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(Hemiptera, Miridae), with a Review of Their  
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## Redescription of *Beamerella* Knight and *Hambletoniola* Carvalho and Included Species (Hemiptera, Miridae), with a Review of Their Relationships

THOMAS J. HENRY<sup>1</sup> AND RANDALL T. SCHUH<sup>2</sup>

### ABSTRACT

*Larinocerus* Froeschner is synonymized with *Beamerella* Knight. *Beamerella* and its two included species *personatus* Knight and *balius* Froeschner are redescribed as are *Hambletoniola* Carvalho and its single included species *antennata* Carvalho. A key to included genera and species as well as illustrations of the male and female genitalia, trichobothria, and

pretarsal structures are provided. An asymmetrical "lateral tube" is newly described for the female genitalia of *Beamerella* and *Hambletoniola*; its occurrence is documented for some other Phylini. The interrelationships of the three taxa and their relationship to other Phylini are discussed.

### INTRODUCTION

During April and May of 1978, we collected a large number of Miridae in the southwestern United States and Mexico. We discovered the host plants and collected numerous specimens of the two unusual species, *Hambletoniola antennata* Carvalho and *Larinocerus balius* Froeschner. These taxa are two of three closely allied phylines which can be recognized by the large, flattened, scalelike setae on the antennae, the enlargement of some antennal segments, the stout body form, and the whitish coloration with black spotting. All have been placed in separate genera, chiefly because of varying degrees of antennal development.

Carvalho (1954) described the first of these remarkable mirids as *Hambletoniola antennata* from Mexico (specimens intercepted at Brownsville, Texas). Knight (1959) later de-

scribed *Beamerella personatus* from Texas, and noted that unlike *Hambletoniola*, it had both the second and third antennal segments inflated, a character to which he ascribed generic significance. Froeschner (1965) recognized a third taxon, *Larinocerus balius*, from California and eventually placed it in a new genus, because of the formation of the antennae, the wider vertex, and the form of the costal margin of the hemelytra. Knight (1968) and Slater and Baranowski (1978) included *Beamerella* and *Larinocerus* in their keys, but did not treat *Hambletoniola*. Although all three genera have similarities, no author has carefully compared them.

In the present paper we examine the three taxa described by Carvalho, Froeschner, and Knight. Based on examination of numerous ex-

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ternal characters, including the antennae and width of the vertex, as well as the male and female genitalia, we consider *Larinocerus* congeneric with *Beamerella*; as the more recently described taxon, *Larinocerus* is therefore placed in synonymy. All three species are re-described and a key to genera and species is provided. All measurements are in millimeters.

We thank Dr. J. C. Schaffner, Texas A & M University, for a gift of specimens, and Dr. R. C. Froeschner, National Museum of Natural History, Smithsonian Institution, for a loan of paratypes of *balius*. Ms. Kathleen Schmidt prepared all the illustrations and Ms. Brenda Massie helped prepare the manuscript.

#### KEY TO GENERA AND SPECIES

1. Antennal segments two and three shiny black, strongly swollen, covered with erect, black, scalelike setae (figs. 1, 3); width of vertex at least 3 times the dorsal width of an eye; vesica of male without "notches" on proximal half (figs. 18, 21) ..... 2
- Only antennal segment three enlarged, dark, and with erect black scalelike setae (figs. 2, 4); antennal segment two weakly swollen in males, more strongly swollen in females; vertex about two and one-half times dorsal width of an eye; vesica of male with "notches" on proximal half (figs. 24, 25) ..... *Hambletoniola antennata*
2. Face shiny black at and below level of base of tylus; rostrum reaching beyond metacoxae; total length not over 3.00 ..... *Beamerella personatus*
- Face darkened only below level of antennal insertion, not shining, rostrum reaching middle of mesocoxae; length 3.50 or greater ..... *Beamerella balius*

#### BEAMERELLA KNIGHT

Figures 1, 3, 7, 8, 11, 14, 15, 18-23, 28-30

*Beamerella* Knight, 1959, p. 423.

*Larinocerus* Froeschner, 1965, p. 86. NEW SYNONYMY.

**DIAGNOSIS:** Similar to *Hambletoniola* in size, coloration, and vestiture but consistently recognizable by the proportionally wider vertex in the male, the strongly inflated second antennal segment, the vesica of the male forming a single complete coil, and by the form of the

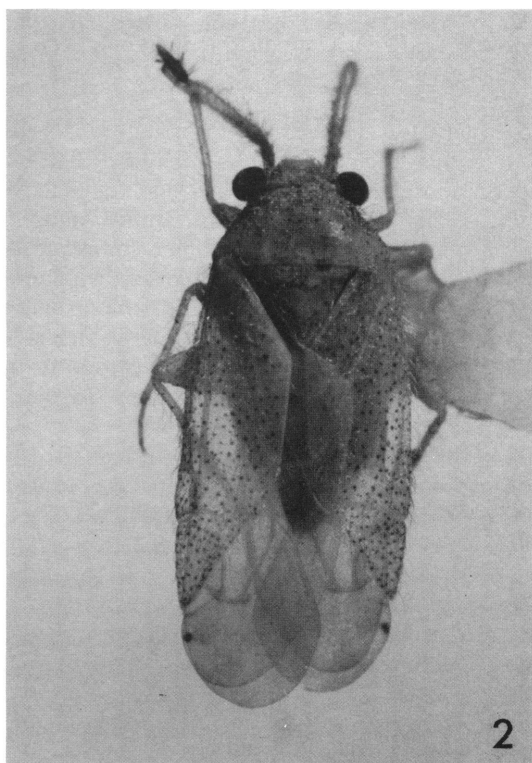
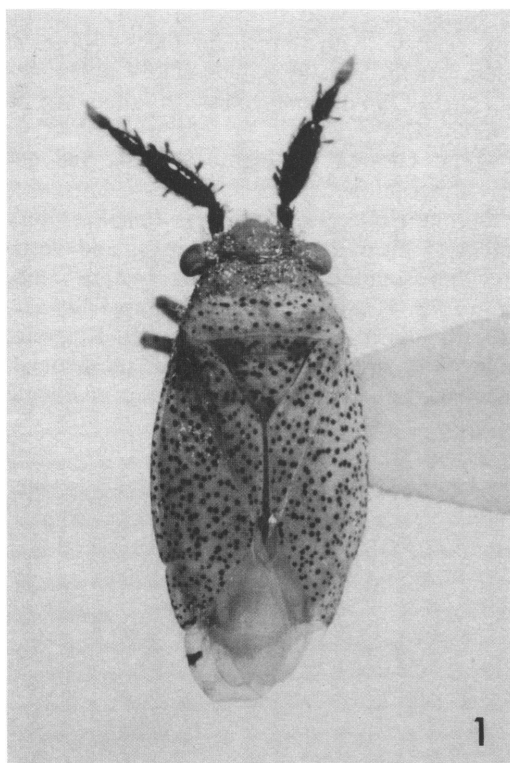
sclerotized rings and the asymmetrical lateral tube associated with the right side of the bursa copulatrix of the female.

**DESCRIPTION:** Macropterous male. Small, ovoid, length 2.70-3.80, pallid to greenish white, uniformly covered with small dark spots, thickly clothed with silvery, woolly pubescence, intermixed with erect, silvery, simple setae, and some apically flattened setae (fig. 10). Head transverse, including eyes wider than anterior margin of pronotum, vertex more than three times dorsal width of eye, posterior margin rounded, ecarinate; antennal segments one, two, and three shiny black, moderately to strongly swollen, clothed with large black scalelike setae, segment four fusiform, not black, clothed with simple setae; rostrum variable reaching at least to mesocoxae; pronotum subrectangular, anterior margin weakly sinuate, without impression anterior to calli, posterior and lateral margins nearly straight, humeral angles rounded; mesoscutum and scutellum nearly flat, scutellum separated from mesoscutum by a distinct, nearly straight, transverse impression; hemelytra arcuate laterally, cuneal incisure shallow; legs with coloration as body, without woolly pubescence, with some flattened setae (fig. 10), metafemora rather strongly enlarged, mesofemora with six trichobothria, metafemora with nine (figs. 14, 15); tibiae with erect spines, many of length nearly two times tibial diameter; metatarsal segment one shorter than segment two, segment three longer than two; claws broad basally, tapered, abruptly curved on distal one-fourth; pulvilli relatively large, covering claw up to point of distal curvature; parempodia setiform (fig. 11).

**MALE GENITALIA:** Vesica elongate, forming a single complete coil, with a spinelike attenuate apex subtended by a well-developed secondary gonopore with some surrounding small spicules (figs. 18, 21); phallosome L-shaped, with a heavily sclerotized "band" on its basal portion (figs. 20, 23); left clasper typically phylline, boat-shaped, rather heavy bodied (figs. 19, 22); right clasper small, leaflike.

**DESCRIPTION:** Macropterous female. Similar in coloration, vestiture, and general structure to male.

**FEMALE GENITALIA:** Posterior wall a simple



FIGS. 1-2. 1. *Beamerella balius*. 2. *Hambletoniola antennata*.

plate with a transversely striate anterolateral region, a sclerotized mesial region, and a spicular posterolateral region (fig. 30); bursa copulatrix with well-developed, slightly laterally infolded sclerotized rings; a well-sclerotized folded "lateral tube" arising from vulvar area between bases of anterior ovipositor valves and positioned on the right side of the bursa, entering bursa below sclerotized ring; smaller sclerites between bases of anterior valves asymmetrical (figs. 28, 29).

TYPE SPECIES: *Beamerella personatus* Knight, by original designation.

SYNONYMY: See general discussion at end.

*Beamerella balius* (Froeschner), new combination

Figures 1, 3, 7, 8, 11, 14, 15, 18-20, 28-30

*Larinocerus balius* Froeschner, 1965, p. 88; Knight, 1968, p. 58.

DIAGNOSIS: Recognized by the shining black frons and rostrum reaching to middle of the mesocoxae.

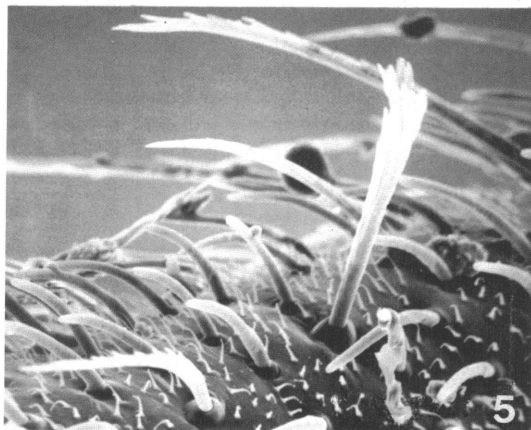
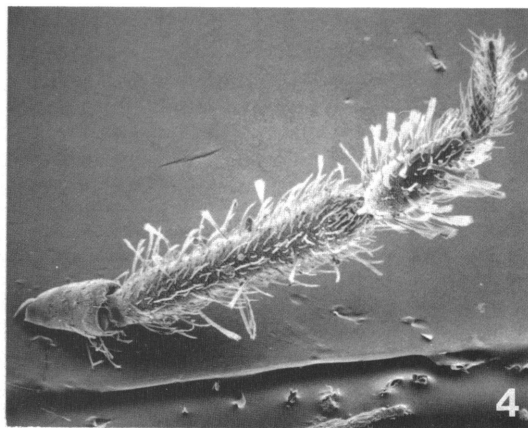
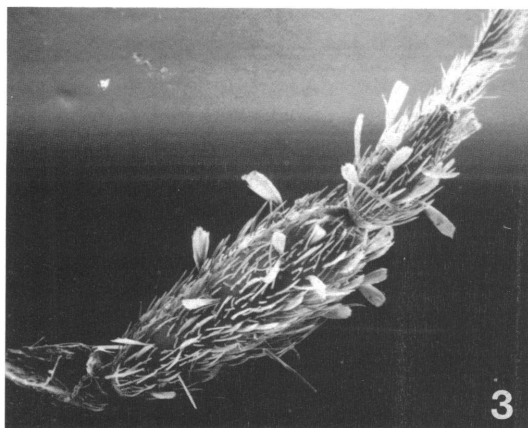
DESCRIPTION: Macropterous male (fig. 1). Length 3.76, width 1.72, generally gray to greenish white, uniformly covered with small, brownish black spots. Head: length 0.52, width across eyes 1.08, vertex 0.68, dorsal width of eye 0.20, with a few small, brownish black spots, especially along areas bordering eyes, fuscous between antennal bases across apex of tylus; frons with some light, shining, scalelike setae. Rostrum: length 1.04, stout, pale greenish, segment four fuscous to black, reaching middle of mesocoxae. Antennae (fig. 3): segments one, two, and three shiny black, swollen, with recumbent, black simple setae, and large, black, flattened scalelike setae, segment four terete, mostly fuscous, covered with recumbent short simple setae; I, 0.28; II, 0.68,

diameter at middle 0.18; III, 0.32, diameter at middle 0.12; IV, usually distorted and not accurately measurable. Pronotum: length 0.60, maximum width 1.28, calli not raised. Hemelytra: moderately arcuate laterally; membrane opaque white with a large, rectangular, marginal, black spot just posterior to apex of cuneus; veins and a diffuse spot near apex of membrane infusate. Venter: sternum sometimes infusate. Legs: pale greenish yellow; coxae without spots; femora strongly spotted, profemora and mesofemora without spots proximally, meta-femora with three large spots on ventral surface; trichobothrial patterns as in figures 14 and

15; tibiae pale with black and white spines, some spines with brownish black spots at bases, length of many spines nearly two times diameter of tibia; tarsi yellowish; pretarsus as in figure 11.

**MALE GENITALIA:** Figures 18-20. See generic description.

**DESCRIPTION:** Macropterous female. Very similar to male in color, markings, and vestiture, but slightly more robust. Length 3.68, width 1.72. Head: length 0.58, width 1.14, vertex 0.76, dorsal width of an eye, .19. Rostrum: length 1.10, reaching middle of mesocoxae. Antennae: I, 0.32; II, 0.70, diameter at middle



FIGS. 3-6. Scanning electron micrographs of antennae. 3. *Beamerella balius* ♂, 105X. 4. *Hambletoniola antennata* ♂, 110X. 5. *Idem*, segment 2, 1100X. 6. *Idem*, segment 3, 550X.

0.22; III, 0.34, diameter at middle 0.12; IV, 0.28. Pronotum; length 0.60, maximum width 1.34.

**FEMALE GENITALIA:** Figures 28-30. See generic description.

**SPECIMENS EXAMINED:** CALIFORNIA: *San Bernardino Co.*: 1.5 mi. N of Yucca Valley, 1155 m., May 13, 1978, J. D. Pinto and R. T. Schuh, taken on *Salazaria mexicana* (Labiatae) (AMNH), 7 ♀, 10 ♂; S of Palmdale, Oman, 1935 (USNM), 1 ♂, 2 ♀ paratypes. NEVADA: *Clark Co.*: 1 mi E of Searchlight, 1095 m., May 17, 1978, R. T. Schuh, taken on *Salazaria mexicana* (AMNH), 16 ♂, 11 ♀; 5.8 mi. W of Valley of Fire State Park, 845 m., May 17, 1978, R. T. Schuh, taken on *Salazaria mexicana* (AMNH), 35 ♂, 52 ♀.

The holotype of *balius* is in the National Museum of Natural History, Smithsonian Institution, Washington, D.C., type no. 67449. Paratypes from the type locality were examined for this study.

**DISCUSSION:** The specimens upon which Froeschner based his original description had no host information associated with them. He speculated that *balius* might live on a plant with white pruinose leaves, such as *Artemesia*. The host was later recorded as *Salazaria mexicana* (Labiatae) by Knight (1968). We found *balius* in abundance on this small bushy plant which has sparse, dull, greenish white foliage. The bugs blend in remarkably well with the leaves and stems of *Salazaria* and are usually evident only because of the large black antennae.

*Beamerella personatus* Knight  
Figures 21-23

*Beamerella personatus* Knight, 1959, p. 423;  
Knight, 1968, p. 58.

**DIAGNOSIS:** Recognized by the face being shiny black at and below the level of the base of the tylus and the rostrum reaching beyond the metacoxae.

**DESCRIPTION:** Macropterous male. Length 2.72, width 1.28, generally grayish white, uniformly covered with small, dark brown spots. Head: length 0.36, width across eyes 0.88, ver-

tex 0.56, dorsal width of eye 0.16, with a few small brown spots on vertex and a large brown spot near inner margin of each eye roughly midway between posterior margin of vertex and base of tylus; frons at and below level of base of tylus shining brownish black; frons with some black scalelike setae. Rostrum: length 1.10, slender, pale, reaching slightly beyond metacoxae to second abdominal segment; segment four black. Antennae: segments one, two, and three shiny black, swollen, clothed with recumbent, black, simple setae, intermixed with large, black flattened scalelike setae, segment four terete, fuscous on basal half, clothed with recumbent simple setae; I, 0.20; II, 0.46, diameter at middle 0.20; III, 0.34, diameter at middle 0.16; IV, 0.32. Pronotum: length 0.48, maximum width 1.06, calli weakly raised. Hemelytra: moderately arcuate laterally; membrane including veins opaque white, speckled with brown (marmorate), with a black, spherical, marginal spot posterior to apex of cuneus. Venter: sternum fuscous. Legs: pale yellowish; coxae without spots (except for a single row of fine spots on procoxae); femora strongly spotted, profemora and mesofemora without spots proximally, metafemora with two large spots on ventral surface; trichobothrial pattern as in *balius* (figs. 14, 15); tibiae pale with light spines, some with brownish black bases, length of spines slightly greater than diameter of tibia; tarsi yellowish; pretarsus as in *balius* (fig. 11).

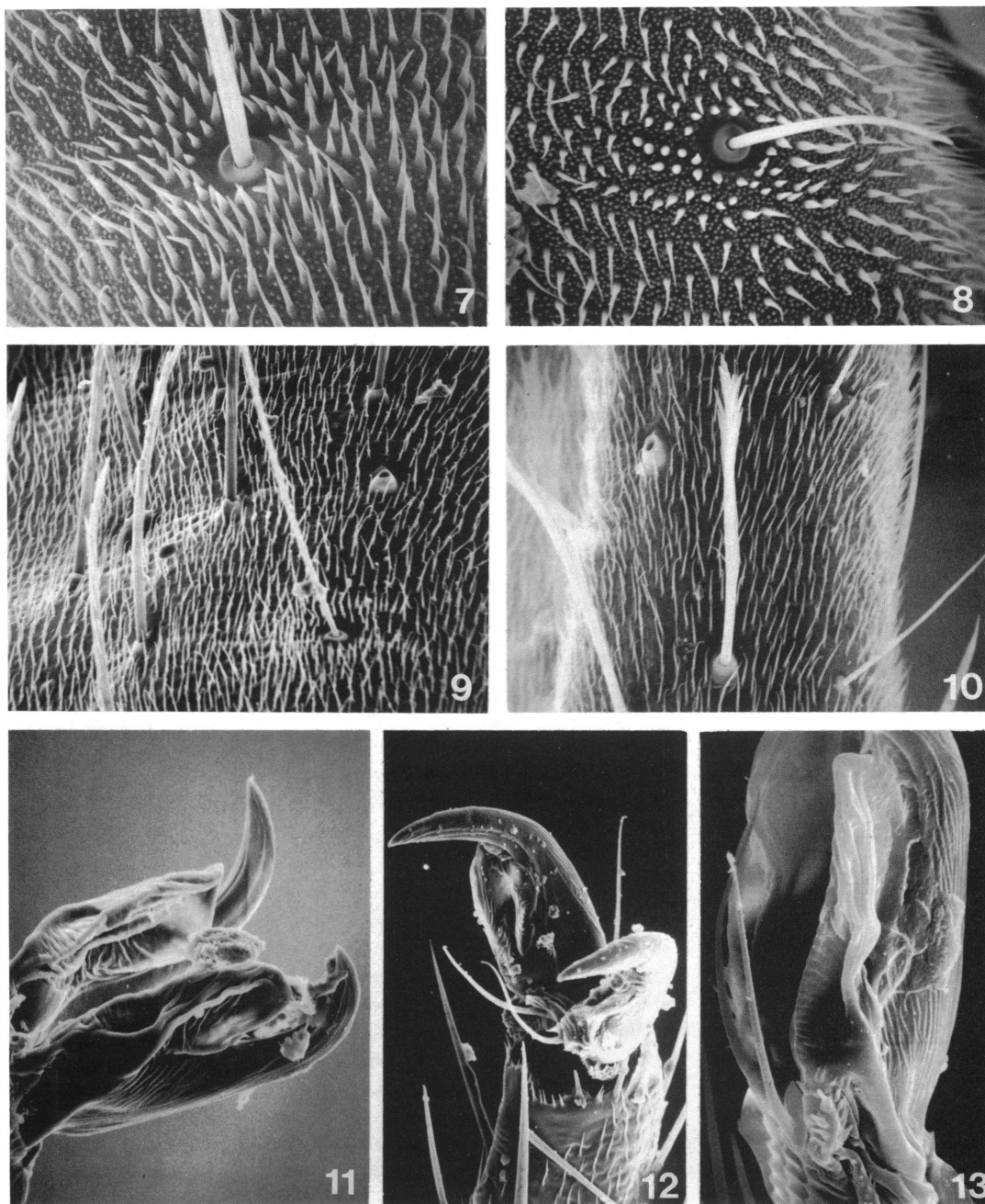
**MALE GENITALIA:** Figures 21-23. See generic description.

**DESCRIPTION:** Macropterous female. Very similar to male in color, structure, and vestiture. Length 2.76, width 1.32. Head: length 0.40, width 0.92, vertex 0.58, dorsal width of an eye 0.15. Rostrum: length 1.20, reaching just beyond metacoxae to base of ovipositor. Antennae: I, 0.24; II, 0.42, diameter at middle 0.18; III, 0.36; IV, 0.32. Pronotum: length 0.42, maximum width 1.02.

**FEMALE GENITALIA:** Very similar to *balius*. See figures 28-30 and generic description.

**SPECIMENS EXAMINED:** TEXAS: *Jeff Davis Co.*: Ft. Davis, August 1969, Board and Hafernik (AMNH), 2 ♂, 3 ♀.

The holotype of *personatus* is in the Snow



FIGS. 7-13. Scanning electron micrographs of trichobothria and pretarsal structures. 7. *Beamerella balius*, base of trichobothrium on mesoleg, 2300X. 8. *Idem*, trichobothrium on metaleg, 2000X. 9. *Hambletoniola antennata*, trichobothrium on metaleg, 1000X. 10. *Idem*, flattened seta and trichobothria on metaleg, 1050X. 11. *Beamerella balius*, pretarsus, 1050X. 12. *Hambletoniola antennata*, pretarsus, 1000 X. 13. *Idem*, lateral view of pretarsus, 2000X.



Entomological Museum, University of Kansas, Lawrence. It was not examined for this study.

**DISCUSSION:** No host records are available for *personatus*. It is probably not a ground inhabitant (as indicated by Knight [1968]) in view of the host association of *balius*, its nearest known relative, with *Salazaria*.

#### *HAMBLETONIOLA* CARVALHO

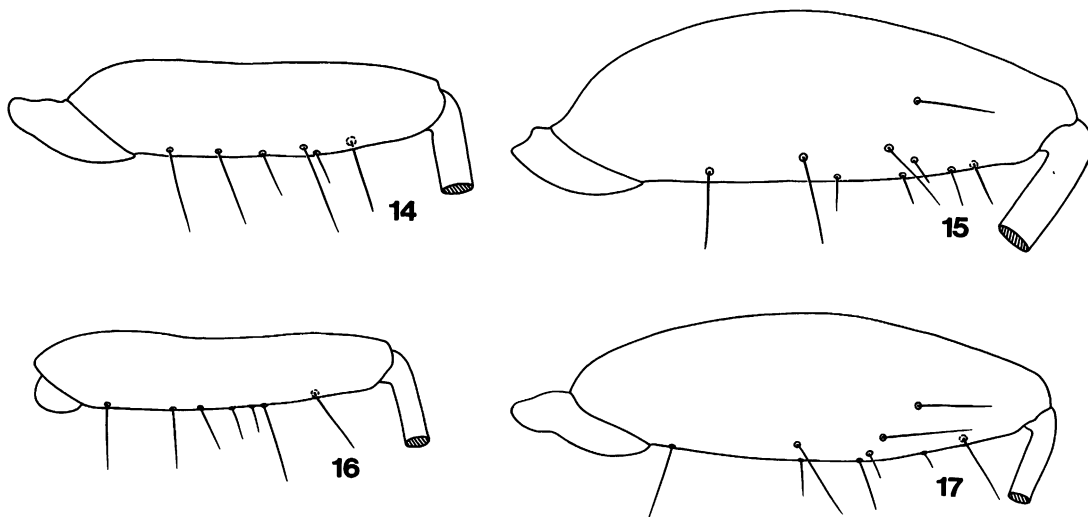
Figures 2, 4-6, 9, 10, 12, 13, 16, 17, 24-27, 31

*Hambletoniola* Carvalho, 1954, p. 128.

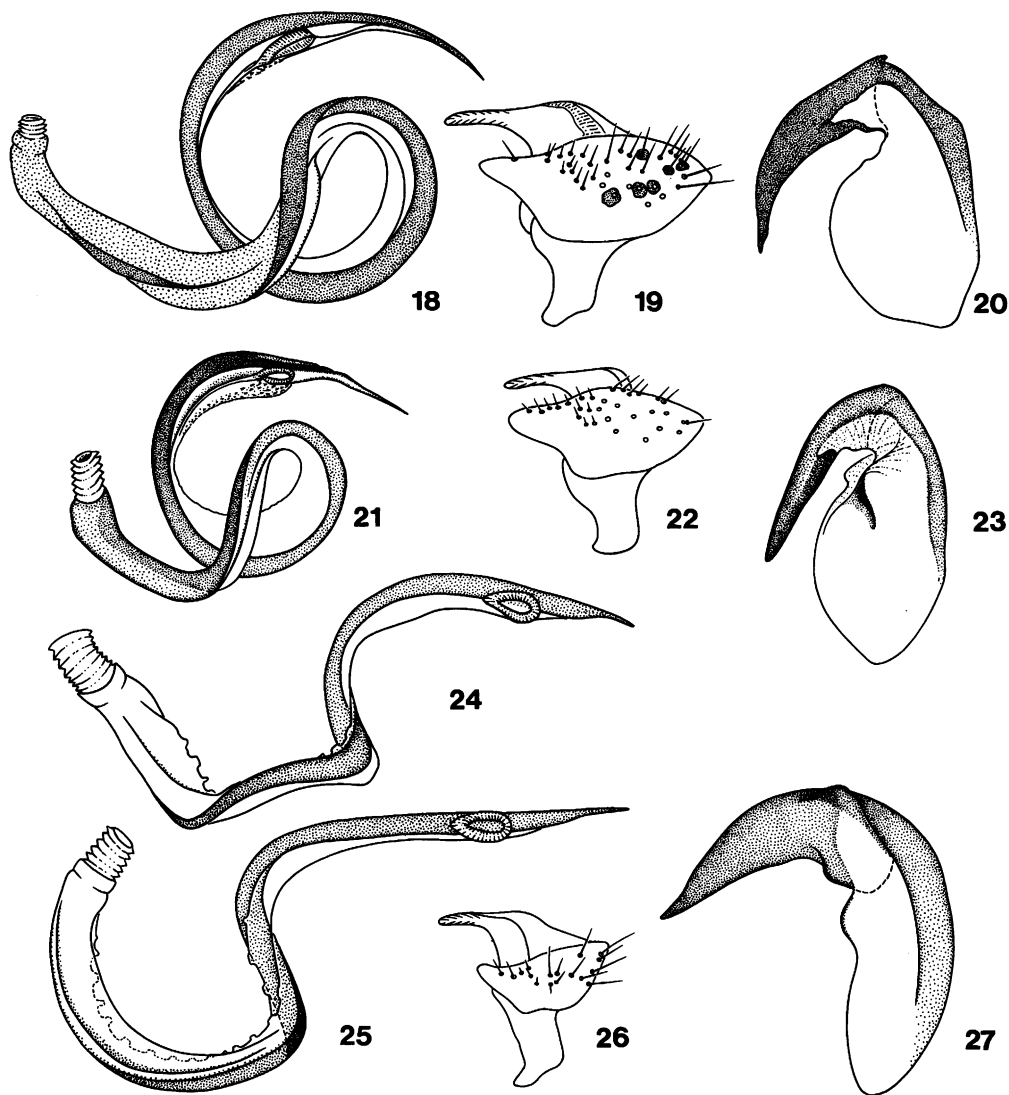
**DIAGNOSIS:** Similar to *Beamerella* in size and coloration, but separated by the relatively more narrow vertex, only antennal segment three being dark in color, conspicuously inflated and bearing large black, scalelike setae, the vesica in the male not forming a complete coil and having a series of notches on the proximal half, as well as by the form of the bursa copulatrix and associated structures of the female genitalia (fig. 31).

**DESCRIPTION:** Macropterous male. Generally small, elongate, length 3.30-3.40, pallid to pale green, lightly speckled with brown, clothed with silvery, woolly pubescence, intermixed with erect, silvery, simple setae, and some apically flattened setae (fig. 10). Head: transverse,

including eyes wider than anterior margin of pronotum, vertex about two and one-half times wider than dorsal width of an eye, posterior margin nearly flat mesially, laterally in the form of a low rounded ridge; antennal segments one and two simple, stout, pale, clothed with pale, scalelike setae, and some simple setae, segments three and four fusiform, three dark brown clothed with erect, black scalelike setae, four with reclining short, simple setae; rostrum moderately stout, reaching mesocoxae; pronotum trapezoidal, anterior margin noticeably sinuate, distinctly impressed mesially between anterior margin and weakly raised calli, posterior and lateral margins nearly straight, humeral angles broadly rounded, mesoscutum and scutellum weakly elevated, separated by an incomplete, shallow, transverse impression; hemelytra nearly straight sided, cuneal incisure distinct; legs with coloration as body, without woolly pubescence, with some flattened setae; metafemora weakly enlarged; mesofemora with seven trichobothria, metafemora with nine trichobothria (figs. 16, 17); tibiae with erect spines of length about one and one-half times tibial diameter; metatarsal segments one and two subequal in length, somewhat shorter than three; claws broad basally, rather strongly



FIGS. 14-17. Mesofemoral and metafemoral trichobothria. 14. *Beamerella balius*, mesofemur. 15. *Idem*, metafemur. 16. *Hambletoniola antennata*, mesofemur. 17. *Idem*, metafemur.



FIGS. 18-27. Male genitalia. 18. *Beamerella balius*, vesica. 19. *Idem*, right paramere. 20. *Idem*, phallosome. 21. *Beamerella personatus*, vesica. 22. *Idem*, right paramere. 23. *Idem*, phallosome. 24. *Hambletoniola antennata*, vesica. 25. *Idem*, vesica, another view. 26. *Idem*, right paramere. 27. *Idem*, phallosome.

curved on distal one-third; pulvilli relatively large, flaplike, covering about one-half total length of claw; parempodia setiform (figs. 12, 13).

**MALE GENITALIA:** Vesica long, slender, curving, apex antenuate, subtended by a well-developed, secondary gonopore, proximal one-half with two series of "notches" (figs. 24,

25); phallosome L-shaped, with a heavily sclerotized band on its basal portion (fig. 27); left clasper typically phyline, boat shaped (fig. 26); right clasper small, leaflike.

**DESCRIPTION:** Macropterous female. Similar in coloration and vestiture to male; body form more compact, ovoid, hemelytra distinctly arcuate laterally, cuneal incisure shallow; eyes

smaller than in male, vertex relatively wider; antennal segment two shorter and more slender than in male, segment three much more strongly swollen, nearly globose.

**FEMALE GENITALIA:** Posterior wall similar to *Beamerella*; bursa copulatrix with sclerotized rings transverse and somewhat contorted; asymmetrical "lateral tube" arising from vulvar area between anterior ovipositor valves well-developed (fig. 31), but somewhat smaller and differently shaped than in *Beamerella* (figs. 28, 29).

**TYPE SPECIES:** *Hambletoniola antennata* Carvalho, by monotypy.

**DISCUSSION:** See general discussion at end.

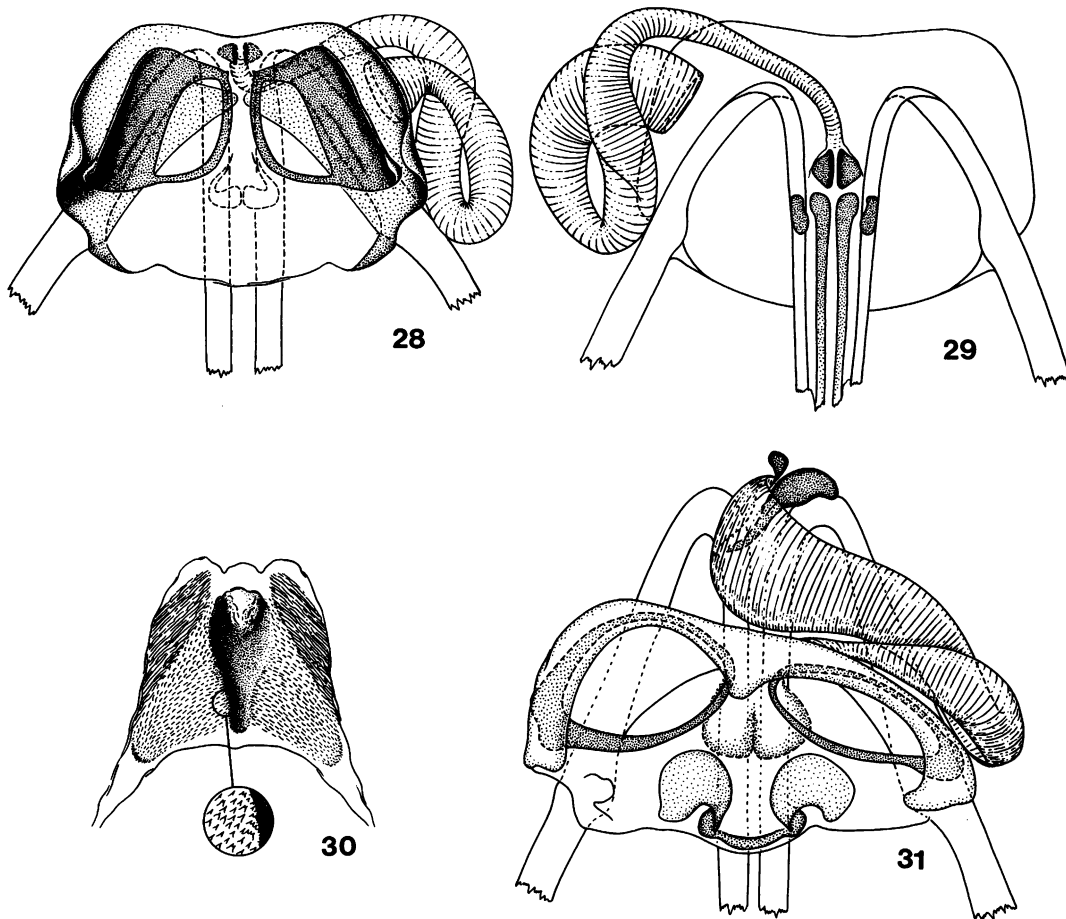
*Hambletoniola antennata* Carvalho

Figure 2, 4-6, 9, 10, 12, 13, 16, 17, 24-27, 31

*Hambletoniola antennata* Carvalho, 1954, p. 126.

**DIAGNOSIS:** Recognized by the fact that only antennal segment three is dark and swollen, more strongly so in females than in males.

**DESCRIPTION:** Macropterous male. Length 3.36, width 1.00, generally grayish white, dull, finely but uniformly brown speckled; Head: length 0.46, width across eyes 0.88, vertex 0.48, dorsal width of eye 0.20, tylus and area below antennal bases with enlarged, apically flattened, pale setae. Rostrum: length 0.82,



FIGS. 28-31. Female genitalia. 28. *Beamerella balius*, dorsal view of bursa copulatrix showing sclerotized rings and lateral tube. 29. *Idem*, ventral view of bursa copulatrix showing lateral tube. 30. *Idem*, posterior wall. 31. *Hambletoniola antennata*, dorsal view of bursa copulatrix showing sclerotized rings and lateral tube.

pale to testaceous, segment four black, reaching bases of mesocoxae. Antennae: (fig. 4), I, 0.24, pale to testaceous, finely brown speckled; II, 0.68, diameter at middle 0.10, cylindrical, gradually enlarged distally, pale to testaceous; III, 0.36, diameter at middle 0.08, fuscous to black; IV, 0.24, pale, fuscous at extreme base. Pronotum: length 0.56, maximum width 1.16, calli somewhat darker than remainder of pronotum. Hemelytra: membrane opaque white, with a small black marginal spot posterior to apex of cuneus; veins pale, slightly infusate apically. Venter: mesosternum black; pleural region with pale, silvery, woolly setae; abdomen with longer more recumbent, silvery simple setae. Legs: pale, coxae without spots; femora finely brown spotted, spots absent on proximal one-fourth of all femora; trichobothrial patterns as in figures 16 and 17; tibial spines pale with small fuscous spots at bases, basal three or four spines longest, of length about two times diameter of segment; tarsi pale; pretarsus as in figures 12 and 13.

**MALE GENITALIA:** Figures 24-27. See generic description.

**DESCRIPTION:** Macropterous female. Similar to male in color and vestiture, but head distinctly roseate and mesoscutum infusate; structural differences as in generic description; length 3.12, width 0.76. Head: length 0.50, width across eyes 0.88, width vertex 0.52, dorsal width of eye 0.16. Rostrum: length 1.00. Antennae: I, 0.22; II, 0.54, diameter at middle 0.06; III, 0.28, diameter at middle 0.14, IV, 0.26. Pronotum: length 0.52, maximum width 1.12.

**FEMALE GENITALIA:** Figure 31. See generic description.

**SPECIMENS EXAMINED:** MEXICO: *Nuevo Leon*: 9 mi. W of Iturbide, July 3, 1974, Clark, Murray, Ashe, Schaffner (AMNH), 2 ♂, 2 ♀. TEXAS: *Kinney Co.*: 21 mi W of Uvalde, 370 m., April 25, 1978, taken on *Leucophyllum* sp. (Scrophulariaceae), T. J. Henry and R. T. Schuh (AMNH, PA Dept. Agr., T. J. Henry collection), 15 ♂, 5 ♀.

The holotype is deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C., type no. 61996. It was not examined for this study.

**DISCUSSION:** Originally recorded by Carvalho (1954) as occurring on *Leucophyllum* sp. (Scrophulariaceae) in Mexico. Our collections, the first from the United States, confirm this host association. As is the case with *Beamerella balius*, *antennata* is extremely well camouflaged on the white pubescent foliage of its host plant.

## DISCUSSION

The three taxa discussed above appear to be related because they all have at least one antennal segment enlarged and covered with erect, black, scalelike setae. Such characters are unknown elsewhere in the Phylinae. The male and female genital structures also suggest a close relationship; however, because detailed information regarding genitalia is not available for the Phylinae as a whole, and particularly not for North American taxa, it is difficult at this time to judge at what taxonomic level these characters might be useful.

The three taxa can be interrelated as shown in figure 32 by the characters given in table 1. The apomorphic condition for these characters was determined by outgroup comparison: characters 1 and 2 are apparently unique to *Beamerella* and *Hambletoniola*; character 3 as it occurs in *Hambletoniola* is known in no other phylines at present; swollen, shining first and second antennal segments with flattened scalelike setae, as in character 4, are unknown elsewhere in the Phylinae; for character 5 the shorter rostrum is considered apomorphic since most phylines and other Miridae have the rostrum reaching the metacoxae; and, although the presumed apomorphic state of character 6 occurs in other phylines, it shows no congruence with the other characters which unite *Beamerella* and *Hambletoniola*. Since *balius* and *personatus* are apparently each other's closest known relatives, we have chosen to treat them as members of one genus. Thus *Larinocerus* Froeschner becomes a junior synonym of *Beamerella* Knight.

*Hambletoniola antennata* could be treated as congeneric with the other two species since it has antennal characteristics in common with them. We have arbitrarily chosen to retain

*Hambletoniola* as a separate genus because doing so does not change the scheme of inter-relationships of the three taxa, but does allow for recognition of the differences between the two groups of species. Among these are the presence in *Hambletoniola* of rather strong sexual dimorphism (with the males having much larger eyes and a more elongate dorsal aspect than the females), the absence of strongly swollen and shining black first and second antennal segments, and the differences in the genitalia.

The relationships of *Beamerella* and *Hambletoniola* within the Phylini are not ob-

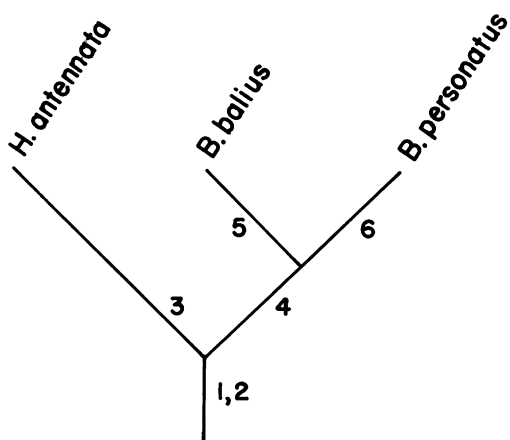


FIG. 32. Phyletic relationships of species of *Beamerella* and *Hambletoniola*. The ex-group is all other Phylini. Characters as in table 1.

vious. No other Phylinae are known to have the type of flattened setae on the antennae found in *Beamerella* and *Hambletoniola*, although similar setae are found on antennal segment one in *Neurocolpus* Reuter (Mirinae). Several genera (viz., *Atractotomus* Fieber, *Criocoris* Fieber, *Heterocapillus* Wagner, *Millerimiris* Carvalho, etc.) have an enlarged second antennal segment; thus such an enlargement may have arisen a number of times and be of little use as a taxonomic character. On the other hand, conspicuous enlargement of segment three is known only in *Beamerella* and *Hambletoniola*.

Other attributes can be judged as follows: The general habitus and coloration of *Beamerella* and *Hambletoniola* are not uncommon in phylines from many dry areas of the world, including quite a large number of taxa from the southwestern United States. In all cases such coloration makes the insects extremely difficult to see on the plants.

The mesofemoral and metafemoral trichobothria may be of some taxonomic interest. Schuh (1975) suggested that the plesiomorphic condition for the Orthotylinae and Phylinae is probably six mesofemoral and seven metafemoral trichobothria. The mesofemora of *Beamerella balius* (and probably *personatus*) apparently have six trichobothria (fig. 14), whereas in *Hambletoniola antennata* there are seven (fig. 16). All three taxa apparently have nine metafemoral trichs (figs. 15 and 17). Some of the smaller trichobothria (those in addition to the common complement of six mesofemoral

TABLE 1  
Characters Used in Constructing Phylogeny in Figure 32

PLESIOMORPHIC	APOMORPHIC
1. Antennal segment three more or less linear, covered only with reclining common setae	Antennal segment three swollen, dark brown-black, covered with erect scalelike setae
2. Membrane without marginal black spot posterior to apex of cuneus	Membrane with a conspicuous black marginal spot posterior to apex of cuneus
3. Vesica of male smooth on proximal half, without notches	Vesica of male with notches on proximal half
4. Antennal segments one and two usually linear, if black not shining, and only with common setae	Antennal segments one and two swollen, shining black, and covered with erect, scalelike setae
5. Rostrum reaching posterior coxae or beyond	Rostrum reaching only to middle of mesocoxae
6. Face at and below level of base of tylus not shining black	Face at and below level of base of tylus shining black

and seven metafemoral found in the Phylinae) are at times difficult to distinguish from common setae, even with the scanning electron microscope. This is particularly so when the bothrium is not noticeably recessed and the trichoma is not conspicuously differentiated from the spicules on the body surface, as in *Beamerella* and *Hambletoniola* (figs. 7-10) and some other phylines (see Schuh, 1975). Although sufficient information is not now available, trichobothrial numbers in the Phylinae may eventually allow us to recognize groupings within the subfamily. One such grouping might be represented by taxa with more than seven metafemoral trichobothria. Such a grouping would almost certainly contain many genera and be of little use in identifying the sister group of *Beamerella* and *Hambletoniola*.

With regard to pretarsal structures, the parmpodia are setiform as in most Phylinae. The pulvilli are enlarged and cover about two-thirds of the ventral surface of the claw. The claws lack "claw hairs" on the exterior surface (figs. 11-13), a feature found in most Phylinae so far examined (Schuh, 1976).

The male and female genitalia may at present give the clearest indication of the relationships of *Beamerella* and *Hambletoniola*. *Beamerella balius* and *personatus* have very similar male genitalia. No known North American taxa appear to possess similar vesicae, but then only a very few phylines from the region have been illustrated in the literature (see Kelton, 1959). Perusal of Wagner's (1973, 1975) *Die Miridae des Mittelmeerraumes*, one of the most complete surveys of the western Palearctic fauna, indicates only a few possibilities, *Psallomimus* Wagner being one of the most obvious. Schuh (1974) described and illustrated *Austropsallus*, *Capecapus*, *Coatonocapsus*, and *Odhiamboella* from South Africa which have coiled vesicae similar to those in *Beamerella*, with one or two apical spines. "*Sthenarus*" *myersi* Woodward from New Zealand and a group of undescribed species from Southeast Asia and the Pacific have vesicae which are structurally very similar to those in *Beamerella*.

The form of the vesica in *H. antennata*, although differing from that found in *Beamerella*, has similarities with some other phylines. The notches are found in quite a

number of taxa, including *Ragmus importunitas* Distant and several species of *Ellenia* Reuter. In those taxa the vesica is differently shaped than in *H. antennata* and the notches are basad to the secondary gonopore. In the case of *Hambletoniola* and some European taxa (see Wagner, 1975), the utility of the notches in establishing relationships remains to be established, although they appear to be useful in *Ellenia* and *Ragmus*, which also have many other characters in common.

The female genitalia of these three species present a most interesting area for investigation. Kullenberg (1947) studied and illustrated female genitalia of four European phylines. Slater (1950) studied the females of 11 species of Phylinae from North America (nine under the classification of that time). The characters he examined left little doubt that the group as it was then defined was almost certainly not monophyletic (see Wagner, 1955; Schuh, 1974, 1976). Since then little new information has been added concerning the female genitalia of the group. Schuh (1974) illustrated the sclerotized rings and/or posterior walls of four species and commented on the phyline character (simple posterior wall) of a number of the other species in the genera he examined. He did not indicate the discovery of any characters useful for establishing relationships within the group.

Our dissection of females of *balius* revealed an asymmetrical structure apparently not observed by previous workers. This structure is in the form of a folded "lateral tube" positioned anteriorly and/or laterally and somewhat ventrally of the right sclerotized ring (figs. 28, 29). In *balius* the sclerotized rings remain symmetrical; in *antennata* the right ring is distorted (fig. 31). This lateral tube arises in the area of the vulva (see Kullenberg, 1947), between the bases of the ovipositor valves and just anterior to the bursa copulatrix. It terminates in the bursa copulatrix at the margin of the right sclerotized ring (figs. 28, 31). In most species of mirids there seem to be two small sclerites in the area of the origin of the lateral tube. These were apparently referred to by Davis (1955, p. 140) as "... lobes [that] converge medially to form an asymmetrical, sclerotized protuberance which extends ventrally into the vestibulum" in *Lopidea staphyleae* Knight and *Plagiognathus*

*albatus* (Van Duzee). In most Phylinae these are apparently asymmetrical, whereas at least in some Orthotylinae (see Schuh and Lattin, ms.) they are symmetrical. It appears that the lateral tube may conduct sperm into the bursa copulatrix during copulation.

Available literature indicates no other phylina taxa with such asymmetrical structures in the female genitalia. We therefore dissected females of taxa with male genitalia resembling those of *Beamerella* and *Hambletoniola*. Our survey at this time is limited because of the worldwide distribution of the group and our limited knowledge of the genitalia of both sexes. Current work by Schuh on phylines from the Orient and Southwest Pacific indicates that "*Sihenarus*" *myersi* from New Zealand has male genitalia much like those of *balius*, even though superficially the bugs are very dissimilar. The female genitalia of *myersi* do possess a well-sclerotized lateral tube, similar in form to that found in *balius*. *Coatonocapsus sweeti* Schuh and *Odhiamboella solani* (Odhiambo) also have this structure. *Autropsallus drakensbergensis* Schuh apparently lacks the structure. A group of species of doubtful generic identity (but which superficially resemble *Campylomma*) from the Orient and the Southwest Pacific have the lateral tube in a smaller and less heavily sclerotized condition.

Since a widely dispersed assemblage of phylines is known now to possess this structure, two conclusions are possible: that it is of no phylogenetic value, or that the monophyletic group that it defines is widely distributed. Only dissections of additional species will determine which is correct. This same approach will also be required to further clarify knowledge of the relationships of *Beamerella* and *Hambletoniola* within the Phylinae.

#### LITERATURE CITED

- Carvalho, J. C. M.  
1954. Neotropical Miridae, LXIX: a remarkable new genus of Phylini (Hemiptera). Ent. News, vol. 15, pp. 123-126.
- Davis, N. T.  
1955. Morphology of the female organs of reproduction in the Miridae (Hemiptera). Ann. Ent. Soc. Amer., vol. 48, no. 1, pp. 132-150.
- Froeschner, R. C.  
1965. *Larinocerus balius*, a new genus and new species of plant bug from the United States (Hemiptera: Miridae). Ent. News, vol. 76, pp. 85-89.
- Kelton, L. A.  
1959. Male genitalia as taxonomic characters in the Miridae (Hemiptera). Canadian Ent., vol. 91, suppl. 11, 72 pp.
- Knight, H. H.  
1959. New genera and species of North American Miridae (Hemiptera). Iowa St. Coll. Jour. Sci., vol. 33, pp. 421-426.  
1968. Taxonomic review: Miridae of the Nevada Test Site and western United States. Brigham Young Univ. Sci. Bull., Biol. Ser., vol. 9, no. 3, pp. 1-282.
- Schuh, R. T.  
1974. The Orthotylinae and Phylinae (Hemiptera: Miridae) of South Africa with a phylogenetic analysis of the ant mimetic tribes of the two subfamilies for the World. Ent. Amer., vol. 47, pp. 1-332.  
1975. The structure, distribution, and taxonomic importance of trichobothria in the Miridae (Hemiptera). Amer. Mus. Novitates, no. 2585, 26 pp.  
1976. Pretarsal Structure in the Miridae (Hemiptera) with a cladistic analysis of relationships within the family. Amer. Mus. Novitates, no. 2601, 39 pp.
- Schuh, R. T., and J. D. Lattin  
[MS] *Myrmecophyes oregonensis* a new species of Halticini (Hemiptera-Miridae) from the western United States.
- Slater, J. A.  
1950. An investigation of the female genitalia as taxonomic characters in the Miridae (Hemiptera). Iowa St. Coll. Jour. Sci., vol. 25, pp. 1-81.
- Slater, J. A., and R. M. Baranowski  
1978. How to know the true bugs (Hemiptera-Heteroptera). Wm. C. Brown Co. Publ., Dubuque, Iowa, 256 pp.
- Wagner, E.  
1973. Die Miridae Hahn, 1831, des Mittelmeerraumes und der Makaronesischen Inseln (Hemiptera, Heteroptera). Part 2. Ent. Abh., vol. 39, suppl., 421 pp.  
1975. Die Miridae Hahn, 1831, des Mittelmeerraumes und der Makaronesischen Inseln (Hemiptera, Heteroptera). Part 3. Ent. Abh., vol. 40, suppl., 483 pp.











