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E. LaBerge

NORTH AMERICAN BEES OF THE GENUS *AGAPOSTEMON* GUERIN

J. C. CRAWFORD, JR.

So far as known, all forms belonging to North America, excluding Cuba, are included in this paper. The material upon which it is based is, primarily, that found in the collection of the University of Nebraska. Other material was kindly loaned by the following institution and persons: Leland Stanford Jr. University; Prof. C. V. Piper, Agric. Coll., Pullman, Wash.; Dr. L. O. Howard, U. S. Entomologist, and Mr. W. H. Ashmead, U. S. Nat. Mus.; Prof. Theo. D. A. Cockerell, East Las Vegas, N. M.; Prof. Carroll Fowler, Univ. of California; Prof. J. M. Aldrich, Univ. of Idaho; Mr. S. N. Dunning, Hartford, Conn.; Messrs. C. T. Brues and A. L. Melander, Univ. of Texas. Due acknowledgments are made to all for their very kind assistance.

Especial thanks are due Prof. Lawrence Bruner, under whose personal directions I worked and who at all times gave me great assistance, particularly in correcting my manuscript.

The synonymy of Mr. Chas. Robertson, as given in the *Proceedings of the St. Louis Academy of Science*, vol. 7, no. 14, is used as a basis, since to go back of this would only invite the former hopeless confusion.

TABLE FOR SEPARATING THE SPECIES

FEMALES

- A. Abdomen green or bluish.
- B. Mesothorax with punctures of two sizes.
- C. Base of metathorax with indications
of a triangular enclosure. . . . *subtilior* Ckll.

- CC. Base of metathorax without a triangular enclosure.
 - D. Pubescence white or griseous, smaller species.....*texanus* Cress.
 - DD. Pubescence ochraceous, larger species*borealis* n. sp.
- BB. Mesothorax uniformly punctured or roughened.
 - C. Metathorax with truncation not bounded by a salient rim....*Bruneri* n. sp.
 - CC. Metathorax with truncation bounded by a salient rim.
 - D. Metathorax with a triangle of finer lines on base.
 - E. Larger, 12-15 mm., pubescence ochraceous..*splendens* Lep.
 - EE. Smaller, 10-12 mm., pubescence white*Cockerelli* n. sp.
 - DD. Metathorax without such triangle.
 - E. Larger, 12-14 mm.
 - femoratus* n. sp. (?)
 - EE. Smaller, 10-12 mm.
 - F. Abdominal hair bands prominent ..*Cockerelli* n. sp.
 - FF. Abdominal hair bands slight or lacking.
 - G. Green, with slight hair bands.
 - radiatus* Say.
 - GG. Blue, with no hair bands.
 - californicus* n. sp. (?)
 - AA. Abdomen not green.
 - B. Abdomen black.
 - C. Clypeus yellow anteriorly... *fasciatus* n. sp.
 - CC. Clypeus not yellow anteriorly.

- D. Larger, head and thorax bluish;
pubescence white..*coloradensis* n. sp.
- DD. Smaller, head and thorax green;
pubescence on thorax slightly
ochraceous.....*viridulus* Fabr.
- BB. Abdomen honey color.....*melliventris* Cress.

MALES

- A. Hind femora greatly swollen or incrassate.
 - B. Abdomen green.....*Bruneri* n. sp.
- BB. Abdomen black and yellow.
 - C. Larger, hind femora about one-half
as broad as long.....*splendens* Lep.
- CC. Smaller, hind femora nearly as broad
as long.....*femoratus* n. sp.
- AA. Hind femora only slightly or not swollen.
 - B. Smaller, under 9 mm. in length.
 - C. Scape of antennae yellow, or with a
brown dot above.....*melliventris* Cress.
 - CC. Scape of antennae yellow only beneath.
 - D. Trochanters golden green *fasciatus* n. sp.
 - DD. Trochanters black or yellow.
 - E. Anterior margin of clypeus
depressed and notched
medially; two posterior
pairs of trochanters
black*nasutus* Sm.
 - EE. Not so; two apical joints of
antennae clavate.*rhopalocera* Sm.
- BB. Over 9 mm. in length.
 - C. Head and thorax above blue; yellow
on clypeus not produced to a tooth
in middle*californicus* n. sp.
 - CC. Head and thorax above green; yellow
on clypeus more or less toothed.

D. Abdomen with six yellow bands; pubescence on apical segments dark.....*radiatus* Say.

DD. Abdomen with five yellow bands; pubescence on apical segments light.

E. Last ventral segment with a median carina..*viridulus* Fabr.

EE. Last ventral segment without a median carina.

F. Larger; anterior and intermediate trochanters yellow to black; hind tibiae heavily marked with black.

texanus Cress.

FF. Smaller; trochanters golden green; hind tibiae not heavily marked with black.

fasciatus n. sp.

DESCRIPTION OF SPECIES

As the following descriptions mention only the distinctive characters, the common ones are given here:

For the males (taken mainly from Robertson): head and thorax green, mandibles, except tips, labrum, clypeus anteriorly and scape in front yellow; flagellum fulvous beneath; joints sub-moniliform; head and thorax densely punctured; nervures, stigma, and tegulae testaceous, the latter with a yellow spot in front; legs yellow, marked with black; abdomen black marked with yellow bands.

For the females: green, abdomen green or black; mandibles at base yellowish; head and thorax densely punctured; antennae more or less fulvous beneath; clypeus anteriorly black; legs nearly black.

1. *A. texanus subtilior* Ckll. One type specimen from Prof. Cockerell (Pasco, Wash.) and one specimen in the collection of the University of Nebraska (Sioux Co., Nebr.), also several specimens showing gradations between this and the typical *texanus*. It is probably, therefore, only a subspecies, but until the male is taken this can not be determined definitely.

2. *A. texanus* Cress. Some Nebraska specimens and a few from Messrs. Brues and Melander are larger than Cresson's measurements, being 0.45–0.50 of an inch. In addition to the above variation the color of the pubescence on the thorax also varies from white or griseous to ochraceous.

Many specimens from Nebraska, California, Colorado, Wyoming, Texas, Michigan, Iowa, and Washington.

3. *A. borealis* n. sp. Female. Entirely green, showing bluish reflections; mesothorax with double punctuation, coarser than in *texanus*; mandibles piceous; pubescence ochraceous and more abundant than in *texanus*; wings clouded, apical margins darker; abdominal segments 2–4, showing slightly basal bands of appressed white pubescence, the other pubescence being ochraceous; legs with decidedly ochraceous pubescence. Otherwise very similar to a large *texanus*.

Length about 12 mm.

One specimen, Vancouver, April 4, 1896, Livingston.
(From Mr. Dunning.)

Male unknown.

4. *A. Bruneri* n. sp. Male. Body entirely green; head and thorax with long, dense, slightly ochraceous pubescence; no black stripe back of yellow on clypeus; truncation of metathorax not surrounded by a salient rim, the only indications being at the sides basally and a short line medially above; wings slightly dusky; abdomen with thin pubescence; apical margins of segments broadly depressed; edge of depression on segments 1–3 with a black line not quite reach-

ing sides of abdomen; legs yellow, with long, thin pubescence; trochanters black, intermediate ones with a yellow stripe in front; posterior ones with a yellow spot at apex. Femora: anterior, green behind; intermediate, black in front and behind, coalescing basally above; hind, greatly incrassate, with a broad green stripe above at apex. Tibiae: anterior, with a black stripe exteriorly; intermediate, black above and behind; posterior, swollen, with a black stripe exteriorly, at base.

Length about 10 mm.

Female. Similar, larger, and not so pubescent. Clypeus anteriorly black; pubescence light, even on the fifth abdominal segment; thorax coarsely, densely, and evenly punctured; metathorax as in the male; legs dark brown; pubescence light silky brown.

Length about 12 mm.

One male and one female, Tlalpam, Mex., November, 1897. (L. Bruner, coll.)

5. *A. splendens* Lep. Nebraska specimens of this species are larger than the others seen, being 12-15 mm. long for the female. Specimens have been examined from Nebraska, Colorado, New Jersey, Florida, and Michigan.

6. *A. Cockerelli* n. sp. Female. Entirely green; mesothorax roughened as in *radiatus*; metathorax with fine lines, the triangular space with fewer, more distinct, and finer lines; the pubescence snow-white, on thorax slightly ochraceous; wings hyaline, apical margins dusky; abdomen with wide bands of snow-white pubescence on the basal margins of segments 2-5; pubescence on all tarsi and anterior and intermediate tibiae more or less silky brown; that on the femora white, except that the posterior pair have a dark stripe externally, and within the pubescence is slightly yellowish.

Length about 11 mm.

One specimen, Mesilla Park, N. M., April 30, 1900; on *Fallugia paradoxa acuminata*. (Prof. Cockerell, coll.)

Male unknown.

On account of the metathoracic triangle being indistinct, this insect is mentioned twice in the tables.

7. *A. femoratus* n. sp. Male. Head and thorax green, with bluish or golden tinge; thorax closely and coarsely punctured; pubescence on the thorax dense, usually white, sometimes ochraceous on dorsum; wings hyaline, apically a little dusky; abdomen with six yellow bands; pubescence, on first segment and sides of abdomen light, on apical segments dark brown; venter yellow, with apical margins of segments dark; legs yellow; trochanters yellow; anterior legs with no dark markings; femora of intermediate legs with a black spot externally at apex; their tibiae with a line externally near base, and a dot within, at apex; hind femora excessively swollen, nearly as broad as long; apex with a large spot, externally; tibiae also swollen; black at base and with a line on outside near base; hind metatarsi with a large dentiform angle.

Length, 10-12 mm.

Fourteen specimens: Wawawai, Wash. (C. V. Piper); Palo Alto, Cal., July 27, 1892 (Leland Stanford Jr. Univ.); Lewiston and Moscow, Idaho (S. N. Dunning); Moscow, Harrison, and Lewiston, Idaho (J. M. Aldrich).

Female (?). Large, green; the abdomen with bluish reflections, especially on the depressed margins of segments; head and thorax rugose, becoming distinct punctures only toward rear of mesothorax; base of metathorax roughly lined; pubescence slightly ochraceous; wings hyaline, apical margins dusky; hair bands on abdomen only slight; punctuation coarser and not so dense as in *radiatus*.

Length nearly 14 mm.

One specimen, East Washington, R. W. Doane, collector (from C. V. Piper); also one from Moscow, Idaho (from J. M. Aldrich).

8. *A. radiatus* Say. A common species, of which there are here many Nebraska specimens; also others from Wyoming, Massachusetts, California, Michigan, and Connecticut.

9. *A. coloradensis* n. sp. Body robust, much more so than in *viridulus*; head and thorax green with bluish tinge, coarsely and closely punctured; pubescence white; mandibles entirely dark, except perhaps a little reddish on middle, blunt at apex; wings deeply infuscated; abdomen black, with a steel blue reflection; base of first segment with erect pubescence; second, third, and fourth, basally with narrow white bands; fifth with a wider band, the rest of the segment with brownish pubescence; abdomen finely punctured; pubescence on venter light brownish; legs with long, thin, light pubescence, becoming a silky reddish brown on the tarsi.

Length 12-14 mm.

Four specimens, South Colorado, 1900. (Wm. Shear coll.)

Male unknown.

This insect differs from *viridulus* in the color of the mandibles, in its greater size, and in being more robust. It also has darker colored wings, less pubescence on the sides of abdomen and on legs; and the color of its abdominal bands are white, whereas in *viridulus* they are creamy white.

10. *A. viridulus* Fabr. A common species in the United States. Specimens from Nebraska, Illinois, Massachusetts, South Dakota, and Colorado have been examined.

11. *A. fasciatus* n. sp. Female. Head and thorax green, varying from golden to bluish tints, both densely and coarsely punctured; the pubescence yellowish or whitish; clypeus anteriorly with a yellow line, behind which is a black one; mandibles yellow at base; apex not blunted, with a tooth above; abdomen black; basal segment with about anterior half covered with a band of white appressed pubescence; segments 2, 3, and 4 also with hair bands on their basal margins; remaining segments with erect white pubescence; legs blackish, inclining to reddish, covered with whitish pubescence, on

inner side of tarsi brownish sericeous; abdomen finely and closely punctured; venter with light pubescence.

Length 10–11 mm.

Eighteen specimens; Lincoln, Nebr., May, June, August, September; September, on *Grindelia* and *Aster* (Merritt Cary).

Male. Wings hyaline; abdomen with five bands; pubescence on apical segments light; trochanters all black with a greenish reflection; front and intermediate femora with black at base; intermediate tibiae yellow or with a dusky stripe on middle, within; hind femora black at apex; their tibiae with black bases, and sometimes with a line towards the apex, behind. Some specimens show evidences of a triangular enclosure on the metathorax, the lines extending about half way across towards postscutellum.

Length 8–10 mm.

Thirty-seven specimens; Lincoln, Nebr., August, September, October; September, on *Grindelia*. (M. Cary, Crawford); one, Volga, S. Dak. (S. N. Dunning).

This species is about the size of the *radiatus*, but the light pubescence of the abdomen and the color of the trochanters easily separate them when the sixth band of *radiatus* can not be seen.

12. *A. melliventris* Cress. The collection contains two males from Mesilla, N. Mex. (Prof. Cockerell, coll.), and one female from Texas.

13. *A. californicus* n. sp. Male. Head and thorax blue above; sides green; yellow on clypeus, rounded, not toothed; wings slightly clouded apically; abdomen five banded, the depressed margins at sides, or extending all the way across, metallic; pubescence white or slightly ochraceous; metathorax with a triangle of finer lines and at times showing the enclosing lines; front and intermediate trochanters black with, at most, a yellow stripe anteriorly; behind pair black to greenish, sometimes with a yellow apical dot within. Tibiae: front, with a black spot at apex, exteriorly; intermediate,

with a line at base exteriorly or one within, or both, coalescing basally; hind, with a line at base, outside; black at base and apex, and interiorly a spot at apex. Front and intermediate femora with black lines externally; hind ones with the usual black at apex, only slightly swollen. Ventral segments 1-4, yellow, with fuscous margins; third from last with a metallic spot on the middle of the depressed portion.

Length, 9-10 mm.

Female (?). Very similar to *radiatus* in size, shape, and punctuation. Color blue-green with violet reflections, while *radiatus* is brassy-green; pubescence light, hardly a tinge of ochraceous; even the scopa is light-colored. There is no indication of hair bands on the abdomen; bands on the venter visible only from the side.

Two female specimens from Moscow, Idaho (Prof. Aldrich); nine male specimens, California: South California (D. A. Saunders) Pacific Grove, July, 1894 (Saunders); Berkeley, August 18, 1898, and October 11, 1898 (C. Fowler); Stanford Univ., September 19, 1898 (C. T. Brues); four male specimens, Moscow, Idaho (J. M. Aldrich).

14. *A. nasutus* Sm. Mexico. Not seen.

15. *A. rhopalocera* Sm. Mexico. Not seen.

A. pulchra Sm. Robertson in his first paper on the genus (*Trans. Amer. Ent. Soc.*, XX, 1893, p. 147) gives this as a synonym of *A. radiatus*, but in his second paper does not mention it. Since no examples of what might be Smith's species have been seen by the writer, he refrains from giving an opinion here.

A. caeruleus Ashm. is an *Augochlora* (Prof. Cockerell in litt.).

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THE TIGER BEETLES OF NEBRASKA

LAWRENCE BRUNER

Perhaps one of the best represented families of beetles in Nebraska in proportion to the total number of species found in North America is that known as Cicindelidae, or Tiger-beetles. Out of a grand total of about seventy-five species there have been upwards of forty species and recognized varieties taken within our borders. With but few exceptions all of these are now represented in the collections of the University of Nebraska.

Whether or not the occurrence of this large number of forms can be taken as a criterion of what might be found in other coleopterous families were they equally well worked, I can not say. When we take into consideration the location of our state among others, and its relation to the country at large, along with its variations in altitude above sea level, surface configuration, etc., we are less surprised to find such varied and abundant life as we do. In every other instance where any particular group of animals or plants has been carefully worked, our state seems to be exceedingly rich in species. For example, our bird list is greater than that of any other state in the immediate vicinity, and perhaps, for that matter, in the entire country. Where other groups have been equally well worked we also find like numerous forms. The following list of Tiger-beetles will show what has been done in this particular direction towards a survey of the state:

Amblychila cylindriciformis
Say.

Tetracha carolina Linn.
Tetracha virginica Linn.

<i>Cicindela celeripes</i> Lec.	<i>Cicindela ancocisconensis</i> Harr.
<i>Cicindela cursitans</i> Lec.	<i>Cicindela vulgaris</i> Say.
<i>Cicindela longilabris</i> Say.	<i>Cicindela obliquata</i> Kirby.
<i>Cicindela montana</i> Lec.	<i>Cicindela repanda</i> Dej.
<i>Cicindela scutellaris</i> Say.	<i>Cicindela 12-guttata</i> Dej.
<i>Cicindela Lecontei</i> Hald.	<i>Cicindela pusilla</i> Say.
<i>Cicindela pulchra</i> Say.	<i>Cicindela terricola</i> Say.
<i>Cicindela 6-guttata</i> Fab.	<i>Cicindela cyanella</i> Lec.
<i>Cicindela violacea</i> Fab.	<i>Cicindela hirticollis</i> Say.
<i>Cicindela consentanea</i> Dej.	<i>Cicindela cinctipennis</i> Lec.
<i>Cicindela purpurea</i> Oliv.	<i>Cicindela punctulata</i> Fab.
<i>Cicindela Audubonii</i> Lec.	<i>Cicindela micans</i> Fab.
<i>Cicindela graminea</i> Schaupp.	<i>Cicindela cuprascens</i> Lec.
<i>Cicindela 10-notata</i> Say.	<i>Cicindela puritana</i> Horn.
<i>Cicindela limbalis</i> Kl.	<i>Cicindela macra</i> Lec.
<i>Cicindela splendida</i> Hentz.	<i>Cicindela sperata</i> Lec. and var.
<i>Cicindela formosa</i> Say.	<i>Cicindela lepida</i> Dej.
<i>Cicindela generosa</i> Dej.	<i>Cicindela circumpecta</i> Laf
<i>Cicindela venusta</i> Lec.	<i>Cicindela togata</i> Laf.
<i>Cicindela fulgida</i> Say.	<i>Cicindela Hentzii</i> Dej.
<i>Cicindela limbata</i> Say.	

Among the forms listed above several are of especial interest on account of their peculiar habits, extraordinary distribution, or historical records. The *Amblychila cylindri-formis*, perhaps, is the most restricted within our state of any of the species that may belong to our fauna, but it is comparatively common a little farther south in Kansas, where it is at home along the Smoky River. Its record in Nebraska is based on some fragments of a single specimen found in the Republican Valley, which presumably was at one time alive in that region. The *Tetracha carolina* and *T. virginica* belong to the southern fauna and are more common in regions farther south than here in Nebraska, although both species have been taken at Lincoln and other points between this and the

southeast corner of the state. The *Cicindela limbata* is interesting since it was described from the state in the thirties by Thomas Say, who collected it while on an expedition to the Rocky Mountains, and it was afterwards lost to science, the type specimens having been destroyed. After a number of years it was rediscovered along the sand-hills of northern Nebraska, and several years ago was collected in large numbers by representatives from the University of Nebraska, who were collecting insects in the Sand-hill region. It is an insect that is especially local in its distribution, being found only in the deep blow-outs of the sand-hills, where its light-colored body so nearly resembles the white sands as to make it difficult of detection. It is also a very active insect and quite easily eludes the would-be captor.

The beautiful *Cicindela pulchra* occurs in the southwestern portion of the state, where it is not at all abundant. A number of other bright-colored species are found in the sand-hills of central and western Nebraska, while on the salty marshes and alkali flats of various parts of the state six or seven saline forms occur in great abundance. There are also a number of ordinary appearing species which occur at certain points within the state and are nocturnal in their habits.

Allow me to suggest that it is quite desirable that various people take an interest in the Tiger-beetles of their respective localities to see whether or not our list as given here can be added to or whether it is complete.

W. E. LaBerge