An Introduction to the Ichneumonidae of Australia

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With a contribution on Metopiinae
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CONTENTS

AN INTRODUCTION TO THE ICHNEUMONIDAE OF AUSTRALIA

SYNOPSIS

Illustrated keys are given to the 22 subfamilies and 215 genera of ichneumonids occurring in Australia. Four subfamilies (Lycorininae, Orthocentrinae, Oxytorinae and Phrudinae) are newly recorded from the continent as are six tribes, 80 genera and subgenera and 11 species. One new tribe, the Ankylophonini, is proposed in the Tryphoninae and 44 genera and 55 species are described as new. Eleven new combinations and 13 new synonyms are proposed. The name *Delopia* Cameron is re-instated for the large genus previously known as *Dusona* Cameron, and *Dusona* is limited to a small New Zealand species-group. One replacement name for a junior homonym is proposed. For each subfamily a diagnosis is given together with brief distributional and biological notes. Under each genus is listed a full synonymy, brief diagnosis (which may be expanded if the generic limits have been altered), list of Australian species and the known hosts. Introductory sections include notes on nomenclature, terminology and relationships, an extensive account of ichneumonid biology, a history of ichneumonid work in Australia and an account of the relationships and characteristics of the Australian fauna. The work is completed by a check-list of Australian ichneumonids, an extensive bibliography and indexes to both ichneumonids and their hosts.

INTRODUCTION

The last two decades have seen a profound change in public opinion about the use of insecticides. These chemicals, initially envisaged as a panacea for ridding the world of insect pests, have come to be regarded increasingly with suspicion (Carson, 1962; Perring & Mellanby, 1977; van den Bosch, 1978). Ecology and pollution have become both household words and major political issues. In many countries the use of several insecticides has been prohibited and the toxicity of others is being monitored. The efficacity of some insecticides is decreasing as many pests develop considerable immunity (Brown & Pal, 1971), and spiralling petroleum prices have caused great increases in the costs of agrochemicals and their application. Although it is unrealistic to think modern agriculture could be practised without insecticides (Fletcher, 1975), it is not surprising that there has been an increase in interest in alternative methods of pest management such as biological and integrated control (Wilson, 1960; Huffaker & Messenger, 1976; Minks & Gruys, 1980). For these selective control programmes to be successful an intimate knowledge of the biology of a pest and its parasites is essential and a sound taxonomic basis is vital for the development of such knowledge (Elmo Hardy, 1982). A comprehensive taxonomic study permits the accurate identification of an organism and hence provides constancy and universality in the usage of names, a prerequisite to the international communication of information. Furthermore, a modern classification is no arbitrary filing system. It is an approximation of a 'natural arrangement' enabling reasonably accurate predictions to be made about the biological characteristics of newly discovered taxa by reference to what is known about their nearest relatives (Crowson, 1970).

Amongst the most important of the natural enemies of insect pests are the parasitic Hymenoptera, a large group of animals whose larvae develop at the expense of other insects (Askew, 1971). Under normal circumstances the populations of many injurious insects are severely limited by the attacks of Parasitica and in several countries, including Australia, the ravages of accidentally imported pests have been curtailed by the introduction of one or more hymenopterans (Muldrew, 1967; Taylor, 1978).

Despite the enormous importance of Parasitica in the ecosystem, and notwithstanding the fundamental position of systematics in biology, the taxonomy of the parasitic Hymenoptera is amongst the least studied of any group of living organisms. This is the result of a variety of factors including the sheer size of the group (several families are each larger than the phylum Vertebrata), the great similarity of many species resulting from a high degree of morphological convergence (Gauld & Mound, 1982), an often large range of intraspecific variation and the great difficulty of culturing protelean parasites in the laboratory. The lack of an extensive systematic basis has discouraged many ecologists and agriculturalists from studying the group, and taxonomic problems present major difficulties to many entomologists who are working with Parasitica (Committee of European Research Councils, 1977).

The present work is intended to serve as an introduction and identification guide to one of the largest families of Parasitica, the Ichneumonidae, a group previously little studied in Australia. The only comprehensive work on the world genera of Ichneumonidae (Townes, 1969-1971) was undertaken with very little access to Australian material and consequently has, because of the uniquely isolated zoogeographical position of Australia, severe limitations in the region. Large numbers of species are not placeable in any genus. The incorporation of these Australian species into the ichneumonid classification has necessitated both the redefinition of many genera and the description as new of a number of endemic genera. This reclassification has been undertaken after study of a great deal of material in the major Australian institutions and in the comprehensive world collections of the British Museum (Natural History) and Drs H. and M. Townes. This study has been supplemented by additional collecting and by examination of the holotypes of almost all described Australian species. Although primarily an illustrated guide to the genera, the work is also intended to serve as an introduction to the biology and distribution of Australian Ichneumonidae, and to provide a check-list of the described species and an index to their known hosts.

NOMENCLATURAL PROBLEMS

The influential hymenopterist Dr H. K. Townes does not follow the *International Code of Zoological Nomenclature* nor does he accept the validity of the published opinions of the International Commission that affect hymenopterous nomenclature (Townes, 1969; Fitton & Gauld, 1976). Although Townes has argued his case rationally it is difficult to see what he has achieved by ignoring international conventions. In groups where he has done little work such as the Proctotrupidae (= Serphidae sensu Townes), Chironomidae (= Tendipedidae sensu Townes) and Braconidae (= Anomalidae sensu Townes) his family-group nomenclature is almost universally ignored. In the Ichneumonidae, however, his work is so important that it has had a great effect on other workers. This becomes more apparent as several of his former students have published a great deal in their own rights and used the Townes' system of nomenclature. Fitton & Gauld (1976, 1978) have attempted to establish the correct family-group names in the belief that it is unsatisfactory for a single family to be nomenclaturally out of step with the rest of zoology. Zoologists in general are unlikely to alter their practice of nomenclature to conform to the Townesian system so in this work an attempt has been made to alter ichneumonid names to conform to the generally accepted principles of zoological nomenclature.

TAXONOMIC CONCEPTS

GENERA

The author's ideas on genera have recently been published elsewhere (Gauld & Mound, 1982) and, although not repeated here, are relevant to the present work. The only new genera herein described are thought to be holophyletic assemblages but, as so little is known about ichneumonid phylogeny, very little attempt has been made to alter the *status quo*. In a very few cases where, in the author's opinion, the division between taxa is arbitrary (e.g. *Lycorina/Gonioglyphus/Toxophoroides*), or where one genus comprises a few specialized species belonging to a larger group (e.g. *Astomaspis/Caenopimpla*), synonymies have been established. A conservative approach has been adopted towards the erection of new taxa, and almost certainly several large genera (e.g. *Paraphylax*) will eventually be subdivided. As these are tropicopolitan taxa, any attempt at subdivision based only on the limited Australian fauna is unlikely to be helpful to other workers, and consequently has not been attempted at present.

As there is no way of standardizing the generic category (Clayton, 1972) it is not surprising that there are differences in generic concepts throughout the family that reflect different specialists' classificatory predilections. Townes' reclassification (1969-71*b*) has done much to standardize generic concepts over most of the family but he has not covered the Ichneumoninae. Genera in this subfamily are smaller, narrower and consequently more numerous than elsewhere.

SPECIES

Almost all female specimens examined during the course of this work have been sorted to 'species', i.e. groups of morphologically very similar individuals. On this basis approximate numbers of Australian species per genus have been estimated. These estimates will be most accurate in groups where species are large and distinctive (e.g. Pimplinae, Mesostenini, Ichneumoninae) or where the author has had experience at species level taxonomy (e.g. Ophioninae, Anomaloninae, Xoridinae). In taxonomically difficult groups where the species are very similar (e.g. Phytodietini, some Cremastinae, Campopleginae and Banchinae) or in poorly studied groups containing many small species (e.g. Mesochorinae, Orthocentrinae, some Oxytorinae) these estimates will be less reliable.

SUBSPECIES

In previous literature a number of Australian ichneumonids are regarded as separate subspecies from their northern relatives (Townes *et al.*, 1961; Gupta, 1962; Townes & Chiu, 1970). In the present work the subspecies category is not used and, as this is contrary to current trends in ichneumonidology, this action requires some justification.

Acceptance of geographical subspecies would seem to rest on four assumptions. These are -

1, the taxonomist's species is a single biological species;
2, the specimens at hand are a representative sample of populations under study;
3, each subspecies is morphologically more homogeneous than would be the combination of two adjacent subspecies;
4, a geographical segregate can be defined by a small number of chromatic or morphological characters.

It is the author's contention that none of these assumptions are justifiable for Indo-Australian Ichneumonidae.

Firstly, most modern morphotaxonomists recognize that their 'species' are unlikely to correspond exactly with biological species. Some recent research on insects demonstrates that certain morphospecies are groups of biological siblings (e.g. Angus, 1982; Lambert & Coetzee, 1982). Whilst the use of morphospecies as an initial approximation can be defended for purposes of practicality, the division of these into subspecies which may or may not coincide with the biological species serves only to obscure biological reality.

Secondly, no species is collected well enough to enable assessment of its true variability in the Indo-Australian region. Even the most commonly collected species, such as nocturnal ophionines, are only known from a few localities, and then often only from short series (Gauld & Mitchell, 1981).

Thirdly, generally only one or two characters are used to delineate a subspecies, although in the species as a whole large numbers of characters may vary. Thorpe (1980) demonstrated the inadequacies of using only few of many variables to delineate subspecies. The use of very few characters for delimiting subspecies of Indo-Australian ichneumonids appears suspiciously like editing the available data to fit one's preconceived ideas.

Fourthly, many of the 'subspecific characters' do not work when additional material is examined. Not infrequently one can find a typical example of one subspecies in the wrong area (Gauld, 1976*c*). In some cases the geographical ranges of the different sexes of the same subspecies do not wholly coincide (Betram & Bradley, 1972) though this biological anomaly does not prevent the authors using the category.

TERMINOLOGY AND ABBREVIATIONS

The following abbreviations have been used for depositories containing specimens examined.

AM	Australian Museum, Sydney, Australia.
ANIC	Australian National Insect Collection, Canberra, Australia.
BMNH	British Museum (Natural History), London, U.K.
DAH	Department of Agriculture, Hobart, Australia.
DAR	Department of Agriculture, Rydalmere, Australia.
DPIQ	Department of Primary Industry, Brisbane, Australia.
MNHN	Muséum National d'Histoire Naturelle, Paris, France.
MNHU	Museum für Naturkunde der Humboldt-Universität, Berlin, D.D.R.
NMV	National Museum of Victoria, Melbourne, Australia.
QM	Queensland Museum, Fortitude Valley, Australia.
TC	Townes Collection, Ann Arbor, Michigan, U.S.A.
TDF	Tasmanian Department of Forestry, Hobart, Australia.
TM	Természettudományi Múzeum, Budapest, Hungary.
UQM	University of Queensland Museum, Brisbane, Australia.
WAM	Western Australia Museum, Perth, Australia.

Distributions of the various species are abbreviated as follows.

A	Asio-Australian: i.e. widely distributed throughout South East Asia through to tropical Australia.
C	Cosmopolitan
E	Endemic Australian
I	Introduced into Australia
M	Melanesian: i.e. found throughout New Guinea and tropical Australia and usually the Solomons as well.
P	Pacific: i.e. found on some of the smaller western Pacific islands such as New Caledonia and the New Hebrides in addition to Australia.
T	Tropicopolitan Old World
W	Widespread east of Wallace's line.
Z	Australo-New Zealand

An asterisk (*) indicates a new record for Australia.

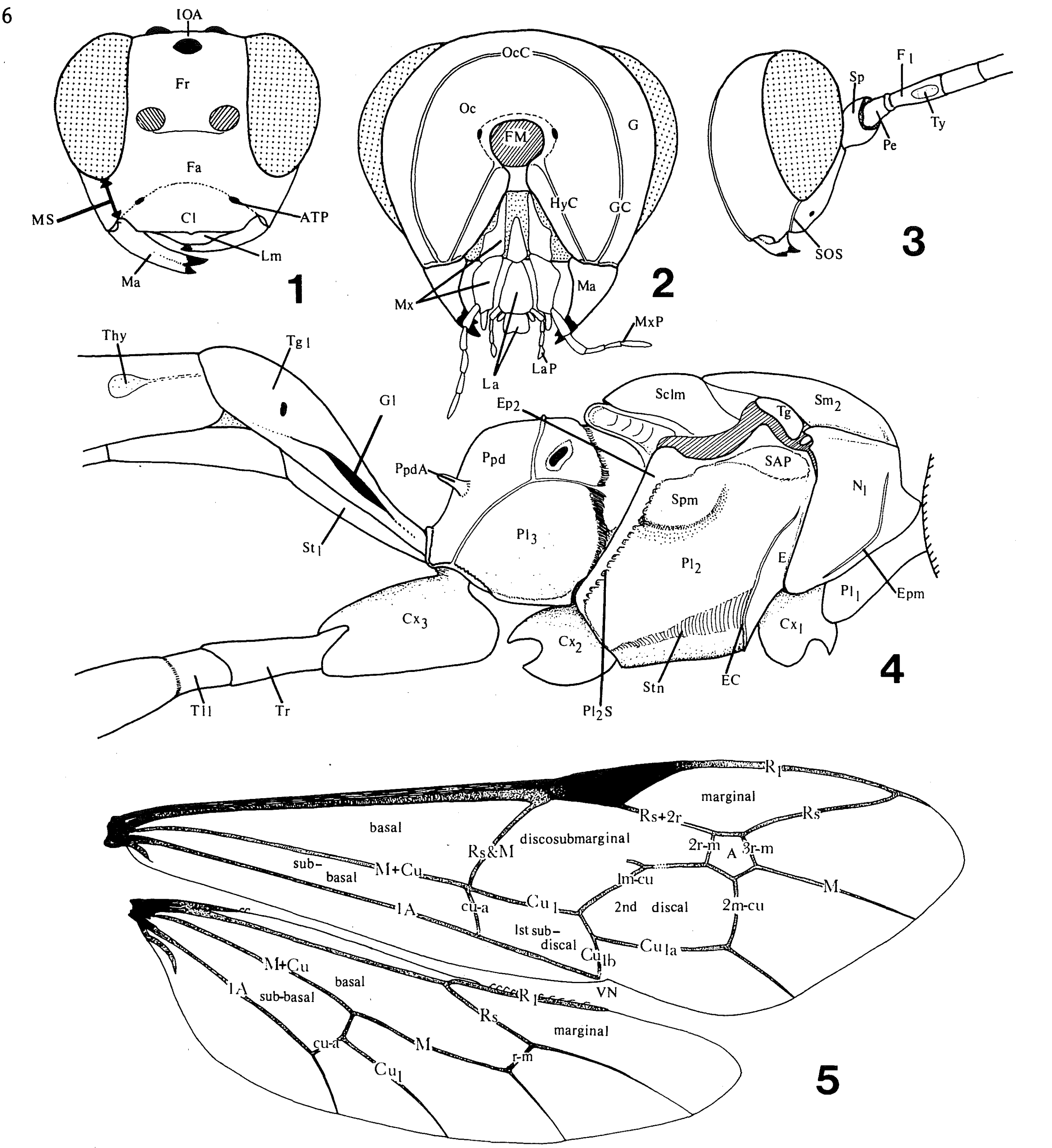
Distances and altitude given on labels have, where necessary, been altered to kilometres and metres. Locality names are used as in the 1972 edition of the *Times Atlas of the World*. These are listed in alphabetical order, firstly by state, then by locality within a state. The names of the hosts have, where appropriate, been altered to the generally accepted modern equivalent.

The morphological terminology used throughout the work is broadly similar to that used by Riek (1970). The naming of wing cells follows Eady (1974) and that of genitalia structures follows Peck (1937). The naming of microsculpture follows the system outlined by Eady (1968) and that of larval structure follows Short (1978). All morphological structures are illustrated in Figs 1-15 but a few specialized terms require further comment.

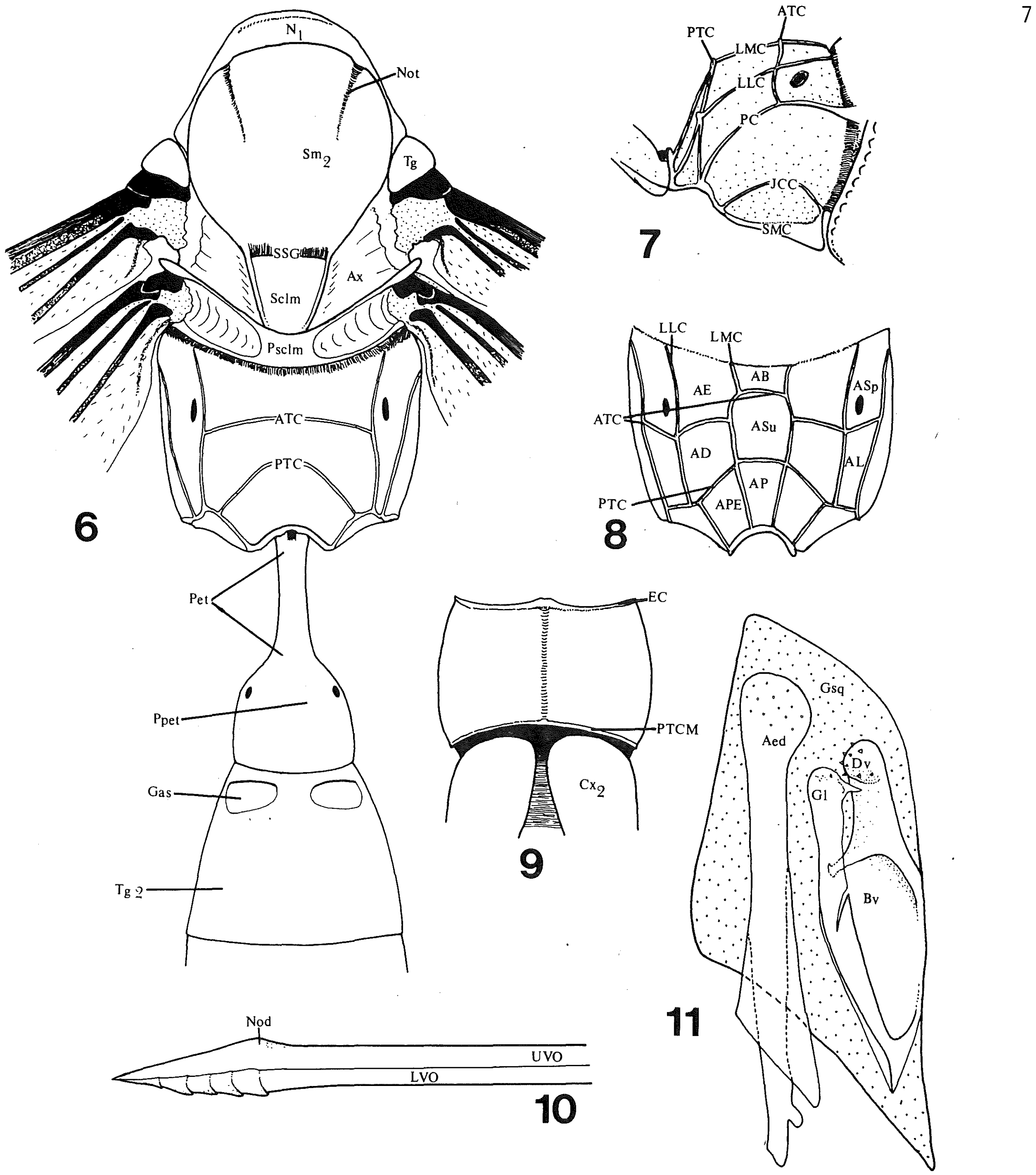
The LOWER FACE is that part of the face below the antennal sockets and includes the clypeus. Its width is the minimum distance between the inner margins of the eyes and its length is from the midline level with the lower margin of the antennal sockets to the median apex of the clypeus. Some smaller ichneumonids have a sharp groove extending from the eye to the mandible socket. This is the SUBOCULAR SULCUS and should not be confused with the band of coriaceous sculpture more commonly found in the same position. The antenna distal to the pedicel is termed the FLAGELLUM and its segments are numbered from the most proximal (which is 1) and exclude the annellus. Any type of large indented, flattened or raised sensory area is called a TYLOID, but the term is not applied to the narrow, elongate sensilla, the placoid sensilla, several of which occur on most flagellar segments.

The definitive insect thorax is composed of three segments, but in apocrite Hymenoptera the first abdominal segment or PROPODEUM is fused to the reduced metathorax. This combined thorax + propodeum is called the ALITRUNK and corresponds to the mesosoma of some contemporary North American authors. In older works, especially pre-1930, the propodeum was frequently mistakenly called the metathorax. The propodeum is often subdivided by carinae into a number of AREAE. A complete set of carinae and areae is shown in Figs 7, 8, but in many species these are reduced and care is needed in the interpretation of the resultant configurations. Generally the posterior transverse carina is somewhat raised at its junctions with the lateral longitudinal carinae. These promontories are the PROPODEAL APOPHYSES (Fig. 4). In some recent works (e.g. Townes, 1969) the anterior transverse carina is called the basal carina and the posterior one, the apical carina. In these works the epicnemial carina is usually termed the prepectal carina and the posterior transverse carina of the mesosternum is the postpectal carina. For other features of the alitrunk the terminology is more uniform. The NOTAULI are a pair of grooves arising from the front margin of the mesoscutum and extending posteriorly whilst the STERNAULUS is a broad shallow, often foveolate groove extending from the epicnemial carina towards the lower hind corner of the mesopleuron. Another important mesopleural feature is the SPECULUM, a convex, usually smooth area in the upper hind corner, anterior to the mesopleural suture. The EPOMIA is a carina on the pronotum laterally. Its lower end is usually close to and parallel with the anterior pronotal margin, but its upper end is often strongly divergent and may be raised to form a crest at its upper end. The ventral part of the mesothorax between the fore and mid coxae is called the MESOSTERNUM. Almost certainly the true mesosternum is very reduced or invaginated and this region is a continuation of the mesopleuron, but mesosternum is a convenient term to use. The wing venation follows the Comstock-Needham system (Fig. 5) as interpreted for the Hymenoptera by Richards (1956). Compound veins may be of two sorts - *M+Cu* where the plus means the vein is the result of longitudinal fusion of the named veins, and *Rs&M* where the & means the named veins have fused end to end so the resultant vein is *Rs* for part of its length and *M* for the rest. An ABSCISSA is a length of vein between two other veins except for distal abscissae which are the length of veins from their last junction to the wing margin. Although Eady's (1974) terminology has been adopted for venation, the second submarginal cell, which is, if present, very small, is called the AREOLET as this term is in almost universal usage for Ichneumonidae. The areolet should not be confused with the areola, a term not used in this work but one widely used for the area superomedia.

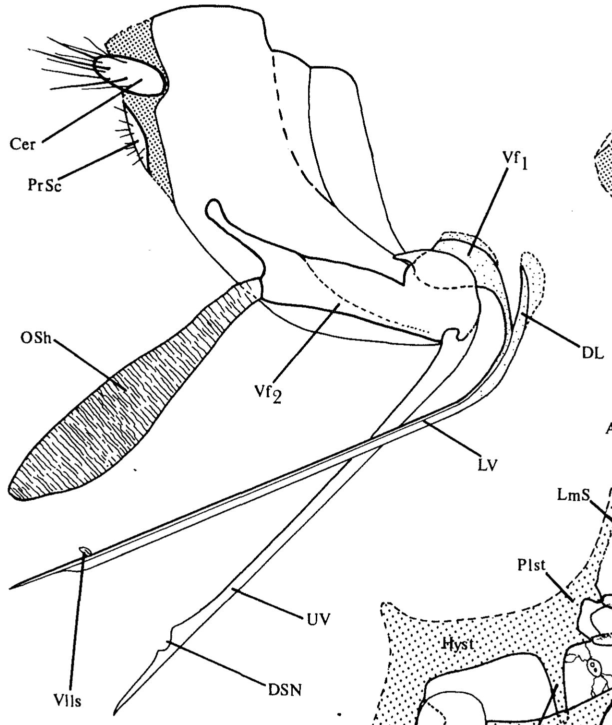
The GASTER is the abdomen less the propodeum and corresponds to the metasoma of some contemporary authors. The first segment of the gaster is the second abdominal segment, but in this work segment numbering starts from 1, the petiolar or first gastral segment. This segment is of great taxonomic importance. In some species the anterior part is narrow, subcylindrical and abruptly broadened near the spiracles. This anterior part is termed the PETIOLE whilst the posterior part is the POSTPETIOLE. The anterior part may bear a pair of lateral pits, the GLYMMAE, which may be small and shallow or very large, deep and virtually meeting in the midline. Tergite 2 usually bears a pair of oval or elliptical smooth areas, the THYRIDIA. These are usually near the anterior margin and flush with the surface, but in some ichneumonines they are sunken in broad concavities, the GASTROCOELI. The LENGTH OF THE OVIPOSITOR (OR SHEATH) projecting beyond the apex of the gaster



Figs 1-5 Stylized ichneumonid labelled to show terminology. 1-3 Heads (1) anterior (2) posterior (3) lateral. ATP = anterior tentorial pit; Cl = clypeus; F_1 = first flagellar segment; Fa = face; FM = foramen magnum; Fr = frons; G = gena; GC = genal carina; HyC = hypostomal carina; IOA = interocellar area; La = labium; LaP = labial palp; Lm = labrum; Ma = mandible; MS = malar space; Mx = maxilla; MxP = maxillary palp; Oc = occipital carina; Pe = pedicel; SOS = subocular sulcus; Sp = scape; Ty = tyloid. 4 Alitrunk and anterior end of gaster, lateral. Cx_{1-3} = coxae 1-3; E = epicnemium; Ep_2 mesepimeron; Epm = epomia; Gl = glymma; N_1 = pronotum; Pl_1 = propleuron; Pl_2 = mesopleuron; Pl_2S = mesopleural suture; Pl_3 = metapleuron; Ppd = propodeum; PpdA = propodeal apophysis; SAP = subalar prominence; Sclm = scutellum; Sm_2 = mesoscutum; Spm = speculum; St_1 = sternite 1; Stn = sternaulus; Tg = tegula; Tgl = tergite 1; Thy = thyridia; Tll = trochantellus; Tr = trochanter. 5 Fore and hind wings. A = areolet (the 2nd submarginal cell); VN = vannal notch.



Figs 6-11 Stylized ichneumonid labelled to show terminology. 6 Alitrunk and anterior end of gaster, dorsal. ATC = anterior transverse carina; Ax = axilla; Gas = gastrocoelus; N_1 = pronotum; Not = notaulus; Pet = petiole; Ppet = postpetiole; Psclm = postscutellum; PTC = posterior transverse carina; Sclm = scutellum; Sm_2 = mesoscutum; SSG = scuto-scutellar groove; Tg = tegula; Tg2 = tergite 2 of gaster. 7-8 Propodeum (7) lateral (8) dorsal. AB = area basalis; AD = area dentipara; AE = area externa; AL = area lateralis; AP = area petiolaris; APE = area postero-externa; ASp = area spiracularis; ASu = area superomedia; ATC = anterior transverse carina; JCC = juxta-coxal carina; LLC = lateral longitudinal carina; LMC = lateromedian longitudinal carina; PC = pleural carina; PTC = posterior transverse carina; SMC = submetapleural carina. 9 Mesosthorax, ventral. Cx_2 = mid coxa; EC = epicnemial carina; PTCM = posterior transverse carina of the mesosternum. 10 Apex of ovipositor, lateral. LVO = lower valve of ovipositor; Nod = nodus; UVO = upper valve. 11 Male genitalia, right-hand side. Aed = aedeagus; Bv = basivolsella; Dv = distivolsella; Gl = gonolacinia; Gsq = gonosquama.



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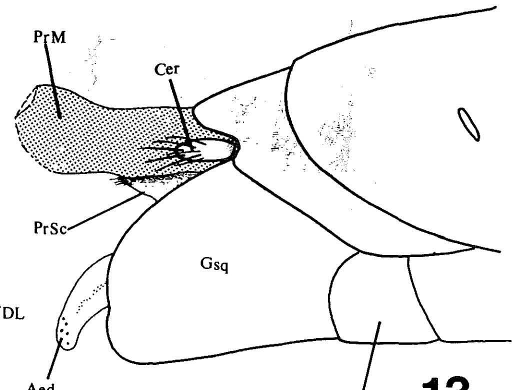

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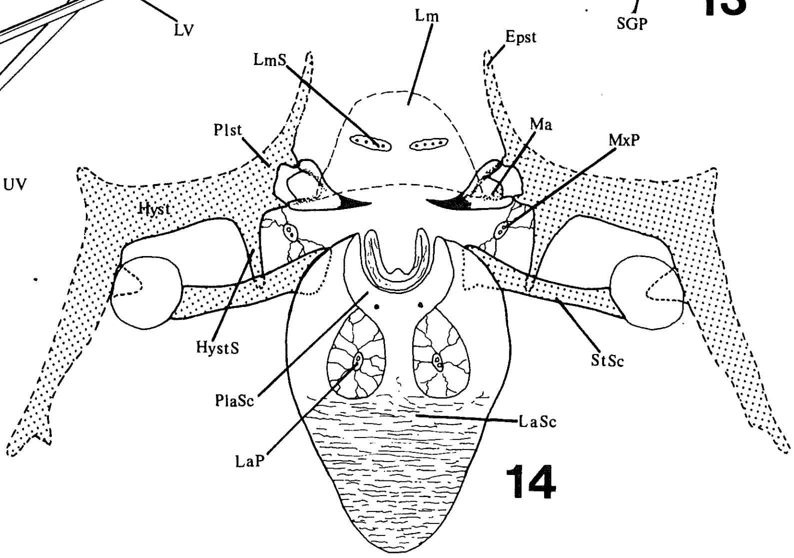

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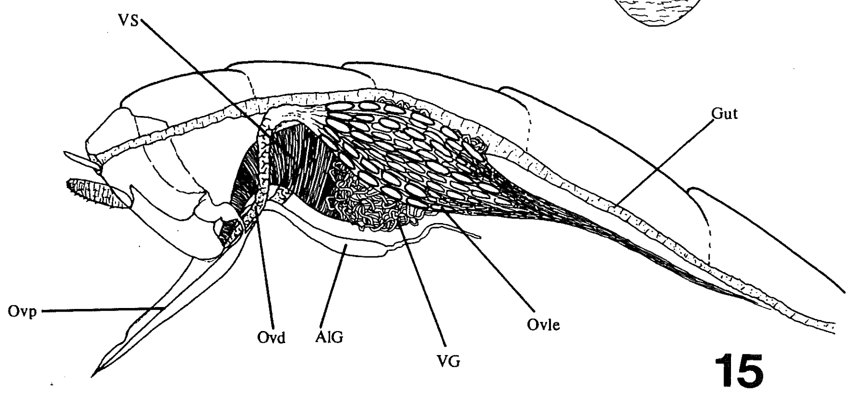

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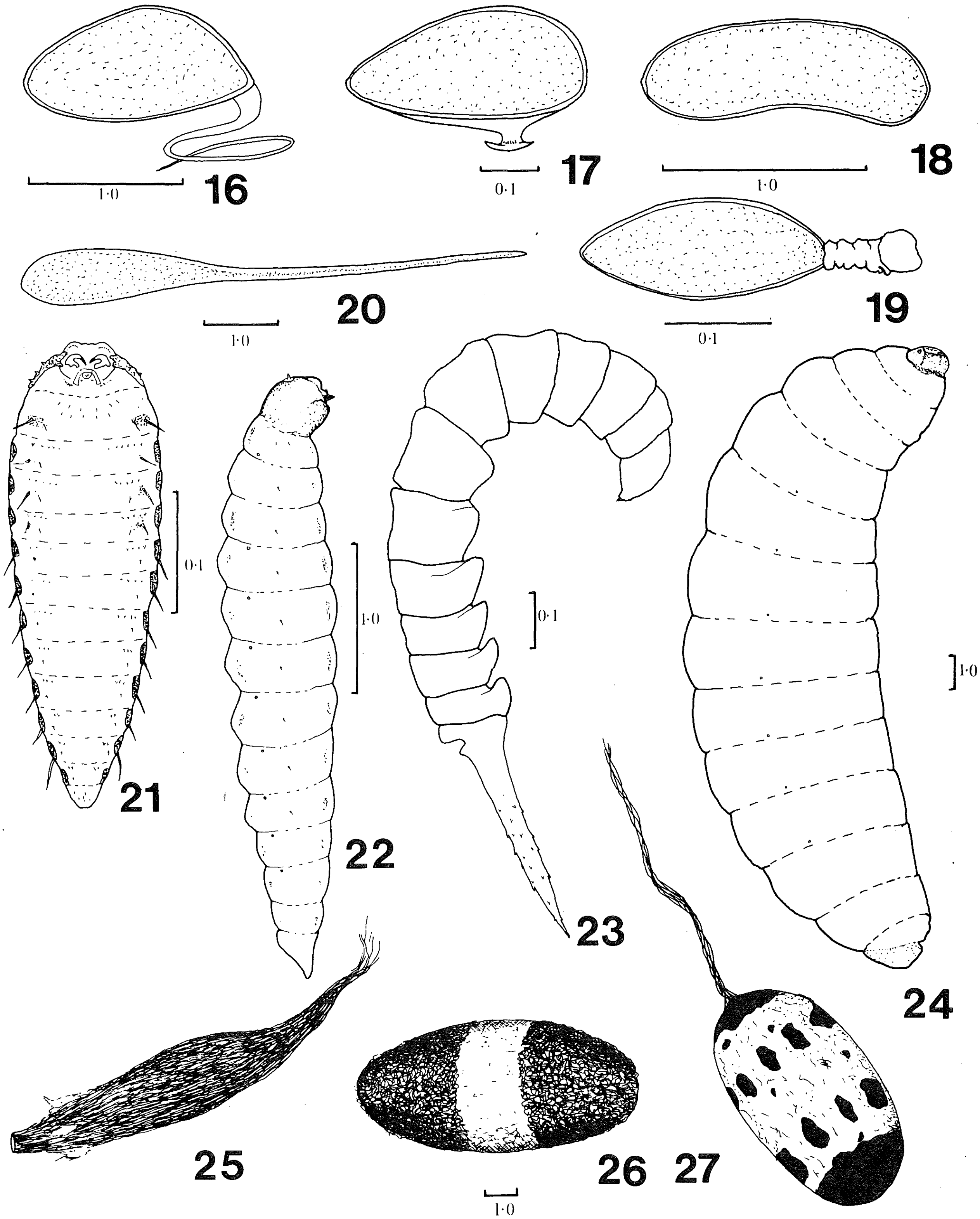
Figs 12-15 Stylized ichneumonid labelled to show terminology. 12 Female genitalia, partially dislocated. Cer = cercus; DL = dorsal lobe of valvula 1; DSN = dorsal subapical notch; LV = lower valve of ovipositor; OSh = ovipositor sheath (valvula 3); PrSc = proctodeal sclerite; UV = upper valve of ovipositor; Vf_{1-2} = 1st and 2nd valvifers; Vlls = valvillus. 13 Apex of male gaster with proctodeal membrane evaginate. Aed = aedeagus; Cer = cercus; Gsq = gonosquama; PrM = proctodeal membrane; SGP = subgenital plate (sternite 8 of gaster). 14 Facial skeleton of final instar larva. Epst = epistoma (when these join in midline structure is called epistomal arch); Hyst = hypostoma; HystS = hypostomal spur; LaP = labial palp; LaS = labial sclerite; Lm = labrum; LmS = labral sensilla; Ma = mandible; MxP = maxillary palp; PlaSc = prelabial sclerite; Plst = pleurostoma; StSc = stipital sclerite. 15 Female reproductive system and associated glands of *Enicospilus*. AlG = alkaline gland; Ovd = right oviduct; Ovle = ovariole; ovp = ovipositor; VG = venom gland; VS = venom sac.



Figs 16-27 Immature stages of ichneumonids. 16-20 Ovarian eggs (16) *Netelia* (17) *Heteropelma* (18) *Ichneumon* (19) *Euceros* (20) *Rhyssa*. 21-23 First instar larvae (21) *Euceros*, a planidial larva (after Varley, 1964) (22) *Rhyssa* (23) an anomalonine, a caudiform larva. 24 Final instar larva of *Enicospilus*. 25-27 Cocoons (25) *Eriostethus* (26) *Enicospilus* (27) *Charops*. (Scale lines in millimetres).

is measured in dorsal aspect with the ovipositor in the 'at rest' position, and is expressed as a proportion of the hind tibia length. Whilst this ratio varies slightly within a species, the absolute length can often vary a great deal and overlap that of related species or genera. In a few species which are weakly sclerotized and habitually die with the ovipositor reflexed forwards, the total length of the ovipositor may be given. This is measured from base to apex of valvula 2. The UPPER and LOWER VALVES of the ovipositor are respectively the second and first valvulae. The former may have a depression, the DORSAL SUBAPICAL NOTCH, before its end, or a raised crest, the NODUS, discernible. Valvula 1 has apical teeth and bears internally one or more articulated flaps, the VALVILLI, which are used to move the egg down the lumen of the ovipositor (Rodgers, 1972). The last gastral sternite is the SUBGENITAL PLATE and corresponds with the hypopygium of some workers. At the posterior end of the gaster is a pair of short appendages, the CERCI (= pygostyles sensu Richards, 1956). In some larger species, e.g. Rhyssini, the lateral margins of the proctodeal sclerite may be sclerotized and hirsute, and somewhat resemble a second pair of cerci (Fig. 13).

THE RELATIONSHIP OF ICHNEUMONIDAE WITH OTHER HYMENOPTERA

BIOLOGICAL RELATIONSHIPS

The Hymenoptera is one of the largest and most successful orders of animals in the world. They have an unusual adaptation which has probably been a major factor in influencing the evolutionary development of the group. This is the possession of a haplo-diploid sex determination mechanism: females are diploid whilst males are almost invariably haploid. Consequently the entire genetic complement carried by the male is exposed to natural selection, resulting in the efficient elimination of deleterious mutant genes. This removes a major factor mitigating against sib-mating and brother/sister copulation is quite common in the order. Furthermore, as many Hymenoptera can apparently control the access of sperm to the egg as it is laid, the sex of the offspring can be chosen. This system of facultative arrhenotoky allows the best utilization of resources: male eggs can be laid in or on small hosts and fertilized eggs laid in or on large hosts. Thus the females, which are longer lived and required to carry the eggs and search out a suitable host, are often, on average, the larger sex, particularly in the case of ectoparasites or others that do not permit the host to grow after it has been attacked. Frequently the sex ratio may be very unbalanced with a great preponderance of females.

The Apocrita, or 'waisted' Hymenoptera to which the family Ichneumonidae belongs, possess a further important adaptation, the specialization of the larva, with a closed gut, to highly nutritious, semi-fluid food (some Gasteruptionid larvae apparently do not have a closed gut (Malyshev, 1968) but this may be a secondary adaptation). The fact that in most Apocrita the mid gut does not open into the proctodeum until the final larval ecdysis means that the larva does not foul its immediate environment. The faecal matter is contained in the mid gut until it is voided about the time pupation occurs. Endoparasitism and pre-social nesting (i.e. the development of a relatively immobile larva on a protein-rich food store in a very confined space) would have been unlikely to develop if the hymenopterous larva produced copious faeces, thereby poisoning its immediate environment or host.

The basic apocritan biology, as exemplified by Stephanidae, Aulacidae, some primitive Ichneumonidae (e.g. *Rhyssa*, *Certonotus*) and many lower aculeates (e.g. Cleptidae, Thynninae) is for the hymenopteran to seek out a large, concealed host/prey individual which is then stung to immotility in its hideaway, and on which an egg is laid. The hymenopteran then develops solely by devouring the immotile insect. The disadvantage of this strategy is that large hosts are both generally uncommon and, at least if mobile, potentially dangerous. To some extent the latter disadvantage can be overcome by attacking virtually immotile objects such as pupae in cocoons or larvae whose movement is restricted (e.g. concealed in plant tissue). However, throughout the evolutionary history of the Hymenoptera there is a tendency to utilize younger and more readily available host/prey individuals. This has been achieved in two different ways which reflect the biological divergence between the Aculeata and the Parasitica. Aculeates have, at a relatively early stage in their evolutionary history, developed the ability to construct a nest (Evans & Eberhard, 1970). Initially they have continued to use a single prey individual (e.g. Pompilidae) but in more advanced groups (e.g. some Sphecidae) multiple smaller prey organisms are used or progressive provisioning (again with smaller prey) is practised. The shortage of nesting sites and the vulnerability of the stored food to cleptoparasites and saprophages has perhaps encouraged the development of sociality. It is characteristic of Aculeata that the ovipositor is usually not used for egg laying but for stinging the prey. Most aculeates produce powerful venoms to suppress their prey and many species are specialized to exploit very active arthropods such as Orthoptera, adult Diptera and spiders.

Powerful venoms can also be produced by parasitic Hymenoptera that use the ovipositor for egg laying. These are usually species which spend considerable periods host-searching, attack large hosts, have a low fecundity and therefore are able to invest more protein resources in venom production. In many Parasitica irritative or paralysing envenomation is often reduced, partly so as to allow a host to grow and hide and partly because of a tendency to attack younger and smaller hosts. The utilization of smaller hosts is achieved by Parasitica in two ways. Firstly, in many taxa (e.g. Chalcidoidea, Proctotrupoidea) the adults themselves are very small and consequently require a much smaller developmental food resource. Many ichneumonoids, however, are comparable in size to aculeates. They often oviposit in or on a relatively immature host and undergo a protracted first larval instar, during which time the host insect grows and may develop to, or almost to, the pupal phase. There is a marked tendency for the more primitive ichneumonoids to attack large hosts (and possess paralyzing venoms) whilst more specialized species oviposit in young larvae or even eggs. Although some ichneumonoids may emerge from immature larvae (e.g. some Microgasterinae, some Campopleginae) none undergo complete development within the egg as is the case with many microhymenoptera (e.g. Scelionidae, Mymaridae).

SYSTEMATIC RELATIONSHIPS

Structurally as well as biologically, ichneumonoids are amongst the more primitive Apocrita and are probably correctly placed near the basal bifurcation of Parasitica and Aculeata. The superfamily Ichneumonoidea is almost certainly a holophyletic group (Königsmann, 1978). It is recognizable by the following apomorphies:

- fusion of *C+Sc+R* in the fore wing with the corresponding virtual obliteration of the costal cell.
- sternite 1 of gaster divided (Mason, 1981).

The number of families in the Ichneumonoidea varies depending on the preferences and prejudices of individual workers but at the most there may be six- Ichneumonidae, Braconidae, Apozygidae, Aphidiidae, Paxylommatidae and Agriotypidae. The Stephanidae is not related to the group and best placed as a separate superfamily as are the Megalyridae and the Trigonalidae (Königsmann, 1978).

Some workers accept only two of the six ichneumonoid families. These, the Ichneumonidae and Braconidae, are extremely large and account for more than 95% of the species. The third largest family, the Aphidiidae, may be considered a subfamily of Braconidae (Achterberg, 1976*b*) whilst many workers (e.g. Perkins, 1959; Townes, 1969; and including the present author) treat the Agriotypidae as a subfamily of Ichneumonidae. The Apozygidae is only known from two males from Chile and seems to be very close to the Braconidae. The Paxylommatidae is a rather problematical taxon and has been treated as a separate family (Mason, 1981), a subfamily of Braconidae (Achterberg, 1976*a*) and a subfamily of Ichneumonidae (Rasnitsyn, 1980). The type-genus of the taxon, *Hybrizon*, contains a few highly specialized species and most of the distinctive features of the group are autapomorphies and therefore of no use in assessing its systematic position. Mason (1981) correctly points out that *Hybrizon* lacks the main apomorphy of braconids and therefore should not be included in the Braconidae. He also claims that there is a fundamental difference in the hind wing between ichneumonids and *Hybrizon*. Mason states that the radio-medial cross vein in braconid wings is 1*r-m* whilst that in ichneumonids is 2*r-m*. This may or may not be true but what is an observable fact is the in braconids the cross vein is proximal to the first fork of *R* (i.e. R_1/Rs junction). In ichneumonids the cross vein always arises from *Rs* distal to its junction with R_1. Mason then continues (1981: 431) by claiming that the cross vein in the wing of *Hybrizon* is 1*r-m* despite the fact that it arises from *Rs* distal to the junction with R_1. Certainly the abscissa of *Rs* is much shorter than in most ichneumonids (although it is comparable with some species of Phrudinae, Neorhacodinae, Tersilochinae and Cremastinae) but nevertheless the condition of *Hybrizon* and the Ichneumonidae is fundamentally similar, and different from that of Braconidae. Mason's logic for excluding *Hybrizon* from the Ichneumonidae is therefore incorrect. Although *Hybrizon* has a rather aberrant fore wing venation and a highly specialized body there is no fundamental reason why it should be excluded from the Ichneumonidae, therefore the present author agrees with Rasnitsyn (1980) and includes Paxylommatinae as a subfamily of Ichneumonidae.

The hind wing venational character given above is the main autapomorphy by which the family Ichneumonidae may be recognized. All ichneumonids lack a vein dividing the first discal cell from the first submarginal cell in the fore wing but so do many braconids. No braconid has 2*m-cu* present in the fore wing (*Apozyx* does) and usually this vein is present in ichneumonids, though in a few species (e.g. some *Dicamptus*; *Sathropterus*) it is absent.

THE BIOLOGY OF ICHNEUMONIDAE

Ichneumonids, like most other Parasitica, are protelean parasites, that is their larval stages are parasitic on other insects and arthropods whilst the adults are free living (Askew, 1971). Such animals are sometimes termed parasitoids to distinguish them from organisms whose adult stage is parasitic. Although described as parasites or parasitoids, ichneumonid larvae exhibit a wide diversity of biological habits ranging from highly modified specialist endoparasites, to mobile predators consuming spider's eggs in silken egg-sacs or bee larvae in a series of cells (Daly, 1983). Some Australian Labenines are at least partially vegetarian, developing on pollen stores of their host (Houston, 1965). However, the majority of ichneumonids are intimately associated with a single host individual, feeding either inside the body or living on its surface and feeding through an integumentary lesion. Endoparasites are physically protected even in an unconcealed host but because of their more exposed situation, ectoparasites are usually found upon hosts living in concealed places such as stem mines or pupal cells. Whilst most ichneumonids are solitary parasites a few ectoparasites may be gregarious (Fitton *et al*., 1982); none are known to be polyembryonic, though Shaw (pers. comm.) suspects isolated species of Banchinae and Campopleginae may be.

The majority of Ichneumonidae attack larvae of holometabolous insects, particularly those of the Lepidoptera and Symphyta. In most areas more than 60% of ichneumonid species are parasites of Lepidoptera and almost all species of Ichneumoninae, Banchinae, Lycorininae, Stilbopinae, Campopleginae, Ophioninae, Cremastinae, Metopiinae and Anomaloninae are restricted to hosts of this order. Large numbers of Phygadeuontinae and some Pimplinae and Tryphoninae are also associated with lepidopterans. Most Tryphoninae and almost all Ctenopelmatinae, Collyriinae and Adelognathinae are sawfly parasites. Relatively small numbers of species attack Diptera (Shaw & Askew, 1979) and, except for some phygadeuontines that parasitize cyclorrhaphous puparia, these all belong to small highly specialized subfamilies. The Orthocentrinae and Oxytorinae attack Mycetophilidae and the

Diplazontinae are parasites of aphidophagous Syrphidae. A number of ichneumonids from a variety of subfamilies attack Coleoptera. The Anomalonini parasitize tenebrionids and the Tersilochinae parasitize curculionids, chrysomelids and a few species of the small cucujoid families. A few campoplegines also attack curculionid and chrysomelid larvae whilst a phrudine is known to parasitize derondontids. Wood-boring beetles serve as hosts for a number of species of Pimplinae, Xoridinae, Phygadeuontinae, Acaenitinae and Labeninae. A few species of Phygadeuontinae and Labeninae parasitize Neuroptera or Mecoptera whilst species of the small subfamily Agriotypinae are parasitic on Trichoptera larvae. Apocrite Hymenoptera serve as hosts for a variety of ichneumonids; orthopelmatines parasitize cynipid larvae, groteines and some phygadeuontines attack bees whilst sphecophagines and some delomeristines attack vespids. A number of other Phygadeuontinae and some Pimplinae attack solitary wasps. The Polysphinctini are exceptional in being ectoparasites of spiders and a few phygadeuontines, labenines and pimplines use spider egg-sacs as hosts. A number of ichneumonids are hyperparasites. Hyperparasitism, the developing of one parasite on another, takes two forms, true hyperparasitism or pseudohyperparasitism (Shaw & Askew, 1976). The first type is where the hyperparasite develops at the expense of a primary parasite living on or within the primary host. The majority of Mesochorinae are obligate hyperparasites, developing internally in internal parasites such as campoplegines and microgasterine braconids. The insects can sometimes be observed probing a lepidopterous larva with their ovipositors, searching for primary parasites. A pseudohyperparasite attacks its host, the primary parasite, after this has in its turn destroyed its host (Shaw, 1981*b*). large numbers of small phygadeuontines and some pimplines are pseudohyperparasites. Most are facultative, attacking a wide range of small cocoons including those of ichneumonoids, but some species of the *Acrolyta* genus-group (Townes, 1970*a*) are apparently obligate pseudohyperparasites (Blunck & Kerrich, 1956).

The majority of ichneumonids are arrhenotokous with both males and females occurring in a population. A few cosmopolitan species (e.g. *Diplazon laetatorius*) are, for much of their range, thelytokous. In most bisexual species the males emerge before the females. In many diplazontines (Fitton & Rotheray, 1982) and orthocentrines the males form conspicuous flying swarms beneath trees, like some Nematocera, but in other species, e.g. wood-boring pimplines, males congregate around trees from which the females are about to emerge. In some species (e.g. *Megarhyssa*) males have a specially modified tubular gaster to allow them to mate with a female before she leaves the log (Nuttall, 1973). Males of a variety of species congregate on flower heads, particularly those with exposed nectaries such as many Umbelliferae. Mating is usually rather brief. Frequently the male approaches from behind repeatedly stroking the female with his antennae. Copulation occurs with the male behind or uppermost whilst mutual antennation continues (Gordh & Hendrikson, 1976; Danthanarayana *et al*,. 1977). In some species wing vibration occurs in the males, possibly in response to a female pheromone (Vinson, 1972*b*).

Although the behaviour of males of many species makes them conspicuous, the females spend much of their times host-searching in inconspicuous places and are thus less often seen, though at certain times of the day, often early morning, many females visit flowers to feed or can be seen drinking from dew droplets on vegetation. Pollen and nectar appear to be important in improving the fertility of aging females and increasing the viability of their eggs (Finlayson & Finlayson, 1957). Females also commonly feed on aphid honeydew whilst many ectoparasites feed on haemolymph exuding from lesions made in a prospective host with the ovipositor (Cushman, 1926; Graham, 1947; Leius, 1960).

The process of host-location and oviposition involves several distinct steps: host-habitat location, host-finding, host-acceptance, and for successful parasitization, host-suitability and host-regulation (Doutt, 1959; Vinson, 1975). A number of ichneumonids are initially attracted to the host's food source, e.g. *Venturia canescens* is attracted to oatmeal (Thorpe & Jones, 1937) whilst *Exeristes rufi-*

collis is attracted by the odour of pine oil (Thorpe & Caudle, 1938). Having located a suitable host-habitat, the flight pattern of the ichneumonid can change (Gauld, 1976*c*) as the process of host-finding is begun. Most species use the antennae to locate the host, frequently by running them in sweeps over the surface of the vegetation. Some species respond to the presence of host frass (Spradbery, 1970*a*) whilst some may probe the substrate with the ovipositor (Vinson, 1975). Once the female ichneumonid has located a potential host the next step is examination prior to host-acceptance. This is usually undertaken with the antennae though may also involve probing of the host with the ovipositor. Vinson (1975) suggests host-acceptance involves two steps, host-identification and discriminating whether or not the host is already parasitized.

Most ichneumonids probably inject glandular secretions into their hosts during the oviposition sequence. Many ectoparasites sting the host and inject a venom prior to egg laying. Such venoms may induce permanent paralysis (c.f. braconid venom, Beard, 1978). Other ectoparasites inject venom which only causes temporary paralysis. The host recovers and continues development (Cushman, 1926; 1937). Endoparasites generally only insert their ovipositor once and leave the host able to move, feed and moult whilst the parasitic larva grows within. However, they may introduce with the egg a secretion (van Veen, 1981). Some of these non-paralysing venoms are known to contain proteins produced by the lateral oviduct (Vinson, 1972*a*), others contain viral particles (Stoltz & Vinson, 1979). These venoms are known to regulate host development or decrease the efficacity of the host's defensive system (Vinson, 1972*a*; 1975; Smilowitz, 1974; Shaw, 1981*a*).

As might be expected the fecundity of ichneumonids varies inversely with the probability of successful parasitization. Species which have a planidial larva have a very reduced likelihood of finding a suitable host, and produce very large numbers of eggs, whilst species laying in or on a host produce fewer, larger eggs. Furthermore, species attacking young larvae, which are generally more abundant, produce more and smaller eggs than species attacking fully grown hosts such as pupae (Price, 1973; 1975). The various timing strategies adopted, and consequent fecundities, are of comparable overall efficiency, not only because the larger the parasite egg the less susceptible it is to the host's defences, but also because hosts selected later in their development are less prone to decimation by other causes (Shaw & Askew, 1976).

Ichneumonid females may have from around 10 (in some Ichneumoninae and Phygadeuontinae) to several thousand (in Eucerotinae) potential eggs. Those of most species are ovoid, pale and without apparent chorionic sculpture (Iwata, 1958) (Fig. 18) but a few genera have specialized eggs furnished with some sort of anchoring device. The most common example of this is amongst the tryphonines which have large eggs furnished with a variety of hooks or anchors (Fig. 16) which are used to attach the egg externally to the host's cuticle (Kasparayan, 1981). The eggs of some endoparasites, e.g. Anomaloninae (Fig. 17) and Tersilochinae, may be furnished with a sucker-like anchor to secure them to the endoderm (Gauld, 1976*c*), whilst the eggs of eucerotines are furnished with a long stalk to raise them off the leaf surface away from predators (Tripp, 1961) (Fig. 19). Many species with very long ovipositors have an extremely elongate egg (Fig. 20) that is compressible to facilitate passage down the lumen of the ovipositor.

The female ichneumonid may deposit the egg in a variety of places in, on or near a host. As mentioned above eucerotines place the egg on a leaf where carrier-hosts are feeding. Some ectoparasites, especially those permanently paralysing the host, simply lay an egg near to the host (Spradbery, 1969; Lloyd, 1956) whilst many ectoparasites, whose hosts recover, place an egg in a position where the host is unable to reach it with its mandibles (Simmonds, 1947; Baltensweiler & Moreau, 1957). Adelognathines apparently glue the egg to the host's integument (Fitton *et al.*, 1982). Whilst the majority of endoparasites place the egg free in the host's haemocoel some Ichneumoninae oviposit into the gut wall (van Veen, 1981) or salivary gland (Strickland, 1923), some Metopiinae oviposit into the cephalic ganglion (Gerig, 1960) and Anomaloninae attach the egg to some internal organ (Tothill, 1922). In species which lay on or into a host larva, development is often delayed and the ichneumonid generally consumes its host after a pupal chamber has been constructed. A few species (e.g. some Diplazontinae) oviposit into eggs but only complete development after the host has pupated. A few campoplegines are exceptional in completing development before the host larva is fully grown.

Many ectoparasites have a wide host range, sometimes attacking species of several different orders found in a single ecological niche (e.g. some pimplines are recorded from larvae of Sesiidae, Buprestidae and Xiphydriidae (Aubert, 1969)). This is possible as the host is an immobile food store for the ichneumonid larva. Most endoparasites, living in the host's haemocoel, have to adapt to the physiological stresses of the environment and usually have a much narrower host range than ectoparasites. The polyphagous ectoparasite avoids the danger inherent in being restricted to and dependant upon a single host species, but a monophagous endoparasite is able to evolve very efficient adaptations for the exploitation of its host, involving better host searching behaviour, an increased ability to counteract the host's defensive mechanisms and synchronization of its life-cycle with that of its host (Shaw & Askew, 1976).

Where several eggs of a single species are laid in a host that normally supports a single parasite (superparasitism), usually only one develops to maturity. The dominant larva may either physically destroy its competitors or cause their encapsulation (Cushman, 1916). Many ichneumonids are capable of detecting whether or not a host has been previously parasitized and avoid superparasitism (Lloyd, 1940). In at least some Parasitica, this discriminatory ability has to be learnt by the female encountering both parasitized and unparasitized hosts. Furthermore, the rate of superparasitism increases when females encounter many parasitized hosts (van Lenteren *et al.*, 1978). When two or more different species are present in a single host (multiparasitism) again usually only one survives. An unusual example of obligate multiparasitism occurs in the pimpline genus *Pseudorhyssa*. Species are incapable of drilling through timber to reach their siricid hosts, but oviposit instead through the borings made by *Rhyssa*. The first instar larva of *Pseudorhyssa* destroys that of *Rhyssa* before attacking the siricid (Spradbery, 1969).

In ichneumonids there are generally five larval instars, but in some groups e.g. Anomaloninae (Tothill, 1922) the number may be reduced to three, though the exact number is often difficult to ascertain (Rojas-Rousse & Benoit, 1977). The first instar larvae of comparatively few species are described but the majority of ectoparasites, and many endoparasites, have a simple spindle-shaped larva with a well-developed head capsule, conspicuous antennae and strongly sclerotized, sharp mandibles (Fig. 22). The spiracles of at least some species are open (Spradbery, 1970*b*) on the prothorax and first eight abdominal segments. The more specialized endoparasites (e.g. Anomaloninae, Ophioninae, Campopleginae) have a caudiform first instar larva (Fig. 23) with a weakly sclerotized head capsule, vestigial antennae, no spiracles and a characteristic long caudal appendage of unknown function (Thorpe, 1932). The mandibles may be well developed (Tothill, 1922) or vestigial (Gauld, 1976*a*). A few endoparasites may have a small membranous vesicle near the base of the caudal appendage; the function of this vesicle is not known but it apparently encloses a thin walled diverticulum of the mid gut (Błedowski & Kraińska, 1926). Vesiculate larvae are not nearly so common in ichneumonids as they are amongst Braconidae (Clausen, 1940). Eucerotines are unusual in having planidial first instar larvae (Tripp, 1961). These are flatter than those of most ichneumonids, more sclerotized and bear numerous setae (Fig. 21).

During progressive larval instars there is a gradual loss of the caudal appendage (if present) and heavily sclerotized head capsule (if present). The final instar larvae of most ichneumonids are superficially similar in being bloated, almost featureless objects with the head capsule small and partially retracted into the thorax (Fig. 24). Some ectoparasitic larvae, especially those of pimplines, may possess dorsal tubercles bearing small hooks or bristles to help them retain purchase on the host (Skaife, 1921; Nielsen, 1923). Because the final instar larval skin is generally retained in the cocoon and consequently is relatively easily collected, a considerable study has been made of the morphology of this stage (e.g. Finlayson, 1975; Short, 1978). Many good characters have been found to help identify various taxa, but some authors seem to have been unduly influenced by larval structure and have correspondingly accorded it considerable weight in classification (e.g. Townes, 1969). I believe this is unwarranted as there is clear evidence for striking convergence in the form of the head sclerites which is correlated with similarity in biology rather than indicative of phylogenetic affinity (Gauld, 1976*a*). For example, species that pupate within a host pupa, and consequently spin only a superficial cocoon have very reduced hypostomal spurs, or have lost them (Anomaloninae, Ichneumoninae, Metopiinae). Endoparasites of lepidopterous pupae have more than two sensilla on the maxillary and labial palps (Pimplini, Ichneumoninae) and ectoparasites often have denticulate mandibles (some Pimplinae and Tryphoninae, most Phygadeuontinae, Brachycyrtini, Xoridinae). Many other differences are largely due to size - smaller species having far less extensively sclerotized head capsules and consequently appearing to have lost parts such as much of the epistomal arch or the ventral part of the labial sclerite (Short, 1978).

Ichneumonid cocoons are usually formed where the host dies, thus many that kill their hosts as prepupae are in pupation chambers - those of tenthredinoids and macrolepidoptera often in soil or leaf litter whilst those of microlepidoptera may be in leaf rolls or under bark. Usually these ichneumonid cocoons are fibrous ovoid structures and some (e.g. Ophioninae) have characteristic patterning (Fig. 26). A few of these cocoons have a nacreous-like internal wall and are very resistant to dessication. Some multivoltine species which spend very short periods in the cocoon spin only a thin transparent cocoon (Danthanarayana *et al.*, 1977: pl. 10). Ichneumonids that pupate within the host pupa usually spin only a vestigial cocoon. Some campoplegines which kill their host on its food plant in a middle instar spin cocoons attached to the vegetation. These may be mottled to resemble bird's droppings and in some cases (e.g. *Charops*) suspended from leaves by a long thread (Fig. 27). The small cocoons of some campoplegines (e.g. *Bathyplectes*, *Phobocampe*) are capable of 'jumping' as a result of rapid movements of the larva within. Polysphinctines generally construct a cocoon within a spider's web. In some less specialized species (e.g. *Schizopyga*) it is ovoid and loosely spun, like a hemerobiid cocoon, but in many species it is angular, bearing ribs and usually has a small ventral opening (Fig. 25) used for voiding the meconium.

Many ichneumonids achieve synchronization by overwintering as adults within the cocoon (Morley, 1915*a*) but others overwinter as a first instar larva within a diapausing host. A few species, particularly ichneumonines, overwinter as adults in grass tussocks, leaf litter etc. (Rasnitsyn, 1964). Some bivoltine species utilize different host species at different times of the year (Salt, 1931; van Veen, 1981).

As ichneumonids may inflict severe mortality upon their hosts, there are strong selection pressures on host populations favouring the evolution of defensive measures. Many Lepidoptera migrate, thereby excaping from an area with a high parasite density, but a number of ichneumonids seem also to migrate, perhaps following their hosts (Common, 1954). Many endopterygote larvae conceal themselves either by hiding during the day and feeding after dark, or by feeding in mines, leaf rolls etc. The night-feeding caterpillars of noctuids are heavily parasitized by nocturnal ichneumonids. Concealed larvae of a variety of orders are parasitized by ichneumonids with long ovipositors. Pupae are particularly susceptible to parasitization and a variety of mechanisms have been adopted to escape the attention of parasites (and no doubt predators). Most commonly pupation occurs in a concealed place, such as under bark or in an earthen cell. Many pimplines and phygadeuontines oviposit through bark, whilst a number of ichneumonines and phygadeuontines have stout fossorial legs and tunnel to find their hosts. Exposed pupae often have a hard polished integument which, coupled with abdominal wriggling, prevents parasites inserting their ovipositors (Cole, 1959). The pupae of a few lepidopterans have spines between their abdominal segments which may serve to pinch prospective parasites and drive them away (Hinton, 1955). Some moths (e.g. limacodids) have extremely hard cocoons, but a few ichneumonids (e.g. *Litochila*, *Ceratomansa*) seem to have specialized on such hosts and have a corkscrew-like ovipositor apex which is twisted into the host cocoon (Momoi & Okamoto, 1965). A variety of larger lepidopterans spin a bulky, loose, woolly cocoon which tends to entangle and thus deter many ichneumonids. Some ophionines have specially modified mandibles to cope with such hosts (Gauld & Mitchell, 1981). Several adaptations to reduce parasitism are shown by ichneumonid cocoons, including their suspension from plants by a thread, having jumping cocoons and, in some species of *Hyposoter*, constructing a false cocoon (Finlayson, 1966).

Other defensive devices of the host operate after parasitization. The eggs of ectoparasites may be dislodged, although careful placing reduces such losses (Baltensweiler & Moreau, 1957). Endoparasites are in particular danger of being encapsulated, that is surrounded and suffocated by the host's haemocytes (Salt, 1970). A variety of strategies are adopted to circumvent encapsulation. In some cases a venom injected by the adult parasite inhibits the host's haemocyte reaction (Vinson, 1975; Salt, 1980), but a number of other methods may be adopted. Salt (1968) lists six methods of resistance to encapsulation - that due to protective coating; that due to attrition of the host; that due to acquired resistance by temporary occupation of an organ; that due to enveloping membrane; that due to the stage of the host attacked; that due to active resistance by the parasitoid. All of these strategies are in some way adopted by various ichneumonids. The egg and subsequently the first instar larva of *Venturia canescens* is coated with a proteinaceous particulate secretion of the calyx, a swollen region at the upper end of the oviduct (Rotheram, 1973*a*; 1973*b*). These particles, which become enmeshed in microscopic projections of the surface of the egg, inhibit host haemocyte action. This method is not likely to be adopted by all ichneumonids as many species have no calyx (Smith, 1932). Some ichneumonines (e.g. *Phaeogenes*) seem to overcome host resistance by rapid feeding, thus preventing by attrition any defence action (Salt, 1968). Some ichneumonine eggs or first instar larvae may be shielded from haemocyte action by living within an organ such as a salivary gland (Strickland, 1923) or the gut wall (van Veen, 1981). Enveloping membranes are found around the young larvae of anomalonines (Tothill, 1922; Rosenberg, 1934) and a ctenopelmatine (Caltagirone, 1964). Salt (1968) suggests that ichneumonids that oviposit into a host's egg or very young larva can acquire immunity before the host develops an adequate haemocytic defence. Puttler (1961) and van den Bosch (1964) both observed that campoplegines which develop successfully from eggs deposited in very young larvae, were encapsulated as larvae if eggs were deposited in more mature host larvae. Less evidence is available about active resistance to encapsulation by ichneumonid larvae though Schneider (1950) working with a *Diplazon* species observed physical repulsion and also postulated a secretory activity by the serosa.

THE HISTORY OF THE ICHNEUMONIDAE IN AUSTRALIA

The earliest descriptions of endemic Australian ichneumonids are of *Ichneumon nutatorius* and *Ichneumon caudator*. These were written by J. C. Fabricius in 1775 working with specimens collected by Sir Joseph Banks who accompanied Captain James Cook on his voyage along the east coast of Australia (1768-71). Both insects are tropical species and may well have been collected during the period Banks spent ashore in Queensland when the *Endeavour* was being repaired. In the following 100 years the Australian fauna received very little attention. Only about 20 species were described in the works of Erichson (1842) and Brullé (1846). The latter author described the first two Australian ichneumonid genera, *Labium* and *Westwoodia*. Unfortunately Brullé's work is marred by confused localities, and care needs to be exercised in interpreting his species. For example, *Mesostenus spinifrons*, described from 'the Cape of Good Hope in South Africa' is an endemic Australian species belonging to a genus (*Ceratomansa*) which does not occur in Africa.

The end of the ninteenth century was marked by a proliferation of descriptive taxonomy. In the three decades following 1895 more than 150 species of ichneumonids were described from Australia, mostly in the works of Cameron (1898-1912*b*), Szépligeti (1905-1916) and Morley (1912*a*-1915*b*). Generally works of this period were superficial and are of value today only for nomenclatural purposes. Two remarkable exceptions were Krieger's (1914) monograph on *Xanthopimpla* (which is now superceded by Townes & Chiu, 1970) and Turner & Waterston's revision of Australian *Labium* (1920). One possible reason for the high standard of this latter work is R. E. Turner's personal experience of collecting in Australia. He visited the continent several times and made large collections of Hymenoptera from around Hobart in Tasmania, Geraldton in Western Australia and from along the Queensland coast. Turner accumulated the best early collection of Australian Ichneumonidae which remained unsurpassed until the development of recent Malaise trap collecting techniques in the 1970s.

At the beginning of the twentieth century economic entomology started to develop and interest began in biological control. Some of the earliest work undertaken on ichneumonids in Australia was by Henry Tryon studying noctuid pests. Tryon considered ichneumons an important factor in controlling them and remarked "... a plague of caterpillars caused some consternation by reason of its ravages in the district immediately to the south of Brisbane in March, 1895. The immediate descendants of these marauders still exist, a score of generations having succeeded one another since then; and yet we have learnt of no further trouble from caterpillars in the districts alluded to. But that this would be so was predicted by the writer at the time, after having remarked the extent to which parasitic insects had victimised these grubs concerned in the ravages complained of." (Tryon, 1900: 140). This early interest in ichneumonid biology was continued by the pioneer Australian entomologist, W. W. Froggatt, who published a number of papers that include reference to economically important ichneumonids (Froggatt, 1907-1919).

Ironically, the increase in interest in ichneumonids by agricultural entomologists was rapidly followed by a decline in taxonomic work and, in the 40 years following 1920, the Australian ichneumonid fauna, in common with that of many other regions, received little attention. Only a few dozen species were described, mostly by A. A. Girault (*vide* Townes, 1971*a*) and L. E. Cheesman (1936). A. W. Parrott (1953-1957) published a series of small interesting papers on the taxonomy and biology of a few Australian Ichneumonidae.

Interest in ichneumonids for agricultural purposes continued to increase, especially as the idea of introducing parasites to control exotic pests gained favour. This work, pioneered in North America, was taken up in New Zealand during the 1920s and 30s to try and control pests such as *Cydia pomonella*, *Sirex noctilio* and *Plutella xylostella* (Tillyard, 1926; Miller & Clark, 1935; Morrison 1937). Encouraged by success of the biological control programmes in New Zealand, and no doubt worried by the spread of pests in their own island, the Tasmanian Department of Agriculture embarked on a programme of introducing, from New Zealand, a European *Diadegma* species to control *Plutella* and a *Rhyssa* species to control *Sirex* (Miller, 1949; Miller & Hudson, 1953).

The 1960s were a period of rapid change in ichneumonid systematics. In 1961 Townes and co-workers published a catalogue and reclassification of the Indo-Australian Ichneumonidae. This monumental work summarized virtually all work undertaken on Ichneumonidae in Australia. It also represents about the half way stage in the formulation of Townes' ideas on the phylogeny of ichneumonids which began with his 1944 catalogue of North American species and culminated in his *Genera of Ichneumonidae* (1969-1971*b*). Townes produced revolutionary changes in ichneumonid classification rearranging the original five subfamilies into 25 and providing keys to the world genera. Unfortunately he had seen little Australian material when he wrote *Genera of Ichneumonidae* and it is this ommission that has necessitated this work being undertaken.

Just after the *Indo-Australian Catalogue* was published one of the most detailed studies ever undertaken of an insect and its ichneumonid parasites was initiated by the Australians. This, the Sirex Project, was aimed at finding an effective method of controlling siricids in forestry plantations and to a large extent it appears to have succeeded (Taylor, 1978). The information accrued about the life history and behaviour of several parasitoids has advanced the knowledge of ichneumonid biology greatly (e.g. Spradbery, 1969; 1970*a*).

Riek (1970) in *Insects of Australia* gave a key to the major subfamilies of Ichneumonidae. The usefulness of this is rather limited as large, common groups such as Banchinae and Labeninae are omitted and a number of other genera will not run to the correct subfamily (e.g. some Phygadeuontini). However, a number of interesting biological observations are included. Since 1970 several modern taxonomic papers have been published specifically on Australian Ichneumonidae (e.g. Chandra, 1976*a*-*c*; Gauld, 1976*b*; 1977*a*). A number of additional Australian species have been dealt with in works on various Indo-Australian genera (e.g. Townes & Chiu, 1970; Gupta & Tikar, 1978). Until the present work was undertaken about 200 species in about 80 genera were known to occur in Australia. This is less than half the number of genera and one fifth of the number of species now known from Australia.

THE AUSTRALIAN ICHNEUMONID FAUNA

Australia has long been of interest to biologists on account of its unusual and highly endemic flora and fauna. Recently, considerable advances have been made in understanding the geological and climatological history of the continent (see summaries in Audley-Charles *et al.*, 1981 and Keast, 1981). Biologists have used this information to explain the origins and distribution of the Australian biota (e.g. Rich, 1975; York Main, 1981; Naumann, 1982).

To put the present day distribution of Ichneumonidae in context it is necessary to summarize briefly what is known about the geological and climatological history of the continent. It is fairly generally accepted that Australia once formed part of the southern supercontinent, Gondwanaland, and was joined directly to Antarctica and indirectly to South America, Africa, India and Madagascar (Raven & Axelrod, 1972; Gill, 1975; Audley-Charles *et al.*, 1981). At the beginning of the Cretaceous, about 140mya, this supercontinent began to break up. Although primitive xyeloid symphytans are known from the Jurassic, there is no evidence to suggest that any ichneumonids existed prior to the breakup of Gondwanaland: the earliest known proto-ichneumonid fossils are northern and date from the middle Lower Cretaceous (120mya) (Townes, 1973*a*). By this time India, Africa and Madagascar had probably begun to separate from the other gondwanic continents. Australia, however, remained adjacent to Antarctica until about 55mya (Audley-Charles *et al.*, 1981) and probably until this time an archipelagic connection existed between South America and Antarctica (Rich, 1975). Palaeobotanical data suggest the climate of at least the coast of Antarctica and the Antarctic peninsula was considerably warmer at this time allowing the continent to support a considerable flora including such southern elements as *Nothofagus*, *Araucaria*, *Agathis*, *Podocarpus*, Proteaceae and Winteraceae (see review by Rich, 1975). Clearly a cool temperate southern dispersal route existed at this time between Australia and South America. Certainly Ichneumonidae were extant at this time, as fossil tryphonines are known from Baltic amber dated 80-90mya (Townes, 1973*b*). It is therefore not unreasonable to suggest that considerable southern radiations of ichneumonids may have occurred at the beginning of the Tertiary period. It is noteworthy that at this time Australia was very widely separated from South East Asia and the only dispersal route to the continent was via Antarctica.

Around the end of the Palaeocene (about 55mya) a gap began to open between Australia and Antarctica. Australia moved rapidly northwards, crossing at least fifteen degrees of latitude in under 40 million years. This northward movement occurred during a period of worldwide decreasing temperature (Raven & Axelrod,

1972) which perhaps favoured the survival of many south temperate elements. Gradually the humid early Tertiary climate was replaced by a drier one in post-Eocene times as Australia entered the 'horse latitudes'. It has been suggested that much of the characteristic Australian xerophytic vegetation evolved from mesophytes during this period (Herbert, 1950). Possibly at this time the few dry-adapted large southern ichneumonid taxa (e.g. *Anacis*, *Labium*) radiated, but comparatively few ichneumonids have been successful at adapting to drought conditions. Many older southern groups (e.g. Labenini, the *Westwoodia*-group of genera) probably became restricted to the more humid and cooler forest regions where they have remained.

About 15mya the Australian plate collided with South East Asia along the north edge of New Guinea and in Sulawesi (Audley-Charles *et al.*, 1981). This approach of Australia to the Malesian tropics allowed a considerable interchange of biota, though the predominant movement appears to have been into Australia. *Acacia* pollen first appeared in Australia in the Miocene (Gill, 1975) whilst *Phyllocladus* and *Podocarpus* reached Borneo in the late Pliocene (Whitmore, 1981).

During the Pleistocene glacial periods the climate of South East Asia and New Guinea was cooler (Tsukada, 1966; Petersen, 1970; Flenley, 1972) allowing a movement into the tropics and partial exchange of north and south temperate elements (van Steenis, 1964). Australia was probably more humid, and broad corridors of moist vegetation existed across the country allowing trans-continental distribution of many species (Mackerras, 1962). For long periods sea level would have been sufficiently low for dry land connections to exist between Victoria and Tasmania, and Queensland and New Guinea.

Today much of Australia is characterized by low, erratic rainfall (Nix, 1981). On the northern and western coasts, where there is a relatively high rainfall, it is seasonal and there are very long periods of drought. Only along the east coast and in Tasmania are there areas of sustained rainfall providing conditions favourable to ichneumonids generally.

It is possible to recognize a number of distinct distributional patterns amongst Australian ichneumonids. Several of these correlate well with patterns observed for other groups and can be related to the geological and climatological past as described above. The most distinctive patterns may be summarized thus.

1 Archaic or Marsupial Elements

York Main (1981) limits the use of the term archaic to groups with a widespread distribution on Pangaea. As this necessarily involves considerable speculation, the term is here used to describe the distribution of ancient groups (which may or may not still be extant in other parts of the world) which are quite well represented in Australia. Although in the Hymenoptera generally several old groups (e.g. Megalyridae, Orussidae, Colletidae and myrmeciine ants) show a marsupial distribution, no ichneumonids can be definitely assigned to this class. *Ankylophon*, an archaic tryphonine and the Eucerotinae, an ancient ichneumonid lineage that is well represented in Australia may fit into this category.

2 Endemic Australian Elements

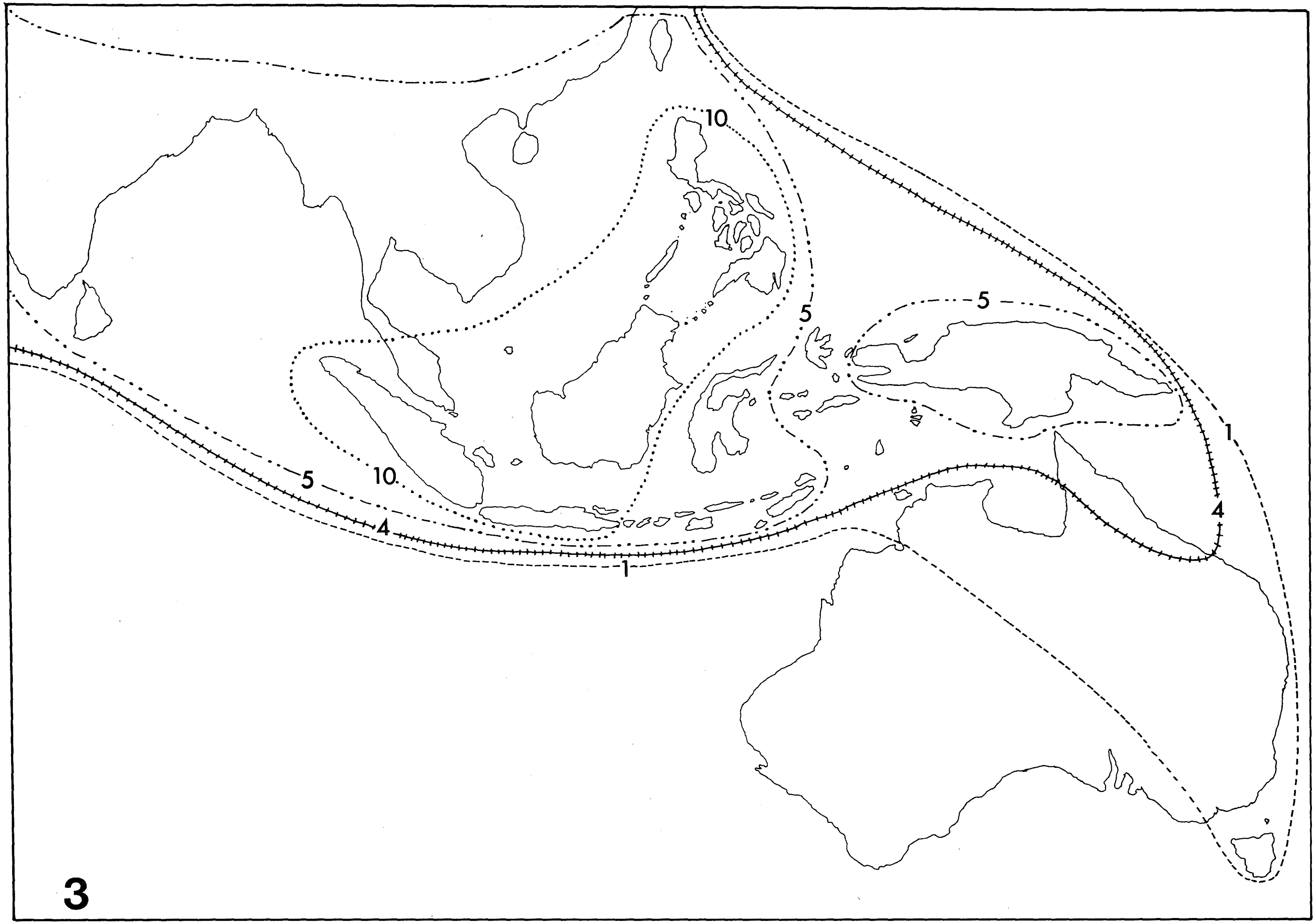
A number of genera (e.g. *Megaceria*, *Xanthocryptus*, *Stiromesostenus*) are endemic either to Australia or the Australian plate (or sometimes also New Zealand). Too little is known about their phylogeny to allow much more to be said about these insects but their wide distribution and great diversity suggest they may have a southern origin.

3 Antarctic or Southern Elements

Several less specialized groups show this distribution including, in the Hymenoptera, the Pergidae, Thynninae and Ambositrinae. Amongst the ichneumonids the most striking example of this (Map 1) is the Labeninae (Gauld, 1983) but a number of genera of other subfamilies also exhibit this pattern (e.g. *Anacis*, *Meringops* and possibly *Sciron*). Presumably these groups radiated from a southern origin in the early Tertiary when archipelagic dispersal routes existed between Australia and South America.

Map 1. Distribution of genera of Labeninae, a southern group. Numbers refer to genera occurring in a particular area. Ten genera also occur in South America, five of which are shared with Australia.

Map 2. Distribution of *Ophion* species, an old northern element. Numbers refer to species occurring in a particular area. Note how the Philippine/Malesian species are restricted to areas of high ground.



Map 3. Distribution of *Theronia* species, a Palaeotropical group. Numbers refer to species occurring in a particular area.

Often these southern groups are quite large and include species that are widespread throughout Australia (possibly because they have been associated with the continent for such a long period). However, many still show signs of the presumed temperate origin and are best represented in the cooler south-east. Although both these and the endemic Australian genera may be well represented in New Guinea (particularly in the upland *Nothofagus* forest zone), they have been comparatively unsuccessful in spreading westwards into Malesia. The most widely distributed of Australian genera in Malesia are *Leptophion* and *Eriostethus*. The former has reached the Asian mainland, whilst the latter extends to the Philippines and Borneo. Most southern groups, however, are apparently not able to compete well with the 'genetically fitter' (see Darlington, 1965) Palaearctic and Oriental groups. An example of this may be seen with the Labenini and the Rhyssini. The former is of southern origin whilst the latter is northern; they share a similar niche as parasites of wood-boring insect larvae (e.g. Hocking, 1967) and therefore may be expected to compete directly. A few labenines have reached the Moluccas but none have colonized the greater Sunda Islands or the Philippines. Rhyssines have been quite successful at spreading into New Guinea, and one species has even reached tropical Queensland.

4 Old Northern Elements

A few species belonging to north temperate genera (e.g. *Ophion*, *Ischnus*, *Ichneumon*) have succeeded in reaching Australia despite the inhospitable barrier of the everwet tropics. During the Pleistocene glaciations the average temperature in Malesia was cooler, possibly as much as the equivalent to 500-1000 m depression of altitude (Medway, 1964; Petersen, 1970). This would have allowed the temperate-favouring species to colonize large areas of higher ground and spread south to Australia. The post-glacial amelioration in climate resulted in the restriction of these temperate species to the peaks of higher mountains in South East Asia such as the Sierra Madre in Luzon, Mt Kinabalu in Borneo and the Central Highlands in Sulawesi (Heinrich, 1937; Gauld & Mitchell, 1981). The genus *Ophion* shows such a mountain top distribution (Map 2). A few temperate genera which may have reached Australia in this way have undergone a modest radiation in the cooler south-east (e.g. *Aclastus*).

5 Palaeotropical Intrusive Elements

A very considerable proportion of the north-eastern Australian ichneumonid fauna is derived from the Palaeotropical region. Most noticeable of these perhaps are many Pimplinae and Mesostenini. In the latter group 14 of the 36 Australian genera are Palaeotropical intrusives. These are almost entirely restricted to tropical Queensland and generally contain very few species. The closest relatives of these Queensland species are Papuan but the genera to which they belong are most diverse in South East Asia (e.g. Gupta, 1962) (Map 3). It is not surprising that more genera have not spread to Australia from New Guinea as, to a large extent, Ichneumonidae are most diverse in the Paleotropics in forests above 1500 m and some genera only occur above 2300 m. Comparable wet highland tropical habitats are very restricted in northern Queensland.

A few ichneumonids may have reached Australia from the north-west, possibly via a seasonally dry corridor which has existed sporadically through South East Asia (van Meeuwen *et al.*, 1961). Examples of this type of distribution are *Dicamptus indicus* and closely related species and *Enicospilus borroloolai*. The former are characteristic of dry areas in South East Asia and have not been recorded from New Guinea whilst the latter is the sister-species of a widespread Afro-Asian species, *E. albiger* (Gauld & Mitchell, 1981).

6 Recent Immigrants

A number of ichneumonids have been deliberately introduced into Australia for biological control purposes (e.g. *Rhyssa*) but a few Holarctic species have probably been transported accidentally by human agency in historical times. Most notable of these are *Venturia canescens*, a common insect in flour mills, and *Xenolytus bitinctus*, a parasite of synanthropic tineids (Richards, 1949).

A number of species and genera do not fit any of the above described patterns and others (e.g. *Lissonota*) offer ambiguous interpretation. Some of these anomalous elements may belong to different distributional patterns but as so little is currently known about the ichneumonids of New Guinea and Chile, many may prove to belong to one of the above patterns.

Possibly because of the extremely dry nature of the continent, and also perhaps because of its relative isolation from the North Temperate region, the epicentre of much ichneumonid radiation, the Australian ichneumonid fauna is rather impoverished. Currently only slightly more than 1000 species are known from the continent and even assuming a total of about twice this figure (2000 species) the Australian fauna would only be comparable to that of a small northern continental island such as Britain. Thus the number of species per 10,000 square kilometres in Australia is less than half that for most areas where reasonable data exist.

Region	Area km^2	Number of species of Ichneumonidae	Species per 10,000 km^2
Nearctic (south of 60°N)	13,958,000	8,000	5.7
W. Palaearctic	10,832,000	6,000	5.6
Neotropical	22,812,000	17,000	7.5
Afrotropical	24,492,000	11,000	4.5
Australia	7,717,000	2,000	2.6

Because of the similarity in size of the British and Australian ichneumonid faunas it is interesting to make a detailed comparison of the two regions (Table 1). Australia contains only a single subfamily, the Labeninae, not represented in Britain whereas seven Holarctic subfamilies, Adelognathinae, Agriotypinae, Collyriinae, Neorhacodinae, Orthopelmatinae, Paxylommatinae and Stilbopinae are absent from Australia. Interestingly these are all rather small taxa accounting, in total, for slightly more than 1% of the British ichneumonid fauna. Furthermore all, except for one species of the last group, are rare insects often associated with a very narrow host range (e.g. Collyriines are parasites of grass-mining cephid sawflies whilst orthopelmatines attack Cynipini on *Rosa* species).

The largest subfamily in both areas is the Phygadeuontinae which accounts for an approximately similar proportion of the total fauna in each region, although their generic compositions are strikingly different. The next three largest Australian subfamilies are Banchinae, Cremastinae and Ichneumoninae, all of which are similar in size. This is rather different from Britain where the next three largest subfamilies are Ichneumoninae, Campopleginae and Ctenopelmatinae; the former is considerably larger than either of the latter two. Several reasons may be advocated to account for this striking difference. Firstly, the ctenopelmatines (like most tryphonines, another group substantially larger in Britain than Australia) are parasites of Symphyta, a group which is far better represented in the North Temperate region than it is in Australia (nearly 500 species in Britain compared with slightly more than 150 in Australia). Secondly, although all five subfamilies (Ichneumoninae, Ctenopelmatinae, Banchinae, Campopleginae and Cremastinae) are fairly specialist endoparasites, the Cremastinae and Banchinae have, on average, longer ovipositors and favour concealed hosts. As much of Australia is arid, one might expect a greater preponderance of larvae feeding in concealment, certainly more so than in Britain where many caterpillars feed on exposed foliage. Thirdly, the Cremastinae is well known to be an eremic group (Townes, 1971*b*). Compared with seasonally dry southern Europe, humid Britain has in impoverished cremastine fauna (Fitton & Gauld, 1980), whilst arid central Australia is extremely rich in species.

Amongst the smaller subfamilies, the Ophioninae is much richer in Australia than in Britain. This is as expected, for Ophioninae are generally more diverse in tropical than in temperate habitats and a sizeable proportion of the Australian species belong to the very large tropicopolitan genus *Enicospilus*. The Australian

TABLE 1. A comparison of ichneumonid fauna of Australia and the British Isles.

SUBFAMILY	AUSTRALIA			BRITISH ISLES		
	Number of genera	Number of species	Percentage of all species	Number of genera	Number of species	Percentage of all species
PIMPLINAE	17	55	4.5	36	98	4.8
TRYPHONINAE	6	30	2.4	27	156	7.7
ADELOGNATHINAE	-	-	0	1	15	0.7
LABENINAE	10	89	7.3	-	-	0
XORIDINAE	1	3	0.2	3	13	0.6
PHYGADEUONTINAE	56	293	23.9	80	447	22.0
AGRIOTYPINAE	-	-	0	1	1	<0.1
ORTHOPELMATINAE	-	-	0	1	2	0.1
ICHNEUMONINAE	25	121	9.9	79	339	16.7
EUCEROTINAE	1	9	0.7	1	4	0.2
CTENOPELMATINAE	8	29	2.4	49	207	10.2
BANCHINAE	11	129	10.5	11	111	5.5
LYCORININAE	1	3	0.2	1	1	<0.1
STILBOPINAE	-	-	0	1	3	0.1
NEORHACODINAE	-	-	0	1	1	<0.1
CAMPOPLEGINAE	20	89	7.3	28	253	12.5
OPHIONINAE	8	67	5.5	4	23	1.1
CREMASTINAE	5	128	10.4	4	13	0.6
TERSILOCHINAE	9	27	2.2	11	32	1.6
PHRUDINAE	1	1	<0.1	3	5	0.2
MESOCHORINAE	5	23	1.9	4	50	2.5
ORTHOCENTRINAE	3	21	1.7	6	43	2.1
OXYTORINAE	6	20	1.6	17	59	2.9
ANOMALONINAE	8	32	2.6	11	33	1.6
ACAENITINAE	1	7	0.6	5	5	0.2
DIPLAZONTINAE	3	5	0.4	11	53	2.6
METOPIINAE	10	45	3.7	9	62	3.1
COLLYRIINAE	-	-	0	1	2	0.1
PAXYLOMMATINAE	-	-	0	1	2	0.1
TOTALS	215	1226		407	2033	

diplazontine fauna is very impoverished, probably because aphids and aphidophagous syrphids are less numerous than in the North Temperate region.

Biological comparison between the two faunas reveals several interesting facts. Rather surprisingly there is very little difference in the proportion of ectoparasitic species in both areas (39% for Australia, 36% for Britain). Striking differences exist in the proportions of each group and ratios of host to parasite numbers of species, as seen in the table below, for example.

	AUSTRALIA	BRITAIN
LEPIDOPTERA PARASITES		
Percentage of total ichneumonid fauna	76%	64%
Proportion of parasite to host species	1 : 12.2	1 : 1.7
SYMPHYTA PARASITES		
Percentage of total ichneumonid fauna	3%	24%
Proportion of parasite to host species	1 : 4.9	1 : 1.1
MYCETOPHILID PARASITES		
Percentage of total ichneumonid fauna	3%	5%
Proportion of parasite to host species	1 : 5.4	1 : 4.9

In each case there are fewer ichneumonids in Australia per unit number of potential host species, strongly suggesting that the ichneumonid fauna of Australia is impoverished, and that the family Ichneumonidae is underutilizing their available host resources. Probably the dry climate is one of the major factors in this underutilization (most ichneumonids need to drink from dew or rain spots daily) but as ichneumonids are more diverse in dry Africa, this is not likely to be the only factor.

Rathke & Price (1976) cite increased predation, particularly from ants, as a factor likely to reduce parasitoid diversity. This could be an important factor as Australia has a much larger formicid fauna than Britain. Brown & Taylor (1970) estimate there are about 1500 species of Australian ants compared with about 50 species in Britain (Fitton *et al.*, 1978). However, Rathke & Price's hypothesis has one major weakness, the assumption that parasitized larvae are more susceptible to predation than healthy, unparasitized ones. This has yet to be established as true, for certainly, in many cases, parasitized larvae are apparently indistinguishable from non-parasitized individuals (Janzen & Shaw, pers. comm.). Even at low predation pressures one might expect that a differential predation rate between parasitized and non-parasitized larvae would eventually lead to the virtual extinction of endoparasites in an environment.

Janzen (1975) and Janzen & Pond (1975) have proposed that resource scarcity, caused by the great degree of subdivision of the environment, may account for low parasitoid diversity in lowland tropical regions. This factor may explain why chalcids (a number of specimens of which usually develop in a single host) are more diverse in tropical Queensland than are ichneumonids (which are usually solitary parasites).

Very little is yet known of the distribution of ichneumonids within Australia. The wet tropics of Queensland provide a habitat for numerous genera and species not found elsewhere on the continent (e.g. *Eurycryptus*, *Irabatha*, *Diloa*) as well as a number of localized species of Australian genera (e.g. *Lophoglutus* sp., *Asperellus* sp.). Ichneumonids are relatively scarce in tropical rain forest and, although many species may be present, few are taken in large numbers. For example, during a recent survey of Bellenden Ker (Monteith, 1982) between October 15 and November 10 1981 a total of 122 specimens of Ichneumonidae were collected. This sample comprised 44 species, one of which was represented by 21 specimens, a second by 17 and none of the rest by more than 10 specimens. Indeed 34 species were represented by either one or two specimens. Similar high diversity has been observed in the ichneumonid fauna of diverse temperate habitats (Owen *et al.*, 1981) and is attributed to the high numbers of niches exploitable in the environment.

In the extensive areas of drier eucalypt forests common over much of eastern Australia the ichneumonid fauna is far less diverse. Several species such as *Lissopimpla excelsa*, *Heteropelma scaposum*, *Campoletis* sp., *Anacis* sp., *Gavrana* sp., *Delopia* sp. and *Netelia producta* can be very common, but relatively few species can be collected at most sites.

The cooler wetter parts of south-eastern Australia support a larger ichneumonid fauna. *Ankylophon obligatus* and some species of *Tryonocryptus* are restricted to this habitat. In Tasmania *Euceros*, *Megaceria*, *Xanthocryptus*, *Debophanes*, *Dicamptus fuscicornis*, *Stiromesostenus* and *Labium* are all relatively common.

The drier central parts of Australia support few species of ichneumonids but a number of unusual species of Ophioninae and Cremastinae do occasionally appear relatively common. Species are most common along water courses (Besserdin, 1972) and a number possess elongated mouthparts.

This discussion about the distribution of ichneumonids within Australia is necessarily brief as so little data are currently available. A tremendous amount of work needs yet to be done on the biology and ecology of Australian ichneumonids. It is hoped that this introductory work will stimulate research on this important, little known and fascinating group of insects.

CHECKLIST OF AUSTRALIAN ICHNEUMONIDAE

Valid generic and specific names are shown in italics, synonyms in roman. Generic synonyms are given only when they result from taxonomic changes made in the work, full generic synonymy is listed in the text. Synonyms of family-group names are only listed when the name is in wide current usage; a full list of such synonyms is given by Fitton and Gauld (1976; 1978). New records for Australia are denoted by an asterisk and the approximate total numbers of species per genus and subfamily are given in parentheses.

1 PIMPLINAE (55)
= Ephialtinae
Rhyssini
Epirhyssa Cresson* (1)
= Hierax Tosquinet syn. n.
= Synchnostigma Baltazar syn. n.
Megarhyssa Ashmead (1)
nortoni (Cresson)
Rhyssa Gravenhorst (1)
persuasoria (L.)
Delomeristini
= Theroniini
Theronia Holmgren (5)
subg. *Theronia* Holmgren
= Poecilopimpla Cameron syn. n.
fumipennis Morley
maculosa Krieger
viridicans Morley
steindachneri Krieger
dubia Krieger
teiae (Cameron)
antherae (Cameron)
claripennis Morley
subg. *Parema* Gupta*
penetrans (Smith)*
fumata Krieger
papuana Cameron
subg. *Nomosphecia* Gupta
melanosoma Morley
Pimplini
= Ephialtini sensu Townes
Alophopimpla Momoi (1)
Echthromorpha Holmgren (1)
agrestoria (Swederus)
melioratorius (Fabricius)
interrupta (Brullé)
insidiator (Smith)
platymischa (Vachal)
striata Krieger
conopleura Krieger
immaculata Krieger
notulatoria *var* immaculata Morley
diversor Morley
intricatoria (Fabricius)
excavata (Guillou)
12-guttata (Ashmead)
nigricornis (Smith)
maxima Krieger
fastigata Krieger
Lissopimpla Kriechbaumer (4)
atra Girault
excelsa (Costa)
semipunctata (Kirby)
10-notata Kriechbaumer
haemorrhoidalis Kriechbaumer

8-guttata Kriechbaumer
rufipes Tryon
priocnemidea Vachal
scutata Krieger
Xanthopimpla Saussure (17)
arealis Krieger
gracilis Krieger
beauforti Cameron
papuana Cameron
australis Krieger
similis Krieger
micholitzi Krieger
basimacula Cameron
xanthocephala Cameron
dahli Krieger
binodus Townes & Chiu*
ecaudata Krieger
hispida Krieger
minor Krieger
flavolineata Cameron
emaculata Szépligeti
immaculata Morley
xanthostigma Girault
xara Cheesman
sesamiae Rao
fraterculus Townes & Chiu
hiatus Townes & Chiu
hirsuta (Girault)
ochracea (Smith)
caudata (Smith)
crassa Krieger
parva Krieger
kriegeri Ashmead
axis Roman
valga Krieger
yami Uchida
peterseni Townes & Chiu
pubidorsis Townes & Chiu*
quadridens Townes & Chiu
rhopaloceros Krieger
xanthopimploides Girault
striata Townes & Chiu
summervillei (Girault)
terminalis (Brullé)

Ephialtini
= Pimplini sensu Townes
Acropimpla Townes* (1)
Camptotypus Kriechbaumer (3)
atropos (Morley)
bicolor Kriechbaumer
flaviceps (Cameron)
clotho (Morley)
lachesis (Morley)
sellatus Kriechbaumer
Parvipimpla gen. n. (1)
petita sp. n.
Sericopimpla Kriechbaumer (1)
australis Townes, Townes & Gupta§
annulipes (Cameron)
crenator (Fabricius)
pilosella (Cameron)
Zaglyptus Foerster (1)
glabrinotum (Girault)
Polysphinctini
Acrodactyla Haliday* (3)
quadrisculpta (Gravenhorst)*
Dreisbachia Townes* (1)
Eriostethus Morley (5)
= Millironia Baltazar syn. n.
carinatus Baltazar
perkinsi (Baltazar) comb. n.
pulcherrimus Morley
Zatypota Foerster* (4)

2 TRYPHONINAE (30)
Ankylophonini trib. n.
Ankylophon gen. n. (1)
obligatus sp. n.
Phytodietini
Netelia Gray (20)
subg. *Apatagium* Enderlein*
subg. *Netelia* Gray
aberrans Townes, Townes & Gupta
antipodum (Morley)
constricta (Morley)
contraria (Morley)
dimidiata (Morley)
gracilis (Morley)

§ Gupta & Tikar (1978) reinstated *annulipes* (Cameron, 1912*a*) as the name for this taxon on the grounds that its senior secondary homonym *annulipes* (Cameron, 1905*c*) is not available as it is a junior synonym of *Sericopimpla albobalteata* (Cameron). This action was incorrect for *annulipes* (Cameron, 1905*c*) remains an available name in *Sericopimpla* despite the fact that it is a junior synonym. A secondary homonym can only be revived if, when rejected after 1960, the two species-group taxa in question are not congeneric (Article 59 (c) of the *International Code of Zoological Nomenclature*). As both *annulipes* (Cameron, 1905*c*) and *annulipes* (Cameron, 1912*a*) refer to species currently treated as *Sericopimpla* the latter remains a junior secondary homonym and must thus be rejected in favour of the replacement name *australis* Townes, Townes & Gupta (1961).

incommunis (Szépligeti)
morleyi Townes, Townes & Gupta
gracilis (Morley)
producta (Brullé)
foveatus (Cameron)
testaceinervis (Cameron)
Phytodietus Gravenhorst (4)
subg. *Phytodietus* Gravenhorst
celsissimus (Turner)
subg. *Weisia* Schmiedeknecht*
Oedemopsini
= Eclytini
= Thymaridini
Debophanes gen. n. (1)
areolatus sp. n.
Oedemopsis Tschek (2)
hobartensis Turner
Thymaris Foerster* (2)

3 LABENINAE (89)
= Labiinae
Labenini
Asperellus Townes (5)
hinnuleus (Krieger)
leeuwinensis (Turner)
Certonotus Kriechbaumer (12)
annulatus Morley
apicalis Morley
geniculatus Morley
humeralifer Krieger
tuberculicollis (Cameron)
monticola Morley
nitidulus Morley
rufescens Morley
tasmaniensis Turner
varius Kriechbaumer
Labena Cresson (5)
annulata (Brullé)
chadwickii (Parrott)
Groteini
= Labiini
Labium Brullé (50)
approximatum Turner & Waterston
associatum Turner & Waterston
bivittatum Turner & Waterston
brevicorne Turner & Waterston
centrale Turner & Waterston
clavicorne Morley
ferrugineum Cameron
fulvicorne Turner & Waterston
gracile Rayment
hobartense Turner & Waterston
inflexum (Morley)
longiceps (Cameron)
longicorne Turner & Waterston
montivagum Turner & Waterston
multiarticulatum Turner & Waterston
occidentale Turner & Waterston
petitorium (Erichson)
pilosum Turner & Waterston
raymenti Cushman
rufiscutum Cushman
sculpturatum Turner & Waterston
spiniferum Turner & Waterston
subaequale Turner & Waterston
subpilosulum Turner & Waterston
superbum (Szépligeti)
variegator (Erichson)
vasseanum Turner & Waterston
walkeri Turner & Waterston
Poecilocryptini
Alaothyris gen. n. (1)
elongissimus sp. n.
Poecilocryptus Cameron (5)
nigripectus Turner & Waterston
nigromaculatus Cameron
stramineus (Morley)
Urancyla gen. n. (1)
fulva sp. n.
Brachycyrtini
Adelphion Townes* (6)
Brachycyrtus Kriechbaumer (3)
australis Roman
Monganella gen. n. (1)
variegata sp. n.

4 XORIDINAE (3)
Xorides Latreille (3)
subg. *Cyanoxorides* Cameron
australiensis (Szépligeti)
crudelis (Turner)
5 PHYGADEUONTINAE (293)
= Cryptinae
= Gelinae
Phygadeuontini
= Gelini
Aclastus Foerster* (8)
Aclosmation gen. n. (2)
rufum sp. n.
Amblyaclastus gen. n. (1)
melanops sp. n.
Asmenophylax gen. n (12)
minutus sp. n.
Astomaspis Foerster (4)
= Caenopimpla Cameron syn. n.
= Caenoaulax Cameron syn. n.
froggatti (Turner)
ruficornis (Turner)
Austriteles gen. n. (3)
armatorius sp. n.
Dichrogaster Doumerc* (2)
Gelis Thunberg* (1)
?cinctus (L.)*
Glyphaclastus gen. n. (2)
uvulus sp. n.

Handaoia Seyrig* (2)
Isdromas Foerster* (29)
granulatus sp. n.
paternicus sp. n.
yuendumui sp. n.
Lienella Cameron (1)
Meringops Townes* (3)
Nipponaetes Uchida* (1)
Paraphylax Foerster* (53)
anax sp. n.
corvax sp. n.
mirax sp. n.
pulax sp. n.
Rhadinomastrus gen. n. (3)
elongatus sp. n.
Tryonocryptus Gauld & Holloway (3)
amicus Gauld & Holloway
gigas Gauld & Holloway
nigridorsalis Gauld & Holloway
Xenolytus Foerster (1)
bitinctus (Gmelin)
Hemigasterini
= Echthrini sensu Townes
Hemigaster Brullé (1?)
lutea Brullé
Mansa Tosquinet (1)
volatilis (Smith)
fumipennis Turner
Mesostenini
= Cryptini
Allophatnus Cameron* (1)
Anacis Porter (56)
exul (Turner)
Aprix Townes (3)
nutatoria (Fabricius)
Arthula Cameron (2)
Ateleute Foerster* (10)
Ceratomansa Cushman (7)
prima Cushman
spinifrons (Brullé)
curvilineata (Cameron)
Cremnocryptus Cushman* (1)
Diloa Cheesman (1)
antipodialis (Ashmead)
Euchalinus Townes* (1)
Eurycryptus Cameron* (1)
laticeps Cameron*
Gambroides Betrem* (1)
?javensis (Rohwer)*
Glabridorsum Townes (7)
stokesii (Cameron)
Goryphus Holmgren (3)
flavocinctus (Brullé)
turneri Cheesman
Gotra Cameron (10)
annulipes (Cameron)
bimaculata Cheesman
caveata Cheesman
doddi Cheesman
gilberti (Turner)
luctuosa (Brullé)
pomonellae (Cameron)
stirocephalus (Cameron)
Hackerocryptus gen. n. (1)
dentatus sp. n.
Iaria Cheesman (1)
papiliomaculata Cheesman
veitchi Cheesman
Irabatha Cameron (1)
cairnsensis Cheesman
Ischnus Gravenhorst* (1)
Junctivena gen. n. (2)
gallowayi sp. n.
Listrognathus Tschek* (1)
subg. *Suvalta* Cameron*
= Stivadens Townes syn. n.
Lophoglutus gen. n. (2)
bouceki sp. n.
monticolus (Turner) comb. n.
Lorio Cheesman* (3)
Mesostenus Gravenhorst* (1)
Myrmeleonostenus Uchida* (8)
Neaprix gen. n. (1)
insolens sp. n.
Nebostenus gen. n. (4)
crypticus sp. n.
terebratus sp. n.
Necolio Cheesman* (5)
Paranacis gen. n. (2)
brunnea sp. n.
Stenarella Szépligeti (1)
victoriae (Cameron)
trilineata (Cheesman)
Stiromesostenus Cameron (9)
= Erythromesostenus Cameron syn. n.
albiorbitalis Cheesman
rufus (Cameron) comb. n.
Syntrips gen. n. (1)
maculatus sp. n.
Takestenus Uchida* stat. rev. (2)
Thelodon Townes (1)
elongatus (Szépligeti)
papuensis (Cheesman)
Tomagotra gen. n. (1)
roddi sp. n.
Xanthocryptus Cameron (6)
lugubris Cheesman
novozealandicus (Dalla Torre)
albopictus (Smith)
Xylostenus gen. n. (2)
curtus sp. n.

6 ICHNEUMONINAE (121)
Ctenocalini*
Magwengiella Heinrich* (1)

Ichneumonini
= Joppini sensu Townes
Aculicoxa gen. n. (1)
striata sp. n.
Algathia Cameron* (1)
Barichneumonites Heinrich (3)
australasiae (Brullé)
Ctenochares Foerster* (1)
bicolorus (L.)*
instructor (Fabricius)
rufator (Thunberg)
apicalis (Wiedemann)
apicalis (Brullé)
xanthomelas (Brullé)
Eutanyacra Cameron* (1)
licitatorius (Erichson) comb. n.
Gavrana Cameron (26)
spinosa sp. n.
conica sp. n.
maculipes Cameron
Ichneumon L. (2)
promissorius Erichson
australis (Brullé)
leucaniae (Tryon)
albocinctus (Cameron)
varilineatus Cameron
Lissosculpta Heinrich (9)
basalis (Morley)
Longichneumon Heinrich* (1)
Phaeneumon gen. n. (4)
phoenix sp. n.
Setanta Cameron* (4)
Tricholabus Thomson* (2)
Uloola gen. n. (5)
brevis sp. n.
Ischnojoppini
Ischnojoppa Kriechbaumer (1)
luteator (Fabricius)
lutea (Fabricius)
adspersor (Thunberg)
rufa (Brullé)
agraensis (Cameron)
rufus (Cameron)
akonis (Uchida)
Listrodromini*
Listrodromus Wesmael* (1)
Oedicephalini*
= Notosemini sensu Townes
Imeria Cameron* (1)
Phaeogenini
= Alomyini sensu Townes
Akymichneumon gen. n. (12)
rufipes (Cameron) comb. n.
Diadromus Wesmael (1)
collaris (Gravenhorst)
Eleebichneumon gen. n. (1)
pittata sp. n.
Phairichneumon gen. n. (10)
orbitalis sp. n.
Platylabini
= Pristicerotini sensu Townes
Neolevansa gen. n. (12)
hirsuta sp. n.
Platylabus Wesmael (15)
altitudinis Turner
Pristiceros Gravenhorst* (2)
Protichneumonini*
= Ichneumonini sensu Townes
Yeppoona gen. n. (4)
grandis sp. n.

7 EUCEROTINAE (9)
Euceros Gravenhorst (9)
annulicornis Barron
croceus Barron
incisurae Barron
maculicornis Barron
melleus Barron
ruficeps Barron
signicornis Barron

8 CTENOPELMATINAE (29)
= Scolobatinae
Pionini*
Austropion gen. n. (1)
mandibularis sp. n.
Scolobatini*
= Westwoodiini syn. n.
Dictyopheltes gen. n. (3)
robustus sp. n.
Hypopheltes Cushman (2)
pergae Cushman
Pergaphaga gen. n. (4)
nigra sp. n.
Tasmabates gen. n. (1)
capitatus sp. n.
Westwoodia Brullé (4)
= Scolobatina Roman syn. n.
ruficeps Brullé
longipes nom. n.
ruficeps (Roman)
Euryproctini
Denticeria gen. n. (1)
cardaleae sp. n.
Megaceria Szépligeti (13)
opheltes Szépligeti
pagana (Morley)
rufiventris (Brullé)

9 BANCHINAE (129)
Glyptini
Apophua Morley* (1)
Australoglypta Gauld (18)
latrobei Gauld
Glypta Gravenhorst (3)
rufiscutellaris Cresson

Atrophini
= Lissonotini sensu Townes
Amphirhachis Townes* (2)
Leptobatopsis Ashmead (4)
caudator (Fabricius)
indica (Cameron)
annulipes (Cameron)
australiensis Ashmead
albovaria (Tosquinet)
clypearia (Ashmead)
annulipes (Cameron)
javanicus (Schmiedeknecht)
apicalis (Szépligeti)
mesominiata Chandra
Lissonota Gravenhorst (80)
adornata Chandra
aurantia Chandra
bella Chandra
gibboclypeata Chandra
granulata Chandra
macqueeni Chandra
nigroscutellata Chandra
rubida Chandra
rugosa Chandra
spilostethus Townes & Townes
flavopicta (Kriechbaumer)
Shortia gen. n. (1)
siccula sp. n.
Spilopimpla Cameron* (1)
Syzeuctus Foerster (13)
conformis Chandra
galbinus Chandra
insolens Chandra
speciosus (Girault)
tanycorpus Chandra
Tossinola Viktorov*
Banchini
Philogalleria Cameron (5)
sextuberculata Cameron

10 LYCORININAE* (3)
Lycorina Holmgren* (3)
= Toxophoroides Cresson syn. n.
= Chlorolycorina Cushman syn. n.
= Gonioglyphus Seyrig syn. n.

11 CAMPOPLEGINAE (89)
= Porizontinae sensu Townes
Campoplegini
= Macrini
Campoletis Foerster (2)
tasmaniensis (Cameron)
Campoplex Gravenhorst (18)
calamae Cameron
Casinaria Holmgren (12)
meridionalis (Turner)
Charops Holmgren (3)
pulchripes Girault
Delopia Cameron stat. rev. (15)
extranea (Turner) comb. n.
negata (Turner) comb. n.
wilsoni (Parrott) comb. n.
Diadegma Foerster (4)
eucerophaga Horstmann
[cerophagus (Gravenhorst) of authors: Misidentification.]
rapi (Cameron)
tibialis (Gravenhorst)
Enytus Cameron* (3)
Eriborus Foerster (7)
iavilai (Cheesman)*
molestae (Uchida)
Eucaphila gen. n. (3)
vulgaris sp. n.
Hyposoter Foerster (3)
bombycivorus (Cameron)
Melalophacharops Uchida* (1)
Neolophron gen. n. (2)
canberrai sp. n.
Nepiera Foerster (1)
sidnica (Holmgren)
Olesicampe Foerster* (2)
Picacharops gen. n. (2)
brevithorax sp. n.
Sinophorus Foerster* (1)
Slenda gen. n. (2)
ocypeta sp. n.
Sliochia Gauld* (1)
Venturia Schrottky (5)
canescens (Gravenhorst)
oahuensis (Ashmead)
insularis (Ashmead)
ephestia Froggatt
ephestiae (Cameron)
australicus (Girault)
christianae (Cheesman)
Xanthocampoplex Morley (2)
luteus (Szépligeti)
regis Girault

12 OPHIONINAE (67)
Dicamptus Szépligeti (5)
collessi Gauld
fuscicornis (Erichson)
triangularis (Morley)
indicus Nikam*
uptoni Gauld
Enicospilus Stephens (43)
amplipennis (Morley)
longinotus (Girault)
antennatus (Morley)
boonamini Gauld
borroloolai Gauld
cardaleae Gauld
chiuae Gauld & Mitchell*
coarctatus (Brullé)

deflexus (Morley)
commoni Gauld
consobrinus (Girault)
diminutus Gauld
dolosus (Tosquinet)
spilonotus Cameron
melanospilus Cameron
samoanus (Kohl)
atricornis (Morley)
apicifumatus (Morley)
hammersteini Enderlein
laticarinatus Chiu
dwibinduae Rao & Nikam
dubitator (Morley)
crassus (Morley)
fulvicaput (Morley)
opimus Townes, Townes & Gupta
flavivenae (Girault)
stramineus (Morley)
pilatus Townes
flavocephalus (Kirby)
lunulatus (Szépligeti)
albicaput (Morley)
similus (Matsumura & Uchida)
fraucai Gauld
fusiformis Chiu
gardei (Morley)
consimilis (Morley)
rex (Girault)
inghami Gauld
insularis (Kirby)
interruptus (Szépligeti)
melanospilus (Morley)
pellospilus Townes, Townes & Gupta
javanus (Szépligeti)
fulacorensis Brues
gephyrus Chiu
diurnus Nikam
lineolatus (Roman)
striatus Cameron
flatus Chiu
uniformis Chiu
gussakovskii Viktorov
striolatus Townes, Townes & Gupta
unicornis Rao & Nikam
melanocarpus Cameron
reticulatus Cameron
nigrinervis (Szépligeti)
nocturnus (Kohl)
batavianus (Szépligeti)
turneri (Morley)
atricornis *var* zeylanicus (Morley)
crassivena (Enderlein)
uncivena (Enderlein)
nigrivenalis Cushman
quintuplex Chiu
brunnis Rao & Nikam
morleyi Townes & Townes
trinotatus (Morley)
obliquus (Morley)
pseudantennatus Gauld
pulkus Gauld
quogiae Gauld
ruskini (Girault)
sausi Gauld
skeltonii (Kirby)
xanthocephalus Cameron
bullatus Chiu
obliquus Chiu
clinatus Townes, Townes & Gupta
paraclinatus Nikam
pexus Gauld
Leptophion Cameron (7)
anici Gauld
antennatus (Morley)
iochus Gauld
longiventris Cameron
melanostigma (Szépligeti)
chopini (Girault)
tetus Gauld
unicalcaratus Gauld
yampus Gauld
Ophion Fabricius (5)
adeus Gauld
gelus Gauld
lagus Gauld
zerus Gauld
Pamophion Gauld (1)
sorus Gauld
Riekophion Gauld (2)
bolus Gauld
conspicuus (Morley)
emandibulator (Morley)
Stauropoctonus Brauns (1)
torresi Gauld
Xylophion Gauld (2)
ketus (Gauld)
xylus (Gauld)

13 CREMASTINAE (128)
Dimophora Foerster* (9)
Gahus gen. n. (1)
siccus sp. n.
Pristomerus Curtis (50)
atrifemur Girault
bicinctus Girault
giraulti Townes, Townes & Gupta
atriceps Girault
Temelucha Foerster (55)
australiensis (Szépligeti)
verimaculata (Cameron)
cycnea Kerrich
minuta (Morley)
clausa Kerrich
nivalis Kerrich
Trathala Cameron (13)

14 TERSILOCHINAE (27)
Allophrys Foerster* (2)
Areyonga gen. n. (1)
eremica sp. n.
Diaparsis Foerster* (9)
Horstmannolochus gen. n. (2)
pulchripennis (Szépligeti) comb. n.
Petilochus gen. n. (1)
naumanni sp. n.
Phradis Foerster* (5)
Probles Foerster* (3)
Sathropterus Foerster* (1)
pumilus (Holmgren)*
Stethantyx Townes* (3)
argentinensis (Blanchard) comb. n.
parkeri (Blanchard) comb. n.

15 PHRUDINAE* (1)
Phrudus Foerster* (1)

16 MESOCHORINAE (23)
Astiphromma Foerster* (1)
Cidaphus Foerster (2)
glabrosus Parrott
Mesochorus Gravenhorst (13)
pinarae Girault
Plectochorus Uchida* (1)
Stictopisthus Thomson (6)
australiensis Szépligeti

17 ORTHOCENTRINAE* (21)
Orthocentrus Gravenhorst* (16)
excalibur sp. n.
daucus sp. n
trichomma sp. n.
Neurateles Ratzeburg* (1)
Plectiscus Gravenhorst* (4)

18 OXYTORINAE* (20)
= Microleptinae sensu Townes
Aperileptus Foerster* (1)
Eusterinx Foerster* (4)
Helictes Haliday* (1)
Laepserus Foerster* (1)
Megastylus Schiødte* (12)
Proclitus Foerster* (1)

19 ANOMALONINAE (32)
= Anomalinae sensu Townes
Anomalonini
Anomalon Panzer (3)
australense (Morley)
morleyi Gauld
Gravenhorstiini
= Therionini
Agrypon Foerster (3)
coarctatum (Brullé)
ferrugineum Morley
Aphanistes Foerster (1)
variicolor (Morley)
Barylypa Foerster* (1)
Habronyx Foerster (14)
subg. *Austranomalon* Gauld
atropos Gauld
clothos Gauld
coarctatus (Ashmead)
transpositor (Morley)
lachesis Gauld
pammi Gauld
perturbans (Morley)
robustus (Morley)
partithorax (Girault)
sulcator (Morley)
trilineatus (Cameron)
victorianus (Morley)
subg. *Habronyx* Foerster
australasiae (Morley)
Heteropelma Wesmael (4)
flavitarse (Brullé)
trichiosomum (Cameron)
perniciosum (Turner)
scaposum (Morley)
atrichiosoma (Morley)
Perisphincter Townes (1)
tooloomi Gauld
Trichomma Wesmael (5)
biroi (Szépligeti)
melanura Morley
clavipes Krieger
elegantulum Turner
tambourinum Gauld

20 ACAENITINAE (7)
Yezoceryx Uchida (7)
apicipennis (Turner)

21 DIPLAZONTINAE (5)
Diplazon Viereck (1)
laetatorius (Fabricius)
varipes (Smith)
generosus (Cameron)
Syrphoctonus Foerster (2)
nigreoauratilis Diller
rubeoauratilis Diller
Woldstedtius Carlson (2)
[= Syrphoctonus Foerster sensu Viereck: Misidentification.]
rubellus Diller
subditicius Diller

22 METOPIINAE (45)
Carria Schmiedeknecht* (5)
Colpotrochia Holmgren* (2)
Drepanoctonus Pfankuch (6)
bifasciatus (Brullé)
Exochus Gravenhorst* (2)

Hypsicera Latreille (5)
femoralis (Geoffroy)
Metopius Panzer (3)
subg. *Metopius* Panzer
crassicornis Morley stat. rev.
michaelseni Szépligeti
unifenestratus Morley
Sciron Fitton, gen. n. (15)
fundator Fitton, sp. n.
Seticornuta Morley* (1)
Triclistus Foerster* (3)
Trieces Townes* (3)

SPECIES INCERTAE SEDIS

Allocamptus bituberculatus Szépligeti (see Gauld, 1977)
Ichneumon ischioleucus Brullé
Mesostenus physoscelus Brullé

SPECIES ERRONEOUSLY RECORDED AS AUSTRALIAN

Ichneumon iridipennis (Cameron) (Morley, 1915*b*). Indian species.
Liotryphon caudatus (Ratzeburg) (Townes, Townes & Gupta, 1961). Holarctic species introduced to New Zealand but not Australia.
Netelia (Netelia) celebensis (Szépligeti) var. 2 (Szépligeti, 1906). Indonesian; Australian variety is not conspecific.
Netelia (Netelia) ferruginea (Cameron) (Morley, 1913*a*). Asian species.
Netelia (Netelia) longitarsis (Cameron) (Morley, 1913*a*). Asian species.
Netelia (Netelia) opacula (Thomson) (Morley, 1913*a*). Palaearctic species.
Netelia (Netelia) testacea (Gravenhorst) (Girault, 1925). Holarctic species.
Ophion luteus (L.) (Fabricius, 1775). Western Palaearctic species.

KEY TO SUBFAMILIES OF ICHNEUMONIDAE OCCURRING IN AUSTRALIA

The following key is designed to be as simple as possible and will probably only work for Australasian material. As far as possible characters of both sexes have been used but until a worker is familiar with the facies of the various taxa it is suggested that only females be keyed. Males of some Banchinae, Acaenitinae and Phygadeuontinae are particularly difficult to key and are best recognized by their overall appearance.

1 Wings entirely absent......................PHYGADEUONTINAE (in part) (p. 99)
\- Wings present...2

2 Spiracle of first tergite of gaster placed 0.6 or more of way along the segment, clearly behind the centre; anterior part of segment 1 usually slender, often cylindrical and somewhat broadened at or behind spiracles; sternite 1 usually reaching to or beyond spiracles.......3
\- Spiracle of first tergite close to, at, or in front of centre of segment; anterior part of segment 1 usually broad and flattened, not or only fairly evenly broadened posteriorly; sternite 1 often short and not reaching to spiracle, rarely long..........................27

3 Fore wing with *2m-cu* with a single bulla or *2m-cu* absent (Figs 31-33, 40-44)..4
\- Fore wing with *2m-cu* with two separate bullae (cf. Fig. 88)...............21

4 Female with ovipositor very slender, quite long, enclosed in a rigid sheath and with a large triangular subgenital plate (Fig. 28); male with gonosquama produced into an elongate spine (Fig. 29).
Fore wing with a large rhombic or obliquely quadrate areolet (Fig. 30); tergite 1 with long, moderately deep glymma; claws usually pectinate; clypeus not separated from face by a distinct groove; area superomedia usually elongate, separated from area petiolaris.........
....MESOCHORINAE (in part) (p. 317)

- Female with ovipositor very short to very long, if projecting far beyond apex of gaster then sheath is not rigid and/or subgenital plate is not triangular in profile; male with gonosquama unspecialized or slightly elongate, never spine-like.............................5

5 Gaster with tergites 2-4 somewhat laterally compressed, *or* if indistinctly so then *either* with tarsal claws conspicuously pectinate *or* with areolet rhombic, petiolate above *or* apex of ovipositor with a dorsal subapical notch; tarsal claws otherwise pectinate or not; areolet otherwise usually rhombic, obliquely quadrangular or absent; ovipositor otherwise various, usually with a dorsal subapical notch........6

- Gaster with tergites 2-4 depressed; tarsal claws never pectinate; areolet, when present, usually pentagonal or quadrate; ovipositor never with a dorsal subapical notch.....................................17

6 Fore wing with single intercubital vein, *3r-m* distal to *2m-cu* by more than 0.4 of its length (Figs 31-33)...................................7

- Fore wing with one or two intercubital veins, *2r-m* and *3r-m*, if with one this is *2r-m* and it is proximal to or subopposite *2m-cu* (Figs 40-44)..9

7 Fore wing with spurious vein extending from vannal notch to tornus; discosubmarginal cell usually with a glabrous area (Fig. 33); ocelli usually large, the posterior ones close to or contiguous with eyes (Fig. 35).

Colour usually brownish orange, rarely blackish; ovipositor short, barely projecting beyond apex of gaster; tarsal claws generally densely pectinate..................................OPHIONINAE (p. 286)

- Fore wing without a spurious vein posterodistally though sometimes with a pigmented band; discosubmarginal cell evenly hirsute; ocelli not enlarged, separated from eye by about their own diameter or more (Fig. 36)...8

8 Second discal cell longer than first subdiscal cell (Fig. 32); fore wing with pterostigma rather slender.........ANOMALONINAE (in part) (p. 324)

- Second discal cell shorter than first subdiscal cell (Fig. 31); fore wing with pterostigma broadly triangular....TERSILOCHINAE (in part) (p. 304)

9 Head in dorsal view with ocelli closer to occipital carina than their own diameter (Fig. 34); propodeum reticulately sculptured, without regular areae bounded by carinae (Fig. 37).

Areolet never complete; hind tarsus of male generally slightly enlarged; gaster extremely slender..........ANOMALONINAE (in part) (p. 324)

- Head in dorsal view with ocelli separated from occipital carina by more than ocellar diameter; propodeum usually with regular carinae and with delimited area, very rarely somewhat reticulate (Figs 38-39)...10

10 Posterior transverse carina of mesosternum complete.......................11

- Posterior transverse carina of mesosternum incomplete or absent............12

11 Tibial spurs inserted in a common area with the tarsus; clypeus weakly separated from face; face usually black; hind wing with *Rs* from slightly shorter than to much longer than *r-m* (Fig. 45); fine sculpture of alitrunk and gaster often weakly polished, granulate; propodeum often with area superomedia confluent with area petiolaris (Fig. 38); mandible often with a ventral flange; pterostigma rather slender (Fig. 41).......................CAMPOPLEGINAE (most) (p. 254)

\- Tibial spurs inserted in a separate area from that of the tarsus, the apex of each tibia thus having two membranous insertion areas separated by a bridge; face often pale marked; hind wing with *Rs* from subequal to, to very much shorter than length of *r-m* (Fig. 46); fine sculpture of alitrunk generally highly polished, smooth, punctate or striate; propodeum often with area superomedia elongate, separated from area petiolaris (Fig. 39); mandible without a ventral flange; pterostigma quite short and broadly triangular (Fig. 40)...CREMASTINAE (p. 297)

12 Hind wing with proximal part of $M+Cu_1$ obsolescent, unpigmented; *Rs* less than 0.5 times length of *r-m* (Fig. 47)..............................13

\- Hind wing with proximal part of $M+Cu_1$ distinct, pigmented; *Rs* 0.8 or more times as long as *r-m* (Fig. 45)..................................14

13 Tergite 1 of gaster with lateromedian longitudinal carinae; tarsal claws pectinate to apices (Fig. 49); propodeum with both transverse carinae complete, lateromedian carinae absent; ovipositor without a dorsal subapical notch.................................PHRUDINAE (p. 315)

\- Tergite 1 of gaster without lateromedian carinae; tarsal claws apparently simple (Fig. 48); propodeum with anterior transverse carina and usually lateromedian longitudinal carinae present enclosing a large area superomedia + petiolaris, often with area posteroexterna also delineated, posterior transverse carina never complete (Fig. 50); ovipositor with a dorsal subapical notch.

Clypeus very wide, with fringe of stout bristles...TERSILOCHINAE (most) (p. 304)

14 Fore wing with 2*r-m* virtually obliterated by fusion of *Rs* and *M* (Fig. 42); propodeum with insertion of gaster widely separated from insertion of hind coxa (Fig. 70).....................LABENINAE (in part) (p. 84)

\- Fore wing with 2*r-m* distinct (Figs 43-44); propodeum with gaster inserted close to insertion of hind coxa, the distance separating them less than diameter of gastral insertion.............................15

15 Fore wing with areolet pentagonal, quadrate or absent, never petiolate (Fig. 44); apex of ovipositor without a dorsal notch; sternaulus often extending 0.5 or more times length of pleuron...PHYGADEUONTINAE (in part) (p. 99)

\- Fore wing with areolet rhombic, petiolate above (Fig. 43); apex of ovipositor with a dorsal notch (Fig. 84); sternaulus absent or vestigial...16

16 Propodeum fairly completely areolated, area superomedia confluent with area petiolaris (Fig. 38); anterior end of submetapleural carina narrow or obsolescent.................CAMPOPLEGINAE (a few) (p. 254)

\- Propodeum without carinae or with a single posterior transverse carina; anterior end of submetapleural carina broadened into a flange....................................BANCHINAE (a few) (p. 237)

17 Hind leg with fifth tarsal segment more than 1.5 times as long as the second, the fourth segment distally transversely truncate (Fig. 52); flagellum slightly clavate, in section circular (Fig. 53).

Either with clypeus very large, exposed (Fig. 51) or gaster inserted on propodeum above and remote from hind coxae (Fig. 71)...LABENINAE (in part) (p. 84)

\- Hind leg with fifth tarsal segment shorter than the second unless the fourth is obliquely truncate or bilobate distally; fourth segment otherwise various, sometimes transversely truncate; flagellum filiform, tapered distally, often flattened below...........................18

18 Female with ovipositor short, projecting beyond apex of gaster by about 0.2 or less times length of hind tibia; tergite 2 of gaster with a transverse groove before centre (Fig. 562); notaulus vestigial.
Area superomedia distinct, rounded anteriorly; distal abscissa of Cu_1 vestigial, discernible only as a pigmented trace...ICHNEUMONINAE (a few) (p.183)
- Female with ovipositor projecting beyond apex of gaster by at least 0.4 times length of hind tibia; tergite 2 of gaster without a transverse groove; notaulus weak to very strongly impressed...................19

19 Mandible not or barely twisted; hind wing with distal abscissa of Cu_1 present (Fig. 64)....................PHYGADEUONTINAE (in part) (p. 99)
- Mandible twisted about 90°; hind wing with distal abscissa of Cu_1 absent, Cu_1+*cu-a* without even a trace of angulation (Fig. 63).............20

20 Sternaulus distinct (Fig. 55); inner margins of eyes ventrally subparallel.................................PHYDAGEUONTINAE (a few) (p. 99)
- Sternaulus absent (Fig. 54); inner margins of eyes generally convergent ventrally.................................OXYTORINAE (a few) (p. 334)

21 Tarsal claws with a small accessory tooth near apex (Fig. 57); distal apex of hind tibia with an inturned, blunt, shelf-like margin.
Areolet almost triangular with *2m-cu* joining far distal to centre (Fig. 66).................................TRYPHONINAE (a few) (p. 72)
- Tarsal claws simple, without an accessory tooth; distal apex of hind tibia without a shelf-like inturned margin...............................22

22 First segment of gaster with large deep glymmae that almost meet in midline (Fig. 56); ovipositor in part weakly sclerotized...TRYPHONINAE (in part) (p. 72)
- First segment of gaster without distinct glymmae, or glymmae small and pit-like; ovipositor evenly sclerotized...............................23

23 Hind wing with distal abscissa of Cu_1 present (cf. Fig. 64)................24
- Hind wing with distal abscissa of Cu_1 absent (cf. Fig. 63).................25

24 Face broad with clypeus rather flat, usually truncate (Fig. 58); sternaulus absent or indistinct, notauli generally weak, if present then short; ovipositor not projecting beyond apex of gaster by more than 0.5 times length of hind tibia, generally less and always with ovipositor sheath rigid; tergite 2 of gaster often with deep gastrocoeli.
Areolet complete........................ICHNEUMONINAE (most) (p. 183)
- Face moderately broad, usually with clypeus somewhat convex, margin seldom truncate (Fig. 59); sternaulus from indistinct to strong and complete, reaching hind corner of mesopleuron; notauli often long and deeply impressed; ovipositor projecting beyond apex of gaster by 0.4 or more times length of hind tibia, sheath flexible; tergite 2 without distinct gastrocoeli..............PHYGADEUONTINAE (in part) (p. 99)

25 Mandible not twisted; either hind tibia with an internal fringe of close fine hairs or hind wing with basal cell deep and *Rs* very short (Fig. 65)................................LABENINAE (in part) (p. 84)
- Mandible twisted 80° or more; hind tibia without an internal fringe of close fine hairs; hind wing with basal cell narrow, *Rs* about as long as *r-m* (cf. Figs 63-64)...26

26 Sternaulus deep, reaching 0.7 of way along pleuron (cf. Fig. 55); inner margins of eyes not convergent ventrally; propodeum without exceptionally strong apophyses............PHYGADEUONTINAE (in part) (p. 99)

\- Sternaulus absent or vestigial (Fig. 54); inner margins of eyes generally strongly convergent ventrally; propodeum with strong apophyses.. ....OXYTORINAE (a few) (p. 334)

27 Fore wing with one bulla in *2m-cu* (Figs 67-68)...........................28
\- Fore wing with two bullae in *2m-cu* (Fig. 88).............................44

28 Upper tooth of mandible divided apically so mandible appears tridentate (Fig. 60)...29
\- Mandible bidentate or unidentate...30

29 Fore wing with *cu-a* more or less opposite base of *Rs&M* (Fig. 68); hind wing with first abscissa of Cu_1 about equal to *cu-a*; mid tibial spur moderately long, not reaching 0.4 times length of basitarsus.
Ovipositor short, barely projecting beyond apex of gaster; rather small insects with head transverse...................DIPLAZONTINAE (p. 349)
\- Fore wing with *cu-a* distal to base of *Rs&M* by more than 0.5 times its own length (Fig. 67); hind wing with first abscissa of Cu_1 0.2 or less as long as *cu-a*; mid tibial spurs long, the longer about 0.5 times length of basitarsus.................BANCHINAE (in part) (p. 237)

30 Metanotum produced laterally into a small hook that engages a process on the propodeum (Fig. 69); tergites 2-4 of gaster with deeply impressed trans-striate grooves delineating central triangular areas (Fig. 62); female subgenital plate large, triangular, centrally membranous.
Areolet absent; ovipositor without a dorsal subapical notch, with a distinct nodus (Fig. 61)........................LYCORININAE (p. 251)
\- Metanotum not produced into a hook laterally; tergites 2-4 of gaster usually convex, if with impressed grooves these do not bound a triangular area centrally; female subgenital plate small to large, if large and triangular then centrally evenly sclerotized................31

31 Female with ovipositor sheath rigid, projecting beyond apex of gaster by at least 0.4 times length of hind tibia, ovipositor itself very slender; male with gonosquama extended posteriorly into a long spine (Fig. 29).
Fore wing with large rhombic or oblique areolet (Fig. 30); petiole with distinct, long glymma; clypeus not separated from face by groove.................................MESOCHORINAE (in part) (p. 317)
\- Female with ovipositor sheath flexible, from very short to very long, ovipositor itself not exceptionally slender unless very short; male with gonosquama simple, not extended posteriorly.........................32

32 Posterior transverse carina of mesosternum complete (aberrant individuals only)..5
\- Posterior transverse carina of mesosternum incomplete or absent...........33

33 Face and clypeus flat with a large shield-shaped area bounded by carinae (Fig. 74); mid tibia with one spur.....METOPIINAE (in part) (p. 353)
\- Face and clypeus without a large shield-shaped area bounded by carinae (Fig. 75); mid tibia with two spurs.......................................34

34 Gaster inserted high on propodeum, separated from insertion of hind coxae by more than diameter of propodeal insertion (Fig. 71); hind tarsus with fifth segment much longer than second and with ovipositor projecting beyond apex of gaster by more than length of hind tibia... ....LABENINAE (in part) (p. 84)
\- Gaster inserted low on propodeum, separated from insertion of hind coxae by less than diameter of propodeal insertion (Figs 72-73); either with hind tarsus with fifth segment equal to or shorter than the second or with ovipositor not projecting beyond apex of gaster........35

35 Pronotum mediodorsally with a raised bifurcate flange or bilobate process (Fig. 76); metathorax laterally with a narrow triangular area bounded anteriorly by the margin of the mesepimeron and posteriorly by a deep groove, this area smooth and separated from the swollen area at the anterior end of the pleural carina, which in this case is not separated from propodeum by a furrow (Fig. 72); male with flagellum flattened and broadened centrally.
Ovipositor almost concealed; areolet absent.........EUCEROTINAE (p. 221)

\- Pronotum mediodorsally simple or with a transverse furrow or rarely with a small ridge, never with a bifurcate or bilobate protuberance; metathorax laterally either with part anterior to deep groove concealed by mesepimeron, or more usually with a rounded, punctate, triangular area at anterior end of pleural carina, this area separated from propodeum by furrow (narrow triangular smooth area absent) (Fig. 73); male flagellum not flattened and broadened centrally...36

36 Face and clypeus from strongly to weakly convex, in profile virtually continuous, not separated by a groove or furrow (Figs 79-80); femora stout.
Ovipositor not projecting far beyond apex of gaster..................37

\- Clypeus separated from face by a groove or furrow, the two, in profile, not forming a continuous surface, not convex (Fig. 78); femora not exceptionally stout...38

37 Scape rather long and cylindrical, more than 1.8 times as long as broad; mandible very slender, twisted apically; malar space very broad, usually with a distinct subocular sulcus (Fig. 79).
Fore wing length 5 mm or less..........ORTHOCENTRINAE (in part) (p. 343)

\- Scape short, goblet-shaped, less than 1.7 times as long as broad; mandible various, if slender, not noticeably twisted; malar space often shorter than basal mandibular width, never with a subocular sulcus (Fig. 80)................................METOPIINAE (most) (p. 353)

38 Flagellum with 12 segments; clypeus about 3.0 times as broad as long, fringed with stout hairs; hind wing with first abscissa of *Rs* very short, less than 0.5 times length of *r-m* (Fig. 47)..TERSILOCHINAE (in part) (p. 304)

\- Flagellum with 14 or more segments; clypeus less than 2.8 times as broad as long, usually not fringed with stout hairs; hind wing with first abscissa of *Rs* from about as long as, to longer than *r-m*............39

39 Apex of ovipositor without a dorsal notch, the ovipositor always projecting beyond apex of gaster by at least 0.4 times length of hind tibia; sternaulus usually distinct, deep and extending 0.7 times length of pleuron (Fig. 55).
Areolet pentagonal or with 3*r-m* absent; fourth tarsal segment of fore leg often obliquely truncate and bilobate; glymma absent..PHYGADEUONTINAE (a few) (p. 99)

\- Apex of ovipositor with a dorsal notch (Fig. 84), ovipositor very long to not projecting beyond apex of gaster; sternaulus vestigial or absent...40

40 Apical edge of fore tibia with a distinct tooth on outer side (Fig. 86); either with fore wing with first subdiscal cell very strongly explanate distally or with first segment of flagellum bearing a large tyloid on outer surface (Fig. 359); ovipositor very short, its sheath barely visible, glabrous except for a few hairs distally (Fig. 81); metapleural carina narrow or vestigial....CTENOPELMATINAE (in part) (p. 222)

- Apical edge of fore tibia without a distinct tooth on outer side; fore wing with first subdiscal cell barely broadened distally; first segment of flagellum without a tyloid; ovipositor generally long, rarely short but always with sheath densely hirsute externally; metapleural carina often strongly broadened into a lobe anteriorly (Fig. 73)..BANCHINAE (most) (p. 237)

41 Fore tarsal claw with an internal accessory tooth; subgenital plate of female very large, extended posteriorly and shaped rather like a plough share (Fig. 77); sternite 1 with a swelling or process.
Face rather flat (Fig. 75); areolet absent; fifth tarsal segment as long as or longer than the second; ovipositor without a dorsal subapical notch...ACAENITINAE (p. 333)
- Fore tarsal claw without an accessory tooth, sometimes lobate; subgenital plate small to large, if large, triangular, never shaped like a plough share; sternite 1 usually without a distinct process........42

42 Scuto-scutellar groove with a median carina and bounded anteriorly by a transverse flexible suture; pronotum mediodorsally with a complex array of radiating crests (Fig. 87); mandible chisel-shaped; antenna of female with an angulation near distal end, the segment proximal to angulation bearing one or more stout bristles, the segments distal to the angulation smaller than the others (Fig. 82)... ....XORIDINAE (p.181)
- Scuto-scutellar groove without a median carina and usually without a transverse flexible suture; pronotum mediodorsally simple or with a single small crest; mandible various, usually bidentate, rarely chisel-shaped; antenna of female without an angulation...................43

43 Face and clypeus, in profile forming an evenly convex curved surface, the clypeus not separated by a distinct groove or impression; scape rather long, cylindrical (Fig. 79).
Mandible small, very strongly tapered..ORTHOCENTRINAE (in part) (p. 343)
- Face and clypeus not forming a single evenly convex surface, the clypeus separated by a groove or impression; scape short to moderately long, often goblet-shaped...44

44 Distal end of fore tibia with a distinct acute tooth on outer margin (cf. Fig. 86)...45
- Distal end of fore tibia without an acute tooth, rarely with a weak blunt lobule on outer margin...46

45 Gaster inserted on propodeum remote from insertion of hind coxa, the two areas separated by length of propodeal spiracle (cf. Fig. 71); mandible short, strongly tapered with a longitudinal hirsute groove (Fig. 85); ovipositor very long, its apex with fine file-like teeth (Fig. 83)...LABENINAE (in part) (p. 84)
- Gaster inserted on propodeum very close to insertion of hind coxa; mandible long, weakly tapered without a hirsute groove; ovipositor short, barely projecting beyond apex of gaster, its apex unspecialized..................................CTENOPELMATINAE (in part) (p. 222)

46 Sternaulus long, strongly developed, reaching at least to centre of pleuron, generally reaching to hind margin (Fig. 55); glymma absent; areolet present or absent, if present, pentagonal (cf. Fig. 44).
Notauli often strongly impressed; ovipositor without a dorsal subapical notch..........................PHYGADEUONTINAE (in part) (p. 99)
- Sternaulus short and weak or absent, not reaching to centre of segment or if present then with glymmae discernible at anterior end of segment; glymmae otherwise usually present, sometimes absent; areolet absent or if present rhombic or almost triangular, pointed above..........47

47 Tarsal claws densely and closely pectinate (Figs 132-133); glymmae large, deep, separated in mid line by only a thin membranous partition (Fig. 136); gaster generally laterally compressed posteriorly. ....TRYPHONINAE (in part) (p. 72)

\- Tarsal claws simple, lobate or with a few scattered pectinae; glymmae generally small and shallow, rarely deeper and larger; gaster cylindrical or depressed posteriorly..48

48 Mandible short, strongly narrowed, its apex twisted 20° or more............49

\- Mandible moderately long, evenly narrowed, not twisted.....................50

49 Fore tarsal claw of female simple (Fig. 90); areolet absent; distal abscissa of Cu_1 far longer than *cu-a*; gaster often weakly sclerotized consequently collapsing in dried specimens; subocular sulcus usually present (Fig. 78).

Male flagellum sometimes with concave tyloids.................. ....OXYTORINAE (in part) (p. 334)

\- Fore tarsal claw of female basally lobate (Fig. 91) unless, sometimes areolet is present and/or first abscissa of Cu_1 is very much shorter than *cu-a*; areolet otherwise present or absent; distal abscissa of Cu_1 present or absent; gaster strongly sclerotized; subocular sulcus absent though a band of coriaceous sculpture may be present..PIMPLINAE (in part) (p. 49)

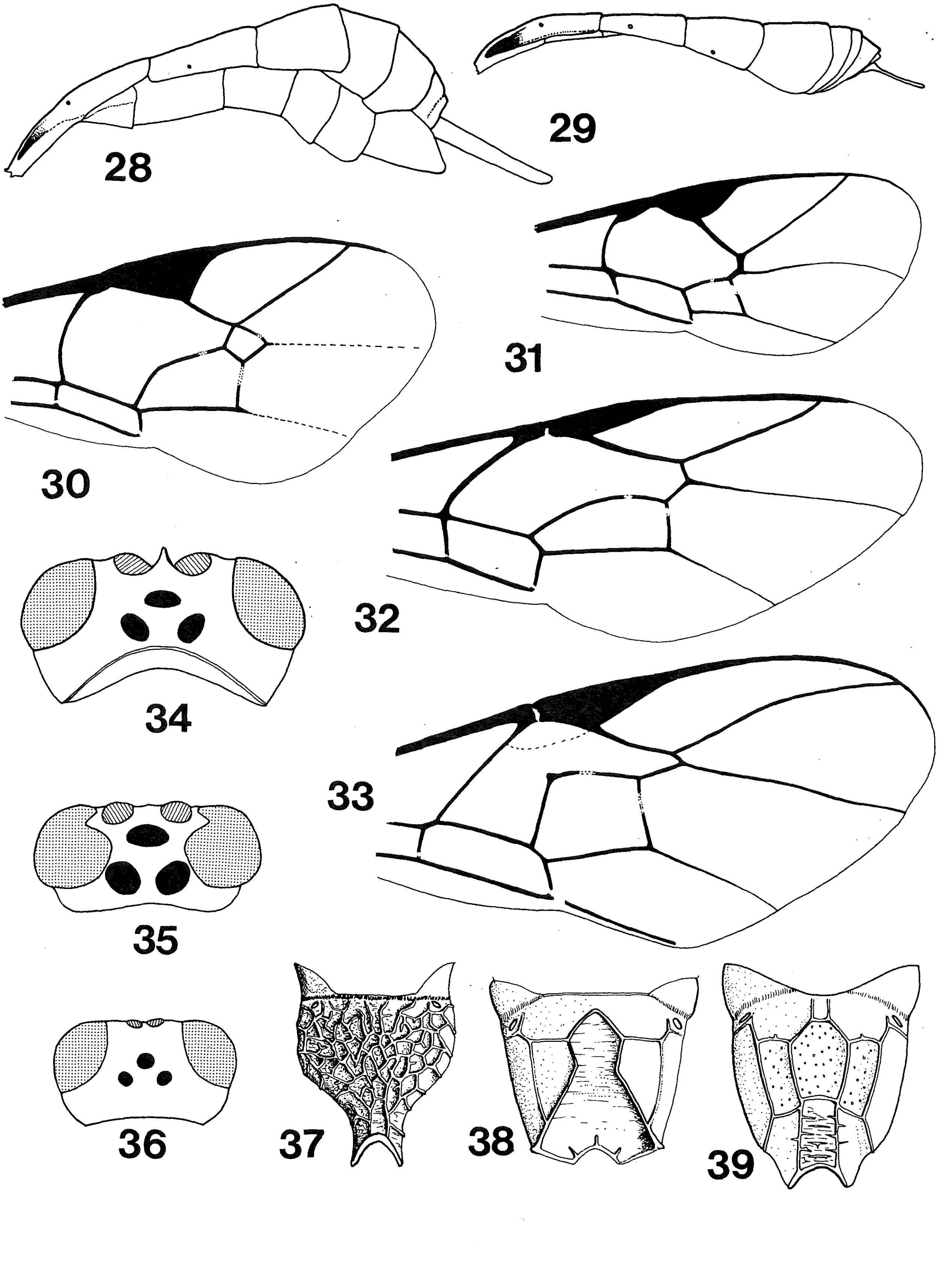
50 Apex of ovipositor with a dorsal notch (Fig. 84); subgenital plate large, with a median indentation or membranous notch on hind margin; tergite 1 of gaster without lateromedian longitudinal carinae; tarsal claws usually sparsely pectinate.

Tergites 2-4 often with inverted V-shaped grooves; propodeum sometimes with only posterior transverse carina present (Fig. 371)..BANCHINAE (in part) (p. 237)

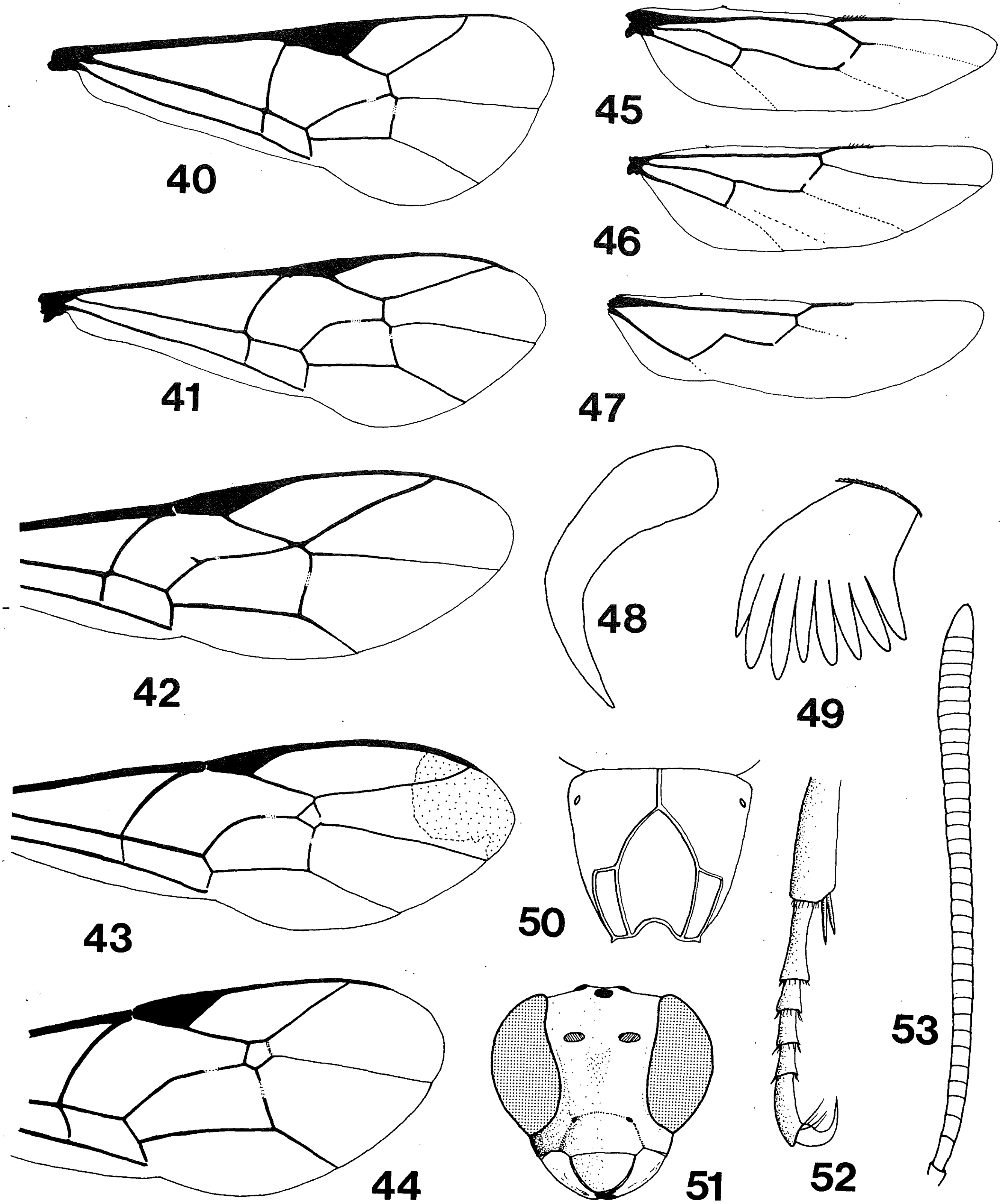
\- Apex of ovipositor without a dorsal notch; subgenital plate minute to large, if large then without a median indentation, if small often with a membranous border; tergite 1 of gaster usually with lateromedian longitudinal carinae; tarsal claws simple or lobate................51

51 Areolet present (Figs 103-104); or if absent, with claws of female lobate (Fig. 91); face of female not tuberculate, ovipositor evenly sclerotized; epomia absent or else close to and parallel with anterior margin of pronotum........................PIMPLINAE (in part) (p. 49)

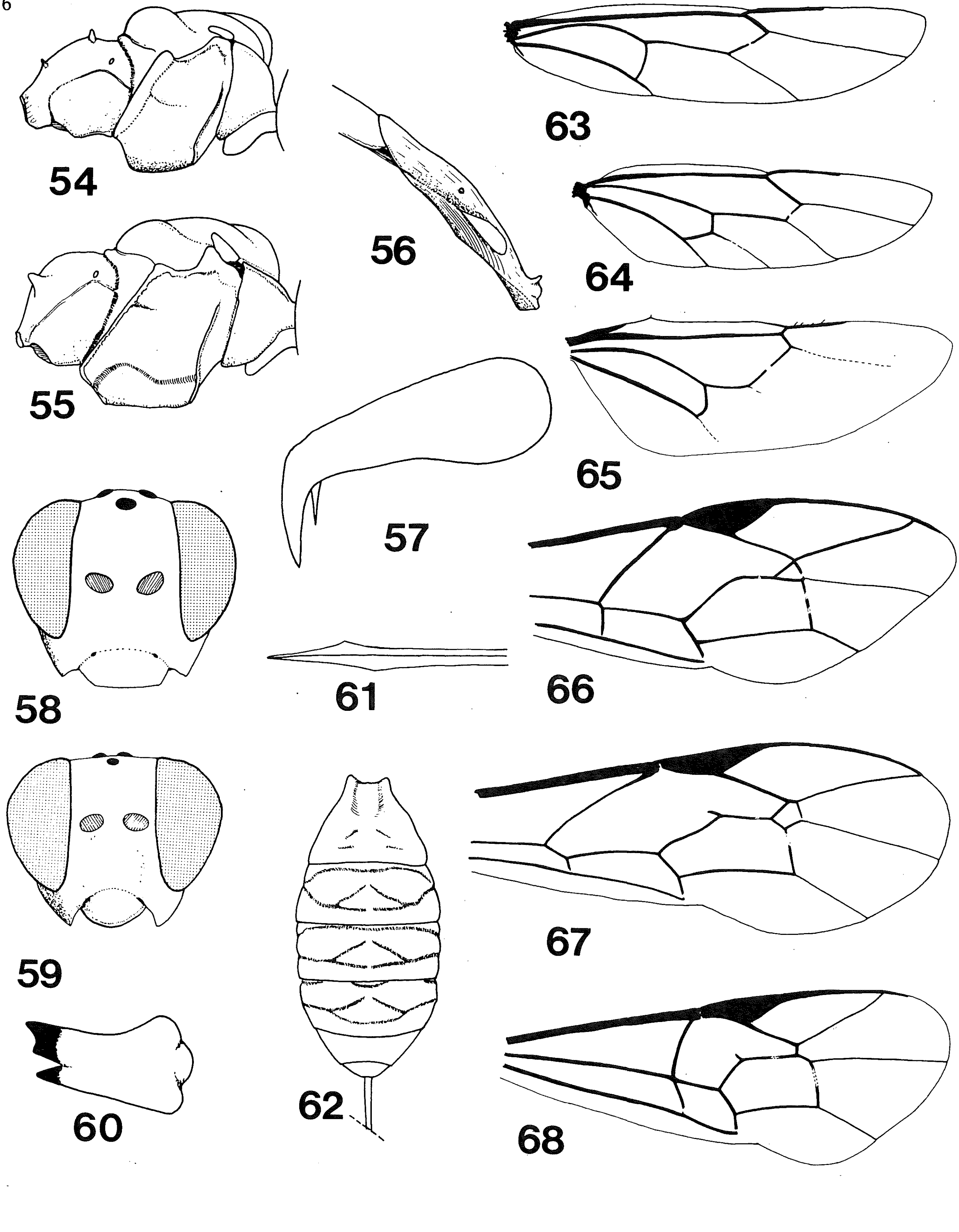
\- Areolet absent; claws of female simple; face of female raised and tuberculate (Fig. 148); ovipositor partially membranous (cf. Fig. 154); epomia present, strong, widely divergent from anterior margin of pronotum..................................TRYPHONINAE (in part) (p. 72)



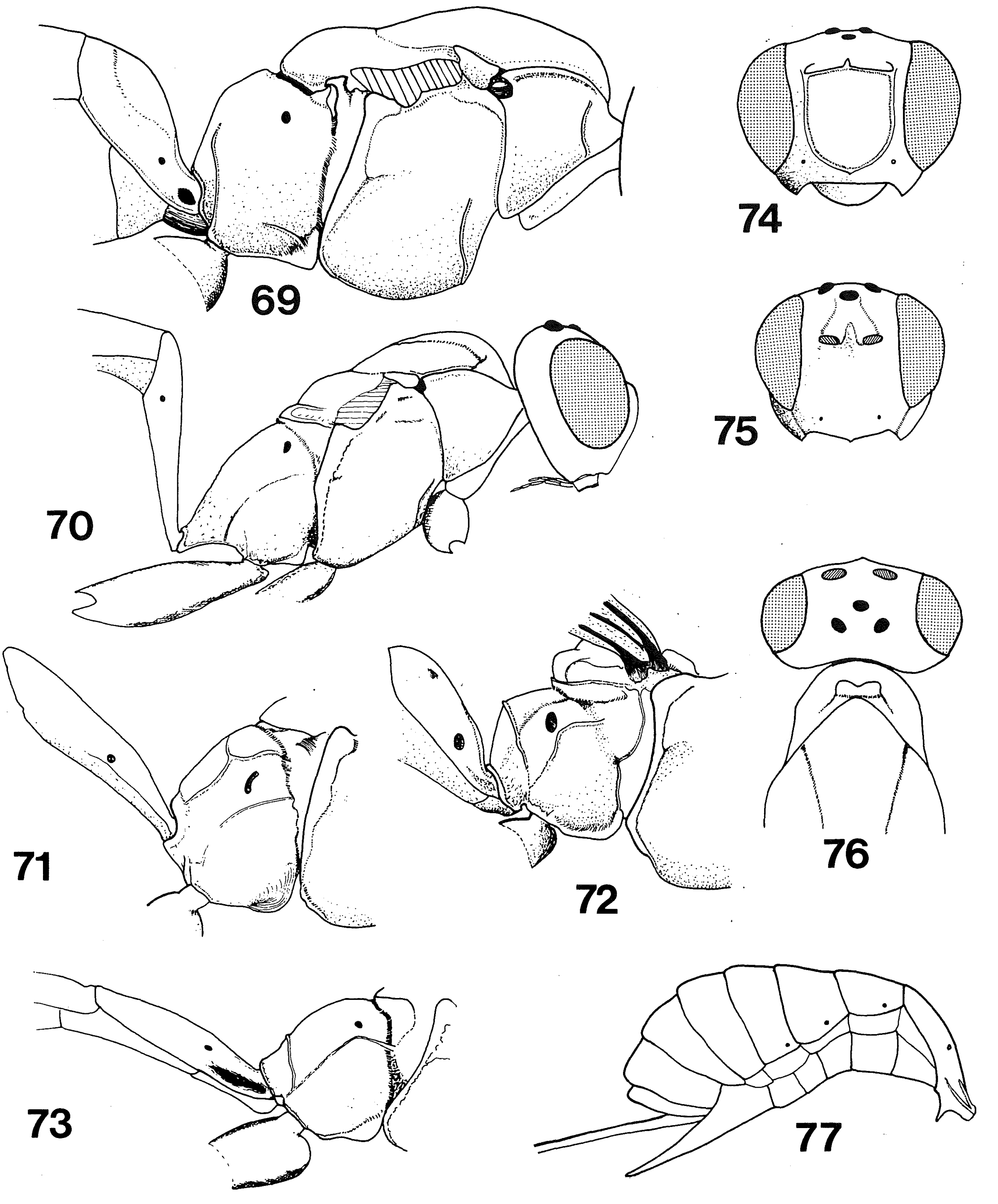
Figs 28-39. 28-29 Gasters, lateral (28) *Mesochorus* ♀ (29) *Mesochorus* ♂. 30-33 Fore wings (30) *Stictopisthus* (31) *Horstmannolochus pulchripennis* (32) *Anomalon morleyi* (33) *Xylophion xylus*. 34-36 Heads, dorsal (34) *Heteropelma scaposum* (35) *Enicospilus pseudantennatus* (36) *Anomalon morleyi*. 37-39 Propodea, dorsal (37) *Habronyx (Austranomalon)* (38) *Campoletis* (39) *Temelucha*.



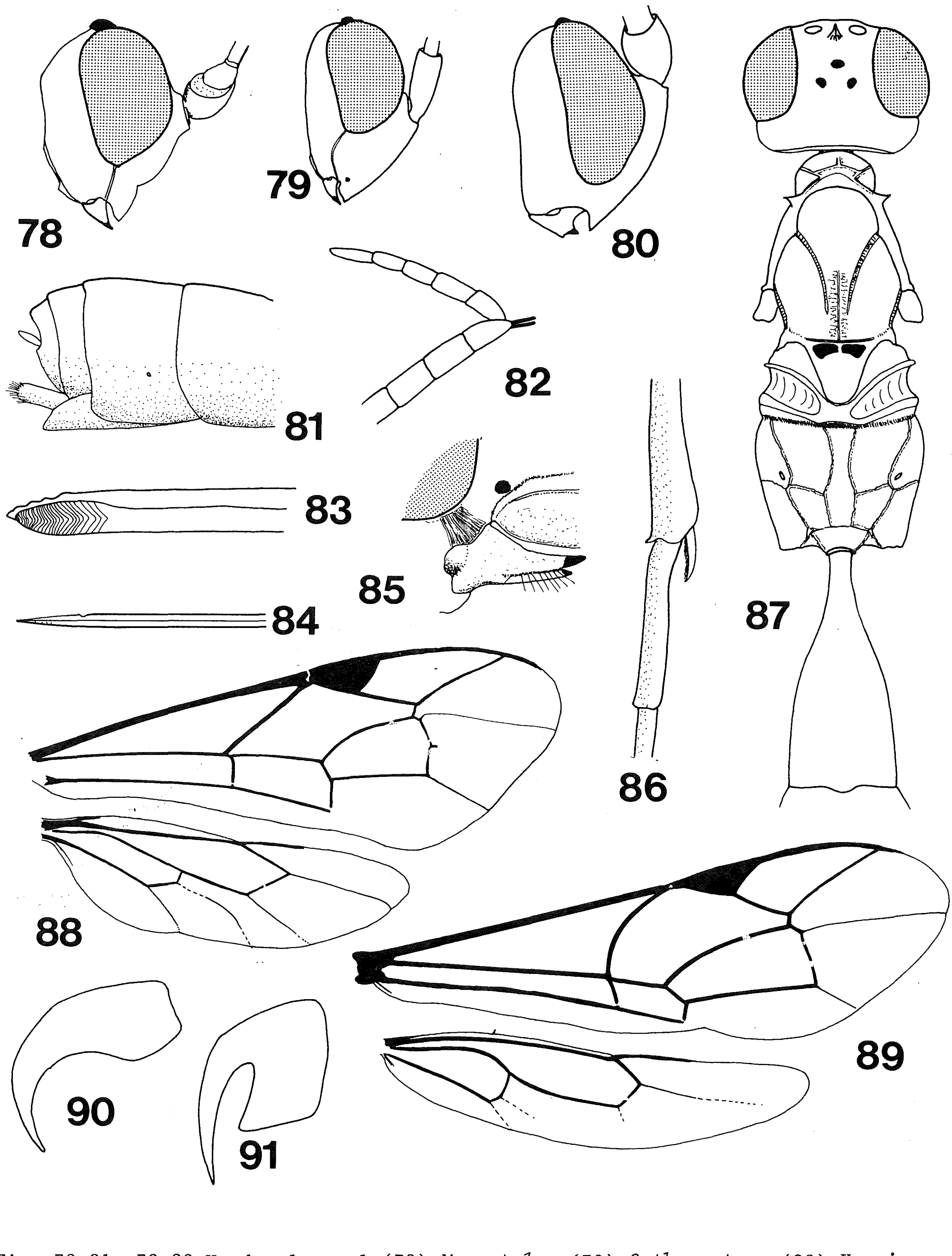
Figs 40-53. 40-44 Fore wings (40) *Temelucha* (41) *Campoplex* (42) *Alaothyris elongissimus* (43) *Leptobatopsis mesominiata* (44) *Anacis*. 45-47 Hind wings (45) *Campoplex* (46) *Temelucha* (47) *Phradis*. 48-49 Hind tarsal claws, ♀ (48) *Diaparsis* (49) *Phrudus*. 50 Propodeum, *Diaparsis*. 51-53 *Labium* (51) face (52) hind tarsus (53) flagellum.



Figs 54-68. 54-55 Alitrunks, lateral (54) *Eusterinx* (55) *Paraphylax*. 56 Petiole, *Thymaris*. 57 Claw, *Ankylophon obligatus* ♀. 58-59 Faces (58) *Gavrana* (59) *Anacis*. 60 Mandible, *Philogalleria*. 61-62 *Lycorina* (61) apex of ovipositor (62) gaster, dorsal. 63-65 Hind wings (63) *Eusterinx* (64) *Tryonocryptus gigas* (65) *Brachycertus*. 66-68 Fore wings (66) *Ankylophon obligatus* (67) *Philogalleria* (68) *Diplazon laetatorius*.



Figs 69-77. 69-70 Alitrunks, lateral (69) *Lycorina* (70) *Alaothyris elongissimus*. 71-73 Propodea, lateral (71) *Certonotus* (72) *Euceros* (73) *Lissonota*. 74-75 Face (74) *Metopius* (75) *Yezoceryx*. 76 Head and anterior part of alitrunk, dorsal, *Euceros*. 77 Gaster, lateral, *Yezoceryx*.



Figs 78-91. 78-80 Heads, lateral (78) *Megastylus* (79) *Orthocentrus* (80) *Hypsicera*. 81 End of gaster, *Megaceria* ♀. 82 Apex of flagellum, *Xorides*. 83-84 Apex of ovipositor (83) *Certonotus* (84) *Lissonota*. 85 Mandible, *Certonotus*. 86 Fore tibia, *Megaceria*. 87 Head, alitrunk and petiole, dorsal, *Xorides*. 88-89 Fore and hind wings (88) *Xanthopimpla* (89) *Megastylus*. 90-91 Fore tarsal claws (90) *Megastylus* (91) *Zaglyptus*.

(= Ephialtinae sensu Townes)

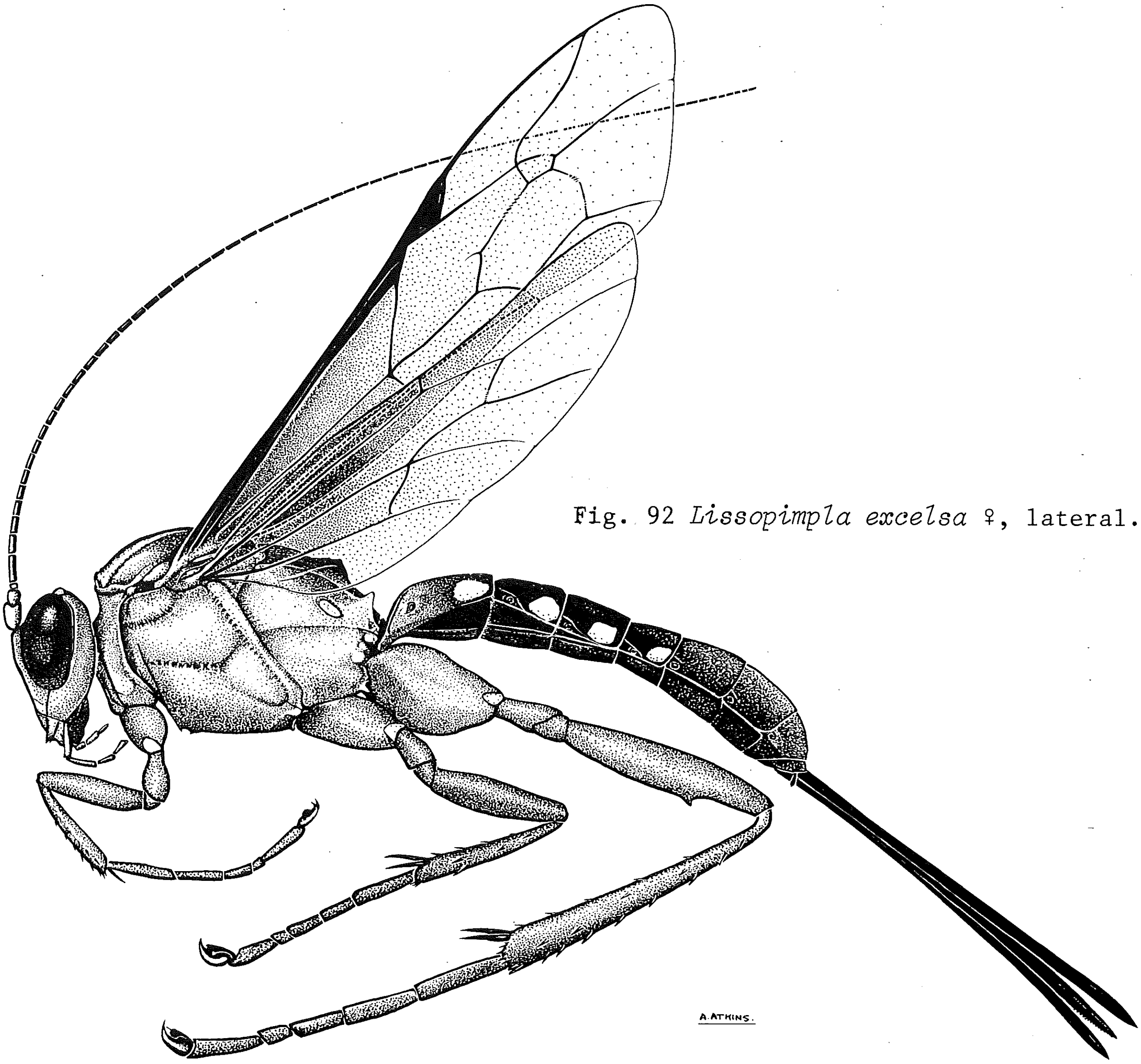


Fig. 92 *Lissopimpla excelsa* ♀, lateral.

The Pimplinae is, world-wide, a moderately large subfamily of Ichneumonidae. Several pimpline genera contain numerous common species and are widely distributed throughout tropical or temperate regions. Some of these genera, e.g. *Echthromorpha*, have species that are capable of long-distance migration and apparently have spread eastwards from South East Asia to colonize Indonesia, Melanesia and Australia. One species has even spread across the Pacific, establishing populations on remote islands such as the Marquesas and Easter Island (Perkins, 1952; Mason, 1974). Australia, compared with other large land-masses, has a relatively small pimpline fauna with only about 50 species. Many of these seem to be restricted to the tropical north-eastern parts of the continent. A few species, however, are very widely distributed. As these are generally large, brightly coloured insects and are frequently encountered in suburban gardens, they attract more attention than perhaps any other Ichneumonidae. Seventeen genera are known to occur in Australia; one of these, *Parvipimpla*, is new and six, *Acropimpla*, *Zatypota*, *Acrodactyla*, *Epirhyssa*, *Alophopimpla* and *Dreisbachia*, have not previously been recorded as Australian.

DIAGNOSIS

Small to very large ichneumonids, fore wing length 4-30 mm. Clypeus separated from face by groove, with margin thin, truncate or with a median notch, very rarely with a weak median apical tooth; mandible bidentate; male flagellum without tyloids. Sternaulus absent or weak; posterior transverse carina of mesosternum never complete; propodeum often with carination reduced. Apical edge of fore tibia without a tooth on outer side; tarsal claws not pectinate, often with a basal lobe. Fore wing with 3*r-m* usually present, enclosing a triangular or rhombic areolet; hind wing usually with distal abscissa of Cu_1 present. First tergite of gaster rather short and broad, only slightly broadened posteriorly, anteriorly broadly attached to propodeum; petiolar spiracles at or before centre of tergite; gaster dorsoventrally depressed, tergites 2-4 often with surface impressions and swellings; ovipositor short to very long, the apex of the lower valve usually with strong teeth; upper valve of ovipositor without a dorsal subapical notch.

In Australia the Rhyssini may be confused with wood-boring Labeninae such as *Certonotus*. These two taxa are compared below. Male Pimplines may be confused with Lycorininae or Banchinae. Lycorinines have a distinct triangular area defined by grooves on tergites 2 and 3; if grooves are present in pimplines then the area defined is rhombic not triangular. Banchinae often have pectinate claws and frequently have only the posterior transverse carina present near the hind end of the propodeum; pimplines with reduced propodeal carination never have the posterior transverse carina alone discernible.

CLASSIFICATION

The Pimplinae is currently subdivided into seven tribes, Delomeristini, Ephiatini, Rhyssini, Pimplini, Neoxoridini, Polysphinctini and Diacritini, but authors have not yet reached agreement about the exact limits of some tribes (compare Finlayson, 1967 with Townes, 1969). The Delomeristini is probably a polyphyletic assemblage whilst the Ephialtini is a paraphyletic group, from within which the other groups have almost certainly arisen. The remaining tribes seem to be natural holophyletic groups, although the definition of one, the Polysphinctini, can be altered depending upon whether a classification is formulated on larval or adult characters.

It is unfortunate that there is continuing nomenclatural confusion in the Pimplinae resulting, not just in the using of alternative names (as is so common throughout other suprageneric taxa in Ichneumonidae), but in an actual dual usage of the same names which are transposed in different nomenclatural systems (Townes, 1969; Fitton & Gauld, 1976). This confusion stems from Townes' refusal to recognize the validity of Opinion 159 of the International Commission on Zoological Nomenclature (1945). Various arguments have been proposed for or against different nomenclatural systems (e.g. Townes, 1969: 15-20; Fitton & Gauld, 1976: 249-250: Carlson, 1979: 315-316), but as ichneumonid workers are currently almost equally divided in their usage of these names these alternative systems are tabulated below.

Fitton & Gauld, 1976	Townes, 1969
Subfamily PIMPLINAE	Subfamily EPHIALTINAE
Tribe EPHIALTINI (Type-genus: *Ephialtes* Schrank sensu Gravenhorst, 1829*a*) [This became a correct identification on publication of Opinion 159.]	Tribe PIMPLINI (Type-genus: *Pimpla* F. sensu Curtis, 1828) [This became a misidentification on publication of Opinion 159.]
Genus *Ephialtes* Schrank	Genus *Pimpla* F.
Tribe PIMPLINI (Type-genus: *Pimpla* F. sensu Gravenhorst, 1829*a*)	Tribe EPHIALTINI (Type-genus: *Ephialtes* Schrank)

[The above became a correct identification on publication of Opinion 159.]

Genus *Apechthis* Foerster

Genus *Pimpla* F.
(= *Coccygomimus* Saussure)

[The above became a misidentification on publication of Opinion 159.]

Genus *Ephialtes* Schrank
(= *Apechthis* Foerster)

Genus *Coccygominus* Saussure

DISTRIBUTION

Australia has a rather depauperate pimpline fauna. Many genera well represented in South East Asia seem not to have spread east of the Makassar Strait, and a few others represented by species in the mountains of New Guinea are not present in Australia. The number of genera occurring in South East Asia, New Guinea and Australia is summarized below.

	Continental South East Asia	New Guinea	Australia
Delomeristini	2	1	1
Ephialtini	20	6	5
Rhyssini	7	5	1*
Pimplini	7	6	4
Neoxoridini	3	-	-
Polysphinctini	6	4	4
Diacritini	1	-	-
TOTALS	46	22	15

(* plus two genera introduced for biological control purposes)

There is a marked relationship between the Australian and Papuan pimplines, suggesting the Australian Fauna is largely derived from that of New Guinea. For example, the Rhyssini is represented in Australia by one native species; the same species and some closely related ones occur in New Guinea. Many endemic Australian species of other pimpline genera have their closest relatives in New Guinea (e.g. *Theronia*, *Alophopimpla*, *Xanthopimpla*, *Camptotypus*). There are two exceptions to this pattern. The genus *Eriostethus*, represented by species on islands from Japan and the Philippines to Samoa, seems to have its centre of diversity in Australia. *Eriostethus* may be related to *Hymenopimecis*, a Neotropical genus, and this suggests a possible southern origin for this group of Polysphinctini. The ephialtine genus *Parvipimpla* is unknown outside Australia.

BIOLOGY

Biologically the Pimplinae is both one of the most diverse and one of the more primitive subfamilies of Ichneumonidae. Pimplines attack a wide range of holometabolous insect larvae and pupae, and one group attacks spider egg sacs and spiders. Prior to oviposition, pimplines often paralyse or kill their host by injecting venom with the ovipositor (Cushman, 1926; Spradbery, 1968). Parasites which attack prospective hosts in such a manner generally lay large, well-developed eggs (Price, 1975) and have rapid larval development. To successfully form such large eggs many female pimplines apparently need protein-rich food of animal origin. In addition to feeding at flowers, like the males, these females consume haemolymph exuding from the punctures they make in pupae used as hosts (Cushman, 1926; Graham, 1947; Leius, 1960). As pimpline eggs are large, adult females have relatively few mature oocytes in the oviduct at any one time. Iwata (1960) calculated the average number to be about six with a maximum of generally less than 20. Banchines, which are similar-sized insects, but specialist endoparasites, have on average about 53 mature oocytes with a maximum of up to 176.

The powerful venom injected by pimplines prevents any immune reaction by the host. Even endoparasitic Pimplini have not needed to develop immunological compatability with a host (such as has been found for specialist endoparasites in other ichneumonid subfamilies (Salt, 1975)). Consequently pimplines often utilize a very wide range of hosts, though generally they are restricted to a particular habitat-type. For example, one Nearctic species of *Dolichomitus* parasitizes various timber-borers such as larvae of Buprestidae, Cerambycidae and Sesiidae (Townes, 1971 *a*). The common Australian species *Echthromorpha intricatoria* has been reared as an endoparasite of a wide range of lepidopterous pupae including those of Anthelidae, Lymantriidae, Noctuidae and Nymphalidae. Pimplinae not only utilize a wide range of hosts, but they attack a variety of different sized hosts. Consequently, size variation in adults so some species may be very large. For example, females of *Rhyssa persuasoria* have a fore wing length range of between 9 and 25 mm. Females of some pimplines are facultatively arrhenotokous, laying fertilized (female) eggs in large hosts and unfertilized (male) eggs in smaller ones. Thus the females are, on average, larger than the males.

The majority of species of the tribes Ephialtini and Rhyssini are ectoparasites of concealed larvae of holometaboulous insects. Perhaps the hosts of ancestral pimplines were wood-boring larvae (e.g. Siricidae, Cerambycidae) but recent Ephialtini have diversified to make use of a variety of lepidopterous, dipterous, coleopterous and hymenopterous hosts including even the larvae of aculeates nesting in holes in timber (Jussila & Käpylä, 1975). These rather unspecialized ectoparasites have to penetrate a considerable distance through plant tissue to reach their hosts, so the females usually have a very long ovipositor.

A few species of Ephialtini parasitize larvae in cocoons or silken bags. For example, *Sericopimpla* species sting psychid larvae to death then lay an egg attached to the inside of the bag. This hatches in a few days and the larva feeds externally. It is furnished with hooks on the dorsum of each abdominal segment which serve to hold it securely in position whilst feeding (Skaife, 1921). Species of the Holarctic ephialtine genus *Iseropus* attack large cocoons in which they lay several eggs, and at least one Oriental *Sericopimpla* is also a gregarious parasite. A number of adults will emerge from a single host cocoon (Iwata, 1961). Species which make use of hosts in cocoons oviposit through silk and the presence of silk is apparently necessary to elicit oviposition. It is perhaps not surprising to find that species of *Tromatobia* (a genus that is related to *Iseropus*) parasitize araneid egg sacs (Nielsen, 1923). This transition from lepidopterous cocoons to spider egg sacs probably represents the origin of the polysphinctine evolutionary line, a specialized offshoot of the Ephialtini, and a group which uses spiders as hosts. The genus *Zaglyptus*, treated by some authors as an ephialtine (e.g. Townes, 1969) and by others as a polysphinctine (e.g. Gupta & Tikar, 1978), is both structurally and biologically intermediate. *Zaglyptus* species select as hosts the concealed egg sacs of spiders which are guarded by the mother. The spider is stung and killed by the ichneumonid which then lays several eggs either on the batch of spider eggs or on the spider. The larvae then consumes the eggs and also often the dead body of the spider (Nielsen, 1935; Maneval, 1936). *Schizopyga* species are primitive Holarctic polysphinctines which kill spiders in their retreats. A single egg is laid on the body of a spider which is consumed by the ichneumonid larva (Nielsen, 1923). Polysphinctines of some other genera, such as *Acrodactyla* and *Polysphincta*, have reduced envenomation. They temporarily paralyse a spider before attaching an egg to the base of its opisthosoma. The spider then recovers and lives actively for a time whilst the larval polysphinctine gradually devours it (Fig. 127) (Nielsen, 1923; Cushman, 1926).

The Pimplini are endoparasites, ovipositing mostly in exposed or partially exposed pupae of Lepidoptera. Biologically they are similar to the ectoparasite Ephialtini as they usually totally incapacitate the host by envenomation prior to oviposition. The larvae merely devour the host from within rather than from without. The most striking consequence of the internal parasitic habit of Pimplini is that their larvae have a specialized head capsule with atrophied hypostoma (Fig. 126). This is superficially quite like that of Ichneumoninae which have a similar developmental biology.

The Delomeristini are biologically rather a heterogeneous group with one genus cleptoparasitic on Siricidae via Rhyssini, another genus parasitizing stem-nesting aculeates and a third attacking sawfly cocoons. The only Australian genus, *Theronia*, includes mostly species which are primary or secondary parasites of Lepidoptera. The hosts of *Theronia (Nomosphecia)* species are thought to be vespid larvae (Gupta, 1962).

KEY TO THE GENERA OF PIMPLINAE OCCURRING IN AUSTRALIA

The tribal groupings in the Pimplinae are based to some extent on structures of the final instar larvae (Finlayson, 1967; Short, 1978). The characters used to place adults in tribes are often subtle and difficult for an inexperienced person to appreciate, and they are frequently subject to exceptions. For ease of identification the key given below is direct to genus although I have indicated some tribal groupings in parentheses.

1 Mesoscutum without sharp, transverse wrinkles or rugae (Figs 93-95); last visible tergite of ♀ gaster not cornute 2

\- Mesoscutum with sharp, transverse wrinkles or rugae (Figs 96-97); last visible tergite of ♀ gaster ending in a short horn (Fig. 100). (Rhyssini) 15

2 Epicnemial carina entirely absent; posterior margins of tergites 3-5 incised (Fig. 98).
3*r-m* lacking in fore wing and hind wing with first abscissa of Cu_1 shorter than *cu-a* ..... *PARVIPIMPLA* (p. 67)

\- Epicnemial carina present, at least ventrally; posterior margins of tergites 3-5 not conspicuously incised 3

3 Hind wing with *cu-a* more than 1.8 times as long as first abscissa of Cu_1 (Fig. 103) (or sometimes with distal abscissa of Cu_1 and *M* basally united); distal abscissa of Cu_1 present; fore tarsal claws of ♀ simple 4

\- Hind wing with *cu-a* about equal to or shorter than first abscissa of Cu_1 (Fig. 104) or with distal abscissa of Cu_1 absent (Fig. 105); fore tarsal claws of ♀ with a basal lobe 7

4 Hind femur with a ventral tooth (Fig. 99); face with vertical impression either side of raised mid-line (Fig. 106); mesopleuron with two trans-striate grooves, one below subalar prominence, the second extending back from upper end of epicnemial carina (Fig. 94) ..... *LISSOPIMPLA* (p. 64)

\- Hind femur without a ventral tooth; face without vertical impressions (Figs 107-109); mesopleuron without trans-striate grooves though often with shallow furrows 5

5 Mandible not or only moderately tapered, not twisted (Fig. 108); labrum concealed when mandibles closed; clypeus transverse and entire 6

\- Mandible strongly tapered, twisted (Figs 107, 109); labrum exposed when mandibles closed; clypeus elongate, or if transverse then divided by a transverse ridge 7

6 Propodeal spiracle almost circular; propodeum dorsally without carinae; occipital carina dorsally absent ..... *ALOPHOPIMPLA* (p. 62)

\- Propodeal spiracle elliptical; propodeum dorsally with lateral longitudinal and lateromedian carinae discernible; occipital carina complete ..... *THERONIA* (p. 60)

7 Malar space equal to or longer than basal mandibular width (Fig. 107); marginal cell of fore wing with distal infumate spot; fore wing with *cu-a* distal to *Rs&M* ..... *ECHTHROMORPHA* (p. 63)

- Malar space shorter than basal mandibular width (Fig. 109); marginal cell of fore wing without an infumate spot; fore wing with *cu-a* more or less opposite base of *Rs&M*.........................*XANTHOPIMPLA* (p. 65)

8 Fore wing with *3r-m* present enclosing a subtriangular or rhombic areolet (Fig. 113). (Ephialtini in part)..................................9
- Fore wing with *3r-m* absent...11

9 Pterostigma bright yellow contrasting with infumate wings and dark veins; occipital carina obsolescent or absent mediodorsally; tergite 3 with diagonal grooves delineating a subtriangular area (Figs 118, 556)...*CAMPTOTYPUS* (p. 66)
- Pterostigma blackish, concolorous with other veins; occipital carina present mediodorsally; tergite 3 with a pair of lateromedian swellings (Figs 117, 555)..10

10 Eye with a strong indentation opposite base of antenna; hind ocellus separated from eye by about its own diameter; head behind eyes very strongly narrowed (Fig. 112)..........................*SERICOPIMPLA* (p. 68)
- Eye with very weak indentation opposite base of antenna; hind ocellus separated from eye by more than its own diameter; head behind eyes evenly rounded (Fig. 111)................................*ACROPIMPLA* (p. 66)

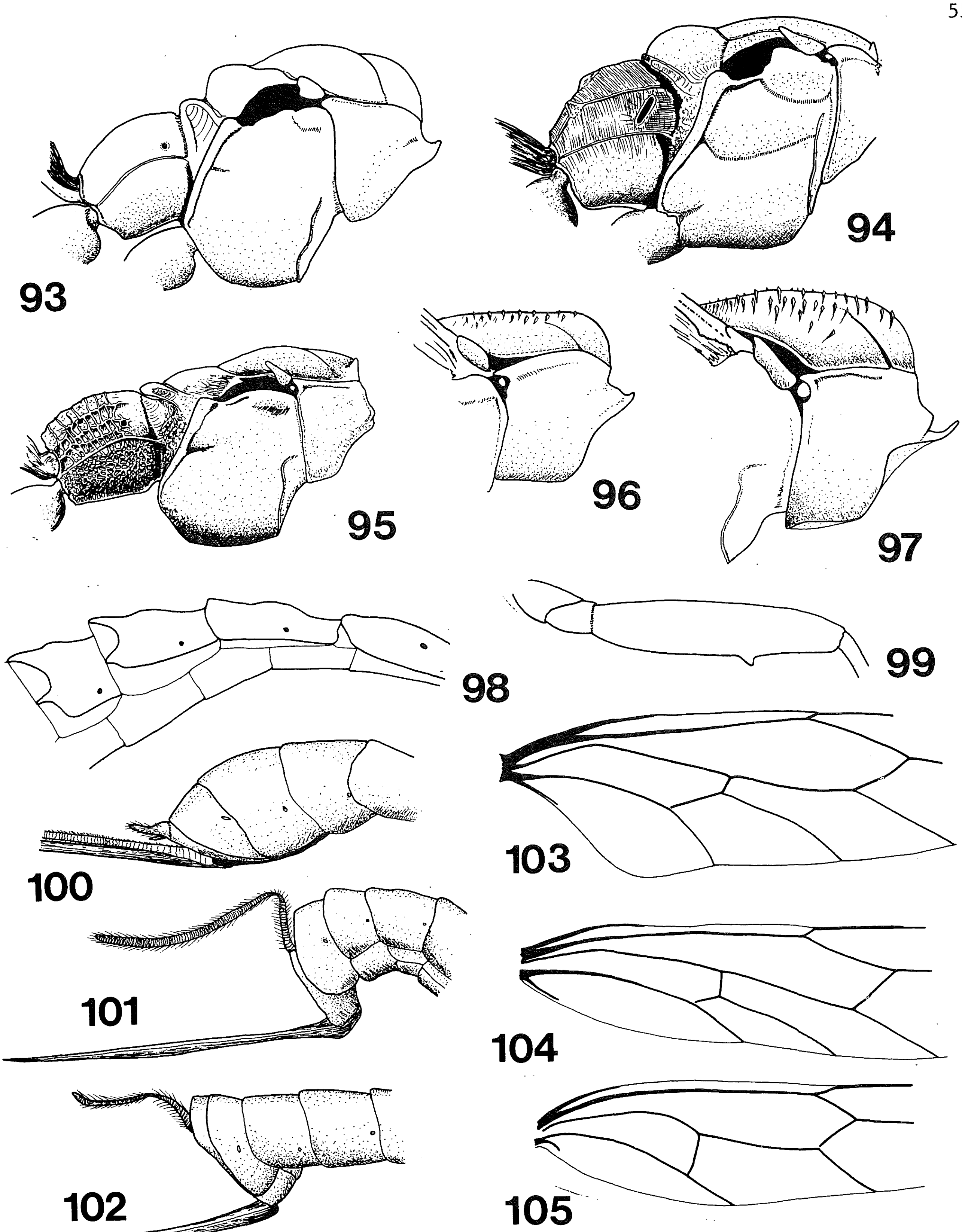
11 Propodeum with lateral subapical tubercles; ovipositor shaft in profile parallel-sided, the apex abruptly tapered with proximal tooth bearing an elongate free tip (Fig. 116); segment 5 of hind tarsus quite slender, about 2.5 times as long as broad...........*ZAGLYPTUS* (p. 69)
- Propodeum without lateral subapical tubercles; ovipositor shaft in profile evenly tapered from centre to apex, apical teeth indistinct, the most proximal never with an elongate free tip (Figs 101, 102); segment 5 of hind tarsus stout, 2.0 times or less as long as broad. (Polysphinctini)..12

12 Mesoscutum with a small crest near anterior end of notaulus (Fig. 95); propodeum in profile rather long, often coarsely sculptured; distal abscissa of Cu_1 of hind wing always present.............*ACRODACTYLA* (p. 70)
- Mesoscutum without an anterior crest; propodeum in profile rather evenly rounded, generally smooth and polished (Fig. 93); distal abscissa of Cu_1 of hind wing usually absent (Figs 119, 120)...............13

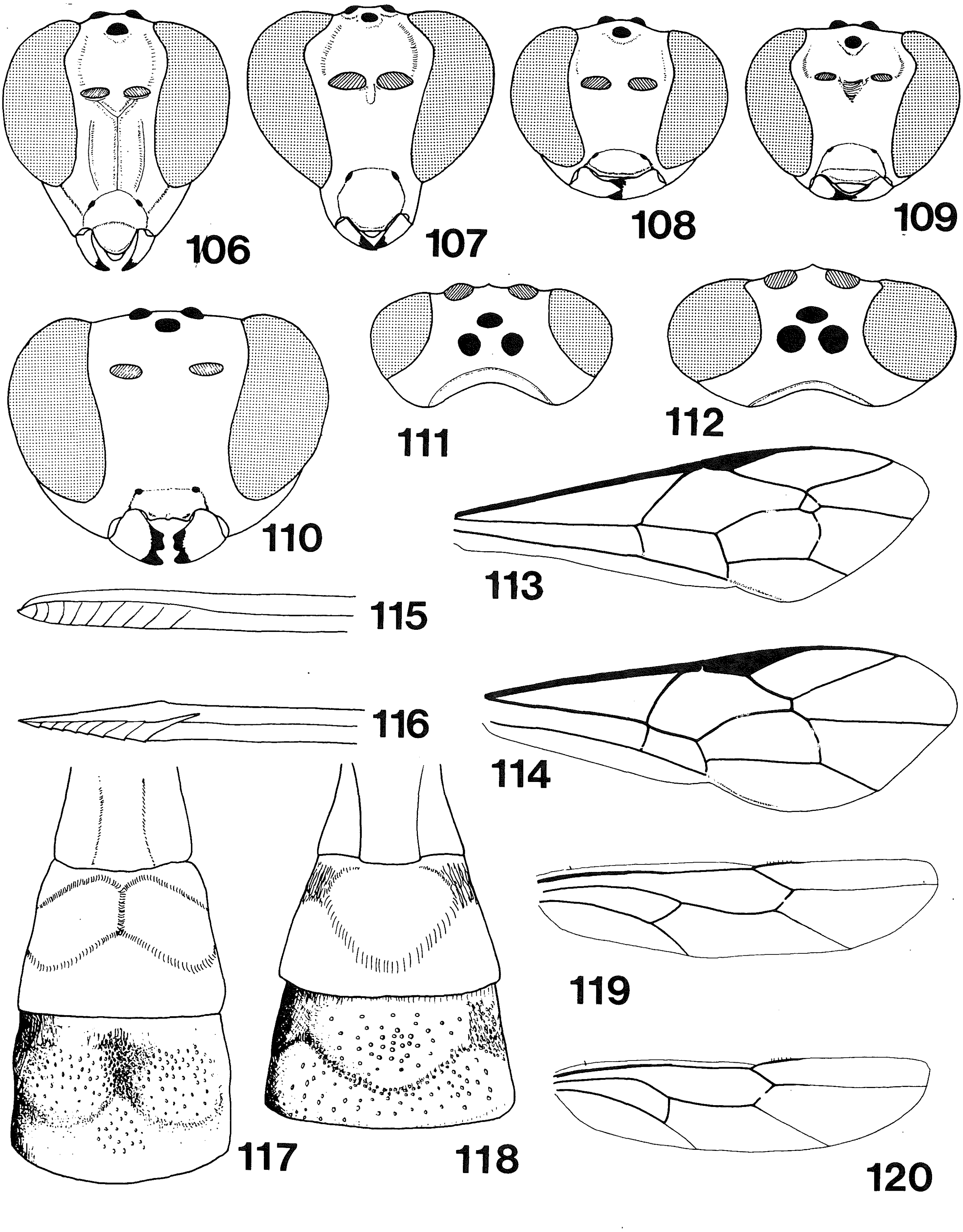
13 Mesoscutum with central lobe evenly and closely pubescent; surface of eye bearing scattered long conspicuous hairs; ovipositor slightly up-curved (Fig. 102)..................................*DREISBACHIA* (p. 70)
- Mesoscutum without hair centrally; surface of eye with, at most, inconspicuous short hair; ovipositor straight (Fig. 101)..................14

14 Ovipositor projecting beyond apex of gaster by more than 0.9 times length of hind tibia; hind wing with distal abscissa of Cu_1 absent, Cu_1&*cu-a* inclivous, anterodistal corner of sub-basal cell 90° or less (Fig. 119)...*ERIOSTETHUS* (p. 71)
- Ovipositor projecting beyond apex of gaster by less than 0.5 times length of hind tibia; hind wing with distal abscissa of Cu_1 present or absent, if absent Cu_1&*cu-a* oblique so anterodistal corner of sub-basal cell 100° or more (Fig. 120).........................*ZATYPOTA* (p. 71)

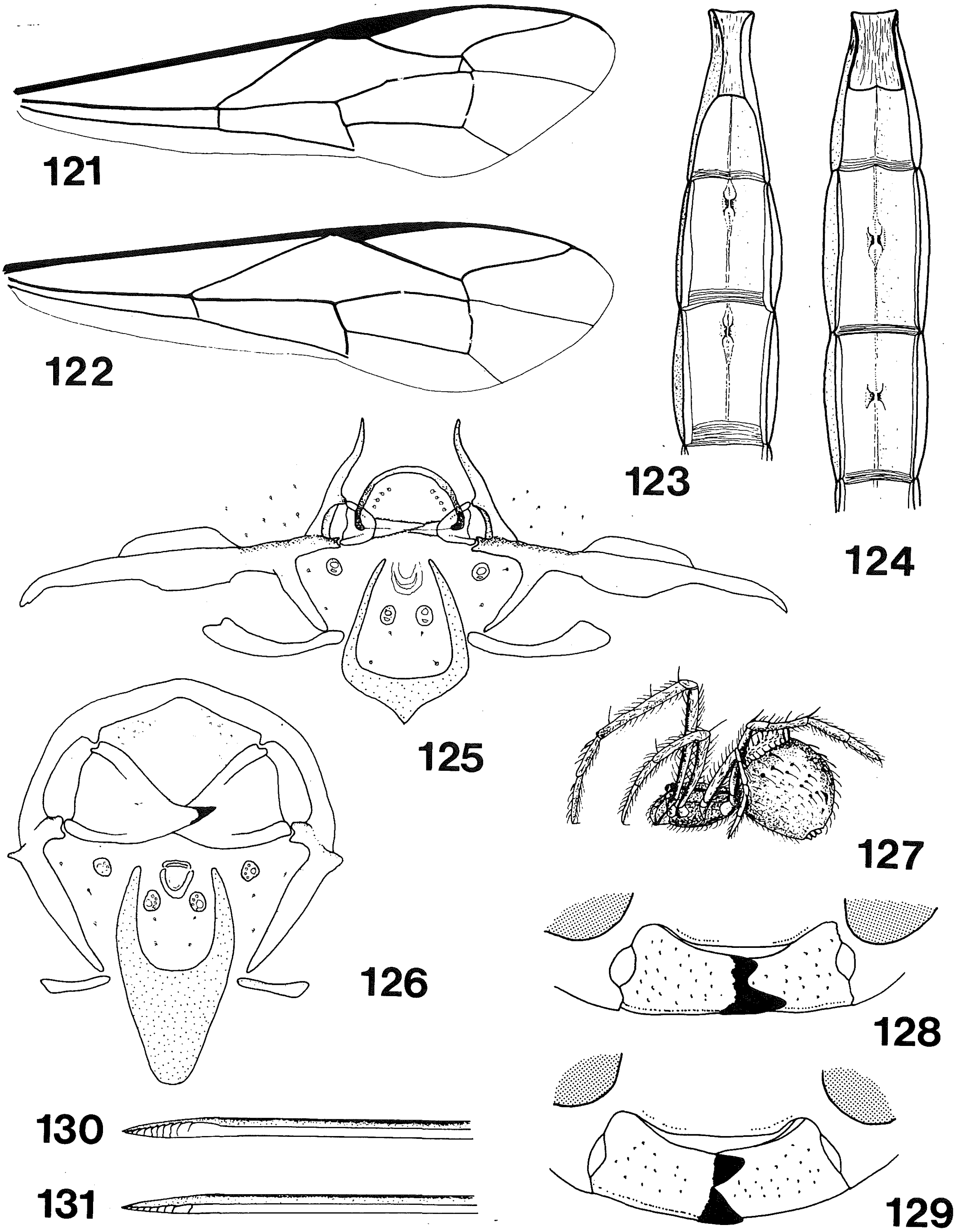
15 Pronotum mediodorsally with a depression centrally, but without a deep transverse furrow separating an anterior lip-like portion (Fig. 96); first sternite not fused to tergite; ♀ with sternites 2-4 with a median pair of tubercles (Fig. 124)......................*RHYSSA* (p. 59)
- Pronotum mediodorsally with deep transverse groove separating off a recurved anterior lip (Fig. 97); first sternite fused to tergite; ♀ with sternites 2-4 bearing tubercles near anterior edge (Fig. 123)........16



Figs 93-105 Pimplinae. 93-95 Alitrunks, lateral (93) *Zatypota* (94) *Lissopimpla* (95) *Acrodactyla*. 96-97 Anterior part of alitrunks, lateral (96) *Rhyssa* (97) *Epirhyssa*. 98. Gaster, lateral *Parvipimpla petita*. 99 Hind femur, *Lissopimpla*. 100-102 Apex of gaster, ♀ (100) *Epirhyssa* (101) *Eriostethus* (102) *Dreisbachia*. Figs 103-105 Hind wings (103) *Xanthopimpla* (104) *Camptotypus* (105) *Dreisbachia*.



Figs 106-120 Pimplinae. 106-110 Faces (106) *Lissopimpla excelsa* (107) *Echthromorpha agrestoria* (108) *Theronia maculosa* (109) *Xanthopimpla* (110) *Epirhyssa*. 111-112 Heads, dorsal (111) *Acropimpla* (112) *Sericopimpla*. 113-114 Fore wings (113) *Sericopimpla crenator* (114) *Parvipimpla petita*. 115-116 Apex of ovipositors (115) *Epirhyssa* (116) *Zaglyptus glabrinotum*. 117-118 Tergites 1-3 of gasters, dorsal (117) *Sericopimpla* (118) *Camptotypus*. 119-120 Hind wings (119) *Eriostethus* (120) *Zatypota*.



Figs 121-131 Pimplinae. 121-122 Fore wings (121) *Megarhyssa* (122) *Epirhyssa*. 123-124 Sternites 1-3, ♀ (123) *Megarhyssa* (124) *Rhyssa*. 125-126 Cephalic capsule of first instar larva (125) *Sericopimpla* (126) *Echthromorpha*. 127 Unidentified polysphinctine larva feeding on immature spider (Courtesy D. I. Gauld). 128-129 Mandibles (128) *Theronia (Nomosphecia) melanosoma* (129) *Theronia (Theronia) maculosa*. 130-131 Ovipositors, apices (130) *Theronia (Parema) penetrans* (131) *Theronia (Theronia) maculosa*.

16 Fore wing with $3r$-m absent (Fig. 122); tergite 1 without dorsolateral carinae anteriorly; tergite 2 with thyridia contiguous with anterior margin...*EPIRHYSSA* (p. 58)
\- Fore wing with $3r$-m present enclosing rhombic areolet (Fig. 121); tergite 1 with dorsolateral carinae on anterior 0.1; tergite 2 with thyridia separated from anterior margin...................*MEGARHYSSA* (p. 59)

Tribe RHYSSINI

Very large ichneumonids characterized by the presence of transverse rugae on the mesoscutum and with the female having a cornute process on the hind end of the last visible tergite. Rhyssini may easily be confused with labenines of the genera *Certonotus* and *Asperellus*. The following differences serve to distinguish them.

Australian Rhyssini	*Certonotus*, *Asperellus*
Clypeus small, with a trace of a median apical tooth, often laterally tuberculate (Fig. 110).	Clypeus large, without a trace of either a median apical tooth or lateral tubercles (Fig. 162).
$2m$-cu in fore wing bowed centrally outwards.	$2m$-cu in fore wing bowed or angled centrally inwards.
Lower anterior corner of metapleuron simple, not produced.	Lower anterior corner of metapleuron produced into a large lobe.
Apex of ovipositor with coarse teeth on lower valve (Fig. 115).	Apex of ovipositor with fine file-like teeth on lower valve (Fig. 164).

Rhyssini are parasites of Siricoidea and Cerambycidae. Seven genera have been recorded from South East Asia, three of which occur in Australia. Two additional genera, *Lytarmes* and *Myllenyxis*, occur either in New Guinea or the Solomons so they may possibly occur in Australia. The Oriental species have recently been revised by Kamath & Gupta (1972) who include a key to genera.

EPIRHYSSA Cresson*

Epirhyssa Cresson, 1865: 39. Type-species: *Epirhyssa speciosa* Cresson, by subsequent designation, Viereck, 1914: 52.
Rhyssonota Kriechbaumer, 1890: 489. Type-species: *Rhyssonota tristis* Kriechbaumer by monotypy.
Hierax Tosquinet, 1903: 255. Type-species: *Hierax raptor* Tosquinet, by monotypy. [Homonym of *Hierax* Vigors, 1826.] Syn. n.
Sychnostigma Baltazar, 1961: 75. [Replacement name for *Hierax* Tosquinet.] Syn. n.

Large species, fore wing length 15-17 mm; clypeus with a trace of a median apical tooth, laterally tuberculate (Fig. 110); occipital carina complete, mediodorsally dipped. Pronotum mediodorsally with a deep transverse groove separating off recurved anterior lip (Fig. 97); epicnemial carina present; propodeum without distinct carinae, spiracle elliptical. Female with claws simple; fore wing with $3r$-m absent (Fig. 122); hind wing with first abscissa of Cu_1 short, less than 0.2 times length of *cu-a*. Sternites 2-4 of female bearing tubercles near anterior edge; tergite 2 with thyridia contiguous with anterior margin; tergite 2-4 smooth; ovipositor straight, projecting beyond apex of gaster by about 4.0 times length of hind tibia.

Remarks. Townes (1969) treated *Sychnostigma* as a genus distinct from *Epirhyssa*. Since Townes wrote his key many more species have been collected (*vide* Porter, 1978) and the supposed differences between these genera have broken down repeatedly. Consequently the maintenance of *Sychnostigma* as a separate genus is no longer tenable. Dr Townes (pers. comm.) agrees with this interpretation.

Epirhyssa, as currently defined, is a very large tropicopolitan genus, most species of which, occur in lowland rain forest.

Australian species. One, undescribed, from N. Queensland (ANIC). It appears to be conspecific with some New Guinea specimens (TC).

Host records. None.

MEGARHYSSA Ashmead

Thalessa Holmgren, 1859*b*: 122. Type-species: *Ichneumon clavatus* F. (= *Ichneumon gigas* Laxmann), by subsequent designation, Ashmead, 1900*a*: 53. [Homonym of *Thalessa* Adams, 1843.]
Megarhyssa Ashmead, 1900*b*: 368. [Replacement name for *Thalessa* Holmgren.]
Megalorhyssa Schulz, 1906: 115. [Unjustified emendation.]

Very large species, fore wing length 21-30 mm; clypeus with a weak median apical tooth, laterally tuberculate; occipital carina usually obsolescent centrally. Pronotum mediodorsally with a deep transverse groove cutting off anterior recurved lip; epicnemial carina present; propodeum without distinct carinae, spiracle oval. Female with claws simple; fore wing with *3r-m* present, enclosing large, triangular areolet (Fig. 121); hind wing with first abscissa of Cu_1 very short, less than 0.2 times length of *cu-a*. Sternites 2-4 of female bearing tubercles near anterior edge (Fig. 123); tergite 2 with thyridia separated from anterior margin; tergites 2-4 smooth; ovipositor straight, projecting beyond apex of gaster by about 6.0 times length of hind tibia.

Remarks. A moderate-sized Holarctic and Oriental genus with a single North American species, *M. nortoni*, introduced into Tasmania and Victoria to control *Sirex* infestations in *Pinus radiata* plantations (Taylor, 1976; Neumann & Minko, 1981). A second species, *M. emarginatoria* (Thunberg), was also introduced into Tasmania in 1964, but the females displayed little interest in the *Sirex* infested timber (Taylor, 1967) and the species has not become established. *M. nortoni*, however, has become an important factor in controlling the population of *Sirex* in south-east Australia (Taylor, 1978).

Australian species. *M. nortoni* (Cresson) (I).

Host records. *M. nortoni*- Siricidae: *Sirex noctilio* F. In the Nearctic region this rhyssine has been reared from a variety of siricids (Townes & Townes, 1960).

RHYSSA Gravenhorst

Rhyssa Gravenhorst, 1829*c*: 260. Type-species: *Ichneumon persuasorius* L., by subsequent designation, Westwood, 1840: 59.
Cryptocentrum Kirby, 1837: 260. Type-species: *Cryptocentrum lineolatum* Kirby, by monotypy.
Pararhyssa Walsh, 1873: 109. Type-species: *Ichneumon persuasorius* L., by subsequent designation, Viereck, 1914: 111.

Medium-sized to very large species, fore wing length 7-25 mm; clypeus with a median apical tooth, without lateral tubercles; occipital carina mediodorsally incomplete. Pronotum with a mediodorsal depression, without a deep transverse furrow separating anterior lip-like portion (Fig. 96); epicnemial carina present; propodeum without distinct carinae, often transversely striate, spiracle oval. Female with claws simple; fore wing with *3r-m* present enclosing a triangular areolet; hind wing with first abscissa of Cu_1 short, less than 0.3 times length of *cu-a*. First sternite not fused with tergite; sternites 2-4 of female bearing tubercles near centre (Fig. 124); tergite 2 with thyridia near to anterior margin; tergites

2-4 smooth; ovipositor straight, projecting beyond apex of gaster by more than 4.0 times length of hind tibia.

Remarks. *Rhyssa* is a relatively small genus, species of which are common parasites of siricids in the north temperate region. One species, *R. persuasoria*, was first introduced into the southern hemisphere in 1928-31 in an attempt to control *Sirex noctilio* in New Zealand (Millar & Clark, 1935). The discovery of *S. noctilio* in a *Pinus radiata* plantation near Hobart, Tasmania in March 1952 (Gilbert & Miller, 1952) prompted the Tasmanian Department of Agriculture to approach the New Zealand authorities (DSIR and the Forest Research Institute) for shipments of *R. persuasoria*. In 1957 this rhyssine was liberated in Tasmania, and by 1959 it seemed to have become established (Taylor, 1967). In 1961 *Sirex* was discovered in Victoria (Irvine, 1962) and the following year the National Sirex Fund was established to promote an extensive programme of research on *Sirex* and its parasites. In subsequent years many parasites were introduced into Australia including eight species of *Rhyssa*. These were (in alphabetical order)- *R. alaskensis* Ashmead (49 ♀ from south-western U.S.A.); *R. amoena* Gravenhorst (12 ♀ from Europe); *R. crevieri* (Provancher) (31 ♀ from eastern Canada); *R. hoferi* Rohwer (34 ♀ from Arizona and New Mexico); *R. howdenorum* Townes (95 ♀ from south-eastern U.S.A.); *R. jozana* Matsumura (26 ♀ from Japan); *R. lineolata* (Kirby) (30 ♀ from New Zealand and 30 ♀ from Canada and the U.S.A.); *R. persuasoria* (L.) (1622 ♀ from Europe, Turkey, Morocco, North America, Japan and India) (Taylor, 1976). Of these only *R. persuasoria* seems to have become firmly established (Neumann & Minko, 1981).

In a recent study of insect parasitoids in relation to *Sirex noctilio*, Taylor (1978) concluded that *R. persuasoria* and *Megarhyssa nortoni* together were mainly responsible for reducing the level of the population of the pest in Tasmania between 1965 and 1974. He suggests that the two rhyssine species act as a single delayed density-dependent factor.

Australian species. *R. persuasoria* (L.) (I).

Host records. *R. persuasoria*- Siricidae: *Sirex noctilio* F. In the north temperate region this species is parasitic on borers in conifers, especially Siricidae; there are a few records of this species as a parasite on larvae of Cerambycidae (Aubert, 1969).

Tribe DELOMERISTINI
(= Theroniini sensu Townes)

A heterogeneous assemblage of genera placed together on account of the lack of basal tooth on the fore tarsal claw of the female, the usually elongate male subgenital plate and the often delineated, rather long, area superomedia. The final instar larvae all possess a large internal tooth on the mandible and have a well-developed hypostoma (Short, 1978). A single genus, *Theronia*, occurs in Australia.

THERONIA Holmgren

Medium-sized to moderately large species, fore wing length 7-14 mm; clypeus with margin slightly concave; mandible not twisted; occipital carina complete. Epicnemial carina present, at least ventrally; mesopleural suture angled centrally; propodeum with strong carinae, spiracle oval. Tarsal claws of female without basal lobes, but usually large and with spatulate bristles; fore wing with *3r-m* present, enclosing rhombic areolet; hind wing with first abscissa of Cu_1 about 0.3 times length of *cu-a*. Tergite 1 rather slender; tergites 2-5 smooth and polished; ovipositor projecting beyond apex of gaster by 1.2-1.9 times length of hind tibia.

Remarks. This is a very large tropicopolitan genus with a few species occurring in temperate regions. Gupta (1962) recognized five subgenera in the Indo-Australian region but Townes (1969) encreased this to seven. In the present work I have followed Gupta in placing three of the common Australian species in *T. (Theronia)*. Townes (1969) placed these in *T. (Poecilopimpla)* but I do not think this group deserves subgeneric status. The Australian species placed by Townes in *T. (Poecilopimpla)* will neither run to this subgenus in his key nor do they agree with the subgeneric diagnosis.

Theronia species are mostly bright yellow or green and in flight they are conspicuous amongst the forest vegetation. When caught they sink their large claws into their captor. These are difficult to disengage and usually break near their bases at the level of an apparently fluid-filled cavity. Townes (1940) suggested the claws may function as poison fangs to deter predators. As yet this idea has not been proven; nobody has analysed the fluid in the cavity.

The Indo-Australian species of *Theronia* have been revised by Gupta (1962) who included a discussion of the phylogeny and zoogeography of the group.

Key to subgenera of *Theronia* occurring in Australia

1 Lower tooth of mandible twice as long as the upper (Fig. 128); hind tibia and often femur blackish................*THERONIA (NOMOSPHECIA)* (p. 62)

\- Lower tooth of mandible subequal to the upper (Fig. 129); hind femur never black, tibia often reddish brown..............................2

2 Lateral longitudinal carinae extending slightly more than 0.5 times length of scutellum; lower valve of ovipositor partially enclosing the upper (Fig. 130).............................*THERONIA (PAREMA)* (p. 62)

\- Lateral longitudinal carinae not extending more than 0.2 times length of scutellum; lower valve of ovipositor not enclosing the upper (Fig. 131)..................................*THERONIA (THERONIA)* (p. 61)

THERONIA (THERONIA) Holmgren

Theronia Holmgren, 1859*b*: 123. Type-species: *Pimpla flavicans* F. (= *Ichneumon atalantae* Poda), by monotypy.
Pseudacoenites Kriechbaumer, 1892: 219. Type-species: *Pseudaceonites moravicus* Kriechbaumer (= *Pimpla laevigata* Tschek), by monotypy.
Poecilopimpla Cameron, 1903*a*: 141. Type-species: *Poecilopimpla lucida* Cameron, by monotypy. Syn. n.
Orientotheronia Morley, 1913*b*: 146. Type-species: *Orientotheronia rufescens* Morley (= *Pimpla zebra* Snellen van Vollenhoven), by original designation.
Theronia (Theronia) Holmgren; Gupta, 1962: 9.
Theronia (Poecilopimpla) Cameron; Townes, 1969: 123.

Remarks. The largest subgenus with most species occurring in the Old World tropics and a few aberrant species in the Holarctic. Three species occur in Australia. They are not uncommon in woodland on the eastern side of the continent from Queensland to Tasmania. At least one species, *T. (T.) maculosa*, has a brilliant emerald green gaster when alive though this colour fades rapidly to greenish yellow after death.

Australian species. *T. (T.) fumipennis* Morley, (E); *T. (T.) maculosa* Krieger (E); *T. (T.) steindachneri* Krieger (E).

Host records. *T. (T.) maculosa* - Anthelidae: *?Anthela acuta* (Walker). Saturniidae: *Antheraea astrophela* Walker (Chadwick & Nikitin, 1976). *T. (T.) steindachneri* - Lymantriidae: *Teia anartoides* Walker (Cameron, 1912*a*). Noctuidae - *Pericyma cruegeri* (Butler) (DPIQ). Psychidae: *Hyalarcta huebneri* (Westwood) (QM). Saturniidae: *Antheraea astrophela* Walker (Cameron, 1912*a*; Chadwick & Nikitin, 1976). Short (1978), on the basis of dissection of host remains, suggests that *Theronia (Theronia)* species are hyperparasites, using Pimplini as hosts.

THERONIA (PAREMA) Gupta*

Theronia (Parema) Gupta, 1962: 54. Type-species: *Theronia nigrobalteata* Cameron, by original designation.

Remarks. A small subgenus restricted to the Indo-Papuan area. This is the first record of this subgenus for Australia. Specimens have been collected in North Queensland (ANIC).

Australian species. *T. (P.) penetrans* (Smith)* (M).

Host records. None.

THERONIA (NOMOSPHECIA) Gupta

Theronia (Nomosphecia) Gupta, 1962: 68. Type-species: *Theronia zebroides* Krieger, by original designation.

Remarks. A moderately small subgenus restricted to the Indo-Australian region. The Australian species appears to be restricted to tropical Queensland.

Australian species. *T. (N.) melanosoma* Morley (E).

Host records. None from Australia, but in South East Asia species have been reared from nests of *Stenogaster* and *Eumenes* (Vespidae) (Gupta, 1962).

Tribe PIMPLINI
(= Ephialtini sensu Townes)

This is a holophyletic group of genera which are most easily recognized by their final instar larvae; these have a strongly developed epistomal arch and a totally reduced hypostoma (Fig. 126). The adults are small to large insects with the ovipositor about as long as, or shorter than the gaster, a subcircular to oval propodeal spiracle, a very short first abscissa of Cu_1 in the hind wing and an almost straight mesopleural suture.

World-wide this tribe contains nine genera, four of which occur in Australia. Two additional genera, *Itoplectis* and *Pimpla*, are recorded from New Guinea (Momoi, 1966; 1973), but these are unlikely to occur in Australia as they are virtually restricted to montane regions between 2000 and 3300 m (Momoi, 1973).

The majority of Australian Pimplini are brightly patterned, generally either yellow with black markings or blackish with yellow or white markings. They form a common and conspicuous part of the Australian ichneumonid fauna. Two species, *Lissopimpla excelsa* and *Echthromorpha intricatoria*, are unusual in that they migrate in large numbers. Common (1954) observed them flying WSW., near Braidwood, in October, and more recently, Green (1981: pers. comm.) observed *L. excelsa* at Deadhorse Gap (1560 m) migrating SW. on the 19th-22nd of November. On the 19th at midday 45-50 per minute were flying past whilst on the 22nd numbers had dropped to 6-10 per minute.

ALOPHOPIMPLA Momoi*

Alophopimpla Momoi, 1966: 160. Type-species: *Alophopimpla polia* Momoi, by original designation.

Medium-sized species, fore wing length 6 mm; clypeus transverse, its margin slightly concave; mandible moderately narrowed, not twisted, when closed concealing labrum; malar space about 0.2 times as long as basal mandibular width; occipital carina dorsally absent. Epicnemial carina present (absent in New Guinea species);

mesopleuron without impressed, trans-striate groove; mesopleural suture not centrally angled; propodeum with only pleural carinae, other carinae absent; spiracle circular. Tarsal claws of female large, without a basal lobe, with a spatulate bristle; hind femur simple; fore wing with 3*r-m* present, enclosing rhombic areolet; marginal cell without an infumate spot; hind wing with first abscissa of Cu_1 about 0.2 times as long as *cu-a*. Gaster highly polished, smooth; ovipositor slightly decurved, projecting beyond apex of gaster by 1.0-1.4 times length of hind tibia.

Remarks. A small genus previously only known from a single New Guinea specimen. A second species occurs in Queensland. It differs from *A. polia* in having a complete epicnemial carina and a longer ovipositor but in other structures and even colour pattern the two species are extremely similar. *Alophopimpla* species resemble some species of *Itoplectis*, particularly species of the *Itoplectis melanocephala* (Gravenhorst) group which lack a lobe on the fore tarsal claws. However, the incomplete occipital carina, smooth gastral tergites, nonemarginate eyes and smooth propodeum distinguish *Alophopimpla*.

Australian species. One, undescribed (BMNH).

Host records. None.

ECHTHROMORPHA Holmgren

Echthromorpha Holmgren, 1868: 406. Type-species: *Echthromorpha maculipennis* Holmgren (= *Ichneumon agrestorius* Swederus), by subsequent designation, Ashmead, 1900*a*: 57.
Syene Snellen van Vollenhoven, 1878: lxxvi. Type-species: *Cryptus notulatorius* F. (= *Ichneumon agrestorius* Swederus), by subsequent designation, Townes, 1960: 43.
Stagmopimpla Saussure, 1892: 16. Type-species: *Stagmopimpla hyalina* Saussure (= *Ichneumon agrestorius* Swederus), by subsequent designation, Viereck, 1914: 136.
Rhynchopimpla Kriechbaumer, 1894*a*: 51. Type-species: *Pimpla interrupta* Brullé (= *Ichneumon agrestorius* Swederus), by monotypy.
Polyamma Kriechbaumer, 1894*b*: 304. Type-species: *Pimpla continua* Brullé sensu Kriechbaumer (= *Ichneumon agrestorius* Swederus), by monotypy.
Chrysopimpla Cameron, 1899: 185. Type-species: *Chrysopimpla ornatipes* Cameron (= *Ichneumon agrestorius* Swederus), by subsequent designation, Viereck, 1914: 32.
Allotheronia Ashmead, 1900*a*: 55. Type-species: *Allotheronia 12-guttata* Ashmead (= *Cryptus intricatorius* F.), by original designation.
Glyptogastra Ashmead, 1900*a*: 57. Type-species: *Glyptogastra hawaiiensis* Ashmead, by original designation.
Polyhamma Dalla Torre, 1901*a*: 455. [Unjustified emendation.]

Medium-sized to large species, fore wing length 9-20 mm; clypeus elongate, its margin slightly concave; mandible strongly narrowed, twisted, when closed, exposing labrum; malar space as long as or longer than basal mandibular width (Fig. 107); occipital carina complete. Epicnemial carina present; mesopleuron without impressed, trans-striate grooves; mesopleural suture slightly angled centrally; propodeum without distinct carinae though sometimes with apophyses; spiracle elliptical. Tarsal claws of female large, without a strong basal lobe, but with spatulate bristle; hind femur simple; fore wing with 3*r-m* present enclosing subpetiolate, rhombic areolet; marginal cell with infumate spot distally; hind wing with first abscissa of Cu_1 very short or obsolete. Gaster somewhat polished, with or without coarse punctures; ovipositor very slightly decurved, projecting beyond apex of gaster by about length of hind tibia.

Remarks. A moderately large genus centred in the Papuan subregion but with a few species in Africa. One species is extremely widespread and has colonized many Pacific islands (Perkins, 1952; Mason, 1974). It has been divided into numerous subspecies (i.e. different colour forms) which are disregarded in the present work.

Australian species. *E. agrestoria* (Swederus) (= *agrestoria insidiator* Smith) (T); *E. intricatoria* (F.) (Z); *E. nigricornis* (Smith) (M).

Host records. *E. agrestoria* - Hesperiidae: *Parnara amalia* (Semper) (DPIQ). Noctuidae: *Anomis flava* (F.), *A. lyona* (Swinhoe) (DPIQ). Tortricidae: *Cryptophlebia ombrodelta* (Lower) (Ironside, 1974). *E. intricatoria* - Agaristidae: *Phalaenoides glycinae* Lewin. Anthelidae: *Anthela denticulata* (Newman) (Cameron, 1912*a*); *A. xantharcha* (Meyrick) (QM). Bombycidae: *Bombyx mori* (L.) (Chadwick & Nikitin, 1976). Hesperiidae: *Hesperilla chrysostricha* (Meyrick & Lower); *H. donnysa* Hewitson (Parrott, 1957). Lycaenidae: *Ogyris olane* Hewitson (Parrott, 1957). Lymantriidae: *Euproctis edwardsi* (Newman); *Olene mendosa* Hübner (Chadwick & Nikitin, 1976); *Teia anartoides* Walker (ANIC). Noctuidae: *Persectania ewingii* (Westwood) (Martyn *et al*., 1977); *Spodoptera exempta* (Walker) (Chadwick & Nikitin, 1976). Nymphalidae: *Vanessa itea* (F.) (ANIC). Psychidae: *Hyalarcta huebneri* (Westwood); *Lomera caespitosa* (Oke) (Chadwick & Nikitin, 1976). Xyloryctidae: *Neodrepta luteotactella* (Walker) (DPIQ). *E. nigricornis* - Papilionidae: *Ornithoptera priamus euphorion* (Gray) (Morley, 1913*a*). Saturniidae: *Antheraea saccopoea* Turner (QM).

LISSOPIMPLA Kriechbaumer
(Whole insect, Fig. 92)

Lissopimpla Kriechbaumer, 1889: 309. Type-species: *Lissopimpla 8-guttata* Kriechbaumer (= *Pimpla excelsa* Costa), by subsequent designation, Ashmead, 1900*a*: 55.
Xenopimpla Cameron, 1898: 28. Type-species: *Rhyssa semipunctata* Kirby (= *Pimpla excelsa* Costa), by monotypy.
Trichrus Tosquinet, 1903: 373. Type-species: *Trichrus stupenda* Tosquinet (= *Pimpla basalis* Snellen van Vollenhoven), by monotypy.
Notiopimpla Vachal, 1907: 118. Type-species: *Notiopimpla priocnemidea* Vachal (= *Pimpla excelsa* Costa), by subsequent designation, Viereck, 1914: 101.

Medium-sized to large species, fore wing length 7-18 mm; clypeus divided into basal and apical parts by transverse suture; clypeal margin convex; mandible strongly narrowed and twisted; malar space longer than basal mandibular width; face with vertical impression either side of midline (Fig. 106); occipital carina complete. Epicnemial carina present; mesopleuron with impressed, trans-striate grooves (Fig. 94); mesopleural suture angled centrally; propodeum with traces of carinae often with apophyses and a central low crest, spiracle elliptical. Tarsal claws of female large, without basal lobes but with spatulate bristle; hind femur with a ventral tooth (Fig. 99); fore wing with 3*r-m* present, enclosing large rhombic areolet; hind wing with first abscissa of Cu_1 very short or obliterated. Gaster polished, virtually impunctate; ovipositor slightly decurved, projecting beyond apex of gaster by 0.7-1.7 times length of hind tibia.

Remarks. A small genus occurring in the Indo-Australian region. One Australian species, *L. excelsa*, is a very common and conspicuous insect which frequently can be observed probing with its ovipositor in grass tussocks in gardens. Tryon (1900) gave an account of its biology (under the name *Theronia rufipes*). Males of *L. excelsa* are known to pollinate the orchid *Cryptostylis leptochila* by attempting to mate with the flowers (Coleman, 1928). Occasionally specimens may be found with the orchid pollinia attached to the tip of the gaster.

Australian species. *L. atra* Girault (E); *L. excelsa* (Costa) (= *semipunctata* Kirby) (PZ); *L. scutata* Krieger (E). I have seen one undescribed species (ANIC).

Host records. *L. excelsa* - Anthelidae: *Anthela denticulata* (Newman) (Cameron, 1912*a*). Noctuidae: *Achaea janata* (L.) (Morley, 1913*a*); *Mythimna convecta* (Walker) (Chadwick & Nikitin, 1976); *M. separata* (Walker) (Tryon, 1900). *Spodoptera exempta*

(Walker) (ANIC); *S. mauritia* (Boisduval) (Tryon, 1900). Pyralidae: *Cactoblastis* sp. (Chadwick & Nikitin, 1976).

XANTHOPIMPLA Saussure

Xanthopimpla Saussure, 1892: 13. Type-species: *Xanthopimpla hova* Saussure, by subsequent designation, Ashmead, 1900*a*: 56.
Chloropimpla Saussure, 1892: 13. Type-species: *Chloropimpla dorsigera* Saussure, by monotypy.
Notopimpla Krieger, 1899: 106. Type-species: *Pimpla terminalis* Brullé, by monotypy.
Neopimploides Viereck, 1912*a*: 151. Type-species: *Neopimploides syleptae* Viereck (= *Ichneumon punctatus* F.), by original designation.
Austrapophua Girault, 1926: 135. Type-species: *Austrapophua xanthopimploides* Girault (= *Xanthopimpla rhopaloceros* Krieger), by subsequent designation, Walkley, 1963: 116.

Small to moderately large-sized species, fore wing length 4-11 mm; clypeus divided into basal and apical parts by transverse suture; clypeal margin transverse; mandible strongly twisted about 90°, slightly narrowed (Fig. 109); malar space less than basal mandibular width; occipital carina complete. Epicnemial carina present; mesopleural suture generally not angled centrally; propodeum usually with strong carinae, spiracle oval to elliptical. Female with claws simple, large, often with spatulate bristle; fore wing with *3r-m* present or absent, if present then generally enclosing a petiolate areolet; hind wing with first abscissa of Cu_1 about 0.3 times length of *cu-a* (Fig. 88). Gaster usually polished, often punctate; ovipositor from barely projecting beyond apex of gaster to projecting by 1.5 times length of hind tibia, straight or decurved. Yellow insects, frequently marked with black spots on body.

Remarks. A very large tropicopolitan genus, most species of which occur in South East Asia. Several are associated with disturbed areas of secondary growth and a few are commonly collected in agricultural areas where they parasitize a variety of lepidopterous pests. The majority of *Xanthopimpla* species occur in tropical forests at various altitudes from coastal mangrove swamps to montane forests. The Indo-Australian species have recently been revised by Townes & Chiu (1970). They include 13 species from Australia; I have seen four additional species, two of which are undescribed.

Australian species. *X. arealis* Krieger (M); *X. australis* Krieger (W); *X. binodus* Townes & Chiu* (P); *X. ecaudata* Krieger (W); *X. flavolineata* Cameron (A); *X. fraterculus* Townes & Chiu (E); *X. hiatus* Townes & Chiu (E); *X. hirsuta* (Girault) (E); *X. ochracea* (Smith) (A); *X. pubidorsis* Townes & Chiu* (M); *X. quadridens* Townes & Chiu (E); *X. rhopaloceros* Krieger (E); *X. striata* Townes & Chiu (M); *X. summervillei* (Girault) (MP); *X. terminalis* (Brullé) (E). I have seen two undescribed species (ANIC; TC).

Host records. *X. australis* - Gelechiidae: *Pectinophora scutigera* (Holdaway) (DPIQ). *X. rhopaloceros* - Nolidae: *Uraba lugens* Walker (DPIQ). Tortricidae: *Epiphyas postvittana* (Walker) (Dumbleton, 1940); *Merophyas divulsana* (Walker) (DPIQ).

In South East Asia *X. flavolineata* is a common parasite of *Chilo suppressalis* (Walker), *Cnaphalocrocis medinalis* (Guenée) (Pyralidae) and *Sesamia* species (Townes & Chiu, 1970) but I have seen no reared specimens from Australia.

Tribe EPHIALTINI
(= Pimplini sensu Townes)

This tribe is a paraphyletic assemblage. It is certainly the group from within which the Polysphinctini has arisen and it is possible that the other tribes arose from ephialtines too. As a paraphyletic 'group' it can only be characterized by its lack of the apomorphic features of other tribes.

Ephialtines are small to moderately large insects and usually have the ovipositor as long as or longer than the gaster; the fore wing may or may not lack *3r-m* (this is always present in the Pimplini) and the first abscissa of Cu_1 in the hind wing is more than 0.6 times the length of *cu-a* (it is less than 0.5 in the Pimplini).

About 30 genera are known; these are divisible into four rather ill-defined generic groups (Townes, 1969). Currently there is disagreement about the limits of the Ephialtini. Gupta & Tikar (1978) exclude the genera *Zaglyptus*, *Clistopyga* and *Tromatobia* which, following Finlayson (1967), they place in the Polysphinctini. Most other authors (e.g. Townes, 1969; Aubert, 1969) retain these three genera in the Ephialtini. Of the three, only *Zaglyptus* occurs in Australia, and I have placed it in the Ephialtini because the adult does not possess the slender ovipositor or the swollen tarsi which are synapomorphies characteristic of the 'traditional' polysphinctine genera.

Gupta & Tikar (1978) have revised the Oriental Ephialtini. Of the 17 genera discussed only two, *Sericopimpla* and *Camptotypus*, are recorded as having species occurring east of the Makassar Strait. These two genera, together with *Acropimpla* (which I have also seen from New Guinea), *Zaglyptus* and an undescribed endemic genus, are the only Ephialtini known to occur in Australia. *Liotryphon caudatus* (Ratzburg) (= *Apistephialtes messor* auctt.) is listed by Townes *et al.*(1961) as occurring in Australia. However, this species, a widespread parasite of *Cydia pomonella* (L.), was never introduced into Australia (Froggatt, 1909).

ACROPIMPLA Townes*

Selenaspis Roman, 1910: 191. Type-species: *Hemipimpla alboscutellaris* Szépligeti, by original designation. [Homonym of *Selenaspis* Bleeker, 1858.]
Acropimpla Townes, 1960*b*: 159. Type-species: *Charitopimpla leucostoma* Cameron, by original designation.

Medium-sized species, fore wing length 7-8 mm; clypeus with a median apical notch; eye weakly indented opposite antennal socket; malar space 0.3 times as long as basal mandibular width; occipital carina complete. Epomia short; epicnemial carina strong; propodeum without carinae, spiracle circular. Female with claws basally lobate; fore wing with *3r-m* present, enclosing a broad rhombic areolet; hind wing with first abscissa of Cu_1 longer than *cu-a*. Lateromedian carina of tergite 1 not reaching to end of segment; tergites 2-4 with lateromedian swellings; ovipositor straight, projecting beyond apex of gaster by 1.5 times length of hind tibia. Wings infumate with pterostigma black.

Remarks. A moderately large genus most species of which occur in the Oriental region, a few are Holarctic and some are Ethiopian. Gupta & Tikar (1978) recognized 26 Oriental species but none from south-east of Mindanao. I have seen a species from New Guinea and a single Australian specimen from tropical Queensland which may be conspecific with the New Guinea species.

Australian species. One, undescribed (M) (TC).

Host records. Oriental species have been reared from a variety of microlepidopterous pupae, especially those of Pyralidae (Gupta & Tikar, 1978).

CAMPTOTYPUS Kriechbaumer

Camptotypus Kriechbaumer, 1889: 311. Type-species: *Camptotypus sellatus* Kriechbaumer, by subsequent designation, Viereck, 1914: 27.
Erythropimpla Ashmead, 1900*a*: 57. Type-species: *Erythropimpla abbottii* Ashmead

(= *Pimpla olythia* Cameron), by original designation.
Trichiothecus Cameron, 1903*a*: 136. Type-species: *Trichiothecus ruficeps* Cameron (= *Ichneumon rugosus* DeGeer), by monotypy.

Medium-sized to moderately large species, fore wing length 9-14 mm; clypeus with a median apical notch; eye weakly indented opposite antennal socket; malar space 0.5-1.0 times as long as basal mandibular width; occipital carina obsolescent or absent dorsally, present laterally and ventrally. Epomia weak; epicnemial carina present, not strong; propodeum virtually without carinae, spiracle subcircular. Female with claws basally lobate; fore wing with 3*r-m* present, enclosing a broad, rhombic areolet; hind wing with first abscissa of Cu_1 longer than *cu-a* (Fig. 104). Lateromedian carinae of tergite 1 reaching end of segment; tergites 2, 3 and to a lesser extent 4 with diagonal furrows delimiting raised central areas (Fig. 118); tergites 3-5 sometimes with posterolateral corner incised, rarely produced as a blunt tooth; ovipositor straight, projecting beyond apex of gaster by 2.2-3.2 times length of hind tibia. Wings strongly infumate with pterostigma yellow.

Remarks. A moderately large genus confined to the Palaeotropical region. Townes (1969) recognized two subgenera, *C. (Camptotypus)* for the Indo-Australian species and *C. (Hemipimpla)* for the Afrotropical species. Gupta & Tikar (1978) treat *Hemipimpla* as a separate genus and I accept their opinion.

Five nominal species are recorded from Australia, but I have seen material of only three. The two Kriechbaumer species were described from unique specimens; their whereabouts is at present unknown. These names were excluded from Gupta & Tikar's revision, and it is probable that they will be shown to be senior synonyms of other species.

Australian species. *C. atropos* (Morley) (W); *C. bicolor* Kriechbaumer (E); *C. flaviceps* (Cameron) (M); *C. lachesis* (Morley) (E); *C. sellatus* Kriechbaumer (E).

Host records. None from Australia. There is only a single host record for the genus, a species in Taiwan reared from *Hyblaea* sp. (Hyblaeidae) (Sonan, 1930).

PARVIPIMPLA gen. n.

Type-species: *Parvipimpla petita* sp. n.

Lower face subquadrate; clypeus flat, apically bilobed with a median apical notch; apical margin of clypeus thin; malar space shorter than basal mandibular width; mandible of moderate length, weakly tapered with upper tooth slightly the longer. Occipital carina absent. Antenna rather short, that of male without tyloids.

Alitrunk highly polished, very sparsely punctate and with only scattered hairs; epomia present but short; mesoscutum in profile abruptly rounded, notauli strongly impressed, reaching back to level of centre of tegulae; epicnemial carina absent; propodeum without carinae; submetapleural carina absent.

All tarsal claws of female with conspicuous basal lobe; those of male simple; distal segments slightly broadened.

Fore wing with 3*r-m* absent; *cu-a* more or less opposite base of *Rs&M* (Fig. 114). Hind wing with distal abscissa of Cu_1 present; first abscissa of Cu_1 about 0.6 times length of *cu-a*.

Gaster smooth and highly polished; tergite 1 relatively long, without obvious lateromedian longitudinal carinae; tergite 2 with oblique grooves cutting off anterior corners and a pair of weaker diagonal impressions posteriorly cutting off hind corners so that the centre of the tergite is a convex rhombus; tergites 3 and 4 with grooves on posterior 0.6; hind margin of tergites 3-5 incised, the membranous incision narrow medially, broadest close to lateral margin but not extending laterally right to corner (Fig. 98). Male subgenital plate transverse, simple; female with ovipositor about as long as gaster, cylindrical, with a nodus and with about seven strong oblique teeth on lower valve.

Etymology. *Parvi* (= small) + *Pimpla* (generic name) referring to the small size of this pimpline. Feminine.

Remarks. In Townes' (1969) key to genera *Parvipimpla* runs to the *Camptotypus*-group. It strongly resembles some species of the Neotropical genus *Zonopimpla*, but these always have the first abscissa of Cu_1 in the hind wing much longer than *cu-a* and have 3*r-m* present in the fore wing. *Parvipimpla* is quite like *Tromatobia* and *Zaglyptus* in these venational characters, though it is otherwise quite different. A striking feature of *Parvipimpla* is the deep posterior incision on the gastral segments. Although this feature is not so developed in any other genus, a minute incision is present laterally in some *Camptotypus* species. In many features of head and body structure *Parvipimpla* also resembles *Camptotypus* so I suggest it is placed in the *Camptotypus*-group.

Australian species. One, described below.

Parvipimpla petita sp. n.

Fore wing length 6-7 mm. Head highly polished with few scattered punctures; ocelli forming a nearly equilateral triangle; flagellum of ♀ with 20, of ♂ with 19 segments. Alitrunk highly polished, almost without punctures and with long pale sparse hairs. Legs with conspicuous long hairs. Gaster smooth and polished with a few minute hair-bearing punctures posteriorly and laterally on the tergites.

Female: head, alitrunk and anterior two pairs of legs reddish brown; pedicel, flagellum, tergites of gaster, hind tibia and tarsus and ovipositor sheath black; remainder of hind leg blackish red; membranous incision of tergites 3+ white. Wings infumate, pterostigma blackish.

Male: similar except face white, all coxae yellowish brown, hind femur and tibia yellowish with indistinct infumation.

The striking colour pattern is like that of many other similar-sized Australian Parasitica (e.g. *Eriostethus*, one species of *Philogalleria*, some Braconinae etc.). It is characteristic of Australia.

Material examined

Holotype ♀, New South Wales: Urbenville, Tooloom scrub, 22-23.iii.1975 (*Cantrell*) (DPIQ).

Paratype. Queensland: 1 ♂, Mt Nebo, ii. (TC).

Host records. None.

SERICOPIMPLA Kriechbaumer

Sericopimpla Kriechbaumer, 1895: 135. Type-species: *Pimpla sericata* Kriechbaumer, by monotypy.

Charitopimpla Cameron, 1902*a*: 48. Type-species: *Charitopimpla flavobalteata* Cameron, by monotypy.

Philopsyche Cameron, 1905*c*: 137. Type-species: *Philopsyche albobalteata* Cameron (= *Pimpla sagrae* Snellen van Vollenhoven), by monotypy.

Moderately large species, fore wing length 13-15 mm; clypeus with median apical notch; eye large, strongly indented opposite antennal socket; malar space very short; occipital carina complete. Epomia strong; epicnemial carina complete; propodeum without distinct carinae, spiracle circular. Female with claws basally lobate; fore wing with 3*r-m* present enclosing triangular areolet (Fig. 113); first abscissa of Cu_1 in hind wing longer than *cu-a*. Lateromedian carinae of tergite 1 not reaching to posterior margin; tergites 2-4 of gaster with lateromedian swellings (Fig. 117); ovipositor slightly decurved, projecting beyond apex of gaster by 2.0 times length of hind tibia.

Remarks. A moderately large Old World tropical genus species of which are solitary or gregarious parasites of psychids. The larva is equipped with hooks in clusters on the dorsum of each abdominal segment and thus resembles the larvae of *Zaglyptus* and some polysphinctines. In Australia species are widely distributed from Queensland south to Victoria.

Australian species. *S. australis* Townes *et al.* (E); *S. crenator* (F.) (P) and one undescribed species.

Host records. *S. australis* - Psychidae: *Clania ignobilis* (Walker) and *Hyalarcta huebneri* (Westwood) (Chadwick & Nikitin, 1976). *S. crenator* - Psychidae: *Clania ignobilis* (Walker) (ANIC); *C. tenuis* Rosenstock (ANIC); *Hyalarcta huebneri* (Westwood) (Heather, 1976); *H. nigrescens* (Doubleday) (Chadwick & Nikitin, 1976); *Oiketicus elongatus* Saunders (Chadwick & Nikitin, 1976).

ZAGLYPTUS Foerster

Zaglyptus Foerster, 1869: 166. Type-species: *Polysphincta varipes* Gravenhorst, by subsequent designation, Woldestedt, 1877: 17.

Medium-sized species, fore wing length 6-8 mm; clypeal margin concave; occipital carina complete. Epomia weak; epicnemial carina complete; propodeum without carinae but with lateral subapical tubercles; propodeal spiracle subcircular. Female with claws basally lobate; fore wing with *3r-m* absent; hind wing with first abscissa of Cu_1 about equal in length to *cu-a* or very slightly shorter. Lateromedian carinae of tergite 1 not reaching to posterior margin; tergite 2 of gaster with oblique grooves delineating a central, raised, rhombic area; tergites 3-4 with transverse tubercles; ovipositor straight, projecting beyond apex of gaster by about 1.2 times length of hind tibia, with most proximal tooth of lower valve with an elongate free tip (Fig. 116).

Remarks. A moderately small cosmopolitan genus with nine described species in the Indo-Australian region (Gupta (1961). A single species occurs in Australia. It is very closely related to *Z. grandis* Gupta from New Guinea.

Australian species. *Z. glabrinotum* (Girault) (E).

Host records. None in Australia, but Palaearctic species of this genus attack spiders guarding egg sacs in nests, e.g. *Cheiracanthium* sp. (Nielsen, 1935).

Tribe POLYSPHINCTINI

This tribe is a specialized offshoot of the Ephialtini. The adults have elongately tapered ovipositors and swollen distal tarsal segments. Almost always vein *3r-m* is absent in the fore wing and frequently the distal abscissa of Cu_1 in the hind wing is weak or absent. The larvae are ectoparasitic on spiders and are furnished with a variety of abdominal hooks or holdfast organs to enable them to maintain their position.

Polysphinctines are usually rather small, inconspicuous insects. Many inhabit moist forests where they fly amongst the tangle of ground vegetation so they are rarely collected. World-wide 16 genera are recognized, but only five, *Acrodactyla*, *Dreisbachia*, *Eriostethus*, *Millironia* and *Sinarachna*, have been recorded from South East Asia (Townes *et al.*, 1961; Baltazar, 1964; Momoi, 1966). I have seen *Zatypota* and *Polysphincta* from this region and specimens of *Acrodactyla*, *Dreisbachia*, *Eriostethus* and *Zatypota* from New Guinea. These four genera are also represented in Australia though only one, *Eriostethus*, has previously been recorded. With the exception of this genus, very few specimens of any one species have been collected.

ACRODACTYLA Haliday*

Acrodactyla Haliday, 1839: 117. [as a subgenus of *Pimpla* Fabricius]. Type-species: *Pimpla (Acrodactyla) degener* Haliday, by subsequent designation, Westwood, 1840: 57.
Acrodactyla Haliday; Westwood, 1840: 57. [Raised to genus.]
Colpomeria Holmgren, 1859*b*: 126. Type-species: *Colpomeria laevigata* Holmgren (= *Ichneumon quadrisculptus* Gravenhorst), by monotypy.
Symphylus Foerster, 1871: 105. Type-species: *Symphylus hadrodactylus* Foerster (= *Pimpla (Acrodactyla) degener* Haliday), by original designation. [Homonym of *Symphylus* Dallas, 1851.]
Polemophthorus Schulz, 1911: 22. [Replacement name for *Symphylus* Foerster.]

Small to medium-sized insects, fore wing length 4-6 mm; clypeus convex, apically slightly flattened; eye surface bare; occipital carina complete. Epomia strong; mesoscutum polished, glabrous to sparsely pubescent, with a crest near anterior end of notaulus; epicnemial carina present; propodeum in profile long (Fig. 95); dorsally with some traces of carinae, often coarsely sculptured. Tarsal claws of female basally lobate; fore wing with 3*r-m* absent; hind wing with distal abscissa of Cu_1 present, first abscissa of Cu_1 longer than *cu-a*. Tergites 2-4 polished, sparsely punctate with weakly defined central rhombic areas; ovipositor slightly upcurved, projecting beyond apex of gaster by about 0.3 times length of hind tibia.

Remarks. A moderate-sized genus with most species in the Holarctic and Oriental regions. Several authors (e.g. Aubert, 1969; Carlson, 1979) treat *Colpomeria* as a separate genus. I have chosen to follow Townes (1969) for the present because at least one species seems to be intermediate. The Australian species would be placed in *Colpomeria* if one were to separate it. The Palaearctic species *A. quadrisculpta* was presumably accidently introduced.

Australian species. *A. quadrisculpta* (Gravenhorst)* (I). I have seen two endemic undescribed species (ANIC).

Host records. None in Australia. In Europe species of this genus have been reared from Araneidae, Linyphiidae and Tetragnathidae (Aubert, 1969).

DREISBACHIA Townes*

Laufeia Tosquinet, 1903: 381. Type-species: *Laufeia mira* Tosquinet, by monotypy. [Homonym of *Laufeia* Simon, 1889.]
Dreisbachia Townes, 1962: 38. [Replacement name for *Laufeia* Tosquinet.]

Small insects, fore wing length 4-5 mm; clypeus flat, in same plane as face, its apical margin truncate; surface of eye bearing long hairs; occipital carina complete. Epomia present; epicnemial carina present but with upper end rather far from anterior margin of pleuron; mesoscutum subpolished, with close pubescence; propodeum in profile evenly rounded, dorsally without distinct carinae, polished. Tarsal claws of female with basal lobes; fore wing with 3*r-m* absent; hind wing with distal abscissa of Cu_1 absent (Fig. 105). Tergites 2-4 polished, with weak central rhombic areas; ovipositor slightly upcurved, projecting beyond apex of gaster by 0.6 times length of hind tibia (Fig. 102).

Remarks. A small genus with a few species widely scattered throughout the world. The majority of species have 3*r-m* present in the fore wing. Momoi (1966) described a Papuan species which, like the Australian one, lacks this vein. Neither of these species will run correctly in Townes' (1969) key.

Australian species. One undescribed species (ANIC).

Host records. None from Australia. In Europe one species has been reared from Drassodidae (Aubert, 1969).

ERIOSTETHUS Morley

Eriostethus Morley, 1914: 34. Type-species: *Eriostethus pulcherrimus* Morley, by monotypy.
Millironia Baltazar, 1964: 394. Type-species: *Millironia trifasciata* Baltazar, by original designation. Syn. n.

Medium-sized insects, fore wing length 6-9 mm; clypeus in profile convex, its margin slightly rounded; ocelli often enlarged; eye surface bare; occipital carina present, weak or absent. Epomia absent; epicnemial carina present; mesoscutum polished, glabrous; propodeum in profile evenly rounded, dorsally smooth without obvious carinae. Tarsal claws of female basally lobate; fore wing with *3r-m* absent; hind wing with distal abscissa of Cu_1 absent (Fig. 119). Tergites 2-4 from smooth, to with rounded lateromedian prominences; ovipositor straight, projecting beyond apex of gaster by 0.9-1.2 times length of hind tibia (Fig. 101).

Remarks. A moderate-sized genus centred in New Guinea with a number of species in Australia, South East Asia and Samoa. Baltazar (1964) recently revised this genus and separated one group of species as a distinct genus, *Millironia*. The main difference between these two genera is the size of the ocelli. Those of *Millironia* are very enlarged (presumably this is an adaptation to a crepuscular or nocturnal existence as its occurrence in light-traps bears out). Several of the other generic characters Baltazar uses are differences resulting from having large rather than small ocelli (e.g. head shape, frontal width) and can be considered a set of linked characters. The majority of other features intergrade. For example, *Millironia* has a strong occipital carina whereas that of *Eriostethus* is weak or absent; *Eriostethus* has tergite 2 transverse whereas that of *Millironia* is quadrate to elongate. When compared with other polysphinctines these two taxa can be seen to be very closely inter-related and I think it is most logical to treat them as a single genus showing a moderate, but almost continuous, range of morphological variation.

Australian species. *E. carinatus* Baltazar (E); *E. perkinsi* (Baltazar) comb. n. (E); *E. pulcherrimus* Morley (E). I have seen two undescribed species (ANIC; BMNH; TC).

Host records. None from Australia.

ZATYPOTA Foerster*

Zatypota Foerster, 1869: 166. Type-species: *Ichneumon percontatorius* Müller, by subsequent designation, Viereck, 1914: 156.
Polysphinctopsis Habermehl, 1917: 167. Type-species: *Polysphincta eximia* Schmiedeknecht (= *Glypta albicoxa* Walker), by monotypy.
Lycorinopsis Haupt, 1954: 110. Type-species: *Lycorinopsis rhombifer* Haupt (= *Ichneumon percontatorius* Müller), by original designation.

Small insects, fore wing length 4-5 mm; clypeus moderately convex in profile, its apical margin slightly rounded; ocelli normal; eye surface almost bare; occipital carina present. Epomia present; epicnemial carina strong; mesopleuron subpolished, virtually glabrous; propodeum in profile evenly rounded, smooth with lateromedian longitudinal carinae (Fig. 93). Tarsal claws of female basally lobate; fore wing with *3r-m* absent; hind wing with distal abscissa of Cu_1 absent or faint, if present then first abscissa of Cu_1 is much longer than *cu-a* (Fig. 120). Tergites 2-4 with oblique grooves delimiting an almost rhombic central area; ovipositor straight, projecting beyond apex of gaster by less than 0.5 times length of hind tibia.

Remarks. A moderately large genus widely distributed throughout the world. *Zatypota* species are small ichneumonids which favour damp habitats. Few species are described, and Townes *et al.*, (1961) did not list any as occurring in the Indo-Australian region. Several species do occur in South East Asia, particularly in cloud forests above 1500 m.

Australian species. Four, all undescribed (ANIC).

Host records. None from Australia. In Britain I have seen several specimens reared as ectoparasites of immature Theridiidae.

SUBFAMILY TRYPHONINAE

The Tryphoninae is, world-wide, a moderately large subfamily containing about 40 genera grouped into six tribes, Sphinctini, Phytodietini, Oedemopsini, Tryphonini, Exenterini and Idiogrammatini. The majority of tryphonines are Holarctic and only the Phytodietini and Oedemopsini are represented in the Old World tropics. Both of these tribes also occur in Australia. In the present work six genera are included as Australian. One of these, *Ankylophon*, is placed in a newly erected tribe. This genus and *Debophanes* are endemic Australian, the remaining four genera are cosmopolitan.

DIAGNOSIS

Small to large ichneumonids, fore wing length 4-20 mm. Clypeus separated from face by groove, often large and bluntly rounded, sometimes with a fringe of parallel hairs; mandible bidentate; frons usually without a strong carina; occipital carina present or absent. Notaulus present or absent, sternaulus vestigial or absent; posterior transverse carina of mesosternum never complete; propodeum from without carinae to almost completely carinate. Apex of fore tibia without a distinct tooth on outer side; tarsal claws usually pectinate. Fore wing with *3r-m* present or absent, if present then areolet is usually rhombic, often petiolate above. Hind wing with *Rs* generally much longer than *r-m*; distal abscissa of Cu_1 usually present. First segment of gaster usually with spiracles before centre, evenly broadened and with large glymmae, rarely without glymmae and with spiracles behind centre; gaster of female from slightly compressed to slightly depressed. Ovipositor relatively short, at most projecting beyond apex of gaster by 1.2 times length of hind tibia, without a dorsal subapical notch, generally with inconspicuous teeth; underside of ovipositor (especially near base) often with an egg attached.

CLASSIFICATION

For almost a century the Tryphoninae was, as one of the five 'classical' subfamilies of Ichneumonidae, a heterogeneous group of ichneumonids with short ovipositors and broadly attached gasters. Townes, in various papers culminating in his 1969 generic revision, removed many groups such as metopiines, adelognathines and ctenopelmatines and elevated them to the status of separate subfamilies. In his 1969 work Townes recognized seven tribes, but one, the Eucerotini, is currently treated as a separate subfamily by most workers. The Tryphoninae is now restricted to include only those ichneumonids in which the egg travels down the outside of the ovipositor. Currently six tribes are recognized, two of which, Sphinctini and Idiogrammatini, contain only a single aberrant genus. A seventh tribe, endemic to Australia, is described in this work. All tribes, except the Tryphonini, are probably holophyletic groups. The Tryphonini includes a diverse assemblage of genera and is almost certainly a paraphyletic group. It is possibly the ancestral group of Tryphoninae and some extant tryphonine genera, e.g. *Grypocentrus*, appear to be quite closely related to Cretaceous fossil genera (Townes, 1973*b*).

DISTRIBUTION

The majority of the Tryphoninae occur in the cooler parts of the north temperate region. The tribes Sphinctini, Exenterini, Idiogrammatini and Tryphonini are almost exclusively Holarctic with a few representatives in the mountains of South America, Madagascar and South East Asia. Two oedemopsine genera, *Oedemopsis* and *Thymaris*, are almost cosmopolitan. The Phytodietini contains only two genera, both of which are large cosmopolitan taxa divided into many subgenera.

In Australia the Oedemopsini is represented by *Thymaris* and *Oedemopsis* and the Phytodietini by *Phytodietus* and *Netelia*. The only other two genera occurring in Australia, *Ankylophon* and *Debophanes*, are endemic.

BIOLOGY

The majority of Tryphoninae are external parasites of symphytan larvae but many oedemopsines and probably all phytodietines attack lepidopterous larvae. Tryphonines have a unique form of oviposition. The egg is large and has a non-compressible chorion and consequently cannot enter the lumen of the ovipositor. The egg actually emerges from a genital opening at the base of the ovipositor but it is attached by a stalk to the ovipositor. The stalk often terminates in an anchor, and it is this that passes down the ovipositor, pulling with it the egg which travels down the ventral surface of the ovipositor. The egg may be retained at the base of the ovipositor partially protected by the subgenital plate for some time, even until the larva is fully formed and ready to hatch (Kasparayan, 1981). Species of *Netelia* may, if unable to find a host, shed these mature eggs (Stenton, 1910), for if they hatch, the larva will commence to devour the parent (Shevyrev, 1912).

Female tryphonines generally oviposit into fairly mature larvae. A few species of Phytodietini temporarily paralyse their host prior to oviposition (Simmonds, 1947) but apparently this habit is not widespread in the subfamily (Kasparayan, 1981). Oviposition is usually made by a quick stab with the ovipositor and the egg is attached externally to the host by means of either the stalk or an anchor inserted into the host's body. The usual oviposition site is towards the front end of the host larva so the egg cannot be reached by the host's mandibles (Baltensweiler & Moreau, 1957). The larvae of phytodietines and oedemopsines hatch but remain attached by the hind end of their bodies to the egg throughout their developmental period. There are usually five larval instars, the first of which may be rather protracted. The remaining four instars proceed quickly, generally taking, in total, less than 10 days. When feeding is completed (usually after the host has spun a cocoon) the tryphonine larva spins its cocoon in which it pupates. Some adult tryphonines, like many other ectoparasitic ichneumonids, feed from the haemolymph exuding from punctures made in prospective hosts (Vance, 1927) but this habit does not occur in all tryphonines (Kasparayan, 1981).

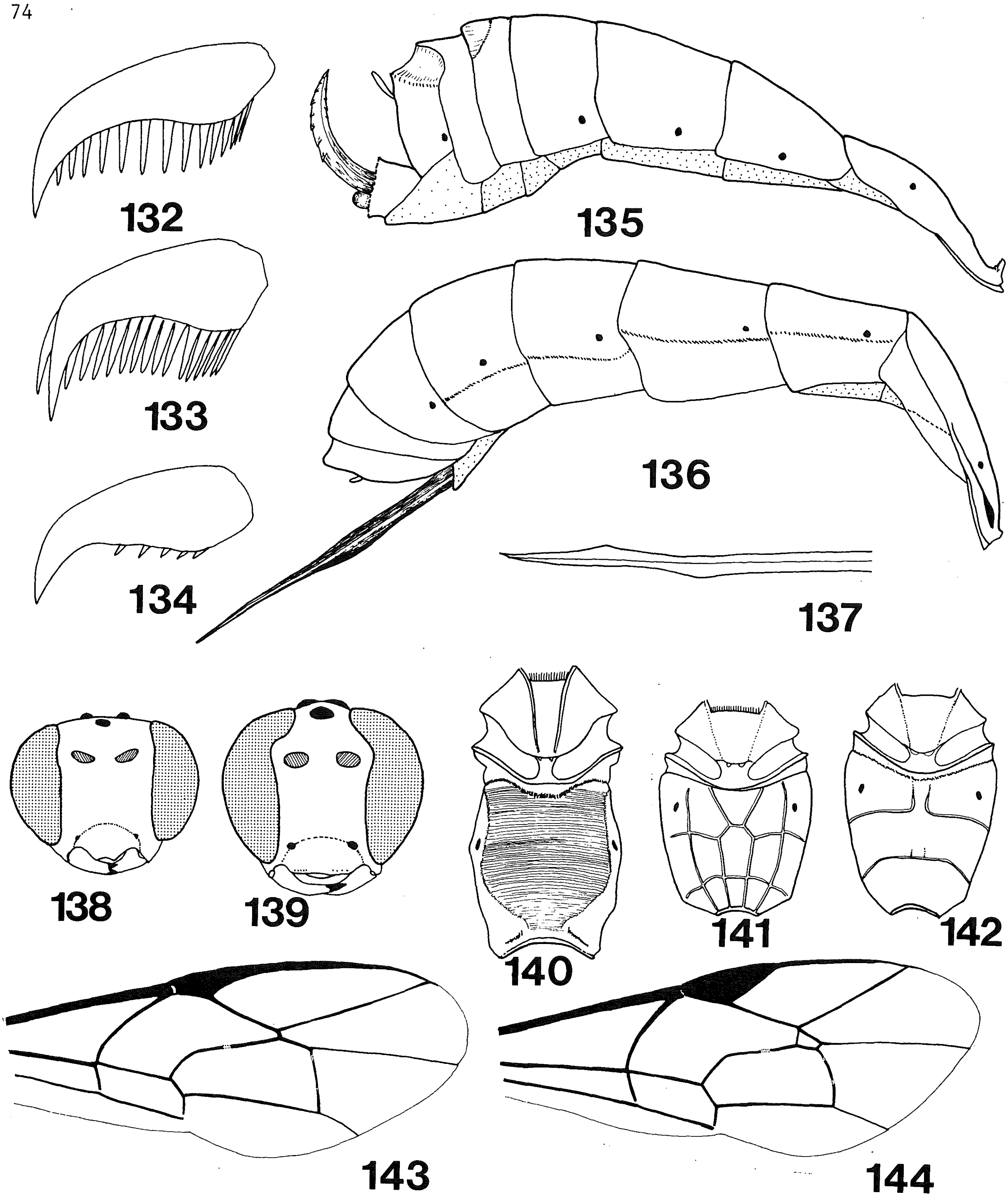
The cephalic capsule of a final instar tryphonine larva is relatively strongly sclerotized with an incomplete epistomal arch and large mandibles which usually have minute teeth along the upper edge of the blade. Phytodietines have a sclerotized rectangular plate below the labial sclerite (Fig. 155) (Short, 1978).

KEY TO GENERA OF TRYPHONINAE OCCURRING IN AUSTRALIA

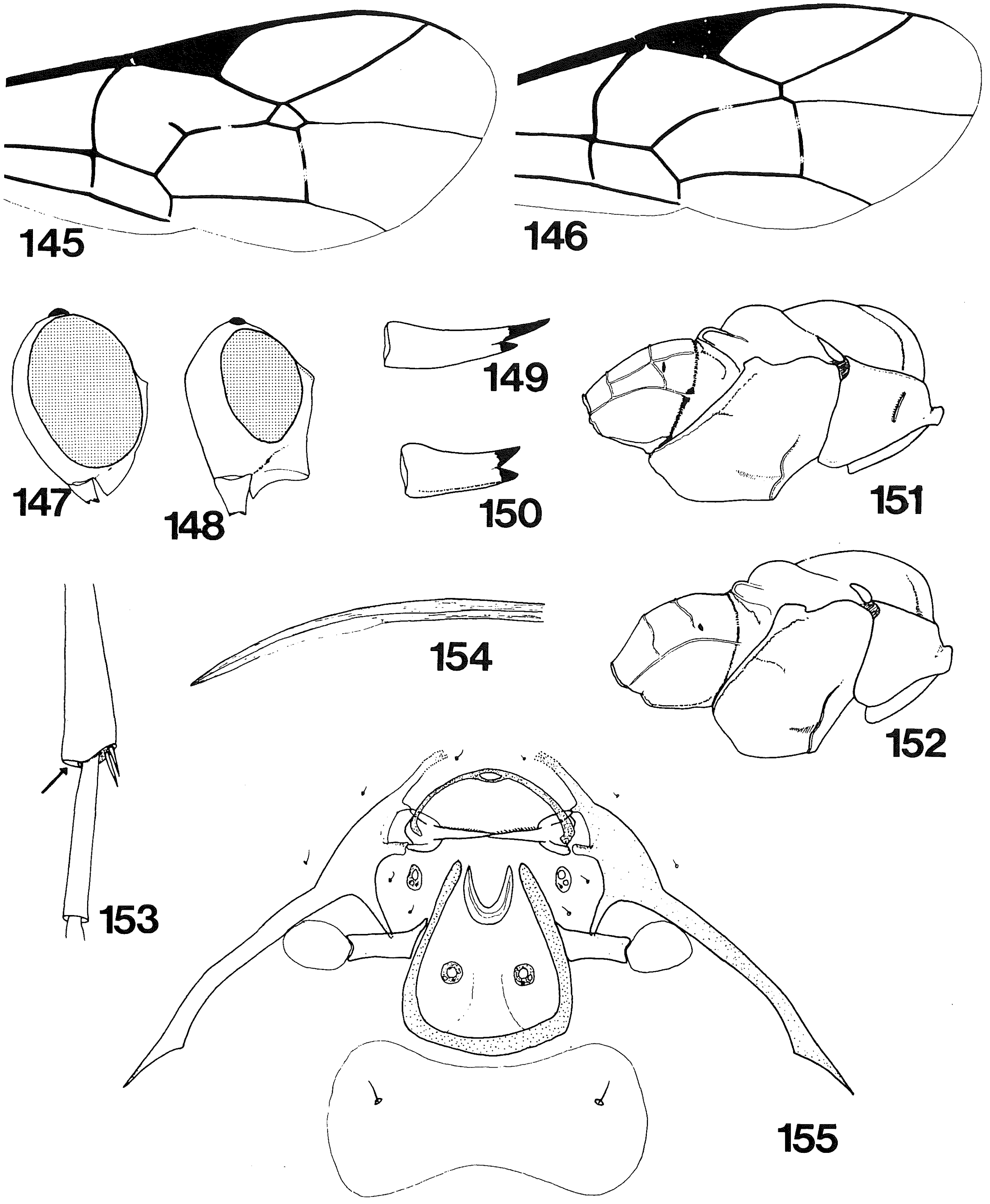
As only six genera are represented in Australia a key is given direct to genus. The tribal groupings are indicated in the key in parentheses.

1 Tergite 1 of gaster without glymma, with spiracles positioned behind the centre (Fig. 135); distal apex of hind tibia with a blunt, 'shelf-like' margin (Fig. 153); ovipositor strongly up-curved. (Ankylophonini)........*ANKYLOPHON* (p. 76)

\- Tergite 1 of gaster with a glymma, spiracles positioned at or before centre (Fig. 136); distal apex of hind tibia simple; ovipositor straight or very slightly up-curved........2



Figs 132-144 Tryphoninae. 132-134 Hind tarsal claws, ♀ (132) *Netelia (Netelia)* (133) *Netelia (Apatagium)* (134) *Thymaris*. 135-136 Gaster ♀, lateral (135) *Ankylophon obligatus* (136) *Netelia (Netelia)*. 137 Ovipositor, *Phytodietus*. 138-139 Faces (138) *Phytodietus* (139) *Netelia*. 140-142 Propodea, dorsal (140) *Netelia* (141) *Thymaris* (142) *Debophanes*. 143-144 Fore wings (143) *Phytodietus (Weisia)* (144) *Phytodietus (Phytodietus)*.



Figs 145-155 Tryphoninae. 145-146 Fore wings (145) *Debophanes* (146) *Thymaris*. 147-148 Heads, lateral (147) *Thymaris* (148) *Oedemopsis* ♀. 149-150 Mandibles (149) *Thymaris* (150) *Oedemopsis*. 151-152 Alitrunks, lateral (151) *Thymaris* (152) *Debophanes*. 153 Hind tibia, *Ankylophon obligatus*. 154 Ovipositor, *Thymaris*. 155 Cephalic capsule, final instar larva, *Netelia*.

2 Propodeum smooth or transversely striate, without carinae or with posterior one represented by sublateral crests (Fig. 140); posterior transverse carina of mesosternum absent except for lateral vestiges; tarsal claws pectinate to apices (Figs 132-133). (Phytodietini)............3

\- Propodeum with at least lateromedian longitudinal carinae partially present (Figs 141-142); posterior transverse carina of mesosternum present laterally and medioventrally; tarsal claws sparsely pectinate near bases (Fig. 134) (Oedemopsini)..................................4

3 Mandible twisted so lower tooth is internal to upper (Fig. 139); hind wing with first abscissa of Cu_1 shorter than *cu-a*; ovipositor simply tapered (Fig. 136)...*NETELIA* (p. 78)

\- Mandible not twisted (Fig. 138); hind wing with first abscissa of Cu_1 longer than *cu-a*; ovipositor with a distinct nodus (Fig. 137).. ....*PHYTODIETUS* (p. 80)

4 Pronotum without a trace of epomia (Fig. 152); fore wing with *3r-m* present enclosing an almost pentagonal areolet (Fig. 145).*DEBOPHANES* (p. 81)

\- Pronotum with epomia strong (Fig. 151); fore wing with *3r-m* absent (Fig. 146)...5

5 Mandible weakly tapered, the lower tooth about 0.8 times length of upper (Fig. 150); clypeus of ♀ produced medially, with a groove running from centre to mandibular base (Fig. 148)...........*OEDEMOPSIS* (p. 82)

\- Mandible strongly tapered, the lower tooth about 0.3 times length of upper (Fig. 149); clypeus of ♀ simply convex (Fig. 147).....*THYMARIS* (p. 83)

Tribe ANKYLOPHONINI tribe n.

Type-genus: *Ankylophon* gen. n.

The only genus in this tribe is quite unlike any other tryphonine in the combination of characters it exhibits and consequently cannot be included in any extant tribe. The long slender petiole with postmedial spiracles resembles only the Sphinctini but *Ankylophon* differs from *Sphinctus* in so many other characters (e.g. clypeal shape, presence of notauli, tibial spur number, shape of tibial apex, shape of ovipositor etc.) as to make their inclusion together in a single tribe untenable. Probably the similarity of tergite 1 is a result of evolutionary convergence. The ovipositor of *Ankylophon* is like that of some Tryphonini though the shape of the petiole, presence of notauli, lack of glymma, and shape of hind tibial apex are quite unlike those of any described genera. Fossil tryphonines are known from the Upper Cretaceous and probably the group was very diverse at that time (Townes, 1973). It is possible that *Ankylophon* is a relict of a very ancient group.

ANKYLOPHON gen. n.

Type-species: *Ankylophon obligatus* sp. n.

Moderately large species, fore wing length 12-13 mm; lower face transverse; clypeus broad, margin evenly rounded with a small out-turned thickened area that is flat below; mandible very long, weakly tapered, almost equally bidentate; malar space 0.7-0.8 times basal mandibular width. Frons concave above antennal sockets, with a median rugose, non-depressed area; ocelli small, the posterior ones widely separated from eyes; eye margin not indented opposite antennal base. Scape cylindrical, apically truncate at about 15° to transverse; flagellum of moderate length, unspecialized.

Epomia short and weak; mesoscutum with notauli strongly impressed to centre; scutellum convex, carinate beyond centre. Epicnemial carina present, sternaulus absent; posterior transverse carina of mesosternum represented by lateral vestiges and a weak trace medioventrally. Propodeum short, convex, abruptly rounded; anterior transverse carina incomplete centrally, posterior one present only laterally as a vestige.

Fore leg with tibia spinose, tibial spur with comb reaching to apex; mid and hind tibiae bicalcarate; hind tibia with apex folded over to form a 'shelf-like' platform on the end. Claws with an auxillary tooth near apex (Fig. 57).

Fore wing with *cu-a* distal to base of *Rs&M*; 3*r-m* present, enclosing an almost triangular areolet; 2*r-m*, 3*r-m* and abscissa of *M* between 2*r-m* and 2*m-cu* almost equal in length; 2*m-cu* joining areolet near distal corner, with two bullae; pterostigma broad (Fig. 66). Hind wing with first abscissa of Cu_1 shorter than *cu-a*.

Gaster with tergite 1 anteriorly slender, with spiracles behind centre on broadened posterior part; glymma absent; sternite 1 reaching to centre of segment; tergites 2+ smooth and polished; female subgenital plate large, triangular, projecting beyond apex of gaster; ovipositor short, stout, curved 90°, with conspicuous teeth on lower valve; ovipositor sheath broad (Fig. 135).

Etymology. *Ankylos* (a hook) + *phon* (from *Tryphon*, a related genus). Masculine.

Remarks. Only a single species of this remarkable genus is known. It is apparently restricted to the south-east of the continent. The structure of the ovipositor of this insect is quite like that of some north temperate Tryphonini that parasitize sawfly larvae. This suggests that *Ankylophon* may be associated with pergids. The peculiar form of the hind tibia is very like that of the phygadeuontine genus *Colocnema*, though its function is unknown.

Australian species. One, described below.

Ankylophon obligatus sp. n.

Female: inner orbits ventrally divergent, lower face transverse, polished with few scattered coarse punctures; mandible with a strong proximal concavity; vertex smooth and polished; head behind eyes quite broad. Mesoscutum smooth and polished with a few punctures anteriorly. Mesopleuron with speculum smooth, remainder coarsely wrinkled; metapleuron convex, similarly sculptured. Wing with hairs quite short and widely interspaced.

Black; *from with* face, mouthparts, frontal orbit, genal orbit, propleuron, lower corner of pronotum, mesoscutal stripes, subalar prominence, epicnemium, margin of scutellum and postscutellum and anterior two pairs of legs yellowish, *to with* these plus most of meso- and metapleura yellowish. Gaster except for tergite 1 brownish orange; most of hind legs orange, hind tibia distally and tarsal segments 1 and 2 together with tergite 1 black. Flagellum proximally blackish, distally pale. Pterostigma black, wings very slightly infumate.

Male: similar to female but with antenna blackish with a white band distally, apex dark.

Material examined

Holotype ♀, Victoria: Healesville, i.1956 (NMV).

Paratypes. New South Wales: 1 ♀, Taralga, i. (TC). Victoria: 1 ♂, same data as holotype (NVM); 1 ♀, Cobungra, i.1957 (NMV); 1 ♀, 'Lowra', i.1931 *(Raff)* (BMNH).

Host records. None.

Tribe PHYTODIETINI

Species of this tribe are usually quite large insects characterized by the virtual absence of propodeal carinae. The gaster is usually somewhat laterally compressed and the claws densely pectinate. Species of *Netelia* are mostly unicolorous reddish orange whilst those of *Phytodietus* are usually striped. Both are parasites of lepidopterous larvae. Unlike other tryphonines the egg lacks an anchor but has instead a coiled stalk which is inserted into the host. *Netelia* species are crepuscular or nocturnal and are some of the most common Australian ichneumonids.

NETELIA Gray

Medium-sized to large ichneumonids, fore wing length 6-20 mm; mandible strongly twisted through 90° (Fig. 139); face weakly convex, clypeus virtually truncate; malar space very short, usually less than 0.2 times basal mandibular width; eye with strong indentation opposite base of antenna; ocelli very large, the hind ones often contiguous with eye. Epomia absent; posterior transverse carina of mesosternum present only laterally as vestiges; propodeum with at most lateral crests present, generally trans-striate (Fig. 140). Fore wing with *3r-m* usually present, enclosing a small, almost triangular areolet; *Rs* strongly curved immediately before joining areolet. Hind wing with first abscissa of Cu_1 shorter than *cu-a*. Segment 1 of gaster slender, with spiracle before centre and with large deep glymma (Fig. 135); laterotergite 1 broad, membranous, often pendant. Ovipositor projecting beyond apex of gaster by 0.3-0.7 times length of hind tibia, in distal half evenly tapered to a sharp point; male genitalia usually with a specialized pad and brace on inner side of gonosquama.

Remarks. Most *Netelia* species are uniformly reddish orange insects and are active from around dusk until about midnight. They are often confused with other nocturnal ichneumonids, especially ophionines. Ophioninae have the spiracle of tergite 1 far behind the centre, lack glymma, and lack vein *2r-m* in the fore wing and are thus very easily separated from *Netelia*. Less easily separated are some of the other nocturnal species such as *Cidaphus* and *Megaceria*, but none of these has the mandibles twisted.

Netelia species are widely distributed throughout Australia and in many areas they are extremely common. I have seen very large numbers roosting by day under tree-ferns in the Blue Mountains of New South Wales (December, 1981) and they flew off in great swarms when approached. At light several hundred were taken in an hour. When handled females readily inflict a painful sting with the ovipositor.

The genus is currently divided into 10 subgenera, and most of these were first clearly distinguished and defined by Townes (1939). Since then several subgenera have been added and a large number of species referred to subgenera on the basis of Townes' keys. These keys place great reliance on very simple characters, such as 'presence or absence of *3r-m*, occipital carina or scutellar carinae'. Such character differences seem to me to be subject to parallel evolution and I doubt the naturalness of the present classification and whether all the species subsequently referred to the various subgenera are correctly placed. Several Australian species will run on key characters to *Bessobates*, *Longiterebates* or *Parophteltes* yet on other features, including genital structure, they appear to have no more in common with 'typical' members of the subgenus than they do with other Australian species placed in different subgenera. I have therefore placed almost all species from Australia in *Netelia (Netelia)* and suggest that this is the most satisfactory placement until such time as a detailed reassessment can be made of the Indo-Australian fauna. It should then be possible to judge whether the Australian species represent a specialized radiation from a *Netelia (Netelia)* stock and have come to parallel species of other subgenera, or whether there is a real phylogenetic affinity between some Australian species and the predominantly northern, small subgenera.

In addition to *Netelia* I recognize one other Australian subgenus, *Apatagium*. This is clearly definable as a holophyletic group and there is every reason to suppose, from its known distribution, that its range extends to Australia.

Key to subgenera of *Netelia* occurring in Australia

- Pecten of hind tarsal claw extending beyond true apex of claw (Fig. 133); occipital carina absent....................*NETELIA (APATAGIUM)* (p. 79)
- Pecten of hind tarsal claw not extending beyond true apex of claw (Fig. 132); occipital carina usually present.......*NETELIA (NETELIA)* (p. 79)

NETELIA (APATAGIUM) Enderlein*

Apatagium Enderlein, 1912*b*: 115. Type-species: *Apatagium tristrigatum* Enderlein, by original designation.
Amaloctenus Cushman, 1934: 4. Type-species: *Amaloctenus melleus* Cushman (= *Apatagium rectum* Enderlein), by original designation.
Netelia (Apatagium) Enderlein; Townes, 1939: 185.

Remarks. A moderately large subgenus most species of which are confined to montane forests above 1500 m in the Indo-Papuan region (Gauld, 1983*b*). I have seen one battered specimen taken on a mountain top in north Queensland.

Australian species. One, undescribed (ANIC).

Host records. One Asian species is recorded as a parasite of a pyralid (*Hapalia macheralis* Walker) defoliating teak (Beeson & Chatterjee, 1935; Garthwaite & Desai, 1939). It is recorded as being endoparasitic for the first part of its life, emerging to feed externally prior to pupation. This requires confirmation and is clearly unlike any other studied *Netelia*, which are always ectoparasites.

NETELIA (NETELIA) Gray

Netelia Gray, 1860: 341. Type-species: *Paniscus inquinatus* Gravenhorst, by original designation.
Buchekerius Schulz, 1906: 280. Type-species: *Buchekerius perforatus* Schulz, by monotypy.
Scammatanotum Enderlein, 1918: 231. Type-species: *Scammatanotum herero* Enderlein, by monotypy.
Amebachia Uchida, 1928*a*: 218. Type-species: *Amebachia baibarana* Uchida, by original designation.

Remarks. This subgenus contains over 75% of the genus. Its distribution is world-wide, and it is probably one of the largest groups of ichneumonids. The majority of species are rather similar morphologically and in many cases only males can be reliably identified, and then only by examination of the genitalia. Because of this similarity several early European authors determined exotic material as common European species. Consequently the records of *N. (N.) testacea* (Gravenhorst) and *N. (N.) opacula* (Thomson) as Australian (e.g. by Morley, 1913*a*) are erroneous. The occurrence of two Indian species, *N. (N.) ferruginea* (Cameron) and *N. (N.) longitarsis* (Cameron), recorded by Morley (1913*a*) is also questionable and as I have seen no material from Australia that represents these species I think they should be deleted from the Australian list. However, *Netelia* species are highly vagile insects, rivalling *Enicospilus* in their ability to colonize oceanic islands and it is quite possible that a number of widespread Oriental species will be found to occur in Queensland. Ascertaining such a distribution will be difficult for, although the Indian species have recently been revised by Kaur & Jonathan (1979), I have seen very large numbers of additional species from other parts of South East Asia. All the species listed below as Australian are described from Australian specimens. The distributions are based on reliably identified specimens but statements such as 'endemic' must be considered tentative as so little is known of the Papuan and Malaysian *Netelia*. Cameron's record (1905*a*) of *N. (N.) producta* from Java is based on a misidentification.

Australian species. *Netelia (Netelia) aberrans* Townes, Townes & Gupta (E); *N. (N.) constricta* (Morley) (E); *N. (N.) contraria* (Morley) (E); *N. (N.) dimidiata* (Morley) (E); *N. (N.) gracilis* (Morley) (P); *N. (N.) incommunis* (Szépligeti) (E); *N. (N.) morleyi* Townes, Townes & Gupta (E); *N. (N.) producta* (Brullé) (Z); *N. (N.) testaceinervis* (Cameron) (E). I have seen 10 additional (?) undescribed species (ANIC; BMNH).

Host records. *N (N.) producta* - Noctuidae: *Agrotis infusa* (Boisduval); *A. munda* Walker (Chadwick & Nikitin, 1976); *Heliothis* sp. (BMNH); *Mythimna convecta* (Walker); *Spodoptera litura* (F.) (Chadwick & Nikitin, 1976). Pieridae: *Pieris rapae* (L.) (Parrott, 1951). *Netelia (Netelia)* spp. - Noctuidae: *Heliothis armigera* (Hübner); *Mythimna separata* (Walker) (DPIQ); *Persectania ewingii* (Westwood) (BMNH); *Spodoptera exempta* (Walker) (Chadwick & Nikitin, 1976).

PHYTODIETUS Gravenhorst

Small to medium-sized species, fore wing length 5-10 mm; mandible not twisted; face weakly convex, clypeus from apically bilobate to simply truncate; malar space less than basal mandibular width (Fig. 138); eye not indented opposite base of antenna; ocelli not enlarged. Epomia absent; posterior transverse carina of mesosternum represented only by lateral vestiges; propodeum without carinae, faintly trans-striate or smooth. Fore wing with or without *3r-m*; *Rs* only weakly curved before joining *Rs+2r* (Figs 143, 144). Hind wing with first abscissa of Cu_1 much longer than *cu-a*. Segment 1 of gaster moderately long, slightly broadened posteriorly, with spiracles before the centre and with deep glymma; laterotergite narrow. Ovipositor projecting beyond apex of gaster by 0.8-1.2 times length of hind tibia; upper valve with a strong nodus, lower valve elongately acute; male genitalia unspecialized.

Remarks. *Phytodietus* is a large cosmopolitan genus. It is currently divided into four subgenera and two of these, *Phytodietus* and *Weisia*, occur in Australia. A third, *Euctenopus*, is endemic to New Zealand whilst the fourth, *Neuchorus*, does not occur south-east of the Philippines. The Oriental representatives of this genus were recently revised by Kaur & Jonathan (1979).

Key to subgenera of *Phytodietus* occurring in Australia

- Fore wing with *3r-m* present (Fig. 144); clypeus weakly convex...... ....*PHYTODIETUS (PHYTODIETUS)* (p. 80)
- Fore wing with *3r-m* absent (Fig. 143); clypeus strongly convex..... ....*PHYTODIETUS (WEISIA)* (p. 81)

PHYTODIETUS (PHYTODIETUS) Gravenhorst

Phytodietus Gravenhorst, 1829*b*: 928. Type-species: *Phytodietus astutus* Gravenhorst, by subsequent designation, Westwood, 1840: 58.
Phytodiaetus Agassiz, 1846: 291. [Unjustified emendation.]

Remarks. Generally brightly patterned insects and relatively uncommon in general collections. All the Australian specimens I have seen are from the east, between south Queensland and Tasmania. One species is of interest in that it appears to be a parasite of orchard pests. In Europe several species of this subgenus are recognized as economically beneficial insects and one, *P. (P.) segmentator*, was introduced into the U.S.A. to help control *Choristoneura* (Carlson, 1979). An account of the life-history of another economically important Nearctic species, *P. (P.) pulcherrimus*, is given by Simmonds (1947).

Australian species. *P. (P.) celisissimus* (Turner) (E). I have seen two additional undescribed species (BMNH; TC).

Host records. *P. (P.) celsissimus* - Tortricidae: *Epiphyas postvittana* (Walker) (Dumbleton, 1940). Xyloryctidae: *Neodrepta luteotactella* (Walker) (DPIQ). *Phytodietus* sp. - Geometridae: *Microdes squamulata* Guenée (TDF).

PHYTODIETUS (WEISIA) Schmiedeknecht*

Weisia Schmiedeknecht, 1907*b*: 1257. Type-species: *Weisia elegans* Schmiedeknecht, by monotypy.
Phytodietus (Weisia) Schmiedeknecht; Townes, 1969: 148.

Remarks. A small subgenus containing about 10 species widely distributed throughout the Old World from the Mediterranean and southern Africa to Madagascar and the Philippines. All the Australian specimens I have seen are from Queensland.

Australian species. One, undescribed (BMNH).

Host records. None.

Tribe OEDEMOPSINI
(= Eclytini sensu Townes)

Species of this tribe are generally fairly small insects. They are most easily recognized by the possession of membranous areas in the ovipositor (Fig. 154) and by the quite slender tergite 1 with deep glymmae. Eight genera are known and Townes (1969) considers the centre of distribution of the tribe to be the Neotropical region. Two genera, *Thymaris* and *Oedemopsis*, are almost cosmopolitan; both are represented in Australia. A third genus, *Debophanes*, is known only from Australia. The usual hosts of oedemopsines are microlepidoptera though some species parasitize small tenthredinids.

DEBOPHANES gen. n.

Type-species: *Debophanes areolatus* sp. n.

Small species, fore wing length 3-4 mm; lower face fairly flat, almost quadrate; clypeus weakly convex, margin out-flared, rounded with median 0.2 subtruncate; mandible long, strongly tapered, twisted 70° so that lower tooth is almost behind the upper; lower tooth about 0.5 times length of the upper; malar space 0.7 times as long as basal mandibular width. Frons simple, neither concave nor carinate; ocelli small, the posterior ones widely separated from eyes; eye margins not indented opposite antennal bases. Scape goblet-shaped, apically truncate about 40° from transverse; flagellum long, unspecialized.

Epomia absent (Fig. 152); mesoscutum granulate, matt, with notauli strong anteriorly, reaching to about centre of scutum; scutellum convex, without lateral carinae. Epicnemial carina present; posterior transverse carina of mesosternum represented by lateral and medioventral vestiges; propodeum long, evenly rounded, with anterior and posterior transverse carinae almost complete, lateromedian longitudinal carinae present anteriorly (Fig. 142).

Fore leg with tibia not obviously spinose; tibial spur with comb reaching 0.6 times its length; mid and hind tibiae bicalcarate; hind tibial apex simple.

Fore wing with *cu-a* opposite base of *Rs&M*; *3r-m* present, enclosing an irregularly pentagonal areolet, *2m-cu* joining areolet distal to centre; ramellus present (Fig. 145). Hind wing with first abscissa of Cu_1 longer than *cu-a*; distal abscissa of Cu_1 faint.

Gaster with tergite 1 quite slender, spiracle at centre, glymma strong; sternite 1 reaching almost to centre of segment; tergites 2+ polished, obsoletely granulate; ovipositor projecting beyond apex of gaster by 1.0 times length of hind tibia; upper valve without a nodus, lower valve partially membranous with a tendency to collapse in distal 0.3 in dried specimens.

Etymology. *De* (from the letter D used to denote this genus in manuscript) + *bophanes* (from *Hybophanes*, the old name for a related genus). Masculine.

Remarks. *Debophanes* is rather similar to *Thymaris* from which it is most easily distinguished by its lack of epomia. The twisted mandible and uniformly matt alitrunk are unlike those of other oedemopsines.

Australian species. One, described below.

Debophanes areolatus sp. n.

Female: head and alitrunk matt, granulate; apex of clypeus with a fringe of long hair; flagellum with 30-32 segments. Tarsal claws short, pectinate basally.

Black; clypeus, mouthparts, scape, fore and mid legs, hind trochanter, trochantellus and most of tibia whitish yellow; flagellum brown; pronotum reddish, hind femur, tibia distally and tarsi infuscate. Gaster with hind 0.3 of tergite 2 whitish, following segments reddish brown. Wings hyaline, pterostigma blackish brown.

Male: similar to female but generally slightly smaller with legs darker.

Material examined

Holotype ♀, Tasmania: Mt Wellington, ii.1963 *(Colless)* (ANIC).

Paratypes. Tasmania: 1 ♀, 1 ♂, Geeveston, ii. (TC); 1 ♂, Gordon, i-ii. (TC); 2 ♀, Lake St Clair, 750 m, i.1980, in litter under tree ferns and *Nothofagus (Lawrence & Weir)* (ANIC); 1 ♂, King William Range, ii. (TC); 1 ♂, Strahan, ii-iii. (TC); 1 ♂, Waldheim, i-ii. (TC). Victoria: 1 ♀, Mt Bogong, 1700 m, ii. (TC).

Host records. None.

OEDEMOPSIS Tschek

Oedemopsis Tschek, 1869: 276. Type-species: *Oedemopsis rogenhoferi* Tschek (= *Tryphon scabriculus* Gravenhorst), by monotypy.

Hybophanes Foerster, 1869: 166. Type-species: *Tryphon scabriculus* Gravenhorst, by subsequent designation, Viereck, 1914: 72.

Campothreptus Foerster, 1869: 201. Type-species: *Tryphon nasutus* Cresson (= *Oedemopsis davisi* Carlson), by subsequent monotypy, Davis, 1897: 247.

Zarhynchus Ashmead, 1900*a*: 59. Type-species: *Tryphon nasutus* Cresson (= *Oedemopsis davisi* Carlson), by original designation. [Homonym of *Zarhynchus* Oberholser, 1899.]

Oedematopsis Morley, 1908: 258. [Unjustified emendation.]

Small species, fore wing length 3-5 mm; mandible evenly tapered, not twisted, with lower tooth about 0.7 times length of upper (Fig. 150); face of female with strong convexity above clypeus, this convexity margined by a groove and bearing a central tubercle (Fig. 148); clypeal margin rounded; eye not indented opposite antennal base; ocelli small. Epomia present, long; posterior transverse carina of mesosternum narrowly interrupted before mid coxae; propodeum reticulate, with transverse carina almost complete. Fore wing with *3r-m* absent. Hind wing with first abscissa of Cu_1 longer than *cu-a*. Segment 1 of gaster slender, with spiracles slightly before centre, and with glymma. Ovipositor projecting beyond apex of gaster by 0.5-0.7 times length of hind tibia, its apex usually blunt.

Remarks. A widespread genus with about 25 species occurring in most regions. In most works this genus has appeared under the name *Hybophanes* until Carlson (1980) established the priorty of the Tschek name. The female is easily recognized by the peculiarly produced face but the male is less obvious and may be confused with *Thymaris*. In *Thymaris* the propodeum is smooth except for the virtually complete carination; in *Oedemopsis* it is reticulate and the longitudinal carinae are not complete. In Europe species of this genus have been recorded as parasites of Tortricidae, especially Olethreutinae. Morley (1908) summarizes the biology of one species.

Australian species. *O. hobartensis* Turner (E). I have seen an undescribed species from Western Australia (BMNH).

Host records. *O. hobartensis* - Tortricidae: *Epiphyas postvittana* (Walker) (UQM)

THYMARIS Foerster*

Thymaris Foerster, 1869: 151. Type-species: *Thymaris pulchricornis* Brischke (= *Mesoleptus tener* Gravenhorst), by subsequent monotypy, Brischke, 1880: 145.
Thymarus Thomson, 1883: 908. [Unjustified emendation.]

Small species, fore wing length 4-5 mm; mandible very long and slender, strongly tapered, with lower tooth less than 0.3 times length of the upper; face weakly convex (Fig. 147), clypeus large and quite strongly convex, margin blunt, evenly arcuate; eye conspicuously hairy, not indented opposite antennal socket; ocelli moderately small. Epomia present, strong (Fig. 151); posterior transverse carina of mesosternum present laterally and medioventrally; propodeum long, evenly rounded, with carinae complete, area superomedia elongate (Fig. 141). Fore wing with *3r-m* absent (Fig. 146). Hind wing with first abscissa of Cu_1 longer than *cu-a*. Segment 1 of gaster striate, slender, with spiracles slightly before the centre, glymma deep. Ovipositor projecting beyond apex of gaster by 0.7 times length of hind tibia, slightly decurved.

Remarks. A moderately large genus centred in the Indo-Papuan region. Most species are undescribed.

Australian species. Two, undescribed (ANIC; BMNH).

Host records. None.

SUBFAMILY LABENINAE

(= Labiinae sensu Townes)

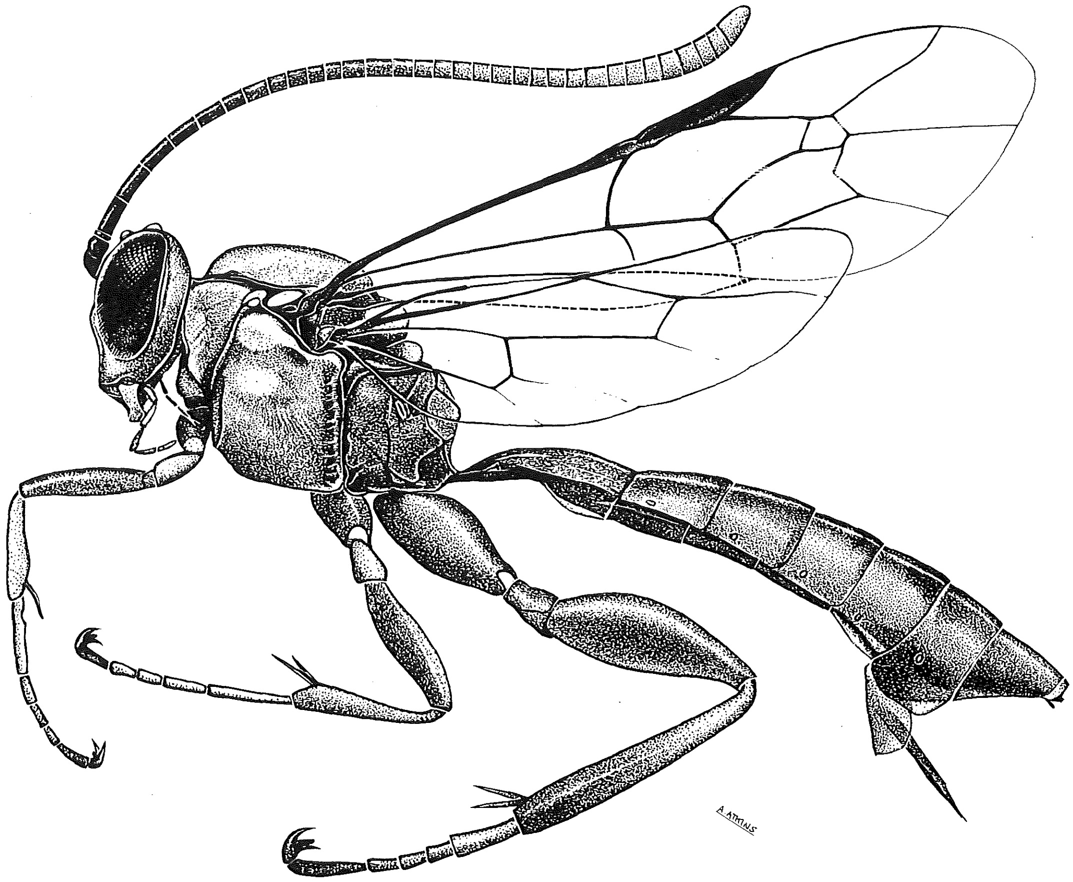


Fig. 156 *Labium* ♀, lateral.

The Labeninae is a moderately small-sized subfamily containing 15 genera grouped into four tribes. Groteini (= Labiini sensu Townes), Labenini, Poecilocryptini and Brachycyrtini. The subfamily is morphologically primitive and a southern hemisphere group. The majority of species occur in Australia and the Neotropical region. Nine genera are present in Australia. Six of these have been recorded previously (Townes *et al.*, 1961) and one, *Adelphion* is newly recorded. Three genera, *Urancyla*, *Alaothyris* and *Monganella*, are described as new.

DIAGNOSIS

Small to very large insects, fore wing length 2-23 mm; clypeus separated from face by a groove, often quite large, margin concave to convex, usually thin and never with an apical tooth; mandible short to long, bidentate or rarely unidentate; frons generally simple; occipital carina complete to entirely absent on upper part of head. Antenna often clavate. Notaulus usually present, sometimes rather weak but if discernible then with a small crest at anterior end so notaulus turns outwards and backwards before joining scutal margin; sternaulus absent or vestigial; posterior transverse carina of mesosternum incomplete. Hind margin of mesopleuron (the mesepimeron) produced, usually covering the triangular area at anterior end of pleural carina. Propodeum usually with several carinae, often with area superomedia delineated, unusual in having (in many species) the gaster inserted high, well above level of insertion of hind coxae. Apex of fore tibia usually with a tooth on outer side; fore and mid tarsal claws simple or basally lobate; fifth tarsal segment often longer than second. Fore wing usually with *3r-m* present, enclosing a pentagonal, rhombic or triangular areolet, rarely with veins fused so *2r-m* and *3r-m* are obscured or with *3r-m* absent; pterostigma moderately narrow. Hind wing with first abscissa of *Rs* from slightly shorter than, to longer than *r-m*; distal abscissa of Cu_1 present or absent. First segment of gaster moderately to very slender, with spiracles from before to far behind centre; sternite 1 fused with tergite; glymma absent; gaster of female depressed, cylindrical or rarely compressed; female subgenital plate small, inconspicuous. Ovipositor from very long to short, not exserted; ovipositor apex without a dorsal subapical notch.

Morphologically the labenines are very diverse and genera resemble taxa in various other subfamilies. Some Labenini may be confused with Rhyssini from which they can be most easily separated by the presence of a broad lobe on the lower anterior corner of the metapleuron. The brachycyrtines may be confused with some phygadeuontines. Most species of the former have the swelling at the anterior end of the pleural carina concealed by the mesepimeron; this swelling is exposed in small phygadeuontines. *Labium* is, because of its face, a very characteristic genus and is unlikely to be confused with other ichneumonids once it has been recognized. Initially, however, it may cause some confusion as it is superficially rather unlike other labenines and may be mistaken for a tryphonine, ctenopelmatine or even a metopiine. No member of these subfamilies has the face and clypeus quite like *Labium* (Fig. 161), which has a very large exposed labrum.

CLASSIFICATION

The labenines have had a very unsettled taxonomic history. *Labena* and *Certonotus* were treated by classical authors as Pimplinae. *Brachycyrtus* has been treated both as a phygadeuontine (Ashmead, 1906*a*) and campoplegine (Morley, 1912*b*). *Labium* was placed in the Tryphoninae by Brullé (1849), treated as an ichneumonine by Cameron (1901*b*) and Turner & Waterston (1920) and as a banchine by Morley, 1915*b*). *Poecilocryptus* was considered to be a pimpline by Morley (1914) and a phygadeuontine by Turner & Waterston (1920). Townes *et al.* (1961) associated these genera (as separate tribes Labenini, Brachycyrtini, 'Labiini' and Poecilocryptini) within the subfamily Xoridinae. In his 'Genera of Ichneumonidae' Townes (1969) amalgamated the Brachycyrtini and Poecilocryptini into one tribe and removed this tribe, together with the Labenini and 'Labiini', from the Xoridinae and placed them in a separate new subfamily, 'Labiinae' (= Labeninae). To this subfamily Townes added a fourth and new tribe, Clasini, containing Neotropical genera, one of which was previously placed in the Phygadeuontini (Townes & Townes, 1966).

Gauld (1983*a*) redefined the subfamily and transferred the Clasini to the Phygadeuontinae. Four tribes were recognized - Labenini, Groteini (= 'Labiini'), Poecilocryptini and Brachycyrtini. In the same paper a detailed analysis of the phylogenetic inter-relationships of the world genera was presented.

DISTRIBUTION

The Labeninae is primarily a southern hemisphere group and there is no evidence to suggest anything but a southern origin (Gauld, 1983*a*). Representatives of three of the four tribes occur in both Australia and South America but the group is absent (except for one specialized genus which has almost a world-wide distribution) from southern Africa. This suggests that the main radiation of the labenines occurred in the southern hemisphere in the late Cretaceous, between 120mya (the separation of Africa from Gondwanaland) and 55mya (the separation of Australia, Antarctica and South America) (Audley-Charles *et al.*, 1981). The Labeninae could therefore be one of the oldest groups of Ichneumonidae.

The Labenini and Groteini are widespread throughout Australia and South America. A few species of *Grotea* and *Labena* have extended their range northwards into the Nearctic region and *Certonotus* and *Asperellus* are quite well represented in New Guinea and the juxta-Australian Pacific Islands (New Zealand, New Hebrides, etc.). The Poecilocryptini is endemic to Australia whilst the Brachycyrtini is the most widespread of all tribes. Of the five brachycyrtine genera, two, *Adelphion* and *Monganella*, are restricted to Australia and New Guinea, and a third, *Pedunculus*, is restricted to Chile. A fourth genus, *Brachycyrtus*, is most diverse in the Neotropical region but is represented in almost every other region by one or two species. There is very little morphological differentiation between the non-Neotropical species, suggesting that this genus has recently spread throughout the warmer parts of the world. This hypothesis is further strengthened by the fact that *Habryllia*, the sister-genus of *Brachycyrtus*, is restricted to South America.

BIOLOGY

The majority of labenines are ectoparasites of concealed coleopterous larvae that mine in plant tissue, usually woody stems but also galls. Some may attack other hosts in a similar situation such as siricid larvae, eriococcid galls and (this requires confirmation) some lepidopterous larvae (Hocking, 1967; Chadwick & Nikitin, 1976). There are two lines of biological specialization in the subfamily. The groteines attack solitary bees of the families Xylocopidae, Megachilidae and Halictidae. The ichneumonid larva either kills or devours the egg or young bee larva and completes development on the stored pollen (Graenicher, 1905; Houston, 1965; Slobodchikoff, 1967). The Brachycyrtini are parasites in small cocoons and spider egg sacs.

A particularly interesting facet of labenine biology is their tendency towards secondary phytophagy. Apart from groteines, which complete development on pollen, there is some evidence that poecilocryptines may feed on plant-gall tissue (Short, 1978).

The head capsules of the final instar larvae are very diverse in form, but generally more extensively sclerotized than those of other ichneumonids. The mandible of *Poecilocryptus* is unique amongst Ichneumonoidea in being bidentate, a feature considered by Short (1978) to indicate the extremely primitive nature of this subfamily.

KEY TO THE GENERA OF LABENINAE OCCURRING IN AUSTRALIA

For convenience the key is given direct to genera; the tribal groupings are in parentheses.

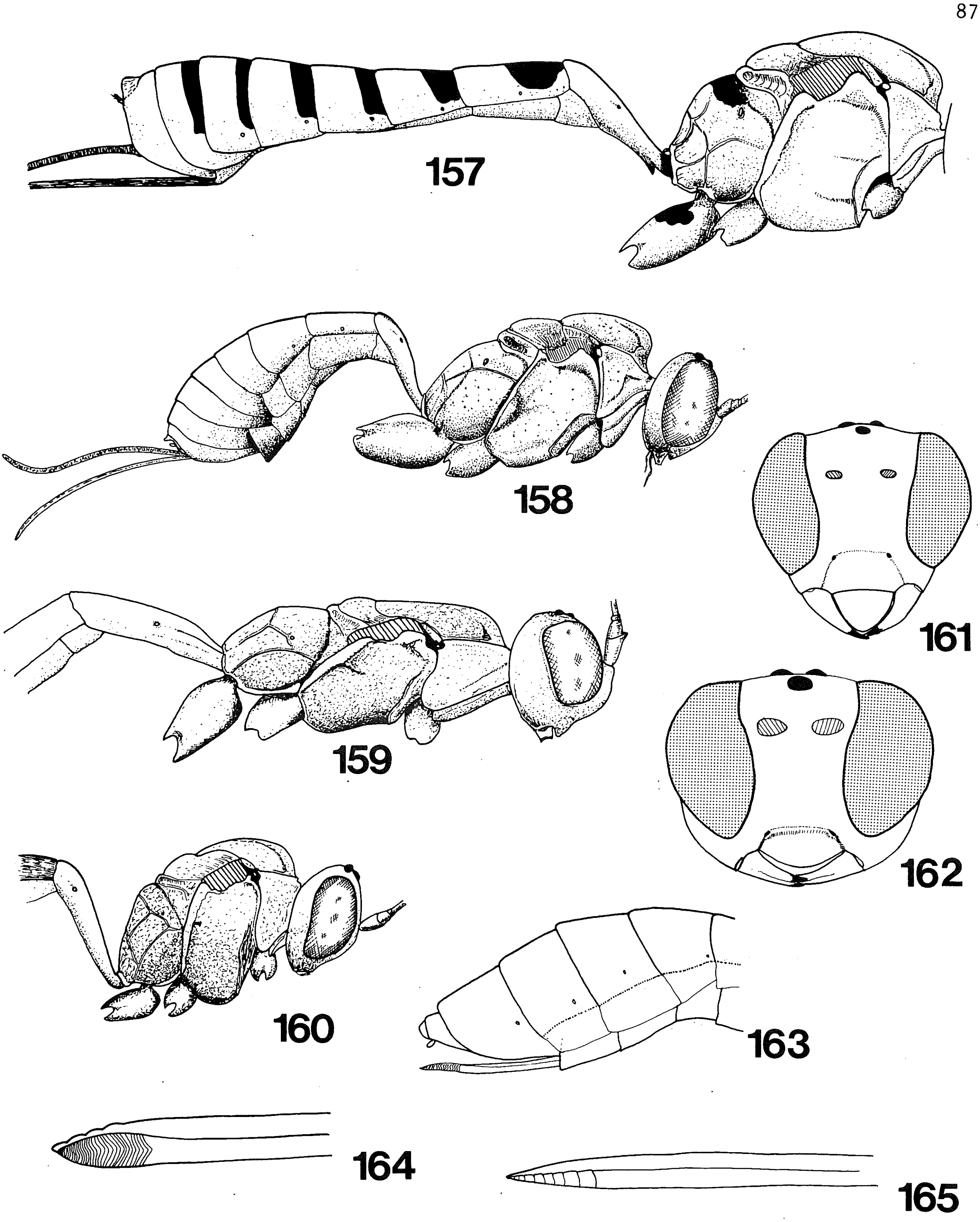
1 Mandible long and slender; labrum exceptionally large (Fig. 161), almost as long as clypeus; ovipositor very short, barely projecting beyond apex of gaster, dorsoventrally depressed (Fig. 163).
Hind wing with *Sc* usually with more than two hamuli. (Groteini). ....*LABIUM* (p. 92)

\- Mandibles rather short, not particularly slender; labrum moderately small to virtually concealed (Fig. 162); ovipositor projecting beyond apex of gaster by at least 0.5 times length of hind tibia............2

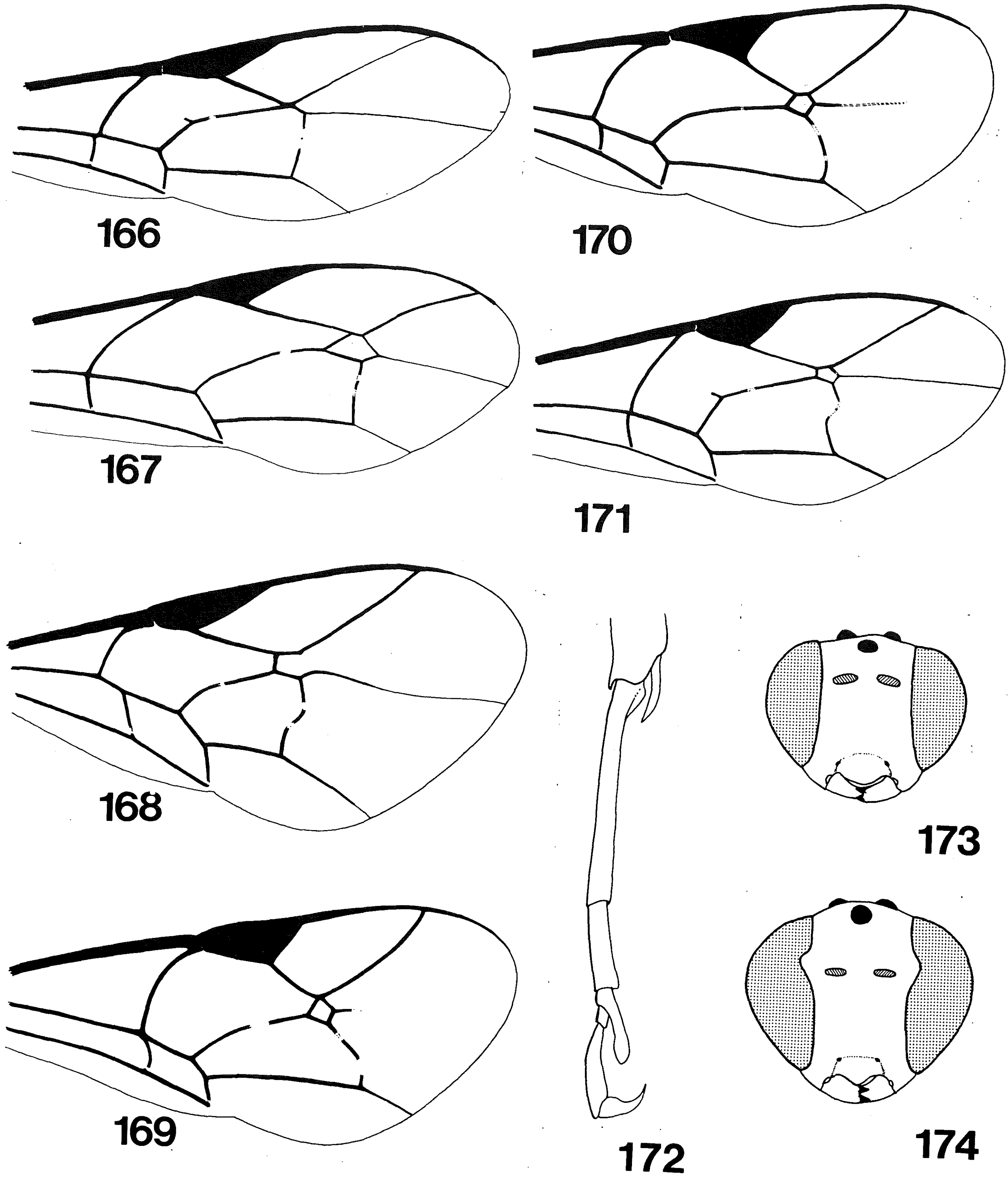
2 Fore wing with abscissa of Cu_1 between 1*m-cu* and Cu_{1a} at least 1.4 times as long as Cu_{1b} (Fig. 167); ovipositor tip with fine file-like teeth (Fig. 164); hind coxa of ♀ with carina delineating a furrow on anterior surface internally. (Labenini)..........................3

\- Fore wing with abscissa of Cu_1 between 1*m-cu* and Cu_{1a} from subequal to, to conspicuously shorter than Cu_{1b} (Figs 168-171); ovipositor tip with coarse teeth (Fig. 165) or without distinct teeth; hind coxa of ♀ without a furrow on anterior surface internally.................5

3 Mesoscutum punctate, smooth; occipital carina complete or narrowly interrupted mediodorsally; apex of fore tibia with a conspicuous long curved spine on outer distal margin; ♀ with third fore tarsal segment produced apically into a lobe reaching beyond apex of fourth segment (Fig. 172)..*LABENA* (p.91)



Figs 157-165 Labeninae. 157 *Poecilocryptus*, alitrunk and gaster, lateral. 158 *Urancyla fulva* ♀, lateral. 159-160 Head, alitrunk and petiole, lateral (159) *Monganella variegata* (160) *Adelphion*. 161-162 Faces (161) *Labium* (162) *Labena*. 163 *Labium* ♀, apex of gaster. 164-165 Apex of ovipositors (164) *Labena* (165) *Poecilocryptus*.



Figs 166-174 Labeninae. 166-171 Fore wings (166) *Alaothyris elongissimus* (167) *Labena* (168) *Brachycyrtus* (169) *Adelphion* (170) *Monganella variegata* (171) *Urancyla fulva*. 172 *Labena* ♀, fore leg. 173-174 Faces (173) *Adelphion* (174) *Brachycyrtus*.

- Mesoscutum with transverse rugae; occipital carina dorsally entirely absent; apex of fore tibia with a short tooth on outer distal margin; ♀ with fore tarsus simple..4

4 Hind wing with distal abscissa of *Cu*$_1$ absent..............*ASPERELLUS* (p. 89)
- Hind wing with distal abscissa of *Cu*$_1$ present.............*CERTONOTUS* (p. 90)

5 Fore wing with *2m-cu* with one long bulla, sometimes with indistinct trace of vein centrally (Figs 166, 171); occipital carina dorsally absent. (Poecilocryptini)...6
- Fore wing with *2m-cu* with two bullae widely separated from each other (Figs 168-170); occipital carina dorsally complete. (Brachycyrtini)........8

6 Fore wing with areolet and *2r-m* obliterated by fusion of *Rs* and *M* (Fig. 166); gaster very strongly laterally compressed; ovipositor extremely long, at least 6.0 times length of hind tibia...*ALAOTHYRIS* (p. 93)
- Fore wing with areolet and *2r-m* distinct (Fig. 171); gaster not laterally compressed, usually slightly depressed; ovipositor projecting beyond apex of gaster by less than 5.0 times length of hind tibia..........7

7 Hind wing with distal abscissa of *Cu*$_1$ present; carinae of propodeum vestigial; ♀ without tubercles on sternite 1 and with ovipositor strongly decurved (Fig. 158)..............................*URANCYLA* (p. 95)
- Hind wing with distal abscissa of *Cu*$_1$ absent entirely; propodeum with some well-developed carinae; ♀ with a pair of tubercles near anterior 0.2 of sternite 1, and with ovipositor straight (Fig. 157)..*POECILOCRYPTUS* (p. 94)

8 Fore wing with *cu-a* distal to *Rs&M* by 0.5 times its length; *3r-m* absent (Fig. 168); hind tibia without a specialized fringe of fine close hairs on inner distal margin; eye strongly notched opposite antennal socket (Fig. 174)..............................*BRACHYCYRTUS* (p. 97)
- Fore wing with *cu-a* opposite or distal to *Rs&M* by less than 0.3 times its own length; *3r-m* present (Figs 169-170); hind tibia with a fringe of fine, close hairs on inner distal margin; eye not or only slightly indented opposite antennal socket (Fig. 173)................9

9 Tergite 1 with spiracles positoned near to centre of segment (Fig. 159); propodeum long, evenly rounded; fore wing with areolet pentagonal (Fig. 170)..*MONGANELLA* (p. 98)
- Tergite 1 with spiracles positioned close to hind margin of segment (Fig. 160); propodeum short, abruptly declivous; fore wing with areolet rhombic, pointed above (Fig. 169).................*ADELPHION* (p. 96)

Tribe LABENINI

Labenines are characterized by the modified ovipositor tip which has fine, close, file-like teeth. All are thought to be parasites of wood-borers, particularly coleopterous larvae. Three of the five genera occur in Australia.

ASPERELLUS Townes

Asperellus Townes *in* Townes, Townes & Gupta, 1961: 471. Type-species: *Certonotus hinnuleus* Krieger, by original designation.

Small to medium-sized insects, fore wing length 4-8 mm; clypeus flat, transverse, margin thin, evenly arcuate; labrum barely projecting; mandible short, stout but tapered, twisted 25-35°, with upper tooth the longer; outer mandibular surface with a groove bearing hairs; malar space trans-striate, usually a little longer than basal mandibular width. Occipital carina dorsally absent; eye not indented next to antennal socket. Antenna slightly clavate, apically pointed, without a flat sensillum.

Mesoscutum with transverse rugae, notauli weak, notaular crests very weak. Propodeum short, convexly rounded with spiracle subcircular to elongately oval; anterior transverse carina complete, laterally joining lateral carinae to enclose a large composite area; other carinae obsolexcent or absent; gaster inserted high up on propodeum above level of hind coxae.

Fore tibia with a short tooth on outer distal margin; fore tarsus unspecialized; hind coxa of ♀ with an anterior carina continued ventrally as a process, the area behind this carina concave and closely punctate; tarsal claws simple.

Fore wing with *cu-a* from slightly proximal to, to opposite, base of *Rs&M*; *3r-m* usually present; areolet triangular, usually petiolate above; *2m-cu* sinuous with two close bullae. Hind wing with distal abscissa of Cu_1 absent; basal cell slender; *Sc* with one or two hamuli.

Gaster quite long, tergite 1 from stout to quite slender, with spiracles before centre; sternite 1 reaching nearly to level of spiracles; laterotergites 2-4 membranous, folded under; tergite 8 highly modified, projecting laterally as a pair of prominences at either side of ovipositor base, dorsally with tergite 9 projecting through concave orifice in hind margin, tergite 7 often mediodorsally incised. Ovipositor projecting beyond apex of gaster by 3.0-8.0 times length of hind tibia, its apex compressed, the upper valve with weak, blunt serrations, the lower valve enclosing the upper, with fine, file-like teeth.

Remarks. This is a moderate-sized genus restricted to the Australian region. In addition to the Australian species I have seen seven from New Guinea, one from New Caledonia and one from the New Hebrides.

This group of species hardly warrants distinction from *Certonotus* and the only consistent difference (apart from size) is the absence of the distal abscissa of Cu_1 in *Asperellus*. Townes (1969) claims that *Asperellus* species differ from *Certonotus* in having a spine-like bristle on the upper edge of the hind tibia. This bristle is also found in some *Certonotus*.

Australian species. *A. hinnuleus* (Krieger) (P); *A. leeuwinensis* (Turner) (E). I have seen three undescribed species (BMNH; TC).

Host records. None.

CERTONOTUS Kriechbaumer

Certonotus Kriechbaumer, 1889: 308. Type-species: *Certonotus varius* Kriechbaumer, by monotypy.

Moderately large to very large insects, fore wing length 12-23 mm; clypeus flat, transverse, margin thin, evenly arcuate; labrum barely projecting; mandible short, stout but tapered, twisted 25-35°, with upper tooth the longer; outer mandibular surface with a groove bearing hairs (Fig. 85); malar space trans-striate, usually a little longer than basal mandibular width. Occipital carina dorsally absent; eye not indented next to antennal socket. Antenna slightly clavate, apically pointed, without a flat sensillum.

Mesoscutum with transverse ruage, notauli weak, notaular crests very weak. Propodeum short, convexly rounded with spiracle elliptical (Fig. 71); anterior transverse carina usually complete except centrally, other carinae reduced, area superomedia not delineated; gaster inserted high up on propodeum, above level of hind coxae.

Fore tibia with a short tooth on outer distal margin; fore tarsus unspecialized; hind coxa of ♀ with an anterior carina continued ventrally as a process, the area behind this carina concave and closely punctate; tarsal claws simple.

Fore wing with *cu-a* proximal to base of *Rs&M*; *3r-m* present, areolet almost triangular, petiolate above; *2m-cu* sinuous, with two close bullae. Hind wing with distal abscissa of Cu_1 present; first abscissa of Cu_1 shorter than *cu-a*; basal cell slender; *Sc* with one or two hamuli.

Gaster quite long, tergite 1 from stout to quite slender, with spiracles before centre; sternite 1 reaching nearly to level of spiracles; laterotergites 2-4 membranous, folded under; tergite 8 highly modified, projecting laterally as a pair of prominences at either side of ovipositor base, dorsally with tergite 9 projecting through concave orifice in hind margin, tergite 7 often mediodorsally incised. Ovipositor projecting beyond apex of gaster by 3.0-8.0 times length of hind tibia, its apex compressed, the upper valve with weak, blunt serrations, the lower valve enclosing the upper with fine, file-like teeth (Fig. 83).

Remarks. *Certonotus* is a large genus centred in the Australasian region. A few species also occur in the Neotropics. It is very closely related to *Asperellus* and a Neotropical genus, *Apechoneura*. *Certonotus* and its relatives may easily be confused with Rhyssini but the clypea of the two tribes are quite different. Rhyssines also have no broad lobe present on the lower anterior corner of the metapleuron whilst such a lobe is well-developed in most Labenini. The marked similarity in general facies is presumably due to convergence resulting from the similarities in biology between species of these tribes.

Australian species. *C. annulatus* Morley (E); *C. apicalis* Morley (E); *C. geniculatus* Morley (E); *C. humeralifer* Krieger (E); *C. monticola* Morley (E); *C. nitidulus* Morley (E); *C. rufescens* Morley (E); *C. tasmaniensis* Turner (E); *C. varius* Kriechbaumer (E). I have seen three undescribed species (ANIC; BMNH; TC).

Host records. *Certonotus* sp. 1 - Buprestidae: *Diadoxus erythrurus* White (Chadwick & Nikitin, 1976). *C. humeralifer* - Limacodidae: *Doratifera* sp. (Chadwick & Nikitin, 1976). *C. tasmanicus* - Siricidae: *Sirex noctilio* (F.) (Hocking, 1967). In Tasmania one species of *Certonotus* is possibly associated with *Ancita* sp. (Cerambycidae) (TDF) and in New Zealand another species has been reared from the curculionid *Rhynchodes* (Hudson, 1927).

LABENA Cresson

Labena Cresson, 1864: 399. Type-species: *Cryptus grallator* Say, by subsequent designation, Viereck, 1914: 80.
Caryoecus Walsh, 1866: 30. Type-species: *Mesochorus fuscipennis* Brullé (= *Cryptus grallator* Say), by monotypy.
Microtritus Driechbaumer, 1889: 307. Type-species: *Microtritus apicalis* Kriechbaumer, by monotypy.
Dysidopus Schulz, 1906: 103. [Unjustified emendation.]
Neonotus Parrott, 1955*a*: 230. Type-species: *Neonotus chadwidkii* Parrott, by original designation.

Moderately large to large insects, fore wing length 11-20 mm; clypeus small, flat or concave, very thin with margin arcuate; labrum barely projecting; mandible tapered, twisted 30°, with upper tooth slightly the longer; outer mandibular surface with a median longitudinal groove bearing hairs; malar space shorter than basal mandibular width. Occipital carina complete or narrowly interrupted centrally; eye margin slightly indented opposite antennal socket. Antenna almost cylindrical, that of ♀ with a small flat sensillum on extreme distal apex.

Fore tibia inflated (so it often collapses in dried specimens) with a large curved spine on outer distal margin; fore tarsus with segment 3 lobed, the lobe reaching nearly to centre of segment 5, segment 4 reduced (Fig. 172); hind coxa of ♀ flattened internally with a short basal groove; tarsal claws large, simple.

Fore wing with *cu-a* opposite base of *Rs&M*; *3r-m* present, areolet large, rhombic or with very short anterior side (Fig. 167); *2m-cu* sinuous with two bullae. Hind wing with distal abscissa of Cu_1 present, sometimes not joining to first abscissa of Cu_1, if joined, then first abscissa of Cu_1 is shorter than *cu-a*; basal cell slender; *Sc* with one or two hamuli.

Gaster quite long, cylindrical; tergite 1 with spiracles a little before centre; sternite 1 reaching to level of spiracles; laterotergites 2-4 membranous; last visible tergite not specialized. Ovipositor projecting beyond apex of gaster by 2.0-2.8 times length of hind tibia; upper valve with apex bearing blunt serrations, lower valve apically almost enclosing the upper with series of close, file-like teeth and a fine coriaceous patch just proximal to these teeth (Fig. 164).

Remarks. *Labena* is a very large genus with numerous species in the Neotropical region. Two species occur in the Nearctic region and a number are endemic to Australia and New Guinea. It is easily distinguished from other labenines by the smooth mesoscutum.

Australian species. *L. annulata* (Brullé) (E); *L. chadwickii* (Parrott) (E). I have seen three undescribed species (TC; WAM).

Host records. *L. chadwickii* - Buprestidae: *Ethon affine* L. & G. (Parrott, 1955*a*). *Labena* sp. - Curculionidae: *Orthorhinus* sp. (Chadwick & Nikitin, 1976). In the Western Australia Museum there is a series of an unidentified *Labena* species found associated with and ovipositing in timber infested by a cerambycid.

Tribe GROTEINI

This tribe is easily recognizable on account of the large, exposed clypeus. Most species have more than two hamuli on vein *Sc*. Groteines are all thought to be parasites of bees; larval development is completed on the pollen store. Three genera are known, but only one, *Labium*, occurs in Australia.

LABIUM Brullé
(Whole insect Fig. 156)

Labium Brullé, 1846: 316. Type-species: *Labium bicolor* Brullé, by monotypy.
Orthognathella Szépligeti, 1908 : 321. Type-species: *Orthognathella superba* Szépligeti, by monotypy.

Small to medium-sized ichneumonids, fore wing length 3-10 mm; clypeus broad, apically truncate or concave; labrum large, conspicuous (Fig. 161); mandible long, tapered with one or two apical teeth; malar space usually less than basal mandibular width. Occipital carina complete; eye with weak to moderate indentation opposite antennal socket. Antenna fairly short, stout, often slightly clavate (Fig. 53).

Mesoscutum polished, punctate; notauli weak or vestigial, notaular crest present or absent. Propodeum abruptly rounded, spiracle elliptical; carinae often complete and enclosing a large area superomedia; insertion of gaster slightly above that of hind coxae.

Fore tibia inflated and spinose, but apex not bearing a conspicuous long spine; tarsal claws simple, large (Fig. 52).

Fore wing with *cu-a* usually about opposite to *Rs&M*; 3*r-m* present, enclosing a large pentagonal areolet; 2*m-cu* with a single bulla, sinuous. Hind wing with distal abscissa of Cu_1 present or absent; basal cell broad; *Sc* bearing one to six hamuli.

Gaster quite stout, tergite 1 slender, evenly broadened posteriorly with spiracles behind the centre. Ovipositor short, depressed, not projecting beyond apex of gaster.

Remarks. A very large genus centred in Australia with a few species in New Guinea and the Neotropical region. Many species are very common in the drier and cooler parts of western and southern Australia. I have observed large numbers flying around banks where bees are nesting. Males can often be collected from flowers.

Turner & Waterston (1920) published an excellent revision of about 20 species but subsequent collecting has shown that there are large numbers of additional species, thus considerably reducing the usefulness of their keys. Whether each *Labium* species is associated with a different species of bee is not known, but this is suggested by the available host records.

Through the kindness of Dr T. Houston, I have been able to examine the final instar larva of *L. pilosum*. It is very much like that of *Grotea* (as figured by Short, 1978) except that the epistomal arch is incompletely sclerotized and the mandible is long, slender and apparently simple (I could not determine if an internal basal tooth is present).

Australian species. *L. approximatum* Turner & Waterston (E); *L. associatum* Turner & Waterston (E); *L. bivittatum* Turner & Waterston (E); *L. brevicorne* Turner & Waterston (E); *L. centrale* Turner & Waterston (E); *L. clavicorne* Morley (E); *L. ferrugineum* Cameron (E); *L. fulvicorne* Turner & Waterston (E); *L. gracile* Rayment (E); *L. hobartense* Turner & Waterston (E); *L. inflexum* (Morley) (E); *L. longiceps* (Cameron) (E); *L. longicorne* Turner & Waterston (E); *L. montivagum* Turner & Waterston (E); *L. multiarticulatum* Turner & Waterston (E); *L. occidentale* Turner & Waterston (E); *L. petitorium* (Erichson) (E); *L. pilosum* Turner & Waterston (E); *L. raymenti* Cushman (E); *L. rufiscutum* Cushman (E); *L. sculpturatum* Turner & Waterston (E); *L. spiniferum* Turner & Waterston (E); *L. subaequale* Turner & Waterston (E); *L. subpilosulum* Turner & Waterston (E); *L. superbum* (Szépligeti) (E); *L. variegator* (Erichson) (E); *L. vasseanum* Turner & Waterston (E); *L. walkeri* Turner & Waterston (E). I have seen many additional undescribed species and tentatively suggest there may be about 50 species in Australia.

Host records. *L. gracile* - Halictidae: *Homalictus raymenti* (Cockerell) (Rayment, 1935). *L. pilosum* - Halictidae: *Lasioglossum lanarium* (Smith) (Houston, 1965). *L. raymenti* - Halictidae: *Lasioglossum victoriellum* (Cockerell) (Rayment, 1935). *L. rufiscutum* - Halictidae: *Lasioglossum seductum* (Cockerell) (Rayment, 1935).

Tribe POECILOCRYPTINI

A relatively small tribe characterized by the lack of occipital carina and presence of a single bulla in *2m-cu*. It is restricted to Australia and contains three genera. Townes (1969) included this tribe within the Brachycyrtini but the two are biologically quite distinct (Gauld, 1983*a*).

ALAOTHYRIS gen. n.

Genus A Gauld, 1983*a*: 169.
Type-species: *Alaothyris elongissimus* sp. n.

Medium-sized species, fore wing length 6 mm; clypeus small, flat, truncate; labrum moderately large, exposed; mandible quite short, tapered, twisted about 20°, almost evenly bidentate; malar space slightly less than basal mandibular width. Occipital carina absent on dorsal part of head, ventrally joining hypostomal carina above base of mandible. Antenna long, not tapered.

Mesoscutum polished, almost smooth; notaulus deep on anterior 0.2 of scutum, notaular crest occluding extreme anterior end; scutellum weakly convex, not laterally carinate. Propodeum long, evenly rounded without carinae dorsally (Fig. 70); propodeal spiracles circular; gaster inserted at end of short propodeal neck, above and far behind hind coxal insertion.

Fore tibia with a small tooth on outer side; mid and hind coxae very elongate; tarsal claws simple.

Fore wing with *cu-a* proximal to base of *Rs&M*; 3*r-m* absent; *Rs* and *M* fused to obliterate areolet and 2*r-m*; 2*m-cu* with a single bulla (Fig. 166). Hind wing with distal abscissa of Cu_1 absent; basal cell slender; *Sc* bearing one hamulus.

Gaster very long and slender, laterally compressed; tergite 1 slender, with spiracles a little behind centre; sternite 1 reaching far behind level of spiracles; tergites 2-3 with laterotergites folded under. Ovipositor very long and slender, projecting beyond apex of gaster by more than 6.0 times length of hind tibia; apex cylindrical.

Etymology. *Alaos* (blind) + *thyris* (a window) referring to the occluded areolet. Masculine.

Remarks. A very distinctive genus easily recognized by its slender facies and characteristic venation. The systematic position of this genus is questionable. The mandible and elongate structure suggest a relationship with the Labenini, but the position of the petiolar spiracle, venation and shape of propodeum suggest that it is perhaps more closely related to the Poecilocryptini, especially *Poecilocryptus*. Unlike the Labenini, *Alaothyris* does not have fine, file-like teeth on the ovipositor apex.

Australian species. One, described below.

Alaothyris elongissimus

Lower face slightly elongate, with a pronounced central tubercle; eye surface finely pubescent; ocelli arranged in an equilateral triangle; flagellum with about 28 segments. Mesoscutum polished, impunctate; mesopleuron and metapleuron similarly smooth, epicnemial carina dorsally obsolescent; submetapleural carina broad anteriorly. Gaster highly polished.

Predominantly orange brown species with flagellum, hind legs and gaster darker brown. Wings hyaline, pterostigma brown.

Material examind

Holotype ♀, Queensland: Yarraman, vii.1969 *(Heather)* (ANIC).

Paratype. Queensland: 1 ♂, Yarraman, vii.1969 *(Heather)* (ANIC).

Host records. The holotype and paratypes emerged from the seeds of *Araucaria cunninghami*. What their host was is not known. Probably it will be found to be some seed-feeding beetle but the possibility (given the semi-phytophagous tendencies of some labiines) that this is partially a seed-feeding ichneumonid cannot be ruled out.

POECILOCRYPTUS Cameron

Poecilocryptus Cameron, 1901*d*: 527. Type-species: *Poecilocryptus nigromaculatus* Cameron, by monotypy.

Poecilopimpla Morley, 1914: 35, 36. [Unnecessary replacement name for *Poecilocryptus* Cameron.] [Homonym of *Poecilopimpla* Cameron, 1903*a*.]

Medium-sized species, fore wing length 6-10 mm; clypeus rather small, apically very thin, truncate; labrum small, exposed; mandible short, slightly twisted, strongly narrowed, bidentate; malar space shorter than basal mandibular width. Occipital carina dorsally absent; eye with a weak indentation opposite antennal socket. Antenna moderately long, clavate.

Mesoscutum polished, virtually impunctate; notauli deep on anterior 0.2 of scutum, notaular crests strong. Propodeum abruptly rounded with spiracle oval (Fig. 157); area superomedia large, quadrate, often confluent with area petiolaris; area externa not usually defined laterally; gaster inserted well above level of hind coxae.

Fore tibia simple, its apex not bearing a long spine; tarsal claws large, basally lobate.

Fore wing with *cu-a* slightly proximal to base of *Rs&M*; 3*r-m* complete, enclosing a large, transverse pentagonal areolet; 2*m-cu* with a single bulla, straight but inclivous. Hind wing with distal abscissa of Cu_1 absent; basal cell not exceptionally broad; *Sc* bearing about two hamuli.

Gaster long, quite slender; tergite 1 slender, evenly broadened posteriorly with spiracles at or slightly behind the centre, sternite reaching to spiracles, that of ♀ bearing a pair of knob-like protuberances near anterior end. Ovipositor moderately long, projecting beyond apex of gaster by 2.8-3.3 times length of hind tibia, its apex cylindrical, with lower valve partially enclosing the upper, with an indistinct matt area laterally, the upper valve with weak dorsal teeth (Fig. 165).

Remarks. *Poecilocryptus* is an endemic Australian genus. Until the advent of Townes' (1969) reclassification there was considerable confusion between the names *Poecilocryptus* and *Poecilopimpla*. Cameron (1901*d*) originally described this genus as *Poecilocryptus*. In the same year, but four months later Kriechbaumer described a Neotropical mesostenine as *Poecilocryptus*. Morley (1914) thought the Kriechbaumer name had priority and proposed a replacement name, *Poecilopimpla*, for *Poecilocryptus* Cameron, overlooking the fact that Cameron (1903*a*) had described a pimpline genus *Poecilopimpla*. Morley's name is both a junior homonym and an unnecessary replacement name.

Species of this genus are widely distributed throughout Australia and seem to be associated with galls on trees of the genera *Eucalyptus* and *Acacia*. Parrott (1954*b*) provides a key to the described species.

Australian species. *P. nigripectus* Turner & Waterston (E); *P. nigromaculatus* Cameron (E); *P. stramineus* (Morley) (E). I have seen two undescribed species (ANIC; TC).

Host records. *P. nigripectus* - Anthribidae: ex 'Anthribid gall' (BMNH). *P. stramineus* - Pteromalidae: ex *Trichilogaster* galls on *Acacia* (ANIC). *Poecilocryptus* sp. - Eriococcidae: ex gall of *Apiomorpha conica* Froggatt (Chadwick & Nikitin, 1976).

URANCYLA gen. n.

Genus U, Gauld, 1983*a*: 169.
Type-species: *Urancyla fulva* sp. n.

Medium-sized species; fore wing length 6 mm; clypeus flat, small, apically truncate with margin thin; mandible strongly tapered, twisted and with upper tooth slightly the longer; malar space shorter than basal mandibular width. Occipital carina absent dorsally, ventrally joining hypostomal carina well above base of mandible. Antenna long, neither tapered nor clavate distally.

Mesoscutum polished, punctate; notaulus present near front margin, with a small crest occluding extreme end; scutellum flat without lateral carinae. Propodeum evenly rounded (Fig. 158), with vestiges of carinae though areae superomedia and petiolaris are not defined; gaster inserted low on propodeum, near level of hind coxae.

Fore tibia with a small tooth on outer side, femur with a weak longitudinal ventral furrow; tarsal claws of ♀ with a basal lobe.

Fore wing with *cu-a* subopposite *Rs&M*; 3*r-m* present, weakly pigmented, enclosing a small pentagonal areolet; 2*m-cu* with a single bulla (Fig. 171). Hind wing with distal abscissa of Cu_1 present; first abscissa of Cu_1 shorter than *cu-a*; basal cell moderately broad; *Sc* bearing one hamulus.

Gaster moderately long, tergite 1 slender with spiracle slightly behind centre; tergites 2 and 3 with pendant laterotergites which are almost membranous. Ovipositor about as long as gaster, evenly decurved, apex simply acute with inconspicuous teeth and indistinct matt area laterally.

Male unknown.

Etymology. *Oura* (tail) + *ankylos* (bent) referring to the decurved ovipositor. Feminine.

Remarks. In Townes' (1969) key to Labiinae this genus runs to the tribe Clasini but it does not appear to be related to the genera in this group. Clasines have a nodus on the ovipositor apex, long, simple claws and two bullae in *2m-cu*. They also have no trace of a notaular crest. The basally lobate claws, twisted mandible and single bulla in *2m-cu* are characters that *Urancyla* shares with *Poecilocryptus* and the two genera appear to be closely related.

Australian species. One, described below.

Urancyla fulva sp. n.

Lower face elongate, regularly punctate; frons polished and finely punctate; ocelli arranged in an equilateral triangle. Flagellum with 30 segments. Mesoscutum polished, regularly and finely punctate; mesopleuron highly polished, smooth, almost impunctate; metapleuron polished with scattered fine punctures; submetapleural carina moderately wide, evenly tapered anteriorly. Gaster highly polished, finely punctate.

Predominantly orange brown species; face, upper orbits, genae, propleuron, anterior margin of pronotum, diagonal stripe across mesopleuron, fore coxae and trochanters and a stripe on the mid coxae pale yellowish; flagellum, except centrally, scape and pedicel, frons centrally, vertex, interocellar area, occiput, mesoscutum and ovipositor sheath black; central flagellar segments white. Wings subhyaline; pterostigma black.

Material examined
Holotype ♀, Queensland: Brisbane, xi.1972 *(Sedlacek)* (TC).

Host records. None.

Tribe BRACHYCYRTINI

Small insects, generally with matt, granulate body structure. Brachycyrtines resemble small phygadeuontines but can be recognized by the differences in venation. As far as is known, brachycyrtines are parasites in small cocoons and spider egg sacs. Oviposition is through silk rather than plant tissue. Five genera are known, three of which occur in Australia.

ADELPHION Townes*

Adelphion Townes, 1969: 204. Type-species: *Adelphion pallibasis* Townes, by original designation.

Small species, fore wing length 2-4 mm; clypeus small, convex, margin rounded; labrum concealed; mandible evenly narrowed, almost evenly bidentate; malar space longer than basal mandibular width. Occipital carina complete; eye not indented opposite antennal socket (Fig. 173).

Mesoscutum polished to granulate, notauli weak, discernible on anterior 0.1 of scutum, notaular crest vestigial. Propodeum abruptly rounded (Fig. 160), spiracle small, circular; propodeal carinae more or less complete; area superomedia hexagonal, area petiolaris long; gaster inserted close to level of hind coxae.

Fore tibia simple; tarsal claws very small, simple or with trace of pectination at base.

Fore wing with *cu-a* opposite base of *Rs&M*; *3r-m* present enclosing a rhombic areolet; *2m-cu* bowed, with two widely interspaced bullae (Fig. 169). Hind wing with distal abscissa of Cu_1 absent; basal cell moderately slender; *Sc* bearing one or two hamuli.

Gaster moderately short; tergite 1 slender, slightly broadened posteriorly, with spiracles well behind centre; sternite 1 reaching behind level of spiracles. Ovipositor straight, projecting beyond apex of gaster by 0.6-1.0 times length of hind tibia, its apex sharp, slightly compressed, sometimes with a distinct nodus.

Remarks. A moderately small genus centred in Australia, with two species occurring in New Guinea. *Adelphion* is a rather difficult genus to recognize and is very like some small phygadeuontines except that the areolet is rhombic and the clypeus small and convex. Structurally it is quite similar to *Brachycyrtus* though it is easily distinguished by the venation.

Australian species. Six, all undescribed (ANIC; BMNH; TC).

Host records. *Adelphion* sp. 4 - Araneidae: ex egg sac *Dichrostichus magnificus* Rb. (Chadwick & Nikitin, 1976).

BRACHYCYRTUS Kriechbaumer

Brachycyrtus Kriechbaumer, 1880: 161. Type-species: *Brachycyrtus ornatus* Kriechbaumer, by monotypy.
Proterocryptus Ashmead, 1906*a*: 174. Type-species: *Proterocryptus nawaii* Ashmead, by monotypy.
Xanthocharops Morley, 1912*b*: 173. Type-species: *Xanthocharops primus* Morley, by monotypy.
Vakau Cheesman, 1928: 189. Type-species: *Vakau taitensis* Cheesman, by original designation.
Brachycyrtomorpha Kreibohm de la Vega, 1940: 170. Type-species: *Brachycyrtomorpha crossi* Kreibohm de la Vega, by monotypy.

Small-sized insects, fore wing length 3-5 mm; clypeus small, flat, apically rounded; labrum small, slightly exposed; mandible short, evenly tapered, subequally bidentate; malar space slightly longer than basal mandibular width. Occipital carina complete; eye strongly indented opposite base of antenna (Fig. 174). Antenna slightly clavate.

Mesoscutum polished, punctate; notaulus vestigial; notaular crest (in Australian species) absent. Propodeum very abruptly declivous, spiracle circular; area superomedia confluent with area petiolaris; gaster inserted low down on propodeum.

Fore tibia unspecialized; claws simple.

Fore wing with *cu-a* well distal to base of *Rs&M*; *3r-m* absent; *2m-cu* with two bullae (Fig. 168). Hind wing with distal abscissa of Cu_1 obsolescent, represented by a basal stub; first abscissa of Cu_1 shorter than *cu-a*; basal cell very broad (Fig. 65); *Sc* with one hamulus.

Gaster quite slender, slightly laterally compressed; tergite 1 slender, with spiracles well behind centre; sternite 1 reaching beyond level of spiracles; tergites 2-4 with laterotergites pendant, membranous. Ovipositor projecting beyond apex of gaster by 1.0-1.1 times length of hind tibia, its apex abruptly pointed with indistinct teeth on lower valve.

Remarks. A cosmopolitan genus with one or two species in most regions but most diverse in the Neotropics. Townes (1969) treated *Habryllia* as a subgenus of *Brachycyrtus* but the differences in the structure of the mesonotum seem to warrant the retention of *Habryllia* as a separate genus.

Brachycyrtus is easily recognized by its characteristic venation. Most species are yellow and black. The South East Asian species were recently revised by Walkley (1956*a*) who recognized one Australian species.

Australian species. *B. australis* Roman (E). I have seen two undescribed species (BMNH).

Host records. *Brachycyrtus* sp. A - Chrysopidae (BMNH).

MONGANELLA gen. n.

Type-species: *Monganella variegata* sp. n.

Small species, fore wing length 3 mm; clypeus small, convex, margin rounded; labrum concealed; mandible evenly narrowed, almost equally bidentate; malar space 1.2 times length of basal mandibular width. Occipital carina complete; eye not strongly indented opposite antennal socket. Antenna relatively slender.

Mesoscutum deplanate, granulate; notauli weak, discernible on anterior 0.2 of scutum, notaular crest weak. Propodeum long, evenly rounded (Fig. 159), spiracle small, circular; anterior and posterior transverse carinae almost complete, lateromedian carinae complete only anteriorly; gaster inserted low on propodeum.

Fore tibia unspecialized; claws simple.

Fore wing with *cu-a* slightly distal to base of *Rs&M*; *3r-m* present, enclosing a pentagonal areolet; *2m-cu* bowed, with two widely interspaced bullae (Fig. 170). Hind wing with distal abscissa of Cu_1 absent; basal cell slender; *Sc* bearing one hamulus.

Gaster quite long; tergite 1 subcylindrical, evenly broadened posteriorly, with spiracles near centre; sternite 1 reaching behind level of spiracles. Ovipositor straight, projecting beyond apex of gaster by 0.8 times length of hind tibia, laterally compressed with a distinct nodus.

Etymology. Derived from type-locality, Monga, N.S.W. Feminine.

Remarks. This genus was not available for study when the phylogeny of labenines was recently examined (Gauld, 1983*a*). However, it fits remarkably well, and clearly belongs to the brachycyrtine lineage with which it agrees in all characters except for the position of the petiolar spiracles. The placing of these spiracles in *Monganella* is probably a reversal of character-states, for the form of the first segment does not correspond to the plesiomorphous labenine condition with the spiracles near the centre and the sternite very short. In *Monganella* the sternite is very long, similar to other brachycyrtines. This genus is probably the sister-group of *Adelphion*. Both have the distal abscissa of Cu_{1a} very short, have *2m-cu* strongly bowed and have similar granulate sculpture. These three apomorphies separate *Monganella* and *Adelphion* from *Pedunculus*. All these three genera have a characteristic groove and fringe of close hairs on the hind tibial apex.

Australian species. One, described below.

Monganella variegata sp. n.

Head almost spherical, lower face transverse, matt; ocelli small, grouped in a close equilateral triangle, the hind ones separated from eyes by about 2.0 times their own diameter. Flagellum slender with 28 segments. Alitrunk long, cylindrical, dorsally deplanate; meso- and metapleuron granulate, weakly polished; submetapleural carina very narrow. Gaster granulate, weakly polished.

Yellowish, dorsally slightly darker; back of head, upper pronotum, mesoscutum centrally, upper mesopleuron, lower metapleuron and propodeum, tergite 1 laterally, tergites 2-3 laterally excluding hind edge, and tergites 4+ almost entirely, except for hind margins, blackish; flagellum distally brownish. Legs whitish, tarsi distally infuscate; hind coxa distally, and tibia both proximally and distally, blackish. Wings hyaline, pterostigma dark brown.

Male similar to female but with gonosquamae large, whitish.

Material examined

Holotype ♀, New South Wales: 2 km N by E Monga, xi.1981 *(Naumann & Cardale)* (ANIC).

Paratypes. New South Wales: 1 ♂, same data as holotype (ANIC); 1 ♀, same data as holotype *(Gauld)* (BMNH).

Host records. None.

SUBFAMILY PHYGADEUONTINAE

(= Gelinae sensu Townes; = Cryptinae sensu earlier authors and Carlson, 1979)

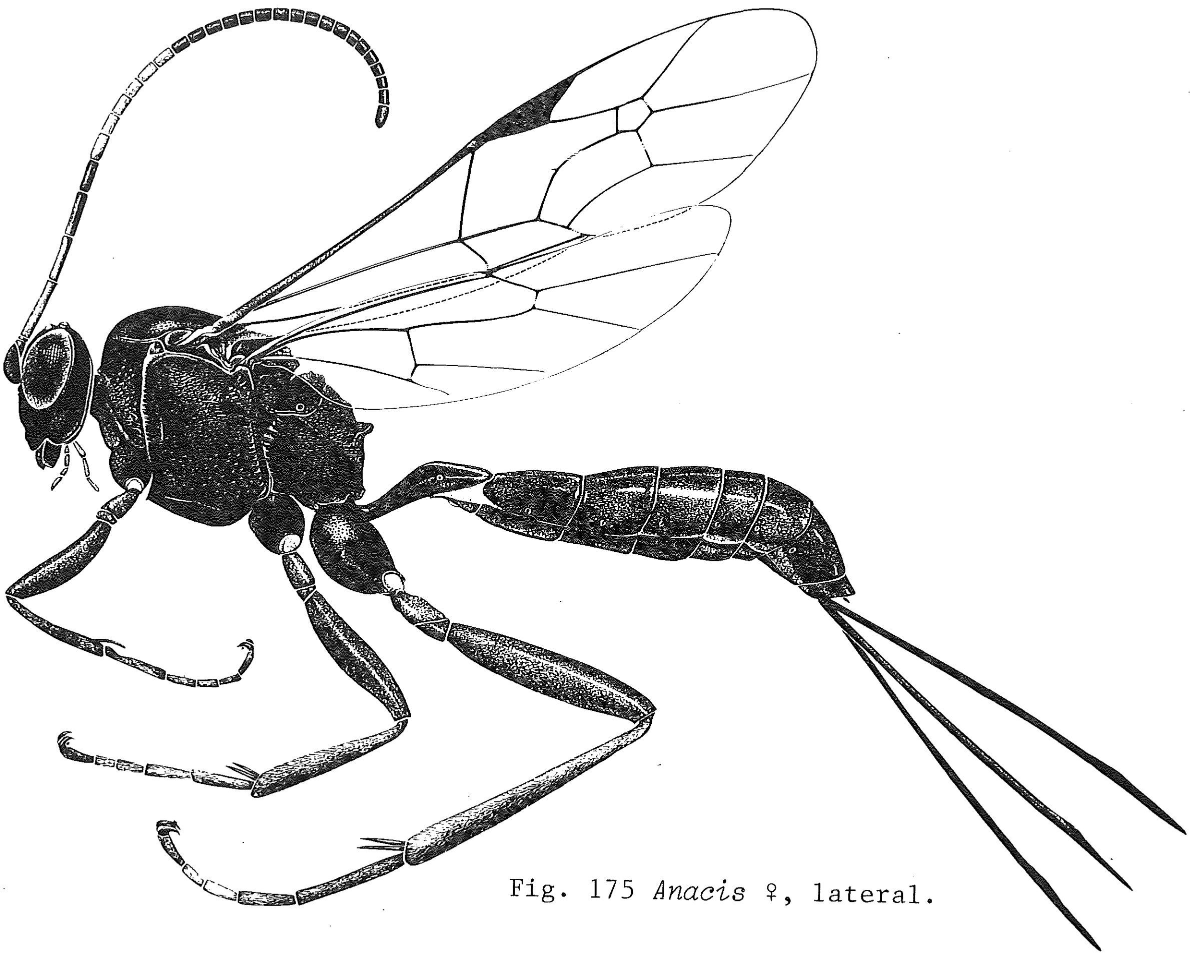


Fig. 175 *Anacis* ♀, lateral.

The Phygadeuontinae is the largest subfamily of Ichneumonidae with over 300 genera worldwide. Phygadeuontines occur in almost all kinds of habitats from the Arctic tundra to tropical rain forests and semi-deserts. In cold regions female brachyptery and aptery is common and some species even have apterous or brachypterous males (Salt, 1952). In almost all areas male phygadeountines are amongst the most frequently collected ichneumonids. Many are brightly coloured and, as they have a dancing flight in open spaces or over low bushes, they are very conspicuous insects. The females are often less frequently collected as they spend a great deal of time searching for hosts on the ground, in leaf litter or deep in tangles of vegetation. Those with bright colour patterns are often easily seen but difficult to net.

Despite their size and relative conspicuousness the phygadeuontines are a comparatively poorly studied group. This is partly because of the sheer size of the subfamily. Many genera look superficially similar; for example, possibly as many as 100 tropical genera contain black and white striped species, many of which may be collected together along forest paths. Phygadeuontines exhibit a confusing array of differences and similarities making supergeneric classification difficult and often contentious. Usually the 'generic characters' are obvious in any individual species, making generic identification easy if one has a reference collection, but the phylogenetic interrelationships of the genera are obscure and one genus may appear to be morphologically far more similar to a very distantly related genus than it is to neighbouring genera. The small phygadeuontines are relatively poorly known and superspecific classification, particularly of tropical species of the *Chirotica/Paraphylax* complex, is far from satisfactory.

All three tribes of Phygadeuontinae, Phygadeuontini, Hemigasterini and

Mesostenini, are represented in Australia. The former includes 18 genera, eight of which are described as new. The Mesostenini has 36 genera in Australia, 10 of which are new, and the Hemigasterini, a smaller and predominantly Holarctic group, is represented by two genera.

DIAGNOSIS

Small to large insects, fore wing length 3-20 mm. Clypeus separated from face by a groove, usually convex with margin thin, evenly arcuate, or with a tooth or pair of teeth, rarely truncate or even concave, but never with a median notch; mandible from short and stout to long and slender, usually bidentate, sometimes with lower or upper tooth vestigial. Male flagellum usually with tyloids; female flagellum often very slightly clavate, flattened apico-ventrally, sometimes with a median white band. Sternaulus frequently strongly impressed; posterior transverse carina of mesosternum usually incomplete, less commonly complete; propodeum from completely carinate to without carinae, sometimes with apophyses strong and even horn-like. Apical edge of fore tibia without a tooth on outer margin; tarsal claws usually simple, or if very rarely pectinate, then only so near base. Fore wing with *3r-m* present or absent, if present then areolet is pentagonal, quadrate or wedge-shaped, never rhombic or petiolate above; hind wing almost always with distal abscissa of Cu_1 present; some taxa apterous. Gaster with tergite 1 from evenly broadened posteriorly, to long and slender, sometimes abruptly broadened posteriorly; spiracles usually behind the centre, very rarely at or even slightly before the centre; sternite 1 usually reaching to centre of tergite; tergite 1 always narrowly attached to propodeum, glymma never present. Tergites 2-4 usually slightly dorsoventrally depressed, usually evenly punctate, alutaceous or smooth, very rarely with strong impressed grooves or tubercles; ovipositor generally projecting well beyond apex of gaster, without a dorsal subapical notch, often with strong teeth on the lower valve.

Despite the fact that it is difficult to write a succinct diagnosis of the subfamily without incorporating many 'ors' and 'buts' the Phygadeuontinae is a relatively easily recognized group. A few Ichneumoninae may be confused with phygadeuontines (especially in Australia) but these have rigid ovipositor sheaths quite unlike the flexible ones of phygadeuontines. The face and clypeus of Ichneumoninae are flattened and very broad, they almost never have a distinct sternaulus and always have *3r-m* present in the fore wing. Some of the smaller phygadeuontines (e.g. *Aclastus*) may be mistaken for Oxytorinae. Provision for these has been made in the oxytorine key.

CLASSIFICATION

The Phygadeuontinae is one of the oldest and most stable of subfamilies. It was one of the five original subfamilies of early authors (e.g. Morley, 1907), and unlike most of the other classical subfamilies, its limits have hardly changed since the early nineteenth century, except that the group has expanded to incorporate the numerous tropical genera. Until the middle of the twentieth century the group was called Cryptinae, a name based on the genus *Cryptus* Fabricius. It was discovered that *Cryptus* Fabricius, 1804 is a junior homonym of *Cryptus* Jurine, 1801 (a sawfly taxon to which the name has never been applied for over a century). To try to retain the usage of *Cryptus* in the established sense the International Commission on Zoological Nomenclature issued their contentious Opinion 157 (1945) in which *Cryptus* Fabricius was placed on the Official List of Generic Names in Zoology. It was hoped that this, and the Commission's earlier action (Opinion 135, 1939) of suppressing the 'Erlangen List' which included *Cryptus* Jurine, would ensure the continued usage of *Cryptus* and Cryptinae in the Ichneumonidae. Some modern authors argue for the maintenance of these names (e.g. Carlson, 1979) but Townes, in his influential '*Genera of Ichneumonidae*' refused to accept these rulings (1969: 15-20). Townes formed his supergeneric names from the oldest included genus, and as he considers *Cryptus* a sawfly, he calls the Cryptinae of classical authors Gelinae.

Fitton & Gauld (1976) could not accept Townes' nomenclature and pointed out that family-group names have their own date and authorship and compete for priority in the normal way. Although these authors accept the rulings of the International Commission, they point out that the Commission blundered in overlooking *Cryptus* Panzer, 1804, a name which predates *Cryptus* Fabricius. As *Cryptus* Panzer is an argid sawfly (although the name has not since been used) the name *Cryptus* cannot be used in the Ichneumonidae. Under Article 39, a family-group name based on a junior homonym is invalid, thus Cryptinae Kirby, 1837 is an invalid name. The next available name for this taxon is one of four, Hemiteloidae, Pezomachoidae, Phygadeuontoidae and Stilpnoidae, proposed by Foerster (1869). Fitton & Gauld (1976) chose Hemitelinae. In a later paper these authors (1978) pointed out an error in their earlier work in overlooking that Morley (1907) had made a first reviser choice in placing Hemitelini as a subtribe of his Phygadeuonides. As Morley also included Pezomachoides as a subgroup of this subtribe he determined the relative priorities of the names Phygadeuontinae, Hemitelinae and Pezomachinae. Fitton & Gauld then selected Phygadeuontinae as the most suitable name (from the two available) for the subfamily.

Currently the majority of authors subdivide the Phygadeuontinae into three tribes, Phygadeuontini (= Gelini sensu Townes), Hemigasterini (= Echthrini sensu Townes) and Mesostenini. Many Indian authors (e.g. Jonathan & Gupta, 1973) treat Mesostenini as a distinct subfamily solely on account of its size. Because of the obvious close relationship between the three tribes no other author has accepted this elevation of status.

Townes (1970*a*) divided the Phygadeuontini into 14 subtribes and the Mesostenini into 15. Several of these subtribes (e.g. Chiroticina, Endaseina, Osprynchotina and Gabuniina) are almost certainly holophyletic groups, but many of the others are ill-defined groupings or even polyphyletic assemblages (e.g. Baryceratina). Some of these groupings merely serve to obscure true phylogenetic affinities, and as they are often not particularly distinctive morphologically I have not adopted them in this work. Where relevant, I have indicated in the remarks section the subtribe to which a particular taxon belongs. Persons intending any detailed study of this group are strongly advised to study Townes' groupings (1970*a*) in detail.

DISTRIBUTION

The three tribes show rather different distribution patterns. Both the Phygadeuontini and the Hemigasterini are predominantly Holarctic taxa whilst the Mesostenini is most diverse in the tropics. Of the Phygadeuontini, the *Chirotica* complex of genera is best represented in the tropics and the southern subtropics. The very large north temperate genera such as *Mastrus*, *Phygadeuon*, *Bathythrix*, *Stilpnus* and *Gelis*, together with a large complex of their related genera, are virtually absent in the tropics and south of the Equator.

In Australia, the genera of Phygadeuontinae can be divided into four distributional types. Only one or two genera (e.g. *Ischnus*) cannot be assigned to one of these patterns, and this is probably due to under-collecting in other parts of the world. These patterns are as follows.

1. Tropical intrusive. Many genera of Mesostenini which are well represented in New Guinea or the Oriental region have one or two Australian representatives. Most of these are restricted to tropical Queensland (e.g. *Stenarella*, *Thelodon*, *Goryphus* and *Mansa*).

2. Trans-Antarctic. A few genera are represented in both southern South America and Australia. Most species of these genera in Australia occur in Tasmania or in the cooler parts of the south (e.g. *Meringops*, *Anacis*).

3. Widespread Old World genera with a pronounced radiation in Australia. Several of these genera contain more Australian species than there are in the rest of the world. Species of such genera tend to be widely distributed throughout Australia

(e.g. *Myrmeleonostenus*, *Paraphylax*). Certain endemic Australian genera which are related to cosmopolitan genera can also be considered part of an Australian radiation (e.g. *Amblyaclastus*, *Glyphaclastus*, *Paranacis*).

4. Endemic Australian. There are a number of distinct Australian genera. Several of these have a very few representatives in New Guinea. Species of these genera are widely distributed throughout Australia (e.g. *Xanthocryptus*, *Stiromesostenus*).

Two genera which do not seem to fit any of these patterns are *Gambroides* and *Xenolytus*. The former is an African genus with one or two species in the dry areas of the Indo-Australian region (a circum Indian Ocean distribution). *Xenolytus* is a Holarctic genus with one cosmopolitan species associated with synanthropic insects. *Gelis* was introduced into Tasmania.

BIOLOGY

Despite the large diversity of size and structure, species of this subfamily exhibit a rather uniform biology (cf. Salt, 1931; Ahmad & Mathur, 1945). Almost all are ectoparasites of endopterygote pupae, prepupae or, less often, larvae. Many are solitary but a number are known to be gregarious (Kugler & Wollberg, 1967). The most common hosts are Lepidoptera and, in north temperate regions, Symphyta, but species of many other orders may also serve as hosts. Hemerobiidae and Chrysopidae are parasitized by *Dichrogaster*, Myrmeleontidae by *Myrmeleonostenus*, Pompilidae, Sphecidae and solitary Vespidae are parasitized by *Nemapodius*, *Stenarella* and related genera, and social Vespidae by *Sphecophaga* and *Arthula*. Ichneumonid and braconid cocoons serve as hosts for a wide range of species including *Acrolyta*, *Isdromus* and related genera. Amongst the Coleoptera, Cerambycidae, Buprestidae and probably other wood-boring beetles are attacked by *Echthrus*, *Helcostizus* and several other genera. Cocoons of Gyrinidae are parasitized by *Oecotelma* and *Pleurogyrus*. *Ethelurgus* and *Rhembobius* attack Syrphidae and other cyclorrhaphous dipteran puparia are parasitized by *Stilpnus*, *Phygadeuon* and related genera. *Aritranis* species are unusual in that a single parasite develops at the expense of several hosts. Species of this genus attack stem-nesting ceratine bees. The ichneumonid larva devours the first bee larva then breaks into a second cell attacking another bee, destroying five or more cells in succession (Daly, 1983). *Hemiteles*, *Trychosis* and some species of *Gelis* attack spider egg sacs and *Obisiphaga* parasitizes the egg sacs of pseudoscorpions.

Many of the species that attack lepidopterous or symphytan cocoons can develop equally well as a primary or secondary parasite. For example, *Theroscopus hemipterus* was recorded both as a parasite of *Cephus* and *Microbracon* (a primary parasite of *Cephus*) (Salt, 1931).

Host searching is usually undertaken on foot and females may be seen running over leaves and investigating prospective hosts with their antennae. Despite their relative abundance, the life histories of comparatively few species have been investigated thoroughly, but of those known, *T. hemipterus*, as studied by Salt (1931) and Rosenberg (1934), serves as a typical example. After examining the host cocoon with her antennae the female ichneumonid probes a few times with her ovipositor. The host is then stung to a state of paralysis and a cylindrical egg is placed externally on the host within the cocoon. Within a day or two the egg hatches and the fusiform first instar larva begins to feed. Subsequent larval stages are similar in shape and there appears to be five short and approximately equal larval instars. The ichneumonid pupates within the host cocoon. Short (1978) reviews the structure of the head capsule of final instar larvae. Most are relatively strongly sclerotized with an incomplete or weak epistomal arch, well developed hypostomal spurs and long mandibles which meet or overlap centrally. Generally the mandibular blade bears minute auxillary teeth. The labial sclerite is U-shaped and generally strongly sclerotized (Fig. 300).

Phygadeuontinae, like other ectoparasites, have a great range of specialized ovipositor tips, and several types can be correlated with a particular biology.

Many species (e.g. *Ceratomansa*, *Mansa*) have pronounced teeth on the upper and lower valves which together form a 'corkscrew-like' structure. This is used to penetrate the hard cocoons of Limacodidae. A number of other species (e.g. some *Aptesis*, *Tryonocryptus*) have a blunt upper valve. This type of ovipositor is used to penetrate loose fibrous masses surrounding some symphytan and saturniid cocoons. One species of the Neotropical genus *Dotocryptus*, which attacks mud-nesting aculeates, penetrates the hard wall of the host cell with the aid of a fluid secreted via its ovipositor (Janvier, 1933).

KEY TO TRIBES OF PHYGADEUONTINAE

As currently recognized (Townes, 1970*a*) the tribes are polythetic groups and consequently impossible to characterize by any very simple combination of characters (Gauld & Mound, 1982). The key given below is quite long, but I have attempted to use only the more obvious features. Some characters, such as the metanotal tooth which is widely used by Townes (1970*a*), are often difficult to see and easily confused with other structures, even by experienced workers.

1 Wings absent, or if present then fore wing with two bullae in vein *2m-cu* (Figs 177-179)......................PHYGADEUONTINI (in part) (p. 104)
\- Wings invariably present, the fore wing with one bulla in vein *2m-cu* (Figs 176, 235-237)..2

2 Areolet very large, distance along front edge about 1.4 times length of Cu_1 between *cu-a* and *1m-cu* (Fig. 214)....HEMIGASTERINI (in part) (p. 131)
\- Areolet large to small or incomplete, if present then distance along front edge is less than length of Cu_1 between *cu-a* and *1m-cu* (Figs 176, 213, 235)..3

3 Tergites 2 and 3 fused to form a convex carapace, tergites 4+ more or less retracted beneath this carapace (Fig. 215).....................
....HEMIGASTERINI (in part) (p. 131)
\- Tergites 2 and 3 not fused together, tergites 4 and 5 not retracted.........4

4 Posterior transverse carina of mesosternum complete..........................5
\- Posterior transverse carina of mesosternum incomplete in front of mid coxae..6

5 Fore wing with *3r-m* weak but discernible, areolet much wider than it is high (Fig. 218).........................MESOSTENINI (in part) (p. 133)
\- Fore wing with *3r-m* absent or if discernible then areolet is as high as wide or higher (Fig. 176)..............PHYGADEUONTINI (in part) (p. 104)

6 Mandible twisted 80-90° (Fig. 183); hind wing with distal abscissa of Cu_1 entirely absent, not even discernible as a basal stub...........
....PHYGADEUONTINI (in part) (p. 104)
\- Mandible not or only slightly twisted (Fig. 185); hind wing with distal abscissa of Cu_1 present at least as a stub at junction of Cu_1 and *cu-a*..7

7 Apical truncation of scape about 10° from horizontal (Fig. 203); vertex of female with very long pubescence....PHYGADEUONTINI (in part) (p. 104)
\- Apical truncation of scape about 40° or more from horizontal (Fig. 202); vertex with short pubescence..8

8 Small insects, fore wing length 3-4 mm; head and alitrunk unicolorous blackish................................PHYGADEUONTINI (in part) (p. 104)
\- Large to medium-sized insects, or if small (with fore wing length 3-5 mm) then head and alitrunk not unicolorous blackish; colour of head and alitrunk otherwise various, usually strikingly patterned, only in a few larger species unicolorous blackish................
....MESOSTENINI (most) (p. 133)

Tribe PHYGADEUONTINI
(= Gelini sensu Townes)

This large tribe contains, world-wide, about 100 genera which are arranged by Townes (1970*a*) in 14 subtribes. The majority of phygadeuontines are small insects with two bullae in *2m-cu*. However, a number of species have only a single bulla, but these generally have the fore wing length less than 5 mm and are uniformly blackish. A few phygadeuontines are large and strikingly patterned insects but these always have two bullae in *2m-cu*. In most phygadeuontines the postero-distal corner of the second discal cell is less than 90°. The sternaulus, when complete, reaches the hind edge of the mesopleuron a little above the lower hind corner. The propodeum is frequently almost completely areolated, and if the carinae are reduced the posterior transverse carina is often strong whilst the anterior one is obsolescent.

The hosts of Phygadeuontini are more diverse than either of the other two tribes and include not only contents of cocoons of most endopterygote orders, but also the egg sacs of some arachnids. A number of Phygadeuontini are hyperparasitic. Aptery is known in several genera. The generic classification of this tribe is one of the most unsatisfactory in the family. Although a number of genera have been understood for a considerable time (e.g. *Endasys*, *Bathythrix*, *Stilpnus*) most species were lumped into two genera, '*Hemiteles*' if the areolet was open distally and '*Phygadeuon*' if it was closed. Townes (1970*a*) showed the artificiality of these aggregates and greatly expanded the number of genera. Although his work is a good start, a great deal remains to be done. Even in comparatively well-worked areas such as western Europe, study of a group reveals several undescribed genera (e.g. Horstmann, 1974; 1976). The fauna of the tropics and the southern temperate region is very poorly known.

In the current work 18 genera are included as Australian. Only three have previously been recorded from Australia. Seven are described as new and the remaining eight are new records. Several of the genera used here (e.g. *Paraphylax*, *Isdromas*) include a bewildering array of species and these are almost certain to be divided when they are better known.

KEY TO GENERA OF PHYGADEUONTINI OCCURRING IN AUSTRALIA

1 Wings absent...*GELIS* (p. 115)
\- Wings present...2

2 Posterior transverse carina of mesosternum complete.........................3
\- Posterior transverse carina of mesosternum incomplete.......................8

3 Fore wing with one bulla in *2m-cu* (Fig. 176)...............................4
\- Fore wing with two bullae in *2m-cu* (Fig. 177).............................5

4 Tergite 2 of gaster strongly longitudinally striate; mandible with upper tooth conspicuously the longer (Fig. 185); area superomedia defined by strong raised carinae.......................*NIPPONAETES* (p. 123)
\- Tergite 2 of gaster microreticulate; mandible with teeth of almost equal length (Fig. 186); area superomedia laterally rather indistinctly delineated.................................*HANDAOIA* (p. 118)

5 Tergites 2 and 3 of gaster with transverse furrows which are striate (Fig. 553); sternite 1 with carina parallel to and slightly anterior to posterior margin (Fig. 184); tergite 1 with lateromedian carinae. ....*ASTOMASPIS* (p. 112)
\- Tergites 2 and 3 of gaster usually without transverse furrows, or if with vestigial furrows then sternite 1 has no parallel carina; sternite 1 never with a strong carina parallel to posterior margin; tergite 1 of gaster at most with vestiges of lateromedian carinae.............6

6 Upper tooth of mandible more or less equal to the lower (Fig. 189); ovipositor various, generally projecting beyond the gaster by more 0.8 times length of hind tibia, or if shorter then with apex shortly acute...*PARAPHYLAX* (p. 123)

- Upper tooth of mandible distinctly longer than the lower (Fig. 187); ovipositor quite short, elongately acutely pointed, projecting beyond apex of gaster by less than 0.8 times length of hind tibia............7

7 Proximal flagellar segments slender, segment 1 more than 6.0 times as long as broad; scape apically obliquely truncate at about 50° from horizontal (Fig. 192); clypeus broad, weakly convex apically, with weak teeth; malar space slightly less than basal mandibular width...*LIENELLA* (p. 121)

- Proximal flagellar segments stouter, segment 1 about 4.0 times as long as broad or less; scape apically truncate at about 20-30° from horizontal (Fig. 193); clypeus small, convex, apically centrally truncate; malar space far longer than basal mandibular width....... ....*ASMENOPHYLAX* (p. 111)

8 Mandible with apex twisted about 90° so upper tooth is on the outside (Fig. 183); hind wing with distal abscissa of Cu_1 absent, not even discernible as an angulation at confluence of Cu_1 and *cu-a*.................9

- Mandible with apex not or only slightly twisted (Fig. 188); hind wing with distal abscissa of Cu_1 present, at least as a basal stub.............11

9 Fore wing with two bullae in *2m-cu* (Fig. 178); ovipositor with upper valve distally enlarged, surrounding apex of lower valve (Fig. 210). ....*AMBLYACLASTUS* (p. 110)

- Fore wing with one bulla in *2m-cu* (Fig. 180); ovipositor simple, upper valve not enclosing the lower valve (Figs 211, 212)................10

10 Mandible with inner tooth truncate (Fig. 190); pronotum with a mediodorsal keel (Fig. 204); apex of ovipositor with a dorsal nodus (Fig. 211)..*GLYPHACLASTUS* (p. 117)

- Mandible with inner tooth acute (Fig. 191); pronotum without a mediodorsal keel; apex of ovipositor simply acute, without a nodus (Fig. 212)..*ACLASTUS* (p. 108)

11 Propodeum smooth, long, dorsally without any carinae (Fig. 198); ovipositor very long, projecting beyond apex of gaster by at least 3.0 times length of hind tibia..........................*RHADINOMASTRUS* (p. 129)

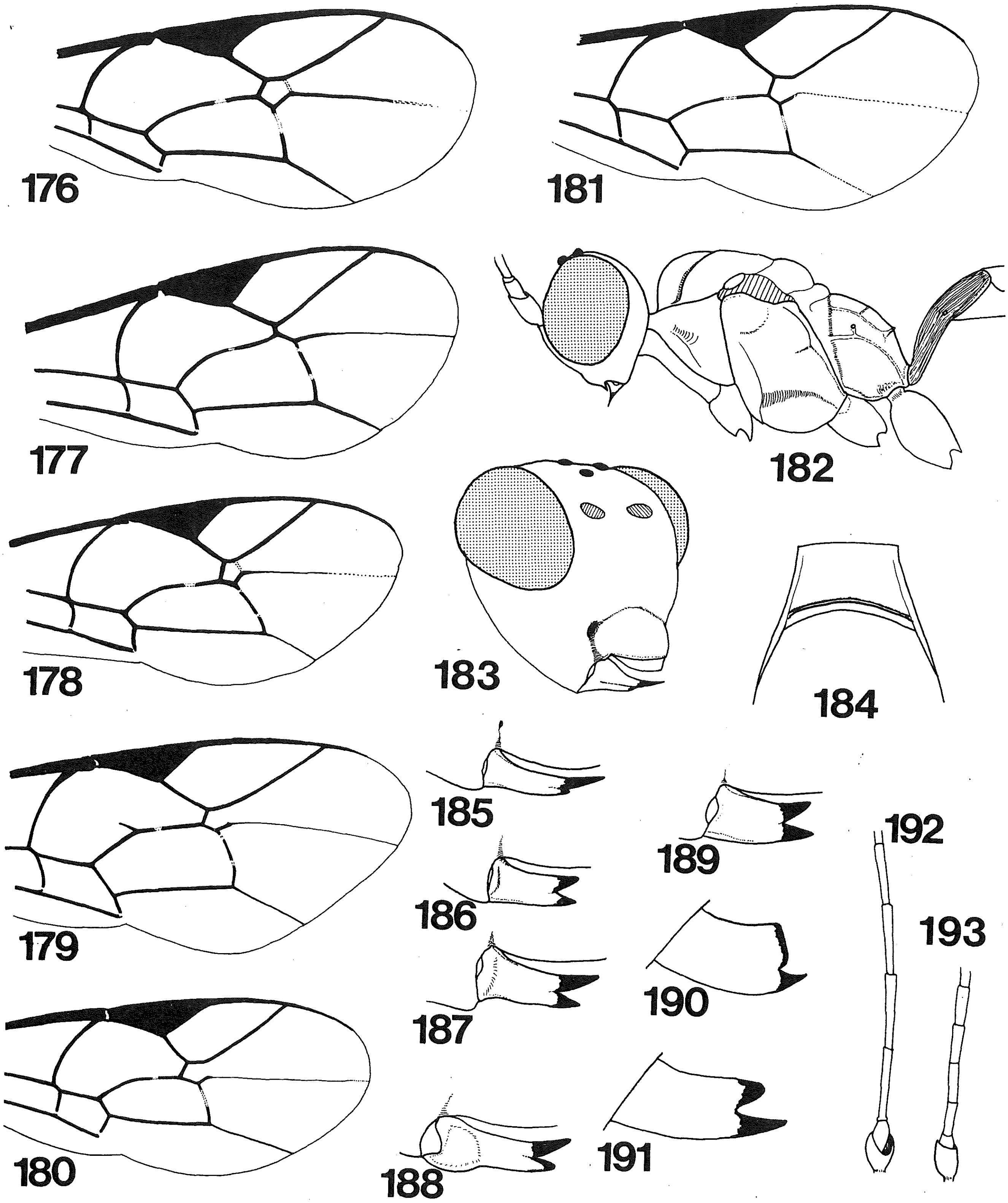
- Propodeum shorter, with transverse carinae discernible (Figs 196-197, 199-201); ovipositor not projecting beyond apex of gaster by more than 2.0 times length of hind tibia......................................12

12 Scape long and cylindrical, distally truncate at 10-15° from horizontal; flagellum of ♀ short and stout, with segment 2 less than 3.0 times as long as broad (Fig. 203).....................................13

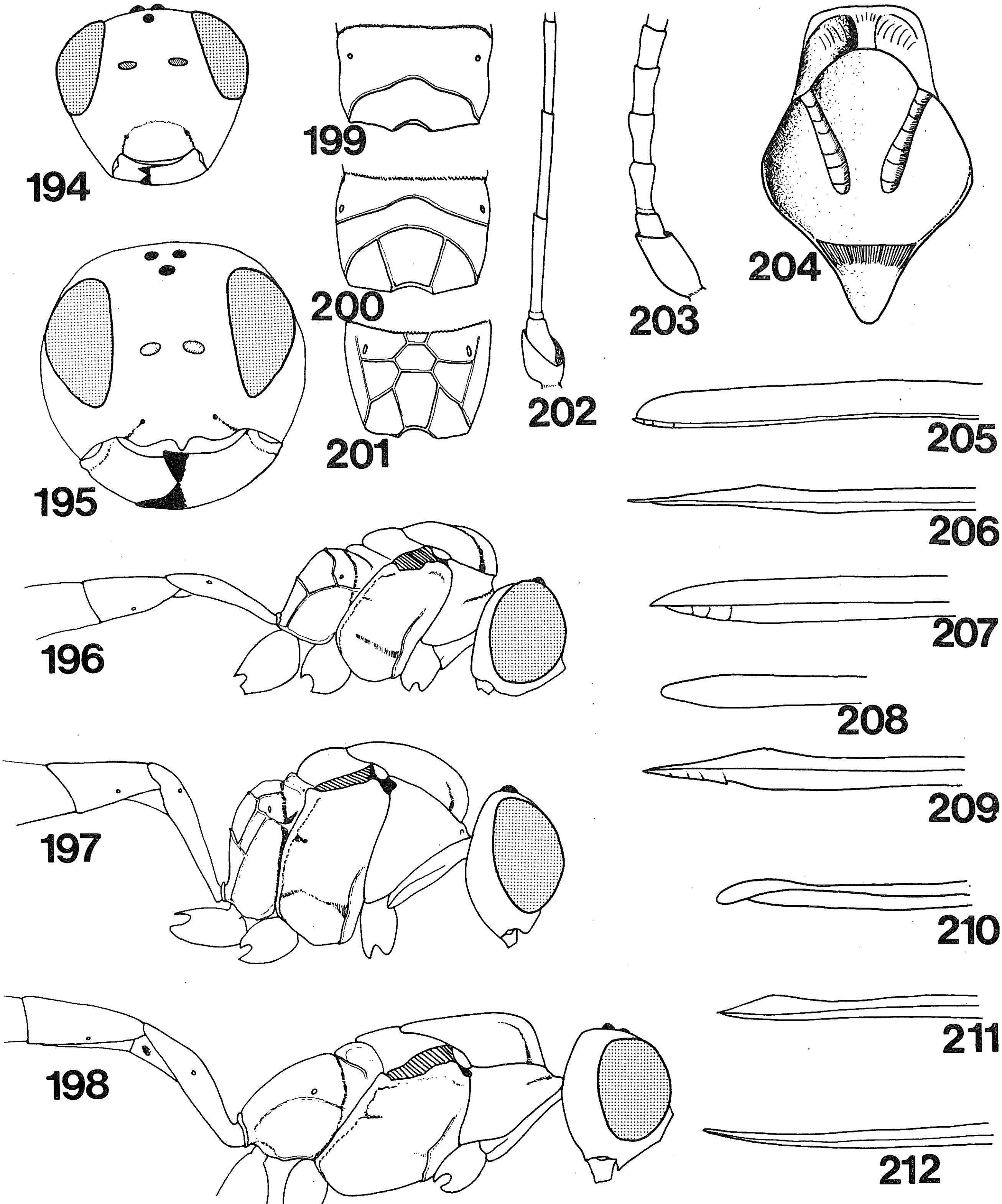
- Scape shorter and distally obliquely truncate at 35° or more from horizontal; flagellum of ♀ longer and more slender, with segment 2 3.5 or more times as long as broad (Fig. 202)...........................15

13 Head, alitrunk and legs with short close pubescence; mandible slender with outer surface convexly swollen, with a strong basal concave area; upper tooth conspicuously the longer (Fig. 188)..*XENOLYTUS* (p. 130)

- Head, alitrunk and legs with conspicuous, dense, long pubescence; mandible stout to moderately broad, with outer surface at most slightly convex, with a shallow basal concave area; upper tooth from very slightly longer to much shorter than the lower (Figs 194, 195).......14



Figs 176-193 Phygadeuontinae. 176-181 Fore wings (176) *Handaoia* (177) *Paraphylax* (178) *Amblyaclastus melanops* (179) *Isdromas* (180) *Glyphaclastus uvulus* (181) *Austriteles armatorius*. 182 *Aclastus*, head and gaster, lateral. 183 *Glyphaclastus uvulus*, Head. 184 *Astomaspis*, sternite 1. 185-189 Mandibles (185) *Nipponaetes* (186) *Handaoia* (187) *Lienella* (188) *Xenolytus* (189) *Paraphylax*. 190-191 Apex of mandibles, dorsal (190) *Glyphaclastus uvulus* (191) *Aclastus*. 192-193 Base of antennae, ♀ (192) *Lienella* (193) *Asmenophylax minutus*.



Figs 194-212 Phygadeuontinae. 194-195 Faces, ♀ (194) *Meringops* (195) *Tryonocryptus*. 196-198 Head, alitrunk and base of gaster, lateral (196) *Isdromus granulatus* (197) *Dichrogaster* (198) *Rhadinomastrus elongatus*. 199-201 Propodea (199) *Aclosmation* (200) *Isdromas* (201) *Dichrogaster*. 202-203 Base of antennae, ♀ (202) *Isdromas* (203) *Meringops*. 204 *Glyphaclastus uvulus*, pro- and mesonotum. 205-212 Apices of ovipositors (205) *Tryonocryptus gigas* (206) *Meringops* (207) *Aclosmation rufum* (208) *A. rufum*, dorsal (209) *Isdromas* (210) *Amblyaclastus melanops* (211) *Glyphaclastus uvulus* (212) *Aclastus*.

14 Mandible distally flared with lower tooth the longer; clypeus with a median apical tooth or tubercle (Fig. 195); upper valve of ovipositor bluntly rounded at apex (Fig. 205); fore wing length 10 mm or more... ....*TRYONOCRYPTUS* (p. 130)

\- Mandible slightly tapered with lower tooth equal to or a little shorter than upper (Fig. 194); clypeus without a distinct median apical protuberance; upper valve of ovipositor simply tapered (Fig. 206); fore wing length 6 mm or less...........................*MERINGOPS* (p. 122)

15 Fore wing with one bulla in *2m-cu* (Fig. 181); tergite 2 of gaster with laterotergite curved under, not separated by a sharp crease... ....*AUSTRITELES* (p. 113)

\- Fore wing with two bullae in *2m-cu* (Fig. 179); tergite 2 of gaster with laterotergite folded under, usually separated by a sharp crease, often inconspicuous...16

16 Propodeum in profile very abruptly rounded (Fig. 197); area superomedia distinctly delineated, transverse (Fig. 201); tergite 1 more or less smooth and polished; clypeus small, mandible swollen at base; anterior part of lateral carina present above spiracle.*DICHROGASTER* (p. 114)

\- Propodeum in profile various (Fig. 196), if abruptly rounded then usually without a distinct area superomedia, if rarely with a transverse area superomedia then tergite 1 is striate and matt; tergite 1 otherwise various, often matt and sculptured; clypeus relatively large, mandible not swollen near base; anterior part of lateral carina usually missing above spiracle......................................17

17 Propodeum with only posterior transverse carina present, the anterior one entirely absent (Fig. 199); apex of ovipositor with a few strong teeth on lower valve, upper valve slightly depressed and slightly blunted (Figs 207, 208)...............................*ACLOSMATION* (p. 109)

\- Propodeum with anterior transverse carina present in addition to posterior one and often also longitudinal carinae discernible (Fig. 200); apex of ovipositor with relatively inconspicuous teeth on lower valve, upper valve compressed, sharp (Fig. 209)...........*ISDROMAS* (p. 118)

ACLASTUS Foerster*

Microplex Foerster, 1869: 175. Type-species: *Aclastus rufipes* Ashmead, by subsequent monotypy, Roman, 1909: 235.
Daetora Foerster, 1869: 175. Type-species: *Hemiteles solutus* Thomson, by subsequent designation, Perkins, 1962: 416.
Aclastus Foerster, 1869: 175. Type-species: *Aclastus rufipes* Ashmead, by subsequent monotypy, Ashmead, 1902: 187.
Opisthostenus Foerster, 1869: 175. Type-species: *Hemiteles etorofuensis* Uchida, by subsequent monotypy, Uchida, 1936*b*: 43.

Small species, fore wing length 4-5 mm; lower face transverse with a weak median convexity; clypeus strongly convex, margin impressed, simple; labrum short, margin arcuate; mandible twisted 90°, inner and outer teeth acute (Fig. 191); malar space about 1.0 times basal mandibular width. Antenna of ♀ slender, scape obliquely truncate; flagellum without a white band, with about 26 segments.

Pronotum with a deep transverse mediodorsal furrow; mesoscutum convex, polished with deep notauli reaching almost to hind margin; scutellum convex. Sternaulus strong, reaching almost to hind end of pleuron; posterior transverse carina of the mesosternum broadly interrupted before mid coxae. Propodeum evenly rounded (Fig. 182), usually completely carinate, with an elongate area superomedia, lateral carina usually absent above spiracle.

Fore wing with *cu-a* slightly distal to base of *Rs&M*; *3r-m* vestigial, its position discernible from angulations of *Rs* and *M*; *2r-m* slightly shorter than abscissa of *M* between *2r-m* and *2m-cu*; *2m-cu* with a single bulla. Hind wing with distal abscissa of Cu_1 entirely absent.

Tergite 1 of gaster slender, longitudinally striate; sternite 1 reaching behind centre to level of spiracles which are positioned about 0.7 of way along segment. Tergite 2 with laterotergites folded under, often separated by a sharp crease; tergite 3 similar. Ovipositor straight or up-curved, projecting beyond apex of gaster by 0.6-1.3 times length of hind tibia; ovipositor apex elongately acute, without a nodus (Fig. 212).

Remarks. *Aclastus* is a large genus with species occurring in almost all regions of the world. Relatively few species are known from the tropics but there are many undescribed species in high altitude cloud forests. *Aclastus* species favour damp habitats. In boreal latitudes species may be brachypterus, but this condition is not yet known in any Australian species.

Aclastus is placed by Townes (1970*a*) in his subtribe Hemitelini and it appears to be related to the Holarctic genus *Polyaulon*. It is also close to two new Australian genera, *Amblyaclastus* and *Glyphaclastus*. These two genera would run to the Acrolytina in Townes' (1970*a*) key but they are not closely related to any acrolytine genus.

Australian species. I have seen eight Australian species, all undescribed (ANIC; BMNH; TC).

Host records. None.

ACLOSMATION gen. n.

Type-species: *Aclosmation rufum* sp. n.

Small to medium-sized species, fore wing length 4-7 mm; lower face granulate, clypeus weakly convex, margin polished and sharp, simply arcuate; upper tooth of mandible slightly the longer; malar space 1.0-1.1 times as long as basal mandibular width. Antenna of ♀ slender, cylindrical; scape obliquely truncate; segment 1 of flagellum more than 6.0 times as long as broad; flagellum with a white band, terminal segment with a flat sensory area at extreme apex.

Propodeum with a mediodorsal transverse furrow; mesoscutum matt, finely granulate, with notauli from vestigial to strong but short, not reaching to level of anterior edges of tegulae; scutellum convex. Sternaulus weak to strong, not reaching to edge of pleuron; posterior trasnverse carina of mesosternum completely absent. Propodeum short, dorsally convex, abruptly declivous posteriorly; anterior transverse carina absent, posterior one strong; longitudinal carinae absent dorsally (Fig. 199).

Fore wing with *cu-a* distal to base of *Rs&M*; *3r-m* absent though its position is indicated by angulations of *Rs* and *M*; *2r-m* about as long as abscissa of *M* between *2r-m* and *2m-cu*; *2m-cu* with two widely interspaced bullae. Hind wing with distal abscissa of Cu_1 present.

Tergite 1 quite short and evenly broadened with spiracles slightly behind the centre; sternite 1 not quite reaching to spiracles; tergite 2 with laterotergite separated by a sharp crease; tergite 3 similar. Ovipositor projecting beyond apex of gaster by 0.6-0.7 times length of hind tibia; ovipositor apex with upper valve without a nodus, somewhat rounded to end, then at extreme end a little flattened and (in dorsal view) blunt; lower valve with three or four large teeth (Figs 207, 208).

Etymology. *A* (without) + *klosmation* (a small line) referring to the lack of a propodeal carina. Neuter.

Remarks. *Aclosmation* is distinct on account of the lack of the anterior transverse carina of the propodeum, the characteristic ovipositor and the apical antennal sensilla. It probably belongs to the Mastrina and may be related to *Helcostizus* which has a similar ovipositor, antennae and petiole. However, *Helcostizus* has quite different mandibles and clypeus, so the apparent similarity between the two genera may be due to evolutionary convergence.

Aclosmation is a south temperate genus with species in Australia and New Zealand.

Australian species. Two in Tasmania (TC), one of which is described below.

Aclosmation rufum sp. n.

Female: small species, fore wing length 4-5 mm; head and alitrunk uniformly granulate, matt; clypeus apically polished; labrum protruding, its margin arcuate; frons simple; ocellar triangle far broader than high; occipital carina evenly arched dorsally; genal carina joining hypostomal carina above base of mandible. Mesoscutum abruptly rounded, notauli weakly impressed, short; mesopleuron with speculum slightly polished, sparsely granulate; sternaulus weak, reaching to centre of pleuron.

Reddish brown species; flagellum with a white band, distally blackish; sclerites of alitrunk margined with black; tegula white, posterior end of gaster yellowish; legs orange-brown. Wings slightly infumate; pterostigma very large, triangular, brown with proximal corner whitish.

Male unknown.

A. rufum differs from the other three species of this genus in its matt alitrunk. The other species have the granulation of the meso- and metapleurae weak, sparse and polished. The other Tasmanian species has quite a different colour pattern to *A. rufum*.

Material examined

Holotype ♀, Tasmania: Mt Barrow, 700 m, xii-i. (TC).

Paratype. Tasmania: 1 ♀, same data as holotype (BMNH).

Host records. None, but the morphology of the adult suggests a stem-boring host.

AMBLYACLASTUS gen. n.

Type-species: *Amblyaclastus melanops* sp. n.

Small species, fore wing length 3-5 mm; lower face with a weak median convexity; clypeus convex, with a transverse ridge parallel to margin, the margin impressed and truncate; labrum quadrate, protruding; mandible slender, twisted through 90°, with outer tooth the longer; malar space slightly longer than basal mandibular width. Antenna of ♀ slender, scape very obliquely truncate; flagellum without a white band, with about 27 segments.

Pronotum with a mediodorsal keel; mesoscutum alutaceous, matt, with notauli strong, reaching almost to hind margin; scutellum convex, partially carinate laterally. Sternaulus broad but shallow, not reaching to hind end of pleuron; posterior transverse carina of mesosternum absent except for lateral vestiges. Propodeum short, evenly rounded, with transcarinae strong, longitudinal carinae vestigial.

Fore wing with *cu-a* slightly proximal to base of *Rs&M*; 3*r-m* vestigial, but its position discernible from angulations of *Rs* and *M*; 2*r-m* slightly shorter than abscissa of *M* between 2*r-m* and 2*m-cu*; 2*m-cu* with two widely separated bullae (Fig. 178). Hind wing with distal abscissa of Cu_1 absent, not even discernible as a basal stub.

Tergite 1 of gaster smooth, evenly broadened with prominent spiracles slightly behind the centre; sternite 1 reaching almost to level of spiracles; tergite 2 smooth, polished, with laterotergites evenly turned under, not separated by a crease; tergite 3 similar. Ovipositor slightly curved, extending beyond apex of gaster by 0.7 times length of hind tibia; ovipositor apex with upper valve blunt, angled downwards and enclosing the apex of the lower valve (Fig. 210).

Etymology. *Ambly* (blunt) + *Aclastus* (a related genus) referring to the blunt ovipositor. Masculine.

Remarks. *Amblyaclastus* is a distinctive genus on account of the blunt, decurved ovipositor tip. It is obviously related to *Aclastus* with which it shares the characters of twisted mandible and lack of distal abscissa of Cu_1. Unlike *Aclastus* it has two bullae in *2m-cu* and a strong median dorsal keel on the pronotum.

Australian species. One, described below.

Amblyaclastus melanops sp. n.

Female: lower face transverse, coriaceous; clypeus with sparse, coarse punctures; frons punctate, with a central glabrous, impunctate band reaching to median ocellus; vertex closely and finely punctate. Mesopleuron relatively smooth, slightly rugose below subalar prominence and around sternaulus; metapleuron polished, smooth. Gaster smooth and shining.

Head black, flagellum black, scape rufescent; alitrunk and gaster red-brown with indistinct black marks on mesoscutum, axillae, scutellum and metanotum; tergites 3+ blackish. Legs brownish, hind tibia and tarsus infuscate. Wings hyaline; pterostigma dark brown.

Male: very like female but more extensively infuscate on alitrunk.

Material examined

Holotype ♀, New South Wales: 8 km E. Braidwood, iv.1970 *(Riek)* (ANIC).

Paratypes. New South Wales: 1 ♀, Clyde Mt, ix.1979 *(Naumann & Cardale)* (ANIC). Victoria: 1 ♀, Mt Dandenong, 300 m, ii. (TC). Tasmania: 1 ♂, Bronte Park, ii-iii. (TC); 1 ♂, Coles Bay, iv. (TC); 1 ♂, King William Rg., ii-iii. (TC); 1 ♀, 1 ♂, Port Arthur, ii-iii. (TC); 1 ♀, Port Davey, ii. (TC); 1 ♀, Waldheim, i. (TC).

Host records. None.

ASMENOPHYLAX gen. n.

Type-species: *Asmenophylax minutus* sp. n.

Small to medium-sized species, fore wing length 3-6 mm; lower face very broad, short, about 1.4 or more times as broad as high, slightly convex centrally; clypeus small, convex in profile, with margin centrally narrowly truncate; mandible strongly narrowed, short, with upper tooth very much longer than the lower; malar space from 1.2-1.9 times as long as basal mandibular width. Antenna slightly broadened distally, with scape truncate, at only about 20-30° from horizontal; segment 1 of flagellum 4.0 or less times as long as broad (Fig. 193); flagellum without a white band, with 16-22 segments.

Pronotum with a mediodorsal keel; mesoscutum from smooth to coarsely punctate, notauli rather weak, extending only to level of centre of tegulae; scutellum deplanate to convex, sometimes laterally carinate. Sternaulus generally not reaching to hind margin of pleuron; posterior transverse carina of the mesosternum complete. Propodeum usually short, evenly rounded to abruptly declivous, from completely carinate to with longitudinal carinae obsolescent.

Fore wing with *cu-a* opposite base of *Rs&M*; *3r-m* absent, *2r-m* generally slightly shorter than abscissa of *M* between *2r-m* and *2m-cu*; *2m-cu* with two widely separated bullae. Hind wing with distal abscissa of Cu_1 present.

Tergite 1 of gaster evenly and quite strongly broadened posteriorly, generally relatively smooth above; sternite 1 reaching almost to level of spiracles which are positioned just behind centre of segment; tergites 2-3 with laterotergites usually turned under, sometimes folded under, never pendant; spiracles separated from crease by more than their own diameter. Ovipositor straight, evenly acute, projecting beyond apex of gaster by 0.2-0.8 times length of hind tibia.

Etymology. *Asmenos* (pleased) referring to the impression of the broad 'smiling' face these species give, + *phylax* (from *Paraphylax*, a related genus). Masculine.

Remarks. *Asmenophylax* is a medium-sized genus with species widely distributed throughout Australia. It belongs in the Chiroticina of Townes (1970*a*) but is distinct from all other genera on account of the stout flagellum, weakly obliquely truncated scape, extremely broad face and small truncate clypeus. Most are known only from single specimens, but are very distinct morphologically. The type-species described below is the only one known from a series.

Australian species. I have seen 12 species from Queensland, New South Wales, Australian Capital Territory and Tasmania (ANIC; BMNH; TC).

Asmenophylax minutus sp. n.

Female: fore wing length 4 mm; face transversely rugose to punctate; malar space 1.3 times basal mandibular width; vertex coarsely punctate. Flagellum with 18-19 segments. Mesoscutum coarsely punctate, polished; scutellum convex, without lateral carinae, sparsely punctate. Propodeum with area superomedia complete, longer than broad with anterior side narrow. Tergite 1 faintly sculptured; tergites 2-4 with obsolescent punctures. Ovipositor 0.6 times as long as hind tibia.

Black; marks on orbits opposite antennal bases, underside of antenna, tegula, most of legs and gaster except base of segment 1 orange; proximal apex of hind tibia with yellow spot. Wings hyaline; pterostigma brownish.

A. minutus is the only species examined in this genus with an orange gaster and black coxae.

Material examined

Holotype ♀, Tasmania: Coles Bay, ii-iii. (TC).

Paratypes. Tasmania: 1 ♀, Coles Bay, ii-iii. (BMNH); 2 ♀, same data (TC).

Host records. None.

ASTOMASPIS Foerster

Astomaspis Foerster, 1869: 175. Type-species: *Astomaspis metathoracica* Ashmead, by subsequent monotypy, Ashmead, 1904: 140.

Caenopimpla Cameron, 1900*a*: 99. Type-species: *Caenopimpla ruficollis* Cameron, by monotypy. Syn. n.

Syrites Tosquinet, 1903: 117. Type-species: *Syrites acanthogaster* Tosquinet, by monotypy.

Caenoaulax Cameron, 1905*b*: 195. Type-species: *Caenoaulax striatus* Cameron, by monotypy. Syn. n.

Caenoaulax Cameron, 1905*f*: 247. Type-species: *Caenoaulax striatus* Cameron (= *Caenoaulax striatus* Cameron, 1905*b*), by monotypy. [Homonym of *Caenoaulax* Cameron, 1905*b*.]

Acanthoprymnus Cameron, 1905*i*: 249. Type-species: *Acanthoprymnus violaceipennis* Cameron, by monotypy.

Camptolynx Cameron, 1911*e*: 252. Type-species: *Camptolynx striatus* Cameron (= *Astomaspis striola* Townes, Townes & Gupta), by subsequent designation, Viereck, 1914: 27.

Small to medium-sized insects, fore wing length 4-6 mm; face slightly convex; clypeus convex, margin impressed, simple; face and clypeus together coarsely puncto-reticulate; mandible slender, strongly narrowed, with a broad basal flange, slightly twisted and with upper tooth very much longer than the lower; malar space about equal to basal mandibular width. Antenna relatively slender, scape obliquely truncate; segment 1 of ♀ flagellum about 6.0 times as long as broad; flagellum without a white band, with about 22 segments.

Pronotum with a weak mediodorsal keel; mesoscutum coarsely wrinkled, polished; the notauli strong and reaching behind level of hind edges of tegulae; scutellum rugose, carinate laterally for part of its length. Sternaulus strong but reaching only about 0.5 times length of pleuron; posterior transverse carina of mesosternum complete. Propodeum short, evenly declivous with transverse carinae complete, the longitudinal ones weak and discontinuous.

Fore wing usually strongly infumate; *cu-a* proximal to base of *Rs&M*; *3r-m* absent; *2r-m* shorter than abscissa of *M* between *2r-m* and *2m-cu*; *2m-cu* with two widely separated bullae. Hind wing with distal abscissa of Cu_1 present.

Tergite 1 of gaster very strongly but evenly broadened posteriorly with lateromedian carinae, dorsally coarsely striate; sternite 1 short, not reaching to level of spiracles and with a strong carina parallel to, but before, hind margin (Fig. 184); spiracles slightly behind centre; tergites 2 and 3 large, coarsely striate with strong transverse furrows (Fig. 553); laterotergites folded under, the edge of fold sharp; spiracle of tergite 2 separated from edge by at least twice its own diameter; tergites 5+ of ♀ short, barely visible. Ovipositor straight, evenly acute, projecting beyond apex of gaster by 0.1-0.2 times length of hind tibia.

Remarks. Most authors (e.g. Townes, 1970*a*) treat *Astomaspis* and *Caenopimpla* as separate genera. The males of *Astomaspis* are distinct in having tergite 3 enlarged and bearing apicolateral spines. The remainder of the male gaster is retracted beneath this segment. The males of *Caenopimpla* lack these spines and tergites 4 and 5 project slightly. However, the females are almost indistinguishable though those of *Astomaspis* have slightly more retracted terminal gastral segments. It is obvious from comparing these two groups that *Astomaspis* species represent a specialized species-group derived from the *Caenopimpla* type of morphology. Such a character does not warrant generic distinction as it is merely the end form in a progressive series of modifications of the gaster into a carapace shown by this group. I have therefore grouped all species into a single genus.

Astomaspis is a large Palaeotropical chiroticine genus, readily recognizable by the characteristic gaster. Most species are reddish brown, at least in part, with black heads and infumate, patterned wings. The Australian species I have seen were all collected in Queensland or northern New South Wales. A key to the Indo-Papuan species was given by Cushman (1922).

Australian species. *A. froggatti* (Turner) (E); *A. ruficornis* (Turner) (E). I have seen two undescribed specimen-groups which may be species (ANIC).

Host records. None.

AUSTRITELES gen. n.

Type-species: *Austriteles armatorius* sp. n.

Small insects, fore wing length 3-4 mm; face matt, granulate, centrally slightly convex; clypeus convex, more polished with margin arcuate, without teeth; upper mandibular tooth slightly the longer; malar space 1.2-1.3 times basal mandibular width. Antenna of ♀ slightly clavate, distally flattened below, scape obliquely truncate; segment 1 of flagellum 5.0 or more times as long as broad; flagellum with a white band, with 19-20 segments.

Pronotum mediodorsally with a transverse groove; mesoscutum granulate, with short notauli reaching to about level of front margin of tegulae; scutellum granulate. Sternaulus reaching to centre of pleuron; posterior transverse carina of mesosternum absent. Propodeum of moderate length, subhorizontal then abruptly declivous behind posterior transverse carina; anterior transverse carina present, quite weak, posterior one strong, longitudinal carinae more or less absent.

Fore wing with *cu-a* distal to base of *Rs&M*; *3r-m* absent but position distinguishable by angulation of *Rs*; *2r-m* longer than abscissa of *M* between *2r-m* and *2m-cu*; *2m-cu* with a single bulla (Fig. 181). Hind wing with distal abscissa of Cu_1 discernible as a basal stub.

Tergite 1 of gaster granulate, posteriorly evenly broadened and laterally carinate; spiracle at centre; sternite 1 not reaching to level of spiracle; tergite 2 with laterotergite turned under, not separated by a crease and bearing the spiracle; tergite 3 similar. Ovipositor almost straight, projecting beyond apex of gaster by 0.4-0.7 times length of hind tibia.

Etymology. *Austr* (southern) + *iteles* (from *Hemiteles*, a related genus). Masculine.

Remarks. *Austriteles* would run in Townes' (1970*a*) key to the subtribe Hemitelina and then to *Hemiteles*. It appears to be quite closely related to this genus but differs in lacking the central part of the posterior transverse carina of the mesosternum, in not having a defined area superomedia, in having a nodus on the dorsal valve of the ovipositor and in having a quite differently shaped segment 1 of the gaster. The antenna of *Austriteles* is more clavate and flattened below than that of *Hemiteles*.

Australian species. I have seen two Australian species (ANIC; BMNH; TC), one of which is described below.

Austriteles armatorius sp. n.

Female: head and alitrunk granulate matt or weakly shining; genae very strongly narrowed behind eyes; occipital carina mediodorsally sharply raised, almost forming a point; genal carina joining hypostomal carina virtually at base of mandible. Mesopleuron with speculum granulate and with a strong pit just below it. Hind leg with tibia strongly inflated. Gaster with tergites 2+ polished, alutogranulate.

Black species; antenna proximally yellowish brown, distally infuscate with a white band on about flagellar segments 5-7; gaster with tergites 2+ reddish brown. Legs yellow-brown, fore and mid coxae and trochanters whitish, hind coxa red-brown. Wings slightly infumate; pterostigma brown.

Male: like female but more slender; propodeum longer and evenly rounded; tergite 1 narrow, almost parallel-sided.

A. armatorius is very similar to the undescribed species, differing most obviously in colour and in having a slightly longer propodeum.

Material examined

Holotype ♀, Queensland: Mt Glorious, ii-vi. *(Hiller)* (ANIC).

Paratypes. Queensland: 2 ♀, Brisbane, ix-xi. (TC); 5 ♀, 2 ♂, Mt Glorious, i-iii. (TC); 3 ♀, Mt Glorious, ii-vi.1977 *(Hiller)* (BMNH); 1 ♂, Mt Nebo, viii. (TC).

Host records. *Austriteles* sp. - Araneidae: *Argiope antheria* Brown (ANIC).

DICHROGASTER Doumerc*

Dichrogaster Doumerc, 1855: 88. Type-species: *Microgaster perlae* Doumerc (= *Hemiteles aestivalis* Gravenhorst), by monotypy.

Otacustes Foerster, 1869: 174. Type-species: *Otacustes atriceps* Ashmead (= *Otacustes chrysopae* Ashmead), by subsequent designation, Viereck, 1914: 107.

Microtorus Foerster, 1869: 178. Type-species: *Microtorus kichijoi* Uchida, by subsequent designation, Townes, 1957: 111.

Xenobrachys Foerster, 1869: 179. Type-species: *Hemiteles longicaudatus* Thomson, by subsequent designation, Perkins, 1962: 462.

Brachycephalus Foerster, 1869: 179. Type-species: *Hemiteles aestivalis* Gravenhorst, by subsequent designation, Townes, 1944: 180. [Homonym of *Brachycephalus* Fitzinger, 1826.]

Brachycranium Ashmead, 1900*b*: 368. [Replacement name for *Brachycephalus* Foerster.]

Chrysopoctonus Cushman, 1919*a*: 518. Type-species: *Otacustes atriceps* Ashmead (= *Otacustes chrysopae* Ashmead), by original designation.

Small species, fore wing length 3-5 mm; head broad, lower face transverse, with a slight median convexity; clypeus small, weakly convex, its margin sharp, arcuate; mandible with teeth almost equal in length, the outer surface slightly convex; malar space slightly longer than basal mandibular width. Antenna of ♀ quite slender, without a white band; scape obliquely truncate; flagellum with segment 1 more than 5.0 times as long as broad.

Alitrunk rather short (Fig. 197); pronotum with mediodorsal transverse furrow; mesoscutum convex, notauli weak or reaching to about centre; scutellum convex, laterally carinate. Sternaulus moderately strong, not reaching to end of the pleuron; posterior transverse carina of mesosternum interrupted before mid coxae. Propodeum short, abruptly declivous with almost complete carinae; area superomedia short and usually transverse, area petiolaris very long (Fig. 201).

Fore wing with *cu-a* opposite to base of *Rs&M*; 3*r-m* absent or weak; 2*r-m* longer than abscissa of *M* between 2*r-m* and 2*m-cu*; 2*m-cu* with two widely separated bullae. Hind wing with distal abscissa of Cu_1 present at least as a stub.

Tergite 1 of gaster evenly broadened, with spiracles behind centre; sternite 1 reaching almost to spiracles; remainder of gaster short, broad and rather dorsoventrally flattened; tergite 2 with laterotergite folded under, separated by a sharp crease; tergite 3 similar. Ovipositor straight, projecting beyond apex of gaster by 0.6-1.0 times length of hind tibia; upper valve with a nodus.

Remarks. *Dichrogaster* is a moderate-sized genus of the subtribe Gelina. It is easily recognized on account of its short, deep alitrunk and broad head which give it an appearance that is quite characteristic, and once seen, easily remembered. *Dichrogaster* species occur mostly in the north temperate region although there are a few species in other regions. Previously no species has been recorded south-east of the Asian continental mainland.

Australian species. Two, undescribed (ANIC).

Host records. None from Australia but in the Holarctic region *Dichrogaster* species are relatively common parasites in the cocoons of Chrysopidae and Hemerobiidae (Carlson, 1979).

GELIS Thunberg*

Gelis Thunberg, 1827: 199. Type-species: *Mutilla acarorum* L., by subsequent designation, Viereck, 1914: 61.
Pezomachus Gravenhorst, 1829*b*: 867. Type-species: *Mutilla acarorum* L., by subsequent designation, Curtis, 1835: 487.
Pezolochus Foerster, 1850: 71. Type-species: *Pezolochus rufipes* Foerster, by monotypy.
Hemimachus Ratzeburg, 1852: 157. Type-species: *Hemimachus fasciatus* Ratzeburg (= *Mutilla melanocephala* Schrank), by subsequent designation, Viereck, 1914: 68.
Thaumatotypus Foerster, 1869: 172. Type-species: *Thaumatotypus femoralis* Brischke, by subsequent monotypy, Brischke, 1881: 349.
Alegina Foerster, 1869: 176. Type-species: *Alegina alaskensis* Ashmead (= *Gelis alegininus* Carlson), by subsequent monotypy, Ashmead, 1902: 188.
Rhadiurgus Foerster, 1869: 177. Type-species: *Hemiteles bicolorinus* Gravenhorst (= *Ichneumon cinctus* L.), by subsequent monotypy, Uchida, 1933: 153. [Homonym of *Rhadiurgus* Loew, 1849.]
Aschistus Foerster, 1869: 177. Type-species: *Hemimachus variabilis* Ratzeburg, (= *Ichneumon cursitans* F.), by subsequent designation, Viereck, 1914: 15.
Blapsidotes Foerster, 1869: 177. Type-species: *Hemiteles melanarius* Gravenhorst, by subsequent designation, Perkins, 1962: 410.
Philonygmus Foerster, 1869: 177. Type-species: *Philonygmus alaskensis* Ashmead,

(= *Gelis aleginінus* Carlson), by subsequent designation, Viereck, 1914: 115.
Ilapinastes Foerster, 1869: 179. Type-species: *Hemiteles (Ilapinastes) davidsonii* Ashmead, by subsequent monotypy, Ashmead, in Davidson, 1896: 320.
Barydotira Foerster, 1869: 178. Type-species: *Barydotira hammari* Viereck, by subsequent monoty, Viereck, 1912*c*: 584.
Terpiphora Foerster, 1869: 185. Type-species: *Alegina alaskensis* Ashmead (= *Gelis aleginінus* Carlson), by subsequent designation, Viereck, 1914: 144.
Micromeson Strickland, 1912: 114, 137. Type-species: *Pezomachus (Micromeson) annulatus* Strickland, by subsequent designation, Viereck, 1914: 95.
Leptogelis Ceballos, 1925: 155. Type-species: *Gelis (Leptogelis) ariasi* Ceballos, by subsequent designation, Townes, 1944: 191.
Holcogelis Aubert, 1957: 226. Type-species: *Pezomachus corruptor* Foerster, by original designation.
Arctodeuon Hêllen, 1967: 100. Type-species: *Hemiteles glacialis* Holmgren, by original designation.
Rhadiurginus Hêllen, 1967: 109. [Replacement name for *Rhadiurgus* Foerster.]

Small species, fore wing length 3-4 mm; or in ♀ apterous; lower face transverse or almost quadrate; clypeus convex, granulate with scattered punctures, clypeal margin impressed, acute, simple; labrum semicircular; mandible quite stout, proximally with outer surface swollen, with upper tooth slightly the longer, not twisted; malar space 1.0-1.3 times as long as basal mandibular width. Antenna moderately long, scape obliquely truncate; flagellum with 17-19 segments, usually without a white band but proximally paler than distally.

Pronotum simple; mesoscutum finely granulate, almost matt, that of ♀ reduced, ♀ scutellum absent, propodeum larger than mesoscutum, with vestigial carinae; ♂ scutellum convex, not laterally carinate; sternaulus short, extending about half the length of mesopleuron.

Fore wing with *cu-a* opposite base of *Rs&M*; 3*r-m* faint but discernible; 2*m-cu* with two widely interspaced bullae. Hind wing with distal abscissa of Cu_1 complete.

Tergite 1 of gaster evenly broadened with spiracles behind centre, sternite reaching to level of spiracles; tergite 2 with laterotergite folded under, separated by a sharp crease. Ovipositor straight, projecting beyond apex of gaster by 0.5-0.7 times length of hind tibia; upper valve with nodus.

Remarks. *Gelis* is a very large, mainly north temperate genus. The majority of species have apterous females that have a highly modified thoracic structure. They are reddish brown or blackish insects, with an ant-like manner of movement. They can often be beaten off shrubs, where they search for hosts. They attack a wide range of small cocoons of various insects including Lepidoptera, Neuroptera and Hymenoptera (Townes, 1970*b*) and the egg sacs of spiders (Barron & Bisdee, 1977). Many are associated with economically important insects as can be judged by the fact that *Gelis* species are referred to in the index of every *Review of Applied Entomology* for the last 20 years. They have been recorded both as parasites and hyperparasites (Puttler, 1966; Balduf, 1968; Baeschlin, 1974; Priore, 1975) especially of coleophorids, pyralids, braconids and ichneumonids.

There are in the collections of the Department of Agriculture, Hobart, a series of laboratory reared specimens of a *Gelis* reared on *Coleophora frischella* (L.) (= *alcyonipella* Kollar) which were imported from New Zealand (c. 1968?) from a laboratory culture of European origin. Apparently this species was subsequently liberated in the Derwent Valley, Tasmania, as there are in the same collection, field collected specimens labelled "collected on blackcurrants, i.75, Plenty, Tas." No published record of a European *Gelis* being introduced to the southern hemisphere could be found, but Parrott (1956) described the European *Gelis cinctus* (L.) as "possibly widely distributed throughout New Zealand".

Australian species. *Gelis ?cinctus* (L.) (I).

Host records. *Gelis ?cinctus* - Coleophoridae: *Coleophora frischella* (L.) (DAH).

GLYPHACLASTUS gen. n.

Type-species: *Glyphaclastus uvulus*

Small species, fore wing length 3-5 mm; lower face elongate with a weak central ridge; clypeus convex, polished with margin impressed, simple; labrum long, truncate; mandible stout, twisted 90° with upper tooth sharp, lower (inner) tooth flat, truncate (Fig. 190); malar space 1.8 times basal mandibular width. Antenna long, slightly broadened in distal 0.5, scape obliquely truncate; flagellum with 22-27 segments, without a white band.

Pronotum with a mediodorsal keel (Fig. 204); mesoscutum polished to matt with notauli weak to strong; scutellum convex, not laterally carinate. Sternaulus broad, shallow, reaching almost to end of pleuron; posterior transverse carina of mesosternum broadly interrupted before mid coxae. Propodeum unusual in having anterior transverse groove broad and deep with four pairs of juxtapositioned teeth; propodeum short, abruptly declivous with at least posterior transverse carina complete, sometimes fully carinate.

Fore wing with *cu-a* slightly distal to base of *Rs&M*; *3r-m* virtually absent though its position is discernible from angulations of *Rs* and *M*; *2r-m* about as long as abscissa of *M* between *2r-m* and *2m-cu*; *2m-cu* with a single bulla. Hind wing with distal abscissa of Cu_1 absent, not even discernible as a stub.

Tergite 1 slender, striate, with spiracles behind centre; sternite 1 reaching to or almost to level of spiracles; tergite 2 polished, laterotergites turned under, not separated by a crease, tergite 3 similar. Ovipositor straight, projecting beyond apex of gaster by 0.5-0.6 times length of hind tibia; apex of ovipositor compressed, with a well-developed nodus (Fig. 211).

Etymology. *Glyph* (from *glyphanos*, a chisel, referring to mandible) + *Aclastus* (a related genus). Masculine.

Remarks. *Glyphaclastus*, like *Amblyaclastus*, is another Australian genus related to the taxonomically isolated cosmopolitan genus *Aclastus*. *Glyphaclastus* is easily recognized by the characteristic mandible, but it differs from *Aclastus* in many other features including the presence of a pronotal keel, the long truncate labrum and the laterally compressed ovipositor with a strong nodus.

Australian species. I have seen two species (BMNH; TC), one of which is described below.

Glyphaclastus uvulus sp. n.

Female: fore wing length 3-4 mm; face polished, smooth except for coriaceous area centrally below antennal sockets; frons smooth and shining, with median vertical carina; genae broad, highly polished, almost impunctate. Flagellum with 22-23 segments. Pronotum rugose; mesoscutum smooth and polished, notauli foveolate; mesopleuron with upper part smooth and polished, lower part foveolate to rugose; metapleuron rugose. Propodeum with area superomedia 'coffin-shaped'. Gaster highly polished.

Brownish, head darker, mesoscutum, axillae, and legs orange-brown; wings slightly infumate, pterostigma clear brown.

Male: like female except that flagellum is more slender and coxae are whitish.

G. uvulus differs from the undescribed New South Wales species in being generally smooth and polished, not granulate and matt, and having shorter antennae and strong foveolate notauli.

Material examined

Holotype ♀, Queensland: Mt Tambourine, xii. (TC).

Paratypes. Queensland: 1 ♀, Mt Tambourine, x-xii. (BMNH); 2 ♀, 1 ♂, same data (TC).

Host records. None.

HANDAOIA Seyrig*

Handaoia Seyrig, 1952: 26. Type-species: *Handaoia spinosa* Seyrig, by original designation.

Small species, fore wing length 3 mm; face slightly convex centrally; clypeus convex, its margin not impressed, simple; mandible evenly tapered, with teeth about equal (Fig. 186); malar space slightly longer than basal mandibular width. Antenna slightly clavate; scape obliquely truncate; segment 1 of flagellum of ♀ about 8.0 times as long as broad; flagellum with a white band, with about 22 segments.

Pronotum mediodorsally simple, with a transverse furrow; mesoscutum polished, obsoletely alutaceous with notauli extending to level of centres of tegulae; scutellum without lateral carinae. Sternaulus strong; posterior transverse carina of mesosternum complete. Propodeum quite long, evenly rounded; transverse carinae strong, lateromedian and lateral carinae virtually absent so area superomedia is not defined.

Fore wing with *cu-a* distal to base of *Rs&M*; 3*r-m* virtually absent; 2*r-m* slightly shorter than abscissa of *M* between 2*r-m* and 2*m-cu*; 2*m-cu* with a single bulla (Fig. 176). Hind wing with distal abscissa of Cu_1 present, weak.

Tergite 1 of gaster evenly broadened posteriorly, dorsally indistinctly striate; sternite 1 reaching to level of spiracles which are positioned centrally; tergite 2 with indistinct microreticulation, polished; laterotergite 2 folded under, with spiracle on tergite close to crease; tergite 3 with laterotergite folded under. Ovipositor straight, slightly hastate apically, with a distinct dorsal nodus; ovipositor projecting beyond apex of gaster by 0.6-0.7 times length of hind tibia.

Remarks. *Handaoia* belongs in the subtribe Chiroticina and is quite closely related to *Paraphylax* from which it is easily distinguished by the single bulla in 2*m-cu* and the dorsally white pedicel. It is a moderately large genus with most species occurring in the tropics. It is known from both the Palaeotropical and Neotropical regions and one species occurs in Japan. Only a few Madagascan species are described. The Australian species were collected in Queensland.

Australian species. Two, undescribed (ANIC; BMNH).

Host records. None.

ISDROMAS Foerster*

Phatnacra Foerster, 1869: 179. Type-species: *Hemiteles monterai* Costa Lima, by subsequent monotypy, Costa Lima, 1948: 31.

Isdromas Foerster, 1869: 179. Type-species: *Acrolyta aletiae* Ashmead (= *Hemiteles lycaenae* Howard), by subsequent monotypy, Ashmead, 1900*d*: 569.

Larsephna Cameron, 1903*d*: 97. Type-species: *Larsephna varipes* Cameron, by subsequent designation, Viereck, 1914: 82.

Daictimorpha Viereck, 1912*b*: 636. Type-species: *Daictimorpha peruviana* Viereck, by original designation.

Small insects, fore wing length 3-5 mm; lower face slightly swollen centrally, usually transverse, matt and granulate; clypeus lenticular, weakly to moderately convex, margin arcuate; mandible short to long, quite strongly tapered near apex, generally about equally bidentate, rarely with upper tooth by far the longer; malar space 0.8-1.1 times basal mandibular width. Antenna from slender to clavate, with or without a white band; scape obliquely truncate (Fig. 202); segment 1 of flagellum more than 5.0 times as long as broad.

Pronotum mediodorsally with a pair of pits or a distinct longitudinal keel; mesoscutum convex, usually granulate; notauli weak to quite strong, generally not reaching to centre, rarely longer; scutellum weakly to quite strongly convex, not laterally carinate. Sternaulus not reaching to hind end of pleuron; posterior transverse carina of mesosternum virtually absent. Propodeum from short and abruptly rounded to quite long and evenly rounded (Fig. 196); propodeal carinae from complete (except for anterior abscissa of lateral carina above the spiracle) to with longitudinal carinae vestigial; area superomedia defined or not (Fig. 200).

Fore wing with *cu-a* opposite or distal to base of *Rs&M*; 3*r-m* absent; 2*r-m* generally about as long as abscissa of *M* between 2*r-m* and 2*m-cu*; 2*m-cu* with two bullae (Fig. 179). Hind wing with distal abscissa of Cu_1 present though sometimes weak.

Gaster with tergite 1 from slender to quite strongly broadened posteriorly, spiracles behind centre; sternite 1 extending to centre or almost to level of spiracles. Tergite 2 with laterotergite separated by crease, quite broad; tergite 3 usually but not always with laterotergite separated by crease. Ovipositor projecting beyond apex of gaster by 0.5-1.6 times length of hind tibia, straight, usually with a nodus and with quite weak oblique teeth on lower valve (Fig. 209).

Remarks. *Isdromas* is a very large genus with numerous species in the Neotropical and Afrotropical regions. The genus, as currently defined, includes a rather heterogeneous assemblage of species, with as yet no satisfactory way of dividing them into more natural smaller groups. Such a task would require a detailed study of extensive material from all areas. There are quite large numbers of species in Australia which seem to fall into three relatively distinct species-groups. These are compared below and a typical species of each is described. These comparisons should enable the reader to appreciate the breadth of this genus.

Character	*I. granulatus* species-group	*I. paternicus* species-group	*I. yuendumui* species-group
Area superomedia	complete, transverse	laterally incomplete or complete and elongate	incomplete laterally
Mesoscutum	matt, granulate	polished to matt, granulate	polished, smooth
Tergite 1	very slender	evenly broadened posteriorly	evenly broadened posteriorly
♀ flagellum	clavate	slender	slender
Mandibles	short	short	very long and slender

Australian species. Apart from the three described below I have seen 26 undescribed species from Australia. All are believed to be endemic.

The *granulatus*-group

This species-group contains three species (BMNH; TC) which are characterized by their small delicate appearance, slender tergite 1 and matt, granulate sculpture. They are restricted to tropical Australia.

Isdromas granulatus sp. n.

Female: fore wing length 3-4 mm; clypeus slightly convex, relatively small, mandible short, quite evenly tapered; flagellum proximally slender, distally broadened, slightly flattened, with about 24 segments. Mesoscutum matt, granulate, notauli short but quite deeply compressed; scutellum granulate; mesopleuron short, granulate; transverse groove before propodeum striate; propodeum short, abruptly declivous, with area superomedia complete, transverse; area petiolaris very long. Tergite 1 of gaster slender, more than 2.0 times as long as posteriorly broad, dorsally striate. Ovipositor projecting beyond apex of gaster by 0.5-0.6 times length of hind tibia, slender.

Yellowish brown species with pale yellow marks on face, scape, upper pronotum, mesoscutal margin, most of legs, anterior margin of tergite 2 and hind margin of tergites 2-6; fore and mid coxae whitish. Wings hyaline.

Male: similar to female but slightly more polished; flagellum not clavate.

I. granulatus may be distinguished from other species in this group by the short, slender ovipositor, colour, lack of flagellar white band and hyaline wings.

Material examined

Holotype ♀, Queensland: Mt Glorious, ii-vi.1977 *(Hiller)* (ANIC).

Paratypes. Queensland: 1 ♀, 1 ♂, Brisbane, ix-xi. (TC); 3 ♀, Mt Glorious, ii-vi.1977 *(Hiller)* (BMNH); 1 ♀, Mt Glorious, xii.1976 *(Boucek)* (BMNH); 1 ♀, Mt Glorious, xii.1979 *(Galloway)* (BMNH); 2 ♀, 4 ♂, Mt Glorious, ix-iii. (TC); 1 ♂, Mt Nebo, viii. (TC); 1 ♀, Mt Tambourine, xi.1977 *(Galloway)* (BMNH).

The *paternicus*-group

This species-group contains about 20 species (ANIC; BMNH; TC) which are widely distributed throughout Australia. It is characterized by the broad tergite 1, the generally compressed ovipositor tip and the slender flagellum. The area superomedia is elongate or has the lateral carinae absent.

Isdromas paternicus sp. n.

Female: fore wing length 4-5 mm; clypeus rather flattened near apex, margin almost truncate; mandible short, fairly evenly tapered; flagellum slender, with about 26 segments, with a white band. Mesoscutum granulopunctate, centrally becoming wrinkled; slightly polished; notauli weak but reaching to levels of middle of tegulae; scutellum polished, punctate; mesopleuron quite long, polished, striate, ventrally grading to irregularly wrinkled; transverse groove before propodeum deep, striate; propodeum abruptly declivous; anterior and posterior transverse carinae strong, others obsolescent. Tergite 1 broad, 1.2-1.3 times as long as posteriorly broad, very weakly striate dorsally. Ovipositor projecting beyond apex of gaster by 0.8-0.9 times length of hind tibia.

Head and alitrunk black; scape and basal flagellar segments brown ventrally, flagellar segments 4-5 white; palp, anterior margin and hind corner of pronotum and tegula whitish; legs and gaster brownish red. Wings hyaline.

Male: like female but flagellum entirely black and tergite 1 slightly more slender.

I. paternicus is distinct from the other species in this group on account of its colour pattern, sculpture and length of ovipositor.

Material examined

Holotype ♀, Tasmania: Weldborough, ii-iii. (TC).

Paratypes. Tasmania: 1 ♀, Mt Barrow, 700 m, i. (BMNH); 1 ♀, 2 ♂, Weldborough, ii-iii. (TC). Victoria: 4 ♂, Mt Dandenong, 300 m, ii. (TC).

The *yuendumui*-group

This distinctive species-group is characterized by the broad clypeus, long slender mandible and long ovipositor. I have seen six species, mostly from drier parts of Australia (BMNH; TC).

Isdromas yuendumui sp. n.

Female: fore wing length 5 mm; clypeus flat, very broad, its margin simple; mandible very long and slender with upper tooth more than 2.0 times the length of the lower; flagellum slender, with about 20 segments, without a white band. Mesoscutum convex, polished with few punctures anteriorly, centrally smooth; notauli strong to centre of scutum then weak and continuing almost to scutoscutellar groove; scutellum convex, polished, smooth; mesopleuron polished, upper part striate grading ventrally to coriaceous, below weak sternaulus almost smooth; transverse groove in front of propodeum smooth; propodeum quite long, evenly rounded with anterior and posterior transverse carinae present, longitudinal carinae absent. Tergite 1 quite broad, about 1.8 times as long as posteriorly broad, dorsally finely alutaceous. Ovipositor projecting beyond apex of gaster by 1.5-1.6 times length of hind tibia, its apex very slender.

Head and alitrunk black; scape brown; mandible, palp, tegula and fore and mid coxae whitish; rest of legs orange to reddish brown; gaster red-brown, paler towards the hind end. Wings hyaline.

Male: similar to female but with scape yellow ventrally and tergite 1 more slender and black. Hind coxa black.

This is the only species in the species-group with such strongly unequal mandibular teeth. The hind coxae of other species are usually black in both sexes.

Material examined

Holotype ♀, Northern Territory: 30 km NW. by W. Alice Springs (23°32'S, 133°38'W), x.1978 *(Cardale)* (ANIC).

Paratypes. Northern Territory: 6 ♀, 4 ♂, Areyonga, 600 m, vii. (TC); 19 ♀, 102 ♂, Yuendumu, viii-ix. (TC).

Host records. *Isdromas* sp. 14 - Tortricidae: *Epiphyas postvittana* (Walker) (ANIC). Species of this genus are most commonly reared in other regions as parasites of small ichneumonid and braconid cocoons, especially those of *Apanteles* (Carlson, 1979).

LIENELLA Cameron

Lienella Cameron, 1905*b*: 196. Type-species: *Lienella nigripes* Cameron, by monotypy.

Lienella Cameron, 1905*f*: 246. Type-species: *Lienella nigripes* Cameron (= *Lienella nigripes* Cameron, 1905*b*). by monotypy. [Homonym of *Lienella* Cameron, 1905*b*.]

Marakelia Seyrig, 1952: 117. Type-species: *Marakelia albatoria* Seyrig, by original designation.

Small species, fore wing length 4 mm; centre of face weakly convex; clypeus rather flat, its apex with a pair of weak lateromedian teeth; mandible quite slender, the upper tooth distinctly the longer (Fig. 187); malar space about 0.7 times basal mandibular width. Antenna of ♀ slender, scape obliquely truncate; segment 1 of flagellum 6.0-7.0 times as long as broad (Fig. 192); flagellum without a white band, with about 23 segments.

Pronotum mediodorsally with a deep transverse furrow; mesoscutum transversely rugose, notauli strong, reaching beyond level of centre of tegulae; scutellum convex, carinate anteriorly. Sternaulus strong, reaching beyond centre of pleuron; posterior transverse carina of mesosternum complete. Propodeum short, abruptly rounded with transverse carinae present, longitudinal carinae weak, in places absent.

Fore wing with *cu-a* opposite base of *Rs&M*; 3*r-m* absent; 2*r-m* slightly longer than abscissa of *M* between 2*r-m* and 2*m-cu*; 2*m-cu* with a pair of widely separated bullae. Hind wing with distal abscissa of Cu_1 present.

Tergite 1 of gaster dorsally smooth, evenly expanded posteriorly; sternite 1 not reaching to level of spiracle which is positioned slightly before the centre; tergites 2-3 coarsely punctate, with laterotergites folded under, spiracles widely separated from crease. Ovipositor straight, elongately acute, projecting beyond apex of gaster by 0.3 times length of hind tibia.

Remarks. *Lienella* is a large Palaeotropical genus with comparatively few described species. It belongs to the subtribe Chiroticina and is probably related to *Astomaspis*. It has a strongly sclerotized rigid gaster, though unlike *Astomaspis* the gaster is long and slender. *Lienella* as a genus is hardly separable from *Bentyra* Cameron, a large Oriental genus. Any attempt to run the Australian species in Townes' (1970*a*) key to the Chiroticina would probably founder at couplet 17 or may even place the species in *Bentyra*. However, *Bentyra* seems to me to be less heavily sclerotized and on balance the Australian specimens are best placed in *Lienella* pending a thorough study of the Old World species.

In Australia, *Lienella* has only been taken in Queensland.

Australian species. One, undescribed (ANIC).

Host records. Hyperparasitic (?) on an ichneumonoid parasite of *Plutella xylostella* L. (Yarrow, 1970), but possibly misidentified.

MERINGOPS Townes*

Meringops Townes, 1970*a*: 80. Type-species: *Meringops minipes* Townes, by original designation.

Small to medium-sized insects, fore wing length 4-6 mm; head, alitrunk and legs bearing exceptionally long dense pubescence. Lower face transverse, swollen so that antennal insertion is almost horizontal; clypeus weakly convex, margin impressed, truncate; mandible moderately long, with upper tooth the longer; malar space 1.3 or more times basal mandibular width (Fig. 194). Antenna quite short and stout with proximal flagellar segment less than 2.0 times as long as broad (Fig. 203), the central ones transverse; truncation of scape almost horizontal; flagellum with 17-19 segments, with or without a white band.

Pronotum mediodorsally long, without a distinct keel; mesoscutum polished, punctate with notauli very short, not reaching to level of anterior edges of tegulae; scutellum flat without lateral carinae. Sternaulus weak; posterior transverse carina of the mesosternum interrupted in front of mid coxae. Propodeum short, abruptly rounded, usually with transverse, delineated area superomedia and crest-like apophyses.

Fore wing with *cu-a* distal to base of *Rs&M*; 3*r-m* present, areolet small; 2*r-m* shorter than or equal to abscissa of *M* between 2*r-m* and 2*m-cu*; 2*m-cu* with one or two very close bullae. Hind wing with distal abscissa of Cu_1 weak but present as a basal stub.

Gaster with tergite 1 slender, spiracle well behind centre; sternite 1 not reaching to spiracle; tergites 2+ polished and smooth, with few hairs; tergite 2 with laterotergite membranous, often not separated by a distinct crease; tergite 3 similar. Ovipositor projecting beyond apex of gaster by 0.5-0.8 times length of hind tibia; ovipositor apex simply acute, with a strong nodus (Fig. 206).

Remarks. *Meringops* is a small endaseine genus restricted to the south temperate region. The type-species (the only one described) occurs in Chile. In Australia the genus is restricted to the south-east corner; I have seen no material from north of 35° S.

Australian species. Three, undescribed (AM; ANIC; BMNH).

Host records. None from Australia. In Europe several endaseines are extremely common on flower heads but they are almost never reared. Morphologically endaseines seem to be adapted for burrowing in leaf litter and loose soil. The few records of reared specimens are from various cocoons (e.g. Tripp, 1961). This suggests that these insects are parasites of cocoons in leaf litter and soil.

NIPPONAETES Uchida*

Nipponaëtes Uchida, 1933: 160 [as a subgenus of *Hemiteles* Gravenhorst]. Type-species: *Hemiteles (Nipponaëtes) haeussleri* Uchida, by original designation.
Potia Seyrig, 1952: 36. Type-species: *Potia inelegans* Seyrig, by original designation.
Nipponaëtes Uchida; Townes, 1957: 113. [Raised to genus.]
Thalops Townes, 1958: 57. Type-species: *Thalops fessus* Townes, by original designation.

Small species, fore wing length about 3 mm; face with a median convex elevation at centre; clypeus convex, margin simple, impressed; mandible slender, with upper tooth very much the longer (Fig. 185); malar space about as long as basal mandibular width. Antenna of ♀ slender, not obviously subclavate; scape obliquely truncate; segment 1 of glagellum about 7.0 times as long as broad; flagellum without a white band, with about 20 segments.

Pronotum with a mediodorsal keel; mesoscutum granulate with notauli strong, reaching to behind level of centre of tegulae; scutellum convex, partially carinate laterally. Sternaulus strong; posterior transverse carina of mesosternum complete. Propodeum moderately short, with all areae defined by strong carinae.

Fore wing with *cu-a* about opposite base of *Rs&M*; 3*r-m* completely absent; 2*r-m* long, slightly longer than abscissa of *M* between 2*r-m* and 2*m-cu*; 2*m-cu* with a single bulla. Hind wing with distal abscissa of Cu_1 present, faint.

Tergite 1 of gaster dorsally longitudinally striate; posteriorly evenly broadened with spiracles behind centre; sternite 1 not reaching to spiracles, separated from tergite by carina; tergite 2 similarly striate, with laterotergites slightly turned under, the spiracle separated from the lateral crease by about its own diameter; tergite 3 with laterotergite broad, pendant. Ovipositor straight, tapered to sharp point, projecting beyond apex of gaster by 0.4-0.5 times length of hind tibia.

Remarks. *Nipponaetes* is a small genus with only three described species from Korea, Madagascar and Micronesia. Townes (1970*a*) places this genus in the subtribe Rothneyiina, but in his key the Australian species would run to the Acrolytina. The single Australian species is from Queensland.

Australian species. One, undescribed (ANIC).

Host records. None from Australia. *N. haeussleri* has been recorded from *Cydia molesta* (Busck) in Korea (Uchida, 1933).

PARAPHYLAX Foerster*

Strepsimallus Foerster, 1869: 176. Type-species: *Strepsimallus bicinctus* Ashmead, by subsequent monotypy, Ashmead, 1905*a*: 115.
Paraphylax Foerster, 1869: 176. Type-species: *Paraphylax fasciatipennis* Ashmead, by subsequent monotypy, Ashmead, 1904: 141.
Paurophatnus Cameron, 1905*j*: 342. Type-species: *Paurophatnus annulipes* Cameron, by monotypy.
Valoga Cameron, 1911*b*: 178. Type-species: *Valoga nitidisentis* Cameron, by monotypy.
Photoptera Viereck, 1913: 380. Type-species: *Photoptera erythronota* Viereck, by original designation.
Neotheroscopus Turner, 1927: 559. Type-species: *Neotheroscopus caffer* Turner, by original designation.
Tsangamania Seyrig, 1952: 38. Type-species: *Tsangamania nimbipennis* Seyrig, by original designation.
Parallocota Seyrig, 1952: 86. Type-species: *Parallocota montypa* Seyrig, by original designation.

Diodontops Seyrig, 1952: 90. Type-species: *Diodontops cubiceps* Seyrig, by original designation.
Resosoa Seyrig, 1952: 124. Type-species: *Resosoa ridens* Seyrig, by original designation.
Mioplectiscus Benoit, 1955*a*: 339. Type-species: *Mioplectiscus basilewskyi* Benoit, by original designation.

Small to medium-sized species, fore wing length 3-9 mm; face with a weak to strong median convex elevation at centre; clypeus flat to weakly convex, margin simply convex or with a pair of median weak teeth; mandible quite short, evenly narrowed, upper tooth as long as or very slightly longer than the lower; malar space 0.6-1.3 times basal mandibular width. Antenna of ♀ slender with scape truncate at 40° or more to horizontal; segment 1 of flagellum at least 4.0 times as long as broad; flagellum with or without a white band.

Pronotum mediodorsally with a keel, or with a pair of pits or simple with a transverse furrow; mesoscutum from smooth and virtually unsculptured to coriaceous, coarsely punctate or transversely striate; notauli usually strong, reaching to level of centre of tegulae or more, often supplemented by a median longitudinal furrow; scutellum convex with or without carinae. Sternaulus generally strong, reaching almost to hind margin of pleuron (Fig. 55); posterior transverse carina of mesosternum complete. Propodeum various, from completely carinate to with only transcarinae discernible.

Fore wing with *cu-a* opposite or slightly proximal to base of *Rs&M*; 3*r-m* absent; 2*r-m* from very much shorter than abscissa of *M* between 2*r-m* and 2*m-cu* to almost equal to it; 2*m-cu* with two moderately separated bullae (Fig. 177). Hind wing with distal abscissa of Cu_1 present.

Tergite 1 of gaster generally simple, convex above, smooth or variously sculptured; sternite 1 extending about 0.5 times length of tergite, not reaching to level of spiracles, positioned 0.6-0.7 of way along segment; tergite 2 with laterotergite narrow to broad, usually turned under, always separated by crease; spiracles variously positioned; tergite 3 with or without laterotergite upturned and separated by crease. Ovipositor usually straight, projecting beyond apex of gaster by 0.3-1.7 times length of hind tibia.

Remarks. *Paraphylax* is a very large genus most species of which occur in the Old World Tropics although it is widely distributed throughout Australia. It is a very difficult genus to define and includes a diverse assemblage of species, many of which will eventually be separated as good genera. At present this is not possible unless an intensive study were to be made of the several hundred species available. Furthermore, *Paraphylax* is not clearly separable from *Chirotica* and several species (e.g. *C. decorata* Tosquinet) can equally well be placed in either genus (Townes *et al.*, 1961; Townes, 1970*a*).

Several of the larger Australian species could be placed in *Chirotica* as defined by Townes (1970*a*) but then one would have to assign a number of intermediate Australian species almost arbitrarily to one or other genus. To do this would be quite impractical at present and I have chosen to place all Australian species in *Paraphylax*. The 'true' *Chirotica* (as represented by a group of Holarctic species including the type-species) have hastate, laterally compressed ovipositors quite unlike those of any Australian ones. The large *Chirotica*-like Australian species probably represent a different phyletic lineage from the Palaearctic species.

There is a large range of morphological variation in the Australian *Paraphylax* and several rather poorly defined species-groups are discernible. These are compared in Table 2 and a typical example of each is described below. These should serve to convey to the reader my concept of the genus.

Australian species. Apart from the four species described below I have seen 49 other species, all apparently undescribed. I have not seen any Australian species from elsewhere.

CHARACTER	*P. anax* species-group	*P. pulax* species-group	*P. mirax* species-group	*P. corvax* species-group
Mesoscutal sculpture	coarsely trans-striate	coarsely trans-striate	smooth with central sculpture or incipient trans-striation	smooth
Facial tubercle	strong	moderately strong	weak	moderate
Facial sculpture	coriaceous	striate/rugose	punctostriate	coriaceous
Propodeal apophyses	present	absent	±absent	absent
Length of ovipositor projection as a proportion of hind tibia	1.2–1.4	0.3–0.6	0.5–1.2	0.5–1.7
Position of spiracle on tergite 2	close to margin	widely separated from margin	close to margin	close to margin
Vein *2r-m* as a proportion of abscissa of *M* between *2r-m* & *2m-cu*	0.2–0.4	0.2–0.4	0.4–1.0	0.2–0.4
Tergite 1	slender	slender	slender	stout
Sternite 1 reaching to _____ level of tergite 1	centre	beyond centre	to or beyond centre	not reaching centre

TABLE 2. A comparison of the Australian species-groups of *Paraphylax*

The *anax*-group

This species-group contains three species which are characterized by having a strongly transversely striate mesoscutum, a strong facial tubercle, weak to strong propodeal apophyses, a very short *2r-m* and a relatively long ovipositor. The species of this group are large insects and are somewhat similar to *Chirotica* species. The species described below is a typical example of this species-group.

Paraphylax anax sp. n.

Female: fore wing length 7-8 mm; lower face transverse, coriaceous, with a strong median swelling; clypeus flat, virtually unsculptured, its margin with a pair of weak median teeth; malar space 0.8 times basal mandibular width; frons striate, with an impressed median vertical furrow; genae strongly narrowed behind the eyes; flagellum with about 28 segments, with a median white band. Pronotum mediodorsally with a transverse furrow, the anterior lip of this furrow swollen; epomia short and weak. Mesoscutum transversely striate, notauli long ans strongly impressed; scutellum convex. Mesopleuron rugose to striate. Propodeum short, abruptly rounded with carinae weak; propodeal apophyses strong, long. Fore wing with *cu-a* opposite base of *Rs&M*; *2r-m* 0.3 times length of *M* between *2r-m* and *2m-cu*. Gaster with petiole slender, sternite 1 reaching to centre of segment; tergite 2 with laterotergite of moderate width, folded under; spiracle separated from margin of segment by about its own diameter. Ovipositor projecting beyond apex of gaster by about 1.2 times length of hind tibia.

Red species with black and white marks on face, genae and all parts of alitrunk. Gaster reddish, laterally slightly infuscate. Fore and mid legs orange, coxae white marked; hind legs red-brown, femur and tibia distally black; tibia proximally and most of tarsus white. Wings hyaline with obsolescent infumate patches.

P. anax is easily distinguished from other species in this group by its colour and long propodeal apophyses.

Material examined

Holotype ♀, Queensland: Mt Tambourine, x.1977 *(Galloway)* (ANIC).

Paratypes. Queensland: 23 ♀, Mt Tambourine, x-xii.1976-78 *(Galloway)* (ANIC; BMNH; DPIQ); 2 ♀, Mt Glorious, xii.1976 *(Boucek)* (BMNH); 1 ♀, Mt Glorious, ii-vi. 1977 *(Hiller)* (BMNH).

The *pulax*-group

This species-group contains five species which are characterized by having a strongly sculptured face, transversely striate mesoscutum, a relatively rigid gaster with the spiracles of tergite 2 separated from edge by about 4.0 times their own diameter, and a short ovipositor. The species of this group are large, mainly black insects with a slender petiole and polished gastral tergites. The one described below is typical of this species-group except that it has a well-developed frontal horn.

Paraphylax pulax sp. n.

Female: fore wing with 7-9 mm; lower face transverse, striate or rugose, with moderately strong median swelling; clypeus flat, sculptured almost to apex which is simple; malar space 1.2-1.3 times as long as basal mandibular width; frons striate with a median blunt horn; genae moderately wide behind eyes; flagellum with about 34 segments, with or without a white band. Pronotum mediodorsally with a transverse furrow interrupted by a crest or pair of pits; epomia short. Mesoscutum transversely striate; scutellum convex. Mesopleuron rugose to striate, speculum smooth. Propodeum moderately long, evenly convex, with almost complete carinae; area superomedia long and narrow; propodeal apophyses absent. Fore wing with *cu-a* opposite base of *Rs&M*; *2r-m* about 0.3 times length of abscissa of *M* between *2r-m* and *2m-cu*. Gaster with petiole slender; sternite 1 reaching behind centre; tergite 2 with laterotergite turned completely under; spiracle separated from margin of tergite by at least 4.0 times its own diameter; tergite 2 anteriorly punctate, posteriorly smooth; remainder of gaster smooth. Ovipositor projecting beyond apex of gaster by 0.3 times length of hind tibia.

Black species. Antenna pale yellow, distally infuscate. Fore and mid coxae rufescent; fore and mid legs red; hind tibia proximally paler; hind tarsal segments 1 distally and 2-4 entirely white. Wings hyaline.

Male: like female but with flagellum black, fore and mid legs orange, hind coxa to femur reddish and tergites 1, 2 and 3 anteriorly reddish.

P. pulax is easily distinguished from related species by the frontal horn and the smooth shining speculum.

Material examined

Holotype ♀, Queensland: Mt Tambourine, x-xi.1978 *(Galloway)* (ANIC).

Paratypes. New South Wales: 1 ♀, Barrington N. P., i. (TC); 1 ♂, Ebor, i. (TC). Queensland: 1 ♀, Mt Glorious, xii.1976 *(Boucek)* (BMNH); 3 ♂, Mt Glorious (TC); 1 ♀, Mt Tambourine, x.1977 *(Galloway)* (BMNH); 3 ♂, Mt Tambourine, xii. (TC).

The *mirax*-group

This is the largest species-group with about 40 species which are generally 'typical' *Paraphylax*; most are small species with strongly patterned wings. This group is characterized by having a short, usually convex mesoscutum which is centrally coarsely sculptured but otherwise either smooth or very weakly sculptured, a very weak facial tubercle, obsolescent propodeal apophyses, a relatively long vein 2 and a moderately long ovipositor. Several species have incipient striation on the mesoscutum and have *2r-m* shorter. These are thus intermediate between the *P. mirax* and *P. anax* species-groups.

The species described below is typical of the majority of species in this group.

Paraphylax mirax sp. n.

Female: fore wing length 4-5 mm; lower face slightly transverse, punctostriate, with a weak median swelling; clypeus slightly convex, its lower part broadly unsculptured, its margin blunt with a pair of weak median teeth; malar space 0.8 times basal mandibular width; frons striate, with a median vertical furrow; genae quite strongly narrowed behind eyes; flagellum with about 22 segments, with a white median band. Pronotum mediodorsally with a pair of pits; epomia vestigial. Mesoscutum short, convex, smooth except for a central striate area; scutellum moderately convex. Mesopleuron coriaceous, with speculum shining. Propodeum evenly rounded with transverse carinae strong, longitudinal carinae obsolescent. Fore wing with *cu-a* almost opposite *Rs&M*; *2r-m* as long as abscissa of *M* between *2r-m* and *2m-cu*. Tergite 1 long, petiole quite slender; sternite 1 reaching beyond centre of segment; tergite 2 with membranous laterotergite; spiracle close to tergite margin; gastral segments smooth and polished. Ovipositor projecting beyond apex of gaster by 0.6 times length of hind tibia.

Black species; mandible, pronotum, anterior part of mesoscutum, scutellum, upper anterior corner of mesopleuron red; fore and mid legs with coxae and trochanters white, remainder orange; hind legs brownish orange, trochanter and proximal apex of tibia white. Wings hyaline, the fore wing with two broad central infumate stripes.

P. mirax may be distinguished from all others by the characteristic colour pattern, the propodeal sculpture, polished gaster and white flagellar band.

Material examined

Holotype ♀, Queensland: Brisbane, Long Pocket, ix.1977 *(Galloway)* (ANIC).

Paratypes. Queensland: 4 ♀, Brisbane, Long Pocket, ix.1977 *(Galloway)* (BMNH;

DPIQ); 2 ♀, Camp Mt, i.1980 *(Galloway)* (BMNH); 5 ♀, Mt Glorious, xii.1976 *(Boucek)* (BMNH); 15 ♀, Mt Tambourine, ix-x.1977-78 *(Galloway)* (BMNH).

The *corvax*-group

A small species-group containing five species. It is characterized by having a relatively short, broad tergite 1 with sternite 1 short, not reaching 0.4 times length of tergite. The mesoscutum is rather long and usually flat, with at most only a faint sculpture centrally, it is otherwise smooth and highly polished. The ovipositor is moderately to very long and has a very strong nodus; the part beyond the nodus, in some species, is angled downwards. The species described below is a typical example of this group.

Paraphylax corvax sp. n.

Female: fore wing length 4 mm; lower face transverse, coriaceous with a moderately developed median tubercle; clypeus convex, not sculptured to apex, margin with a pair of vestigial teeth; malar space about 1.2 times basal mandibular width; frons striate with median vertical groove; head strongly constricted behind eyes; flagellum with 25 segments, without a white band. Pronotum with a deep transverse furrow mediodorsally; epomia indistinct. Mesoscutum long, smooth and polished, with deep notauli; scutellum convex. Mesopleuron punctostriate, speculum polished. Propodeum evenly rounded, almost fully carinate with elongate area superomedia. Fore wing with *cu-a* opposite base of *Rs&M*; *2r-m* about 0.3 times length of abscissa of *M* between *2r-m* and *2m-cu*. Tergite 1 of gaster strongly and evenly broadened posteriorly, sternite 1 short, not reaching to centre of segment; tergite 2 with laterotergite broad, sclerotized, turned under; spiracle close to margin of tergite; tergites 2 and 3 weakly rugulose, polished, remaining segments smooth and polished. Ovipositor projecting beyond apex of gaster by 1.1 times length of hind tibia, with apex of upper valve with a distinct nodus and decurved beyond this nodus.

Black species; anterior of mesoscutum, tegula, hind upper corner of pronotum and spots on fore and mid coxae yellow; flagellum brown; gaster reddish; legs, except rufescent coxae, orange, hind legs with tarsus infuscate; trochanters and proximal end of hind tibia marked with white.

Male: similar to female but with slightly more extensive pale marks; fore and mid coxae whitish.

This species is easily recognized by the angulate ovipositor tip, colour pattern and relatively smooth gaster. Most other species in this group have the gaster finely alutaceous and quite matt.

Material examined

Holotype ♀, New South Wales: Monga, ix.1967 *(Riek)* (ANIC).

Paratypes. New South Wales: 3 ♀, 3 ♂, Helensburgh, iv.1979 *(Chadwick)* (AM). Queensland: 1 ♀, Kuranda, vii.1913 *(Turner)* (BMNH); 1 ♀, Mackay (BMNH).

Host records. *Paraphylax corvax* - Araneidae: *Eriophora* sp. (AM). *Paraphylax* sp. 1 - Psychidae: *Lomera caespitosae* (Oke) ?secondary (Chadwick & Nikitin, 1976). *Paraphylax* sp. 2 - Araneidae: *Araneus transmarinus* Keys, egg sac (Chadwick & Nikitin, 1976). *Paraphylax* sp. 11 - Pieridae: *Pieris rapae* (L.) (BMNH); Plutellidae: *Plutella xylostella* L. (BMNH). [In both cases sp. 11 may have been parasitic on apanteline braconids, primary parasites rather than the hosts indicated.] *Paraphylax* sp. 13 - Psychidae: *Norycia* sp. (ANIC). *Paraphylax* sp. 23 - Plutellidae: *Plutella xylostella* L. (BMNH) (Incorrectly determined as *Lienella* sp.). *Paraphylax* sp. 24 - 'ribbed case moth' (BMNH). *Paraphylax* sp. 29 - Pergidae: *Phylacteophaga froggati* Riek (ANIC). *Paraphylax* sp. 34 - Psychidae (BMNH). *Paraphylax* sp. 35 - Araneidae: *Celaenia excavata* Koch (DAR). *Paraphylax* sp. - Saturniidae: *Antheraea* sp., 37 adults ex one cocoon (TDF).

In many other parts of the world *Paraphylax/Chirotica* species are common parasites on Psychidae. In Australia, where there are relatively few small Phygadeuontini, *Paraphylax* species seem to have diversified to utilize a broader range of hosts, attacking small cocoons. As with many other phygadeuontines the presence of silk and a host of approximately the right dimensions are probably more important requirements than a particular host species.

RHADINOMASTRUS gen. n.

Type-species: *Rhadinomastrus elongatus* sp. n.

Small to medium-sized species, fore wing length 3-6 mm; lower face fairly flat; clypeus weakly to moderately convex, margin arcuate, simple; mandible evenly narrowed, with lower tooth usually slightly the longer; malar space 0.8-1.0 times basal mandibular width. Antenna long and slender, scape obliquely truncate; flagellum with 24-26 segments, without a white band.

Pronotum mediodorsally apparently simple (though under high power a faint trace of a median keel is discernible) to with a keel; mesoscutum finely sculptured, granulate to coriaceous, notauli weak, not reaching to level of centre of tegulae; scutellum flat, without lateral carinae. Sternaulus weak; posterior transverse carina of mesosternum incomplete. Propodeum long (Fig. 198), evenly rounded, dorsally without carinae.

Fore wing with *cu-a* distal to base of *Rs&M*; *3r-m* weak or absent, sometimes its position discernible from angulation of *Rs* and *M*; *2r-m* from shorter than to equal to abscissa of *M* between *2r-m* and *2m-cu*; *2m-cu* with two widely interspaced bullae. Hind wing with distal abscissa of Cu_1 present, weak.

Tergite 1 of gaster evenly broadened posteriorly, granulate or coriaceous, with spiracle slightly behind centre; sternite 1 not reaching to level of spiracle; tergite 2 polished, with laterotergite quite wide to narrow, folded under and separated by a sharp crease, tergite 3 similar. Ovipositor straight, projecting beyond apex of gaster by 3.3-3.6 times length of hind tibia, with a distinct nodus.

Etymology. *Rhadinos* (slender, lithe) + *Mastrus* (a related genus). Masculine.

Remarks. Species of this genus are long, slender ichneumonids with subspherical heads, obviously adapted for exploiting hosts concealed in mines in plant tissue. The systematic position of the genus is in doubt as it could either be placed in the Acrolytina or Mastrina as defined by Townes (1970*a*). This problem will remain until related, less specialized species are found.

Rhadinomastrus species are only known from the east side of the continent between south Queensland and Tasmania. I have seen one Chilean species which may belong here (BMNH).

Australian species. I have seen three un-named species (ANIC; BMNH; TC), one of which is described below.

Rhadinomastrus elongatus sp. n.

Female: fore wing length 3-4 mm; lower face transverse, granulate; frons relatively flat, granulate; head behind the eyes evenly rounded, vertex polished and weakly granulate. Pronotum without a distinct median keel, long; alitrunk rather long and cylindrical, moderately strongly polished; mesopleuron with speculum polished; laterotergite 2 quite broad, 0.25 times as broad as long. Ovipositor with extreme apex beyond nodus slightly down turned.

Blackish; mandible, tegula and hind corner of pronotum, most of fore and mid coxae and distal apices of all trochanters yellow; pronotum reddish; antenna, legs and most of gaster brownish, tergite 3 anteriorly orange-brown.

Male: like female only slightly darker.

R. elongatus differs from the other two species in the sculpture of the alitrunk and tergite 1 of the gaster, in the shape of the ovipositor tip and in the size of the laterotergites. It appears to be a late autumn/winter species.

Material examined
Holotype ♀, Australian Capital Territory: Canberra, v.1963 *(Riek)* (ANIC).
Paratypes. Australian Capital Territory: 1 ♀, Canberra, v.1963 *(Riek)* (BMNH). Queensland: 1 ♀, 5 ♂, Stanthorpe, v-vii. (TC).

TRYONOCRYPTUS Gauld & Holloway

Tryonocryptus Gauld & Holloway, 1983: 192. Type-species: *Tryonocryptus nigridorsalis* Gauld & Holloway, by original designation.

Moderately large to large species; fore wing length 10-18 mm; face rather flat, transverse; clypeus broad, fairly flat, with a blunt median apical tooth or tubercle; mandible very large, broad, slightly broadened distally, the lower tooth larger and longer than the upper (Fig. 195); malar space 0.3 or less times basal mandibular width. Antenna of ♀ short, scape cylindrical, distally truncate at 10-15° from horizontal; segment 1 of flagellum 5.0-6.0 times as long as broad, segments 5+ transverse; flagellum with a white band.

Pronotum mediodorsally with transverse furrow; mesoscutum polished, punctate, notauli vestigial; scutellum convex weakly, not laterally carinate. Sternaulus more or less absent; posterior transverse carina of mesosternum incomplete. Propodeum short, abruptly declivous with anterior and usually posterior transverse carinae present, close together, longitudinal carinae more or less absent.

Legs unusual in being rather short and stout, all tibiae, especially the anterior one, spinose.

Fore wing with *cu-a* opposite base of *Rs&M*; *3r-m* present enclosing a large pentagonal areolet; *2m-cu* with one long, or rarely two very close bullae. Hind wing with distal abscissa of Cu_1 present.

Tergite 1 of gaster dorsally flat, smooth, evenly broadened posteriorly, sternite 1 not quite reaching to level of spiracle, which is positioned behind centre; tergites 2-3 strongly depressed, broad and almost smooth with laterotergites turned under but not separated by a sharp crease. Ovipositor slightly decurved, projecting beyond apex of gaster by 0.7-1.6 times length of hind tibia; upper valve stout, rather abruptly and bluntly rounded apically (Fig. 205).

Remarks. *Tryonocryptus* is a small endemic Australian genus. It is easily recognized by the blunt ovipositor, short antenna and flared mandible.

Tryonocryptus belongs to the endaseine group of genera. The three species recognized are widely distributed in eastern Australia.

Australian species. *T. amicus* Gauld & Holloway (E); *T. gigas* Gauld & Holloway (E); *T. nigridorsalis* Gauld & Holloway (E).

Host records. *Tryonocryptus gigas* - Lasiocampidae: *Entometa apicalis* (Walker) (NMV).

XENOLYTUS Foerster

Xenolytus Foerster, 1869: 174. Type-species: *Xenolytus rufipes* Cameron (= *Ichneumon bitinctus* Gmelin), by subsequent monotypy, Cameron, 1906*a*: 154.
Sternocryptus Roman, 1925: 12. Type-species: '*Cryptus bintinctus* Gravenhorst' (= *Ichneumon bitinctus* Gmelin), by original designation.

Small species; fore wing length 3-4 mm; lower face transverse, with a strong median convexity; clypeus large, centrally flattened, margin sharp, truncate; mandible quite long and slender, outer surface very convex, with a strong proximal concavity; upper mandibular tooth conspicuously the longer (Fig. 188); malar space 1.1-1.2 times as long as basal mandibular width. Antenna short, cylindrical, scape only slightly obliquely truncate; flagellum without a white band, with only 17 segments.

Pronotum without a mediodorsal keel; mesoscutum polished with notauli weak, not extending to level of anterior edges of tegulae; scutellum convex. Sternaulus weak, reaching to centre of pleuron; posterior transverse carina of mesosternum incomplete. Propodeum short, abruptly rounded with more or less complete carinae; area superomedia transverse, apophyses weak.

Fore wing with *cu-a* distal to base of *Rs&M*; 3*r-m* very weak, delineating an almost regularly pentagonal areolet; 2*m-cu* with one bulla or two bullae close together. Hind wing with distal abscissa of Cu_1 weak but discernible.

Tergite 1 of gaster slender with spiracles well behind centre; sternite 1 reaching slightly beyond spiracles. Tergite 2 polished, its laterotergite separated by sharp crease, folded under; tergite 3 similar. Ovipositor decurved, projecting beyond apex of gaster by 1.0 times length of hind tibia; ovipositor apex with a weak nodus.

Remarks. *Xenolytus* is a small Holarctic and Oriental genus belonging to the subtribe Gelina of Townes (1970*a*). One species, *X. bitinctus*, is widespread throughout the world and occurs around flour mills, granaries, etc. where it parasitizes a variety of Microlepidoptera. It is also found associated with bird nests (Richards, 1949). Carlson (1979) noted that this species occurred in Australia and I have seen a single Australian specimen collected in Wilson Cave, Victoria.

Australian species. *X. bitinctus* (Gmelin) (C).

Host records. None from Australia but in the north temperate regions it is associated with *Tinea pallescentella* Stainton (Tineidae), *Hofmannophila pseudospretella* (Stainton) and *Endrosis sarcitrella* (L.) (Oecophoridae) (Richards, 1949).

Tribe HEMIGASTERINI
(= Echthrini sensu Townes)

This relatively small tribe contains 25 genera, most of which are restricted to the north temperate region. The majority are parasites of Symphyta. The limits of this tribe have been subject to almost continuous change since it was first recognized as a natural unit by Thomson (1873) (although it was not named). Townes (1944) grouped most of the genera (the *Aptesis* generic complex) together under the name Aptesini. Narayanan & Kundan Lal (1958), pirating Townes' unpublished notes, included *Echthrus* within this tribe and renamed it Echthrini. Townes & Townes (1962) treated *Echthrus* as belonging to the Mesostenini but included *Hemigaster* with the aptesine genera under the name Hemigasterini. In a later work (1970*a*) Townes removed *Rhembobius* to the Phygadeuontini and transferred *Echthrus* back into the Hemigasterini. As defined by Townes (1970*a*) the Hemigasterini appears to include three groups of genera, the *Aptesis*-group (which includes most members of the tribe), the *Hemigaster*-group (which includes *Hemigaster*, *Litochila* and *Mansa*) and the *Echthrus*-group (which includes only the genus *Echthrus*). Whether or not these three groups are closely phylogenetically related is liable to be debated for many years to come. Carlson (1979) believes that the *Hemigaster*-group is more closely related to the baryceratine group of Mesostenini. However, both are parasites of Limacodidae and the similarities may be the result of evolutionary convergence. I have studied the genus *Litochila*, which is the least specialized of the *Hemigaster*-group, and believe Townes' interpretation is correct. Certainly in the structure of the metanotum *Litochila* appears to be related to the *Aptesis*-group rather than to baryceratines. It is far more difficult to believe that similarities in this, rather reduced structure, are convergences. However, the similarity of such an adaptive character as the ovipositor tip, which exists between the *Hemigaster*-group and Baryceratines, could well be due to evolutionary convergence.

Although a few genera (e.g. *Javra*, *Polytribax*) occur on the northern periphery of the Oriental region the only true tropical South East Asian species belong to *Mansa* and *Hemigaster*. Both these genera are recorded from Australia (Townes *et al.*, 1961) but the record of *Hemigaster* is rather dubious.

KEY TO GENERA OF HEMIGASTERINI OCCURRING IN AUSTRALIA

1 Fore wing with 3*r-m* present (Fig. 214); tergites 4-6 normal, not retracted beneath tergite 3; tergite 1 without carinae........*MANSA* (p. 133)
\- Fore wing with 3*r-m* absent (Fig. 213); tergites 4-6 retracted beneath tergite 3 which together with tergite 2 forms a sort of carapace (Fig. 215); tergite 1 with lateral and lateromedian longitudinal carinae....................................*HEMIGASTER* (p. 132)

HEMIGASTER Brullé

Hemigaster Brullé, 1846: 266. Type-species: *Hemigaster fasciata* Brullé, by subsequent designation, Viereck, 1914: 67.
Chreusa Cameron, 1899: 209. Type-species: *Chreusa fulvipes* Cameron, by subsequent designation, Ashmead, 1900*a*: 14.
Asius Tosquinet, 1903: 260. Type-species: *Asius fulvus* Tosquinet, by monotypy.
Charmis Tosquinet, 1903: 274. Type-species: *Charmis limbatus* Tosquinet (= *Chreusa fulvipes* Cameron), by monotypy.
Cryptoderma Morley, 1913*b*: 312. Type-species: *Cryptoderma anormis* Morley (= *Chreusa fulvipes* Cameron), by original designation.

Medium-sized to moderately large species; fore wing length 6-11 mm; face with a median vertical ridge; clypeus small, truncate; mandible short, the upper tooth slightly the longer; malar space far longer than basal mandibular width. Frons with a median lamella; occipital carina mediodorsally interrupted. Antenna spindle-shaped, with or without a median white band.

Alitrunk short; mesoscutum with weak to quite strong notauli, with a transverse deep furrow immediately before the scuto-scutellar groove; scutellum laterally carinate. Propodeum abruptly declivous, almost completely carinate except that areae superomedia and basalis are often confluent and weakly separated from very long area petiolaris.

Fore wing with 3*r-m* absent (Fig. 213); 2*r-m* much longer than abscissa of *M* between 2*r-m* and 2*m-cu*. Hind wing with distal abscissa of Cu_1 present.

Gaster with tergite 1 evenly broadened with lateral and lateromedian longitudinal carinae; tergites 2 and 3 larger, rigid, forming a carapace and remainder of gaster retracted. Ovipositor 0.5-0.6 times length of hind tibia.

Remarks. A very distinctive genus on account of the carapace-like gaster (Fig. 215) which is reminiscent of that of cheloníne braconids.

Hemigaster is a moderate-sized genus. All the species I have seen are from tropical Asia or the islands to the south and east of the South China Sea. Despite extensive collection it has not been taken in New Guinea, nor have I seen a single specimen from Australia. The status of this genus as Australian rests upon a dubious record by Brullé (1846). Townes (1970*a*), who has made a thorough study of the Brullé types, says this of *Hemigaster* - "Brullé, however, is notorious for giving incorrect localities". I doubt that *Hemigaster* occurs in Australia but I believe it is premature to delete it from the Australian list. I have therefore included it in this work.

Australian species. *H. lutea* Brullé (? Asian).

Host records. None, but Townes (1970*a*) suggests that Limacodidae may be the hosts of this genus.

Mansa Tosquinet

Mansa Tosquinet, 1896: 209. Type-species: *Mansa singularis* Tosquinet, by monotypy.
Colganta Cameron, 1902*c*: 20. Type-species: *Colganta nigromaculata* Cameron, by subsequent designation, Viereck, 1914: 35.
Pseudomansa Szépligeti, 1916: 229. Type-species: *Pseudomansa minor* Szépligeti, by subsequent designation, Townes *et al*., 1961: 134.

Medium-sized to large insects; fore wing length 10-20 mm; face with a median weak convexity, clypeus truncate; mandible small, evenly tapered with upper tooth the longer; malar space far longer than basal mandibular width. Frons simple; occipital carina complete. Antenna slightly broadened distally, ventrally flattened, with a white band or with apex darkened.

Alitrunk fairly short; mesoscutum without distinct notauli and without a furrow before the scutoscutellar groove; scutellum laterally carinate. Propodeum abruptly declivous, from without carinae to carinate but with area superomedia fused with area basalis.

Fore wing with 3*r-m* present, areolet very large, anteriorly explanate (Fig. 214); 2*r-m* far longer than abscissa of *M* between 2*r-m* and 2*m-cu*. Hind wing with distal abscissa of Cu_1 present.

Gaster with tergite 1 slender, posteriorly abruptly broadened; tergites 2-7 exposed, unspecialized. Ovipositor projecting beyond apex of gaster by 0.6-0.8 times length of hind tibia.

Remarks. A very easily recognizable genus on account of its wing venation. *Mansa* is a moderately large genus with species widely distributed throughout the Old World tropics. Several species occur in New Guinea and one occurs in north Queensland.

Turner (1919) and Cushman (1922) treat the Australian representative of the genus as a distinct subspecies on account of its more infuscate wings. When so few specimens are at hand to enable one to judge the normal range of variation, such a status seems to be premature so I have not recognized it as a separate subspecies.

Australian species. *M. volatilis* (Smith) (W).

Host records. None. Townes (1970*a*) suggests that Limacodidae may be the hosts of this genus. Limacodids are known to be the hosts of species of the related genus *Litochila* (Momoi & Okamoto, 1965).

Tribe MESOSTENINI
(= Cryptini of authors)

Mesostenines are generally large or medium-sized ichneumonids. They have a single bulla in 2*m-cu* and never have complete propodeal areolation. Frequently only the anterior transverse carina is present, though the posterior one may be represented by strong apophyses. Unlike the Hemigasterini, the dorsal rim of the metanotum does not have teeth laterally although sometimes teeth are present below the rim. Very few species have the posterior transverse carina of the mesosternum complete.

The Mesostenini is the largest of the three tribes and, unlike the other two, it is most diverse in the tropics. Townes (1970*a*) recognized over 175 genera which he grouped into 15 subtribes. In almost every piece of work on tropical mesostenines published subsequently additional genera have been recognized (e.g. Jonathan, 1980). A large proportion of the tropical species are brightly coloured and have disruptive or mimic colour patterns. Often these are diagnostic of a species, but are repeated in a number of different genera. In cooler areas species are less brightly coloured. Many mesostenines mimic aculeates and some can inflict a painful sting.

In the present work 36 genera are recorded from Australia. Of these, 14 were previously known, 10 are described as new and the remaining 12 are new records. A large proportion of the genera are only known from tropical Queensland. These genera are principally Old World tropical genera and generally have only one or two Australian species. Further south there are fewer genera, but those genera occurring generally have more Australian species.

Biologically mesostenines are more conservative than Phygadeuontini. Most species attack the cocoons of Lepidoptera. A few genera parasitize aculeates, one genus parasitizes myrmeleontids and another parasitizes spider egg sacs.

KEY TO GENERA OF MESOSTENINI OCCURRING IN AUSTRALIA

1 Posterior transverse carina of mesosternum strong and complete; clypeus flat and in profile flared outwards (Fig. 222); hind tibia often unusually long.
Fore wing as in Fig. 218 .... *ATELEUTE* (p. 150)

\- Posterior transverse carina of mesosternum incomplete, interrupted in front of fore coxa or absent; clypeus often convex with margin impressed or if flat then margin not out-flared; hind tibia usually not remarkably long 2

2 Hind wing with distal abscissa of 1*A* completely absent, or if present then stub-like, shorter than *cu-a* and never reaching more than 0.3 of distance to wing margin (Fig. 217) 3

\- Hind wing with distal abscissa of 1*A* at least as long as *cu-a* and reaching more than 0.5 of distance to wing margin (Fig. 216) 9

3 Fore wing with 1*m-cu* and Cu_{1a} more or less touching basally (Fig. 219); frons with a long median cornus .... *JUNCTIVENA* (p. 162)

\- Fore wing with 1*m-cu* and Cu_{1a} basally widely separated (Fig. 220); frons simple or with a median vertical carina which may be sharp and raised to a point 4

4 Frons with a semicircular carina above the antennal socket (Fig. 223); tergite 2 of gaster matt, coarsely and closely punctate .... *GAMBROIDES* (p. 155)

\- Frons without a semicircular carina above the antennal socket (Fig. 224); tergite 2 of gaster polished or subpolished, variously sculptured but if punctate then finely so 5

5 Segment 1 of gaster very long and slender with posterior margin of sternite 1 far behind the spiracle; head conspicuously broader than alitrunk (Fig. 229); ♂ flagellum with numerous sharp short spine-like sensilla on ventral surface of at least first four segments... .... *MYRMELEONOSTENUS* (p. 167)

\- Segment 1 of gaster posteriorly broadened, with posterior margin of sternite 1 before, opposite or very rarely very slightly behind the spiracle; head only slightly broader than alitrunk (Fig. 230); ♂ flagellum without spine-like sensilla on ventral surface of first four segments 6

6 Fore wing with areolet large, usually complete externally and about the height of length of 2*m-cu* above bulla, or higher (Fig. 220).... .... *ANACIS* (most species) (p. 148)

7 Epomia present on pronotum (Fig. 227); anterior end of tergite 1 of gaster with acute lateral projections (Fig. 228), dorsally convex; lobes of hind tarsal segment 4 asymmetrical .... *DILOA* (p. 152)

\- Epomia absent; anterior end of tergite 1 without conspicuous acute lateral projections (cf. Fig. 230), dorsally deplanate; lobes of hind tarsal segment 4 symmetrical 8

8 Clypeus with a median apical tooth (Fig. 226); tergite 2 of gaster with large semilunar thyridia........................*HACKEROCRYPTUS* (p. 159)

\- Clypeus without a median tooth (Fig. 225); tergite 2 of gaster without semilunar thyridia.................................*PARANACIS* (p. 171)

9 Ovipositor very short, barely projecting beyond apex of gaster (Fig. 231); flagellum shorter than fore wing, without a white band.
Hind leg very long.................................*ARTHULA* (p. 149)

\- Ovipositor projecting beyond apex of gaster by at least length of hind tarsus 3; flagellum moderately to very long, in ♀ almost always with a white band...10

10 Mandible very long and slender, at least 2.2 times as long as basally broad; upper mandibular tooth very much the longer, lower tooth vestigial (Fig. 239).
Lower valve of ovipositor partially enclosing upper valve.............11

\- Mandible less slender, less than 2.0 times as long as basally broad or if rarely slightly longer then not slender and with lower tooth subequal to or longer than upper; mandibular teeth otherwise various, but never with lower tooth reduced to a vestige..........................12

11 Upper valve of ovipositor with conspicuous coarse teeth (Fig. 233); fore wing with *cu-a* proximal to base of *Rs&M*; propodeum without sublateral crests; ovipositor much longer than head and body combined.
....*STENARELLA* (p. 172)

\- Upper valve of ovipositor without obvious teeth (Fig. 234); fore wing with *cu-a* distal to base of *Rs&M*; propodeum with conspicuous sublateral crests; ovipositor slightly shorter than head and body combined..*IARIA* (p. 160)

12 Upper tooth of mandible reduced to a vestige, lower tooth long and strong (Fig. 238); lower valve of ovipositor with matt finely coriaceous lobe partially enclosing the upper valve (Fig. 245)..........
....*EURYCRYPTUS* (p. 154)

\- Upper tooth of mandible well-developed from slightly shorter than to longer than the lower (Figs 240-242); lower valve of ovipositor usually without a lobe, or if with lobe partially enclosing upper valve then lobe is not matt and coriaceous...............................13

13 Upper valve of ovipositor with weak to strong teeth on distal apex (Figs 243, 244)..14

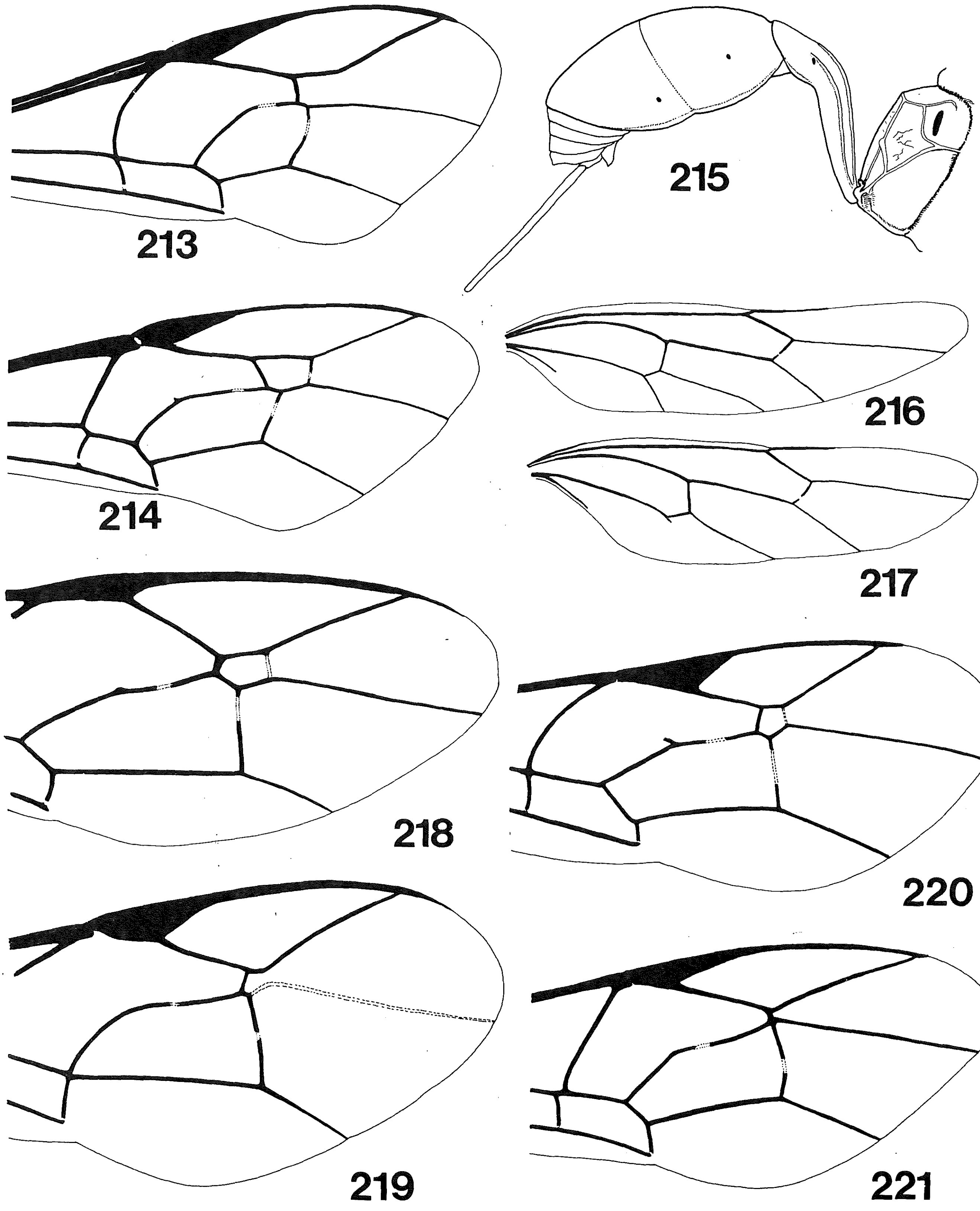
\- Upper valve of ovipositor simple, without any teeth on distal apex (Figs 268-271)..16

14 Fore wing with areolet large, complete and higher than length of *2m-cu* above bulla; *2r-m* and *3r-m* divergent anteriorly (Fig. 235); frons with a strong median cornus.....................*CERATOMANSA* (p. 151)

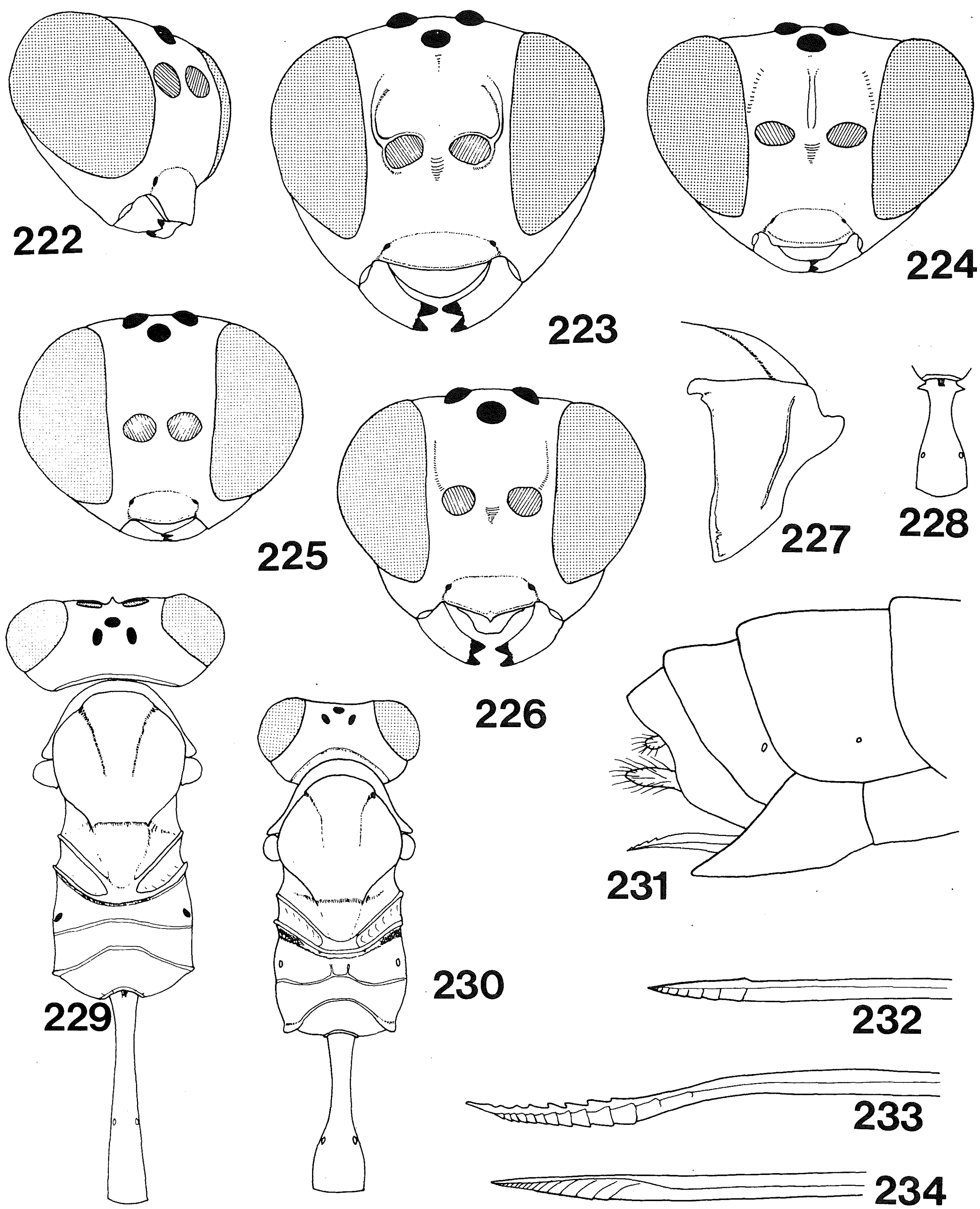
\- Fore wing with areolet small, either incomplete distally or not higher than length of *2m-cu* above bulla; *2r-m* and *3r-m* (if both present) slightly convergent anteriorly (Figs 236, 237); frons with, at most, an obscure median tubercle...................................15

15 Mandible of ♀ weakly tapered (Fig. 240), of ♂ enlarged (Fig. 241), with teeth subequal in length but upper much broader than lower; upper end of weak epomia reaching onto swollen pronotal margin where it forms a blunt crest (Fig. 246); fore wing with *3r-m* entirely absent (Fig. 236)..*SYNTRIPS* (p. 174)

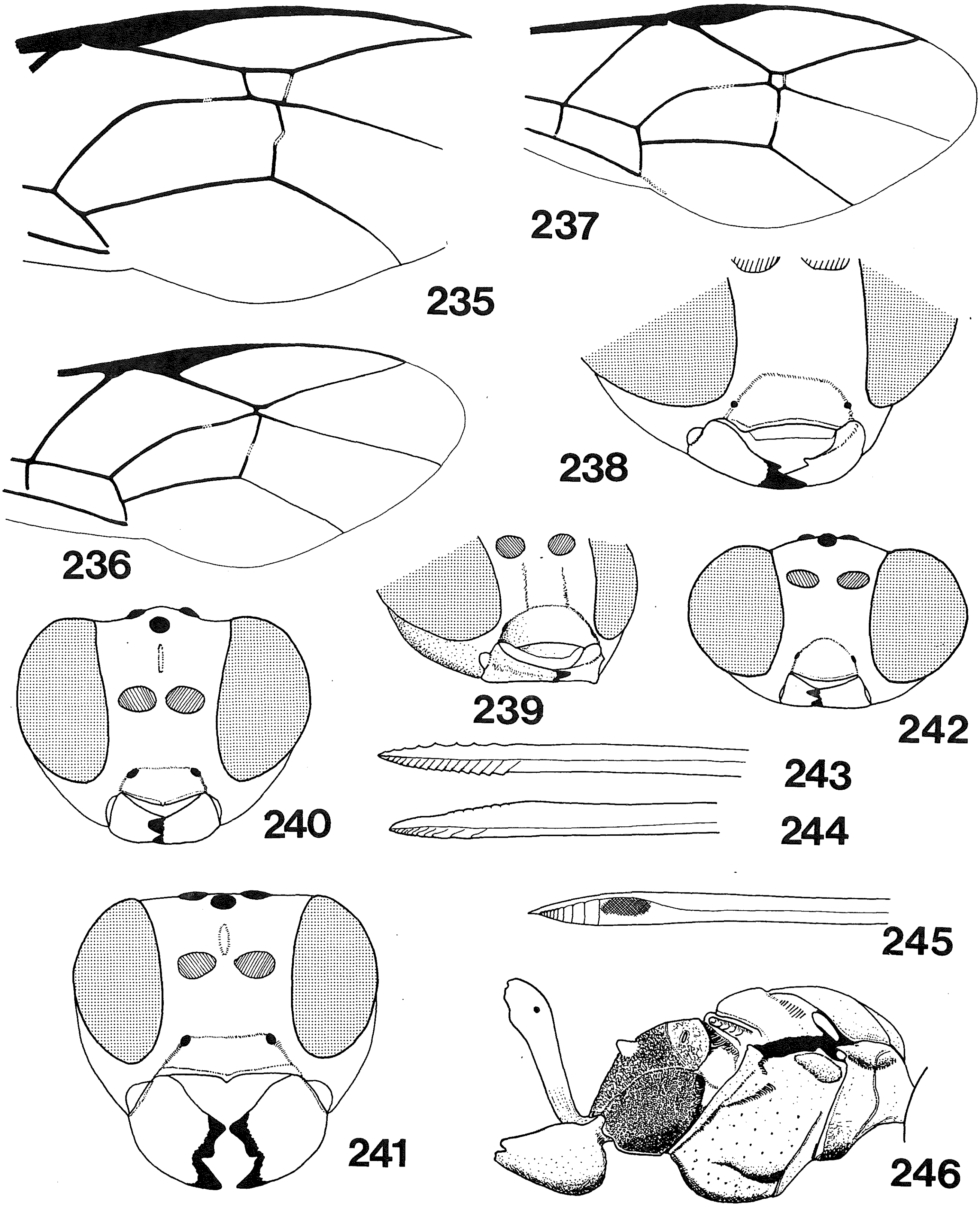
\- Mandibles not sexually dimorphic, strongly tapered with upper tooth longer than lower but only slightly broader (Fig. 242); upper end of epomia not reaching onto swollen pronotal margin; fore wing with *3r-m* present, weakly pigmented (Fig. 237)....................*EUCHALINUS* (p. 153)



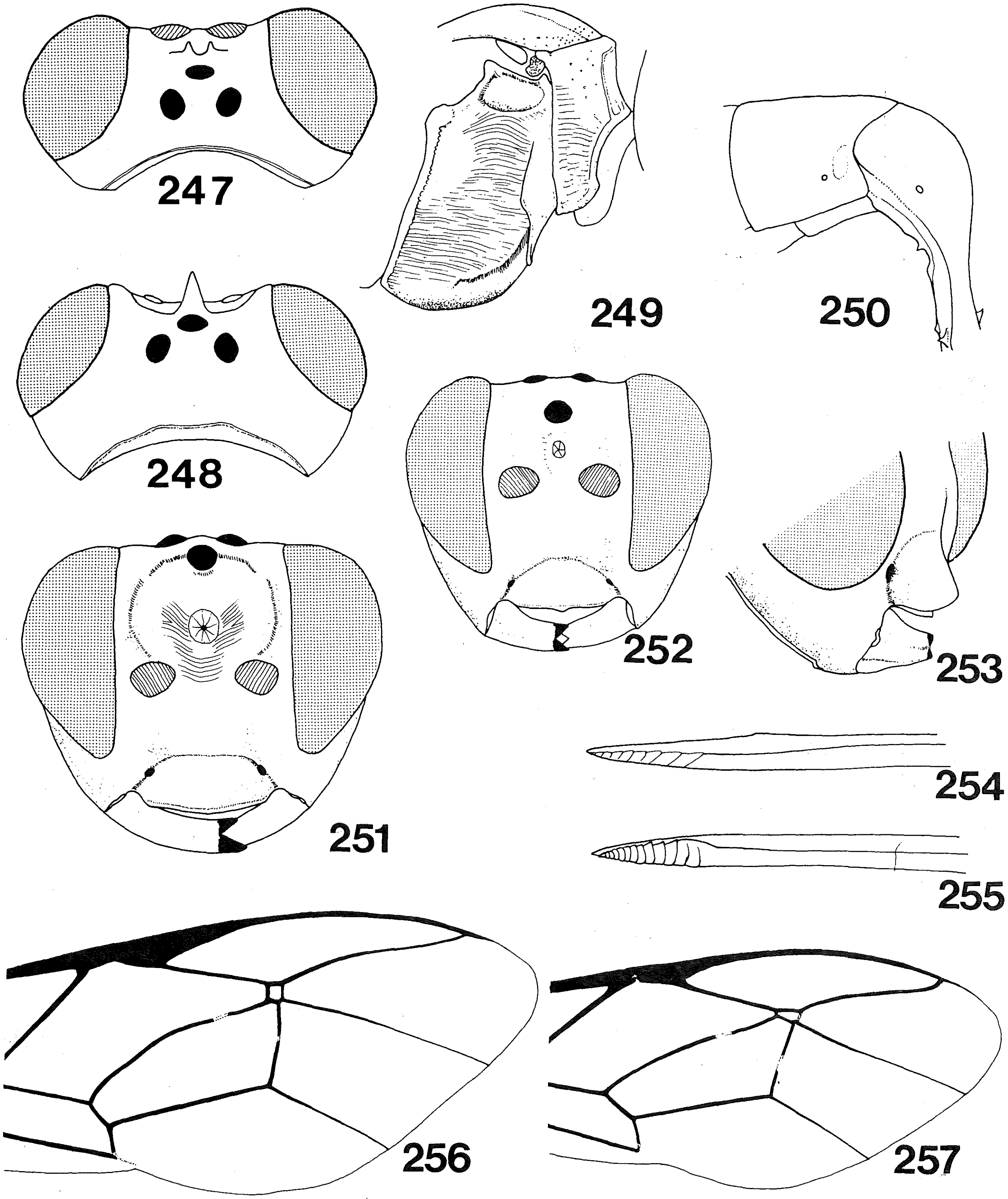
Figs 213-221 Phygadeuontinae. 213-214 Fore wings (213) *Hemigaster* (214) *Mansa*. 215 Gaster, *Hemigaster* ♀. 216-217 Hind wings (216) *Goryphus* (217) *Myrmeleonostenus*. 218-221 Fore wings (218) *Ateleute* (219) *Junctivena gallowayi* (220) *Anacis* (221) *Hackerocryptus dentatus*.



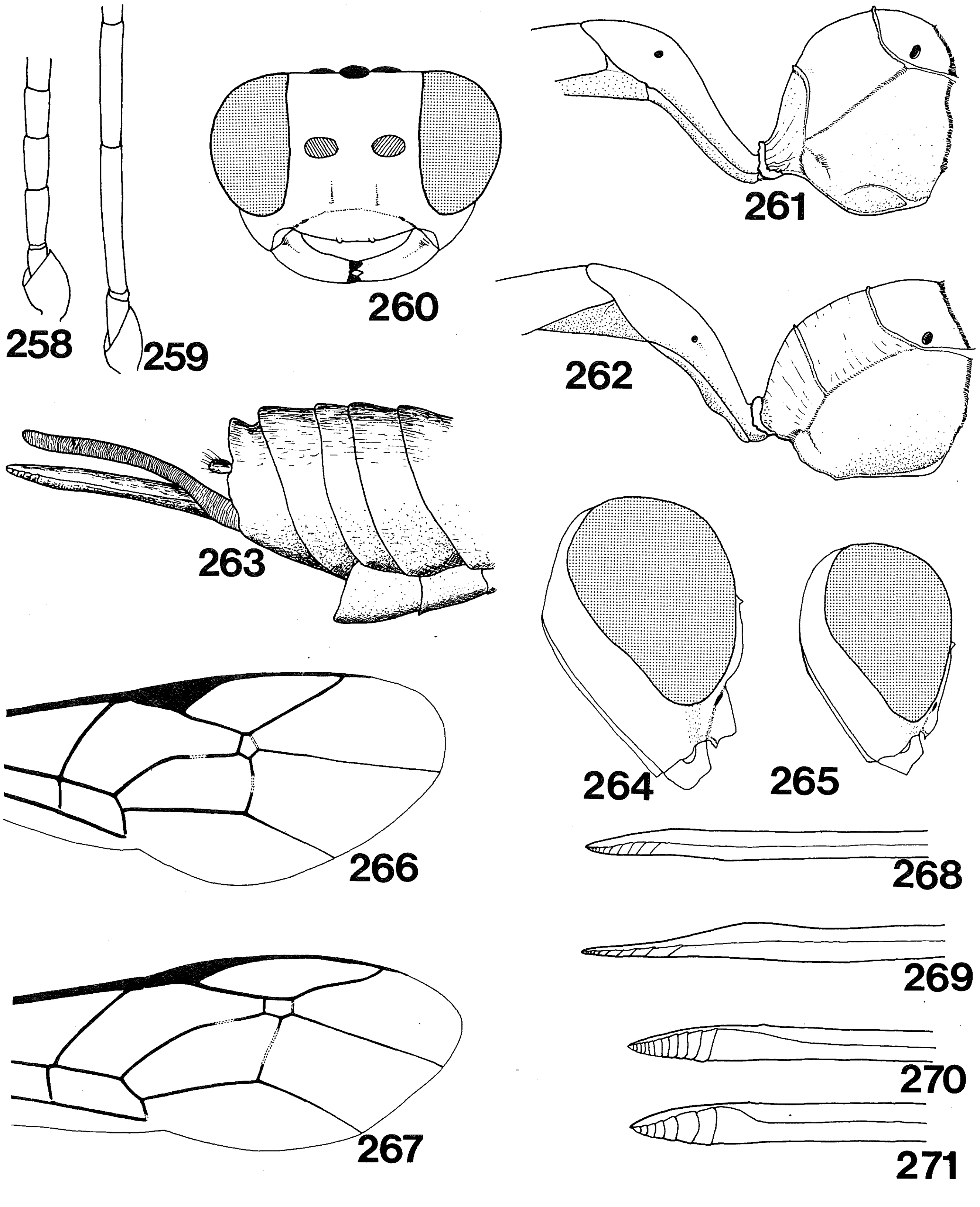
Figs 222-234 Phygadeuontinae. 222 Head, antero-lateral, *Ateleute*. 223-226 Faces (223) *Gambroides* (224) *Myrmeleonostenus* (225) *Paranacis* (226) *Hackerocryptus dentatus*. 227-228 *Diloa antipodialis* (227) pronotum (228) petiole. 229-230 Head, alitrunk and petiole, dorsal (229) *Myrmeleonostenus* (230) *Anacis*. Apex of gaster, *Arthula* ♀. 232-234 Apices of ovipositors (232) *Hackerocryptus dentatus* (233) *Stenarella victoriae* (234) *Iaria papiliomaculata*.



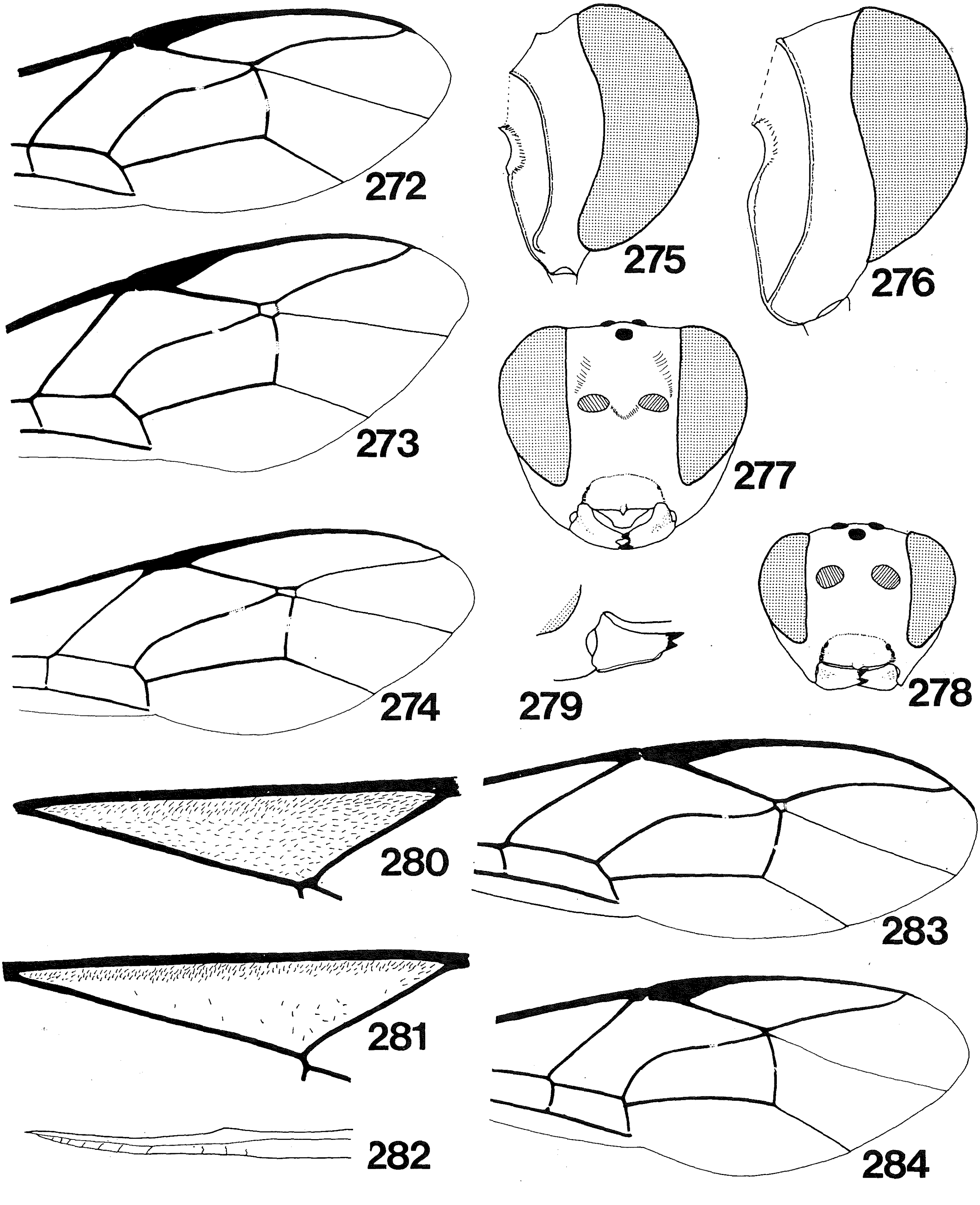
Figs 235-246 Phygadeuontinae. 235-237 Fore wings (235) *Ceratomansa* (236) *Syntrips* (237) *Euchalinus*. 238-239 Lower part of head, antero-lateral (238) *Eurycryptus* (239) *Stenarella victoriae*. 240-242 Faces (240) *Syntrips maculatus*, ♀ (241) *S. maculatus*, ♂ (242) *Euchalinus*. 243-245 Apices of ovipositors (243) *Ceratomansa* (244) *Syntrips maculatus* (245) *Eurycryptus*. 246 Alitrunk lateral, *Syntrips maculatus*.



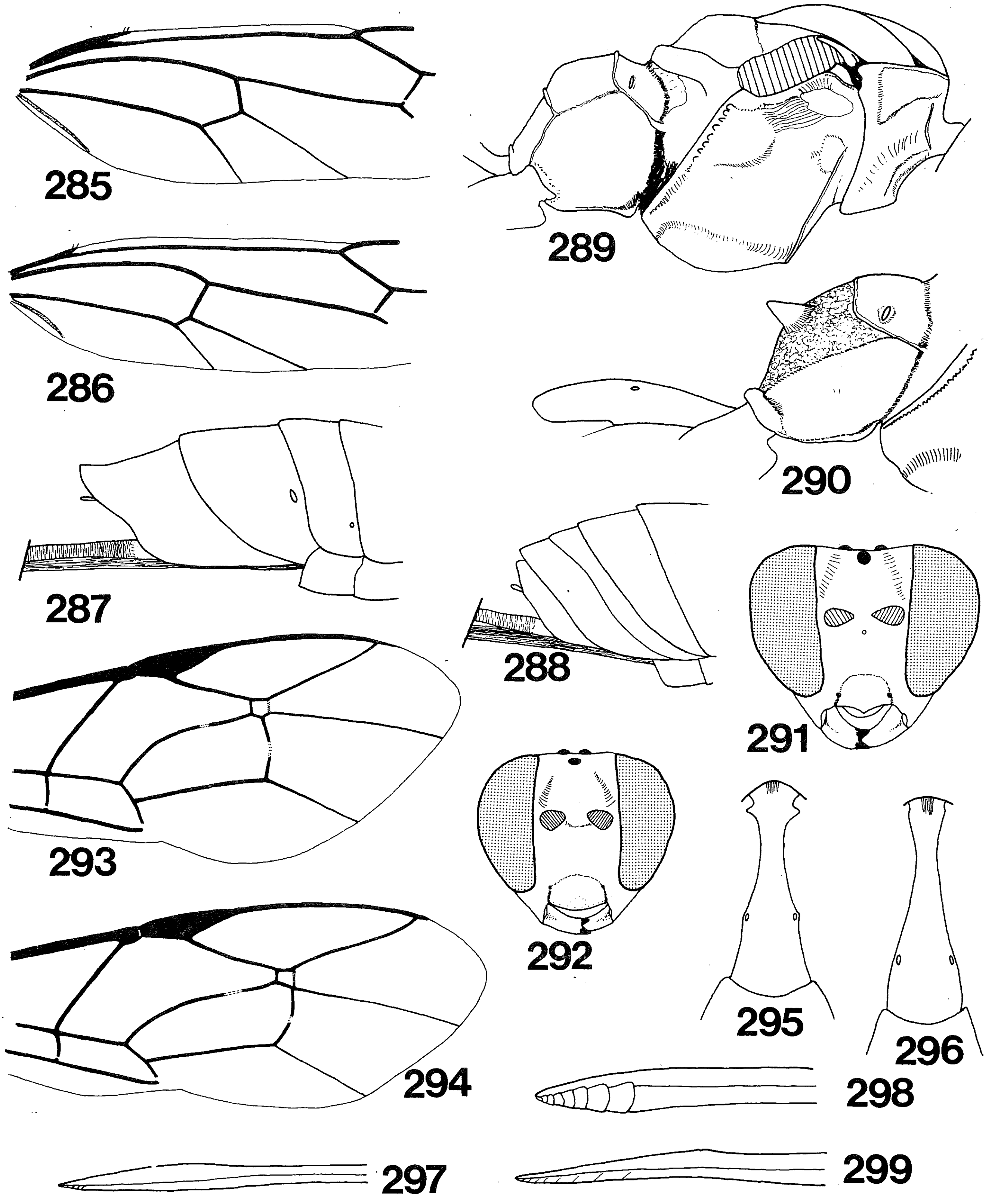
Figs 247-257 Phygadeuontinae. 247-248 Heads, dorsal (247) *Cremnocryptus* (248) *Neaprix insolens*. 249-250 *Listrognathus* (249) alitrunk, lateral (250) petiole, dorsolateral. 251-252 Faces (251) *Neaprix insolens* (252) *Aprix*. 253 *Listrognathus*, head, anterolateral. 254-255 Apices of ovipositors (254) *Neaprix insolens* (255) *Aprix*. 256-257 Fore wings (256) *Neaprix insolens* (257) *Gotra*.



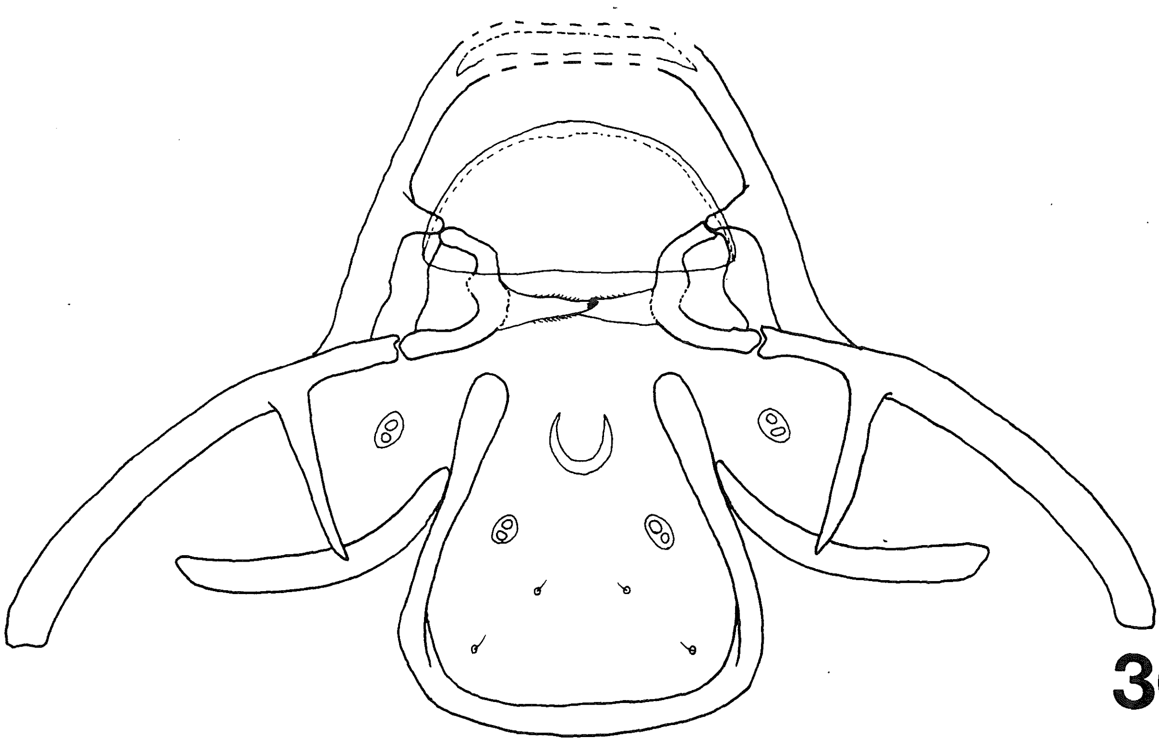
Figs 258-271 Phygadeuontinae. 258-259 Bases of antennae, ♀ (258) *Nebostenus crypticus* (259) *Gotra*. 260 Face, *Nebostenus crypticus*. 261-262 Propodea and petioles (261) *Glabridorsum* (262) *Xylostenus curtus*. 263 Apex of gaster *Xylostenus curtus* ♀. 264-265 Heads, lateral (264) *Ischnus* (265) *Glabridorsum*. 266-267 Fore wings (266) *Glabridorsum* (267) *Allophatnus*. 268-271 Apices of ovipositors (268) *Goryphus* (269) *Takastenus* (270) *Lophoglutus bouceki* (271) *Xanthocryptus*.



Figs 272-284 Phygadeuontinae. 272-274 Fore wings (272) *Lophoglutus bouceki* (273) *Xanthocryptus* (274) *Thelodon elongatus*. 275-276 Heads, posterolateral (275) *Thelodon elongatus* (276) *Gotra*. 277-278 Faces (277) *Xanthocryptus* (278) *Tomagotra roddi*. 279 Mandible, *Thelodon elongatus*. 280-281 Fore wings, basal cell (280) *Tomagotra roddi* (281) *Stiromesostenus*. 282 Apex of ovipositor, *Tomagotra*. 283-284 Fore wings (283) *Lorio* (284) *Stiromesostenus*.



Figs 285-299 Phygadeuontinae. 285-286 Hind wings (285) *Stiromesostenus* (286) *Lorio*. 287-288 Apices of gasters, ♀ (287) *Lorio* (288) *Irabatha cairnsensis*. 289 *Tomagotra roddi*, alitrunk, lateral. 290 *Irabatha cairnsensis* propodeum, lateral. 291-292 Faces (291) *Lorio* (292) *Necolio*. 293-294 Fore wings (293) *Goryphus flavocinctus* (294) *Mesostenus*. 295-296 Petioles, dorsal (295) *Tomagotra roddi* (296) *Necolio*. 297-299 Apices of ovipositors (297) *Necolio* (298) *Lorio* (299) *Irabatha cairnsensis*.



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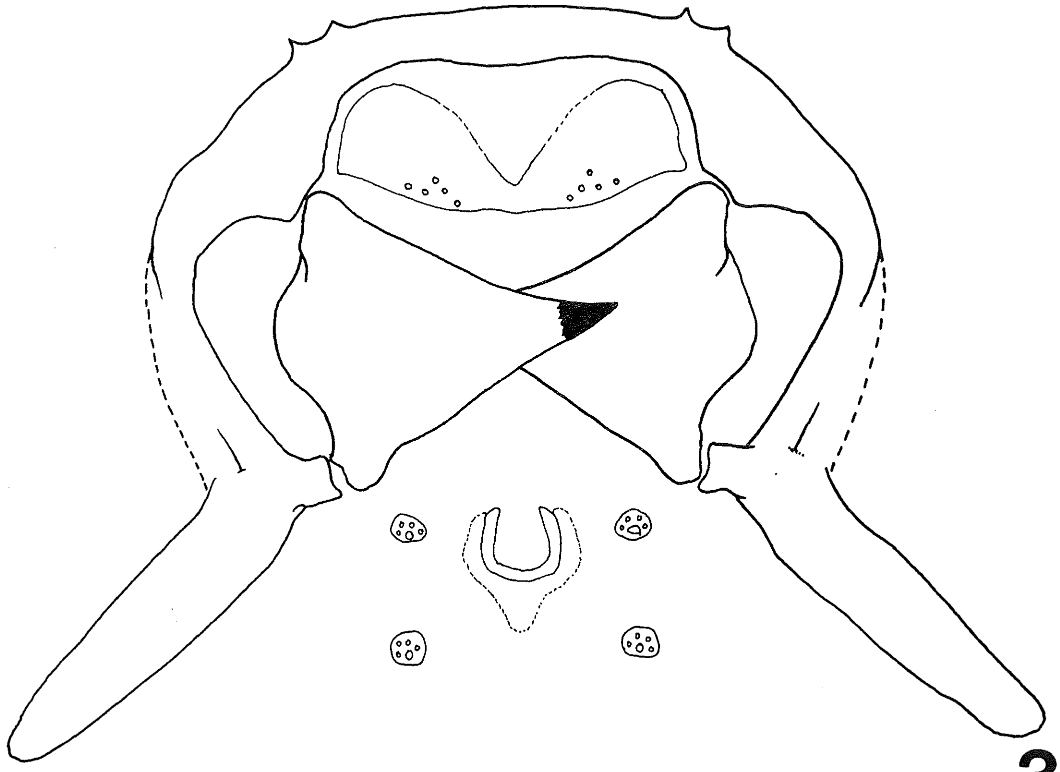


301

Figs 300-301 Cephalic capsules of final instar larvae (300) *Glabridorsum* (301) *Ichneumon*.

16 Frons with a median cornus or a very strongly raised median lamella or with a pair of corni (Figs 247, 248)....................................17
- Frons without a distinct process, at most with a median vertical carina...21

17 Frons with a pair of pointed, lateromedian corni (Fig. 247)......... ....*CREMNOCRYPTUS* (p. 152)
- Frons with a single median cornus or high lamella (Fig. 248)...............18

18 Clypeus in profile nasute (Fig. 253); epomia reaching onto pronotal swelling and forming a small crest on dorsal surface (Fig. 249); petiole with angular flange on lower corner, raised into a tooth at level of junction of posterior end of sternite with tergite (Fig. 250)..*LISTROGNATHUS* (p. 163)
- Clypeus in profile convex to flat; epomia not reaching onto pronotal swelling; petiole without angular flange or tooth on lower corner at level of junction of posterior end of sternite with tergite...............19

19 Fore wing with areolet transverse, wedge-shaped (Fig. 257); anterior end of petiole with a pair of lateral thorn-like protuberances; frontal protrusion in form of crest.................*GOTRA* (few species) (p. 158)
- Fore wing with areolet almost quadrate (Fig. 256); anterior end of petiole without thorn-like protuberances; frontal protrusion in form of sharp cornus..20

20 Lower valve of ovipositor not enclosing the upper (Fig. 254); mandible very long, not tapered, with lower tooth about 1.5 times as long as upper (Fig. 251)..*NEAPRIX* (p. 168)
- Lower valve of ovipositor partially enclosing the upper (Fig. 255); mandible of moderate length, tapered, with lower tooth only very slightly the longer or about equal in length to upper (Fig. 252)... ....*APRIX* (p. 149)

21 Proximal flagellar segments of ♀ short and stout, the first segment less than 2.5 times as long as broad (Fig. 258); clypeus in profile flat, margin not impressed but smooth with tendency to have widely interspaced, faint lateromedian teeth (Fig. 260).........*NEBOSTENUS* (p. 169)
- Proximal flagellar segments of ♀ longer and more slender, the first segment at least 3.0 times as long as broad or much longer (Fig. 259); clypeus in profile various, usually with margin impressed or with single median apical tooth or with two close lateromedian teeth......22

22 Fore wing with length of *2m-cu* above bulla from shorter than to about equal to height of areolet (Figs 266, 267); areolet large, more or less complete...23
- Fore wing with length of *2m-cu* above bulla conspicuously longer than the height of the areolet (Figs 272-274, 283, 284); areolet medium or small, sometimes effaced.
Goryphus is intermediate..29

23 Tergite 1 with spiracle slightly before the centre (Fig. 262) and barely broadened posteriorly; ovipositor short, projecting beyond apex of gaster by about 0.3 times length of hind tibia (Fig. 263).
Propodeal spiracle circular........................*XYLOSTENUS* (p. 180)
- Tergite 1 with spiracle well behind centre (Fig. 261) and strongly broadened posteriorly; ovipositor projecting beyond apex of gaster by more than 0.5 times length of hind tibia..............................24

24 Fore wing with *2r-m* and *3r-m* strongly convergent anteriorly so that anterior side of areolet is less than 0.5 times breadth of areolet at widest point (Fig. 266)..25

- Fore wing with *2r-m* and *3r-m* at most only slightly convergent anteriorly so that anterior side of areolet is 0.8 or more times breadth of areolet at widest part (Figs 175, 220, 267) 26

25 Mesoscutum uniformly punctate all over, the area between the punctures microreticulate (Fig. 546); clypeus in profile very strongly convex (Fig. 264) .... *ISCHNUS* (p. 161)
- Mesoscutum smooth and polished, without punctures except at extreme anterior margin (Fig. 548); clypeus in profile moderately convex (Fig. 265) .... *GLABRIDORSUM* (p. 156)

26 Malar space longer than 0.7 times basal mandibular width; pronotum with epomia absent or weak; notauli comparatively weakly impressed, generally at most reaching to level of hind edges of tegulae (Fig. 547) 27
- Malar space short, less than 0.6 times basal mandibular width; pronotum with epomia very long and strong; notauli deeply and sharply impressed, reaching beyond level of hind edges of tegulae (Fig. 545) 28

27 Fore wing with areolet transverse, about 1.2 times as broad as high; posterodistal corner of second subdiscal cell obtuse, 120-135° (Fig. 267); scutellum with lateral carinae extending 0.4 times its length; mesoscutum polished, punctate .... *ALLOPHATNUS* (p. 147)
- Fore wing with areolet as high as wide or slightly higher than wide; posterodistal corner of second subdiscal cell about 90° (Fig. 175); scutellum without lateral carinae except at extreme anterior end; mesoscutum alutaceous, submatt .... *ANACIS* (in part) (p. 148)

28 Tergite 2 of gaster finely alutaceous, apparently impunctate (Fig. 550); dorsal apex of ovipositor, beyond nodus, slightly concave, with concave surface weakly flattened (Fig. 269) .... *TAKASTENUS* (p. 176)
- Tergite 2 of gaster coarsely punctate (Fig. 549); dorsal apex of ovipositor slightly convex, in section convex also (Fig. 268) .... *GORYPHUS* (in part) (p. 156)

29 Lower valve of ovipositor with lobe which partially encloses the upper valve (Figs 270, 271); mandible with lower tooth distinctly the longer; clypeus with a median apical tooth (Fig. 277) 30
- Lower valve of ovipositor not enclosing the upper or if very slightly enlarged then either with mandible with upper tooth slightly the longer or with two lateromedian teeth on clypeus; mandible otherwise various, generally with teeth subequal; clypeus otherwise various without teeth or with one or two apical teeth 31

30 Apex of ovipositor with about 12 teeth (Fig. 270); posterior transverse carina of propodeum complete or obsolescent centrally, laterally raised to form small crests, positioned closer to anterior transverse carina than to posterior end of propodeum (Fig. 551); fore wing with *3r-m* absent; abscissa of Cu_1 between *1m-cu* and Cu_{1a} 0.7-0.8 times length of Cu_{1b} (Fig. 272); lower margin of tergite 1 not carinate, evenly rounded to join sternite .... *LOPHOGLUTUS* (p. 164)
- Apex of ovipositor with about six teeth (Fig. 271); posterior transverse carina of propodeum weak or absent, or if present not laterally raised into crests and generally positioned closer to posterior end of propodeum than it is to anterior transverse carina (Fig. 552); fore wing with *3r-m* present but weakly pigmented, abscissa of Cu_1 between *1m-cu* and Cu_{1a} equal to length of Cu_{1b} (Fig. 273); lower margin of tergite 1 carinate, angled abruptly to join sternite .... *XANTHOCRYPTUS* (p. 179)

31 Fore wing with areolet transverse, wedge-shaped with its inner side (2*r-m*) less than 0.5 times as long as the outer (3*r-m*) and 2*r-m* about 0.3 times as long as width of areolet (Fig. 274)....................32

\- Fore wing with areolet effaced or almost quadrate or pentagonal, if slightly transverse then with 2*r-m* 0.7 or more times as long as 3*r-m* or with 2*r-m* 0.6 or more times as long as width of areolet (Figs 283, 284)....................34

32 Genal carina not reaching hypostomal carina, its end turned abruptly away and continuing ventrally (Fig. 275); occipital carina mediodorsally interrupted, remote from hind ocelli; lower margin of mandible with a small ventral lobe (Fig. 279)....................*THELODON* (p. 177)

\- Genal carina joining hypostomal carina above lower corner of mandible (Fig. 276); occipital carina complete, separated from ocelli by 2.0-3.0 times maximum ocellar diameter; lower margin of mandible without a ventral lobe....................33

33 Clypeus with a weak median apical tooth (Fig. 278); apex of ovipositor slender, dorsally concave, ventrally with proximal teeth widely interspaced (Fig. 282); tergite 2 of gaster polished with obsolescent punctures....................*TOMAGOTRA* (in part) (p. 178)

\- Clypeus convex or with a vestigial pair of teeth; apex of ovipositor evenly tapered, ventrally with proximal teeth quite close; tergite 2 of gaster usually coarsely punctate, rarely alutaceous....................*GOTRA* (in part) (p. 158)

34 Basal cell of fore wing with a broad glabrous area posteriorly (Fig. 281)....................35

\- Basal cell of fore wing usually uniformly hirsute, sometimes more sparsely so posteriorly but never glabrous (Fig. 280)....................37

35 Fore wing with *cu-a* opposite or distal to base of *Rs&M* (Fig. 284); hind wing with first abscissa of Cu_1 0.6-1.3 times as long as *cu-a* (Fig. 285)....................*STIROMESOSTENUS* (p. 173)

\- Fore wing with *cu-a* proximal to base of *Rs&M* (Fig. 283); hind wing with first abscissa of Cu_1 more than 1.3 times as long as *cu-a* (Fig. 286)....................36

36 Propodeal apophyses weak, barely discernible as crests; tergite 8 long, in dorsal view about as long as tergite 7 (Fig. 287); apex of ovipositor with teeth almost vertical, slightly expanded above (Fig. 298)....................*LORIO* (in part) (p. 165)

\- Propodeal apophyses long, horn-like (Fig. 290); tergite 8 in dorsal view about 0.5 times as long as tergite 7 (Fig. 288); apex of ovipositor elongately acute, teeth weak, oblique, not expanded above (Fig. 299)....................*IRABATHA* (p. 160)

37 Segment 1 of gaster with strong lateral triangular protuberances at anterior end (Fig. 295); epomia distinct, often long and strong (Fig. 289)....................38

\- Segment 1 of gaster without strong lateral protuberances at anterior end (Fig. 296); epomia very indistinct....................40

38 Clypeus with a weak median apical tooth (Fig. 278); ovipositor with distal end of upper valve conspicuously concave (Fig. 282); tergite 2 of gaster polished with superficial punctures.*TOMAGOTRA* (in part) (p. 178)

\- Clypeus without a median apical tooth; ovipositor with distal end of upper valve simply tapered (Fig. 268); tergite 2 of gaster either matt and superficially punctate or polished and deeply, coarsely punctate......39

39 Fore wing with *2m-cu* joining areolet near centre (Fig. 293); tergite 2 of gaster polished and deeply, coarsely punctate; upper margin of pronotum swollen..............................*GORYPHUS* (in part) (p. 156)
- Fore wing with *2m-cu* joining areolet near distal side, almost opposite *3r-m* (Fig. 294); tergite 2 of gaster matt, with superficial punctures; upper margin of pronotum not swollen.............*MESOSTENUS* (p. 166)

40 Ovipositor with small inconspicuous teeth at extreme apex (Fig. 297); clypeus very convex with margin impressed, acute, evenly convex (Fig. 292)..*NECOLIO* (p. 170)
- Ovipositor with strong conspicuous teeth on lower valve (Fig. 298); clypeus relatively flat, with margin weakly impressed and with a median apical tooth (Fig. 291)....................*LORIO* (in part) (p. 165)

ALLOPHATNUS Cameron*

Allophatnus Cameron, 1905*e*: 233. Type-species: *Allophatnus fulvipes* Cameron, by monotypy.
Phaedraspis Cameron, 1906*c*: 196. Type-species: *Phaedraspis rufobalteata* Cameron (= *Cryptus fulvitergus* Tosquinet), by monotypy.
Stictocryptus Cameron, 1907*b*: 462. Type-species: *Stictocryptus testaceus* Cameron (= *Cryptus fulvitergus* Tosquinet), by monotypy.

Medium-sized species, fore wing length 6-9 mm; clypeus moderately convex in profile, margin blunt, not impressed; mandible evenly tapered, equally bidentate; malar space 0.9-1.0 times as long as basal mandibular width; frons concave with weak median carina; occipital carina complete; genal carina joining hypostomal carina well above base of mandible. Flagellum of ♀ with segment 1 about 4.0 times as long as broad; flagellum centrally with an incomplete white band.

Epomia absent, upper edge of pronotum not swollen; mesoscutum punctate, polished, notauli weak, barely impressed to level of anterior edge of tegulae (Fig. 547); scutellum convex, laterally carinate at base. Propodeum in profile evenly rounded, with anterior transverse carina complete, posterior transverse carina vestigial, present laterally as weak crests; propodeal spiracles elliptical.

Fore wing with *cu-a* proximal to base of *Rs&M*; *1m-cu* and Cu_{1a} separated by more than length of Cu_{1b} basally; areolet complete, transverse, large with *2m-cu* joining just distal to centre (Fig. 267); *2m-cu* above bulla 0.8 times as long as height; posterodistal corner of second discal cell 120-130°; basal cell uniformly hirsute. Hind wing with distal abscissa of *1A* present; first abscissa of Cu_1 1.5-1.6 times as long as *cu-a*.

Gaster with tergite 1 strongly broadened posteriorly, with triangular lateral projection at base; sternite 1 reaching almost to the level of spiracles which are positioned 0.7 of way along segment. Tergite 2 matt to subpolished, punctate with fine reticulation; tergite 8 projecting by 0.5 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.9 times length of hind tibia; upper valve with a weak nodus; lower valve with strong oblique teeth.

Remarks. A rather small goryphine genus, most species of which occur in the seasonally dry parts of Africa. A few species occur in South East Asia. The Australian species is close to *A. fulvitergus* (Tosquinet) from which it differs in having a less coarsely punctate gaster and shorter scutellar carinae.

Australian species. One, undescribed (ANIC; BMNH).

Host records. None in Australia but in Asia a species has been reared from lepidopterous borers in Graminae (BMNH collection records).

ANACIS Porter
(Whole insect, Fig. 175)

Anacis Porter, 1967: 376. Type-species: *Anacis festiva* Porter, by original designation.
Baeocryptus Porter, 1967: 380. Type-species: *Ichneumon (Cryptus) rubripes* Spinola, by original designation.
Dochmidium Porter, 1967: 389. Type-species: *Dochmidium camponotus* Porter, by original designation.

Small to medium-sized species, fore wing length 3-9 mm; clypeus in profile weakly to moderately convex, margin evenly rounded, impressed weakly; mandible evenly tapered, usually with upper tooth slightly the longer; malar space 0.3-0.9 times as long as basal mandibular width; frons simple or with a median vertical carina; occipital carina complete; genal carina curved to join hypostomal carina above base of mandible. Flagellum of ♀ with segment 1 4.0-9.0 times as long as broad; flagellum centrally with a white band, distally not flattened ventrally.

Epomia weak to absent, upper edge of pronotum not swollen; mesoscutum matt to slightly polished, usually finely alutaceous, less often punctate, notauli weak to moderate, generally not reaching to level of centre of tegulae; scutellum from without lateral carinae to carinate on anterior 0.3. Propodeum in profile usually subhorizontal then abruptly rounded, with anterior transverse carinae usually complete, posterior transverse carina from complete to absent, usually with apophyses well developed; propodeal spiracles almost circular.

Fore wing with *cu-a* opposite or proximal to base of *Rs&M*; 1*m-cu* and Cu_{1a} widely separated basally; areolet large, complete, slightly asymmetrical, sometimes with 3*r-m* weak; 2*m-cu* above bulla 0.2-0.7 times as long as height of areolet (Fig. 220); posterodistal corner of second discal cell 90-100°; basal cell uniformly hirsute. Hind wing with distal abscissa of 1*A* usually absent, rarely present as a stub or in two species almost complete; first abscissa of Cu_1 1.7-2.2 times as long as *cu-a*.

Gaster with tergite 1 evenly broadened posteriorly, without distinct triangular lateral projection at base (Fig. 230); sternite 1 usually not reaching to spiracle; spiracle well behind the centre. Tergite 2 usually polished, rarely almost matt, finely aluteceous; tergite 8 projecting by 0.3-0.6 length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.4-1.6 times length of hind tibia; upper valve with a weak nodus, evenly tapered; lower valve with moderately weak teeth.

Remarks. This is the largest genus of Mesostenini in Australia and it includes some very common species. The majority have strong propodeal apophyses, lack a distal abscissa of 1*A*, are quite polished and have an ovipositor about 0.5-0.8 times as long as the hind tibia. There are, however, a number of rather aberrant species which I have included in this genus. Several Tasmanian species are stouter, more matt and have some trace at least of the distal abscissa of 1*A*. Two Queensland species lack the propodeal apophyses and a third has a relatively slender petiole and is more like the Chilean type-species, *A. festiva*. Some of the more common Australian species will run in Townes' (1970*a*) key to genera of the subtribe Ischnina to *Biconus*, a Neotropical genus, but in Australia there appears to be no real distinction between *Biconus* and *Anacis*. In time the Australian species may well be divided into several genera but such division will have to take into account the numerous species of this complex which occur in southern South America. For the present it is suggested all Australian species be placed together in a single genus, *Anacis*.

Australian species. *Anacis exul* (Turner) (E). I have seen 55 undescribed species (AM; ANIC; BMNH; TC).

Host records. *Anacis* sp. - Coleophoridae: *Coleophora frischella* (L.) (DAH). Lymantriidae: ex lymantriid pupa (TDF).

APRIX Townes

Aprix Townes, 1961: 472. Type-species: *Ichneumon nutatorius* F., by original designation.

Medium to moderately large-sized species, fore wing length 9-13 mm; clypeus in profile convex, margin truncate with a vestigial median tooth (Fig. 252); mandible of moderate length, slightly narrowed with upper tooth slightly the shorter; malar space 0.7-0.8 times as long as basal mandibular width; frons concave, with a strong median cornus; occipital carina complete; genal carina joining hypostomal carina above base of mandible. Flagellum of ♀ with segment 1 6.0-7.0 times as long broad; flagellum distally not flattened below, with a central white band.

Epomia short, weak, upper edge of pronotum slightly swollen; mesoscutum polished, finely punctate, notauli strong, reaching well beyond level of hind margin of tegulae; scutellum slightly convex, without lateral carinae. Propodeum in profile evenly rounded, with anterior transverse carina complete, posterior transverse carina represented by weak lateral crests; propodeal spiracles elliptical.

Fore wing with *cu-a* slightly proximal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by about length of Cu_{1b} basally; areolet quadrate, 3*r-m* present, weak, 2*m-cu* joining distad of centre; 2*m-cu* above bulla 2.7-3.0 times as long as height of areolet; posterodistal corner of second discal cell 100-110°; basal cell uniformly sparsely hirsute. Hind wing with distal abscissa of 1*A* present; first abscissa of Cu_1 1.8-2.0 times as long as *cu-a*.

Gaster with tergite 1 evenly broadened, without triangular lateral projection at base; sternite 1 nearly reaching to level of spiracles which are positioned about 0.7 of way along segment. Tergite 2 finely alutaceous; tergite 8 projecting by 0.2-0.4 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 1.7-2.3 times length of hind tibia; upper valve elongately tapered, with a nodus; lower valve partially enclosing the upper, with teeth almost vertical (Fig. 255).

Remarks. This genus was placed by Townes (1970*a*) in the subtribe Ceratocryptina on account of the lack of lateral metanotal teeth. These teeth seem to be present, at least as a vestige, in the males. It is closely related to *Neaprix* from which it may be distinguished not only by the characters given in the key but also in having a cylindrical flagellum.

Australian species. *A. nutatoria* (F.). I have seen an undescribed second, smaller species with a shorter ovipositor from south Queensland (BMNH). There is also an unassociated male from north Queensland which probably represents a third species.

Host records. *A. nutatoria* - Pergidae: *Pterygophorus* sp. (DPIQ); *Pterygophorus cinctus* Klug (DAH).

ARTHULA Cameron

Arthula Cameron, 1900*a*: 110. Type-species: *Arthula brunneocornis* Cameron, by monotypy.
Orientocryptus Uchida, 1931: 174. Type-species: *Orientocryptus formosanus* Uchida, by original designation.
Kuniocryptus Sonan, 1937: 172. Type-species: *Orientocryptus flavofasciatus* Uchida, by original designation.

Medium-sized species, fore wing length 7-9 mm; clypeus in profile weakly convex, transverse, margin impressed, truncate; mandible quite strongly tapered, short, with upper tooth slightly the longer; malar space 0.7-0.8 times as long as basal mandibular width; frons with a median vertical furrow; occipital carina complete; genal carina joining hypostomal carina above base of mandible. Flagellum short and stout with segment 1 3.2-3.5 times as long as broad; apical segments transverse;

flagellum of ♀ without a white band.

Epomia absent, upper edge of pronotum weakly swollen; mesoscutum matt, punctate, finely reticulate between punctures; notauli weak, extending to level of centre of tegulae; scutellum without lateral carinae. Propodeum in profile abruptly rounded, with anterior transverse carina only present; propodeal spiracles elliptical.

Fore wing with *cu-a* almost opposite base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by 0.75 times length of Cu_{1b} basally; areolet effaced by short, broad 2*r-m*; 2*m-cu* above bulla 3.0 times as long as 2*r-m*; posterodistal corner of second discal cell 100°; basal cell uniformly hirsute. Hind wing with distal abscissa of 1*A* complete; first abscissa of Cu_1 0.9 times as long as *cu-a*.

Gaster with tergite 1 long and slender, with weak triangular lateral projection at base; sternite 2 reaching behind level of the spiracle which is positioned 0.6 of way along segment. Tergite 2 long and narrow, punctoreticulate, weakly polished; tergite 8 projecting by 0.3 times length of tergite 7; ♀ subgenital plate large, triangular. Ovipositor barely projecting beyond apex of gaster (Fig. 231); upper valve with weak apical teeth; lower valve apparently simple.

Remarks. *Arthula* is one of three closely related genera forming the subtribe Sphecophagina. All lack any trace of an areolet, have an unusually short ovipositor, have short stout antennae and possess a large triangular subgenital plate. Only *Arthula* has been recorded in Australia. It is a moderately large genus restricted to the Indo-Australian region.

Australian species. I have seen two undescribed species. A small brown and yellow-marked species with unicolorous brown hind tibia occurs in New South Wales. The second species is larger, black and yellow and has a black hind tibia which distally is broadly pale-marked. This species occurs in Queensland and New Guinea.

Host records. *Arthula* sp. 1 - Vespidae: *Polistes humilis* (F.) (Chadwick & Nikitin, 1976); *Rhopalidia plebeiana* Richards (Richards, 1978).

ATELEUTE Foerster*

Ateleute Foerster, 1869: 171. Type-species: *Ateleute linearis* Foerster, by subsequent monotypy, Foerster, 1871: 99.
Ateleuta Schulz, 1906: 99. [Unjustified emendation.]
Talorga Cameron, 1911*a*: 63. Type-species: *Talorga spinipes* Cameron, by monotypy.
Tsirirella Seyrig, 1952: 45. Type-species: *Tsirirella tsiriria* Seyrig, by subsequent designation, Townes *et al*., 1961: 126.
Psychostenus Uchida, 1955: 32. Type-species: *Psychostenus minusculae* Uchida, by original designation.

Small to medium-sized species, fore wing length 3-7 mm; clypeus in profile flat, slightly out-flared, margin sharp (Fig. 222); mandible moderately long, evenly tapered with upper tooth shorter than lower; malar space 0.5-0.8 times as long as basal mandibular width; frons flat, without a median vertical carina; occipital carina dorsally absent; genal carina joining hypostomal carina above base of mandible. Flagellum of ♀ with segment 1 6.0-8.0 times as long as broad; flagellum centrally with a white band, that of ♂ unicolorous.

Epomia absent, upper edge of pronotum not swollen; mesoscutum almost matt, finely alutaceous, notauli quite strong, reaching to level of centre of tegulae; scutellum with lateral longitudinal carinae; posterior transverse carina of mesosternum complete. Propodeum in profile moderately long, evenly rounded, without carinae; propodeal spiracles circular, minute.

Fore wing with *cu-a* almost opposite base of *Rs&M*; 1*m-cu* and Cu_{1a} very widely separated basally; areolet transverse with 3*r-m* obsolescent; 2*m-cu* above bulla 0.2-0.5 times as long as height of areolet (Fig. 218); posterodistal corner of second discal cell about 90° (Fig. 293); basal cell uniformly hirsute. Hind wing with distal abscissa of *1A* present, reaching almost to wing margin; first abscissa of Cu_1 1.8-2.1 times as long as *cu-a*.

Gaster with tergite 1 evenly broadened, striate, without triangular lateral projection at base; sternite 1 not reaching to level of the spiracles which are positioned slightly behind centre. Tergite 2 striate; tergite 8 projecting by almost the length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.7-0.9 times length of hind tibia, decurved; upper valve evenly tapered, without a distinct nodus; lower valve apparently without teeth.

Remarks. A large, very distinctive genus, most species of which occur in the Old World tropics. It is easily recognized by the complete posterior transverse carina of the mesosternum, the venation and the unusually long and often spinose hind tibia of the males. Taxonomically, *Ateleute* is a rather isolated genus and its systematic position is unclear; some authors (e.g. Townes *et al.*, 1961) have placed it in the Phygadeuontini, but currently it is placed in the Mesostenini (Townes, 1970*a*).

Australian species. I have seen 10 species, all undescribed (ANIC; TC).

Host records. None from Australia. Uchida (1955) recorded a Japanese species as a parasite of psychids; Momoi *et al.* (1965) detail the biology.

CERATOMANSA Cushman

Ceratomansa Cushman, 1922: 574. Type-species: *Ceratomansa prima* Cushman, by original designation.

Moderately large species, fore wing length 11-15 mm; clypeus in profile flat or weakly convex, margin blunt, slightly convex, often with a pair of weak lateromedian tubercles; mandible short, evenly tapered, with upper tooth the longer; malar space 0.9-1.3 times as long as basal mandibular width; frons concave, with a weak to very strong median cornus; occipital carina strong, flange-like; genal carina joining hypostomal carina well above base of mandible. Flagellum of ♀ with segment 1 6.0-7.0 times as long as broad; flagellum distally slightly flattened below, centrally with a white band, that of ♂ usually with a white band.

Epomia long and strong, upper edge of pronotum weakly to moderately swollen; mesoscutum finely punctate, notauli strong, reaching to about level of hind end of tegulae; scutellum convex, carinate at base or simple. Propodeum in profile abruptly rounded, with anterior transverse carina vestigial, posterior transverse carina usually discernible as weak lateral keels; propodeal spiracles elliptical.

Fore wing with *cu-a* proximal to base of *Rs&M*; *1m-cu* and Cu_{1a} separated by about length of Cu_{1b} basally; areolet large, pentagonal with *2r-m* and *3r-m* divergent anteriorly, *2m-cu* joining distal to centre (Fig. 235); *2m-cu* above bulla 0.9-1.1 times as long as height; posterodistal corner of second discal cell 110-120°; basal cell evenly hairy, rarely quite sparsely hirsute. Hind wing with distal abscissa of *1A* present; first abscissa of Cu_1 2.1-2.3 times as long as *cu-a*.

Gaster with tergite 1 abruptly broadened posteriorly, without triangular lateral projection at base; sternite not reaching to level of spiracles which are positioned behind 0.8 times length of segment. Tergite 2 microreticulate, without obvious punctures; tergite 8 projecting by 0.7-1.2 times length of tergite 7. Ovipositor straight, projecting beyond apex of gaster by 0.9-1.0 times length of hind tibia; upper vlave with conspicuous subapical teeth; lower valve with strong, slightly oblique teeth so apex of ovipositor has the appearance of being 'screw-threaded' (Fig. 243).

Remarks. *Ceratomansa*, the only Australian representative of the subtribe Baryceratina, is a moderate-sized genus. Several species are quite common in open eucalypt forest where they can be found as parasites of limacodid pupae. The peculiar screw-like end of the ovipositor is adapted to penetrate the extremely hard cocoons.

Ceratomansa is endemic to Australia. It is widespread and I have seen specimens from most states. One species, *C. spinifrons*, was described as occurring in the Cape Colony, South Africa (Brullé, 1846). Townes & Townes (1973) point out that *Ceratomansa* does not occur in Africa and suggest the Brullé specimen was mislabelled.

Australian species. *C. spinifrons* (Brullé) (= *curvilineata* Cameron) (E); *C. prima* Cushman (E). I have seen about five undescribed species (ANIC; BMNH; TC).

Host records. *C. spinifrons* - Limacodidae: *Doratifera vulnerans* (Lewin) (DPIQ).

CREMNOCRYPTUS Cushman*

Cremnocryptus Cushman, 1945: 176. Type-species: *Polyaenus spinferus* Cameron, by original designation.

Medium-sized species, fore wing length 8-10 mm; clypeus in profile convex, with margin impressed, convex; mandible slightly tapered, with a ventral flange and with upper tooth broader and slightly longer than the lower; malar space 0.5 times as long as basal mandibular width; frons with a median vertical groove and a pair of sharp lateromedian corni (Fig. 247); occipital carina complete, close to hind ocelli; genal carina joining hypostomal carina only slightly above base of mandible. Flagellum of ♀ with segment 1 5.0-6.0 times as long as broad; flagellum centrally with a white band, slightly flattened.

Epomia weak, short, upper edge of pronotum swollen; mesoscutum polished, caorsely punctate, notauli strong, reaching behind level of hind margin of tegulae; scutellum convex, without lateral carinae. Propodeum in profile evenly rounded, with anterior transverse carina almost complete, posterior transverse carina represented by a pair of horn-like apophyses; propodeal spiracles elliptical.

Fore wing with *cu-a* opposite *Rs&M*; 1*m-cu* and Cu_{1a} separated by slightly more than length of Cu_{1b} basally; areolet transverse, 3*r-m* present, 2*m-cu* above bulla 2.5 times as long as height; posterodistal corner of second discal cell 110-115°; basal cell sparsely hirsute. Hind wing with distal abscissa of 1*A* present; first abscissa of Cu_1 about 2.5 times as long as *cu-a*.

Gaster with tergite 1 strongly broadened posteriorly, dorsally flattened, with strong triangular lateral projection at base; sternite not reaching to level of spiracles which are positioned near posterior 0.8 of segment. Tergite 2 polished, coarsely and closely punctate; tergite 8 projecting by 0.2-0.3 times length of tergite 7. Ovipositor stout, slightly decurved, projecting beyond apex of gaster by about 0.9 times length of hind tibia; upper valve elongately tapered, with an indistinct nodus and slightly flattened near distal end; lower valve with weak oblique teeth.

Remarks. A small genus restricted to the Indo-Australian region with two described species. Townes (1970*a*) placed *Cremnocryptus* in the subtribe Ceratocryptina. It is readily distinguishable from other Australian Mesostenini on account of the pair of sharp frontal horns.

I have seen a single Australian species from north Queensland. It is very close to the Papuan species *C. arrogans* (Smith) and, though I have seen little material, it appears to be specifically distinct.

Australian species. One, undescribed (ANIC).

Host records. None.

DILOA Cheesman

Diloa Cheesman, 1936: 372. Type-species: *Mesostenus pudens* Tosquinet, by original designation.

Small to medium-sized species, fore wing length 4-7 mm; clypeus in profile weakly convex, margin impressed; mandible evenly narrowed, with upper tooth very slightly the longer; malar space 0.4-0.5 times as long as basal mandibular width; frons with median vertical carina; occipital carina complete; genal carina curved to join hypostomal carina above mandibular base. Flagellum of ♀ with segment 1 9.0-12.0 times as long as broad; flagellum centrally with a white band, broadened and flattened, distally setaceous.

Epomia strong, long, upper edge of pronotum not swollen (Fig. 227); mesoscutum polished, finely punctate, notauli very strongly impressed, reaching beyond hind edge of tegulae; scutellum laterally carinate only at anterior end. Propodeum in profile subhorizontal then abruptly rounded, with transverse carinae complete, apophyses strong, crest-like; propodeal spiracles almost circular. Hind leg with tarsal segment 4 asymmetrically lobed.

Fore wing with *cu-a* proximal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by less then length of Cu_{1b} basally; areolet small, 3*r-m* absent; 2*m-cu* above bulla 3.5 times as long as height of areolet; posterodistal corner of second discal cell 95-105°; basal cell broadly glabrous. Hind wing with distal abscissa of 1*A* absent; first abscissa of Cu_1 1.6-1.8 times as long as *cu-a*.

Gaster with tergite 1 evenly broadened, with triangular lateral projection at base (Fig. 228); sternite 1 not reaching to level of spiracle; spiracle positioned 0.75 of way along segment. Tergite 2 almost matt, finely alutaceous; tergite 8 projecting by 0.4 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.7 times length of hind tibia; upper valve distally evenly elongately rounded; lower valve with fine teeth.

Remarks. A moderately small genus apparently restricted to the east of Wallace's Line. Most species occur in New Guinea and I have seen an undescribed species from New Caledonia. Townes (1970*a*) placed *Diloa* in the Mesostenina close to *Stiromesostenus* which it resembles in venation. I agree that the two genera may be closely related.

Australian species. *Diloa antipodialis* (Ashmead) (E).

Host records. Helson (1939) recorded this species as a parasite of the tortricid *Cydia molesta* (Busck). The identity of the ichneumonid as *Diloa* is questionable as the locality where the host was collected is Victoria. *D. antipodialis* seems to me to be restricted to tropical Queensland and I have seen no specimens from south of Mackay.

EUCHALINUS Townes*

Euchalinus Townes, 1961: 471. Type-species: *Skeatia balteata* Cameron, by original designation.

Medium-sized species, fore wing length 6-7 mm; clypeus in profile strongly convex, margin impressed, convex; mandible quite strongly narrowed with a ventral flange, with upper tooth obviously the longer (Fig. 242); malar space 0.3-0.4 times as long as basal mandibular width; frons with a median vertical ridge; occipital carina mediodorsally weak; genal carina reaching hypostomal carina above base of mandible. Flagellum of ♀ with segment 1 8.0-9.0 times as long as broad; flagellum centrally with a white band.

Epomia long and strong but not produced as crest dorsally, upper edge of pronotum convexly swollen; mesoscutum polished, punctate, notauli quite strong, reaching to level of hind edge of tegulae; scutellum convex, without lateral carinae. Propodeum in profile short and abruptly rounded, with anterior transverse carina complete, posterior transverse carina almost complete, laterally raised as low crests; propodeal spiracles oval.

Fore wing with *cu-a* proximal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by less than length of Cu_{1b} basally; areolet pentagonal, with 3*r-m* present (Fig. 237), unpigmented and *2m-cu* joining distal to centre; *2m-cu* above bulla 2.0-2.5 times as long as height of areolet; posterodistal corner of second discal cell 95-105°; basal cell uniformly sparsely hirsute. Hind wing with distal abscissa of *1A* present; first abscissa of Cu_1 2.2-2.7 times as long as *cu-a*.

Gaster with tergite 1 strongly broadened posteriorly, dorsally deplanate, with strong triangular lateral projection at base; sternite 1 not reaching to level of spiracles, which are positioned more than 0.8 of way along segment. Tergite 2 coarsely punctate; tergite 8 projecting by 0.2-0.3 of length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.9 times length of hind tibia; upper valve with a distinct nodus and several small teeth distal to nodus; lower valve with weak oblique teeth.

Remarks. *Euchalinus* is a moderately large genus of the subtribe Goryphina and contains 13 described species in southern and South East Asia from India to Sulawesi. This is the first record of the genus from so far east and the Australian species is by no means typical. The majority of *Euchalinus* species have no teeth on the upper valve of the ovipositor and have a small pronotal crest though in venation and structure of mandibles they resemble the Australian species. I have adopted a conservative approach placing the Australian species in *Euchalinus* and, until the fauna of Indonesia and New Guinea is better known, I consider this the most appropriate action.

The single Australian species is only known from north Queensland.

Australian species. One, undescribed (BMNH; UMQ).

Host records. None.

EURYCRYPTUS Cameron*

Eurycryptus Cameron, 1901*a*: 231. Type-species: *Eurycryptus laticeps* Cameron, by monotypy.
Alriada Cameron, 1911*b*: 176. Type-species: *Alriada spilocephala* Cameron, by monotypy.
Neotorbda Uchida, 1932*a*: 153. Type-species: *Torbda (Neotrobda) sakaguchii* Uchida, by original designation.
Didiaspis Seyrig, 1952: 189. Type-species: *Didiaspis fondamentalis* Seyrig, by original designation.

Medium-sized species, fore wing length 8 mm; clypeus in profile flat with margin sharp, concave; mandible strongly tapered with upper tooth vestigial (Fig. 238), lower tooth long and strong; malar space 0.1 times as long as basal mandibular width; frons smooth; occipital carina dorsally complete; genal carina not joining hypostomal carina. Flagellum of ♀ with segment 1 9.0-10.0 times as long as broad; flagellum centrally with a white band.

Epomia quite strong but short, upper edge of pronotum not swollen; mesoscutum polished, finely punctate, notauli strong, reaching beyond level of hind edges of tegulae; scutellum without lateral carina. Propodeum in profile evenly rounded, with anterior transverse carina and posterior transverse carina more or less complete; propodeal spiracles oval.

Fore wing with *cu-a* proximal to base of *Rs&M*; *1m-cu* and Cu_{1a} separated by 0.8 times length of Cu_{1b} basally; areolet transverse, pentagonal, *3r-m* present and weak, *2m-cu* joining in about centre; *2m-cu* above bulla 1.1 times as long as height of areolet; posterodistal corner of second discal cell 120°; basal cell uniformly, but quite sparsely hirsute. Hind wing with distal abscissa of *1A* complete; first abscissa of Cu_1 1.0 times as long as *cu-a*.

Gaster with tergite 1 slightly broadened posteriorly, deplanate, with weak triangular lateral projection at base; sternite reaching to level of spiracles which are slightly behind the centre of the segment. Tergite 2 closely and coarsely punctate, with lateral oblique shallow concavities forming a V-shape; tergite 8 projecting by 1.7 times length of tergite 7. Ovipositor projecting beyond apex of gaster by about length of hind tibia; upper valve simple, evenly tapered; lower valve partially enclosing the upper, with a few strong vertical teeth and lobe finely coriaceous (Fig. 245).

Remarks. A small genus restricted to the Old World tropics. *Eurycryptus* was placed in the subtribe Gabuniina by Townes (1970*a*). It is easily recognized by the vestigial upper mandibular tooth. A single species occurs in the extreme north of Queensland.

Australian species. *Eurycryptus laticeps* Cameron* (M).

Host records. None for Australia. Iwata (1961) records one species as a parasite of *Trypoxylon* and *Ectemnius* (Sphecidae).

GAMBROIDES Betrem*

Gambroides Betrem, 1941: 67. Type-species: *Eripternimorpha javensis* Rohwer, by original designation.
Vadonina Seyrig, 1952: 185. Type-species: *Vadonina nimbipennis* Seyrig, by original designation.

Small to medium-sized species, fore wing length 4-9 mm; clypeus in profile weakly convex, margin impressed, truncate; mandible evenly narrowed, often slightly swollen, with upper tooth slightly the longer; malar space 0.7-0.9 times as long as basal mandibular width; frons with semicircular carina above antennal socket (Fig. 223); occipital carina complete; genal carina joining hypostomal carina above base of mandible. Flagellum of ♀ with segment 1 7.0-9.0 times as long as broad; flagellum centrally with a white band which may be indistinct, that of ♂ usually not banded.

Epomia long, weak, upper edge of pronotum not swollen; mesoscutum closely punctate, notauli moderately strong, reaching to level of centres of tegulae; scutellum carinate laterally on anterior 0.3. Propodeum in profile long, evenly rounded, with anterior transverse carina weak, other carinae vestigial; propodeal spiracles circular.

Fore wing with *cu-a* almost opposite base of *Rs&M*; 1*m-cu* and Cu_{1a} widely separated basally; areolet regularly pentagonal, complete; 2*m-cu* above bulla 0.9-1.1 times as long as height of areolet; posterodistal corner of second discal cell 110-125° basal cell uniformly hirsute. Hind wing with distal abscissa of 1*A* absent; first abscissa of Cu_1 0.5-0.6 times as long as *cu-a*.

Gaster with tergite 1 evenly broadened, with triangular lateral projection at base; sternite 1 reaching behind level of spiracle, the spiracles 0.6 of distance along segment. Tergite 2 matt, very closely and coarsely punctate; tergite 8 projecting by 0.5 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 1.0-1.4 times length of hind tibia, straight; upper valve with slight nodus, evenly tapered; lower valve with fairly weak teeth.

Fore wing frequently with an infumate central patch.

Remarks. A moderately small genus of the Old World tropics which, until recently, was treated as a synonym of *Isotima* (Townes, 1970*a*). Jonathan (1980) recently revised the '*Isotima*-complex' and accorded *Gambroides* separate generic status. He recognized four species from South East Asia. I have seen about ten from Africa, but only a single specimen from north Queensland, Australia. Species of this genus are parasites of graminaceous stem-boring Lepidoptera and include some of the more common parasites of several notorious agricultural pests. The biology of one species, *G. javensis* (misidentified as *Melcha ornatipennis*) is detailed by Ahmad & Mathur (1946).

Australian species. I have seen a single male from Australia. It may be *G. javensis* (Rowher)*.

Host records. In South East Asia, *G. javensis* is a common parasite of *Scirpophaga nivella* (F.) (Pyralidae) (Jonathan, 1980).

GLABRIDORSUM Townes

Glabridorsum Townes, 1970*a*: 174. Type-species: *Gambrus stokesii* Cameron, by original designation.

Small to medium-sized species, fore wing length 4-9 mm; clypeus in profile moderately convex, margin impressed (Fig. 265); mandible evenly narrowed, from equally bidentate to with upper tooth slightly the larger; malar space 0.5-0.7 times as long as basal mandibular width; frons swollen with a vestige of a median carina; occipital carina complete; genal carina joining hypostomal carina close to base of mandible. Flagellum of ♀ with segment 1 9.0-11.0 times as long as broad; flagellum centrally with a white band.

Epomia short, weak, upper edge of pronotum moderately swollen; mesoscutum polished, virtually without punctures (Fig. 548), notauli deep, reaching back to level of hind edges of tegulae; scutellum convex, carinate at extreme anterior end. Propodeum in profile fairly evenly rounded, with anterior transverse carina and posterior transverse carina complete, the latter raised into crests laterally; propodeal spiracles circular.

Fore wing with *cu-a* opposite base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by less than length of Cu_{1b} basally; areolet large, with 2*r-m* and 3*r-m* strongly convergent anteriorly, 2*m-cu* joining about in centre (Fig. 266); 2*m-cu* above bulla 0.5-0.6 times as long as height of areolet; posterodistal corner of second discal cell 95-105°; basal cell evenly but sparsely hirsute. Hind wing with distal abscissa of 1*A* present; first abscissa of Cu_1 1.3-1.8 times as long as *cu-a*.

Gaster with tergite 1 strongly broadened posteriorly with triangular lateral projection at base; sternite not or only just reaching to level of spiracles which are positioned 0.7-0.8 of way along segment (Fig. 260). Tergite 2 finely alutaceous; tergite 8 projecting by 0.5 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.65-0.85 times length of hind tibia, its apex compressed; upper valve with a distinct nodus bearing a small notch; lower valve with many oblique teeth.

Remarks. A moderately large genus of Ischnina with most species occurring in the Indo-Australian region. *Glabridorsum* is easily recognized by the smooth, shining and virtually impunctate mesoscutum.

Seven species occur in Australia, one of which, *G. stokesii*, is a well-known parasite of economically important fruit pests. The biology of this species was studied by Allen, Holloway & Haeussler (1940) who record its liberation in the U.S.A. It does not seem to have become established there.

Australian species. *Glabridorsum stokesii* (Cameron) (E). I have seen six undescribed species, mostly from Queensland (ANIC; BMNH; TC).

Host records. *G. stokesii* - Tortricidae: *Cydia molesta* (Busck) (Haeussler, 1945); *C. pomonella* (L.) (Miller, 1938; BMNH). Xyloryctidae: *Neodrepta luteotactella* (Walker) (DPIQ).

GORYPHUS Holmgren

Goryphus Holmgren, 1868: 398. Type-species: *Goryphus basilaris* Holmgren, by subsequent designation, Viereck, 1914: 64.

Psacus Holmgren, 1868: 400. Type-species: *Psacus areolaris* Holmgren, by subsequent designation, Viereck, 1914: 124. [Homonym of *Psacus* Pascoe, 1866.]

Brachycoryphus Kriechbaumer, 1894 : 46. Type-species: *Brachycoryphus calabaricus* Kriechbaumer, by subsequent designation, Viereck, 1914: 23.

Filistina Cameron, 1902*a*: 56. Type-species: *Filistina maculipennis* Cameron, by monotypy.
Cratocryptus Cameron, 1905*d*: 141. Type-species: *Cratocryptus maculiceps* Cameron, by monotypy. [Homonym of *Cratocryptus* Thomson, 1873.]
Loiada Cameron, 1905*h*: 166. Type-species: *Loiada maculiceps* Cameron (= *Cratocryptus maculiceps* Cameron), by monotypy.
Cratocryptodes Schulz, 1906: 123.[Replacement name for *Cratocryptus* Cameron.]
Cratocryptoides Schmiedeknecht, 1908: 62. [Replacement name for *Cratocryptus* Cameron.]
Scenopathus Enderlein, 1918: 215. Type-species: *Scenopathus ferrugineus* Enderlein, by original designation.
Miramilia Seyrig, 1952: 179. Type-species: *Miramilia communis* Seyrig, by original designation.

Small to medium-sized species, fore wing length 4-8 mm; clypeus in profile convex, margin evenly convex, not impressed; mandible quite strongly tapered, short, with upper tooth slightly the longer; malar space 0.5 times as long as basal mandibular width; frons concave, with weak median vertical carina; occipital carina complete; genal carina joining hypostomal carina above base of mandible. Flagellum of ♀ with segment 1 6.0-7.0 times as long as broad; flagellum centrally with a white band.

Epomia strong, upper edge of pronotum from weakly to strongly swollen; mesoscutum polished (Fig. 545), punctate, notauli reaching to level of hind margin of tegulae; scutellum convex, not laterally carinate. Propodeum in profile abruptly declivous, with anterior transverse carina weak but complete, posterior transverse carina represented by cornute apophyses; propodeal spiracles elliptical.

Fore wing with *cu-a* slightly proximal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by 0.6-1.0 times length of Cu_{1b} basally; areolet more or less complete; 3*r-m* weak, 2*m-cu* joining close to centre; 2*m-cu* above bulla 1.0-1.6 times as long as height of areolet; posterodistal corner of second discal cell 110-120°; basal cell evenly though rather sparsely pubescent. Hind wing with distal abscissa of 1*A* present; first abscissa of Cu_1 about 2.0 times as long as *cu-a* (Fig. 216).

Gaster with tergite 1 dorsally deplanate, strongly broadened posteriorly, with triangular lateral projection at base; sternite 1 not reaching to level of spiracles which are positioned 0.7-0.8 of way along segment. Tergite 2 large, uniformly closely and coarsely punctate (Fig. 549); tergite 8 projecting by 0.3-0.6 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.7-0.8 times length of hind tibia; upper valve with indistinct nodus, evenly tapered, the distal apex slightly convex; lower valve more strongly tapered with oblique teeth (Fig. 268).

Remarks. A very large genus, most species of which occur in the Old World tropics. The species are often brightly patterned and many have infumate patterning on the wings. They are common insects in lowland tropical forests where they run over leaves, pausing to vibrate their antennae. When handled many species are capable of inflicting a painful sting. The Indo-Australian species were revised by Jonathan & Gupta (1973) who recognized 73 species. Many additional species, particularly from Malesian rain forests, await description.

The Australian species are most common in Queensland though one, *G. turneri*, extends into New South Wales.

Australian species. *Goryphus flavocinctus* (Brullé) (E); *G. turneri* Cheesman (E). I have seen an (?)undescribed species from north Queensland (ANIC).

Host records. *G. turneri* - Pieridae: *Pieris rapae* L. (Hassan, 1976). Xyloryctidae: *Neodrepta luteotactella* (Walker) (DPIQ). *Goryphus* spp. - Curculionidae: *Euthyrhinus meditabundus* (F.) (Chadwick & Nikitin, 1976). Tortricidae: *Cydia molesta* (Busck); *C. pomonella* (L.) (Chadwick & Nikitin, 1976).

GOTRA Cameron

Gotra Cameron, 1902*b*: 206. Type-species: *Gotra longicornis* Cameron, by monotypy.
Stenaraeoides Uchida, 1932 : 181. Type-species: *Mesostenus octocinctus* Ashmead, by original designation.

Medium to moderately large-sized species, fore wing length 7-12 mm; clypeus in profile convexly rounded, margin convex, often slightly impressed or with a pair of vestigial teeth; mandible evenly narrowed, with upper tooth slightly the longer; malar space 0.4-0.7 times as long as basal mandibular width; frons rugulose, usually with a median vertical carina, rarely this carina in form of a strong lamella; occipital carina complete; genal carina joining hypostomal carina above base of mandible (Fig. 276). Flagellum of ♀ with segment 1 6.0-8.0 times as long as broad (Fig. 259); flagellum distally flattened below, centrally with a white band.

Epomia present, often strong, upper edge of pronotum usually swollen, often strongly so; mesoscutum polished, coarsely punctate to rugose, notauli strong, extending to above level of hind edges of tegulae; scutellum flat to rather convex, without lateral carinae. Propodeum in profile short to moderately long, abruptly declivous, with anterior transverse carina complete, often weak, posterior transverse carina absent but often represented by a pair of cornute apophyses; propodeal spiracles elliptical.

Fore wing with *cu-a* opposite, proximal to or even distal to base of *Rs&M*; *1m-cu* and Cu_{1a} separated by about length of Cu_{1b} basally; areolet transverse, wedge-shaped with *3r-m* weak, 2.0 times the length of *2r-m* (Fig. 257); *2m-cu* joining distal to centre; *2m-cu* above bulla 3.0-5.0 times as long as height of *3r-m*; posterodistal corner of second discal cell 110-120°; basal cell with sparse scattered hair centrally. Hind wing with distal abscissa of *1A* present; first abscissa of Cu_1 2.6-3.3 times as long as *cu-a*.

Gaster with tergite 1 abruptly broadened posteriorly, with weak triangular lateral projection at base; sternite 1 reaching to or beyond level of spiracles which are positioned 0.7-0.8 of way along segment. Tergite 2 usually coarsely punctate, rarely alutaceous; tergite 8 projecting by 0.5-0.7 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.7-2.2 times length of hind tibia, usually laterally compressed; upper valve evenly tapered, with a small nodus or in a few species with end slightly blunt; lower valve elongately tapered, with oblique teeth.

Remarks. *Gotra* is a very large mesostenine genus restricted to the Indo-Australian region. The majority of species are conspicuous black and white-striped ichneumonids commonly encountered in tropical and subtropical forests. One of the more common species (?*G. stirocephalus*) can often be found searching for host cocoons on the rough bark of trees.

The majority of Australian species are restricted to Queensland and northern New South Wales but a few are more widely distributed. I have seen about 10 species, many of which are superficially rather similar. One of these has a black gaster, the rest are black and white-striped. These striped species can be separated by colour of hind coxa, colour pattern of propodeum, sculpture of mesoscutum and tergite 2, head shape, presence of frontal protuberance, length of ovipositor and shape of its apex.

Australian species. *Gotra annulipes* (Cameron) (E); *G. bimaculata* Cheesman (M); *G. caveata* Cheesman (E); *G. doddi* Cheesman (E); *G. gilberti* (Turner) (E); *G. luctuosa* (Brullé) (E); *G. pomonellae* (Cameron) (E); *G. stirocephalus* (Cameron) (E). I have seen two (?)undescribed species (ANIC; BMNH).

Host records. *G. bimaculata* - Tortricidae: *Cryptophlebia ombrodelta* (Lower) (Ironside, 1974). *G. pomonellae* - Tortricidae: *Cydia pomonella* (L.) (Cameron, 1912*a*). *Gotra* spp. - Anthelidae: *Anthela acuta* (Walker) (Chadwick & Nikitin, 1976); *A. magnifica* (Lucas) (ANIC).

HACKEROCRYPTUS gen. n.

Type-species: *Hackerocryptus dentatus* sp. n.

Medium-sized species, fore wing length 9 mm; clypeus in profile flat, margin blunt with median apical tooth (Fig. 226); mandible evenly narrowed with upper tooth slightly the shorter; malar space 0.6 times as long as basal mandibular width, unusual in bearing small rugose impressions; frons with a faint median vertical carina; occipital carina complete; genal carina joining hypostomal carina above base of mandible. Flagellum of ♀ with segment 1 5.5 times as long as broad;

Epomia absent, upper edge of pronotum not swollen; mesoscutum polished, closely punctate, notauli strong, reaching to level of hind margin of tegulae; scutellum convex, without lateral carinae. Propodeum in profile short, abruptly rounded, with anterior transverse carina complete except centrally, posterior transverse carina vestigial; propodeal spiracles almost circular.

Fore wing with *cu-a* proximal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by about length of Cu_{1b} basally; areolet small, with 3*r-m* entirely absent; 2*m-cu* above bulla 6.0 times as long as height of areolet; posterodistal corner of second discal cell 120° (Fig. 221); basal cell sparsely but evenly hirsute. Hind wing with distal abscissa of 1*A* absent; first abscissa of Cu_1 1.4 times as long as *cu-a*.

Gaster with tergite 1 strongly broadened posteriorly, deplanate, without triangular lateral projection at base; sternite 1 not reaching to centre of segment, spiracle about at centre. Tergite 2 unusual in having a large semilunar thyridia, otherwise finely punctate; tergite 8 projecting by 0.8 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 1.2 times length of hind tibia, cylindrical; upper valve with weak nodus; lower valve with distinct teeth (Fig. 232).

Etymology. *Hacker* (personal name) + *cryptus* (a commonly applied suffix based on a well-known generic name). Masculine.

This genus is named in honour of H. Hacker, the collector of the type-species.

Remarks. A very distinctive genus on account of its unusual combination of features. The face, clypeus and mandible are rather like those of the Gabuniina whilst the venation and ovipositor are reminiscent of Mesostenina. The unusual flattened petiolar segment and the impressed sculptured areas on the malar space are unlike any other Australian mesostenine.

Australian species. One, described below (QM).

Hackerocryptus dentatus sp. n.

Lower face transverse, relatively flat; ocellar triangle broad based; vertex punctate, microreticulate between punctures; pronotum with a strong transverse furrow; mesopleuron dorsally striate, ventrally grading to irregularly wrinkled; epicnemial carina evenly curved to anterior margin of pleuron; metapleuron punctostriate; pleural carina absent behind level of spiracle; hind coxa matt, punctate. Tergites of gaster polished, finely punctate posteriorly becoming alutaceous.

Female: head and anterior part of alitrunk black; lower face and clypeus entirely, orbits, scape ventrally, anterior margin of pronotum, spot in centre of mesoscutum, scutellum, postscutellum, tegula and subalar prominences pale yellow. Fore and mid legs, mesothorax ventrally, metapleuron and propodeum, hind coxa, trochanteral segments and femur, and tergite 1 of gaster reddish brown; hind tibia black, distally paler, hind tarsus white, basitarsus proximally at segment 5 almost entirely black; gastral tergites 2+ black, with distal margins narrowly pale yellow. Pterostigma black, wings hyaline.

Male: unknown.

Material examined

Holotype ♀, Queensland: Ormiston, 17.xi.1924 (*H. Hacker*) (QM).

Host records. None.

IARIA Cheesman

Iaria Cheesman, 1936: 369. Type-species: *Mesostenus palatus* Tosquinet, by original designation.

Medium-sized species, fore wing length 9-10 mm; clypeus very weakly convex in profile, transverse with margin thin, truncate; mandible very long and strongly tapered with upper tooth much longer than the lower; malar space 0.3 times as long as basal mandibular width; frons with an obsolescent median vertical carina; occipital carina complete; genal carina joining hypostomal carina at base of mandible. Flagellum of ♀ proximally flattened, with segment 1 6.0-7.0 times as long as broad; flagellum centrally with a white band.

Epomia weak on upper part of pronotum; upper edge of pronotum slightly swollen; mesoscutum almost matt, sparsely punctate, microreticulate, notauli strongly impressed, reaching to level of hind edges of tegulae; scutellum convex, without lateral carinae. Propodeum in profile evenly rounded, with anterior transverse carina complete, and with crest-like apophyses; propodeal spiracles elliptical.

Fore wing with *cu-a* distal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by 0.6 times length of Cu_{1b} basally; areolet effaced, 2*r-m* broad, 3*r-m* absent; 2*m-cu* above bulla 9.0 times as long as 2*r-m*; posterodistal corner of second discal cell 110°; basal cell posteriorly sparsely pubescent, anteriorly hirsute. Hind wing with distal abscissa of 1*A* present; first abscissa of Cu_1 1.1-1.2 times as long as *cu-a*.

Gaster with tergite 1 evenly broadened with triangular lateral projection at base; sternite 1 not reaching to level of spiracles which are positioned about 0.8 of way along segment. Tergite 2 submatt, microreticulate with scattered punctures; tergite 8 projecting by 0.8 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 1.4 times length of hind tibia; upper valve without teeth, slightly depressed; lower valve partially enclosing the upper, with numerous oblique teeth (Fig. 234).

Remarks. *Iaria* is a small genus centred in New Guinea with one species is New Britain and one in tropical Australia. It is related to *Stenarella* but is easily distinguished by the form of the ovipositor and the position of *cu-a* in the fore wing.

Australian species. *Iaria papiliomaculata* Cheesman (M).

Host records. None.

IRABATHA Cameron

Irabatha Cameron, 1906*e*: 47. Type-species: *Irabatha albispina* Cameron, by monotypy.

Medium-sized species, fore wing length 8-10 mm; clypeus in profile convex, margin blunt, with a vestigial pair of median teeth; mandible stout, outer surface swollen with upper tooth slightly longer but much broader than the lower; malar space 0.4 times as long as basal mandibular width; frons concave, smooth except for a short median vertical carina; occipital carina strong, complete; genal carina reaching hypostomal carina close to base of mandible. Flagellum of ♀ with segment 1 9.0 times as long as broad; flagellum centrally with a white band.

Epomia short, weak, upper edge of pronotum not swollen; mesoscutum polished, micropunctate, notauli very strong, reaching far behind level of hind edges of tegulae; scutellum convex, carinate laterally at base. Propodeum in profile very long, evenly rounded, with anterior transverse carina complete, posterior transverse carina absent but with a pair of very long horn-like apophyses (Fig. 290); propodeal spiracles elliptical.

Fore wing with *cu-a* proximal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by

0.6-0.7 times length of Cu_{1b} basally; areolet small, almost quadrate, *3r-m* weak, *2m-cu* almost opposite *3r-m*; *2m-cu* above bulla 4.0 times as long as height; posterodistal corner of second discal cell 100°; basal cell centrally glabrous. Hind wing with distal abscissa of *1A* present; first abscissa of Cu_1 1.3-1.5 times as long as *cu-a*.

Gaster with tergite 1 evenly broadened posteriorly, with triangular lateral projection at base; sternite 1 reaching to level of spiracles which are positioned 0.6 of way along segment. Tergite 2 alutaceous, only slightly polished; tergite 8 projecting by 0.4 times length of tergite 7 (Fig. 288). Ovipositor projecting beyond apex of gaster by 0.9 times length of hind tibia; upper valve with weak nodus and elongately acute; lower valve very elongately acute with weak oblique teeth (Fig. 299).

Remarks. A moderately small mesostenine genus centred in New Guinea with a single species in tropical Queensland. *Irabatha* species are easily recognized by the characteristic long propodeum with horn-like apophyses.

Australian species. *Irabatha cairnsensis* Cheesman (E).

Host records. None.

ISCHNUS Gravenhorst*

Ischnus Gravenhorst, 1892*a*: 638. Type-species: *Ichneumon porrectorius* F. (= *Ichneumon inquisitorius* Müller), by subsequent designation, Westwood, 1840: 57.
Habrocryptus Thomson, 1873: 498. Type-species: *Ichneumon porrectorius* F. (= *Ichneumon inquisitorius* Müller), by subsequent designation, Viereck, 1914: 65.
Aglaocryptus Cameron, 1903*b*: 31. Type-species: *Aglaocryptus curvimaculatus* Cameron, by subsequent designation, Viereck, 1914: 6.
Erythrocryptus Cameron, 1905*g*: 126. Type-species: *Erythrocryptus rufus* Cameron, (= *Ichneumon inquisitorius* Müller), by monotypy.

Small to medium-sized species, fore wing length 4-8 mm; clypeus in profile very strongly convex, pyramidal, margin impressed (Fig. 244), transverse; mandible evenly tapered, with upper tooth about equal to lower; malar space 0.7-0.8 times as long as basal mandibular width; frons smooth and polished; occipital carina complete; genal carina joining hypostomal carina above base of mandible. Flagellum of ♀ with segment 1 10.0-12.0 times as long as broad; flagellum slightly flattened distally, centrally with a white band.

Epomia short, weak, upper edge of pronotum moderately swollen; mesoscutum punctate, area between punctures microreticulate (Fig. 546), notauli strong, reaching beyond level of hind edges of tegulae; scutellum convex, carinate laterally at extreme base. Propodeum in profile convexly rounded, with fine sculpturing, anterior transverse carina complete, posterior transverse carina absent; propodeal spiracles almost circular.

Fore wing with *cu-a* proximal to base of *Rs&M*; *1m-cu* and Cu_{1a} separated by 0.6 times length of Cu_{1b} basally; areolet complete, constricted anteriorly so front side is shorter than its height; *2m-cu* above bulla 0.4 times as long as height; posterodistal corner of second discal cell 100°; basal cell evenly but rather sparsely hirsute. Hind wing with distal abscissa of *1A* present; first abscissa of Cu_1 2.5-3.0 times as long as *cu-a*.

Gaster with tergite 1 evenly broadened posteriorly, with triangular lateral projection at base, tergite 1 reaching slightly behind the spiracles which are positioned 0.6 of way along segment. Tergite 2 weakly polished, finely alutaceous; tergite 8 projecting by 0.4 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.7 times length of hind tibia; apex of ovipositor compressed; upper valve with a strong nodus bearing a small notch; lower valve with many oblique teeth.

Remarks. A moderately large cosmopolitan genus. *Ischnus* is easily recognizable on account of the large, anteriorly strongly narrowed areolet, convex clypeus and punctate mesoscutum. It is apparently very closely related to *Glabridorsum*.

Australian species. One undescribed species from north Queensland (TC).

Host records. None from Australia but in the Holarctic region *Ischnus* species are known to parasitize a variety of lepidopterous pupae (Townes & Townes, 1962).

JUNCTIVENA gen. n.

Type-species: *Junctivena gallowayi* sp. n.

Small species, fore wing length 4-5 mm; clypeus small, convex with margin impressed, flat and quite acute; clypeus in anterior aspect truncate; labrum exposed when mandible is closed; mandible evenly tapered, the upper tooth slightly the longer; malar space slightly narrower than basal mandibular width. Lower face matt, microreticulate; frons very slightly concave above antennal sockets, with a small to large median blunt horn; ocellar triangle slightly broader at base than sides; vertex declivous behind ocelli; occipital carina complete; genal carina joining hypostomal carina above base of mandible. Antenna with scape very obliquely truncate, forming an angle of about 60° to transverse; proximal flagellar segments very long and slender, distal segments longer than broad.

Pronotum with epomia distinct; notauli wuite strong, reaching to level of hind edge of tegulae; scuto-scutellar groove striate; scutellum with lateral carina on extreme anterior end; mesoscutum and scutellum matt. Epicnemial carina strong, inclined to anterior margin of pleuron above level of lower corner of pronotum; speculum polished though rest of mesopleuron submatt; sternaulus strong, reaching almost to mid coxa; metanotum with small teeth on hind rim lateral to postscutellum. Posterior transverse carina of mesosternum absent. Propodeum in profile evenly rounded, about as long as high; propodeal spiracle circular, small; anterior and posterior transverse carinae present, subparallel; pleural carina absent behind anterior transverse carina; propodeal apophyses absent; propodeum matt, microreticulate.

Fore wing with *cu-a* subopposite or slightly proximal to *Rs&M*; base of 1*m-cu* and Cu_{1a} virtually united so that 1*m-cu*, Cu_{1a} and Cu_{1b} seem to arise from the same point; 2*m-cu* with a short central bulla, length of vein above bulla longer than height of areolet (Fig. 219); *M* distal to junction with 2*m-cu* and 3*r-m* very indistinct, unpigmented; posterodistal corner of second discal cell about 80°; basal cell fairly uniformly hirsute. Hind wing with *M* and Cu_1 strongly arcuate distally; first abscissa of Cu_1 present; distal abscissa of 1*A* entirely absent.

Fore leg of ♀ with deeply bilobate, asymmetrical tarsus 4.

Tergite 1 of gaster rather slender, weakly and evenly expanded posteriorly; petiole without obvious lateral thorn-like protuberances; tergites 1 and 2 submatt, without obvious coarse sculpture. Ovipositor projecting beyond apex of gaster by about length of hind tibia; ovipositor apex fairly elongately pointed, nodus indistinct; lower valve with inconspicuous teeth.

Etymology. *Junctus* (join) + *vena* (vein) referring to fusion of bases of 1*m-cu* and Cu_{1a}. Feminine.

Remarks. *Junctivena* is easily recognized on account of the basally united Cu_{1a} and 1*m-cu*. This is an unusual feature in Mesostenini and only known in some genera of the Lymeonina. *Junctivena* probably belongs to the subtribe Mesostenina and appears to be related to *Diloa*.

Australian species. I have seen two species, one of which is described below.

Junctivena gallowayi sp. n.

Small species, fore wing length 4-5 mm.

Female: frontal horn strongly developed, higher than basally broad; alitrunk weakly polished, alutopunctate; pleural carina of propodeum absent; gaster weakly polished. Orange-brown; mouth parts, clypeus, orbits, anterior margin of pronotum, tegula, subalar prominence, posterior corner of mesopleuron, fore and mid coxae whitish. Antenna distally infuscate with striking pale band on flagellar segments 8-10.

Male: same as female except antenna unicolorous.

This species differs from the undescribed Tasmanian species (TC) in having a more pronounced frontal cornus and being orange-brown rather than black. It is named in honour of the collector of the holotype, Dr Ian Galloway.

Material examined

Holotype ♀, Queensland: Mt Tambourine, ix-x.1978 *(Galloway)* (ANIC).

Paratypes. Queensland: 15 ♀, 18 ♂, Mt Tambourine, ix-x.1978 *(Galloway)* (ANIC; BMNH; DPIQ); 2 ♂, Mt Tambourine, x.1977 *(Galloway)* (BMNH); 1 ♀, Mt Glorious, xii. 1976 *(Bouček)* (BMNH); 1 ♀, Mt Glorious, ii-iv.1977 *(Hiller)* (BMNH); 1 ♀, Mt Glorious, i. (TC). Australian Capital Territory: 1 ♀, Canberra, Black Mt, x.1979 *(Colless)* (ANIC).

Host records. None.

LISTROGNATHUS Tschek*

Listrognathus is a large genus with species occurring in the Holarctic region and the Old World tropics. Townes (1970*a*) placed this genus in the subtribe Goryphina. It is currently divided into five subgenera several of which are quite distinct groups but two, *Suvalta* and *Stivadens*, seem very close. *Stivadens* being merely a small species-group of *Suvalta*, it is distinguishable from it by a single autapomorphy, the presence of a small tooth or teeth on the lower lateral edge of tergite 1. These teeth in *Stivadens* are formed from a broad flange found in the same position in *Suvalta*. In my opinion such a difference does not warrant subgeneric distinction and I have treated *Stivadens* as a synonym of *Suvalta*. This is the only subgenus that occurs in Australia.

LISTROGNATHUS (SUVALTA) Cameron*

Suvalta Cameron, 1903*g*: 301. Type-species: *Suvalta rugifrons* Cameron, by subsequent designation, Viereck, 1914: 140.
Listrognathus (Suvalta) Cameron; Townes *et al*., 1961: 178.
Listrognathus (Stivadens) Townes, 1961: 472. Type-species: *Suvalta annulipes* Cameron, by original designation. Syn. n.

Medium to moderately large-sized species, fore wing length 10-11 mm; clypeus in profile nasute (Fig. 253), pyramidal, margin impressed, truncate; mandible evenly narrowed, with upper tooth slightly broader and longer than the lower; malar space 0.8 times as long as basal mandibular width; frons concave, with a strong median cornus; occipital carina complete, broad; genal carina joining hypostomal carina above base of mandible. Flagellum of ♀ with segment 1 7.0-8.0 times as long as broad; flagellum centrally with a white band.

Epomia long, strong, reaching to upper edge of pronotum which is swollen where it forms a small crest (Fig. 249); mesoscutum coarsely punctate anteriorly, posteriorly almost impunctate, notauli short, reaching only to about level of centres of tegulae; scutellum convex, without lateral carinae. Propodeum in profile horizontal then abruptly rounded, with anterior transverse carina present, posterior transverse carina represented only laterally by low apophyses; propodeal spiracles elliptical.

Fore wing with *cu-a* proximal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by more than length of Cu_{1b} basally; areolet pentagonal, 3*r-m* present, 2*m-cu* joining distal to centre; 2*m-cu* above bulla about 1.0 times as long as height of areolet; posterodistal corner of second discal cell 115-120°; basal cell evenly hirsute centrally. Hind wing with distal abscissa of 1*A* complete; first abscissa of Cu_1 2.0-2.5 times as long as *cu-a*.

Gaster with tergite 1 broad, strongly broadened posteriorly, with strong triangular lateral projection at base and with angular flange at lower lateral corner which is raised into teeth (Fig. 250); sternite reaching only to centre of segment, spiracles near posterior 0.8. Tergite 2 closely punctate; tergite 8 projecting by 0.6-0.7 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.5-0.6 times length of hind tibia; upper valve evenly tapered, dorsoventrally depressed; lower valve evenly tapered with weak oblique teeth.

Remarks. This is a moderately large subgenus restricted to the Indo-Australian region. Gupta & Kamath (1967) recognized 11 species from India and Java and I have seen several others from east of Wallace's Line. A single species occurs in Australia. It is easily distinguished by the characters given in the key. It is the only black and white patterned mesostenine in Australia with the posterior white band of tergites 1 and 2 mediodorsally incomplete. All the specimens I have seen are from south Queensland. Gupta & Kamath (1967) remark that in India *Listrognathus (Suvalta)* species are most common among bushes between 450 and 1400 m.

Australian species. One, undescribed (ANIC).

Host records. None for Australia, but I have seen an Indian species reared from an unidentified lepidopterous cocoon on *Casuarina* (BMNH).

LOPHOGLUTUS gen. n.

Type-species: *Lophoglutus bouceki* sp. n.

Medium to moderately large-sized species, fore wing length 6-13 mm; clypeus in profile weakly convex, margin truncate with a median apical tooth; mandible evenly tapered with upper tooth shorter than the lower; malar space 0.3-0.4 times as long as basal mandibular width; frons concave, often with a median vertical carina; occipital carina complete; genal carina joining hypostomal carina above base of mandible. Flagellum of ♀ with segment 1 7.0-10.0 times as long as broad; flagellum centrally with a white band.

Epomia absent, upper edge of pronotum not swollen; mesoscutum polished, closely punctate, notauli extending back to level of hind edges of tegulae; scutellum convex, without lateral carinae. Propodeum in profile evenly rounded to abruptly declivous, with anterior transverse carina complete, posterior transverse carina strong, complete or centrally interrupted, laterally raised as small crests (Fig. 551); propodeal spiracles oval.

Fore wing with *cu-a* opposite or proximal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by 0.7-0.8 times length of Cu_{1b} basally; areolet incomplete, 3*r-m* absent (Fig. 272); 2*m-cu* above bulla about 4.0 times as long as height of 2*r-m*; posterodistal corner of second discal cell 95-105°; basal cell with sparse hairs posteriorly. Hind wing with distal abscissa of 1*A* present; first abscissa of Cu_1 1.2-1.5 times as long as *cu-a*.

Gaster with tergite 1 evenly broadened posteriorly with only vestiges of triangular lateral projection at base; sternite 1 reaching to level of spiracles which are positioned 0.6-0.7 of way along segment. Tergite 2 finely alutaceous, weakly polished; tergite 8 projecting by 1.0 or more times length of tergite 7. Ovipositor projecting beyond apex of gaster by 1.1-1.4 times length of hind tibia; upper valve evenly tapered with a sharp ventral apical keel (which is usually obscured by the lower valve); lower valve partially enclosing the upper, with about 12 vertical teeth (Fig. 270).

Etymology. *Lopho* (a crest) + *gluto* (rump) referring to characteristic propodeal carination. Masculine.

Remarks. A small gabuniine genus related to *Xanthocryptus* from which it can be distinguished by the characters given in the key. Two species are known, one common in Queensland, the other from Tasmania. *Mesostenus physoscelus* Brullé, which is unknown to me, may belong here. It may be a senior synonym of *L. monticolus* (Turner).

Australian species. *Lophoglutus monticolus* (Turner) comb. n. and *L. bouceki* sp. n. described below.

Lophoglutus bouceki sp. n.

Fore wing length 6-11 mm.

Female: lower face sparsely punctate with microreticulation between the punctures; clypeus truncate with lateral slightly sharpened lobes and a median tooth; labrum truncate, laterally deeply incised; frons with a median vertical carina; vertex finely punctulate; flagellum cylindrical. Mesopleuron polished, speculum smooth and shining, rest of upper part striate grading to punctate ventrally; sternaulus complete; metapleuron punctate to punctostriate. Propodeum with anterior transverse furrow almost smooth, anterior area punctate, the entire area behind the anterior transverse carina striate. Ovipositor projecting beyond apex of gaster by 1.3-1.5 times length of hind tibia.

Reddish brown species, face centrally, just below antennae, marks on vertical orbit yellowish; hind tarsal segments 1 and 5 blackish, 2-4 whitish; flagellum black, central segments white. Pterostigma brown; wings faintly infumate.

Male: similar to female but with tyloids on the four flagellar segments distal to the white band. Pale yellow; antenna (except for white band), frons and vertex, mesoscutal stripes, axilla, much of propodeum, hind coxa, hind femur except proximally, distal apex of hind tibia and tarsal segments 1, 2 and 5 black; remainder of mesoscutum, gaster, fore and mid legs distal to trochanters, and much of hind leg orange-brown.

This species is named after the collector of the holotype, Dr Z. Bouček.

L. bouceki is most easily distinguished from *L. monticolus* by the colour of the female head; that of *monticolus* is black with profuse pale markings. *L. monticolus* is also slightly larger on average with more regularly punctate sculpture. I chose to make *L. bouceki* the type-species as far more material of this species is available for circulation.

Material examined

Holotype ♀, Queensland: Mt Glorious, xii.1976 *(Bouček)* (ANIC).

Paratypes. New South Wales: 1 ♀, 1 ♂, Barrington P., i. (TC). Queensland: 4 ♀, Mt Glorious, xii.1976 *(Bouček)* (BMNH); 5 ♀, 11 ♂, Mt Glorious, x.-i. (TC); 13 ♀, 3 ♂, Mt Tambourine, x.1977-xi.1978 *(Galloway)* (DPIQ; BMNH); 27 ♂, Mt Tambourine x.-i. (TC).

Host records. None.

LORIO Cheesman

Lorio Cheesman, 1936: 383. Type-species: *Mesostenus austerus* Tosquinet, by original designation.

Moderately large-sized species, fore wing length 11-15 mm; clypeus in profile weakly to moderately convex, margin sharp with one or two median teeth (Fig. 291); mandible evenly narrowed, almost evenly bidentate, with upper tooth slightly the stouter; malar space 0.2-0.7 times as long as basal mandibular width; frons concave with a sharp median vertical carina; occipital carina complete; genal carina joining hypostomal carina far above base of mandible. Flagellum of ♀ with segment 1

7.0-11.0 times as long as broad; flagellum distally very slightly flattened, with a white band centrally.

Epomia present, short, rarely absent, upper edge of pronotum weakly to moderately swollen; mesoscutum polished, punctate, notauli strong, reaching behind level of hind edge of tegulae; scutellum slightly convex, rather 'squared off' posteriorly, without lateral carinae. Propodeum in profile abruptly declivous, with anterior transverse carina complete, posterior transverse carina complete or centrally absent, sometimes raised laterally to form keels; propodeal spiracles elliptical.

Fore wing with *cu-a* proximal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by 0.8-1.2 times length of Cu_{1b} basally; areolet small, quadrate or wanting (Fig. 283); 3*r-m* weak or absent, 2*m-cu* joining near to outer corner; 2*m-cu* above bulla 4.0 times as long as height of areolet; posterodistal corner of second discal cell 110-120°; basal cell centrally glabrous (or in one species, evenly hirsute). Hind wing with distal abscissa of 1*A* present; first abscissa of Cu_1 1.7 or more times as long as *cu-a* (Fig. 286).

Gaster with tergite 1 evenly broadened, with vestigial triangular lateral projection at base; sternite 1 reaching to level of spiracles which are positioned about 0.6 of way along segment. Tergite 2 finely punctate to alutaceous; tergite 8 projecting by 0.9-1.2 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.8-0.9 times length of hind tibia (Fig. 287); upper valve with a trace of a nodus, evenly tapered; lower valve with upper edge of proximal two or three teeth slightly expanded, to extend against upper valve but without a definite lobe; teeth few in number and subvertical (Fig. 298).

Remarks. This is a moderate-sized ceratocryptine genus restricted to Australia, New Guinea and adjacent islands. It is recognizable by the characteristic ovipositor tip, venation and elongate tergite 8. *Lorio* species may be confused with some species of *Xanthocryptus* or one species of *Stiromesostenus*. In *Xanthocryptus*, the apex of the ovipositor bears a distinct lobe; the proximal two or three teeth are marked on this lobe but are not dorsally separate. In *Lorio*, the upper edges of the proximal two or three teeth may, individually, be expanded but then they are never united as a single lobe; the upper edge of the teeth of *Stiromesostenus* are not expanded. The transverse furrow anterior to the propodeum of *Lorio* is broad and shallow without a pair of teeth on hind margin of metanotum lateral to postscutellum. In *Stiromesostenus* this groove is deeper and shorter, and most usually the teeth are present, though in one species they are not discernible.

Australian species. I have seen three undescribed species, two from Queensland (ANIC; BMNH; QM) and a third from Western Australia (ANIC; NMV).

Host records. *Lorio* sp. 3 - Cerambycidae: *Strongylurus scutellaris* Hope (BMNH).

MESOSTENUS Gravenhorst*

Mesostenus Gravenhorst, 1829*b*: 750. Type-species: *Mesostenus transfuga* Gravenhorst, by subsequent designation, Westwood, 1840: 58.
Stenaraeus Thomson, 1896: 2380. Type-species: *Mesostenus transfuga* Gravenhorst, by subsequent designation, Viereck, 1914: 136.
Umlima Cameron, 1902*b*: 208. Type-species: *Umlima penetralis* Cameron, by monotypy.
Derocentrus Cushman, 1919*b*: 113. Type-species: *Coleocentrus texanus* Ashmead (= *Mesostenus longicaudis* Cresson), by original designation.

Medium-sized species, fore wing length 8-10 mm; clypeus in profile convex, margin impressed; mandible evenly narrowed, almost equally bidentate; malar space 0.6-0.7 times as long as basal mandibular width; frons with a median vertical carina; occipital carina complete; genal carina joining hypostomal carina above base of mandible. Flagellum of ♂ without a white band.

Epomia present, upper edge of pronotum barely swollen; mesoscutum punctate, notauli strong, reaching behind level of centres of tegulae; scutellum flattish, carinate only at anterior end. Propodeum in profile evenly rounded, reticulate, with anterior transverse carina weak, posterior transverse carina vestigial; propodeal spiracles elliptical.

Fore wing with *cu-a* opposite base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by length of Cu_{1b} basally; areolet quadrate, 3*r-m* weak, 2*m-cu* joining almost opposite 3*r-m* (Fig. 294); 2*m-cu* above bulla 1.5-2.0 times as long as height of areolet; posterodistal corner of second discal cell 110-120°; basal cell evenly hirsute. Hind wing with distal abscissa of 1*A* present; first abscissa of Cu_1 2.5-3.0 times as long as *cu-a*.

Gaster with tergite 1 evenly broadened, with triangular lateral projection at base. Tergite 2 matt, superficially punctoalutaceous.

Remarks. I have seen four male specimens of this genus from Moggil, Queensland. Dr Townes confirmed their identity as *Mesostenus*. They appear to be rather similar structurally to many African species and I have surmised (in the key) that the ovipositor characters of this species are like those of typical *Mesostenus*, i.e. with a simple, evenly acute apex. *Mesostenus* is a cosmopolitan genus; many species are associated with dry areas.

Australian species. One, undescribed (TC).

Host records. None for Australia but other regions species of this genus parasitize pupae of Lepidoptera (Bare, 1942).

MYRMELEONOSTENUS Uchida*

Myrmeleonostenus Uchida, 1936*a*: 116. Type-species: *Myrmeleonostenus babai* Uchida, by original designation.

Small to medium-sized species, fore wing length 5-9 mm; clypeus in profile convex, apically truncate, margin strongly impressed, sharp; mandible quite strongly, evenly narrowed with upper tooth slightly the longer; malar space 0.4-0.7 times as long as basal mandibular width; frons with a median vertical carina which may be raised into a small tooth (Fig. 224); occipital carina complete, very far from ocelli; genal carina curved to join hypostomal carina above base of mandibles. Flagellum of ♀ and ♂ with a white band, that of ♂ with minute peg-like sensilla on ventral side of proximal segments.

Epomia very weak, upper edge of pronotum not swollen; mesoscutum polished, punctate, notauli strongly impressed, reaching to level of hind edges of tegulae; scutellum slightly convex, without lateral carinae. Propodeum in profile abruptly rounded, usually with anterior and posterior transverse carinae strong, complete; propodeal spiracles elliptical.

Fore wing with *cu-a* usually opposite base of *Rs&M*; 1*m-cu* and Cu_{1a} separated basally by less than length of Cu_{1b}; areolet present, small to moderately large; 2*m-cu* above bulla 1.1-1.5 times as long as height of areolet; posterodistal corner of second discal cell 100°; basal cell posteriorly rather sparsely hirsute. Hind wing with distal abscissa of 1*A* absent; first abscissa of Cu_1 1.5-2.0 times as long as *cu-a* (Fig. 217).

Gaster with tergite 1 long and slender (Fig. 229), without triangular lateral projection at base; sternite 1 extending well posterior to spiracles which are positioned 0.65 of way along segment. Tergite 2 matt, finely alutaceous; tergite 8 projecting by 0.3 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.8-1.5 times length of hind tibia, straight; upper valve evenly tapered, without a distinct nodus; lower valve with a few weak teeth.

Remarks. A medium-sized genus with a few scattered species in the southern Palaearctic and Indo-Australian regions. I have seen more species from Australia than from all other countries.

Myrmeleonostenus species are distinctive on account of the broad head, very long slender petiole, square clypeus and abruptly rounded bitranscarinate propodeum. Townes (1970*a*) placed this genus in the subtribe Ischnina.

Australian species. I have seen eight species, all undescribed (ANIC; BMNH; TC). They differ strikingly in colour pattern. *Myrmeleonostenus* species have been seen from all states except Tasmania.

Host records. None in Australia but Baba (1937) gives an account of the biology of a Japanese species reared as a parasite of *Myrmeleon* and *Distoleon* species (Myrmeleontidae).

NEAPRIX gen. n.

Type-species: *Neaprix insolens* sp. n.

Medium-sized species, fore wing length 9-10 mm; clypeus very broad, in profile flat, polished, with margin sharp, truncate; mandible long, barely narrowed with upper tooth shorter than the lower (Fig. 251); malar space 0.6-0.7 times as long as basal mandibular width; frons concave, with a long stout median cornus (Fig. 248); occipital carina complete, broadened mediodorsally; genal carina joining hypostomal carina above base of mandible. Flagellum of ♀ with segment 1 4.2 times as long as broad; flagellum distally flattened below with a white band centrally.

Epomia weak, short, upper edge of pronotum slightly swollen; mesoscutum finely punctate, polished, notauli strong, extending behind level of hind edges of tegulae; scutellum flat, without lateral carinae. Propodeum in profile abruptly declivous, with anterior transverse carina strong, posterior transverse carina represented only laterally by vestiges; propodeal spiracles elliptical.

Fore wing with *cu-a* almost opposite base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by slightly less than length of Cu_{1b} basally; areolet quadrate, 3*r-m* weak, 2*m-cu* joining near distal side; 2*m-cu* above bulla 1.3 times as long as height of areolet (Fig. 256); posterodistal corner of second discal cell 110-115°; basal cell uniformly sparsely hirsute. Hind wing with distal abscissa of 1*A* present; first abscissa of Cu_1 1.8-1.9 times as long as *cu-a*.

Gaster with tergite 1 evenly broadened posteriorly, without triangular lateral projection at base; sternite 1 almost reaching to level of spiracles which are positioned at posterior 0.7 of segment. Tergite 2 finely alutaceous, polished; tergite 8 projecting by 0.2 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.75 times length of hind tibia; upper valve evenly tapered, with a nodus; lower valve with moderately strong oblique teeth (Fig. 254).

Etymology. *Ne* (new) + *Aprix* (a related genus). Feminine.

Remarks. This genus is related to *Aprix* from which it differs in having a simple ovipositor, larger, flatter clypeus and longer mandible. Monobasic.

Australian species. One, described below.

Neaprix insolens sp. n.

Female: lower face weakly polished, microreticulate between punctures; clypeus almost impunctate, with apex slightly broadened centrally; face transverse, about 1.4 times as broad as high. Flagellum with 30-31 segments. Occipital carina broadened mediodorsally, its horizontal part trans-striate. Pronotum with transverse furrow; pleural carina absent. Gaster polished, finely alutaceous.

Orange-brown; head, pronotum and mesoscutum black with white markings on face, clypeus, orbits, anterior pronotal margin, upper part of pronotum, mesoscutum centrally, scutellum and subalar prominences. Antenna black with white band, scape ventrally pale. Hind tarsal segments 2-4 pale. Pterostigma blackish, wings hyaline.

Male: like female but with lower face subquadrate. Flagellum with 35-37 segments. Colour like that of female but with black marks on propodeum; hind basitarsus, distal tarsal segment, distal apex of hind tibia and mid tarsal segments 2-5 blackish.

Material examined

Holotype ♀, Queensland: Pine Creek, 12 m S. of Bundaberg, iv.1976 *(Frauca)* (ANIC).

Paratypes. New South Wales: 1 ♀, Blue Mts, Woodford, 600 m, i. (TC); 1 ♂, Tathra, 20 m (TC). Queensland: 1 ♀, Brisbane, iii.1955 *(Greenhill)* (UMQ); 2 ♀, 5 ♂, Brisbane, 1972 *(Sedlacek)* (TC). Victoria: 1 ♂, Warburton, ii. (TC).

Host records. None.

NEBOSTENUS gen. n.

Type-species: *Nebostenus crypticus* sp. n.

Small to medium-sized species, fore wing length 5-8 mm; clypeus transverse, in profile flat, rather smooth, margin not impressed, convex, with often vestiges of a pair of teeth (Fig. 260); mandible long, weakly narrowed, with upper tooth equal to or longer than the lower; malar space 0.2-1.0 times as long as basal mandibular width; frons smooth; occipital carina complete; genal carina joining hypostomal carina close to or above base of mandible. Flagellum of ♀ with segment 1 short, 0.8-1.0 times as long as segment 2, less than 2.5 times as long as broad (Fig. 258); flagellum distally flattened below with a white band centrally.

Epomia weak, short, or absent, upper edge of pronotum not or only slightly swollen; mesoscutum finely punctate, polished to matt, microreticulate, notauli weak to moderate, generally reaching to level of centres of tegulae; scutellum flat, without carinae or carinate laterally anteriorly. Propodeum in profile horizontal, then abruptly declivous, with anterior transverse carina present though often weak, posterior transverse carina complete, quite strong; propodeal spiracles oval.

Fore wing with *cu-a* proximal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by about length of Cu_{1b} basally; areolet complete, quadrate or narrowly pentagonal; 2*m-cu* above bulla about 1.0 times as long as height of areolet; posterodistal corner of second discal cell 90-110°; basal cell uniformly hirsute. Hind wing with distal abscissa of 1 present; first abscissa of Cu_1 1.3-2.0 times as long as *cu-a*.

Gaster with tergite 1 evenly broadened posteriorly, without triangular lateral projection at base; sternite 1 not reaching quite to level of spiracles which are positioned about 0.6-0.7 of way along segment. Tergite 2 polished, finely sculptured; tergite 8 projecting by 0.4-0.7 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.4-1.7 times length of hind tibia; upper valve evenly tapered or sometimes blunt, rather convexly rounded; lower valve evenly tapered, with oblique teeth.

Etymology. *Nebo* (from Mt Nebo, a locality where the type-species was collected) + *stenus* (from *Mesostenus*, a related genus). Masculine.

Remarks. This genus resembles several genera in the *Aptesis/Cubocephalus* group of the Hemigasterini in the form of the antenna, general shape and sculpture, the often blunt ovipositor and the spinose tibiae. However, this similarity is probably the result of evolutionary convergence rather than indicative of any phylogenetic affinity as I believe *Nebostenus* species belong in the Mesostenini, subtribe Ischnina, near *Anacis*. Unlike aptesines there is no trace of a lateral longitudinal carina above the propodeal spiracle nor is the metanotal tooth developed in quite the right position. The area superomedia is never delineated laterally.

I have seen four undescribed species which I refer to this genus. It is by no means certain all will be grouped together eventually as they differ strikingly in the size and shape of the ovipositor. It was thought better, at present, to place all in *Nebostenus* until more material is available.

Australian species. Four undescribed species (ANIC; TC), two of which are described below to give an example of the range of variation in the group.

Nebostenus crypticus sp. n.

Female: fore wing length 5-6 mm; lower face transverse, 1.3-1.4 times as broad as long, centrally convex, laterally flat, punctate; clypeus polished with faint pair of apical teeth; vertex finely punctate, genae narrow; malar space 0.2-0.3 times basal mandibular width. Flagellum with 30-32 segments. Alitrunk highly polished, punctate; notaulus, epomia and sternaulus weak; scutellum very flat, without lateral carinae. Fore tibia strongly swollen, bearing numerous stout spines on outer surface. Fore wing with areolet very narrow, *2r-m* and *3r-m* anteriorly separated by about 0.2-0.4 times their own length. Ovipositor projecting beyond apex of gaster by about length of hind tibia, apically simply acute.

Orange-brown; head blackish, orbits yellowish brown; clypeus and face centrally yellowish; flagellum blackish brown with median white band; hind tarsal segments 2-4 whitish. Pterostigma golden; wings hyaline.

Male: similar to female but face narrower, subquadrate; flagellum with 28-30 segments. Colour like female but head almost entirely pale yellowish; hind tibia, basitarsus and tarsal segment 5 strongly infuscate.

This is the only species in the genus with a brownish alitrunk. It is easily recognized by the simply acute ovipositor which projects by about length of tibia. The other two species with relatively short ovipositors have the apex of the upper valve blunt.

Material examined

Holotype ♀, Queensland: Atherton, ii.1975 *(Howden)* (TC).

Paratypes. Queensland: 1 ♀, 1 ♂, Atherton, ii.1975 *(Howden)* (TC); 1 ♀, Mt Nebo, ii. (TC).

Nebostenus terebratus sp. n.

Female: fore wing length 7 mm; lower face matt, alutaceous, 1.3 times as broad as long, flat; clypeus polished, without teeth; vertex finely alutaceous, genae moderately broad; malar space 1.0 times as long as basal mandibular width. Flagellum with 27 segments. Alitrunk polished, punctate, laterally more coarsely so; notauli strong anteriorly, posteriorly obsolescent; scutellum with lateral carinae on extreme anterior end; sternaulus moderately impressed. Fore tibia with long strong spines on outer surface. Fore wing with areolet almost quadrate, distance between *2r-m* and *3r-m* anteriorly about 0.7 times length of *3r-m*. Ovipositor long, slightly upcurved, projecting beyond apex of gaster by 1.7 times length of hind tibia.

Black species; clypeus, upper orbits, tegula, fore and most of mid coxae yellow; scape, marks on vertex, most of fore and mid legs reddish orange. Gaster and hind legs reddish brown; tergites 2+ laterally with black spots. Flagellum blackish with yellowish white median band.

Male unknown.

This species is distinct in having a long ovipositor and broad malar space.

Material examined

Holotype ♀, Australian Capital Territory: Canberra, Black Mt, x.1979 *(Colless)* (ANIC).

Host records. None.

NECOLIO Cheesman*

Necolio Cheesman, 1936: 373. Type-species: *Necolio jugosus* Cheesman, by original designation.

Afrocryptus Seyrig, 1952: 162. Type-species: *Afrocryptus imperialis* Seyrig, by original designation.

Medium to moderately large-sized species, fore wing length 6-12 mm; clypeus in profile convex, flattened near apical margin which is acute (Fig. 292); mandible evenly tapered with upper tooth slightly the longer; malar space 0.4-0.8 times as long as basal mandibular width; frons usually with a weak median vertical carina, sometimes simple; occipital carina complete; genal carina joining hypostomal carina above base of mandible. Flagellum of ♀ with segment 1 at least 4.0 times as long as broad; flagellum centrally with a white band.

Epomia indistinct to absent, upper edge of pronotum not or only slightly swollen; mesoscutum weakly polished, closely punctate, notauli impressed to level of hind edges of tegulae; scutellum usually carinate laterally, at least at base. Propodeum in profile flat then abruptly declivous, with anterior transverse carina complete, posterior transverse carina represented laterally by crests; propodeal spiracles elliptical.

Fore wing with *cu-a* opposite or proximal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by about length of Cu_{1b} basally; areolet quadrate, 3*r-m* faint, 2*m-cu* joining distal to centre; 2*m-cu* above bulla 2.0-3.0 times as long as height of areolet; posterodistal corner of second discal cell 100-110°; basal cell from sparsely to closely, but always uniformly, hirsute. Hind wing with distal abscissa of 1*A* present; first abscissa of Cu_1 2.1-3.3 times as long as *cu-a*.

Gaster with tergite 1 evenly broadened posteriorly, without triangular lateral projection at base (Fig. 296); sternite 1 extended beyond the spiracles which are positioned 0.7-0.8 of way along segment. Tergite 2 from finely punctate to nearly smooth with vestigial alutaceous sculpture; tergite 8 projecting by 0.3-0.6 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.9-1.1 times length of hind tibia, the tip always laterally compressed; upper valve from evenly tapered to with a nodus; lower valve evenly tapered with weak teeth at extreme distal apex (Fig. 297).

Remarks. *Necolio* is a moderately large palaeotropical mesostenine genus. Its most characteristic feature is the virtual lack of teeth on the lower valve of the ovipositor. The species I have seen from Australia are all from Queensland. One of these (the large black and white species) is very similar to *N. jugosus*, from which it differs in being slightly smaller and more profusely white marked. It may be only an extreme 'variant'.

Australian species. Five, undescribed (ANIC; BMNH).

Host records. None.

PARANACIS gen. n.

Type-species: *Paranacis brunnea* sp. n.

Small to medium-sized species, fore wing length 4-6 mm; clypeus in profile weakly convex, margin evenly rounded, slightly impressed; mandible evenly narrowed with upper tooth about equal to lower; malar space 0.3 times as long as basal mandibular width; frons without a distinct median vertical carina (Fig. 225); occipital carina complete; genal carina joining hypostomal carina above base of mandible. Flagellum of ♀ with segment 1 9.0-11.0 times as long as broad; flagellum centrally with a white band.

Epomia short and weak or absent, upper edge of pronotum not swollen; mesoscutum abruptly rounded, usually polished, notauli reaching to level of centre of tegulae; scutellum convex, carinate at most at extreme anterior end. Propodeum in profile abruptly rounded, with anterior transverse carina complete, posterior transverse carina vestigial or absent; propodeal spiracles circular.

Fore wing with *cu-a* proximal to or opposite base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by less than the length of Cu_{1b} basally; areolet small, 3*r-m* unpigmented or absent; 2*m-cu* above bulla 3.0-5.0 times as long as height; posterodistal corner of second discal cell 100-110°; basal cell evenly, sparsely hirsute. Hind wing with distal abscissa of *1A* absent or present as a stub; first abscissa of Cu_1 1.4-1.7 times as long as *cu-a*.

Gaster with tergite 1 evenly broadened, dorsally slightly deplanate, without triangular lateral projection at base; sternite 1 reaching to level of spiracles which are positioned about 0.6 of way along segment. Tergite 2 polished, finely punctate; tergite 8 projecting by 0.4-0.6 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 1.1-1.2 times length of hind tibia, slightly compressed; upper valve with a weak nodus, evenly tapered; lower valve with moderate teeth.

Etymology. *Par* (like) + *Anacis* (a related genus). Feminine.

Remarks. A small genus of Mesostenina which superficially resembles some species of *Anacis* but the venation indicates a close relationship with *Diloa*. *Paranacis* differs from *Diloa* in having the anterior end of the petiole simple, having the hind tarsal segment 4 symmetrically lobate and in having tergite 1 slightly deplanate. The species I have seen are both from Queensland.

Australian species. Two undescribed (TC), one of which is described below.

Paranacis brunnea sp. n.

Female: fore wing length 4-6 mm; lower face elongate, polished, finely shagreened; vertex polished, very finely and sparsely punctate; pronotum with a strong transverse furrow, without epomia, smooth and highly polished. Remainder of alitrunk polished, with very fine punctures; propodeum with anterior transverse carina strong, posterior transverse carina entirely absent, the posterior area smooth. Tergites of gaster polished.

Orange-brown; head and antenna black, flagellar segments 5-11 white; upper orbits yellow-marked; anterior margin of pronotum whitish yellow. Pterostigma brown, wings hyaline.

Male: like female but with flagellum unicolorous blackish.

P. brunnea differs from the undescribed species (BMNH) in having a smooth posterior end to the propodeum and in lacking an epomia.

Material examined
Holotype ♀, Queensland: Mt Tambourine, x. (TC).

Paratypes. Queensland: 3 ♀, Brisbane, i-vi.1971, xi-xii.1971, xi.1972 *(Sedlacek)* (TC; BMNH). 1 ♂, Highvale, xi. (TC).

Host records. None.

STENARELLA Szépligeti

Stenarella Szépligeti, 1916: 307. Type-species: *Ichneumon gladiator* Scopoli, by subsequent designation, Roman, 1943: 20.
Orientostenaraeus Uchida, 1930: 321. Type-species: *Orientostenaraeus chinensis* Uchida (= *Mesostenus insidiator* Smith), by original designation.
Parasilsila Cheesman, 1936: 368. Type-species: *Parasilsila trilineata* Cheesman (= *Mesostenus victoriae* Cameron), by original designation.

Medium to moderately large-sized species, fore wing length 10-12 mm; clypeus transverse, in profile almost flat, margin sharp, slightly concave; mandible long, strongly and elongately tapered with upper tooth very much the longer (Fig. 239); malar space 0.2 times as long as basal mandibular width; frons with a median vertical carina; occipital carina complete; genal carina joining hypostomal carina close to base of mandible. Flagellum of ♀ proximally flattened with segment 1 (measured on flat side) 6.0 times as long as broad; flagellum centrally with a white band.

Epomia short, on upper part of pronotum; upper edge of pronotum slightly swollen; mesoscutum polished, coarsely punctate, notauli very strong, reaching beyond hind edges of tegulae; scutellum without lateral carinae. Propodeum in profile strongly and evenly rounded, with only anterior transverse carina present; propodeal spiracles elliptical.

Fore wing with *cu-a* proximal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by more than length of Cu_{1b} basally; areolet transverse, wedge-shaped with 3*r-m* absent; 2*m-cu* above bulla 3.0-4.0 times as long as height of areolet; posterodistal corner of second discal cell 110-120°; basal cell evenly hirsute. Hind wing with distal abscissa of 1*A* present; first abscissa of Cu_1 2.0-2.5 times as long as *cu-a*.

Gaster with tergite 1 slender, with blunt triangular lateral projection at base; sternite 1 reaching to level of spiracles which are positioned about 0.7 of way along segment. Tergite 2 polished, finely punctate with microreticulation between punctures; tergite 8 projecting by 0.5-0.8 times length of tergite 7. Ovipositor projecting beyond apex of gaster by about 5.0 times length of hind tibia; apex of ovipositor sinuous; upper valve with very strong curved teeth; lower valve partially enclosing the upper with about 10 strong teeth (Fig. 233).

Remarks. *Stenarella* together with *Iaria* are the only two Australian representatives of the subtribe Osprynchotina (= Nematopodiina sensu Townes). This group is easily recognized by the long slender mandible with the elongate upper tooth. *Stenarella* is a moderate-sized genus most species of which occur in the Old World tropics, especially central and southern Africa. A single species is known to occur in Australia. It is easily recognized by the very long ovipositor (which may exceed 30 mm) which has a sinuate end bearing strong teeth. It is fairly common in Queensland and New South Wales.

Australian species. *Stenarella victoriae* (Cameron) (E).

Host records. *S. victoriae* - Pompilidae: *Pseudagenia* sp. (DPIQ). Sphecidae: *Sceliphron* sp. (BMNH).

STIROMESOSTENUS Cameron

Stiromesostenus Cameron, 1911*c*: 228. Type-species: *Stiromesostenus xanthostomus* Cameron, by monotypy.
Erythromesostenus Cameron, 1911*d*: 333. Type-species: *Erythromesostenus rufus* Cameron, by monotypy. Syn. n.

Small to moderately large-sized species, fore wing length 4-12 mm; clypeus in profile convex with margin impressed, usually with weak pair of apical teeth, or with a single tooth; mandible evenly narrowed, with upper tooth slightly longer than the lower; malar space 0.5-0.7 times as long as basal mandibular width; frons concave, smooth or with median vertical carina; occipital carina complete; genal carina joining hypostomal carina a little above base of mandible. Flagellum of ♀ with segment 1 8.0-10.0 times as long as broad; flagellum slightly flattened ventrally, centrally with a white band.

Epomia present or absent, if present, short, upper edge of pronotum weakly to moderately swollen; mesoscutum smooth or punctate, sometimes wrinkled, notauli strong, reaching beyond level of hind edges of tegulae; scutellum convex, from carinate basally to with lateral carinae reaching almost to posterior apex. Propodeum in profile abruptly declivous, with anterior transverse carina present, posterior transverse carina vestigial, often present laterally as crests or even strong cornute apophyses; propodeal spiracles elliptical.

Fore wing with *cu-a* opposite or distal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by 0.2-0.6 times length of Cu_{1b} basally; areolet effaced, 3*r-m* absent, 2*r-m* very short and broad, almost opposite 2*m-cu* (Fig. 284); 2*m-cu* above bulla 5.0 or more times as long as height of 2*r-m*; posterodistal corner of second discal cell 90-110°; basal cell centrally glabrous or with isolated hairs (Fig. 281). Hind wing with distal abscissa of 1*A* present; first abscissa of Cu_1 0.6-1.3 times as long as *cu-a*.

Gaster with tergite 1 abruptly broadened posteriorly, with triangular lateral projection at base; sternite 1 not reaching to or reaching just to level of spiracles which are positioned 0.7 of way along segment. Tergite 2 polished, finely alutaceous; tergite 8 projecting by 0.4-0.6 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.8-1.0 times length of hind tibia; upper valve with a small nodus, evenly tapered; lower valve generally quite elongately tapered with oblique teeth but in one species more shortly tapered, with subvertical teeth.

Remarks. This is a large mesostenine genus confined to Australia, New Guinea and adjacent islands. The majority of species are reddish brown and several have the wing apices infumate.

There is considerable variation in the carination of the propodeum but intermediates exist between typical *Erythromesostenus* and *Stiromesostenus* as defined by Townes (1970*a*). I have seen about nine species from Australia and New Guinea. From this material I conclude that *Erythromesostenus* does not warrant separate generic status and should be included as a synonym of *Stiromesostenus*.

In Australia, species of *Stiromesostenus* are relatively uncommon insects although species are widely distributed and occur in almost all states (I have seen no specimens from Northern Territory or South Australia).

Australian species. *Stiromesostenus albiorbitalis* Cheesman (E); *S. rufus* (Cameron) comb. n. (E). I have seen approximately seven undescribed species (ANIC; BMNH; TC) but judging limits of species is very difficult and some of my 'species' may be merely smaller examples of others.

Host records. *S. rufus* - 'fern moth' larva (Cameron, 1911*d*). *Stiromesostenus* spp. - Nolidae: *Uraba lugens* Walker (ANIC; NMV). Xyloryctidae: *Neodrepta luteotactella* (Walker) (DPIQ).

SYNTRIPS gen. n.

Type-species: *Syntrips maculatus* sp. n.

Medium-sized species, fore wing length 5.5-8 mm; clypeus convex, separated from face by a groove; clypeal margin subacute, in anterior aspect slightly convex with a vestigial median tooth in ♀, a strong median tooth in ♂; anterior tentorial pits large. Mandible strongly sexually dimorphic (Figs 240, 241), in both sexes with upper tooth of similar length to but much broader and blunter than the lower; mandible of ♂ very enlarged; malar space about width of scape. Lower face centrally convex; frons concave above antennal sockets with a weak median vertical carina; ocellar triangle broader at base than sides; vertex abruptly declivous immediately behind ocelli; occipital carina complete; genal carina joining hypostomal carina away from base of mandible. Scape very obliquely truncate, 65° from horizontal; flagellum of ♀ with basal segments very long and slender, apical segments slightly transverse, with elongate placoid sensillae only on under side; ♂ similar.

Pronotum with upper margin very strongly swollen and with a blunt tubercle on this swelling formed from upper edge of epomia (Fig. 246); lower part of epomia weak. Notauli strongly impressed, reaching behind level of hind ends of tegulae; mesoscutum polished with scattered large punctures, the punctures more sparse posteriorly; scuto-scutellar groove striate; scutellum large, weakly convex, without lateral carinae. Epicnemial carina strong, inclined to reach from end of pleuron well above level of lower corner of pronotum; sternaulus strong except for posterior 0.3 which is obsolescent; metanotum without obvious teeth either side of scutellum but with deep transverse furrow between it and propodeum. Posterior transverse carina of mesosternum broadly incomplete. Propodeum in profile rather short and abruptly declivous; anterior transverse carina present very close to front part of propodeum, curved forward medially and often lacking central 0.2; posterior transverse carina absent; propodeal apophyses strong, not quite as high as broad basally; propodeal spiracle elliptical; pleural carina absent behind anterior transverse carina; propodeum reticulate grading laterally to coarsely punctate.

Fore wing with *cu-a* slightly proximal to base of *Rs&M*; *2m-cu* with a broad central bulla, which is nearly as long as part of vein above bulla; *2m-cu* above bulla longer than height of areolet; *3r-m* entirely absent (Fig. 236); basal cell with anterior band of close hair, posteriorly with sparse scattered hairs; posterodistal corner of second discal cell about 110°. Hind wing with $M+Cu_1$ weakly but evenly curved; first abscissa of Cu_1 much longer than *cu-a*; distal abscissa of Cu_1 and *1A* present.

Fore leg of ♀ with tarsus 4 quite deeply but almost symmetrically bilobate.

Gaster with tergite 1 with a pair of thorn-like lateral protuberances near anterior end; dorsal part of segment very flat, anteriorly narrow, posteriorly strongly broadened, more so in ♀ than ♂; tergite 1 smooth and polished; tergite 2 polished, at most with anterior 0.5 punctate. Ovipositor projecting beyond apex of gaster by 0.5-0.7 times length of hind tibia, more or less straight; ovipositor apex evenly tapered, upper valve with a row of minute central teeth distal to nodus; lower valve with inconspicuous teeth (Fig. 244).

Etymology. Greek; 'the smasher' - an allusion to the grossly enlarged mandibles of the male. Masculine.

Remarks. I have seen two species of this genus, the type-species from north Queensland and a second species from near Port Moresby, Papua New Guinea.

Syntrips belongs to the subtribe Goryphina as defined by Townes (1970*a*) and appears to be related to the *Goryphus* complex of genera. It is distinct from any other genus in this complex in having teeth on the upper valve of the ovipositor, having a strongly swollen upper margin of the pronotum with a tubercle on it and in the sexually dimorphic mandibles.

The specialized male mandible of *Syntrips* is a unique feature amongst Ichneumonidae, for although sexually dimorphic mandibles occur in some other genera (e.g. *Glyphicnemis*) it is only the female which is specialized, apparently for digging. The extent of development of male mandibles in *Syntrips* is not constant, some have more enlarged mandibles than others. It is possibly some sort of display feature.

Australian species. One, described below.

Syntrips maculatus sp. n.

Female: fore wing length 5.5-8 mm; vertex smooth; mesopleuron punctate, polished or with fine reticulation between punctures; metapleuron coarsely punctate; hind coxa smooth and polished; gaster except for anterior part of tergite 2 which is closely punctate, smooth and polished; ovipositor projecting beyond apex of gaster by 0.7 times length of hind tibia.

Black; flagellar band, face, clypeus, mandible, lower part of gena, upper orbits broadly, lower anterior margin of pronotum, pronotal prominence, tegula, subalar prominence, scutellum, metanotum laterally, propodeal apophyses, fore and mid coxae, hind margins of tergites 4-7 yellowish white; fore and mid legs except coxae, hind coxa, trochanteral segments, proximal 0.6 of femur, central part of tibia and tergites 1-2 orange; hind tarsus infuscate. Pterostigma blackish, wings hyaline.

Male: similar to female but generally with paler areas more extensive. Mandible from slightly to grossly enlarged.

S. maculatus differs from the undescribed Papuan species in lacking a broad whitish band on the mesopleuron, haveing the distal 0.4 of the hind femur black, having the anterior 0.5 of tergite 2 punctate (it is smooth in the other species) and in having a slightly longer ovipositor.

Material examined

Holotype ♀, Queensland: Elliott Heads, 17 km E. by S. Bundaberg, 9.x.1980 *(Frauca)* (ANIC).

Paratypes. Queensland: 1 ♂, Biloela (BMNH); 1 ♀, Gympia (sic) - Mackay, 16. xii. (TC); 5 ♀, 1 ♂, Mackay, 1909 (BMNH); 1 ♀, Redlynch, xii.1938 *(Sternitzky)* (BMNH); 1 ♀, 2 ♂, Townesville *(Dodd)* (BMNH).

Host records. *S. maculatus* - Noctuidae: *Earias perhuegeli* Holloway (DPIQ).

TAKASTENUS Uchida*

Takastenus Uchida, 1931: 188. Type-species: *Takastenus longidentatus* Uchida, by original designation.

Medium-sized species, fore wing length 6-10 mm; clypeus in profile moderately convex with margin sharp, with vestiges of lateromedian teeth; mandible evenly tapered with upper tooth slightly longer and broader than the lower; malar space 0.5 times as long as basal mandibular width; frons smooth or with vestige of median vertical carina; occipital carina complete; genal carina joining hypostomal carina above mandible. Flagellum of ♀ with segment 1 6.0-7.0 times as long as broad; flagellum centrally with a white band.

Epomia long and strong, reaching to the upper edge of pronotum, which is not swollen; mesoscutum polished with fine sparse punctures, notauli strong, reaching behind level of hind edges of tegulae; scutellum convex, without lateral carinae. Propodeum in profile quite long, evenly rounded, with anterior transverse carina complete, posterior transverse carina represented only laterally by horn-like apophyses; propodeal spiracles elliptical.

Fore wing with *cu-a* well proximal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by about length of Cu_{1b} basally; areolet large, complete, with 2*r-m* and 3*r-m* more or less parallel, 2*m-cu* joining distal to centre; 2*m-cu* above bulla about 1.0 times as long as height of areolet; posterodistal corner of second discal cell 95-105°; basal cell evenly hirsute. Hind wing with distal abscissa of 1*A* present; first abscissa of Cu_1 2.8-3.2 times as long as *cu-a*.

Gaster with tergite 1 evenly broadened posteriorly, with triangular lateral projection at base; sternite 1 not reaching to level of spiracles which are positioned 0.8 of way along segment. Tergite 2 almost matt, impunctate, alutaceous (Fig. 550); tergite 8 projecting by 0.5 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.8-0.9 times length of hind tibia; upper valve with a nodus, the part distal to nodus concave, in section deplanate; lower valve strongly tapered and with oblique teeth on distal apex (Fig. 269).

Remarks. This goryphine genus has had a confused taxonomic history. Townes *et al.* (1961) treated it as distinct from *Buodias* and *Melcha* which they considered to be synonyms. Subsequently, Gupta (1969) separated *Melcha* from *Buodias*. Townes (1970*a*) then synonymized *Takastenus* with *Buodias* but also treated *Melcha* as a separate genus. The characters Townes used in his key are rather weak but the type-species of *Takastenus*, *T. longidentatus*, runs to *Buodias*. However, this species runs to *Melcha* in Gupta's (1969) key, indicating that Townes' and Gupta's concepts of these genera differ.

I have re-examined the Oriental material and suggest that the three genera should be recognized as separate. *Buodias ruficoxis* (the type-species of the genus) is a very specialized species, not very closely related to any other species though possibly a sister-lineage to *Melcha* plus *Takastenus*. *Melcha* and *Takastenus* both have specialized antennae in the males but *Melcha* differs in having pectinate claws and a different ovipositor.

The following key will serve to separate the Indo-Australian representatives of these genera.

1 Areolet transverse, anteriorly about 2.0 times as broad as length of 2*r-m*; anterior part of propodeum with transverse furrow striate; ovipositor strongly decurved; male flagellum simple....................*BUODIAS*

- Areolet more or less quadrate, anteriorly 0.9-1.5 times as broad as length of 2*r-m*; anterior part of propodeum with transverse furrow smooth; ovipositor almost straight; male flagellum with keels or flattened..2

2 All tarsal claws strongly pectinate at bases; hind trochantellus dorsally as long as broad; ovipositor apex elongately acute, slightly compressed; male flagellum strongly flattened centrally..............*MELCHA*

- Tarsal claws simple, with only a few hairs basally; hind trochantellus dorsally much shorter than broad; ovipositor apex acute, with distal end of upper valve slightly concave, in section flattened; male with raised keels on flagellar segments immediately distal to white band, central segments not flattened.......................*TAKASTENUS*

Of the three genera neither *Buodias* nor *Melcha* are known to occur in Australia.

Takastenus is a moderately large genus, widely distributed throughout the Indo-Australian region. In Australia all species appear to be restricted to Queensland though one occurs as far south as Brisbane.

Australian species. Two, undescribed (ANIC; BMNH). One has two 'colour forms' which may prove to be separate species.

Host records. None.

THELODON Townes

Thelodon Townes, 1961: 473. Type-species: *Silsila spilonota* Cameron, by original designation.

Medium-sized species, fore wing length 8-10 mm; clypeus in profile convex, margin rounded, acute; mandible evenly tapered with a small apicoventral lobe, with upper tooth much longer than the lower (Fig. 279); malar space 0.3 times as long as basal mandibular width; frons smooth, concave; occipital carina mediodorsally interrupted, laterally strong; genal carina not reaching hypostomal carina, its end turned abruptly away and continuing ventrally (Fig. 275). Flagellum of ♀ with segment 1 9.0-11.0 times as long as broad; flagellum distally slightly flattened, with a white band centrally.

Epomia present on lower part of pronotum, upper edge of pronotum moderately convex; mesoscutum polished, almost impunctate with few long hairs, notauli deep, reaching behind level of hind edges of tegulae; scutellum quite long, convex, not laterally carinate. Propodeum in profile long, evenly rounded, with carinae very weak; propodeal spiracles large, elliptical.

Fore wing with *cu-a* proximal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by length of Cu_{1b} basally; areolet wedge-shaped, transverse, with 3*r-m* very weak, 2.0 times length of 2*r-m* (Fig. 274); 2*m-cu* above bulla 4.0 or more times as long as height of 3*r-m*; posterodistal corner of second discal cell 110-115°; basal cell evenly hirsute. Hind wing with distal abscissa of 1*A* present; first abscissa of Cu_1 about 3.0 times as long as *cu-a*.

Gaster with tergite 1 evenly broadened posteriorly, rather slender, with vestiges of triangular lateral projection at base; sternite 1 reaching behind level of spiracles which are positioned 0.7-0.8 of way along segment. Tergite 2 polished, alutaceous, with weak diagonal grooves cutting off anterolateral corners which are contrasting in colour with centre of tergite; tergite 8 projecting by 0.5 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 1.2-1.3 times length of hind tibia; upper valve with small nodus, elongately tapered; lower valve elongately tapered with inconspicuous oblique teeth near apex.

Remarks. A moderate-sized ceratocryptine genus restricted to the Indo-Australian region. All the species I have seen are slender, black and white-patterned ichneumonids with a venation very like that of *Gotra*. The characteristic mandible and genal carina distinguish this genus from other Mesostenina. The single Australian species is known only from Queensland.

Australian species. *Thelodon elongatus* (Szépligeti) (M).

Host records. none.

TOMAGOTRA gen. n.

Type-species: *Tomagotra roddi* sp. n.

Medium to moderately large-sized species, fore wing length 10-11 mm; clypeus in profile convex, margin impressed, with a weak median apical tooth (Fig. 278); mandible evenly tapered, with upper tooth very slightly longer than the lower; malar space 0.8 times as long as basal mandibular width; frons concave, rugose with weak median vertical carina; occipital carina complete; genal carina joining hypostomal carina above base of mandible. Flagellum of ♀ with segment 1 5.0 times as long as broad; flagellum distally slightly flattened, centrally with a white band.

Epomia distinct, upper edge of pronotum swollen (Fig. 289); mesoscutum polished, sparsely punctate, notauli deep, extending to level of hind edges of tegulae; scutellum slightly convex, without lateral carinae. Propodeum in profile moderately long, evenly rounded, with anterior transverse carina present, posterior transverse carina vestigial, present laterally as keels; propodeal spiracles elliptical; anterior transverse furrow striate, broad with weak teeth on rim of metanotum.

Fore wing with *cu-a* proximal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by 0.8 times length of Cu_{1b} basally; areolet present, almost quadrate, 3*r-m* slightly longer than 2*r-m*; 2*m-cu* joining near outer corner; 2*m-cu* above bulla 2.4 times as long as height of areolet; posterodistal corner of second discal cell 100°; basal cell uniformly hirsute (Fig. 280). Hind wing with distal abscissa of 1*A* present; first abscissa of Cu_1 3.0 times as long as *cu-a*.

Gaster with tergite 1 evenly broadened posteriorly, with triangular lateral projection at base (Fig. 295); sternite 1 reaching to level of spiracles which are positioned 0.6-0.7 of way along segment. Tergite 2 polished, smooth, with obsolescent punctures; tergite 8 projecting by 0.4-0.5 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.6 times length of hind tibia; upper valve with a distinct nodus, concave and elongately tapered, with three widely interspaced teeth far proximal to apical oblique teeth.

Etymology. *Toma* (from Mt Tomah) + *Gotra* (a related genus). Feminine.

Remarks. This genus belongs in Townes' subtribe Mesostenina and appears to be related to *Irabatha* and *Gotra*. Unlike either of these genera *Tomagotra* has the fourth fore tarsal segment shallowly incised. The ovipositor is quite unlike that of other mesostenine genera.

Australian species. One, described below.

Tomagotra roddi sp. n.

Female: face transverse, centrally slightly swollen, with coarse, elongate punctures; vertex finely punctate, upper part of gena smooth, polished, without sculpture. Flagellum with about 36 segments, the distal ones ventrally flattened. Mesopleuron with raised, smooth subalar prominence and speculum, upper part striate ventrally grading into punctate; sternaulus strong, reaching to lower corner of pleuron; metapleuron punctostriate. Hind leg with trochantellus in dorsal view longer than broad. Gaster mostly polished and smooth.

Black, with ivory markings on clypeus, face centrally, facial, frontal and genal orbits, upper and anterior margins of pronotum, tegula, subalar prominence, speculum, a spot near upper end of epicnemial carina, centre of mesoscutum, axilla anteriorly, fore and mid coxae. Rest of fore and mid legs red, hind coxa, femur and tibia except distal apexes, reddish; hind tarsi 2-4 white. Gaster red with only anterior part of tergites 2 and 3 and all of tergite 1 black. Wings hyaline; pterostigma black.

This species is named in honour of its collector Mr Norman Rodd.

Material examined

Holotype ♀, New South Wales: Mt Tomah, Blue Mts, iii.1979 *(Rodd)* (AM).

Paratypes. Tasmania: 1 ♀, Port Arthur, ii-iii. (TC). Victoria: 1 ♀, Warburton iii.1930 *(Burns)* (NMV).

Host records. None

XANTHOCRYPTUS Cameron

Xanthocryptus Cameron, 1901*a*: 233. Type-species: *Xanthocryptus robustus* Cameron, by monotypy.

Lorentzia Cameron, 1911*c*: 210. Type-species: *Lorentzia flavomaculata* Cameron, by monotypy. [Homonym of *Lorentzia* Cossman, 1908.]

Medium to large species, fore wing length 8-16 mm; clypeus in profile weakly convex, margin truncate, with median apical tooth (Fig. 277); mandible short, strongly tapered, with a small deep hair-bearing furrow on outer side near base of teeth; upper tooth distinctly the shorter; malar space 0.5-0.8 times as long as basal mandibular width; frons usually flat and without a distinct median vertical carina; occipital carina complete; genal carina joining hypostomal carina above base of mandible. Flagellum of ♀ with segment 1 8.0-11.0 times as long as broad; flagellum centrally with a white band.

Epomia weak to absent, upper edge of pronotum weakly swollen or flat; mesoscutum polished, closely punctate, notauli reaching back to level of hind edges of tegulae; scutellum convex, without lateral carinae. Propodeum in profile evenly rounded, with anterior transverse carina complete, posterior transverse carina vestigial to weak, not laterally raised, close to hind end of propodeum (Fig. 552); propodeal spiracles elliptical.

Fore wing with *cu-a* proximal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by about length of Cu_{1b} basally; areolet small to moderately large, transverse to quadrate, with 3*r-m* unpigmented but present (Fig. 273); 2*m-cu* above bulla 2.5-3.8 times as long as height of areolet; posterodistal corner of second discal cell 95-105°; basal cell with few scattered hairs posteriorly. Hind wing with distal abscissa of 1*A* present; first abscissa of Cu_1 0.9-1.4 times as long as *cu-a*.

Gaster with tergite 1 evenly but strongly broadened posteriorly, with weak to strong triangular lateral projection at base; ventrolateral margin of tergite carinate; sternite 1 reaching to level of spiracles which are positioned 0.5-0.6 of way along segment. Tergite 2 from sparsely to closely punctate; tergite 8 projecting by 0.9-1.2 times length of tergite 7. Ovipositor projecting beyond apex of gaster by 0.8-1.5 times length of hind tibia; upper valve evenly tapered, with or more usually without a nodus; lower valve partially enclosing the upper with six to seven coarse vertical teeth (Fig. 271).

Remarks. A large genus restricted to Australia, Melanesia and New Zealand. Townes (1970*a*) placed this genus in the subtribe Gabuniina though it seems to have some affinities with some Ceratocryptina, especially *Lorio*. These trans-subtribal affinities which one constantly encounters in this group clearly show the subtribal groupings to be of dubious value. Townes (1970*a*) described a new genus *Arhytis* (type-species: *Echthrus maculiscutis* Cameron) which he considered contained two species-groups, the *maculiscutis* species-group, an Oriental group with numerous fine teeth on the ovipositor, and the *novozealandicus* species-group, an Australian group with few sparse teeth on the ovipositor apex. These two species-groups do not belong in the same genus. *A. maculiscutis* has a finely coriaceous area on the ovipositor tip and a deep V-shaped groove on tergite 2 indicating a close relationship with *Eurycryptus*. The *novozealandicus* species-group lacks these characters and, except for possessing a slightly larger areolet, agrees with *Xanthocryptus*. I have therefore placed all the Australian gabuniines (except those placed in *Lophoglutus*) in *Xanthocryptus*.

In Australia species of *Xanthocryptus* are widely distributed occurring from tropical Queensland to Western Australia and Tasmania.

Australian species. *Xanthocryptus lugubris* Cheesman (E); *X. novozealandicus* (Dalla Torre) (M,Z). I have seen four undescribed species (ANIC; BMNH; TC).

Host records. *X. novozealandicus* - Limacodidae: *Doratifera* sp. (Froggatt, 1907). Noctuidae: *Mythimna* sp. (Parrott, 1953). *Xanthocryptus* sp. - Noctuidae: *Mythimna convecta* (Wakler) (DPIQ).

XYLOSTENUS gen. n.

Type-species: *Xylostenus curtus* sp. n.

Medium-sized species, fore wing length 6-7 mm; clypeus in profile weakly convex, margin not impressed, evenly convex; mandible evenly tapered with upper tooth slightly the longer; malar space 0.9-1.0 times as long as basal mandibular width; frons finely alutaceous, simple; occipital carina complete; genal carina joining hypostomal carina well above base of mandible. Flagellum of ♀ with segment 1 8.0-9.0 times as long as broad; flagellum distally cylindrical, centrally with a white band.

Epomia weak, short, upper edge of pronotum not swollen; mesoscutum weakly polished, closely punctate, notauli reaching to level of hind edges of tegulae; scutellum convex, not laterally carinate; sternaulus strong, complete. Propodeum in profile long, evenly rounded, with anterior transverse carina complete, posterior transverse carina complete, strong; propodeal spiracles more or less circular.

Fore wing with *cu-a* proximal to base of *Rs&M*; 1*m-cu* and Cu_{1a} separated by length of Cu_{1b} basally; areolet complete, asymmetrically pentagonal, 3*r-m* weak, 2*m-cu* joining near distal side; 2*m-cu* above bulla 1.0-1.2 times as long as height; posterodistal corner of second discal cell 110-120°; basal cell evenly hirsute. Hind wing with distal abscissa of 1*A* present; first abscissa of Cu_1 2.0-2.3 times as long as *cu-a*.

Gaster with tergite 1 subcylindrical, only barely broadened posteriorly, without triangular lateral projection at base; sternite extending beyond spiracles which are positioned slightly before centre of segment (Fig. 262). Tergite 2 closely alutopunctate; tergite 8 projecting by 0.4-0.8 times length of tergite 7 (Fig. 263). Ovipositor projecting beyond apex of gaster by 0.3 times length of hind tibia; upper valve quite stout, evenly tapered without a nodus; lower valve with teeth vertical, most proximal one oblique.

Etymology. *Xylo* (wood) + *stenus* (from *Mesostenus*, a related genus) referring to the shape of body which suggests it parasitizes miners in woody stems.

Remarks. An aberrant genus of Ischnina possibly related to *Anacis* from which it differs in the form of the petiole, shape and sculpture of the propodeum and form of ovipositor.

Australian species. I have seen two species, one from Australian Capital Territory and Victoria described below and an undescribed species from Tasmania (TC).

Xylostenus curtus sp. n.

Female: medium-sized species, fore wing length 6-7 mm; lower face almost quadrate, polished, closely punctate with fine sculpture between punctures; clypeus smooth and polished; vertex almost matt, finely coriaceous to alutaceous, genae strongly narrowed posteriorly. Flagellum with 35 segments. Pronotum mediodorsally long; mesopleuron punctate ventrally grading to reticulate-wrinkled, metapleuron similarly sculptured. Gaster alutopunctate.

Head, alitrunk, tergite 1 of gaster black; clypeus, facial, frontal and lower genal orbits, pronotal margin, antennal band, tegula, subalar prominence and scutellum white. Legs and remainder of gaster red; fore coxa and trochanter infuscate, mid coxa with a pale stripe, hind tibia distally and basitarsus proximally infuscate, hind tarsal segments 2-4 whitish. Pterostigma blackish; wings hyaline.

Male unknown.

X. curtus differs from the undescribed species in having the mid and hind coxae and tergite 2 red, not black, and in having a slightly more slender ovipositor.

Material examined

Holotype ♀, Australian Capital Territory: Canberra, Black Mt, ii.1980 *(Colless)* (ANIC).

Paratypes. Victoria: 2 ♀, Mt Dandenong, 200 m, ii. (TC); 2 ♀, Warburton, ii.-iii. (BMNH; TC).

Host records. None

SUBFAMILY XORIDINAE

The Xoridinae is one of the smaller subfamilies containing, world-wide, four genera, Three of these are north temperate, the fourth, *Xorides*, is moderately large and cosmopolitan. It is represented in tropical Australia by very few species, but one is not uncommon.

DIAGNOSIS

Small to moderately large species, fore wing length 4-14 mm; clypeus separated from face, small, transverse, usually with a strong transverse ridge and with distal part flat, margin evenly rounded; mandible short, in Australian species unidentate; frons with a crest between antennal bases; occipital carina complete; genal carina joining hypostomal carina above base of mandibles. Flagellum usually filiform, with 26-34 segments. Notaulus deep, reaching usually to hind edge of mesoscutum; sternaulus weak or absent; posterior transverse carina of mesosternum complete or interrupted before mid coxae; propodeum usually distinctly carinate. Fore tibia without a tooth on apical margin, basal claws simple, short. Fore wing with 3*r-m* absent; 2*r-m* usually much shorter than abscissa of *M* between 2*r-m* and 2*m-cu*; 2*m-cu* with two bullae; pterostigma moderately broad; marginal cell long and quite slender. Hind wing with first abscissa of *Rs* shorter than *r-m*; distal abscissa of Cu_1 present. First segment of gaster long, quite stout, with spiracles at or before centre; gaster cylindrical or depressed; ovipositor projecting beyond apex of gaster by more than 2.0 times length of hind tibia, slender and often decurved, without a dorsal apical notch.

Xoridines are a very distinctive group and once seen are unlikely to be confused with other Ichneumonidae except for a few north temperate species (Gauld & Fitton, 1981). In Australia, *Xorides* could be confused with *Gotra* and some other phygadeuontines but the mandible and antenna of *Xorides* are quite unlike those of any phygadeuontine.

DISTRIBUTION

Of the four genera in the Xoridinae only *Xorides* occurs outside the north temperate region. Species of this genus are not uncommon in temperate and tropical forests. *Xorides* is currently divided into 10 subgenera (Townes, 1969) four of which occur in the Oriental region. Only one subgenus, *X. (Cyanoxorides)*, extends to Australia and I have only seen species of this group from Queensland and northern New South Wales.

BIOLOGY

Xoridines are parasites of wood-boring Coleoptera and Symphyta. Most usually larvae serve as hosts but pupae and even adults within their cocoon may be parasitized. The families Cerambycidae and Siricidae are the commonest hosts though several other coleopterous families are also attacked. There are a number of studies on the biology of xoridines in Europe and North America and that of Chrystal & Skinner (1931) serves as a typical example. These authors observed that the female xoridine oviposited through the bark into the host gallery. A single egg was deposited on or near the cerambycid larva. Although it was never observed they consider it highly likely that the host larva was stung and paralysed prior to oviposition. Larvae that had been oviposited on were virtually immotile but alive and, even if the xoridine egg failed to hatch the cerambycid larva remained unmoving for weeks before eventually dying. The elongate, fusiform egg hatched about eight days after oviposition and the first instar larva immediately began attacking the host. It fed by burying its mandibles in the host's integument and sucking the body fluids. Growth was rapid and after six or seven days the larva moulted. The second instar larva resembled the first and lasted a further four or five days. At about this time the host larva was found to be dead. The third larval instar was stouter with a less well-developed head. This continued to feed on the host for six to seven days before moulting. The fourth and final instar larva consumed the entire host, except for the head capsule and chitinous exoskeleton, in five or six days. It then remained motionless for several days before spinning a capacious cocoon. The larva was observed to overwinter in this cocoon and pupated in the spring of the following year. The duration of the pupal stage was short, with the adult emerging after 9-10 days.

The head of the final instar xoridine larva is quite strongly sclerotized and the antenna is papilliform, which is probably the plesiomorphous condition for ichneumonids. The epistomal arch is incomplete but the other sclerites are well formed. The mandibles are large with numerous small accessory teeth. Short (1978) considered xoridine larvae to be structurally primitive.

XORIDES (CYANOXORIDES) Cameron

Cyanoxorides Cameron, 1903*a*: 141. Type-species: *Cyanoxorides brookei* Cameron, by monotypy.
Spiloxorides Cameron, 1903*a*: 143. Type-species: *Spiloxorides ruficeps* Cameron, by monotypy.
Xorides (Cyanoxorides) Cameron; Townes & Townes, 1960: 491.

Flagellum of ♀ with subapical angulation, the segment proximal to this angulation bearing peg-like seta (Fig. 82); flagellum of ♂ filiform with conspicuous long fine pubescence; pronotum specialized with dorsal carinae and strong epomia; epicnemial carina present; scuto-scutellar groove with a median carina (Fig. 87); posterior transverse carina of mesosternum interrupted before mid coxae. Fore wing with *cu-a* proximal to base of *Rs&M*. Gaster with tergite 2 with anterior corners impressed, with traces of diagonal furrows and a central depression which may be raised to form a median longitudinal ridge posteriorly.

Remarks. The flagellum, mandibles, pronotum, scuto-scutellar groove and gaster sculpture are distinctive features enabling these insects to be easily recognized.

Australian species. *Xorides (C.) australiensis* (Szépligeti) (E); *X. (C.) crudelis* (Turner) (E). I have seen one undescribed species (ANIC).

Host records. None from Australia but in the north temperate region *Xorides* species have been reared from Anobiidae, Buprestidae, Cerambycidae, Curculionidae, Elateridae, Melandryidae, Scolytidae and Siricidae (Gauld & Fitton, 1981).

SUBFAMILY ICHNEUMONINAE

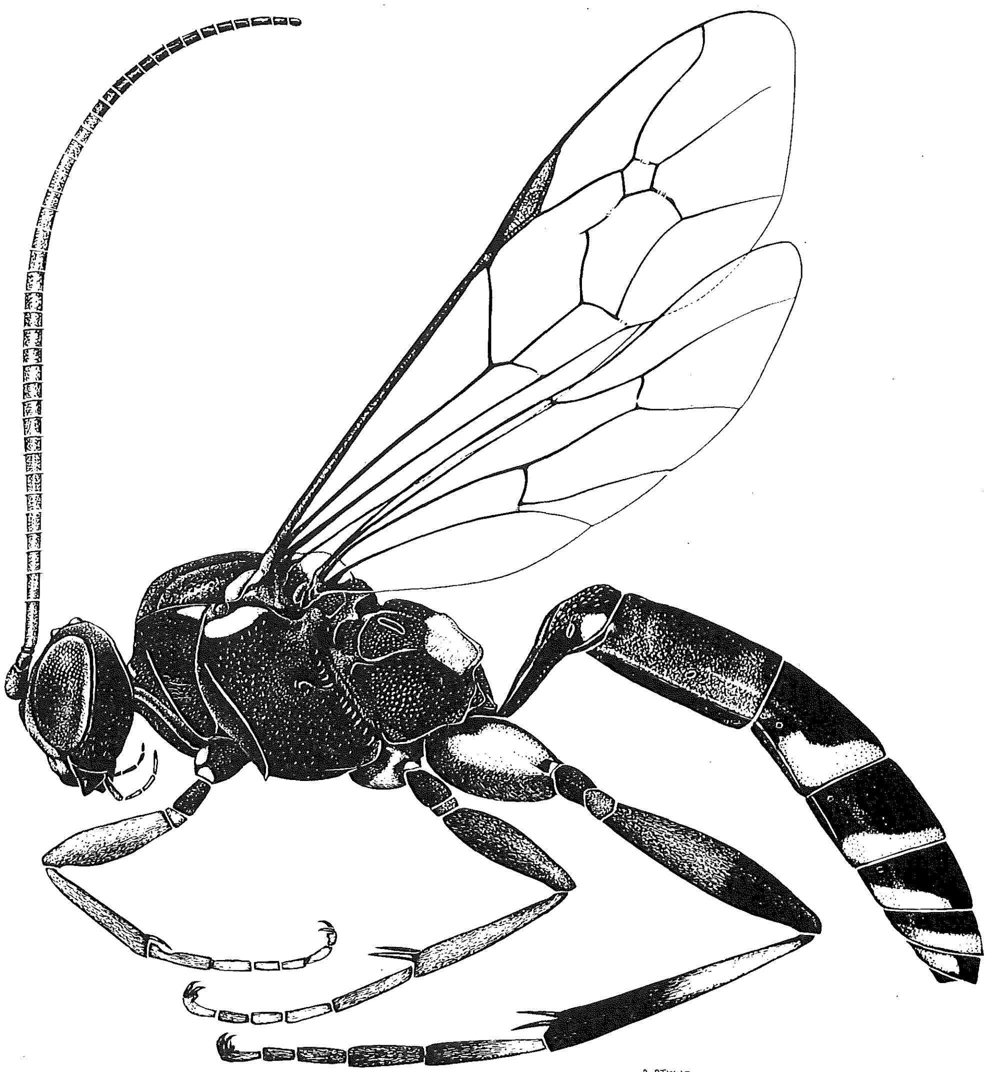


Fig. 302 *Ichneumon promissorius* ♂, lateral.

The Ichneumoninae is the second largest subfamily and includes about 320 genera. Many of these are quite small, but a few (e.g. *Cratichneumon*, *Ichneumon*, *Coelichneumon*) are very large indeed and contain several hundred species. Townes *et al.* (1961) record 10 genera from Australia. Two of these, *Levansa* and *Coelichneumon* (= *Ichneumon* sensu Townes), do not occur in Australia. In this work 23 genera are recognized as Australian, eight of which are described as new. Several of the larger ichneumonines are common insects in Australia, and *Ichneumon promissorius* (and a number of other species with a similar colour pattern) may frequently be observed flying in long grass and shrubbery in suburban habitats. Most of these species are markedly sexually dichromatic. The males are more often observed than the females which tend to search for lepidopterous larvae and pupae amongst the ground vegetation and litter.

DIAGNOSIS

Small to large insects, fore wing length 3-16 mm; clypeus usually separated from face by weak groove, generally broad and flat with margin sharp, truncate, less commonly concave or with median apical tooth, in a few species clypeus slightly convex in profile with margin arcuate; mandible usually long and frequently very slender, with lower tooth usually reduced or even absent; male flagellum often with tyloids, that of female often with distal apex flattened ventrally. Sternaulus absent; posterior transverse carina of mesosternum never complete; propodeum usually with a fairly complete set of carinae delineating distinct area, rarely with carinae reduced. Apex of fore tibia without a tooth on outer side; tarsal claws usually simple, very rarely pectinate. Fore wing with *3r-m* always present, generally enclosing a pentagonal areolet, or less commonly with *2r-m* and *3r-m* virtually touching anteriorly; hind wing with distal abscissa of Cu_1 almost always present, first abscissa of Cu_1 always longer than *cu-a*. First tergite of gaster slender anteriorly, usually rather abruptly broadened in posterior 0.3, without glymma and with spiracles behind the centre; tergite 2 usually with deep gastrocoeli; tergite 2-4 dorsoventrally depressed. Ovipositor sheath short, at most projecting beyond apex of gaster by about 0.5 times length of hind tibia, generally shorter, and whether long or short always rigid; ovipositor straight, usually slender, without a dorsal subapical notch.

The Ichneumoninae is one of the most distinctive subfamilies and is only likely to be confused with Phygadeuontinae. The rigid ovipositor sheath of ichneumonines is quite unlike the flexible one of phygadeuontines. Males are more difficult to separate but phygadeuontines never have the broad, flat, truncate clypeus so common amongst ichneumonines. The latter usually have a short, weak notaulus and only a vestigial sternaulus whereas both these grooves may be well developed in phygadeuontines. Many phygadeuontines lack *3r-m*; this is always present in Ichneumoninae. Many Ichneumoninae have deep lateral pits on the fore margin of tergite 2. These gastrocoeli are not found in most other ichneumonids.

CLASSIFICATION

The Ichneumoninae is taxonomically the most confused (and confusing) of all subfamilies, largely because Townes has not produced an overview of world genera. Townes and co-authors in various catalogues (1951; 1961; 1965; 1966; 1973) have given keys to tribes and genera but these do not always agree with the classifications adopted by Perkins (1959; 1960) for European species or by Heinrich (1934; 1938; 1961; 1967) for Nearctic, Afrotropical or Indonesian species. The limits of the tribes are vague in the extreme. For example, the Protichneumonini blurs into the Trogini and genera such as *Catadelphus* may be placed in either tribe whereas *Coelichneumon*, another protichneumonine genus, seems to intergrade into *Lissosculpta*, a genus always placed in the Ichneumonini.

The classification adopted in this work is largely that used by J. F. Perkins in his re-curation of the collection of the British Museum (Natural History). It differs from that used by Townes in his catalogues in some details but the groupings are broadly comparable, alghouth Townes uses a different set of names which do not conform with various opinions of the International Commission (see Carlson, 1979).

At present I recognize 15 tribes. These together with alternative names and taxonomic notes are listed alphabetically below.

1	Alomyini	(Only part of Townes, 1971*b* Alomyini. Includes only *Alomya* and *Megalomya* and is thus equivalent to Alomyinae sensu Perkins, 1959.)
2	Ceratojoppini	(*vide* Heinrich, 1967.)
3	Ctenocalini	(*vide* Heinrich, 1967.)
4	Eurylabini	(Includes only *Eurylabus*. Treated as part of Platylabini by Townes *et al*., 1965.)
5	Goedartiini	(Includes *Goedartia* and related genera. Tentatively included within Eurylabini by Perkins, 1959.)
6	Heterischnini	(*vide* Townes & Townes, 1973; included by Perkins, 1959 within Phaeogenini.)

7	Ichneumonini	(= Joppini sensu Townes; in present sense it includes the Acanthojoppini or Joppocryptini of Heinrich, 1967; 1977.)
8	Ischnojoppini	(*vide* Heinrich, 1967.)
9	Listrodromini	(*vide* Perkins, 1959; Heinrich, 1967.)
10	Oedicephalini	(= Notosemini sensu Townes; see p. 210.)
11	Phaeogenini	(= Alomyini in part of Townes *et al.*, 1961. Corresponds to Phaeogenini of Perkins, 1959 and Diller, 1981 except that *Heterischnus* and *Notosemus* are excluded.)
12	Platylabini	(= Pristicerotini sensu Townes.)
13	Protichneumonini	(= Ichneumonini sensu Townes; in present sense it includes the *Catadelphus*-group which parasitizes large Heterocera)
14	Trogini	(Restricted to include only those genera parasitizing Papilionidae and other Rhopalocera.)
15	Zimmeriini	(*vide* Perkins, 1959.)

Although I regard several aspects of this classification as unsatisfactory it is beyond the scope of this work to attempt further rationalization of higher ichneumonine taxonomy. The terms 'Ichneumoninae stenopneusticae' and 'Ichneumoninae cyclopneusticae' are still occasionally used. The latter refers to small ichneumonines, mainly Phaeogenini and Heterischnini, the former to all other tribes except Alomyini. Eight of the above mentioned tribes, the Ctenocalini, Ichneumonini, Ischnojoppini, Listrodromini, Oedicephalini, Phaeogenini, Platylabini and Protichneumonini, occur in Australia.

DISTRIBUTION

Very little is know about the distribution of Ichneumoninae in South East Asia and Melanesia except for Heinrich's (1937) study of those occurring in Sulawesi. Many Australian species belong to large Old World Tropicopolitan genera (e.g. *Gavrana*, *Lissosculpta*) and it would therefore seem that much of the Australian ichneumonine fauna is derived from the north. Certain anomalous elements (e.g. *Tricholabus*, *Ctenochares*) may well turn out to be far more widely distributed than is currently known. Several of these are associated with seasonally dry areas and almost nothing is known of the Asian ichneumonids of such environments.

BIOLOGY

Ichneumonines are internal parasites of Lepidoptera. Oviposition is into mature larvae or pupae and the adult ichneumonid emerges from the host pupa (Hinz, 1983). Females usually search for hosts on foot amongst the undergrowth and leaf litter; some have fossorial fore limbs and probably tunnel into loose soil. Males, which often have quite a different colour pattern, are more conspicuous and can be seen flying areond low bushes and over long grass. In the north temperate region females of many species hibernate during the winter as adults in leaf litter, under bark etc. (Rasnitzin, 1964). These usually have a single generation per year. A number of other species overwinter as first instar larvae in the fatty tissue of the host pupae (Klomp & Teerink, 1978). These are often bivoltine and many require a different host species in the spring and autumnal generations (van Veen, 1981) whilst some species may even have two generations in a single host generation. This is achieved by the ichneumonid emerging from the host pupa in early spring then parasitizing other pupae of the same host generation.

Ichneumonines usually have relatively few mature eggs in the ovary at any one time (Iwata, 1960). The egg may be deposited free in the host haemocoel, but in at least some species the egg is placed in a particular position such as the salivary gland wall or the gut wall (Askew, 1971; van Veen, 1981). Although usually the host is not paralysed a drop of fluid from the 'poison sac' is introduced with the egg. Females of some species feed on host pupae (Lloyd, 1940).

Ichneumonine larvae may undergo three or four instars. The final instar larva has a characteristic head capsule with well-developed epistomal arch, pleurostoma and hypostoma, which is directed ventrally. The stipital sclerites and hypostomal spur are absent and the mandibles are large, simple and triangular. The maxillary and labial palps are unusual in bearing four or five sensilla (Fig. 301). Other ichneumonids usually have two or rarely three sensilla.

KEY TO THE GENERA OF ICHNEUMONINAE OCCURRING IN AUSTRALIA

The key given is direct to genera but the tribal groupings are indicated in parentheses.

1 Mandible broad, weakly narrowed, twisted 90° so upper tooth is external (Fig. 303); areolet rhombic, petiolate above (Fig. 330) and scutellum strongly laterally carinate. (Ctenocalini)......*MAGWENGIELLA* (p. 193)

\- Mandible either broad, weakly narrowed and not twisted or if twisted then long and slender; areolet usually pentagonal, or if rhombic then scutellum without lateral carinae; scutellum otherwise carinate or not....................2

2 Head in dorsal view very long (Fig. 305); vertex almost horizontal and distance from posterior ocellus to eye is more than 2.0 times interocellar distance; mandible with outer surface grossly swollen; clypeus with a median apical tooth and a pair of weak lateral teeth (Fig. 304). (Oedicephalini)....................*IMERIA* (p. 210)

\- Head in dorsal view shorter (Figs 313-316); vertex usually abruptly declivous, if horizontal then distance from posterior ocellus to occipital carina is less than 2.0 times interocellar distance; mandible not or only slightly swollen; clypeus usually without a median tooth, or if rarely with one then never with lateral teeth also............3

3 Face and clypeus forming a single, slightly convex surface, not separated from each other by a groove (Fig. 306); genal carina joining hypostomal carina at mandibular base; mandible broad, only weakly narrowed (Fig. 310)....................4

\- Face and clypeus separated by a weak to strong groove, usually either flat or sometimes with clypeus convex slightly; genal carina joining hypostomal carina above base of mandible or rarely very close to base; mandible usually very slender, strongly tapered proximally, distally almost parallel-sided (Fig. 311)....................5

4 Clypeus with a median apical tooth (Fig. 307); head in dorsal view with genae short (Fig. 313); gaster short, abruptly tapered anteriorly and posteriorly; malar space 1.2-1.3 times as long as basal mandibular width. (Listrodromini)....................*LISTRODROMUS* (p. 209)

\- Clypeus without an apical tooth (Fig. 308); head in dorsal view with genae quite long (Fig. 314); gaster long, centrally parallel-sided; malar space 1.6-1.8 times as long as basal mandibular width. (Ischnojoppini)....................*ISCHNOJOPPA* (p. 208)

5 Propodeal spiracle from circular to oval, at most 2.5 times as long as broad and clypeus with anterior margin convex (Fig. 309), often slightly convex in profile. (Phaeogenini).
Smaller species, fore wing length 7 mm or less....................6

\- Propodeal spiracle elongately oval, almost always more than 2.5 times as long as broad, if rarely 2.0 times as long, then with clypeus truncate, or if rarely convex, then propodeal spiracle is very elongately oval....................9

6 Gastrocoeli quadrate, very large and deep, extending about 0.3 of way along segment; remainder of tergite 2 strongly striate (Fig. 312); clypeus with a very weak median concavity in the slightly convex margin....................*ELEEBICHNEUMON* (p. 213)

- Gastrocoeli small and transverse or absent, never extending more than 0.2 of way along segment; tergite 2 otherwise smooth, granulate or punctate; clypeus evenly convex marginally........................7

7 Tergite 2 of gaster smooth and polished, without any trace of gastrocoeli (Fig. 563); fore wing with areolet usually broad and with distance between 2*r-m* and 3*r-m* anteriorly often equal to length of *M* between 2*m-cu* and 3*r-m* (Fig. 329)....................*AKYMICHNEUMON* (p. 211)
- Tergite 2 of gaster with distinct gastrocoeli, from smooth and posished to punctate or matt and granulate (Figs 562, 564); fore wing with areolet narrow, 2*r-m* and 3*r-m* strongly convergent, anteriorly very close (Fig. 331)..8

8 Tergite 2 almost matt, granulate, with gastrocoeli deep, joining in midline to form a continuous transverse furrow (Fig. 562); hind wing with anterodistal corner of sub-basal cell about 75°; head in dorsal view with genae quite long, weakly narrowed (Fig. 315)....*DIADROMUS* (p. 213)
- Tergite 2 polished, smooth or punctate, with gastrocoeli shallow and not joining in midline (Fig. 564); hind wing with anterodistal corner of sub-basal cell 85-90°; head in dorsal view with genae short, strongly narrowed (Fig. 316)..............*PHAIRICHNEUMON* (in part) (p. 214)

9 Scutellum with lateral carinae extending 0.5 or more of length.............10
- Scutellum without a trace of lateral carinae except at extreme base........18

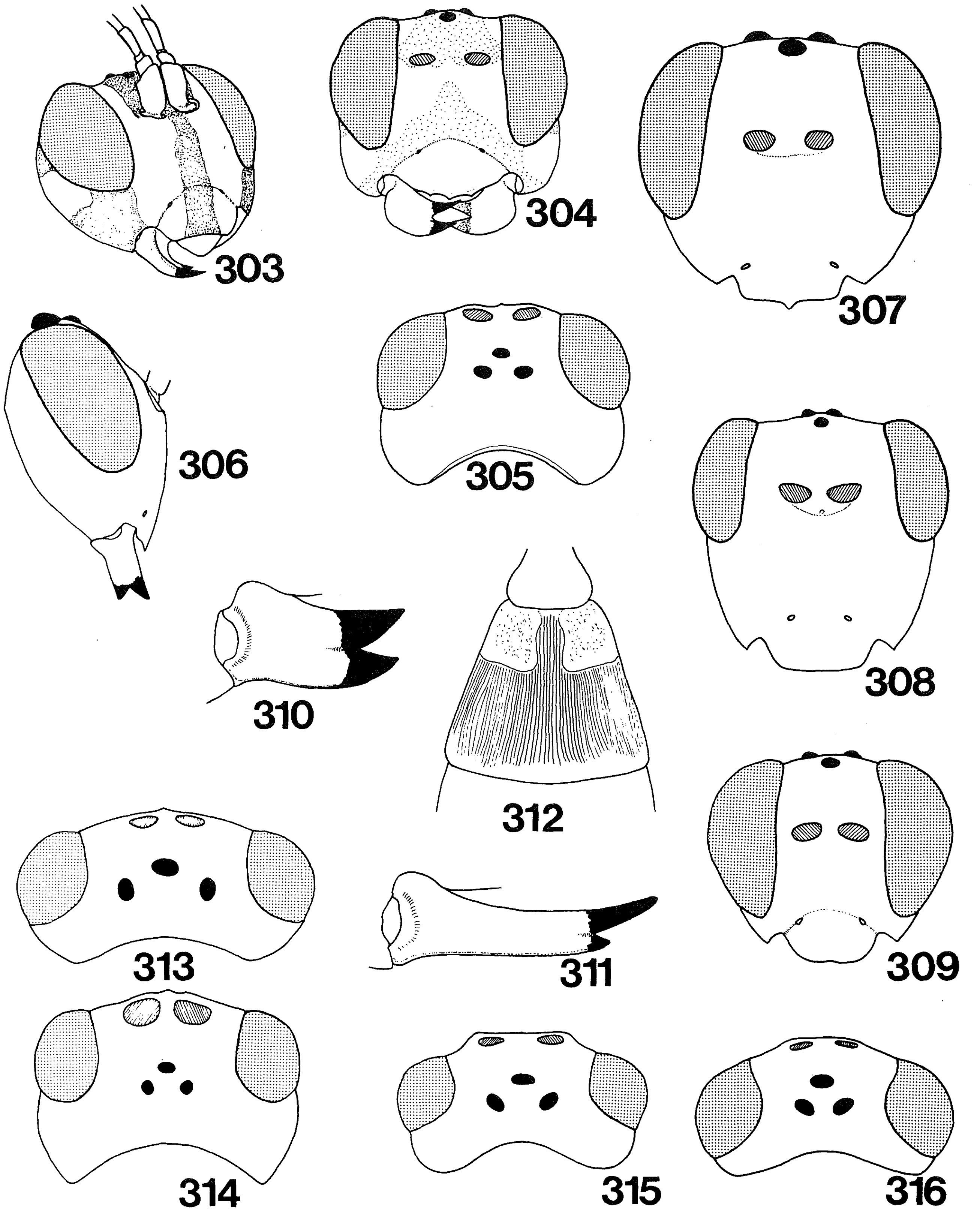
10 Petiole flattened dorsally and ventrally (especially in ♀) so that near anterior 0.2 the segment is broader than high; speculum punctate, at least sparsely, often as closely as rest of mesopleuron (Figs 334, 557); propodeal apophyses present. (Platylabini)...............11
- Petiole not flattened strongly and in anterior 0.2 generally higher than broad; speculum smooth and shining, without punctures at least centrally; propodeal apophyses usually absent, rarely present. (Ichneumonini, in part)..13

11 Female subgenital plate without a median tuft of close hairs near hind margin (Fig. 332); male without tyloids on flagellum.....*PLATYLABUS* (p. 217)
- Female subgenital plate with a conspicuous median tuft of close hairs next to hind margin (Fig. 333); male with tyloids on about segments 12-18 of flagellum (Fig. 337)..12

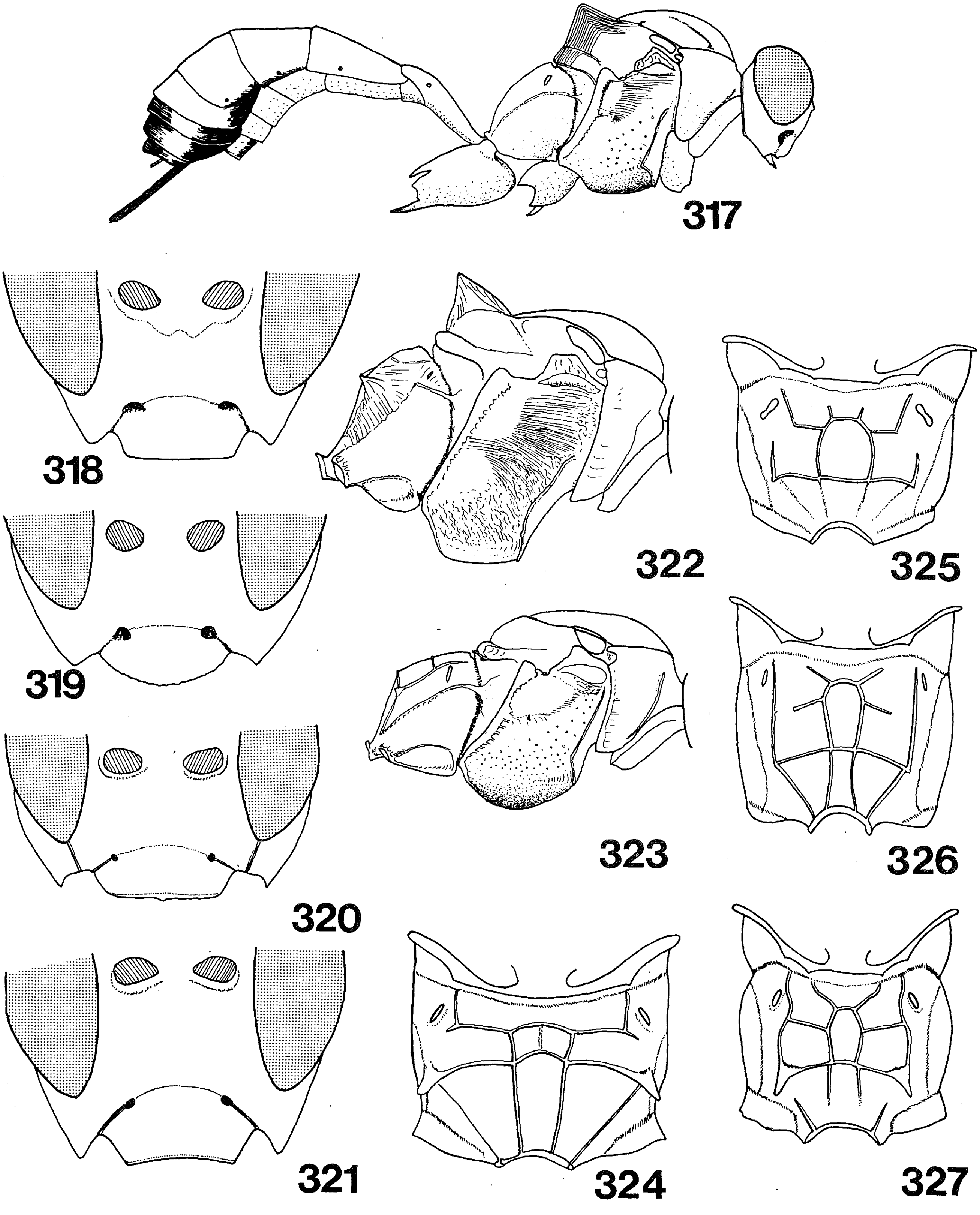
12 Tergite 2 of gaster with strong close punctures; gastrocoeli strongly impressed; hind margin of metanotum without a strong triangular tooth opposite propodeal spiracles (Fig. 335)................*PRISTICEROS* (p. 218)
- Tergite 2 of gaster with weak, sparse punctures; gastrocoeli moderately impressed to vestigial; hind margin of metanotum with a triangular tooth opposite propodeal spiracles (Fig. 336), this tooth weaker in males but very strong in females....................*NEOLEVANSA* (p. 216)

13 Tarsal claws conspicuously pectinate; fore wing pale yellow with distal apex strongly infumate.............................*CTENOCHARES* (p. 197)
- Tarsal claws simple; fore wing uniformly hyaline or weakly and evenly infumate..14

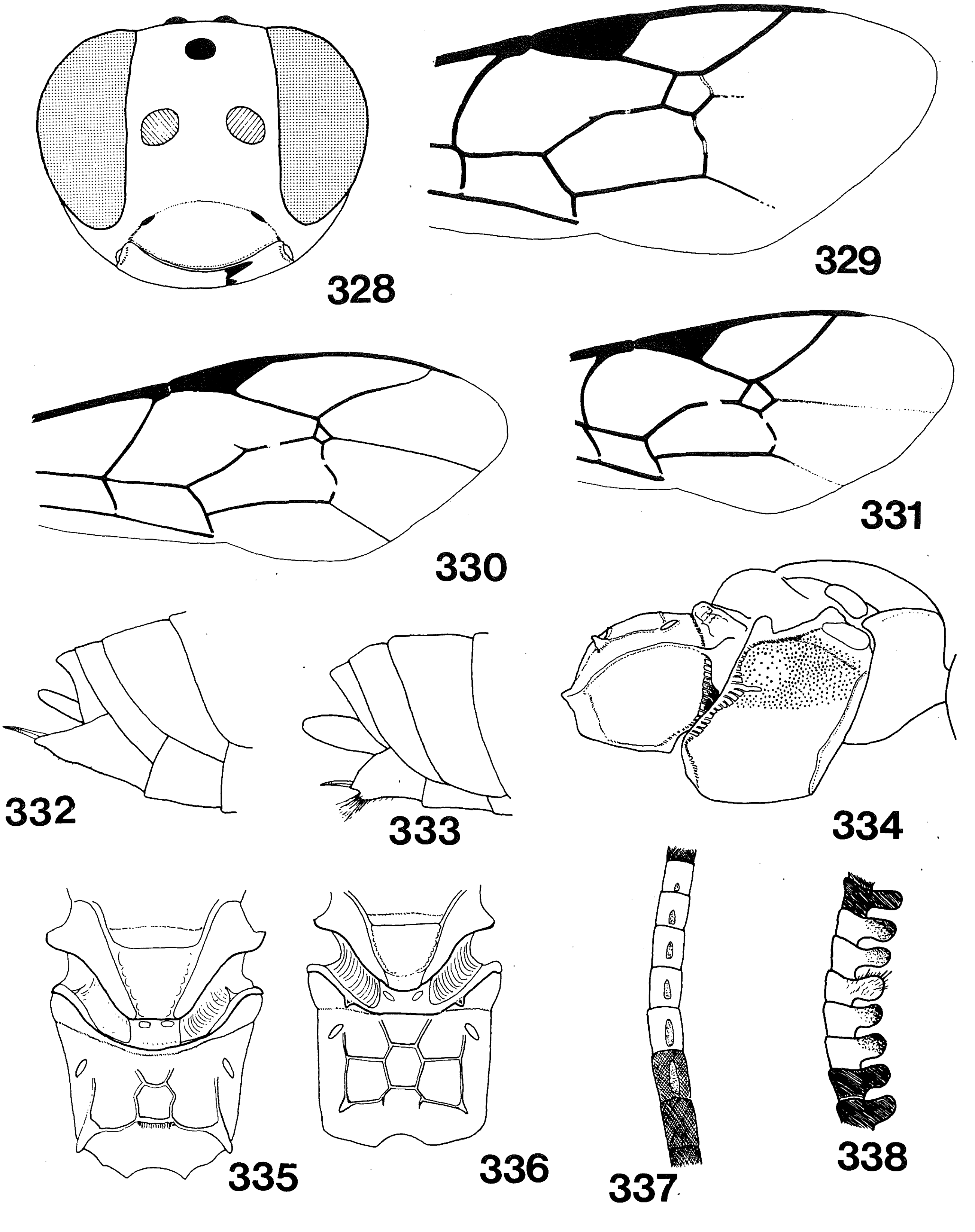
14 Hind coxa with distal margin produced ventrally into a long spine; scutellum pyramidal, longitudinally striate (Fig. 317); genal carina with lower end curved and raised into a small tubercle, not reaching hypostomal carina.......................................*ACULICOXA* (p. 195)
- Hind coxa without a long ventral spine; scutellum flat to convex, never longitudinally striate; genal carina usually reaching hypostomal carina, never raised into a small tubercle ventrally...............15



Figs 303-316 Ichneumoninae. 303 *Magwengiella*, head. 304-305 *Imeria* (304) face (305) head, dorsal. 306 *Listrodromus*, head, lateral. 307-309 Faces (307) *Listrodromus* (308) *Ischnojoppa* (309) *Eleebichneumon*. 310-311 Mandibles (310) *Ischnojoppa* (311) *Ctenochares*. 312 *Eleebichneumon*, tergite 2. 313-316 Heads, dorsal (313) *Listrodromus* (314) *Ischnojoppa* (315) *Diadromus* (316) *Phairichneumon*.



Figs 317-327 Ichneumoninae. 317 *Aculicoxa striata*, body, lateral. 318-321 Faces (318) *Gavrana* (319) *Phaeneumon* (320) *Lissosculpta* (321) *Setanta*. 322-323 Alitrunks, lateral (322) *Uloola brevis* (323) *Gavrana*. 324-327 Propodea, dorsal (324) *Uloola brevis* (325) *Gavrana conica* (326) *G. maculipes* (327) *G. spinosa*.



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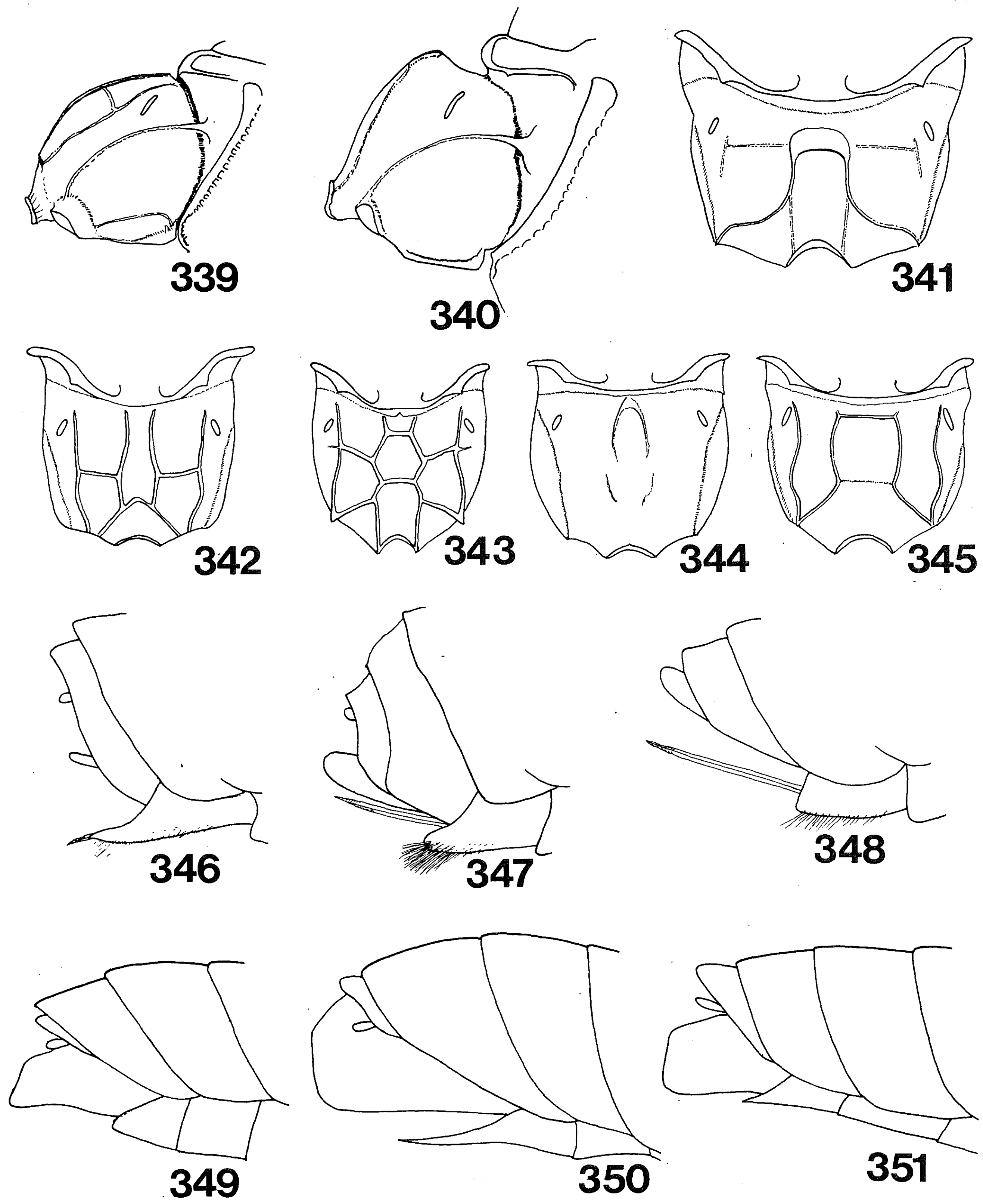


Figs 339-351 Ichneumoninae. 339-340 Propodea, lateral (339) *Lissosculpta basalis* (340) *Yeppoona grandis*. 341-345 Propodea, dorsal (341) *Yeppoona* (342) *Lissosculpta* (343) *Barichneumonites* (344) *Tricholabus* (345) *Eutanyacra*. 346-348 ♀ subgenital plates (346) *Tricholabus* (347) *Eutanyacra* (348) *Ichneumon*. 349-351 ♂ subgenital plates (349) *Tricholabus* (350) *Eutanyacra* (351) *Ichneumon*.

15 Apex of clypeus, in anterior aspect, convexly curved (Fig. 319); flagellum of male without tyloids, that of female with distal segments not appreciably flattened ventrally...........*PHAENEUMON* (in part) (p. 204)

\- Apex of clypeus in anterior aspect truncate, straight or slightly concave (Figs 318, 320, 321) (except in one species which has strong lateral spines on the scutellum, a character not found in *Phaeneumon* species); flagellum of male with tyloids, that of female with distal segments strongly flattened ventrally....................................16

16 Tergite 2 of gaster, in anterior 0.5, quite coarsely punctate to anterior margin; gastrocoeli minute, joined to anterior margin of tergite by conspicuous groove (Fig. 561); ovipositor projecting beyond apex of gaster by 0.1 times length of hind tibia......*LONGICHNEUMON* (p. 203)

\- Tergite 2 of gaster impunctate or with sparse scattered punctures, or if closely, coarsely punctate then not so to anterior margin; gastrocoeli distinct though often weak, not joined to anterior margin of tergite; ovipositor sheath projecting beyond apex of gaster by 0.2 or more of length of hind tibia...17

17 Propodeum in profile very short, abruptly declivous (Fig. 322), area superomedia at front of propodeum, strongly transverse (or rarely incomplete posteriorly), area petiolaris very long (Fig. 324); hind wing with anterodistal corner of sub-basal cell about 90° or slightly more.

Mandible strongly twisted; male scutellum with carinae raised to form two horns...*ULOOLA* (p. 207)

\- Propodeum in profile from evenly rounded to quite steeply declivous (Fig. 323); area superomedia usually elongate, rarely slightly transverse, area petiolaris moderately long (Figs 325-327); hind wing with anterodistal corner of sub-basal cell 80° or less..........*GAVRANA* (p. 199)

18 Propodeum in profile pyramidal (Fig. 340), its 'summit' formed by a lenticular boss, representing area superomedia, and with posterior transverse carina extending back and outwards (Fig. 341); gaster with sternites 2-4 uniformly sclerotized, without a median longitudinal fold. (Protichneumonini)........................*YEPPOONA* (p. 220)

\- Propodeum in profile rounded or horizontal and abruptly declivous (Fig. 339), area superomedia normal, not boss-like and usually with carinae more extensive, the posterior one more transverse (Figs 342-345); gaster with sternites 2-4 with a longitudinal fold medially, or membranous. (Ichneumonini, in part)....................................19

19 Speculum smooth and polished, without punctures (Fig. 558)................20

\- Speculum smooth, usually completely but sometimes only partially punctate (Figs 559-560)...22

20 Gaster with tergite 2 punctate coarsely, anteromedially, between the deep gastrocoeli striate (Figs 567, 568); margin of clypeus transverse with a weak median apical tooth (Fig. 320).

Propodeum of female with lateromedian carina close and subparallel, enclosing a narrow elongate area superomedia which may be confluent with area basalis (Fig. 342).............*LISSOSCULPTA* (p. 202)

\- Gaster with tergite 2 smooth and polished, gastrocoeli shallow; margin of clypeus slightly convex, without a median apical tooth............21

21 Mesoscutum flattened, smooth, centrally striate; scutellum flat; margin of clypeus evenly rounded, smooth......*PHAIRICHNEUMON* (in part) (p. 214)

\- Mesoscutum convex, evenly punctate, without central striations; scutellum slightly convex; margin of clypeus slightly rounded, slightly crenulate (Fig. 319)...........................*PHAENEUMON* (in part) (p. 204)

22 Clypeus slightly concave in anterior view (Fig. 321); gastrocoeli quite shallow, striate and joined to each other by a striate transverse furrow, so that anterior margin of tergite 2 is crossed by a striate depressed area (Fig. 566).
Female subgenital plate large, triangular...............*SETANTA* (p. 205)

\- Clypeus transverse in anterior view; gastrocoeli deep, usually not striate but never connected by a transverse striate furrow so the anteromedial margin of tergite 2 is neither depressed nor striate (Fig. 565)...23

23 Propodeal carinae obsolescent, at least in females, usually only area superomedia discernible (Fig. 344); propodeal apophyses absent; female subgenital plate large, covering most of ovipositor (Fig. 346); male flagellum serrato-flabellate (Fig. 338), subgenital plate in profile bluntly rounded at margin (Fig. 349)...........*TRICHOLABUS* (p. 206)

\- Propodeal carinae well-developed in both sexes, most lateral area delineated; female subgenital plate often small, if larger then propodeal apophyses are present; male flagellum setaceous, subgenital plate in profile flatter, with margin sharp.............................24

24 Area basalis with a median tubercle on anterior edge (Fig. 343); mandible moderately tapered, the lower tooth about 0.5 times length of upper...*BARICHNEUMONITES* (p. 196)

\- Area basalis without a median tubercle (Fig. 345); mandible strongly tapered, the lower tooth less than 0.3 times length of the upper..........25

25 Subgenital plate of male produced into a long spine, the gonosquamae very large; subgenital plate of female with a conspicuous median tuft of hair near posterior margin (Fig. 347); flagellum of female without a white band....................................*EUTANYACRA* (p. 198)

\- Subgenital plate of male simple, the gonosquamae of normal size (Fig. 351); subgenital plate of female without a median tuft of hair (Fig. 348); flagellum of female usually with a white band........................26

26 Postpetiole centrally striate; scuto-scutellar groove more or less smooth; posterior end of gaster black...................*ICHNEUMON* (p. 201)

\- Postpetiole punctate, at least near hind margin, without any striations; scuto-scutellar groove striate; posterior end of gaster with a white spot...*ALGATHIA* (p. 196)

Tribe CTENOCALINI*

Hitherto this small tribe has been recorded only from Africa and Madagascar. Heinrich (1967) included four genera, one of which, *Magwengiella*, is here newly recorded from the Indo-Australian region. Ctenocalines are most easily recognized by the twisted mandibles and the large deep gastrocoeli.

Nothing is known about the biology of this tribe.

MAGWENGIELLA Heinrich*

Magwengiella Heinrich, 1938: 42. Type-species: *Magwengiella obtusa* Heinrich, by original designation.

Medium-sized species, fore wing length 8-9 mm; clypeus and face forming a single almost flat surface; clypeus 2.0 times as broad as long, its apex sharp, slightly concave; mandible twisted about 90°, only slightly narrowed with upper (outer) tooth about 2.0 times as long as the lower (Fig. 303); malar space about 0.8 times as long as basal mandibular width. Genal and hypostomal carinae meeting at base of mandible. Head in dorsal view with genae long, weakly narrowed. Flagellum setaceous, that of ♀ with central white band and distally slightly flattened, that of ♂ unicolorous black with central segments bearing an obscure median ring of stout sensory bristles on ventral and lateral sides.

Mesoscutum polished, sparsely punctate with obsolescent notauli; scutellum convex, with strong lateral carinae which in ♂ may form lateral protuberances. Propodeum evenly rounded with elliptical spiracles; propodeal carinae more or less complete, area superomedia concave behind, area petiolaris long; apophyses absent.

Legs unspecialized, tarsal claws simple. Fore wing with *2r-m* and *3r-m* meeting so that areolet is pointed above and petiolate (Fig. 330).

Gaster spindle-shaped with tergite 1 dorsally flattened, postpetiole strongly broadened, not lateromedially carinate to hind margin; gastrocoeli strong and deep oval, separated across midline by less than breadth of one; remainder of tergite 2 coarsely and closely punctate. Ovipositor sheath short, barely protruding; ♀ subgenital plate small, ♂ subgenital plate triangular, pointed behind and evenly hirsute.

Colour of only known Australian species is black and white with reddish femora.

Remarks. *Magwengiella* is a moderately small genus containing three described species from Zaire and Madagascar, and a number of undescribed species from southern Africa. I have seen four undescribed species from the Indo-Australian region, one each from India, New Guinea, the Philippines and tropical Queensland.

Australian species. One, undescribed (ANIC).

Host records. None.

Tribe ICHNEUMONINI
(= Joppini sensu Townes)

This large tribe contains most species of the subfamily. It is cosmopolitan and has been divided into several, rather ill-defined subtribes (Heinrich, 1967) though these are not used in the present work. Of all Ichneumoninae, this tribe is the most difficult to define and it is really an assemblage of ichneumonine genera left behind when other, more easily recognizable, tribes have been removed. The limits of this subfamily seem to be rather arbitrary and its relationships with other taxa are extremely confusing. For example, *Lissosculpta* appears to be quite closely related to the protichneumonine genus *Coelichneumon* whilst other genera appear to be related to phaeogenines. However, the majority of genera do appear to be closely (and confusingly) inter-related, suggesting that perhaps this is a paraphyletic rather than a polyphyletic assemblage.

Most members of this tribe are parasites of macroheterocera. Many have only a single generation a year. In temperate northern latitudes many species overwinter as hibernating adult females. These can be collected in grass tussocks, under bark and in deep litter in coppice stools. It is not known if females behave similarly in the seasonally cold parts of Australia.

Sexual dimorphism is probably more pronounced in species of this tribe than anywhere else in the subfamily. Males generally have a narrower malar space, more slender antenna and a slightly different shaped area superomedia. Some males also have a totally different colour pattern from the corresponding female, making sex association of isolated specimens difficult.

Townes *et al.* (1961) listed four genera as occurring in Australia. In the present work 13 Australian genera are recognized, three of which are described as new. The recording of several of the genera as new from Australia came as a complete surprise as they are not known from adjacent areas. Most notable of these are *Tricholabus* and *Ctenochares*. The former was considered to be Holarctic and northern Neotropical whilst the latter was only known from the Afrotropical and

Mediterranean areas. These apparent anomalies can perhaps be explained by our lack of knowledge of Ichneumonini in adjacent regions. There has never been any serious study of either the Neotropical or the Papuan faunas.

ACULICOXA gen. n.

Type-species: *Aculicoxa striata* sp. n.

Medium-sized species, fore wing length 7-8 mm; clypeus separated from face by groove, in profile convex, about 1.9 times as broad as long, truncate apically; mandible slender, twisted about 45° with upper tooth conspicuously the longer; malar space 1.3-1.4 times as long as basal mandibular width. Genal carina ventrally curved, raised into a small tubercle, not reaching hypostomal carina. Flagellum setaceous, without a white band, that of ♀ distally flattened ventrally, that of ♂ without tyloids, the distal segments with a median circumferential swelling bearing stout bristles, at least ventrally.

Mesoscutum weakly polished, punctate anteriorly with fine reticulation between the punctures, posteriorly transversely wrinkled; notauli quite deep, reaching to centre of segments; scutellum laterally carinate almost entire length, pyramidal, longitudinally striate (Fig. 317). Propodeum of moderate length, very evenly rounded, without carinae, punctostriate; propodeal spiracle elliptical.

Hind and, to a less extent also, the mid coxae with a strong pointed process near distal apex ventrally; hind femur slightly swollen; claws simple. Fore wing with areolet pentagonal, 2*r-m* and 3*r-m* slightly convergent anteriorly.

Gaster short with tergite 1 broadened posteriorly, anteriorly with petiole deeply O-shaped; gastrocoeli absent; tergite 2 polished, almost smooth except for very fine alutaceous sculpture; posterior end of gaster of ♀ compressed. Ovipositor sheath projecting beyond apex of gaster by 0.3-0.4 times length of hind tibia; ♀ subgenital plate transverse, evenly hirsute; ♂ subgenital plate transverse, evenly hirsute.

Etymology. *Acul* (*aculeus*, a spine) + *coxa* referring to peculiar hind coxae. Feminine.

Remarks. The rather long ovipositor of this species is quite like that of some phygadeuontines. The rigid ovipositor sheaths are the most obvious ichneumonine feature of *Aculicoxa*. The peculiar spined coxae and pyramidal striate scutellum are unique features enabling this genus to be easily recognized.

Australian species. One, described below.

Aculicoxa striata sp. n.

Female: face obscurely alutaceous, polished, with anterior tentorial pits very large and deep; flagellum rather long, with about 37 segments; ocelli forming a small, almost equilateral triangle, the interocellar distance less than the diameter of an ocellus. Pronotum with a raised flange along anterior margin; epomia absent. Mesopleuron with subalar prominence strongly produced, and flattened above; speculum polished, smooth grading to striate anteriorly, not punctate; lower corner of epicnemial carina produced as a blunt tooth. Fore wing with abscissa of Cu_1 between 1*m-cu* and Cu_{1a} shorter than Cu_{1b}. Apex of ovipositor compressed, upper valve with weak nodus, teeth vestigial.

Brownish yellow, flagellum slightly infuscate; interocellar area blackish; tergites 5+, distal apex of hind femur and proximal end narrowly and distal 0.5 of hind tibia black; hind tibia centrally whitish. Wings weakly infumate; pterostigma brownish.

Male: similar to female.

Material examined
Holotype ♀, Queensland: Bundaberg, iii.1972 *(Frauca)* (ANIC).

Paratypes. Queensland: 2 ♀, Atherton, ii.1975 *(Howden)* (TC); 1 ♂, Bundaberg, ix.1971 *(Frauca)* (ANIC); 1 ♀, Kuranda, vi-vii.1913 *(Turner)* (BMNH); 1 ♀, 1 ♂, N. Pine River, vi.1929 *(Hacker)* (QM); 2 ♀, Mt Tambourine *(Davidson)* (QM).

Host records. None.

ALGATHIA Cameron*

Algathia Cameron, 1902*d*: 392. Type-species: *Algathia maculiceps* Cameron, by monotypy.

Medium-sized species, fore wing length 5-7 mm; clypeus flat, separated from face by groove, about 2.2 times as broad as long, margin truncate, sharp; mandible very long and slender, upper tooth distinctly the longer; malar space 0.7-1.3 times basal mandibular width. Genal carina joining hypostomal carina above base of mandible. Flagellum setaceous, with a white median mark, that of ♀ distally, slightly flattened below, that of ♂ with tyloids on about segments 6-12, distal segments centrally broadened.

Mesoscutum convex, punctate, with short notauli, unusual in having scuto-scutellar groove striate; scutellum flat, without carinae or carinate on anterior 0.2; speculum punctostriate. Propodeum horizontal then abruptly declivous behind centre, spiracle elliptical; area superomedia slightly elongate, area dentipara separated from area externa; apophyses weak.

Legs unspecialized; tarsal claws simple. Fore wing with *2r-m* and *3r-m* strongly convergent, but not touching, anteriorly.

Gaster spindle-shaped; tergite 1 evenly posteriorly broadened with traces of dorsal carinae; tergite 2 with deep gastrocoeli which are separated by more than breadth of one; remainder of tergite 2 punctate. Ovipositor sheath barely projecting beyond apex of gaster; ♀ subgenital plate triangular, evenly hirsute; ♂ subgenital plate elongate, slightly produced medially, evenly hirsute.

Hind end of gaster with a conspicuous white spot on tergites 6+.

Remarks. A moderately small Indo-Australian genus. The Nearctic species previously assigned to this genus (Townes *et al.*, 1961) have been referred to other taxa (Carlson, 1979).

In Australia this genus is easily recognized by the combination of striate scuto-scutellar groove and the white spot on the apex of the gaster.

Australian species. One, undescribed (ANIC; BMNH).

Host records. None.

BARICHNEUMONITES Heinrich

Barichneumonites Heinrich, 1934: 214. Type-species: *Barichneumonites sphaeriscutellatus* Heinrich, by original designation.

Medium-sized species, fore wing length 7-9 mm; clypeus very flat, separated from face by a weak groove, margin truncate; mandible moderately narrow (broader than in most other Ichneumonini) with upper tooth about 2.0 times length of the lower; malar space 0.4-0.8 times basal mandibular width. Genal carina meeting hypostomal carina above base of mandible. Flagellum setaceous, with white band, that of ♀ ventrally flattened distally, that of ♂ with tyloids and with distal segments broadened centrally.

Mesoscutum moderately convex, with short, deep notauli near anterior margin; scutellum weakly convex, carinate laterally on anterior 0.1-0.2; speculum punctate, at least on upper 0.5. Propodeum moderately short, quite steeply rounded, spiracle elliptical; area basalis unusual in having a forward directed median tubercle on anterior margin (Fig. 343); area superomedia distinct, slightly elongate with hind margin concave; area externa separated from area dentipara.

Legs unspecialized; tarsal claws simple. Fore wing with *2r-m* and *3r-m* strongly convergent but not meeting anteriorly.

Gaster spindle-shaped; tergite 1 stout, petiole cylindrical, abruptly broadened posteriorly with traces of carinae dorsally; tergite 2 with gastrocoeli strong, separated across midline by more than width of one, remainder of tergite punctate. Ovipositor sheath projecting beyond apex of gaster by less than 0.1 times length of hind tarsus; ♀ subgenital plate transverse, subquadrate, evenly hirsute; ♂ subgenital plate elongate, evenly hirsute.

The colour of the Australian species is black with white markings.

Remarks. A moderate-sized genus centred in the 'everwet' part of the Oriental region. In Australia *Barichneumonites* species are recognizable on account of the shape of their mandibles and the presence of a tubercle on the area basalis. All of the specimens I have seen were taken in Queensland.

Australia species. *Barichneumonites australasiae* (Brullé) (E). I have seen two undescribed species (ANIC; BMNH; TC).

Host records. None.

CTENOCHARES Foerster*

Ctenochares Foerster, 1869: 191. Type-species: *Ichneumon xanthomelas* Brullé (= *Ichneumon bicolorus* L.), by subsequent designation, Schmiedeknecht, 1903: 256.
Stenophorus Saussure, 1892: 16. Type-species: *Stenophorus amoenus* Saussure, by monotypy.
Joppites Berthoumieu, 1894: 511. Type-species: *Ichneumon xanthomelas* Brullé (= *Ichneumon bicolorus* L.), by monotypy.
Henicophatnus Kriechbaumer, 1894*b*: 301. Type-species: *Henicophatnus rufithorax* Kriechbaumer, by monotypy.
Celmis Tosquinet, 1896: 71. Type-species: *Celmis blanditus* Tosquinet, (= *Henicophatnus rufithorax* Kriechbaumer), by subsequent designation, Viereck, 1914: 29.
Pseudojoppa Kriechbaumer, 1898: 31. Type-species: *Ichneumon instructor* F. (= *Ichneumon bicolorus* L.), by monotypy.
Joppoides Berthoumieu, 1904: 23. Type-species: *Ichneumon xanthomelas* Brullé (= *Ichneumon bicolorus* L.), by monotypy.
Anisojoppa Cameron, 1906*a*: 168. Type-species: *Anisojoppa lutea* Cameron, by monotypy.
Talimeda Cameron, 1912*b*: 382. Type-species: *Talimeda pallidiceps* Cameron (= *Hoplismenus fulvidus* Tosquinet), by monotypy.

Moderately large insects, fore wing length 11-12 mm; clypeus separated from face by a weak groove, flat, 1.8-1.9 times as broad as long, its margin transverse, truncate; mandible slender, evenly tapered, with upper tooth far longer than the lower (Fig. 311); malar space 0.6-0.7 times basal mandibular width. Genal and hypostomal carinae joining above base of mandible. Head in dorsal view slightly tapered behind eyes, genae long. Flagellum setaceous with a medium whitish band (that is more apparent in ♀ than in ♂), that of ♀ distally flattened on ventral surface, that of ♂ also slightly flattened below, with tyloids on about segments 9-20.

Mesoscutum weakly polished, closely, coarsely punctate, with obsolescent notauli; scutellum with strong lateral carinae. Propodeum long, evenly rounded, coriaceous-reticulate, without distinct carinae; propodeal spiracle elliptical; apophyses present, rather small.

Legs of ♀ with few stout spines on anterior tibia; tarsal claws with strong pectination reaching to apex. Fore wing with areolet large and pentagonal, quite strongly narrowed anteriorly.

Gaster long and slender, tergite 1 almost evenly broadened posteriorly, postpetiole coriaceous centrally; tergite 2 with deep gastrocoeli, separated across midline by less than breadth of one; remainder of tergite shallowly but closely, coarsely punctate. Ovipositor sheath short, barely projecting beyond apex of gaster; ♀ subgenital plate subtriangular, quite short, but bearing long stout hairs along posterior margin; ♂ subgenital plate short, triangular, evenly hirsute.

Orange-brown with most of head, lower and lateral parts of alitrunk and tergites 4+ black; wings yellowish with distinct blackish apices.

Remarks. *Ctenochares* is easily recognized by the pectinate claws and the lack of propodeal carinae. It is primarily an African genus with 10 described species mostly found on the savannah. One species, *C. bicolorus*, is recorded from most parts of Africa and southern Europe around the Mediterranean. The striking colour pattern of this insect, and its association with a common moth, make it a very noticeable and frequently collected species. It appeared in eastern Australia in the 1970s though how it was introduced I have not been able to ascertain. It does not seem to occur in Asia so it is unlikely to have spread into Australia without human assistance. Recently (1981) this ichneumonid has been collected in New Zealand.

Australian species. *Ctenochares bicolorus* (L.) (I?).

Host records. *C. bicolorus* - Noctuidae: *Chrysodeixis eriosoma* (Doubleday) (ANIC).

EUTANYACRA Cameron*

Eutanyacra Cameron, 1903*e*: 227. Type-species: *Eutanyacra pallidicoxis* Cameron, by monotypy.

Moderately large species, fore wing length 12-14 mm; clypeus flat, very broad, 2.5-2.7 times as broad as long, separated from face by a vestigial groove, margin transverse, almost acute; mandible very long and slender, with upper tooth very much longer than the lower; malar space 0.3-0.7 times basal mandibular width. Genal carina meeting hypostomal carina above base of mandible. Flagellum setaceous, without a white band but infuscate distally, that of ♀ short, with distal segments very slightly flattened ventrally, that of ♂ slightly longer, with tyloids and with distal segments broadened centrally.

Mesoscutum weakly convex, sparsely punctate; notauli vestigial; scutellum flat, not laterally carinate; speculum punctate over at least 0.5 of its surface. Propodeum abruptly declivous behind posterior transverse carina, spiracles elliptical; area superomedia large, quadrate and elevated (Fig. 345); area externa and area dentipara confluent; apophyses small but distinct.

Legs rather short and stout; claws simple. Fore wing with 2*r-m* and 3*r-m* convergent anteriorly but not touching.

Gaster spindle-shaped, that of ♀ short; petiole cylindrical, very strongly expanded posteriorly with weak dorsal carinae; tergite 2 with small gastrocoeli that are very widely separated across midline (Fig. 565); remainder of tergite 2 punctate. Ovipositor sheath not projecting beyond apex of gaster; ♀ subgential plate large, triangular, almost covering ovipositor sheath, with a central tuft of hair close to hind margin (Fig. 347); ♂ subgenital plate transverse, short, with a long posteriorly directed central spine; gonosquamae very large (Fig. 350).

Remarks. A large genus previously recorded from only the Neotropical, Holarctic and Oriental regions. A single Australian species in known and has previously been placed in *Ichneumon*. There is particularly marked sexual dimorphism in this genus and the two sexes of the Australian species have quite different colour patterns. The male resembles *Ichneumon* species but can easily be separated on account of the genitalia. The female is much stockier and blackish with yellow marks; it may be recognized by the combination of large subgenital plate with a tuft of hair, short antenna without a pale band and flat, simple scutellum.

Australian species. *Eutanyacra licitatorius* (Erichson) comb. n. (E)

Host records. None in Australia but in North America species of this genus parasitize Noctuidae (Carlson, 1979).

GAVRANA Cameron

Gavrana Cameron, 1906*b*: 180. Type-species: *Gavrana maculipes* Cameron, by monotypy.
Rossitera Cheesman, 1953: 626. Type-species: *Cryptus tiphiipuppis* Vachal, by original designation.

Medium to moderately large species, fore wing length 6-14 mm; clypeus separated from face by weak groove, usually 2.0 times as broad as long, flattened apically with margin sharp, transversely truncate (Fig. 318); mandible slender, from not twisted to twisted about 60°, upper tooth conspicuously the longer; malar space 0.4-1.4 times basal mandibular width. Genal carina meeting hypostomal carina above mandibular base. Flagellum setaceous, usually white-banded, that of ♀ distally strongly flattened ventrally, that of ♂ with tyloids, distal segments slightly swollen centrally.

Mesoscutum usually weakly convex, closely punctate with notauli impressed on anterior 0.2-0.3; scutellum weakly convex, carinate laterally for 0.7 of length, in some species the carinae turned to meet centrally, in a few species with ends of carinae produced as weak spines; mesopleuron with speculum smooth and polished. Propodeum usually quite long (Fig. 323), fairly evenly rounded with spiracle elliptical; area superomedia usually elongate, rarely subquadrate (Figs 325-327); apophyses from very long and strong to vestigial or even absent.

Legs unspecialized; tarsal claws simple. Fore wing with 2*r-m* and 3*r-m* weakly to strongly convergent anteriorly, areolet usually pointed above, rarely broad and pentagonal.

Gaster spindle-shaped, quite long; tergite 1 evenly broadened posteriorly; gastrocoeli weak, moderately large, tergite 2 otherwise from smooth to finely punctate. Ovipositor sheath projecting beyond apex of gaster by 0.2-0.4 times length of hind tibia; ♀ subgenital plate small; ♂ subgenital plate usually truncate, transverse, rarely triangular.

Remarks. *Gavrana* is a large genus, most species of which occur in Australia although some have been recorded from Sulawesi east to New Caledonia (Townes *et al*, 1961). It is very close to, and only poorly differentiated from two other large genera, *Stirexephanes* Cameron, on Oriental genus and *Crytea* Cameron, an African genus. As currently defined these genera contain a number of rather similar species-groups and some of the species in one genus may have close affinities with one of the other genera. Until a serious revisionary study can be undertaken on a large number of Old World and Australian species I suggest retaining the three 'regional' genera. That approach has been adopted here.

Australian species. The 26 Australian species are divisible into three groups which are here treated as species-groups. When the Old World fauna is better known one or more of these may be deemed to warrant generic distinction but, considering the close affinity of *Gavrana* with other large genera, I have adopted a conservative approach in this work.

Key to species-groups of *Gavrana*

1 Mandible twisted at least 60°, so lower tooth is behind the upper; malar space 1.3-1.4 times as long as basal mandibular width; fore wing with abscissa of Cu_1 between 1*m-cu* and Cu_{1a} from slightly longer than to subequal to Cu_{1b}; propodeum of ♀ with well-developed apophyses which are about as high as basally broad, or higher (Fig. 327); ♂ with scutellar carinae raised into horns posteriorly; ♀ with first flagellar segment 4.0 or more times as long as broad ....*spinosa*-group

- Mandible twisted 20° or less so lower tooth is clearly visible; malar space less than 1.2 times as long as basal mandibular width; fore wing with abscissa of Cu_1 between $1m\text{-}cu$ and Cu_{1a} much longer than Cu_{1b}; either with propodeum of ♀ with vestigial apophyses or without apophyses or with ♂ without scutellar horns or with ♀ with first flagellar segment less than 4.0 times as long as broad....................2

2 Area superomedia almost quadrate (Fig. 325); scutellum of ♂ pyramidal; head fairly narrow, genae long, weakly narrowed................*conica*-group
- Area superomedia (at least in ♀) elongate (Fig. 326); scutellum of ♂ weakly to moderately convex, never pyramidal; head moderately wide; genae short, quite strongly narrowed........................*maculipes*-group

The *spinosa*-group

This distinctive species-group can be recognized by the twisted mandible, rather slender flagellum, short second abscissa of Cu_1 in the fore wing, strong female propodeal apophyses, long malar space and horned male scutellum. In several of these characters these species resemble *Uloola* species but differ in the form of the scutellum.

I have seen five species (ANIC; BMNH; TC), mostly from tropical Australia. One is described below, the remainder are undescribed.

Gavrana spinosa sp. n.

Fore wing length 7-8 mm; face punctate; genae short, strongly narrowed posteriorly; mandible very slender and strongly twisted; malar space 1.4 times basal mandibular width; flagellum slender, of female with about 40 segments, of male with about 42 segments. Scutellum convex, in male with carinae produced into short horns; mesopleuron, except speculum, coarsely and closely punctate. Propodeum with area superomedia elongate; apophyses strong. Fore wing with $2r\text{-}m$ and $3r\text{-}m$ touching anteriorly; abscissa of Cu_1 between $1m\text{-}cu$ and Cu_{1a} 1.1-1.3 times as long as Cu_{1b}; terminal segments of gaster of female slightly compressed.

Female: orange-brown species; head and antenna black, mark on vertical orbit and flagellar band whitish; distal apices of hind femur and tibia black, hind tarsus black except for segments 3 and 4 which are white.

Male: similar but with face whitish. Wings of both sexes slightly infumate, pterostigma blackish.

This is the only species in the species-group with this colour pattern.

Material examined

Holotype ♀, Queensland: Bundaberg, vii.1971 *(Frauca)* (ANIC).

Paratypes. Queensland: 1 ♂, Baldwin Swamp, E. Bundaberg, xi.1877 *(Frauca)* (ANIC); 2 ♂, Biggenden, coast range, x.1976 *(Frauca)* (ANIC); 1 ♂, Bluff Range, Biggenden, viii.1976 *(Frauca)* (ANIC); 3 ♀, 4 ♂, Brisbane, i.1971-x.1972 *(Sedlacek)* (TC); 1 ♀, Brisbane, Indooroopilly, xi.1976 *(Boucek)* (BMNH); 2 ♀, Brisbane, Long Pocket, xii.-i.1977-1979 *(Galloway)* (BMNH; DPIQ); 2 ♂, Camp Mt, xi.-i.1979-1980 *(Galloway)* (BMNH; DPIQ); 1 ♂, Cooloola N. P., x.1978 *(Galloway)* (BMNH); 1 ♂, Iron Range, Cape York Pen., iii.-iv.1973 *(Monteith)* (ANIC); 1 ♂, Kuranda, vi.-vii.1913 *(Turner)* (BMNH); 1 ♀, Maleny, iv. (TC); 1 ♂, Millstream, Falls N. P. (17°41'S, 145°26'E), v.1980 *(Naumann & Cardale)* (ANIC); 1 ♀, 2 ♂, Mt Glorious, i. (TC); 3 ♀, Mt Tambourine, x.1977 *(Galloway)* (BMNH); 1 ♀, Shipton's Flat, x.1980 *(Cardale)* (ANIC); 1 ♂, Toowoomba, iii. (TC); 1 ♂, Wenlock R., Moreton, Cape York, vi.1975 *(Monteith)* (ANIC).

The *conica*-group

A small species-group occurring in southern Victoria and Tasmania. It differs from the other species-groups in having a more quadrate head, less mesopleural sculpture, a conical male scutellum and an almost quadrate area superomedia.

I have seen three species (ANIC; QUM; TC) only one of which is represented by a series of specimens. This is described below, the others are undescribed.

Gavrana conica sp. n.

Fore wing length 9-10 mm; face sparsely punctate; genae moderately long, rather weakly narrowed; mandible moderately slender, not twisted; malar space of female 1.2 times, of male 0.6 times basal mandibular width; flagellum quite stout, of female with about 38 segments, of male with about 39 segments and without a pale band. Scutellum of female weakly convex, of male pyramidal; mesopleuron with subalar prominence inflated, speculum smooth, rest of pleuron punctate, the punctures separated by about 2.0 times their own diameter. Propodeum with area superomedia subquadrate, slightly rounded anteriorly; apophyses vestigial. Fore wing with 2*r-m* and 3*r-m* strongly convergent, almost touching anteriorly; abscissa of Cu_1 between 1*m-cu* and Cu_{1a} about 1.8 times as long as Cu_{1b}; terminal segments of female gaster cylindrical.

Female: reddish brown species with yellow marks on mandible, clypeus laterally, gena ventrally, vertical orbit, pronotal margin, subalar prominence, mesopleuron, scutellum and all coxae. Wings weakly infumate, pterostigma brown.

Male: similar to female but with face entirely yellow and legs distally more orange.

The only species in this group with an inflated subalar prominence and immaculate male flagellum; the other two species have very few punctures on the mesopleuron and have a broadly pentagonal areolet.

Material examined

Holotype ♀, Tasmania: Roseberry, i. (TC).

Paratypes. Tasmania: 3 ♂, Bronte Park, iii. (TC); 1 ♀, 1 ♂, Frenchman's Gap Trail/Franklin River, ii.-iii. (TC); 2 ♀, Roseberry, i. (BMNH; TC).

The *maculipes*-group

This species-group contains the only previously described Australian species, *G. maculiceps* Cameron. I have seen additionally 17 undescribed species from all over Australia. Several of these are very common insects. Species of this group have the head strongly narrowed posteriorly, have rather flat scutella and an evenly convex propodeum with an elongate, slender area superomedia. The areolet is always almost pointed above and the speculum is smooth and polished.

Host records. None.

ICHNEUMON Linnaeus
(Whole insect Fig. 302)

Ichneumon Linnaeus, 1758: 342, 560. Type-species: *Ichneumon extensorius* L., by subsequent designation, Opinion 159, 1945.

Brachypterus Gravenhorst, 1829*a*: 673. Type-species: *Brachypterus means* Gravenhorst (= *Ichneumon latrator* F.), by monotypy. [Homonym of *Brachypterus* Kugelman, 1794.]

Pterocormus Foerster, 1850: 71. [Replacement name for *Brachypterus* Gravenhorst.]

Colobacis Cameron, 1900*b*: 110. Type-species: *Colobacis forticornis* Cameron (= *Ichneumon lotatorius* F.), by monotypy.

Tyanites Cameron, 1903*d*: 95. Type-species: *Tyanites rufipes* Cameron, by monotypy.

Vabsaris Cameron, 1903*d*: 96. Type-species: *Vabsaris forticornis* Cameron (= *Tyanites rufipes* Cameron), by monotypy.

Euichneumon Berthoumieu, 1904: 33. Type-species: *Ichneumon sarcitorius* L., by subsequent designation, Townes, 1944: 379.

Matsumuraius Ashmead, 1906*a*: 169. Type-species: *Matsumuraius grandis* Ashmead (= *Ichneumon primatorius* Foerster), by monotypy.

Coreojoppa Uchida, 1926: 63. Type-species: *Coreojoppa flavomaculata* Uchida, by original designation.
Bureschias Heinrich, 1936: 82. Type-species: *Bureschias balcanicus* Heinrich (= *Ichneumon tuberosus* Berthoumieu), by original designation.

Moderately large species, fore wing length 12-15 mm; clypeus flat, strongly transverse, that of ♀ 2.7-3.0 times as broad as long, that of ♂ slightly narrower; clypeal margin truncate, sharp; mandible very long and slender, the lower tooth vestigial, the upper tooth long and acute; malar space 0.4-0.9 times basal mandibular width. Genal carina meeting hypostomal carina above base of mandible. Flagellum short, setaceous, that of ♀ with a whitish mark centrally, distally flattened below, that of ♂ with tyloids, without a white band and with distal segments slightly broadened centrally.

Mesoscutum weakly convex, punctate, notauli vestigial; scutellum flat, not carinate; speculum partially punctate (Fig. 560). Propodeum horizontal, then abruptly declivous beyond centre; spiracles elliptical; area superomedia discrete, quadrate; area dentipara confluent with area externa; apophyses weak.

Legs short and stout, of the ♀ with tibiae spinose; claws simple. Fore wing with 2*r-m* and 3*r-m* convergent but not touching anteriorly so areolet is pentagonal.

Gaster spindle-shaped, tergite 1 strongly expanded behind centre, the postpetiole divided into three by longitudinal carinae; tergite 2 with deep, widely separated gastrocoeli, remainder of tergite punctate. Ovipositor sheath barely projecting beyond apex of gaster; ♀ subgenital plate transverse, short, with a broad central hirsute region (Fig. 348); ♂ subgenital plate transverse, slightly produced centrally but not spine-like, evenly hirsute (Fig. 351).

All of the Australian specimens I have seen are black with at least tergite 2 red and with some pale markings.

Remarks. A very large cosmopolitan genus which is comparatively poorly represented in Australia.

There has been considerable confusion over which name to apply to this genus. All classical authors and currently most European authors (including Heinrich) use the name *Ichneumon* L. (type-species: *I. extensorius*). This follows Opinion 159 of the International Commission (1945). Some North American authors (e.g. Townes, 1969; Carlson, 1979) use the name *Pterocormus* Foerster and apply the name *Ichneumon* L. (type-species: *I. comitator* L., designated by Curtis, 1839) to a different genus, called by Europeans *Coelichneumon* Thomson. These North American authors argue that Opinion 159 is invalid (Townes, 1969). However, only a minority of authors use the name *Pterocormus* for this genus, the majority accepting Opinion 159.

In Australia *Ichneumon* species are widespread and I have specimens from all states except Northern Territory. One species, *I. promissorius*, has a considerable range of variation and may possibly be a complex of sibling species.

Australian species. *Ichneumon promissorius* Erichson (P). I have seen males of one undescribed species (BMNH); these differ from *I. promissorius* in having tergite 3 red.

Host records. *I. promissorius* - Noctuidae: *Heliothis armigera* (Hübner) (DPIQ); *Mythimna convecta* (Walker) (Tyron, 1900; DPIQ); *Persectania ewingii* (Westwood) (Parrott, 1957; Martyn *et al.*, 1977); *Spodoptera exempta* (Walker) (Chadwick & Nikitin, 1976).

LISSOSCULPTA Heinrich

Lissosculpta Heinrich, 1934: 193. Type-species: *Ichneumon impexus* Tosquinet, by original designation.

Moderately large insects, fore wing length 10-14 mm; clypeus separated from face by weak groove, flat, margin truncate with a vestigial median tooth (Fig. 320); mandible long and slender, upper tooth conspicuously the longer; malar space 0.4-0.8 times basal mandibular width. Genal carina joining hypostomal carina above base of mandible. Flagellum setaceous, usually with a white band; that of ♀ distally flattened beneath, that of ♂ with tyloids and central segments with a median ridge bearing stout hairs ventrally.

Mesoscutum rather flat, punctate, with notauli impressed on anterior 0.1; scutellum flat, not carinate; speculum smooth and polished, impunctate (Fig. 558). Propodeum quite long, abruptly declivous behind posterior carina or sometimes evenly rounded (Fig. 339); area superomedia (of ♀) always very long and narrow, usually confluent with area basalis; area externa separated from area dentipara (Fig. 342); apophyses absent.

Legs unspecialized; tarsal claws simple. Fore wing with 2*r-m* and 3*r-m* virtually touching anteriorly so areolet is pointed above.

Gaster elongate, spindle-shaped; tergite 1 abruptly broadened posteriorly, without distinct carinae but often striate or punctate; gastrocoeli deep (Fig. 567), widely interspaced, the area between them striate to fore margin of tergite (Fig. 568); remainder of tergite 2 punctate, centrally punctostriate. Ovipositor sheath not projecting beyond apex of gaster; ♀ subgenital plate small, evenly hirsute; ♂ subgential plate small, unspecialized.

Remarks. *Lissosculpta* is a large genus centred in the lowlands of the Oriental region but with a few species in Africa, Australia and Madagascar.

Lissosculpta may be distinguished from other large Australian ichneumonines by the presence of an obsolescent clypeal tooth, by the characteristic sculpture of tergite 2 and by the smooth, polished, impunctate speculum. In the Oriental region *Lissosculpta* species closely approach some *Coelichneumon* species and the resemblance seems to indicate a close phylogenetic affinity between the two. Both have similar sculpture on tergite 2; some *Coelichneumon* have a vestigial clypeal tooth and an impunctate speculum. Male *Lissosculpta* have the propodeum quite like that of some male *Coelichneumon*, though most female *Coelichneumon* have a typically protichneumonine propodeal sculpture. It appears that the primitive propodeal carination is an almost square area superomedia (found in some female *Coelichneumon* most male *Coelichneumon* and male *Lissosculpta*) and the modified form of *Coelichneumon* females and *Lissosculpta* females represents different evolutionary specializations. If these conclusions are correct then *Coelichneumon* should be removed from the Protichneumonini and placed in the Ichneumonini.

The only species of *Coelichneumon* (= *Ichneumon* sensu Townes) recorded from Australia, *C. iridipennis* (Cameron), is an Indian insect. Morley's (1915*b*) record of this species as Australian is based on a misidentification of *Lissosculpta* species 7.

All of the Australian species I have seen are from Queensland. They are distinguishable on colour pattern (as well as finer morphological detail) but some care is needed to separate the four black and white species.

Australian species. *Lissosculpta basalis* (Morley) (E). I have seen eight additional undescribed species (BMNH).

Host records. None.

LONGICHNEUMON Heinrich*

Longichneumon Heinrich, 1934: 169. Type-species: *Longichneumon annaelisae* Heinrich, by original designation.

Medium-sized species, fore wing length 6-8 mm; clypeus separated from face by weak groove, flat, about 2.0 times as broad as long, its margin sharp, truncate or with slight indication of a median tooth; mandible long and slender, twisted about 10°; upper tooth conspicuously the longer; malar space about equal to basal mandibular width. Genal carina joining hypostomal carina above base of mandible. Flagellum setaceous, with a white band, of ♀ distally very strongly flattened beneath, of ♂ simple, with tyloids.

Mesoscutum weakly polished, obsoletely punctate, notauli vestigial; scutellum carinate almost entire length; propodeum quite long, evenly declivous, with spiracles elliptical; propodeal carinae usually complete, area superomedia subquadrate, hind margin concave; apophyses very small.

Legs unspecialized; claws simple. Fore wing with areolet pentagonal, *2r-m* and *3r-m* only slightly convergent anteriorly.

Gaster very long and slender, elongately tapered posteriorly; tergite 1 slender, evenly broadened posteriorly; tergite 2 in anterior 0.5 coarsely punctate to anterior margin, gastrocoeli minute, joined to anterior margin of tergite by diagonal and striate groove (Fig. 561). Ovipositor projecting beyond apex of gaster by 0.1 times length of hind tibia.

Remarks. A relatively small genus centred in the Indonesian subregion with a few species in Madagascar and Africa and one in Australia. This genus may be recognized by the slender gaster (which usually has a white subterminal spot) and the characteristic sculpture of tergite 2. Unlike most other ichneumonines many *Longichneumon* species have quite strongly developed sternauli.

Australian species. One, undescribed (TC).

Host records. None.

PHAENEUMON gen. n.

Type-species: *Phaeneumon phoenix* sp. n.

Small to medium-sized species, fore wing length 5-8 mm; clypeus separated from face by a weak groove, in profile slightly convex, 2.1-2.2 times as broad as long, evenly rounded with slightly crenulate, blunt margin (Fig. 319); mandible moderately slender, not twisted, upper tooth conspicuously the longer; malar space 0.4-0.8 times as long as basal mandibular width. Genal carina joining hypostomal carina only just above base of mandible. Flagellum of ♀ very slightly clavate, with a white band, the apical segment transverse, only slightly flattened ventrally, of ♂ setaceous, without tyloids, distal segments slightly broadened centrally especially on lower surface.

Mesoscutum polished to almost matt, punctate with microreticulation between punctures; notauli vestigial; scutellum with lateral carina on anterior 0.1-0.8. Propodeum quite long, abruptly declivous behind posterior transverse carina; propodeal spiracles elliptical; carinae usually complete and with quite coarse secondary sculpture (wrinkling or reticulation) within areae; area superomedia transverse to elongate; apophyses short but discernible.

Legs unspecialized; claws simple. Fore wing with *2r-m* and *3r-m* strongly convergent, virtually touching anteriorly so areolet is pointed above.

Gaster moderately long, evenly tapered posteriorly; tergite 1 evenly broadened posteriorly, rather slender; tergite 2 polished, punctate; gastrocoeli obsolescent, sometimes with thyridia distinct. Ovipositor sheath projecting beyond apex of gaster by 0.3-0.6 times length of hind tibia; ♀ subgenital plate small, evenly hirsute; ♂ subgenital plate posteriorly produced slightly.

Etymology. *Phae* (from *Phaeogenes*) + *neumon* (from *Ichneumon*) referring to similarity of this ichneumonine genus to phaeogenine genera. Masculine.

Remarks. This is a small genus containing four species. The most characteristic feature of *Phaeneumon* is the bluntly rounded clypeus which is rather like that of some phaeogenines. The elliptical propodeal spiracles differentiate species of this genus from the Phaeogenini. The structure of the alitrunk and gaster suggest that this genus is related to *Gavrana*.

Australian species. One described below and three undescribed species (ANIC; BMNH; TC).

Phaeneumon phoenix sp. n.

Fore wing length 7-8 mm; face polished, punctate; malar space 0.4-0.5 times as long as basal mandibular width; flagellum of female with about 28 segments, of male with about 33 segments. Epomia strong; mesoscutum polished; scutellum carinate laterally for 0.8 of its length mesopleuron polished; speculum smooth and shining; propodeum with anterior transverse carina laterally weak; area superomedia elongate; all areae with reticulate secondary sculpture. Ovipositor sheath projecting beyond apex of gaster by about 0.4 times length of hind tibia; upper valve of ovipositor with a nodus and weak apical teeth.

Female: brownish yellow, darker on centres of sclerite and gaster, paler ventrally and around eyes; frons centrally, vertex, much of mesoscutum dark brown; flagellum infuscate; legs orange, distal 0.5 of hind femur and distal 0.2 of tibia black.

Male: similar basic colour but with frons centrally, vertex, scape dorsally, subdorsal stripe on pronotum, stripe below subalar prominence, mesoscutum and axillae black; hind leg with distal 0.5 of femur and tibia, and tarsus black; posterior apex of gaster blackish. Wings of both sexes hyaline, pterostigma black.

This is the only species in the genus with the described colour pattern. The other species I have seen differ in shape of area superomedia, sculpture of propodeum, polish on the mesoscutum, length of scutellar carinae and length of ovipositor.

Material examined

Holotype ♀, Queensland: Mt Tambourine, x.1977 *(Galloway)* (ANIC).

Paratypes. Queensland: 1 ♀, Long Pocket, Brisbane, x.1977 *(Galloway)* (BMNH); 5 ♀, Mt Tambourine, x.-xii.1977-1979 *(Galloway)* (BMNH; DPIQ); 5 ♂, Mt Tambourine, xi.xii. (TC).

Host records. None.

SETANTA Cameron*

Setanta Cameron, 1901*c*: 483. Type-species: *Setanta rufipes* Cameron, by monotypy.

Moderately large insects, fore wing length 10-13 mm; clypeus flat, separated from face by a groove, margin sharp, slightly concave (Fig. 321); mandible long and slender, usually with upper tooth conspicuously the longer, or in one species teeth obsolescent, tip of mandible chisel-like; malar space 0.5-0.8 times basal mandibular width. Genal carina joining hypostomal carina above base of mandible. Flagellum setaceous, usually with a white band, that of ♀ distally flattened below, that of ♂ with numerous tyloids, central segments with a median circumferential ridge bearing stout hairs ventrally.

Mesoscutum moderately convex, punctate, notauli vestigial; scutellum weakly convex, not carinate; speculum punctate (Fig. 559). Propodeum subhorizontal, abruptly declivous posteriorly, spiracles elliptical; most carinae present, area superomedia delineated; area externa confluent with area dentipara.

Legs unspecialized, claws simple. Fore wing with *2r-m* and *3r-m* convergent, but not touching, anteriorly so that areolet is pentagonal.

Gaster spindle-shaped; tergite 1 abruptly broadened posteriorly, sometimes with a pair of obsolescent longitudinal dorsal carinae; tergite 2 with gastrocoeli shallow, striate, connected across midline by a shallow striate groove that is adjacent to anterior margin of tergite (Fig. 566), remainder of tergite 2 closely punctate. Ovipositor not distinctly projecting beyond apex of gaster; ♀ subgenital plate large, triangular, fairly evenly hirsute, sometimes with a slight notch in margin; ♂ subgenital plate small, triangular.

Remarks. *Setanta* is a moderate-sized genus with species in the Oriental, Neotropical and Nearctic regions. In Africa it is replaced by a very closely related genus *Setantops*.

Species of *Setanta* may be distinguished from other large Australian ichneumonines by the combination of concave clypeus and characteristic sculpture of tergite 2. One species has very often been misidentified as *Ichneumon promissorius* and two species are very similar to it in colour. *Setanta* species all have two short white stripes on the mesoscutum just before the scuto-scutellar groove; such stripes are absent in *Ichneumon* species.

Setanta is widely distributed throughout Australia and I have seen species from all states except Tasmania and Northern Territory.

Australian species. Four, undescribed (ANIC; BMNH).

Host records. None.

TRICHOLABUS Thomson*

Tricholabus Thomson, 1894: 2113. Type-species: *Tricholabus femoralis* Thomson, by subsequent designation, Viereck, 1914: 148.
Epiopelmidea Viereck, 1913: 374, Type-species: *Epiopelmidea erythrogaster* Viereck, by monotype.
Otohimea Uchida, 1926: 146. Type-species: *Otohimea nigra* Uchida, by original designation.

Medium-sized to moderately large insects, fore wing length 9-12 mm; clypeus flat, separated from face by a groove, margin blunt, transversely truncate; mandible quite slender, twisted about 10°, upper tooth conspicuously the longer; malar space 1.0-1.2 times basal mandibular width. Genal carina and hypostomal carina joining above base of mandible. Flagellum of ♀ setaceous, quite slender, distally flattened beneath, of ♂ serrato-flabellate (Fig. 338), the inner margin of most segments expanded and cup-like, without tyloids, both sexes with a white band.

Pronotum unusual in having anterior margin curved up and broadened. Mesoscutum convex, punctate with notauli extending 0.3 of its length; scutellum weakly convex, not laterally carinate except at extreme anterior end; speculum from evenly punctate to smooth centrally but with posterior 0.4 punctate. Propodeum evenly rounded, quite long; propodeal spiracles elliptical; propodeal carinae weak or obsolescent, usually only area superomedia discernible and most of propodeum reticulate-wrinkled or punctate (Fig. 344), apophyses absent.

Legs unspecialized; tarsal caws simple. Fore wing with 2*r-m* and 3*r-m* anteriorly convergent, touching so that areolet is pointed above.

Gaster quite long, parallel-sided and terminally shortly pointed; tergite 1 evenly broadened posteriorly, dorsally without carinae; tergite 2 with gastrocoeli deep and large, separated across midline by less than diameter; remainder of tergite 2 punctate. Ovipositor sheath barely projecting beyond apex of gaster; ♀ subgenital plate large, triangular, almost covering ovipositor sheath (Fig. 346); ♂ subgenital plate transverse, centrally convex, in profile bluntly margined, bearing a fringe of short close hairs (Fig. 349); aedeagus unusual in being hooked apically and possessing a large weakly sclerotized spinose ventral area.

The Australian species are black and white with red-marked gasters.

Remarks. A moderate-sized genus previously only known from the Holarctic and Neotropical regions. The male is easily recognized by the peculiar flagellum and characteristic genitalia. The female is less easily determined but both Australian species have reduced propodeal sculpture.

Australian species. Two undescribed species, one from Queensland/New South Wales and a second from south-western Western Australia (ANIC; BMNH).

Host records. *Tricholabus* sp. 1 - Noctuidae: *Pantydia sparsa* Guenée (ANIC). In Europe one species attacks noctuids of the genus *Heliothis* (Morley, 1903).

ULOOLA gen. n.

Type-species: *Uloola brevis* sp. n.

Medium-sized species, fore wing length 6-9 mm; clypeus separated from face by a weak groove, about 2.0 times as broad as long, its apical part flat; clypeal margin truncate, sharp; mandible strongly tapered, twisted about 60°, with upper tooth conspicuously the longer; malar space about equal to basal mandibular width. Genal carina joining hypostomal carina above base of mandible. Flagellum setaceous, usually white-banded, that of ♀ distally flattened ventrally, that of ♂ with tyloids, distal segments slightly swollen centrally.

Mesoscutum weakly polished, shallowly punctate with microreticulations between punctures, notauli present near margin; scutellum convex, laterally carinate 0.7 of their length, in males of all and females of some species laterally produced into two horns (Fig. 322); propodeum with horizontal part short, posteriorly abruptly declivous, spiracle elliptical; area superomedia transverse (Fig. 324), about 2.0 times as broad as long, rarely incomplete; apophyses from weak to moderately strong.

Legs unspecialized, tarsal claws simple. Fore wing with 2*r-m* and 3*r-m* strongly convergent, touching or almost touching anteriorly so that areolet is pointed above.

Gaster spindle-shaped; tergite 1 slender, evenly broadened posteriorly; gastrocoeli moderately strong, large, separated by less than breadth of one, sometimes with a transverse groove joining them; remainder of tergite 2 polished, sparsely punctate. Ovipositor projecting beyond apex of gaster by 0.3-0.5 times length of hind tibia; ♀ subgenital plate small, evenly hirsute; ♂ subgenital plate triangular, evenly hirsute.

Etymology. *Uloola* - an aboriginal word meaning sun, referring to the colour of these insects. Treated as feminine.

Remarks. *Uloola* is a small genus which is probably related to *Aculicoxa* and *Gavrana*. It is most easily recognized by the short propodeum but may be confused with some *Gavrana* species. Unlike these species (but not all *Gavrana*) *Uloola* has large gastrocoeli.

Australian species. One, described below, and four additional undescribed species (ANIC; BMNH; TC).

Uloola brevis sp. n.

Female: fore wing length 7-9 mm; white flagellar band not complete; epomia strong, gradually divergent from collar margin; scutellum produced laterally into two teeth; speculum shining, smooth, rest of mesopleuron striate, ventrally becoming wrinkled; sternaulus impressed about 0.5 of length of pleuron. Propodeum with area superomedia complete; posterior transverse carina strong, apophyses moderately strong. Fore wing with abscissa of Cu_1 between 1*m-cu* and Cu_{1a} about equal to Cu_{1b}. Tergite 2 with gastrocoeli interconnected by shallow transverse groove.

Orange-brown species, with orbits, clypeus laterally and scape ventrally whitish. Frons centrally, vertex, flagellum, hind tarsus blackish. Wings almost hyaline, pterostigma blackish brown.

Male: same as female except uniformly slightly darker and whitish areas smaller.

This is the only species in the genus with this colour pattern and with the female with scutellar 'horns'.

Material examined
Holotype ♀, Queensland: Bundaberg, vii.1971 *(Frauca)* (ANIC).

Paratypes. Queensland: 1 ♀, Bluff Range, Biggenden, viii.1971 *(Frauca)* (ANIC); 2 ♂, Cunningham Pass, iii. (TC); 1 ♀, Electra, S. F., 25 km S. Bundaberg, xi.1976 *(Frauca)* (BMNH); 1 ♂, Mt Glorious, xii.1976 *(Boucek)* (BMNH); 2 ♂, Mt Glorious, ii.-iv.1977 *(Hiller)* (BMNH; DPIQ); 11 ♂, Mt Glorious, i.-x. (TC); 3 ♂, Mt Nebo, ii. (TC); 10 ♂, Mt Tambourine, xii. (TC). New South Wales: 1 ♂, Barrington N. P., i. (TC); 2 ♂, Dorrigo, i. (TC).

Host records. I have seen one species which was reared from a small unidentified rhopaloceran chrysalis (ANIC).

Tribe ISCHNOJOPPINI

This small Old World tribe contains two genera, only one of which occurs in Australia. The centre of dispersal of ischnojoppines is southern Africa and Madagascar. One species is widely distributed throughout the Indo-Australian region.

Ischnojoppines are easily recognized by the characteristic head with long malar space and broad mandible, the slender gaster and the yellow colour pattern. They are parasites of stem-boring Lepidoptera.

ISCHNOJOPPA Kriechbaumer

Ischnojoppa Kriechbaumer, 1898: 32. Type-species: *Joppa lutea* F. (= *Ichneumon luteator* F.), by subsequent designation, Ashmead, 1900*a*: 15.
Bodargus Cameron, 1902*a*: 52. Type-species: *Bodargus rufus* Cameron (= *Ichneumon luteator* F.), by monotypy.

Medium to moderately large insects, fore wing length 9-12 mm; clypeus and face forming a single flat surface; clypeus about 2.0 times as broad as long, its apex sharp, transversely truncate (Fig. 308); mandible barely narrowed, not twisted, outer surface slightly convex, with apical teeth deeply divided, the upper slightly the longer (Fig. 310); malar space 1.6-1.8 times as long as basal mandibular width. Genal and hypostomal carinae meeting at base of mandible. Head in dorsal view with genae very long, not narrowed (Fig. 314). Flagellum setaceous, that of ♀ with a central white band, then distally broadened and strongly flattened ventrally, that of ♂ with central segments bearing an indistinct line of bristles on ventral and lateral sides.

Mesoscutum matt, closely punctate with obsolescent notauli; scutellum convex with strong lateral carinae. Propodeum quite long and evenly rounded with spiracle elliptical; propodeal carinae very faint, area superomedia, if discernible, elongate; apophyses absent.

Legs unspecialized, tarsal claws simple. Fore wing with 2*r-m* and 3*r-m* strongly convergent but not joining anteriorly; 2*m-cu* unusual in usually having a central out-pointing stub of a spurious vein.

Gaster elongate, parallel-sided with tergite 1 fairly evenly broadened, postpetiole not clearly defined, not lateromedially carinate; ♀ gastrocoeli large, oval, separated across midline by less than diameter of one; tergite 2 anteromedially striate, the striae grading to punctures centrally. Ovipositor projecting beyond apex of gaster by about 0.15 times length of hind tibia; ♀ subgenital plate small; ♂ subgenital plate with transverse hind margin, evenly hirsute.

Colour predominantly yellowish with tergites 5+ of gaster black and with a white spot on dorsum of tergite 7.

Remarks. *Ischnojoppa* is easily recognized by the characteristic head and striking colour pattern. Only one species occurs outside the Afrotropical region and this is widely distributed throughout South East Asia. In Australia it appears to be restricted to north Queensland.

Australian species. *Ischnojoppa luteator* (F.) (A).

Host records. None in Australia but in Asia *I. luteator* is a common parasite of graminaceous stem-boring lepidopterous pests and is reared frequently from the pyralid *Scirpophaga incertulas* (Walker).

Tribe LISTRODROMINI*

This rather small cosmopolitan tribe contains nine genera, most of which include relatively few species. In any one area it is unusual to find more than two or three species of Listrodromini. Four genera, *Validentia*, *Anisobas*, *Listrodromus* and *Neotypus*, are represented in the Indo-Australian region. One of these, *Listrodromus*, is here newly recorded from Australia.

Listrodromines are quite easily recognized by their characteristic heads with simply convex faces. Most species have rather short and broadly spindle-shaped gasters.

The usual host of listrodromines are Lycaenidae and (at least for one Nearctic genus) Hesperiidae.

LISTRODROMUS Wesmael*

Listrodromus Wesmael, 1845: 146. Type-species: *Ichneumon nycthemerus* Gravenhorst, by monotypy.
Sogna Cameron, 1907*f*: 91. Type-species: *Sogna crassipes* Cameron, by monotypy.

Small species, fore wing length 3-5 mm; clypeus and face forming an evenly convex, continuous surface; clypeus about 2.0 times as broad as long, its apex sharp, with a median tooth (Fig. 307); mandible not twisted, weakly narrowed, with upper tooth about 2.0 times as long as the lower; malar space 1.2-1.3 times as long as basal mandibular width. Genal and hypostomal carinae joining at base of mandible. Head in dorsal view short, almost lenticular with genae constricted behind eyes (Figs 306, 313). Flagellum of both sexes unspecialized.

Mesoscutum polished, punctate with vestigial notauli; scutellum large, convex, with lateral carinae at least partially represented. Propodeum short, abruptly declivous, with spiracles subcircular; propodeal carinae almost complete, area superomedia transverse, area petiolaris long, apophyses vestigial.

Legs unspecialized; tarsal claws of anterior two pairs of legs of ♀ pectinate at bases. Fore wing with areolet large, almost regularly pentagonal.

Gaster short, broad, abruptly tapered anteriorly and posteriorly; tergite 1 dorsally flattened, somewhat abruptly broadened behind centre, without lateromedian carinae; gastrocoeli shallow, oval, separated across midline by about their own diameter; tergite 2 polished and punctate. Ovipositor not projecting; ♀ subgenital plate quite large, pointed posteriorly; ♂ subgenital plate triangular, evenly hirsute.

Colour of only known Australian species mainly black with face, scutellum, tergite 1 and hind end of gaster bright yellow.

Remarks. *Listrodromus* is a small Palaearctic and Oriental genus and can be distinguished from other Listrodromini by the presence of a clypeal tooth. Most species have the female fore tarsal claws pectinate but the pectination is very obscure in the Australian species.

Australian species. One undescribed species widely distributed throughout Australia. Miss J. Cardale collected a long series around Alice Springs in September and October 1978.

Host records. None, but the genus is believed to be restricted to Lycaenidae. The European species, *L. nycthemerus*, is a regular parasite of *Celastrina argiolus* (L.).

Tribe OEDICEPHALINI*
(= Notosemini sensu Townes)

A small tribe occurring mostly in tropical latitudes with one species in Europe. This tribe has had rather a confused history. Heinrich (1967) includes the genera *Imeria* and *Oedicephalus* together in this tribe whilst Townes *et al.*, (1961; 1966; 1973) also includes *Notosemus*, a genus previously placed in the Phaeogenini (Perkins, 1959). Perkins, in recurating the collections of the British Museum (Natural History), later changed his mind and placed *Imeria*, *Oedicephalus*, *Aulojoppa*, *Notosemus* and *Bambuscopus* together in the Oedicephalini. In the present work I am following Perkins' unpublished interpretation.

Oedicephalines have an almost cubical head with the vertex between the occipital carina and the ocelli very long and horizontal.

A single genus, *Imeria*, occurs in Australia. Some authors (e.g. Townes *et al.*, 1961) have treated *Imeria* as having several subgenera, but these seem to me to intergrade and I have not adopted them here.

IMERIA Cameron*

Imeria Cameron, 1903*f*: 173. Type-species: *Imeria albomaculata* Cameron, by monotypy.
Elasmognathus Ashmead, 1905*b*: 405. Type-species: *Elasmognathus cephalotes* Ashmead, by monotypy. [Homonym of *Elasmognathus* Fieber, 1844.]
Caenojoppa Cameron, 1905*d*: 155. Type-species: *Caenojoppa longitarsis* Cameron, by monotypy.
Caenojoppa Cameron, 1905*h*: 162. Type-species: *Caenojoppa longitarsis* Cameron, (= *Caenojoppa longitarsis* Cameron), by monotypy. [Homonym of *Caenojoppa* Cameron, 1905*d*.]
Elasmognathias Ashmead, 1906*b*: 31. [Replacement name for *Elasmognathus* Ashmead.]
Imeriella Heinrich, 1938: 44. Type-species: *Caenojoppa (Imeriella) seyrigi* Heinrich, by monotypy.

Medium-sized species, fore wing length 7-9 mm; clypeus and face forming a single flat surface; clypeus about 2.1 times as broad as long, its apex sharp with a median and a pair of weak lateromedian teeth (Fig. 304); mandible not twisted, but with outer surface very convex, teeth deeply divided, the upper slightly the longer; malar space about 0.7 times as long as basal mandibular width. Genal and hypostomal carinae meeting at base of mandible. Head in dorsal view cubical, genae very long (Fig. 305). Flagellum setaceous, that of ♀ ventrally flattened, with a median white band, that of ♂ similar.

Mesoscutum polished, very sparsely punctate, without notauli; scutellum convex to pyramidal, laterally carinate with carinae often meeting centrally to form an acute promontary. Propodeum short, abruptly rounded with most carinae present, spiracle oval; area superomedia regularly hexagonal, apophyses short.

Legs unspecialized, tarsal claws simple. Fore wing with 2*r-m* and 3*r-m* strongly convergent anteriorly, but not joining.

Gaster spindle-shaped with tergite 1 slightly flattened dorsally, postpetiole moderately broadened, not carinate; gastrocoeli large, deep, separated across midline by less than breadth of one; remainder of tergite 2 sparsely punctate. Ovipositor sheath projecting beyond apex of gaster by 0.1 times length of hind tibia; ♀ subgenital plate small; ♂ subgenital plate transverse, posteriorly truncate, evenly hirsute.

Colour of only known Australian species is black and white with reddish marked hind femur.

Remarks. *Imeria* is a moderately small genus with about 18 described species in the Old World tropics from Angola to Sulawesi. I have seen an undescribed species from New Guinea and another from north Queensland.

Superficially *Imeria* is rather like *Magwengiella* though they are easily separable on account of the differences in the clypeus and mandible.

Australian species. One, undescribed (ANIC).

Host records. None.

Tribe PHAEOGENINI
(= Alomyini sensu Townes)

This moderately large cosmopolitan tribe, containing mostly smaller-sized species, is characterized by the circular or subcircular petiolar spiracles and the rather convex clypeus. In older works it was often considered, under the name Cyclopneusticae, as a group of equivalent status to all other ichneumonines, the Ichneumoninae Stenopneusticae. This was primarily a convenience classification rather than any attempt at recognizing phylogeny, as the phaeogenines (a notoriously difficult group) were frequently not treated in monographs on Ichneumoninae. The Phaeogenini is probably not a natural group (in the sense it is used here) and is certainly polyphyletic in the broader sense of Perkins (1959) and Diller (1981). There is a tendency for smaller ichneumonines to have rounder spiracles and more convex clypea; consequently the Phaeogenini is probably an assemblage of unrelated smaller ichneumonines. Despite this, the group is used in this work. This is, frankly, because the author is not sufficiently familiar with the Ichneumoninae to be able to correctly reassign the several taxa. Currently there are no other ichneumonid workers studying this problem, and given the unsatisfactory nature of ichneumonine higher classification, the Phaeogenini is likely to remain as a functional group for many years to come.

Diller (1981) recognizes six subtribes, two of which, the Heterischnina and the Notosemina, are treated separately in the present work. In total Diller recognizes 37 genera (including the two assigned to other tribes in this work). Most are Palaearctic or Holarctic with a few (e.g. *Oronotus*, *Tycherus*, *Centeterus*) extending to the northern part of the Oriental region. One subtribe, the Chauviniina is Afrotropical.

In the present work subtribes are not used. A single described genus, *Diadromus*, is recorded from Australia, where one species, *D. collaris*, has been introduced. Three further, undescribed, genera occur in Australia. They are not particularly closely inter-related and one, *Phairichneumon* may be related to *Auklandella*, a New Zealand genus and thus has true affinity with ichneumonines of the *Cratichneumon* complex.

AKYMICHNEUMON gen. n.

Type-species: *Otacustes rufipes* Cameron

Small insects, fore wing length 3-5 mm; clypeus separated from face by a groove, 2.0-2.3 times as broad as long, slightly convex in profile, its margin evenly arcuate and often bearing long hairs; mandible not twisted, very long and slender with upper tooth much longer than the lower; malar space from 0.8-1.4 times basal mandibular width. Genal and hypostomal carinae joining close to (but slightly above) base of mandible. Frons matt; ocellar triangle basally broader than high; genae moderately short, evenly narrowed behind eye. Scape truncate, 30-40° from transverse; flagellum of ♀ cylindrical, with or without a pale band, distal segment quadrate or slightly transverse, barely flattened ventrally; flagellum of ♂ setaceous, unspecialized, without tyloids.

Pronotum with epomia distinct. Mesoscutum puncto-granulate, with notauli short; scutellum rather flat, generally with lateral carinae discernible on anterior 0.2. Propodeum usually evenly rounded, spiracle small and more or less circular; propodeal carinae generally complete, sometimes with lateromedian ones obsolescent; apophyses vestigial.

Legs unspecialized, tarsal claws simple. Fore wing with *2r-m* and *3r-m* convergent anteriorly but usually separated by about length of abscissa of *M* between *2m-cu* and *3r-m* (Fig. 329); *cu-a* subvertical, slightly distal to base of *Rs&M*. Hind wing with anterodistal corner of sub-basal cell about 90°; distal abscissa of Cu_1 absent or weak.

Gaster generally quite long and slender; tergite 1 evenly broadened posteriorly, dorsally polished, without obvious sculpture or carinae; tergite 2 without gastrocoeli, smooth and polished, impunctate (Fig. 563). Ovipositor projecting beyond apex of gaster by 0.4-0.5 times length of hind tibia; ♀ subgenital plate small; ♂ subgenital plate transverse, hind margin truncate, evenly hirsute.

Etymology. *Akym* (from akymatos, smooth) + *ichneumon* referring to the lack of gastrocoeli. Masculine.

Remarks. *Akymichneumon* is a moderate-sized Australian genus. It is easily recognized as the species have no trace of gastrocoeli. They differ from other phaeogenines in usually having a broader areolet, having a matt frons and a less obliquely truncate scape, an in often having a longer ovipositor. In collections I have frequently seen *Akymichneumon* species incorrectly determined as phygadeuontines, presumably because of their long ovipositors. The sheath of the ovipositor of ichneumonines is always rigid and quite unlike the flexible ones of phygadeuontines.

Australian species. I have seen 12 endemic species, most of which are from Victoria and Tasmania (ANIC; BMNH; TC). The type-species, *A. rufipes*, is more widely distributed and occurs in Australian Capital Territory and New South Wales. The holotype lacks a head and the redescription of the species given below is based on recently collected material.

Akymichneumon rufipes (Cameron) comb. n.

Otacustes? rufipes Cameron, 1906*b*: 181. Holotype ♀, 'Australia' (BMNH) [examined]. [Lacks head, distal parts of legs and ovipositor.]
Phaeogenes? rufipes (Cameron) Townes *et al.*, 1961: 335.

Female: fore wing length 3-4 mm. Face punctate tending to punctostriate centrally, clypeus more sparsely punctured; malar space 0.9 times basal mandibular width; flagellum with 29-31 segments, with a median pale band. Scutellum punctostriate, carinate for 0.6 of its length. Propodeum with area superomedia delineated, hexagonal with anterior side the narrowest, posterior side slightly concave; area petiolaris defined, elongate; other carinae complete but weak. Gaster long and slender with ovipositor projecting beyond apex of gaster by 0.5 times length of hind tibia.

Male unknown.

Predominantly reddish brown species with edges of some sclerites blackish and orbits, upper margin of pronotum, tegula and lateral edges of scutellum obscurely yellowish. Wings hyaline, pterostigma dark brown.

A. rufipes is one of a complex of four rather similar species which are more elongate than the remainder of the genus. All are similarly coloured and *A. rufipes* can be recognized most easily by the propodeal carination. None of the other similar species has the area superomedia of the same shape.

Material examined
Holotype ♀, 'Australia' (BMNH).

Non-type material: Australian Capital Territory: 3 ♀, Canberra, Black Mt, ix.1978-iii.1981 *(Tidemann)* (ANIC; BMNH); 1 ♀, Canberra, Black Mt, x.1979 *(Colless)* (ANIC); 1 ♀, Blundell's, ix.1930 *(Graham)* (ANIC). New South Wales: 1 ♀, Cabbage Tree Ck, Clyde Mt, ix.1979 *(Naumann & Cardale)* (ANIC).

Host records. None.

DIADROMUS Wesmael

Diadromus Wesmael, 1845: 207. Type-species: *Ichneumon troglodytes* Gravenhorst, by subsequent designation, Ashmead, 1900*a*: 23.
Thyraeella Holmgren, 1890: 402. Type-species: *Ischnus collaris* Gravenhorst, by monotypy.

Small insects, fore wing length 3-4 mm; clypeus separated from face by a groove, in profile very weakly convex; clypeus in anterior aspect 2.0-2.2 times as long as broad, its margin convex; mandible not twisted, very long and slender with upper tooth more than 3.0 times length of the lower; malar space 0.9 times basal mandibular width. Genal and hypostomal carinae meeting above base of mandible. Head in dorsal view with genae quite long, weakly narrowed (Fig. 315). Flagellum of ♀ filiform, without a central band, distally slightly flattened, that of ♂ similar but cylindrical.

Mesoscutum polished, punctate with very weak notauli; scutellum convex, laterally carinate for about 0.5 of its length. Propodeum evenly rounded, spiracles subcircular; area superomedia distinct, rounded anteriorly; apophyses vestigial.

Legs unspecialized; tarsal claws simple. Fore wing with 2*r-m* and 3*r-m* strongly convergent anteriorly.

Gaster long and slender, tergite 1 polished, almost evenly broadened posteriorly; tergite 2 granulate with gastrocoeli centrally confluent so as to form a transverse furrow (Fig. 562). Ovipositor sheath projecting beyond apex of gaster by 0.1-0.2 times length of hind tibia; ♀ subgenital plate small, ♂ subgenital plate transverse.

Colour of only known species brown with head, propodeum, tergite 1 and tergites 5+ blackish.

Remarks. *Diadromus* is a Holarctic genus containing many species. One, *D. collaris*, is a common and effective parasite of *Plutella xylostella* (Lloyd, 1940) and has been introduced into many countries. Males of this species are very uncommon and probably its normal mode of reproduction is by thelytokous parthenogenesis.

D. collaris was established in New Zealand in 1939 and in 1949 it was introduced into Tasmania (Miller, 1949) where it was stated subsequently to have become established (Miller & Hudson, 1953).

The form of tergite 2 and the striking colour pattern make *D. collaris* one of the most distinctive of phaeogenines.

Australian species. *Diadromus collaris* (Gravenhorst) (I).

Host records. *D. collaris* - Plutellidae: *Plutella xylostella* (L.) (Yarrow, 1970). In Europe this phaeogenine will attack other *Plutella* species (Lloyd, 1940).

ELEEBICHNEUMON gen. n.

Type-species: *Eleebichneumon pittata* sp. n.

Small species, fore wing length 4-5 mm; clypeus slightly convex, separated from face by a deep groove, margin truncate with an indistinct median concavity (Fig. 309); mandible very long and slender, not twisted, upper tooth far longer than the lower; malar space 0.7-0.8 times basal mandibular width. Genal carina joining hypostomal carina above base of mandible. Flagellum filiform, with a median white band, slightly flattened ventrally.

Mesoscutum convex, polished and almost impunctate with notauli impressed on anterior 0.1; scutellum convex, transverse, without lateral carinae; speculum smooth and shining. Propodeum anteriorly horizontal, posteriorly abruptly declivous; apiracle circular; propodeal carinae very strong, all areae defined; apophyses weak.

Legs unspecialized; claws pectinate at least basally. Fore wing with areolet broad, pentagonal.

Gaster broadly spindle-shaped, tergite 1 evenly broadened, slightly flattened and striate near hind end; gastrocoeli very large, quadrate, remainder of segment striate (Fig. 312), tergites 3+ smooth. Ovipositor sheath very short, not projecting; ♀ subgenital plate large, triangular, reaching almost to apex of gaster.

Male unknown.

Etymology. *Eleeb* (from *eleebana*, an aboriginal work meaning beauty) + *ichneumon*. Masculine.

Remarks. A very distinctive genus here placed in the Phaeogenini largely for convenience. I do not think it is at all closely related to any other phaeogenines, but nor can I decide to what else it is related. It has a superficial resemblance to *Cushmaniella* but differs in the shape of the subgenital plate, the mandible and the scutellum, suggesting they are not really related.

Australian species. One, from Queensland, described below.

Eleebichneumon pittata sp. n.

Flagellum with about 25 segments; genae strongly narrowed behind eyes; mesopleuron dorsally impunctate, polished, ventrally evenly punctate.

Black insect; vertical orbits, clypeus, mandible, flagellar band, subalar prominence, scutellum, anterior two pairs of trochanters, spots on hind corners of tergites 2-4 and centrally on hind margin of tergites 6-7 white; legs otherwise orange; scape, tergite 1 and anterior part of tergite 2 orange-brown.

Material examined

Holotype ♀, Queensland: Brisbane, i.-ii.1980 *(Galloway)* (ANIC).

Paratype. Queensland: 1 ♀, Galton, xii. (TC).

PHAIRICHNEUMON gen. n.

Type-species: *Phairichneumon orbitalis* sp. n.

Small to medium-sized species, fore wing length 3-7 mm; clypeus separated from face by a groove, 2.1-2.4 times as broad as long, moderately convex in profile, its margin evenly arcuate (Fig. 328); mandible not or only very slightly twisted, long and slender with upper tooth far longer than the lower; malar space 0.3-0.8 times basal mandibular width. Genal and hypostomal carinae joining a little above base of mandible. Frons usually highly polished; ocellar triangle slightly broader basally than high; genae short, strongly narrowed posteriorly (Fig. 316). Scape truncate at 45-50° to transverse; flagellum of ♀ cylindrical, distal segment transverse, ventrally flattened, of ♂ setaceous with or without tyloids.

Pronotum with epomia strong. Mesoscutum punctogranulate to smooth and polished, often flattened and centrally striate; notauli short to long; scutellum usually deplanate with indistinct traces of carinae laterally. Propodeum generally a little longer than high, usually abruptly declivous behind posterior transverse carina so area superomedia is horizontal; propodeal spiracles circular to shortly oval; carinae usually complete, effaced partially in smaller species; propodeal apophyses vestigial.

Legs unspecialized; claws simple. Fore wing with *2r-m* and *3r-m* strongly convergent, separated anteriorly by about 0.5 times length of abscissa of *M* between *2m-cu* and *3r-m* (Fig. 331); *cu-a* quite strongly oblique opposite or distal to base of *Rs&M*. Hind wing with anterodistal corner of sub-basal cell 85-90°; distal abscissa of Cu_1 usually distinct.

Gaster spindle-shaped, with tergite 1 fairly evenly broadened, usually smooth dorsally; tergite 2 with gastrocoeli large, superficial, the space between them narrower than width of one, remainder of gaster smooth and highly polished, impunctate (Fig. 564). Ovipositor projecting beyond apex of gaster by 0.3-0.4 times length of hind tibia; ♀ subgenital plate small, transverse; ♂ subgenital plate short, truncate, evenly hirsute.

Etymology. *Phairos* (shining) + *ichneumon* referring to polished appearance of species of this genus. Masculine.

Remarks. As it is used here, this genus contains a rather heterogeneous assemblage of species. The majority have a highly polished, flattened scutellum and mesoscutum and the centre of the mesoscutum between the notauli is striate. There are a few species which have punctogranulate mesoscuta and are provisionally included here. These undoubtedly have a phylogenetic affinity with the group though they may warrant generic distinction when the fauna is better known. I believe this genus to be closely related to *Aucklandella*, a large New Zealand genus. However, *Aucklandella* as currently used (Townes *et al.*, 1961) is a very broad group of only distantly related species and will probably be subdivided when the New Zealand fauna is better known. The type-species of *Aucklandella*, *A. flavomaculata*, is a peculiar brachypterous species without propodeal carinae, and with a short, fairly stout tergite 1. It is a very specialized member of its group and its relationships are thus difficult to ascertain.

Australian species. *Phairichneumon* is a moderate-sized genus with about 10 undescribed species widely distributed throughout Australia (ANIC; BMNH; DPIQ; TC). The more 'typical' members of the genus occur in New South Wales and south Queensland. The more aberrant species are mainly found in Tasmania and Victoria. The type-species is described below.

Phairichneumon orbitalis sp. n.

Female: fore wing length 5-7 mm. Face polished, laterally smooth with isolated punctures, centrally striate; malar space 0.3-0.4 times basal mandibular width; flagellum with 30-32 segments. Mesoscutum flattened, polished, laterally smooth centrally, striate; scutellum flat, highly polished. Propodeum long, anterior transverse carina absent except centrally; area superomedia weakly defined, elongate. Hind coxa with a tubercle near inner margin. Gaster slender.

Male unknown.

Predominantly reddish brown species, head with face, clypeus, orbits whitish, frons centrally and vertex black; flagellum red-brown with pale central band.

P. orbitalis is very similar to, though on average larger than, an undescribed species. The two differ in several inconspicuous features, most notably in the form of the hind coxa. Only *P. orbitalis* has a tubercle on the inner margin. The males of the closely related, undescribed species have tyloids on flagellar segments 10-14. The males of at least one species with granulate mesoscutum lack tyloids.

Material examined

Holotype ♀, Queensland: Mt Glorious, xii.1976 *(Bouček)* (ANIC).

Paratypes. Queensland: 8 ♀, Mt Glorious, x.-iv.1976-1978 *(Bouček, Galloway & Hiller)* (ANIC; BMNH; DPIQ); 6 ♀, Mt Tambourine, ix.-xi.1977-1978 *(Galloway)* (BMNH).

Host records. None.

Tribe PLATYLABINI
(= Pristicerotini sensu Townes)

This is a moderately large tribe, species of which occur in all zoogeographical regions. Heinrich (1967) states that this is one of the easiest tribes of Ichneumoninae to recognize because of the combination of dorsally flattened petiole and convex clypeus. However, Heinrich then remarks that not any of the 20 African species of *Platylabus* described by a number of authors actually are platylabines. This suggests that the group is in fact rather difficult to recognize. I certainly have found it so and it takes experience to appreciate the slightly flattened petiole and slightly convex clypeus. Platylabines (especially the females) generally have the apex of the gaster rather truncated, being quite bluntly rounded and quite a different shape to that of many other ichneumonines with carinate scutella. In Australia, platylabines are most likely to be confused with *Gavrana* species. Both are common, medium or moderately large-sized ichneumonines with carinate scutella and conspicuous colour patterns often incorporating numerous yellow spots and flashes. Apart from the difference in the shape of the gasters *Gavrana* species have a deeper petiole, that in section is U-shaped ventrally, and they generally have no division between the sternite and tergite. This is unlike the flattened O-shaped petiole of platylabines, which generally have a carina between the sternite and tergite. Few *Gavrana* species have propodeal apophyses and all have a smooth speculum. Platylabines all have propodeal apophyses and have the speculum punctate, at least sparsely.

As far as is known all platylabines are parasites of Geometroidea, most attack Geometridae. They oviposit into fairly mature larvae and, at least some species, place their egg in the wall of the hind gut rather than leave it free in the haemocoel.

There are about 20 described platylabine genera which are, for the most part, poorly differentiated. Many of the characters used in generic keys are subject to frequent exceptions (Perkins, 1959) and the species-groups tend to blur into one another.

Little use has been made previously of the shape of the female subgenital plate and of the occurrence of tyloids on the male falgellum. Using the combination of specialized subgenital plate and presence of tyloids (and there seems to be complete correlation between these characters) the 29 Australian species can be divided into two groups (i.e. having these two characters or not having them). These groups differ also in a number of subtler features such as clypeal shape and size of gastrocoeli which suggests they are natural groups. The larger corresponds with *Platylabus* whilst the smaller contains two subgroups. One of these almost corresponds with *Pristiceros* (and I have provisionally placed the two Australian species in this genus) whilst the larger subgroup is distinct from any described genus. This I have described as a new genus and I suggest it is possibly related to the New Zealand genus *Levansa*. Typical *Levansa* does not occur in Australia.

NEOLEVANSA gen. n.

Type-species: *Neolevansa hirsuta* sp. n.

Medium to moderately large-sized species, fore wing length 7-11 mm; clypeus separated from face by a groove, slightly convex with margin truncate, 1.8-1.9 times as broad as long; mandible long and slender, twisted about 30°, with upper tooth conspicuously the longer; malar space 0.9-1.0 times basal mandibular width. Genal and hypostomal carinae meeting above base of mandible. Head in dorsal view evenly narrowed behind eyes. Flagellum setaceous, with pale band, that of ♀ flattened ventrally, that of ♂ with tyloids on about segments 12-18 (Fig. 337), distal segments simple or very slightly serrate.

Mesoscutum convex, punctate, notauli vestigial; scutellum convex, carinate laterally for 0.7 or more of its length; metanotum with a strong triangular protuberance directed towards propodeal spiracle (Fig. 336). Propodeum fairly evenly rounded (Fig. 334), in most species quite strongly carinate, spiracles elliptical; area superomedia hexagonal or almost quadrate, elongate, usually with hind margin straight; area externa and area dentipara usually separated by carinae, or in some species with carinae obsolescent; apophyses present.

Legs of ♀ generally rather short and stout, tarsi swollen; tarsal claws simple. Fore wing with *2r-m* and *3r-m* anteriorly convergent so areolet is nearly pointed above.

Gaster relatively short, bluntly rounded posteriorly; tergite 1 flattened so that petiole is broader than high at anterior 0.2; gastrocoeli shallow, superficial and separated across midline by more than width of one; tergite 2 otherwise virtually unsculptured, smooth and polished, sometimes with isolated small punctures. Ovipositor projecting beyond apex of gaster by 0.1 times length of hind tibia; ♀ subgenital plate transverse, rarely almost quadrate, hind margin usually convex and with a median blunt rounded prominence bearing a tuft of long hairs (Fig. 333); ♂ subgenital plate small, evenly hirsute.

Remarks. *Neolevansa* is a moderately large genus with species widely distributed throughout Australia except in tropical parts. It is quite closely related to the New Zealand genus *Levansa* but there are a sufficient number of morphological dissimilarities to warrant the erection of a new genus for the Australian species. The two genera are compared below.

NEOLEVANSA	*LEVANSA*
Flagellum white-banded	Flagellum not banded
Male antenna with tyloids	Male antenna without tyloids
Scutellum carinate most of its length	Scutellum carinate only on anterior 0.2
Propodeal spiracle elliptical	Propodeal spiracle oval to circular
Metanotal protuberance present	Metanotal protuberance absent
Propodeum from completely carinate to with anterior carinae weak, area superomedia elongate	Propodeum with only posterior transverse carina present, so far forward that area superomedia, if present, would be strongly transverse

Townes *et al.* (1961) include one Australian species, *Ichneumon ischioleucus*, in *Levansa*. However, the type is apparently lost and the description is inadequate to recognize the insect concerned. From Brullé's original description it is possible to deduce that this species is one of the small reddish ichneumonines with both black and pale markings. It is possibly a species of *Gavrana*.

Australian species. I have seen 12 undescribed species (AM; ANIC; BMNH; TC). One, the type-species, is described below.

Neolevansa hirsuta sp. n.

Female: moderately large species, fore wing length 10-11 mm; face punctate, labrum with a fringe of very long hairs. Propodeum with anterior transverse carina very weak; area superomedia quadrate, about 1.5 times as long as broad. Tarsi swollen, the inner surface bearing very short inconspicuous pubescence and obviously contrasting with other surfaces. Fore wing with ramellus present.

Head and alitrunk blackish, clypeus, face centrally and genae ventrally reddish; facial and frontal orbits, pronotal margin, subalar prominence, scutellum, postscutellum, two spots on mesopleuron and large spot on metapleuron yellow; antenna black, with a white band, proximally reddish. Legs and gaster red, hind femur and tibia distally blackish. Wings hyaline, pterostigma black.

Male: similar to female but with tarsi slender; metanotal protuberance somewhat weaker, but still clearly present.

Material examined

Holotype ♀, Victoria: Macclesfield, xii.1892 *(French)* (BMNH).

Paratypes. Victoria: 1 ♂, Macclesfield, xii.1892 *(French)* (BMNH). Indecipherable locality data: 1 ♀, 1 ♂, *(French)* (ANIC; BMNH).

PLATYLABUS Wesmael

Platylabus Wesmael, 1844: 166. Type-species: *Platylabus rufus* Wesmael, by subsequent designation, Ashmead, 1900*a*: 19.

Pyramidophorus Tischbein, 1882: 484. Type-species: *Pyramidophorus flavoguttatus* Tischbein, by monotypy.
Pachyjoppa Cameron, 1901*c*: 374. Type-species: *Pachyjoppa tibialis* Cameron, by monotypy.
Lamprojoppa Cameron, 1901*c*: 482. Type-species: *Lamprojoppa caerulea* Cameron, by monotypy.
Pagarenes Cameron, 1903*c*: 183. Type-species: *Pagarenes erythropus* Cameron, by monotypy.
Chlorojoppa Cameron, 1907*b*: 466. Type-species: *Chlorojoppa viridis* Cameron, by monotypy.

Medium-sized species, fore wing length 6-8 mm; clypeus separated from face by a groove, slightly convex with margin truncate, 1.7-1.8 times as broad as long; mandible long and slender, twisted about 30°, with upper tooth conspicuously the longer; malar space 1.0 times as long as basal mandibular width. Genal and hypostomal carinae meeting above base of mandible. Head in dorsal view evenly narrowed behind eyes. Flagellum setaceous, with a pale median band, that of ♀ distally flattened below, that of ♂ simple, without tyloids.

Mesoscutum convex, polished, punctate, notauli vestigial; scutellum convex, carinate laterally for 0.7 or more of its length; metanotum with strong triangular tooth projecting beck towards propodeal spiracle. Propodeum evenly rounded, spiracles elliptical; area superomedia defined, quadrate, slightly transverse with hind margin concave; area externa usually confluent with area dentipara; apophyses present.

Legs unspecialized or rather short and stocky; tarsal claws simple. Fore wing with 2*r-m* and 3*r-m* strongly convergent so areolet is nearly pointed above.

Gaster rather short, bluntly rounded posteriorly; tergite 1 with petiole flattened so it is broader than high anteriorly; tergite 2 with gastrocoeli shallow but wide, separated by slightly less than width of one; remainder of tergite 2 alutaceous or weakly granulate. Ovipositor projecting beyond apex of gaster by about 0.1 of length of hind tibia; ♀ subgenital plate rather flat, slightly elongate, with hind margin centrally produced to a point of about 100°, bearing fine, fairly even pubescence (Fig. 332); ♂ subgenital plate elongate, evenly hirsute.

Remarks. A large cosmopolitan genus. *Platylabus* species have larger, less widely interspaced gastrocoeli than most other genera in this tribe. The females have a subgenital plate of rather different shape than that of other Australian platylabines; the males are easily distinguished by their lack of tyloids. In some keys (e.g. Townes *et al.*, 1961) great reliance has been placed upon the propodeal carination for separating *Platylabus* from related genera such as *Pristoceros*. The presence or absence of a carina separating the area externa from the area dentipara is not a reliable character, even at species level. Although most *Platylabus* lack this carina and most *Pristiceros* have it there are exceptions to both in Australia.

Australian species. *Platylabus altitudinis* Turner (E). I have seen 14 additional undescribed species (ANIC; BMNH; TC).

The majority of species occur in the south and west. Very few species seem to occur in Queensland and I have seen none from the tropical north.

Host records. None from Australia but in Europe species of this genus are apparently restricted to Geometridae and Drepanidae (Perkins, 1959).

PRISTICEROS Gravenhorst*

Pristiceros Gravenhorst, 1829*a*: 635. Type-species: *Pristiceros serrarius* Gravenhorst, by monotypy.
Neopristiceros Heinrich, 1961: 13. Type-species: *Ichneumon lascivus* Cresson, by original designation.

Pristicerops Heinrich, 1962: 786. Type-species: *Platylabus bakeri* Davis, by original designation.

Moderately large species, fore wing length 13-14 mm; clypeus separated from face by a groove, slightly convex with margin truncate, 1.7-1.8 times as broad as long; mandible slender, barely twisted 10°, upper tooth conspicuously the longer; malar space 0.6-0.7 times as long as basal mandibular width. Genal and hypostomal carinae meeting above base of mandible. Head in dorsal view slightly narrowed behind eyes. Flagellum setaceous, with a pale median band, that of ♀ flattened beneath, that of ♂ with tyloids on about segments 13-20, distal segments distinctly serrate.

Mesoscutum convex, punctate, with short distinct notauli; scutellum convex, laterally carinate about 0.8 of its length; metanotum without a lateral triangular protuberance opposite propodeal spiracle (Fig. 335). Propodeum abruptly declivous beyond centre; spiracles elliptical; area superomedia almost square, raised, areae externa and dentipara separated by very weak carina; apophyses strong.

Legs unspecialized; tarsal claws simple. Fore wing with *2r-m* and *3r-m* convergent anteriorly but not touching.

Gaster relatively short, bluntly rounded posteriorly; tergite 1 flattened so that petiole is broader than high at anterior 0.2; gastrocoeli strong, separated across midline by 1.6 times width of one, remainder of tergite 2 coarsely, closely punctate. Ovipositor projecting beyond apex of gaster by 0.1 times length of hind tibia; ♀ subgenital plate transverse, hind margin convex and with a median prominence bearing a tuft of long hairs; ♂ subgenital plate small, evenly hirsute.

Remarks. I am not certain that the two Tasmanian species here included in *Pristiceros* are correctly place, but with only limited material at hand and, given the rather arbitrary nature of the platylabine genera, they seem, at least temporarily better placed here than in any other genus. The European and Asian species of *Pristiceros* I have examined (including *P. serrarius*) all have a large triangular protuberance present on the hind edge of the metanotum opposite the propodeal spiracles. This structure is absent in the Australian species; however, they resemble typical *Pristiceros* in having serrate male antenna with distinct tyloids, similarly sculptured gasters and similar female subgenital plates.

Australian species. Two, undescribed (BMNH).

Host records. *Pristiceros* sp. 2 - Geometridae: *Mnesampela privata* (Guenée) (BMNH).

Tribe PROTICHNEUMONINI*
(= Ichneumonini sensu Townes)

This large tribe of generally quite large ichneumonines is widely distributed throughout the world. Protichneumonines are most easily recognized by the characteristic propodeum which resembles that of the Trogini, a tribe not represented in Australia. In protichneumonines the propodeal 'boss' is formed from the entire area superomedia and the strongest carinae radiating back from it are the ones separating the area dentipara from the areae postero-externa. In trogines the propodeal 'boss' is formed from the anterior rim of the area superomedia and the area is open posteriorly and confluent with the area petiolaris which is delineated laterally by carinae which are stronger than those separating the areae dentipara and postero-externa.

Thirteen genera of protichneumonines are recorded from the Oriental region. One species of *Coelichneumon* (= *Aglaojoppa*), *C. iridipennis* Cameron, has been recorded from Australia (Morley, 1915*b*) but this is an Indian species and does not occur in the Australian region. None of the other twelve genera has been recorded from east of Weber's Line. A number of species of a new genus, *Yeppoona*, occur in Australia and New Guinea.

YEPPOONA gen. n.

Type-species: *Yeppoona grandis* sp. n.

Moderately large to large species, fore wing length 13-16 mm; clypeus flat, separated from face by weak groove, its margin transversely truncate, sharp; mandible moderately long and slender, twisted about 20°, with upper tooth about 2.0 times as long as the lower; malar space 0.5-0.6 times basal mandibular width. Genal carina joining hypostomal carina above base of mandible. Flagellum setaceous, without a white band, that of ♀ distally flattened below, that of ♂ without tyloids, with segments slightly swollen centrally.

Mesoscutum polished, closely punctate, notauli vestigial, anterior margin of scutum slightly flattened; scutellum convex, without lateral carinae; speculum smooth. Propodeum in profile pyramidal (Fig. 340), with spiracles elliptical; area superomedia reduced to a lenticular boss on 'summit' of propodeum, with posterior transverse carina extending back and curving out, lateromedian carinae obsolescent and other carinae absent (Fig. 341).

Legs unspecialized; tarsal claws simple. Fore wing with 2*r-m* and 3*r-m* touching anteriorly, areolet pointed above.

Gaster with tergite 1 stout, strongly and abruptly broadened posteriorly, dorsally without distinct carinae; gastrocoeli obsolescent, close to anterior margin of tergite; tergite 2 punctate; sternites 2-4 evenly sclerotized without a median longitudinal fold or membranous area (though in some specimens the sternites may crumple as the insect dries). Ovipositor sheath short, barely projecting beyond apex of gaster; ♀ subgenital plate large, triangular, reaching to apex of gaster, evenly hirsute; ♂ subgenital plate large, quadrate, evenly hirsute.

Etymology. From Yeppoon, the type-locality. Feminine.

Remarks. This Australian and New Guinean genus is close to the Nearctic *Catadelphus* but the petiole is more convex dorsally and it lacks the large gastrocoeli so prominent in other protichneumonine genera.

Australian species. I have seen five undescribed species, one from Papua New Guinea (TC) and four from Australia (ANIC; BMNH; QM; TC). Very little material is at hand and it is possible that the two Australian 'species' represented by males may be a single species and that one of the females, though quite different, is the female of that species. The other female is clearly distinct. Thus the number of Australian species could be only two, but it was thought unwise to suggest sex associations on the meagre material available. The type-species is described from two males. Two of the other three Australian 'species' are represented by single specimens. All are from Queensland.

Yeppoona grandis sp. n.

Fore wing length 14-15 mm; face punctate; epomia weak; meso- and metapleurae sparsely punctate.

Head yellow, frons centrally, vertex broadly posteriorly blackish; scape infuscate dorsally, flagellum black. Alitrunk and gaster dark brown; pronotum anteriorly and posterodorsally, mesoscutal stripes, tegula, subalar prominence, axilla in part, upper corner of epicnemium, most of fore and mid leg yellowish. Wings weakly infumate, pterostigma brownish.

The only species with this colour pattern. The male of the other 'species' is similar but extensively yellow-marked whilst both females are almost entirely yellow and one has patterned wings.

Material examined

Holotype ♂, Queensland: Yeppoon, x.1924 (QM).

Paratype. Queensland: 1 ♂, Mackay, 1909 (BMNH).

Host records. None from Australia. In other regions protichneumonines parasitize a variety of Heterocera, especially Sphingidae.

SUBFAMILY EUCEROTINAE

The Eucerotinae is a very small subfamily of Ichneumonidae containing only a single cosmopolitan genus, *Euceros*. The group was recently revised by Barron (1976; 1978) who recognized seven Australian species. I have seen two additional, undescribed species, one of which is very unusual in having a well-developed ovipositor. It is possible that this species warrants generic distinction, but as there is only a single specimen at hand, I have refrained from taking this action.

DIAGNOSIS

Small to medium-sized species, fore wing length 4-10 mm. Clypeus usually with margin blunt; mandible bidentate, teeth generally of similar length; occipital carina complete, reaching base of mandible without joining hypostomal carina first. Flagellum, especially that of male, broadened and flattened centrally. Pronotum mediodorsally with an indented raised flange (Fig. 76); notauli present, often strongly impressed; propodeum usually with at least one transverse carina. Fore tibia without a distinct tooth on apical margin; tarsal claws simple or pectinate. Fore wing with *3r-m* entirely absent; hind wing with first abscissa of *Rs* longer than *r-m*; first abscissa of Cu_1 longer than *cu-a* and distal abscissa of Cu_1 present. First segment of gaster short and broadly attached to propodeum, petiolar spiracles before the centre; gaster dorsoventrally depressed; ovipositor short and inconspicuous.

In Australia *Euceros* is most likely to be confused with the Ctenopelmatinae or Banchini. Neither of the latter two taxa has flattened, centrally broadened antennae or a mediodorsal pronotal flange. Banchini have tridentate mandibles and Ctenopelmatinae have a strong tooth on the outer distal margin of the fore tibia.

The Eucerotinae are distinct from other ichneumonids in having a smooth, narrowly triangular area on the metathorax laterally, defined anteriorly by the mesepimeron and posteriorly by grooves, this area being separate from the swollen area at the anterior end of the pleural carina which is itself unusual in being confluent with the propodeum.

CLASSIFICATION

Euceros has been placed alternately in the Tryphoninae and Ctenopelmatinae (Townes, 1945; 1969; Perkins, 1959). Currently, largely as a result of studies on its immature stages and biology (Finlayson, 1960; Tripp, 1961), most ichneumonid workers favour placing *Euceros* in a separate family. Barron (1976) postulates that it may be the sister-group of Ctenopelmatinae.

DISTRIBUTION

Euceros is represented by relatively few species which are distributed widely throughout the world including Madagascar, New Guinea, Australia and New Zealand. Barron (1978) recognizes four main species-groups, two of which are mainly Old World, a third which contains the majority of species is Nearctic and a fourth contains almost all the Australian species together with the New Zealand and the New Guinean species. Barron suggests the single Neotropical species is related to the Australasian species-group.

The majority of *Euceros* species occur in cool temperate areas, especially in North America where they are particularly numerous in the Canadian boreal and transition zones. In Britain, where four species occur, I have found them to be most common on ericaceous heaths in Scotland. In Australia the majority of species seem to be restricted to Tasmania and the south-eastern mountains.

BIOLOGY

Adult females of *Euceros* have an exceptionally large number of mature oocytes in their ovaries. Iwata (1960) counted up to 5,000 in *E. pruinosus* and Tripp (1961) reported 900 in *E. frigidus*. This high number is related to the unusual and rather hazardous life history of the insect. Tripp (1961) observed that the adult female laid large numbers of stalked eggs on plant tissue in the vicinity of lepidopterous or symphytan larvae. The first larval instar of *Euceros*, a planidium, remained attached to the egg shell. It a suitable caterpillar brushed past, the planidium was observed to transfer its grip to the caterpillar's integument where it eventually took up a position in a fold, often behind a thoracic leg. The planidium managed to maintain its position on successive instars of the carrier-host until it was attached externally to a prepupa. During this period it fed on the carrier-host's haemolymph, but had no observable deliterious effect. The eucerotine larva was unable to develop further than the first instar on the carrier-host and it may well die in the following spring when the carrier-host pupates. However, if a primary endoparasite (such as a campoplegine or banchine) emerges from the carrier-host in spring, the eucerotine planidium leaves the carrier-host remains and enters the body of the ichneumonid larva where it develops to maturity. The planidium will develop equally well in an ectoparasitic ichneumonid larva should the carrier-host be attacked by one (e.g. phygadeuontine).

Adult female eucerotines have atrophied ovipositors (Perkins, 1959), presumably because they lay directly onto a leaf surface. In Australia there is an undescribed species (ANIC) which has a well-developed ovipositor. It would be interesting to know if this species has a similar life history to that described above, or if the ovipositor is used in some other way.

EUCEROS Gravenhorst

Euceros Gravenhorst, 1829*c*: 368. Type-species: *Euceros crassicornis* Gravenhorst (= *Tryphon pruinosus* Gravenhorst), by monotypy.
Eumesius Westwood, 1840: 153. [Unnecessary replacement name.]
Omaloceros Giraud, 1857: 163. [Unnecessary replacement name.]
Tautozelus Foerster, 1869: 212. Type-species: *Euceros egregius* Holmgren (= *Euceros serricornis* Haliday), by subsequent designation, Perkins, 1962: 457.
Pseudasthenara Uchida, 1930: 276. Type-species: *Pseudasthenara rufocincta* Ashmead, by original designation.

Remarks. Barron (1978) described seven species from Australia. The majority are only known from very few specimens but over 100 examples of *E. signicornis* were collected near Bronte Park, Tasmania in January and February.

Australian species. *Euceros annulicornis* Barron (E); *E. croceus* Barron (E); *E. incisurae* Barron (E); *E. maculicornis* Barron (E); *E. melleus* Barron (E); *E. ruficeps* Barron (E); *E. signicornis* Barron (E). I have seen two undescribed species (AM; ANIC).

Host records. *Euceros* sp. - Stenomatidae: *Agriophora* sp. (?carrier-host) (TDF). In the Palaearctic region various Anomaloninae, Banchinae, Campopleginae, Ctenopelmatinae and Phygadeuontinae are the main hosts with lepidopterous or symphytan larvae as carrier-hosts.

SUBFAMILY CTENOPELMATINAE
(= Scolobatinae sensu Townes)

The Ctenopelmatinae is, world-wide, a moderately large subfamily with about 90 genera classified in eight tribes. The majority of species occur in the North Temperate region where, in the spring and early summer, they constitute a large proportion of the total ichneumonid fauna. In the tropics and southern latitudes ctenopelmatines are much scarcer and mostly restricted to montane habitats. Only four genera, *Westwoodia*, *Hypopheltes*, *Megaceria* and *Scolobatina* have been recorded from

Australia (Townes *et al.*, 1961). In the present work eight Australian genera are recognized, five of which, *Austropion*, *Denticeria*, *Dictyopheltes*, *Pergaphaga* and *Tasmabates*, are new. *Scolobatina* is treated as a synonym of *Westwoodia*.

DIAGNOSIS

Small to large ichneumonids, fore wing length 4.5-21 mm. Lower face usually transverse; clypeus fairly flat, most often with margin blunt and slightly concave or transverse; mandible usually large, weakly narrowed and with two well-developed teeth; occipital carina present or absent. Alitrunk stout, from smooth to coarsely sculptured; propodeum short, abruptly rounded with large oval spiracles, and generally without extensive carinae; posterior transverse carina of mesosternum never complete. Fore tibia with a tooth on outer distal margin; tarsal claws not distinctly pectinate. Fore wing with *3r-m* present, or rarely absent, when present, delineating a rhombic areolet. Hind wing with distal abscissa of Cu_1 present. First segment of gaster slender to very stout, with spiracle at or before the centre, or very rarely slightly behind the centre; glymmae present or absent; gaster cylindrical or slightly laterally compressed, generally rather short; female subgenital plate quite large, triangular to rectangular; ovipositor sheath glabrous, with a tuft of hair on distal end, short, barely projecting beyond apex of gaster; ovipositor with a dorsal subapical notch.

The Australian Ctenopelmatinae exhibit a relatively diverse facies, consequently, different taxa are liable to be confused with different subfamilies. *Westwoodia*, *Pergaphaga* and closely related genera may be confused with species of Banchini or Eucerotinae. The large, bidentate mandible differentiates them from banchines, and unlike eucerotines, ctenopelmatines do not have a crest mediodorsally on the pronotum. The nocturnal ctenopelmatines (e.g. some species of *Hypopheltes* and *Megaceria*) are often mixed in collections with the mesochorine *Cidaphus*. *Cidaphus* has a long slender ovipositor without a dorsal notch and the males have elongate genital parameres. Nocturnal ctenopelmatines either have no glymma or both glymmae and a tyloid on flagellar segment 1. *Cidaphus* has a glymma but no tyloids on the first flagellar segment.

CLASSIFICATION

Townes (1970*b*) recognized eight tribes, five of which, Westwoodiini, Ctenopelmatini, Olethrodontini, Pionini and Scolobatini, are quite distinctive. The remaining three, Perilissini, Mesoleiini and Euryproctini, are very large and contain very poorly defined (and hence taxonomically difficult) generic groups. Both Short (1978) and Carlson (1979) comment on the rather unsatisfactory nature of the classification of these insects.

The taxonomic history of the four described Australian genera has been rather confused. Townes *et al.* (1961) placed all but *Megaceria* in the Mesoleiini; *Megaceria* they placed in the Euryproctini. Later, Townes (1970*b*) placed all the Australian genera together in a single tribe, Westwoodiini, which should correctly have been called the Megaceriini (Fitton & Gauld, 1976). Townes' action is the result of having been loaned specimens incorrectly determined as *Megaceria*. His illustration of this genus (1970*b*: fig. 54) shows the type-species of *Pergaphaga*, a new genus described below. The larva figured by Short (1978: fig. 299) is the same species. Study of available Australian material, including the type-specimens of all described species, has revealed that the Megaceriini is a polyphyletic group. *Westwoodia*, *Scolobatina* and *Hypopheltes* share a remarkable series of apomorphic characters including the presence of a large tyloid on the outer side of the first flagellar segment and the development in the male of a large invaginated proctodeal membrane (Fig. 367). *Megaceria* does not have such structures, but has clear affinities with some euryproctine genera such as *Hadrodactylus*. The tyloid on the first flagellar segment and the enlarged proctodeal membrane of the *Westwoodia*-group of genera are characters also found in species of the tribe Scolobatini. Scolobatines are similar to the *Westwoodia*-group in having a very convex propodeum and a simple petiole with membranous epipleura. It would therefore seem logical to place the westwoodiine genera in the Scolobatini. This action necessitates the following changes to the suprageneric nomenclature outlined by Fitton & Gauld (1976):

Tribe 1 Megaceriini (= Westwoodiini sensu Townes, in part). This tribe no longer exists.

Tribe 6 Scolobatini Schmiedeknecht, 1911 (Type-genus: *Scolobates* Gravenhorst) is the correct name for this taxon which now includes as a new synonym Westwoodiini Townes, 1970*b* (Type-genus: *Westwoodia* Brullé).

Tribe 7 Euryproctini Thomson, 1883 (Type-genus: *Euryproctus* Holmgren) is the correct name for this taxon which now includes as a new synonym Megaceriini Szépligeti, 1908*a* (Type-genus: *Megaceria* Szépligeti).

The tribe Pionini is newly recorded from Australia.

DISTRIBUTION

The Ctenopelmatinae are predominantly a North Temperate group, although a few genera do occur south of the equator in the Andes of South America. The Oriental region has very few ctenopelmatines, and most of these occur either in the transitional region between the eastern Palaearctic and Oriental regions (such as the Himalayan foothills) or on mountain tops. Townes *et al.* (1961) list 10 genera from the Orient; all of these are from northern India or Taiwan. I have seen one or two Perilissini from high altitudes in Borneo and Burma.

All the Australian genera are endemic and most are not obviously very closely related to genera occurring in other parts of the world. *Megaceria* seems to be related to the Holarctic genus *Hadrodactylus* and *Austropion* may be related to *Hodostates*, a small genus with one Nearctic and one Palaearctic species. The Scolobatini, to which the westwoodiine group of genera belong, also includes one Neotropical genus, one Nearctic genus and a Holarctic genus, *Scolobates*, which has a few species on the northern periphery of the Oriental region.

BIOLOGY

Most Ctenopelmatinae are endophagous parasites of the larvae of Symphyta, although two species of the widely distributed genus *Lathrolestes* have been reared from Eriocraniidae and *Megaceria* species parasitize Geometridae and Notodontidae. Species of the Ctenopelmatini seem to be restricted to larvae of Pamphiliidae (Barron, 1981). The Scolobatini of the northern hemisphere parasitize larvae of Argidae whilst the Australian genera attack Pergidae. The remaining tribes Perilissini, Pionini, Mesoleiini and Euryproctini attack a variety of tenthredinoids, most usually Tenthredinidae, Diprionidae and, less commonly, Cimbicidae. The Pionini usually attack very young larvae or even oviposit into sawfly eggs. As a consequence pionines tend to have more mature ovarian eggs than other ctenopelmatines, 25-30 as opposed to 7-20 (Iwata, 1960).

Little is known of the life history of ctenopelmatines, but that of *Mesoleius tenthredinidis* Morley, as investigated by Graham (1953), serves as a typical example. This species oviposits in mature exposed larvae of *Pristiphora* (Tenthredinidae), usually through the posterior ventral surface. The usually single egg is free in the haemocoel and hatches within a few days to give a first instar larva that has a short caudal appendage and a relatively large head with conspicuous hooked mandibles. Most individuals overwinter as first instar larvae within the hibernating host larva in the cocoon. The subsequent two larval instars are of short duration and, having consumed its host, the ichneumonid pupates within the host cocoon.

The final instar larva has a rather generalized endoparasitic type of head capsule with weak epistomal arch, simple mandibles, moderately long hypostomal spur, long hypostoma and semicircular labial sclerite (Fig. 368) (Short, 1978). The spiracle is distinctive in having a relatively long, thin-walled closing apparatus very close to the atrium.

A few ctenopelmatines are nocturnal. These often unrelated species tend to look similar and have a pronounced ophionoid facies (Gauld & Huddleston, 1976) with large eyes and ocelli, long appendages and a uniformly yellowish brown colour.

KEY TO GENERA OF CTENOPELMATINAE OCCURRING IN AUSTRALIA

1 Tergite 1 of gaster with a pair of strongly developed lateromedian carinae which extend 0.8 times length of segment; propodeum with area superomedia distinctly delineated (Fig. 361). (Pionini)....... ....*AUSTROPION* (p. 228)

\- Tergite 1 of gaster at most with weak lateromedian carina extending less than 0.4 times length of tergite, usually without carinae; propodeum usually without a distinct area superomedia (Figs 357, 358).........2

2 Flagellum with first segment 1.7 or more times as long as second, without a trace of tyloid on outer side; first subdiscal cell strongly explanate distally (Fig. 366). (Euryproctini)....................3

\- Flagellum with first segment 1.2 or less times as long as second, with a distinct tyloid on outer side near base (Fig. 359); first subdiscal cell not, or only weakly explanate distally (Fig. 365). (Scolobatini)..4

3 Gaster with tergite 1 short and stout, less than 2.0 times as long as posteriorly broad; sternite 1 not reaching to level of spiracle (Fig. 352); tergite 3 with laterotergite separated by a crease.*DENTICERIA* (p. 234)

\- Gaster with tergite 1 slender, more than 3.0 times as long as posteriorly broad; sternite 1 reaching behind level of spiracles (Fig. 353); tergite 3 with laterotergite not separated...............*MEGACERIA* (p. 235)

4 Pterostigma broad, emitting *Rs+2r* from centre (Fig. 364); hind wing with first abscissa of Cu_1 longer than *cu-a*; occipital carina absent..*TASMABATES* (p. 232)

\- Pterostigma narrow, emitting *Rs+2r* from near proximal end (Fig. 365); hind wing with first abscissa of Cu_1 shorter than *cu-a*; occipital carina more or less complete...5

5 Notaulus not reaching to anterior margin of mesoscutum (Fig. 554); propodeum uniformly coarsely wrinkled-reticulate (Fig. 356)........ ....*DICTYOPHELTES* (p. 229)

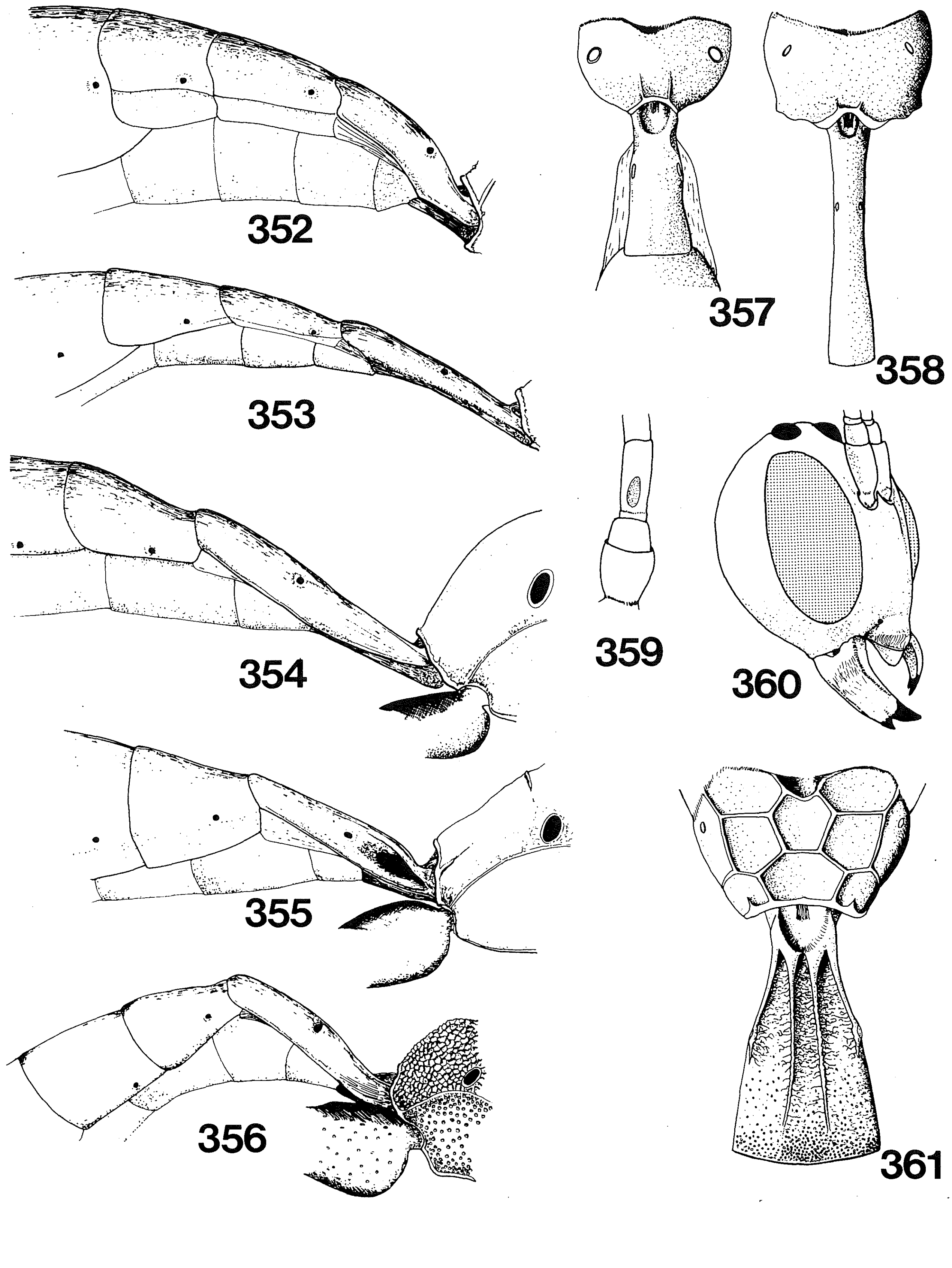
\- Notaulus reaching to anterior margin of mesoscutum; propodeum smooth or finely coriaceous, with or without carinae.............................6

6 Sternite 1 very short, barely longer than broad and not reaching 0.3 of distance to petiolar spiracle; tergite 1 less than 2.3 times as long as posteriorly broad, with a membranous epipleuron projecting laterally; propodeum and mesoscutum smooth and highly polished (Fig. 357)...*WESTWOODIA* (p. 233)

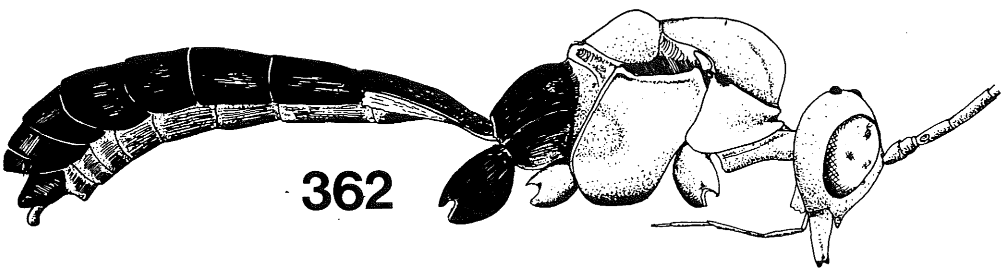
\- Sternite 1 reaching at least 0.5 of distance to petiolar spiracle; tergite 1 more than 2.5 times as long as posteriorly broad, with epipleuron narrow; propodeum and mesoscutum not both smooth and highly polished...7

7 Tergite 1 with large glymmae; tergite 2 with laterotergite broad, slightly in-turned, not separated by a sharp crease (Fig. 355)..... ....*HYPOPHELTES* (p. 230)

\- Tergite 1 without glymmae; tergite 2 with laterotergite narrow, folded under and separated from tergite by a sharp crease (Fig. 354)...*PERGAPHAGA* (p. 231)



Figs 352-361 Ctenopelmatinae. 352-356 Anterior end of gasters, lateral (352) *Denticeria cardaleae* (353) *Megaceria* (354) *Pergaphaga nigra* (355) *Hypopheltes* (356) *Dictyopheltes*. 357-358 Propodeum and tergite 1, dorsal (357) *Westwoodia ruficeps* (358) *Megaceria*. 359 *Westwoodia*, base of antenna. 360-361 *Austropion mandibularis* (360) head, anterolateral (361) propodeum and tergite 1, dorsal.



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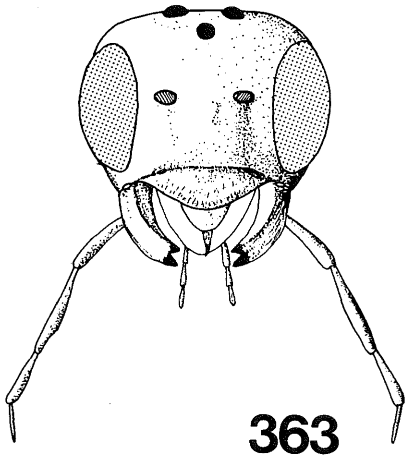

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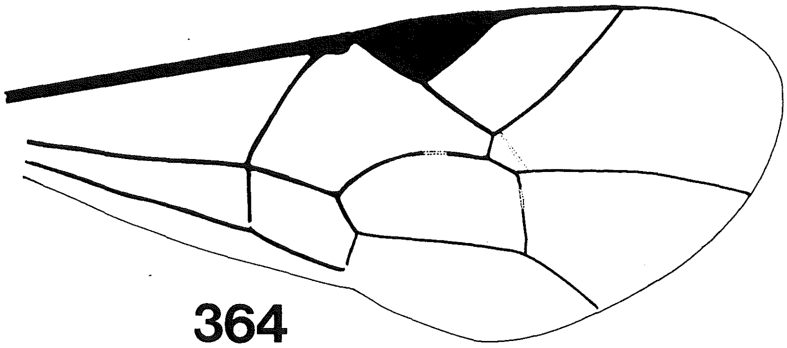

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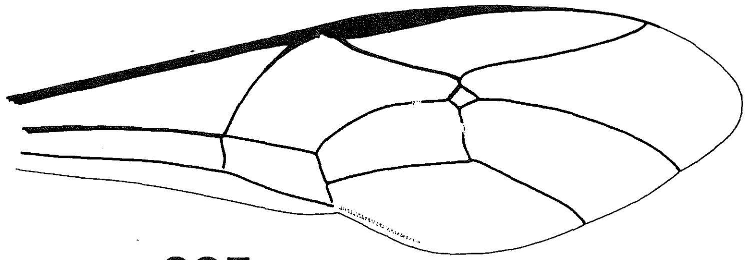

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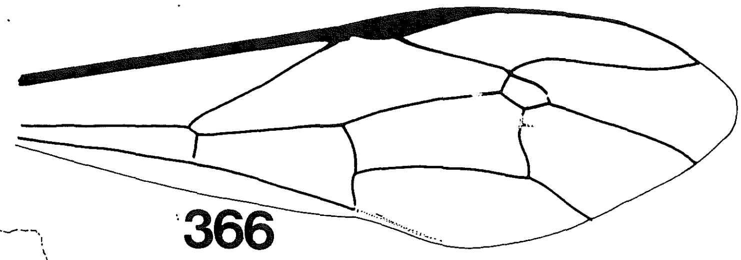

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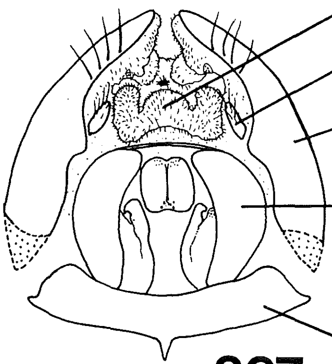

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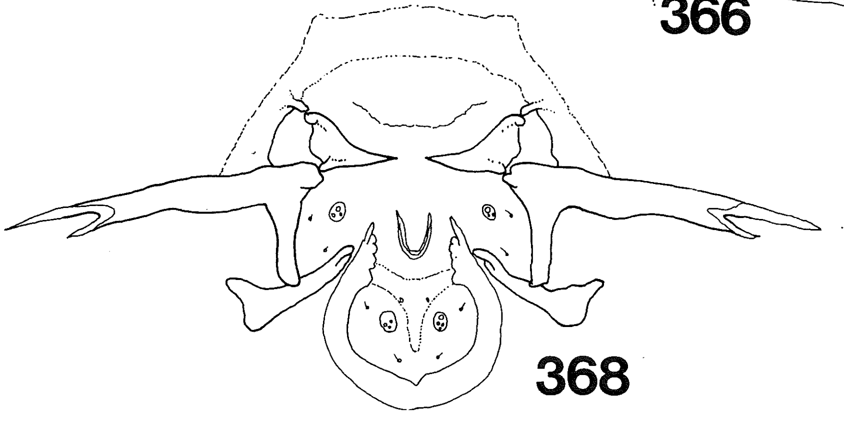

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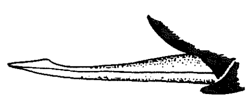

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Figs 362-369 Ctenopelmatinae. 362-363 *Tasmabates capitatus* (362) head and body, lateral (363) head, anterior. 364-366 Fore wings (364) *Tasmabates capitatus* (365) *Westwoodia ruficeps* (366) *Megaceria*. 367 Posterior aspect of gaster, *Pergaphaga* ♂. Ce = cercus; Gsq = gonosquama; PM = proctodeal membrane; Stg = syntergite; S_8 = subgenital plate, sternite 8 of gaster. 368 Cephalic capsule of final instar larva, *Pergaphaga nigra*. 369 Ovipositor, *Austropion mandibularis*.

Tribe PIONINI*

Pionines are characterized by their complete propodeal carination and characteristic first tergite. Many species (though not the Australian one) have very slender ovipositors. Pionini is a moderate-sized tribe with 17 recognized genera. The majority of species occur in the Holarctic region but several are restricted to Chile; a few species are found in the Afrotropical and Oriental regions. A single genus, *Austropion*, occurs in Australia.

AUSTROPION gen. n.

Type-species: *Austropion mandibularis* sp. n.

Lower face broad, the inner margins of the eyes slightly divergent ventrally; clypeus small, transverse, in profile weakly convex with margin flat, almost truncate. Mandible long, weakly and evenly tapered, the upper tooth conspicuously the longer (Fig. 360). Flagellum of moderate length, the first segment about 1.2 times the length of the second, without a tyloid. Occipital carina dorsally complete, ventrally obsolescent.

Notaulus weak; epicnemial carina reaching virtually to front edge of mesopleuron. Propodeum completely areolated, area superomedia distinct, longer than broad (Fig. 361).

Distal outer margin of fore tibia with a strongly developed tooth; hind tibia with spurs short, barely longer than distal breadth of tibia and less than 0.25 times length of basitarsus; claws long, weakly curved, simple.

Fore wing with pterostigma stout, emitting *Rs+2r* from near its centre; *cu-a* distal to base of *Rs&M*, oblique so that upper inner corner of first subdiscal cell is about 50°; areolet present, petiolate, with *2m-cu* joining at most opposite *3r-m*. Hind wing with first abscissa of Cu_1 conspicuously longer than *cu-a*.

Gaster with tergite 1 quite long and evenly broadened so it is about 0.4 times as broad posteriorly as it is long; tergite 1 with a pair of lateromedian carinae extending about 0.8 times length of tergite, the surface fairly rugose near carinae; glymmae small but very strong, near proximal end of tergite; sternite 1 not reaching to level of spiracles which are situated just before centre of segment. Tergite 2 onwards finely and sparsely punctate. Ovipositor straight, short, not longer than apical gastral depth, with a broad shallow dorsal subapical notch; apex of ovipositor acute, not very slender (Fig. 369).

Male unknown.

Etymology. *Austro* + *Pion* (the type-genus of the tribe). Masculine.

Remarks. This is a rather aberrant member of the Pionini as it does not have a needle-like ovipositor. However, the propodeum and tergite 1 are very like those of many other pionines. The ovipositor of *A. mandibularis* resembles that of species of *Hodostates*. The two genera also have similar venation. *Austropion* differs from *Hodostates* in having very short tibial spurs and having longer mandibles with an elongate upper tooth.

Australian species. One, described below.

Austropion mandibularis sp. n.

Female: fore wing length 7 mm; lower face strongly and evenly punctate, transverse, polished; malar space 0.6 times basal mandibular width. Scape about as long as segment 2 of flagellum, apically almost transversely truncated. Pro- and mesothorax and metanotum polished, regularly punctate. Mid and hind tibiae slightly compressed. Propodeal carinae as in Fig. 361. Tergite 1 of gaster polished but extensively rugose except near hind end; tergites 2+ smooth and highly polished, sparsely punctate.

Black species; antenna, fore and mid legs entirely orange; clypeal margin, mandible, hind leg, tergites 1 and 2 and anterior margin of tergite 3 orange-brown. Pterostigma black; wings hyaline.

Male unknown.

Material examined
Holotype ♀, Queensland: Brisbane, xi.1972 *(Sedlacek)* (TC).

Host records. None.

Tribe SCOLOBATINI*

This tribe is characterized by the possession of a tyloid on the short first flagellar segment, the enlarged, invaginated proctodeal membrane of the male (Fig. 367), the membranous epipleuron of tergite 1 and the simple, convex propodeum. It contains eight genera, five of which, *Dictyopheltes*, *Hypopheltes*, *Pergaphaga*, *Tasmabates* and *Westwoodia*, are endemic to Australia. Until now the species of these genera have been confused and the generic limits improperly recognized. I have therefore given a longer than usual diagnosis of the previously described genera.

DICTYOPHELTES gen. n.

Type-species: *Dictyopheltes robustus* sp. n.

Moderately large insects, fore wing length 10-13 mm; lower face strongly transverse, inner margins of eye subparallel; clypeus in profile slightly out-turned, in anterior aspect with margin blunt, truncate; mandible stout, long, with lower tooth distinctly the longer; malar space from 0.6-1.1 times basal mandibular width. Flagellum long, very slender; first segment about 0.9 times as long as the second, with a distinct tyloid on outer side at base; frons with concavities above antennal sockets, with a median protuberance. Occipital carina complete, joining hypostomal carina above base of mandible.

Notauli very weak to strong, extending from a level of hind edges of tegulae forward, but not reaching to anterior margin of mesoscutum (Fig. 554); alitrunk generally rather strongly punctate; epicnemial carina reaching above level of lower corner of pronotum, not reaching to anterior margin of pleuron; scutellum convex, without lateral carinae; propodeum short and convex, dorsally without distinct carinae, uniformly closely wrinkled-reticulate (Fig. 356).

Hind tibial spurs short, subequal, the longer spur less than breadth of tibial apex; claws simple.

Fore wing with pterostigma narrow, emitting *Rs+2r* close to proximal end; *cu-a* almost opposite base of *Rs&M*, vertical; areolet complete, petiolate, or with *3r-m* absent, if present, slightly longer than *2r-m*; marginal cell slender; first subdiscal cell distally not explanate. Hind wing with first abscissa of Cu_1 slightly shorter than *cu-a*.

Tergite 1 of gaster broad, less than 2.0 times as long as posteriorly broad, with spiracles at or before centre; sternite 1 short, reaching at most 0.5 of distance to spiracles; glymmae absent; epipleuron 1 membranous, narrow; tergite 2 with laterotergite narrow, folded under and separated from tergite by a sharp crease; tergite 3 usually without a crease separating off laterotergite. Ovipositor short; ♀ subgenital plate moderately large, almost triangular in profile.

Etymology. *Dictyos* (a net, referring to the propodeal sculpture) + *Opheltes* (a related genus). Masculine.

Remarks. A distinctive genus on account of the strongly sculptured propodeum and anteriorly incomplete notauli.

Australian species. I have seen three undescribed species, two from Queensland (ANIC) and a third from Victoria and Western Australia (BMNH); one, the type-species, is described below.

Dictyophe1tes robustus sp. n.

Female unknown.

Male: fore wing length 10.5 mm. Head uniformly closely punctate; outer surface of mandible punctate, hirsute, with a strong basal concavity; malar space 0.6 times as long as basal mandibular width; frons with a weak median protuberance between antennal sockets. Pronotum, mesoscutum, mesopleuron punctate; scutellum sparsely punctate. Propodeum with pleural carina complete. Hind basitarsus 0.35 times length of tibia, fourth tarsal segment slightly longer than broad, not laterally compressed. Fore wing with *3r-m* present, enclosing a rhombic petiolate areolet. Gaster smooth, polished, without obvious sculpture.

Black species; scape, pedicel and anellus yellow; tegula, legs except hind coxa reddish yellow; tergites 4+ orange. Wings slightly infumate, especially along anterior margins.

Material examined

Holotype ♂, Queensland: Biggenden, Bluff Range, 1-19.xii.1971 *(Frauca)* (ANIC).

Host records. *Dictyopheltes* sp. 2 - Pergidae: *Perga leaski* Benson (BMNH).

HYPOPHELTES Cushman

Hypopheltes Cushman, 1924: 11. Type-species: *Hypopheltes pergae* Cushman, by original designation.

Moderately large to very large species, fore wing length 14-21 mm; lower face transverse, inner margins of eyes ventrally divergent; clypeus in profile outflared, in anterior aspect with margin truncate or slightly concave, blunt; mandible long with lower tooth slightly the longer; malar space 0.2-0.6 times basal mandibular width. Flagellum long and slender; first flagellar segment subequal to second, with a distinct tyloid at base on outer side; frons above antennae concave, with median vertical carina or lamella. Occipital carina complete, joining hypostomal carina above base of mandible.

Notauli long and strong, reaching from anterior margin of mesoscutum to level of hind edges of tegulae; epicnemial carina reaching above level of lower corner of pronotum, not reaching to anterior margin of pleuron; scutellum convex, without lateral carina; propodeum short, evenly rounded, with or without anterior transverse carina.

Hind tibia with spurs unequal, the longer about 1.6 times length of the shorter, slightly to conspicuously longer than apical breadth of tibia; claws simple.

Fore wing with pterostigma narrow, emitting *Rs+2r* from near proximal end; *cu-a* opposite or distal to base of *Rs&M*, almost vertical; areolet complete, pentagonal or rhombic and petiolate; *3r-m* always slightly longer than *2r-m*; marginal cell relatively slender; first subdiscal cell not distally explanate. Hind wing with first abscissa of Cu_1 slightly shorter than *cu-a*.

Tergite 1 of gaster quite long, more than 2.0 times as long as posteriorly broad, with spiracle slightly before centre; sternite reaching 0.5 or more of distance to spiracle; glymma present, large (Fig. 355); epipleuron 1 membranous, not projecting conspicuously laterally; laterotergite 2 slightly turned inwards ventrally (but not turned under) with a crease only on anterior 0.5 and then crease weak; tergite 3 without any crease separating laterotergite. Subgenital plate large, almost triangular in profile.

Remarks. This genus appears to be related to *Pergaphaga* but is easily distinguished by the large glymmae.

Australian species. *Hypopheltes pergae* Cushman (E) and one undescribed species from Victoria (BMNH).

Host records. *H. pergae* - Pergidae: *Perga* sp. (Cushman, 1924). *Hypopheltes* sp. - Pergidae: *Pseudoperga belinda* Kirby (BMNH).

PERGAPHAGA gen. n.

[*Megaceria* Szépligeti; Townes, 1970*b*: 57. Misidentification.]
[*Megaceria* Szépligeti; Short, 1978: 64. Misidentification.]
Type-species: *Pergaphaga nigra* sp. n.

Moderately large to large species, fore wing length 11-17 mm; lower face short, transverse, the inner margins of eyes parallel or slightly convergent; clypeus transverse, flat, the apical margin truncate or concave, blunt; mandible large, long, with teeth about equal; malar space 0.5-0.7 times basal mandibular width. Flagellum quite long; first flagellar segment about equal to second, with a distinct oval tyloid on outer side at base; frons concave above antennal sockets, often with a median vertical crest. Occipital carina complete, reaching hypostomal carina before base of mandible.

Notaulus moderately to strongly impressed, reaching from anterior margin of mesoscutum to level of centres of tegulae; mesoscutum in profile evenly rounded, rather closely punctate; epicnemial carina present, reaching above level of lower corner of pronotum, inclined to but not reaching anterior margin of pleuron; scutellum convex to pyramidal, without lateral carinae. Propodeum convex, short; carinae present anteriorly or absent, if absent propodeum is irregularly coriaceous.

Hind tibia with spurs short, barely longer than apical tibial breadth and less than 0.2 times length of basitarsus; claws long, strongly curved, simple.

Fore wing with pterostigma slender, emitting *Rs+2r* from near proximal end; *cu-a* opposite or distal to *Rs&M*, almost vertical so that upper inner corner of first subdiscal cell is about 75°; areolet present or absent, if present then petiolate above; marginal cell quite narrow; first subdiscal cell not or only slightly explanate distally. Hind wing with first abscissa of Cu_1 shorter than *cu-a*.

Gaster with tergite 1 quite long and slender, 2.2 or more times as long as posteriorly broad; sternite 1 generally reaching to spiracle; glymma absent (Fig. 354); petiolar spiracle prominent, situated slightly behind centre of segment; epipleuron 1 narrow, almost concealed; tergite 2 with laterotergite folded under, separated from tergite by crease; tergite 3 similar. ♀ with subgenital plate almost triangular in profile; ♂ subgenital plate transverse, entire.

Etymology. *Perga* (from the sawfly genus) + *phaga* (to eat). Feminine.

Remarks. The rather slender petiole which lacks glymmae is superficially similar to that of *Megaceria* and this has probably led to the confusion of the two genera. *Pergaphaga* is easily distinguished from *Megaceria* by the characters given in couplet 2 of the key. *Pergaphaga* is most closely related to *Hypopheltes*.

Australian species. I have seen four undescribed species, all from the south-east of Australia (ANIC; BMNH; QM). One, the type-species, is described below.

Pergaphaga nigra sp. n.

Female: fore wing length 13-17 mm; lower face coarsely and closely punctate; malar space 0.7 times basal mandibular width; frons with a median vertical crest reaching between antennal bases. Genae inflated; interocellar distance 0.7 times orbital-ocellar distance; vertex finely punctate, upper part of gena with few punctures, becoming more closely punctate ventrally. Flagellum with 43-45 segments.

Mesoscutum punctate, mesopleuron more finely so dorsally, ventrally becoming more coarsely sculptured. Anterior transverse carina of propodeum present laterally; lateromedian carina vestigial; pleural carina complete.

Fore tibia swollen, slightly flattened; mid and hind coxae coarsely punctate.
Fore wing with areolet present, broad, rhombic and petiolate above.
Gaster with all tergites polished, finely punctate; terminal segments laterally compressed.

Black species; femora reddish; fore tibia and tarsus yellowish white; mid and hind tibiae red-brown with proximal pale band, the basitarsi similar; distal hind tarsal segments blackish brown; posterior margin of gastral tergite yellow, intersegmental membranes yellowish white. Wings slightly infumate; pterostigma black.

Male: similar to female except terminal segments of gaster cylindrical or slightly depressed.

P. nigra differs from the other three species of this genus in having a black rather than a red gaster and in having a broad rather than narrow areolet. The majority of specimens were taken late in the season, March to June being the most common months of occurrence.

Material examined
Holotype ♀, New South Wales: Murrumbateman, ex *Perga* cocoon, col. iii.1973, em. iii.1974 *(McInnes)* (ANIC).

Paratypes. Australian Capital Territory: 1 ♀, Canberra, v.1959 *(Carne)* (ANIC); 2 ♂, Duntroon, v.1959 (ANIC). New South Wales: 2 ♀, Avoca, vi.1957, ex symphytan on *Eucalyptus (Leask)* (BMNH) (one of these specimens has been labelled 'generic drawing' by Townes); 1 ♂, Cookardinia, ii.1960 (BMNH); 16 ♀, 15 ♂, Murrumbateman, ex *Perga* cocoon, col. iii.1973, em. iii.1974 *(McInnes)* (ANIC). South Australia: 2 ♀, no further data (BMNH).

Host records. *P. nigra* - Pergidae: *Perga* sp. (ANIC); *Perga affinis* Kirby (ANIC; BMNH). *Pergaphaga* sp. 1 - Pergidae: *Pergagrapta gravenhorstii* (Westwood)(BMNH); *P. bella* Newman (TDF).

TASMABATES gen. n.

Type-species: *Tasmabates capitatus* sp. n.

Lower face short, strongly transverse, the inner margins of eyes almost parallel (Fig. 363); clypeus transverse, in profile flared outwards, with apical margin blunt; margin in anterior aspect slightly convex; mandible large, long, evenly tapered, with lower tooth slightly the longer; maxillary palp unusually long, reaching back to mid coxa. Flagellum of moderate length; first flagellar segment 0.9 times as long as the second, with an oval tyloid on outer side near base. Occipital carina completely absent.

Notaulus short, weakly impressed; mesoscutum in profile anteriorly abruptly rounded, having a humped appearance; epicnemial carina absent (Fig. 362). Scutellum almost pyramidal, without lateral carinae. Propodeum smooth, without any trace of carinae.

Hind tibia with spurs slightly longer than apical breadth of tibia and about 0.25 times length of basitarsus; claws moderately long, weakly curved, simple.

Fore wing with a stout pterostigma, with *Rs+2r* arising from near centre; *cu-a* opposite to base of *Rs&M*, subvertical so that upper inner corner of first subdiscal cell is about 75° (Fig. 364); areolet present, sessile, with *3r-m* weakly pigmented; marginal cell quite short and deep. Hind wing with distal abscissa of Cu_1 complete; first abscissa of Cu_1 longer than *cu-a*.

Gaster with tergite 1 long, quite slender, broadened posteriorly so that it is about 0.35 times as broad posteriorly as it is long; spiracles prominent, slightly before the centre; sternite 1 very short, not reaching 0.5 of distance to spiracles; glymma small, deep; all tergites including the first smooth, without obvious coarse sculpture; epipleuron 1 broad, membranous. ♂ subgenital plate short, posteriorly concave. ♀ unknown.

Etymology. *Tasma* (from Tasmania) + *bates* (from *Scolobates*, the type-genus of the tribe). Masculine.

Remarks. This distinctive genus does not appear to be closely related to other Australian Scolobatini. It differs in general body shape and in having a much stouter pterostigma, the first abscissa of Cu_1 longer than *cu-a*, a lenticular head without an occipital carina, and more slender mandibles. In most features of body shape and venation *Tasmabates* is more like the Neotropical genus *Physotarsus*, though in *Physotarsus* the occipital carina is complete and the claws are pectinate.

Australian species. One, described below.

Tasmabates capitatus sp. n.

Female unknown.

Male: fore wing length 4.5 mm; lower face sparsely punctate, polished; clypeus with scattered stout hairs; malar space 0.3 times as long as basal mandibular width. Scape shorter than second flagellar segment, apically truncate at about 20° from transverse; flagellum with 23 segments, the proximal ones equally long.

Mesoscutum, mesopleuron and metapleuron smooth, polished with inconspicuous punctures. Propodeum convex, smooth and highly polished, without carinae. Gaster highly polished.

Black species; marks above eyes, most of face, clypeus and mandibles, alitrunk except for propodeum and metapleuron, fore leg except for trochanter and trochantellus, and most of hind leg orange; epipleuron of tergite 1 white. Pterostigma blackish; wings infumate.

Material examined
Holotype ♂, Tasmania: Mt Barrow, 1200 m, 10-25.i. (TC).

WESTWOODIA Brullé

Westwoodia Brullé, 1846: 126. Type-species: *Westwoodia ruficeps* Brullé, by monotypy.
Scolobatina Roman, 1915: 4. Type-species: *Scolobatina ruficeps* Roman (= *Westwoodia longipes* nom. n.), by monotypy. Syn. n.

Medium-sized to moderately large species, fore wing length 10-16 mm; lower face transverse, the inner margins of the eyes subparallel; clypeus in profile weakly out-turned, margin in anterior aspect truncate, blunt; mandible stout, long, barely tapered, with teeth subequal; malar space about equal to basal mandibular width. Flagellum long and relatively slender;first segment about as long as second, with a tyloid on outer side at base (Fig. 359); frons with concavities above antennal sockets, and with a median vertical lamella or V-shaped carina. Occipital carina complete or indistinct dorsally, joining hypostomal carina above base of mandible.

Notauli short, very deeply impressed to anterior margin of mesoscutum; alitrunk highly polished with very inconspicuous punctures; epicnemial carina reaching above level of lower corner of pronotum, not reaching anterior margin of pleuron; scutellum convex, without lateral carinae; propodeum short, abruptly declivous, smooth, without carina.

Tarsi strongly flattened, sometimes with plantar lobes projecting apically; mid and hind tibial spurs short, not longer than apical breadth of tibia; claws simple.

Fore wing with pterostigma narrow, emitting *Rs+2r* close to proximal end; *cu-a* more or less opposite *Rs&M*, almost vertical; areolet usually complete (Fig. 365), shortly petiolate, with *3r-m* only slightly longer than *2r-m*, or with *2r-m* absent; marginal cell slender; first subdiscal cell not explanate distally. Hind wing with first abscissa of Cu_1 slightly shorter than *cu-a*; distal abscissa of Cu_1 strong.

Tergite 1 of gaster broad, less than 2.0 times as long as posteriorly broad, with spiracles slightly before the centre; sternite 1 short, reaching only 0.25 of distance to spiracle; glymma present but small; epipleuron 1 broad and membranous, projecting laterally (Fig. 367); tergite 2 with laterotergite neither folded under nor separated by a sharp crease for entire length; tergite 3 similar. Ovipositor short, subgenital plate large, triangular in profile.

Remarks. I have seen four species of this genus. *W. ruficeps* is unusual in having short tarsi with well-developed plantar lobes. *W. longipes* is exceptional in this subfamily in only having a single intercubital vein (?3*r-m*) distal to 2*m-cu*.

Females of *W. ruficeps* (the only species I have dissected) have large, ellipsoidal eggs which are almost 0.6 times the length of the ovipositor. The female dissected had 109 mature eggs in her gaster. To facilitate laying such large eggs, the upper valve of the ovipositor has a very long subapical notch.

I have seen *Westwoodia* species from all states except Northern Territory.

Australian species. *Westwoodia ruficeps* Brullé (E); *W. longipes* nom. n. (E) (= *ruficeps* Roman, a junior secondary homonym of *ruficeps* Brullé). I have seen one undescribed species from Western Australia (QM) and a second from Victoria (BMNH).

Host records. *W. ruficeps* - Pergidae: *Pseudoperga* sp. (BMNH).

Tribe EURYPROCTINI

The Euryproctini is a large tribe containing 18 genera. Two occur in Australia, a third in South America and the remainder are almost entirely Holarctic. Euryproctines are characterized by the complete absence of glymma, the simple tarsal claws and the long, slender first flagellar segment. Many are large insects commonly encountered in old meadows and on upland pasture.

DENTICERIA gen. n.

Type-species: *Denticeria cardaleae* sp. n.

Lower face slightly convex, transverse with inner margins of eyes almost parallel; clypeus transverse, flared outwards towards margin; margin in anterior aspect slightly concave, thick and blunt; maxillary palp short, reaching only to epicnemium. Mandible large, moderately long, parallel-sided, with lower tooth slightly the longer; malar space 0.8 times basal mandibular width. Flagellum moderately long, quite stout; first flagellar segment 2.4 times as long as second, without tyloids; frons above antennal socket without concavities, simple. Occipital carina complete, reaching to hypostomal carina just above base of mandible.

Notaulus indistinct; mesoscutum in profile abruptly rounded, margin outturned; epicnemial carina present, reaching above level of lower corner of pronotum, not joining anterior margin of pleuron; scutellum convex, with lateral carinae reaching 0.4 of its length. Propodeum in profile short, convex, with large oval spiracles; posterior transverse carina present; longitudinal carinae vestigial.

Distal outer margin of fore tibia with a strong, acute tooth and with a flange continuing around margin from tooth; hind tibial spurs very unequal, the longer 2.0 times the length of the shorter, extending 0.3 times length of basitarsus; tarsal claws simple.

Fore wing with pterostigma of moderate breadth, emitting *Rs+2r* near proximal 0.3; *cu-a* opposite base of *Rs&M*, almost vertical; areolet present, large, with 3*r-m* centrally angled, far longer than 2*r-m*; marginal cell long and narrow; first subdiscal cell strongly explanate distally so that 1*m-cu* almost forms a straight line with first abscissa of Cu_1. Hind wing with distal abscissa of Cu_1 present, virtually arising from base of *M*.

Gaster with tergite 1 broad, less than 2.0 times as long as posteriorly broad; glymma absent; spiracles prominent, positioned well before the centre of segment (Fig. 352); epipleuron narrow; sternite 1 short, not reaching to level of spiracles. Tergite 2 with laterotergite broad, slightly turned in, but not separated by a sharp crease; tergite 3 similar, but with a sharp crease. ♀ subgenital plate triangular in profile.

Male unknown.

Etymology. *Denti* (tooth, referring to unusual tooth on fore tibia) + *ceria* (from *Megaceria*, a related genus). Feminine.

Remarks. This genus is closely related to *Megaceria* which it resembles in venation and structure of head and alitrunk. It differs in the structure of the gaster, particularly in the shape of the first segment.

Australian species. One, the type-species, described below.

Denticeria cardaleae sp. n.

Female: fore wing length 10 mm; lower face sparsely punctate; clypeus coarsely punctate; ocelli small, forming a broad-based isosceles triangle; genae and vertex with fine, inconspicuous punctures; flagellum with 40 segments.

Alitrunk for the greater part polished, finely punctate; fore tibia broad, flattened, with conspicuous stout spines on outer surface; hind coxae inconspicuously punctate. Gaster polished, with very fine punctures.

Orange-brown species; segments 1-3 of gaster black; tergite 4 and hind tarsal segments 1-2 blackish red; posterior margin of tergites 4+ yellow-marked. Pterostigma black, wings infumate.

Male unknown.

This species is named in honour of its collector, Miss J. Cardale, who has collected so many interesting Australian ichneumonids. The colour pattern of *D. cardaleae* is very similar to that of *Lissopimpla excelsa* and, as it has neither large fluid-filled claws nor a strong ovipositor, it is presumably a Batesian mimic of the latter species.

Material examined

Holotype ♀, Northern Territory: 56 km S. by E. of Alice Springs (24°11' S; 134°01' E) x.1978 *(Cardale)* (ANIC).

MEGACERIA Szépligeti

Megaceria Szépligeti, 1908*a*: 323. Type-species: *Megaceria opheltes* Szépligeti, by monotypy.

Moderately large to large-sized species, fore wing length 12-19 mm; lower face transverse to elongate; inner margins of eyes almost parallel; clypeus in profile out-flared towards margin, the margin in anterior aspect transverse, slightly concave, rarely slightly convex, always blunt; mandible long, often slightly broadened distally with teeth of similar length or with lower tooth the longer; malar space generally less than 0.5 times basal mandibular width. Flagellum long and slender, first segment more than 2.0 times length of second, without tyloids; frons without concavities above antennal sockets. Occipital carina complete or narrowly obsolescent centrally, joining hypostomal carina above base of mandible.

Notauli weak to moderately strongly impressed; epicnemial carina strong, not reaching to anterior margin of pleuron; scutellum convex, with or without lateral carinae. Propodeum in profile short and convex, spiracle large and oval; posterior transverse carina often present, rarely more extensively carinate.

Fore tibia with a small apical tooth; mid and hind tibiae with well-developed spurs, the longer always longer than apical tibial breadth; tarsal claws simple.

Fore wing with pterostigma narrow to moderately broad, emitting *Rs+2r* between proximal 0.2 and 0.4; *cu-a* slightly distal to base of *Rs&M*, almost vertical; areolet present, large, rhombic, with *3r-m* much longer than *2r-m*; marginal cell long and narrow; first subdiscal cell strongly explanate distally. Hind wing with distal abscissa of Cu_1 present; first abscissa of Cu_1 from very much shorter than *cu-a* to effaced.

Gaster with segment 1 tubular (Fig. 358), tergite and sternite fused to form a cylinder, the sternite reaching about 0.7 or more of length of tergite (Fig. 353); spiracles central; glymma absent. Tergite 2 with laterotergite pendant or up-turned, very thin, membranous; tergite 3 with laterotergite pendant, not separated by a crease. ♀ subgenital plate large, triangular in profile.

Remarks. All of the species I have seen of this genus occur in the cooler southeast of the continent, and they are most common in Tasmania. They fall into two species-groups, the *opheltes*-group (containing *M. opheltes* and *M. pagana*, two nocturnal species with lower tooth of the mandible the larger and a broader pterostigma) and the *rufiventris*-group (containing *M. rufiventris* and 10 undescribed species which have narrower mandibles with subequal teeth and a narrower pterostigma). Parrott (1955*b*) gave a key to the *opheltes*-group.

M. pagana has frequently been collected at light in Canberra where it seems to be active during the winter as specimens have been taken from July until September.

Australian species. *Megaceria opheltes* Szépligeti (E); *M. pagana* (Morley) (E); *M. rufiventris* (Brullé) and 10 undescribed species (ANIC; BMNH; TC).

Host records. *M. pagana* - Geometridae: *Mnesampela privata* (Guenée) (Morley, 1913*a*; Parrott, 1955*b*) (NMV). *Megaceria* sp. - Geometridae: *Mnesampela privata* (Guenée) (TDF); *Stathmorrhopa* sp. (TDF). Notodontidae: unidentified pupa (DAH). The two records of *Megaceria* as parasites of Geometridae have been considered highly suspect by Townes (1970). However, I have seen in two collections (DAH; TDF) examples of *Megaceria* together with host remains which are clearly of lepidopterous origin. In each case the ichneumonid emerged from the host pupa by biting a roughly circular hole near the anterior end.

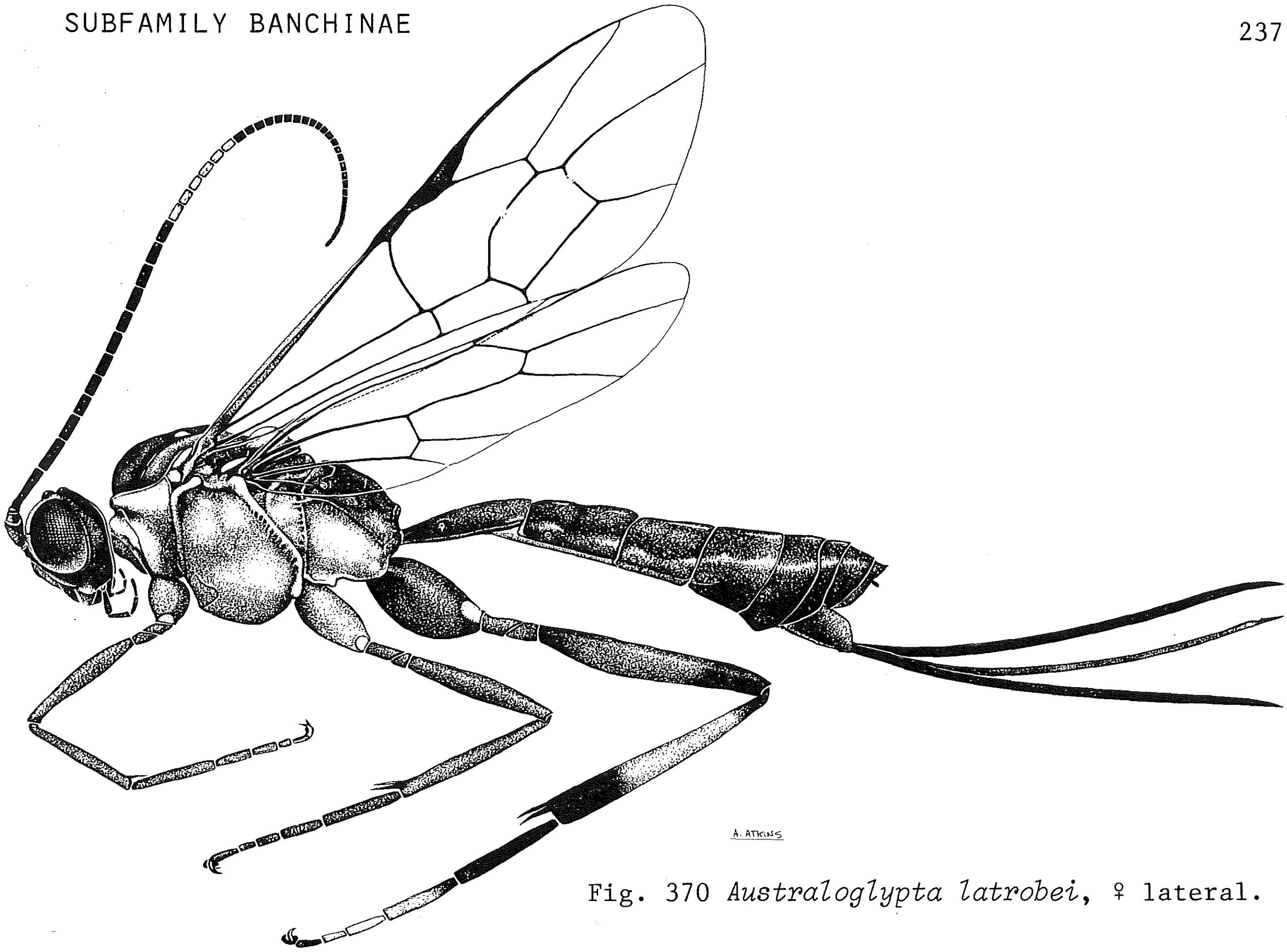


Fig. 370 *Australoglypta latrobei*, ♀ lateral.

The Banchinae is a large subfamily with, world-wide, 47 genera in three tribes, Glyptini, Banchini and Atrophini. Several genera (e.g. *Glypta*, *Lissonota* and *Exetastes*) are very large and contain many hundreds of species, a number of which are very common insects in many parts of the world. Banchines are endoparasites of lepidopterous larvae and several species are beneficial insects, being common parasites of pests.

The classification of the group has remained fairly stable for the past decade of so, but the genera are really quite poorly differentiated. Several very weak characters (e.g. absence of occipital carina; loss of vein 3*r-m*) are given considerable weight in the current classification and it is probable that a number of the accepted genera will eventually be synonymized. In the present work no attempt has been made to alter the generic classification proposed by Townes (1970*b*) though it is noteworthy that one "short ovipositored" *Lissonota* would run to *Cryptopimpla* in Townes' key. I would have placed this genus in *Cryptopimpla* but Dr Townes opined that it belonged to *Lissonota* and resembles some Nearctic species of the *anomala*-group (Townes & Townes, 1978). These differ from *Cryptopimpla* in having the mesopleuron more polished and sparsely sculptured, especially on the speculum.

All three tribes are represented in Australia, the Glyptini by three genera, the Atrophini by seven genera and the Banchini by a single endemic genus.

DIAGNOSIS

Small to moderately large insects, fore wing length 4-15 mm. Clypeus usually separated from face by a groove, with margin relatively thin, evenly arcuate, medially truncate or bilobate with a median apical notch; mandible bidentate or with the upper tooth broad, divided so mandible appears tridentate; male flagellum without tyloids. Sternaulus absent; posterior transverse carina of the mesosternum absent; propodeum sometimes completely carinate, more usually with only posterior transverse carina present, occasionally without carinae. Apical edge of the fore tibia without a tooth on outer side; tarsal claws usually not pectinate (in Australian species) or only basally so. Fore wing with *3r-m* present or absent, if present enclosing an irregularly rhombic areolet; hind wing usually with distal abscissa of Cu_1 present. First tergite of gaster usually quite stout and broad, with its spiracle before the centre, less commonly slender with spiracle at or slightly behind the centre; sternite and tergite usually not fused; glymma present or absent; gaster usually dorsoventrally depressed; tergites 2-4 convex, smooth or punctate or rarely with V-shaped grooves or impressions; ovipositor short to very long, the upper valve with a distinct subapical notch, the lower with weak teeth; female subgenital plate usually prominent, triangular in profile, its apex with a median notch.

The majority of banchines are easily recognized by the long, dorsally notched ovipositor and broadly attached gaster. Many have only the posterior transverse carina of the propodeum present and, in such cases, it is often very strong and quite close to the hind end of the propodeum. This feature is not found in most other ichneumonids. Many banchines have the anterior end of the submetapleural carina broadly expanded into a lobe, a feature not common in other groups. The Banchini is a more difficult group to recognize, but in Australia the single genus has tridentate mandibles and is thus distinct from all other ichneumonids except diplazontines, which are smaller and have *cu-a* almost opposite the base of *Rs&M* (*cu-a* is far distal to *Rs&M* in *Philogalleria*, the only Australian genus of Banchini).

CLASSIFICATION

For many years the majority of banchines (the tribes Atrophini and Glyptini) were placed in the Pimplinae on account of their long ovipositors and broad petioles. The Banchini was treated by classical authors variously as belonging to the Tryphoninae or Ophioninae. Townes (1944) was mainly responsible for reclassifying the Ichneumonidae and associating the Banchini, Atrophini and Glyptini in a single subfamily. Townes (1951) included five tribes in the subfamily, Glyptini, Lycorinini, Lissonotini, Neorhacodini and Banchini. Subsequently (1970*b*) he added a further tribe, Stilbopini but removed the Lycorinini which he elevated to the status of subfamily. Recent study of the larvae (Horstmann, 1968; Short, 1978) and re-evaluation of adult characters (Townes & Townes, 1978) have resulted in the elevation of the Neorhacodini and Stilbopini to the status of separate subfamilies leaving the restricted Banchinae with three tribes although one genus, *Panteles*, assigned to the Stilbopini belongs in the Atrophini.

The tribe Atrophini has been called Lissonotini in most works. This name is based on the genus *Lissonota* Gravenhorst and is a junior homonym of Lissonotini based on *Lissonotus* Schoenherr (Cerambycidae). Carlson (1979) emended the ichneumonid name to Lissonotanini, an illegal action as it is mandatory under Article 55 to refer such cases to the Commission. Until such a submission is prepared it is suggested that simple priority be applied (as Carlson chose, also illegally, to do in the case of Labiini/Groteini). Accordingly I have adopted the next available name, Atrophini, based on the large Afrotropical genus *Atropha* Kriechbaumer.

DISTRIBUTION

The Banchinae is a cosmopolitan subfamily but is prehaps most diverse in the Holarctic region. The Oriental region has, when compared with other areas, remarkably few banchines and most of these are restricted to high altitudes. Chandra & Gupta (1977) recognized 10 genera of Atrophini and three of Banchini from South East Asia. Excluding the mountains of the northern Philippines only three atrophine genera, *Stictolissonota*, *Syzeuctus* and *Leptobatopsis*, occur in Malesia and the South East Asian islands. Of the Glyptini, only one genus, *Apophua*, has Malesian representatives (Townes *et al*., 1961). It is somewhat surprising therefore to find banchines well represented in Australia.

Apophua, *Leptobatopsis* and *Syzeuctus* are primarily tropical in Australia and presumably reached the continent from South East Asia but *Lissonota*, *Australoglypta* and *Philogalleria* are predominantly southern (in Australia) and not present in South East Asia. *Australoglypta* is related to a Neotropical genus and thus may have reached Australia from South America via the Antarctic. Possibly the other two genera reached Australia the same way though *Lissonota* is very widespread and could possibly have reached Australia from Asia during the colder periods of the Pleistocene. One species of *Glypta* was introduced for biological control purposes and it is probable that all Australian *Glypta* are recent introductions.

The origins of the remaining genera are not yet known, but the nearest relatives of the Australian *Amphirhachis* and *Tossinola* are Asian.

BIOLOGY

Banchines are solitary endoparasites of lepidopterous larvae. There are a few records of European species attacking Symphyta but these need confirmation. Most banchines have long ovipositors and use as hosts larvae living in tunnels, leaf rolls etc. Species with short ovipositors (e.g. Banchini) oviposit in more exposed larvae such as those of Noctuidae and Geometridae. Many species are important in the natural control of orchard pests (Zajanckauskas *et al.*, 1979).

The eggs are generally elongately oval and relatively small. Over 170 mature eggs have been found in some species but the average number is nearer 50 (Iwata, 1960). Oviposition is usually into young larvae, generally either late first instar or early second though some species regularly attack more mature larvae. The host larva is usually not paralysed (Danthanarayana *et al.*, 1977). The first instar banchine larva has an elongate caudal appendage which is progressively lost in successive instars. The exact number of instars is not certain but probably varies between three and five. The ichneumonid remains as a first instar larva until the host larva has almost completed development. The banchine rapidly completes larval development and the final instar larva emerges from the host remains and either drops to the ground where it spins a dense, ovoid cocoon in which it rests, usually over winter, before pupating the following year, or spins a cocoon in the host tunnel or leaf roll (Danthanarayana *et al.*, 1977). Most species are univoltine but a few (e.g. *Glypta rufiscutellaris*) are multivoltine, having up to three generations a year.

Biologically banchines are very similar to many other specialist endoparasitic ichneumonids, especially Ctenopelmatinae, Ophioninae and Cremastinae. The final instar larvae of all of these subfamilies are quite similar (Short, 1978). Probably the most generalized form of final instar larval head capsule is found in the Glyptini which has a long hypostoma, simple mandible, incomplete epistomal arch and an indistinct prelabial sclerite (Fig. 388). In Atrophini the hypostoma is very reduced and the mandible often has a trace of a tooth on the blade whilst the Banchini have a strongly sclerotized Y-shaped prelabial sclerite (Short, 1978).

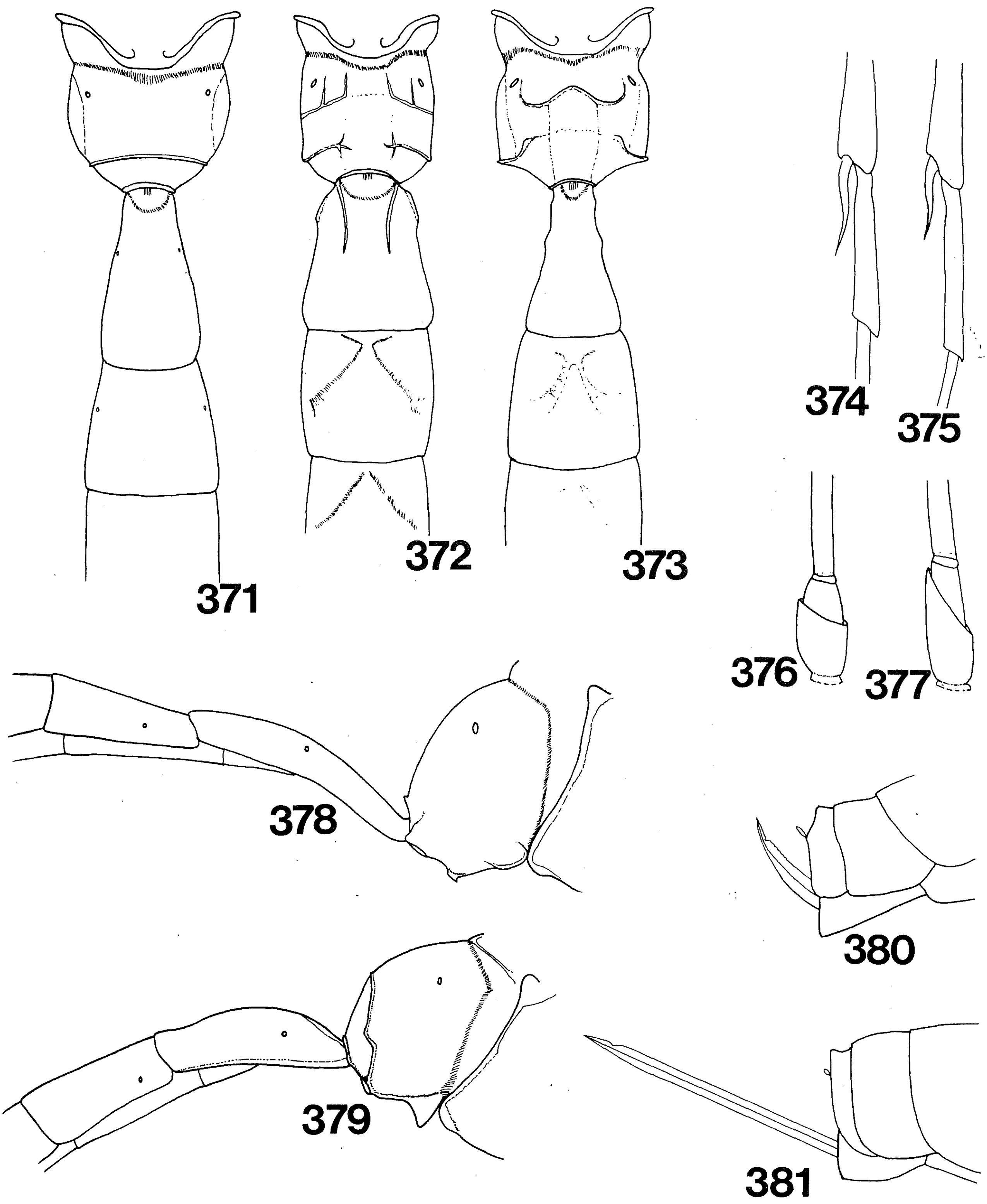
KEY TO THE GENERA OF BANCHINAE OCCURRING IN AUSTRALIA

The key is direct to genus but tribal groupings are indicated in parentheses.

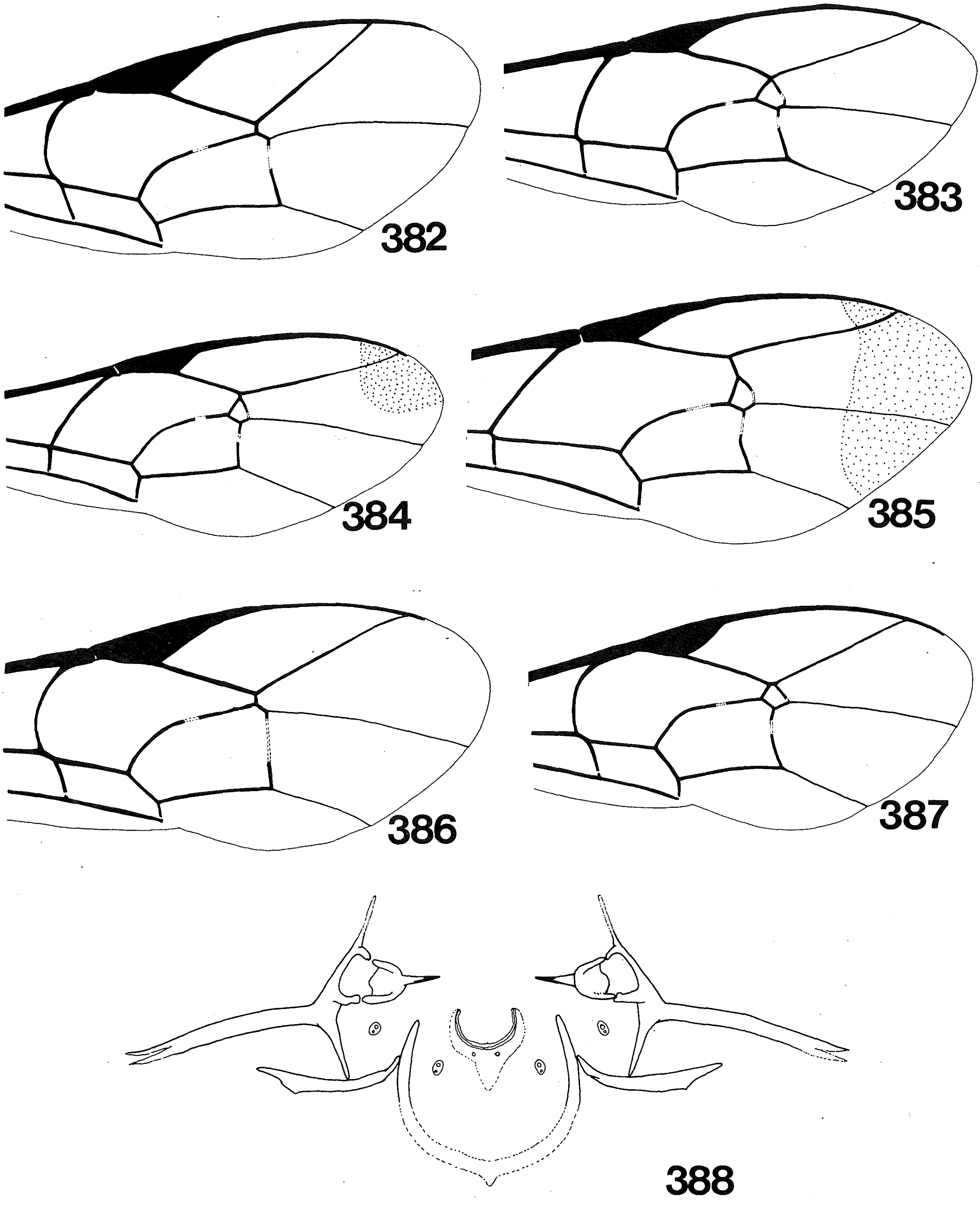
1 Upper tooth of mandible far broader than the lower, apical tooth bifid so mandible appears tridentate (Fig. 60); hind wing with *cu-a* at least 3.0 times as long as first abscissa of Cu_1; ovipositor short, barely projecting beyond apex of gaster. (Banchini) ...*PHILOGALLERIA* (p. 251)

\- Mandible simply bidentate, the upper tooth not or only slightly broader than the lower; hind wing with *cu-a* at most 1.5 times as long as first abscissa of Cu_1; ovipositor usually very long, less often short......2

2 Tergite 2 and often also 3 with weak to strong oblique impressions; propodeum usually with anterior transverse carina present, posterior transverse carina present or more usually weak (Figs 372, 373). (Glyptini)...3



Figs 371-381 Banchinae. 371-373 Propodeum and anterior end of gasters (371) *Lissonota* (372) *Glypta* (373) *Australoglypta*. 374-375 Fore tibial spurs (374) *Apophua* (375) *Australoglypta*. 376-377 Scapes (376) *Spilopimpla* (377) *Shortia siccula*. 378-379 Propodeum and anterior end of gasters (378) *Leptobatopsis* (379) *Tossinola*. 380-381 End of gasters, ♀ (380) *Shortia siccula* (381) *Spilopimpla* (valvula 3 omitted).



Figs 382-388. Banchinae. 382-387 Fore wings (382) *Tossinola* (383) *Amphirhachis* (384) *Leptobatopsis* (385) *Syzeuctus* (386) *Shortia siccula* (387) *Lissonota*. 388 Cephalic capsule of final instar larva of *Australoglypta*.

- Tergites 2 and 3 smoothly convex, without trace of oblique impression; propodeum without carinae or with strong posterior transverse carina (Fig. 371). (Atrophini)....5

3 Fore leg with tibial spur extending 0.6 times length of basitarsus (Fig. 374); genal carina strongly sinuate so that it curves out onto the cheek....*APOPHUA* (p. 243)
- Fore leg with tibial spur not reaching to centre of basitarsus (Fig. 375); genal carina not or only weakly sinuate....4

4 Tergite 1 with a pair of lateromedian carinae extending almost half the length of tergite (Fig. 372); antenna unicolorous black..*GLYPTA* (p. 244)
- Tergite 1 without a trace of dorsal carinae (Fig. 373); antenna with a white ring....*AUSTRALOGLYPTA* (p. 243)

5 Occipital carina broadly incomplete dorsally....6
- Occipital carina complete dorsally....7

6 Tergite 1 slender with spiracles at or slightly behind centre (Fig. 378); fore wing with 3*r-m* present enclosing a rhombic areolet (Fig. 384)....*LEPTOBATOPSIS* (p. 245)
- Tergite 1 stout with spiracles distinctly before the centre (Fig. 379); fore wing with 3*r-m* absent (Fig. 382)....*TOSSINOLA* (p. 250)

7 Genal carina reaching base of mandible; fore wing with 2*r-m* and 3*r-m* joining well away from *Rs*, with 2+3*r-m* almost as long as height of areolet (Fig. 385); epomia usually discernible....*SYZEUCTUS* (p. 249)
- Genal carina joining hypostomal carina above base of mandible; fore wing either with 3*r-m* absent (Fig. 386), or if present then joining 2*r-m* close to *Rs* so 2+3*r-m* is always short (Figs 383, 387); epomia absent....8

8 Ovipositor very long, projecting beyond apex of gaster by at least length of hind tibia....*LISSONOTA* (most species) (p. 246)
- Ovipositor short, not projecting beyond apex of gaster by length of hind tibia....9

9 Fore wing with 3*r-m* absent (Fig. 386)....10
- Fore wing with 3*r-m* present (Figs 383, 387)....11

10 Ovipositor barely projecting beyond apex of gaster, upcurved with trace of teeth on upper valve proximal to notch (Fig. 380); scape apically truncate at 55-60° from transverse (Fig. 377); hind wing with distal abscissa of Cu_1 weak....*SHORTIA* (p. 247)
- Ovipositor projecting distinctly beyond apex of gaster, straight, without vestigial teeth on upper valve proximal to notch (Fig.381); scape apically truncate at 30-35° from transverse (Fig. 376); hind wing with distal abscissa of Cu_1 absent....*SPILOPIMPLA* (p. 248)

11 Posterior transverse carina of propodeum absent; fore wing with 2*m-cu* emitted from distal side of large areolet (Fig. 383); speculum punctate, matt....*AMPHIRHACHIS* (p. 245)
- Posterior transverse carina of propodeum present; fore wing with 2*m-cu* emitted from near centre of medium-sized areolet (Fig. 387); speculum smooth and polished....*LISSONOTA* (few species) (p. 246)

Tribe GLYPTINI

Members of this tribe are most readily recognized by the possession of quite deep oblique impressions on tergite 2, often 3 and sometimes also 4. The propodeum of glyptines is the least specialized of any banchine and some species have a full complement of carinae. Eleven genera are recognized, two of which, *Glypta* and *Australoglypta*, are recorded from Australia. In the present work an additional genus, *Apophua*, is recognized as Australian.

APOPHUA Morley*

Apophua Morley, 1913*b*: 213. Type-species: *Apophua carinata* Morley, by original designation.

Small species, fore wing length 5 mm; clypeus slightly convex, with margin arcuate; mandible bidentate, evenly tepered, not twisted. Occipital carina dorsally incomplete; genal carina sinuate, ventrally joining hypostomal carina at base of mandible. Antenna with scape truncate at 15° from transverse; flagellum black.

Epomia distinct; speculum smooth and polished. Propodeum with area superomedia distinct. Fore leg with tibial spur extending more than 0.6 times length of basitarsus (Fig. 374).

Fore wing with *3r-m* absent; hind wing with distal abscissa of Cu_1 weak, shorter than first abscissa of Cu_1.

Gaster with tergite 1 bearing a pair of strong lateromedian dorsal carinae, with spiracle before centre; tergites 2-4 with deep oblique grooves; ovipositor projecting beyond apex of gaster by about 2.0 times length of hind tibia.

Remarks. *Apophua* is a large genus, with most species occurring in the Old World tropics. A few are present in the Palaearctic region and one occurs in North America. A single species has been collected in Queensland.

Australian species. One, undescribed (DPIQ).

Host records. None from Australia

AUSTRALOGLYPTA Gauld
(Whole insect, Fig. 370)

Australoglypta Gauld, 1977*b*: 607. Type-species: *Australoglypta latrobei* Gauld, by original designation.

Small to moderately large species, fore wing length 5-11 mm; clypeus raised and flattened, apically usually with margin incised; mandible bidentate, evenly tapered, not twisted. Occipital carina complete or dorsally incomplete; genal carina not sinuate, joining hypostomal carina from a little to well above base of mandible. Antenna with scape truncate, 30-40° from transverse; flagellum dark with pale band.

Epomia short; speculum polished, smooth to finely sharpened. Propodeum with anterior and usually also posterior transverse carina distinct; area superomedia present or not. Fore leg with tibial spur reaching at most to centre of basitarsus (Fig. 375).

Fore wing with *3r-m* absent; hind wing with distal abscissa of Cu_1 present, *cu-a* far shorter than first abscissa of Cu_1.

Gaster with tergite 1 stout, without dorsal longitudinal carinae and with spiracles before centre (Fig. 373); tergite 2, less frequently tergite 3 and tergite 4 very rarely, with weak to moderately strongly impressed oblique furrow. Ovipositor projecting beyond apex of gaster by 1.6 or more times length of hind tibia.

Remarks. *Australoglypta* is a moderately small genus restricted to the Australian region. It is easily distinguished from Oriental glyptines by the white-banded antenna and dorsally smooth tergite 1. It appears to be more closely related to some Neotropical genera, especially *Levibasis*.

Australoglypta species are widely distributed throughout Australia but the majority of species seem to occur in the south-east. A few occur in New Guinea.

Australian species. *Australoglypta latrobei* Gauld (E). I have seen 17 undescribed species (AM; ANIC; DPIQ; NMV; QM; TC).

Host records. *A. latrobei* - Tortricidae: *Epiphyas postvittana* (Walker) (Danthanarayana *et al.*, 1977).

GLYPTA Gravenhorst

Glypta Gravenhorst, 1829*c*: 3. Type-species: *Glypta sculpturata* Gravenhorst, by subsequent designation, Westwood, 1840: 58.
Conoblasta Foerster, 1869: 165. Type-species: *Pimpla ceratites* Gravenhorst, by subsequent designation, Viereck, 1914: 35.
Diblastomorpha Foerster, 1869: 165. Type-species: *Glypta bicornis* Boie, by subsequent monotypy, Woldstedt, 1877: 444.
Hemiephialtes Ashmead, 1906*a*: 177. Type-species: *Hemiephialtes glyptus* Ashmead, by monotypy.
Foveoglypta Hellén, 1915: 57. Type-species: *Glypta (Foveoglypta) monstrosa* Hellén, by monotypy.

Small to moderately large species, fore wing length 5-11 mm; clypeus slightly convex, margin arcuate, often with median indentation; mandible bidentate, evenly tapered, not twisted. Occipital carina mediodorsally absent; genal carina slightly sinuate, joining hypostomal carina above base of mandible. Antenna with scape apically truncate at 30-40° from transverse; flagellum unicolorous.

Epomia indistinct; speculum in part smooth and polished. Propodeum with anterior and posterior transverse carinae discernible. Fore leg with tibial spur extending about 0.3 times length of basitarsus.

Fore wing with *3r-m* absent; hind wing with distal abscissa of Cu_1 present, weak; *cu-a* very much shorter than first abscissa of Cu_1.

Gaster with tergite 1 stout, with lateromedian and often lateral carinae; spiracles before the centre; tergites 2-4 with deep oblique furrows. Ovipositor projecting beyond apex of gaster by 1.7 or more times length of hind tibia.

Remarks. *Glypta* is a very large genus with most species occurring in the North Temperate region. The few species that are recorded from the Oriental region (Townes *et al.*, 1961) are from highlands near to the Oriental/Palaearctic border. In the Holarctic region several species of *Glypta* have been found to be important in the natural control of insect pests and one, *G. rufiscutellaris*, was apparently introduced into Australia to help control *Cydia (= Grapholita)* (Anonymous, 1937). In North America *G. rufiscutellaris* is one of the most important parasites of *Cydia* (Putman, 1935) but it seems not to have been particularly successful in Australia (Helson, 1939).

Although I have seen old material of *G. rufiscutellaris* I have not seen any recently collected Australian specimens; there are two other species, one in Queensland and a second in Victoria and Tasmania. I doubt if these are native but I have not as yet ascertained their identity.

Australian species. *Glypta rufiscutellaris* Cresson (I, ?failed to establish). Two (?)undescribed (?I) species (ANIC; BMNH; TC).

Host records. *G. rufiscutellaris* - Tortricidae: *Cydia molesta* (Busck) (other Nearctic hosts are listed by Carlson, 1979).

Tribe ATROPHINI
(= Lissonotini sensu Townes)

A large tribe with representatives in most regions. Several atrophine genera (e.g. *Lissonota*) are extremely large and virtually cosmopolitan.

World-wide this tribe contains about 26 genera. A number are rather weakly defined and move in and out of synonymy according to the whims of particular authors. In the present work Townes' generic concepts have been adopted but far more work needs to be done before limits of the taxa are firmly established on a world-wide basis.

Seven genera occur in Australia. Three of these, *Lissonota*, *Syzeuctus* and *Leptobatopsis*, have previously been recorded from the region (Chandra & Gupta, 1977). Three genera, *Amphirhachis*, *Tossinola* and *Spilopimpla*, are newly recorded as Australian and one, *Shortia*, is described as new. Ironside (1970) recorded a species of *Asphragis* as Australian. This generic name used to be used for some *Lissonota* species without an areolet but in fact it is a synonym of *Cylloceria*, a Holarctic oxytorine genus. Almost certainly Ironside's record refers to *Lissonota*.

AMPHIRHACHIS Townes*

Amphirhachis Townes, 1970*a*: 33. Type-species: *Amphirhachis nigra* Townes, by original designation.

Medium-sized species, fore wing length 7-9 mm; clypeus convex, margin arcuate; mandible bidentate, evenly tapered, quite long and not twisted. Occipital carina complete; genal carina joining hypostomal carina above base of mandible. Antenna with scape truncate at about 50° from transverse; flagellum with a white band.

Epomia absent; speculum punctate. Propodeum without distinct carinae, short and abruptly declivous. Fore leg with tibial spur reaching slightly beyond centre of basitarsus.

Fore wing with *3r-m* enclosing a large rhombic areolet with *2m-cu* emitted close to distal side (Fig. 383); hind wing with distal abscissa of Cu_1 present, first abscissa of Cu_1 far longer than *cu-a*.

Gaster with tergite 1 moderately slender, with spiracle before centre, without dorsal carinae and with glymma; tergites 2-4 evenly convex. Ovipositor projecting beyond apex of gaster by 0.5-0.6 times length of hind tibia.

Remarks. *Amphirhachis* is a rather small genus occurring in Australia, Japan, Burma and New Guinea. It can be distinguished from the *Lissonota* species with short ovipositors by the large areolet and punctate speculum. It is probably closely related to *Cryptopimpla*, a mainly Palaearctic and Afrotropical genus.

Australian species. Two, undescribed, (ANIC; BMNH; TC) from Queensland and New South wales.

Host records. None.

LEPTOBATOPSIS Ashmead

Leptobatopsis Ashmead, 1900*a*: 47. Type-species: *Leptobatopsis australiensis* Ashmead (= *Cryptus indicus* Cameron), by original designation.
Leptobatopsis Ashmead, 1900*c*: 349. Type-species: *Leptobatopsis australiensis* Ashmead (= *Cryptus indicus* Cameron), by monotypy.
Tanera Cameron, 1905 : 141. Type-species: *Tanera annulipes* Cameron (= *Cryptus indicus* Cameron), by monotypy.
Sauterellus Enderlein, 1912*b*: 112. Type-species: *Sauterellus planiscutellus* Enderlein, by original designation.
Megacremastus Meyer, 1932: 31. Type-species: *Megacremastus mongolicus* Meyer, by monotypy.

Medium-sized species, fore wing length 5.5-9.0 mm; clypeus weakly convex, margin simply arcuate; mandible bidentate, quite strongly tapered, not twisted. Occipital carina dorsally absent or interrupted; genal carina joining hypostomal carina above base of mandible. Antenna with scape apically truncate at about 50° from transverse; flagellum unicolorous or with a white band.

Epomia absent; speculum punctate. Propodeum without carinae, quite strongly rounded. Fore leg with tibial spur reaching only about 0.3 times length of basitarsus.

Fore wing with *3r-m* present (Fig. 384), enclosing a petiolate rhombic areolet with *2m-cu* emitted distal to centre; hind wing with distal abscissa of Cu_1 weakly present or absent, if present first abscissa of Cu_1 from slightly to conspicuously longer than *cu-a*.

Gaster with tergite 1 slender, with spiracles slightly behind centre (Fig. 378), without glymma and dorsally smooth; tergites 2-4 evenly convex. Ovipositor projecting beyond apex of gaster by 1.5-1.8 times length of hind tibia.

Remarks. *Leptobatopsis* is a moderately large genus centred in the Oriental region. Chandra & Gupta (1977) recognize 21 species, one of which, *L. indica*, occurs in Australia as well as throughout the Indo-Malayan area. In Australia the majority of species appear to be restricted to Queensland. Chandra (1976*a*) included four Australian species but one of these, *L. speciosa*, belongs in the genus *Syzeuctus* Townes, 1971*a*).

Australian species. *Leptobatopsis caudator* (F.) (E); *L. indica* (Cameron) (A); *L. mesominiata* Chandra (E). I have seen one undescribed species (ANIC).

Host records. *L. indica* - Pyralidae: *Herpetogramma licarsisalis* (Walker) (DAR; DPIQ).

LISSONOTA Gravenhorst

Lissonota Gravenhorst, 1829*c*: 30. Type-species: *Ichneumon setosus* Fourcroy, by subsequent designation, Curtis, 1832: 407.
Lampronota Curtis, 1832: 407. [Unnecessary replacement name for *Lissonota* Gravenhorst, 1829*c*.]
Stilbonota Stephens, 1835: 127. Type-species: *Lissonota sulphurifera* Gravenhorst (= *Ichneumon fundator* F.), by subsequent designation, Viereck, 1914: 138.
Meniscus Schiødte, 1839: 10. Type-species: *Ichneumon catenator* Panzer, (= *Ichneumon lineolaris* Gmelin), by subsequent designation, Viereck, 1914: 92.
Asynida Gistel, 1848: ix. [Unnecessary replacement name for *Lissonota* Gravenhorst.]
Bothynophrys Foerster, 1869: 166. Type-species: *Ichneumon catenator* Panzer (= *Ichneumon lineolaris* Gmelin), by subsequent monotypy, Woldestedt, 1877: 444.
Ensimus Foerster, 1869: 167. Type-species: *Lissonota dubia* Holmgren, by subsequent designation, Viereck, 1914: 51. [Homonym of *Ensimus* Thomson, 1859.]
Amersibia Foerster, 1869: 167. [Unnecessary replacement name for *Meniscus* Schiødt.]
Bathycetes Foerster, 1869: 167. Type-species: *Ichneumon catenator* Panzer (= *Ichneumon lineolaris* Gmelin), by subsequent monotypy, Schmiedeknecht, 1888: 439.
Opisorhyssa Kriechbaumer, 1890: 488. Type-species: *Opisorhyssa flavopicta* Kriechbaumer (= *Lissonota spilostethus* Townes), by monotypy.
Ctenopimpla Cameron, 1899: 189. Type-species: *Ctenopimpla albomaculata* Cameron, by monotypy. [Homonym of *Ctenopimpla* Kriechbaumer 1898.]
Pimplopterus Ashmead, 1900*a*: 52. Type-species: *Pimplopterus alaskensis* Ashmead (= *Ichneumon coracina* Gmelin), by original designation.
Harrimaniella Ashmead, 1900*a*: 52. Type-species: *Harrimaniella yukakensis* Ashmead (= *Lissonota genalis* Thomson), by original designation.
Echthrodoca Schmiedeknecht, 1900: 328. Type-species: *Lissonota conflagrata* Gravenhorst, by subsequent designation, Viereck, 1914: 49.
Anarthronota Schmiedeknecht, 1900: 330. Type-species: *Lissonota manca* Brauns, by subsequent designation, Viereck, 1914: 10.

Campocineta Schmiedeknecht, 1900: 343. Type-species: *Campocineta varicornis* Schmiedeknecht, by monotypy.
Adelopimpla Schulz, 1906: 116. [Replacement name for *Ctenopimpla* Cameron, 1899.]
Stilbopoides Rohwer, 1913: 183. Type-species: *Stilbopoides maculiventris* Rohwer, by original designation.
Lophantium Clément, 1925: 400. Type-species: *Lissonota clypealis* Thomson, by original designation.
Gibbonota Heinrich, 1937: 364. Type-species: *Gibbonota duplanae* Heinrich (= *Lissonota dubia* Holmgren), by original designation.
Lissonotoides Benoit, 1955*b*: 29. Type-species: *Lissonotoides pectinatus* Benoit, by original designation.

Small to moderately large insects, fore wing length 4-15 mm; clypeus convex, margin arcuate or narrowly truncate in centre; mendible bidentate, usually rather short, not twisted. Occipital carina complete; genal carina joining hypostomal carina above base of mandible. Antenna with scape truncate at about 50° from transverse; flagellum with or without a white band.

Epomia absent; speculum smooth and polished. Propodeum either without carinae or with only posterior transverse carina present and near hind end. Fore leg with tibial spur not reaching to centre of basitarsus.

Fore wing with *3r-m* present or absent, if present enclosing a rhombic areolet which emits *2m-cu* near centre (Fig. 387); hind wing with distal abscissa of Cu_1 usually present; first abscissa of Cu_1 usually far longer than *cu-a*.

Gaster with tergite 1 moderately stout to fairly slender, dorsally smooth (Fig. 371), usually without glymma and with spiracles always well before centre; tergites 2-4 evenly convex. Ovipositor usually projecting beyond apex of gaster by more than 1.8 times length of hind tibia, often very long, or in one species short 0.5 times length of hind tibia.

Remarks. *Lissonota* is an extremely large genus with several hundred described Palaearctic and Nearctic species. The taxonomy of the group at species level is particularly difficult. Comparatively few species were thought to occur outside the Holarctic region. Chandra & Gupta (1977) included 43 species from the Oriental region, but most of these occur in the mountains at the confluence with the eastern Palaearctic region. Bain (1970) recorded six species from New Zealand and Chandra (1976*c*) described nine from Australia. Chandra's work, whilst being superficially sound, is quite unusable for identification as he made no attempt to examine most of the extensive Australian material available. Had he done so he would have realized that there are at least 25 very common Australian species and, including Tasmanian and more restricted species, the total number so far seen is about 80. The northern species tend to be quite brightly patterned. The greatest number of species occur in Victoria and Tasmania. Here they are usually blackish or rufus and are difficult to separate.

Australian species. *Lissonota adornata* Chandra (E); *L. aurantia* Chandra (E); *L. bella* Chandra (E); *L. gibboclypeata* Chandra (E); *L. granulata* Chandra (E); *L. macqueeni* Chandra (E); *L. nigroscutellata* Chandra (E); *L. rubida* Chandra (E); *L. rugosa* Chandra (E); *L. spilostethus* Townes & Townes (E). I have seen 70 undescribed species (ANIC; BMNH; NMV; TC).

Host records. *Lissonota* sp. - Pyralidae: *Homoeosoma vagella* Zeller (Ironside, 1970).

SHORTIA gen. n.

Type-species: *Shortia siccula* sp. n.

Small to medium-sized species, fore wing length 4-6 mm; clypeus small, convex, margin arcuate; mandible bidentate, quite long and strongly tapered, twisted about 10°. Occipital carina complete; genal carina joining hypostomal carina above base of mandible. Antenna with scape truncate at 55-60° from transverse (Fig. 377); flagellum unicolorous.

Epomia absent; speculum relatively smooth and polished. Propodeum with only posterior transverse carina complete, very close to hind edge. Fore leg with tibial spur extending about 0.2 times length of basitarsus.

Fore wing with *3r-m* absent (Fig. 386); hind wing with distal abscissa of Cu_1 weak; first abscissa of Cu_1 far longer than *cu-a*.

Gaster with tergite 1 stout, without dorsal carinae, or with a small glymma and with spiracle well before centre; tergites 2-4 convex. Ovipositor barely projecting beyond apex of gaster, strongly compressed, up-curved with a trace of teeth on upper valve proximal to notch (Fig. 380).

Etymology. This genus is named in honour of the late Dr J. R. T. Short who organised the running of malaise traps in the Botanic Gardens, Canberra, and was responsible for collecting many interesting specimens till his untimely death in 1982.

Remarks. This genus is easily distinguished from other atrophines by the characteristic ovipositor. The mandibles are also more slender than those of other Australian species.

Australian species. Two species are known, one from New Guinea (TC) and a second, the type-species described below, from Australia.

Shortia siccula sp. n.

Female: upper tooth of mandible 1.6 times length of lower; face and clypeus convex, punctate with fine reticulations between punctures. Notauli vestigial. Alitrunk mostly punctate with fine reticulate sculpture between punctures; submetapleural carina evenly but strongly broadened anteriorly. Tergites of gaster matt, granulate.

Head, prothorax, mesoscutum, scutellum, tergite 2 centrally, 3 almost entirely and 4+ entirely black; remainder of body orange-red except for vertical marks, clypeus, mandibles and stripe on last tergite which are white and hind margin of tergites 2 and 3 which are yellowish; antenna blackish; fore leg paler orange, hind tibia and tarsus infuscate. Wings very slightly infumate, pterostigma blackish brown.

Male: same as female.

Material examined

Holotype ♀, Australian Capital Territory: Canberra, xi.1978 *(Tidemann)* (ANIC).

Paratypes. New South Wales: 1 ♂, Parramatta, i. (TC). Queensland: 1 ♀, Brisbane, Long Pocket, xi.1977 *(Galloway)* (BMNH); 1 ♀, Cooloola Nat. Pk., x.1979 *(Galloway)* (DPIQ); 1 ♂, Mt Cootha, v. (TC); 5 ♂, Mt Glorious, xii. (TC); 1 ♀, Mt Tambourine, xi.1977 *(Galloway)* (BMNH); 1 ♀, 5 ♂, Stanthorpe, 700 m, xii. (TC). Tasmania: 13 ♂, Coles Bay, ii.-iii. (TC); 1 ♂, Hellyer Gorge, i.-ii. (TC); 4 ♂, Port Arthur, ii.-iii. (TC); 1 ♂, Roseberry, iii. (TC); 1 ♀, 1 ♂, Strathan, iii. (TC); 4 ♀, 40 ♂, Togari, iv. (TC). Victoria: 40 ♂, Mt Dandenong, 200 m, ii. (TC); 4 ♂, Warburton, ii.-iii. (TC).

Host records. None.

SPILOPIMPLA Cameron*

Spilopimpla Cameron, 1904*b*: 143. Type-species: *Spilopimpla rufithorax* Cameron, by monotypy.

Afronyx Benoit, 1953: 156. Type-species: *Afronyx spinata* Benoit, by original designation.

Small species, fore wing length 4 mm; clypeus quite broad and weakly separated from face, margin very slightly arcuate with a fringe of long fine hairs; mandible stout, not twisted, bidentate. Occipital carina complete; genal carina joining hypostomal carina above base of mandible. Antenna with scape truncate at 30-35° from transverse (Fig. 376); flagellum unicolorous.

Epomia absent; speculum polished, punctate only on upper part. Propodeum short with only posterior transverse carina present. Fore leg with tibial spur not extending 0.3 times length of basitarsus.

Fore wing with *3r-m* absent, *2r-m* unusually short, about 0.5 times length of abscissa of *M* between *2r-m* and *2m-cu* (Fig. 386); hind wing with distal abscissa of Cu_1 absent.

Tergite 1 quite broad, dorsally smooth and polished, without glymma and with spiracles before centre; tergites 2-4 convex. Ovipositor projecting beyond apex of gaster by 0.8 times length of hind tibia, compressed, straight (Fig. 381).

Remarks. A moderately large genus common in the drier parts of Africa. A single Australian species from Canberra is known. It is not clear whether this species is phylogenetically related to the African ones. Structurally it appears to have some affinity but the venation is rather different. The limits of the genera of "short-ovipositored" atrophines are not clearly defined at present and I have perhaps erred on the side of caution in not describing this as a genus separate from the African species.

Australian species. One, undescribed (ANIC).

Host records. None.

SYZEUCTUS Foerster

Diceratops Foerster, 1869: 167. Type-species: *Pimpla bicornis* Gravenhorst, by subsequent monotypy, Schmiedeknecht, 1888: 438.
Syzeuctus Foerster, 1869: 167. Type-species: *Ichneumon maculatorius* F., by subsequent monotypy, Schmiedeknecht, 1888: 439.
Syzeucta Thomson, 1889*b*: 1415. [Unjustified emendation.]
Meyva Cameron, 1899: 191. Type-species: *Meyva villosa* Cameron, by monotypy.
Rhynchotrevoria Cameron, 1906*a*: 125. Type-species: *Rhynchotrevoria rostrata* Cameron, by monotypy.
Ephialtina Szépligeti, 1908*b*: 74. Type-species: *Ephialtina apicalis* Szépligeti, by monotypy.
Leptoglyphis Brèthes, 1927: 319. Type-species: *Leptoglyphis minasensis* Brèthes, by monotypy.
Paratanera Rao, 1953: 171. Type-species: *Paratanera indica* Rao, by original designation.

Medium-sized species, fore wing length 7-10 mm; clypeus quite broad, weakly convex, margin arcuate or medially flattened; mandible quite stout, evenly tapered, not twisted, bidentate. Occipital carina complete; genal carina joining hypostomal carina at base of mandible. Antenna with scape truncate at 50-55° from horizontal; flagellum blackish, unicolorous.

Epomia usually present; speculum in part polished, punctate. Propodeum convex, usually devoid of carinae, rarely with posterior transverse carina present. Fore leg with tibial spur reaching 0.3-0.4 of way along basitarsus.

Fore wing with an irregularly rhombic, petiolate areolet, the petiole (2+*3r-m*) as long as height of areolet (Fig. 385), *2m-cu* emitted just distal to centre; hind wing with distal abscissa of Cu_1 present, weak; first abscissa of Cu_1 from slightly to conspicuously longer than *cu-a*.

Gaster with tergite 1 quite long, fairly slender with minute glymma, without dorsal carinae and with spiracles far before centre; tergites 2-4 convex. Ovipositor projecting beyond apex of gaster by more than 2.0 times length of hind tibia.

Remarks. *Syzeuctus* is a moderately large, cosmopolitan genus, most species of which occur in the drier areas of the tropics and subtropics. It is one of the most distinctive of lissonotine genera on account of the characteristic venation and the genal carina joining the hypostomal carina at the base of the mandible. Most Australian species are quite stout insects with a coarsely punctate alitrunk and usually with the wing tips infumate. Many are yellow and the males of a number of species are extraordinary in having large 'velvety' areas visible around the spiracles of tergites 1-3 of the gaster.

In Australia species are widely distributed and I have seen examples from all states except South Australia. Chandra (1976*b*) described several Australian species but his key is of limited value as he failed to realize only males have the velvety spiracular areas.

Australian species. *Syzeuctus conformis* Chandra (E); *S. galbinus* Chandra (E); *S. insolens* Chandra (E); *S. speciosus* (Girault) (E); *S. tanycorpus* Chandra (E). I have seen eight undescribed species (ANIC; BMNH; TC).

Host records. None from Australia but one Oriental species has been recorded from a pyraustine pyralid (Chandra & Gupta, 1977).

TOSSINOLA Viktorov*

Tossinola Viktorov, 1958: 1500. Type-species: *Tossinola pulchra* Viktorov, by original designation.

Small to medium-sized species, fore wing length 4-6 mm; clypeus weakly convex, margin arcuate with fringe of fine hairs; mandible bidentate, quite long, not twisted. Occipital carina broadly incomplete centrally; genal carina joining hypostomal carina above base of mandible. Antenna with scape truncate at 30° from horizontal; flagellum unicolorous.

Epomia absent; speculum sparsely punctate. Propodeum short, abruptly but convexly rounded, with posterior transverse carina strong. Fore leg with tibial spur reaching 0.2 times length of basitarsus.

Fore wing with *3r-m* absent, *2r-m* short, less than 0.5 times length of abscissa of *M* between *2r-m* and *2m-cu* (Fig. 382); hind wing with distal abscissa of Cu_1 very faint; first abscissa of Cu_1 far longer than *cu-a*.

Gaster with tergite 1 stout, coarsely punctate dorsally, without carinae or glymma and with small spiracle well before centre (Fig. 379); tergites 2-4 convex. Ovipositor projecting beyond apex of gaster by 1.3 times length of hind tibia, slightly up-curved.

Remarks. A small genus with a few scattered species in the U.S.S.R., tropical Africa and the Philippines. It is easily distinguished by the broadly incomplete occipital carina and wing venation. Structurally it is rather similar to the Australian species of *Spilopimpla*, especially in the fore wing venation and form of the clypeus. The two differ not only in the form of the occipital carina but *Tossinola* has the distal abscissa of Cu_1 present in the hind wing and has the gaster coarsely sculptured, not smooth.

All of the Australian specimens I have seen were taken in Queensland.

Australian species. One, undescribed (TC).

Host records. None.

Tribe BANCHINI

This is a small tribe containing nine genera. Most are restricted to the Holarctic region but one, *Exetastes*, is very widespread and probably contains as many species as all other genera combined. Only one genus is known to occur in Australia and this seems to be endemic.

In Europe some banchines oviposit into very immature larvae; their larvae are unusual in having a pronounced vesicle (Błedowski & Kraińska, 1926).

PHILOGALLERIA Cameron

Philogalleria Cameron, 1912*a*: 190. Type-species: *Philogalleria sextuberculata* Cameron, by monotypy.

Medium-sized to moderately large species, fore wing length 6-12 mm; clypeus flat, thin, apically bilobate; mandible virtually tridentate, the real upper tooth broad and somewhat bifid (Fig. 60). Occipital carina complete; genal carina faint but joining hypostomal carina well above base of mandible. Antenna with scape apically oblique, truncate at 45-50° from transverse; flagellum unicolorous.

Epomia short or absent; speculum smooth and polished; propodeum short, usually without carinae. Fore leg with tibial spur reaching 0.6 times length of basitarsus.

Fore wing with *3r-m* present, areolet large, quandrangular or pentagonal (Fig. 67); hind wing with distal abscissa of Cu_1 present; *cu-a* very much longer than first abscissa of Cu_1.

Gaster with tergite 1 slender, without lateromedian carinae and with spiracles before centre; tergites 2-4 smooth. Ovipositor short, barely projecting beyond apex of gaster.

Remarks. *Philogalleria* is a small genus restricted to Australia. There is considerable range of diversity in colour pattern amongst the species and care is needed to avoid confusing them with some ctenopelmatines (see p. 223). The form of the mandible should be sufficient to enable *Philogalleria* species to be easily recognized.

Some *Philogalleria* species are quite widely distributed throughout Australia but most occur in the extreme south-east.

Australian species. *Philogalleria sextuberculata* Cameron (E). I have seen four additional undescribed species (AM; ANIC; BMNH; NMV; TC; TDF).

Host records. *P. sextuberculata* - Pyralidae: *Galleria mellonella* (L.) (Cameron, 1912*a*). *Philogalleria* sp. 2 - Geometridae: *Thalaina* sp. (TDF); *Stathmorrhopa aphotista* Turner (Short, 1978) (TDF).

SUBFAMILY LYCORININAE*

The Lycorininae is a very small subfamily containing about 30 species placed, in the present work, in a single genus. Although it is a cosmopolitan group lycorinines are apparently rare insects. Australia possesses several rather uncommon species.

DIAGNOSIS

Small to medium-sized insects, fore wing length 3-7 mm; clypeus separated from face by groove, with margin slightly concave medially; mandible bidentate; malar space with an impressed groove running from eye to mandible; frons simple. Occipital carina complete or narrowly interrupted mediodorsally; genal carina joining hypostomal carina above base of mandible. Flagellum cylindrical, unspecialized. Notauli vestigial; sternaulus absent; posterior transverse carina of mesosternum absent. Propodeum with dorsolateral corner projecting anteriorly and engaging a small hook on the metanotum (Fig. 69); propodeum with or without carinae. Fore tibia without a tooth on apical margin; tarsal claws strongly pectinate. Fore wing with *3r-m* absent; *2r-m* longer than abscissa of *M* between *2r-m* and *2m-cu*; *2m-cu* with one bulla; pterostigma broadly triangular; marginal cell moderately long.

Hind wing with first abscissa of *Rs* longer than *r-m*; distal abscissa of Cu_1 present or absent. Gaster with tergite 1 broad, dorsally convex with spiracles before the centre, sternite not reaching to spiracles; tergites 2-4 with strongly impressed, striate grooves defining triangular central areas (Fig. 62). Female with subgenital plate large, triangular, centrally membranous; ovipositor projecting beyond apex of gaster by about 1.5 times length of hind tibia, its apex with a strong nodus.

Lycorinines are one of the more distinctive ichneumonid taxa on account of the grooves on tergites 2-4 and their unique propodeal/metathoracic 'catch' (Fig. 69).

CLASSIFICATION

Lycorina was placed by classical authors in the Pimplinae. Townes, in his various reclassifications of ichneumonids, initially placed it as a tribe in the Banchinae (Townes, 1951), later as a genus in the banchine tribe Glyptini (Townes *et al.*, 1965) and finally, on the basis of information about the larva, as a distinct subfamily (Townes, 1970*b*).

Structurally *Lycorina* occupies an isolated position within the family. Although it is traditionally placed close to the Banchinae most of the shared similarities are symplesiomorphies. Banchines form, together with the Ctenopelmatinae and ophionine subfamilies (Ophioninae, Cremastinae, Tersilochinae and Campopleginae), a specialized group of endoparasitic Ichneumonidae. All share several specializations including a notch on the upper valve of the ovipositor, simple triangular larval mandibles and a caudate first instar larva. The first instar larva of lycorinines is unknown but the female has a nodate ovipositor and the mandibles of the final instar larva are denticulate, suggesting it is not closely related to the Banchinae.

There has been some confusion over the correct subfamily name. The generic names as first used by Holmgren (1859*b*) is feminine so the correct stem is thus Lycorin- although many authors have used the more pronounceable, but incorrect, form Lycorinae.

Townes (1970*b*) recognized three genera, *Lycorina* from the Palaearctic and Oriental regions, *Gonioglyphus* from the Afrotropical region and *Toxophoroides* from the New World. These genera were distinguished by the degree of development of propodeal carinae and presence or absence of the distal abscissa of Cu_1 in the hind wing. The latter feature has been observed to vary within a species whilst the validity of the former as a generic character is dubious. There is a marked tendency for ichneumonids in drier regions to have reduced propodeal carination. If one were to accept the genera as Townes defined them then all three would be present in Australia. This was considered to be unlikely so the genera were reexamined. As a consequence the generic limits were found not to be 'real' i.e. there exists a continuous range of variation from completely carinate to totally acarinate propodea. Apart from this all species appear to be very closely interrelated and it would seem more logical to include all in a single genus. Townes also has had doubts about the validity of the genera for, in an earlier work (Townes *et al.*, 1965), he included all as a single genus.

DISTRIBUTION

This is a cosmopolitan group of morphologically rather similar species. They are never very common nor are there large numbers of species in any one area.

BIOLOGY

Virtually nothing is known of the biology of Lycorininae, not even whether they are endo- or ectoparasitic. The long-bladed, denticulate mandible of the final instar larva (Finlayson, 1976) suggests that lycorinines may be ectoparasites. Several species have been reared in North America. In all cases the hosts are microlepidoptera, especially species of the families Gelechiidae, Pyralidae and Tortricidae. The egg of lycorinines is a most unusual shape, being leech-like and centrally twisted (Iwata, 1958).

LYCORINA Holmgren*

Lycorina Holmgren, 1859*b*: 126. Type-species: *Lycorina triangulifera* Holmgren, by monotypy.
Toxophoroides Cresson, 1873: 406. Type-species: *Lycorina? apicalis* Cresson, by original designation. Syn. n.
Chlorolycorina Cushman, 1920*a*: 9. Type-species: *Glypta acitula* Cresson, by original designation. Syn. n.
Gonioglyphus Seyrig, 1932: 22. Type-species: *Lycorina (Gonioglyphus) fici* Seyrig, by monotypy. Syn. n.

Remarks. The species of this genus are quite widely distributed throughout Australia and I have seen specimens from all states except Northern Territory and South Australia. These insects may be restricted to woodlands and denser scrubs. The Australian lycorinines can be divided into two species-groups. One contains two species which have some propodeal carinae, quite long, well-developed pectinae on the claws and a simple eighth female tergite. This group seems to be restricted to tropical Queensland. The second group contains one or possibly two species. It is characterized by the absence of propodeal carinae, short tarsal pectinae and acuminate tergite 8 in females. Two colour forms exist but their ranges overlap and I doubt they represent separate species. This taxon is widely distributed from southern Queensland to Tasmania and Western Australia.

Australian species. Three, undescribed (ANIC; BMNH; TC).

Host records. One specimen in the BMNH from Queensland is labelled "ex *I. miserana*, collected on flowers".

SUBFAMILY CAMPOPLEGINAE
(= Porizontinae sensu Townes)

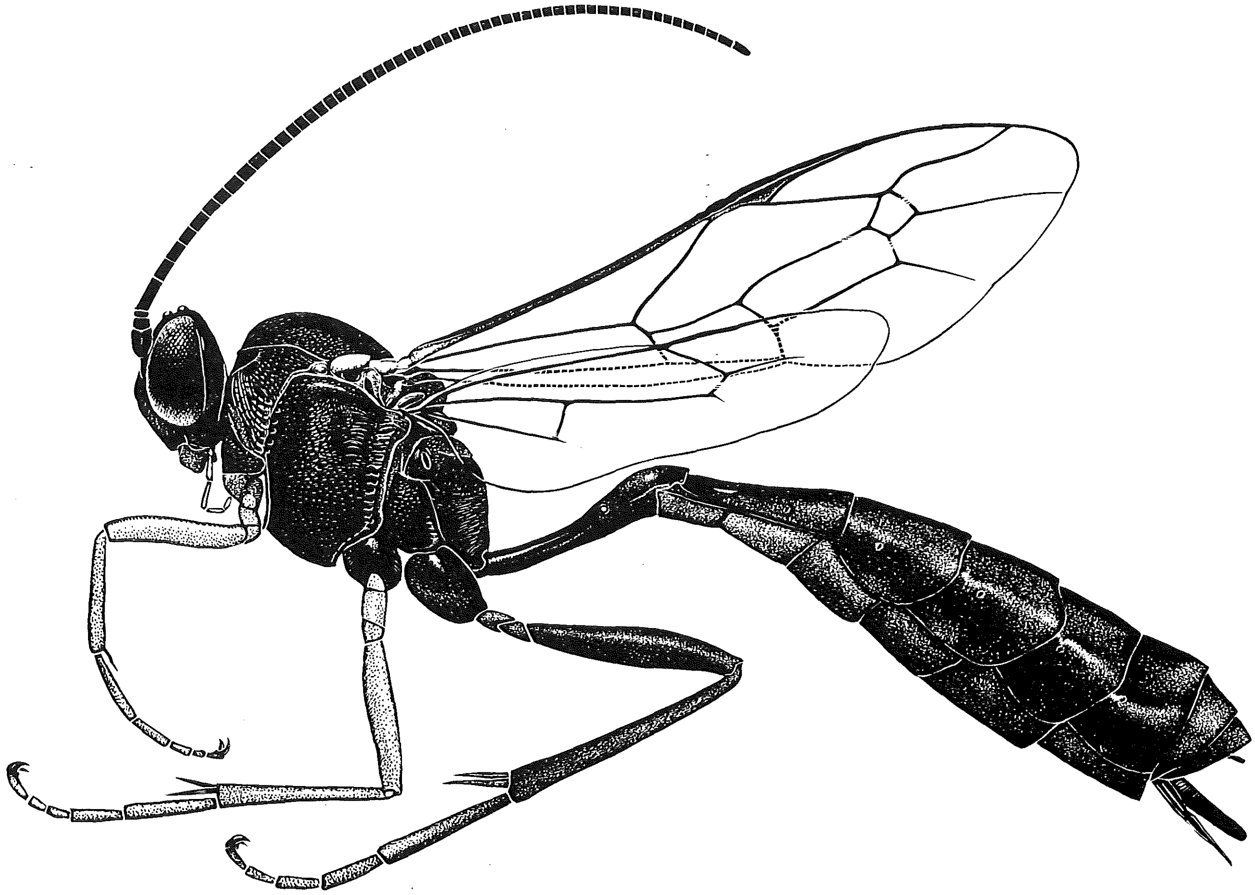


Fig. 389 *Delopia* ♀, lateral.

The Campopleginae is a large subfamily of Ichneumonidae with, world-wide, about 55 genera. A number of these are very large and rather poorly defined, and several genera are arbitrarily delimited (Carlson, 1979). This makes classification and identification difficult, a particularly unfortunate circumstance as campoplegines are amongst the most common ichneumonids and several species are parasites of economically significant insect pests. Despite the importance of many species, there are no modern revisionary studies of the numerous Indo-Australian species of *Diadegma*, *Campoletis*, *Eriborus* or *Hyposoter* and even in the comparatively well-worked western Palaearctic region many species of these genera are unidentifiable at present. Because so little has been done on the group previous identifications are often erroneous, even at generic level, and a number of published host-parasite associations are probably incorrect.

In the present work 20 genera are recognized from Australia. Eleven of these have previously been recorded (Townes *et al.*, 1961; Ironside, 1970) and four, *Eucaphila*, *Neolophron*, *Picacharops* and *Slenda*, are described as new. The remaining five genera, *Enytus*, *Melalophacharops*, *Olesicampe*, *Sinophorus* and *Sliochia*, are all newly recorded as Australian.

DIAGNOSIS

Small to moderately large species, fore wing length 2-12 mm; head and body often granulate, weakly polished and usually predominantly black and red or black in colour, rarely polished and brighter coloured. Clypeus rather weakly separated from face by groove, with margin thin or blunt, usually weakly arcuate, less commonly truncate or with a vestige of a median apical tooth; mandible fairly evenly bidentate, often with a ventral flange; male flagellum without tyloids. Sternaulus absent or short; posterior transverse carina of mesosternum usually complete (only in one rare Australian species incomplete); propodeum usually with some carinae, often with areae superomedia and petiolaris confluent, forming a long, somewhat inverted U- or V-shaped area, sometimes with carinae reduced and/or with a median longitudinal furrow. Apical edge of fore tibia usually without a tooth on outer side; tarsal claws usually pectinate, sometimes simple, never lobate. Fore wing with $3r\text{-}m$ present or absent, when present enclosing a more or less rhombic or obliquely quadrangular areolet which is often petiolate above; hind wing with *Rs* from slightly longer than to shorter than $r\text{-}m$; distal abscissa of Cu_1 usually absent or weak. First tergite of gaster long, usually more or less cylindrical, anteriorly with slender petiole, only slightly broadened posteriorly; petiolar spiracles far behind centre of tergite, with or without a glymma; gaster laterally compressed, at least in the posterior part of females and often very strongly so for its whole length; tergites 2-4 usually with very weak microsculpture, without coarse punctures, grooves or furrow (except for thyridia); ovipositor short to moderately long, when projecting beyond apex of gaster usually up-curved; apex of ovipositor always with a dorsal subapical notch (though this is difficult to see in *Sliochia*), often without a nodus and with indistinct apical teeth.

In Australia campoplegines are most likely to be confused with species of Anomaloninae, Tersilochinae or Cremastinae. All have a superficially similar appearance with rather slender, laterally compressed gasters. The propodeum of anomalonines is coarsely reticulate and the clypeus often bears a median apical tooth; the posterior ocelli are separated from the occipital carina by about their own diameter unless $3r\text{-}m$ rather than $2r\text{-}m$ is present in the fore wing. In campoplegines the propodeum is usually not coarsely reticulate (except in *Charops*), the clypeus has only a vestigial tooth or lacks a tooth entirely, the posterior ocelli are remote from the occipital carina and $3r\text{-}m$ is never present if $2r\text{-}m$ is absent. Tersilochines have a broad fringed clypeus and a very deep marginal cell quite unlike any campoplegine. Cremastines usually have pale faces; amongst campoplegines only *Xanthocampoplex* species have the face yellow. Most cremastines have a large pterostigma, a very short *Rs* in the hind wing and often have a sinuate ovipositor tip. Campoplegines have a relatively narrow pterostigma, usually have *Rs* about as long as or longer than $1r\text{-}m$ and never have a sinuate ovipositor tip. Cremastines are generally highly polished and some have tergite 2 longitudinally striate whereas most campoplegines are weakly polished and tergite 2, if sculptured, is granulate.

CLASSIFICATION

In older works the campoplegines were treated as a tribe in the subfamily Ophioninae, but recently it has generally been accepted that the group warrants subfamilial rank (e.g. Townes, 1970*b*; Gupta & Maheshwary, 1977; Carlson, 1979). Several authors, however, point out their close resemblance to ophionines, particularly in the larval stages (e.g. Short, 1978), and the Ophioninae and Campopleginae are probably sister-groups.

Townes (1970*b*) recognized four tribes, Nonnini, Helwigiini, Campoplegini and Porizontini. Later (Townes & Townes, 1973) the name Porizontini was applied to the Campoplegini whilst the old Porizontini was re-named Macrini. However, recent authors do not accept that the latter two tribes have any phyletic validity and treat all as a single tribe, the Campoplegini (Finlayson, 1975; Carlson, 1979). I agree with these authors and, in the present work, three tribes are recognized, Campoplegini, Helwigiini and Nonnini. The last two are very small, each containing two genera, and are not known from Australia. The Campoplegini contains the great majority of genera and species and is well represented in Australia.

DISTRIBUTION

As mentioned above only one tribe, the Campoplegini, occurs in Australia and the majority of genera and species show a distinct affinity with the South East Asian fauna. Excluding three newly described endemic genera, *Eucaphila*, *Neolophron* and *Picacharops*, 15 of the 17 genera represented in Australia are well represented in South East Asia. In fact, only seven of the 22 Asian genera (*Scenocharops*, *Cymodusa*, *Phobocampe*, *Rhachioplex*, *Kartika*, *Urvashia* and *Menaka*) do not have Australian representatives. Most of these occur in the transition region between the Palaearctic and Oriental regions and are unlikely to occur in Australia. The only non-endemic genera to occur in Australia which lack relatives in the Oriental region are *Nepiera* and *Enytus*. The former is very rare and may have been accidental introduction but *Enytus* is represented by three species in the southern part of the continent and is probably a native. It is possible that *Enytus* reached Australia from the south as it is otherwise only known from the Holarctic and Neotropical regions.

BIOLOGY

Campoplegines are solitary endoparasites of holometabolous insect larvae. The great majority attack lepidopterous larvae though some species of smaller genera utilize other hosts. Amongst the Coleoptera cerambycid larvae serve as hosts for some species of *Rhimphoctona*, curculionid larvae are parasitized by *Bathyplectes* and the usual hosts of *Lemophagus* species are exposed chrysomelid larvae. Some other species of *Rhimphoctona* and *Nemeritis* parasitize larvae of Rhaphidiidae whilst many species of *Olesicampe* and *Lathrostizus* are parasites of symphytan larvae.

Many of the campoplegines that attack Lepidoptera have a well-defined and rather narrow host range. Those with short ovipositors attack exposed larvae whilst the long ovipositors of other species are used to gain access to concealed larvae. A number of the campoplegines parasitizing exposed larvae (e.g. *Campoletis* spp.) oviposit into very young larvae and the host is killed before reaching the final instar. In these cases the parasite generally spins a characteristic greyish or blotched cocoon attached to the host's food plant. In such a situation the cocoon is particularly vulnerable to being secondarily parasitized by small phygadeuontines and pimplines. Consequently campoplegines have adopted a number of ruses to avoid parasites. Some species (e.g. *Charops*) suspend their cocoon from the plant by a long thread and many also have black and white blotched cocoons that resemble bird droppings. Some other species construct a false cocoon above the real one whilst the mature larvae of a few genera (e.g. *Spudastica* and some *Phobocampe*) are able to cause their cocoons to jump. Species of some other genera (e.g. *Delopia* and *Olesicampe*) generally only kill their host after it has constructed a pupal chamber whilst a few species (e.g. some *Hyposoter*) pupate in the dead host larva (Short, 1978).

Some campoplegines apparently temporarily paralyse their hosts (Gupta & Maheshwary, 1977) though others do not (Lloyd, 1940). Many attack very young larvae and some species of *Olesicampe* will only oviposit into first instar larvae (Muldrew, 1967). *Sinophorus*, *Casinaria* and *Campoplex* species often attack third or even fourth instar larvae (Gupta & Maheshwary, 1977) whilst *Diadegma eucerophaga* will attack all larval stages including the prepupa (Lloyd, 1940). A single egg is deposited free in the haemocoel and this generally hatches withint two or three days. The first instar larva is slender with a pronounced caudal appendage. The head is furnished with a pair of small curved mandibles (Gerig, 1960). In subsequent instars the caudal appendage is progressively reduced and the larva becomes stouter. There are few records of the exact number of larval instars but five is probably the most usual (Gerig, 1960; Muldrew, 1967).

The cephalic capsule of the final instar larvae is characteristic in having simple, rather small mandibles, an incomplete epistomal arch and a long hypostoma with a rather short hypostomal spur (Fig. 430). Most species have a Y-shaped prelabial sclerite and the labial sclerite varies from rather slender and sometimes weakly sclerotized ventrally (as in some *Campoplex* and *Campoletis* spp.) to large and heart-shaped (e.g. *Delopia* spp.) (Finlayson, 1975; Short, 1978).

Because many campoplegines have a rather narrow host range this group is probably of more interest to biological control workers than any other. The biology of numerous species has been studied and many have been introduced into different parts of the world to control pests. A number of *Olesicampe* have introduced into North America from Europe to control sawfly pests (e.g. Muldrew, 1967), whilst species of *Diadegma*, *Eriborus*, *Venturia* and *Casinaria* have been imported into the Pacific area to control a number of pest microlepidoptera (Townes *et al.*, 1961).

KEY TO GENERA OF CAMPOPLEGINAE OCCURRING IN AUSTRALIA

As stated above, the campoplegine genera are difficult to delineate and in Australia they blur into each other. The key is designed for ease of use and is thus highly 'artificial'. For many genera confirmatory characters are given in separate paragraphs; alone these are not diagnostic but the combination of all features should provide an adequate characterization of the genus.

1 Head predominantly yellow, alitrunk and gaster extensively yellow, sometimes black-marked; hind wing with Cu_1&*cu-a* subvertical, without angulation (Fig. 414).
  Ovipositor not longer than apical depth of gaster; glymma present; genal carina joining hypostomal carina at base of mandible... .... *XANTHOCAMPOPLEX* (p. 285)

\- Head more or less entirely black; alitrunk and gaster usually black or reddish, very rarely yellow; hind wing with first abscissa of Cu_1 usually angled at junction with *cu-a*, if not, then usually not subvertical............ 2

2 First segment of gaster with sternite and tergite fused, without a trace of join (Fig. 390); fore wing with areolet large, rhombic or almost pentagonal (Fig. 404).
  Propodeum long, usually with only anterior transverse carina present, sometimes without carinae; ovipositor short, straight; propodeal spiracle usually elliptical............ *DELOPIA* (p. 269)

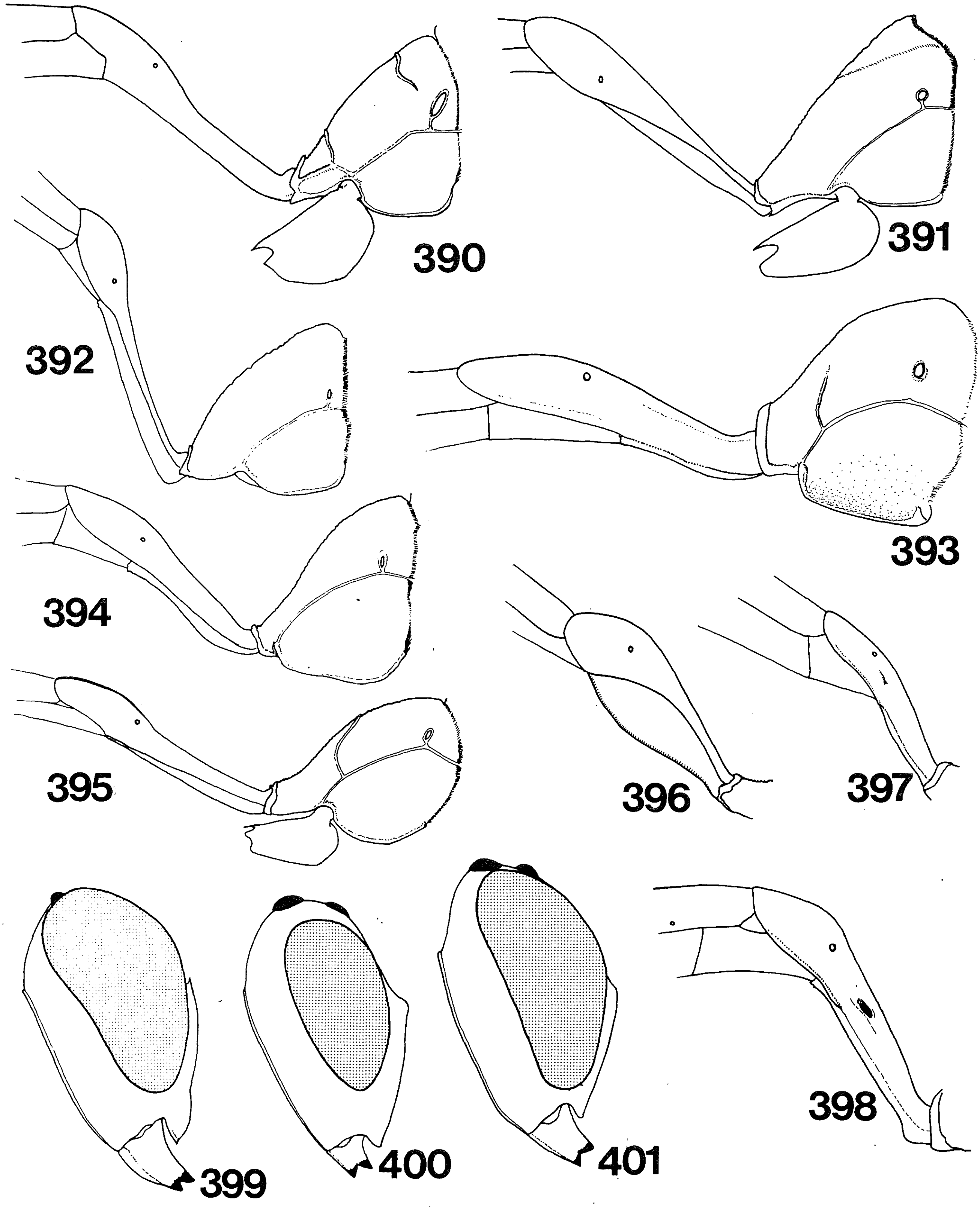
\- First segment of gaster with tergite and sternite not completely fused, generally with each differently sculptured and/or with join distinct (Figs 391-395), or if very rarely this join is obscure then the areolet is small and oblique; areolet otherwise various, from moderately large to small to absent............ 3

3 Ovipositor with a distinct nodus and with a minute, inconspicuous dorsal subapical notch (Fig. 423); fore wing with marginal cell very short, about 2.2 times as long as deep (Fig. 403); hind wing with *M+Cu* very close to and parallel with *Sc+R*.
  3r-m entirely absent; very small species, fore wing length less than 4 mm............ *SLIOCHIA* (p. 283)

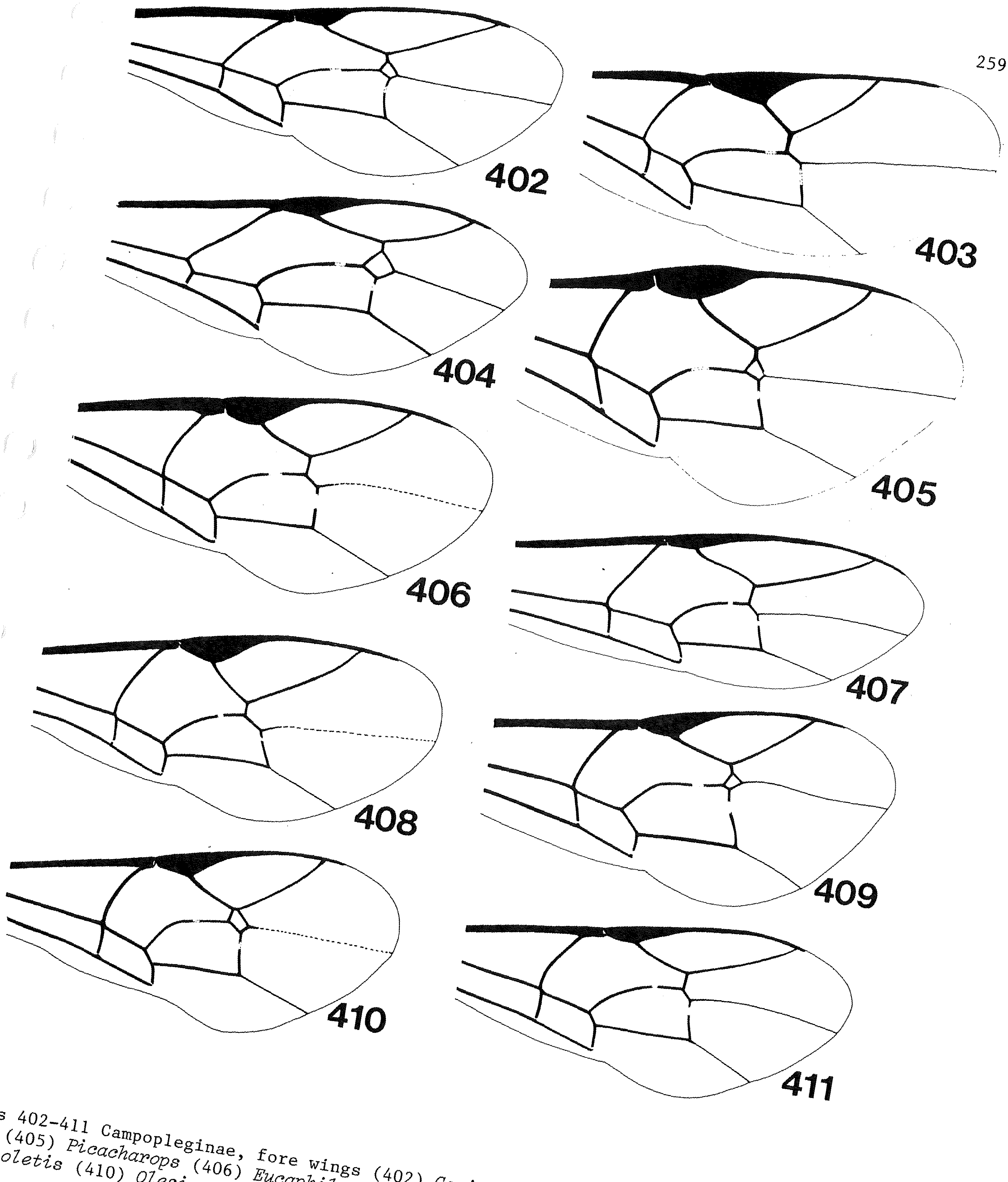
\- Ovipositor without a nodus, dorsal subapical notch usually conspicuous (Fig. 424); fore wing with marginal cell moderately long, usually about 2.8 times as long as deep (Figs 405-413), if shorter, then hind wing with *M+Cu* not close to and parallel with *Sc+R*; hind wing other wise various............ 4

4 Tergite 1 with glymma absent, at most with a scar before each spiracle (Figs 391-397)............ 5

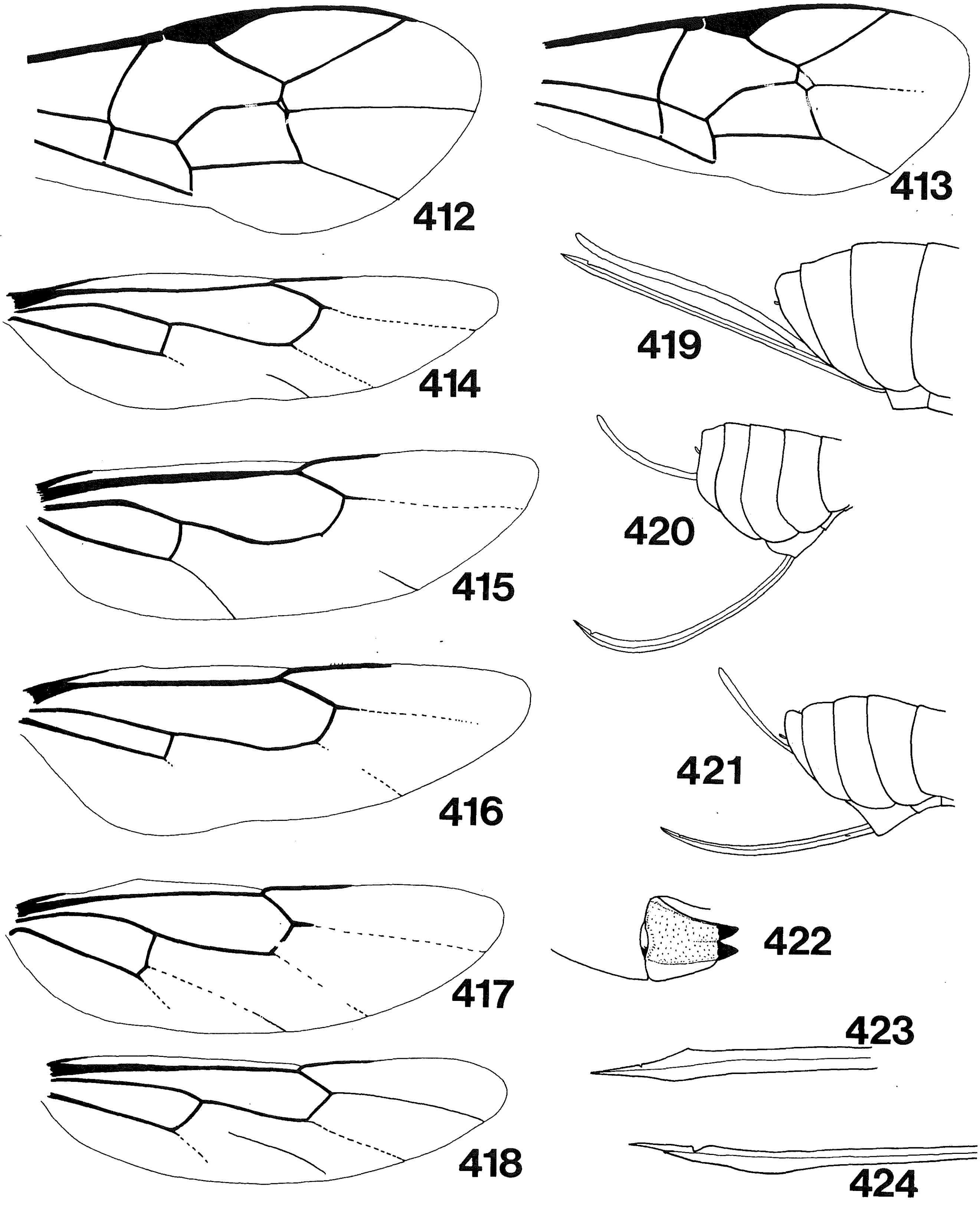
\- Tergite 1 with glymma present as a distinct pit (Fig. 398) (Intermediate specimens will key either way)............ 15



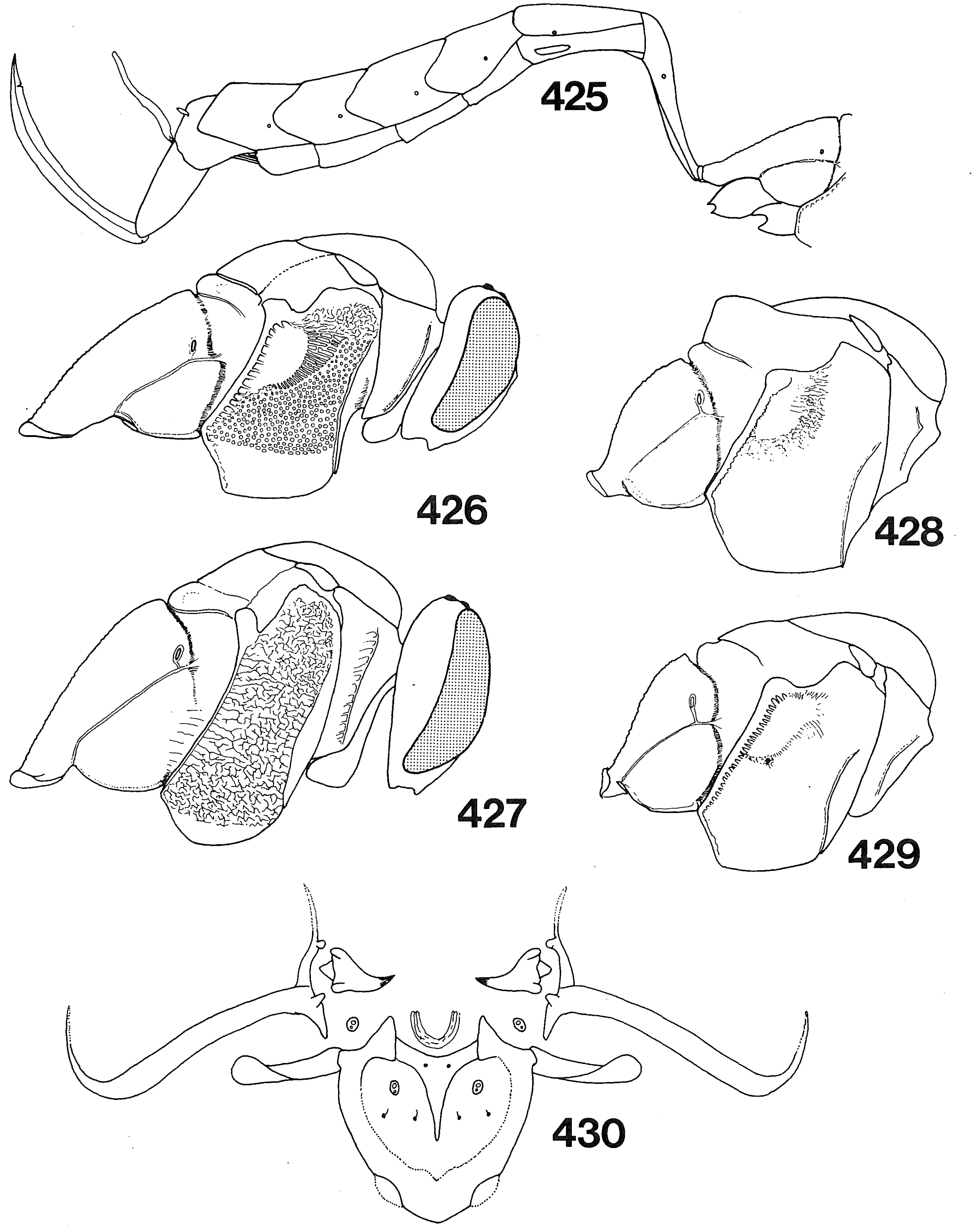
Figs 390-401 Campopleginae. 390-395 Propodeal regions, lateral (390) *Delopia* (391) *Casinaria* (392) *Eucaphila* (393) *Neolophron* (394) *Campoplex* (395) *Venturia*. 396-398 Tergites 1, lateral (396) *Casinaria meridionalis* (397) *Olesicampe* (398) *Hyposoter*. 399-401 Heads, lateral (399) *Hyposoter* (400) *Diadegma* (401) *Eriborus*.



Figs 402-411 Campopleginae, fore wings (402) *Casinaria* (403) *Sliochia* (404) *Delo-pia* (405) *Picacharops* (406) *Eucaphila* (407) *Melalophacharops* (408) *Enytus* (409) *Campoletis* (410) *Olesicampe* (411) *Eriborus*.



Figs 412-424 Campopleginae. 412-413 Fore wings (412) *Hyposoter* (413) *Diadegma*. 414-418 Hind wings (414) *Xanthocampoplex* (415) *Hyposoter* (416) *Melalophacharops* (417) *Campoletis* (418) *Casinaria*. 419-421 End of gasters (419) *Neolophron* (420) *Enytus* (421) *Diadegma*. 422 Mandible, *Picacharops*. 423-424 Ovipositor tips (423) *Sliochia* (424) *Sinophorus*.



Figs 425-430 Campopleginae. 425 Gaster, lateral, *Slenda*. 426-427 Head and alitrunks, lateral (426) *Casinaria* (427) *Charops*. 428-429 Alitrunks, lateral (428) *Melalophacharops* (429) *Picacharops*. 430 Cephalic capsule of final instar larva of *Hyposoter*.

5 Central 0.3 or more of mesopleural suture not impressed, indicated only by raised mesepimeron (Fig. 427); speculum not differentiated from uniformly coarsely sculptured pleuron and *3r-m* absent in fore wing.

Head strongly flattened anteroposteriorly; male genitalia often with gonosquama elongated apically........................*CHAROPS* (p. 268)

\- Central 0.3 or more of mesopleural suture impressed as a distinct groove (Fig. 426); speculum smooth and polished or very finely sculptured, clearly differentiated from remainder of pleuron, or if rarely not clearly differentiated then *3r-m* present enclosing a small areolet; *3r-m* otherwise present or absent...............................6

6 Ventral surface of hind tarsal segments 1-3 ridged, with a median row of fine closely spaced hairs along crest of ridge (Fig. 571); scutellum in profile very convex, posteriorly abruptly rounded (Fig. 428); hind wing with sub-basal cell narrow, less than 0.5 times as wide as the broad basal cell (Fig. 416) (both measured at broadest point)................................*MELALOPHACHAROPS* (in part) (p. 277)

\- Ventral surface of hind tarsal segments 1-3 rounded, without a median row of fine closely spaced hairs ventrally; scutellum flat to moderately convex, posteriorly at most evenly rounded; hind wing with sub-basal cell of moderate width, usually more than 0.5 times as broad as basal cell (Fig. 418)..7

7 Fore wing with *cu-a* strongly oblique so that anteroproximal corner of first subdiscal cell is about 55° (Fig. 405); propodeum short, abruptly declivous (Fig. 429); mandible short with a broad flange along lower margin (Fig. 422).

Ovipositor very short; mesoscutum matt, coarsely punctate; speculum only slightly less coarsely sculptured than mesopleuron...... ....*PICACHAROPS* (p. 280)

\- Fore wing with *cu-a* vertical to weakly oblique so that anteroproximal corner of first subdiscal cell is at least 70° (Fig. 402); propodeum various, usually longer and more evenly rounded; mandible generally moderately long, often with a narrow flange along lower margin............8

8 Pronotum in profile very short (Fig. 426); fore wing with *3r-m* present; eyes indented opposite antennal insertion; hind wing with Cu_1&*cu-a* virtually straight, often inclined obliquely so posterodistal corner of sub-basal cell is about 100° (Fig. 418); first segment of gaster with long slender petiole, with suture between tergite and sternite near dorsal surface (Figs 391, 396); propodeum posteriorly elongate, without carinae (except rarely for anterior vestiges) and with a median longitudinal trough; ovipositor not longer than apical depth of gaster......................*CASINARIA* (p. 266)

\- Not agreeing entirely with above; pronotum in profile moderately long; fore wing with *3r-m* present or absent; eyes not or only weakly indented opposite antennal insertion; hind wing with Cu_1&*cu-a* angulate, or if straight then not strongly oblique; first segment of gaster various, if with petiole slender then usually with suture between tergite and sternite about midline (in profile) (Fig. 395); propodeum elongate or not, with or without carinae and often without a median longitudinal trough; ovipositor from short to projecting well beyond apex of gaster..9

9 Combined areae petiolaris and superomedia of propodeum forming a broad concave trough; hind wing with distal abscissa of Cu_1 present but very faint, not joined to Cu_1&*cu-a*; ovipositor with lower valve very strongly deepened before level of dorsal subapical notch (Fig. 424)..*SINOPHORUS* (p. 282)

- Combined areae petiolaris and superomedia of propodeum not forming a trough; hind wing with distal abscissa of *Cu*1 absent or, if present, usually joining *Cu*1&*cu-a*; ovipositor with lower valve only slightly deepened before level of dorsal subapical notch............................10

10 Ovipositor short, projecting only slightly beyond apex of gaster...........11
- Ovipositor projecting beyond apex of gaster by at least 0.3 times length of hind tibia..12

11 First segment of gaster with petiole with suture between sternite and tergite slightly above midline (Fig. 392) (in profile); flagellum short, slightly clavate, not as long as fore wing; fore wing with 3*r-m* absent (Fig. 406).................................*EUCAPHILA* (p. 275)
- First segment of gaster with petiole with suture between sternite and tergite, if visible, near ventral margin (in profile) (Fig. 397); flagellum slender, clearly longer than fore wing; fore wing with 3*r-m* usually present (Fig. 410)...............*OLESICAMPE* (in part) (p. 279)

12 Tergite 3 of gaster with laterotergite not separated by a sharp crease; tarsal claws long, pectinate only at extreme bases; propodeum projecting posteriorly as a 'neck' which extends almost to apex of hind coxa (Fig. 425); ovipositor exceptionally stout (Fig. 425)...*SLENDA* (p. 282)
- Tergite 3 of gaster with a sharp crease below spiracle (at least anteriorly) separating off a laterotergite which is often turned under; tarsal claws moderately short, generally pectinate to apices; propodeum various, if produced into a long 'neck' then it does not reach to apex of hind coxa; ovipositor slender (Fig. 419).................13

13 Ovipositor straight (Fig. 419); first segment of gaster with petiole stout, short, gradually tapered from postpetiole to anterior margin with suture between tergite and sternite on ventral side (Fig. 393); sternite 1 about 0.5 times length of tergite; mesepimeron broad, the area posterior to it strongly swollen...............*NEOLOPHRON* (p. 278)
- Ovipositor distinctly up-curved; first segment of gaster with petiole fairly slender, usually parallel-sided and with suture between tergite and sternite on lateral side (Figs 394, 395); sternite 1 usually longer than 0.5 times length of tergite; mesepimeron narrow, the area posterior to it weakly swollen......................................14

14 Petiole very long and slender, in section circular, in profile with suture between tergite and sternite at or above centre (Fig. 395); tergite 1 often smooth and subpolished...................*VENTURIA* (p. 284)
- Petiole moderately long, in section a depressed oval or rectangular, in profile with suture between tergite and sternite slightly below centre (Fig. 394); tergite 1 often with a groove or coriaceous area in front of spiracle, sometimes matt....................*CAMPOPLEX* (p. 265)

15 Posterior transverse carina of mesosternum interrupted before each mid coxa.
Fore wing with 3*r-m* present; ovipositor short, not projecting beyond apex of gaster....................................*NEPIERA* (p. 279)
- Posterior transverse carina of mesosternum complete.......................16

16 Fore wing with 2*r-m* short, about 0.5 times length of abscissa of *M* between 2*r-m* and 2*m-cu* (Fig. 408); ovipositor abruptly up-curved towards apex (Fig. 420).
Fore wing with 3*r-m* absent............................*ENYTUS* (p. 272)
- Fore wing with 2*r-m* about equal to or longer than *M* between 2*r-m* and 2*m-cu* (Fig. 409); ovipositor from straight to evenly curved (Fig. 421)..17

17 Fore wing with *3r-m* present, the areolet petiolate with *2m-cu* joining between centre and proximal side (Fig. 409); hind wing with *Cu1&cu-a* with a distinct angulation below centre, sometimes with a stub of distal abscissa of *Cu1* discernible (Fig. 417); clypeus with a vestigial median apical tooth.
Malar space about equal to basal mandibular width; ovipositor projecting beyond apex of gaster by about 0.15 times length of hind tibia, almost straight.................................*CAMPOLETIS* (p. 264)

\- Fore wing with *3r-m* present or absent, if present then areolet is either not petiolate, or if petiolate, then *2m-cu* joins closer to distal side than proximal side (Figs 407, 411-413); hind wing with *Cu1&cu-a* evenly curved or straight, without an angulation (Fig. 415); distal abscissa of *Cu1* absent; clypeus usually without a median apical tooth..18

18 Clypeal margin at least laterally impressed and acute, the clypeus in profile moderately convex (Fig. 399); mandible with a strongly developed ventral flange; ovipositor short, barely projecting beyond apex of gaster...19

\- Clypeal margin blunt or subacute, never impressed, the clypeus in profile flat or slightly convex (Figs 400, 401); mandible with, or more usually without a strongly developed ventral flange; ovipositor from short to long...20

19 Hind tarsal segments 1-3 with a medioventral keel bearing short close hairs (Fig. 571); hind wing with sub-basal cell very narrow (Fig. 416); fore wing with areolet absent (Fig. 407)....................
....*MELALOPHACHAROPS* (in part) (p. 277)

\- Hind tarsal segments 1-3 unspecialized; hind wing with sub-basal cell moderately broad (Fig. 415); fore wing usually with areolet present, often small and almost triangular, rarely obliterated (Fig. 412)...*HYPOSOTER* (p. 276)

20 Fore wing with areolet absent (Fig. 411); hind tarsal segments 1-3 with a medioventral row of close, short hairs; malar space narrow, always less than 0.5 times basal mandibular width (Fig. 401); propodeal spiracle oval or elliptical.......................*ERIBORUS* (p. 272)

\- Fore wing with areolet present (Figs 410, 413), less commonly absent; hind tarsal segments 1-3 without a medioventral row of close short hairs; malar space 0.5-0.8 times basal mandibular width (Fig. 400); propodeal spiracle circular...21

21 Ovipositor short, barely projecting beyond apex of gaster; gaster (of Australian species) predominantly red..........*OLESICAMPE* (in part) (p. 279)

\- Ovipositor projecting distinctly beyond apex of gaster by at least 0.4 times length of hind tibia; gaster (of Australian species) entirely black..*DIADEGMA* (p. 270)

CAMPOLETIS Foerster

Sagaritis Holmgren, 1859*a*: 325. Type-species: *Campoplex declinator* Gravenhorst (= *Ichneumon dilatator* Thunberg), by monotypy. [Homonym of *Sagaritis* Billberg, 1820.]

Echphora Foerster, 1869: 154. Type-species: *Campoplex viennensis* Gravenhorst, by subsequent designation, Viereck, 1914: 50. [Homonym of *Echphora* Conrad, 1843.]

Campoletis Foerster, 1869: 157. Type-species: *Mesoleptus tibiator* Cresson, by subsequent monotypy, Houghton, 1907: 89.

Anilastus Foerster, 1869: 157. Type-species: *Campoplex rapax* Gravenhorst, by subsequent designation, Viereck, 1913: 11.

Anilasta Thomson, 1887: 1053. [Unjustified emendation.]
Ecphoropsis Ashmead, 1900 : 368. [Replacement name for *Echphora* Foerster.]
Sagaritopsis Hincks, 1944: 36. [Replacement name for *Sagaritis* Holmgren.]

Small species, fore wing length 4-5 mm; head subquadrate; clypeus weakly convex, margin impressed, arcuate with a trace of a median apical tooth; mandible short, strongly tapered, with a very narrow flange ventrally; malar space 0.8-0.9 times basal mandibular width. Eyes not indented opposite antennal sockets; genal carina joining hypostomal carina above base of mandible.

Pronotum in profile moderately long, epomia indistinct; scutellum weakly convex; mesopleuron with speculum smooth and polished; mesopleural suture strong. Posterior transverse carina of mesosternum complete. Propodeum evenly rounded, fully carinate except that areae superomedia and petiolaris are confluent; propodeum not produced into a posterior 'neck', spiracles subcircular; longitudinal furrow absent.

Ventral surface of hind tarsal segments 1-3 unspecialized.

Fore wing with *cu-a* oblique so that anteroproximal corner of first subdiscal cell is about 65°; *3r-m* present, areolet petiolate, with *2m-cu* joining proximal to centre (Fig. 409); marginal cell of moderate length. Hind wing with distal abscissa of Cu_1 present or absent, Cu_1&*cu-a* vertical, angled below centre (Fig. 417).

Gaster with segment 1 moderately long, petiole quite slender, with suture between tergite and sternite obsolescent anteriorly, glymma present; sternite 1 reaching about 0.8 times length of tergite. Gaster moderately slender, tergite 3 with laterotergite folded under, separated by a crease. Ovipositor straight, with distinct dorsal subapical notch, projecting beyond apex of gaster by 0.1-0.2 times length of hind tibia.

Remarks. *Campoletis* is a very large cosmopolitan genus. Many species have both a well-developed clypeal tooth and the distal abscissa of Cu_1 complete though both of these characters are very weak in Oriental and Australian species. These can most easily be recognized by the petiolate areolet with *2m-cu* joining proximal to the centre. In species of *Diadegma*, which may be confused with *Campoletis*, *2m-cu* is distal to centre of areolet.

Two species have been found in Australia. One of these, *C. tasmaniensis* is extremely common in Tasmania, Victoria, Australian Capital Territory and southern New South Wales. In malaise trap collections in Canberra it was the most common ichneumonid.

Australian species. *Campoletis tasmaniensis* (Cameron) (E). I have seen one undescribed species (ANIC).

Host records. *C. tasmaniensis* - Noctuidae: *Mythimna convecta* (Walker) (ANIC); *Persectania ewingii* (Westwood) (ANIC). In North America and South East Asia some species of *Campoletis* are important parasites of noctuid pests (Gangrade, 1964; Gupta, 1974; Wene, 1943).

CAMPOPLEX Gravenhorst

Campoplex Gravenhorst, 1829*c*: 453. Type-species: *Ichneumon difformis* Gmelin, by subsequent designation, Westwood, 1840: 60.
Dioratica Foerster, 1869: 153. Type-species: *Porizon borealis* Zetterstedt, by subsequent designation, Townes *et al.*, 1965: 274.
Omorgus Foerster, 1869: 153. Type-species: *Limneria mutabilis* Holmgren (= *Ichneumon difformis* Gmelin), by subsequent designation, Viereck, 1912*a*: 641.
Omorga Thomson, 1887: 1052. [Unjustified emendation.]
Zatranosema Viereck, 1912*e*: 45. Type-species: *Tranosema bicolor* Szépligeti, by monotypy.
Pseuderipternoides Viereck, 1917: 269. Type-species: *Mesoleptus porrectus* Cresson, by monotypy.

Small to moderately large species, fore wing length 3-13 mm; head generally subquadrate, rarely somewhat lenticular; clypeus weakly convex, margin usually blunt, not impressed, evenly arcuate; mandible moderately to quite long, with or without a ventral flange; malar space 0.3-0.8 times basal mandibular width. Eyes not or only very slightly indented opposite antennal socket; genal carina joining hypostomal carina above base of mandible.

Pronotum in profile moderately long, epomia vestigial or absent; scutellum weakly to quite strongly convex; mesopleuron with speculum smooth and polished; mesopleural suture impressed. Posterior transverse carina of mesosternum complete. Propodeum fairly long, evenly declivous, area superomedia generally not delineated laterally, anterior transverse carina present, posterior one present or absent; propodeum without a longitudinal concavity, spiracle oval to almost circular; propodeal apex not produced into a 'neck'.

Ventral surface of hind tarsal segments 1-3 simple.

Fore wing with *cu-a* generally oblique so anteroproximal corner of first subdiscal cell is about 65-75°, or rarely in larger species *cu-a* almost vertical; 3*r-m* present or absent, if present the areolet is usually petiolate, with 2*m-cu* joining at or distal to centre, if absent then 2*r-m* equal to or longer than abscissa of *M* between 2*r-m* and 2*m-cu*; marginal cell moderately long. Hind wing with distal abscissa of Cu_1 usually present as a faint trace, rarely absent; Cu_1&*cu-a* usually angled below centre.

Gaster with segment 1 moderately long, petiole moderately slender, in section rectangular or oval, in profile with suture between tergite and sternite below centre (Fig. 394), tergite 1 often with a groove or coriaceous area before spiracle but glymma absent; sternite 1 reaching at least 0.6 of way along tergite. Gaster moderately slender, tergite 3 with laterotergite membranous, pendant or turned under. Ovipositor up-curved, projecting beyond apex of gaster by 0.8-2.6 times length of hind tibia, its apex with a distinct dorsal notch.

Remarks. *Campoplex* is an extremely large genus of world-wide distribution. It is very closely related to *Venturia* and the separation is difficult and rather contrived (see p. 263). However, all recent authors do recognize the two genera and I have placed the more slender species in *Venturia*.

The Australian species currently placed in *Campoplex* include a considerable range of morphological diversity. Two species, including *C. calamae*, are unusual in their general stoutness and in having a stronger distal abscissa of Cu_1 in the hind wing, but probably they are only 'aberrant' because of their greater size. Several of the smaller *Campoplex* are relatively elongate and resemble *Venturia* except they lack a distinct propodeal 'neck'. The petiole is shorter and stouter than *Venturia* so including these insects in *Campoplex* is probably most reasonable at present.

Australian species. *Campoplex calamae* Cameron (E). I have seen 17 undescribed species (ANIC; BMNH; QM; TC).

Host records. *C. calamae* - Cameron (1912*a*) listed the host of this species as *"Calama expressa"*. The generic name may be a *lapsus* for *Calamia*, a noctuid, but Dr I. F. B. Common (pers comm.) stated this species is not recognizable as Australian. *Campoplex* sp. - Noctuidae: *Uraba lugens* Walker (BMNH). Whilst most species of this genus are parasites of lepidopterous larvae, one Oriental species is purported to be a parasite of *Polistes* (Sonan, 1937; 1944). It may be that its real host is a lepidopterous commensal of *Polistes*.

CASINARIA Holmgren

Casinaria Holmgren, 1859*a*: 325. Type-species: *Campoplex tenuiventris* Gravenhorst, by monotypy.

Amorphota Foerster, 1869: 152. Type-species: *Amorphota orgyiae* Howard (= *Limneria limentidis* Howard), by subsequent monotypy, Howard, 1897: 53.

Campotrephus Foerster, 1869; 152. Type-species: *Campoplex tenuiventris* Gravenhorst by subsequent designation, Viereck, 1914: 27.
Horogenes Foerster, 1869: 152. Type-species: *Campoplex tenuiventris* Gravenhorst, by subsequent monotypy, Brischke, 1880: 147.
Anempheres Foerster, 1869: 154. Type-species: *Anempheres diaphaniae* Viereck (= *Limneria infesta* Cresson), by subsequent designation, Viereck, 1911: 188.
Nothanomalon Szépligeti, 1905: 39. Type-species: *Nothanomalon novoguineensis* Szépligeti, by monotypy.
Trophocampa Schmiedeknecht, 1907*a*: 598. Type-species: *Campoplex mesozostus* Gravenhorst, by original designation.
Fiebrigia Viereck, 1912*b*: 638. Type-species: *Campoplex texanus* Ashmead (= *Casinaria grandis* Walley), by original designation.
Neonortonia Viereck, 1912c: 592. Type-species: *Campoplex genuinus* Norton, by original designation.
Zastenomorpha Viereck, 1921: 81. Type-species: *Zastenomorpha lamina* Viereck, by original designation.
Zastenogastra Viereck, 1925*c*: 259. Type-species: *Zastenogastra graciliventris* Viereck, by subsequent designation, Viereck, 1926: 186.
Nothanomaloides Uchida, 1928*a*: 273. Type-species: *Nothanomaloides matsuyamensis* Uchida, by original designation. [Homonym of *Nothanomaloides* Viereck, 1925*b*.]
Deltops Seyrig, 1935: 84. Type-species: *Deltops granulicoxis* Seyrig, by original designation.
Longicharops Uchida, 1940: 131. [Replacement name for *Nothanomaloides* Uchida.]
Neonortoniella Blanchard, 1947*a*: 4. Type-species: *Neonortoniella plusiae* Blanchard by original designation.
Casinariodes Aubert, 1960: 64. Type-species: *Casinaria monticola* Thomson, by original designation.

Medium-sized to moderately large species, fore wing length 6-11 mm; head generally lenticular; clypeus very weakly convex, broad, evenly arcuate; mandible quite short, with a broad flange on ventral margin that abruptly ends about 0.7 of way along mandible; malar space 0.3-0.6 times basal mandibular width. Eye indented opposite antennal socket; genal carina reaching base of mandible.

Pronotum in profile short; epomia long and strong; scutellum flat to weakly convex; mesopleuron with speculum distinct, polished and smooth or very weakly sculptured; mesopleural suture strong (Fig. 426). Posterior transverse carina of mesosternum complete. Propodeum long, evenly declivous, usually produced into a 'neck' posteriorly; propodeal carinae absent or present anteriorly as vestiges; propodeum with a median longitudinal furrow; spiracle oval.

Ventral surface of hind tarsal segments 1-3 unspecialized.

Fore wing with *cu-a* subvertical; *3r-m* present, areolet petiolate, *2m-cu* joining slightly distal to centre (Fig. 402); marginal cell long. Hind wing with distal abscissa of Cu_1 absent or discernible as a vestige, not joining Cu_1*&cu-a*; Cu_1*&cu-a* evenly curved, often curved inwards so anterodistal corner of sub-basal cell is acute (Fig. 418).

Gaster with segment 1 long, petiole slender, cylindrical or compressed, in profile with suture separating tergite and sternite above centre (Figs 391, 396); sternite 1 reaching 0.7 or more of length of tergite; glymma absent. Gaster slender, tergite 3 with or without crease separating laterotergite. Ovipositor straight or slightly curved, simply acute with distinct dorsal subapical notch; ovipositor barely projecting beyond apex of gaster.

Remarks. *Casinaria* is a large cosmopolitan genus that is well represented in Australia. Two species-groups are discernible; one has a very elongate propodeal 'Neck' and does not have laterotergite 3 differentiated, the other has a shorter propodeum and a distinct laterotergite 3. Only one species of the former is described, *C. meridionalis*. This is exceptional in having the first sternite flattened laterally and sharpened ventrally, so the first segment is knife-like below. Species of the *C. meridionalis*-group are parasites of hesperiid larvae. No species of the second group are described, but various species have been reared from Heterocera including a pyralid, a geometrid and a notodontid.

Australian species. *Casinaria meridionalis* (Turner) (E). I have seen 11 undescribed species (ANIC; BMNH; TC).

Host records. *C. meridionalis* - Hesperiidae: *Oreisplanus munionga* (Olliff) (ANIC). *Casinaria* sp. 2 - Hesperiidae: *Trapezites lutea* Tepper. *Casinaria* sp. 3 - Hesperiidae: *Hesperilla chrysostricha* (Meyrick & Lower); *H. donnysa* Hewitson (ANIC). *Casinaria* sp. 6 - Pyralidae: *Musotima ochropteralis* (Guenée) (DPIQ); Geometridae: *Mnesampela privata* (Guenée) (TDF). *Casinaria* sp. 7 - Notodontidae: *Danima* sp. (TDF).

CHAROPS Holmgren

Charops Holmgren, 1859*a*: 324. Type-species: *Campoplex decipiens* Gravenhorst (= *Ichneumon cantator* DeGeer), by monotypy.
Zacharops Viereck, 1912*b*: 646. Type-species: *Charops annulipes* Ashmead, by original designation.
Gongropelma Enderlein, 1921: 13. Type-species: *Gongropelma formosanum* Enderlein (= *Agrypon bicolor* Szépligeti), by original designation.

Medium-sized species, fore wing length 6-7 mm; head lenticular; clypeus convex, margin impressed, evenly arcuate; mandible rather short, with a broad ventral flange on basal 0.7; malar space 0.3-0.5 times basal mandibular width. Eye strongly indented opposite antennal socket; genal carina joining hypostomal carina at base of mandible.

Pronotum in profile very short, epomia strong, slightly divergent from anterior margin; scutellum deplanate; mesoscutum uniformly reticulate, speculum not differentiated; mesopleural furrow not distinctly impressed (Fig. 427). Posterior transverse carina of mesosternum complete. Propodeum moderately long, abruptly declivous, posteriorly produced into a short 'neck', propodeum fairly evenly reticulate, spiracles elliptical, longitudinal furrow absent.

Ventral surface of hind tarsal segments 1-3 unspecialized.

Fore wing with *cu-a* vertical; *3r-m* absent, *2r-m* longer than abscissa of *M* between *2r-m* and *2m-cu*; marginal cell long. Hind wing with distal abscissa of Cu_1 obsolescent; Cu_1&*cu-a* generally sloping inwards posteriorly so anterodistal corner of sub-basal cell is acute.

Gaster with segment 1 very long and slender, suture separating tergite from sternite nearly dorsal on anterior 0.3; glymma absent, sternite 1 reaching 0.8 of length of tergite. Gaster slender, laterally compressed; tergite 3 with laterotergite folded under. Ovipositor short, usually straight, not projecting beyond apex of gaster but with a distinct dorsal subapical notch.

Remarks. *Charops* is a moderately large genus with species most numerous in the Old World tropics; it is easily recognized by the total lack of differentiated speculum and the centrally unimpressed mesopleural suture.

Gupta & Maheshwary (1977) recognize 12 species from South East Asia but none of these are known to extend east of Wallace's Line.

In Australia species of this genus seem to be restricted to Queensland.

Australian species. *Charops pulchripes* Girault. I have seen two additional undescribed species (ANIC; DPIQ; QM).

Host records. *Charops* sp. 1 - Geometridae: *Cleora* sp. (ANIC). *Charops* sp. 2 - Noctuidae: *Heliothis* sp. (DPIQ).

DELOPIA Cameron stat. rev.
(Whole insect, Fig. 389)

[*Dusona* sensu auctt. Misidentifications.]
Delopia Cameron, 1903*g*: 304. Type-species: *Delopia cariniscutis* Cameron, by monotypy.
Anisitsia Viereck, 1912*b*: 632. Type-species: *Campoplex villosus* Norton, by original designation. [Homonym of *Anisitsia* Eigermann, 1903.]
Campoplegidea Viereck, 1912*b*: 644. Type-species: *Campoplex oxyacanthae* Boie, by original designation.
Pseudocasinaria Viereck, 1912*b*: 644. Type-species: *Campoplex americana* Ashmead, by original designation.
Thymarimorpha Viereck, 1913: 384. Type-species: *Thymarimorpha platygastra* Viereck, by original designation.
Viereckiana Strand, 1914: 163. [Replacement name for *Anisitsia* Viereck.]
Zachrestinus Enderlein, 1921: 38. Type-species: *Zachrestinus fractocristatus* Enderlein, by original designation.
Idiosomidea Viereck, 1925*c*: 271. Type-species: *Campoplex photomorphus* Viereck, by original designation.
Neodelopia Benoit, 1957: 314. Type-species: *Neodelopia pauliani* Benoit, by original designation.

Medium to moderately large-sized species, fore wing length 6-12 mm; head somewhat lenticular to subquadrate; clypeus weakly convex, broad, truncate or arcuate with margin blunt; mandible of moderate length, with flange on lower margin that is evenly narrowed distally; malar space 0.1-0.3 times basal mandibular width. Eye strongly indented opposite antennal socket; genal carina joining hypostomal carina above base of mandible.

Pronotum in profile very short, epomia strong; scutellum weakly to moderately convex; mesopleuron with speculum glabrous, relatively smooth and polished; mesopleural suture strong. Posterior transverse carina of mesosternum complete. Propodeum long, evenly declivous and produced into a 'neck' posteriorly; anterior transverse carina present or absent, other carinae absent, longitudinal furrow usually absent; spiracles oval to elliptical.

Ventral surface of hind tarsal segments 1-3 unspecialized.

Fore wing with *cu-a* subvertical; *3r-m* present enclosing a large rhombic or pentagonal areolet which is usually not petiolate above, *2m-cu* joining proximal to or at centre (Fig. 404); marginal cell long. Hind wing with distal abscissa of Cu_1 absent or rarely vestigial; Cu_1&*cu-a* slightly angulate near lower 0.3.

Gaster with segment 1 long, petiole slender, cylindrical, in profile with tergite and sternite completely fused (Fig. 390), suture not discernible; sternite 1 reaching 0.8 or more of length of tergite; glymma absent. Gaster moderately stout to fairly slender, tergite 3 without crease separating off laterotergite. Ovipositor straight, simply acute with a distinct dorsal subapical notch; ovipositor barely projecting beyond apex of gaster.

Remarks. *Delopia* is an extremely large cosmopolitan genus with species common in most parts of the world; many are found in open grasslands and low scrub where they parasitize exposed lepidopterous larvae. Gupta & Gupta (1978) revised the Oriental species and recognized six species-groups. Most Australian species appear to belong to the *pyratanes*-group but a number do not fit any of their groupings. In Australia *Delopia* species are easily recognized by the absence of sternotergal suture on the first gastral segment. No species have glymma.

This genus has previously been known under the name *Dusona* Cameron. The type-species, *Dusona stramineipes*, is a New Zealand species (Cameron, 1900*b*) which differs from *Delopia* species in numerous features tabulated in the following table.

DUSONA	*DELOPIA*
Tergite 3 slender with laterotergite folded under and separated by a sharp crease.	Tergite 3 rather short and deep with laterotergite pendant, not defined by sharp crease.
Fore wing with *cu-a* slightly proximal to base of *Rs&M*.	Fore wing with *cu-a* distal to base of *Rs&M* by 0.2 or more of its length.
Areolet small, with *2m-cu* joining close to distal side.	Areolet medium to large, usually with *2m-cu* joining near cnetre.
Female subgenital plate incised medially, ovipositor decurved.	Female subgenital plate simple, ovipositor usually straight.
Petiole anteriorly without any trace of carinae on dorsolateral corners.	Petiole anteriorly with short carinae on dorsolateral corners either side of raised point of attachment of petiolar ligament.
Mesopleuron with a weak impression extending from epicnemial carina to mesopleural pit, the area above the pit without strong striae.	Mesopleuron without a longitudinal impression, the area above mesopleural pit usually strongly striate.
Suture separating sternite 1 from tergite visible.	Suture separating sternite 1 from tergite usually effaced.
Tarsal claws with a fine close pectination at base.	Tarsal claws sparsely and coarsely pectinate almost to apices.

Gupta & Gupta (1978) separate an Oriental genus *Kartika* from *Delopia* on account of the turned under third laterotergites. *Kartika*, which also occurs in South America, differs from *Dusona* in having tergite 3 shorter and deeper and in all other characters listed above it resembles *Delopia* rather than *Dusona*. The large areolet, short deep third tergite and loss of sternotergal suture are apomorphies separating *Delopia* + *Kartika* from other campoplegines. *Dusona* is probably the sister-group to *Delopia* + *Kartika* as all three genera have indented eyes, similar mouthparts and similarly specialized propodea. The proximal position of *cu-a*, absence of petiolar carina, incised female subgenital plate and impressed mesopleuron are apomorphies of *Dusona*.

It is unfortunate that it is necessary to restrict *Dusona* to the single New Zealand species as the name has been used for the very large number of species from all parts of the world which now need to be transferred to *Delopia*. However, it is clear that *Dusona stramineipes* cannot reasonably be included in the same genus as the large number of *Delopia* species previously associated with it.

Australian species. *Delopia extranea* (Turner) comb. n. (E); *Delopia negata* (Turner) comb. n. (E); *Delopia wilsoni* (Parrott) comb. n. (E). I have seen about 12 additional undescribed species (ANIC; TC).

Host records. *D. negata* - Geometridae: *Hypobapta percomptaria* (Guenée) (Chadwick & Nikitin, 1976). *Delopia* sp. - Geometridae: *Clenias* sp. (TDF); *Zermizinga indocilisaria* Walker (Chadwick & Nikitin, 1976); Lymantriidae: *Acyphas* sp. (TDF).

DIADEGMA Foerster

Angitia Holmgren, 1859*a*: 327. Type-species: *Angitia glabricula* Holmgren, by monotypy. [Homonym of *Angitia* Walker, 1858.]

Diadegma Foerster, 1869: 153. Type-species: *Campoplex crassicornis* Gravenhorst, by subsequent monotypy, Schmiedeknecht, 1907*a*: 599.

Pectinella Morley, 1915*a*: 173. Type-species: *Angitia latungula* Thomson, by monotypy. [Homonym of *Pectinella* Verrill, 1897.]
Areolina Enderlein, 1921: 41. Type-species: *Areolina imbecilla* Enderlein, by original designation.
Nothanomaloides Viereck, 1925*c*: 272. Type-species: *Nothanomaloides stenosomus* Viereck, by original designation.
Neoarthula Rao, 1953: 179. Type-species: *Neoarthula piersae* Rao, by original designation.

Small to medium-sized species, fore wing length 3-6 mm; head transverse; clypeus weakly convex, margin not impressed (Fig. 400), arcuate; mandible moderately long, with or without a small ventral flange; malar space 0.5 or more times basal mandibular width. Eye not indented opposite antennal socket; genal carina joining hypostomal carina before base of mandible.

Pronotum in profile moderately long, epomia present or absent; scutellum weakly convex; mesopleuron with speculum polished, smooth or almost so, mesopleural suture strong. Posterior transverse carina of mesosternum complete. Propodeum fairly evenly rounded, not produced into a 'neck', carinae usually more or less complete but the areae superomedia and petiolaris confluent, not concave; propodeal spiracle circular.

Ventral surface of hind tarsal segments 1-3 unspecialized.

Fore wing with *cu-a* subvertical; *3r-m* present or absent, if present *2m-cu* joining areolet slightly distal to centre, if absent then *2r-m* longer than abscissa of *M* between *2r-m* and *2m-cu* (Fig. 413); marginal cell moderately long. Hind wing with distal abscissa of Cu_1 absent or vestigial, Cu_1&*cu-a* more or less vertical.

Gaster with segment 1 rather slender, petiole quite long, subcylindrical, evenly broadened posteriorly; suture separating tergite from sternite, if visible, ventral; glymma present; sternite 1 reaching at least 0.7 of way along tergite. Gaster rather slender, tergite 3 with laterotergite folded under. Ovipositor projecting beyond apex of gaster by at least 0.4 times length of hind tibia, strongly up-curved, with a distinct dorsal subapical notch (Fig. 421).

Remarks. This is an extremely large genus with species occurring in all zoogeographical regions although the majority occur in the Holarctic region.

A number of species are important parasites of small species of pest Lepidoptera and several of these, particularly the parasites of *Plutella xylostella*, have been spread around the world both inadvertantly and by deliberate introduction. In the Indo-Australian region the seven species *D. eucerophaga* Horstmann, *D. fenestralis* (Holmgren), *D. insularis* (Cresson), *D. plutellae* (Viereck), *D. rapi* (Cameron), *D. tibialis* (Gravenhorst) and *D. varuna* Gupta are all recorded as parasites of *P. xylostella* (Townes *et al.*, 1961; Gupta, 1974). How many different species are really involved is problematic as misidentifications of species were very common before the preliminary work on the genus by Horstmann (1969). Of the above mentioned species one is native to Australia and two were apparently introduced (Miller & Hudson, 1953). I have seen no recently collected material of *D. tibialis* and doubt whether it is established in Australia.

Venkatraman (1964) studied the biology of *D. eucerophaga* and *D. rapi*. He observed that these species differed in longevity, fecundity and duration of developmental period and although cross mating occurred fertilization never resulted.

Australian species. *Diadegma eucerophaga* Horstmann (I); *D. rapi* (Cameron) (E); *D. tibialis* (Gravenhorst) (I). I have seen one (?)undescribed species (BMNH).

Host records. *D. eucerophaga* - Plutellidae: *Plutella xylostella* (L.) (Horstmann, 1969; Yarrow, 1970). *D. rapi* - Plutellidae: *Plutella xylostella* (L.) (Miller & Hudson, 1953). *D. tibialis* - Plutellidae: *Plutella xylostella* (L.) (Miller & Hudson, 1953). *Diadegma* sp. 1 - Lymantriidae: *Teia anartoides* Walker (Chadwick & Nikitin, 1976).

ENYTUS Cameron*

Dioctes Foerster, 1869: 153. Type-species: *Campoplex exareolatus* Ratzburg, by subsequent designation, Viereck, 1914: 46. [Homonym of *Dioctes* Ménétriés, 1849.]
Enytus Cameron, 1905*g*: 132. Type-species: *Enytus maculipes* Cameron, by monotypy.
Inareolata Ellinger & Sachtleben, 1928: 117. [Replacement name for *Dioctes* Foerster.]

Small species, fore wing length 3-4 mm; head quadrate; clypeus broad, weakly convex, margin arcuate, sharp; mandible of moderate length, ventral flange obsolescent; malar space 0.6-0.8 times basal mandibular width. Eye barely indented opposite antennal socket; genal carina joining hypostomal carina a little above base of mandible.

Pronotum in profile moderately short, epomia obsolescent; scutellum very weakly convex; mesopleuron with speculum smooth and polished; mesopleural suture strong. Posterior transverse carina of mesosternum complete. Propodeum short, abruptly declivous with weak lateral and posterior transverse carinae present, together forming a roughly inverted V-shape; propodeum not longitudinally concave, spiracle circular.

Ventral surface of hind tarsal segments 1-3 unspecialized.

Fore wing with *cu-a* vertical; *3r-m* absent, *2r-m* shorter than abscissa of between *2r-m* and *2m-cu* (Fig. 408); marginal cell moderately short, quite deep. Hind wing with distal abscissa of Cu_1 absent; Cu_1&*cu-a* evenly arcuate, subvertical.

Gaster with segment 1 moderately long, stout and slightly depressed, petiole stout; suture separating sternite from tergite near lateroventral corner, sternite reaching 0.7 of way along segment; glymma present, deep. Gaster quite short and stocky, anteriorly depressed, posteriorly compressed; tergite 3 with laterotergite pendant, membranous. Ovipositor strongly up-curved, more so near apex (Fig. 420); apex of ovipositor slender, with a distinct subapical notch; ovipositor projecting beyond apex of gaster by at least 0.5 times length of hind tibia.

Remarks. *Enytus* is a moderately small genus that is very closely related to *Diadegma*. The separation between the genera is very subtle and some authors (e.g. Horstmann, 1969) do not recognize *Enytus* as a distinct genus. The Australian species, which all lack *3r-m* can be separated from *Diadegma* without *3r-m* on account of the short vein *2r-m* which is shorter than *M* between *2r-m* and *2m-cu*; in *Diadegma* *2r-m* is longer than *M* between *2r-m* and *2m-cu*. The ovipositor of *Enytus* is more markedly up-curved towards the apex than is usual for *Diadegma*.

In Australia species have been seen from New South Wales, Tasmania and Western Australia.

Australian species. Three species, undescribed (ANIC; BMNH).

Host records. None from Australia.

ERIBORUS Foerster

Zaporus Foerster, 1869: 152. Type-species: *Campoplex dorsalis* Gravenhorst, by subsequent monotypy, Schmiedeknecht, 1907*a*: 599.
Eriborus Foerster, 1869: 153. Type-species: *Campoplex perfidus* Gravenhorst, by subsequent designation, Morley, 1913*b*: 469.
Bosmina Cameron, 1899: 120. Type-species: *Bosmina spinipes* Cameron, by monotypy. [Homonym of *Bosmina* Baird, 1845.]
Hymenobosmina Dalla Torre, 1901*b*: 52. [Replacement name for *Bosmina* Cameron.]
Neobosmina Cameron, 1906*d*: 250. Type-species: *Neobosmina pilosella* Cameron, by subsequent desingation, Viereck, 1914: 99.

Small to medium-sized species, fore wing length 4-8 mm; head stout, quadrate; clypeus flat or almost so, margin blunt (Fig. 401), truncate or slightly rounded, sometimes with a median thickening; mandible short, moderately strongly tapered, usually with a broad ventral flange proximally, sometimes with this flange narrow; malar space 0.2-0.3 times basal mandibular width. Eye not or only slightly indented opposite antennal socket; genal carina joining hypostomal carina close to or above base of mandible.

Pronotum long, epomia vestigial; mesoscutum rather coarsely punctate, scutellum weakly convex; mesopleuron with speculum smooth and polished; mesopleural suture strong. Posterior transverse carina of mesosternum complete. Propodeum moderately long, evenly convex, often with strong carina, sometimes with carinae obsolescent, when present the area superomedia often (but not always) separated from area petiolaris; propodeum not produced into a 'neck', nor with concave groove; propodeal spiracle oval to somewhat elliptical.

Ventral surface of hind tarsal segments 1 and usually 2 and 3 with a median keel which bears a row of fine close hairs (this may be very weak and difficult to discern).

Fore wing with *cu-a* more or less vertical; 3*r-m* absent, 2*r-m* from equal to, to conspicuously longer than abscissa of *M* between 2*r-m* and 2*m-cu*; marginal cell long. Hind wing with distal abscissa of Cu_1 absent; Cu_1&*cu-a* evenly arcuate, vertical or almost so.

Gaster with segment 1 long, often slightly depressed, petiole fairly slender, with suture separating sternite from tergite tending to be on ventral or ventrolateral surface; glymma deep, sternite 1 reaching 0.7 or more of length of tergite. Gaster from quite stout to slender; tergite 3 always with laterotergite separated by a crease, generally with it folded under. Ovipositor weakly to strongly up-curved, projecting beyond apex of gaster by 0.2-1.2 times length of hind tibia, its apex with a distinct dorsal notch.

Remarks. *Eriborus* is a very large Palaeotropical genus with a few species in the Palaearctic region. Like many of the campoplegine genera it is difficult to characterize although with experience it is readily recognizable. Superficially the species are often rather like *Hyposoter* in being a little stouter and more coarsely sculptured than many smaller campoplegines. Unlike *Hyposoter* they never have an areolet and the clypeal margin is not impressed. In Australia the only campoplegines with a deep glymma and without an areolet belong to the genera *Xanthocampoplex*, *Enytus*, *Eriborus* and *Diadegma* (part). These four genera may be separated by the characters given in Table 3.

One Oriental species, *E. molestae* (Uchida) was introduced into Australia in an attempt to control *Cydia molesta* (Helson, 1939). This was treated as a species of *Diadegma* by Townes *et al*. (1961).

A large number of *Eriborus* species have been described from the Indo-Australian region (Townes *et al*., 1961) including several from New Caledonia, New Guinea and Fiji. I have examined only the type of *E. iavilai* (Cheesman), previously known only from New Caledonia and the New Hebrides, and found this species to be present in Queensland. As I have not examined other types I cannot say whether some described species are conspecific with the tropical Australian species at hand.

Australian species. *Eriborus iavilai* (Cheesman)* (P); *E. molestae* (Uchida) (I). I have seen five undescribed species (ANIC; BMNH; TC).

Host records. *E. molestae* - Tortricidae: *Cydia molesta* (Busck) (Helson, 1939). *Eriborus* sp. - Geometridae: *Mnesampela privata* (Guenée) (TDF). Plutellidae: *Plutella xylostella* (L.) (Chadwick & Nikitin, 1976). Pyralidae: *Homoeosoma vagella* Zeller (Ironside, 1970). Tortricidae: *Epiphyas* sp. (TDF). Many of the Oriental species are important parasites of pest Lepidoptera including *E. trochanteratus* (Morley) which attacks *Phthorimaea operculella* (Zeller) (Gupta, 1974), *E. argenteopilosus* (Cameron) which attacks *Heliothis armigera* (Hübner) and other noctuids (Townes *et al*., 1961; Gupta, 1974) and *E. sinicus* (Holmgren) and *E. terebrans* (Gravenhorst), parasites of pyralid stem-borers in Gramineae such as *Chilo supressalis* (Walker) and *Scirpophaga incertulas* (Walker) (Sonan, 1944; Momoi, 1968; Nagatomi, 1972).

CHARACTER	*XANTHOCAMPOPLEX*	*ENYTUS*	*ERIBORUS*	*DIADEGMA*
Colour predominantly	yellow	black	black or red	black
Clypeus	convex	weakly convex	flat	weakly convex
Clypeal margin	impressed, acute	sharp but not impressed	blunt	moderately sharp but not impressed
Length of *2r-m* compared with *M* between *2r-m* and *2m-cu*	2.0 or more	0.8 or less	1.0 or more	1.2 or more
Length of longer mid tibial spur compared with shorter	2.0 or more	1.2-1.5	2.0 or more	about 1.5
Ovipositor shape	straight	curved, more so distally	evenly curved	evenly curved
Length of ovipositor beyond apex of gaster as a proportion of hind tibia	0.2-0.3	0.5-1.6	0.2-1.2	0.4+

TABLE 3. Comparison of morphological features of four common Australian campoplegine genera.

EUCAPHILA gen. n.

Type-species: *Eucaphila vulgaris* sp. n.

Small species, fore wing length 4-5 mm; head subquadrate; clypeus flat, margin sharp but not impressed, evenly but weakly arcuate; mandible moderately long, with a narrow, but distinct ventral flange; malar space 0.6-0.7 times basal mandibular width. Eye not indented opposite antennal socket; genal carina joining hypostomal carina a little above base of mandible.

Pronotum in profile moderately short, epomia weak; scutellum weakly convex; mesopleuron with speculum fairly smooth and polished; mesopleural suture strong. Posterior transverse carina of mesosternum complete. Propodeum quite long but rather steeply declivous, posteriorly produced into a distinct 'neck'; propodeal carinae from weak to almost complete, area superomedia discernible, elongate, usually confluent with area petiolaris, the two not concave; propodeal spiracle circular.

Ventral surface of hind tarsal segments 1-3 unspecialized.

Fore wing with *cu-a* almost vertical; *3r-m* absent; *2r-m* subequal to or longer than abscissa of *M* between *2r-m* and *2m-cu* (Fig. 406); marginal cell long. Hind wing with distal abscissa of Cu_1 absent; Cu_1&*cu-a* inclined slightly inwards anteriorly so anterodistal corner of sub-basal cell is obtuse.

Gaster with segment 1 very long, petiole slender, cylindrical with suture separating tergite from sternite slightly above midline in profile (Fig. 392); glymma absent, sternite 1 reaching 0.8 of way along tergite. Gaster slender, tergite 3 with laterotergite folded under. Ovipositor very slightly up-curved, with lower valve slightly deepened before apex, dorsal subapical notch distinct; ovipositor barely projecting beyond apex of gaster.

Etymology. *Euca* (from *Eucalyptus*) + *phila* (to like) referring to the fact that the type-species is often found flying around eucalypt saplings. Feminine.

Remarks. The structure of the first segment of the gaster is very like that of *Casinaria* and *Venturia*. Other structural features suggest *Eucaphila* is indeed closely related to these genera but the combination of short ovipositor, unnotched eyes, loss of *3r-m* and ventrally flanged mandible are unique to this genus.

The type-species, *E. vulgaris*, is relatively common in open eucalypt woodlands where it flies in long grass and around small saplings.

Australian species. One species, described below, and two undescribed species (ANIC; BMNH).

Eucaphila vulgaris

Female: face subquadrate, granulo-punctate; frons granulo-punctate, without a carina; ocelli positioned in a broad based isosceles triangle, the lateral ones separated from eyes by about their own diameter, the vertex steeply declivous behind ocelli. Flagellum short, with about 20 segments, subapical ones quadrate. Mesoscutum convex, granulo-punctate, scutellum similarly sculptured. Mesopleuron finely granulo-punctate, with shallow diagonal furrow. Propodeum with area externa separated from area dentipara. Longer mid tibial spur 1.8 times length of shorter. Gaster finely granulate, tergite 2 with oval thyridia widely separated from anterior margin.

Black; mouthparts, scape and pedicel ventrally, tegula, fore and mid coxae, all trochanters and trochantelli yellow; legs orange, hind tarsus infuscate. Gaster reddish with tergites 1 and most of 2 black.

Male: like female.

E. vulgaris can easily be distinguished from the other two Australian species by the presence of a carina separating areae dentipara and externa. Although the propodeal carinae of the other species are strong, these areae are confluent.

Material examined.
Holotype ♀, Australian Capital Territory: Canberra, ii.1979 (*Tidemann*) (ANIC).

Paratypes. Australian Capital Territory: 1 ♀, Black Mt, iii.1967 (*Colless*) (ANIC); 1 ♂, Black Mt, xii.1979 (*Colless*) (ANIC); 1 ♀, 2 ♂, Blundell's, i.1931 (*Graham*) (ANIC); 42 ♀, Canberra, xi.-xii.1978, i.-ii.1979, xi.-xii.1979 (*Short, Tidemann, Anderson & Samson*) (ANIC; BMNH); 8 ♀, 3 ♂, Canberra, Black Mt, xi.1981 (*Gauld*) (BMNH); 1 ♀, Ginninderra, iii.1966 (*Grant*) (ANIC); 1 ♀, 3 km E. Mt Coree, xi.1968 (*Colless*) (ANIC). New South Wales: 1 ♀, Armidale, Pond's Ck, x.1962 (*Colless*) (ANIC); 2 ♀, Bateman's Bay, x.1968 (*Cardale*) (ANIC); 1 ♀, Boolijah Ck, xi. 1979 (*Cardale*) (ANIC); 1 ♂, 11 km SW. Broken Hill, iii.1975 (*Liepa*) (ANIC); 1 ♀, Brown Mt, i.1969 (*Cardale & Curtis*) (ANIC); 1 ♀, Clyde Mt, xi.1968 (*Cardale*) (ANIC); 1 ♀, 20 km NW. Milton, xi.1968 (*Colless*) (ANIC); 1 ♀, Mt Kosiusko, xii. 1931 (*Tonnoir*) (ANIC); 1 ♀, Narooma, Mt Dromedary, ii.1969 (*Upton & Cardale*) (ANIC); 1 ♀, Nelligen, x.1968 (*Cardale*) (ANIC); 1 ♀, Pilliga Scrub, x.1963 (*Colless*) (ANIC); 1 ♀, 68 km W. Wanaaring, x.1949 (*Paramonov*) (ANIC). Northern Territory: 1 ♀, Waterhouse Rg., 23.59S 133.38E, x.1978 (*Cardale*) (ANIC). Queensland: 2 ♀, Mt Tambourine, x.1977 (*Galloway*) (BMNH). South Australia: 1 ♀, Sleaford Bay, xii.1960 (*Casanova*) (ANIC). Western Australia: 1 ♀, Carnamah, xi.1958 (*Riek*) (ANIC); 1 ♀, Millstream, x.1970 (*Colless*) (ANIC).

Host records. None.

HYPOSOTER Foerster

Rhythmonotus Foerster, 1869: 151. Type-species: *Rhythmonotus singularis* Schmiedeknecht, by subsequent monotypy, Schmiedeknecht, 1909: 1617.
Hyposoter Foerster, 1869: 152. Type-species: *Limnerium parorgyiae* Viereck, by subsequent designation, Viereck, 1910: 383.
Ischnoscopus Foerster, 1869: 156. Type-species: *Ischnoscopus synchlorae* Ashmead, by subsequent monotypy, Ashmead, 1898*b*: 168.
Ameloctonus Foerster, 1869: 157. Type-species: *Banchus fugitivus* Say, by subsequent designation, Viereck, 1914: 9.
Neozachresta Havrylenko & Winterhalter, 1949: 46. Type-species: *Neozachresta havrylenkoi* Havrylenko & Winterhalter, by monotypy.

Small to medium-sized species, fore wing length 4-7 mm; head sublenticular; clypeus weakly convex, margin impressed, sharp (Fig. 399); mandible moderately long, with a broad ventral flange on basal 0.6; malar space 0.5-0.7 times basal mandibular width. Eyes barely indented opposite antennal sockets; genal carina joining hypostomal carina above base of mandible.

Pronotum moderately long, epomia indistinct; scutellum weakly convex; mesopleuron with speculum glabrous, very finely granulate and fairly polished; mesopleural suture strong. Posterior transverse carina of mesosternum complete. Propodeum rather abruptly declivous, with transverse carinae discernible, not produced into a 'neck' and not concave longitudinally; propodeal spiracle oval.

Ventral surface of hind tarsal segments 1-3 unspecialized.

Fore wing with *cu-a* almost vertical; *3r-m* present enclosing a very small, almost triangular, petiolate areolet with petiole (2+*3r-m*) longer than height of areolet (Fig. 412); *2m-cu* joining near distal corner; marginal cell long. Hind wing with distal abscissa of Cu_1 absent; Cu_1&*cu-a* evenly arcuate, vertical (Fig. 415).

Gaster with segment 1 moderately long, petiole slender, with suture separating tergite from sternite ventral or lateroventral (Fig. 398); glymma deep; sternite 1 reaching 0.7-0.8 of length of tergite. Gaster moderately stout; tergite 3 with laterotergite separated by a crease. Ovipositor straight, projecting beyond apex of gaster by 0.2 or less times length of hind tibia, with a distinct dorsal subapical notch.

Remarks. *Hyposoter* is a moderately large genus, most species of which occur in the Holarctic and Neotropical regions. *Hyposoter* is quite closely related to *Xanthocampoplex*. The most obvious differences between the two genera are their coloration and the position of the genal and hypostomal carinae.

There are three species occurring in Australia, one of which is quite widespread.

Australian species. *Hyposoter bombycivorus* (Cameron) (E). I have seen two undescribed species (ANIC; BMNH).

Host records. *H. bombycivorus* - Lymantriidae: *Teia anartoides* (Walker) (DPIQ). *Hyposoter* sp. - Lymantriidae: *Acyphas* sp. (TDF). Noctuidae: *Mythimna convecta* (Walker) (ANIC); *Persectania ewingii* (Westwood) (Chadwick & Nikitin, 1976). In other regions species of this genus are common parasites of exposed lepidopterous larvae, especially those with a hirsute cuticle such as Lasiocampidae and Lymantriidae.

MELALOPHACHAROPS Uchida*

Melalophacharops Uchida, 1928*a*: 280. Type-species: *Melalophacharops tamanukii* Uchida, by original designation.
Dichelobosmina Uchida, 1932*b*: 201. Type-species: *Dichelobosmina tuberculata* Uchida (= *Charops papilionis* Ashmead), by original designation.

Medium-sized species, fore wing length 9-10 mm; head lenticular, clypeus convex, margin impressed, acute, almost truncate; mandible short and broad, with a wide ventral flange which is evenly tapered distally; malar space 0.3 times basal mandibular width. Eye distinctly indented opposite antennal socket; genal carina joining hypostomal carina above base of mandible.

Pronotum in profile narrow, epomia short, strong, divergent from pronotal margin; scutellum convex, abruptly declivous posteriorly (Fig. 428); mesopleuron with speculum smooth and polished. Posterior transverse carina of mesosternum complete. Propodeum short, abruptly declivous, not produced into a 'neck' posteriorly; propodeal carinae distinct, area superomedia confluent with area petiolaris; propodeal spiracle oval.

Hind leg with a median ventral longitudinal keel on tarsal segments 1-3, the keel bearing a row of close erect short hairs (Fig. 571).

Fore wing with *cu-a* vertical; 3*r-m* absent (Fig. 407); 2*r-m* longer than abscissa of *M* between 2*r-m* and 2*m-cu*; marginal cell long. Hind wing with distal abscissa of Cu_1 discernible only as a vestige not joining Cu_1&*cu-a*, this latter vein vertical; sub-basal cell unusually narrow in comparison to basal cell (Fig. 416).

Gaster with segment 1 long, petiole slender, the suture between the tergite and sternite on ventrolateral corner; glymma small, rather difficult to discern (allowance has been made for this and the genus comes out in the key twice); sternite 1 reaching 0.8 of length of tergite. Gaster quite stout but strongly laterally compressed; tergite 3 with laterotergite folded under. Ovipositor short, almost straight, not projecting beyond apex of gaster, with a distinct dorsal subapical notch.

Remarks. *Melalophacharops* is a small tropical Oriental genus with one species occurring in southern Japan. Of all the genera with the specialized hind tarsus this has the character most strongly developed. Structurally it is very similar to *Xanthocampoplex* and *Echthronomas*. These three genera have very unequal mid tibial spurs, short strongly pectinate claws, a specialized hind tarsus, a short, almost straight ovipositor, a stout gaster with weak or incipient glymma, a stout slightly compressed flagellum, a convex clypeus with sharply impressed margin and a broad flange on the mandible. These features are never found all together in *Eriborus*, the only other palaeotropical genus with a specialized hind tarsus but nearly all features except this tarsal character are found in many species of

Hyposoter. *Hyposoter*, *Xanthocampoplex*, *Echthronomas* and *Melalophacharops* probably constitute a holophyletic group.

In Australia, *Melalophacharops* seems to be restricted to tropical Queensland.

Australian species. One, undescribed (ANIC; UMQ).

Host records. *Melalophacharops* sp. - Saturniidae: *Antheraea eucalypti* (Scott) (UMQ).

NEOLOPHRON gen. n.

Type-species: *Neolophron canberrai* sp. n.

Medium to moderately large-sized species, fore wing length 8-12 mm; clypeus weakly convex, margin blunt, almost truncate; mandible quite long and evenly tapered, with a ventral flange on proximal 0.4; malar space 0.5-0.6 times basal mandibular width. Eye very slightly indented opposite antennal sockets; genal carina joining hypostomal carina above base of mandible.

Pronotum in profile moderately long, epomia vestigial; scutellum moderately convex; mesopleuron with speculum from partially fairly smooth to almost undifferentiated; mesopleural suture deep, the mesepimeron much broader than most campoplegines, the area posterior to it very strongly swollen. Posterior transverse carina of mesosternum complete. Propodeum rather short, convex, with carinae weak; propodeum not extended posteriorly as a 'neck', propodeal spiracle oval.

Hind leg with tarsal segments 1-3 ventrally spinose but otherwise unspecialized.

Fore wing with *cu-a* subvertical to slightly oblique, anteroproximal corner of first subdiscal cell 70°+; *3r-m* present enclosing a small petiolate areolet, *2m-cu* joining distal to centre; marginal cell long. Hind wing with distal abscissa of Cu_1 weak but discernible, joining Cu_1&*cu-a* below centre.

Gaster with segment 1 stout, evenly tapered anteriorly with suture separating tergite and sternite on ventral side (Fig. 393); glymma absent; sternite 1 not reaching beyond centre of tergite. Gaster stout, tergite 3 with laterotergite turned under. Ovipositor almost straight (Fig. 419), projecting beyond apex of gaster by more than 0.8 times length of hind tibia, its apex with a distinct dorsal notch.

Etymology. *Neo* (new) + *lophron* (from *Dolophron*, a related genus). Neuter.

Remarks. *Neolophron* is a small Australian genus easily recognized by the stout first segment of the gaster, the broad mesepimeron and the long straight ovipositor.

Australian species. One species described below and a further undescribed species from Tasmania (ANIC; BMNH; TC).

Neolophron canberrai sp. n.

Female: face finely granulate, with long pale pubescence; ocelli forming a broad-based isoscles triangle, the posterior ones separated from the eye by almost 2.0 times their own diameter. Flagellum moderately stout with about 45 segments. Alitrunk weakly polished, rather hirsute; upper part of mesopleuron striate, remainder granulate; pleural carina distinct; propodeum with anterior transverse and lateromedina longitudinal carinae discernible. Longer mid tibial spur about 1.3 times the shorter. Gaster stout, moderately polished; ovipositor projecting beyond apex of gaster by about length of hind tibia.

Black; mandible centrally yellowish; fore and mid legs except coxae, hind trochantellus, femur, tibia except distal apices, hind margin of tergite 1 and tergites 2+ entirely reddish; tarsus whitish.

Male unknown.

N. canberrai can be distinguished from the undescribed Tasmanian species by the black coxae, longer ovipositor, complete pleural and lateromedian propodeal carinae and small areolet. The undescribed species has red coxae, the ovipositor 0.8 times as long as the hind tarsus, the pleural and lateromedian propodeal carinae absent and a regularly rhombic areolet.

Material examined
Holotype ♀, Australian Capital Territory: Canberra, Black Mt, x.1981 (*Gauld*) (ANIC).

Host records. None.

NEPIERA Foerster

Asinamora Foerster, 1869: 155. Type-species: *Ichneumon collector* Thunberg, by subsequent monotypy, Townes *et al.*, 1965: 291.
Nepiera Foerster, 1869: 156. Type-species: *Limneria concinna* Holmgren (= *Ichneumon collector* Thunberg), by subsequent monotypy, Thomson, 1887: 1137.

Small species, fore wing length 4-5 mm; head slightly lenticular; clypeus weakly convex, margin sharp, subtruncate; mandible short, its lower edge with a narrow flange; malar space about 0.5 times basal mandibular width. Eye very weakly indented opposite antennal socket; genal carina joining hypostomal carina above base of mandible.

Pronotum in profile moderately long, epomia strong; scutellum weakly convex; mesopleuron with speculum smooth and polished, mesopleural suture strong. Posterior transverse carina of mesosternum interrupted before each mid coxa. Propodeum moderately long, evenly rounded, its carinae weak but almost complete; propodeum produced slightly into a short posterior 'neck'; spiracles circular.

Ventral surface of hind tarsal segments 1-3 unspecialized.

Fore wing with *cu-a* slightly oblique, anteroproximal corner of first subdiscal cell about 70°; *3r-m* present, *2m-cu* joining areolet distal to centre; marginal cell moderately short. Hind wing with distal abscissa of Cu_1 faint but complete.

Gaster with segment 1 moderately long, petiole quite slender; suture separating tergite from sternite near lateroventral corner; glymma present. Gaster moderately slender; tergite 3 with laterotergite separated by a crease. Ovipositor straight, with a distinct dorsal subapical notch, barely reaching beyond apex of gaster.

Remarks. *Nepiera* is a small genus most species of which occur in the north temperate region. Townes (1970*b*) treated *Nepiera* as a synonym of *Meloboris* but other authors (e.g. Carlson, 1979) prefer to treat them as separate genera.

A single Australian species is known, but I have seen no recently collected material of this genus.

Australian species. *Nepiera sidnica* (Holmgren) (E).

Host records. None from Australia.

OLESICAMPE Foerster*

Limneria Holmgren, 1859*a*: 326. Type-species: *Ichneumon longipes* Mueller, by subsequent designation, Viereck, 1912*e*: 45. [Homonym of *Limneria* Adams, 1851.]
Olesicampe Foerster, 1869: 153. Type-species: *Ichneumon longipes* Mueller, by subsequent designation, Viereck, 1912*e*: 45.
Omoborus Foerster, 1869: 154. Type-species: *Omoborus kincaidi* Davis, by subsequent monotypy, Davis, 1898: 363.
Holocremnus Foerster, 1869: 157. Type-species: *Limneria cothurnata* Holmgren, by subsequent designation, Viereck, 1914: 71.

Olesicampa Thomson, 1887: 1053. [Unjustified emendation.]
Holocremna Thomson, 1887: 1053. [Unjustified emendation.]
Limnerium Ashmead, 1900*b*: 368. [Replacement name for *Limneria* Holmgren.]
Zaplatystoma Viereck, 1925*b*: 177. Type-species: *Zaplatystoma typicum* Viereck, by original designation.

Small species, fore wing length 3-5 mm; head transverse; clypeus weakly convex, margin not impressed, fairly blunt, evenly arcuate; mandible moderately long, with a narrow ventral flange; malar space 0.6 times basal mandibular width. Eye not indented opposite antennal socket; genal carina joining hypostomal carina above base of mandible.

Pronotum in profile short, epomia weak; scutellum weakly convex; mesopleuron with speculum polished, smooth or almost so; mesopleural suture strong. Posterior transverse carina of mesosternum complete. Propodeum abruptly declivous, not produced into a 'neck', with carinae quite strong, the areae superomedia and petiolaris confluent, not concave; propodeal spiracle circular.

Ventral surface of hind tarsal segments 1-3 unspecialized.

Fore wing with *cu-a* subvertical, anteroproximal corner of first subdiscal cell 70°+; 3*r-m* usually present enclosing a pentagonal areolet (Fig. 410), very rarely this vein obsolescent; 2*m-cu* joining areolet far distal to centre; marginal cell rather short. Hind wing with distal abscissa of Cu_1 absent; Cu_1&*cu-a* evenly curved, vertical.

Gaster with segment 1 slender, petiole long, slightly depressed, the suture separating tergite from sternite, if visible, then ventral (Fig. 397); sternite 1 reaching 0.7 or more of length of tergite, glymma absent or rather shallow and indistinct. Gaster quite short, tergite 3 with laterotergite folded under. Ovipositor short, straight, not projecting noticeably beyond end of gaster, with a distinct dorsal subapical notch.

Remarks. *Olesicampe* is a large, mainly north temperate genus. It is very closely related to several other genera, particularly *Lemophagus* and *Hyposoter*, and the generic limits are extremely poorly defined (Carlson, 1979). Typical *Olesicampe* are quite stout little campoplegines with broad genae, wide clypeus and stout mandibles. The lower tooth is often the longer. As far as is known these are all parasites of symphytan larvae. However, there are a number of less stout species and the division from *Hyposoter* is usually made on biological grounds as species of this genus are parasitic on lepidopterous larvae. The Australian species are very atypical but Townes (pers. comm.) considers they are correctly placed in *Olesicampe* as they resemble some South African species. In host preference the Australian species seem similar to *Lemophagus* and perhaps they are better placed in that genus, but until more is known of southern campoplegines I have opted to treat them as *Olesicampe*, of which I think *Lemophagus* may prove to be a synonym.

Australian species. Two species, undescribed (ANIC; BMNH).

Host records. *Olesicampe* sp. - Chrysomelidae: *Stethopachys formosa* Baly (DAR). Two from Australia are given by Chadwick & Nikitin (1976) but in view of frequent misidentifications these require confirmation.

PICACHAROPS gen. n.

Type-species: *Picacharops brevithorax* sp. n.

Small species, fore wing length 3 mm; head lenticular; clypeus weakly convex, margin abruptly impressed, sharp, evenly arcuate; mandible short, fairly strongly narrowed with a very broad ventral flange that is abruptly narrowed 0.7 of way along mandible (Fig. 422); malar space 0.6-0.7 times basal mandibular width. Eye very weakly indented opposite antennal socket; genal carina joining hypostomal carina at base of mandible.

Pronotum in profile very short, epomia distinct, parallel to anterior margin; scutellum weakly convex (Fig. 429); mesopleuron with speculum granulate, weakly polished; mesopleural suture strong. Posterior transverse carina of mesosternum complete. Propodeum abruptly declivous from anterior end so propodeum is pyramidal in profile; propodeal carinae strong, areae superomedia and basalis confluent, not very concave, extending virtually entire length of propodeum; propodeum not produced into a 'neck'; spiracles oval.

Ventral surface of hind tarsal segments 1-3 unspecialized.

Fore wing with *cu-a* very oblique so that anteroproximal corner of first subdiscal cell is about 55° (Fig. 405); 3*r-m* present enclosing a small rhombic, petiolate areolet; 2*m-cu* joining areolet distal to centre; marginal cell moderately short, deep. Hind wing with distal abscissa of Cu_1 vestigial, discernible as a faint trace, Cu_1&*cu-a* evenly bowed, vertical.

Gaster with segment 1 long, petiole slender but strongly depressed; suture separating sternite and tergite ventrolateral anteriorly, becoming ventral centrally; sternite reaching 0.7 of length of tergite; glymma absent. Gaster rather short, tergite 3 with laterotergite separated by a crease. Ovipositor very short, straight, with a distinct dorsal subapical notch, not projecting beyond apex of gaster.

Etymology. *Pica* (very small) + *charops* (a related genus). Feminine.

Remarks. A small genus that is probably related to *Xanthocharops* which it resembles in the head shape, but from which it differs in the form of the areolet, lack of glymma and the unspecialized hind tarsus. It may be related to the Neotropical genus *Microcharops* though this also has a specialized hind tarsus and lacks an areolet. *Picacharops* is one of the easiest Australian campoplegine genera to recognize on account of its small size, strongly oblique *cu-a* and short, abruptly declivous propodeum.

Australian species. One, described below and a second undescribed species which occurs in southern Queensland (ANIC; BMNH).

Picacharops brevithorax sp. n.

Female: face transverse with large shallow confluent punctures overlaid with fine microreticulation; frons with an obsolexcent median vertical carina; ocelli in broad-based isosceles triangle, the lateral ones separated from eyes by about their own diameter, the vertex vertically declivous behind ocelli. Flagellum with about 27 segments. Mesoscutum convex, short, coarsely closely punctured with fine overlay of microreticulation; scutellum similarly sculptured. Mesopleuron granulate with a striate shallow oblique furrow; metapleuron granulate. Mid leg with longer tibial spur 1.5-1.6 times the shorter; tarsal claws sparsely pectinate. Gaster finely granulate, weakly polished; tergite 2 with a large oval thyridia close to anterior margin.

Black; tegula, trochanters and trochantelli pale yellow; legs and scape yellowish brown, hind tarsus infuscate; gaster with tergites 2+ reddish.

Male: same as female.

P. brevithorax differs from the undescribed species in having the flagellum and coxae black, the pleural sculpture finer and weaker, the propodeal carinae weaker and the area superomedia narrower.

Material examined

Holotype ♀, Australian Capital Territory: Canberra, xi.1959 (*Riek*) (ANIC).

Paratypes. Australian Capital Territory: 2 ♀, 2 ♂, Canberra, xi.1959 (*Riek*) (ANIC; BMNH). New South Wales: 1 ♀, 20 km W. of Braidwood, i.1970 (*Cardale*)(ANIC). Tasmania: 1 ♀, 1 km NE. Kingston, xii.1979 (*Cardale*) (ANIC).

Host records. None.

SINOPHORUS Foerster*

Sinophorus Foerster, 1869: 153. Type-species: *Limneria canarsiae* Ashmead, by subsequent monotypy, Ashmead, 1898*a*: 126.
Eulimneria Schmiedeknecht, 1907*a*: 600. Type-species: *Ichneumon albidus* Gmelin, by subsequent designation, Morley, 1913*b*: 480.
Campopletidea Viereck, 1912*b*: 634. Type-species: *Campoplex caradrinae* Viereck, by monotypy.

Small species, fore wing length 3-5 mm; head sublenticular; clypeus rather flat, broad, with margin sharp, transversely truncate; mandible of moderate length with an indistinct ventral flange; malar space 0.2-0.4 times basal mandibular width. Eyes not strongly indented opposite antennal socket; genal carina reaching hypostomal carina above base of mandible.

Pronotum in profile moderately long, epomia weak; scutellum almost flat; mesopleuron with speculum glabrous, smooth and highly polished; mesopleural suture strong. Posterior transverse carina of mesosternum complete. Propodeum rather short, steeply rounded; anterior transverse carina discernible, others vestigial, but with deep median longitudinal concave area; propodeum not produced into a 'neck' posteriorly; spiracle oval.

Ventral surface of hind tarsal segments 1-3 unspecialized.

Fore wing with *cu-a* subvertical; *3r-m* present enclosing a moderately large areolet, *2m-cu* joining distal to centre; marginal cell moderately long. Hind wing with distal abscissa of Cu_1 present but weak, not joining Cu_1&*cu-a*; Cu_1&*cu-a* vertical, almost evenly curved.

Gaster with segment 1 long, petiole moderately slender, suture separating sternite from tergite laterally at anterior end of segment, almost ventral at centre; sternite 1 reaching 0.6 of way along tergite; glymma absent. Gaster moderately slender, tergite 3 with laterotergite turned under, separated by a sharp crease. Ovipositor almost straight, apex very slightly up-turned; subapical notch strong, lower valve distinctly deepened before level of dorsal notch (Fig. 424); ovipositor projecting beyond apex of gaster by 1.2 times length of hind tibia.

Remarks. *Sinophorus* is a moderately large cosmopolitan genus that is best represented in the Holarctic region. Many species tend to favour dry habitats. Structurally, species of *Sinophorus* are close to species of *Campoplex* and the division between the genera is, in places, fairly arbitrary. The Australian species is quite distinctive on account of the unusual ovipositor apex. It is only known from the Northern Territory around Areyonga.

Australian species. One, undescribed (TC).

Host records. None from Australia but in Asia species have been recorded from a variety of microlepidopterous hosts (Gupta & Maheshwary, 1977).

SLENDA gen. n.

Type-species: *Slenda ocypeta* sp. n.

Small species, fore wing length 2-4 mm; head sub-spherical; clypeus weakly convex, margin blunt, weakly arcuate; mandible moderately long, without a distinct ventral flange; malar space about 0.5 times basal mandibular width. Eyes not indented opposite antennal sockets; genal carina joining hypostomal carina above base of mandible.

Pronotum in profile moderately long, usually somewhat striate, epomia indistinct; scutellum almost flat; mesopleuron with speculum smooth and polished; mesopleural suture strong. Posterior transverse carina of mesosternum complete. Propodeum very long, weakly declivous and posteriorly produced into a long 'neck' which reaches almost to apex of hind coxa; propodeal area distinct, area superomedia confluent with area petiolaris, the two together about 7.0 times as long as broad, and not concave; propodeal spiracle circular.

Hind leg with tarsal segments 1-3 unspecialized.

Fore wing with *cu-a* subvertical; *3r-m* absent, *2r-m* about equal to *M* between *2r-m* and *2m-cu*; marginal cell moderately long. Hind wing with distal abscissa of Cu_1 absent.

Gaster with segment 1 long, petiole slender, with suture between tergite and sternite strong, on anterior 0.5 of segment above the centre (when viewed laterally); sternite 1 reaching 0.8 or more of length of tergite. Gaster very long and slender, tergites 3+ posteriorly incised mid-dorsally; tergite 3 with laterotergite not separated by a crease, pendant. Ovipositor stout (Fig. 425), strongly upcurved, laterally compressed, projecting beyond apex of gaster by 0.3-0.8 of length of hind tibia, with a distinct dorsal subapical notch.

Etymology. An arbitrary euphonius combination of letters. Feminine.

Remarks. *Slenda* is a small genus with a number of species in the Indo-Australian region. All are superficially similar in being very elongate, gracile insects with a very stout compressed ovipositor. *Slenda* species superficially resemble the Palaearctic species *Gonotypus melanostoma* but *Gonotypus* is characterized by strong glymmae and a more '*Diadegma*-like' alitrunk. The slender, simple petiole, characteristic mesopleural sculpture and narrow pronotum indicate that *Slenda* is related to *Venturia* from which it differs in having long almost simple claws, incised gastral tergites, laterotergite 3 undifferentiated and a stout compressed ovipositor.

Australian species. One species, described below, and a further undescribed species (AM; ANIC; BMNH).

Slenda ocypeta sp. n.

Female: head granulate; ocelli forming an almost equilateral traingle, the posterior ones separated from eye by about 2.0 times their own diameter; flagellum with 22-23 segments, the distal ones somewhat moniliform. Alitrunk granulate, weakly polished. Gaster smooth, highly polished with isolated hairs. Ovipositor (measured from tip in straight line to its base) as long as hind tibia.

Black; mouthparts and legs except for hind coxae brownish.

Male: same as female.

S. ocypeta differs from the undescribed Australian species in having black hind coxae and a short ovipositor. The undescribed species from Queensland has red hind coxae and the ovipositor (measured from tip in a straight line to its base) is 1.4 times as long as the hind tibia. There are also slight differences in sculpture.

Material examined

Holotype ♀, Tasmania: Lyell Highway, 21 km E. of Queenstown, xii.1979 (*Norris*) (ANIC).

Paratypes. Australian Capital Territory: 1 ♀, Brindabella Mts, Mt Aggie, 1250 m, ix.1981 (*Gauld*) (BMNH); 1 ♀, Brindabella Mts, Mt Ginini, 1600 m, ix.1981 (*Gauld*) (BMNH). New South Wales: 4 ♀, Dainers Gap, iii.1974 (*Morrow*) (ANIC); 1 ♀, Sassafras, xi.1968 (*Colless*) (ANIC). Tasmania: 1 ♀, 20 km S. of Deloraine, iii.1963 (*Common & Upton*) (ANIC). Western Australia: 2 ♀, 1 ♂, Dongarra, x.1935 (*Turner*) (BMNH); 1 ♀, Mt Chudalup, S. of Northcliffe, x.1970 (*Colless*) (ANIC).

Host records. None, but the morphology of the adult suggests it may parasitize stem-mining lepidopterous larvae.

SLIOCHIA Gauld*

Sliochia Gauld, 1976*d*: 1. Type-species: *Sliochia bala* Gauld, by original designation.

Small species, fore wing length 1.5-3.0 mm; head almost hemispherical, posteriorly flattened, bearing obvious pale pubescence; clypeus weakly convex, margin arcuate; mandible short, with a narrow indistinct flange along lower margin; malar space 0.5-0.6 times basal mandibular width. Eyes not indented opposite antennal sockets; genal carina joining hypostomal carina close to base of mandible.

Pronotum in profile long, epomia distinct, parallel to anterior margin; mesoscutum and scutellum flattened; mesopleuron smooth and polished; mesopleural suture strong. Posterior transverse carina of mesosternum complete. Propodeum evenly rounded, not produced into a 'neck' posteriorly; propodeal carinae distinct, area defined but areae petiolaris and superomedia confluent, not concave; spiracle circular.

Ventral surface of hind tarsal segments 1-3 with a median row of hairs, other wise unspecialized.

Fore wing with *cu-a* oblique, anteroproximal corner of first subdiscal cell about 65°; *3r-m* absent, *2r-m* about equal in length to abscissa of *M* between *2m-cu* and *2r-m*; marginal cell short (Fig. 403). Hind wing with distal abscissa of Cu_1 absent; Cu_1&*cu-a* virtually straight, vertical.

Gaster with segment 1 short, depressed fairly evenly broadened posteriorly, suture separating sternite from tergite on underside; sternite reaching 0.7 times length of tergite, swollen centrally; glymma absent. Gaster strongly depressed, tergite 3 with anterolateral corners membranous, without a crease separating laterotergite. Ovipositor straight with a distinct nodus and minute dorsal subapical notch distal to nodus (Fig. 423); ovipositor projecting beyond apex of gaster by 0.55 times length of hind tibia.

Remarks. *Sliochia* is a small genus occurring in the Oriental everwet tropics. Only one species is described, *S. bala* from Borneo, but other species are known from New Guinea and the Philippines. A single Australian species occurs in northern Queensland.

Sliochia females are very easily recognized by the ovipositor. Males may be recognized by the venation. The scape of the Australian species is shorter than that of *S. bala* and the flagellum relatively longer so these characters can no longer be considered as part of the generic diagnosis.

Australian species. One species, undescribed (ANIC).

Host records. None from Australia. In Borneo *S. bala* is a parasite of *Acrocercops* sp. (Gracillariidae) on cocoa (Gauld, 1976*d*).

VENTURIA Schrottky

Idechthis Foerster, 1869: 154. Type-species: *Idechthis oahuensis* Ashmead, by subsequent monotypy, Ashmead, 1901: 355. [Homonym of *Idechthis* Hübner, 1821.]
Venturia Schrottky, 1902: 102. Type-species: *Venturia argentina* Schrottky, by original designation.
Devorgilla Cameron, 1907*e*: 51. Type-species: *Devorgilla dilatata* Cameron, by monotypy.
Balcarcia Brèthes, 1922: 133. Type-species: *Balcarcia bergi* Brèthes, by monotypy.
Notamorphota Blanchard, 1947*b*: 292. Type-species: *Notamorphota timocraticae* Blanchard, by original designation.
Exidechthis Walkley, 1958: 59. [Replacement name for *Idechthis* Foerster.]

Medium-sized species, fore wing length 6-10 mm; head generally subquadrate; clypeus flat to weakly convex, margin not impressed, rather blunt, truncate or evenly arcuate; mandible moderately long, without a ventral flange; malar space 0.4-0.6 times basal mandibular width. Eyes not or only very weakly indented opposite antennal socket; genal carina joining hypostomal carina above base of mandible.

Pronotum in profile moderately long, epomia vestigial; scutellum weakly convex; mesopleuron with speculum polished, usually smooth, rarely slightly granulate;

mesopleural suture impressed. Posterior transverse carina of mesosternum complete. Propodeum quite long, evenly declivous, area superomedia usually delineated laterally, anterior transverse carina present; propodeum without a longitudinal concavity, spiracle oval, propodeal apex produced into a 'neck' that reaches 0.4 times length of hind coxa.

Ventral surface of hind tarsal segments 1-3 unspecialized.

Fore wing with *cu-a* slightly oblique; 3*r-m* present or absent, if present then enclosing a petiolate areolet, 2*m-cu* joining distal to centre; marginal cell moderately long. Hind wing with distal abscissa of Cu_1 usually very faint, Cu_1&*cu-a* angled below centre.

Gaster with segment 1 long, petiole long and slender, in section circular, with suture separating sternite and tergite at or slightly above the centre near anterior 0.3 (Fig. 395); glymma absent; sternite 1 reaching 0.8 or more of length of tergite. Gaster relatively slender, tergite 3 with laterotergite folded under. Ovipositor up-curved, projecting beyond apex of gaster by 1.3 or more times length of hind tibia, with a distinct dorsal subapical notch; ♂ genitalia with gonosquama with a weak to strong dorsal notch.

Remarks. *Venturia* is a moderately large genus, most species of which occur in the Old World tropics. It is very closely related to *Campoplex* from which it can be separated by having a distinct propodeal 'neck' which reaches almost to centre of hind coxa, having a slender petiole and having an excised male genitalia capsule.

In Australia the majority of species occur in Queensland, though one, *V. canescens* (Gravenhorst), is widely distributed. This species is a common insect in store houses and granaries (Richards, 1949) where it parasitizes microlepidopterous larvae. It was almost certainly accidently introduced into Australia from Europe.

Australian species. *Venturia canescens* (Gravenhorst) (I). I have seen four undescribed species (AM; ANIC; BMNH; DPIQ; TC).

Host records. *V. canescens* - Pyralidae: *Ephestia kuehniella* Zeller; *Plodia interpunctella* (Hübner) (Champ, 1966; Chadwick & Nikitin, 1976). *Venturia* sp. - Pyralidae: *Styphlolepis agenor* Turner (DPIQ).

XANTHOCAMPOPLEX Morley

Xanthocampoplex Morley, 1913*b*: 445. Type-species: *Xanthocampoplex orientalis* Morley (= *Zachresta nigromaculata* Cameron), by original designation.

Medium-sized species, fore wing length 6-8 mm; head lenticular; clypeus quite strongly convex, margin impressed, acute, evenly arcuate; mandible quite short, with broad flange on ventral margin that abruptly ends about 0.7 of way along mandible; malar space 0.4-0.6 times basal mandibular width. Eyes very weakly indented opposite antennal socket; genal carina reaching base of mandible.

Pronotum in profile quite short, epomia close to and parallel with fore margin; scutellum moderately convex; mesopleuron with speculum smooth and polished; mesopleural suture strong. Posterior transverse carina of mesosternum complete. Propodeum quite short, abruptly declivous, not produced into a 'neck' posteriorly; posterior transverse carina present laterally, longitudinal furrow weak or moderate; spiracle oval.

Ventral surface of hind tarsal segments 1-3 with a median ridge bearing fine close hairs.

Fore wing with *cu-a* subvertical; 3*r-m* present enclosing a small oblique petiolate areolet, or with 2*r-m* and 3*r-m* fused, the former always longer than abscissa of *M* between 2*r-m* and 2*m-cu*; marginal cell long and slender. Hind wing with distal abscissa of Cu_1 absent; Cu_1&*cu-a* almost straight, vertical (Fig. 414).

Gaster with segment 1 long, petiole slender, the suture separating sternite and tergite not discernible; glymma small but deep. Gaster stout but strongly compressed, tergite 3 without a crease separating laterotergite. Ovipositor straight, projecting beyond apex of gaster by about 0.2-0.3 times length of hind tibia, its apex simply acute with a distinct dorsal subapical notch.

Remarks. *Xanthocampoplex* is a moderately large genus, most species of which occur in the Old World tropics. The genus is structurally intermediate between *Hyposoter* and *Echthronomas*. The former lack the ridge and hairs on the hind tarsus whilst *Echthronomas* species have Cu_1&*cu-a* in the hind wing strongly reclivous, have the genal carina joining the hypostomal carina above the base of the mandible and have a matt speculum (Gupta, 1973).

Nine species are known from the Indo-Australian region, one of which occurs in north Queensland. The Australian examples have been treated as a subspecies of a Papuan species on account of superficial colour differences. Oddly, Philippine specimens have also been included in the Australian subspecies. What little use the subspecies category might have as a geographical segregate is clearly invalidated by the inclusion of Philippine and Australian specimens as one subspecies and New Guinea examples as a second. It is clearly observable fact that many yellow ichneumonoids with black markings have New Guinea populations with fewer black marks. A number of factors (e.g. local selection pressure; climatic differences) could be invoked to account for this tendency, but the obscuring of biological reality by spurious subspecific names helps nobody. Accordingly the subspecies category is not used here.

Australian species. *Xanthocampoplex luteus* (Szépligeti) (W + Philippines). Mr G. Holloway recently (1982) collected a series representing a second species at Mt Keira (AM).

Host records. None from Australia but in South East Asia species have been reared from Pyralidae (Gupta, 1973).

SUBFAMILY OPHIONINAE

The Ophioninae is, world-wide, a large subfamily containing about 34 genera. Almost all species are nocturnal and readily come to light. Consequently they are relatively easy to collect and large numbers may be found in most collections. Taxonomically ophionines are probably the best known group of Ichneumonidae in the Old World tropics, they occur in all habitats from upper montane heathland to forest and even semidesert, though the greatest species diversity is usually found in tropical forest between 1200 and 1700 m. The Australian species were revised by Gauld (1977*a*) who subsequently (Gauld, 1979) transferred two Australian species to a new genus; since then 15 additional ophionine species have been collected, almost all in tropical Queensland.

DIAGNOSIS

Medium-sized to very large insects, fore wing length 6-24 mm; clypeus in profile usually weakly convex, in anterior aspect slightly concave to convex, never with a median tooth or teeth; mandible bidentate, sometimes twisted; ocelli almost always large, the posterior ones separated from the eyes by less than their maximum diameter; occipital carina usually complete, rarely absent. Antenna generally very long and slender, often with more than 55 flagellar segments. Notauli weak to obsolescent; mesoscutum usually sparsely punctate; sternaulus absent; posterior transverse carina of mesosternum complete or interrupted before each mid coxa; propodeum from completely areolated to with only anterior transverse carina present and the posterior part coarsely sculptured or very rarely without carinae. Legs slender, tibial spurs very long, usually unequal; tarsal claws long, pectinate to apices. Fore wing large, with a single intercubital vein, *3r-m*, well distal to *2m-cu*; spurious vein present extending from distal end of *1A* to tornus; discosubmarginal cell often with an anterior glabrous area. Hind wing with first abscissa of *Rs* straight to curved, longer than *r-m*; distal abscissa of Cu_1 present. Gaster with segment 1 very long and slender, the tergite and sternite fused to form a cylinder, the spiracles positioned well behind the centre and glymmae absent; remainder of gaster strongly laterally compressed; ovipositor short, generally projecting beyond apex of gaster by about apical depth of gaster, straight, with a dorsal subapical notch. Body colour usually brownish orange to yellowish.

Ophionines are frequently confused with other nocturnal ichneumonids, especially *Netelia*. All other nocturnal Ichneumonidae in Australia have an areolet in the fore wing and have the spiracles of tergite 1 near or before the centre.

CLASSIFICATION

Townes (1971*b*) divided the Ophioninae into two tribes, Ophionini and Enicospilini. This classification is not very satisfactory as the latter group contains at least two evolutionary lineages whilst the former is a paraphyletic assemblage from within which the latter has arisen (Gauld, unpublished data).

DISTRIBUTION

The Ophioninae of the Old World tropics, Australia and New Zealand have recently been revised (Parrott, 1954*a*; Gauld, 1977*a*; Gauld & Mitchell, 1978, 1981) and it is therefore possible to assess the relationships of the Australian fauna resonably accurately. The numbers of species per genus in Australia, New Guinea and New Zealand are compared below:

	NEW GUINEA	AUSTRALIA	NEW ZEALAND
Ophion	1	5	10
Xylophion	1	2	-
Riekophion	-	3	-
Stauropoctonus	1	1	-
Pamophion	-	1	-
Leptophion	9	7	-
Dicamptus	1	5	-
Enicospilus	141	43	2

Riekophion and *Pamophion* are endemic to Australia. The former is one of the more primitive ophionine genera and probably represents a relict of an ancient group. The three extant species are not at all closely interrelated, though they share several apomorphies indicating they constitute a single evolutionary line. *Pamophion* is a more derived genus and is probably the sister-group of *Leptophion*. *Stauropoctonus* is also a relict genus with four widely scattered species, one of which ranges throughout much of Indonesia and New Guinea, and extends into north Queensland. *Xylophion* is a small genus with two species, one of which occurs both sides of the Torres Straits.

The remaining four genera, *Leptophion*, *Ophion*, *Dicamptus* and *Enicospilus*, each show different distribution patterns although that of the latter is more complex because of the larger number of species involved.

Leptophion is centred in New Guinea but is well represented in the Moluccas, Australia and the Pacific Islands to the east. Most *Leptophion* species are endemic to the island where they occur. One of the species occurring in Australia is widely distributed throughout Melanesia as well, but the remainder of the Australian species form a monophyletic group. All but one are endemic; the exception, *L. anici*, also occurs in New Caledonia. Throughout most of their non-Australian range, *Leptophion* species are associated with cloud forests. The Australian species occur in drier regions, so probably the ancestor of this species-group made the great transition to surviving in a more arid habitat, enabling it to give rise to a small Australian radiation.

Ophion is primarily a Holarctic genus and outside this region species only occur in cooler areas. In the past, *Ophion* probably extended its range from the north into the tropics, possibly during the cooler periods associated with the northern glaciations (Tsukada, 1966; Flenley, 1972). Subsequent warming of the tropics would have the effect of isolating *Ophion* species on mountain tops or 'trapping species' in southern temperate latitudes. That this has happened is attested to by the presence of *Ophion* species in widely scattered south temperate localities and on high mountains in Borneo, Sulawesi, New Guinea and the Philippines. The five Australian species form a monophyletic group, but they are quite closely related to the Old World species occurring on the Palaearctic/Oriental interface. Neither the New Zealand nor the New Guinea species appear to be at all closely related to the Australian species, but they are much more derived and not obviously related to any other *Ophion* species.

Dicamptus is a genus usually associated with areas that have a pronounced dry season, and in Australia four species are most commonly collected in the Northern Territory. The majority of *Dicamptus* species occur in India and Africa. A single species that is widely distributed throughout South East Asia occurs in New Guinea and Australia. The remaining four Australian species belong to an Afro-Asian species-group that is not present in Melanesia. One, *D. indicus*, is not even specifically distinct and I believe this is strong evidence to suggest recent colonization of Australia from the north-west, via the drier Lesser Sunda Isles.

Enicospilus is a very large tropicopolitan genus with relatively few species present in temperate areas. There have been several centres of radiation, one of the largest being New Guinea. A large proportion of the 141 species in New Guinea are endemic and belong to endemic species-groups. The proximity of this centre of radiation has had relatively little impact on the composition of the Australian fauna. Of the 43 Australian species, 21 are endemic, 12 are widespread tropical Indo-Australian species, eight are Australo-Papuan and two are Australo-New Zealand. The 21 endemic species may be further subdivided into seven which belong to an endemic species-group, 11 which belong to widespread Indo-Australian species-groups, two which (like most *Dicamptus*) belong to Afro-Asian species-groups which are not present in Melanesia, and one which belongs to a New Guinea species-group.

Thus the majority of Australian *Enicospilus* (53 per cent) belong to widespread Old World tropicopolitan species-groups. Many of these are insects which are associated with disturbed habitats and they appear to be extending their range in the wake of man's destruction of primary forests. The next largest group (21 per cent) are of Papuan origin and this is closely followed by the 'true' Australian species (16 per cent) which are endemic species belonging to endemic species-groups. A very small proportion is composed of species which are either Australo-New Zealand (5 per cent) or Afro-Asian (5 per cent).

To try to understand why the New Guinea centre of radiation has had such a comparatively small effect on Australia it is necessary to look closely at the distribution of New Guinean species. A comparison of light-trap collections made at 1000 m and 2300 m in nearby sites in Wau, New Guinea (Gauld & Mitchell, 1981) revealed that no single species occurred at both sites. Furthermore 100 per cent of the species collected at the higher altitude were endemics whilst 60 per cent of those collected lower down were widespread Indo-Papuan species. It is a reasonable generalization to say that most endemic New Guinean species are primarily insects of the mist forests above 1700 m. There are very few areas of such forest in Australia and where it does occur one often finds *Enicospilus* species that are closely related to New Guinean ones.

BIOLOGY

The majority of Ophioninae are active at night; the females search vegetation for nocturnal caterpillars. The males of some species may be observed in flight during the day. The life history of very few Ophioninae has been investigated. Moutia & Courtois (1952) observed that *Enicospilus (sesamiae)* laid a single, cylindrical, slightly curved, pale-coloured egg in the body cavity of a lepidopterous larva. In the host studied (*Sesamia vuteria* larvae) the fourth or fifth instar were those most generally selected. The ichneumonid egg was found to take two to three days to hatch and the larva underwent three instars in the host, lasting, in total, 25-35 days, depending upon temperature. The third instar larva emerged from the host about the time of the host's death. The ophionine larva then took 24-36 hours to spin a cocoon. The prepupal stage and the pupal instar lasted 28-42 days.

The larvae of some species of Ophioninae (e.g. *Enicospilus coarctatus*) do not emerge from the host until the latter has spun a cocoon. The parasite larva then spins a cocoon within the host cocoon. Many Palaearctic ophionines (e.g. *Ophion scutellaris* Thomson) remain as adults in the cocoon for many months before emerging (Morley, 1915*b*). Such species frequently emerge very early in spring to attack larvae which have diapaused through the winter.

Ophionines do not seem to be very host specific, but are more niche specific. Some species search ground layer vegetation whilst others are only found flying fairly high up in trees. Some species (e.g. *E. signativentris*) only attack almost mature larvae (Price, 1975).

There are few records of hyperparasites attacking ophionines but in Australia a species of *Taeniogonalos* (Trigonalidae) was reared from an *Enicospilus* parasitizing an anthelid (Riek, 1962).

The final instar larvae of Ophioninae are typical endoparasites having a weakly sclerotized epistomal arch, small, unidentate mandible and a large well-developed labial sclerite (Gauld, 1977*a*) (Fig. 452). The cocoons are rather characteristic, being dark brown ovoids with a pale circumferential stripe (Fig. 26).

KEY TO GENERA OF OPHIONINAE OCCURRING IN AUSTRALIA

1 Occipital carina absent; mid and hind trochantelli with anterodistal margin produced into an acute tooth (Fig. 442).......*STAUROPOCTONUS* (p. 296)

\- Occipital carina present, sometimes mediodorsally interrupted but most usually complete; mid and hind trochantelli simple or produced as a blunt tooth marginally (Figs 440, 442, 443)..........................2

2 Fore wing with a large glabrous area in discosubmarginal cell adjacent to *Rs+2r*, this area usually bearing one or more sclerotized patches (Figs 438, 450, 451)..3

\- Fore wing with, at most, a small glabrous area in anterior corner of discosubmarginal cell, this area never bearing detached sclerites (Fig. 439)..5

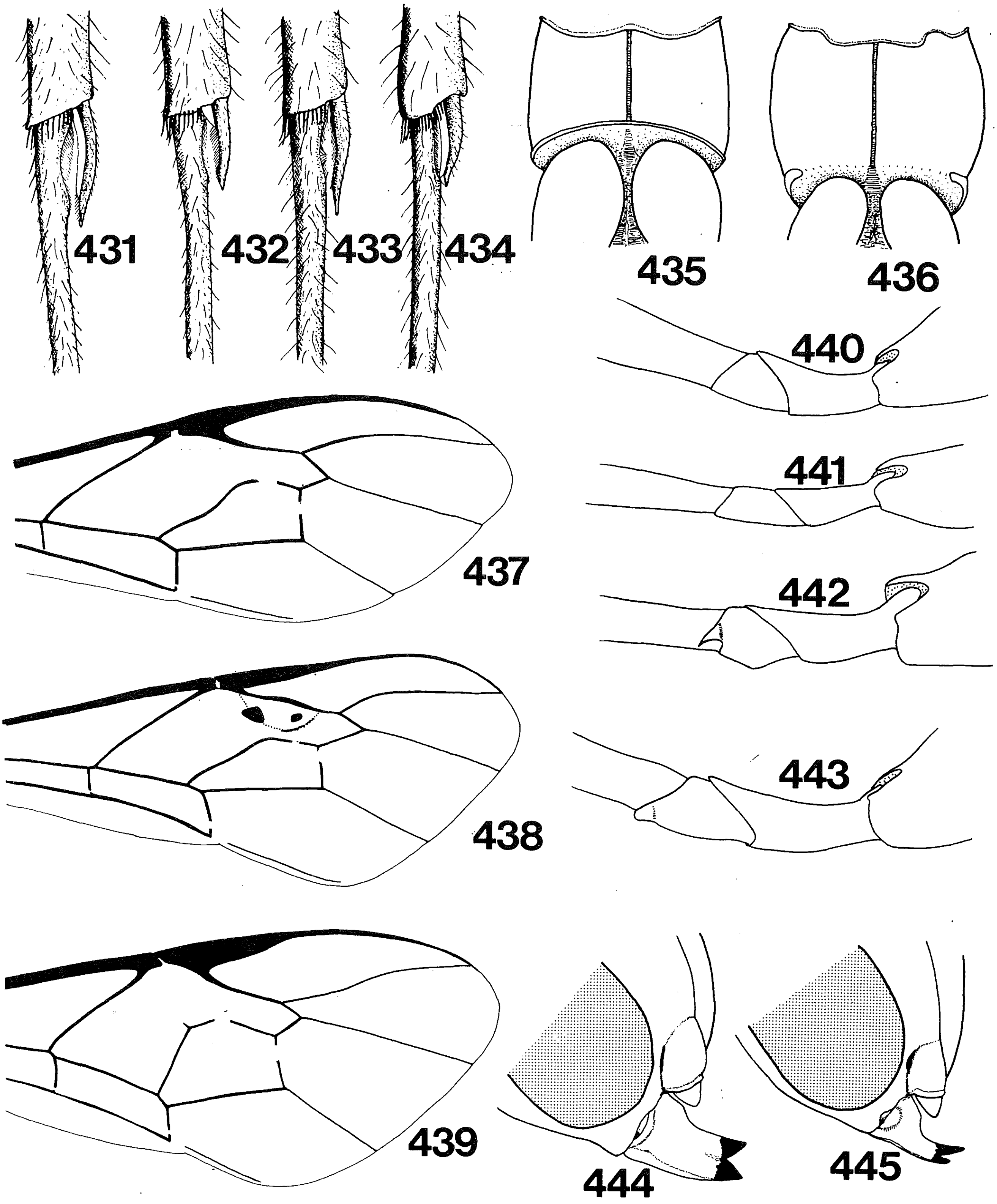
3 Fore tibial spur with a membranous flange along posterior side, behind macrotrichial comb (Fig. 434); posterior transverse carina of propodeum partially discernible, usually complete (Fig. 448)....... ....*RIEKOPHION* (p. 295)

\- Fore tibial spur without a membranous flange behind macrotrichial comb (Fig. 433); propodeum with posterior transverse carina absent or vestigial (Fig. 449)..4

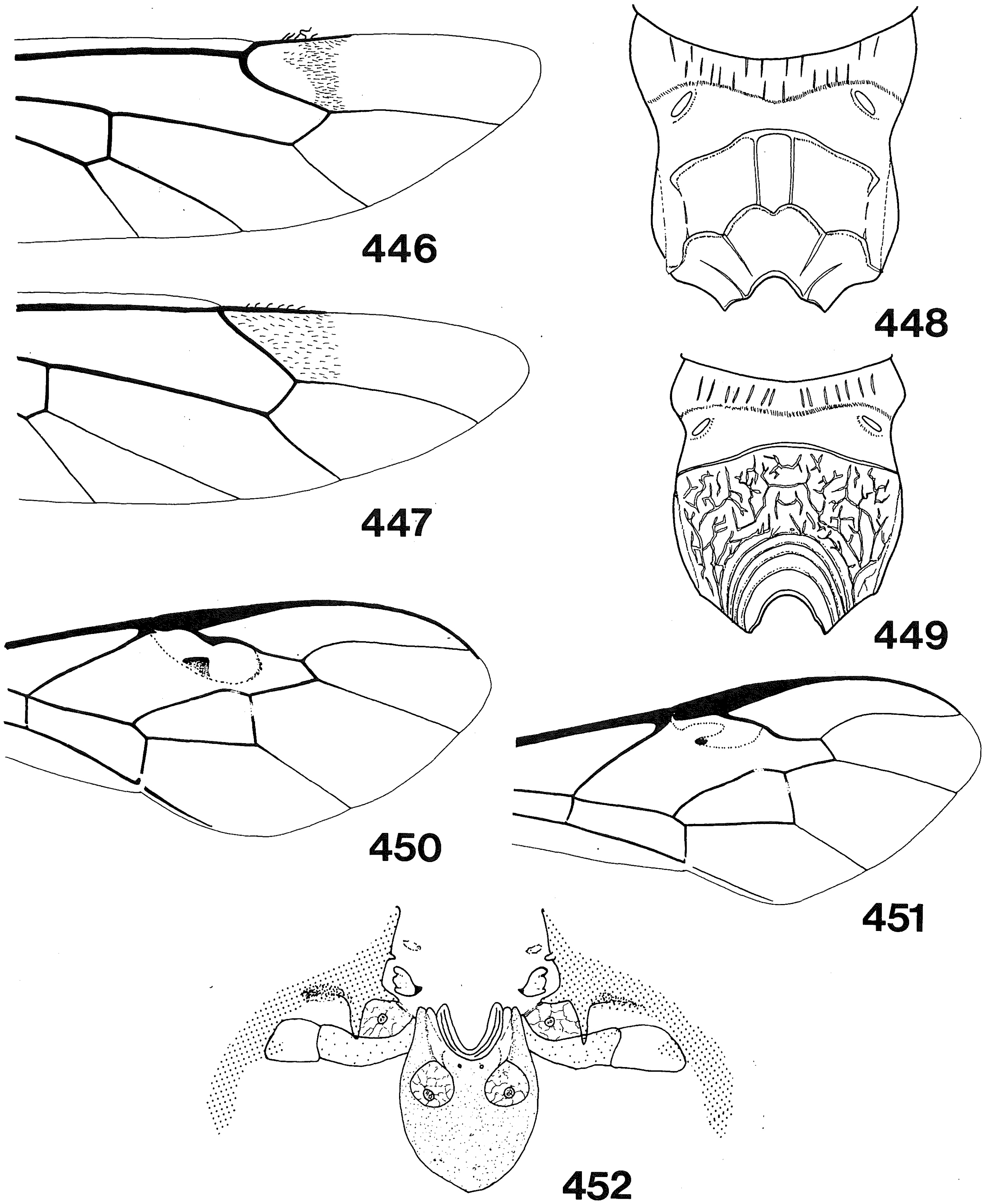
4 Mandible weakly tapered from base to apex, not twisted and with teeth of equal length (Fig. 444); interocellar area always black......... ....*DICAMPTUS* (p. 292)

\- Mandible weakly to strongly tapered from base to apex, slightly to very strongly twisted, often with upper tooth the longer (Fig. 445); interocellar area black or yellowish..................*ENICOSPILUS* (p. 292)

5 Hind wing with first abscissa of *Rs* almost straight (Fig. 447); mid and hind trochantelli with anterodistal margin produced into a blunt tooth (Fig. 443)......................................*PAMOPHION* (p. 295)



Figs 431-445 Ophioninae. 431-434 Fore tibial spurs (431) *Ophion* (432) *Xylophion* (433) *Enicospilus* (434) *Riekophion*. 435-436 Mesosterna (435) *Enicospilus* (436) *Ophion*. 437-439 Fore wings (437) *Leptophion* (438) *Enicospilus* (439) *Ophion*. 440-443 Hind trochantellar segments (440) *Ophion* (441) *Xylophion* (442) *Stauropoctonus* (443) *Pamophion*. 444-445 Faces (444) *Dicamptus* (445) *Enicospilus*.



Figs 446-452 Ophioninae. 446-447 Hind wings (446) *Leptophion* (447) *Pamophion*. 448-449 Propodea, dorsal (448) *Riekophion* (449) *Enicospilus*. 450-451 Fore wings (450) *Dicamptus* (451) *Riekophion*. 452 Cephalic capsule of final instar larva of *Enicospilus*.

- Hind wing with first abscissa of *Rs* bowed (Fig. 446); mid and hind trochantelli simple (Fig. 440)....................................6

6 Fore wing with 1*m-cu* sinuous or evenly curved, without a ramellus (Fig. 437); hind wing usually with penultimate distal hamulus longer than the others, or if of similar size then posterior transverse carina of mesosternum complete (cf. Fig. 435); posterior transverse carina of mesosternum otherwise complete or not.........*LEPTOPHION* (p. 294)

- Fore wing with 1*m-cu* centrally angled, often with a ramellus (Fig. 439); hind wing with penultimate distal hamulus of similar size to the others and posterior transverse carina of mesosternum interrupted before the mid coxae (Fig. 436)....................................7

7 Hind leg with trochantellus dorsally as long as broad (Fig. 441); fore tibial spur with membranous flange not reaching more than 0.2 times length of macrotrichial comb (Fig. 432)............*XYLOPHION* (p. 296)

- Hind leg with trochantellus dorsally much broader than long (Fig. 440); fore tibial spur with membranous flange reaching almost to apex of macrotrichial comb (Fig. 431).......................*OPHION* (p. 294)

DICAMPTUS Szépligeti

Dicamptus Szépligeti, 1905: 21, 28. Type-species: *Dicamptus giganteus* Szépligeti, by monotypy.

Medium to large-sized species, fore wing length 6-12 mm; mandible very weakly tapered, not twisted (Fig. 444); occipital carina complete; propodeum with anterior transverse carina complete, posterior transverse carina absent. Fore tibial spur without a membranous flange; mid and hind trochantelli simple. Fore wing with 1*m-cu* arcuate to sinuous; discosubmarginal cell with a fenestra adjacent to *Rs+2r* which bears one or two sclerites (Fig. 450). Hind wing with first abscissa of *Rs* straight; distal hamuli of similar size and shape.

Remarks. *Dicamptus* is a moderate-sized Palaeotropical genus with five species occurring in Australia. Most species are associated with seasonally dry areas but one, *D. fuscicornis*, is widely distributed in the east of the continent. The northern tropical form and southern temperate form may well prove to be separate species. Some specimens of *D. uptoni* lack 2*m-cu* in the fore wing.

D. fuscicornis is one of the more common nocturnal ichneumonids in Victoria and large numbers come to light around Melbourne.

Australian species. *Dicamptus collessi* Gauld (E); *D. fuscicornis* (Erichson) (A); *D. indicus* Nikam* (Australia, South East Asia); *D. uptoni* Gauld (E). I have seen one undescribed species (ANIC).

Host records. *D. fuscicornis* - Noctuidae: *Persectania* sp. (BMNH).

ENICOSPILUS Stephens

Enicospilus Stephens, 1829: 352. [Nomen nudum.]
Enicospilus Stephens, 1835; 126. Type-species: *Ophion merdarius* Gravenhorst sensu Stephens (= *Ichneumon ramidulus* L.) by subsequent monotypy, Stephens, 1845.
Henicospilus Agassiz, 1846: 138. [Unjustified emendation.]
Allocamptus Foerster, 1869: 150. Type-species: *Ophion undulatus* Gravenhorst, by subsequent designation, Thomson, 1888*a*: 1189.
Dispilus Kriechbaumer, 1894*b*: 309. Type-species: *Ophion (Dispilus) natalensis* Kriechbaumer, by monotypy.
Pleuroneurophion Ashmead, 1900*a*: 86. Type-species: *Pleuroneurophion hawaiiensis* Ashmead, by original designation.

Cymatoneura Kriechbaumer, 1901*a*: 22. Type-species: *Ophion undulatus* Gravenhorst, by subsequent designation, Viereck, 1914: 8.
Pterospilus Kriechbaumer, 1901*b*: 156. Type-species: *Ophion (Enicospilus) dubius* Tosquinet, by subsequent designation, Viereck, 1914: 126. [Homonym of *Pterospilus* Rondani, 1856.]
Trispilus Kriechbaumer, 1901*b*: 156. Type-species: *Ophion (Enicospilus) trimaculatus* Tosquinet, by monotypy.
Metophion Szépligeti, 1905: 28. Type-species: *Metophion bicolor* Szépligeti, by subsequent designation, Viereck, 1914: 94.
Ceratospilus Szépligeti, 1905: 28. Type-species: *Ceratospilus biroi* Szépligeti, by monotypy.
Atoponeura Szépligeti, 1905: 34. Type-species: *Atoponeura concolor* Szépligeti (= *Enicospilus atoponeurus* Cushman), by monotypy.
Ophiomorpha Szépligeti, 1905: 34. Type-species: *Ophion curvinervis* Cameron (= *Enicospilus cameronii* Dalla Torre), by subsequent designation, Hooker, 1912: 134. [Homonym of *Ophiomorpha* Nilsson, 1836.]
Cryptocamptus Brèthes, 1909: 230. [Replacement name for *Allocamptus* Foerster.]
Eremotyloides Perkins, 1915: 530. Type-species: *Eremotylus orbitalis* Ashmead, by monotypy.
Amesospilus Enderlein, 1918: 222. Type-species: *Ophion unicallosus* Snellen, by original designation.
Schizospilus Seyrig, 1935: 79. Type-species: *Schizospilus divisus* Seyrig, by original designation.

Medium to large-sized insects, fore wing length 7-19mm; mandible weakly to strongly tapered, twisted 5-90° (Fig. 445); occipital carina complete or narrowly mediodorsally interrupted; interocellar area yellowish or black. Posterior transverse carina of mesosternum complete (Fig. 435); propodeum with anterior transverse carina usually complete, the area behind this generally coarsely sculptured, posterior transverse carina absent or vestigial (Fig. 449). Fore tibial spur without a membranous flange behind macrotrichial comb (Fig. 433); mid and hind trochantelli simple. Fore wing with *1m-cu* arcuate to sinuous; discosubmarginal cell with a large glabrous fenestra adjacent to *Rs+2r*, the area usually bearing one or more detached sclerites (Fig. 438). Hind wing with first abscissa of *Rs* straight or weakly bowed; distal hamuli of similar size and shape.

Remarks. *Enicospilus* is a very large cosmopolitan genus that is most diverse in tropical parts of the world. In Australia most species occur in Queensland but several are restricted to the drier central and western areas. Few species occur in the temperate south.

Australian species. *Enicospilus amplipennis* (Morley) (E); *E. antennatus* (Morley) (E); *E. boonamini* Gauld (E); *E. borroloolai* Gauld (E); *E. cardaleae* Gauld (E); *E. chiuae* Gauld & Mitchell* (M); *E. coarctatus* (Brullé) (?E; a dubious record from New Guinea); *E. commoni* Gauld (E); *E. consobrinus* (Girault) (E); *E. diminutus* Gauld (E); *E. dolosus* (Tosquinet) (T); *E. dubitator* (Morley) (E); *E. flavivenae* (Girault) (M); *E. flavocephalus* (Kirby) (A); *E. fraucai* Gauld (E); *E. fusiformis* Chiu (A); *E. gardei* (Morley) (E); *E. inghami* Gauld (A); *E. insularis* (Kirby) (Z); *E. interruptus* (Szépligeti) (W); *E. javanus* (Szépligeti) (A); *E. lineolatus* (Roman) (A); *E. melanocarpus* Cameron (A); *E. morleyi* Townes & Townes (M); *E. obliquus* (Morley) (E); *E. pseudantennatus* Gauld (A); *E. pulkus* Gauld (E); *E. quogiae* Gauld (E); *E. ruskini* (Girault) (E); *E. sausi* Gauld (E); *E. skeltonii* (Kirby) (Z); *E. xanthocephalus* Cameron (A). I have seen 11 undescribed species (ANIC).

Host records. *E. pseudantennatus* - Noctuidae: *Mythimna separata* (Walker) (DPIQ). *E. sausi* - Lymantriidae: *Acyphas* sp. (TDF). *E. skeltonii* - Geometridae: *Chlenias* sp. (ANIC). Noctuidae: *Mythimna* sp. (Burns & Mungomery, 1925). *Enicospilus* sp. - Anthelidae: *Anthela varia* (Walker) (Chadwick & Nikitin, 1976).

LEPTOPHION Cameron

Leptophion Cameron, 1901*a*: 227. Type-species: *Leptophion longiventris* Cameron, by monotypy.
Spilophion Cameron, 1905*c*: 124. Type-species: *Spilophion maculipennis* Cameron, by monotypy.
Coiloneura Szépligeti, 1905: 35. Type-species: *Coiloneura melanostigma* Szépligeti (= *Leptophion longiventris* Cameron), by subsequent designation, Viereck, 1914: 35.

Medium to large-sized insects, fore wing length 9-16 mm; mandible very weakly tapered, not twisted; occipital carina complete; interocellar area usually reddish or yellowish, less often black. Posterior transverse carina of mesosternum complete or interrupted before mid coxae; propodeum usually with anterior transverse carina complete and posterior transverse carina vestigial, sometimes entirely without carinae. Fore tibial spur without a membranous flange behind the macrotrichial comb; mid and hind trochantelli simple. Fore wing with 1*m-cu* slightly to strongly sinuous (Fig. 437); discosubmarginal cell at most with a glabrous area anteriorly, without sclerites. Hind wing with first abscissa of *Rs* curved (Fig. 446); distal hamuli usually with the penultimate one enlarged and longer than the remainder.

Remarks. *Leptophion* is a moderately large genus, most species of which occur in New Guinea and adjacent areas. With the exception of *L. longiventris*, the Australian species form a single species-group. Unlike other species of the genus they are not restricted to tropical forests. *L. tetus* is an aberrant species which may be diurnal.

Australian species. *Leptophion anici* Gauld (Australia, New Caledonia); *L. antennatus* (Morley) (E); *L. iochus* Gauld (E); *L. longiventris* Cameron (M); *L. tetus* Gauld (E); *L. unicalcaratus* Gauld (E); *L. yampus* Gauld (E).

Host records. None for the genus.

OPHION Fabricius

Ophion Fabricius, 1798: 210, 235. Type-species: *Ichneumon luteus* L., by subsequent designation, Curtis, 1836: 600.
Paniscus Schrank, 1802: 316. Type-species: *Ichneumon luteus* L., by monotypy.
Psylonychia Szépligeti, 1905: 21. [Nomen nudum.]
Stenophthalmus Szépligeti, 1905: 23. Type-species: *Stenophthalmus algiricus* Szépligeti, by subsequent designation, Viereck, 1914: 137. [Homonym of *Stenophthalmus* Becker, 1903.]
Pachyprotoma Kohl, 1906: 223. Type-species: *Ophion (Pachyprotoma) capitatus* Kohl, by monotypy.
Australophion Morley, 1912*a*: 4, 30. Type-species: *Ophion peregrinus* Smith, by monotypy.
Neophion Morley, 1912*a*: 4, 30. Type-species: *Neophion crassus* Morley, by subsequent designation, Viereck, 1914: 100.
Apatophion Shestakov, 1926: 262. Type-species: *Apatophion mirsa* Shestakov, by original designation.
Platophion Hellén, 1926: 13. Type-species: *Platophion areolaris* Brauns, by subsequent designation, Cushman, 1947: 475.
Potophion Cushman, 1947: 476. Type-species: *Potophion caudatus* Cushman, by original designation.
Psylonychia Cushman, 1947: 476. [Unavailable name, proposed in synonymy.]
Apomesus Townes, 1971*b*: 54. Type-species: *Apomesus longiceps* Townes, by original designation.
Mecetron Townes, 1971*b*: 60. Type-species: *Stenophthalmus choaspese* Uchida, by original designation.

Moderately large to large species, fore wing length 9-17 mm; mandible weakly tapered, not twisted; occipital carina usually complete; interocellar area black. Posterior transverse carina of mesosternum broadly interrupted before each mid cosa (Fig. 436); propodeum from completely carinate to with only transverse carinae discernible. Fore tibial spur with a membranous flange behind macrotrichial comb (Fig. 431); mid and hind trochantelli simple (Fig. 440). Fore wing with *1m-cu* centrally angled, often with a trace of ramellus; discosubmarginal cell with a small glabrous area in anterior corner, without detached sclerites (Fig. 439). Hind wing with first abscissa of *Rs* curved; distal hamuli of more or less similar size and shape.

Remarks. *Ophion* is a large, mainly Holarctic genus with a few species-groups in other regions. Relatively few species occur in Australia. Most are widely distributed throughout the continent except for tropical Queensland.

Australian species. *Ophion adeus* Gauld (E); *O. gelus* Gauld (E); *O. lagus* Gauld (E); *O. zerus* Gauld (E). I have seen one undescribed species (ANIC).

Host records. *Ophion* sp. - Anthelidae: *Anthela* sp. (Chadwick & Nikitin, 1976). In other parts of the world species of this genus are common parasites of Noctuidae.

PAMOPHION Gauld

Pamophion Gauld, 1977*a*: 28. Type-species: *Pamophion sorus* Gauld, by original designation.

Moderately large species, fore wing length 11-13 mm; mandible weakly narrowed, not twisted; occipital carina complete; interocellar area black. Posterior transverse carina of mesosternum complete; propodeum with anterior transverse carina complete, posterior one vestigial. Fore tibial spur without a membranous flange behind macrotrichial comb; mid and hind trochantelli with anterodistal margin produced into a blunt tooth (Fig. 443). Fore wing with *1m-cu* sinuous; discosubmarginal cell glabrous only at anterior corner. Hind wing with first abscissa of *Rs* straight (Fig. 447); distal hamuli of similar size and shape.

Remarks. A monobasic genus related to *Leptophion*.

Australian species. *Pamophion sorus* Gauld (E).

Host records. None.

RIEKOPHION Gauld

Riekophion Gauld, 1977*a*: 21. Type-species: *Allocamptus emandibulator* Morley, by original designation.

Moderately large to very large species, fore wing length 12-24 mm; mandible weakly narrowed, not or barely twisted; occipital carina complete; interocellar area reddish to black. Posterior transverse carina of mesosternum more or less complete; propodeum with anterior and posterior transverse carinae strong, the latter sometimes obsolescent centrally (Fig. 448). Fore tibial spur with a membranous flange behind macrotrichial comb (Fig. 434); mid and hind trochantelli simple. Fore wing with *1m-cu* sinuous; discosubmarginal cell with a glabrous area adjacent to *Rs+2r*, the area bearing one or two small detached sclerites (Fig. 451). Hind wing with first abscissa of *Rs* almost straight; distal hamuli of similar size and shape.

Remarks. A very distinctive Australian genus with a mixture of primitive and specialized features which suggests it is the modern remnant of a very old ophionine group. The three species occur mostly in the south and west of Australia.

Australian species. *Riekophion bolus* Gauld (E); *R. conspicuus* (Morley) (E); *E. emandibulator* (Morley) (E).

Host records. *R. emandibulator* - Anthelidae: *Anthela* sp. (BMNH).

STAUROPOCTONUS Brauns

Stauropoctonus Brauns, 1889: 75. Type-species: *Ophion bombycivorus* Gravenhorst, by monotypy.
Stauropodoctonus Morley, 1913*b*: 375. [Unjustified emendation.]
Nipponophion Uchida, 1928*a*: 201. Type-species: *Nipponophion variegatus* Uchida (= *Ophion bombycivorus* Gravenhorst), by original designation.

Large to very large species, fore wing length 18-22 mm; mandible strongly narrowed, twisted 80°; occipital carina absent; interocellar area blackish. Posterior transverse carina of the mesosternum complete; propodeum with only anterior transverse carina present. Fore tibial spur without a membranous flange behind macrotrichial comb; mid and hind trochantelli with anterodistal margin produced to form an acute, curved tooth (Fig. 442). Fore wing with 1*m-cu* sinuous; discosubmarginal cell with a small glabrous area in anterior corner, without detached sclerites. Hind wing with first abscissa of *Rs* almost straight; distal hamuli of similar size and shape.

Remarks. *Stauropoctonus* is a very small genus with one archaic species in Madagascar, one in the Philippines, one widespread throughout the Palaearctic region and a fourth widespread in South East Asia, Melanesia and tropical Australia. It is related to a small Neotropical genus, *Aulophion* Cushman, and the two are probably relicts of a much more widely spread group.

Australian species. *Stauropoctonus torresi* Gauld (A).

Host records. None from Australia but the Palaearctic species is a parasite of large Notodontidae (Morley, 1915*b*).

XYLOPHION Gauld

Xylophion Gauld, 1979: 77. Type-species: *Ophion xylus* Gauld, by original designation.

Medium to moderately large insects, fore wing length 6-13 mm; mandible barely tapered, not twisted; occipital carina complete; interocellar area black. Posterior transverse carina of mesosternum interrupted in front of each mid coxa; propodeum with anterior transverse carina complete, posterior one usually vestigial. Fore tibial spur with only a vestige of a membranous flange present behind macrotrichial comb (Fig. 432); mid and hind trochantelli simple (Fig. 441). Fore wing with 1*m-cu* centrally angled, usually with a trace of a ramellus; discosubmarginal cell with glabrous area in anterior corner (Fig. 33). Hind wing with first abscissa of *Rs* curved; distal hamuli of similar size and shape.

Remarks. *Xylophion* is a small genus of two species. It is superficially similar to *Ophion* but differs in a number of subtle characters which suggest that it is more closely related to the enicospiline evolutionary line (Gauld, 1977*a*; Gauld & Mitchell, 1981).

Australian species. *Xylophion ketus* (Gauld) (E); *X. xylus* (Gauld) (M).

Host records. None.

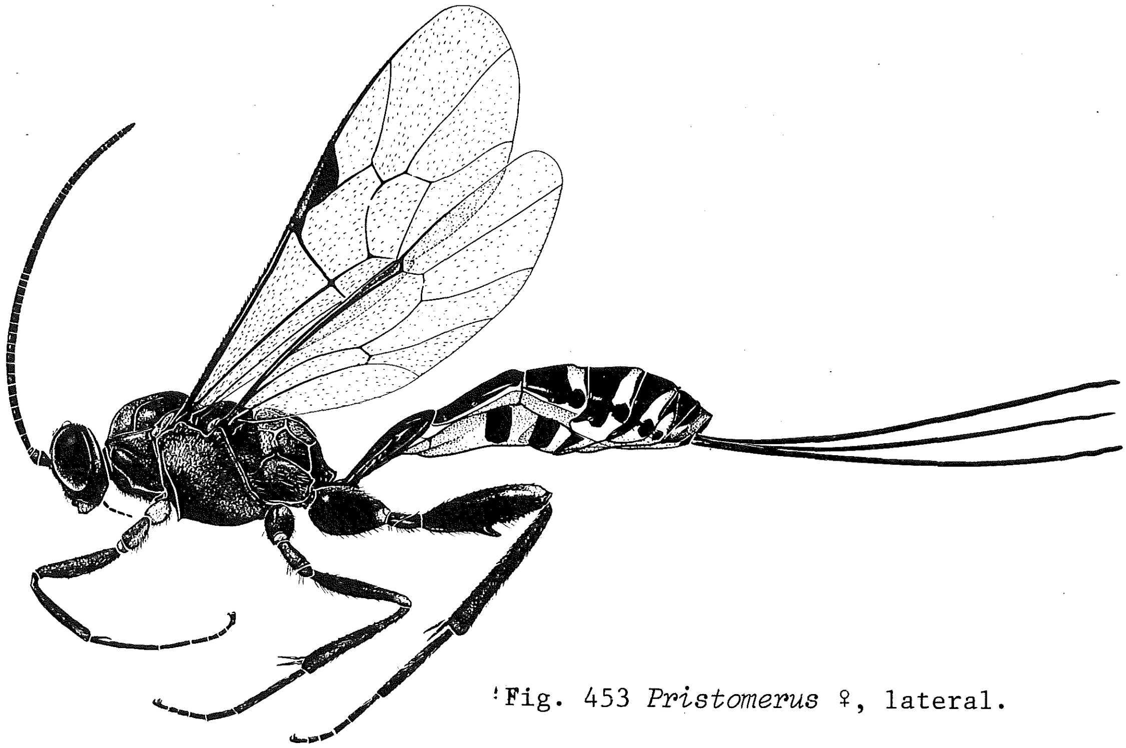


Fig. 453 *Pristomerus* ♀, lateral.

The Cremastinae is a moderately large subfamily with, world-wide, 25 genera. They have achieved their greatest diversity in the Neotropical region where many genera are endemic. Several are cosmopolitan and usually these are very large. Most cremastines live in relatively dry habitats and in central Australia they are the most commonly collected ichneumonids. Cremastines parasitize a variety of lepidopterous and coleopterous larvae, usually species that are concealed in leaf rolls, mines etc. Several are noteworthy in that they attack agriculturally important insect pests (Gauld, 1980*a*), but despite this, little work has been done on the taxonomy of the group outside Europe and North America.

Five genera occur in Australia. Two of these, *Pristomerus* and *Temelucha*, are very large and contain numerous commonly collected species. One genus, *Gahus*, is described as new. It is known only from Australia.

DIAGNOSIS

Small to medium-sized species, fore wing length 2.5-10.0 mm; clypeus separated from face by a groove, generally convex, margin simple, without a tooth or teeth; mandible from relatively short, fairly evenly bidentate to quite long and twisted 30°, or rarely very long, with upper tooth elongate and acute, the lower tooth vestigial. Notaulus generally relatively weak; sternaulus weak or absent; posterior transverse carina of mesosternum complete. Propodeum relatively long, usually with a complete or almost complete set of carinae; area superomedia when defined always longer than broad. Apex of fore tibia without a tooth; mid and hind tibial spurs inserted in separate membranous areas, which are separated from insertion of basitarsus by a sclerotized bridge; tarsal claws from basally to completely pectinate. Fore wing with areolet complete and rhombic, or more usually, absent; pterostigma broadly triangular. Hind wing with first abscissa of *Rs* from slightly shorter than *r-m*, to very short, less than 0.3 times length of *r-m*; distal abscissa of Cu_1 usually present, often weak, rarely completely absent. First segment of gaster slender with spiracles far behind centre; remainder of gaster strongly laterally compressed; tergite 2 often with fine longitudinal striation. Ovipositor generally long, reaching beyond apex of gaster by 1.3-4.0 times length of hind tibia, or in one species very short, up-curved, not projecting beyond end of gaster;

ovipositor apex usually with a dorsal subapical notch, usually slightly decurved or even sinuous.

The presence of three separate insertion areas at the tibial apex is an autapomorphy of the Cremastinae. However, this character is difficult to observe and in some small species confusion may occur with Campopleginae. Campoplegines often have tergite 2 granulate and matt and their faces are usually black. Cremastines generally have tergite 2 polished and often longitudinally striate; their faces are often pale. Campoplegines usually have a narrow pterostigma, have *Rs* longer than *r-m* and have a straight or up-curved ovipositor.

CLASSIFICATION

In earlier works (e.g. Schmiedeknecht, 1908; Morley, 1915*a*) the Cremastinae was treated as one of several tribes in the subfamily Ophioninae. Currently, largely due to the efforts of Townes (e.g. 1971*b*), the status of this group as a distinct subfamily has gained wide acceptance. However, cremastines are really quite closely related to the subfamilies Ophioninae, Campopleginae and Tersilochinae. The four are alike in adult morphology, in having similar first instar larvae and in the head capsule of the final instar larva which usually has an incomplete epistomal arch, short simple mandibles which do not meet and has a well-developed labial sclerite (Short, 1978). Within this group, the Cremastinae appear to be most closely related to the Tersilochinae. The Cremastinae plus Tersilochinae probably constitute a holophyletic group characterized by the short vein *Rs* in the hind wing, the broadly triangular pterostigma, the lack of a tooth on the apex of the fore tibia and the tendency to develop a sinuous ovipositor apex.

In the Cremastinae, as in most other groups of Ichneumonidae, parallelism is very common and in Australia there is a particularly striking example of this phenomenon. Several species of *Temelucha*, *Trathala* and *Pristomerus* have developed similarly elongate heads, twisted mandibles and long mouthparts. This suite of characters is probably an adaptation to feeding in a certain type of flower and has clearly evolved separately in several sympatric species which look superficially quite similar and may possibly by mistaken for a single species-complex.

DISTRIBUTION

The Cremastinae is most diverse in the New World. In the Neotropical region there are eight endemic genera in addition to three cosmopolitan ones. Three further genera are endemic to the southern Nearctic region. There are four endemic genera in Africa and only two (both of which are monobasic) in South East Asia. Only three cosmopolitan genera, *Pristomerus*, *Trathala* and *Temelucha*, have been recorded from south-east of the Macassar Strait. All of these are well represented in Australia. Two further genera occur in Australia. One of these, *Dimophora*, is otherwise only known from a few species in Europe and North America. It is structurally primitive and possibly has a relict distribution. The fifth genus, *Gahus*, is morphologically very aberrant and its phylogenetic affinities are unknown. It is endemic to Australia.

BIOLOGY

Cremastines parasitize a wide range of mainly microlepidopterous larvae mining in fruit, flower heads, living in tunnels and leaf rolls etc. Several species also attack coleopterous larvae in similar habitats. A number of species attack commercially important agricultural pests and, as a result, a few detailed accounts of the biology of individual species are available (e.g. Bradley & Burgess, 1934; Rosenberg, 1934). The following notes, taken from the former paper, exemplify a typical cremastine life history. The eggs are small, elongate ovoids or kidney-shaped with both ends rounded. They are deposited free in the haemocoel of fairly young host larvae. The ovipositor is inserted once, generally into the thorax, and the caterpillar is not paralysed, even temporarily. The egg takes about three and a half days to hatch. The resultant first instar larva has a heavily sclerotized head with small curved mandibles, a 13-segmented body and a long caudal appendage. Under normal conditions the duration of the first larval instar is about five days. During this time it actively feeds and grows but the host larva shows no apparent ill-effects. The second larval instar lasts a single day. This has a rounder head and a much shorter caudal process; the mandibles are less acute and more nearly triangular in shape. The third instar larva is more than twice the size of the second and has spiracles visible on the first thoracic and the first to eighth abdominal segments. The caudal appendage is virtually lost. The cephalic capsule has a well-developed hypostomal spur, an incomplete epistomal arch and simple, rather sharply pointed but small mandibles. About 24 hours after the parasite enters the third instar, the host larva becomes quiescent and spins a loose web attaching itself to the substrate. It gradually darkens and dies. Then, about 48 hours after moulting, the parasite larva emerges and immediately begins to spin a cocoon, cementing it to any nearby surface. The parasite remains as a prepupa for about 72 hours then pupates. Seven days later the adult emerges. Cremastines usually pass the winter as a first instar larva in a suitable over-wintering host.

There is quite strong evidence to indicate that cremastines are not very host specific. For example, Rosenberg (1934) noted that *Pristomerus vulnerator*, a European parasite of *Cydia pomonella*, had been recorded from 16 other species belonging to the families Tortricidae, Oecophoridae, Pyralidae, Gelechiidae, Tineidae, Lasiocampidae and Sesiidae. However, all species have in common the fact that they feed on hedgerow and garden trees, particularly arborescent Rosaceae.

KEY TO GENERA OF CREMASTINAE OCCURRING IN AUSTRALIA

1 Tergite 2 of gaster with distinct thyridia (Fig. 547); hind femur sometimes with a tooth or series of teeth ventrally (Fig. 453)..... ....*PRISTOMERUS* (p. 302)

\- Tergite 2 of gaster without thyridia (Fig. 573); hind femur never with a ventral tooth or teeth..2

2 Fore wing with areolet complete, rhombic (Fig. 460)........*DIMOPHORA* (p. 299)

\- Fore wing with 3*r-m* absent, areolet not discernible (Fig. 459).............3

3 First segment of gaster in ventral view with tergite 1 bowed centrally to enclose or partly enclose the sternite (Fig. 457) or sometimes with the margin between the two indistinct.........*TEMELUCHA* (p. 303)

\- First segment of gaster in ventral view with margins of tergite 1 strongly defined, parallel, not bowed to partially enclose sternite (Fig. 458)...4

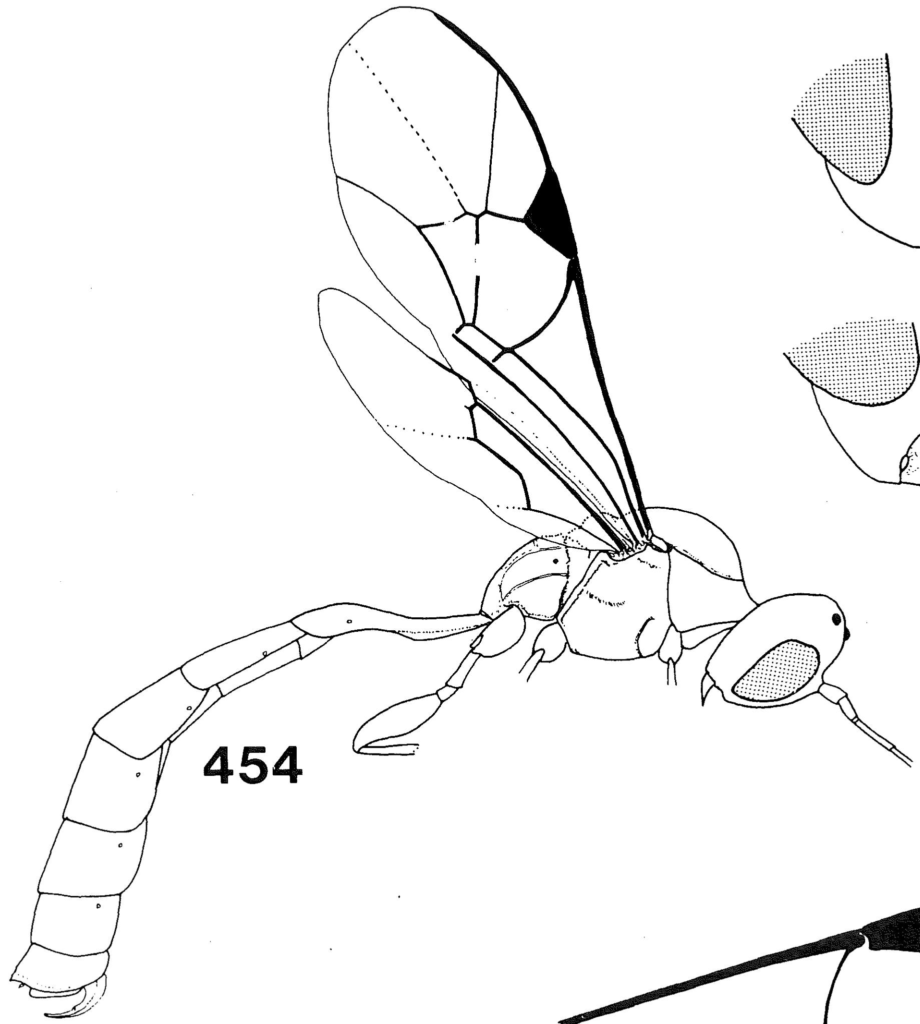
4 Mandible very long and slender, apparently unidentate (Fig. 456); ovipositor short, not projecting beyond apex of gaster (Fig. 454)...*GAHUS* (p. 301)

\- Mandible rather short, almost equally bidentate (Fig. 455); ovipositor projecting beyond apex of gaster by at least 2.0 times length of hind tibia....................................*TRATHALA* (p. 303)

DIMOPHORA Foerster*

Dimophora Foerster, 1869: 155. Type-species: *Dimophora robusta* Brischke, by subsequent monotypy, Brischke, 1894: 55.
Dimophorus Thomson, 1889*a*: 1356. [Unjustified emendation.]
Oligotmema Cushman, 1920*b*: 280. Type-species: *Oligotmema prima* Cushman, by original designation.

Small to medium-sized species, fore wing length 3-7 mm; body rather stout; occipital carina complete. Hind femur simple, without a ventral tooth. Fore wing with a



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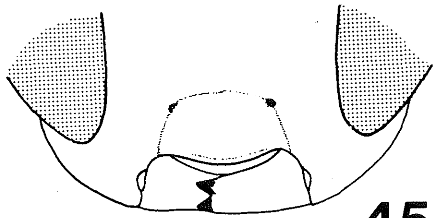

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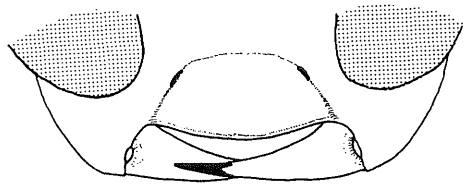

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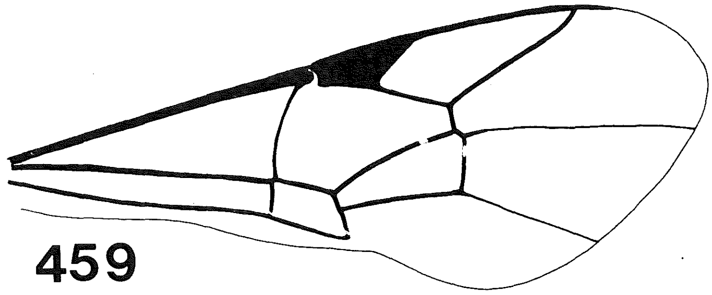

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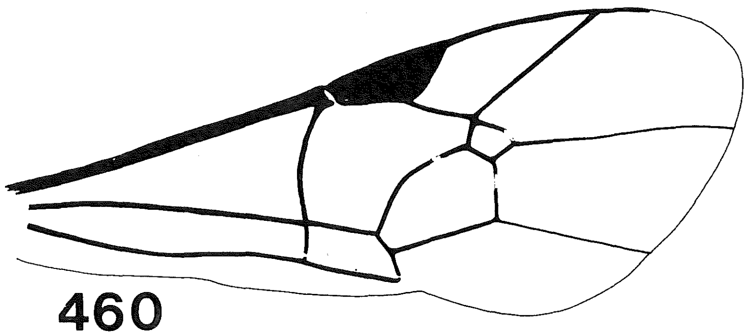

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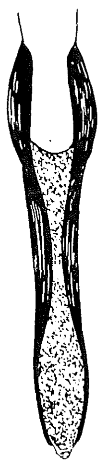

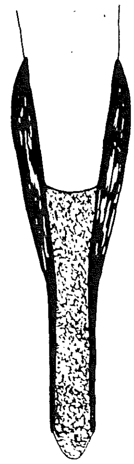

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Figs 454-460 Cremastinae. 454 *Gahus siccus*, lateral. 455-456 Mandibles (455) *Temelucha* (456) *Gahus siccus*. 457-458 Segment 1 of gasters, ventral (457) *Temelucha* (458) *Trathala*. 459-460 Fore wings (459) *Temelucha* (460) *Dimophora*.

petiolate rhombic areolet present, 3*r-m* present, strongly pigmented (Fig. 460). First tergite stout, its ventral edges distant, parallel; tergite 2 quite broad, without thyridia. Apex of ♂ paramere rounded; ovipositor projecting beyond apex of gaster by 1.4-1.8 times length of hind tibia, its apex simple, straight or downcurved.

Remarks. *Dimophora* is a small genus. The only described species occur in Europe and North America and its existence in Australia is rather puzzling. Structurally *Dimophora* may be considered one of the most primitive cremastines with its stout gaster, simple decurved ovipositor and complete venation. Its present distribution may therefore be a relict of a wider ancestral cremastine distribution.

Australian species. Nine undescribed species from all areas, especially the south-east (ANIC; BMNH; TC).

Host records. None.

GAHUS gen. n.

(Body, lateral Fig. 454)

Type-species: *Gahus siccus* sp. n.

Small species, fore wing length 2.5 mm; head large, face slightly convex, bearing several long stout hairs, with a strong groove separating clypeus centrally but not laterally; clypeus convex, its margin impressed, sharp; mandible very long and slender, apparently unidentate (though they are difficult to see), the apex of one reaching almost to base of other when closed (Fig. 456); malar space less than basal mandibular width. Frons smooth; ocelli small, forming an almost equilateral triangle; occipital carina complete, dorsally convex; genal carina joining hypostomal carina above base of mandible.

Alitrunk highly polished, scutellum convex, without lateral carina; propodeum long, evenly rounded, with anterior transverse and lateral longitudinal carinae complete; lateromedian carinae absent, posterior transverse carina vestigial.

Mid and hind tibiae with spurs very unequal; hind femur simple; tarsal claws very small, apparently pectinate.

Fore wing with *cu-a* opposite base of *Rs&M*; 3*r-m* absent; 2*r-m* about equal to length of *M* between 2*r-m* and 2*m-cu*; pterostigma large, broadly triangular; marginal cell very short; distal abscissa of *M* absent. Hind wing with *Rs* very short, about 0.2 times length of *r-m*; proximal abscissa of *M+Cu* absent; distal abscissae of *Rs*, *M*, Cu_1 and 1*A* all absent.

Gaster very long and slender; tergite 1 without glymma, ventrally with margins of tergite almost parallel, exposing sternite; tergite 2 without thyridia; tergites 2+ strongly laterally compressed. Ovipositor short, up-curved, not as long as apical depth of gaster; apex of ovipositor without an apparent notch.

Etymology. Named in honour of its collector, G. A. Holloway. Masculine.

Remarks. This remarkable taxon is quite unlike any described cremastine genus. The long, sharply unidentate mandible, vestigial propodeal carination, short up-curved ovipositor and characteristic appearance make it easily recognizable. No other Australian cremastines have a short ovipositor but this feature is found in the Neotropical genus, *Creagrura*, and the Afrotropical genus, *Belesica*. In both these genera the ovipositor is decurved and the mandibles are shorter and almost evenly bidentate. The relationship of *Gahus* is not known, but it is possible that it is a specialized off-shoot of the *Cremastus/Trathala*-group which it resembles in the structure of the first and second gastral tergites.

Australian species. One, described overleaf.

Gahus siccus sp. n.

Female: head highly polished, with inconspicuous punctures; antenna slender, pedicel almost as long as scape; flagellum with 15 segments. Alitrunk polished, pro- and mesothorax smooth with isolated punctures; mesoscutum with conspicuous pale pubescence; propodeum finely striate transversely. Gaster very slender, highly polished with sparse long hairs arranged in groups on upper and lower margin of tergites.

Head, alitrunk and tergite 1 of gaster black; antenna proximally yellow, distally infuscate; legs brown; gaster except tergite 1 reddish brown. Wings hyaline; pterostigma brown, proximally colourless.

Male unknown.

The characteristically slender gaster with the 'tufts' of hairs suggest that this species may probe for hosts in cracks in wood. The European orthocentrine *Neurateles papyraceus* Ratzeburg probes with a similarly modified gaster in cracks for mycetophilid larvae.

Material examined
Holotype ♀, New South Wales: Dorrigo National Park, 30°20'S, 152°45'E, i.1970 *(Holloway)* (AM).

Host records. None.

PRISTOMERUS Curtis
(Whole insect, Fig. 453)

Pristomerus Curtis, 1836: 624. Type-species: *Ichneumon vulnerator* Panzer, by original designation.
Pristomeridia Ashmead, 1900*a*: 100. Type-species: *Porizon agilis* Cresson (= *Pristomerus austrinus* Townes), by original designation.
Pristocelus Szépligeti, 1905: 48. Type-species: *Pristocelus atriceps* Szépligeti, by monotypy.
Neopristomerus Viereck, 1912*c*: 592. Type-species: *Pristomerus appalachianus* Viereck (= *Ichneumon spinator* Fabricius), by original designation.
Nesanomalon Morley, 1913*a*: 56. Type-species: *Nesanomalon dimidiatum* Morley, by monotypy.

Small to medium-sized species, fore wing length 3-10 mm; body fairly slender; occipital carina usually complete and evenly arched mediodorsally. Hind femur usually with a ventral tooth or teeth, or in some species simple. Fore wing with 3*r-m* absent. First tergite stout to slender, its ventral edges distant, parallel; tergite 2 slender, with thyridia near anterior margin (Fig. 574). Apex of ♂ paramere rounded; ovipositor projecting beyond apex of gaster by 1.6-2.5 times length of hind tibia, its apex usually sinuate.

Remarks. *Pristomerus* is a very large genus with most species occurring in tropical latitudes. Many species are quite colourful insects with enlarged hind femora which bear a single large tooth or row of teeth on the ventral surface. However, there is a large species-group in Australia which has a simple hind femur. They are relatively small, often blackish species and I have seen specimens in collections determined as *Cremastus* sp. The presence of thyridia immediately distinguishes *Pristomerus* from *Cremastus*. I have seen no species of the latter genus from Australia.

Australian species. *Pristomerus atrifemur* Girault (E); *P. bicinctus* Girault (E); *P. giraulti* Townes, Townes & Gupta (E). I have seen 47 undescribed species (ANIC; BMNH; TC).

Host records. *P. atrifemur* - Gelechiidae: *Pectinophora* sp. (Girault, 1925). *P. giraulti* - Noctuidae: *Heliothis* sp. (DPIQ); *Spodoptera* sp. (DPIQ). *Pristomerus* sp. 4 - Nolidae: *Uraba lugens* Walker (BMNH). *Pristomerus* spp. - Coleophoridae: *Coleophora alcyonipennella* Kollar (BMNH); Psychidae: *Lomera caespitosae* (Oke) (Chadwick & Nikitin, 1976); Pyralidae: *Homoeosoma vagella* Zeller (Ironside, 1970); Tortricidae: *Bathrotoma constrictana* Meyrick (Chadwick & Nikitin, 1976).

TEMELUCHA Foerster

Temelucha Foerster, 1869: 148. Type-species: *Porizon macer* Cresson (= *Porizon facilis* Cresson), by subsequent designation, Perkins, 1962: 457.
Paracremastus Szépligeti, 1900: 28. Type-species: *Paracremastus genalis* Szépligeti, by monotypy.
Tarytia Cameron, 1907*d*: 587. Type-species: *Tarytia basimacula* Cameron, by subsequent designation, Viereck, 1914: 143.
Androna Cameron, 1911*b*: 185. Type-species: *Androna fuscicornis* Cameron, by subsequent designation, Viereck, 1914: 11.
Cremastidea Viereck, 1912*c*: 587. Type-species: *Cremastidea chinensis* Viereck (= *Ophionellus biguttulus* Matsumura), by original designation.
Neocremastus Meyer, 1930*b*: 67. Type-species: *Neocremastus asiaticus* Meyer, by monotypy. [Homonym of *Neocremastus* Cushman, 1917.]

Small to medium-sized species, fore wing length 3-9 mm; body slender; occipital carina mediodorsally interrupted, the free ends often down-turned. Hind femur simple, without a ventral tooth. Fore wing with *3r-m* absent (Fig. 459). First tergite moderately to very slender, its ventral edges bowed medially to meet or almost meet in midline, thus enclosing the sternite partially (Fig. 457); tergite 2 slender, without thyridia (Fig. 573). Apex of ♂ paramere rounded to subtruncate; ovipositor projecting beyond apex of gaster by 1.9-4.0 times length of hind tibia, its apex usually decurved.

Remarks. *Temelucha* is a very large genus of almost world-wide distribution but most species seem to occur in the seasonally dry parts of the tropics and subtropics. Townes (1971*b*) states that the usual habitat of *Temelucha* species is amongst herbage, grasses and bushes. This certainly seems true for some Australian species as a number of *Temelucha* attack agriculturally important pests in arable crops (Gauld, 1980*a*).

In Australia there are large numbers of species of *Temelucha*. They are widely distributed throughout the continent but the greatest diversity appears to be in the south-west.

Australian species. *Temelucha australiensis* (Szépligeti) (E); *T. cycnea* Kerrich (E); *T. minuta* (Morley) (A); *T. nivalis* Kerrich. I have seen 51 undescribed species (ANIC; BMNH; TC).

Host records. *T. australiensis* - Psychidae: *Oiketicus* sp. (Gauld, 1980*a*). *T. cycnea* - Pyralidae: *Etiella behrii* (Zeller) (BMNH); *Loxostege* sp. (BMNH). *T. minuta* - Cosmopterigidae: *Macrobatha* sp. (TDF); Gelechiidae: *Phthorimaea operculella* (Zeller) (BMNH); Pyralidae: *Etiella behrii* (Zeller) (BMNH). *T. nivalis* - Psychidae: *Plutorectis* sp. (Gauld, 1980*a*). *Temelucha* sp. 3 - Gelechiidae: *Phthorimaea operculella* (Zeller) (Gauld, 1980*a*). *Temelucha* sp. 4 - Tortricidae: *Merophyas divulsana* (Walker) (Gauld, 1980*a*). *Temelucha* sp. 6 - 'rice stem borer' (Gauld, 1980*a*).

TRATHALA Cameron

Trathala Cameron, 1899: 122. Type-species: *Trathala striata* Cameron, by monotypy.
Epicremastus Szépligeti, 1905: 51. Type-species: *Epicremastus concolor* Szépligeti, by monotypy.
Paurolexis Cameron, 1907*d*: 587. Type-species: *Paurolexis flavus* Cameron, by monotypy.

Haristaeus Cameron, 1910: 442. Type-species: *Haristaeus nigrifrons* Cameron, by monotypy.

Medium-sized insects, fore wing length 6-8 mm; body slender; occipital carina usually complete, sometimes mediodorsally obsolescent, but then never with free ends down-turned. Hind femur simple, without a ventral tooth. Fore wing with *3r-m* absent. First tergite quite slender, its ventral edges parallel, not enclosing the sternite (Fig. 458); tergite 2 slender, without thyridia. Apex of ♂ paramere rounded; ovipositor projecting beyond apex of gaster by 2.0-2.5 times length of hind tibia, its apex decurved or sinuous.

Remarks. *Trathala* is a very large genus with most species occurring in the seasonally dry tropics. One species, *T. flavoorbitalis* (Cameron), is a native of South East Asia and has been introduced onto various Pacific Islands to control pest Microlepidoptera (Swezey, 1915; Vandenberg, 1933; Hoyt, 1957). It is recorded from the 'Australian region' (Cushman, 1933) but I have not seen any specimens from Australia.

Australian species. I have seen 13 ?undescribed species (ANIC; BMNH; TC).

Host records. None from Australia.

SUBFAMILY TERSILOCHINAE

The Tersilochinae is a medium-sized subfamily with, world-wide, about 15 genera. Taxonomically it is a poorly studied group and outside western Europe, where tersilochines have been monographed by Horstmann (1971; 1981), virtually no species have been described. Even in North America there are less species described than are known from the British Isles, despite the fact that several tersilochines are important natural enemies of coleopterous pests.

Tersilochines are small inconspicuous ichneumonids. Many are common in the spring in temperate areas whilst in the tropics they are usually found in the cooler damp climates at higher altitudes. Most are parasites of curculionid and chrysomelid larvae though other coleopterous families and even other endopterygote orders may also serve as hosts.

Only a single native Australian species has been described though three species of a New World genus have been introduced for biological control purposes. In the present work nine genera are recorded as Australian, three of which, *Petilochus*, *Horstmannolochus* and *Areyonga*, are described as new.

DIAGNOSIS

Small to medium-sized insects, fore wing length 2-9 mm; clypeus weakly convex, usually distinctly separated from face by a groove, often very broad indeed and lenticular, with margin arcuate or bluntly pointed medially; mandible long, generally slender and bidentate, rarely with lower tooth vestigial; genal sulcus absent; occipital carina present or absent. Antenna generally short, often with less than 20 flagellar segments, the segments usually slightly moniliform. Alitrunk rather short and deep; notaulus weak or vestigial, sometimes with a crest anteriorly; sternaulus absent but mesopleuron usually with a foveate groove which may appear somewhat like a sternaulus; posterior transverse carina of the mesosternum incomplete or absent; propodeum usually with a large and inverted U-shaped area superomedia + area petiolaris defined by a carina and with other areae posteroexterna distinct, other areae usually undefined except rarely area basalis which, if present, is always slender. Legs fairly slender, tibial spurs usually short, sometimes curved; tarsal claws usually simple. Fore wing very characteristic, with single, usually short intercubital vein (?*2r-m*); pterostigma large and triangular, marginal cell deep. Hind wing with first abscissa of *Rs* shorter than *r-m*; distal abscissa of Cu_1 absent; proximal 0.6 of $M+Cu_1$ obsolescent. Gaster with first segment slender, with spiracles far behind centre, with tergite and sternite fused; glymma present or absent, if present then in the form of a small pit close to, but before, spiracle; remainder of gaster laterally compressed, usually smooth and polished; ovipositor slightly to strongly up-curved or with sinuous apex, with a dorsal subapical notch and a few teeth on lower valve; ovipositor from short, not projecting beyond apex of gaster to very long, 3.0 times length of hind tibia.

Tersilochines are one of the easiest ichneumonid taxa to recognize on account of their characteristic venation and slender petiole. In collections examined some small cremastines have consistently been confused with tersilochines. Both have rather similar venation and gasters but tersilochines have a much broader clypeus and longer mandibles than most cremastines. Cremastines also generally have a long shallow elliptical glymma quite unlike the pit-like glymma of tersilochines. Tersilochines do not have the tibial bridge characteristic of cremastines.

CLASSIFICATION

The subfamily has been recognized as a discrete group for over a century. Classical authors (e.g. Schmiedeknecht, 1908; Morley, 1915*a*) treated it as a tribe of Ophioninae under the name Porizonini. Townes (1945) used the name Tersilochini for the group as the identity of *Porizon*, and hence the application of the family-group name, is in doubt (Fitton & Gauld, 1976). Townes still retained the tribe within the Ophioninae, but subsequently (Townes, 1969) he elevated the taxon to subfamily status.

Classification below the subfamily level is difficult and some of the tersilochine genera (e.g. *Barycnemis* and *Probles*) tend to intergrade. Horstmann (1971; 1981) has produced a satisfactory classification of European species in which he recognizes a number of subgenera within *Heterocola*, *Diaparsis*, *Probles* and *Tersilochus*. In the present work it has not been found possible to place the Australian species of *Diaparsis* and *Probles* in any of Horstmann's subgenera so only the generic category is used.

DISTRIBUTION

Two of the nine genera occurring in Australia are introduced, *Stethantyx* deliberately from South America and *Sathropterus* presumably inadvertently from Europe. Of the remaining seven genera, three, *Areyonga*, *Petilochus* and *Horstmannolochus*, are only known from Australia. The remaining four genera, *Probles*, *Diaparsis*, *Allophrys* and *Phradis*, are all quite large and widely distributed throughout the world. At present almost nothing is known of tropical tersilochines so it is impossible to assess further the relationship of the Australian fauna.

BIOLOGY

The majority of tersilochines are endophagous parasites of coleopterous larvae although those of other endopterygote insects serve as hosts of a few species. For example, one Nearctic tersilochine has been reared from an eriocraniid and an *Allophroides* species parasitizes xyelids (Carlson, 1979). Amongst the Coleoptera species of Curculionidae and Chrysomelidae are the most frequent hosts but tersilochines have been recorded from a variety of cucujoid families including Melandryidae, Nitidulae, Cisidae and Endomychidae (Horstmann, 1971; 1981). Most tersilochines are arrhenotokous but a few are probably thelytokous (Kerrich, 1961). The tersilochine egg is usually deposited in the haemocoel though one species of *Diaparsis* probably attaches the egg to an internal organ (Montgomery & DeWitt, 1975), whilst species of the *Stethantyx parkeri*-group place the egg between the dermis and hypodermis (Parker *et al.*, 1950). Some species have a protrusion on the egg, rather like that found in anomalonines, but this is not always developed, even within a single species (Montgomery & DeWitt, 1975). Superparasitism is not uncommon, but invariably only one larva survives to complete development (Cushman, 1916; Dysart *et al.*, 1973). Supernumerary larvae have been observed being enclosed by amoebocytes, but apparently this is not due to any protective adaptation on the part of the host, but is somehow caused by the dominant tersilochine larva (Cushman, 1916). After oviposition the egg hatches rapidly. The minute caudiform larva may emerge and be free in the haemocoel or may remain partially in the egg membrane, in which case the posterior end is only rudimentary. In such cases, as development progresses the larva becomes more differentiated until about 18 days after oviposition it is a fully formed caudiform larva, free of the egg membrane (Parker *et al.*, 1950). The first instar larva has sickle-shaped mandibles, a well-developed head capsule and some species, at least, have abdominal pseudopods. The first instar larva feeds and continues to grow, usually until the host larva enters the ground and constructs a pupal cell, generally several weeks after oviposition. Thereafter, the development of the parasite is very rapid, for within about 10 days it passes through the second to fifth instar. The fifth and final instar larva emerges from the now dead host and spins a cocoon. Within a few days it has pupated and quite soon after the fully formed adult emerges from the pupa but usually remains within the cocoon until the following year. In the north temperate region most tersilochines are univoltine though some may be partially bivoltine (Horstmann, 1971).

The cephalic capsules of final instar larvae of tersilochines are weakly sclerotized with an incomplete epistomal arch, long hypostoma, distinct hypostomal spur and ventrally incomplete labial sclerite. The most distinctive feature of the subfamily is the conical mandible with a small papillate tooth on the apex (Short, 1978).

As tersilochines are parasites of curculionids and chrysomelids many are of economic interest. *Diaparsis temporalis* Horstmann was introduced into the U.S.A. from Europe to help control the cereal leaf beetle (*Oulema melanopus* L.) (Carlson, 1979) whilst the native Nearctic species, *Tersilochus conotracheli* (Riley), has long been recognized as an important parasite of the plum curculio (*Conotrachelus nenuphar* Herbst) (Cushman, 1916). Several *Stethantyx* species from the southern Neotropical region have been introduced into Australia and the U.S.A. (Wilson & Wearne, 1962; Clancy, 1969) to control vegetable weevils (*Listoderes* spp.).

KEY TO GENERA OF TERSILOCHINAE OCCURRING IN AUSTRALIA

1 Tergite 1 of gaster with spiracles in centre, its sternite short, reaching 0.2-0.5 of length of tergite; lower tooth of mandible longer than upper; propodeal carinae obsolescent.........*PETILOCHUS* (p. 312)

\- Tergite 1 of gaster with spiracles far posterior to centre, its sternite reaching at least 0.6 of length of tergite; lower tooth of mandible equal to or shorter than the upper; propodeal carinae usually strong..2

2 Propodeum with a single median longitudinal carina on anterior 0.3 or more (Fig. 461), or if very rarely this carina is vestigial then with a very narrow rugulose strip which extends about 0.4 times length of propodeum..3

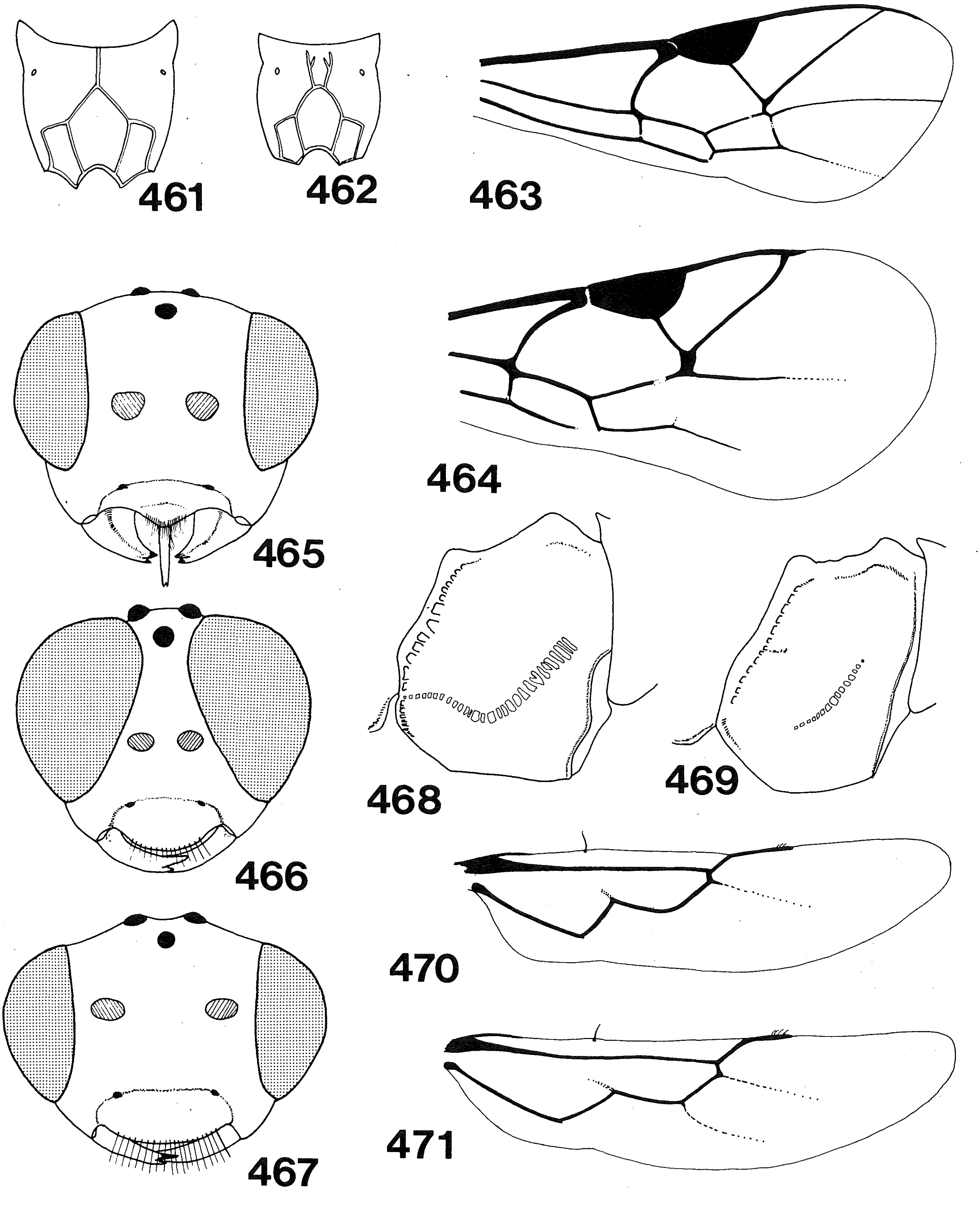
\- Propodeum with either a pair of lateromedian longitudinal carinae anteriorly, or with a broad groove or if with a fairly wide median rugulose strip this is less than 0.3 times length of propodeum (Fig. 462)..4

3 Fore wing with first subdiscal cell closed at apex; vein *2m-cu* present (Fig. 463); propodeal spiracle separated from metapleural carina by more than its own diameter..........................*DIAPARSIS* (p. 310)

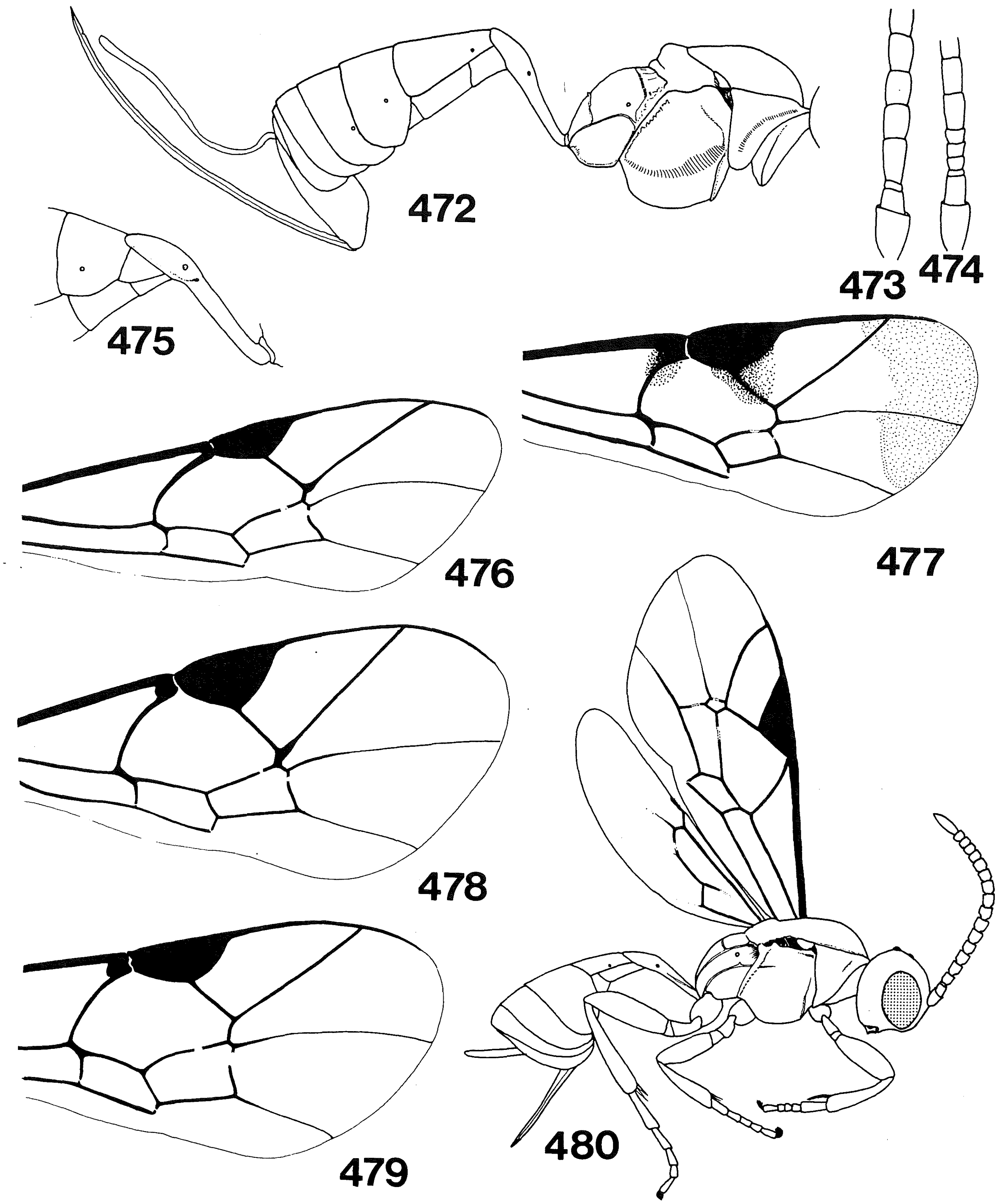
\- Fore wing with first subdiscal cell open at apex; vein *2m-cu* absent (Fig. 464); propodeal spiracle close to metapleural carina......... ....*SATHROPTERUS* (p. 314)

4 Glymma present, clearly discernible in front of spiracle (Fig. 475).........5

\- Glymma absent (Fig. 472)..7



Figs 461-471 Tersilochinae. 461-462 Propodea, dorsal (461) *Diaparsis* (462) *Phradis*. 463-464 Fore wings (463) *Diaparsis* (464) *Sathropterus*. 465-467 Heads, anterior (465) *Horstmannolochus* ♀ (466) *Allophrys* ♂ (467) *Phradis* ♂. 468-469 Mesopleura, lateral (468) *Probles* (469) *Stethantyx*. 470-471 Hind wings (470) *Phradis* (471) *Allophrys*.



Figs 472-480 Tersilochinae and Phrudinae. 472 *Horstmannolochus pulchripennis* ♀, lateral. 473-474 Base of antennae (473) *Probles* (474) *Areyonga eremica*. 475 Tergite 1 of gaster, *Areyonga eremica*. 476-479 Fore wings (476) *Probles* (477) *Horstmannolochus* (478) *Allophrys* (479) *Stethantyx* (480) *Phrudus* ♀, lateral.

5 Occipital carina entirely absent; flagellar segments 1-3 short and quadrate, shorter and narrower than following segments (Fig. 474).. ....*AREYONGA* (p. 310)
- Occipital carina complete; flagellar segments 1-3 elongate, longer than, and as broad as the following segments (Fig. 473)..................6

6 Ovipositor projecting beyond apex of gaster by 2.0-3.0 times length of hind tibia, cylindrical or slightly depressed; genae and vertex polished, smooth or punctate; epicnemial carina curved abruptly forward to anterior margin of pleuron (Fig. 468); fore wing with *Rs* thick at base adjacent to *2r-m*, then abruptly tapered distally (Fig. 476)..*PROBLES* (p. 314)
- Ovipositor not projecting beyond apex of gaster, compressed; genae and vertex submatt, granulate; epicnemial carina gradually converging towards margin of pleuron, not reaching it and evanescent above (Fig. 469); fore wing with *Rs* slender, not thickened at base adjacent to *2r-m* (Fig. 479)...............................*STETHANTYX* (p. 315)

7 Clypeus triangular, margin centrally produced to form a blunt prominence (Fig. 465); fore wing with *2r-m* distal to *2m-cu* by about its own length (Fig. 477); flagellum with 19-33 segments.............. ....*HORSTMANNOLOCHUS* (p. 311)
- Clypeus broadly oval, margin evenly arcuate (Fig. 467); fore wing with *2r-m* from slightly distal to *2m-cu* to proximal to *2m-cu* (Fig. 478); flagellum with 16 or fewer segments................................8

8 Hind wing with Cu_1&*cu-a* very oblique (Fig. 471), posterodistal angle of sub-basal cell 120° or more; ♂ with eyes strongly convergent dorsally, almost touching ocelli (Fig. 466)..................*ALLOPHRYS* (p. 309)
- Hind wing with Cu_1&*cu-a* vertical to moderately oblique (Fig. 470); posterodistal angle of sub-basal cell 115° or less; ♂ with eyes parallel dorsally, remote from ocelli (Fig. 467)............*PHRADIS* (p. 313)

ALLOPHRYS Foerster*

Allophrys Foerster, 1869: 147. Type-species: *Thersilochus oculatus* Ashmead, by subsequent designation, Viereck, 1914: 8.

Small species, fore wing length 2-3 mm; clypeus lenticular, margin arcuate, slightly reflexed; mandible not twisted, long, slender, with upper tooth about 1.8 times the lower. Occipital carina complete or mediodorsally interrupted. Eyes of ♂ dorsally strongly convergent (Fig. 466), almost touching ocelli. Flagellum with 13-14 segments.

Mesoscutum polished, finely alutaceous. Propodeum with a pair of lateromedian longitudinal carinae defining narrow area basalis; area superomedia + petiolaris confluent; area posteroexterna complete; propodeal spiracle separated from metapleural carina by more than its diameter.

Fore wing with *2r-m* slightly proximal to *2m-cu*; *2m-cu* distinct; *Rs* proximally broadened; first subdiscal cell complete (Fig. 478). Hind wing with Cu_1&*cu-a* very oblique so posterodistal angle of sub-basal cell is 120° or more (Fig. 471).

Petiole without a glymma. Ovipositor short, curved, projecting beyond apex of gaster by 1.0-1.2 times length of hind tibia.

Remarks. A small genus that is structurally very similar to *Phradis*. Whilst the males are easily distinguished by the eyes, females are rather difficult to recognize.

Most species of *Allophrys* occur in the Neotropical region though there are a few scattered species known from the Old World tropics (Townes, 1971*b*). In Australia it is most common in Queensland.

Australian species. Two, undescribed (AM; ANIC).

Host records. None.

AREYONGA gen. n.

Type-species: *Areyonga eremica* sp. n.

Small species, fore wing length 3 mm; clypeus lenticular, margin arcuate, slightly truncate medially; mandible long, quite strongly narrowed, twisted about 40° with lower tooth vestigial, the upper tooth long. Occipital carina absent. Flagellum with 24 segments, unusual in having the very short, almost quadrate and apparently without placoid sensilla (Fig. 474).

Mesoscutum very highly polished, with few scattered punctures. Propodeum with short broad rugulose groove extending mediodorsally to transverse carina; area superomedia + petiolaris defined, area posteroexterna absent; propodeal spiracle separated from metapleural carina by slightly more than its own diameter.

Fore wing with *2r-m* proximal to *2m-cu* distinct; *Rs* proximally incrassate; first subdiscal cell closed at apex. Hind wing with Cu_1&*cu-a* subvertical.

Petiole with glymma present before spiracle (Fig. 475). Ovipositor evenly curved, extending beyond apex of gaster by 3.0 times length of hind tibia.

Etymology. Named after the type-locality. Feminine.

Remarks. *Areyonga* is a very distinctive genus on account of the absence of occipital carina, reduced lower mandibular tooth and short 'annellar-like' basal flagellar segments. It appears to be related to *Probles*.

Australian species. One species, described below.

Areyonga eremica sp. n.

Female: lower face transverse, polished, rather flat with a pair of weak median vertical ridges; frons smooth with scattered punctures; malar space 0.8 times as long as basal mandibular width; head very broad in dorsal aspect, lenticular, smooth and polished. Epicnemial carina curved to anterior margin of pleuron just above lower corner of pronotum; mesopleuron polished with larger sparse punctures and with a subvertical median foveate groove that does not reach hind margin. Hind tibia with a large lobe on distal exterior margin, the lobe bearing a fringe of fine hairs; tibial spurs short, straight. Tarsal claws long, simple. Thyridia small, oval. Apex of ovipositor with two weak dorsal nodi before and behind subapical notch.

Brownish orange species; flagellum, face, orbits and legs paler yellowish; ovipositor sheath black. Pterostigma brown.

Male unknown.

Material examined
Holotype ♀, Northern Territory: Areyonga, 600 m, 30.x. (TC).

Host records. None.

DIAPARSIS Foerster*

Ischnobatis Foerster, 1869: 148. Type-species: *Thersilochus (Ischnobatis) stramineipes* Brischke, by subsequent monotypy, Brischke, 1880: 194.
Diaparsis Foerster, 1869: 149. Type-species: *Porizon nutritor* (F.) sensu Gravenhorst (= *Porizon truncatus* Gravenhorst), by subsequent designation, Perkins, 1962: 417.
Diaparsus Thomson, 1889*a*: 1369. [Unjustified emendation.]
Luchatema Walkley, 1956*a*: 154. Type-species: *Luchatema baldufi* Walkley, by original designation.

Small species, fore wing length 2-5 mm; clypeus lenticular, its margin arcuate; mandible not twisted, long and evenly tapered with upper tooth a little longer than the lower; ♂ with eyes dorsally parallel, remote from ocelli. Occipital carina complete. Flagellum with 12-20 segments.

Mesoscutum very weakly polished, granulate or very finely punctate with overlaid microreticulation. Propodeum with median longitudinal carina anteriorly that reaches its combined area superomedia and petiolaris, rarely the anterior carina obsolescent; area posteroexterna enclosed (Fig. 461); propodeal spiracle from close to, to widely separated from metapleural carina.

Fore wing with *2r-m* from opposite to proximal to *2m-cu*; *2m-cu* present; *Rs* proximally incrassate; first subdiscal cell closed at apex (Fig. 463). Hind wing with Cu_1*&cu-a* vertical to moderately oblique.

Petiole with glymma absent or in one species present but weak. Ovipositor curved, projecting beyond apex of gaster by 1.0-2.5 times length of hind tibia.

Remarks. *Diaparsis* is a large Holarctic, Oriental, Afrotropical and Australasian genus with the majority of species occurring in the Old World tropics. Townes (1971*b*) remarks that it is especially well represented in Africa and I have seen many species from Melanesia and New Zealand. In Australia species are widely distributed from north Queensland to Tasmania and Western Australia.

Australian species. Nine, undescribed (ANIC; BMNH; TC).

Host records. None from Australia but in Europe and North America species have been reared from chrysomelid and curculionid larvae (Horstmann, 1971; Dysart *et al.*, 1973: Montgomery & DeWitt, 1975).

HORSTMANNOLOCHUS gen. n.

Type-species: *Thersilochus pulchripennis* Szépligeti

Small to medium-sized species, fore wing length 3-8 mm; clypeus moderately narrow, triangular, with a blunt prominence medially (Fig. 465); labium unusual in being quite long; mandible twisted 30°, rather short, strongly tapered, with upper tooth slightly the longer; ♂ with eyes dorsally parallel, remote from ocelli. Occipital carina complete. Flagellum with 19-33 segments.

Mesoscutum polished with fine punctures. Propodeum with a broad median longitudinal rugose furrow joining transverse carina; area superomedia + petiolaris defined, area posteroexterna not completely delineated; propodeal spiracle close to metapleural carina.

Fore wing with *2r-m* far distal to *2m-cu*; *2m-cu* complete; *Rs* proximally broadened; first subdiscal cell closed apically (Fig. 477). Hind wing with Cu_1*&cu-a* more or less vertical.

Petiole without a glymma. Ovipositor long, curved, projecting beyond apex of gaster by 2.5 times length of hind tibia (Fig. 472).

Etymology. Named in honour of Dr Klaus Horstmann who has done much to resolve the confusion surrounding tersilochine classification. Masculine.

Remarks. *Horstmannolochus* belongs to the *Probles*-group of genera but is distinct on account of the form of the clypeus, the elongate labium, lack of glymma and position of *2r-m*.

Australian species. *Horstmannolochus pulchripennis* (Szépligeti) and one undescribed species (ANIC). The type-species is redescribed below.

Horstmannolochus pulchripennis (Szépligeti) comb. n.

Female: fore wing length 7-8 mm; lower face transverse, polished, punctate, with central vertical swelling; frons slightly concave above antennal sockets, in dorsal aspect with genae broad. Epicnemial carina curved to margin of pleuron just above lower corner of pronotum; mesopleuron polished, punctate with foveate groove extending from near epicnemial carina sinuously to hind corner. Hind tibia with spurs moderately short. Tarsal claws simple. Thyridia small, well separated from anterior of tergite. Apex of ovipositor simply acute, with a weak dorsal notch.

Black; clypeus apically yellowish, legs and hind part of gaster blackish with rufescent highlights. Pterostigma blackish; marginal cell proximally and distal apex of fore wing infumate.

Male unknown.

H. pulchripennis differs from the undescribed species in having infumate fore wings, a broader malar space and longer antennae.

Material examined
Holotype ♀, New South Wales: Sydney, 1900 (*Biró*) (TM).

Non-type material. South Australia: 1 ♀, 30 km W. Bordertown, x.1958 (*Riek*) (ANIC). Victoria: 1 ♀, no further locality, 1912 (*French*) (BMNH).

Host records. None.

PETILOCHUS gen. n

Type-species: *Petilochus naumanni* sp. n.

Small species, fore wing length 2 mm; clypeus lenticular, margin arcuate; mandible long and slender, not twisted, with upper tooth distinctly the shorter. Occipital carina complete, with a slight mediodorsal dip. Flagellum with 12 segments.

Mesoscutum highly polished, centrally smooth, anteriorly with scattered punctures. Propodeum virtually smooth, with only the weakest vestiges of carinae discernible; propodeal spiracle separated from metapleural carina by less than its own diameter.

Fore wing with *2r-m* very short, almost occluded, proximal to *2m-cu*; *2m-cu* distinct; *Rs* proximally barely broadened; first subdiscal cell closed at apex. Hind wing with Cu_1*&cu-a* moderately oblique.

Tergite 1 exceptional in being moderately broad, with spiracle close to centre and with a small glymma at extreme anterior end; sternite 1 of ♀ very short, reaching 0.2-0.3 times length of its tergite; of ♂ longer, reaching to centre. Ovipositor short, not as long as apical depth of gaster, moderately up-curved.

Etymology. *Peti* (from petiole, referring to the unusual first tergite) + *lochus* (from *Tersilochus*). Masculine.

Remarks. *Petilochus* is only known to include a single, Western Australian species. It is a remarkable genus, easily distinguished from other tersilochines on account of the first segment of the gaster. The short, separate sternite, the central spiracles and the glymmae close to the anterior end are all features of more primitive ichneumonids (e.g. pimplines and tryphonines). Traditionally tersilochines have been considered one of the ophionine subfamilies (Schmiedeknecht, 1908; Townes, 1969), characterized by the slender petiole and strongly postcentral spiracles. In all other features, such as the specialized venation and head, *Petilochus* is a typical tersilochine, so two hypotheses suggest themselves, either the structure of tergite 1 is a plesiomorphous feature, and therefore the Tersilochinae have evolved the petiolate gaster separately from the other ophionine subfamilies, or the unspecialized tergite is a reversal to the plesiomorphous condition. At present it is not known which is the more probable, but the slightly modified male suggests the latter hypothesis.

Australian species. One, described below.

Petilochus naumanni sp. n.

Female: lower face transverse, polished with fine punctures; frons slightly convex, sculptured like face; surface of clypeus with conspicuous short hairs; malar space about 0.4 times basal mandibular width. Alitrunk with sparse long pale pubescence, rather smooth and highly polished; epicnemial carina inclined towards anterior margin of pleuron; mesopleuron without any foveolate grooves, impunctate. Legs unspecialized, tibial spurs short, not strongly curved. Tarsal claws of moderate length, apparently simple. Fore wing with *cu-a* opposite base of *Rs&M*. Gaster moderately stout, polished; tergite 2 with a conspicuous glymma close to anterior margin; tergites 2-5 bearing a transverse row of erect fine hairs. Ovipositor elongately tapered to a sharp point, evenly up-curved.

Blackish species; clypeus yellowish, legs dark brown, the femora distally and the tibiae proximally yellowish brown. Wings hyaline, pterostigma blackish.

Male: similar to female but with legs paler yellowish. Sternite 1 reaching nearly to centre of tergite.

This species is named in honour of Dr Ian Naumann, as a gesture of thanks for his help in this project.

Material examined

Holotype ♀, Western Australia; 4 km W. of Yellowdine (31°18's, 119°37'E), x.1981 (*Naumann & Cardale*) (ANIC)

Paratypes. Western Australia: 1 ♂, same data as holotype (ANIC); 1 ♀, 12 km E. of Carrabin (31°23'S, 118°48'E), xi.1981 (*Naumann & Cardale*) (ANIC); 3 ♀, 4 ♂, 2 km N.N.W. Crossman (32°45'S, 116°34'E) (*Naumann & Cardale*) (ANIC; BMNH); 2 ♀, 1 ♂, 19 km S.S.W. Grass Patch (33°23'S, 121°40'E) (*Naumann & Cardale*) (ANIC); 1 ♀, 1 ♂, 45 km S.W. of Mt Ragged (33°42'S, 123°07'E) (*Naumann & Cardale*) (ANIC).

Host records. None.

PHRADIS Foerster*

Phradis Foerster, 1869: 148. Type-species: *Thersilochus (Phradis) brevis* Brischke, by subsequent monotypy, Brischke, 1880: 195.

Eutomus Foerster, 1869: 148. Type-species: *Isurgus lanceolatus* Szépligeti (= *Thersilochus morionellus* Holmgren), by subsequent designation, Viereck, 1914: 58. [Homonym of *Eutomus* Hope, 1838.]

Isurgus Foerster, 1869: 148. Type-species: *Isurgus lanceolatus* Szépligeti (= *Thersilochus morionellus* Holmgren), by subsequent designation, Viereck, 1914: 78.

Small species, fore wing length 2-4 mm; clypeus lenticular, margin evenly arcuate; mandible long and slender, not twisted, with upper tooth about 2.0 times length of lower. Occipital carina complete. Eyes of ♂ dorsally parallel, remote from ocelli (Fig. 467). Flagellum with 12-16 segments.

Mesoscutum finely granulate, often punctate. Propodeum usually with a pair of lateromedian carinae delimiting a narrow area basalis; area superomedia + petiolaris confluent; area posteroexterna defined (Fig. 462); propodeal spiracle from close to metapleural carina to separated from it by 2.0 times its own diameter.

Fore wing with *2r-m* subopposite or slightly proximal to *2m-cu*; *2m-cu* distinct; *Rs* proximally incrassate; first subdiscal cell complete. Hind wing with Cu_1&*cu-a* vertical to oblique, posterodistal corner of sub-basal cell 115° or less (Fig. 470).

Petiole without glymma. Ovipositor short, up-curved, projecting beyond apex of gaster by 0.6-1.2 times length of hind tibia.

Remarks. A moderately large, mainly Holarctic genus recognized in Australia by the short ovipositor and flagellum and lack of glymma.

Australian species. Five, undescribed (ANIC; BMNH; TC).

Host records. None in Australia but in Europe species of this genus are common parasites of *Meligethes* spp. (Nitidulidae) (Horstmann, 1971).

PROBLES Foerster*

Probles Foerster, 1869: 147. Type-species: *Probles melanarius* Szépligeti (= *Porizon erythrostomus* Gravenhorst), by subsequent monotypy, Szépligeti, 1899: 219.

Small to medium-sized species, fore wing length 3-9 mm; clypeus lenticular, its margin arcuate, sometimes a little thickened medially; mandible long, evenly tapered with upper tooth 1.3-1.8 times as long as the lower; ♂ with eyes dorsally parallel, remote from ocelli. Occipital carina complete. Flagellum with 18-30 segments.

Mesoscutum finely granulate, in larger species with coarse punctures (Fig. 468). Propodeum with groove flanked by weak carinae extending forward in midline from transverse carina; area superomedia + petiolaris distinctly delineated, area posteroexterna usually distinct; propodeal spiracle contiguous with or close to metapleural carina.

Fore wing with *2r-m* proximal to *2m-cu*; *2m-cu* present; *Rs* proximally incrassate (Fig. 476); first subdiscal cell closed at apex. Hind wing with Cu_1*&cu-a* vertical to moderately oblique.

Petiole with glymma present, deep. Ovipositor curved, projecting beyond apex of gaster by 2.0-3.0 times length of hind tibia, usually slightly depressed, rarely cylindrical.

Remarks. *Probles* is a large genus of world-wide distribution. It is very closely related to and somewhat arbitrarily separated from *Barycnemis*, a large Holarctic genus. In Australia species are widely distributed.

Australian species. Three, undescribed (AM; BMNH; NMV).

Host records. None in Australia but in Europe *Probles* species have been reared from the cucujoid families Endomychidae, Cisidae and Melandryidae (Horstmann, 1971).

SATHROPTERUS Foerster*

Sathropterus Foerster, 1869: 147. Type-species: *Thersilochus pumilus* Holmgren, by subsequent monotypy, Szépligeti, 1905: 55.

Small species, fore wing length 2-3 mm; clypeus lenticular, its margin arcuate; mandible long, evenly tapered, not twisted, with upper tooth about 2.0 times as long as the lower; ♂ with eyes dorsally parallel, remote from ocelli. Occipital carina complete. Flagellum of ♀ with 18-19 segments, of ♂ with about 24 segments.

Mesoscutum polished, obsoletely granulate. Propodeum with median longitudinal carina anteriorly, posteriorly with a delineated area superomedia + petiolaris and laterally with area posteroexterna distinct; propodeal spiracle contiguous with metapleural spiracle.

Fore wing with *2r-m* distinct, *2m-cu* absent; *Rs* proximally incrassate; first subdiscal cell open at apex, Cu_{1b} absent (Fig. 464). Hind wing with Cu_1*&cu-a* very oblique, posterodistal corner of sub-basal cell about 135°.

Petiole with small glymma in front of spiracle. Ovipositor projecting beyond apex of gaster by about 2.7-3.3 times length of hind tibia, its apex sinuate.

Remarks. A single species of this genus is known. *Sathropterus* is quite closely related to the medium-sized, widespread *Aneuclis* from which it differs in lacking *2m-cu* and possessing a sinuate ovipositor tip.

Horstmann (pers. comm.) states that *S. pumilus* seems to have been transported around the world by man; he has seen examples from Europe, South Africa, North and South America. In Australia it is known from around Brisbane.

Australian species. *Sathropterus pumilus* (Holmgren) (C)*.

Host records. None.

STETHANTYX Townes*

Stethantyx Townes, 1971*b*: 42. Type-species: *Stethantyx nearctica* Townes, by original designation.

Small to medium-sized species, fore wing length 5-7 mm; clypeus lenticular, margin arcuate; mandible long, evenly tapered, not twisted, with upper tooth slightly the longer. Eyes of ♂ dorsally parallel, remote from ocelli. Flagellum with 27-31 segments.

Mesoscutum weakly polished, granulate (Fig. 469). Propodeum with a pair of lateromedian carinae anteriorly or with the carinae obsolescent; area superomidia + petiolaris confluent, defined; area posteroexterna defined; propodeal spiracle (of *parkeri*-group) remote from metapleural carina.
Fore wing with *2r-m* proximal to *2m-cu*; *2m-cu* distinct; *Rs* proximally not incrassate (Fig. 474); first subdiscal cell complete. Hind wing with Cu_1&*cu-a* more or less vertical.

Petiole with glymma before spiracle. Ovipositor (of *parkeri*-group) short, as long as apical depth of gaster, not projecting, slightly up-curved, compressed.

Remarks. *Stethantyx* is a large Neotropical genus with a few species in the southern Nearctic region. I have included in *Stethantyx* the three Neotropical species (*argentinensis*, *parkeri* and sp. 1) that were formerly placed in *Tersilochus* and introduced into Australia (Kerrich, 1961; Wilson & Wearne, 1962). These differ from other species in the genus in having a shorter ovipositor and the propodeal spiracle remote from the metapleural carina, but there are similarities which suggest this placement is perhaps justifiable. The form of the epicnemial carina, i.e. having the upper end gradually convergent with the pleural margin, and the slender base of *Rs* in the fore wing are unusual features of *Stethantyx* and are found in the *parkeri*-group. Carlson (1979) treated the *parkeri*-group as 'unplaced taxa of Tersilochinae'. The final generic placement of the *parkeri*-group is unlikely to be resolved until the Neotropical species are studied in detail. At present only about 1 per cent of the Neotropical tersilochines are even described and, as no one is currently studying the group in this region, the generic limits are unlikely to be resolved in the near future. Therefore, rather than leave the *parkeri*-group as *Tersilochus*, which they clearly are not, or treat them as monomials I have placed them in the most suitable described genus.

The three species were introduced into eastern Australia in the late 1950s in an attempt to control the weevil *Listroderes obliquus* which attacks many cultivated vegetables (Wilson & Wearne, 1961). A key to these species is provided by Kerrich (1961).

Australian species. *Stethantyx argentinensis* (Blanchard) comb. n. (I); *S. parkeri* (Blanchard) comb. n. (I); *Stethantyx* sp. 1 (I).

Host records. All species have been reared from *Listroderes obliquus* Klug (Curculionidae) (Parker *et al.*, 1950; Wilson & Wearne, 1961). Costa Lima (1962) records the two described species from a number of other species of *Listroderes* in Brazil.

SUBFAMILY PHRUDINAE*

The Phrudinae is one of the smaller subfamilies of Ichneumonidae with, world-wide, 10 genera. Only one, *Phrudus*, is known to occur in Australia. The Phrudinae is a rather heterogeneous assemblage of genera and may not be a monophyletic group. There is insufficient evidence at present either to warrant dividing the group or to justify assigning some of the genera to other subfamilies.

Phrudines are relatively uncommon insects in collections. This may be because they are, on account of their small size, easily overlooked, but evidence is accumulating (e.g. frequency of occurrence in malaise trap collections) that phrudines really are rare insects. The following diagnosis does not take account of extralimital Afrotropical genera.

DIAGNOSIS

Very small insects, fore wing length about 2-3 mm; clypeus transverse, weakly to strongly separated from face, marginally evenly rounded; mandible slender, bidentate, with upper tooth slightly the longer; frons simple or with carina; occipital carina complete; genal carina joining hypostomal carina above base of mandible. Flagellum usually short, with 14-20 segments. Notauli vestigial; sternaulus usually absent; posterior transverse carina of mesosternum incomplete; propodeum often carinate, sometimes with area superomedia more or less complete. Fore tibia usually without a distinct tooth on apical margin; tarsal claws pectinate or simple. Fore wing with a small rhombic or pentagonal areolet, or with *3r-m* absent; pterostigma broadly triangular; marginal cell short and deep. Hind wing with first abscissa of *Rs* shorter than *r-m*; distal abscissa of Cu_1 usually absent; proximal end of *M+Cu* usually obsolescent. First segment of gaster stout to fairly slender, with spiracles slightly before, at or behind centre. Gaster of female slightly compressed, of male slightly depressed; ovipositor from about as long as apical depth of gaster to as long as hind tibia, without a dorsal subapical notch and with lower valve apparently devoid of teeth.

In Australia phrudines are most likely to be confused with small Phygadeuontinae. Very few Phygadeuontinae lack the distal abscissa of Cu_1 in the hind wing and none has the claws completely pectinate. Most Phygadeuontinae have a strong sternaulus. This feature is found only in one phrudine genus and this has strongly pectinate claws.

DISTRIBUTION

Three closely inter-related phrudine genera (which may not be related to the other genera) are restricted to tropical Africa and Madagascar. The other genera are Holarctic except for *Brachyscleroma* which is only known from a single Javan species.

I have not collected *Phrudus* in Australia, but in Europe phrudines are most usually collected by sweeping low herbage in wooded areas.

BIOLOGY

As far as is known (and there are very few records) phrudines are protelean endoparasites of beetle larvae. In Europe a species of *Earobia* has been reared from *Laricobius* sp. (Derondontidae). Franz (1958) observed that the female parasite attacked the third or fourth instar beetle larva, inducing temporary paralysis. The egg, laid in the host's fat-body, rapidly hatched, but the ichneumonid larva remained small whilst the host continued to be active. When the beetle larva descended to the forest floor litter and became inactive, the ichneumonid larva grew rapidly, finally devouring the entire host except for its cuticle. The phrudine larva then broke out of the host skin and spun a whitish cocoon studded with soil particles. The adult emerged the following year.

The Phrudinae is the only subfamily whose larval morphology has not been studied by Short (1978).

PHRUDUS Foerster*
(Whole insect, Fig. 480)

Phrudus Foerster, 1869: 148. Type-species: *Phrudus monilicornis* Bridgman, by subsequent monotypy, Dalla Torre, 1901: 329.

Phrudus Bridgman, 1886: 361. Type-species: *Phrudus monilicornis* Bridgman, by monotypy. [Homonym of *Phrudus* Foerster, 1869.]

Ktenostilpnus Strobl, 1901: 256. Type-species: *Ktenostilpnus aequearticulatus* Strobl (= *Phrudus monilicornis* Bridgman), by monotypy.

Vendolius Roman, 1914: 35. Type-species: *Vendolius stilpninus* Roman (= *Phrudus monilicornis* Bridgman), by monotypy.

Clypeus more than 2.4 times as broad as long, separated from face by a weak groove; frons simple; flagellum with 12-18 segments, moniliform (Fig. 480). Sternaulus absent. Fore tibia without an apicomarginal tooth; tarsal claws pectinate to apices, the pectinae long and flattened. Fore wing with areolet pentagonal or with *3r-m* lacking (Fig. 480). Hind wing with distal abscissa of Cu_1 absent; proximal end of *M+Cu* absent. First segment of gaster slender, spiracles behind centre and with sternite 1 reaching behind the level of spiracles; ovipositor as long as apical depth of gaster.

Remarks. *Phrudus*, in the sense that I have used it here, is a more restricted genus than that adopted by Townes (1971*b*). I consider *Astrenis* to be a separate genus from *Phrudus*; the two differ in many features including the form of the claws and the shape of the clypeus. Townes (pers. comm.) agrees with this interpretation. *Phrudus* may be distinguished from all other ichneumonid genera on account of the tarsal claw pectination (Fig. 49).

Australian species. One species, undescribed, collected on Mt Nebo, Queensland (ANIC). It is close to the European *P. monilicornis*, but has only 12 flagellar segments compared with about 17-18 segments in the European species. The Australian species also has a rather compressed head.

Host records. None.

SUBFAMILY MESOCHORINAE

This is a moderately large subfamily containing, world-wide, 10 genera. They contain mostly small species and one genus, *Mesochorus*, is very large with numerous undescribed species in the Old World tropics. As far as is known most mesochorines are hyperparasites; their usual hosts are endoparasitic Braconidae (especially Microgasterinae) and less frequently Ichneumonidae and Tachinidae. A moderate number of species occur in Australia. These were being revised by Dr J. Short immediately prior to his death. Unfortunately his work had not reached a stage sufficiently advanced to permit posthumous publication.

DIAGNOSIS

Usually small, rarely medium-sized to moderately large species, fore wing length 3-12 mm. Clypeus not separated from face by a groove, usually moderately large, with margin evenly arcuate; mandible bidentate; frons usually simple, rarely carinate; occipital carina complete. Male flagellum simple, without tyloids. Notaulus vestigial or weak; sternaulus absent or vestigial; posterior transverse carina of mesosternum incomplete. Propodeum evenly rounded, usually fairly completely carinate, almost always with at least area dentipara distinctly delineated. Apex of fore tibia without a tooth on outer side; tarsal claws simple to completely pectinate. Fore wing with *3r-m* usually present (present in all known Australian species) enclosing a large rhombic, or rarely oblique quadrate areolet; *2r-m* usually almost equal to *3r-m*. Hind wing with *Rs* from much longer to slightly shorter than *r-m*; distal abscissa of Cu_1 present or absent. First tergite of gaster fairly slender, slightly broadened posteriorly, spiracle near or behind centre; glymma large and deep; gaster of females slightly compressed, rarely cylindrical and elongate. Female subgenital plate large, triangular in profile; ovipositor sheath quite broad, rigid, enclosing a very thin ovipositor which has neither a dorsal subapical notch nor obvious teeth on lower valve. Male genitalia unusual in having gonosquama extended into a long narrow rod.

The Mesochorinae is, with practice, one of the easiest subfamilies to recognize although they may confuse inexperienced workers. Most species have a characteristic large rhombic areolet. The ovipositor is always very slender and the female subgenital plate large. Males are very distinctive on account of the rod-like prolongation of the gonosquama (Fig. 29). The head of mesochorines is distinctive but difficult to describe; no other ichneumonid has one quite the same. It is almost lenticular in profile with the clypeus not separated by a groove. *Cidaphus* species are far larger than other mesochorines and may be mistaken for nocturnal ctenopelmatines. *Cidaphus* has strong glymmae, densely pectinate tarsal claws and no tyloids on flagellar segment one. No nocturnal ctenopelmatine has this combination of characters.

CLASSIFICATION

The Mesochorinae was included by classical authors as a tribe within the Ophioninae. Although its status has altered the limits remain virtually unchanged since it was first defined (Foerster, 1869), except it has been expanded to include a number of recently described Neotropical genera (Townes, 1971*b*; Dasch, 1974). Ten genera are currently recognized. One, *Cidaphus*, is clearly closer to the ancestral stem than any other, both in larval and adult structure. The adults possess plesiomorphic features such as epicnemial carina not reaching pleural margin, oblique areolet, either two bullae or one central bulla in *2m-cu*, numerous distal hamuli, complete Cu_1 in the hind wing and unspecialized face whilst the final instar larvae have an almost complete set of cephalic sclerites and the mandible firmly united with its blade (Short, 1976). The remaining Old World genera can be ranked as a nesting series showing increasing specialization from *Astiphromma* (rhombic areolet, single bulla in *2m-cu* close to areolet; few distal hamuli; larva with mandible blade membranous at base) to *Mesochorus* (transverse facial carina below antennae; loss of distal abscissa of Cu_1 in hind wing; larva with hypostomal spur reduced) to *Stictopisthus* (epicnemial carina reaching anterior margin of pleuron; larva with blade of mandible curved and central portion of labial sclerite membranous) to *Plectochorus* (specialized propodeal neck and elongate gaster).

DISTRIBUTION

Five of the 10 mesochorine genera, *Lepidura*, *Latilumbus*, *Oncocotta*, *Piestetron* and *Rhaibaspis* are restricted to the Neotropical region and one, *Plectochorus*, is mainly Oriental but extends into the Palaearctic and Australian regions. *Cidaphus* has a somewhat fragmented relict distribution with one or two species in most regions but absent over much of South East Asia. The remaining three genera, *Astiphromma*, *Mesochorus* and *Stictopisthus*, are cosmopolitan.

It is not possible at present to assess the relationship of the Australian fauna to other areas as very little is known of the Oriental mesochorines. Undoubtedly *Plectochorus*, which is restricted to north Queensland, represents a spread into Australia from the Indo-Papuan area.

BIOLOGY

Townes (1971*b*) states 'there is evidence, not yet refuted, that some species of this subfamily [Mesochorinae] are primary parasites'. However, as more information is accumulated it seems that the majority of mesochorines are obligate secondary endoparasites. Their known hosts are endophagous larvae of Braconidae, Ichneumonidae and Tachinidae. Amongst the braconids species of Microgasterinae, Rogadinae, Macrocentrinae and Euphorinae are the most usual hosts and amongst ichneumonids campoplegines are commonly attacked. The primary host is often lepidopterous but may also be coleopterous or symphytan. One *Mesochorus* species even attacks euphorine larvae within a myrid (Box, 1943).

The female mesochorine probes with its fine ovipositor within the haemocoel of the primary host and searches for the primary parasite larvae. If one is located she oviposits into it and the mesochorine larva develops internally (Blunck, 1944). Many mesochorines attack gregarious endoparasites and frequently a number of individual larvae within a single host will be parasitized. It is not an uncommon event to rear a mixed series of *Apanteles* and *Mesochorus* from many lepidopterous larvae.

There is only one reliable record of mesochorines being primary parasites and that is for a species of *Plectochorus* (Haeussler, 1940).

Many mesochorines, including all *Cidaphus*, are crepuscular or nocturnal and often quite large numbers may be collected at light.

KEY TO GENERA OF MESOCHORINAE OCCURRING IN AUSTRALIA

1 Hind wing with distal abscissa of Cu_1 present (Fig. 488); malar space without a deep groove; space between antennal socket and orbit without a carina....................2

\- Hind wing with distal abscissa of Cu_1 absent (Fig. 487); malar space with a deep groove reaching from orbit to base of mandible; space between antennal sockets and orbit with a short oblique carina (Figs 483, 484)....................3

2 Fore wing with areolet obliquely quandrangular, 2*r-m* less than 0.5 times length of 3*r-m* (Fig. 486); ocelli very large, the hind ones virtually touching orbit..........*CIDAPHUS* (p. 321)

\- Fore wing with areolet almost regularly rhombic, 2*r-m* nearly equal in length to 3*r-m* (Fig. 485); ocelli not enlarged, the hind ones separated from orbit by more than 0.5 times their own diameter.......... *ASTIPHROMMA* (p. 319)

3 Upper end of the epicnemial carina separated from margin of pleuron by a distance about equal to diameter of flagellum; transverse carina beneath antennal sockets depped in midline (Fig. 483); fore wing with *cu-a* subopposite base of *Rs&M*..........*MESOCHORUS* (p. 322)

\- Upper end of epicnemial carina virtually reaching anterior margin of pleuron; transverse carina beneath antennal sockets horizontal, not dipped in midline (Fig. 484); fore wing with *cu-a* distal to base of *Rs&M* by at least 0.3 times its own length....................4

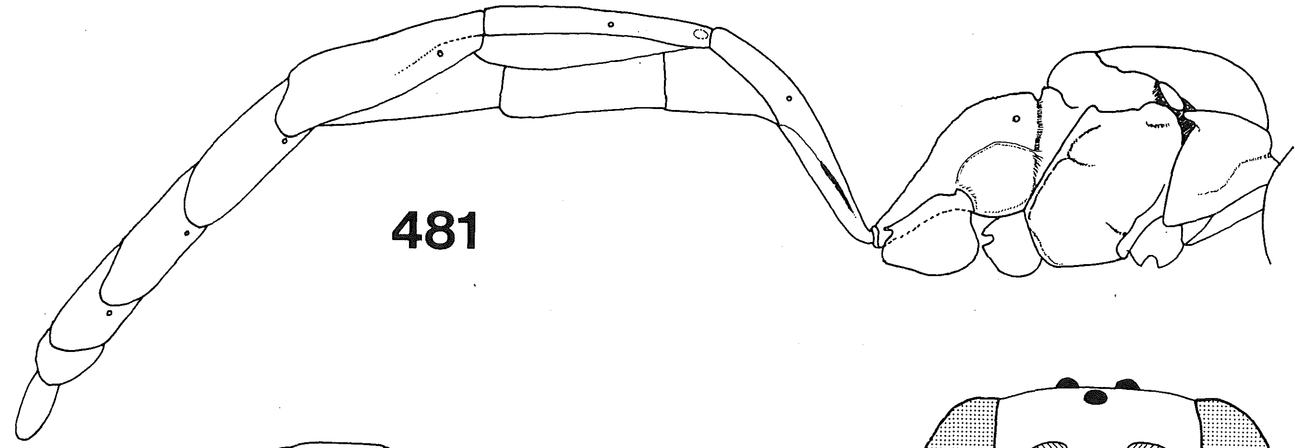
4 Apex of propodeum of ♀ produced into a neck that reaches almost to level of apex of hind coxa; ovipositor sheath about 3.0 times as long as broad; gaster very long and slender (Fig. 481).*PLECTOCHORUS* (p. 322)

\- Apex of propodeum of ♀ not produced into a neck, not reaching beyond centre of hind coxa; ovipositor sheath more than 4.0 times as long as broad; gaster not exceptionally slender (Fig. 482).*STICTOPISTHUS* (p. 323)

ASTIPHROMMA Foerster*

Astiphromma Foerster, 1869: 170. Type-species: *Mesochorus scutellatus* Gravenhorst, by subsequent designation, Morley, 1913*b*: 156.
Astiphrommus Thomson, 1886: 327. [Unjustified emendation.]
Dolichochorus Strobl, 1904: 108. Type-species: *Mesochorus (Dolichochorus) longiceps* Strobl, by monotypy.
Mesochorella Szépligeti, 1911: 48. Type-species: *Mesochorus nigriceps* Brischke, by monotypy.
Pseudoacoenitus Kiss, 1924: 96. Type-species: *Pseudacoenitus transylvannicus* Kiss, by monotypy.
Demophorellus Hedwig, 1955: 379. Type-species: *Demophorellus mimulus* Hedwig, by monotypy.

Medium-sized species, fore wing length about 6 mm; face without a transverse or oblique carina below or lateral to antennal socket; malar space without a vertical groove; ocelli not enlarged, the posterior ones separated from orbits by about their own diameter or more. Upper end of epicnemial carina distant from anterior margin of mesopleuron; propodeum not produced posteriorly into a neck. Fore wing with areolet large and fairly regularly rhombic (Fig. 485), 2*r-m* subequal to 3*r-m*;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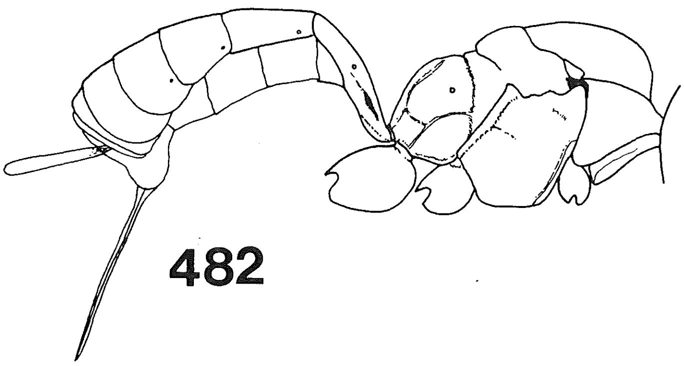
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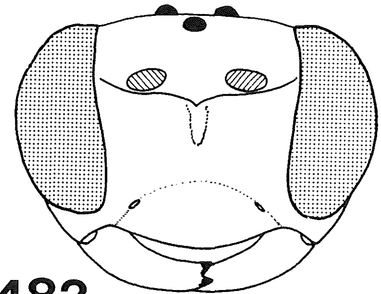
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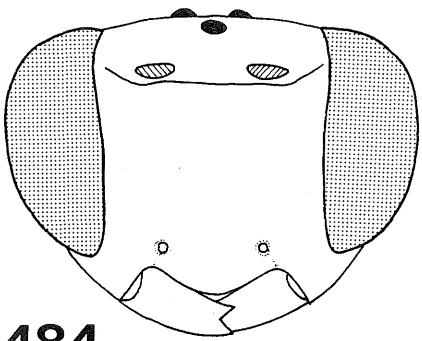
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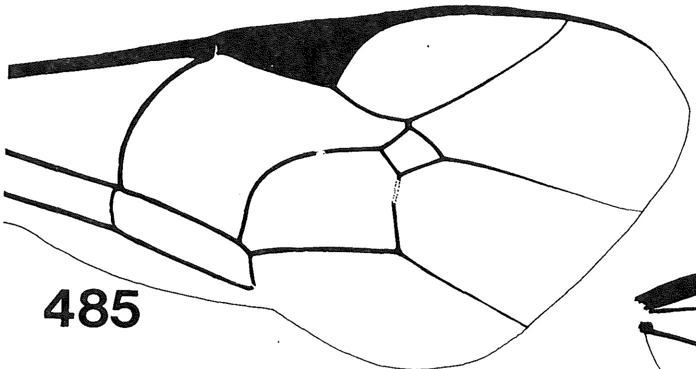
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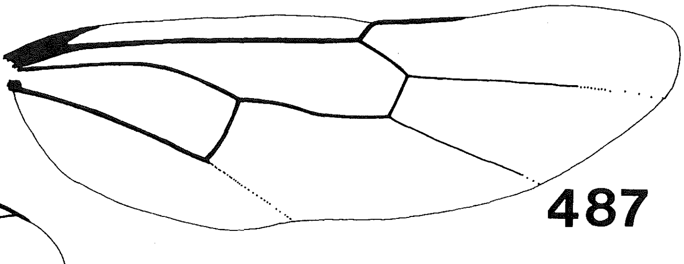
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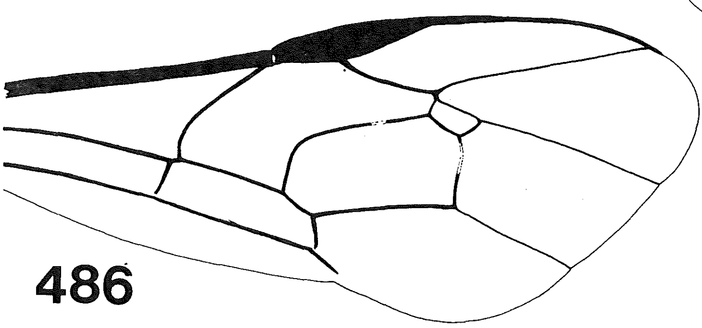
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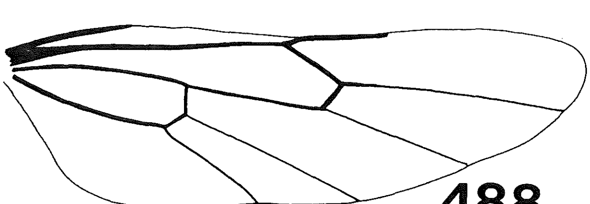
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Figs 481-488 Mesochorinae. 481-482 Alitrunk and gasters, lateral (481) *Plectochorus* (482) *Stictopisthus*. 483-484 Faces (483) *Mesochorus* (484) *Plectochorus*. 485-486 Fore wings (485) *Astiphromma* (486) *Cidaphus*. 487-488 Hind wings (487) *Mesochorus* (488) *Cidaphus*.

cu-a opposite or slightly distal to base of *Rs&M*; hind wing with distal abscissa of Cu_1 present. Gaster with tergite 1 moderately slender; gaster not exceptionally elongate; ovipositor sheath at least 5.0 times as long as broad.

Remarks. This is a moderate-sized genus, most species of which occur in the Holarctic region.

Australian species. One, undescribed (ANIC).

Host records. None for Australia but in the U.S.S.R. one species is known to attack a *Rogas* species (Braconidae) which is endoparasitic on lasiocampids (Kolomiets, 1962). Short (1978) records an *Astiphromma* reared from *Thelaira* (Tachinidae) parasitizing an arctiid, and another species from campoplegines parasitizing geometrids and noctuids.

CIDAPHUS Foerster

Cidaphus Foerster, 1869: 149. Type-species: *Cidaphus thuringiacus* Brauns, by subsequent designation, Viereck, 1914: 33.

Plesiophthalmus Foerster, 1869: 170. Type-species: *Mesochorus alarius* Gravenhorst, by subsequent monotypy, Brischke, 1880: 183. [Homonym of *Plesiophthalmus* Motschoulsky, 1858.]

Mater Schulz, 1911: 22. [Replacement name for *Plesiophthalmus* Foerster.]

Tetragonalys Morley, 1913*a*: 132. Type-species: *Tetragonalys barbarica* Morley, by subsequent designation, Morley, 1913*b*: 360.

Plesiophthalmidea Viereck, 1914: 119. Type-species: *Plesiophthalmus paniscoides* Ashmead, by original designation.

Ophthalmochorus Roman, 1925: 29. [Replacement name for *Plesiophthalmus* Foerster.]

Medium to moderately large-sized species, fore wing length 9-12 mm; face without a transverse or oblique carina below or lateral to antennal socket; malar space without a vertical groove; ocelli very large, the posterior ones almost contiguous with orbits. Upper end of epicnemial carina not reaching anterior margin of mesopleuron; propodeum not produced posteriorly into a neck. Fore wing with areolet obliquely quadrate (Fig. 486), *2r-m* about 0.5 or less times length of *3r-m*; *cu-a* virtually opposite base of *Rs&M*; hind wing with distal abscissa of Cu_1 present (Fig. 488). Gaster with tergite 1 slender; gaster moderately long; ovipositor sheath at least 4.0 times as long as broad.

Remarks. *Cidaphus* is a small genus represented by one or two species in most parts of the world. They are fairly large, usually orange-brown insects with a typical ophionoid facies (Gauld & Huddleston, 1976). They are very local, but where they occur they come readily to light. The described Australian species is widely distributed in Victoria, New South Wales and the Australian Capital Territory. In the collections of the Western Australia Museum is a single female specimen with slender mandibles, the upper tooth of which is markedly the longer. This may represent a second species.

Australian species. *Cidaphus glabrosus* Parrott (E) and a possible second undescribed species (WAM).

Host records. None from Australia. In Europe, Brischke (1880) reared one from a species of *Delopia*. Short (1978) recorded one European species from *Banchus* parasitizing a noctuid. In Britain I have strong circumstantial evidence suggesting that a *Cidaphus* species parasitizes a ctenopelmatine, *Opheltes*, parasitizing a cimbicid sawfly.

MESOCHORUS Gravenhorst

Mesochorus Gravenhorst, 1829*b*: 960. Type-species: *Mesochorus splendidulus* Gravenhorst, by subsequent designation, Curtis, 1833: 464.
Edrisa Cameron, 1907*f*: 111. Type-species: *Edrisa pilicornis* Cameron, by monotypy.
Zamesochorus Viereck, 1912*a*: 152. Type-species: *Zamesochorus orientalis* Viereck, by original designation.
Cryptochorus Aubert, 1965: 22. Type-species: *Cryptochorus obliterator* Aubert, by original designation.

Small species, fore wing length 3-5 mm; face with transverse carina below antennal sockets, this carina dipped in midline and laterally up-curved, extending nearly to orbit (Fig. 483); ocelli usually not enlarged, the posterior ones separated from orbits by more than 0.5 times their diameter. Upper end of epicnemial carina distant from anterior margin of mesopleuron; propodeum not produced posteriorly into a neck. Fore wing with areolet large and rhombic, *2r-m* about as long as *3r-m*; hind wing with distal abscissa of Cu_1 absent (Fig. 487). Gaster with tergite 1 moderately slender; gaster not exceptionally elongate; ovipositor sheath more than 5.0 times as long as broad.

Remarks. *Mesochorus* is a very large genus with many species in almost all parts of the world. Only the European and New World species are at all well known; the majority of species in other regions are undescribed. In many cases the species are very similar, differing slightly in colour pattern or superficial sculpture, and considerable difficulty is usually experienced in deciding whether slight differences are inter- or intraspecific variation.

Australian species. (?)*Mesochorus pinarae* Girault (The type-specimen is lost so this may be either a *Mesochorus* or *Stictopisthus*.). I have seen about 12 undescribed species (ANIC; BMNH; TC).

Host records. *M. pinarae* - secondary parasite of *Pinara* sp. (Lasiocampidae). *Mesochorus* sp. - Tachinidae: *Froggattimyia* sp. in *Paropsis* sp. (Chrysomelidae); *Paropsivora* sp. in *Paropsis* sp. (Chrysomelidae) (Short, 1978). In the north temperate region *Mesochorus* species are very common parasites of microgasterine braconids.

PLECTOCHORUS Uchida*

Plectochorus Uchida, 1933: 163. Type-species: *Mesochorus iwatensis* Uchida, by original designation.

Small species, fore wing length 3-4 mm; face with a transverse carina below antennal sockets, the carina not dipped in midline, turned upwards near ends and almost reaching orbit (Fig. 484); malar space with a vertical groove; ocelli not enlarged, the posterior ones separated from orbit by more than their own diameter. Upper end of epicnemial carina reaching to anterior margin of mesopleuron; propodeum of ♀ elongate, produced posteriorly into a neck that reaches almost to apex of hind tibia. Fore wing with areolet large and rhombic, *2r-m* about equal to *3r-m*; *cu-a* distal to base of *Rs&M* by 0.4 of its length; hind wing with distal abscissa of Cu_1 absent. Gaster with tergite 1 slender; gaster very long and slender (Fig. 481), almost cylindrical, with posterior margins of tergites 3-6 dorsally strongly concave; ovipositor sheath about 3.0 times as long as broad.

Remarks. *Plectochorus* is a moderately small Oriental genus with two species occurring in the Palaearctic region (Nakanishi, 1968). Three species are described from the Philippines (Townes, 1956) but the majority are undescribed. A single species is known to occur in northern Queensland.

The females of this genus are very distinctive on account of their elongate appearance. The males are virtually indistinguishable from *Stictopisthus*, consequently *Plectochorus* could be regarded as only a species-group of *Stictopisthus*.

This is largely a matter of personal preference, but at present no attempt has been made to alter the currently accepted generic classification (Townes, 1971*b*).

Australian species. One, undescribed (ANIC).

Host records. None in Australia. Haeussler (1940) reared *P. iwatensis*, an Asian species, from *Cydia molesta* (Busck) of which it may be a primary parasite.

STICTOPISTHUS Thomson

Stictopisthus Thomson, 1886: 327. Type-species: *Mesochorus bilineatus* Thomson, by subsequent designation, Viereck, 1914: 138.

Small species, fore wing length 3-4 mm; face with a transverse carina below antennal sockets, the carina not dipped in midline, turned upwards near ends and almost reaching orbit; malar space with a vertical groove; ocelli not enlarged, the posterior ones separated from orbit by more than their own diameter. Upper end of epicnemial carina reaching to anterior margin of mesopleuron; propodeum not produced into a neck. Fore wing with areolet large, regularly rhombic, *2r-m* about equal to *3r-m*; *cu-a* distal to base of *Rs&M* by 0.6 or more times its length; hind wing with distal abscissa of Cu_1 absent. Gaster with tergite 1 moderately slender; gaster not exceptionally elongate (Fig. 482); ovipositor sheath more than 4.0 times as long as broad.

Remarks. A moderately large, cosmopolitan genus. In practice, it is often difficult to separate the European *Mesochorus* from *Stictopisthus* but this problem does not seem to occur in other parts of the world.

Australian species. *Stictopisthus australiensis* Szépligeti (E). I have seen five undescribed species (ANIC; TC).

Host records. None from Australia but Oriental species have been reared from *Apanteles* (Braconidae) (Cushman, 1934) and *Euphorus* (Braconidae) (Ferrière, 1925).

SUBFAMILY ANOMALONINAE
(= Anomalinae sensu Townes)

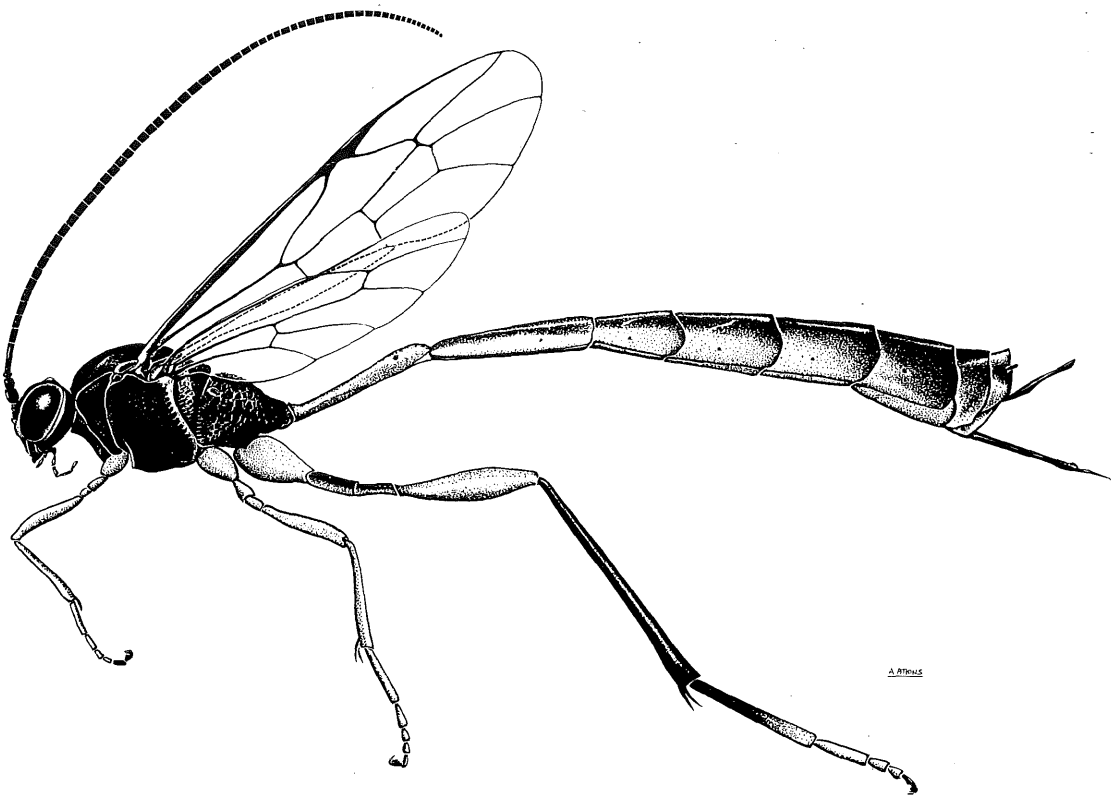


Fig. 489 *Heteropelma scaposum* ♀, lateral.

World-wide the Anomaloninae is a moderately large subfamily of Ichneumonidae comprising 35 genera. Species occur in a wide range of habitats and, unlike many ichneumonids, some anomalonines can tolerate very dry conditions. Australia has a fairly large anomalonine fauna with a high proportion of endemic species. One or two are very common insects but the majority are apparently quite rare. The Australian species were revised by Gauld (1976*b*) and since that date 10 undescribed species have been collected, including one in the genus *Barylypa*, not previously recorded from Australia.

DIAGNOSIS

Small to very large ichneumonids, fore wing length 4-25 mm. Clypeus convex, separated from face by a groove, usually with a median apical tooth or pair of teeth; mandible bidentate; posterior ocelli usually positioned very close to occipital carina; occipital carina present or sometimes centrally interrupted. Alitrunk generally quite coarsely punctate; notaulus usually weak; sternaulus absent; posterior transverse carina of mesosternum present or rarely absent; propodeum posteriorly projecting beyond insertion of hind coxae, without regular carinae, usually coarsely reticulate. Hind tarsi of male often swollen, usually brightly coloured; tarsal claws relatively small, pectinate or not. Fore wing with pterostigma long and narrow; areolet absent, only a single intercubital vein (?2*r-m*) present which may be proximal to, opposite or distal to 2*m-cu*; hind wing with first abscissa of *Rs* about equal in length to or longer than *r-m*; distal abscissa of Cu_1 present or absent. Gaster with segment 1 very long and slender, the tergite and sternite fused to form a cylinder, the spiracles positioned well behind the centre; remainder of gaster strongly laterally compressed; ovipositor short, projecting beyond apex of gaster by about apical gastral depth or rarely about as long as hind tibia;

ovipositor with a dorsal subapical notch or abruptly constricted at apex; male often with aedeagus ornamented with spines or inflatable lobes.

In Australia the Anomaloninae may be confused with some Campopleginae, especially species of *Casinaria*. Many campoplegines have an areolet in the fore wing and those that do not have a relatively smooth propodeum with at least some distinct areae. Few campoplegines have yellow faces; most anomalonines do.

CLASSIFICATION

The Anomaloninae was subdivided by Townes (1971*b*) into four tribes, Anomalonini, Gravenhorstiini, Therionini and Podogastrini. This classification has not gained general acceptance. Gauld (1976*a*) showed that the Therionini of Townes was a polyphyletic assemblage and recognized only two tribes, Anomalonini and Therionini. Carlson (1979) accepted this classification but pointed out an overlooked earlier usage of the suprageneric-group name Gravenhorstiini (Enderlein, 1912*a*) which has precedence over Therionini (Viereck, 1918). Both tribes are represented in Australia.

DISTRIBUTION

The Anomaloninae of Australia and New Guinea have recently been revised (Gauld, 1976*b*; 1978*a* and *b*) so it is possible to compare the species composition of the two areas. The table below lists the numbers of species from each area and the number they have in common.

	NEW GUINEA	SPECIES SHARED	AUSTRALIA
Anomalon	2	1	3
Trichomma	3	2	5
Heteropelma	3	-	4
Therion	1	-	-
Pseudanomalon	1	-	-
Aphanistes	8	1	1
Habronyx	-	-	14
Barylypa	-	-	1
Agrypon	8	-	3
Perisphincter	1	-	1

Of the four species in common to both areas, *Trichomma clavipes* (= *elegantulum*) and an undescribed *Trichomma* species are frequently encountered in disturbed areas and are widely distributed in north-east Australia and New Guinea. The third species, *Anomalon morleyi*, only occurs in dry areas on the coast of New Guinea but is apparently widely distributed throughout Queensland and New South Wales. The fourth species, *Aphanistes variicolor*, is fairly wide-spread in New Guinea but in Australia it is apparently restricted to north Queensland. The most striking feature of the Australian anomalonine fauna is the large number of *Habronyx* species. These seem to be associated with open, relatively dry areas or southern temperate habitats. Several species are restricted to the extreme south or west of Australia.

The genera *Aphanistes* and *Agrypon* contain predominantly high altitude, wet forest-dwelling species in New Guinea, so the scarcity of species in Australia is perhaps not surprising. Similarly the New Guinean *Heteropelma* species are cloud forest-living insects. Those of Australia are characteristic of sclerophyll woodland.

BIOLOGY

As far as is known, all Gravenhorstiini are endophagous parasites of lepidopterous larvae whereas Anomalonini are mostly parasites of tenebrionid beetle larvae. Anomalonines have a characteristic flight pattern; they hold the gaster slightly elevated, the antennae out-stretched and the hind legs splayed out behind (Slobodchikoff, 1973; Gauld, 1976). Whilst host searching on low trees they often adopt an 'up and down' flight pattern about two centimetres away from the vertical edge of the vegetation. The female anomalonine selects as host a relatively immature lepidopterous larva into which she introduces a minute 'lamp-shaped' egg (Tothill, 1922). Unlike many other endoparasitic ichneumonids the egg is not free in the host's haemocoel but is anchored to muscles or the gut by means of a small 'holdfast'. The first instar larva emerges from the chorion, but is still contained within the embryonic membrane. Although the larva feeds and grows quite rapidly, it remains in its first instar until the host pupates. This protracted first larval instar may occupy the greater part of the life cycle. Tothill (1922) noted that *Therion morio*, a univoltine parasite of *Hyphantria* in North America, remained as a first instar larva from August until the following June. Subsequent larval development in the host pupa is very rapid. The final instar larva of an anomalonine has a characteristic, heavily sclerotized head capsule, large mandibles and no distinct hypostomal spur (Short, 1978). The loss of hypostomal spur is unusual in larval ichneumonids. This loss is associated with species which spin only a very thin cocoon within a host pupa (e.g. Anomaloninae, Metopiinae), for the hypostomal spur is the point of insertion of muscles used by the larva for moving its head from side to side whilst spinning (Short, 1959). The adult anomalonine emerges from the host pupa, generally by biting a roughly circular hole in the anterior end.

KEY TO GENERA OF ANOMALONINAE OCCURRING IN AUSTRALIA

1 Tergite 3 of gaster with a longitudinal crease just below spiracle (Fig. 492); mid tibia with a single spur (Anomalonini).....*ANOMALON* (p. 328)

\- Tergite 3 of gaster without a longitudinal crease below spiracle (Fig. 493); mid tibia with two apical spurs (Gravenhorstiini)....................2

2 Hind wing with distal abscissa of Cu_1 entirely absent, not even discernible as a stub at junction of Cu_1 and *cu-a* (Fig. 496)..................3

\- Hind wing with distal abscissa of Cu_1 present (Fig. 495)....................6

3 Surface of eye bearing conspicuous long hairs; eyes ventrally strongly convergent (Fig. 502); ovipositor projecting beyond apex of gaster by 0.3 or more times length of hind tibia.............*TRICHOMMA* (p. 333)

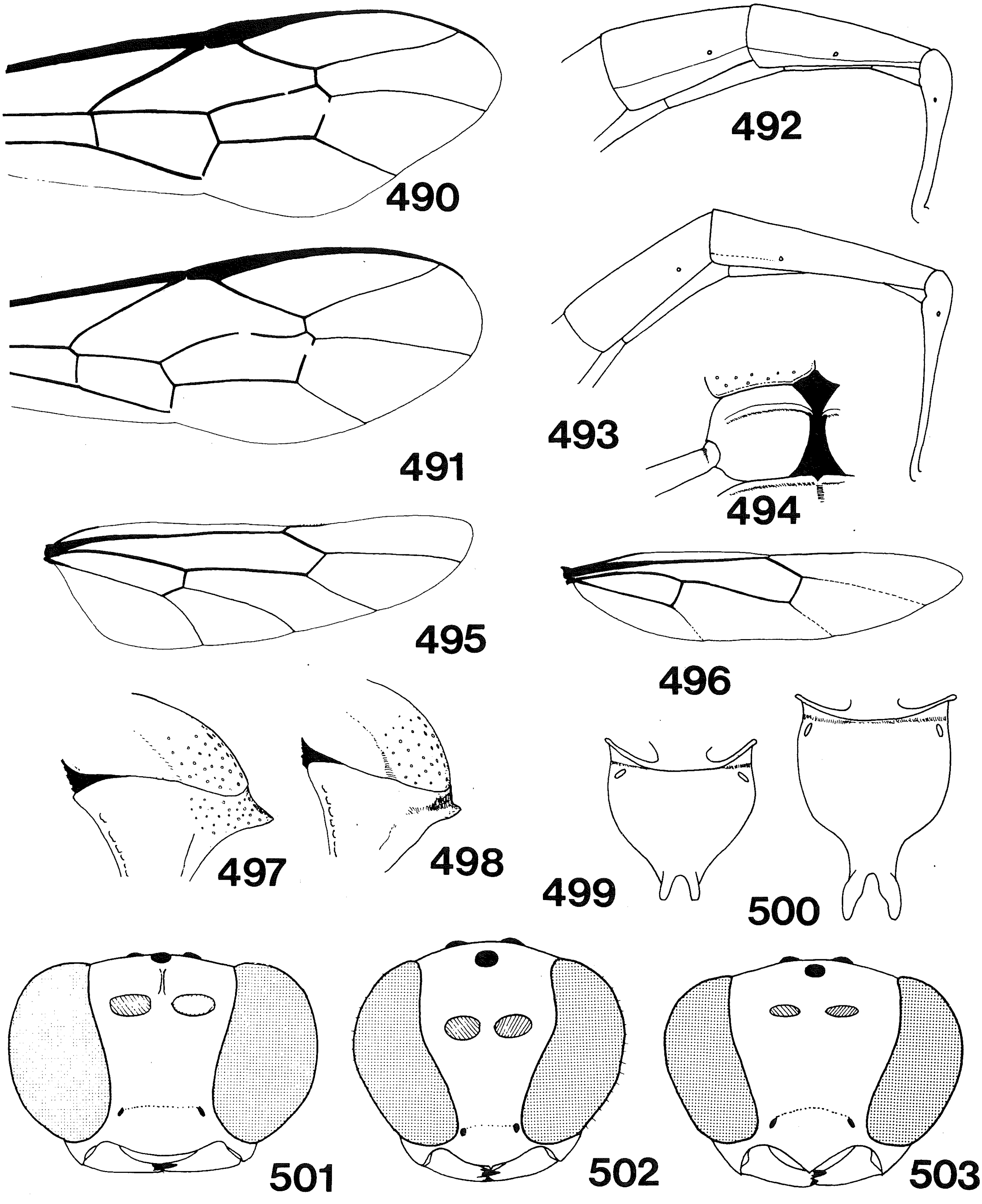
\- Surface of eye glabrous; eyes ventrally only slightly convergent (Fig. 503); ovipositor projecting beyond apex of gaster by less than 0.5 times length of hind tibia...4

4 Fore coxa simple, without carina; pronotum mediodorsally long, flat and uniformly sculptured (Fig. 497); scutellum slightly convex, sparsely punctate...*BARYLYPA* (p. 330)

\- Fore coxa with carina at least on anterior side (Fig. 494); pronotum mediodorsally of moderate length, slightly concave and with central area of different sculpture (Fig. 498); scutellum flat, coarsely rugulose...5

5 Fore coxa completely encircled by a carina; clypeus with a pair of lateromedian teeth in addition to central tooth; propodeum short (Fig. 499)...*PERISPHINCTER* (p. 332)

\- Fore coxa with carina present only on anterior and inner sides; clypeus with only a single median apical tooth; propodeum posteriorly produced into an elongate 'neck' (Fig. 500)................*AGRYPON* (p. 329)



Figs 490-503 Anomaloninae. 490-491 Fore wings (490) *Heteropelma* (491) *Habronyx*. 492-493 Anterior part of gasters (492) *Anomalon* (493) *Heteropelma*. 494 Fore coxae, ventral, *Agrypon*. 495-496 Hind wings (495) *Heteropelma* (496) *Trichomma*. 497-498 Pronota and mesoscuta, anterolateral (497) *Barylypa* (498) *Agrypon*. 499-500 Propodea, dorsal (499) *Perisphincter* (500) *Agrypon*. 501-503 Faces (501) *Heteropelma* (502) *Trichomma* (503) *Habronyx*.

6 Fore wing with Cu_1 between *Rs&M* and *1m-cu* almost as long as *1m-cu* (Fig. 490); posterior transverse carina of mesosternum complete.... ....*HETEROPELMA* (p. 332)
- Fore wing with Cu_1 between *Rs&M* and *1m-cu* at most 0.7 times as long as *1m-cu* (Fig. 491); posterior transverse carina of mesosternum interrupted in front of mid coxae or vestigial..............................7

7 Hind tarsal claws pectinate to apices; frons with a large median vertical lamella.......................................*APHANISTES* (p. 329)
- Hind tarsal claws simple or only pectinate at bases; frons at most with a median vertical carina, often simple...............*HABRONYX* (p. 330)

Tribe ANOMALONINI

This tribe consists of relatively uncommon ichneumonids characterized by the separated laterotergite of segment 3, the unicalcarate mid tibia and the unusual venation. The genitalia of both the male and female are unspecialized and the larvae have distinct denticles on the mandibles (Gauld, 1976*a*). The tribe contains two closely related genera, one Neotropical, the other cosmopolitan. Most species occur in dry areas where they parasitize tenebrionid larvae. At least one Nearctic species is known to attack lepidopterous larvae (Carlson, 1979).

ANOMALON Panzer

Anomalon Panzer, 1804: 115. Type-species: *Anomalon cruentatus* Panzer (= *Ophion foliator* F.), by monotypy.
Trachynotus Gravenhorst, 1829*c*: 713. Type-species: *Ophion foliator* F., by monotypy. [Homonym of *Trachynotus* Latreille, 1829.]
Nototrychys Marshall, 1872: 259. [Replacement name for *Trachynotus* Gravenhorst.]
Ophiononeura Cameron, 1904*a*: 174. Type-species: *Ophiononeura flavomaculata* Cameron, by monotypy.
Stictophion Cameron, 1906*a*: 85. Type-species: *Stictophion rufipes* Cameron, by subsequent designation, Viereck, 1914: 138.
Erythrophion Cameron, 1906*a*: 87. Type-species: *Erythrophion ferrugineus* Cameron (= *Stictophion rufipes* Cameron), by monotypy.
Anomalum Schulz, 1906: 96. [Unjustified emendation.]
Trachyopterus Morley, 1912*a*: 67. Type-species: *Trachyopterus primus* Morley, by monotypy.
Pseudonototrachys Meyer, 1930*a*: 221. Type-species: *Pseudonototrachys pallidus* Meyer (= *Nototrachis* (sic) *kozlovi* Kokujev), by monotypy.
Microcremastus Hedwig, 1961: 292. Type-species: *Microcremastus amseli* Hedwig, by subsequent designation, Townes, 1971*b*: 125.

Small to medium-sized species, fore wing length 4-9 mm; clypeus with a pair of lateromedian teeth; antenna short, barely longer than head and alitrunk; surface of eye glabrous; inner margins of eyes almost parallel. Fore wing with *2r-m* distal to *2m-cu* (Fig. 32); hind wing with distal abscissa of Cu_1 absent. Gaster with tergite 2 with laterotergite separated by a crease (Fig. 492); ovipositor projecting beyond apex of gaster by about 0.9 times length of hind tibia.

Remarks. *Anomalon* is a large genus, most species of which occur in the drier parts of the world.

Species of this genus are notoriously variable in colour and in the development of clypeal teeth.

Australian species. *Anomalon australense* (Morley) (E); *A. morleyi* Gauld (M). I have seen one undescribed species (ANIC).

Host records. *A. australense* - Tenebrionidae: *Gonocephalum carpentariae* Blackburn (DPIQ). *A. morleyi* - Tenebrionidae: *Gonocephalum macleayi* Blackburn (P. G. Allsopp, pers. comm.); *Pteroheleas darlingensis* Carter (P. G. Allsopp, pers.comm.).

Tribe GRAVENHORSTIINI

This tribe contains the majority of Anomaloninae. World-wide there are 32 genera, seven of which occur in Australia. Morphologically the Australian genera form a uniform group, characterized by their very slender appearance, lack of differentiated laterotergite on gastral segment 3 and bicalcarate mid tibia.

AGRYPON Foerster

Agrypon Foerster, 1860: 151. Type-species: *Ophion flaveolatus* Gravenhorst, by subsequent designation, Morley, 1913*b*: 424.
Trichonotus Cameron, 1905*d*: 124. Type-species: *Trichonotus reticulatus* Cameron, by monotypy. [Homonym of *Trichonotus* Schneider, 1801.]
Trichionotus Cameron, 1905*h*: 168. Type-species: *Trichionotus reticulatus* Cameron (= *Trichonotus reticulatus* Cameron), by monotypy.
Odontagrypon Cameron, 1906*a*: 90. Type-species: *Odontagrypon spilonotus* Cameron, by monotypy.
Paragrypon Uchida, 1941: 159. Type-species: *Gongropelma kikuchii* Uchida, by original designation.
Dioborus Rao, 1953: 204. Type-species: *Dioborus indica* Rao (= *Agrypon nox* Morley), by original designation.

Medium-sized species, fore wing length 8-10 mm; clypeus with a median apical tooth; inner margin of eyes weakly convergent, surface of eye glabrous; frons without a lamella, rarely with a median vertical carina. Propodeum posteriorly produced into a long 'neck' which reaches almost to apex of hind coxa (Fig. 500). Fore coxa with carina on anterior and inner sides only (Fig. 494); tarsal claws pectinate basally. Fore wing with *2r-m* proximal to *2m-cu*; abscissa of Cu_1 between 1*m-cu* and Cu_{1a} 0.15-0.30 times as long as Cu_{1b}; abscissa of Cu_1 between *Rs&M* and 1*m-cu* very much shorter than 1*m-cu*; hind wing with distal abscissa of Cu_1 absent. Ovipositor projecting beyond apex of gaster by about 0.3 times length of hind tibia.

Remarks. *Agrypon* is one of the largest genera in the subfamily with species occurring in all major zoogeographical regions. The Australian species are very closely related to species of the *A. omabense* Cheesman species-complex that occur in New Caledonia and the New Hebrides.

Australian species. *Agrypon coarctatum* (Brullé) (E); *A. ferrugineum* Morley (E). I have seen a single specimen of a third species, undescribed (ANIC).

Host records. *A. coarctatum* - ex 'tisiphone' pupa (Gauld, 1976*b*).

APHANISTES Foerster

Aphanistes Foerster, 1869: 145. Type-species: *Anomalon bellicosum* Wesmael, by subsequent designation, Viereck, 1914: 13.
Anochilacrum Enderlein, 1921: 12. Type-species: *Anochilacrum flavigena* Enderlein, by original designation.

Moderately large species, fore wing length 10-14 mm; clypeus with a strong median apical tooth; inner margins of eyes barely convergent ventrally, surface of eye glabrous; frons with a median vertical lamella. Propodeum produced posteriorly into a short 'neck'. Fore coxa simple; tarsal claws pectinate to apices. Fore wing with *2r-m* proximal to *2m-cu*; abscissa of Cu_1 between *1m-cu* and Cu_{1a} 1.5-1.6 times as long as Cu_{1b}; abscissa of Cu_1 between *Rs&M* and *1m-cu* 0.7 times as long as *1m-cu*; hind wing with distal abscissa of Cu_1 present. Ovipositor projecting beyond apex of gaster by about 0.3 times length of hind tibia.

Remarks. *Aphanistes* is a moderately large genus; the majority of species are forest-living insects. They occur in most areas of the world, but have not yet been recorded from the Afrotropical region. The single Australian species is closely related to a Papuan species-complex (Gauld, 1978*a*) but not at all closely related to the New Zealand species (Gauld, 1980*b*).

Australian species. *Aphanistes variicolor* (Morley) (M).

Host records. None in Australia but in the Holarctic region species of this genus are known to parasitize arboreal Geometridae.

BARYLYPA Foerster*

Barylypa Foerster, 1869: 146. Type-species: *Anomalon genalis* Thomson, by subsequent designation, Viereck, 1914: 19.
Laphyctes Foerster, 1869: 146. Type-species: *Laphyctes insidiator* Foerster, by subsequent designation, Viereck, 1914: 19. [Homonym of *Laphyctes* Dujardin, 1844.]
Sarntheina Dalla Torre, 1901*a*: 161. [Replacement name for *Laphyctes* Foerster.]
Hadromanus Szépligeti, 1905: 14. Type-species: *Anomalon laevicoxis* Schmiedeknecht, by monotypy.
Magnibucca Morley, 1913*a*: 79. Type-species: *Magnibucca testacea* Morley, by monotypy.
Trochiscomerus Meyer, 1931: 8. Type-species: *Trochiscomerus schmiedeknechti* Meyer, by monotypy.

Medium-sized species, fore wing length 6 mm; clypeus with a moderately strong median apical tooth; inner margins of eyes not convergent ventrally, surface of eye glabrous; frons with a median vertical carina. Pronotum mediodorsally flat, quite long, (Fig. 497); propodeum with a slight posterior projection. Fore coxa simple; tarsal claws apparently simple. Fore wing with *2r-m* slightly proximal to *2m-cu*; abscissa of Cu_1 between *1m-cu* and Cu_{1a} 0.1 times as long as Cu_{1b}; abscissa of Cu_1 between *Rs&M* and *1m-cu* 0.6 times as long as *1m-cu*; hind wing with distal abscissa of Cu_1 absent. Ovipositor projecting beyond apex of gaster by 0.3 times length of hind tibia.

Remarks. *Barylypa* is a moderately large genus, most species of which occur in the drier parts of the Holarctic. The single Australian species is quite typical except that it lacks the distal abscissa of Cu_1 in the hind wing (and thus will not run to *Barylypa* in any published key). The long pronotum, which is mediodorsally flat and uniformly sculptured, is an apomorphic feature of this genus. I know of no other *Barylypa* species occurring east of continental Asia. The '*Barylypa*' species listed by Townes *et al.* (1961) belong in the genus *Habronyx*.

Australian species. One, undescribed (DPIQ).

Host records. *Barylypa* sp. - Pyralidae: *Mampava rhodoneura* (Turner) (DPIQ).

HABRONYX Foerster

Small to very large species, fore wing length 4-25 mm; clypeus with a vestigial to strong median apical tooth (Fig. 503), rarely with a strong beak-like tubercle; eyes ventrally weakly convergent, surface of eye glabrous or with few short hairs; frons simple or with median vertical carina. Propodeum posteriorly only slightly lengthened. Fore coxa simple; tarsal claws pectinate at base or simple. Fore wing with *2r-m* distal to, proximal to or opposite to *2m-cu*; abscissa of Cu_1 between *1m-cu* and Cu_{1a} 0.7-1.9 times as long as Cu_{1b} (Fig. 491); abscissa of Cu_1 between *Rs&M* and *1m-cu* at most 0.7 times as long as *1m-cu*; hind wing with distal abscissa of Cu_1 present. Ovipositor projecting beyond apex of gaster by 0.2-0.4 times length of hind tibia.

Remarks. This genus has been divided into four subgenera (Gauld, 1976*a*). Two occur in Australia and the other two are restricted to the Holarctic region.

Key to subgenera of *Habronyx* occurring in Australia

- Clypeus at most with a small median apical tooth; small to large-sized species, fore wing length 4-17 mm..........*HABRONYX (AUSTRANOMALON)* (p. 331)
- Clypeus with a strong median apical beak-like tubercle; very large species, fore wing length 22-25 mm..............*HABRONYX (HABRONYX)* (p. 331)

HABRONYX (AUSTRANOMALON) Gauld

Habronyx (Austranomalon) Gauld, 1976*a*: 39. Type-species: *Habronyx (Austranomalon) pammi* Gauld, by original designation.

Remarks. This subgenus is endemic to Australia. A number of species have *2r-m* distal to *2m-cu*, a character which is found elsewhere only in the Ophioninae and *Anomalon*. The majority of species occur in the southern and western parts of the continent and several appear to be restricted to the extreme south-west.

Australian species. *Habronyx (Austranomalon) atropos* Gauld (E); *H. (A.) clothos* Gauld (E); *H. (A.) coarctatus* (Ashmead) (E); *H. (A.) lachesis* Gauld (E); *H. (A.) pammi* Gauld (E); *H. (A.) perturbans* (Morley) (E); *H. (A.) robustus* (Morley) (E); *H. (A.) sulcator* (Morley) (E); *H. (A.) trilineatus* (Cameron) (E); *H. (A.) victorianus* (Morley) (E). I have seen three undescribed species (ANIC; TC; WAM).

Host records. *H. (A.) coarctatus* - Psychidae: *Clania ignobilis* (Walker) (BMNH); *C. tenuis* Rosenstock (BMNH). *Habronyx (A.)* sp. - Geometridae: *Cleora* sp. (Chadwick & Nikitin, 1976). Saturniidae: *Antheraea* sp. (Chadwick & Nikitin, 1976).

HABRONYX (HABRONYX) Foerster

Habronyx Foerster, 1869: 145. Type-species: *Habronyx gravenhorstii* Foerster (= *Anomalon heros* Wesmael), by monotypy.
Acanthostoma Kriechbaumer, 1895: 128. Type-species: *Acanthostoma japonicum* Kriechbaumer (= *Anomalon insidiator* Smith), by monotypy.
Macrostemma Shestakov, 1923: 46. Type-species: *Macrostemma elegans* Shestakov, by monotypy.
Formosanomalon Uchida, 1928*a*: 241. Type-species: *Formosanomalon baibarense* Uchida, by monotypy.
Habronyx (Habronyx) Foerster; Gauld, 1976*a*: 36.

Remarks. Species of this subgenus occur in all regions except the Afrotropical region. The undescribed species from South Africa referred to by Gauld (1976*a*) are specimens of *H. (H.) insidiator*, an eastern Palaearctic species. The data labels are probably incorrect. A single species occurs in Australia where it is apparently restricted to the south-east. It may be related to a Chilean species, *H. (H.) albifrons* (Spinola).

Australian species. *H. (H.) australasiae* (Morley) (E).

Host records. *H. (H.) australasiae* - Saturniidae: *Antheraea* sp. (BMNH).

HETEROPELMA Wesmael
(Whole insect, Fig. 489)

Heteropelma Wesmael, 1849: 120 [as a subgenus of '*Anomalon*' Jurine]. Type-species: *Anomalon (Heteropelma) calcator* Wesmael, by monotypy.
Schizoloma Wesmael, 1849: 120. Type-species: *Ichneumon amictus* F., by monotypy.
Schizopoma Foerster, 1869: 145, 220. [Unjustified emendation.]
Tanypelma Townes, 1971*b*: 157. Type-species: *Heteropelma fulvicorne* Townes, by original designation.

Moderately large to large species, fore wing length 11-19 mm; clypeus without a median apical tooth (Fig. 501); eyes moderately convergent ventrally, their surface glabrous; frons with a median vertical lamella. Propodeum produced posteriorly into a short 'neck'. Fore coxa simple; tarsal claws geniculate, without pectination. Fore wing with *2r-m* proximal to *2m-cu*; abscissa of Cu_1 between *1m-cu* and Cu_{1a} 0.7-0.9 times as long as Cu_{1b}; abscissa of Cu_1 between *Rs&M* and *1m-cu* 0.8-1.0 times as long as *1m-cu* (Fig. 490); hind wing with distal abscissa of Cu_1 present (Fig. 495). Ovipositor projecting beyond apex of gaster by 0.2-0.3 times length of hind tibia.

Remarks. *Heteropelma* is a moderately large genus with 18 described species. The majority occur in the Indo-Australian region with a few scattered throughout the Holarctic and Neotropical regions. It is unknown from the Afrotropical region. The genus was recently revised by Gauld (1976*c*). One Australian species, *H. scaposum*, is a very common insect and may often be found flying around low bushes (1-2 m high) in open eucalypt woodlands. It also occurs frequently in cultivated areas where it has been reared from several economically important lepidopterous pests.

H. scaposum and another species, *H. flavitarse*, are morphologically very variable. A similar wide range of variation exists in other species of the genus (Gauld, 1976*c*). Not all workers agree with my interpretation. Townes (pers. comm.) considers there are about 15 Australian species of *Heteropelma*. Far more material needs to be examined before a satisfactory conclusion can be reached for this problem and, until such time, I continue to favour the more conservative interpretation.

Australian species. *Heteropelma flavitarse* (Brullé) (E); *H. perniciosum* (Turner) (E); *H. scaposum* (Morley) (E). I have seen an additional undescribed species (NMV; TC).

Host records. *H. flavitarse* - Agaristidae: *Phalaenoides glycinae* Lewin (Chadwick & Nikitin, 1976). *H. scaposum* - Lasiocampidae: *Digglesia australasiae* (F.) (BMNH). Noctuidae: *Heliothis armigera* (Hübner) (BMNH); *Spodoptera litura* (F.) (DPIQ).

PERISPHINCTER Townes

Perisphincter Townes, 1961: 474. Type-species: *Agrypon tisiphone* Morley, by original designation.

Small to medium-sized species, fore wing length 4-8 mm; clypeus with a median apical tooth and a pair of weak lateral teeth; inner margins of eyes weakly convergent ventrally, their surface glabrous; frons with an indistinct median vertical carina. Propodeum barely produced posteriorly (Fig. 499). Fore coxa encircled by carina; claws pectinate basally. Fore wing with *2r-m* proximal to *2m-cu*; abscissa of Cu_1 between *1m-cu* and Cu_{1a} 0.2-0.3 times as long as Cu_{1b}; abscissa of Cu_1 between *Rs&M* and *1m-cu* far shorter than *1m-cu*; hind wing with distal abscissa of Cu_1 absent. Ovipositor decurved, projecting beyond apex of gaster by about 0.3 times length of hind tibia.

Remarks. A small genus widely distributed throughout South East Asia with isolated species in other regions.

Australian species. *Perisphincter tooloomi* Gauld (E).

Host records. None.

TRICHOMMA Wesmael

Trichomma Wesmael, 1849: 119 [as a subgenus of '*Anomalon*' Jurine]. Type-species: *Anomalon (Trichomma) fulvidens* Wesmael, by monotypy.
Trichomella Szépligeti, 1910: 91. Type-species: *Trichomma clavipes* Krieger, by subsequent designation, Viereck, 1914: 148.

Small to medium-sized species, fore wing length 3-8 mm; clypeus with a median apical tooth; inner margins of eyes strongly convergent ventrally, their surface bearing long hair (Fig. 502); frons simple or with a weak median vertical carina. Propodeum slightly produced posteriorly. Fore coxa simple; claws pectinate basally or for half their length. Fore wing with *2r-m* proximal to *2m-cu*; abscissa of Cu_1 between *1m-cu* and Cu_{1a} 0.4-0.7 times as long as Cu_{1b}; abscissa of Cu_1 between *Rs&M* and *1m-cu* much shorter than *1m-cu*; hind wing with distal abscissa of Cu_1 absent (Fig. 496). Ovipositor projecting beyond apex of gaster by 0.8 or more times length of hind tibia.

Remarks. This is a moderately large genus with species occurring in all main zoogeographical regions. Many are associated with disturbed habitats and agricultural areas. Some species regularly parasitize orchard pests, especially concealed larvae such as tortricids (Rosenberg, 1934).

Australian species. *Trichomma biroi* (Szépligeti) (E); *T. clavipes* Krieger (= *elegantulum* Turner) (M); *T. tambourinum* Gauld (E). I have seen an undescribed species from the centre of the continent (ANIC; TC) and another from Queensland (DPIQ).

Host records. *T. clavipes* - Oecophoridae: *Garrha* sp. (ANIC). Tortricidae: *Procalyptis parooptera* (Turner) (ANIC). *Trichomma* sp. - Tortricidae: *Acroclita* sp. (Chadwick & Nikitin, 1976).

SUBFAMILY ACAENITINAE

The Acaenitinae is a moderately small subfamily containing, world-wide, 24 genera grouped into two tribes, Coleocentrini and Acaenitini. The former is mainly Holarctic whilst the latter is primarily a Palaeotropical group. Most acaenitines are quite large, brightly coloured insects and when seen, they generally excite considerable interest. However, they are relatively uncommon insects and most species are restricted to forests. A single genus, *Yezoceryx*, occurs in Australia. I have seen one species determined as *Arotes*, a genus that does not occur in the Indo-Papuan region.

DIAGNOSIS

Small to moderately large-sized insects, fore wing length 5-15 mm; clypeus separated from face by groove (Fig. 75), often with a sharp, preapical ridge making apex appear thick, in profile relatively flat, apically truncate or with a median apical tooth; mandible short, usually with almost equal teeth; frons with a median vertical carina; occipital carina complete or mediodorsally absent. Notaulus present or absent; sternaulus absent; posterior transverse carina of mesosternum incomplete. Propodeum usually with some carinae, often with area superomedia delineated. Apex of fore tibia without a tooth on outer side; fore and mid tarsal claws with an accessory tooth near apex; fifth hind tarsal segment conspicuously longer than second. Fore wing with *3r-m* absent; pterostigma rather narrow. Hind wing with first abscissa of *Rs* longer than *r-m*; distal abscissa of Cu_1 present. First segment of gaster stout to slender, usually without glymma, with spiracles at or before the centre; gaster of female often slightly compressed; female subgenital plate very large, triangular, folded along midline, its apex often surpassing apex of gaster (Fig. 77). Ovipositor generally at least as long as gaster, often longer than remainder of insect; ovipositor apex without a dorsal subapical notch, usually with weak ridges.

The Acaenitinae may be confused with Lycorininae or some Banchinae. Neither banchines nor lycorines have a single accessory tooth on the fore tarsal claw and generally they have the second hind tarsal segment longer than the fifth. Banchines have a dorsal subapical notch on the ovipositor and lycorines have triangular impressions on tergites 2-4.

DISTRIBUTION

The majority of the Coleocentrinae are Holarctic and this tribe is not likely to occur in Australia. The Acaenitini is the larger tribe and has two large centres of diversity, one in Africa and a second in South East Asia. A few genera have dispersed into the Palaearctic and Nearctic regions, with one extending to Central America. Otherwise no acaenitines occur in the Neotropical region. Several genera occur in the forests of Borneo and the Philippines, but only one genus, *Yezoceryx*, extends into New Guinea and tropical Australia.

BIOLOGY

It has been stated (Townes, 1971*b*) that Acaenitinae are parasites of wood-boring Coleoptera. However, very few species have ever been reared and almost no biological observations have been made on the group. There are early records in Europe of acaenitines parasitizing Sesiidae (Aubert, 1969). Townes & Townes (1960) summarize host records of Nearctic species; most are from Cerambycidae or Melandryidae.

The final instar larvae of few species are known. Those examined have a long hypostomal spur, toothless mandibles and have the stipital sclerite vestigial, fused with the hypostomal spur (Short, 1978).

YEZOCERYX Uchida

Yezoceryx Uchida, 1928*b*: 36. Type-species: *Yezoceryx scutellaris* Uchida, by original designation.

Occipital carina complete across midline. Posterior transverse carina of propodeum usually mediodorsally incomplete so area superomedia and area petiolaris are confluent. Ventral swelling of first sternite of gaster without hairs. Usually yellowish species, often with black marks.

Remarks. The above short description should serve to distinguish *Yezoceryx* species from those of any of the Oriental genera. *Yezoceryx* is a large genus with many species in the islands of South East Asia and New Guinea. Several species occur in the eastern Palaearctic region and one occurs in the northern United States. The Australian species have only been recorded in Queensland and New South Wales.

Australian species. *Yezoceryx apicipennis* (Turner) (E). I have seen six additional species, undescribed (ANIC; BMNH; QM; TC; WAM).

Host records. None from Australia.

SUBFAMILY OXYTORINAE*
(= Microleptinae sensu Townes)

The Oxytorinae is a moderately large subfamily with, world-wide, 26 described genera. It is one of the least studied ichneumonid taxa; a comparatively small proportion of the species have been described and very few have ever been reared. Only seven species in five genera have been recorded from the Indo-Australian region (Townes *et al.*, 1961) although recent collecting suggests large numbers of species are present in tropical rain forests. The subfamily is not recorded from Australia but six genera are represented in Australian collections.

Oxytorines are slender, inconspicuous insects most usually collected in damp woodlands or wet forests where they may be extremely numerous. In a recent malaise trap sample taken during a year in England about 30 per cent of the total ichneumonid catch was Oxytorinae. In Australia, species seem to be most common in the more humid areas in the east of the continent. Little is known of oxytorine biology. The majority are believed to be endoparasites of mycetophilid larvae but it is possible that other dipterous families also serve as hosts.

DIAGNOSIS

Small to medium-sized insects, fore wing length 2-7 mm. Clypeus convex, separated from face by a groove, apically evenly arcuate or slightly truncate, without a tooth or teeth; mandible unidentate or bidentate, generally strongly narrowed and often twisted; genal sulcus usually present; occipital carina usually complete, rarely obsolescent. Antenna slender, often with conspicuous hairs, sometimes in males with deeply concave tyloids. Alitrunk generally polished with little sculpture; notaulus weak to strong, mesoscutum usually very convex; sternaulus absent; posterior transverse carina of mesosternum incomplete or absent; propodeum from completely areolated to without carinae. Legs slender, tibial spurs often very long, hind tibia usually with a fringe of close fine hairs internally; tarsal claws simple. Fore wing with 3*r-m* present or absent, if present areolet is most usually irregularly rhombic and petiolate above. Hind wing with first abscissa of *Rs* about equal to or shorter than *r-m*; distal abscissa of Cu_1 usually absent, rarely present but weak. Gaster with first segment slender to stout, with spiracle before, at or behind centre; tergite and sternite not fused; glymma present or absent; remainder of gaster cylindrical or slightly depressed; ovipositor from very short to projecting beyond apex of gaster by up to 0.8 times length of hind tibia, usually slender and without discernible apical teeth; upper valve with or without a subapical notch.

The Oxytorinae is a rather difficult subfamily to define. However, all of the Australian representatives are similar in being delicate, slender species with quite large, convex eyes, abruptly constricted genae usually with a distinct genal sulcus. The mandibles are smaller and more strongly tapered than those of most other ichneumonids and the antennae are frequently more hirsute. The very convex mesoscutum gives oxytorines a characteristic 'hunch-backed' appearance. Some males have deeply concave tyloids on one or more flagellar segments, a feature not found in any other ichneumonid taxon.

Oxytorines are most easily confused with orthocentrines and *Aclastus*, a phygadeuontine. Orthocentrines all have a more convex, evenly rounded face and clypeus with a long slender scape. *Aclastus* has a well-developed sternaulus, a feature not found in any Australian oxytorines.

CLASSIFICATION

This subfamily was treated by classical authors as a tribe of Ophioninae (e.g. Schmiedeknecht, 1911*a*; Morley, 1915*a*) under the name Plectiscini. Townes (1944) elevated the status of this group to a subfamily. Later Townes realized that the name *Plectiscus* should correctly be applied to a genus of Orthocentrinae and introduced the name Microleptinae for this subfamily notwithstanding that Oxytorinae Thomson has priority (Fitton & Gauld, 1976). Townes (1971*b*) describes the Oxytorinae as a 'wastebasket group' and suggests that *Microleptes*, *Oxtorus*, *Tatogaster* and *Hyperacmus* may not belong in this taxon. It is not clear where else these genera may belong and the current classification is probably best left unchanged at present.

DISTRIBUTION

The majority of oxytorine genera are north temperate though a number of the larger genera, *Proclitus*, *Plectiscidea*, *Aperileptus*, *Laepserus*, *Symplecis*, *Eusterinx* and *Megastylus*, are cosmopolitan. Of these seven widespread genera only *Plectiscidea* and *Symplecis* have not yet been found in the Australian region. The remaining five genera occur in Australia together with *Helictes*, a mainly Neotropical genus (Townes, 1971*b*).

The majority of species of *Aperileptus*, *Proclitus*, *Megastylus* and *Laepserus* occur in Queensland suggesting that they may have spread into Australia from the north, possibly in close association with their mycetophilid hosts. Colless & McAlpine (1970) remark that there is a pronounced Indo-Malayan element in north Australian mycetophilids. *Eusterinx* seems to be most diverse in the south-west whilst the single species of *Helictes* is known only from Tasmania. The occurrence of *Helictes* may be the result of trans-Antarctic dispersal as the genus is only known from the Neotropical and Holarctic regions. A number of southern Neotropical oxytorine genera (e.g. *Tatogaster* and *Sphingozona*) have not been found in Australia.

BIOLOGY

Virtually nothing is known of the biology of oxytorines. A few species of *Plectiscidea*, *Aperileptus*, *Symplecis*, *Eusterinx*, *Helictes* and *Megastylus* have been reared from Mycetophilidae, particularly species inhabiting Polyporaceae, and one or two species of the other genera have emerged from fungus, suggesting the same host family. However, there is one questionable record of an oxytorine being reared from a stratiomyiid (Townes, 1971*b*) and certain species (e.g. *Cylloceria*) are probably too large to be parasitic on mycetophilids. There are no host records from Australia.

Short (1978) reviews what little is known of oxytorine larvae. All have a rather reduced cephalic skeleton with an incomplete epistomal arch and vestigial hypostoma. The stipital sclerite is lacking but the hypostomal spur is generally long and strong and the labial sclerite well-developed. Almost certainly oxytorine larvae are endoparasitic.

KEY TO GENERA OF OXYTORINAE OCCURRING IN AUSTRALIA

For convenience the phygadeuontine genus *Aclastus*, which is very oxytorine-like, is also included in this key although it should be separated in the key to subfamilies.

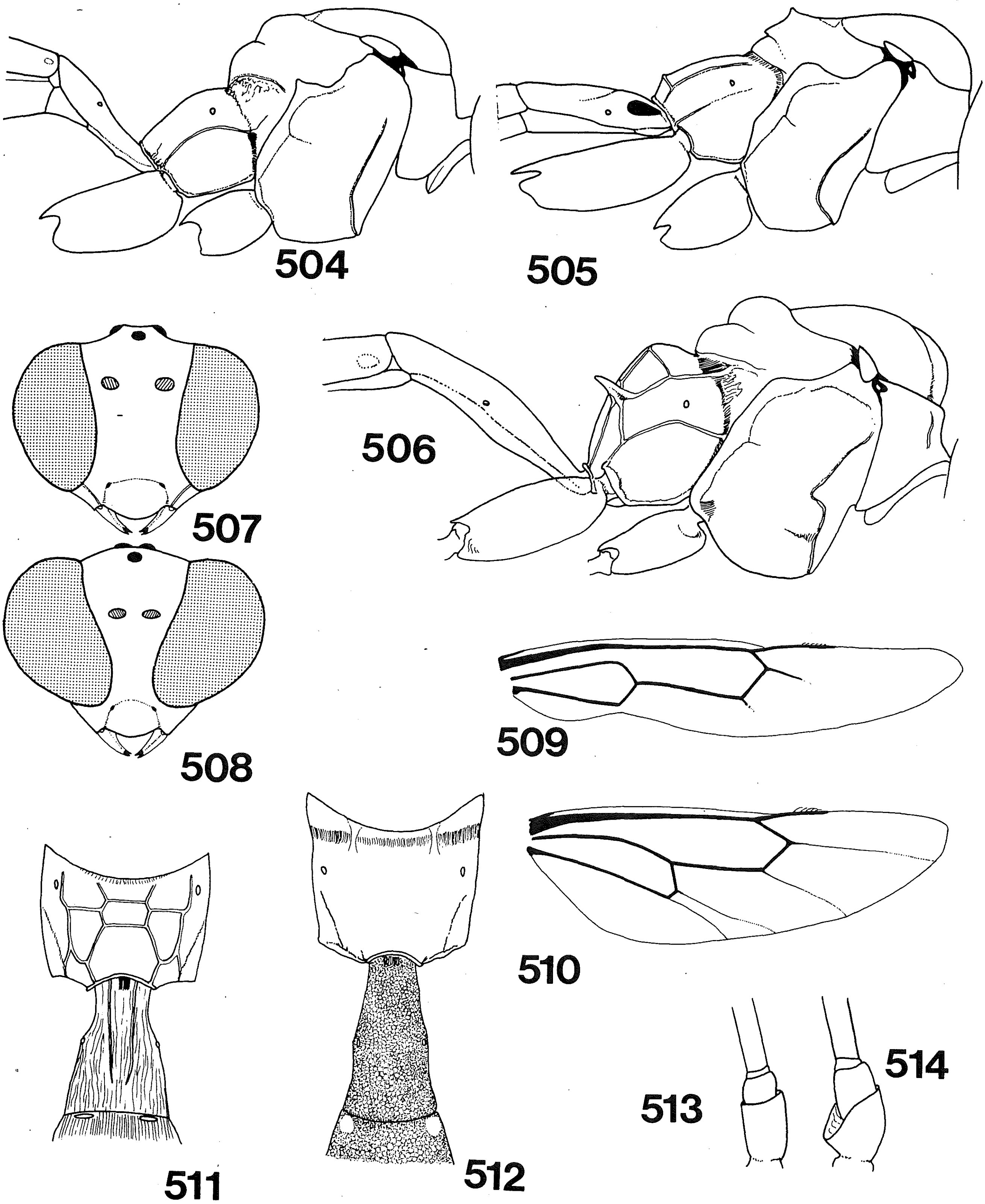
1 Hind margin of apical truncation of scape membranous, in dried specimens somewhat infolded, the scape inflated and very obliquely truncate (Fig. 514); flagellum usually bearing long, erect hairs..*MEGASTYLUS* (p. 342)

\- Hind margin of apical truncation of scape not membranous, the scape rather slender and usually only slightly obliquely truncate (Fig. 513); flagellum without specialized pubescence..............................2

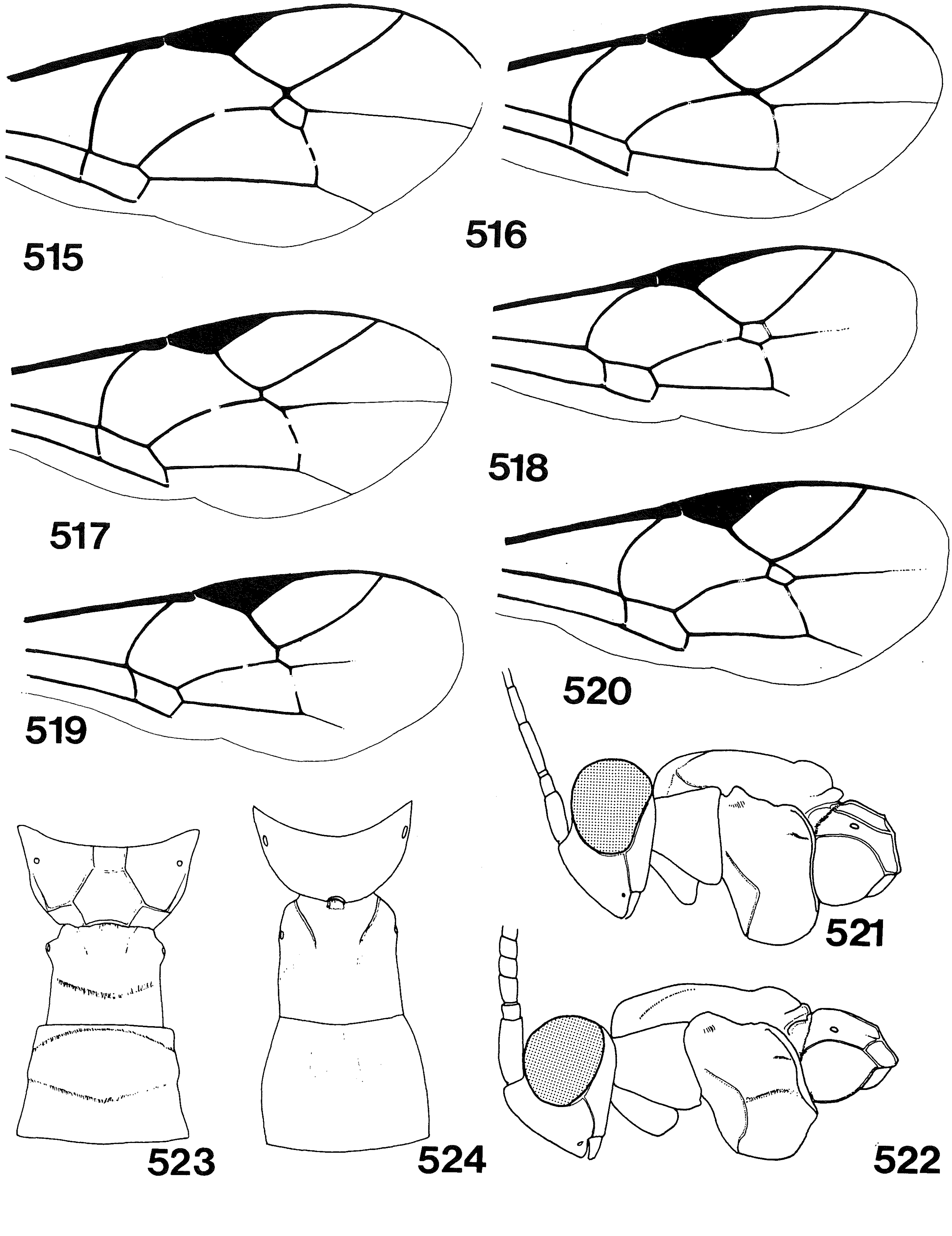
2 Gaster with segment 1 cylindrical, spiracles slightly behind centre but sternite, which is completely fused with the tergite, reaching 0.8 times length of tergite; propodeal apophyses very strongly raised (Fig. 506); ♀ with eyes strongly convergent ventrally (Fig. 508). ....*EUSTERINX* (p. 340)

\- Gaster with segment 1 deplanate, spiracles before, at or behind centre, sternite not completely fused with the tergite; propodeal apophyses from absent to moderately strong (Figs 504, 505); ♀ with eyes not convergent ventrally (Fig. 507)..............................3

3 Gaster with sternite 1 short, extending about 0.2 times length of tergite (Fig. 505); apical margin of clypeus blunt with a fringe of hair; fore wing with areolet complete (Fig. 515)........*APERILEPTUS* (p. 339)



Figs 504-514 Oxytorinae. 504-506 Alitrunks and petioles, lateral (504) *Helictes* (505) *Aperileptus* (506) *Eusterinx*. 507-508 Faces (507) *Proclitus* (508) *Eusterinx*. 509-510 Hind wings (509) *Proclitus* (510) *Laepserus*. 511-512 Propodea and petioles, dorsal (511) *Laepserus* (512) *Helictes*. 513-514 Bases of antennae (513) *Helictes* (514) *Megastylus*.



Figs 515-524 Oxytorinae, Orthocentrinae and Diplazontinae. 515-520 Fore wings (515) *Aperileptus* (516) *Proclitus* (517) *Helictes* (518) *Orthocentrus trichomma* (519) *Plectiscus* (520) *Orthocentrus daucus*. 521-522 Head and alitrunks, lateral (521) *Orthocentrus excalibur* (522) *O. daucus*. 523-524 Propodea and tergites 1-2, dorsal (523) *Diplazon laetatorius* (524) *Syrphoctonus*.

- Gaster with sternite 1 reaching 0.4-0.7 times length of tergite (Fig. 504); apical margin of clypeus sharp, with or without a fringe of hair; fore wing with *3r-m* absent (Figs 516, 517)........................4

4 Mesopleuron with a strongly impressed sternaulus; hind tibia without an internal apical fringe of fine close hairs; hind leg with fifth tarsal segment shorter than second segment..*ACLASTUS* (Phygadeuontini p. 108)

- Mesopleuron without a distinct sternaulus; hind tibia with an internal apical fringe of fine close hairs; hind leg with fifth tarsal segment equal to or longer than second segment..........................5

5 Fore wing with *2r-m* virtually obliterated by fusion of *M* and *Rs+2r* (Fig. 516); hind wing with distal abscissa of Cu_1 absent (Fig. 509), sub-basal cell separated from hind margin of wing distally by less than 0.3 times length of Cu_1&*cu-a*; maxillary palps long, reaching beyond base of hind coxa................................*PROCLITUS* (p. 342)

- Fore wing with *2r-m* distinct (Fig. 517); hind wing with distal abscissa of Cu_1 present but weak, sub-basal cell quite widely separated from hind margin of wing distally (Fig. 510); maxillary palps not exceptionally long, not reaching to base of mid coxa..................6

6 Tergite 1 of gaster with lateromedian longitudinal carinae; propodeum with area superomedia distinct (Fig. 511); ♀ with ovipositor projecting well beyond apex of gaster, up-curved; ♂ with flagellum simple...*LAEPSERUS* (p. 341)

- Tergite 1 of gaster without lateromedian carinae; propodeum without any transverse carinae (Fig. 512); ♀ with ovipositor not projecting beyond apex of gaster; ♂ with concave tyloids on about segment 6 of flagellum...*HELICTES* (p. 340)

APERILEPTUS Foerster*

Aperileptus Foerster, 1869: 170. Type-species: *Plectiscus albipalpus* Gravenhorst, by subsequent designation, Foerster, 1871: 77.

Small species, fore wing length 3-4 mm; face transverse, inner orbits ventrally slightly divergent; clypeus convex, its margin blunt and bearing a fringe of long hairs; mandible strongly narrowed, with upper tooth the longer; maxillary palp long, reaching almost to base of mid coxa. Occipital carina obsolescent. Antenna with scape long and slender, cylindrical, truncate apically at about 30° from horizontal; flagellum of ♂ unspecialized or ♀ with long, close hairs.

Notauli weak; mesoscutum smooth and polished; scutellum laterally carinate anteriorly; propodeum without carinae except laterally.

Hind tibia with an apical fringe of fine close pale hairs internally; fifth tarsal segment about equal in length to second; tarsal claws small, slender.

Fore wing with *3r-m* present enclosing a large irregularly rhombic areolet (Fig. 515); hind wing with distal abscissa of Cu_1 absent.

Gaster with tergite 1 broad, depressed, with spiracles before centre and with glymma (Fig. 505); sternite 1 short, extending about 0.2 times length of tergite. Ovipositor short, not projecting beyond apex of gaster, slightly decurved, with a dorsal subapical notch.

Remarks. A moderately large cosmopolitan genus. It is distinguishable from other Australian oxytorines by the form of the first segment of the gaster and the smooth propodeum lacking transverse or lateromedian carinae.

Australian species. One, undescribed from north Queensland (ANIC).

Host records. None from Australia.

EUSTERINX Foerster*

Holomeristus Foerster, 1869: 171. Type-species: *Holomeristus tenuicinctus* Foerster, by subsequent designation, Foerster, 1871: 81.
Eusterinx Foerster, 1869: 172. Type-species: *Eusterinx oligomera* Foerster, by subsequent designation, Viereck, 1914: 57.
Trestis Foerster, 1869: 174. Type-species: *Trestis tricincta* Ashmeak (= *Catastenus trifasciatus* Ashmead), by subsequent monotypy, Ashmead, 1902: 187.
Ischyracis Foerster, 1869: 175. Type-species: *Catomicrus alpigenus* Strobl (= *Catomicrus bispinosa* Strobl), by subsequent designation, Perkins, 1962: 431.
Catomicrus Thomson, 1888*b*: 1291. Type-species: *Catomicrus trichops* Thomson (= *Tryphon pusillus* Zetterstedt), by monotypy.
Dallatorrea Ashmead, 1902: 205. Type-species: *Dallatorrea armata* Ashmead, by monotypy.
Stroblia Schmiedeknecht, 1911*a*: 2182. Type-species: *Catomicrus alpigenus* Strobl (= *Catomicurs bispinosa* Strobl), by monotypy. [Homonym of *Stroblia* Pokorny, 1893.]
Acanthostroblia Roman, 1925: 21. [Replacement name for *Stroblia* Schmiedeknecht.]
Cymodusoides Viereck, 1925*a*: 74. Type-species: *Cymodusoides gracilis* Viereck, by monotypy.

Small to medium-sized species, fore wing length 4-7 mm; face elongate, inner orbits strongly convergent ventrally (Fig. 508); clypeus convex, margin sharp; mandible abruptly tapered to sharp point, its apex twisted 90°; maxillary palp short, reaching to fore coxa. Occipital carina strong. Antenna with scape quite slender, apically truncate 30-40°; flagellum of ♂ with tyloids usually on at least sixth and often sixth to ninth segments, of ♀ with fine close hairs.

Notauli deep, extending at least 0.5 of length of mesoscutum; mesoscutum smooth and polished; scutellum convex, not carinate laterally; propodeum with at least posterior transverse carina complete, usually completely carinate, apophyses strong.

Hind tibia without a specialized apical fringe of close hairs; fifth tarsal segment subequal to or shorter than the second; tarsal claws large, strongly curved.

Fore wing with *3r-m* present or absent, if present, enclosing an irregularly rhombic areolet; hind wing with distal abscissa of Cu_1 absent.

Gaster with tergite 1 slender, long, with spiracle slightly behind centre, without glymma (Fig. 506); sternite 1 long, reaching about 0.8 times length of tergite and closely associated with it (though not fused) to form a cylinder. Ovipositor projecting beyond apex of gaster by about 0.5 times length of hind tibia, curved or straight but elongately tapered, without a dorsal subapical notch.

Remarks. *Eusterinx* is a large cosmopolitan genus that includes a diverse assemblage of species. The Australian species are easily distinguished from other oxytorines by the strongly convergent eyes in the females and the long cylindrical first segment of the gaster with the sternite reaching 0.8 times length of the tergite.

Australian species. Four, undescribed (AM; ANIC; BMNH).

Host records. None in Australia.

HELICTES Haliday*

Helictes Haliday, 1837: 106. Type-species: *Ichneumon erythrostoma* Gmelin, by subsequent designation, Westwood, 1840: 58.
Myriarthrus Foerster, 1869: 172, 218. [Unnecessary replacement name for *Helictes* Haliday.]
Paipila Cameron, 1905*i*: 258. Type-species: *Paipila longipes* Cameron, by monotypy.

Small species, fore wing length 5 mm; face elongate, inner orbits subparallel; clypeus flat, long, with apical margin sharp and slightly medially incised; mandible strongly tapered, twisted 90°; maxillary palp rather short, reaching to about epicnemial carina. Occipital carina complete. Antenna with scape rather short, fairly slender, cylindrical, apically truncate at about 20° from horizontal (Fig. 513); flagellum stout, that of ♂ with concave tyloids on segment 6.

Notauli weak but long; mesoscutum granulate, weakly polished; scutellum subpyramidal, not carinate laterally; propodeum without carinae except laterally.

Hind tibia with an apical fringe of close fine hairs internally; fifth tarsal segment longer than the second; tarsal claws large, strongly curved.

Fore wing with 3*r-m* absent (Fig. 517); hind wing with distal abscissa of Cu_1 present.

Gaster with tergite 1 slightly broadened, dorsally without carinae (Fig. 512); spiracles at or slightly behind centre (Fig. 504); sternite 1 reaching about 0.4-0.6 times length of tergite. Ovipositor not projecting beyond apex of gaster.

Remarks. *Helictes* is a large genus with species occurring in the Holarctic and Neotropical regions. Townes (1971*b*) states that most species occur in Chile and the Andes. In Australia, *Helictes* is only known from a single specimen collected by the author near Fordham's Pass, Tasmania in December.

Australian species. One, undescribed (BMNH).

Host records. None for Australia.

LAEPSERUS Foerster*

Gnathochorisis Foerster, 1869: 152. Type-species: *Gnathochorisis flavipes* Foerster, by subsequent designation, Foerster, 1871: 113.
Laepserus Foerster, 1869: 205. Type-species: *Blapticus crassulus* Thomson, by subsequent designation, Perkins, 1962: 434.
Acroblapticus Schmiedeknecht, 1911*a*: 2173. Type-species: *Blapticus dentifer* Thomson, by subsequent designation, Viereck, 1914: 4.

Small species, fore wing length 3-5 mm; face subquadrate, inner orbits slightly divergent ventrally, clypeus flat, quite long, with apical margin sharp and faintly medianly incised or truncate; mandible strongly narrowed, twisted 30° or more; maxillary palp quite long, reaching to about centre of mesosternum. Occipital carina complete. Antenna with scape quite long and slender, cylindrical, apically truncate at about 20° from horizontal; flagellum of both sexes unspecialized.

Notauli weak, generally only discernible at anterior end; mesoscutum finely punctate, polished; scutellum convex, at most only carinate laterally at extreme anterior end; propodeum fully carinate, area superomedia strongly delineated.

Hind tibia with an apical fringe of fine close pale hairs internally, fifth tarsal segment about equal to or a little longer than second; tarsal claws large, strongly curved.

Fore wing with 3*r-m* absent (in Australian species, but in others often present); hind wing with distal abscissa of Cu_1 at least discernible as a trace at extreme proximal end (Fig. 510).

Gaster with tergite 1 evenly broadened posteriorly, slightly flattened and dorsally carinate (Fig. 511); spiracle slightly before centre, glymma absent; sternite 1 reaching about 0.4 times length of tergite. Ovipositor projecting beyond apex of gaster by 0.5-0.6 times length of hind tibia, slightly up-curved and with a dorsal subapical notch.

Remarks. In most works this genus has gone under the name *Blapticus* (e.g. Townes, 1971*b*) but van Rossem (1981) re-examined the type-species of *Blapticus* and found it to be a species of *Symplecis*. Accordingly he synonymized *Blapticus* under *Symplecis* and chose *Laepserus* as the name for the genus formerly called *Blapticus*.

Laepserus is a large genus with an almost world-wide distribution. Structurally it is rather similar to *Aperileptus* though the differences in the clypeus and propodeum enable the Australian species to be easily separated.

Australian species. One, undescribed from north Queensland (ANIC).

Host records. None for Australia.

MEGASTYLUS Schiødte*

Megastylus Schiødte, 1838: 139. Type-species: *Megastylus cruentator* Schiødte, by subsequent designation, Foerster, 1871: 104.
Idioxenus Foerster, 1869: 171. Type-species: *Megastylus mediator* Schiødte (= *Megastylus cruentator* Schiødte), by subsequent designation, Foerster, 1871: 94.
Dicolus Foerster, 1869: 171. Type-species: *Dicolus insectator* Foerster, by subsequent designation, Viereck, 1914: 45.
Megalostylus Schulz, 1906: 94. [Unjustified emendation.]
Letosha Cameron, 1909: 724. Type-species: *Letosha longicoxis* Cameron, by monotypy.
Myriarthridea Viereck, 1914: 97. Type-species: *Myriarthrus cingulator* Foerster, by original designation.
Miomeroides Kiss, 1924: 113. Type-species: *Miomeroides transsylvanicus* Kiss, by monotypy.

Small species, fore wing length 2-5 mm; lower face transverse to subquadrate; inner orbits parallel; clypeus convex, with margin sharp, often truncate (Fig. 78); mandible short, strongly tapered, and twisted 90° (Fig. 571); maxillary palp quite long, often reaching to centre of mesosternum. Occipital carina complete. Antenna with scape goblet-shaped, truncate at about 70° from transverse, the hind edge of apical truncation membranous and in dried specimens infolded (Fig. 514); flagellum often somewhat moniliform, bearing long erect hairs.

Notauli weak to quite strong; mesoscutum polished, usually with weakly coriaceous sculpture centrally; scutellum convex, laterally carinate for about 0.5 of its length; propodeum quite long, coriaceous with weak irregular carinae.

Hind tibia with an apical fringe of long, fine pale hairs internally; fifth hind tarsal segment shorter than second, claws small.

Fore wing with *3r-m* present or absent, if present then enclosing an irregularly rhombic areolet; hind wing with distal abscissa of Cu_1 present or absent (Fig. 89).

Gaster with tergite 1 quite long and slender with spiracle at centre, without glymma; sternite 1 reaching to about level of spiracles. Ovipositor short, not or barely projecting beyond apex of gaster, its apex often abruptly constricted, terminating in a short point.

Remarks. *Megastylus* is probably the largest genus of Oxytorinae. Species are commonly encountered in wet forest habitats in all parts of the world. The structure of the scape of this genus is unique amongst the Ichneumonidae.

In Australia species are widely distributed but perhaps the greatest concentration is in eastern Queensland.

Australian species. Twelve, undescribed (ANIC; BMNH; TC).

Host records. None for Australia.

PROCLITUS Foerster*

Clepticus Haliday, 1839: 116. Type-species: *Clepticus praetor* Haliday, by subsequent designation, Westwood, 1840: 61. [Homonym of *Clepticus* Cuvier, 1829.]
Proclitus Foerster, 1869: 172. Type-species: *Proclitus grandis* Foerster, by subsequent designation, Viereck, 1914: 123.

Aclastoneura Kriechbaumer, 1896: 359. Type-species: *Aclastoneura tricolor* Kriechbaumer, by monotypy.
Mischoxorides Ashmead, 1900*b*: 368. [Replacement name for *Clepticus* Haliday.]

Small species, fore wing length 3-4 mm; face elongate, inner orbits parallel (Fig. 507); clypeus large and convex, its apical margin flat, sharp and forming an even arc or truncate medially; mandible quite long, slender, twisted 60° or more; maxillary palp very long, reaching to hind coxa. Occipital carina complete. Antenna with scape rather short, cylindrical, truncate at about 30° from transverse; flagellum of both sexes unspecialized.

Notauli quite strong anteriorly; mesoscutum smooth and polished, often with a median longitudinal furrow; scutellum convex, not laterally carinate; propodeum with posterior transverse carina strong, other carinae quite weak.

Hind wing with a rather coarse fringe of hairs on inner distal margin; fifth hind tarsal segment longer than second; claws large, strongly curved.

Fore wing with *3r-m* absent, *2r-m* obliterated by fusion of *Rs+2r* and *M* (Fig. 516); hind wing with distal abscissa of Cu_1 absent (Fig. 509).

Gaster with tergite 1 slender, with spiracle at or slightly behind centre; glymma absent; sternite 1 reaching to spiracle. Ovipositor projecting beyond apex of gaster by 0.7-0.8 times length of hind tibia, straight, without a dorsal subapical notch (in Australian species though notch is present in many others).

Remarks. *Proclitus* is a large cosmopolitan genus. It is easily distinguished by the characteristic venation.

Australian species. One, undescribed from north Queensland (ANIC).

Host records. None for Australia.

SUBFAMILY ORTHOCENTRINAE*

The Orthocentrinae is, world-wide, a moderately large subfamily containing seven genera, two of which are extremely large. Most orthocentrines are small or very small ichneumonids and often 'collapse' when dried. Perhaps for these reasons, the Orthocentrinae is one of the least studied of all ichneumonid taxa. Even in western Europe a considerable number of species await description whilst virtually none has been described from the tropics. Townes *et al*. (1961) list two species from the Indo-Australian region, from Taiwan and Sri Lanka respectively. Numerous others occur throughout the region but all are undescribed.

In the present work three genera, *Orthocentrus*, *Neurateles* and *Plectiscus*, are recognized from Australia. The first is large and contains several distinct species-groups which probably warrant separate generic status. With so few species described, however, it is premature to formally divide *Orthocentrus* so I have erected a number of species-groups which correspond to the morphological aggregates of the Australian species. Rather surprisingly, the widespread genus *Stenomacrus* Foerster does not seem to be present in Australia. In the key *Stenomacrus* species would run to couplet 4, but they differ from *Neurateles* and *Plectiscus* species in having a distinct epicnemial carina present on the antero-central part of the mesopleuron.

DIAGNOSIS

Small insects, fore wing length 3-5 mm; face and clypeus forming a single convex surface, the latter not separated by a distinct groove; clypeus apically concave, truncate or convex, usually thin; mandible short, strongly tapered, bidentate or unidentate; malar space generally long, usually with subocular sulcus distinct; frons simple; occipital carina usually absent. Antenna with scape long and cylindrical, flagellum often short. Notaulus weak or absent, sometimes with a small crest near anterior end; sternaulus vestigial or absent; posterior transverse carina of mesosternum incomplete. Propodeum with or without carinae, the lateromedian ones usually present. Apex of fore tibia without a tooth on outer side; fore and mid tarsal claws simple, often large. Fore wing with *3r-m* present or absent; pterostigma moderately broad, marginal cell short. Hind wing with first abscissa of *Rs* equal to or shorter than *r-m*; distal abscissa of Cu_1 usually absent. First segment of gaster moderately short, generally broad, parallel-sided, always with spiracles before centre; sternite 1 short, not fused to tergite; glymma present; gaster of female depressed, cylindrical or somewhat compressed, especially posteriorly; female subgenital plate small; ovipositor moderately short, rather straight, without a distinct dorsal subapical notch, often with base exposed by partial rotation downwards of the valvifers; ovipositor sheath generally weakly sclerotized proximally, distally bearing long hairs.

The Orthocentrinae is a distinctive and morphologically a very uniform group. Species are only likely to be confused with small metopiines from which they differ in the shape of the scape. No metopiines have a well-developed subocular sulcus.

CLASSIFICATION

Orthocentrines were traditionally treated at a subgroup of the Exochini (i.e. the Metopiinae less *Metopius*) (Morley, 1911) because of their convex faces, but currently most authors recognize this superficial similarity is convergence and treat the Orthocentrinae as a distinct subfamily. Structurally orthocentrines are similar to many oxytorines, especially *Aperileptus* and related genera though the faces are rather different. Whether the similarities in mandibles, the presence of subocular sulcus, the similarly cylindrical scapes and the structurally similar gasters and fringed hind tibiae result from a genuine close relationship between some oxytorines and orthocentrines, or are parallelisms resulting from similarities in biology is not known.

Townes (1971*b*) recognizes seven genera. With the exception of *Orthocentrus* these genera are very closely inter-related and require some care to distinguish them. *Orthocentrus* is very distinctive but contains many species-groups which appear to warrant separate generic status.

DISTRIBUTION

The Orthocentrinae is a cosmopolitan group. Most species seem to occur in humid forests where they frequently can be observed flying in large aggregations over the low vegetation in shafts of sunlight. Species are common in upland forest in South East Asia and many appear to be widely distributed throughout eastern Australia from Queensland to Tasmania. Too little is known about orthocentrines to allow an assessment of their zoogeographical distribution to be made.

BIOLOGY

Virtually nothing is known about the biology of the group but on the basis of a very few records (e.g. Short, 1978) most workers described them as parasites of Mycetophilidae (cf. Townes, 1971*b*; Carlson, 1979). Whether they are internal or external parasites is not known but the final instar larva of at least one species has well-developed bristles on the caudal region (Short, 1978). In Europe, *Neurateles* species seem to be associated with decaying timber.

KEY TO GENERA AND SPECIES-GROUPS OF ORTHOCENTRINAE OCCURRING IN AUSTRALIA

1 Fore wing with areolet pentagonal, *3r-m* sometimes weak but its position discernible (Fig. 518); face submatt, coriaceous or granulate; surface of eye of ♀ usually densely hirsute, rarely sparsely so (Fig. 569); subocular sulcus weak or absent........... *ORTHOCENTRUS* (*trichomma*-group) (p. 346)

- Fore wing with areolet absent or if present, obliquely rhombic (Figs 519, 520); face polished, smooth or with inconspicuous sculpture; surface of eye glabrous; subocular sulcus strong (Figs 521, 522)..........2

2 Mesoscutum with anterior end of short notaulus occluded by a crest (Fig. 521); propodeum with lateromedian and lateral longitudinal carinae strong, the latter present above the spiracle..*ORTHOCENTRUS* (*excalibur*-group) (p. 347)

- Mesoscutum without a crest at anterior margin, notaulus absent or vestigial (Fig. 522); propodeum with lateromedian and lateral longitudinal carinae weak, the latter never present above spiracle.............3

3 Epicnemial carina present on mesopleuron; fore wing with areolet obliquely rhombic (Fig. 520); hind wing with Cu_1+*cu-a* vertical, anterodistal corner of sub-basal cell about 90°; flagellum of ♀ somewhat moniliform, short...........................*ORTHOCENTRUS* (*daucus*-group) (p. 346)

- Epicnemial carina entirely absent; fore wing with 3*r-m* absent (Fig. 519); hind wing with Cu_1+*cu-a* oblique so anterodistal corner of sub-basal cell is 80° or less; flagellum of ♀ slender, filiform to slightly clavate..4

4 Pleural carina of propodeum absent, its course represented by a furrow; gaster very long and slender, strongly laterally compressed... ....*NEURATELES* (p. 347)

- Pleural carina of propodeum present; gaster moderately long, laterally compressed only at hind end.........................*PLECTISCUS* (p. 348)

ORTHOCENTRUS Gravenhorst*

Orthocentrus Gravenhorst, 1829*c*: 358. Type-species: *Orthocentrus fulvipes* Gravenhorst, by subsequent designation, Westwood, 1840: 59.
Tapinops Foerster, 1869: 160. Type-species: *Orthocentrus californicus* Ashmead, by subsequent monotypy, Ashmead, 1896: 204.
Atmetus Foerster, 1869: 160. Type-species: *Atmetus tetrazonatus* Ashmead, by subsequent designation, Viereck, 1914: 17.
Phaenosemus Foerster, 1869: 160. Type-species: *Phaenosemus sitkensis* Ashmead, by subsequent monotypy, Ashmead, 1902: 231.
Exochiscus Walsh, 1873: 96. Type-species: *Exochiscus pusillus* Walsh, by monotypy.
Pachyonyx Walsh, 1873: 100. [Nomen nudum.]
Pachyonyx Viereck, 1914: 108. Type-species: *Orthocentrus trifasciatus* Walsh, by original designation. [Homonym of *Pachyonyx* Schoenherr, 1837.]
Orthocentrellus Benoit, 1954: 1. Type-species: *Orthocentrellus elongaticornis* Benoit, by original designation.

Small species, fore wing length 3-5 mm; clypeal margin slightly convex, truncate or concave, covering labrum; face from smooth and polished to granulate or coriaceous, matt; subocular sulcus present or absent; eyes hairy or glabrous. Flagellum of ♀ usually rather short and either moniliform or with segments quadrate.

Notaulus present or absent, mesoscutal crest present or absent; epicnemial carina present on mesopleuron; propodeum with posterior transverse and lateromedian longitudinal carinae usually well-developed, sometimes with lateral carinae present also; pleural carinae present or absent.

Fore wing with *cu-a* usually distal to base of *Rs&M*; 3*r-m* present or absent, if present areolet may be pentagonal or obliquely rhombic. Hind wing with Cu_1+*cu-a* more or less vertical, anterodistal corner of sub-basal cell about 90°.

Gaster barely laterally compressed; ovipositor generally short, its total length 1.0-1.5 times length of hind basitarsus.

Remarks. *Orthocentrus* is a large cosmopolitan genus containing a very heterogeneous assemblage of species. It is distinct from all other genera of Orthocentrinae in not having an exposed labrum (Townes, 1971*b*). The Australian species clearly fall into three species-groups and the same groups can be recognized in some other regions. These groups are both distinctive and discrete in the material examined and probably correspond with 'genera' as used in most other ichneumonid subfamilies. I have avoided formally splitting *Orthocentrus* into smaller, more natural groups as this should only be attempted after study of the numerous species available from all over the world and is clearly beyond the scope of the present work. However, so strong is my conviction that these groups warrant generic status, I have included them in the key.

Australian species. Three species described below and an additional 13 species, all undescribed (AM; ANIC; BMNH; DPIQ; NMV; TC) belonging to the three species-groups also described below.

The *trichomma*-group

Face submatt, coriaceous or granulate; clypeal apex slightly convex; antenna of ♀ usually very short with segments quadrate or transverse, rarely as ♂, slender and elongate; subocular sulcus absent or weak; surface of eye generally bearing long hairs (Fig. 569), rarely almost glabrous. Mesoscutum with notaulus and crest absent; propodeum with lateral carina absent or only present near hind end. Fore wing with areolet present, pentagonal (Fig. 518).

This group contains 10 Australian species (AM; ANIC; BMNH; NMV; TC), one of which is described below.

Orthocentrus trichomma sp. n.

Female: fore wing length 3-4 mm; eye densely hirsute; face granulate; subocular sulcus absent. Flagellum short, segments transverse. Dorsum of mesothorax finely alutaceous. Ovipositor very short, usually concealed.

Dark brown; face, tegula and legs except coxae yellowish brown. Wings hyaline, pterostigma pale brown.

Male: similar to female but with antenna longer and more slender.

Material examined

Holotype ♀, Queensland: Mt Tambourine, x.1978 (*Galloway*) (ANIC).

Paratypes. Australian Capital Territory: 1 ♀, Canberra, Black Mt, ix.1981 (*Gauld*) (BMNH). Queensland: 7 ♀, 1 ♂, Mt Tambourine, x.1978 (*Galloway*) (ANIC; BMNH; DPIQ).

The *daucus*-group

Face polished, smooth; clypeal apex truncate or slightly concave; antenna of ♀ moniliform, especially in distal 0.5, of ♂ simple, elongate; subocular sulcus present, strong, arcuate; surface of eye glabrous. Mesoscutum smooth or with a trace of notaulus near anterior end, without a notaular crest (Fig. 522); propodeum with lateral carina absent above spiracle. Fore wing with areolet present, obliquely rhombic (Fig. 520).

This group contains five undescribed species in Australia (ANIC; BMNH). One is described below.

Orthocentrus daucus sp. n.

Female: fore wing length 3-4 mm; lower side of scape bearing few long stout hairs. Mesoscutum smooth and polished, notaulus absent. Metapleuron smooth and polished. Ovipositor very short, its sheath with a few long stout curved hairs.

Black; lower face, genae, scapes ventrally, mesosternum and legs except coxae orange; frons partly, orbits, mesoscutal and scutellar stripes, stripe on mesopleuron, subalar prominence, tegula, fore and mid coxae and often small marks on margins of pronotum, propleuron and mesepimeron yellow. Wings hyaline, pterostigma blackish, proximally and distally slightly paler.

Male: rather similar but more extensively yellow with black and orange areas reduced; hind coxa yellow-marked; gonosquama simply rounded posteriorly.

Material examined

Holotype ♀, New South Wales: 5 km S. by W. Monga, xi.1981 (*Gauld*) (ANIC).

Paratypes. New South Wales: 5 ♀, 5 km S. by W. Monga, xi.1981 (*Gauld*) (BMNH); 1 ♀, 2 km S. by W. Monga, xi.1981 (*Gauld*) (ANIC); 1 ♂, Shoalhaven River, xi.1981 (*Gauld*) (BMNH). Tasmania: 1 ♀, 1 ♂, Mt Barrow, xii.1981 (*Gauld*) (ANIC). Victoria: 1 ♀, Toolangi, xii.1981 (*Gauld & Farrugia*) (BMNH).

The *excalibur*-group

Face polished, smooth; clypeal apex slightly concave; antenna slender, all segments more than 2.0 times as long as broad; subocular sulcus present, strong, straight; eye surface glabrous. Mesoscutum smooth, notaulus short with anterior end occluded by crest (Fig. 521); propodeum with lateral carina present above spiracle. Fore wing with *3r-m* absent.

This group contains a single species which is described below.

Orthocentrus excalibur sp. n.

Female: mesoscutum polished, with shallow punctures; alitrunk laterally smooth and highly polished. Fore wing with *cu-a* almost opposite base of *Rs&M*.

Blackish brown; marked yellowish brown on face, orbits, mesoscutum, scutellum and subalar prominences. Legs and mesosternum paler yellowish. Wings hyaline, pterostigma clear brown.

Male unknown.

Material examined

Holotype ♀, Queensland: Mt Tambourine, xi.1978 (*Galloway*) (ANIC).

Paratypes. Queensland: 5 ♀, Mt Tambourine, xi.1978 (*Galloway*) (ANIC; BMNH; DPIQ).

NEURATELES Ratzeburg*

Neurateles Ratzeburg, 1848: 86. Type-species: *Neurateles papyraceus* Ratzeburg, by monotypy.

Neuratelus Foerster, 1869: 159. [Unjustified emendation.]

Small species, fore wing length 3-4 mm; clypeal margin truncate, labrum exposed; face smooth and quite polished; subocular sulcus present; eyes glabrous. Flagellum of ♀ slightly thickened distally.

Notaulus absent; epicnemial carina absent; propodeum without any carinae, course of pleural carina indicated by a groove.

Fore wing with *cu-a* subopposite base of *Rs&M*; *3r-m* absent. Hind wing with Cu_1+*cu-a* slightly oblique so anterodistal corner of sub-basal cell is acute, about 75°.

Gaster very long and slender, tergites 3+ strongly laterally compressed. Ovipositor of moderate length, its total length about 2.0 times length of hind basitarsus.

Remarks. A moderate-sized genus previously only known from the Holarctic and Neotropical regions. The Australian specimens I have seen are from southern Queensland.

Australian species. One, undescribed (ANIC; BMNH).

Host records. None in Australia but in Europe species are associated with rotten timber.

PLECTISCUS Gravenhorst*

Plectiscus Gravenhorst, 1829*b*: 978. Type-species: *Plectiscus impurator* Gravenhorst, by subsequent designation, Westwood, 1840: 58.
Brephoctonus Foerster, 1869: 159. Type-species: *Plectiscus impurator* Gravenhorst, by subsequent monotypy, Foerster, 1871: 79.

Small species, fore wing length 3-4 mm; clypeal margin truncate, labrum exposed slightly; face smooth and polished; subocular sulcus present; eye glabrous (Fig. 570). Flagellum of ♀ slender.

Notaulus absent; epicnemial carina absent; propodeum with posterior transverse carina usually present, pleural carina present, other carinae absent or vestigial.

Fore wing with *cu-a* distal to base of *Rs&M*; 3*r-m* absent (Fig. 519). Hind wing with Cu_1+*cu-a* slightly sloping so anterodistal corner of sub-basal cell is acute, about 75°.

Gaster moderately long, if laterally compressed, then only so at hind end; ovipositor moderately short, its total length 1.3-1.8 times length of hind basitarsus.

Remarks. A small Holarctic, Oriental and Neotropical genus widely distributed throughout the east of Australia.

Australian species. Four, undescribed (ANIC; BMNH; TC).

Host records. None.

SUBFAMILY DIPLAZONTINAE

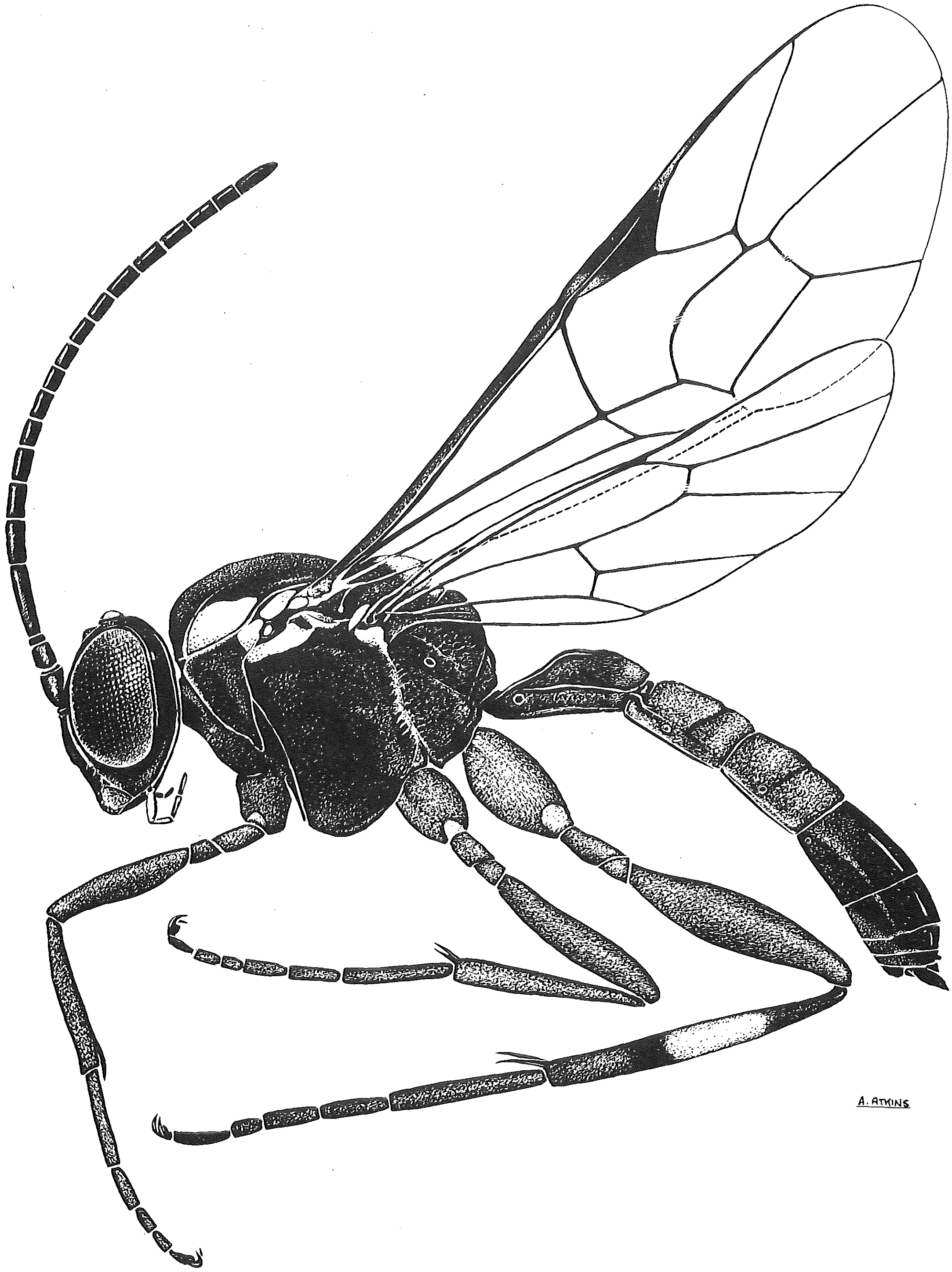


Fig. 525 *Diplazon laetatorius* ♀, lateral.

The Diplazontinae is one of the smaller subfamilies of Ichneumonidae. Currently 18 genera are recognized, the majority of which are restricted to the Holarctic region though three are endemic to the mountains of New Guinea (Diller, 1982). Although most species of diplazontines occur in the north temperate region, one species, *Diplazon laetatorius*, is a common cosmopolitan insect, frequently encountered in agricultural areas. Over much of its range this species is thelytokously parthenogenetic. In a recent review of the Australasian diplazontines Diller (1982) recognized three genera, *Diplazon*, *Syrphoctonus* and *Woldstedtius*, and five species as occurring in Australia.

DIAGNOSIS

Small to medium-sized ichneumonids, fore wing length 3-5 mm. Clypeus separated from face by groove, weakly convex, flat or slightly concave with margin concave, notched or bilobate or rarely evenly arcuate; upper tooth of mandible divided so mandible appears tridentate; frons simple; occipital carina present; flagellum of male usually with tyloids. Notaulus short or absent, sternaulus vestigial or absent; posterior transverse carina of mesosternum absent except for lateral vestiges; propodeum short, rather evenly convex with, or more usually, without carinae. Apex of fore tibia without a tooth on outer side; tarsal claws simple. Fore wing with 3*r-m* present or absent, if present enclosing an obliquely rhombic areolet. Hind wing with *Rs* about equal to or a little longer than *r-m*; distal abscissa of Cu_1 present, often weak. First segment of gaster short and rather broad, with spiracles before centre, dorsally sometimes with longitudinal carina; glymma vestigial; gaster dorsoventrally depressed, in a few females slightly compressed posteriorly. Ovipositor short, barely projecting beyond apex of gaster, with a dorsal notch about 0.5 of way along.

Diplazontines are one of the easiest ichneumonid taxa to recognize on account of their characteristic tridentate mandibles and short stocky appearance. In Australia the only species liable to be confused with diplazontines are some banchines with tridentate mandibles. These banchines are larger, have *cu-a* in the fore wing far distal to *Rs&M* (it is about opposite in diplazontines) and have the first abscissa of Cu_1 in the hind wing very short, less than 0.2 times length of *cu-a* (it is almost equal in diplazontines).

CLASSIFICATION

The Diplazontinae has been recognized as a discrete group for well over a century. Classical authors treated it as a subdivision of the Tryphoninae, the 'tryphonides schizondonti'. During the early middle part of the twentieth century this group was known by most authors as the Bassini based on a misidentification of the genus *Bassus* Nees (which is a synonym of *Alysia* Latreille, a genus of Braconidae).

The genera are fairly well defined although a few species are intermediate, making the exact generic limits somewhat arbitrary. Some authors have adopted a very broad generic concept (e.g. Beirne, 1941) but there is currently general agreement on smaller groupings (e.g. Dasch, 1964; 1982; Townes, 1971*b*; Fitton & Rotheray, 1982).

DISTRIBUTION

The majority of diplazontines are Holarctic and most genera are restricted to this region. A few genera are fairly well represented in the Neotropical region and three genera are endemic to montane New Guinea, but elsewhere only a few species of the larger genera (e.g. *Diplazon* and *Syrphoctonus*) occur.

Three genera have been found in Australia (Diller, 1982). One, *Diplazon*, is represented by a single cosmopolitan species. The other two, *Woldstedtius* and *Syrphoctonus*, are both represented by two endemic species. These seem to be restricted to the south-east of the continent.

BIOLOGY

Most diplazontines are endophagous parasites of aphidophagous syrphids, though there are a few rearings from phytophagous syrphids. Although there are numerous old records of rearings from other hosts it is now generally considered that these were erroneous (Townes, 1971*b*; Fitton & Rotheray, 1982). Oviposition is into the host egg or larva. Some species (e.g. *Syrphophilus tricinctorius* (Thunberg) and *Diplazon* spp.) show a preference for eggs over 48 hours old and young larvae (prior to the third instar) whilst others (e.g. *Enizemum* and *Syrphoctonus*) will not oviposit in eggs but will accept as hosts all larvae including those in the third instar (Rotheray, 1981*b*). Many diplazontines will devour syrphid eggs and older females will sometimes eat larvae. Oviposition is into the host haemocoel and the larva is free in the haemolymph. Development from egg to adult takes approximately three weeks under optimum conditions. The ichneumonid pupates in the host puparium from which the adult will in due course emerge. Overwintering takes place in the larval or pupal stages within the host (Scott, 1939). The peculiar mandible of diplazontines is used to make a series of semicircular cuts in the host puparium. This leads to a number of concentric strips being removed to provide an exit hole for the ichneumonid (Rotheray, 1981*a*).

The final instar larvae of diplazontines are characteristic in having a large well-sclerotized, Y-shaped labial sclerite and a very long closing apparatus adjacent to the spiracular atrium. The mandibles are small and simple and the other elements of the cephalic skeleton very weakly sclerotized (Short, 1978).

Because of their host range and the marked tendency of the older females to devour potential hosts, diplazontines may be considered harmful insects. In parts of northern Europe they can be extremely numerous around aphid colonies and must be responsible for destroying large numbers of syrphids.

KEY TO GENERA OF DIPLAZONTINAE OCCURRING IN AUSTRALIA

1 Tergites 2 and 3 of gaster with transverse grooves (Fig. 523); notaulus short but deeply impressed; hind tibia tricoloured, proximally and centrally black, separated by a white band and distally red.... ....*DIPLAZON* (p. 351)

\- Tergites 2 and 3 of gaster without distinct transverse grooves (Fig. 524); notaulus absent or very indistinct; hind tibia bicoloured, proximally orange, distally black...2

2 Clypeus with a preapical transverse impression so that it appears weakly convex in profile; flagellum of ♂ with tyloids; mesoscutum highly polished, smooth...............................*SYRPHOCTONUS* (p. 352)

\- Clypeus without preapical transverse impression, in profile slightly concave; flagellum of ♂ without tyloids; mesoscutum weakly polished, finely granulate...................................*WOLDSTEDTIUS* (p. 352)

DIPLAZON Viereck
(Whole insect, Fig. 525)

Diplazon Viereck, 1914: 46. Type-species: *Ichneumon laetatorius* F., by original designation.

Small to medium-sized species, fore wing length 4-5 mm; clypeus in profile concave, margin thin with a median impression. Notaulus strongly impressed on anterior 0.2 of mesoscutum; mesoscutum polished, punctate; propodeum centrally coriaceous, with strong lateromedian carinae which diverge strongly posteriorly, turn out and join the lateral carinae. Hind tibia banded, in Australian species, tricoloured; fore wing with 3*r-m* absent. Gaster with tergite 1 dorsally with carinae; tergites 1-4 with transverse grooves which are best developed on tergites 2 and 3 (Fig. 523).

Remarks. This is one of the larger genera in the subfamily. The majority of species occur in the Holarctic region with a few in the Neotropical region and isolated species in the mountains of South East Asia (Baltazar, 1955; Diller, 1977). A single species, *D. laetatorius*, is cosmopolitan. Over much of its range it is thelytokously parthenogenetic and is one of the most commonly collected of all ichneumonids occurring not only on all the inhabited continents but also on remote oceanic islands. *D. laetatorius* is associated with a variety of syrphids commonly found preying on aphid pests of commercial crops and probably the present distribution of this ichneumonid is a result of human activity. Being thelytokous, single introductions could rapidly establish a population in cultivated areas.

Australian species. *Diplazon laetatorius* (F.) (C).

Host records. From 'syrphid pupa' (Chadwick & Nikitin, 1976). In Europe this diplazontine is oligophagous and known to attack species of the genera *Episyrphus*, *Sphaerophoris*, *Melanostoma* and *Metasyrphus* (Fitton & Rotheray, 1982).

SYRPHOCTONUS Foerster

Syrphoctonus Foerster, 1869: 162. Type-species: *Bassus exsultans* Gravenhorst, by subsequent monotypy, Woldstedt, 1877: 391.
Homotropus Foerster, 1869: 162. Type-species: *Bassus elegans* Gravenhorst, by subsequent designation, Walkley, 1958: 57.
Homoporus Thomson, 1890: 1488. [Unjustified emendation.]
Homocidus Morley, 1911: 87. [Unnecessary replacement name for *Homoporus* Thomson.]

Small species, fore wing length 3-4 mm; clypeus in profile weakly convex, with a preapical transverse impression, with a median notch. Flagellum of ♂ with tyloids. Notaulus lacking; mesoscutum highly polished, virtually impunctate; propodeum rather smooth, usually without or with weak indistinct carinae. Hind tibia predominantly reddish or brown; fore wing with 3*r-m* present or absent. Gaster with tergite 1 with or without dorsal carinae; tergites 1-4 without transverse grooves (Fig. 524).

Remarks. *Syrphoctonus* is the largest genus in the subfamily with species in most areas though the majority occur in the Holarctic and Neotropical regions. The few species occurring in the Oriental region are restricted to montane areas (Baltazar, 1955). The Australian species are apparently restricted to the south-eastern part of the continent.

In most recent works on the Diplazontinae (e.g. Dasch, 1964; Townes, 1971*b*; Diller, 1980) the name *Homotropus* has been used for this genus whilst the name *Syrphoctonus* was applied incorrectly to the genus now named *Woldstedtius* (Carlson, 1979).

Australian species. *Syrphoctonus nigreoauratilis* Diller (E); *S. rubeoauratilis* Diller (E).

Host records. No named host in Australia but in Europe various species attack syrphids of the genera *Platycheirus*, *Syrphus*, *Episyrphus* and *Epistrophe* (Fitton & Rotheray, 1982)

WOLDSTEDTIUS Carlson

[*Syrphoctonus* Foerster; Viereck, 1914: 142. Misidentification and invalid type-species selection.]
Woldstedtius Carlson, 1979: 719. Type-species: *Bassus biguttatus* Gravenhorst, by original designation.

Small species, fore wing length 3-4 mm; clypeus in profile slightly concave, without a preapical transverse impression, with a median notch. Flagellum of ♂ without tyloids. Notaulus lacking; mesoscutum weakly polished, granulate; propodeum usually matt, without carinae. Hind tibia distally black, with proximal end paler; fore wing with 3*r-m* absent. Gaster with tergite 1 without dorsal carinae; tergites 1-4 without transverse grooves.

Remarks. This is rather a small, predominantly Holarctic genus with a few species in the Neotropical and cooler parts of the Oriental regions (Diller, 1980). In most works it has incorrectly been called *Syrphoctonus* (see above).

Woldstedtius is very closely related to *Syrphoctonus* but is maintained as a separate genus because the males lack tyloids, the clypeus is concave and lacks a preapical impression.

In Australia species of this genus are uncommon and most records are from Tasmania and Victoria.

Australian species. *Woldstedtius rubellus* Diller (E); *W. subditicius* Diller (E).

Host records. None from Australia. One European species has been reared from a syrphid of the genus *Neocnemodon* on aphid-infested apple trees (Evenhuis, 1959).

SUBFAMILY METOPIINAE
by M. G. FITTON

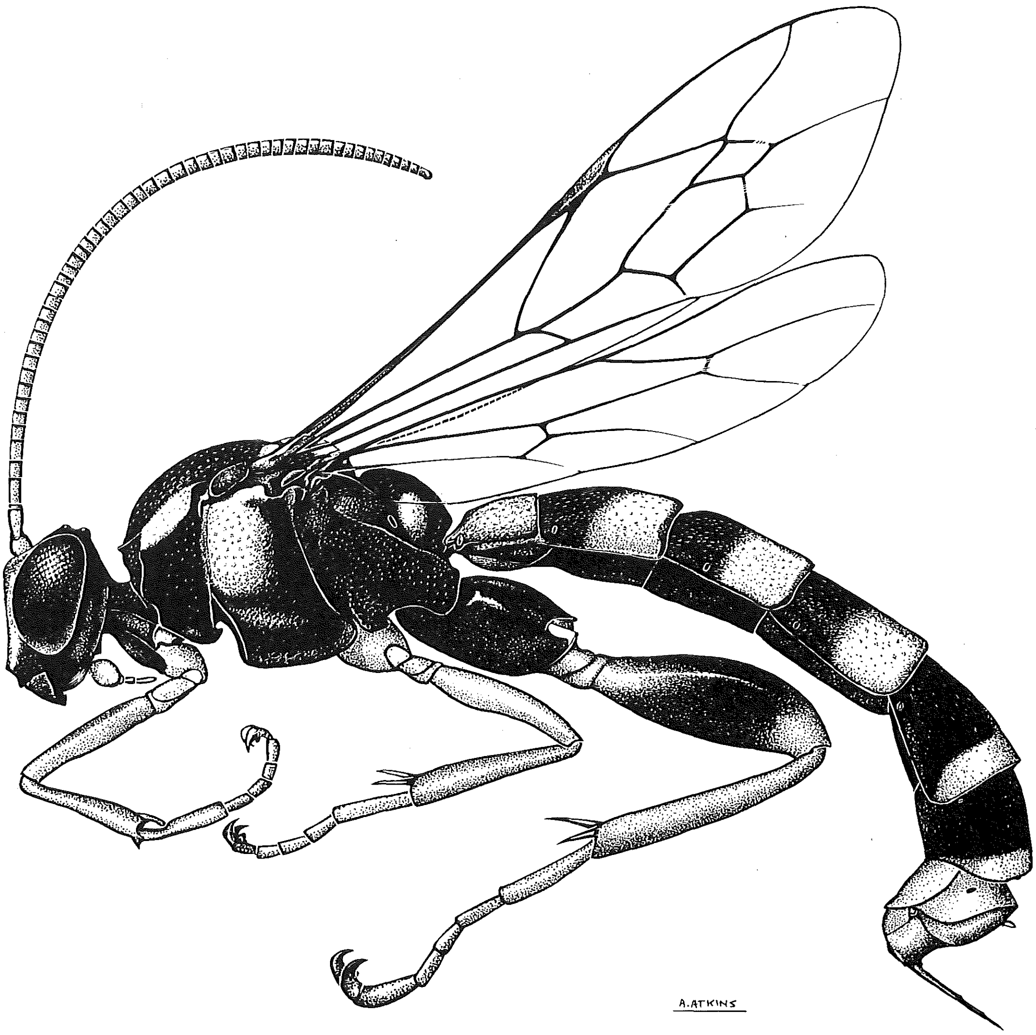


Fig. 526 *Metopius* ♀, lateral.

The Metopiinae is an average-sized subfamily with about 540 valid, described species world-wide. The two largest genera, *Exochus* and *Metopius*, account for over half of these species. Only five species, representing three genera, have been recorded previously from Australia. In the present work 10 genera are recognized, one of which, *Sciron*, is new.

DIAGNOSIS

Small to moderately large ichneumonids, fore wing length 2.6-11.1 mm. Face and clypeus forming a single convex surface or the face with a flat or concave shield-shaped area bounded by a carina; the clypeus not separated from the face by a groove; clypeus apically concave, truncate or convex; labrum sometimes conspicuously exposed; mandible with two teeth or one, sometimes strongly tapered and with the lower tooth reduced; occipital carina present or absent. Notaulus short or absent; posterior transverse carina of mesosternum complete or interrupted in front of each mid coxa. Propodeum usually with carinae; metapleuron often polished and with few hairs and little sculpture. Sulcus between fore and mid trochantellus and femur obsolete or absent; fore tibia with or without a tooth on outer distal margin; mid tibia with one or two apical spurs; tarsal claws simple or pectinate. Fore wing with *3r-m* present or absent; *2m-cu* with one or two bullae. Hind wing with the distal abscissa of Cu_1 usually present. First segment of gaster moderately long to short and stout, with spiracle before the centre, glymma present; gaster depressed, subcylindrical or compressed; laterotergites vestigial to very wide; apical tergites (at most from the seventh and differing between genera and sexes) often retracted beneath the preceding ones; female subgenital plate relatively large, more or less sclerotized; ovipositor short, not projecting beyond apex of gaster, without a dorsal subapical notch but sometimes with a weak notch some distance from the apex.

DISTRIBUTION AND CLASSIFICATION

The Metopiinae is world-wide in distribution and there are no endemic Australian genera. Many of the currently recognized genera, even those with few species, have very wide, disjunct distributions. One must conclude that either the classification of the subfamily needs considerable attention or that there are some interesting problems of zoogeography to be solved. It is already acknowledged that parts of the classification are unsatisfactory (Townes, 1971*b*: 90) but this does not immediately effect the Australian fauna and no major changes are made here. However, study of the Australian fauna has necessitated changes to some generic concepts, so that the diagnoses given although only applicable to Australia, do not agree completely with those given by Townes (1971*b*) for the world fauna. The diagnoses are brief because fuller ones could only be regarded as provisional, pending the outcome of a more extensive study. It should also be noted the Townes' key to genera is unsatisfactory for much recently collected non-Australian material (mainly because the character used in couplet 11 is unreliable).

The relationship of the Metopiinae to other subfamilies is uncertain. Carlson (1979) placed it between the Ichneumoninae and the Banchinae, but without giving reasons for so doing. Townes' (1969: 34) association of the Metopiinae and the Anomaloninae seems to be unwarranted and not indicative of any close relationship (Gauld, 1976*a*: 92-94). The limits and overall composition of the subfamily have also been in doubt since Townes (1971*b*: 90) included within it a number of genera whose affinities are uncertain.

BIOLOGY

What little is known of general metopiine biology can be summarized as follows: hosts are Lepidoptera, larval metopiines are solitary and endophagous, oviposition is into the host larva and adult emergence is from the host pupa, within which a flimsy cocoon is spun. The adult escapes by cutting off the anterior end of the host pupa. Host species are those with larvae which are exposed or lightly concealed (e.g. in leaf rolls) and oviposition is often into an early instar. Colour patterns and behaviour suggest that adults of many larger species (e.g. *Metopius*) are involved in mimicry complexes as Batesian mimics. When disturbed, adults of some smaller species (*Exochus*) are able to produce a pungent odour (Townes & Townes, 1959), which presumably has a defensive function.

There are a reasonable number of published host records. However, a great many are of dubious value because they consist of nothing more than a host species name, some not even making clear whether the record is original or merely repetition of an earlier one. It is difficult, if not impossible, to make valid generalisations about host associations, of a genus for example, from such records.

The only detailed information on metopiine biology has come from recent work on the parasites of *Zeiraphera diniana* (Guenée) (Tortricidae) in Europe. The most important observations relate to *Chorinaeus funebris* (Gravenhorst), *Triclistus podagricus* (Gravenhorst) and *Triclistus pygmaeus* (Cresson) (Aeschlimann, 1974*a*, 1974*b*, 1975). All three species are univoltine. *C. funebris* and *T. podagricus* are arrhenotokous, males forming 32-57 per cent of samples, whilst *T. pygmaeus* is deuterotokous, males being extremely rare (about 1 per cent of samples). *T. podagricus* females mainly attack third instar larvae whilst *T. pygmaeus* prefers those in the fifth instar. In *Triclistus* the ovipositor is inserted behind the head of the host larva and the egg is deposited in, or adjacent to, the suboesophageal ganglion. In *T. podagricus* the egg does not hatch until about the time of host pupation. Females of *C. funebris* insert their ovipositor into the host's anus and deposit their egg in the hind gut. The egg hatches within the gut and the first instar larva makes its way through the gut wall into the haemocoel. The hosts selected are in the last larval instar and if the parasite has not reached the host's haemocoel before pupation it perishes (possibly as a result of simple mechanical expulsion at the ecdysis). Females feed on host body-fluids after oviposition, in *Triclistus* at the site of ovipositor insertion and in *Chorinaeus* at a wound especially made with the mandibles.

The final instar larva of metopiines has a characteristic, well-sclerotized head capsule, large mandibles and either no hypostomal spur or only a vestigial one (Short, 1978). This combination of characters, notably the loss of the hypostomal spur, is associated with ichneumonids which spin only a frail cocoon within the host pupa.

KEY TO GENERA OF METOPIINAE OCCURRING IN AUSTRALIA

1 Face with a large shield-shaped area bounded by a carina (Fig. 527). Mid tibia with one apical spur.......................... *METOPIUS* (p. 360)

\- Face simply convex (Fig. 528). Mid tibia with two apical spurs (Figs 541-544)...2

2 Median process of upper margin of face continued as an interantennal lamella joining the frons in front of the median ocellus, the lamella at this point with a groove in its upper edge (Fig. 575)..................3

\- Median process of upper margin of face, if continued as an interantennal lamella then not reaching beyond antennal sockets (Fig. 576)...........4

3 Tergite 1 of gaster broad anteriorly (Fig. 530), with spiracle less than 0.32 of the tergite's length from its anterior end..*TRICLISTUS* (p. 362)

\- Tergite 1 of gaster narrower anteriorly (as in Fig. 529 or narrower), with spiracle more than 0.39 of the tergite's length from its anterior end.......................................*COLPOTROCHIA* (p. 357)

4 Tergite 3 of gaster without obvious laterotergites (Fig. 531)...............5

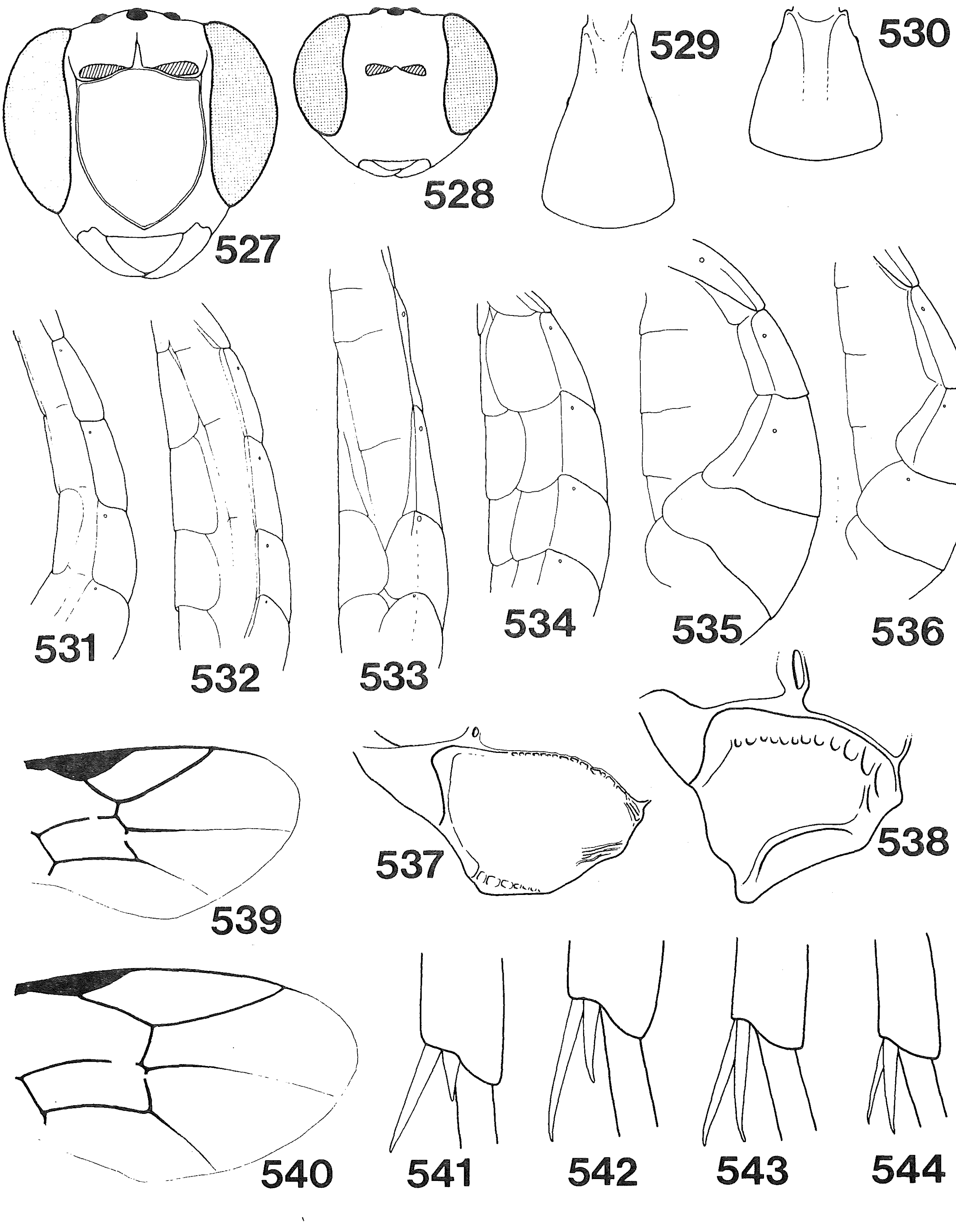
\- Tergite 3 of gaster with well-developed laterotergites (Figs 532-536).......6

5 Fore wing with *2r-m* subequal to or shorter than the abscissa of *M* between *2r-m* and *2m-cu* (Fig. 539). Tergite 2 of gaster with a single median and sublateral longitudinal carinae extending its entire length (Fig. 577).......................................*TRIECES* (p. 363)

\- Fore wing with *2r-m* many times the length of the abscissa of *M* between *2r-m* and *2m-cu* (Fig. 540). Tergite 2 of gaster with at most a trace of only a median longitudinal carina (sometimes double anteriorly) (Fig. 578).......................................*DREPANOCTONUS* (p. 358)

6 Mid tibia with the anterior apical spur much shorter than the posterior apical spur (Figs 541, 542)..........................*EXOCHUS* (p. 359)

\- Mid tibia with the apical spurs more or less subequal in length (Figs 543, 544)...7



Figs 527-544 Metopiinae. 527-528 Head, anterior (527) *Metopius* (528) *Sciron fundator*. 529-530 Gaster segment 1, dorsal (529) *Colpotrochia* (530) *Triclistus*. 531-534 Gaster segments 2-4, left ventro-lateral (531) *Drepanoctonus* (532) *Carria* (533) *Sciron* (534) *Seticornuta*. 535-536 Gaster segments 2-4, left lateral (535) *Hypsicera* (536) *Sciron fundator*. 537-538 Metapleuron, left lateral (537) *Sciron fundator* (538) *Seticornuta*. 539-540 Fore wing, right apex (539) *Trieces* (540) *Drepanoctonus*. 541-544 Mid tibial spurs, left (541) *Exochus* (542) *Exochus* (543) *Hypsicera* (544) *Sciron fundator*.

7 Tergite 2 of gaster with laterotergite very wide, overlapping the mid-ventral line (Fig. 534). Metapleuron with a complete juxtacoxal carina and with a broad furrow along its upper margin (Fig. 538)... ....*SETICORNUTA* (p. 362)

\- Tergite 2 of gaster with laterotergite relatively narrow, at most reaching two-thirds to the mid ventral line (Figs 532, 533, 535, 536). Metapleuron lacking a juxtacoxal carina and with only a very narrow groove along its upper margin (Fig. 537)............................8

8 Propodeum with anterior transverse carina present except medially (Fig. 579)...*HYPSICERA* (p. 359)

\- Propodeum with anterior transverse carina absent (Fig. 580)................9

9 Occipital carina absent. Tergite 4 of gaster with laterotergite separated by a defined crease along its entire length (Fig. 532).*CARRIA* (p. 357)

9 Occipital carina present. Tergite 4 of gaster with laterotergite separated by a defined crease only at its anterior end (Fig. 533) or not at all (Fig. 536).....................................*SCIRON* (p. 361)

CARRIA Schmiedeknecht*

Carria Schmiedeknecht, 1924: 112. Type-species: *Carria paradoxa* Schmiedeknecht, by monotypy.

Small insects, fore wing length 3.4-4.2 mm. Upper margin of face medially produced, at most, into a weak point. Occipital carina completely absent. Propodeal carination complete except that anterior transverse carina is absent. Metapleuron smooth and shining or weakly sculptured, at most with a few fine punctures around the periphery. Mid tibia with anterior spur slightly longer than posterior spur. Fore wing with 3*r-m* present or absent and with 2*r-m* more or less subequal to the abscissa of *M* between 2*r-m* and 2*m-cu*. Tergite 1 of gaster of medium length, broad anteriorly and with spiracle about 0.3 of the tergite's length from its anterior end. Tergite 2 without longitudinal carinae. Tergites 2 to 6 with laterotergites (usually narrow on tergite 2 and reaching at least halfway to the mid line on tergites 3 to 6), separated by a defined crease on tergites 2 to 5 and sometimes on 6 (Fig. 532). Tergite 7 not retracted in either sex.

Remarks. A small, widely distributed genus. Most of the species occur in Australia, New Zealand and New Guinea.

Australian species. Five, undescribed (ANIC; BMNH; TC).

Host records. None.

COLPOTROCHIA Holmgren*

Colpotrochia Holmgren, 1856 (1854): 80. Type-species: *Ichneumon elegantulus* Schrank (= *Sphex cincta* Scopoli), by monotypy.
Exochoides Cresson, 1868: 37. Type-species: *Exochoides mexicana* Cresson, by subsequent designation, Viereck, 1914: 59.
Alcocerus Foerster, 1869: 161. Type-species: *Tryphon? trifasciatus* Cresson, by subsequent monotypy, Davis, 1897: 207.
Scallama Cameron, 1899: 216. Type-species: *Scallama trilineata* Cameron, by subsequent designation, Morley, 1913*b*: 263.
Ischyrocnemopsis Ashmead, 1900*a*: 81. Type-species: *Exochoides texana* Cresson, by monotypy.
Aithris Cameron, 1900*a*: 106. Type-species: *Aithris coenutus* Cameron, by monotypy.
Aethris Schulz, 1906: 98. [Unjustified emendation.]
Inoresa Cameron, 1909: 724. Type-species: *Inoresa pilosa* Cameron, by monotypy.

Sychnoleteroides Brèthes, 1909: 229. Type-species: *Sychnoleteroides flavus* Brèthes, by monotypy.
Colpotrochioides Uchida, 1930: 263. Type-species: *Colpotrochioides orientalis* Uchida, by original designation.

Small to medium-sized insects, fore wing length 4.3-6.0 mm. Upper margin of face medially continued as an interantennal lamella joining the frons in front of the median ocellus, the lamella at this point widened and with a groove in its upper edge. Occipital carina complete dorsally. Propodeal carinae often obsolete or absent. Metapleuron smooth and polished, almost impunctate or evenly covered with small punctures. Mid tibial spurs subequal in length. Fore wing with *3r-m* present or absent and with *2r-m* shorter or longer than the abscissa of *M* between *2r-m* and *2m-cu*. Tergite 1 of gaster (Fig. 529) relatively long, narrow anteriorly and with spiracle about 0.4 or more of the tergite's length from its anterior end. Tergite 2 without longitudinal carinae. Tergite 1 without obvious laterotergites, tergites 2 to 6 with laterotergites (narrow or wide, sometimes very narrow on 2), separated by a defined crease on tergites 2 to 4. Tergite 7 partially retracted in ♀, not in ♂.

Remarks. I do not recognize the two subgenera used by Townes (1971*b*: 105). They have little value because of the difficulty of assigning to them a number of 'intermediate' species and I doubt that the subgenus *Scallama* is monophyletic. In addition the division between the whole of *Colpotrochia* and *Triclistus* is problematical.

Australian species. Two, undescribed (ANIC; TC).

Host records. The only host records are for the European species *C. cincta* (Scopoli), which has been reared from *Mythimna turca* (L.) (Aerts, 1950) and *M. conigera* (Denis & Schiffermüller) (Györfi, 1944) (Noctuidae). Morley (1913*b*: 308) noted that a specimen of *C. pilosa* (Cameron) had been bred from the nest of a eumenid wasp (*Delta campaniforme esuriens* (F.)) in India. Townes *et al*., (1961: 304) were almost certainly incorrect in concluding that the wasp was the host of the ichneumonid. It seems much more likely that the metopiine larva was already in one of the caterpillars used by the wasp to provision its nest and, following some failure in the development of the wasp, the ichneumonid completed its development.

DREPANOCTONUS Pfankuch

Drepanoctonus Pfankuch, 1911: 688. Type-species: *Drepanoctonus tibialis* Pfankuch, by monotypy.
Zonopius Benoit, 1961: 305. Type-species: *Zonopius brevicinctus* Benoit, by original designation.

Medium-sized insects, fore wing length 5.1-10.8 mm. Upper margin of face medially produced and continued to meet the frons at the level of the upper edge of the antennal sockets, the edges of the interantennal process raised into flanges (Fig. 576). Occipital carina complete dorsally. Propodeal carinae more or less obsolete, anterior transverse carina completely absent. Metapleuron covered with numerous small, strong punctures. Mid tibial spurs subequal in length. Fore wing with *3r-m* absent and with *2r-m* many times the length of the abscissa of *M* between *2r-m* and *2m-cu* (Fig. 540). Tergite 1 of gaster of medium length, broad anteriorly and with spiracle about 0.2 of the tergite's length from its anterior end. Tergite 2 with at most a trace of only a single median longitudinal carina (sometimes double anteriorly) (Fig. 578). Tergites 1 to 3 without obvious laterotergites; tergites 4 to 6 with laterotergites (reaching about halfway to the mid-ventral line), all separated by a defined crease (Fig. 531). Tergite 7 retracted in both sexes.

Remarks. A small genus with (as presently constituted) only four species outside Australia (in Europe, Madagascar, Taiwan and Burma). All the Australian species have a conspicuous black and yellow (or in one case black, yellow and red) colour pattern.

Australian species. *Drepanoctonus bifasciatus* (Brullé) (E). I have seen five undescribed species (AM; ANIC; NMV; WAM).

Host records. None from Australia. The European species (*D. tibialis* (Pfankuch)) is said to have been reared from *Drepana binaria* (Hufnagel) (Drepanidae) and *Ptilodon capucina* (L.) (Notodontidae) (Pfankuch, 1911: Short, 1978).

EXOCHUS Gravenhorst*

Exochus Gravenhorst, 1829*b*: 328. Type-species: *Ichneumon gravipes* Gravenhorst, by subsequent designation, Viereck, 1912*d*: 176.
Amesolytus Foerster, 1869: 161. Type-species: *Amesolytus ferrugineus* Ashmead, by subsequent monotypy, Ashmead, 1896: 201.
Mima Davis, 1895: 317. [Nomen nudum.]
Mima Davis, 1897: 206, 219. Type-species: *Mima washingtonensis* Davis, by monotypy. [Homonym of *Mima* Meigen, 1820.]
Xanthexochus Morley, 1913*b*: 292. Type-species: *Xanthexochus scutellatus* Morley, by monotypy.

Small to medium-sized insects, fore wing length 3.8-6.0 mm. Upper margin of face medially produced into a point, reaching towards frons but not meeting it. Occipital carina complete dorsally. Propodeal carination complete except that anterior transverse carina is sometimes absent. Metapleuron smooth and shining, sometimes with a few fine punctures. Mid tibia with anterior spur much shorter than posterior spur (Figs 541, 542). Fore wing with *3r-m* absent or sometimes present and with *2r-m* subequal to or slightly shorter than abscissa of *M* between *2r-m* and *2m-cu*. Tergite 1 of gaster of medium length, relatively broad anteriorly and with spiracle 0.3-0.4 of the tergite's length from its anterior end. Tergite 2 without longitudinal carinae. Tergite 1 without a laterotergite, tergite 2 with a very narrow laterotergite, tergites 3 to 6 with laterotergites (reaching halfway or more to the mid-ventral line), separated by a defined crease on tergites 2 to 5. Tergite 7 not retracted in either sex.

Remarks. The largest genus in the subfamily, world-wide in distribution but with most species in the north temperate region. One of the Australian species is unique in having vein *3r-m* present in the fore wing in some specimens.

Australian species. Two, undescribed (BMNH; TC; UQM).

Host records. Despite the large size of this genus there are relatively few host records. It is impossible to assess the reliability of many of these and difficult to make valid generalisations. Bauer (1934) suggests that hosts are smaller Lepidoptera, especially Tortricidae, and he dismisses the few records from Coleoptera, Symphyta and Cynipidae.

HYPSICERA Latreille

Hypsicera Latreille, 1829: 288. Type-species: *Ichneumon femoralis* Geoffroy, by monotypy.
Metacoelus Foerster, 1869: 161. Type-species: *Ichneumon femoralis* Geoffroy, by subsequent designation, Viereck, 1914: 93.
Polyclistus Foerster, 1869: 161. Type-species: *Ichneumon femoralis* Geoffroy, by subsequent designation, Viereck, 1912*d*: 176.
Plesioexochus Cameron, 1905*b*: 202. Type-species: *Plesioexochus rufipes* Cameron (= *Ichneumon femoralis* Geoffroy), by monotypy.

Small to medium-sized insects, fore wing length 2.7-6.1 mm. Upper margin of face medially produced into a blunt point but not continued as an interantennal lamella. Occipital carina present or absent dorsally. Propodeal carination complete except that medial section of anterior transverse carina is absent (Fig. 579). Metapleuron smooth and polished, sometimes with a few fine punctures near its upper margin. Mid tibial spurs subequal in length (Fig. 543). Fore wing with *3r-m* absent and with *2r-m* subequal to the abscissa of *M* between *2r-m* and *2m-cu*. Tergite 1 of gaster of medium length, narrow anteriorly and with spiracle about 0.4 of the tergite's length from its anterior end. Tergite 2 without longitudinal carinae. Tergites 1 to 6 with laterotergites (narrow or vestigial on 1 and 2; wide, reaching more than halfway to the mid-ventral line on 3 to 6), separated by a defined crease on tergites 1 to 4 (Fig. 535). Tergite 7 not retracted in either sex.

Remarks. A widely distributed genus with a concentration of species in South East Asia. No species, apart from two introductions, occur in South America.

Australian species. *Hypsicera femoralis* (Geoffroy) (C). I have seen four undescribed species (BMNH; TC).

Host records. *H. femoralis* (Geoffroy) is found often in buildings and it is assumed that is parasitizes some stored-product lepidopteran (Townes & Townes, 1959). A related species, *H. curvator* (F.), has *Tinea pellionella* (L.) (Tineidae), *Pyralis farinalis* (L.) (Pyralidae) and *Yponomeuta padella* (L.) (Yponomeutidae) as its recorded hosts and is also widely distributed and associated with man (Townes & Townes, 1959; Richards, 1949). There are no reliable host records for other species.

METOPIUS Panzer
subgenus *METOPIUS* s. str.

Metopius Panzer, 1806: 78. Type-species: *Sphex vespoides* Scopoli, by subsequent designation, Viereck, 1912*d*: 176.
Peltastes Illiger, 1807: 55. Type-species: *Ichneumon necatorius* F. (= *Sphex vespoides* Scopoli), by subsequent designation, Curtis, 1824: 4.
Peltopius Clément, 1927: 3461, 3465. Type-species: *Sphex vespoides* Scopoli, by subsequent designation, Clément, 1930: 347.

Medium to moderately large-sized insects, fore wing length 7.7-9.7 mm (Fig. 526). Face with a large shield-shaped area bounded by a carina (Fig. 527). Upper margin of face medially continued as an interantennal lamella extending about halfway to the median ocellus. Occipital carina complete dorsally. Propodeal carinae obsolete or absent except for lateromedian longitudinal carinae anteriorly. Metapleuron covered with numerous coarse punctures. Mid tibia with a single spur. Fore wing with *3r-m* present and with *2r-m* subequal to or shorter than the abscissa of *M* between *2r-m* and *2m-cu*. Tergite 1 of gaster short, broad anteriorly and with spiracle about 0.2 of the tergite's length from its anterior end. Tergite 2 without longitudinal carinae. Tergites 1 to 6 of ♀ or 7 of ♂ with large laterotergites (reaching more than two-thirds of way to mid-ventral line), all separated by a defined crease. Tergite 7 retracted in ♀, not in ♂.

Remarks. *Metopius* species are conspicuously coloured and relatively large. They are said to mimic eumenid wasps and to buzz when disturbed. About 130 species have been described. The subgenus *Metopius* is widely distributed and includes most of the species of the Old World tropics.

Australian species. *Metopius (Metopius) crassicornis* Morley stat. rev. (E); *M. (M.) michaelseni* Szépligeti (E); *M. (M.) unifenestratus* Morley (E). It was not possible to examine all material of *Metopius* in collections. The specimens seen were tentatively grouped as three species, but one of these needs further investigation because of variation in a number of characters. Townes, Townes & Gupta's

(1961: 302) synonymy of *M. crassicornis* with *M. unifenestratus* is not justified on present knowledge and their placement of the latter species in the subgenus *Ceratopius* is incorrect.

Host records. There are more host records for *Metopius* than for any other metopiine genus, probably because the hosts tend to be larger, more conspicuous Lepidoptera. The host families involved include Papilionidae, Sphingidae, Notodontidae, Lasiocampidae, Noctuidae, Geometridae and Arctiidae (Clément, 1930). The only rearing record from Australia is for *M. unifenestratus* Morley from an introduced noctuid, *Spodoptera exempta* (Walker) in Queensland (Jarvis, 1921).

SCIRON Fitton gen. n.

Type-species: *Sciron fundator* Fitton sp. n.

Small insects, of moderate proportions, fore wing length 2.7-5.7 mm. Combined face and clypeus convex, with punctate-trans-striate sculpture (Fig. 528). Upper margin of face medially produced into a weak to moderate point, not continued as an interantennal lamella. Edge of clypeus concave to weakly convex, labrum not exposed. Occipital carina complete dorsally, sometimes obsolete ventrally. Mandible narrow or broad, with two apical teeth, the lower tooth smaller than the upper. Notaulus present. Scutellum almost flat or weakly convex, with lateral carinae only at extreme anterior. Epicnemial carina complete, extending up to subtegular ridge. Subtegular ridge simple. Posterior transverse carina of mesosternum obsolete in front of each mid coxa. Sternaulus absent. Metapleuron smooth and polished, at most with a few fine punctures around the periphery (Fig. 537). Propodeal carination complete except that the anterior transverse carina is absent (Fig. 580). The dorsal areas of the propodeum often trans-striate, or punctate or smooth. Propodeal spiracle subcircular. Mid tibia with spurs more or less subequal in length (Fig. 544). Fore wing with 3*r-m* present or absent and with 2*r-m* longer or shorter than the abscissa of *M* between 2*r-m* and 2*m-cu*. Hind wing with distal abscissa of Cu_1 absent or present as a faint trace. Gaster tapering anteriorly, weakly depressed, subcylindrical or strongly compressed from the posterior of segment 3. Tergite 1 of medium length, narrow anteriorly, with lateromedian longitudinal carinae present or absent, and with the spiracle 0.2-0.3 of the tergite's length from its anterior end. Tergite 2 without longitudinal carinae. Tergites 1 and 2 without obvious laterotergites, tergites 3 to 6 with relatively wide laterotergites, which are separated by a defined crease only on tergite 3 and sometimes at the anterior of tergite 4 (Figs 533, 536). Tergite 7 not retracted in either sex. Ovipositor with a weak dorsal notch some distance from the apex.

Etymology. A proper name, a noted robber, killed by Theseus. Masculine.

Remarks. A relatively large genus in Australia. A further six species (all undescribed) are known from New Guinea and New Zealand. Three small Neotropical species-groups (only six species in total, all undescribed) resemble *Sciron* and may be congeneric. *Sciron* itself seems closest to *Carria* and *Hypsicera*.

Australian species. I have seen 15 Australian species (AM; ANIC; BMNH; TC), one of which is described below.

Sciron fundator Fitton sp. n.

Female and male: fore wing length 2.6-3.3 mm. Upper margin of face medially produced into a weak point (Fig. 528). Edge of clypeus almost straight. Occipital carina obsolete ventrally. Mandible narrow apically, the lower tooth about half the size of the upper. Dorsal areas of propodeum finely trans-striate (Fig. 580). Fore wing with 3*r-m* present, 2*r-m* slightly shorter than abscissa of *M* between 2*r-m* and 2*m-cu*. Gaster subcylindrical, tapering anteriorly. Tergite 1 with lateromedian longitudinal carinae reaching to about midlength. Laterotergite of tergite 4 not separated by a crease at its anterior end.

Blackish species: tegula and proximal sections of wing veins, fore and mid legs, and hind trochanter, trochantellus, femur proximally, tibia and tarsus reddish-yellow. Tibiae of all legs more or less infuscate distally. Palps whitish.

Material examined

Holotype ♀, Queensland: Mt Tambourine, 14.xi-12.x.1978 (*Galloway*) (ANIC).

Paratypes. Queensland: 3 ♀, same data as holotype (BMNH); 3 ♀, 1 ♂, same data except x.1977 (BMNH); 2 ♀, same data except xi.1977 (BMNH): 11 ♀, same data except 20.x-14.xi.1978 (ANIC; BMNH; TC); 7 ♀, Mt Glorious, xii.1976 (*Boucek*) (BMNH); 10 ♀, Mt Glorious, ii-vi.1977 (*Hiller*) (AM; BMNH): 6 ♀, 1 ♂, Brisbane, Long Pocket, 1977 (*Galloway*) (BMNH); 16 ♀, 2 ♂, Brisbane, Long Pocket, ix.1977 (*Galloway*) (DPIQ; NMV; QM; WAM). Australian Capital Territory: 1 ♂, Canberra, Black Mountain, x.1976 (*Boucek*) (BMNH).

Host records. None.

SETICORNUTA Morley*

Megatrema Cameron, 1907*c*: 468. Type-species: *Megatrema albopilosa* Cameron, by monotypy. [Homonym of *Megatrema* Leach, 1825.]

Seticornuta Morley, 1913*b*: 310. Type-species: *Seticornuta albicalcar* Morley (= *Megatrema albopilosa* Cameron), by monotypy.

Moderately large insects, fore wing length 10.0-11.1 mm. Upper margin of face medially produced into a blunt point but not continued as an interantennal lamella. Occipital carina complete dorsally. Propodeal carination complete except that anterior transverse carina is absent. Metapleuron with a complete juxtacoxal carina and a broad furrow along its upper margin, the remainder bare and polished (Fig. 538). Mid tibial spurs subequal in length. Fore wing with 3*r-m* present and with 2*r-m* slightly longer than the abscissa of *M* between 2*r-m* and 2*m-cu*. Tergite 1 of gaster short, broad anteriorly and with spiracle about 0.3 of the tergite's length from its anterior end. Tergite 2 without longitudinal carinae. Tergites 1 to 6 of ♀ or 7 of ♂ with very large laterotergites (those on 2 to 5 of ♀, 6 of ♂ overlapping the mid-ventral line), all separated by a defined crease (Fig. 534). Tergite 7 not retracted in either sex.

Remarks. A small genus. The Australian species belongs to the same species-group as the type-species and is immediately recognizable, being entirely black (including the wings, which have a metallic, bluish reflection) except for the fore legs, which are orange.

Australian species. One, undescribed (ANIC; BMNH; QM; TC).

Host records. Two specimens of the Australian species were reared: one from an unidentified cocoon, the other from a pyralid on *Acacia decurrens* (both ANIC). The Nearctic species have also been reared: *S. apicalis* (Cresson) from several *Acrobasis* species (Pyralidae) (Townes & Townes, 1959) and *S. terminalis* (Ashmead) from *Nephopteryx* species (Carlson, 1979). It should be noted that the Nearctic species assigned to *Seticornuta* differ markedly from those in the Old World.

TRICLISTUS Foerster*

Triclistus Foerster, 1869: 161. Type-species: *Exochus podagricus* Gravenhorst, by subsequent designation, Morley, 1913*b*: 300.

Small insects, fore wing length 3.5-5.7 mm. Upper margin of face medially continued as an interantennal lamella joining the frons in front of the median ocellus, the lamella at this point widened and with a groove in its upper edge (Fig. 575). Occipital carina complete dorsally. Propodeal carination complete except that the anterior transverse carina is absent and lateromedian longitudinal carinae are sometimes obsolete. Metapleuron smooth, shining and impunctate or weakly sculptured with a few punctures. Mid tibial spurs subequal in length. Fore wing with *3r-m* present or absent and with *2r-m* slightly longer than the abscissa of *M* between *2r-m* and *2m-cu*. Tergite 1 of gaster (Fig. 530) of medium length, relatively broad anteriorly and with spiracle about 0.3 of the tergite's length from its anterior end. Tergite 2 without longitudinal carinae. Tergites 1 and 2 without obvious laterotergites; tergites 3 to 5 with relatively narrow laterotergites, separated by a defined crease on tergites 3 and 4. Tergite 7 retracted in ♀, partially retracted in ♂.

Remarks. This is a fairly large, widely distributed genus.

Australian species. Three, undescribed (AM; ANIC).

Host records. *Triclistus* species parasitize a range of smaller Lepidoptera, with more than half of the recorded hosts belonging to the Tortricidae (Aeschlimann, 1973*b*; Kusigemati, 1971; Townes & Townes, 1959). The biology of *T. pygmaeus* (Cresson) in Europe has been investigated by Aeschlimann (1974*a*, 1975).

TRIECES Townes*

Trieces Townes, 1946: 60. Type-species: *Exochus texanus* Cresson, by original designation.

Small insects, fore wing length 2.6-3.6 mm. Upper margin of face medially produced into a blunt point, but not continued as an interantennal lamella. Occipital carina complete dorsally. Propodeal carination complete except that anterior transverse carina is absent. Metapleuron with a complete juxtacoxal carina, some striations on its posterior part and with fine punctures (varying in extent). Mid tibia with anterior spur much shorter than posterior spur. Fore wing with *3r-m* absent and with *2r-m* subequal to or shorter than the abscissa of *M* between *2r-m* and *2m-cu* (Fig. 539). Tergite 1 of gaster of medium length, broad anteriorly and with spiracle about 0.2-0.3 of the tergite's length from its anterior end. Tergite 2 with a single median and sublateral longitudinal carinae extending its entire length (Fig. 577). No tergites with laterotergites. Tergite 7 retracted in ♀, not in ♂.

Remarks. A moderately large genus, world-wide in distribution.

Australian species. Three, undescribed (ANIC; BMNH).

Host records. Smaller Lepidoptera feeding on trees and shrubs serve as hosts for *Trieces* in the north temperate region. Several families of Lepidoptera are involved (Kusigemati, 1967, 1971; Aeschlimann, 1973*a*; Carlson, 1979).

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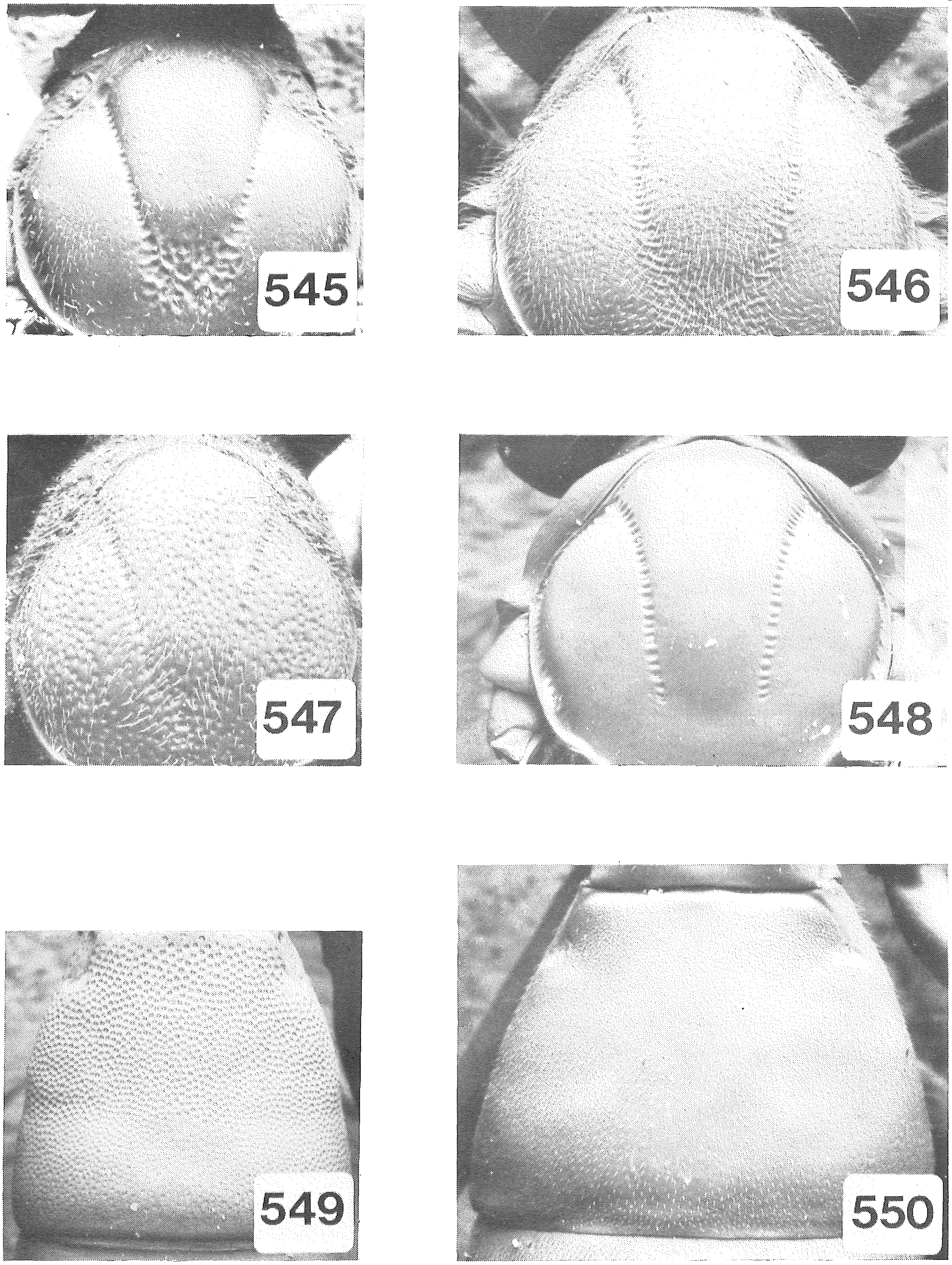
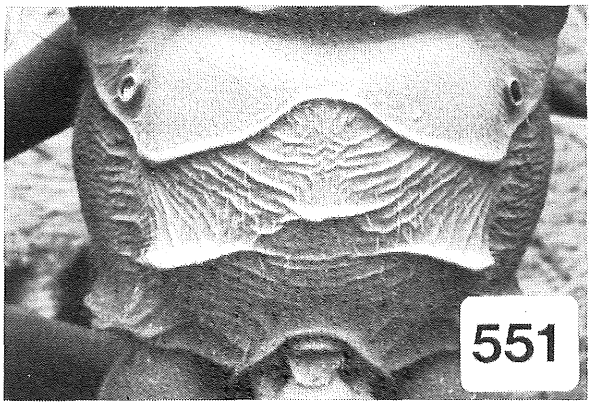
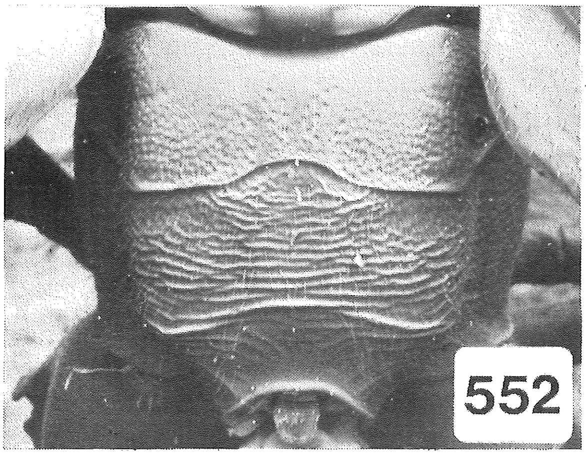
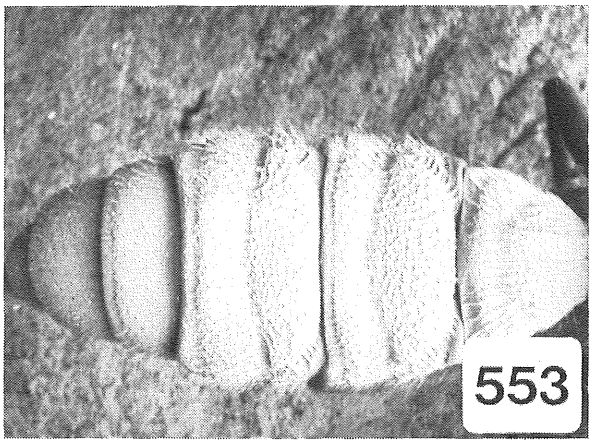
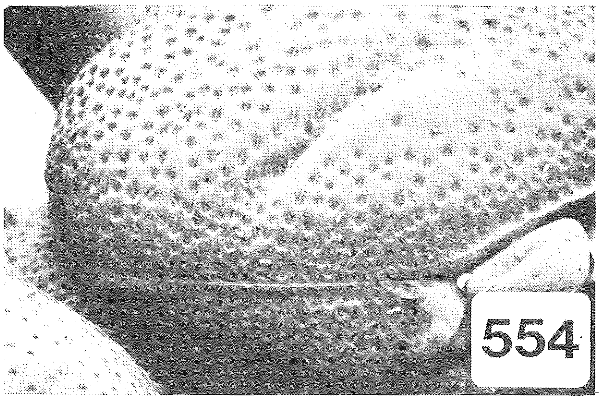


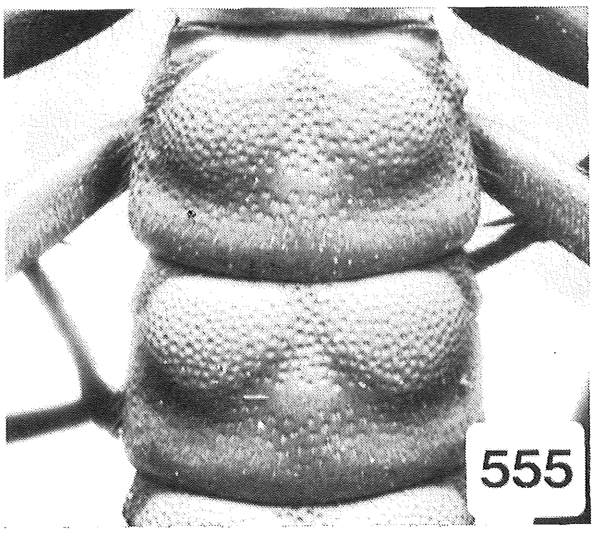
Figs 545-550 Stereoscan photographs of Phygadeuontinae. 545-548 Mesoscuta (545) *Goryphus* (546) *Ischnus* (547) *Allophatnus* (548) *Glabridorsum*. 549-550 Tergite 2 of gasters (549) *Goryphus* (550) *Takastenus*.

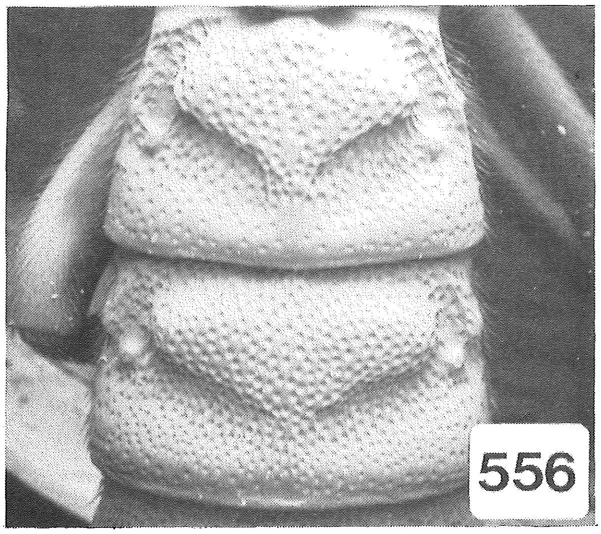




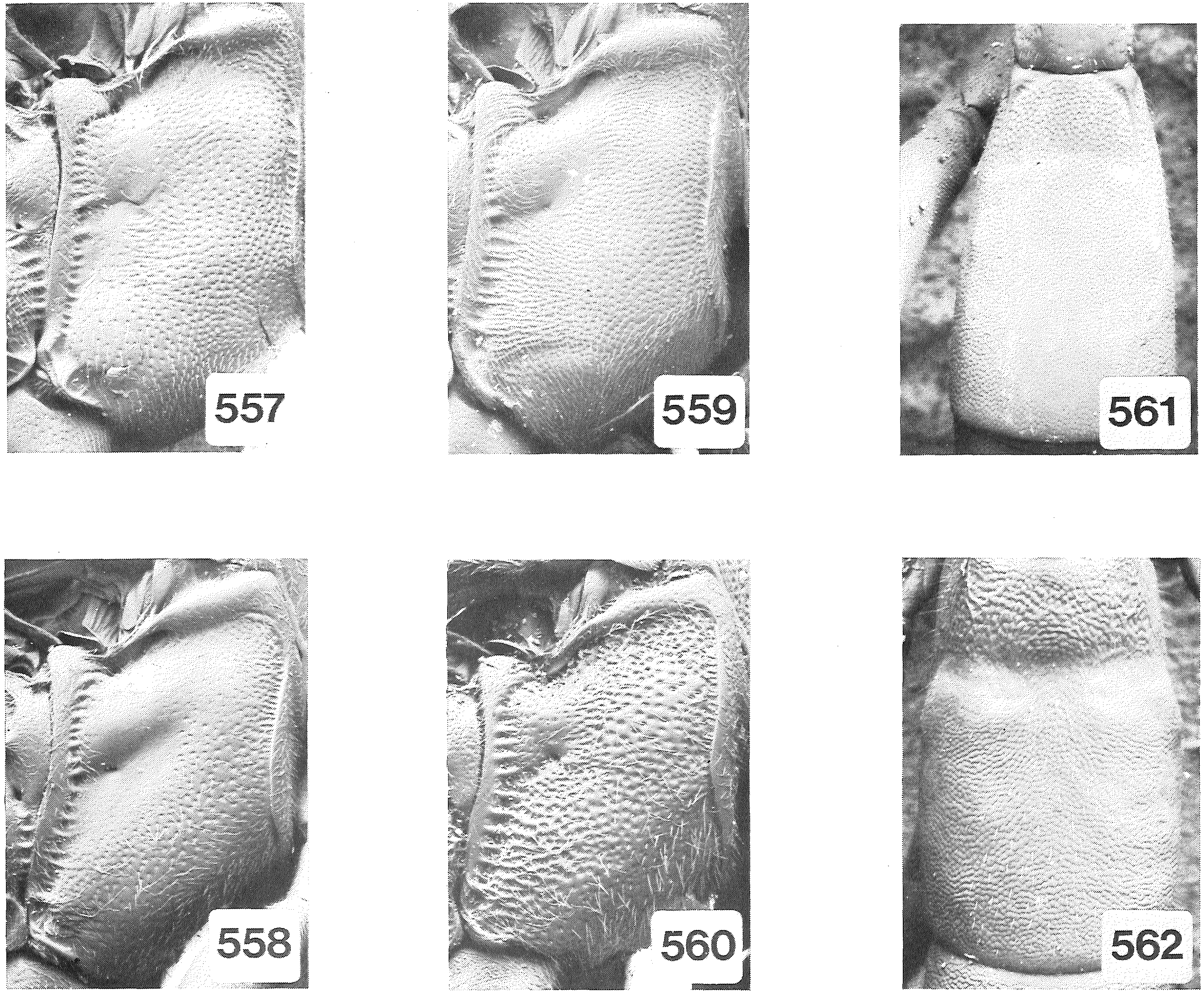




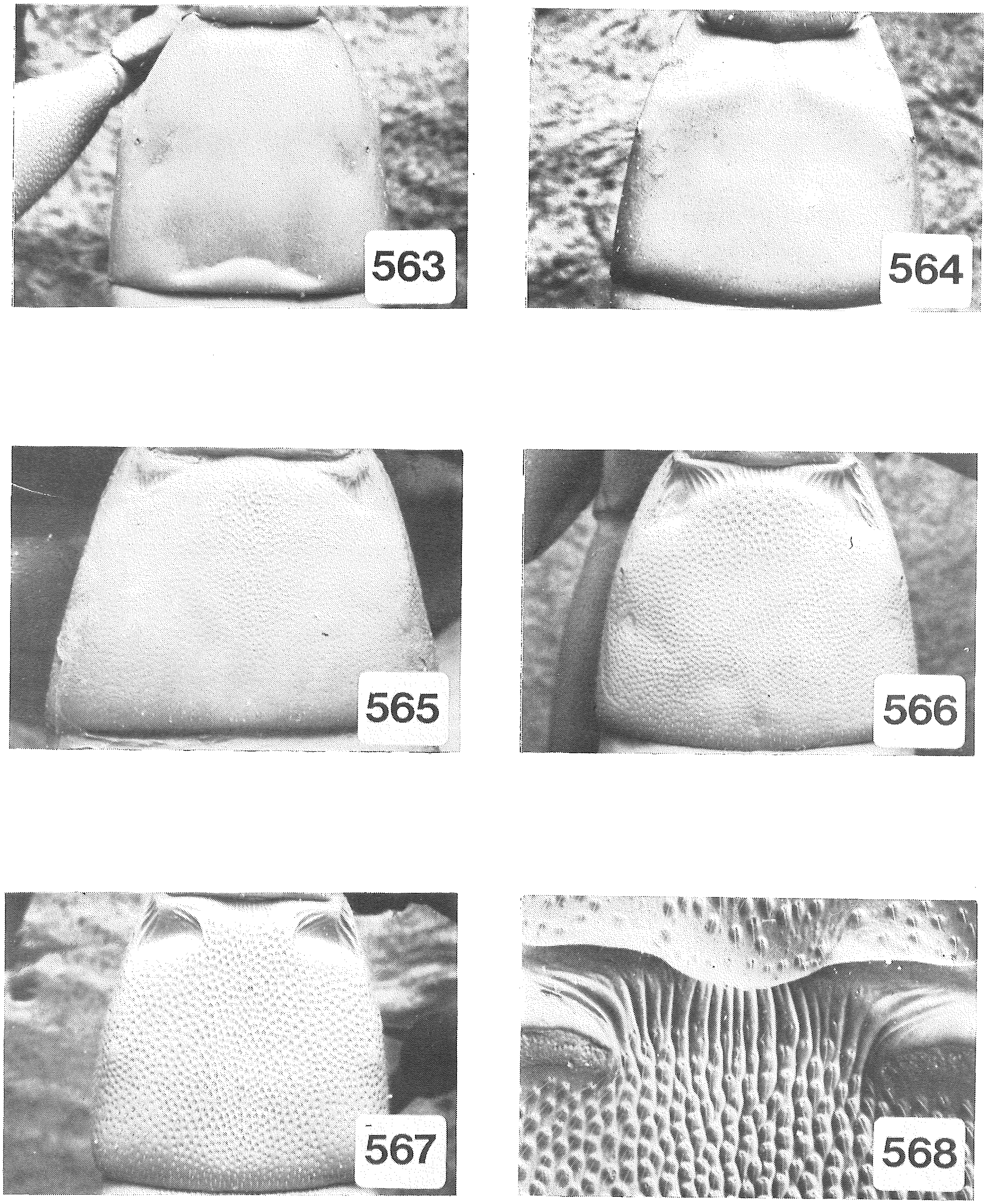




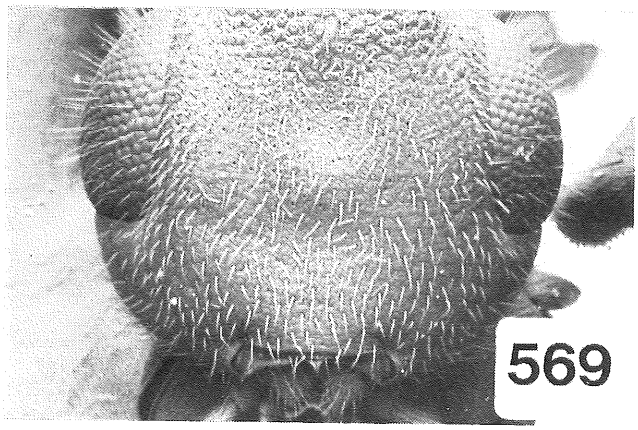
Figs 551-556 Stereoscan photographs of Phygadeuontinae, Ctenopelmatinae and Pimplinae. 551-552 Propodea (551) *Lophoglutus* (552) *Xanthocryptus*. 553 Gaster, dorsal *Astomaspis*. 554 Notaulus, *Dictyophelte*s. 555-556 Tergite 2 of gasters (555) *Sericopimpla* (556) *Camptotypus*.

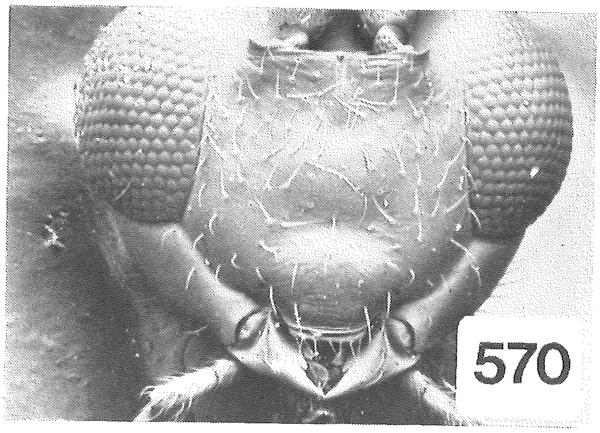


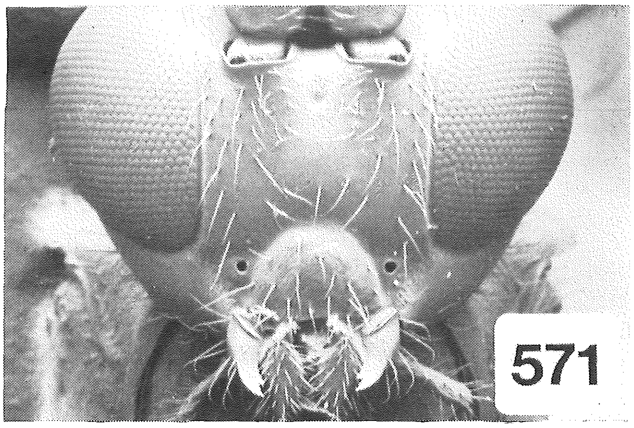
Figs 557-562 Stereoscan photographs of Ichneumoninae. 557-560 Mesopleurae (557) *Platylabus* (558) *Lissosculpta* (559) *Setanta* (560) *Ichneumon*. 561-562 Tergite 2 of gasters (561) *Longichneumon* (562) *Diadromus collaris*.

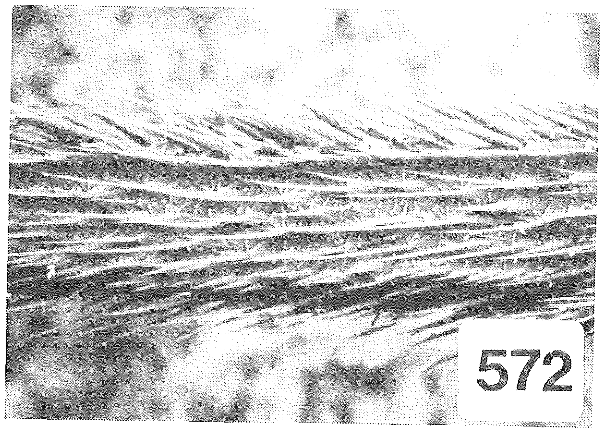


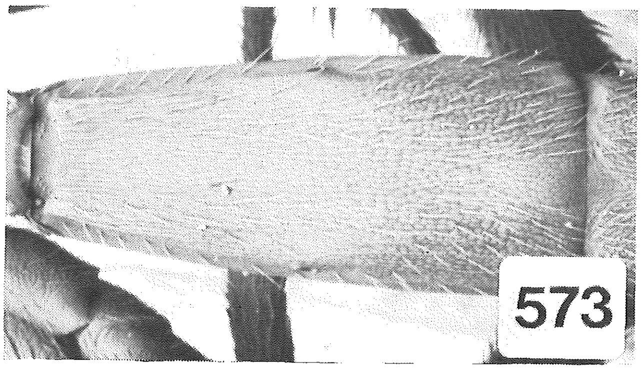
Figs 563-568 Stereoscan photographs of Ichneumoninae. 563-567 Tergite 2 of gasters (563) *Akymichneumon* (564) *Phairichneumon* (565) *Eutanyacra* (566) *Setanta* (567) *Lissosculpta*. Anteromedial part of tergite 2, *Lissosculpta*.

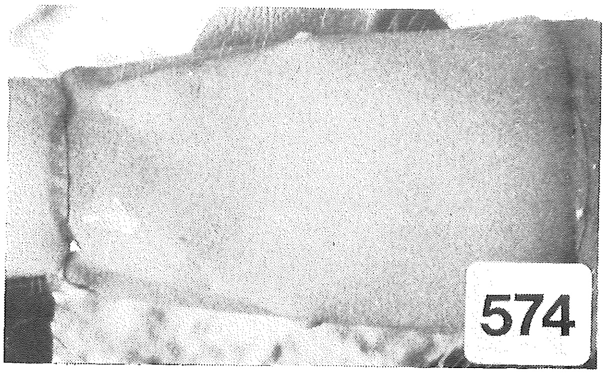




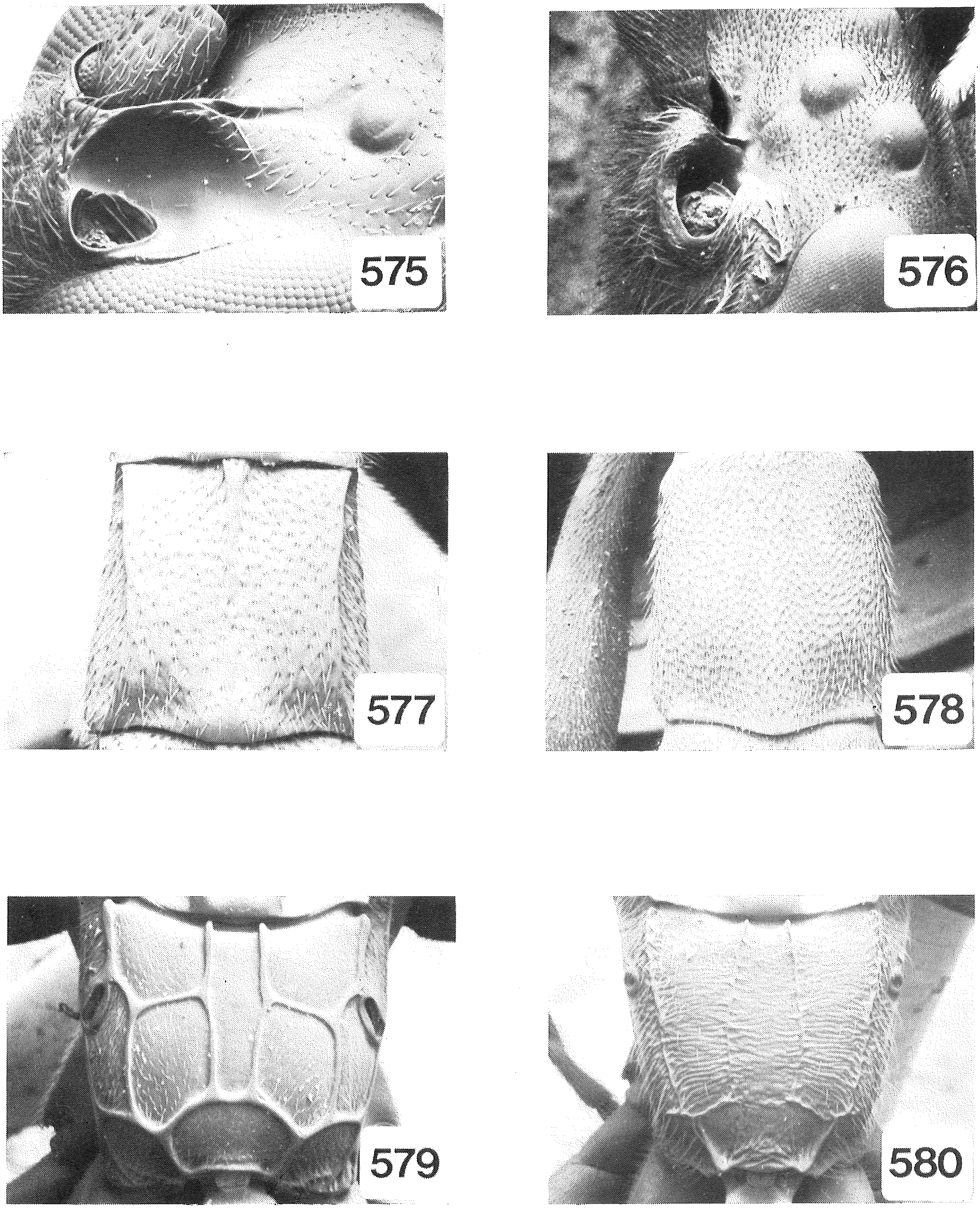








Figs 569-574 Stereoscan photographs of Orthocentrinae, Oxytorinae, Campopleginae and Cremastinae. 569-571 Faces (569) *Orthocentrus trichomma* (570) *Plectiscus* (571) *Megastylus*. 572 Hind basitarsus, ventral *Melalophacharops*. 573-574 Tergite 2 of gasters (573) *Temelucha* (574) *Pristomerus*.



Figs 575-580 Stereoscan photographs of Metopiinae. 575-576 Interantennal lamella, left dorso-lateral (575) *Triclistus* (576) *Drepanoctonus*. 577-578 Gaster segment 2, dorsal (577) *Trieces* (578) *Drepanoctonus*. 579-580 Propodeum, dorsal (579) *Hypsicera* (580) *Sciron*.

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INDEX TO HOSTS

INDEX TO ICHNEUMONIDAE

Valid names are in roman, synonyms in *italics* and principal references are underlined.