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FIVE NEW SUBSPECIES OF TIGER BEETLES OF THE GENUS *CICINDELA* AND TWO CORRECTIONS (COLEOPTERA, CICINDELIDAE)

By Patricia Vaurie[1]

The description of the following subspecies has been made possible by the large series of comparative material in the American Museum of Natural History from many localities and by the loan of further specimens for study by Dr. W. J. Brown of the Canadian Department of Agriculture, by Mr. J. H. Robinson, by the University of Michigan, the University of Kansas, and by South Dakota State College.

The advice and help given by Dr. Mont A. Cazier, at whose suggestion this work was undertaken, are gratefully acknowledged. I wish to thank Miss Marjorie Statham for the excellent drawings.

Cicindela repanda novascotiae, new subspecies

Figure 1A

Labrum with front margin slightly sinuate and with small median tooth; antennal scape with three long hairs at apex and two or three just below the middle; gena with two to 12 reclining hairs, usually five or six; front of head with sparse erect hairs; thorax with sparse reclining hairs at sides; elytra, male, nearly parallel to apical fifth where it narrows obliquely to conjointly rounded apex, apical margin serrate; female, suddenly widened at basal fourth, then gradually rounded to conjointly

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rounded apex, apical margin serrate. Elytral markings shortened, narrowed, broken through or obliterated. Color bronze.

TYPE LOCALITY: Truro, Nova Scotia, holotype male, July 22, 1913 (R. Matheson), allotype female, August 7, 1913 (R. Matheson), and 39 paratopotypes in the American Museum of Natural History.

Fifty paratypes: *Nova Scotia:* Amherst, July 11, 1949 (Schramel), 10; Great Village, July 14, 1949 (Schramel), eight. *Prince Edward Island:* Summerside, July 5, 1949 (Schramel), three; Rusticoville, Rustico Harbor, July 6, 1949 (Schramel), eight; White Sands, July 7, 1949 (Schramel), 10; *Quebec:* Magdalen Islands: September 11, 1914 (C. H. Young), six; Entry Island, August 16–17, 1917 (F. Johansen), three; Alright Island, August 17, 1917 (F. Johansen), two. Paratypes in the collection of the American Museum of Natural History except for 11 in the Canadian Department of Agriculture.

DISTRIBUTION: Nova Scotia, Prince Edward Island, Magdalen Islands, and Cape Breton Island, Canada.

DIAGNOSIS: Differs from other *repanda* in reduced or partially obliterated elytral markings and lighter, more bronze color.

DISCUSSION: In this subspecies the basal lunule is usually broken where it turns inward, the middle band is narrowed or broken in two places, or the apical lunule lacks the inward projections, or the markings may be obliterated in other places. In the large series from Truro nearly half the specimens have all the markings so reduced that the resulting pattern is composed of dots, two at the base, two behind the middle, two larger ones at the apex. The Nova Scotia populations have more markings reduced than the island populations. None of the described varieties or subspecies of *repanda* has the markings obliterated as in *novascotiae*. Comparison with about 400 specimens of *repanda*, excepting *novascotiae*, from many localities shows only 19 individuals with the middle band partly obliterated, eight with the projections of the apical lunule lacking, and none with the basal lunule disconnected. (Greased specimens may appear to have the markings obliterated, but examination under a microscope will show whether this is true or not.)

Of the 91 specimens of *novascotiae*, there are 22 (24 per cent), that resemble *repanda* in their complete markings. The entire series of *novascotiae*, however, is predominantly lighter in color than *repanda*, being more bronze (some specimens are even red-

dish) and not the dull chocolate brown of *repanda*. Eight of the 91 specimens have a greenish tinge.

This subspecies has been seen only from Nova Scotia and the islands to the north and east. In New Brunswick, west of Nova Scotia, nominate *repanda* occurs, and specimens have been examined from Penobsquis, Apohaqui, and Bathhurst, also from Cascapedia, Quebec, on the Gaspé Peninsula, northward across the bay from Bathhurst. A green specimen from Boiestown in the center of New Brunswick has the middle band broken as in *novascotiae*, but this is only a single specimen and cannot be assumed to be representative.

Cicindela circumpicta salinae, new subspecies

Labrum with front margin definitely and equally tridentate; antennal scape with a single long white hair at apex only; gena without hair; front of head without hair; thorax with a few scattered, white, reclining hairs on sides, base, and apex; elytra, male, nearly parallel to apical fifth, then narrowing obliquely to the conjointly rounded apex, each elytron with small acute spine at suture; female, same as male except apices of elytra separately rounded, the sutural angle retracted, the spine less acute. Elytral markings connected along margins, basal lunule scarcely defined, middle band merely an acute angle emerging from the margin, although sometimes longer and extending obliquely farther inward and downward. Color muddy brown.

TYPE LOCALITY: Lincoln (Salt Basin), Lancaster County, Nebraska, holotype male, allotype female, June 28, 1949 (P. and C. Vaurie), and 275 paratopotypes, same date and collectors, in the collection of the American Museum of Natural History.

Two paratypes from Ashland, Nebraska, in the American Museum of Natural History and at South Dakota State College.

DISTRIBUTION: Lincoln and Ashland, Nebraska.

DIAGNOSIS: Differs from *circumpicta* (southern and southeastern Texas) by its much smaller size and the reduction of the middle band; from *johnsoni*[1] (northern Texas, Oklahoma, Missouri, Kansas, eastern Colorado, eastern New Mexico) by its darker color (chocolate brown, blackish, dull red) and smaller size.

DISCUSSION: Two other differences between *salinae* and the other subspecies are that it lacks the glossy sheen of *circumpicta*

[1] Casey's *ambiens*, 1913, was found to be superseded by Fitch's *johnsoni*, 1856.

and *johnsoni*, and there are no examples in the large series from Lincoln of the distinct green or blue color phase that occurs in small proportions in the other two subspecies. There are, however, about a dozen specimens with a dull dark bluish or greenish cast.

Although rather similar to *circumpicta* in color, *salinae* is definitely smaller. The size differences in millimeters of all three subspecies are shown in table 1 (measured from the front of the eye to the apex of the elytra).

TABLE 1

AVERAGE LENGTH IN *C. circumpicta*

	15 males	15 females
C. c. salinae	11.0–12.5 (11.9)	11.5–13.0 (12.6)
C. c. johnsoni	11.5–13.5 (12.8)	12.5–14.5 (13.6)
C. c. circumpicta	13.0–15.0 (14.1)	14.0–16.0 (15.0)

It can be seen from table 1 that *salinae* is closer to *johnsoni* in size, as it is also closer in elytral markings; the middle band in both is nearly always reduced, while in *circumpicta* it is nearly always distinct and protrudes from the margin towards the suture. In color *johnsoni* and *salinae* are quite different, the former being bright red or green, the latter dark muddy brown to black. But there are some dull red or reddish individuals in *salinae* in the proportion of about 60 out of 275, or 22 per cent. In *johnsoni*, of 11 populations totaling 82 specimens, there are 49 red specimens, or 60 per cent, 36 per cent bright green or blue, and only three, or 4 per cent, muddy brown as in *salinae*. The *johnsoni* reds are brighter and glossier than the *salinae* reds.

Below, in all subspecies, there are coppery reflections on the thorax except in the bright green or blue specimens.

Cicindela c. salinae probably intergrades with *johnsoni* in northern Kansas.

The type and paratopotypes were collected on the saline muddy shores of the Salt Basin Lake; about half the individuals were taken by hand at night when they came out from clumps of wiry vegetation on the shore.

Cicindela hamata monti, new subspecies

Labrum with front margin nearly straight and with median tooth large in female, small in male; antennal scape with one

long white hair at apex; gena with dense depressed white hairs; front of head with sparse depressed white hairs; thorax with sparse hairs at sides only, in female; at sides, center, base, and apex in male; elytra, male, only slightly wider at the middle, narrowing obliquely at apical fourth to the truncate apex where each elytron is separately rounded, sutural angle retracted, and with small spine; female, much wider at middle, narrowing obliquely at apical fourth to apex where each elytron is separately rounded, sutural angle retracted far from apex and with long hooked spine, apices often overlapping each other. Elytral markings connected along margin, basal median spot present, basal lunule much narrowed before apical hook, middle band with apical hook confused and broken. Color green.

TYPE LOCALITY: Ten miles southwest of Sabine, Jefferson County, Texas, holotype male, allotype female, June 1, 1948 (Mont Cazier), and 30 paratopotypes, same date and collector, in the American Museum of Natural History.

Two hundred and thirty-one paratypes from Texas: High Island, Chambers County, June 1, 1948 (M. Cazier), one; Port Bolivar, Galveston County, June 1, 1948 (M. Cazier), one; Port Isabel, Cameron County, June 7, 1948 (M. Cazier), 14; Padre Island, Port Isabel, Cameron County, June 8, 1948 (M. Cazier), 15; Del Mar Beach, Del Mar Canyon, Cameron County, June 21, 1948 (M. Cazier), 10; Matagorda, Matagorda County, June 4, 1948 (M. Cazier), 26; Port Lavaca, Calhoun County, June 4, 1948 (M. Cazier), one; Portland, San Patricio County, June 5, 1948 (M. Cazier), 58; Los Olmos Creek, 3 miles south of Riviera, Kleburg County, June 18, 1948 (M. Cazier), seven; Riviera Beach, Baffins Bay, Kleburg County, June 18, 1948 (M. Cazier), 59; 1/4 mile north of Armstrong, Kenedy County, June 19, 1948 (M. Cazier), four; Corpus Christi, Nueces County, June 5, 1948 (M. Cazier), one; May 20, 1937 (K. L. Maehler), 14, May 21, one; Brownsville, June, 1912, three, June 23–25, 1930 (E. G. Linsley), nine; Dimmit County (Van Dyke), one; Port Aransas, Aransas County, June 27, 1930 (Leonora K. Gloyd), two; Red Fish Bay, Willacy County, June 2, 1939 (L. K. Gloyd), two; Indianola, Calhoun County, May 26, 1939 (L. K. Gloyd), one. Paratypes in the American Museum of Natural History.

DISTRIBUTION: Gulf coast of Texas and north along the Rio Grande to Dimmit County.

DIAGNOSIS: Differs from *lacerata* (coast of Georgia, Florida, Alabama) in its green, not brown, color; from *hamata* (Mexico) in its larger size, broader elytral markings, and confused middle band; from *pallifera* (Yucatan, Mexico) in the separation of markings (not merging across the disc).

DISCUSSION: In size and elytral pattern, *monti* is most similar to *lacerata*, but *lacerata* is dark brown in daylight (deep red all over under a lighted microscope), while *monti* is dull green in daylight (just the disc often deep red under microscope). Of 145 specimens of *lacerata* examined, six individuals, or 4 per cent, were green as in *monti*, and 27 of 269 *monti*, or 10 per cent, were brownish as in *lacerata*, but most of them not the same deep brown of *lacerata*.

No specimens of either *monti* or *lacerata* have been seen from the intervening coastal area between Alabama and Texas.

The type and paratopotypes were collected on wet, dark salt flats about 150 yards from the beach, in small open places surrounded by salt grass.

Cicindela nevadica olmosa, new subspecies

Figure 1B

Labrum with front margin nearly straight and with small median tooth; antennal scape with a dozen or more hairs at base, middle, and apex; gena with dense, white, reclining hairs; front of head same as gena, but sparser; thorax with white reclining hairs on sides and scattered ones at center, base, and apex; elytra, male, somewhat widened at middle and at apical fifth narrowing obliquely to the acute apex; female, much widened at middle, and at apical fifth forming an obtuse or right angle, thence narrowing obliquely to the somewhat truncate apex, the sutural angle not retracted. Elytral markings complete and broad, no median basal spot. Color greenish.

TYPE LOCALITY: Los Olmos, Kenedy County, Texas, holotype male, allotype female, June 7, 1948 (M. Cazier), and one paratopotype, in the collection of the American Museum of Natural History.

Twenty-nine paratypes from New Mexico: 25 miles west of Tularosa, July 1, 1940 (D. E. Hardy), 27; Organ, July 3, 1940 (L. J. Lipovsky), two. Eight paratypes in the American Museum of Natural History, the others in the University of Kansas.

DISTRIBUTION: Southeastern New Mexico and extreme southern Texas.

DIAGNOSIS: Differs from the other subspecies in the much broader elytral markings, some of which are partially confluent, and in the predominantly green color.

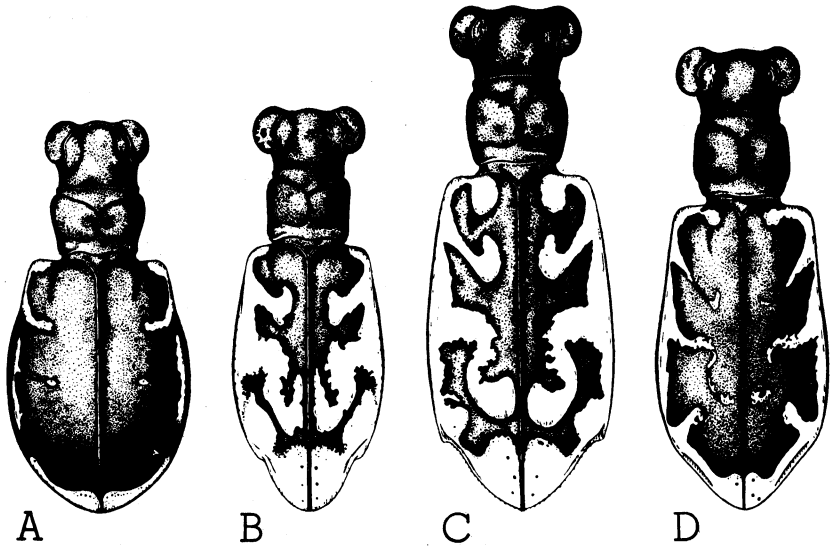

FIG. 1. A. *Cicindela repanda novascotiae*, female. B. *C. nevadica olmosa*, female. C. *C. macra fluviatilis*, female. D. *C. m. ampliata*, male.

DISCUSSION: The markings in *olmosa* are especially broad at the apex of the elytra, where the spreading apical lunule nearly closes up the space between it and the middle band. Although the other subspecies vary in the width of markings, none shows so much white as *olmosa*, nor are the markings so glossy. The next widest markings are to be found in some *tubensis* (Arizona, northern New Mexico), from the type locality, Tuba City, Arizona, and one each from Newcomb and Canon Largo in northern New Mexico, but this subspecies is predominantly red in color, whereas *olmosa* is more greenish, and most *tubensis* do not have broad markings. Almost all specimens of *nevadica* (California and Nevada), *lincolniana* (Lincoln, Nebraska), and *knausi* (central and northern states) have narrow or even partially obsolete markings. There is one *knausi* from Newcastle, Wyoming, that is the same in markings as an *olmosa*

with narrower markings from Tularosa, New Mexico, but it is darker in color. In *olmosa* and *tubensis* the markings never become obsolete.

There are wide collecting gaps in this species, none of the subspecies coming together at any point in the present known distribution, and populations of the new subspecies *olmosa* being widely separated. This lack of material is due either to chance or the possibility that *nevadica* is very local in occurrence.

The type and paratopotypes were taken on white alkali sand on the banks of Los Olmos Creek.

Cicindela macra fluviatilis, new subspecies

Figure 1C

Labrum with front margin nearly straight to quite sinuous and with a small median tooth; antennal scape with two or three long white hairs at apex only; gena with dense white reclining hairs; front of head same as gena but hairs sparser; thorax with white, reclining hairs on sides and a few on both sides of center of thorax; elytra, male, almost parallel to apical fifth, then narrowing obliquely to acute apex; female, almost parallel to apical fifth, then forming an obtuse or a right angle and narrowing obliquely to acute apex, the sutural angle not retracted. Elytral markings complete and broad, shoulder of elytra with median spot connected with basal lunule. Color red.

TYPE LOCALITY: Red River, north of Quanah, Hardeman County, Texas, holotype male, allotype female, August 25, 1948 (C. and P. Vaurie), and 13 paratopotypes, same date and collectors, in the collection of the American Museum of Natural History.

One hundred and eighteen paratypes: *Oklahoma:* Great Salt Plains Reservoir, Alfalfa County, August 26, 1948 (C. and P. Vaurie), 14; Orienta, Cimarron River, Major County, August 26, 1948 (C. and P. Vaurie), seven; Perkins, July, 1914 (Skinner), two; Lake Altus, Greer County, August 25, 1948 (C. and P. Vaurie), 29. *Texas:* 15 miles north of Amarillo, Canadian River, Potter County, August 23, 1948 (C. and P. Vaurie), 48; Newlin, Hall County, August 24, 1948 (C. and P. Vaurie), eight; Red River, north of Childress, Childress County, August 24, 1948 (C. and P. Vaurie), six; Lake Childress, Childress County, August 24, 1948 (C. and P. Vaurie), one; Burkburnett, Red River, Wichita County, June 26, 1948 (C. and P. Vaurie),

two; Oklaunion, Wilbarger County, June 27, 1948 (C. and P. Vaurie), one. Paratypes in the collection of the American Museum of Natural History.

DISTRIBUTION: Oklahoma and northwestern Texas (Panhandle) southeast along the Red River as far as Wichita County, Texas.

DIAGNOSIS: Differs from *macra* (central and east central states), *puritana* (northeastern states), and *ampliata* (northeastern Texas) in the color of the elytra which is dull or bright red, seldom greenish, and in the broader and always complete elytral markings.

DISCUSSION: Of the 133 specimens of *fluviatilis* examined (in daylight, not under microscope), 76 per cent have the elytra red, 19 per cent dark brown without any green, and 5 per cent green or greenish brown as in the three other subspecies. But the elytral markings on the 24 per cent non-red specimens are as broad and complete as in the red ones, not so narrow as in *puritana* or in the majority of *macra* and *ampliata*, and never broken or disappearing. There are a few *fluviatilis* with somewhat narrower markings, and, if these should occur among the 24 per cent brown or green individuals, they might then be difficult to separate from some *ampliata*.

Cicindela m. fluviatilis is consistently larger and bulkier than *macra* or *puritana*, the smaller males equaling in size the large females of the other two subspecies. It is about the same size as *ampliata* to the southeast, but that subspecies is predominantly green or greenish, not red, and has reduced elytral markings.

Intergrades with *ampliata* in Forestburg, Montague County, Texas (see under *ampliata*), and probably with *macra* in southern Kansas and northern Oklahoma. The specimens from Great Salt Plains and Orienta in north central Oklahoma are *fluviatilis*, but two specimens from Washunga, Kay County, to the east and one from Saratoga, Harper County, to the west, although large in size and with broad markings as in *fluviatilis*, are green as in *macra*. On the basis of this small sample, these three specimens are presumed to belong to the intergrading populations of southern Kansas, but further material from these localities might possibly change their status.

The type and paratopotypes were collected on a sand bank of the Red River situated close to shore but separated from it by a sloping moist ditch with several pools.

Cicindela macra ampliata, new subspecies

Figure 1D

Similar to *C. m. fluviatilis* but differs from that subspecies by having the elytral markings narrow, especially the basal lunule, the markings often broken through or disappearing in part or completely. Color dark green.

TYPE LOCALITY: Denton County, Texas, holotype male, allotype female, July 9, 1938 (J. H. Robinson), and 66 paratopotypes. Holotype and allotype and five paratopotypes in the collection of the American Museum of Natural History, other paratopotypes in the collection of J. H. Robinson.

Seventeen paratypes from Texas: Dallas, July 6, 1934 (J. H. Robinson), three; Kaufman County, June 10, 1934, July 3, 1938 (J. H. Robinson), 14; in the collection of the American Museum of Natural History and of J. H. Robinson.

DISTRIBUTION: From Denton County in northeastern Texas, southeastward from the Red River to Kaufman County.

DIAGNOSIS: Differs from *fluviatilis* (Oklahoma, northern and northwestern Texas) in the dark green color and in the narrower or obsolete elytral markings; from *puritana* (Connecticut, Massachusetts, Maryland) in the less acute angulation of the female elytra and in the much larger size; from *macra* (central and east central states) in larger size, in the obliterated or broken elytral markings, and in the proportionately wider and shorter elytra.

DISCUSSION: This large green subspecies is superficially quite similar to *macra*, but there are three differences, besides the fact of its isolation from it, that separate it from *macra*. One is that the elytral markings, though narrow in both subspecies, are more often obsolete in *ampliata*. In 79 specimens of *ampliata*, 53 per cent have the basal lunule and/or the middle band broken through or partially disappearing, while in 189 specimens of *macra*, only 8 per cent have such markings (greased specimens were examined under the microscope to determine whether the markings were actually obliterated or not). The second difference is one of size, *ampliata* being longer. In total length, in millimeters, three Texas populations of *ampliata* (84 specimens) have a range of 13.1 to 13.5 (13.2), while seven northern populations of *macra* (189 specimens) have a range of 11.5 to 12.8 (12.2).

Since a 1-mm. average difference in length is not significant enough, proportions were also taken, and these constitute the third difference, *ampliata* having the elytra proportionately wider and shorter than *macra*. The specimens were measured with an eye-piece micrometer calibrated to one-twentieth of a millimeter.

TABLE 2

MEASUREMENTS OF ELYTRAL LENGTH AND ELYTRAL WIDTH IN *Cicindela macra macra* AND *C. m. ampliata*
(Unit of measurement $^1/_{20}$, or .05, mm.)

	N	Elytral Length		Elytral Width		E.L.: E.W.	
C. m. ampliata							
Denton Co.,							
Texas	10 ♂	290–338	(319.2)	152–189	(174.8)	1.72–1.90	(1.81)
	9 ♀	310–362	(328.5)	176–198	(187.5)	1.68–1.82	(1.75)
C. m. macra							
Halsey,							
Nebraska	10 ♂	291–330	(317.2)	149–170	(161.6)	1.90–2.00	(1.96)
	9 ♀	313–345	(336.0)	165–185	(174.2)	1.85–2.00	(1.93)

The ratio of the elytral length to the elytral width, when plotted on a scatter diagram, shows no overlap except in the case of one female.

The average size of *puritana* and *ampliata*, which are both the same dark green color, is 11 mm. for 14 specimens of *puritana* and 13.2 mm. for 84 specimens of *ampliata*. (For comparison with *fluviatilis*, see discussion under that subspecies.)

A population of 11 specimens from Forestburg, Montague County, Texas, which is about midway between Denton County (*ampliata*) and Wichita County (*fluviatilis*), seems to show intergradation between the two subspecies, although it is closer to *ampliata*. In markings, six of these specimens have them complete, but not so broad as in *fluviatilis* except in one; five have them obsolete as in *ampliata*. In color, four are red, but not so bright a red as in most *fluviatilis;* seven are dull green as in *ampliata*.

CORRECTIONS

Dr. W. J. Brown of the Canadian Department of Agriculture was kind enough to draw my attention to the fact that two of

the names given in a previous paper had already been used in the genus *Cicindela*. These are here renamed as follows:

Cicindela californica erronea, new name

Cicindela californica viridicyanea VAURIE, 1950, Amer. Mus. Novitates, no. 1458, p. 1.

The name *viridicyanea* is preoccupied by *Cicindela viridicyanea* Audouin and Brullé, 1839, now in the genus *Prothyma* Hope.

Cincindela lemniscata rebaptisata, new name

Cicindela lemniscata rufipes VAURIE, 1950, Amer. Mus. Novitates, no. 1458, p. 5.

The name *rufipes* is preoccupied by *Cicindela rufipes* Klug, 1825, now in the genus *Odontochila* Castelnau.