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the United States (Homoptera: Issidae):
male and female genitalic morphology

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The planthopper genus *Acanalonia* in the United States (Homoptera: Issidae): male and female genitalic morphology

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Abstract: The issid planthopper genus *Acanalonia* is reviewed and a key to the 18 species provided. Detailed descriptions and illustrations of the complete external morphology of *A. conica* (Say), and descriptions and illustrations of the male and female external genitalia of the species of United States *Acanalonia* are given. The principal genitalic features used to separate species included: male - shape and length of the aedeagal caudal and lateral processes, and presence of caudal extensions; female - shape of the 8th abdominal segment and the number of teeth on the gonapophysis of the 8th segment.

Keywords. Homoptera, Fulgoroidea, Issidae, *Acanalonia*, North America.

Introduction

The planthopper genus *Acanalonia* is the only North American representative of the 13 genera of the issid subfamily Acanaloniinae. This New World genus includes 63 species (Caldwell and Martorell 1950; Fennah 1955, 1965; Metcalf 1954a), 18 of which have been recorded from the United States (Metcalf 1954a).

The biology of acanaloniine planthoppers is poorly known and has only been detailed for two species, *A. bivittata* (Say) and *A. conica* (Say) (Wilson and McPherson 1980c, 1981). These species are univoltine, overwinter as eggs inserted in woody tissues by a heavily sclerotized sword-shaped ovipositor, and feed on a wide variety of mostly woody plants (Wilson and McPherson 1980c, 1981). Nymphs of *A. conica* have been found feeding in mixed species assemblages of planthopper nymphs. These assemblages of acanaloniine and flatid nymphs were often surrounded by copious amounts of a waxy substance produced by the nymphs; the wax has been suggested to afford the nymphs with protection from predators (Wilson and McPherson 1980d).

Acanaloniines are generally considered to be of little economic importance, however, nymphs of *A. conica* aggregate in large numbers on stems and

leaves and could reach pest status (Wilson and McPherson 1981). This species has been reported as a pest of ginseng (Wilson and O'Brien 1987). Host plant data were summarized by Wilson *et al.* (1994) for 13 species of *Acanalonia* recorded from 23 species of host plants in 13 families.

Nymphs of *A. bivittata*, *A. conica*, and *A. pumila* (Van Duzee) have been described (Wheeler and Hoebeke 1982, Wilson and McPherson 1981). Information on parasites and parasitoids of *A. bivittata* and *A. conica* was summarized by Wilson and McPherson (1981).

The United States species of *Acanalonia* were revised by Doering (1932). Since her work, additional species have been described, and two of the 16 species she listed have been determined to be synonyms. She described and illustrated the head and salient features of the external morphology of each species, but not the male and female genitalia. Genitalic features are recognized by homopteran systematists as critical for separating species. Using Doering's work as a starting point, we describe and illustrate the complete external morphology of one species, describe and illustrate the male and female external genitalia of the 18 species of United States *Acanalonia*, and provide a key for their identification.

Methods

The following descriptions, illustrations and the construction of the key are based principally on specimens borrowed from the Snow Museum, University of Kansas, which includes extensive material collected by K. C. Doering, R. H. Beamer, and numerous others. Unless otherwise stated, all specimens used in the study are housed at the Snow Museum. A few specimens were loaned by the National Museum of Natural History (NMNH), Smithsonian Institution, Washington, D. C. and a few from S. W. Wilson's planthopper collection, housed at Central Missouri State University, Warrensburg, were used in the study. As Doering (1932) provided a monograph of the United States species in the genus, reference is made to the appropriate pages in her paper for each species; otherwise, only references subsequent to Metcalf's catalogue (1954a) are included with the description of each species. The external morphology of *Acanalonia conica* including head, thorax, legs, wings, abdomen, and external male and female genitalia is described in detail and illustrated. Terminology of the wings is that of Shcherbakov (1981). The salient features of the male and female external genitalia are described and illustrated for each of the remaining 17 species. Scale bars for all illustrations are equal to 1mm.

Genus *Acanalonia* Spinola

Acanalonia Spinola 1839:448.
Acanonia, Amyot and Serville 1843:520.
Amphiscepa, Melichar 1906:215.

The genus was described by Spinola (1839) for his species *A. servillei*. It was treated as the nominate taxon for establishment of the family Acanaloniidae which has been relegated to subfamily status, Acanloniinae, within Issidae (Fennah 1954, Wheeler and Wilson 1987). A complete list of the use of generic synonyms is given in Metcalf (1954a). A detailed generic description was given by Doering (1932).

Distribution of United States *Acanalonia*

bivittata (Say). United States: Eastern, Central, Southeastern; Canada
clypeata Van Duzee. United States: Southwestern
conica (Say). United States: Eastern, Central, Southeastern

concinnulla Fowler. United States: Southeastern, Southwestern; Mexico
fasciata Metcalf. United States: Southwestern
grandicella Doering. United States: Southwestern
hadesensis Caldwell. United States: Southwestern
immaculata Kirkaldy. United States: Southwestern; Mexico
invenusta Doering. United States: Southwestern
laticosta Doering. United States: Southwestern
mollicula Van Duzee. United States: Southwestern
parva Doering. United States: Southwestern
planata Ball. United States: Southwestern
pumila (Van Duzee). United States: Southeastern
saltonia Ball. United States: Southwestern
servillei Spinola. United States: Eastern, Southeastern
similis Doering. United States: Southwestern
virescens Stål. United States: Southeastern, Southwestern; Mexico

Key to the Species of *Acanalonia* of the United States

1. Body green (occasionally rose), with two prominent brown stripes extending posteriorly from behind eye along lateral margins of thorax to inner margins of clavus 2
 Body green, without brown stripes 4
2. Length from vertex to apex of forewings greater than 6.5 mm; reticulation prominent over entire forewing; male aedeagal caudal process slightly widened in distal 1/3, abruptly narrowing to acute apex, short acute extension where process narrows; lateral process subcylindrical; dorsal expansion with small teeth on dorsal aspect; female gonapophysis of 8th segment with 6 teeth; in ventral view, 8th segment with 2 subtriangular processes on either side of midline (Fig. 5) *bivittata* (Say)
 Length from vertex to apex of forewings less than 6.5 mm; reticulation not prominent over entire forewing; male aedeagal caudal process with extension longer, extending beyond apex of process; lateral process not subcylindrical; dorsal expansion without teeth; female gonapophysis of 8th segment with 7 or 8 teeth. 3
3. Male aedeagal caudal process with elongate slender acute extension arising where process narrows and extending slightly beyond apex; lateral process constricted then expanded in middle; female gonapophysis of 8th segment with 8 teeth; in ventral view, 8th segment widest along outer margins, gradually narrowing to 0.5X outer width at midline (Fig. 6)
 *fasciata* Metcalf
 Male aedeagal caudal process with elongate slender extension arising anterior to where process

- narrows and extending well beyond apex; lateral process gradually narrowing to acute apex; female gonapophysis of 8th segment with 7 teeth; in ventral view, 8th segment subrectangular laterally; shallowly concave at midline (Fig. 7) *concinnula* Fowler
4. Length from vertex to apex of forewings 7 mm or greater 5
 Length from vertex to apex of forewings less than 7 mm. 11
5. Length from vertex to apex of forewings greater than 9 mm; prominent median carina extending from vertex onto pronotum and mesonotum; male aedeagal caudal process truncate, short irregular extension in posterior 1/3; lateral process short; dorsal expansion spinose in posteroventral 1/2; in ventral view, female 8th segment gradually narrowing towards midline, slightly convex at midline (Fig. 8)
 *servillei* Spinola
 Length from vertex to apex of forewings less than 9 mm; without a prominent continuous median carina on vertex, pronotum and mesonotum; genitalia not as above 6
6. In dorsal view, vertex conically or broadly triangularly produced beyond eyes 7
 In dorsal view, vertex truncate or broadly rounded, not greatly produced beyond eyes 9
7. Vertex greatly produced conically; ventral aspect of forewings rounded; male posterodorsal aspect of aedeagus with teeth; aedeagal caudal process elongate, subcylindrical, acute; lateral process slender, saber-shaped; female gonapophysis of 8th segment with 8 teeth; in ventral view, 8th segment subtriangular laterally, narrowing towards midline, with a slender elongate process at midline (Figs. 1-4)
 *conica* (Say)
 Vertex broadly triangular, not greatly produced conically; ventral aspect of forewings subrectangular; genitalia not as above 8
8. Male aedeagal caudal process with dorsal row of teeth, slightly widening distally before sharply narrowing to acute apex, short acute extension arising anterior to apex of caudal process; female gonapophysis of 8th segment with 8 teeth; in ventral view, 8th segment subrectangular, slightly concave at midline (Fig. 9)
 *clypeata* Van Duzee
 Male aedeagal caudal process with ventral row of 5 teeth, subcylindrical until narrowing at apex, acute; slender acute extension arising anterior to and extending beyond apex; female gonapophysis of 8th segment with 7 teeth; in ventral view, 8th segment subrectangular, ventral aspect irregular, slightly concave at midline (Fig. 10) *saltonia* Ball
9. Postclypeus large and tumid; male aedeagal caudal process slightly widening distally before narrowing to acute apex, long slender acute extension extending well beyond apex; lateral process elongate, slender, acute; posterodorsal aspect of dorsal expansion with teeth; female gonapophysis of 8th segment with 9 teeth; in ventral view 8th segment subrectangular, narrowing towards midline, with a wide short process at midline (Fig. 11)
 *grandicella* Doering
 Postclypeus not tumid; genitalia not as above
 10
10. Vertex truncate in dorsal view; male aedeagal caudal process subcylindrical acute, short acute extension in posterodorsal aspect; lateral process short, base bulbous, acute; posterior aspect of dorsal expansion expanded, small teeth on dorsal aspect; in ventral view, female 8th segment widest laterally, with a short, rounded process at midline (Fig. 12) *virescens* Stål
 Vertex broadly rounded in dorsal view; male aedeagal caudal process truncate, short extension in posterior 1/2; lateral process slender, acute; dorsal expansion elongate, acute, without teeth, spinose; in ventral view, female 8th segment subrectangular, slightly concave at midline, slightly convex on either side of midline (Fig. 13) *immaculata* Kirkaldy
11. Vertex broadly triangular and produced beyond eyes in dorsal view; male aedeagal caudal process widening in distal 1/2 before narrowing to apex, slender acute extension arising anterior to apex; lateral process elongate, slender, convex dorsally, concave ventrally, acute; dorsal expansion with a dorsal row of small teeth, posterodorsally spinose; female gonapophysis of 8th segment with 8 teeth; in ventral view, 8th segment slightly constricted at midline (Fig. 14)
 *mollicula* Van Duzee
 Vertex truncate or broadly rounded, usually not produced much beyond eyes in dorsal view; genitalia not as above 12
12. Vertex sloping and rounded in dorsal view 13
 Vertex flat and mostly truncate in dorsal view ..
 15
13. Length from vertex to apex of forewings greater than 4 mm; forewings subrectangular; male aedeagal caudal process elongate, subcylindrical, gradually narrowing to acute apex; lateral process with base expanded, narrowing to acute

- apex; dorsal expansion large, suboval; female gonapophysis of 8th segment with 8 teeth; in ventral view 8th segment sharply constricted on either side of midline, with an elongate, forked process at midline (Fig. 15)
 *similis* Doering
 Length from vertex to apex of forewings less than 4 mm; forewings much more rounded, nearly hemispherical; genitalia not as above 14
14. Male styles length ca. 0.5X that of pygofer in lateral view; aedeagal caudal process short, length less than 0.5X that of aedeagus, anterior aspect expanded, narrowing to acute apex; lateral process convex ventrally, acute; dorsal expansion elongate, expanded posteriorly, spinose; in ventral view, female 8th segment slightly convex ventrally, gradually narrowing to midline, short wide forked process at midline (Fig. 16) *invenusta* Doering
 Male styles subequal in length to that of pygofer in lateral view; aedeagal caudal process elongate, subcylindrical, 2X length of aedeagus, with short slender acute extension in distal 1/3; lateral process slender, concave and curved ventrally; dorsal expansion subcircular; in ventral view, female 8th segment narrow, slightly convex at midline (Fig. 17) *pumila* (Van Duzee)
15. Forewing subrectangular, venation strongly reticulate; male aedeagal caudal process subcylindrical, gradually narrowing to acute apex, short acute extension arising from posterodorsal aspect; lateral process short, base bulbous, narrowing sharply to apex; posterior aspect of dorsal expansion expanded, small teeth on dorsal aspect (Fig. 18) *planata* Ball
 Forewing hemispherical, venation weakly reticulate, especially apically; genitalia not as above 16
16. Male styles length ca. 0.75X that of pygofer in lateral view; in lateral view, pygofer with length of ventral aspect much greater than dorsal aspect; aedeagal caudal process subcylindrical, acute; lateral process length ca. 0.3X that of caudal process, saber-shaped, acute; in ventral view, female 8th segment subrectangular, narrowing towards midline, concave at midline (Fig. 19) *parva* Doering
 Male styles length ca. 0.5X that of pygofer, in lateral view; in lateral view, pygofer with length of ventral and dorsal aspects subequal; aedeagal lateral process length ca. 0.5X or more that of caudal process; in ventral view, female 8th segment with a short process at the midline or, if concave at midline, then not as deeply concave 17
17. Male aedeagal caudal process narrowing in distal 1/2 to acute apex; lateral process with base slightly bulbous, narrowing to acute apex, slightly concave in ventral aspect, extending mainly posteriorly; in ventral view, female 8th segment with short rounded process at midline (Fig. 20) *laticosta* Doering
 Male aedeagal caudal process narrowing along its length to acute apex; lateral process elongate, acute, extending posterodorsally; in ventral view, female 8th segment concave at midline (Fig. 21) *hadesensis* Caldwell

Morphological descriptions of the *Acanalonia* species of the United States

Acanalonia conica (Say)

Figs. 1-4

Acanalonia conica (Say); Doering 1932:768, 784-786; Metcalf 1954a:21-23; Stephan 1975:122, 128, 134, 138; Wilson and McPherson 1980a:16, 1980b:29, 1980c:21-27, 1980d:185-186.

Description. Form elongate, laterally compressed; fore wings subrectangular; green (in life).

Head: Head conically produced anteriorly. In dorsal view, vertex flat, pentagonal; anterior aspect curves onto frons where it forms a conical projection; carina, interior to outer margin, extends posteriorly from tip of vertex along both sides to base of vertex where it connects in a tectiform shape. Lateral carina extends anteriorly on each side from base of vertex along outer margin of frons. Frons slightly wider than long; bordered laterally by outwardly convex carina; frontoclypeal suture divides frons from clypeus. Clypeus elongate; length twice that of width, widest in dorsal 1/3; anteclypeus length ca. 0.3X that of postclypeus, separated from it by a weak transclypeal suture, more prominent from lateral view of head; anteclypeus longer than wide. Labrum small, circular in shape. Beak 3 segmented, with brown tip; segment 1 short and partially hidden by anteclypeus; segment 2 length ca. 1.5X that of segment 3; beak extends posteriorly to metacoxae. Gena with ocellus in dorsal 1/3. Eyes red, with ventral ridge. Antennae 3 segmented; cylindrical scape length ca. 0.3X that of subcylindrical pedicel; slender flagellum length ca. 4X that of pedicel, extends from center of pedicel, bulbous base of flagellum length ca. 0.5X that of scape.

Pronotum collar-like, extending laterally, posteroventral to compound eye. Dorsal carina ex-

tends along margin of pronotum. Weak median longitudinal groove extending from below apex to posterior aspect; semicircular indentation present on either side of median groove. In dorsal view, mesonotum subtriangular; brown, oval indentation present in basal 1/2 of mesonotum near lateral margin on each side; small subtriangular scutellum separated from mesonotum by v-shaped suture. Metanotum obscured by overlapping mesonotum and wings. Forewings thick, parchment like, tectiform, subrectangular with rounded corners; each covered at base by pad-like tegula; venation prominent, reticulate; costal vein slightly reflexed at base. Hind wings membranous, translucent; main portion of M elongate, forking in posterior 1/3 of wing; Cu veins with a short main trunk, separating early anteriorly; Cu1 highly branched in posterior 1/2; base of anal veins close together, main trunk of PCu and 1A close and parallel, 2A forking near posterior margin of wing. Pro- and mesocoxae subcylindrical; metacoxae wider, subquadrate. Mesocoxae closer to procoxae than to metacoxae. Pro- and mesotrochanters small, subcylindrical; metatrochanters flatter, subcylindrical. Femora slightly flattened laterally, dorsal aspect convex, ventral aspect slightly concave with lateral margins carinate; dorsal and ventral surfaces covered with setae. Tibiae length ca. 2X that of femora, subcylindrical, dorsal aspect slightly concave with lateral margins carinate, ventral aspect slightly convex, bearing setae. Metatibia with apical transverse row of 7 brown tipped spines. Tarsi each with 3 tarsomeres covered with setae; pro- and mesotarsomeres 1 and 2 small and wedge shaped; tarsomere 3 subcylindrical, curved, longer than 1 and 2 combined; pair of brown apical claws and a median pulvillus. Metatarsomere 1 with an apical transverse row of 7 brown tipped spines, metatarsomere 2 with 2 lateral brown tipped spines; tarsomere 3 subcylindrical, curved, longer than 1 and 2 combined, with pair of brown apical claws and median pulvillus.

In lateral view, abdomen elongate, subcylindrical, consisting of 11 segments. Tergite and sternites 1-8 subrectangular, elongate dorsoventrally; male pygofer (9th tergite) elongate, subrectangular; anal tube (10th tergite) elongate, subcylindrical, narrowing beyond juncture with style; anal style (11th tergite); styles subtriangular; female 9th tergite reduced, subrectangular, dorsal to valvifer of 8th segment; anal tube (10th tergite) elongate, subcylindrical, narrowing beyond juncture with style; anal style (11th tergite); valvifer of

8th segment large, subrectangular; lateral gonapophysis of 9th segment large, subrectangular, rounded posteriorly.

Male genitalia: In lateral view, pygofer subrectangular; height ca. 0.75X that of abdomen; convex anteriorly, concave dorsally and posteriorly. In caudal view, pygofer U-shaped. In ventral view, pygofer subrectangular, slightly convex laterally. In lateral view, anal tube elongate, subcylindrical, narrowing beyond juncture with anal style. Anal valve and anal style subcylindrical, valve slightly smaller. In dorsal view, anal tube subtriangular, rounded posteriorly; anal valve subrectangular, wider than long; anal style subcylindrical, width ca. 0.3X that of valve. In lateral view, paired styles subtriangular, length ca. 0.5X that of pygofer, rounded posteriorly, with curved hook-like spines dorsally. Connective consisting of four parts: 1) anterodorsal tectiform body with ridge ventral to connective arm and base of tectiductus, ventrally directed, subrectangular, concave anteriorly; connective (*sensus stricto*) composed of: 2) connective arm dorsal to tectiform body, small, surrounding ventral aspect of tectiductus in anterior 1/3; 3) connective body elongate, subcylindrical, connected anteriorly to connective arm, extending posteroventrally towards juncture of pygofer and style, acute; 4) ventral support of the connective acute, slightly anteriorly curved. Tectiductus extending posterodorsally from dorsal aspect of tectiform structure of the connective to posterodorsal aspect of suspensorium. Dorsal aspect of diaphragm connected to pygofer, surrounding aedeagus in anterior 1/4. Suspensorium connected to diaphragm at base. Ligamentary process suboval, anterior to and connected to aedeagus. Aedeagus connected basally to ligamentary process; elongate, subcylindrical, dorsal aspect concave in anterior 1/2, dorsal aspect with teeth in posterior 1/3, forked at juncture with dorsal expansion into paired caudal processes; each caudal process extending posteriorly towards apex of style then recurved ventrally; elongate, subcylindrical, acute, length ca. subequal to that of aedeagus; paired lateral processes with each process arising lateral to aedeagus just anterior to base of caudal processes; slender, acute, length ca. 0.5X that of caudal process, saber-shaped, extending posterodorsally. Dorsal expansion arising from center portion of aedeagus, dorsal to caudal and lateral processes, suboval and forked posteriorly. In dorsal view, aedeagus subcylindrical, row of teeth in posterior 1/3 on lateral aspect; forked in poste-

rior 1/4 to form elongate caudal processes; posterior 1/2 of lateral processes extend posteriorly, overlap at tips; dorsal expansion arising anteriorly from middle of aedeagus, suboval, dorsomedian aspect slightly indented. In ventral view, aedeagus subcylindrical; caudal processes arising posteriorly and extending anteriorly; lateral processes arising from posterolateral 1/4 of aedeagus, slender, acute, extending posteriorly, overlapping at tips.

Female genitalia: In lateral view, 9th tergite small, subrectangular. Anal tube elongate, subcylindrical, narrowing beyond juncture with anal style. Anal valve and anal style subcylindrical, valve slightly smaller. Valvifer of 8th segment paired; large, length ca. 2X that of 9th tergite; subrectangular; with small, oval, brown mark on posterodorsal aspect; dorsal aspect covering small portion of 9th tergite in middle. Gonangulum paired, subtriangular, length ca. 0.7X that of valvifer of 8th segment, widest dorsally narrowing ventrally; ventral to 9th tergite and separated from it by a longitudinal suture; almost completely covered by valvifer of 8th segment; connected ventrally to gonapophysis of 8th segment. Valvifer of 9th segment paired, reduced, slender, subcylindrical; extending from posteroventral aspect of 9th tergite to ventral aspect of gonangulum. Lateral gonapophysis of 9th segment paired; large, length ca. 2X that of valvifer of 8th segment; subtriangular; dorsal aspect concave; broadly rounded posteriorly. Median gonapophysis of 9th segment small, slender, positioned horizontally and dorsal to gonapophysis of 8th segment, paired and fused anteriorly where connected to valvifer of 9th segment and extending posteriorly. Gonapophysis of 8th segment paired, aligned closely and parallel to one another, heavily sclerotized, slender, elongate, slightly convex ventrally, narrowing posteriorly; dorsal row of 8 blunt teeth in posterior 1/2. Ventral lobe ventral to gonapophysis of 8th segment, paired, convex on ventral aspect, each connected anteriorly to gonapophysis of 8th segment. In ventral view, 8th segment subtriangular laterally; narrowing towards midline; with a slender, elongate process at midline.

Comparative Notes: Distinguished from all other species by the distinct conically produced vertex, shape of the male pygofer, and the elongate lobe-like process in the middle of the 8th abdominal sternite of the female.

Specimens examined. Distribution records for the specimens used in this study are: Missouri: Jackson Co., Johnson Co.; Oklahoma: Marshall Co.; Illinois: Alexander Co., Jackson Co. Descriptions and illustrations were based on 9 specimens; 45 total specimens were examined; 26 May - 6 December. Specimens are located in the collection of S. W. Wilson (WILSON) at Central Missouri State University.

Distribution. United States: Arkansas, Alabama, Delaware, Florida, Georgia, Iowa, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maryland, Missouri, Mississippi, Nebraska, North Carolina, Ohio, Oklahoma, Tennessee, Texas, Virginia. Records are from Doering (1932), Metcalf (1954a), and Wilson (unpubl. data).

Acanalonia bivittata (Say)

Fig. 5, Table 1

Acanalonia bivittata (Say); Doering 1932:766-768, 783, 785-786; Metcalf 1954a:11-17; Wilson and McPherson 1980a:16, 1980b:29, 1980c:22, 24, 26-27, 1980d:185-186.

Description: Male genitalia: In lateral view, pygofer subtriangular; height ca. 0.5X that of abdomen; longest along ventral aspect. In caudal view, pygofer slanting outwards dorsolaterally. In lateral view, styles larger than pygofer. Tectiform body of connective posteroventrally directed, subrectangular, slightly wider in ventral aspect; connective (s. s.) with connective arm surrounding ventral aspect of tectiductus in anterior 1/4; ventral support of the connective small. Dorsal aspect of diaphragm surrounding aedeagus in anterior 1/3. Ligamentary process surrounding ventral aspect of tectiductus in middle. Aedeagus with each caudal process slightly widened in basal 1/3, ventral aspect convex, abruptly narrowing to acute apex, short acute extension where process narrows, length ca. 3X that of aedeagus. Dorsal expansion elongate, widened in posterior 1/3, with small sharp teeth on dorsal aspect.

Female genitalia: In lateral view, 9th tergite with anterior aspect obscured by 8th tergite. Valvifer of 8th segment large, length ca. 3X that of 9th tergite. Gonangulum length ca. 0.5X that of valvifer of 8th segment. Gonapophysis of 8th segment with dorsal row of 6 blunt teeth in posterior 2/3. In ventral view, 8th segment subrectangular lateral-

ly, with two subtriangular processes, one on each side of midline.

Comparative Notes: This species is similar to *A. fasciata* and *A. concinnula*. Specimens of *A. bivittata* can be separated from these by its larger size and prominent reticulation over the entire forewing. Male aedeagal caudal and lateral processes are very different in size and shape, and teeth are lacking on the dorsal expansion in *A. fasciata* and *A. concinnula*. Females of *A. bivittata* have fewer teeth on the gonapophysis of the 8th segment, and the ventral view of the 8th segment is strikingly different from that of the other two species.

Specimens examined: Distribution records for the specimens used in this study are: Missouri: Lafayette Co., Johnson Co.; Illinois: Alexander Co. Descriptions and illustrations were based on 6 specimens; 72 total specimens were examined; 3 July - 1 November. Specimens are located in the collection of S. W. Wilson (WILSON) at Central Missouri State University .

Distribution: Canada: Ontario; Mexico: Coahuila, Morelos, Sinaloa; United States: Arkansas, Alabama, Arizona, Connecticut, DC, Florida, Georgia, Iowa, Illinois, Indiana, Kansas, Kentucky, Louisiana, Massachusetts, Maine, Maryland, Michigan, Minnesota, Missouri, Mississippi, North Carolina, New Jersey, New York, Ohio, Pennsylvania, South Carolina, Texas, Virginia, Wisconsin, West Virginia. Records are from Doering (1932), Metcalf (1954a), and Wilson and McPherson (1980a).

Acanalonia fasciata Metcalf

Fig. 6

Acanalonia fasciata Metcalf; Doering 1932:765-766, 783, 785-786; Metcalf 1954a:24-25.

Description: Male genitalia: In lateral view, pygofer longest along ventral aspect, dorsal aspect broadly rounded. In lateral view, styles length ca. 1.25X that of pygofer.

Tectiform body of connective anteroventrally directed, subtriangular, rounded in ventral aspect; connective (*s. s.*) with connective arm surrounding ventral aspect of tectiductus in anterior 1/2. Dorsal aspect of diaphragm surrounding aedeagus in anterior 1/3. Ligamentary process surrounding ventral aspect of tectiductus in middle. Aedeagus with each caudal process slightly widened in posterior 1/

3, narrowing sharply to acute apex, long slender acute extension where process narrows, length ca. 2X that of aedeagus; each lateral process elongate, anterior 1/4 bulbous, constricted then expanded in middle, gradually narrowing to acute apex, slightly convex dorsally, ventral aspect irregular in middle, length ca. 0.5X that of caudal process, extending posterodorsally. Dorsal expansion elongate, subcylindrical.

Female genitalia: Valvifer of 8th segment large, length ca. 3X that of 9th tergite. Gonangulum length ca. 0.5X that of valvifer of 8th segment. Lateral gonapophysis of 9th segment subrectangular. Gonapophysis of 8th segment with dorsal row of 8 blunt teeth, 5 posterior most teeth close together, remaining 3 spaced further apart. In ventral view, 8th segment widest along outer margins, gradually narrowing to 0.5X width at midline.

Comparative Notes: This species is similar to *A. bivittata* and *A. concinnula*. It can be separated from *A. bivittata* with relative ease (see comparative notes for *A. bivittata*). It is more similar to and difficult to differentiate from *A. concinnula*, but there are several good distinguishing characters — the difference in the caudal processes where they narrow to the apex, this distal narrowing is much sharper in *A. fasciata*; the extension arising from the caudal processes is much longer in *A. concinnula*; male styles are more elongate in *A. fasciata*; females of *A. fasciata* have 8 teeth on the gonapophysis of the 8th segment versus 7 teeth in *A. concinnula*; and, in ventral view, the 8th segment is more greatly narrowed toward the midline in *A. fasciata*.

Specimens examined: Distribution records for the specimens used in this study are: Arizona: Huachuca Mountains, Santa Rita Mountains, Faraway Ranch. Descriptions and illustrations were based on 3 specimens; 48 total specimens were examined; 22 July - 24 August.

Distribution: United States: Arizona, Texas, Utah. Records are from Doering (1932) and Metcalf (1954a).

Acanalonia concinnula Fowler

Fig. 7

Acanalonia concinnula Fowler; Ball 1933:150; Doering 1932:781-782, 784-786; Metcalf 1954a:20-21; Wilson and McPherson 1980a:16.

Description: Male genitalia: In lateral view, pygofer subtriangular; height ca. 0.5X that of abdomen; longest along ventral aspect. In lateral view, styles subrectangular, length ca. 1.25X that of pygofer. Connective (s. s.) with connective arm surrounding ventral aspect of tectiductus in anterior 1/4. Dorsal aspect of diaphragm surrounding aedeagus in anterior 1/3. Aedeagus with each caudal process slightly widened in basal 1/3, ventral aspect convex, abruptly narrowing to acute apex, long slender extension arising anterior to and extending beyond apex, length ca. 2X that of aedeagus; each lateral process with base bulbous, convex dorsally, concave ventrally, gradually narrowing to acute apex, length ca. 0.5X that of caudal process, extending posteroventrally. Dorsal expansion elongate, subcylindrical, small indentation in posterodorsal 1/4.

Female genitalia: In lateral view, 9th tergite with anterior aspect obscured by 8th tergite. Valvifer of 8th segment large, length ca. 2.3X that of 9th tergite. Gonangulum length ca. 0.5X that of valvifer of 8th segment. Lateral gonapophysis of 9th segment subrectangular. Gonapophysis of 8th segment with dorsal row of 7 blunt teeth in posterior 2/3. In ventral view, 8th segment subrectangular laterally; shallowly concave at midline.

Comparative Notes: This species is similar to *A. bivittata* and *A. fasciata* (see comparative notes for these species).

Specimens examined: Distribution records for the specimens used in this study are: Arizona: Yarnell Co., Yavapai Co. Descriptions and illustrations were based on 2 specimens, 47 total specimens were examined; 27 July - 22 October.

Distribution: Mexico: Guerrero, Jalisco; United States: Florida, Texas. Records are from Ball (1933), Metcalf (1954a) and Wilson and McPherson (1980a).

Acanalonia servillei Spinola

Fig. 8

- Acanalonia servillei* Spinola 1839:448.
Poeciloptera latifrons Walker 1851:457. Synonymy in Metcalf 1954a:27; Fennah 1971:334.
Poeciloptera robusta Walker 1851:449. Synonymy in Metcalf 1954a:31.
Poeciloptera quadrata Walker 1851:460. Synonymy in Metcalf 1954a:31.

Poeciloptera complanata Walker 1851:461. Synonymy in Fennah 1971:334.

Poeciloptera lata Walker 1851:462. Synonymy in Metcalf 1954a:31.

Acanalonia latifrons Stål 1862:491. Synonymy in Metcalf 1954a:27; Fennah 1971:334.

Doering 1932:764-765, 783, 785-786; Fennah 1971:334-335; Metcalf 1954a:27-28, 31-33; Metcalf 1954b:17-18; Metcalf and Bruner 1930:407-408, 424; Spooner 1938:52-53, 58-61; Wilson and McPherson 1980a:17.

There has been much confusion as to the status of *A. latifrons*. Metcalf and Bruner (1930) treated *A. servillei* and *A. latifrons* as separate species but used specimens from Cuba, rather than Pennsylvania, the type locality of *A. servillei*. Doering (1932) used a specimen from Cuba in describing and illustrating *A. servillei* (Fennah 1971). Ball (1933) examined specimens from Pennsylvania and Florida and concluded that *A. latifrons* was a [junior] synonym of *A. servillei*. Metcalf (1954a) discounted that conclusion in his catalogue. Fennah (1971) examined the holotype of *A. latifrons* and determined that it corresponded to Spinola's concept of *A. servillei*. Fennah (1971) also implied that *A. servillei* is restricted to the United States and illustrated the male genitalia; his illustration of the male genitalia matches specimens we examined from Georgia and Florida.

Description: Male genitalia: In lateral view, pygofer subtriangular; height ca. 0.5X that of abdomen. In lateral view, styles subrectangular, length ca. 0.75X that of pygofer. Tectiform body of connective anteroventrally directed, with irregular lateral margins; connective (s. s.) with connective arm surrounding ventral aspect of tectiductus in anterior 1/4; ventral support of connective slender. Dorsal aspect of diaphragm surrounding aedeagus in anterior 1/3. Aedeagus with truncate, short irregular extension in posterior 1/3, length of each caudal process ca. 2X that of aedeagus; each lateral process length ca. 0.25X that of caudal process. Dorsal expansion elongate, expanded posteriorly, concave on dorsal aspect, convex on ventral aspect, rounded posteriorly, spinose in posteroventral 1/2.

Female genitalia: Valvifer of 8th segment large, length ca. 4X that of 9th tergite. Lateral gonapophysis of 9th segment large, length ca. 1.5X that of valvifer of 8th segment; subrectangular. Gonapophysis of 8th segment with dorsal row of 3

shallow, rounded teeth in posterior 1/2 (all other specimens examined had 7 teeth; 3 teeth may have resulted from wear during oviposition). In ventral view, 8th segment subrectangular laterally; gradually narrowing towards midline; slightly convex at midline.

Comparative Notes: Easily distinguished from other species by the presence of a median carina extending from the vertex onto the pronotum and mesonotum.

Specimens examined: Distribution records for the specimens used in this study are: Georgia: Okefenokee Swamp; Florida: Fort Meade, Coconut Grove. Descriptions and illustrations were based on 4 specimens, 24 total specimens were examined; 17 June - September 3.

Distribution: United States: Florida, Georgia, Louisiana, Mississippi, North Carolina, New York, Pennsylvania, South Carolina. Records are from Doering (1932), Metcalf (1954a), Metcalf and Bruner (1930), and Wilson and McPherson (1980a). Records in Metcalf (1954a), and Metcalf and Bruner (1930) from the Bahama Islands; Brazil, Cuba, Haiti; Jamaica, and St. Vincent, are suspect (see above).

Acanalonia clypeata Van Duzee

Fig. 9

Acanalonia clypeata Van Duzee; Doering 1932:769-770, 784-786; Metcalf 1954a:19-20.

Description: Male genitalia: In lateral view, pygofer height ca. 0.5X that of abdomen, longest along ventral aspect. In lateral view, styles length ca. 0.75X that of pygofer. Connective (*s. s.*) with connective arm surrounding ventral aspect of tectiductus in anterior 1/2; ventral support of connective slender. Dorsal aspect of diaphragm surrounding aedeagus in anterior 1/3. Aedeagus with each caudal process bearing dorsal row of small sharp teeth in anterior 1/2, slightly widening distally before sharply narrowing to acute apex, short acute extension arising anterior to apex, length ca. 2.25X that of aedeagus. Dorsal expansion with posterior 1/2 expanded, suboval, spinose.

Female genitalia: In lateral view, 9th tergite with anterior aspect obscured by 8th tergite. Lateral gonapophysis of 9th segment large, length ca. 1.5X that of valvifer of 8th segment; subrectangu-

lar. In ventral view, 8th segment subrectangular; slightly concave at midline.

Comparative Notes: Similar to *A. saltonia*, but males separated from it by the broader apex of the style, differently shaped caudal process, and a shorter caudal process extension. Females differ in the shape of the 8th abdominal segment, gonapophysis of 8th segment with 8 teeth in *A. clypeata* and 7 in *A. saltonia*. Habitus similar to that of *A. grandicella*, but distinguished from it by the lack of teeth on the male aedeagal caudal process, long extension from the caudal process, and the presence of teeth on the dorsal aspect of the dorsal expansion. *A. clypeata* females differ from *A. saltonia* in the shape of the 8th abdominal segment, and from *A. grandicella* which have 9 teeth on the gonapophysis of the 8th segment. *A. clypeata* females differ from *A. mollicula* in the truncate ventral aspect of the forewing rather than broadly rounded as in *A. mollicula*; male aedeagal caudal process of *A. mollicula* lacks teeth.

Specimens examined: Distribution records for the specimens used in this study are: Arizona: Congress Junction, Miami. Descriptions and illustrations were based on 4 specimens, 7 total specimens were examined; 22 July - 16 August.

Distribution: United States: Arizona, California, Nevada, Utah. Records are from Doering (1932) and Metcalf (1954a).

Acanalonia saltonia Ball

Fig. 10

Acanalonia saltonia Ball 1933:149; Metcalf 1954a:31.

Description: Male genitalia: In lateral view, pygofer height ca. 0.5X that of abdomen; widest in ventral aspect; narrowing anteriorly. In lateral view, styles subrectangular, length ca. 0.75X that of pygofer, narrowing posteriorly, convex in ventral aspect. Tectiform body of connective widest ventrally; connective (*s. s.*) with connective arm surrounding ventral aspect of tectiductus in anterior 1/4. Dorsal aspect of diaphragm surrounding aedeagus in anterior 1/2. Aedeagus with each caudal process bearing 5 small teeth on ventrolateral aspect in anterior 1/2, acute, slender acute extension arising slightly anterior to apex and extending beyond apex; length ca. 2.75X that of aedeagus; each lateral process elongate, convex dorsally, con-

cave ventrally. Dorsal expansion elongate, expanded posteriorly, dorsal aspect with fine teeth.

Female genitalia: Valvifer of 8th segment large, length ca. 3X that of 9th tergite. Gongangulum length ca. 0.3X that of valvifer of 8th segment. Lateral gonapophysis of 9th segment large, length ca. 1.5X that of valvifer of 8th segment; dorsal aspect slightly concave; narrowing posteriorly. Gonapophysis of 8th segment with dorsal row of 7 teeth in posterior 2/3. In ventral view, 8th segment subrectangular, ventral aspect irregular, slightly concave at midline.

Comparative Notes: Similar to *A. clypeata* (see comparative notes for *A. clypeata*).

Specimens examined: Distribution records for the specimens used in this study are: Arizona: Yuma; California: Imperial. Holotype (female), California: Imperial, coll. Eastern D. Ball, 18 June 1909; located in the E. D. Ball collection, NMNH, Smithsonian Institution, Washington D. C. Descriptions and illustrations were based on 2 specimens, 36 total specimens were examined; 18 June - 14 August. Specimens located at the NMNH.

Distribution: United States: Arizona, California. Records are from Metcalf (1954a), and specimens from the E. D. Ball collection, NMNH.

Acanalonia grandicella Doering

Fig. 11

Acanalonia grandicella Doering 1932:771-772, 784-786; Metcalf 1954a:25.

Description: Male genitalia: In lateral view, pygofer height ca. 0.5X that of abdomen; longest along ventral aspect. In lateral view, styles subrectangular, length ca. 1.25X that of pygofer, concave in posteroventral aspect. Tectiform body of connective widest ventrally, slightly convex posteriorly; connective (*s. s.*) with connective arm surrounding ventral aspect of tectiductus in anterior 1/4. Dorsal aspect of diaphragm surrounding aedeagus in anterior 1/3. Aedeagus with each caudal process enlarged in posterior 1/4, narrowing to acute apex, long slender acute extension arising from enlarged portion, length ca. 3X that of aedeagus; each lateral process elongate, convex dorsally, concave ventrally. Dorsal expansion with large teeth on dorsal aspect in posterior 1/2, spinose.

Female genitalia: Valvifer of 8th segment large, length ca. 3X that of 9th tergite. Gongangulum length ca. 0.5X that of valvifer of 8th segment, widest dorsally, narrowing ventrally. Lateral gonapophysis of 9th segment large, length ca. 1.5X that of valvifer of 8th segment; subrectangular. Gonapophysis of 8th segment with dorsal row of 9 blunt teeth in posterior 1/2. In ventral view, 8th segment subrectangular; convex ventrolaterally, narrowed to midline; with a wide, short process at midline.

Comparative Notes: Habitus similar to that of *A. clypeata* (see comparative notes for *A. clypeata*).

Specimens examined: Distribution records for the specimens used in this study are: Arizona: Maricopa Co., Yavapai Co.; Paratype (female), Arizona: Yavapai Co., coll. L. D. A., 1 July 1930; Paratype (male), Arizona: Maricopa Co., coll. R. H. Beamer, 1 July 1929; located at the Snow Entomological Museum, University of Kansas, Lawrence. Descriptions and illustrations were based on 2 specimens, 4 total specimens were examined; 26 June - 1 July.

Distribution: United States: Arizona, California. Records are from Doering (1932) and Metcalf (1954a).

Acanalonia virescens Stål

Fig. 12

Acanalonia virescens Stål; Ball 1933:145-150; Doering 1932:773-774, 784-786; Metcalf 1954a:37-38; Wilson and McPherson 1980a:17.

Description: Male genitalia: In lateral view, pygofer height ca. 0.5X that of abdomen; widest in ventral aspect, convex; concave anteriorly. In caudal view, pygofer narrowing along dorsolateral aspect. Connective (*s. s.*) with connective arm small, surrounding ventral aspect of tectiductus in anterior 1/4. Dorsal aspect of diaphragm surrounding aedeagus in anterior 1/3. Aedeagus with each caudal process bearing short acute extension in posterodorsal aspect; length ca. 1.7X that of aedeagus; each lateral process short, base bulbous, length ca. 0.2X that of caudal process. Dorsal expansion with posterior aspect expanded, dorsal aspect with fine teeth.

Female genitalia: Valvifer of 8th segment large, length ca. 3X that of 9th tergite. Gongangu-

lum length ca. 0.3X that of valvifer of 8th segment. Lateral gonapophysis of 9th segment large, length ca. subequal to that of valvifer of 8th segment. Gonapophysis of 8th segment with dorsal row of 7 blunt teeth in posterior 1/2. In ventral view, 8th segment subrectangular, widest laterally; concave on either side of midline; with a short, rounded process at midline.

Comparative Notes: Habitus similar to that of *A. immaculata*, but male genitalia distinctly different, and females easily separated by shape of 8th abdominal segment. Male genitalia similar to that of *A. planata*; slight differences in aedeagal caudal processes, caudal process extension, and lateral processes, as well as differences in the shapes of the pygofer and styles.

Specimens examined: Distribution records for the specimens used in this study are: Texas: Cameron Co., Hidalgo Co., Brownsville. Descriptions and illustrations were based on 4 specimens, 13 total specimens were examined; 28 July - 29 August.

Distribution: Costa Rica; Guatemala; Mexico: Tamaulipas, Vera Cruz, Yucatan; Panama; United States: Florida, Texas. Records are from Ball (1933), Doering (1932), Metcalf (1954a) and Wilson and McPherson (1980a).

Acanalonia immaculata Kirkaldy

Fig. 13

Acanalonia immaculata Kirkaldy; Doering 1932:774-775, 783, 785-786; Metcalf 1954a:25-26.

Description: Male genitalia: In lateral view, pygofer height ca. 0.5X that of abdomen; longest along ventral aspect; concave anteriorly. In caudal view, pygofer slightly convex laterally. In lateral view, styles subtriangular, length ca. 0.75X that of pygofer, convex in ventral aspect. Tectiform body of connective anteroventrally directed, narrowing dorsally; connective (*s. s.*) with connective arm oval, surrounding ventral aspect of tectiductus in anterior 1/4. Dorsal aspect of diaphragm surrounding aedeagus in anterior 1/3. Aedeagus with each caudal process truncate, short subcylindrical extension in posterior 1/2; length ca. 3.5X that of aedeagus; each lateral process slightly concave ventrally, length ca. 0.3X that of caudal process. Dorsal expansion subcylindrical, concave dorsally

and convex ventrally in posterior 1/2, acute, spinose.

Female genitalia: Valvifer of 8th segment large, length ca. 3X that of 9th tergite; dorsal aspect covering small portion of 9th tergite in posterior 1/3. Lateral gonapophysis of 9th segment subrectangular. Gonapophysis of 8th segment with dorsal row of 7 teeth in posterior 2/3. In ventral view, 8th segment subrectangular, slightly concave at midline, slightly convex on either side of midline.

Comparative Notes: Habitus is similar to that of *A. virescens* (see comparative notes under *A. virescens*). Male caudal process similar to that of *A. servillei* (see comparative notes under *A. servillei*).

Specimens examined: Distribution records for the specimens used in this study are: Arizona: Huachuca Mountains. Descriptions and illustrations were based on 4 specimens, 28 total specimens were observed; 24 July - 22 August.

Distribution: Mexico: Vera Cruz; United States: Arizona. Records are from Doering (1932) and Metcalf (1954a).

Acanalonia mollicula Van Duzee

Fig. 14

Acanalonia mollicula Van Duzee; Ball 1933:150; Doering 1932:772-773, 784-786; Metcalf 1954a:28-29.

Description: Male genitalia: In lateral view, pygofer height ca. 0.5X that of abdomen; longest along ventral aspect; concave anteriorly. In caudal view, pygofer slightly slanting outwards dorsolaterally. In lateral view, styles subrectangular, slightly smaller than pygofer, slightly convex along ventral aspect. Tectiform body of connective posteroventrally directed, slightly wider along ventral aspect; connective (*s. s.*) with connective arm surrounding ventral aspect of tectiductus in anterior 1/5. Dorsal aspect of diaphragm surrounding aedeagus in anterior 1/3. Aedeagus with each caudal process length ca. 3X that of aedeagus; each lateral process elongate, convex dorsally, concave ventrally. Dorsal expansion with posterior 1/3 expanded, suboval, row of fine teeth dorsally, spinose.

Female genitalia: Valvifer of 8th segment large, length ca. 3X that of 9th tergite. Gongangulum length ca. 0.5X that of valvifer of 8th segment. Gonapophysis of 8th segment with dorsal row of 8

blunt teeth in posterior 2/3. In ventral view, 8th segment subrectangular, ventral aspect slightly irregular, narrower at midline.

Comparative Notes: Similar to *A. clypeata* (see comparative notes under *A. clypeata*).

Specimens examined: Distribution records for the specimens used in this study are: California: Mount Springs. Descriptions and illustrations were based on 3 specimens, 52 total specimens were examined; 22 July - 12 August.

Distribution: United States: Arizona, California, Nevada, Utah. Records are from Ball (1933), Doering (1932) and Metcalf (1954a).

Acanalonia similis Doering

Fig. 15

Acanalonia similis Doering; Doering 1932:776-777, 784-786; Metcalf 1954a:34.

Description: Male genitalia: In lateral view, pygofer height ca. 0.5X that of abdomen; concave anteriorly and posteriorly. In dorsal view, anal style with base width ca. 0.5X that of anal valve, narrowing posteriorly. In lateral view, styles slightly convex along ventral aspect. Connective (s. s.) with connective arm surrounding ventral aspect of tectiductus in anterior 1/4. Dorsal aspect of diaphragm surrounding aedeagus in anterior 1/2. Aedeagus with each caudal process length ca. 2X that of aedeagus; each lateral process elongate, base expanded, length ca. 0.7X that of caudal process. Dorsal expansion slightly convex dorsally.

Female genitalia: Valvifer of 8th segment large, length ca. 3X that of 9th tergite. Gongangulum length ca. 0.3X that of valvifer of 8th segment. Gonapophysis of 8th segment with dorsal row of 8 blunt teeth in posterior 1/2. In ventral view, 8th segment widest laterally; sharply constricted on either side of midline; with an elongate, forked process at midline

Comparative Notes: Similar to *A. invenusta* in size and shape, but differs in the structure of the male and female genitalia. Male aedeagal caudal process much shorter in *A. invenusta*; female with 8 teeth on gonapophysis of 8th segment versus 7 teeth in *A. invenusta*, and distinct difference in the shape of the 8th segment.

Specimens examined: Distribution records for the specimens used in this study are: New Mexico: White Sands. Descriptions and illustrations were based on 4 specimens; 43 total specimens were examined; 20 June - 20 July.

Distribution: United States: New Mexico, Texas. Records are from Doering (1932) and Metcalf (1954a).

Acanalonia invenusta Doering

Fig. 16

Acanalonia invenusta Doering 1932:775-776, 784-786; Metcalf 1954a:26.

Description: Male genitalia: In lateral view, pygofer height ca. 0.5X that of abdomen; longest along ventral aspect; concave anteriorly and posteriorly. In caudal view, pygofer antero- and posterodorsal aspects slanting inwards. In lateral view, styles convex along ventral aspect. Connective (s. s.) with connective arm surrounding ventral aspect of tectiductus in anterior 1/4. Aedeagus with each caudal process short, anterior aspect expanded, sharply narrowing in posterior 1/2, length ca. 2X that of aedeagus; each lateral process elongate, slightly convex ventrally. Dorsal expansion elongate, subcylindrical, expanded posteriorly, spinose.

Female genitalia: Valvifer of 8th segment large, length ca. 3X that of 9th tergite. Gongangulum length ca. 0.5X that of valvifer of 8th segment. Lateral gonapophysis of 9th segment length ca. 1.5X that of valvifer of 8th segment; subrectangular. Gonapophysis of 8th segment with dorsal row of 7 blunt teeth in posterior 2/3. In ventral view, 8th segment slightly convex ventrally; gradually narrowing to midline; short, wide forked process at midline.

Comparative Notes: Size and shape similar to *A. similis* (see comparative notes under *A. similis*).

Specimens examined: Distribution records for the specimens used in this study are: Texas: Marathon. Descriptions and illustrations were based on 3 specimens; 26 total specimens were examined; 25 June - 9 August.

Distribution: United States: New Mexico, Texas. Records are from Doering (1932) and Metcalf (1954a).

Acanalonia pumila (Van Duzee)

Fig. 17

Acanalonia pumila (Van Duzee); Doering 1932:778-779, 783, 785-786; Metcalf 1954a:30-31; Metcalf 1954b:18-19; Metcalf and Bruner 1930:408; Wheeler and Hoebeke 1982: 341; Wilson and Hilburn 1991:417; Wilson and McPherson 1980a:17.

Description: Male genitalia: In lateral view, pygofer height ca. 0.3X that of abdomen; concave anteriorly; narrowing and slightly concave posteriorly. In lateral view, styles subequal in size to pygofer. Tectiform body of connective anteroventrally directed, subrectangular, widest ventrally, narrowing dorsally. Aedeagus with each caudal process bearing short slender extension in posterior 1/3, length ca. 3X that of aedeagus; each lateral process convex dorsally and concave ventrally, length ca. 0.3X that of caudal process. Dorsal expansion subcircular, with internal structure that protrudes from expansion posterodorsally, width slightly less than length of lateral process.

Female genitalia: Valvifer of 8th segment large, length ca. 3X that of 9th tergite. Gongangulum length ca. 0.3X that of valvifer of 8th segment. Lateral gonapophysis of 9th segment length ca. 1.5X that of valvifer of 8th segment; subrectangular. Gonapophysis of 8th segment with dorsal row of 7 blunt teeth in posterior 1/2. In ventral view, 8th segment narrow; slightly convex at midline.

Comparative Notes: Similar in size to *A. parva* and *A. laticosta*. Male aedeagus and aedeagal processes distinctly different from those species; females easily separated by shape of 8th abdominal segment.

Specimens examined: Distribution records for the specimens used in this study are: Florida: Hobe Sound, Key West. Descriptions and illustrations were based on 4 specimens; 28 total specimens were examined; 14 March - 9 August.

Distribution: Bahama Islands: North Bimini, South Bimini; Bermuda; Cuba: Camaguey, Havana, Isla de Piños, Oriente; United States: Florida, North Carolina. Records are from Doering (1932), Metcalf (1954a, 1954b), Metcalf and Bruner

(1930), Wilson and Hilburn (1991) and Wilson and McPherson (1980a).

Acanalonia planata Ball

Fig. 18

Acanalonia planata Ball; Ball 1933:150, Metcalf 1954a:29.

Description: Male genitalia: In lateral view, pygofer height ca. 0.5X that of abdomen; longest along ventral aspect; concave anteriorly. In caudal view, pygofer narrowing dorsolaterally. In lateral view, styles length ca. 0.7X that of pygofer, convex along ventral aspect. Tectiform body of connective concave ventrally. Dorsal aspect of diaphragm surrounding aedeagus in anterior 1/3. Aedeagus with each caudal process bearing short acute extension arising from posterodorsal aspect, length ca. 2X that of aedeagus; each lateral process short, bulbous base, narrowing sharply to apex, length ca. 0.25X that of caudal process. Dorsal expansion elongate, posterior aspect expanded, suboval piece arising from center, small teeth on dorsal aspect.

Female genitalia: No female specimen of this species was available for study.

Comparative Notes: Male genitalia very similar to those of *A. virescens* (see comparative notes under *A. virescens*).

Specimens examined: The distribution record for the specimen used in this study is: Texas: Brownsville; Esperanza Ranch, May, E. D. Ball collection Paratype (Male) (NMNH).

Distribution: United States: Texas Records are from Ball (1933) and Metcalf (1954a).

Acanalonia parva Doering

Fig. 19

Acanalonia parva Doering; Doering 1932:780-781, 784-786; Metcalf 1954a:29.

Description: Male genitalia: In lateral view, pygofer height slightly less than 0.5X that of abdomen; concave anteriorly. In caudal view, pygofer narrowing dorsolaterally. In dorsal view, anal style width ca. 0.5X that of anal valve. In lateral view, styles length ca. 0.75X that of pygofer, convex along ventral aspect. Tectiform body of connective slightly concave anteriorly and ventrally, narrow-

ing dorsally; connective (s. s.) with connective arm surrounding ventral aspect of tectiductus in anterior 1/4. Dorsal aspect of diaphragm surrounding aedeagus in anterior 1/3. Ligamentary process elongate, surrounding ventral aspect of tectiductus in middle. Aedeagus with each caudal process length ca. 2X that of aedeagus; each lateral process elongate, slender, length ca. 0.3X that of caudal process. Dorsal expansion elongate.

Female genitalia: Valvifer of 8th segment large, length ca. 2.5X that of 9th tergite. Gongangulum length ca. 0.7X that of valvifer of 8th segment. Lateral gonapophysis of 9th segment length ca. 1.5X that of valvifer of 8th segment; subrectangular. Gonapophysis of 8th segment with dorsal row of 7 blunt teeth in posterior 2/3. In ventral view, 8th segment subrectangular, narrowed toward midline, concave at midline.

Comparative Notes: Similar in size to *A. pumila* (see comparative notes under *A. pumila*). Habitus similar to *A. laticosta*, but aedeagal caudal processes are longer than those of *A. laticosta*, and the lateral processes differ in shape. Females easily separated by the shape of the 8th abdominal segment, which is concave at the midline versus having a rounded process at the midline as in *A. laticosta*.

Specimens examined: Distribution records for the specimens used in this study are: Texas: Aransas Co., coll. R. H. Beamer, 6 August 1928, Paratype (Male), NMNH. Descriptions and illustrations were based on 2 specimens; 18 total specimens were examined; 3 June - 8 August.

Distribution: United States: New Mexico, Texas. Records are from Doering (1932) and Metcalf (1954a).

Acanalonia laticosta Doering

Fig. 20

Acanalonia laticosta Doering 1932:779-780, 784-786, Metcalf 1954a:27.

Description: Male genitalia: In lateral view, pygofer height ca. 0.7X that of abdomen; concave anteriorly. In ventral view, pygofer narrowing posteriorly. In dorsal view, anal style width ca. 0.5X that of anal valve, narrowing posteriorly. In lateral view, styles subtriangular, convex along

ventral aspect. Tectiform body of connective slightly concave posteriorly. Dorsal aspect of diaphragm surrounding aedeagus in anterior 1/2. Ligamentary process surrounding ventral aspect of tectiductus in middle. Aedeagus with each caudal process narrowing in posterior 1/2 to acute apex, length ca. 2X that of aedeagus; each lateral process short, slightly bulbous anteriorly, narrowing to acute apex, length ca. 0.5X that of caudal process. Dorsal expansion elongate.

Female genitalia: Valvifer of 8th segment large, length ca. 4.5X that of 9th tergite. Gongangulum length ca. 0.3X that of valvifer of 8th segment. Lateral gonapophysis of 9th segment length ca. 1.3X that of valvifer of 8th segment; subrectangular. Gonapophysis of 8th segment with dorsal row of 7 blunt teeth in posterior 1/2. In ventral view, 8th segment subrectangular, ventral aspect irregular, with a short, rounded process at midline.

Comparative Notes: Similar in appearance to *A. pumila* and *A. parva* (see comparative notes under these species). Male genitalia similar to those of *A. hadesensis*, but with much shorter aedeagal caudal processes than *A. hadesensis*, and with differences in shape and orientation of the lateral processes.

Specimens examined: Distribution records for the specimens used in this study are: Texas: Loyal Valley. Descriptions and illustrations were based on 4 specimens; 70 total specimens were examined; 13 April - 26 December.

Distribution: United States: Texas. Records are from Doering (1932) and Metcalf (1954a).

Acanalonia hadesensis Caldwell

Fig. 21

Acanalonia hadesensis Caldwell 1938:305-306; Metcalf 1954a:25.

Description: Male genitalia: In lateral view, pygofer subrectangular; height ca. 0.5X that of abdomen; concave anteriorly. In caudal view, pygofer slightly narrowing dorsolaterally. In lateral view, styles convex along ventral aspect. Tectiform body of connective concave posteriorly and ventrally. Dorsal aspect of diaphragm surrounding aedeagus in anterior 1/2. Ligamentary process elongate, surrounding ventral aspect of tectiductus in middle. Aedeagus with each caudal process length ca. 2X that of aedeagus; each lateral process with

base slightly bulbous, elongate, slightly concave ventrally, gradually narrowing to acute apex. Dorsal expansion elongate, subcylindrical.

Female genitalia: Valvifer of 8th segment large, length ca. 3.5X that of 9th tergite. Gongangulum length ca. 0.5X that of valvifer of 8th segment. Lateral gonapophysis of 9th segment length ca. 1.3X that of valvifer of 8th segment; subrectangular. Gonapophysis of 8th segment with dorsal row of 7 teeth in posterior 2/3. In ventral view, 8th segment subrectangular, slightly convex laterally, concave at midline.

Comparative Notes: Male genitalia similar to those of *A. laticosta* (see comparative notes under *A. laticosta*).

Specimens examined: Distribution records for the specimens used in this study are: Texas: Blanco Co., Laredo. Descriptions and illustrations were based on 2 specimens; 13 total specimens were examined. Specimens located at the NMNH.

Distribution: United States: Texas. Records are from Caldwell (1938) and Metcalf (1954a).

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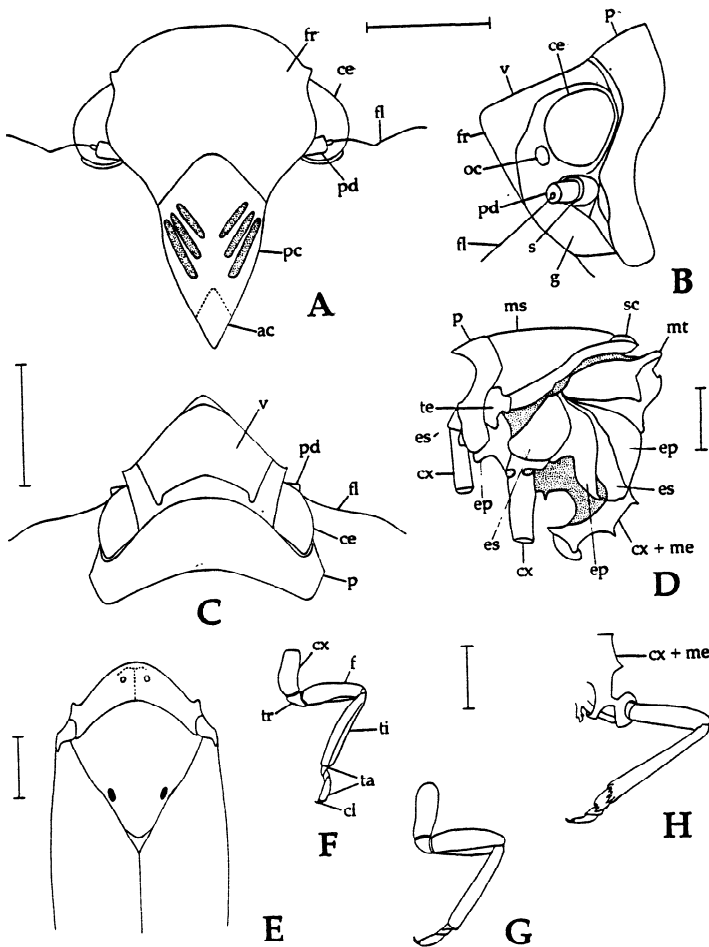


Figure 1. Morphology of *Acanalonia conica*. A. Head, frontal view. B. Head, lateral view. C. Head, dorsal view. D. Thorax, lateral view. E. Thorax and wings, dorsal view. F. Prothoracic leg, lateral view. G. Mesothoracic leg, lateral view. H. Metathoracic leg, lateral view. ac - anteclypeus, ce - compound eye, cl - claw, cx - coxa, ep - epimeron, es - episternum, f - femur, fl - flagellum of antenna, fr - frons, g - gena, me - meron, ms - mesonotum, mt - metanotum, oc - ocellus, p - pronotum, pc - postclypeus, pd - pedicel of antenna, s - scape of antenna, sc - scutellum, ta - tarsus, te - tegula, ti - tibia, tr - trochanter, v - vertex.

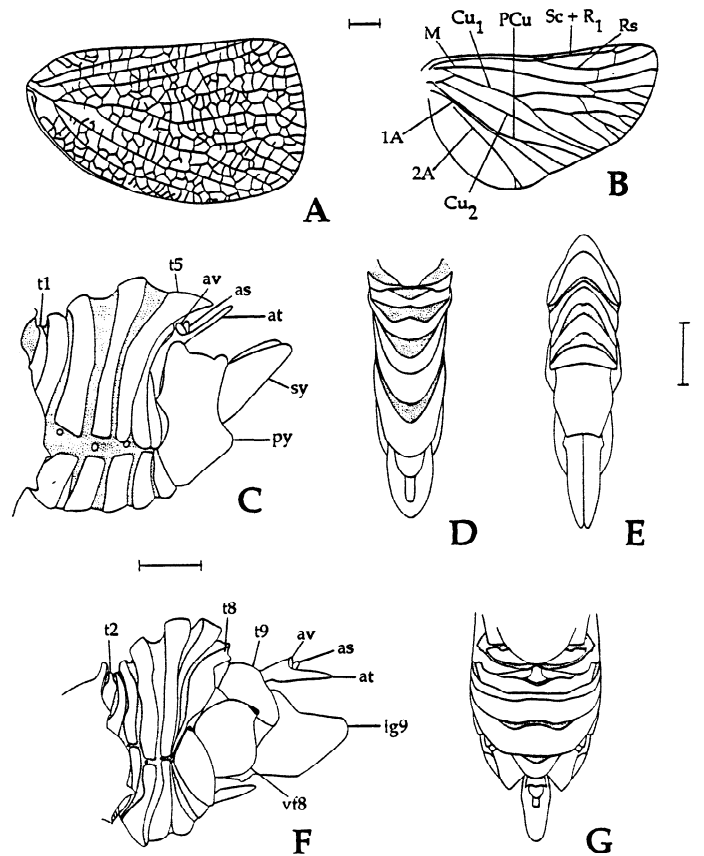


Figure 2. Morphology of *Acanalonia conica*. A. Fore wing, left lateral view. B. Hind wing, right lateral view. C. Male abdomen, lateral view. D. Male abdomen, dorsal view. E. Male abdomen, ventral view. F. Female abdomen, dorsal view. G. Female abdomen, lateral view. A - anal vein, as - anal style, at - anal tube, av - anal valve, Cu - cubital vein, lg9 - lateral gonapophysis of 9th segment, M - median vein, PCu - postcubital vein, py - pygofer, R1 - radial vein, Rs - radial sector vein, Sc - subcostal vein, sy - style, t - tergite, vf8 - valvifer of 8th segment.

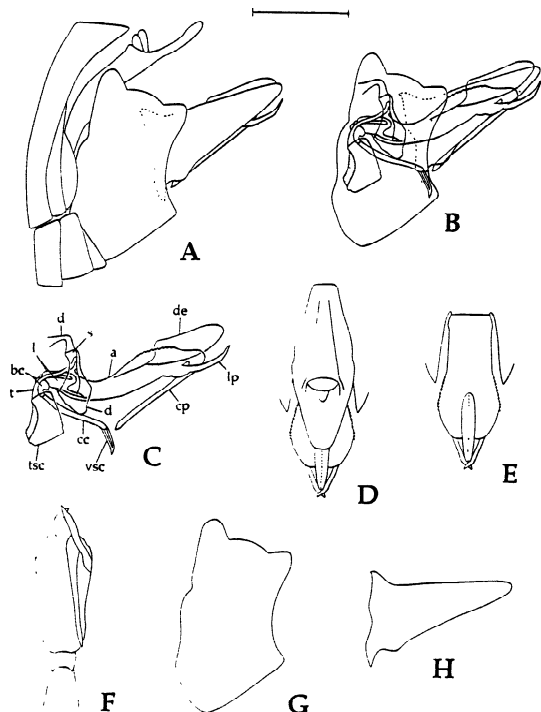


Figure 3. Morphology of *Acanalonia conica*. A. Terminal segments of male abdomen, lateral view. B. Male genitalia, lateral view. C. Aedeagus and aedeagal processes, lateral view. D. Anal tube, aedeagus and aedeagal processes, lateral view. E. Aedeagus and aedeagal processes, dorsal view. F. Aedeagus and aedeagal processes, ventral view. G. Pygofer, lateral view. H. Style, lateral view. a - aedeagus, bc - brachi connectivi (connective arm), cc - corpus connectivi (connective body), cp - caudal process, d - diaphragm, de - dorsal expansion, l - ligamentary process, lp - lateral process, s - suspensorium, t - tectiductus, tsc - tectiform structure of connective, vsc - ventral support of connective.

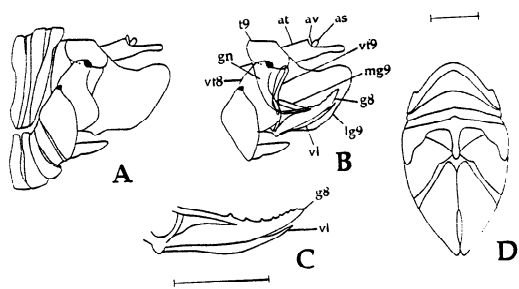


Figure 4. Morphology of *Acanalonia conica*. A. Terminal segments of female abdomen, lateral view. B. Female genitalia, lateral view. C. Gonapophysis of 8th segment and ventral lobe, lateral view. D. Terminal segments of female abdomen, ventral view. as - anal style, at - anal tube, av - anal valve, g8 - gonapophysis of 8th segment, gn - gonangulum.

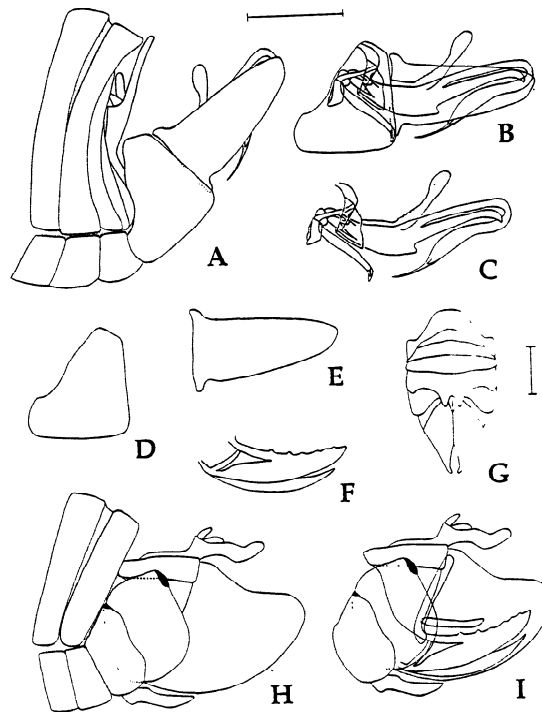


Figure 5. Morphology of *Acanalonia bivittata*. A. Terminal segments of male abdomen, lateral view. B. Male genitalia, lateral view. C. Pygofer, lateral view. D. Aedeagus and aedeagal processes, lateral view. E. Style, lateral view. F. Gonapophysis of 8th segment and ventral lobe, lateral view. G. Terminal segments of female abdomen, lateral view. H. Terminal segments of female abdomen, ventral view. I. Female genitalia, lateral view.

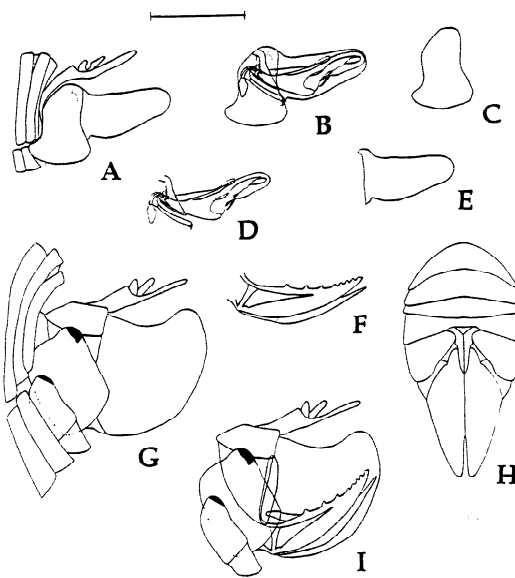


Figure 6. Morphology of *Acanalonia fasciata*. A. Terminal segments of male abdomen, lateral view. B. Male genitalia, lateral view. C. Pygofer, lateral view. D. Aedeagus and aedeagal processes, lateral view. E. Style, lateral view. F. Gonapophysis of 8th segment and ventral lobe, lateral view. G. Terminal segments of female abdomen, lateral view. H. Terminal segments of female abdomen, ventral view. I. Female genitalia, lateral view.

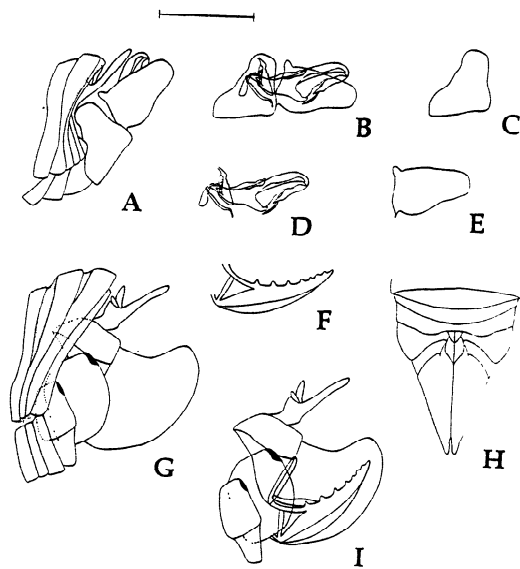


Figure 7. Morphology of *Acanalonia concinnula*. A. Terminal segments of male abdomen, lateral view. B. Male genitalia, lateral view. C. Pygofer, lateral view. D. Aedeagus and aedeagal processes, lateral view. E. Style, lateral view. F. Gonapophysis of 8th segment and ventral lobe, lateral view. G. Terminal segments of female abdomen, lateral view. H. Terminal segments of female abdomen, ventral view. I. Female genitalia, lateral view.

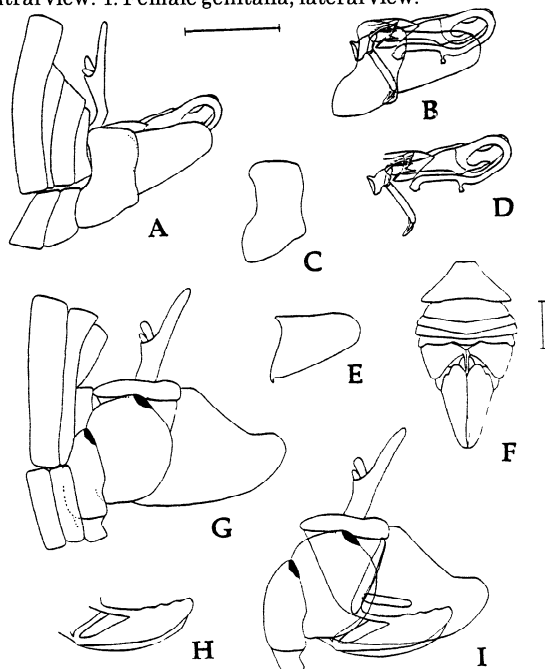


Figure 8. Morphology of *Acanalonia servillei*. A. Terminal segments of male abdomen, lateral view. B. Male genitalia, lateral view. C. Pygofer, lateral view. D. Aedeagus and aedeagal processes, lateral view. E. Style, lateral view. F. Terminal segments of female abdomen, ventral view. G. Terminal segments of female abdomen, lateral view. H. Gonapophysis of 8th segment and ventral lobe, lateral view. I. Female genitalia, lateral view.

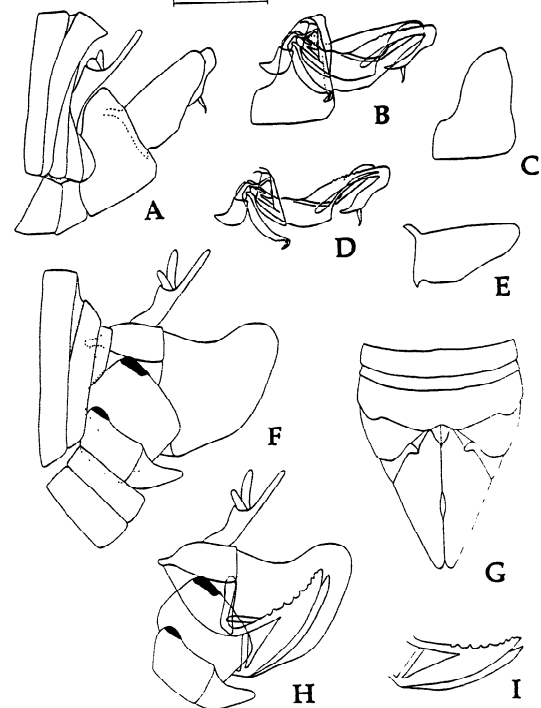


Figure 9. Morphology of *Acanalonia clypeata*. A. Terminal segments of male abdomen, lateral view. B. Male genitalia, lateral view. C. Pygofer, lateral view. D. Aedeagus and aedeagal processes, lateral view. E. Style, lateral view. F. Terminal segments of female abdomen, lateral view. G. Terminal segments of female abdomen, ventral view. H. Female genitalia, lateral view. I. Gonapophysis of 8th segment and ventral lobe, lateral view.

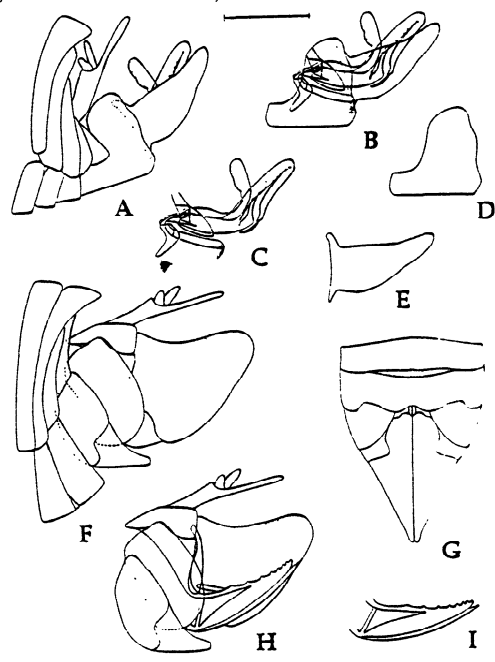


Figure 10. Morphology of *Acanalonia saltonia*. A. Terminal segments of male abdomen, lateral view. B. Male genitalia, lateral view. C. Aedeagus and aedeagal processes, lateral view. D. Pygofer, lateral view. E. Style, lateral view. F. Terminal segments of female abdomen, lateral view. G. Terminal segments of female abdomen, ventral view. H. Female genitalia, lateral view. I. Gonapophysis of 8th segment and ventral lobe, lateral view.

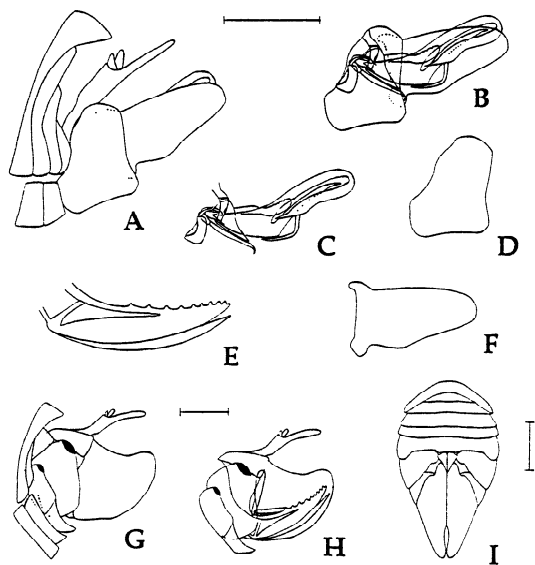


Figure 11. Morphology of *Acanalonia grandicella*. A. Terminal segments of male abdomen, lateral view. B. Male genitalia, lateral view. C. Aedeagus and aedeagal processes, lateral view. D. Pygofer, lateral view. E. Gonapophysis of 8th segment and ventral lobe, lateral view. F. Style, lateral view. G. Terminal segments of female abdomen, lateral view. H. Female genitalia, lateral view. I. Terminal segments of female abdomen, ventral view.

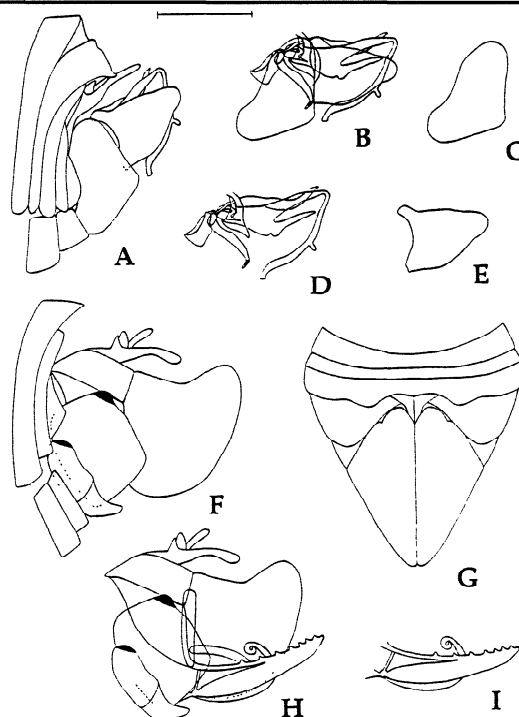


Figure 13. Morphology of *Acanalonia immaculata*. A. Terminal segments of male abdomen, lateral view. B. Male genitalia, lateral view. C. Pygofer, lateral view. D. Aedeagus and aedeagal processes, lateral view. E. Style, lateral view. F. Terminal segments of female abdomen, lateral view. G. Terminal segments of female abdomen, ventral view. H. Female genitalia, lateral view. I. Gonapophysis of 8th segment and ventral lobe, lateral view.

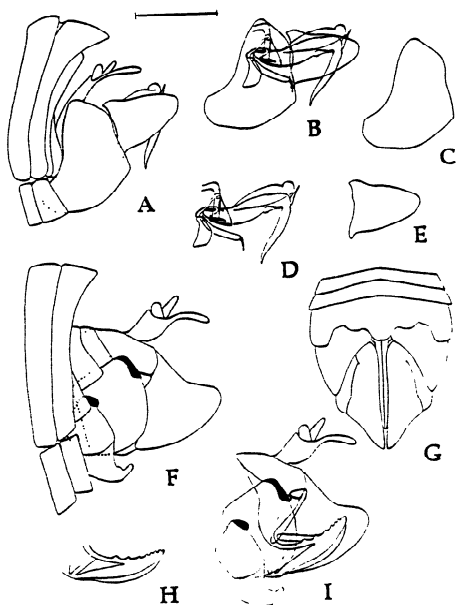


Figure 12. Morphology of *Acanalonia virescens*. A. Terminal segments of male abdomen, lateral view. B. Male genitalia, lateral view. C. Pygofer, lateral view. D. Aedeagus and aedeagal processes, lateral view. E. Style, lateral view. F. Terminal segments of female abdomen, lateral view. G. Terminal segments of female abdomen, ventral view. H. Gonapophysis of 8th segment and ventral lobe, lateral view. I. Female genitalia, lateral view.

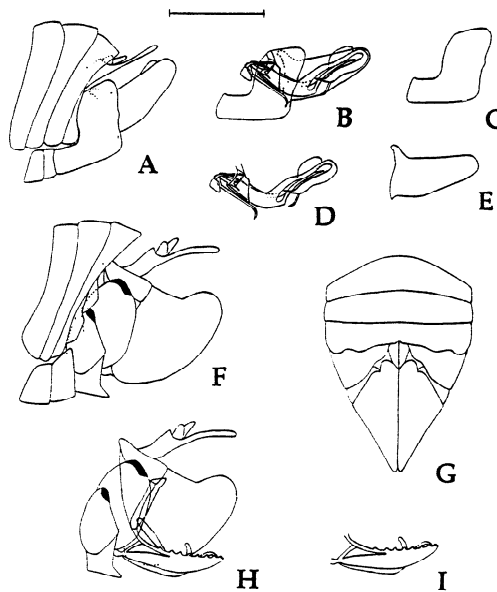


Figure 14. Morphology of *Acanalonia mollicula*. A. Terminal segments of male abdomen, lateral view. B. Male genitalia, lateral view. C. Pygofer, lateral view. D. Aedeagus and aedeagal processes, lateral view. E. Style, lateral view. F. Terminal segments of female abdomen, lateral view. G. Terminal segments of female abdomen, ventral view. H. Female genitalia, lateral view. I. Gonapophysis of 8th segment and ventral lobe, lateral view.

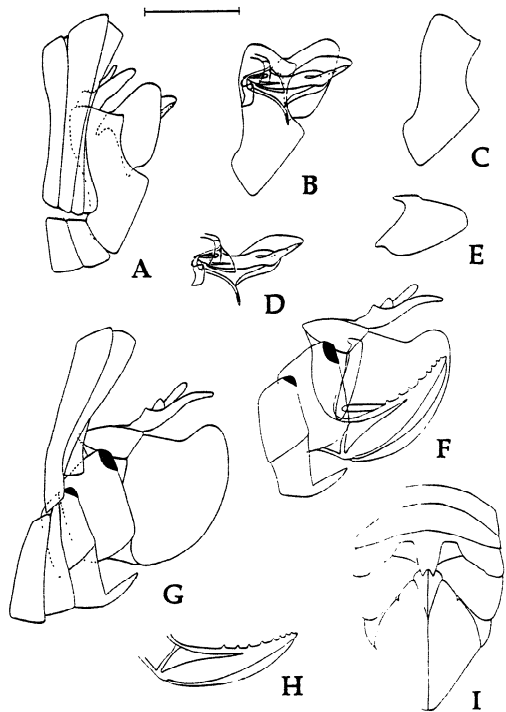


Figure 15. Morphology of *Acanalonia similis*. A. Terminal segments of male abdomen, lateral view. B. Male genitalia, lateral view. C. Pygofer, lateral view. D. Aedeagus and aedeagal processes, lateral view. E. Style, lateral view. F. Female genitalia, lateral view. G. Terminal segments of female abdomen, lateral view. H. Gonapophysis of 8th segment and ventral lobe, lateral view. I. Terminal segments of female abdomen, ventral view.

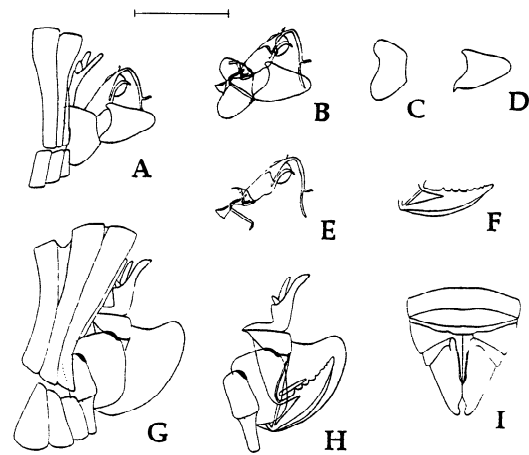


Figure 17. Morphology of *Acanalonia pumila*. A. Terminal segments of male abdomen, lateral view. B. Male genitalia, lateral view. C. Pygofer, lateral view. D. Style, lateral view. E. Aedeagus and aedeagal processes, lateral view. F. Gonapophysis of 8th segment and ventral lobe, lateral view. G. Terminal segments of female abdomen, lateral view. H. Female genitalia, lateral view. I. Terminal segments of female abdomen, ventral view.

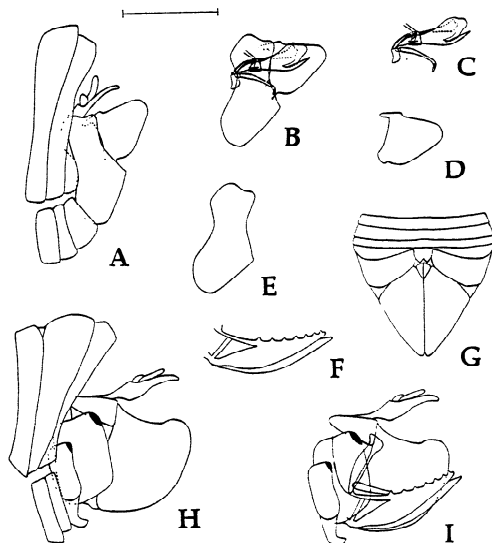


Figure 16. Morphology of *Acanalonia invenusta*. A. Terminal segments of male abdomen, lateral view. B. Male genitalia, lateral view. C. Aedeagus and aedeagal processes, lateral view. D. Style, lateral view. E. Pygofer, lateral view. F. Gonapophysis of 8th segment and ventral lobe, lateral view. G. Terminal segments of female abdomen, ventral view. H. Terminal segments of female abdomen, lateral view. I. Female genitalia, lateral view.

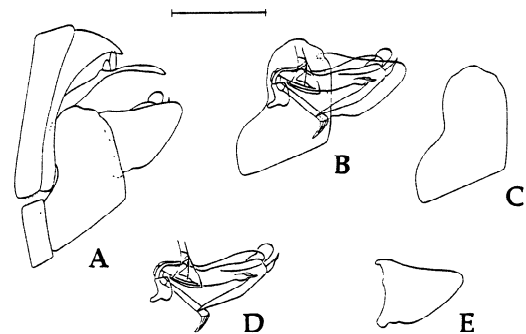


Figure 18. Morphology of *Acanalonia planata*. A. Terminal segments of male abdomen, lateral view. B. Male genitalia, lateral view. C. Pygofer, lateral view. D. Aedeagus and aedeagal processes, lateral view. E. Style, lateral view.

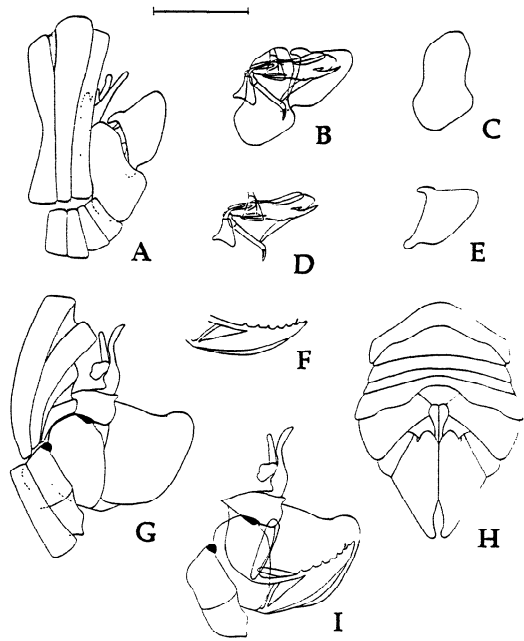


Figure 19. Morphology of *Acanalonia parva*. A. Terminal segments of male abdomen, lateral view. B. Male genitalia, lateral view. C. Pygofer, lateral view. D. Aedeagus and aedeagal processes, lateral view. E. Style, lateral view. F. Gonapophysis of 8th segment and ventral lobe, lateral view. G. Terminal segments of female abdomen, lateral view. H. Terminal segments of female abdomen, ventral view. I. Female genitalia, lateral view.

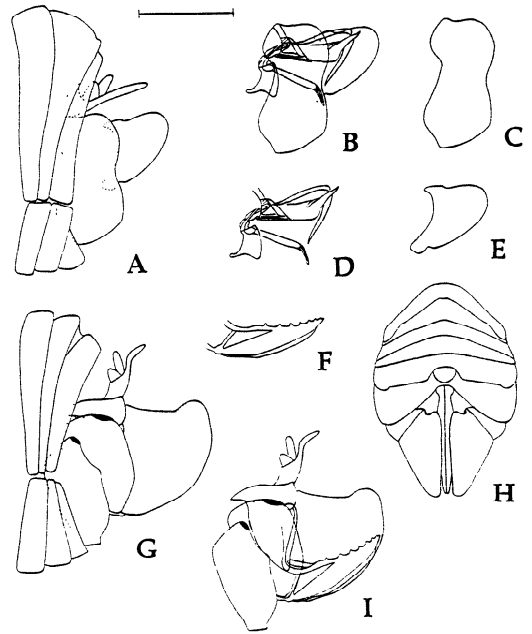


Figure 21. Morphology of *Acanalonia hadesensis*. A. Terminal segments of male abdomen, lateral view. B. Male genitalia, lateral view. C. Pygofer, lateral view. D. Aedeagus and aedeagal processes, lateral view. E. Style, lateral view. F. Gonapophysis of 8th segment and ventral lobe, lateral view. G. Terminal segments of female abdomen, lateral view. H. Terminal segments of female abdomen, ventral view. I. Female genitalia, lateral view.

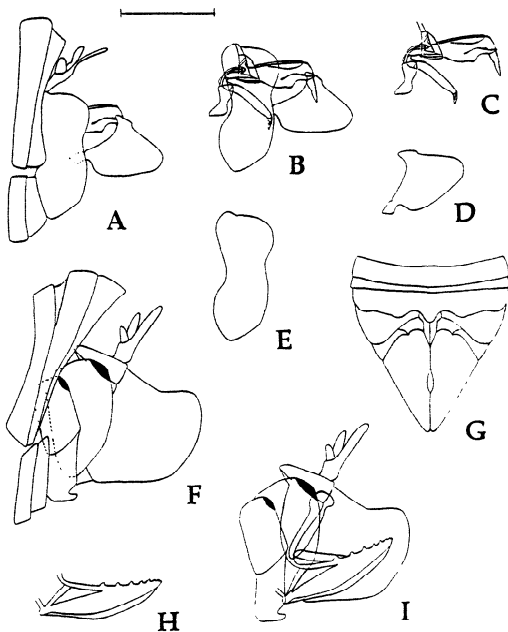


Figure 20. Morphology of *Acanalonia laticosta*. A. Terminal segments of male abdomen, lateral view. B. Male genitalia, lateral view. C. Aedeagus and aedeagal processes, lateral view. D. Style, lateral view. E. Pygofer, lateral view. F. Terminal segments of female abdomen, lateral view. G. Terminal segments of female abdomen, ventral view. H. Gonapophysis of 8th segment and ventral lobe, lateral view. I. Female genitalia, lateral view.

