

THE PARASITIC HYMENOPTERA ASSOCIATED WITH SUNFLOWER  
(*HELIANTHUS* SPP.) IN MID-WESTERN CANADA

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**Abstract**

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A key to the species of Hymenoptera that parasitize insects feeding on sunflower seed heads is presented. The data base for this work is from rearings done in mid-western Canada but the key should be reliable throughout North America. A discussion of each parasitoid, giving host records, distribution, references, and a morphological diagnosis, is presented. Finally, a list of all of the species of parasitic Hymenoptera associated with sunflower in North America is given including important references.

**Résumé**

Nous donnons un tableau d'identification des hyménoptères parasites des insectes des semences du tournesol. Les données de ce travail résultent d'élevages faits dans la région des prairies canadiennes. Cependant, nous croyons que ces résultats seront suffisamment complets au travers de l'Amérique du Nord. Sous chaque espèce nous discutons des hôtes, de la distribution, et donnons un diagnose morphologique et des références. Finalement nous listons toutes les espèces d'hyménoptères parasites de l'Amérique du Nord associées au tournesol et ajoutons les références d'importances.

**Introduction**

This paper deals with the parasitic Hymenoptera associated with the seed heads of wild and cultivated sunflowers (*Helianthus* spp.) in mid-western Canada. Parasitoids associated with sunflower seed heads, in our definition, are those that parasitize insects feeding in seeds and flowers, or those that are hyperparasites of the primary parasitoids of these insects.

Several papers have dealt with the parasitoids of the sunflower moth *Homoeosoma electellum* (Hulst) in North America (Arthur and Campbell 1979; Beregovoy 1985; Satterthwait and Swain 1946), but this is the first comprehensive treatment of the parasitoids attacking insects feeding on sunflower seed heads. It is also the first to present identification keys to the parasitoids.

This paper is divided into three sections: (1) a key to the parasitic Hymenoptera; (2) detailed information on each species in the key; and (3) a list of all parasitic Hymenoptera previously associated with sunflower in North America.

Our key treats those species of parasitoids that occurred repeatedly in rearings done by A. Arthur. His collections are from a wide range of localities in southern Saskatchewan and Alberta (Arthur and Campbell 1979). We expect that the key presented here will be accurate and useful wherever sunflower occurs in North America. The key is simplified for the use of non-taxonomists and will work only for those species reared from the heads of sunflower in North America.

In each species treatment, the host of the parasitoids, the parasitoid's known range, biology, and references dealing with its relationship to sunflower are presented.

**Key to the Parasitic Hymenoptera Reared from the Heads of Sunflowers**

1. Fore wing with venation mostly restricted to the anterior margin (Figs. 17, 20, 21, 36) or venation very reduced (Fig. 37) ..... (Chalcidoidea and Platygasteridae) 2

- Fore wing with more extensive venation (Figs. 18, 19, 26, 28–35)..... (Ichneumonoidea) 6
- 2. Fore wing venation reduced to wing base (Figs. 37)..... 20. *Platygaster* spp.
- Fore wing with veins along the anterior margin and a clearly indicated stigmal vein (Figs. 17, 20, 21, 36)..... 3
- 3. Hind femur with a tooth ventrally (Fig. 23); body color metallic blue-green ..... 24. *Zaglyptonotus mississippiensis*
- Hind femur without a tooth ventrally, body color variable..... 4
- 4. Body coarsely pitted (Fig. 16); abdomen as high as long (Fig. 21).... 19. *Perilampus tristis*
- Body not coarsely pitted, smoother; abdomen longer than high (Figs. 17, 20)..... 5
- 5. Body metallic green in color ..... 14. *Habrocytus elevatus*
- Body lacking metallic coloration; body usually yellow, but rarely with yellow color partially reduced and replaced by black..... 1. *Aprostocetus fidius*
- 6. Distal anterior angle of the most anterior closed cell of hind wing obtuse (greater than 90°) (Figs. 19, 26, 29, 33, 34, 35); fore wing with 2 recurrent veins, 1 rv, 2 rv (Figs. 19, 26, 29, 33–35)..... (Ichneumonidae) 7
- Distal anterior angle of the most anterior closed cell of the hind wing acute (less than 90°) (Fig. 27); fore wing with 1 recurrent vein, rv (Figs. 18, 28, 30–32)..... (Braconidae) 15
- 7. Abdomen very narrow, compressed laterally (Fig. 19) ..... 8
- Abdomen normal, not compressed laterally (Fig. 25)..... 10
- 8. Eyes hairy (Fig. 2)..... 23. *Trichomma maceratum*
- Eyes lacking distinct hair ..... 9
- 9. Base of middle coxa black ..... 17. *Parania geniculata*
- Middle coxa entirely yellow..... 18. *Parania pulchra*
- 10. Hind tibia uniformly colored ..... 11
- Hind tibia with dark bands near base and apex (Fig. 22)..... 12
- 11. Abdomen entirely pale; head yellow around eyes..... 16. *Mesostenus gracilis*
- Abdomen mostly dark; head dark around eyes ..... 10. *Diadegma openangorum*
- 12. First abdominal segment more than 2 times as long as its greatest width (Fig. 25)..... 13
- First abdominal segment about as long as it is wide (Fig. 13) ..... 14
- 13. Body length 3.0–4.5 mm; propodeum flat medially (Fig. 7), nor forming a concave trough ..... 9. *Diadegma* n.sp.
- Body length 6.0–7.5 mm; propodeum excavated medially forming a concave trough (Fig. 8) ..... 22. *Sinophorus tumidus*
- 14. Areolet present in fore wing (Fig. 34)..... 21. *Scambus tecumseh*
- Areolet absent in fore wing (Fig. 33) ..... 12. *Glypta* n.sp.
- 15. Fore wing with 4 closed cells (Fig. 32)..... 11. *Dolichogenidea homeosomae*
- Fore wing with 5–7 closed cells (Figs. 30, 31, 33–35)..... 16
- 16. Dorsum of abdomen composed of unsegmented carapace (Fig. 15) ..... 17
- Dorsum of abdomen divided by transverse sutures (Figs. 10, 13, 14, 25)..... 18
- 17. Cu 1a vein of fore wing short, ending abruptly well before wing margin (Fig. 31); scutellum flat, weakly pitted to smooth medially ..... 7. *Chelonus altitudinus*
- Cu 1a vein of fore wing long, gradually weakening towards wing margin (Fig. 30); scutellum convex, rough medially..... 8. *Chelonus phaloniae*
- 18. Mouth round, i.e. space formed between clypeus and mandibles round (Fig. 3)..... 19
- Mouth transverse (Fig. 4)..... 21
- 19. Dorsum of abdomen smooth, lacking sculpture beyond segment 2 (Fig. 9) ..... 6. *Bracon nuperus*
- Dorsum of abdomen at least partially sculptured beyond segment 2, i.e. granular or leather-like (Fig. 10) ..... 20
- 20. Dorsum of abdomen mostly orange ..... 5. *Bracon mellitor*
- Dorsum of abdomen mostly black ..... 13. *Habrobracon gelechia*

21. 1 RS cell 4-sided (as in *B. mellitor* Fig. 18) ..... 15. *Macrocentrus ancylicivorus*  
 — 1 RS cell 3-sided (Fig. 28)..... 22
22. Dorsal surface of thorax with 2 converging grooves (notaulices) composed of many pits (Fig. 6) ..... 2. *Bassus arthurellus*  
 — Dorsal surface of thorax with 2 smooth converging grooves (Fig. 5) ..... 23
23. Malar space (space between the eye and the mouth) more than 2/3 the height of the eye (Fig. 24, *ms*) ..... 4. *Bassus nigripes*  
 — Malar space about 1/2 the height of the eye..... 3. *Bassus buttricki*

### Species Treatments

Every species of parasitic Hymenoptera that was repeatedly reared in the studies conducted in mid-western Canada (Arthur and Campbell 1979) is dealt with independently in this section. For each species, the following information is presented: biology and host relationships, distribution, diagnosis, and references. The species are treated in alphabetical order according to their generic names.

**Biology and host relationships.** The parasitic Hymenoptera of this study attack at least five primary hosts: three species of Lepidoptera (*Homoeosoma electellum* (Hulst), *Cochylis arthuri* Dang, and *Cochylis hospes* Wism.) and two species of Diptera (*Neotephritis finalis* (Loew.) and *Mayetiola* sp.). We associate most of the parasitoids with a particular host, though sometimes this is not possible. For example, there are at least two species of *Cochylis* that feed on the heads of sunflower in North America and although it is possible to distinguish between the adults of these two species, the larvae are not easily identified. For this reason, those parasitoids reared from *Cochylis* larvae are simply recorded as parasitoids of *Cochylis* sp.

Most parasitoids in this study are not host specific; they have alternate hosts that are not associated with sunflower. When these alternate hosts are few in number, we list them; however, they are often too numerous to mention. The interested reader can refer to Krombein *et al.* (1979) for more extensive lists of the hosts of these species.

We include a brief account of the life history of each parasite. Most of the parasitoids attack the larval stage of one of the insects feeding on sunflower heads; when a parasite has an unusual life history it is dealt with in more detail. Finally, we try to give an idea of how important the parasite is in the natural control of its host by estimating how frequently it was encountered in the mid-western Canada study. Parasitoids are classified as very common, common, or rare, but even those classified as rare were reared repeatedly from sunflower. Those that were simply reared a few times are omitted from the key and species treatments but included in the list of species recorded from sunflower.

**Distribution.** Geographic distribution was determined using various catalogues of Hymenoptera, primarily Krombein *et al.* (1979), from specimens in the Canadian National Collection, and, for several species, from taxonomic revisions published after 1979. In several cases our knowledge of species distributions is fragmentary.

**Diagnosis.** Here we list several characters that the reader can use to confirm a determination; most of these diagnostic characters are illustrated. The diagnosis section is important because rarely (we hope) the user of the key will be trying to identify a species not included in the key. Nonetheless, the specimen may "key out" somewhere and the diagnosis can be used to verify the identification.

**References.** Here we list papers that give some information on the parasite as it relates to sunflower. In most cases other references for the parasitoids can be found in Krombein *et al.* (1979) but these will not deal specifically with hosts that feed on sunflower.

1. *Aprostocetus fidius* Girault  
(Eulophidae, Tetrastichinae)  
(Fig. 17)

**Biology and host relationships.** Larval parasitoid of *Mayetiola* sp. reared from *Taxodiomyia cupressiananassa* (O.S.). It was very common in rearings from mid-western Canada.

**Distribution.** Widespread in the southern USA from Florida to New Mexico, and north into Saskatchewan. In Canada it is apparently restricted to the mid-western provinces.

**Diagnosis.** 1. Fore wing venation reduced (Fig. 17).  
2. Body color mostly or partly yellow (do not include legs which are yellow in several other species as well).

**References.** Breland (1939).

2. *Bassus arthurellus* Sharkey  
(Braconidae, Agathidinae)  
(Figs. 6, 28)

**Biology and host relationships.** Larval parasitoid of *Cochylis* sp. It was common in rearings from mid-western Canada.

**Distribution.** Known only from Saskatchewan but doubtlessly more widespread.

**Diagnosis.** 1. 1 RS cell triangular (Fig. 28).  
2. Dorsal surface of scutum with converging pitted grooves (notaulices) (Fig. 6).

**References.** Sharkey (1985).

3. *Bassus buttricki* Viereck  
(Braconidae, Agathidinae)  
(Fig. 11)

**Biology and host relationships.** Larval parasitoid of *H. electellum*. Marsh (in Krombein *et al.* 1979) lists other species of Lepidoptera as hosts. It was common in rearings from mid-western Canada.

**Distribution.** Widespread throughout all of eastern North America, from Canada's Atlantic region south to Florida and as far west as Alberta and Texas.

**Diagnosis.** 1. 1 RS cell of fore wing triangular (as in Fig. 9).  
2. Dorsal surface of the 1st abdominal segment with 2 strong longitudinal ridges (Fig. 11).  
3. Malar space about 1/2 of the eye height.

**References.** Beregovoy (1985). Satterthwait and Swain (1946), Teetes and Randolph (1969).

4. *Bassus nigripes* (Cresson)  
(Braconidae, Agathidinae)  
(Figs. 12, 24)

**Biology and host relationships.** Larval parasitoid of *H. electellum* (new record); previously recorded from *Phaneta bucephaloides* (Wlsm.). It was rare in rearings from mid-western Canada.

**Distribution.** Recorded as widespread over all of temperate North America (Krombein *et al.* 1979) but we have found it to be common only in the west, i.e. Manitoba west to the dry interior of southern British Columbia and south to Arizona and western Texas.

- Diagnosis.** 1. 1 RS cell of fore wing triangular (as in Fig. 28).  
2. Dorsal surface of the 1st abdominal segment with 2 strong longitudinal ridges (Fig. 12).  
3. Malar space (*ms*) about 2/3 as long as eye height (Fig. 24).

5. *Bracon mellitor* (Say)  
(Braconidae, Braconinae)  
(Figs. 3, 18)

**Biology and host relationships.** Larval parasitoid of *Cochylis* sp. (new record). Satterthwait and Swain (1946) recorded *B. mellitor* as a parasitoid of *H. electellum* but this needs verification. Reported from many species of Lepidoptera (Krombein *et al.* 1979; Shenefelt 1978). Rare in rearings from mid-western Canada.

**Distribution.** Widespread over temperate North America.

- Diagnosis.** 1. Fore wing with many closed cells (Fig. 18).  
2. Head and mesosoma mostly orange.  
3. Dorsal surface of abdomen sculptured (as in Fig. 10).  
4. Mouth circular (Fig. 3).

**References.** Beregovoy (1985), Satterthwait (1948), Satterthwait and Swain (1946).

6. *Bracon nuperus* (Cresson)  
(Braconidae, Braconinae)  
(Fig. 9)

**Biology and host relationships.** Larval parasitoid of *H. electellum*. Other hosts, all Lepidoptera, are listed in Krombein *et al.* (1979) and Shenefelt (1978). It was very common in rearings from mid-western Canada.

**Distribution.** Southern Canada west of Quebec and throughout the USA except New England.

- Diagnosis.** 1. Forewing with many closed cells (as in Fig. 18).  
2. Head and thorax black; abdomen pale.  
3. Dorsum of abdomen smooth (Fig. 9).  
4. Mouth circular (as in Fig. 3).

**References.** Satterthwait and Swain (1946).

7. *Chelonus altitudinus* Viereck  
(Braconidae, Cheloninae)  
(Figs. 15, 31)

**Biology and host relationships.** Egg-larval parasitoid of *H. electellum*. Eggs are laid in the egg of the host and remain inactive until the host larvae is almost fully developed and large enough to provide a complete meal. It was common in rearings from mid-western Canada.

**Distribution.** Widespread in western North America from Canada to Mexico.

- Diagnosis.** 1. Dorsum of abdomen forming a carapace without transverse sutures (Fig. 15).  
2. Cu 1a vein of fore wing short, ending abruptly, well before wing margin (Fig. 31).

**References.** Beregovoy (1985), Satterthwait (1948), Satterthwait and Swain (1946), Teetes and Randolph (1969).

8. *Chelonus phaloniae* Mason  
(Braconidae, Cheloninae)  
(Fig. 30)

**Biology and host relationships.** Egg-larval parasitoid (see *C. altitudinus* for a definition of this type of parasitism) of *H. electellum* (new record) and *Cochylis* sp. Recorded as a parasitoid of *Cochylis hospes* (Mason 1959) but this record needs verification as a new species, *C. arthuri*, has been reared from sunflower heads and as yet the larvae of the two species cannot be differentiated. It was common in rearings from mid-western Canada.

**Distribution.** Known only from Saskatchewan and Manitoba though undoubtedly more widespread.

**Diagnosis.** 1. Dorsal surface of abdomen forming a carapace without transverse sutures (as in Fig. 15).  
2. Cu la vein of fore wing long, gradually becoming weaker towards the wing margin (Fig. 30).

**References.** Mason (1959).

9. *Diadegma* n.sp.  
(Ichneumonidae, Campopleginae)  
(Figs. 7, 22, 25, 29)

**Biology and host relationships.** Larval parasitoid of Lepidoptera (host unknown; either *H. electellum* or *Cochylis* sp.). It was rare in rearings from mid-western Canada.

**Distribution.** Only known from Saskatchewan but undoubtedly more widespread.

**Diagnosis.** 1. Hind tibia with dark bands (Fig. 22).  
2. Fore wing with areolet (Fig. 29).  
3. First abdominal segment more than 2 times longer than its greatest width (Fig. 25).  
4. Propodeum flat medially (Fig. 7), lacking a concave trough (as in Fig. 8).

10. *Diadegma openangorum* (Viereck)  
(Ichneumonidae, Campopleginae)

**Biology and host relationships.** Larval parasitoid of *H. electellum*. Other lepidopterous hosts are listed in Krombein *et al.* (1979). It was very common in rearings from mid-western Canada.

**Distribution.** Widespread in temperate North America (Maine to British Columbia, Gulf states to California).

**Diagnosis.** 1. Hind tibia unicolorous.  
2. Fore wing with areolet (Fig. 29).  
3. Abdomen dark.  
4. First segment of abdomen more than 2 times longer than its greatest width (as in Fig. 25).

**References.** Arthur and Campbell (1979). The following authors have referred to *Diadegma* sp. probably meaning *D. openangorum*: Beregovoy (1985), Satterthwait and Swain (1946), Teetes and Randolph (1969).

11. *Dolichogenidea homoesomae* (Muesebeck)  
(Braconidae, Microgastrinae)  
(Fig. 32)

**Biology and host relationships.** Larval parasitoid of *H. electellum*, rare in rearings from mid-western Canada.

**Distribution.** Widespread throughout western North America, in the north from Washington to Saskatchewan and as far south as Texas.

**Diagnosis.** 1. Fore wing with only 4 closed cells (Fig. 32).  
2. Body, excluding appendages, entirely black.  
3. Wings milky white.  
4. Ovipositor longer than abdomen.

**References.** Beregovoy (1985), Satterthwait and Swain (1946), Teetes and Randolph (1969).

**12. *Glypta* n.sp.**

(Ichneumonidae, Banchinae)  
(Figs. 13, 33)

**Biology and host relationships.** Larval parasitoid of *Cochylis* sp. It was very common in rearings from mid-western Canada.

**Distribution.** Only known from mid-western Canada, though undoubtedly more widespread.

**Diagnosis.** 1. Fore wing with many veins but lacking an areolet (Fig. 33).  
2. Segments 2–4 of abdomen with diverging pair of grooves (Fig. 13).

**13. *Habrobracon gelechia* (Ashmead)**

(Braconidae, Braconinae)  
(Fig. 10)

**Biology and host relationships.** Larval parasitoid of *H. electellum* (new record) and a wide range of other lepidopterous hosts (Krombein *et al.* 1979). It was very common in rearings from mid-western Canada.

**Distribution.** Widespread over temperate North America.

**Diagnosis.** 1. Fore wing with closed cells (as in Fig. 31).  
2. Head, thorax, and abdomen mostly black.  
3. Dorsum of abdomen sculptured (Fig. 10).  
4. Mouth round (Fig. 3).

**14. *Habrocytus elevatus* (Walker)**

(Pteromalidae, Pteromalinae)  
(Fig. 20)

**Biology and host relationships.** Larval or pupal parasitoid of *Neotephritis finalis* Loew. (*H. elevatus* attacks either the larval or pupal stage of its host). It was common in rearings from mid-western Canada. Varley (1937, 1947) recorded it (as *H. trypetae*) as an ectoparasitoid of *Urophora* (= *Euribia*) *jaceana* (Hering) and gave a detailed description of its life history.

**Distribution.** Holarctic, widespread in Europe and southern Canada from east to west coast. Distribution in the USA is poorly known but probably widespread.

**Diagnosis.** 1. Venation reduced (Fig. 20).  
2. Body color, metallic green or blue-green.  
3. Stigmal vein more than 4 times longer than wide and thicker at apex (Fig. 20).

15. *Macrocentrus ancylivorus* Rohwer  
(Braconidae, Macrocentrinae)  
(Fig. 27)

**Biology and host relationships.** Larval parasitoid of *H. electellum* and a wide range of other Lepidoptera (Krombein *et al.* 1979). It was very common in rearings from mid-western Canada.

**Distribution.** Widespread throughout temperate North America.

- Diagnosis.** 1. Body entirely pale colored.  
2. Anterior distal angle of the most anterior closed cell in the hind wing acute (Fig. 27).  
3. Posterior-most closed cell in hind wing large (Fig. 27).

**References.** Beregovoy (1985), Satterthwait (1948), Satterthwait and Swain (1946), Teetes and Randolph (1969).

16. *Mesostenus gracilis* Cresson  
(Ichneumonidae, Phygadeuontinae)

**Biology and host relationships.** Larval parasitoid of *H. electellum* and a wide range of other Lepidoptera including some stored product pests (Krombein *et al.* 1979). It was rare in rearings from mid-western Canada.

**Distribution.** Widespread over temperate and semitropical North America.

- Diagnosis.** 1. Fore wing with 7 closed cells (as in Fig. 29).  
2. Abdomen entirely pale.

17. *Parania geniculata* (Holmgren)  
(Ichneumonidae, Anomaloniinae)  
(Fig. 19)

**Biology and host relationships.** Larval parasitoid of a broad range of Lepidoptera larvae. On sunflower the host is either *H. electellum* or *Cochylis* sp. It was rare in rearings from mid-western Canada.

**Distribution.** Widespread over most of temperate North America and Europe.

- Diagnosis.** 1. Abdomen laterally compressed (Fig. 19).  
2. Fore wing with 6 closed cells and lacking an areolet (Fig. 19).  
3. Eyes without visible hair.  
4. Base of middle coxa black.

18. *Parania pulchra* Dasch  
(Ichneumonidae, Anomaloniinae)

**Biology and host relationships.** Larval parasitoid of Lepidoptera, in this study either *H. electellum* or *Cochylis* sp. It was rare in rearings from mid-western Canada.

**Distribution.** Widespread in western North America from southern Canada to southern New Mexico.

- Diagnosis.** 1. Abdomen laterally compressed (as in Fig. 19).  
2. Fore wing with 6 closed cells and no areolet (as in Fig. 19).  
3. Eyes without visible hair.  
4. Middle coxa entirely yellow.



**19. *Perilampus tristus* Mayer**

(Pteromalidae, Perilampinae)

(Figs. 16, 21)

**Biology and host relationships.** The host in the rearings from mid-western Canada is not known. *Perilampus tristus* is probably hyperparasitic on one of the ichneumonids or braconids. As far as known, all *Perilampus* lay their eggs on plant tissue; these hatch into planidia larvae which attach themselves to any moving object. If they encounter a lepidopterous larva, they enter its body and if this body contains a primary parasitoid (the primary parasitoid) is parasitized by *Perilampus*. Development stops at this point until the primary parasitoid pupates then members of the genus *Perilampus* take an external position and continue to feed. This species was common in rearings from mid-western Canada. Several other species of *Perilampus* have been associated with sunflower. All species are hyperparasitoids and all will key out to *P. tristus* if this key is used.

**Distribution.** Widespread in North America east of the Rocky Mountains, also widespread in Europe.

**Diagnosis.** 1. Venation reduced (Fig. 21).

2. Body coarsely pitted (Fig. 16).

3. Body dark black.

4. Abdomen triangular in lateral view and higher than long (Fig. 21).

**20. *Platygaster* spp.**

(Platygasteridae, Platygasterinae)

(Figs. 1, 37)

**Biology and host relationships.** Egg-larval parasitoids of cecidomyiid flies feeding on sunflower seed heads. Eggs of the parasitoid are laid into the host egg but do not develop until the host has nearly completed growth. It was rare in rearings from mid-western Canada. There are several species of Platygasteridae that attack a number of different species of cecidomyiid flies on sunflower. The taxonomy of these parasitic wasps is poorly known, and most species are undescribed.

**Distribution.** Unknown.

**Diagnosis.** 1. Venation of fore wing very reduced and restricted to wing base (Fig. 37).

2. Body color black.

3. Antennae arising low on face, below the lower margin of the eyes (Fig. 1).

**21. *Scambus tecumseh* Viereck**

(Ichneumonidae, Pimplinae)

(Figs. 14, 34)

**Biology and host relationships.** Believed to be an internal larval parasitoid of *H. electellum* but this has not been determined with certainty. It also has a wide range of other lepidopterous hosts (Krombein *et al.* 1979). It was rare in rearings from mid-western Canada.

**Distribution.** Widespread across temperate North America.

**Diagnosis.** 1. Fore wing with an areolet (Fig. 34).

2. Dorsal surface of abdomen coarsely pitted (Fig. 14).

**22. *Sinophorus tumidus* Sanborne**

(Ichneumonidae, Campopleginae)

(Fig. 8)

**Biology and host relationships.** Parasitoid of larval Lepidoptera; however the host associated with sunflower is unknown. It was common in rearings from mid-western Canada.

**Distribution.** Widespread throughout southern Canada and the northern USA as far south as South Carolina.

- Diagnosis.** 1. Fore wing with an areolet (as in Fig. 29).  
 2. Hind tibia with dark bands (as in Fig. 22).  
 3. Propodeum with a concave trough medially (Fig. 8).

**23. *Trichomma maceratum* (Cresson)**  
 (Ichneumonidae, Anomaloninae)  
 (Figs. 2, 35)

**Biology and host relationships.** Larval parasitoid of *H. electellum* (new record) and a wide range of other Lepidoptera (Dasch 1984). It was rare in rearings from mid-western Canada.

**Distribution.** Found in the west from British Columbia to California east to Saskatchewan and Iowa.

- Diagnosis.** 1. Abdomen laterally compressed (as in Fig. 19).  
 2. Fore wing with 6 closed cells and lacking an areolet (Fig. 35).  
 3. Eyes hairy (Fig. 2).

**References.** Satterthwait (1948).

**24. *Zaglyptonotus mississippiensis* Breland**  
 (Torymidae, Monodontomerinae)  
 (Fig. 23)

**Biology and host relationships.** Pupal parasitoid of *Neotephritus finalis*. It was rare in rearings from mid-western Canada.

**Distribution.** Recorded from mid-western Canada, Alabama, and Mississippi. It is probably widespread throughout North America where tephritids are associated with sunflower.

- Diagnosis.** 1. Venation reduced (as in Fig. 36).  
 2. Body color, dark metallic green.  
 3. Hind femur with small tooth on ventral margin (Fig. 23).

**References.** Breland (1938, 1939).

### Species List

Here we present a list of all parasitic Hymenoptera that have been associated with sunflower heads in North America, including a few species that were reared very rarely in mid-western Canada and not included in our key nor in our previous species discussions. An asterisk beside the specific name of the parasitoid identifies species not included in the key. When known, the hosts of the parasitoids are given. To save space, references are given in a numerical code.

The references corresponding to the numerical code are given following the species list.

Parasite	Family	Host	References
<i>Apanteles epinothiae</i> *	Braconidae	<i>H. electellum</i>	5,8
<i>Aprostocetus fidius</i>	Eulophidae	<i>Mayetiola</i> sp. (sp.?)	4
<i>Bassus arthurellus</i>	Braconidae	<i>Cochylis</i> sp. or spp.	7
<i>Bassus buttricki</i>	Braconidae	<i>H. electellum</i>	1,2,6,8
<i>Bassus nigripes</i>	Braconidae	<i>H. electellum</i>	
<i>Bracon caulicola</i> *	Braconidae	<i>H. electellum</i> ?	5
<i>Bracon mellitor</i>	Braconidae	<i>H. electellum</i> ?	
		<i>Cochylis</i> sp. or spp.	2,6,5
<i>Bracon nuperus</i>	Braconidae	<i>H. electellum</i>	6

Parasite	Family	Host	References
<i>Bracon</i> sp.			
(perhaps referring to <i>nuperus</i> )*	Braconidae	<i>H. electellum</i>	5
<i>Chelonus altitudinus</i>	Braconidae	<i>H. electellum</i>	2,5,6,8
<i>Chelonus phaloniae</i>	Braconidae	<i>Cochylis</i> sp. or spp.	
<i>Copidosoma truncatellum</i> *	Encyrtidae	<i>Feltia herilis</i>	
<i>Cremastus epagoges</i> *	Ichneumonidae	<i>H. electellum</i>	6
<i>Diadegma</i> sp.	Ichneumonidae	Lepidoptera (sp.?)	2,6,8
<i>Diadegma opengorium</i>	Ichneumonidae	<i>H. electellum</i>	1
<i>Dolichogenidea homoeosomae</i>	Ichneumonidae	<i>H. electellum</i>	2,6,8
<i>Elasmus setioscutellatus</i> *	Eulophidae	<i>H. electellum</i>	2
<i>Eurytoma obtusiventris</i> *	Eurytomidae	<i>Neotephritis finalis</i>	4
<i>Glypta</i> n.sp.	Ichneumonidae	<i>Cochylis</i> sp. or spp.	
<i>Goniozus floridanus</i> *	Bethylidae	<i>H. electellum</i>	2
<i>Habrobracon gelechia</i>	Braconidae	<i>H. electellum</i>	
<i>Habrocytus elevatus</i>	Pteromalidae	<i>Neotephritis finalis</i>	
<i>Macrocentrus ancyllivorus</i>	Braconidae	<i>H. electellum</i>	1,2,6,8
<i>Mesostenus gracilis</i>	Ichneumonidae	<i>H. electellum</i>	
<i>Parania geniculata</i>	Ichneumonidae	<i>H. electellum</i>	
<i>Parania pulchra</i>	Ichneumonidae	Lepidoptera (sp.?)	
<i>Perilampus similis</i> *	Pteromalidae	Hymenoptera (sp.?)	6,7
<i>Perilampus</i> sp.*	Pteromalidae	Hymenoptera (sp.?)	
<i>Perilampus tristis</i>	Pteromalidae	Hymenoptera (sp.?)	
<i>Platygaster</i> sp.	Platygasteridae	<i>Mayetiola</i> sp. (sp.?)	5,9
<i>Pristomerus austrinus</i> *	Ichneumonidae	<i>H. electellum</i>	2
<i>Pristomerus euryptychiae</i> *	Ichneumonidae	<i>H. electellum</i>	5
<i>Pristomerus</i> sp.*	Ichneumonidae	<i>H. electellum</i>	
<i>Rileyia cecidomyiae</i> *	Eurytomidae	<i>Dasyneura</i> sp.	4
<i>Rileyia</i> sp.*	Eurytomidae	<i>Asphondylia globulus</i>	4,5
<i>Scambus canadensis</i> *	Ichneumonidae	<i>H. electellum</i>	1
<i>Scambus tecumseh</i>	Ichneumonidae	<i>H. electellum</i> ?	2
<i>Sinophorus tumidus</i>	Ichneumonidae	Lepidoptera (sp.?)	
<i>Temelucha</i> sp.	Ichneumonidae	Lepidoptera (sp.?)	1,8
<i>Tenuipetiolus teredon</i> *	Eurytomidae	<i>Asphondylia helianthiglobulus</i>	4
<i>Torymus capillaceus</i> *	Torymidae	<i>Asphondylia globulus</i>	4
<i>Torymus coloradensis</i> *	Torymidae	<i>Dasineura</i> (sp.?)	9
<i>Torymus obscurus</i> *	Torymidae	<i>Lasioptera murtfeldtiana</i>	3,5
<i>Trichomma maceratum</i>	Ichneumonidae	<i>H. electellum</i>	
<i>Zaglyptonotus mississippiensis</i>	Torymidae	<i>Neotephritis finalis</i>	3,4

Reference list: 1. Arthur and Campbell (1979); 2. Beregovoy (1985); 3. Breland (1938); 4. Breland (1939); 5. Satterthwait (1948); 6. Satterthwait and Swain (1946); 7. Sharkey (1985); 8. Teetes and Randolph (1969); 9. Walker (1936).

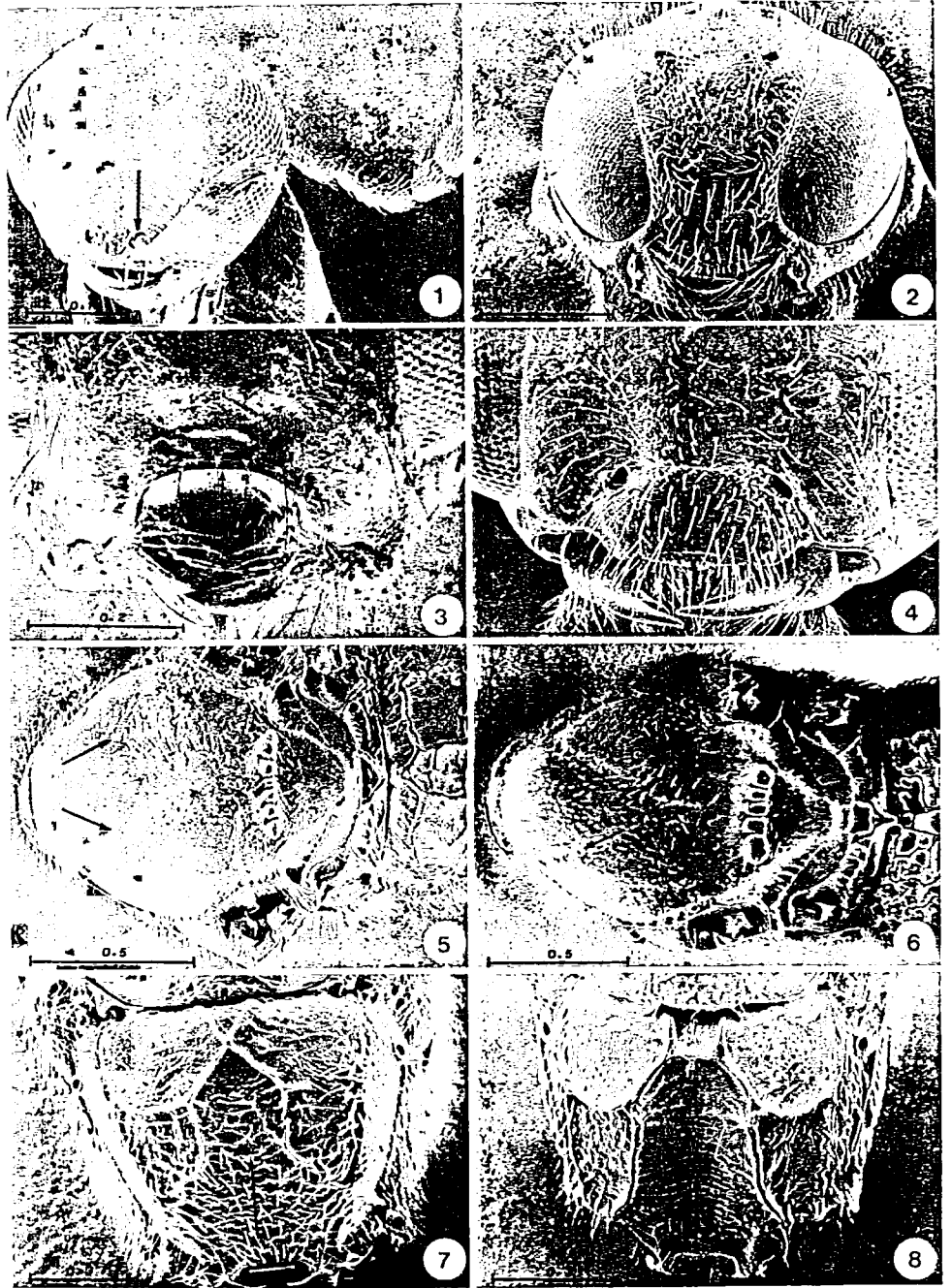
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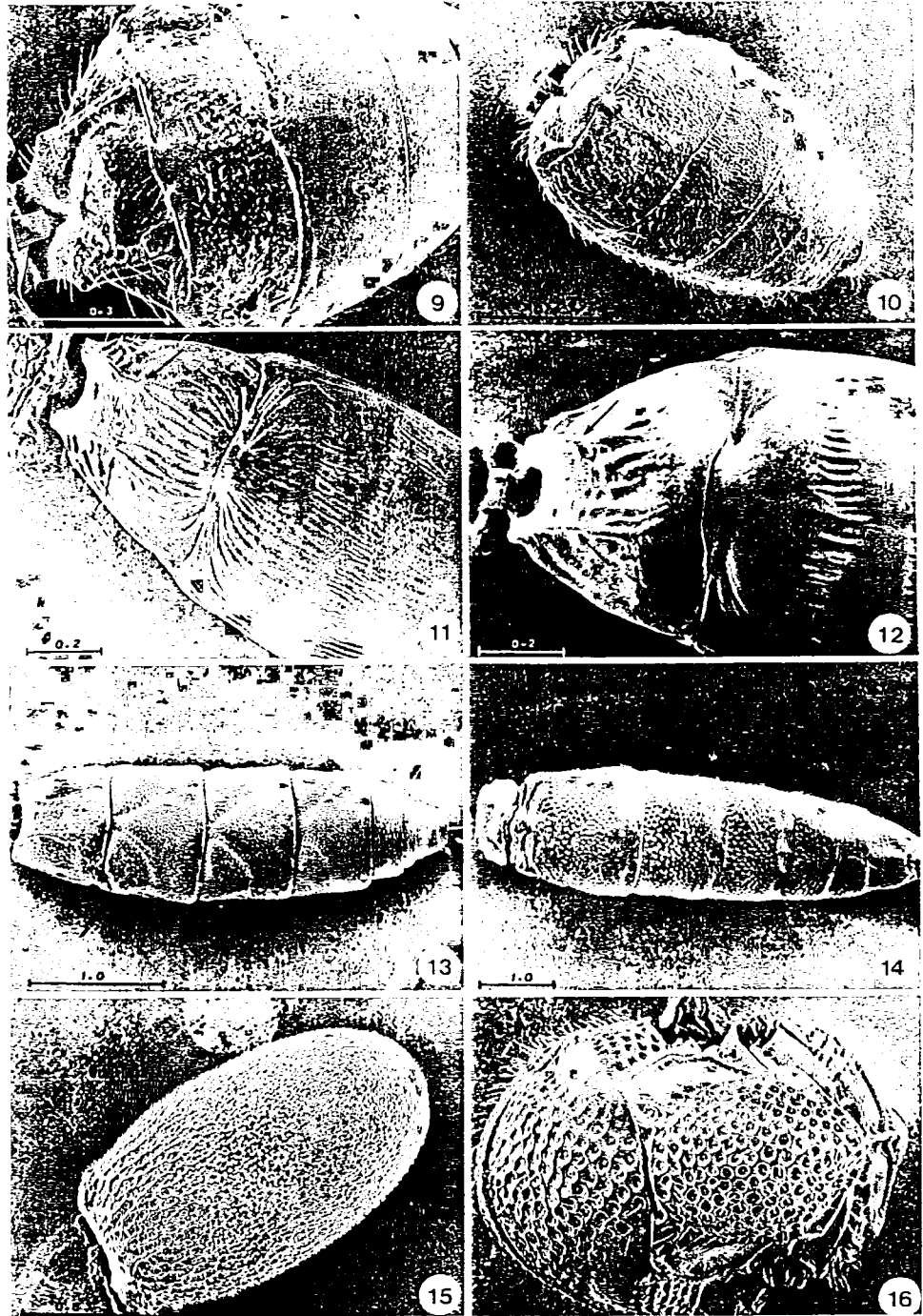
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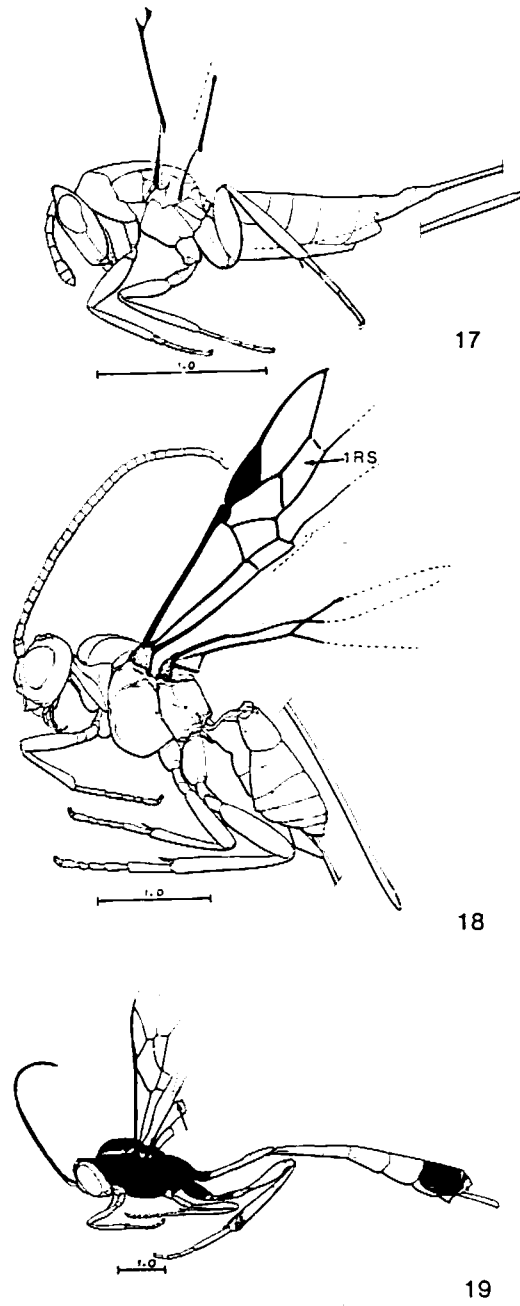
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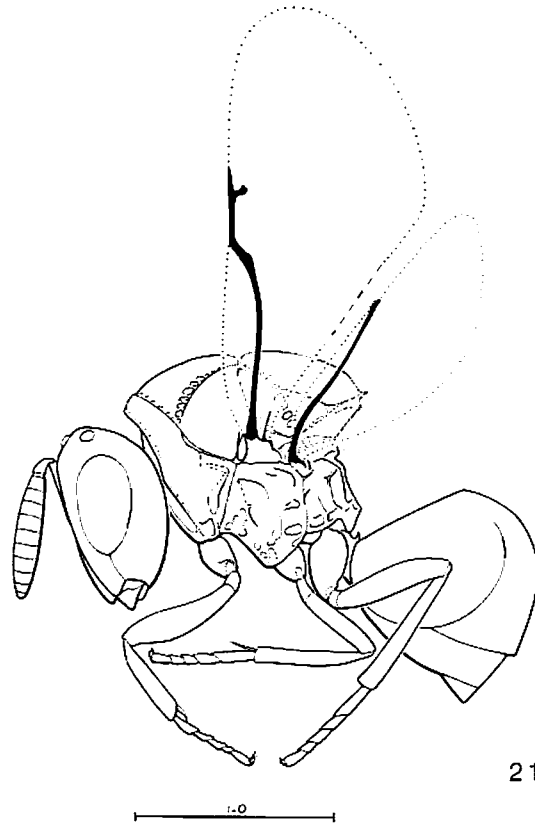
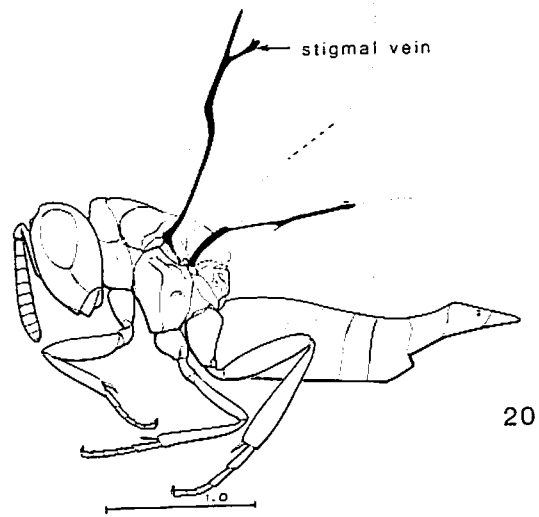
FIGS. 1-8. 1, *Platygaster* sp., frontal aspect of head; 2, *Trichomma maceratum*, frontal aspect of head; 3, *Bracon mellitor*, frontal aspect of lower head; 4, *Macrocentrus ancyliivorus*, frontal aspect of lower head; 5, *Bassus buttricki*, dorsal aspect of thorax; 6, *Bassus arthurellus*, dorsal aspect of thorax; 7, *Diadegma* n.sp., dorsal aspect of propodeum; 8, *Sinophorus tumidus*, dorsal aspect of propodeum. Scale bars in millimetres.



FIGS. 9-16. 9, *Bracon nuperus*, dorsal aspect of abdomen; 10, *Habrobracon gelechia*, dorsal aspect of abdomen; 11, *Bassus buttricki*, dorsal aspect of terga 1 and 2 of abdomen; 12, *Bassus nigripes*, dorsal aspect of terga 1 and 2 of abdomen; 13, *Glypta* n.sp., dorsal aspect of abdomen; 14, *Scambus tecumseh*, dorsal aspect of abdomen; 15, *Chelonus altitudinus*, dorsal aspect of abdomen; 16, *Perilampus tristus*, dorsal aspect of thorax. Scale bars in millimetres.

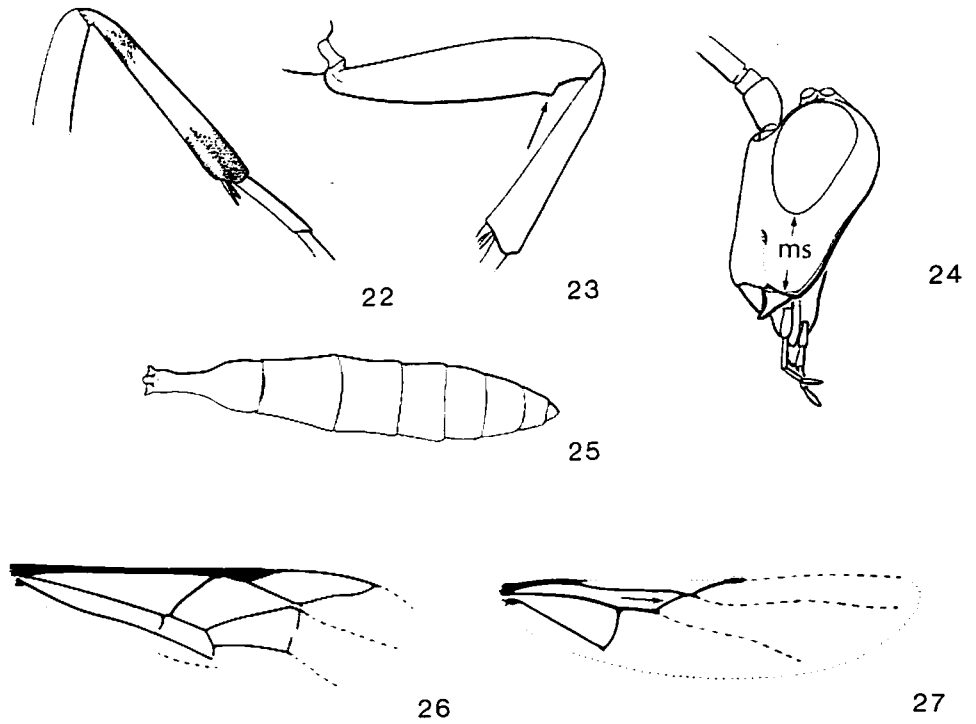


FIGS. 17-19. 17, *Aprostocetus fidius*, lateral habitus; 18, *Bracon mellitor*, lateral habitus; 19, *Parania geniculata*, lateral habitus. Scale bars in millimetres.

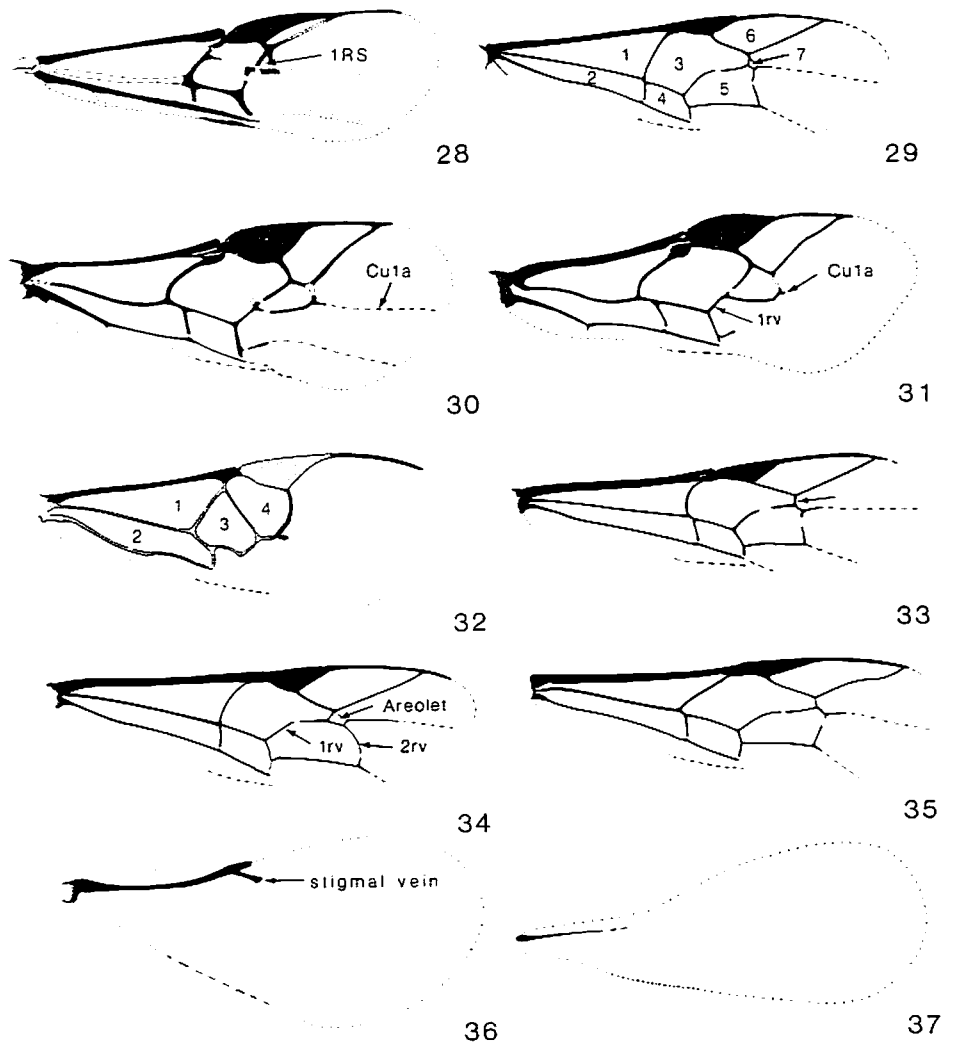


FIGS. 20-21. 20, *Hybrocytus elevatus*, lateral habitus; 21, *Perilampus tristis*, lateral habitus. Scale bars in millimetres.





FIGS. 22-27. 22, *Diadegma* n.sp., hind tibia; 23, *Zaglyptonotus mississippiensis*, hind femur; 24, *Bassus nigripes*, lateral aspect of head (*ms*, malar space); 25, *Diadegma*, n.sp., dorsal aspect of abdomen; 26, *Mesostenus gracilis*, fore wing; 27, *Macrocentrus ancylivorus*, hind wing.



FIGS. 28-37. 28, *Bassus arthurellus*, fore wing; 29, *Diadegma* n.sp., fore wing; 30, *Chelonus phaloniae*, fore wing; 31, *Chelonus altitudinus*, fore wing; 32, *Dolichogenidea homoeosomae*, fore wing; 33, *Glypta* n.sp., fore wing; 34, *Scambus tecumseh*, fore wing; 35, *Trichomma maceratum*, fore wing (rv, recurrent vein); 36, *Copidosoma truncatellum*, fore wing; 37, *Plygaster* sp., fore wing.