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**Tiger Beetles of the Genus *Cicindela*
in Arizona (Coleoptera: Cicindelidae)**

Judy Bertholf

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Tiger Beetles of the Genus *Cicindela* in Arizona (Coleoptera: Cicindelidae)

Judy Bertholf

Tiger beetles (Coleoptera: Cicindelidae) are active, predatory insects with a worldwide distribution. Bright coloration of the type, and largest genus, *Cicindela* Linné, has made it the object of extensive collecting by both professionals and amateurs. As a result, many manuscripts have been published concerning collecting techniques (Cutler, 1969; Ferris, 1969; Wendler, 1969; Willis, 1971). These insects are housed in many private and museum collections throughout the world.

According to Vaurie (1950b), there are three habitats in which tiger beetles are almost always found. These are sand hills, alkali lakes or flats, and sand banks. Habitats such as these, which are found throughout most of Arizona, plus warm temperatures, account for that state's large tiger beetle fauna. In addition, the advent of stock water tanks in recent years has provided numerous ideal habitats for the tiger beetles.

Sexually mature adult tiger beetles emerge in the spring and live for two to 10 months. The adult males can be easily distinguished by dense pads of hair on their front tarsi. The adult females have a large bladelike ovipositor for depositing eggs in the ground.

The eggs are laid singly and after usually two weeks of incubation hatch into the first larval stage. This larval stage lasts a month, during which time the larvae dig a vertical burrow and prey on arthropods that happen by the entrance.

The next two larval stages vary in length depending on the species and a number of environmental factors, including temperature and moisture. The third larval stage is followed by pupal ecdysis, which usually lasts two weeks, and is followed by the last ecdysis. Newly emerged adults remain in the burrow for several days as their pigment develops.

There may be either one or two years between generations. If there is one year between generations, the beetles usually hibernate in the third larval stage. If there are two years between generations they may hibernate both years in the larval stage or one year as a larva and one as an adult. The generations may overlap and color-changes have been observed (Shelford, 1908).

In reviewing the *Cicindela* literature it became clear that although several general works have been published with zoogeographical emphasis, our knowledge of the distribution of many species is incomplete. These works have largely been arranged according to states, and, until recently, the southwest United States has been virtually ignored (Rumpp, 1956, 1961; Sumlin, 1976).

Papers including information of *Cicindela* species in Arizona have been published concerning habitats (Davis, 1921; Payne, 1971; Sherman, 1908; Vaurie, 1950b), life-histories (Hamilton, 1925; Shelford, 1908), and biology and control (Frick, 1957). Species descriptions and Arizona distributional records have been scattered throughout the literature (Cazier, 1954; Duncan, 1958; Harris, 1913; Rumpff, 1977; Van Dyke, 1947; Vaurie, 1950). As a result, the total picture of the *Cicindela* fauna in Arizona has been unclear.

MATERIALS AND METHODS

The present study began with an extensive literature search. Descriptions, localities, and habitat notes were reviewed and catalogued. These data were then compared to approximately 10,000 specimens from the following collections: Arizona State University, University of Arizona, University of Northern Arizona, University of Chicago, Midwestern State University, Texas Tech University, and several from the personal collection of Mr. Norman Rumpff. Morphological characteristics examined in the systematics of the genus included presence or absence of setae, number and size of teeth on the anterior margin of the labrum, and color and size of maculations on the elytra.

After the preliminary morphological study, the various species of *Cicindela* were mapped. During the summer of 1978, spot collecting was performed throughout Arizona at localities where distributions were unclear. The maps were then modified to include the new localities. (Detailed listing of all localities at which each taxon had been taken was found to be economically unfeasible; however, such lists are available directly from the author upon request.) Illustrations of the specimens were added, drawn at uniform scale for ease of comparison. (Illustrations and maps are grouped in the back of the volume.) Diagnoses, remarks, and keys were also included for further identification of the taxa.

Thirty-seven nominal taxa of *Cicindela* occur in Arizona including one new combination, *Cicindela haemorrhagica arizonae*, and two new synonyms: *Cicindela punctulata chihuahuae* under *Cicindela punctulata*, and *Cicindela tranquebarica cibecuei* under *Cicindela tranquebarica lassenica*.

Definitions for all terms used in the descriptions of species can be found in Torre-Bueno (1950).

SYSTEMATICS

The family Cicindelidae can be distinguished from other beetles by the first abdominal segment, which is divided behind the coxae, and the head, which is as wide as or wider than the thorax. Three genera occur in Arizona: *Amblychila* Say, *Cicindela* Linné and *Tetracha* Hope. The genera may be separated by the following key:

1. Third joint of the maxillary palpi shorter than the fourth *Cicindela*
- Third joint of the maxillary palpi longer than the fourth.....2

2. Eyes small, size 20-25 mm *Amblychila*
 Eyes large, size 25-35 mm *Tetracha*

Of the three genera, nearly all of the Arizona tiger beetle fauna belong to the genus *Cicindela*. In this genus there are 37 nominal taxa composed of six monotypic species and 31 subspecies of 23 polytypic species.

New county records included in the Arizona distributions are designated by an asterisk. The majority of these new records are in the collection of Arizona State University and were collected by Dr. Mont A. Cazier.

Key to the Arizona Species of Cicindela

1. Front trochanter with subapical seta or pit 4
 Front trochanter without subapical seta or pit 2
2. Apical dot or lunule present 3
 Apical dot or lunule absent *ocellata*
3. Elytral margins slightly convex, widest at middle or basal third *haemorrhagica*
 Elytral margins nearly parallel, gradually widening to apical fourth *sedecimpunctata*
4. Middle trochanter with subapical seta or pit 7
 Middle trochanter without subapical seta or pit 5
5. Elytron with maculations connected to form a submedian longitudinal stripe *lemniscata*
 Elytron with maculations not forming a submedian longitudinal stripe 6
6. Elytra impunctate, proepisternum bronze or green with bronze reflection *wickhami*
 Elytra punctate, proepisternum deep green or blue *viridisticta*
7. Clypeus glabrous or with very few erect setae 11
 Clypeus clothed with decumbent setae 8
8. Antennae and legs without pigment, appearing pale tan *lepidi*
 Antennae and legs pigmented blue, green or cupreous 9
9. First antennal segment with distal sensory setae only 10
 First antennal segment with decumbent setae below distal sensory setae *nevadica*
10. Proepisternum blue to green *marutha*
 Proepisternum bronze *sperata*
11. Front of head bare except for ocular setae 20
 Front of head pilose medially 12
12. Gena pilose 13
 Gena bare 15
13. First antennal segment with a few erect setae or pits below distal sensory setae 14
 First antennal segment with distal sensory setae only *repanda*
14. Apical elytral margins serrate, color cupreous *lengi*
 Apical elytral margins not serrate, color blue-black or green *purpurea*
15. First antennal segment with several erect setae or pits below distal sensory setae 16
 First antennal segment with distal sensory setae only *hirticollis*
16. Elytra immaculate or with maculations consisting of humeral dot and may have short transverse line *pimeriana*
 Elytra maculations consisting of more than humeral dot and transverse line 17

17. Elytra dull 18
 Elytra shiny 19
18. Labrum unidentate, proepisternum blue green with cupreous reflections *willistoni*
 Labrum tridentate, proepisternum rosy with some cupreous reflections *tranquebarica*
19. Proepisternum green with cupreous reflections, medium size (11-12 mm) *fulgida*
 Proepisternum blue with green reflections, large size (15-17 mm) *pulchra*
20. Elytra with subsutural row of fovea extending from base to near apex 21
 Elytra with obscure fovea, none at all, or fovea only at base 22
21. Apical elytral margins serrate *punctulata*
 Apical elytral margins not serrate *nigrocoerulea*
22. Proepisternum glabrous *debilis*
 Proepisternum pilose, may be just a few setae near coxal margin 23
23. Apical elytral margins serrate 24
 Apical elytral margins not serrate 26
24. Middle band long and slender, and curving inward *tenuisignata*
 Middle band short and wide or represented by a bulge 25
25. Genae with sparse, decumbent setae, body robust *praetextata*
 Genae without setae, body elongate *fulgoris*
26. Elytra immaculate *hornii*
 Elytra with maculations 27
27. First antennal segment pilose medially, below sensory setae *longilabris*
 First antennal segment with distal sensory setae only 28
28. Size large (19-21 mm), pronotum smooth and dull *obsoleta*
 Size medium (10-11 mm), pronotum granulate and shiny *terricola*

ACCOUNTS OF SPECIES

Cicindela debilis Bates

(Figs. 3, 34)

Cicindela debilis Bates, 1890:509; W. Horn, 1897:182; W. Horn, 1903b:219; Harris, 1911:52; W. Horn, 1915:389; W. Horn, 1916:14; Leng, 1920:42; Cazier, 1954:287; Rumpff, 1977:177.
Cicindela debilis var. *segnis* Harris, 1913:69; W. Horn, 1915:389; Cazier, 1954:287.

Type data.—Type(s) from “Cuidad in Durango, Mexico” (Cazier, 1954); British Museum (Natural History), London.

General distribution.—Parts of north-central Mexico into southwestern United States.

Arizona distribution.—Cochise and Santa Cruz counties (Fig. 34).

Diagnosis.—Color blue green dorsally; purple blue ventrally. Head finely rugose, bald; labrum unidentate; clypeus glabrous; gena bald; first antennal segment with sensory setae only. Thorax granulate, slightly pilose laterally; proepisternum bare, purple blue. Legs purple blue, with setae on front and middle trochanters. Abdomen bald to sparsely hairy. Elytra (Fig. 3) evenly punctate, rounded at apex with spine, widest at middle. Length 7-10 mm.

Remarks.—The two varietal names of this species were synonymized by Cazier (1954). This species is very distinct and shows little variation in size, color, and maculation. Adults can be collected in sandy fields from July to November.

Cicindela fulgida fulgida Say

(Figs. 4, 35)

Cicindela fulgida Say, 1823:141; Dunn, 1891:153; Wickham, 1899:217; Leng, 1902a:139; Smyth, 1907-1908:182; W. Horn, 1916:7; Leng, 1920:41; Cazier, 1936:159; Vaurie, 1950b:146; Wallis, 1961:51; Graves, 1963:494; Willis, 1967:153; Ferris, 1969:10.

Type data.—Type(s) from "Missouri Territory," near the mountains on the Platte and Arkansas rivers; Academy of Natural Sciences of Philadelphia; lost or destroyed.

General distribution.—Southwestern and midwestern United States northward to Wyoming.

Arizona distribution.—Coconino and Navajo counties (Fig. 35).

Diagnosis.—Color red with green and cupreous reflections dorsally, green with cupreous reflections ventrally. Head rugose, pilose medially; labrum unidentate; clypeus glabrous; gena bare; first antennal segment with proximal erect setae. Thorax rugose, pilose laterally; proepisternum pilose, green with cupreous reflections. Legs green with cupreous reflections, with setae on front and middle trochanters. Abdomen pilose. Elytra (Fig. 4) glossy, densely punctate, serrate at apex, with spine, widest at apical fourth. Length 10-12 mm.

Remarks.—Adults of this polytypic species can be collected in June and July along streams and mud flats in northeast Arizona. Members of this species are easily identified and show little variation in size and maculation.

Cicindela haemorrhagica Le Conte

Key to Subspecies of *Cicindela haemorrhagica* Le Conte

Color black, black blue to black green, body robust. *haemorrhagica*
 Color reddish brown, body size reduced *arizonae*

Hybrid populations between *haemorrhagica* and *arizonae* have been found in southern Utah and northern Arizona (Rumpp, personal communication).

Cicindela haemorrhagica haemorrhagica Le Conte

(Figs. 5, 36)

Cicindela carthagena var. *haemorrhagica* Le Conte, 1851:171; Le Conte, 1857:55; Bates, 1881-1884:9; Schaupp, 1883-1884:105; Dunn, 1891:154; Blaisdell, 1892:48; G. Horn, 1892:27; G. Horn, 1894:306; W. Horn, 1897:179; Wickham, 1899:217; W. Horn, 1903b:218; Smyth, 1907-1908:181; W. Horn, 1915:388; W. Horn, 1916:13; Leng, 1920:42; Moore, 1937:109; Hatch, 1938:236; LaRivers, 1946:139; Cazier, 1948:11.

Cicindela haemorrhagica haemorrhagica: Leng, 1920:176; Cazier, 1954:282; Rumpp, 1954:131; Frick, 1957:503.

Type data.—Type(s) from San Diego, San Diego County, California (Cazier, 1954); Museum of Comparative Zoology, Harvard University, Cambridge.

General distribution.—From Baja California Norte extending northward through Washington and eastward into Texas.

Arizona distribution.—Cochise, Graham, Maricopa, Pima, and Yuma counties (Fig. 36).

Diagnosis.—Color black with some green reflections dorsally, black ventrally. Head finely striate, bald; labrum unidentate; clypeus glabrous; gena bald; first antennal segment with sensory setae only. Thorax feebly rugose, slightly pilose laterally; proepisternum pilose, black. Legs black, front and middle trochanters without setae. Abdomen slightly pilose laterally. Elytra (Fig. 5) faintly and evenly punctured, apex finely serrate, with spine, widest at middle. Length 10-16 mm.

Remarks.—This widely distributed subspecies occurs along streams, lakes, and alkali flats. Adults can be found from June to September. There is much variation throughout its range; the maculations may be broad and complete or consist of broken lunules, in which case specimens resemble *C. sedecimpunctata*. The two can be distinguished from each other by characters in the key and by the broadness of the maculations found in *C. haemorrhagica*.

***Cicindela haemorrhagica arizonae* Wickham (new combination)**
(Fig. 36)

Cicindela rufiventris var. *arizonae* Wickham, 1899:226; Leng, 1902a:178.

Cicindela carthagena arizonae Smyth, 1907-1908:181; W. Horn, 1915:388; W. Horn, 1916:13; Leng, 1920:42.

Type data.—Male syntypes from canyon of Colorado River (date unknown, R. Hayward: July 1982, Townsend); University of Iowa.

General distribution.—Arizona and Utah.

Arizona distribution.—Coconino County (Fig. 36).

Diagnosis.—Color brown red with purple and green reflections dorsally, cupreous ventrally. Head striate, bald; labrum unidentate; clypeus glabrous; gena bald; first antennal segment with sensory setae only. Thorax rugose, pilose laterally; proepisternum pilose, cupreous with red reflections. Legs cupreous, front and middle trochanters without setae. Abdomen pilose laterally. Elytra granulate, apex serrate, with spine, widest at middle. Length 10-12 mm.

Remarks.—Cazier (1954) recognized *C. haemorrhagica* as a distinct species. Until now *arizonae* has remained as a subspecies under *C. carthagena*; however, *arizonae* is more closely related to *C. haemorrhagica* as is evident by its smaller size and reduced maculations. Therefore, *arizonae* is now placed as a subspecies under *C. haemorrhagica*.

Adults of this subspecies are found from May to August in the Grand Canyon. They have the markings of *C. haemorrhagica* but can be distinguished by their brilliant red brown color.

Cicindela hirticollis corpuscula Rumpff

(Figs. 6, 37)

Cicindela hirticollis corpuscula Rumpff, 1961:174.

Type data.—Holotype, male, from Potholes, Imperial County, California (12 May 1946, N. L. Rumpff); the Norman L. Rumpff collection.

General distribution.—Parts of southwestern and western United States.

Arizona distribution.—Coconino*, Graham, Greenlee*, Maricopa, Navajo*, Pinal*, and Yuma counties (Fig. 37).

Diagnosis.—Color dull bronze dorsally, reddish bronze ventrally. Head finely striate, pilose; labrum unidentate; clypeus glabrous; gena bare; first antennal segment with sensory setae only. Thorax slightly rugose, pilose laterally; proepisternum pilose, cupreous. Legs reddish bronze, front and middle trochanters with setae. Abdomen slightly pilose. Elytra (Fig. 6) shallowly punctate throughout, apex serrate, with spine, widest in anterior half. Length 11-12 mm.

Remarks.—Adults of this subspecies can be collected from April to November. They are primarily located on sand banks along the Colorado River and its tributaries. This species somewhat resembles *C. repanda* but can easily be distinguished by its larger size and somewhat pointed abdomen.

Cicindela hornii hornii Schaupp

(Figs. 7, 38)

Cicindela anthracina G. Horn, 1880:139 (preoccupied).*Cicindela hornii* Schaupp, 1883-1884:80, Leng, 1902a:127; W. Horn, 1903b:216; Smyth, 1907-1908:188; W. Horn, 1916:9; Leng, 1920:41; Cazier, 1954:247; Rumpff, 1977:177.*Cicindela ritleri* Bates, 1890:496; W. Horn, 1900:116; Leng, 1920:41.

Type data.—Type(s) from Fort Bayard, Grant County, New Mexico (Cazier, 1954); type depository unknown.

General distribution.—North-central Mexico northward into southwestern United States.

Arizona distribution.—Cochise and Pima counties (Fig. 38).

Diagnosis.—Color entirely glossy black to purple black to metallic green. Head finely rugose, bald; labrum unidentate; clypeus glabrous; gena bare; first antennal segment with sensory setae only. Thorax smooth to slightly rugose, single row of short hair laterally; proepisternum slightly pilose. Legs pigmented, setae on front and middle trochanters. Abdomen glabrous. Elytra (Fig. 7) coarsely punctate near base, feebly serrate at apex, with weak spine, widest at middle. Length 13-15 mm.

Remarks.—With the exception of color, the characters in this species are stable. They can easily be distinguished by their glabrous, immaculate appearance. This species is rare, but adults may be found at high altitude, from June to August, along rocky hillsides. They are somewhat difficult to catch.

Cicindela lemniscata lemniscata Le Conte

(Figs. 8, 39)

Cicindela lemniscata Le Conte, 1854:220; Le Conte, 1857:59; Dunn, 1891:152; G. Horn, 1892:27; G. Horn, 1894:307; W. Horn, 1897:184; Wickham, 1899:224; Leng, 1902a:174; W. Horn, 1903b:220; Smyth, 1905:252; Smyth, 1907-1908:187; Casey, 1913:16; W. Horn, 1915:384; W. Horn, 1916:11; Leng, 1920:41; W. Horn, 1926:170; Cazier, 1948:15; Vogt, 1949:6; Cazier, 1954:263; Rumpff, 1977:177.

Type data.—Male, holotype, from San Diego, California to El Paso, Texas (1850-1852, T. H. Webb); Museum of Comparative Zoology, Harvard University, Cambridge.

General distribution.—Northwestern Mexican coastal states extending into parts of western and southwestern United States.

Arizona distribution.—Cochise, Gila, Graham, Maricopa, Pima, Pinal, Santa Cruz, Yavapai, and Yuma counties (Fig. 39).

Diagnosis.—Color cupreous red dorsally, cupreous red ventrally. Head striate to granulate-rugose, bald; labrum unidentate; clypeus glabrous; gena bare; first antennal segment with sensory setae only. Thorax rugose, slightly pilose laterally; proepisternum bare, blue. Legs cupreous with green reflections, setae on front trochanters only. Abdomen pilose. Elytra (Fig. 8) deeply granulate, serrate at apex, with spine, widest at apical fourth. Length 7-10 mm.

Remarks.—Throughout the summer, adults may be collected at night around electric lights, or during the day along streams, ponds, and lakes. They are easily identified and show little variation in size, maculation, and coloration.

Cicindela lengi jordai Rotger

(Figs. 9, 39)

Cicindela lengi jordai Rotger, 1974:9.

Type data.—Holotype, male, from Heart Canyon, 4 miles north of Aztec, San Juan County, New Mexico (29 May 1970, B. Rotger), collection of Reverend B. Rotger.

General distribution.—Parts of southwestern United States.

Arizona distribution.—Apache* County (Fig. 39).

Diagnosis.—Color red with green and blue reflections dorsally, blue green with cupreous reflections ventrally. Head granulate, pilose; labrum tridentate; clypeus glabrous; gena pilose. Thorax striate, pilose laterally; proepisternum pilose, blue green. Legs blue green with cupreous reflections, setae on front and middle trochanters. Abdomen pilose. Elytra (Fig. 9) granulate at base, smooth at apex, apex serrate with spine, widest at apical fourth. Length 12-15 mm.

Remarks.—Adults of this recently described subspecies are present from May to June along sandy banks of dry washes. Their large size and broad maculations make them distinctive. The only Arizona specimen was taken in June just west of Fort Defiance in Apache County.

Cicindela lepida Dejean

(Figs. 10, 40)

Cicindela lepida Dejean, 1831:255; Le Conte, 1848:181; Le Conte, 1857:51; Jones, 1884:74; Leng and Beutenmuller, 1894:95; Wickham, 1899:224; Knaus, 1900:109; Leng, 1902a:169; Leng, 1902b:239; Smyth, 1905:252; Criddle, 1907:105; Fall, 1907:155; Smyth, 1907-1908:180; Shelford, 1908:168; Blatchley, 1910:27; Fox, 1910:75; Knaus, 1915:35; Dow, 1916:69; W. Horn, 1916:18; Leng, 1920:43; Hamilton, 1925:32; Dawson and Horn, 1928:13; Cazier, 1936:28; Vaurie, 1950b:148; Cazier, 1954:297; Wallis, 1961:67; Graves, 1963:501; Graves, 1973:191.

Type data.—Type(s) from "America septentrionale"; University of Paris.

General distribution.—Chihuahua, Mexico northward into southern Canada; extending eastward from Nevada through Gulf and midwestern states to north-Atlantic states.

Arizona distribution.—Apache*, Coconino, Mojave, and Navajo* counties (Fig. 40).

Diagnosis.—Color bronze with green reflections dorsally, green bronze ventrally. Head striate, pilose; labrum unidentate; clypeus with decumbent setae; gena bare; first antennal segment pilose medially, not pigmented. Thorax rugose, pilose laterally and medially; proepisternum pilose, green bronze. Legs not pigmented, pale tan, front and middle trochanters with setae. Abdomen densely pilose. Elytra (Fig. 10) with shallow punctations, apex obtuse, faint spine to no spine, widest at apical fourth. Length 9-12 mm.

Remarks.—This monotypic species has an extensive range throughout the United States. In Arizona, adults can be found from June to August. They are easily distinguished by their light color and are most often collected on sandy slopes.

Cicindela longilabris vestalia Leng

(Figs. 11, 34)

Cicindela longilabris var. *vestalia* Leng, 1902a:121; Leng, 1920:41; Hatch, 1938:235.

Type data.—Lectotype, female, designated by Dahl (1941), from Maiden, Silver Bow County, Montana (17 June 1890, F. C. Bowditch); American Museum of Natural History, New York.

General distribution.—Arizona northward to Montana.

Arizona distribution.—Apache* and Coconino counties (Fig. 34).

Diagnosis.—Color entirely black, brown, or green. Head granulate-rugose, bald; labrum tridentate; clypeus glabrous; gena bald; first antennal segment pilose medially. Thorax striate, pilose laterally; proepisternum bare to slightly pilose. Legs pigmented, front and middle trochanters with setae. Abdomen glabrous to slightly pilose. Elytra (Fig. 11) granulate, rounded to apex, with spine, widest at middle. Length 15-16 mm.

Remarks.—Adults of this rather rare species occur at high elevations from June to August. Maculations are variable and so narrow that the elytra may appear immaculate. Specimens may occasionally be found on gravel along roadsides.

Cicindela marutha Dow

(Figs. 12, 41)

Cicindela sperata var. *marutha* Dow, 1911:272; Leng, 1920:42.*Cicindela sperata* var. *rubicunda* Harris, 1911:55.*Cicindela marutha*: Cazier, 1954:296.

Type data.—Syntypes from Fort Wingate, McKinley County, New Mexico (J. Woodgate); type depository unknown.

General distribution.—Chihuahua, Mexico northward into southwestern United States.

Arizona distribution.—Apache*, Cochise, Coconino*, Maricopa*, Mojave*, and Navajo* counties (Fig. 41).

Diagnosis.—Color green to blue green or cupreous red dorsally, blue green ventrally. Head granulate-striate, pilose; labrum unidentate; clypeus pilose; gena bare; first antennal segment with sensory setae only. Thorax striate, pilose laterally and medially; proepisternum pilose, blue green with cupreous reflections. Legs green with cupreous reflections, front and middle trochanters with setae. Abdomen pilose laterally. Elytra (Fig. 12) punctate basal to near smooth apical, somewhat obtuse; apex serrate, with spine, widest at apical third. Length 13-14 mm.

Remarks.—From June to August adults of this monotypic species can be found on alkali flats or near seepage (see discussion under *C. sperata sperata*).

Cicindela nevadica Le ConteKey to Subspecies of *Cicindela nevadica* Le Conte

Color reddish brown, markings broad *tubensis*
 Color brownish bronze, with green micropits, middle band narrow *citata*

Cicindela nevadica citata Rumpff

(Fig. 42)

Cicindela nevadica citata Rumpff, 1977:170.

Type data.—Holotype, male, from eight kilometers WSW Willcox, Cochise County, Arizona (20 July 1970, N. L. Rumpff); type no. 12528, California Academy of Sciences, San Francisco.

General distribution.—Sonora, Mexico northward into Arizona.

Arizona distribution.—Cochise County (Fig. 42).

Diagnosis.—Color brown bronze with green reflections dorsally, brown with green reflections ventrally. Head granulate, pilose; labrum unidentate; clypeus pilose; gena pilose; first antennal segment pilose medially. Thorax feebly granulate, pilose laterally and medially; proepisternum pilose, bronze. Legs green with cupreous reflections, front and middle trochanters with setae. Abdomen pilose laterally. Elytra punctate with blue green micropits, subsutural row of fovea, apex obtuse, serrate, with spine, widest at apical third to middle. Length 10-11 mm.

Remarks.—This recently described subspecies is found in the Sulphur Springs Valley in southeastern Arizona. It can be distinguished from *C. nevadica tubensis* by its bronze green color. Adult specimens have been collected in July or August along playa lakes.

Cicindela nevadica tubensis Cazier

(Figs. 13, 42)

Cicindela nevadica tubensis Cazier, 1936:24; Vaurie, 1951:7.

Type data.—Holotype, female, from Tuba City, Coconino County, Arizona (5 July 1937, R. P. Allen); American Museum of Natural History, New York.

General distribution.—Southwestern United States.

Arizona distribution.—Apache, Coconino, and Navajo Counties (Fig. 42).

Diagnosis.—Color cupreous red dorsally, cupreous with some green reflections ventrally. Head granulate-striate, pilose; labrum unidentate; clypeus pilose; gena pilose; first antennal segment pilose medially. Thorax striate, pilose medially and laterally; proepisternum bronze, pilose. Legs cupreous with some green reflections, front and middle trochanters with setae. Abdomen pilose laterally. Elytra (Fig. 13) with shallow green punctures, rounded to apex, with spine, widest at middle. Length 11-12 mm.

Remarks.—This subspecies can be distinguished for *C. nevadica citata* by its cupreous red color. Adults are found from June to August in large populations along bodies of water. Members of this species take flight when approached but with care can be caught by hand.

Cicindela nigrocoerulea nigrocoerulea Le Conte

(Figs. 4, 43)

Cicindela nigrocoerulea Le Conte, 1848:181; Leng, 1902a:123; W. Horn, 1903b:213; Smyth, 1905:252; Smyth, 1907-1908:180; Casey, 1909:267; W. Horn, 1916:9; Leng, 1920:41; Cazier, 1954:246.

Type data.—Type(s) from Arkansas River, probably in Colorado (Cazier, 1954); Museum of Comparative Zoology, Harvard University, Cambridge.

General distribution.—North-central Mexico extending into southwestern United States.

Arizona distribution.—Apache*, Cochise, Coconino*, Gila, Graham, Maricopa*, Navajo*, Pima, Pinal*, Santa Cruz*, and Yavapai counties (Fig. 43).

Diagnosis.—Color blue to green to black with cupreous reflections dorsally, purple blue ventrally. Head finely rugose, bald; labrum tridentate; clypeus glabrous; gena glabrous; first antennal segment with sensory setae only. Thorax finely rugose, pilose laterally; proepisternum pilose, blue green. Legs blue green, front and middle trochanters with setae. Abdomen sparsely pilose. Elytra (Fig. 14) with base heavily punctate, apex almost smooth, sub-sutural row of fovea, apex rounded to small spine, widest at middle. Length 10-14 mm.

Remarks.—This species shows variation throughout its range. Adults may be immaculate or have complete maculations (Fig. 14). Specimens found along the Puero River have a reddish outline along the edge of the elytra. Color may range from brilliant blue to dull green to black. Adults are found from June to October in fairly dry areas near alkaline soil. This species can be differentiated from *C. punctulata* because its elytra are widest at middle and not serrate at apex.

***Cicindela obsoleta santaclarae* Bates**
(Figs. 15, 44)

Cicindela obsoleta santaclarae Bates, 1890:493; W. Horn, 1903b:216; Smyth, 1907-1908:188; Casey, 1909:268; W. Horn, 1916:9; Leng, 1920:41; Cazier, 1954:249.

Type data.—Type(s) from Santa Clara, Chihuahua, Mexico (Cazier, 1954); British Museum (Natural History), London.

General distribution.—Durango, Mexico northward into Arizona and New Mexico.

Arizona distribution.—Apache*, Cochise, Gila*, Navajo*, Pima*, Pinal*, Santa Cruz, and Yavapai* counties (Fig. 44).

Diagnosis.—Color entirely green to blue green to black to red. Head finely striate, bald; labrum tridentate; clypeus glabrous; gena bare; first antennal segment with sensory setae only. Thorax smooth to finely rugose, pilose laterally, proepisternum pilose, Legs pigmented, front and middle trochanters with setae. Abdomen sparsely pilose. Elytra (Fig. 15) with minute punctures at base, smooth at apex, apex serrate to smoothly rounded, widest at middle. Length 20-22 mm.

Remarks.—Adults of this species can be easily distinguished by their large size. Somewhat rare, they can be found at high elevations, from June to September, in short grass. Maculations vary and may consist of lunules or may be broken into dots.

***Cicindela ocellata ocellata* Klug**
(Figs. 16, 40)

Cicindela ocellata Klug, 1834:33; Graves, 1973:180.

Cicindela flavopunctata Chevrolat, 1833-1835:2; Bates, 1881-1884:10; Bates, 1890:505; Dunn, 1891:152; W. Horn, 1897:177; W. Horn, 1903b:217; Knaus, 1906:147; Smyth, 1907-1908:185; W. Horn, 1915:387; W. Horn, 1916:12; Leng, 1920:42; Vogt, 1949:1; Cazier, 1954:275.

Type data.—Type(s) from Mexico (Cazier, 1954); probably part of the Walther Horn Collection at Berlin-Dahlem, East Berlin.

General distribution.—Northward from Central America and southern and central Mexico into southwestern United States.

Arizona distribution.—Cochise, Gila*, Graham, Pima*, Pinal*, and Santa Cruz* counties (Fig. 40).

Diagnosis.—Color cupreous brown with blue green reflections dorsally, cupreous bronze ventrally. Head granulate, bald; labrum unidentate; clypeus glabrous; gena bare; first antennal segment with sensory setae only. Thorax

smooth to faintly rugose, pilose laterally; proepisternum cupreous, pilose. Legs green with cupreous reflections, front and middle trochanters without setae. Abdomen pilose. Elytra (Fig. 16) shallowly to deeply punctate, serrate at apex, with spine, widest at apical third. Length 9-10 mm.

Remarks.—Adults of this species occur along the southern border of Arizona from June to October. They are often taken at electric lights, or in sandy areas near water. Specimens show little variation with respect to size, color, and maculation.

Cicindela oregona Le Conte

Key to Subspecies of *Cicindela oregona* Le Conte

Color dark purple *maricopa*
 Color cupreous *navajoensis*

Cicindela oregona maricopa Leng

(Figs. 17, 45)

Cicindela oregona maricopa Leng, 1902a:147; Smyth, 1907-1908:181; W. Horn, 1916:7; Leng, 1920:41.

Cicindela oregona mormonella Casey, 1924:15.

Cicindela oregona provensis Casey, 1924:15.

Cicindela oregona nephiana Casey, 1924:16.

Type data.—Lectotype, male, designated by Dahl (1941), from Phoenix, Maricopa County, Arizona; American Museum of Natural History, New York.

General distribution.—California westward to New Mexico.

Arizona distribution.—Cochise*, Coconino, Gila*, Greenlee*, Maricopa, Mohave*, Navajo*, Pima*, Pinal, and Yavapai counties (Fig. 45).

Diagnosis.—Color blue green to purple dorsally, blue green ventrally. Head granulate, bald; labrum tridentate; clypeus glabrous; gena bare; first antennal segment pilose medially. Thorax granulate-striate, pilose laterally; proepisternum pilose, blue green. Legs blue green, front and middle trochanters with setae. Abdomen sparsely pilose. Elytra (Fig. 17) granulate, finely serrate at apex, with spine, widest at middle. Length 11-14 mm.

Remarks.—Maculations in this subspecies show little variation, whereas coloration may range from blue green to purple. Adults occur from April to October along streams.

Cicindela oregona navajoensis Van Dyke

(Fig. 45)

Cicindela oregona navajoensis Van Dyke, 1947:155.

Type data.—Holotype, male, from 15 miles WNW Kayenta, Navajo County, Arizona (17-24 June 1933, H. N. Hultgren); type number 5864, California Academy of Sciences, San Francisco.

General distribution.—Parts of southwestern United States.

Arizona distribution.—Coconino* and Navajo counties (Fig. 45).

Diagnosis.—Color cupreous dorsally, metallic green ventrally. Head granulate-striate, bald; labrum tridentate; clypeus glabrous; gena bare; first antennal segment pilose medially. Thorax granulate-striate, pilose laterally; proepisternum pilose, green with cupreous reflections. Legs cupreous, front and middle trochanters with setae. Abdomen bare to sparsely pilose. Elytra with green punctures, serrate at apex, with spine, widest at middle. Length 11-14 mm.

Remarks.—This subspecies has the maculations of *C. oregona maricopa* but can be distinguished by its cupreous color. Adults are found in northern Arizona, from June to July, along streams. They are sometimes confused with *C. repanda repanda*, from which they differ by their usually broken humeral and apical lunules and their first antennal segment, which is pilose medially.

***Cicindela pimeriana* Le Conte**
(Figs. 18, 46)

Cicindela viatica Le Conte, 1857:62 (preoccupied).

Cicindela pimeriana Le Conte, 1866:363; Leng, 1902a:127; W. Horn, 1903b:215; Smyth, 1907-1908:186; W. Horn, 1916:7; Leng, 1920:41; Cazier, 1954:242; Rumpp, 1977:177.

Cicindela pimeriana var. *cochisensis* Casey, 1909:274.

Type data.—Type(s) from Sonora, Mexico (Cazier, 1954); Museum of Comparative Zoology, Harvard University, Cambridge.

General distribution.—Sonora, Mexico, northward into Arizona and New Mexico.

Arizona distribution.—Cochise County (Fig. 46).

Diagnosis.—Color entirely blue to blue green, glossy. Head granulate to finely rugose, pilose; labrum tridentate; clypeus glabrous; gena bare; first antennal segment pilose medially. Thorax finely rugose, pilose laterally; proepisternum pilose, blue green. Legs blue green, front and middle trochanters with setae. Abdomen pilose. Elytra (Fig. 18) shallowly punctate, serrate at apex, with spine, widest at apical third. Length 11-13 mm.

Remarks.—This monotypic species occurs in the southeastern corner of Arizona. Adults can be found from June to August, near water. Specimens show little variation in size and shape; however, their maculations vary from a humeral spot and a transverse line to immaculateness. Despite this diversity, their glossy blue-green color makes them easy to distinguish from other species.

***Cicindela praetextata praetextata* Le Conte**
(Fig. 47)

Cicindela praetextata Le Conte, 1854:220; Le Conte, 1857:58; Schaupp, 1833-1884:104; W. Horn, 1897:183; Acciavatti, 1980:233-236.

Cicindela circumpecta praetextata: Leng, 1902a:171.

Cicindela californica praetextata: W. Horn, 1903b:219; Casey, 1913:33; W. Horn, 1915:391; W. Horn, 1916:14; Leng, 1920:42; Cazier, 1948:24.

Cicindela praetextata: Cazier, 1954:288.

Type data.—Syntypes, males, from San Diego, California, to El Paso, Texas (1850-1852, T. H. Webb); Museum of Comparative Zoology, Harvard University, Cambridge.

General distribution.—Arizona, California, and Utah.

Arizona distribution.—Gila, Graham, Maricopa, Mohave, Pinal, Yavapai, and Yuma counties (Fig. 47).

Diagnosis.—Color light brown dorsally, bronze ventrally. Head striate, bald; labrum unidentate; clypeus glabrous; gena bare; first antennal segment with sensory setae only. Thorax smooth to slightly rugose, pilose medially and laterally; proepisternum pilose, bronze. Legs bronze, front and middle trochanters with setae. Abdomen pilose. Elytra evenly punctate, serrate at apex, with spine, widest at apical third. Length 12-14 mm.

Remarks.—This subspecies has the maculations of *C. fulgoris fulgoris* (Fig. 19) but can be distinguished by its dull, light brown color. From June to August, adult specimens are commonly collected on sandbanks throughout central Arizona.

Cicindela fulgoris Casey

Key to the Subspecies of *Cicindela fulgoris* Casey

Color cupreous red or cupreous green *fulgoris*
 Color dull green or blue with no cupreous reflections *erronea*

Cicindela fulgoris fulgoris Casey

(Figs. 19, 47)

Cicindela praetextata ssp. *fulgoris* Casey, 1913:34.

Cicindela praetextata ssp. *stringens* Casey, 1913:34.

Cicindela fulgoris Acciavatti, 1980:233-236.

Type data.—Type(s) from El Paso, El Paso County, Texas; United States National Museum, Washington, D.C.

General distribution.—Southwestern United States.

Arizona distribution.—Cochise and Navajo* counties (Fig. 47).

Diagnosis.—Color cupreous red, may have green reflections dorsally, bronze with green reflections ventrally. Head granulate, bald; labrum unidentate; clypeus glabrous; gena bare; first antennal segment with sensory setae only. Thorax rugose, pilose medially and laterally; proepisternum pilose, bronze. Legs bronze or green, front and middle trochanters with setae. Abdomen densely pilose. Elytra (Fig. 19) punctate throughout, serrate at apex, with spine, widest at apical third. Length 11-12 mm.

Remarks.—From July to September, adults of this subspecies can be found on sand and alkali flats. They can be distinguished from *C. praetextata praetextata* by their red color and more elongate size.

***Cicindela fulgoris erronea* Vaurie**
(Fig. 47)

Cicindela californica viridicyanea Vaurie, 1950a:1 (preoccupied).

Cicindela californica erronea Vaurie, 1951:12; Rumpff, 1956:131.

Cicindela praetextata erronea Vaurie (new combination, Rumpff, 1957:144).

Cicindela fulgoris erronea Vaurie: Acciavatti, 1980:233-236.

Type data.—Holotype, male, from Willcox, Cochise County, Arizona (1 September 1947, F. H. Parker); American Museum of Natural History, New York.

General distribution.—Arizona.

Arizona distribution.—Cochise County (Fig. 47).

Diagnosis.—Color blue or green dorsally, blue ventrally. Head striate, bald; labrum unidentate; clypeus glabrous, gena bald; first antennal segment with sensory setae only. Thorax striate, pilose laterally; proepisternum pilose, blue green. Legs blue with green reflections, front and middle trochanters with setae. Abdomen pilose. Elytra evenly punctate throughout, serrate at apex, with spine, widest at apical third. Length 12-13 mm.

Remarks.—Adults of this subspecies are found only in the Sulphur Springs Valley of Arizona. Their blue green color makes them easy to identify. Specimens show little variation with regard to size and shape, although their maculations also resemble those of *C. fulgoris fulgoris* (Fig. 19). They can be collected from July to September on mud flats at the water's edge.

***Cicindela pulchra* Say**

Key to the Subspecies of *Cicindela pulchra* Say

Color red with violet reflections, immaculate or with reduced maculations *pulchra*
Color red with green reflections, maculations usually connected along margin *dorothea*

***Cicindela pulchra pulchra* Say**
(Figs. 20, 48)

Cicindela pulchra Say, 1823:142; Ulke, 1875:813; Wickham, 1899:213; Smyth, 1907-1908:188; W. Horn, 1916:7; Leng, 1920:41.

Type data.—Type from "Missouri Territory," along the Platte and Arkansas rivers near the mountains; Academy of Natural Sciences of Philadelphia; lost or destroyed.

General distribution.—Texas northward into Wyoming.

Arizona distribution.—Apache County (Fig. 48).

Diagnosis.—Color purple-violet with green reflections, glossy dorsally, blue to blue green ventrally. Head granulate, pilose; labrum tridentate; clypeus glabrous; gena bare; first antennal segment pilose medially. Thorax smooth to slightly rugose, pilose laterally; proepisternum pilose, blue green. Legs blue green, front and middle trochanters with setae. Abdomen sparsely pilose. Elytra (Fig. 20) punctate, rounded at apex, faint spine, widest at apical fourth. Length 16-18 mm.

Remarks.—Adults of this subspecies occur from July to August on bare sand and gravel. Coloration ranges from violet to deep purple to red, and maculations may consist of isolated spots or be absent. Members of this subspecies are easily recognizable.

Cicindela pulchra dorothea Rumpff

(Figs. 21, 48)

Cicindela pulchra dorothea Rumpff, 1977:170.

Type data.—Holotype, male, from 5.2 to 6.2 kilometers SE of Wilcox, Cochise County, Arizona (26 July 1946, N. L. and D. H. Rumpff); type number 12529, California Academy of Sciences, San Francisco.

General distribution.—Arizona.

Arizona distribution.—Cochise County (Fig. 48).

Diagnosis.—Color red orange with blue green reflections, glossy dorsally, blue to blue green ventrally. Head slightly rugose, pilose; labrum tridentate; clypeus glabrous; gena bare; first antennal segment pilose medially. Thorax rugose, pilose laterally; proepisternum pilose, blue green. Legs blue to blue green, front and middle trochanters with setae. Abdomen slightly pilose. Elytra (Fig. 21) punctate, smooth and rounded at apex, with spine, widest at apical fourth. Length 15-16 mm.

Remarks.—In July and August, this orange red subspecies has been collected on the open flatlands of southeastern Arizona. Maculations are variable and may be connected along the outer margin or reduced to dots. This subspecies can be distinguished from *C. pulchra pulchra* by its color, broad maculations, and smaller size.

Cicindela punctulata Olivier

(Fig. 22)

Cicindela punctulata Olivier, 1790:27; Gould, 1834:54; Le Conte, 1848:182; Leng and Beutenmuller, 1894:93; Wickham, 1899:218; Leng, 1902a:158; Leng, 1902b:239; W. Horn, 1903b:217; Brimley, 1906:81; Smyth, 1907-1908:181; Criddle, 1907:105; Shelford, 1908:168; Blatchley, 1910:27; Fox, 1910:75; Johnson, 1915:307; Knaus, 1915:35; Goldsmith, 1916:447; W. Horn, 1916:10; Leng, 1920:41; Blanchard, 1921:396; Hamilton, 1925:41; Dawson, 1928:6; Cartwright, 1935:73; Vogt, 1949:6; Vaurie, 1950b:150; Cazier, 1954:251; Wallis, 1961:61; Graves, 1963:503; Willis, 1967:154; Graves, 1973:117.

Cicindela punctulata chihuahuae Bates, 1890:500; Leng, 1920:41; Tanner, 1928:269; Cazier, 1954:251; new synonym.

Type data.—Type(s) from New Jersey (Cazier, 1954); Muséum National d'Histoire Naturelle, Paris; destroyed.

General distribution.—Widespread in North America, from north-central Mexico northward to southern Canada.

Arizona distribution.—Apache, Cochise, Coconino, Gila*, Maricopa, Mohave,* Navajo*, Pima*, Santa Cruz*, and Yavapai counties.

Diagnosis.—Color brown to green to blue to purple dorsally, blue green to purple ventrally. Head granulate-rugose, bald; labrum unidentate; clypeus

glabrous; gena bare; first antennal segment with sensory setae only. Thorax granulate to nearly smooth, pilose laterally; proepisternum pilose, cupreous to blue green. Legs green with cupreous to blue green reflections, front and middle trochanters with setae. Abdomen pilose. Elytra (Fig. 22) punctate throughout, subsutural row of green fovea, serrate at apex, with spine, widest at apical fourth. Length 10-14 mm.

Remarks.—In the past, the subspecific name *chihuahuanae* was given for the high altitude green to purple color form, and *punctulata* for the low altitude green to brown form of this species. There has since been extensive collecting and mapping (Mayr, 1969:178) of this common species at high, low, and intermediate altitudes. These studies have shown wide ranges of color at nearly every altitude, clearly examples of color variation. Therefore, *chihuahuanae* is placed in synonymy.

Adult specimens of this common species can be collected throughout most of Arizona from May to September along roadsides, alkali flats, or near water. They are strong fliers and often difficult to catch. Elytra may be immaculate or maculations may consist of isolated spots (see discussion under *C. nigrocoerulea*).

Cicindela purpurea Olivier

Key to the Subspecies of *Cicindela purpurea* Olivier

Color black to black green with maculations usually complete around margin *cimarrona*
 Color green with cupreous reflections, maculations not complete around margin *graminea*

Cicindela purpurea cimarrona Le Conte

(Figs. 23, 49)

Cicindela purpurea cimarrona Le Conte, 1868:49; Leng, 1902a:134; Smyth, 1907-1908:183; Leng, 1920:40.

Type data.—Syntypes, six male(s), female(s) from south of Raton Mountain, Colfax County, New Mexico (1867, S. Lewis); Museum of Comparative Zoology, Harvard University, Cambridge.

General distribution.—Arizona, Colorado, and New Mexico.

Arizona distribution.—Graham County (Fig. 49).

Diagnosis.—Color entirely black or green. Head rugose, pilose, labrum tridentate; clypeus glabrous; gena pilose; first antennal segment pilose medially. Thorax granulate, pilose laterally; proepisternum slightly pilose. Legs pigmented, front and middle trochanters with setae. Abdomen sparsely pilose. Elytra (Fig. 23) granulate-punctate, smooth at apex, with weak spine, widest at apical fourth. Length 12-15 mm.

Remarks.—This subspecies has been collected at over 8,000 feet in the Pinaleno Mountains. Adults occur from June to August on bare soil. Specimens show little variation in size, color, and maculation, and are easily identified.

Cicindela purpurea graminea Schaupp

(Figs. 24, 49)

Cicindela purpurea graminea Schaupp, 1883-1884:89; Dunn, 1891:153; Wickham, 1899:215; Leng, 1902a:132; Smyth, 1907-1908:180; Leng, 1920:40; Hamilton, 1925:27; Dawson and Horn, 1928:9; LaRivers, 1946:135.

Type data.—Type(s) from Kansas and California; type depository unknown.

General distribution.—Western United States northward into southwestern Canada.

Arizona distribution.—Apache*, Coconino, and Greenlee* counties (Fig. 49).

Diagnosis.—Color dark green dorsally, dark blue with some green reflections ventrally. Head granulate-striate, pilose; labrum tridentate; clypeus glabrous; gena pilose; first antennal segment pilose medially. Thorax granulate, pilose laterally; proepisternum pilose, rosy. Legs green with cupreous reflections, front and middle trochanters with setae. Abdomen sparsely pilose. Elytra (Fig. 24) shallowly punctate, smooth at apex, with weak spine, widest at apical fourth. Length 10-12 mm.

Remarks.—Adults occur from July to August throughout most of Arizona along barren soil or sandy beaches. They are easily identified by their coloration and narrow maculations.

Cicindela repanda repanda Dejean

(Figs. 25, 50)

Cicindela repanda Dejean, 1825:74; Jones, 1884:74; Dunn, 1891:154; Leng and Buetenmuller, 1894:93; Wickham, 1899:215; Knaus, 1900:109; Leng, 1902a:147; Hood, 1903:113; Smyth, 1905:252; Moore, 1906:338; Criddle, 1907:105; Smyth, 1907-1908:184; Shelford, 1908:170; Blatchley, 1910:27; Fox, 1910:75; Davis, 1912:18; Goldsmith, 1916:447; Leng, 1920:40; Blanchard, 1921:396; Hamilton, 1925:31; Dawson and Horn, 1928:7; W. Horn, 1930:81; Cartwright, 1935:71; Hatch, 1938:233; Vaurie, 1950b:151; Willis, 1967:154; Graves, 1969:86; Graves, 1973:168.

Cicindela unijuncta Casey, 1897:299.

Type data.—Types(s) from "America septentrionale"; University of Paris.

General distribution.—Widespread in the United States and southern Canada.

Arizona distribution.—Maricopa County (Fig. 50).

Diagnosis.—Color brown with some green reflections dorsally, green blue with bronze reflections ventrally. Head granulate, pilose; labrum tridentate; clypeus glabrous; gena pilose; first antennal segment with sensory setae only. Thorax rugose, pilose laterally; proepisternum rosy, pilose. Legs cupreous with green reflections, front and middle trochanters with setae. Elytra (Fig. 25) granulate-punctate, subsutural row of green fovea, serrate at apex, with weak spine, widest at middle. Length 11-12 mm.

Remarks.—Adults of this species are found throughout the summer along sandy beaches. Although markings are stable they are often confused with

other species (see discussion under *C. hirticollis corpuscula* and *C. oregona navajoensis*).

***Cicindela sedecimpunctata sedecimpunctata* Klug**

(Figs. 26, 51)

Cicindela sedecimpunctata Klug, 1834:32; Le Conte, 1857:57; Schaupp, 1883-1884:106; Bates, 1881-1884:259; Bates, 1890:503; W. Horn, 1897:172; Smyth, 1907-1908:181; Casey, 1913:15; Cazier, 1954:270.

Cicindela rufiventris var. *sedecimpunctata*: Leng, 1902a:178; W. Horn, 1903b:216; W. Horn, 1915:386; W. Horn, 1916:12.

Type data.—Type(s) from Mexico (Cazier, 1954); probably from the Walther Horn Collection at Berlin-Dahlem, East Berlin.

General distribution.—Guanajuato, Mexico northwestward into southwestern United States.

Arizona distribution.—Cochise, Coconino*, Gila*, Graham, Greenlee, Navajo*, Pima, Pinal, and Santa Cruz counties (Fig. 51).

Diagnosis.—Color brown with some blue and green reflections dorsally, bronze ventrally. Head striate, bald; labrum unidentate; clypeus glabrous; gena bald; first antennal segment with sensory setae only. Thorax rugose, pilose laterally; proepisternum pilose, bronze with blue green reflections. Legs bronze with green reflections, front and middle trochanters without seta. Abdomen pilose. Elytra (Fig. 26) evenly punctate throughout, serrate at apex, with spine, widest at apical fourth. Length 10-13 mm.

Remarks.—Adults occur in large numbers on mud flats or along sandy shores. They may be found with *C. haemorrhagica* but can be differentiated by size and coloration (see discussion under *C. haemorrhagica*). Members of this species are active from May to November and can be easily collected during the hottest part of the day as they conceal themselves under debris in the shade at the water's edge.

***Cicindela sperata sperata* Le Conte**

(Figs. 27, 52)

Cicindela sperata Le Conte, 1857:50; G. Horn, 1876:239; Wickham, 1899:206; Leng, 1902a:167; W. Horn, 1903b:219; Smyth, 1907-1908:185; W. Horn, 1916:17; Leng, 1920:42; Vogt, 1949:1; Cazier, 1954:296.

Type data.—Type(s) from "Rio Grande, at various places" (Cazier, 1954); Museum of Comparative Zoology, Harvard University, Cambridge.

General distribution.—Northern Mexico northward into southwestern United States.

Arizona distribution.—Apache*, Cochise*, Coconino, Navajo*, and Yuma counties (Fig. 52).

Diagnosis.—Color brown cupreous dorsally, green ventrally. Head rugose, pilose; labrum unidentate; clypeus pilose; gena bare; first antennal segment with sensory setae only. Thorax striate, pilose medially and laterally; proepisternum pilose, bronze. Legs bronze, front and middle trochanters with

setae. Abdomen pilose. Elytra (Fig. 27) closely punctate throughout, serrate at apex, with spine, widest at apical third. Length 12-14 mm.

Remarks.—Adults occur from June to August on mud flats and at water banks. Superficially, they resemble *C. marutha* but are distinguished by the following characters: deeper punctations on the elytra, bronze proepisternum, and the striate appearance of the thorax.

***Cicindela tenuisignata* Le Conte**

(Figs. 28, 46)

Cicindela tenuisignata Le Conte, 1851:171; Dunn, 1891:152; Wickham, 1899:220; Leng, 1902a:153; W. Horn, 1903b:218; W. Horn, 1916:10; Leng, 1920:41; LaRivers, 1946:138; Vogt, 1949:6; Cazier, 1954:256.

Cicindela psilogramma Bates, 1890:507.

Type data.—Type(s) from "Colorado Desert," probably California (Cazier, 1954); Museum of Comparative Zoology, Harvard University, Cambridge.

General distribution.—Northern Mexico (including Baja California Norte) northward into parts of western and southwestern United States.

Arizona distribution.—Cochise, Coconino*, Gila*, Graham, Maricopa, Navajo*, Pima*, Pinal*, Yavapai*, and Yuma* counties (Fig. 46).

Diagnosis.—Color brown bronze dorsally, metallic green with bronze reflections ventrally. Head striate, bald; labrum unidentate; clypeus glabrous; gena bare; first antennal segment with sensory setae only. Thorax granulate, pilose laterally; proepisternum bronze, pilose. Legs bronze, front and middle trochanters with setae. Abdomen pilose. Elytra (Fig. 28) punctate, serrate at apex, with spine, widest at apical fourth. Length 11-12 mm.

Remarks.—Adults of this monotypic species are found throughout most of Arizona from May to November. They show little variation and are easily identified by a narrow descending middle band. They most often occur in ditches and on alkali flats.

***Cicindela terricola cinctipennis* Le Conte**

(Figs. 29, 38)

Cicindela pusilla var. *cinctipennis* Le Conte, 1848:182; Le Conte, 1857:45; Schaupp, 1883-1884:82; Dunn, 1891:154; Wickham, 1899:206; Leng, 1902a:155; W. Horn, 1915:390; W. Horn, 1916:14; Leng, 1920:42; Wallis, 1961:64; Rumpp, 1961:171.

Cicindela terricola cinctipennis: Huber, 1969:19.

Type data.—Type(s) from the Rocky Mountains; Museum of Comparative Zoology, Harvard University, Cambridge.

General distribution.—Arizona north to Alberta and Saskatchewan.

Arizona distribution.—Apache*, Coconino, and Navajo counties (Fig. 38).

Diagnosis.—Color bronze with blue green reflections dorsally, blue green ventrally. Head striate, bald; labrum tridentate; clypeus glabrous; gena bald; first antennal segment with sensory setae only. Thorax granulate-striate, pilose laterally and medially; proepisternum pilose, green. Legs green with bronze reflections, front and middle trochanters with seta. Abdomen pilose

laterally. Elytra (Fig. 29) punctate throughout, smooth at apex, with spine, widest at apical fourth. Length 9-12 mm.

Remarks.—From July to September, adults of this species may be collected in short grass along the edges of alkali flats, or on muddy shores. They resemble no other species and are easily distinguished.

***Cicindela tranquebarica kirbyi* Le Conte**
(Figs. 30, 53)

Cicindela obliquata Dejean, 1825:72; Blaisdell, 1892:48; Leng, 1902a:145 (preoccupied).

Cicindela tranquebarica kirbyi Le Conte, 1866:362; Wickham, 1899:206; W. Horn, 1916:6; Leng, 1920:40; Dawson and Horn, 1928:8; Cazier, 1936:27; La Rivers, 1946:136.

Type data.—Type(s) from “America septentrionale”; United States National Museum, Washington, D.C.

General distribution.—Texas northward into southern Canada.

Arizona distribution.—Apache*, Coconino, Gila*, Navajo*, and Maricopa* counties (Fig. 53).

Diagnosis.—Color coppery brown with some blue green reflections dorsally, blue green with cupreous reflections ventrally. Head striate-granulate, pilose; labrum tridentate; clypeus glabrous; gena bald; first antennal segment pilose medially. Thorax granulate, sparsely pilose laterally; proepisternum pilose, rosy. Legs bronze, front and middle trochanters with setae. Abdomen pilose laterally. Elytra (Fig. 30) granulate at base, punctate at apex, serrate at apex, weak spine to no spine, widest at apical fourth. Length 13-15 mm.

Remarks.—Adults of this subspecies may be found from April to June along lakes, stream, and in grassy fields near water. Specimens show little variation. They can be distinguished from *C. willistoni sulfontis* by characters in the key, and from *C. tranquebarica lassenica* by their brown coloration.

***Cicindela tranquebarica lassenica* Casey**
(Fig. 53)

Cicindela tranquebarica lassenica Casey, 1914:22.

Cicindela tranquebarica cibecuei Duncan, 1958:43; new synonym.

Type data.—Type locality reported as probably California (Casey, 1914). Rumpff (personal communication) has indicated Casey's material is identical to populations below the Mogollon Rim, Gila and Navajo counties, Arizona; United States National Museum, Washington, D.C.

General distribution.—Arizona.

Arizona distribution.—Gila and Navajo counties (Fig. 53).

Diagnosis.—Color entirely navy blue to black. Head striate-granulate, pilose; labrum tridentate; clypeus glabrous; gena bald; first antennal segment pilose medially. Thorax striate, pilose laterally; proepisternum pilose. Legs pigmented, front and middle trochanters with setae. Abdomen pilose laterally. Elytra granulate at base, punctate at apex, serrate at apex, with weak spine to no spine, widest at apical fourth. Length 13-15 mm.

Remarks.—Norman Rumpff (personal communication) has compared types of *tranquebarica lassenica* Casey to *tranquebarica cibecuei* Duncan, and found them to be the same. Casey listed the type locality as probably California, but it is actually one of the populations below the Mogollon Rim in east-central Arizona. Following Rumpff's suggestion, I propose to place *tranquebarica cibecuei* in synonymy under *tranquebarica lassenica*.

Adults of this subspecies have a distinctive coloration and are found on dry sand above creek beds from April to June.

Cicindela viridisticta arizonensis Bates

(Figs. 31, 35)

Cicindela viridisticta arizonensis Bates, 1881-1884:1; W. Horn, 1935:65; Cazier, 1956:284.

Cicindela arizonensis: W. Horn, 1903b:219; W. Horn, 1915:388; W. Horn, 1916:13; Leng, 1920:42.

Cicindela viridisticta: Schaupp, 1883-1884:103; Leng, 1902a:115; W. Horn, 1903a:182; Smyth, 1907-1908:188; Rumpff, 1977:178.

Type data.—Type(s) from Arizona (Cazier, 1954); British Museum (Natural History), London.

General distribution.—Chihuahua, Mexico northward into Arizona.

Arizona distribution.—Cochise, Gila*, Maricopa*, Pima, and Santa Cruz* counties (Fig. 35).

Diagnosis.—Color brown bronze dorsally, greenish blue ventrally. Head granulate-striate, bald; labrum unidentate; clypeus glabrous; gena bare; first antennal segment with sensory setae only. Thorax granulate-striate, pilose laterally, proepisternum bald, deep green or blue. Legs green with cupreous reflections, front trochanters with setae, middle trochanters without. Abdomen sparsely pilose. Elytra (Fig. 31) evenly, deeply punctate, subsutural row of fovea, serrate at apex, with weak spine, widest at apical fourth. Length 7-8 mm.

Remarks.—Adults of this subspecies show little variation throughout their range. They occur from July to October in short grass along streams, ditches, and ponds. Superficially, this subspecies resembles *C. wickhami*, but it can be distinguished by the subsutural row of fovea and a more convex appearance.

Cicindela wickhami Horn

(Figs. 32, 48)

Cicindela wickhami W. Horn, 1903a:182; Smyth, 1907-1908:180; Leng, 1920:42; W. Horn, 1926:170; Cazier, 1948:18; Cazier, 1954:284.

Cicindela lemniscata: Smyth, 1907-1908:188 (misidentification).

Type data.—Types(s) from Tucson, Pima County, Arizona (Cazier, 1954); Berlin-Dahlem, East Berlin.

General distribution.—Northwestern Mexico (including Baja California Norte) northward into Arizona.

Arizona distribution.—Cochise, Pima, Pinal, and Santa Cruz counties (Fig. 48).

Diagnosis.—Color cupreous green to cupreous red dorsally, cupreous, green, and blue ventrally. Head granulate-striate, bald; labrum unidentate; clypeus glabrous; gena bald; first antennal segment with sensory setae only. Thorax granulate-striate, pilose laterally and medially; proepisternum bald, bronze or green with bronze reflections. Legs brown with cupreous reflections, front and middle trochanters with setae. Abdomen pilose. Elytra (Fig. 32) with shallow green punctations, weakly serrate at apex, with no spine to weak spine, widest at apical fourth. Length 6-8 mm.

Remarks.—Adults may be collected from June to July in bare areas next to water (see discussion under *C. viridisticta arizonensis*).

***Cicindela willistoni sulfontis* Rumpff**
(Figs. 33, 50)

Cicindela willistoni sulfontis Rumpff, 1977:170.

Type data.—Holotype, male from 5.6 kilometers WSW of Willcox, Cochise County, Arizona; type number 12530, California Academy of Sciences, San Francisco.

General distribution.—Arizona.

Arizona distribution.—Cochise County (Fig. 50).

Diagnosis.—Color dark blue green, green bronze or dull brown dorsally, blue green or green with blue and cupreous reflections ventrally. Head granulate-striate, pilose; labrum unidentate; clypeus glabrous; gena bald; first antennal segment pilose medially. Thorax rugose, pilose laterally; proepisternum pilose, blue green with cupreous reflections. Legs blue green or green with cupreous reflections, front and middle trochanters with setae. Abdomen pilose. Elytra (Fig. 33) with even green punctations throughout, weakly serrate, with spine, widest at middle. Length 13-14 mm.

Remarks.—Adults of this species occur from mid-July to August on mud flats in the Sulphur Springs Valley. Maculations show little variation, but occur in two color forms, green and brown (see discussion under *C. tranquebarica kirbyi*).

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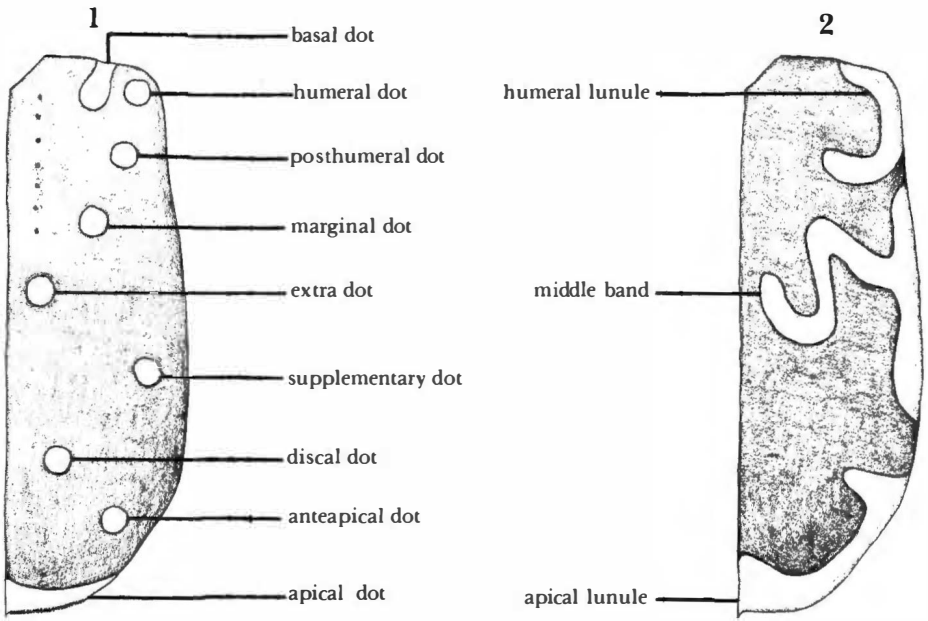
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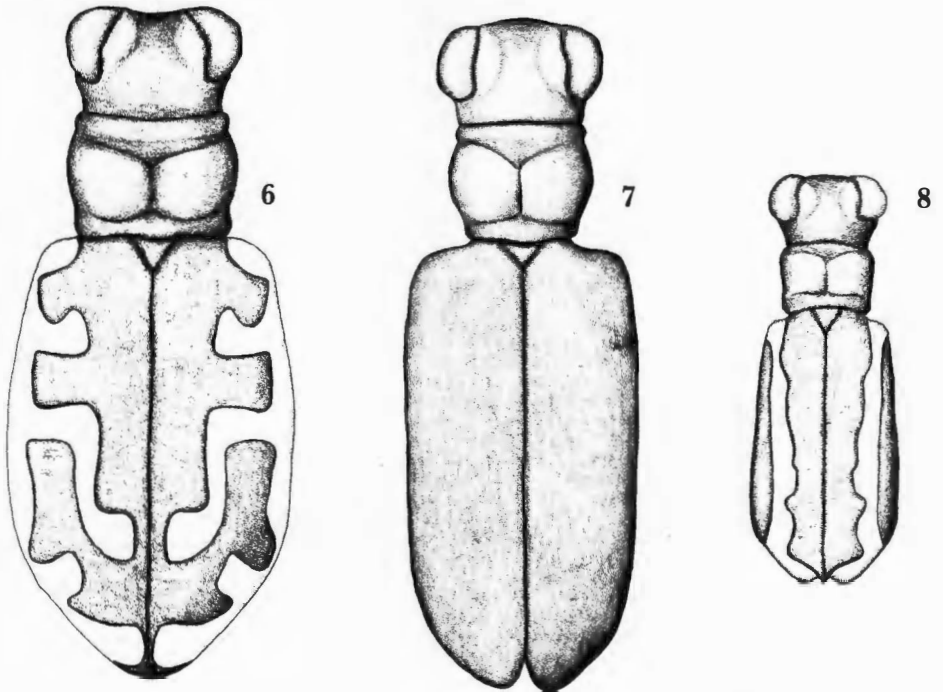
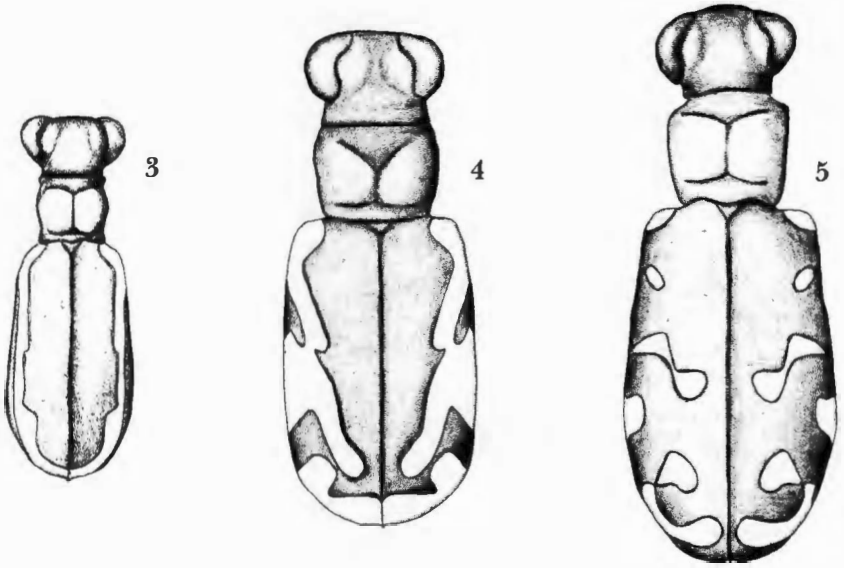
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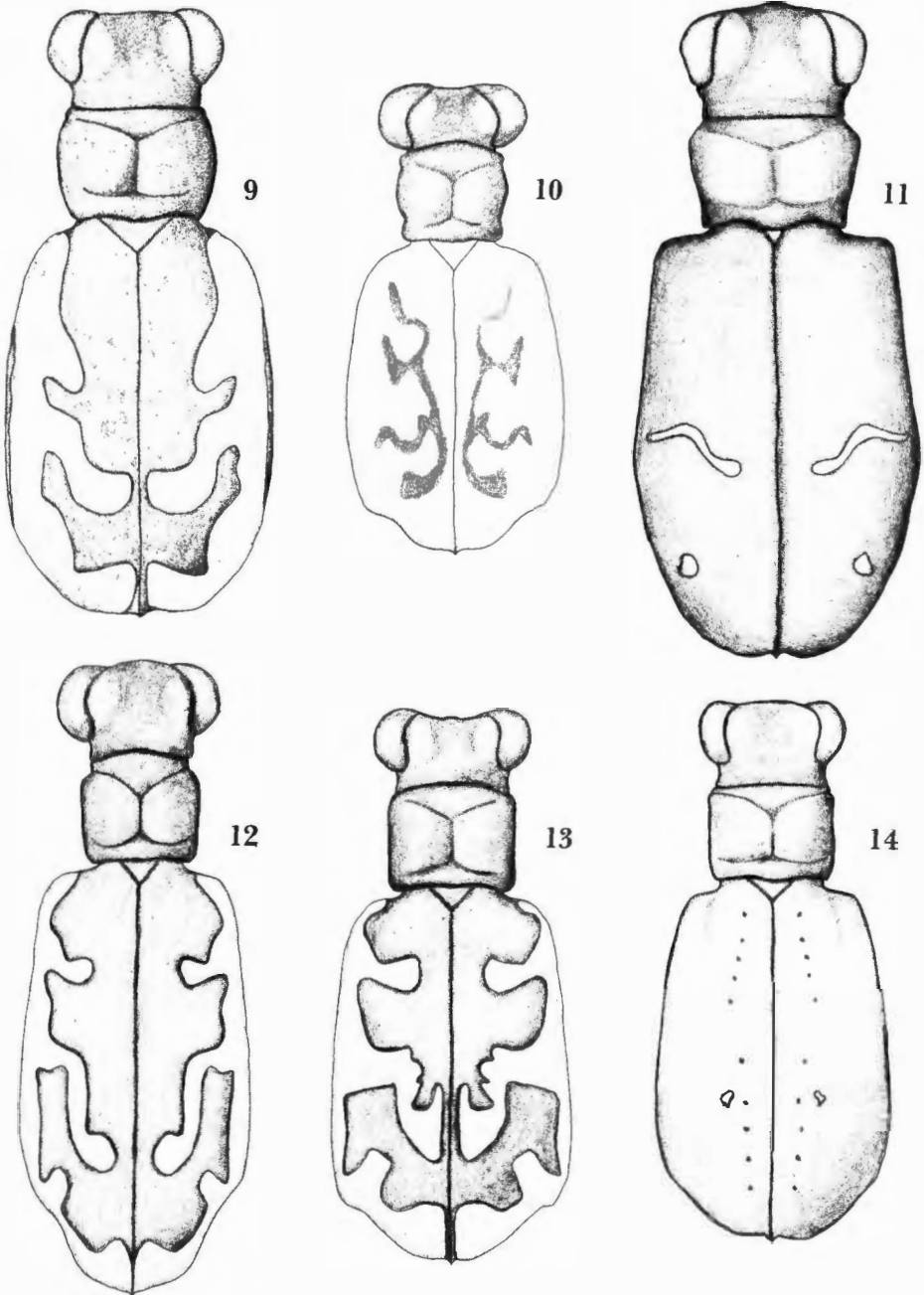
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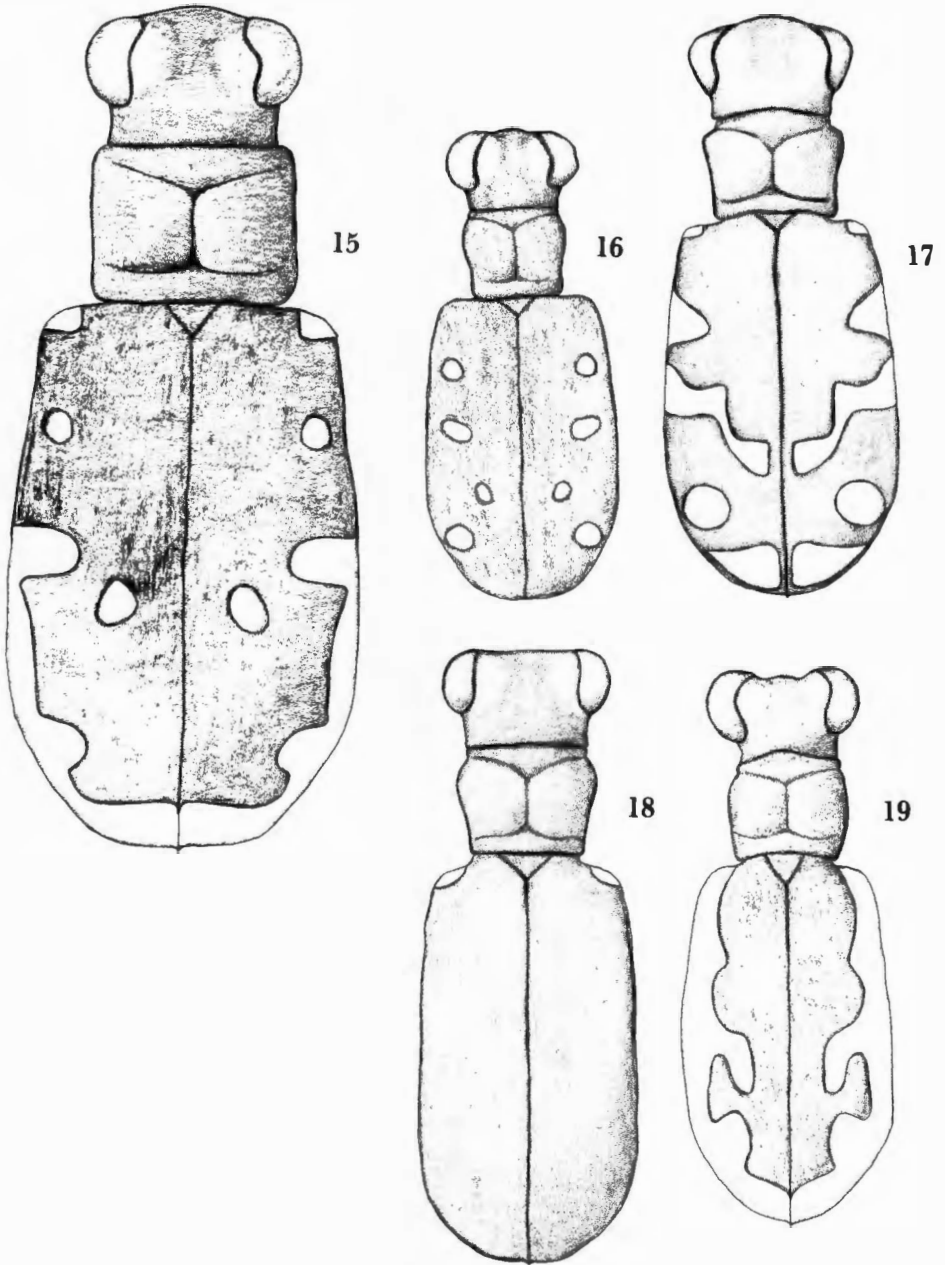
FIGS. 1-2.—Types of elytral markings.



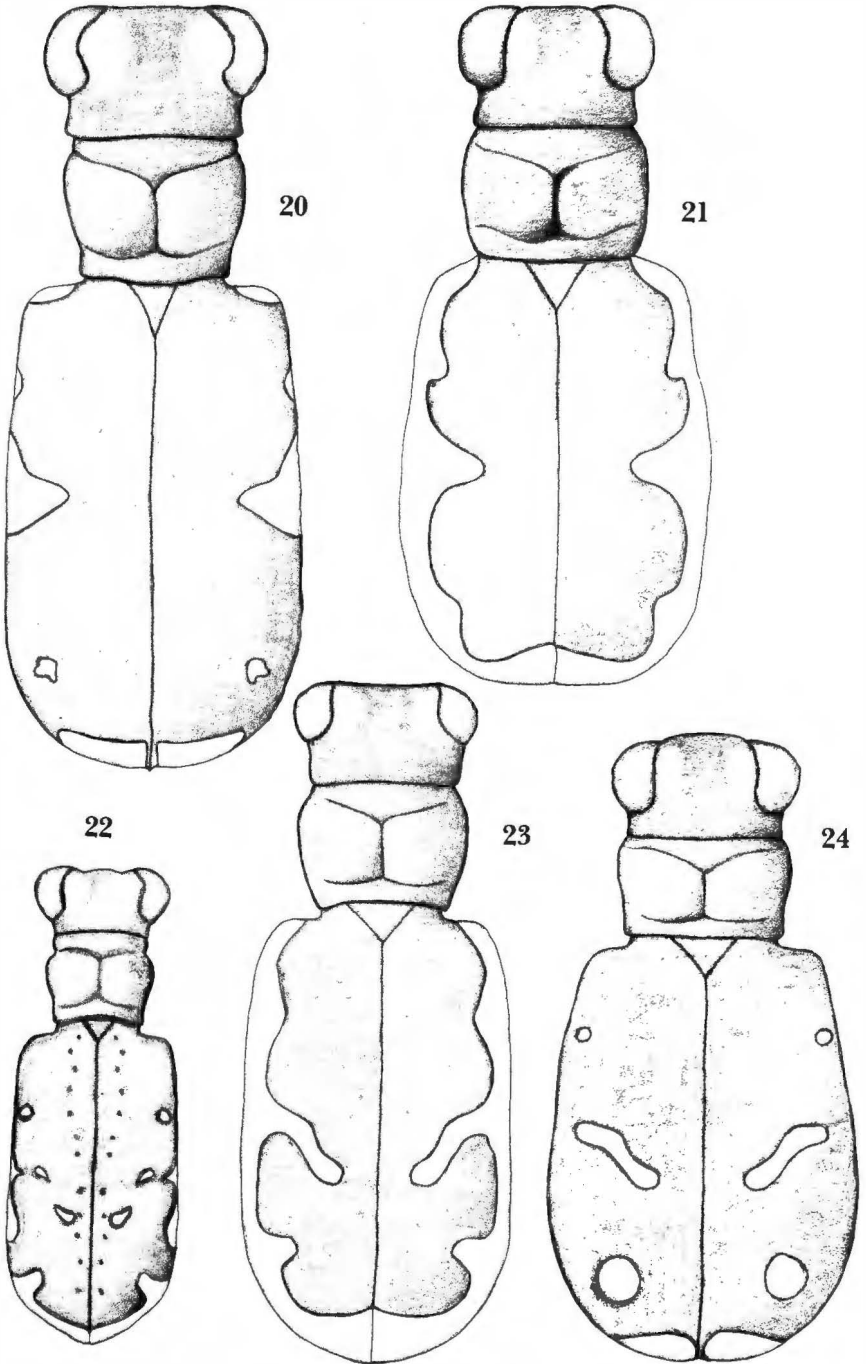
FIGS. 3-8—Dorsal view of *Cicindela* species: 3, *C. debilis* Bates; 4, *C. fulgida fulgida* Say; 5, *C. haemorrhagica haemorrhagica* Le Conte; 6, *C. hirticollis corpuscula* Rumpff; 7, *C. hornii hornii* Schaupp; 8, *C. lemniscata lemniscata* Le Conte.



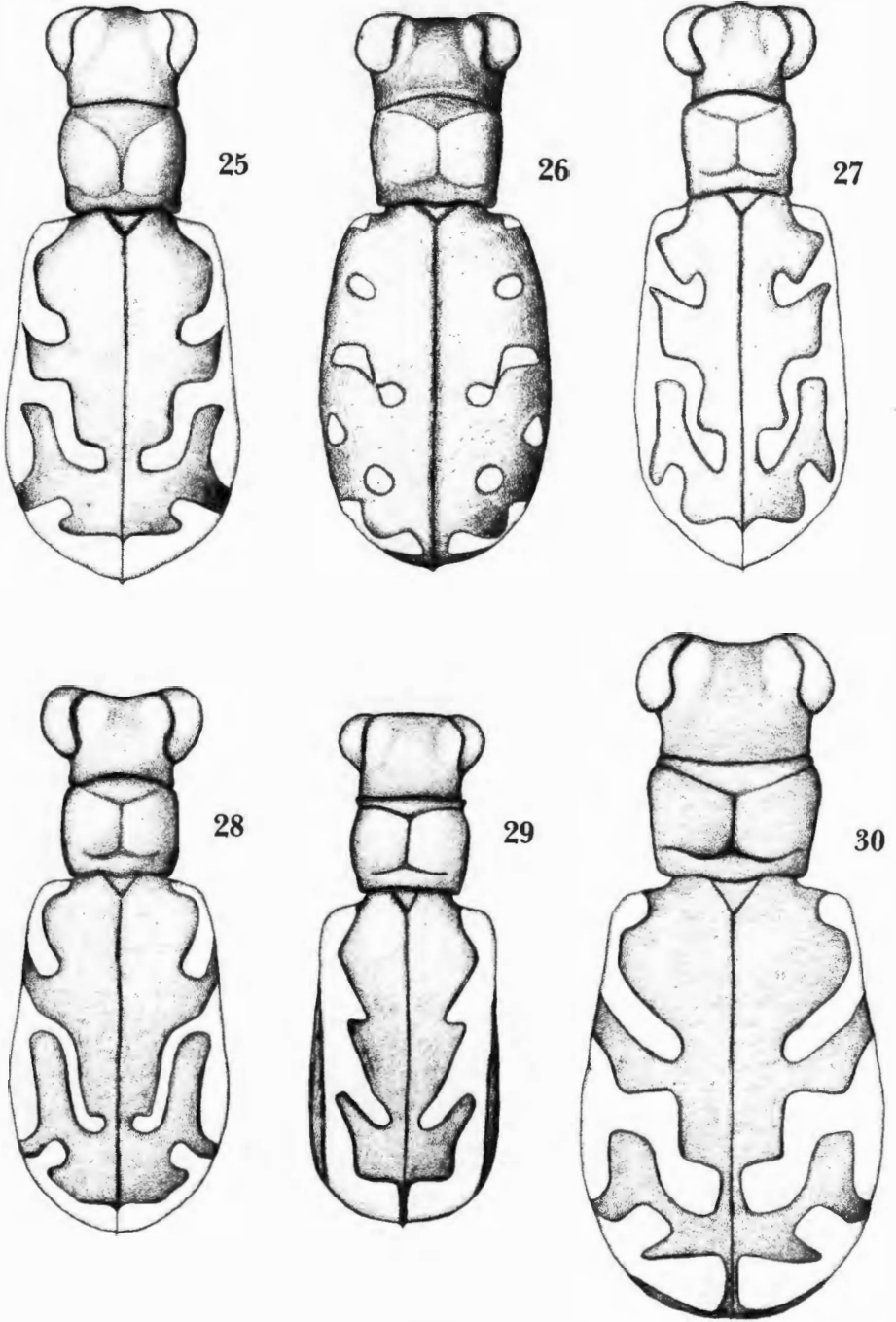
FIGS. 9-14.—Dorsal view of *Cicindela* species: 9, *C. lengi jordai* Rotger; 10, *C. lepida* Dejean; 11, *C. longilabris vestalia* Leng; 12, *C. marutha* Dow; 13, *C. nevadica tubensis* Cazier; 14, *C. nigrocoerulea nigrocoerulea* Le Conte.



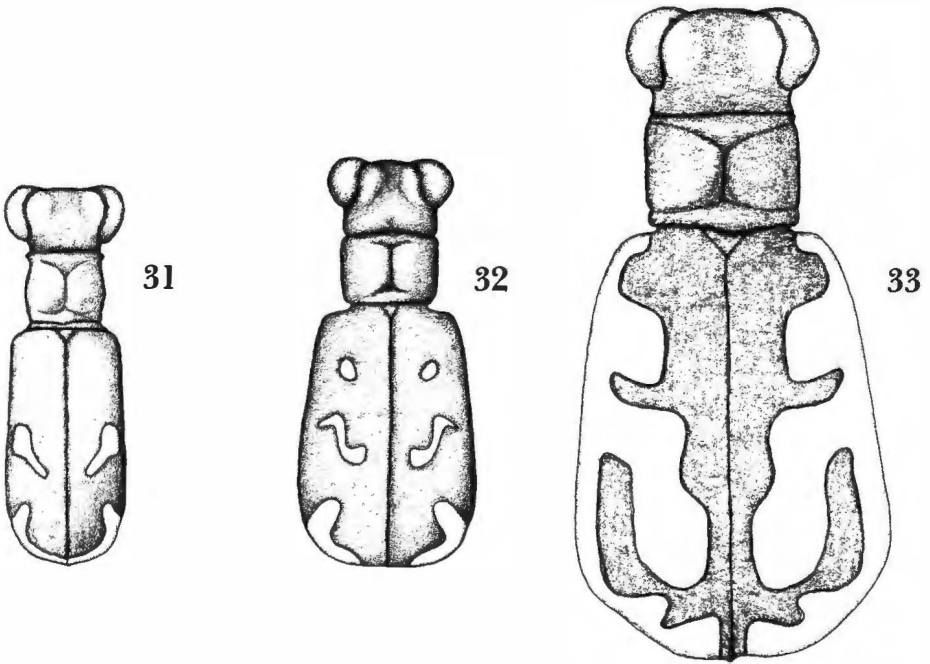
FIGS. 15-19.—Dorsal view of *Cicindela* species: 15, *C. obsoleta santaclarae* Bates; 16, *C. ocellata ocellata* Klug; 17, *C. oregona maricopa* Leng; 18, *C. pimeriana* Le Conte; 19, *C. fulgoris fulgoris* Casey.



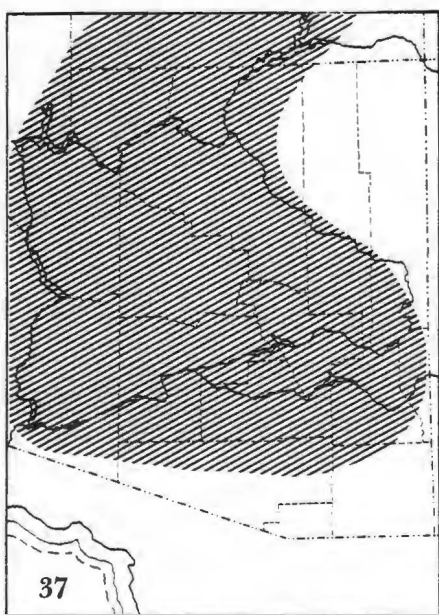
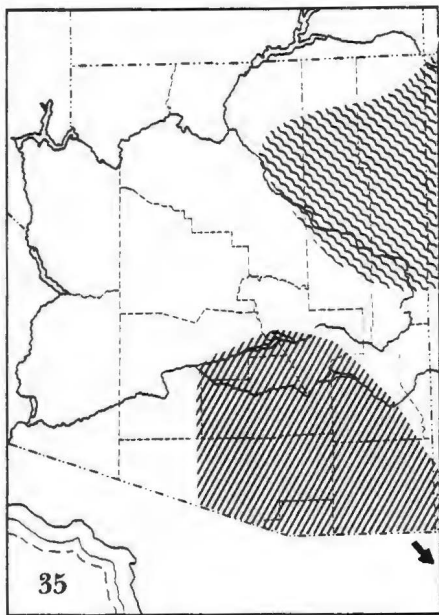
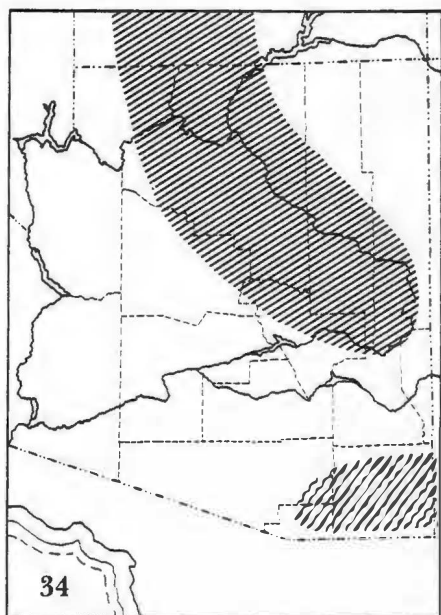
FIGS. 20-24.—Dorsal view of *Cicindela* species: 20, *C. pulchra pulchra* Say; 21, *C. pulchra dorothea* Rumpff; 22, *C. punctulata punctulata* Olivier; 23, *C. purpurea cimarrona* Le Conte; 24, *C. purpurea graminea* Schaupp.



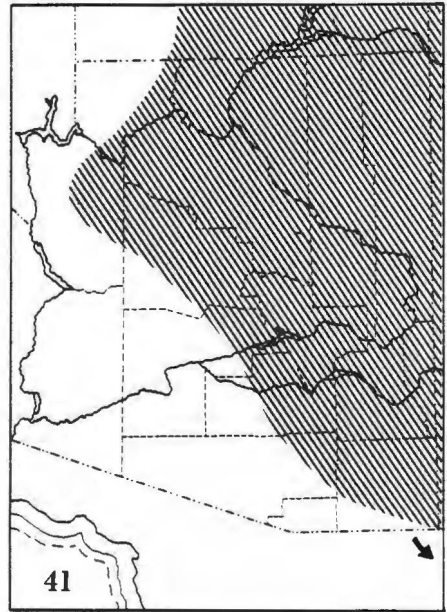
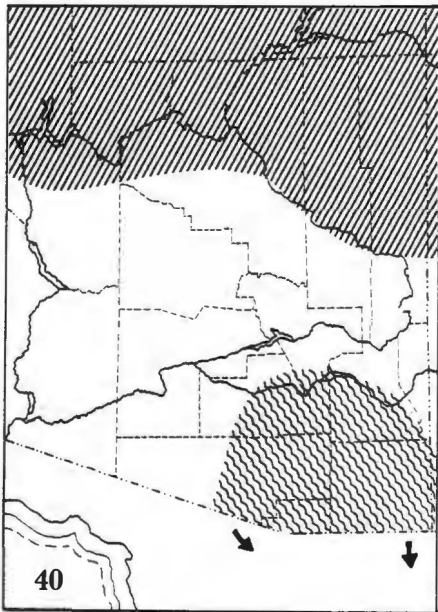
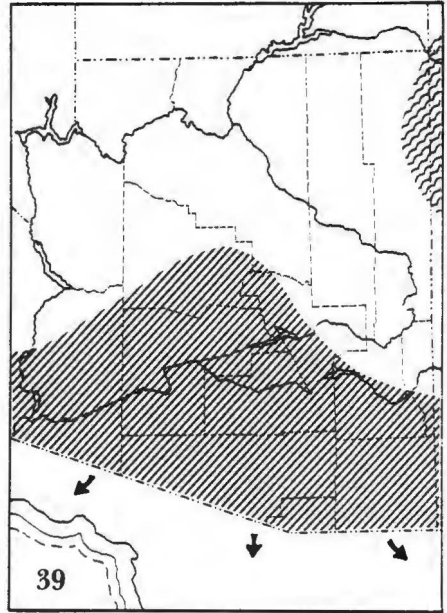
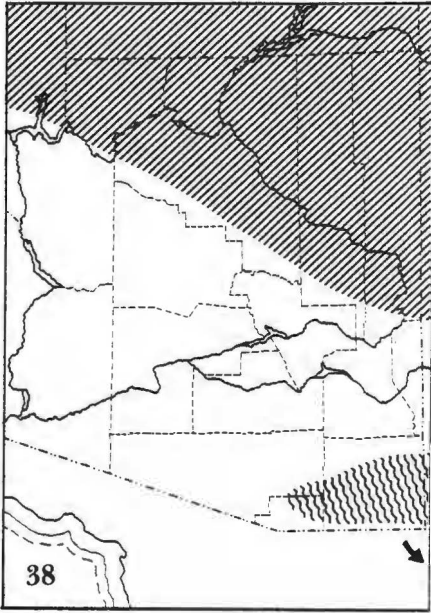
FIGS. 25-30.—Dorsal view of *Cicindela* species: 25, *C. repanda repanda* Dejean; 26, *C. sedecimpunctata sedecimpunctata* Klug; 27, *C. sperata sperata* Le Conte; 28, *C. tenuisignata* Le Conte; 29, *C. terricola cinctipennis* Le Conte; 30, *C. tranquebarica kirbyi* Le Conte.



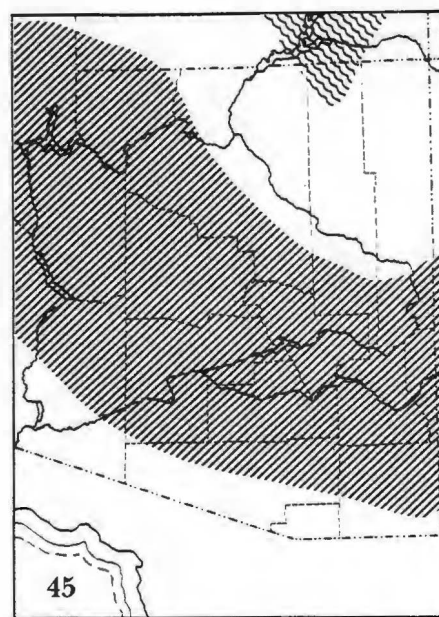
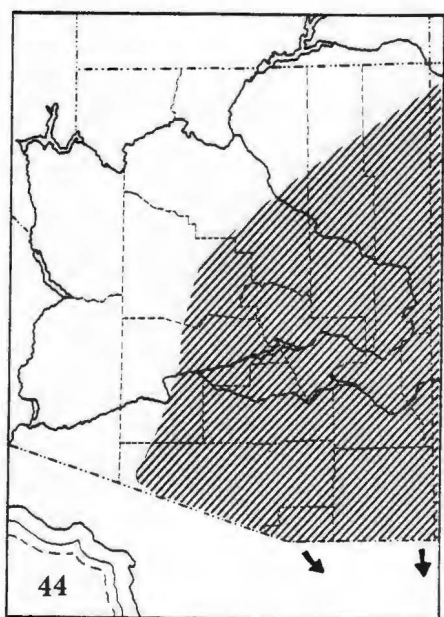
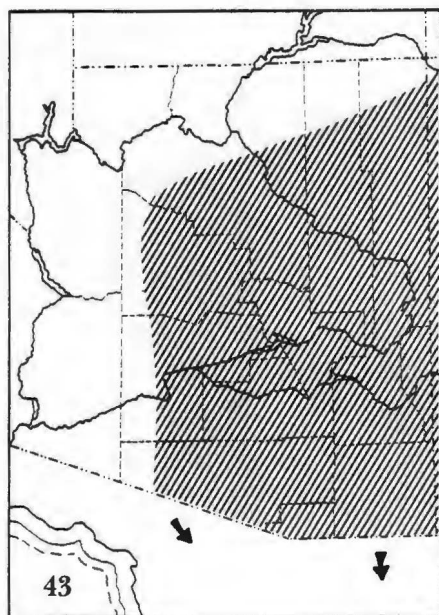
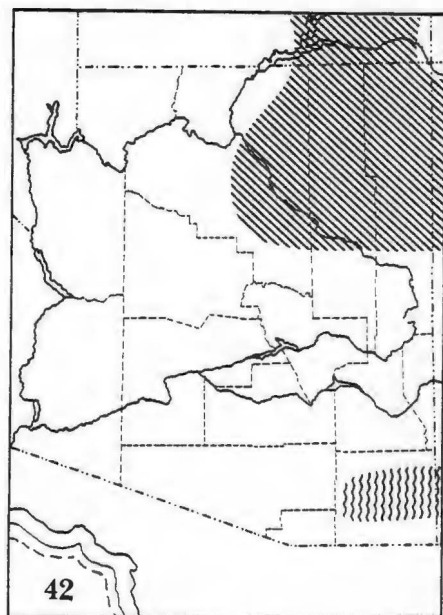
FIGS. 31-33.—Dorsal view of *Cicindela* species: 31, *C. viridisticta arizonensis* Bates; 32, *C. wickhami* W. Horn; 33, *C. willistoni sulfontis* Rumpff.



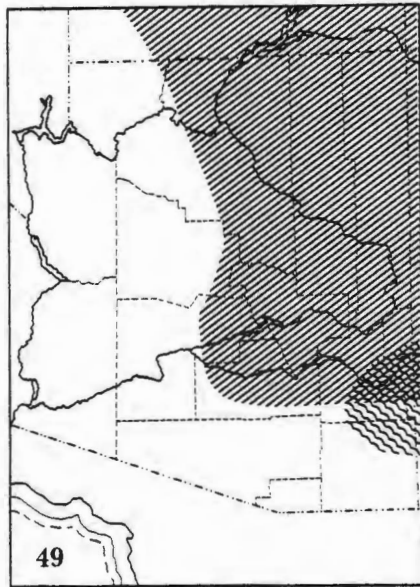
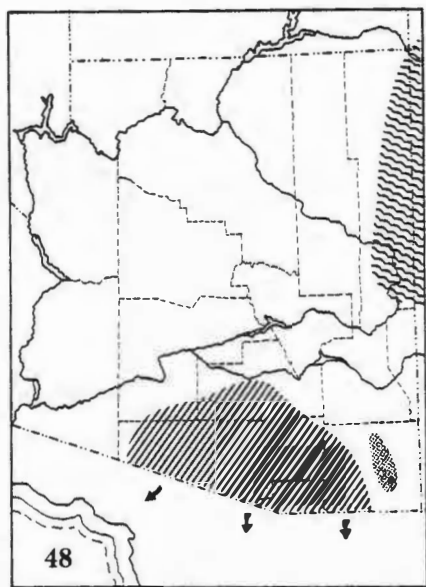
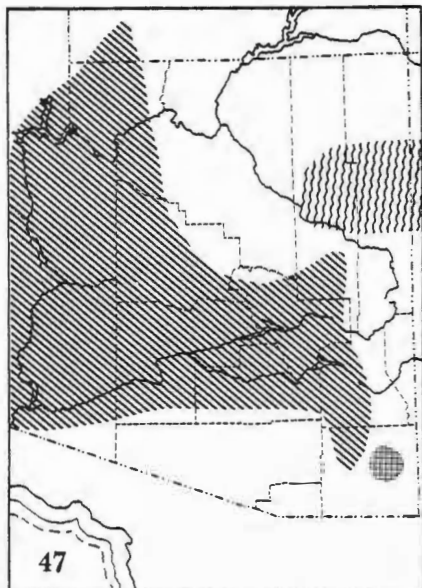
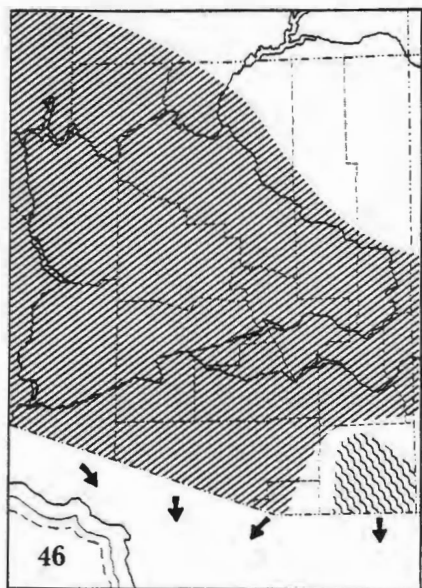
FIGS. 34-37.—Arizona distribution of *Cicindela* species: 34, *C. debilis* Bates (wavy lines), and *C. longilabris vestalia* Leng (straight lines); 35, *C. fulgida fulgida* Say (wavy lines), and *C. viridisticta arizonensis* Bates (straight lines); 36, *C. haemorrhagica arizonae* Wickham (wavy lines), and *C. haemorrhagica haemorrhagica* Le Conte (straight lines); 37, *C. hirticollis corpuscula* Rumpff.



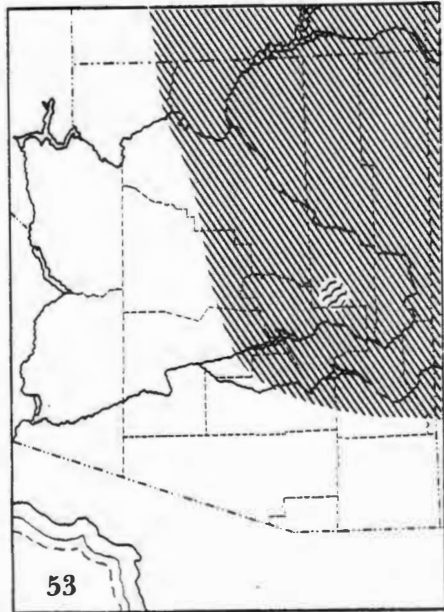
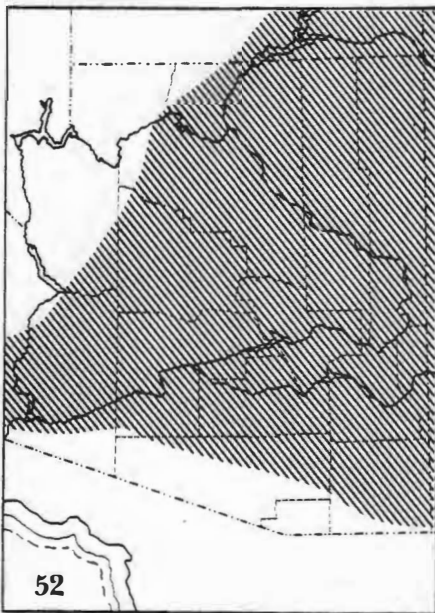
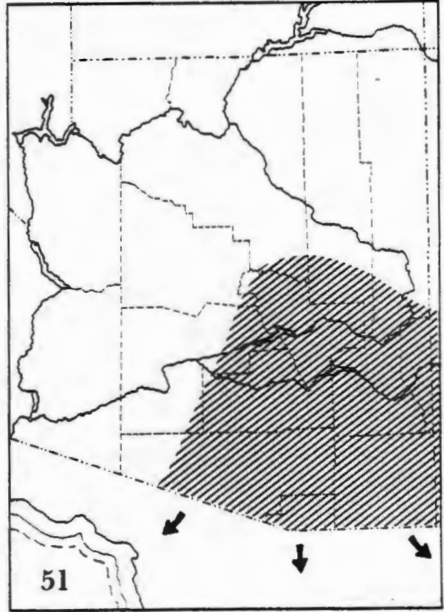
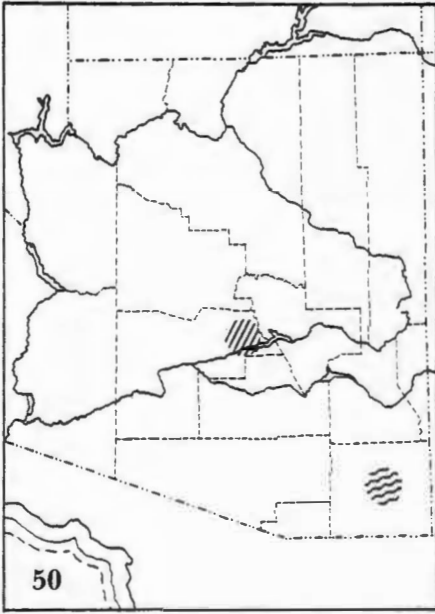
FIGS. 38-41.—Arizona distribution of *Cicindela* species: 38, *C. hornii hornii* Schaupp (wavy lines), and *C. terricola cinctipennis* Le Conte (straight lines); 39, *C. lengi jordai* Rotger (wavy lines), and *C. lemniscata lemniscata* Le Conte (straight lines); 40, *C. ocellata ocellata* Klug (wavy lines), and *C. lepida* Dejean (straight lines); 41, *C. marutha* Dow.



FIGS. 42-45.—Arizona distribution of *Cicindela* species: 42, *C. nevadica citata* Rumpff (wavy lines), and *C. nevadica tubensis* Cazier (straight lines); 43, *C. nigrocoerulea nigrocoerulea* Le Conte; 44, *C. obsolata santaclarae* Bates; 45, *C. oregona navajoensis* VanDyke (wavy lines), and *C. oregona maricopa* Leng (straight lines).



FIGS. 46-49.—Arizona distribution of *Cicindela* species: 46, *C. pimeriana* Le Conte (wavy lines), and *C. tenuisignata* Le Conte (straight lines); 47, *C. fulgoris fulgoris* Casey (wavy lines), *C. praetextata praetextata* Le Conte (straight lines), and *C. fulgoris erronea* Vaurie (dots); 48, *C. pulchra pulchra* Say (wavy lines), *C. wickhami* W. Horn (straight lines), and *C. pulchra dorothea* Rumpff (dots); 49, *C. purpurea cimarrona* Le Conte (wavy lines), and *C. purpurea graminea* Schaupp (straight lines).



FIGS. 50-53.—Arizona distribution of *Cicindela* species: 50, *C. willistoni sulfontis* Rumpff (wavy lines), and *C. repanda repanda* Dejean (straight lines); 51, *C. sedecimpunctata sedecimpunctata* Klug; 52, *C. sperata sperata* Le Conte; 53, *C. tranquebarica lassenica* Casey (wavy lines), and *C. tranquebarica kirbyi* Le Conte (straight lines).