

ROBERT D. GORDON

*A Revision of the  
Genus Zenoria Mulsant  
(Coleoptera:  
Coccinellidae)*

## SERIAL PUBLICATIONS OF THE SMITHSONIAN INSTITUTION

The emphasis upon publications as a means of diffusing knowledge was expressed by the first Secretary of the Smithsonian Institution. In his formal plan for the Institution, Joseph Henry articulated a program that included the following statement: "It is proposed to publish a series of reports, giving an account of the new discoveries in science, and of the changes made from year to year in all branches of knowledge." This keynote of basic research has been adhered to over the years in the issuance of thousands of titles in serial publications under the Smithsonian imprint, commencing with *Smithsonian Contributions to Knowledge* in 1848 and continuing with the following active series:

*Smithsonian Annals of Flight*  
*Smithsonian Contributions to Anthropology*  
*Smithsonian Contributions to Astrophysics*  
*Smithsonian Contributions to Botany*  
*Smithsonian Contributions to the Earth Sciences*  
*Smithsonian Contributions to Paleobiology*  
*Smithsonian Contributions to Zoology*  
*Smithsonian Studies in History and Technology*

In these series, the Institution publishes original articles and monographs dealing with the research and collections of its several museums and offices and of professional colleagues at other institutions of learning. These papers report newly acquired facts, synoptic interpretations of data, or original theory in specialized fields. These publications are distributed by subscription to libraries, laboratories, and other interested institutions and specialists throughout the world. Individual copies may be obtained from the Smithsonian Institution Press as long as stocks are available.

S. DILLON RIPLEY  
*Secretary*  
Smithsonian Institution

SMITHSONIAN CONTRIBUTIONS TO  
ZOOLOGY

NUMBER 86

*Robert D. Gordon* A Revision of The  
Genus *Zenoria* Mulsant  
(Coleoptera:  
Coccinellidae)

SMITHSONIAN INSTITUTION PRESS

CITY OF WASHINGTON

1971

## ABSTRACT

Gordon, Robert D. A Revision of the Genus *Zenoria* Mulsant (Coleoptera: Coccinellidae). *Smithsonian Contributions to Zoology*, 86: 1-22. 1971.—The available knowledge of the Neotropical genus *Zenoria* Mulsant is brought together, a key to species, distributional data and an illustrated generic diagnosis presented. Fifteen species are described as new: *Z. pallida*, *Z. crotchi*, *Z. annularis*, *Z. schwarzi*, *Z. circumcincta*, *Z. variabilis*, *Z. emarginata*, *Z. similis*, *Z. serva*, *Z. patula*, *Z. nigra*, *Z. flavicollis*, *Z. paprzyckii*, *Z. discrepa*, *Z. carinata*. One species, *Z. circumclusa* Gorham, is transferred to the genus *Anovia* Casey.

*Official publication date is handstamped in a limited number of initial copies and is recorded in the Institution's annual report, Smithsonian Year.*

UNITED STATES GOVERNMENT PRINTING OFFICE  
WASHINGTON : 1971

---

For sale by the Superintendent of Documents, U.S. Government Printing Office  
Washington, D.C. 20402 · Price 35 cents (paper cover)

Robert D. Gordon

## A Revision of The Genus *Zenoria* Mulsant (Coleoptera: Coccinellidae)

*Zenoria* Mulsant is a genus of the Western Hemisphere ranging from Mexico south to Bolivia and southern Brazil. Two species are known from Trinidad, but none have been observed from any other West Indian locality except a doubtful record of *Z. tricolor* Nunenmacher from Cuba. Northern Argentina and Paraguay are probably within the range of the genus although no specimens have been examined from either country.

Blackwelder (1945) listed 9 species and 1 subspecies in *Zenoria*. Examination of a syntype of *Z. circumclusa* Gorham has shown that it is a member of the genus *Anovia* Casey. *Z. linteolata* Mulsant is raised to specific rank and 15 new species are here described. With the inclusion of *Z. tricolor* Nunenmacher (1944) the total number of species is now 25. *Zenoria* is not well represented in collections and in only a few instances were large series available for study. Biological data are practically nonexistent, the only host records available being of *Z. emarginata*, new species, feeding on *Asterolecanium* sp. and *Aspidiotus destructor* Signoret.

In addition to specimens in the Smithsonian Institution's National Museum of Natural History, hereafter referred to as NMNH, I wish to thank the following individuals and institutions for the

loan of material: John Smart, University Museum, Cambridge, England (UMC) for a loan of Crotch types and specimens; H. B. Leech, California Academy of Sciences, San Francisco (CAS); P. J. Darlington, Jr., Museum of Comparative Zoology, Harvard University (MCZ); F. Hieke, Zoology Museum, Humboldt University, East Berlin (HUM); G. Wallace, Carnegie Museum, Pittsburgh, Pa. (CM); R. D. Pope, British Museum (Natural History) (BMNH) for loan of type material of *Z. circumclusa* Gorham. The late Gerhard Dieke had set aside as new some species of *Zenoria* in his collection and given them manuscript names. I have used these names wherever possible and so indicated in the discussion of the species. The habitus views were prepared by Arthur Cushman. Special thanks must go to George Steyskal for his assistance in translating French and German papers.

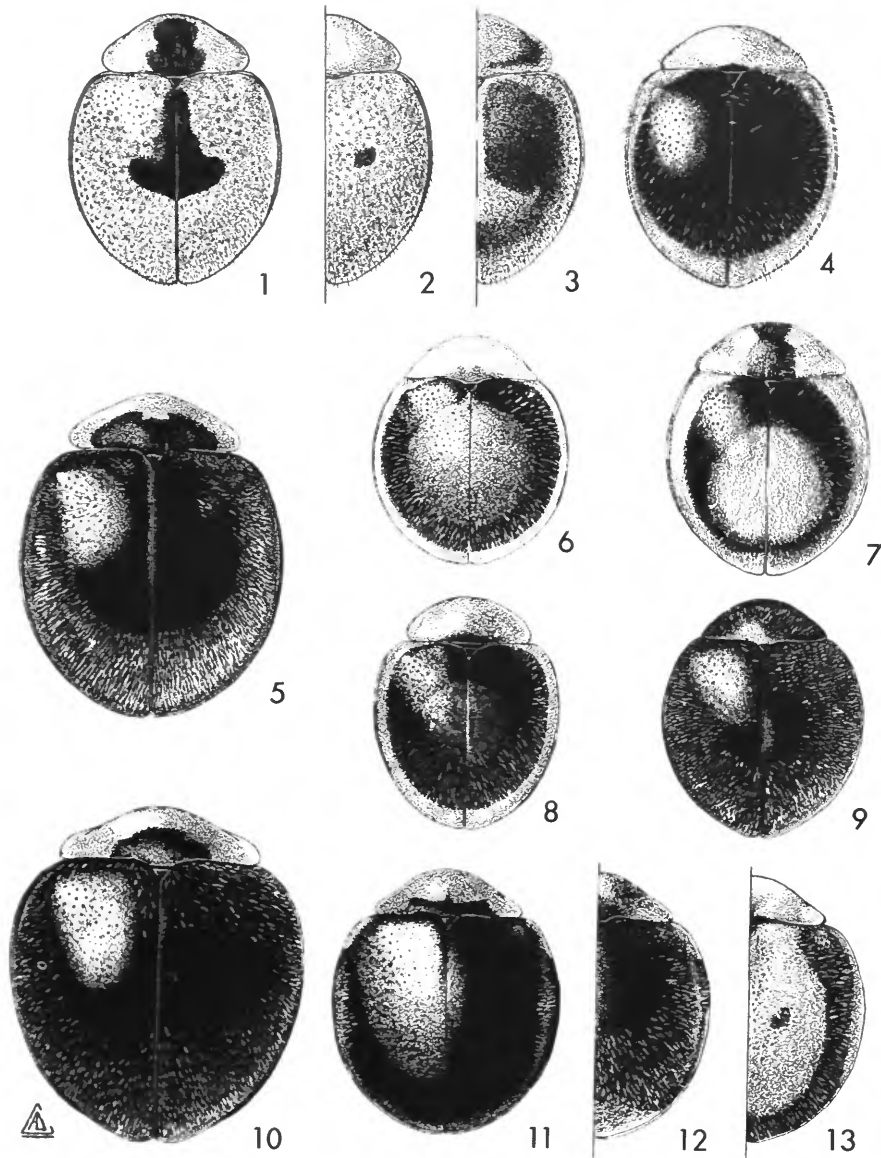
### Genus *Zenoria* Mulsant

*Zenoria* Mulsant, 1850, p. 898.—Crotch, 1874, p. 277.—Chapuis, 1876, pp. 207-208.—Korschefsky, 1931, p. 108.—Blackwelder, 1945, p. 443. Type species *Zenoria revestita* Mulsant, by subsequent designation of Crotch 1874.

Form nearly round, widest at middle or anterior to middle of elytra. Dorsal surface, including eye, pubescent. Head narrow; eye large, finely faceted, inner margin rounded; frons narrow, slightly wider than diameter of eye; anterior clypeal margin emarginate, angles bluntly rounded; antenna 11-segmented, club apparently 2-segmented, antenna extending slightly posterior to anterior pronotal

---

Robert D. Gordon, Systematic Entomology Laboratory of the Agricultural Research Service, United States Department of Agriculture, in the National Museum of Natural History, Smithsonian Institution.



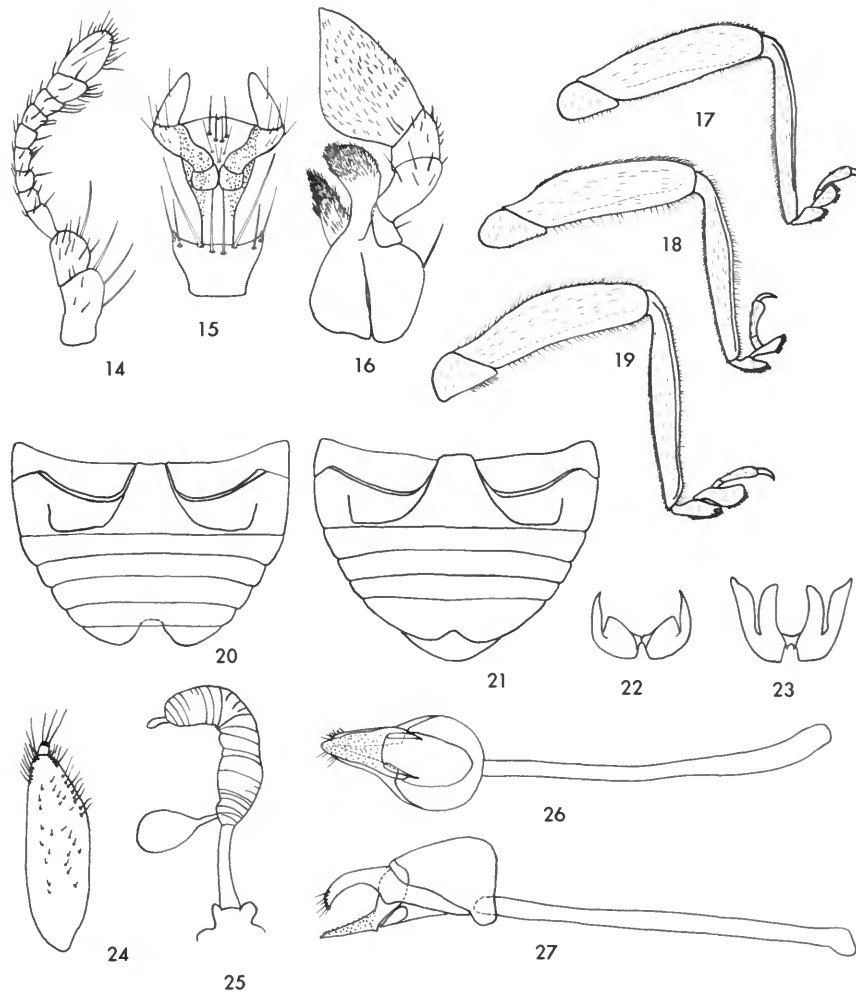
FIGURES 1-13.—Habitus views of *Zenoria* spp.: 1-3, *Z. variabilis*, new species; 4, *Z. crotchi*, new species; 5, *Z. paprzyckii*, new species; 6, *Z. emarginata*, new species; 7, *Z. circumcincta*, new species; 8, *Z. tricolor* Nunenmacher; 9, *Z. revestita* Mulsant; 10, *Z. major* Crotch; 11-13, *Z. subcostalis* Mulsant.

angle (Figure 14); mandible bifid at apex, a small basal tooth present; maxilla with palpus stout, ultimate segment securiform (Figure 16); labium widening apically, anterior angle pronounced,

palpus inserted medially (Figure 15). Pronotum with anterior margin slightly broadly emarginate, lateral angle and margin rounded, posterior angle obtuse, posterior margin sinuate, produced me-

dially, distinctly margined at least medially; surface punctate, shining, alutaceous sculpture lacking. Elytron with lateral margin sinuate (feebly so in *revestita* Mulsant), explanate, usually with coarse deep punctures everywhere except disc, often with discal area of a different color; surface shining, alutaceous sculpture lacking; epipleuron broad, horizontal (descending externally in *Z. carinata*, new species), the interior margin carinate, carina

separate from margin at base. Prosternum with intercoxal lobe narrow, apex slightly widened, rounded, margined laterally, margins extending to anterior margin of prosternum, an elongate concave area present between margins. Legs very long, slender; apex of femur extending to, or slightly beyond, outer margin of elytral epipleuron, at least anterior femur usually visible in dorsal view; tibia equal in length to femur, narrow; tarsi cryptote-



FIGURES 14-27.—*Zenoria* spp.: 14-19, *Z. variabilis*, new species: 14, antenna; 15, labium; 16, maxilla; 17, proleg; 18, middle leg; 19, hind leg. 20, *Z. subcostalis* Mulsant, male abdomen. 21, *Z. emarginata*, new species, female abdomen. 22-25, *Z. paprzyckii*, new species: 22, male hind tarsal claw; 23, male protarsal claw; 24, female genital plate; 25, female internal genitalia. 26, 27, *Z. subcostalis* Mulsant, male genitalia: 26, phallobase (ventral view); 27, phallobase (lateral view).

tramerous, short, second segment broadly expanded (Figures 17, 18, 19); tarsal claws bifid or angulate internally; male anterior and middle claws with inner tooth long, sharp (Figure 23), male posterior claw and all female claws with inner angulation short, blunt (Figure 22). Abdomen with 5 visible sterna (6th sternum sometimes protruding); male with median area of 5th sternum depressed, concealed 6th sternum deeply emarginate (Figure 20); female usually with 5th sternum entire, some species with apex emarginate; postcoxal lines incomplete, extending downward nearly to hind margin, of 1st sternum, two-thirds the distance to lateral margin, abruptly upward about two-thirds the distance to coxal depression, outer portion of line parallel to lateral margin of sternum (Figures 20, 21). Male genitalia with trabes long, usually about one and one-half times as long as phallobase; accessory sclerotized areas present at base of basal piece; basal piece and lobe usually slightly asymmetrical, compact, basal lobe with small, rounded tubercles at least apically; parameres curved downward toward basal lobe; siphon much longer than phallobase, curved approximately 180 degrees near base, nearly straight from median

point to near apex. Female genitalia with spermatheca long, curved; cornu prominent, pointed; accessory gland present; sperm duct short (Figure 25). Female genital plate elongate, oval, stylus present (Figure 24).

The dorsal pubescence, elongate legs, sexual and intrasexual dimorphism in the form of the claws, divergent carina on the epipleuron, form of the postcoxal line, and type of male genitalia set *Zenoria* apart from any other described coccinellid genus. This type of male genitalia with the short, compact phallobase, tuberculate basal lobe, and accessory sclerotized areas where the siphon passes through appears to be unique within the family.

Both Mulsant (1850) and Crotch (1874) placed *Zenoria* near *Azya* Mulsant and *Ortalia* Mulsant. Blackwelder (1945) erected the tribe Azyini for *Azya* and placed it near the Exoplectrini. The genera most nearly resembling *Zenoria* appear to be *Ortaliestes* Gorham and *Eupalea* Mulsant, and Blackwelder was probably correct in placing *Zenoria* in the Ortaliini near these two genera. The species of *Zenoria* having the color pattern of *Z. revestita* Mulsant are amazingly similar to *Azya* and *Ladoria* on superficial examination but differ structurally.

#### Key to Species of *Zenoria*

1. Dorsal surface uniformly pale yellow or red, without markings .....2  
Dorsal surface completely dark colored or with a dark color pattern .....4
2. Ventral surface with at least the metasternum dark brown piceous. *Z. pallida*, new species  
Ventral surface as pale as the dorsal surface .....3
3. Length 4.00 mm; clytra yellowish red .....*Z. rodoloides* Crotch  
Length 3.40 mm; clytra pale reddish yellow .....*Z. pilosula* Mulsant
4. Elytron with 1 to 3 dark, longitudinal vittae .....5  
Elytron with dark spots, rings, or entirely dark colored .....6
5. Elytron with 1 dark, submarginal vitta, occasionally with a small median spot between vitta and suture .....*Z. subcostalis* Mulsant  
Elytron with 3 dark longitudinal vittae .....*Z. ratzeburgi* Mulsant
6. Elytron completely black or dark metallic green, only a trace of pale color present at humeral or apical angles on some specimens .....18  
Elytron with varying color patterns, always with some yellow or red color .....7
7. Elytron pale yellow with a small dark median spot (Figure 2); Peru.  
*Z. variabilis*, new species  
Elytron with color pattern not as above .....8
8. Elytron yellow or red with a single dark submarginal band (Figures 6, 7) .....9  
Elytron with color pattern not as above .....10
9. Length 3.45 mm; last sternum of female entire; Brazil .....*Z. circumcineta*, new species  
Length less than 3.10 mm; last sternum of female strongly emarginate; (Figure 21);  
Trinidad .....*Z. emarginata*, new species



10. Elytra with a single black or metallic green spot occupying disc, outer margins pale yellow (Figure 4) .....11  
 Elytra with color pattern not as above .....15
11. Length 4.00 mm; discal elytral spot black.....*Z. delicatula* Weise  
 Length less than 3.50 mm; discal elytral spot black or metallic green .....12
12. Meso- and metasternum yellow; discal elytral spot metallic green .....13  
 Meso- and metasternum black, discal elytral spot metallic green or black .....14
13. Length less than 3.10 mm; Panama .....*Z. schwarzi*, new species  
 Length more than 3.35 mm; Brazil .....*Z. annularis*, new species
14. Discal elytral spot black; male genitalia with basal lobe as long as paramere, a small tooth at apex of paramere (Figures 36, 37); Peru, Bolivia .....*Z. discoidalis* (Kirsch)  
 Discal elytral spot usually metallic green; male genitalia with basal lobe shorter than paramere, paramere with a tooth on inner margin before apex (Figures 30, 31); Brazil.  
*Z. crotchi*, new species
15. Elytral pattern tricolored, marginal band yellow, middle band black or metallic green, median spot red (Figure 8) .....16  
 Elytral color pattern not as above .....17
16. Middle band of elytra black; Brazil .....*Z. tricolor* Nunenmacher  
 Middle band of elytra metallic green; Panama .....*Z. schwarzi*, new species
17. Elytra dark metallic green, most of lateral margin and a broad apical area and narrow sutral margin paler (Figure 12) .....*Z. subcostalis* Crotch  
 Elytra pale yellow with a black triangular spot on disc, or pale yellow with a large dark brown spot occupying most of elytra, broadly yellow post-medically and narrowly along suture (Figures 1, 3); Peru .....*Z. variabilis*, new species
18. Female with last sternum strongly emarginate; male with narrow outer margin of elytron yellow; Trinidad .....*Z. emarginata*, new species  
 Female with last sternum not emarginate; male with elytral margins not paler than rest of elytra .....19
19. Epipleuron descending externally; female with last sternum carinate medially; Surinam.  
*Z. carinata*, new species  
 Epipleuron horizontal; female with last sternum not carinate .....20
20. Elytra dark metallic green, area of dark pubescence on disc not apparent .....27  
 Elytra black, area of dark pubescence on disc very apparent .....21
21. Length 4.70 mm or more .....*Z. discrepa*, new species  
 Length less than 4.70 mm .....22
22. Length more than 4.10 mm; Peru .....*Z. paprzyckii*, new species  
 Length less than 4.00 mm .....23
23. Margin of elytron feebly, abruptly explanate, in side view slightly sinuate; southern Brazil.  
*Z. revestita* Mulsant  
 Margin of elytron broadly, gradually explanate, in side view strongly sinuate .....24
24. Male genitalia with basal lobe shorter than or as long as paramere; southern Brazil .....25  
 Male genitalia with basal lobe longer than paramere .....26
25. Male genitalia with basal lobe equal in length to paramere (Figures 52, 53); length 3.90 mm.  
*Z. patula*, new species  
 Male genitalia with basal lobe shorter than paramere (Figures 50, 51); length 3.58 mm.  
*Z. serva*, new species
26. Length 3.30 mm or less; male genitalia with basal lobe wide at base, concealing parameres in ventral view, gradually evenly narrowed to a bluntly rounded apex (Figures 54, 55).  
*Z. nigra*, new species  
 Length 3.45 mm or more; male genitalia with basal lobe narrower at base, not concealing parameres in ventral view, narrowed from middle to a bluntly rounded point (Figures 48, 49) .....*Z. similis*, new species
27. Length 4.30 mm or more; mesosternum black, metasternum yellow .....*Z. major* Crotch  
 Length less than 4.10 mm; and metasternum black .....28
28. Pronotum all black except anterior margin yellow; male genitalia with basal lobe slender in lateral view, parameres nearly touching apically (Figures 56, 57) .....*Z. limeolata* Mulsant  
 Pronotum yellow except median basal projection black; male genitalia with median lobe thick in lateral view; parameres widely separated from base to apex (Figures 58, 59).  
*Z. flavicollis*, new species

*Zenoria subcostalis* Mulsant

FIGURES 11, 12, 13, 20, 26, 27, 66

*Zenoria subcostalis* Mulsant, 1850, p. 899.—Crotch, 1874, p. 277.—Korschefsky, 1931, p. 108.—Blackwelder, 1945, p. 443.

MALE.—Length 3.10 mm, width 2.50 mm. Form round, slightly elongate. Color reddish yellow; pronotum, head, and underside pale yellow; each elytron with a wide black, submarginal vitta extending from humerus two-thirds the distance to apex, band widest at middle, nearly reaching elytral disc. Pronotum with yellowish white pubescence laterally, average length of hairs 0.60 mm, pronotal disc apparently almost glabrous; punctures fine, separated by 1 to 2 times their diameter; width to length ratio 1.89:1.01 mm. Elytron with sparse pubescence, average length of hairs 0.10 mm, most of discal area and apex appearing almost glabrous; coarse punctures deep, separated by their diameter or slightly less, interspersed fine punctures separated by 1 to 2 times their diameter, disc with coarse punctures entirely lacking, fine punctures very shallow, widely spaced; margin of elytron broadly reflexed; epipleuron with inner carina extending one-half the distance to outer margin at base. First abdominal sternum with postcoxal line abruptly curved cephalad (Figure 20). Genitalia with basal lobe longer than paramere, slightly asymmetrical, tapering to a blunt point; paramere short, abruptly curved (Figures 26, 27); siphon sinuate near apex, tip acuminate (Figure 66).

FEMALE.—See variation below.

VARIATION.—Length 3.10 to 3.30 mm. The description above was taken from the single specimen (male) labelled "type" in the Crotch collection, Cambridge University Museum. In addition to this specimen, 4 others were examined and considered to be this species. One specimen from Río Frío has the same type of color pattern as above except that the submarginal black vitta on each elytron extends from the base of the elytron to the apex and a small black spot is present on the disc post-medially (Figure 13). The pronotum has a small black spot on base anterior to the scutellum. The other specimen from Río Frío has the elytron piceous except for narrow lateral and sutural margins pale and apical one-third of elytron pale (Figure 12). Base of pronotum has a narrow

black band medially. The epipleuron has a dark brown band across the median one-third. The female of a pair of specimens from San Bernado del Viento is black dorsally except lateral and anterior pronotal margins and apical one-fourth of elytron pale. The male from the same locality has the same color pattern as the female except the pronotum is pale yellow with a black basal band and the elytron has just a slight trace of pale color at the apex (Figure 11). The elytron in both specimens from San Bernado is basically black with a green iridescence. The dorsal pubescence is much denser and more noticeable on all specimens than on the type; average length of elytral hairs is 0.16 mm. Mulsant described *subcostalis* as "parcimonieusement pubescente," and I suspect that the type specimen was rubbed prior to his examination.

TYPE LOCALITY.—"Nouvelle Grenada" (Colombia, probably near Cartagena).

TYPE DEPOSITORY.—University Museum, Cambridge, England.

DISCUSSION.—The color forms described above apparently all represent one species. The male genitalia are identical and no structural differences can be found. It is possible that *Z. pilosula* Mulsant and *Z. ratzeburgi* Mulsant are also the same species, in which case *ratzeburgi* has page priority. The type specimen was loaned by the University Museum, Cambridge.

SPECIMENS EXAMINED.—5 from the following localities in Colombia: Magdalena, Río Frío, Darlington (MCZ); San Bernado del Viento, 16 Oct. 1935, Murillo 102 (NMNH).

*Zenoria ratzeburgi* Mulsant*Zenoria ratzeburgi* Mulsant, 1850, p. 898.—Crotch, 1874, p. 277.—Korschefsky, 1931, p. 108.—Blackwelder, 1945, p. 443.

No specimen fitting Mulsant's description has been examined. The following description is taken from Mulsant's original diagnosis.

Length 3.33 mm, width 2.80 mm. Form round, slightly elongate. Pubescence sparse, yellowish white. Pronotum yellowish white with a black band occupying the median one-fourth of basal margin. Elytron grayish white with three longitudinal black vittae, the first and second beginning very near the base, the third beginning at humerus; first vitta

nearly one-fourth as wide as elytron, extending three-sevenths the length of elytron, a narrow dark line present between vitta and suture and first and second vittae; second vitta extending four-fifths the length of an elytron, more transverse and abruptly enlarged almost as far as the suture at the median point, gradually curving outward from that point to its extremity; third vitta consisting of two spots barely connected, extending nearly as far posteriorly as the second. Underside and legs grayish white.

TYPE LOCALITY.—"Bresil."

TYPE LOCALITY.—Paris Museum (lost?)

DISCUSSION.—*Z. ratzeburgi* would seem to belong near *Z. subcostalis* and possibly is only a color variant. The vittae on the elytra will distinguish this species from any other presently described.

M. Gourreau at the Paris Museum has informed me that the major part of the Mulsant collection has been destroyed and that no Mulsant types are presently located here. The type of *Z. ratzeburgi* must tentatively be considered lost.

### *Zenoria pilosula* Mulsant

*Zenoria pilosula* Mulsant, 1850, p. 900.—Crotch, 1874, p. 277.—Korschefsky, 1931, p. 108.—Blackwelder, 1945, p. 443.

No specimens have been recognized with certainty as belonging to this species and I have not been able to locate the type. The Crotch collection has two specimens labelled *pilosula*, one female of *Zenoria* with head and prothorax missing, agreeing fairly well with Mulsant's description, the other a member of the genus *Hyperaspis*. The following abbreviated description is taken from the first specimen in the Crotch collection and from Mulsant's original diagnosis.

FEMALE.—Length 3.33 mm, width 2.80 mm. Form round, slightly elongate. Color reddish yellow, pronotum paler yellowish red. Elytron sparsely pubescent, hairs erect, average length 0.13 mm; coarse punctures shallow, separated by their diameter, interspersed fine punctures separated by 1 to 3 times their diameter, coarse punctures occurring on disc more widely spaced; margin of elytron broadly explanate; epipleuron with inner carina nearly reaching outer margin.

TYPE LOCALITY.—"Carthagene" (Colombia).

TYPE DEPOSITORY.—Unknown.

DISCUSSION.—This species is the only described *Zenoria* in this size range that is uniformly reddish yellow both dorsally and ventrally. It is possible that *pilosula* is only another color form of *subcostalis* but an adequate series of *subcostalis* must be examined to determine this. In the absence of a male specimen I am leaving *pilosula* as a valid species.

Mulsant (1850) stated that the type was in the Dejean collection.

SPECIMENS EXAMINED.—1, locality unknown (UMC).

### *Zenoria pallida*, new species

FIGURES 28, 29, 67

HOLOTYPE MALE.—Length 3.90 mm, width 3.08 mm. Form round, slightly elongate. Color pale yellowish white; meso- and metasternum and median area of first abdominal sternum dark brown. Pronotum with white, semidecumbent pubescence, average length of hairs 0.12 mm; punctures fine, separated by their diameter or less; width to length ratio 2.45:1.15 mm. Elytron covered with yellowish white, semierect pubescence, average length of hairs 0.16 mm; coarse punctures shallow, separated by 1 to 2 times their diameter, slightly shallower on disc, extending nearly to suture, interspersed fine punctures separated by 4 to 5 times their diameter; margin of elytron broadly explanate; epipleuron with inner carina reaching outer margin. Postcoxal line not reaching hind margin of first abdominal sternum, outer end gradually curved cephalad. Genitalia with basal lobe shorter than paramere, slightly narrowed at median point, gradually narrowing to a broadly rounded apex; paramere strongly narrowed toward apex, apex flattened (Figures 28, 29); siphon curved downward before apex, broadly recurved to acuminate apex (Figure 67).

FEMALE.—None available.

VARIATION.—Length 3.75 to 3.90 mm, width 2.98 to 3.08 mm.

HOLOTYPE.—Brazil, Santarém (UMC).

PARATYPE.—Brazil, "Amaz." (UMC).

DISCUSSION.—The immaculate dorsal surface and large size place this species near *Z. rodoloides* Crotch. *Z. pallida* is paler in color dorsally, the meso- and metasternum are dark, the elytral punc-

tures much more distinct and the form obviously less robust than *rodolioides*.

The type is number 14 and the paratype 16 in the series of *Z. revestita* in the Crotch collection. This species Crotch's variety  $\zeta$ .

### *Zenoria rodolioides* Crotch

*Zenoria rodolioides* Crotch, 1874, p. 277.—Korschefsky, 1931, p. 108.—Blackwelder, 1945, p. 443.

**HOLOTYPE FEMALE.**—Length 4.05 mm, width 3.42 mm. Form round, slightly elongate. Color yellowish red; pronotum, head, underside, and legs yellow. Pronotum covered with grayish white, semidecumbent pubescence, average length of hairs 0.11 mm; punctures fine, separated by slightly less than to slightly more than their diameter; width to length ratio 2.24 to 1.01 mm. Elytron covered with grayish white, semierect pubescence, average length of hairs 0.16 mm; coarse punctures shallow, separated by their diameter, interspersed fine punctures separated by 1 to 3 times their diameter, coarse punctures not occurring on disc; margin of elytron broadly explanate; epipleuron with inner carina nearly reaching outer margin.

**TYPE LOCALITY.**—Brazil, Santarém.

**TYPE DEPOSITORY.**—University Museum, Cambridge, England.

**DISCUSSION.**—The combination of color and size should distinguish *rodolioides*. Although the type is a female there is little doubt that this is a valid species. The type was loaned by the University Museum, Cambridge.

**SPECIMEN EXAMINED.**—The unique type.

### *Zenoria delicatula* Weise

*Zenoria delicatula* Weise, 1910, pp. 60-61.—Korschefsky, 1931, p. 108.—Blackwelder, 1945, p. 443.

The type of *Z. delicatula* was loaned by the Humboldt Museum but the entire specimen was missing except for two legs that remained glued to the point. No specimen matching Weise's description has been examined in the course of this study. According to the original description, *Z. delicatula* has the same color pattern as *discoidalis* (Kirsch) and is very little different except in size. *Z. discoidalis* is less than 3.50 mm in length, while *delicatula*

is supposed to be 4.00 mm. The type locality of *delicatula* is assumed to be Brazil although Weise mentioned no locality. All other species listed in his paper were collected in Brazil, nearly all from São Paulo, Rio de Janeiro, or farther south. He received the type specimen from the Museu Paulista in São Paulo. As *Z. discoidalis* was described from Peru and is much smaller than *delicatula*, I am assuming *Z. delicatula* to be a valid species.

**TYPE LOCALITY.**—Brazil?

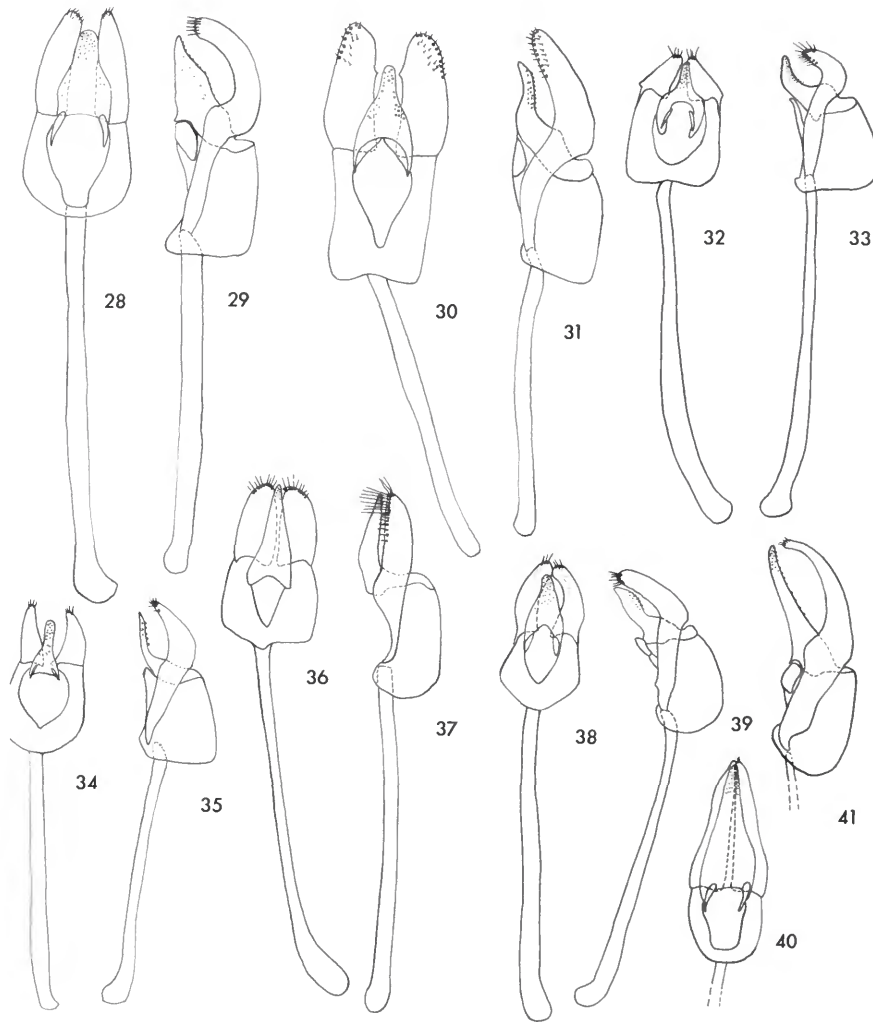
**TYPE DEPOSITORY.**—Zoology Museum, Humboldt University, East Berlin.

### *Zenoria crotchi*, new species

FIGURES 4, 30, 31, 68

**HOLOTYPE MALE.**—Length 3.36 mm, width 2.90 mm. Form round, slightly elongate. Color pale yellow; elytra with a large metallic green spot occupying discal three-fourths, covering half the humeral callus; pronotum with basal median projection piceous (Figure 4); metasternum and median area of first 3 abdominal sterna black. Pronotum sparsely covered with yellowish white, semidecumbent pubescence, average length of hairs 0.12 mm; punctures fine, separated by 1 to 3 times their diameter; width to length ratio 1.99:0.99 mm. Elytron covered with yellowish white, semierect pubescence, average length of hairs 0.16 mm; coarse punctures shallow, separated by their diameter, interspersed fine punctures separated by 1 to 3 times their diameter, coarse punctures extending onto elytral disc, becoming only slightly shallower and more widely spaced; margin of elytron broadly explanate; epipleuron with inner carina extending half the distance to outer margin. Postcoxal line not reaching hind margin of first abdominal sternum, gradually curved upward at outer end. Male genitalia with basal lobe much shorter than paramere, wide basally, abruptly narrowing to a blunt apex at apical third; paramere long, broad, a tooth present on inner margin two-thirds the distance to apex (Figures 30, 31); siphon with apex missing (Figure 68).

**FEMALE.**—Similar to male except last abdominal sternum carinate medially, apex of last sternum with a faint emargination.



FIGURES 28-41.—Male genitalia of *Zenoria* spp.: phallobase, ventral and lateral views: 28, 29, *Z. pallida*, new species; 30, 31, *Z. crotchi*, new species; 32, 33, *Z. annularis*, new species; 34, 35, *Z. schwarzi*, new species; 36, 37, *Z. discoidalis* (Kirsch); 38, 39, *Z. tricolor* Nunenmacher; 40, 41, *Z. emarginata*, new species.

VARIATION.—No apparent variation in the type series. A female I tentatively place as this species is smaller, 3.10 mm long, the elytral spot black, not reaching the humerus.

HOLOTYPE.—Brazil, Para. (CM, 2966).

PARATYPES.—Total 3: 1, same data as type (CM); 1 (from CM 2966), Brazil, Rio de Janeiro (NMNH); 1 Brazil, Santarém (UMC).

DISCUSSION.—See discussion below for *Z. annularis*, new species. The male genitalia are very distinctive. The extremely large paramere with the inner tooth does not resemble closely any other known member of the genus.

The paratype from the University Museum, Cambridge, is number 8 in the series of *Z. revestita* in the Crotch collection.

*Zenoria annularis*, new species

FIGURES 32, 33, 70

**HOLOTYPE MALE.**—Length 3.40 mm, width 3.00 mm. Like *Z. crotchi* with the following differences: metallic green spot on elytral disc slightly larger, metasternum and abdomen pale yellow. Postcoxal line extending very near hind margin of first abdominal sternum, abruptly curving cephalad at outer end. Genitalia with phallobase short, broad; basal lobe equal in length to paramere, broad at base, abruptly narrowing to a blunt apex; paramere angulate at base, tapering suddenly to a blunt apex, sharply curved downward in lateral view (Figures 32, 33); siphon with apex curved downward, attenuate tip abruptly recurved (Figure 70).

**FEMALE.**—Similar to male except the median basal projection of pronotum narrowly piceous.

**VARIATION.**—Length 3.40 to 3.55 mm, width 3.00 to 3.10 mm. There is considerable variation in the density of the dorsal pubescence which probably has been caused by rubbing of the specimens.

**HOLOTYPE.**—Brazil; Santarém, (CM, acc. 2966).

**PARATYPES.**—Total 6: 3 with same data as holotype (2 in CM, 1 in NMNH); 1, Brazil, "Amaz." (UMC); 2 Brazil, Santarém (UMC).

**DISCUSSION.**—The 3 paratypes from the University Museum, Cambridge, are numbers 3, 7, and 11 in the series of *revestita* in the Crotch collection. These plus number 8 are the specimens Crotch was referring to when describing his color variety ♂ of *revestita*. Number 8 is *crotchi*, new species.

The new species *Z. annularis*, *crotchi*, and *schwarzi*, and *Z. discoidalis* (Kirsch), *Z. delicatula* Weise, and *Z. tricolor* Nunenmacher all have the same basic color pattern, a spot of varying size occupying the elytral disc and a pale pronotum. *Z. annularis* and *crotchi* resemble each other closely, both have the elytral spot a metallic green. This color pattern is approached by the form of *Z. schwarzi* that lacks the central red spot. In *schwarzi* the elytral spot covers the humeral callus while in the other two species only half the callus is covered. *Z. discoidalis* and *delicatula* are quite similar in having the elytral spot black but *delicatula* is described as being 4.00 mm long while *discoidalis* is less than 3.50 mm. The pattern of a large elytral spot with a small red spot on the disc occurs in both *Z. schwarzi* and *tricolor*, apparently

more consistently in *tricolor*. *Z. tricolor* has the large spot black, the small red spot distinctly visible, *schwarzi* has the large spot metallic green, the small red spot indistinct except under magnification.

*Zenoria discoidalis* (Kirsch)

FIGURES 36, 37, 71

*Siola discoidalis* Kirsch, 1876, p. 127

*Zenoria discoidalis*: Weise, 1910, p. 60.—Korschefsky, 1931, p. 108.—Blackwelder, 1945, p. 443.

**MALE.**—Length 3.23 mm, width 2.60 mm. Form round, slightly elongate. Color yellowish white, large elytral spot, intercoxal area of mesosternum, metasternum and median area of first two abdominal sterna black. Pronotum with sparse yellowish white, semidecumbent pubescence, average length of hairs 0.11 mm; punctures fine, separated by 1 to 2 times their diameter; width to length ratio 1.74:0.89 mm. Elytron with sparse yellowish white, semierect pubescence; coarse punctures deep, separated by less than their diameter, extending onto elytral disc nearly to center, interspersed fine punctures separated by 2 to 5 times their diameter; margin of elytron broadly explanate; epipleuron with inner carina reaching outer margin. Genitalia with basal lobe equal in length to paramere, narrow, tapering gradually to a sharp apex; paramere broad, emarginate before apex, a small tooth on inner margin anterior to emargination, (Figures 36, 37); siphon with apex deeply emarginate (Figure 71).

**FEMALE.**—Similar to male except pronotum with a basal black band occupying approximately the median one-third.

**VARIATION.**—Length 3.10 to 3.30 mm, width 2.58 to 2.65 mm. The elytral black spot is smaller in some specimens, not reaching the humeral callus at all and extending only slightly more than two-thirds the distance to the elytral apex.

**TYPE LOCALITY.**—Peru.

**TYPE DEPOSITORY.**—Dresden Museum, Dresden, Germany (may have been destroyed).

**DISCUSSION.**—See discussion under *Z. annularis*. This species is perhaps limited to the Andean Highlands as are so many South American coccinellids. Kirsch's types have been reported destroyed during World War II, but from his description

there is little doubt that the species discussed here is *Z. discoidalis*. Weise (1910) stated that he had specimens of this species from "Itaituba, Amazonas"; this locality is in Pará, on the Topajós River. Weise's specimens were probably either *Z. annularis* or *crotchi*.

### *Zenoria tricolor* Nunenmacher

FIGURES 8, 38, 39, 69

*Zenoria tricolor* Nunenmacher, 1944, p. 144.

**MALE.**—Length 2.90 mm, width 2.40 mm. Form round, slightly elongate. Color pale yellow; median projection of pronotum black, elytra with a large black spot occupying three-fourths of elytra, a small, circular, brick-red spot on suture in center of black spot (Figure 8). Pronotum with sparse, yellowish white, semidecumbent pubescence, average length of hairs 0.10 mm; punctures fine, indistinct, separated by 1 to 3 times their diameter; width to length ratio 1.66:0.82 mm. Elytron covered with yellowish white, semierect pubescence, average length of hairs 0.15 mm; coarse punctures deep, separated by their diameter, becoming shallow and widely spaced on disc, interspersed fine punctures nearly absent; margin of of elytron broadly explanate; epipleuron with inner carina reaching the outer margin. Genitalia with basal lobe slightly shorter than paramere, broad at base, narrowing slightly in apical third to a blunt, round apex; parameres broad, curved toward each other and nearly touching at apex; outer angle of paramere angulate (Figures 38, 39); siphon with apex wide, not attenuate (Figure 69).

**FEMALE.**—Similar to male in all respects except sexual characters.

**VARIATION.**—Length 2.90 to 3.00 mm, width 2.55 to 2.59 mm.

**TYPE LOCALITY.**—Brazil; Pará, Amazon.

**TYPE DEPOSITORY.**—California Academy of Sciences.

**Discussion.**—See discussion under *Z. annularis*. The type was loaned by H. B. Leech (CAS), and proved to be a female. The color pattern, which is quite distinctive, will serve to distinguish this pretty little beetle from any other described species of *Zenoria*. The single specimen from the Korschefsky collection, labeled "Cuba," is definitely

*tricolor*, but the accuracy of the locality label is suspect.

**SPECIMENS EXAMINED.**—7 from the following localities: Brazil, Santarém (CM, acc. 2966) (NMNH); Cuba?, no further data (NMNH).

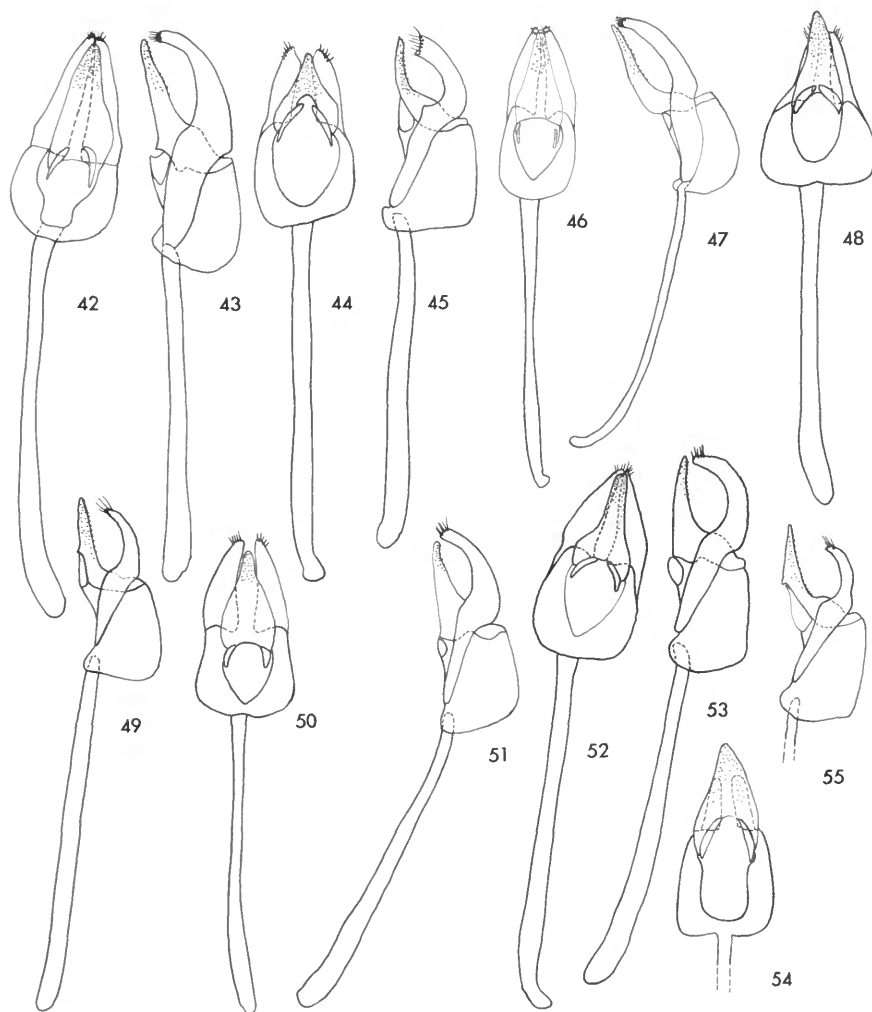
### *Zenoria schwarzi*, new species

FIGURES 34, 35, 72

**HOLOTYPE MALE.**—Length 3.05 mm, width 2.55 mm. Form round, slightly elongate. Color pale yellow; metasternum slightly darker; pronotum with median basal projection black, elytra with a large, discal, dark metallic green spot occupying most of elytra, a small, oval, dark red spot on suture in the center of green spot, red extending forward narrowly along suture to scutellum. Pronotum with sparse yellowish white, semidecumbent pubescence, average length of hairs 0.10 mm; punctures fine, separated by 1 to 2 times their diameter; width to length ratio 1.85:0.71 mm. Elytron covered with yellowish white, semierect pubescence, average length of hairs 0.15 mm; coarse punctures deep, separated by their diameter or less, becoming shallow and widely spaced on disc, completely absent near suture, interspersed fine punctures separated by 1 to 3 times their diameter; margin of elytron broadly explanate; epipleuron with inner carina reaching outer margin. Postcoxal line extending caudad to posterior margin of first abdominal sternum, outer end abruptly curved cephalad. Genitalia with basal lobe slightly shorter than paramere, broad at base, suddenly constricted at midpoint, sides parallel to apex, apex bluntly rounded; parameres narrowing apically, curving slightly toward each other (Figures 34, 35); siphon straight before apex, tip attenuate, curved abruptly upward (Figure 72).

**FEMALE.**—Similar to male in all respects except sexual characters.

**VARIATION.**—Length 2.95 to 3.10 mm, width 2.45 to 2.65 mm. Some specimens have the elytral red spot missing entirely except for a very narrow area along the suture. In these specimens the elytron, except a narrow outside pale band, is entirely dark green. The pronotum may or may not have the median basal projection black. This is not a sexual difference as is often the case in other species of *Zenoria*.



FIGURES 42-55.—Male genitalia of *Zenoria* spp.: phallobase, ventral and lateral views: 42, 43, *Z. circumcincta*, new species; 44, 45, *Z. variabilis*, new species; 46, 47, *Z. revestita* Mulsant; 48, 49, *Z. similis*, new species; 50, 51, *Z. serva*, new species; 52, 53, *Z. patula*, new species; 54, 55, *Z. nigra*, new species.

**HOLOTYPE.**—Panama; Porto Bello, 18-2 [II]-11, E. A. Schwarz coll., on Musaceae (NMNH 70928).

**PARATYPES.**—Total 9. 2, same data as holotype (NMNH); 2, Panama, Porto Bello, 15-II-11, 17-II-11, E. A. Schwarz (NMNH); 2-Panama, Porto Bello, 27-II-11, 19-II-11, A. Busck (NMNH); 3-Panama, Canal Zone, Barro Colorado, May 1929, Darlington (MCZ).

**DISCUSSION.**—See under *Z. annularis*, above.

***Zenoria circumcincta*, new species**

FIGURES 7, 42, 43, 73

**HOLOTYPE MALE.**—Length 3.45 mm, width 2.90 mm. form round, slightly elongate. Color pale yellow, metasternum slightly darker; elytra with a large black spot occupying discal three-fourths, a large obovate yellowish red spot on suture, widest posterior to middle, ending at a point anterior to



the middle. Pronotum with sparse yellowish white, semidecumbent pubescence, average length of hairs 0.09 mm; punctures fine separated by 1 to 2 times their diameter; width to length ratio 1.99:0.89 mm. Elytron covered with sparse yellowish white, semierect pubescence, average length of hairs 0.13 mm; coarse punctures shallow, separated by their diameter, not occurring on discal area, interspersed fine punctures sparse, separated by 1 to 5 times their diameter; margin of elytron broadly explanate; epipleuron with inner carina reaching outer margin. Postcoxal line extending caudad and out nearly to hind margin of first abdominal sternum, outer end abruptly curved cephalad. Genitalia with basal lobe slightly shorter than paramere, broad at base, gradually narrowing to a blunt rounded apex; parameres narrow, close together, parallel (Figures 42, 43); siphon straight before apex, curved downward, abruptly recurved (Figure 73).

**FEMALE.**—Similar to male except median fourth of pronotum black from base to apex (Figure 7).

**HOLOTYPE.**—Brazil, "Amaz." (UMC).

**PARATYPE.**—Brazil, Santarém (UMC).

**DISCUSSION.**—The elytra give the appearance of having 3 rings of color, the outer yellow, median black, and inner ring red. Some females of *Z. emarginata*, new species, have the same type of pattern.

The holotype and paratype are both in the Crotch collection, the holotype is number 2 and the paratype 13 in the series of *Z. revestita*. Crotch based his color variety  $\epsilon$  of *revestita* on these two specimens.

### *Zenoria variabilis*, new species

FIGURES 1, 2, 3, 44, 45, 75

**HOLOTYPE MALE.**—Length 3.90 mm, width 3.00 mm. Form round, slightly elongate. Color pale yellowish white; mesosternum, metasternum, and median area of first 2 abdominal sterna black, elytron with a small brown spot on disc near suture (Figure 2). Pronotum with white, semidecumbent pubescence, average length of hairs 0.12 mm; punctures fine, separated by 1 to 3 times their diameter; width to length ratio 2.10:1.05 mm. Elytron covered with white semierect pubescence, average length of hairs 0.16 mm; coarse punctures shallow, separated by their diameter or less, becoming shallower and

more widely spaced toward disc, completely absent near suture, interspersed fine punctures separated by 1 to 3 times their diameter; margin of elytron broadly explanate; epipleuron with inner carina reaching outer margin. Postcoxal line extending caudad nearly to hind margin of first abdominal sternum, outer end abruptly curved cephalad. Genitalia with basal lobe equal in length to paramere, very broad basally, tapering to a point apically; paramere strongly curved downward, a large inner tooth present at apex (Figures 44, 45); siphon sinuate before apex, apex slightly curved upward, extruded internal sac with a cluster of teeth (Figure 75).

**FEMALE.**—Similar to male in all respects except sexual characteristics.

**VARIATION.**—Length 3.85 to 4.00 mm, width 2.96 to 3.02 mm. The dorsal color pattern is subject to a good deal of variation. The majority of the specimens examined had the color pattern as described for the holotype, but 9 specimens are colored as in Figure 3 and 3 as in Figure 1: these two patterns may be sexually related to some degree; the 2 males in this group both have the pronotum immaculate as in the typical form.

**HOLOTYPE.**—Peru, Satipo, IX–X–1942 Paprzycki (NMNH 70929).

**PARATYPES.**—Total 49: 15, same data as holotype; 34, Peru, Satipo, XI 1941, V–VI 1942, X 1942, XI 1942, VII–VIII 1942, V–VI 1942, all in NMNH.

**DISCUSSION.**—This species does not resemble closely any known species of *Zenoria*. The color patterns, although variable, are found only in *variabilis*. The male genitalia with the large tooth on the paramere are also distinctive.

### *Zenoria emarginata*, new species

FIGURES 6, 21, 40, 41, 76

**HOLOTYPE MALE.**—Length 3.00 mm, width 2.55 mm. Form round, slightly elongate. Color pale yellow; tip of basal median projection of pronotum, elytron except narrow outer band, meso- and metasternum black. Pronotum with grayish white, semidecumbent pubescence, average length of hairs 0.11 mm; punctures fine, separated by 1 to 2 times their diameter; width to length ratio 1.80:0.84 mm. Elytron covered with grayish white, semierect

pubescence, average length of hairs 0.15 mm; coarse punctures deep, separated by their diameter or less, becoming shallow and widely spaced on disc, absent near suture, interspersed fine punctures separated by 1 to 3 times their diameter; margin of elytron broadly explanate; epipleuron with inner carina extending less than half the distance to outer margin. Postcoxal line nearly reaching hind margin of first abdominal sternum, outer end abruptly curved cephalad (Figure 21). Genitalia with basal lobe long, equal in length to paramere, gradually narrowing from near base to rounded apex; paramere long, curved downward at tip (Figures 40, 41); siphon curved downward before apex, apex recurved, acuminate (Figure 76).

**FEMALE.**—Similar to male except pronotum black, narrow anterior margin yellow; elytron black except faint yellow traces on margin at humerus and apex. Last ventral sternum strongly emarginate (Figure 21).

**VARIATION.**—Length 2.93 to 3.00 mm, width 2.50 to 2.57 mm. In addition to the sexual variation noted above, two kinds of color patterns have been observed in females, as follows: 1, pronotum yellow with a wide median, longitudinal black band from base to apex; elytra with a narrow yellow ring, second ring wide, brown, third ring narrow, yellow, and a dark brown discal spot; 2, pronotum yellow; elytra with a narrow, yellow, marginal ring, second ring wide, brown, discal area yellow (Figure 6).

**HOLOTYPE.**—British West Indies, Trinidad, St. Augustine, February 1941, F. J. Simmonds (NMNH 70930).

**PARATYPES.**—Total 18. 3, same data as holotype; 15-Trinidad, April 1951, March 1951, and St. Augustine, April 1951, 13 December 1950, F. J. Simmonds; Port-of-Spain, Dept. Agr. Grounds, 24 October 1918, Harold Morrison (A818); Port-of-Spain, K. A. Bartlett (P. R. 2238); all in NMNH.

**DISCUSSION.**—This is the only described species of *Zenoria* with the female last visible ventral sternum deeply emarginate. The extreme color variation in some specimens may possibly be related to maturity. In all cases observed, where the color pattern differed from the typical, the specimens were teneral to some degree.

*Z. emarginata* has been recorded feeding on *Asterolecanium* sp. and on *Aspidiotus destructor* Signoret on coconut.

### *Zenoria revestita* Mulsant

FIGURES 9, 46, 47, 77

*Zenoria revestita* Mulsant, 1850, p. 900.—Crotch, 1874, pp. 277-278.—Korschefsky, 1931, p. 108.—Blackwelder, 1945, p. 443.

**LECTOTYPE MALE.**—Length 3.30 mm, width 3.00 mm. Form round, slightly elongate. Color black (Figure 9); anterior margin and angles of pronotum, head, antenna, mouthparts, underside of pronotum, last three abdominal sterna and legs pale yellow. Pronotum covered with grayish white, semidecumbent pubescence, average length of hairs 0.11 mm; punctures fine, separated by 2 to 4 times their diameter; width to length ratio 1.96:0.98 mm. Elytra covered with grayish white, semidecumbent pubescence, average length of hairs 0.13 mm, discal fourth with dark-brown pubescence; coarse punctures deep, separated by less than their diameter, interspersed fine punctures separated by 2 to 4 times their diameter, coarse punctures becoming widely separated, shallow on discal fourth; margin of elytron abruptly reflexed, feebly sinuate in lateral view; epipleuron with inner carina reaching less than half the distance to outer margin. Genitalia with basal lobe equal in length to paramere, narrowed at middle, tapering to a blunt point; paramere flattened on underside medially, broad (Figures 46, 47); siphon bent downward slightly at tip, apex fine, acuminate (Figure 77).

**FEMALE.**—Similar to male except head, anterior angles and underside of pronotum, front and middle legs (except tarsi), and hind femur black.

**VARIATION.**—Length 3.00 to 3.30 mm, width 2.60 to 3.00 mm. Some male specimens have the metafemur black as in the female. Females may have the metatibia black, at least basally.

**TYPE LOCALITY.**—Brazil.

**TYPE DEPOSITORY.**—University Museum, Cambridge, England (lectotype here designated).

**DISCUSSION.**—*Z. revestita* is one of several species having the dorsal surface black with an apparently nonpubescent spot on the elytral disc. This illusion is caused by the hairs being dark brown and difficult to see against the black background. The coarse punctures are much shallower and less dense on the disc than around the margin.

Crotch (1874) included 16 specimens under this name in his collection. Crotch considered them

all to be *revestita* and described six color varieties, giving them Greek letters.

Since no type has been formally designated, I hereby designate the first specimen in the series of *revestita* in the Crotch collection as the lectotype.

### *Zenoria similaris*, new species

FIGURES 48, 49, 74

**HOLOTYPE MALE.**—Length 3.48 mm, width 2.95 mm. Form round, elytron slightly narrower and elongate posterior to middle. Color black; broad anterior and lateral margins of pronotum, head and mouthparts, underside of pronotum, legs, and abdomen yellow; discal area of elytra appearing shiny, black, nonpubescent. Pronotum covered with grayish white, semidecumbent pubescence, average length of hairs 0.12 mm; punctures fine, separated by 1 to 3 times their diameter; width to length ratio 2.01:0.91 mm. Elytron covered with dense grayish white, semierect pubescence, discal area with pubescence dark brown, average length of hairs 0.16 mm; coarse punctures deep, separated by their diameter or less, not extending onto discal area, interspersed fine punctures separated by 1 to 2 times their diameter; margin of elytron broadly explanate, strongly sinuate in lateral view; epipleuron with inner carina extending half the distance to outer margin. Postcoxal line extending caudad nearly to hind margin of first abdominal sternum, outer end abruptly curved cephalad. Genitalia with basal lobe longer than paramere, tapering from near base to bluntly rounded apex; paramere short, narrow, gradually curved downward at apex (Figures 48, 49); siphon sinuate before apex, curved down and outward, acuminate (Figure 74).

**FEMALE.**—Similar to male except a very narrow anterior pronotal margin yellow, underside of pronotum and prosternum black.

**VARIATION.**—Length 3.43 to 3.51 mm, width 2.91 to 2.98 mm. The basal black area of pronotum covers between two-thirds and three-fourths of pronotal area, apical border may be emarginate with yellow medially. The discal area of the elytra has a narrow band of grayish white pubescence separating the dark discal spot in half on typical specimens, giving the appearance of a small round dark spot on each elytron. On many of the exam-

ples in the type series this narrow band is missing, the dark area being one large central spot.

**HOLOTYPE.**—Colombia, Palmira, 26-I-41, Murillo 84 (NMNH 70931).

**PARATYPES.**—Total 38. 1, same data as holotype. Colombia: 9, Palmira, 15-V-39, Murillo 5022, 18-V-39, Murillo 5252, 27-I-41, Murillo 5454, 5369; 1, Garzón, 28-III-39, Murillo 5074; 1, Manizales, 13-II-41, Murillo 13; 1, Cauca, Puerto Tejada, 23-V-39, Murillo 5265; 7, Candelaria, 30-I-41, Murillo 33, and 31-I-41, Murillo 5494; 9, Buga, 4-II-41, Murillo 35, 5395, 6-II-41, Murillo 1, 2, and 8-II-41, Murillo 27 (NMNH); 4, Río Frío, Magdalena, Darlington; 2, Sevilla, Darlington (MCZ). Mexico: 1, Orizaba, 1-IV-10, F. C. Bowditch (MCZ); 1, Veracruz, Córdoba, 13-VIII-1964, Paul J. Spangler; 1, Veracruz, Nacimiento de Río Atojal 13-VII-65, A. B. Lau (NMNH).

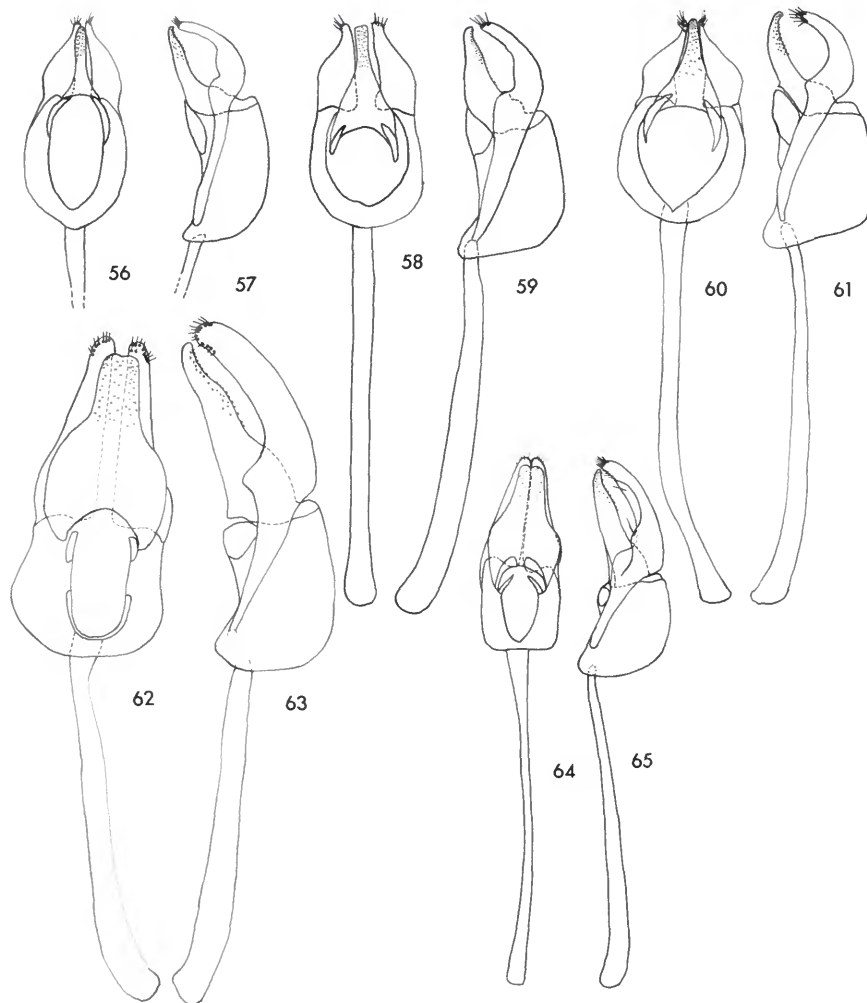
**DISCUSSION.**—*Z. similaris* superficially resembles *revestita*, but *similaris* has the margin of the elytron broadly explanate and strongly sinuate in lateral view, male pronotum with at least a fourth of area yellow, and male genitalia with basal lobe distinctly longer than paramere.

*Z. similaris* and all the following species except *carinatus*, new species, have the strongly sinuate, broadly explanate lateral margin of the elytron. The general appearance of these species is that of a more elongate, broader insect than the preceding species.

### *Zenoria serva*, new species

FIGURES 50, 51, 78

**HOLOTYPE MALE.**—Length 3.58 mm, width 3.20 mm. Form round, slightly elongate. Color black; anterior and lateral margins of pronotum, head and mouthparts, posternum, legs and abdomen yellow. Pronotum with grayish white, semidecumbent pubescence, average length of hairs 0.13 mm; punctures fine, separated, by 1 to 3 times their diameter; width to length ratio 2.13:1.06 mm. Elytron covered with grayish white, semierect pubescence, discal area with pubescence dark brown, average length of hairs 0.16 mm; coarse punctures deep, separated by their diameter or slightly more, not extending onto discal area; interspersed fine punctures separated by 2 to 5 times their diameter;



FIGURES 56-65.—Male genitalia of *Zenoria* spp.: phallobase, ventral and lateral views: 56, 57, *Z. linteolata* Mulsant; 58, 59, *Z. flavicollis*, new species; 60, 61, *Z. paprzyckii*, new species; 62, 63, *Z. discrepa*, new species; 64, 65, *Z. major* Crotch.

margin of elytron broadly explanate, strongly sinuate; epipleuron with inner carina extending less than half the distance to outer margin. Post-coxal line extending caudad nearly to hind margin of first abdominal sternum, outer end abruptly curved cephalad. Genitalia with basal lobe shorter than paramere, broad at base, sides rounded, tapering to apical third, sides gradually narrowing to rounded point; paramere gradually curved downward at apex, broad at base, tapering to narrow

apex (Figures 50, 51); siphus sinuate before apex, tip acuminate (Figure 78).

FEMALE.—Not known.

HOLOTYPE.—Brazil, São Paulo, Campinas, F. C. Comargo (NMNH) 70932).

DISCUSSION.—*Z. serva* is another species with the *revestita* type of color pattern and most nearly resembling *Z. patula*, new species. These three are the only *Zenoria* examined from southern Brazil. *Z. revestita* is easily separated by the characters

previously discussed. The other two species are distinguished with certainty only by the male genitalia. The slight color and size differences may not prove to be valid when a series of each species is available.

### *Zenoria patula*, new species

FIGURES 52, 53, 79

**HOLOTYPE MALE.**—Length 3.90 mm, width 3.40 mm. Like *Z. serva*, with the following differences: pronotum with black area not extending to posterolateral angles, extending to within 0.20 mm of anterior margin medially. Genitalia with basal lobe equal in length to paramere, wide at base, abruptly narrowing at basal third, sides parallel to rounded apex (Figures 52, 53); siphon bent downward slightly before apex, tip acuminate (Figure 79).

**FEMALE.**—Not known.

**HOLOTYPE.**—Brazil, Minas Gerais, Vicosa, 6-VIII-33, E. J. Hambleton (NMNH 70933).

**DISCUSSION.**—*Z. patula* is 0.60 mm longer than *Z. serva*. The yellow on the pronotum is reduced in *Z. serva*, not reaching the posterolateral angles and present only as a narrow band along the anterior margin. The only specimen available of each species was a male therefore the pronotal color differences may have some specific value.

### *Zenoria nigra*, new species

FIGURES 54, 55, 80

**HOLOTYPE MALE.**—Length 3.30 mm, width 2.75 mm. Form round, slightly elongate. Color black; pronotum (except basal median area), head, mouthparts, legs and abdomen yellow; meso- and metasternum and anterior fourth of epipleuron brown to piceous; discal area of elytra appearing shiny black, nonpubescent. Pronotum covered with grayish white, semidecumbent pubescence, average length of hairs 0.12 mm; punctures fine, separated by 1 to 2 times their diameter; width to length ratio 1.90:0.87 mm. Elytron covered with grayish white, semierect pubescence, discal area with pubescence dark brown, average length of hairs 0.15 mm; coarse punctures deep, separated by 1 to 2 times their diameter; margin of elytron broadly explanate, strongly sinuate in lateral view; epipleuron with inner carina extending less than half the distance to outer margin. Postcoxal line extending

caudad nearly to hind margin of first abdominal sternum, outer end gradually curved cephalad. Genitalia, with basal lobe much longer than paramere, gradually narrowing from base to bluntly rounded apex; paramere short, abruptly curved downward (Figures 54, 55); siphon sinuate before apex, tip straight, acuminate (Figure 80).

**FEMALE.**—Similar to male except a narrow anterior and anterolateral margin of pronotum, meso- and metasternum, and epipleuron black.

**VARIATION.**—Length 3.28 to 3.32 mm, width 2.74 to 2.78. The black area of the male pronotum varies from a small median basal spot to a band extending half way to the anterior margin and nearly to the lateral angles. Meso- and metasternum and epipleuron brown in some specimens.

**HOLOTYPE.**—Panama, Porto Bello, 18-2-11, E. A. Schwarz coll., on Musaceae (NMNH 70944).

**PARATYPES.**—Total 10, Panama: 7, XX Plantation, Blackwelder coll., 2-9-30, 4 Feb., 1930; 1, Porto Bello, "Mar. 11," E. A. Schwarz; 1, Canal Zone, Frijoles, Wheeler; 1, Tobago Is., 21, 22 Sept. 1918, H. F. Dietz (G-239). All paratypes in NMNH collection.

**DISCUSSION.**—The small size, male genitalia and distribution should distinguish *Z. nigra* from other members of the *revestita* group. It most nearly resembles *Z. emarginata* in size and color pattern.

The discal spot is not divided at the suture and extends forward nearly to the scutellum.

### *Zenoria linteolata* Mulsant

FIGURES 56, 57, 81

*Zenoria linteolata* Mulsant, 1850, p. 901.—Crotch, 1874, p. 277.

*Zenoria lineolata*: Korschefsky, 1931, p. 108.—Blackwelder, 1945, p. 443 (error).

**FEMALE.**—Length 3.80 mm, width 3.33 mm. Form round, slightly elongate. Color black; elytra dark metallic green; narrow anterior and lateral pronotal margins, head and mouthparts, prosternum, legs, and abdomen yellow. Pronotum covered with grayish white, semidecumbent pubescence, average length of hairs 0.10 mm; punctures fine, separated by less than their diameter; width to length ratio 2.18:1.05 mm. Elytron with grayish white, semierect pubescence, discal area with pubescence dark brown, average length of hairs 0.13

mm; coarse punctures deep, separated by less than their diameter, not extending onto discal area, interspersed fine punctures separated by 1 to 2 times their diameter; margin of elytron broadly explanate, strongly sinuate; epipleuron with inner carina extending half the distance to outer margin.

**MALE.**—Similar to female except for the following differences: length 4.00 mm, width 3.60 mm; pronotum with basal three-fourths black, anterior margin of black area briefly emarginate with yellow on each side of middle; genitalia with basal lobe slender, parallel-sided to rounded tip, equal in length to paramere, paramere strongly curved downward, flared laterally near base (Figures 56, 57), siphon long, slightly sinuate before apex, tip acuminate (Figure 81).

**TYPE LOCALITY.**—Brazil.

**TYPE DEPOSITORY.**—Unknown.

**DISCUSSION.**—The female description above was taken from two specimens in the Crotch collection, numbers 4 and 9 in the series of *Z. revestita*. Crotch synonymized *Z. linteolata* under *revestita* and described it as color variety  $\gamma$ . During the course of this study, a male specimen I believe to be conspecific with these two females was examined and described above. The unusual combination of metallic-green elytra and black pronotum as well as the relatively large size and male genitalia distinguish this species. The genitalia are of the same type as those of *Z. paprzyckii*, new species, indicating a closer relationship than is apparent from external appearance. I have been unable to locate the type specimen of this species. Mulsant (1850) states that it was in the Mocquerys collection.

**SPECIMENS EXAMINED.**—Brazil. Pará, Santarém. British Guiana. Bartica District, Kartabo.

### *Zenoria flavicollis*, new species

FIGURES 58, 59, 82

**HOLOTYPE MALE.**—Length 4.00 mm, width 3.32 mm. Form round, slightly elongate. Elytron dark metallic green except a small yellow spot on humeral margin; pronotum yellow except basal median projection black; head and mouthparts, prosternum, legs, and abdomen yellow; meso- and metasternum and epipleuron black. Pronotum with grayish white, semidecumbent pubescence, average length of hairs 0.12 mm; punctures fine, separated by 1 to 3 times their diameter; width to length

ratio 2.63:1.08 mm. Elytron covered with grayish white, semierect pubescence, discal area with pubescence dark brown, average length of hairs 0.16 mm; coarse punctures deep, separated by their diameter, not extending onto discal area, interspersed fine punctures separated by 1 to 3 times their diameter; margin of elytron broadly explanate, strongly sinuate; epipleuron with inner carina extending slightly less than half the distance to outer margin. Postcoxal line distinctly removed from hind margin of first abdominal sternum, gradually curving cephalad at outer end. Genitalia with phallobase short; basal lobe subequal in length to paramere, abruptly narrowing from base to basal third, apical two-thirds with sides parallel to nearly truncate apex, thick in lateral view at base; paramere strongly curved downward apically, outer margin flared at base, parameres widely, evenly separated from base to apex (Figures 58, 59); siphon slightly bent downward before apex, tip straight, acuminate (Figure 82).

**FEMALE.**—Not known.

**VARIATION.**—The paratype differs from the holotype in having the black spot on the basal median projection of the pronotum larger, extending onto the pronotal disc, and the elytra lacking the yellow spot on the humeral margin.

**HOLOTYPE.**—Brazil. Ega (UMC).

**PARATYPE.**—1, same data as holotype.

**DISCUSSION.**—The two specimens studied are numbers 5 and 10 in the series of *Z. revestita* in the Crotch collection and represent Crotch's color variety  $\alpha$ . *Z. flavicollis* most nearly resembles *lin-teolata* both in external appearance and male genitalia. *Z. linteolata* has the basal lobe more slender, elongate, narrower in lateral view and the parameres nearly touching apically. In *flavicollis* the basal lobe is not as slender, quite thick in lateral view, especially basally, and the parameres are widely separated from base to apex.

### *Zenoria paprzyckii*, new species

FIGURES 5, 60, 61, 83

**HOLOTYPE MALE.**—Length 4.20 mm, width 3.35 mm. Form round, elongate. Color black (Figure 5); anterior half of pronotum, head and mouthparts, posternum, legs, and abdomen pale yellow. Pronotum covered with grayish white, semidecumbent pubescence, average length of hairs 0.10

mm; punctures fine, separated by 1 to 4 times their diameter; width to length ratio 2.35:1.01 mm. Elytron covered with dense grayish white pubescence, discal area with pubescence dark brown, average length of hairs 0.16 mm; coarse punctures deep, dense, separated by less than their diameter, extending onto discal area, absent near suture, interspersed fine punctures separated by 1 to 4 times their diameter; margin of elytron broadly explanate, strongly sinuate; epipleuron with inner carina extending slightly less than half the distance to outer margin. Postcoxal line distinctly removed from hind margin of first abdominal sternum, outer end abruptly bent cephalad. Genitalia with phallobase short; basal lobe slightly longer than paramere, narrow, strongly narrowed near base, sides parallel in apical third to rounded apex; paramere strongly curved downward, outer margin widely flared near base (Figures 60, 61); siphon emarginate on undersides in apical tenth, apex acuminate (Figure 83).

**FEMALE.**—Similar to male except pronotum with a very narrow anterior and anterolateral margin pale yellow; frons with a black spot of varying size; prosternum black.

**VARIATION.**—Length 4.08 to 4.22 mm, width 3.33 to 3.70 mm. The anterior margin of the pronotal black spot is usually emarginate with yellow medially, either feebly or strongly so, and the spot approaches to within 0.20 to 0.30 mm of the lateral margin. The area of dark pubescence on the elytra is not divided at the suture and in some specimens extends as far forward as the base of the pronotum.

**HOLOTYPE.**—Peru, Satipo, "IX-X-1942, "Paprzycki (NMNH 70945).

**PARATYPES.**—Total 300, Peru. Satipo, Paprzycki, VIII 1941, XI 1941, V-VI 1942, VIII 1942, X 1942, XI, 1942, VII-VIII 1942, IX-X 1942, VIII 1942; all in NMNH.

**DISCUSSION.**—The large size and *Z. revestita*-type color pattern distinguish *paprzyckii*. The male genitalia are of a type approached only by the genitalia of *Z. linteolata* and *flavicollis*.

### *Zenoria discrepa*, new species

FIGURES 62, 63, 84

**HOLOTYPE MALE.**—Length 4.83 mm, width 4.00 mm. Form round, broad, elongate posteriorly.

Color black; anterior and lateral margins of pronotum, head and mouthparts, underside of pronotum, prosternum, legs, and abdomen yellow; median area of metasternum reddish brown. Pronotum with grayish white, semidecumbent pubescence, average length of hairs 0.10 mm; punctures fine, separated by 2 to 4 times their diameter; width to length ratio 2.80:1.42 mm. Elytron covered with grayish white, semierect pubescence, discal area with pubescence dark brown, average length of hairs 0.16 mm; coarse punctures shallow, separated by their diameter or less, not extending onto discal area, interspersed fine punctures separated by 1 to 3 times their diameter; margin of elytron broadly explanate, strongly sinuate; epipleuron with inner carina extending a third the distance to outer margin. Postcoxal line not reaching hind margin of first abdominal sternum, outer end gradually curved cephalad. Genitalia with basal lobe slightly shorter than paramere, very broad in basal half, abruptly narrowing anterior to middle, sides parallel to nearly truncate apex; parameres flared at base, tapering to a narrow apex, contiguous at apex (Figures 62, 63); siphon sinuate before apex, tip stout, pointed (Figure 84).

**FEMALE.**—Similar to male except anterior and lateral margins of pronotum very narrowly yellow, underside of pronotum partially black.

**VARIATION.**—Length 4.80 to 4.83 mm, width 3.90 to 4.00 mm. The dark discal area of the elytra may extend anteriorly nearly to the scutellum and on one specimen is divided into two parts by a narrow line of grayish white pubescence along the suture.

**HOLOTYPE.**—Colombia, Cáqueza, 8-XII-40, Murillo 5437 (NMNH 70946).

**PARATYPES.**—Total 2, Panama Canal Zone, Barro Colorado Is., "I-III-44, Z-5123" (NMNH).

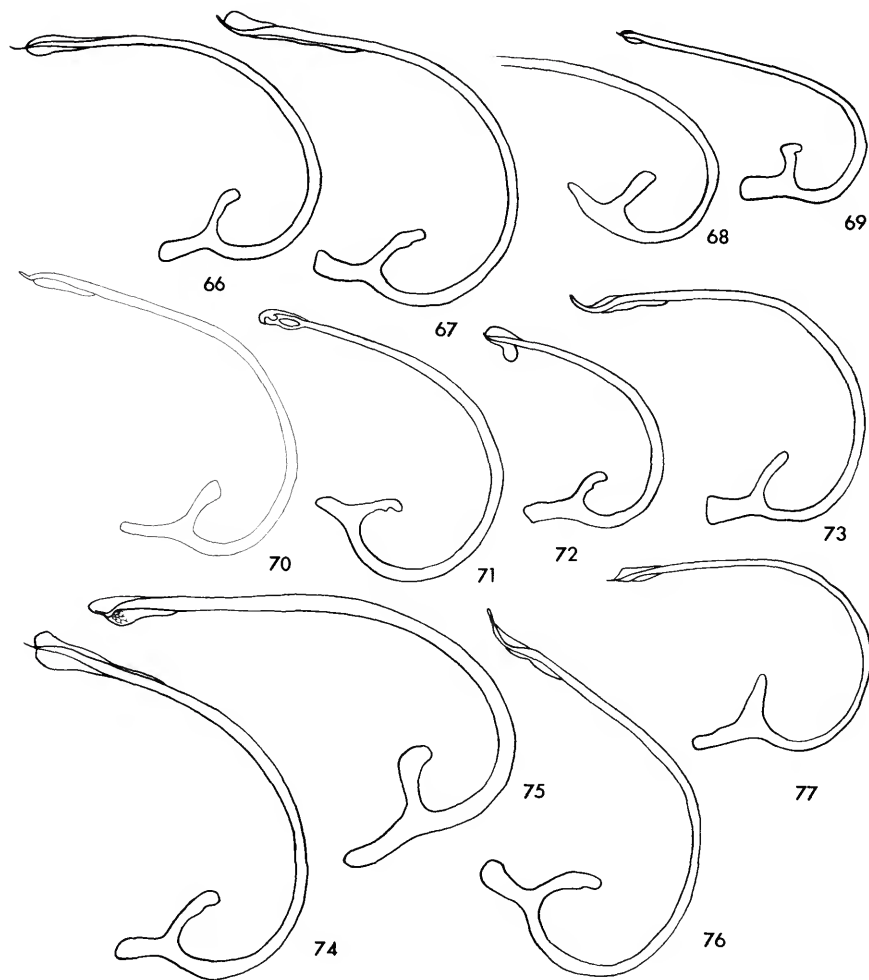
**DISCUSSION.**—This is the largest known species of *Zenoria*. The color pattern is of the *revestita* type with the usual reduction of the yellow color in the female.

### *Zenoria major* Crotch

FIGURES 10, 64, 65, 85

*Zenoria major* Crotch, 1874, p. 278.—Korschefsky, 1931, p. 108.—Blackwelder, 1945, p. 443.

**LECTOTYPE FEMALE.**—Length 4.75 mm, width 4.05 mm. Form broad, round, elongate posteriorly.



FIGURES 66-77.—Male genitalia of *Zenoria* spp.: siphos, lateral view: 66, *Z. subcostalis* Mulsant; 67, *Z. pallida*, new species; 68, *Z. crotchi*, new species; 69, *Z. tricolor* Nunenmacher; 70, *Z. annularis*, new species; 71, *Z. discoidalis* (Kirsch); 72, *Z. schwarzi*, new species; 73, *Z. circumcincta*, new species; 74, *Z. similis*, new species; 75, *Z. variabilis*, new species; 76, *Z. emarginata*, new species; 77, *Z. revestita* Mulsant.

Color pale yellow; elytron dark metallic green; pronotum except narrow anterior margin, mesosternum, and epipleuron black. Pronotum with grayish white, semidecumbent pubescence, average length of hairs 0.13 mm; punctures fine, separated by 1 to 4 times their diameter; width to length ratio 2.71: 1.31 mm. Elytron covered with grayish white, semierect pubescence, discal area with some pubescence dark brown, average length of hairs 0.16 mm; coarse punctures shallow, separated by

their diameter, extending onto discal area nearly to suture, interspersed fine punctures separated by 1 to 3 times their diameter; margin of elytron broadly explanate, strongly sinuate; epipleuron with inner carina extending less than half the distance to outer margin. Postcoxal line extending caudad nearly to hind margin of first abdominal sternum, outer end abruptly curved cephalad.

MALE.—Pronotum yellow except a median basal area black (Figure 10). Genitalia as in *discrepa*.



basal lobe not as wide, emarginate at apex; parameres separate, not contiguous at apex (Figures 64, 65); siphon as in *discrepa* (Figure 85).

VARIATION.—Length 4.30 to 4.75 mm, width 3.94 to 4.05 mm. Black pronotal area of male may be expanded nearly to lateral margin.

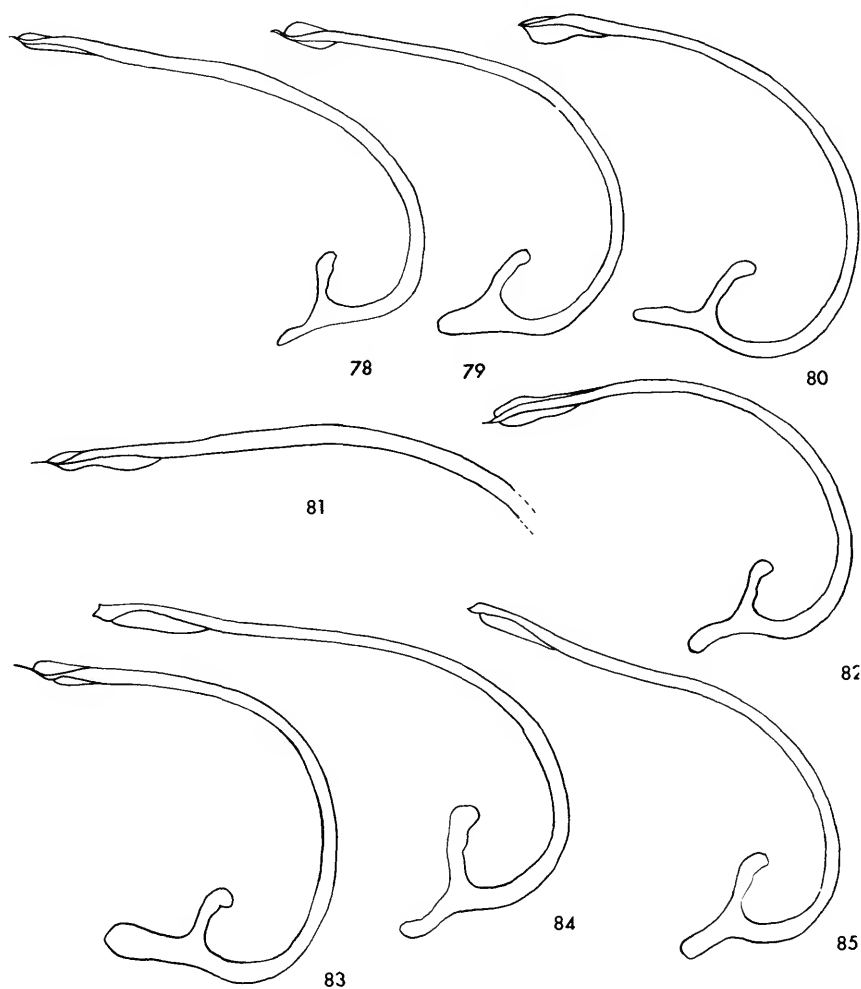
TYPE LOCALITY.—Brazil, Santarém.

TYPE DEPOSITORY.—University Museum, Cambridge, England (lectotype here designated).

DISCUSSION.—Although the lectotype and another specimen in the Crotch collection are females, I

am placing the male specimen described above as this species, since in all respects except sex and pronotal color, the specimens appear to be conspecific.

*Z. major* and *discrepa* form a group within the genus characterized by the broad elongate form, large size, and male genitalia. The elytra are widest anterior to the middle, while in the other members of the genus they are widest at the middle. The very broad basal lobe of the male genitalia is a character peculiar to these two species.



FIGURES 78-85.—Male genitalia of *Zenoria* spp.: siphon, lateral view: 78, *Z. serva*, new species; 79, *Z. patula*, new species; 80, *Z. nigra*, new species; 81, *Z. linteolata* Mulsant; 82, *Z. flavicollis*, new species; 83, *Z. paprzyckii*, new species; 84, *Z. discrepa*, new species; 85, *Z. major* Crotch.

The male specimen from the UMC is number 6 in the series of *Z. revestita* in the Crotch collection and was described by him as color variety  $\beta$ . The original Crotch type series of *Z. major* was comprised of three specimens, two females and a third specimen belonging to a genus in the Exoplectrini near *Exoplectra*. The first female is here designated as the lectotype.

SPECIMENS EXAMINED.—4 from the following localities in Brazil: Ega (UMC), Santarém (UMC), Pára (MCZ).

### *Zenoria carinata*, new species

HOLOTYPE FEMALE.—Length 4.00 mm, width 3.80 mm. Form round, convex. Color black; narrow anterior margin of pronotum, lateral margin of vertex, mouthparts, legs, and abdomen yellow; elytron dark metallic green. Pronotum with grayish white, semidecumbent pubescence, average length of hairs 0.11 mm; punctures fine, separated by 1 to 3 times their diameter; width to length ratio 2.41:1.15. Elytron covered with grayish white, semi-erect pubescence, discal area with pubescent dark brown, average length of hairs 0.15 mm; coarse punctures shallow, separated by their diameter or slightly less, not extending onto discal area, interspersed fine punctures separated by 1 to 4 times their diameter; margin of elytron narrowly, abruptly explanate, very slightly sinuate in lateral view; epipleuron descending externally, inner carina extending less than half the distance to outer margin. Postcoxal line extending caudad nearly to hind margin of first abdominal sternum, outer end abruptly curved cephalad. Fifth abdominal sternum with 2 short, internal carinae at apical third.

MALE.—Not known.

VARIATION.—No apparent variation in the type series.

HOLOTYPE.—Surinam, Paramaribo, April 1951, F. J. Simmonds (NMNH 70947).

PARATYPE.—1, same data as holotype.

DISCUSSION.—This species is easily recognized by the round, convex form and descending epipleuron, as well as the carinae on the female last ventral sternum. These two carinae are on the inside of the sternum, but give the impression of being one wide, external carina in specimens that are not dissected. The overall length of a species of *Zenoria* is usually 0.50 mm or more greater than the width, but in *carinata* the difference is only 0.20 mm.

### Literature Cited

- Blackwelder, R. E.  
1945. Checklist of the Coleopterous Insects of Mexico, Central America, the West Indies, and South America, Part 3. *United States National Museum Bulletin* 185, 188 pages.
- Chapuis, F.  
1876. Familles des phytophages des érotlyiens des endomychides et des coccinellides. Volume 12, pages 1-424 in J. T. Lacordaire, *Histoire naturelle des insectes. Genera des coléoptères*.
- Crotch, G. R.  
1874. *A Revision of the Coleopterous Family Coccinellidae*. 311 pages. London.
- Kirsch, T. F. W.  
1876. Beiträge zur Kenntnis der Peruanischen Käferfauna auf Dr. Abendroth's Sammlungen basirt. *Deutsche Entomologische Zeitschrift*, 20:81-133.
- Korschefsky, Richard  
1931. Pars 118, Coccinellidae I. Volume 16, pages 1-224, in *Coleopterorum Catalogus*.
- Mulsant, E.  
1850. Species de coléoptères trimères sécuripalpes. *Annales des Sciences Physiques et Naturelles, Lyon*, 2 (2) :1-1104.
- Nunenmacher, F. W.  
1944. Studies among the Coccinellidae—No. 9 (Coleoptera.) *Pan-Pacific Entomologist*, 20:144-146.
- Weise, J.  
1910. Aufzählung von Coccinellen aus dem Museu Paulista. *Revista do Museu Paulista*, 7:54-63.

## Publication in Smithsonian Contributions to Zoology

*Manuscripts* for serial publications are accepted by the Smithsonian Institution Press subject to substantive review, only through departments of the various Smithsonian museums. Non-Smithsonian authors should address inquiries to the appropriate department. If submission is invited, the following format requirements of the Press should govern the preparation of copy.

*Copy* must be typewritten, double-spaced, on one side of standard white bond paper, with 1½" top and left margins, submitted in ribbon copy with a carbon or duplicate, and accompanied by the original artwork. Duplicate copies of all material, including illustrations, should be retained by the author. There may be several paragraphs to a page, but each page should begin with a new paragraph. Number all pages consecutively, including title page, abstract, text, literature cited, legends, and tables. A manuscript should consist of at least thirty pages, including typescript and illustrations.

The *title* should be complete and clear for easy indexing by abstracting services. Taxonomic titles will carry a final line indicating the higher categories to which the taxon is referable: "(Hymenoptera: Sphecidae)." Include an *abstract* as an introductory part of the text. Identify the *author* on the first page of text with an unnumbered footnote that includes his professional mailing address. A *table of contents* is optional. An *index*, if required, may be supplied by the author when he returns page proof.

Two *headings* are used: (1) text heads (boldface in print) for major sections and chapters and (2) paragraph sideheads (caps and small caps in print) for subdivisions. Further headings may be worked out with the editor.

In *taxonomic keys*, number only the first item of each couplet; if there is only one couplet, omit the number. For easy reference, number also the taxa and their corresponding headings throughout the text; do not incorporate page references in the key.

In *synonymy*, use the short form (taxon, author, date, page) with a full reference at the end of the paper under "Literature Cited." Begin each taxon at the left margin with subsequent lines indented about three spaces. Within a taxon, use a period-dash (.—) to separate each entry. Enclose with square brackets any annotation in or at the end of the taxon. For *synonymy* and *references within the text*, use the author-date system: "(Jones 1910)." Use the colon system for page references: "(Jones 1910:122)," and abbreviate further data: "(Jones 1910:122, fig. 3, pl. 5: fig. 1)."

Simple *tabulations* in the text (e.g., columns of data) may carry headings or not, but they should not contain rules. Formal *tables* must be submitted as pages separate from the text, and each table, no matter how large, should be pasted up as a single sheet of copy.

Use the *metric system* instead of (or in addition to) the English system.

*Illustrations* (line drawings, maps, photographs, shaded drawings) usually can be intermixed throughout the printed text. They will be termed *Figures* and should be numbered consecutively; however, if a group of figures is treated as a single figure, the individual components should be indicated by lowercase italic letters on the illustration, in the legend, and in text references: "Figure 9*b*." Submit all legends on pages separate from the text and not attached to the artwork. An instruction sheet for the preparation of illustrations is available from the Press on request.

In the *bibliography* (usually called "Literature Cited"), spell out book, journal, and article titles, using initial caps with all words except minor terms such as "and, of, the." (For capitalization of titles in foreign languages, follow the national practice of each language.) Under-score (for italics) book and journal titles. Use the colon-parentheses system for volume number and page citations: "10(2):5-9." Spell out such words as "figures," "plates," "pages."

For *free copies* of his own paper, a Smithsonian author should indicate his requirements on "Form 36" (submitted to the Press with the manuscript). A non-Smithsonian author will receive fifty free copies; order forms for quantities above this amount, with instructions for payment, will be supplied when page proof is forwarded.

