THE PTEROMALIDAE OF NORTH-WESTERN EUROPE (HYMENOPTERA: CHALCIDOIDEA)

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CONTENTS

SYNOPSIS

A new key to the families of Chalcidoidea is presented so as to facilitate recognition of Pteromalidae, the limits of which are difficult to define succinctly. The main part of the work deals with Pteromalidae ; this family is keyed to species level in all except a few genera which need further study. Full synonymy is given, as far as possible, at all levels. The distribution, and where known the biology, of each species is indicated. More than 800 species are dealt with ; 4 new genera and 87 new species are described. The work is based mainly on a critical study of type-material ; almost all (663) of the types of Palaearctic Pteromalidae in the British Museum (Nat. Hist.), and also about 300 types in other important European collections, were examined.

INTRODUCTION

SINCE the publication of Walker's *Monographia Chalciditum* (1833–1839) and volumes 4 and 5 of Thomson's *Hymenoptera Scandinaviae* (1876–1878), no monograph including all the described Pteromalidae of the region has appeared. The former work, though it includes nearly 250 of the species now known from Europe, is of little use because of its poor descriptions and lack of keys. Thomson's work is still a fundamental treatise and remarkable for its excellent descriptions, but it does not include more than about half the number of genera or species now known. Neither of these works was provided with illustrations. Thomson recognized comparatively few of Walker's species because he was unable to see their types (or indeed those of most of the species previously described by other British and Continental authors). In fact, none of the 19th and 20th century writers on Chalcidoidea had access to more than a negligible amount of each other's original material. Consequently great confusion has arisen. In some cases the same species has been listed twice in the same publication under different specific names, these being sometimes placed in different genera. This has happened for instance in the *Check List* of Kloet & Hincks (1945) which first induced me to begin a revision of the British Pteromalidae. The wealth of species described by Walker clearly offered a unique basis for such a revision as I was able to study his types. My revision began with papers published in *The Entomologist's monthly Magazine* (1956–1957). It soon became evident that a wider treatment of the group was expedient, and that a revision was likely to be of limited use unless accompanied by keys for identifying the numerous genera and species. These conclusions led to the preparation of the present work.

After the time of Thomson, publications dealing with Pteromalidae were, until recently, sporadic. Ashmead (1904) keyed out the subfamilies, tribes and genera of Pteromalidae, Cleonymidae and Miscogasteridae (the two latter are now included in Pteromalidae). The work of Schmiedeknecht (1909), which was a compilation, mainly followed that of Ashmead. In some ways these two works were an improvement on Thomson's, but some features contained in them were retrograde. Ashmead attached too high a value to the mandibular dentition and some other characters, which led him to define some artificial groups which are in fact heterogeneous. Ruschka (1912–1924) and Masi (1907–1953) made notable contributions to the study of Pteromalidae, by revising certain genera and species, and describing new taxa. Kryger also worked on certain Pteromalidae ; his little-known paper of 1934 included keys to the genera. Nikol'skaya's useful work (1952) also contains keys to genera. After 1945, interest in Chalcidoidea revived and in succeeding years much excellent work was done in revising older taxa and describing new ones, by Bouček, Delucchi, Erdös, Ferrière, Hedqvist, Kerrich, von Rosen and others. Their work need not be discussed here, because I have cited in the text all of their papers dealing with European Pteromalidae. I should just like to say that I have learnt a great deal from their efforts.

I have examined the types of nearly all the species described by the chief European authors (the exceptions are those described by Rondani and Kurdjumov, and many

of those described by Förster, whose collections were not available for study, and those of Nees and Ratzeburg whose collections were for the most part destroyed by military action during World War II). Therefore the synonymy presented here depends very largely upon the direct comparison of type-specimens, which has not been attempted before on a comprehensive scale. Walker's types have been particularly valuable because I have been able to compare with them large quantities of fresh material which I have collected during the past 20 years in the country in which Walker himself collected (often in the type-localities), as well as much material collected by others. This has, in the case of the majority of species, made it possible to find a virtually exact match for type-specimens and to study the range of variation without having to worry unduly about the distracting features of geographical variation. The same procedure has been applied to the species described by Thomson, using the fine assemblage of fresh material collected in Sweden by Dr. J. F. and Mrs. D. M. S. Perkins, and other material which I collected there in 1959.

The present study concerns primarily the fauna of the north-western part of Europe, especially the British Isles and Scandinavia. Some species and genera from other parts of Europe, and even from other regions, are included where this is considered expedient for special reasons. Thus all the genera so far described from Europe have been included in the keys to genera for the sake of completeness. It is therefore hoped that the revision may be of rather more than local interest.

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TAXONOMIC AIMS

These have been to revise the synonymy by a study of type-specimens, to attempt a more satisfactory delimitation of genera and higher categories, to give some biological information, and to provide a representative though not exhaustive bibliography.

Regarding delimitation of genera, the writer has been rather conservative in accepting as valid all those which could be maintained on the basis of reasonably clear-cut characters (not necessarily the same in both sexes). Possibly a number of genera, now regarded as distinct, will eventually be united ; but it is wise not to attempt this until the European fauna has been more adequately surveyed.

The present revision is exploratory rather than exhaustive, and can doubtless be improved upon when the keys have been tested and some little-known genera better worked. The taxonomy of Chalcidoidea at family level is still in a state of flux. Keys to the families have been published by Richards (1956), Ferrière & Kerrich (1958), and Peck *et al.* (1964). These, particularly that of Peck *et al.*, are extremely useful and a great improvement on earlier ones ; but the characters used to separate some of the families are not definite enough, whilst one character used (the relative size of the hind coxae in Torymidae) is misleading. Thus Ashmead (1904 : 229) included Torymidae in a section having " hind coxae very large and long, usually five or six times larger than the anterior coxae "; Richards (1956 : 67) put Torymidae (excluding Megastigminae) in a section having "hind coxae large, 5–6 times longer than the front one ". I do not know of any European Torymid having the hind coxae more than about two and a half times as long as the front coxae. The ratio of the average length of the hind coxa to that of the front coxa is indeed somewhat greater in Torymidae than in Pteromalidae, but some of the latter approach the condition seen in Torymids with shortest coxae, hence the character is

not very definite. I therefore include here a new key to the families, which embodies an attempt to cover as far as possible the extremes of variation within each. Such extremes often make it difficult to define the limits of a family concisely. Possibly a more mature classification may result in a reduction in the number of families. Thus Eucharitidae might be united with Perilampidae ; Leucospididae with Chalcididae ; Eupelmidae, and even Torymidae, with Pteromalidae ; Tetracampidae, Elasmidae, Signiphoridae, Aphelinidae, and Trichogrammatidae, with Eulophidae. The problems of higher categories, however, need discussion in a separate paper.

The only reasonably comprehensive modern key to the European genera of Pteromalidae is that of Bouček (*in* Peck *et al.*, 1964) which is excellent and includes very good figures. But as the authors state (1964 : 27) it incorporates recent changes only in part. My own keys, worked out independently, embody some differences of detail and emphasis as compared with that of the above authors, although in the main I agree with their grouping of the genera. I regret that my keys to the genera (and to the subfamilies) of Pteromalidae are so lengthy, but this was unavoidable when I had to take into account the considerable range of variation in some groups.

In order to keep the size of the work within reasonable bounds, full descriptions of genera and species have been omitted except in special cases (new taxa ; redescription of an important type-species). Consequently a worker will have to rely on the keys, which have been carefully integrated and made as detailed as possible.

The term " sp. indet." is sometimes used in my keys and text for certain species which are probably valid but which I do not wish to describe at present, either because my material is inadequate or for some other reason.

Regarding biological information, clearly many of the older host-records are untrustworthy because of erroneous identifications (in some cases both of a parasite and its host). In most cases the material upon which the records were based no longer exists or cannot be recognized. Where such data could be verified it has been included, but in general I have been fairly ruthless in rejecting old records, knowing many to be valueless or even misleading. In doing so I have no wish to disparage earlier workers who produced so much of value in spite of severe practical limitations. References cited refer chiefly to descriptions but include the more important ones dealing with biology ; amongst the latter is the extremely valuable catalogue of Peck (1963).

Nomenclature of plants in the main follows Clapham, Tutin & Warburg (1962). That of insect hosts for the most part follows Kloet & Hincks (1945, 1964). Various Continental works were also consulted for species not contained in the above to find as far as possible the most up to date nomenclature.

TYPE SPECIMENS

Most species were described before the formal designation of types had become customary. A lack of type-fixation has often resulted in confusion in nomenclature. Types have been examined by the writer unless the contrary is stated.

Types are designated here in nearly all cases where this has not already been done. LECTOTYPE means a present designation ; Lectotype a designation in some previous work. The writer has attached his lectotype label to each type which he has personally designated. Holotype means that the describer either designated one specimen as such or had only one specimen. If neither of these conditions applies but there is a strong presumption that the describer had only one specimen, this is referred to as " ? holotype " or " probably holotype ". Often it is not evident how many specimens of a given species the describer possessed, although his collection now contains only one (e.g., many Walker species). Such a single specimen is not necessarily a holotype, as for instance when the describer gave a size-range or mentioned more than one locality. Where there is any doubt, I have usually designated the single extant specimen as lectotype, provided that it agrees with the description. " Type destroyed " means that definite evidence of this exists. " Type lost " means that, although there is no positive information of its destruction, the type could not be located after extensive search.

The types of all Walker species are located in the BM(NH) unless the contrary is stated in the text. Most of Walker's original specimens bear a characteristic rectangular label with the generic and specific name followed by the words " Stood under this name in the old B.M. Collection, C. Waterhouse " (on the underside of the label) ; to avoid repetition, this label is referred to as Waterhouse label. Walker probably rearranged his collection 1846–8 and again in 1860, and when doing so he transferred some of his species to genera different from those in which he had originally described them ; for example, many *Miscogaster* species were transferred to *Lamprotatus*. The Waterhouse labels were added after this, consequently they sometimes bear the name of the genus to which the species had been transferred, and not the original one. Walker also synonymized some of his species at later dates (chiefly 1846–8) ; in such cases the Waterhouse label bears another species-name. These changes have all been elucidated by reference to Walker's publications and every care has been taken to ensure that the original material has been correctly identified as such. The types of only 23 of Walker's European species are missing, as listed below ; three of them (*Pteromalus bryce, P. felginas* and *Selimnus diores*) are not cited in Walker's *Lists* (1846, 1848) and were certainly returned to de Romand in Geneva (see note under *Selimnus diores*, p. 149). In the case of types marked * the species cannot be recognized ; the others have either been definitely recognized or else placed with a fair degree of probability.

Cyrtogaster poesos (1848 : 164, ♀)
Eutelus signatus (1834 : 357, ♂)
Gastrancistrus alectus (1848 : 158, " ♂ ")
Merisus splendidus (1834 : 167, ♀)
Meromalus flavicornis (1834 : 178, ♂)
Miscogaster lugubris (1833 : 462, ♂)
Miscogaster nicaee (1839 : 197, ♂)
Miscogaster stygne (1839 : 201, ♂)
Miscogaster tenuicornis (1833 : 462, ♀)

Ormocerus aletes (1848 : 163, ♀)
**Platyterma terminale* (1834 : 306, ♀)
**Platyterma comptum* (1834 : 341, ♀)
**Pteromalus aeson* (1848 : 174, ♂)
**Pteromalus amabilis* (1836 : 495, ♀)
**Pteromalus bryce* (1842 : 336, ♀)
**Pteromalus felginas* (1842 : 336, ♀)
Pteromalus lentulus (1839 : 232, ♂)
**Pteromalus mediocris* (1835a : 97, ♀)
Pteromalus pandens (1872a : 101, ♂)
**Pteromalus tiburtus* (1839 : 251, ♂)
Selimnus diores (1842 : 335, ♀)
Trigonoderus hirticornis (1836a : 23, ♂)
Urolepis cychreus (1850 : 131, ♂)

The types of all Thomson and Zetterstedt species are in Universitetets Zoologiska Institutionen, Lund, unless otherwise stated.

DATES OF PUBLICATION

The date given on the title-page of Thomson's *Skandinaviens Hymenoptera* (4e Delen) is 1875. I have cited 1876 as being the correct date of this part, for the following reason. Ashmead (1900, *Proc. U.S. natl. Mus.* **22** : 325–6) pointed out that Howard had given reliable evidence which showed that this part of Thomson's work appeared later than Mayr's paper on Encyrtidae in *Verh. zool.-bot. Ges. Wien* **25**. The latter was read in December 1875 and not published until 1876.

In determining the dates of publication of some other works (e.g., Westwood, 1839) I have made use of internal evidence from sources such as MSS and letters.

The plates A–P in *The Entomologist* **1**, drawn by Haliday, were published separately with different numbers of the periodical (Walker, in litt. to Haliday) during 1841 and 1842. As the precise date of publication for some of them cannot be determined, I have cited 1841–1842 as an inclusive date.

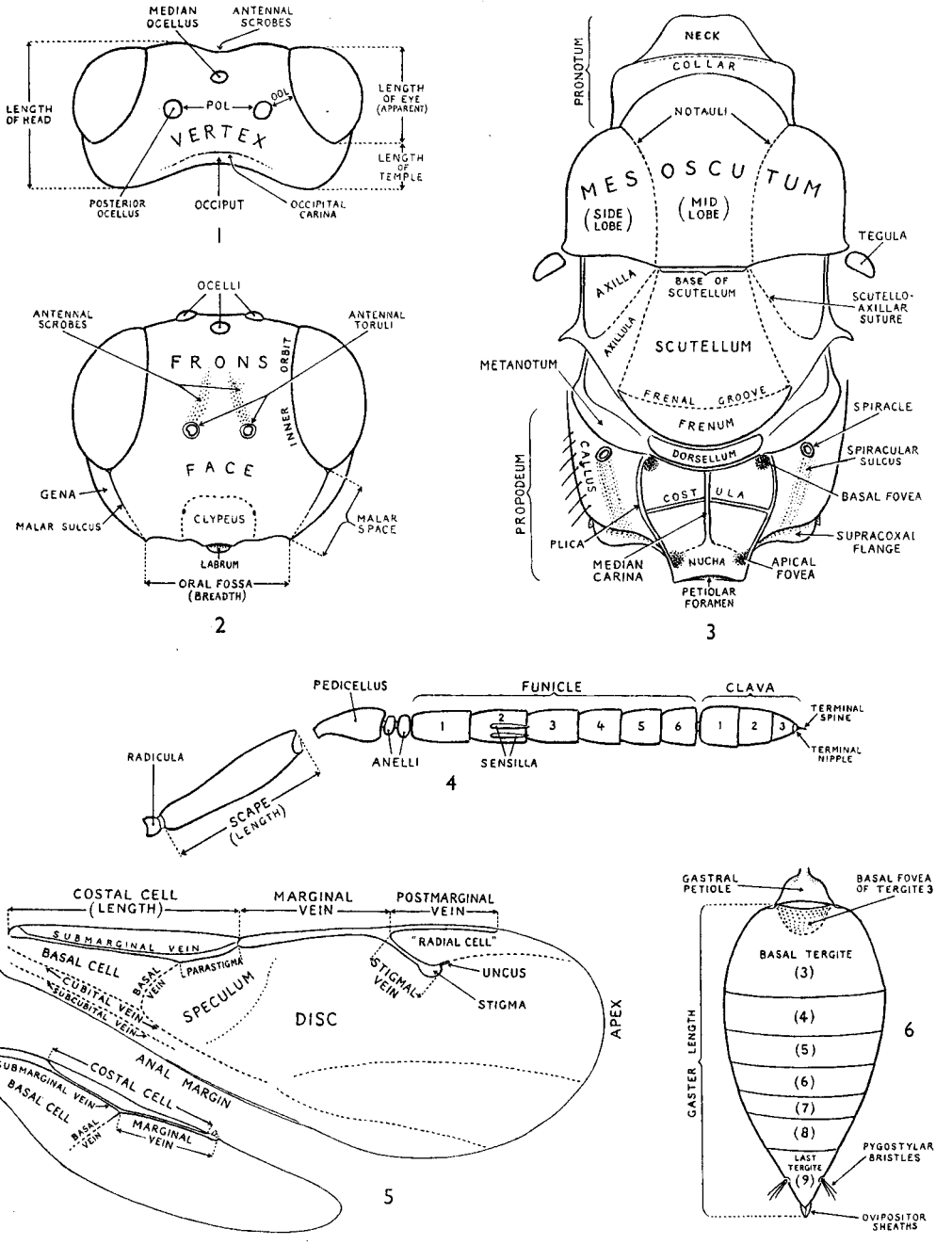
TERMINOLOGY

The terms used are nearly all illustrated in Text-figs. 1–6, and are in the main those employed by Richards (1956). A few terms, which either differ from those of Richards or need more explanation, are the following :

Antenna : unless otherwise stated, the Text-figures illustrate the right antenna viewed from the outside.

Antennal clava : this is regarded as having at most 3 segments. In many species a small area (" terminal nipple ", Text-fig. 4) is differentiated at the tip of the clava. and may be quite large in rare cases ; it is not regarded as being a true segment.

Antennal formula denotes : scape ; pedicellus ; number of anelli ; number of funicular segments ; number of claval segments. Thus the formula of the antenna in Text-fig. 4 is 11263.



FIGS. 1–6. Terminology : 1, head, dorsal ; 2, head, frontal ; 3, thorax, dorsal ; 4, antenna ; 5, wings ; 6, petiole and gaster.

Antennal scape : the length of the scape (Text-fig. 4) does not include the radicula, which is sometimes hidden or hard to measure.

Axillula : a small subtriangular area on each side of the scutellum, marked off by impressed lines from both the scutellum and the adjacent axilla. Apparently present in all Pteromalidae, but indistinct or absent in some members of other families (e.g., Chalcididae, Eurytomidae).

Dorsellum : the central area of the metanotum (Text-fig. 3) ; the " metascutellum " of my previous papers, and of some other authors.

Eye : *length* in general means the true length as measured in the vertical axis of the head ; in descriptions of the head in dorsal view, however, " length " means apparent length as measured in the longitudinal axis of the body (see Text-fig. 1).

Face : the area below the antennal toruli, between the eyes and above the clypeus, bounded laterally below the eyes by the malar sulci (= " lower face " of some authors).

Frenum : the area of the scutellum lying behind the frenal groove when present (Text-fig. 3).

Frons : the area above the antennal toruli, between the eyes and below the median ocellus (= " upper face " of some authors).

Gaster (Text-fig. 6) : *length* is measured in dorsal view, from the junction with the petiole to the tips of the ovipositor sheaths (when the latter are far exserted, as in *Anogmus strobilorum*, the length of the exserted portion is not included in the length of the gaster). The gaster comprises abdominal segments 3–9 (numbered in Text-fig. 6), but in many cases it is convenient to refer to abdominal tergites 3 and 9 as the " basal tergite of the gaster " and the " last tergite " respectively.

Mandibular formula : number of teeth in left and right mandibles ; thus 3.4 indicates three teeth in left mandible, four in right mandible.

Mesosternum : used in the traditional sense ; the " subpleural area " of Richards (1956, fig. 38).

Pronotal collar : length of the collar (e.g., median length) is measured in the longitudinal axis of the body ; breadth of the collar is measured in the transverse axis of the body.

Propodeum : *length* is measured along the median longitudinal line (with the latter as nearly as possible at right-angles to the line of sight).

The structure of the pleural and ventral parts of the thorax is illustrated by Richards (1956, figs. 37, 38). In the main this is followed, though in the keys I have occasionally referred to the " mesopleuron " in its traditional sense (meaning mesepisternum + mesepimeron).

The text-figures have been drawn by the author, using a Watson stereoscopic binocular microscope and magnifications of × 50 and ×100. Some figures published in earlier papers have been partly redrawn. Measurements were made with an eyepiece micrometer.

KEY TO FAMILIES OF CHALCIDOIDEA

1 Petiole of gaster composed of two segments, each of which is longer than

broad, while both together are as long as the rest of the gaster (*Mymaromma*)
MYMARIDAE (part)

– Either the gaster has a petiole composed of one segment, which is sometimes inconspicuous ; or it is sessile 2

2 (1) Head (Text-fig. 7) with antennal toruli much nearer to the eyes than to each other, and separated by not more than their own diameter from the eyes ; frons with an impressed transverse straight line just above the antennal toruli ; from the ends of this line two other pairs of lines extend along the orbits on to the vertex and face respectively. Nearly always macropterous, with hind wing (Text-fig. 8) having a basal stalk which is composed solely of the submarginal vein, the wing-lamina not extending to its base ; wing, beyond the hamuli, nearly always linear with its front and hind edges subparallel. Fore wing (Text-fig. 8) venation characteristic : marginal vein relatively short, stigmal vein rudimentary, the tip of the latter most often situated before the middle of the wing, rarely beyond it. Antennae without true anelli. Tarsi four- or five-segmented. Body non-metallic
MYMARIDAE

– Antennal toruli rarely nearer to the eyes than to each other, if so then the frons lacks impressed lines running along the orbits and the transverse line, if present, is usually not straight, whilst the structure of the fore and hind wings is different, the antennae usually have one or more anelli, and the body is often metallic. Tarsi sometimes with only three segments 3

3 (2) Apterous forms, or brachypterous forms having the wings shortened, rudimentary, or (occasionally) represented by narrow filaments . . . 4

– Forms having wings, except very rarely the hind wings, fully developed, sometimes narrow but never filamentous 10

4 (3) Males only : species associated with figs (*Ficus* spp.). Body and appendages often very aberrant in structure ; apterous, or with wings represented by filaments ; tarsi often heteromerous ; ocelli usually absent
AGAONIDAE and some **TORYMIDAE (SYCOPHAGINAE)**

– Males and females : species not associated with figs 5

5 (4) Tarsi with three segments. Small to minute species, 0·3 to 1·4 mm. ; antennae with only five to eight segments and usually very short
TRICHOGRAMMATIDAE (part)

– Tarsi with four or five segments. Species often larger ; antennae often with a greater number of segments 6

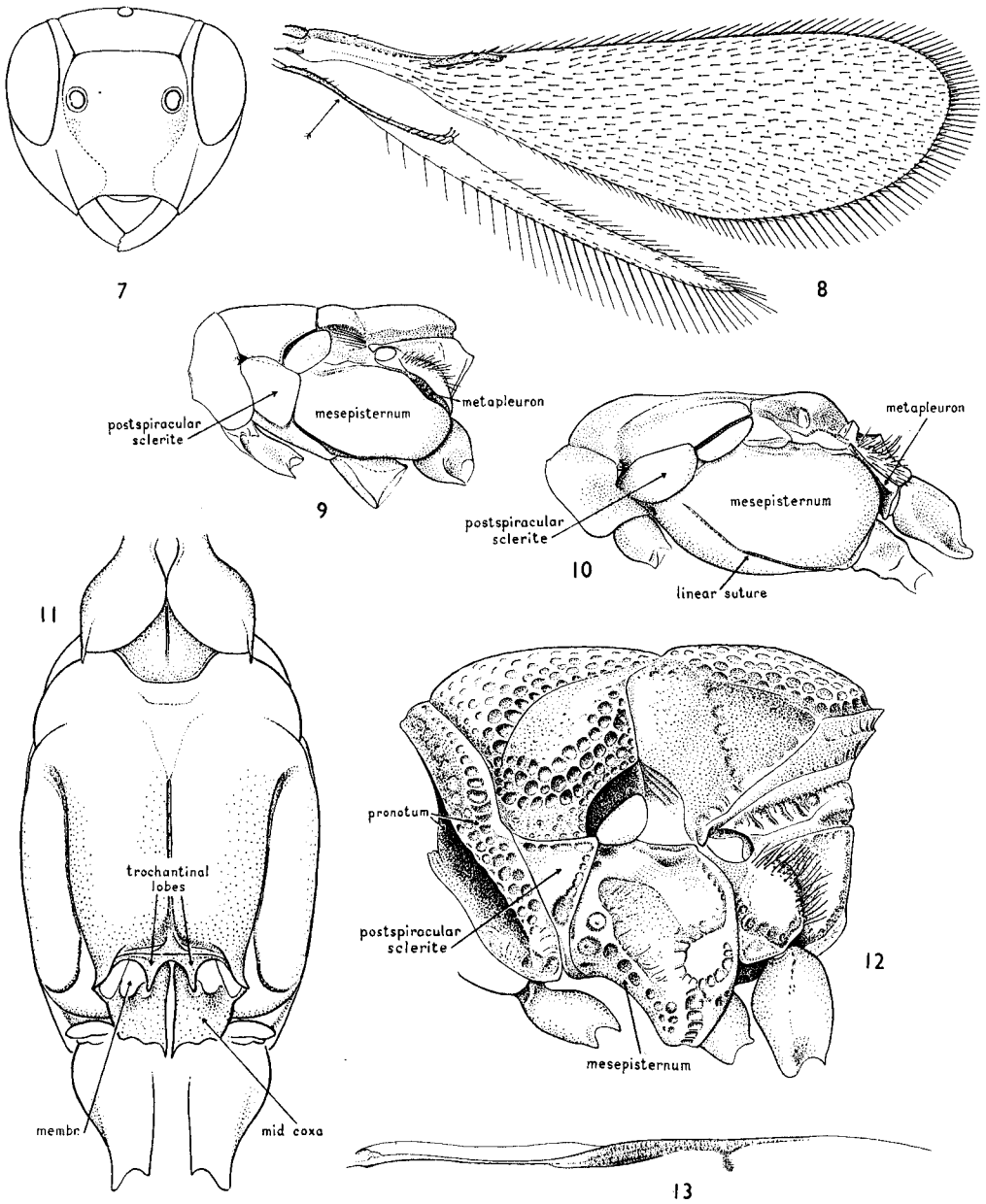
6 (5) Tarsi with four segments . . . . . **EULOPHIDAE** (part)

– Tarsi with five segments 7

7 (6) Mid coxae inserted at or slightly in front of the middle of the mesepisternum (Text-fig. 9) ; mid tarsi thickened proximally, tapering distally, their first segment, and often some of the following segments, with a double row of short thick spines beneath ; mesepisternum (Text-fig. 9) convex, without a femoral groove . . . . . **ENCYRTIDAE** (part)

- Mid coxae inserted at or near the hind end of the mesepisternum. Mid tarsi with or without short thick spines beneath. Mesepisternum with or without a femoral groove 8

8 (7) Mid tarsi thickened proximally, tapering distad, their first segment, and often some of the following segments, with a double row of short thick spines beneath ; mesepisternum (Text-fig. 10) convex, without a true femoral groove, though separated from the mesosternum by an impressed line or suture ; mid coxae ventrally with a membranous area (Text-fig. 11, membr.) at their bases . . . . . **EUPELMIDAE** (part)



FIGS. 7–13. 7, *Polynema* sp., ♀ head ; 8, *Ooctonus soykai* (Hincks), ♀, wings ; 9, *Microterys* sp., ♀, thorax, profile ; 10, *Eupelmus urozonus* Dalman, ♀, thorax, profile ; 11, *Calosota acron* (Walker), ♀, thorax, ventral ; 12, *Perilampus ruficornis* (F.), ♀, thorax, profile ; 13, *Eucharis adscendens* (F.), ♀, fore wing, venation.

– Mid tarsi not thus thickened, without a double row of short thick spines beneath. Mesepisternum, except in a few Aphelinidae, not evenly convex, but having a femoral groove. Mid coxae ventrally touching the trochantinal lobes, without a membranous area at their bases 9

9 (8) Antennae with six to eight segments ; pronotum not large, shorter than the mesoscutum . . . . . **APHELINIDAE** (part)

– Either the antennae have 11 to 13 segments ; or else the pronotum is large, longer than the mesoscutum . . . . . **PTEROMALIDAE** (part)

10 (3) Females only : tarsi heteromerous, fore and hind tarsi with five segments, mid tarsi with four segments 11

– Females and males : tarsi not heteromerous 12

11 (10) Antennae with twelve to thirteen segments. Fore wing (Text-fig. 66) with postmarginal and stigmal veins well-developed. Moderate-sized species, length 2·0 to 3·5 mm. (*Macromesus* only) . . . **PTEROMALIDAE**

– Antennae with eight segments. Fore wing : postmarginal vein absent or rudimentary, stigmal vein short (much as in Text-fig. 31). Minute species, length 0·5 to 0·8 mm. (some *Encarsia*) . . . . . **APHELINIDAE**

12 (10) Tarsi with three segments. Small to minute species, length 0·3 to 1·4 mm. ; antennae with only five to eight segments and usually very short ; hairs of fore wing often in longitudinal lines . **TRICHOGRAMMATIDAE** (part)

– Tarsi with four or five segments. Species often larger ; antennae often with a greater number of segments ; hairs of fore wing rarely arranged in longitudinal lines 13

13 (12) Tarsi with four segments 42

– Tarsi with five segments 14

14 (13) Mid coxae (Text-fig. 9) inserted about level with the middle of the mesepisternum, or even anterior to this, the mesosternum being very short ; mesepisternum enlarged and at least partly covering the mesepimeron, convex, without a femoral groove ; mid tibiae with a very thick apical spur ; mid tarsi thickened proximally, at least their first segment with two rows of short stout spines beneath.

Notauli usually absent, occasionally present or even complete but in such cases very superficial. Metapleuron often very narrow or invisible. Last tergite of gaster often more or less V-shaped . . . **ENCYRTIDAE**

– Mid coxae (Text-figs. 10, 12, 15, 17, 20, 24, 26) inserted behind the level of the middle of the mesepisternum. Mesepisternum, except in most female and some male Eupelmidae, and a few aberrant species of other families, neither enlarged nor evenly convex, but having a femoral groove. Mid tibial spur and mid tarsi, except in most Eupelmidae, not thus modified . 15

15 (14) Mid tarsi thickened proximally and tapering distally, their first segment, and usually some of the following segments, with two rows of short stout spines beneath ; mid coxae separated from the trochantinal lobes of the mesosternum by a membranous area (Text-fig. 11, membr.) which allows the coxae to be swung directly forwards ; spur of mid tibia thick ; mesepisternum (except in *Oodera*) greatly enlarged, evenly convex and without a femoral groove, though separated from the mesosternum by a linear suture, see Text-fig. 10. Pronotum often divided longitudinally down the middle, by a groove, a membranous line, or a carina. Postspiracular sclerite (Text-fig. 10) often longer than high, tending to be convex, sometimes free ventrally and overlapping the mesepisternum somewhat. Propodeum nearly always shorter medially than at the sides, sometimes nil medially ; its hind margin being deeply, almost semicircularly, excised. Antennae of

female most often with one anellus, seven funicular segments, and a solid or three-segmented clava . . . . . **EUPELMIDAE**

– Mid tarsi not modified as in the above ; mid coxae without a membranous area ventrally and not capable of being swung directly forwards ; spur of mid tibia rarely so thick ; mesepisternum nearly always with a femoral groove, which extends from the base of the mid coxa towards the base of the fore wing. Pronotum, except in some exotic Pteromalidae Cleonyminae, not divided longitudinally. Postspiracular sclerite not free ventrally, nearly always as high or higher than broad, usually flat, or somewhat concave with its upper and hind margins slightly raised. Propodeum usually not shorter, but often longer, medially than at the sides 16

16 (15) Postspiracular sclerite (Text-fig. 12) lying in the same plane as, and fused with, the lateral part of the pronotum ; the latter is rigidly coadapted to the mesepisternum. Thorax in profile (Text-fig. 12) short and high. Gaster often with only one or two tergites visible in dorsal view. Notauli complete 17

– Postspiracular sclerite [absent in a very few species] not lying in the same plane as, and not fused with, the lateral part of the pronotum ; the latter can usually swing forwards away from the mesothorax. Thorax sometimes otherwise in shape. Gaster most often with more than two tergites visible in dorsal view 18

17 (16) Pronotum not visible from above, being hidden by the mesoscutum which is strongly convex, or protuberant anteriorly. Mandibles nearly always sickle-shaped, in a few species very short, straight, and hanging down vertically ; in these species the antennal scape is shorter than the first funicular segment and hardly longer than broad, whilst the head is narrower than the thorax. Petiole of gaster longer, often very much longer, than broad, often as long as the rest of the gaster ; third abdominal tergite usually covering the rest in dorsal view. Fore wing (Text-fig. 13) : stigmal vein usually directed at approximately a right angle relative to the costal edge, sometimes slightly oblique. Head in front view usually more or less triangular. Antennae very varied in form : most often without anelli or with only one, usually with seven or eight funicular segments ; flagellum in male often with branches. Scutellum in exotic species often with bizarre processes . . . . . **EUCHARITIDAE**

– Pronotum clearly visible in dorsal view of thorax. Mandibles not sickle-shaped. Antennal scape very much longer than the first funicular segment, and much longer than broad. Petiole very short and transverse ; dorsal surface of gaster often occupied wholly or nearly wholly by the connate third and fourth abdominal tergites. Fore wing : stigmal vein oblique. Head in front view not triangular. Antennal formula usually 11173, sometimes 11171 ; flagellum without branches. Scutellum without, or with at most short, teeth or processes . . . **PERILAMPIDAE**

18 (16) Females only : mandible with a proximal appendage which lies against the underside of the head and is transversely ridged, these ridges sometimes appearing like serrations. Third or fourth segment of antenna often with a process or appendage. Species associated with figs (*Ficus* spp.).

The only species found in Europe is *Blastophaga psenes* (L.) which occurs in south-west Europe, Asia, and Africa . . . . . **AGAONIDAE**

– Males and females : mandibles without such an appendage. Third and fourth segments of female antenna without processes. Species, except some Torymidae and Eurytomidae, not associated with figs 19