

- Crowson 1955, 1981.  
 Donisthorpe 1935 (fungus hosts).  
 Gardner 1931b.  
 Gorham 1887.  
 Hayashi *et al.* 1959 (larvae of *Ancylopus melanocephalus* (Olivier), *Endomychus gorhami* Lewis, *Lycoperdina mandarinea* Gerstaecker, and *L. dux* Gorham).  
 Hinton 1945b (stored products species).  
 Kemner 1924 (larva of *Trochoideus termitophilus* Roepke).  
 Klippel 1952 (larva of *M. hirta*).  
 Lawrence 1982c.  
 Mamaev 1977 (larva of *Agaricophilus reflexus* Motschulsky).  
 Pakaluk 1984 (larva and biology of *Lycoperdina ferruginea*).  
 Peterson 1951 (larvae of *Endomychus biguttatus* and *Lycoperdina ferruginea*).  
 Sasaji 1971, 1978a (larva of *Mychothenus asiaticus* Sasaji), 1978b (larva of *Saula japonica*).  
 Sen Gupta and Crowson 1973 (position of *Eidoreus*).  
 Silvestri 1912 (larva of *Coluocera formicaria* Motschulsky).  
 Strohecker 1953.  
 Verhoeff 1923 (larva of *M. hirta*).  
 Weiss and West 1920 (fungus hosts).

## COCCINELLIDAE (CUCUJOIDEA)

Laurent LeSage, *Biosystematics Research Centre, Agriculture Canada*

### The Lady Beetles, Lady Birds

Figures 34.570-624

**Relationships and Diagnosis:** The Coccinellidae, commonly known as ladybird beetles, belong to the superfamily Cucujoidea, and are closely related to the Endomychidae and Corylophidae (van Emde 1949; Crowson 1955). There are about 490 genera and 4200 world species (Sasaji 1971) of which about 425 are known from the United States and Canada. Coccinellid larvae usually have a reduced mola on the mandible (absent in Epilachninae) (figs. 34.593-34.599), a gular area between the labium and the thorax (fig. 34.586), and the median epicranial stem (coronal suture) is absent in most genera (figs. 34.583-34.585). The most distinctive characteristics of coccinellid larvae are a great development of the body armature into setose processes in most tribes, a campodeiform and usually brightly colored body, and mandibles of a predaceous type in most tribes (acute at apex). Except in Epilachnini and Psylloborini, they are usually very active predators.

Many galerucine and some alticine larvae in the Chrysomelidae superficially resemble larvae of coccinellids. However, chrysomelid larvae have short legs, none or only 1 pair of stemmata, no setose processes on the body (rarely with processes covered by fine setae) and the mandibles lack a mola, whereas coccinellid larvae which may be mistaken for chrysomelid larvae have long legs, 3 pairs of stemmata, large setose body processes covered by robust setae, and a mandibular mola.

**Biology and Ecology:** It is not possible to treat here in detail the bionomics and ecology of Coccinellidae. See the excellent reviews by Balduf (1935), Hagen (1962), and Hodek (1967, 1973).

The eggs, usually oval or spindle-shaped, vary in colour from yellowish to reddish orange, and are mostly laid in clusters on the underside of leaves or in bark crevices in the vicinity of prey.

In general, there are 4 larval instars which last about 10 days each, but with great variation according to species and ecological factors. A unique feature among coccinellid larvae is the presence of secretory structures that produce a visible coating of waxy threads in the larvae of several tribes; these probably have primarily a defensive role against predators (Pope 1979). Cannibalism is frequent in coccinellid larvae and increases the chances of survival when there is a very low density of prey (Hodek 1973; Dimetry 1976). Larvae perceive their prey only by contact (Fleschner 1950; Putman 1955a, 1955b; Dixon 1959; Kaddou 1960; Frazer *et al.* 1981). With the development of biological control programs, attempts have been made to rear larvae on artificial diets or dried food. Several recent experiments gave excellent results (Smith 1960; Fisher 1963; Shands *et al.* 1966; Hodek 1973 (review); Kariluoto 1980).

Different types of pupae occur in Coccinellidae. Coccinellinae and Sticholotini have naked pupae attached by the cauda to the substrate. Pupae of the Chilochorini and Noviini are partly covered by the skin of the last larval instar, and the Hyperaspini and Scymnini have pupae completely covered by larval skins. The pupa is not entirely immobile; if irritated, the head region is raised several times by upward jerks of the body.

The number of generations varies greatly according to species and latitudes; types of voltinism were summarized by Hagen (1962). Perhaps the most fascinating phenomenon coccinellid adults display is the formation of aggregations. Species involved usually feed mostly on aphids, exhibit long dormancy or diapause periods, and mate at the aggregation site before the beetles disperse or migrate (Hagen 1962; Hodek 1967, 1973; Benton & Crump 1979; Lee 1980).

The role of coccinellids in natural control has been demonstrated many times. Various interrelated factors affect the ability of coccinellids to check pest infestations. However, it seems that the most important factor involved, temperature, was probably also the most neglected in theories of insect predation (Baumgaertner *et al.* 1981).

Since the bionomics, general habitus and food preference are generally distinctive for each tribe, a key to tribes is presented below, followed by a short synopsis of each tribe.

**Body Armature:** Gage's terminology (Gage 1920) is generally followed for different structures on the body of larvae. A *seta* (fig. 34.610) is situated directly on the body surface; a *chalaza* is a seta mounted on a small base (fig. 34.611). A *verruca* or *tubercle* is a small protuberance covered by setae instead of chalazae (fig. 34.612). A *struma* appears to be a mound-like projection of the body-wall upon which are situated a few chalazae (fig. 34.613). A *parascolus* (fig. 34.614) is an elongate process covered by chalazae, but less than 3 times as long as wide. A *scolus* (fig. 34.616) is a branched projection, usually more than 5 times as long as wide; each branch bears at its distal end a single stout seta. A *sentus* (fig. 34.615) is a projection of the body-wall which is not branched like a scolus but bears stout setae on its trunk. Larvae may have structures intermediate between scoli, senti, parascoli or strumae.

## KEY TO TRIBES OF NORTH AMERICAN LARVAE OF COCCINELLIDAE

1. Body with scoli (figs. 34.570, 34.616); mandible without mola (fig. 34.597) ..... **Epilachnini**  
 Body without scoli (figs. 34.572–34.575); mandible with mola (figs. 34.593–34.596) ..... 2
- 2(1). Epicranial suture present (figs. 34.582, 34.583, 34.585) ..... 3  
 Epicranial suture absent (fig. 34.584) ..... 11
- 3(2). Epicranial suture V-shaped (fig. 34.585) ..... 4  
 Epicranial suture U-, Y-, or lyre-shaped (figs. 34.582, 34.583) ..... 6
- 4(3). Antennae large, conspicuous, second and third segments elongate (fig. 34.600) ..... **Scymnillini**  
 Antennae small, inconspicuous, second and third segments short (fig. 34.585) ..... 5
- 5(4). Mature larvae small, less than 3 mm (fig. 34.575); tibiotarsi with a pair of apical flattened setae (fig. 34.618); maxillary palps 3-segmented (fig. 34.608) ..... **Sticholotini**  
 Mature larvae larger, more than 6 mm (fig. 34.574); tibiotarsi with several apical clavate setae (fig. 34.617); maxillary palps 2-segmented (fig. 34.609) ..... **Noviini**
- 6(3). Pores of repugnatorial glands present in the coria between abdominal segments on the antero-lateral margin (fig. 34.587); body always with long senti (figs. 34.587, 34.615) ..... **Chilochorini**  
 Pores of repugnatorial glands absent, body usually with strumae (fig. 34.613) or parascoli (fig. 34.614), rarely with senti (fig. 34.615) ..... 7
- 7(6). Apex of mandible simple (fig. 34.594) ..... 8  
 Apex of mandible bidentate (figs. 34.596, 34.599) ..... 10
- 8(7). Body densely covered with fine hairs and long setae (fig. 34.624); tibiotarsi slender and narrowing apically ..... **Serangiini**  
 Body covered with few large setae located on tubercles or strumae (figs. 34.623, 34.573); tibiotarsi short, stout, and truncated apically (fig. 34.588) ..... 9
- 9(8). Three pairs of conspicuous, pigmented, sclerotized plates (strumae) on abdominal segments 1–8 (fig. 34.623); body not covered by wax-like secretions ..... **Stethorini**  
 Three pairs of inconspicuous, not pigmented, tubercles on abdominal segments 1–8; body covered by wax-like secretions ..... (in part) **Scymnini**
- 10(7). Few large chalazae on disk or posterior margin of abdominal segment 9 (fig. 34.622); body dull yellowish; third antennal segment always well-developed and cupola-like (fig. 34.602) ..... **Coccidulini**  
 Numerous setae and/or small chalazae on abdominal segment 9 (fig. 34.621); body brightly colored with black, brown, red, yellow or orange; third antennal segment usually much reduced, antenna appearing 2-segmented (fig. 34.606) ..... **Coccinellini**
- 11(2). Apex of mandible multidentate (fig. 34.595); body without wax-like secretions ..... **Psylloborini**  
 Apex of mandible simple (fig. 34.594); body covered with wax-like secretions ..... 12
- 12(11). Labial palp very small, dome-shaped, 1-segmented (fig. 34.592) ..... **Hyperaspini**  
 Labial palp normal, 2-segmented (fig. 34.591) ..... (in part) **Scymnini**

**Tribal Information**

Unlike other coccinellids, the **Epilachnini** (Epilachninae) have an unusual porcupine-like appearance (fig. 34.570), and are phytophagous. Furthermore, in this tribe the mandible (fig. 34.597) lacks a mola and has a multidentate apex. *Epilachna borealis* (Fabricius), the squash beetle, attacks squash and pumpkins, and *E. varivestis* (Mulsant), the Mexican bean beetle, is a serious pest of beans including soybeans (Guyon & Knull 1925). The European alfalfa beetle, *Subcoccinella vigintiquatuorpunctata* (L.) was discovered in 1972 in Pennsylvania (Anonymous 1974). While an important pest of alfalfa and clover in Europe, it has been found

feeding only on bouncing bet, *Saponaria officinalis*, campion, *Lychnus alba*, and oatgrass, *Arrhenatherum elatius* in the United States (Anonymous 1974).

**Chilochorini** (Chilochorinae) superficially resemble Epilachnini when senti are well-developed as in *Chilochorus* (fig. 34.571), or some Coccinellini when senti are more reduced. However, the presence of large pores of repugnatorial glands (fig. 34.587) on the abdomen will separate them easily from both. Chilochorini feed primarily on aphids and scales, therefore are used for biological control (Huffaker & Doult 1965). For example, *Exochomus flavipes* Thunberg, indigenous to South Africa (Geyer 1947a, 1947b), was successfully used in the United States against mealybugs infesting commercial

greenhouses (Doutt 1951). *E. quadripustulatus* (L.) was released against the woolly aphid *Adelges piceae* (Ratz). The twice-stabbed lady beetle, *Chilocorus stigma* (Say), is an important predator of the Florida red scale, *Chrysomphalus aonidum* (L.) which infests citrus groves (Muma 1955a, 1955b).

**Coccinellini** (Coccinellinae) are the best known coccinellid larvae because they live exposed, are very active, relatively large, and brightly coloured. The body armature is very diverse in this tribe (figs. 34.572, 34.579–34.581) and all structures are represented except scoli. These larvae can be distinguished from those of other tribes by the lyre-shaped epicranial suture of the head (fig. 34.583), the bidentate apex of the mandible (fig. 34.599), the reduced, inconspicuous third antennal segment (fig. 34.606) and the well-developed body armature. All native Coccinellini are beneficial and several foreign species have been introduced to aid in control of pests (DeBach 1964; Hodek 1967, 1973). Some species are widely distributed and well known. *Anatis mali* (Say), the eye-spotted lady beetle, bears senti on the body similar to fig. 34.580, and occurs on conifers where it is able to survive at low prey densities (Smith 1965; Watson 1976). The spotted ladybird, *Coleomegilla maculata* (De Geer) (fig. 34.621), eats pollen as well as aphids and is usually found on herbaceous plants, wild and cultivated, where its food is abundant (Smith 1965). *Hippodamia* species are important aphid predators (Cuthright 1924; Hodek 1973) and a common species, *Hippodamia convergens* Guérin, the convergent lady beetle (fig. 34.579), can keep aphids in check in alfalfa fields (Cooke 1963). *Adalia bipunctata* (L.) (fig. 34.581), the 2-spotted ladybird, is a widespread polymorphic species (Hodek 1973) which prefers trees above 2 m. Consequently, it is especially beneficial in orchards and groves where it is the most important coccinellid aphid predator (Smith 1958; Putman 1964; Hodek 1973). *Coccinella* species (fig. 34.572) are known as aphid predators (Palmer 1914; Clausen 1916; McMullen 1967), and some have become established after repeated releases over large areas; others like *C. undecimpunctata* L., are becoming well established on their own, along with the aid of man's commerce (Watson 1979; Wheeler & Hoebeke 1981).

**Coccidulini** (Coccidulinae) much resemble Coccinellini but differ by the features of the last abdominal segment (fig. 34.622) and antenna (fig. 34.602), their dull coloration, and the presence of a thin powdery coating of wax (Pope 1979). Their biology is not well known. *Coccidula* live in wet habitats. *Rhyzobius ventralis* (Erichson) has been introduced from Australia to California and Hawaii for control of scale insects (Pope 1981; Richards 1981).

**Scymnini** and **Hyperaspini** larvae are strikingly different from others because of their thick coating of wax (fig. 34.577) which is absent or inconspicuous in other tribes.

**Scymnini** (Scymninae) larvae have very sharp unidentate mandibles (fig. 34.594) and very small tubercles on the abdomen (fig. 34.573). *Scymnus* species feed mainly on aphids; some are useful predators in red pine plantations (Gagné & Martin 1968), cotton fields (Davidson 1921b) or sugarbeet fields (Buntin & Tamaki 1980); others attack psyllids and are beneficial in pear orchards (Westigard et al. 1968)

while a few feed on mealybugs in citrus groves (Muma 1955a), or on phylloxera on wild grape (Wheeler & Jubb 1979).

**Hyperaspini** (Scymninae) larvae are separated from all others by the unique dome-shaped, 1-segmented labial palps (fig. 34.592). *Hyperaspis* (figs. 34.576, 34.577) species are known as efficient predators of scale insects (Simanton 1916; Böving 1917; Phillips 1963).

**Noviini** (Coccidulinae) is the only tribe where the larvae have only 2 pairs of sclerotized tubercles and 1 pair of soft lateral projections on the abdominal segments (fig. 34.574). *Rodolia cardinalis* Mulsant, the vedalia lady beetle, is a famous classic example of successful use of coccinellids in biological control of coccids (DeBach 1964).

**Psylloborini** (Coccinellinae) larvae are immediately recognized by the multidentate apex of their mandibles (fig. 34.595). They differ from other tribes in that they are mycophagous and feed on mildew. They are beneficial because they eat destructive fungi (Davidson 1921a).

Larvae of the 4 remaining tribes are usually overlooked because of their small size. *Microweisea* larvae (fig. 34.575) in the tribe **Sticholotini** (Sticholotinae) are easily identified by the 2 large flattened setae at the apex of the tibiae (fig. 34.618). They are beneficial scale feeders (Burgess & Collins 1912; Muma 1955a; Sharma & Martel 1972).

**Serangiini** (Sticholotinae) larvae have the body densely covered with fine setae (fig. 34.624) and their tibiae are unusually slender (fig. 34.590), characters which distinguish them from all others. *Delphastus* species in this tribe are predators of Aleyrodidae (Muma 1955a, 1955b).

**Stethorini** (Scymninae) larvae resemble superficially the Serangiini but are separated from them and all other tribes by the few large setae fixed on small tubercles covering the body (figs. 34.578, 34.623) and their short tibiae, apically truncated (fig. 34.588). They feed chiefly on mites, and many *Stethorus* species are active predators of these pests (Fleschner 1950; Robinson 1953; Putman 1955a, 1955b; Putman & Herne 1966; Tanigoshi & McMurtry 1977).

**Scymnillini** (Coccidulinae) larvae are distinguished by their unusual, large, antennae (fig. 34.600). Their biology is poorly known. *Scymnillus aterrimus* Horn has been reported as an incidental predator of scale insects in citrus groves (Muma 1955b).

**Description:** Coccinellid larvae are extremely diverse as described in the previous section, and illustrated in the family key, where they key out at several couplets. Therefore, they cannot be distinguished altogether by only 1 or 2 characters as in many beetle families. On the other hand, larvae of each tribe show a distinctive general habitus and have morphological features which are shared by all members of the tribe. The striking flattened larvae of the Palaearctic Platynaspini do not occur in North America.

**Head:** Hypognathous, usually rounded (fig. 34.582), sometimes elongate (fig. 34.585) as in *Microweisea*, or transverse as in Hyperaspini, Platynaspini, and some Scymnini (fig. 34.584). In most species, the head is completely sclerotized, but sometimes it may be partly or only very slightly sclerotized. The epicranial suture is usually distinct, V-shaped (fig. 34.585), Y-shaped (fig. 34.582), lyre-shaped (fig. 34.583), or absent (fig. 34.584) but the epicranial stem is usually absent.

The antenna of the typical form of coccinellid larvae consists of 3 sclerotized segments (figs. 34.600, 34.602, 34.603), and bears a large spine-like seta on the membranous apical area of the second segment. However, they may appear to be 2-segmented (figs. 34.601, 34.605, 34.606) or even 1-segmented (fig. 34.604) when the third, and sometimes the second and third segments are reduced and not sclerotized; in those cases the homology of the segments apparently missing is often difficult to establish (Sasaji 1968b). The labrum is distinct and transverse (fig. 34.582).

The mandible is either apically simple and acute (figs. 34.593, 34.594), bidentate (figs. 34.596, 34.599), or multi-dentate in plant feeders (figs. 34.595, 34.597); the mola is usually present but reduced (figs. 34.595, 34.596, 34.598, 34.599), highly reduced in *Microwisea* (fig. 34.593) and absent in *Epilachna* (fig. 34.597); a retinaculum may be either absent (figs. 34.593, 34.594), developed with 1 tooth (fig. 34.596), or multidenticulate (fig. 34.595). The maxillary palps are generally 3-segmented, but are 2-segmented in *Noviini* (fig. 34.609). The labial palps are either 1- or 2-segmented (figs. 34.591, 34.592). The labium has the submentum fused with the ligula (fig. 34.586).

**Thorax and Abdomen:** Pronotum with 2 or 4 plates. Meso- and metanotum each with 2 plates and distinct armature. Legs usually long and slender (figs. 34.589, 34.590), short in *Hyperaspini* and *Stethorini* (fig. 34.588), consisting of 5 segments (coxa, trochanter, femur, tibia and claw-like tarsungulus). Tarsungulus curved (fig. 34.620), with a robust quadrangular tooth in some species (fig. 34.619). The apex of the tibiae usually bears clavate or flattened setae which are important in taxonomy (figs. 34.588, 34.617, 34.618).

Abdomen 10-segmented, widest basally, tapering to caudal end, dorsally with distinct armature, usually characteristic for each tribe. The tenth segment may be modified as a proleg or a sucking disk. Pores of repugnatorial glands may occur on each antero-lateral margin of terga in the coria between segments (fig. 34.587).

**Spiracles:** Small, annular, and located on abdominal segments 1-8 (fig. 34.587).

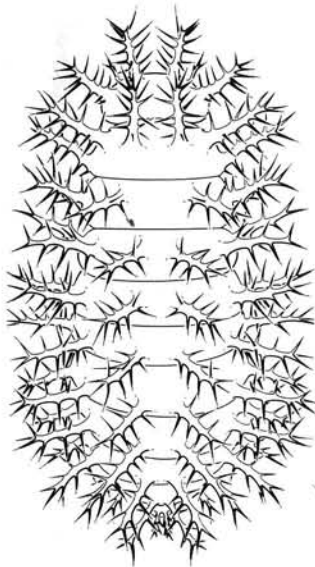
**Comments:** The larval stage of most coccinellid species consists of 4 instars. The first instar can be recognized by the paired egg-bursters on pronotum, and differences in proportions in size of head, abdomen, legs, setae, etc. Changes occur in coloration, proportions and armature of the body between successive instars. Larvae of the first and second instars are monochrome, with sclerotization and armature less developed than in older instars. Larvae of the third and fourth instars are usually brightly coloured and well sclerotized.

Palaearctic coccinellid larvae are now fairly well known with the recent contributions of several authors (van Emden 1949; Savoiskaya 1957, 1960, 1962, 1964a, 1964b; Kamiya 1965; Sasaji 1968a, 1968b; Klausnitzer 1970; Savoiskaya & Klausnitzer 1973). The taxonomy of the Nearctic coccinellid larvae has not been comprehensively studied; only the early works of Böving (1917) and Gage (1920) provide a general treatment of the family. With the field key of Storch (1970) one can identify the larvae of 5 common native species. Phuoc

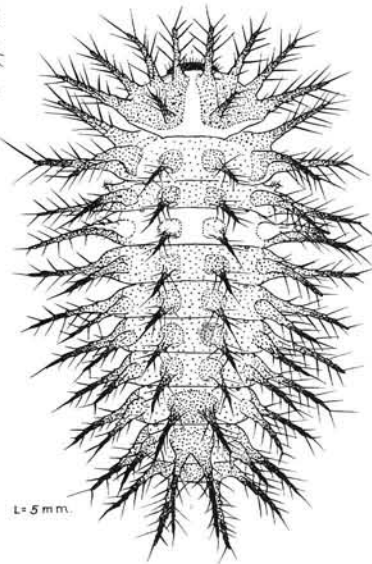
and Stehr (1974) studied the morphology and the phylogenetic relationships of coccinellid pupae based on their morphology and suggested the need for a similar study of the larvae.

### Selected Bibliography

- Anonymous 1974.  
 Balduf 1935.  
 Baumgaertner *et al.* 1981.  
 Benton and Crump 1979.  
 Böving 1917. (key)  
 Buntin and Tamaki 1980.  
 Burgess and Collins, 1912.  
 Clausen 1916.  
 Cooke 1963.  
 Crowson 1955.  
 Cuthright 1924.  
 Davidson 1921a, 1921b.  
 DeBach 1964.  
 Dimetry 1976.  
 Dixon 1959.  
 Doutt 1951.  
 Emden 1949. (key)  
 Fisher 1963.  
 Fleschner 1950.  
 Frazer *et al.* 1981.  
 Gage 1920. (key)  
 Gagné and Martin 1968.  
 Geyer 1947a, 1947b.  
 Guyon and Knull 1925.  
 Hagen 1962.  
 Hodek 1967, 1973.  
 Huffaker and Doutt 1965.  
 Kaddou 1960.  
 Kamiya 1965.  
 Kariluoto 1980.  
 Klausnitzer 1970. (key)  
 Lee 1980.  
 McMullen 1967.  
 Muma 1955a, 1955b.  
 Palmer 1914.  
 Phillips 1963.  
 Phuoc and Stehr 1974. (key, pupae)  
 Pope 1979, 1981.  
 Putman 1955a, 1955b, 1964.  
 Putman and Herne 1966.  
 Richards 1981.  
 Robinson 1953.  
 Sasaji 1968a, 1968b, 1971.  
 Savoiskaya 1957 (key), 1960, 1962, 1964a, 1964b.  
 Savoiskaya and Klausnitzer 1973. (key)  
 Shands, Holmes and Simpson 1966.  
 Shands *et al.* 1972.  
 Sharma and Martel 1972.  
 Simanton 1916.  
 Smith 1958, 1960, 1965.  
 Storch 1970. (key)  
 Tanigoshi and McMurtry 1977.  
 Watson 1976, 1979.  
 Westigard *et al.* 1968.  
 Wheeler and Hoebeke 1981.  
 Wheeler and Jubb 1979.

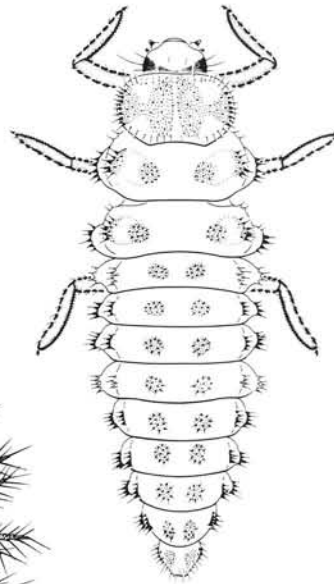


*Epilachna*  
Figure 34.570

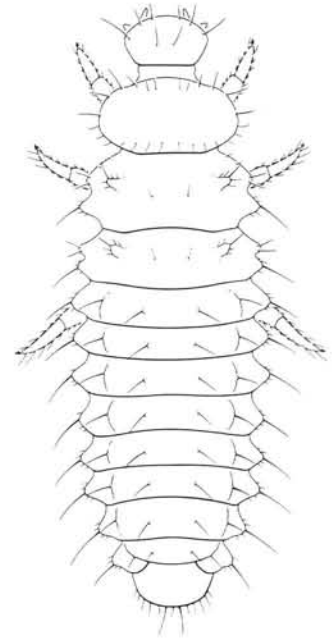


L = 5 mm.

*Chilocorus*  
Figure 34.571



*Coccinella*  
Figure 34.572



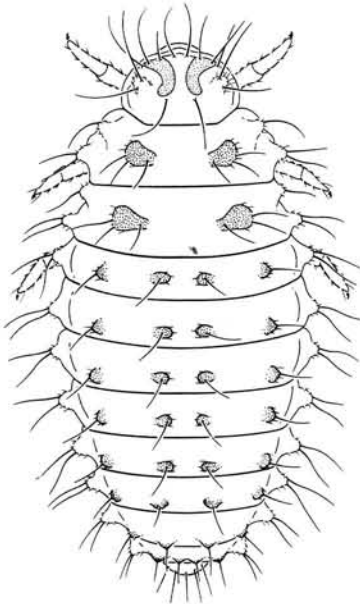
*Scymnus*  
Figure 34.573

**Figure 34.570.** See also figures 34.597, 34.601, 34.616. Coccinellidae. *Epilachna varivestis* Mulsant. Mexican bean beetle. (Epilachnini) Length 11 mm; cyphosomatic, yellow, brownish around stemmata and tips of scoli; abdominal segments 1-8 each bearing 6 scoli; 4 scoli on prothorax, 6 on both meso- and metathorax; light slender setae on head, legs, and verrucae of all segments; 1 pair of verrucae on sterna of each thoracic and abdominal segment 1; 3 pairs on abdominal segments 2-7, 2 pairs on 8; caudal segment in the form of a sucker-like protuberance; spiracles inconspicuous, annular, and ventrad of supraspiracular scoli. It can be a serious defoliator of many kinds of beans, including soybeans. Jerome, Idaho, 25-VII-1960, Gibson & Evans.

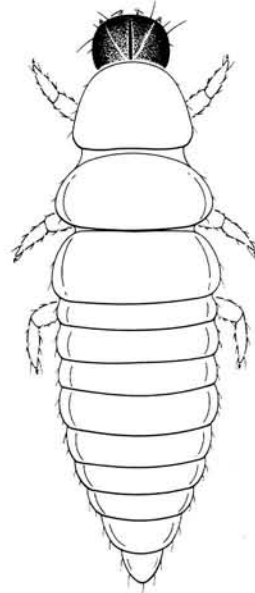
**Figure 34.571.** Coccinellidae. *Chilocorus stigma* (Say), twice-stabbed lady beetle. (Chilochorini) Length = 5 ± mm. Cyphosomatic, oval, and covered with prominent senti; color brownish with most senti and pinacula near black, mid-dorsal line and dorsum of first abdominal segment yellow to near white; prothorax with 5 pairs of prominent senti, mesothorax and metathorax with 4 pairs of senti; pinacula of dorsal senti on abdominal segments 1-5 separated, contiguous on segments 6-8; all senti deep brown to near black except the yellow to near white dorsal and supraspiracular senti on the first abdominal segment; all abdominal segments with 3 pairs of senti except the eighth where lateral senti are wanting; 7 pairs of conspicuous, circular openings to glands are found in the coriae between abdominal segments 1-8; less conspicuous circular spiracles occur on the mesothorax and abdominal segments 1-8 cephaloventrad of the supraspiracular senti. Feeds on scale insects, especially soft bodied scales and immatures. (From Peterson, 1951)

**Figure 34.572.** Coccinellidae. *Coccinella transversoguttata* Faldermann. (Coccinellini) Transverse lady beetle, an aphid predator. Length = 11 mm. Fusiform with ground color bluish-gray, all processes on abdominal segments black except for lateral and dorsolateral ones on abdominal segments 1 and 4; basal portion of head black, labrum and frons cream to white; epicranial suture lyre-shaped; medial plates on prothorax separated by narrow yellowish stripe, sclerotized plates on both meso- and metathorax well-separated; dorsal and dorsolateral aspects of abdominal segments 1-8 each provided with parascoli or strumae, ventral aspect with verrucae or chalazae; legs well-developed, robust, and black; basal portion of claw with a distinct rectangular tooth. Ottawa, Ontario, 20-VIII-1980, on potatoes, L. LeSage.

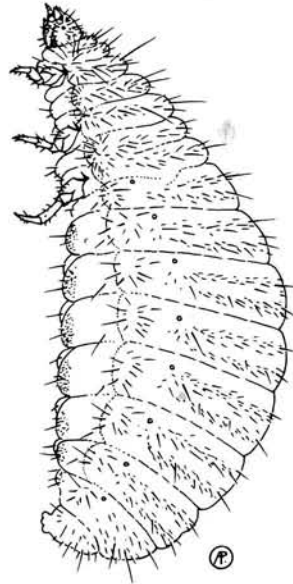
**Figure 34.573.** Coccinellidae. *Scymnus hemorrhous* LeConte, a predator. (Scymnini) Length = 3 mm. Shape fusiform; head, body and legs yellowish; epicranial suture absent; prothorax transverse, ovoid, with a row of marginal setae; meso- and metathorax each with a pair of dorsal sclerotized tubercles and 2 pairs of lateral and moderately developed tubercles; abdominal segments 1-8 each with 3 pairs of weakly developed tubercles, each bearing a large seta and a few small setae; legs relatively short and rather stout. Baton Rouge, Louisiana, 15-VIII-1952, (reared), O.L.C.



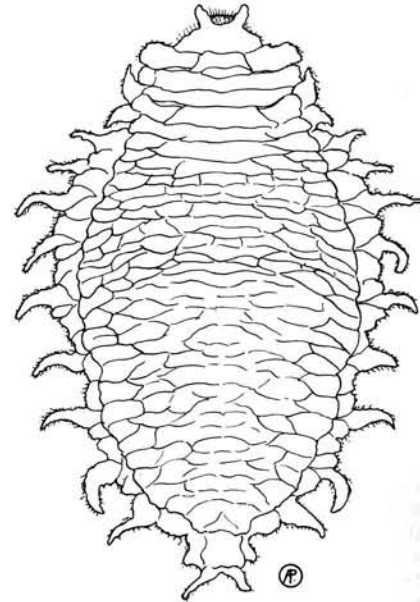
Rodolia  
Figure 34.574



Microwesia  
Figure 34.575



Hyperaspis  
Figure 34.576



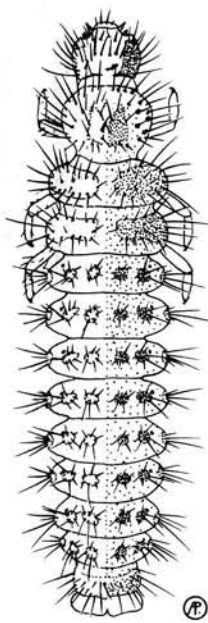
Hyperaspis  
Figure 34.577

**Figure 34.574.** Coccinellidae. *Rodolia cardinalis* (Mulsant). (Noviini) Vedalia lady beetle, a predator on the cottony-cushion scale, *Icerya purchasi* Raaskell. Length = 7 mm. Shape elliptical and weakly convex above; dorsum dark red with brown sclerotized plates and tubercles; head black, subquadrate; epicranial suture V-shaped; maxillary palpi 2-segmented; each thoracic segment with a pair of sclerotized plates, meso- and metathorax each bearing 2 additional pairs of soft lateral projections; abdominal segments 1-8 each with 2 pairs of dorsal plates and 1 pair of soft lateral projections bearing 2 long setae. Los Angeles, California, July 1892, D. V. Coquillett.

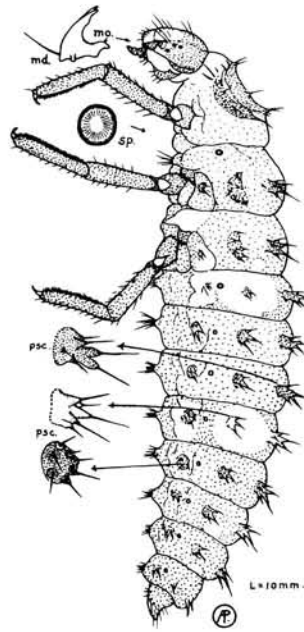
**Figure 34.575.** Coccinellidae. *Microwesia* sp. (Stilochotini) Length = 3 mm. Shape fusiform, yellowish throughout except the dark brown head; head elongate with a V-shaped epicranial suture; prothorax trapezoidal, meso- and metathorax transverse; lateral margin of each thoracic segment with a fringe of inconspicuous fine setae; legs well-developed; tibiotarsi with a pair of large flattened setae at the apex; abdominal segments 1-8 similar, but becoming successively smaller, bearing a few inconspicuous small setae. New Orleans, Louisiana, 13-VII-1923, Quaintance.

**Figures 34.576, 34.577.** Coccinellidae. *Hyperaspis signata* Olivier. (Hyperaspini) Length = 5 mm. Cyphosomatic, greatest width near mid-abdominal region and entire dorsal aspect covered with a near white, cottony, wax covering; body cream to greenish color (may be pinkish in preserved specimens), head mottled brown and legs brown especially the 2 distal segments; numerous short, brown setae scattered over lateral and dorsal aspects of all segments and also on the head, only a few setae on venter of abdomen; legs small, well developed but not projecting beyond sides of body; caudal segment with an eversible sucking disk; inconspicuous circular spiracles on lateral aspects dorsad of lateral ridge. Larvae feed on mealybugs, and soft scales, especially immatures. (From Peterson, 1951).

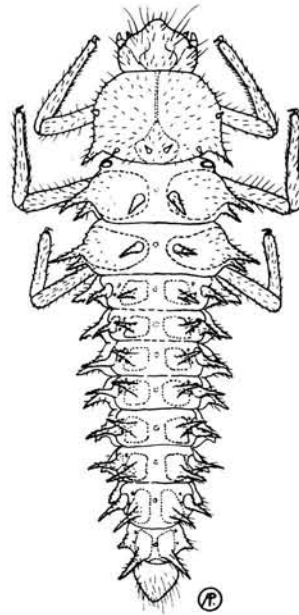




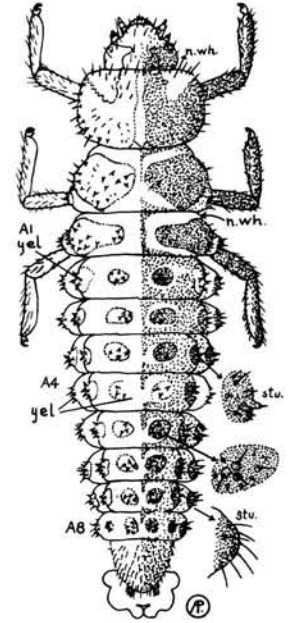
Stethorus  
Figure 34.578



Hippodamia  
Figure 34.579



Anatis  
Figure 34.580



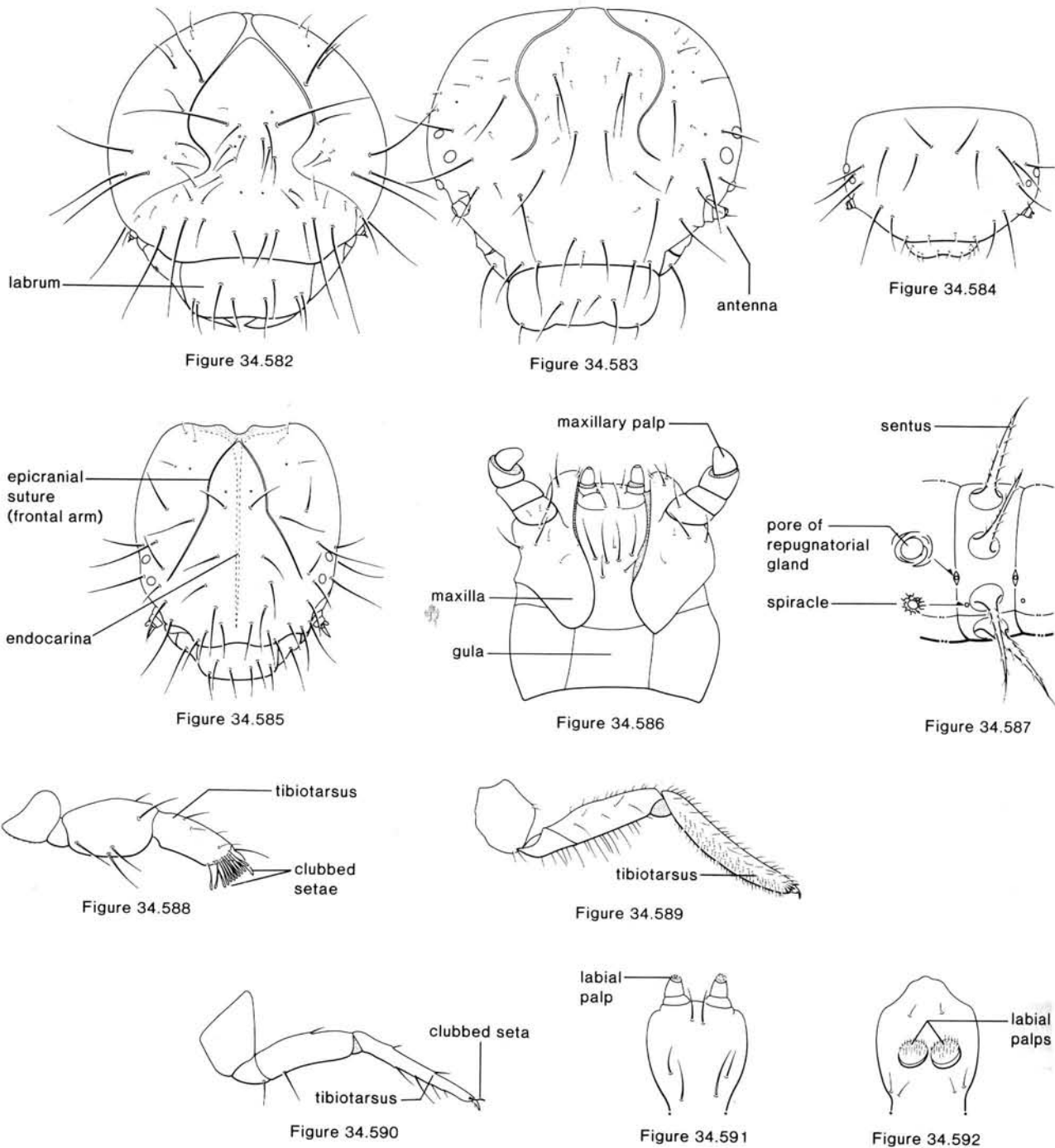
Adalia  
Figure 34.581

**Figures 34.578, and 34.623.** Coccinellidae. *Stethorus punctum* LeConte. (Stethorini) Length = 2.5-3 mm. Somewhat fusiform with greatest diameter in metathorax and first abdominal segments; light gray to light brown with brown to gray verrucae and brown to gray areas on thorax and head; head light brown laterally and mottled on frons; solid brown to mottled brown pigment areas laterad of the meson on all thoracic segments; 6 verrucae on the dorsal and lateral aspects of abdominal segments 1-8; numerous, light colored, elongate setae on the head, dorsum of thorax, on all verrucae and venter of the abdomen; well developed legs possess a few setae and are partially pigmented; spiracles circular and located ventrad of supraspiracular verrucae. Feeds on plant-infesting mites, common on apple. (From Peterson, 1951)

**Figure 34.579.** Coccinellidae. *Hippodamia convergens* Guérin-Méneville, convergent lady beetle. (Coccinellini) Length = 10-11 mm. Somewhat fusiform, subcylindrical with greatest diameter in region of metathorax; dark brown to black with a bluish cast, light areas ranging from orange, to yellow to near-white; prothorax oval, wider than long and with 4 longitudinal dark areas with light yellow areas between, cephalad, and caudad of dark areas. Chalazae on the cephalic and lateral portions and on the pigmented areas; parascoli on caudolateral margin of metathorax cream colored; each abdominal segment 1-8 with 3 pairs of parascoli, subdorsal, supraspiracular and subspiracular, all deeply pigmented except the supraspiracular and subspiracular on the first and fourth abdominal segments and the subdorsal on the fourth segment; the light colored parascoli and the areas about them plus the areas between the subdorsal and supraspiracular parascoli on the 6th and 7th segments are yellow to deep orange; sterna on segments 2-8 with transverse rows of 6 verrucae; legs well developed, elongate and tarsal claws without appendiculate teeth. Feeds on aphids and soft bodied insects. (From Peterson, 1951)

**Figure 34.580.** Coccinellidae. *Anatis quindecimpunctata* Olivier. (Coccinellini) Length = 17-18 mm. Elongate, widest at metathorax and tapering toward both ends; color on dorsal half a deep brown except for light spots and median line, ventral half near white to yellow; head one-half diameter of prothorax, flattened, light on frontal area and dark on caudolateral portions; prothorax with parascoli on caudolateral margin and a light spot on the caudomeson bearing 2 chalazae; mesothorax and metathorax bearing 2 pairs of senti and 1 extreme, lateral pair of parascoli; abdominal segments 1-8 with 2 pairs of senti dorsad of the spiracles and 1 pair of senti or parascoli immediately ventrad of spiracles; thoracic sterna similar, each bearing a pair of verrucae adjacent to the meson; thoracic legs long, slender, nearly 1.5 times as long as the metathorax is wide. Feeds chiefly on aphids. (From Peterson, 1951)

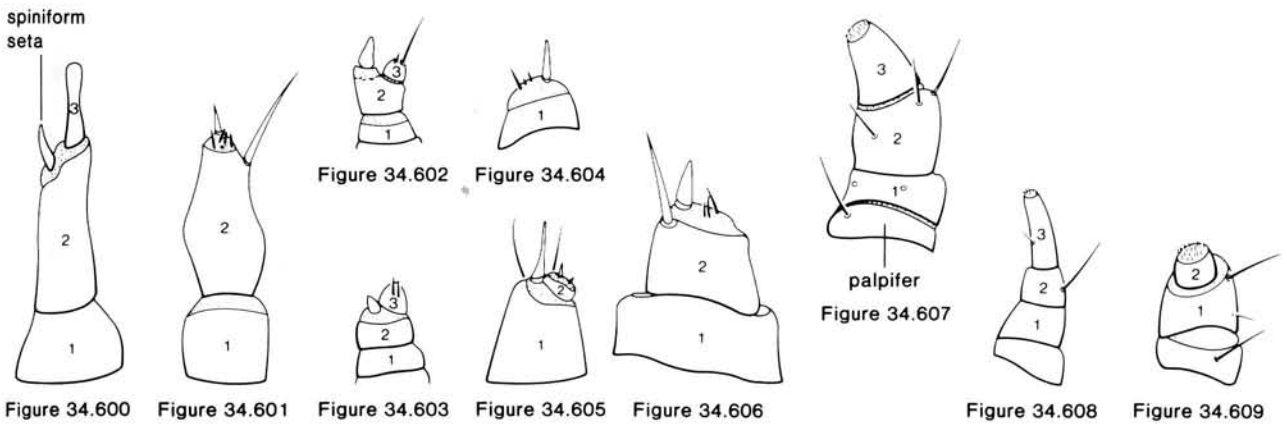
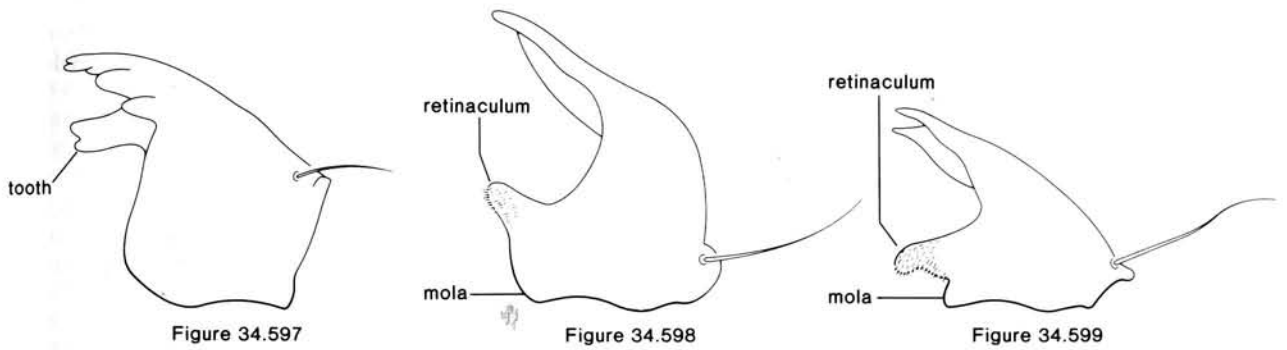
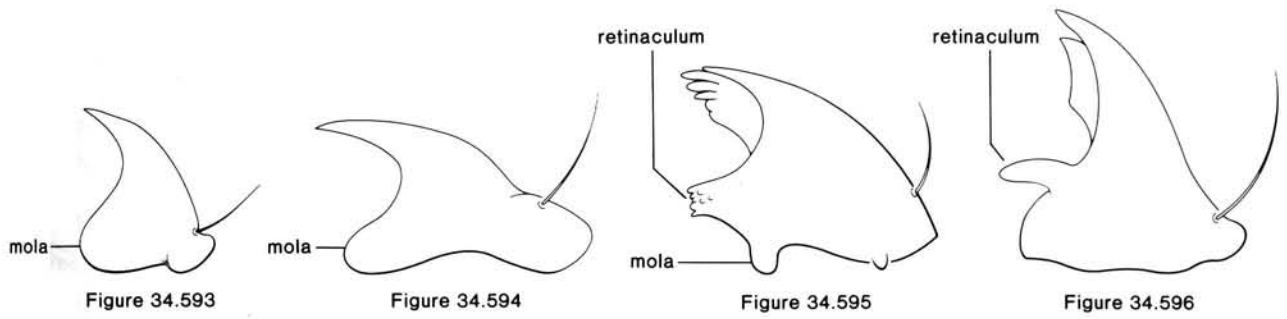
**Figure 34.581.** Coccinellidae. *Adalia bipunctata* (L.), two-spotted lady beetle. (Coccinellini) Length = 9 ± mm. Fusiform with greatest width in region of 2nd to 4th abdominal segments; dark brown to bluish-gray, mottled with yellow to cream spots, dorsal half of head deeply pigmented and ventral portion of frons and clypeus cream to white; prothorax with a medium yellow stripe and 2 cephalolateral yellow areas; each abdominal segment 1-8 with 2 pairs of strumae dorsad of the spiracles and 1 pair ventrad; each struma may have 3-8 chalazae and additional setae; 2 of the lateral strumae on first abdominal segment cream to yellow, and on the fourth abdominal segment the most lateral strumae and the pair adjacent to the meson are light colored or yellow; ninth segment deeply pigmented, setiferous and giving rise to a large, eversible, fleshy protuberance. Feeds chiefly on aphids. (From Peterson, 1951)



**Figures 34.582–34.592.** Coccinellidae. Structures of larvae.  
**Figure 34.582.** *Chilochorus cacti* (L.), head capsule, dorsal. (Chilochorini)  
**Figure 34.583.** *Coccinella transversoguttata* Faldermann, head capsule, dorsal. (Coccinellini)  
**Figure 34.584.** *Scymnus creperus* Mulsant, head capsule, dorsal. (Scymnini)  
**Figure 34.585.** *Microweisea* sp., head capsule, dorsal. (Sticholotini)  
**Figure 34.586.** *Hippodamia tredecimpunctata* (L.), head capsule, ventral. (Coccinellini)

**Figure 34.587.** *Chilochorus cacti* (L.), third abdominal segment, lateral. (Chilochorini)  
**Figure 34.588.** *Stethorus histrio* Chazeau, foreleg. (Stethorini)  
**Figure 34.589.** *Coccinella transversoguttata* Faldermann, foreleg. (Coccinellini)  
**Figure 34.590.** *Delphastus sonoricus* Casey, foreleg. (Serangiini)  
**Figure 34.591.** *Scymnus collaris* Melsheimer, labium. (Scymnini)  
**Figure 34.592.** *Hyperaspis binotata* Say, labium. (Hyperaspini)





Figures 34.593–34.609. Coccinellidae. Structures of larvae.

Figure 34.593. *Microwisea*, mandible. (Stilochotini)

Figure 34.594. *Scymnus creperus* Mulsant, mandible. (Scymnini)

Figure 34.595. *Psyllobora* sp., mandible. (Psylloborini)

Figure 34.596. *Lindorus lophantae* Blaisdell, mandible. (Coccidulini)

Figure 34.597. *Epilachna varivestis* Mulsant, mandible. (Epilachnini)

Figure 34.598. *Hyperaspis binotata* Say, mandible. (Hyperaspini)

Figure 34.599. *Coccinella* sp., mandible (Coccinellini)

Figure 34.600. *Zagobla ornata* (Horn), antenna (Scymnillini)

Figure 34.601. *Epilachna varivestis* Mulsant, antenna. (Epilachnini)

Figure 34.602. *Lindorus lophantae* Mulsant, antenna. (Coccidulini)

Figure 34.603. *Scymnus creperus* Mulsant, antenna. (Scymnini)

Figure 34.604. *Chilochorus cacti* (L.), antenna. (Chilochorini)

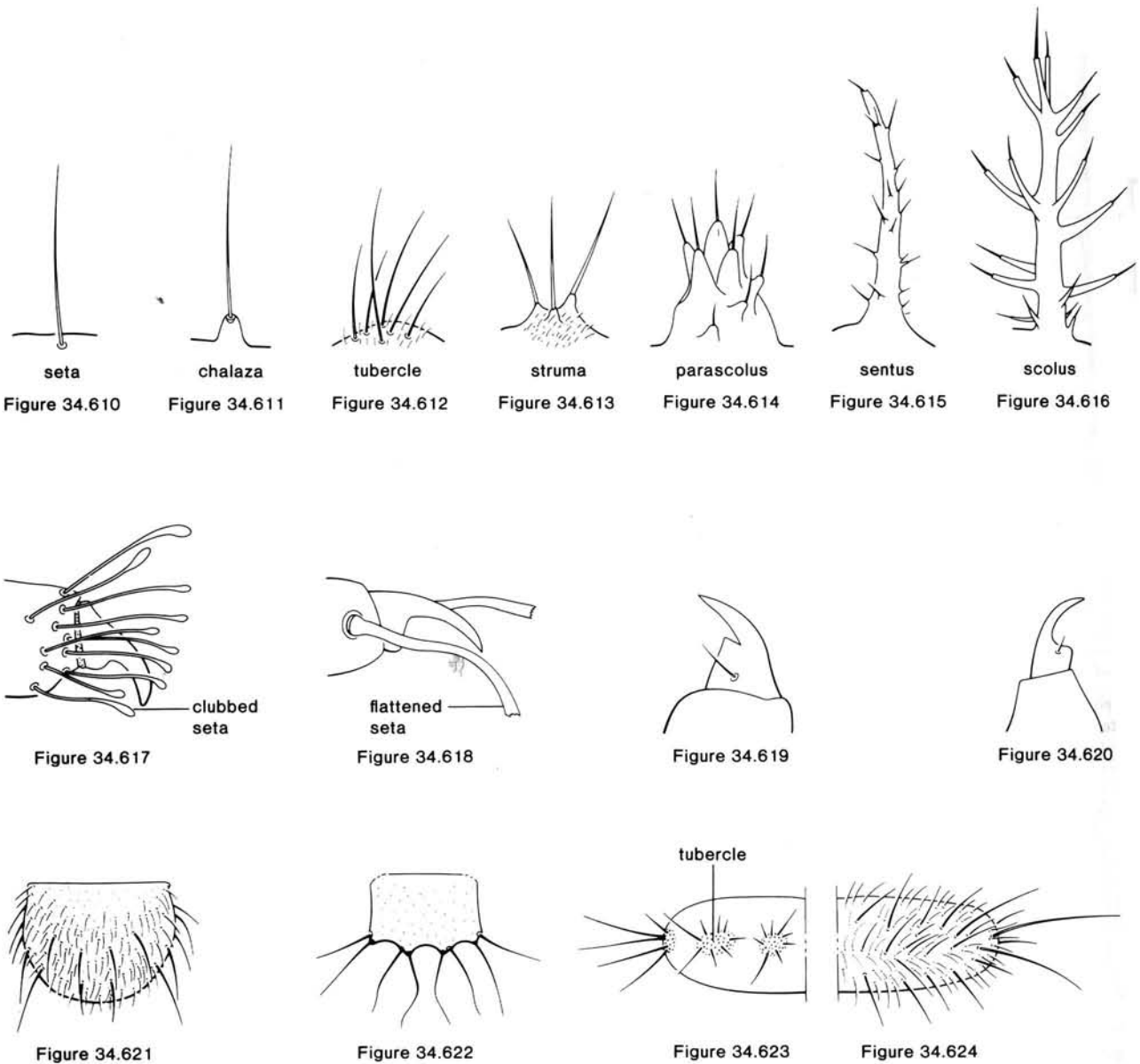
Figure 34.605. *Rodolia cardinalis* (Mulsant), antenna. (Noviini)

Figure 34.606. *Coccinella transversoguttata* Faldermann, antenna. (Coccinellini)

Figure 34.607. *Coccinella transversoguttata* Faldermann, maxillary palp. (Coccinellini)

Figure 34.608. *Microwisea* sp., maxillary palp. (Stilochotini)

Figure 34.609. *Rodolia cardinalis* (Mulsant), maxillary palp. (Noviini)



**Figures 34.610–34.624.** Coccinellidae. Structures of larvae.

- Figure 34.610.** *Hippodamia tredecimpunctata* (L.), seta. (Coccinellini)  
**Figure 34.611.** *Hippodamia tredecimpunctata* (L.), chalaza. (Coccinellini)  
**Figure 34.612.** *Microweisea* sp., verruca. (Stilochotini)  
**Figure 34.613.** *Coleomegilla maculata* (De Geer), struma. (Coccinellini)  
**Figure 34.614.** *Coccinella transversoguttata* Faldermann, parascolus. (Coccinellini)  
**Figure 34.615.** *Chilochorus cacti* (L.), sentus. (Chilorchorini)  
**Figure 34.616.** *Epilachna varivestis* Mulsant, scolus. (Epilachnini)  
**Figure 34.617.** *Rodolia cardinalis* (Mulsant), apex of tibiotarsus. (Noviini)

- Figure 34.618.** *Microweisea* sp., apex of tibiotarsus. (Stilochotini)  
**Figure 34.619.** *Coccinella transversoguttata* Faldermann, apex of tibiotarsus. (Coccinellini)  
**Figure 34.620.** *Coleomegilla maculata* (De Geer), apex of tibiotarsus. (Coccinellini)  
**Figure 34.621.** *Coleomegilla maculata* (De Geer), ninth abdominal tergite. (Coccinellini)  
**Figure 34.622.** *Lindorus lophantae* Mulsant, ninth abdominal tergite. (Coccidulini)  
**Figure 34.623.** *Stethorus punctum* (LeConte), third abdominal tergite, left half. (Stethorini)  
**Figure 34.624.** *Delphastus sonoricus* (LeConte), third abdominal tergite, right half. (Serangiini)