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Neobruchidius lovie, new genus and new species from Latin America (Coleoptera: Chrysomelidae: Bruchinae)

C. D. JOHNSON† & J. ROMERO-NAPOLES[1]

†. Deceased. Department of Biological Sciences, Northern Arizona University, Flagstaff, AZ, 86011-5640, USA.
1 Programa de Entomología y Acarología, CEIFIT, Colegio de Postgraduados, Montecillo, Estado de Mexico, Mexico; e-mail: jnapoles@colpos.mx

Abstract

The new genus *Neobruchidius* is described principally because of the single spine near the apex of the hind femur of all ten species. This and other characters differentiate it from other genera in the New World and ally it to the Old World genus *Bruchidius*, hence the name. Seven of the ten species of *Neobruchidius* were all originally described in the genus *Acanthoscelides* by Johnson and one is the new species *Neobruchidius lovie.* The nine species are *Neobruchidius barinas, N. canar, N. curimagua, N. guatemala, N. lituratus,* (Sharp), *N. macheta, N. tabidus* (Erichson), *N. tibiospinalis,* and *N. zacatlan*. A discussion of the genus is provided as is a key to species, and some comments on allometry in adult bruchids due to seed size of their hosts. *Neobruchidius lovie* differs from species in the genus *Sennius* principally by lacking hinge sclerites in the median lobe of the male genitalia and with a mucro on the apex of the hind tibia that is much shorter than 0.25 times as long as the first hind tarsomere. Most species of *Sennius* lack a mucro or almost so.

Key words: *Neobruchidius lovie, Neobruchidius,* Bruchidae, New Genus, *Sennius*

Introduction

In the key in his paper on the genera of Bruchidae of America north of Mexico, Bridwell (1946) used the presence, or in one case absence, of the subapical spines on the hind femur as a major character to define his new genera *Gibbobruchus*, *Cercidiestes*, *Meibomeus*, *Merobruchus*, *Mimosestes*, *Stator*, *Althaeus*, *Algarobius*, *Abutiloneus* and *Sennius*. Bridwell also used these spines to further define the genus *Acanthoscelides* Schilsky. The fundamentals of Bridwells definitions of these genera have been used by systematists in the New World to further define these genera and to classify other new taxa. The use of the

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structure of the hind leg and its characters for criteria to define genera of the world was further amplified by Borowiec (1987: 37) when he stated that the characters used on the hind leg such as enlargement of the femur, number of femoral spines, state of hind tibia deflection, development and reduction of the tibial carinae and apical denticles were of significant value. He also suggested other characters be used but these are not of significance to us here. Borowiec (1987) also indicated that the genera with the most species were *Acanthoscelides* (New World) and *Bruchidius* Schilsky (Old World). He indicated that these genera were closely related (homologous) and both should be placed in the tribe Acanthoscelidini.

Bridwell (1946) separated his easily confused new genera with one spine near the apex of the hind femur, *Sennius* Bridwell and *Stator* Bridwell, using the following characters: S*tator* with lateral margin of pronotum with a carina, hind femur flattened beneath, both edges carinate, the inner carina with a strong, suberect tooth near the apex. *Sennius* was described as being without or with a vestigial carina on the lateral margin of the pronotum. Only the inner margin of the ventral surface of its hind femur is carinate, the carina extending nearly to the base of the femur, the carina is microserrulate before the simple, apical spine (Table 1).

TABLE 1. Useful charactes to separate *Sennius*, *Stator*, and *Acathoscelides* genera.

Character / Genus	*Sennius*	*Stator*	*Acathoscelides*
Lateral carina on pronotum	Absent	Present	Absent
Number of spines on hing femur	1	1	2–5
Carinae on ventral hind femur	Only the inner margin of the ventral surface carinate	with both edges carinate	Only the inner margin of the ventral surface carinate
Hinge sclerites in male genitalia	Present	Absent	Absent
Sclerites in internal sac of male genitalia	Only small needles or spines	Large sclerites, needles and spines	Large sclerites, needles and spines
Basal tubercles on elytra	Absent	Absent	Usually present

Johnson and Kingsolver (1973) limited *Sennius* to species to the characters above and those whose internal sac of the male genitalia had hinge sclerites. According to them “the term hinge sclerites is applied to a pair of arcuate often boat-shaped sclerites embedded in the internal sac on either side of the apical orifice and articulating laterally with the sclerotized sidewalls of the median lobe”.

Johnson discovered *Neobruchidius lovie* in the Bottimer collection about 30 years ago but other studies interfered with the describing of this very interesting relative of species in the genus *Sennius*. In many ways it is almost identical with species in *Sennius* but it lacks

hinge sclerites in the male genitalia, structures used to define the genus *Sennius*. This is a propitious time to describe this genus and species as we are embarking upon a revision of the *Sennius* of northern South America.

According to Borowiec (1987) the Old World *Bruchidius* species have no spines on the hind femur or one minute spine. The other characters that he used to characterize the genus were characters that define *Acanthoscelides*. Thus it appears that *Bruchidius* and *Acanthoscelides* are more closely related than earlier systematists believed. The reason is simple, there are too many bruchids and too few researchers and these researchers are busy trying to classify the bruchids in their particular area. Thus, there is too little knowledge about the relationships between Old and New World bruchids.

When we discovered *Neobruchidius lovie* we noted that at least nine species had been described in the New World as *Acanthoscelides* that had only one spine on the hind femur. We then decided to include these species in a new genus, *Neobruchidius*, that had characteristics of both *Acanthoscelides* and *Bruchidius* but was endemic to the New World. These species are dealt with below (Table 2). It is interesting that our present knowledge is that seven of the ten species are from South America. This indicates to us, based on experience in field work and other groups of bruchids, that there may be many more species near *Acanthoscelides* in South America that will be included in *Neobruchidius*. Also, because *Acanthoscelides* has been used as a catch-all genus, this new taxon is a monophyletic group that reduces the number of species in *Acanthoscelides*, definitely not a monophyletic group as it now stands.

TABLE 2. List of *Neobruchidius* Species synonomized here.

Neobruchidius barinas (Johnson), New Combination
Acanthoscelides barinas Johnson, 1990b: 334.
Neobruchidius canar (Johnson), New Combination
Acanthoscelides canar Johnson, 1990b: 347.
Neobruchidius curimagua (Johnson), New Combination
Acanthoscelides curimagua Johnson, 1990b: 361.
Neobruchidius guatemala (Johnson), New Combination
Acanthoscelides guatemala Johnson, 1990a: 10.
Neobruchidius lituratus (Sharp), New Combination
Bruchus lituratus Sharp, 1885: 450.
Neobruchidius lovie Romero & Johnson, new species
Neobruchidius macheta (Johnson), New Combination
Acanthoscelides macheta Johnson, 1990b: 419.
Neobruchidius tabidus (Erichson), New Combination
Bruchus tabidus Erichson, 1847: 124.
Neobruchidius tibiospinalis (Johnson), New Combination
Acanthoscelides tibiospinalis Johnson, 1990b: 478.
Neobruchidius zacatlan (Johnson), New Combination
Acanthoscelides zacatlan Johnson, 1990a: 17.

In our field collections of pods and seeds to obtain bruchids from them, we have noted two primary phenomena relating to allometry between seed size, size of the bruchids and especially size and number of subapical spines on the ventral surface of the hind femur. These are that the size of the adult is (1) apparently genetically determined and (2) that if the seed size or portions of a seed has enough food for an adult to emerge, even though malnourished, it will be smaller in size than other specimens reared from the same lot of seeds. In both cases, the number and size of the body parts may be smaller or lacking. This is especially true of the size and number of subapical spines on the hind femur. Johnson (1970) first noticed this with the very small *Acanthoscelides napensis* Johnson that was swept from a small species of endemic clover. He noted that this species did not have the minimal number of spines on the hind femur to place it in *Acanthoscelides*. Johnson, however, pointed out that other structures closely allied *A. napensis* to the larger sized A. *pauperculus* (LeConte) and *A. inquisitus* (Fall). This is an interesting example because at that time the host plant for *A. pauperculus,* the most abundant bruchid collected in California by conventional means, was unknown. Then Johnson (1977) found the host plant to be a clover (*Trifolium obtusiflorum* Hook. f.), in a genus with numerous endemic species in the western United States. Therefore we believe that the three names *A. pauperculus, A. inquisitus,* and *A. napensis* probably refer to the same species because in all probability the differences in size between the three species indicates nothing more than that they feed in different sizes of seeds and probably different species of clovers. But that synonymy will have to be done after further study and collecting of clovers wherever the species occur. We believe that this shows adaptation to small seeds and that the small larvae can feed enough so that the adults have the ability to reproduce when reared from small seeds.

Bottimer (1935) declared that the hind femur of his small, new *Acanthoscelides tenuis* Bottimer was “armed near apex with a small tooth and two minute denticles, the latter sometimes quite rudimentary or absent”. Then Bottimer (1969a) stated that his small new species *Acanthoscelides mucrofer* Bottimer had on its hind femur near the apex three small denticles. Seed size was very important in this instance as well.

Bruchid species of small size are quite common in the small seeds of many species of the Malvaceae. We believe this to be an example of bruchids that have evolved the ability to feed in small seeds. A few examples are the very small species *Acanthoscelides guerrero* Johnson and *A. santarosa* Johnson in seeds of *Herissantia crispa* (L.) Briz. and *A. pyramididos* Johnson in seeds of *Sida pyramidata* Cav. There are many more species of bruchids that are small in size and feed in small malvaceous seeds and all have a variable number of spines on the hind femur within each species. This group of *Acanthoscelides* resembles and feed in the Malvaceae as does the very small *Abutiloneus idoneus* Bridwell that has no spines on the hind femur. Future research using different characters may show that all of these are in a distinct group, perhaps a monophyletic genus.

This summarizes that characters such as the number of spines on the hind femur of

bruchid beetles are convenient when the adults are large and represent the species as a whole. But when the insects are small for several reasons then these characters may not be useful.

Host Plants of Species of *Neobruchidius*

Neobruchidius guatemala and its host seeds, *Chiranthodendron pentadactylon* Larréategui (family Sterculiaceae), were reported by port inspectors as being intercepted on several occasions (Johnson, 1990a). The host seeds have been reared from seeds of this plant by Romero on several occasions, and it is the only verified host for species of *Neobruchidius*. It is an ornamental in Chapingo, Texcoco, Estado de México, México, 2250 m, coordinates: 19° 29' 37" N, 98° 52' 54" W. The host is native to Guatemala and southern Mexico but has been transported around the world for use as an ornamental and medicinal plant. In Chapingo flowering starts at the end of August and the seeds mature in September and October when the bruchids lay eggs and the larvae feed in the seeds and the life cycle continues.

Host plants have not been reported for the other nine species so host plant preferences offer little information for evolutionary interactions with plants.

Neobruchidus Johnson and Romero, New Genus

Small to large bruchids in the tribe Acanthoscelidini with the following morphological characteristics:

Head. Frons usually with median, glabrous line or carina extending from frontoclypeal suture to vertex, frons sometimes smooth, sometimes with granulate glabrous area on vertex with shallow pits on dorsomedial surface; eyes usually about as wide as or slightly wider than frons, sometimes eyes up to 2 times wider than frons; posterior margin of eye usually protruding from adjacent surfaces, sometimes merging smoothly into contour of head; antennae occasionally sexually dimorphic, distal segments usually slightly eccentric; antennae usually extending to humerus, sometimes varying to one-third length of elytra.

Prothorax. Disk subcampanulate to conical, usually with coarse punctures; cervical sulcus on anterolateral margin; lateral carina varying from obsolete to incomplete to strong and extending almost to coxal cavity; usually short median impressed line on median basal lobe; procoxae contiguous at apices.

Scutellum. Varying from small to large and transverse to elongate, usually quadrate; bifurcate at apex, covered with dense hairs.

Elytra. About twice as long as broad; striae moderately to deeply impressed, subequal at base; often striae 3 and 4 closer to each other at base; striae sometimes abbreviated at base, often with small spines at base.

Hind Leg. Femur usually expanded medially to about width of or wider than width of hind coxa; femur armed with one large subapical acuminate spine without additional smaller spines; mucro 0.05–1.3 times as long as tarsomere 1; usually without (but occasionally with) a deep sinus at the base of an elongated dorsal coronal spine at apex of hind tibia (fig. 2).

Abdomen. Usually with sterna unmodified, sternum 1 occasionally with round patch of white hairs or with medial round or elongate depression or both, sometimes with elongate hairs; ventral surface of abdomen sometimes arcuate; pygidium ranging from evenly rounded to strongly convex; apical margin of last sternum slightly to strongly emarginate to receive apex of pygidium, apical margin of last sternum of females usually without emargination.

Male Genitalia. Usually without dorsal hood at apex; armature of internal sac ranging from only a lining of spicules to large spines; without hinge sclerites; lateral lobes cleft for a part of their length.

Type species of the Genus. *Neobruchidius lovie* Johnson & Romero.

Diagnosis. *Neobruchidius*, may be separated from *Acanthoscelides* using the following characters: a) femur armed with one large subapical acuminate spine without additional smaller spines, b) femur usually expanded medially to about width of or wider than width of hind coxa, c) mucro 0.05–1.3 times as long as tarsomere 1.

The terminology of the parts of the male genitalia follows that proposed by Kingsolver (1970) and Romero & Johnson (2000), the terminology of the parts of the hind leg follows that of Johnson & Kingsolver (1973).

Discussion. According to Borowiec (1987) and Johnson (1983, 1990) *Acanthoscelides* and *Bruchidius* have been used as genera into which species are placed that do not fit within the limits of other genera. For exmaple *Sulcobruchus*, *Conicobruchus*, *Megabruchidius*, *Kingsolverius*, *Decellebruchus* and *Salvibruchus* were separated from *Bruchidus*. In *Acanthoscelides* genus is occurring the same process, *Abutiloneus* use to be part of this later genus and we continue with the clarification of the genus. At least the new genus *Neobruchidius*is probably, it may be separated from *Acanthoscelides* using the following characters mentioned in the generic diagnois above. The strongest character is the first one.

Key to Species of *Neobruchidius*

1a. Deep sinus at base of an elongated dorsal coronal spine at the apex of the hind tibia (fig. 2); the spine is about 0.2–0.25 as long as tarsomere 1 2
b. Without Deep sinus at base of an elongated dorsal coronal spine at the apex of the hind tibia (fig. 1); the spine much shorter than 0.2–0.25 as long as tarsomere 1 4
2a. Head, body, and appendages black ..... *N. canar* (Johnson)
b. Head, body, and appendages of some lighter color 3

3a. Elongate golden brown hairs on the ventral, medial surface of abdominal sterna 2 and 3; subapical acuminate spine near the apex of the hind femur with a spinulation on its posterior margin and is 1.5 times as long as the width of the base of the tibia .... *N. curimagua* (Johnson)

b. Without the above characters, but legs that are entirely red-orange, the other two species have legs with some darker color .....*N. tibiospinalis* (Johnson)

4a. Posterior margin of subapical spine on hind femur with 2 small serrations .... N. *lituratus* (Sharp)

b. Posterior margin of subapical spine on hind femur smooth, without 2 small serrations 5

5a. Pronotum, elytra, and hind legs all black 6

b. Pronotum, elytra, and hind legs not all black, of some lighter color 7

6a. Head, body and hind legs black in combination with antennae and first two pairs of legs dark brown ..... *N. zacatlan* (Johnson)

b. Antennae, pronotum, elytra, and legs all black ..... *N. macheta* (Johnson)

7a. Undersurface of hind femur with carina on inner margin, often 2–4 small spines on carina along middle one-third of femur; femur armed on inner edge with subapical acuminate spine from 0.25 (Ecuador, Colombia, Venezuela) to 1.3 (Peru) times as long as width of tibial base, without additional spines .....*N. tabidus* (Erichson)

b. Not with characters as in couplet 7a 8

8a. Antennae and legs red-orange; body robust; eyes large, about 2.2 times width of the frons; elytral striae 3 and 4 abbreviated at their bases by a raised, flattened area terminating in small spines at the bases of these striae; hind femur constricted apically and basally, the greatest width of the femur being at about 0.2 from the apex of the femur (consequently the femur is spindle-shaped); mucro at apex of hind tibia formed by a sinus on the ventral surface of the tibial apex (thus the apex of the mucro extends only to the apex of the tibia) ..... *N. barinas* (Johnson)

b. Not with characters as in couplet 8a 9

9a. Pronotum varying from mostly all red orange with small chocolate brown spots to mostly chocolate brown with small red orange spots .....*N. guatemala* (Johnson)

b. Pronotum not varying from mostly all red orange with small chocolate brown spots to mostly chocolate brown with small red orange spots; elytron usually all red orange surrounded by narrow stripe of brown, sometimes all red orange, without chocolate brown spots (fig. 3) ..... *N. lovie* Johnson & Romero

Neobruchidius lovie Johnson & Romero, new species

Length (Pronotum-elytra) 1.5–1.8 mm. Width 1.0–1.1 mm. Maximum thoracic depth 0.9–1.0 mm.

Male

Integument color. Head and eyes black; antennae light brown to red orange; usually pronotum brown, varying from all black to all red orange; elytron usually all red orange surrounded by narrow stripe of brown, sometimes all red orange (fig. 3); meso- and metathoracic sterna varying from light brown to usually all black; remainder of undersurfaces, legs and pygidium all red orange.

Vestiture. With recumbent white hairs as follows: eye with medial fringe of white hairs; postocular lobe with short white hairs; postocular patch of sparse white hairs; remainder of head with sparse white hairs; dorsal surfaces with sparse white hairs, sterna with sparse white hairs, sometimes patches of moderately dense to dense white hairs on lateral margins of sterna.

Structure

Head. Slightly elongate, densely punctulate; frons with median, glabrous, finely punctulate line extending from frontoclypeal suture to vertex; vague transverse sulcus between upper limits of eyes; width of eye about 1.6 times wider than width of frons; ocular sinus about 2/5 as long as width of eye; posterior margin of eye protruding from adjacent surfaces; postocular lobe strong, rounded, not angulate; distance from base of antennae to apex of labrum about 1/2 as long as distance from upper limits of eyes to apex of labrum; antennal segments 1 and 3 usually filiform, 2 usually moniliform; 4 to 10 eccentric, 11th subacute apically; 5 to 10 broader than long, 11 longer than broad; antenna reaching to about 0.5 length of elytron.

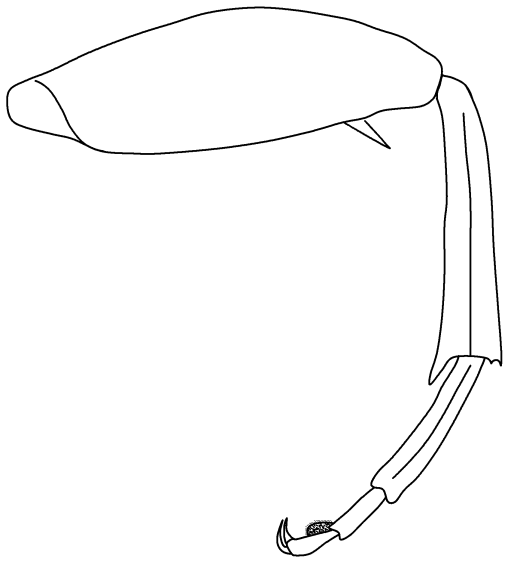

FIGURE 1. *Neobruchidius lovie*, hind leg, lateral view.

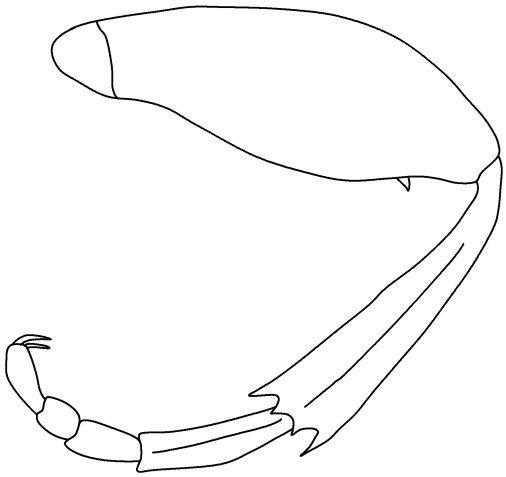

FIGURE 2. *Neobruchidius tibiospinalis*, hind leg, lateral view showing deep sinus at base of an elongated dorsal coronal spine at the apex of the hind tibia.

Prothorax. Disk campanulate (fig. 3), with many punctations, punctations more coarse at base and lateral margins; cervical sulcus shallow, extending from near coxal cavity to about 1/2 distance to pronotal midline; lateral prothoracic carina vague, extending about 1/4 distance from base to coxal cavity; vague, short median impressed line on median basal lobe usually obscured by pubescence; prosternum separating procoxae from about 0.7 their length.

Mesothorax and Metathorax. Scutellum small, slightly longer than broad, clothed with dense recumbent white hairs; elytron slightly longer than broad; striae deep, punctate, strial intervals rugulose; striae 2, 3 and 4, and 5 and 6 closer to one another at base than to adjacent striae (fig. 3); without spines at base of elytron; humerus rugulose; undersurfaces punctate; all of hind coxa punctate; hind femur constricted basally and apically, expanded medially to slightly less than width of coxa (fig. 1); inner ventral surface with a vague longitudinal carina, without lateral longitudinal carina; femur armed with an inner subapical acuminate spine about as long as width of tibial base; tibia with ventral, lateral, and dorsomesal glabrous longitudinal carinae, without lateroventral carina; dorsal surface without fossa; tibial corona with 3 to 4 spinules, mucro much shorter than 1/4 as long as 1st tarsomere; without sinus at base of mucro; 1st tarsomere with ventral, lateral and dorsal glabrous longitudinal carinae.

Abdomen. Sterna not flattened medially; 1st sternum about 2/3 as long as abdomen, posterior margin straight; sterna 2 to 4 unmodified, 5th emarginate; pygidium punctulate, convex in lateral view.

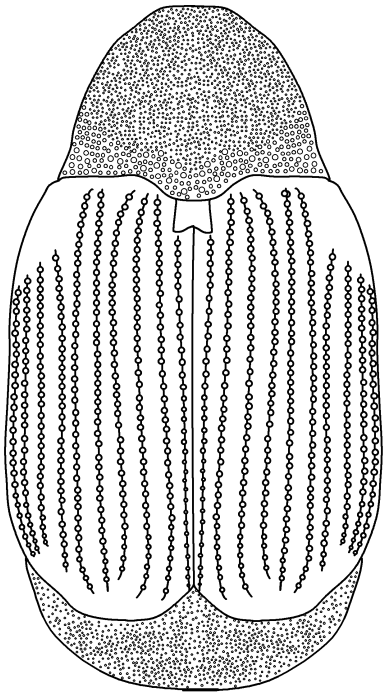

FIGURE 3. *Neobruchidius lovie*, dorsal surface.

Genitalia. Median lobe elongate; in ventral view, ventral valve triangular, lateral margins concave, base about 3/4 as wide as apex of median lobe, arcuate in lateral view; without hinge sclerites; armature of internal sac consisting of many spicules extending almost to apex of internal sac; with about 5 small spines and round, sclerotized gonopore sclerite basally (fig. 4). Lateral lobes expanded apically, apices with many fine hairs medially and about 5 larger hairs; cleft to about 2/3 their length (fig. 5).

Female

Antennal segments 1 and 2 usually moniliform, 3 usually filiform; 4 to 10 slightly eccentric, 11th subacute apically; 5 to 10 slightly broader than long, 11 longer than broad; antenna shorter than male, reaching to humerus; 5th abdominal sternum not emarginate at apex, in a gentle curve.

Host Plants. Unknown.

Type Series

Holotype male, allotype female and 11 paratypes: Panama. Panama: El Valle, 14 -19, 1963, L. J. Bottimer Collection No. 117i. Panama Canal Zone, 5 mi. NNE Arriajan, 31-VII-1962, H. & A. Howden. Venezuela. Aragua: 500 m., El Limon, Feb. 21, 1971, H. & A. Howden.

Holotype, allotype, and six paratypes deposited in the Canadian National Collection of Insects, Ottawa. Two paratypes on loan to the Canadian National Collection of Insects, Ottawa, by H. and A. Howden, two deposited in the Jesús Romero Collection, one deposited in the C. D. Johnson Collection, and two deposited in the Texas A&M University Collection.

Etymology. The specific epithet is named after the mother of the first author, Lovie Mae Johnson, and is a noun in apposition to *Neobruchidius*.

Diagnosis and Discussion

Neobruchidius lovie is closely related to species in the genera *Sennius* and *Acanthoscelides* based on the characters given by Bridwell (1946) and later by Johnson and Kingsolver (1973). It differs distinctly from species of *Sennius* by lacking hinge sclerites in the male genitalia. It differs from most *Sennius* by having a mucro that is about 1/4 as long as the first tarsomere and from many species of *Sennius* with its large hind femoral spine, its small size, and its lack of colored markings on the elytra.

Unfortunately the host seeds of *N. lovie* are unknown. When the host plants of *N. lovie* are discovered this will give a better basis for comparing the relationships between the two genera. Larvae of all species of *Sennius* known to us from Central America northward feed in seeds of *Cassia* (s. l.). *Cassia* (s. l.) seeds, of course, are fed upon by some species of *Acanthoscelides*. Johnson has unpublished records of some species of *Sennius* from northern South America that feed in seeds other than *Cassia* (s. l.). Therefore, host relationships offer few clues to the phylogeny of this species.

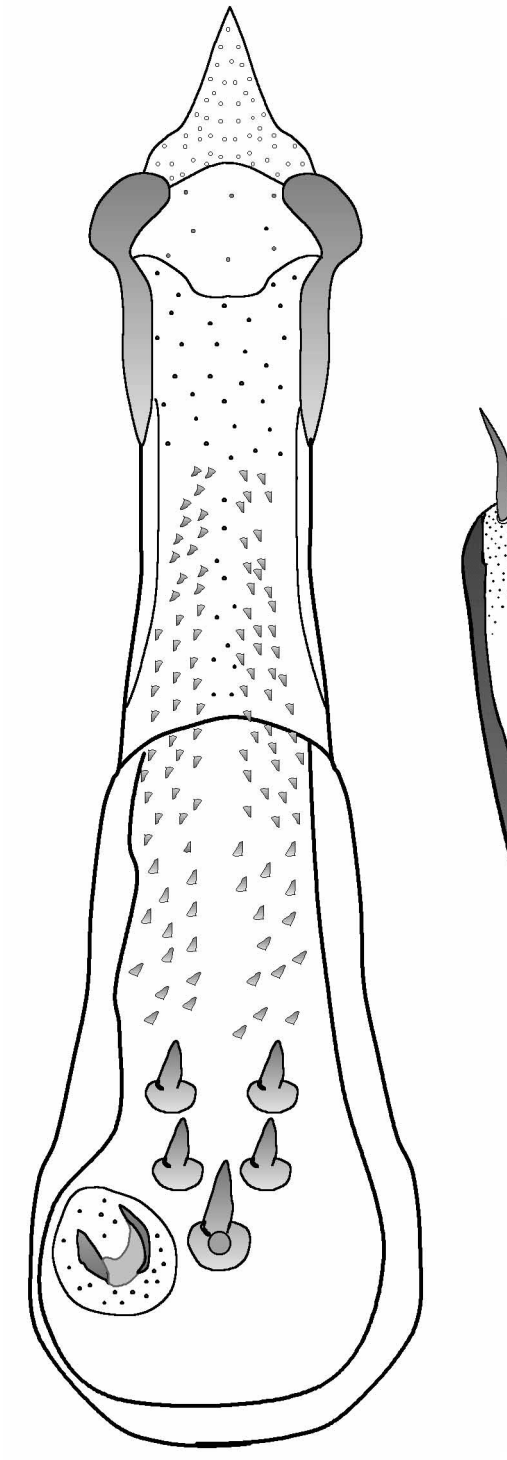

FIGURE 4. *Neobruchidius lovie*, median lobe, male genitalia, ventral view.

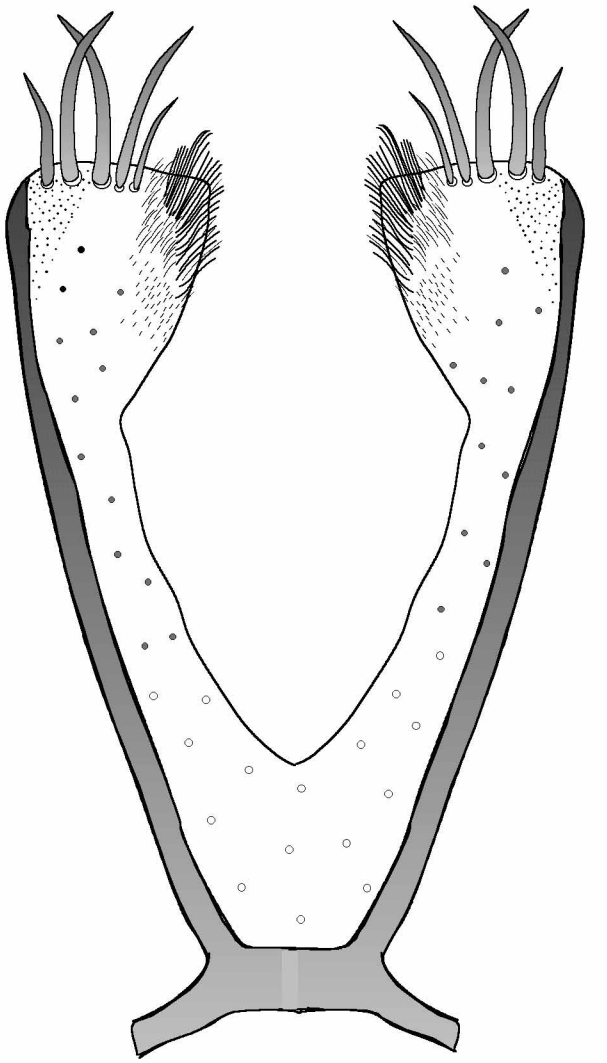

FIGURE 5. *Neobruchidius lovie*, lateral lobes, male genitalia, ventral view.

Acknowledgments

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