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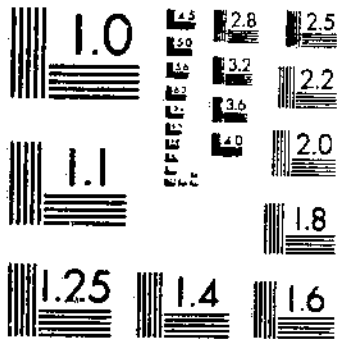
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A TAXONOMIC REVISION OF THE LEAFHOPPER GENUS *ALEXANIA* AND A NEW RELATED

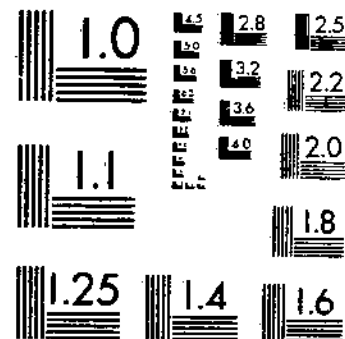
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**A TAXONOMIC REVISION
OF THE
LEAFHOPPER GENUS FLEXAMIA
AND A NEW RELATED GENUS**

(HOMOPTERA, CICADELLIDAE)

By DAVID A. YOUNG, Jr., and BRYAN P. BEIRNE

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A TAXONOMIC REVISION OF THE LEAFHOPPER GENUS *FLEXAMIA* AND A NEW RELATED GENUS

(HOMOPTERA, CICADELLIDAE)¹

By DAVID A. YOUNG, JR.,² *Entomology Research Division, Agricultural Research Service, United States Department of Agriculture*, and BRYAN P. BEIRNE, *Entomology Division, Science Service, Canada Department of Agriculture*³

INTRODUCTION

This bulletin brings up to date the taxonomic information on the leafhopper genus *Flexamia* and describes a new related genus, *Spartopyge*. The *Flexamia* species are common and occasionally very numerous in the leafhopper fauna of grasslands in much of the United States and Canada. In some parts of their distribution range, which extends from Canada to Michoacán, Mexico, they are able to survive in very dry habitats. Although most species are very common in collections, little information has been published on their life histories or food plants. Presumably they are exclusively grass feeders, having been recorded from species of *Andropogon*, *Aristida*, *Bouteloua*, *Distichlis*, and *Muhlenbergia*. Information on their biology has been reported by Osborn and Ball (20, pp. 630-635)⁴ and DeLong (?). None of the species are known to be vectors of plant-virus pathogens, and the authors are not aware of any such research.

Most of the material used in this study is in the United States National Museum and in the Canadian National Collection. Material from other collections was obtained only to fix species identities or to add to distribution records.

TAXONOMY OF THE GENUS *FLEXAMIA*

Early literature pertaining to this leafhopper group treated most of the species under the genus *Deltocephalus*. In 1926 DeLong (?) first recognized that the species formed an entity within his concept of *Deltocephalus*. He placed most of the species herein discussed in the new subgenus *Flexamia*, which was based on gross morphological characters, and he included several additional species subsequently relegated to other genera. In 1929 DeLong and Slesman (14, p. 82) elevated "Flexamius" to generic rank, and they erected the subgenus *Secopennis* for *Deltocephalus slossonae* Ball.

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² Resigned May 14, 1957. Now with Department of Entomology, North Carolina State College, Raleigh.

³ The authors are indebted to J. N. Knull of Ohio State University, W. E. LaBerge of the University of Kansas, and H. H. Ross of the Illinois Natural History Survey for loaning specimens from their institutions; D. M. DeLong for loaning specimens from his private collection; and W. E. China of the British Museum (Natural History) for his observations and sketches of the type of *Flexamia producta* (Wlk.).

⁴ Italic numbers in parentheses refer to Literature Cited, p. 51.

Oman (17, p. 167) in his treatment of the Nearctic genera recognized the importance of the male genitalia in determining species relationships, and he listed in *Fleramia* most of the species herein treated.

Judging from external appearances alone, the genus *Acurhinus* Osb. (type *Dorydium maculatum* Osb.) is related to *Fleramia*, and DeLong and Caldwell (11, p. 26) placed *Deltocephalus pyrops* Crumb in the Osborn genus. *D. maculatum* is represented in the Ohio State University collection by 3 female specimens and 2 specimens with missing abdomens. *D. maculatum* closely resembles *Fleramia pyrops* (Crumb), but the ovipositor of the former is longer in proportion to the pygofer and the clypellus is parallel sided and not broader at the base than at the apex. Until males of *maculatum* from Guatemala can be examined, it seems advisable to continue to treat the Nearctic species in *Fleramia*, following Oman's (17, p. 167) interpretation.

Oman (17) placed *Aferia* Oman and *Secopennis* DeL. and Sles. near *Fleramia*. The type of the monobasic *Aferia* (fig. 1) has an

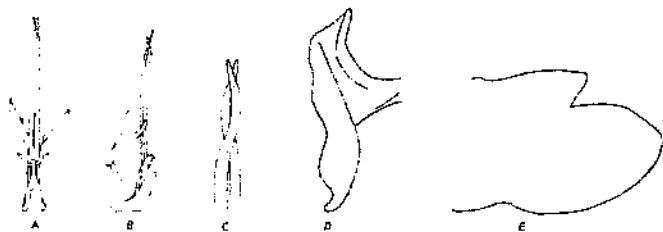


FIGURE 1.—*Aferia rubranura* (DeLong): A, Aedeagus and connective, dorsal aspect; B, same, lateral aspect; C, apex of aedeagus, dorsal aspect; D, left style, dorsal aspect; E, pygofer, lateral aspect. (All from paratype.)

aedeagus consisting primarily of two long slender processes arising at the base, a condition not known in *Fleramia*. The authors have relegated the monobasic *Secopennis* to synonymy under *Fleramia* after a careful study of its type. The truncate forewings and the basal ventral aedeagal process tend to set it apart from other species of *Fleramia*, but the authors interpret these characters as of specific rather than of generic value. It is noteworthy that some characters widely used in the Deltocephalinae as generic criteria are only of specific value in *Fleramia*, for example bilateral symmetry or asymmetry of the aedeagus and the presence or absence of a joint between the aedeagus and the connective.

DISSECTION AND STORAGE TECHNIQUES

The shape of the bases of the first valvulae of the ovipositor is valuable in distinguishing the females of the *Fleramia* species. To examine these bases critically, macerate the female abdomen in potassium hydroxide solution, and clear with the same technique commonly employed in preparing males for identification. After transferring the abdomen to glycerin, sever the conjunctiva between the sixth and seventh abdominal sterns, the conjunctiva between the eighth and ninth terga, and then the pleuroventral membrane on both sides

from the base of the seventh sternum to the base of the pygofer. This dissection frees, as a unit, the seventh sternum, the genital vestibular chamber (see Snodgrass 22, p. 79), and the pygofer with the ovipositor attached. If this abdominal apex is then oriented with the caudal extremity up, the membrane of the genital vestibule can be pressed against the surface of the slide and severed with no damage to the seventh sternum, which is thereby freed.

The bases of the first valvulae of the ovipositor are easy to examine in dorsal aspect with transmitted light after the underlying seventh sternum is so removed. Dissected parts may be immobilized very satisfactorily for making illustrations of the bases of the first valvulae. Place a small amount of boric acid ointment in the concavity of a hollow-ground slide. Add glycerin. Then press lightly the lateral portion of the pygofer to the boric acid ointment. This method of preparation allows easy manipulation and examination from all aspects and has been found far superior to permanent slide mounts. However, for identification purposes only, it is frequently sufficient to clear the female abdomen without dissection, because in most species the diagnostic characters at the base of the ovipositor can be seen through the cleared dorsal wall of the abdomen.

To store the female genitalia, place the seventh sternum in the remainder of the abdomen, and put it and the pygofer in a small drop of glycerin in the bottom of a small vial. Attach the vial to the pin bearing the specimen from which the abdomen was taken by thrusting the pin diagonally through the cork. This technique is widely used in North America for storage of the genitalia. Examinations of structures so preserved for almost 25 years in the United States National Museum show no deleterious effects. The dissections are readily transferred to glycerin on slides and can be examined in all aspects. This method of storage is extremely helpful to leafhopper taxonomists. It is far superior to permanent slide mounts, balsam mounts on cardboard rims through which the pin bearing the specimen is thrust, or the completely abominable practice of gluing the parts when dry on a small piece of cardboard through which the pin is thrust.

One precaution is mandatory in using the small vials. Do not allow the glycerin to remain in contact with the cork. This is easily avoided if the inside of the vial is free of dust. The vial can be easily cleaned before the glycerin is added by using an ordinary pipe cleaner obtainable at tobacco stores and most drugstores in the United States. The glycerin will not all run to the bottom of the vial if the sides are dusty. Frequently after shipping, many dissections must be transferred to clean vials, because the jarring and inverting in transit cause the glycerin to touch the cork of the vial. If glycerin remains in contact with the cork for a protracted period, it seeps to the pin, which may rust or corrode, and to the labels, which become discolored. In addition, the preparations become darkened and brittle, presumably the result of dissolved tannins from the cork. Such preparations may often be restored to a satisfactory condition by re-treating with potassium hydroxide. Proper storage and maintenance of the dissections is as important a curatorial responsibility as keeping a collection free of museum pests.

GENUS FLEXAMIA DELONG

Deltocephalus subgenus *Flexamia* DeLong, Ohio State Univ., Univ. Studies 2, No. 13, pp. 20, 22. 1926. Type *Deltocephalus reflexus* Osborn and Ball, 1897, by original designation.

Flexamius, DeLong and Slesman, Amer. Ent. Soc. Ann. 22: 82. 1929. (Err. pro *Flexamia* DeLong.)

Flexamia subgenus *Secopennis* DeLong and Slesman, *ibid.*: 85. 1929. (Ortho-type *Deltocephalus slossoni* Ball.)

Small deltocephaline leafhoppers. Length of males 2.8–5.6 mm. Head well produced; median length of crown greater than interocular width (exception *decora*); clypellus broader at base than at apex. Forewing with reflexed veinlets to costal margin in vicinity of outer antepical cell. Anterior tibiae dorsally with 3 setae in anterior row, 4 in posterior; middle tibiae dorsally with 4 setae in each row; hind femora with apical setal arrangement 2:2:1.

Sternal abdominal apodemes vestigial. Male plates usually shorter than pygofer (exception *slossonae*), frequently fused for some distance along mesal margins, with setae usually in longitudinal row. Male pygofer constricted and usually with pronounced posterior lobe in lateral aspect (exceptions *graminea*, *slossonae*). Style with preapical lobe, which is longitudinally grooved and usually not pronounced (exception *doeringae*). Connective with arms contiguous basally. Dorsal aedeagal apodeme with pair of conspicuous appendages directed caudoventrad or caudad.

The species are chiefly yellowish brown, with ferruginous to black markings. Nearly always an apical area of the crown is partly or completely surrounded by darker markings. In the latter case the crown exhibits a clearly defined apical areolet. In addition, the crown often has a pair of oblique darker markings at its base, a pair of transverse darker markings at about midlength, and a pair of darker markings parallel to the lateral margins near the apex. Usually the pronotum is faintly striped longitudinally with darker color. The veins of the forewings are usually dark margined, and frequently a distinct dark-margined areole is near the center of the corium. The face varies from completely black to pale with dark markings only near the margin of the crown. Some infuscation extends along the posterior margin of the seventh sternum of the female at or near the middle. Except for the markings of the face, the color of most species varies too much for use in species separation.

The two claval veins of the forewings also exhibit much individual variation. They may be entirely separate, contiguous, or fused through a considerable portion of their length.

In the males the apices of the plates vary interspecifically from bilobed to sharply or broadly rounded. The longitudinal row of macrosetae may extend over the basal three-fourths, seven-eighths, or only middle half of the length of the plate. The setae of the pygofer, although fairly numerous, are short, and the pygofer does not appear heavily setose as in many deltocephaline genera. The setae may occur generally over the surface of the pygofer, or they may be restricted to a portion of the surface. They do not occur in localized rows or clusters.

The connective in lateral aspect is more heavily sclerotized in its lower than in its upper portion, which is often thinner and is extended

dorsad in a thin keel, the width of which is useful in distinguishing the species. The joint between the connective and the aedeagus may be present and very distinct or absent depending on the species. The aedeagus is without processes in some species and has several in others. The processes are nearly always recurved, and one or more of them may be conspicuously or minutely serrate along one edge. In most species there is a strong tendency toward asymmetry in the aedeagus. The asymmetry may be slight in some species, the result of an unpaired process not lying in the median sagittal plane or of two similar processes not lying within corresponding planes; or the asymmetry may be extreme. In the latter case the asymmetry may have been caused by an asymmetrical development of the apical aedeagal processes or by a twisting of the aedeagal shaft, both of which are believed to be phyletic. The position of the gonopore varies greatly. It is never in the basal half of the shaft.

In the females the seventh sternum is nearly always much longer than the sixth, often twice as long or slightly more. In most species the hind margin of the seventh sternum is concave on each side of a median broadly produced portion, which has a slight median notch and a slight convexity on each side of the notch. However, several species differ from this usual condition. The pygofer bears well-dispersed setae, which may be pale, dark, or pale at the base and dark apically. Usually the ovipositor barely reaches the apex of the pygofer.

FLEXAMIA SPECIES RELATIONSHIPS

In view of what is known of evolutionary developments within the animal kingdom, it can scarcely be questioned that when bilateral symmetry and asymmetry occur in a group of organisms, those representatives exhibiting asymmetry, ignoring other characters, are invariably the more specialized. The male genitalia of leafhoppers, developing as paired structures, are bilaterally symmetrical in their typical condition. This sort of symmetry is predominant in the family and common enough, though not universal, in the primitive members of the family to make logical the assumption that bilateral symmetry of the male genitalia is an ancestral condition.

Asymmetry in the male genitalia is not rare. It is often such a minor departure from bilateral symmetry (e. g., paired similar processes one of which lies in a plane not symmetrical with its opposite member) that unquestionably the asymmetry is a derived condition. However, it is unusual for a genus to contain some species with symmetrical male genitalia and others with markedly asymmetrical genitalia. *Flexamia* is such a genus. Only the presence of morphologically intermediate species prevents serious questioning of retaining all the species within a single generic concept, in the light of modern taxonomy at generic level within the family Cicadellidae.

The authors hypothesize that in the genus *Flexamia* a primitive condition in the structure of the aedeagus included two pairs of recurved bilaterally symmetrical appendages at or near the apex and a subterminal gonopore at or near the apex of the aedeagal shaft on its caudoventral surface. From such a prototype several lines of development are probably derived. The order in which they are

discussed is not to be interpreted as the order in which the developments may have taken place.

In one line of development the apical pair of processes tends to fuse and the antepical to remain separate. Such a condition is found in *pyrops* (fig. 2, *D*)⁵ and *picta* (fig. 3, *E*). In the latter the fusion of apical processes attains a maximum among known species. The probability of the affinity of these two species is strengthened by the similarity of the male pygofer (figs. 2, *G*, and 3, *G*).

A second line of development includes a group with two species in which both primitive pairs of processes are preserved and two species that are apparently derived from that condition. This group includes *surcula* (fig. 4, *D*), in which the antepical processes are in asymmetrical planes and the gonopore is small and nearly circular; *currata* (fig. 5, *E*), in which the more apical processes are asymmetrical and the gonopore is slitlike; *abbreviata* (fig. 6, *E*), in which the more basal processes are absent and the more apical ones are greatly reduced, the gonopore being elongate also; and *canyonensis* (fig. 7, *F*), in which the aedeagal processes are absent, but the location of the gonopore suggests a derivation from a condition like that of *abbreviata*. It is noteworthy that nothing in the shape or location of the gonopore indicates torsion of the aedeagal shaft in the first two species of this group, and the asymmetry appears to be simply the result of one of the paired processes extending in a plane asymmetrical to that of its complement. In addition to the position of the gonopore, these four species have a distinct joint between the connective and the aedeagus, narrow dorsal keels on the connective, modified style apices, and a general similarity in the shape of the seventh sternum of the female.

In a third line of development there is a large group of species in which the antepical pair of aedeagal processes tends markedly to fuse into a single ventral process. This process is referred to hereafter as the unpaired ventral process. Sometimes the area of fusion appears to have persisted as a rather distinct groove. This group is considered to have two subdivisions, which possibly arose independently.

In the first subdivision, development appears to have included the formation of an unpaired ventral process, either with the development of extra processes as in the bizarre *serrata* (fig. 8, *D*) or with the branching of the more apical processes as in *slossonae* (fig. 9, *C*) and *albida* (fig. 10, *D*). The gonopore is elongate and slitlike; it is located on the unpaired ventral process in *slossonae* and at the base of the grooved unpaired ventral process in *serrata*. In *albida* apparently the unpaired ventral process has become partly adherent to the shaft, a condition believed to be highly specialized.

In the second subdivision are included most of the species in the genus. In the more generalized species the gonopore is small and not elongated, and it is located on the caudoventral surface near the apex. These species include *decora* (fig. 14, *C*), *stylata* (fig. 13, *E*), *modica* (fig. 15, *A*), *ritana* (fig. 11, *C*), *arizonensis* (fig. 17, *C*), *flerulosa* (fig. 18, *C*), and *inflata* (fig. 12, *C*). In *prairiana* (fig. 19, *E* and *F*) the same condition prevails, but apparently a torsion of the shaft has occurred, so that the gonopore is antepical on the anterodorsal surface of the shaft. In this species the pronounced groove on the unpaired process is noteworthy.

⁵ For illustrations, see pp. 12-48.

In *imputans* (fig. 21, A) the aedeagal apex is similar to that of *prairiana*, but the groove constitutes the gonopore. The authors hypothesize that through such an ancestral form, with the fusion of this process to the aedeagal shaft, the gonopore moved to a more basal position on the shaft. *F. reflexa* (fig. 22, B) possibly represents an intermediate condition in the movement of the gonopore, with the unpaired process fused basally to the aedeagal shaft but free at its extremity, the gonopore circular and some distance from the base of the process on the anterodorsal surface, and a trace of the groove persisting on the free apical portion of the process. The position of the gonopore has shifted similarly in *sandersi* (fig. 23, B), but here the gonopore is more elongate. In *producta* (fig. 24, D) movement of the gonopore approaches a maximum. The elongate gonopore is on the anterodorsal surface, and the unpaired process has become almost completely adherent to the shaft except for a minute free process, which probably represents only the apex of an initially longer process. In *graminea* (fig. 25, B and D) the unpaired process has completely disappeared except for a narrow edge, and the shaft appears to have undergone torsion, so that the elongate gonopore now seems to be spiral. *F. clayi* (fig. 26, C) undoubtedly stands in the same line of development.

The antepical processes possibly have been lost in *grammica* (fig. 27, F) and *dakota* (fig. 28, D), where the gonopore is subovate on the anterodorsal surface and the apical processes suggest phyletic torsion of the shaft; and in *atlantica* (fig. 29, D), where the gonopore is antepical, circular, and lateral and the processes also indicate a twisting of the shaft. Possibly these species belong in the second subdivision.

F. pectinata (fig. 30, C) and *doeringae* (fig. 31, D) differ from the preceding species, because they have no trace of the aedeagal processes; otherwise they are similar to the other members of the genus. Possibly they belong at the culmination of one of the three developmental lines.

KEY TO THE FLEXAMIA MALES

1. Apical portion of aedeagus with 4 or more processes or with 2 antepical processes and 1 apical flangelike process 2
 Apical portion of aedeagus without processes or with 2 or 3 processes (processes may be branched) 6
- 2 (1). Pygofer with conspicuous acutely angulate ventral lobe (figs. 2, G, and 3, G); aedeagus with pair of antepical processes and apical flangelike process 3
 Pygofer with posterior lobe rounded ventrally; aedeagus not as above. 4
- 3 (2). Aedeagus with antepical processes arising basad of gonopore, apical flangelike process extending basad of gonopore (fig. 2, D); length of crown more than twice interocular width. *pyrops* (Crumb)
 Aedeagus with antepical processes arising at lateral margins of gonopore, apical flangelike process not attaining basal margin of gonopore (fig. 3, E); length of crown less than twice interocular width
pida (Osborn)
- 4 (2). Aedeagus with 2 pairs of apical processes in addition to 1 unpaired ventral and 1 unpaired dorsal process (fig. 8, D); style apex not foot shaped in broadest aspect *serrata* Beamer and Tutill
 Aedeagus with 2 pairs of processes only; style apex foot shaped in broadest aspect. 5

- 5 (4). Gonopore a small subcircular opening near apex of aedeagus; apical pair of processes short (fig. 4, D)..... *surcula* DeLong and Slicesman
Gonopore elongate; apical pair of processes much longer (fig. 5, E)
curvata DeLong
- 6 (1). Aedeagus with pair of branched apical processes (figs. 9, C, and 10, D)
(additional processes may be present)..... 7
Aedeagus without branched processes..... 8
- 7 (6). Aedeagus with unpaired ventral process near base of shaft (fig. 9, B);
gonopore slitlike on unpaired ventral apical process (fig. 9, C);
forewings obliquely truncate apically..... *glossanae* (Ball)
Aedeagus without unpaired basal process; gonopore subterminal, not
slitlike (fig. 10, D); forewings not as above... *albida* (Osborn and Ball)
- 8 (6). Aedeagus with 3 processes on shaft (1 may be small and much basad
of apex)..... 9
Aedeagus with 2 processes on shaft or none..... 22
- 9 (8). Pygofer produced caudally in spinelike process (fig. 13, F)
stylata (Ball)
Pygofer not so..... 10
- 10 (9). Pygofer with posterior lobe produced, heavily sclerotized, and angled on
ventral margin (fig. 17, D)..... *arizonensis*, n. sp.
Pygofer with posterior lobe rounded ventrally..... 11
- 11 (10). Aedeagus with ventral process spatulate apically; lateral processes
lyriform; apex of aedeagus attenuate beyond bases of lateral processes
(fig. 11, C)..... *ritana* Beamer
Aedeagus lacking above characters..... 12
- 12 (11). Aedeagus with unpaired ventral process greatly elongate (figs. 12, C,
and 14, C); gonopore subapical on caudoventral surface..... 13
Aedeagus not with 1 process conspicuously longer than other 2 (figs. 17,
C, and 18, C); gonopore as above or slitlike or much basad of apex
of shaft..... 14
- 13 (12). Aedeagus with unpaired ventral process forming angle of about 45°
with axis of shaft in lateral aspect; paired processes not serrate;
shaft arched slightly caudoventrad (fig. 12, B)
inflata (Osborn and Ball)
Aedeagus with unpaired ventral process forming angle of much less
than 45° with axis of shaft in lateral aspect; paired processes serrate
along one edge; shaft arched caudodorsad (fig. 14, D)
decora Beamer and Tuthill
- 14 (12). Gonopore small, short-oval or triangular, and near apex of aedeagal
shaft, not located on process but at base of one..... 15
Gonopore varied, slitlike or oval, and pronouncedly antepical; if short-
oval (*reflexa*), then definitely located on process at some distance
from base of latter..... 18
- 15 (14). Distinct joint present between connective and aedeagus (fig. 16, B)... 16
Without distinct joint between connective and aedeagus (fig. 19,
B)..... *prairiana* DeLong
- 16 (15). Connective in lateral aspect with dorsal keels very narrow (fig. 18, A);
aedeagus with unpaired ventral process extending basad less than
one-third length of shaft; pygofer in lateral aspect with caudoventral
margin of hind lobe more strongly produced than caudodorsal
margin..... *flexulosa* (Ball)
Connective in lateral aspect with dorsal keels broader, extending dorsad
half or more length of dorsal aedeagal apodeme (fig. 16, A); aedeagus
with unpaired ventral process extending basad approximately
one-third length of shaft; pygofer in lateral aspect with caudodorsal
margin of hind lobe more strongly produced than caudoventral
margin..... 17

- 17 (16). Face with interocular band deep black; base of unpaired ventral process of aedeagus appearing fused to shaft in lateral aspect (fig. 15, B)..... *modica* Beamer and Tuthill
Face with interocular band pale brown; base of unpaired process of aedeagus not appearing fused to shaft in lateral aspect (fig. 16, C)..... *lezana*, n. sp.
- 18 (14). Gonopore slitlike, extending full length of one of apical processes (fig. 20, D)..... 19
Gonopore otherwise..... 20
- 19 (18). Forewing with conspicuous black areole on disk; pygofer with caudal margin distinctly concave; without joint between aedeagus and connective..... *areolata* (Ball)
Forewing without dark areole; pygofer with caudal margin convex; with distinct joint between aedeagus and connective..... *imputans* (Osborn and Ball)
- 20 (18). Pygofer with posterior lobe strongly expanded on ventral margin; expanded portion rounded ventrally and overlapping corresponding lobe of other side (fig. 24, F and G)..... *producta* (Walker)
Pygofer with ventral margin of posterior lobe weakly expanded and not overlapping complementary lobe ventrally..... 21
- 21 (20). Plate with distinct antepical protuberance along lateral margin (fig. 23, F); gonopore on lateral surface of shaft..... *sandersi* (Osborn)
Plate with lateral margin simple; gonopore on dorsal surface of shaft (fig. 22, D)..... *reflexa* (Osborn and Ball)
- 22 (8). Gonopore spiral (figs. 25, B, and 26, C)..... 23
Gonopore not spiral..... 24
- 23 (22). Aedeagal shaft not strongly expanded at base of gonopore (fig. 25, D); apodemal appendages of aedeagus without prominent antepical protuberances..... *graminea* (DeLong)
Aedeagal shaft strongly expanded at base of gonopore (fig. 26, C); apodemal appendages of aedeagus each with prominent antepical protuberance directed mesad..... *clayi*, n. sp.
- 24 (22). Style with apex foot shaped, obliquely truncate, or bifid apically in broadest aspect..... 25
Style with apex gradually tapered..... 27
- 25 (24). Size large, length 4.5 mm. or more; apical aedeagal processes distinct; gonopore on anterodorsal surface of aedeagal shaft (fig. 27, F)..... *grammica* (Ball)
Size smaller, not exceeding 4.0 mm.; apical aedeagal processes indistinct or absent; gonopore on caudoventral surface of aedeagal shaft.... 26
- 26 (25). Aedeagal shaft almost parallel sided in caudoventral aspect; gonopore elongate, slitlike, base approximately at base of apical third of length of shaft (fig. 6, E); style apex biramous in broadest aspect..... *abbreviata* (Osborn and Ball)
Aedeagal shaft elongate and diamond shaped in caudoventral aspect (fig. 7, B); gonopore not as above, located approximately at midlength of shaft; style apex obliquely truncate in broadest aspect..... *canyonensis*, n. sp.
- 27 (24). Aedeagal shaft without paired apical processes..... 29
Aedeagal shaft with distinct paired apical processes..... 28
- 28 (27). Gonopore antepical on anterodorsal surface of shaft, which has apical process on each side (fig. 28, D)..... *dakota*, n. sp.
Gonopore antepical on lateral surface of shaft, which has both apical processes arising on one side (fig. 29, D)..... *atlantica* (DeLong)
- 29 (27). Style with preapical lobe produced posteriorly (fig. 31, F)..... *doeringae* Beamer and Tuthill
Style with preapical lobe not produced (fig. 30, F)..... *pectinata* (Osborn and Ball)

KEY TO THE FLEXAMIA FEMALES

1. Dorsum with pair of vittae extending from hind portion of disk of crown across pronotum and scutellum (fig. 27, A)----- 2
 Dorsum variously marked, without such vittae----- 5
- 2 (1). Seventh sternum with hind margin broadly concave (fig. 27, I)
grammica (Ball)
 Seventh sternum with hind margin produced at middle----- 3
- 3 (2). Seventh sternum distinctly trilobed, lateral lobes very pronounced (southern Florida) (fig. 9, G)----- *slossonae* (Ball)
 Seventh sternum not distinctly trilobed, but with more or less pronounced median lobe (Central and Southwestern United States)--- 4
- 4 (3). Clypeus entirely pale except for small areolet at base
albida (Osborn and Ball)
 Clypeus with basal broad black interocular band bearing white arcs
ritana Beamer
- 5 (1). Face entirely black, genae at most with oblique pale streak----- 6
 Face black basally, pale apically, or brownish in part, at least genae pale----- 7
- 6 (5). Forewing with conspicuous black spot in corium (fig. 20, A); seventh sternum strongly and rather abruptly produced at middle; crown with median length more than one-half greater than interocular width
areolata (Ball)
 Forewing without conspicuous black spot in corium; seventh sternum broadly convex at middle; crown with median length less than one-half greater than interocular width---- *imputans* (Osborn and Ball)
- 7 (5). Crown of head with median length twice or more interocular width (fig. 2, A); face carinate at middle of base----- *pyrops* (Crumb)
 Crown of head with median length less than twice interocular width; face not carinate at base----- 8
- 8 (7). Seventh sternum with median apical notch half length of sternum or more (fig. 7, G)----- *canyonensis*, n. sp.
 Seventh sternum not so----- 9
- 9 (8). Ovipositor with base of each first valvula recurved dorsally in dorsal aspect----- 10
 Ovipositor with base of each first valvula not recurved dorsally----- 26
- 10 (9). Ovipositor with base of each first valvula curved dorsad and laterad, forming angle of more than 45° with long axis of valvula and extending laterad beyond lateral margin of valvula when viewed from above (figs. 13, I, 14, I, and 15, E)----- 11
 Ovipositor with recurved portion of each first valvula not extending laterad beyond lateral margin of valvula (or only very slightly so); if longer than broad, then with long axis forming angle of less than 45° with axis of valvula when viewed from above----- 13
- 11 (10). Recurved base of each first valvula very slender in dorsal aspect, posterior margin concave (fig. 13, I)----- *stylata* (Ball)
 Recurved base of each first valvula broader in dorsal aspect, anterior margin straight or convex----- 12
- 12 (11). Recurved base of each first valvula more distant from broadest part of valvula and with dorsal portion often lightly sclerotized and with small anterior point (fig. 14, I)----- *decora* Beamer and Tuthill
 Recurved base of each first valvula without small anterior point and situated closer to broadest part of valvula (fig. 15, E)
modica Beamer and Tuthill
- 13 (10). Recurved base of each first valvula elongate, slender, evenly curved, submembranous caudally, extremity parallel to long axis of valvula (fig. 5, I)----- *curvata* DeLong
 Recurved bases of first valvulae not so; if slender, then with apices divergent----- 14

- 14 (13). Recurved portions of first valvulae large, conspicuous, with more lightly sclerotized extremities, which are caliperate in dorsal aspect (fig. 8, *I*).....*serrata* Beamer and Tuthill
 Recurved portions of first valvulae not so; if caliperate (*pectinata*), then much smaller..... 15
- 15 (14). First valvulae each with angular protuberance at base and more caudal convex lobe, which forms with complement of opposite valvula a collarlike structure (fig. 6, *K*).....*abbreviata* (Osborn and Ball)
 First valvulae not so..... 16
- 16 (15). Recurved portions of first valvulae caliperate in dorsal aspect (fig. 30 *H*).....*pectinata* (Osborn and Ball)
 Recurved portions of first valvulae not so..... 17
- 17 (16). Seventh sternum with posterior margin strongly, narrowly produced at middle (fig. 31, *G*).....*doeringae* Beamer and Tuthill
 Seventh sternum not so; if produced, then less strongly and usually more broadly so..... 18
- 18 (17). Recurved portion of each first valvula short, with acute dorsal projection directed anterolaterad (fig. 12, *H*).....*inflata* (Osborn and Ball)
 Recurved portion of each first valvula without such projection..... 19
- 19 (18). Recurved portion of each first valvula bisinuate, with more lightly sclerotized posterior projection from caudoventral region (fig. 3, *J*).....*picta* (Osborn)
 Recurved portion of each first valvula not bisinuate..... 20
- 20 (19). Recurved portion of each first valvula parallel to anteriormost border of each valvula in dorsal aspect and appearing as rim above latter (figs. 25, *H*, and 26, *E*)..... 21
 Recurved portion of each first valvula not so..... 22
- 21 (20). Anteriormost border of each first valvula appearing somewhat angular in dorsal aspect, recurved portion very narrow and not high (fig. 25, *H*).....*graminea* (DeLong)
 Anteriormost border of each first valvula rounded, recurved portion much broader and considerably higher (fig. 26, *E*).....*clayi*, n. sp.
- 22 (20). Recurved portion of each first valvula concave posteriorly in dorsal aspect (fig. 17, *G*).....*arizonensis*, n. sp.
 Recurved portion of each first valvula not so..... 23
- 23 (22). Recurved portions of first valvulae divergent posteriorly..... 24
 Recurved portions of first valvulae very short, not divergent posteriorly..... 25
- 24 (23). Recurved portion of each first valvula directed strongly caudolaterad (fig. 4, *I*); seventh sternum with hind margin broadly concave at middle (fig. 4, *G*).....*surcula* DeLong and Slesman
 Recurved portion of each first valvula directed almost caudally (fig. 18, *I*); seventh sternum with hind margin broadly convex at middle.....*fleculosa* (Ball)
- 25 (23). Recurved portion of each first valvula with hind margin more strongly convex (fig. 16, *I*); without sclerite in membrane of dorsal wall of genital vestibule above and behind base of valvula.....*texana*, n. sp.
 Recurved portion of each first valvula very short, less strongly convex (fig. 19, *I*); with sclerite in membrane of dorsal wall of genital vestibule above and behind base of valvula.....*prairiana* DeLong
- 26 (9). Bases of first valvulae obliquely truncate, valvulae apparently becoming membranous basally (fig. 22, *J*).....*reftera* (Osborn and Ball)
 Bases of first valvulae convex basally..... 27
- 27 (26). First valvulae broadest near bases in dorsal aspect (fig. 24, *I*).....*producta* (Walker)
 First valvulae broadest more posteriorly in dorsal aspect (figs. 23, *H*, and 29, *H*).....*sandersi* (Osborn), *atlantica* (DeLong)

DESCRIPTIONS OF THE FLEXAMIA SPECIES⁶*Flexamia pyrops* (Crumb)

Deltocephalus pyrops Crumb, Amer. Ent. Soc. Ann. 8: 191. 1915.

Deltocephalus (Acurrhinus) pyrops, DeLong, Ohio State Univ., Univ. Studies 2, No. 13, p. 21. 1926.

Flexamia pyrops, Oman, Wash. Ent. Soc. Mem. No. 3, p. 167. 1949.



FIGURE 2.—*Flexamia pyrops* (Crumb): A, Habitus; B, aedeagus and connective, lateral aspect; C, same, ventral aspect; D, apical portion of aedeagus, caudo-ventral aspect; E, same, lateral aspect; F, right style, dorsal aspect; G, male pygofer, lateral aspect; H, first valvifer and base of first valvula of female, in situ; I, seventh sternum of female, showing individual variation.

Length of male 3.7–3.8 mm., of female 3.8–4.2 mm. Head very strongly produced, with median length of crown more than twice interocular width and approximately equal to transocular width. Hind wing reduced, not exceeding claval apex of forewing; forewing attaining apex of abdomen in male, exposing dorsum of pygofer in female. Face stramineous, except interocular fuscous line basally, which has three or more short lobate projections from lower margin.

Male pygofer with distinct notch on dorsal margin before posterior lobe, which is produced and sharply rounded dorsally and produced ventrad in conspicuous acute process. Connective with dorsal keels narrow. Joint between connective and aedeagus poorly developed. Aedeagus symmetrical; shaft slightly bisinuate in lateral aspect, elongate, slender, gradually tapering; gonopore subapical on caudo-ventral surface; apex of shaft capitate, expanded apical portion with fewer more distinct teeth on margin than in *picta* (see p. 13); pair of slender recurved anteapical processes arising some distance basad of gonopore, each with one edge minutely toothed.

⁶ Under each species heading the synonymy listed is selective, not complete. It shows the original description, the best combination with *Flexamia* as a subgenus or genus, and specific synonyms.

In the discussion of distribution under each species, an effort has been made to exclude previously published records of undetermined validity and to distinguish distribution based on published records from that based on material actually examined. This method is considered preferable to that of summarizing published distribution records indiscriminately and at the risk of perpetuating errors resulting from misidentifications made before knowledge of specific characters reached a satisfactory degree of refinement.

Female seventh sternum with hind margin conspicuously concave at middle, with small convex median projection within concavity; ovipositor with each first valvula appearing curved dorsad through 90° at base in lateral aspect, this basal portion extending laterad beyond margin of valvula in dorsal aspect.

This species was described from specimens taken from *Aristida longespica* in Clarksville, Tenn. A male cotype from the Snow entomological collection, University of Kansas, has been examined and is here designated lectotype. Specimens have also been examined from Maryland, Georgia, and Florida. DeLong (7, p. 22; 10, p. 226) has reported it from Illinois, Tennessee, Mississippi, Ohio, Pennsylvania, Maryland, Virginia, and North Carolina.

F. pyrops is closely related to *picta*, from which it is readily distinguished by its much more produced head in both sexes, by the origin of the aedeagal shaft processes basad of the gonopore in the male, and by the concave posterior margin of the seventh sternum in the female.

Flexamia picta (Osborn)

Dellocephalus pictus Osborn, Davenport Acad. Sci. Proc. 10, p. 165. 1907.

Dellocephalus funabulus Crumb, Amer. Ent. Soc. Ann. 8: 189. 1915.

Dellocephalus (Flexamia) pictus, DeLong, Ohio State Univ., Univ. Studies 2, No. 13, p. 32. 1926.

Flexamius pictus, DeLong and Slesman, Amer. Ent. Soc. Ann. 22: 83. 1929. (Err. pro *Flexamia*.)

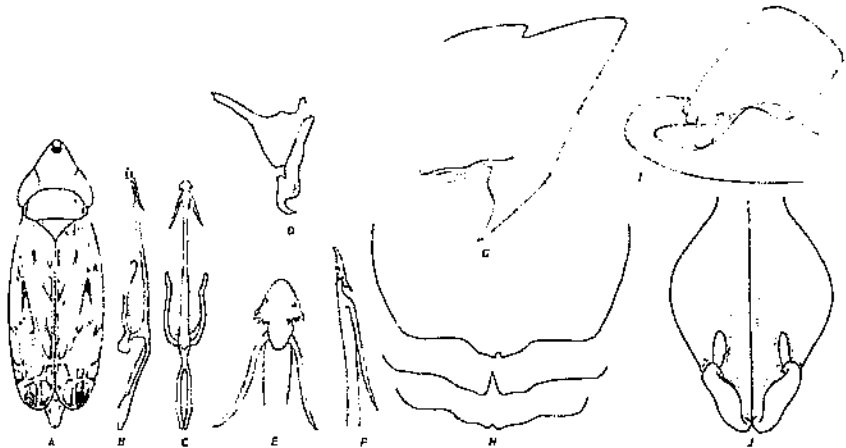


FIGURE 3.—*Flexamia picta* (Osborn): A, Habitus; B, aedeagus and connective, lateral aspect; C, same, caudoventral aspect; D, right style, dorsal aspect; E, apex of aedeagus, caudoventral aspect; F, same, lateral aspect; G, male pygofer, lateral aspect; H, seventh sternum of female, showing individual variation; I, first valvifer and base of first valvula of female, lateroventral aspect; J, bases of first valvulae of female, dorsal aspect.

Length of male 3.7–4.1 mm., of female 3.8–5.1 mm. Head with median length of crown about one-fourth greater than interocular width and approximately six-tenths transocular width. Forewing exceeding abdominal apex or subbrachypterous, exposing pygofer dorsally; hind wing as in *pyrops*. Face pale, with broad interocular

fuscous band, in which white arcs are visible across upper half of clypeus.

Male pygofer as in *pyrops*. Connective similar to that of *pyrops*, but with dorsal keels narrower. Joint between connective and aedeagus poorly developed. Aedeagus symmetrical; shaft straight, elongate, slender, gradually tapering; gonopore subapical on caudoventral surface; apex of shaft capitate, expanded portion with few minute teeth; pair of slender recurved antepical processes with entire edges, arising one on each side of gonopore, extending basad about one-fourth length of shaft.

Female seventh sternum with hind margin concave at each side of broad weak convex median projection, which is slightly notched apically; ovipositor with base of each first valvula curved through 180° and giving off less heavily sclerotized ventral subapical branch, which is directed caudad, recurved portion oblique and bisinuate in dorsal aspect.

A specimen of the original cotype series of *Deltocephalus funabulus* Crumb collected on "*Aristida gracilis*" from Clarksville, Tenn., has been examined. The lectotype of the Crumb species, designated by Beamer (4, p. 257), is in the Snow entomological collection, University of Kansas. The holotype of *picta*, from Staten Island, N. Y., is in the Ohio State University collection. A male compared with the type has been studied. Other specimens have been examined from Pennsylvania, Maryland, Virginia, the District of Columbia, Ohio, Tennessee, Kentucky, Illinois, Kansas, and Texas.

The male genitalia of *picta* resemble those of *pyrops* in general. Distinguishing characters have been noted in the discussion of *pyrops*. The females can be distinguished from those of other species by the characters mentioned in the key.

Flexamia surcula DeLong and Slesman

Flexamia surculus DeLong and Slesman, Amer. Ent. Soc. Ann. 22: 99. 1929.
(Err. pro *Flexamia*.)

Length of male 2.8-3.2 mm., of female 3.4-3.6 mm. Head with median length of crown approximately one-third greater than interocular width and two-thirds transocular width. Hind wing reduced, not attaining claval apex of forewing, which usually does not attain abdominal apex. Face stramineous, except for broad brown basal interocular line.

Male pygofer with posterior lobe strongly produced and rounded on dorsal portion of posterior margin. Style with narrowed apical portion foot shaped but with "toe" longer than in *curvata*. Connective and joint between connective and aedeagus distinct. Aedeagus almost symmetrical; shaft elongate, more slender than in *curvata* in caudoventral aspect, gradually broadening in apical half to short narrowed apical portion in lateral aspect; gonopore antepical on caudoventral surface; pair of recurved apical processes, much shorter than in *curvata*, and pair of longer processes arising one on each side of gonopore, extending basad but curved slightly laterad at apices, all processes with edges entire; apodemal processes slender, each with antepical ventrally directed branch.

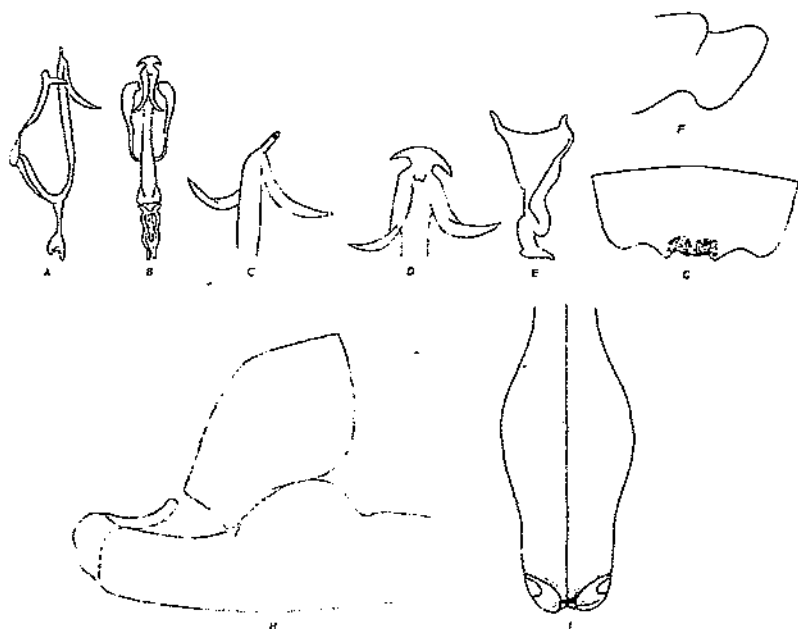


FIGURE 4.—*Flexamia surcula* DeLong and Sleesman: A, Aedeagus and connective, lateral aspect; B, same, ventral aspect; C, apex of aedeagus, lateral aspect; D, same, caudal aspect; E, right style, dorsal aspect; F, male pygofer, lateral aspect; G, seventh sternum of female; H, first valvifer and base of first valvula of female, lateroventral aspect; I, bases of first valvulae of female, dorsal aspect. (C and D from paratype.)

Female seventh sternum not strongly produced, with hind margin slightly concave on each side of pair of triangular projections, which flank shallow median excision (fig. 4, G); ovipositor with each first valvula with basal portion curved dorsad through more than 90° , recurved portion oblique and crescentiform in dorsal aspect.

A male paratype has been examined. The species is known only from the type series and other specimens from Brownsville, Tex.

F. surcula is closely related to *curvata*, in the treatment of which distinguishing characters for the males are discussed.

Flexamia curvata DeLong

Deltocephalus (Flexamia) curvatus DeLong, Ohio State Univ., Univ. Studies 2, No. 13, p. 34. 1926.

Flexamia curvatus, DeLong and Caldwell, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 27. 1937. (Err. pro *Flexamia*.)

Length of male 2.6–3.5 mm., of female 2.9–3.7 mm. Head with median length of crown from one-fifth to almost half greater than interocular width and six-tenths or more transocular width. Hind wing usually reduced, not attaining claval apex; forewing frequently exposing pygofer in both sexes. Face pale, with few pale-brown transverse arcs dorsally on clypeus.

Male pygofer with upper part of posterior lobe strongly produced

caudally. Style with narrowed apical portion foot shaped in broadest aspect, but with "toe" short. Connective in lateral aspect with keels narrow. Joint between connective and aedeagus distinct. Aedeagus symmetrical; shaft broad in caudoventral aspect, gradually narrowed in apical half; gonopore elongate channel on caudoventral surface, beginning slightly basad of antepical processes and extending to base of apical processes; recurved antepical processes extending basad almost to midlength of shaft; pair of shorter apical processes extending basad and laterad, not in bilaterally symmetrical planes, all processes with edges entire; apodemal processes slender, each with mesal antepical protuberance.

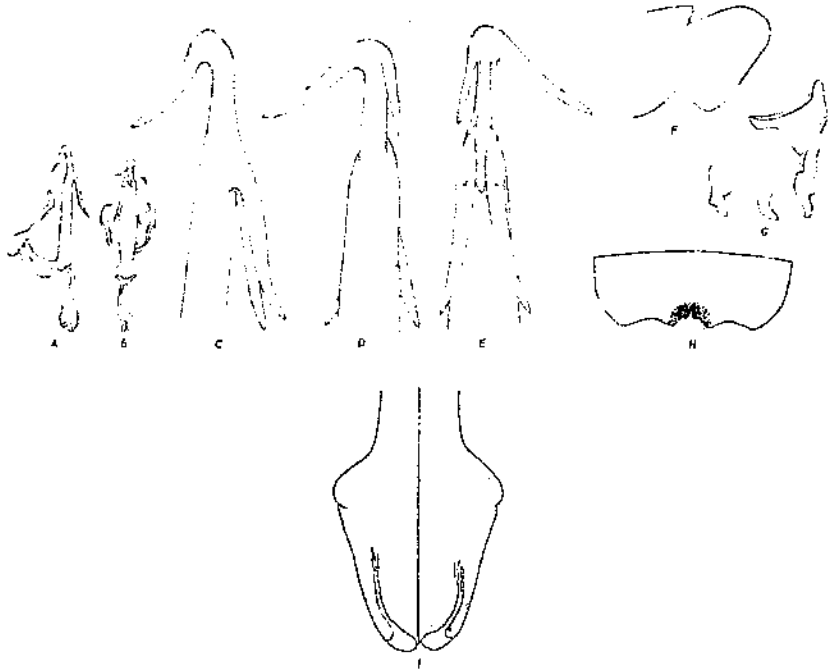


FIGURE 5.—*Flexamia curvata* DeLong: A, Aedeagus and connective, lateral aspect; B, same, ventral aspect; C, apex of aedeagus, lateral aspect; D, same, anterodorsal aspect; E, same, caudoventral aspect; F, male pygofer, lateral aspect; G, right style, dorsal aspect, and style apices in lateral aspect of two specimens, showing individual variation; H, seventh sternum of female; I, bases of first valvulae of female, dorsal aspect. (Male structures compared with type specimen.)

Female seventh sternum not strongly produced, with hind margin slightly concave on each side of median excision, which is flanked by pair of short triangular projections; ovipositor with base of each first valvula bearing posteriorly directed slender process, which is concave along mesal margin and evanescent apically.

The type, a female from Delphos, Kans., has been examined. A male with the same collection data but without any type label, in the DeLong collection, is referable to *abbreviata*. Additional specimens have been examined from Kansas, Colorado, Oklahoma, and Texas.

F. curvata is closely related to *surcula*, but the male is distinct in the less pronounced "toe" of the style, the more basal location of the gonopore on the aedeagal shaft, and the longer aedeagal processes. Females are not likely to be confused with those of other species on the basis of the form of the first valvulae bases.

Specimens examined from Colorado are much smaller (males 2.6-2.8 mm., females 2.9-3.0 mm.) than those from the other three States, but they appear to be identical morphologically.

Flexamia abbreviata (Osborn and Ball)

Dellocephalus abbreviatus Osborn and Ball, Iowa Acad. Sci. Proc. 4, p. 206. 1897.

Dellocephalus (Flexamia) abbreviatus, DeLong, Ohio State Univ., Univ. Studies 2, No. 13, p. 33. 1926.

Flexamius abbreviatus, DeLong and Sleesman, Amer. Ent. Soc. Ann. 22: 83. 1929. (Err. pro *Flexamia*.)

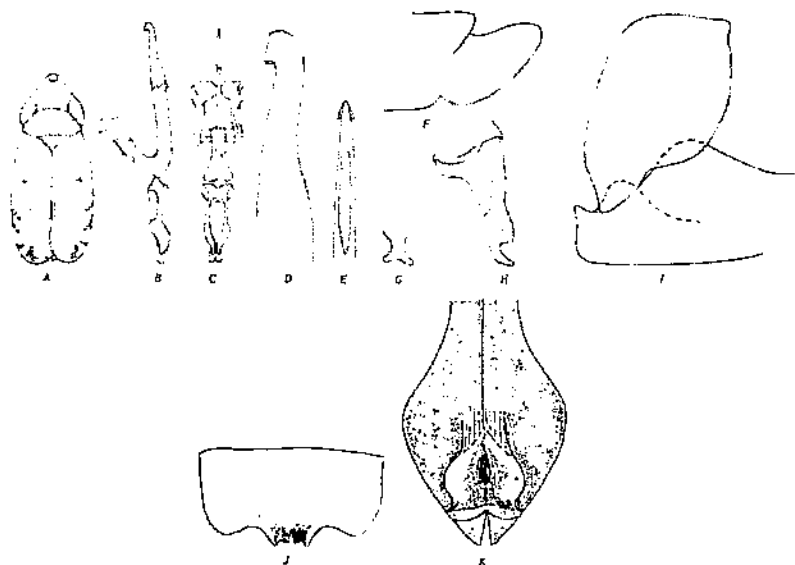


FIGURE 6.—*Flexamia abbreviata* (Osborn and Ball): A, Habitus; B, aedeagus and connective, lateral aspect; C, same, ventral aspect; D, apex of aedeagus, lateral aspect; E, same, caudal aspect; F, male pygofer, lateral aspect; G, apex of style, lateral aspect; H, right style, dorsal aspect; I, first valvifer and base of first valvula of female, lateral aspect; J, seventh sternum of female; K, bases of first valvulae of female, dorsal aspect.

Length of male 2.7-3.3 mm., of female 3.1-3.6 mm. Head not strongly produced, median length of crown usually one-fourth or more greater than interocular width and approximately six-tenths trans-ocular width. Hind wing variable in length, from almost as long as forewing to length in which it only attains claval apex of forewing. Face without distinct interocular line, clypeus brown, with pale median line and pale arcs, remainder pale or variably marked with brown.

Male pygofer strongly constricted, with notches dorsally and ventrally before posterior lobe, which is strongly produced posteriorly on

upper portion of posterior margin. Style with apex bilobed. Aedeagus symmetrical; shaft elongate, slender, in ventral aspect gradually tapering to acute apex, in lateral aspect abruptly narrowed in apical third, with apex consisting of pair of short truncate processes curved cephalad; gonopore elongate, slender, antepical on caudoventral surface; apodemal processes each with broad membranous apical expansion.

Female seventh sternum with hind margin concave at each side of strong, broad, median trapezoidal projection, which is notched medially, with smaller shallower notch on each side of median one; ovipositor with base of each first valvula truncate, with short dorsal angular protuberance (fig. 6, *K*) and sclerotized lobe on inner surface, apposed lobes forming collarlike structure on dorsal surface of first valvulae behind bases.

Originally *abbreviata* was described from specimens taken on *Bouteloua hirsuta* in Iowa. The lectotype is in the Iowa State College collection. The present interpretation of the species is based on specimens in the United States National Museum from the original cotype series. Additional specimens have been examined from Illinois, Wisconsin, Minnesota, North and South Dakota, Nebraska, Kansas, Texas, Colorado, New Mexico, Arizona, Alberta, Saskatchewan, and Manitoba.

This species can be readily distinguished from *canyonensis* by the broad, curved, apparently truncate aedeagal apex in lateral aspect and the location of the gonopore well distad of the midlength of the shaft in the males, and the structure of the seventh sternum in the females. The relationship of *abbreviata* and *canyonensis* to *surcula* and *curvata* is discussed on page 6.

Flexamia canyonensis, new species

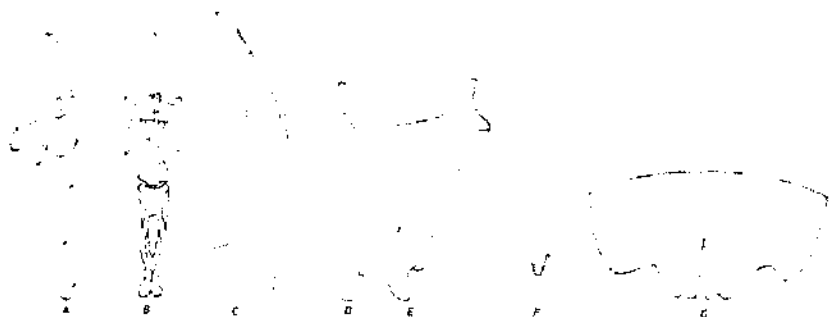


FIGURE 7.—*Flexamia canyonensis*, n. sp.: A, Connective and aedeagus, lateral aspect; B, same, caudoventral aspect; C, apex of aedeagus, lateral aspect; D, apex of style, lateral aspect; E, right style, dorsal aspect; F, apex of aedeagus, caudoventral aspect; G, seventh sternum of female. (A-F from type.)

Length of male 3.7 mm., of female 3.8 mm. Head with median length of crown one-half greater than interocular width and slightly more than one-half transocular width. Hind wings exceeding claval apices of forewings, which expose dorsum of pygofer. Face with

clypeus and dorsal portion of genae black, clypeus with irregular pale markings; clypellus, lora, and lower part of genae pale yellow and variably marked with black.

Male pygofer as in *abbreviata*. Style with apical portion obliquely truncate in lateral aspect. Aedeagus nearly symmetrical; shaft scimitar shaped in lateral aspect; gonopore ventral, near midlength of shaft, more distal portion with narrow ventral triangular keel on each side, apical half of shaft appearing diamond shaped in caudoventral aspect; apodemal appendages each with slender anteapical process, which is directed mesad.

Female seventh sternum as in *abbreviata*, but with median lobe more strongly produced and more deeply notched.

The male holotype and one female paratype, Sabino Canyon, Ariz., dated "10-27-33," (E. D. Ball), are in the United States National Museum (cat. No. 63,403).

The very unusual aedeagus of the male, with the gonopore occurring near the midlength of the shaft, separates *canyonensis* from all other species of *Flexamia*. The deep notch in the female seventh sternum is also specifically diagnostic.

Flexamia serrata Beamer and Tuthill

Flexamia serrata Beamer and Tuthill, Kans. Ent. Soc. Jour. 7: 4. 1934.

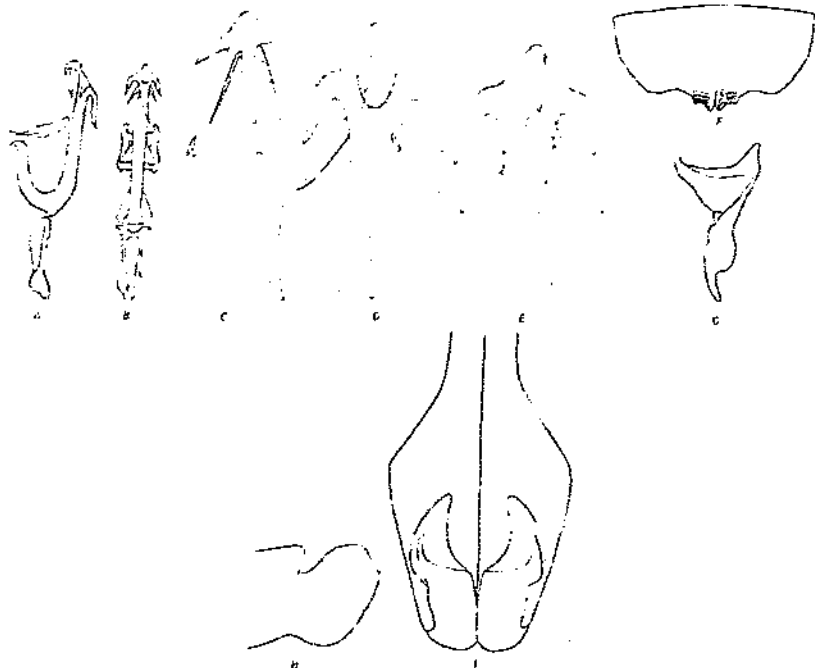


FIGURE 8.—*Flexamia serrata* Beamer and Tuthill: A, Aedeagus and connective, lateral aspect; B, same, caudoventral aspect; C, apex of aedeagus, lateral aspect; D, same, caudoventral aspect; E, same, anterodorsal aspect; F, seventh sternum of female; G, right style, dorsal aspect; H, pygofer of male, lateral aspect; I, bases of first valvulae of female, dorsal aspect.

Length of male 4.0-4.2 mm., of female 4.0-4.5 mm. Head with median length of crown approximately one-fourth greater than interocular width and almost five-sevenths transocular width. Hind wing attaining apex of forewing, or reduced and not extending beyond base of second apical cell of forewing; forewing attaining or exceeding apex of abdomen. Face pale, with several narrow, parallel, fuscous interocular lines, which are interrupted at middle.

Male pygofer with posterior margin of lobe subangulate above midlength. Style with narrowed apical portion longer than usual in genus, sharply rounded at tip. Connective in lateral aspect with dorsal keels not extending dorsad to midlength of dorsal apodeme. Aedeagus almost symmetrical; shaft elongate, gradually tapered in lateral aspect, slightly broadened distad of midlength in caudoventral aspect; gonopore antepical on caudoventral surface; prominent unpaired ventral process arising basad of gonopore, extending basad along shaft, but not attaining midlength; pair of shorter recurved processes arising one on each side of gonopore, extending laterad, then basad; short median and pair of longer processes arising apically on anterodorsal surface, latter extending laterobasad and diverging slightly from axis of shaft in caudoventral aspect; all processes with edges entire; apodemal processes each with mesal antepical protuberance.

Female seventh sternum with hind margin slightly concave at each side of broad median posterior projection, which bears pair of angular protuberances and slight median apical notch; ovipositor with base of each first valvula very strongly recurved, recurved portion approximately parallel to axis of valvula, sclerotization weak at extremity, which is biramous, dorsal branch evanescent, ventral branch shaped somewhat like pruning hook.

The female holotype and male allotype from British Columbia are in the Snow entomological collection, University of Kansas. The male allotype has been studied. Specimens from Utah, Washington, and Saskatchewan have also been examined.

The species seems related to *slossonae* and *albida*, from which it differs externally in its lack of conspicuous dorsal stripes. Morphologically the males of *serrata* can be readily separated from those of all other species in the genus by the number of apical aedeagal processes and the presence of an unpaired recurved dorsal process. Females may be separated from those of other species by the very distinct form of the bases of the first valvulae of the ovipositor (fig. 8, I).

Flexamia slossonae (Ball)

- Deltocephalus slossoni* [sic] Ball, Biol. Soc. Wash. Proc. 18: 119. 1905.
Deltocephalus (Flexamia) slossoni, DeLong, Ohio State Univ., Univ. Studies 2, No. 13, p. 36. 1926.
Deltocephalus (Scelopennis) slossoni, DeLong and Slesman, Amer. Ent. Soc. Ann. 22: 85. 1929.
Flexamia slossoni, DeLong and Caldwell, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 27. 1937. (Err. pro *Flexamia*.)
Scelopennis slossonae, Oman, Wash. Ent. Soc. Mem. No. 3, p. 168. 1949.

Length of male 4.0-4.1 mm., of female 4.2-4.5 mm. Crown of head with median length at least one-third greater than interocular width and at least six-tenths transocular width. Hind wing exceeding claval

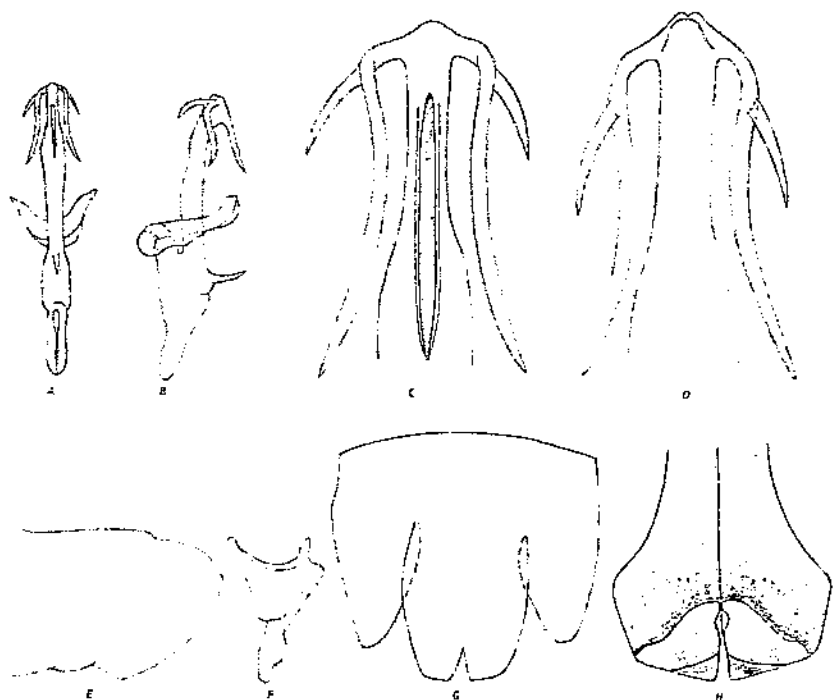


FIGURE 9.—*Flexamia slossonae* (Ball): A, Aedeagus and connective, caudoventral aspect; B, same, lateral aspect; C, apex of aedeagus, caudoventral aspect; D, same, dorsal aspect; E, male pygofer, lateral aspect; F, right style, dorsal aspect; G, seventh sternum of female; H, bases of first valvulae of female, dorsal aspect.

apex of forewing but not attaining latter's apex, which is obliquely truncate, exposing apex of abdominal dorsum. Face ivory, with black interocular line at base.

Male pygofer in lateral aspect with posterior lobe only weakly delimited by shallow notches on dorsal and ventral margins. Connective in lateral aspect gradually and regularly broadened from base to dorsal apodeme. Joint between aedeagus and connective distinct in ventral aspect. Aedeagus symmetrical; shaft broadest slightly distad of midlength in ventral aspect; gonopore elongate slit extending through most of length of unpaired ventral process, which diverges gradually from shaft in lateral aspect; unpaired ventral process near base of shaft, diverging from long axis of latter at angle of nearly 90° ; apical processes once branched; all processes without teeth.

Female seventh sternum conspicuously trilobed, middle lobe extending caudad farther than lateral lobes and notched at middle of subtruncate hind margin; ovipositor with laterobasal portion of each second valvula curved dorsad and mesad in short rounded lobe.

Originally *slossonae* was described from a single female from Biscayne Bay, Fla., which is now in the United States National Museum. Additional specimens have been examined from southern Florida. DeLong (7, p. 37) reported collecting it from *Distichlis spicata* in Florida.

F. slossonae is distinct from all other members of the genus in its obliquely truncate forewings, the conspicuously trilobate seventh sternum of the female, and the spine near the base of the aedeagal shaft in the male. Were it not for the existence of *albida*, the retention of *slossonae* in a separate genus would certainly appear warranted. The habitus, the branched apical aedeagal processes, and the poorly delimited pygofer lobe in the male suggest a relationship between *albida* and *slossonae* that, in the authors' opinion, precludes placing the latter in a separate genus.

Flexamia albida (Osborn and Ball)

Deltocephalus albidus Osborn and Ball, Iowa Acad. Sci. Proc. 4, p. 201. 1897.

Deltocephalus (Flexamia) albidus, DeLong, Ohio State Univ., Univ. Studies 2, No. 13, p. 36. 1926.

Fleramius albidus, DeLong and Slesman, Amer. Ent. Soc. Ann. 22: 83, 84. 1929. (Err. pro *Flexamia*.)

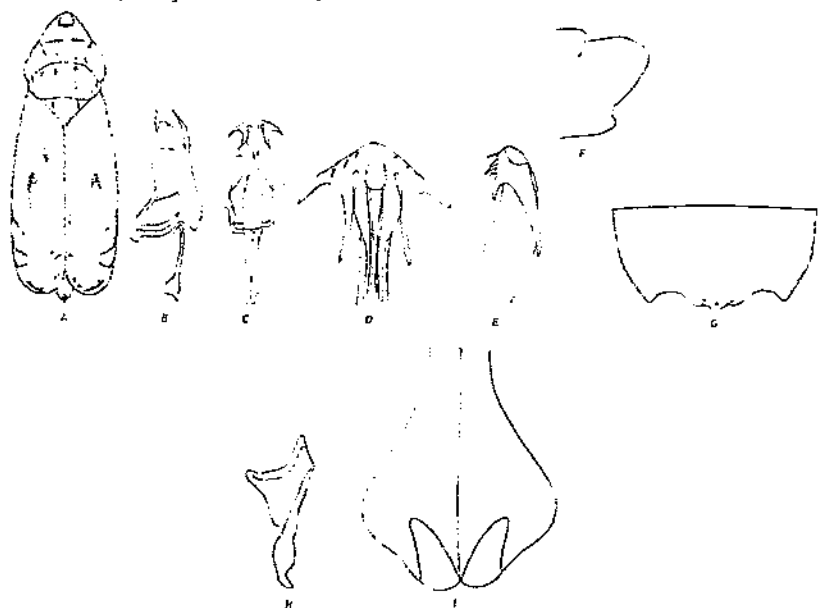


FIGURE 10.—*Flexamia albida* (Osborn and Ball): A, Habitus; B, aedeagus and connective, lateral aspect; C, same, ventral aspect; D, apex of aedeagus, caudo-ventral aspect; E, same, lateral aspect; F, male pygofer, lateral aspect; G, seventh sternum of female; H, right style, dorsal aspect; I, bases of first valvulae of female, dorsal aspect. (C and D from original cotype series.)

Length of male 3.6-3.8 mm., of female 4.1-4.3 mm. Head with median length of crown from one-tenth to one-eighth greater than interocular width and more than one-half transocular width. Hind wing almost attaining apex of forewing, which exceeds abdominal apex. Face entirely pale.

Male pygofer with posterior lobe slightly produced on dorsal portion, posterior margin oblique and regularly convex for most of length, ventral portion produced in distinct small rounded lobe.

Style apex with narrowed apical portion tapered, sharply rounded at tip. Connective in lateral aspect with width of dorsal keels about half length of dorsal aedeagal apodeme. Aedeagus symmetrical; shaft slightly narrowed at midlength, broad in lateral aspect; gonopore subapical on caudoventral surface; pair of bifurcate apical processes, each with few teeth on dorsal margin, in caudoventral aspect with dorsal ramus diverging obliquely from axis of shaft and ventral ramus subparallel to long axis of shaft; shaft with pair of longitudinal ridges on caudoventral surface basad of gonopore; apodemal processes greatly expanded at apex.

Female seventh sternum with posterior margin shallowly concave on each side of broadly produced median convex portion, which is slightly notched at middle; ovipositor with base of each first valvula recurved, basal extremity rounded and directed caudodorsad, recurved portion not heavily sclerotized.

Specimens have been examined from the original cotype series of this species from Ames, Iowa, which are in the United States National Museum. The lectotype is in the Iowa State College collection. Additional specimens from Iowa and Minnesota have been examined.

Distinguishing characteristics have been discussed under *stossonae*. The groove basad of the gonopore suggests a phylogenetic fusion of an unpaired ventral process with the aedeagal shaft.

Flexamia ritana Beamer

Flexamia ritana Beamer, Canad. Ent. 68: 257. 1936.

Length of male 4.4 mm., of female 4.5 mm. Head with median length of crown approximately two-thirds greater than interocular width and five-sevenths transocular width. Hind wing almost attaining apex of forewing, which exceeds abdominal apex. Face pale white, with broad fuscous interocular band.

Male pygofer with posterior lobe strongly produced and rounded on upper portion of posterior margin. Connective in lateral aspect with keels extending dorsad about one-third length of aedeagal apodeme. Aedeagus symmetrical; shaft elongate, slender in caudoventral aspect, broader in lateral aspect; gonopore on caudoventral surface at base of unpaired process, which extends basad along shaft about half distance to base of latter and is slightly expanded and rounded apically in caudoventral aspect; apical third of aedeagus slightly bisinuate, with pair of symmetrical recurved anteapical processes arising about one-third distance from gonopore to aedeagal apex, processes together somewhat lyrate; none of processes serrate; apodemal processes each with anteapical protuberance.

Female seventh sternum with hind margin strongly produced at middle in truncate projection, which is narrowly notched medially; each first valvula of ovipositor curved dorsad through 90° at base, dorsal extremity of recurved portion obscurely lobed.

The type, from the Santa Rita Mountains, Ariz., is in the Snow entomological collection, University of Kansas. The above interpretation is based on a pair of topotypic paratypes. *F. ritana* is known only from Arizona.

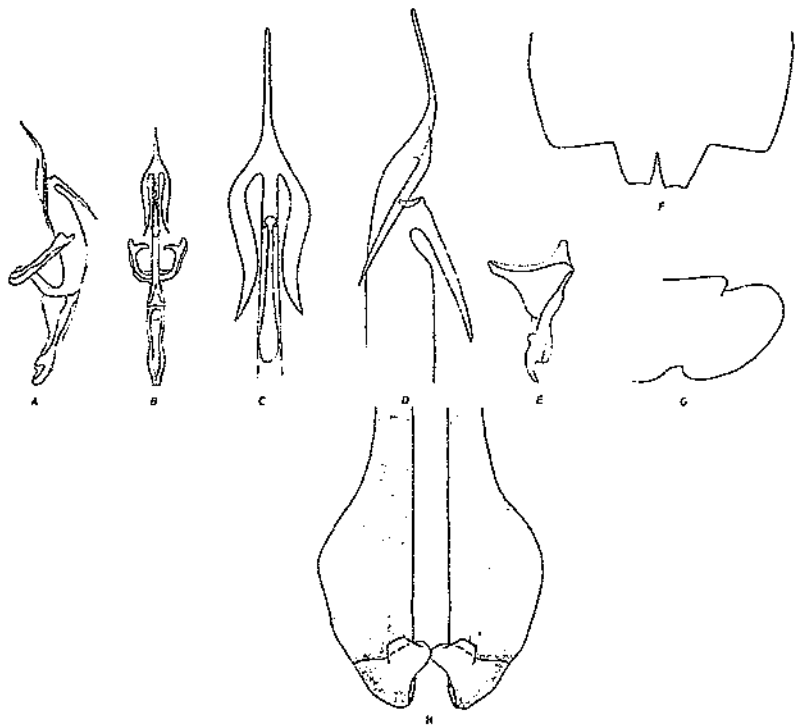


FIGURE 11.—*Flexamia ritana* Beamer: A, Aedeagus and connective, lateral aspect; B, same, ventral aspect; C, apex of aedeagus, caudoventral aspect; D, same, lateral aspect; E, right style, dorsal aspect; F, seventh sternum of female; G, male pygofer, lateral aspect; H, bases of first valvulae of female, dorsal aspect. (C, D, and F from paratypes.)

The attenuate aedeagal apex and the lyriform aedeagal processes readily separate males of *ritana* from those of other species. Females can be recognized by the characters given in the key.

Flexamia inflata (Osborn and Ball)

Deltocephalus inflatus Osborn and Ball, Iowa Acad. Sci. Proc. 4, p. 202. 1897.

Deltocephalus (Flexamia) inflatus, DeLong, Ohio State Univ., Univ. Studies 2, No. 13, p. 35. 1926.

Flexamius inflatus, DeLong and Slesman, Amer. Ent. Soc. Ann. 22: 84. 1929. (Err. pro *Flexamia*.)

Length of male 3.7–3.9 mm., of female 4.0–4.5 mm. Head with median length of crown slightly greater than interocular width and more than half transocular width. Hind wing usually reduced, not attaining claval apex of forewing; forewing exceeding apex of abdomen or not. Face stramineous, with basal interocular line usually pale brown.

Male pygofer with upper portion of posterior lobe strongly produced posteriorly. Style apex with narrowed apical portion tapered, sharply rounded at tip. Connective in lateral aspect with keels extending as far dorsad as aedeagal apodeme. Aedeagus asymmetrical; shaft elongate, slender, gradually broadening apically; gonopore apical

on caudoventral surface; pair of short recurved processes arising one on each side of gonopore and slender unpaired ventral process almost half length of shaft, slightly expanded antepically, acute at apex, which extends to right of shaft, all processes with edges entire; apodemal processes slender, variable, unmodified to expanded slightly at apex.

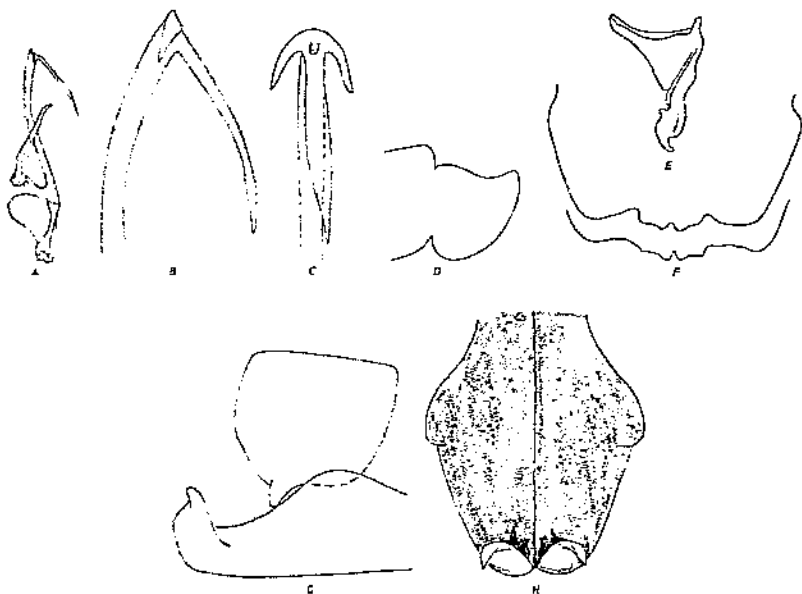


FIGURE 12.—*Flexamia inflata* (Osborn and Ball): A, Aedeagus and connective, lateral aspect; B, apex of aedeagus, lateral aspect; C, same, caudoventral aspect; D, male pygofer, lateral aspect; E, right style, dorsal aspect; F, seventh sternum of female, showing individual variation; G, first valvifer and base of first valvula of female, lateroventral aspect; H, bases of first valvulae of female, dorsal aspect.

Female seventh sternum with hind margin broadly and slightly produced at middle, with slight median notch; ovipositor with base of each first valvula curved dorsad and with dorsal edge bearing small projection, which extends dorsolaterad, entire curved portion more heavily sclerotized and appearing almost as separate sclerite in ventrolateral aspect.

The male lectotype from Ames, Iowa, (Oman 16, p. 183) is in the Iowa State College collection. A male from the original type series, which is in the United States National Museum, has been examined. Additional specimens have been examined from Maryland, Illinois, Wisconsin, Iowa, North Dakota, Kansas, Colorado, Utah, Arizona, and Montana.

The form of the aedeagus is similar in general to that found in *ritana* and several other species herein discussed. It has paired lateral and unpaired ventral processes. The form of the pygofer and the particular form of the aedeagal processes distinguish the *inflata* males. The females may be identified by the characters used in the key.

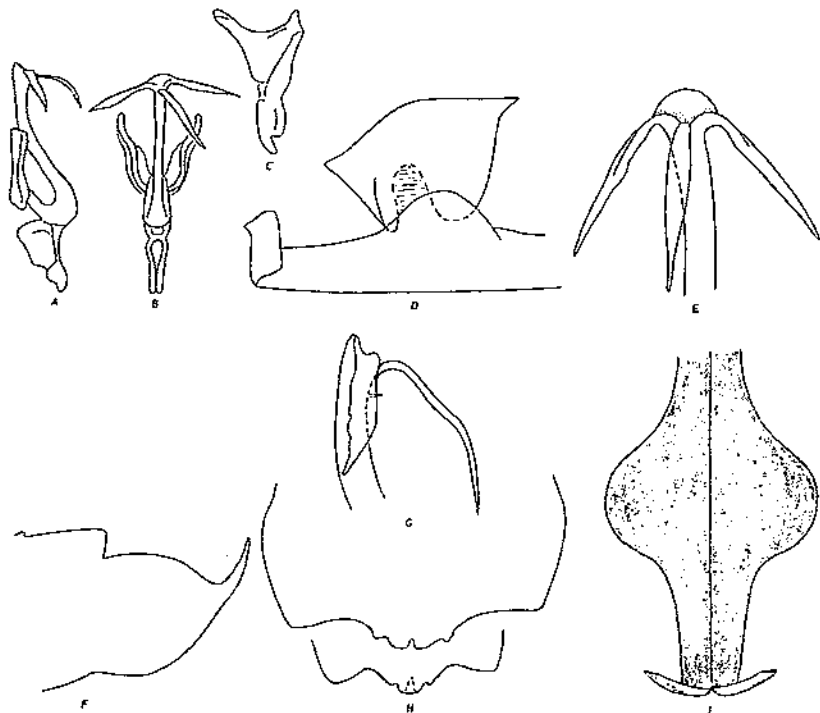
Flexamia stylata (Ball)*Dellocephalus stylatus* Ball, Canad. Ent. 31: 190. 1899.*Dellocephalus (Flexamia) stylatus*, DeLong, Ohio State Univ., Univ. Studies 2, No. 13, p. 34. 1926.*Flexamia stylatus*, DeLong and Steesman, Amer. Ent. Soc. Ann. 22: 84. 1929. (Err. pro *Flexamia*.)

FIGURE 13.—*Flexamia stylata* (Ball): A, Aedeagus and connective, lateral aspect; B, same, caudoventral aspect; C, right style, dorsal aspect; D, first valvifer and base of first valvula of female, lateroventral aspect; E, apex of aedeagus, caudoventral aspect; F, male pygofer, lateral aspect; G, apex of aedeagus, lateral aspect; H, seventh sternum of female, showing individual variation; I, bases of first valvulae of female, dorsal aspect.

Length of male 4.1–4.4 mm., of female 4.1–4.5 mm. Head with median length of crown less than three-tenths greater than interocular width and more than four-sevenths transocular width. Hind wing exceeding claval apex of forewing, which almost or completely reaches abdominal apex. Face very pale white, except broad transocular fuscous line and fuscous markings in center of apical portion of clypellus.

Male pygofer with posterior margin strongly produced, gradually narrowed to form slender slightly curved spinelike process, which is directed caudodorsad. Connective in lateral aspect with dorsal keels extending almost as far dorsad as aedeagal apodeme. Aedeagus asymmetrical; shaft subcylindrical; gonopore subapical on caudoventral surface, occurring at base of three processes; pair of apical processes

directed laterobasad and unpaired ventral process, which extends basad about to midlength of but not parallel to axis of shaft, the three processes appearing subequal in length in caudoventral aspect, in lateral aspect paired processes appearing shorter and each slightly serrate on dorsal edge; apodemal processes without antepical protuberances. The two male cotypes dissected have an inconspicuous small spine slightly basad of the unpaired ventral process on the aedeagal shaft (fig. 13, G), but this structure appears to be inconstant.

Female seventh sternum with hind margin concave at each side of convex median projection, which has angular protuberance on each side and is usually slightly notched apically; ovipositor with base of each first valvula curved dorsad through slightly more than 90°, recurved portion extending laterad beyond lateral margin of valvula in dorsal aspect.

The type series in the United States National Museum consists of the 10 cotypes mentioned in the original description. One of them, a male from the Experiment Station in Little Rock, Iowa, dated "7-2-97," and bearing a "type" label, is hereby designated lectotype. Additional specimens have been examined from Arizona, Wyoming, North and South Dakota, Iowa, Minnesota, and Saskatchewan. De-Long (10, p. 232) reported the species from Nebraska also.

The form of the male pygofer sets *stylata* well apart from related species. This character is usually easily observed without clearing the genital capsule. The females can be identified by the characters given in the key. For specific relationships, see page 6.

Flexamia decora Beamer and Tuthill

Flexamia decora Beamer and Tuthill, Kans. Ent. Soc. Jour. 7: 2. 1934.

Length of male 3.7-4.2 mm., of female 3.6-4.3 mm. Head not strongly produced, with median length of crown equal to or slightly exceeding interocular width and more than half transocular width. Hind wings fully developed or shorter and only slightly exceeding claval apices of forewings, which may be longer than abdomen or slightly shorter and exposing dorsum of pygofer. Face pale stramineous, with broad basal brown or black interocular stripe.

Male pygofer with upper part of hind margin of posterior lobe strongly produced posteriorly. Connective in lateral aspect with dorsal keels about one-third height of aedeagal apodeme. Aedeagus symmetrical; shaft elongate, gradually tapering in lateral aspect; gonopore circular; antepical on caudoventral surface; pair of retrorse processes arising one on each side of gonopore, each serrate on dorsal edge, and longer unpaired ventral process, with entire edges, extending basad more than half length of shaft, with median ventral groove in basal portion; apodemal processes divergent apically, without antepical protuberance.

Female seventh sternum with hind margin concave at each side of median convex projection, which bears slight angular protuberance on each side and is slightly notched apically; ovipositor with each first valvula with base expanded dorsally and laterally, lateral expansion in slide preparations extending dorsad and forming right angle with long axis of valvula, in dorsal aspect with recurved portion extending

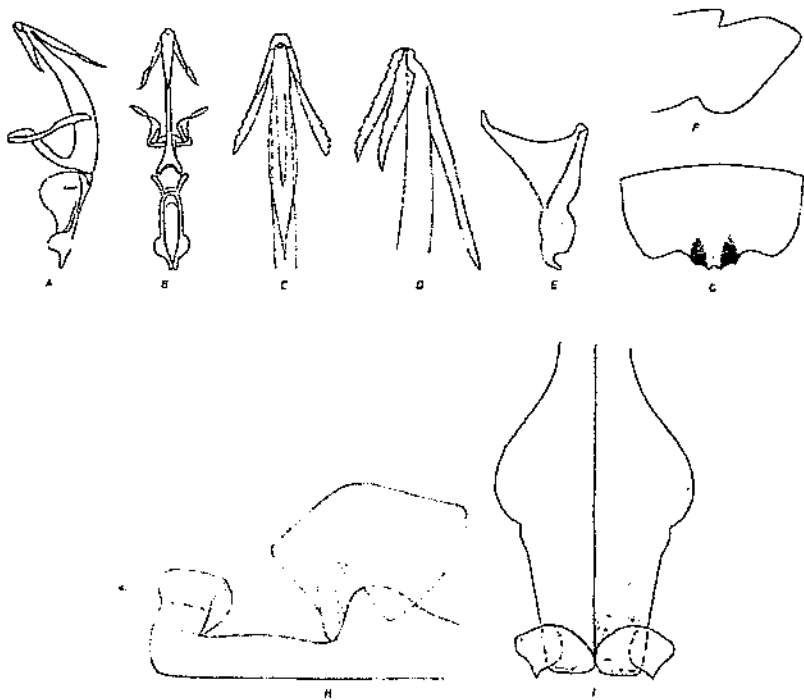


FIGURE 14.—*Flexamia decora* Beamer and Tuthill: A, Aedeagus and connective, lateral aspect; B, same, caudoventral aspect; C, apex of aedeagus, caudoventral aspect; D, same, lateral aspect; E, right style, dorsal aspect; F, male pygofer, lateral aspect; G, seventh sternum of female; H, first valvifer and base of first valvula of female, lateroventral aspect; I, bases of first valvulae of female, dorsal aspect.

laterad beyond lateral margin of valvula and bearing small triangular projection, which extends cephalad.

This interpretation of this species is based on a pair of paratypes from Walden, Colo., which are in the United States National Museum. Additional specimens from Colorado, Utah, Kansas, Kentucky, Virginia, and Saskatchewan have been examined.

In the series of species with three aedeagal processes, *decora* is distinct in having a long ventral process and serrate-edged paired processes.

Flexamia modica Beamer and Tuthill

Flexamia modica Beamer and Tuthill, Kans. Ent. Soc. Jour. 7: 3. 1934.

Length of male 3.4 mm., of female 3.6–3.7 mm. Head with median length of crown about one-third greater than interocular width and approximately two-thirds transocular width. Hind wing slightly exceeding claval apex of forewing, which does not attain abdominal apex. Face ivory, with broad transverse interocular stripe bearing pale arcs.



FIGURE 15.—*Flexamia modica* Beamer and Tuthill: A, Apex of aedeagus, caudoventral aspect; B, same, lateral aspect; C, seventh sternum of female; D, first valvifer and base of first valvula of female, lateroventral aspect; E, bases of first valvulae of female, dorsal aspect. (C and D from paratypes.)

Connective in lateral aspect with keels extending dorsad more than half length of aedeagal apodeme. Aedeagus asymmetrical, with gonopore triangular; unpaired ventral process less than half length of shaft, not in median plane throughout length, not conspicuously grooved, base appearing fused to shaft in lateral aspect; apodemal processes divergent apically, each with mesal anteapical protuberance. Other male genital characters as in *decora*.

Female seventh sternum with middle half of hind margin having broad median convex projection, which is notched medially; ovipositor with base of each first valvula turned dorsad through 90° and bilobed, recurved portion extending strongly laterad and exceeding lateral margin of valvula in dorsal aspect.

F. modica is known only from New Mexico. This description is based on a series of 5 specimens, 2 males and 1 female of which were dissected.

This species is closely related to *decora*, from which males may be distinguished by the characters in the description above, and to *flexulosa*, from which males may be separated by the characters given in the key. The key should be consulted for specific characters of the females.

Flexamia texana, new species

Length of male 2.9–3.1 mm., of female 3.3–3.5 mm. Head with median length of crown from one-fifth to one-fourth greater than interocular width and approximately two-thirds transocular width. Hind wing reduced, not or only slightly exceeding claval apex of forewing; forewing exceeding apex of abdomen or not. Face as in *inflata*.

Male with ventral lobe of pygofer more nearly acute than in *inflata*. Aedeagus asymmetrical; unpaired ventral and pair of lateral processes all about equal in length and all arising near gonopore, ventral process not lying in median sagittal plane and lateral processes not lying in symmetrical planes. Other male genital characters much as in *inflata*.

Female seventh sternum as in *inflata*; ovipositor with base of each first valvula curved dorsad through about 90° in lateroventral aspect,

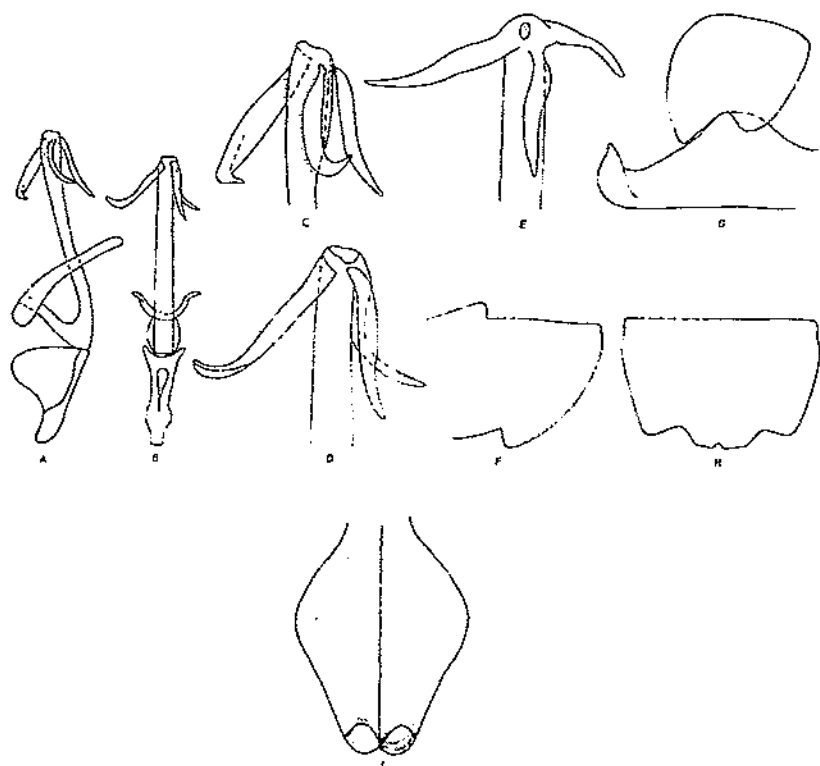


FIGURE 16.—*Flexamia texana*, n. sp.: A, Aedeagus and connective, lateral aspect; B, same, ventral aspect; C, apex of aedeagus, lateral aspect; D, same, ventral aspect; E, same, caudoventral aspect; F, male pygofer, lateral aspect; G, first valvifer and base of first valvula of female, lateroventral aspect; H, seventh sternum of female; I, bases of first valvulae of female, dorsal aspect. (All from paratypes.)

extreme base acute in lateral aspect, regularly convex in dorsal aspect.

Male holotype and 14 paratypes of both sexes from Uvalde, Tex., dated "9-1-36," (E. D. Ball), are in the United States National Museum (cat. No. 63,404).

This species is very closely related to *modica* and *inflata*, from which it can be distinguished by the characters given in the keys.

Flexamia arizonensis, new species

Length of male 3.4-3.6 mm., of female 3.5-4.0 mm. Head with median length of crown less than one-half greater than interocular width and two-thirds or more transocular width. Hind wings usually not attaining claval apex of forewings, which usually expose dorsum of pygofer. Face pale white, with jet-black interocular line.

Male pygofer with posterior lobe truncate apically, ventral portion extending ventrad as short heavily sclerotized process. Style apex as in *inflata*. Connective with narrow dorsal keels. Aedeagus sym-

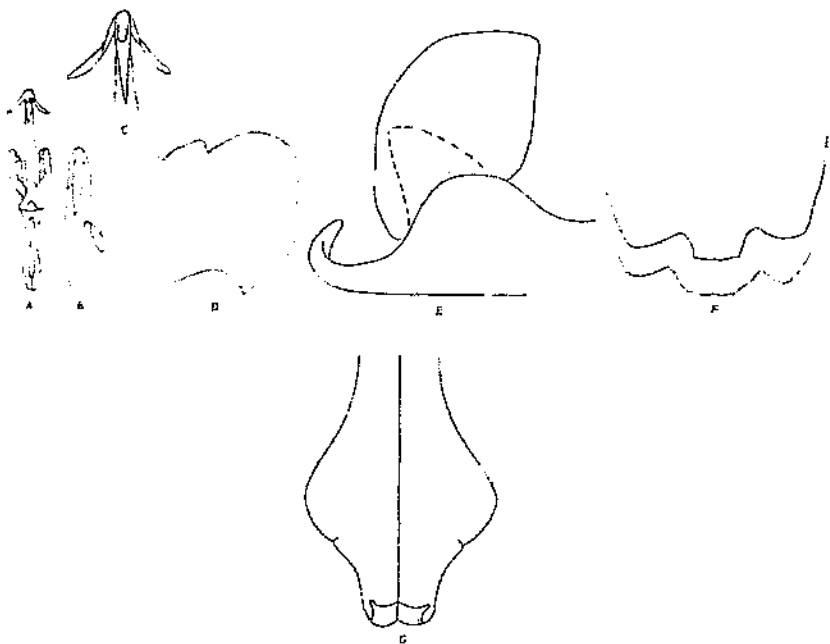


FIGURE 17.—*Flexamia arizonensis*, n. sp.: A, Aedeagus and connective, caudoventral aspect; B, apex of aedeagus, lateral aspect; C, same, caudoventral aspect; D, male pygofer, lateral aspect; E, first valvifer and base of first valvula of female, lateroventral aspect; F, seventh sternum of female, showing individual variation; G, bases of first valvulae of female, dorsal aspect.

metrical; shaft elongate, slender, in caudoventral aspect broadest at midlength; gonopore subapical on caudoventral surface and involving base of unpaired ventral process; paired apical processes arising one on each side of gonopore; unpaired ventral process almost one-third length of shaft.

Female seventh sternum with hind margin produced in subquadrate or strongly convex lobe, which is very shallowly concave medially; ovipositor with each first valvula curved at base through more than 90° , recurved portion distinctly concave caudally in dorsal aspect.

Male holotype (cat. No. 63,274) and 12 paratypes, Faraway Ranch, Cochise County, Ariz., June 10, 1933, (P. W. Oman); additional paratypes of both sexes, Patagonia, Ariz., June 24, 1933; Granite Dells, Ariz., "June 29"; Copper, Ariz., June 30, 1933; (all P. W. Oman); Douglas, Ariz., "10-15-31," and Granite Dells, Ariz., "7-17-29," (both E. D. Ball). Additional specimens are from several other Arizona localities. The holotype and paratypes are in the United States National Museum and paratypes in the Canadian National Collection. The type locality is west of the Chiricahua Mountains.

From *flexulosa*, which it closely resembles, *arizonensis* can be separated by its downward projecting pygofer process and by its more elongate gonopore, which involves the base of the unpaired ventral aedeagal process in the male. Females can be identified by the characters given in the key.

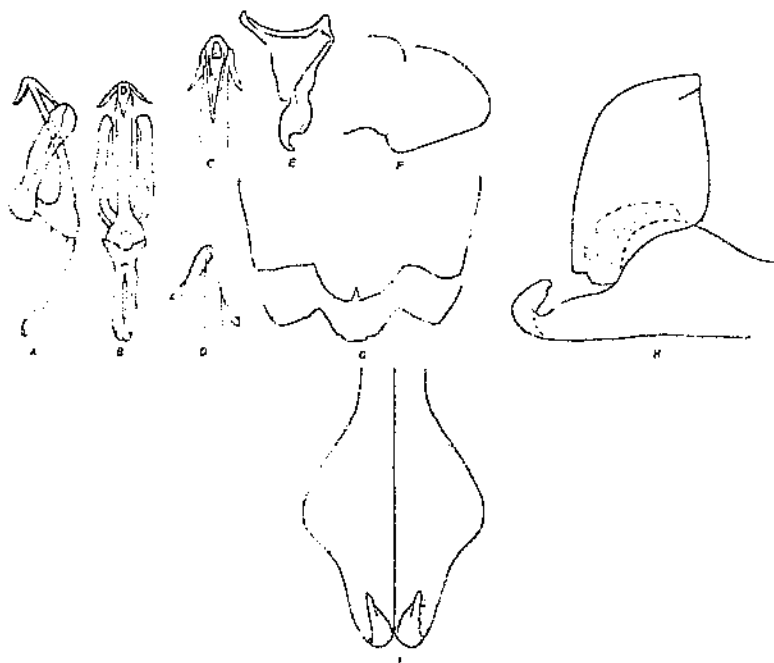
Flexamia flexulosa* (Ball)Doltocephalus flexulosus* Ball, Canad. Ent. 31: 189. 1899.*Doltocephalus (Flexamia) flexulosus*, DeLong, Ohio State Univ., Univ. Studies 2, No. 13, p. 31. 1926.*Flexamius flexulosus*, DeLong and Slesman, Amer. Ent. Soc. Ann. 22: 84. 1929. (Err. pro *Flexamia*.)

FIGURE 18.—*Flexamia flexulosa* (Ball): A, Aedeagus and connective, lateral aspect; B, same, caudoventral aspect; C, apex of aedeagus, caudoventral aspect; D, same, lateral aspect; E, right style, dorsal aspect; F, male pygofer, lateral aspect; G, seventh sternum of female, showing individual variation; H, first valvifer and base of first valvula of female, lateroventral aspect; I, bases of first valvulae of female, dorsal aspect. (A-D, H, and lower G from original cotype series.)

A greatly variable species. Length of male 2.9-3.6 mm., of female 3.1-3.6 mm. Crown with median length varying from equal to, to about one-third greater than, interocular width and approximately six-tenths transocular width. Hind wings attaining or only slightly exceeding claval apex of forewings, which exceed apex of abdomen in male, often exposing dorsum of pygofer in female. Face pale stramineous, with black interocular line.

Male pygofer with posterior lobe rounded on posterodorsal margin. Style as in *inflata*. Connective with dorsal keels narrow in lateral aspect. Aedeagus symmetrical; shaft elongate, slender, gradually broadening apically, attaining greatest width antepically; gonopore as in *inflata*; paired apical processes short, arising one on each side of gonopore, each minutely serrulate along one edge; unpaired ventral process short, grooved, less than one-fourth length of shaft, acute at apex; apodemal processes wider than shaft in lateral aspect.

Female seventh sternum with hind margin strongly produced at middle to form regularly convex lobe, which may or may not be notched medially; ovipositor with each first valvula curved through more than 90° at base, recurved portion usually appearing slender and almost parallel to long axis of valvula in dorsal aspect, with narrow projection extending caudad at basal extremity.

This species was originally described from Fort Collins and several other Colorado localities. A male cotype from Fort Collins, Colo., dated "7-29 99," and bearing a cotype label and the United States National Museum catalog No. 6,105 (affixed by E. H. Gibson) is here designated lectotype of *Deltocphalus flexulosus* Ball. The lectotype is in the United States National Museum. Specimens have also been examined from Montana, Wyoming, Colorado, Arizona, North and South Dakota, Nebraska, Kansas, Texas, and Saskatchewan.

F. flexulosa is closely related to *decora* and *modica*. The best distinguishing characters discovered are given in the keys.

Flexamia prairiana DeLong

Flexamia prairiana DeLong, Pan-Pacific Ent. 13: 32. 1937.



FIGURE 19. *Flexamia prairiana* DeLong: A, Aedeagus and connective, lateral aspect; B, same, ventral aspect; C, apex of aedeagus, caudoventral aspect; D, right style, lateral aspect; E, apex of aedeagus, anterodorsal aspect; F, same, lateral aspect; G, seventh sternum of female, showing individual variation; H, male pygofer, lateral aspect; I, bases of first valvulae of female, dorsal aspect.

Quite variable externally. Length of male 3.3-3.8 mm., of female 3.3-4.3 mm. Head with median length of crown varying from approximately one-fifth to almost one-half greater than interocular width and from slightly more than one-half to two-thirds transocular width. Hind wings exceeding claval apices of forewings, which are seldom short enough to expose dorsum of pygofer. Face varying from almost completely black to stramineous, with broad black interocular line.

Male pygofer with upper part of hind margin of posterior lobe strongly produced posteriorly. Style with narrowed apical portion tapered, sharply rounded at tip. Without distinct joint between connective and aedeagus. Connective with keels narrow in lateral aspect. Aedeagus asymmetrical; shaft slender, elongate, gradually broadened apically; gonopore oval, antepical on anterior surface; three retrorse processes arising apically on shaft, extending basad for approximately one-third length of shaft and slightly divergent from shaft; anterodorsal process arising just basad of gonopore, with margins entire, crossing axis of shaft, apex acute and to right of shaft, with dorsal longitudinal groove through more than apical half of length; pair of ventrolateral processes arising slightly more distad, each strongly serrate on ventral margin; apodemal processes slender, unmodified.

Female seventh sternum with hind margin slightly produced and with small median notch; ovipositor with first valvulae turned dorsad very slightly at bases, dorsal wall of genital vestibule with pair of small sclerites situated above and slightly behind bases of first valvulae, these occasionally fused medially to form V-shaped sclerite.

Originally this species was described from Illinois. Paratypes from Illinois have been examined, as well as specimens from Minnesota, South Dakota, Kansas, and Arizona.

Superficially this species resembles *decora*, *modica*, and *flexulosa*. Males of *prairiana* differ conspicuously, because the joint between the connective and the aedeagus is not distinct and the gonopore is located on the anterior surface of the aedeagal shaft, presumably the result of phyletic twisting. Correspondingly, the paired processes are toothed on their ventral instead of their dorsal edges as in the foregoing related species that have the gonopore on the caudoventral surface.

Flexamia areolata (Ball)

Dellocephalus areolatus Ball, Canad. Ent. 31: 188. 1899.

Dellocephalus (Flexamia) areolatus. DeLong, Ohio State Univ., Univ. Studies 2, No. 13, p. 25. 1926.

Flexamius areolatus, DeLong and Slesman, Amer. Ent. Soc. Ann. 22: 54. 1929. (Err. pro *Flexamia*.)



FIGURE 20.—*Flexamia areolata* (Ball): A, Habitus; B, aedeagus and connective, lateral aspect; C, apex of aedeagus, caudolateral aspect; D, same, lateral aspect; E, male pygofer, lateral aspect; F, right style, dorsal aspect; G, seventh sternum of female. (C and D from original cotype series.)

Length of male 2.7-2.8 mm., of female 3.6-4.0 mm. Head strongly produced, crown with median length more than one-half greater than interocular width and from two-thirds (male) to three-fourths (female) transocular width. Hind wings exceeding claval apices of forewings, almost attaining apices of latter, which expose, apically at least, dorsum of pygofer and often dorsum of preceding segment as well. Face entirely black.

Male pygofer with dorsal portion of posterior lobe produced caudadorsad, posterior margin oblique and slightly concave. Style apex as in *inflata*. Connective in lateral aspect with dorsal keels narrow. No joint between aedeagus and connective. Aedeagus asymmetrical; 3 tapering apical processes, 2 shorter and extending basad along right side of shaft, both with a serrate edge, third extending basad along left side of shaft for about half length of latter, broader than other 2 processes, bearing gonopore as elongate slit through almost entire length, adorned in middle portion with minute projections; apodemal processes each with apical lobe along mesal margin.

Female seventh sternum with posterior margin concave on each side of median convex projection, which is notched apically; ovipositor with first valvulae not curved dorsad at bases.

(Originally this species was described from 2 females from College Park, Md., and Phoenix, Ariz., and 1 male from "Md. (Heideman).") The specimens are in the United States National Museum. The specimen from College Park has the abdomen missing. The male bears the label "Relay St., Md., 4-8 85" and Ball's identification label. It is here designated lectotype of *Deltocephalus areolatus* Ball.

In addition to the type material, specimens have been examined from Texas, Kansas, Illinois, Wisconsin, Maryland, the District of Columbia, Virginia, and North Carolina. DeLong (10, p. 231) has recorded the species from Arizona.

From *prairiana* to which it is closely related, *areolata* differs markedly in its possession of a slitlike gonopore on one of the apical processes, a condition which suggests a derivation from the grooved process found in *prairiana*. The females may be identified by the characters in the key.

Flexamia imputans (Osborn and Ball)

Deltocephalus imputans Osborn and Ball, Davenport Acad. Nat. Sci. Proc. 7, p. 75-1898.

Deltocephalus (Flexamia) imputans, DeLong, Ohio State Univ., Univ. Studies 2, No. 13, p. 29. 1926.

Flexamia imputans, DeLong and Caldwell, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 27. 1937. (Err. pro *Fleramia*.)

Length of male 3.2-3.6 mm., of female 3.5-3.8 mm. Crown of head with median length from one-sixth (male) to one-third (female) greater than interocular width and from one-half to three-fifths transocular width. Hind wing almost as long as forewing. Face black, occasionally with oblique pale streak on each gena.

Male genitalia as in *areolata*, but with hind margin of pygofer convex and with distinct joint between connective and aedeagus.

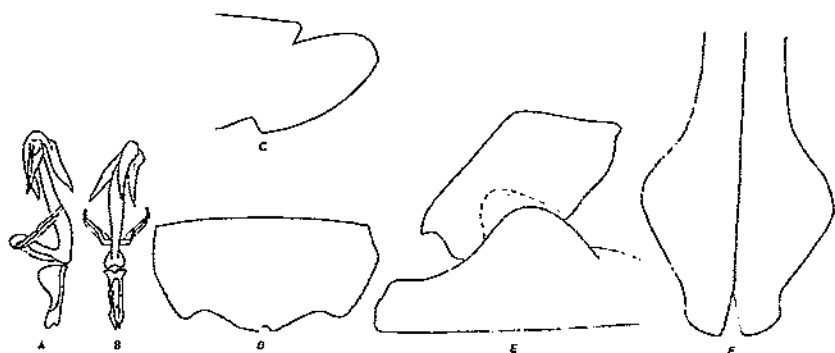


FIGURE 21.—*Flexamia imputans* (Osborn and Ball): A, Aedeagus and connective, lateral aspect; B, same, ventral aspect; C, male pygofer, lateral aspect; D, seventh sternum of female; E, first valvifer and base of first valvula of female, lateroventral aspect; F, bases of first valvulae of female, dorsal aspect.

Female seventh sternum with hind margin broadly, slightly convexly produced, with slight median notch; ovipositor with bases of first valvulae not recurved.

The lectotype (Oman 16, p. 182) is in the Iowa State College collection. Topotypic specimens of the original cotype series have been examined from the United States National Museum. Other specimens have been examined from North Dakota. DeLong (10, p. 234) has recorded this species from *Muhlenbergia* in Kansas, Iowa, and Wisconsin.

F. imputans is very closely related to *areolata*, from which males of *imputans* can be distinguished by the genital characters herein given. Females can be identified by the characters in the key.

Flexamia reflexa (Osborn and Ball)

Deltocephalus reflexus Osborn and Ball, Iowa Acad. Sci. Proc. 4, p. 203. 1897.

Deltocephalus (Flexamia) reflexus, DeLong, Ohio State Univ., Univ. Studies 2, No. 13, p. 28. 1926.

Flexamius reflexus, DeLong and Caldwell, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 27. 1937. (Err. pro *Flexamia*.)

Length of male 3.2–3.8 mm., of female 3.6–4.2 mm. Head with length of crown variable, usually one-third greater than interocular width and approximately two-thirds transocular width. Hind wing exceeding claval apex of forewing, usually almost attaining apex of latter; forewing attaining abdominal apex, but exposing dorsum of pygofer. Face with color quite variable, from pale with pair of dark markings on clypellus to almost completely dark.

Male pygofer with posterior lobe strongly produced, truncate apically. Style apex with narrowed apical portion tapered, sharply rounded at tip. Connective in lateral aspect with dorsal keels extending almost as far dorsad as aedeagal apodeme. Aedeagus asymmetrical; shaft elongate, slender, cylindrical, gradually tapered; gonopore antecapical on anterodorsal surface, closely associated with short unpaired process, which is grooved apically; pair of recurved

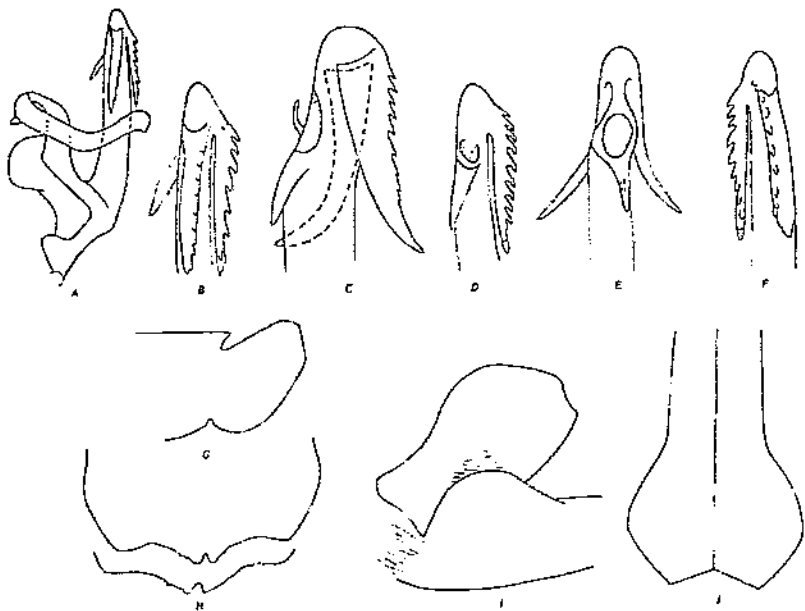


FIGURE 22.—*Flexamia reflexa* (Osborn and Ball): A, Aedeagus and connective, lateral aspect; B and C, apices of aedeagi, lateral aspect, showing individual variations; D and E, same, anterodorsal aspect, showing individual variations; F, apex of aedeagus, caudoventral aspect; G, male pygofer, lateral aspect; H, seventh sterna of females, showing individual variations; I, first valvifer and base of first valvula of female, lateroventral aspect; J, bases of first valvulae of female, dorsal aspect. (C, G, H, and I from original cotype series.)

apical ventrolateral processes arising distad of gonopore, extending basad less than half length of shaft in lateral aspect, each process serrate along ventral edge, occasionally with minute dorsal process arising at edge of gonopore; apodemal processes directed mesad apically, without anteapical protuberance.

Female seventh sternum with hind margin with slight convex median apical protuberance, which is notched at middle; ovipositor with first valvulae membranous basally, not curved dorsad, sclerotized portion appearing obliquely truncate in dorsal aspect.

The identity of this species, as here interpreted, is based on a study of topotypic cotype specimens of the original series in the United States National Museum. The lectotype (Oman 16, p. 185), which is in the Iowa State College collection, is from Ames, Iowa. Additional specimens have been examined from Kansas, Maryland, and Florida.

F. reflexa is related to *areolata* and *imputans*, but the position and form of the gonopore of the male serve to differentiate it from these species. The position of the gonopore, some distance from the aedeagal apex and on a process that is partially fused to the shaft, is highly suggestive of one of the probable intermediate steps in the phyletic movement of the gonopore.

Flexamia sandersi (Osborn)

- Deltocephalus sandersi* Osborn, Davenport Acad. Sci. Proc. 10, p. 164. 1907.
Deltocephalus (Flexamia) sandersi, DeLong, Ohio State Univ., Univ. Studies 2,
 No. 13, p. 27. 1926.
Flexamia sandersi, DeLong and Slesman, Amer. Ent. Soc. Ann. 22: 83. 1929.
 (Err. pro *Flexamia*.)
Flexamia bidentata DeLong, *ibid.* 28: 155. 1935. New synonymy.

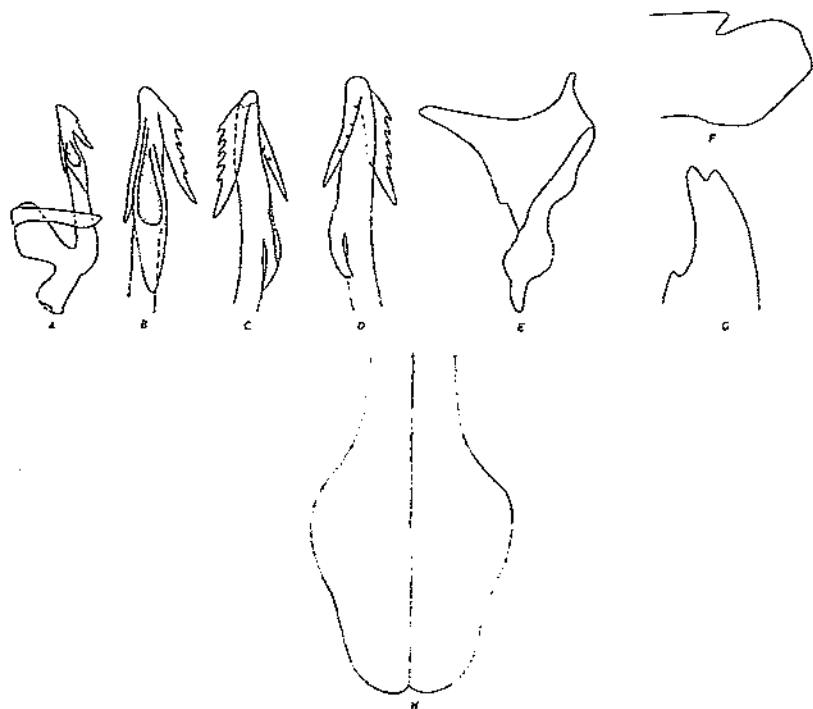


FIGURE 23.—*Flexamia sandersi* (Osborn): A, Aedeagus and connective, lateral aspect; B, apex of aedeagus, lateral aspect; C, same, dorsal aspect; D, same, caudoventral aspect; E, right style, dorsal aspect; F, male pygofer, lateral aspect; G, apical portion of right male plate, ventral aspect; H, bases of first valvulae of female, dorsal aspect. (A-G from type.)

Length of male 3.4–3.8 mm., of female 3.6–4.3 mm. Head with proportions variable, but median length of crown usually about one-half greater than interocular width and two-thirds transocular width. Hind wing exceeding claval apex, not attaining apical margin of forewing. Face varying from dark above and shading to paler apically to brown or black throughout, in former case with dark area fading gradually along lower margin, not appearing as definite interocular band.

Male pygofer with posterior lobe produced posteriorly and truncate on dorsal portion of posterior margin. Connective in lateral aspect with keels flared dorsally, adjoining margin of dorsal apodeme not abruptly differentially sclerotized. Aedeagus asymmetrical; shaft

elongate, gradually tapered; gonopore at base of apical third of length of shaft on dorsolateral surface at base of retrorse process, which has one minutely serrate margin and extends basad to midlength of shaft; pair of apical retrorse processes, dorsal slightly longer than ventral, each with a distinctly serrate margin and with apex more acute than unpaired process; apodemal processes abruptly angled antepically, each with small protuberance at angle.

Female seventh sternum with broad, convex, median posterior projection, which is notched at middle; ovipositor with base of each first valvula not curved dorsad.

This species was originally described from a pair of specimens from Chain Bridge, Va., and a pair from Monticello, Ga. A male of the Virginia pair is in the Ohio State University collection and bears a "type" label affixed by Osborn. It is the basis of this interpretation. The holotype of *bidentata*, from Wellesley, Mass., has been examined. Other specimens have been examined from North and South Dakota, Nebraska, Kansas, Illinois, Wisconsin, Louisiana, Mississippi, Alabama, Tennessee, Kentucky, New York, Massachusetts, Connecticut, Maryland, the District of Columbia, Virginia, and North and South Carolina.

This species is very closely related to *reflexa*, from which it can be separated by the male genitalia characters mentioned in the key. Reliable morphological characters have not been found to separate females of this species from *atlantica* females.

Flexamia producta (Walker)

Iassus productus Walker, List of the Specimens of Homopterous Insects in the Collection of the British Museum, pt. 3, p. 891. 1851.

Deltocephalus visendus Crumb, Amer. Ent. Soc. Ann. 8: 189. 1915. New synonymy.

Deltocephalus (Flexamia) productus, DeLong, Ohio State Univ., Univ. Studies 2, No. 13, p. 43. 1926.

Flexamia producta, DeLong and Knull, Ohio State Univ., Grad. School Studies, Biol. Sci. Ser. No. 1, p. 35. 1945.

Length of male 3.2–3.6 mm., of female 3.4–3.7 mm. Head with median length of crown approximately one-half greater than interocular width and more than two-thirds transocular width. Hind wing shorter than forewing, occasionally not attaining claval apex of forewing, which exceeds abdominal apex. Face variable in color, from tan with clearly delimited interocular line to almost completely infuscated, except sublateral areas of genae.

Male plates each slightly notched at apex. Pygofer with posterior lobe produced and rounded apically, ventral portion extending mesad as pronounced lobe, which is serrate along margin, the two lobes overlapping in ventral aspect. Style apex as in *flexulosa*. Connective variable in lateral aspect, from not keeled to keeled, with keels extending dorsad farther than dorsal aedeagal apodeme. Aedeagus asymmetrical apically; shaft elongate, slender, slightly swollen antepically; gonopore irregularly oval, on left side of dorsal surface of shaft at base of apical third of length of latter; pair of processes arising asymmetrically at apex of shaft, extending basad almost half length of shaft and diverging from it, each process laterally compressed and

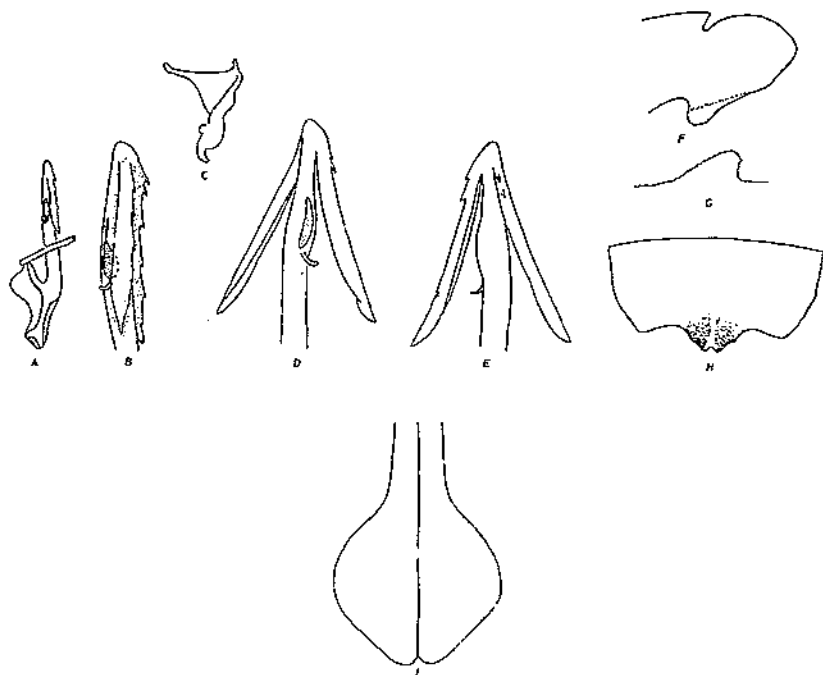


FIGURE 24.—*Flexamia producta* (Walker): *A*, Aedeagus and connective, lateral aspect; *B*, apex of aedeagus, lateral aspect; *C*, right style, dorsal aspect; *D*, apex of aedeagus, anterodorsal aspect; *E*, same, caudal aspect; *F*, male pygofer, lateral aspect; *G*, pygofer lobe, ventral aspect; *H*, seventh sternum of female; *I*, bases of first valvulae of female, dorsal aspect.

with conspicuous teeth along ventral edge; unpaired process arising near proximal portion of gonopore, short, small, curved, extending sinistrad; apodemal processes short, unmodified apically.

Female seventh sternum with hind margin moderately produced posteriorly at middle and with shallow median notch; ovipositor with bases of first valvulae not curved dorsad, in dorsal aspect with broader portions closer to bases than in *sandersi*.

DeLong (7, p. 43) indicated that *visenda* (Crumb) is probably synonymous with *producta* (Wlk.) This opinion is very plausible and is followed here. The type of *producta*, a female, was examined and the seventh sternum sketched by W. E. China of the British Museum (Natural History). The type agrees with *visenda* and related species. In view of the common occurrence of this species in the Jacksonville, Fla., area, it seems advisable to synonymize the Crumb species, a cotype of which has been examined.

Specimens have been examined from Maryland, Virginia, North and South Carolina, Alabama, Georgia, and Florida.

F. producta is closely related to *sandersi*, which lacks the pronounced ventral male pygofer lobe. The broadest portion of the first valvulae of the female occurs closer to the bases of the valvulae (fig. 24, *I*) than in *sandersi* (fig. 23, *H*).

***Flexamia graminea* (DeLong)**

Deltocephalus (Flexamia) gramineus DeLong, Ohio State Univ., Univ. Studies 2, No. 13, p. 30. 1926.

Flexamia gramineus, DeLong and Caldwell, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 27. 1937. (Err. pro *Flexamia*.)

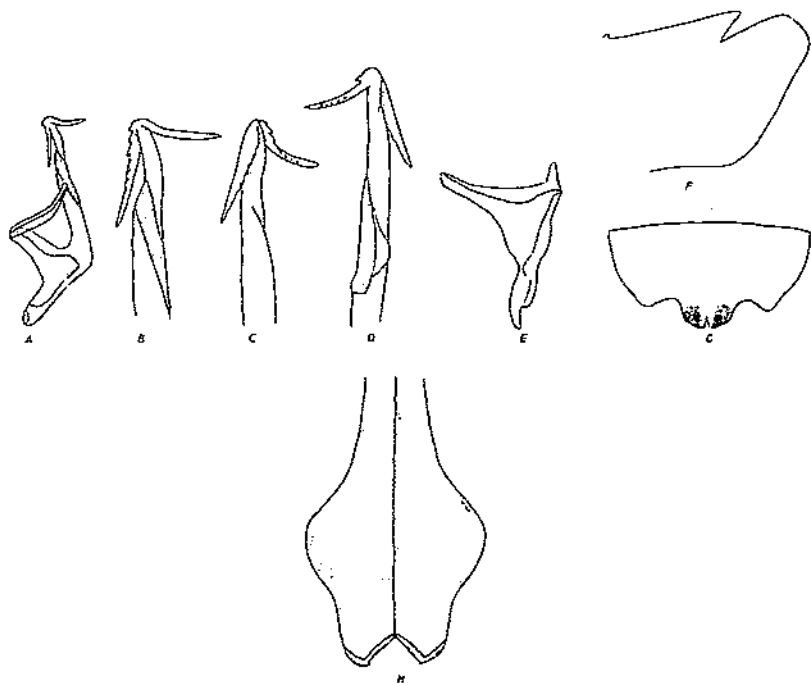


FIGURE 25.—*Flexamia graminea* (DeLong): A, Acdeagus and connective, lateral aspect; B, apex of aedeagus, lateral aspect; C, same, dorsal aspect; D, same, ventral aspect; E, right style, dorsal aspect; F, male pygofer, lateral aspect; G, seventh sternum of female; H, bases of first valvulae of female, dorsal aspect. (A-D and F from type.)

Length of male 3.4-3.7 mm., of female 3.7-4.0. mm. Head with median length of crown almost one-third greater than interocular width and about two-thirds transocular width. Hind wing exceeding claval apex, but not attaining apex of forewing, which is variable in length. Face variable, from entirely stramineous to stramineous with clypeus darkened, from tan to almost black with pale arcs.

Male pygofer with posterior lobe not well differentiated ventrally, posterodorsal portion produced caudodorsad and truncate apically. Connective in lateral aspect with keels extending strongly dorsad, forming narrow, anterior, lightly sclerotized border along cephalic margin of dorsal aedeagal apodeme to its apex. Aedeagus asymmetrical; shaft elongate, slender, appearing twisted in apical half; gonopore a spiral groove beginning at midlength of shaft; pair of asymmetrical retrorse apical processes, each with one edge minutely serrate; apodemal processes slightly expanded antepically.

Female seventh sternum with hind margin strongly produced posteriorly at middle in convex protuberance, which is slightly notched apically, very similar to that of *areolata*; ovipositor with base of each first valvula somewhat angular in dorsal aspect, narrowly curved dorsad anterolaterally and anteromedially (fig. 25, *H*), recurved portion extending only slightly dorsad.

The type, a male from Douglas County, Kans., has been studied. Additional specimens have been examined from Kansas, North and South Dakota, Missouri, Illinois, and the District of Columbia.

From *producta*, to which it is closely related, *graminea* can be distinguished by its shorter apical aedeagal processes and its lack of a conspicuous ventral pygofer lobe in the male. It is also closely related to *clayi*, in the discussion of which distinguishing characters are mentioned.

Flexamia clayi, new species

Flexamia sandersi, Young, in part, Ky. Acad. Sci. Trans. 13, p. 64. 1949.
(Misdetermination.)

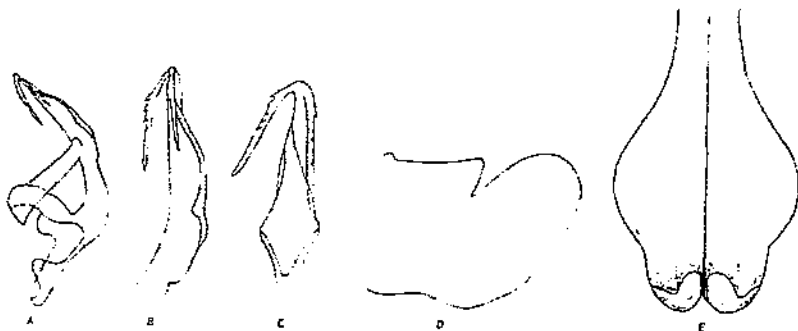


FIGURE 26.—*Flexamia clayi*, n. sp.: A, Aedeagus and connective, lateral aspect; B, apex of aedeagus, lateral aspect; C, same, caudoventral aspect; D, male pygofer, lateral aspect; E, bases of first valvulae of female, dorsal aspect.

Length of male 3.5 mm., of female 3.6–3.8 mm. Head with median length of crown from one-third (male) to almost two-thirds (female) greater than interocular width and more than seven-tenths transocular width. Hind wing exceeding claval apex, but not attaining apex of forewing. Face brown to black above, usually shading gradually to paler below.

Male pygofer with posterior lobe slightly more distinct than in *graminea*. Connective in lateral aspect with keels broad, but not extending dorsad to apex of aedeagal apodeme. Aedeagus much as in *graminea*, but with shaft much more expanded at base of gonopore and with apodemal processes each having prominent anteapical lobe, which is directed mesad.

Female seventh sternum much as in *graminea*; ovipositor with base of each first valvula rounded, with recurved portion which is broader and extends much farther dorsad than in *graminea*.

Male holotype and one female paratype, Pineville, Ky., "3 July 1948," (D. A. Young, Jr.); one female paratype, Raleigh, N. C.,

"Oct. 16, 1938," (P. W. Oman); and one female paratype, Louisville, Ky., "9 September 1941," (D. A. Young, Jr.); in the United States National Museum (cat. No. 63,409).

This species is very closely related to *graminea*, from which it can be separated by the comparative characters of the male and female genitalia given in the above description. The species is named in honor of W. M. Clay of the University of Louisville, Ky., who encouraged the early taxonomic efforts of the senior author in the family Cicadellidae.

Flexamia grammica (Ball)

Dellocephalus grammicus Ball, Canad. Ent. 32: 204. 1900.

Dellocephalus (Flexamia) grammicus, DeLong, Ohio State Univ., Univ. Studies 2, No. 13, p. 37. 1926.

Flexamius grammicus, DeLong and Caldwell, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 27. 1937. (Err. pro *Flexamia*.)



FIGURE 27. *Flexamia grammica* (Ball): A, Habitus; B, aedeagus and connective, ventral aspect; C, same, lateral aspect; D, apex of aedeagus, caudoventral aspect; E, same, lateral aspect; F, same, anterodorsal aspect; G, male pygofer, lateral aspect; H, apex of right style, dorsal aspect; I, seventh sternum of female; J, first valvifer and base of first valvula of female, lateroventral aspect.

Length of male 4.5-4.7 mm., of female 4.7-5.0 mm. Head not strongly produced, crown with median length from at least one-tenth (male) to one-seventh (female) greater than interocular width and from one-half to six-tenths transocular width. Hind wing as long

or almost as long as forewing, which exceeds apex of abdomen in both sexes. Dorsum with three pairs of pronotal longitudinal dark vittae; median pair extending anteriorly onto hind portion of crown and posteriorly through scutellum and caudad along commissural margins of wings in repose; pair laterad of these extending from anterior margin of pronotum behind eyes caudomesad, almost touching basal angles of scutellum, almost to claval apex, each confluent with neighboring member of middle pair of vittae near claval apex, both pairs interrupted by pale claval veins; outer pair short, each extending across pronotum from hind margin of eye to middle of humeral margin of pronotum. Face stramineous, with single narrow black interocular line near base.

Male pygofer with posterior lobe strongly produced on upper portion, hind margin oblique and slightly concave. Style apex foot shaped. Connective in lateral aspect with keels narrow. Aedeagus asymmetrical; shaft in lateral aspect with ventral margin narrowed abruptly near midlength; gonopore antecapical on anterodorsal surface; pair of recurved processes, one apparently edentate, arising on left side near gonopore, other arising at apex of shaft, fused with shaft through most of length, with minute teeth through most of length, neither process extending as far basad as midlength of shaft; apodemal processes extending at right angles to axis of shaft in dorsal aspect.

Female seventh sternum with broad, shallow, median regular concavity on posterior margin; ovipositor with each first valvula without sclerotized portion that is curved dorsad.

This species was originally described from "Sneyder" and Julesburg, Colo., and from Kimball, Nebr. The United States National Museum contains one female cotype from "Julesburg, Col., 8, 4-99" and Ball's identification label. This specimen is here designated lectotype of *Deltocephalus grammicus* Ball. Specimens are at hand from Kansas, Nebraska, North Dakota, and Saskatchewan.

This species superficially resembles *albida*, from which it can be easily distinguished in the male by its broad foot-shaped style apices and unbranched apical aedeagal processes and in the female by its broadly concave hind margin of the seventh sternum.

Flexamia dakota, new species

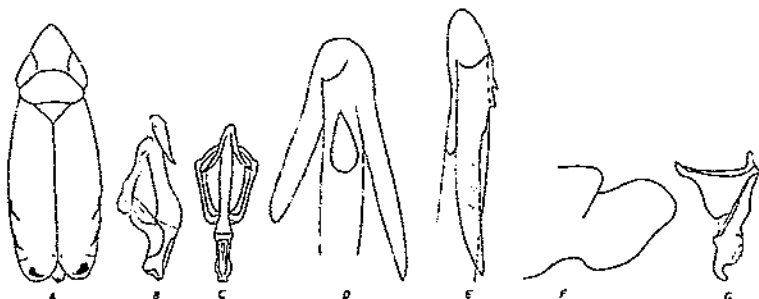


FIGURE 28.—*Flexamia dakota*, n. sp.: A, Habitus; B, aedeagus and connective, lateral aspect; C, same, ventral aspect; D, apex of aedeagus, dorsal aspect; E, same, lateral aspect; F, male pygofer, lateral aspect; G, right style, dorsal aspect.

Length of male 3.2-3.4 mm. Head with median length of crown approximately one-third greater than interocular width and two-thirds transocular width. Hind wing exceeding claval apex of forewing. Face tan, clypeus, variable marking on clypellus, genal area beneath each eye darker brown, clypeus with paler arcs.

Male pygofer with upper portion of posterior lobe strongly produced posteriorly. Style apex with narrowed apical portion tapered, sharply rounded at tip. Connective in lateral aspect with keels extending as far dorsad as aedeagal apodeme. Aedeagus symmetrical; shaft elongate, slender, in lateral aspect narrower near midlength than at base or apex; gonopore anteapical on anterodorsal surface; pair of recurved processes extending basad almost half length of shaft, each process serrate on mesoventral margin; apodemal processes broadened anteapically in dorsal aspect, each with pronounced anteapical protuberance.

Female unknown.

Male holotype, Philip, S. Dak., July 22, 1935. (Oman), and male paratype, same data, in the United States National Museum (cat. No. 63,273).

In the form of the aedeagus and the pygofer this species is similar to *grammica*, from which it differs in its more basal position of the gonopore, the form of the style, and markedly in its external appearance. It is possible that the aedeagal structure could have evolved from an ancestral condition like that exhibited by *reflexa*, through additional coalescence of the unpaired aedeagal process.

Flexamia atlantica (DeLong)

Deltocephalus (*Flexamia*) *atlanticus* DeLong, Ohio State Univ., Univ. Studies 2, No. 13, p. 29. 1926.

Flexamia atlanticus, DeLong and Caldwell, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 27. 1937. (Err. pro *Flexamia*.)

Length of male 3.8-4.2 mm., of female 4.0-4.2 mm. Head with median length of crown usually about one-third greater than interocular width and approximately two-thirds transocular width. Hind wing almost as long as forewing, which may or may not extend to abdominal apex. Face black in upper half with pale arcs, lower half with black markings variable in extent.

Male pygofer not constricted on ventral margin, constricted on dorsal margin, posterior lobe well produced in upper portion of posterior margin. Connective in lateral aspect with keels extending dorsad about two-thirds height of dorsal apodeme. Aedeagus asymmetrical; shaft of nearly uniform width throughout length; gonopore anteapical on right side, simple, not slitlike nor elongate; pair of elongate retrorse processes arising at apex, extending basad approximately half length of shaft, each with a serrate edge; apodemal processes variable, in dorsal aspect with or without slight anteapical protuberance.

Female seventh sternum and bases of first valvulae as in *sandersi*.

The type, a male from Egg Harbor, N. J., has been examined. Male specimens have been examined from Kansas, Oklahoma, and New Jersey.

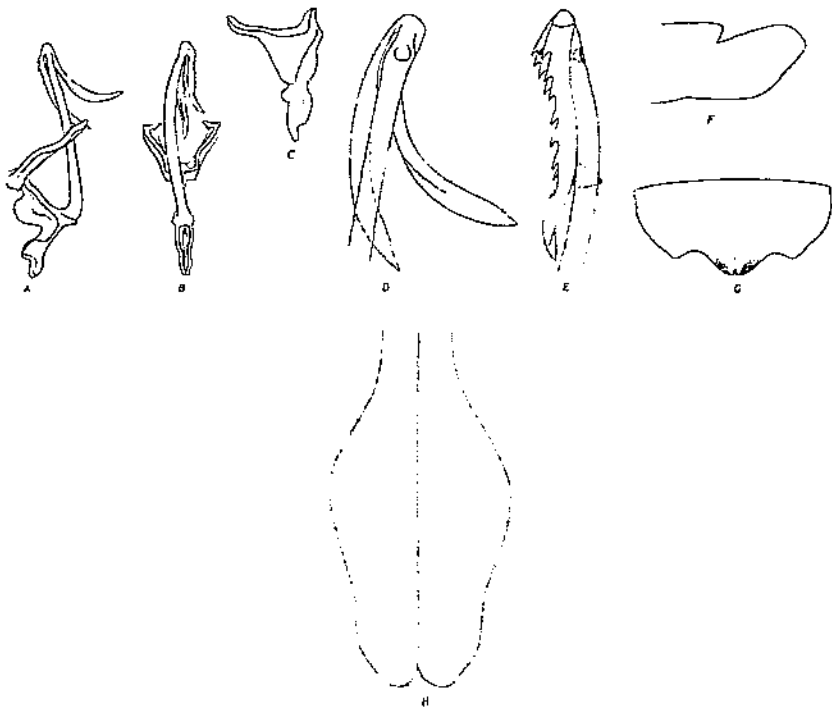


FIGURE 20.—*Flexamia atlantica* (DeLong): A, Aedeagus and connective, lateral aspect; B, same, caudoventral aspect; C, right style, dorsal aspect; D, apex of aedeagus, lateral aspect; E, same, cephalic aspect; F, male pygofer, lateral aspect; G, seventh sternum of female; H, bases of first valvulae of female, dorsal aspect.

This species is closely related to *dakota*, but males of the latter have much shorter aedeagal processes. Reliable characters have not been found to separate *dakota* and *sandersi* females.

Flexamia pectinata (Osborn and Ball)

- Deltocephalus pectinatus* Osborn and Ball, Iowa Acad. Sci. Proc. 4, p. 205. 1897.
Deltocephalus (Flexamia) pectinatus, DeLong, Ohio State Univ., Univ. Studies 2, No. 13, p. 32. 1926.
Flexamius pectinatus, DeLong and Slesman, Amer. Ent. Soc. Ann. 22: 83. 1929. (Err. pro *Flexamia*.)
Flexamia zamora DeLong and Hershberger, Brooklyn Ent. Soc. Bul 42: 137. 1947. New synonymy.
Flexamia minima DeLong and Hershberger, *ibid.*, p. 138. 1947. New synonymy.

Length of male 2.8–3.7 mm., of female 3.4–3.6 mm. Head weakly produced, with median length of crown one-fifth or more greater than interocular width and approximately six-tenths transocular width. Hind wing reduced, not exceeding claval apex; forewing attaining apex of abdomen or not. Clypeus fuscous, with pale arcs; trans-clypeal suture, loral sutures, pair of longitudinal markings on clypeal-

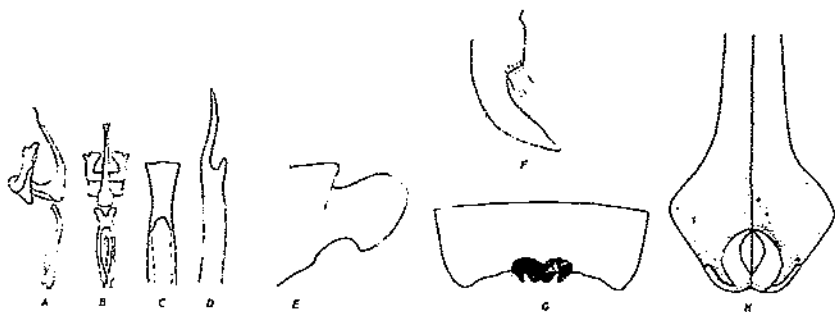


FIGURE 30.—*Flexamia pectinata* (Osborn and Ball): *A*, Aedeagus and connective, lateral aspect; *B*, same, caudoventral aspect; *C*, apex of aedeagus, caudoventral aspect; *D*, same, lateral aspect; *E*, male pygofer, lateral aspect; *F*, apex of right style, dorsal aspect; *G*, seventh sternum of female; *H*, bases of first valvulae of female, dorsal aspect.

lus, large genal spot beneath each eye, fuscous; remainder of face sordid yellow.

Male pygofer with posterior lobe slightly produced on dorsal portion of posterior margin. Style apex with narrowed apical portion longer than usual in genus. Connective in lateral aspect with keels narrow. Joint between connective and aedeagus distinct. Aedeagus symmetrical, without lateral processes; gonopore subapical on caudoventral surface, in lateral aspect with slight protuberance from basal edge; apodemal processes short, each with lateral anteapical protuberance.

Female seventh sternum with hind margin slightly produced and truncate in middle third and bearing three small notches; ovipositor with bases of first valvulae recurved and caliperate.

The holotype of *F. zamora* from Zamora, Michoacán, Mexico, has been examined. The male holotype of *minima* from Valles, San Luis Potosí, Mexico, appears identical in structure to *zamora*, but it is much smaller (length 2.8 mm.). The lectotype of *pectinata* is in the Iowa State College collection. The present identification of this species is based on a male of the original cotype series from Ames, Iowa, in the United States National Museum.

Additional specimens have been examined from Illinois, Wisconsin, Minnesota, Iowa, South Dakota, Kansas, and Texas, as well as from the Mexican localities mentioned.

Flexamia doeringae Beamer and Tuthill

Flexamia doeringae Beamer and Tuthill, Kans. Ent. Soc. Jour. 7: 3. 1934.

Length of male 3.6-4.2 mm., of female 3.7-3.8 mm. Head with median length of crown from slightly less than to slightly more than one-half greater than interocular width and approximately seven-tenths transocular width. Hind wing attaining or slightly exceeding claval apex of forewing; forewing varying in length, attaining apex of abdomen or slightly more or less. Face ivory, with broad black basal interocular line with pale arcs, occasionally with some dark markings beneath.

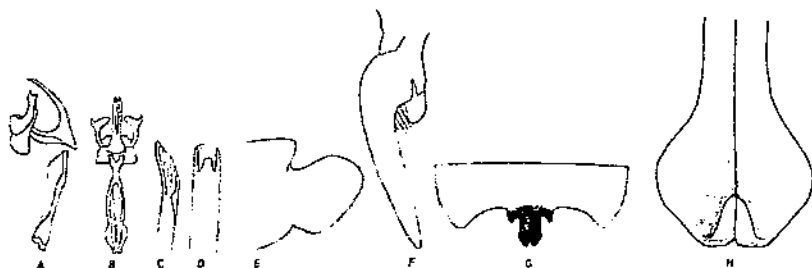


FIGURE 31.—*Fleramia doeringae* Beamer and Tutill: *A*, Aedeagus and connective, lateral aspect; *B*, same, ventral aspect; *C*, apex of aedeagus, lateral aspect; *D*, same, caudoventral aspect; *E*, male pygofer, lateral aspect; *F*, apex of right style, dorsal aspect; *G*, seventh sternum of female; *H*, bases of first valvulae of female, dorsal aspect.

Male genitalia as in *pectinata*, but with preapical lobe of style more strongly developed, flattened and produced posteriorly, and with protuberance near apex of aedeagal shaft closer to tip of shaft in ventral aspect.

Female seventh sternum strongly produced posteriorly at middle in pair of long central lobes and shorter lobe on each of these; ovipositor with each first valvula recurved at base, recurved portion with transverse lobe cephalad of basal extremity.

The identity of this species, as interpreted here, is based on a pair of paratypes from the Huachuca Mountains in Arizona. Other specimens have been examined from Arizona.

This species, with *pectinata*, forms a distinct group within the genus in the form of the male genitalia. Its position in relation to the other species can only be surmised. The two species may belong near *abbreviata* and *canyonensis*, which have reduced aedeagal processes, narrow keels on the connective, and a distinct joint between the aedeagus and connective. Both groups have modified style apices, but they are modified in different ways. The female seventh sternum of *pectinata* would strengthen such a placement, but that of *doeringae* differs markedly.

GENUS SPARTOPYGE, NOVUM

Type of the genus, *Fleramia mexicana* DeLong and Hershberger.

Closely related to *Flexamia* in general facies. Male pygofer elongate, with distinct posterior lobe and bearing tuft of elongate close-set setae on inner surface. Style with apical portion narrow, more produced than in most species of *Fleramia*. Joint distinct between connective and aedeagus. Aedeagus symmetrical, short; pair of very short small processes near middle of shaft, without apical processes; gonopore antepical on caudoventral surface; dorsal aedeagal apodeme large, hoodlike. Female seventh sternum with shallow concavity at apex.

This genus is known only in the Southwestern United States and Mexico.

The form of the aedeagus and the tuft of setae on the inner surface of the pygofer readily separate the *Spartopyge* species from the *Flexamia* species.

KEY TO THE SPARTOPYGE SPECIES

- Length 5.6 mm. or more; male with tuft of pygofer setae exceeding posterior pygofer margin.....*mexicana* (DeLong and Hershberger)
 Length 5.3 mm. or less; male with tuft of pygofer setae not exceeding posterior pygofer margin.....*miranda* (Knull)

DESCRIPTIONS OF THE SPARTOPYGE SPECIES

Spartopyge mexicana (DeLong and Hershberger), new combination

Fleramia mexicana DeLong and Hershberger, Brooklyn Ent. Soc. Bul. 42: 136. 1947.

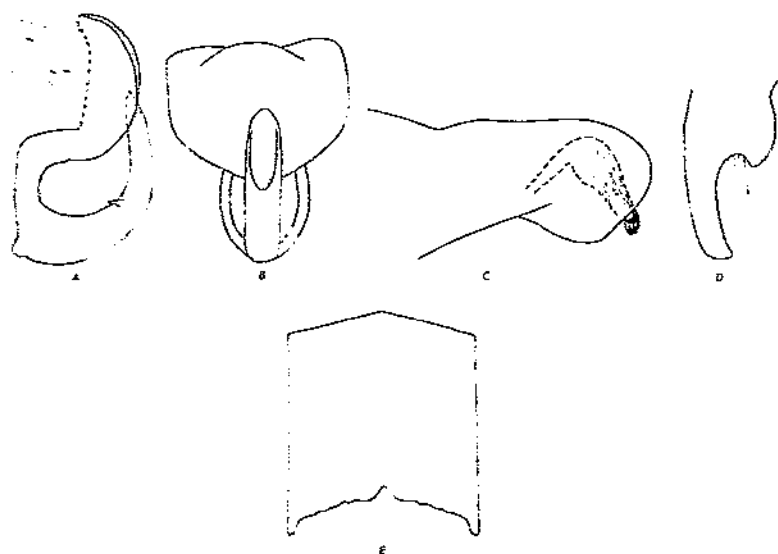


FIGURE 32.—*Spartopyge mexicana* (DeLong and Hershberger): A, Aedeagus, lateral aspect; B, same, caudal aspect; C, pygofer, lateral aspect; D, apex of right style, dorsal aspect; E, seventh sternum of female. (A–D from type, E from paratopotype.)

Length of male 5.6 mm., of female 6.0 mm. Head with median length of crown almost one-half greater than interocular width and approximately seven-tenths transocular width. Hind wing almost as long as forewing, which exceeds abdominal apex. Face ivory, with transverse interocular basal black stripe marked with pale arcs.

Male pygofer with posterior lobe strongly produced posteriorly, rounded apically, with process arising on inner surface of disk near ventral portion of constriction, extending caudodorsad thence caudoventrad beyond caudoventral pygofer margin and appearing in

posterior portion to consist of numerous fine setae. Style apex truncate apically. Aedeagus with shaft gradually tapered in lateral aspect, not exceeding dorsal apodeme, pair of short inconspicuous processes near midlength; gonopore apical on caudoventral surface, rounded basally; dorsal apodeme short, broad, strongly attached to integument of segment X. Male plates exceeding posterior pygofer margin.

Female seventh sternum with hind margin shallowly concave, slightly undulate at each side of median triangular notch, postero-lateral corners produced and rounded, disk with oblique depressed area on each side, leaving midline keeled and hind margin flared.

The male holotype and a female paratype from Iguala, Guerrero, Mexico, have been examined.

Spartopyge miranda (Knull), new combination

Pteramia miranda Knull, Ohio Jour. Sci. 51: 177. 1951.

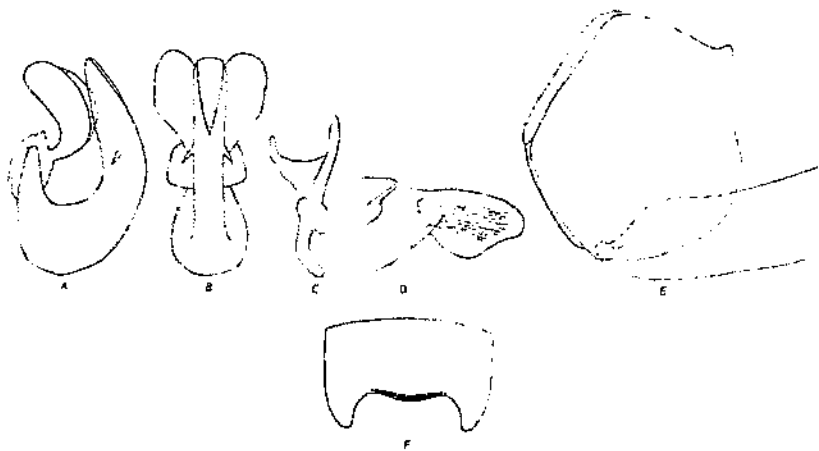


FIGURE 33.—*Spartopyge miranda* (Knull): A, Aedeagus, lateral aspect; B, same, caudal aspect; C, right style, dorsal aspect; D, male pygofer, lateral aspect; E, first valvifer and base of first valvula of female, lateral aspect; F, seventh sternum of female.

Length of male 4.4–4.5 mm., of female 4.8–5.3 mm. Head very strongly produced, with median length of crown approximately two-thirds interocular width and seven-tenths or more transocular width. Hind wing attaining apex of forewings, which exceed apex of abdomen. Pronotum with single short median and three pairs of full-length fuscous vittae, most median pair extending anteriorly onto crown and posteriorly through scutellum onto clavus. Face ivory, except broad interocular fuscous basal line, which contains white arcs.

Male pygofer as in *americana*, but with posterior lobe more strongly produced, with internal tuft of setae more divergent apically and not exceeding pygofer margin. Other male genital characters as in *americana*, but with aedeagal shaft slightly broader in lateral aspect.

Female seventh sternum with hind margin deeply concave, with short broadly convex median projection, which is darkened apically

within concavity; first valvifers of ovipositor with anterior portions heavily sclerotized and extending slinglike across bases of first valvulae; first valvulae not curved dorsad at bases.

The species is known only from Arizona.

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