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North American genera of Tetrastichinae (Hymenoptera: Eulophidae)

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The North American members of the eulophid subfamily Tetrastichinae are reviewed in light of systematic advances which have occurred in other geographic realms. Forty-two genera are recognized as valid, with the largest of these, *Aprostocetus*, having four subgenera in the study area. Thirteen new genera are described: *Apterastichus*, *Careostrix*, *Chytrolestes*, *Comastichus*, *Cucarastichus*, *Dapsilothrix*, *Eriastichus*, *Exalarius*, *Exastichus*, *Hadrotrichodes*, *Mesofrons*, *Oxypracetus*, *Styotrichia*; the new subgenus *Quercastichus* is described in the genus *Aprostocetus*. Five new generic synonymies are made. With *Aprostocetus* Westwood, 1833: *Exurus* Philippi, 1873, *Omphalomopsis* Girault, 1917, *Paromphaloidomyiia* Girault, 1917, and *Prothymus* Girault, 1917. With *Pentastichus* Ashmead, 1894: *Hypertetrastichus* Moser, 1965. Six previously described genera are newly recorded from North America: *Aceratoneuromyia*, *Anaprostocetus*, *Henryana*, *Kocourekia*, *Lisseurytomella* and *Pentastichus*. Two hundred and twelve species of North American Tetrastichinae are currently recognized as valid. Eighty new combinations are proposed from North America, and three from the Neotropical Region. The majority of these species are being moved from the genus *Tetrastichus*, which had previously held most of the North American Tetrastichinae species. Eighteen new species are described: *Aprostocetus* (*Quercastichus*) *burksi*, *Apterastichus oculatus*, *Careostrix yoshimotoi*, *Chytrolestes alibaba*, *Comastichus zopheros*, *Cucarastichus texanus*, *Dapsilothrix jeanae*, *Eriastichus cigdemae*, *E. masneri*, *E. nakos*, *Exalarius huachucensis*, *Exastichus odontos*, *Hadrotrichodes waukheon*, *Kostjukovius grahami*, *Mesofrons villosus*, *Oxypracetus opacus*, *Styotrichia bicolor*, *S. quadrata*. One new specific synonymy is made. With *Aprostocetus* (*Quercastichus*) *pattersonae* (Fullaway, 1912): *Tetrastichus spilopteris* Burks, 1943. A lectotype is designated for *Tetrastichus pattersonae* Fullaway. *Aprostocetus* (*Ootetrastichus*) *mymaridis* (Girault) is removed from synonymy with *Tetrastichus polynemae* Ashmead and considered as valid. Twelve previously described species are newly recorded from North America: *Aceratoneuromyia fimbriata* Graham, *Anaprostocetus acuminatus* (Ratzeburg), *Aprostocetus antiguensis* (Crawford), *A. leucone* (Walker), *A. pygmaeus* (Zetterstedt), *A. strobilanae* (Ratzeburg), *A. longicauda* (Thomson), *A. terebrans* (Erdös), *Henryana magnifica* Yoshimoto, *Kocourekia debilis* (Ratzeburg), *Lisseurytomella flava* (Ashmead), *Tamarixia leucaenae* Bouček.

KEYWORDS: Eulophidae, Tetrastichinae, systematics, North America.

Introduction

The eulophid subfamily Tetrastichinae is one of the largest and most widespread of all parasitic Hymenoptera groups. Species occur in virtually all terrestrial habitats

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in all geographic realms, and they are clearly an important component of many terrestrial ecosystems. They are a fascinating group from a biological standpoint, and display a great deal of variation. Hosts for Tetrastichinae are found in 100 families of insects in 10 different orders, plus spider eggs, mites, and even nematodes. There are also species that are phytophagous, inquilines, or gall-formers.

Unfortunately, they are an extremely difficult group taxonomically. There are a large number of species, they are morphologically rather uniform and boring compared with many of their relatives in the Chalcidoidea, and they tend to collapse or shrivel when they die, making them difficult to study. Species-level determinations are impossible in most geographic regions, and this has hindered work on various aspects of their biology and behaviour.

Owing to the lack of an understanding of relationships in this subfamily, most species of this subfamily have traditionally been placed in the genus *Tetrastichus*, and this is the classification that is used in the latest North American catalogue (Burks, 1979). Recently, Graham (1987) provided a major reclassification of the European Tetrastichinae by dividing the large genus *Tetrastichus* into several more natural groups. He gave generic status to many of these groups, and what was *Tetrastichus* has now been replaced by over 15 valid genera. The redefined genera are for the most part more uniform in terms of their morphology and biology, and appear to represent more evolutionarily meaningful units. This classification has since been followed by Bouček (1988a) in his treatment of Australasian Chalcidoidea. The largest genus in all regions is *Aprostocetus*, with many hundreds of species. Following in size is *Baryscapus*, which is mainly Holarctic in distribution, and then *Tetrastichus* and *Quadrastichus*. Any further work on North American Tetrastichinae is impossible without understanding how North American species fit into this new classification.

Purpose and scope

The purposes of this paper are to:

(1) Review North American Tetrastichinae in light of recent changes in systematics of Tetrastichinae (Graham, 1987, 1991; Bouček, 1988a), so that the generic classification used in North America becomes consistent with that used in other regions of the world.
(2) Place all North American species in their proper genera, so that: (*a*) species names can be cited in the correct combination to avoid the continued usage of outdated nomenclature in the literature; and (*b*) workers who desire further information on certain genera will know which species are involved.
(3) Supply the necessary descriptions of several new genera in order to make them available for a key to North American Chalcidoidea genera which is currently in preparation.
(4) Provide a key for the identification of all North American genera of Tetrastichinae.

Each generic treatment is accompanied by (where appropriate) the following sections: diagnosis, description (for new genera), discussion, distribution, biology and hosts, biological control, notes and recent literature, new records (described species newly recorded from North America), other New World species, and a list of North American species. New host or biological information is treated under the species. An extensive bibliography to North American Tetrastichinae is provided.

This paper should be considered as a starting point for the study of North American Tetrastichinae. This is a very difficult group, with a great many undescribed species. It is difficult to construct keys that will fit all the variation seen within this group, and yet still remain usable by more than a few specialists. Additionally, it is almost certain that species are yet to be discovered in North America which will not fit the keys, particularly in the warmer regions of the Southern USA.

Justification

It has not been customary to include a justification section in taxonomic papers, but perhaps it should be. With diminishing resources for all biological sciences, and systematics in particular, groups of exceptional importance should be chosen for priority study (Soulé, 1990); it is no longer enough for systematists to work on groups simply because they like them.

A variety of reasons for choosing parasitic Hymenoptera as one such focal group have been supplied by LaSalle and Gauld (1992) and several chapters in LaSalle and Gauld (1993). Even within the parasitic Hymenoptera, the Tetrastichinae is an unusually important group. It is not only one of the most speciose groups of parasitic Hymenoptera, but species have been the focus of a variety of ecological, biological and behavioural studies. Additionally, tetrastichines have been used in several biological control projects, and no doubt contribute to many cases of natural regulation of phytophagous insects.

It is hoped that this paper will be of value not only to a few other taxonomists, but to workers in other fields of entomology and biology as well.

Format

Certain conventions in the format of this paper are clarified as follows:

North America. In this paper North America is defined as that area of the continent north of Mexico (i.e. Continental USA, Canada, Alaska). This is admittedly an arbitrary definition which does not reflect a true biogeographical realm. It was chosen because this is the area treated by the various North American catalogues (Peck, 1951, 1963; Burks, 1958, 1967a, 1979), and these catalogues serve as a basis for the species lists of Tetrastichinae which are included in this paper.

Type repositories. In lists of included species, the repository of the primary type(s) is given in parentheses at the end of the original reference, except in the few cases where it was not known. In almost all cases type material was examined.

Lectotypes. Where syntypes existed, lectotypes were not designated as a matter of routine, as I felt that this should be left to later revisions at the specific level.

Synonymy lists. Synonymy lists generally only include names relevant to North American literature, with references where appropriate to extralimital synonymy lists.

Girault publications. In order to avoid confusion, numbers are given in brackets immediately after the year for all Girault publications. These numbers were given by Dahms (1978), who listed all Girault papers in chronological order (see also note under Girault in Literature Cited).

Other New World Species. In some of the generic treatments I have included lists of other New World species belonging to that genus. This is not intended to represent a complete list, but it seemed helpful to include these species in their proper genera when I knew them. References to these species can be found in the various catalogues treating the Americas south of the USA (De Santis, 1967, 1979, 1980, 1981, 1989).

References are given in this section only if the treatment of the species differs from that given by De Santis.

New records. A separate section under each generic treatment lists any species newly recorded from North America. Specific information is given under that species.

Acronyms. The following acronyms are used for museums and collections: BMNH, The Natural History Museum, London, UK; BPBM, Bernice P. Bishop Museum, Honolulu, HI, USA; CNC, Canadian National Collection, Ottawa, Canada; CU, Cornell University, Ithaca, NY, USA; INBIO, Instituto Nacional de Biodiversidad de Costa Rica, San José, Costa Rica; INHS, Illinois Natural History Survey, Champaign, IL, USA; LACM, Los Angeles County Museum of Natural History, Los Angeles, CA, USA; LAS, collection of the author; MCZ, Museum of Comparative Zoology, Harvard University, Cambridge, MA, USA; MHNG, Muséum d'Histoire Naturelle, Geneva, Switzerland; MSNG, Museu Civico di Storia Naturale, Genoa, Italy; MUCR, Museo de Insectos, Universidad de Costa Rica, San José, Costa Rica; NHMV, Naturhistorisches Museum, Vienna, Austria; NRS, Naturhistoriska Riksmuseet, Stockholm, Sweden; QMB, Queensland Museum, Brisbane, Australia; SMEK, Snow Museum of Entomology, University of Kansas, Lawrence, KS, USA; TMB, Termeszettudomanyi Muzeum, Budapest, Hungary; UCD, University of California, Davis, USA; UCR, University of California, Riverside, CA, USA; UMO, University Museum, Oxford University, Oxford, UK; USNM, United States National Museum (Natural History), Washington, DC, USA; UZIL, Universitets Zoologiska Institut, Lund, Sweden; ZIL, Zoological Institute, Academy of Sciences, St Petersburg, Russia; ZMS, Zoologische Staatsammlung München, Munich, Germany; ZMUA, Zoologisch Museum, Universiteit van Amsterdam, Amsterdam, The Netherlands; and ZSBS, Zoologische Sammlungen des Bayerischen Staates, Munich, Germany.

Subfamily **TETRASTICHINAE**

Brief history

The first serious taxonomic assault on the Tetrastichinae was by Burks (1943), who provided a key to North American species of *Tetrastichus*. This work treated the bulk of North American tetrastichine species as belonging to the genus *Tetrastichus*. Although there was little discussion of classification, Burks was the first to recognize the use many important characters in his key to species. Various of his characters are still the best for characterizing certain genera.

Burks later provided revisions of *Syntomosphyrum* (Burks, 1952) and *Aprostocetus* (Burks, 1967b). Unfortunately, he never provided key characters by which to separate these genera from *Tetrastichus*, and the characters he apparently used were not good generic-level characters. Thus, his usage of these generic names does not match current usage, and he included species from several different genera in each group.

Graham (1961a, b) was the first to form groups of related species within *Tetrastichus*, and he split the European species into species groups (using the older name *Aprostocetus* as the valid generic name). These groups, for the most part, match the genera which are today considered as valid. His species groups were later used by Domenichini (1966a, 1967) who used the name *Tetrastichus* as valid rather than *Aprostocetus*. Kostjukov (1977) elevated many of these groups to subgeneric status, again within *Tetrastichus*.

Bouček (1977) provided a key to world genera to Tetrastichinae, in which he included the '*Tetrastichus* aggregate', which was equivalent to the genus *Tetrastichus* as treated by the above authors.

Graham (1987) provided an in-depth reclassification of European Tetrastichinae. In this work he raised most of his species groups to generic level, provided a key to genera, and gave a species-level revision for eight of the genera. The remaining genera were subsequently revised by Graham (1991). The classification provided by Graham was for the most part followed by Bouček (1988a), and is the classification followed in the present paper.

North American generic concepts

Generic concepts in North America have not always been in agreement with those used in Europe, and certainly differ drastically from those recently proposed by Graham (1987). To facilitate an understanding of the changes being made in this paper, the genera which were included in the Tetrastichinae in the most recent North American catalogue (Burks, 1979) are listed here, with a brief statement as to their current status.

Aprostocetus. Although this is currently the largest of Tetrastichine genera, it has been treated in a very restricted sense in North American literature. The character which has been traditionally used to define *Aprostocetus* in North America has been an elongate and pointed gaster, often with an exserted ovipositor. This is not a good generic-level character; although most of the 16 species placed in *Aprostocetus* by Burks (1979) do properly belong in *Aprostocetus*, he also included species which belong in *Baryscapus* and *Tetrastichus*.

Burksia. Synonymized with *Neotrichoporoides* (Graham, 1987).
Ceratoneura. Valid genus.
Crataepus. Valid genus.
Flockiella. Synonymized with *Quadrastichodella* (Bouček, 1977).
Galeopsomopsis. Synonymized with *Galeopsomyia* (LaSalle and Schauff, 1992).
Galeopsomyia. Valid genus.
Hypertetrastichus. Synonymized with *Pentastichus* (this paper).
Melittobia. Valid genus.
Omphalomopsis. Synonymized with *Aprostocetus* (this paper).
Paragaleopsomyia. Valid genus.
Paraspalangia. Valid genus.
Prothymus. Synonymized with *Aprostocetus* (this paper).

Syntomosphyrum. This genus (as based upon its type species, *S. fulvipes*) was first synonymized with *Aprostocetus* by Graham (1961b). However, the concept of *Syntomosphyrum* that has been used in North America is different, and it appears to include species which have a rather short, ovate gaster, and two or more setae on the submarginal vein. Eight species were included in *Syntomosphyrum* by Burks (1979); these species belong in the genera *Aprostocetus*, *Baryscapus*, and *Tetrastichomyia*.

Tetrastichus. Burks (1979) used *Tetrastichus* in the traditional, broad sense and included 125 species in it. These include species which now belong to the genera: *Aprostocetus*, *Baryscapus*, *Minotetrastichus*, *Oomyzus*, *Quadrastichus*, *Tamarixia*, *Tetrastichus*, and *Thripastichus*. The genus *Tetrastichus* in the restricted sense, as used in this paper, contains only 21 species.

Thriposoma. Synonymized with *Baryscapus* (LaSalle and Graham, 1990).
Thymus. Unplaced Tetrastichinae.

Winnemana. Removed from Tetrastichinae and synonymized with *Cirrospilus* (Graham, 1975).

North American species

Currently there are 212 valid North American species of Tetrastichinae. All North American species names should be treated in this paper, although extralimital synonymies are not always included. Appendix 3 lists all names used in the North American literature (whether currently valid or not), along with the genus in which that species is currently placed.

Important references

This section contains some of the more important works to those interested in learning about Tetrastichinae. It is not a complete bibliography, but contains works which are felt to be of particular use or interest. Any important works on classification have already been given in the brief history section.

Keys. This section lists generic-level keys, or keys to all species of Tetrastichinae for a particular region. Keys to species within a genus (where available) are listed under the generic treatments. The earliest keys to tetrastichine genera, such as Förster (1856: 83–84), Ashmead (1904: 347–350), Girault (1913 [167]: 249–251) are of historical interest, but will not provide much help with identification.

Bouček (1977) provided a tentative key to world genera, in which he treated 17 genera and the '*Tetrastichus* complex'. No other modern key to world genera exists; however, since that work the *Tetrastichus* complex has been divided into several genera (Graham, 1987; Bouček, 1988a), and the genus *Seyrigina* has been moved to the Eulophinae (Graham, 1987: 3–4, 381). The most important keys currently are Graham (1987, 1991) and Bouček (1988a). Although these keys treat Europe and Australasia respectively, they may, with some restraint, be applied outside of those areas, and they are the only keys (outside of the one in this work) which reflect current classification in the Tetrastichinae.

North America. A key to North American genera is presented in this work. Burks (1943) provided a key to species of *Tetrastichus*, and later *Syntomosphyrum* (Burks, 1952) and *Aprostocetus* (Burks, 1967b). Although many of these species are transferred in this paper to other genera, these keys may still prove useful in the identification of many North American species of Tetrastichinae.

Europe. Graham (1987) reclassified European Tetrastichinae, and provided keys to genera for Europe, and species-level keys for eight of the genera. Species-level keys for the remaining genera were subsequently provided (Graham, 1991). Kostjukov (1978) provided keys to the Tetrastichinae of the European part of the USSR. Many of the species he placed in *Tetrastichus* have since been moved by Graham (1987, 1991) into other genera. Since Kostjukov's key follows the same major outline of his key to subgenera (1977), it is relatively easy to understand which species currently belong to which genera.

Earlier, regional keys to genera of Tetrastichinae (such as Peck *et al.*, 1964; Yoshimoto and Ishii, 1965; Hayat, 1985) are of limited value because they no longer reflect the classification currently in use.

Catalogues which include Tetrastichinae. For North America: Peck (1951), with supplements by Burks (1958, 1967a); Peck (1963); Burks (1979). Although Burks (1979) is the most recent catalogue, Peck (1963) is also valuable in that it contains a more extensive list of biological references.

For the Neotropical Region: De Santis (1967) for Argentina; De Santis (1979) for Neotropical Region except Argentina and Brazil, with supplements by De Santis (1983, 1989); De Santis (1980) for Brazil.

For Europe: Domenichini (1966b). See also lists of included species in Kostjukov (1978), Graham (1987, 1991).

For India: Husain and Khan (1986).

For the Philippines: Baltazar (1966).

For Australia: No catalogue available, but Bouček (1988a) gives lists of included species for each genus.

Biology

In terms of their biology, the Tetrastichinae is one of the most interesting groups of Chalcidoidea. The range displayed in host selection, mode of development, and behaviour is equalled within the Chalcidoidea only by the Pteromalidae and Encyrtidae. Within the Eulophidae, the Entedoninae display some of the variation seen in the Tetrastichinae; however, the other subfamilies are relatively dull in comparison. Species can be solitary or gregarious, internal or external parasitoids, primary or secondary parasitoids, predatory, or phytophagous.

Tetrastichinae utilize > 100 families of hosts in 10 orders of insects (figures compiled from Domenichini, 1966b; Graham, 1987, 1991; Bouček, 1988a; this paper). Some tetrastichines act as specialized predators, consuming many prey within an enclosed situation. They are known to attack spider eggs in egg sacs (LaSalle, 1990b), gall-forming mites (Vereshchagina, 1961), and nematodes within galls (Van den Berg *et al.*, 1990). Additionally phytophagy is known with species developing as gall formers (Hawkins and Goeden, 1982), inquilines, and seed infesters. One European species *Baryscapus diaphantus*, which is a parasitoid within cynipid galls, is also a pollinator of the orchid *Herminium monorchis* (Nilsson, 1979).

Differing degrees of host specialization are shown by different genera. Many *Aprostocetus* species are parasitoids of cecidomyiids or other gall insects, but other species are parasitic in eggs, larvae or pupae of various insects, and many species are known to be hyperparasitoids. *Baryscapus* shows a similar wide range in host affinities. However, *Melittobia* species are gregarious parasites of some aculeate Hymenoptera, the closely related *Tachinobia* in Diptera (mostly Tachinidae) puparia. *Aceratoneuromyia* species are also gregarious endoparasitoids of Diptera.

Restricted host associations within the Tetrastichinae have apparently arisen in two ways. For example, *Tamarixia* species are all parasitoids of Psylloidea, and attack both free-living and gall-forming species; they apparently arrived at this restricted host association through a specialization on their host taxon. The Neotropical genus *Cirrospilopsis* also attacks only psyllids, but apparently reached this host association through niche specialization. *Cirrospilopsis* species attack gall-forming psyllids, and appear to be related to a group of genera which are all associated with galls, as parasitoids, inquilines, or gall-formers. This group also includes *Galeopsomyia*, *Ceratoneura*, and *Paragaleopsomyia*. Many of the species in these genera are larger and more hard-bodied than other tetrastichines.

Various aspects of behaviour have also been seen to be useful taxonomic tools in Tetrastichinae, and have contributed to our understanding of relationships in this group (Assem, 1975; Assem *et al.*, 1982a, b; Bosch and Assem, 1986).

Hosts

A host list for all North American Tetrastichinae is provided at the end of the paper in Appendix 1. Lists of extralimital hosts can be found in Domenichini (1966b) and Graham (1987, 1991), and gathered from the various catalogues listed above.

Biological control

Species of Tetrastichinae have been used in biological control projects throughout the world, primarily against Coleoptera and Diptera, although Lepidoptera and Thysanoptera have also been targeted. Graham (1987) gave a brief summary of Tetrastichinae used in biological control projects throughout the world. A list of Tetrastichinae which have been used (or in some cases only investigated for use) in biological control programmes in the North and Central America is given at the end of this paper in Appendix 2.

Although several species have been used in biological control programmes, this group does not begin to rival the successes seen in the Encyrtidae, Aphelinidae or Braconidae. It is likely that tetrastichines have far more significance for their population regulation of insects in natural environments, and thus the maintenance of ecosystem balance.

Morphology

Morphology used mainly follows Graham (1987), with the following exceptions:

Mesosoma is the combined thorax and propodeum. It should follow that I would then use metasoma for the combined petiole and gaster; however, I prefer to maintain the use of these latter two terms separately so as to be able more precisely to discuss a specific body region.

Frontofacial suture is used rather than median carina on frons, because in certain genera (e.g. *Pronotalia*, *Tachinobia*), these sutures are quite widely separated from each other dorsally, and thus no longer really median.

Abbreviations. The following abbreviations are used for morphological terms in the text:

F1–F4, funicular segments 1–4
C1–C3, club segments 1–3
SMV, submarginal vein
PMV, postmarginal vein
MV, marginal vein
SV, stigmal vein
POL, posterior ocellar length (the distance between the lateral ocelli)
OOL, oculo-ocellar length (the distance between the lateral ocellus and the eye margin).

Recognition of Tetrastichinae

There are several keys for the recognition of the subfamilies of Eulophidae. Among the best are the recent ones by Graham (1987), Bouček (1988a) and Grissell and Schauff (1990). The family is currently divided into four subfamilies: the two largest are Tetrastichinae and Entedoninae, followed in size by Eulophinae and Euderinae. Another subfamily, Elachertinae, has often been used in the literature, but this has since been included with the Eulophinae. The Elasmidae is

generally treated as distinct, although certain authors (e.g. Burks, 1979) have included it as a subfamily of the Eulophidae.

Although the Tetrastichinae appears to represent a monophyletic group, there is little real support for its monophyly. Tetrastichinae can generally be recognized by the following characters:

(1) Postmarginal vein absent or highly reduced (less than half the length of the stigmal vein).
(2) Scutellum with two pairs of longitudinal lines: a pair of submedian lines and a pair of sublateral lines (and with 2 pairs of setae).
(3) Axilla strongly advanced, delimiting a linear scapular flange.
(4) Female antenna with three funicular segments; male antenna with four.
(5) Submarginal vein not joining the parastigma smoothly, but tapering to a point which joins the parastigma slightly distal to its base.
(6) Maxillary and labial palps one-segmented.

Unfortunately, every one of these characters can be found in some other subfamily; and there are exceptions to every one of these characters found within the Tetrastichinae.

Graham (1987: 15) listed a single character which he considered to be an autapomorphy found only in Tetrastichinae: the presence of a sensory plaque on the ventral edge of the male scape. This structure is still unknown in other Eulophidae; however, the tetrastichine genus *Phymastichus* has since been described (LaSalle, 1990a) in which this sensory plaque is lacking.

Key to North American Tetrastichinae genera

1	Wings absent or greatly shortened, not extending over half the length of the gaster (Figs 7, 23) 2
1′	Wings present and of normal size 7
2(1)	Males only. Malar sulcus absent (Figs 5, 12). Compound eye slightly to considerably reduced (Figs 5, 6, 12, 13). Scape (Figs 6, 12) slightly to considerably swollen. (Possibly here also *Kocourekia*, for which males are unknown.) 3
2′	Males or females. Malar sulcus present (as in Figs 99, 110, 115). Eyes normal 4
3(2)	Frontofacial sutures absent (Fig. 6); head somewhat enlarged *Melittobia* Westwood
3′	Frontofacial sutures present and widely separated from each other dorsally (Fig. 13); head not enlarged . . . . . *Tachinobia* Bouček
4(2)	Midlobe of mesoscutum with setae restricted to a single row of adnotaular setae at lateral margin (Fig. 83) 5
4′	Midlobe of mesoscutum with *either*: setae uniformly covering mesoscutum; *or* setae situated in $\geqslant 2$ rows at lateral margin (Fig. 23) 6
5(4)	Dorsellum divided medially by a longitudinal channel (Fig. 84). Antenna with 3rd anellus larger than preceding two anelli and with setae (Fig. 85). Scutellum without submedian lines, with deep sublateral lines (Fig. 84). Midlobe of mesoscutum without median line (Fig. 83). Callus with many (> 10) setae (Fig. 84). Vertex with small but distinct transverse carina posterior to ocelli (Fig. 86) . . . . . *Tetrastichomyia* Girault
5′	Dorsellum not medially divided (as in Figs 87, 94, 96). Antenna with 3rd anellus about equal in size to preceding anelli; if somewhat larger than preceding two, then it is not setose (Figs 52, 57, 111). Submedian lines on scutellum and median line on midlobe of mesoscutum variable, but usually present. Callus usually

with < 10 setae. Vertex usually without transverse carina. (A few aberrant species of *Aprostocetus* might key here.) 53

6(4) Midlobe of mesoscutum sparsely but uniformly covered with setae. Antennal club with long terminal stylus (as long as terminal club segment) *Exalarius* gen. n.

6′ Midlobe of mesoscutum bare medially, but with setae situated in ⩾ 2 sparse rows at lateral margin (Fig. 23). Antennal club without such a long terminal stylus . . . . . *Apterastichus* gen. n.

7(1) Malar sulcus absent (Figs 1, 8, 18). Body usually somewhat flattened, with elongate pronotum (Figs 4, 15, 20). Female with hypopygium situated beyond (usually well beyond) middle of gaster (Fig. 21). Midlobe of mesoscutum without median line (Figs 4, 10, 20). Submarginal vein of forewing with 3–6 dorsal setae (Figs 129, 130). Funicular segments generally wider than long to quadrate (Fig. 3) 8

7′ Malar sulcus present (Figs 24, 99, 110, 115). Other characters variable, present or absent, but usually not present in above combination 13

8(7) Fore tibia enlarged, with large, black, bifid apical spur (Fig. 16). Pronotum large, rectangular (Fig. 15). Female with ovipositor distinctly exserted (Fig. 14). Head distinctly wider than high, and frontofacial sutures widely separated dorsally, enclosing a small, triangular area beneath anterior ocellus (Fig. 17) *Crataepus* Förster

8′ Fore tibia normal, without enlarged apical spur. Other characters variable, but not in above combination 9

9(8) Scutellum (and mesoscutum) with numerous scattered setae. Frontofacial sutures narrowly separated from each other dorsally. Head densely setose *Kocourekia* Bouček

9′ Scutellum with only 2 pairs of setae (rarely with an extra 1 or 2 adventitious setae). Mescoscutum with or without many scattered setae; other characters variable 10

10(9) Midlobe of mesoscutum with setae scattered over entire surface, not confined to a single row at lateral margin (Figs 4, 10) 11

10′ Midlobe of mesoscutum with setae confined to a single row of adnotaular setae at lateral margin (Fig. 20) 12

11(10) Frontofacial sutures widely separated from each other dorsally (Fig. 9). Scutellum without submedian lines (Fig. 10). Setae on head and mesosoma generally erect . . . . . *Tachinobia* Bouček

11′ Frontofacial sutures narrowly separated from each other dorsally (Fig. 2). Scutellum with distinct submedian lines (Fig. 4). Setae on head and mesosoma generally decumbent . . . . . *Melittobia* Westwood

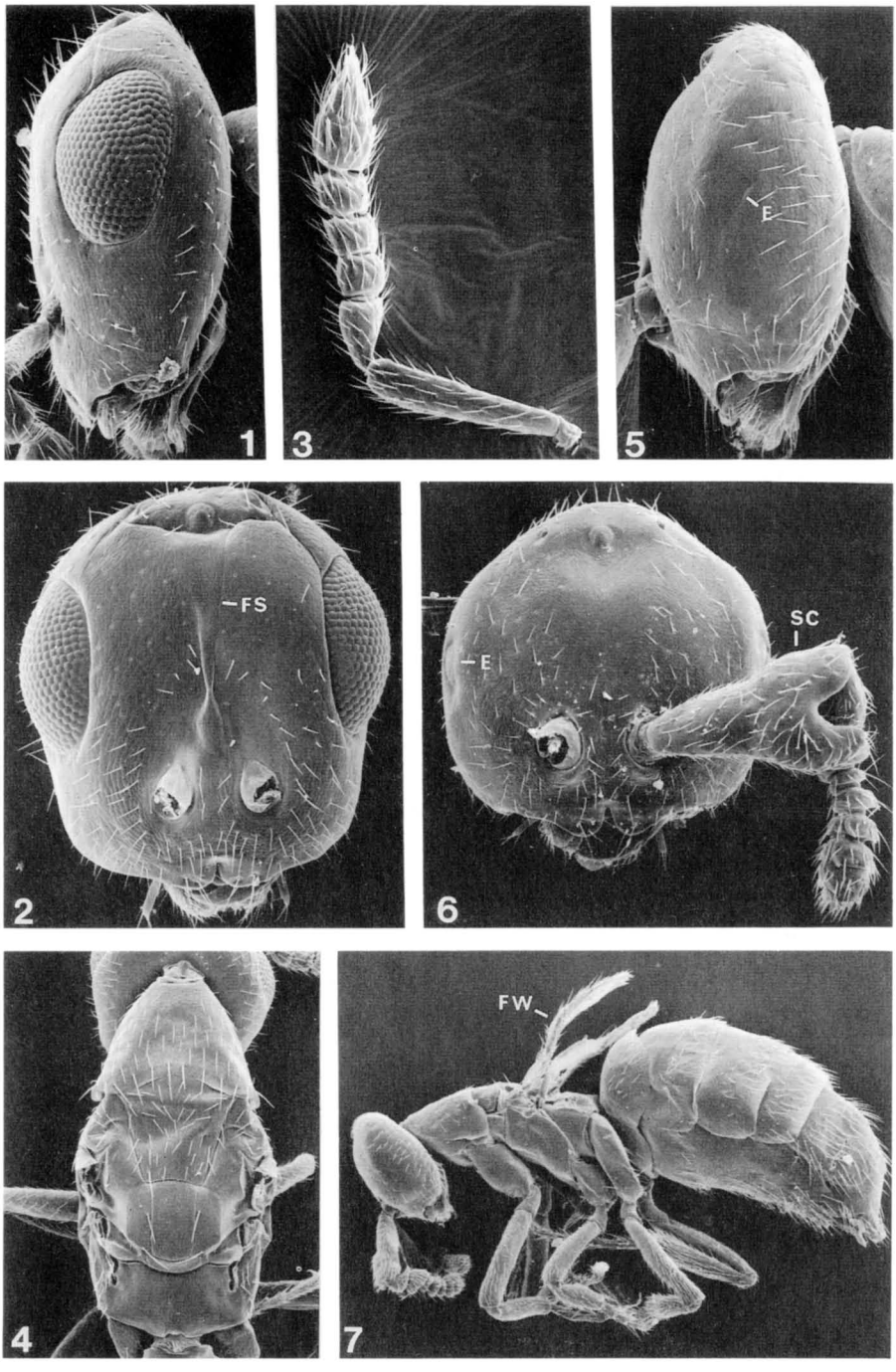
12(10) Frontofacial sutures widely separated from each other dorsally (Fig. 19). Scutellum with submedian lines present and distinct (Fig. 20). (See also couplet 48.) . . . . . *Pronotalia* Gradwell

12′ Frontofacial sutures narrowly separated from each other dorsally (Fig. 89). Scutellum without submedian lines or with indistinct submedian lines, but with deep sublateral lines (Fig. 91). (See also couplet 49.) *Aceratoneuromyia* Girault

13(7) Scape and pedicel with distinct, raised, rasp-like sculpture on inner surface (Fig. 25). Antenna with 4 large anelli, whose combined length equals that of first funicular segment (Fig. 25). Postmarginal vein about half as long as stigmal vein (Fig. 131). Gena distinctly swollen posterior to curved malar sulcus (Fig. 24) . . . . . *Quadrastichodella* Girault

13′ Scape and pedicel without rasp-like structure. Anelli different. Other characters variable 14

14(13) Propodeum (at least callus and the area just medial to the spiracle) densely covered in fine setae (Figs 27, 30). Mesoscutum without median line, densely



FIGS 1–7. (1, 2) *Melittobia acasta*, ♀: 1, ♀ head and malar region; 2, ♀ face; (3, 4) *Melittobia digitata*, ♀: 3, antenna; 4, mesosoma; (5–7) *Melittobia acasta*, ♂: (5) ♂ head and malar region; (6) ♂ face; (7) ♂ body, lateral view. e, Eye; fs, fronto-facial suture; fw, forewing; sc, scape.

and uniformly covered with short, fine setae (Figs 26, 29). Fore wing (Fig. 133) densely setose basally, without speculum; postmarginal vein present, 0·5–1·0 the length of stigmal vein . . . . . *Eriastichus* gen. n.

14′ Propodeum never so densely setose; callus never with more than 10–15 setae. Other characters variable 15

15(14) Head with postgenal sulcus and strongly swollen gena; vertex extending much higher than dorsal margin of eyes (Fig. 32). Propodeal spiracle small, round, and placed near or behind the midline of the propodeum; separated by distinctly more than its own diameter from anterior margin (Fig. 33). Submarginal vein with (usually 3) short setae on dorsal surface, these in distinct contrast to the very long setae on marginal vein (Fig. 132). Entire body extremely elongate (Fig. 33) . . . . . *Henryana* Yoshimoto

15′ Head without postgenal sulcus; gena swollen or not swollen. Propodeal spiracle usually larger and within its own diameter of anterior margin of propodeum. Forewing without setae on submarginal vein contrasting so distinctly in size with marginal vein setae. Body not so elongate 16

16(15) Postmarginal vein present and as long as (or longer than) stigmal vein (Fig. 134) 17

16′ Postmarginal vein absent, or, if present, no more than half the length of stigmal vein (Figs 139–144) 20

17(16) Midlobe of mesoscutum with only a single row of adnotaular setae *Peckelachertus* Yoshimoto

17′ Midlobe of mesoscutum with more than a single row of adnotaular setae, either: with 2 or 3 rows of adnotaular setae, or with setae uniformly scattered over entire surface 18

18(17) Scutellum with >3 pairs of setae; with distinct submedian lines. Midlobe of mesoscutum with median bare area, but with 2 or 3 rows of adnotaular setae *Mesofrons* gen. n.

18′ Scutellum with only 2 pairs of setae; without submedian lines. Midlobe of mesoscutum with setae uniformly scattered over entire surface 19

19(18) Scutellum (Figs 34, 35) with anterior pair of setae in anterior half, distinctly closer to anterior margin than to posterior pair. Propodeum with spiracle set in shallow furrow formed between paraspiracular carina and a second carina lateral to the spiracle; hind corner of propodeum with a small but distinct, posteriorly directed spine (Fig. 35) . . . . . *Cucarastichus* gen. n.

19′ Scutellum (Figs 36, 37) with both pairs of setae placed in posterior half and distinctly closer to each other than anterior margin. Propodeum without spiracle set in shallow furrow as described in alternate; hind corner without spine *Careostrix* gen. n.

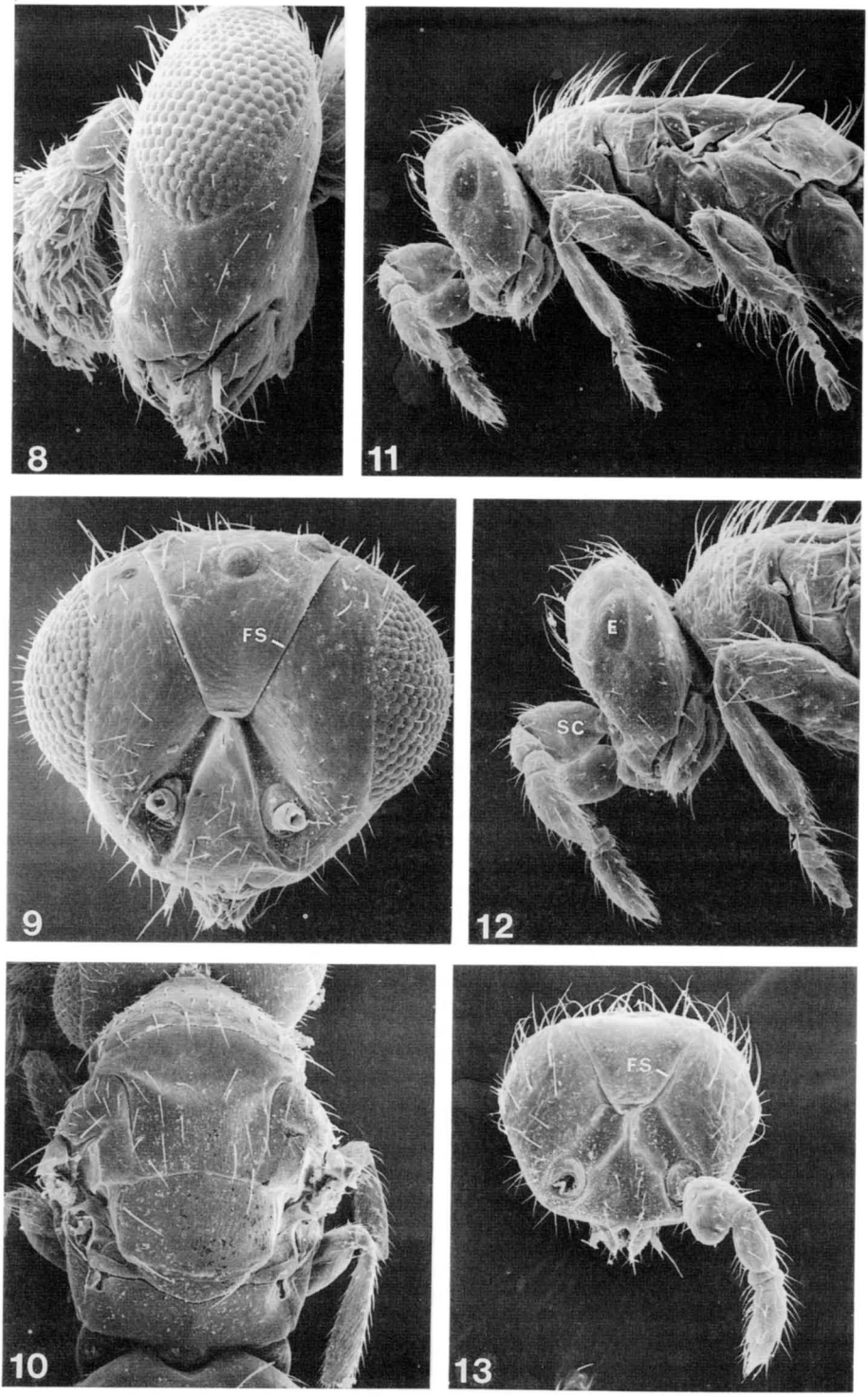
20(16) Submarginal vein with 1 seta on dorsal surface (Figs 135, 136) 21

20′ Submarginal vein with ≥ 2 setae on dorsal surface (Figs 139–144) . . 28

21(20) Dorsum of mesosoma with very strong, black setae (Figs 38, 39); frons with numerous short, stout black setae (Fig. 40; these setae appear as white in the photomicrographs). Fore leg with basitarsus very short, distinctly shorter than second tarsal segment (Fig. 39); last tarsal segment about as long as segments 1–3 taken together. Scutellum without submedian lines (Fig. 38). Mandible characteristically shaped, with large falcate outer tooth, and two very small, closely approximated inner teeth (Fig. 41) . . . . . *Chytrolestes* gen. n.

21′ Dorsum of mesosoma and frons without such characteristic black setae. Tarsi never as above. Other characters variable 22

22(21) Mandible characteristically shaped, with large falcate outer tooth, and two very small, closely approximated inner teeth (as in Fig. 41). First gastral segment with sculpture dorsally (Figs 44, 45). Dorsum of mesosoma brightly metallic, with erect, silvery setae. Scutellum with at least 3 pairs of setae (Fig. 44) *Chaenotetrastichus* Graham



FIGS 8–13. (8–13) *Tachinobia repanda*: (8) ♀ head and malar region; (9) ♀ face; (10) ♀ mesosoma; (11) ♂ head and mesosoma, lateral view; (12) ♂ head, lateral view; (13) ♂ face. e, Eye; fs, fronto-facial suture; sc, scape.

22′ Mandible not as above. First gastral segment not sculptured dorsally. Dorsum of mesosoma without erect, silvery setae 23

23(22) Propodeum with an inverted 'Y'-shaped paraspiracular carina just medial to spiracle (Fig. 43) . . . . . *Tetrastichus* Haliday

22′ Propodeum without such a Y-shaped carina medial to spiracle (Fig. 46); a simple paraspiracular carina may be present (as in Fig. 51), but this will not have a distinct branch directed posteromedially to give it the characteristic Y-shape 24

24(23) With the following combination of characters: body dorsoventrally flattened, with relatively long pronotum and propodeum; propodeal spiracle small, circular, and separated from anterior margin of propodeum by more than its own diameter; terminal spine of antennal club long and narrow, with an apical seta which is as long as spine (similar to that seen in *Aceratoneuromyia*, Fig. 92) *Kostjukovius* Graham

24′ Differing somehow from above. Only rarely with body flattened, and then, either: propodeal spiracle larger and placed within its own diameter of the anterior margin, or antenna not as above 25

25(24) Midlobe of mesoscutum with 2 adnotaular setae at lateral margin, one placed in anterior half of mesoscutum the other in posterior half; these setae relatively strong, dark, subequal in length, and erect or semi-erect (Figs 46–48). Anterior margin of clypeus truncate, without teeth (Fig. 49), or (rarely) with 2 very small lobes. Never with metallic coloration: mesosoma black; gaster black, may have yellow markings. Parasitoids of psyllids . . . *Tamarixia* Mercet

25′ Midlobe of mesoscutum with 1 to several adnotaular setae at lateral margin, these setae differing in general appearance from those described above. If with 2 setae, then clypeal margin distinctly bidentate (Fig. 53), and body usually with some metallic coloration. Other characters, and hosts, variable . . 26

26(25) Species with the following combination of characters: all funicular segments longer than broad (Fig. 111); mesosoma with distinct metallic coloration; mesoscutum with as least two adnotaular setae, and without median line (Fig. 113). (Some aberrant forms of subgenus *Ootetrastichus* with only 1 seta on the submarginal vein.) . . . . . *Aprostocetus* Westwood

26′ Somehow differing from the above. If all funicular segments are longer than broad, then either: mesosoma without metallic coloration, or mesoscutum with only one adnotaular seta or mesoscutum with median line (Fig. 50) . . 27

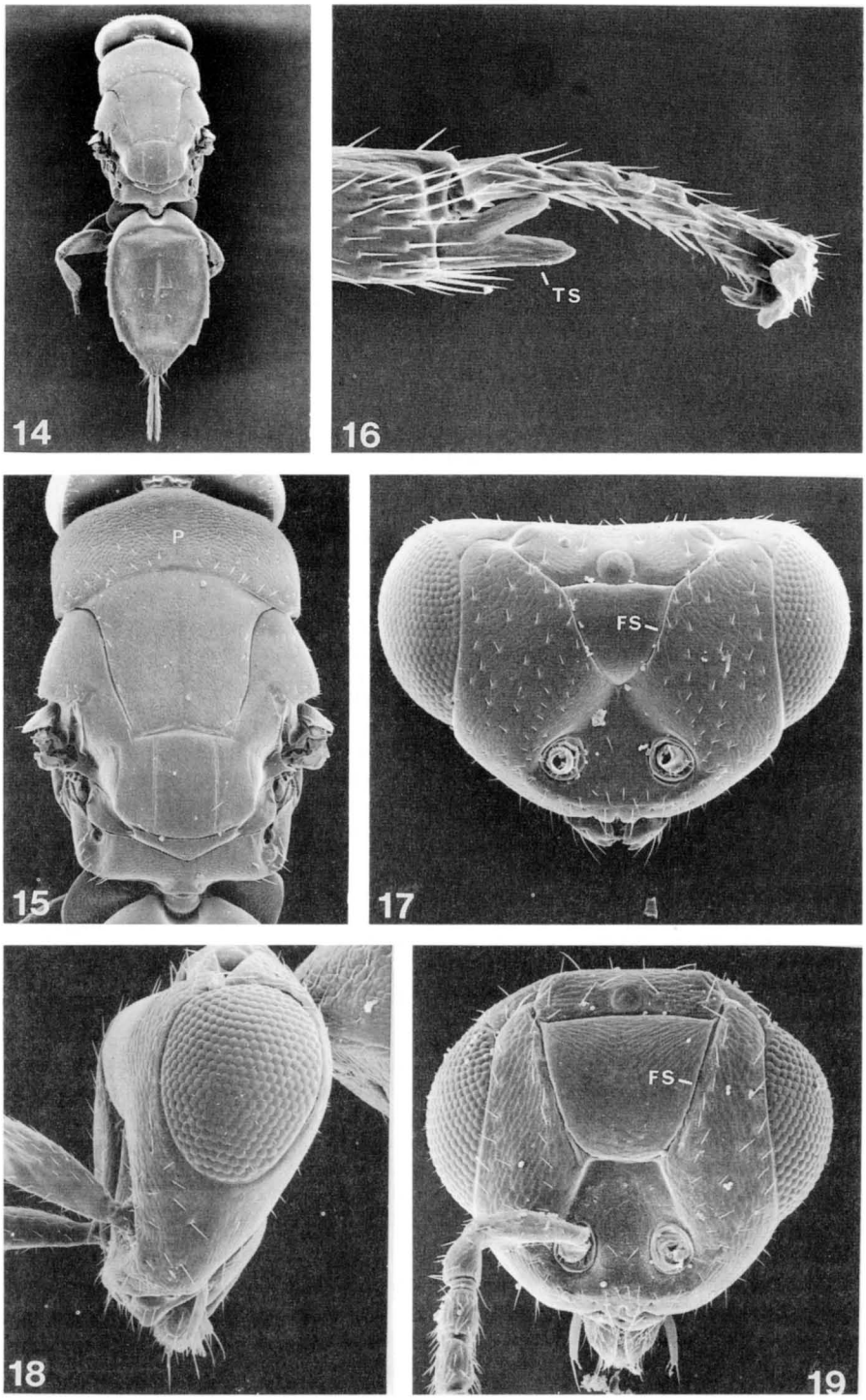
27(26) All funicular segments longer than wide (Fig. 52), and at least third funicular segment (and sometimes the others) with long curved sensillae which pass the apex of the segment. Mesoscutum often with only 1 adnotaular seta (Fig. 50) (although sometimes with 2–4). Gaster generally elongate and usually with apex acute (Fig. 54) . . . . . *Quadrastichus* Girault

27′ At least third funicular segment, and often the others, quadrate or wider than long (Fig. 57); funicular segments without such long curved sensillae. Mesoscutum with $\geqslant$ 2 adnotaular setae (Fig. 55). Gaster generally shorter and more ovate (Fig. 56) . . . . . *Oomyzus* Rondani

28(20) Fore wing infuscated beyond level of parastigma except for hyaline stripe near apex of stigmal vein (Fig. 138). Parastigma swollen; darker than remaining wing veins. Petiole present, short, white to yellow, and distinctly contrasting with dark brown propodeum and gaster. All coxae white to yellow, somewhat elongate . . . . . *Paraspalangia* Ashmead

28′ Fore wing hyaline or only very slightly and uniformly infuscate. Parastigma not swollen. Petiole present or absent, but if present then not contrasting in colour with propodeum and gaster. Coxae variable 29

29(28) Lower face with conspicuous striae radiating from the mouth margin (Fig. 58). Apex of vein in hind wing (at hamuli) swollen or knobbed (Fig. 137). Petiole present, distinct (Figs 59, 60) . . . . *Ceratoneura* Ashmead



FIGS 14–19. (14–17) *Crataepus marbis*, ♀: (14) body; (15) mesosoma; (16) fore tibial spur; (17) face; (18–19) *Pronotalia carlinarum*, ♀: (18) head and malar region; (19) face. fs, Fronto-facial suture; p, pronotum; ts, fore tibial spur.

29′ Lower face without radiating striae. Apex of vein in hind wing not swollen or knobbed. Petiole usually absent, rarely present 30

30(29) First gastral tergite (or first and short second) smooth dorsally, in distinct contrast to remaining tergites which are reticulate dorsally (Fig. 62). Propodeum fairly long, with strong, straight carina extending directly from spiracle to posterior margin; median area of propodeum strongly and uniformly reticulate (Fig. 61). Petiole distinct, but short. Midlobe of mesoscutum with a single line of adnotaular setae. Body strongly sclerotized *Paragaleopsomyia* Girault

30′ Gaster never as above; occasionally strongly reticulate dorsally, but then without smooth first gastral tergite. Propodeum generally not so distinctly reticulate; when it is reticulate then paraspiracular carina situated medial to spiracle, rather than extending directly backwards from it (Figs 75, 81), and mesoscutum often with more than a single line of adnotaular setae (Figs 74, 79) 31

31(30) Petiole present and distinct, at least half as long as wide and with distinct dorsal sculpturing (Figs 63, 68, 69) **and** toruli placed high on frons so that scape extends well above level of vertex (Figs 66, 67) 32

31′ Petiole absent or hidden, less than half as long as wide and without dorsal sculpturing. If (rarely) present, then toruli placed near or below middle of frons; scape not exceeding level of vertex 33

32(31) Axilla not or barely projecting forward of scuto-scutellar line; scapular flange broad, triangular (Fig. 64). Propodeum with complete, strong and raised median carina, and strong arc-shaped paraspiracular carina; median panels reticulate to rugose (Fig. 65). Dorsellum entire (Fig. 65). Face and frons strongly sculptured, with many scattered piliferous punctures (Fig. 66) . . *Oxypracetus* gen. n.

32′ Axilla projecting distinctly forward of scuto-scutellar line; scapular flange linear (Fig. 68). Propodeum rugose, without complete median carina, without distinct paraspiracular carina; median panels with strong, irregular carinae (Fig. 69). Dorsellum divided medially by a longitudinal groove or a series of deep punctures (Fig. 69). Face and frons smooth or lightly sculptured, with at most minute punctures (Fig. 67) . . . *Lisseurytomella* Gahan & Fagan

33(31) Dorsum of mesosoma with unusually strong setae: at least anterior pair of scutellar setae, and usually also setae on mesoscutum and pronotum (Figs 70, 71). Median line on mesoscutum and submedian lines on scutellum wide and shallow (Fig. 70) 34

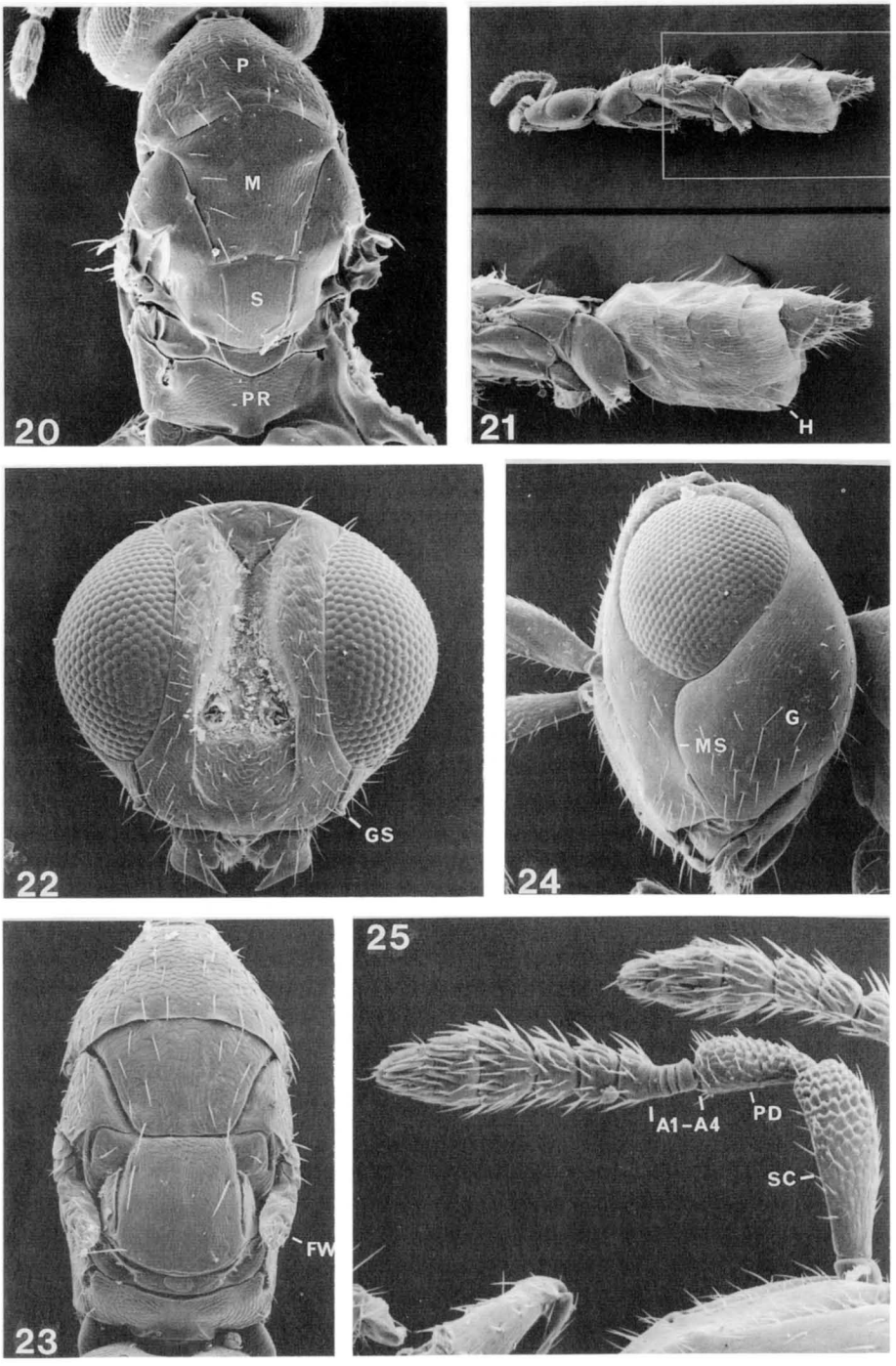
33′ Dorsum of mesosoma without setae which are distinctly stronger than normal. Lines on mesoscutum and scutellum variable 35

34(33) Anterior pair of scutellar setae much stronger than posterior pair (which are of normal size). Antennal club short, with long apical spine (as long as terminal club segment). Flagellum dark. Submarginal vein with $\geqslant 3$ setae . . . 35

34′ Either both pairs of scutellar setae strong (Figs 70, 71), or scutellum with > 2 pairs of enlarged setae. Antennal club without such a long apical spine. Flagellum usually yellow or otherwise light-coloured. Submarginal vein usually with 2 setae (Fig. 139). Males often with a dark spot on apical margin of wing distal to stigmal vein. . . . . *Pentastichus* Ashmead

35(33, 34) Anterior pair of scutellar setae distinctly stronger and longer than posterior pair. Mid-lobe of mesoscutum with at least a few setae placed near the middle of the sclerite in addition to the adnotaular setae (these median setae generally smaller than the adnotaular setae). Dorsellum flattened, its posterior margin slightly overhanging propodeum. Median line on mesoscutum and submedian lines on scutellum wide and shallow. Antennal club short with long apical spine (as long as terminal club segment). . . . . *Hadrotrichodes* gen. n.

35′ Anterior pair of scutellar setae not distinctly longer and stronger than posterior pair. Other characters variable, but not found in the above combination . . 36



FIGS 20–25. (20, 21) *Pronotalia carlinarum*, ♀: (20) mesosoma; (21) body/gaster, lateral view; (22, 23) *Apterastichus oculatus*, ♀: (22) face; (23) mesosoma; (24, 25) *Quadrastichodella nova*, ♀: (24) head and malar region; (25) antenna. a1–a4, Annelli 1–4; fw, forewing; g, gena; gs, spine on gena; h, hypopygium; m, mesoscutum; ms, malar sulcus; p, pronotum; pd, pedicel; pr, propodeum; s, sactellum; sc, scape.

36(35) Mesoscutum uniformly setose over entire surface (Figs 72, 74, 122, 127), or with just a small, bare median area anteriorly (Fig. 120). Note: setae may be densely or sparsely distributed. 37

36′ Mesoscutum not uniformly setose, and with a well-defined bare area medially: usually with a single row of adnotaular setae (Figs 83, 93, 117), at most with 2 or 3 rows of adnotaular setae (Figs 79, 95, 101) 44

37(36) Mesosoma metallic blue green, in distinct contrast to gaster which is predominantly yellow (although darkened dorsally). Scutellum with 3–5 pairs of setae; submedian lines of scutellum absent. Exserted portion of ovipositor at least half the length of hind tibia . . . . . *Dapsilothrix* gen. n.

37′ Mesosoma and gaster never coloured as above, either both metallic or both non-metallic. Scutellum with 2 to many pairs of setae; submedian lines of scutellum usually present, sometimes absent. Exserted portion of ovipositor variable, but generally less than half the length of the hind tibia . . . 38

38(37) Scutellum with > 3 pair setae (4–many) (Figs 72, 120) 39

38′ Scutellum usually with 2 pair of setae (Fig. 75), rarely with a third pair . . 40

39(38) Submedian lines of scutellum distinct, about equidistant from each other and from lateral lines (Fig. 120). Cercal setae unequal in length, with one being distinctly longer than the others and sinuate (Fig. 121). Propodeum with a raised lobe of the callus which partially overhangs the outer rim of the spiracle (Fig. 120). Mesosoma and gaster with distinctive white to silver setae *Aprostocetus homeri* (Girault)

39′ Submedian lines of scutellum faint or absent (Fig. 73); if indicated then they are much closer to each other than to sublateral lines, and enclose an area that is at least 4 times longer than wide. Cercal setae subequal in length, straight. Entire rim of the propodeal spiracle visible (Fig. 73). Setae on mesosoma and gaster darker in colour . . . . . *Comastichus* gen. n.

40(38) With the following combination of characters: basitarsus of middle and hind leg distinctly longer (about 1·5 times) than second segment (Fig. 126); hind coxa yellow; cercal setae unequal in length, with one being distinctly longer than the others and sinuate (as in Figs 119, 121); propodeum with a raised lobe of the callus which partially overhangs the outer rim of the spiracle (Fig. 128); both pairs of scuteller setae placed close together near hind margin of the scutellum (Fig. 128). From cockroach oothecae. (Subgenus *Tetrastichodes*.) *Aprostocetus* Westwood

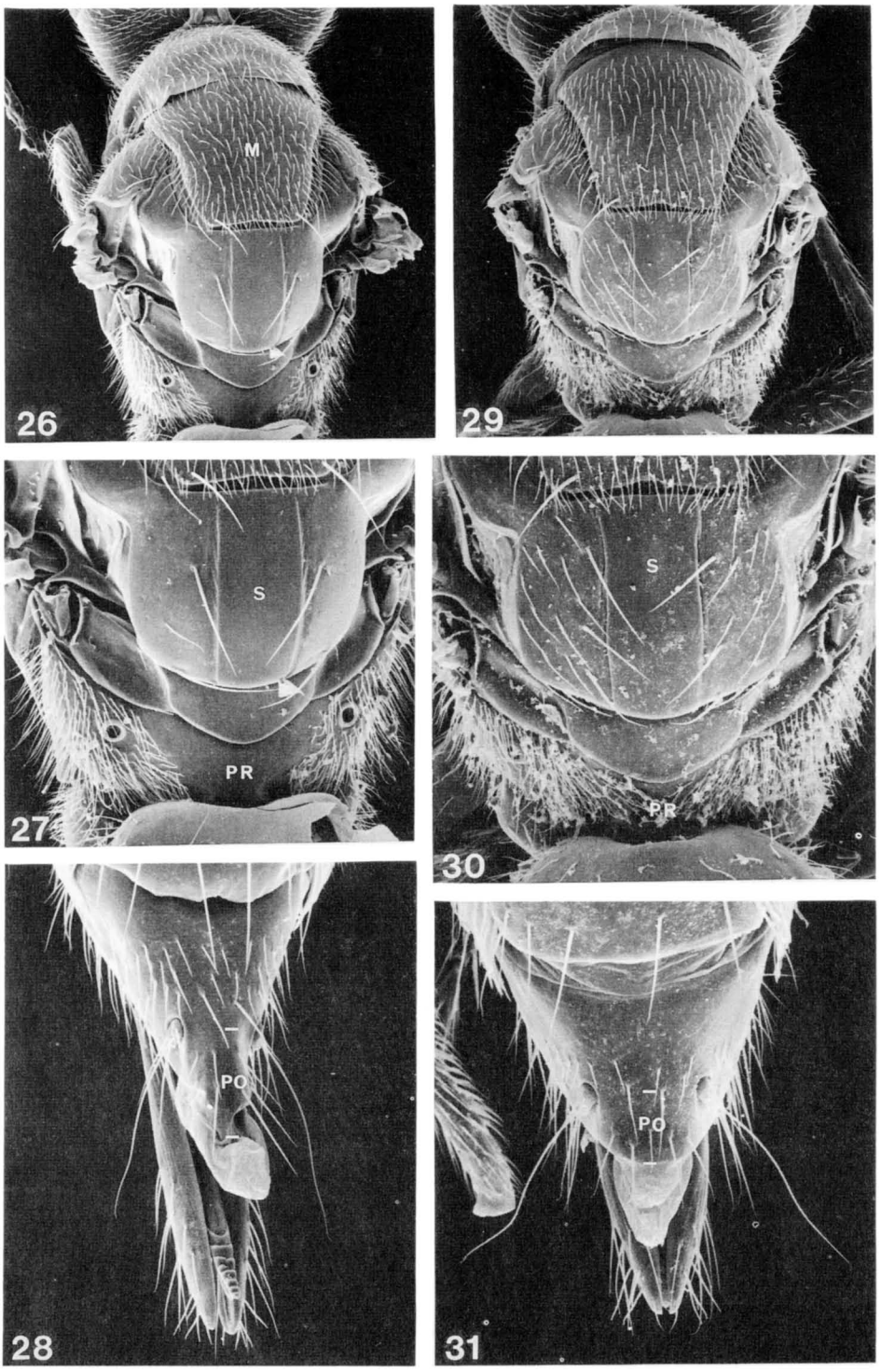
40′ Somehow differing from the above. If basitarsus of middle and hind leg distinctly longer than second segment, then either: the hind coxa is dark or metallic; or the longest two cercal setae are subequal in length and straight or only slightly curved; or entire rim of the propodeal spiracle is visible; or the anterior pair of scutellar setae is placed near the midline of the scutellum; or the host is different 41

41(40) Scutellum strongly sculptured, rugose, with submedian lines indistinct or replaced by broad shallow furrows, sublateral lines strong and laterally carinate (Fig. 75). Propodeum distinctly reticulate medially, with a smooth area between the spiracle and a strong paraspiracular carina (Fig. 75), and a raised lobe of the callus which partially overhangs the outer rim of the spiracle. Cercal setae approximately equal in length. From spider egg sacs . . *Aranobroter* LaSalle

41′ Scutellum and propodeum not so strongly sculptured (Figs 122, 123). Other characters (propodeal spiracle, cercal setae, host) variable, but never present in the above combination 42

42(41) Scutellum without submedian lines. Anterior pair of scutellar setae placed near anterior margin of scutellum. Mesoscutum sparsely covered with long, erect or semi-erect setae. One of the cercal setae distinctly longer than the others and sinuate . . . . . *Styotrichia* gen. n.

42′ Scutellum with submedian lines (Figs 122, 123). Anterior pair of scutellar setae placed near or behind midline of scutellum. Mesoscutum more densely setose, with short, decumbent setae. Cercal setae often subequal in length . . . 43



FIGS 26–31. (26–28) *Eriastichus cigdemae*, ♀: (26) mesosoma; (27) scutellum and propodeum; (28) apex of gaster; (29–31) *Eriastichus masneri*, ♀: (29) mesosoma; (30) scutellum and propodeum; (31) apex of gaster. m, Mesoscutum; po, postcercale; pr, propodeum; s, scutellum.

43(42) Propodeum with raised lobe of callus which partially overhangs spiracle (Fig. 123). Mesoscutum completely covered with setae (Fig. 122). Cercal setae variable: either one of the cercal setae distinctly longer than the others and sinuate (Fig. 125), or the longest two of the cercal setae subequal in length, relatively short and often not conspicuous in their difference from the setae on the surrounding gastral tergites (Fig. 124). From cynipid galls on oaks. (Subgenus *Quercastichus*.) . . . . . *Aprostocetus* Westwood

43′ Entire rim of propodeal spiracle visible (Figs 103, 104). Mesoscutum usually with at least anteromedial area bare of setae. At least the longest two of the cercal setae subequal in length, relatively short and often not conspicuous in their difference from the setae on the surrounding gastral tergites (Figs 105, 106). Hosts extremely variable, although some species may occur from cynipid galls. (Only a few species might occur here.) . *Baryscapus* Förster

44(36) Mandibles large and exodont (curving outwards). Mouth opening very wide, malar space with large excavation near mouth margin. . *Exastichus* gen. n.

44′ Mandibles and malar space normal 45

45(44) Body strongly sclerotized (Figs 79–82), with all gastral segments reticulate dorsally and non-collapsing (Figs 77, 78). Propodeum strongly reticulate, with strong paraspiracular carina, and transverse carina along posterior margin (Figs 81, 82). Malar space with distinct fovea just below eye (Fig. 76) *Galeopsomyia* Girault

45′ Body not so strongly sclerotized, and gastral segments not reticulate dorsally. Propodeum rarely strongly reticulate, if so then without carinae as above. Malar space usually without (only rarely with) a fovea 46

46(45) Dorsellum divided medially by a longitudinal channel (Fig. 84). Antenna with 3rd anellus larger than preceding two anelli and with setae (Fig. 85). Scutellum without submedian lines, with deep sublateral lines (Fig. 84). Midlobe of mesoscutum without median line (Fig. 83). Callus with many ($>$ 10) setae (Fig. 84). Vertex with small but distinct transverse carina posterior to ocelli (Fig. 86) . . . . . *Tetrastichomyia* Girault

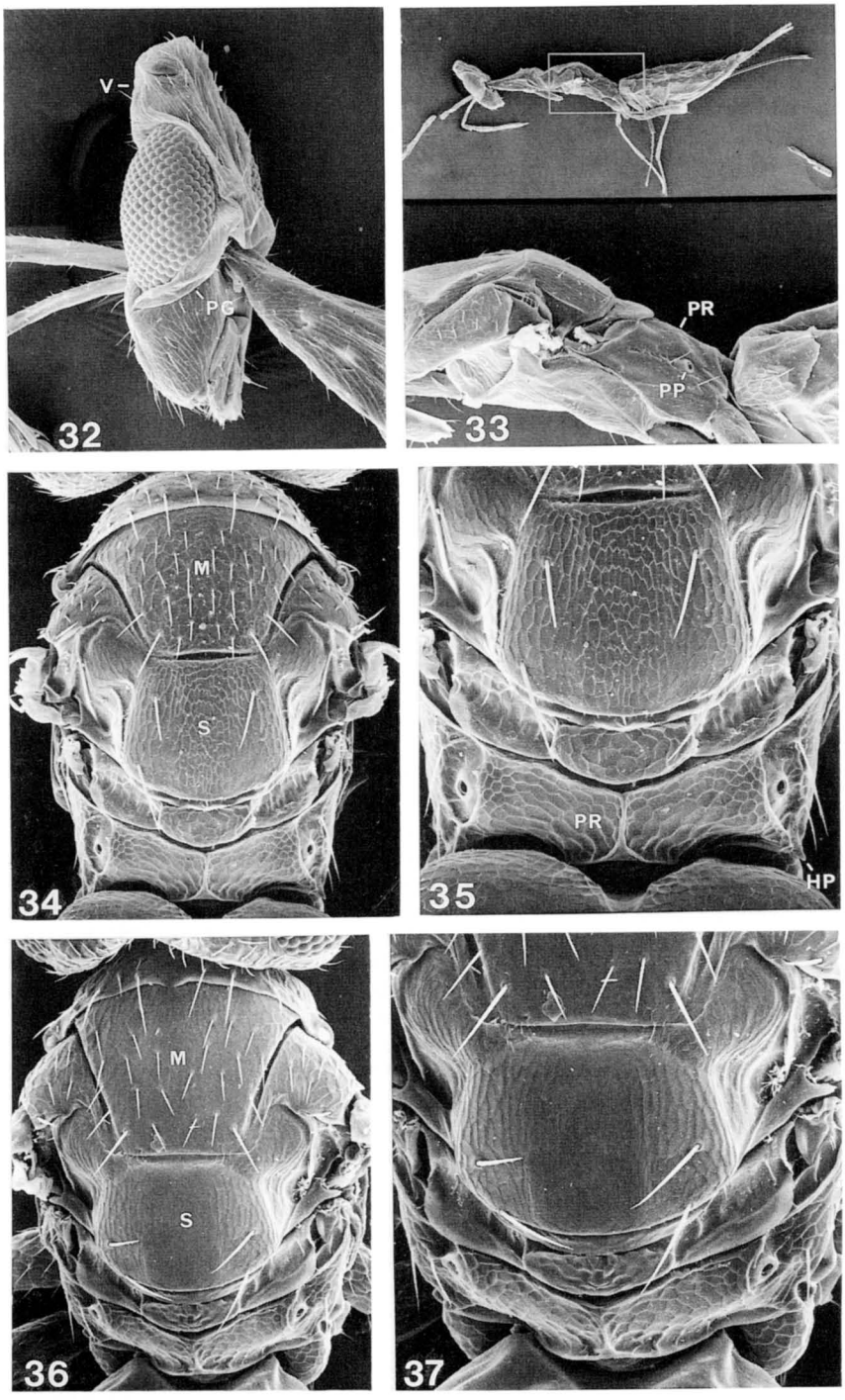
46′ Dorsellum not medially divided (Figs 87, 94, 96). If 3rd anellus somewhat larger than preceding two then it is not setose. Submedian lines on scutellum and median line on midlobe of mesoscutum variable, but usually present. Callus usually with $<$ 10 setae. Vertex usually without transverse carina . 47

47(46) Submarginal vein of fore wing with 2 dorsal setae which are fairly close to each other near the middle of the vein (Fig. 140). Ovipositor sheaths short, concealed. Gaster distinctly narrowed at base (Fig. 88), and with dorsal, sub-basal pale spot. Petiole small but visible. propodeum (Fig. 88) large, smooth, without median carina and with entire rim of spiracle exposed. Parasite of thrips *Thripastichus* Graham

47′ Somehow differing from above. Submarginal vein usually with 3 or more setae; if with only 2 then either: ovipositor sheaths distinct and partly exserted, or gaster not so narrowed, or without visible petiole, or without dorsal, sub-basal pale spot; or host different 48

48(47) With the following combination of characters: antennal toruli placed distinctly below level of ventral margin of eye (Fig. 19); frontofacial sutures widely separated from each other dorsally (Fig. 19); fore wing with a decolorized area between parastigma and marginal vein (Fig. 130); female with tip of hypopygium situated slightly past middle of gaster (Fig. 21); body black or dark brown, at most with barely perceptible metallic tinge . . *Pronotalia* Gradwell

48′ Somehow differing from above. Either: antennal toruli placed above (Fig. 97), or even with (Fig. 89) level of ventral margin of eye; or frontofacial sutures not widely separated from each other dorsally (Fig. 89); or fore wing without a decolorized area between parastigma and marginal vein (Figs 143, 144); or female with tip of hypopygium placed before middle of gaster; or body distinctly metallic 49



FIGS 32–37. (32, 33) *Henryana magnifica*, ♀: (32) head, showing malar region and postgenal sulcus; (33) body/mesosoma, lateral view; (34, 35) *Cucarastichus texanus*, ♀: (34) mesosoma; (35) scutellum and propodeum; (36, 37) *Careostrix yoshimotoi*, ♀: (36) mesosoma; (37) scutellum and propodeum. hp, Hind corner of propodeum; m, mesoscutum; s, scutellum; pp, propodeal spiracle; pr, propodeum; v, vertex.

49(48) Antenna (Fig. 92): all funicular segments transverse, with long, erect setae, and club with apical seta of the long terminal spine about twice as long as spine (this often broken). Scutellum without submedian lines or with indistinct submedian lines, but with strong sublateral lines (Fig. 91). Setae on head and mesosoma sparse, but long and erect (Figs 89, 90). Female with tip of hypopygium situated past middle of gaster. Mesosoma somewhat flattened with relatively long pronotum and propodeum (Fig. 90) . *Aceratoneuromyia* Girault

49′ Antenna not as above. If all funicular segments transverse, then without long, erect setae and terminal spine of the club without a long apical setae. Other characters variable, but not found in above combination 50

50(49) Stigmal vein short (shorter than or equal to parastigma); marginal vein 7·0–9·5 times as long as stigmal vein (Fig. 141). Sculpture on propodeum stronger than sculpture on mesoscutum or scutellum (Figs 93, 94). Axilla not very strongly advanced (Fig. 93). Scutellum distinctly longer than wide, and with anterior seta nearer to sublateral line than to submedian line (Fig. 94) *Neotrichoporoides* Girault

50′ Stigmal vein usually longer than parastigma; marginal vein not more than 6·0 times as long as stigmal vein (Figs 142–144). Sculpture on propodeum not distinctly stronger than sculpture on mesoscutum or scutellum (Figs 95, 101, 117). Axilla usually strongly advanced (Figs 95, 102, 117). Scutellum either wider than long or with anterior seta not nearer to sublateral line than to submedian line (Figs 96, 104, 118) 51

51(50) Hind coxa with carina extending the length of the dorsal margin (Fig. 108). Propodeum with strong, curved paraspiracular carina; median panels of propodeum uniformly reticulate; area lateral to paraspiracular carina distinctly smoother than median panels (Fig. 107). Vertex with ocelli completely enclosed by sutures; with shallow depression lateral to lateral ocellus (Fig. 109). Body bright metallic green to blue . . . . *Anaprostocetus* Graham

51′ Hind coxa without carina along dorsal margin. Propodeum and vertex variable, but rarely as above. Colour variable 52

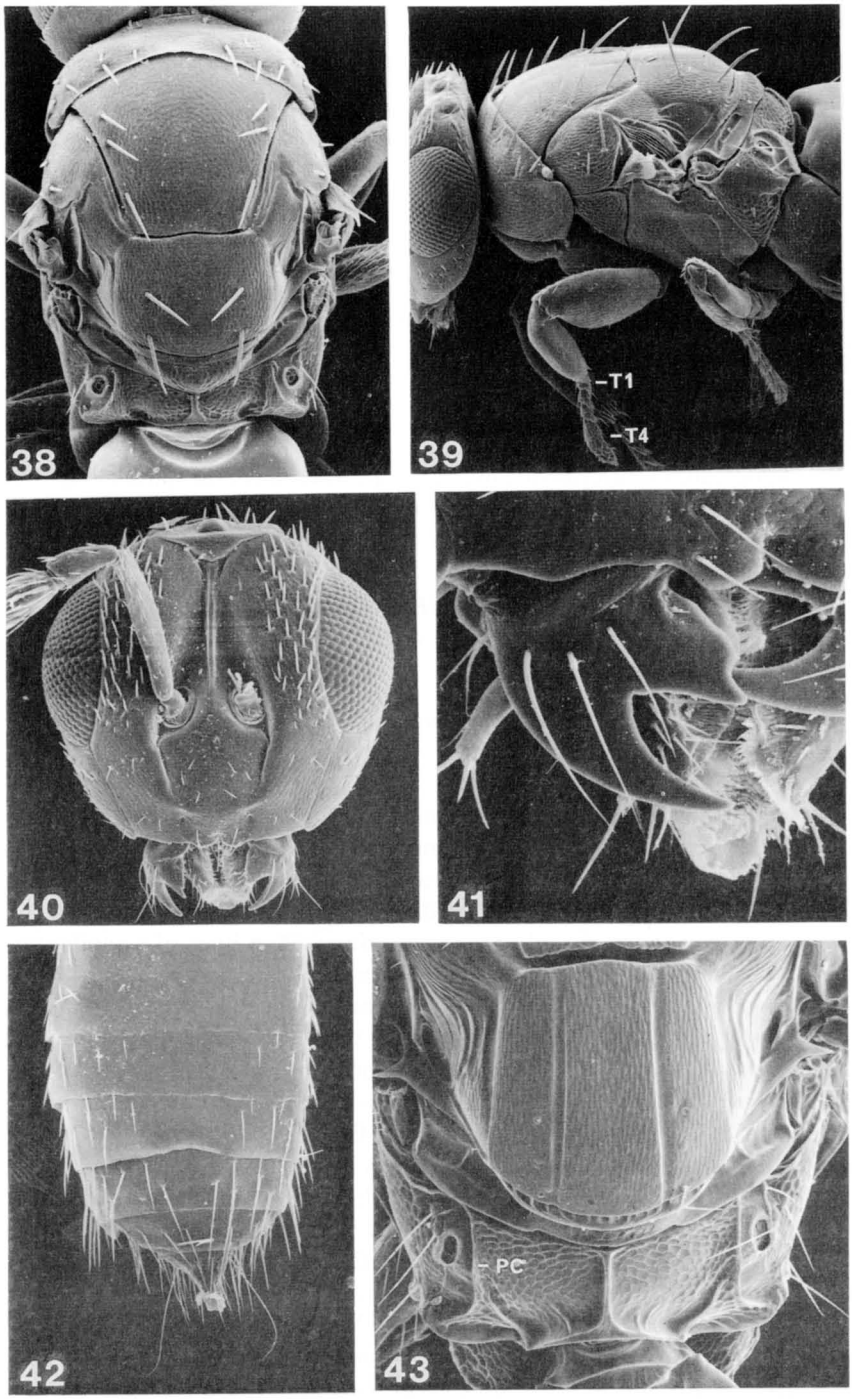
52(51) With the following combination of characters: fore wing with subcubital line of setae starting at or nearly at the level of basal vein (Fig. 142); one of the cercal setae distinctly longer (usually 2 times) than the others and sinuate or curved (Fig. 112); mesoscutum generally without median line (Fig. 113), rarely with this line indicated posteriorly; propodeal spiracles small, circular, propodeum with or without a raised lobe of the callus which partially overhangs the outer rim of the spiracle (Fig. 114); gena often somewhat swollen behind malar sulcus (Fig. 110). Generally somewhat elongate species with bright metallic mesosoma. (Subgenus *Ootetrastichus*.) . . . . *Aprostocetus* Westwood

52′ Not as above. Subcubital line of setae usually starting (much) further distally on wing. If subcubital vein starting near basal vein, then longest two cercal setae subequal in length. Other characters variable 53

53(5, 52) With the following three characters in combination: submarginal vein of fore wing with $\geq$ 3 dorsal setae (Fig. 143); one of the cercal setae distinctly longer (usually 1·5 times) than the others and sinuate or curved (Figs 119, 121); propodeum with a raised lobe of the callus which partially overhangs the outer rim of the (conspicuous) spiracle (Figs 118, 120, 123, 128). [Mesosternum generally flat in front of trochantinal lobe, with a distinct precoxal suture (Fig. 116). Malar sulcus generally straight, or only slightly curved (Fig. 115)]. (Subgenus *Aprostocetus*.) . . . . . *Aprostocetus* Westwood

53′ At least one of the characters different. Either submarginal vein with only 2 setae; or at least the two longer cercal setae subequal in length and generally straight or only slightly curved (Figs 98, 105, 106); or entire rim of the (sometimes minute) propodeal spiracle exposed (Figs 96, 103, 104) . . . 54

54(53) With the following combination of characters: propodeal spiracle small with entire rim exposed, and separated from anterior margin of propodeum by at least half its own diameter (Fig. 96). Clypeal margin truncate or weakly bilobed



FIGS 38–43. (38–42) *Chytrolestes alibaba*, ♀: (38) mesosoma; (39) mesosoma, lateral view; (40) face; (41) mandible; (42) apex of gaster; (43) *Tetrastichus* sp., ♀, propodeum. pc, Paraspiracular carina; t1,t4, tarsal segments 1,4.

(Fig. 97). Cercal setae subequal in length, straight or only slightly curved (Fig. 98). Body metallic with at least some yellow markings *Minotetrastichus* Kostjukov

54′ Somehow differing from above. Either: edge of propodeal spiracle touching or nearly touching anterior margin of propodeum (Figs 103, 104); or propodeum with a raised lobe of the callus which partially overhangs the outer rim of the spiracle (Fig. 118); or clypeal margin distinctly bidentate (as in Fig 53); or one of the cercal setae distinctly longer than the others and sinuate (Fig. 121); or body entirely metallic or dark, without any yellow markings 55

55(54) With the following combination of characters: at least the longest two cercal setae subequal in length, relatively short and often not conspicuous in their difference from setae on surrounding gastral tergites (Figs 105, 106); propodeal spiracle with entire rim exposed (Figs 103, 104); body dark or metallic, without pale or yellow markings. [Mesoscutum often with more than a single row of adnotaular setae (Fig, 101). Mesosternum generally convex in front of trochantinal lobe, without a distinct precoxal suture (Fig. 100). Malar sulcus often strongly curved (Fig. 99).] . . . . . *Baryscapus* Förster

55′ Somehow differing from the above. Either: one of the cercal setae distinctly longer than others and sinuate (Figs 119, 121); or propodeum with a raised lobe of the callus which partially overhangs the outer rim of the spiracle (Fig. 118); or body with some yellow markings. (Some members of subgenus *Aprostocetus*.) . . . . . *Aprostocetus* Westwood

Genus *ACERATONEUROMYIA* Girault
(Figs 89–92)

Aceratoneuromyia Girault, 1917[334]: 151.

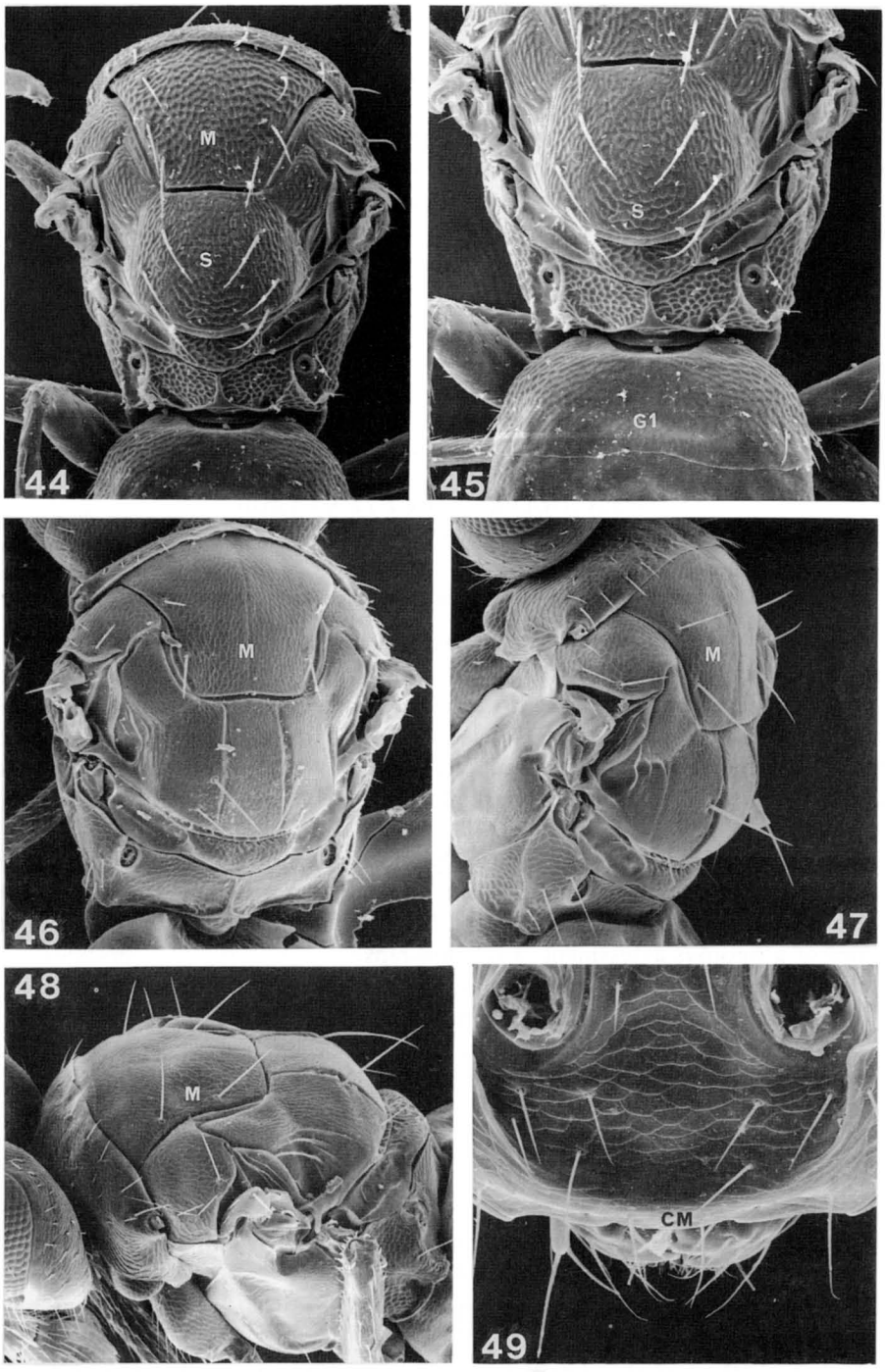
Type species. *Aceratoneuromyia australia* Girault [= *A. indica* (Silvestri)] (original designation).

Diagnosis. Antenna (Fig. 92) with apical seta of terminal spine very long (about twice as long as terminal spine), and with long, scattered erect or semi-erect setae; funicular segments quadrate to transverse. Malar sulcus fine, present but not always easily visible. Frontofacial sutures (Fig. 89) not or only slightly divergent dorsally. Mesosoma (Fig. 90) somewhat flattened, with scattered erect or semi-erect setae and elongate pronotum and propodeum. Submedian lines of scutellum usually absent or indistinctly indicated, although sublateral lines distinct and laterally carinate (Fig. 91). Gaster in dorsal view rounded or obtuse apically, ovipositor sheaths not visible. Hypopygium extending distinctly more than half the length of the gaster.

Discussion. Gahan (1938: 227) synonymized *Aceratoneuromyia* with *Melittobia*, but subsequent authors have considered these genera to be distinct (Gradwell, 1958; Domenichini, 1966a, b, 1967; Bouček, 1977, 1988a; Dahms, 1984a; Graham, 1987). *Aceratoneuromyia* has generally been considered to belong to a group of genera related to *Melittobia* (Gradwell, 1958; Ferrière, 1960; Domenichini, 1967; Dahms, 1984a); however, recent evidence based on courtship behaviour indicated that *Aceratoneuromyia* may not properly belong to this group (Bosch and Assem, 1986), and morphological evidence supports this opinion (Graham, 1991).

Distribution. Known mainly from the Old World; however, *A. indica* (Silvestri) has been widely spread throughout the world (including Central and South America) as a biological control agent of fruit flies. The European species, *A. fimbriata*, is here recorded from North America.

Biology and hosts. Species of *Aceratoneuromyia* are parasitoids of Diptera, mainly Tephritidae, Calliphoridae, Muscidae and Sarcophagidae.



FIGS 44–49. (44–45) *Chaenotetrastichus semiflavus*, ♀: (44) mesosoma; (45) scutellum, propodeum, base of gaster; (46–49) *Tamarixia* sp., ♀: (46) mesosoma; (47, 48) mesosoma, lateral view; (49) clypeal margin. cm, Clypeal margin; g1, first gastral tergite; m, mesoscutum; s, scutellum.

Biological control. *A. indica* has been released as a biological control agent of various fruitflies (Tephritidae) in Mexico, Central America, and the Caribbean (Clausen, 1978; Cock, 1985).

Notes and recent literature. *Aceratoneuromyia* species have been revised for the Palaearctic region by Domenichini (1967), and for Europe by Graham (1991). The genus has been discussed or keyed at a generic level by Graham (1987, 1991) and Bouček (1988a). The courtship behaviour of *A. granularis* Domenichini has been described and discussed in terms of its implications as to taxonomic position by Bosch and Assem (1986).

New North American records. *A. fimbriata* Graham.

Other New World species. *A. indica* (introduced).

North American species

fimbriata Graham. *Aceratoneuromyia fimbriata* Graham, 1991: 43–44 [BMNH].

New record. USA, FL, Gainesville, 15.i.1986, D. Schuster (1♀, USNM).

Genus *ANAPROSTOCETUS* Graham
(Figs 107–109)

Anaprostocetus Graham, 1987: 84.

Type species *Anaprostocetus dehraensis* Graham (original designation).

Diagnosis. Hind coxa (Fig. 108) with distinct carina running for the entire length of the dorsal margin. Propodeum (Fig. 107) with strong, curved paraspiracular carina; the area from paraspiracular carina to median carina with distinct reticulation, the area from paraspiracular carina to spiracle somewhat recessed and smooth. Ocelli (Fig. 109) surrounded by an impressed line, and vertex with a large shallow fovea just lateral to the lateral ocellus. Body bright metallic blue to green. Other characters as in *Aprostocetus*.

Discussion. This genus is extremely close to *Aprostocetus*, and I am not convinced that it does not just represent a lineage from within *Aprostocetus* that possesses a few autapomorphic characters. I am willing to maintain it as distinct in the absence of a rigorous assessment of relationships.

Distribution. One Holarctic species, and one species from India.

Biology and hosts. The one species whose biology is known is a parasitoid of tenthredinid sawflies in the genus *Euura*.

Notes and recent literature. There are only two species known in this genus, *acuminatus* and *dehraensis*. Graham (1987) provided a key to these two species.

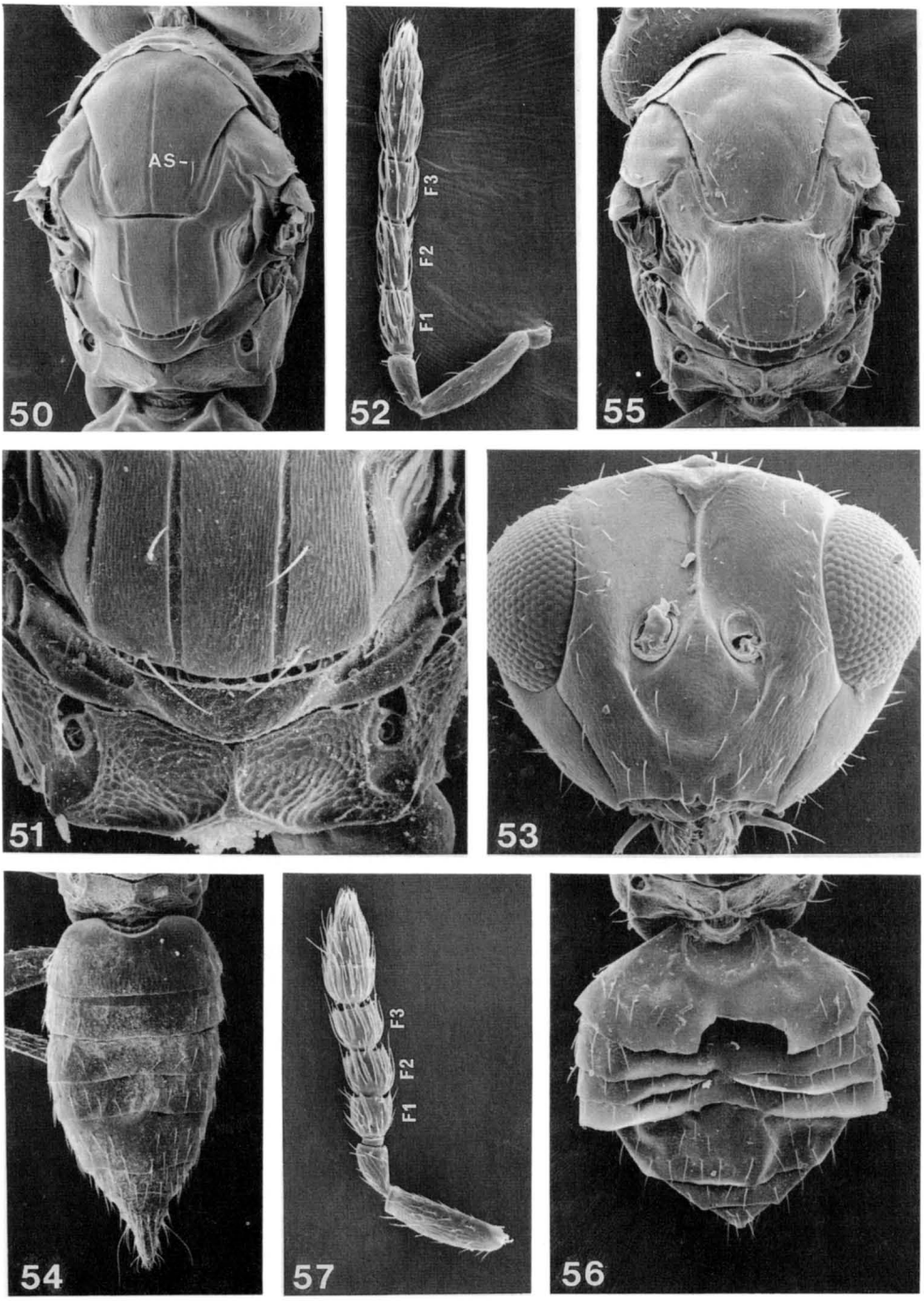
New North American records. *A. acuminatus* (Ratzeburg).

North American species

acuminatus (Ratzeburg). *Entedon acuminatus* Ratzeburg, 1848: 169. Transferred to *Anaprostocetus* by Graham, 1987: 84.

Hosts. Tenthredinidae: *Euura atra*. Graham (1987) also lists *E. laeta* as a host in Europe.

New record. Canada, Ottawa, Ontario, various dates between June and September 1972 and 1973, O. Peck, swept from *Salix blanda* with *Euura atra* (40♀, CNC).



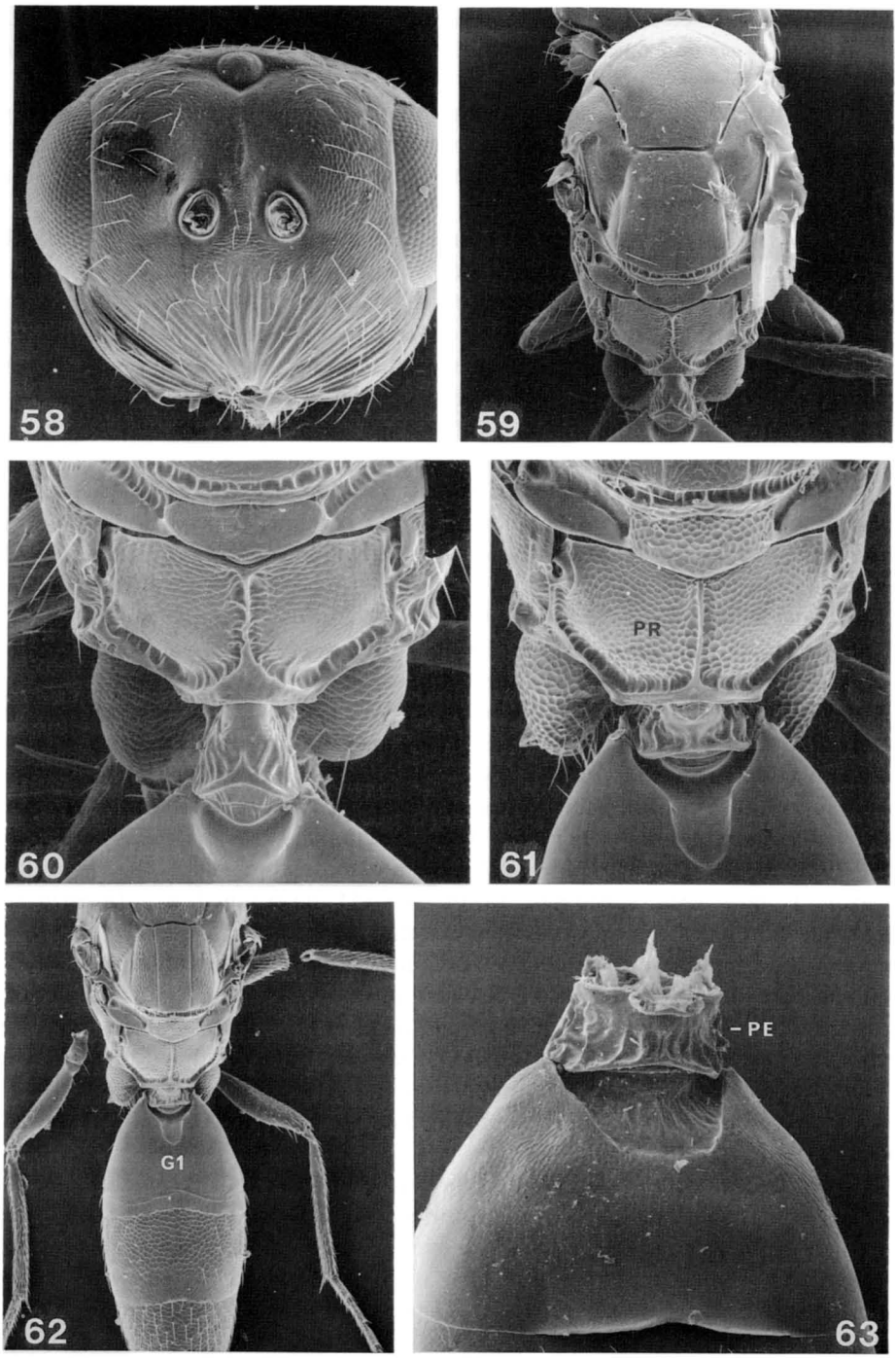
FIGS 50–57. (50–54) *Quadrastichus* spp., ♀: (50) mesosoma; (51) scutellum and propodeum; (52) antenna; (53) face and clypeal margin; (54) gaster; (55–56) *Oomyzus scaposus*, ♀: (55) mesosoma; (56) gaster; (57) *Oomyzus sokolowskii*, ♀, antenna. as, Adnotaular seta; f1–f3, funicular segments 1–3.

Genus *APROSTOCETUS* Westwood
(Figs 110–128, 142, 143)

Aprostocetus Westood, 1833: 144.
Type species *Aprostocetus caudatus* Westwood (monotypy).
Tetrastichus Walker, 1842: 116 (nec Haliday, 1844).
Type species *Cirrospilus lycidas* Walker (subsequent designation: Peck, 1951: 443). Placed on the Official Index of Rejected and Invalid Generic Names in Zoology (ICZN, 1965).
Exurus Philippi, 1873: 296. **Syn. n.**
Type species *Exurus colliguayae* Philippi (monotypy).
Syntomosphyrum Förster, 1878: 60.
Type species *Syntomosphyrum fulvipes* Förster (monotypy).
Tetrastichodes Ashmead, 1887: 203.
Type species *Tetrastichus floridanus* Ashmead (monotypy).
Ootetrastichus Perkins, 1906: 263.
Type species *Ootetrastichus beatus* Perkins (monotypy).
Paromphaloidomyiia Girault, 1917[309]: 1. **Syn. n.**
Type species *Paromphaloidomyiia homeri* Girault (original designation).
Prothymus Girault, 1917[309]: 1. **Syn. n.**
Type species *Prothymus novus* Girault (original designation).
Blattotetrastichus Girault, 1917[319]: 257.
Type species *Entedon hagenowii* Ratzeburg (original designation).
Omphalomopsis Girault, 1917[336]: 88. **Syn. n.**
Type species *Omphalomopsis marilandia* Girault (original designation).
Neomphaloidomyia Girault, 1917[338]: 118.
Type species *Hyperteles polynemae* Ashmead (original designation).
Chrysotetrastichus Kostjukov, 1977: 189 (as subgenus of *Tetrastichus*).
Type species *Tetrastichus oreophilus* Förster (original designation).
For more complete lists of extralimital synonymies see Graham (1987: 86), Bouček (1988a: 676–677).

Diagnosis. Subgenus *Aprostocetus*. Propodeal spiracle partially covered (particularly in lateral view) by a raised lobe or flap on the callus (Figs 118, 120). One of the cercal setae distinctly longer than the remaining setae, and usually curved or sinuate (Figs 119, 121). Submarginal vein generally with $\geqslant 3$ setae on the dorsal surface (Fig. 143). Malar sulcus straight or only slightly curved (Fig. 115). Submedian lines generally present on scutellum (Figs 118, 120). Mesosternum usually flat just anterior to trochantinal lobes, and mesepisternum in most species with precoxal suture present (Fig. 116). Midlobe of mesoscutum generally with only 1 row of adnotaular setae (Fig. 117), rarely with a second row, and in one case (*A. homeri*, Fig. 120) with > 2 rows. Propodeal callus usually with 2 setae (Fig. 118), occasionally with more. Fore wing (Fig. 143) with subcubital line of setae not reaching or approaching the level of basal vein. Coloration variable, body may range from entirely metallic to entirely non-metallic and yellow or brown. Male funicle and clava generally with whorls of long, dark setae, which reach beyond the tip of the segment following the one which bears them.

Subgenus *Ootetrastichus*. Agrees with *Aprostocetus* except: fore wing with subcubital line of setae reaching, or very nearly reaching, the level of basal vein (Fig. 142); mesoscutum generally with median line indistinct or absent (Fig. 113); propodeum (Fig. 114) may not have a distinct flap partially covering the spiracle; spiracle sometimes very small and circular; species often with 2 (or rarely 1) setae on SMV; the longest cercal setae is very long, often twice as long as the remaining setae (Fig. 112); gena often swollen behind malar sulcus, which can be somewhat curved (Fig.110); body generally elongate.



FIGS 58–63. (58–60) *Ceratoneura* sp., ♀: (58) face; (59) mesosoma; (60) propodeum and petiole; (61, 62) *Paragaleopsomyia* sp., ♀: (61) propodeum and petiole; (62) mesosoma, petiole, and base of gaster; (63) *Oxypracetus opacus*, ♀, petiole. g1, First gastral tergite; pe, petiole; pr, propodeum.

Subgenus *Tetrastichodes*. Agrees with *Aprostocetus* except: mesoscutum evenly covered with setae (Fig. 127); middle and hind basitarsus quite long, about 1·5 times as long as second tarsal segment (Fig. 126); hind coxa yellow in contrast to metallic mesosoma.

Subgenus *Quercastichus*. Agrees with *Aprostocetus* except: mesoscutum evenly covered with setae (Fig. 122); cercal setae variable, may have 1 seta distinctly longer than the others and sinuate (Fig. 125), or may have the two longest setae subequal in length and straight or only slightly curved (Fig. 124).

Discussion. This genus displays considerable variation, making it difficult to characterize. However, the majority of species (particularly in the subgenus *Aprostocetus*), will possess the following three characters: SMV with $\geqslant 3$ setae on dorsal surface, propodeal spiracle partially covered by a raised flap on the callus, one of the cercal setae distinctly longer than the others, and generally strongly curved or sinuate. Additionally, only a very few species have more than a single row of adnotaular setae.

Aprostocetus is the largest genus in the Tetrastichinae, and is present in all geographic realms. Many of the species previously treated in North America as belonging to *Tetrastichus* properly belong here. As currently interpreted it may be a paraphyletic or polyphyletic genus; however, attempts to more rigidly define it will have to await further study.

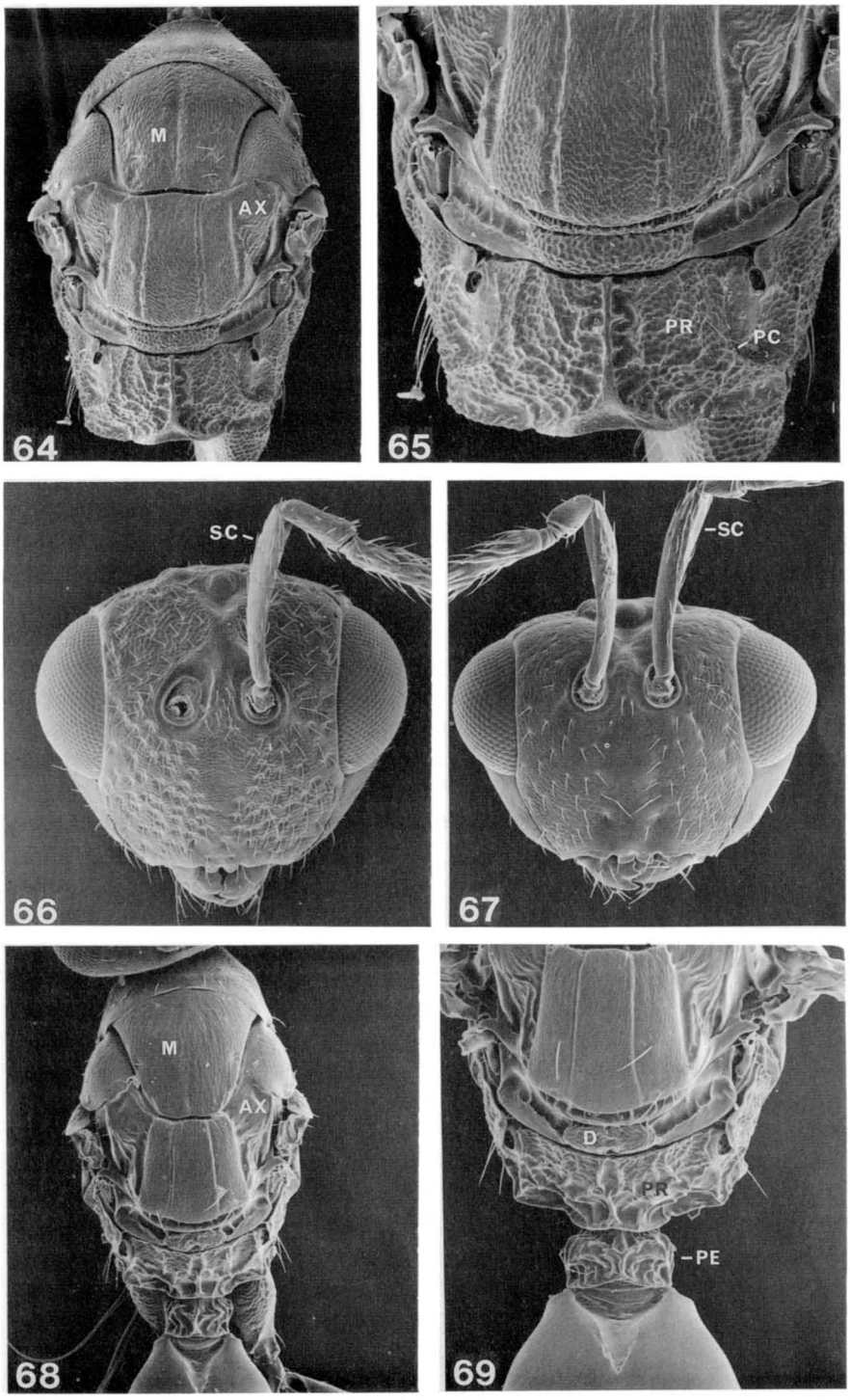
I have made four new generic synonymies with *Aprostocetus*. Three are equal to the subgenus *Aprostocetus*: *Exurus* Philippi, *Paromphaloidomyiia* Girault, and *Prothymus* Girault; and *Omphalomopsis* Girault is equal to *Ootetrastichus*.

I am synonymizing *Exurus*, as based on the type species *E. colliguayae* Philippi from South America, with *Aprostocetus*. This species was reared from a gall on *Colliguaja* [Euphorbiaceae] from Chile. I am making this synonymy with some hesitation, as I have not been able to find and examine type material for this species. Additionally, most species which have been traditionally placed in *Exurus* (Costa Lima, 1959a, b; De Santis, 1979, 1980) are not closely related to *Aprostocetus*. However, I have seen specimens in the USNM determined as '*Tetrastichus colliguayae* (Philippi)' which were reared from a dipteran gall on *Colliguaja* from Santiago, Chile, and these specimens are definitely *Aprostocetus*. Furthermore, these specimens agree well with the description and figure given by Philippi. In particular, the figure of the female antenna given by Philippi (1873: plate 1) agrees with the specimens I have seen, but not with other species currently placed in *Exurus*. I have not examined all the other species currently placed in *Exurus* (De Santis, 1979, 1980); however, at least one of them, *E. gallicola* (Ferrière), is quite distinct and will warrant separate generic status.

Paromphaloidomyiia is represented by the single species, *P. homeri* Girault. *P. homeri* agrees well in every way with *Aprostocetus*, except that the dorsum of the mesosoma and the sides of the gaster are covered with strong, white setae. This species had previously been placed in *Tetrastichus* by Burks (1943; as *T. argyrus* Burks).

Prothymus is represented by a single species, *P. novus* Girault. The unique holotype is badly damaged; however, it appears to belong in *Aprostocetus*, and I am placing it here.

Omphalomopsis is represented by a single species, *O. marilandia* Girault. Although the unique holotype is badly damaged, it is recognizable as belonging to *Aprostocetus* (subgenus *Ootetrastichus*).



FIGS 64–69. (64–66) *Oxypracetus opacus*, ♀: (64) mesosoma; (65) propodeum; (66) face; (67–69) *Lisseurytomella flava*, ♀: (67) face; (68) mesosoma; (69) scutellum, propodeum, and petiole. ax, Axilla; d, dorsellum; m, mesoscutum; pc, paraspiracular carina; pe, petiole; pr, propodeum; sc, scutellum.

Graham (1987) recognized five subgenera within *Aprostocetus*: *Aprostocetus*, *Ootetrastichus*, *Tetrastichodes*, *Chrysotetrastichus*, and *Coriophagus*, and supplied a key to separate these subgenera (*loc. cit.*: 87–89). The subgenera *Chrysotetrastichus* and *Coriophagus* are not known from the New World. I am describing an additional subgenus *Quercastichus* in the present paper.

Distribution. *Aprostocetus* occurs in abundance in all geographic realms. There are four subgenera found in North America. Of these, *Aprostocetus*, *Ootetrastichus* and *Tetrastichodes* are cosmopolitan; *Quercastichus* is restricted to the New World.

Biology and hosts. The subgenus *Aprostocetus* attacks a variety of hosts, but often insects inhabiting plant galls, including Diptera (particularly Cecidomyiidae), Hymenoptera (Cynipoidea), Coleoptera, Coccoidea, and eriophyid mites. Species of *Ootetrastichus* are egg parasitoids of Hemiptera, Homoptera, Orthoptera, Odonata, and Coleoptera. Species of *Tetrastichodes* are parasitoids of cockroach oothecae. Species of *Chrysotetrastichus* and *Coriophagus* (not known from North America) are egg parasitoids of Coleoptera and Hemiptera respectively. *Quercastichus* species are parasitoids of gall-forming Cynipidae.

Biological control. Few species of *Aprostocetus* have figured into biological control projects. Attempts at using *A. gala* as a biological control agent of citrus weevils (Curculionidae: *Diaprepes* spp., *Exophthalmus* spp.) have been reviewed by Cock (1985: 9—as *Tetrastichus gala*).

Notes and recent literature. European species have recently been revised by Graham (1987); however, there are no revisions of this genus for any other geographic realm. Bouček (1988a) listed > 220 Australasian species of *Aprostocetus*. LaSalle (1990b) transferred three New World species into *Aprostocetus*, and LaSalle and Schauff (1992) transferred 26 New World species into this genus.

New North American records. *A. antiguensis* (Crawford), *A. leucone* (Walker), *A. longicauda* (Thomson), *A. pygmaeus* (Zetterstedt); *A. strobilanae* (Ratzeburg), *A. terebrans* Erdös.

Other New World species

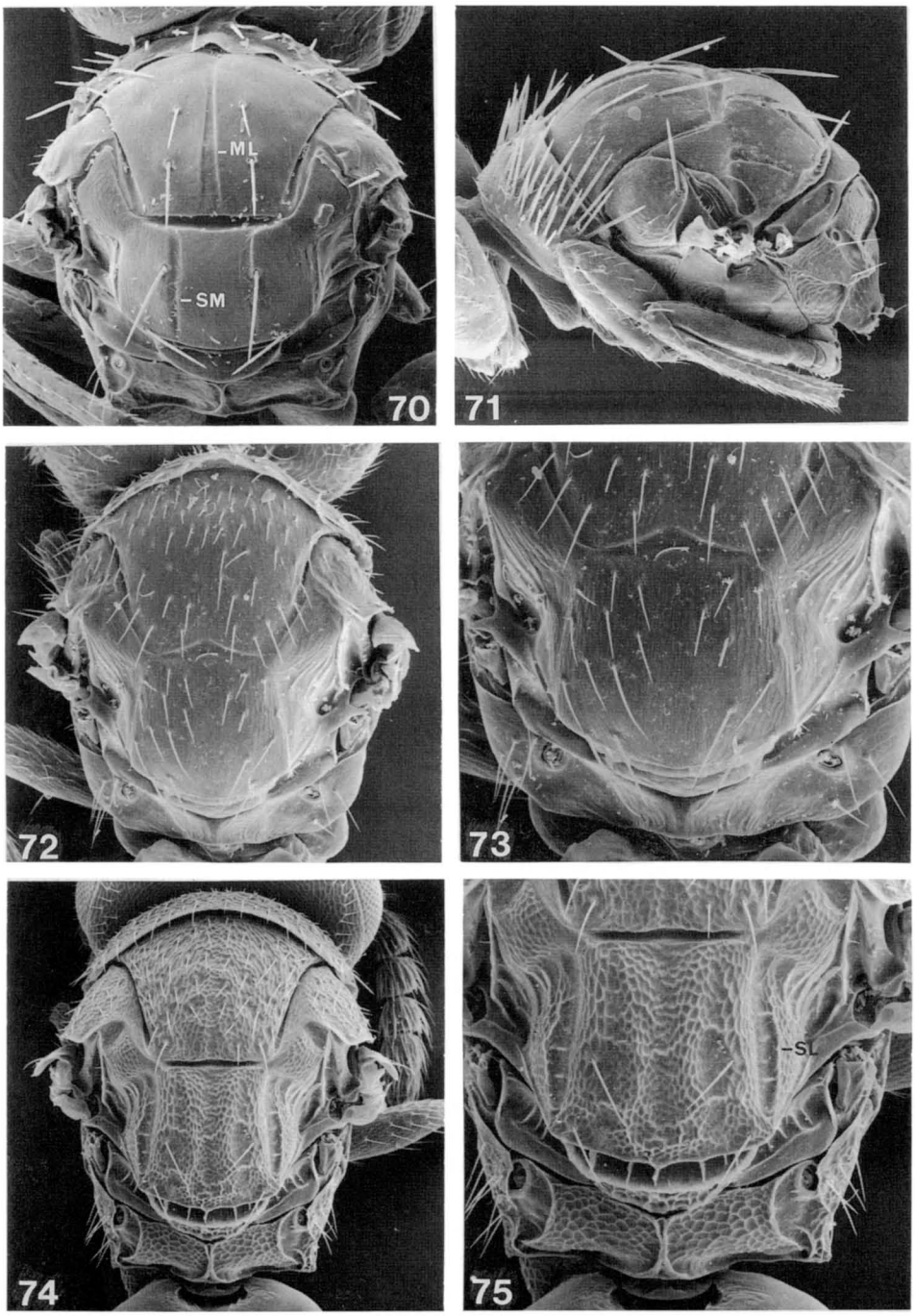
Subgenus *Aprostocetus.* Transferred by LaSalle and Schauff (1992): *acutipennis* (Ashmead), *ashmeadi* (Howard), *basilaris* (Ashmead), *basimacula* (Cameron), *brasilensis* (Ashmead), *cacus* (Walker), *chapadae* (Ashmead), *cleonica* (Walker), *daimachus* (Walker), *elevatus* (Howard), *fasciatus* (Ashmead), *februus* (Walker), *femoratus* (Ashmead), *longicornis* (Ashmead), *narcaeus* (Walker), *naucles* (Walker), *norax* (Walker), *orbitalis* (Ashmead), *phryno* (Walker), *polybaea* (Walker), *punctifrons* (Ashmead), *rusticus* (De Santis), *similis* (Howard), *vulgaris* (Ashmead), *xenocles* (Walker). Transferred by LaSalle (1990b): *arachnophagus* (Brèthes), *riverai* (Brèthes). New combinations: *vaquitarum* (Wolcott, 1923) **comb. n.**, *zemani* (Brèthes, 1920) **comb. n.**

Subgenus *Ootetrastichus.* Transferred by LaSalle and Schauff (1992): *coxalis* (Howard), *cupreus* (Ashmead).

APROSTOCETUS subgenus *APROSTOCETUS*

(Figs 115–121, 142)

The subgenus *Aprostocetus* is the largest subgenus of *Aprostocetus*, and many of the species previously treated in North America as *Tetrastichus* properly belong here. Species of the subgenus *Aprostocetus* are present and abundant in all geographic



FIGS 70–75. (70, 71) *Pentastichus* sp., ♀: (70) mesosoma; (71) mesosoma, lateral view; (72, 73) *Comastichus zopheros*, ♀: (72) mesosoma; (73) scutellum and propodeum; (74, 75) *Aranobroter rayorae*, ♀: (74) mesosoma; (75) scutellum and propodeum. ml, Median line on mesoscutum; sl, sublateral line on scutellum; sm, submedian line on scutellum.

realms, and attack a wide range of hosts. This is a large and somewhat heterogeneous subgenus and contains species which have previously been treated in the European literature (Graham, 1961a, b; Domenichini, 1966a, 1967) as belonging to the following species groups: *arundinis*, *catius*, *caudatus*, *elongatus*, *fulvipes*, *lycidas*, *neglectus*, *pausiris*, *strobilanae*. It contains the following subgenera of Kostjukov (1977): *Domenichinia*, *Syntomosphyrum*, *Trichoceras*.

Species attack a variety of hosts, but often insects inhabiting plant galls, including Diptera (particularly Cecidomyiidae), Hymenoptera (Cynipoidea), Coleoptera, Coccoidea, and eriophyid mites. Other hosts are extremely varied. The larva of a South African species is predatory on nematodes within galls (Van den Berg *et al.*, 1990), and other species act as egg predators within spider egg sacs (LaSalle, 1990b).

North American species

ajax (Girault). *Tetrastichomorpha ajax* Girault, 1916[289]: 132 [USNM]. Transferred to *Aprostocetus* by Peck (1951: 450).

animus Girault. *Aprostocetus animus* Girault, 1917[317]: 2 [USNM].

anthophilus Burks, **comb. n.** *Tetrastichus anthophilus* Burks, 1947: 85 [USNM].
Hosts. Cecidomyiidae: *Rhopalomyia anthophila.*

anthracinus (Ashmead), **comb. n.** *Tetrastichus anthracinus* Ashmead, 1902a: 146 [USNM].

antiguensis (Crawford), **comb. n.** *Tetrastichus antiguensis* Crawford, 1911a: 447–448 [USNM].
Hosts. Coccidae: *Ceroplastes floridensis.*
New record. USA, FL, Alachua Co., Gainesville, 21.vii.1988, F. D. Bennett, ex. *Ceroplastes floridensis* on *Ilex cornuta* (1♀ USNM, 1♀ BMNH).

argyrus see *homeri*

asperulus see *granulatus*

banksii (Howard). *Tetrastichus banksii* Howard, 1892: 299 [USNM]. Transferred to *Aprostocetus* by LaSalle (1990b: 1378).
Hosts. Epeiridae: egg sac of unidentified epeirid.

blastophagi (Ashmead), **comb. n.** *Hyperteles blastophagi* Ashmead, 1887: 202 [USNM]. Transferred to *Tetrastichus* by Burks (1943: 595).
Hosts. Cynipidae: *Callirhytis blastophaga.*

blattae (Burks). *Syntomosphyrum blattae* Burks, 1952: 263 [USNM]. Transferred to *Aprostocetus* by LeBeck (1991: 344).
Hosts. Blattellidae: *Paracoblatta* sp. oothecae.

blepyri see *minutus*

bruzzonis (Masi). *Tetrastichus bruzzonis* Masi, 1930: 26–32 [MSNG]. Graham (1987: 294) recorded this species from Canada, but did not give a more precise location. European hosts are *Cassida vittata* and *C. rubiginosa* [Chrysomelidae].

carinatus see *zosimus*

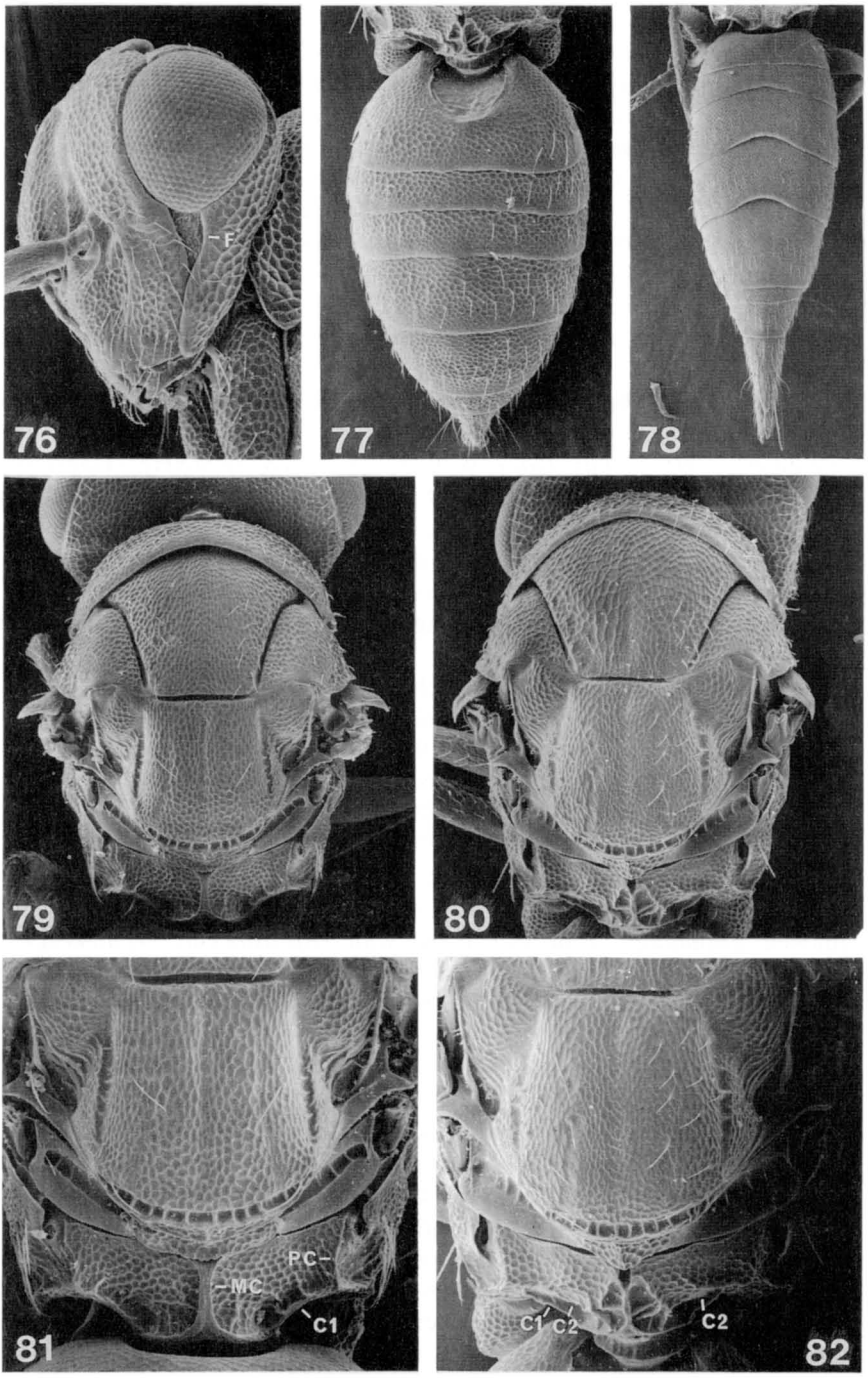
cassidis (Burks), **comb. n.** *Tetrastichus cassidis* Burks, 1943: 555 [USNM].
Hosts. Chrysomelidae: *Deloyala guttata, Metriona bicolor.*

charoba see *zosimus*

cuneiformis see *marylandensis*

detrimentosus see *minutus*

diplosidis Crawford. *Aprostocetus diplosidis* Crawford, 1907: 180–181 [USNM]. Wide distribution in warm temperature and tropical zones.
Hosts. Cecidomyiidae: *Contarinia sorghicola.*



FIGS 76–82. (76–82) *Galeopsomyia* spp., ♀: (76) head and malar region; (77, 78) gaster; (79) mesosoma (*Galeopsomyia*); (80) mesosoma (*Galeopsomopsis*); (81) scutellum and propodeum (*Galeopsomyia*); (82) scutellum and propodeum (*Galeopsomopsis*). c1, Carina along posterior margin of propodeum; c2, second transverse carina anterior to c1; f, fovea beneath eye; mc, median carina on propodeum; pc, paraspiracular carina.

esurus (Riley), **comb. n.** *Cirrospilus esurus* Riley, 1879: 162 [USNM]. Transferred to *Syntomosphyrum* by Burks (1952: 263).

= *Syntomosphyrum orgyiae* Ashmead, 1894b: 343 [USNM].

Hosts. Arctiidae: *Hyphantria cunea*. Lasiocampidae: *Malacosoma disstria*. Lymantriidae: *Nygmia phaeorrhoea*, *Orgyia leucostigma*, *Lymantria dispar*. Noctuidae: *Alabama argillaceae*, *Anomis erosa*. Oecophoridae: *Stenoma algidella*. Pyralidae: *Acrobasis juglandis*, *Diatraea saccharalis*. Tortricidae: *Choristoneura fumiferana*, *C. pinus*, *Grapholita molesta*, *Gretchena bolliana*.

faustus (Burks), **comb. n.** *Tetrastichus faustus* Burks, 1943: 582 [USNM].

Hosts. Tephritidae: *Rhagoletis fausta*.

fidius Girault. *Aprostocetus fidius* Girault, 1917[308]: 1 [USNM].

Hosts. Cecidomyiidae: *Taxodiomyia cupressiananassa*, and possibly other gall midges.

florida (Girault). *Neomphaloidella florida* Girault, 1917[309]: 4 [USNM]. Transferred to *Aprostocetus* by Burks (1958: 66).

gala (Walker). *Tetrastichus Gala* Walker, 1847: 28 [BMNH]. Transferred to *Aprostocetus* by Bouček (1988a: 681; see also this paper for extralimital synonymies). Biological information given by Schauff (1987).

Hosts. Curculionidae: *Diaprepes abbreviatus*, *D. famelicus*. Egg parasitoid.

gelastus (Burks), **comb. n.** *Tetrastichus gelastus* Burks, 1943: 539 [USM]. The date of publication for this species was wrongly given as 1963 in the most recent catalog (Burks, 1979).

Hosts. Triozidae: *Trioza* on Chinese elm.

granulatus Ashmead. *Aprostocetus granulatus* Ashmead, 1888: 105 [USNM].

= *Tetrastichus microcosmus* Girault, 1917[316]: 22. Unnecessarily proposed new name for *granulatus* Ashmead (nec *granulatus* Walker).

= *Tetrastichus asperulus* Graham, 1981: 2–5 [UMO].

Widely distributed, including Europe, Trinidad, India, Australia (Graham, 1987; Bouček, 1988a; both as *A. asperulus*).

Notes. Graham and LaSalle (1991: 91) synonymized *asperulus* with *granulatus*, removed *granulatus* from synonymy with '*Aprostocetus*' *epidius* (Walker) (see Burks, 1975, 1979), and transferred *epidius* to the genus *Galeopsomyia*. *A. granulatus* Ashmead should not be confused with *Baryscapus granulatus* (Walker).

hesperius (Burks), **comb. n.** *Tetrastichus hesperius* Burks, 1947: 88 [INHS].

Hosts. Cynipidae: *Diplolepis ignota*.

hibus (Burks), **comb. n.** *Tetrastichus hibus* Burks, 1943: 582 [USNM].

Hosts. *Rhopalomyia* sp. on *Salvia apiana*. Label data on the type series states this species is from Claremont, California, from 'cup gall on white sage'. No scientific name was given for this plant and Burks (1943: 183) assumed it to be *Artemisia ludoviciana*; however, this plant is almost certainly *Salvia apiana*. I have reared a series of *A. hibus* from 'cup galls' on *S. apiana* in Devore, California, and the emerging cecidomyiid was kindly determined by R. J. Gagné as *Rhopalomyia* sp.

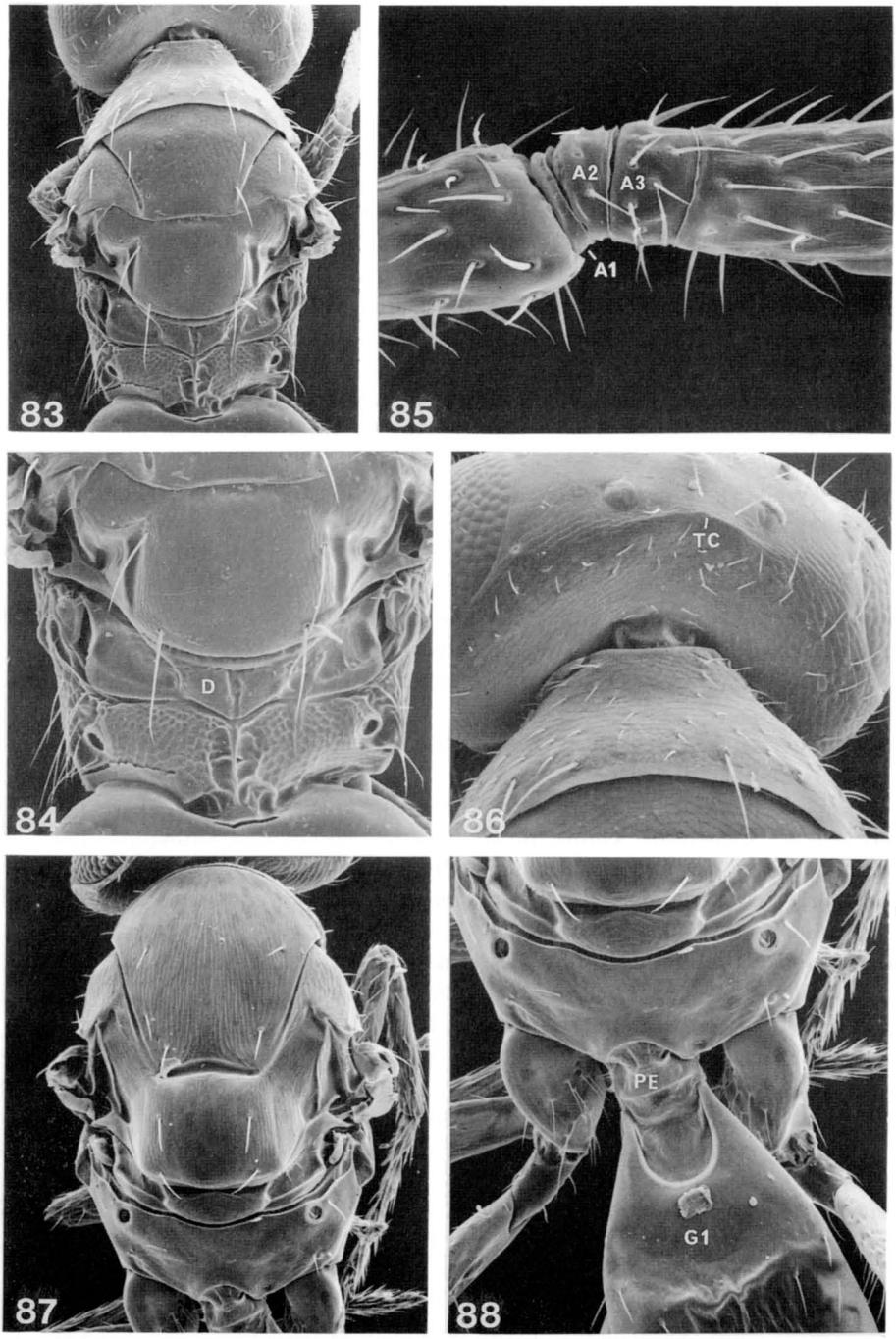
homeri (Girault), **comb. n.** *Paromphaloidomyiia homeri* Girault, 1917[309]: 1 [USNM].

= *Tetrastichus argyrus* Burks, 1943: 558 [USNM].

Hosts. Cecidomyiidae: *Asteromyia carbonifera* leaf gall on *Solidago*.

impexus (Girault), **comb. n.** *Tetrastichus impexus* Girault, 1917[309]: 2 [USNM].

Hosts. Cynipidae: *Disholcaspis quercusglobulus* gall on *Quercus stellata*.



FIGS 83–88. (83–86) *Tetrastichomyia clisiocampae*, ♀: (83) mesosoma; (84) scutellum, dorsellum and propodeum; (85) anelli; (86) vertex; (87, 88) *Thripastichus gentilei*, ♀: (87) mesosoma; (88) propodeum, petiole, base of gaster. a1–a3, Anelli 1–3; d, dorsellum; g1, first gastral tergite; pe, petiole; tc, transverse carina behind ocelli.

irvingi (Girault). *Neomphaloidella irvingi* Girault, 1917[338]: 118 [USNM]. Transferred to *Aprostocetus* by Peck (1951: 451).

ischnopterae (Girault). *Epomphaloides ischnopterae* Girault, 1917[319]: 257 [USNM]. Transferred to *Syntomosphyrum* by Burks (1952: 260). Transferred to *Aprostocetus* by LeBeck (1991: 344).

Hosts. Blattellidae: *Ischnoptera* sp., *Parcoblatta* sp. oothecae. Possibly as a hyperparasitoid attacking Evaniidae.

juniperi (Crawford), **comb. n.** *Geniocerus juniperi* Crawford, 1915: 585 [USNM]. Transferred to *Tetrastichus* by Burks (1943: 597).

kansasia Girault. *Aprostocetus kansasia* Girault, 1917[336]: 88 [USNM].

lasiopterae Ashmead see *lasius*

lasius (Burks), **comb. n.** *Tetrastichus lasius* Burks, 1943: 596. Replacement name for *Tetrastichoides*[!] *lasiopterae* Ashmead (nec *Geniocerus lasiopterae* Lindemann, 1881).

= *Tetrastichoides*[!] *lasiopterae* Ashmead, 1894a: 54 [USNM].

Hosts. Cecidomyiidae: *Asteromyia agrostis* on *Muhlenbergia* and *Distichlis.*

lecanii see *minutus*

leucone (Walker). *Cirrospilus Leucone* Walker, 1839a: 325 [BMNH]. For extralimital synonyms see Graham (1987: 239).

New record. USA, OR, 2 km E. Junction City, 2.viii.1991, S. L. Heydon (1 ♀ UCD).

longicauda (Thomson). *Tetrastichus longicauda* Thomson, 1878: 292 [UZIL]. Transferred to *Aprostocetus* by Graham (1961b: 54; 1987).

New record. USA, OR, 2 km E. Junction City, 2.viii.1991, S. L. Heydon (1 ♀ UCD).

longicorpus (Girault), **comb. n.** *Neotetrastichodes longicorpus* Girault, 1916[289]: 129 [USNM].

Hosts. Tortricidae: *Rhyacionia frustrana* on *Pinus ponderosa.*

marcovitchi (Crawford), **comb. n.** *Geniocerus marcovitchi* Crawford, 1915: 586 [USNM]. Transferred to *Tetrastichus* by Gahan *et al.* (1928: 904).

Hosts. Cecidomyiidae: *Dasineura balsamicola, Oligotrophus betheli,* undet. cecidomyiid on juniper berries.

marylandensis (Girault), **comb. n.** *Epitetrastichus marylandensis* Girault, 1916[287]: 295 [USNM]. Transferred to *Tetrastichus* by Burks (1943: 598).

= *Epitetrastichus cuneiformis* Girault, 1917[316]: 18 [USNM].

Hosts. Gelechiidae: *Exoteleia pinifoliella.* Tortricidae: *Rhyacionia frustrana.* Cecidomyiidae: undet. cecidomyiid.

milleri (Burks), **comb. n.** *Tetrastichus milleri* Burks, 1963: 56 [USNM].

Hosts. Hyperparasitoid of Gelechiidae: *Recurvaria milleri.*

microcosmus see *granulatus*

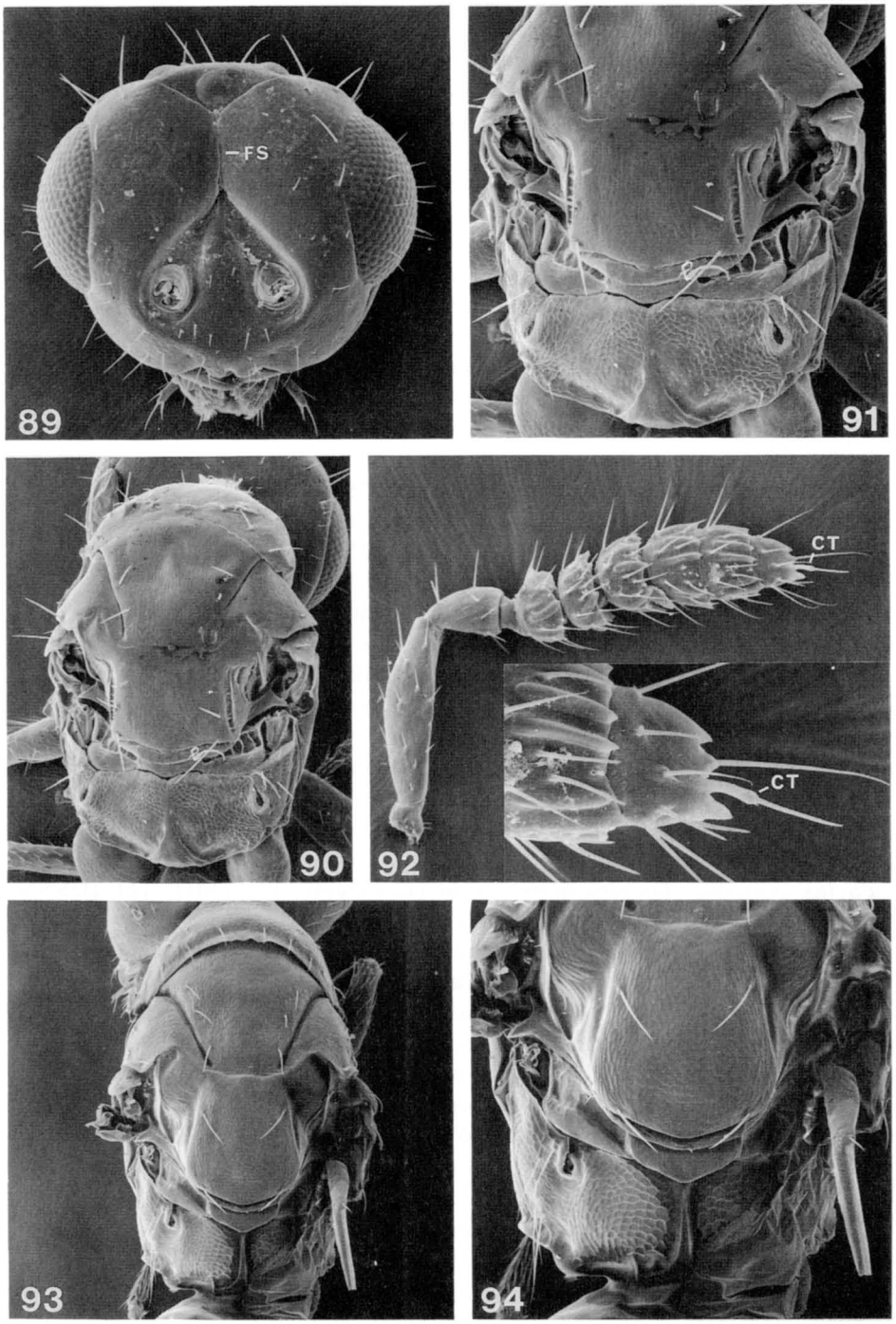
minutus (Howard), **comb. n.** *Astichus minutus* Howard, 1881: 369 [USNM]. Transferred to *Tetrastichus* by Burks (1943: 580).

= *Tetrastichus lecanii* Ashmead, 1885: xix [?lost].

= *Tetrastichus blepyri* Ashmead, 1902b: 302 [USNM].

= *Tetrastichus* (*Tetrastichodes*) *detrimentosus* Gahan, 1913: 439 [USNM].

Hosts. Recorded from the following hosts, but probably always as a hyperparasitoid. Aphididae: *Aphis gossypii, A. pomi.* Coccidae: *Lecanium corni, L. nigrofasciatum, L. persicae, Physokermes insignicola, Pulvinaria bigelovia, Saissetia oleae.* Pseudococcidae: *Phenacoccus acericola, P. helianthi,*



FIGS 89–94. (89–92) *Aceratoneuromyia indica*, ♀: (89) face; (90) mesosoma; (91) scutellum and propodeum; (92) antenna/apex of club; (93, 94) *Neotrichoporoides viridimaculatus*, ♀: (93) mesosoma; (94) scutellum and propodeum. ct, Terminal spine on club; fs, fronto-facial suture.

Pseudococcus comstocki, *P. juniperi*. Coccinellidae: *Adalia bipunctata*, *Cycloneda sanguinea*, *C. sanguinea immaculata*. Aphelinidae: *Coccophagus albicoxa*, *C. lycimnia*, *Coccophagus* sp. Braconidae: *Praon* sp. Encyrtidae: *Anagyrus yuccae*, *Anagyrus* sp., *Aphycus lounsburyi*, *A. physokermes*, *Blastothrix longipennis*, *Chalcaspis phenacocci*, *Chrysoplatycerus ferrisi*, *C. splendens*, *Clausenia purpurea*, *Homalotylus terminalis*, *Microterys mazzinini*, *Microterys* sp., *Pseudleptomastix squammulata*, *Zarhopalus corvinus*. Pteromalidae: *Pachyneuron californicum*.

nebraskensis (Girault), **comb. n.** *Neomphaloidella nebraskensis* Girault, 1916[265]: 103 [USNM]. Transferred to *Tetrastichus* by Burks (1943: 594).

Hosts. Cecidomyiidae: *Contarinia wattsi*, *Dasineura leguminicola*.

neglectus (Domenichini). *Tetrastichus neglectus* Domenichini, 1957a: 227–229. Transferred to *Aprostocetus* by Graham (1961b: 59; 1987: 292). Recorded from North America by Hendrickson *et al.* (1991: 199).

Hosts. Coccinellidae: *Chilocorus kuwanae*. European hosts listed by Graham (1987: 293), however the record of this species from *Coccinella septempunctata* is probably erroneous (Schaefer and Semyanov, 1992: 129).

neuroteri (Ashmead), **comb. n.** *Hyperteles neuroteri* Ashmead, 1887: 203 [USNM]. Transferred to *Tetrastichus* by Balduf (1929: 221).

Hosts. Cynipidae: *Neuroterus quercusrileyi*, *N. saltarius*.

novus (Girault), **comb. n.** *Prothymus novus* Girault, 1917[309]: 1 [USNM].

oklahoma (Girault), **comb. n.** *Neomphaloidella oklahoma* Girault, 1917[316]: 9 [USNM]. Transferred to *Tetrastichus* by Burks (1943: 557).

Hosts. Unknown, although reared from grass stems with *Harmolita* sp. [Eurytomidae].

oncideridis (Gahan). *Tetrastichus oncideridis* Gahan, 1932: 745 [USNM]. Transferred to *Aprostocetus* by Burks (1958: 67).

Hosts. Cerambycidae: *Oncideridis cingulata*.

orgyiae Ashmead see *esurus*

oviductus (Girault). *Epitetrastichus oviductus* Girault, 1917[301]: 111 [USNM]. Transferred to *Aprostocetus* by Peck (1951: 451).

pallipes (Dalman). *Entedon pallipes* Dalman, 1820: 181 [NRS]. Graham (1987: 332) recorded this species from Alberta, Canada.

Hosts. Cecidomyiidae: *Oligotrophus* (= *Semudobia*) *skuhravae* on *Betula pumila*. For additional extralimital hosts see Graham (1987: 332).

pandora (Burks), **comb. n.** *Tetrastichus pandora* Burks, 1943: 530 [USNM].

Hosts. Saturniidae: *Coloradia pandora*.

pausiris (Walker). *Cirrospilus Pausiris* Walker, 1839a: 327 [BMNH]. Transferred to *Aprostocetus* by Graham (1961b: 50). For more complete history see Graham (1987: 263).

Hosts. Cecidomyiidae: *Dasineura leguminicola*.

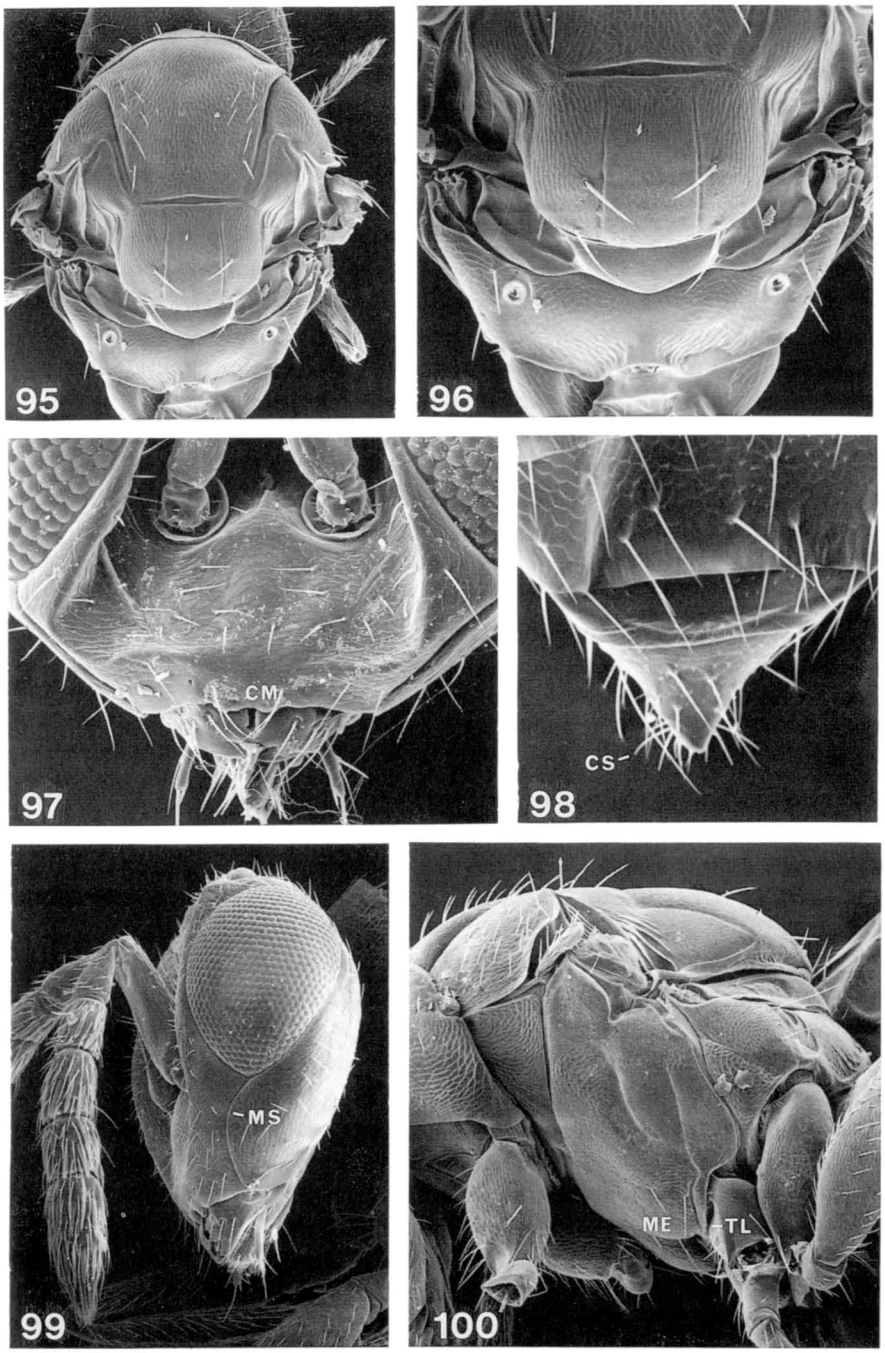
psyllaephagus (Burks), **comb. n.** *Tetrastichus psyllaephagus* Burks, 1963: 54 [USNM].

Hosts. Triozidae: *Trioza collaris* on *Baccharis glutinosa*.

punctatifrons (Girault), **comb. n.** *Epitetrastichus punctatifrons* Girault, 1916[289]: 128 [USNM]. Transferred to *Tetrastichus* by Burks (1943: 572).

Hosts. Leafminer (probably *Paraleucoptera albella* [Lyonetiidae]) on *Populus*.

pygmaeus (Zetterstedt). *Entedon pygmaeus* Zetterstedt, 1838: 428 [UZIL].



FIGS 95–100. (95–98) *Minotetrastichus frontalis*, ♀: (95) mesosoma; (96) scutellum and propodeum; (97) clypeal margin; (98) apex of gaster showing cercal setae; (99, 100) *Baryscapus* spp., ♀: (99) head and malar region; (100) mesopleuron and mesosternum. cs, Cercal seta; me, mesosternum; ms, malar sulcus; px, precoxal suture; tl, trochantinal lobe.

Extralimital synonymies and taxonomic history given by Graham (1987: 338–339).

Hosts. Not known for North America. In Europe it is apparently associated with Cecidomyiidae on grasses (Graham, 1987).

New record. Canada, Alberta, Fairview, ix.1990, J. J. Soroka (3♀ CNC).

rosae (Ashmead), **comb. n.** *Tetrastichus rosae* Ashmead, 1886: 134 [USNM].

Hosts. Cynipidae: *Diplolepis ignota, D. ostensackeni.*

semiauraticeps (Girault), **comb. n.** *Epitetrastichus semiauraticeps* Girault, 1916[289]: 127–8 [USNM]. Transferred to *Tetrastichus* by Burks (1943: 556).

Hosts. Needle gall on *Pinus ponderosa*, bud gall on *Pinus scopulorum.*

silvaticus (Gahan), **comb. n.** *Tetrastichus silvaticus* Gahan, 1937: 266 [USNM].

Hosts. Lasiocampidae: *Malacosoma disstria.*

sobrius (Gahan), **comb. n.** *Tetrastichus sobrius* Gahan, 1919b: 166 [USNM].

Hosts. Cecidomyiidae: *Asphondylia websteri, Asphondylia* sp.

strobilanae (Ratzeburg). *Eulophus strobilanae* Ratzeburg, 1844: 166 [ZMUA].

See Graham (1987: 299) for synonymy.

Hosts. Not known for North America; European hosts are *Kaltenbachiola strobi* and *Plemeliella abietina* [Cecidomyiidae] (Graham, 1987).

New record. Canada, New Brunswick, York Co., Fredericton Golf Club, 22.iii.1990 (1♀, 1♂ CNC).

strobilus (Burks), **comb. n.** *Tetrastichus strobilus* Burks, 1943: 552 [USNM]. Hosts. Tortricidae: *Barbara colfaxiana* in cones of *Pinus, Picea,* and *Pseudotsuga.*

terebrans Erdös. *Aprostocetus terebrans* Erdös, 1954: 353 [TMB].

New record. USA, IL, Cook Co., Chicago, Forest Park, 15.vi.1984, L. LeBeck, near river (1♀ USNM; 1♀ BMNH).

tesserus (Burks), **comb. n.** *Tetrastichus tesserus* Burks, 1943: 552 [USNM].

Hosts. Cecidomyiidae: *Asteromyia* sp. on *Solidago.*

varicornis (Girault), **comb. n.** *Epitetrastichus varicornis* Girault, 1917[317]: 4 [USNM]. Transferred to *Tetrastichus* by Burks (1943: 592).

Hosts. Tortricidae: *Epinotia nanana, Rhyacionia frustrana.*

venustus (Gahan). *Tetrastichus venustus* Gahan, 1914: 168 [USNM]. Transferred to *Aprostocetus* by Graham (1987: 277). For extralimital synonymies see Graham (1987: 277).

Hosts. Probably *Bruchophagus* spp. (Eurytomidae) in seeds of *Medicago sativa* and *Onobrychis* (see Graham, 1987: 278).

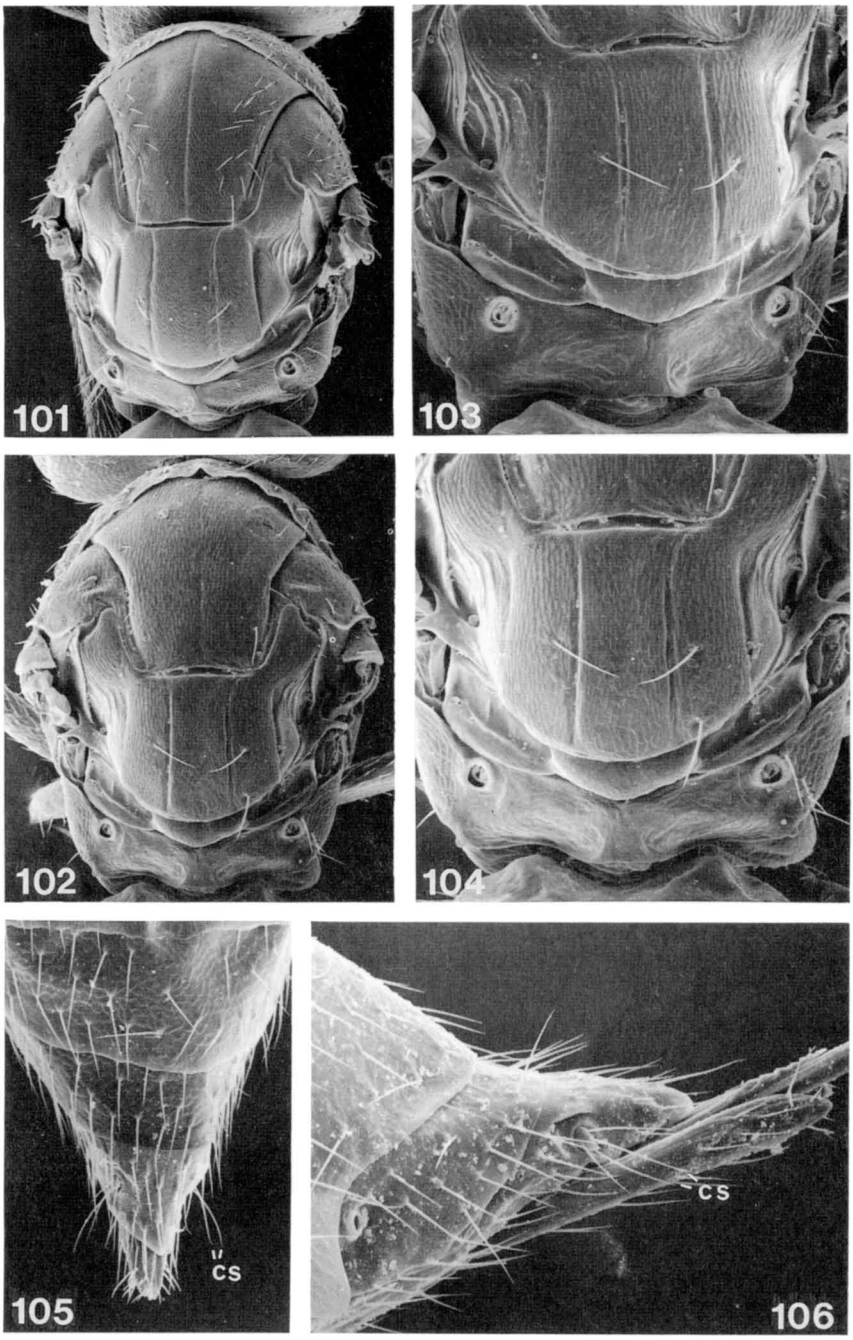
Notes. Teitelbaum and Black (1954) reported a case of phytophagy involving a species determined as *venustus.* These specimens (which I have examined) are not *A. venustus,* but represent a different, undetermined species of *Aprostocetus.*

zosimus (Walker). *Cirrospilus Zosimus* Walker, 1839a: 297 [BMNH].

= *Tetrastichus carinatus* Forbes, 1885: 48–49 [INHS].

This species is lised in the North American catalog under the name *Tetrastichus charoba* Walker (Burks, 1979). For an extensive list of extralimital synonyms see Graham (1987: 232–233).

Hosts. Cecidomyiidae: *Dasineura leguminicola, Mayetiola destructor, M. phalaridis,* and also occasionally as hyperparasitoids of these species through their parasitoids, Platygasteridae: *Platygaster zosime, P. herrichi.* Pteromalidae: *Homoporus destructor.*



FIGS 101–106. *Baryscapus* spp., ♀: 101, 102) mesosoma; (103, 104) scutellum and propodeum; (105, 106) apex of gaster showing cercal setae. cs, Cercal seta.

APROSTOCETUS subgenus *OOTETRASTICHUS*
(Figs 110–114, 142)

Ootetrastichus is the second largest subgenus of *Aprostocetus*, and it occurs in all geographical realms. It contains species previously treated in the *crino* species group (Graham, 1961a, b; Domenichini, 1966a, 1967). Kostjukov (1977) treated this group under the subgeneric name *Anellaria*, and the North American *Neomphaloidomyia* and *Omphalomopsis* are synonyms of this subgenus.

Species of *Ootetrastichus* are predominantly egg parasitoids of Hemiptera, Homoptera, Orthoptera, Odonata, and Coleoptera. One African species is a hyperparasitoid of a lepidopterous stem borer through a Braconidae (LaSalle, in press).

North American species

compar see *crino*

crino (Walker). *Cirrospilus crino* Walker, 1838b: 382. Transferred to *Aprostocetus* by Graham (1961b: 44; 1987: 109)..

= *Tetrastichus dispar* Silvestri, 1920: 249. (Preoccupied by *dispar* Masi, 1917.)

= *Tetrastichus oecanthivorus* Gahan, 1932: 743. Replacement name for *dispar* Silvestri.

= *Tetrastichus oceanthivorus* var. *compar* Gahan, 1932: 743.

For a more complete extralimital synonymy list see Graham (1987: 109).

Hosts. Gryllidae: *Oecanthus quadripunctatus*, *Oecanthus* sp. For additional extralimital hosts see Graham (1987: 110).

dispar see *crino*

gibboni Girault, **comb. n.** *Ootetrastichus gibboni* Girault, 1917[335]: 86 [USNM]. Transferred to *Tetrastichus* by Burks (1943: 574).

Hosts. Languriidae: *Languria mozardi*.

hillmeadia Girault, **comb. n.** *Ootetrastichus hillmeadia* Girault, 1917[332]: 2 [USNM]. Transferred to *Tetrastichus* by Burks (1943: 534).

marilandia Girault, **comb. n.** *Omphalomopsis marilandia* Girault, 1917[336]: 88 [USNM].

Notes. The badly damaged type has been generally treated as unrecognizable; however, it appears to properly belong here.

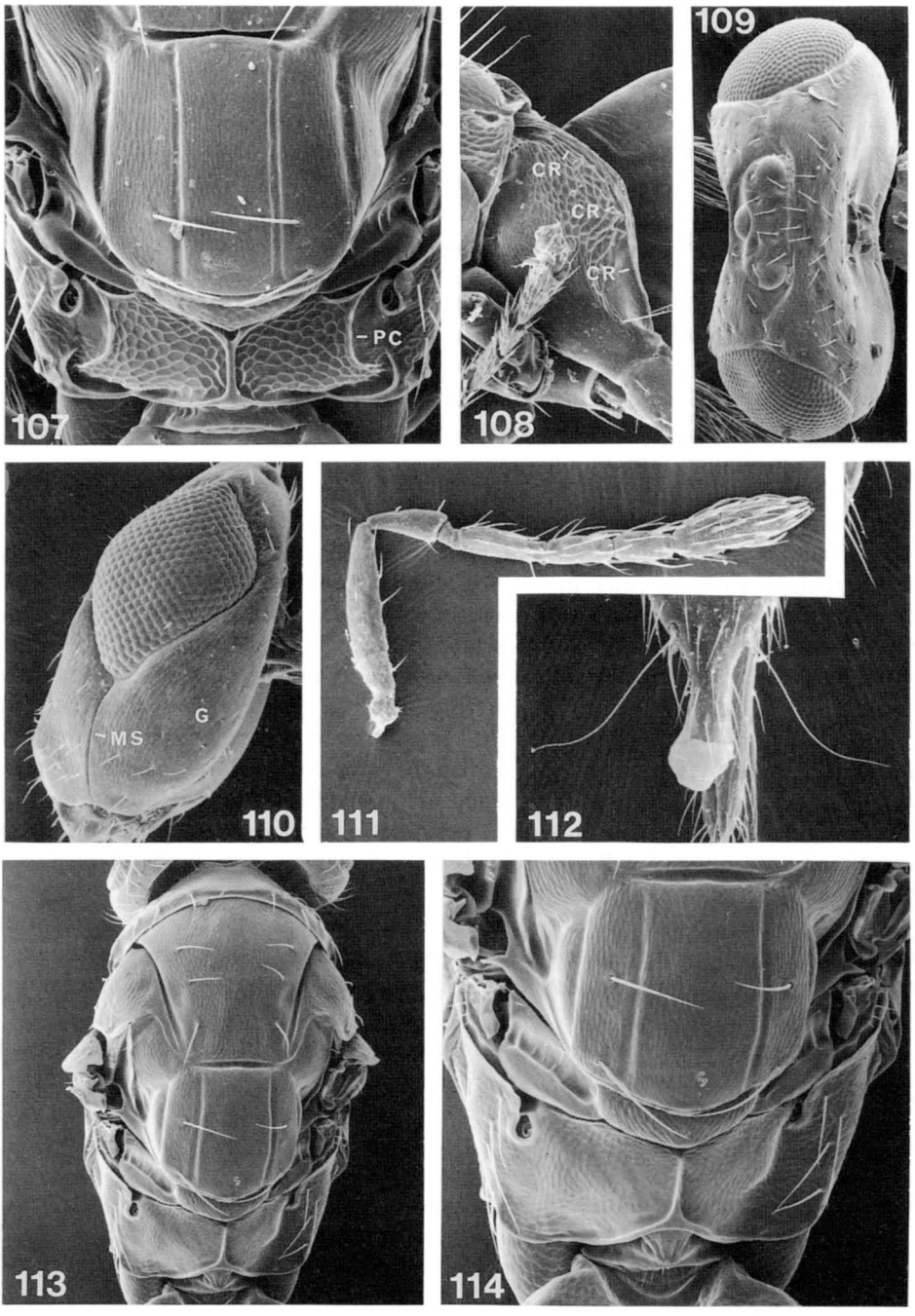
mymaridis Girault, **comb. n., stat., rev.** *Ootetrastichus mymaridis* Girault, 1916[289]: 130 [USNM]. Burks (1943: 575) synonymized this species with *Tetrastichus polynemae* Ashmead (nec *Aprostocetus polynemae* (Ashmead)). I am removing *mymaridis* from synonymy with *T. polynemae*, as those two species are currently placed in separate genera. *A. mymaridis* also appears distinct from *A. polynemae*; *polynemae* has the last gastral tergite distinctly lengthened, while in *mymaridis* the last gastral tergite is not so lengthened.

Hosts. Lestidae: *Lestes* sp.

oecanthivorus see *crino*

polynemae (Ashmead). *Hyperteles polynemae* Ashmead, 1900c: 615 [USNM]. Transferred to *Aprostocetus* by Peck (1951: 451). This species not to be confused with *Tetrastichus polynemae* Ashmead.

Hosts. Aeshnidae: *Anax junius*. Lestidae: *Lestes* sp.



FIGS 107–114. (107–109) *Anaprostocetus acuminatus*, ♀: (107) scutellum and propodeum; (108) hind coxa, lateral view; (109) vertex; (110–114) *Aprostocetus* (*Ootetrastichus*) spp., ♀: (110) head and malar region; (111) antenna; (112) apex of gaster showing cercal setae; (113) mesosoma; (114) scutellum and propodeum. cr, Carina along dorsal margin of hind coxa; g, gena; ms, malar sulcus; pc, paraspiracular carina.

APROSTOCETUS subgenus *QUERCASTICHUS*, sgen. n.
(Figs 122–125)

Type species: *Tetrastichus pattersonae* Fullaway. (Gender masculine).

Diagnosis. Mesoscutum completely covered with setae (Fig. 122). Cercal setae variable: either one of the cercal setae distinctly longer than the others and sinuate (Fig. 125), or at least the longest two of the cercal setae subequal in length, relatively short and often not conspicuous in their difference from the setae on the surrounding gastral tergites (Fig. 124). From cynipid galls on oaks. Other characters as normal for *Aprostocetus*.

Female. Agreeing with *Aprostocetus* except for the characters mentioned in the diagnosis. Species generally metallic green to blue in coloration, although some species are dark, with only a slight metallic shine.

Male. Similar to female except genitalia and antenna. Condition of funicular segments variable among species: in some species each segment has a dorsal whorl of long dark setae which extends distinctly past the apex of the segment; in other species this whorl is absent. In some species there is a dark spot on the anterior margin of the wing past the stigmal vein.

Discussion. This group appears to represent a distinct lineage within *Aprostocetus*. It possesses the normal characters for the genus except that the mesoscutum is uniformly covered with setae (Fig. 122), and in some species the cercal setae are approximately equal in size and straight or only slightly curved (Fig. 124). *Quercastichus* is similar to the subgenus *Tetrastichodes*, except that in *Tetrastichodes* the first segment of the middle and hind tarsi is distinctly longer (about 1·5 times) than the second (Fig. 126), the hind coxa is yellow to white, and the anterior pair of scutellar setae is placed near the posterior pair (Fig. 128); in *Quercastichus* the first tarsal segment is not distinctly longer than the second, the hind coxa is usually metallic to dark (at least one undescribed species has the hind coxa yellow), and the anterior pair of scutellar setae is generally situated in the middle of the scutellum (Fig. 123). These two groups also have quite different hosts: *Quercastichus* species are always associated with cynipid galls on oak; *Tetrastichodes* are parasitoids of cockroach oothecae.

Distribution. Northern New World. I have seen specimens from as far south as Costa Rica. They are associated with oaks which do not extend farther south than Colombia (at high altitudes), so that is probably the southernmost extension of *Quercastichus*.

Biology and hosts. Species of *Quercastichus* are parasitoids in cynipid galls in oaks (Fagaceae: *Quercus*).

North American species

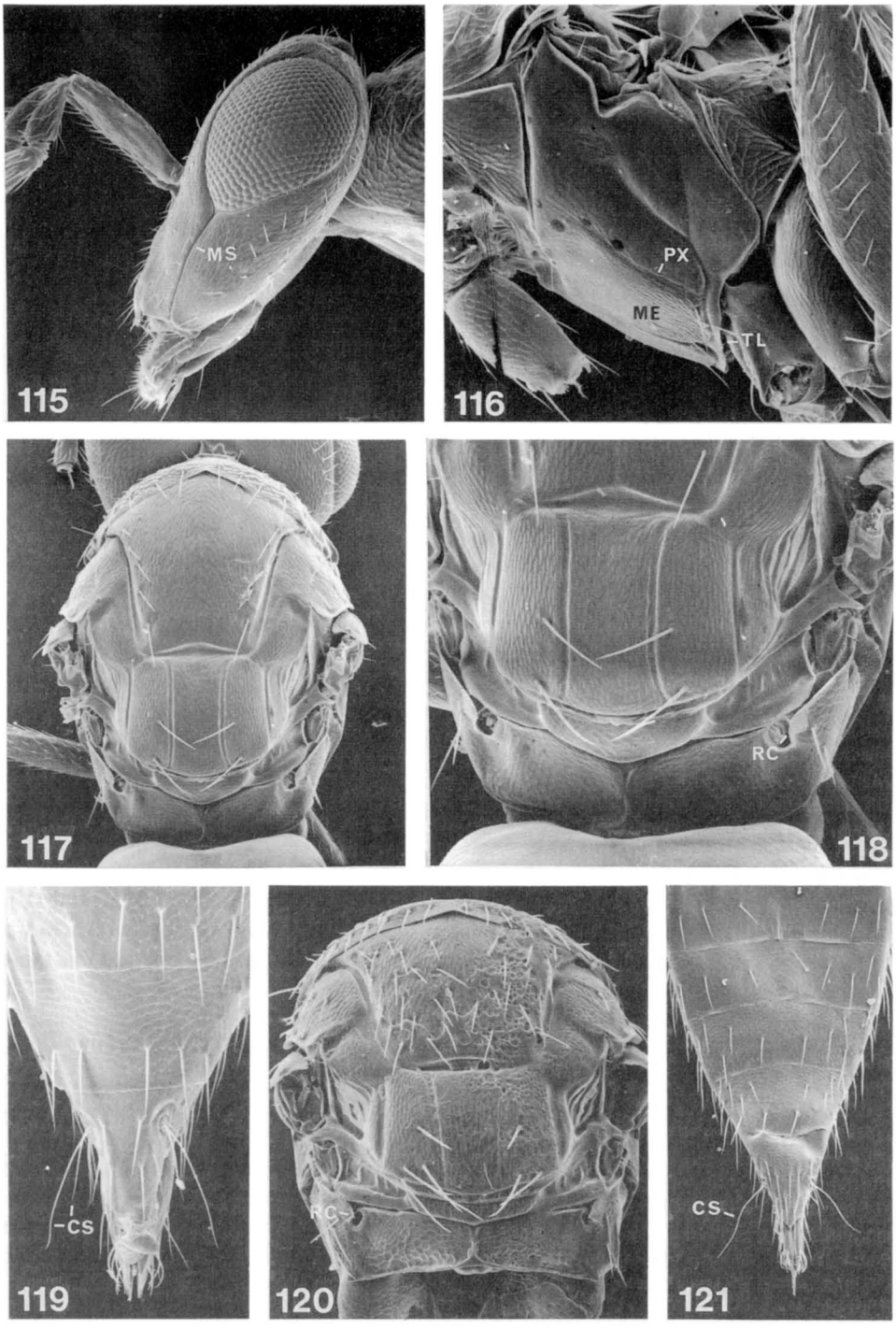
***burksi*, sp. n.** See descriptions of new species.

[= *Tetrastichus pattersonae* Fullaway, *sensu* Burks (1943: 563; 1963: 48, 49; 1979: 999); Peck (1951: 448; 1963: 143). Misidentification. See comments below under *pattersonae*.]

Hosts. Cynipidae: *Antron quercusechinus*, *Callirhytis quercuspomiformis*, *Disholcaspis chrysolepidis*.

garryana (Burks), **comb. n.** *Tetrastichus garryana* Burks, 1963: 49 [USNM].

Hosts. Cynipidae: *Besbicus mirabilis*, several undetermined cynipid galls on *Quercus garryana*.



FIGS 115–121. (115–119) *Aprostocetus* (*Aprostocetus*) *hibus*, ♀: (115) head and malar region; (116) mesopleuron and mesosternum; (117) mesosoma; (118) scutellum and propodeum; (119) apex of gaster showing cercal setae. (120, 121) *Aprostocetus* (*Aprostocetus*) *homeri*, ♀: (120) mesosoma; (121) apex of gaster showing cercal setae. cs, Cercal seta; me, mesosternum; ms, malar sulcus; px, precoxal carina; rc, raised lobe of callus which partially overhangs propodeal spiracle; tl, trochantinal lobe.

pattersonae (Fullaway), **comb. n.** *Tetrastichus pattersonae* Fullaway, 1912: 280. Lectotype ♂, CA [LACM] (**present designation**).
= *Tetrastichus spilopteris* Burks, 1943: 564 [USNM]. **Syn. n.**
Hosts. Cynipidae: *Andricus kingi*, *Dryocosmus bicornis*, *Neuroterus saltatorius*.
Notes. The type material of *pattersonae* had been considered as lost (Burks, 1943: 563; Peck, 1963: 143), however, type material for this species is now in the LACM. *T. pattersonae* was described from 1♀, 3♂ specimens (Lot 508, s.19). The female is missing; however, the three male specimens are present. I have chosen the best of these as lectotype, the other two become paralectotypes. Without having seen any type material, Burks (1943) mistakenly assigned an undescribed species to the name *pattersonae* (this species is described in this work as *burksi*, sp. n.), and he described the new species *spilopteris*, which is synonymous with *pattersonae* as based on Fullaway's types.

politi (Burks), **comb. n.** *Tetrastichus politi* Burks, 1963: 48 [USNM].
Hosts. Cynipidae: *Xanthoteras politum*.

spilopteris see *pattersonae*

verrucarii (Balduf), **comb. n.** *Tetrastichus verrucarii* Balduf, 1929: 221 [USNM].
Hosts. Cynipidae: *Neuroterus floccosus*, *N. niger*, *N. quercusverrucarum*.

APROSTOCETUS subgenus *TETRASTICHODES*
(Figs 126–128)

There are only two species known in the subgenus *Tetrastichodes*, *hagenowii* and *asthenogmus*, and these species were recently treated and discussed by Graham (1987: 89–91). The generic name *Blattotetrastichus* is a synonym of this subgenus.

Species of *Tetrastichodes* are parasitoids of cockroach oothecae.

North American species

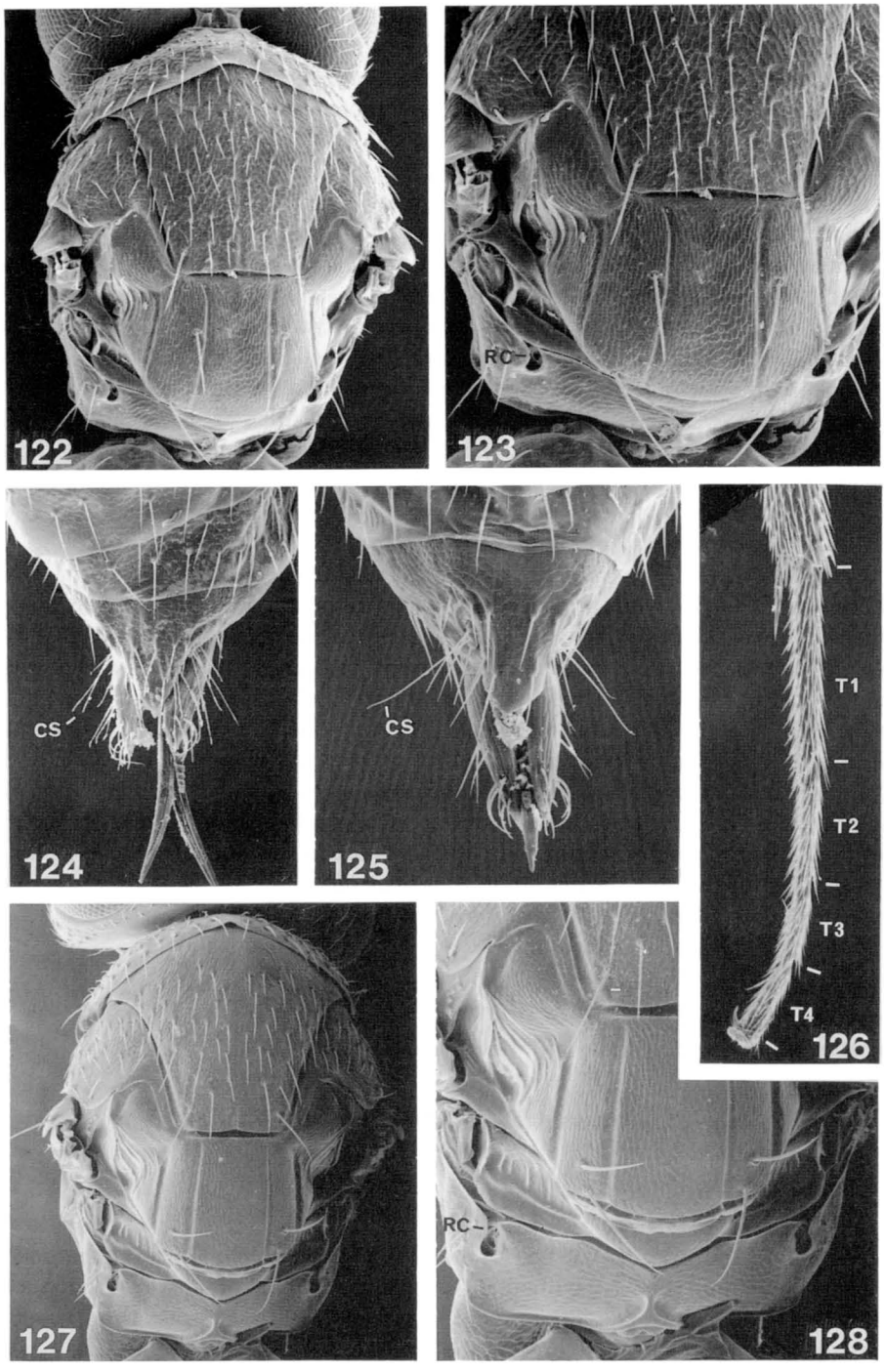
asthenogmus (Waterston). Not known from North America, but see discussion under *hagenowii*.

floridanus see *hagenowii*

hagenowii (Ratzeburg). *Entedon hagenowii* Ratzeburg, 1852: 211 [NMV]. Transferred to *Aprostocetus* by Graham (1987: 90). This species, which has a widespread through tropical and warm temperate zones, has been treated in most literature under the generic name *Tetrastichus*.
= *Tetrastichus floridanus* Ashmead, 1887: 203 [USNM].
For extralimital synonymies and further discussion see Graham (1987: 90), Bouček (1988a: 681).
Hosts. Blattidae: *Blatta orientalis*, *Eurycotis floridana*, *Periplaneta americana*, *P. australasiae*, *P. brunnea*, *P. fuliginosa*.
Notes. *Aprostocetus* (*Tetrastichodes*) *asthenogmus* (Waterston, 1915), has been treated as a synonym of *hagenowii* (Roth and Willis, 1960: 249; Burks, 1979: 996), but was removed from this synonymy by Bouček (1979: 96). *A. asthenogmus* is known from Africa, Asia and the Caribbean, but is not yet recorded from North America.

Genus ***APTERASTICHUS*** gen. n.
(Figs 22, 23)

Type species: *Apterastichus oculatus* sp. n. (Gender masculine).



FIGS 122–128. (122–125) *Aprostocetus* (*Quercastichus*) spp., ♀: (122) mesosoma; (123) scutellum and propodeum; (124, 125) apex of gaster showing cercal setae; (126–128) *Aprostocetus* (*Tetrastichodes*) *hagenowii*, ♀: (126) hind tarsi; (127) mesosoma; (128) scutellum and propodeum. cs, Cercal seta; rc, raised lobe of callus which partially overhangs propodeal spiracle; t1–t4, tarsal segments 1–4.

Diagnosis. Wings greatly reduced, fore wing shorter than length of scutellum (Fig. 23). Scutellum without submedian grooves and with the anterior pair of setae near the anterior margin (Fig. 23). Propodeum sloping in respect to the rest of the mesosoma. Mesoscutum bare medially but with more than a single row of adnotaular setae (Fig. 23).

Female. Malar sulcus present, straight, fine. Clypeal margin entire. Mandibles unusual for Tetrastichinae, with a long, straight lower tooth, and a short, truncate upper tooth; the outer margin somewhat produced ventrally (Fig. 22). Gena with a small tooth or spine (Fig. 22), although this may be difficult to see. All funicular segments distinctly longer than wide. Mesoscutum (Fig. 23) without median line; adnotaular setae in 2 or 3 scattered rows (medial area bare). Scutellum (Fig. 23) only slightly convex, without submedian lines; sublateral lines distinct and laterally carinate; anterior pair of setae placed near anterior margin of scutellum. Propodeum at distinct angle (~ 45°) to plane of scutellum, without distinct median carina or paraspiracular carina, and uniformly reticulate throughout. Wings greatly reduced, fore wing shorter than length of scutellum. Two longest setae of each cercus subequal in length, curved, and distinctly longer than remaining setae. Body without metallic coloration.

Male. Unknown.

Discussion. Only two other genera (*Tetrastichomyia*, *Exalarius*) in North America have females with such shortened wings (although this character may be seen in the occasional species of *Aprostocetus*). *Apterastichus* is easily distinguishable from *Tetrastichomyia* because it lacks several derived characters which define that genus (see key and diagnosis of *Tetrastichomyia*). From *Exalarius* it differs by having the mesoscutum bare medially (although there are two or more rows of adnotaular setae), and in not having such a long terminal stylus as seen in *Exalarius*. Additionally, the propodeum in *Apterastichus* lacks a median carina (present and distinct in *Exalarius*); and *Exalarius* has the propodeal spiracle minute, and separated from the anterior margin of the propodeum by more than its own diameter (propodeal spiracle within its own diameter of the anterior margin in *Apterastichus*).

Distribution. Known only from southern Florida.

Biology and hosts. Unknown.

North American species

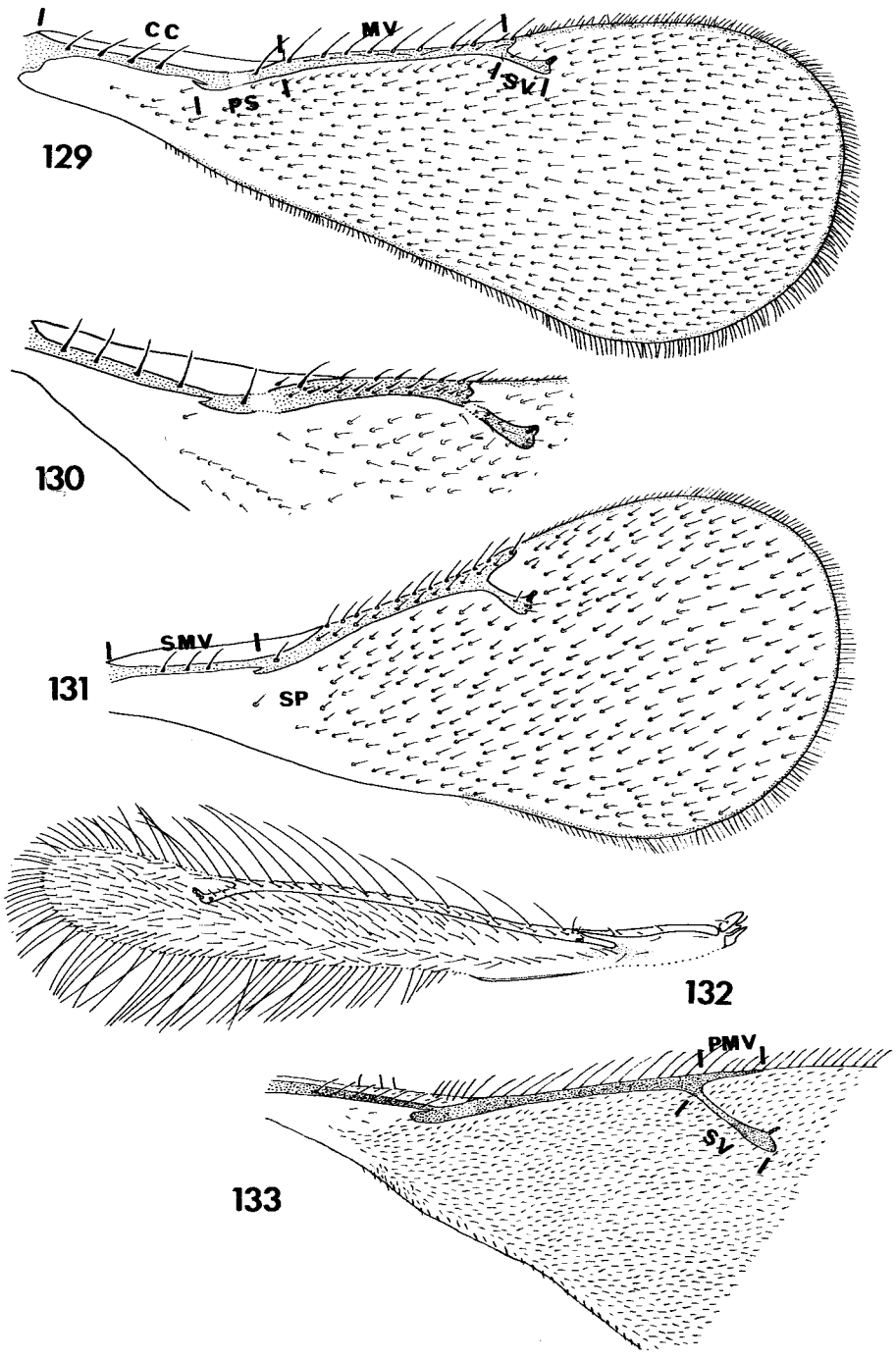
***oculatus* sp. n.** See descriptions of new species.

Genus ***ARANOBROTER*** LaSalle
(Figs 74, 75)

Aranobroter LaSalle, 1990b: 1382–1385.

Type species *Aranobroter rayorae* LaSalle (original designation).

Diagnosis. Mesoscutum (Fig. 74) uniformly covered with setae, without medial bare area. Scutellum (Fig. 74) without distinct submedian lines but with broad grooves or furrows; with distinct, laterally carinate sublateral lines. Cercal setae short, subequal in length, not appreciably longer than the surrounding setae on the terminal gastral tergites. Propodeum (Fig. 75) with a raised lobe of the callus which partially overhangs the outer rim of the spiracle, and a distinct, curved paraspiracular carina; median panels of propodeum strongly and uniformly reticulate. Vertex smoothly rounded behind ocelli, without transverse carina. Postmarginal vein present, although short (less than one-half the length of the stigmal vein). Malar sulcus with subtriangular fovea



FIGS 129–133. (129) *Melittobia digitata*, ♀, forewing; (130) *Pronotalia carlinarum*, ♀, forewing venation; (131) *Quadrastichodella nova*, ♀, forewing; (132) *Henryana magnifica*, ♀, forewing; (133) *Eriastichus cigdemae*, ♀, base of forewing. cc, Costal cell; mv, marginal vein; pmv, postmarginal vein; ps, parastigma; smv, submarginal vein; sp, speculum; sv, stigmal vein.

just below eye. Male antenna with each funicular segment with a whorl of long, dark setae.

Discussion. The characters given the key and diagnosis separate *Aranobroter* from other New World genera, in particular the mesoscutum uniformly covered with setae; the propodeum with a raised lobe of the callus which partially overhangs the outer rim of the spiracle; cercal setae short, straight, subequal in length, without one or two of them being distinctly longer than the others; and the strongly reticulate propodeum.

Several tetrastichine genera have species which have been recorded from spider egg sacs (LaSalle, 1990b), however only two genera are known whose members are exclusively predators in egg sacs: *Aranobroter* and the Australasian *Arachnoobius* Bouček (and possibly also *Comastichus*, see below). *Arachnoobius* differs from *Aranobroter* in several characters, the most obvious of which are: mesoscutum with a single row of adnotaular setae; occiput with a transverse carina just posterior to the ocelli; mouth small and concealed in anterior view, mandibles reduced.

Biology and hosts. Species of *Aranobroter* are predators of spider eggs within the egg sacs (LaSalle, 1990b).

Distribution. Known from the New World from Texas to Argentina.

Notes and recent literature. This genus was recently described by LaSalle (1990b), who discussed biology, gave a key to the two New World species, and mentioned an undescribed species known from a single specimen from Texas.

Other New World species. See LaSalle (1990): *grioti* (Blanchard), *rayorae* LaSalle.

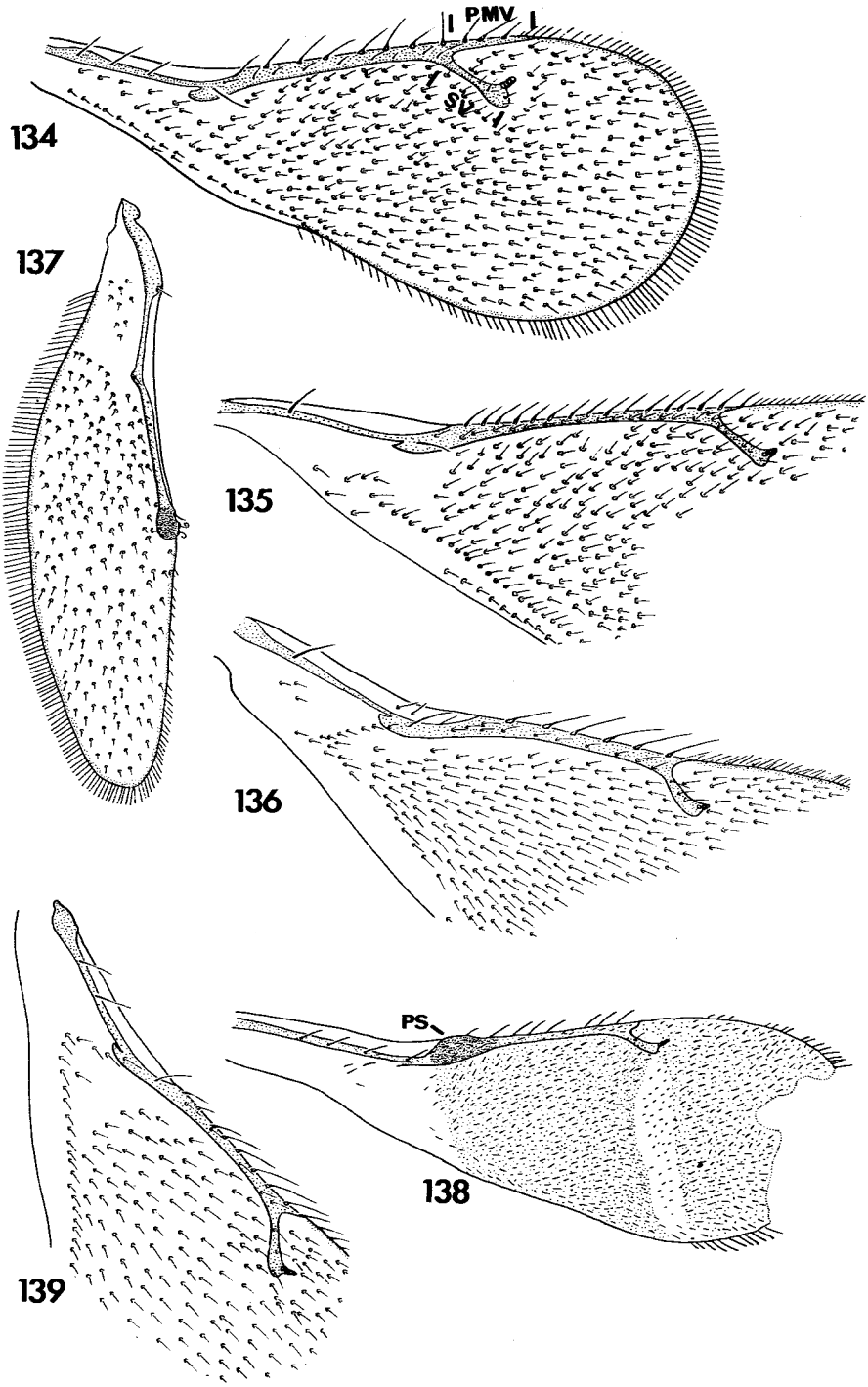
North American species

No described species are known from North America; however, an undescribed species of this genus was reported from Texas by LaSalle (1990b).

Genus ***BARYSCAPUS*** Förster
(Figs 99–106, 144)

Baryscapus Förster, 1856: 84.
Type species *Baryscapus centricolae* Ashmead (subsequent monotypy).
Thriposoma Crawford, 1913: 255.
Type species *Thriposoma grafi* Crawford (original designation),
Tetrastichopsis Girault, 1916[289]: 132.
Type species *Tetrastichopsis prionomeri* Girault (original designation).
Eutetrastichus Kostjukov, 1977: 189 (as subgenus of *Tetrastichus*).
Type species *Eulophus evonymellae* Bouché (original designation).

Diagnosis. Body and tegula dark, varying from black to bright metallic blue or green, but without pale markings. Propodeal spiracle with entire rim exposed (without an overhanging raised lobe of the callus) (Figs 103, 104). Cercal setae subequal in length (without one seta which is distinctly longer than the rest and often sinuate), and often not visibly longer than the setae on the last tergite (Figs 105, 106). Malar sulcus (Fig. 99) usually distinctly curved. Submarginal vein (Fig. 144) with $\geqslant 2$ dorsal setae; often a decolorized area between the parastigma and the marginal vein. Scutellum (Figs 103, 104) with submedian lines present, although sometimes faint. Mesosternum usually convex just anterior to trochantinal lobes, and mesepisternum in most species with precoxal suture absent or virtually obsolete (Fig. 100). Propodeal callus nearly always with $\geqslant 3$ setae. POL at least twice OOL. Midlobe of mesoscutum often with more than a single row of adnotaular setae (Fig. 101).



FIGS 134–139. (134) *Careostrix yoshimotoi*, ♀, forewing; (135) *Tetrastichus* sp., ♀, base of forewing; (136) *Tamarixia* sp., ♀, base of forewing; (137) *Ceratoneura* sp., ♀, hindwing; (138) *Paraspalangia annulipes*, ♀, forewing; (139) *Pentastichus* sp., ♀, base of forewing. pmv, Postmarginal vein; ps, parastigma; sv, stigmal vein.

Stigmal vein usually at a slightly larger angle to the fore margin of the wing (up to 45°) than in related genera, and somewhat longer in relation to the length of the marginal vein (often up to half the length of marginal vein). Male funicle and clava often without whorls of long, dark setae; when these whorls present they are relatively short and only reach about half-way along the segment following the one which bears them.

Discussion. Until recently the genus *Baryscapus* has remained unrecognized because the type species, *B. centricolae* Ashmead, was represented only by a damaged type specimen. However, LaSalle and Graham (1990) recognized *Baryscapus* as being a senior synonym of the genus *Eutetrastichus* Kostjukov. This genus contains species previously treated in the European literature (Graham, 1961a, b; Domenichini, 1966a, 1967) as belonging to the species groups of *evonymellae* and *daira*. Further discussion of this genus was given by LaSalle and Graham (1990).

Distribution. *Baryscapus* species are cosmopolitan in distribution. They are most abundant in the Holarctic, where they are the second largest genus, next only to *Aprostocetus*. In tropical zones they are relatively unimportant in number.

Biology and hosts. Species of *Baryscapus* attack a wide variety of insect hosts (Lepidoptera, Coleoptera, Hymenoptera, Diptera, Neuroptera), as well as spider egg sacs. They often act as hyperparasitoids.

Biological control. *B. bruchivorus* has been introduced into North America against the vetch weevil, *Bruchus brachialis* [Curculionidae]. *B. turionum* (Hartig) has been introduced against the European pine shoot moth, *Rhyacionia buoliana* [Olethreutidae].

Notes and recent literature. This genus has been included in keys to European tetrastichine genera (Graham, 1987, as *Eutetrastichus*; Graham, 1991). Its identity was clarified by LaSalle and Graham (1990), who synonymized *Eutetrastichus*, *Thriposoma* and *Tetrastichopsis* with *Baryscapus*. European species were revised and keyed by Graham (1991).

Other New World species. Transferred by Etienne and Delvare (1991): *fennahi* (Schauff). Transferred by LaSalle and Schauff (1992): *albitarsis* (Ashmead), *insularis* (Ashmead).

North American species

americanus (Ashmead), **comb. n.** *Aprostocetus americanus* Ashmead, 1888: 106 [USNM].

Hosts. Xylocopidae: *Ceratina dupla*, *C. ignara*, *C. nanula*, *C. sequoiae*, *Ceratina* sp. Eurytomidae: *Axima zabriskiei* (as a hyperparasitoid on *Ceratina*).

annapolis see *chrysopae*

barbarae (Burks), **comb. n.** *Tetrastichus barbarae* Burks, 1963: 52 [USNM].

Hosts. Tortricidae: *Barbara colfaxiana* in *Abies* cones; also found in cones of *Pinus ponderosa*, *Pseudotsuga menziesii*. Possibly a hyperparasitoid.

bewicki (Girault), **comb. n.** *Aprostocetus bewicki* Girault, 1917[309]: 2 [USNM].

bruchivorus (Gahan). *Tetrastichus bruchivorus* Gahan, 1942: 8 [USNM]. Transferred to *Baryscapus* by LaSalle and Graham (1990: 124). Introduced from Europe.

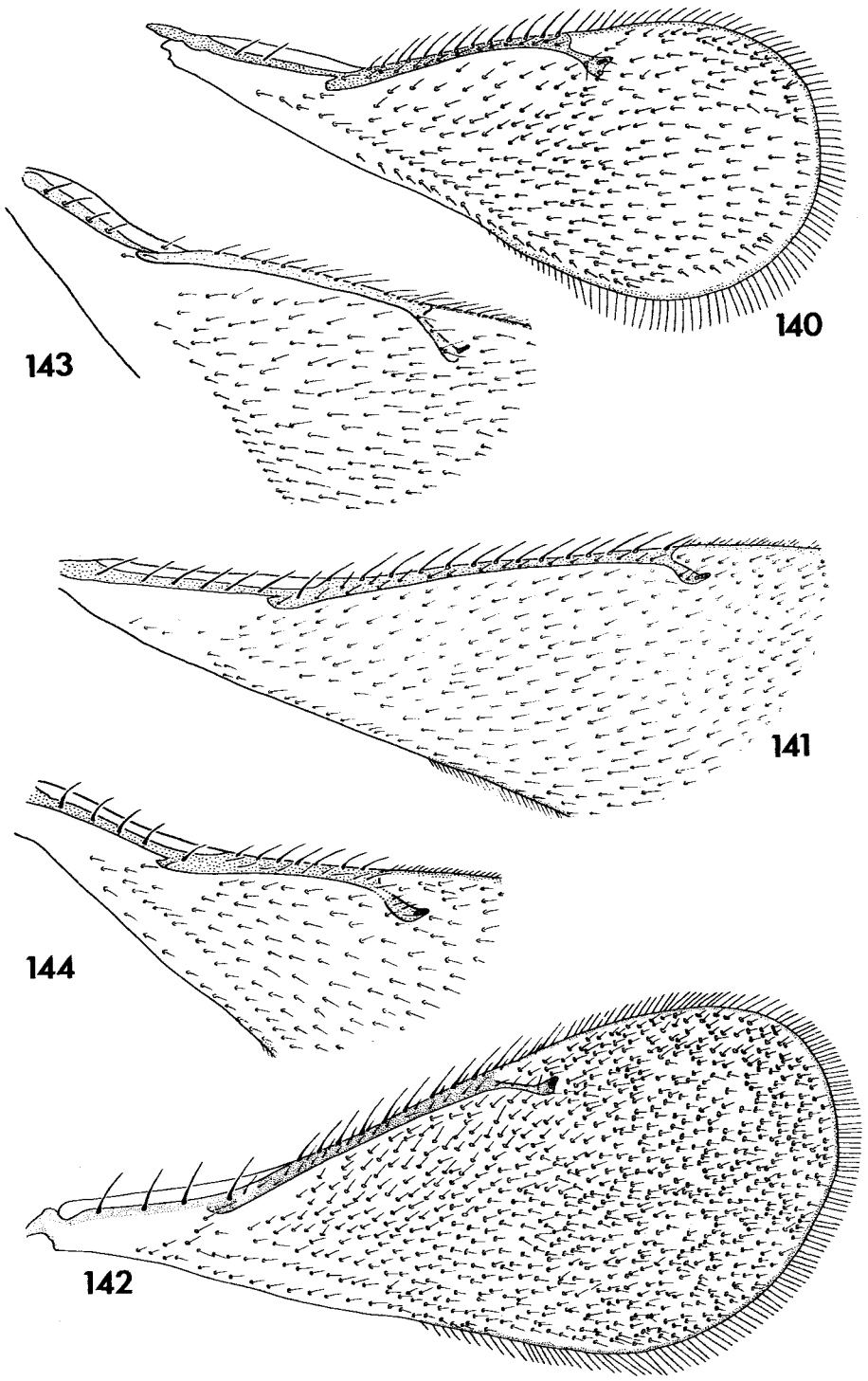
Hosts. Bruchidae: *Bruchus brachialis*.

bruchophagi (Gahan). *Tetrastichus brucophagi*[!] Gahan, 1913: 439 [USNM]. Transferred to *Baryscapus* by LaSalle and Graham (1990: 124).

= *Tetrastichus bruchophagi* Gahan: Girault, 1916[289]: 128, 132 [emendation].

Hosts. Eurytomidae: *Bruchophagus* spp.

californicus see *racemariae*



FIGS 140–144. (140) *Thripastichus gentilei*, ♀, forewing; (141) *Neotrichoporoides viridimaculatus*, ♀, forewing; (142) *Aprostocetus* (*Ootetrastichus*) sp., ♀, forewing; (143) *Aprostocetus* (*Aprostocetus*) sp., ♀, forewing; (144) *Baryscapus* sp., ♀, forewing.

canadensis see *daira*

carpatus see *tineivorus*

cecidophagus (Wangberg), **comb. n.** *Tetrastichus cedidophagus* Wangberg, 1977: 237 [USNM].

Hosts. Tephritidae: *Aciurina bigeloviae*, *A. ferruginea*, *A. maculata*, *Procecidochares* spp.

centricolae see *racemariae*

chlamytis (Ashmead), **comb. n.** *Tetrastichus chlamytis* Ashmead, 1896: 234 [USNM].

Hosts. Chrysomelidae: *Chlamisus gibbosus*, *Chlamisus* sp., *Exema dispar*, *E. mormona*.

chrysopae (Crawford). *Geniocerus chrysopae* Crawford, 1915: 584 [USNM]. Transferred to *Baryscapus* by Graham (1991: 101).

= *Aprostoceroloides annapolis* Girault, 1917[321]: 2 [USNM].

Hosts. Chrysopidae: *Chrysopa californica*, *C. oculata*, *C. plorabunda*, *C. rufilabris*, *Chrysopa* sp.

coerulescens (Ashmead). *Tetrastichus coerulescens* Ashmead, 1898: 130 [INHS]. Transferred to *Baryscapus* by LaSalle (1990: 1388). This species has been misspelled in the literature as *caerulescens* (Burks, 1943; see Peck, 1963 for others).

= *Tetrastichus doteni* Crawford, 1911b: 234 [USNM].

Hosts. Braconidae: *Apanteles congregatus*, *A. melanoscelus*, *Apanteles* sp., *Bracon gelechiae*, *B. hebetor*, *Bracon* sp., *Meteorus acronyctae*, *Microgaster* sp. Ichneumonidae: *Hyposoter pilosulus*. Pteromalidae: *Catolaccus aeneoviridis*, *Dibrachys cavus*, *Pteromalus* sp. As a secondary or tertiary parasitoid of Coleoptera, Lepidoptera, Neuroptera.

cormus (Burks), **comb. n.** *Tetrastichus cormus* Burks, 1943: 579 [INHS].

Hosts. Cynipidae: *Aulacidea podagrae*. Pteromalidae: *Hemadus nubilipennis* [this record questionable].

daira (Walker). *Cirrospilus daira* Walker, 1839a: 330 [BMNH]. Transferred to *Baryscapus* by LaSalle and Graham (1990: 124).

= *Aprostocetus canadensis* Ashmead, 1888: 106 [USNM].

For further taxonomic history and additional extralimital synonymies see Graham (1991: 147–148).

Hosts. Tephritidae: *Orellia ruficauda*. For additional extralimital hosts see Domenichini (1966b: 27), Graham (1991: 149–150).

dolosus (Gahan). *Tetrastichus dolosus* Gahan, 1917: 215 [USNM]. Transferred to *Baryscapus* by LaSalle (1990: 1378).

Hosts. Coleophoridae: *Coleophora laricella*. Gelechiidae: *Fascista cercerisella*. Gracillariidae: *Parornix* sp. Plutellidae: *Homadaula anisocentra*. Tortricidae: *Ancylis comptana fragariae*, *Evora hemidesma*. Eulophidae: *Euplectrus comstockii*, *E. platyhypenae*. May act as a primary or secondary parasitoid.

doteni see *coerulescens*

erynniae (Domenichini). *Tetrastichus erynniae* Domenichini, 1966a: 123 [MSNG]. Transferred to *Baryscapus* by LaSalle and Graham (1990: 124). Probably inadvertently introduced from Europe.

Hosts. Tachinidae: *Erynniopsis rondanii* (parasitic on *Pyrrhalta luteola* [Chrysomelidae]). For additional extralimital hosts see Domenichini (1966b: 30), Graham (1991: 126).

evonymellae (Bouché). *Eulophus evonymellae* Bouché, 1834: 172 [BMNH].

Transferred to *Baryscapus* by LaSalle and Graham (1990: 124). Introduced from Europe.

Hosts. Lyonetiidae: *Leucoptera spartifoliella.* For additional extralimital hosts see Domenichini (1966b: 31), Graham (1991: 115–116).

Notes. Neotype designation by Graham (1991: 113).

fechteri Doğanlar. *Baryscapus fechteri* Doğanlar, 1992a: 200 [ZMS].

Notes. The original description stated that this species was from New York, but it is actually from California (Riverside Co., Rancho Mirage).

flocci see *racemariae*

fumipennis (Girault), **comb. n.** *Neomphaloidella fumipennis* Girault, 1917[318]: 2 [USNM]. Transferred to *Tetrastichus* by Burks (1943: 553).

Hosts. Cecidomyiidae: *Asteromyia carbonifera* all on *Solidago.*

galactopus (Ratzeburg). *Eulophus galactopus* Ratzeburg, 1844: 169. Transferred to *Baryscapus* by LaSalle and Graham (1990: 124). For further extralimital synonyms see Graham (1991: 130–131).

Hosts. Braconidae: *Apanteles glomeratus* (parasitic on *Pieris* [Pieridae]). For further extralimital hosts see Domenichini (1966b: 32; Graham, 1991: 132).

Notes. This species often misidentified as *rapo* and *microgastri* in the North American literature.

gerstaeckeriae (Gahan), **comb. n.** *Tetrastichus gerstaeckeriae* Gahan, 1936b: 485 [USNM].

Hosts. Curculionidae: *Gerstaeckeria nobilis, G. porosa.*

gigas (Burks), **comb. n.** *Tetrastichus gigas* Burks, 1943: 560 [USNM].

Hosts. Cynipidae: *Andricus quercuscalifornicus.*

Notes. See notes at *Baryscapus stanfordiensis.*

grafi Crawford. *Thriposoma grafi* Crawford, 1913: 255 [USNM]. Transferred to *Baryscapus* by LaSalle and Graham (1990: 124).

granulatus (Walker), **comb. n.** *Tetrastichus granulatus* Walker, 1844: 17 [BMNH].

Notes. This species should not be confused with *Aprostocetus granulatus* Ashmead.

holbeini (Girault), **comb. n.** *Tetrastichus holbeini* Girault, 1917[309]: 2 [USNM].

Hosts. Buprestidae: *Chrysobothris femorata, C. mali.*

hunteri (Crawford). *Tetrastichus hunteri* Crawford, 1909: 150 [USNM]. Transferred to *Baryscapus* by LaSalle (1990: 1388).

Hosts. Curculionidae: *Anthonomus grandis.*

ichthyus (Burks), **comb. n.** *Tetrastichus ichthyus* Burks, 1943: 528 [USNM].

Hosts. Cynipidae [both records questionable]: *Neuroterus quercusrileyi, Xanthoteras emoryi.*

kilinceri Doğanlar. *Baryscapus kilinceri* Doğanlar, 1992a: 201–202 [ZMS].

Notes. The original description stated that this species was from New York, but it is actually from California (Riverside Co., Indio).

lissus (Burks), **comb. n.** *Tetrastichus lissus* Burks, 1943: 527 [USNM].

Hosts. Lycaenidae: *Strymon melinus.*

malacosomae (Girault), **comb. n.** *Tetrastichus malacosomae* Girault, 1917[301]: 110 [USNM].

Hosts. Lasiocampidae: *Malacosoma americanum, M. californicum, M. disstria, M. fragile, M. pluviale recenseo.*

malophilus (Burks), **comb. n.** *Tetrastichus malophilus* Burks, 1943: 585 [USNM].

Hosts. Cerambycidae: *Crossidius hirtipes.* Curculionidae: *Rhynchaenus pallicornis.*

megachilidis (Burks), **comb. n.** *Tetrastichus megachilidis* Burks, 1963: 57 [USNM].

Hosts. Megachilidae: *M. centuncularis, Megachile concinna, M. gentilis, M. xylocopoides.*

microgastri see *galactopus*

microrhopalae (Ashmead), **comb. n.** *Tetrastichus microrhopalae* Ashmead, 1896: 234 [USNM].

Hosts. Chrysomelidae: *Microrhopala xerene, M. vittata.*

modestus (Howard), **comb. n.** *Tetrastichus modestus* Howard, 1889: 1872, 1892, 1894 [USNM].

= *Epitetrastichus mundicornis* Girault, 1917[332]: 1 [USNM].

Hosts. Braconidae: *Apanteles atalantae, A. edwardsii, A. pyraustae, Microgaster congregatiformis.* A secondary parasitoid of Lepidoptera.

mundicornis see *modestus*

nordi (Burks), **comb. n.** *Tetrastichus nordi* Burks, 1963: 51 [USNM].

Hosts. Buprestidae: *Agrilus champlaini, A. horni.*

phegus see *racemariae*

phidippi (Burks). *Tetrastichus phidippi* Burks, 1963: 60 [USNM]. Transferred to *Baryscapus* by LaSalle (1990: 1379).

Hosts. Salticidae: *Phidippus opifex* eggs.

philodromi (Gahan). *Tetrastichus philodromi* Gahan, 1924: 18 [USNM]. Transferred to *Syntomosphyrum* by Peck (1951: 451); to *Baryscapus* by LaSalle (1990: 1379).

Hosts. Thomisidae: *Philodromus aureolus.*

prionomeri (Girault). *Tetrastichopsis prionomeri* Girault, 1916[289]: 132 [USNM]. Transferred to *Syntomosphyrum* by Peck (1951: 452); to *Baryscapus* by LaSalle and Graham (1990: 124).

Hosts. Curculionidae: *Odontopus calceatus.*

racemariae (Ashmead). *Tetrastichus racemariae* Ashmead, 1886: 134 [USNM]. Transferred to *Baryscapus* by LaSalle and Graham (1990: 124).

= *Baryscapus centricolae* Ashmead, 1887: 202 [USNM]. Synonymized with *racemariae* by LaSalle and Graham (1990: 124).

= *Tetrastichus californicus* Ashmead, 1887: 203 [USNM].

= *Hyperteles flocci* Ashmead, 1887: 203 [USNM].

= *Tetrastichus phegus* Burks, 1943: 559 [USNM].

Hosts. Cynipidae: *Amphibolips quercuscinerea, A. quercusjuglans, A. quercusracemaria, Andricus quercusflocci, A. lasius, Atrusca quercuscentricola, Callirhytis quercuspomiformis, Disholcaspis cinerosa, D. quercusmamma, Heteroecus pacificus, Neuroterus noxiosus, N. quercusbatatus.*

rapo see *galactopus*

repulsus (Girault), **comb. n.** *Tetrastichus repulsus* Girault, 1917[309]: 4 [USNM].

rugglesi (Rohwer), **comb. n.** *Tetrastichus rugglesi* Rohwer, 1919: 160 [USNM].

Hosts. Buprestidae: *Agrilus arcuatus, A. champlaini, A. rubicola.*

stanfordiensis (Fullaway), **comb. n.** *Tetrastichus stanfordiensis* Fullaway, 1912: 281.

Notes. This species was described from a single (holotype) female (L.S.J.U. Lot 497, s.8), which is apparently lost. There are eight male specimens in LACM which are from the same lot, and which are labelled as being *Tetrastichus*

stanfordiensis Fullaway. These specimens appear to be very close to *Baryscapus gigas* (Burks); however, they are in poor condition and they differ in at least one character: the male gaster in *gigas* is about 1·5 times as long as the mesosoma, in the specimens labelled as *stanfordiensis* the gaster is about as long as (or only slightly longer than) the mesosoma.

thanasimi (Ashmead), **comb. n.** *Tetrastichus thanasimi* Ashmead, 1894b: 343 [USNM].

Hosts. Cleridae: *Cymatodera* sp., *Thanisimus dubius*, *T. trifasciatus*, *Thanasimus* sp.

theclae (Packard), **comb. n.** *Eulophus theclae* Packard, 1881: 34.

Transferred to *Tetrastichus* by Henshaw (1887: 43).

Hosts. Lycaenidae: *Strymon falacer*.

tineivorus (Ferrière). *Tetrastichus tineivorus* Ferrière, 1941: 376 [MHNG]. Transferred to *Baryscapus* by LaSalle and Graham (1990: 124).

= *Tetrastichus carpatus* Burks, 1943: 566 [USNM].

Hosts. Braconidae: *Apanteles carpatus*. For further extralimital hosts see Graham (1991: 105).

turionum (Hartig). *Eulophus turionum* Hartig, 1838: 268 [ZSBS]. Transferred to *Baryscapus* by LaSalle and Graham (1990: 124). Introduced from Europe.

Hosts. Tortricidae: *Rhyacionia buoliana*. For further extralimital hosts see Graham (1991: 134).

Genus ***CAREOSTRIX*** gen. n.

(Figs 36, 37, 134)

Type species: *Careostrix yoshimotoi*, sp. n. (Gender feminine).

Diagnosis. Postmarginal vein present and as long as stigmal vein (Fig. 134). Mesoscutum (Fig. 36) uniformly covered with setae. Scutellum (Fig. 37) without submedian lines, and with both pairs of setae in the posterior half.

Female. Malar sulcus present, slightly curved. Anterior margin of clypeus straight. Vertex with a weak transverse carina posterior to ocelli (similar to that seen in *Tetrastichomyia*). Funicular segments all at least slightly longer than wide. Mesoscutum (Fig. 36) without median line; uniformly covered with setae; one seta at posterolateral margin of mesoscutum stronger and distinctly darker than the rest. Scutellum (Fig. 37) without submedian lines, wider than long, and with both pairs of setae in the posterior half. Propodeum (Fig. 37) with median carina; callus with 1 or 2 setae. Propodeal spiracle round, with its entire rim exposed, and separated by a distance equal to or slightly greater than its own diameter from the anterior margin of the propodeum. Fore wing (Fig. 134) with postmarginal vein as long as or slightly longer than stigmal vein. Submarginal vein with 3 or 4 dorsal setae. Subcubital line of setae complete to basal cell. Longest seta of cercus sinuate and distinctly longer than remaining setae. Body without metallic coloration.

Male. Similar to female except genitalia and antenna. Antenna with all funicular segments longer than wide. Funicular segments with scattered slender setae, the greatest length of which is about equal to 1·5 the length of the segment; these setae not arranged in distinct whorls.

Discussion. *Careostrix* appears most closely related to *Cucarastichus* and *Mesofrons*, the two other genera of tetrastichines which have a distinct postmarginal vein and more than a single row of adnotaular setae (note: *Eriastichus* has the mesoscutum uniformly and densely covered with short, fine setae, and a distinct

postmarginal vein (0·5–1·0 the length of stigmal vein), but is easily recognizable due to the setation on the propodeum). *Careostrix* and *Cucarastichus* can be distinguished from *Mesofrons* by having only two pairs of setae on the scutellum, and having the mesoscutum completely covered with setae. These two genera can be separated from each other by the characters given in the key.

Distribution. USA (Florida and Michigan).

Biology and hosts. Unknown.

North American species

***yoshimotoi* sp. n.** See descriptions of new species.

Genus *CERATONEURA* Ashmead
(Figs 58–60, 137)

Ceratoneura Ashmead, 1894c: 178.
Type species *Ceratoneura petiolata* Ashmead (subsequent designation by Ashmead, 1904: 347, 369).
Ceratotetrastichodes Girault, 1917[305]: 2.
Type species *Ceratoneura pretiosa* Gahan (original designation).
For further extralimital synonymies see Bouček (1988a: 670).

Diagnosis. Lower face with conspicuous striae radiating from the mouth margin (Fig. 58). Petiole present and distinct (Figs 59, 60). Head and mesosoma strongly sclerotized. Toruli inserted high on frons (Fig. 58); apex of scape reaching above level of vertex. Apex of venation in hindwing (at hamuli) swollen or knobbed (Fig. 137).

Discussion. *Ceratoneura* is easily recognizable by the characters given in the diagnosis, in particular the striae on the lower face which are found in no other tetrastichine genus. Additionally, species have a distinct petiole, and the antenna is usually inserted fairly high on the face. The female antenna in some species may have four funicular segments rather than three. When this occurs the first funicular segment is usually shorter than the others, sometimes quadrate. However, I have seen one undescribed species which has four long funicular segments.

Distribution. Known from warm temperate or tropical regions throughout the world (Americas, Africa, SE Asia, Australia).

Biology and hosts. From galls on a variety of plants, perhaps always those caused by Cecidomyiidae. Lists of host plant species have been given by Bouček (1977: 22, 1988a: 670), who believed that there was some question as to whether *Ceratoneura* species were parasitoids of gall-formers or inquilines in galls.

Notes and recent literature. *Ceratoneura* is keyed and discussed at the generic level by Bouček (1977, 1988a). Gahan (1941) transferred *femorata* Ashmead (*Tetrastichodes* not *Gyrolasia*) to *Ceratoneura*, however this species has since been transferred to *Paragaleopsomyia* by LaSalle and Schauff (1992: 32).

Other New World species. *mexicana* Ashmead, *pallida* Ashmead.

North American species

petiolata Ashmead. *Ceratoneura petiolata* Ashmead, 1894c: 179 [USNM].

Hosts. Reared from gall on *Larrea.*

pretiosa Gahan. *Ceratoneura pretiosa* Gahan, 1914: 165 [USNM].

Genus *CHAENOTETRASTICHUS* Graham
(Figs 44, 45)

Chaenotetrastichus Graham, 1987: 25.
Type species *Tetrastichus grangeri* Erdös (original designation).

Diagnosis. Submarginal vein with a single dorsal seta. Mandible with a long, falcate outer tooth and 2 very small, closely approximated inner teeth (similar to that seen in *Chytrolestes*, Fig. 41). Scutellum (Fig. 45) with 3–6 pairs of setae. Mesosoma (Fig. 44) brightly metallic green to blue-green, with long, erect or semi-erect white setae; dorsal surface with raised reticulation; mid lobe of mesoscutum without a median line. Gaster with at least the first tergite, and maybe the entire gaster, with distinct reticulate sculpture dorsally (Figs 44, 45).

Discussion. This genus seems most closely related to *Chytrolestes*, and is discussed under that genus.

Distribution. One species known from Europe, one from North America.

Biology and hosts. The North American species, *semiflavus,* has been reared from *Auplopus* sp. [Pompilidae]. No host records are known for the European species.

Notes and recent literature. Chaenotetrastichus was described by Graham (1987) to contain a single European species, *grangeri* (Erdös). LaSalle and Schauff (1990) further discussed this genus, and included a second species, the North American *semiflavus* (Girault), which Burks (1979) still had placed in the Entedoninae in the genus *Parachrysocharis.*

North American species

semiflavus (Girault). *Parachrysocharis semiflava* Girault, 1917[313]: 129 [USNM].
Transferred to *Chaenotetrastichus* by LaSalle and Schauff (1990: 283).
Hosts. Pompilidae: *Auplopus* sp.

Genus *CHYTROLESTES* gen. n.
(Figs 38–42)

Type species: *Chytrolestes alibaba*, sp. n. (Gender masculine).

Diagnosis. Submarginal vein with a single, large, dorsal seta. Mandible (Fig. 41) with a long, falcate outer tooth and two very small, closely approximated inner teeth. Mesosomal setae black and stout (which appear white in Fig. 38). Fore leg with basitarsus very short, distinctly shorter than second tarsal segment (Fig. 39); last tarsal segment about as long as segments 1–3 taken together. Scutellum (Fig. 38) without submedian lines; mesoscutum (Fig. 38) with median line absent, or only faintly indicated posteriorly. Frons and vertex with numerous short, stout black setae (which appear white in Fig. 40).

Female. Body dark metallic, with strong, black setae. Malar sulcus present, slightly curved. Clypeus bilobed (Fig. 40). Mandible (Fig. 41) with a long, falcate outer tooth and two very small, closely approximated inner teeth. Frons and vertex with numerous short, stout black setae (Fig. 40). Funicular segments all distinctly longer than wide. Mesoscutum (Fig. 38) with median line absent, or only faintly indicated posteriorly, and a single row of 3 or 4 adnotaular setae. Scutellum (Fig. 38) without submedian lines; with anterior pair of setae placed about in middle of sclerite. Propodeum (Fig. 38) with median carina, and a weakly defined inverted Y-shaped paraspiracular carina just median to spiracle. Propodeal spiracle with entire rim exposed, not partially covered by a raised lobe or flap on the callus; callus with 2 setae.

Fore and hind femur distinctly enlarged and somewhat flattened; middle femur normal, smaller than other two. Fore leg with basitarsus very short, distinctly shorter than second tarsal segment (Fig. 39); last tarsal segment about as long as segments 1–3 taken together. Fore wing with a single, large, dorsal seta on the submarginal vein, and a similar seta on the parastigma. Gaster (Fig. 42) rather short and somewhat rounded apically, with numerous scattered black seta on the apical three tergites. One of the cercal setae distinctly longer than the remaining seta, and curved or sinuate.

Male. Unknown.

Discussion. This genus appears most closely related to *Chaenotetrastichus*. Both of these genera have the distinctively shaped mandible, with a long, falcate outer tooth and two very small, closely approximated inner teeth; this form of mandible is unknown in other tetrastichines. These two genera also share the following characters: the dorsal surface of the submarginal vein with only 1 seta; mesoscutum without a median line; scutellum without submedian lines; propodeum with an inverted Y-shaped paraspiracular carina (although this may not be well defined). They also have similar host associations; both attack pompilids in the tribe Auplopodini. *Chytrolestes* and *Chaenotetrastichus* can be separated by the characters given in the key. The combination of the Y-shaped carina and the single seta on the submarginal vein indicate that these two genera might also be related to *Tetrastichus*.

Distribution. Known from Kansas and Quebec.

Biology and hosts. Reared from the mud nests of *Phanagenia bombycina* [Pompilidae].

North American species

***alibaba* sp. n.** See descriptions of new species.

Hosts. Pompilidae: *Phanagenia bombycina.*

Genus *COMASTICHUS* gen. n.

(Figs 72, 73)

Type species: *Comastichus zopheros*, sp. n. (Gender masculine).

Diagnosis. Mesoscutum (Fig. 72) without median line and uniformly covered with setae. Scutellum (Fig. 73) with many ($>$ 10) setae on each side, leaving a narrow bare median strip; submedian lines faint or absent, if indicated then they are much closer to each other than to sublateral lines, and enclosing an area that is at least 4 times longer than wide. Propodeal spiracle with entire rim exposed (Fig. 73). Cercal setae subequal in length, straight. At least funicular segments 2 and 3 distinctly transverse. Body without metallic coloration.

Female. Body non-metallic, dark. Malar sulcus present, only very slightly curved. Anterior margin of clypeus weakly bilobed. Each funicular segment slightly wider than preceding one, segments 2 and 3 transverse. Mesoscutum (Fig. 72) without median line and uniformly covered with setae. Scutellum (Fig. 73) with many (more than 10) setae on each side, leaving a narrow bare median strip; submedian lines faint or absent, if indicated then they are much closer to each other than to sublateral lines, and enclosing an area that is at least 4 times longer than wide. Propodeum (Fig. 73) with spiracle with entire rim exposed; callus with 4–6 setae. Mesosternum curved anterior to trochantinal lobes, and mesepisternum with precoxal suture absent. SMV with several (usually $\geq$ 4) dorsal setae. Cercal setae subequal in length, straight. Gaster pointed apically.

Male. Unknown.

Discussion. This genus is immediately distinguished from other North American Tetrastichinae by: scutellum with many (> 10) setae on each side, and the mesoscutum uniformly covered with setae (and the presence of a malar sulcus to distinguish it from *Kocourekia*). It is mainly Neotropical in distribution, and any firm idea about its relationships must await a study of the Neotropical fauna.

Distribution. Known from southern Florida, Mexico and Costa Rica.

Biology and hosts. One series has been reared from spider egg sacs.

North American species

***zopheros* sp. n.** See descriptions of new species.

Genus *CRATAEPUS* Förster
(Figs 14–17)

Crataepus Förster, 1878: 61.

Type species *Crataepus aquisgranensis* Förster [= *Crataepus marbis* (Walker)] (original designation).

Diagnosis. Malar groove absent. Pronotum (Fig. 15) large, elongate, subrectangular. Fore leg somewhat enlarged, with large, black, bifid tibial spur (Fig. 16). Fore coxa longer than hind coxa. Frontofacial sutures widely separated dorsally (Fig. 17). Body dorsoventrally flattened. Fore wing with hyaline break between submarginal vein and parastigma. Hypopygium extending over half the length of the gaster. Ovipositor distinctly exserted (Fig. 14).

Discussion. *Crataepus* is easily recognizable by the large, bifid fore tibial spur, the elongate, subrectangular pronotum, and the exserted ovipositor (up to just over half the length of the gaster). The lack of a malar sulcus and general elongation and flattening of the body indicate a relationship with *Melittobia*, *Kocourekia*, *Tachinobia* and *Pronotalia* (see discussion under *Melittobia*). It shares with *Pronotalia* the distinct hyaline break between the submarginal vein and the parastigma.

Distribution. A single Holarctic species.

Biology and hosts. The single species is a parasitoid of Tephritidae in flower heads of thistles [Asteraceae]. A single host species is listed for North America (Burks, 1979; Peck, 1963), although several species are known from Europe (Domenichini, 1966b).

Notes and recent literature. *Crataepus* was keyed and discussed at the generic level by Bouček (1977); and included in a generic key by Graham (1987). It was further treated by Graham (1991). Gradwell (1953) provided biological information.

North American species

fletcheri see *marbis*

marbis (Walker). *Cirrospilus marbis* Walker, 1839a: 330 [BMNH]. Transferred to *Crataepus* by Szelenyi (1941: 42).

= *Crataepus fletcheri* Ashmead, 1892b: 309 [USNM].

Hosts. Tephritidae: *Orellia ruficauda.* See Domenichini (1966b) for further European hosts.

Genus *CUCARASTICHUS* gen. n.
(Figs 34, 35)

Type species: *Cucarastichus texanus*, sp. n. (Gender masculine).

Diagnosis. Postmarginal vein as long as stigmal vein. Mesoscutum (Fig. 34) uniformly covered with setae. Scutellum (Fig. 35) with anterior pair of setae in anterior half of scutellum. Hind corner of propodeum with small but distinct posteriorly directed spine (Fig. 35).

Female. Head and body dark, non-metallic; all legs and coxae white to yellow. Malar sulcus present, slightly curved. Anterior margin of clypeus truncate to weakly bilobed. Scape long and slender; all funicular segments distinctly longer than wide, although each segment shorter than the preceding one; terminal stylus on antenna as long as last club segment. Mesoscutum (Fig. 34) without median line and uniformly covered with setae. Scutellum (Fig. 35) with submedian lines absent or only faintly indicated; sublateral lines deep with carinate outer edge; anterior pair of scutellar setae distinctly closer to anterior margin of sclerite than to posterior pair. Propodeum (Fig. 35) with spiracle small, circular, with entire rim exposed; spiracle set in shallow depression formed between paraspiracular carina and callus. Hind corner of propodeum with small but distinct spine. Mesosternum flat anterior to trochantinal lobes, with distinct median concavity. Postmarginal vein present, as long as stigmal vein. SMV with 3–4 dorsal setae. One of cercal setae distinctly longer than others and slightly curved. Gaster pointed apically.

Male. Unknown.

Discussion. *Cucarastichus* appears most closely related to the two other genera of tetrastichines which have a distinct postmarginal vein and more than a single row of adnotaular setae: *Careostrix* and *Mesofrons* (note: *Eriastichus* has the mesoscutum uniformly and densely covered with short, fine setae, and a distinct postmarginal vein, but is easily recognizable due to the setation on the propodeum). *Cucarastichus* can be separated from these genera by the characters given in the key.

Distribution. Known only from Texas.

Biology and hosts. The one known species is a hyperparasitoid in cockroach oothecae.

North American species

***texanus* sp. n.** See descriptions of new species.

Hosts. Eupelmidae: *Anastatus tenuipes*, which is a parasitoid of *Supella longipalpa* (Blattellidae).

Genus ***DAPSILOTHRIX*** gen. n.

Type species: *Dapsilothrix jeanae*, sp. n. (Gender feminine).

Diagnosis. Mesoscutum without median line and uniformly covered with setae. Scutellum with 3–4 setae on each side; submedian lines absent, although they may appear very faintly indicated in certain lights and then they are closer to each other than to sublateral lines and enclosing an area that is at least 4 times longer than wide. Propodeal spiracle with entire rim exposed. Cercal setae subequal in length, straight. All funicular segments distinctly longer than wide. Mesosoma with metallic coloration; gaster predominantly yellow (more or less darkened dorsally) and non-metallic.

Female. Malar sulcus straight or only slightly curved. Anterior margin of clypeus weakly bilobed. Antenna with all funicular segments distinctly longer than wide. Mesoscutum without median line and uniformly covered with setae. Scutellum with 3–4 setae on each side; submedian lines absent, although they may appear very faintly indicated in certain lights and they they are closer to each other than to

sublateral lines and enclosing an area that is at least 4 times longer than wide. Propodeal spiracle with entire rim exposed. Callus with 6–8 setae. Mesosternum curved anterior to trochantinal lobes, and mesepisternum with precoxal suture absent. Submarginal vein with several (5–6) dorsal setae. Cercal setae subequal in length, straight. Gaster pointed apically; ovipositor sheaths distinctly exserted past apex of gaster.

Male. Unknown.

Discussion. This genus is immediately distinguished from other tetrastichines with the mesoscutum completely and uniformly covered with setae by the presence of $\geqslant 3$ pairs of setae on the scutellum, the unusual colour combination of the metallic green to blue mesosoma and the predominantly yellow gaster, and the distinctly exserted ovipositor. It may be related to *Baryscapus* with which it shares the characters: propodeal spiracle with entire rim exposed; cercal setae subequal in length and straight or only slightly curved; mesosternum curved anterior to trochantinal lobes, and mesepisternum with precoxal suture absent. It differs from *Baryscapus* in having the malar sulcus almost straight, and in having extensive yellow coloration (gaster, ventral portion of head).

Distribution. Known from Texas and Mexico (Baja California Sur).

Biology and hosts. Unknown.

North American species

***jeanae* sp. n.** See descriptions of new species.

Genus ***ERIASTICHUS*** gen. n.

(Figs 26–31, 133)

Type species: *Eriastichus cigdemae*, sp. n. (Gender masculine).

Diagnosis. Propodeum (Figs 27, 30) with at least callus and the area just medial of the spiracle densely covered in fine setae; callus region with > 50 setae. Mesoscutum (Figs 26, 29) without median line, densely and uniformly covered with short, fine setae. Scutellum (Figs 27, 30) with distinct submedian lines, with from 2 pairs to many setae on either side. Fore wing (Fig. 133) with postmarginal vein present, 0·5–1·0 the length of stigmal vein; base of wing densely setose and speculum absent.

Female. Body generally dark in coloration, with slight metallic shine. Malar sulcus present, slightly curved; gena behind malar curve somewhat swollen. Anterior margin of clypeus bilobed. Flagellum long and slender; all funicular segments distinctly longer than wide. Mesoscutum (Figs 26, 29) without median line and densely and uniformly covered with short, fine setae (although 2 large setae are also present at posterior margin). Scutellum (Figs 27, 30) smooth and shiny, with submedian lines distinct; scutellum with from 2 pairs (*cigdemae*) to many (*masneri*, *nakos*) setae on each side. Propodeum (Figs 27, 30) densely covered with fine setae; these setae either completely covering propodeum (*masneri*), or propodeum bare medially and with setae confined to sides (*cigdemae*, *nakos*). Propodeal spiracle with entire rim exposed. Mesosternum convex anterior to trochantinal lobes, and mesepisternum with precoxal suture absent. Fore wing (Fig. 133) with postmarginal vein present, 0·5–1·0 times as long as stigmal vein. SMV with many (5–12) dorsal setae. Entire wing densely setose, with speculum absent and area between cubital and subcubital veins filled with setae. One of cercal setae distinctly longer than others and sinuate (Figs 28, 31). Gaster pointed apically.

Male. (Known only for *cigdemae*). Similar to female except genitalia and antenna. Antenna with all funicular segments longer than wide. Funicular segments with scattered slender setae, the greatest length of which is just over twice the length of the segment; these setae not arranged in distinct whorls. Ventral plaque small (only about $\leq 0{\cdot}25$ the length of scape) and placed near the centre of the scape.

Discussion. This genus does not seem particularly closely related to other North American forms, and it is likely that its closest relatives are confined to the Neotropics. It is certainly quite distinct morphologically, and, on the basis of the setation on the propodeum, should not be easily mistaken for anything else.

Distribution. Mainly Neotropical, with one species reaching the southern USA in Texas. I have seen representatives of this genus from as far south as Brazil.

Biology and hosts. Unknown.

Other New World species. Two other New World species are described in this paper: *masneri* **sp. n.**, and *nakos* **sp. n.** See descriptions of new species.

North American species

***cigdemae* sp. n.** See descriptions of new species.

Genus *EXALARIUS* gen. n.

Type species: *Exalarius huachucensis*, sp. n. (Gender masculine).

Diagnosis. Wings shortened, length of fore wing less than length of mesosoma. Mesoscutum without median line, with setae uniformly (although sparsely) distributed over entire surface. Antennal club with long terminal stylus. Propodeal spiracle with entire rim exposed. Cercus with two setae distinctly longer than the others and somewhat curved.

Female. Malar sulcus present, curved. Ocelli quite small, POL about twice OOL. Antennal torulus placed low on face, at level of lower eye margin. Antennal club with long terminal stylus. All funicular segments longer than wide. Pronotum relatively long, about as long as the mesoscutum. Mesoscutum without median line, with setae uniformly (although sparsely) distributed over entire surface. Scutellum with submedian lines (these tending to be indistinct anteriorly), without sublateral lines. Propodeal spiracle small, circular, with entire rim exposed. Propodeum with median carina; callus with 2 setae. Mesosternum flat anterior to trochantinal lobes, and mesepisternum with precoxal suture present. Wings extremely short, fore wing less than length of mesosoma. Gaster long, longer than head and mesosoma combined. Cercus with two setae distinctly longer than the others and somewhat curved. Body without metallic coloration.

Discussion. This genus appears to be quite distinct from the other two genera of North American tetrastichines (*Tetrastichomyia*, *Exalarius*) which have such shortened wings. Like *Apterastichus*, it is easily distinguishable from *Tetrastichomyia* because it lacks several derived characters which define that genus (see key and diagnosis of *Tetrastichomyia*). It is distinguished from *Apterastichus* by the characters given in the key (see also discussion under *Apterastichus*).

Distribution. Known only from Arizona.

Biology and hosts. Unknown.

North American species

***huachucensis* sp. n.** See descriptions of new species.

Genus *EXASTICHUS* gen. n.

Type species: *Exastichus odontos*, sp. n. (Gender masculine).

Diagnosis. Mandibles large and exodont. Mouth opening very wide, malar space near mouth margin with a large excavation. Mesoscutum with median line and a single row of adnotaular setae. Propodeal spiracle relatively small, placed within its own diameter off the anterior margin of the propodeum and with entire rim exposed. Submarginal vein with > 2 (3–4) dorsal setae. Cercal setae subequal in length, straight, not distinctly longer than surrounding setae on gaster. Colour brown, non-metallic.

Female. Mandibles large and exodont. Mouth opening very wide, malar space near mouth margin with a large excavation. POL slightly over twice OOL. Malar sulcus present, straight. Anterior margin of clypeus straight, with very slight median incision. All funicular segments longer than wide. Mesoscutum with median line and a single row of adnotaular setae. Scutellum with submedian lines closer to sublateral lines than to each other; both pairs of setae placed in posterior half of scutellum. Propodeal spiracle relatively small, placed within its own diameter of the anterior margin of the propodeum and with entire rim exposed; propodeum without paraspiracular carina, callus with 2 setae. Mesosternum flat anterior to trochantinal lobes, and mesepisternum with precoxal suture present. Submarginal vein with > 2 (3–4) dorsal setae. Cercal setae subequal in length, straight, not distinctly longer than surrounding setae. Colour brown, non-metallic.

Discussion. The large exodont mandibles immediately distinguish this genus from all other tetrastichines. It seems closest to *Baryscapus* (entire rim of propodeal spiracle exposed, cercal setae subequal in length); however, it differs in enough respects to warrant maintaining it as separate. In particular: the mesosternum is fairly flat anterior to the trochantinal lobes, the precoxal suture is present, and the callus has 2 setae (there are usually more in *Baryscapus*).

Distribution. Known only from Southern California.

Biology and hosts. Unknown.

North American species

***odontos* sp. n.** See descriptions of new species.

Genus *GALEOPSOMYIA* Girault
(Figs 76–82)

Trichaporus Förster, 1856: 84.
Type species *Euderus columbianus* Ashmead (subsequent monotypy by Ashmead, 1900b: 561). Placed on Official Index of Rejected and Invalid Generic Names in Zoology (ICZN, 1985).

Trichoporus Ashmead, 1900b: 561. Incorrect subsequent spelling of *Trichaporus* Förster. Placed on Official Index of Rejected and Invalid Generic Names in Zoology (ICZN, 1985).

Galeopsomyia Girault, 1916[280]: 348.
Type species *Euderus columbianus* Ashmead [= *G. haemon* (Walker)] (original designation).

Galeopsomopsis Girault, 1917[305]: 1.
Type species *Galeopsomopsis multisulcata* Girault (original designation). Synonymized with *Galeopsomyia* by LaSalle and Schauff, 1992: 29.

Diagnosis. Propodeum (Figs 81, 82) strongly reticulate, with a strong paraspiracular carina, and a transverse carina along posterior margin. Body strongly sclerotized, with all gastral tergites reticulate dorsally (Figs 77, 78). Malar space with

a triangular fovea below eye, this generally with some sculpture (Fig. 76). SMV with ⩾ 2 dorsal setae.

Discussion. *Galeopsomyia* can be recognized chiefly by the combination of the non-collapsing gaster with all tergites strongly reticulate, the strong triangular fovea beneath the eye, and the distinctive carinae on the propodeum.

Galeopsomopsis was synonymized with *Galeopsomyia* (LaSalle and Schauff, 1992), although there are differences between these groups. They can usually be separated by the following characters (some intergrading may occur in South American forms): *Galeopsomyia* has 2 pairs of setae on the scutellum (Fig. 67), and only 2 carinae on the propodeum, a paraspiracular carina, and a transverse carina along the posterior margin (Fig. 69); *Galeopsomopsis* has > 2 pairs of setae on the scutellum (often ⩾ 10 pairs) (Fig. 68), and a transverse carina or ridge on the propodeum which extends medially from the paraspiracular carina towards the median carina anterior to the transverse carina on the hind margin (Fig. 70). These genera were synonymized because the recognition of *Galeopsomopsis* would probably leave a paraphyletic
Galeopsomyia.

Distribution. New World, being most abundant in the tropics and semitropics.

Biology and hosts. *Galeopsomyia* species are associated with galls, mostly as parasitoids of Cecidomyiidae and Cynipidae. One species has been shown to be an inquiline within cecidomyiid galls (Hawkins and Goeden, 1984).

Notes and recent literature. *Galeopsomyia* was keyed and discussed at the generic level by Bouček (1977). Graham and LaSalle (1991: 91) removed A*prostocetus granulatus* from synonymy with *Tetrastichus epidius* Walker, and transferred *epidius* to *Galeopsomyia.*

Other New World species. Transferred by LaSalle and Schauff (1992): *compacta* (Howard), *cuprea* (Ashmead) (from *Tetrastichus*), *deilochus* (Walker), *multisulcata* (Girault) (automically transferred to *Galeopsomyia* as type of *Galeopsomopsis*), *nicaraguaensis* (Cameron), *scadius* (Walker), *sulcata* (Howard), *valerus* (Walker).

North American species

columbiana see *haemon*

epidius (Walker). *Tetrastichus Epidius* Walker, 1847: 28 [BMNH]. Transferred to *Aprostocetus* by Burks (1975: 142); to *Galeopsomyia* by Graham and LaSalle (1991: 91).

Hosts. Undetermined gall-maker on elderberry.

haemon (Walker). *Tetrastichus Haemon* Walker, 1847: 28 [BMNH]. Transferred to *Galeopsomyia* by Burks (1975: 144).

= *Euderus columbianus* Ashmead, 1888: 104 [USNM].

Hosts. Cecidomyiidae: *Asphondylia helianthiglobulus*, *Rhopalomyia* sp. gall on *Solidago.*

nigrocyanea (Ashmead). *Gyrolasia nigrocyaneus* Ashmead, 1886: 134 [USNM].

Hosts. Cynipidae: *Belonocnema treatae.*

squamosa (Girault), **comb. n.** *Galeopsomopsis squamosus* Girault, 1917[309]: 3 [USNM].

transcarinata (Gahan), **comb. n.** *Galeopsomopsis transcarinatus* Gahan, 1919b: 168 [USNM].

Hosts. Cecidomyiidae: *Asphondylia websteri.*

Genus ***HADROTRICHODES*** gen. n.

Type species: *Hadrotrichodes waukheon*, sp. n. (Gender feminine).

Diagnosis. Anterior pair of scutellar setae enlarged, much stronger than posterior pair which are of normal size. Mid lobe of mesoscutum with setae not confined to a single adnotaular row, but with a few setae near midline. Club short, with long apical spine. Flagellum dark. Submarginal vein with $\geqslant 3$ setae.

Female. Malar sulcus present, slightly curved. Anterior margin of clypeus truncate. POL about twice OOL. Antenna with pedicel long, longer than F1. F1 longer than wide, F3 quadrate. Club with long terminal spine (as long as or longer than C3). Midlobe of mesoscutum with a median line; with 2–4 adnotaular setae and a few additional (relatively weak) setae scattered near the midline; some of the setae on mesoscutum and pronotum quite strong. Submedian lines of scutellum wide and distinct, nearer to each other than to sublateral lines. Anterior pair of scutellar setae situated near middle of scutellum distinctly enlarged, much stronger than posterior pair of setae which are of normal size. Dorsellum large, somewhat flattened and slightly overhanging propodeum medially. Propodeal spiracle small, circular, with entire rim exposed, removed from anterior margin of propodeum by its own diameter. Propodeum with distinct median carina; median panels of propodeum smooth or very lightly sculptured. Callus with 2 setae. Fore wing with > 2 (3–4) dorsal setae on submarginal vein. Cercal setae not equal in length, one of them distinctly longer than remaining setae (at least half again as long); all setae straight or only very slightly curved.

Male. Unknown.

Discussion. *Hadrotrichodes* can be recognized by the characters given in the diagnosis and key; in particular the long, strong anterior pair of setae on the scutellum in contrast to the shorter pair which are of normal size. It does not appear to be particularly closely related to *Pentastichus* (the other tetrastichine genus with enlarged mesosomal setae), and it is probably most closely related to Neotropical forms.

Distribution. North America (California, Virginia).

Biology and hosts. Unknown.

Notes. A single, poor specimen of *Hadrotrichodes* appears to represent a second species: Virginia, 13 July 1884 (1 ♀ USNM).

North American species

***waukheon* sp. n.** See descriptions of new species.

Genus ***HENRYANA*** Yoshimoto
(Figs 32, 33, 132)

Henryana Yoshimoto, 1983: 90–91.

Type species *Henryana magnifica* Yoshimoto [as *Henrya*[!] *magnifica*] (original designation).

Diagnosis. Head (Fig. 32) with swollen gena which is delimited anteriorly by a strongly curved malar sulcus and posteriorly by a postgenal sulcus. Propodeal spiracle small, round, and placed near or behind the midline of the propodeum (Fig. 33). Fore wing (Fig. 132) with (usually 3) short setae on SMV, these in distinct contrast to the very long setae on marginal vein; subcubital vein reaching or nearly reaching level of basal vein; marginal fringe long, often half or more as long as wing width. Body long and thin (Fig. 33). Posterior margin of fore wing usually with a constriction

past the base of the marginal vein. Vertex usually produced dorsally above level of eyes (Fig. 32). Mesoscutum usually without a median line. Scape generally very long and thin (> 5 times longer than wide). Cercal setae unequal in length, with one of them being considerably longer than the others and sinuate in form.

Discussion. This genus is recognizable not only due to its extremely long, thin habitus, but by two unique characters within the Tetrastichinae: the distinctly swollen gena which is delimited anteriorly by a strongly curved malar sulcus and posteriorly by a postgenal sulcus (other tetrastichines might have a swollen gena and/or a strongly curved malar sulcus, but do not have the postgenal sulcus); and the submarginal vein of fore wing with several (≥ 3) short setae on dorsal surface, which are in distinct contrast to the very long setae on marginal vein.

Distribution. Predominantly the tropical and subtropical areas of the New World; however, 1 undescribed species known from each Africa and Southeast Asia.

Biology and hosts. Unknown.

Notes and recent literature. Nothing has been published on this genus since its description (Yoshimoto, 1983).

New North American record: *magnifica* Yoshimoto.

North American species

magnifica Yoshimoto. *Henryana magnifica* Yoshimoto, 1983: 91–92 [CNC].

New records. FL, Dade Co., S. Miami, Old Cutler Hammock, 21.ii–1.vi.1986, S.&J. Peck, (1 ♀, CNC); FL, Alachua Co., Gainesville, American Entomological Institute, 30.iv.1987, L. Masner (1 ♂, CNC); GA, McIntosh Co., Sapelo Isl., 18.vii–11.ix.1987, BRC Hym Team, live oak forest (1 ♀, CNC); MO, Wayne Co., Williamsville, 16.vii–8.viii.1988, J. T. Becker (1 ♀, CNC); VA, Fairfax Co., nr. Annandale, 19–25.vi.1988, D. R. Smith (1 ♀, USNM).

Genus ***KOCOUREKIA*** Bouček

Kocourekia Bouček, 1966: 376–378.

Type species *Kocourekia hirtula* Bouček [= *Kocourekia debilis* (Ratzeburg)] (original designation).

Diagnosis. Malar sulcus absent. Scutellum and mesoscutum with numerous scattered setae. Frontofacial sutures narrowly separated from each other dorsally. Head densely setose. Body generally flattened, with long pronotum and propodeum. Female with hypopygium situated well beyond middle of gaster. Midlobe of mesoscutum without median line. Submarginal vein of fore wing with 3–6 dorsal setae.

Discussion. *Kocourekia* is the only tetrastichine genus which lacks a malar sulcus, lacks submedian lines on the scutellum, and has the scutellum uniformly covered with numerous setae. It appears most closely related to *Melittobia* and *Tachinobia* (see discussion of other related genera under *Melittobia*), but can be distinguished by the characters given above.

Distribution. A single Holarctic species.

Biology and hosts. In Europe a series was reared from an unknown host (possibly an aculeate Hymenoptera) dwelling in galls of *Cynips kollari* Hartig (Bouček, 1966: 379, as *K. hirtula*), and Graham (1991) suggested the possibility of some species of Pemphredoninae (Sphecidae) serving as host.

Notes and recent literature. *Kocourekia* was keyed and discussed at the generic level by Bouček (1977) and included in a key to European tetrastichine genera by Graham (1987). The single European species was discussed by Graham (1991), who transferred *Entedon debilis* Ratzeburg into *Kocourekia* as a senior synonym of *hirtula* Bouček.

New North American record: *debilis* (Ratzeburg).

North American species

debilis (Ratzeburg). *Entedon debilis* Ratzeburg, 1852: 210 [NHMV]. Transferred to *Kocourekia* by Graham (1991: 179).

Hosts. Host unknown in North America (see above).

New record. USA, NC, Almance Co., 19.iv.1985, (1♀, CNC).

Genus ***KOSTJUKOVIUS*** Graham

Kostjukovius Graham, 1991: 18, 167–168.

Type species: *Crataepiella platycephalae* Kostjukov (in Djurich and Kostjukov, 1978) (original designation).

Diagnosis. Dorsal surface of submarginal vein with 1 seta. Propodeal spiracle small, circular, separated by distinctly more than its diameter from the anterior margin of propodeum. Frontofacial sutures either narrowly (*K. platycephalae*, Europe) or widely (*K. grahami*, North America) separated from each other dorsally. Antenna with long erect or semi-erect setae, and terminal spine or club long and narrow, with an apical seta which is as long as spine (similar to the antenna in *Aceratoneuromyia*, Fig. 92). Body dorsoventrally flattened, with relatively long pronotum and propodeum; dorsellum and propodeum lying in the same plane as mesoscutum and scutellum. Median line on mesoscutum present, although it may be faint. Submedian lines on scutellum either present and distinct (*grahami*) or absent (*platycephalae*). Hypopygium extending over half the length of the gaster. Malar sulcus complete. Foramen magnum situated slightly to distinctly above centre of head.

The male is unknown.

Discussion. This genus appears superficially to be similar to *Melittobia*, *Tachinobia*, and *Kocourekia*; all of which have a body which is somewhat dorsoventrally flattened and relatively elongate pronotum and propodeum, and a hypopygium that extends over half the length of the gaster; however, it differs from these genera in having a complete and distinct malar sulcus, as well as other characters discussed below.

Kostjukovius is probably more closely related to *Pronotalia* and *Aceratoneuromyia*. The antenna in *Kostjukovius* are quite similar to those in *Aceratoneuromyia*, with long erect or semi-erect setae, and terminal spine of club long and narrow, with an apical seta which is as long as spine. It differs from all the above genera in having the propodeal spiracle small, circular, and separated from the anterior margin of the propodeum, and only 1 seta on the dorsal surface of the submarginal vein.

Distribution. Europe and North America.

Biology and hosts. The single European species of this genus has been reared as a parasitoid of *Platycephala umbraculata* F. [Chloropidae]. The single North American species is apparently associated with pine cones, perhaps as a parasitoid of *Dioryctria* [Pyralidae] or a cecidomyiid.

Notes and recent literature. Genus described and discussed by Graham (1991).

North American species
***grahami* sp. n.** See descriptions of new species.

Genus *LISSEURYTOMELLA* Gahan & Fagan
(Figs 67–69)

Lisseurytoma Cameron, 1913: 120–121. Type species *Lisseurytoma nigricornis* Cameron [= *Lisseurytomella flava* (Ashmead)] (monotypy). Preoccupied by *Lisseurytoma* Cameron, 1912: 202.

Lisseurytomella Gahan and Fagan, 1923: 81. Replacement name for *Lisseurytoma* Cameron, 1913 (not *Lisseurytoma* Cameron, 1912).

Diagnosis. Petiole (Fig. 69) distinct, strongly sculptured. Toruli placed high on frons, closer to median ocellus than clypeal margin, so that scape extends well above the level of vertex (Fig. 67). Propodeum (Fig. 69) with a raised lobe of the callus which partially overhangs the outer rim of the spiracle; rugose, without complete median carina, without distinct paraspiracular carina; median panels with strong, irregular carinae. Axilla (Fig. 68) projecting forward of scuto-scutellar line. Dorsellum divided medially, by a longitudinal groove or a series of deep punctures (Fig. 69). Face and frons smooth or lightly sculptured, with at most minute punctures (Fig. 67).

A redescription is given because this genus has remained unrecognized since is description.

Female. Malar sulcus present, straight or only slightly curved. Anterior margin of clypeus distinctly bilobed. Frontofacial sutures absent, head strongly sclerotized and non-collapsing. Ocelli placed in close triangle, OOL greater than POL. Toruli (Fig. 67) placed high on head, nearer to anterior ocellus than clypeal margin. Scape (Fig. 67) long, distinctly longer than eye. All funicular segments much longer than wide. C1 loosely attached to C2 + C3. Mesoscutum (Fig. 68) with 2–3 adnotaular setae in a single row; median line absent or present in posterior half. Axilla (Fig. 68) projecting forward of scuto-scutellar line so that scapular flanges are linear (although rather short). Scutellum (Fig. 69) with distinct, fairly broad submedian lines, which are nearer to sublateral lines than to each other; anterior pair of scutellar setae situated in posterior half of scutellum. Dorsellum (Fig. 69) reticulate, with longitudinal median groove (which may appear as a series of punctures). Propodeum (Fig. 69) somewhat elongate, without complete median carina or distinct paraspiracular carina; median panels with strong, irregular carinae. Callus with 3–5 setae. PMV absent or very short. SMV with 2–3 dorsal setae. Petiole (Fig. 69) present, wider than long, but with strong sculpture dorsally. T2 with basal furrow, which is laterally carinate (although sometimes weakly so posteriorly). Longest cercal setae distinctly longer than remaining setae, and sinuate. Colour non-metallic (predominantly yellow in the only known species).

Male. Similar to female except in antenna and sexual characters. Scape with ventral plaque situated in distal half, which is slightly swollen. Funicular segments and C1 with a basal whorl of long setae in dorsal half, which extend to about half the length of the following segment.

Discussion. This genus appears to be related to *Pracetus* (see Bouček, 1988a), and *Oxypracetus* gen. n. (from North America, described in this paper). All three genera have a distinct, sculptured petiole, and the toruli placed high on the frons, with

a long scape that extends well above the level of the vertex. *Pracetus* differs from *Lisseurytomella* and *Oxypracetus* in having the propodeal spiracle well separated from the anterior margin of the propodeum, and without a raised lobe of the callus overhanging the spiracular rim. *Lisseurytomella* and *Oxypracetus* may be distinguished by characters given in the key.

There is presently only 1 included species, *L. flava* (Ashmead).

Distribution. Known in North America from Texas and Florida; also from the Caribbean (Grenada) and northern South America (Guyana).

Biology and hosts. The single species seems to be associated with *Cardiospermum* seeds [Sapindaceae]. Material from Florida, as well as the type specimen of *Lisseurytoma nigricornis* from Guyana (= *L. flava*), has been collected in association with this host, and this species is phytophagous within the seeds (J. Loye, personal communication, 1991). Records from Texas associate this species with *Clematis* seed pods [Ranunculaceae], perhaps as a lycaenid parasitoid, but these may be mistaken.

Notes and recent literature. This genus was briefly discussed by LaSalle and Schauff (1992).

New North American record. *L. flava* (Ashmead).

North American species

flava (Ashmead). *Tetrastichus flavus* Ashmead, 1900a: 264 [BMNH]. Transferred to *Lisseurytomella* by LaSalle and Schauff (1992: 31); see this paper also for extralimital synonymy.

Hosts. Sapindaceae: *Cardiospermum microcarpum* (phytophagous in seeds).

Notes. This species was discussed by LaSalle and Schauff (1992).

New records. FL, Monroe Co., Key Largo, Pt. Bouganville, i–ii.1988, J. E. Loye and S. P. Carroll, ex. seeds *Cardiospermum corindum* (2♀2♂ USNM, 2♀2♂ BMNH). FL, Flamingo, 20.ii.1961, ex. seeds *Cardiospermum microcarpum* (1♀3♂ USNM); FL, Homestead, 5.iv.1940, ex. seeds of *Cardiospermum* (1♀ USNM); FL, Homestead, 29.x.1957, F. W. Mead, at *Persea americana* (1♀ USNM); TX, Brownsville, 9.xi.1938, in seed pod of wild *Clematis*, ?parasite of lycaenid in pod (2♀1♂, 1 pupa USNM); TX, Brownsville, 21.vi.1945, on cotton (1 damaged specimen, sex unknown, USNM).

Genus ***MELITTOBIA*** Westwood
(Figs 1–7, 129)

Melittobia Westwood, 1848: xviii.

Type species *Melittobia Audouinii* Westwood [= *Melittobia acasta* (Walker)] (monotypy). For a complete list of extralimital generic synonymies see Dahms (1984a), Graham (1991).

Diagnosis. **Female.** Malar sulcus absent (Fig. 1). Body usually somewhat flattened, with elongate pronotum and propodeum (Fig. 4). Hypopygium extending well beyond middle of gaster. Fore wing (Fig. 129) with 3–6 dorsal setae on SMV. Mesoscutum (Fig. 4) without median line; scutellum with submedian lines. Scutellum with 2 pairs of setae. Setae on midlobe of mesoscutum scattered, not confined to a single row at lateral margin. Frontofacial sutures narrowly separated dorsally (Fig. 2). Setae on head and mesosoma generally decumbent.

Male. Apterous or brachypterous (Fig. 7). Head (Fig. 5, 6) enlarged, without

malar sulcus or frontofacial sutures; ocelli absent; eye reduced to a single facet. Scape (Fig. 6) enlarged and swollen.

Discussion. *Melittobia* belongs to a group of genera which share the following characters: malar sulcus absent; body somewhat dorsoventrally flattened and with a relatively elongate pronotum and propodeum; midlobe of mesoscutum without a median line; hypopygium extending over half the length of the gaster, dorsal surface of the submarginal vein with 3–6 setae. Other genera in this group are *Crataepus*, *Kocourekia*, *Tachinobia*, and perhaps *Pronotalia* (which may have a faint malar sulcus). Some genera are superficially similar to this group (e.g. *Kostjukovius*, *Aceratoneuromyia*, some *Baryscapus* and *Aprostocetus*), however this similarity appears to be due to convergence.

The characters used in the key will allow differentiation of these genera; however, relationships are not easily understood. It does appear that *Melittobia*, *Kocourekia* and *Tachinobia* are quite closely related. These genera have setae scattered irregularly over the entire midlobe of the mesoscutum; and at least for *Melittobia* and *Tachinobia* (males unknown for *Kocourekia*) the males are highly modified with reduced wings and eyes.

Distribution. Cosmopolitan.

Biology and hosts. *Melittobia* species are parasitoids or hyperparasitoids of mostly aculeate Hymenoptera, but they may also attack other insects such as Lepidoptera, Coleoptera or Diptera (usually in the vicinity of aculeate nests). They often develop gregariously. Certain species (such as *chalybii*) have been found to attack an extremely wide range of hosts under laboratory conditions (Burks, 1979). A detailed review of the biology of *Melittobia* species was given by Dahms (1984b), who also presented a substantial list of references.

Mating behaviour has been particularly well studied in this genus, and recent papers on this subject include Dahms (1973), Assem (1975), Evans and Matthews (1976), Assem and Maeta (1978), Assem *et al.* (1982a). Dahms (1984b) listed further references on this subject.

Notes and recent literature. *Melittobia* was keyed and discussed at the generic level by Bouček (1977), and included in a key to European tetrastichine genera by Graham (1987, 1991). Dahms (1984a) revised the world species of *Melittobia*, and did much to clear up confusion concerning species within this genus, and erroneous host records. Since Dahms found that much of the information in catalogues was incorrect, because records were based upon misidentified species, almost all host records listed below are taken from Dahms (1984a). Several recent papers (among them Assem, 1975; Evans and Matthews, 1976: Assem *et al.*, 1982a; Dahms, 1984b, c) have treated various aspects of *Melittobia* biology or biology or behaviour (see above section on biology and hosts). Dahms (1984c) discussed the structure and function of antennal sense organs in *Melittobia*.

The original publication date of the name *Melittobia* is 1848, rather than 1847 as has been used in the past (see Wheeler, 1912; see also not in references at Westwood, 1848).

Other New World species. Recorded by Dahms (1984a): *hawaiiensis* Perkins, and an undescribed species from Argentina.

North American species

acasta (Walker). *Cirrospilus acasta* Walker, 1839a: 328 [BMNH]. Not listed as being

in North America in any catalogues, however Dahms (1984a: 289–290) recorded this from Alberta, MA, PA.

(= *chalybii* of Hobbs and Krunic, 1971)

Hosts. Megachilidae: *Megachile relativa.* Limacodidae: *Cnidocampa flavescens.* Tachinidae: tachinid puparium. For additional extralimital hosts see Dahms (1984a: 289–290).

aeneus see *megachilis*

australica Girault. *Melittobia australica* Girault, 1912[124]: 203 [QMB].

(= *chalybii* of Evans and Matthews, 1976).

Hosts. Sphecidae: *Trypargilum lactitarse.* For additional extralimital hosts see Dahms (1984a: 298–299).

chalybii Ashmead. *Melittobia chalybii* Ashmead, 1892a: 231 [USNM].

Hosts. This species will attack almost any insect in culture; in nature apparently only attacks aculeate Hymenoptera and associated parasitoids. Blattidae: *Periplaneta americana.* Cerambycidae: *Saperda candida.* Ichneumonidae: *Sphecophaga vesparum burra.* Leucospidae: *Leucospis affinis.* Megachilidae: *Megachile centuncularis, M. inermis, M. relativa.* Sphecidae: *Chalybion californicum, Sceliphron caementarium, Trypargilum politum.* Tenthredinidae: *Pikonema alaskensis.* Vespidae: *Ancistrocerus antilope, Eumenes fraternus.*

digitata Dahms. *Melittobia digitata* Dahms, 1984a: 292–293 [USNM]. Described from FL, CT, MI, TX, VA, MS.

(= *chalybii* of Buckell, 1928)

(= species 4 of Assem *et al.*, 1982a)

Hosts. Sphecidae: *Trypargilum politum.*

evansi Dahms. *Melittobia evansi* Dahms, 1984a: 290–291 [USNM]. Described from GA, NY.

Hosts. Sphecidae: *Trypargilum lactitarse, T. politum.*

femorata Dahms. *Melittobia femorata* Dahms, 1984a: 293–294 [USNM]. Described from NC.

Hosts. Sphecidae: *Trypargilum politum.*

gerardi see *megachilis*

megachilis (Packard). *Anthophorabia megachilis* Packard, 1865: 134 [MCZ].

= *Pteromalus gerardi* Hickok, 1875: 131.

= *Melittobia megalochilae* Schulz, 1906: 143 [emendation].

= *Chrysocharis aeneus* Brues, 1909: 161.

Hosts. Sphecidae: *Crabro* sp., *Sceliphron caementarium.*

megalochilae see *megachilis*

scapata Dahms. *Melittobia scapata* Dahms, 1984a: 291–292 [USNM]. Described from NY.

Hosts. Sphecidae: *Trypoxylon* sp.

Genus ***MESOFRONS*** gen. n.

Type species: *Mesofrons villosus* sp. n. (Gender masculine).

Diagnosis. Postmarginal vein about as long as stigmal vein. Distance between toruli distinctly greater than distance from torulus to eye margin. Scutellum with 4–5 pairs setae. Mesoscutum bare in medial third, but with many scattered adnotaular setae. Scutellum with submedial lines. Eyes distinctly hairy.

Female. Malar sulcus present, fine, straight. Clypeal margin entire. Distance between toruli distinctly greater than distance from torulus to eye margin (3:2). Eyes distinctly hairy. All funicular segments longer than wide. Pedicel and flagellum densely covered in semi-erect setae. Scape with a complete row of setae on ventral margin. Mesoscutum without a median line; adnotaular setae not confined to a single row, but scattered at either side (medial third bare). Scutellum with submedian lines and 4–5 setae on either side. Propodeum with several (at least 3–4) setae on the callus, and at least 1 seta medial to the spiracle. Fore wing with postmarginal vein as long as stigmal vein. Submarginal vein with several (> 4) dorsal setae. Entire wing quite setose, with speculum absent and several seta in area between submarginal vein and cubital row of setae. Hypopygium extending more than half the length of the gaster. Longest of the cercal setae about equal in length and only slightly curved. Body without metallic coloration.

Male. Unknown.

Discussion. *Mesofrons* appears most closely related to the two other genera of tetrastichines which have a distinct postmarginal vein and more than a single row of adnotaular setae: *Careostrix* and *Cucarastichus* (note: *Eriastichus* has the mesoscutum uniformly and densely covered with short, fine setae, and a distinct postmarginal vein, but is easily recognizable due to the setation on the propodeum). *Mesofrons* can be separated from these genera by the scutellum having 4–5 pairs of setae and distinct submedian lines; the mesoscutum with 2–3 rows of adnotaular setae (rather than completely covered with setae), and in having the toruli closer to the eye margin than to each other.

Distribution. Known only from Oregon.

Biology and hosts. Unknown.

North American species

***villosus* sp. n.** See descriptions of new species.

Genus *MINOTETRASTICHUS* Kostjukov
(Figs 95–98)

Minotetrastichus Kostjukov, 1977: 190 (as subgenus of *Tetrastichus*).
Type species *Eulophus* [recte *Cirrospilus*] *ecus* Walker [= *M. frontalis* (Nees)] (original designation).

Diagnosis. Clypeal margin truncate or weakly bilobed (Fig. 97). Propodeal spiracle (Fig. 96) small, round, with its entire rim exposed, and separated from metanotum by at least its own diameter. The two longest cercal setae subequal in length, straight or only slightly curved (Fig. 98). Body metallic with some yellow coloration. Callus with 2–3 setae. Malar sulcus present. SMV with 2 or more dorsal setae. Mesosternum convex. Mesoscutum (Fig. 95) usually without median line.

Discussion. This genus is difficult to distinguish from *Aprostocetus* and *Baryscapus*. It differs from both these genera in having the clypeal margin weakly lobed or truncate, and the propodeal spiracle small, circular, and separated from the metanotum by at least its own diameter. Additionally, from *Aprostocetus* it differs by having the propodeal spiracle with its entire rim exposed, having the two longest cercal setae subequal in length and straight or only slightly curved, and mesosternum convex; from *Baryscapus* it may be distinguished by having yellow coloration, and having 2 or 3 setae on callus (often more in *Baryscapus*).

Distribution. Holarctic, with one species known from the Caribbean.

Biology and hosts. Species of *Minotetrastichus* are primary or sometimes secondary parasitoids of leaf-mining Lepidoptera, Coleoptera and Hymenoptera.

Notes and recent literature. Minotetrastichus was described by Kostjukov (1977) as a subgenus of *Tetrastichus*. It was given generic status by Graham (1987), who included it in a key to European tetrastichine genera and revised the European species. This genus corresponds to the '*ecus* group' of Graham (1961b) and Domenichini (1966a, 1967).

Graham and LaSalle (1991) transferred *Eulophus frontalis* to *Minotetrastichus* and placed *M. ecus* in synonymy with *frontalis*.

Other New World species: *pallidocinctus* (Gahan), **comb. n.**

North American species

ecus see *frontalis*

frontalis (Nees). *Eulophus frontalis* Nees, 1834: 161 [NHMV]. Transferred to *Minotetrastichus* by Graham and LaSalle (1991: 89).

= *Cirrospilus ecus* Walker, 1838d: 204 [BMNH].

See Graham and LaSalle (1991: 89) for further, extralimital synonymies.

Hosts. Coleophoridae: *Coleophora laricella.* Heliozelidae: *Coptodisca splendoriferella.* Curculionidae: *Rhynchaenus pallicornis.* Braconidae: *Phanomeris phyllotomae.* Tenthredinidae: *Fenusa ulmi, Heterarthrus nemoratus.*

Genus ***NEOTRICHOPOROIDES*** Girault
(Figs 93, 94, 141)

Neotrichoporoides Girault, 1913[156]: 50.
Type species *Neotrichoporoides uniguttata* Girault (original designation).
Burksia Fullaway, 1955: 409.
Type species *Burksia viridimaculata* Fullaway (original designation).
See Graham (1987) and Bouček (1988a) for further extralimital synonymies.

Diagnosis. Fore wing (Fig. 141) with stigmal vein short (shorter than parastigma); marginal vein 7·0–9·5 times longer than stigmal vein. Sculpture on propodeum stronger than sculpture on mesoscutum or scutellum (Fig. 94). Axillae (Fig. 93) not very strongly advanced. Scutellum (Fig. 94) distinctly longer than wide, and with anterior seta nearer to sublateral line than to submedian line. One of the cercal setae distinctly longer than the others and sinuate. Propodeum (Fig. 94) with a raised lobe of the callus which partially overhangs the outer rim of the spiracle. Malar sulcus usually foveate below eye (this fovea very small in *viridimaculatus*).

Discussion. This genus appears most closely related to *Aprostocetus*, with which it shares such characters as: one of the cercal setae distinctly longer than the others, rim of the callus partially overhanging propodeal spiracle, and several (≥ 4) dorsal setae on the SMV. It differs by the characters given above, in particular the long marginal vein in respect to the stigmal vein, the relatively stronger sculpture on the propodeum than the scutellum, and the axilla not very strongly advanced. *Neotrichoporoides* may represent nothing more than a specialisted group of *Aprostocetus*, but I am maintaining it as distinct pending further study.

Distribution. Mainly Old World tropics and subtropics, with one widespread species, *N. viridimaculatus*, also known from North and South America.

Biology and hosts. Parasitoids of Diptera (e.g. Diopsidae, Muscidae, Lonchaeidae) in stems of grasses.

Notes and recent literature. *Neotrichoporoides* was keyed and discussed at the generic level by Graham (1987) who also revised European species, and Bouček (1988a) who provided a list of Australasian species.

North American species

viridimaculatus (Fullaway). *Burksia viridimaculata* Fullaway, 1955: 410 [BPBM].
Transferred to *Neotrichoporoides* by Graham (1987).
Hosts. Unknown, collected in association with coarse grasses.

Genus *OOMYZUS* Rondani
(Figs 55–57)

Oomyzus Rondani, 1870: 140.
Type species *Pteromalus gallerucae* Fonscolombe (monotypy).

Diagnosis. SMV with one dorsal seta. Propodeum (Fig. 55) without posteriorly bifurcate paraspiracular carina. Midlobe of mesoscutum (Fig. 55) with 2–5 adnotaular setae. Antenna (Fig. 57) with funicular segments generally not all longer than wide; usually at least F3 quadrate to transverse, F1 often shorter than the pedicel. Gaster (Fig. 56) generally short, usually not longer than head plus mesosoma, and blunt or rounded apically. Malar sulcus straight or nearly so.

Discussion. This genus is difficult to characterize. It is most difficult to distinguish from *Quadrastichus*; however, it can generally be distinguished by the characters above. In contrast, *Quadrastichus* species generally only have 1 adnotaular seta (sometimes 2 or even 3), have all funicular segments distinctly longer than wide, and have the gaster distinctly longer than the head plus mesosoma and acute apically. it also appears close to *Baryscapus*; however, *Baryscapus* species have more than 1 dorsal seta on the SMV, and a distinctly curved malar sulcus.

Distribution. All continents except South America.

Biology and hosts. Egg, larval, or pupal parasitoids of mostly Coleoptera, but also Lepidoptera, Neuroptera and Diptera.

Biological control. *O. incertus* has been introduced from Europe for the control of the alfalfa weevil (Curculionidae: *Hypera posterica*). *O. gallerucae* introduced from Europe for the control of the elm leaf beetle (Chrysomelidae: *Pyrrhalta luteola*); *O. brevistigma* is native to North America, but has been moved around the continent for control of elm leaf beatle.

Notes and recent literature. *Oomyzus* in the present interpretation contains species which had previously been placed in the '*sempronius* group' and '*coccinellae* group' (Graham, 1961b), and the '*galerucae* [*sic*] group' (Domenichini, 1966a, 1967). It was treated as a subgenus of *Tetrastichus* by Kostjukov (1977), and at the generic level by Graham (1987, 1991) and Bouček (1988a). Graham (1991) revised European species.

North American species

brevistigma (Gahan), **comb. n.** *Tetrastichus brevistigma* Gahan, 1936a: 76 [USNM].
Hosts. Chysomelidae: *Pyrrhalta luteola.*

gallerucae (Fonscolombe). *Pteromalus gallerucae* Fonscolombe, 1832: 302 [BMNH].
Transferred to *Oomyzus* by Rondani (1870: 141). This species name has occasionally been misspelled in the literature as *galerucae.*
= *Oomyzus xanthomelanae* Rondani, 1873: 148 [nomen nudum].

Introduced from Europe for the biological control of Elm Leaf Beetle, *Pyrrhalta luteola.*

Hosts. Chrysomelidae: *Pyrrhalta luteola* eggs.

Notes. The identity of this species was discussed by Bouček (1957), Graham (1985). Returned to the genus *Oomyzus* by Graham (1991).

incertus (Ratzeburg). *Eulophus incertus* Ratzeburg, 1844: 168 [USNM]. Transferred to *Oomyzus* by Graham (1987: 11).

= *Tetrastichus erdoesi* Domenichini, 1966a: 99. Unnecessary replacement name (see Burks, 1971; Graham, 1991).

Introduced from Europe for the biological control of the alfalfa weevil, *Hypera postica.*

Hosts. Curculionidae: *Hypera postica.*

Notes. See Graham (1991: 197) for additional extralimital synonymy.

melanis see *scaposus*

scaposus (Thomson). *Tetrastichus scaposus* Thomson, 1878: 284 [ZIL]. Transferred to *Oomyzus* by Bouček (1988a: 695). Further extralimital synonymies given by Graham (1991: 200).

= *Tetrastichus coccinellae* Kurdjumov, 1912: 239 (ZIL). Synonymized with *scaposus* by Bouček, (1988a: 695).

= *Tetrastichus melanis* Burks, 1943: 529 [USNM]. Synonymized with *scaposus* by (Graham, 1991: 200).

Hosts. Coccinellidae: *Coccinella quinquenotata, Coccinella* sp. Graham (1991: 201) lists several more extralimital hosts.

Notes. This species has been extensively treated in the literature under the name *coccinellae.*

sokolowskii (Kurdjumov). *Tetrastichus sokolowskii* Kurdjumov, 1912 [ZIL]. Transferred to *Oomyzus* by Graham (1991: 203).

Hosts. Plutellidae: *Plutella xylostella* (a facultative hyperparasitoid). For additional extralimital hosts see Domenichini (1966b: 49).

xanthomelanae see *gallerucae*

Genus ***OXYPRACETUS*** gen. n.

(Figs 63–66)

Type species: *Oxypracetus opacus* sp. n. (Gender masculine).

Diagnosis. Petiole (Fig. 63) distinct, about half as long as broad, and distinctly sculptured. Toruli placed high on frons, closer to median ocellus than clypeal margin, so that scape extends well above level of vertex (Fig. 66). Mesoscutum (Fig. 64) with median line. Axilla not or barely projecting forward of scuto-scutellar line (Fig. 64). Propodeum (Fig. 65) with a raised lobe of the callus which partially overhangs the outer rim of the spiracle; with complete, strong and raised median carina, and strong arc-shaped paraspiracular carina; median panels reticulate to rugose. Dorsellum (Fig. 65) regularly reticulate, without median line or groove. Face and frons strongly sculptured, with many scattered piliferous punctures (Fig. 66).

Female. Malar sulcus present, straight or only slightly curved. Anterior margin of clypeus distinctly bilobed. Frontofacial sutures absent, head strongly sclerotized and non-collapsing. Ocelli placed in close triangle, OOL greater than POL. Toruli placed high on head, nearer to anterior ocellus than clypeal margin (Fig. 66). Scape (Fig. 66) long, distinctly longer than eye. All funicular segments much longer than wide. C1 loosely attached to C2 + C3, making the antenna appear to have 4 funicular

segments and a 2-segmented club. Mesoscutum (Fig. 64) with 6–10 adnotaular setae in 2 (or 3) uneven rows; median line present. Axilla (Fig. 64) barely projecting forward of scuto-scutellar line; scapular flanges broad. Scutellum (Figs 64, 65) with distinct, fairly broad submedian lines, which are nearer to sublateral lines than to each other; with 2–4 (generally 3) pairs of setae. Dorsellum (Fig. 65) regularly reticulate, without longitudinal median groove. Propodeum (Fig. 65) somewhat elongate, with complete median carina and strong, arc-shaped paraspiracular carina; median panels reticulate to rugose. Callus with 4–6 setae. SMV with many (5–8) dorsal setae. Petiole (Fig. 63) present, about half as long as wide, but with strong sculpture dorsally. T2 with basal furrow, which is laterally carinate (although sometimes weakly so posteriorly). Longest cercal setae distinctly longer than remaining setae, and sinuate. Colour non-metallic, predominantly black with some reddish areas.

Male. Similar to female except in antenna and sexual characters. Scape with ventral plaque situated in distal half, which is slightly swollen. Funicular segments and C1 with a basal whorl of long setae in dorsal half, which extends to about the apex of the following segment.

Discussion. This genus appears related to *Lisseurytomella*, which also has a distinct, sculptured petiole, and the toruli placed high on the frons, with a long scape that extends well above the level of the vertex, these characters are also seen in the Australian genus *Pracetus*. See further discussion of these genera under *Lisseurytomella*.

Distribution. Eastern USA. I have seen specimens of an undescribed species from Brazil (see below).

Biology and hosts. Unknown.

Other New World species. An undescribed species is known from Brazil with the following data: **Brazil**, Linhares, E. Santo, ix.1972, M. Alvarenga (1 ♀, CNC), **Brazil**, Nova Teutonia, vii.1972, F. Plaumann (1 ♀, CNC).

North American species

***opacus* sp. n.** See descriptions of new species.

Genus ***PARAGALEOPSOMYIA*** Girault
(Figs 61, 62)

Paragaleopsomyia Girault, 1917[305]: 1.
Type species *Paragaleopsomyia eja* Girault (original designation).

Diagnosis. Body strongly sclerotized. Gaster (Fig. 62) with first tergite (and maybe also narrow second tergite) smooth dorsally, in distinct contrast to remaining segments which are strongly reticulate dorsally. Propodeum (Fig. 61) fairly long, with strong, straight carina extending directly from spiracle to posterior margin; median area of propodeum strongly and uniformly reticulate.

Discussion. This genus is easily recognized by the characters given above. It might be confused with *Galeopsomyia*, which also has a strongly sclerotized body, but *Galeopsomyia* has a posteriorly bifurcate paraspiracular carina on the propodeum which is placed medial to the spiracle (not extending directly from it). Additionally, *Galeopsomyia* species have the malar sulcus developed into a distinct triangular fovea beneath the eye (the bottom of which may even be sculptured), and the first gastral tergite is never smooth, although the reticulation may be weaker than the following segments in a few species.

Distribution. Tropical and subtropical areas of the New World.

Biology and hosts. From galls of Cecidomyiidae. Hawkins and Goeden (1982, as *Tetrastichus* n. sp.) showed that *P. cecidobroter* is not a parasitoid but forms a separate gall within the cecidomyiid gall.

Notes and recent literature. *Paragaleopsomyia* was keyed and discussed at the generic level by Bouček (1977). The biology of *P. cecidobroter* was discussed by Hawkins and Goeden (1982 [as *Tetrastichus* n. sp.], 1984).

The three North American species currently placed in *Paragaleopsomyia* are quite close morphologically. *Paragaleopsomyia* is quite commonly collected from the desert regions of Western North America, and can be swept from a multitude of host plants and reared from several species of gall. I suspect that this will eventually prove to be a single species, although it could proved to be any number of closely related species. Biological studies will most likely be necessary for solving species level questions in this genus.

Other New World species. Transferred by LaSalle and Schauff (1992); *athenais* (Walker), *coxalis* (Howard), *femorata* (Ashmead).

North American species

cecidobroter (Gordh and Hawkins), **comb. n.** *Tetrastichus cecidobroter* Gordh and Hawkins, 1982: 426–428 [USNM].

Hosts. The larvae of this species are phytophagous gall-formers within *Asphondylia* spp. galls (Cecidomyiidae) on *Atriplex canescens* (Chenopodiaceae) (Hawkins and Goeden, 1982 [as *Tetrastichus* n. sp.], 1984; Gordh and Hawkins, 1982).

eja Girault. *Paragaleopsomyia eja* Girault, 1917[305]: 1 [USNM].

gallicola Gahan. *Paragaleopsomyia gallicola* Gahan, 1919b: 167 [USNM].

Hosts. Reared from cecidomyiid gall on *Pluchea borealis*.

Genus ***PARASPALANGIA*** Ashmead
(Fig. 138)

Paraspalangia Ashmead, 1904: 334.

Type species *Paraspalangia annulipes* Ashmead (monotypy).

Stigmatotrastichus Girault, 1916[287]: 303–304.

Type species *Stigmatotrastichus emersoni* Girault [objective synonym of *P. annulipes*] (original designation).

Diagnosis. This genus should be easily recognizable based on two characters of the fore wing that are not seen in any other North American Tetrastichinae: fore wing (Fig. 138) infuscated beyond level of parastigma except for hyaline stripe near apex of stigmal vein; parastigma swollen, darker than remaining wing vein. Other characters (given in the key and below) will also serve to distinguish this genus.

A redescription is given because this genus has remained unrecognized since its description.

Female. Head somewhat large; eyes large. Malar sulcus curved. Gena with small tooth on ventral margin (similar to that seen in *Apterastichus*, Fig. 22). Antenna with first funicular segment longer and narrower than second; segments becoming wider and shorter apically. Scape white, pedicel mostly white, darkened above, funicle and club dark. Mesoscutum without median line. Scutellum with submedian and sublateral lines; anterior pair of scutellar setae near anterior margin. Axillae not strongly produced. Dorsellum flattened, slightly enlarged. Propodeum with distinct median

carina. Coxae white, the hind and especially the fore coxa elongate. Basitarsus distinctly longer than second tarsal segment. Fore wing (Fig. 138) infuscated beyond level of parastigma except for hyaline stripe near apex of stigmal vein. Parastigma swollen; darker than remaining wing veins. SMV with 4–5 setae. Petiole small but distinct, white to yellow, contrasting with dark brown propodeum and gaster. Gaster short and oval. One cercal setae much longer than others, and sinuate. Head and mesosoma dark brown, with distinct metallic shine, particularly on pronotum and mesoscutum.

Male. Similar to female except in antenna and sexual characters, and some coloration. Funicular segments and C1 with a loose basal whorl of long setae, which extend to about half the length of the following segment. Scape and coxae pale to light brown, not so distinctly white in contrast to surrounding body segments.

Discussion. This is a quite distinctive genus, and easily recognizable by the characters given above. Unfortunately, the single female specimen is in poor shape and additional material will be required to get some idea of its placement. It is the only known North American tetrastichine with distinct infuscation on the fore wing and the junction of the SMV and parastigma swollen.

Distribution. One species known from Texas. A male specimen of *Paraspalangia* has been collected in California (San Bernardino Co., 7 mls E Phelan, Baldy Mesa, 23.ix–8.x.1981, J. T. Huber).

Biology and hosts. Unknown.

Notes and recent literature. *Paraspalangia* has not been treated since 1916 when Girault redescribed it based on Ashmead's material. Ashmead (1904) described the genus *Paraspalangia* in a key to genera of spalangiine Pteromalidae, and gave the type species as *P. annulipes* Ashmead. He did not further describe this species, although his characterization in the key was sufficient to serve as a description of both the genus and the species. It appears that he had more than a single specimen, since he included *Paraspalangia* in a key to females with the indication 'antenna 9-jointed', and in a key to males with the indication 'antenna (?) 10-jointed (broken)'.

The generic name *Stigmatotrastichus* is an objective synonym of *Paraspalangia.* Girault (1916[287]) described the genus *Stigmatotrastichus* in the Ceratoneurini, and designated as type species his new species *S. emersoni.* Girault stated that this species was described from a female in the USNM labelled as '*Paraspalangia annulipes* Ashmead, female type'.

North American species

annulipes Ashmead. *Paraspalangia annulipes* Ashmead, 1904: 334 [USNM].
= *Stigmatotrastichus emersoni* Girault, 1916[287]: 304 [same type specimen as *P. annulipes* Ashmead].

emersoni see *annulipes.*

Genus ***PECKELACHERTUS*** Yoshimoto

Peckelachertus Yoshimoto, 1970: 908.
Type species *Peckelachertus diprioni* Yoshimoto (original designation).

Diagnosis. Fore wing with PMV long, subequal in length to SV. Mesoscutum with a single row of adnotaular seta. Scutellum with anterior pair of setae placed near anterior margin. Clypeus truncate. SMV with 3–6 dorsal setae. Propodeal spiracle small, circular, with entire rim visible.

Discussion. This genus is generally recognizable as being the only North American tetrastichine with a distinctly elongate postmarginal vein (as long as the stigmal vein), and having only a single row of adnotaular setae. Other characters are given in the diagnosis. The two species presently placed in this genus (the Holarctic *P. diprioni* Yoshimoto and the Palaearctic *P. anglicanus* Graham) do not have submedian lines on the scutellum. There are two undescribed North American species (both known from a unique female specimen) which agree well in all characters with *Peckelachertus* except that they both have distinct (although perhaps faint) submedian lines on the scutellum. Data for these specimens is as follows: USA, OR, Ochoco Summit, 25.vi.1982, G. Gordh (1♀, UCR); **Canada**, Ontario, Ottawa, RKcf.PK., v.1975, J. R. Barron, on rose (1♀, CNC).

Distribution. Europe and North America.

Biology and hosts. The one species whose biology is known is a parasitoid of the eggs of sawflies in the family Diprionidae.

Notes and recent literature. This genus was described as an elachertine, and that is where it appeared in the most recent North American catalogue (Burks, 1979). It was transferred to the Tetrastichinae by Graham (1977), who recorded the North American species *diprioni* from Europe and described a second European species. It was keyed and discussed at the generic level by Bouček (1977), and included in a key to European tetrastichine genera by Graham (1987, 1991). Graham (1991) supplied a key to the two European species.

North American species

diprioni Yoshimoto. *Peckelachertus diprioni* Yoshimoto, 1970: 908 [CNC].

Hosts. Diprionidae: *Gilpinia* [= *Diprion*] *frutetorum.*

Genus ***PENTASTICHUS*** Ashmead
(Figs 70, 71, 139)

Pentastichus Ashmead, 1894c: 187.
Type species *Pentastichus xanthopus* Ashmead (monotypy).
Hypertetrastichus Moser, 1965: 15. **syn. n.**
Type species *Hypertetrastichus ithacus* Moser (original designation).

Diagnosis. Mesosoma (Figs 70, 71) with unusually strong setae, including: at least both pairs of scutellar setae (some species have > 2 pairs of scutellar setae); as well as setae on mesoscutum and pronotum. Median line on mesoscutum and submedian lines on scutellum present, and generally somewhat widened and very distinct. Antenna generally with flagellum yellow or light coloured. Fore wing (Fig. 139) usually with only 2 dorsal setae on SMV. Males often have a darkened spot on the fore wing distal to the SV.

Discussion. This genus is easily recognized by the numerous strong setae on the mesosoma. Some species have an increased number of setae (≤ 50 or so on the scutellum) giving them the appearance of a porcupine or hedgehog. It does not appear to be closely related to any North American forms, and it is likely that will require a study of the Neotropical fauna to uncover its relationships.

Distribution. New World, mostly tropical to subtropical.

Biology and hosts. Associated with galls. *P. ithacus* is a hyperparasite in psyllid galls. An undescribed species from Texas has been reared from galls formed by the tanaostigmatid *Tanaostigmodes meltoni* on *Pithecellobium flexicaule.*

Notes and recent literature. I have seen several undescribed species from the Neotropics and the southern USA, (CA, TX, FL, TN).

Other New World species. See LaSalle and Schauff (1992): *longior* Howard, *xanthopus* Ashmead, *zetetes* (De Santis).

North American species

ithacus (Moser), **comb. n.** *Hypertetrastichus ithacus* Moser, 1965: 16 [USNM].

Hosts. Eulophidae: *Omphale* [= *Moserina*] *maculata* (parasitic in *Pachypsylla* [Psyllidae] galls).

Genus ***PRONOTALIA*** Gradwell
(Figs 18–21, 130)

Pronotalia Gradwell, 1957: 1.
Type species *Pronotalia trypetae* Gradwell (original designation).
Crataepiella Domenichini, 1957b: 107.
Type species *Crataepiella fiorii* Domenichini (monotypy).

Diagnosis. Malar sulcus absent (or rarely faintly indicated) (Fig. 18). Body somewhat flattened, with elongate pronotum (Fig. 20). Female with hypopygium extending beyond (usually well beyond) middle of gaster (Fig. 21). Mesoscutum (Fig. 20) without median line, and with a single row of adnotaular setae. Fore wing (Fig. 130) with 3–6 dorsal setae on SMV. Scutellum (Fig. 20) with two pairs of setae. Frontofacial sutures (Fig. 19) widely separated dorsally.

Discussion. Pronotalia belongs to a group of genera related to *Melittobia* (see discussion under that genus).

Pronotalia and *Crataepiella* Domenichini were both described in 1957. Bouček (1977) used the name *Crataepiella* in accordance with earlier literature (e.g. *Domenichini*, 1966a, b, 1967), but mentioned that it was possible that *Pronotalia* was actually the older name. Graham (1987) used the name *Pronotalia*, and later (Graham, 1991) pointed out that the publication date of *Pronotalia* was 6 March 1957, and that the date of *Crataepiella* could not be established, therefore *Pronotalia* should have priority.

This genus has not been previously recorded from North America, except that Graham (1991) mentioned USA as part of its distribution. A series of several specimens of this genus from Washington was kindly identified as *P. carlinarum* by M. Graham.

Distribution. Holarctic Region and Africa.

Biology and hosts. Species are gregarious parasitoids in the puparia of Diptera, mainly Tephritidae but also Chloropidae and Agromyzidae.

Notes and recent literature. European species were revised and keyed by Graham (1991).

New record. P. carlinarum (Szelenyi and Erdös).

North American species

carlinarum (Szelenyi and Erdös) [in Erdös], 1951: 234–235.

Hosts. Unknown in North America, but known from Europe from several species of Diptera (Domenichini, 1966b).

New record. USA, WN, Kittitas Co., Cle Elum, 20.vii.1988, J. D. Pinto (1♀1♂ USNM).

Genus *QUADRASTICHODELLA* Girault
(Figs 24, 25, 131)

Quadrastichodella Girault, 1913[175]: 69.
Type species *Quadrastichodella bella* Girault (original designation).
Flockiella Timberlake, 1957: 109.
Type species *Flockiella eucalypti* Timberlake [= *Q. nova* Girault] (original designation).

Diagnosis. Antenna (Fig. 25) with distinct, raised, rasp-like sculpture on inner surface of scape and pedicel, and 4 large anelli, whose combined length equals that of 1st funicular segment. Fore wing (Fig. 131) with postmarginal vein about half as long as stigmal vein, $\geqslant 3$ (usually 3) setae on dorsal surface of SMV. Gena (Fig. 24) distinctly swollen posterior to curved malar sulcus.

Discussion. This is an introduced genus which does not appear to be closely related to other Holarctic forms.

Distribution. Originally Australasia; however, some species have been moved with *Eucalyptus* to various parts of the world (North America, Europe, South America, Africa).

Biology and hosts. Species are phytophagous and associated with *Eucalyptus.* Flock (1957) discussed the biology of *Q. nova* (as *Flockiella eucalypti*), which oviposits into young flower buds of *E. umbellata.* The bud is transformed into several galls which are similar in size and shape to a seed, perhaps accounting for the number of times this species has been introduced around the world.

Notes and recent literature. This genus has been discussed by Bouček (1977, 1988a), and Graham (1991).

North American species

eucalypti see *nova*

nova Girault. *Quadrastichodella nova* Girault, 1922[360]: 40–41.
= *Flockiella eucalypti* Timberlake, 1957: 110 [UCR] (synonymy by Bouček, 1988a: 669; see also this work for additional extralimital synonymy).
Hosts. *Eucalyptus umbellata*, and probably other species of *Eucalyptus.* Additional extralimital hosts given by Bouček (1977: 25).

Genus *QUADRASTICHUS* Girault
(Figs 50–54)

Quadrastichus Girault, 1913[167]: 232, 251.
Type species *Quadrastichus nigrinotatus* Girault, 1913, by original designation.
Cecidotetrastichus Kostjukov, 1977: 189 (as subgenus of *Tetrastichus*).
Type species *Cirrospilus vacuna* Walker, 1839, by original designation.

Diagnosis. SMV with 1 dorsal seta. Propodeum (Fig. 51) without posteriorly bifurcate paraspiracular carina. Antenna (Fig. 52) with all funicular segments longer than wide; at least the third funicular segment (and sometimes the others) with long curved setae which equal the length of the segment. Mesoscutum (Fig. 50) usually with only 1 adnotaular seta (rarely with 2 or 3). Gaster (Fig. 54) usually distinctly longer than the head plus mesosoma and acute apically.

Discussion. This genus is generally distinguishable by the characters given in the diagnosis. It may be difficult to distinguish from *Oomyzus*; however, *Oomyzus* species usually have: funicular segments generally not all longer than wide; usually at least F3 quadrate to transverse, F1 often shorter than the pedicel; midlobe of mesoscutum with

2–5 adnotaular setae; gaster generally short, usually not longer than head plus mesosoma, and blunt or rounded apically.

Distribution. Cosmopolitan.

Biology and hosts. Generally parasitoids of Cecidomyiidae or various Coleoptera, although other hosts are known including Cynipidae and Tephritidae. One European species, *sajoi*, has larvae which are predatory within galls of eriophyid mites.

Notes and recent literature. *Quadrastichus* in the present interpretation contains species which had previously been placed in the '*brevinervis* group' and the '*anysis* group' (Graham, 1961a, b); or the '*vacuna* group' and '*microscopicus* group' (Domenichini, 1966a, 1967). This genus was treated under the name *Cecidotetrastichus* (Kostjukov, 1977; Graham, 1987); however, Bouček (1988a: 677) remarked on the similarity of *Quadrastichus* and *Cecidotetrastichus*, and Graham and LaSalle (1991) formally synonymized them. European species were revised and keyed by Graham (1991).

I am including *Tetrastichus haitiensis* Gahan in *Quadrastichus* (see included species). The female has typical characters of this genus: SMV with 1 dorsal seta; mesoscutum with 2 or 3 adnotaular setae; all funicular segments distinctly longer than wide; gaster distinctly longer than the head plus mesosoma and acute apically. Dr M. Graham (1992, personal communication) does not feel that this species belongs here, because it possesses quite distinctive male genitalia, which differ from *Quadrastichus* (and most other tetrastichines). Rather than erect a new genus to contain this single species, I am provisionally placing it in *Quadrastichus* pending a more detailed study of its relationships.

Other New World species. Transferred by Graham and LaSalle (1991): *flavus* (Howard) (from *Pentastichus*).

North American species

ainsliei (Gahan), **comb. n.** *Tetrastichus ainsliei* Gahan, 1917: 214 [USNM].
= *Neomphaloidella mediogutta* Girault, 1917[319]: 255 [USNM].
Hosts. Curculionidae: *Cylindrocopturus adspersus.* Mordellidae: *Mordellistena pustulata*, *Mordellistena* sp. Cecidomyiidae: *Mayetiola destructor.*

baldufi (Burks), **comb. n.** *Tetrastichus baldufi* Burks, 1943: 540 [USNM].
Hosts. Cynipidae: *Neuroterus quercusverrucarum.*

diarthronomyiae (Gahan), **comb. n.** *Tetrastichus diarthronomyiae* Gahan, 1923: 65 [USNM].
Hosts. Cecidomyiidae: *Diarthronomyia chrysanthemi.*

flora (Girault). *Aprostocetus flora* Girault, 1917[309]: 3 [USNM]. Transferred to *Tetrastichus* by Burks (1943: 533), to *Quadrastichus* by Graham and LaSalle (1991: 94).
= *Epitetrastichus tricolor* Girault, 1917[316]: 9 [USNM].
Hosts. Cecidomyiidae: *Monarthropalpus buxi.*

haitiensis (Gahan), **comb. n.** *Tetrastichus haitiensis* Gahan, 1929: 17 [USNM].
Hosts. Curculionidae: *Diaprepes abbreviatus*, *Exopthalmus quadrivattatus*, *Pachneus litus*, *P. opalus.*
Notes. See discussion of this species above under notes and recent literature for the genus *Quadrastichus.*

marilandicus see *whitmani*

mediogutta see *ainsliei*

pulchriventris (Girault), **comb. n.** *Neomphaloidella pulchriventris* Girault, 1916[265]: 101 [USNM]. Transferred to *Tetrastichus* by Glick (1939: 47).

semilongifasciatus (Girault), **comb. n.** *Neomphaloidella semilongifasciatus* Girault, 1916[273]: 35 [USNM]. Transferred to *Tetrastichus* by Burks (1943: 536).

solidaginis (Burks). *Tetrastichus solidaginis* Burks, 1943: 534 [USNM]. Transferred to *Quadrastichus* by Doğanlar (1992b: 526).

Hosts. Tephritidae: *Eurosta solidaginis* gall.

tricolor see *flora*

ulysses (Girault), **comb. n.** *Aprostocetus ulysses* Girault, 1916[300]: 112 [USNM]. Transferred to *Tetrastichus* by Burks (1943: 536).

whitmani (Girault), **comb. n.** *Aprostocetus whitmani* Girault, 1916[287]: 296 [USNM]. Transferred to *Tetrastichus* by Burks (1943: 538).

= *Aprostocetus marilandicus* Girault, 1916[299]: 21 [USNM]. Publication date for this species is 1916, not 1917 as given in several catalogues (Peck, 1951, 1963; Burks, 1979).

Hosts. Chrysomelidae: *Physonota unipunctata.* Cecidomyiidae: *Dasineura balsamicola.*

Genus ***STYOTRICHIA*** gen. n.

Type species: *Styotrichia quadrata*, sp. n. (Gender feminine).

Diagnosis. Midlobe of mesoscutum with setae randomly scattered over entire surface, these setae long and semi-erect; mesoscutum without median line. Scutellum without submedian lines; anterior pair of setae placed nearer to anterior margin than to posterior pair of setae. Postmarginal vein short, less than half the length of the stigmal vein. One of the cercal setae distinctly longer than the others and curved or sinuate.

Female. Malar sulcus present, straight or very slightly curved. Anterior margin of clypeus with 2 small lobes. Antenna with pedicel longer than F1. Funicular segments either all slightly longer than wide (*bicolor*) or from subequal in length and width to slightly wider than long (*quadrata*). Midlobe of mesoscutum without a median line; with long, semi-erect setae scattered over entire surface. Scutellum without submedian lines; anterior pair of setae situated nearer to anterior margin than to posterior pair. Propodeal spiracle small, circular, with a raised lobe of the callus which partially overhangs the outer rim (this flap is small and may be difficult to see in this genus). Propodeum with light median carina; median panels of propodeum smooth or very lightly sculptured. Callus with 2 setae. Fore wing with 2–4 dorsal setae on submarginal vein. One of the cercal setae distinctly longer (more than twice) than the remaining setae and sinuate or curved.

Male. Unknown.

Discussion. This genus does not seem to have any clear affinities with other North American genera. Other genera which have the mesoscutum uniformly covered with setae generally have the setae decumbent and more densely distributed. It is perhaps most closely related to Neotropical forms.

Distribution. Known only from the Southeastern USA (FL, NC).

Biology and hosts. Unknown.

North American species

bicolor **sp. n.** See descriptions of new species.

quadrata **sp. n.** See descriptions of new species.

Genus *TACHINOBIA* Bouček
(Figs 8–13)

Tachinobia Bouček, 1977: 26.
Type species *Tachinobia repanda* Bouček (original designation).

Diagnosis. **Female.** Malar sulcus absent (Fig. 8). Body usually somewhat flattened, with elongate pronotum and propodeum. Hypopygium situated well beyond middle of gaster. Submarginal vein of fore wing with 3–6 dorsal setae. Mesoscutum (Fig. 10) without median line, with setae scattered over entire surface and not confined to a single row at lateral margin. Scutellum (Fig. 10) without submedian lines; with 2 pairs of setae. Frontofacial sutures (Fig. 9) widely separated dorsally. Setae on head and mesosoma generally semi-erect.

Male. Apterous or brachypterous (Fig. 11). Head (Figs 12, 13) without malar sulcus, with distinct frontofacial sutures which are widely separated from each other dorsally. Ocelli absent; eye somewhat reduced.

Discussion. *Tachinobia* is the only tetrastichine genus which lacks a malar sulcus, lacks submedian lines on the scutellum, and has the midlobe of the mesoscutum uniformly covered with numerous setae, and only two pairs of setae on the scutellum, and has the frontofacial sutures widely separated dorsally. It appears most closely related to *Melittobia* and *Kocourekia* (see discussion of other related genera under *Melittobia*), but can be distinguished by the characters given above.

Distribution. South and Central America, southern North America, Africa, India to SE Asia and Australia.

Biology and hosts. *Tachinobia* species are gregarious parasitoids, mostly in the puparia of Tachinidae attacking various Lepidoptera, but also in various other Diptera (e.g. Chloropidae attacking spider eggs).

Notes and recent literature. This genus was discussed by Bouček (1977, 1988a). *T. repanda* was recorded as a parasitoid of *Pseudogaurax signatus* [Chloropidae] pupae in a spider egg sac (LaSalle, 1990b).

North American species

repanda Bouček. *Tachinobia repanda* Bouček, 1977: 27–28.

Hosts. Chloropidae: *Pseudogaurax signatus.* Tachinidae: *Carcelia lagoae.* Several additional extralimital hosts given by Bouček (1977: 27–28).

Genus *TAMARIXIA* Mercet
(Figs 46–49, 136)

Tamarixia Mercet, 1924: 57.
Type species *Tamarixia bicolor* Mercet (original designation).

Diagnosis. Fore wing (Fig. 136) with a single seta on the dorsal surface of the SMV. Propodeum without a Y-shaped paraspiracular carina. Midlobe of mesoscutum (Figs 46–48) with 2 pairs of long, semi-erect setae which are about equal in length, one in the anterior half and the other in the posterior half. Anterior margin of clypeus truncate, slightly convex, or with 2 minute lobes (Fig. 49). Relatively short and squat. Body without metallic coloration; mesosoma black, gaster black to yellow. Parasitoids of Psylloidea.

Discussion. *Tamarixia* appears to be a monophyletic genus, although it is difficult to define precisely. It can be recognized by the combination of a single dorsal seta on the SMV, and the adnotaular setae on the mesoscutum: there are two setae on

each side, they are nearly equal in length, and they are generally erect or semi-erect (Figs 47, 48). Additionally, the distinct form of the male genitalia has been mentioned by Burks (1943) and Graham (1991). The male genitalia are quite large and usually extended in dried specimens; the genital armature is 4–8 times as long as broad; the digitus 4–6 times as long as broad, with a distinct apical hook or spine.

Distribution. Cosmopolitan.

Biology and hosts. Parasitoids of Psylloidea.

Biology control. T. leucaenae was described as a parasite of the leucaena psyllid from Trinidad, and is currently under investigation for control of this pest in SE Asia (M. Cock, 1993, personal communication).

Notes and recent literature. Tamarixia contains species previously treated in the *pubescens* group (Graham, 1961b; Domenichini, 1966a, 1967). Kostjukov (1977) treated *Tamarixia* as a subgenus of *Tetrastichus*, and Graham (1987, 1991) and Bouček (1988a) treated it as a genus. Bouček (1988b) described a new species, *T. leucaenae*, from the Caribbean. Graham (1991) revised European species.

Other New World species. None described. Bouček (1988a) mentioned that this genus was not known from South America, however I have seen several species from this region.

New North American record. T. leucaenae Bouček.

North American species

dyra (Burks). *Tetrastichus dyrus* Burks, 1943: 541 [USNM]. Transferred to *Tamarixia* by Graham (1991: 276).

Hosts. Psyllidae: *Aphalara curta.* Triozidae: *Trioza* spp.

leucaenae Bouček. *Tamarixia leucaenae* Bouček, 1988b: 545–546 [BMNH].

New record. Florida, Alachua Co., Gainesville, 10.vii.1991, F. D. Bennett, on *Leucaena* infested with *Heteropsylla cubana* (2♀ USNM, 2♀ BMNH).

Hosts. Psyllidae: *Heteropsylla cubana.*

triozae (Burks). *Tetrastichus triozae* Burks, 1943: 542 [USNM]. Transferred to *Tamarixia* by Bouček (1988b: 546).

Hosts. Calophyidae: *Calophya californica, C. nigrella, C. triozomima.* Psyllidae: *Euglyptoneura minuta, Euphalerus vermiculosus, Pexopsylla cercocarpi.* Triozidae: *Paratrioza cockerelli, Trioza albifrons, T. beameri.*

Genus ***TETRASTICHOMYIA*** Girault
(Figs 83–86)

Tetrastichomyia Girault, 1916[289]: 48.
Type species *Miotropis clisiocampae* Ashmead (original designation).
Apterolophus Gahan, 1919a: 3.
Type species *Apterolophus pulchricornis* Gahan (original designation).

Diagnosis. Dorsellum (Fig. 84) divided medially by a longitudinal channel. Antennae (Fig. 85) with 3rd anellus larger than preceding two anelli and with setae. Scutellum (Fig. 84) without submedian lines, with deep sublateral lines which are laterally carinate. Midlobe of mesoscutum (Fig. 83) without median line. Callus with many ($>$ 10) setae (Fig. 84). Vertex (Fig. 86) with small but distinct transverse carina posterior to ocelli. May be macropterous or brachypterous.

Discussion. Graham (1991: 293) pointed out that *Tetrastichomyia* appears to be relatively isolated. Although it is easily characterized and recognized by several

apomorphic characters (given in the key and diagnosis), further study will be necessary to resolve its relationship to other tetrastichine genera.

Distribution. Known from Europe and North and Central America; an undescribed African species was mentioned by Graham (1987: 28).

Biology and hosts. *T. clisiocampae*, the only species whose biology is known, attacks a variety of lepidopterous hosts as a primary, and occasionally a secondary, parasitoid.

Notes and recent literature. *Tetrastichomyia* was discussed by LaSalle and Schauff (1990), who placed *Apterolophus* in synonymy with it. Graham (1991) revised European species, and synonymized the European *Tetrastichus goidanichi* Domenichini with *T. clisiocampae.* See also notes added in press at the end of this paper.

North American species

clisiocampae (Ashmead). *Miotropis clisiocampae* Ashmead, 1894b: 341 [USNM]. Transferred to *Tetrastichomyia* [as type species] by Girault (1916[288]: 48); to *Syntomosphyrum* by Burks (1967a: 229); back to *Tetrastichomyia* by Graham (1987: 28, by implication when he restored *Tetrastichomyia* as a valid genus).
= *Tetrastichomyia orgyiae* Girault, 1916[300]: 111–112 [USNM].
= *Tetrastichomyia orgyiazele* Burks, 1979: 1005. Unnecessary replacement name. Burks (1979: 1005) assigned *orgyiazele* as a replacement name for *orgyiae* Girault (nec *orgyiae* Ashmead) when he had both these names placed in the genus *Syntomosphyrum.*
= *Tetrastichus Goidanichi* Domenichini, 1967: 96–100. Synonymized with *clisiocampae* by Graham (1991: 294).
Hosts. Lasiocampidae: *Malacosoma americanum.* Noctuidae: *Achatodes zeae.* Pyralidae: *Diatraea crambidoides, Ostrinia nubilalis.* Sesiidae: *Sanninoidea exitiosa.* Tortricidae: *Grapholita molesta.* Braconidae: *Microplitis gortynae.*

orgyiae see *clisiocampae*

orgyiazele see *clisiocampae*

pulchricornis (Gahan). *Apterolophus pulchricornis* Gahan, 1919a: 3–4 [USNM]. Transferred to *Tetrastichomyia* by LaSalle and Schauff (1990: 284).
Hosts. Unknown; taken sifting litter in tree hole.

silvensis Girault. *Tetrastichomyia silvensis* Girault, 1916[300]: 111 [USNM]. Transferred to *Miotropis* by Peck (1951: 455); to *Syntomosphyrum* by Burks (1967a: 229); to *Tetrastichomyia* by LaSalle and Schauff (1990: 284).

Genus *TETRASTICHUS* Haliday
(Figs 43, 135)

Tetrastichus Haliday, 1844: 297.
Type species *Cirrospilus attalus* Walker [= *Eulophus miser* Nees] (monotypy).
See Graham (1991: 205–206) for a complete list of extralimital synonyms.

Diagnosis. Submarginal vein with 1 dorsal seta (Fig. 135). Propodeum (Fig. 43) with a characteristic carina in the shape of an inverted Y (formed by the paraspiracular carina and an additional carina running posteromedially from the paraspiracular carina); median panels of the propodeum generally reticulate. Outer surface of the hind coxa usually with strong reticulation. Body usually black to dark or bright metallic, generally without light coloration.

Discussion. Until very recently (Graham, 1987, 1991; Bouček, 1988a) *Tetrastichus* had been considered to be a very large genus which contained most of the species in the Tetrastichinae. In its restricted sense, as used by the above authors and in this paper, it is the third largest genus of Tetrastichinae behind *Aprostocetus* and *Baryscapus.*

The generic limits of *Tetrastichus* are not always clear. Species of *Tetrastichus* can generally be defined by two characters: a single dorsal setae on the SMV, and the inverted Y-shaped carina on the propodeum. However, the Asian species *T. howardi* (Olliff) and *T. inferens* Yoshimoto both have two dorsal setae on the SMV, and at least one Southeast Asian species has several (3 or 4) setae on the SMV.

Also, the relationship of *Tetrastichus* to certain other genera still needs study. For example, both *Chaenotetrastichus* and *Chytrolestes* have a single seta on the SMV and some form of a Y-shaped carina on the propodeum. They are considered as distinct on the basis of several characters in which they differ from *Tetrastichus*, but future study may show that they should be considered as aberrant members of this genus.

Distribution. All continents.

Biology and hosts. Species attack a variety of hosts, including Coleoptera, Hymenoptera, Diptera and Lepidoptera. The North American *T. polynemae* (Ashmead) has been recorded as a hyperparasitoid in dragonfly eggs, and the Neotropical *T. periplanetae* attacks cockroach oothecae.

Biological control. Several species of *Tetrastichus* have been used in biological control projects in the New World, including: *T. coerulus* against *Crioceris asparagi*; *T. giffardianus* against a variety of fruitfly species; *T. howardi* against *Diatraea* spp.; *T. julis* against *Oulema melanopus*; and *T. spirabilis* against *Hypsipyla grandella.*

Other New World species. Most of the species listed as belonging to *Tetrastichus* by De Santis (1967, 1979–1981, 1989) would now be considered as belonging to different genera, and several of them have already been transferred from this genus (LaSalle and Schauff, 1992). Other New World species which are presently known to belong to *Tetrastichus* in its restricted sense are: *incongruus* Ashmead, *nigriscapus* (Howard), *periplanetae* Crawford, and the introduced *giffardianus* Silvestri, *howardi* (Olliff) and *spirabilis* Waterston.

North American species

aeneoviridis (Girault). *Trichaporus aeneoviridis* Girault, 1912[106]: 75 [INHS]. Transferred to *Tetrastichus* by Burks (1943: 547).

Hosts. Syrphidae: unknown puparia.

agrili Crawford. *Tetrastichus agrili* Crawford, 1914: 181 [USNM].

Hosts. Buprestidae: *Agrilus sinuatus.*

asparagi see *coeruleus*

auplopus Burks. *Tetrastichus auplopus* Burks, 1963: 55 [USNM].

Hosts. Pompilidae: *Auplopus* sp.

byersi Burks. *Tetrastichus byersi* Burks, 1963: 53 [USNM].

Hosts. Tipulidae: *Dolichopeza americana, D. walleyi.*

cincinnatus (Girault), **comb. n.** *Neomphaloides cincinnatus* Girault, 1917[323]: 92 [USNM]. Transferred to *Aprostocetus* by Peck (1951: 451).

clito (Walker). *Cirrospilus clito* Walker, 1839f: 30. Transferred to *Tetrastichus* by Walker (1848: 147). Adventive from Europe.

Hosts. Chrysomelidae: *Cassida rubiginosa.* Additional extralimital hosts given by Domenichini (1966b: 25), Graham (1991: 269).

coelioxydis (Burks), **comb. n.** *Aprostocetus coelioxydis* Burks, 1967b: 758 [USNM].
Hosts. Megachilidae: *Coelioxys* sp. (parasitic on *Megachile brevis*).

coeruleus (Nees). *Eulophus coeruleus* Nees, 1834: 174 [UMO].
= *Tetrastichus asparagi* Crawford, 1909: 150 [USNM]. Synonymy by Graham (1987: 11).
Hosts. Chrysomelidae: *Crioceris asparagi.*

euplectri Gahan. *Tetrastichus euplectri* Gahan, 1914: 167 [USNM].
Hosts. Braconidae: *Meteorus* sp. Eulophidae: *Euplectrus platyhypenae.*

hylotomae see *trisulcatus*

johnsoni Ashmead. *Tetrastichus johnsoni* Ashmead, 1896: 233 [USNM].
Hosts. Pompilidae: *Dipogon sayi, Phanagenia bombycina.*

julis (Walker). *Cirrospilus Julis* Walker, 1839b: 354 [BMNH]. Transferred to *Tetrastichus* by Domenichini (1966a: 90).
= *Cirrospilus Tulis*[!] Walker, 1839a: 333. This misspelling used until corrected by Graham (1961b: 38).
See Graham (1991: 235) for further, extralimital synonymies.
Introduced from Europe.
Hosts. Chrysomelidae: *Oulema melanopus.* Additional extralimital hosts given by Domenichini (1966b: 36).

ovipransus Crosby and Leonard. *Tetrastichus ovipransus* Crosby and Leonard, 1917: 368 [CU].
Hosts. Chrysomelidae: *Blepharida rhois* eggs.

paracholus Burks. *Tetrastichus paracholus* Burks, 1943: 551 [USNM].
Hosts. Gelechiidae: *Gnorimoschema gallaesolidaginis.*

polynemae Ashmead. *Tetrastichus polynemae* Ashmead, 1900c: 616 [USNM].
Hosts. Lestidae: *Lestes* sp. Mymaridae: *Polynema needhami.*

pompilicola Graham. *Tetrastichus pompilicola* Graham [in Lindroth and Graham], 1960: 94–97 [CNC].
Hosts. Pompilidae: *Anoplius nigerrimus.*

productus Riley. *Tetrastichus productus* Riley, 1885: 419 [USNM].
Hosts. Cephidae: *Janus abbreviatus.*

scolyti Ashmead. *Tetrastichus scolyti* Ashmead, 1894b: 343 [USNM].
Hosts. Scolytidae: *Scolytus rugulosus.*

scriptus Burks. *Tetrastichus scriptus* Burks, 1943: 550 [USNM].
Hosts. Questionably recorded from *Euplectrus* sp. [Eulophidae].

semideae (Packard). *Eulophus semideae* Packard, *in* Scudder, 1874: 347 [MCZ]. Transferred to *Tetrastichus* by Henshaw (1887: 43).
Hosts. Satyridae: *Oeneis melissa.*

tibialis (Ashmead). *Tetrastichodes tibialis* Ashmead, 1894b: 344 [USNM]. Transferred to *Tetrastichus* by Girault (1916[289]: 35).
Hosts. Braconidae: *Apanteles* sp. Encyrtidae: *Homalotylus* sp. Ichneumonidae: *Olesicampe* sp.

trisulcatus Provancher. *Tetrastichus trisulcatus* Provancher, 1887: 211 [CNC].
= *Hyperteles hylotomae* Ashmead, 1888: 105 [USNM].
Hosts. Argidae: *Arge pectoralis, A. scapularis, Arge* sp.

tulis see *julis*

Genus *THRIPASTICHUS* Graham
(Figs 87, 88, 140)

Thripastichus Graham, 1987: 26.
Type species *Tetrastichus gentilei* Del Guercio (original designation).

Diagnosis. Submarginal vein of fore wing with 2 dorsal setae which are fairly close to each other near the middle of the vein (Fig. 140). Ovipositor sheaths short, concealed. Gaster distinctly narrowed at base (Fig. 88), and with dorsal, subbasal pale spot; petiole small but visible. Propodeum (Fig. 88) large, smooth, without median carina and with entire rim of spiracle exposed. Parasite of thrips.

Discussion. Graham (1991: 296) mentioned that this genus was not closely related to any other European genus, and the same can be said for North America. It is readily recognizable on the basis of the characters given in the key and the diagnosis. It is not clear where its closest relatives might be, as the extent of its current distribution that is due to man's activities is not known.

The median line on the mesoscutum and the submedian lines on the scutellum are variable in this species. They can range from being present and distinct (the usual state) to being completely absent (as in Fig. 87).

Distribution. Widely distributed throughout the world (Holarctic, Neotropical and Indomalaya), although how much of this is due to introduction is not known.

Biology and hosts. Known to attack a variety of thrips in the family Phaleothripidae.

Biological control. The single known species, *T. gentilei*, has been introduced into the New World as a natural enemy of *Gynaikothrips ficorum* (laurel thrips).

Notes and recent literature. This genus was described by Graham (1987) and subsequently mentioned by Bouček (1988a) and Graham (1991).

North American species

gentilei (Del Guercio). *Tetrastichus Gentilei* Del Guercio, 1911: 222–227.
= *Tetrastichus thripophonus* Waterston, 1923: 453 [BMNH].
= *Tetrastichus tatei* Dozier, 1937: 129 [USNM].
Further extralimital synonyms given by Graham (1991: 296).
Hosts. Phlaeothripidae: *Gynaikothrips ficorum*, *G. uzeli*, *Hoplothrips pedicularis*, *Liothrips laureli*, *L. oleae*, *L. urichi*.

tatei see *gentilei*

thripophonus see *gentilei*

Unplaced genus

Genus *THYMUS* Girault

Thymus Girault, 1916[268]: 113.
Type species *Encyrtus albocinctus* (Ashmead) [= *Eupelmus albocinctus* Ashmead] (original designation).

Thymiscus Ghesquiere, 1946: 37.
New name unnecessarily proposed for *Thymus*.

Unplaced species

acutus Ashmead. *Tetrastichus acutus* Ashmead, 1886: 134 [type lost].

alaskensis Ashmead. *Tetrastichus alaskensis* Ashmead, 1902a: 146 [?type lost].

albocinctus Ashmead. *Eupelmus albocinctus* Ashmead, 1885: xvi [USNM]. Types unrecognizable.

Hosts. Cynipidae: unknown gall on *Quercus nigra.*

compsivorus Crawford. *Tetrastichus compsivorus* Crawford, 1914: 180–181 [USNM]. Types unrecognizable.

Hosts. Curculionidae: *Compsus auricephalus.*

flavipes Ashmead. *Tetrastichus flavipes* Ashmead, 1886: 135 [type lost].

Hosts. Cynipidae: *Disholcaspis quercusvirens.*

flavopictus Ashmead. *Ceranisus flavopictus* Ashmead, 1887: 202 [type lost].

saundersii Packard. *Eulophus Saundersii* Packard, 1881: 34 [MCZ]. Transferred to *Tetrastichus* by Henshaw (1887: 43). Types unrecognizable.

Hosts. Lycaenidae: *Strymon edwardsii, S. falacer.*

Misidentified species. The following two species have been recorded from North America by Burks (1979), but examination of the specimens in the USNM upon which these records are based shows that they are misidentifications. It is important to point this out, because both these species have since been transferred (by Graham, 1987) to genera other than *Tetrastichus*, which are not known to occur in North America.

Sigmophora brevicornis (Panzer).

Cited as *Tetrastichus brevicornis* by Burks (1979: 992). Not known from North America.

Holcotetrastichus rhosaces (Walker).

Cited as *Tetrastichus rhosaces* by Burks (1979: 1000). Not known from North America.

Removed from Tetrastichinae

The genus *Winnemana* (type species, and only included species, *W. argei*) had been placed in the Tetrastichinae (Peck, 1951, 1963; Burks, 1979), but it has since been removed to the Eulophinae where it has been synonymized with *Cirrospilus* (Graham, 1975).

Description of new species

The species treated below will all be recognizable from the descriptions, diagnoses and key given in the generic section, or in keys provided in the following section (or, in one case, through reference to previously published work). For this reason, descriptions are kept quite brief, and are provided simply to augment the information which has already been given, discuss any variation, and give type information. When a species being described is the only known member of a genus, the description is kept to colour and any variation; when it is being described in a genus with other known species sufficient characters are given to distinguish it from those other species.

Aprostocetus (Quercastichus) burksi sp. n.

This species has been repeatedly treated in the literature as *pattersonae* (Burks, 1943, 1963, 1979; Peck, 1951, 1963). It was described and diagnosed sufficiently by Burks (1943: 563–564: as *pattersonae*) and differentiated from other members of this genus by Burks in a key (1943: 515; key couplets 50–51: as *pattersonae*) and in the descriptions of *politi* (Burks, 1963: 48; as *pattersonae*) and *garryana* (Burks, 1963: 49; as *pattersonae*). In the absence of a revision of this genus, further description or diagnosis is not necessary, and reference to the above works may serve to validate this name. A combination of characters that will serve to separate this species from other *Quercastichus* is: malar sulcus with a distinctly developed fovea below eye; rows of setae representing basal and cubital veins complete basally and meeting below the submarginal vein; gaster acute apically.

This species was misidentified by Burks (1943) as *Tetrastichus pattersonae* Fullaway (at the time Fullaway's types were presumed to be lost). Examination of *pattersonae* types in LACM revealed that what Burks (1943, 1963) treated as *spilopteris* is *pattersonae* Fullaway, and *pattersonae sensu* Burks is the species here described as *burksi*. To ensure that the current concept of *burksi* matches what Burks treated as *pattersonae*, I have chosen the holotype for *burksi* from material examined by Burks and determined by him as *pattersonae*. I have seen material definitely attributable to this species only from California.

Hosts and biology. From galls of Cynipidae. Recorded hosts are *Antron quercusechinus*, *Callirhytis quercuspomiformis*, *Disholcaspis chrysolepidis*.

Material examined. HOLOTYPE ♀, USA, CA, Berkeley, 26.i.1923, C. T. Dodds (USNM).

Nine ♀ paratypes. CA: as holotype but 22.i.1923 (2♀ USNM); Los Altos, 18.v.1922, E. O. Essig (4♀ USNM, 1♀ BMNH, 1♀ CNC); Kern Co., 15 mls SE Maricopa, Marian Campground, 7000 ft., 25.vi.1987, D. B. Wahl (1♀ LAS).

Apterastichus oculatus sp. n.

(Figs 22, 23)

Female. Length 1·05–1·3 mm. Head and body a golden yellow to brown; head somewhat lighter in colour than mesosoma and gaster. Gaster generally darker than mesosoma; each gastral tergite with a transverse band at posterior margin which is darker than the remainder of the tergite. Antenna light brown to brown; although apex of club slightly paler than remainder of antenna. At least fore and hind coxa, and sometimes middle coxa, pale yellow or white. Legs honey yellow; tarsi light yellow.

Male. Unknown.

Hosts and biology. Unknown.

Material examined. HOLOTYPE ♀: USA, FL, Monroe Co., Big Pine Key, Watson's Hammock, 1.viii–17.ix.1985. S. and J. Peck (CNC).

Twelve ♀ paratypes (all USA, FL, Monroe Co.). As holotype (1♀ CNC, 1♀ USNM); as holotype but 31.viii–9.xii.1986 (2♀ CNC); Sugarloaf Key, Kitching's, 26.ii–6.vi.1986 and 3.v–3.viii.1985, S. and J. Peck (2♀ CNC, 1♀ BMNH, 1♀ LAS); Sugarloaf Key, SE$\frac{1}{4}$ S23, 6.vi–29.viii.1986, S. and J. Peck (1♀ CNC); Bahia Honda Key, 13–15.xii.1986, Klimaszewski and Peck (1♀ CNC); Key Largo, Pennekamp St. Pk., 1986, S. and J. Peck (2♀ CNC).

Careostrix yoshimotoi sp. n.

(Figs 36, 37, 134)

Female. Length 0·08–1·2 mm. Head brown to dark brown. Mesosoma with pronotum brown to dark brown; mesoscutum dark brown (and occasionally with a slight metallic tint) to light brown; scutellum, propodeum and mesopleuron light brown to yellow. Gaster brown to dark brown, may be lighter brown basally. Antenna with scape and pedicel white or very light yellow, in distinct contrast to the dark brown flagellum. All coxae white; legs yellow. Setae on mesoscutum yellow, the seta at each hind corner somewhat stronger and black. Wings hyaline, veins light brown.

Male. Length 0·7–0·9 mm. Similar in coloration to the female, except the antenna is a uniform light brown in colour. The scape and pedicel may be somewhat lighter in colour than the flagellum, but never in such distinct contrast as in the female.

Discussion. There is a good deal of variation in colour, particularly in the mesosoma. However, the relative coloration of various structures appears constant. For example, the head is always the darkest of all body parts. The pronotum is as dark as the head or somewhat lighter. The mesoscutum, which can range from very dark brown to honey yellow, is always lighter than the pronotum, but darker than the scutellum, propodeum and mesopleuron (which are usually the same in colour). A slight metallic shine may be present on the darker-coloured parts, particularly on the mesoscutum when that sclerite is darkened.

This species is known only from Florida, except for a single specimen each from Washington and Michigan. The scutellum, which is light yellow to honey yellow in all other specimens, is dark in the specimen from Michigan and concolorous with the mesoscutum (although it is normal colour in the specimen from Washington).

Hosts and biology. Unknown.

Material examined. HOLOTYPE ♀: USA, FL, Monroe Co., No Name Key, 3.vi–27.vii.1986, S. and J. Peck (CNC).

Forty-seven ♀, 12♂ paratypes (all USA, FL, Monroe Co., collected by S. and J. Peck). No Name Key, 4.iii–29.iv.1985 (4♀1♂ CNC, 4♀2♂ USNM, 2♀ TAMU); No Name Key, 4.v–4.viii.1985 (3♀ CNC); No Name Key, 3.viii–18.xi.1985 (3♀ CNC, 2♀ UCR, 2♀ UCD); No Name Key, 19.xi.1985–26.ii.1986 (1♀1♂ CNC); No Name Key, 23.ii–3.vi.1986 (3♀ CNC); No Name Key, 3.vi–27.viii.1986 (1♀1♂ CNC, 4♀ BMNH); No Name Key, 28.viii–13.xii.1986 (3♀3♂ CNC, 2♂ BMNH, 2♀1♂ LAS); N. Key Largo, Sec. 35, 4.iii–28.iv.1985 (1♂ CNC); N. Key Largo, Sec. 35, 4.v–4.viii.1985 (2♀ CNC); N. Key Largo, Sec. 35, 1.viii–16.xi.1985 (1♀ CNC); Key Largo, Pennekamp St. Pk., 22.ii–2.vi.1986 (2♀ CNC); Key Largo Key, 1.viii–16.xi.1986 (2♀CNC); Big Pine Key, Watson's Hammock, 3.v–3.viii.1985 (3♀ CNC); Big Pine Key, Cactus Hammock, 30.vii–17.xi.1985 (1♀ CNC); Fat Deer Key, 4.v–4.viii.1985 (1♀ CNC); Torch Key, SW$\frac{1}{4}$ Sec 12, 4.iii–29.iv.1985 (1♀ CNC).

Non-type material. USA, MN, Livingston Co., E. S. George Reserve, 13.viii.1949, K. Bohnsack, 131A (1♀ USNM); USA, WN, Pend Oreille Co., Tiger, 10 mls S Hwy 20, 25.vii.1985, Finnamore and Thormin (1♀ CNC).

Etymology. During the final stages of this study I was given a large series of this species by Dr C. M. Yoshimoto, who had also recognized them as representing a new genus and species. I am taking this opportunity to name this species in honour of my colleague, Carl Yoshimoto.

Chytrolestes alibaba sp. n.

(Figs 38–42)

Female. Length 1·1–1·35 mm. Head and body uniformly dark metallic green. Antenna with scape dark yellow, pedicel and flagellum dark brown. Coxae and femora concolorous with body, although femora with apex dark yellow; tibiae and tarsi dark yellow except for 4th tarsal segment which is brown. Setae on head and body (which appear white in photomicrographs) black and strong. Wings hyaline; veins light brown; the single seta on the SMV and one seta on the parastigma strong and black (like the setae on the body).

Male. Unknown.

Discussion. I am describing this species from a series reared from the pot-shaped mud nests of a pompilid in Kansas, USA. The only other specimen represents quite an increase in distribution and was collected in Quebec, Canada.

Hosts and biology. Reared from the mud nests of *Phanagenia bombycina* [Pompilidae]. A lycosid spider (♀ *Schizocosa* sp., det. B. Cutler) was found in the cells as provision for the pompilid.

Material examined. HOLOTYPE ♀: USA, KS, Douglas Co., Fitch Natural History Reserve, 9.viii.1991, H. Guarisco, ex. mud nests of *Phanagenia bombycina* [Pompilidae], T12S R20E S4 [USNM].

Thirty-five ♀ paratypes: same data as holotype [15♀ USNM, 5♀ SMEK, 3♀ each: BMNH, CNC, LAS; 2♀ each: TAMU, UCD, UCR].

Non-type material. Canada, Quebec, Gatineau Park, Luskville Falls, vii.1986, J. Denis and L. Dumouchel, 1♀ (CNC).

Comastichus zopheros sp. n.

(Figs 72, 73)

Female. Length 0·85–1·6 mm. Head and body dark brown to black. Antenna light brown to dark brown. Coxae and femora dark brown to black; femora usually yellow at extreme apex. Tibiae mostly brown, although yellow basally, and more apically; the extent of the yellow colour variable. Tarsi brown. Wings hyaline, veins brown. Setae on body brown to light brown.

Small specimens may only have 4–5 pairs of setae on the scutellum; however, there are generally 12–20 setae on each side.

Male. Unknown.

Discussion. The distribution of this species (Costa Rica, Michoacan, FL, DC) indicates that it is probably rather widespread, and might be fairly common when these regions are better collected. I can find no differences to indicate that there is more than a single widespread species involved; however, I have restricted the type series to specimens from Costa Rica.

Hosts and biology. Presumably spider eggs. One series of this species from Costa Rica was reared from 'huevos de araña'.

Material examined. HOLOTYPE ♀: **Costa Rica**, Guanacaste, Santa Rosa NP, Hacienda 1-O, 4–24.v.1986, D. H. Janzen and I. D. Gauld (BMNH).

Nine ♀ paratypes. As holotype but Hacienda 4-C, 13.iv–4.v.1986 (1♀ BMNH); as holotype but San Emilio 6-C, 10–31.i.1987 (1♀ BMNH); as holotype but San Emilio 6-C, 31.i–21.ii.1987 (1♀ USNM); **Costa Rica**, San José, 25.vi.1987, 'huevos de araña' (2♀ MUCR, 2♀ INBIO, 1♀ BMNH, 1♀ USNM).

Non-type material. **USA**: FL, Monroe Co., No Name Key (19.xi.1985–25.ii.1986), (23.ii–3.vi.1986), and (3.viii–18.xi.1986). S. and J. Peck (3♀ CNC, 1♀ LAS); FL, Monroe Co., Torch Key, SW$\frac{1}{4}$ S12, 1.ix–15.xii.1986, S. and J. Peck (1♀ CNC); FL, Dade Co., Chekika St. Rec. Area, 50 km SW Miami, 1.v–2.viii.1986, S. and J. Peck (1♀ LAS). **Mexico**: Michoacan, 3 km NW Periban, 11.ii.1989, D. Hollis (1♀ BMNH).

Cucarastichus texanus sp. n.

(Figs 34, 35)

Female. Length 1·2–1·6 mm. Head and mesosoma uniformly very dark brown to black; gaster brown, may have a lighter spot on the basal tergite(s). Antenna with scape and pedicel yellow, flagellum brown. Coxae white; legs entirely yellow. Fore wing very lightly and evenly infuscate except for the extreme base, which is hyaline; veins brown.

Male. Unknown.

Hosts and biology. This species is a hyperparasitoid of *Anastatus tenuipes* [Eupelmidae] in the oothecae of the brown-banded cockroach, *Supella longipalpa* [Blattellidae]. It is apparently specific to this host cockroach, and fairly specific to *A. tenuipes*, although it will occasionally develop on *Comperia merceti* [Encyrtidae]. Type material came from a culture maintained at TAMU, although the culture was started from field collected adults from College Station, Texas. (Biological information from B. M. Pawson, 1993, personal communication.)

Material examined. HOLOTYPE ♀: TX, Brazos Co., College Station, 14.xi.1992, B. M. Pawson, ex. *Anastatus tenuipes* in oothecae of *Supella longipalpa* (USNM).

Forty-four ♀ paratypes. As holotype (20♀ USNM, 8♀ TAMU. 4♀ each: BMNH, CNC, LAS. 2♀ each: UCD, UCR).

Dapsilothrix jeanae sp. n.

Female. Length 1·45–1·65 mm. Head with vertex metallic blue to green, remainder of head yellow. Mesosoma bright metallic blue to green. Gaster yellow to brown dorsally, although with a darker transverse stripe at the posterior margin of each tergite; yellow ventrally. Antenna, coxae and legs yellow. Ovipositor sheaths yellow, brown apically. Head and body with white to yellow setae, which are particularly distinct on the vertex and dorsum of mesosoma. Wings hyaline, veins brown.

Male. Unknown.

Discussion. As with some other species, *D. jeanae* probably has a wide distribution, but is presently only known from Texas and the tip of Baja California. Only the Texas specimens are included as types.

Hosts and biology. Unknown.

Material examined. HOLOTYPE ♀: **USA**: TX, Culberson Co., 3·6 mls S Pine Springs, old Guadalupe Pass Rd., nr. Guadalupe Springs, 5200′, 20–22.vii.1982, G. A. P. Gibson (CNC).

One ♀ paratype. **USA**, TX, Brewster Co., Big Bend Natl. Pk., 2·7 km NE Castalon, 760 m, 14.vii.1982, G. Gibson (CNC).

Non-type material. **Mexico**, Baja California Sur, Las Barracas, ~ 30 km E. Santiago, May 1989, P. H. DeBach (USNM).

Etymology. This species is named for my mother, Jean LaSalle.

Genus *ERIASTICHUS*

Three species of *Eriastichus* are described in this paper. Only one is North American; two new Neotropical species are also described to make their names available and to record this genus from the Caribbean and Central and South America.

Key to species of *Eriastichus*

1 Scutellum with only two or three pairs of setae (Fig. 27) . . . . ***cigdemae* sp. n.**

1′ Scutellum with many setae on each side (Fig. 30) 2

2 Propodeum bare medially, setae confined to sides (as in Fig. 27). Postcercale longer than wide (as in Fig. 28). Hypopygium extending distinctly less than half the length of the gaster. Pronotum entirely dark, concolorous with the mesoscutum . . . . ***nakos* sp. n.**

2′ Entire propodeum covered with setae, without a medial bare area (Fig. 30). Postcercale wider than long (Fig. 31). Hypopygium extending over half the length of gaster. Pronotum generally with at least some lighter (yellow to brown) coloration, in contrast to dark mesoscutum . . . . . ***masneri* sp. n.**

Eriastichus cigdemae sp. n.

(Figs 26–28, 133)

Female. Length 1·2–1·8 mm. Head dark brown, may have some metallic shine; lower face light brown to yellow. Mesosoma dark brown to black, may have a metallic shine; dorsellum generally somewhat lighter than remainder of mesosoma. Gaster brown. Antenna with scape and pedicel from dark yellow to brown, flagellum brown. Coxae yellow; hind coxa may be darkened basally and/or dorsally. Legs yellow; femora may be somewhat darkened. Wings very lightly and evenly infuscate; veins brown. Setae on mesoscutum and propodeum light brown to whitish; those on the scutellum and the posterior large pair on the mesoscutum dark brown.

Scutellum with only two or three pairs of setae. Propodeum bare medially, with the setae confined to the sides. Postcercale longer than wide. Hypopygium extending about half the length of gaster.

Male. Length 1·1–1·35 mm. Similar in colour to female, except scape yellow with dark brown to black ventral plaque, pedicel and flagellum light brown.

Discussion. There is some variation in these species. The holotype, and the majority of the paratypes, have the metapleuron bare. The specimen from Texas, and three of the seven specimens from Campeche, have the metapleuron densely covered with short fine setae (the same as on the callus). I have decided not to treat this as a specific difference at this point, because this is the only difference I noticed, and it varies even with specimens from the same locality (Campeche).

Hosts and biology. Unknown.

Material examined. HOLOTYPE ♀, **Mexico**, Oaxaca, 8 mls NE El Punto, 18.vii.1985, J. Woolley and G. Zolnerowich, 85/074 (USNM).

Eight ♀, 3♂ paratypes. **Mexico**, Campeche, 20 km N. Escarcega, 25.vii.1984, G. Gordh (1♀2♂ USNM, 2♀1♂ UCR, 1♀ TAMU); **Mexico**, Chiapas, El Sumidero, 16–17 July, 1984, G. Gordh (1♀ USNM, 1♀ BMNH); **Costa Rica**, Chilamate, 16.viii.1986, R. K. Velten (1♀ USNM); **USA**, TX, San Jacinto Co., 5 km. S Coldspring, Double Lake Campground, 22–24.v.1983, M. Kaulbars (1♀, CNC).

Etymology. This species is named for my wife, Çiğdem.

Eriastichus masneri sp. n.

(Figs 29–31)

Female. Length 1·25–1·8 mm. Head and mesosoma black with dark green metallic shine; except pronotum, at least laterally and ventrally, brown to light brown or yellow. Gaster brown, may be yellow apically. Antenna with scape and pedicel yellow (to brown), flagellum brown. Coxae and legs yellow. Wings very lightly and evenly infuscate; veins brown. Setae on mesoscutum and scutellum light brown; those on propodeum whitish.

Scutellum with many (12–16) setae on each side. Propodeum completely covered with setae, without a medial bare area. Postcercale wider than long. Hypopygium extending over half the length of gaster.

Male. Unknown.

Hosts and biology. Unknown.

Material examined. HOLOTYPE ♀, **Dominican Republic**, Barahona, Sierra de Bahoruca, Loma Remigio, cloud forest, 800 m, 23.iii.1991, L. Masner (CNC).

Five ♀ paratypes. **Dominican Republic**, Barahona, Sierra de Bahoruca, Alcoa Rd., 25 km, 18.i.1989, L. Masner (3♀ CNC, 1♀ BMNH, 1♀ USNM).

Etymology. This species is named for my friend and colleague, Lubomir Masner, for his dedication and many innovative contributions to the study of parasitic Hymenoptera.

Eriastichus nakos sp. n.

Female. Length 2·5–2·6 mm. Head and mesosoma dark brown to black with dark green metallic shine. Gaster brown. Antenna brown, scape ventrally yellow. Coxae and legs yellow; coxae basally and femora may be somewhat darkened. Wings very lightly and evenly infuscate; veins brown. Setae on mesosoma light brown to yellow or whitish.

Scutellum with many (> 25) setae on each side. Propodeum bare medially, with the setae confined to the sides. Postcercale longer than wide. Hypopygium extending distinctly less than half the length of gaster.

Male. Unknown.

Discussion. The paratype differs from the holotype in having the dorsellum brown (lighter in colour than the rest of the mesosoma); in the holotype the dorsellum is metallic black. The mesosomal setae seem generally lighter in colour on the holotype (yellow to white); whereas they are light brown to yellow on the paratype. It is difficult to assess the meaning of this variation with only two specimens.

Hosts and biology. Unknown.

Material examined. HOLOTYPE ♀, **Dominican Republic**, Barahona, Sierra de Bahoruca, Alcoa Rd., 25 km, 18.i.1989, L. Masner (CNC).

One ♀ paratype. **Ecuador**, Sta. Euela, ii.1983, M. Sharkey (CNC).

Exalarius huachucensis sp. n.

Female. Length 0·95 mm. Head and mesosoma dark brown to black; gaster light brown to yellow, except extreme apex and ovipositor sheaths brown. Coxae and legs yellow. Mesosomal setae dark brown to black.

Male. Unknown.

Hosts and biology. Unknown.

Material examined. HOLOTYPE ♀: AZ, Santa Cruz, Co., ~ 3·5 mls S Elgin, 9.viii.1988, L. Drake (USNM).

This species known only from the holotype.

Exastichus odontos sp. n.

Female. Length 1·15–1·3 mm. Head, mesosoma and gaster uniformly dark brown, except dorsellum lighter brown. Mandible light brown, apex dark brown. Antenna brown. Coxae brown. Femora and tibiae brown, except extreme base and apex yellow. Tarsi yellow, except segment 4 (and sometimes 3) brown. Wings hyaline, veins brown. Setae on mesosoma and gaster light brown.

Male. Unknown.

Hosts and biology. Unknown.

Material examined. HOLOTYPE ♀, USA, CA, San Diego Co., 11 mls E Temecula, 3.iv.1981, S. Frommer (USNM).

Two ♀ paratypes. As holotype (1 ♀ USNM). USA, CA, Tulare Co., Ash Mtn. Pwr. Sta. n. 3, 5.iii.1983, J. A. Halstead (1 ♀ CNC).

Hadrotrichodes waukheon sp. n.

Female. Length 1·3–1·65 mm. Head, mesosoma, gaster, antenna, coxae and legs black to dark brown. Tarsal segments 1–2 may be yellow. Wings hyaline, veins brown. Setae on mesosoma ranging from black to light brown.

Male. Unknown.

Hosts and biology. Unknown.

Material examined. HOLOTYPE ♀: USA, CA, Kern Co., 18 mls SE Maricopa, Marion Campground, 7000 ft, 25 June 1987, D. B. Wahl (USNM).

One ♀ paratype. USA, CA, Argus Mountains [probably Inyo or San Bernardino Co.], May 1891 (1 ♀ USNM).

Kostjukovius grahami sp. n.

Female. Length 1·0–1·5 mm. Head, mesosoma and gaster brown. Antenna brown to light brown, scape yellowish ventrally. Coxae brown. Femora brown medially, yellow basally and apically. Tibiae and tarsi yellow, except last tarsal segment brown. Wings hyaline, veins light brown. Setae on mesosoma light brown.

Frons with frontofacial sutures widely separated dorsally, with the outer arms extending to lateral of the lateral ocellus and enclosing a triangular median area. Submedian lines on scutellum present and distinct. Antenna with F2 and F3 approximately equal in length and width, F1 from slightly longer than wide to approximately equal in length and width.

Male. Unknown.

Discussion. Graham (1991: 168) referred briefly to this species, and took it into account in preparing his generic diagnosis for *Kostjukovius* (Graham, 1991: 167–168, as indet. sp.).

There is presently only one other species of the genus *Kostjukovius*, the European *K. platycephalae* (Kostjukov) (see Graham, 1991, for a discussion of this species). *K. grahami* differs from *platycephalae* in two rather important characters: the shape of the frontofacial sutures and the presence of submedian lines on the scutellum. In *grahami* the frontofacial sutures are widely separated dorsally, with the outer arms extending lateral to the lateral ocellus and enclosing a triangular median area; and the submedian lines on the scutellum are present and distinct. In *platycephalae* the frontofacial sutures are narrowly separated dorsally, with both arms extending to very near the median ocellus and enclosing a distinctly linear area; and there are no submedian lines on the scutellum.

An additional character to separate these species is that in female *platycephalae* all funicular segments are distinctly wider than long, while in *grahami* the segments are generally quadrate, or F1 may even be slightly longer than wide.

Hosts and biology. Unknown; however, label data indicate that this species associated with pine cones, perhaps as a parasitoid of *Dioryctria* [Pyralidae] or a cecidomyiid.

Material examined. HOLOTYPE ♀, **USA**, ID, Bonner Co., 16.ix.1967, J. W. Dale, cones of *Pinus ponderosa* (USNM).

Two ♀ paratypes. **USA**, GA, Clarke Co., 30.vi.1969, H. Yates, parasite of cecidomyiid in pine cones (1 ♀ USNM); **USA**, AR, Lafayette Co., 29.vi.1967, I. Brown, *Dioryctria* on loblolly pine (1 ♀ USNM).

Etymology. It is my pleasure to name this species for Marcus Graham, who has

contributed so much to the study of Tetrastichinae, and helped me in so many ways during the present study.

Mesofrons villosus sp. n.

Female. Length 1·3 mm. Head, mesosoma, gaster, antenna, coxae and legs (including tarsi) all brown; the head and mesosoma slightly darker than the other parts. Wings very lightly and evenly infuscate; veins brown. Setae on head and mesosoma. Setae on head light brown; on mesosoma light brown to dark brown.

Male. Unknown.

Discussion. The single known specimen for this species is not in excellent shape, and therefore not all characters are visible. In particular the propodeum is somewhat obscured by dirt, and several characters are not clearly visible (and thus omitted from the description). Even though somewhat damaged and dirty, this specimen displays enough unique and diagnostic characters to indicate that it represents a readily distinguishable taxa.

Host and biology. Unknown.

Material examined. HOLOTYPE ♀: USA, OR, Linn-Lane Co., Andrews Exp. For., NE Blue River, 1.vii.1986, P. Hanson (1 ♀ USNM).

Oxypracetus opacus sp. n.

(Figs 63–66)

Female. Length 3·2–3·8 mm. Head, mesosoma and gaster black, except propodeum and petiole reddish brown. Antenna with scape yellow (darkened distally), pedicel and flagellum brown to black. Fore coxa black, middle and hind coxae reddish brown. Femora brown to reddish-brown; tibiae and tarsi yellow, but tarsal segment darkened. Wings hyaline, veins brown. Setae on head and mesosoma light brown.

Male. Length 2·5–2·75 mm. Coloration as in female.

Hosts and biology. Unknown. The paratype from Ohio bears the label '1658, Webster, Chlorops nigrata'; however there is no species of Chloropidae with the name *nigrata*, and it is thus not clear to what this label refers.

Material examined. HOLOTYPE ♀: USA, VT, Bennington Co., 5 mls E Arlington, 31.vii.1979, E. E. Grissell and M. E. Schauff (USNM).

Two ♀, 2♂ paratypes. As holotype (1 ♀ USNM); USA, MN, Midland Co., 28.vi.1958, R.&K. Dreisbach (1♂ USNM); OH [this specimen also bears the labels '1658, Webster, Chlorops nigrata' and 'Oxymorpha opaca ♂ Ash' (in Ashmead's handwriting)] (1♂ USNM); NE Massachusetts or S New Hampshire, summer 1967, D. J. Farish (1 ♀ USNM).

Genus *STYOTRICHIA*

Two species of *Styotrichia* are being described in this paper, both from the Southeastern USA.

Key to species of *Styotrichia*

1 All funicular segments at least slightly longer than wide. Mesosoma dark brown to black anteriorly, but scutellum, dorsellum propodeum and the sides and venter yellow to orange. SMV with 4 dorsal setae . . . . . ***bicolor* sp. n.**

1′ Not all funicular segments longer than wide; F3 wider than long, F1–F2 quadrate. Entire mesosoma dark brown to black. SMV with 2 dorsal setae . . ***quadrata* sp. n.**

Styotrichia bicolor sp. n.

Female. Length 1·0 mm. Head, pronotum and mesoscutum dark brown; scutellum, propodeum, mesopleuron yellow to orange. Gaster brown dorsally; with venter yellow or light brown apically except ovipositor sheaths which are brown. Scape and pedicel yellow, flagellum light brown. Coxae and legs entirely yellow. Wings hyaline, veins light brown. Setae on mesosoma dark brown.

All funicular segments at least slightly longer than wide. SMV with 4 dorsal setae.

Male. Unknown.

Hosts and biology. Unknown.

Material examined. HOLOTYPE ♀: USA, NC, Almance Co., 19.iv.1985, R. Ford (CNC).

Known only from the holotype.

Styotrichia quadrata sp. n.

Female. Length 1·2 mm. Head and mesosoma dark brown, gaster brown. Antenna with scape yellow (darkened dorsally), pedicel and flagellum brown. Coxae and femora brown; tibiae and tarsi yellow. Wings hyaline, veins light brown. Setae on mesosoma dark brown.

Antenna with F3 wider than long, F1–F2 quadrate. SMV with 2 dorsal setae.

Male. Unknown.

Discussion. In the unique holotype specimen, the right antenna has the first two funicular segments fused so that this antenna only has two funicular segments. The left antenna is normal.

Hosts and biology. Unknown.

Material examined. HOLOTYPE ♀: USA, FL, Monroe, Co., Sugarloaf Key, Kitching's 26.ii–6.vi.1986, S. and J. Peck (CNC).

Known only from the holotype.

Notes added in press

Two papers appeared while this paper was in press which to some extent affect the information presented in this paper, and should be at least briefly mentioned.

Doğanlar (1993a) synonymized the genera *Tetrastichomyia* Girault, 1916 and *Kolopterna* Graham, 1987 with *Sigmophora* Rondani, 1867. *Kolopterna* and *Sigmophora* are found in the Old World only, and these three genera were treated as separate and valid by Graham (1987, 1991). However, Doğanlar failed to provide conclusive evidence to support these synonymies. I do not agree with his synonymies, and continue to consider *Tetrastichomyia* as a valid genus as it is treated in this paper.

In a second paper, Doğanlar (1993b) described the new genus *Kocaagizus* from North America, with a single included species, *Kocaagizus pirireisi* Doğanlar, 1993b from New York. I have examined this species, and it does appear to represent a valid genus. It can best be distinguished from other North American tetrastichine genera by its extremely large mouth opening (about five times as wide as the malar space) and large mandible (Doğanlar, 1993b, Figs 1 and 2). Other than *Exastichus*, which has exodont mandibles, there are only a few aberrent species of *Baryscapus* (as yet undescribed) which also have such an enlarged mouth opening. *Kocaagizus* is similar to these species in having all the cercal setae subequal in length and straight or only slightly curved. However, *Kocaagizus* differs from these *Baryscapus* species in having: four funicular segments in the female, the first of which is distinctly smaller than the remaining three (Doğanlar, 1993b, Fig. 3); the propodeum with a raised

lobe of the callus which partially overhangs the spiracle, and the malar sulcus straight (as opposed to distinctly curved in the species of *Baryscapus* with an enlarged mouth opening).

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References

ASHMEAD, W. H., 1885, Studies on North American Chalcididae with descriptions of new species from Florida (Paper No. 5), *Transactions of the American Entomological Society*, **12,** x–xix. (In the Proceedings of the Monthly Meetings of the Entomological Section of the Academy of Natural Sciences, Philadelphia.)

ASHMEAD, W. H., 1886, Studies on the North American Chalcididae, with descriptions of new species from Florida (Paper No. 7), *Transactions of the American Entomological Society*, **13,** 125–135.

ASHMEAD, W. H., 1887, Studies on the North American Chalcididae, with descriptions of new species, chiefly from Florida, *Transactions of the American Entomological Society*, **14,** 183–203.

ASHMEAD, W. H., 1888, Descriptions of some new North American Chalcididae, *Canadian Entomologist*, **20,** 101–107.

ASHMEAD, W. H., 1892a. Notes on the genus *Melittobia, Proceedings of the Entomological Society of Washington*, **2,** 228–232.

ASHMEAD, W. H., 1892b, Discovery of the genus *Crataepus* Förster in America, and the description of a new species, *Canadian Entomologist*, **24,** 309–310.

ASHMEAD, W. H., 1894a, Descriptions of thirteen new parasitic Hymenoptera, bred by Prof. F. M. Webster, *Journal of the Cincinnati Society of Natural History*, **17,** 45–55.

ASHMEAD, W. H., 1894b, Descriptions of new parasitic Hymenoptera, *Transactions of the American Entomological Society*, **21,** 318–344.

ASHMEAD, W. H., 1894c, Report on the parasitic Cynipidae, part of the Braconidae, the Ichneumonidae, the Proctotrypidae, and part of the Chalcididae [of the Island of St. Vincent], *Journal of the Linnean Society of London*, Zoology, **25,** 61–78, 108–188, 188–254.

ASHMEAD, W. H., 1896, Descriptions of new parasitic Hymenoptera (Paper No. 2), *Transactions of the American Entomological Society*, **23,** 179–234.

ASHMEAD, W. H., 1898, Descriptions of five new hymenopterous parasites on *Canarsia hammondi* Riley, *Proceedings of the Entomological Society of Washington*, **4,** 124–131.

ASHMEAD, W. H., 1900a, Report on the aculeate Hymenoptera of the island of St. Vincent and Grenada, with additions to the parasitic Hymenoptera and a list of the described Hymenoptera of the West Indies, *Transactions of the Entomological Society of London*, **33,** 207–367.

ASHMEAD, W. H., 1900b, Order Hymenoptera, in J. R. Smith, *Insects of New Jersey, 27th Annual Report of the State Board of Agriculture*, 1899, Trenton (Supplement, 755 pp.), pp. 500–613.

ASHMEAD, W. H., 1900c, Some hymenopterous parasites from dragon-fly eggs, *Entomological News*, **11,** 615–617.

ASHMEAD, W. H., 1902a, Papers from the Harriman Alaska expedition. XXVIII. Hymenoptera, *Proceedings of the Washington Academy of Sciences*, **4,** 117–274.

ASHMEAD, W. H., 1902b, The hymenopterous parasites of *Phenococcus cavalliae*, CKll, *Canadian Entomologist*, **34,** 301–302.

ASHMEAD, W. H., 1904, Classification of the chalcid flies, or the superfamily Chalcidoidea, with descriptions of new species in the Carnegie Museum, collected in South America by Herbert H. Smith, *Memoirs of the Carnegie Museum*, **1,** i–xi, 225–551, pls xxxi–xxxix.

ASSEM, J. VAN DEN, 1975, Temporal patterning of courtship behaviour in some parasitic Hymenoptera, with special reference to *Melittobia acasta, Journal of Entomology* (A), **50,** 137–146.

ASSEM, J. VAN DEN, BOSCH, H. A. J. IN DEN and PROOY, E., 1982a, *Melittobia* courtship behaviour: a comparative study of the evolution of display, *Netherlands Journal of Zoology*, **32,** 427–471.

ASSEM, J. VAN DEN, GIJSWIJT, M. J. and NÜBEL, B. K., 1982b, Characteristics of courtship and mating behaviour used as classificatory criteria in Eulophidae-Tetrastichinae (Hymenoptera), with special reference to the genus *Tetrastichus* s.l, *Tijdschrift voor Entomologie*, **125,** 205–220.

ASSEM, J. VAN DEN and MAETA, Y., 1978, Some observations of *Melittobia* species (Hymenoptera, Chalcidoidea–Eulophidae) collected in Japan, *Kontyu*, ,**46,** 264–272.

BALDUF, W. V., 1929, *Tetrastichus verrucarii*, new species, a chalcid parasite of *Neuroterus* (Cynipidae) on bur oak, *Canadian Entomologist*, **61,** 221–222.

BALTAZAR, C. R., 1966, A catalogue of Philippine Hymenoptera (with a bibliography, 1758–1963), *Pacific Insects Monograph*, **8,** 1–488.

BOSCH, H. A. J. IN DEN and ASSEM, J. VAN DEN, 1986, The taxonomic position of *Aceratoneuromyia granularis* Domenichini (Hymenoptera: Eulophidae) as judged by characteristics of its courtship behaviour, *Systematic Entomology*, **11,** 19–23.

BOUČEK, Z., 1957, *Tetrastichus xanthomelaenae* (Rond.) soll *T. galerucae* (Fonsc.) heissen! (Hym., Chalc.), *Sborník entomologického oddělení Národního Musea v Praze*, **31,** 177–181.

BOUČEK, Z., 1966, Descriptions of three new reared Eulophidae (Hymenoptera) from Europe and Africa, *Acta entomologica bohemoslovaca*, **63,** 373–379.

BOUČEK, Z., 1977, Descriptions of *Tachinobia* gen. n. and three new species of Tetrastichinae (Hymenoptera: Eulophidae), with a tentative key to genera, *Bulletin of Entomological Research*, **67,** 17–30.

BOUČEK, Z., 1979, Description of a new eupelmid parasite (Hymenoptera: Chalcidoidea) of cockroaches in India, *Bulletin of Entomological Research*, **69,** 93–96.

BOUČEK, Z., 1988a, *Australasian Chalcidoidea* (*Hymenoptera*) (Wallingford: CAB Int.), 832 pp.

BOUČEK, Z., 1988b, *Tamarixia leucaenae* sp. n. (Hymenoptera: Eulophidae) parasitic on the leucaena psyllid *Heteropsylla cubana* Crawford (Hemiptera) in Trinidad, *Bulletin of Entomological Research*, **78,** 545–547.

BOUCHÉ, P. F., 1834, *Naturgeschichte der Insekten, besonders in Hinsicht ihrer ersten Zustände als Larven und Puppen* (Berlin), 216 pp.

BRÈTHES, J., 1920, Insectos útiles y dañinos de Rio Grande Do Sul y de La Plata, *Anales de la Sociedad Rural Argentina*, **54,** 281–290, 307–308.

BRUES, C. T., 1909 (1908), Notes and descriptions of North American parasitic Hymenoptera VII, *Bulletin of the Wisconsin Natural History Society*, **6,** 154–163.

BUCKELL, E. R., 1928, Notes on the life-history and habits of *Melittobia chalybii* Ashmead (Chalcidoidea: Elachertidae), *Pan-Pacific Entomologist*, **5,** 14–22.

BURKS, B. D., 1943, The North American parasitic wasps of the genus *Tetrastichus*–a contribution to biological control of insect pests, *Proceedings of the US National Museum*, **93,** 505–608.

BURKS, B. D., 1947, New reared species of *Tetrastichus* (Hymenoptera: Chalcidoidea), *Entomological News*, **53,** 85–89.

BURKS, B. D., 1952, The North American species of *Syntomosphyrum* (Hymenoptera, Chalcidoidea), *Proceedings of the Entomological Society of Washington*, **54,** 258–264.

BURKS, B. D., 1958, Superfamily Chalcidoidea, in K. V. Krombein (Ed.), *Hymenoptera of America North of Mexico. Synoptic Catalog*, Agriculture Monograph 2, 1st supplement (Washington, DC: US Department of Agriculture), pp. 62–84.

BURKS, B. D., 1963, Ten new reared species of *Tetrastichus* (Hymenoptera, Eulophidae), *Proceedings of the Biological Society of Washington*, **76,** 47–58.

BURKS, B. D., 1967a, Superfamily Chalcidoidea, in K. V. Krombein and B. D. Burks (Eds), *Hymenoptera of America North of Mexico. Synoptic Catalog*, Agriculture Monograph 2, 2nd supplement (Washington, DC: US Department of Agriculture), pp. 213–282.

BURKS, B. D., 1967b, The North American species of *Aprostocetus* Westwood (Hymenoptera: Eulophidae), *Annals of the Entomological Society of America*, **60,** 756–760.

BURKS, B. D., 1971, The name *Tetrastichus incertus* (Ratzeburg) as employed for an introduced parasite of the alfalfa weevil, *Hypera postica* (Gyllenhal) (Hymenoptera: Eulophidae), *Proceedings of the Entomological Society of Washington*, **73,** 429–431.

BURKS, B. D., 1975, The species of Chalcidoidea described from North America north of Mexico by Francis Walker (Hymenoptera), *Bulletin of the British Museum (Natural History)*, Entomology series, **32,** 139–170.

BURKS, B. D., 1979, Family Eulophidae, in K. V. Krombein, P. D. Hurd, Jr., D. R. Smith and B. D. Burks (Eds), *Catalog of Hymenoptera in America North of Mexico*, Vol. 1. *Symphyta and Apocrita (Parasitica)* (Washington, DC: Smithsonian Institution Press), pp. 967–1022.

CAMERON, P., 1912, On a collection of parasitic Hymenoptera (chiefly bred), made by Mr. Walter W. Froggatt, F.L.S., in New South Wales, with descriptions of new genera and species. Part 3, *Proceedings of the Linnean Society of New South Wales*, **37,** 172–216.

CAMERON, P., 1913, The Hymenoptera of the Georgetown Museum. Part V, *Timehri*, **3,** 105–137.

CLAUSEN, C. P., 1956, *Biological Control of Insect Pests in the Continental United States*, Technical Bulletin 1139 (Washington, DC: US Department of Agriculture), 151 pp.

CLAUSEN, C. P. (Ed.), 1978, *Introduced Parasites and Predators of Arthropod Pests and Weeds: a world review*, Agriculture Handbook No. 480 (Washington, DC: US Department of Agriculture), 551 pp.

COCK, M. J. W., 1985, *A Review of Biological Control of Pests in the Commonwealth Caribbean and Bermuda up to 1982* (Farnham Royal: Commonwealth Agricultural Bureaux), 218 pp.

COSTA LIMA, A. DA, 1959a, *Trichaporus, Trichoporus* ou *Exurus*? (Hym. Chalcidoidea, Eulophidae, Tetrastichinae), *Anais da Academia Brasiliera de Ciencias*, **31,** 119–128, plate 1.

COSTA LIMA, A. DA, 1959b, Duas novas espécies de *Exurus* da Bahia (Hym. Chalcidoidea, Eulophidae, Tetrastichinae), *Anais da Academia Brasiliera de Ciencias*, **31,** 129–133.

CRAWFORD, J. C., 1907, New North American Hymenoptera, *Journal of the New York Entomological Society*, **15,** 177–183.

CRAWFORD, J. C., 1909, Two new species of the genus *Tetrastichus* [Hymenoptera, Eulophidae], *Proceedings of the Entomological Society of Washington*, **11,** 150.

CRAWFORD, J. C., 1911a, Descriptions of new Hymenoptera. 2, *Proceedings of the US National Museum*, **40,** 439–449.

CRAWFORD, J. C., 1911b, Two new Hymenoptera, *Proceedings of the Entomological Society of Washington*, **13,** 233–234.

CRAWFORD, J. C., 1913, Descriptions of new Hymenoptera, No. 6, *Proceedings of the US National Museum*, **45,** 241–260.

CRAWFORD, J. C., 1914, Some new Chalcidoidea, *Insecutor Inscitiae Menstruus*, **2,** 180–182.

CRAWFORD, J. C., 1915, Descriptions of new Hymenoptera, No. 9, *Proceedings of the US National Museum*, **48,** 577–586.

CROSBY, C. R. and LEONARD, M. D., 1917, An egg parasite of the Sumac Flea-Beetle (Hym., Chalcid.), *Entomological News*, **28,** 368.

DAHMS, E. C., 1973, The courtship behaviour of *Melittobia australica* Girault, 1912 (Hymenoptera: Eulophidae), *Memoirs of the Queensland Museum*, **16,** 411–414.

DAHMS, E. C., 1978, A checklist of the types of Australian Hymenoptera described by Alexandre Arséne Girault: I. Introduction, acknowledgements, biography, bibliography and localities, *Memoirs of the Queensland Museum*, **19,** 127–190.

DAHMS, E. C., 1984a, Revision of the genus *Melittobia* (Chalcidoidea: Eulophidae) with the description of seven new species, *Memoirs of the Queensland Museum*, **21,** 271–336.

DAHMS, E. C., 1984b, A review of the biology of species in the genus *Melittobia* (Hymenoptera: Eulophidae) with interpretations and additions using observations on *Melittobia australica, Memoirs of the Queensland Museum*, **21,** 337–360.

DAHMS, E. C., 1984c, An interpretation of the structure and function of the antennal sense organs of *Melittobia australica* (Hymenoptera: Eulophidae) with the discovery of a large dermal gland in the male scape, *Memoirs of the Queensland Museum*, **21,** 361–385.

DALMAN, J. W., 1820, Försök till Uppstälning af Insect-familjen Pteromalini, i synnerhet med afseende på de i Sverige funne Arter, *Kongliga Svenska Vetenskaps-Academiens Handlingar*, **1820,** 123–182.

DEBACH, P., 1964, Successes, trends, and future possibilities, Chapter 24, pp. 673–713, in P. DeBach (Ed.), *Biological Control of Insect Pests and Weeds* (London: Chapman & Hall), 844 pp.

DEL GUERCIO, G., 1911, Il *Tetrastichus gentilei* Del Guercio nei suoi rapporti con il Fleotripide dell'olivo, *Atti della Reale Accademia dei georgofill di Firenze* (5) **8,** 222–227.

DE SANTIS, L., 1967, *Catálogo de los Himenópteros Argentinos de la Serie Parasítica, incluyendo Bethyloidea* (La Plata, Argentina: Comisión de Investigacion Científica, Provincia de Buenos Aires), 337 pp.

DE SANTIS, L., 1979, *Catálogo de los Himenópteros Calcidoideos de América al sur de los Estados Unidos*, Publicacíon Especial (La Plata, Argentina: Comisión de Investigaciones Científicas, Provincia de Buenos Aires), 488 pp.

DE SANTIS, L., 1980, *Catalogo de los Himenópteros Brasileños de la serie parasitica incluyendo Bethloidea* (Curitiba, Brazil: Editoria da Universidade Federal do Paraná), 395 pp.

DE SANTIS, L., 1983 [1981], Catalogo de los Himenópteros Calcidoideos de América al sur de los Estados Unidos—primer suplemento, *Revista Peruana de Entomologia*, **24,** 1–38. (Note: Actual publication date, given on the inside of the front cover of this volume, is May 30, 1983.)

DE SANTIS, L., 1989, Catalogo de los Himenópteros Calcidoideos (Hymenoptera) al sur de los Estados Unidos. Segundo suplemento, *Acta Entomologica Chilena*, **15,** 9–90.

DJURICH, G. F. and KOSTJUKOV, V. V., 1978, Noviy vid evlofid *Crataepiella platycephalae* Kostjukov, sp. n. (Hymenoptera, Eulophidae)—parazit zlakoboy mukhi, in A. A. Radul (Ed.), *Vrediteli Rasteniy i ikh Entomofagi, Kishinev 'Shiintsa'* 1978, 23–26 [in Russian]. English translation of title: *A new species of Eulophid Crataepiella platycephalae Kostjukov, sp. n. (Hymenoptera, Eulophidae)—parasite of Chloropid fly*, in A. A. Radul (Ed.), *Plant pests and their entomophages*).

DOĞANLAR, M., 1992a, Two new species of *Baryscapus* Foerster from New York USA (Hymenoptera: Eulophidae: Tetrastichinae), *Türkiye Entomoloji Dergisi (Turkish Journal of Entomology)*, **16,** 199–202.

DOĞANLAR, M., 1992b, Notes on the species of some genera of Tetrastichinae in Zoologische Staatssammlung München, *Entomofauna*, **13** (31), 523–527.

DOĞANLAR, M., 1993a, Systematic works on *Sigmophora* Rondani, 1867 (Hymenoptera, Eulophidae, Tetrastichinae), *Entomofauna*, **14** (9), 179–186.

DOĞANLAR, M., 1993b, A new genus of Tetrastichinae from North America (Hymenoptera, Eulophidae), *Entomofauna*, **14** (9), 187–191.

DOMENICHINI, G., 1957a [1956], Contributo all aconoscenza dei parassiti e iperparassiti dei Coleoptera Coccinellidae, *Bolletino di Zoologia Agraria e Bachicoltura*, **22,** 215–246. (Note: This is the volume for the year 1956, however the publication date given on the contents page of the volume is 1957.)

DOMENICHINI, G., 1957b, Descrizione di imenotteri Calcidoidei parassiti ed iperparassiti di '*Lixus iridis*' Oliv. (Coleoptera Curculionidae) e di un Dittero Cloropide suo sinoico, *Bollettino dell'Istituto di Entomologia dell Università degli studi di Bologna*, **22,** 99–118.

DOMENICHINI, G., 1966a [1965], I Tetrastichini (Hymenoptera Eulophidae) paleartici ed i loro ospiti, *Bolletino di Zoologia agraria e di Bachicoltura* (2) **6** (1965), 61–204. (Note: This volume actually published in 1966.)

DOMENICHINI, G., 1966b, Index of Palearctic Tetrastichinae, in V. Delucchi and G. Remaudière (Eds), *Index of Entomophagous Insects* (Paris: Le François), 101 pp.

DOMENICHINI, G., 1967, Contributo all conoscenza biologica e tassonomica dei Tetrastichinae paleartici (Hymenoptera Eulophidae) con particolare riguardo ai materiali dell'Istituto di Entomologia dell'Università di Torino, *Bolletino di Zoologia agraria e Bachicoltura* (2) **8,** 75–110.

DOZIER, H. L., 1937, Descriptions of miscellaneous chalcidoid parasites from Puerto Rico. (Hymenoptera), Journal of Agriculture of the University of Puerto Rico, **21,** 121–135.

ERDÖS, J., 1951, Eulophidae novae, *Acta Biologica*, **2,** 169–237.

ERDÖS, J., 1954, Eulophidae hungaricae indescriptae, *Annales historico-naturales Musei Nationalis hungarici* (S.N.), **5,** 323–366.

ETIENNE, J. and DELVARE, G., 1991, Les parasites de *Diaprepes abbreviatus* (Coleoptera Curculionidae) aux Antilles françaises, *Bulletin de la Société entomologique de France,* **96,** 295–299.

EVANS, D. A. and MATTHEWS, R. W., 1976, Comparative courtship behaviour in two species of the parasitic wasp *Melittobia* (Hymenoptera: Eulophidae), *Animal Behaviour*, **24,** 46–51.

FERRIÈRE, C., 1941, Les parasites de la teigne des vêtements, *Mitteilungen der Schweizerischen Entomologischen Gesellschaft*, **18,** 376–377.

FERRIÈRE C., 1960, Un nouveau Tetrastichinae parasite d'Anthomyides au Japon, *Acta Hymenopterologica*, **1,** 105–108.

FLOCK, R. A., 1957, Biological notes on a new chalcid-fly from seed-like *Eucalyptus* galls in California, *Pan-Pacific Entomologist*, **33,** 153–155.

FONSCOLOMBE, E. L. J. H. BOYER DE, 1832, Monographia Chalciditum, galloprovinciae circa Aquas Sextias degentium, *Annales des Sciences naturelles* (Zool.), **26,** 273–307.

FORBES, S. A., 1885, *Fourteenth Report of State Entomologist on the noxious and beneficial insects of the State of Illinois. Third Annual Report of S. A. Forbes, for the Year 1884* (Springfield), 136 pp.

FÖRSTER, A., 1856, *Hymenopterologische Studien. 2. Chalcidiae und Proctotrupii* (Aachen), 152 pp.

FÖRSTER, A., 1878, Kleine Monographien parasitischer Hymenopteren, *Verhandlungen des naturhistorisches Vereines der preussichen Rheinlande und Westfalens* (4) **5,** 42–82.

FULLAWAY, D. T., 1912, Gall-fly parasites from California, *Journal of the New York Entomological Society*, **20,** 274–282.

FULLAWAY, D. T., 1955, Description of a new genus and species of parasitic wasp (Hymenoptera: Eulophidae), *Proceedings of the Hawaiian Entomological Society*, **15,** 409–410.

GAHAN, A. B., 1913, New Hymenoptera from North America, *Proceedings of the US National Museum*, **46,** 431–443.

GAHAN, A. B., 1914, Descriptions of new genera and species, with notes on parasitic Hymenoptera, *Proceedings of the US National Museum*, **48,** 155–168.

GAHAN, A. B., 1917, Descriptions of some new parasitic Hymenoptera, *Proceedings of the US National Museum*, **53,** 195–217.

GAHAN, A. B., 1919a, A new genus of chalcid-wasp belonging to the family Eulophidae, *Proceedings of the Entomological Society of Washington*, **21,** 2–4.

GAHAN, A. B., 1919b, Some Chalcid-wasps reared from cecidomyid galls, *Annals of the Entomological Society of America*, **12,** 159–170.

GAHAN, A. B., 1923, An eulophid parasite of the chrysanthemum midge (Hymenoptera, Chalcidoidea), *Proceedings of the Entomological Society of Washington*, **25,** 65–66.

GAHAN, A. B., 1924, Some new parasitic Hymenoptera with notes on several described forms, *Proceedings of the US National Museum*, **65,** 1–23.

GAHAN, A. B., 1929, Description of an egg-parasite of *Exopthalmus quadrivittatus* (Olivier), *Proceedings of the Entomological Society of Washington*, **31,** 17–18.

GAHAN, A. B., 1932, Miscellaneous descriptions and notes on parasitic Hymenoptera, *Annals of the Entomological Society of America*, **25,** 736–757.

GAHAN, A. B., 1936a, *Tetrastichus brevistigma*, new species (Hymenoptera: Eulophidae), *Proceedings of the Entomological Society of Washington*, **38,** 76–77.

GAHAN, A. B., 1936b, Four new species of Chalcidoidea parasitic on cactus insects, *Proceedings of the US National Museum*, **83,** 481–486.

GAHAN, A. B., 1937, Two new chalcidoid egg parasites (Eulophidae and Mymaridae), *Proceedings of the Entomological Society of Washington*, **39,** 266–269.

GAHAN, A. B., 1938, Notes on some genera and species of Chalcidoidea (Hymenoptera), *Proceedings of the Entomological Society of Washington*, **40,** 209–227.

GAHAN, A. B., 1941, Note on a Puerto Rican species of Eulophidae (Hymenoptera), *Proceedings of the Entomological Society of Washington*, **43,** 1–2.

GAHAN, A. B., 1942, A new chalcidoid parasite of the vetch bruchid, *Proceedings of the Entomological Society of Washington*, **44,** 8–10.

GAHAN, A. B., CROSBY, C. R. and LEONARD, M. D., 1928, Superfamily Chalcidoidea, pp. 975–984, in M. D. Leonard (Ed.), A list of the insects of New York, with a list of the spiders and certain other allied groups, *Memoirs of the Cornell University Agricultural Experiment Station*, **101,** 1–1121.

GAHAN, A. B. and FAGAN, M. M., 1923, The type species of the genera of Chalcidoidea or chalcid-flies. *Bulletin of the US National Museum*, **124,** 1–173.

GHESQUIÈRE, J., 1946, Contribution à l'étude des Microhyménoptères du Congo belge. X. Nouvelles dénominations pour quelques genres du Chalcidoidea et Mymaroidea, *Revue de Zoologie et Botanique Africaines*, **39,** 367–371.

GIRAULT, A. A. (Note: Girault was a prolific author, and this review cites nine of his papers from 1916, 16 papers from 1917. In order to avoid confusion in citing his publications, a number is given in brackets immediately following the date (e.g. Girault, 1917 [316]). These numbers were given to Girault's publications by Dahms (1978), who listed all of Girault's papers in chronological order. This work should be referred to by anyone interested in Girault, or who wishes to ascertain priority for species names published in the same year.)

GIRAULT, A. A., 1912 [106], Notes on the chalcidoid *Trichaporus* Foerster of the family Eulophidae, with descriptions of one new North American form from Illinois [continued], *Canadian Entomologist*, **44,** 74–83.

GIRAULT, A. A., 1912 [124], A new *Melittobia* from Queensland, Australia, *Psyche*, **19,** 203–205.

GIRAULT, A. A., 1913 [156], New genera and species of chalcidoid Hymenoptera from North Queensland, *Archiv für Naturgeschichte*, **79,** Abt.A., H.6, 46–51.

GIRAULT, A. A., 1913 [167], Australian Hymenoptera Chalcidoidea—IV. The family Eulophidae with descriptions of new genera and species, *Memoirs of the Queensland Museum*, **2,** 140–296.

GIRAULT, A. A., 1913 [175], New genera and species of chalcidoid Hymenoptera in the South Australian Museum, *Transactions of the Royal Society of South Australia*, **37,** 67–115.

GIRAULT, A. A., 1916 [265], Description of eleven new species of chalcid flies, *Canadian Entomologist*, **48,** 100–103.

GIRAULT, A. A., 1916 [268], Description of eleven new species of chalcid flies [continued], *Canadian Entomologist,* **48,** 113–116.

GIRAULT, A. A., 1916 [273], Notes on described chalcidoid Hymenoptera with new genera and species, *Societas Entomologica*, **31,** 35–38.

GIRAULT, A. A., 1916 [280], A new genus of Tetrastichini (chalcidoid Hymenoptera), *Entomological News*, **27,** 348.

GIRAULT, A. A., 1916 [287], New miscellaneous chalcidoid Hymenoptera with notes on described species, *Annals of the Entomological Society of America*, **9,** 291–308.

GIRAULT, A. A., 1916 [288], Descriptions of miscellaneous North American chalcidoid Hymenoptera of the family Eulophidae, *Proceedings of the US National Museum*, **51,** 39–52.

GIRAULT, A. A., 1916 [289], New North American Hymenoptera of the family Eulophidae, *Proceedings of the US National Museum*, **51,** 125–133.

GIRAULT, A. A., 1916 [299], New chalcid-flies from Maryland (Hym.), *Entomological News*, **28,** 20–23.

GIRAULT, A. A., 1916 [300], New species of parasitic Hymenoptera, *Bulletin of the Brooklyn Entomological Society* (N.S.), **11,** 111–113.

GIRAULT, A. A., 1917 (1916) [301], Descriptions of miscellaneous chalcid-flies, *Insecutor Inscitiae Menstruus*, **4,** 109–121.

GIRAULT, A. A., 1917 [305], Speciosissima genera nova Eulophidorum (WN: Girault), 1–4 pp.

GIRAULT, A. A., 1917 [308], New Eulophidae (Glenndale, MD: Girault), 1 p.

GIRAULT, A. A., 1917 [309], New chalcid flies (Glenndale, MD: Girault), 1–5 pp.

GIRAULT, A. A., 1917 [313], The occurrence of the genus *Parachrysocharis* Girault in the United States, *Canadian Entomologist*, **49,** 129.

GIRAULT, A. A., 1917 [316], Descriptiones stellarum novarum (?: Girault), 1–22 pp.

GIRAULT, A. A., 1917 [317], Descriptiones Hymenopterorum Chalcidoidicarum variorum cum observationibus. III (Glenndale, MD: Girault), 1–10 pp.

GIRAULT, A. A., 1917 [318], Chalcidoidea nova Marilandensis (Glenndale, MD: Girault), 1–2 pp.

GIRAULT, A. A., 1917 [319], New chalcidflies from Maryland, II (Hym.), *Entomological News*, **28,** 255–257.

GIRAULT, A. A., 1917 [321], Chalcidoidea nova Marilandensis. II (Glenndale, MD: Girault), 1–2 pp.

GIRAULT, A. A., 1917 [323], New miscellaneous chalcid-flies from North America, *Psyche*, **24,** 91–99.

GIRAULT, A. A., 1917 [332], Chalcidoidea nova Marilandensis. III (Glenndale, MD: Girault), 1–6 pp.

GIRAULT, A. A., 1917 [334], New Australian chalcid-flies (Hymenoptera, Chalcididae), *Insecutor Insicitiae Menstruus*, **5,** 133–155.

GIRAULT, A. A., 1917 [335], Three new chalcid flies from North America, *Bulletin of the Brooklyn Entomological Society,* (N.S.) **12,** 85–86.

GIRAULT, A. A., 1917 [336], New chalcid flies, with notes, *Bulletin of the Brooklyn Entomological Society,* (N.S.) **12,** 86–89.

GIRAULT, A. A., 1917 [338], Notes on Hymenoptera Parasitica, *Bulletin of the Brooklyn Entomological Society,*, (N.S.) **12,** 118.

GIRAULT, A. A., 1922 [360], New chalcid-flies from eastern Australia. I. (Hymenoptera, Chalcididae), *Insecutor Inscitiae Menstruus*, **10,** 39–49.

GLICK, P. A., 1939, *The distribution of Insects, Spiders, and Mites in the Air*, Technical Bulletin No. 673 (Washington, DC: US Department of Agriculture), 1–150.

GORDH, G. and HAWKINS, B. A., 1982, *Tetrastichus cecidobroter* (Hymenoptera: Eulophidae), a new phytophagous species developing within the galls of *Asphondylia* (Diptera: Cecidomyiidae) on *Atriplex* (Chenopodiaceae) in Southern California, *Proceedings of the Entomological Society of Washington*, **84,** 426–429.

GRADWELL, G. R., 1953, Notes on the taxonomy and biology of *Crataepus marbis* (Walker) (Hym., Eulophidae), *Entomologist's Monthly Magazine*, **89,** 73–76.

GRADWELL, G. R., 1957, A new tetrastichine (Hym., Eulophidae) genus with three included species, *Entomologist's Monthly Magazine*, **93,** 1–5.

GRADWELL, G. R., 1958, The selection of a neotype for *Melittobia hawaiiensis* Perkins and re-erection of the genus *Aceratoneuromyia* Girault (Hym., Eulophidae), *Entomologist's Monthly Magazine*, **94,** 277–278.

GRAHAM, M. W. R. DE V., 1961a, New species of *Aprostocetus* Westwood (Hym., Eulophidae) from Britain and Sweden, *Opuscula Entomologica*, **26,** 4–37.

GRAHAM, M. W. R. DE V., 1961b, The genus *Aprostocetus* Westwood, sensu lato (Hym., Eulophidae); with notes on the synonymy of European species, *Entomologist's Monthly Magazine*, **97,** 34–64.

GRAHAM, M. W. R. DE V., 1975, Relationships and synonymy of *Winnemana* Crawford (Hymenoptera Eulophidae), *Journal of Entomology* (B), **44** (3), 281–282.

GRAHAM, M. W. R. DE V., 1977, Systematic position of *Peckelachertus* Yoshimoto (Hym., Eulophidae) and description of a new species from Britain, *Systematic Entomology*, **2,** 45–47.

GRAHAM, M. W. R. DE V., 1981, Two new species of *Tetrastichus* Haliday (Hymenoptera, Chalcidoidea, Eulophidae) from Madeira, *Bocagiana*, **53,** 1–7.

GRAHAM, M. W. R. DE V., 1985, *Tetrastichus* species (Hymenoptera, Eulophidae), parasitizing the elm-leaf beetle *pyrrhalta luteola* (Müll) and allied hosts, *Journal of Natural History*, **19,** 1059–1071.

GRAHAM, M. W. R. DE V., 1987, A reclassifiction of the European Tetrastichinae (Hymenoptera: Eulophidae), with a revision of certain genera, *Bulletin of the British Museum (Natural History)*, Entomology series, **55** (1), 1–392.

GRAHAM, M. W. R. DE V., 1991, A reclassification of the European Tetrastichinae (Hymenoptera: Eulophidae): revision of the remaining genera, *Memoirs of the American Entomological Institute*, **49,** 1–322.

GRAHAM, M. W. R. DE V. and LASALLE, J., 1991, New synonymy in European Tetrastichinae (Hymenoptera: Eulophidae), including designation of some neotypes, lectotypes, and new combinations, *Entomologist's Gazette*, **42,** 89–96.

GRISSELL, E. E. and SCHAUFF, M. E., 1990, *A Handbook of the Families of Nearctic Chalcidoidea (Hymenoptera)* (Washington, DC: The Entomological Society of Washington), 85 pp.

HALIDAY, A. H., 1844, Contributions towards the classification of the Chalcididae, *Transactions of the Entomological Society of London*, **3,** 295–301.

HARCOURT, D. G. and GUPPY, J. C., 1984, *Hypera postica* (Gyllenhal), Alfalfa Weevil (Coleoptera: Curculionidae), in J. S. Kelleher and M. A. Hulme (Eds), *Biological Control Programmes against Insects and Weeds in Canada 1969–1980* (Farnham Royal: Commonwealth Agricultual Bureaux), pp. 41–43.

HARCOURT, D. G., GUPPY, J. C. and ELLIS, C. R., 1984, *Oulema melanopus* (L.), Cereal Leaf Beetle (Coleoptera: Chrysomelidae), in J. S. Kelleher and M. A. Hulme (Eds), *Biological Control Programmes against Insects and Weeds in Canada 1969–1980* (Farnham Royal: Commonwealth Agricultural Bureaux), pp. 65–67.

HARTIG, T., 1938, Über den Raupenfrass im K. Charlottenburger Forste unfern Berlin, waehrend des Sommers 1837. Über die parasitischen Zweiflügler des Waldes—Jahresberichte über die Forstschritte der Forstwissenschaft und forstlichen Naturkunde, etc., *Foerstner, Berlin*, **1,** 246–306.

HAWKINS, B. A. and GOEDEN, R. D., 1982, Biology of a gall-forming *Tetrastichus* (Hymenoptera: Eulophidae) associated with gall midges on saltbush in Southern California, *Annals of the Entomological Society of America*, **75,** 444–447.

HAWKINS, B. A. and GOEDEN, R. D., 1984, Organization of a parasitoid community associated with a complex of galls on *Atriplex* spp. in southern California, *Ecological Entomology*, **9,** 271–292.

HAYAT, M., 1985, Family Eulophidae, pp. 246–252, in B. R. Subba Rao and M. Hayat (Eds), The Chalcidoidea (Insecta: Hymenoptera) of India and the adjacent countries. Part I. Reviews of families and keys to families and genera, *Oriental Insects*, **19,** 163–310.

HENDRICKSON, R. M., DREA, J. J. and ROSE, M., 1991, A distribution and establishment program for *Chilocorus kuwanae* (Silvestri) (Coleoptera: Coccinellidae) in the United States, *Proceedings of the Entomological Society of Washington*, **93,** 197–200.

HENSHAW, S., 1887, *The Entomological Writings of Dr. Alpheus Spring Packard*, Bulletin No. **16** (Washington, DC: US Department of Agriculture, Division of Entomology), 1–49.

HICKOK, H. T., 1875, Experiments with the fly *Pteromalus gerardi*, *Proceedings of the Poughkeepsie Society of Natural History*, **1,** 131–141.

HOBBS, G. A. and KRUNIC, M. D., 1971, Comparative behaviour of three chalcidoid (Hymenoptera) parasites of the alfalfa leaf cutter bee, *Megachile rotundata*, in the laboratory, *Canadian Entomologist*, **103,** 674–685.

HOWARD, L. O., 1881, Part III. Report on the parasites of the Coccidae in the collection of this department, *Annual Report of the Commissioner of Agriculture for the Year 1880,* 350–373

HOWARD, L. O., 1889, The Hymenopterous Parasites of North American Butterflies, pp. 1869–1911, pls 88–89, in S. H. Scudder (Ed.), *The Butterflies of the Eastern United States and Canada, with special reference to New England. Vol. 3.* Appendix, Plates (Cambridge, MA: published by the author), i–vi, 1775–1958; pls. 1–89.

HOWARD, L. O., 1892, The hymenopterous parasites of spiders, *Proceedings of the Entomological Society of Washington*, **2,** 290–302, pl. ii.

HUSAIN, T. and KHAN, M. Y., 1986, Family Eulophidae, pp. 211–245, in B. R. Subba Rao and M. Hayat (Eds), The Chalcidoidea (Insecta: Hymenoptera) of India and the adjacent countries. Part II. A catalogue of Chalcidoidea of India and the adjacent countries, *Oriental Insects*, **20,** 1–430.

ICZN, 1965, Opinion 720, *Tetrastichus* Walker 1842 (Insecta, Hymenoptera): suppressed under the plenary powers. *Bulletin of Zoological Nomenclature*, **22,** 26–27.

ICZN, 1985, Opinion 1351, *Galeopsomyia* Girault, 1916 (Insecta, Hymenoptera): conserved. *Bulletin of Zoological Nomenclature*, **42,** 285–286.

KOSTJUKOV, V. V., 1977, Stravnitel'naya morfologiya khal'tsid podsem. Tetrastichinae i sistema roda *Tetrastichus* Haliday 1844 (Hymenoptera, Eulophidae) [in Russian], *Entomologicheskoe Obozreniye*, **56,** 177–194.
(English translation: A comparative morphology of chalcids of the subfamily Tetrastichinae and the system of the genus *Tetrastichus* Haliday, 1844 (Hymenoptera, Eulophidae), *Entomological Review*, **56,** 134–145.)

KOSTJUKOV, V. V., 1978, Podsem. 5. Tetrastichinae, in G. S. Medvedev (Ed.), *Opredelitel' Nasekomykh Evropeyskoy Chasti SSSR, Tom III, Pereponchatokrylye, Vtoraya chast'* (Leningrad: Nauka), pp. 430–467 [in Russian].
(English translation: Subfamily Tetrastichinae, in G. S. Medvedev (Ed.), *Keys to the Insects of the European Part of the USSR*, Vol. III, *Hymenoptera, Part Two* (New Delhi: Amerind), pp. 796–861 (published 1987).)

KURDJUMOV, N. V., 1912, Hyménoptères-parasites nouveaux ou peu connus, *Revue Russe d'Entomologie*, **12,** 223–240.

LAING, J. E. and HAMAI, J., 1976, Biological control of insect pests and weeds by imported parasites, predators and pathogens, in C. B. Huffaker and P. S. Messenger (Eds), *Theory and Practice of Biological Control* (New York: Academic), pp. 685–743.

LASALLE, J., 1990a, A new genus and species of Tetrastichinae (Hymenoptera: Eulophidae) parasitic on the coffee berry borer, *Hypothenemus hampei* (Ferrari) (Coleoptera: Scolytidae), *Bulletin of Entomological Research*, **80,** 7–10.

LASALLE, J., 1990b, Tetrastichinae (Hymenoptera: Eulophidae) associated with spider egg sacs, *Journal of Natural History*, **24,** 1377–1389.

LASALLE, J., in press, *Aprostocetus* (*Ootetrastichus*) *theioneurus* (Masi): a hyperparasitoid of the cereal stem-borer *Chilo partellus* in Africa (Hymenoptera: Eulophidae; Lepidoptera: Pyralidae), *Zoologische Mededelingen Leiden.*

LASALLE, J. and GAULD, I. D., 1992 [1991], Parasitic Hymenoptera and the biodiversity crisis, *Redia,* **74** (3) (Appendix), 315–334.
(Note: This volume has a publication date of 1991, but was not actually published until 1992.)

LASALLE, J. and GAULD, I. D. (Eds), 1993, *Hymenoptera and Biodiversity* (Wallingford: CAB Int.), 348 pp.

LASALLE, J. and GRAHAM, M. W. R. DE V., 1990, On the identity of *Baryscapus* Foerster (Hymenoptera: Eulophidae: Tetrastichinae), *Entomologist's Gazette*, **41,** 121–126.

LASALLE, J. and SCHAUFF, M. E., 1990, New subfamily placement for some North American Eulophidae (Hymenoptera, Chalcidoidea), *Proceedings of the Entomological Society of Washington*, **92,** 305–308.

LASALLE, J. and SCHAUFF, M. E., 1992, Preliminary studies on Neotropical Eulophidae (Hymenoptera: Chalcidoidea): clarification of Ashmead, Cameron, Howard and Walker types, *Contributions of the American Entomological Institute*, **27,** 1–47.

LEBECK, L. M., 1991, A review of the hymenopterous natural enemies of cockroaches with emphasis on biological control, *Entomophaga*, **36,** 335–352.

LINDEMAN, K., 1881, Über *Eurytoma (Isosoma) hordei, Eurytoma albinervis, Lasioptera (Cecidomyia) cerealis* und ihre Feinde, *Bulletin de la Société des Naturalistes de Moscou*, **55,** 378–389.

LINDROTH, C. H. and GRAHAM, M. W. R. DE V., 1960, A new *Tetrastichus* from Labrador (Hym. Chalc.), parasite of a pompilid wasp, *Opuscula Entomologica*, **25,** 93–97.

MASI, L., 1917, Chalcididae of the Seychelle Islands, *Novitates Zoologicae*, **24,** 121–230.

MASI, L., 1930, Descrizione di un *Tetrastichus* parassita di *Cassida vittata* Villers (Hymen. Chalc.), *Bollettino della Società entomologica italiana*, **62,** 26–32.

MCGUGAN, B. M. and COPPEL, H. C., 1962, Part II. Biological control of forest insects—1910–1958, in CIBC (Eds), *A Review of the Biological Control Attempts against Insects and Weeds in Canada* (Farnham Royal: Commonwealth Agricultureal Bureaux), pp. 35–216.

MERCET, R. G., 1924, Eulofidos de Espana (1a. nota), *Boletín de la Real Sociedad española de Historia natural*, **24,** 54–59.

MOSER, J. C., 1965, The Interrelationships of Three Gall Makers and Their Natural Enemies, on Hackberry (*Celtis Occidentalis* L.), *New York State Museum and Science Service*, Bulletin Number **402,** 1–95.

NEES, C. G., VON ESENBECK, 1834, *Hymenopterorum Ichneumonibus affinium, Monographiae, genera europaea et species illustrantes* (Stuttgartiae et Tubingae), 448 pp.

NILSSON, L. A., 1979, The pollination ecology of *Herminium monorchis* (Orchidaceae), *Botanisk Notiser*, **132,** 537–549.

PACKARD, A. S., 1865 [1864], The Humble Bees of New England and their Parasites; with notices of a new species of *Anthophorabia*, and a new genus of Proctotrupidae, *Proceedings of the Essex Institute*, **4,** 107–140, pl. 3.
(Note: This article appears in **4** (4) for October–December, 1864; however, January 1865 is the publication date given on the cover of the volume.)

PACKARD, A. S., 1881, Descriptions of some new ichneumon parasites of North American butterflies, *Proceedings of the Boston Society of Natural History*, **21,** 18–38.

PECK, O., 1951, Superfamily Chalcidoidea, pp. 410–594, in C. F. W. Muesbeck, K. V. Krombein and H. K. Townes (Eds), *Hymenoptera of America North of Mexico. Synoptic Catalog*, Agriculture Monograph 2 (Washington, DC: US Department of Agriculture), pp. 410–594.

PECK, O., 1963, A catalogue of the Nearctic Chalcidoidea (Insecta: Hymenoptera), *Canadian Entomologist*, Supplement 30, 1–1092.

PECK, O., BOUČEK, Z. and HOFFER, A., 1964, Keys to the Chalcidoidea of Czechoslovakia (Insecta: Hymenoptera), *Memoirs of the Entomological Society of Canada*, **34,** 1–120.

PERKINS, R. C. L., 1906, Leaf-hoppers and their natural enemies (Pt. VIII. Encyrtidae, Eulophidae, Trichogrammatidae), *Hawaiian Sugar Planters' Association, Division of Entomology,* Bulletin No. 1, Part 8, 241–267, pls 18–20.

PHILIPPI, R. A., 1873, Chilenische Insekten, *Stettiner Entomologische Zeitung*, **34,** 296–316.

PROVANCHER, L., 1887, Fam. VIII. Chalcidides, pp. 184–211, in *Additions et Corrections a la Faune Hymenopterologique de la province de Québec* (Québec: C. Darveau), 474 pp.
(Note: This work was issued is separate fascicles between 1885 and 1889.)

RATZEBURG, J. T. C., 1884, *Die Ichneumonen der Forstinsecten in entomologischer und forstlicher Beziehung* **1** (Berlin), 224 pp.

RATZEBURG, J. T. C., 1848, *Die Ichneumonen der Forstinsecten in entomologischer und forstlicher Beziehung* **2** (Berlin), 238 pp.

RATZEBURG, J. T. C., 1852, *Die Ichneumonen der Forstinsecten in entomologischer und forstlicher Beziehung* **3** (Berlin), 272 pp.

RILEY, C. V., 1885, On the parasites of the Hessian fly, *Proceedings of the US National Museum*, **8,** 413–422.

RILEY, C. V., 1879, Parasites of the cotton worm, *Canadian Entomologist*, **11,** 161–162.

ROHWER, S. A., 1919, Descriptions of four new parasitic Hymenoptera, *Canadian Entomologist*, **51,** 160–162.

RONDANI, C., 1870, Nota sugli insetti parassiti della Galleruca dell'olmo, *Bollettino del Comizio agrario parmense*, **3,** 137–142, 1 pl.

RONDANI, C., 1873, Degli insetti nocivi e dei loro parassiti, *Bolletino della Società Entomologica Italiana*, **5,** 133–165.

ROTH, L. M. and WILLIS, E. R., 1960, The Biotic Associations of Cockroaches, *Smithsonian Miscellaneous Collections*, **41,** 1–470.

SCHAEFER, P. W. and SEMYANOV, V. P., 1992, Arthropod parasites of *Coccinella septempunctata* (Coleoptera: Coccinellidae); world parasite list and bibliography, *Entomological News*, **103,** 125–134.

SCHAUFF, M. E., 1987, Taxonomy and identification of the egg parasites (Hymenoptera: Platygasteridae, Trichogrammatidae, Mymaridae, and Eulophidae) of citrus weevils (Coleoptera: Curculionidae), *Proceedings of the Entomological Society of Washington*, **89,** 31–42.

SCHULZ, W. A., 1906, *Spolia Hymenopterologica* (Paderborn), 355 pp.

SCUDDER, S. H., 1874, The Distribution of Insects in New Hampshire, pp. 331–380, in C. H. Hitchcock and J. H. Huntington (Eds), *The Geology of New Hampshire*. Part I. *Physical Geography* (Concord).

SILVESTRI, F., 1920, Contribuzione alla conoscenza dei parassiti delle ova del grilleto canterino (*Oecanthus pellucens* Scop., Orthoptera, Achetidae), *Bolletino del Laboratorio di Zoologia generale e agraria della Reale Scuola superiore d'agricultura, Portici*, **14,** 219–250.

SOULÉ, M. E., 1990, The real work of systematics, *Annals of the Missouri Botanical Garden*, **77,** 4–12.

STEHR, F. W., 1970, Establishment in the United States of *Tetrastichus julis*, a larval parasite of the cereal leaf beetle, *Journal of Economic Entomology*, **63,** 1968–1969.

SUTTON, R. A., SELHIME, A. G. and MCCLOUD, W., 1972, Colonization and release of *Tetrastichus haitiensis* as a biological control agent for citrus root weevils, *Journal of Economic Entomology*, **65,** 184–185.

SYME, P. D., 1971, *Rhyacionia buoliana* (Schiff), European pine shoot moth (Lepidoptera: Olethreutidae), in CIBC (Eds), *Biological Control Programmes Against Insects and Weeds in Canada 1959–1968* (Farnham Royal: Commonwealth Agricultural Bureaux), pp. 194–205.

SZELENYI, G., 1941, Contribution to the knowledge of the chalcidoid fauna of the Carpathian's Basin, *Fragmenta Faunistica Hungarica*, **4,** 37–43.

TEITELBAUM, S. S. and BLACK, L. M., 1954, The effect of a phytophagous species of *Tetrastichus*, new to the United States, on sweet clover infected with wound-tumor virus, *Phytopathology*, **54,** 548–550.

THOMSON, C. G., 1878, *Hymenoptera Scandinaviae 5. Pteromalus* (*Svederus*) *continuato* (Lundae), 307 pp.

TIMBERLAKE, P. H., 1957, A new entedonine chalcid-fly from seed capsules of *Eucalyptus* in California (Hymenoptera: Eulophidae), *Pan Pacific Entomologist*, **33,** 109–110.

VAN DEN BERG, E., PRINSLOO, G. L. and NESER, S., 1990, An unusual host association: *Aprostocetus* sp. (Eulophidae), a hymenopterous predator of the nematode *Subanguina mobilis* (Chit and Fisher, 1975) Brzeski 1981 (Anguinidae), *Phytophylactica*, **22,** 125–127.

VERESHCHAGINA, V. V., 1961, *Tetrastichus* (*Myiomisa*) *sajoi* Szelényi, a predator of the plum shoot mite, *Eriophyes phloeocoptes*, Nal, *Trudy moldavskogo nauchno-issledovatelskogo Instituta sadovodstva, vinogradarstva i Vinodeliya*, **7,** 31–33 [in Russian].

WALKER, F. (Note. Walker's 'Descriptions of British Chalcidites' appeared in nine parts in the years 1838–1839 in the *Annals of Natural History*, not the *Annals and Magazine of Natural History* as has often been cited. The latter journal was formed by the merging of the *Annals of Natural History* and the *Magazine of Natural History*, and began with volume 6. To facilitate the solving of future matters of priority, I have included all nine parts of Walker's 'Descriptions of British Chalcidites', even though not all were cited in this paper, and have given dates of publication by month for these parts (taken from the dates printed on the separate fascicles which are bound in volumes in the BMNH library). I have also included his 1839 *Monographia Chalciditum*, which was published in two parts. The date of publication for part 1 is 9 January 1839 (established by Graham, 1961b: 35). The date of publication for part 2 has not been previously established, but M. Graham has kindly pointed out to me that in the library of the Royal Entomological Society there is a letter from Walker to Haliday dated 29 July 1839 in which Walker states that this work 'will be published immediately'. From Walker's other correspondence we can assume that this meant within a couple of days, and this would set the publication date as 31 July 1839.)

WALKER, F., 1838a, Descriptions of British Chalcidites, *Annals of Natural History*, **1** (June), 307–312.

WALKER, F., 1838b, Descriptions of British Chalcidites, *Annals of Natural History*, **1** (July), 381–387.

WALKER, F., 1838c, Descriptions of British Chalcidites, *Annals of Natural History*, **1** (August), 449–454.

WALKER, F., 1838d [1839], Descriptions of British Chalcidites, *Annals of Natural History*, **2** (November 1838), 198–205.

WALKER, F., 1839a, *Monographia Chalciditum* (London: Baillière), 333 pp. (9 January 1939).

WALKER, F., 1839b, Descriptions of British Chalcidites, *Annals of Natural History*, **2** (January), 350–355.

WALKER, F., 1839c, Descriptions of British Chalicidites, *Annals of Natural History*, **3** (May), 177–182.

WALKER, F., 1839d, *Monographia Chalciditum*, Vol. II, *Species collected by C. Darwin, Esq.* (London: Baillière), 100 pp. (31 July 1839).

WALKER, F., 1839e, Descriptions of British Chalcidites, *Annals of Natural History*, **3** (August), 415–419.

WALKER, F., 1839f [1840], Descriptions of British Chalcidites, *Annals of Natural History*, **4** (September 1839), 29–32.

WALKER, F., 1839g [1840], Descriptions of British Chalcidites, *Annals of Natural History*, **4** (December 1839), 232–236.

WALKER, F., 1842, Descriptions of Chalcidites discovered by C. Darwin, Esq., near Valparaiso, *Annals and Magazine of Natural History*, **10,** 113–117.

WALKER, F., 1844, Descriptions of some Chalcidites of North America, collected by George Barnston, Esq., *Annals and Magazine of Natural History*, **14,** 14–17.

WALKER, F., 1847, Characters of undescribed Chalcidites collected in North America by E. Doublesday, Esq., and now in the British Museum, *Annals and Magazine of Natural History*, **19,** 392–398, **20,** 19–29.

WALKER, F., 1848, *List of specimens of Hymenopterous insects in the collection of the British Museum, Part II. Chalcidites. Additional species iv* (London: BMNH), 237 pp.

WANGBERG, J. K., 1977, A new *Tetrastichus* parasitizing tephritid gall-formers on *Chrysothamnus* in Idaho, *Pan-Pacific Entomologist*, **53,** 237–240.

WATERSON, J., 1915, New species of Chalcidoidea from Ceylon, *Bulletin of Entomological Research*, **5,** 325–342.

WATERSTON, J., 1923, On an internal parasite (Hym.–Chalcidoidea) of a thrips from Trinidad, *Bulletin of Entomological Research*, **13,** 453–455.

WESTWOOD, J. O., 1833, Descriptions of several new British forms amongst the parasitic hymenopterous insects, *London and Edinburgh Philosophical Magazine*, **2** (3), 443–445.

WESTWOOD, J. O., 1848 [1847], Proceedings of the Entomological Society of London (published in) *Transactions of the Entomological Society of London*, **5,** i–lxxxix.
(Note. The proceedings were published in a series of fascicles between 1847 and 1849. The actual publication dates of each of these fascicles has been given by Wheeler (1912). The publication date for the fascicle containing the proceedings of the meeting of 5 July 1847 (where Westwood proposed the name *Melittobia Audouinii*) was 12 January 1848. Publication date of this name is therefore 1848, not 1847 as it has often been treated in the literature. A second mention of *M. Audouinii* in the proceedings (p. lxv) has a publication date of 4 September 1849.)

WHEELER, G., 1912 [1911], On the dates of publications of the Entomological Society of London, *Transactions of the Entomological Society of London*, **44,** 750–767.

WOLCOTT, G. N., 1923, 'Insectae Portoricensis'. A preliminary annotated check-list of the insects of Porto Rico, with descriptions of some new species, *Journal of the Department of Agriculture of Porto Rico*, **7,** 5–513.

YOSHIMOTO, C. M., 1970, A new eulophid parasite (Hymenoptera: Chalcidoidea) from eggs of the nursery pine sawfly, *Diprion frutetorum* (Hymenoptera: Tenthredinoidea), *Canadian Entomologist*, **102,** 908–910.

YOSHIMOTO, C. M., 1983, A new genus of Tetrastichinae from the New World (Hymenoptera: Chalcidoidea: Eulophidae), *Contributions of the American Entomological Institute*, **20,** 90–93.

YOSHIMOTO, C. M. and ISHII, T., 1965, Insects of Micronesia. Hymenoptera. Chalcidoidea: Eulophidae, Encyrtidae (part), Pteromalidae, *Insects of Micronesia*, **19,** 109–178.

ZETTERSTEDT, J. W., 1838, *Insecta Lapponica descripta: Sectio secunda. Hymenoptera* (Lipsiae), 326–476.

Appendix 1: Hosts for North American Tetrastichinae

This appendix only includes host information for North America, and does not include extralimital hosts. When the name *Aprostocetus* is given, this refers to species in the subgenus *Aprostocetus*; the other subgenera are cited with an *A.* and the subgeneric name in parentheses (e.g. *A. (Ootetrasichus) crino*). Author names are given for all arthropod hosts, but not for plant hosts.

Associated notes: [F], facultative hyperparasitoid; [G], gall former; [H], hyperparasitoid; [I], inquiline; [P], phytophagous; [?], questionable record.

Host taxa	Tetrastichine taxa
ARANEAE	
EPEIRIDAE	
unidentified epeirid	*Aprostocetus banksii*
SALTICIDAE	
***Phidippus opifex* (McCook)**	*Baryscapus phidippi*
THOMISIDAE	
***Philodromus aureolus* (Olivier)**	*Baryscapus philodromi*
UNDETERMINED FAMILY	
Undetermined spider eggs	*Tachinobia repanda* [H]
ODONTA	
LESTIDAE	
Lestes sp.	*A. (Ootetrastichus) mymaridis*; *A. (O.) polynemae*; *Tetrastichus polynemae* [?F]
AESHNIDAE	
***Anax junius* (Drury)**	*A. (Ootetrastichus) polynemae*
ORTHOPTERA	
GRYLLIDAE	
***Oecanthus quadripunctatus* Beutenmüller**	*A. (Ootetrastichus) crino*
***Oecanthus* sp.**	*A. (O.) crino*
DICTYOPTERA	
BLATELLIDAE	
***Ischnoptera* sp.**	*Aprostocetus ischnopterae* [?H]
***Parcoblatta* sp.**	*Aprostocetus blattae*; *A. ischnopterae* [?H]
***Supella longipalpa* (Fabricius)**	*Cucarastichus texanus* [H]
BLATTIDAE	
***Blatta orientalis* (L.)**	*A. (Tetrastichodes) hagenowii*
***Eurycotis floridana* (Walker)**	*A. (T.) hagenowii*
***Periplaneta americana* (L.)**	*A. (T.) hagenowii*; *Melittobia chalybii*
***Periplaneta australasiae* (Fabricius)**	*A. (T.) hagenowii*
***Periplaneta brunnea* Burmeister**	*A. (T.) hagenowii*
***Periplaneta fuliginosa* (Serville)**	*A. (T.) hagenowii*
THYSANOPTERA	
PHLAEOTHRIPIDAE	
***Gynaikothrips ficorum* (Marchal)**	*Thripastichus gentilei*
***Gynaikothrips uzeli* (Zimmerman)**	*T. gentilei*
***Hoplothrips pedicularius* (Haliday)**	*T. gentilei*
***Liothrips laureli* (Mason)**	*T. gentilei*
***Liothrips oleae* (Costa)**	*T. gentilei*
***Liothrips urichi* Karny**	*T. gentilei*
HOMOPTERA	
APHIDIDAE	
***Aphis gossypii* Glover**	*Aprostocetus minutus* [?H]

Appendix 1 (*continued*).

Host taxa	Tetrastichine taxa
***Aphis pomi* De Geer**	*A. minutus* [?H]
CALOPHYIDAE	
***Calophya californica* Schwarz**	*Tamarixia triozae*
***Calophya nigrella* Jensen**	*T. triozae*
***Calophya triozomima* Schwarz**	*T. triozae*
COCCIDAE	
***Ceroplastes floridensis* Comstock**	*Aprostocetus antiguensis*
***Lecanium corni* Bouché**	*Aprostocetus minutus* [?H]
***Lecanium nigrofasciatum* Pergande**	*A. minutus* [?H]
***Lecanium persicae* (L.)**	*A. minutus* [?H]
***Physokermes insignicola* (Craw)**	*A. minutus* [?H]
***Pulvinaria bigeloviae* Cockerell**	*A. minutus* [?H]
***Saissetia oleae* (Olivier)**	*A. minutus* [?H]
PSEUDOCOCCIDAE	
***Phenacoccus acericola* King**	*Aprostocetus minutus* [?H]
***Phenacoccus helianthi* (Cockerell)**	*A. minutus* [?H]
***Pseudococcus comstocki* (Kuwana)**	*A. minutus* [?H]
***Pseudococcus juniperi* Ehrhorn**	*A. minutus* [?H]
PSYLLIDAE	
***Aphalara curta* Caldwell**	*Tamarixia dyra*
***Euglyptoneura minuta* Crawford**	*Tamarixia triozae*
***Euphalerus vermiculosus* Crawford**	*T. triozae*
***Heteropsylla cubana* Crawford**	*Tamarixia leucaenae*
***Pachypsylla* sp.**	*Pentastichus ithacus* [H]
***Pexopsylla cercocarpi* Jensen**	*T. triozae*
TRIOZIDAE	
***Paratrioza cockerelli* (Sulc)**	*Tamarixia triozae*
***Trioza albifrons* Crawford**	*T. triozae*
***Trioza beameri* Tuthill**	*T. triozae*
***Trioza collaris* Crawford**	*Aprostocetus psyllaephagus*
***Trioza* sp.**	*Aprostocetus gelastus*; *Tamarixia dyra*
NEUROPTERA	
CHRYSOPIDAE	
***Chrysopa californica* Coquillett**	*Baryscapus chrysopae*
***Chrysopa oculata* Say**	*B. chrysopae*
***Chrysopa plorabunda* Fitch**	*B. chrysopae*
***Chrysopa rufilabris* Burmeister**	*B. chrysopae*
***Chrysopa* sp.**	*B. chrysopae*
LEPIDOPTERA	
ARCTIIDAE	
***Hyphantria cunea* (Drury)**	*Aprostocetus esurus*
COLEOPHORIDAE	
***Coleophora laricella* (Hübner)**	*Baryscapus dolosus* [F]; *Minotetrastichus frontalis*
GELECHIIDAE	
***Exoteleia pinifoliella* (Chambers)**	*Aprostocetus marylandensis*
***Fascista cercerisella* (Chambers)**	*Baryscapus dolosus* [F]
***Gnorimoschema gallaesolidaginis* (Riley)**	*Tetrastichus paracholus*
***Recurvaria milleri* (Busck)**	*Aprostocetus milleri* [H]
GRACILLARIIDAE	
***Parornix* sp.**	*Baryscapus dolosus* [F]
HELIOZELIDAE	
***Coptodisca splendoriferella* (Clemens)**	*Minotetrastichus frontalis*

Appendix 1 (*continued*).

Host taxa	Tetrastichine taxa
LASIOCAMPIDAE	
***Malacosoma americanum* (Fabricius)**	*Baryscapus malacosomae*; *Tetrastichomyia clisiocampae*
***Malacosoma californicum* (Packard)**	*B. malacosomae*
***Malacosoma disstria* Hübner**	*Aprostocetus esurus*; *A. silvaticus*; *B. malacosomae*
***Malacosoma fragile* Stretch**	*B. malacosomae*
***Malacosoma pluviale recenseo* Dyar**	*B. malacosomae*
LIMACODIDAE	
***Cnidocampa flavescens* (Walker)**	*Melittobia acasta*
LYCAENIDAE	
***Strymon edwardsii* (Saunders)**	*saundersii* (unplaced)
***Strymon falacer* (Goedart)**	*Baryscapus theclae*; *saundersii* (unplaced)
***Strymon melinus* (Hübner)**	*Baryscapus lissus*
LYMANTRIIDAE	
***Nygmia phaeorrhoea* (Donovan)**	*Aprostocetus esurus*
***Orgyia leucostigma* (J. E. Smith)**	*A. esurus*
***Lymantria dispar* (L.)**	*A. esurus*
LYONETIIDAE	
***Leucoptera spartifoliella* Hübner**	*Baryscapus evonymellae*
***Paraleucoptera albella* (Chambers)**	*Aprostocetus punctatifrons* [?]
NOCTUIDAE	
***Achatodes zeae* (Harris)**	*Tetrastichomyia clisiocampae*
***Alabama argillacea* (Hübner)**	*Aprostocetus esurus*
***Anomis erosa* (Hübner)**	*A. esurus*
OECOPHORIDAE	
***Stenoma algidella* (Walker)**	*Aprostocetus esurus*
PIERIDAE	
Pieris sp.	*Baryscapus galactopus* [H]
PLUTELLIDAE	
***Homadaula anisocentra* Meyrick**	*Baryscapus dolosus* [F]
***Plutella xylostella* (L.)**	*Oomyzus sokolowskii* [F]
PYRALIDAE	
***Acrobasis juglandis* (LeBaron)**	*Aprostocetus esurus*
***Diatraea crambidoides* (Grote)**	*Tetrastichomyia clisiocampae*
***Diatraea saccharalis* (Fabricius)**	*A. esurus*
***Ostrinia nubilalis* (Hübner)**	*T. clisiocampae*
SATURNIIDAE	
***Coloradia pandora* Blake**	*Aprostocetus pandora*
SATYRIDAE	
***Oeneis melissa* (Say)**	*Tetrastichus semideae*
SESIIDAE	
***Sanninoidea exitiosa* (Say)**	*Tetrastichomyia clisiocampae*
TORTRICIDAE	
***Ancylis comptana fragariae* (Walsh & Riley)**	*Baryscapus dolosus* [F]
***Barbara colfaxiana* (Kearfott)**	*Aprostocetus strobilus*; *Baryscapus barbarae* [?H]
***Choristoneura fumiferana* (Clemens)**	*Aprostocetus esurus*
***Choristoneura pinus* Freeman**	*A. esurus*
***Epinotia nanana* (Treitschke)**	*Aprostocetus varicornis*
***Evora hemidesma* Zeller**	*Baryscapus dolosus* [F]
***Grapholita molesta* (Busck)**	*Aprostocetus esurus*; *Tetrastichomyia clisiocampae*
***Gretchena bolliana* (Slingerland)**	*A. esurus*
***Rhyacionia buoliana* (Schiffenmüller)**	*Baryscapus turionum*

Appendix 1 (*continued*).

Host taxa	Tetrastichine taxa
***Rhyacionia frustrana* (Comstock)**	*Aprostocetus marylandensis*; *A. varicornis*
***Rhyacionia frustrana bushnelli* (Busck)**	*Aprostocetus longicorpus*
COLEOPTERA	
BRUCHIDAE	
***Bruchus brachialis* Fahraeus**	*Baryscapus bruchivorus*
BUPRESTIDAE	
***Agrilus arcuatus* (Say)**	*Baryscapus rugglesi*
***Agrilus champlaini* Frost**	*Baryscapus nordi*; *B. rugglesi*
***Agrilus horni* Kerremans**	*B. nordi*
***Agrilus rubicola* Abeille**	*B. rugglesi*
***Agrilus sinuatus* (Olivier)**	*Tetrastichus agrili*
***Chrysobothris femorata* (Olivier)**	*Baryscapus holbeini*
***Chrysobothris mali* Horn**	*B. holbeini*
CERAMBYCIDAE	
***Crossidius hirtipes* LeConte**	*Baryscapus malophilus*
***Oncideridis cingulata* (Say)**	*Aprostocetus oncideridis*
***Saperda candida* Fabricius**	*Melittobia chalybii*
CHRYSOMELIDAE	
***Blepharida rhois* (Forster)**	*Tetrastichus ovipransus*
***Cassida rubiginosa* Müller**	*Tetrastichus clito*
***Chlamisus gibbosus* (Fabricius)**	*Baryscapus chlamytis*
***Chlamisus* sp.**	*B. chlamytis*
***Crioceris asparagi* (L.)**	*Tetrastichus coeruleus*
***Deloyala guttata* (Olivier)**	*Aprostocetus cassidis*
***Exema dispar* Lacordaire**	*Baryscapus chlamytis*
***Exema mormona* Karren**	*B. chlamytis*
***Metriona bicolor* (Fabricius)**	*Aprostocetus cassidis*
***Microrhopala xerene* (Newman)**	*Baryscapus microrhopalae*
***Microrhopala vittata* (Fabricius)**	*B. microrhopalae*
***Oulema melanopus* (L.)**	*Tetrastichus julis*
***Physonota unipunctata* (Say)**	*Quadrastichus whitmani*
***Pyrrhalta luteola* (Müller)**	*Baryscapus erynniae* [H]; *Oomyzus brevistigma; O. gallerucae*
CLERIDAE	
***Cymatodera* sp.**	*Baryscapus thanasimi*
***Thanisimus dubius* (Fabricius)**	*B. thanasimi*
***Thanasimus trifasciatus* (Say)**	*B. thanasimi*
***Thanasimus* sp.**	*B. thanasimi*
COCCINELLIDAE	
***Adalia bipunctata* (L.)**	*Aprostocetus minutus* [?H]
***Chilocorus kuwanae* (Silvestri)**	*Aprostocetus neglectus*
***Coccinella quinquenotata* Kirby**	*Oomyzus scaposus*
***Coccinella* sp.**	*O. scaposus*
***Cycloneda sanguinea* (L.)**	*Aprostocetus minutus* [?H]
***Cycloneda sanguinea immaculata* (Fab.)**	*A. minutus* [?H]
CURCULIONIDAE	
***Anthonomus grandis* Boheman**	*Baryscapus hunteri*
***Compsus auricephalus* (Say)**	*compsivorus* (unplaced)
***Cylindrocopturus adspersus* (LeConte)**	*Quadrastichus ainsliei*
***Diaprepes abbreviatus* (L.)**	*Aprostocetus gala*; *Quadrastichus haitiensis*
***Diaprepes famelicus* (Olivier)**	*A. gala*
***Exopthalmus quadrivittatus* (Olivier)**	*Quadrastichus haitiensis*
***Gerstaeckeria nobilis* LeConte**	*Baryscapus gerstaeckeriae*
***Gerstaeckeria porosa* LeConte**	*B. gerstaeckeriae*

Appendix 1 (*continued*).

Host taxa	Tetrastichine taxa
***Hypera postica* (Gyllenhall)**	*Oomyzus incertus*
***Odontopus calceatus* Say**	*Baryscapus prionomeri*
***Pachneus litus* (Germar)**	*Quadrastichus haitiensis*
***Pachneus opalus* (Olivier)**	*Q. haitiensis*
***Rhynchaenus pallicornis* (Say)**	*Baryscapus malophilus*; *Minotetrastichus frontalis*
LANGURIIDAE	
Languria mozardi	*A. (Ootetrastichus) gibboni*
MORDELLIDAE	
***Mordellistena pustulata* (Melsheimer)**	*Quadrastichus ainsliei*
***Mordellistena* sp.**	*Q. ainsliei*
SCOLYTIDAE	
***Scolytus rugulosus* (Ratzeburg)**	*Tetrastichus scolyti*
DIPTERA	
CECIDOMYIIDAE	
***Asphondylia helianthiglobulus* Osten Sacken**	*Galeopsomyia haemon*
***Asphondylia websteri* Felt**	*Aprostocetus sobrius*; *Galeopsomyia transcarinata*
***Asphondylia* sp.**	*A. sobrius*; *Paragaleopsomyia cecidobroter* [I/G]
***Asteromyia agrostis* (Osten Sacken)**	*Aprostocetus lasius*
***Asteromyia carbonifera* (Osten Sacken)**	*Aprostocetus homeri*; *Baryscapus fumipennis*
***Asteromyia* sp.**	*Aprostocetus tesserus*
***Contarinia sorghicola* (Coquillett)**	*Aprostocetus diplosidis*
***Contarinia wattsi* Gagné**	*Aprostocetus nebraskensis*
***Dasineura balsamicola* (Lintner)**	*Aprostocetus marcovitchi*; *Quadrastichus whitmani*
***Dasineura leguminicola* (Lintner)**	*Aprostocetus nebraskensis*; *A. pausiris*; *A. zosimus* [F]
***Diarthronomyia chrysanthemi* Ahlberg**	*Quadrastichus diarthronomyiae*
***Mayetiola destructor* (Say)**	*Aprostocetus zosimus* [F]; *Quadrastichus ainsliei*
***Mayetiola phalaridis* Barnes**	*A. zosimus* [F]
***Monarthropalpus buxi* (Laboulbène)**	*Quadrastichus flora*
***Oligotrophus betheli* Felt**	*Aprostocetus marcovitchi*
***Oligotrophus skuhravae* (Roskam)**	*Aprostocetus pallipes*
***Rhopalomyia anthophila* (Osten Sacken)**	*Aprostocetus anthophilus*
***Rhopalomyia* sp.**	*Aprostocetus hibus*; *Galeopsomyia haemon*
***Taxodiomyia cupressiananassa* (Osten Sacken)**	*Aprostocetus fidius*
Undetermined Cecidomyiidae	*Aprostocetus marylandensis*; *Paragaleopsomyia gallicola*
CHLOROPIDAE	
***Pseudogaurax signatus* (Loew)**	*Tachinobia repanda*
SYRPHIDAE	
undetermined syrphid	*Tetrastichus aeneoviridis*
TACHINIDAE	
***Carcelia lagoae* (Townsend)**	*Tachinobia repanda*
***Erynniopsis rondanii* Townsend**	*Baryscapus erynniae*
undetermined tachinid	*Melittobia acasta*
TEPHRITIDAE	
***Aciurina bigeloviae* (Cockerell)**	*Baryscapus cecidophagus*
***Aciurina ferruginea* (Doane)**	*C. cecidophagus*

Appendix 1 (*continued*).

Host taxa	Tetrastichine taxa
***Aciurina maculata* (Cole)**	*B. cecidophagus*
***Eurosta solidaginis* (Fitch)**	*Quadrastichus solidaginis*
***Orellia ruficauda* (Fabricius)**	*Baryscapus daira*; *Crataepus marbis*
***Procecidochares* sp.**	*Baryscapus cecidophagus*
***Rhagoletis fausta* (Osten Sacken)**	*Aprostocetus faustus*
TIPULIDAE	
***Dolichopeza americana* Needham**	*Tetrastichus byersi*
***Dolichopeza walleyi* (Alexander)**	*T. byersi*
HYMENOPTERA	
APHELINIDAE	
***Coccophagus albicoxa* Howard**	*Aprostocetus minutus*
***Coccophagus lycimnia* (Walker)**	*A. minutus*
***Coccophagus* sp.**	*A. minutus*
ARGIDAE	
***Arge pectoralis* (Leach)**	*Tetrastichus trisulcatus*
***Arge scapularis* (Klug)**	*T. trisulcatus*
***Arge* sp.**	*T. trisulcatus*
BRACONIDAE	
***Apanteles atalantae* (Packard)**	*Baryscapus modestus*
***Apanteles carpatus* (Say)**	*Baryscapus tineivorus*
***Apanteles congregatus* (Say)**	*Baryscapus coerulescens*
***Apanteles edwardsii* Riley**	*B. modestus*
***Apanteles glomeratus* (L.)**	*Baryscapus galactopus*
***Apanteles melanoscelus* (Ratzeburg)**	*B. coerulescens*
***Apanteles pyraustae* Vierick**	*B. modestus*
***Apanteles* sp.**	*B. coerulescens*; *Tetrastichus tibialis*
***Bracon gelechiae* Ashmead**	*B. coerulescens*
***Bracon hebetor* Say**	*B. coerulescens*
***Bracon* sp.**	*B. coerulescens*
***Meteorus acronyctae* Muesebeck**	*B. coerulescens*
***Meteorus* sp.**	*Tetrastichus euplectri*
***Microgaster congregatiformis* Vierick**	*B. modestus*
***Microgaster* sp.**	*B. coerulescens*
***Microplitis gortynae* Riley**	*Tetrastichomyia clisiocampae*
***Phanomeris phyllotomae* Muesebeck**	*Minotetrastichus frontalis*
***Praon* sp.**	*Aprostocetus minutus*
CEPHIDAE	
***Janus abbreviatus* (Say)**	*Tetrastichus productus*
CYNIPIDAE	
***Amphibolips quercuscinerea* (Ashmead)**	*Baryscapus racemariae*
***Amphibolips quercusjuglans* (Osten Sacken)**	*B. racemariae*
***Amphibolips quercusracemaria* (Ashmead)**	*B. racemariae*
***Andricus kingi* Bassett**	*A.* (*Quercastichus*) *pattersonae*
***Andricus lasius* (Ashmead)**	*B. racemariae*
***Andricus quercuscalifornicus* (Bassett)**	*Baryscapus gigas*
***Andricus quercusflocci* (Walsh)**	*B. racemariae*
***Antron quercusechinus* (Osten Sacken)**	*A.* (*Quercastichus*) *burksi*
***Atrusca quercuscentricola* (Osten Sacken)**	*B. racemariae*
***Aulacidea podagrae* (Bassett)**	*Baryscapus cormus*
***Belonocnema treatae* Mayr**	*Galeopsomyia nigrocyanea*
***Besbicus mirabilis* Kinsey**	*A.* (*Quercastichus*) *garryana*
***Callirhytis blastophaga* (Ashmead)**	*Aprostocetus blastophagi*
***Callirhytis quercuspomiformis* (Bassett)**	*A.* (*Quercastichus*) *burksi*; *B. racemariae*

Appendix 1 (*continued*).

Host taxa	Tetrastichine taxa
***Diplolepis ignota* (Osten Shacken)**	*Aprostocetus hesperius*; *A. rosae*
***Diplolepis ostensackeni* (Beutenmüller)**	*Aprostocetus rosae*
***Disholcaspis chrysolepidis* (Beutenmüller)**	*A.* (*Quercastichus*) *burksi*
***Disholcaspis cinerosa* (Bassett)**	*B. racemariae*
***Disholcaspis quercusglobulus* (Fitch)**	*Aprostocetus impexus*
***Disholcaspis quercusmamma* (Walsh)**	*B. racemariae*
***Disholcaspis quercusvirens* (Ashmead)**	*flavipes* (unplaced)
***Dryocosmus bicornis* (McCracken & Egbert)**	*A.* (*Quercastichus*) *pattersonae*
***Heteroecus pacificus* (Ashmead)**	*B. racemariae*
***Neuroterus floccosus* (Bassett)**	*A.* (*Quercastichus*) *verrucarii*
***Neuroterus niger* Gillette**	*A.* (*Q.*) *verrucarii*
***Neuroterus noxiosus* (Bassett)**	*B. racemariae*
***Neuroterus quercusbatatus* (Fitch)**	*B. racemariae*
***Neuroterus quercusrileyi* (Bassett)**	*Aprostocetus neuroteri*; *Baryscapus ichthyus* [?]
***Neuroterus quercusverrucarum* (Osten Sacken)**	*Quadrastichus baldufi*; *A.* (*Quercastichus*) *verrucarii*
***Neuroterus saltarius* Weld**	*Aprostocetus neuroteri*
***Neuroterus saltatorius* (Edwards)**	*A.* (*Quercastichus*) *pattersonae*
***Xanthoteras emoryi* (Ashmead)**	*Baryscapus ichthyus* [?]
***Xanthoteras politum* (Bassett)**	*A.* (*Quercastichus*) *politi*
undetermined cynipods	*A.* (*Quercastichus*) *garryana*; *albocinctus* (unplaced)
DIPRIONIDAE	
***Gilpinia frutetorum* (Fabricius)**	*Peckelachertus diprioni*
ENCYRTIDAE	
***Anagyrus yuccae* (Coquillett)**	*Aprostocetus minutus*
***Anagyrus* sp.**	*A. minutus*
***Aphycus lounsburyi* Howard**	*A. minutus*
***Aphycus physokermes* Timberlake**	*A. minutus*
***Blastothrix longipennis* Howard**	*A. minutus*
***Chalcaspis phenacocci* (Ashmead)**	*A. minutus*
***Chrysoplatycerus ferrisi* Timberlake**	*A. minutus*
***Chrysoplatycerus splendens* Howard**	*A. minutus*
***Clausenia purpurea* Ishii**	*A. minutus*
***Homalotylus terminalis* (Say)**	*A. minutus*
***Homalotylus* sp.**	*Tetrastichus tibialis*
***Microterys mazzinini* Girault**	*A. minutus*
***Microterys* sp.**	*A. minutus*
***Pseudleptomastix squammulata* Girault**	*A. minutus*
***Zarhopalus corvinus* (Girault)**	*A. minutus*
EULOPHIDAE	
***Euplectrus comstockii* Howard**	*Baryscapus dolosus* [F]
***Euplectrus platyhypenae* Howard**	*B. dolosus* [F]; *Tetrastichus euplectri*
***Euplectrus* sp.**	*Tetrastichus scriptus* [?]
***Omphale maculata* (Delucchi)**	*Pentastichus ithacus*
EUPELMIDAE	
***Anastatus tenuipes* Bolivar & Pieltain**	*Cucarastichus texanus*
EURYTOMIDAE	
***Axima zabriskiei* Howard**	*Baryscapus americanus* [F]
***Bruchophagus* sp.**	*Aprostocetus venustus* [?]; *Baryscapus bruchophagi*
ICHNEUMONIDAE	
***Hyposoter pilosulus* (Provancher)**	*Baryscapus coerulescens*

Appendix 1 (*continued*).

Host taxa	Tetrastichine taxa
***Olesicampe* sp.**	*Tetrastichus tibialis*
***Sphecophaga vesparum burra* (Cresson)**	*Melittobia chalybii*
LEUCOSPIDAE	
***Leucospis affinis* Say**	*Melittobia chalybii*
MEGACHILIDAE	
***Coelioxys* sp.**	*Tetrastichus coelioxydis*
***Megachile brevis* Say**	*T. coelioxydis* [H]
***Megachile centuncularis* (L.)**	*Baryscapus megachilidis*; *Melittobia chalybii*
***Megachile concinna* Smith**	*B. megachilidis*
***Megachile gentilis* Cresson**	*B. megachilidis*
***Megachile inermis* Provancher**	*Melittobia chalybii*
***Megachile relativa* Cresson**	*Melittobia acasta*; *M. chalybii*
***Megachile xylocopoides* Smith**	*B. megachilidis*
MYMARIDAE	
***Polynema needhami* (Ashmead)**	*Tetrastichus polynemae*
PLATYGASTERIDAE	
***Platygaster zosime* Walker**	*Aprostocetus zosimus* [F]
***Platygaster herrichi* Packard**	*A. zosimus* [F]
POMPILIDAE	
***Anoplius nigerrimus* (Scopoli)**	*Tetrastichus pompilicola*
***Auplopus* sp.**	*Chaenotetrastichus semiflavus*; *Tetrastichus auplopus*
***Dipogon sayi* Banks**	*Tetrastichus johnsoni*
***Phanagenia bombycina* (Cresson)**	*Chytrolestes alibaba*; *Tetrastichus johnsoni*
PTEROMALIDAE	
***Homoporus destructor* (Say)**	*Aprostocetus zosimus*
***Catolaccus aeneovirdis* (Girault)**	*Baryscapus coerulescens*
***Dibrachys cavus* (Walker)**	*B. coerulescens*
***Hemadus nubilipennis* (Ashmead)**	*Baryscapus cormus* [?]
***Pachyneuron californicum* Girault**	*Aprostocetus minutus*
***Pteromalus* sp.**	*B. coerulescens*
SPHECIDAE	
***Chalybion californicum* (Saussure)**	*Melittobia chalybii*
***Crabro* sp.**	*Melittobia megachilis*
***Sceliphron caementarium* (Drury)**	*M. chalybii*; *M. megachilis*
***Trypargilum lactitarse* (Saussure)**	*Melittobia australica*; *M. evansi*
***Trypargilum politum* (Say)**	*M. chalybii*; *M. digitata*; *M. evansi*; *M. femorata*
***Trypoxylon* sp.**	*Melittobia scapata*
TENTHREDINIDAE	
***Euura atra* (L.)**	*Anaprostocetus acuminatus*
***Fenusa ulmi* Sundevall**	*Minotetrastichus frontalis*
***Heterarthrus nemoratus* (Fallén)**	*M. frontalis*
***Pikonema alaskensis* (Rohwer)**	*Melittobia chalybii*
VESPIDAE	
***Ancistrocerus antilope* (Panzer)**	*Melittobia chalybii*
***Eumenes fraternus* Say**	*M. chalybii*
XYLOCOPIDAE	
***Ceratina dupla* Say**	*Baryscapus americanus*
***Ceratina ignara* Cresson**	*B. americanus*
***Ceratina nanula* Cockerell**	*B. americanus*
***Ceratina sequoiae* Michener**	*B. americanus*
***Ceratina* sp.**	*B. americanus*

Appendix 1 (*continued*).

Host taxa	Tetrastichine taxa
PLANT KINGDOM	
CHENOPODIACEAE	
Atriplex canescens	*Paragaleopsomyia cecidobroter* [G]
FABACEAE	
Melilotus albus	*Aprostocetus* sp. [P] (see note at *A. venustus*)
Melilotus officinalis	*Aprostocetus* sp. [P] (see note at *A. venustus*)
MYRTACEAE	
Eucalyptus umbellata	*Quadrastichodella nova* [P]
SAPINDACEAE	
Cardiospermum corindum	*Lisseurytomella flava* [P]
Cardiospermum microcarpum	*L. flava* [P]

Appendix 2. Tetrastichinae used in biological control projects in North America, Caribbean, Central America

Notes associated with target pest: [I], introduced but not recovered; [E] established, extent of control not known; [P], partial control of host; [S], substantial control of host; [?], uncertain.

Tetrastichine	Target pest	Reference
Aceratoneuromyia indica	*Anastrepha* spp. [E, S] [Tephritidae]	Clausen (1978: 333–334), Cock (1985: 10–11)
	Ceratitis capitata [?] [Tephritidae]	Clausen (1978: 322)
Aprostocetus gala	*Diaprepes* spp., *Exophthalmus* spp. [E] [Curculionidae]	As *Tetrastichus gala*: Cock (1985: 9)
Baryscapus turionum	*Rhyaciona buoliana* [E] [Olethreutidae]	(As *Tetrastichus turionum*): Clausen (1956: 8, 66, 130–131); McGugan and Coppel (1962: 73); Syme (1971: 199, 203); Clausen (1978: 218–221)
Baryscapus bruchivorus	*Bruchus brachialis* [E] [Bruchidae]	(As *Tetrastichus bruchivorus*): Clausen (1956: 52); Clausen (1978: 246)
Oomyzus brevistigma	*Pyrrhalta luteola* [P] [Chrysomelidae]	(All as *Tetrastichus brevistigma*): Clausen (1956: 67); DeBach (1964: 687); Laing and Hamai (1976: 722–723); Clausen (1978: 256)
Oomyzus gallerucae	*Pyrrhalta luteola* [E] [Chrysomelidae]	Clausen (1956: 66) (as *Tetrastichus xanthomelaenae*); Clausen (1978: 255–257) (as *Tetrastichus galerucae*)
Oomyzus incertus	*Hypera brunneipennis* [I] [Curculionidae]	As *Tetrastichus incertus*: Clausen (1978: 266)
	Hypera postica [E] [Curculionidae]	As *Tetrastichus incertus*: Harcourt and Guppy (1984: 41–42); Clausen (1978: 268–70)
Oomyzus ovulorum	*Epilachna varivestis* [I] [Coccinellidae]	Clausen (1978: 258) (as *Tetrastichus ovulorum*)

Appendix 2 (*continued*).

Tetrastichine	Target pest	Reference
Oomyzus sokolowskii	*Plutella xylostella* [P, S] [Pyralidae]	Cock (1985: 41–44, 154) (as *Tetrastichus sokolowskii*)
Quadrastichus haitiensis	*Diaprepes* spp. *Exophthalmus* spp. [E] [Curculionidae]	(As *Tetrastichus haitiensis*): Clausen (1978: 262); Cock (1985: 9); Sutton *et al.* (1972); Schauff (1987: 34–36)
	Diaprepes abbreviatus [I] [Curculionidae]	(As *Tetrastichus haitiensis*): Cock (1985: 57)
Tetrastichus asparagi see *Tetrastichus coeruleus*		
Tetrastichus ayyari see *Tetrastichus howardi*		
Tetrastichus brevistigma see *Oomyzus brevistigma*		
Tetrastichus bruchivorus see *Baryscapus bruchivorus*		
Tetrastichus coeruleus	*Crioceris asparagi* [P] [Chrysomelidae]	(As *T. asparagi*): Clausen (1956: 53); DeBach (1964: 687); Laing and Hamai (1976: 722–723); Clausen (1978: 249–250)
Tetrastichus gala see *Aprostocetus gala*		
Tetrastichus galerucae see *Oomyzus gallerucae*		
Tetrastichus gentilei see *Thripastichus gentilei*		
Tetrastichus giffardianus	*Anastrepha suspensa* [I] [Tephritidae]	Clausen (1978: 334)
	Ceratitis capitata [I] [Tephritidae]	Clausen (1978: 322–323)
	Rhagoletis completa [I] [Tephritidae]	Clausen (1956: 25); Clausen (1978b: 335)
Tetrastichus howardi	*Diatraea* spp. [?] [Pyralidae]	Cock (1985: 63) (as *Tetrastichus ayyari*). Mentioned in table without indication of whether or not importation had been attempted
Tetrastichus incertus see *Oomyzus incertus*		
Tetrastichus julis	*Oulema melanopus* [S] [Chrysomelidae]	Stehr (1970: 1968–1969); Clausen (1978: 253); Harcourt *et al.* (1984: 65–67)
Tetrastichus ovulorum see *Oomyzus ovulorum*		
Tetrastichus sokolowskii see *Oomyzus sokolowskii*		
Tetrastichus spirabilis	*Hypsipyla grandella* [I] [Pyralidae]	Cock (1985: 102–103)
Tetrastichus turionum see *Baryscapus turionum*		
Tetrastichus* sp.nr. *vaquitarum	*Saccharosydne saccharivora* [I] [Delphacidae]	Cock (1985: 49–50)
(Note: *Tetrastichus vaquitarum* Wolcott properly belongs in the genus *Aprotocetus*, and is so transferred in this paper. I have not seen specimens of this species near *vaquitarum*, so I cannot be sure of its placement.)		
Tetrastichus xanthomelaenae see *Oomyzus gallerucae*		
Thripastichus gentilei	*Gynaikothrips ficorum* [?] [Phlaeothripidae]	Clausen (1978: 19) (as *Tetrastichus thripophonus*); Cock (1985: 120) (as *Tetrastichus gentilei*). (Note: Cock reported that *T. gentilei* was released but not established, but

Appendix 2 (*continued*).

Tetrastichine	Target pest	Reference
		this species has apparently been in the West Indies since at least the 1930s, when it was described as *Tetrastichus tatei* by Dozier (1937).)

Appendix 3. Species names applied to North American Tetrastichinae, with the current generic placement.
Bold indicates a currently valid name.

acasta	*Melittobia*	***carlinarum***	*Pronotalia*
acuminatus	*Anaprostocetus*	*carpatus*	*Baryscapus*
acutus	unplaced	***cassidis***	*Aprostocetus*
aeneoviridis	*Tetrastichus*	***cecidobroter***	*Paragaleopsomyia*
aeneus	*Melittobia*	***cecidophagus***	*Baryscapus*
agrili	*Tetrastichus*	*centricolae*	*Baryscapus*
ainsliei	*Quadrastichus*	***chalybii***	*Melittobia*
ajax	*Aprostocetus*	*charoba*	*Aprostocetus*
alaskensis	unplaced	***chlamytis***	*Baryscapus*
albocinctus	unplaced	***chrysopae***	*Baryscapus*
alibaba	*Chytrolestes*	***cigdemae***	*Eriastichus*
americanus	*Baryscapus*	***cincinnatus***	*Tetrastichus*
animus	*Aprostocetus*	***clisiocampae***	*Tetrastichomyia*
annapolis	*Baryscapus*	***clito***	*Tetrastichus*
annulipes	*Paraspalangia*	***coelioxydis***	*Tetrastichus*
anthophilus	*Aprostocetus*	***coeruleus***	*Tetrastichus*
anthracinus	*Aprostocetus*	***coerulescens***	*Baryscapus*
antiguensis	*Aprostocetus*	*columbiana*	*Galeopsomyia*
argei	Eulophinae	*compar*	*A. (Ootetrastichus)*
argyrus	*Aprostocetus*	***compsivorus***	unplaced
asparagi	*Tetrastichus*	***cormus***	*Baryscapus*
asperulus	*Aprostocetus*	***crino***	*A. (Ootetrastichus)*
asthenogmus	*A. (Tetrastichodes)*	*cuneiformis*	*Aprostocetus*
auplopus	*Tetrastichus*	*cyclogaster*	*Minotetrastichus*
australica	*Melittobia*		
		daira	*Baryscapus*
baldufi	*Quadrastichus*	***debilis***	*Kocourekia*
banksii	*Aprostocetus*	*detrimentosus*	*Aprostocetus*
barbarae	*Baryscapus*	***diarthronomyiae***	*Quadrastichus*
bewicki	*Baryscapus*	***digitata***	*Melittobia*
bicolor	*Styotrichia*	***diplosidis***	*Aprostocetus*
blastophagi	*Aprostocetus*	***diprioni***	*Peckelachertus*
blattae	*Aprostocetus*	*dispar*	*A. (Ootetrastichus)*
blepyri	*Aprostocetus*	***dolosus***	*Baryscapus*
brevicornis	misidentification	*doteni*	*Baryscapus*
brevistigma	*Oomyzus*	*dubius*	*Aprostocetus*
bruchivorus	*Baryscapus*	***dyra***	*Tamarixia*
bruchophagi	*Baryscapus*		
bruzzonis	*Aprostocetus*		
burksi	*A. (Quercastichus)*	*ecus*	*Minotetrastichus*
byersi	*Tetrastichus*	***eja***	*Paragaleopsomyia*
		emersoni	*Paraspalangia*
caerulescens—see *coerulescens*		***epidius***	*Galeopsomyia*
californicus	*Baryscapus*	*erdoesi*	*Oomyzus*
canadensis	*Baryscapus*	***erynniae***	*Baryscapus*
carinatus	*Aprostocetus*	***esurus***	*Aprostocetus*

Appendix 3 (*continued*).

eucalypti	*Quadrastichodella*
euplectri	*Tetrastichus*
evansi	*Melittobia*
evonymellae	*Baryscapus*
faustus	*Aprostocetus*
fechteri	*Baryscapus*
femorata	*Melittobia*
fidius	*Aprostocetus*
fimbriata	*Aceratoneuromyia*
flava	*Lisseurytomella*
flavipes	unplaced
flavopictus	unplaced
fletcheri	*Crataepus*
flocci	*Baryscapus*
flora	*Quadrastichus*
florida	*Aprostocetus*
floridanus	*A.* (*Tetrastichodes*)
frontalis	*Minotetrastichus*
fumipennis	*Baryscapus*
gala	*Aprostocetus*
galactopus	*Baryscapus*
gallerucae	*Oomyzus*
gallicola	*Paragaleopsomyia*
garryana	*A.* (*Quercastichus*)
gelastus	*Aprostocetus*
gentilei	*Thripastichus*
gerardi	*Melittobia*
gerstaeckeriae	*Baryscapus*
gibboni	*A.* (*Ootetrastichus*)
gigas	*Baryscapus*
grafi	*Baryscapus*
grahami	*Kostjukovius*
granulatus (Ashmead)	*Aprostocetus*
granulatus (Walker)	*Baryscapus*
haemon	*Galeopsomyia*
hagenowii	*A.* (*Tetrastichodes*)
haitiensis	*Quadrastichus*
hesperius	*Aprostocetus*
hibus	*Aprostocetus*
hillmeadia	*A.* (*Ootetrastichus*)
holbeini	*Baryscapus*
homeri	*Aprostocetus*
huachucensis	*Exalarius*
hunteri	*Baryscapus*
hylotomae	*Tetrastichus*
ichthyus	*Baryscapus*
impexus	*Aprostocetus*
incertus	*Oomyzus*
irvingi	*Aprostocetus*
ischnopterae	*Aprostocetus*
ithacus	*Pentastichus*
jeanae	*Dapsilothrix*
johnsoni	*Tetrastichus*
julis	*Tetrastichus*
juniperi	*Aprostocetus*
kansasia	*Aprostocetus*
kilinceri	*Baryscapus*
lasius	*Aprostocetus*
lasiopterae	*Aprostocetus*
lecanii	*Aprostocetus*
leucaenae	*Tamarixia*
leucone	*Aprostocetus*
lissus	*Baryscapus*
longicauda	*Aprostocetus*
longicorpus	*Aprostocetus*
magnifica	*Henryana*
malacasomae	*Baryscapus*
malophilus	*Baryscapus*
marbis	*Crataepus*
marcovitchi	*Aprostocetus*
marilandia	*A.* (*Ootetrastichus*)
marilandicus	*Quadrastichus*
marylandensis	*Aprostocetus*
mediogutta	*Quadrastichus*
megachilidis	*Baryscapus*
megachilis	*Melittobia*
megalochilae	*Melittobia*
melanis	*Oomyzus*
microcosmus	*Aprostocetus*
microgastri	*Baryscapus*
microrhopalae	*Baryscapus*
milleri	*Aprostocetus*
minutus	*Aprostocetus*
modestus	*Baryscapus*
mundicornis	*Baryscapus*
mymaridis	*A.* (*Ootetrastichus*)
nebraskensis	*Aprostocetus*
neglectus	*Aprostocetus*
neuroteri	*Aprostocetus*
nigrocyanea	*Galeopsomyia*
nordi	*Baryscapus*
nova (*Quadrasticho-della*)	*Quadrastichodella*
novus (*Prothymus*)	*Aprostocetus*
oculatus	*Apterastichus*
odontos	*Exastichus*
oecanthivorus	*A.* (*Ootetrastichus*)
oklahoma	*Aprostocetus*
oncideridis	*Aprostocetus*
opacus	*Oxypracetus*
orgyiae Ashmead	*Aprostocetus*
orgyiae Girault	*Tetrastichomyia*
orgyiazele	*Tetrastichomyia*
oviductus	*Aprostocetus*
ovipransus	*Tetrastichus*

Appendix 3 (*continued*).

pallipes	*Aprostocetus*
pandora	*Aprostocetus*
paracholus	*Tetrastichus*
pattersonae	*A. (Quercastichus)*
pausiris	*Aprostocetus*
petiolata	*Ceratoneura*
phegus	*Baryscapus*
phidippi	*Baryscapus*
philodromi	*Baryscapus*
politi	*A. (Quercastichus)*
polynemae (*Hyperteles*)	*A. (Ootetrastichus)*
polynemae (*Tetrastichus*)	*Tetrastichus*
pompilicola	*Tetrastichus*
pretiosa	*Ceratoneura*
prionomeri	*Baryscapus*
productus	*Tetrastichus*
psyllaephagus	*Aprostocetus*
pulchricornis	*Tetrastichomyia*
pulchriventris	*Quadrastichus*
punctatifrons	*Aprostocetus*
pygmaeus	*Aprostocetus*
quadrata	*Styotrichia*
racemariae	*Baryscapus*
rapo	*Baryscapus*
repanda	*Tachinobia*
repulsus	*Baryscapus*
rhosaces	misidentification
rosae	*Aprostocetus*
rugglesi	*Baryscapus*
saundersii	unplaced
scapata	*Melittobia*
scaposus	*Oomyzus*
scolyti	*Tetrastichus*
scriptus	*Tetrastichus*
semiauraticeps	*Aprostocetus*
semideae	*Tetrastichus*
semiflavus	*Chaenotetrastichus*
semilongifasciatus	*Quadrastichus*
silvaticus	*Aprostocetus*
silvensis	*Tetrastichomyia*
sobrius	*Aprostocetus*
sokolowskii	*Oomyzus*
solidaginis	*Quadrastichus*
spilopteris	*A. (Quercastichus)*
squamosa	*Galeopsomyia*
stanfordiensis	*Baryscapus*
strobilanae	*Aprostocetus*
strobilus	*Aprostocetus*
tatei	*Thripastichus*
terebrans	*Aprostocetus*
tesserus	*Aprostocetus*
texanus	*Cucarastichus*
thanasimi	*Baryscapus*
theclae	*Baryscapus*
thripophonus	*Thripastichus*
tibialis	*Tetrastichus*
tineivorus	*Baryscapus*
transcarinata	*Galeopsomyia*
tricolor	*Quadrastichus*
triozae	*Tamarixia*
trisulcatus	*Tetrastichus*
turionum	*Baryscapus*
ulysses	*Quadrastichus*
varicornis	*Aprostocetus*
venustus	*Aprostocetus*
verrucarii	*A. (Quercastichus)*
villosus	*Mesofrons*
viridimaculatus	*Neotrichoporoides*
waukheon	*Hadrotrichodes*
whitmani	*Quadrastichus*
xanthomelanae	*Oomyzus*
yoshimotoi	*Careostrix*
zopheros	*Comastichus*
zosimus	*Aprostocetus*