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THE COCCINELLIDAE (COLEOPTERA) OF BERMUDA

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Abstract.—The 14 species of Coccinellidae occurring on Bermuda are treated, with discussions of distribution, hosts, and immature stages. Keys for the identification of adults and larvae are included. The adult and larva of *Decadiomus hughesi* n. sp., and the larvae of *Scymnus* (*Scymnus*) *floralis* (F.), *Exochomus jamaicensis* Sicard, *Clitostethus arcuatus* (Rossi), and *Naemia seriata* (Melsheimer) are described.

Bermuda has had a rather intensive, albeit short, history of biological control, primarily because of severe damage to the endemic cedar, *Juniperus bermudiana* L., caused by 2 scale insects, *Carulaspis minima* (Targioni-Tozzetti), and *Lepidosaphes pallida* (Maskell) (listed as *Lepidosaphes newsteadi* Sulc in most literature). Documentation of biocontrol efforts has been relatively thorough, especially by Bennett and Hughes (1959) and Bennett et al. (1985). A great deal of information found in these 2 publications is not repeated herein. These publications approach the subject from the pest aspect. Our objective is to present a complementary approach from the predator standpoint and to provide information on taxonomy, distribution, hosts, and immature stages of the predators.

The natural history of Bermuda is relatively uncomplicated and has received considerable attention. A recent publication on terrestrial arthropods by Kevan (1981) is particularly well done and comprehensive from the earliest times to 1928. Ogilvie (1928) provided a list of Bermuda insects, including 7 species of Coccinellidae, 4 of which he considered established. Of the latter, 2 species were intentionally introduced and 2 had arrived by unknown means. Bishop (1902) was the first to record coccinellid, *Rodolia cardinalis* (Mulsant), intentionally introduced from Australia to control the cottonycushion scale, *Icerya purchasi* Maskell. This introduction was followed by those of *Chilocorus bipustulatus* (L.) from Europe, *Rhyzobius lophanthae* (Blaisdell) from Australia, and *Cryptolaemus montrouzieri* Mulsant from Australia (Ogilvie, 1928). Waterston (1940, 1945) provided supplements to Ogilvie (1928) but included no additional species of Coccinellidae. Thompson (1947), in discussing cedar scale, stated he had obtained "from California and Trinidad preliminary shipments of four or five species of ladybirds" and that "two colonies of one ladybird (*Chilocorus distigma*) have already been liberated in infested areas." In 1946 the Commonwealth Institute of Biological Control was asked to undertake cedar scale control (Bennett and Hughes, 1959) and this marked the beginning of one of the most massive bio-

logical control assaults in history. Between 1948 and 1951 thousands of individuals of at least 44 species of Coccinellidae were released, and still other releases were made in ensuing years, resulting in the establishment of 9 species. In addition to the intentionally introduced coccinellids, 5 adventive species have become established on Bermuda, including some of the 4 reported by Ogilvie, bringing the total to 14 species.

The establishment rate of coccinellids on Bermuda seems to be rather low given the favorable climate. Simmonds (1958) expressed the opinion that lizard predation might be responsible for the disappearance of some species and supported this suggestion with experiments. Lizards of several species of *Anolis* are very abundant on Bermuda, and we feel that predation may be a factor.

Type specimens and representative material are deposited in the collections of the British Museum, Natural History, London; Bermuda Department of Agriculture; and United States National Museum, Washington, D.C.

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KEY TO BERMUDA COCCINELLIDAE (ADULTS)

1. Clypeus expanded laterally, shelflike, partially dividing eye; dorsal surface not pubescent 2
– Clypeus not expanded laterally, or if so, briefly and not shelflike; dorsal surface pubescent or not 3
2(1). Postcoxal line on 1st abdominal sternum merging with posterior margin of sternum (Fig. 51) ..... *Chilocorus cacti* (L.)
– Postcoxal line on 1st abdominal sternum not reaching posterior margin of sternum; curved forward apically (Fig. 44) ..... *Exochomus jamaicensis* Sicard
3(1). Apical segment of maxillary palpus conical; anterior angle of pronotum separated from disc by surface line; length less than 1.5 mm ... *Microweisea suturalis* Schwarz
– Apical segment of maxillary palpus dilated apically (securiform) or nearly parallel sided; anterior angle of pronotum not separated from disc by surface line; length usually more than 1.5 mm 4
4(3). Prosternum enlarged, expanded, capable of concealing mouthparts in repose ... . *Cryptolaemus montrouzieri* Mulsant
– Prosternum not enlarged, not concealing mouthparts 5
5(4). Disc of elytron with arcuate yellow band encircling brown or black spot (Fig. 8) ..... *Clitostethus arcuatus* (Rossi)
– Disc of elytron without marking, or if so, then not as above 6
6(5). Antenna short, ⅔ or less as long as head width; apical segment of maxillary palpus usually parallel sided or barrel shaped (Fig. 12), rarely securiform; middle coxal cavities broadly separated 7
– Antenna long, usually more than ⅔ as long as head width; apical segment of maxillary palpus securiform; middle coxal cavities narrowly separated 10
7(6). Postcoxal line on 1st abdominal sternum merging with posterior margin of sternum (Fig. 31) 8
– Postcoxal line on 1st abdominal sternum curved forward apically 9

8(7). Elytron yellow in apical ¼ (Fig. 32) ..... *Diomus terminatus* (Say)
– Elytron completely brown or black ..... *Decadiomus hughesi*, n. sp.
9(7). Postcoxal line on 1st abdominal sternum not reaching base of sternum (Fig. 20); elytron yellowish red with suture and lateral margin black (Fig. 21) .... *Scymnus* (*Scymnus*) *floralis* (F.)
– Postcoxal line on 1st abdominal sternum reaching base of sternum (Fig. 25); elytron black with apex narrowly red ..... *Scymnus* (*Pullus*) *creperus* Mulsant
10(6). Dorsal surface pubescent 11
– Dorsal surface glabrous 13
11(10). Abdomen with 5 visible sterna; epipleuron deeply excavated for reception of femoral apices of middle and hind legs; elytron with dark spot on disc composed of brown hairs (Fig. 76) ..... *Azya orbigera orbigera* Mulsant
– Abdomen with 6 visible sterna; epipleuron not excavated; elytron not as above 12
12(11). Antenna 8-segmented, short (Fig. 67); elytron red with black markings (Fig. 70) ..... *Rodolia cardinalis* (Mulsant)
– Antenna 11-segmented, long (Fig. 57); elytron dark reddish brown with metallic tint (Fig. 62) ..... *Rhyzobius lophanthae* (Blaisdell)
13(10). Elytron immaculate, entirely red or yellow ..... *Cycloneda munda* (Say)
– Elytron pink or pinkish yellow with bold, black maculation .... *Naemia seriata* (Melsheimer)

Genus *Microweisea* Cockerell

Microweisea Cockerell, 1903:38 (new name for *Epismilia* Cockerell, 1990); Pope, 1962:637; Gordon, 1970:207; Gordon, 1977:204; Gordon, 1985:37. Type-species: *Smilia felschei* Weise (=*Pentilia ovalis* LeConte), by monotypy.
Smilia Weise, 1891:288 (not Germar, 1833).
Epismilia Cockerell, 1900:606 (not Fromental, 1861) (new name for *Smilia* Weise).
Pseudoweisea Schwarz, 1904:118 (lapsus calami).

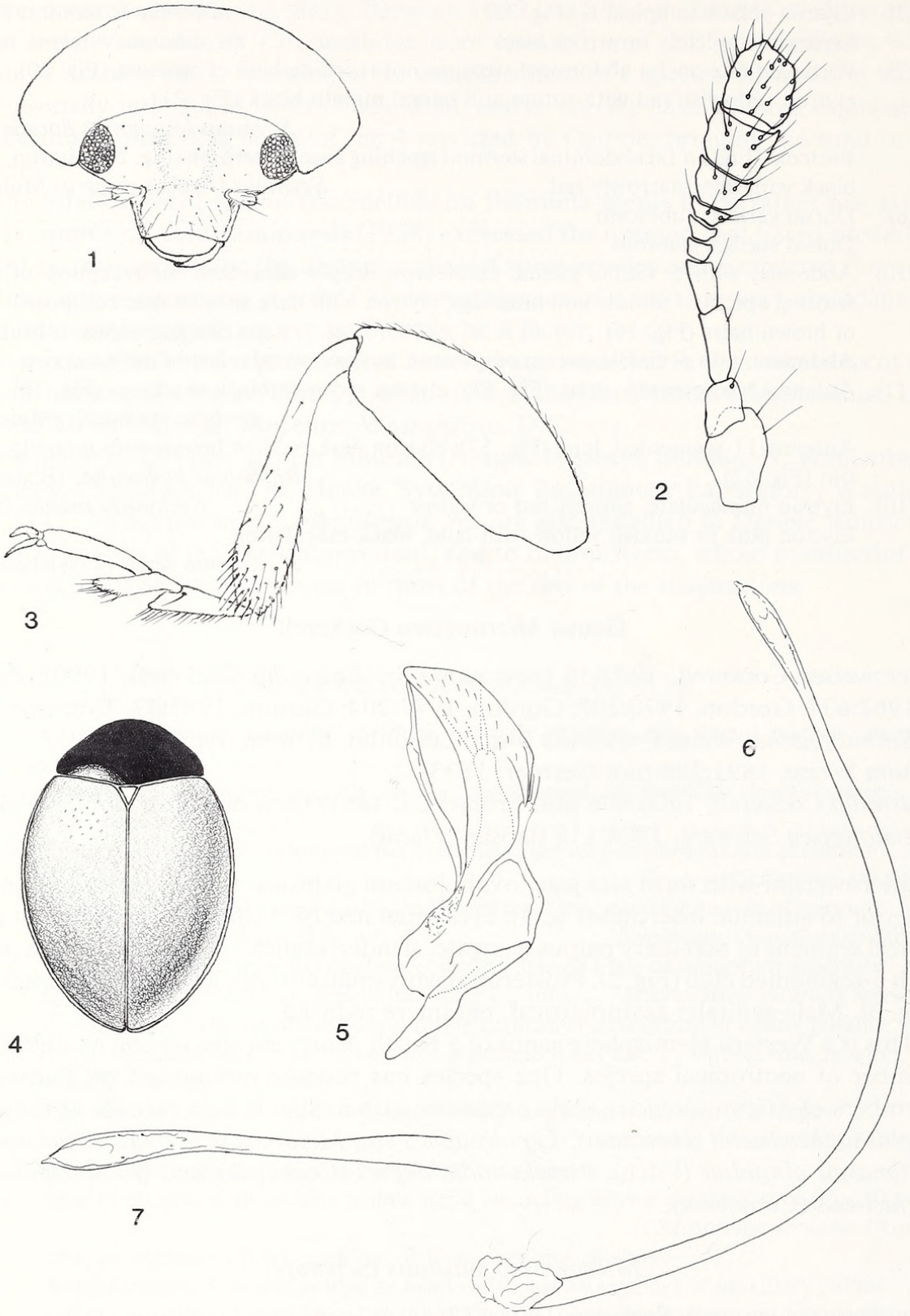
Microweisini with form elongate, oval; dorsum glabrous. Head slightly prolonged anterior to antennal insertion (Fig. 1); eyes separated by 4 times the width of an eye. Apical segment of maxillary palpus elongate, slender, conical. Antenna 10-segmented with 3-segmented club (Fig. 2). Prosternum with small anterior lobe. Tarsus trimerous (Fig. 3). Male genitalia asymmetrical, paramere reduced.

This is a Western Hemisphere genus of 5 North American species and an unknown number of neotropical species. One species has become established on Bermuda. Members of *Microweisea* are scale predators with available host records as follows: *Lepidosaphes beckii* (Newman), *Lepidosaphes* sp., *Melanaspis obscura* (Comstock), *Chionaspis pinifoliae* (Fitch), *Pseudaonidia duplex* (Cockerell), and *Quadraspidiotus perniciosus* (Comstock).

Microweisea suturalis (Schwarz)

Pseudoweisea suturalis Schwarz, 1904:118.
Microweisea suturalis: Leng, 1920:213; Gordon, 1970:209; Gordon, 1985:38.
Pentilia suturalis: Korschefsky, 1932:225.

Diagnosis. Length 1.00 to 1.10 mm, width 0.90 to 0.95 mm. Ground color piceous; elytron yellowish brown with suture narrowly piceous (Fig. 4); ventral surface brown. Male genitalia as in Figures 5–7.



Figs. 1–7. *Microweisea* spp. 1. *Microweisea* sp., head. 2. *Microweisea* sp., antenna. 3. *Microweisea* sp., leg. 4. *Microweisea suturalis,* habitus. 5–7. *Microweisea suturalis,* male genitalia.

World distribution. California: Long Beach: Los Angeles Co.

Bermuda distribution. Island wide, but patchy.

Bermuda temporal distribution. Adults present September through May.

Discussion. This tiny species is unmistakable in the Bermuda fauna because of its size and the anterolateral line on the pronotum. *Microweisea suturalis* was introduced in 1949 for control of the Bermuda cedar scales, *Lepidosaphes pallida* (Maskell) and *Carulaspis minima* (Targioni-Tozzetti). Individual trees or stands of *J. bermudiana* may support populations of *M. suturalis* while adjacent trees, though also infested with scale, often have no *M. suturalis* on them.

Genus *Clitostethus* Weise

Scymnus (*Clitostethus*) Weise, 1885:65. Type-species: *Coccinella arcuata* Rossi, by monotypy.
Clitostethus: Weise, 1899:375.
Clithostetus: Korschefsky, 1931:114 (misspelling).

Scymnini with form elongate, oval. Length less than 1.60 mm. Head with mouthparts directed posteroventrally in repose, concealing prosternum; clypeus extending beyond eye, anterolateral angle produced, rounded, anterior margin truncate, lateral margin emarginate at antennal insertion; lateral projection of gena broad, partially dividing eye. Maxillary palpus with apical segment somewhat securiform (Fig. 12). Antenna long, 11-segmented, extending to posterolateral angle of pronotum, all segments except apical 3 longer than wide, basal segment not strongly widened. Pronotum widest at posterolateral angle, narrowed apically. Prosternum short, only slightly longer than anterior coxa, intercoxal process narrow, apex truncate. Metasternum tumid. Front and middle femora slender; hind femur not enlarged, hind tibia with coarse, long setae, particularly near outer margin; tarsus trimerous (Fig. 13).

This Old World genus resembles the New World *Nephaspis* Casey, but *Nephaspis* has the basal segments of the antenna enlarged, hind femur enlarged medially, and anterior clypeal margin feebly emarginate. There are approximately 5 species in *Clitostethus,* one of which has become established on Bermuda.

Clitostethus arcuatus (Rossi)

Coccinella arcuata Rossi, 1794:88.
Scymnus arcuatus: Mulsant, 1846:245.
Scymnus (*Clitostethus*) *arcuatus*: Weise, 1885:73.
Clitostethus arcuatus: Weise, 1899:375; Korschefsky, 1931:114; Gordon, 1972a:145.

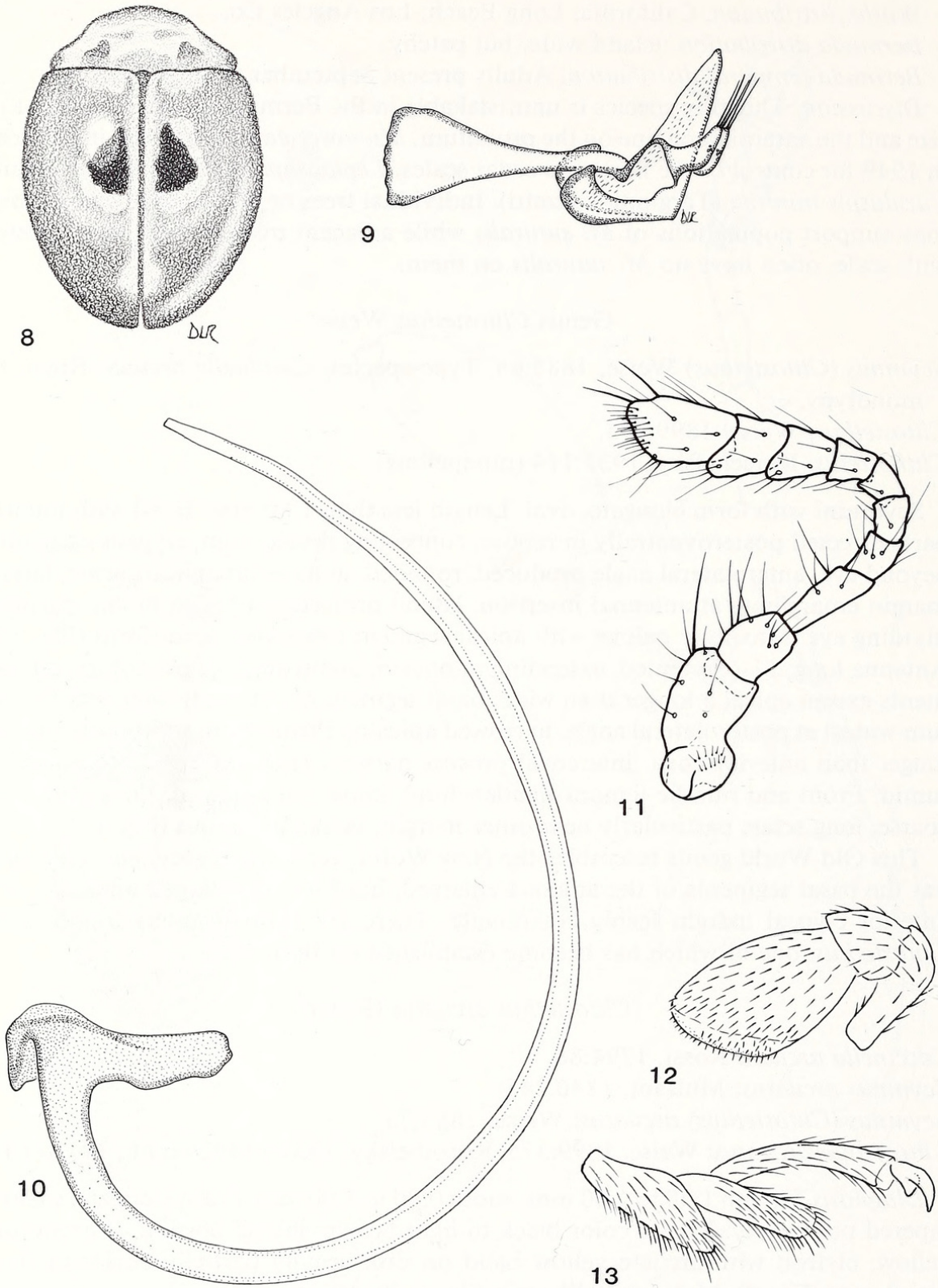
Diagnosis. Length 1.30 to 1.50 mm, width 0.90 to 1.00 mm. Form elongate, slightly tapered posteriorly. Dorsal color black to light brown; lateral portion of pronotum yellow; elytron with arcuate yellow band on disc usually partially enclosing dark discal spot (Fig. 8). Male genitalia as in Figures 9, 10.

World distribution. Europe.

Bermuda distribution. Island wide.

Bermuda temporal distribution. Adults present year round, most common in winter and spring when the host is abundant.

Discussion. The dorsal color pattern is unique among Bermuda coccinellids, thus making this species easily recognizable. *Clitostethus arcuatus* is one of the few species



Figs. 8–13. 8. habitus. 9. 10. male genitalia, *Clitostethus arcuatus*. 11. antenna, *Cryptolaemus montrouzieri*. 12. maxillary palpus. 13. tarsus, *Clitostethus arcuatus*.

occurring on Bermuda that was apparently not intentionally introduced, and we suspect it arrived on imported plant material. It was first observed in the early 1950's (Bennett et al., 1985). Members of both *Clitostethus* and the related New World genus *Nephaspis* are whitefly predators, and the Bermuda host of *C. arcuatus* is *Metaleurodicus cardini* (Back), a pest of fiddlewood, *Citharexylum spinosum* L. *Nephaspis oculatus* (Blatchley) (then known as *Nephaspis amnicola* Wingo or misidentified as *Clitostethus dispar* Sicard) was introduced in the early 1960's, but survived in the field for only a few months (Bennett et al., 1985).

Genus *Cryptolaemus* Mulsant

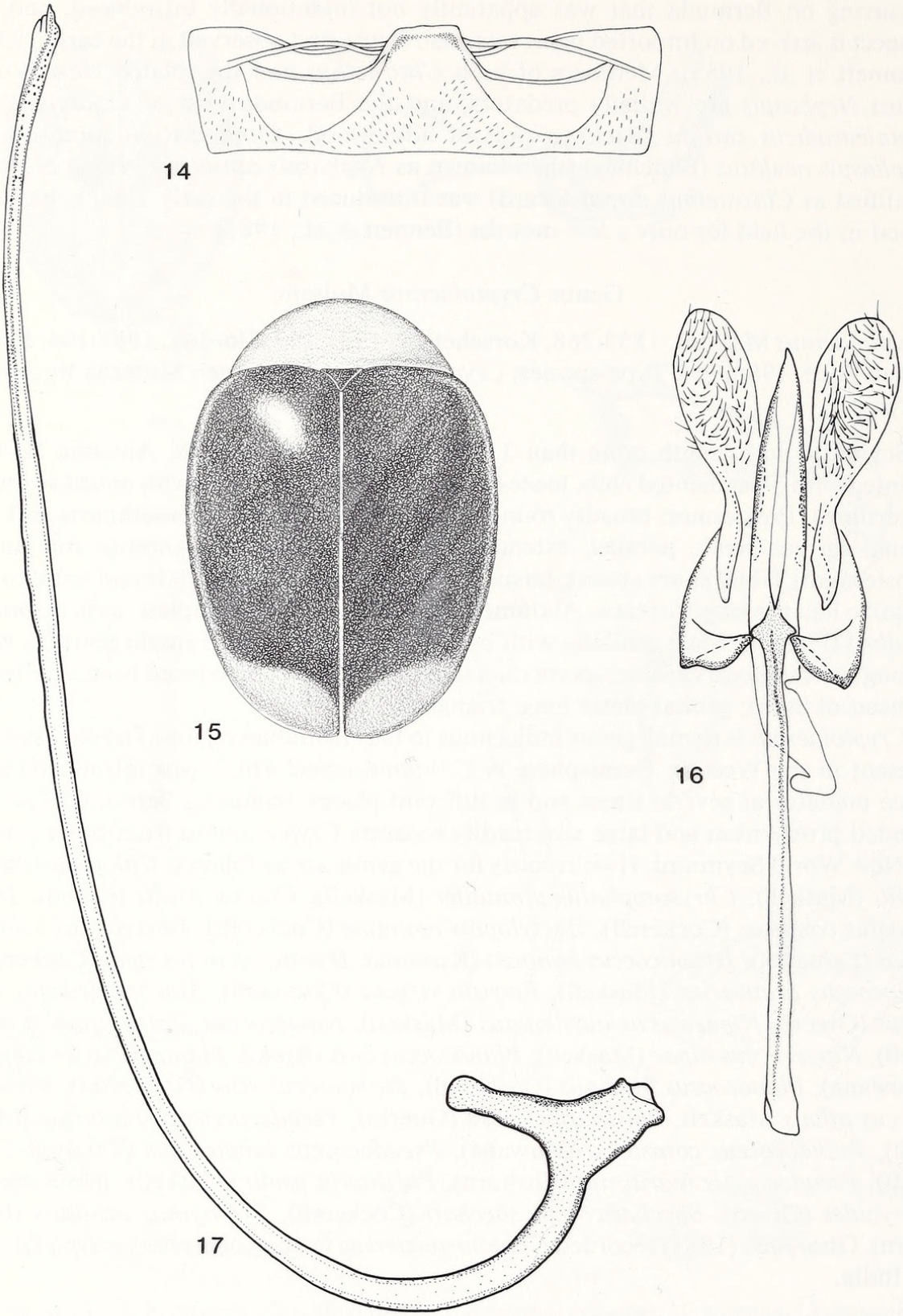
Cryptolaemus Mulsant, 1853:268, Korschefsky, 1931:169; Gordon, 1985:105; Booth and Pope, 1986:704. Type-species: *Cryptolaemus montrouzieri* Mulsant, by monotypy.

Scymnini with length more than 3.00 mm; form oval, convex. Antenna 10-segmented with 3-segmented club, loose (Fig. 11). Maxillary palpus with apical segment securiform. Prosternum broadly rounded anteriorly, concealing mouthparts and antenna; carinae weak, parallel, extending less than halfway to anterior margin of prosternum. Tibial spurs absent; tarsus trimerous; tarsal claw with broad basal tooth equal to half the length of claw. Abdomen with postcoxal line complete, as in *Scymnus* (*Pullus*) (Fig. 14). Male genitalia with basal lobe symmetrical. Female genitalia with strong spermathecal capsule; sperm duct short; infundibulum reduced to small sclerite at head of bursa; genital plates long, triangular.

Cryptolaemus is a small genus indigenous to the Australian region. The only species present in the Western Hemisphere is *C. montrouzieri* which was introduced as a scale predator at several times and in different places, including Bermuda. The expanded prosternum and large size readily separate *Cryptolaemus* from other genera of New World Scymnini. Host records for the genus are as follows: *Chloropulvinaria psidii* (Maskell), *Chrysomphalus pinnulifer* (Maskell), *Coccus viridis* (Green), *Dactylopius confusus* (Cockerell), *Dactylopius opuntiae* (Cockerell), *Dactylopius tomentosus* (Lamarck), *Dysmicoccus boninsis* (Kuwana), *Dysmicoccus brevipes* (Cockerell), *Eriococcus araucariae* (Maskell), *Ferrisia virgata* (Cockerell), *Maconellicoccus hirsutus* (Green), *Nipaecoccus aurilanatus* (Maskell), *Nipaecoccus filamentosus* (Cockerell), *Nipaecoccus nipae* (Maskell), *Planococcus citri* (Risso), *Planococcus krauhniae* (Kuwana), *Planococcus lilacinus* (Cockerell), *Planococcus vitis* (Neidielski), *Pseudococcus affinis* Maskell, *Pulvinaria icerya* (Guerin), *Pseudococcus calceolariae* (Maskell), *Pseudococcus comstocki* (Kuwana), *Pseudococcus longispinus* (Targioni-Tozzetti), *Pseudococcus maritimus* (Ehrhorn), *Pulvinaria psidii* (Maskell), *Rastrococcus iceryoides* (Green), *Saccharicoccus sacchari* (Cockerell), *Trionymus insularis* (Ehrhorn). Ghorpade (1981) recorded *C. montrouzieri* as feeding on *Aphis gossypii* Glover in India.

Cryptolaemus montrouzieri Mulsant

Cryptolaemus montrousieri Mulsant, 1853:149; Gordon, 1985:105.
Cryptolaemus montrouzieri: Crotch, 1874:204 (emendation); Korschefsky, 1931:169; Gordon, 1985:105.
Cryptolaemus montrouzieri montrouzieri: Booth and Pope, 1986:706.



Figs. 14–17. *Cryptolaemus montrouzieri*. 14. 1st abdominal sternum. 15. habitus. 16. 17. male genitalia.

Diagnosis. Length 3.40 to 4.50 mm, width 2.40 to 3.10 mm. Head, prothorax, tip of elytron and abdomen reddish yellow; mesosternum, metasternum, leg, and elytron (except apex) black or blackish (Fig. 15). Punctation of head and pronotum dense, elytral punctation similar except on humeral callus which is shining, almost devoid of punctures. Male genitalia as in Figures 16, 17. Female genitalia as in Figure 18.

World distribution. Native to Australia, but because of biological control introductions, it now occurs in parts of the world too numerous to mention. In North America it occurs from San Francisco to San Diego, California, and in Clearwater, Florida. It has also been recorded from Indiana and Missouri, but is probably not established there.

Bermuda distribution. Botanical Gardens, Paget; St. Paul's Church, Paget.

Bermuda temporal distribution. Adults present May through September.

Discussion. This species was introduced in 1926 for control of the coconut mealybug, *Nipaecoccus nipae* (Maskell), and again in 1953 for control of the long-tailed mealybug, *Pseudococcus longispinus* (Targioni-Tozzetti). Bennett et al. (1985) state that it did not become established in either case although small colonies persisted for several months. We found it to be established at two Bermuda localities, feeding on the long-tailed mealybug on sago palm, *Cycas revoluta,* and on *Pseudococcus* sp. on croton, *Codiaeum variegtum* (L.).

Scymnus (*Scymnus*) Kugelann

Scymnus Kugelann, 1794:545; Mulsant, 1846:219, Casey, 1899:138; Korschefsky, 1931:115; Gordon, 1976:10; Gordon, 1985:115. Type-species: *Scymnus nigrinus* Kugelann, by subsequent designation of Westwood, 1838.

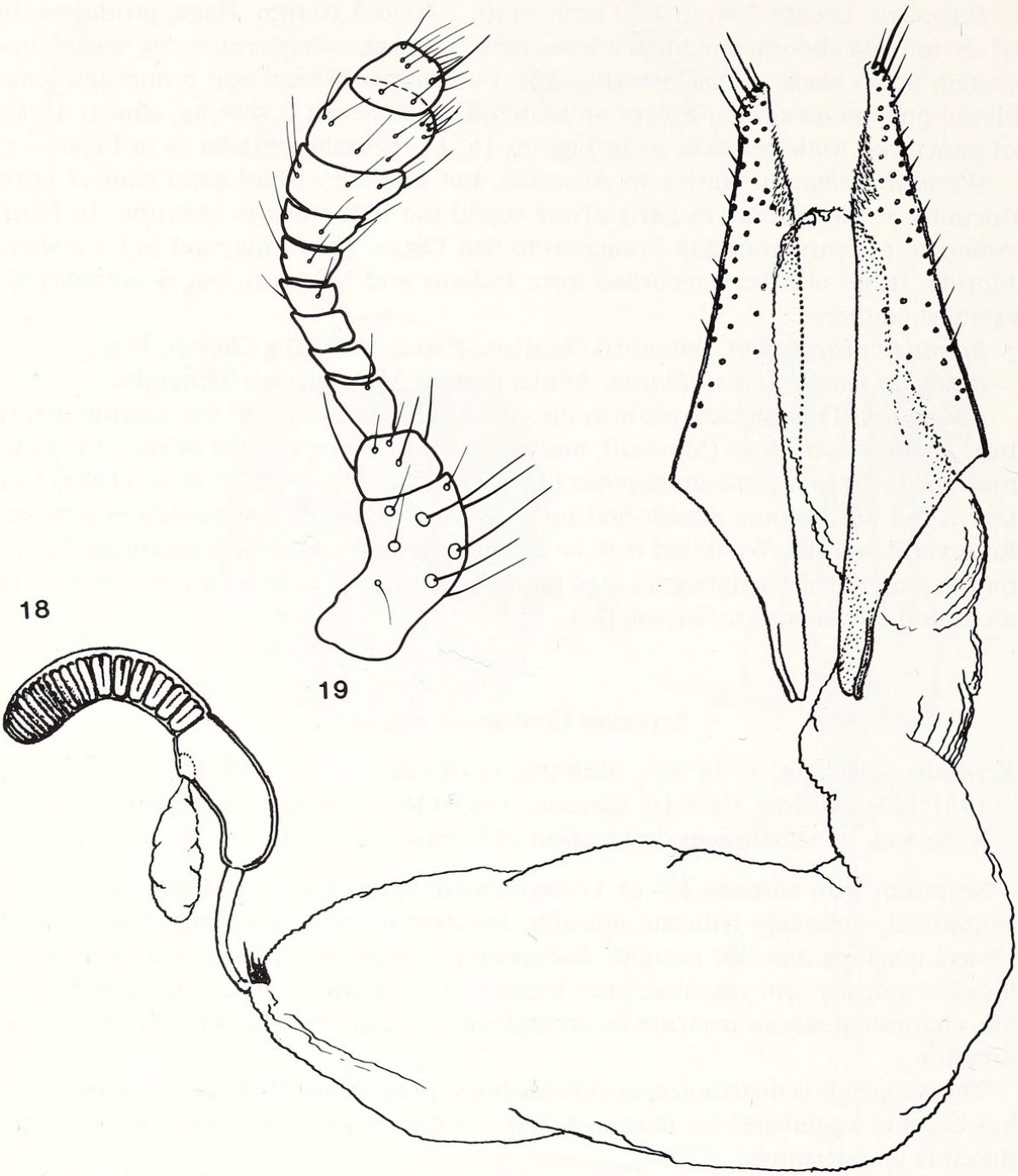
Scymnini with antenna 10- or 11-segmented; apical segment of maxillary palpus cylindrical, obliquely truncate apically. Prosternum with 2 strong carinae nearly always reaching anterior margin. Tarsus cryptotetramerous. Postcoxal line curved forward apically, not reaching basal margin of 1st sternum (Fig. 20); male 5th and 6th abdominal sterna truncate or emarginate apically. Female with distinct infundibulum.

This subgenus is distributed worldwide but is predominantly holarctic. One species has become established on Bermuda, but whether or not it was intentionally introduced is undetermined.

Scymnus (*Scymnus*) *floralis* (F.)

Coccinella floralis Fabricius, 1792:260.
Scymnus (*Scymnus*) *floralis*: Mulsant, 1850:981; Korschefsky, 1931:158.

Diagnosis. Length 1.65 to 2.00 mm, width 1.20 to 1.40 mm. Form oval, somewhat elongate. Dorsal color yellowish red except pronotum mostly black, elytron with basal and sutural margins black, lateral margin black, at least medially (Fig. 21). Postcoxal line on 1st abdominal sternum extending to hind margin of sternum, apex feebly curved forward. Male genitalia as in Figures 22, 23. Female genitalia as in Figure 24.



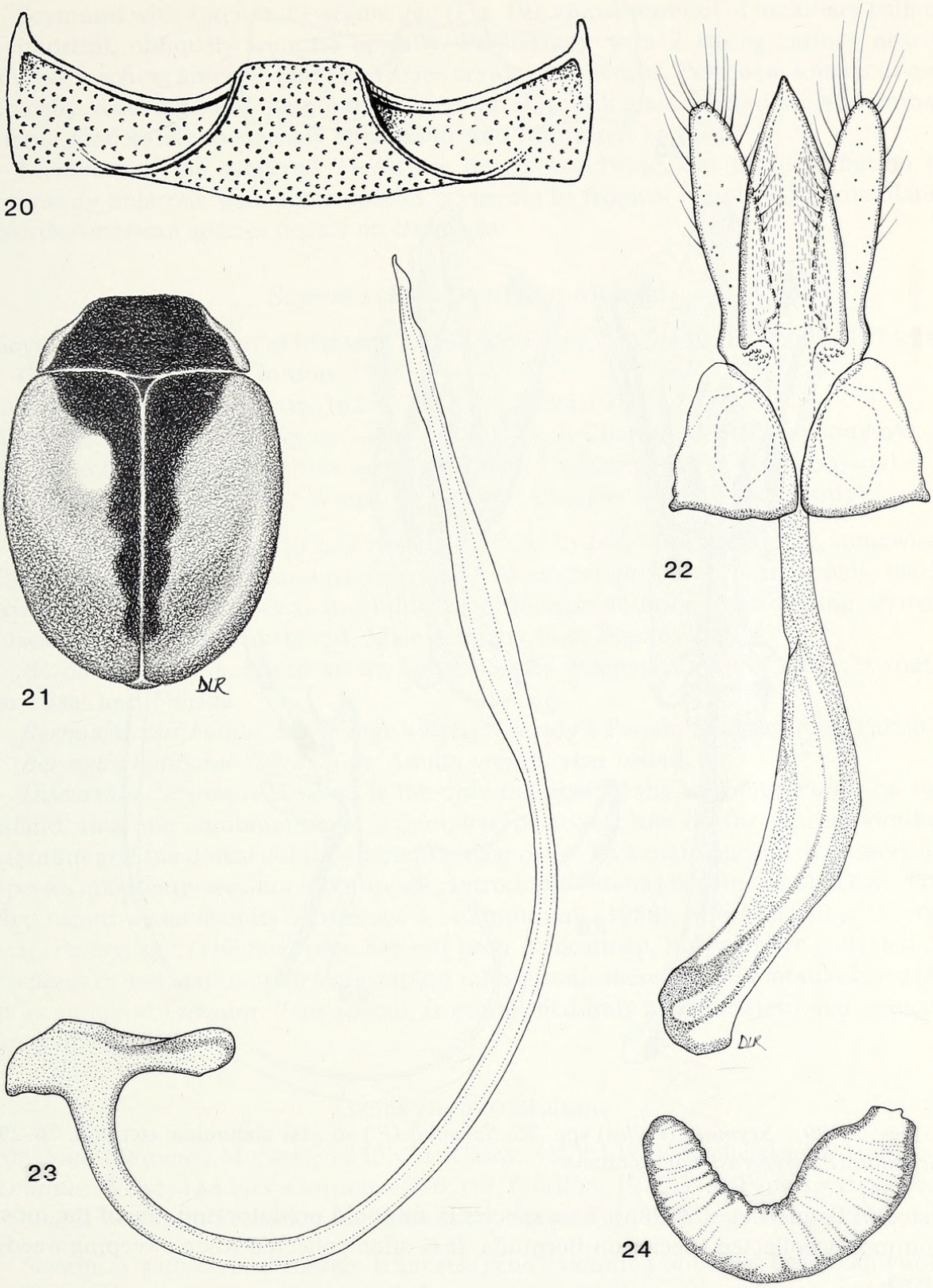
Figs. 18, 19. 18. *Scymnus* (*Pullus*) sp., antenna. 19. *Cryptolaemus montrouzieri,* female genitalia.

World distribution. West Indies.

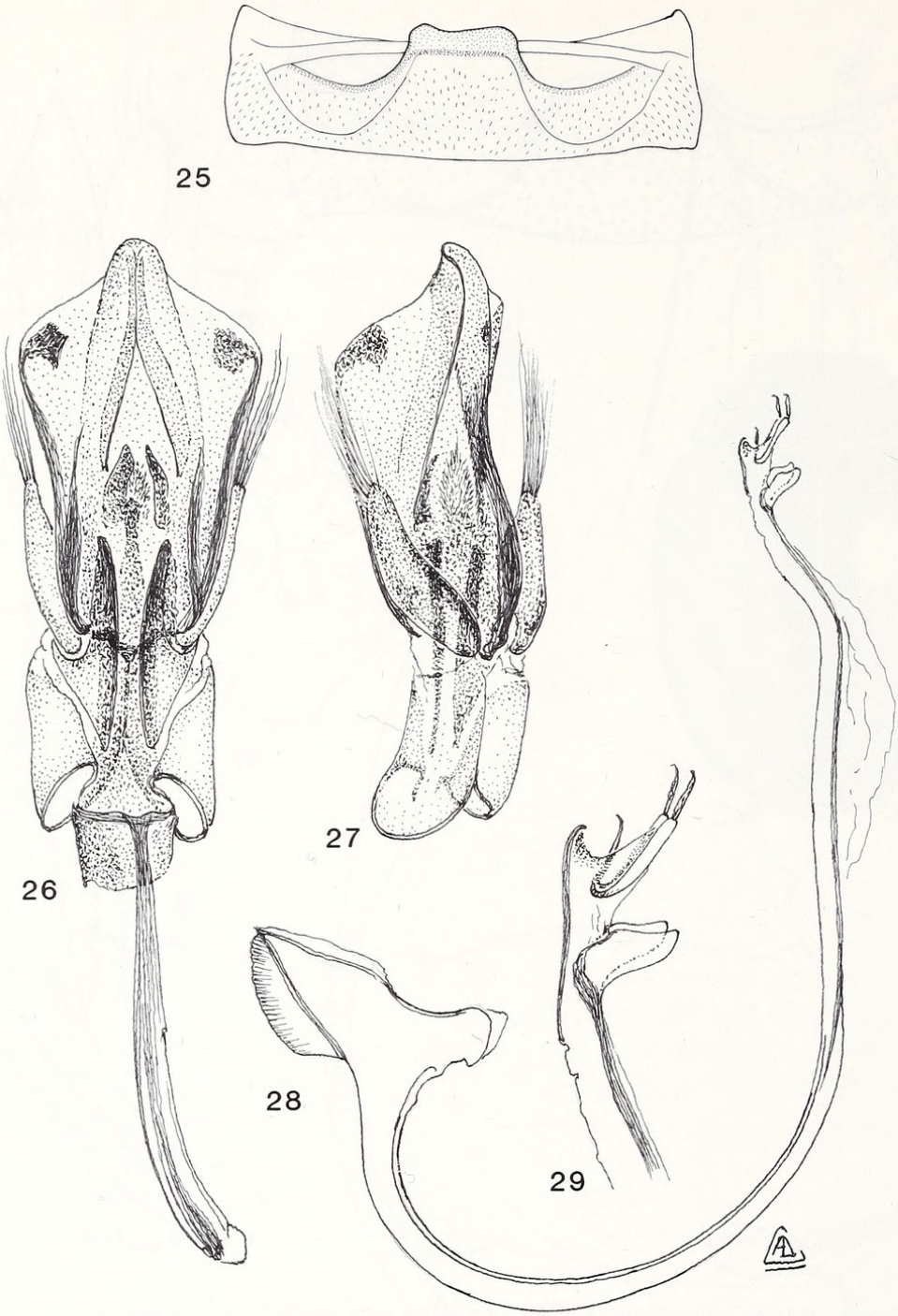
Bermuda distribution. Island wide.

Bermuda temporal distribution. Adults common year round.

Discussion. The dorsal color pattern does not resemble that of any other species of Bermuda Coccinellidae but is nearly identical to that of *S.* (*Pullus*) *loewii* Mulsant. The latter species is native to Mexico and has been widely introduced and established in other parts of the world. This is the first known instance of *S. floralis* becoming established anywhere outside of its natural range. We cannot determine the method of introduction; it may be accidental or this may be one of the species of "*Scymnus*"



Figs. 20–24. *Scymnus* (*Scymnus*) spp. 20. *Scymnus* (*S.*) sp., 1st abdominal sternum. 21. *Scymnus* (*S.*) *floralis*, habitus. 22. 23. *Scymnus* (*S.*) *floralis*, male genitalia. 24. *Scymnus* (*S.*) *floralis*, female spermathecal capsule.



Figs. 25–29. *Scymnus* (*Pullus*) spp. 25. *Scymnus* (*P.*) sp., 1st abdominal sternum. 26–29. *Scymnus* (*P.*) *creperus,* male genitalia.

listed in Bennett et al. (1985). This species is an aphid predator and one of the most commonly collected species on Bermuda. It is often collected when sweeping weedy areas.

Scymnus (*Pullus*) Mulsant

Scymnus (*Pullus*) Mulsant, 1846:241; Mulsant, 1850:976; Casey, 1899:139; Gordon, 1976:48; Gordon, 1985:139. Type-species: *Coccinella subvillosa* Goeze, by subsequent designation of Korschefsky, 1931.

Scymnini with antenna 11-segmented (Fig. 19); apical segment of maxillary palpus cylindrical, obliquely truncate apically. Prosternum with 2 strong carinae nearly always reaching anterior margin. Tarsus cryptotetramerous. Postcoxal line recurved apically, reaching basal margin of 1st sternum (Fig. 25); male 5th and 6th abdominal sterna moderately to strongly emarginate and impressed apically.

Members of the subgenus *Pullus* are found worldwide, but the distribution is primarily holarctic with some species occurring in tropical regions. One mainland North American species occurs on Bermuda.

Scymnus (*Pullus*) *creperus* Mulsant

Scymnus (*Pullus*) *creperus* Mulsant, 1850:985; Casey, 1899:140; J. Chapin, 1974:28; Gordon, 1976:260; Gordon, 1985:276.
Scymnus creperus: LeConte, 1852:139; Horn, 1895:101.
Scymnus (*Pullus*) *medionotans* Casey, 1899:143; J. Chapin, 1974:29 (synonymy).
Scymnus (*Pullus*) *subtropicus* Casey, 1899:143; J. Chapin, 1974:29 (synonymy).
Scymnus (*Pullus*) *hortensis* Wingo, 1952:36; J. Chapin, 1974:29 (synonymy).

Diagnosis. Length 1.76 to 2.68 mm, width 1.23 to 2.00 mm. Form oval, somewhat elongate. Head and pronotum yellowish red except pronotum with small, black triangular spot that extends to middle of pronotum anterior to scutellum; elytron black except apex narrowly red. Male genitalia as in Figures 26, 29.

World distribution. Southeastern United States, Pennsylvania to Colorado, south to Texas and Florida.

Bermuda distribution. St. George's Parish; Sandy's Parish; Southampton Parish.

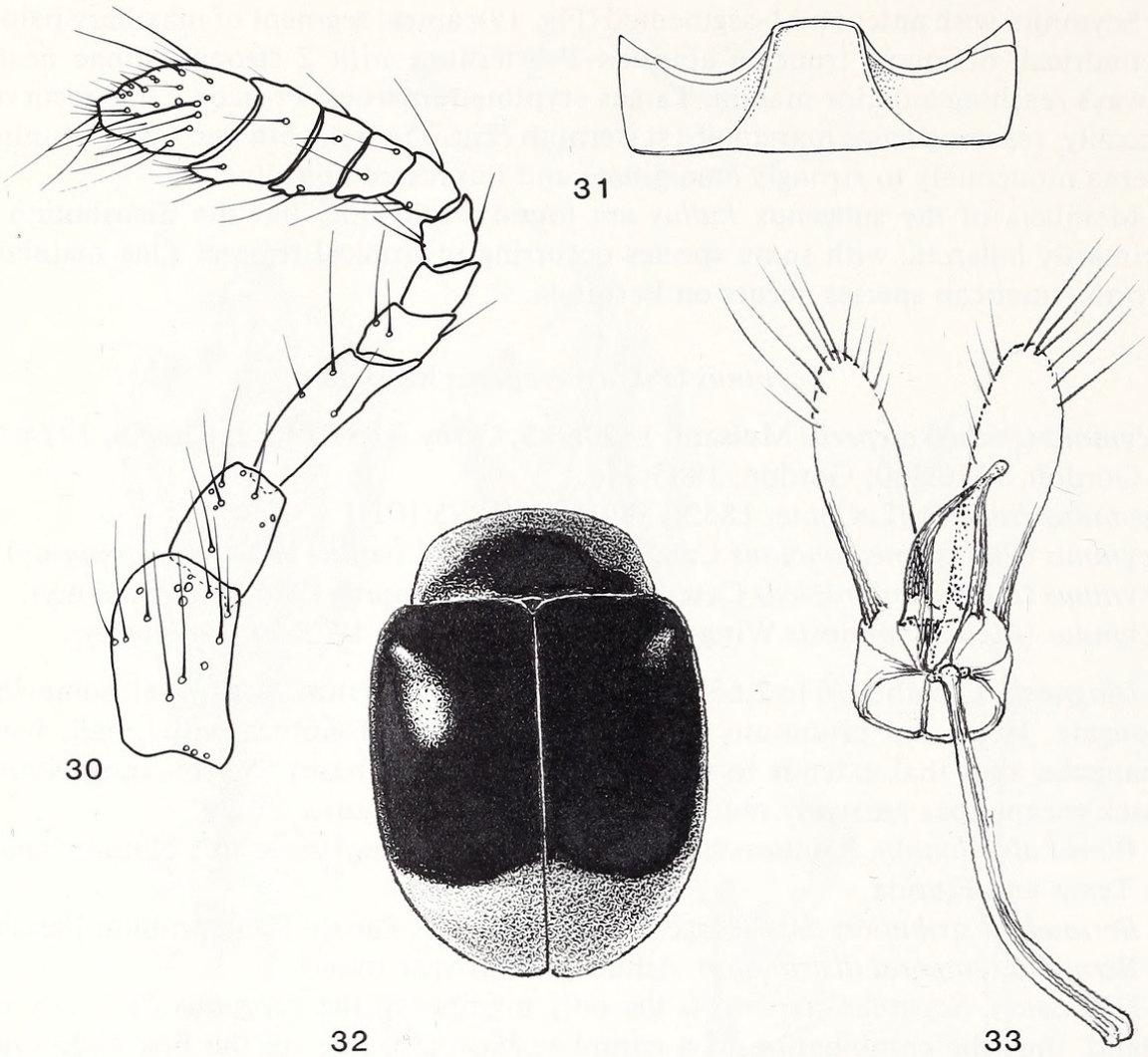
Bermuda temporal distribution. Adults present year round.

Discussion. Scymnus creperus is the only member of the subgenus *Pullus* on the island, thus the combination of a complete postcoxal line on the first abdominal sternum and the dorsal color pattern are diagnostic. This mainland North American species apparently was not intentionally introduced but has become established. The first record we have of its occurrence is in Simmonds (1958), where he lists a "*Scymnus* (*Pullus*) sp." The host prey has not been determined, but we have collected *S. creperus* in association with heavy aphid infestations, therefore we tentatively regard it as an aphid predator. This species is established only at the eastern and western ends of the island.

Genus *Diomus* Mulsant

Scymnus (*Diomus*) Mulsant, 1850:951; Casey, 1899:139; Korschefsky, 1931:116.
Diomus: Weise, 1885:83; Gordon, 1976:319; Gordon, 1985:315. Type-species: *Coccinella thoracica* Fabricius, by subsequent designation of Korschefsky, 1931.

Scymnini with clypeal margin truncate, gena extending onto eye beside antennal insertion; antenna 11-segmented, 3rd segment as long as segments 4–6 combined (Fig. 30), or 10-segmented; apical segment of maxillary palpus securiform. Prosternum with 2 fine carinae extending to anterior margin of prosternum. Tarsus 3- or 4-segmented. Postcoxal line joining hind margin of 1st abdominal sternum (Fig. 31). First abdominal sternum fused to 2nd medially; male with sterna 2–6 contracted, 5th sternum broadly, feebly emarginate apically. Male genitalia with basal lobe asym-



Figs. 30–33. *Diomus* spp. 30. *Diomus* sp., antenna. 31. *Diomus* sp., 1st abdominal sternum. 32. *Diomus terminatus,* habitus. 33. *Diomus terminatus,* phallobase of male genitalia.

metrical; sipho extremely long, slender, or short, robust. Female genitalia with genital plates short, rounded, or truncate apically; sperm duct short, simple.

This genus has a large number of species in the Neotropical Region. One species is established on Bermuda. Food preferences for members of *Diomus* are poorly known, but some appear to feed only on mealybugs and others only on aphids. *Diomus pumilio* Weise was introduced from Australia into California for control of the Albizzia psyllid, *Psylla uncatoides* Ferris & Klyver, on *Acacia*; obviously members of the genus have a wide range of host preferences.

Diomus terminatus (Say)

Scymnus terminatus Say, 1835:203.

Scymnus (*Diomus*) *terminatus*: Mulsant, 1850:952; Casey, 1899:158; Korschefsky, 1931:166.

Scymnus femoralis LeConte, 1852:136.

Scymnus (*Diomus*) *femoralis*: Casey, 1899:158 (synonymy).

Scymnus (*Diomus*) *terminatus* ab. *femoralis*: Korschefsky, 1931:67.

Scymnus (*Diomus*) *partitus* Casey, 1899:158; Korschefsky, 1931:164; Gordon, 1976: 342 (synonymy).
Diomus terminatus: Gordon, 1976:341; Gordon, 1985:337.

Diagnosis. Length 1.50 to 1.90 mm, width 1.04 to 1.49 mm. Form elongate, somewhat oval. Color predominantly black; anterolateral angle of pronotum, head, mouthparts, prosternum, hypopleuron, leg, and last 4 abdominal sterna and apical ¼ of elytron yellow (Fig. 32), pronotum often yellow with median black basal spot. Male genitalia as in Figures 33–35. Female genitalia as in Figure 36.

World distribution. Eastern United States, New England to Iowa, south to Texas and Florida.

Bermuda distribution. Island wide.

Bermuda temporal distribution. Adults present year round.

Discussion. In addition to the generic characters, *Diomus terminatus* is distinguished from *Decadiomus hughesi,* n. sp., by the yellow elytral apex. It is not as frequently found as the latter species, and we have not as yet associated it with a definite host. According to the available literature, it is supposed to be an aphid predator (Whitehead, unpubl.). This is one of 7 species of Coccinellidae listed as occurring on Bermuda by Ogilvie in 1928, therefore it was probably not intentionally introduced for biological control purposes. *Diomus terminatus* is never commonly collected on Bermuda; most specimens have been collected sweeping weedy areas.

Genus *Decadiomus* Chapin

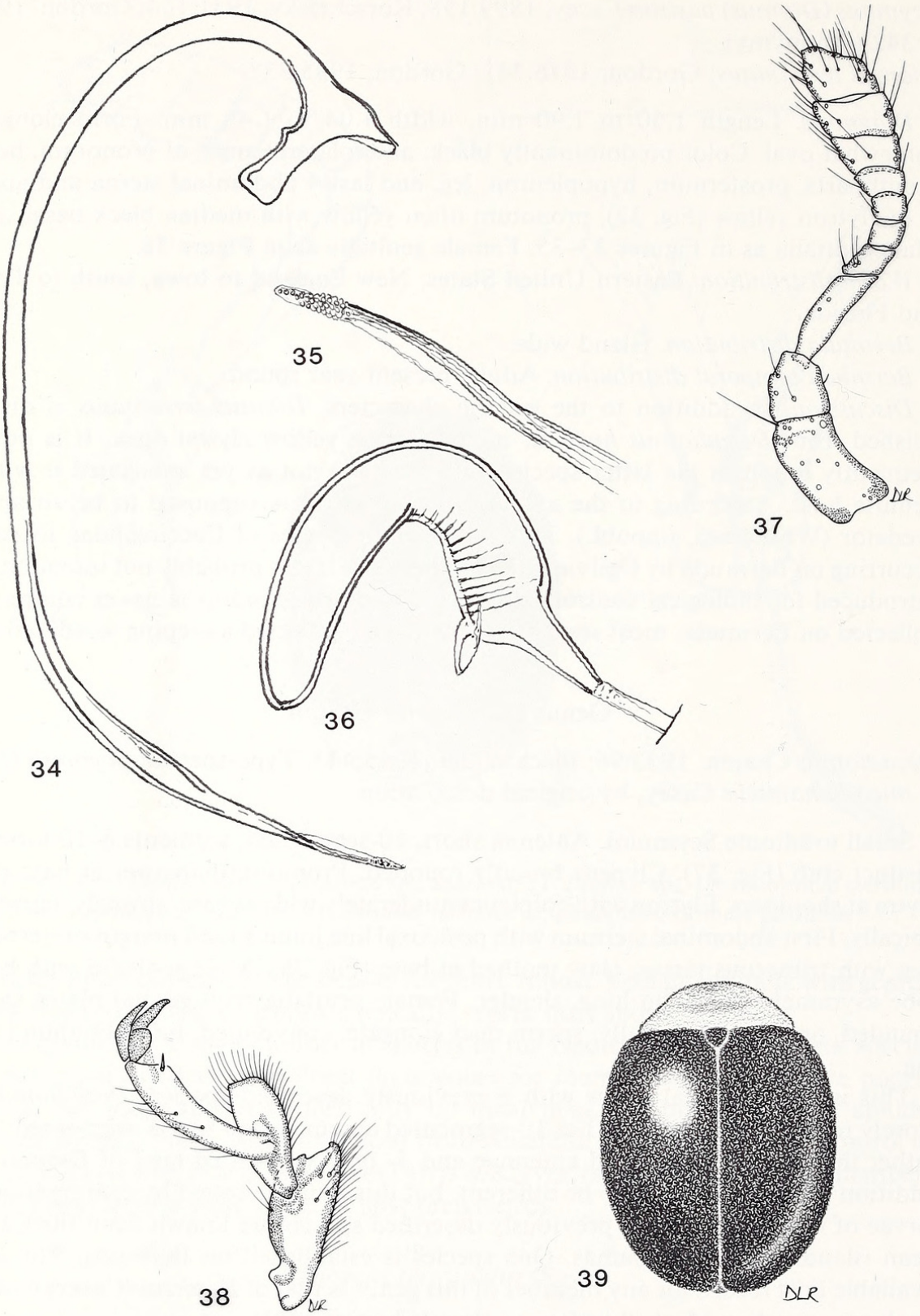
Decadiomus Chapin, 1933:96; Blackwelder, 1945:445. Type-species: *Scymnus* (*Diomus*) *bahamicus* Casey, by original designation.

Small to minute Scymnini. Antenna short, 10-segmented, segments 8–10 forming distinct club (Fig. 37). Clypeus broadly rounded. Pronotum narrower at base than elytra at shoulders. Elytron with epipleura moderately wide at base, strongly narrowed apically. First abdominal sternum with postcoxal line joining hind margin of sternum. Leg with trimerous tarsus, claw toothed at base (Fig. 38). Male genitalia with basal lobe asymmetrical; sipho long, slender. Female genitalia with genital plates short, rounded, or truncate apically; sperm duct elongate, convoluted, infundibulum lacking.

This is a neotropical genus with 5 previously described species. *Decadiomus* is closely related to *Diomus* but has 10-segmented antennae and true 3-segmented tarsi rather than the 11-segmented antennae and 3- or 4-segmented tarsi of *Diomus.* In addition the larvae appear to be different, but this must be tested by examination of larvae of many species. All previously described species are known from the Caribbean islands and the Bahamas. One species is established on Bermuda. The only available host record for any member of this genus is that of *D. pictus* (Casey) feeding on *Icerya purchasi* Maskell in Puerto Rico (Chapin, 1933).

Decadiomus hughesi Gordon and Hilburn, new species

Description. Male, length 1.50 mm, width 1.20 mm. Form oval, widest at middle of elytron (Fig. 39). Color black except pronotum reddish yellow with transverse,



Figs. 34–39. *Diomus terminatus, Decadiomus hughesi.* 34. 35. *Diomus terminatus,* sipho of male genitalia. 36. *Diomus terminatus,* female spermathecal capsule. 37. *Decadiomus hughesi,* antenna. 38. *Decadiomus hughesi,* tarsus. 39. *Decadiomus hughesi,* habitus.

black basal spot anterior to scutellum; head, prosternum, leg and apical abdominal sternum reddish yellow. Punctation on head fine, punctures separated by one to 3 times a diameter; pronotal punctures slightly coarser than on head, separated by a diameter or less; elytron with punctures equal in size to pronotal punctures, separated by about a diameter. Dorsal pubescence yellowish white. First abdominal sternum with basal, crescent-shaped patch of fine setae on each side. Genitalia as in Figures 40, 41.

Female. Similar to male except pronotum dark brown with narrow apical border and lateral ¼ reddish yellow. Genitalia as in Figure 42.

Variation. Length 1.15 to 1.60 mm, width 0.80 to 1.30 mm. The male pronotum is often entirely reddish yellow, lacking the basal black spot; the median black area of the female pronotum is subject to some variation in size.

Type material. Holotype; Bermuda, Smiths Parish, Aquarium, 29-V-87, D. J. Hilburn, on *Pittosporum* (deposited in United States National Museum). Allotype; same data as holotype. Paratypes, Bermuda: 14, same data as holotype; 1, Hamilton Parish, Stelly Bay, 25-V-87, D. J. Hilburn, on sunbather; 1, Paget Parish, 4-VII-87, J. Hendrickson; 1, Paget Parish, Beverly Farm, 28-V-87, D. J. Hilburn; 5, Paget Parish, Bot. Garden, 30-V-87, D. J. Hilburn, on *Cycas revoluta*; 1, Paget Parish, Bot. Garden, 12-VIII-87, D. J. Hilburn, with *Coccus viridis*; 1, Paget Parish, St. Pauls Church, 26-V-87, D. J. Hilburn, on *Cycas revoluta*; 3, Paget Parish, St. Pauls Church, 14-VIII-87, R. Gordon; 1, St. Georges, Ferry Reach, 6-VIII-87, D. J. Hilburn; 8, St. Georges, Airport Ferry Reach, 11-VIII-87, R. Gordon; 1, Smiths Parish, Aquarium, 30-IV-87, D. J. Hilburn; 1, Smiths Parish, Aquarium, 25-VI-87, D. J. Hilburn; 6, Smiths Parish, Penhurst Park and Fort Scaur, 21-VIII-87, P. Marsh; 1, Smiths Parish, Spittal pond, 24-VI-87, D. J. Hilburn; 1, Southampton Parish, Barnes Corner, 29-VI-87, J. Hendrickson, on *Juniperus bermudiana*; 1, Warwick Parish, Uplands, 6-VII-87, J. Hendrickson.

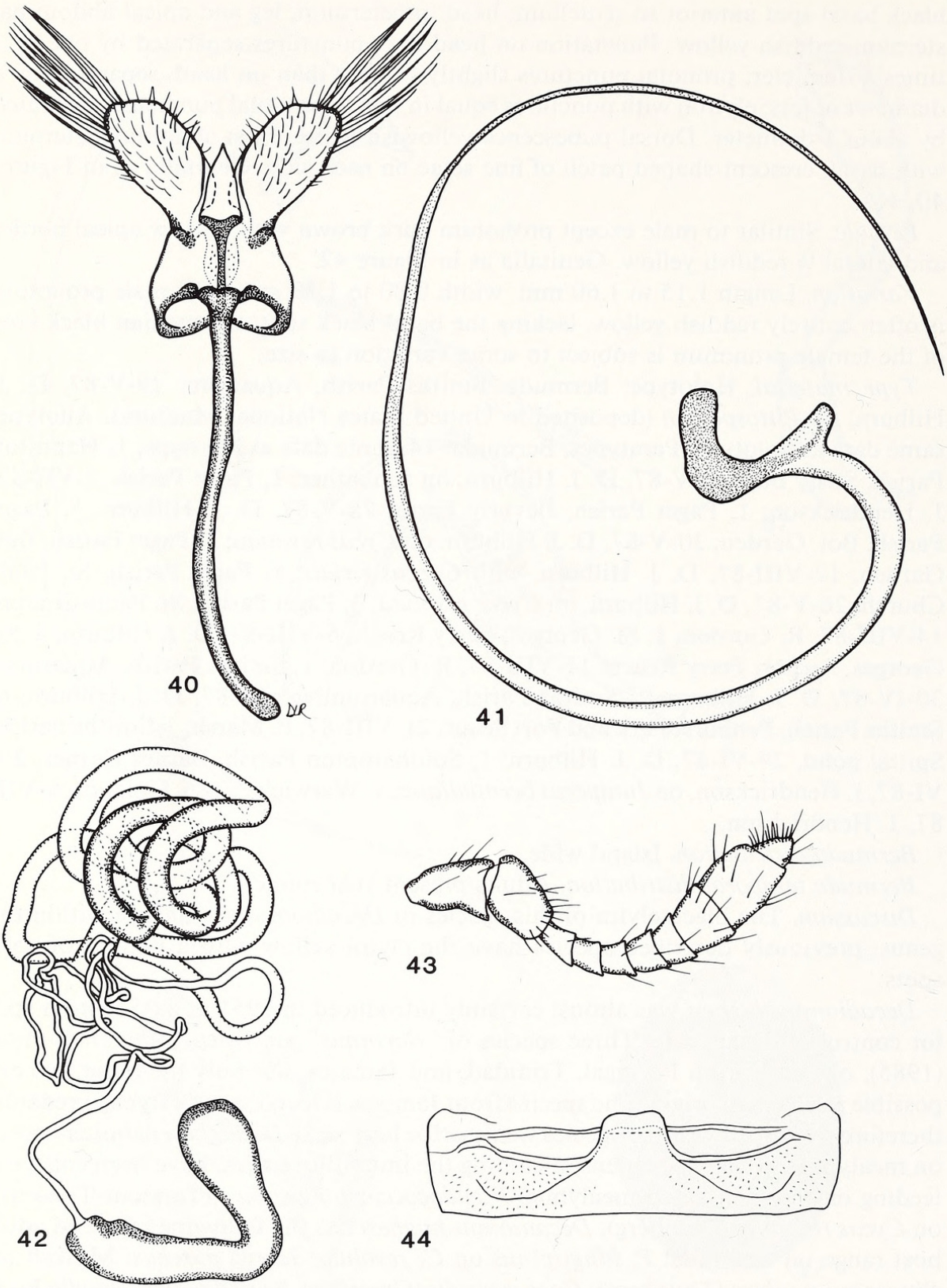
Bermuda distribution. Island wide.

Bermuda temporal distribution. Adults present year round.

Discussion. The black elytra of this species of *Decadiomus* are unique within the genus; previously described species have the elytra yellow with a pattern of dark spots.

Decadiomus hughesi was almost certainly introduced in 1951 as a "*Scymnus* sp." for control of cedar scale. Three species of "*Scymnus*" are listed by Bennett et al. (1985), one each from Portugal, Trinidad, and Jamaica, but only the latter two are possible as places of origin. The species from Jamaica is listed as a mealybug predator, therefore we suspect it is the species we describe here since *D. hughesi* definitely preys on mealybugs. Many specimens, including the immature stages, have been collected feeding on the long-tailed mealybug, *Pseudococcus longispinus* (Targioni-Tozzetti), on *Cycas revoluta* (Thunberg). *Decadiomus hughesi* has the following recorded adult host range on Bermuda: *P. longispinus* on *C. revoluta, Icerya purchasi* Maskell on *Pittosporum tobira* (Thunberg), *Coccus viridis* (Green) on *Brassaia actinophylla* Endlicher, and *Carulaspis minima* (Targioni-Tozzetti) on *Juniperus bermudiana* L. The recorded larval hosts are: *P. longispinus* on *C. revoluta* and *Pseudaulacaspis pentagona* (Targioni-Tozzetti) on *Nerium oleander* L.

We name this species for I. W. Hughes in recognition of his long involvement with biological control on Bermuda.



Figs. 40–44. *Decadiomus hughesi, Exochomus* spp. 40. 41. *Decadiomus hughesi,* male genitalia. 42. *Decadiomus hughesi,* female genitalia. 43. *Exochomus* sp., antenna. 44. *Exochomus* sp., 1st abdominal sternum.

Exochomus Redtenbacher

Exochomus Redtenbacher, 1843:11; Mulsant, 1850:476; Casey, 1899:106; Gordon, 1985:621. Type-species: *Coccinella 4-pustulata* L., by subsequent designation of Korschefsky, 1932.

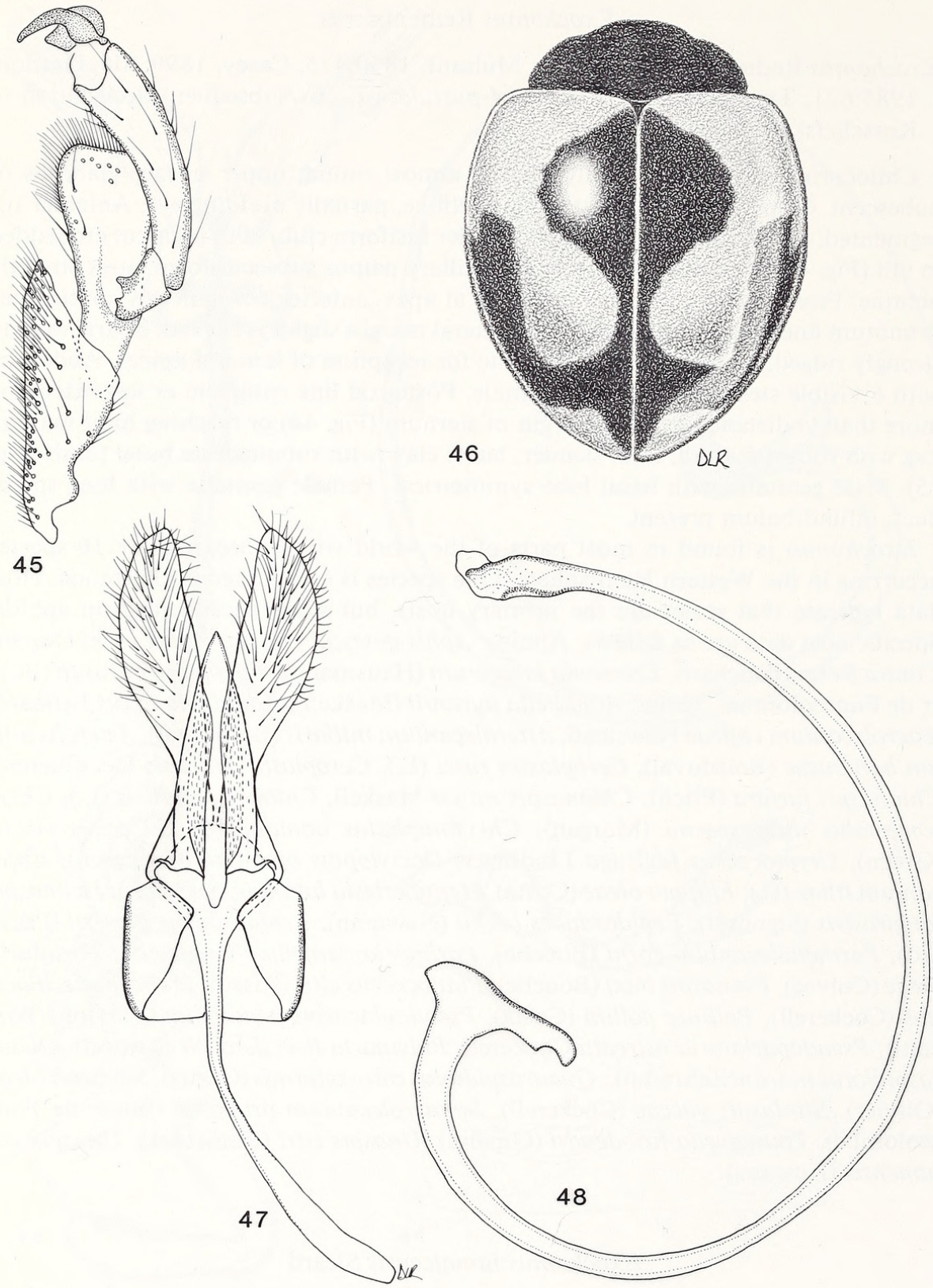
Chilocorini with form broadly oval to almost round; upper surface glabrous or pubescent. Clypeus expanded laterally, shelflike, partially dividing eye. Antenna 10-segmented; last 3 segments forming a slender fusiform club, 10th segment embedded in 9th (Fig. 43). Terminal segment of maxillary palpus subsecuriform, apex strongly oblique. Prosternal lobe narrow, truncate at apex, anterior coxae nearly contiguous. Pronotum finely margined across base, lateral margin slightly reflexed. Elytral margin strongly ridged, epipleuron not foveolate for reception of femoral apices. Abdomen with 6 visible sterna in male, 5 in female. Postcoxal line complete or not extending more than ½ distance to hind margin of sternum (Fig. 44) or reaching hind margin. Leg with robust femora, tibia slender, tarsal claw with subquadrate basal tooth (Fig. 45). Male genitalia with basal lobe symmetrical. Female genitalia with long sperm duct; infundibulum present.

Exochomus is found in most parts of the world with approximately 16 species occurring in the Western Hemisphere. One species is established on Bermuda. Host data indicate that scales are the primary hosts, but some species feed on aphids. Specific host data are as follows. Aphids: *Aphis gossypii* Glover, *Aphis pomi* Degeer, *Cinara fresai* Blanchard, *Eriosoma lanigerum* (Hausmann), *Toxoptera aurantii* (Boyer de Fonscolombe). Scales: *Aonidiella aurantii* (Maskell), *Aonidiella taxus* Leonard; *Asterolecanium coffeae* Newstead, *Asterolecanium miliaris* (Boisduval), *Asterolecanium bambusae* (Boisduval), *Ceroplastes rusci* (L.), *Ceroplastes sinensis* Del Guercio, *Chionaspis furfura* (Fitch), *Chionaspis minor* Maskell, *Chionaspis salicis* (L.), *Chrysomphalus dictyospermi* (Morgan), *Chrysomphalus aonidum* (L.), *Coccus viridis* (Green), *Cryptococcus fagisuga* Lindinger, *Dactylopius opuntiae* (Cockerell), *Eulecanium tiliae* (L.), *Filippia oleae* (Costa), *Hemiberlesia lataniae* (Signoret), *Ischnaspis longirostris* (Signoret), *Lepidosaphes beckii* (Newman), *Lepidosaphes gloverii* (Packard), *Parthenolecanium corni* (Bouche), *Parlatoria camelliae* Comstock, *Parlatoria oleae* (Colvee), *Pinnaspis buxi* (Bouche), *Planococcus citri* (Risso), *Planococcus lilacinus* (Cockerell), *Pollinia pollini* (Costa), *Pseudaulacaspis pentagona* (Targioni-Tozzetti), *Pseudoparlatoria ostreata* Cockerell, *Pulvinaria floccifera* (Westwood), *Quadraspidiotus marani* Zahradnik, *Quadraspidiotus ostreaeformis* (Curtis), *Saissetia oleae* (Olivier), *Situlaspis yuccae* (Cockerell), *Sphaerolecanium prunastri* (Boyer de Fonscolombe), *Toumeyella liriodendri* (Gmelin), *Unaspis citri* (Comstock), *Unaspis yanonensis* (Kuwana).

Exochomus jamaicensis Sicard

Exochomus jamaicensis Sicard, 1922:351; Korschefsky, 1932:263.

Diagnosis. Length 3.10 to 3.70 mm, width 2.80 to 3.10 mm. Form oval, convex. Color black except anterior pronotal angle very narrowly yellow; elytron red or yellowish red with large, black spot behind scutellum narrowly connected along suture to an irregularly transverse black fascia in apical ½ (Fig. 46). Head and pronotum



Figs. 45–48. *Exochomus jamaicensis.* 45. tarsus. 46. habitus. 47. 48. male genitalia.

alutaceous, elytron shining. Male genitalia as in Figures 47, 48. Female spermathecal capsule as in Figure 49.

World distribution. Jamaica.

Bermuda distribution. Island wide.

Bermuda temporal distribution. Adults present year round.

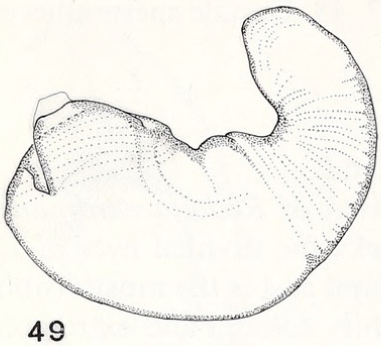
Discussion. The dorsal color pattern resembles only that of *Rodolia cardinalis,* however, the latter species is dorsally pubescent and lacks the divided eyes of *E. jamaicensis.* This species is distributed over the entire island and is the most visible of the Bermuda coccinellids because it is both very brightly colored and extremely active. The most common prey is aphids, but it will feed on scale insects as well, at least under laboratory conditions. It was originally introduced from Jamaica to control cedar scale but is rarely found on Bermuda cedar, and if so, it is usually associated with the juniper aphid, *Cinara fresai* Blanchard. It has also been recorded feeding on *Aphis gossypii* Glover.

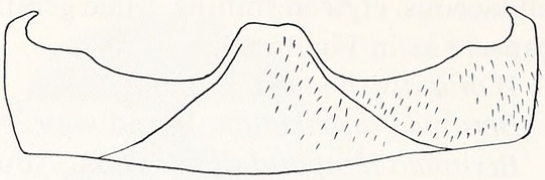
Genus *Chilocorus* Leach

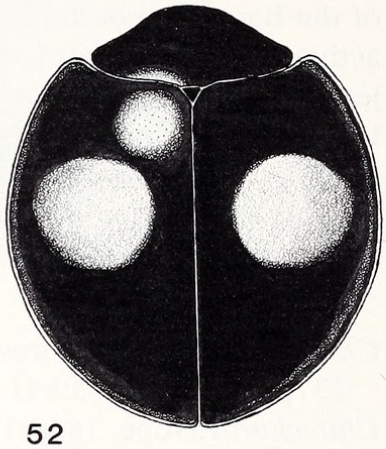
Chilocorus Leach, *in* Brewster, 1815:116; Mulsant, 1850:452; Korschefsky, 1932: 237; Gordon, 1985:641. Type-species: *Coccinella cacti* L., by monotypy.
Chilochorus Hope, 1840:157 (misspelling).

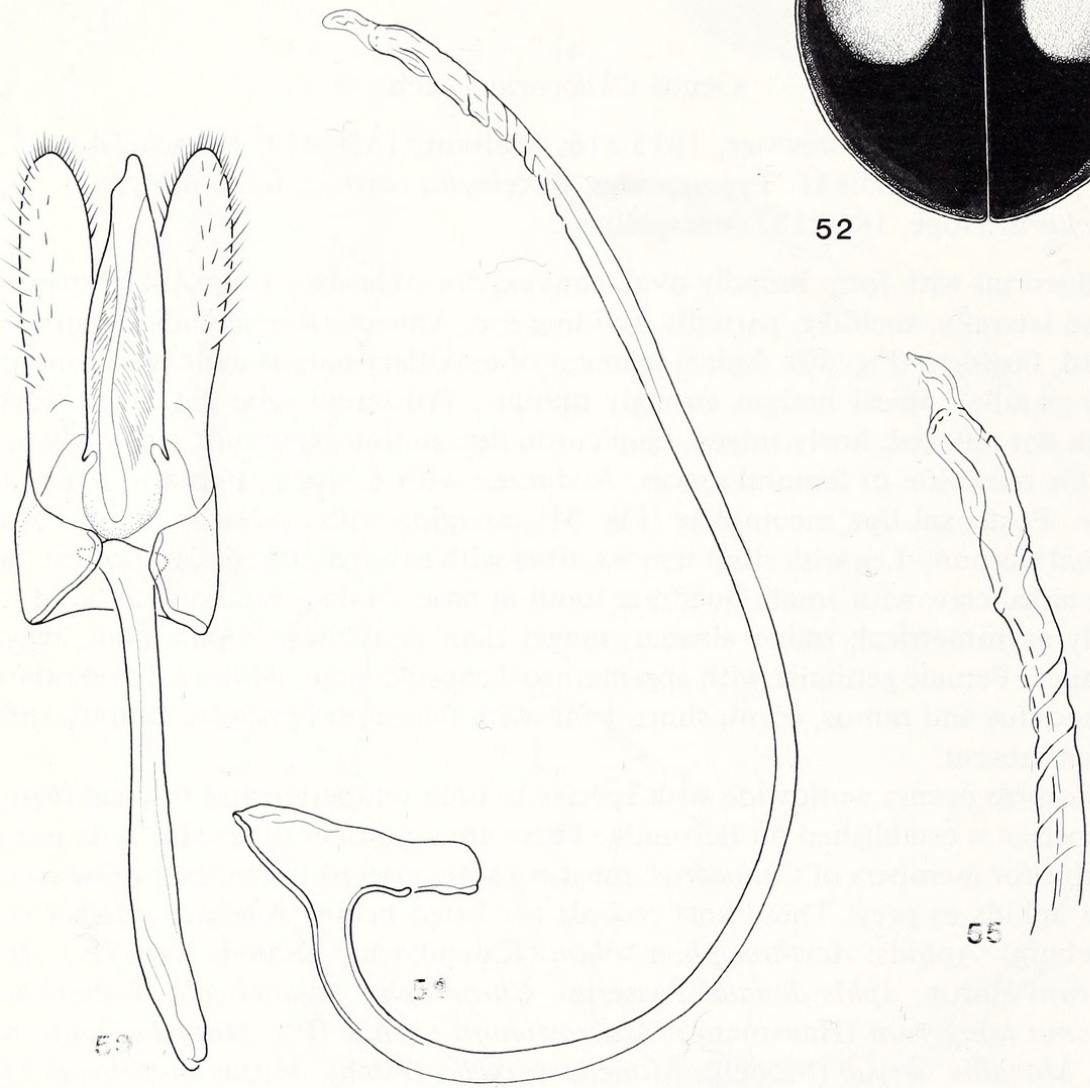
Chilocorini with form broadly oval, convex, dorsal surface glabrous. Clypeus expanded laterally, shelflike, partially dividing eye. Antenna 8-segmented, club 4-segmented, fusiform (Fig. 50). Apical segment of maxillary palpus with lateral margins nearly parallel, apical margin strongly oblique. Prosternal lobe flat, wide. Elytral margin not reflexed, finely ridged; epipleuron descending externally, shallowly foveolate for reception of femoral apices. Abdomen with 6 visible sterna in male, 5 in female. Postcoxal line incomplete (Fig. 51), merging with posterior margin of abdominal sternum. Leg with stout femora; tibia with external, triangular tooth at basal third; tarsal claw with small, quadrate tooth at base. Male genitalia with basal lobe slightly asymmetrical; trabes slender, longer than phallobase; sipho stout, twisted near apex. Female genitalia with spermathecal capsule large, without differentiation into nodulus and ramus, cornu short, bent, with falciform appendix at apex; infundibulum absent.

Chilocorus occurs worldwide with species in both temperate and tropical regions. One species is established on Bermuda. There are a number of specific host records available for members of *Chilocorus*; most are scale insects, but at least some species accept aphids as prey. These host records are listed below. Adelgid: *Adelges picea* (Ratzeburg). Aphids: *Acythrosiphon solani* (Kaltenbach), *Anoecia corni* (F.), *Aphis cytisorum* Hartig, *Aphis donacis* Passerini, *Chromaphis juglandicola* (Kaltenbach), *Eriosoma lanigerum* (Hausmann), *Macrosiphum avenae* (F.), *Monellia californica* Essig, *Monellia caryae* (Monell), *Monelia caryella* (Fitch), *Myzus malisuctus* Matsumura, *Phorodon humuli* (Schrank), *Rhopalomyzus lonicerae* (Siebold), *Rhopalosiphus padi* (L.), *Schizaphis graminum* (Rondani), *Schizaphis piricola* (Matsumura), *Toxoptera citricidus* (Kirkaldy). Scales: *Africaspis chionaspiformis* (Newstead), *Antonina bambusae* (Maskell), *Aonidia lauri* (Bouche), *Aonidiella aurantii* (Maskell), *Aonidiella citrina* (Coquillett), *Aonidiella taxus* Leonardi, *Aonidomytilus albus* (Cockerell), *Aspidiotus nerii* Bouche, *Asterolecanium coffeae* Newstead, *Asterolecanium*









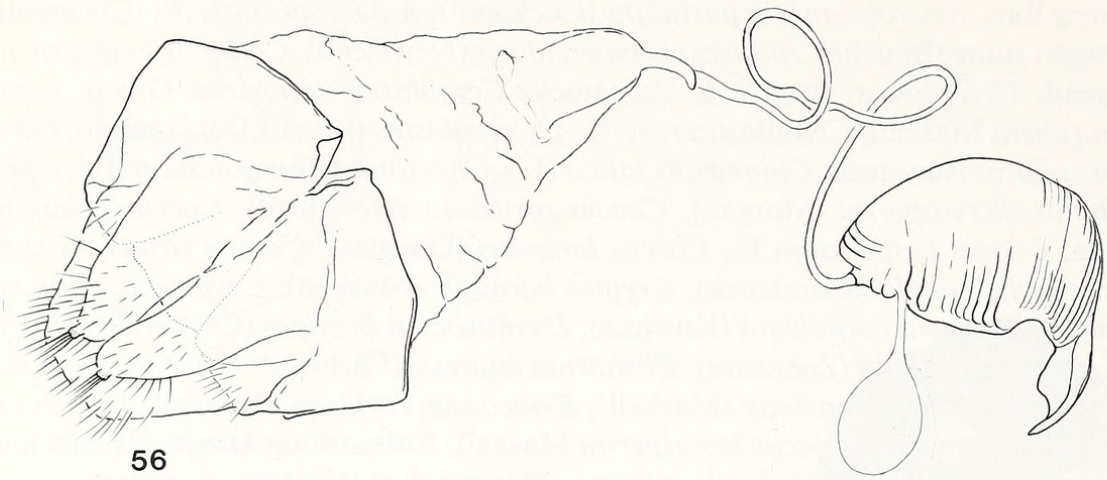
Figs. 49–55. *Exochomus jamaicensis, Chilocorus cacti.* 49. *Exochomus jamaicensis,* female spermathecal capsule. 50. *Chilocorus cacti,* antenna. 51. *Chilocorus cacti,* 1st abdominal sternum. 52. *Chilocorus cacti,* habitus. 53–55. *Chilocorus cacti,* male genitalia.

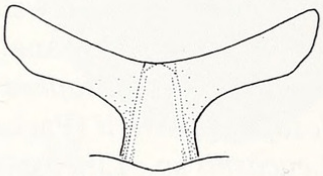
phoenicis Rao, *Asterolecanium pustulans* (Cockerell), *Aulacaspis difficilis* (Cockerell), *Aulacaspis rosae* (Bouche), *Aulacaspis tubercularis* (Newstead), *Ceroplastes destructor* Newstead, *Ceroplastes floridensis* Comstock, *Ceroplastes japonicus* Green, *Ceroplastes rubens* Maskell, *Ceroplastes rusci* (L.), *Ceroplastes sinensis* Del Guercio, *Ceroplastes zonatus* Newstead, *Chionaspis salicis* (L.), *Chrysomphalus aonidum* (L.), *Chrysomphalus dictyospermi* (Morgan), *Coccus africanus* (Newstead), *Coccus colemani* Kannan, *Coccus hesperidum* L., *Coccus longulus* (Douglas), *Coccus viridis* (Green), *Comstockiella sabalis* (Comstock), *Cryptes baccatus* (Maskell), *Cryptoccus fagisuga* Lindinger, *Drosicha corpulenta* (Kuwana), *Dysmicoccus brevipes* (Cockerell), *Duplachionaspis saccharifolii* (Zehntner), *Ehrhornia cupressi* (Ehrhorn), *Ericerus pela* Chavannes, *Eriococcus casuarinae* (Maskell), *Eriococcus coriaceus* Maskell, *Eriococcus ironsidei* Williams, *Eriococcus leptospermi* Maskell, *Eulecanium kunoensis* Kuwana, *Eulecanium tiliae* (L.), *Filippia oleae* Costa, *Fiorinia theae* (Green), *Gossyparia casuarinae* Maskell, *Gossyparia spuria* (Modeer), *Hemiberlesia lataniae* (Signoret), *Hemiberlesia rapax* (Comstock), *Icerya purchasi* Maskell, *Inchoaspis dentilobis* (Newstead), *Inglisia conchiformis* Newstead, *Ischnaspis longirostris* (Signoret), *Kermes ilicis* (L.), *Kermes miyasakii* Kuwana, *Kermes nakagawae* Kuwana, *Lepidosaphes afganensis* Borschsenius, *Lepidosaphes beckii* (Newman), *Lepidosaphes conchiformis* (Gmelin), *Lepidosaphes gloverii* (Packard), *Lepidosaphes olivina* Leonardi, *Lepidosaphes ulmi* (L.), *Leucaspis* sp., *Lineaspis striata* (Newstead), *Mesolecanium nigrofasciatum* (Pergande), *Miscanthaspis tegalensis* (Zehntner), *Monophebulus* sp., *Nelaspis humilis* (Brain), *Nipaecoccus aurilanatus* (Maskell), *Nipaecoccus filamentosus* (Cockerell), *Nipaecoccus nipae* (Maskell), *Paralecanium frenchii* (Maskell), *Parlatoria blanchardi* (Targioni-Tozzetti), *Parlatoria oleae* (Colvee), *Parlatoria pergandii* Comstock, *Parlatoria proteus* (Curtis), *Parlatoria ziziphi* Lucas, *Parthenolecanium corni* Bouche, *Parthenolecanium persicae* (F.), *Parthenolecanium quercifex* (Fitch), *Phenacaspis grandilobis* (Maskell), *Phenacoccus solani* Ferris, *Pinnaspis strachani* (Cooley), *Planococcus citri* (Risso), *Planococcus kenyae* (LePelley), *Planococcus lilacinus* (Cockerell), *Pollinia pollini* (Costa), *Protopulvinaria mangiferae* (Green), *Pseudococcus longispinus* (Targioni-Tozzetti), *Pseudaonidia duplex* (Cockerell), *Pseudaonidia paeoniae* (Cockerell), *Pseudoparlatoria ostreata* (Cockerell), *Pulvinaria aurantii* (Cockerell), *Pulvinaria maxima* Green, *Pulvinaria okitsuensis* Kuwana, *Pulvinaria psidii* Maskell, *Quadraspidiotus ostreaeformis* (Curtis), *Saissetia coffeae* (Walker), *Saissetia oleae* (Olivier), *Unaspis yanonenis* (Kuwana).

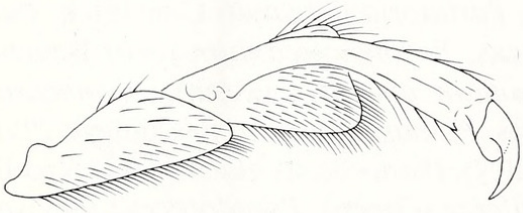
Chilocorus cacti (L.)

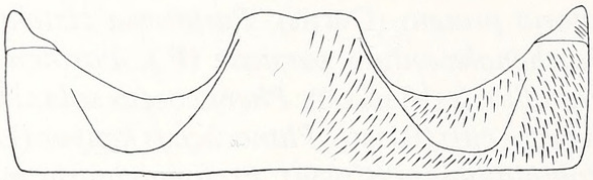
Coccinella cacti L., 1767:584.
Chilocorus cacti: Mulsant, 1850:459; Korschefsky, 1932:237; Gordon, 1985:646.
Chilocorus confusor Casey, 1899:105; Leng, 1908:36 (synonymy).
Chilocorus cacti confusor: Drea, 1956:76.

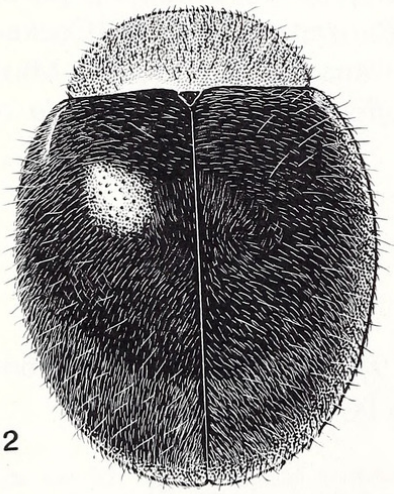
Diagnosis. Length 4.00 to 6.20 mm, width 3.60 to 5.20 mm. Form oval, convex. Color black except large transverse red spot on elytron (Fig. 52), mesosternum, metasternum, and abdomen yellow or red. Dorsal surface smooth, polished, punctures fine, distinct. Male genitalia as in Figures 53–55. Female genitalia as in Figure 56.











Figs. 56–62. *Chilocorus cacti, Rhyzobius lophanthae.* 56. *Chilocorus cacti,* female genitalia. 57. *Rhyzobius lophanthae,* antenna. 58. *Rhyzobius lophanthae,* maxillary palpus. 59. *Rhyzobius lophanthae,* prosternum. 60. *Rhyzobius lophanthae,* tarsus. 61. *Rhyzobius lophanthae,* 1st abdominal sternum. 62. *Rhyzobius lophanthae,* habitus.

World distribution. Northern South America, Central America, Mexico, and southern United States.

Bermuda distribution. Island wide, but patchy.

Bermuda temporal distribution. Adults present October through May.

Discussion. The red or yellow ventral surface (except prosternum) will separate *C. cacti* from other Western Hemisphere species of *Chilocorus.* This species was originally introduced into Bermuda in 1948 for control of cedar scale, but has become established on the palmetto scale, *Comstockiella sabalis* (Comstock).

Genus *Rhyzobius* Stephens

Rhyzobius Stephens, 1829:239; Pope, 1981:22; Gordon, 1985:659. Type-species: *Nitidula litura* F., by monotypy.

Rhizobius Stephens, 1832:373 (error); Leng, 1920:214 Korschefsky, 1931:88; Blackwelder, 1945:443.

Rhizobius Agassiz, 1846:325 (unjustified emendation).

Lindorus Casey, 1899:161; Leng, 1920:214; Blackwelder, 1945:443; Pope, 1981:22. Type-species: *Scymnus lophanthae* Blaisdell, by monotypy.

Rhizobiellus Oke, 1951:21 (unnecessary replacement name for *Rhizobius* Agassiz, 1846 not Burmeister, 1835).

Coccidulini with form elongate or oval; dorsal pubescence composed of dense, decumbent hairs with sparse, erect hairs intermixed. Antenna long, slender, 11-segmented, club serrate (Fig. 57). Head partly concealed beneath pronotum; eye moderately coarsely faceted; apical segment of maxillary palpus securiform (Fig. 58). Prosternum with carinae widely separated, usually not joined apically (Fig. 59). Epipleuron narrow, not descending externally. Tarsus cryptotetramerous; tarsal claw not toothed, slightly angulate at base (Fig. 60), or appendiculate at least on hind leg. Postcoxal line on first abdominal sternum complete, as in *Pullus* (Fig. 61).

The partly concealed head and dual type of pubescence distinguish *Rhyzobius* from the genera of Western Hemisphere Coccidulini which it superficially resembles. The species that has been widely established in other parts of the Western Hemisphere also occurs on Bermuda. Species of *Rhyzobius* (at least the Australian species) are apparently scale feeders on *Aonidiella aurantii* (Maskell), *Chrysomphalus dictyospermi* (Morgan), *Coccus hesperidum* L., *Fiorinia theae* Green, *Planococcus citri* (Risso), *Pseudaulacaspis pentagona* (Targioni-Tozzetti), *Pseudococcus acaciae* (Maskell), *Pseudococcus calceolariae* (Maskell), *Pseudococcus maritimus* (Ehrhorn), *Quadraspidiotus perniciosus* (Comstock), and *Saissetia oleae* (Olivier). The European *Rhyzobius litura* (F.) has been recorded as feeding on the aphids *Dactynotus cirsii* (L.), *Dactynotus jaceae* (L.), and *Macrosiphum avenae* (F.).

Rhyzobius lophanthae (Blaisdell)

Scymnus lophanthae Blaisdell, 1892:51.

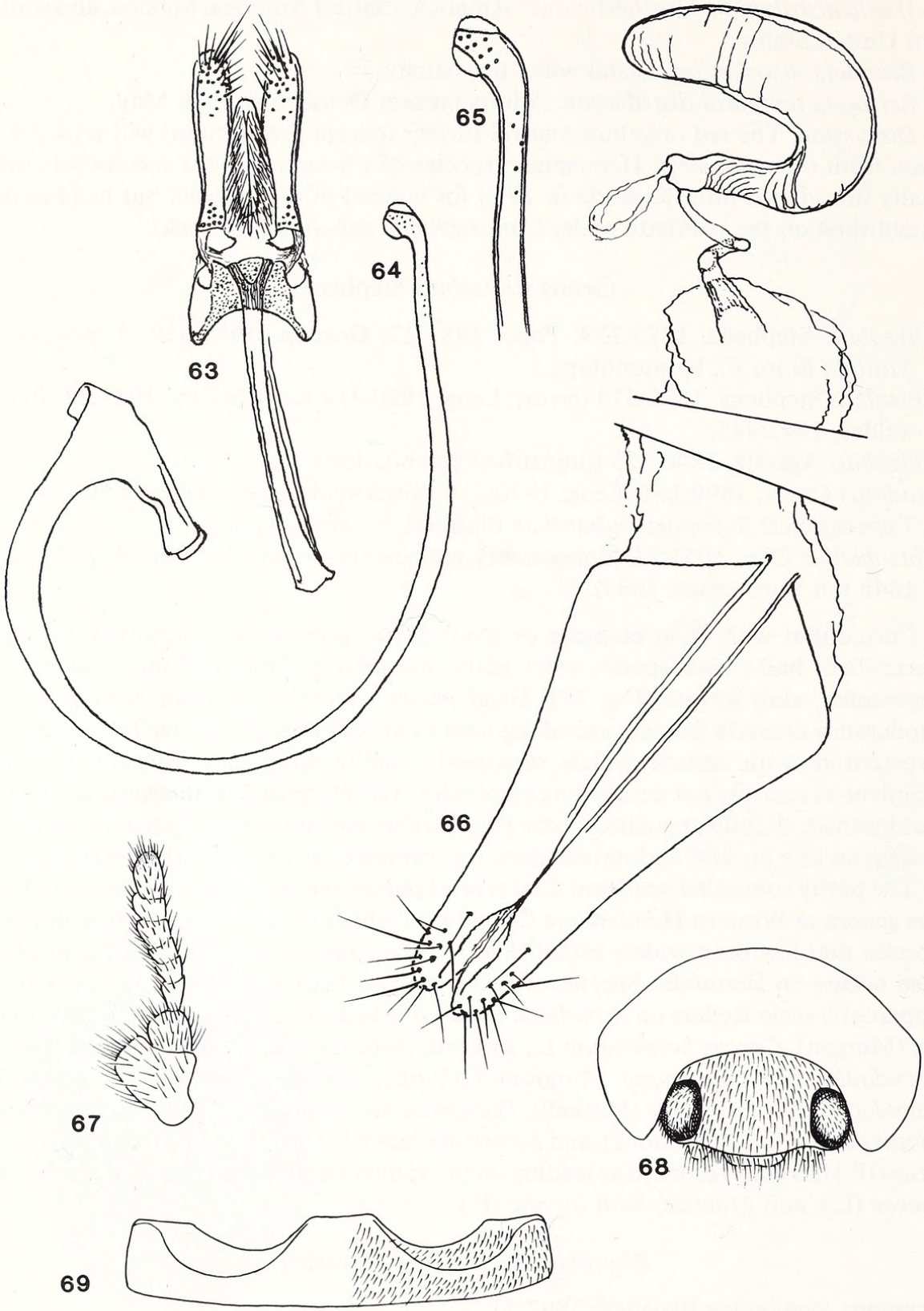
Rhizobius lophanthae: Horn, 1895:112.

Lindorus lophanthae: Casey, 1899:162; Korschefsky, 1931:86.

Lindorus lophantae: Leng, 1920:214 (misspelling).

Rhizobius toowoombae Blackburn, 1892:254; Korschefsky, 1931:86 (synonymy).

Rhyzobius lophanthae: Pope, 1981:22; Gordon, 1985:660.



Figs. 63–69. *Rhyzobius lophanthae, Rodolia cardinalis.* 63–65. *Rhyzobius lophanthae,* male genitalia. 66. *Rhyzobius lophanthae,* female genitalia. 67. *Rodolia cardinalis,* antenna. 68. *Rodolia cardinalis,* head. 69. *Rodolia cardinalis,* 1st abdominal sternum.

Diagnosis. Length 1.70 to 2.85 mm, width 1.35 to 2.00 mm. Form elongate, oval (Fig. 62). Color; pronotum light reddish brown, elytron dark reddish brown with faint, green metallic tint. Dorsal pubescence composed of dense, short, decumbent setae with long, sparse, erect setae intermixed. Male genitalia as in Figures 63–65. Female genitalia as in Figure 66.

World distribution. Native to Australia, introduced into many parts of the world; established in southern United States from Maryland to Florida, west to California.

Bermuda distribution. Island wide.

Bermuda temporal distribution. Adults present September through June.

Discussion. The metallic dorsal sheen and intermixed long and short pubescence will distinguish *R. lophanthae* from other Bermuda coccinellids. This species was introduced into Bermuda for control of cedar scale in 1947, 1948, and 1951, and has become well established and abundant on that host; at certain times of the year it is the commonest coccinellid on the island. For many years this species was known as *Lindorus lophanthae* but was assigned to *Rhyzobius* by Pope (1981).

Genus *Rodolia* Mulsant

Rodolia Mulsant, 1850:902; Korschefsky, 1931:98; Blackwelder, 1945:443; Gordon, 1972b:25; Gordon, 1985:665. Type-species: *Rodolia ruficollis* Mulsant, by subsequent designation of Crotch, 1874.

Rodolia (*Macronovius*) Weise, 1885:63.

Noviini with 8-segmented antenna as in Figure 67. Labrum flat or concave, anterior margin usually feebly emarginate (Fig. 68). Postcoxal line on first sternum complete (Fig. 69); 6th sternum of male with strong apical emargination.

Rodolia cardinalis, the only species of *Rodolia* occurring in the Western Hemisphere, was introduced into California from Australia in 1888 for control of the cottonycushion scale, *Icerya purchasi* Maskell. It has since been introduced and become established in many parts of the world including Bermuda. Species of *Rodolia* prey primarily on scales of the genus *Icerya.* Recorded hosts include *Icerya purchasi* Maskell, *Icerya seychellarum* (Westwood), *Pseudococcus* sp., and *Pseudaulacaspis pentagona* (Targioni-Tozzetti).

Rodolia cardinalis (Mulsant)

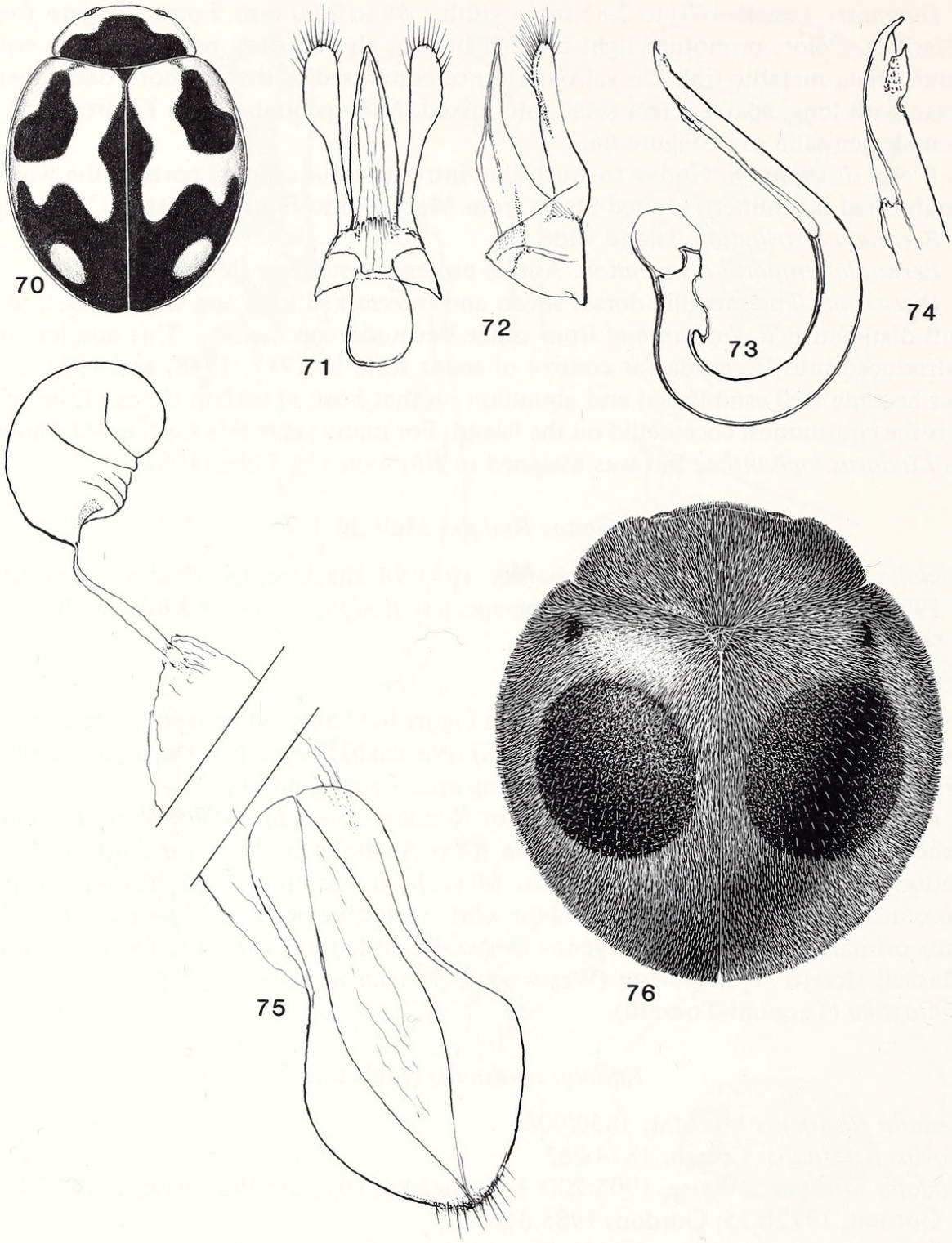
Vedalia cardinalis Mulsant, 1850:906.

Novius cardinalis: Crotch, 1874:283.

Rodolia cardinalis: Weise, 1905:200; Korschefsky, 1931:99; Blackwelder, 1945:443; Gordon, 1972b:25; Gordon, 1985:666.

Diagnosis. Length 2.65 to 4.18 mm, width 2.00 to 3.33 mm. Form elongate, elytron nearly parallel sided, widest at middle. Color predominantly red; basal area of pronotum and head black; meso- and metasternum, femur and median area of basal 2 abdominal sterna piceous; elytron with black maculation (Fig. 70). Male genitalia as in Figures 71–74. Female genitalia as in Figure 75.

World distribution. Native to Australia, introduced into many parts of the world; established in the United States in California and Florida and scattered areas of the southern United States.



Figs. 70–76. *Rodolia cardinalis, Azya orbigera.* 70. *Rodolia cardinalis,* habitus. 71–74. *Rodolia cardinalis,* male genitalia. 75. *Rodolia cardinalis,* female genitalia. 76. *Azya orbigera,* habitus.

Bermuda distribution. Island wide, but patchy.

Bermuda temporal distribution. Adults present January through May.

Discussion. The dorsal color pattern and pubescence will distinguish *R. cardinalis* from other species of Bermuda Coccinellidae. This species was introduced into Ber-

muda in 1902 for control of the cottonycushion scale, *Icerya purchasi* (Maskell). It became established but is found only in some places on the island and only where cottonycushion scale occurs. *Pittosporum* is the most common host infested with this scale.

Genus *Azya* Mulsant

Azya Mulsant, 1850:928; Korschefsky, 1932:230; Gordon, 1980:155; Gordon, 1985: 674. Type-species: *Azya luteipes* Mulsant, by subsequent designation of Crotch, 1874.

Azyini with length ranging from 2.90 to 4.40 mm. Form oval. Dorsal surface black, often with metallic luster, male head yellow; dorsal pubescence dense, appressed, short or long, usually white with spot on elytron composed of brown hairs. Venter usually black or piceous except leg and abdomen yellow. Antenna 11-segmented. Epipleuron foveate for reception of femoral apices. Prosternum lobed anteriorly, partially concealing mouthparts, deeply excavated at side for reception of antenna; intercoxal lobe elevated, narrow, bicarinate or medially ridged. Anterior tibia with dually rounded external border. Male genitalia with paramere slender; apex of sipho slender, with ventral flap before apex. Female genitalia with cornu of spermathecal capsule broader than nodulus; genital plate extremely elongate, triangular.

Azya is native to the Western Hemisphere south of the United States, and one species, *A. orbigera,* has been introduced into many parts of the world, including Bermuda, for biological control purposes. Specific host records for this scale feeding genus are as follows: *Asterolecanium bambusae* (Boisduval), *Asterolecanium miliaris* (Boisduval), *Aulacaspis tubercularis* (Newstead), *Coccus viridis* (Green), *Dysmicoccus brevipes* (Cockerell), *Ferrisia virgata* (Cockerell), *Lecanium* sp., *Lecanium viride* Green, *Parasaissetia nigra* (Nietner), *Pseudococcus* sp., *Saissetia coffeae* (Walker), *Saissetia oleae* (Olivier), and *Selenaspidius* sp.

Azya orbigera orbigera Mulsant

Azya orbigera Mulsant, 1850:930; Korschefsky, 1932:230.
Azya orbigera orbigera: Gordon, 1980:157; Gordon, 1985:676.
Azya luteipes: Blackwelder, 1945:451; Woodruff and Sailer, 1977:1 (not *luteipes* Mulsant, 1850).

Diagnosis. Length 2.90 to 4.25 mm, width 2.50 to 3.45 mm. Form oval. Dorsum greenish black; head of male yellow; each elytron with round discal spot (Fig. 76). Venter black except leg and abdomen yellow. Male genitalia as in Figures 77–79.

World distribution. Native to South America, introduced into many parts of the world; established in the United States only in Florida.

Bermuda distribution. Devonshire Parish; Paget Parish; Smiths Parish; Pembroke Parish. Distribution very patchy.

Bermuda temporal distribution. Adults present year round but most abundant in the warmer months.

Discussion. The presence of a round, dark spot on each elytron and the dually rounded external border of the anterior tibia distinguish *Azya orbigera* from other Bermuda coccinellids. This species was introduced into Bermuda in 1956 and 1957

for control of the green shield scale, *Pulvinaria psidii* Maskell. It became established and is locally found feeding on a variety of scales including green scale, *Coccus viridis* (Green), oleander pit scale, *Asterolecanium pustulans* (Cockerell), and nigra scale, *Parasaissetia nigra* (Nietner).

Genus *Naemia* Mulsant

Naemia Mulsant, 1850:30; Crotch, 1874:92; Brown and de Ruette, 1962:644; Gordon, 1985:693. Type-species: *Coccinella seriata* Melsheimer by subsequent designation of Crotch, 1874.

Coccinellini with length 4.00 to 6.70 mm. Form elongate, somewhat flattened, femur visible beyond lateral margin of elytron. Dorsal color yellow with strong, variable, black maculae. Apex of clypeal margin broadly emarginate, anterolateral angle produced forward. Base of pronotum finely margined. Lateral margin of elytron feebly reflexed; epipleuron nearly flat, sloping downward slightly internally. Intercoxal process of prosternum narrow, feebly convex, lacking carinae but with fine lateral ridge. Metasternum with postcoxal line. Middle and hind tibia each with 2 spurs. Tarsal claw widened basally, not toothed (Fig. 80). Postcoxal line on abdomen lacking. Male genitalia symmetrical. Female genitalia with small infundibulum; coxal plate elongate, stylus distinct.

Naemia is a New World genus containing a single species occurring in eastern North America and from southern California south to Colombia. This species is established on Bermuda. Members of *Naemia* are supposedly aphid predators, but no specific host data are available.

Naemia seriata seriata (Melsheimer)

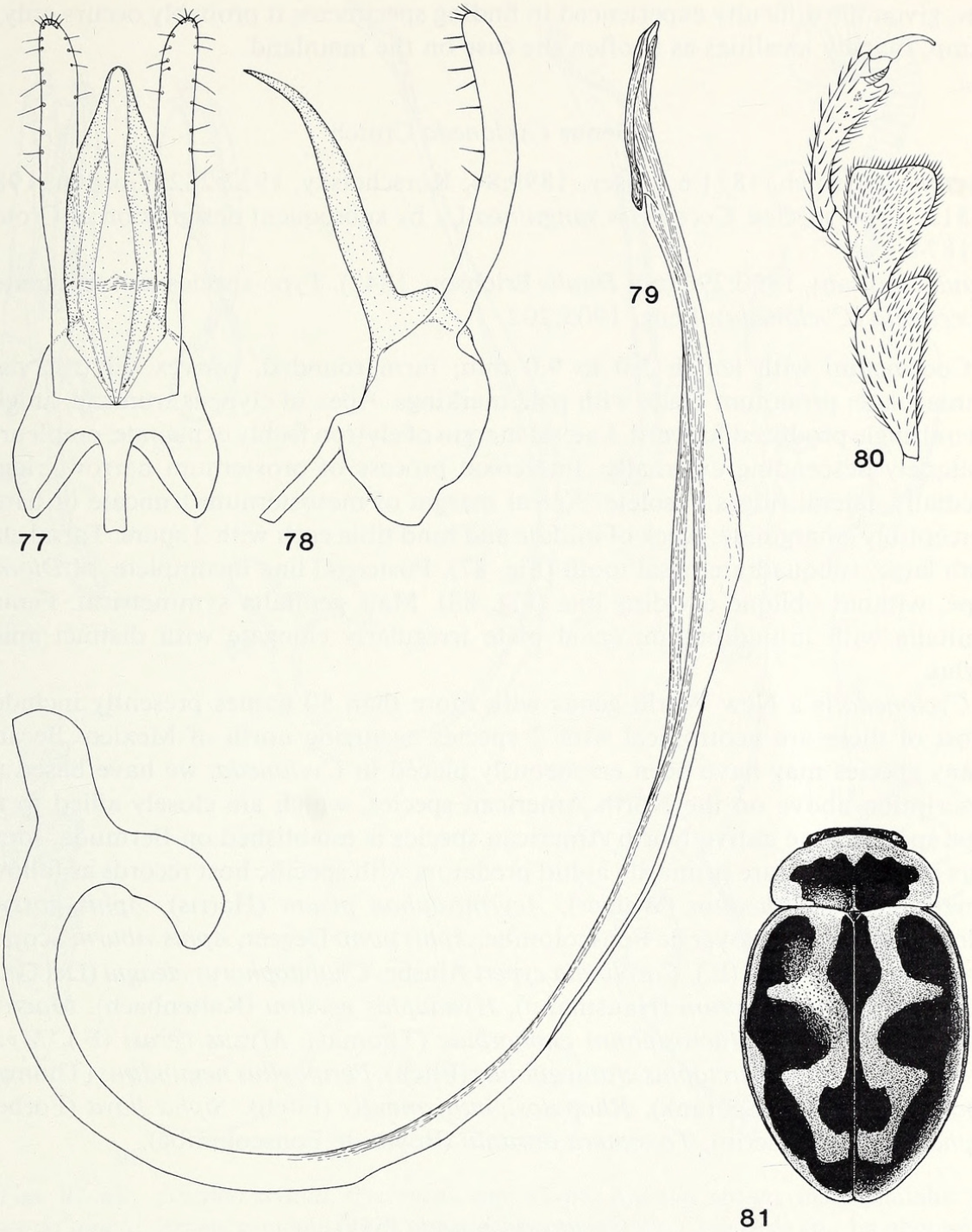
Coccinella seriata Melsheimer, 1847:177.
Anisosticta seriata: LeConte, 1852:130; Crotch, 1873:369; Leng, 1903:37.
Naemia seriata: Mulsant 1866:21; Crotch, 1874:92; Gorham, 1891:152; Casey, 1899: 76; Leng, 1920:215; Korschefsky, 1932:317; Timberlake, 1943:9.
Naemia seriata seriata: Timberlake, 1943:46; J. Chapin, 1974:56; Gordon, 1985: 694.
Megilla fuscilabris decepta Blatchley, 1914:64.
Ceratomegilla fuscilabris a. *decepta*: Leng, 1920:215.
Ceratomegilla maculata ab. *decepta*: Korschefsky, 1932:313.
Naemia seriata decepta: Timberlake, 1943:9, 46.

Diagnosis. Length 4.00 to 6.70 mm, width 2.50 to 3.10 mm. Head black; pronotum typically yellow with an irregular, black, central macula (Fig. 81), but many southern United States specimens have macula broken into ill-defined spots; elytron yellow with 6 black spots more or less fused in northern specimens (typical form). Ventral surface including leg black except prosternum and lateral abdominal margin yellow. Male genitalia as in Figures 82–85. Female genitalia as in Figure 86.

World distribution. North America; Atlantic and Gulf coasts, Rhode Island to south Texas.

Bermuda distribution. Camden Marsh; Spittal Pond, Smiths Parish.

Bermuda temporal distribution. Unknown.



Figs. 77–81. *Azya orbigera, Naemia seriata.* 77–79. *Azya orbigera,* male genitalia. 80. *Naemia seriata,* tarsus. 81. *Naemia seriata,* habitus.

Discussion. The pink or pinkish yellow dorsal surface with bold black maculae distinguishes *N. s. seriata* from other Bermuda Coccinellidae. This species was not intentionally introduced onto the island but is probably a wind blown immigrant from coastal United States. Adult specimens were collected at Camden Marsh (now filled in) in 1955, a larval specimen was collected at Spittal Pond in June, 1987, and one adult was collected at Spittal Pond in 1987. Population density is apparently

low, given the difficulty experienced in finding specimens; it probably occurs only in damp, marshy localities as is often the case on the mainland.

Genus *Cycloneda* Crotch

Cycloneda Crotch, 1871:6; Casey, 1899:84; Korschefsky, 1932:282; Gordon, 1985: 819. Type-species: *Coccinella sanguinea* L., by subsequent designation of Crotch, 1874.
Daulis Mulsant, 1850:296 (not *Daulis* Erichson, 1842). Type-species: not designated.
Coccinella (*Cycloneda*): Leng, 1903:202.

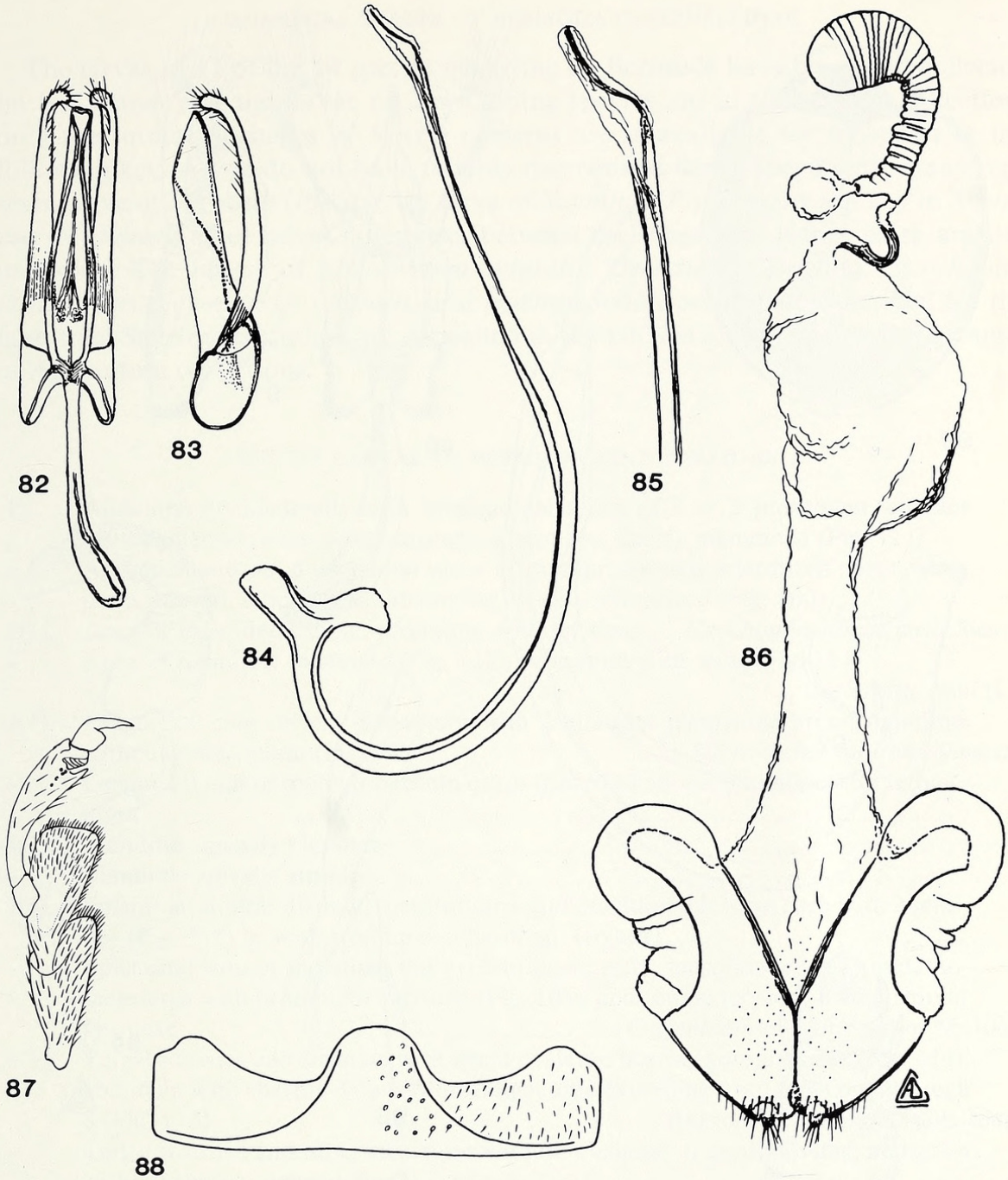
Coccinellini with length 3.0 to 9.0 mm; form rounded, convex. Elytron pale, immaculate; pronotum black with pale markings. Apex of clypeus truncate, anterolateral angle produced forward. Lateral margin of elytron feebly explanate; epipleuron obliquely descending externally. Intercoxal process of prosternum narrow, ridged medially, lateral ridges obsolete. Apical margin of mesosternum truncate or barely perceptibly emarginate. Apex of middle and hind tibia each with 2 spurs. Tarsal claw with large, subquadrate basal tooth (Fig. 87). Postcoxal line incomplete, of *Diomus* type, without oblique dividing line (Fig. 88). Male genitalia symmetrical. Female genitalia with infundibulum; coxal plate irregularly elongate with distinct apical stylus.

Cycloneda is a New World genus with more than 50 names presently included. Most of these are neotropical with 3 species occurring north of Mexico. Because many species may have been erroneously placed in *Cycloneda,* we have based the description above on the North American species, which are closely allied to the type species. One native North American species is established on Bermuda. Members of *Cycloneda* are primarily aphid predators with specific host records as follows: *Acyrthosiphon dirhodum* (Walker), *Acyrthosiphon pisum* (Harris), *Aphis gossypii* Glover, *Aphis nerii* Boyer de Fonscolombe, *Aphis pomi* Degeer, *Aphis viburni* Scopoli, *Brevicoryne brassicae* (L.), *Carolinaia cyperi* Ainslie, *Chapitophorus eleagni* (Del Guercio), *Eriosoma lanigerum* (Hausmann), *Hyadaphis erysimi* (Kaltenbach), *Macrosiphum avenae* (F.), *Macrosiphum euphorbiae* (Thomas), *Myzus cerasi* (F.), *Myzus persicae* (Sulzer), *Nearctaphis crataegifoliae* (Fitch), *Periphyllus negundinis* (Thomas), *Phorodon humuli* (Schrank), *Rhopalosiphum maidis* (Fitch), *Sipha flava* (Forbes), *Sipha maydis* Passerini, *Toxoptera aurantii* (Boyer de Fonscolombe).

Cycloneda munda (Say)

Coccinella munda Say, 1835:202.
Daulis munda: Mulsant, 1850:324.
Cycloneda munda: Crotch, 1871:6; Casey, 1899:93; Korschefsky, 1932:284; Gordon, 1985:824.
Coccinella (*Cycloneda*) *sanguinea* var. *munda*: Leng, 1903:203.

Diagnosis. Length 3.70 to 5.70 mm, width 3.10 to 4.20 mm. Pronotum mostly black with lateral pale spot not completely enclosed by black area, or with separate black spot laterally (Fig. 89); elytron reddish yellow. Male genitalia as in Figures 90–93. Female genitalia as in Figure 94.



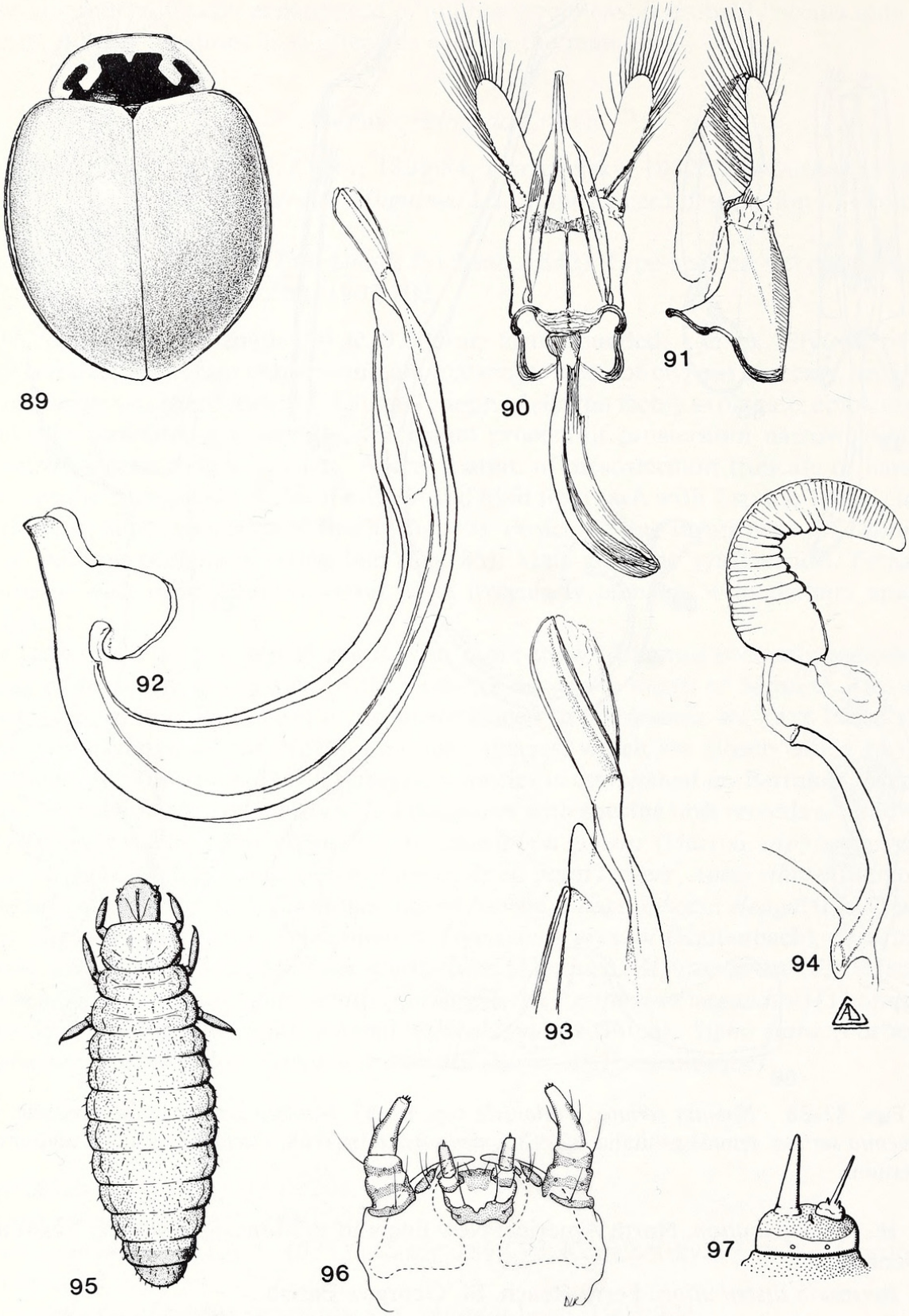
Figs. 82–88. *Naemia seriata, Cycloneda* spp. 82–85. *Naemia seriata,* male genitalia. 86. *Naemia seriata,* female genitalia. 87. *Cycloneda* sp., tarsus. 88. *Cycloneda* sp., 1st abdominal sternum.

World distribution. North America; New England to Montana, south to Texas and Georgia.

Bermuda distribution. Ferry Reach, St. George's Parish.

Bermuda temporal distribution. Adults present June through August.

Discussion. The entirely reddish yellow elytra and pronotal color pattern are unique among Bermuda Coccinellidae. This aphid feeding species was first recorded from Bermuda by Ogilvie (1928) and was probably not intentionally introduced. It is now found at only one locality on the island.



Figs. 89–97. *Cycloneda munda,* larval illustrations. 89. *Cycloneda munda,* habitus. 90–93. *Cycloneda munda,* male genitalia. 94. *Cycloneda munda,* female genitalia. 95. *Microweisea misella,* habitus. 96. *Microweisea suturalis,* mouthparts. 97. *Microweisea* sp., antenna.

IMMATURE STAGES OF BERMUDA COCCINELLIDAE

The larvae of 11 of the 14 species occurring on Bermuda have been field collected on the island, and the larvae of 2 remaining species are in the USNM collection; only the immature stages of *S.* (*P.*) *creperus* are unavailable for inclusion in the following key. As we do not have reliably determined larval specimens of any representative of *Scymnus* (*Pullus*), the larva of *Scymnus* (*P.*) *creperus* will key to *Scymnus* (*S.*) *floralis* since larval differences between the subgenera, if they exist, are still unknown. The larvae of *Microweisea suturalis, Decadiomus hughesi, Exochomus jamaicensis, Scymnus* (*S.*) *floralis,* and *Naemia seriata seriata* are described for the first time. Specimens studied are deposited in the USNM and Bermuda Department of Agriculture collections.

KEY TO LARVAE OF BERMUDA COCCINELLIDAE

1. Abdomen dorsolaterally with longitudinal series of 2 or 3 prominent, circular intersegmental pores; pores strongly sclerotized, darkly pigmented (Fig. 111) 2
– Abdomen without dorsolateral series of circular, strongly sclerotized pores; when pores present, elliptical to subcircular, weakly sclerotized (Fig. 100) 3
2(1). Apex of mandible simple; pronotum without senti .. *Exochomus jamaicensis* Sicard
– Apex of mandible bidentate (Fig. 112); pronotum with senti (Fig. 111) .... *Chilocorus cacti* (L.)
3(1). Length 2.0 mm or less; pronotum with 2 elongate pigmented areas; mandible without retinaculum (Fig. 98) ..... *Microweisea suturalis* Schwarz
– Length 2.0 mm or more; pronotum not as described above; mandible with retinaculum 4
4(3). Mandible apically bidentate 5
– Mandible apically simple 8
5(4). Epicranial sutures distinct; mesothoracic and metathoracic terga each with 2 sclerites (Fig. 118) or with structures other than verrucae 6
– Epicranial sutures indistinct but evident posteriorly; mesothoracic and metathoracic terga with prominent verrucae (Fig. 108); abdominal tergae 1–8 with similar verrucae ..... *Cryptolaemus montrouzieri* Mulsant
6(5). Tergal sclerites and strumae with small chalazae bearing gomphosetae (Fig. 113); abdomen with sharply defined dorsal light area extending from terga one through 3 (Fig. 113) ..... *Rhyzobius lophanthae* (Blaisdell)
– Tergal sclerites and other structures without chalazae or gomphosetae; abdomen without sharply defined dorsal light area 7
7(6). Tibiotarsal claw simple, without basal tooth or rectangular base (Fig. 117) .... *Naemia seriata seriata* (Melsheimer)
– Tibiotarsal claw with basal tooth or rectangular base (Fig. 120) .... *Cycloneda munda* (Say)
8(4). Cardinal, submental, mental areas not fused into single composite structure, area membranous or nearly so (Fig. 99) 9
– Cardine, stipes, submental and mental areas fused into a solid sclerotized, pigmented structure with anterior extension on each side (Fig. 114) .... *Rodolia cardinalis* (Mulsant)
9(8). Hind margin of 9th abdominal sclerite with 2 pairs of strong, short, pointed setae (Fig. 107) ..... *Clitostethus arcuatus* (Rossi)
– Hind margin of 9th abdominal sclerite without strong, pointed setae 10
10(9). Abdominal terga with membranous or non-sclerotized strumae each bearing 2

chalazae with bases extremely small, setae subequal, short, apically truncate (Fig. 115) ..... *Azya orbigera* Mulsant

– Abdominal terga otherwise, or if membranous, strumae or verrucae with collar setae present, setae distinct and long 11

11(10). Maxillary palpus 3-segmented, with segments of palpus and palpifer distinct, sharply defined; abdominal terga without intersegmental pores ..... *Scymnus* (*Scymnus*) *floralis* Mulsant

– Maxillary palpus 2-segmented, palpifer and basal segment of palpus weakly sclerotized, often indistinct and poorly defined; abdomen dorsolaterally on each side with elliptical intersegmental pores (Fig. 109) 12

12(11). Mesopleura and metapleura with poorly defined anterior and posterior lobes; pleura of abdominal segments 1–8 slightly protuberant (Fig. 101) ..... *Decadiomus hughesi*, n. sp.

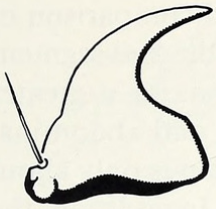
– Mesopleura and metapleura with sharply defined anterior and posterior lobes; pleura of abdominal segments 1–8 distinctly protuberant (Fig. 109) ..... *Diomus terminatus* (Say)

Microweisea suturalis (Schwarz)

Larval references: Boving, 1917:631; Gage, 1920:42.

Description, 4th (last) instar. Body elongate, fusiform, widest across 3rd abdominal segment; length 2.0 mm. Head elongate, parallel sided (Fig. 95), distinctly longer than broad; darkly pigmented dorsally and laterally, with sparse, long setae dorsally; ventral surface moderately pigmented, with narrow, pale strip ventrolaterally; epicranial suture pale, distinct, epicranial stem lacking. Clypeal area deeply hollowed out medially, lateral projection heavily sclerotized. Labrum lying inside hollowed out clypeal area, somewhat triangular apically, armed with 2 pairs of setae, basal pair much longer, more robust than anterior pair. Mandible falcate, simply pointed at apex, lacking receptaculum (Fig. 98). Cardo and stipes of maxilla fused, palpifer distinct; maxillary palpus composed of 3 articles, 3rd article curved inward, narrowed toward apex, with terminal sensillae; basal 2 articles pigmented in basal ½ (Fig. 96). Labial palpus composed of 2 articles, 2nd article elongate, rectangular, 3 times as long as basal segment, with 1 large and 1 small apical sensilla. Antenna of 1 short article, broader than long, pigmented in apical ½, bearing an elongate sensilla and 1 short sensilla (Fig. 97). Dorsum and pleuron of thoracic and abdominal segments densely covered with minute, pointed spicules intermixed with sparse, long, wide based setae, presenting a uniform gray appearance. Prothorax oval, rounded at sides, with 2 pigmented sclerites on each side of middle (Fig. 95). Meso- and metathorax without pigmented sclerites. Sternal areas of all thoracic segments glabrous; sternal areas of abdominal segments with minute spicules less dense than on terga. Thoracic and abdominal spicules small, round. Femur and tibiotarsus subequal in length; femur bearing 3 long setae, tibiotarsus bearing 4 short setae; apex of tibiotarsus with 2 long, paddle-like tenent hairs and appendiculate claw. Abdominal segment 10 cylindrical, directed caudo-ventrad; rectum evaginated to form sucking disc.

Larvae of species of *Microweisea* are very simple in structure, lacking the complicated thoracic and abdominal ornamentation of most other genera of Coccinellidae. The elongate, darkly pigmented head, pigmented prothoracic sclerites, and hollowed out clypeal area are unique to this genus, at least until the immature stages of other genera of the tribe Microweisini are described. The only other described



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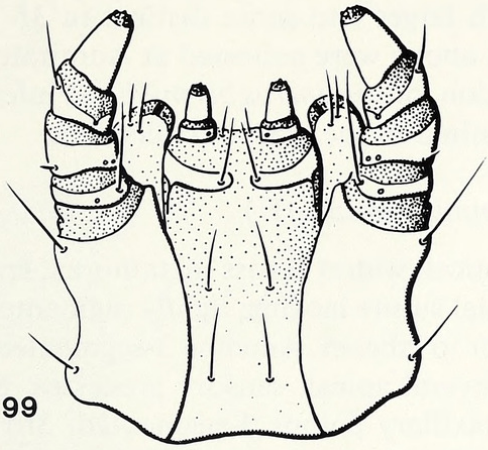

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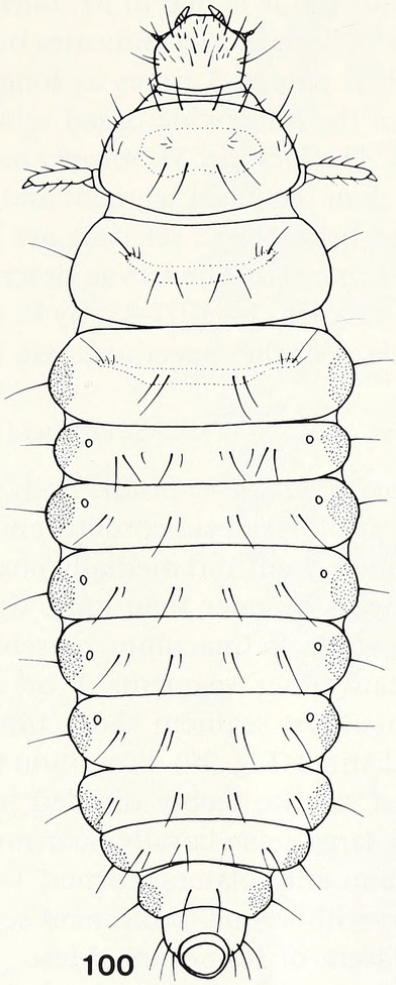

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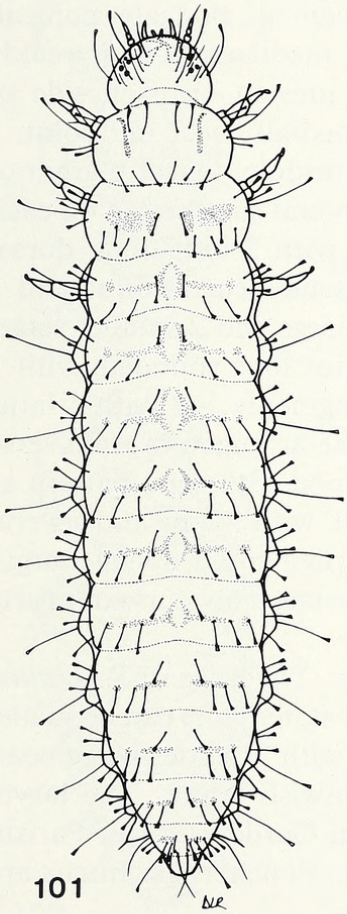

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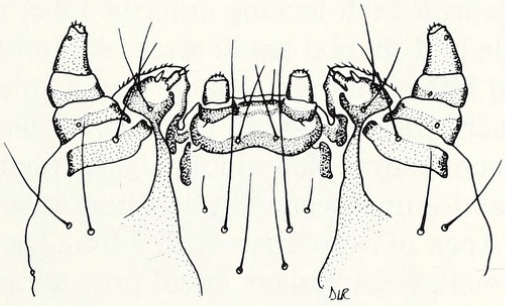

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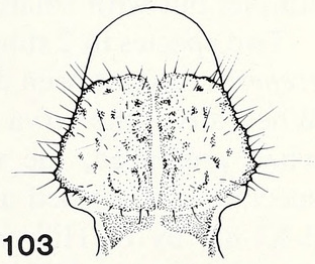

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Figs. 98–103. Larval illustrations. 98. *Microweisea* sp., mandible. 99. *Scymnus* sp., mouthparts. 100. *Scymnus* (*S.*) *floralis*, habitus. 101. *Decadiomus hughesi*, habitus. 102. *Exochomus jamaicensis*, mouthparts. 103. *Exochomus jamaicensis*, pronotum.

larva of this genus is that of *M. misella* (LeConte) (Gage, 1920), and comparison of the larvae of both species indicates that *M. suturalis* differs in having the 2nd segment of the labial palpus 3 times as long as the basal segment and in having a greater number of the long, wide based setae on the tergum of all thoracic and abdominal segments. The larva of *M. misella* has the 2nd article of the labial palpus only about ½ longer than the basal segment and the tergal setae less numerous. In addition, the pigmented prothoracic sclerites are much larger and more distinct in *M. suturalis* than in *M. misella*. The larvae described above were collected at Admiralty House, Pembroke Parish, 14-VIII-87, by R. Gordon, on *Juniperus bermudiana* infested with cedar scale. Voucher specimens are deposited in the USNM collection.

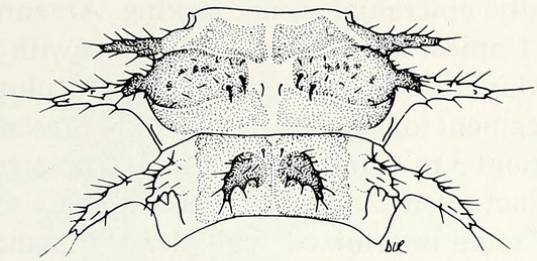
Scymnus (*Scymnus*) *floralis* (F.)

Description, 4th (last) instar. Body elliptical, widest across metathorax, length 3.75 mm (Fig. 100). Head subcordate; epicranial suture lacking; lightly pigmented behind each group of ocelli and medially posterior to labrum. Antenna 3-segmented, 1st and 2nd segments broader than long, with several apical, sensory processes. Mandible apically simple, retinaculum present. Maxillary palpus 3-segmented, 3rd segment longer than either segments 1 or 2, sclerotized; palpifer distinct. Labial palpus 2-segmented, 1st segment short, broader than long, 2nd segment elongate, conical; palpiger distinct (Fig. 99). Pronotum transverse, rectangular; median area with weakly pigmented sclerite feebly divided longitudinally, 5 setae present on each side of sclerite, 2 large setae basally near midpoint, 1 small seta medially near midpoint, 1 small seta at anterolateral corner, 1 small seta laterally at middle; apical margin of pronotum with 4 long, prominent setae; 1 large seta and several small setae on each lateral margin of pronotum. Meso- and metanotum each with 2 indistinct, dorsal sclerites, 1 on each side, each sclerite armed with 2 long setae near midline and 1 small lateral seta; each anterolateral angle with clump of 1 large and 2 smaller setae. Meso- and metapleuron each lacking anterior lobe; posterior lobe rounded, with 1 large seta at middle and several small setae. Abdominal segments 1–8 with 1 large and 1 small seta at lateral margin, 1 large and 2 small setae arranged in transverse row dorsally on each side of middle; each dorsal pleural lobe with setal pattern as on metapleuron; each ventral pleural lobe lightly pigmented, with 2 long and several short setae. Ninth abdominal segment transverse, distinctly pigmented, apical margin with 8 long setae. Apex of tibiotarsus with 2 long, clavate setae; claw curved, nearly simple, but with small, rectangulaar, basal projection.

Two species in 2 subgenera of *Scymnus* occur on Bermuda. The larva of *S.* (*Pullus*) *creperus* has not been discovered, therefore no comparative statements can be made. When alive, the larva of *S.* (*Scymnus*) *floralis* is covered with a white, waxy coat; when preserved, the wax dissolves and the larva is yellowish white. The larval specimens described above were collected at the Botanical Gardens, Paget Parish, 2-XI-87, by D. Hilburn, on hibiscus infested with aphids. Voucher specimens are deposited in the USNM collection.

Decadiomus hughesi Gordon and Hilburn

Description, 4th (last) instar. Body elliptical, widest across 2nd abdominal segment, length 2.40 mm (Fig. 101). Head transversely subrectangular with both extremely



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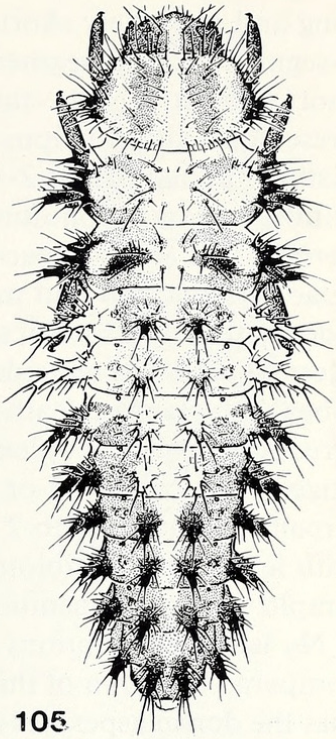

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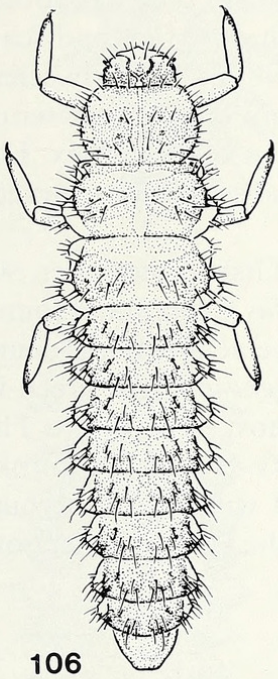

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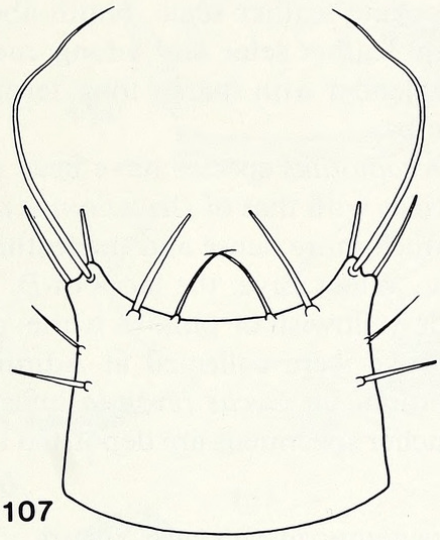

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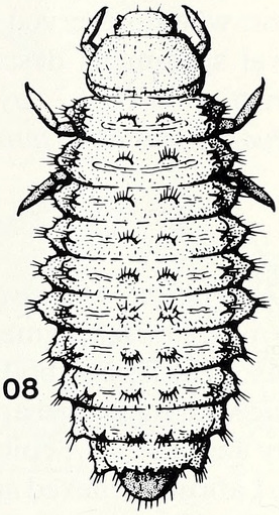

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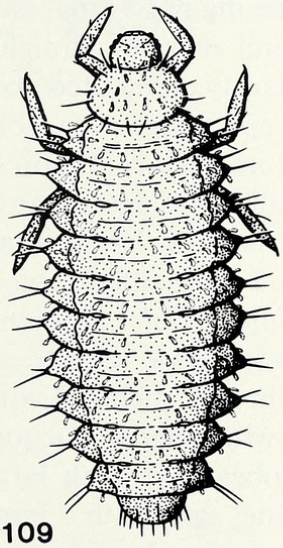

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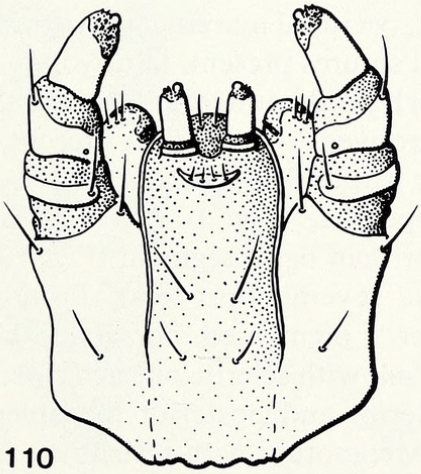

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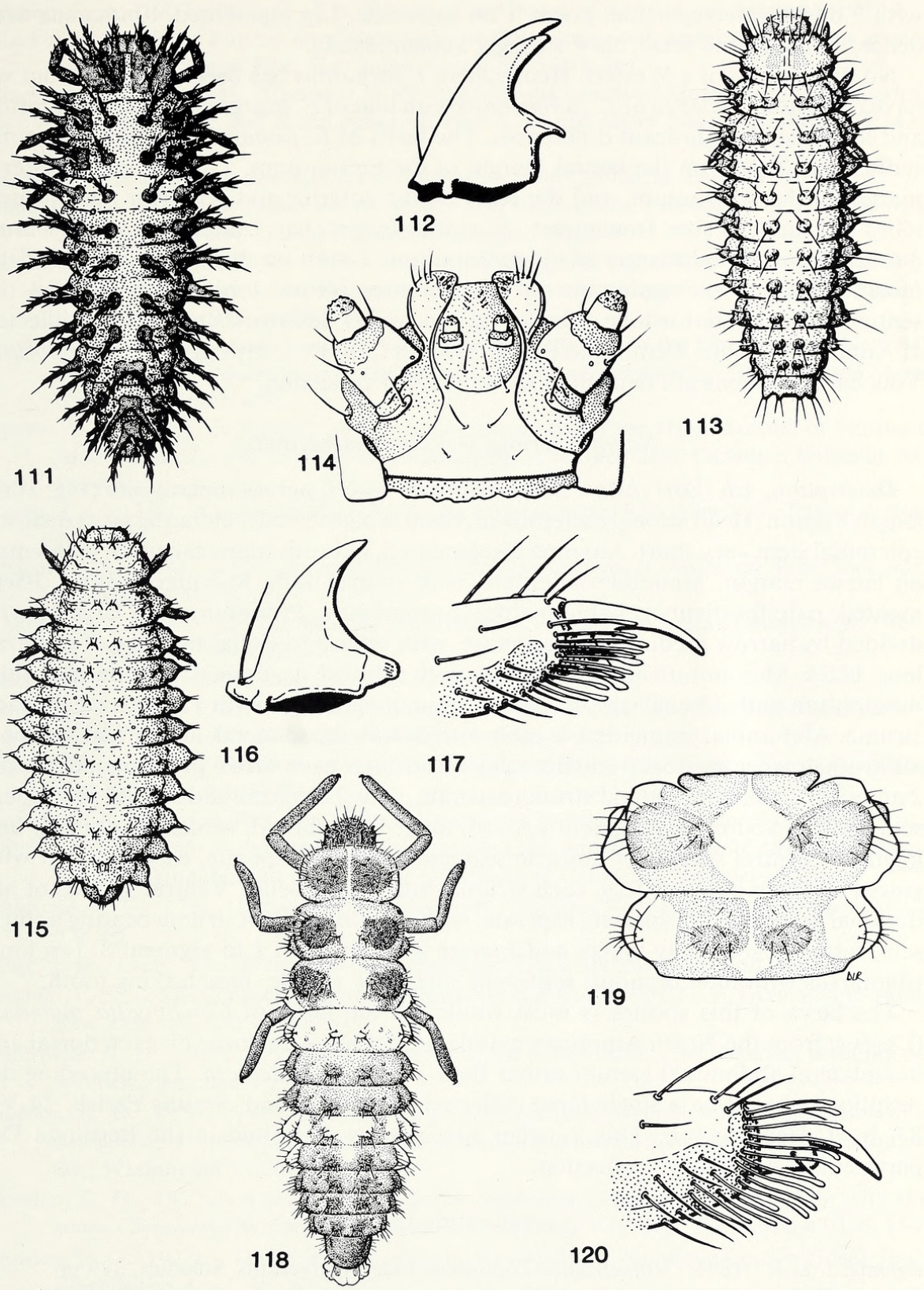
Figs. 104–110. Larval illustrations. 104. *Exochomus jamaicensis,* metanotum, 1st abdominal segment. 105. *Exochomus marginipennis,* habitus. 106. *Naemia seriata,* habitus. 107. *Clitostethus arcuatus,* terminal abdominal segment. 108. *Cryptolaemus montrouzieri,* habitus. 109. *Diomus roseicollis,* habitus. 110. *Diomus roseicollis,* mouthparts.

long and extremely short setae present dorsally; epicranial suture lacking. Antenna 2-segmented, 2nd segment very small, with 1 apical sensilla; basal segment with 1 short, robust sensilla and scattered setae. Mandible apically simple, retinaculum present. Maxillary palpus 2-segmented, 2nd segment longer than 1st, palpifer present, distinct. Labial palpus 2-segmented, 2nd segment 3 to 4 times as long as 1st, palpiger faintly evident. Pronotum with weak, indistinct sclerite on each side, with tiny asperities and widely spaced, clublike feather setae intermixed with slender feather setae. Mesonotum and metanotum each with 2 weak, indistinct sclerites, 1 on each side, with tiny asperities, short setae, sparse chalazae, and clublike feather setae. Mesopleuron and metapleuron each with poorly defined anterior and posterior lobes, lobes with elongate feather setae. Abdominal segments 1–8 with asperities and scattered, clublike setae; pleuron slightly protuberant, terminating in low, weakly sclerotized verruca with 3 or 4 elongate feather setae. Ninth abdominal segment semicircular, asperate, with 2 lateral feather setae and 6 long, median setae at apex. Leg with femur robust, tibiotarsus slender with sparse, long, terminal setae; claw curved, simple, without appendiculate base.

No larval descriptions of *Decadiomus* species have been published, however, we compared the larva of this species with that of *Decadiomus pictus* Chapin and found that the dorsal asperities are much more dense and the feather setae much less dense in *D. hughesi* than in *D. pictus*. When alive, the larva of *D. hughesi* is pale green in color, when preserved it is pale yellowish or pinkish white, almost transparent. The larval specimens described above were collected at Admiralty House, Pembroke Parish, 14-VIII-87, by R. Gordon, on *Cycas revoluta* infested with the mealybug, *Pseudococcus longispinus*. Voucher specimens are deposited in the USNM collection.

Exochomus jamaicensis Sicard

Description, 4th (last) instar. Body elongate oval, widest across metathorax; length 7.0 mm. Dorsal pigmentation composed of minute spicules forming individual patterns on different body segments. Head slightly elongate, lateral margins straight, somewhat narrowed apically; occipital margin nearly straight; darkly pigmented dorsally and laterally; epicranial sutures present, faintly indicated, epicranial stem lacking. Labrum deflexed anteriorly, with numerous long and short dorsal setae. Mandible apically simple, internally grooved, retinaculum present. Maxilla with fused cardo and stipes, distinct palpifer; palpus 3-segmented, 3rd segment narrow, longer than 2nd, bearing short sensory papillae (Fig. 102). Labial palpus 2-segmented, apical segment longer and narrower than basal segment (Fig. 102). Antenna of 1 segment, bearing 1 long sensillum and several short setae. Pronotum with large sclerite on each side, outer ½ pale, inner ½ pigmented, dorsal and lateral margins fringed with chalazae (Fig. 103). Mesonotum with sclerite on each side, each with 2 short, unequal senti on lateral margin; anterior and posterior mesopleural lobes each with large sentus nearly equal in size. Metanotum with sclerite on each side, each with 1 large sentus on lateral margin; anterior and posterior metaplerual lobes each with senti nearly equal in size; anterior metapleural sentus unpigmented, posterior sentus (Fig. 104). Abdominal segments 1–8 each with 6 senti (Fig. 106), dorsal senti of segment 8 longer than on other segments, all senti except mesopleural senti of segments 1 and 5–8 pigmented; 9th segment apically semicircular. Abdominal segments 1–8 each



Figs. 111–120. Larval illustrations. 111. *Chilocorus stigma,* habitus. 112. *Chilocorus* sp., mandible. 113. *Rhyzobius lophanthae,* habitus. 114. *Rodolia cardinalis,* mouthparts. 115. *Azya* sp., habitus. 116. *Azya* sp., mandible. 117. *Hippodamia* sp., tibiotarsal claw. 118. *Cycloneda* sp., habitus. 119. *Cycloneda munda,* metanotum, 1st abdominal segment. 120. *Coccinella* sp., tibiotarsal claw.

with 2 dorsal intersegmental pores, 1 on each side. Leg pigmented, tibiotarsus with dense, apical tactile setae, claw strongly appendiculate.

No description of a Western Hemisphere *Exochomus* has been published, but we have compared the larva of *E. jamaicensis* with that of *E. marginipennis* from Florida and found some significant differences. The larva of *E. jamaicensis* lacks a pronotal sentus, has 2 senti on the lateral margin of the mesonotum, 1 sentus on the lateral margin of the metanotum, and the senti on the anterior and posterior mesopleural lobes are equal in size. In contrast, *E. marginipennis* has 1 lateral pronotal sentus, 3 senti on the lateral margin of the mesonotum, 2 senti on the lateral margin of the metanotum, and the sentus on the anterior mesopleural lobe is smaller than the sentus on the posterior lobe. The larval specimens described above were collected at Admiralty House, Pembroke Parish, 26-V-87, by D. J. Hilburn, on *Pittosporum*. Voucher specimens are deposited in the USNM collection.

Naemia seriata seriata (Melsheimer)

Description, 4th (last) instar. Body fusiform, widest across metathorax (Fig. 106), length 8.5 mm. Head strongly sclerotized, basal ½ pigmented; epicranial arms distinct, epicranial stem very short. Antenna 2-segmented. Labrum subrectangular, pigmented on lateral margin. Mandible bidentate, with retinaculum. Maxillary palpus 3-segmented, palpifer distinct. Labial palpus 2-segmented. Pronotum with large sclerite divided by narrow median area, asperate, with setae and chalazae, setae of chalazae long, black. Mesonotum and metanotum with suboval, asperate struma on each side; mesonotum with 13 chalazae on each struma, metanotum with 12 chalazae on each struma. Abdominal segments 1–8 each with dorsal, dorsolateral, and lateral strumae; all strumae asperate; dorsal and dorsolateral strumae each with 4 prominent chalazae, 2 anterior, 2 posterior; lateral struma asperate, with 2 chalazae and several prominent setae. Ninth abdominal segment conical, longer than broad, setiferous dorsally and laterally. Ventral surface of thoracic segments sparsely asperate, each segment with paired strumae between legs, each struma with 2 long setae. Ventral surface of abdominal segments 1–3 sparsely asperate, with 4 strumae, each struma bearing a single seta, setae progressively longer and coarser from segment 1 to segment 8. Leg long, tibiotarsus with membranous, setiferous sole; claw simple, base lacking tooth.

The larva of this species is most similar to the larva of *Coleomgilla maculata* (Degeer) from the North American mainland, but has 4 chalazae on each dorsal and dorsolateral abdominal sterum rather than 3 as in *C. maculata*. The preceding description is based on a single larva collected at Spittal Pond, Smiths Parish, 24-VI-87, by J. Hendrickson. This voucher specimen is deposited in the Bermuda Department of Agriculture collection.

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