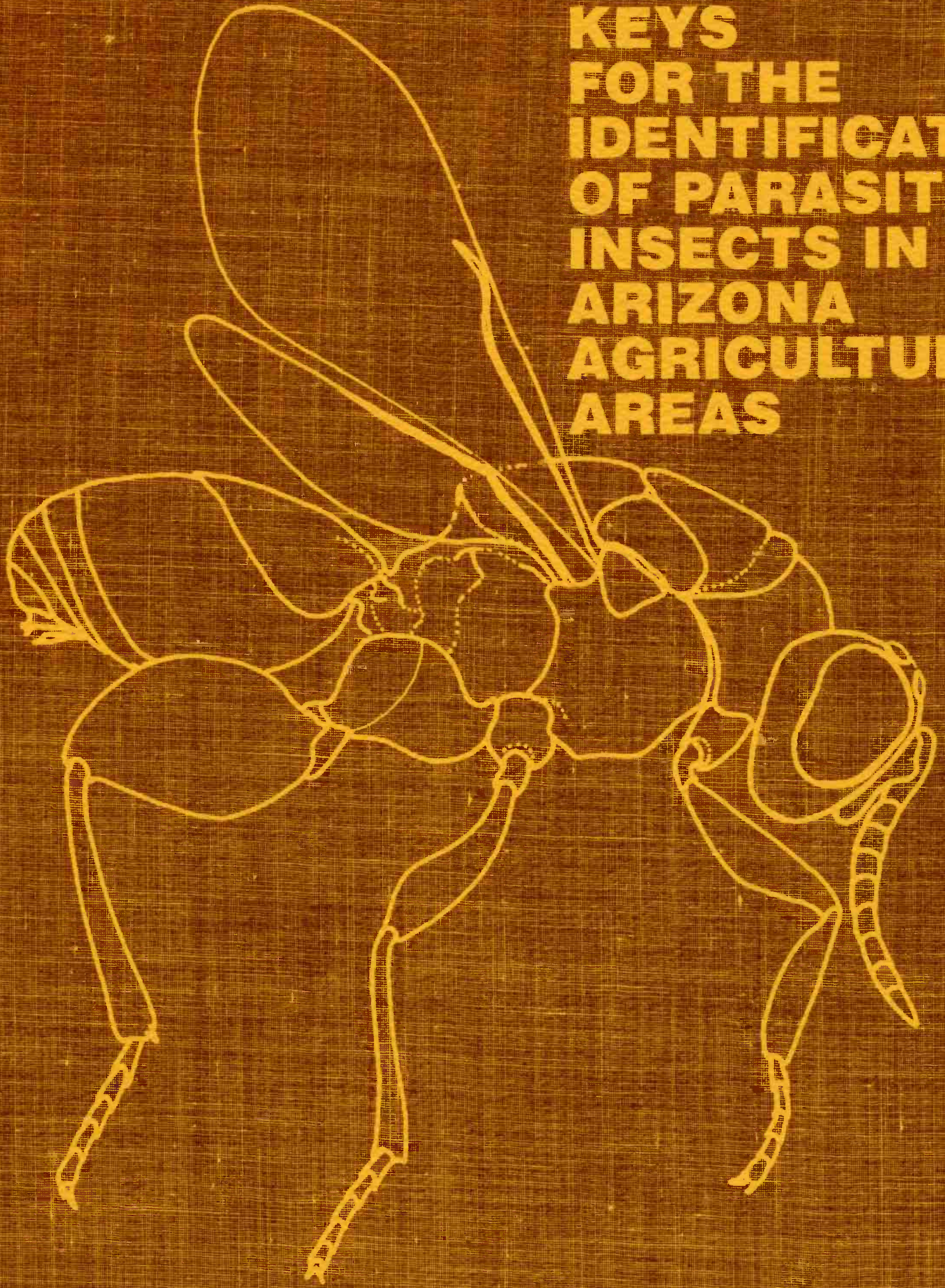
College of Agriculture

Technical Bulletin 236

KEYS FOR THE IDENTIFICATION OF PARASITIC INSECTS IN ARIZONA AGRICULTURAL AREAS



Agricultural Experiment Station
The University of Arizona

by Floyd G. Werner

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Keys for the Identification of Parasitic Insects in Arizona Agricultural Areas

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Contents

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Acknowledgements

The author is most indebted to Ms. Chris van Dyck for the many fine illustrations she has prepared for this bulletin. She is responsible for all except figures 48–56, 58, 61, 63, 68, 74, and 81. These latter were drawn by Ms. Wynne Brown, who worked during the earlier stages of the project. Dr. Donald S. Chandler, formerly a graduate student in entomology, prepared the first version of the keys to the families Eulophidae, Pteromalidae, and Chalcididae, and assisted in numerous modifications during the period that he was doing routine identifications for the project (1973).

This research was supported in part by Cooperative State Research Agreement 316–15–34.

This publication is designed to assist in the identification of the most important, abundant and conspicuous parasitic insects found in irrigated agricultural areas in Arizona. As far as we know, all of the species that are of importance to agriculture are included, at least to the level of the genus. In some cases it has been possible to extend the identification to the level of the species. A high percentage of the largest and most conspicuous species has also been included, in order to enable a worker to identify most of the species that he would be called on to identify. Groups that do not contain any species of special importance or large size are usually treated only at the level of the family.

The use of a stereoscopic microscope is required, and it may be necessary in some cases to prepare microscope slides and use a compound microscope to confirm the presence of features that are at the limit of the magnification of the stereoscopic microscope. Larger specimens are most conveniently examined when they are pinned or pointed. Some of the smallest are better handled in alcohol, since the shrinking caused by drying obscures features that must be seen.

The choice of species and genera to include resulted from a search of the host-association literature for species that have been linked with pests of Arizona crops, or of their predators or parasites. If a species has been so reported from anywhere on the continent, it was included on the initial list. This list was edited and refined to reflect our knowledge of the Arizona insect fauna. The prime source of distributional information has been The University of Arizona insect collection, and particularly specimens resulting from an intensive sampling of crop-associated insects conducted by Dr. George D. Butler, Jr. and the author over several years. Additional editing took place while the keys that were generated from these lists were used for identification of parasites taken in the Pinal County Pest Management area in 1973.

Accompanying the keys is a host-association listing that includes all of the information on parasites of important species on which the original lists were based. The parasites are grouped by host. This list should serve as a guide for anyone doing actual rearing of parasites. If a species or genus appears on the list and not in the key, it has been recorded as associated with the pest in some other region, but we have not found it in the agricultural areas of Arizona.

The different groups of parasites have been treated in greater or lesser detail in the literature. The sources of information that have been used in the preparation of the keys presented here are: Bethyloidea (specimens identified by Dr. Howard E. Evans). Braconidae (many specimens identified by Mr. C. F. W. Muesebeck, with some characters from Marsh, 1963). Chalcidoidea (based almost entirely on Peck et al., 1964, with some additions from specimens identified by Dr. B. D. Burks). Cynipoidea (Weld, 1952, and specimens identified by Mr. Weld). Ichneumonidae (Townes, 1969–1971, with an addition from Carlson, 1972). Proctotrupoidea (Ashmead, 1893, with Scelionidae from Masner, 1976). Tachinidae (many specimens identified by Dr. H. J. Reinhard, and a thesis based on them by Simpson, 1957).

Information on host associations has come primarily from Butler (1958 a, b), Carlson (1972), Krombein (1958), Krombein and Burks (1967), Muesebeck et al. (1951), Peck (1963), Simpson (1957), Stone et al. (1965), Stoner and Butler (1965), Thompson (1943–1965), and Weld (1952). In some cases we have made additions from other sources, including rearing associations in The University of Arizona insect collection.

Parasitic Hymenoptera and Diptera Associated with Arizona Crops

1. With 2 pairs of functional membranous wings. True first abdominal segment fused with thorax as a propodeum. (Hymenoptera) 2

1′ With 1 pair of functional membranous wings, the hind wings reduced to knob-like halteres. (Diptera) 125

Order Hymenoptera

2. Front wing with a closed radial cell (Fig. 1) 3

2′ Front wing without a closed radial cell (Fig. 28), or with a cell in this region and venation reduced to a zig-zag pattern (Fig. 7) 5

3. Front wing with a distinct costal cell (Fig. 5). Antenna with no more than 13 segments 4

3′ Front wing without a costal cell (Fig. 1). Antenna with 16 or more segments. (some Ichneumonoidea, Braconidae) 26

4. Venation reduced and of unusual conformation (Fig. 77, 78). Antennae arising from middle of face. (some Proctotrupoidea) 108

4′ Venation more complete. Antennae arising from low on face. Pronotum a collar, with small lobes that reach to near bases of wings. Wasps and bees. (Superfamilies Sphecoidea and Apoidea) .... Not included

5(2′) Front wing with at least 3 longitudinal veins from base to middle of wing (Fig. 13, 91) 6

5′ Front wing with 1, rarely 2, longitudinal veins from base to middle (Fig. 6, 7) 7

6. Pronotum large, forming a sort of flattened cone on front of thorax. Front wing with a costal cell (Fig. 91). (Superfamily Bethyloidea) 121

6′ Pronotum short, small. Front wing without costal cell (Fig. 13). (some Braconidae, Superfamily Ichneumonoidea) 12

7(5′) Venation zig-zag, with 1 complete vein from base, sometimes a second arising near base (Fig. 7). (Superfamily Cynipoidea) 105

7′ Venation much reduced, from a single vein ending in a fork, the posterior (stigmal) vein ending in a stigma (Fig. 6), to no veins at all 8

8. Body at least partly metallic. (many Superfamily Chalcidoidea). 66

8′ Body not metallic, but often shiny. 9

9. Longitudinal vein of front wing separate from front margin of wing for a distance, then lying along margin at level of origin of stigmal vein (Fig. 6). (some Superfamily Chalcidoidea) 66

9′ Longitudinal vein of front wing lying along front margin (Fig. 79), or reduced to a single vein ending in a knob (Fig. 85), or absent. 10

10. Longitudinal vein of front wing lying along front margin of wing, with a distinct stigmal vein. (Ceraphronidae, Fig. 79, 80, and most Scelionidae, Fig. 81, 82, Superfamily Proctotrupoidea) 108

10′ Longitudinal vein reduced and ending in a knob, or absent 11

11. Wings very slender at base. Antennae slender. (Mymaridae, Fig. 52, Superfamily Chalcidoidea) ... 66

11′ Wings not so slender at base (Fig. 87). Female of one common genus, *Inostemma,* with a long dorsal projection from base of abdomen over thorax. (Platygasteridae, Superfamily Proctotrupoidea) 108

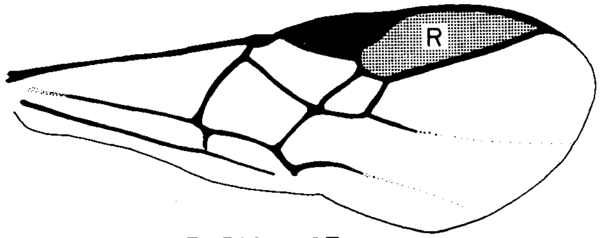

Figure 1. *Meteorus* (Braconidae) front wing, showing radial cell.

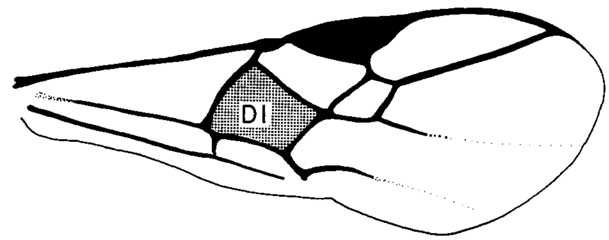

Figure 2. *Meteorus* (Braconidae) front wing, showing first discoidal cell.

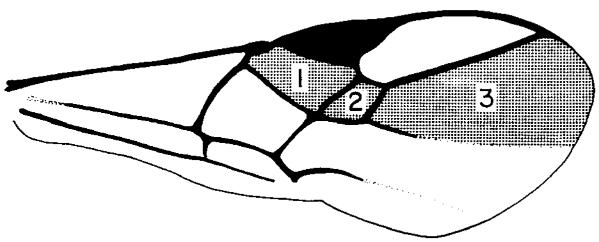

Figure 3. *Meteorus (Braconidae) front wing, showing cubital cells.*

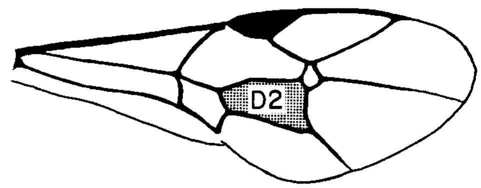

Figure 4. *Campoletis* (Ichneumonidae) front wing, showing second discoidal cell.

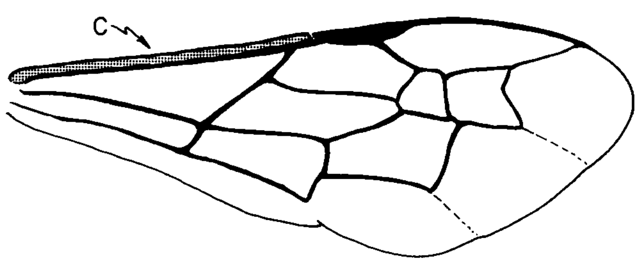

Figure 5. *Pluto* (Sphecidae) front wing, showing costal cell.

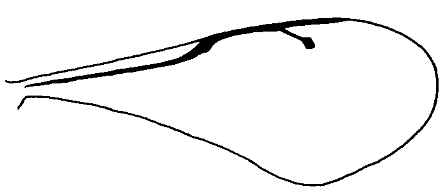

Figure 6. *Halticoptera* (Eulophidae) front wing.

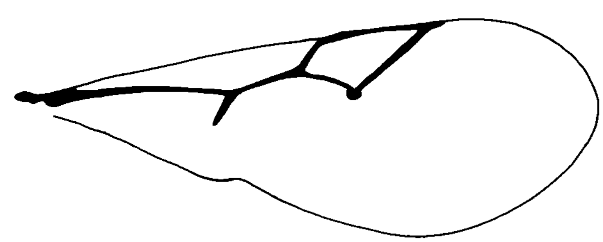

Figure 7. *Eucoila* (Cynipidae) front wing.

Superfamily Ichneumonoidea

12(3′, 6′) Front wing with a second discoidal cell, closed at apex by second recurrent vein (Fig. 4). (Ichneumonidae) 44

12′ Front wing without a second discoidal cell or second recurrent vein (Fig. 2). (Braconidae) 13

Family Braconidae

13. Mandibles normal, with teeth pointing toward midline (Fig. 8). 15

13′ Mandibles not meeting, their teeth confined to outer surface (Fig. 9). 14

14. Front wing without a closed second cubital cell (Fig. 11). 3–5 mm, shiny, usually brown; ovipositor barely visible. Very scarce. Hosts: Diptera (Agromyzidae). (Dacnusinae) ..... ***Dacnusa***

14′ Front wing with closed second cubital cell (Fig. 12). 2–4 mm, shiny, usually brown with paler legs; ovipositor to ⅓ as long as abdomen. Very scarce. Hosts: Diptera (Agromyzidae and Muscoidea). (Alysiinae) ..... ***Alysia***

15(13) Labrum deeply sunken in and clypeus short, its margin semicircularly excavated (Fig. 10). Radial cell of front wing always closed by veins that are as strong as the others. (Cyclostomine Braconidae) 40

15′ Labrum and clypeus normal, labrum not sunken in, often with a pit at each end of a weak frontoclypeal suture (Fig. 8). Radial cell variable, from closed to absent. (Non-cyclostomine Braconidae) 16

Non-cyclostomine Braconidae

16. Upperside of abdomen a solid, very convex plate, evenly rounded at apex, which may have a pair of small spines or a deep pit (Fig. 25–27); sterna weakly sclerotized and hidden; ovipositor arising from middle of underside 35

16′ Upperside of abdomen not a single plate. If terga weakly separated, apex of abdomen not as above 17

17. Radial cell of front wing closed, surrounded by strong veins (Fig. 1) 18

17′ Radial cell open at end or absent (Fig. 13), at most delimited behind by a fold in *Apanteles* (Fig. 14) 26

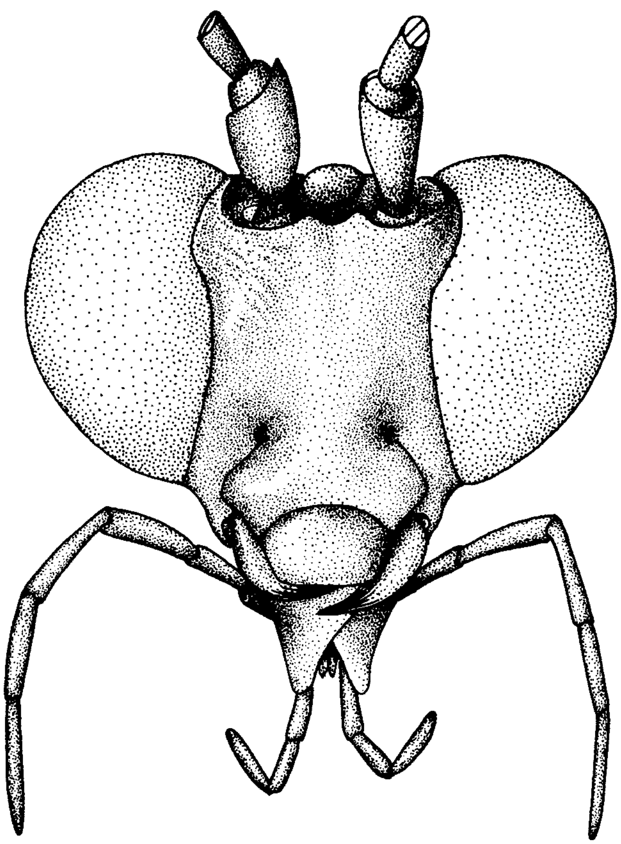

Figure 8. *Zelomorpha* (Braconidae, Agathidinae) head.

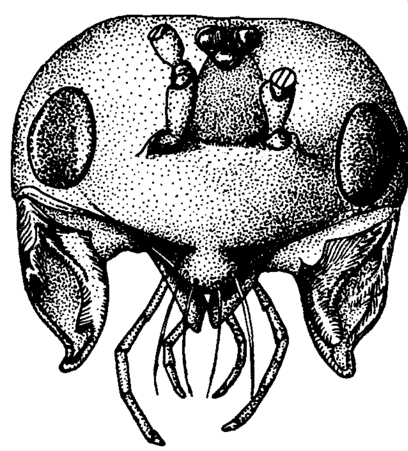

Figure 9. *Idiasta* (Braconidae, Alysiinae) head.

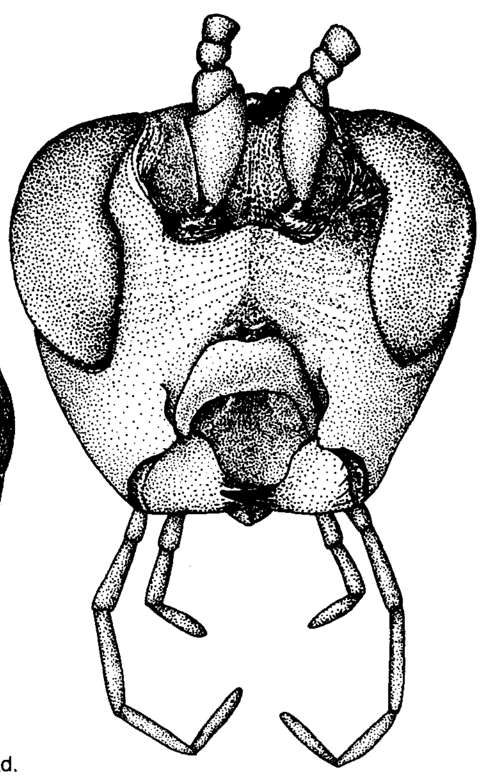

Figure 10. *Rogas* (Braconidae, Rogadinae) head.

18. Middle of front wing with 3 closed cells (discoidal and 2 cubitals), delimited by strong veins (Fig. 16) 19

18′ Middle of front wing with only 2 completely closed cells 24

19. Discoidal cell reaching longitudinal vein of front margin, just basad of stigma (Fig. 17) 20

19′ Discoidal cell not reaching front vein (Fig. 18) 21

20. Apex of second trochanters simple. Occiput margined behind. 5–10 mm, subopaque, tan, head and apex of abdomen dark in male; ovipositor shorter than apical height of abdomen. Scarce, mainly at light. Hosts: Lepidoptera (Noctuidae). (Helconinae) .... ***Zele mellea***

20′ Second trochanters with several small spines on apicolateral edge. Occiput not margined behind. 5–8 mm, shiny, tan; ovipositor as long as abdomen. Frequent at light, especially in spring. Hosts: Lepidoptera (Noctuidae, cutworms; probably Pyralidae). (Macrocentrinae) .... ***Macrocentrus ancylivorus***

21(19′) Second cubital cell longer than broad (Fig. 18). Very small, 1 mm, shiny, brown, abdomen sometimes pale across base; ovipositor short but visible. Frequent. Hosts: Diptera (Agromyzidae). (Opiinae) .... ***Opius***

21′ Second cubital cell broader than long (Fig. 16) 22

22. Radial cell shorter along margin than stigma, its posterior vein strongly curved. 4 mm, dark brown, head, legs and apex of abdomen partly pale; ovipositor half as long as abdomen. Very scarce. Hosts: Coleoptera (Coccinellidae). (Euphorinae) .... ***Perilitus coccinellae***

22′ Radial cell longer than stigma (Fig. 16). 5–6 mm, head and thorax subopaque, abdomen shiny, abdominal tergum 1 usually dark at apex, 2 pale, rest dark; ovipositor half as long as abdomen (Fig. 19). (*Meteorus*) 23

23. Ventral margins of abdominal tergum 1 meeting considerably beyond base and at most joined to each other for a short distance. Tergum 1 uniformly dark. Frequent. Hosts: Lepidoptera (Noctuidae, including *Heliothis*). (Euphorinae) .... ***Meteorus leviventris***

23′ Ventral margins of abdominal tergum 1 meeting at base and touching for nearly half of segment. Tergum 1 pale at base to all pale. Very scarce. Hosts: Lepidoptera (Noctuidae). (Euphorinae) .... ***Meteorus arizonensis***

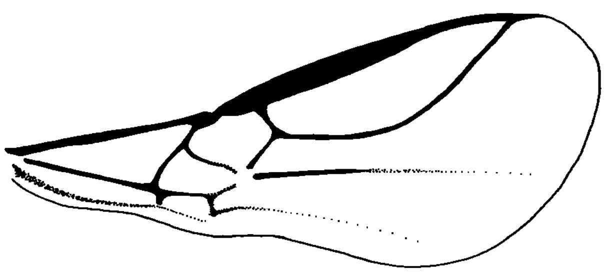

Figure 11. *Dacnusa* (Braconidae, Dacnusinae) front wing.

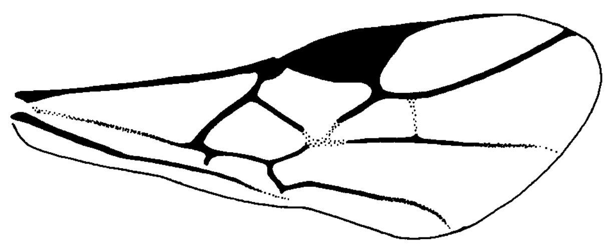

Figure 12. *Alysia* (Braconidae, Alysiinae) front wing.

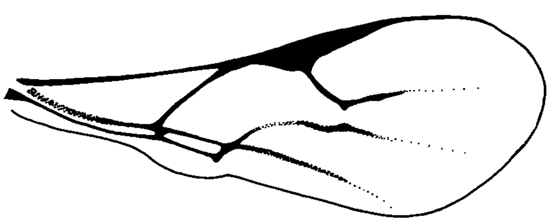

Figure 13. *Aphidius* (Braconidae, Aphidiinae) front wing.

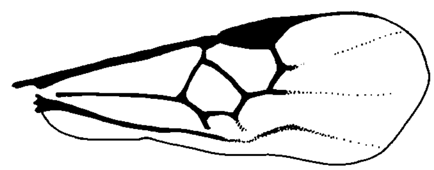

Figure 14. *Apanteles* (Braconidae, Microgasterinae) front wing.

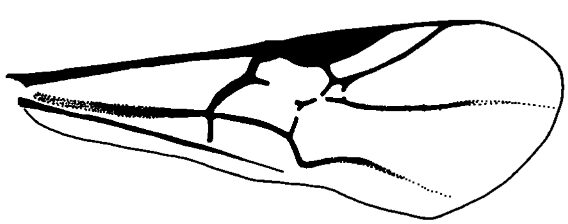

Figure 15. *Cremnops* (Braconidae, Agathidinae) front wing.

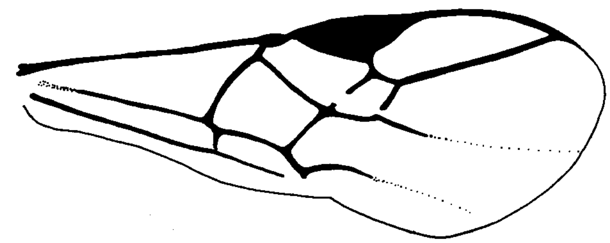

Figure 16. *Meteorus* (Braconidae, Euphorinae) front wing.

24(18′) Discoidal cell open, separated from first cubital cell by an interrupted vein (Fig. 15) 25

24′ Discoidal cell closed by strong veins. 4–5 mm, brown, female with pale head; forebody subopaque, abdomen shiny; ovipositor as long as abdomen. Frequent: Hosts: Microlepidoptera. (Blacinae) ...... ***Orgilus medicaginis***

25. Radial cell about as long as stigma (Fig. 15). 6–7 mm, body and legs orange and black, shiny, wings brown. Clypeus very long. Ovipositor almost as long as abdomen. Scarce. Hosts: Lepidoptera (Pyralidae, *Loxostege*). (Agathidinae) .... ***Cremnops vulgaris***

25′ Radial cell longer than stigma, unusually narrow (Fig. 20). 7–8 mm, body reddish brown, wings slightly dusky. Clypeus normal. Ovipositor short, as long as apical height of abdomen. Frequent at light. Hosts: Lepidoptera (Noctuidae?, reared from 2 unknown pupae). (Agathidinae) .... ***Zelomorpha arizonensis***

26(17′) Wing without closed discoidal or cubital cells (Fig. 13, 21, 22). Tiny, dark-bodied aphid parasites. (Aphidiinae). Vein extending obliquely from stigma with a twig near apex (Fig. 21). 2 mm, shiny, brown, most of legs and base of abdomen usually paler; ovipositor barely visible. Abundant in spring. Hosts: Homoptera (Aphididae, many, not all, species) .... ***Lysiphlebus testaceipes***

26′ Discoidal and at least one cubital cell closed (Fig. 14) 27

27. Second cubital cell closed 30

27′ Second cubital cell not present (Fig. 14). About 3 mm, dark brown to black with at least partly pale legs; ovipositor shorter than apical height of abdomen. Many species, only those reared from crop pests included here. (*Apanteles*) 28

28. Abdominal tergum 1 narrow, exposing membrane along its edges, distinctly narrower at apex than at base; terga 1 and 2 smooth, shiny. Base of abdomen sometimes pale. (Fig. 24). Scarce. Hosts: Lepidoptera (Noctuidae, including *Heliothis*). (Microgasterinae) .... ***Apanteles militaris***

28′ Abdominal tergum 1 wide, covering all of segment, distinctly wider at apex than at base; terga 1 and 2 roughened 29

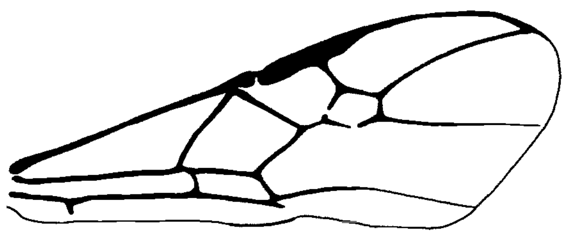

Figure 17. *Zele* (Braconidae, Helconinae) front wing.

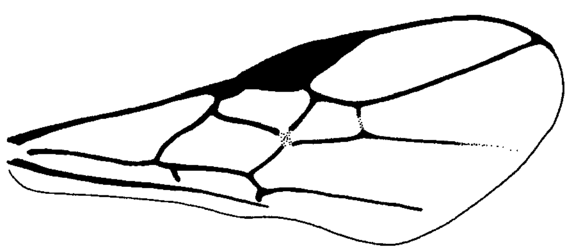

Figure 18. *Opius* (Braconidae, Opiinae) front wing.

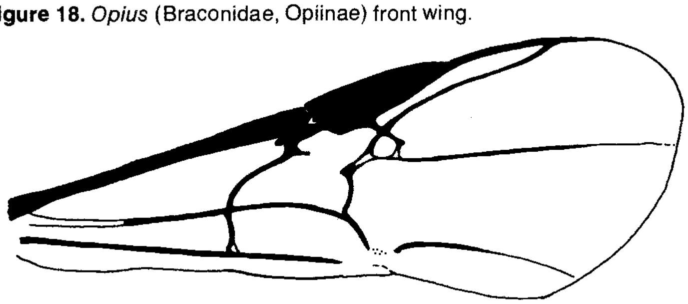

Figure 20. *Zelomorpha* (Braconidae, Agathidinae) front wing.

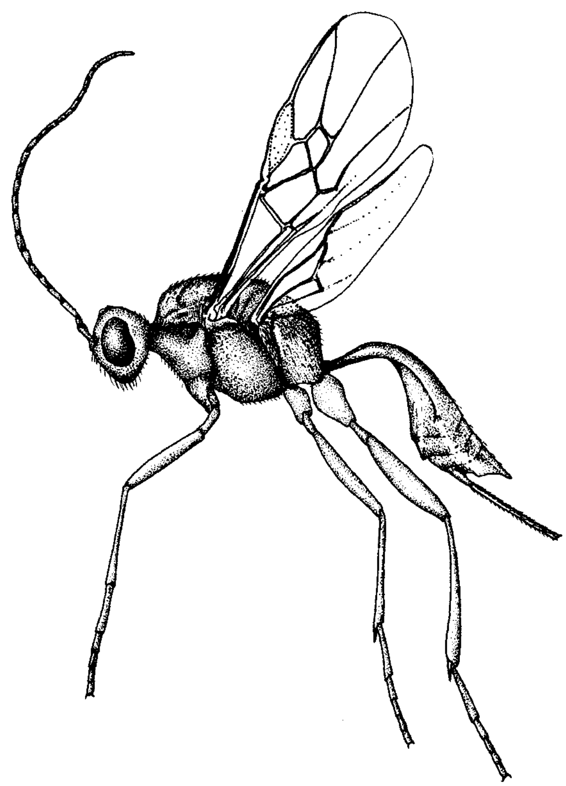

Figure 19. *Meteorus leviventris* (Braconidae, Euphorinae) female.

29. Tegula (small plate at base of front wing) pale. Abdomen often partly pale. Scarce. Hosts: Lepidoptera (Noctuidae, including *Heliothis*). (Microgasterinae) .... ***Apanteles marginiventris***

29′ Tegula brown to black. Frequent. Hosts: Lepidoptera (Pieridae, *Colias*). (Microgasterinae) .... ***Apanteles medicaginis***

30(27) Second cubital cell almost as long as first (Fig. 23). 4 mm, rather stocky, black with largely rufous legs; hind legs heavy; clypeus unusually short; ovipositor half as long as abdomen. Scarce. Hosts: Lepidoptera (Pyralidae, *Loxostege*). (Cardiochilinae) .... ***Cardiochiles explorator***

30′ Second cubital cell less than half as long as first (Fig. 28). 3–5 mm; ovipositor short, at most barely visible beyond abdomen (*Microplitis*) 31

31. Abdomen black or brown, legs yellowish. 3 mm long or less. Head and mesonotum subopaque to opaque. 32

31′ Abdomen and legs beyond base of coxa bright rufotestaceous, rest of body black, wings brown. 3.5 mm or more; forebody feebly shiny. Abdominal tergum 1 narrow, exposing membrane. Frequent, our most abundant species. Hosts: Lepidoptera (Noctuidae, *Heliothis*). (Microgasterinae) .... ***Microplitis croceipes***

32. Abdominal tergum 1 roughly sculptured, distinctly wider at apex than at base; tergum 2 opaque except at sides; wings dusky, stigma bi-colored; ovipositor very short, concealed. Frequent. Hosts: Lepidoptera (Noctuidae, *Autographa*). (Microgasterinae) .... ***Microplitis alaskensis***

32′ Abdominal tergum 1 smooth, almost impunctate; or very narrow, leaving membrane at its edges; tergum 2 shiny 33

33. Abdominal tergum 1 very narrow, twice as long as wide, distinctly punctured. Wings slightly dusky. Scarce. Hosts: Lepidoptera (Noctuidae, cutworms). (Microgasterinae) .... ***Microplitis feltiae***

33′ Abdominal tergum 1 less than twice as long as wide and covering most of segment, shiny and only vaguely punctured 34

34. Wings whitish. Abdominal tergum 1 about $^2/_3$ as broad as long, rounded at apex. Abdomen brown, sometimes quite pale; ovipositor visible. Very scarce. Hosts: Lepidoptera (Noctuidae, *Trichoplusia*). (Microgasterinae) .... ***Microplitis brassicae***

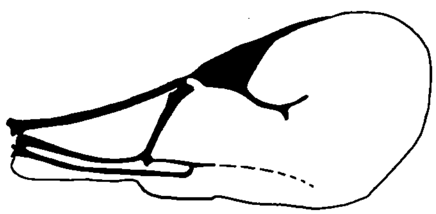

Figure 21. *Lysiphlebus* (Braconidae, Aphidiinae) front wing.

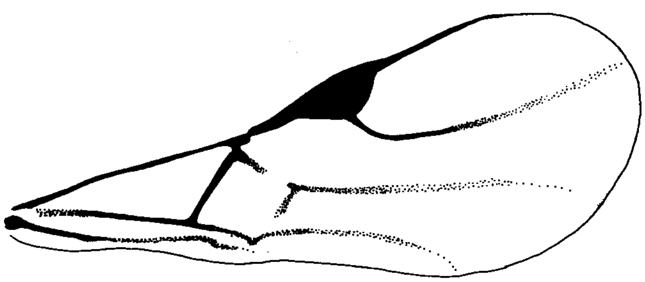

Figure 22. *Trioxys* (Braconidae, Aphidiinae) front wing.

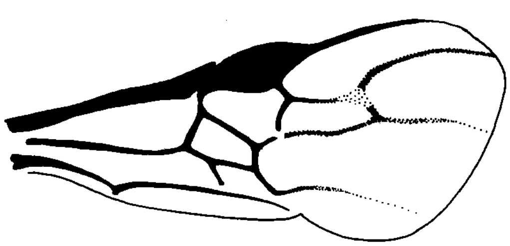

Figure 23. *Cardiochiles* (Braconidae, Cardiochilinae) front wing.

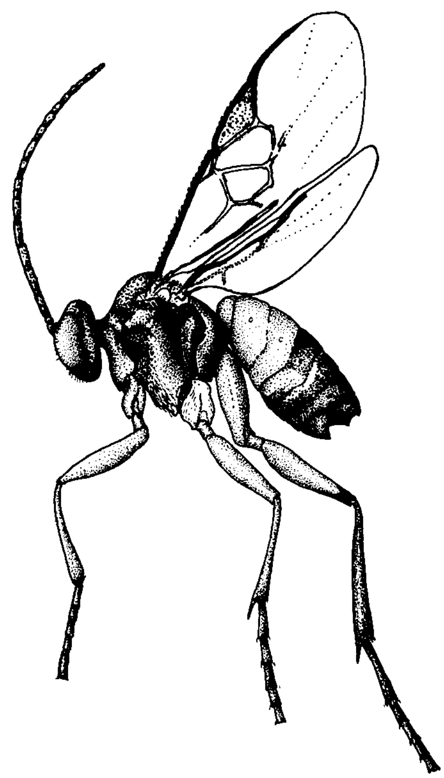

Figure 24. *Apanteles militaris* (Braconidae, Microgasterinae).

34′ Wings clouded across middle. Abdominal tergum 1 about ¾ as broad as long, truncate at apex. Abdomen almost black; ovipositor visible. Very scarce. Hosts: Lepidoptera (Noctuidae, *Autographa*). (Microgasterinae) .... ***Microplitis autographae***

35(16) Apex of abdomen with a pair of short spines. 5 mm, black with red legs. Wing with well-defined discoidal and first cubital cells. Ovipositor almost as long as abdomen, arising at middle of underside of abdomen. Scarce. Hosts: Coleoptera (Bruchidae). (Blacinae) .... ***Urosigalphus bruchi***

35′ Apex of abdomen without spines. Wing with discoidal and first cubital cells separated by a concave fold; second cubital cell well defined (Fig. 26). Ovipositor usually hidden, short, arising near apex of underside. (*Chelonus*) 36

36. Abdominal tergum with an interrupted white band across base, otherwise black, rarely red; rest of body black, femora often pale (Fig. 25). 4–5 mm. Frequent, our most common species. Hosts: Lepidoptera (including Noctuidae, *Heliothis*). (Cheloninae) ....***Chelonus texanus***

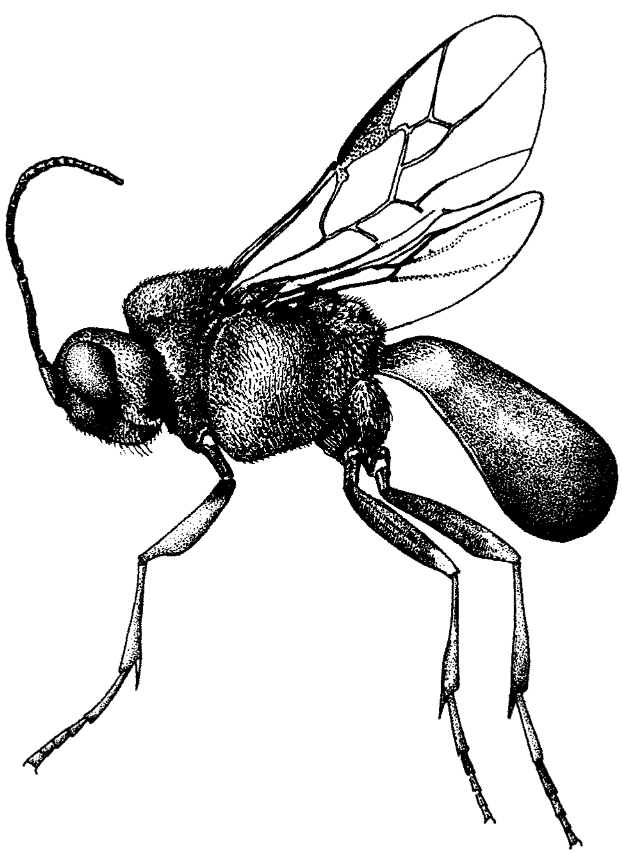

Figure 25. *Chelonus texanus* (Braconidae, Cheloninae).

36′ Abdomen with complete pale band across base or all dark 37

37. Abdomen with a complete white band across base. Black, with partly pale legs. 3.5 mm. Male with a transverse pit across apex of abdomen, reaching almost from side to side (Fig. 27). Scarce. Hosts: Lepidoptera (probably Pyralidae and other Microlepidoptera). (Cheloninae) .... ***Chelonus (Microchelonus) cautus***

37′ Abdomen all black or all red 38

38. Abdomen with pit in apex. (Cheloninae). Males of .... ***Chelonus (Microchelonus)***

38′ Abdomen without pit in apex. 39

39. Males. Femora usually partly pale. (Cheloninae) .... ***Chelonus texanus***

39′ Females. (Cheloninae) ...... ***Chelonus (Microchelonus)***

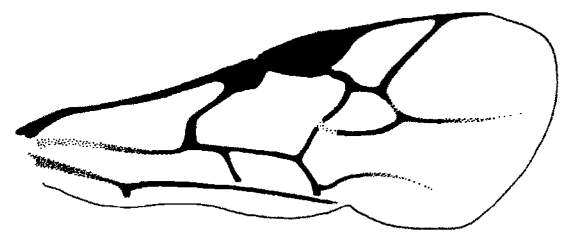

Figure 26. *Chelonus* (Braconidae, Cheloninae) front wing.

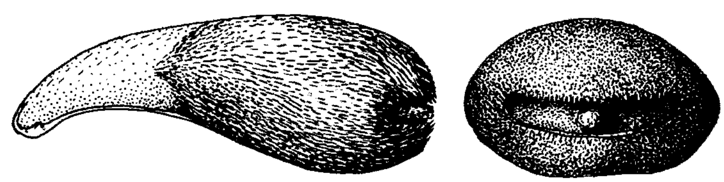

Figure 27. Chelonus (*Microchelonus*) (Braconidae, Cheloninae) male, abdomen in side and back views.

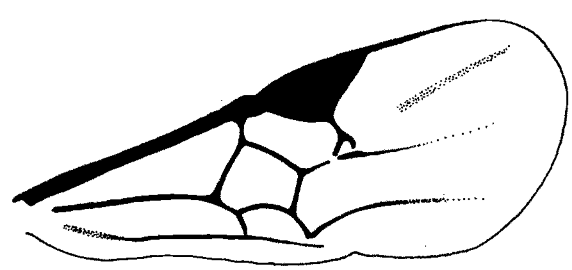

Figure 28. *Microplitis* (Braconidae, Microgasterinae) front wing.

Cyclostomine Braconidae

40(15) Occiput completely margined behind (Fig. 30). Radial cell reaching almost to apex of wing. 41

40′ Occiput not margined behind (Fig. 31). 42

41. Crossvein between first and second cubital cells as strong as other veins (Fig. 29). 4–9 mm, rather slender, subopaque, reddish tan, wings dusky; ovipositor as long as apical height of abdomen. Frequent, especially at light. Hosts: Lepidoptera (Noctuidae, including *Heliothis*). (Rogadinae) .... ***Rogas***

41′ Crossvein between first and second cubital cells weak. 3–5 mm, tan, stocky; ovipositor nearly as long as abdomen, arising near middle of underside. Scarce. Hosts: Coleoptera (Bruchidae). (Doryctinae) .... ***Heterospilus prosopidis***

42(40′) Wings black or dusky. Body reddish brown to red, sometimes with black markings. Most specimens more than 5 mm long without ovipositor. 43

42′ Wings pale. 2–5 mm, slender, tan to almost black, abdomen sometimes paler. Crossvein at base of second cubital cell strongly oblique (Fig. 33). Ovipositor from $^1/_3$ as long as abdomen to about as long as body. Scarce. Hosts: Coleoptera (Curculionidae), Microlepidoptera (including Gelechiidae, *Pectinophora*). (Braconinae) .... ***Bracon***

43. Most of abdominal terga excavated across base. Radial cell reaching almost to apex of wing. 7–14 mm, shiny, red and black with black wings; ovipositor from ½ as long as abdomen to as long as body. Scarce. Hosts: Coleoptera (wood-boring). (Braconinae) ...... ***Iphiaulax***

43′ Abdominal terga not excavated. Radial cell ending well before apex of wing (Fig. 32). 4–10 mm, shiny, reddish brown, head partly black in male, with almost black wings. Ovipositor almost as long as body. Frequent. Hosts: Coleoptera (wood-boring), Lepidoptera (Pyralidae). (Braconinae) .... ***Vipio***

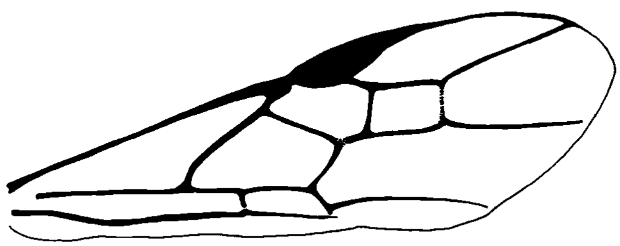

Figure 29. *Rogas* (Braconidae, Rogadinae) front wing.

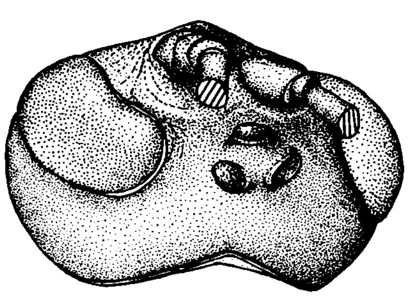

Figure 30. *Rogas* (Braconidae, Rogadinae) head

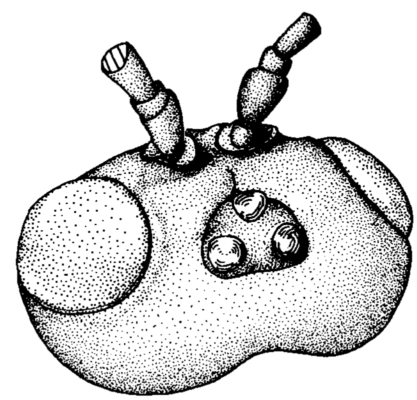

Figure 31. *Vipio* (Braconidae, Braconinae) head.

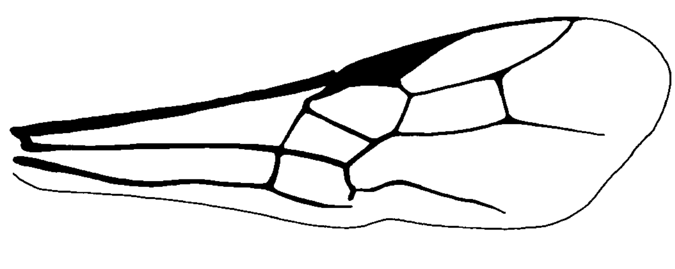

Figure 32. *Vipio* (Braconidae, Braconinae) front wing.

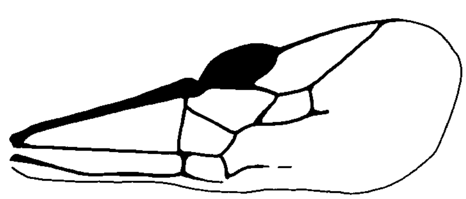

Figure 33. *Bracon* (Braconidae, Braconinae) front wing.

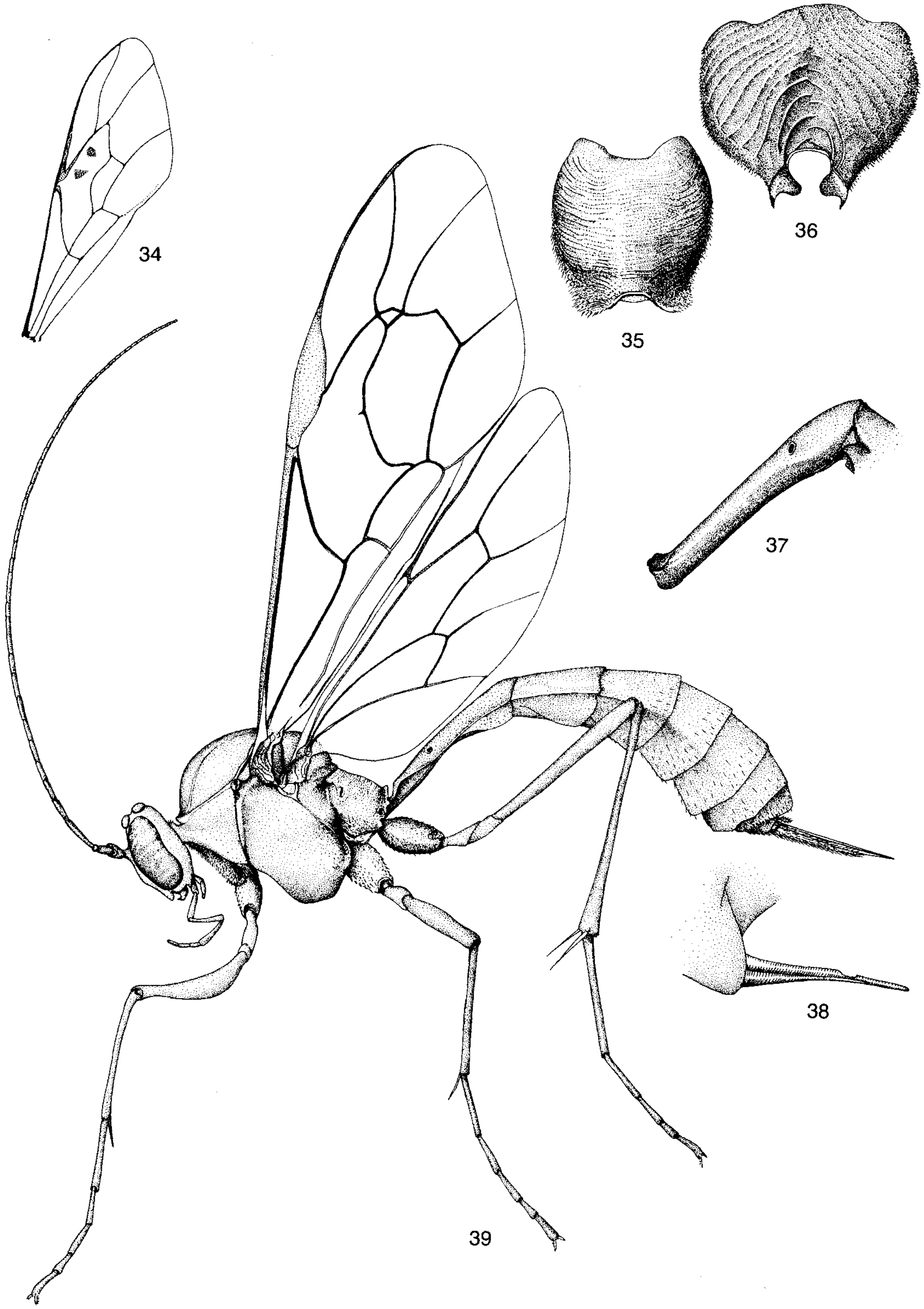

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Figure 34. *Enicospilus* (Ichneumonidae, Ophioninae) front wing.

Figure 35. *Netelia* (Ichneumonidae, Tryphoninae) propodeum, top view.

Figure 36. *Enicospilus* (Ichneumonidae, Ophioninae) propodeum, top view.

Figure 37. *Enicospilus* (Ichneumonidae, Ophioninae) first abdominal segment, side view.

Figure 38. *Genophion* (Ichneumonidae, Ophioninae) ovipositor, side view.

Figure 39. *Netelia* (Ichneumonidae, Tryphoninae) female.

Family Ichneumonidae

44(12) Spiracle of abdominal segment 1 located well behind middle of segment (Fig. 37). 45

44′ Spiracle of abdominal segment 1 located before middle of segment (Fig. 39). 50

45. Abdomen depressed or cylindric in cross-section, segments 3 and 4 wider than deep. Ovipositor from nearly as long as abdomen to longer than body. Antenna with a narrow white band. (Gelinae) 46

45′ Abdomen laterally compressed, segments 3 and 4 deeper than wide. Ovipositor at most 3 times as long as apical height of abdomen. Antenna without a white band. 47

46. Wings yellowish with brown tips, front wing with 2 brown bands. 10–18 mm, body tan with a narrow black band at base of abdominal tergum 2; ovipositor about as long as abdomen. Several species, of which one is most frequent. Scarce on crops. Hosts: unrecorded but one reared from a sawfly at Tucson. (Gelinae) ....*Compsocryptus calipterus***

46′ Wings uniformly dusky. 7–12 mm, slender, female tan with ovipositor longer than body, male black and white on forebody, tan behind. Scarce. Hosts: Lepidoptera (Pyralidae, *Loxostege*). (Gelinae) ....***Mesostenus longicaudus***

47(45′) Tarsal claws pectinate (Fig. 46). Hind margin of front wing with a feeble vein along its edge beyond the posterior closed cells (Fig. 34). Medium to large, usually tan, with large ocelli. (Ophioninae) 56

47′ Tarsal claws not pectinate (with rare exceptions). Front wing without such a vein. 48

48. Propodeum (true first abdominal segment, fused to thorax) roughly sculptured but its surface not divided into zones by ridges (Fig. 40). Mesonotum flattened and sharply edged in front (Fig. 40, 41). Front wing without a small closed cell between radial and second discoidal cells (as Fig. 47). 4–10 mm, tan to black, with white markings usually including rings around eyes; ovipositor half as long as abdomen. Scarce. Hosts: Coleoptera (Elateridae). (Anomalinae) .... ***Anomalon***

48′ Propodeum divided into zones by ridges, the surface in the zones usually finely sculptured (Fig. 42). Front part of mesonotum not flat or sharply edged (Fig. 42, 43). 49

49. Front wing with a small closed cell between radial and second discoidal cells (Fig. 4). Tibial spurs arising from same hole in tip of tibia as tarsus (Fig. 44). (Porizontinae) 61

49′ Front wing without a small cell between radial and second discoidal cells (as Fig. 47). Tibial spurs arising separately from tarsus at tip of tibia (Fig. 45). (Cremastinae) 65

50(44′) Tarsal claws of at least front and middle legs pectinate (Fig. 46). 51

50′ Tarsal claws not pectinate. 52

51. Body tan, abdomen laterally compressed. Upper valve of ovipositor without a subapical dorsal notch (Fig. 39). (Tryphoninae) 54

51′ Body usually contrastingly colored. Upper valve of ovipositor with a subapical dorsal notch (as Fig. 38). Scarce ....Banchinae

52(50′) Upper tooth of mandible simple, mandible thus 2-toothed. (Ephialtinae) 7–15 mm, black with red legs, including coxae; wings dusky; ovipositor $^{2}/_{3}$ as long as abdomen. Scarce. Host: Lepidoptera (Lasiocampidae, *Malacosoma*) .... ***Pimpla sanguinipes***

52′ Upper tooth of mandible with 2 points, separated by a weak notch, mandible thus 3-toothed. (Diplazontinae) 53

Ichneumonidae Diplazontinae

53. Front wing without a small closed cell between radial and second discoidal cells (Fig. 47). 5–7 mm, black and white with broad orange band on abdomen, legs orange, hind tibia with black-bordered white band (Fig. 47). Frequent in spring. Hosts: Diptera (Syrphidae). .... ***Diplazon laetatorius***

53′ Front wing with a small closed cell between radial and second discoidal cells (as Fig. 4). 5–7 mm, black with a few white marks, legs orange. Scarce, in spring. Hosts: Diptera (Syrphidae). .... ***Syrphoctonus fuscitarsus***

Ichneumonidae Tryphoninae

54(51) Front wing with a small closed cell between radial and second discoidal cells (Fig. 4). Propodeum with numerous transverse ridges, none forming isolated zones (Fig. 35). Female with stinging ovipositor that lacks a dorsal notch near its apex, about twice as long as apical height of abdomen (Fig. 39). 12–20 mm, tan to rufescent. Frequent at light in spring. Hosts: Lepidoptera (including Noctuidae, *Heliothis*). Most .... ***Netelia***

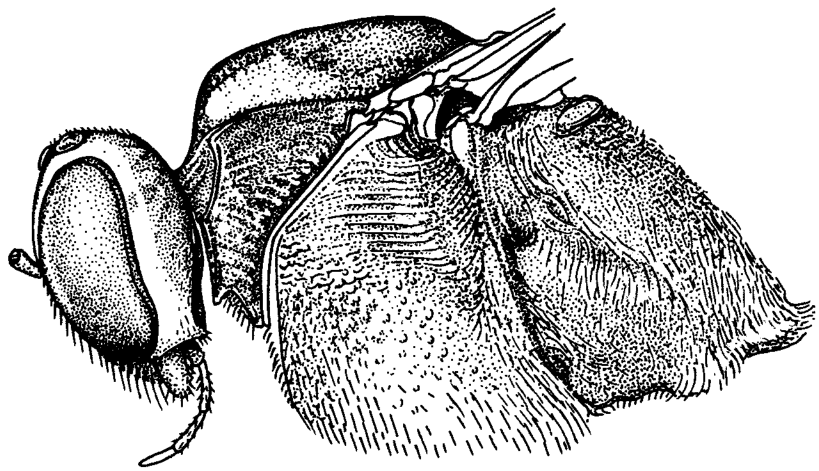


Figure 40. *Anomalon* (Ichneumonidae, Anomalinae) forebody, side view.

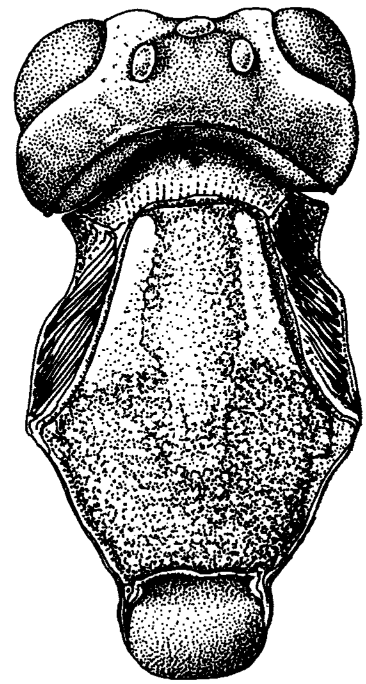


Figure 41. *Anomalon* (Ichneumonidae, Anomalinae) forebody, top view.

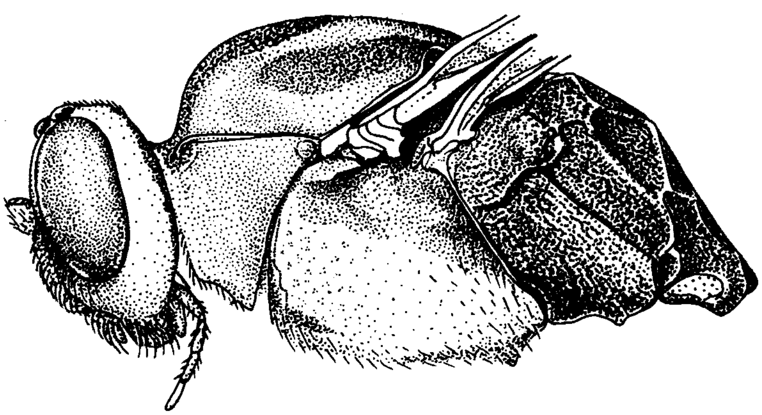


Figure 42. *Temelucha platynotae* (Ichneumonidae, Cremastinae) forebody, side view.

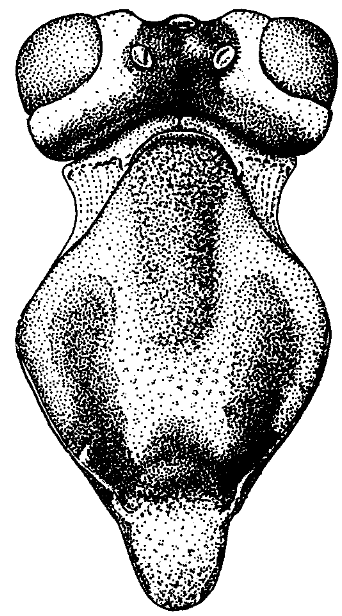


Figure 43. *Temelucha platynotae* (Ichneumonidae, Cremastinae) forebody, top view.

54′ Front wing without a small closed cell between radial and second discoidal cells (Fig. 34). 55

55. Spiracle of abdominal segment 1 located before middle. Mandible with lower part recessed, so that only 1 tooth is readily visible. This is true in whole genus. A few .... ***Netelia***

55′ Spiracle of abdominal segment 1 located behind middle (Fig. 37). Mandible with 2 nearly equal teeth. 56

Ichneumonidae Ophioninae

56(47, 55′) Discocubital (large central) cell of front wing with 2 tan thickenings (Fig. 34), these surrounded by a narrow clear zone. 12–22 mm, tan to brown. Scarce, mostly at light. Hosts: Lepidoptera (including Noctuidae, *Spodoptera*). (Enicospilini) Some ***Enicospilus***

56′ Discocubital cell without such thickenings. 57

57. Posterior portion of mesosternum with a ridge extending completely across, or faint only near midline. 58

57′ Only traces of posterior transverse ridge on mesosternum, beside middle coxae. 59

58. Vein extending obliquely outward from stigma curved and thickened at base. Spur of front tibia with a translucent flange on its mesal face, behind antennal brush and about equal to it. 15 mm, body rufescent, wings dusky. Scarce, at light. Hosts unknown. (Ophionini) .... ***Clistorapha subfuliginosus***

58′ This vein not thickened or curved. Spur of front tibia without flange. Discocubital cell with clear area that shows irregularity where thickenings show in Fig. 34. (Enicospilini) Some .... ***Enicospilus***

59(57′) Notauli (sublateral longitudinal grooves on mesonotum) moderately sharp, reaching $^2/_5$ way down mesonotum. 12–22 mm, tan to brown. Scarce, at light. Hosts: Lepidoptera (no crop pests). (Ophionini) .... ***Ophion***

59′ Notauli absent or short, weak impressions. 60

60. Propodeum without ridges, punctured or finely wrinkled. 12–16 mm, tan to brown. Scarce, at light. Hosts unknown. (Ophionini) .... ***Genophion***

60′ Propodeum with a strong ridge across base and another weaker ridge behind middle. 12 mm, rufescent. Hosts unknown. (Ophionini) .... ***Boethoneura arida***

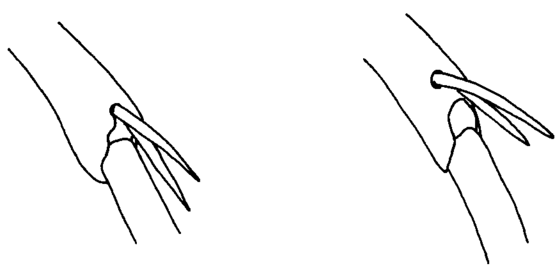


Figure 44. Ichneumonidae, Porizontinae, tip of tibia (left).

Figure 45. Ichneumonidae, Cremastinae, tip of tibia (right).

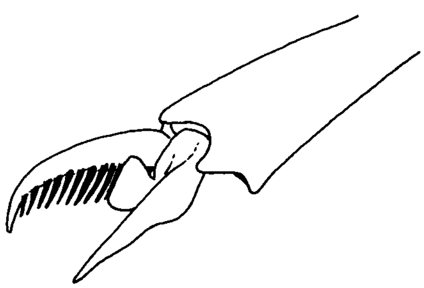


Figure 46. *Netelia* (Ichneumonidae, Tryphoninae) tarsal claws.

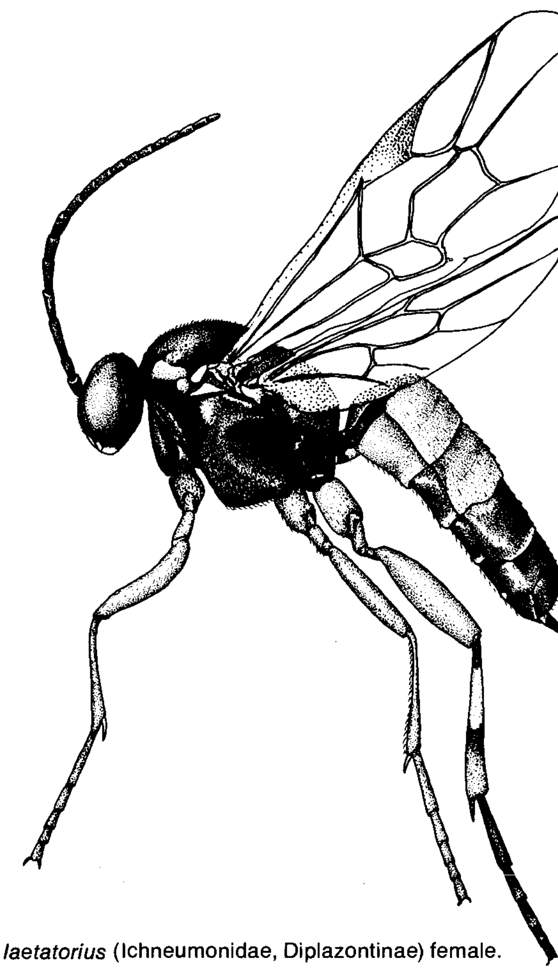


Figure 47. *Diplazon laetatorius* (Ichneumonidae, Diplazontinae) female.

Ichneumonidae Porizontinae

61(49) Abdominal terga dark with sides and apices pale. Hind wing with a very weak vein, more like a fold, from crossvein that closes the posterior basal cell to the margin. (*Campoletis*) 62

61′ Most abdominal terga uniformly colored, all dark or all red. Hind wing without such a vein. 63

62. Hind tibia blackish at base, apex and along underside, white middorsally, the colors sharply defined (see Carlson 1972 for more details). 5–7 mm, subopaque, black with tan apices on most abdominal terga, pale legs; ovipositor slightly less than twice as long as apical height of abdomen. Scarce. Hosts: Lepidoptera (Noctuidae, including *Heliothis* on cotton, *Spodoptera, Trichoplusia*). .... ***Campoletis sonorensis***

62′ Hind tibia similar but markings diffuse and mid-dorsal area straw-colored. Similar otherwise, averaging smaller. Scarce. Hosts: Lepidoptera (Noctuidae, including *Heliothis* on corn, *Spodoptera, Trichoplusia*) ....***Campoletis flavicincta***

63(61′) Abdominal terga all dark, or terga 2 and 3 paler on sides and apex. 5–6 mm, black with reddish legs, hind tibia blackish at base and apex, white in a wide, contrasting midband; ovipositor twice as long as apical height of abdomen. Scarce. Hosts: Lepidoptera (several Microlepidoptera). (= *Horogenes plutellae* of Muesebeck et al. 1951). .... ***Diadegma insularis***

63′ Abdominal terga primarily red. (*Hyposoter*) 64

64. Hind tibia black at base and apex, whitish between. 5–7 mm, black, abdomen red except for some black at base of tergum 1, base and apex of 2, sometimes base of 3; legs reddish with coxae brown, trochanters whitish. Ovipositor as long as apical height of abdomen. Scarce. Hosts: Lepidoptera (Noctuidae, *Heliothis, Spodoptera,* Pieridae, *Colias*) .... ***Hyposoter exiguae***

64′ Hind tibia all reddish or with a weak paler band. 7–8 mm, similarly colored, abdomen with less black toward base. Ovipositor longer, 1½ times as long as apical height of abdomen. Very scarce. Hosts: Lepidoptera (Arctiidae). .... ***Hyposoter pilosulus***

Ichneumonidae Cremastinae

65(49′) Abdominal sternum 1 fully visible for its entire length. Abdominal tergum 1 with a small pale scar on each side near base. Hind femur usually with 1 or several ventral teeth, toward apex. 5–9 mm, tan, to forebody black and abdomen red. Ovipositor 3 times as long as apical height of abdomen, ovipositor, not sheath, with 2 pale-banded waves near apex. Scarce. Hosts: Lepidoptera (Noctuidae, including *Spodoptera,* Pyralidae, *Elasmopalpus, Loxostege*). ... ***Pristomerus***

65′ Abdominal sternum 1 concealed for most of its length by bowed-in lower edges of tergum 1. Abdominal tergum 1 without lateral scars. Hind femur not toothed. 5–9 mm, tan to mostly dark. Mesonotum all dark, or with an anteromedian dark mark and slightly paler lateral marks (Fig. 42, 43), in different species. Ovipositor 3 times as long as apical height of abdomen, not wavy. Scarce. Hosts: Microlepidoptera (including Tortricidae, *Platynota*). (= *Cremastus* of Muesebeck et al. 1951). .... ***Temelucha***

Superfamily Chalcidoidea

66(8, 9, 11) Hind femur robustly enlarged, ventrally toothed; hind tibia arched (Fig. 48, 57–60). 67

66′ Hind femur not enlarged or ventrally toothed (Fig. 49–51). 68

67. Body black or pale, not metallic. Ovipositor barely visible beyond apex of abdomen (Fig. 57). (Chalcididae) . 78

67′ Body metallic, abdomen sometimes reddish at base. Ovipositor almost as long as body. (Fig. 48). Rare in crops, usually seen on eggs of Orthoptera (Mantidae), their only hosts. (Torymidae) .... ***Podagrion***

68(66′) Hind coxa at least 3 times as long as front coxa. Pronotum large. Body metallic, usually slender. Ovipositor from shorter than abdomen to longer than body (Fig. 49). Frequent, especially near saltbush, some species parasitic on gall midges on this plant. (Torymidae). 2 mm, ovipositor shorter than abdomen, body not strongly metallic. Scarce. Host: Hymenoptera (Eurytomidae, *Bruchophagus*). .... ***Liodontomerus***

68′ Hind coxa little longer than front coxa (Fig. 50) 69

69. Pronotum rectangular from above, large. Body non-metallic, from tan to black. Thorax usually coarsely punctured. (Eurytomidae). 1.5–2 mm, chunky, black (Fig. 50, 51). Frequent, especially near alfalfa. Phytophagous, in alfalfa seeds. ***Bruchophagus foddi***

69′ Pronotum tapered anteriorly, not conspicuously large. 70

70. Tarsi 3-segmented. All species less than 1 mm long. Antennae short, with at most 2 segments between scape and club (Fig. 71, 72, 74). Common. (Trichogrammatidae) 102

70′ Tarsi 4- or 5-segmented. If body 1 mm or less, form as in Fig. 52 or 73. 71

71. Antennae arising far from each other, without any short ring segments. Last segment or 2 slightly enlarged in female (Fig. 52). Body never metallic, usually less than 1 mm long. Wings usually very slender at base and with fringes of long setae. Frequent. (Mymaridae) . 86

71′ Antennae arising nearer to each other than to eyes, usually short and with 1–3 short ring segments beyond scape. 72

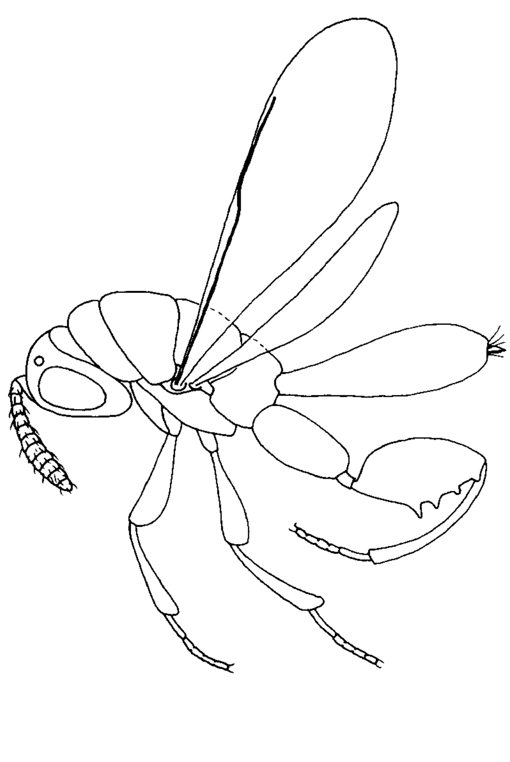


Figure 48. *Podagrion* (Torymidae) male.

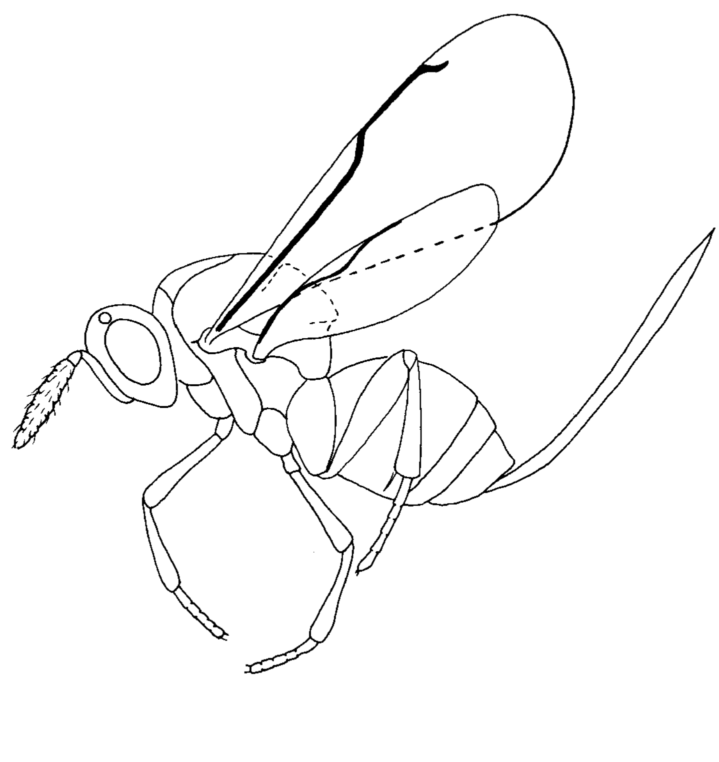


Figure 49. *Torymus* (Torymidae) female.

72. Body 1 mm long or less, not metallic. Tarsi 5-segmented. Abdomen broadly attached to propodeum. Antennae short, with at most 8 evident segments (Fig. 73). One species sometimes common. (=Eulophidae Aphelininae of Muesebeck et al. 1951). (Aphelinidae) 102

72′ Body usually longer than 1 mm. Tarsi 4-segmented and body weakly sclerotized, or tarsi 5-segmented and body hard. 73

73. Tarsi 4-segmented. Front tibial spur short, straight. Body often much shrivelled in dry specimens (Fig. 61–66). Common. (Eulophidae) 81

73′ Tarsi 5-segmented. Front tibial spur usually distinctly curved. Body usually firm. 74

74. Mesopleuron very convex, not grooved to accommodate middle femur. Middle tibia with a long and heavy tibial spur. 75

74′ Mesopleuron not so convex and with a groove for femur; middle tibial spur not enlarged. 76

75. Thorax robust, not narrow and stretched out. Mesoscutum without grooves. Most species 2 mm long or less. (Encyrtidae). Body dark, near 2 mm long, wings without markings (Fig. 53). Sometimes frequent, at least locally. Hosts: Lepidoptera (Noctuidae, especially *Trichoplusia*) .... ***Copidosoma truncatellum***

75′ Thorax unusually slender and stretched out. Mesoscutum with deep grooves in male, smooth in female (Fig. 54). 1–4 mm, usually at least partly metallic. Rare in crops, with no known associations with crop insects in this area. .... Eupelmidae

76(74′) Thorax very high and short, of unusual conformation (Fig. 55, 56). Body always metallic in crop-associated species. 77

76′ Thorax not high and short (Fig. 67–70). Body metallic or not. Sometimes common. (Pteromalidae) 90

77. Robust, pronotum sharply margined in front (Fig. 56). 2–4 mm, usually dark metallic blue. Very scarce in crops. .... Perilampidae

77′ Rather slender, bright metallic (Fig. 55). 2–4 mm. Rare in crops. .... Eucharitidae

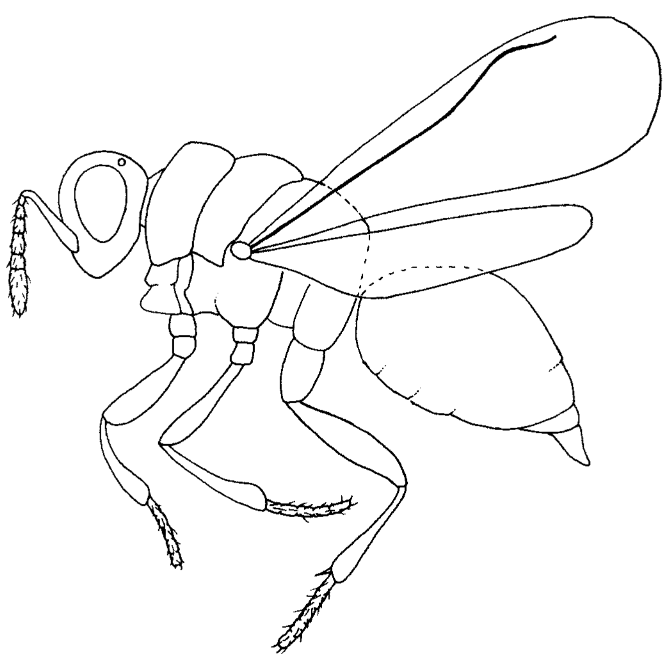


Figure 50. *Bruchophagus roddi* (Eurytomidae) female.

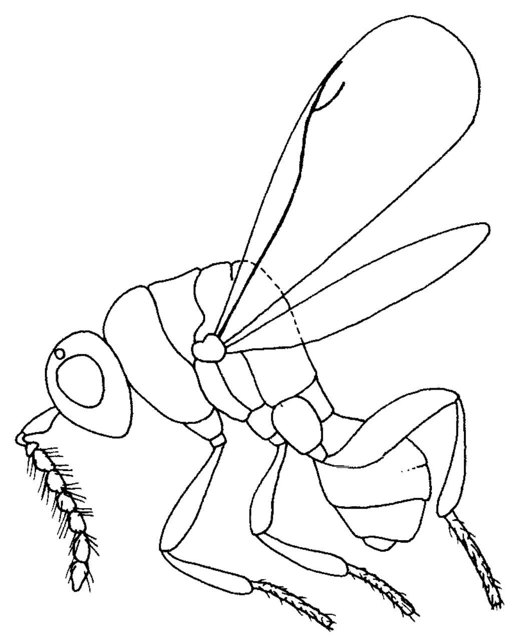


Figure 51. *Bruchophagus roddi* (Eurytomidae) male.

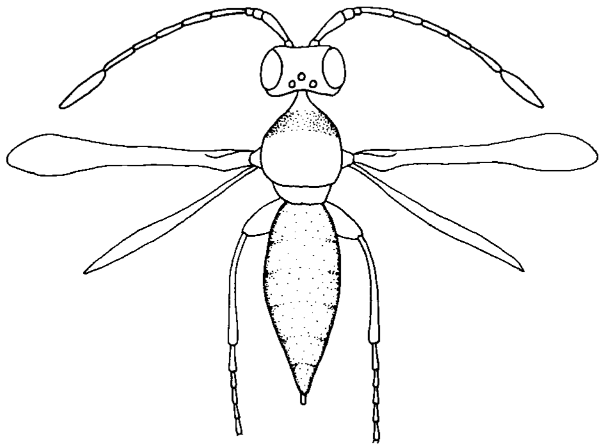


Figure 52. *Anagrus* (Mymaridae).

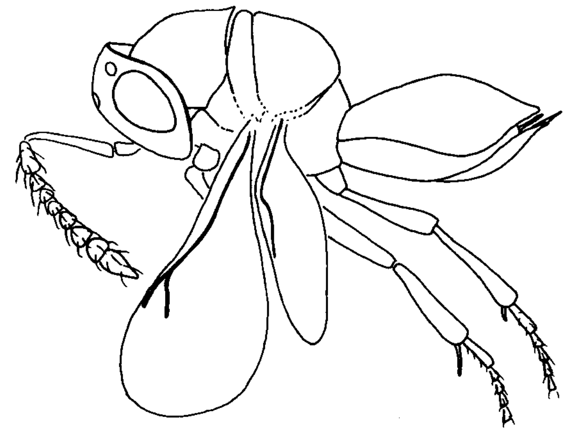


Figure 53. *Copidosoma truncatellum* (Encyrtidae), female.

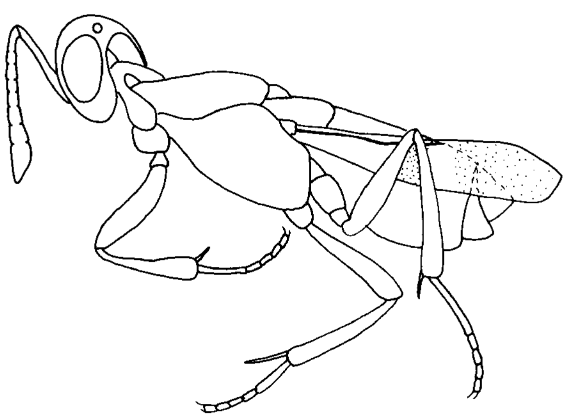


Figure 54. *Anastatus* (Euplemidae) male

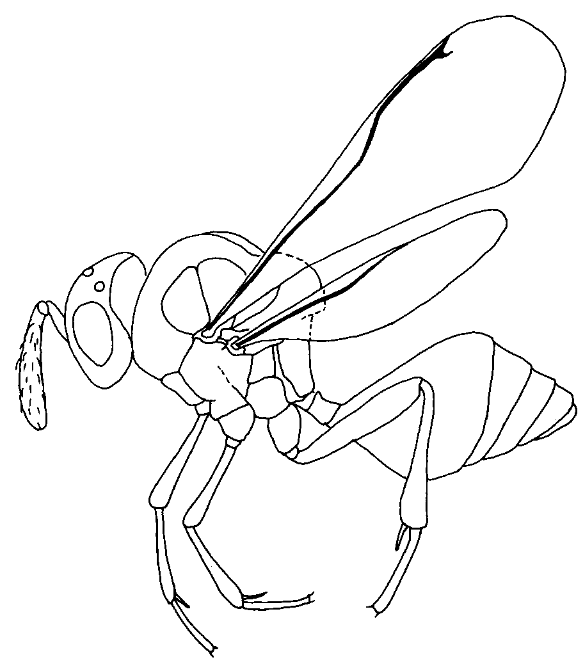


Figure 55. *Orasema* (Eucharitidae).

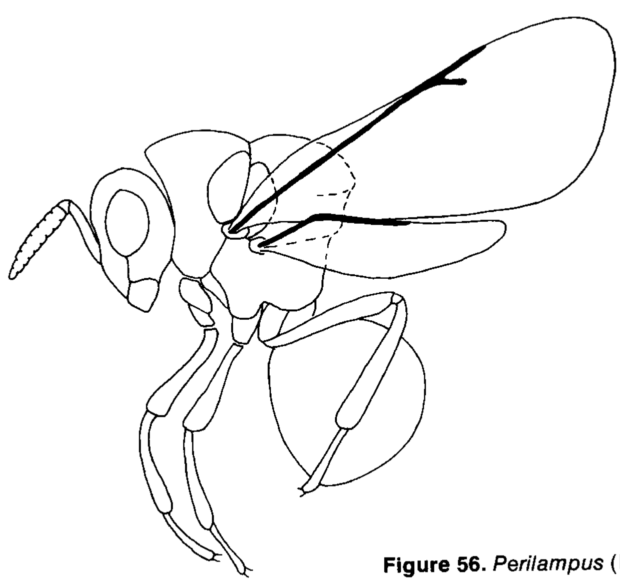


Figure 56. *Perilampus* (Perilampidae).

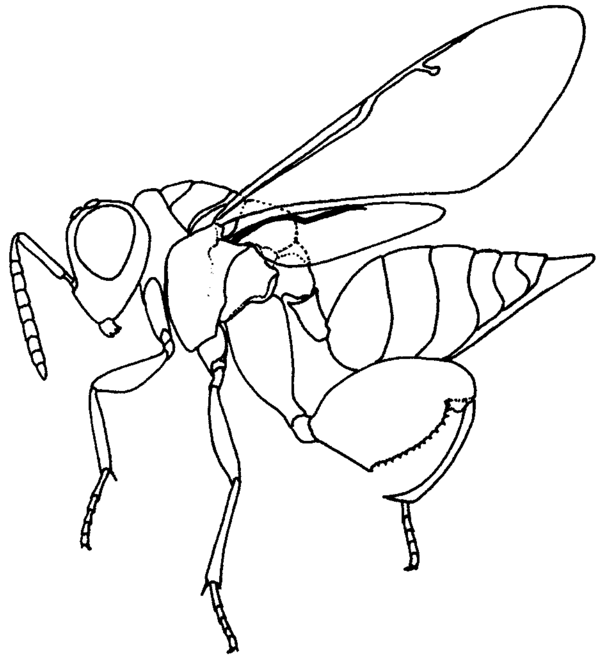


Figure 57. *Spilochalcis* (Chalcididae) female.

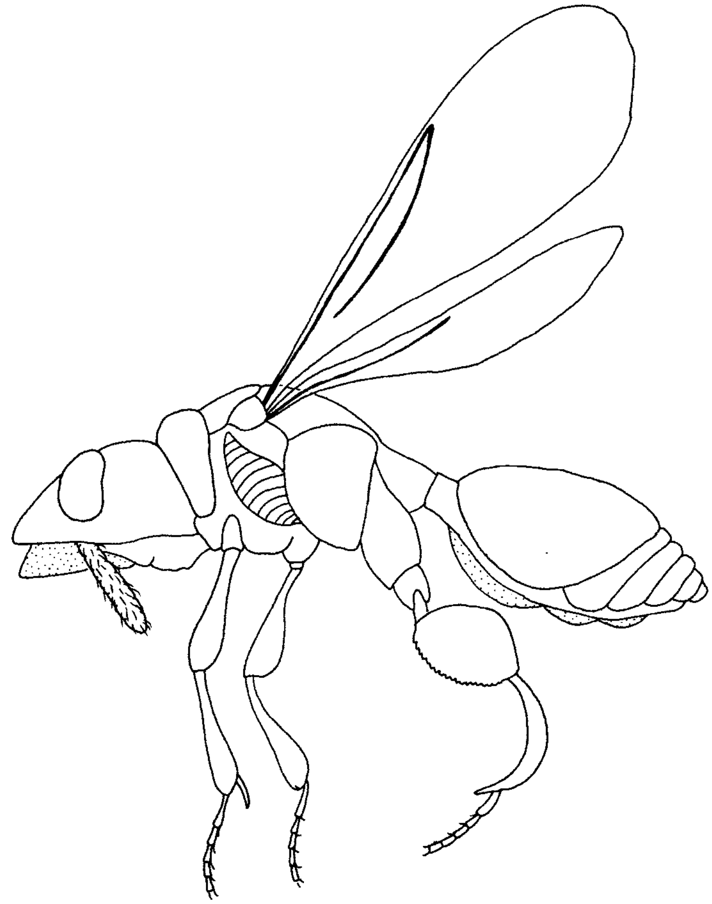


Figure 58. *Dirhinus* (Chalcididae) female.

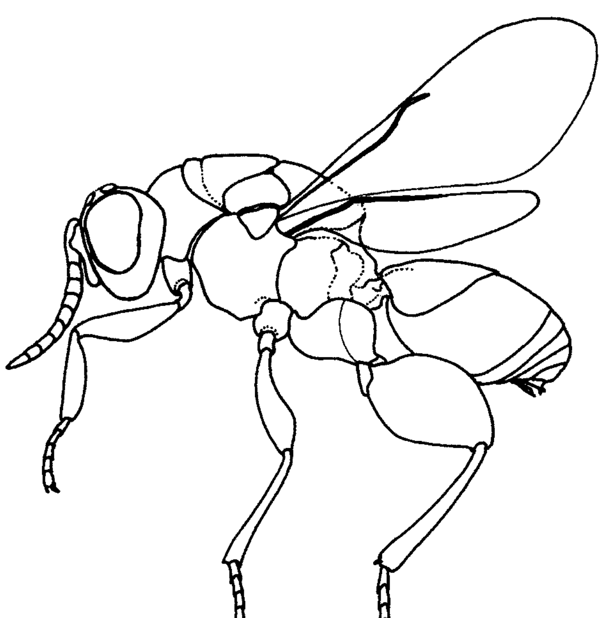


Figure 59. *Euchalcidia* (Chalcididae) female.

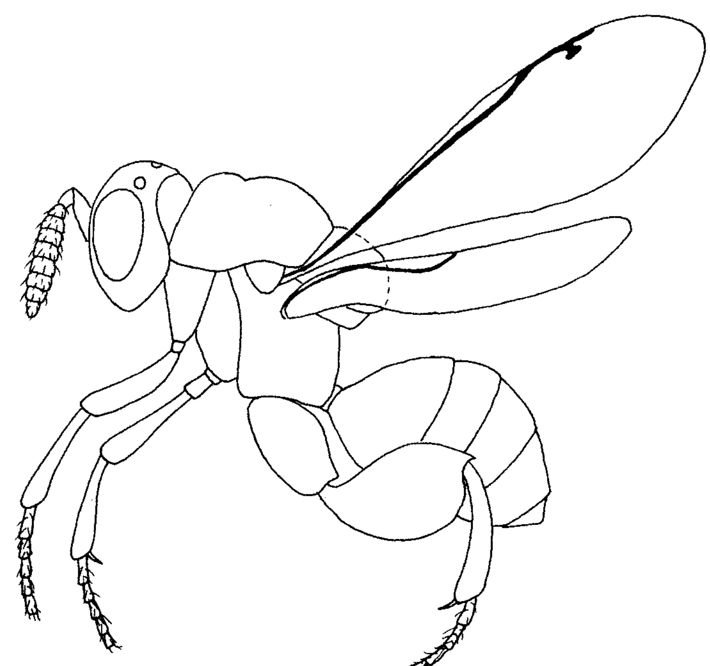


Figure 60. *Brachymeria* (Chalcididae) female.

Family Chalcididae

78(67) Front of head with a deep cleft (Fig. 58). 3–5 mm, black, legs partly brown. Very scarce. Hosts: Lepidoptera (Pyralidae), Diptera (Sarcophagidae). (Dirhininae) .... ***Dirhinus***

78′ Front of head with at most a slight depression. 79

79. Abdomen slender at base (Fig. 57). 3–5 mm, yellow with black markings to black with pale markings, legs not contrastingly paler. Scarce. Hosts: Lepidoptera (mainly, without crop-associated species in this region). (Chalcidinae) .... ***Spilochalcis***

79′ Abdomen with at most a short, indistinct petiole. Body all dark, legs sometimes partly pale. 80

80. Antennae arising just above mouth (Fig. 59). 2.5–3.5 mm, black with a slight metallic cast, legs without pale markings. Frequent. Hosts unknown. (Haltichellinae) .... ***Euchalcidia***

80′ Antennae arising at level of lower edge of eyes (Fig. 60). 2.5–5 mm, black, legs with pale markings, hind legs rufous in some. Scarce in crops. Hosts: Lepidoptera (including Noctuidae, *Heliothis*, and Tortricidae, *Platynota*), Diptera (especially Tachinidae), Orthoptera (Acrididae, *Melanoplus*). (Brachymeriinae) .... ***Brachymeria***

Family Eulophidae

81(73) Body yellow, with narrow brown markings; front wing with some dark clouding (Fig. 61). Ca. 1 mm. Scarce. Hosts: Diptera (Agromyzidae), Homoptera (Aleyrodidae), Microlepidoptera. (Elachertinae) .... ***Zagrammosoma***

81′ Body entirely dark, sometimes metallic. 82

82. Front wing with 2 brown bands (Fig. 62). 0.5–0.8 mm, at least head partly metallic purple. Frequent. Hosts: Microlepidoptera (including Lyonetiidae, *Bucculatrix*) .... ***Closterocerus utahensis***

82′ Wings without dark markings. 83

83. Mesoscutum with a median groove and mesoscutellum with a pair of sublateral grooves (Fig. 63). 1–1.5 mm, body usually not shiny. Vein along front margin of wing stopping abruptly where stigmal vein arises. Frequent. Hosts: many, including many parasitic wasps. One species reared from *Chrysopa* cocoons, another from alfalfa seed chalcid, *Bruchophagus*. (Tetrastichinae) .... ***Tetrastichus***

83′ Mesoscutum without a median groove. Body metallic, shiny. 84

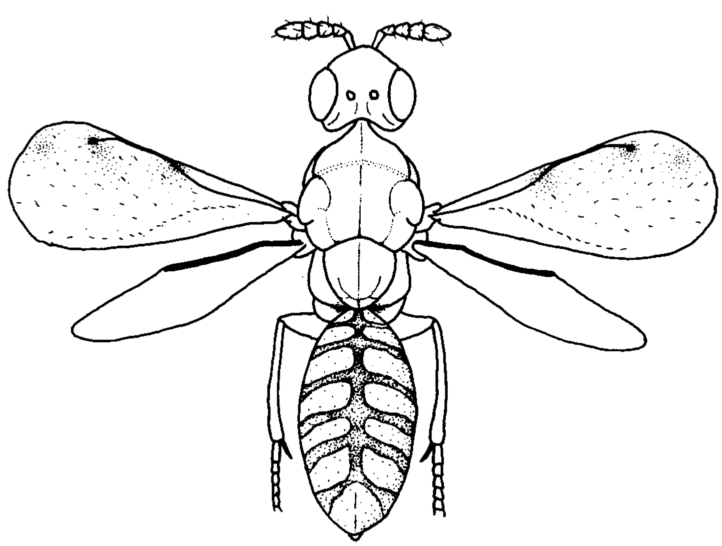


Figure 61. *Zagrammosoma* (Eulophidae).

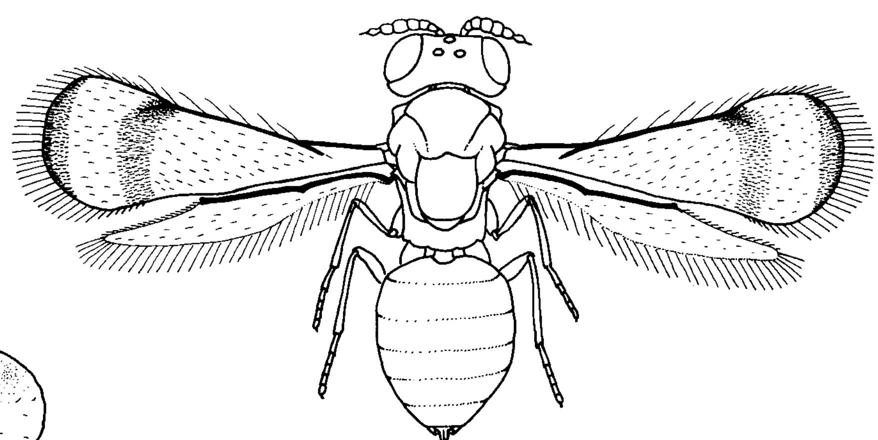


Figure 62. *Closterocerus utahensis* (Eulophidae).

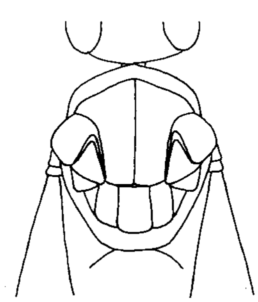


Figure 63. *Tetrastichus* (Eulophidae) thorax, top view.

84. Mesoscutellum with a pair of slightly outcurved lateral grooves. Femora partly dark. Pronotum conical, more than half as long as wide (Fig. 64). 0.7–1 mm. Frequent. Hosts: Diptera (Agromyzidae). (Eulophinae) .... ***Solenotus***

84′ Mesoscutellum without lateral grooves. 85

85. Legs pale except for part of coxae and last tarsal segment (Fig. 65). 0.8–1.2 mm. Frequent. Hosts: Diptera (Agromyzidae). (Entedontinae) .. ***Chrysocharis parksi***

85′ At least part of femur dark, usually metallic. Pronotum transverse, inconspicuous (Fig. 66). 0.5–0.7 mm. Scarce. Hosts: Diptera (Agromyzidae). (= *Derostenus arizonensis* of Muesebeck et al. 1951). (Entedontinae) .... ***Achrysocharella punctiventris***

Family Mymaridae

86(71) Tarsi 5-segmented. Female antenna with 11 segments, male 13. (Gonatocerinae) 87

86′ Tarsi 4-segmented. Female antenna with 9 segments, male 13 (12 in *Anaphes*). (Mymarinae) 88

87. Abdomen sessile or subsessile. Wings quite broad. 0.5–0.7 mm. Scarce. Hosts: Homoptera (Cicadellidae, Membracidae, *Spissistilus*). .... ***Gonatocerus***

87′ Abdomen with a long, slender petiole. 0.7–1.5 mm. Very scarce. Hosts: Homoptera (Cercopidae). .... ***Ooctonus***

88(86′) Abdomen with a distinct petiole. Wing vein ending in a short and broad expansion that is distinctly connected to the rest of the vein. Propodeum with a median keel or tooth. 0.5–0.8 mm. Frequent. Hosts: Homoptera (Cicadellidae, Membracidae, *Spissistilus*), Hemiptera (Miridae, *Lygus*). .... ***Polynema***

88′ Abdomen sessile or subsessile 89

89. Front wing with hair lines extending from vein. Male antenna with 12 segments. 0.5 mm. Very rare. Hosts: including Hemiptera (Miridae, *Lygus, Psallus*). (= *Mymar* of Muesebeck et al. 1951). .... ***Anaphes***

89′ Front wings without distinct hair lines. Male antenna 13-segmented, segments 2 and 3 subequal. 0.5 mm. Very scarce. Hosts: Homoptera (Cicadellidae). ..... ***Anagrus***

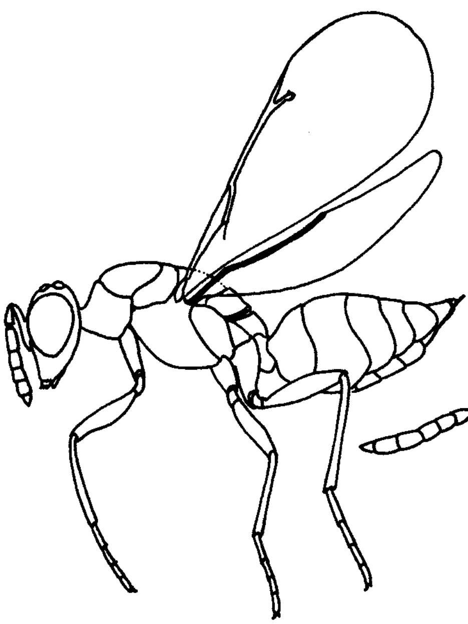


Figure 64. *Solenotus* (Eulophidae) female.

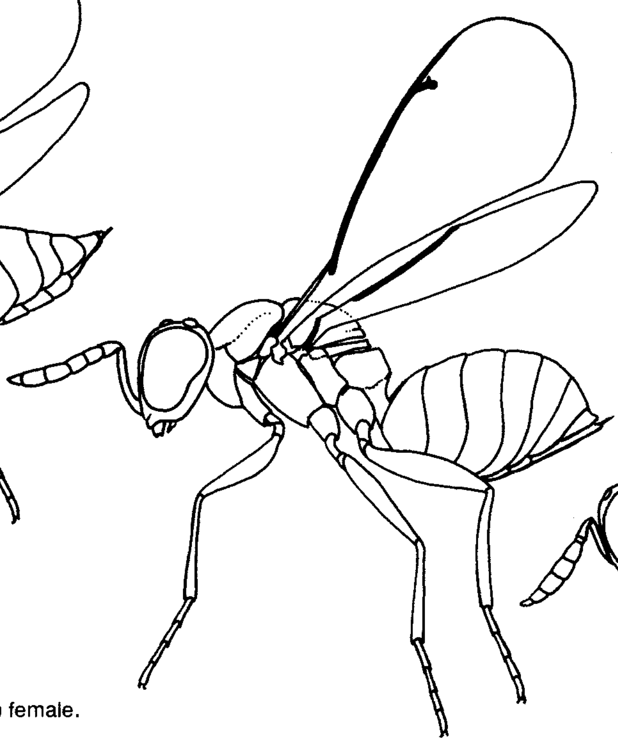


Figure 65. *Chrysocharis* (Eulophidae) female.

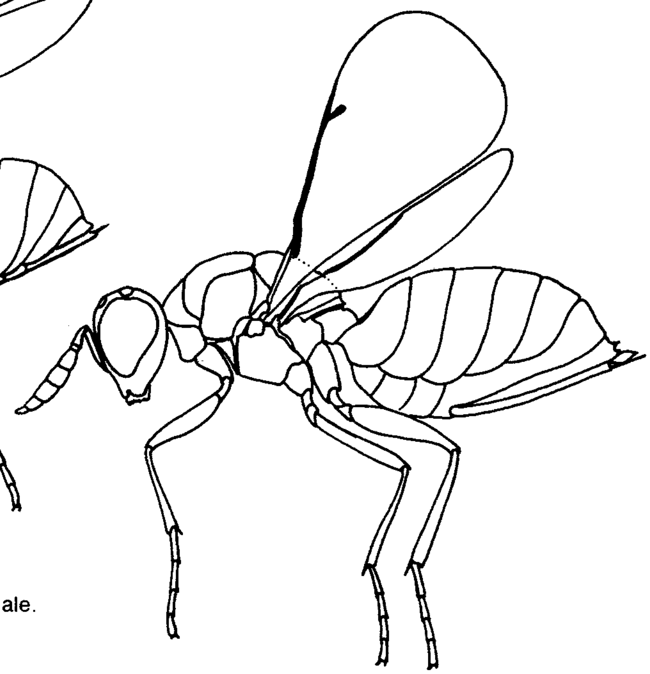


Figure 66. *Achrysocharella* (Eulophidae) female.

Family Pteromalidae

90(76′) Part of vein touching front margin of wing enlarged, as long and more than 3 times as wide as stigmal vein (Fig. 68). Body bright metallic green. 0.7–2 mm. Frequent. Hosts: Homoptera (Aphididae), Diptera (Syrphidae). (Sphegigasterinae) .... ***Pachyneuron***

90′ This vein usually longer and less than twice as wide as stigmal vein. 91

91. Abdomen with a long, distinct petiole. 92

91′ Abdomen sessile or with an obscure petiole. 93

92. Body normally convex; female abdomen strongly keeled below (Fig. 67). Body usually bright, metallic green. 1–1.5 mm. Frequent. Hosts: Diptera (Agromyzidae). (Sphegigasterinae) .... ***Halticoptera aenea***

92′ Body very flat in lateral view. 2–2.5 mm. Rare. Hosts: Diptera (Agromyzidae). (Sphegigasterinae) ....***Syntomopus***

93(91′) Cheeks pinched in at base of mandibles. 94

93′ Cheeks convex at base of mandibles. 97

94. Antennae gradually enlarged to form a club; abdomen with a short petiole; head with moderately dense, long, white setae. 1.5–2.5 mm. Scarce. Hosts: Coleoptera (Chrysomelidae). (Pteromalinae) .... ***Psilocera***

94′ Antennae with apex only slightly thickened; abdomen not petiolate; head with short, sparse setae. 95

95. Female antenna with 3 short ring segments, male 2; head and pronotum metallic green. 1.5–3 mm. Scarce. Hosts: Diptera (Cecidomyiidae, *Asphondylia*). (Pteromalinae) .... ***Pseudocatolaccus***

95′ Female antenna with 2 ring segments; head and pronotum black. 96

96. Mesoscutum with sparse thick, white setae. Head not unusually heavy. 1.5–3 mm. Rare. Hosts: Coleoptera (Bruchidae, Curculionidae). (Pteromalinae). .... ***Heterolaccus hunteri***

96′ Mesoscutum without thick, white setae; head usually thickened behind eyes (Fig. 69). 1.5–2.5 mm. Frequent. Hosts: Hymenoptera (Braconidae, in many hosts). (Pteromalinae) .... ***Catolaccus aeneoviridis***

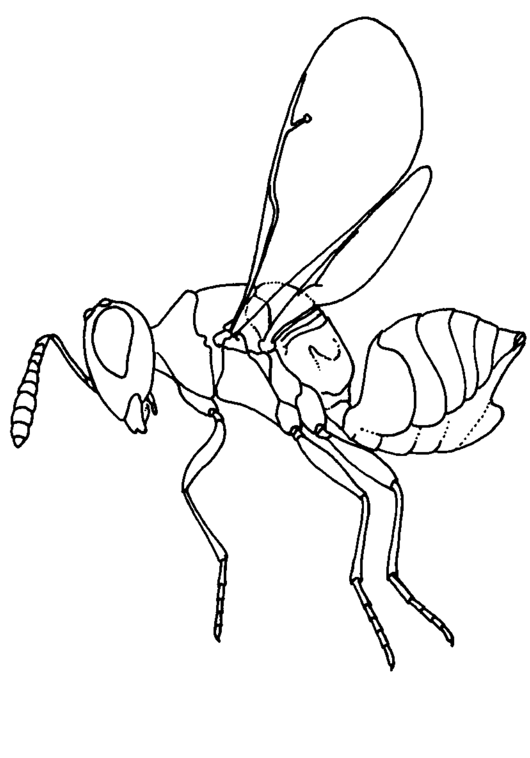


Figure 67. *Halticoptera* (Pteromalidae) female.

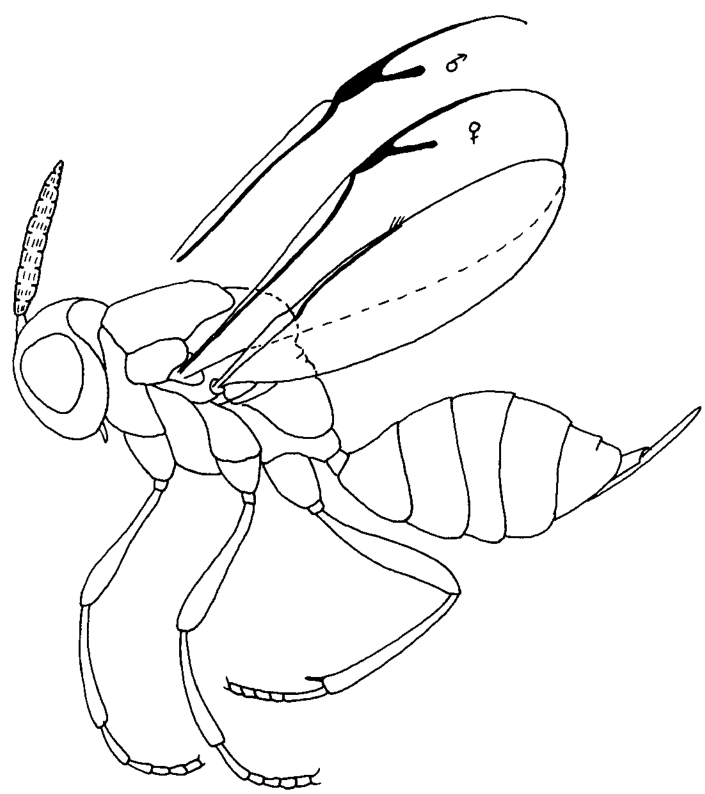


Figure 68. *Pachyneuron* (Pteromalidae).

97(93′) Head, pronotum and mesoscutum with conspicuous long, white setae. Antenna with 3 ring segments. .. 98

97′ Forebody without long, white setae. Antenna usually with 2 ring segments. 100

98. Scape of antenna not reaching median ocellus; propodeum smoothly reticulate, shiny. 1.2–3 mm. Scarce. Hosts: Coleoptera (Bruchidae, Curculionidae). (Pteromalinae) .... ***Zatropis***

98′ Scape extending past median ocellus; propodeum roughly reticulate, dull. 99

99. Propodeum with a distinct neck, and with median and lateral ridges that produce a very distinctive spectacle-like pattern. Thorax compact (Fig. 70). Head and pronotum of female black, abdomen dark metallic green, short, strongly keeled; male metallic green. 2–2.5 mm. Moderately frequent. Hosts: Diptera (Agromyzidae). (Sphegigasterinae) .... ***Heteroschema***

99′ Propodeum without a distinct neck; head and pronotum black with a distinct metallic cast; female abdomen long; propodeum without strong ridges. 2–5 mm. Rare. Hosts: Coleoptera (Curculionidae, Cerambycidae). (Pteromalinae) .... ***Neocatolaccus***

100(97′) Wings without a fringe of setae on margin. 1.5–2 mm, blackish; head with occipital carina extending across top. Rare. Hosts: Hymenoptera (Braconidae, Ichneumonidae), Lepidoptera (many, probably as a hyperparasite). (Pteromalinae) .... ***Dibrachys cavus***

100′ Wings with a marginal fringe of setae, at least on posterior half. Body with at least abdomen orange or with metallic green highlights. 101

101. Antennae arising near lower level of eyes, below center of front, scape not reaching median ocellus. Antenna with 3 ring segments. 1–2 mm. Scarce. Hosts: Microlepidoptera, one species on the alfalfa seed chalcid. (Pteromalinae) .... ***Amblymerus***

101′ Antennae arising near center of front, with 2 ring segments, scape barely reaching median ocellus. 1.5–3 mm. Frequent. Hosts: Microlepidoptera, Coleoptera (Curculionidae), one species on alfalfa seed chalcid. (Pteromalinae) .... ***Habrocytus***

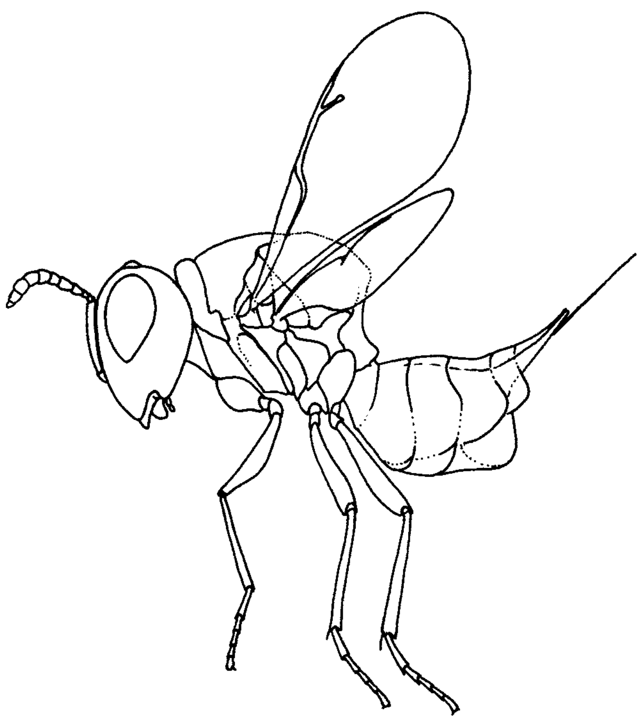


Figure 69. *Catolaccus* (Pteromalidae) female.

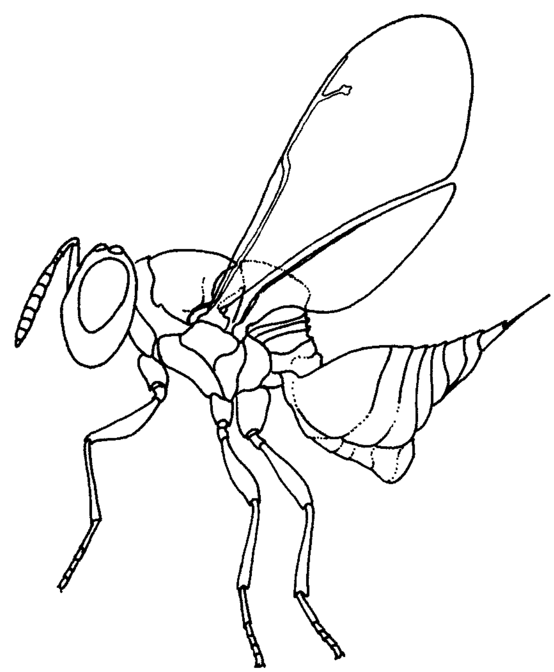


Figure 70. *Heteroschema* (Pteromalidae) female.

Families Trichogrammatidae and Aphelinidae

102(70, 72) Front wings with a dark cloud at the level of the stigma, to dark across whole basal half. 103

102′ Wings all pale, although the stigma may be darker than the membrane. 104

103. Body reddish-brown, eyes red. Front wings dusky across base in well-marked individuals, with only a dark stigmal cloud in others. Antenna dark with a pale zone (Fig. 71). Frequent. Hosts: Homoptera (Cicadellidae). (Trichogrammatidae) .....***Aphelinoidea plutella***

103′ Body yellowish, eyes dark. Front wings moderately slender, with a transverse, slightly recurved stigmal cloud near middle of wing (Fig. 72). Sometimes abundant. Hosts: Homoptera (Cicadellidae), Hemiptera (Miridae, *Halticus*). (Trichogrammatidae) ....***Abbella***

104(102′) Region behind vein on front wings as densely setose as rest of wing. Tarsi 5-segmented. Antennae relatively long (Fig. 73). Yellow with black eyes (female), brownish (male). Frequent. Hosts: Homoptera (Aleyrodidae). Eggs laid in eggs of Lepidoptera (Noctuidae, including *Heliothis*) produce males (Stoner and Butler 1965). (Aphelinidae) .... ***Encarsia lutea***

104′ Region behind vein in front wing almost seta-free, in contrast with rest of wing. Antenna short and clubbed (female), or somewhat brush-like (male). (Fig. 74). Body brownish. Tarsi 3-segmented. Scarce. Hosts: many, but mainly Lepidoptera (including Noctuidae, *Heliothis*). (Trichogrammatidae) .... ***Trichogramma***

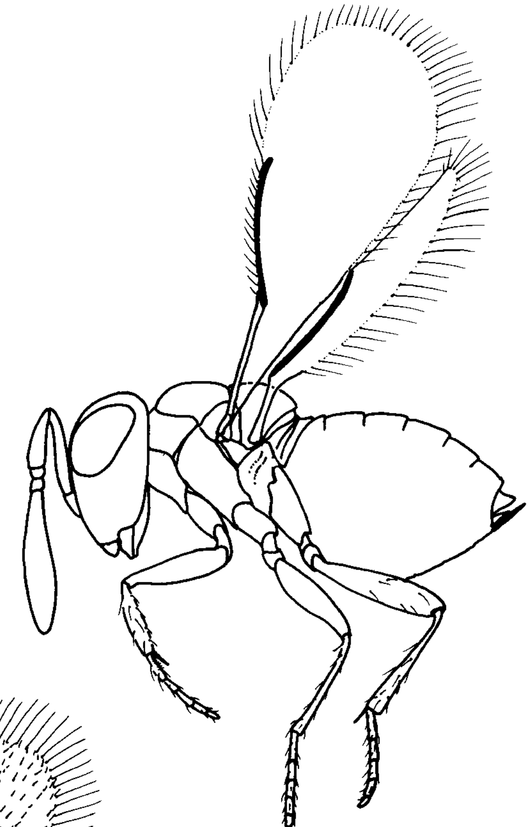


Figure 73. *Encarsia lutea* (Aphelinidae) female.

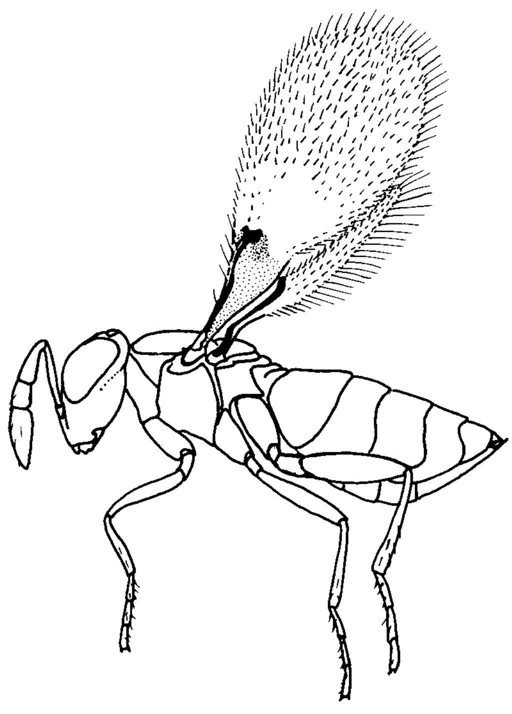


Figure 71. *Aphelinoidea* (Trichogrammatidae) female.

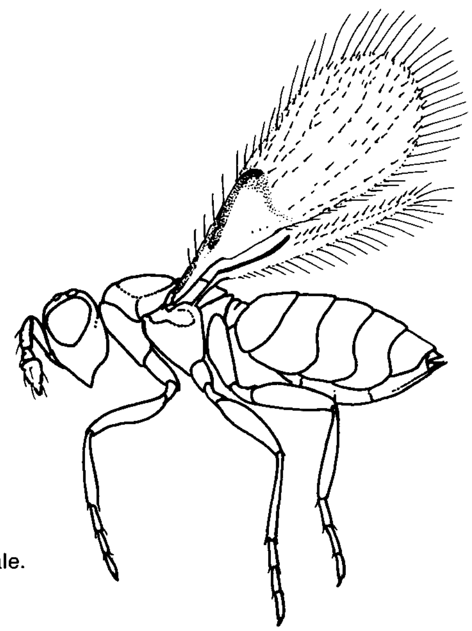


Figure 72. *Abbella* (Trichogrammatidae) female.

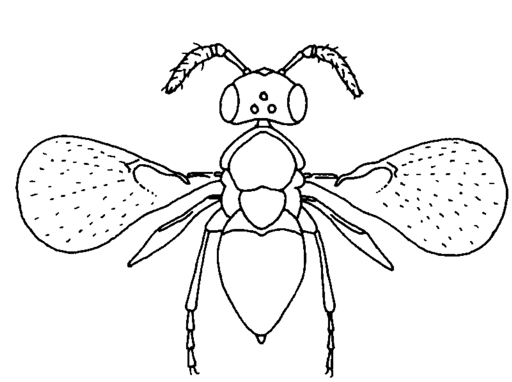


Figure 74. *Trichogramma* (Trichogrammatidae) female.

Superfamily Cynipoidea

105(7) Base of abdomen without a collar of "fur" (Fig. 75). (Figitidae) 106

105′ Base of abdomen with a collar of "fur" (Fig. 76). (Cynipidae) 107

106. Abdominal petiole short. Head not wider than thorax (Fig. 75). 3–4 mm. Frequent. Hosts: Diptera (Sarcophagidae). (Figitinae) . ***Xyalophora quinquelineata***

106′ Abdomen with a long petiole. Head wider than thorax. 2.5–3 mm. Scarce. Hosts: Neuroptera (Chrysopidae, Hemerobiidae). (Anacharitinae) .... ***Anacharis***

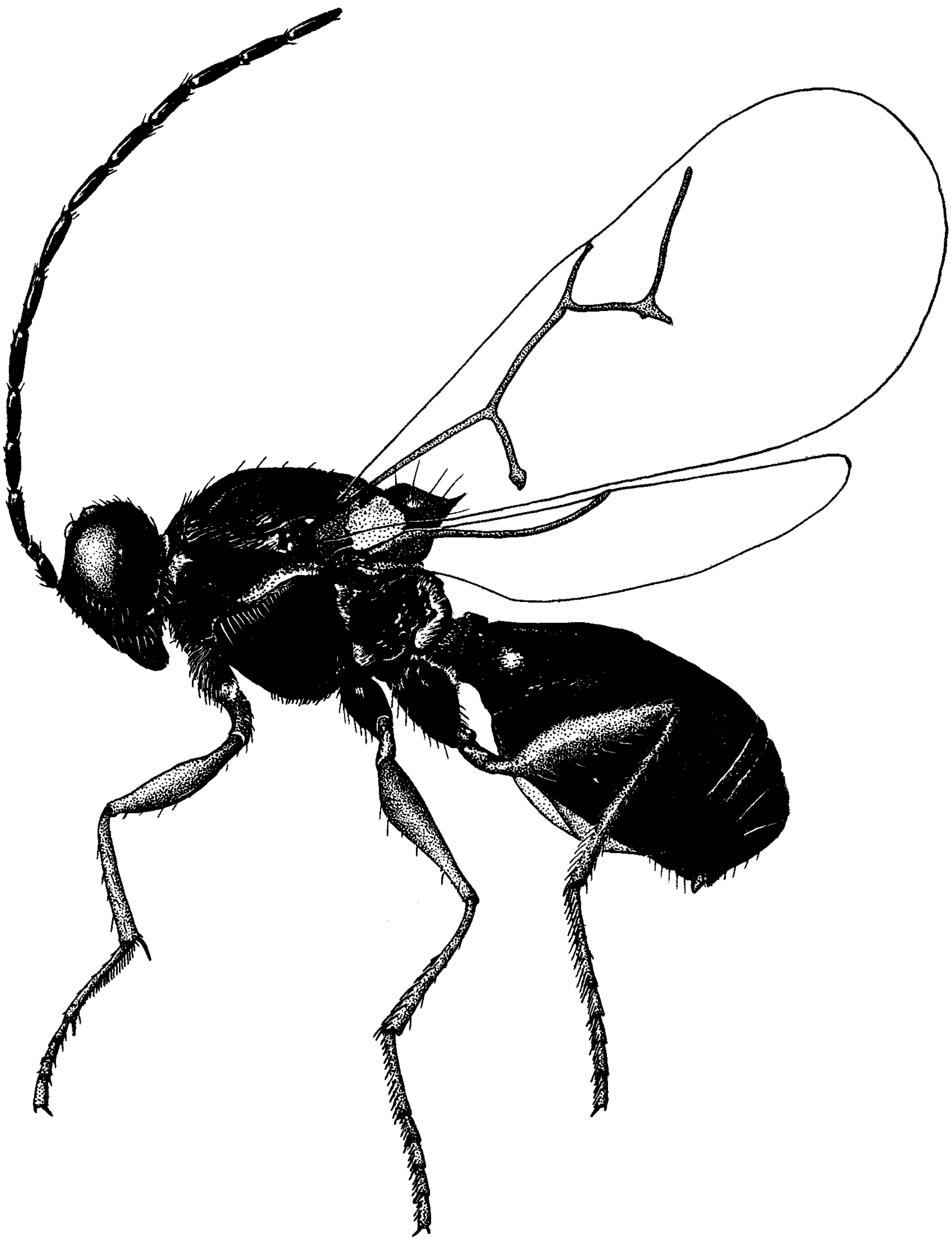


Figure 75. *Xyalophora quinquelineata* (Figitidae) female.

107(105′) Abdominal tergum 2 very large. Scutellum with a pair of large pits at base and an elevated "cup" on disc (Fig. 76). 1.5 mm. Scarce. Hosts: Diptera (including Muscidae, Agromyzidae). .... Eucoilinae

107′ Abdominal tergum 2 not very large. Scutellum smooth and shiny. 1.5 mm. May be abundant in spring. Hosts: Hymenoptera (Braconidae Aphidiinae, inside aphids). .... Charipinae

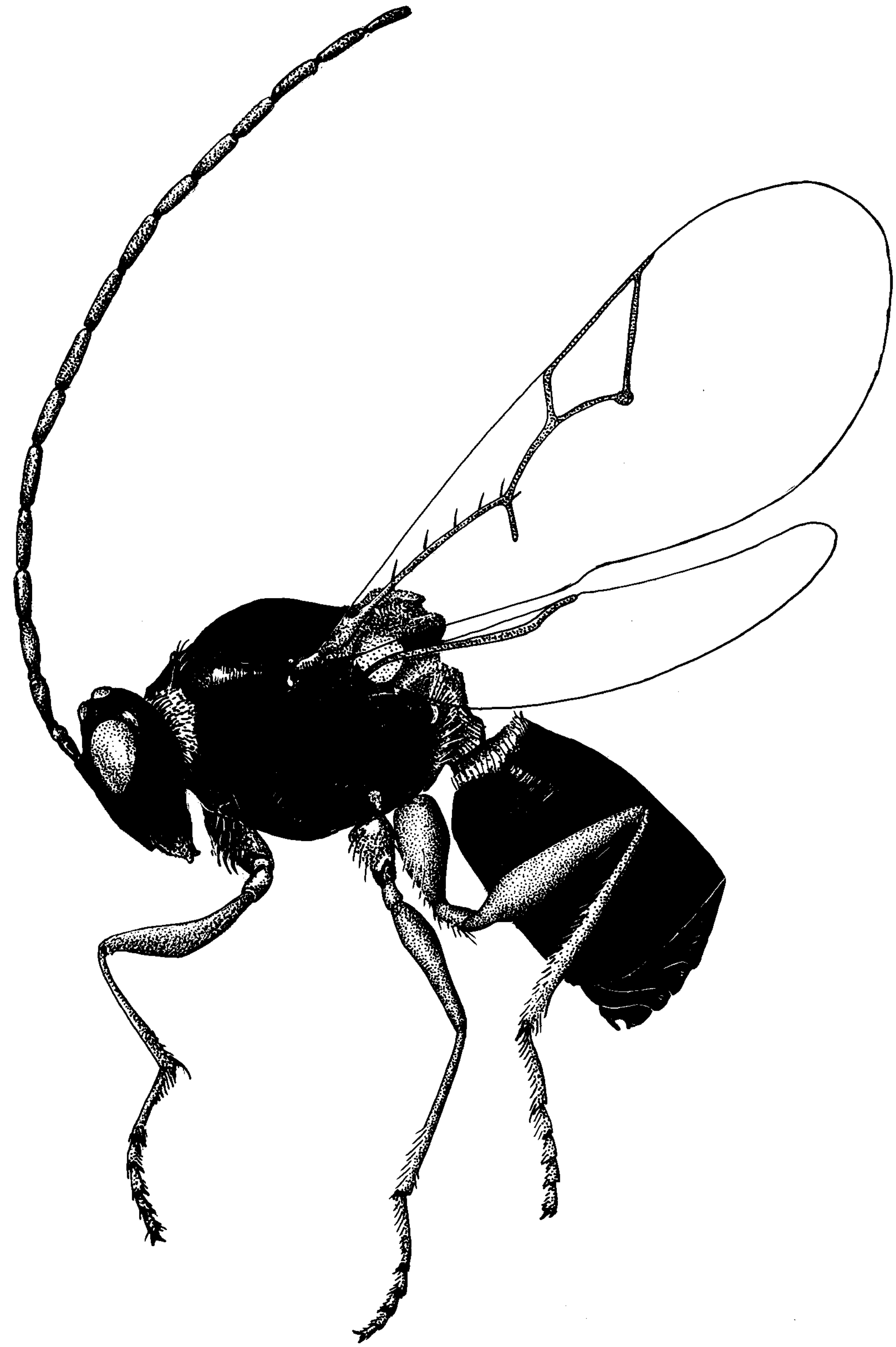


Figure 76. *Eucoila (Cynipidae) female.*

Superfamily Proctotrupoidea

108(4, 10, 11′) Front wing with costal and radial cells (Fig. 77, 78). Large, at least 3 mm long. Antennae arising from middle of face. 109

108′ Only a single vein between base of front wing and stigma, costal and radial cells lacking; varying to wing veinless. 110

109. Only 2 parallel veins arising from base of wing. Stigma heavy. (Fig. 77). 4–7 mm. Rare. Hosts: Coleoptera and other orders, little known. .... Proctotrupidae

109′ Three veins arising from base of wing; stigma slender (Fig. 78). 3 mm. Rare. Hosts unknown. (= Cinetinae of Muesebeck et al. 1951) .... Diapriidae Belytinae

110(108′) Front wing with a definite stigmal vein, angling off main vein (doubtful situations treated in both couplets) 111

110′ Front wing without a stigmal vein, sometimes veinless. 118

111. Stigmal vein curved forward, long (Fig. 79, 80). (Ceraphronidae) 112

111′ Stigmal vein straight or much reduced. 113

112. Stigma heavy (Fig. 79). 2 mm. Rare. Hosts: Diptera (Syrphidae). (Ceraphronidae) ....***Conostigmus***

112′ Stigma very slender (Fig. 80). 1.5–2 mm. Scarce. Hosts: Hymenoptera (Formicidae). (Ceraphronidae) .... ***Ceraphron***

113(111′) Stigmal vein well developed, straight, oblique. Most species small. 114

113′ Stigmal vein much reduced or perpendicular to main vein, which does not continue along margin beyond stigmal vein. Large species, more than 3 mm, with hairy wings. 116

114. Abdomen sharply margined on sides, with a groove near edge on underside. Rare. Hosts: Hemiptera, Orthoptera. .... Scelionidae Scelioninae

114′ Abdomen with at most a rounded angle between top and bottom, this not supplemented by a groove on the underside. (Scelionidae Telenominae) 115

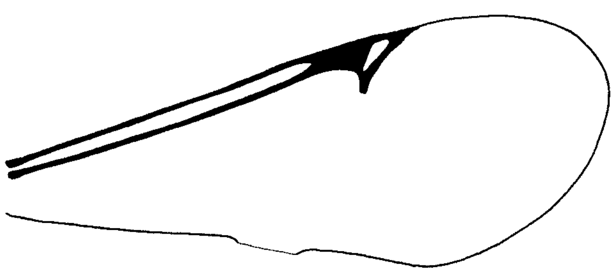


Figure 77. Proctotrupidae front wing.

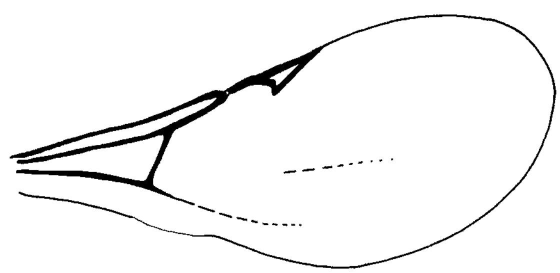


Figure 78. Diapriidae, Belytinae front wing.

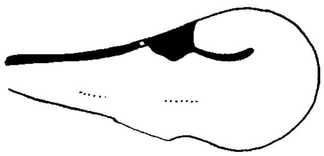


Figure 79. *Conostigmus* (Ceraphronidae) front wing.

Figure 80. *Ceraphron* (Ceraphronidae) front wing.

115. Body chunky, wings moderately broad. Head very transverse, chopped off just behind eyes (Fig. 81). Mesonotum with a pair of longitudinal grooves near hind margin in some species. 1–1.5 mm. Frequent. Hosts: Hemiptera (Pentatomidae). (including *Telenomus utahensis* and some other species of Muesebeck et al. 1951) (Scelionidae Telenominae) .... ***Trissolcus***

115′ Body relatively slender, wings narrower. Head not cut off just behind eyes (Fig. 82). Mesonotum never with grooves. 0.7–0.9 mm. Common. Hosts: Lepidoptera (including Noctuidae), Neuroptera (Chrysopidae, *Chrysopa*). Classification beyond genus difficult. (Scelionidae Telenominae) .... ***Telenomus***

116(113′) Stigmal vein nearly transverse, short (Fig. 83). Slender, 2–3 mm. Rare. Hosts unknown. (Scelionidae Teleasinae) .... ***Trimorus***

116′ Stigmal vein short, not perpendicular to main vein. . 117

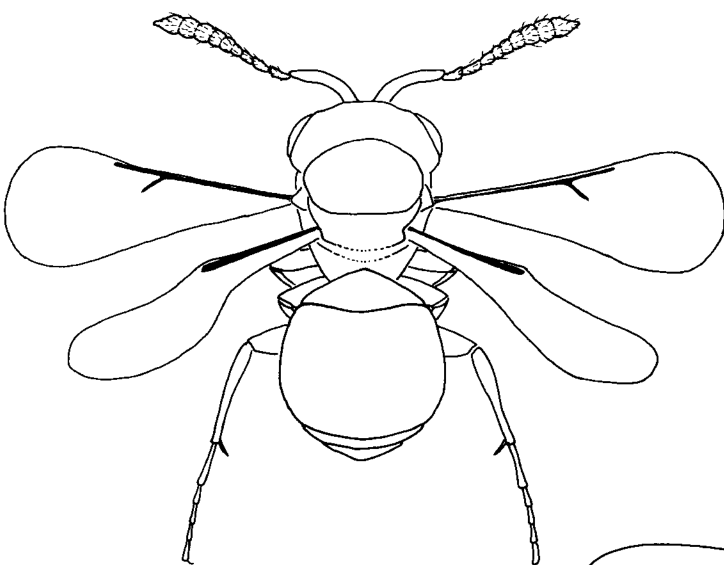


Figure 81. *Trissolcus* (Scelionidae) female.

117. Front of head with a shelf above mouthparts. (Fig. 84). 4–5 mm. Very scarce. Hosts: Orthoptera (Acrididae). (Scelionidae Scelioninae) .... ***Sparasion***

117′ Front of head simple. (Fig. 85). 3–4 mm. Frequent. Hosts: Orthoptera (Acrididae). (Scelionidae Scelioninae) .... ***Scelio***

118(110′) Large species, with stigma more or less developed. 117

118′ Small to medium species, with no more than a knob on the end of the one vein in the front wing, or veinless. 119

119. Wings without veins (Fig. 86). Small, 0.8–1.4 mm. Scarce. Hosts: Diptera (Cecidomyiidae) ....Platygasteridae Platygasterinae

119′ Small to medium species, with a single knobbed vein. 120

120. Small, black species, antenna arising near mouth. 1–1.5 mm. Wing vein well separated from margin (Fig. 87). Common genus is *Inostemma,* in which female has a long, curved projection from base of abdomen over thorax. Frequent. Hosts: Diptera (Cecidomyiidae). .... Platygasteridae Inostemminae

120′ Medium-sized brown species, 1.2–1.8 mm, antennae arising near middle of face. Vein near front margin (Fig. 88). Prothorax with a "fur" collar. Rare. Hosts: Diptera. (Diapriidae Diapriinae) .... ***Trichopria***

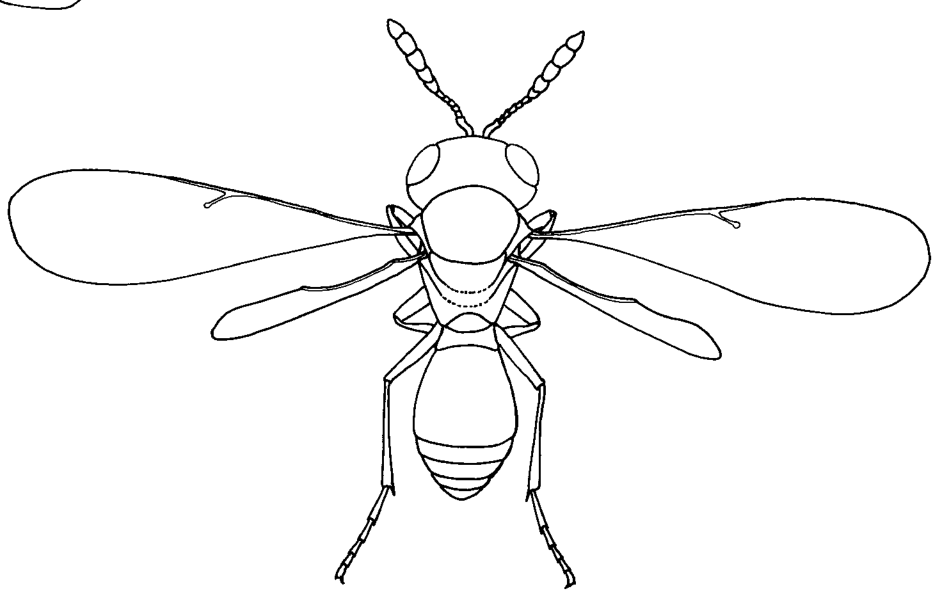


Figure 82. *Telenomus* (Scelionidae) female.

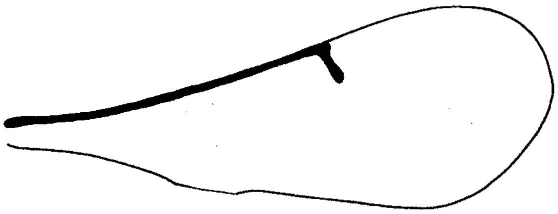


Figure 83. *Trimorus* (Scelionidae) front wing.

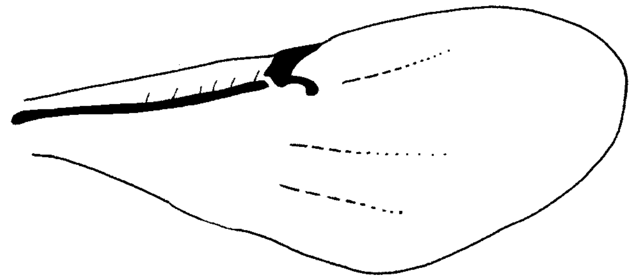


Figure 84. *Sparasion* (Scelionidae) front wing.

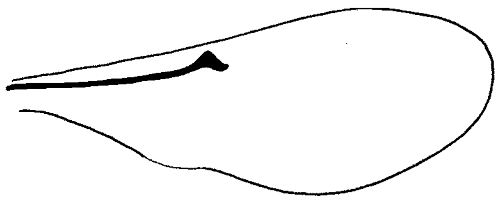


Figure 85. *Scelio* (Scelionidae) front wing.

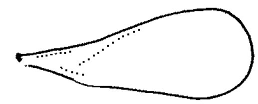


Figure 86. Platygasteridae, Platygasterinae front wing.

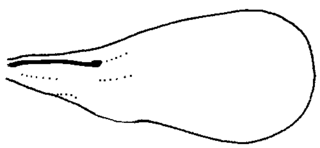


Figure 87. Platygasteridae, Inostemminae front wing.

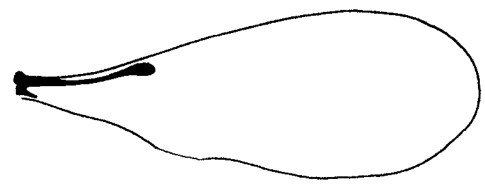


Figure 88. *Trichopria* (Diapriidae) front wing.

Superfamily Bethyloidea

Family Bethylidae

121(6) Front wing with a small discoidal cell. (Fig. 89). 3–5 mm. Frequent. Hosts: Microlepidoptera. (Bethylinae) .... ***Parasierola***

121′ Front wing without a closed discoidal cell 122

122. Front wing with a short vein stub where the front margin of the discoidal cell would be (Fig. 90). 2.5–3.5 mm. Frequent. Hosts: Microlepidoptera (including Tortricidae, *Platynota*). (Bethylinae) .... ***Goniozus***

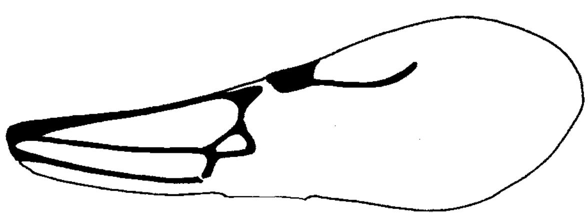


Figure 89. *Parasierola* (Bethylidae) front wing.

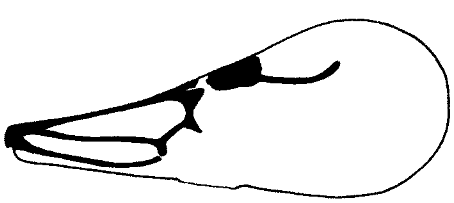


Figure 90. *Goniozus (Bethylidae) front wing.*

122′ With no sign of a vein in this position (Fig. 91). No known Lepidoptera or pest associations. 123

123. Scutellum without a deep transverse groove connecting the lateral pits at its base. 2.5–4.5 mm. Frequent. Hosts unknown. (Epyrinae) .... ***Epyris***

123′ Scutellum with a deep groove across its base, connecting lateral pits. 124

124. Mesonotum without longitudinal parapsidal grooves. 3.0–4.5 mm. Males abundant at light, females wingless. Hosts: Hymenoptera (Formicidae). (Pristocerinae) .... ***Pseudisobrachium***

124′ Mesonotum with parapsidal grooves. Several genera of .... Pristocerinae and Epyrinae

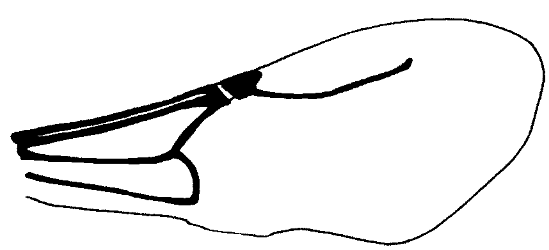


Figure 91. *Epyris* (Bethylidae) front wing.

Order Diptera

125(1′) Postscutellum (Fig. 92, arrow) bulging (Fig. 92, 93). Body form extremely varied (Fig. 95–103) but quite often like that of a house fly. (Tachinidae) 126

125′ Postscutellum not bulging, although the postnotum behind it may be. Fig. 94 shows the condition in most species of Sarcophagidae, the family most likely to be confused with Tachinidae. .... other Diptera

Family Tachinidae

126. Hind tibia with "chaps" of dense black bristles. Wing with front zone orange, then brown, then clear (Fig. 95). 7–10 mm, slender, abdomen almost parallel-sided, 2½ times as long as wide, with a few bristles on last segment and sparse dark setae. Thorax black, front half with golden bloom and 4 black stripes; scutellum and calypters yellow, together forming a band; abdomen black to partly orange, with some golden bloom toward apex. Legs orange. Without facial or parafacial bristles, only a few short bristles near mouth. Scarce. Hosts: Hemiptera (Pentatomidae, Coreidae). (Phasiinae) .... ***Trichopoda***

126′ Hind legs without "chaps". 127

127. Abdomen without bristles, only fine black setae (Fig. 96, 97). 5–7 mm, thorax black with dense white bloom at anterior angles, male with golden bloom in anterior half, a pair of dark stripes near midline and an abbreviated pair at sides. Abdomen orange with base and 1–4 median spots black. Without oral vibrissae, facial or parafacial bristles. Wing veins orange toward base of wing. Frequent in early season. Hosts: Hemiptera (Pentatomidae). (Phasiinae) .... ***Gymnosoma***

127′ Abdomen with some bristles. 128

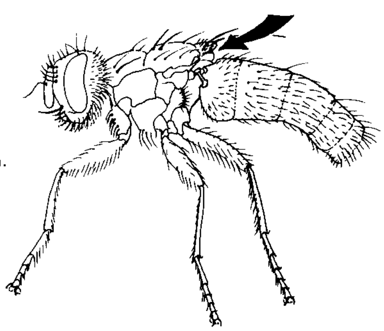
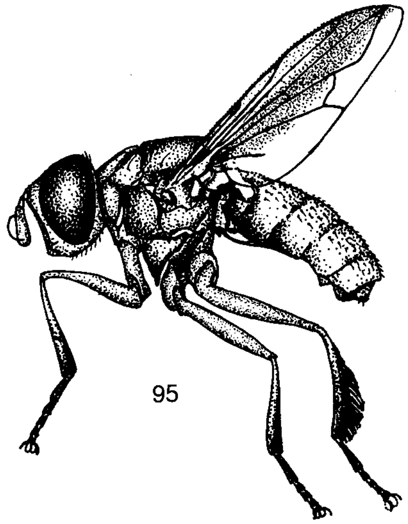


Figure 92. Tachinidae, side view, locating postscutellum.

Figure 93. Tachinidae, postscutellum and surrounding area.

Figure 94. Sarcophagidae, postscutellum and surrounding area.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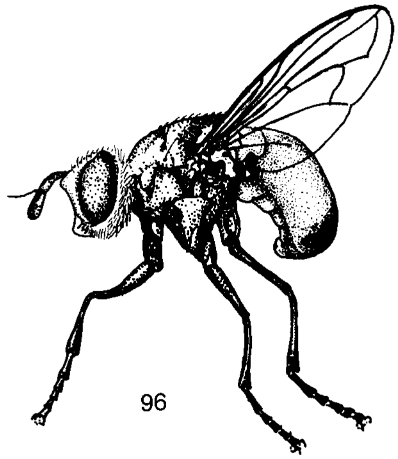
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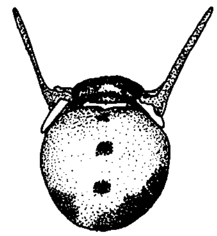
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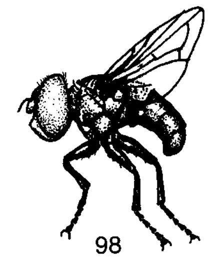
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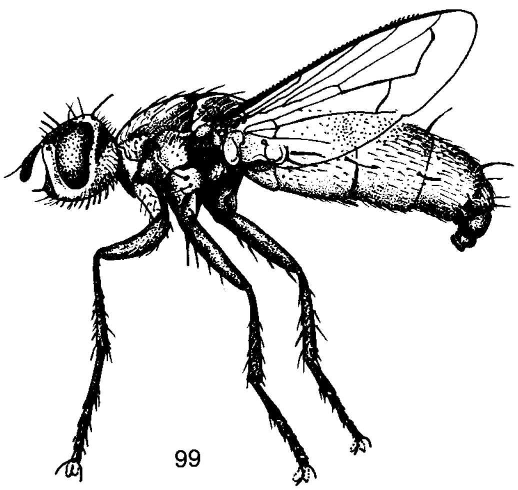
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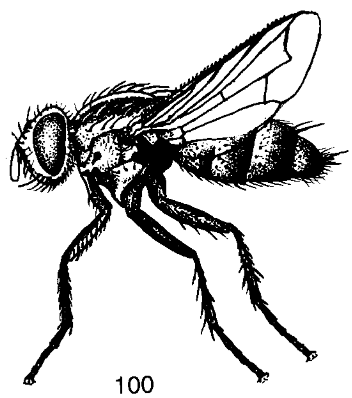
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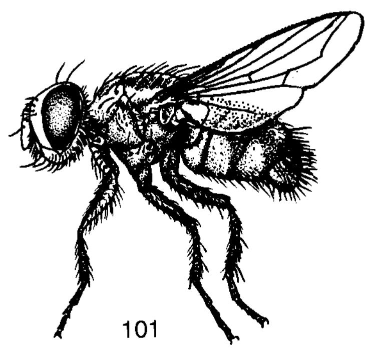
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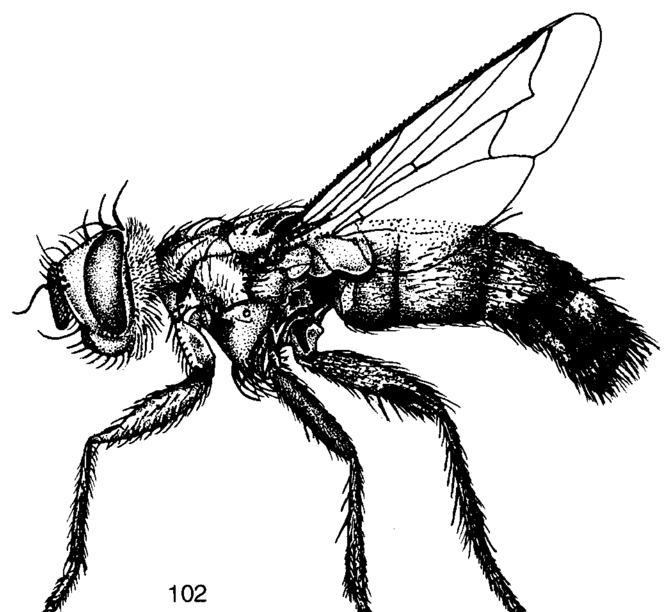
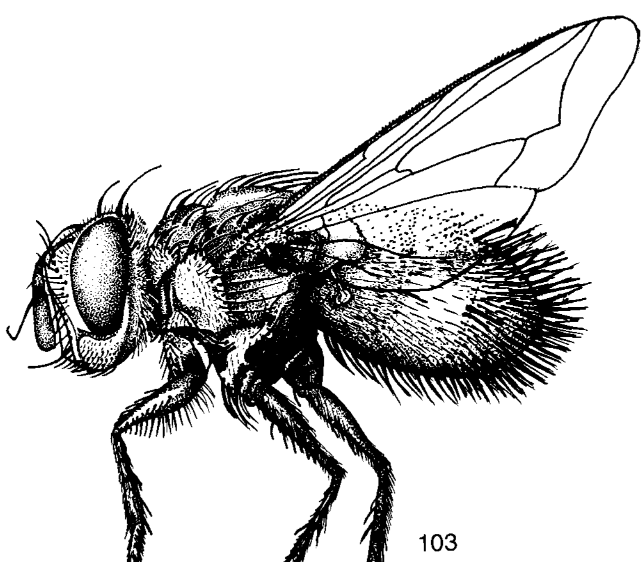

102


103

128. Abdomen parallel-sided, 3 times as long as wide, largely orange (Fig. 99). 7–10 mm, thorax black with gray bloom, abdomen orange with some median markings toward base and all of apex black; legs black. With a few small bristles above oral vibrissae, no parafacial bristles. Wings dusky. Scarce. Hosts: Hemiptera (Pentatomidae). (Phasiinae) .... ***Cylindromyia***

128′ Abdomen less than 2½ times as long as wide, usually dark. 129

129. Eyes with erect setae that are at least 3 times as long as diameter of a lens (Fig. 104) and separated by no more than ½ a seta length. These setae are fine but readily seen with backlighting. 142

129′ Eyes without setae (a few species with obscure shorter and sparser setae, as much as 2 times the diameter of a lens in length but separated by at least the length of a seta). 130

130. Cell R_5 ending in a stalk that is at least 3 times as long as the crossvein at the base of the cell (Fig. 98, closed cell near wing tip). 131

130′ Cell R_5 not stalked or at most with an apical stalk that is as long as the crossvein at the base of the cell. 132

131. Eyes very large, separated by less than width of ocellar triangle, red. 2–4 mm, black with light silvery bloom; head disproportionately large (Fig. 98). With a few fine bristles above oral vibrissae, no parafacial bristles. Frequent. Hosts: Hemiptera (Lygaeidae, *Nysius*). (Phasiinae) .... ***Hyalomya aldrichi***

131′ Eyes separated by twice the width of the ocellar triangle. 2.5–5 mm, similar to last but eyes and head smaller. Scarce. Hosts: Hemiptera (Nabidae, *Nabis*, Rhopalidae, *Liorhyssus*). (Phasiinae) ..... ***Leucostoma***

Figure 95. *Trichopoda* (Tachinidae, Phasiinae).
Figure 96. *Gymnosoma fuliginosa* (Tachinidae, Phasiinae).
Figure 97. *Gymnosoma fuliginosa* (Tachinidae, Phasiinae) abdomen, back view.
Figure 98. *Hyalomya aldrichi* (Tachinidae, Phasiinae).
Figure 99. *Cylindromyia* (Tachinidae, Phasiinae).
Figure 100. *Olenochaeta kansensis* (Tachinidae, Goniinae).
Figure 101. *Lespesia archippivora* (Tachinidae, Goniinae).
Figure 102. *Euphorocera tachinomoides* (Tachinidae, Goniinae).
Figure 103. *Leschenaultia adusta* (Tachinidae, Goniinae).

132(130′) Second section of arista at least $^1/_3$ as long as third (and last; first section always short and inconspicuous). 133

132′ Second section of arista short, no more than $^1/_6$ as long as third and often not much longer than first. 135

133. Only 1 facial bristle above each oral vibrissa; parafacial area (between eye and ridge lateral to antenna) with 3–6 bristles along mesal edge, convex and wide, with scattered setae (Fig. 105). 10–14 mm, robust, thorax dark with gray bloom and 4 darker stripes, abdomen at least partly rufescent. Scarce. Hosts: Lepidoptera (Noctuidae, cutworms, *Pseudaletia*). (Goniinae) .... ***Gonia***

133′ With at least 6 facial bristles above oral vibrissa, extending well toward base of antennal 3 (Fig. 108). 134

134. With a row of parafacial bristles and some setae near eye (Fig. 108). 8–10 mm, black with gray bloom; tibiae dull rufescent, thorax with 4 black stripes, abdominal terga obscurely darker at apices. Scarce. Hosts: Lepidoptera (Noctuidae, including *Spodoptera*). (Goniinae) .... ***Chaetogaedia crebra***

134′ Parafacials bare below level of origin of arista. 3.5–7.5 mm, similar to last but apical half of abdominal terga black, tibiae obscurely yellowish, and thorax with strong black stripes (Fig. 100). Scarce. Hosts unknown. (Goniinae) ....***Olenochaeta kansensis***

135(132′) Black, last 2 abdominal terga with broad, contrastingly paler yellow bands of bloom. 13–15 mm, stout, black with some gray bloom on forebody; wings dusky. Scarce. Hosts: Lepidoptera (Sphingidae, *Manduca*, Saturniidae, *Hemileuca*). (Goniinae) .... ***Belvosia***

135′ Not black with yellow bands on abdomen. 136

136. Abdomen black, dull rufescent laterally, without bloom (Fig. 103). 9–12 mm, black with base of wing dusky, forebody with gray bloom. Scarce. Hosts: Lepidoptera (Arctiidae, *Estigmene*). (Goniinae) .... ***Leschenaultia adusta***

136′ Abdomen with zones of gray bloom. Thorax usually with gray bloom with 4 narrow black stripes, and abdominal terga black across apices, these markings affected by angle of view. 137

137. Only 1–2 facial bristles above each oral vibrissa, not reaching apex of antennal 3 (Fig. 109). 138

137′ Numerous facial bristles above oral vibrissa, extending above apex of antennal 3 (Fig. 110). 140

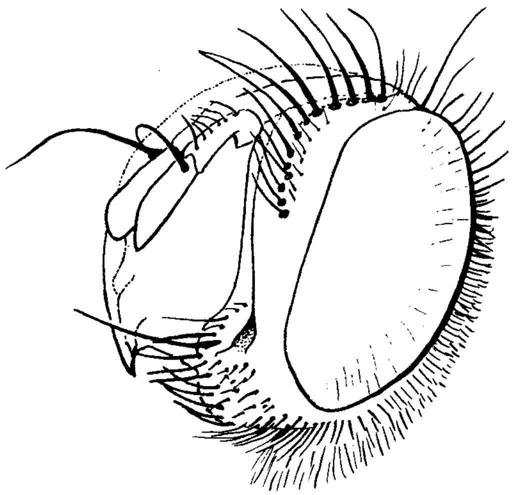


Figure 104. *Nemorilla pyste* (Tachinidae, Goniinae) head.

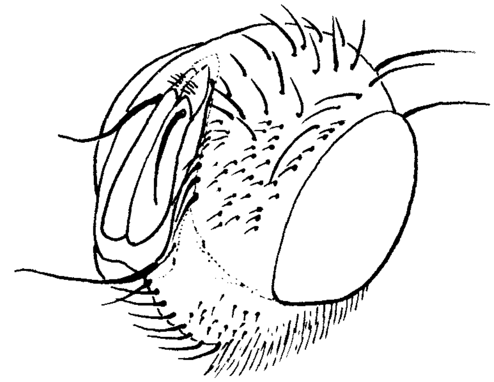


Figure 105. *Gonia* (Tachinidae, Goniinae) head.

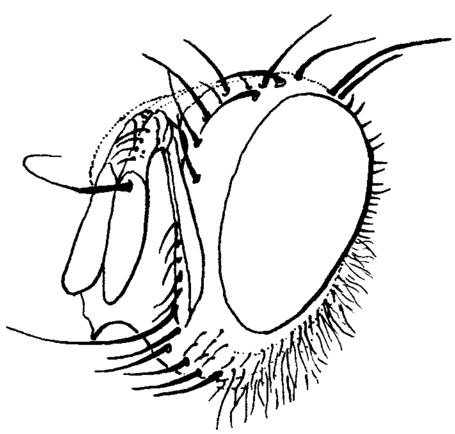


Figure 106. *Eucelatoria armigera* (Tachinidae, Goniinae) head.

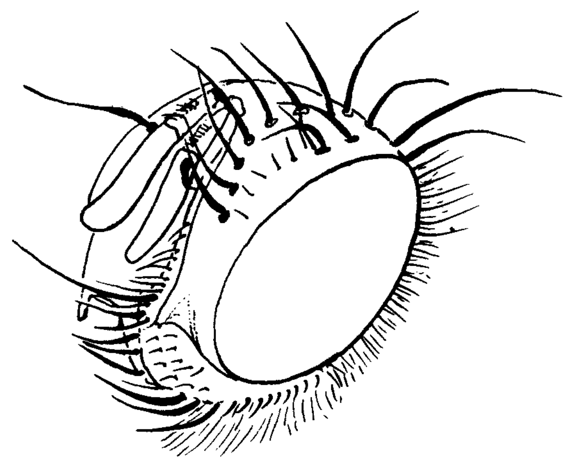


Figure 107. *Exorista mella* (Tachinidae, Goniinae) head.

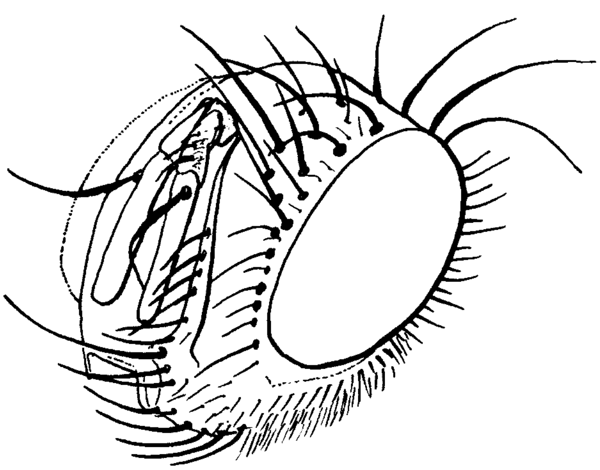


Figure 108. *Chaetogaedia crebra* (Tachinidae, Goniinae) head.

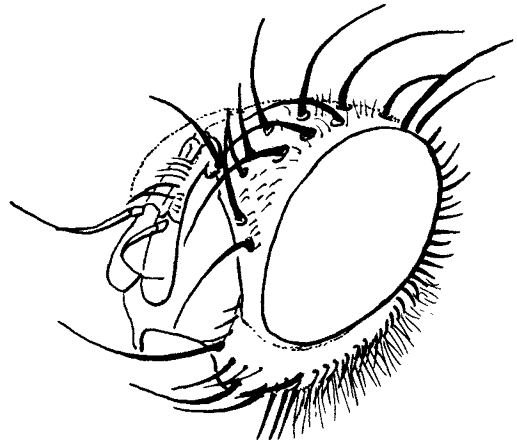


Figure 109. *Voria ruralis* (Tachinidae, Tachininae) head.

138. No proclinate bristles in parafacial series, the lowest reclinate and at level of base of arista, leaving a bristle-free zone between eye and antennal 3. Proboscis slender, twice as long as palpus when folded. 5–8 mm, black with usual markings. Scarce. Hosts: Lepidoptera (Noctuidae, including *Heliothis*). (Tachininae) .... ***Plagiomima cognata***

138′ At least 1 proclinate bristle at bottom of parafacial series. Proboscis short, subequal to palpus when folded 139

139. Only 1, heavy, proclinate bristle in parafacial series (Fig. 109). 4–7 mm, black with thinner than usual bloom, appearing shiny. Frequent. Hosts: Lepidoptera (Noctuidae, especially *Trichoplusia*). (Tachininae) .... ***Voria ruralis***

139′ Usually 3 proclinate bristles at bottom of parafacial series, 2 of them often weak. 4–7 mm, black, thoracic stripes obscure, abdominal bands distinct. Scarce. Hosts: Lepidoptera (Noctuidae, *Pseudaletia*). (Tachininae) .... ***Athyricea cinerea***

140(137′) Arista nearly equal to antennal 3, which is narrrow and partly rufescent toward base (Fig. 110). 4–7 mm, black, abdomen sometimes obscurely rufescent laterally; black markings strong (Fig. 101). Frequent. Hosts: Lepidoptera (Noctuidae, including *Heliothis, Spodoptera, Trichoplusia,* Arctiidae, *Estigmene,* Pieridae, *Colias,* Pyralidae, *Loxostege*). (Goniinae) .... ***Lespesia archippivora***

140′ Arista longer than antennal 3, which is all dark. 141

141. Basicosta (scale between tegula and base of wing) rufescent, much paler than tegula. 4–7 mm, black with abdomen often luteous laterally, rufescent at apex; black markings strong (Fig. 106). Scarce. Hosts: Lepidoptera (Noctuidae, especially *Heliothis*, but also *Spodoptera, Trichoplusia*). (Goniinae) .... ***Eucelatoria armigera***

141′ Basicosta almost as dark as tegula. 9–12 mm, black with distinct markings, base of abdomen sometimes obscurely rufescent laterally. (Fig. 107). Scarce. Hosts: Lepidoptera (Noctuidae, *Heliothis,* Arctiidae, *Estigmene*). (Goniinae) .... ***Exorista mella***

142(129) Basicosta (see 141) much paler than tegula. With 4–6 proclinate parafacial bristles, down nearly to apex of antennal 3. 5–7 mm, black with strong bloom; thorax with 2 strong black stripes and abdominal terga black beyond base. Scarce. Hosts: Lepidoptera (Noctuidae). (Dexiinae) .... ***Paradidyma singularis***

142′ Basicosta dark. No proclinate parafacial bristles. Markings as in 136′. 143

143. With 5–7 facial bristles above each oral vibrissa, almost to base of antennal 3 and lowest parafacial bristles. 7–14 mm, black, abdomen often rufescent laterally, rather slender and tapering in male (Fig. 102). Scarce. Hosts: Lepidoptera (Noctuidae, *Spodoptera, Heliothis,* Pieridae, *Colias*). (Goniinae) .... ***Euphorocera***

143′ With at most a few short facial bristles above oral vibrissa. 144

144. Parafacial area with some scattered fine setae at level of antennal 3. 6–10 mm, black, abdomen extensively rufescent laterally, black down middle; markings in bloom weak. Scarce. Hosts: Lepidoptera (Sphingidae, *Hyles*). (Goniinae) .... ***Winthemia deiliphilae***

144′ Parafacials bare at level of antennal 3 (Fig. 104). 4–7 mm, black, markings indistinct; sides of 1–2 abdominal terga yellowish in some. Frequent. Hosts: Lepidoptera (Noctuidae, *Spodoptera,* Heliothis, Pyralidae, Loxstege). (Goniinae) .... ***Nemorilla pyste***

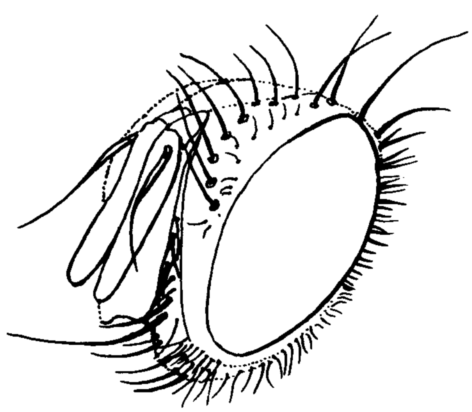


Figure 110. *Lespesia archippivora* (Tachinidae, Goniinae) head.

Explanation of Abbreviations Used for Parasites Listed by Host

BET:	BET	Bethyloidea Bethylidae
CHA:	APH	Chalcidoidea Aphelinidae
	CHABRA	Chalcididae Brachymeriinae
	CHACHA	Chalcididae Chalcidinae
	CHADIR	Chalcididae Dirhininae
	CHAHAL	Chalcididae Haltichellinae
	ELA	Elasmidae
	ENCARR	Encyrtidae Arrhenophaginae
	ENCENC	Encyrtidae Encyrtinae
	EUC	Eucharitidae
	EULELA	Eulophidae Elachertinae
	EULENT	Eulophidae Entedontinae
	EULEUL	Eulophidae Eulophinae
	EULTET	Eulophidae Tetrastichinae
	EUP	Eupelmidae
	EUREUD	Eurytomidae Eudecatominae
	EUREUR	Eurytomidae Eurytominae
	MYMGON	Mymaridae Gonatocerinae
	MYMMYM	Mymaridae Mymarinae
	ORM	Ormyridae
	PER	Perilampidae
	PTEPTE	Pteromalidae Pteromalinae
	PTESPH	Pteromalidae Sphegigasterinae
	THY	Thysanidae
	TORMON	Torymidae Monodontomerinae
	TORTOR	Torymidae Toryminae
	TRI	Trichogrammatidae
CYN:		Cynipoidea
	CYNCHA	Cynipidae Charipinae
	CYNEUC	Cynipidae Eucoilinae
	FIGANA	Figitidae Anacharitinae
	FIGFIG	Figitidae Figitinae
ICH:		Ichneumonoidea
	BRAAGA	Braconidae Agathidinae
	BRAALY	Braconidae Alysiinae
	BRAAPH	Braconidae Aphidiinae
	BRABLA	Braconidae Blacinae
	BRABRA	Braconidae Braconinae
	BRACAR	Braconidae Cardiochilinae
	BRACHE	Braconidae Cheloninae
	BRADAC	Braconidae Dacnusinae
	BRADOR	Braconidae Doryctinae
	BRAEUP	Braconidae Euphorinae
	BRAHEL	Braconidae Helconinae
	BRAMAC	Braconidae Macrocentrinae
	BRAMIC	Braconidae Microgasterinae
	BRANEO	Braconidae Neoneurinae
	BRAOPI	Braconidae Opiinae
	BRAROG	Braconidae Rogadinae
	BRASPA	Braconidae Spathiinae
	ICHANO	Ichneumonidae Anomalinae
	ICHBAN	Ichneumonidae Banchinae
	ICHCRE	Ichneumonidae Cremastinae
	ICHDIP	Ichneumonidae Diplazontinae
	ICHEPH	Ichneumonidae Ephialtinae
	ICHGEL	Ichneumonidae Gelinae
	ICHICH	Ichneumonidae Ichneumoninae
	ICHMES	Ichneumonidae Mesochorinae
	ICHMET	Ichneumonidae Metopiinae
	ICHOPH	Ichneumonidae Ophioninae
	ICHORT	Ichneumonidae Orthocentrinae
	ICHPOR	Ichneumonidae Porizontinae
	ICHTRY	Ichneumonidae Tryphoninae
PRO:		Proctotrupoidea
	CER	Ceraphronidae
	DIA	Diapriidae
	HEL	Heloridae
	PLA	Platygasteridae
	PRO	Proctotrupidae
	SCESCE	Scelionidae Scelioninae
	SCETEL	Scelionidae Telenominae
SPH:		Sphecoidea (*predators*)
	SPHAST	Sphecidae Astatinae
	SPHCRA	Sphecidae Crabroninae
	SPHLAR	Sphecidae Larrinae
	SPHPEM	Sphecidae Pemphredoninae
TAC:		Diptera Tachinidae
	TACDEX	Tachinidae Dexiinae
	TACGON	Tachinidae Goniinae
	TACPHA	Tachinidae Phasiinae
	TACTAC	Tachinidae Tachininae

Parasites Listed by Host

ARACHNIDA ARANEIDA
CHA: EULELA, PTEPTE (Eupteromalus)
ICH: ICHEPH

COLEOPTERA
CHRYSOMELIDAE (Diabrotica)
TAC: TACGON (Celatoria diabroticae)
COCCINELLIDAE
CHA: ENCENC (Anisotylus, Ooencyrtus), EULTET (Tetrastichus), PTEPTE (Dibrachys), PTESPH (Pachyneuron)
ICH: BRAEUP
TAC: TACGON (Doryphorophaga)
CURCULIONIDAE (Hypera)
CHA: CHACHA (Spilochalcis), EULTET (Tetrastichus bruchophagi), EUP (Eupelmella), MYMMYM (Mymar), PTEPTE (Catolaccus, Dibrachys, Eupteromalus)
SCARABAEIDAE
ICH: ICHOPH
TAC: TACDEX (Ptilodexia)

DIPTERA
AGROMYZIDAE
CHA: EULELA: (Cirrospilus, Diaulinopsis), EULENT (Achrysocharella, Chrysocharis, Closterocerus, Entedon, Zagrammosoma), EULEUL (Notanisomorpha, Pnigalio, Solenotus), PTEPTE (Habrocytus), PTESPH (Halticoptera, Heteroschema, Syntomopus), TRI (Abbella, Trichogramma)
CYN: CYNEUC
ICH: BRADAC, BRAOPI
ANTHOMYIIDAE (Hylemya)
CHA: EUP (Eupelmella), PTESPH (Pachycrepoideus, Spalangia)
CECIDOMYIIDAE (Asphondylia)
CHA: EULTET (Galeopsomopsis, Galeopsomyia, Tetrastichus bruchophagi), EUP (Eupelmus), PTEPTE (Pseudocatolaccus, Trimeromicrus maculatus)
SYRPHIDAE
CHA: CHACHA (Spilochalcis), ENCENC (Blastothrix, Bothriothorax, Chrysopophagus), EULTET (Tetrastichus), EUP (Arachnophaga), PTEPTE (Amblymerus), PTESPH (Pachyneuron)
CYN: FIGANA
ICH: ICHDIP (Diplazon, Syrphoctonus)
PRO: CER, DIA
TACHINIDAE
CHA: CHABRA (Brachymeria), CHACHA (Spilochalcis), EULELA (Miotropis), EULENT (Entedon), EULEUL, EUREUR (Eurytoma), PER (Perilampus), PTEPTE (Amblymerus, Dibrachys, Eupteromalus, Habrocytus, Nasonia), TORMON, TRI
PRO: CER

HEMIPTERA
LYGAEIDAE (Nysius)
PRO: SCETEL (Telenomus ovivorus)
SPH: SPHAST (Astata), SPHLAR (Solierella)
TAC: TACPHA (Hyalomya)
MIRIDAE (Lygus)
CHA: MYMMYM (Anaphes ovijentatus, Polynema pratensiphagum)
ICH: BRAEUP (Euphoriana uniformis, Leiophron pallipes)
SPH: SPHCRA (Anacrabro)
TAC: TACPHA (Alophorella)
MIRIDAE (Psallus)
CHA: MYMMYM (Barypolynema aspidiotii, Erythmelus psallidis, Mymar, Anomocerus)
SPH: SPHLAR (Plenoculus)
MIRIDAE (other)
CHA: EULELA (Cirrospilus), TRI (Abbella, Oligosita)
NABIDAE
TAC: TACPHA (Leucostoma)
PENTATOMIDAE
CHA: ENCENC (Ooencyrtus), EUP (Anastatus)
ICH: BRAEUP
PRO: SCETEL (Trissolcus)
TAC: TACPHA (Cylindromyia, Gymnosoma)
REDUVIIDAE
CHA: ENCENC (Ooencyrtus), EUP (Anastatus), MYMMYM (Anagrus giraulti)
PRO: SCESCE, SCETEL (Telenomus hubbardi)
RHOPALIDAE (Liorhyssus)
TAC: TACPHA (Leucostoma)

HOMOPTERA
ALEYRODIDAE
CHA: APH (Encarsia, Prospaltella), ENCENC (Aphidencyrtus), EULELA, EULENT (Zagrammosoma), MYMGON, THY, TRI (Trichogramma)
PRO: PLA
APHIDIDAE
CHA: APH (Aphelinus), ENCENC (Aphidencyrtus, Blastothrix, Bothriothorax, Microterys), EULELA (Euplectrus), EULENT (Closterocerus, Entedon), EULTET (Tetrastichus), EUREUR, MYMGON (Gonatocerus), MYMMYM (Anagrus, Polynema), PTESPH (Pachyneuron)
CYN: CYNCHA (on BRAAPH in aphids)
ICH: BRAAPH (Aphidius, Lysiphlebus, other genera)
PRO: CER, PRO
CICADELLIDAE
CHA: ENCENC (Chrysopophagus, Thysanomastix), EUP, MYMGON (Gonatocerus), MYMMYM (Anagrus, Erythmelus, Mymar, Polynema), EULELA (Miotropis), TRI (Abbella, Aphelinoidea, Oligosita, Trichogramma)
MEMBRACIDAE (Spissistilus)
CHA: MYMGON (Gonatocerus), MYMMYM (Polynema)
PSYLLIDAE
CHA: ENCENC (Aphycus, Psyllaephagus), EULTET (Tetrastichus), EUREUR (Eurytoma), PTEPTE (Habrocytus), TORTOR (Torymus)

HYMENOPTERA
BETHYLOIDEA BETHYLIDAE
CHA: EUP (Euplemus), PER (Perilampus), PTEPTE (Catolaccus)
CHALCIDOIDEA
APHELINIDAE
CHA: APH (Coccophagus), ENCENC (Aphidencyrtus), EULENT, EULTET (Tetrastichus), EUREUR (Eurytoma), MYMMYM (Polynema), THY
CYN: CYNCHA
PRO: CER
CHALCIDIDAE
CHA: EULENT (Entedon), EUP (Eupelmus), PTEPTE (Dibrachys, Habrocytus), TORMON
ENCYRTIDAE
CHA: APH (Coccophagus), ENCENC (Aphycus), EULTET (Tetrastichus), EUP (Euplemus), PTEPTE, PTESPH (Pachyneuron), THY
EULOPHIDAE
CHA: EULELA (Cirrospilus, Elachertus), EULENT (Closterocerus, Entedon, Horismenus), EULTET (Aprostocetus, Tetrastichus), EUP (Eupelmella, Eupelmus), EUREUR (Eurytoma), PER (Perilampus), THY

EUPLEMIDAE
CHA: EULENT (Entedon), EUP (Eupelmella), PTEPTE

EURYTOMIDAE (Bruchophagus)
CHA: EULTET (Tetrastichus bruchophagi), EUP (Eupelmella), PTEPTE (Amblymerus bruchophagi, Trimeromicrus maculatus), TORMON (Liodontomerus)

MYMARIDAE
CHA: EULTET (Aprostocetus, Tetrastichus), TRI (Abbella)

PTEROMALIDAE
CHA: ENCENC, EULENT (Entedon, Horismenus), EULEUL, EULTET (Tetrastichus), EUP (Eupelmella, Eupelmus), EUREUD (Eudecatoma), EUREUR (Eurytoma), MYMMYM (Polynema), ORM, PER, PTEPTE (Amblymerus, Dibrachys, Habrocytus) PTESPH (Pachycrepoideus, Pachyneuron)

TORYMIDAE
CHA: EULTET, EUP (Eupelmella, Eupelmus), EUREUD (Eudecatoma), EUREUR, PTEPTE, TORTOR (Torymus)

CYNIPOIDEA CYNIPIDAE
BET: BET
CHA: CHAHAL, ENCENC, EULENT (Astichus, Chrysocharis, Entedon), EULTET (Tetrastichus), EUP (Anastatus, Eupelmella, Eupelmus), EUREUD (Eudecatoma), EUREUR (Eurytoma, Tenuipetiolatus), ORM, PTEPTE (Habrocytus, Lariophagus), PTESPH (Halticoptera), TORMON (Diomorus), TORTOR (Torymus)
PRO: PLA

ICHNEUMONOIDEA
BRACONIDAE
CHA: CHACHA (Ceratosmicrus, Spilochalcis), CHAHAL, ELA, ENCENC (Aphidencyrtus, Ooencyrtus), EULELA (Cirrospilus, Miotropis), EULENT (Entedon, Euderus, Horismenus), EULTET (Tetrastichus), EUP (Anastatus, Arachnophaga, Encyrtaspis, Eupelmella, Eupelmus), EUREUR (Eurytoma), PER (Perilampus), PTEPTE (Amblymerus, Catolaccus, Eupteromalus, Pteromalus), PTESPH (Habrocytus, Pachyneuron, Spalangia), TORMON (Microdontomerus)
CYN: CYNCHA
ICH: ICHGEL, ICHMES

ICHNEUMONIDAE
CHA: CHACHA (Ceratosmicrus, Spilochalcis), ELA, ENCENC, EULELA (Cirrospilus), EULENT (Entedon, Horismenus), EULEUL, EULTET (Tetrastichus), EUP (Arachnophaga, Eupelmella, Eupelmus), EUREUR (Eurytoma), PER (Perilampus), PTEPTE (Amblymerus, Catolaccus, Dibrachys, Eupteromalus, Habrocytus, Pteromalus), PTESPH (Pachyneuron), TORMON
ICH: ICHGEL

PROCTOTRUPOIDEA
PLATYGASTERIDAE
CHA: APH, ENCENC, EULTET (Tetrastichus), EUP (Eupelmus), PTEPTE (Eupteromalus)

LEPIDOPTERA

ARCTIIDAE (Estigmene acrea)
CHA: EUP (Arachnophaga nocua), PTEPTE (Psychophagus omnivorus, Tritnetptis hemerocampae), TRI (Trichogramma minutum, semifumatum)
ICH: BRAMIC (Apanteles diacrisiae), ICHICH (Ichneumon neutralis), ICHOPH (Therion fuscipenne, morio), ICHPOR (Casinaria genuina)
TAC: TACGON (Exorista mella, Lespesia archippivora, Leschenaultia adusta)

GELECHIIDAE (Pectinophora gossypiella)
CHA: ELA, EUREUR (Eurytoma), PTEPTE (Heterolaccus hunteri, Zatropis)
ICH: BRABRA (Bracon gelechiae, mellitor, platynotae), ICHEPH (Calliephialtes ferrugineus, Coccygomimus punicipes)
TAC: TACGON (Erynnia tortricis, Frontiniella parancilla)

LYCAENIDAE
CHA: CHACHA (Metadontia), ENCENC, EULENT, EULTET (Tetrastichus), EUREUR
ICH: ICHANO, ICHGEL, ICHICH
TAC: TACGON (Aplomya, Lespesia)

LYONETIIDAE (Bucculatrix thurberiella)
CHA: CHACHA (Spilochalcis side), EULENT (Closterocerus utahensis), PTEPTE (Catolaccus aeneoviridis)
ICH: BRAMIC (Apanteles bucculatricis)

NOCTUIDAE (Agrotis, Chorizagrotis, Feltia)
CHA: ENCENC (Copidosoma bakeri)
ICH: ICHTRY
TAC: TACGON (Euphorocera, Lespesia), TACTAC (Archytas, Bonnetia comta)

NOCTUIDAE (Alabama)
CHA: CHABRA (Brachymeria, EULELA (Euplectrus), EULENT (Horismenus)

NOCTUIDAE (Heliothis virescens)
ICH: BRACAR (Cardiochiles nigriceps), BRAMIC (Apanteles marginiventris, Microplitis croceipes), ICHPOR (Campoletis flavicincta, sonorensis)

NOCTUIDAE (Heliothis zea)
CHA: APH (Encarsia lutea), CHABRA (Brachymeria incerta, ovata), CHACHA (Spilochalcis igneoides), EULELA (Euplectrus comstocki, plathypenae), TRI (Trichogramma minutum)
ICH: BRACAR (Cardiochiles tennessensis), BRACHE (Chelonus texanus), BRAEUP (Meteorus laphygmae), BRAMIC (Apanteles marginiventris, Microplitis croceipes, melianae), BRAROG (Rogas perplexus), ICHGEL (Cryptus albitarsis), ICHPOR (Campoletis flavicincta, sonorensis, Hyposoter annulipes, exiguae), ICHTRY (Netelia sayi, spinipes)
PRO: SCETEL (Telenomus hubbardi)
TAC: TACGON (Eucelatoria armigera, Euphorocera claripennis, tachinomoides, Exorista mella, Hyphantrophaga hyphantriae, Lespesia archippivora, Nemorilla pyste), TACTAC (Palgiomima cognata)

NOCTUIDAE (Peridroma sacia)
CHA: EULELA (Euplectrus), PTEPTE (Dibrachys cavus)
TAC: TACGON (Chaetogaedia monticola, Gonia sequax, Madremyia saundersi), TACTAC Archytas apicifer, Bonnetia comta, Voria ruralis)

NOCTUIDAE (Pseudaletia unipuncta)
CHA: CHACHA (Spilochalcis), EULELA (Euplectrus), PTEPTE (Catolaccus, Eupteromalus)
TAC: TACGON (Chaetogaedia monticola, Euphorocera claripennis, Gonia sequax, Lespesia archippivora), TACTAC (Athyricina cinerea)

NOCTUIDAE (Spodoptera exigua)
CHA: EULELA (Euplectrus plathypenae), PTEPTE (Catolaccus aeneoviridis)
ICH: BRACHE (Chelonus texanus), BRAEUP (Meteorus laphygmae), BRAMIC (Apanteles marginiventris, militaris), ICHCRE (Pristomerus, Temelucha), ICHICH (Melanichneumon rubicundus), ICHPOR (Campoplex caradrinae, Hyposoter exiguae, nigrolineatus)
TAC: TACGON (Lespesia archippivora), TACPHA (Leucostoma simplex)

NOCTUIDAE (Spodoptera frugiperda)
CHA: CHABRA (Brachymeria incerta), CHACHA (Ceratosmicra meteori, Spilochalcis igneoides, side), EULELA (Euplectrus comstocki, plathypenae), TRI (Trichogramma minutum)
ICH: BRAEUP (Meteorus laphygmae, vulgaris), BRAHEL (Zele mellea), BRAMIC (Apanteles marginiventris), BRAROG (Rogas laphygmae, terminalis), ICHCRE (Pristomerus), ICHOPH (Enicospilus purgatus), ICHPOR (Campoletis sonorensis)
PRO: SCETEL (Telenomus heliothidis)
TAC: TACGON (Euphorocera claripennis, Hyphantrophaga hyphantriae, Lespesia archippivora, Nemorilla pyste), TACTAC (Archytas marmoratus, Bonnetia comta, Voria ruralis)

NOCTUIDAE (Spodoptera ornithogalli, praefica)
CHA: CHACHA (Spilochalcis sanguiniventris), ENCENC (Copidosoma truncatellum), EULELA (Euplectrus)
TAC: TACGON (Eucelatoria armigera, Euphorocera claripennis, Lespesia archippivora, Nemorilla pyste)

NOCTUIDAE (Trichoplusia ni)
CHA: CHABRA (Brachymeria), ENCENC (Copidosoma truncatellum), EULELA (Euplectrus comstocki), EULENT (Entedon, Pleurotropis sexdentata), TRI (Trichogramma minutum, semifumatum)

ICH: BRAEUP (Meteorus autographae), BRAMIC (Apanteles autographae, glomeratus, laeviceps, Microplitis alaskensis, brassicae), BRAROG (Rogas granulatus, molestus, perplexus, rufocoxalis), ICHGEL (Cryptus, Gambrus), ICHICH (Aoplus), ICHPIM (Itoplectis)
TAC: TACGON (Eucelatoria armigera, Lespesia archippivora), TACTAC (Voria ruralis)

PIERIDAE (Colias)
CHA: CHACHA (Spilochalcis), PTEPTE (Catolaccus, Eupteromalus, Pteromalus), TRI (Trichogramma retorridum, semifumatum)
TAC: TACGON (Euphorocera claripennis, Lepesia archippivora)

PLUTELLIDAE
CHA: CHACHA (Spilochalcis), EULTET (Tetrastichus), PTEPTE (Dibrachys, Habrocytus)
ICH: ICHICH, ICHPOR

PYRALIDAE (Diatraea grandiosella)
CHA: TRI (Trichogramma minutum)
ICH: BRAMIC (Apanteles diatraeae)

PYRALIDAE (Loxostege)
ICH: ICHCRE (Pristomerus)
TAC: TACGON (Hyphantrophaga hyphantriae, Lespesia archippivora, Nemorilla pyste)

TORTRICIDAE (Platynota)
BET: BET (Goniozus hubbardi)
CHA: CHABRA (Brachymeria hammari), EULELA (Cirrospilus platynotae), TRI (Trichogramma minutum, semifumatum)
ICH: BRABRA (Bracon platynotae), BRAEUP (Meteorus dimidiatus), BRAMIC Apanteles epinotiae, Microgaster phthorimaeae), ICHCRE (Temelucha platynotae), ICHMET (Exochus nigripalpus)

NEUROPTERA

CHRYSOPIDAE
CHA: ENCENC (Chrysopophagus), EULTET (Tetrastichus chrysopae), EUP (Arachnophaga), PER (Perilampus), PTEPTE (Catolaccus, Dibrachys), PTESPH (Pachyneuron), TRI (Trichogramma)
CYN: FIGANA
ICH: ICHGEL, ICHPIM
PRO: HEL, PRO, SCETEL (Telenomus chrysopae)

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