, with radius normally emitted at a very acute angle. **cyanescens** (Förster)
(= *pedicellaris* Thomson)

New Forest: only one British specimen known. Rather scarce in Europe.



FIGS. 61-62.—Head of female in sinistral view of : (61) *Trigonoderus cyanescens* (Förster) and (62) *T. filatus* Walker.

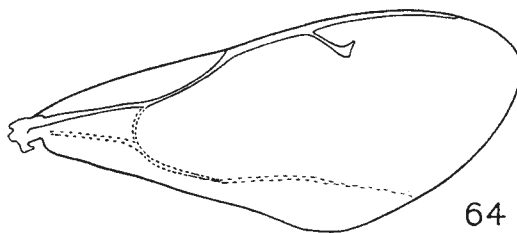
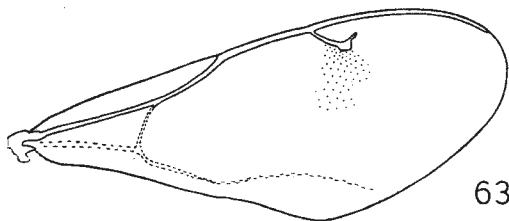
- Head in side view longer, with eyes more bulging, not much longer than broad (fig. 62) : pronotum longer, not sharply margined : propodeum shorter, with median keel not traversed : wings not bifasciate, having radius emitted at about 45° (figs. 63-64) 2
- 2 Fore wing with costal cell moderately broad, with postmarginal vein almost reaching apex, and with a strongly-marked cloud just below the stigma, limited in extent (fig. 63) : gaster distinctly red at base, at least beneath (as in the last species), elongate, the sixth large tergite approximately 2.0 times length of its basal breadth : scutellum slightly but distinctly convex : legs except coxae rufous to testaceous **flatus** Walker
(= *brandti* Ratzeburg)

England SE. to New Forest and Cambs., uncommon. Reared from Pogonocherus hispidus L. (Col., Lamiidae).

- Fore wing with costal cell broader, with postmarginal vein not almost reaching apex (fig. 64), often with an incipient speculum, and with wing-cloud, if developed, generally much weaker and usually extending a good way towards wing base: gaster not distinctly red at base, considerably less elongate (varying greatly in this): scutellum almost flat: legs with femora, except at apex, and fore tibiae often darkened (but not always so)..... **princeps** Westwood

(= *obscurus* Walker, *lichtensteini* Ratzeburg)

England S. to Cheshire and Yorks., Scotland, not uncommon. Reared from *Parmena balteus* L. (Col., Lamiidae).



FIGS. 63-64.—Right fore wing of female of: (63) *Trigonoderus filatus* Walker and (64) *T. princeps* Westwood.

KEY TO SPECIES

(Males)

- 1 Propodeum longer, the median keel traversed by short transverse keels: antennal club with segments well separated..... **cyanescens** (Förster)
- Propodeum shorter, with median keel not traversed: antennal club with segments more closely coalesced..... 2
- 2 Fore wing as described for female: leg colour as described for female: antennae with scape partly pale, and with flagellar segments elongate-cylindrical, not much dilated below..... **filatus** Walker
- Fore wing as described for female, but with wing-cloud undeveloped: legs darkened: antennae with scape dark, with flagellar segments relatively shorter and, especially the first, often distinctly dilated below..... **princeps** Westwood

Genus *Plutothrix* Förster

KEY TO SPECIES

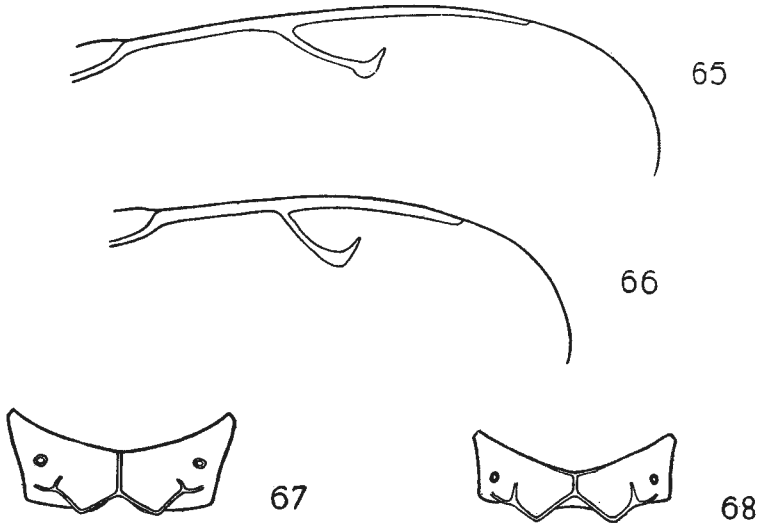
(Females)

- 1 Propodeum with median keel short (fig. 68): gaster not conspicuously red at base: fore wings only with a cloud arising from stigma, sometimes undeveloped..... **coelius** (Walker)

(= *acuminatus* Thomson)

England, southerly. Ireland (A. H. Haliday). Widespread in continental Europe. Reared from *Anobium punctatum* Deg. (Col., Anobiidae).

- Propodeum with median keel long (fig. 67) : gaster conspicuously red at base: fore wings not with a cloud arising from stigma only.....2
- 2 Fore wings trifasciate, the middle fascia arising from the stigma and joining the inner fascia below : first large tergite deeply incised at mid-apex
trifasciatus (Thomson)
England, unlocalized (J. F. Stephens coll.). Known in Sweden and Czechoslovakia.
- Fore wings not trifasciate, nor with any cloud or fascia arising from the stigma : first large tergite not deeply incised at mid-apex.....3



FIGS. 65-68.—Part of right fore wing of female of : (65) *Plutothrix scenicus* (Walker) and (66) *P. coelius* (Walker) ; propodeum of female of (67) *P. scenicus* (Walker) and (68) *P. coelius* (Walker).

- 3 Fore wings having a rounded subapical cloud, sometimes undeveloped
scenicus (Walker)
(= *apicalis* Thomson)
England S. to Cumberland. Ireland (A. W. Stelfox). Not uncommon. Wide-spread in continental Europe. Reared from Anobium punctatum Deg.
- Fore wings bimaculate, having in addition a cloud below the marginal vein
scenicus (Walker) f. vittiger (Thomson)
Cambridge (D. Sharp).
 The radius arises at a more acute angle in *scenicus* (Walker) than in *coelius* (Walker) (fig. 65, cf. fig. 66).

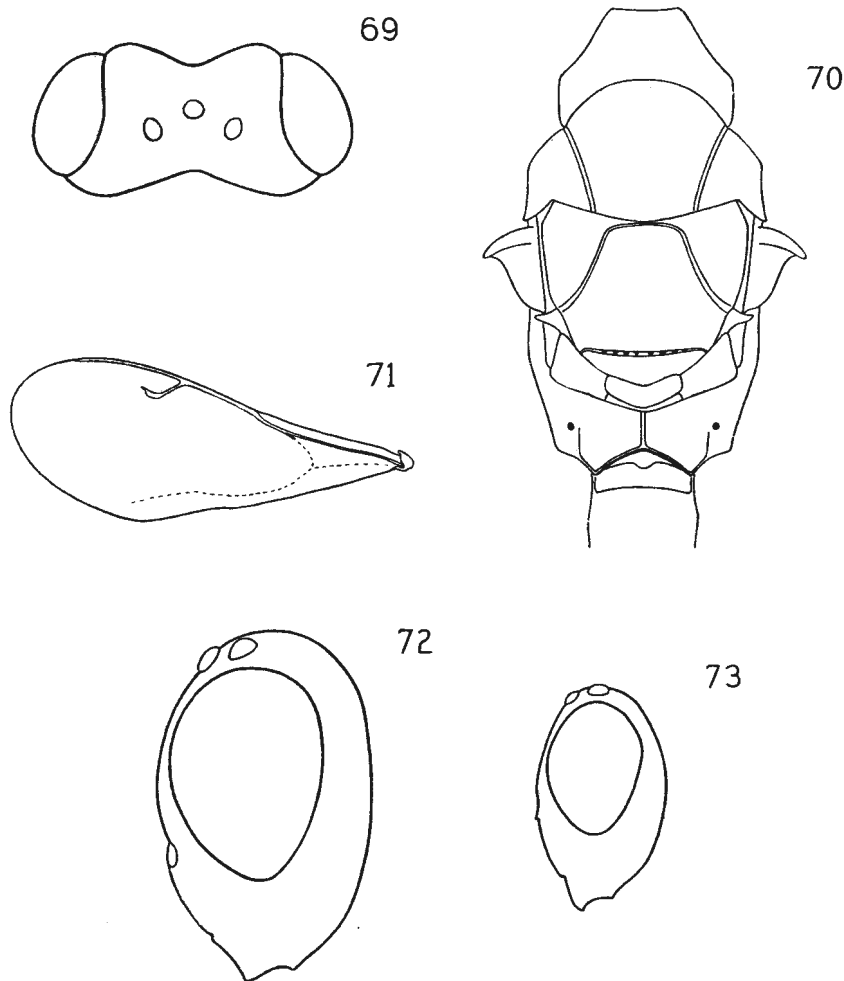
KEY TO SPECIES

(Males)

- 1 Propodeum with median keel long.....2
- Propodeum with median keel short.....*coelius* (Walker)
- 2 Antennal flagellum rather sparsely and very coarsely hairy, bearing hairs whose length is at least almost twice the width of the funicle segments : first club segment free*trifasciatus* (Thomson)
- Antennal flagellum much more densely hairy, the hairs hardly as long as the width of the funicle segments : club with segments closely coalesced. .*scenicus* (Walker)

Genus **Gastracanthus** Westwood

A single European species.....**G. pulcherrimus** Westwood (Fig. V).
 England S. to Leicester, not uncommon. Widespread in continental Europe.
 Biology unknown.



FIGS. 69-71.—*Jansoniella caudata* Kerrich : (69) head of female, viewed from above ; (70) thorax, propodeum and base of gaster, viewed from above ; (71) left fore wing.
 FIGS. 72-73.—Head, in sinistrolateral view, of : (72) *Platygerrhus ductilis* (Walker) and (73) *P. dolosus* (Walker).

Genus *Janssoniella* Kerrich

A single British species. *J. caudata* Kerrich
 (figs. 69-71)
England, unlocalized. Sweden, Germany, Czechoslovakia, E. and W. North America, generally scarce. Reared from large tree fungi, ? associated with Cis (Col., Cidae).

The other described species, *J. major* Kerrich, is known only from southern Sweden. It is larger, has the head relatively broad and shallowly emarginate behind, the metascutellum and propodeum relatively long, and the ovipositor sheaths relatively short.

Genus *Platygerrhus* Thomson

KEY TO SPECIES

Scutellum very finely reticulate, the reticulations arranged in a more or less distinctly longitudinal pattern, much finer than on pronotum: head, at least of female, in side view short (fig. 73): funicle of female antennae having first segment about one and a half times as long as broad, and sixth about quadrate: a single row of hairs on wing cell just below submarginal. *dolosus* (Walker)
London district and unlocalized: scarce. Reared as external parasite of Laemophloeus ater (Olivier) (Col., Cucujidae), predator of Phloeophthorus rhododactylus (Marsham) (Col., Scolytiidae) on broom, by M. R. Smith.

Scutellum normally finely reticulate, the sculpture about as on pronotum: head in side view longer (fig. 72): funicle of female antennae usually having first segment about twice as long as broad, and sixth distinctly longer than broad: a double row of hairs on wing cell just below submarginal. *ductilis* (Walker)
England, southerly. Reared from Anobium punctatum (Deg.).

Family THYSANIDAE

The Thysanidae is a family of small, brownish-black Chalcids of length approximating one millimetre. They are peculiar in lacking the wasp-waist characteristic of the higher Hymenoptera, and in other features mentioned in the key to families (p. 5, see also figs. 74-79). Their systematic status and classification were discussed by Kerrich (1953); and a comparative morphological study has been made by Domenichini (1954), who concluded that they were nearest related to the Aphelinidae.

Most of the species have been described from the hotter parts of the New World, and Thysanids are not very often received among economic material from the tropical Old World. Less than a dozen species are known in Europe, and only two of these are British. Further information on one is available in papers by Novitzky (1954), Domenichini (1955) and Ferrière (1957), while the other was first described in extensive detail by Silvestri (1918). Both species have been found by B. N. Blood in the Bristol Channel area: this material is in the Oxford University Museum.

The majority of the species have been reared from Coccids (mealy-bugs and scale insects), but the more critical records all refer to them as secondary or even tertiary parasites in these hosts. Some tropical species are primary parasites of Diptera.

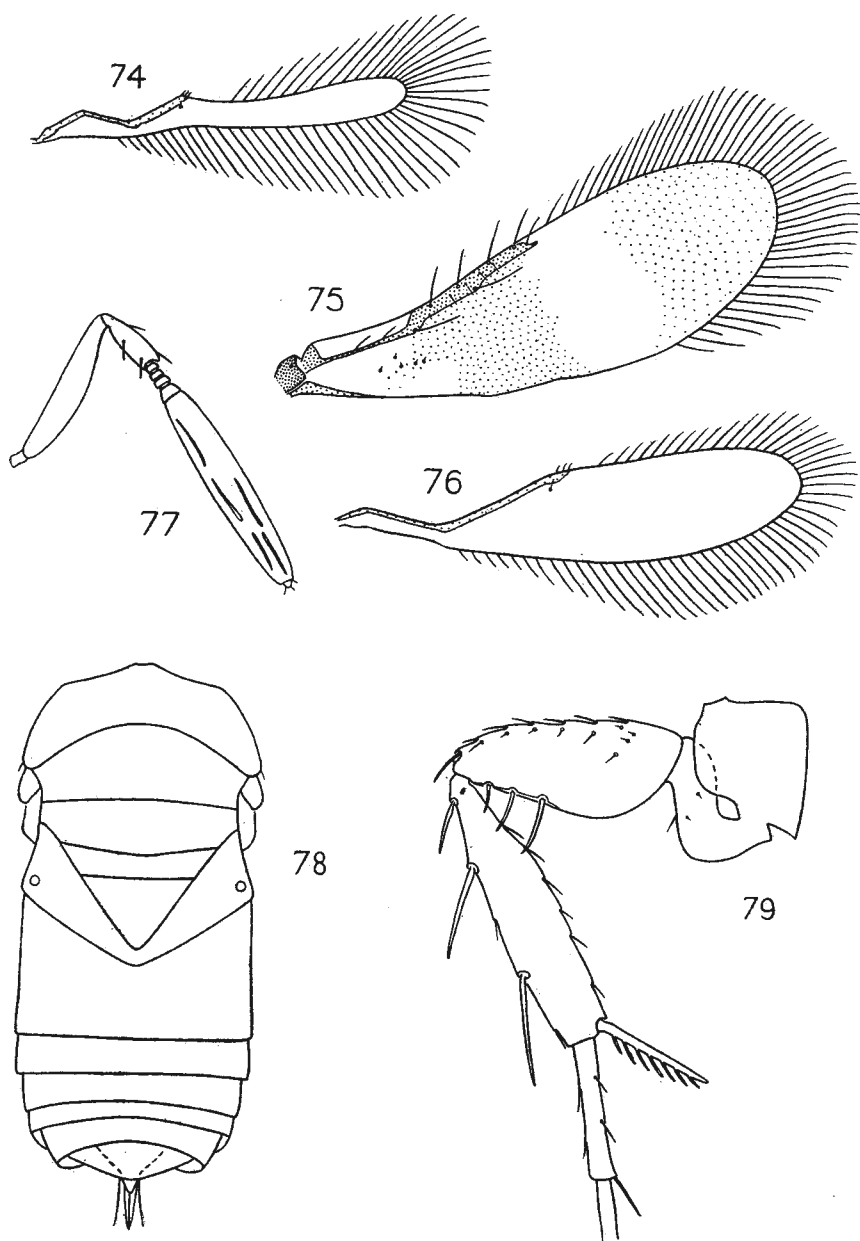


FIG. 74.—*Thysanus ater* Walker, right hind wing.

FIGS. 75–79.—*Thysanus subaeneus* (Förster): (75) right fore wing; (76) right hind wing; (77) right antenna of female (after Domenichini); (78) thorax and abdomen, of female; (79) left mid-leg of female.

Closely related species in this family are difficult to separate ; but the two British species come in what may be considered as at least different subgenera, and are easily distinguished.

Genus *Thysanus* Walker

KEY TO SPECIES

Mandibles tridentate : antennal funicle 4-segmented in both sexes : marginal vein of fore wing much shorter than submarginal : hind wing almost parallel-sided (fig. 74) : mid-metatarsus about equal in length to its tibia : fore wing rather strongly infusate to apex of marginal vein, almost hyaline beyond : rather slender species. *Thysanus* (*s. str.*) **ater** Walker

Mandibles bidentate : antennal funicle 4-segmented in ♀ (fig. 77), 3-segmented in ♂ : marginal vein of fore wing about equal in length to submarginal (fig. 75) : hind wing not almost parallel-sided (fig. 76) : mid-metatarsus much shorter than its tibia (fig. 79) : fore wing rather strongly infusate below marginal vein and, beyond a conspicuous, roughly oval, hyaline band, almost as strongly infusate to apex (fig. 75) ; rather stout species (fig. 78)

Thysanus (subgen. *Signiphora* Ashmead) **subaeneus** (Förster)

(REFERENCES ON p. 37).

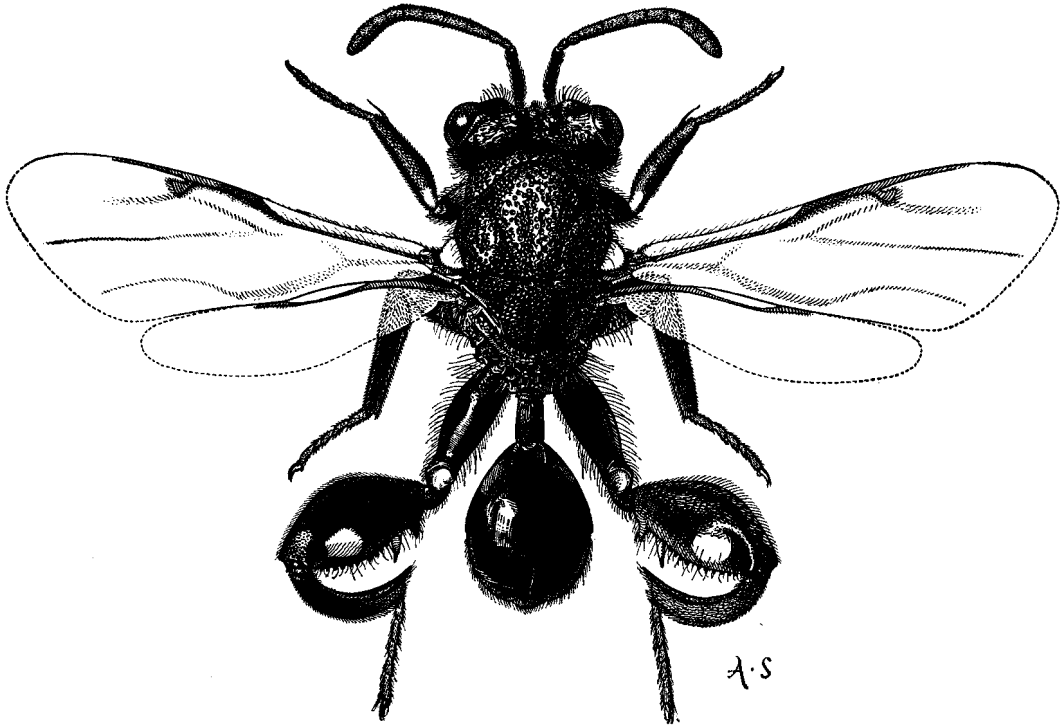


FIG. I.—*Chalcis biguttata* Spinola, female.

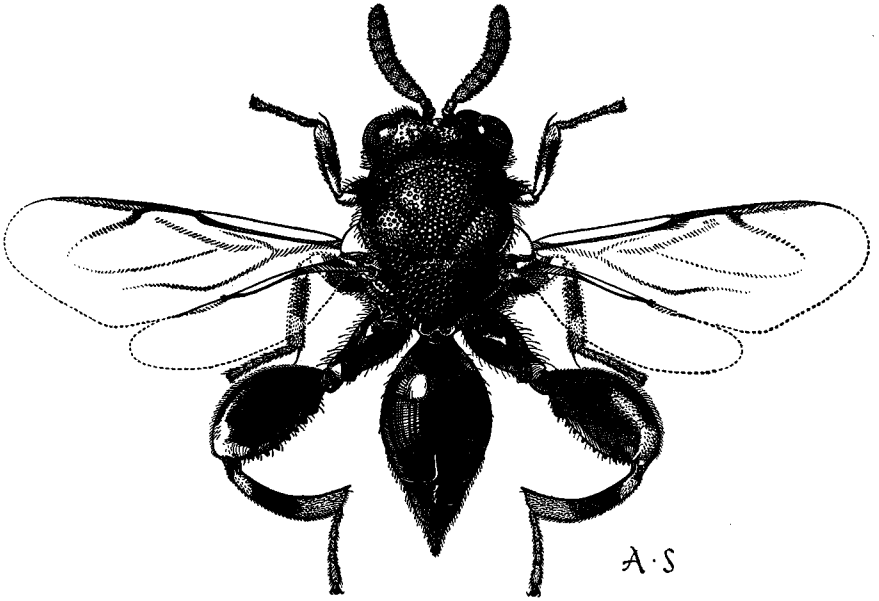


FIG. II.—*Brachymeria minuta* (L.), female.

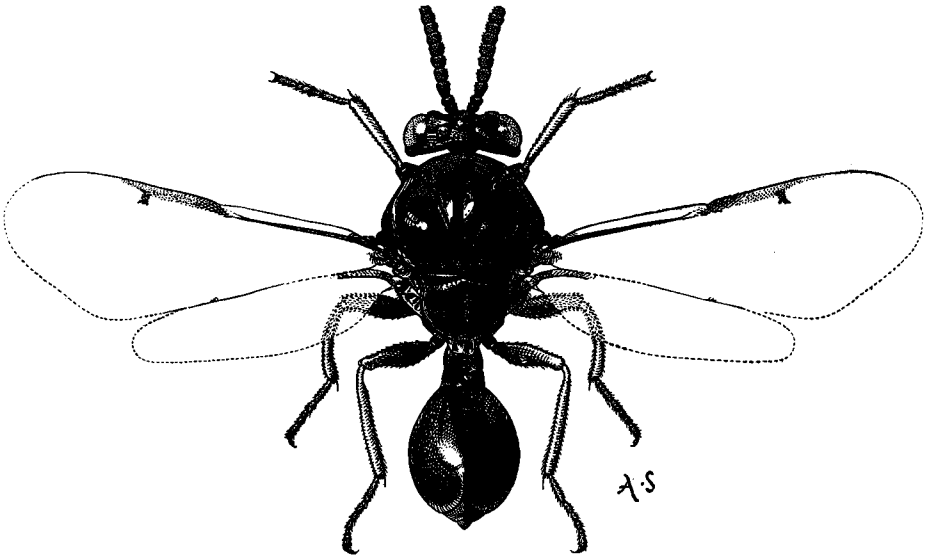


FIG. III.—*Eucharis adscendens* (Fabricius), female.

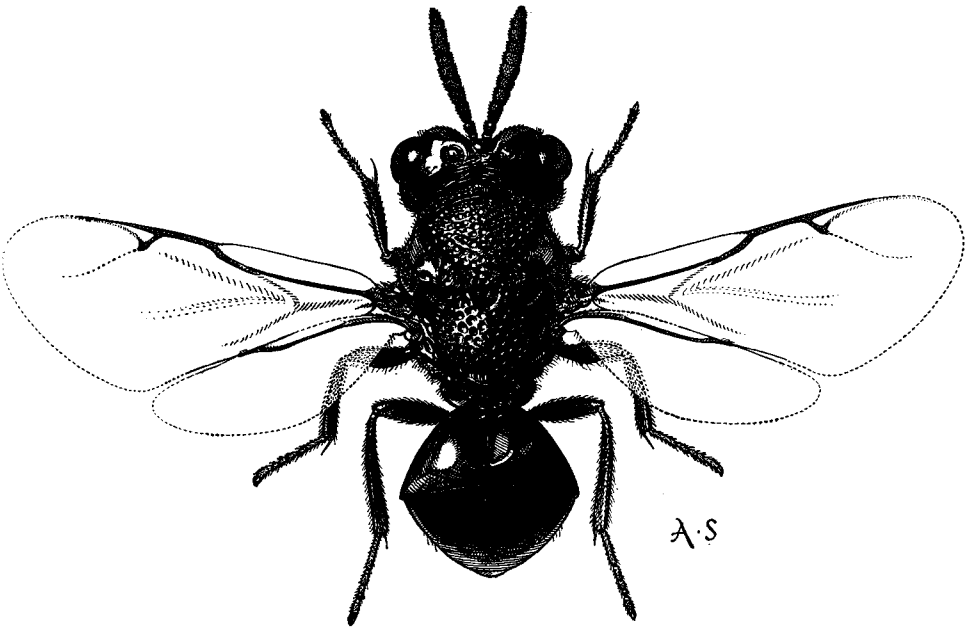


FIG. IV.—*Perilampus aeneus* (Rossi) (= *italicus* Fabricius), female.

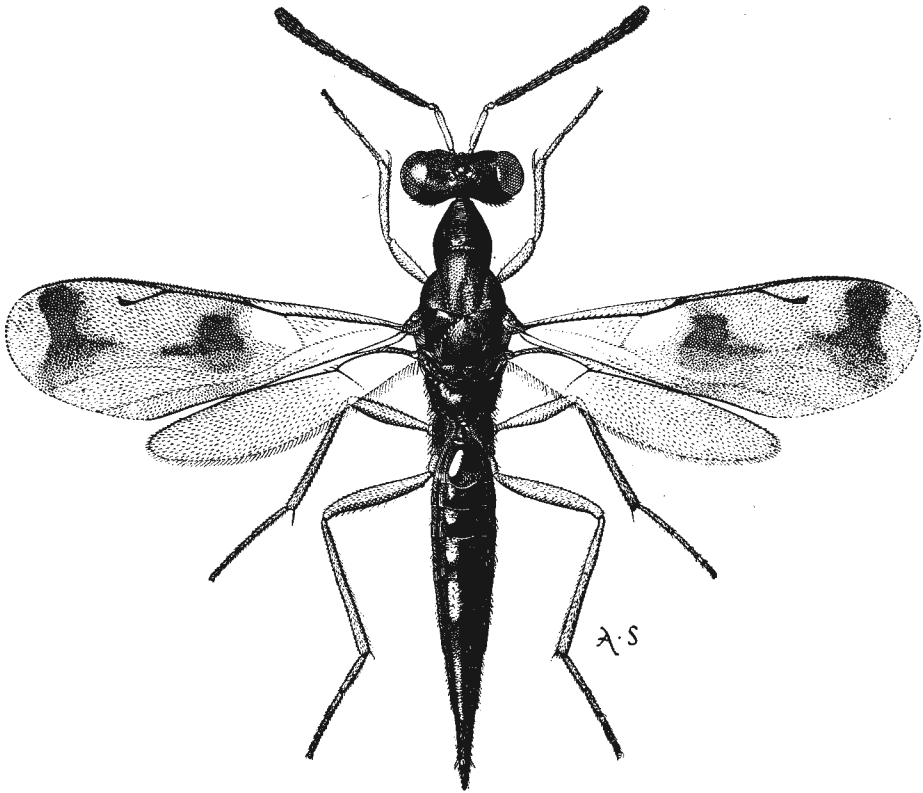


FIG. V.—*Gastracanthus pulcherrimus* Westwood, female.

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