

# Larval systematics of North American *Cycloneda* Crotch (Coleoptera: Coccinellidae)

ROBERT D. GORDON and NATALIA VANDENBERG

Ent. scand.



Gordon, R. D. & Vandenberg, N.: Larval systematics of North American *Cycloneda* Crotch (Coleoptera: Coccinellidae). *Ent. scand.* 24: 301-312. Copenhagen, Denmark. October 1993. ISSN 0013-8711.

Fourth instar larvae of the three North American species of *Cycloneda* Crotch, *C. sanguinea* (L.), *C. munda* (Say), and *C. polita* Casey are described, keyed, illustrated, and compared with the congeneric South American *C. ancoralis* Mulsant and with examples from other New World coccinelline genera.

R. D. Gordon & N. Vandenberg, Systematic Entomology Laboratory, PSI, Agricultural Research Service, USDA, c/o U. S. National Museum of Natural History, Washington D. C., 20560 U.S.A.

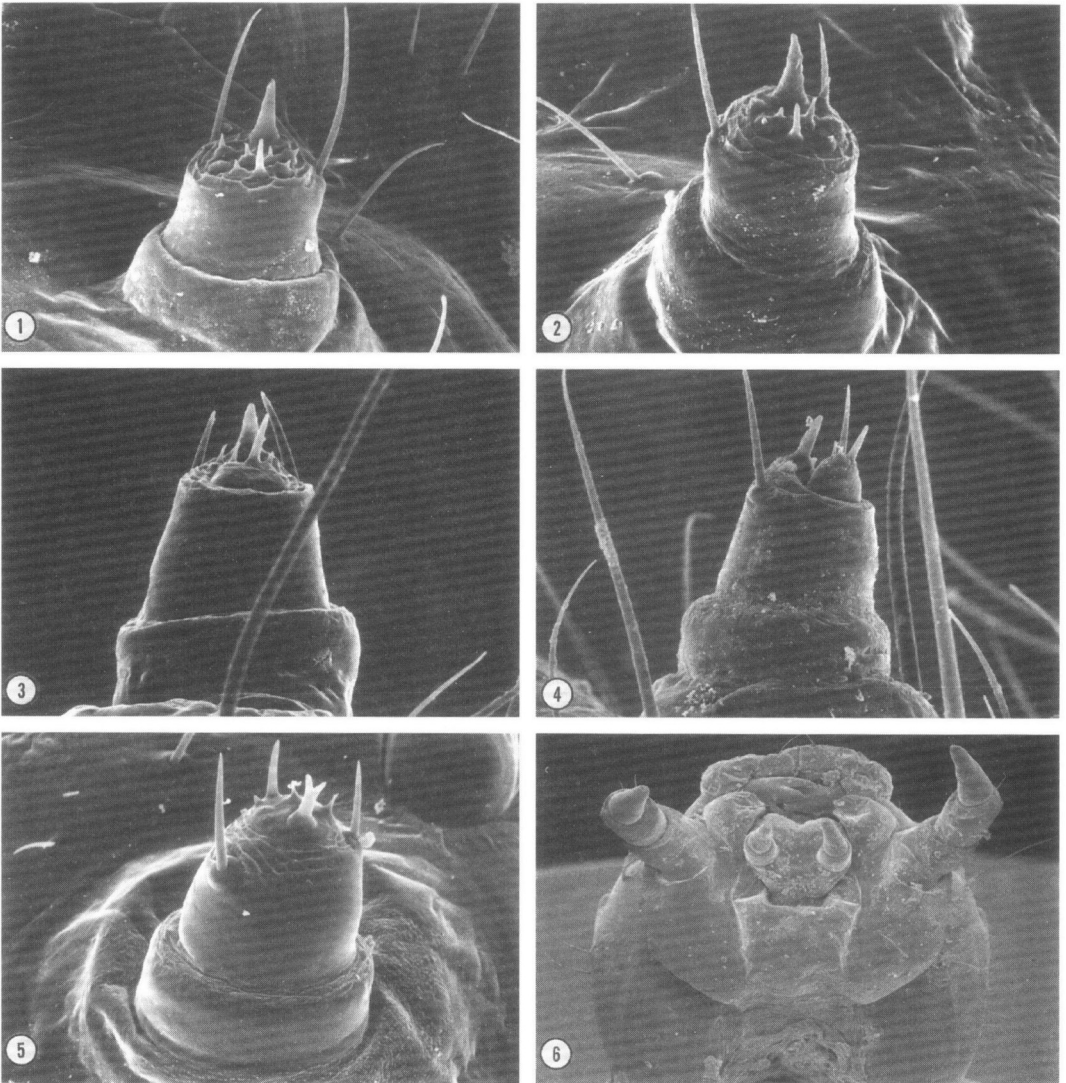
## Introduction

*Cycloneda* is a genus of New World lady beetles belonging to the Coccinellini. The genus is most diverse in temperate areas of Central and South America where it replaces the Holarctic *Coccinella* L. to which it is allied (Vandenberg & Gordon 1988). Like *Coccinella*, *Cycloneda* is primarily aphidophagous (Gordon 1985, Bosq 1952) and frequents grasses and herbs.

In North America three species of *Cycloneda* are recognized: *Cycloneda sanguinea* L., *C. munda* (Say), and *C. polita* Casey. *Cycloneda sanguinea* is subdivided into the continental *C. sanguinea sanguinea* (extending from the southern U.S. into much of Central and South America) and *C. sanguinea limbifer* Casey of the Bahamas, Caribbean islands, and southern Florida. Adults of these species were described and illustrated by Gordon (1985) and the genus included in a revised key to genera of North American Coccinellini by Gordon & Vandenberg (1991). This is the first time that larvae of all North American *Cycloneda* have been described and diagnosed in the same publication. Earlier works provided descriptions and sometimes even color plates or detailed line drawings of single species, but these were generally incorrectly identified. References to some useful works on *Cycloneda* larvae are included at the beginning of each species description.

## Materials and methods

Adults of all three North American species of *Cycloneda* were field collected, placed in culture, and reared to obtain the immature stages. *Cycloneda munda* adults were obtained and reared by R. V. Flanders of the APHIS laboratory, Niles, Michigan and adults of *C. sanguinea sanguinea* and *C. polita* were obtained and reared by the second author. The culture of *C. sanguinea sanguinea* originated from adults collected on fennel plants by C. A. Vandenberg in Santa Barbara, California. The culture of *C. polita* originated from adults collected by the second author on rose and hibiscus in Berkeley, California. Fourth instar larvae were utilized for generic and specific descriptions and accompanying illustrations; however, as there is little difference between third and fourth instars, third instar specimens can also be determined using the key and accompanying illustrations. Color photographs of live laboratory-reared specimens were used to describe larval color patterns because this useful field character is lost when specimens are preserved in alcohol. Larvae of *Cycloneda sanguinea limbifer* were described from a color illustration by J. Zeleny (Hodek 1973) and preserved specimens collected in Santiago de las Vegas, Cuba. The terms "dorsal", "dorsolateral," and "lateral" have been italicized and abbreviated throughout the descriptions when used to describe the position of setose abdominal



Figs 1-6. Antenna, mouthparts: (1) left antenna, *Cycloneda sanguinea*; (2) left antenna, *Cycloneda polita*; (3) left antenna, *Coccinella trifasciata*; (4) right antenna, *Hippodamia parenthesis*; (5) left antenna, *Eriopis* sp.; (6) mouthparts, *Cycloneda munda*.

processes. Terminology used throughout this paper follows that of Gage (1920).

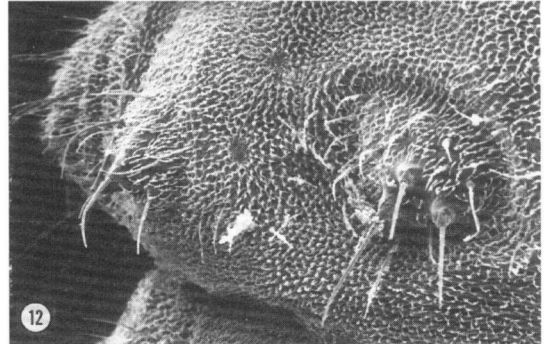
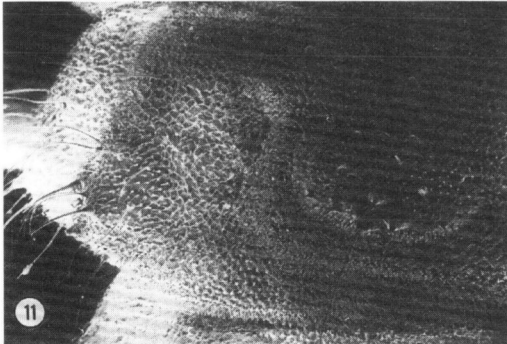
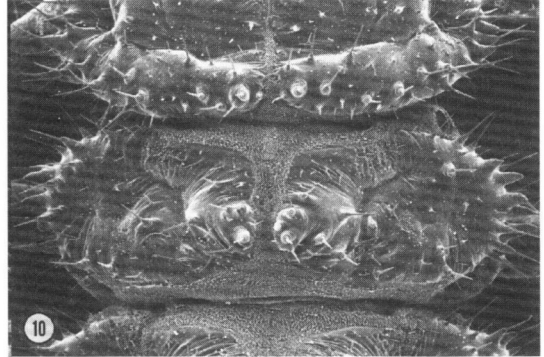
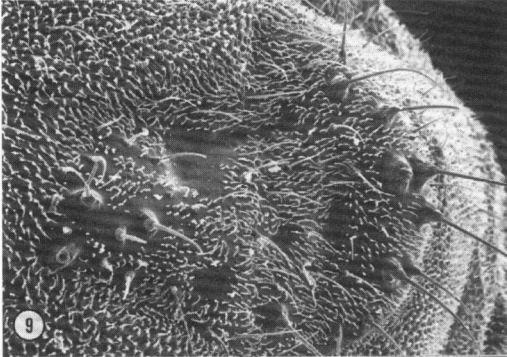
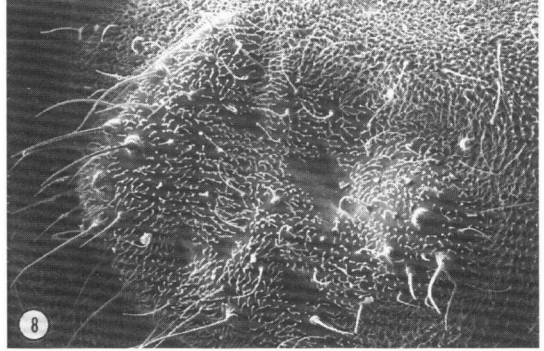
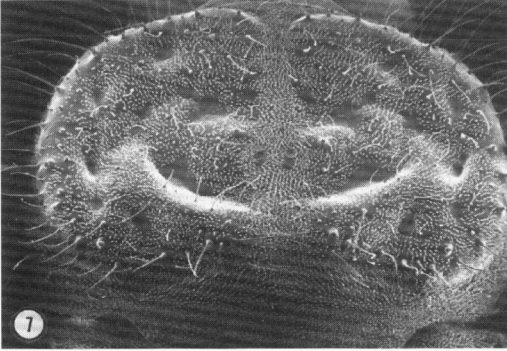
All larval specimens studied are preserved in alcohol and stored in the Coleoptera larval collection, Smithsonian Department of Entomology.

### *Cycloneda* Crotch

*Description of 4th instar larva.* – Body fusiform,

slender to moderately robust, long-legged. Dorsal, lateral surfaces armed with strumae. Ventral surface with scattered to weakly clustered setae, reduced chalazae; clusters verrucous only in paralateral position of abdomen, occasionally on thoracic sternum. All chalazae with small to minute conical bases never exceeding height of corresponding setae.

Ground color of dorsal surfaces grey to bluish



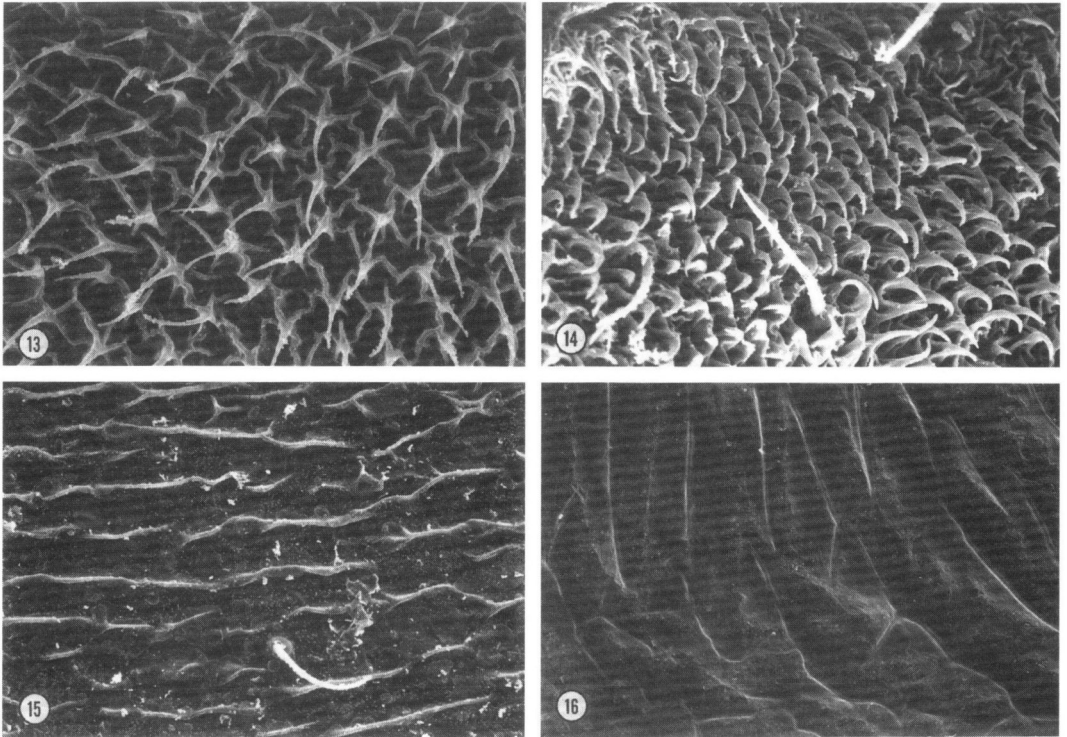
Figs 7-12. Dorsal surface structures: (7) pronotum, *Cycloneda sanguinea*; (8) mesonotum, *Cycloneda sanguinea*; (9) mesonotum, *Cycloneda polita*; (10) mesonotum, *Coccinella transversoguttata*; (11) 7th abdominal tergite, *Cycloneda sanguinea*; (12) 4th abdominal tergite, *Cycloneda polita*.

grey or dusky violet with pale patches yellowish orange to reddish orange, or mixed orange, bright white; legs, dorsal plates, most dorsal setose processes black or very dark brown. Ventral surfaces lighter grey, palest at midline.

All body surfaces pruinose; membranous areas (revealed through SEM) (Fig. 13) with stellate-pleated surface configuration, each stellate structure extended dorsally to form acute microtrichi-

um, pleated radii of each stellate structure not aligned to form whorls or rows of compound rugae; large sclerotized thoracic plates and setiferous processes (strumae, verrucae) devoid of stellate structure, more or less evenly microtrichose, small rarefied or glabrous patches in depressed areas of thoracic plates (Figs 7-9, 11, 12).

Head capsule small relative to total body size, width never exceeding separation of anterior coxae,



Figs 13–16. Vestiture on dorsal surface of abdomen: (13) *Cyclonedea sanguinea*; (14) *Propylea quatuordecimpunctata*; (15) *Mulsantina picta*; (16) *Olla v-nigrum*.

distinctly tapered basally; epicranial suture absent; frontal sutures forming inverted omega, arms attaining antennal sockets, conjoined basal portion broadly rounded to more linearly V-shaped, weakly inflected where joined beneath overlap of pronotum.

Antenna (Figs 1, 2) short, 2 segmented; basal segment slightly shorter, about 1/3 wider than distal segment; distal segment cylindrical with membranous apex bearing scattered short to medium length conical setae or sensilla on individual raised bases; well-developed conical sensorium several times longer than wide, located between center, outer rim on distal surface; pair of slender, erect, preapical setae slightly to much longer than sensorium, placed in diametric opposition or slightly shifted abaxially. Mandible with ventral tooth of bifid apex distinctly shorter, more massive than dorsal tooth. Maxillary palpus elongate (Fig. 6); segments successively narrower in diameter toward apex; segments 1, 2 cylindrical with strongly oblique distal surfaces canted mesally; segment 3

moderately to highly elongate conical with distal sensory surface of moderate to very reduced diameter; palpifer distinct, incompletely annular. Labial palpus with short annular basal segment; distal segment distinctly elongated conical to weakly elongated subcylindrical; palpifer distinct, incompletely annular, fused anteromedially to its opposite. Submentum with row of 2 or 3 long setae on each side of midline, converging toward base of head. Stylus of mala with pair of terminal, elongate, conical, subequal setae; length of setae slightly less than to 1/3 length of corresponding cylindrical bases; inner base about 80% length of conjoined outer base.

Legs long, slender (Figs 17–19); tibiotarsus with leg in closed position slightly to distinctly exceeding length of coxa plus femur; femur, tibiotarsus of foreleg noticeably longer than those of middle, hind legs; claw with large subquadrate basal tooth.

Pronotum (Figs 7, 20–22) transversely elliptic to subcircular, weakly polygonal; dorsal plates large, hemi-elliptic, covering most of pronotum, narrowly

separated at midline; curved outer margin of each plate forming corona of longer setae, chalazae; surface of each plate with scattered chalazae; most abundant near margins. Meso-, metanota (Figs 8, 9) transverse with rounded lateral margins; each with pair of well separated plates bearing few scattered chalazae on surface; curved outer margin of each plate more abundantly armed with chalazae, smaller inner margin bearing struma with few chalazae; pleural region with only posterior area bearing well-developed struma.

Abdominal segments I-VIII transverse, armed with strumae (Figs 11, 12); *d*, *dl* strumae transversely oval with scattered chalazae, generally with three more prominent chalazae disposed in triangle; lateral strumae with scattered chalazae of which at least median chalaza more strongly developed. Tergite of abdominal segment IX slightly longer than wide, roundly tapered in distal 1/2 with blunt apex, with dorsal surface setiferous; apical, lateral areas with setae, weakly developed chalazae.

*Field diagnosis.* – Distinguished from other New World coccinellines and introduced genera by the evenly pruinose dorsal surface, bluish grey ground color, relatively long legs, reduced dorsal chalazae, small head and blunt abdominal apex.

*Comments.* – The generic description applies to all three North American *Cycloneda* (Figs 17-19) and the South American *C. ancoralis* (see color photo in Saini 1985: 5). *Cycloneda ancoralis* differs from its North American congeners in possessing a more broadly oval body form with the anterior pair of legs less dramatically elongated relative to middle and hind legs, and tibiotarsus of each leg only slightly longer than trochanter plus femur. The maxillary palps are also not exceptionally elongate and the sensory surface is only slightly reduced in diameter from the typical coccinelline condition. The labial palps of *C. ancoralis* are less elongate, less tapered than those of North American species. The dorsal and dorsolateral setose abdominal processes do not exhibit the typical condition of North American *Cycloneda* with three primary chalazae of approximately equal development, but instead possess a single primary chalaza (with very well developed conical base and stout seta), and a variable number of smaller chalazae of unequal development.

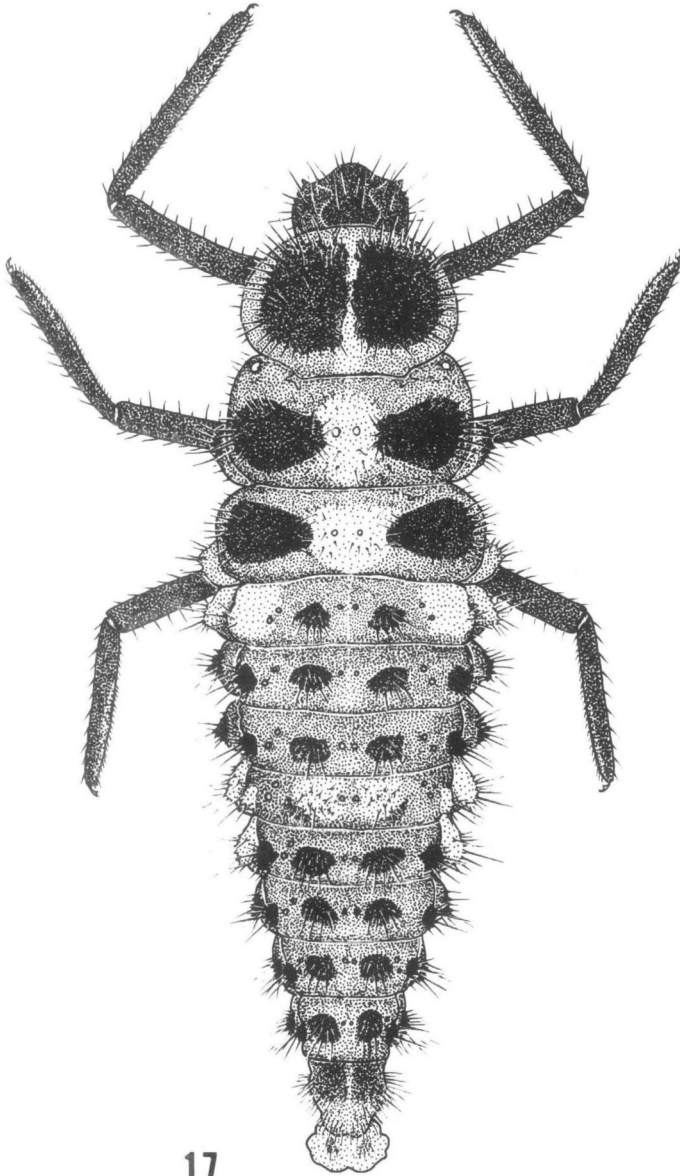
### Systematic relations

The superficial characteristics of a rounded body

form and highly polished cuticle in adults of *Cycloneda sanguinea* (type species) and many unallied Neotropical genera has resulted in inclusion of numerous species (Blackwelder 1945) more properly placed with *Olla* Casey, *Egleis* Mulsant or their various allies. These can be separated easily by adult genital characters (Vandenberg 1992) and by larval characters discussed in that work and below. The Neotropical *Coccinellina* Timberlake (1920) is regarded as a synonym of *Cycloneda* following Iablokoff-Khnzorian (1990).

*Cycloneda* is related to *Coccinella*, but *Coccinella* has a much more massive head (broader than separation of anterior coxae) with base less strongly tapered, dorsal plates and setose processes partially to entirely devoid of microtrichia (appearing somewhat shiny, Fig. 10), dorsal chalazae generally with much more strongly developed bases, and setae of ventral abdominal surfaces forming well defined and strongly verrucous clusters. The microsculpturing of membranous areas is similar in *Coccinella* and *Cycloneda* except that the microtrichia are generally more robust with basal plicate radii less developed in the former. *Coccinella* has an antenna similar in structure to that of *Cycloneda* but differs in having the second segment distinctly tapered, with preapical setae shorter, converging apically; and with most setae and sensilla of the distal surface grouped on a common convexity representing a remnant of the third antennal segment. The third antennal segment is highly reduced or absent in most New World Coccinellini (Figs 1-3, 5) with the exception of *Hippodamia* (Fig. 4) and *Anisostica*.

Our study of *Cycloneda* larvae and comparisons with examples from other genera show that, as with adult coccinellines, the larger morphological characteristics (length of legs, general body shape, etc.) tend to be quite labile, while details of many smaller structures, particularly those of less obvious adaptive significance, tend to be more stable. From our preliminary studies, characteristics which appear to be most indicative of generic and suprageneric relationships are: structure of the setose processes and dorsal plates, nature of microsculpturing, antennal structure and shape of ninth abdominal tergite. Thus *Olla* larvae, which have a similar build to the slender long legged North American *Cycloneda*, can be distinguished by the whorllike patterns of surface microsculpturing and almost complete absence of microtrichia (Fig. 16); as well as the structure of dorsal and dorsolateral setose abdominal processes (Vandenberg



17  
Fig. 17. Habitus of *Cycloneda sanguinea*.

1992). These same characters are shared by many genera whose affinities, as determined by adult genital characteristics (Vandenberg 1992), lie with *Olla* and its near relations. *Mulsantina* Weise (Fig. 15) which falls within the *Egleis* group (Vandenberg 1992; Gordon & Vandenberg 1992) has microsculpturing similar to *Olla* and allies; larvae of other

genera within the *Egleis* group were not available for comparison. The introduced Old World species *Propylea quatuordecimpunctata* (L.) (allied to *Calvia* Mulsant, and *Myzia* Mulsant; Vandenberg & Gordon 1991) might easily be confused with North American *Cycloneda* except that it possesses a terminal median projection of abdominal segment IX,

distinctive microsculpturing (Fig. 14), and very reduced pair of preapical antennal setae. The terminal projection (as figured in Sasaji 1968) and reduced setae (Sasaji 1968, Houston 1988) appear to have some consistency within the group of genera allied to *Propylea* (Vandenberg & Gordon 1991).

**Key to 4th instar *Cycloneda* larvae**

1. Body broad, strongly tapered to apex from abdominal segment II; head entirely dark brown or blackish; meso-, metanotal plates strongly tapered toward *d* struma (Fig. 17); pale areas on dorsal body surface orangy yellow (live specimens) ..... 2
- Body slender, slightly tapered to apex from segment II or IV; head with frontoclypeal area entirely yellow or brown mottled with white; mesonotal plate slightly tapered toward *d* struma (Fig. 18), metanotal plate tapered or not; pale areas on dorsal body surface yellowish white, or mixed bright white, pale orange (live specimens) ..... 3
2. Abdominal segment I bluish gray with *dl*, *l* strumae orangy yellow; area between *d* strumae of abdominal segments III, V bluish gray ..... *sanguinea sanguinea* (L.)
- Abdominal segment I entirely orangy yellow; area between *d* strumae of segments III, V entirely or partially orangy yellow ..... *sanguinea limbifer* Casey
3. Head with frontoclypeal area entirely yellow; pale areas on dorsal body surface yellowish white; abdominal segments VI, VII with lateral areas bluish gray, corresponding strumae dark brown to blackish (live specimens) .... *munda* (Say)
- Head with frontoclypeal area brown mottled with white; pale area on dorsal body surface mixed bright white, pale orange; abdominal segment VI with lateral area including struma white; segment VII with area anterior to *l* struma white, struma dark or mottled (live specimens) ..... *polita* Casey

***Cycloneda sanguinea sanguinea* (L.)**

(Figs 1, 7, 8, 11, 13, 17, 20)

*References.* - Saini 1983: 398-400 (descriptions of color patterns, instars 1-4; key to larval coccinellid predators of alfalfa aphids in Castelar, Argentina) and 1985: 5 (color photograph of 4th instar larva).

*Description of 4th instar larva* (Fig. 17). - Average length 7.2 mm; body elongate, broad; abdomen strongly tapered to apex from segment II. Head entirely dark brown to blackish, gena darker than remainder of head. Dorsal body surfaces bluish gray with paler markings orangy yellow; dorsal plates, most strumae, tergum of abdominal segment IX dark brown to black. Orangy yellow markings as follows: pronotum with narrow median strip be-

tween thoracic plates, narrow anterior border; mesonotum with broad median area; metanotum with broad median area, posterior lateral lobe; abdominal segment I with adjacent dorsolateral, lateral areas including corresponding strumae; segments II, III with small area posterior to lateral struma; segment IV with wide median area including *d* strumae, *dl* struma, lateral area including struma; segment V with lateral area including struma.

Head with scattered, intermixed long, moderately long setae; long setae 2.5X as long as antenna.

Anterior margin of pronotum with 6 chalazae bearing long setae, 6 chalazae bearing short setae; lateral, posterior margin of plate with approximately 8 chalazae bearing long setae, approximately 25 to 30 chalazae bearing short setae; surface of plate (Figs 7, 20) nearly devoid of chalazae medially, with approximately 20 chalazae bearing very short setae scattered in marginal areas. Mesonotal plate (Fig. 8) small, outer margin semicircular; anterior, posterior margins strongly tapered toward *d* struma; inner margin truncate; lateral margin of plate with approximately 20 chalazae bearing long, short setae; anterior margin without chalazae; posterior margin with 6 chalazae bearing long, short setae; *d* struma with 2 chalazae bearing long setae, 5 chalazae bearing short setae; surface of plate with approximately 15 chalazae bearing very short setae. *L* struma of mesothorax with 2 chalazae bearing long setae, 10-13 chalazae bearing short setae. Metanotal plate transverse; outer margin semicircular; anterior, posterior margins strongly tapered toward *d* struma; inner margin abruptly rounded; lateral margin of plate with approximately 16 chalazae bearing long, short, setae; anterior margin without chalazae; posterior margin with one chalaza bearing long seta, 4 chalazae bearing short setae; *d* struma with 3 chalazae bearing long setae, 2 chalazae bearing short setae; surface of plate with approximately 10 chalazae bearing very short setae. *L* struma of metathorax with 2 chalazae bearing long setae, approximately 10 chalazae bearing short setae.

Abdomen (Fig. 11) with *d* struma bearing one large median chalaza, 2 large chalazae in posterior 1/2, all bearing long setae; 10-12 small chalazae bearing short setae scattered over surface; *dl* struma with 2 large median chalazae bearing long setae, one slightly smaller chalaza bearing long seta near lateral margin, approximately 6 small chalazae bearing short setae scattered over surface; *l* struma with 2 large chalazae bearing long setae, one median, one posteromedian, 4 slightly smaller chalazae

bearing slightly shorter setae, 6–10 small chalazae bearing short setae scattered over surface.

Tergum of segment IX with approximately 100 small chalazae bearing long, short setae; chalazae mostly confined to peripheral 1/3 of segment.

*Comments.* – In addition to key characters, *C. sanguinea* differs from *C. munda* and *C. polita* by having dorsal light areas reduced; and tergum IX with approximately 100 chalazae mostly confined to peripheral 1/3 of segment.

### *Cycloneda sanguinea limbifer* Casey

*References.* – Hodek 1973: pl. XXVII, fig. 3 (as *C. limbifer*) (color illustration of 4th instar); and Dimmock 1906: 321, 344–350, pl. I (as *Cycloneda sanguinea*) (key to larvae of Cuban Coccinellidae, description of instars 1–4, habitus drawing and anatomical details of 4th instar).

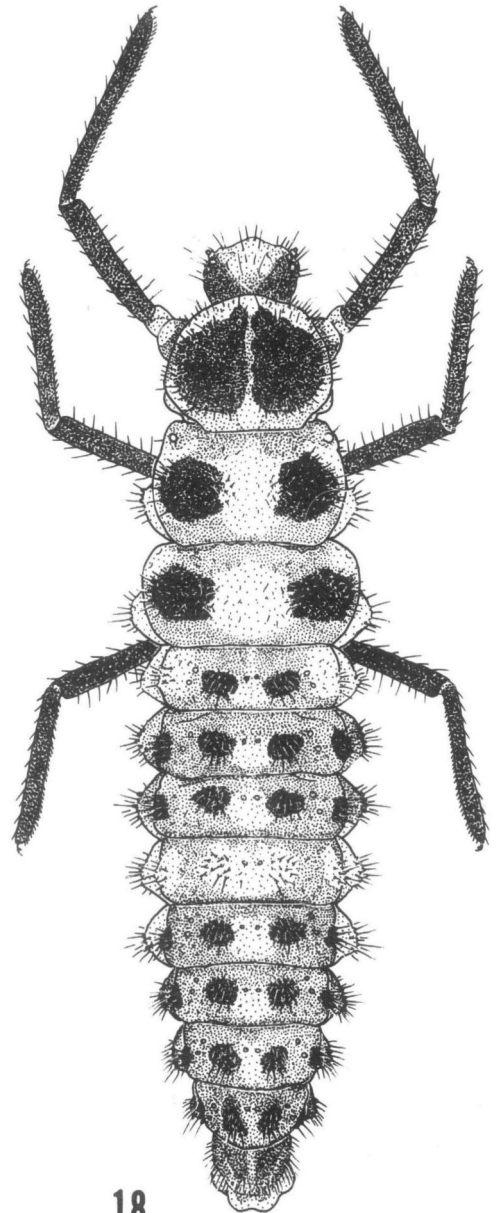
*Description of 4th instar larva.* – Same description as for *Cycloneda sanguinea sanguinea* except abdominal segment I entirely orangy yellow; area between *d* strumae of segments III, V partially to entirely orangy yellow.

### *Cycloneda munda* (Say)

(Figs 6, 18, 21)

*References.* – Gordon & Hillburn 1990: 299 (habitus illustration of 4th instar). Candeze 1861: pl. VI, fig. 7 (as *Daulis sanguinea* var. *immaculata* F.) (habitus of larva); Scudder 1891: 173–175 (as *Cycloneda sanguinea* [L.]) (description of larval color pattern); Gage 1920: 38–39 (as *Coccinella sanguinea* L.) (description of larval armature and color pattern).

*Description of 4th instar larva* (Fig. 18). – Average length 8.0 mm; body elongate, slender, abdomen slightly tapered to apex from segment II. Head yellow except basal half, gena dark brown to blackish. Dorsal surfaces of body bluish gray with paler markings yellowish white; dorsal plates, most strumae, tergum of abdominal segment IX dark brown to black. Yellowish white markings as follows: pronotum with entire outer margin, narrow median strip between thoracic plates; mesonotum, metanotum with median area between thoracic plates including inner part of *d* strumae, lateral lobes; abdomen with segment I with contiguous *dl*, *l* areas including corresponding strumae, irregular area between *d* strumae; segments II, III with basal 2/3 between *d* strumae, small area posterior to *l* struma; segment IV with broad dorsal area including strumae, discrete dorsolateral, lateral areas including



18

Fig. 18. Habitus of *Cycloneda munda*.

corresponding strumae; segment V with lateral area including struma, area between *d* strumae; segments VI–VII with area between *d* strumae.

Head with scattered, intermixed long, moderately long setae; long setae 2.0X as long as antenna.

Anterior margin of pronotum with 6 chalazae



bearing long setae, 6 chalazae bearing short setae; lateral, posterior margins of lateral plate with approximately 12 chalazae bearing long setae, approximately 12 chalazae bearing short setae; surface of plate (Fig. 21) nearly devoid of chalazae, with approximately 50 chalazae bearing very short setae near outer borders. Meso-, metanota with plate small; outer margin semicircular; posterior, anterior margins slightly oblique; inner margin truncate; lateral margin with approximately 26 chalazae bearing long, short setae; anterior margin without chalazae; posterior margin with 5 chalazae bearing long, short setae; *d* struma with 4 chalazae bearing long setae; surface of mesonotal plate with approximately 26 chalazae bearing very short setae; surface of metanotal plate with 22 chalazae bearing very short setae. *L* struma of meso-, metathorax with 8–10 chalazae bearing short setae.

Abdomen with *d* struma with 3 large chalazae bearing long setae, 8–10 small chalazae bearing short setae scattered over surface; *dl* struma with 3 large chalazae bearing long setae, approximately 6 small chalazae bearing short setae scattered over surface; *l* struma with 3 large chalazae bearing long setae, one median, one posterolateral, 4 slightly smaller chalazae bearing slightly shorter setae, 6–10 small chalazae bearing short setae scattered over surface.

Tergum of segment IX with approximately 200 small chalazae bearing long, short setae; chalazae scattered over entire surface of segment.

*Comments.* – *Cycloneda munda* has a greater abundance of chalazae on the dorsal surface than either of the other two species, it is intermediate in degree of dorsal light areas between *C. sanguinea* and *C. polita*, and tergum IX has approximately 200 chalazae scattered over most of surface. Dimmock (1906) was first to recognize the misidentified specimens of Candeze (1861) and Scudder (1891) as belonging to this eastern North American species.

### *Cycloneda polita* (Say)

(Figs 2, 9, 12, 19, 22)

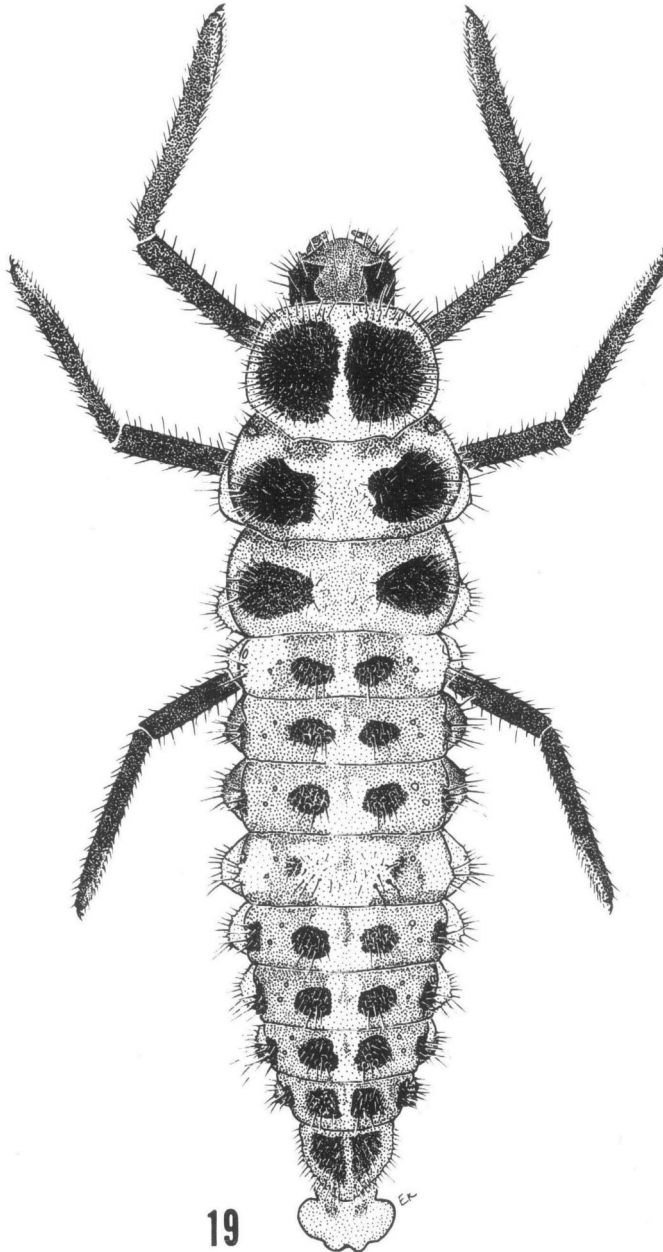
*References.* – Palmer 1914: 232–233, pl. XXXIII (as *Coccinella (Cycloneda) sanguinea* [L.] (description of *Cycloneda polita* instars I–IV, color habitus of late instar).

*Description of 4th instar larva* (Fig. 19). – Average length 7.2 mm; body elongate, slender, abdomen slightly tapered to apex from segment IV. Head brown to blackish feebly mottled with white except gena evenly dark brown. Dorsal body surfaces

bluish gray with paler markings bright white, pale orange; dorsal plates, most strumae, tergum of abdominal segment IX dark brown to blackish. Paler markings as follows: Pronotum with entire outer margin, narrow median strip between thoracic plates white. Meso-, metathorax with median area between dorsal plates mostly pale orange; lateral lobes, anterolateral area white except posterior metathoracic lobe pale orange. Abdominal segment I with adjacent dorsolateral, lateral areas including corresponding strumae, median strip between dorsal strumae white; segments II, III with basal 3/4 between *d* strumae, small area posterior to *l* struma white; segment IV with adjacent dorsolateral, lateral areas including corresponding strumae, median trapezoidal area including all but outermost portions of *d* strumae white; V–VI with area between *d* strumae white, entire lateral area including *l* struma white; segment VII–VIII with area between *d* strumae white; segment VII with lateral area anterior to *l* struma white.

Head with scattered, intermixed long, moderately long setae; long setae 2.0X as long as antenna.

Anterior margin of pronotum with 6 chalazae bearing long setae, 6 chalazae bearing short setae; lateral, posterior margins of lateral plate with approximately 16 chalazae bearing long setae, approximately 14 chalazae bearing short setae; surface of plate (Fig. 22) nearly devoid of chalazae, with approximately 20 chalazae bearing very short setae near outer borders. Mesonotal plate (Fig. 9) small, very slightly tapered toward *d* struma, with outer margin semicircular, anterior margin notched at anteromedian angle, posterior margin semicircular, inner margin slightly rounded; lateral margin of plate with approximately 10 chalazae bearing long, short setae; anterior margin without chalazae; posterior margin with approximately 8 chalazae, bearing long, short setae; *d* struma with 2 chalazae bearing long setae, 2 chalazae bearing short setae; surface of plate with approximately 14 chalazae bearing very short setae; *l* struma of mesothorax with 3 large chalazae bearing long setae, approximately 6 small chalazae bearing short setae. Metanotal plate small, slightly transverse, outer margin semicircular; posterior, anterior margins slightly tapered toward middle, inner margin slightly rounded; lateral margin of plate with approximately 8 chalazae bearing long, short setae; anterior margin without chalazae; posterior margin with 5 chalazae bearing long, short setae; *d* struma with 3 chalazae bearing long setae, one chalaza bearing

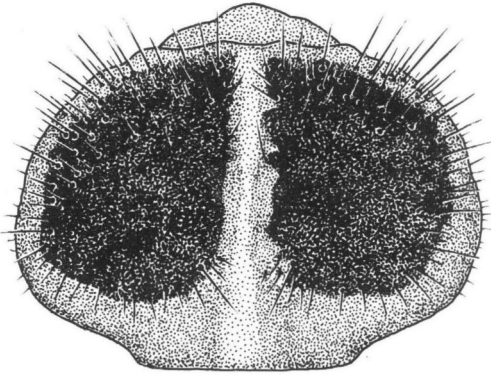


19

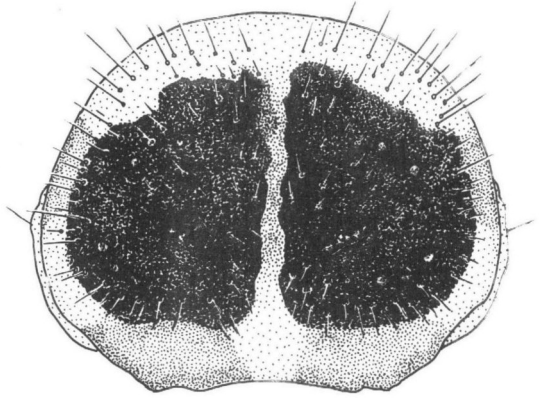
Fig. 19. Habitus of *Cycloneda polita*.

short seta; surface of plate with approximately 20 chalazae bearing very short setae; *l* struma of metathorax with 2 large chalazae bearing long setae, approximately 6 small chalazae bearing short setae.

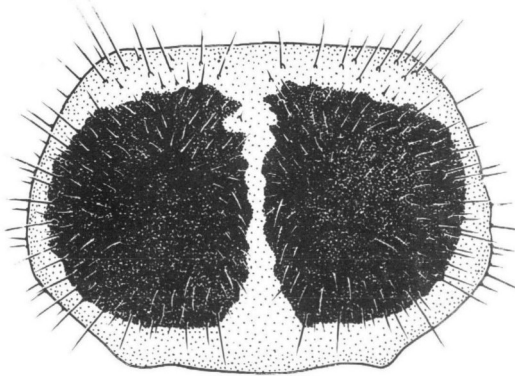
Abdomen (Fig. 12) with *d* struma with 3 large chalazae bearing long setae, 2 slightly smaller chalazae bearing slightly shorter setae near posterior margin, approximately 8 small chalazae bearing short setae scattered over surface; *dl* struma with



20



21



22

Figs 20–22. Pronota of *Cycloneda* species: (20) *C. sanguinea*; (21) *C. munda*; (22) *C. polita*.

one large median chalaza bearing long seta, 2 slightly smaller chalazae bearing long setae, one near posterior margin, one toward medial margin, approximately 6 small chalazae bearing short setae scattered over surface; *I* struma with 2 large chalazae bearing long setae, one median, one posterolateral, 4 slightly smaller chalazae bearing slightly shorter setae, 6–10 small chalazae bearing short setae scattered over surface.

Tergum of segment IX with approximately 80 smaller chalazae bearing long, short setae; chalazae mostly confined to peripheral 1/3.

*Comments.* – This species has the greatest degree of dorsal light areas of any North American species,

the smallest number of dorsal chalazae, and tergum IX has approximately 80 chalazae mostly confined to peripheral 1/3.

**Acknowledgements**

We are especially indebted to R. V. Flanders and D. J. Nelson, USDA, Animal and Plant Health Inspection Service, Biological Control Laboratory, Niles, Michigan, for obtaining adults of *C. munda* and rearing the immatures, to C. A. Vandenberg for obtaining adults of *C. sanguinea* for culturing, and to B. Dean Gooch for assistance in rearing specimens of *C. sanguinea* and *C. polita*. Lisa Roberts prepared all of the illustrations of *Cycloneda* larvae and Sarah Donahue took the SEM photos. Thanks are due R. D. Pope, Natural History Museum, London; H. Dozier,

Pickens, South Carolina; J. Pakaluk and M. Stoetzel, Systematic Entomology Laboratory, USDA, for reviewing the manuscript.

## References

- Blackwelder, R. E. 1944. Checklist of the coleopterous insects of Mexico, Central America, the West Indies, and South America. Part II. *Bulletin of the United States National Museum* 185: 189–341.
- Bosq, J. M. 1952. Enumeracion de predadores observados en la republica Argentina (Coleopteros y Hemipteros). *Ministerio de Agricultura y Ganaderia, Series A*, 54: 1–29.
- Candeze, E. 1861. Histoire des metamorphoses de quelques coleopteres exotiques. *Memoires de la Societe Royale des Sciences de Liege* 16: 325–410.
- Dimmock, G. W. 1906. Algunas Coccinellidae de Cuba. *Primer Informe Anual de la Estacion Central Agronomica de Cuba*, 287–392.
- Gage, J. H. 1920. The larvae of the Coccinellidae. *Illinois Biological Monographs* 6: 1–62.
- Gordon, R. D. 1985. The Coccinellidae (Coleoptera) of America north of Mexico. *Journal of the New York Entomological Society* 93: 1–912.
- Gordon, R. D. & Hilburn, D. J. 1990. The Coccinellidae (Coleoptera) of Bermuda. *Ibidem* 98: 265–309.
- Gordon, R. D. & Vandenberg, N. 1991. Field guide to recently introduced species of Coccinellidae (Coleoptera) in North America, with a revised key to North American genera of Coccinellini. *Proceedings of the Entomological Society of Washington* 93: 845–864.
- 1992. “Considerations about North American Ladybirds,” a response. *Coccinella* 4: 7–9.
- Hodek, I. 1973. Biology of Coccinellidae. 260 pp. Prague & Hague.
- Houston, K. J. 1988. Larvae of *Coelophora inaequalis* (F.), *Phrynocaria gratiosa* (Mulsant) and *P. astrolabiana* (Weise) (Coleoptera: Coccinellidae) with notes on their relationships and prey records. *Journal of the Australian Entomological Society* 27: 199–211.
- Iablokoff-Khnzorian, S. M. 1990. About the classification of the Coccinellini. *Coccinella* 2: 58–60.
- Palmer, M. A. 1914. Some notes on life histories of ladybeetles. *Annals of the Entomological Society of America* 7: 213–238.
- Saini, E. D. 1983. Clave para estadios larvales de Coccinelidos. *Revista de la Sociedad Entomologica Argentina* 42: 397–403.
- 1985. Identificacion practica de “vaquitas” beneficas. Parte I. *Departamento Publicaciones, Prensa y Difusion, Instituto Nacional de Tecnologia Agropecuaria*, 22 pp.
- Sasaji, H. 1968. Descriptions of the coccinellid larvae of Japan and the Ryukyus. *Memoirs of the Faculty of Education, Fukui University, Series II (Natural Science)* 18: 93–136.
- Scudder, S. H. 1891. The early stages of three Coleoptera. *Psyche* 6: 173–175.
- Timberlake, P. H. 1943. The Coccinellidae or ladybeetles of the Koebele collection. Part 1. *Bulletin of the Experiment Station of the Hawaiian Sugar Planters’ Association, Entomological Series* 22: 1–67.
- Vandenberg, N. J. 1992. Revision of the New World lady beetles of the genus *Olla* and description of a new allied genus (Coleoptera: Coccinellidae). *Annals of the Entomological Society of America* 85: 370–392.
- Vandenberg, N. & Gordon, R. D. 1988. The Coccinellidae (Coleoptera) of South America, part I. A revision of the genus *Erythroneda* Timberlake, 1943. *Revista Brasileira de Entomologia* 32: 31–43.
- 1991. Farewell to *Pania* Mulsant (Coleoptera; Coccinellidae); a new synonym of *Propylea* Mulsant. *Coccinella* 3: 30–35.

*Manuscript accepted April 1993.*