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# A KEY TO THE AUSTRALIAN FAMILIES OF ACALYPTRATE DIPTERA (INSECTA)

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(Figs. 1-5). Manuscript Received 23. 1. 58.

## SYNOPSIS

An artificial key to all the families of the superfamily Acalyptrata believed to occur in Australia and one other Australian family of similar facies is presented. Notes on the setting out of the key and some of the important characters used are included. The superfamily Acalyptrata is briefly defined and the family location of certain genera is emended. A list of families with the more important synonyms is provided.

## INTRODUCTION

Australian entomologists wishing to make identifications of Diptera have experienced great difficulty in allocating material to the families of the superfamily Acalyptrata and it has frequently been stated that no satisfactory key to the Australian families exists. Two important keys to the dipterous families of the world have been in common use in recent years, one in German by Hendl (1938), and one in English by Brues and Melander (1932), revised by Brues, Melander and Carpenter (1954). These keys are of great assistance but some of the characters used, most notably the number of breaks in the costa, are much too variable to warrant the importance attributed to them. Moreover these authors were not very familiar with the Australian fauna and many of the characters useful in placing Holarctic forms do not apply to Australian representatives of the same families.

The author has attempted to make the present key as comprehensive as possible. He has examined the descriptions and all available material of the more aberrant genera recorded from Australia and much material of unrecorded forms. The arrangement used in the key has not been arrived at quickly. The scheme has been altered many times and prolonged consideration has been given to certain points. It is now considered likely that only some of the more unusual forms as yet unknown to the author will fail to run to the correct family. However, it should be remembered that the Acalyptrata of the western half of the Australian continent are almost unknown, whilst there are probably some aberrant forms still to be discovered in the east.

The characters here used are frequently not available for distinguishing non-Australian forms. It has been found impracticable to attempt a phylogenetic arrangement. The characters which provide evidence for relationship between families are frequently too inconstant for use in the key.

Certain families have been stated to occur in Australia, but their presence must be considered doubtful as no species are recorded and no material is available. The family Cordyluridae, though once placed in the Acalyptrata, is now accepted as belonging to the Calyptrata. To avoid confusion it has been included in the key. The family Conopidae has been variously placed in the Acalyptrata, Syrphoidea, or in a superfamily to itself, the Conopoidea. Recent investigations suggest that the family is best placed in the Acalyptrata. The family Braulidae, which has been referred to the Pupipara and to the Phoroidea, is included in the Acalyptrata by some recent authors (*e.g.*, Hennig, 1938). The latter course is here followed.

Where there may be some doubt as to the reason for accepting a family as Australian or as to why a family is placed at a certain position in the key, the names of all Australian genera running to this point in the key are placed in brackets before the family name.

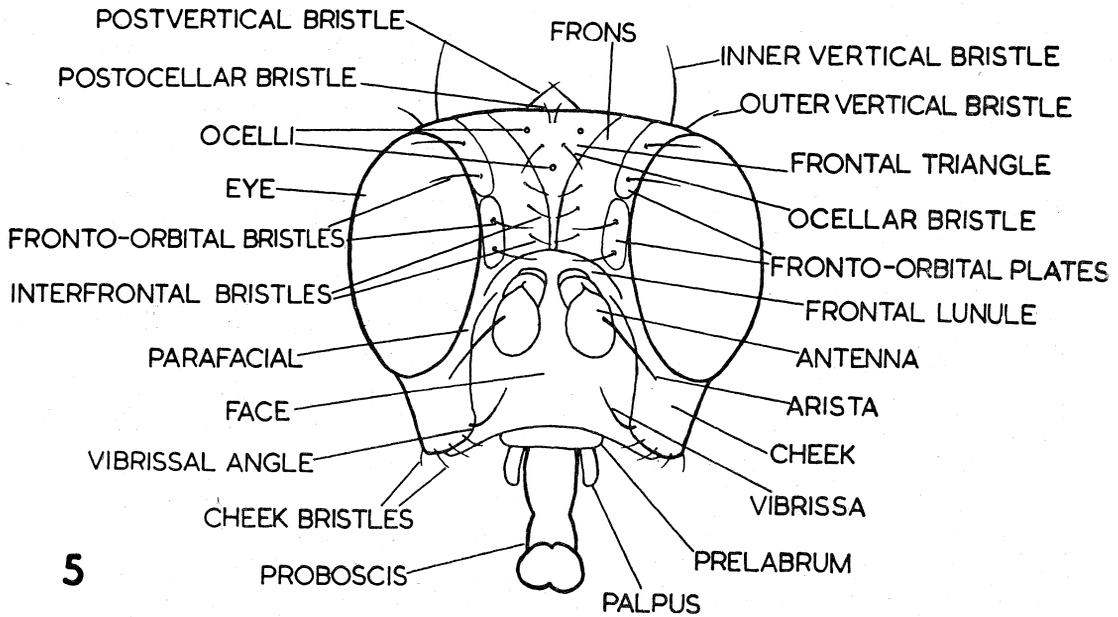
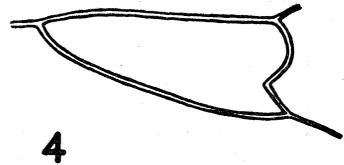
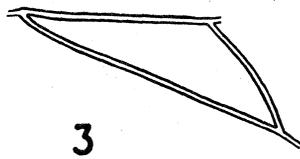
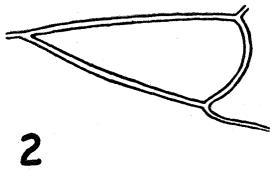
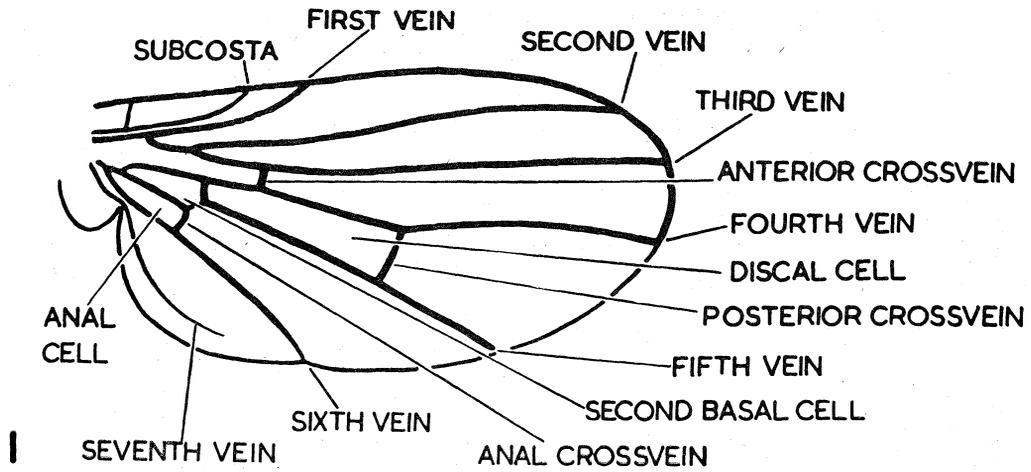
## NOTES ON SOME CHARACTERS USED IN THE KEY

*Wing Venation.*—There is still so much disagreement concerning the homologies of the veins in the Diptera that it seems best to adhere to an old, but not disused, system of numbering the veins from front rear. Only the subcosta (auxiliary vein of many authors) is here referred to by a name indicating its homologies in other groups.

In addition to the longitudinal veins there are three principal transverse veins, usually inaccurately called crossveins. These are the inner or anterior crossvein, the posterior or discal crossvein, and the anal crossvein.

The principal cells of the wing used in classification are the discal, anal and second basal cells. The form of the anal cell is an important character (see Figs. 2 to 4). Fig. 1 illustrates the terminology of the veins and cells used in the key.

*Chaetotaxy.*—Chaetotaxy refers to the arrangement and number of the cuticular bristles. For the purposes of description a bristle is defined as a hair of outstanding length and thickness. The smaller thickened hairs are termed setulae. The distinction between bristles and setulae is only one of degree but is a most convenient one. It is not considered necessary to describe or illustrate the thoracic chaetotaxy of muscoid Diptera as satisfactory accounts and diagrams appear in most textbooks of systematic entomology (*e.g.*, Tillyard, 1926, Fig. W12). The chaetotaxy of the head is less frequently fully described and is therefore illustrated in Fig. 5.



FIGS. 1 TO 5.

Diagrams of Acalyprate structure to illustrate terminology. 1, Wing. 2, Anal cell in which the anal crossvein is recurved. 3, Anal cell of the type occurring in Conopidae. 4, Anal cell which is acutely produced through the angulation of the anal crossvein. 5, Anterior aspect of head.

## SUPERFAMILY ACALYPTRATA

## Diagnostic Description

Cyclorrhaphous Diptera having three antennal segments, the distal one usually bearing a hair-like arista on its dorsal surface. Second antennal segment with dorsal longitudinal suture, when present, almost invariably not reaching to base. Ptilinal suture present. Posthumeral bristles (as distinct from presutural bristles) not developed. Transverse suture of mesoscutum usually interrupted in middle. Inner squame of wing base usually vestigial.

## NOTES ON THE FAMILY LOCATION OF SOME GENERA

The systematic position of the following Australian genera requires clarification.

*Fergusonina* Malloch has been placed in the Agromyzidae. Frick (1952) states that it does not belong to that family but does not suggest any other family to which it might be related. Tonnoir (1937), presented evidence suggesting that *Fergusonina* belongs to a distinct family but set up for it a new subfamily, Fergusoninae, of the Agromyzidae. As there seems more evidence for relationship to the Agromyzidae than to any other family Tonnoir's course is tentatively accepted. The name of the subfamily is emended to Fergusonininae in accordance with the International Rules of Zoological Nomenclature.

*Waterhouseia* Malloch (1936) was originally tentatively placed in the family Anthomyzidae. The differences from all other genera of the family are so great that this position seems inappropriate. I have carefully examined the type of *W. cyclops* Malloch, the only known specimen representing the genus, but have been unable to find evidence for close relationship to any known family. Until more specimens are obtained we can only accept the slender evidence presented by Malloch for its allocation to the Anthomyzidae.

*Aphaniosoma* was recorded from Australia by Malloch (1925) as a geomyzid but the genus is generally placed in the Chiromyiidae being closely related to *Chiromyia*.

The genus *Minda* Paramonov (1957) was considered to represent a new monotypic family, Mindidae. *Minda* is synonymous with *Pemphigonotus* Lamb (1917) (**syn. nov.**) as its type species, *M. rubra* Paramonov is very similar to *P. mirabilis* Lamb, the type of *Pemphigonotus*, though it may be specifically distinct. Paramonov's specific name is preoccupied by *Chlorops rubra* de Meijere (1910) which has been transferred to *Pemphigonotus* by Sabrosky (1940). The representatives of this genus had always been referred to the Chloropidae prior to Paramonov's recent work.

Through the courtesy of Dr. Paramonov and Mr. F. A. Perkins, the author has been able to examine specimens in the collection of the C.S.I.R.O. Division of Entomology and the Entomology Department, University of Queensland, and is now fully convinced that *Pemphigonotus* is only a slightly atypical chloropid. In support of this conviction the following notes are offered.

Of the characters mentioned by Paramonov "which separate this genus from all other Acalyptrate families and genera", all are found in the Chloropidae. Three other characters are most unusual for the Chloropidae. I have not met with any other chloropid with the costa unbroken but this character is known to vary in some other acalyptrate families. The very oblique posterior (discal) crossvein is also an unusual character for the Chloropidae. The costal cell (external subcostal cell of Paramonov) is slightly longer than in other Chloropidae but is not, as Paramonov supposed, longer than in most Periscelididae.

The postvertical bristles are present and convergent as in most Chloropidae, though very small, in *Pemphigonotus* contrary to Paramonov's statement, "entirely lacking bristles on the whole body". The notopleural, prescutellar dorsocentral and scutellar bristles are scarcely differentiated from the surrounding hairs in some other Chloropidae (e.g., *Batrachomyia atricornis* Malloch). The whole subfamily Chloropinae of the Chloropidae has the subcosta scarcely extending beyond the apex of the third vein ( $R_5$ ), exactly as in *Pemphigonotus*. There is at least one other carrion-feeding species in the Chloropidae, *Prohippaelates nigricornis* (Thomson), which breeds in stranded marine molluscs. The structure of the epistome in *Pemphigonotus*, as described by Paramonov, is the same as that in many genera of Chloropidae but quite distinct from that of other Acalyptrata. The depressed elongate pollinose area on the dorsal surface of the hind tibia is another character occurring only in certain Chloropidae. A further important character of *Pemphigonotus* which has been overlooked is the strongly developed vertical carina on the propleuron, which is confined to, and is quite constant in, the Chloropidae among the Acalyptrata.

In view of the fact that its type genus is a chloropid the family Mindidae must be sunk as a synonym of Chloropidae (**syn. nov.**).

The author agrees with Sturtevant (1954) and Hennig (1956) in placing *Stenomicro* in the Anthomyzidae rather than the Asteiidae or Periscelididae. He is doubtful if the transference of *Cyamops* from the Periscelididae to the Anthomyzidae proposed by Sturtevant (1954), is justified.

## LIST OF FAMILIES INCLUDED IN KEY, WITH MORE IMPORTANT SYNONYMS

- Superfamily Calyptrata.  
 Cordyluridae (Scatophagidae, Scatomyzidae).  
 Superfamily Acalyptrata.  
 Conopidae.  
 Micropezidae (Tylidae, including Calobatidae).  
 Neriidae.  
 Pyrgotidae.  
 Platystomatidae (Platystomidae).  
 Ulidiidae (including Chaetopsidae).  
 Trypetidae (Tephritidae, Trypaneidae).  
 Agromyzidae (including Phytomyzidae).  
 Lonchaeidae.  
 Sciomyzidae (Tetanoceridae, including Sepedonidae).  
 Neottiophilidae.  
 Rhinotoridae.  
 Sepsidae.  
 Piophilidae.  
 Thyreophoridae.  
 Psilidae.  
 Lauxaniidae (Sapromyzidae).  
 Chamaemyiidae (Ochthiphilidae).  
 Coelopidae (Phycodromidae).  
 Helomyzidae (including Trixoscelidae or Trichoscelidae).  
 Chironomyiidae (Chyromyiidae).  
 Clusiidae (Heteroneuridae, Clusiodidae).  
 Anthomyzidae.  
 Drosophilidae.  
 Asteiidae (Astiidae).  
 Periscelididae (Periscelidae).  
 Canaceidae.  
 Ephydriidae.  
 Sphaeroceridae (Borboridae, Cypselidae, including Leptoceridae).  
 Chloropidae (Oscinidae, including Mindidae).  
 Cryptochaetidae.  
 Milichiidae (Phyllomyzidae, including Carnidae).  
 Tethinidae.  
 Braulidae.

## KEY TO AUSTRALIAN FAMILIES OF ACALYPTRATA

1. Wings altogether absent; mesoscutum very short and resembling the abdominal segments;  
 scutellum absent ..... BRAULIDAE  
 Functional wings present; mesoscutum large; scutellum present ..... 2
2. Subcosta complete, separate from first vein or meeting it only at apex ..... 3  
 Subcosta apically indistinct, fused with first vein, or joined to it by sclerotization of the  
 intermediate region ..... 21
3. Occiput broadly flattened so that the head is very closely fitted to the thorax; antennae  
 decumbent, the third segment discoid; tarsi with terminal segment triangular and wider  
 than other segments; principally sea shore species ..... COELOPIDAE  
 Not as above ..... 4
4. Metathoracic spiracle with one or more fine setulae on lower margin; face with a row of  
 setulae on each side from which the vibrissae are usually not well differentiated; palpi  
 vestigial; ant-like flies with subspheroid head and abdomen constricted basally ..... SEPSIDAE  
 No setulae on lower margin of metathoracic spiracle; other characters not all as above ..... 5

5. One or rarely two pairs of outstanding vibrissae..... 6  
 Vibrissae absent or vibrissal angle with a row of undifferentiated setulae..... 11
6. Vertex excavated; postvertical bristles convergent or absent; preapical tibial bristles vestigial ..... (*Cairnsimyia*) RHINOTORIDAE  
 Vertex not excavated; postverticals usually present ..... 7
7. Postvertical bristles convergent; preapical dorsal bristles present on at least some tibiae ... 8  
 Postvertical bristles divergent or absent ..... 9
8. Anal crossvein almost straight; one or two dorsocentrals; femora thickened, with stout ventral spines; costa not spinose ..... (*Tapeigaster*) NEOTTIOPHILIDAE  
 Anal crossvein recurved; three to five dorsocentrals; at most only the hind femora spinose ventrally; costa often with distinct spines ..... HELOMYZIDAE, part
9. Mesoscutal transverse suture complete; orbital plates continuous with parafacials and bearing incurved lower fronto-orbitals ..... CORDYLURIDAE  
 Mesoscutal suture interrupted in middle ..... 10
10. Mesopleural bristle present; second antennal segment with a terminal lobe on outer side; face membranous medially with lower margin ill defined; frons at least one quarter the width of head ..... CLUSIIDAE  
 Mesopleural bristle absent; second antennal segment without terminal lobe; face normally sclerotized; frons of male not over one sixth the width of head (female unknown) (*Waterhouseia*) ANTHOMYZIDAE, part
11. Tibiae with preapical dorsal bristles; first vein not setulose; at most two pairs of fronto-orbitals; no stigmatal bristles on mesopleuron ..... 12  
 Tibiae without preapical dorsal bristles or, if these are present on middle tibiae, either the first vein is setulose above or the mesopleuron has upper anterior (stigmatal) bristles just behind spiracle ..... 13
12. Sixth vein discontinued well before margin; mesopleural bristle present; postvertical bristles convergent or rarely absent ..... LAUXANIIDAE  
 Sixth vein discernible almost to margin; mesopleural bristle absent; postvertical bristles usually divergent or parallel ..... SCIOMYZIDAE
13. Anal cell long, acute, with anal crossvein long, oblique and not angulate or indented, or, if the anal cell is shorter with short transverse crossvein (*Stylogaster*), then the proboscis is extremely slender and very much longer than head; third and fourth veins strongly convergent or fused apically; mesopleuron not bristly ..... CONOPIDAE  
 Anal cell, if long and acute, then with the anal crossvein angulate or indented; proboscis stout, usually shorter than head ..... 14
14. Body very elongate; legs abnormally long; third and fourth veins converging distally; first vein not setulose above ..... 15  
 Not as above ..... 16
15. Arista dorsal; front legs much shorter than others and widely separated from them MICROPEZIDAE  
 Arista terminal or almost terminal; front legs at least as long as others, with longer coxae ..... NERIIDAE
16. Incurved lower fronto-orbital bristles present; subcosta abruptly bent forwards to meet costa almost at right angles ..... TRYPETIDAE, part  
 No incurved lower fronto-orbitals ..... 17
17. Anal crossvein recurved (Fig. 2); first vein not setulose; wings without markings..... 18  
 Either the anal crossvein angulate so that the anal cell is acutely produced (Fig. 4) or the first vein setulose above; wings usually with dark markings ..... 19
18. Costa broken at end of subcosta; stigmatal bristles present on mesopleuron; postverticals, when present, divergent; third antennal segment elongate, blunt; colour metallic black ..... LONCHAEIDAE  
 Costa not broken; stigmatal bristles absent; postverticals, when present, usually convergent; third antennal segment rounded or shortly ovate, colour usually dull grey; sometimes shining black ..... CHAMAEMYIIDAE
19. Ovipositor enclosed in a conspicuous, cylindrical or conical, recurved sheath; ocelli usually minute or absent; first vein always setulose ..... PYRGOTIDAE, part  
 Ovipositor not enclosed in such a sheath; ocelli well developed ..... 20

20. First vein not setulose; third antennal segment quite blunt; third and fourth veins sometimes fused apically; anal cell usually narrowly produced ..... ULIDIIDAE  
 First vein setulose above; third antennal segment sharpened, or at least somewhat flattened, apically; third and fourth veins not fused apically; anal cell shortly, if at all, produced..... PLATYSTOMATIDAE
21. Hind metatarsus much swollen or shortened and compressed ..... SPHAEROCERIDAE  
 Hind metatarsus similar to other metatarsi ..... 22
22. Incurved lower fronto-orbital bristles present, but sometimes much shorter than other orbitals and in a separate inner row ..... 23  
 Incurved lower fronto-orbital bristles absent ..... 27
23. Fold representing distal part of subcosta abruptly bent forward to meet costa almost at right angles; anal cell usually acutely produced; no vibrissae ..... TRYPETIDAE, part  
 Distal vestige of subcosta close to first vein; anal cell not angularly produced; vibrissae present ..... 24
24. Anal cell absent or open distally; arista plumose; third antennal segment deflexed at an angle to rest of antenna and not wider than second segment.....  
 (*Stenomicroa*, part; undetermined genus) ANTHOMYZIDAE, part  
 Anal cell closed; arista not plumose; third antennal segment not narrow and deflexed... 25
25. Postvertical bristles divergent; no interfrontals; proboscis and palpi normal AGROMYZIDAE, part  
 Postvertical bristles convergent or parallel, sometimes a smaller pair of divergent postocellar bristles in front of them; interfrontals usually present ..... 26
26. Lower fronto-orbitals incurved, upper fronto-orbitals not incurved; proboscis usually very long and slender; palpi usually enlarged or spatulate ..... MILICHIIDAE  
 Fronto-orbitals directed alternately inwards and outwards, the incurved ones sometimes much shorter and in a separate inner row; proboscis and palpi normal; sea-shore species ..... TETHINIDAE
27. Face convex or protuberant; anal cell incomplete; discal and second basal cells confluent; arista often with long hairs above but always none below; antennae usually inserted closer to vertex than to mouth margin; postvertical bristles divergent or absent... EPHYDRIDAE  
 Not as above ..... 28
28. Anal cell and sixth vein absent ..... 29  
 Anal cell at least partly enclosed or the sixth vein distinct in part..... 30
29. Postvertical bristles almost always convergent; fourth vein usually slightly bent at outer crossvein and not notably converging with third vein towards apex; propleuron with lateral part flat and separated from the transverse anterior part by a vertical carina ..... CHLOROPIDAE  
 Postverticals divergent or absent; fourth vein not at all bent at outer crossvein (which may be absent), thereafter gradually curving forward and converging with third vein; propleuron sloping inwards anteriorly, without vertical carina.....ASTEIIDAE, part
30. Antennae very short, lying in deep pits or grooves level with lower margin of eye; fronto-orbitals, when present, directed outwards; frontal lunule highly arched, reaching well above antennae; postvertical bristles divergent or parallel... (*Fergusonina*) AGROMYZIDAE, part  
 Antennae and frontal lunule not as above ..... 31
31. First vein setulose above; ovipositor enclosed in a conspicuous cylindrical or conical recurved sheath; vibrissae absent; usually large flies, the wings always over 4 mm long ..... PYRGOTIDAE, part  
 First vein not setulose; no such ovipositor sheath; never large flies..... 32
32. Middle tibia with distinct preapical dorsal bristles; all fronto-orbitals reclinate, or, if one proclinate, then there are two preapical dorsal and one anterior bristle on middle tibia and the antennae are porrect; at least three long dorsocentrals; postverticals convergent; vibrissae present ..... HELOMYZIDAE, part  
 Tibiae without preapical dorsal bristles, except most *Drosophilidae* which have a proclinate fronto-orbital, only the one bristle on middle tibia, decumbent antennae and one or two long dorsocentrals ..... 33
33. Subcosta not obsolete apically, either terminating in first vein or joined to it apically by sclerotization of the intermediate region; postverticals more or less divergent..... 34  
 Subcosta apically obsolescent, free from first vein ..... 36

34. Sixth vein not extending beyond anal cell, the seventh vein often distinct; no true vibrissa though cheek bristles often present; third antennal segment orbicular; sea-shore species ..... CANACEIDAE  
Sixth vein extending well beyond anal cell, seventh vein vestigial; one or two pairs of long vibrissae; third antennal segment ovate ..... 35
35. Frons projecting over bases of antennae and bearing anterior marginal bristles; vibrissal angle obsolete; scutellum elongate, at least in male .....  
(*Piophilosoma*, *Chaetopiophila*) THYREOPHORIDAE  
Frons not projecting, without anterior bristles; vibrissal angle present; scutellum normal ..... PLOPHILIDAE
36. Antenna without arista, third segment very large; head without differentiated bristles ..... CRYPTOCHAETIDAE  
Arista present ..... 37
37. One proclinate and one or two reclinate, strong fronto-orbitals; arista usually plumose... 38  
No strong proclinate fronto-orbital; arista not usually plumose ..... 39
38. Ocellar, postvertical and outer vertical bristles absent; proclinate fronto-orbital much closer to eye than the single reclinate one; paired facial bristles present .....  
(*Cyamops*) PERISCELIDIDAE  
The above bristles present, the postverticals usually convergent, occasionally parallel; proclinate fronto-orbital not closer to eye than reclinate ones; typical vibrissae present ..... DROSOPHILIDAE
39. Sternopleural and presutural bristles absent; fronto-orbitals short and weak; no vibrissae... 40  
Sternopleural and presutural bristles present; at least one pair of strong, reclinate fronto-orbitals ..... 41
40. Discal, anal and second basal cells open distally; head exceptionally flattened.....  
(*Nothoasteia*) ASTEIDAE, part  
All the above cells closed; head not flattened ..... PSILIDAE
41. Three fronto-orbitals; vibrissae not distinctly differentiated from the numerous short facial bristles; mesopleural bristle present; third antennal segment broadly rounded, decumbent ..... (*Aphaniosoma*) CHIROMYZIDAE  
One or two fronto-orbitals; vibrissae or a similarly situated pair of bristles present; mesopleural bristle usually absent; third antennal segment narrow and decumbent or broadly rounded and porrect..... (*Stenomicro*, part, *Teratomyza*, etc.) ANTHOMYZIDAE, part

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