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991

***Alterosa*, a new caddisfly genus from Brazil  
(Trichoptera: Philopotamidae)**

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## ABSTRACT

The subgenera of *Dolophilodes* (Trichoptera: Philopotamidae), as recognized by Ross (1956), are reconsidered. *Sortosa* Navás 1918, *Thylakion* Barnard 1934, *Fumonta* Ross 1956, and *Sisko* Ross 1956 are elevated to generic status, and an additional genus, *Alterosa*, is established to include 2 described species, *Dolophilodes (Sortosa) sanctipauli* Flint 1971 and *Dolophilodes (Sortosa) marinonii* Almeida & Duarte 2003, and 20 new species, all from southern or southeastern Brazil. New species described in *Alterosa* include: *Alterosa beckeri*, *A. bocainae*, *A. boraceiae*, *A. caparaonensis*, *A. escova*, *A. falcata*, *A. fimbriata*, *A. fluminensis*, *A. flinti*, *A. guapimirim*, *A. holzenthali*, *A. intervalles*, *A. itatiaiae*, *A. jordaensis*, *A. orgaosensis*, *A. paprockii*, *A. sanctaeteresae*, *A. schadrackorum*, *A. tripuiensis*, and *A. truncata*. *Alterosa bocainae* is designated the type species for the genus. Species recognized as belonging to *Sortosa* include, in their original combinations: *Dolophilodes angulatus* Schmid 1964, *D. appendiculatus* Flint 1967, *D. bifidus* Flint 1970, *D. bispinosus* Flint 1967, *Sortosa chilensis* Navás 1918, *D. duplex* Schmid 1964, *D. dupliplex* Flint 1983, *S. edwardi* Ross 1956, *D. elongatus* Schmid 1964, *D. elongatoides* Flint 1967, *S. flavipunctatus* Schmid 1955, *S. michelbacheri* Ross 1956, *D. paxilliferus* Flint 1970, *S. pectinifera* Schmid 1958, *D. prolixus* Flint 1983, *D. scopulus* Flint 1983, *D. spectabilis* Flint 1983, *S. spinifera* Schmid 1958, *D. spinosellus* Flint 1970, and *D. ventricostus* Flint 1983. Species recognized as belonging to *Thylakion* include, in their original combinations: *Dolophilodes crenophilus* Jacquemart and Statzner 1981, *Thylakion forcipatus* Barnard 1934, *D. natalensis* Morse 1974, and *T. urceolus* Barnard 1934. Species recognized as belonging to *Sisko* include, in their original combinations: *Sortosa oregona* Denning 1966 and *Wormaldia sisko* Ross 1949. The genus *Fumonta* is monotypic and includes, in its original combination, *Dolophilus major* Banks 1914.

**Key words:** Trichoptera, Philopotamidae, Philopotaminae, *Dolophilodes*, *Sortosa*, *Thylakion*, *Sisko*, *Fumonta*, *Alterosa*, new genus, new species, new status, new combination, caddisfly, Neotropics, Brazil

## INTRODUCTION

Until recently, only a single species in the subfamily Philopotaminae was known from Brazil, *Dolophilodes (Sortosa) sanctipauli* Flint 1971. In 2003, a second species, *Dolophilodes (Sortosa) marinonii*, was described from Brazil by Almeida & Duarte. Flint acknowledged at the time of its description that *D. sanctipauli* was distinctly different from other species in the subgenus *Sortosa*, which has a substantial radiation of 20 species in Chile. The 20 new species from Brazil described in this paper suggest that the philopotamine fauna of Brazil is as diverse as that of Chile. Most of these species have been collected in relatively pristine headwater springs, streams or small rivers, and it is likely that additional species remain to be collected in similar habitats, perhaps many more species. All of the new species from Brazil share similarities to the two described species from the region. The distinctiveness of these species has opened the question of their proper generic placement.

## Taxonomic History of Philopotaminae

The treatment of taxa in the current paper provided the opportunity to reassess Ross's (1956) classification of Philopotaminae. Although Ross can be considered a pioneer in recognizing the difference and relative importance of primitive (plesiomorphic) versus derived (apomorphic) characters for inferring relationships, he did not always reflect this in the taxonomy he established. Some of the taxa he recognized were paraphyletic, based on his own assessment of relationships. Ross's (1956) treatment of Philopotamidae is a particularly cogent example of his recognition of genera that fail to conform to what are now standard cladistic criteria, monophyly evidentially supported by synapomorphic characters. Ross recognized one species within Philopotamidae, *Paulianodes tsaratananae* Ross 1956, from Madagascar, as having retained primitive venational characters and justified the establishment of the subfamily Paulianodinae to accommodate it. The rationale for this decision would be accepted under current cladistic methodology. Another clearly derived lineage, including the genera *Chimarra* Stephens 1829 and *Protarra* Ross 1956 (now *Chimarrhodella* Lestage 1925), was left in the subfamily Chimarrinae. All of the other genera of Philopotamidae were retained in the subfamily Philopotaminae, although no synapomorphic characters were proposed to suggest monophyly of the taxon. He placed the majority of the different genera that were then recognized from various parts of the world into a single genus, *Sortosa* Navás 1918, and also established and placed here several additional subgenera, namely *Kisaura*, *Fumonta*, and *Sisko* (Ross 1956). Subsequent to Ross's work, Ulmer (1957) recognized that the genus name *Dolophilodes* Ulmer 1909 has priority over *Sortosa*. Subgenera of *Dolophilodes* recognized by Ross include *Dolophilodes* (North America and eastern Asia), *Kisaura* (eastern Asia), *Fumonta* (E. North America), *Sisko* (North America), *Sortosa* (Chilean subregion of South America), *Hydrobiosella* Tillyard 1924 (Australia, New Zealand, and New Caledonia), and *Thylakion* Barnard 1934 (South Africa, Zaire). An additional monobasic subgenus, *Dolophilodes* (*Hisaura*), was subsequently recognized by Kobayashi (1980), but this subgenus was recently made a synonym of subgenus *Dolophilodes* (Kuhara 2005).

Within Philopotaminae, Ross (1956) did retain generic names for several distinctly apomorphic lineages, including *Philopotamus* Stephens 1829 (Europe), *Wormaldia* MacLachlan 1865 (widespread in the Old and New Worlds), and *Gunungiella* Ulmer 1913 (India and SE Asia). *Doloclanes* Banks 1937 was made a subgenus of *Wormaldia* and *Cabreraia* Enderlein 1929 was considered a probable synonym of *Wormaldia*, although not officially synonymized. In the same work, *Zelobiosella* Mosely 1953 was synonymized under subgenus *Hydrobiosella*. This accounts for all of the taxa then known in Philopotaminae. Ross based his evolutionary discussion of the genera and subgenera of Philopotaminae on what he called the "*Sortosa* ancestor," a species more generalized than any known descendent lineage. Although Ross discussed the apomorphic differences among the lineages descended from this ancestor, the recognition of the genus *Dolophilodes* itself was based on the retention of the same primitive morphological features that

characterized the ancestor, including primitive wing venational and male genitalic characters. Thus *Dolophilodes*, *sensu* Ross 1956, was recognized based on plesiomorphic characters. No apomorphic characters were adduced by Ross to suggest that either the genus-level taxa he transferred to *Dolophilodes*, or the new subgenera he created constituted a collectively monophyletic taxon, nor have any been proposed since. Ross's taxonomic treatment of Philopotaminae is the system from which modern taxonomic usage has evolved, and was recognized by Fischer (1971) in his supplement to the Trichoptorum Catalogus. However, the previously established generic names *Sortosa*, *Thylakion*, *Dolophilodes*, and *Hydrobiosella* were already continued in that usage by Ulmer (1957), who acknowledged that Ross treated these taxa as subgenera. Ulmer's paper included no discussion of the taxonomic status of new subgenera established by Ross.

Since Ross's (1956) treatment of Philopotamidae, several taxa have been given different taxonomic status and also several additional genera have been described. Neboiss (1977) resurrected *Hydrobiosella* to generic status when describing a number of additional species from Tasmania. Cowley (1976) was the only author to actually describe a species of *Hydrobiosella* under the genus name *Dolophilodes*. *Kisaura*, originally established as a subgenus of *Dolophilodes* by Ross (1956), was elevated to full generic status by Malicky (1993a). For both *Hydrobiosella* and *Kisaura*, generic recognition was based on the distinctiveness of the included taxa, but without any assessment of the monophyly of the species remaining in the genus *Dolophilodes*. *Doloclanes*, considered by Ross (1956) a subgenus of *Wormaldia*, has also subsequently been recognized as a genus (Schmid 1991; Malicky 1993a, 1993b, 1994, 1995; Malicky and Chantaramongkol 1993, 1996; Mey 1993, 1996; Neboiss 1999). Although Schmid was the first author after Ross to recognize *Doloclanes* as a genus, he did so without mentioning that Ross had reduced it to subgeneric status, or discussing his reasons for elevating it. Additional new genera recognized in Philopotamidae include *Neobiosella* Wise 1958, *Cryptobiosella* Henderson 1983, and *Xenobiosella* Henderson 1983, all from New Zealand, *Dolomyia* Schmid 1991 and *Dolopsyche* Schmid 1991 from India, and *Edidiehlia* Malicky 1993 from Sumatra.

Of the new genera from New Zealand, *Neobiosella* is monotypic and still only known from the holotype female. *Cryptobiosella* and *Xenobiosella* were established based on their apomorphic differences from other philopotamid genera and analyzed within a cladistic framework that included New Zealand taxa, including *Hydrobiosella*, but were not placed within a broader phylogenetic framework (Henderson 1983). *Dolomyia* and *Dolopsyche* have the same primitive venational characters used by Ross to define *Dolophilodes*, but are not easily placed in any of the subgenera he established. They are also unusual in both having a spur formula of 3:4:4 rather than 2:4:4, as is common among all other genera of Philopotamidae (including *Paulianodes*), with the exception of the genus *Chimarra*, with a derived spur formula of 1:4:4. The single unusual species placed in *Edidiehlia* was considered by Malicky to be close to *Chimarra*, and hence a member of the subfamily Chimarrinae.

For those concerned with issues of monophyly, the taxonomic system, as it currently stands, is disturbing at best, since some taxa are based on plesiomorphic characters and others, while being defined by apomorphic characters, are recognized without any assurance that the sister taxon is not left paraphyletic by its recognition. As an example, within the phylogeny proposed by Ross, *Gunungiella* fell within the genus *Wormaldia*, and *Philopotamus* was considered a possible sister taxon to subgenus *Thylakion* in the genus *Dolophilodes*. Ross's placement of these taxa was admittedly speculative, but accepting his assessment of relationships, *Gunungiella* would appropriately be a synonym of *Wormaldia*, and the subgenera of *Dolophilodes* recognized by Ross would either have to be transferred to *Philopotamus* (the oldest available genus name), or *Thylakion* would have to be recognized as a separate genus. The latter would require many of the other subgenera of *Dolophilodes* recognized by Ross to be elevated to genera to retain the principle of generic monophyly within a cladistic classification. At present I am not much more certain than was Ross how these different lineages are related. This is a question that will require a complete reassessment of the world taxa. Work on this front has begun using molecular characters (Kjer et al. 2002, and unpublished data) and there are some tentative results, but a much more complete taxon sampling and additional sequence data are required before definitive conclusions can be reached. However, even at this point it seems likely, for instance, that the taxa currently recognized as *Dolophilodes* (*Thylakion*) and *Dolophilodes* (*Sortosa*) are more closely related to *Hydrobiosella* than to *Dolophilodes* (*Dolophilodes*). This might have been expected based on biogeography alone, given the numerous studies demonstrating the close relationship of the Chilean and Australian faunas, following the pioneering studies of Brundin (1966).

In my description of new species from Brazil, I have been reluctant to add to this taxonomic confusion. One solution is to follow the path first begun by Ulmer (1957), who continued to recognize some subgeneric names used by Ross as genera. This path was also followed by Neboiss and Malicky when *Hydrobiosella* and *Kisaura* were elevated to generic status. Fortunately, the principle of monophyly can be observed even when the relative relationships among equivalently ranked taxa has not been determined, provided that each of the taxa, independently, is defined by apomorphic characters. Since Ross proposed characters suggesting monophyly of each of the subgenera of *Dolophilodes*, genera based on these names would represent an improvement over the current situation. The genus *Dolophilodes*, as currently recognized, almost certainly does not represent a monophyletic group, especially when including the subgenera *Sortosa* and *Thylakion*. Moreover, since *Dolophilodes*, *sensu* Ross, was defined by plesiomorphic characters, it is not possible to assess the relationship of taxa he included within the genus to genera he excluded, nor to genera described subsequently. Consequently, I propose that *Sortosa*, *Thylakion*, *Sisko*, and *Fumonta* be removed from *Dolophilodes* and elevated to generic status, based primarily on the defining characters originally proposed for the taxa or those suggested by Ross (1956). A synopsis of the generic system for Philopotamidae recog-

nized in this paper is found in Table 1. The taxa currently recognized as *Dolophilodes* (*Sortosa*) *sanctipauli*, *Dolophilodes* (*Sortosa*) *marinonii*, and the new species described in this paper, are very different in a number of respects from species of *Sortosa*, and also from the other genera recognized here. This paper establishes a new genus, *Alterosa*, to accommodate these species. They share several apomorphic characters that indicate their monophyly, as discussed in the generic diagnosis.

**TABLE 1.** Philopotaminae genera.

Genus	Number of Species	Distribution
<i>Philopotamus</i> Stephens 1829	15 + 1 fossil	Europe
<i>Dolophilodes</i> Ulmer 1909	48 <sup>a</sup>	N America & Asia
<i>Sisko</i> Ross 1956	2	N America
<i>Fumonta</i> Ross 1956	1	Eastern N America
<i>Sortosa</i> Navás 1918	20	Chile
<i>Thylakion</i> Barnard 1934	4	South Africa, Zaire
<i>Kisaura</i> Ross 1956	22	Eastern Asia
<i>Hydrobiosella</i> Tillyard 1924	19	Australia, New Zealand, New Caledonia
<i>Alterosa</i> , new genus	22	S & SE Brazil
<i>Cryptobiosella</i> Henderson 1983	4	New Zealand
<i>Xenobiosella</i> Henderson 1983	1	New Zealand
<i>Neobiosella</i> Wise 1958	1	New Zealand
<i>Dolomyia</i> Schmid 1991	1	India
<i>Dolopsyche</i> Schmid 1991	1	India
<i>Wormaldia</i> MacLachlan 1865	91 + 8 fossil	widespread in Old and New Worlds
<i>Doloclans</i> Banks 1937	39	mostly Asia (1 in N America)
<i>Gunungiella</i> Ulmer 1913	62	Asia
<i>Cabreraia</i> Enderlein 1929	1	Canary Islands

<sup>a</sup> Including 7 species unplaced in the previous subgeneric system of Ross.

## MATERIALS AND METHODS

Methods used for preparation of specimens are similar to those discussed in papers by Blahnik (1998) and Blahnik and Holzenthal (2004). Genitalia of specimens were cleared in either 12.5% KOH at room temperature for 6 or more hours, or in a solution of 85% lac-



tic acid heated at 125° C for about 30 minutes, followed by a rinse in distilled water, transferred to a solution of 80–95% EtOH, and then to glycerin for viewing and drawing, and finally stored in a micro vial of glycerin for permanent storage, for specimens on pins, or transferred back to alcohol for specimens stored in alcohol. Pencil drawings of genitalic structures were made by use of an optical grid and inked with a technical pen and the aid of a light table. Drawings of the wings, head and thoracic structures were rendered in Adobe Illustrator®. I used a convention of indicating structures of segment VIII of the male genitalia with a dashed line so as not to obscure features of segment IX, and because structures of segment VIII are generally less diagnostic. Measurements of wings were made to the nearest 0.1 mm. Females were not illustrated, mostly because the differences among them, for those available, were at most very minor and not convincingly diagnostic.

Terminology conforms to that used by Blahnik (1998) and in common use among other workers on Trichoptera. The term “intermediate appendage,” as used here, refers to structures of *de novo* appearance within Philopotaminae. There is no implication that the structures are homologous to structures called intermediate appendages in other taxa, or even to structures called intermediate appendages in other genera of Philopotaminae.

Differences between species are generally distinctive and it should be easy to identify specimens by comparison to the illustrations provided and reference to the species diagnoses. However, because limited material is currently available for most species, it is impossible to predict how much variation may occur within a species. The reader is therefore left to his own judgment if a specimen at hand does not conform to the illustrations provided. Some structures will be found to vary, and it is also possible that additional species remain to be discovered.

Each pinned specimen, or lot of specimens in alcohol, examined during the study was barcoded (4 mil polyester, 8 x 14 mm, code 49) with a unique alphanumeric sequence beginning with the prefix UMSP. The prefix is not meant to imply ownership by the University of Minnesota Insect Collection, but only to indicate that the specimen was databased at that collection. Specimen taxonomic and collection data are stored in Biota® (v. 2.0, Sinauer Associates, Inc.) (Colwell 2003). Specimen barcode information is included for holotypes in the list of material examined. A detailed list of all material examined, including individual barcode numbers, is maintained at UMSP and can be downloaded from <http://www.entomology.umn.edu/museum/databases/BIOTAdatabase.html>.

Holotypes were deposited in the Museu de Zoologia, Universidade de São Paulo, Brazil (MZUSP), and paratypes in the same institution, as well as in the collections of the University of Minnesota, St. Paul (UMSP) and the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (NMNH), as designated in the species descriptions.

## GENERIC DESCRIPTION

*Alterosa*, new genus

Type species: *Alterosa bocainae*, new species.

The single character most useful for diagnosing *Alterosa*, and which may be uniquely apomorphic, is the structure of the phallobase of the male (Figs. 6D, 8D, 9D), which is tubular basally and lacks the basodorsal expansion common in most philopotamids, including species in the subfamily Chimarrinae. Other characters of the male genitalia useful, in combination, to diagnose the genus include: intermediate appendages positioned mesally to the preanal appendages (Figs. 6A,B; 10A,B), absence of ventral processes on any of the terminal segments of the male genitalia, and sternum IX with the posteroventral margin distinctly produced and widely truncate ventrally (Figs. 9A,B; 10A,B) and the posterodorsal margin *acutely* articulating with the tergum (Figs. 6A, 9A). Preanal appendages arise from the base of tergum X (Fig. 6A, 10A), rather than the dorsal margin of sternum IX (as is typical in *Sortosa*, see Ross 1956, figs. 36A, 37A, 38A). In species in which the preanal appendages are not secondarily modified (Fig. 9A), they are relatively simple in structure, elongate and finger-like (Figs. 6A, 11A). Venation (Fig. 1) is primitive for Philopotamidae and very similar to *Sortosa* and *Hydrobiosella*. Female genitalia (Fig. 4), like those of most genera of Philopotaminae, excluding *Dolophilodes*, *Fumontia*, and *Philopotamus*, are elongate and tapered, with very long, articulated apodemes from the anterior margin of sternum VIII and tergum IX.

Adult. Color of pinned, dry specimens dark brown overall with contrasting small light brown or yellowish spots on forewings, these sometimes arranged in irregularly linear arrays near costal margins; legs, palps, and antennae usually paler in color. Three ocelli present, prominent. Eyes with short projecting setae between the ommatidia. Maxillary palps (Fig. 2) 5-segmented, relatively short: 1st segment very short, usually broadly joined (often apparently fused) to 2nd segment, usually with a few setae on apicomesal margin; 2nd segment short, globose, with numerous elongate setae on apicomesal surface; 3rd segment relatively short, about 3 or 4x length of segment 2; 4th segment very short, about 2x as long as wide; 5th segment longer than segment 3, variable in length among species. Setal warts of head (Fig. 3) well developed; posterolateral warts large, typical of Philopotamidae; posterior setal warts rounded, separated mesally; anteromesal setal wart large, subtriangular, notched mesally to accommodate anterior ocellus, laterally fused to anterior setal warts; fused anterior and anteromesal warts roughly M-shaped. Prothorax with rounded mesal setal warts, slightly separated mesally, laterally with indistinctly defined setal areas. Wing venation (Fig. 1) primitive (forewing with forks 1–5 present, hind wing with fork 4 missing, anal veins of hind wing reaching wing margin); fork 1 of forewing branching just proximal to discal crossvein; *s*, *r-m*, and *m* crossveins of forewing

nearly linearly arranged, these plus *m-cu*, base of fork 3, and apex of  $Cu_2$  clear, unpigmented. Spur formula 2:4:4.

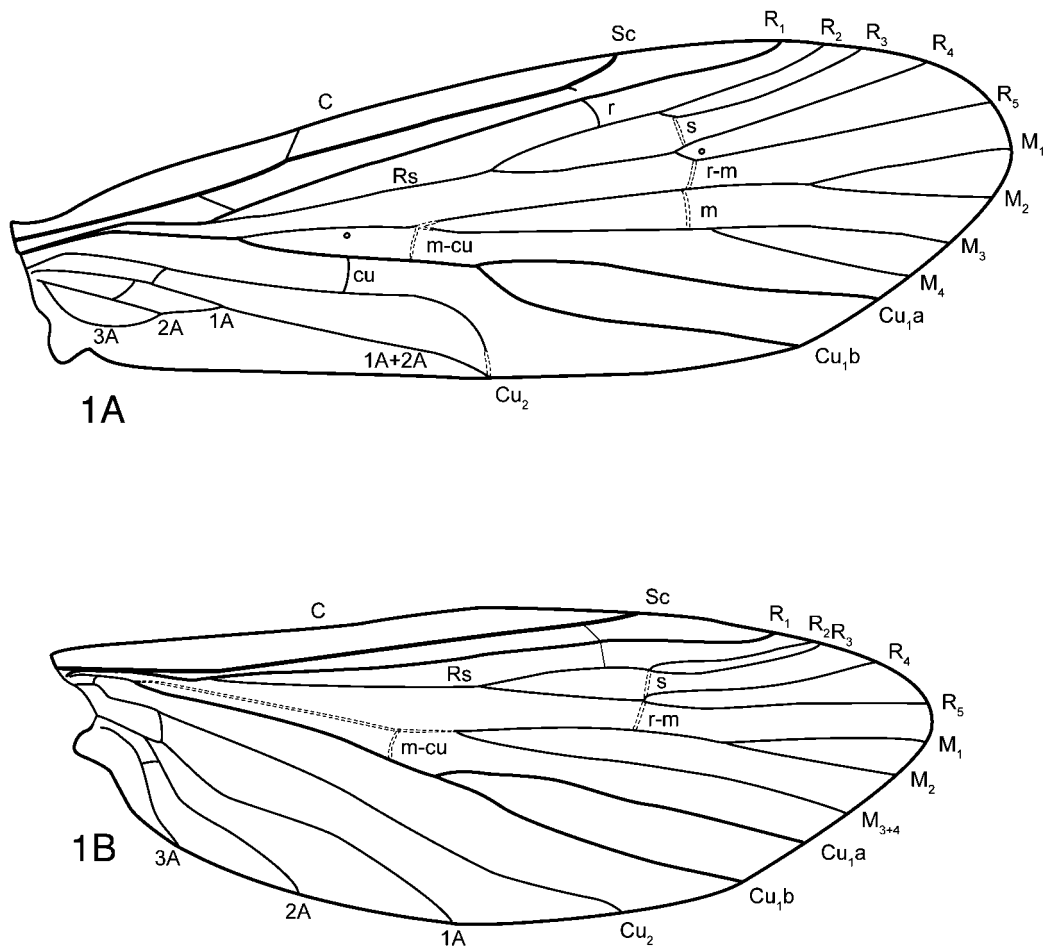
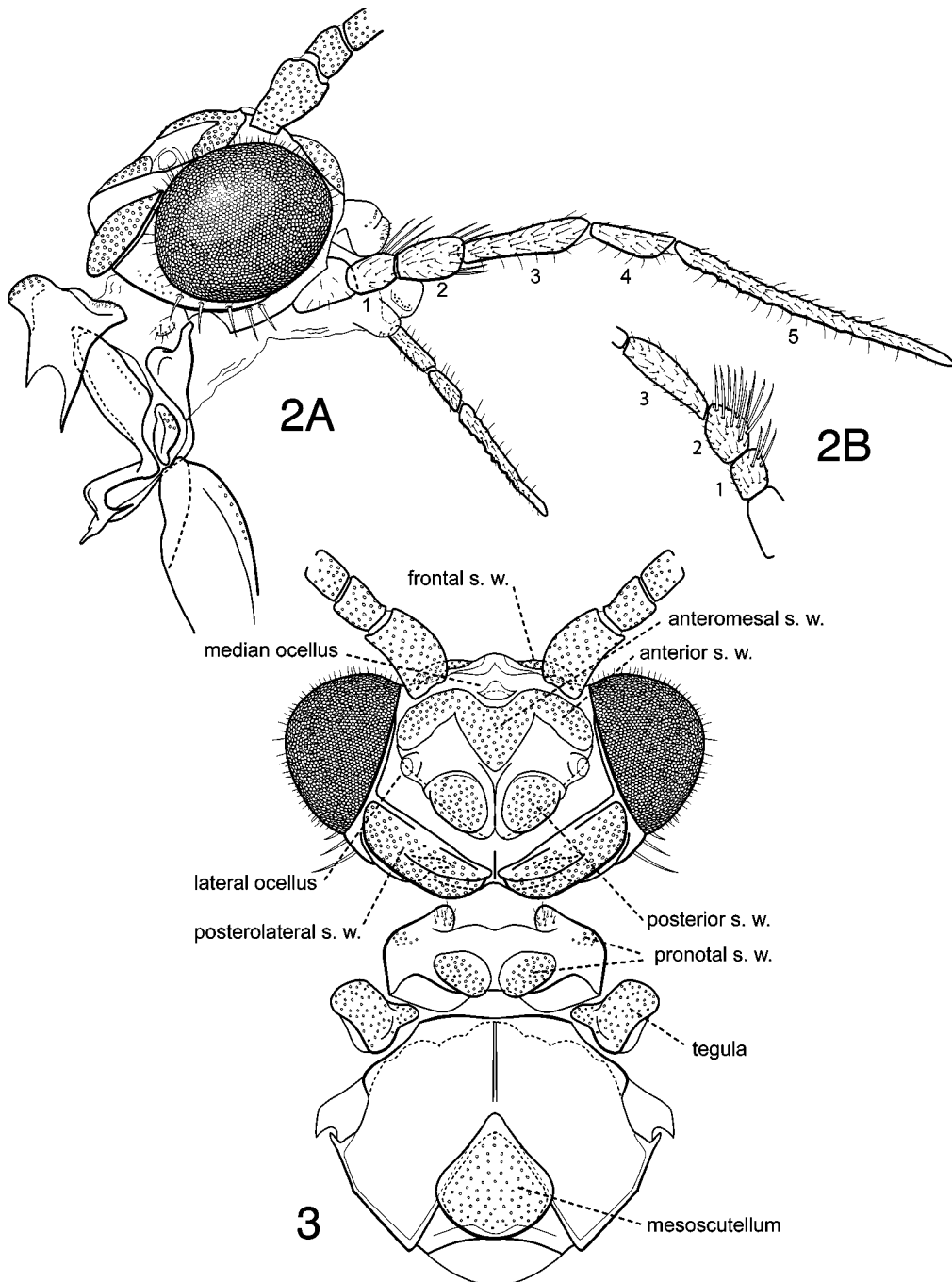


FIGURE 1. *Alterosa bocainae*, new species. Wings: 1A—forewing; 1B—hind wing.



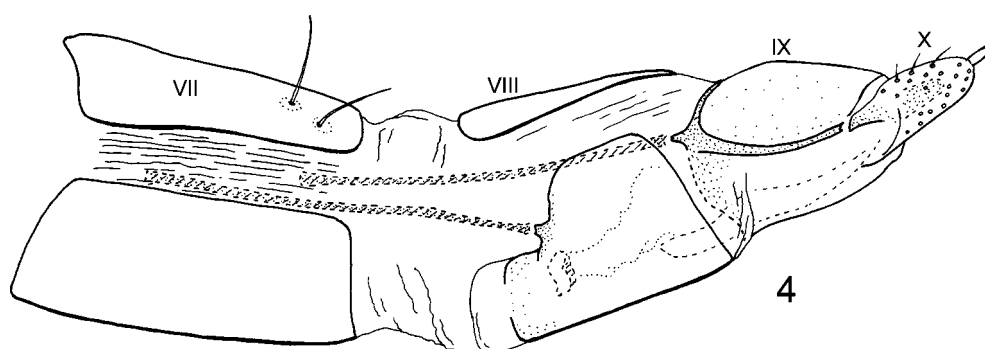
**FIGURE 2.** *Alterosa bocainae*, new species. Head and palps: 2A—lateral view; 2B—dorsal view of maxillary palp segments 1–3. **FIGURE 3.** *Alterosa bocainae*, new species. Setal warts of head and thorax—dorsal view.

Male Genitalia. At least some abdominal terga, through and including tergum VIII, with unpigmented spots surrounding elongate setae on posterior margins. Abdominal

sterna VII, VIII, and IX without ventromesal processes. Tergum VIII usually with distinct posteromesal invagination (Fig. 11E), but sometimes absent or very weakly developed. Sternum IX with posteroventral margin greatly produced; as viewed ventrally, broadly truncate, usually with slight mesal invagination, with distinct mesal suture line extending from anterior to posterior margin; posterodorsal margin acutely articulated with tergum, and below dorsal development of tergum X. Tergum IX greatly reduced or fused to base of tergum X, sometimes developed into mesal or lateral projections extending over base of tergum X. Tergum X moderately to greatly elongate, entire, apically with numerous short sensilla. Intermediate appendage mesal to preanal appendage, very differently developed in different species, often with apical spines or setae. Preanal appendage inserted membranously or apparently partially fused to base of tergum X, elongate linear and basally constricted in most species, highly modified in shape, with apical armature of spines or setae in others. Inferior appendages elongate linear, with 2 articles, varying in relative length among species; apex of 2nd article with pad of short, stiff setae on mesal surface. Phallic apparatus with phallobase tubular, without basodorsal expansion, usually somewhat curved, sometimes distinctly bent; endotheca highly variable, usually with included spines, these varying greatly in size, number and position among different species; phallosomal sclerite usually small, weakly sclerotized and indistinct.

**Female Genitalia.** Genitalia (Fig. 4) elongate and tapered. Segment VII distinctly elongate, pleural region more or less pleated. Intersegmental region between segments VII and VIII membranous and relatively elongate. Segment VIII with tergum reduced, tapered posteriorly; sternum with elongate, rod-like, articulated apodemes from anterolateral margins. Segment IX reduced and tapered; tergum often more sclerotized along anterior and ventral margins, anterolaterally with elongate, rod-like, articulated apodemes; sternum less sclerotized, often nearly membranous. Segment X comprised of pair of bulbous, setose lobes, each terminating in short apical cercus. Vaginal apparatus usually membranous and often more or less indistinct, anteriorly with cupped sclerite.

**Etymology.** *Alterosa* is a name, feminine in gender, traditionally used to refer to the mountains of southern Minas Gerais, Brazil.



**FIGURE 4.** *Alterosa bocainae*, new species. Female genitalia—lateral view.

## SPECIES DESCRIPTIONS

*Alterosa beckeri*, new species

Fig. 5A–D

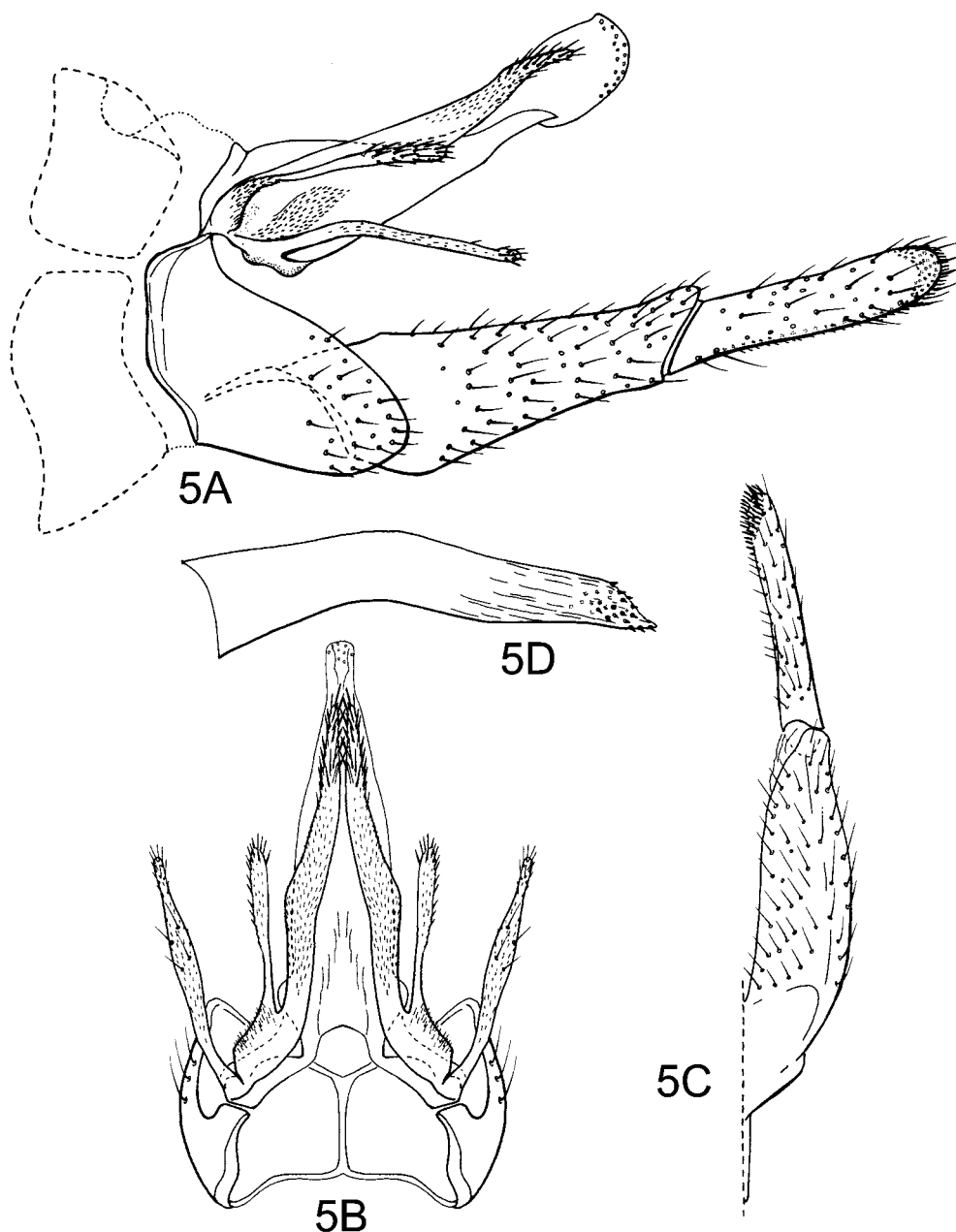
This species is most similar to *A. boraceiae*. It resembles that species in having elongate, apically setose, intermediate appendages, branched near the base. It differs in having the lateral branches of the intermediate appendages more elongate, in lacking paired longitudinal ridges of short spines on tergum X, and in having preanal appendages more elongate and rod-like.

Adult. Color overall, dark brown; legs, palps, and antennae slightly paler, wings irregularly mottled with small light brown spots. Male forewing 8 mm.

Male genitalia. Tergum VIII with posteromesal margin deeply emarginate, emargination V-shaped and extending more than half way to anterior margin. Sternum IX with anterolateral margin weakly rounded, subtruncate; posteroventral margin greatly produced, forming broadly rounded expansion; tergum IX greatly reduced, membranous or fused to base of tergum X. Tergum X narrow, lateral margin gradually narrowing to apex, basolaterally with small rounded protuberance; apex sensillate, subacute as viewed dorsally, rounded and distinctly enlarged in lateral view; tergum textured basolaterally, with scabrous cuticle and numerous small adpressed scale-like spines. Intermediate appendage heavily sclerotized, elongate, extending past preanal appendages, branched basally, forming elongate rod-like mesal branch, nearly as long as tergum X, and shorter lateral branch (about half as long), both branches with numerous fine microsetae on lateral margin; apices of both branches subacute, with brush of coarse setae. Preanal appendage narrow, rod-like, only weakly constricted basally, elongate, with scant setae and numerous minute seta-like spines; apex rounded, with weak brush of short stiff setae. Inferior appendages elongate, linear, flattened on mesal surface; 1st article, in lateral view, narrow, about 3 times longer than wide, tapering apically; 2nd article shorter than 1st, nearly uniform in width, only slightly narrower at base than apex of 1st article; apex rounded, with small pad of short, stiff apicomesal setae. Phallobase tubular, narrow, moderately elongate, weakly, angularly bent near middle, narrowing apically; endotheca with tract of numerous very short spines.

**Holotype male: BRAZIL: Rio de Janeiro:** Itatiaia, 2100 m, 25.i.1993, V. O. Becker (UMSP000204557) (MZUSP).

**Etymology.** This species is named after the eminent lepidopterist, Vitor Becker, who collected and pinned the holotype.



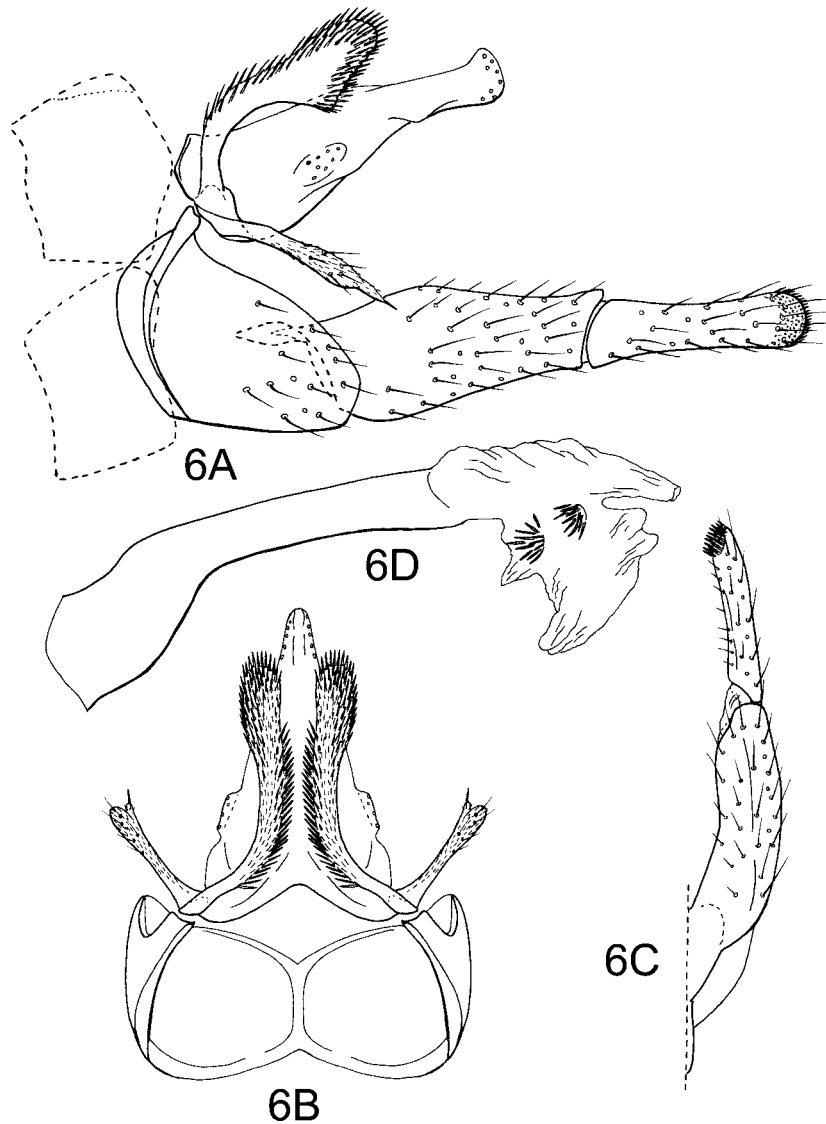
**FIGURE 5.** *Alterosa beckeri*, new species. Male genitalia: 5A—lateral view; 5B—dorsal view of segments IX and X; 5C—inferior appendage, dorsal view; 5D—phallic apparatus, lateral view.

***Alterosa bocainae*, new species**

Figs. 1–4, 6A–D

This species is similar to *A. fimbriata*, but differs in that its intermediate appendage has a longer basal stalk and less of an apical expansion, and also in having tergum X lacking longitudinal rows of spines.

Adult. Color (in alcohol) brown; legs, palps, and antennae distinctly pale, wing pattern not discernable, but costal margin with some paler areas. Male forewing 7–7.8 mm.; female 6.6–6.9 mm.



**FIGURE 6.** *Alterosa bocainae*, new species. Male genitalia: 6A—lateral view; 6B—dorsal view of segments IX and X; 6C—inferior appendage, dorsal view; 6D—phallic apparatus, lateral view.

Male genitalia. Tergum VIII with posteromesal margin moderately emarginate, emargination V-shaped and extending no more than halfway to anterior margin. Sternum IX with anterolateral margin weakly rounded, subtruncate; posteroventral margin greatly produced, forming broadly rounded expansion; tergum IX greatly reduced, membranous or fused to base of tergum X. Tergum X tapered from base, basolaterally with small rounded



sensillate projection; apex sensillate, subacute as viewed dorsally, rounded and slightly enlarged in lateral view. Intermediate appendage heavily sclerotized, short, subequal in length to preanal appendage, posteromesally curved from base and greatly enlarged apically; apex rounded, with brush of coarse setae, extending along apex and dorsomesal margin, also with numerous fine microsetae. Preanal appendage narrow, constricted basally, moderately elongate, not greatly modified, with scant setae and numerous minute seta-like spines; apex abruptly narrowed, forming subacuminate projection, with distinct terminal seta. Inferior appendages elongate, linear, flattened on mesal surface; 1st article, in lateral view, narrow, more than 2x as long as wide, tapering apically; 2nd article shorter than 1st, nearly uniform in width, slightly narrower at base than apex of 1st article; apex rounded, with small pad of short, stiff apicomeral setae. Phallobase tubular, elongate narrow, strongly bent near base; endotheca with clusters of small spines.

**Holotype male: BRAZIL: São Paulo:** Lajeado, Serra da Bocaina, Cachoeira do Lajeado, 22°43.208'S, 44°37.782'W, el 1590 m, 4.iii.2002, Paprocki & Muniz, (UMSP000100627) (MZUSP).

**Paratypes: BRAZIL: São Paulo:** —4 males, 2 females, same locality data as holotype (UMSP); —17 males, 7 females, Parque Nacional da Serra da Bocaina, small trib. on main park road, 22°46.585'S, 44°36.307'W, el 1560 m, 2–3.iii.2002, Holzenthal, Blahnik, Paprocki, Prather, (MZUSP) (UMSP) (NMNH).

Etymology. This species is named *bocainae* for Parque Nacional da Serra da Bocaina, the beautiful park where the type specimens were collected.

#### *Alterosa boraceiae*, new species

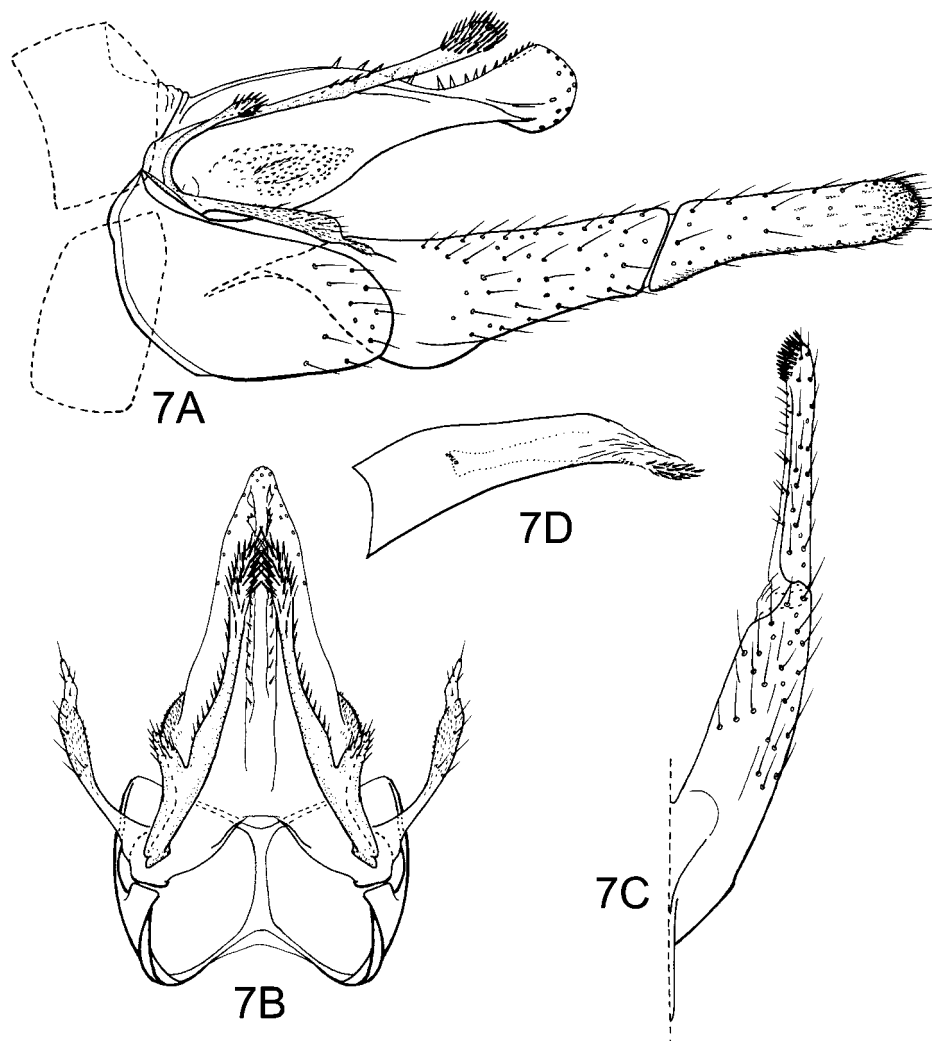
Fig. 7A–D

This species is most similar to *A. beckeri* and resembles that species in having elongate, basally branched intermediate appendages, each with an apical brush. It differs from *A. beckeri* in that the lateral branches of the intermediate appendage are shorter, and in having paired longitudinal ridges of spines on tergum X. The preanal appendage is also less modified and has a single apical seta, rather than a weak brush of setae.

Adult. Color overall, dark brown; legs, palps, and antennae slightly paler, wings irregularly mottled with small light brown spots. Male forewing 6.2–6.8 mm.; female 7.1 mm.

Male genitalia. Tergum VIII with posteromesal margin deeply emarginate, emargination V-shaped and extending more than half way to anterior margin. Sternum IX with anterolateral margin weakly rounded, subtruncate; posteroventral margin greatly produced, forming broadly rounded expansion; tergum IX greatly reduced, membranous or fused to base of tergum X. Tergum X with basolateral margins rounded, tapering apically; dorsally with mesally paired, longitudinal rows of short spines, converging apically; apex sensillate, subacute as viewed dorsally, rounded and distinctly enlarged in lateral view; tergum textured basolaterally, with scabrous cuticle. Intermediate appendage heavily sclero-

tized, elongate, extending past preanal appendages, branched basally, lateral branch very short, mesal branch elongate, rod-like; apices of both branches rounded, with brush of coarse setae. Preanal appendage narrow, constricted basally, moderately elongate, not greatly modified, with scant setae and numerous minute seta-like spines; apex abruptly narrowed, forming subacuminate projection, with distinct terminal seta. Inferior appendages elongate, linear, flattened on mesal surface; 1st article, in lateral view, narrow, more than 2x as long as wide, tapering apically; 2nd article shorter than 1st, scarcely narrower at base than apex of 1st article; apex rounded, with small pad of short, stiff apicomeresal setae. Phallobase tubular, relatively short, narrowing apically, slightly curved; endotheca with paired clusters of short spines.



**FIGURE 7.** *Alterosa boraceiae*, new species. Male genitalia: 7A—lateral view; 7B—dorsal view of segments IX and X; 7C—inferior appendage, dorsal view; 7D—phallic apparatus, lateral view.

**Holotype male: BRAZIL: São Paulo:** Estação Biológica Boraceia, Rio Venerando & tribs., 23°39.185'S, 45°53.414'W, el 850 m, 18–20.iv.1998, Holzenthal, Melo, Froehlich, (UMSP000033080) (MZUSP).

**Paratypes: BRAZIL: São Paulo:** —1 male, 1 female, same locality data as holotype (UMSP); —2 males, 2 females, Estacion Biológica Boraceia, Rio Venerando, 850 m, 3.iv.1977, C. M. & O. S. Flint, Jr., (NMNH).

**Etymology.** This species is named *boraceiae* for the nearly pristine and beautiful nature preserve, Estação Biológica Boraceia, maintained by the Museum of Zoology of the University of São Paulo.

### *Alterosa caparaonensis*, new species

Fig. 8A–D

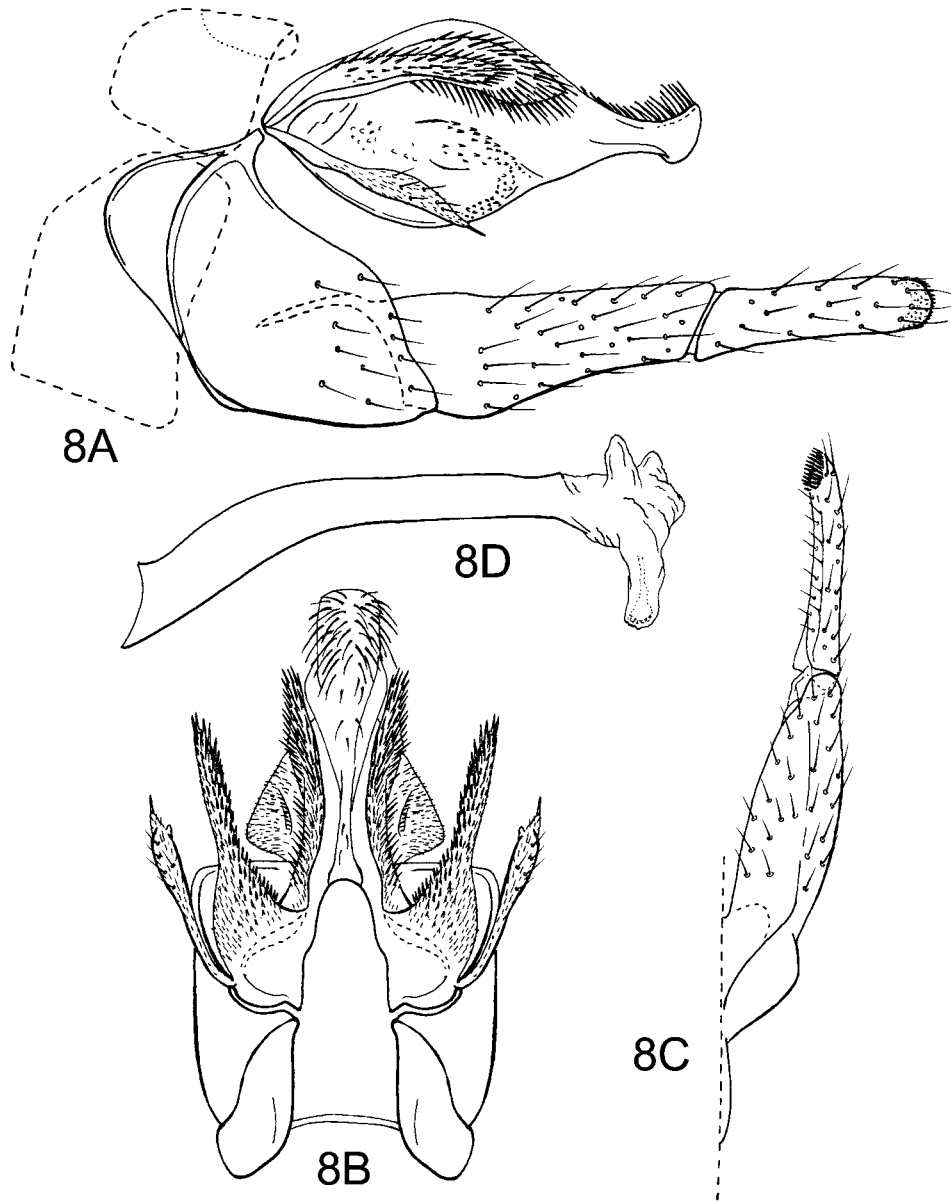
This species is easily diagnosed by the spine-like setae on the apex of tergum X and the structure of the intermediate appendages, which are branched basally and heavily armed with coarse setae. The absence of endothecal spines in the phallus is also a useful diagnostic character; similar only to *Alterosa holzenthali*.

**Adult.** Color (in alcohol) brown; legs and palps scarcely paler, antennae somewhat so, wing pattern not evident. Male forewing 7 mm.

**Male genitalia.** Tergum VIII with posteromesal margin deeply emarginate, emargination V-shaped and extending more than half way to anterior margin. Sternum IX with anterolateral margin broadly rounded in dorsal half; posteroventral margin greatly produced, forming broadly rounded expansion; tergum IX greatly reduced, membranous or fused to base of tergum X. Tergum X with basolateral margins angularly protruding; dorsally with elevated longitudinal mesal ridge; apex expanded, truncate as viewed dorsally, with numerous elongate spine-like setae, apex enlarged and upturned in lateral view; tergum textured basolaterally, with scabrous cuticle and numerous small adpressed scale-like spines. Intermediate appendage heavily sclerotized, moderately elongate, branched basally, with slightly more elongate and apically expanded mesal branch and shorter lateral branch, each covered with numerous spine-like setae, setae longer and more numerous apically; apices of both branches rounded. Preanal appendage narrow, constricted basally, moderately elongate, not greatly modified; apex abruptly narrowed, forming subacuminate projection with distinct terminal seta. Inferior appendages elongate, linear, flattened on mesal surface; 1st article, in lateral view, narrow, about 3 times longer than wide, tapering apically; 2nd article shorter than 1st, nearly uniform in width, only slightly narrower at base than apex of 1st article; apex rounded, with small pad of short, stiff apicomesal setae. Phallobase tubular, elongate narrow, curved in basal half; endotheca without spines.

**Holotype male: BRAZIL: Minas Gerais:** Parque Nacional do Caparaó, small trib. to Rio Caparaó, Vale Verde, 20°25.029'S, 41°50.767'W, el 1350 m, 12–14.iii.2002, Holzenthal, (UMSP000200499) (MZUSP).

Etymology. This species is named *caparaonensis* for Parque Nacional do Caparaó, the beautiful park where the holotype specimen was collected.



**FIGURE 8.** *Alterosa caparaonensis*, new species. Male genitalia: 8A—lateral view; 8B—dorsal view of segments IX and X; 8C—inferior appendage, dorsal view; 8D—phallic apparatus, lateral view.

***Alterosa escova*, new species**

Fig. 9A–D

This species is similar to *Alterosa fluminensis*, *A. flinti*, *A. marinonii* and *A. sanctaeteresae*, all of which have similarly developed inferior appendages and highly modified and enlarged preanal appendages armed with spine-like setae. From *A. flinti* and *A. sanctaeteresae* it differs in lacking elongate, apically setose lateral branches from the intermediate appendages. From *A. marinonii* and *A. fluminensis* it differs in the armature of the preanal appendages, which in *A. escova* is brush-like and confined to the posterolateral margin of the appendage.

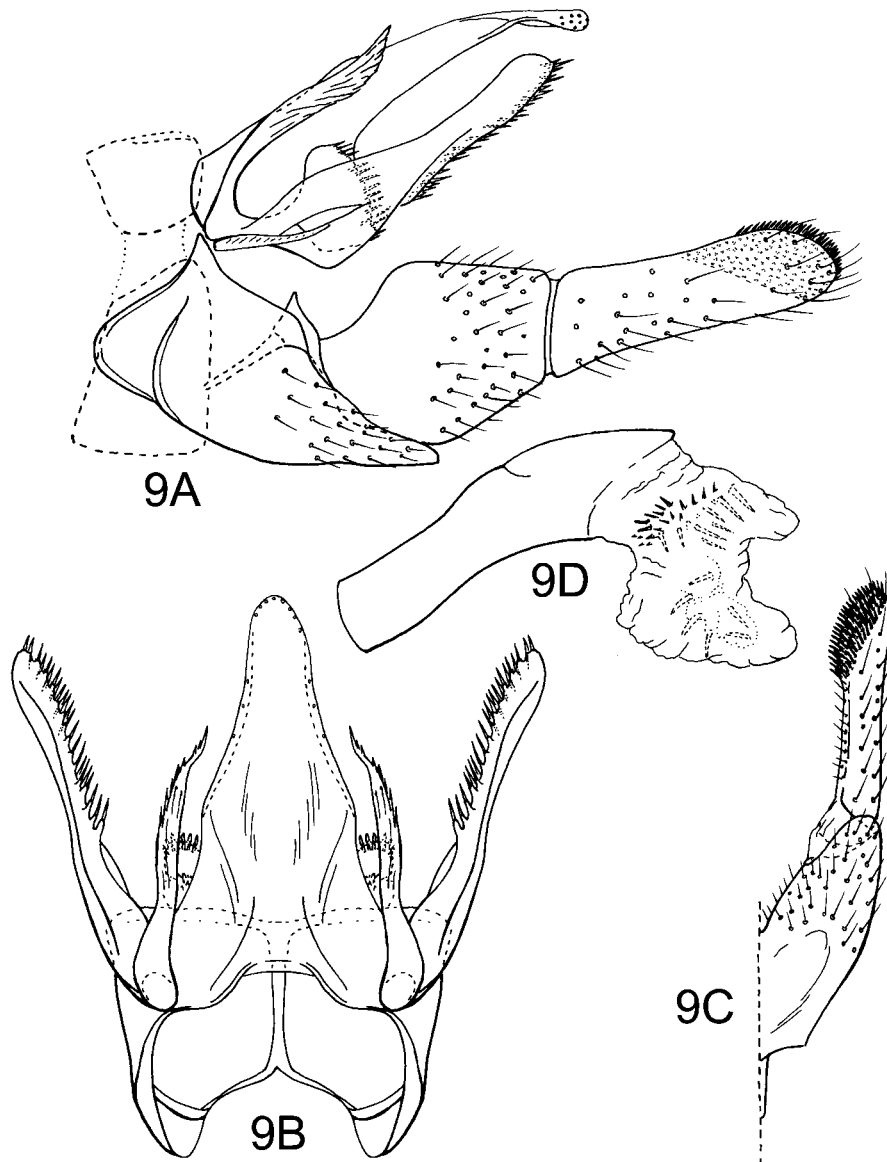
**Adult.** Color overall, dark brown; legs, palps, and antennae slightly paler, wings irregularly mottled with small light brown spots. Male forewing 6–6.7 mm.

**Male genitalia.** Tergum VIII with posteromesal margin slightly emarginate. Sternum IX with anterolateral margin broadly rounded; posteroventral margin greatly produced, extending sinuously from dorsum; tergum IX greatly reduced, membranous or fused to base of tergum X. Tergum X tapered from base, slightly expanded at midlength; apex sensillate, rounded as viewed dorsally, not or scarcely enlarged in lateral view. Intermediate appendage heavily sclerotized, moderately elongate, more or less spine-like and weakly scabrous, with scale-like spines along dorsolateral margin; apex acute. Preanal appendage greatly enlarged, wider at base than apex, elongate, with short, stout setae apically, extending along ventromesal margin; apex rounded; preanal appendage basally with flange-like process bearing cluster of prominent, stalked, spine-like setae, flange-like process large, rounded, with stout apicomarginal setae, mesal to appendage itself. Inferior appendages robust; 1st article, in lateral view, short, nearly as wide as long, bulging mesally; 2nd article longer than 1st article, relatively wide and uniform in width, about as wide basally as apex of 1st article; apex rounded, with prominent pad of short, stiff apicomeresal setae. Phallobase tubular, relatively short and wide, slightly curved dorsally; endotheca relatively short, with numerous short spines, apparently in several paired tracts, basolateral ones very short.

**Holotype male: BRAZIL: São Paulo:** small stream on São Paulo Route 247, 11 km SE Bananal, 22°45.684'S, 44°23.190'W, el 675 m, 23.ix.2002, Blahnik, Prather, Melo, Froehlich, Silva, (UMSP000088791) (MZUSP).

**Paratypes: BRAZIL: Rio de Janeiro:** —1 male, Parque Nacional Itatiaia, Rio Taquaral, 22°27.252'S, 44°36.570'W, el 1300 m, 22–23.xi.2001, Holzenthal, Blahnik, (NMNH); —1 male, Parque Nacional Itatiaia, trib. to Rio Taquaral, 22°26.688'S, 44°36.464'W, el 1320 m, 6.iii.2002, Holzenthal, Blahnik, Prather, (UMSP).

**Etymology.** This species is named *escova*, from the Portuguese word for brush, referring to the somewhat brush-like preanal appendages of this species. The word is used as a noun in apposition.



**FIGURE 9.** *Alterosa escova*, new species. Male genitalia: 9A—lateral view; 9B—dorsal view of segments IX and X; 9C—inferior appendage, dorsal view; 9D—phallic apparatus, lateral view.

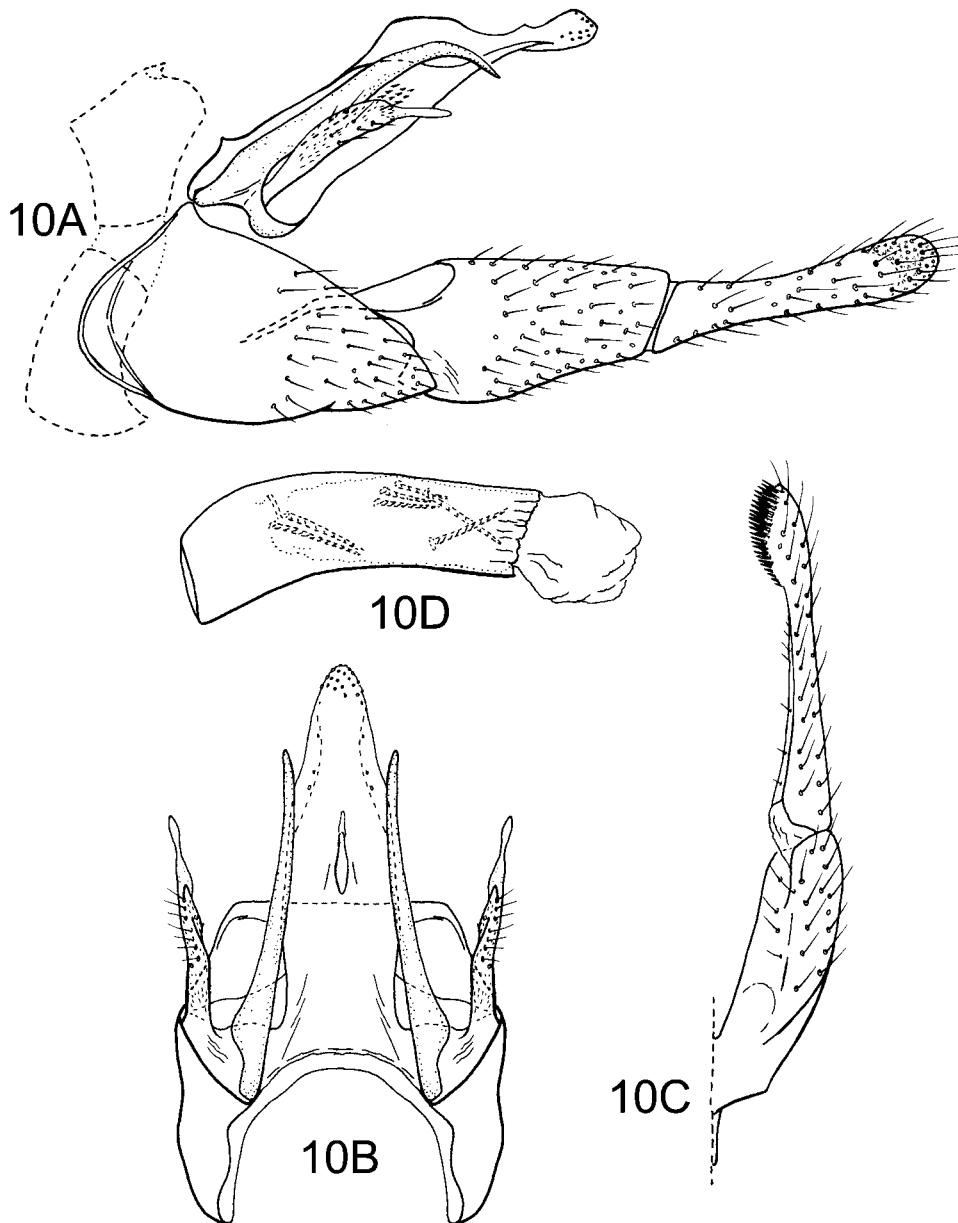
***Alterosa falcata*, new species**

Fig. 10A–D

This species is most similar to *Alterosa jordaensis*, resembling that species in the elongate, curved intermediate appendages and enlarged phallic spines. It differs in that the intermediate appendages in *A. falcata* are more nearly sickle-like. The differences are relatively minor and it is possible that the two will eventually be found to be not specifically distinct.

The mesal, crest-like development of tergum X in *A. falcata* is variably developed in different populations and sometimes absent, or nearly so.

Adult. Color overall, dark brown; legs, palps, and antennae slightly paler, wings irregularly mottled with small light brown spots. Male forewing 5.9–6.8 mm.; female 6.2–6.4 mm.



**FIGURE 10.** *Alterosa falcata*, new species. Male genitalia: 10A—lateral view; 10B—dorsal view of segments IX and X; 10C—inferior appendage, dorsal view; 10D—phallic apparatus, lateral view.

Male genitalia. Tergum VIII with posteromesal margin moderately emarginate, emargination V-shaped and extending no more than halfway to anterior margin. Sternum IX with anterolateral margin broadly rounded; posteroventral margin greatly produced, extending in broad arc or nearly linearly from dorsum; tergum IX greatly reduced, membranous or fused to base of tergum X. Tergum X tapered from base; dorsally with small preapical projection (variably developed), and sometimes with crest-like projection at slightly past midlength (absent in some populations); apex sensillate, rounded as viewed dorsally, rounded and slightly enlarged in lateral view, shape somewhat variable; tergum midlaterally with patch of adpressed seta-like spines. Intermediate appendage heavily sclerotized, elongate, extending past preanal appendages, sickle-shaped, arched, apex curved downward; apex acute. Preanal appendage narrow, constricted basally, moderately elongate, not greatly modified, with scant setae and numerous minute seta-like spines; apex abruptly narrowed, forming subacuminate projection, without apical seta. Inferior appendages elongate, linear, flattened on mesal surface; 1st article, in lateral view, about 2x as long as wide, tapering apically; 2nd article subequal in length to 1st article, relatively narrow, especially at midlength, only slightly narrower basally than apex of 1st article; apex rounded, with prominent pad of short, stiff apicomeresal setae. Phallobase tubular, relatively short and wide, slightly curved; endotheca longer than phallobase when extended, with large sclerotized, nail-like spines (8–13 in specimens available) in about 3 tracts (distinguishable in specimens with endotheca expanded): basal tract of 4 or more spines, usually slightly shorter than others, apical tract(s) arranged as more or less paired spines, extended into 2 (or 3) regions, with middle region most variable in number of spines (2–6).

**Holotype male: BRAZIL: Minas Gerais:** Ibitipoca, sitio of Anestis Papadopoulos, cachoeira, 21°43.441'S, 43°54.537'W, el 1125 m, 4–5.v.1988, Holzenthal & Paprocki, (UMSP000033071) (MZUSP).

**Paratypes: BRAZIL: Minas Gerais:** —1 male, 1 female, same locality data as holotype (UMSP); **Rio de Janeiro:** —1 male, 1 female, Rio Macacú (2nd order), on RJ 116, km 62, 22°23.201'S, 42°33.945'W, el 840 m, 17.iii.1996, Holzenthal, Rochetti, Oliveira, (MZUSP); —1 male, 1 female, Parque Nacional do Itatiaia, Rio Campo Belo, 22°27.003'S, 44°36.818'W, el 1300 m, 7.iii.2002, Holzenthal, Blahnik, Paprocki, Prather, (MZUSP); —1 male, Km 54, 26 km E of Nova Friburgo, 410m, 19.iv.1977, C. M. & O. S. Flint, Jr., (NMNH); **São Paulo:** —2 males, Parque Nacional do Serra do Bocaina, Cachoeira dos Posses, 22°46.437'S, 44°36.250'W, el 1250 m, 3.iii.2002, Holzenthal, Blahnik, Paprocki, Prather, (UMSP); —3 males, 2 females, Lajeado, Serra do Bocaina, Cachoeira do Lajeado, 22°43.208'S, 44°37.782'W, el 1590 m, 4.iii.2002, Paprocki & Muniz, (UMSP).

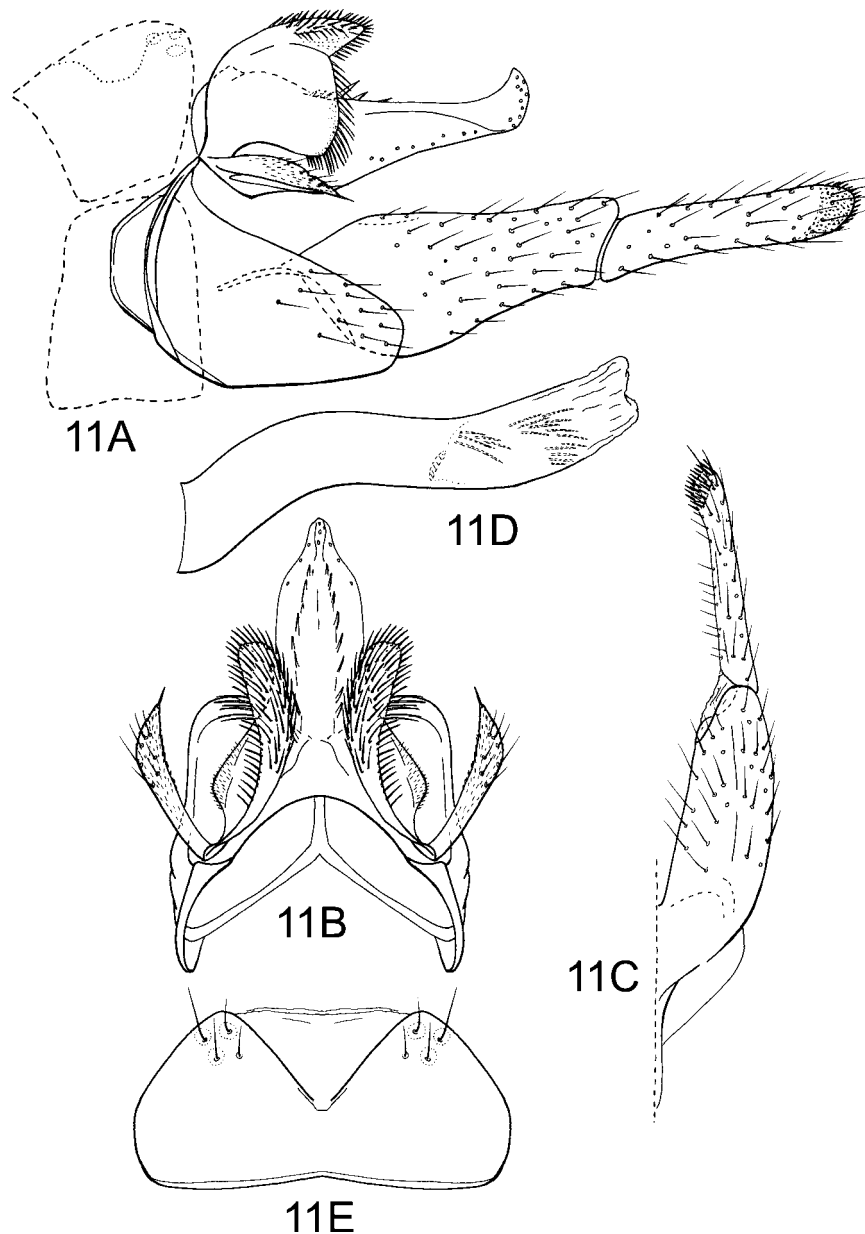
**Etymology.** This species is named *falcata* for shape of the intermediate appendages, which are somewhat falcate or sickle-shaped.



*Alterosa fimbriata*, new species

Fig. 11A–E

This species is most similar to *A. bocainae*, agreeing in having short, apically broadened intermediate appendages armed with coarse setae. It differs in having the intermediate appendages more broadly expanded apically, and in having a tergum X that possesses longitudinal rows of spines.



**FIGURE 11.** *Alterosa fimbriata*, new species. Male genitalia: 11A—lateral view; 11B—dorsal view of segments IX and X; 11C—inferior appendage, dorsal view; 11D—phallic apparatus, lateral view; 11E—dorsal view of segment VIII.

Adult. Color overall, dark brown; legs, palps, and antennae slightly paler, wings irregularly mottled with small light brown spots. Male forewing 7.8 mm.

Male genitalia. Tergum VIII with posteromesal margin deeply emarginate, emargination V-shaped and extending more than half way to anterior margin. Sternum IX with anterolateral margin broadly rounded; posteroventral margin greatly produced, forming broadly rounded expansion; tergum IX greatly reduced, membranous or fused to base of tergum X. Tergum X narrow, lateral margins subparallel; dorsally with mesally paired, longitudinal rows of short spines, converging apically; apex sensillate, subacute as viewed dorsally, apex enlarged and upturned in lateral view, forming a dorsally acute apex. Intermediate appendage heavily sclerotized, short, subequal in length to preanal appendage, lobe, as viewed laterally, with apicoventral margin greatly enlarged and rounded, lobe laterally compressed as viewed dorsally; apex subacute, with brush of coarse setae, setae extending ventrally along margin of apicoventral lobe. Preanal appendage narrow, constricted basally, moderately elongate, not greatly modified, with scant setae and numerous minute seta-like spines; apex rounded, with distinct terminal seta. Inferior appendages elongate, linear, flattened on mesal surface; 1st article, in lateral view, about 2x as long as wide, tapering apically; 2nd article shorter than 1st, nearly uniform in width, narrower at base than apex of 1st article; apex rounded, with small pad of short, stiff apicomeresal setae. Phallobase tubular, narrow, moderately elongate, sinuously curved from base; endotheca with numerous fine needle-like spines.

**Holotype male: BRAZIL: Rio de Janeiro:** Parque Nacional da Serra dos Órgãos, Rio Paqueta, 22°26.992'S, 42°59.899'W, el 1000 m, 26.ii.2002, Holzenthal, Blahnik, Paprocki, Prather, (UMSP000070780) (MZUSP).

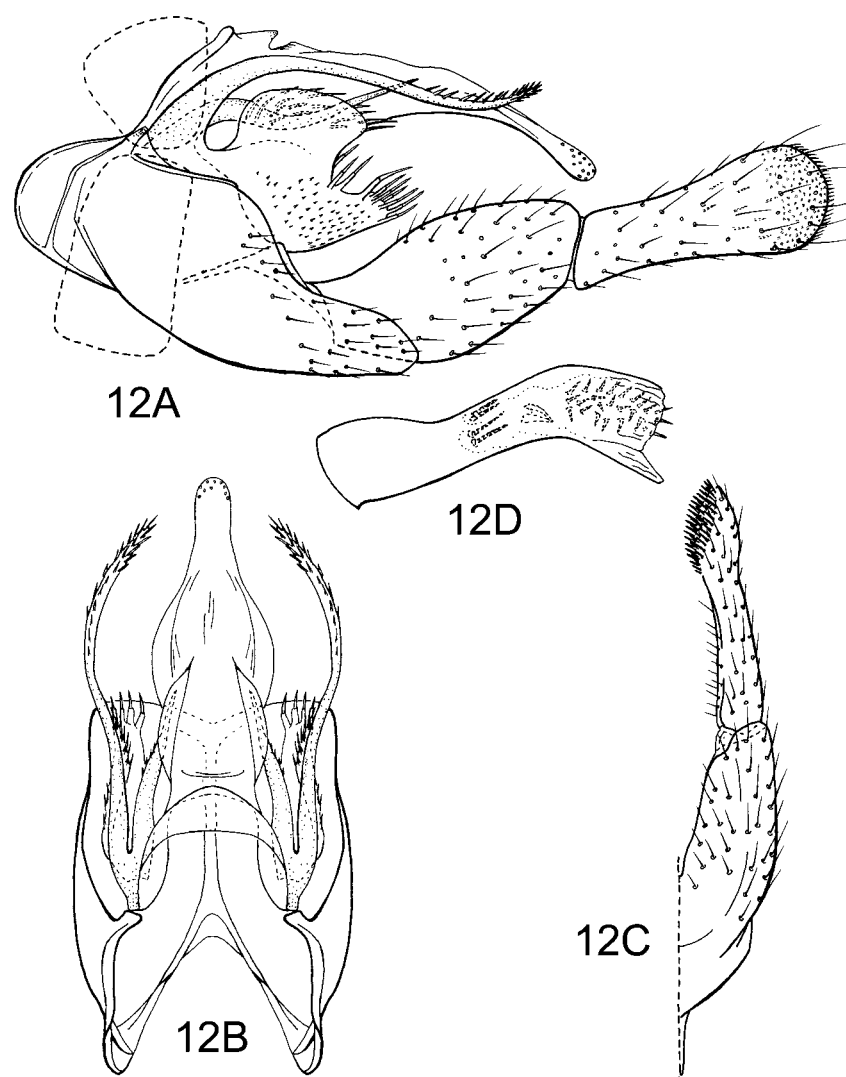
Etymology. This species is named *fimbriata*, Latin for fringed, and referring to the apically widened intermediate appendages which are densely fringed with short spines.

### *Alterosa flinti*, new species

Fig. 12A–D

This species is similar to *Alterosa escova*, *A. fluminensis*, *A. marinonii* and *A. sanctaetersae*, all of which have similarly developed inferior appendages and highly modified and enlarged preanal appendages armed with spine-like setae. From all except *A. sanctaetersae* it differs in possessing elongate, apically setose lateral branches from the intermediate appendages. It differs from *A. sanctaetersae* in the unusual shape of the preanal appendage, which in *A. flinti* has a greatly enlarged, rounded dorsal lobe.

Adult. Color overall, dark brown; legs, palps, and antennae slightly paler, wings irregularly mottled with small light brown spots. Male forewing 5.5–5.9 mm.; female 5.7 mm.



**FIGURE 12.** *Alterosa flinti*, new species. Male genitalia: 12A—lateral view; 12B—dorsal view of segments IX and X; 12C—inferior appendage, dorsal view; 12D—phallic apparatus, lateral view.

Male genitalia. Tergum VIII with posteromesal margin moderately emarginate, emargination V-shaped and extending no more than halfway to anterior margin. Sternum IX with anterolateral margin broadly rounded; posteroventral margin greatly produced, extending sinuously from dorsum; tergum IX reduced, forming a mesal projection over base of tergum X. Tergum X with lateral margins rounded basally, subparallel apically; apex sensillate, rounded as viewed dorsally, not or scarcely enlarged in lateral view. Intermediate appendage heavily sclerotized, elongate, extending past preanal appendages, branched basally, both branches rod-like, mesal branch much shorter, with acuminate apex, lateral branch with apex subacute; with brush of short, stiff setae. Preanal append-

age short, bulbous, forming rounded, laterally compressed structure with coarse, stalked, spine-like setae on posterior margin, ventrally situated setae on slightly emergent process, constricted basally. Inferior appendages robust; 1st article, in lateral view, about one and a half times longer than wide, bulging mesally; 2nd article subequal in length to 1st article, relatively wide, apex enlarged; apex rounded, with prominent pad of short, stiff apicomesal setae. Phallobase tubular, moderately elongate, sinuously flexed in basal and apical third; endotheca with basal tract of about 4 nail-like spines and apical tract of numerous smaller tack-like spines.

**Holotype male: BRAZIL: Espirito Santo:** 24 km SE Santa Teresa, el 280 m, 22.iv.1977, C.M. & O.S Flint, Jr., (UMSP000204550) (MZUSP).

**Paratypes: BRAZIL: Espirito Santo:** —3 males, same locality data as holotype (NMNH) (UMSP); **Rio de Janeiro:** —1 male, 1 female, Km 17, 8 km S of Teresopolis, 18–19.iv.1977, C.M. & O.S. Flint, Jr., (NMNH).

**Etymology.** I take great pleasure in naming this species for Dr. Oliver S. Flint, Jr., the eminent trichopterist who devoted his career to the study of Neotropical caddisflies and who collected the type specimens.

#### *Alterosa fluminensis*, new species

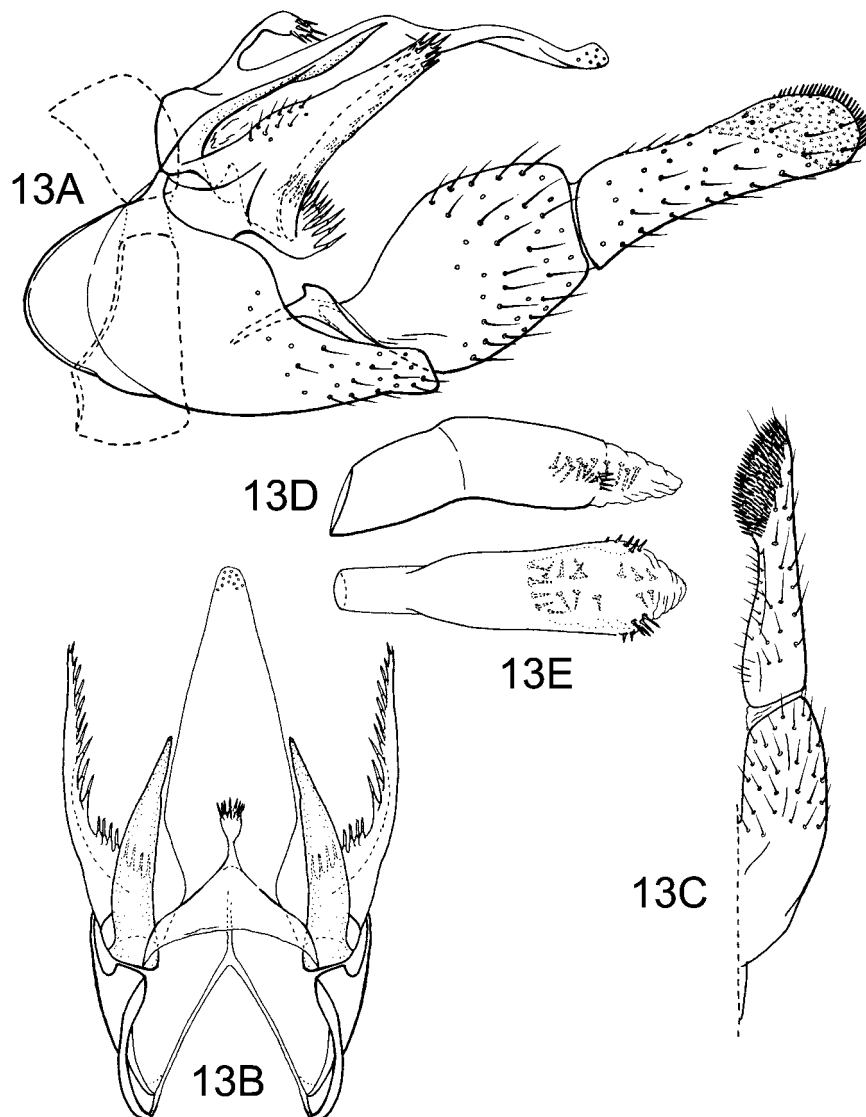
Fig. 13A–E

This species is similar to *Alterosa escova*, *A. flinti*, *A. marinonii* and *A. sanctaeteresae*, all of which have similarly developed inferior appendages and highly modified and enlarged preanal appendages armed with spine-like setae. From *A. flinti* and *A. sanctaeteresae* it differs in lacking elongate, apically setose lateral branches from the intermediate appendages. From *A. escova* and *A. marinonii* it differs in the shape and armature of the preanal appendage, which in *A. fluminensis* possesses a basal pad with elongate, stalked setae, in addition to apical and mesolateral setae. *Alterosa fluminensis* is also unique in possessing a small, stalked basal process at the base of tergum X, although the latter structure may not always be present.

**Adult.** Color overall, dark brown; legs, palps and antennae slightly paler, wings irregularly mottled with small light brown spots. Male forewing 5.2–6 mm.

**Male genitalia.** Tergum VIII with posteromesal margin not or scarcely emarginate. Sternum IX with anterolateral margin broadly rounded; posteroventral margin greatly produced, extending sinuously from dorsum; tergum IX reduced, forming a mesal projection over base of tergum X, mesal projection extending into short mesal stalk, terminating with small bulbous, apically setose process (stalked process broken in holotype specimen, but present with specimen; apparently undeveloped in paratype specimen). Tergum X tapered from base, in lateral profile undulate; apex sensillate, subacute as viewed dorsally, rounded and slightly enlarged in lateral view. Intermediate appendage heavily sclerotized, moderately elongate, spine-like; apex acute. Preanal appendage greatly enlarged, broad basally,

elongate, with short, stout setae apically, extending along ventromesal margin; apex rounded; preanal appendage basally with flange-like process bearing cluster of prominent, stalked, spine-like setae, flange-like process small, rounded, more or less ventral and mesal to appendage itself. Inferior appendages robust; 1st article, in lateral view, short, nearly as wide as long, bulging mesally; 2nd article longer than 1st article, relatively broad and nearly uniform in width; apex rounded, with prominent pad of short, stiff apicomeseal setae. Phallobase tubular, relatively short, narrow basally, expanded apically, rather sharply bent at midlength; endotheca with numerous short tack-like spines.



**FIGURE 13.** *Alterosa fluminensis*, new species. Male genitalia: 13A—lateral view; 13B—dorsal view of segments IX and X; 13C—inferior appendage, dorsal view; 13D—phallic apparatus, lateral view; 13E—phallic apparatus, dorsal view.

**Holotype male: BRAZIL: Rio de Janeiro:** Rio Sousa in Cachoeiras de Macacú, 26°26.567'S, 42°37.957'W, el 150 m, 16.iii.1996, Holzenthal, Rochetti, Oliveira, (UMSP000035880) (MZUSP).

**Paratype: BRAZIL: Rio de Janeiro:** —1 male, Km 54, 26 km E of Nova Friburgo, 410m, 19.iv.1977, C. M. & O. S. Flint, Jr., (NMNH).

**Etymology.** This species is named *fluminensis* from the Latin word for stream, and referring to the state of Rio de Janeiro where the type specimens were collected.

***Alterosa guapimirim*, new species**

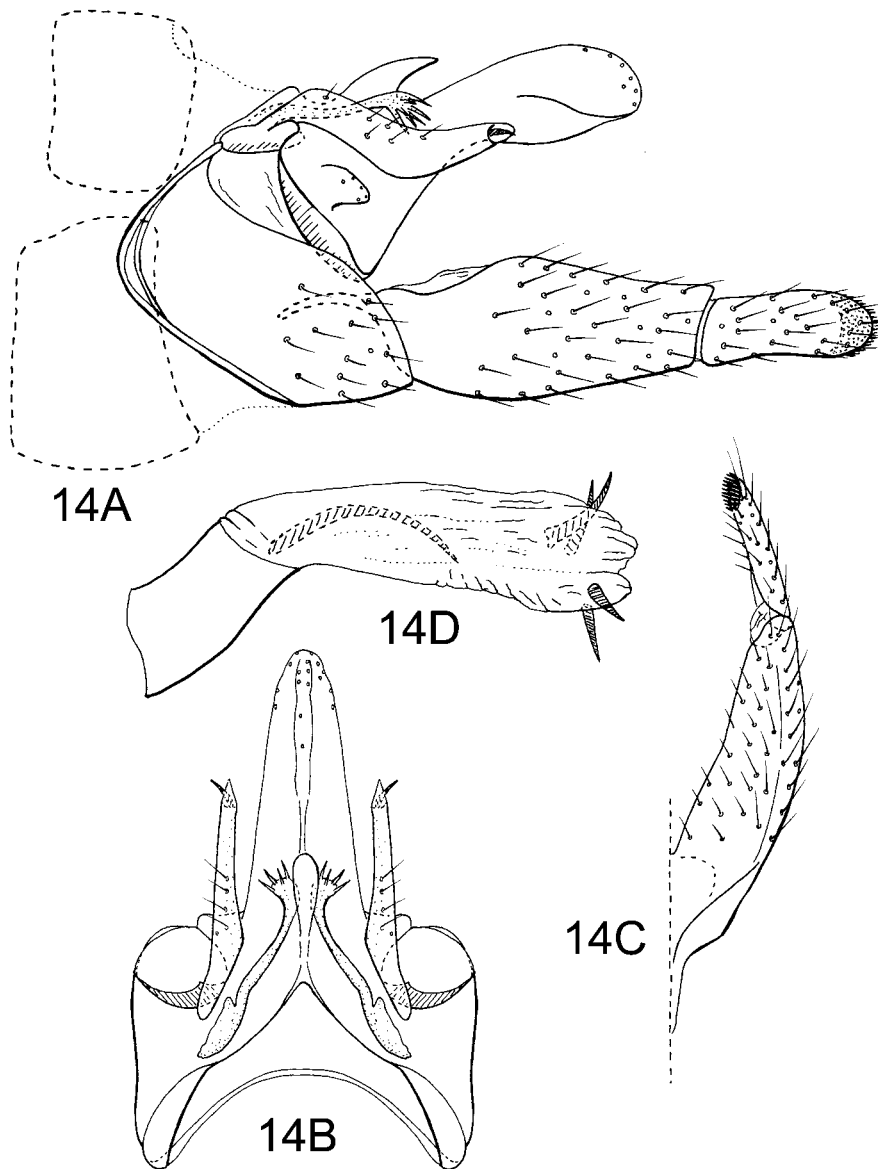
Fig. 14A–D

This species is very similar to *A. orgaosensis* and it is possible that the two may eventually prove to be not specifically distinct. It resembles that species in having an inferior appendage with a very short 2nd article, tergum X with a large, inflated apex and a basolateral margin that is peculiarly cupped. Additionally, the apices of the preanal appendages of both species are unusual in being concavely cupped, each bearing a thick spine-like seta. The two species differ primarily in the structure of the intermediate appendage, which is apically rounded and setose in *A. guapimirim* and concave and armed much like the preanal appendage in *A. orgaosensis*. Additionally, tergum X is more distinctly dome-shaped in *A. orgaosensis*.

**Adult.** Color (in alcohol) brown; legs, palps, and antennae distinctly pale, wing pattern not discernable, but costal margin with some paler areas. Male forewing 6.2–6.9 mm.

**Male genitalia.** Tergum VIII with posteromesal margin not or scarcely emarginate. Sternum IX with anterolateral margin forming a rounded projection in dorsal half; posteroventral margin moderately produced, forming broadly rounded expansion; tergum IX forming a shelf-like projection over base of tergum X, projection prominent, apex as viewed dorsally, rounded, subspatulate. Tergum X with lateral margins subparallel; dorsally with elevated longitudinal mesal ridge; apex sensillate, forming greatly enlarged expansion in apical half, rounded and distinctly enlarged in lateral view; tergum basolaterally with short, setose, apically-rounded projection, set in a large, sclerotized concave depression. Intermediate appendage heavily sclerotized, shorter than preanal appendage, rod-like and mesally curved; apex rounded, slightly expanded, with small number of apical spines. Preanal appendage narrow, sinuous, with apex projecting outward, elongate, with scant setae on lateral margin; apex rounded, with distinct terminal seta; in oblique concavity, seta stout and spine-like. Inferior appendages elongate, linear, flattened on mesal surface; 1st article, in lateral view, more than 2x as long as wide, tapering apically; 2nd article shorter than 1st, (less than half the length), nearly as wide at base as apex of 1st article, more or less uniform in width; apex rounded, with small pad of short, stiff apicomeresal setae. Phallobase tubular, moderately elongate, strongly curved near middle; endotheca with 4 large spines in 2 pairs, dorsal ones slightly curved; internally with appar-

ent pair of elongate, curved spines (actually probably sclerotized margins of a somewhat trough-shaped phallotremal sclerite).



**FIGURE 14.** *Alterosa guapimirim*, new species. Male genitalia: 14A—lateral view; 14B—dorsal view of segments IX and X; 14C—inferior appendage, dorsal view; 14D—phallic apparatus, lateral view.

**Holotype male: BRAZIL: Rio de Janeiro:** Parque Nacional da Serra dos Orgãos, Guapimirim, Trilha das Ruínas, 22°29.679'S, 42°59.729'W, el 940 m, 28.ii.2002, Blahník & Paprocki, (UMSP000083754) (MZUSP).

**Paratypes: BRAZIL: Rio de Janeiro:** —3 males, same locality data as holotype (UMSP) (NMNH).

**Etymology.** This species is named *guapimirim*, using the word as a noun in apposition, referring to the name of the section in Parque Nacional da Serra dos Orgãos where the type specimens were collected.

***Alterosa holzenthali*, new species**

Fig. 15A–D

This species differs from all other species of *Alterosa* in the laterally spinose and projecting posterior margin of tergum IX. The narrow pencil-like intermediate appendage, which closely parallels the lateral margin of tergum X and terminates with a stout apical seta, is similar only to *A. paprockii*.

**Adult.** Color overall, dark brown; legs, palps, and antennae slightly paler, wings irregularly mottled with small light brown spots. Male forewing 5–5.2 mm.

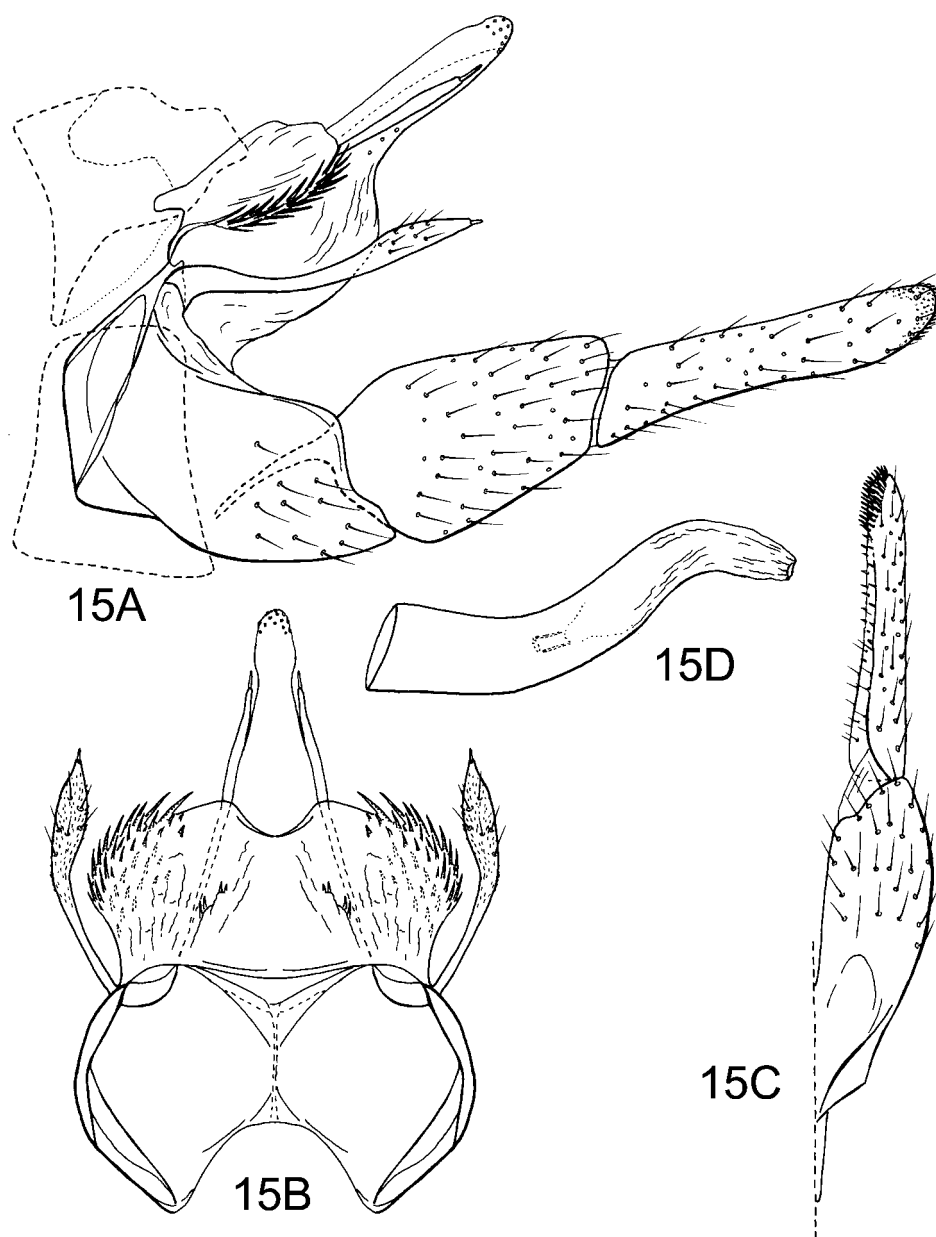
**Male genitalia.** Tergum VIII with posteromesal margin deeply emarginate, emargination V-shaped and extending more than half way to anterior margin. Sternum IX with anterolateral margin angularly truncate; posteroventral margin moderately produced, extending sinuously from dorsum; tergum IX forming a shelf-like projection over base of tergum X, shelf with apicomesal invagination, lateral and ventrolateral margins with numerous short stiff spines, few spines also present basomesally. Tergum X tapered from base; apex sensillate, slightly enlarged and rounded as viewed dorsally, not or scarcely enlarged in lateral view. Intermediate appendage weakly sclerotized, elongate, extending past preanal appendages, appendage narrow, pencil-like, closely adpressed to lateral margin of tergum X; apex acute, terminating in apical spine-like seta, seta short. Preanal appendage narrow, constricted basally, elongate, with scant setae and numerous minute seta-like spines; apex acuminate, with distinct terminal seta. Inferior appendages elongate, linear, flattened on mesal surface; 1st article, in lateral view, about one and a half times longer than wide, tapering apically; 2nd article longer than 1st article, relatively narrow and uniform in width; apex rounded, with small pad of short, stiff apicomesal setae. Phallobase sinuously bent at midlength; endotheca without spines.

**Holotype male: BRAZIL: Santa Catarina:** Parque Ecológica Spitzkopf, confluence Rio Ouro & Rio Caeté, 27°00.352'S, 49°06.693'W, el 140 m, 3.iii.1998, Holzenthal, Froehlich, Paprocki, (UMSP000033074) (MZUSP).

**Paratype: BRAZIL: Santa Catarina:** —1 male, Parque Ecológica Spitzkopf, Rio Caeté above 1st falls, 27°00.35'S, 49°06.70'W, el 170 m, 4.iii.1998, Holzenthal, Froehlich, Paprocki, (UMSP).

**Etymology.** I am pleased to name this species for my friend and colleague, Dr. Ralph W. Holzenthal, not only for collecting the type specimens, but also for his outstanding contributions to the study of Neotropical caddisflies.





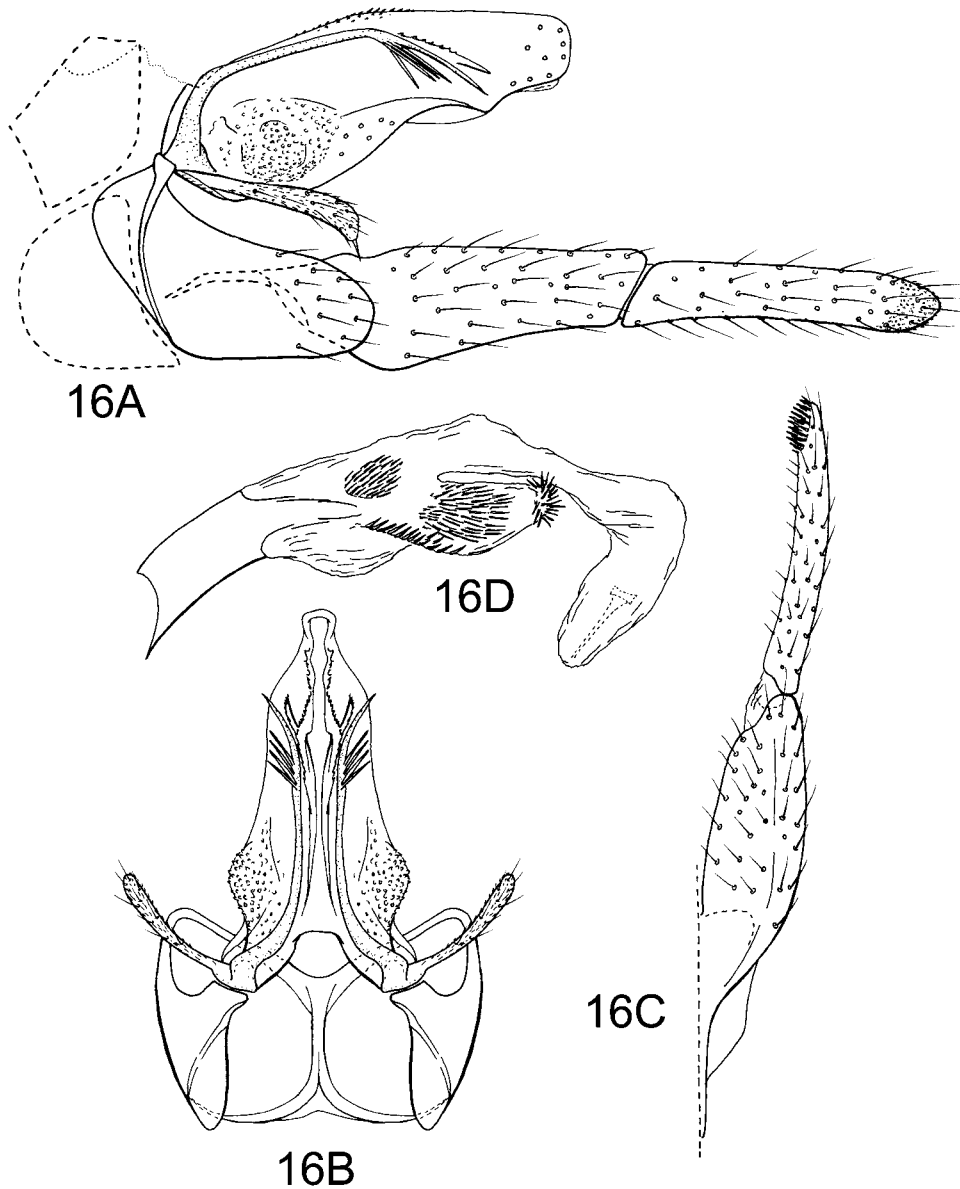
**FIGURE 15.** *Alterosa holzenthali*, new species. Male genitalia: 15A—lateral view; 15B—dorsal view of segments IX and X; 15C—inferior appendage, dorsal view; 15D—phallic apparatus, lateral view.

***Alterosa intervalles*, new species**

Fig. 16A–D

*Alterosa intervalles* is similar to *A. sanctipauli*, resembling that species in the elongate, narrow, unbranched intermediate appendages. It differs in that the setae of the intermediate

appendage in *A. intervalles* are very elongate and located along the apicolateral margin, while those in *A. sanctipauli* are very short and terminal. *Alterosa intervalles* also differs from *A. sanctipauli* in the shape of the apex of tergum X and presence of paired, spined longitudinal ridges found on the same structure.



**FIGURE 16.** *Alterosa intervalles*, new species. Male genitalia: 16A—lateral view; 16B—dorsal view of segments IX and X; 16C—inferior appendage, dorsal view; 16D—phallic apparatus, lateral view.

Adult. Color overall, dark brown; legs, palps, and antennae slightly paler, wings irregularly mottled with small light brown spots. Male forewing 7–7.3 mm.; female 6.8–7 mm.

Male genitalia. Tergum VIII with posteromesal margin deeply emarginate, emargination V-shaped and extending more than half way to anterior margin. Sternum IX with anterolateral margin forming a rounded projection in dorsal half; posteroventral margin greatly produced, forming broadly rounded expansion; tergum IX greatly reduced, membranous or fused to base of tergum X. Tergum X with basolateral margins rounded, tapering apically; dorsally with mesally paired, longitudinal rows of short spines, converging apically; apex sensillate, rounded as viewed dorsally, subtruncate in lateral view; tergum textured basolaterally, with scabrous cuticle. Intermediate appendage heavily sclerotized, elongate, extending past preanal appendages, rod-like, curved near base; apex acute, with linear, preapical row of about four elongate spine-like setae. Preanal appendage narrow, constricted basally, moderately elongate, not greatly modified, with scant setae and numerous minute seta-like spines; apex rounded, with distinct terminal seta. Inferior appendages elongate, linear, flattened on mesal surface; 1st article, in lateral view, narrow, about 3x longer than wide, tapering apically; 2nd article subequal in length to 1st article, nearly uniform in width, only slightly narrower at base than apex of 1st article; apex rounded, with small pad of short, stiff apicomeres setae. Phallobase tubular, short, scarcely curved; endotheca with numerous fine spines in several distinct, paired tracts near base, apex elongate, without spines.

**Holotype male: BRAZIL: São Paulo:** Parque Estadual Intervales, small trib. to Agua Comprida, 24°16.531'S, 48°25.042'W, el 800 m, 01.x.2002, Blahnik & Prather, (UMSP000088786) (MZUSP).

**Paratypes: BRAZIL: São Paulo:** —1 male, 3 females, same collection data as holotype (UMSP) (MZUSP).

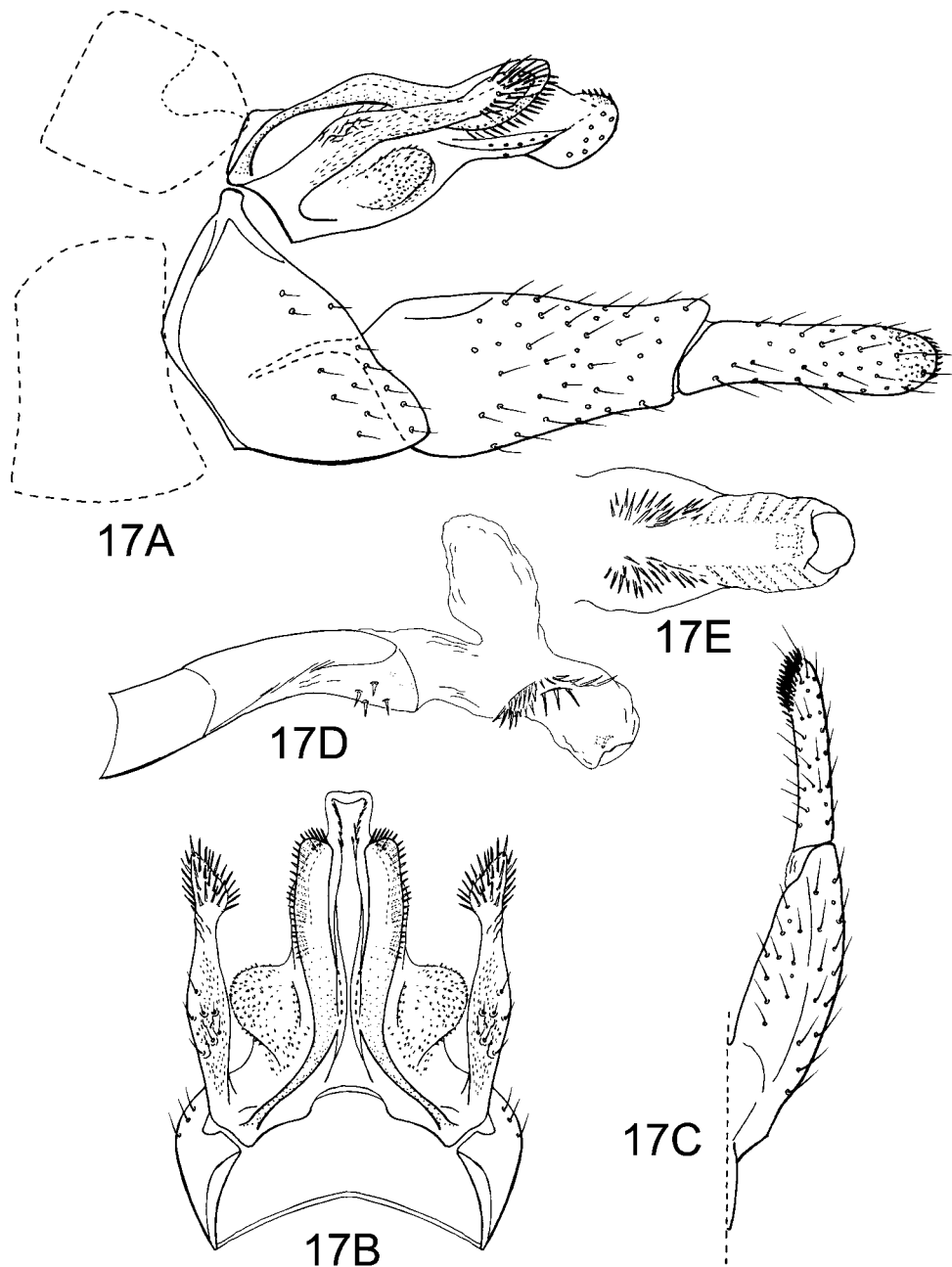
**Etymology.** This species is named *intervales*, used as a noun in apposition, for Parque Estadual Intervales, the very beautiful park where the type specimens were collected.

### ***Alterosa itatiaiae*, new species**

Fig. 17A–E

This species is probably most similar to *A. intervalles*, but differs from that species, and others having a tergum X with a scabrous basal protrusion, in the highly modified and unique structure of the preanal and intermediate appendages. The preanal appendages of *A. itatiaiae* are thick and stout and bear an apical brush of setae, and the intermediate appendages have a linear array of coarse setae on a longitudinal apicolateral fold. The scabrous basal protrusions of tergum X are also more strongly developed than in any other species of *Alterosa*.

Adult. Color overall, dark brown; legs, palps, and antennae slightly paler, wings irregularly mottled with small light brown spots. Male forewing 7–8.3 mm.; female 8 mm.



**FIGURE 17.** *Alterosa itatiaiae*, new species. Male genitalia: 17A—lateral view; 17B—dorsal view of segments IX and X; 17C—inferior appendage, dorsal view; 17D—phallic apparatus, lateral view; 17E—apex of endotheca, ventral view.

Male genitalia. Tergum VIII with posteromesal margin moderately emarginate, emargination V-shaped and extending no more than halfway to anterior margin. Sternum IX with anterolateral margin weakly rounded, subtruncate; posteroventral margin greatly produced, extending nearly linearly from dorsum; tergum IX greatly reduced, membranous or

fused to base of tergum X. Tergum X with rounded lateral margins, forming elevate lateral projections; dorsally with mesally paired longitudinal ridges, each apically lined with short spines, appearing as apparent mesal invagination; apex sensillate, subtruncate as viewed dorsally, rounded and slightly enlarged in lateral view; tergum textured basolaterally, with scabrous cuticle and numerous small adpressed scale-like spines. Intermediate appendage heavily sclerotized, elongate, subequal in length to preanal appendage, narrow at base and gradually expanding apically, with row of thickened setae in lateral cleft on apical half; apex rounded. Preanal appendage narrow, only weakly constricted basally, elongate, with scant setae and numerous minute seta-like spines; apex rounded, with brush of numerous thickened setae. Inferior appendages elongate, linear, flattened on mesal surface; 1st article, in lateral view, about 2x as long as wide, tapering apically; 2nd article shorter than 1st, nearly uniform in width, narrower at base than apex of 2nd article; apex rounded, with small pad of short, stiff apicomeral setae. Phallobase tubular, relatively short and wide, slightly curved; endotheca with about 4 pairs of short tack-like spines basoventrally (as seen with endotheca extended), preapically with paired tracts of fine spines, extending more or less linearly from venter onto apicolateral pleats, dorsally with sack-like projection at about midlength.

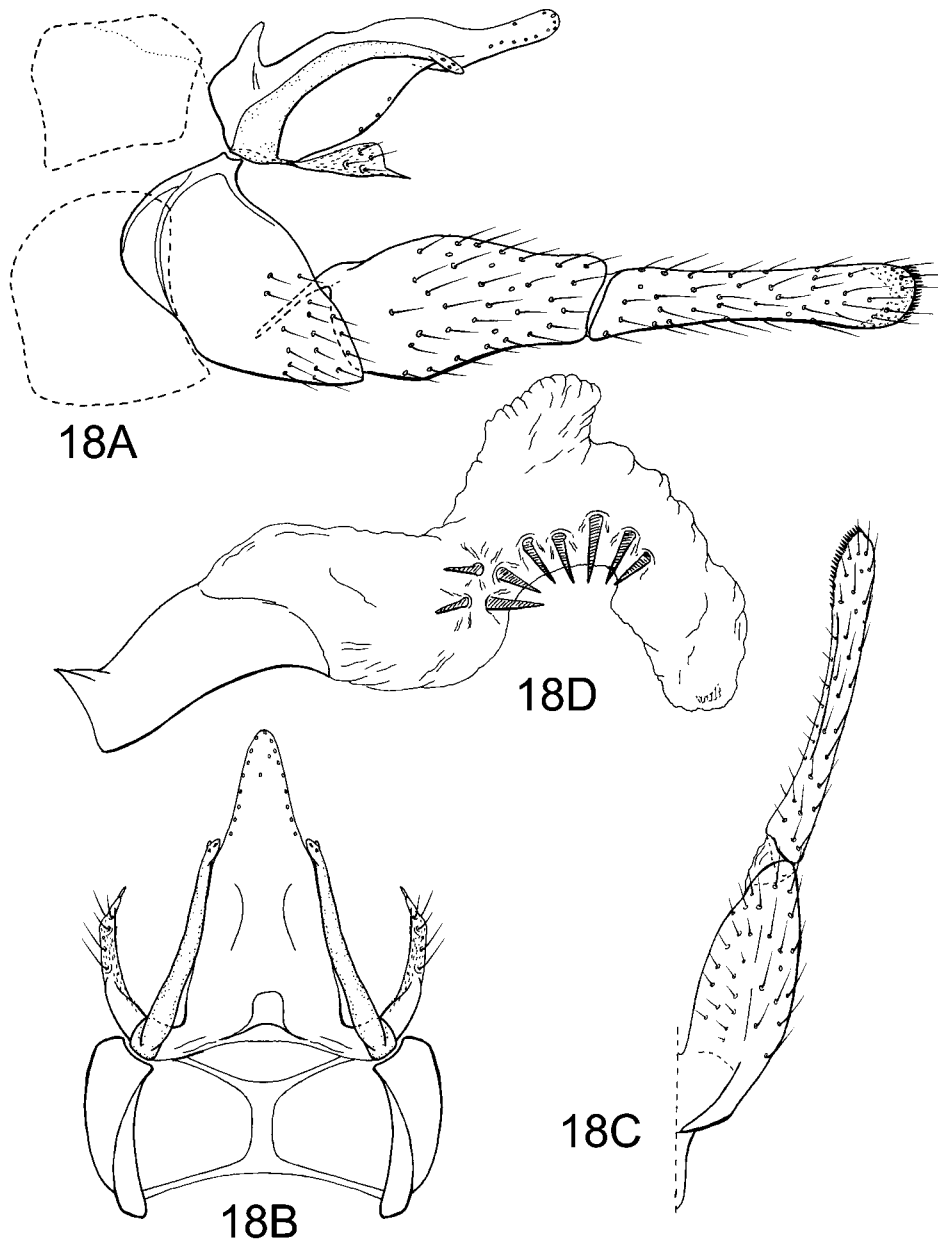
**Holotype male: BRAZIL: Rio de Janeiro:** Parque Nacional Itatiaia, Rio Campo Belo, trail to Veu da Noiva, 22°25.706'S, 44°37.171'W, el 1310 m, 24.xi.2001, Holzenthal, Paprocki, Blahnik, Neto, (UMSP000080369) (MZUSP)

**Paratypes: BRAZIL: Rio de Janeiro:** —11 males, 1 female, same locality data as holotype (MZUSP) (UMSP); —1 male, same locality, 5.iii.2002, Holzenthal, Blahnik, Paprocki, Prather, (NMNH); —5 males, 1 female, same locality, 5.iii.2002, Holzenthal, Blahnik, Paprocki, Prather, (UMSP); —2 males, Parque Nacional Itatiaia, Rio Campo Belo, 22°27.033'S, 44°36.818'W, el 1300 m, 23.xi.2001, Holzenthal, Paprocki, Blahnik, Neto, (NMNH); —2 males, Rio de Janeiro, Parque Nacional Itatiaia, trib. to Rio Taquaral, 22°26.688'S, 44°36.464'W, el 1320 m, 6.iii.2002, Holzenthal, Blahnik, Prather, (MZUSP). Etymology. This species is named *itatiaiae* for Parque Nacional do Itatiaia, the very beautiful Atlantic tropical rainforest site where the type specimens were collected.

### *Alterosa jordaensis*, new species

Fig. 18A–D

*Alterosa jordaensis* is very similar to *A. falcata* and, as discussed under that species, I am not altogether certain that the two are distinct species. At this stage in the description of the fauna, I felt it was better to use species names to describe the differences observed than to make assessments about species limits. While there are numerous minor differences between the two species, the most diagnostic difference is in the shape and structure of the intermediate appendages, which are less acute in *A. jordaensis* and appear to have several small apical sensilla.



**FIGURE 18.** *Alterosa jordaensis*, new species. Male genitalia: 18A—lateral view; 18B—dorsal view of segments IX and X; 18C—inferior appendage, dorsal view; 18D—phallic apparatus, lateral view.

Adult. Color overall, medium brown; legs and antennae paler, wings irregularly mottled with small light brown spots. Male forewing 6.8 mm.

Male genitalia. Tergum VIII with posteromesal margin deeply emarginate, emargination V-shaped and extending more than half way to anterior margin. Sternum IX with anterolateral margin broadly rounded; posteroventral margin moderately produced, extending in broad arc or nearly linearly from dorsum; tergum IX reduced, forming a

mesal projection over base of tergum X, projection mesal, short, tab-like. Tergum X tapered from base. Intermediate appendage heavily sclerotized, elongate, extending past preanal appendages, rod-like, arched, apex curved downward; apex subacute. Preanal appendage narrow, constricted basally, moderately elongate, not greatly modified, with scant setae and numerous minute seta-like spines; apex abruptly narrowed, forming subacuminate projection, with distinct terminal seta. Inferior appendages elongate, linear, flattened on mesal surface; 1st article, in lateral view, about 2x as long as wide, tapering apically; 2nd article subequal in length to 1st article, relatively narrow, especially at midlength; apex rounded, with small pad of short, stiff apicomeral setae. Phallobase tubular, relatively short and wide, slightly curved; endotheca more than 2x length of phallobase, with about 18 large spines, in paired series at about midlength.

**Holotype male: BRAZIL: São Paulo:** Parque Estadual de Campos do Jordão, Rio Galharada, 22°41.662'S, 45°27.783'W, el 1530 m, 13–15.ix.2002, Blahnik, Prather, Melo, Huamantínco, (UMSP000200126) (MZUSP).

**Eymology.** This species is named *jordaensis* after the spectacular site where the holotype specimen was collected, Parque Estadual de Campos do Jordão.

***Alterosa marinonii* (Almeida & Duarte), new combination**

Fig. 19A–D

*Dolophilodes* (*Sortosa*) *marinonii* Almeida & Duarte 2003: 967.

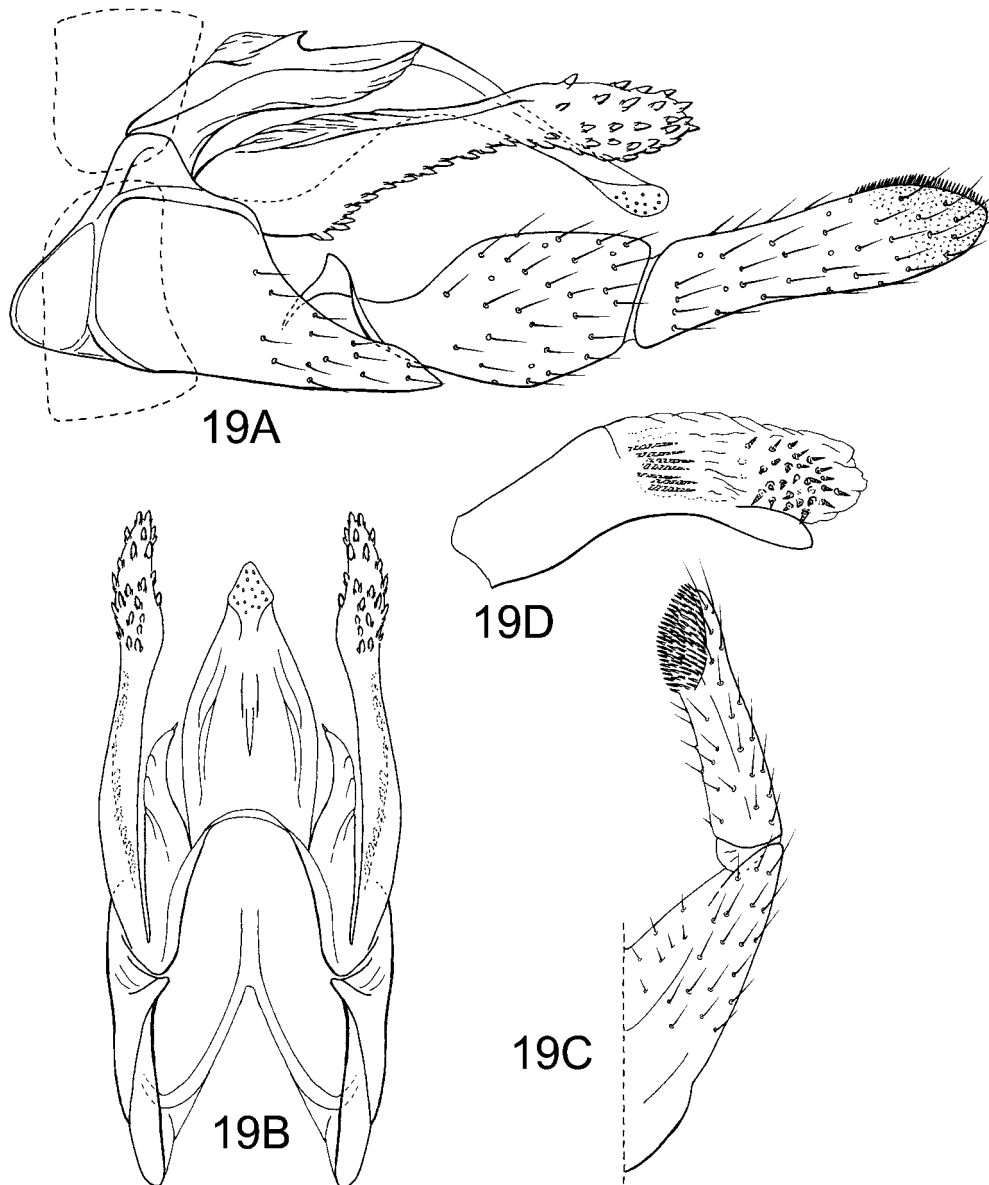
This species is similar to *Alterosa escova*, *A. fluminensis*, *A. flinti*, and *A. sanctaeteresae*, all of which have similarly developed inferior appendages and highly modified and enlarged preanal appendages armed with spine-like setae. From *A. flinti* and *A. sanctaeteresae* it differs in lacking elongate, apically setose lateral branches from the intermediate appendages. From *A. escova* and *A. fluminensis* it differs in the armature of the preanal appendages, which in *A. marinonii* are unique in being studded with very short, stout setae.

**Adult.** Color in alcohol, brown. Male forewing 5 mm.

**Male genitalia.** Tergum VIII with posteromesal margin not or scarcely emarginate. Sternum IX with anterolateral margin forming rounded projection in ventral half; posteroventral margin greatly produced, extending sinuously from dorsum; tergum IX reduced, forming a mesal projection over base of tergum X, projection broadly rounded and weakly developed. Tergum X tapered from base; apex sensillate, subacute as viewed dorsally, not or scarcely enlarged in lateral view. Intermediate appendage heavily sclerotized, shorter than preanal appendage, more or less spine-like and weakly scabrous; apex acute. Preanal appendage greatly enlarged, broad basally, elongate, with numerous very short, stout, spine-like setae located apically and along ventral margin. Inferior appendages robust; 1st article, in lateral view, short, nearly as wide as long, bulging mesally; 2nd article longer

than 1st article, relatively wide and uniform in width, about as wide basally as apex of 1st article; apex rounded, with prominent pad of short, stiff apicomesal setae. Phallobase tubular, short, curved near middle; endotheca basally with about 8 fine needle-like spines, apically with numerous short tack-like spines.

**Material examined:** BRAZIL: Paraná: —1 male, Rio Marumbi, Marumbi, el 1600 ft., 15–16.ii.1969, W.L. & J.G. Peters, (NMNH).



**FIGURE 19.** *Alterosa marinonii* (Almeida and Duarte). Male genitalia: 19A—lateral view; 19B—dorsal view of segments IX and X; 19C—inferior appendage, dorsal view; 19D—phallic apparatus, lateral view.



***Alterosa orgaosensis*, new species**

Fig. 20A–D

This species is very similar to *A. guapimirim* and, as discussed previously, it is possible that the two may eventually prove to be not specifically distinct. It resembles that species in having an inferior appendage with a very short 2nd article, tergum X with a large, inflated apex and a basolateral margin that is peculiarly cupped. Additionally, the apices of the preanal appendages of both species are unusual in being concavely cupped, each bearing a thick spine-like seta. The two species differ primarily in the structure of the intermediate appendage, which is apically rounded and setose in *A. guapimirim* and concave and armed much like the preanal appendage in *A. orgaosensis*. Another difference is that tergum X is more distinctly dome-shaped in *A. orgaosensis*.

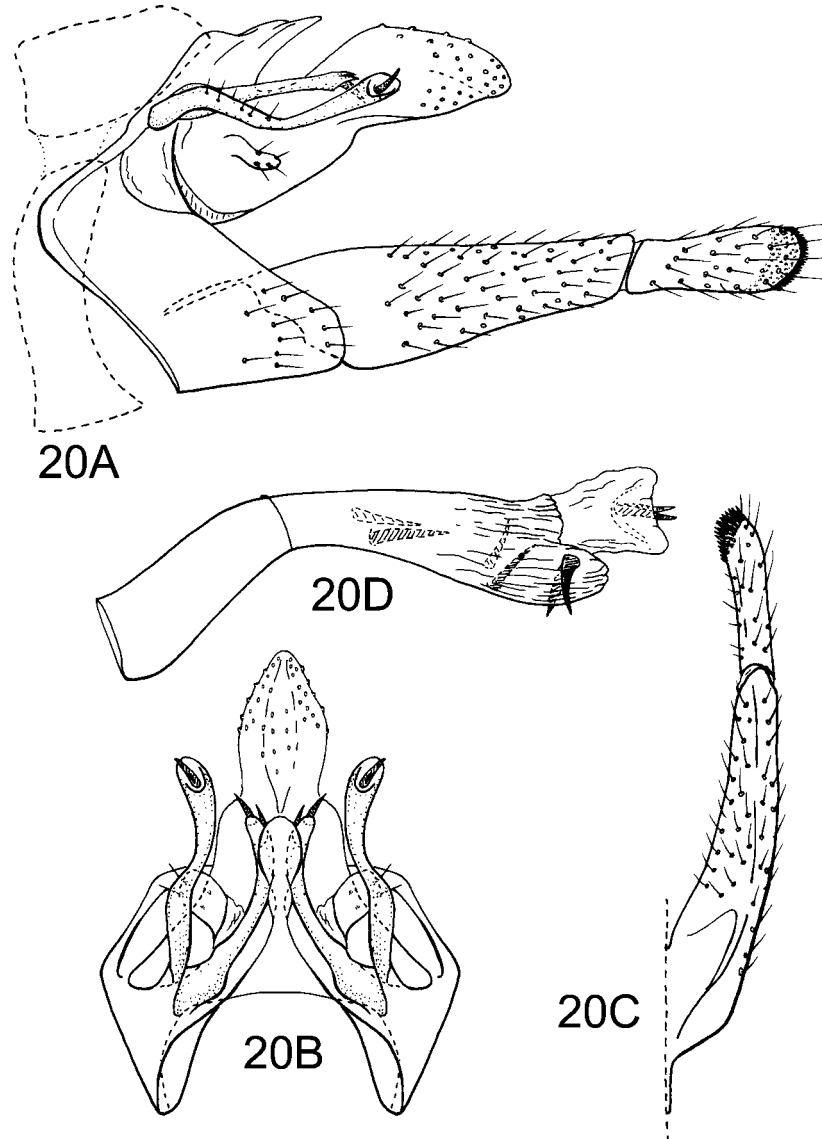
**Adult.** Color overall, dark brown; legs, palps, and antennae slightly paler, wings irregularly mottled with small light brown spots. Male forewing 7.2–7.8 mm.; female 7.8–8.2 mm.

**Male genitalia.** Tergum VIII with posteromesal margin not or scarcely emarginate. Sternum IX with anterolateral margin forming a rounded projection in dorsal half; posteroventral margin moderately produced, forming broadly rounded expansion; tergum IX reduced, forming a mesal projection over base of tergum X, projection prominent, apex as viewed dorsally, rounded, subspatulate. Tergum X with weakly rounded lateral margin and greatly enlarged apex; apex sensillate, forming greatly enlarged expansion in apical half, rounded and distinctly enlarged in lateral view; tergum basolaterally with short, setose, apically-rounded projection. Intermediate appendage heavily sclerotized, moderately elongate, rod-like and mesally curved; apex with rounded preapical concavity, with 1 or 2 setae in concavity, setae sclerotized and spine-like. Preanal appendage similar in structure to, but slightly longer than, intermediate appendage, narrow, sinuous, with apex projecting outward, elongate, with scant setae on lateral margin; apex rounded, with distinct terminal seta in preapical concavity, seta stout and spine-like. Inferior appendages elongate, linear, flattened on mesal surface; 1st article, in lateral view, narrow, about 3 times longer than wide, tapering apically; 2nd article shorter than 1st, (less than half the length), nearly as wide as base as apex of 1st article, more or less uniform in width; apex rounded, with small pad of short, stiff apicomesal setae. Phallobase tubular, narrow, moderately elongate, strongly curved near middle; endotheca with about 8 large spines, basal pair very large and curved.

**Holotype male: BRAZIL: Rio de Janeiro:** Parque Nacional da Serra dos Orgãos, Rio Beija-flor, 22°27.063'S, 43°00.065'W, el 1125 m, 27.ii.2002, Holzenthal, Blahnik, Paprocki, Prather, (UMSP000068474) (MZUSP).

**Paratypes: BRASIL: Rio de Janeiro:** — 2 females, same locality data as holotype (MZUSP); —5 males, 1 female, Rio de Janeiro, Parque Nacional da Serra dos Orgãos, Rio Paquequer, 22°922'S, 42°69.899'W, el 1000 m, 26.ii.2002, Holzenthal, Blahnik, Paprocki, Prather, (UMSP) (NMNH).

Etymology. This species is named *orgaosensis* after the mountain range and park, Parque Nacional da Serra dos Orgãos, where the type specimens were collected.



**FIGURE 20.** *Alterosa orgaosensis*, new species. Male genitalia: 20A—lateral view; 20B—dorsal view of segments IX and X; 20C—inferior appendage, dorsal view; 20D—phallic apparatus, lateral view.

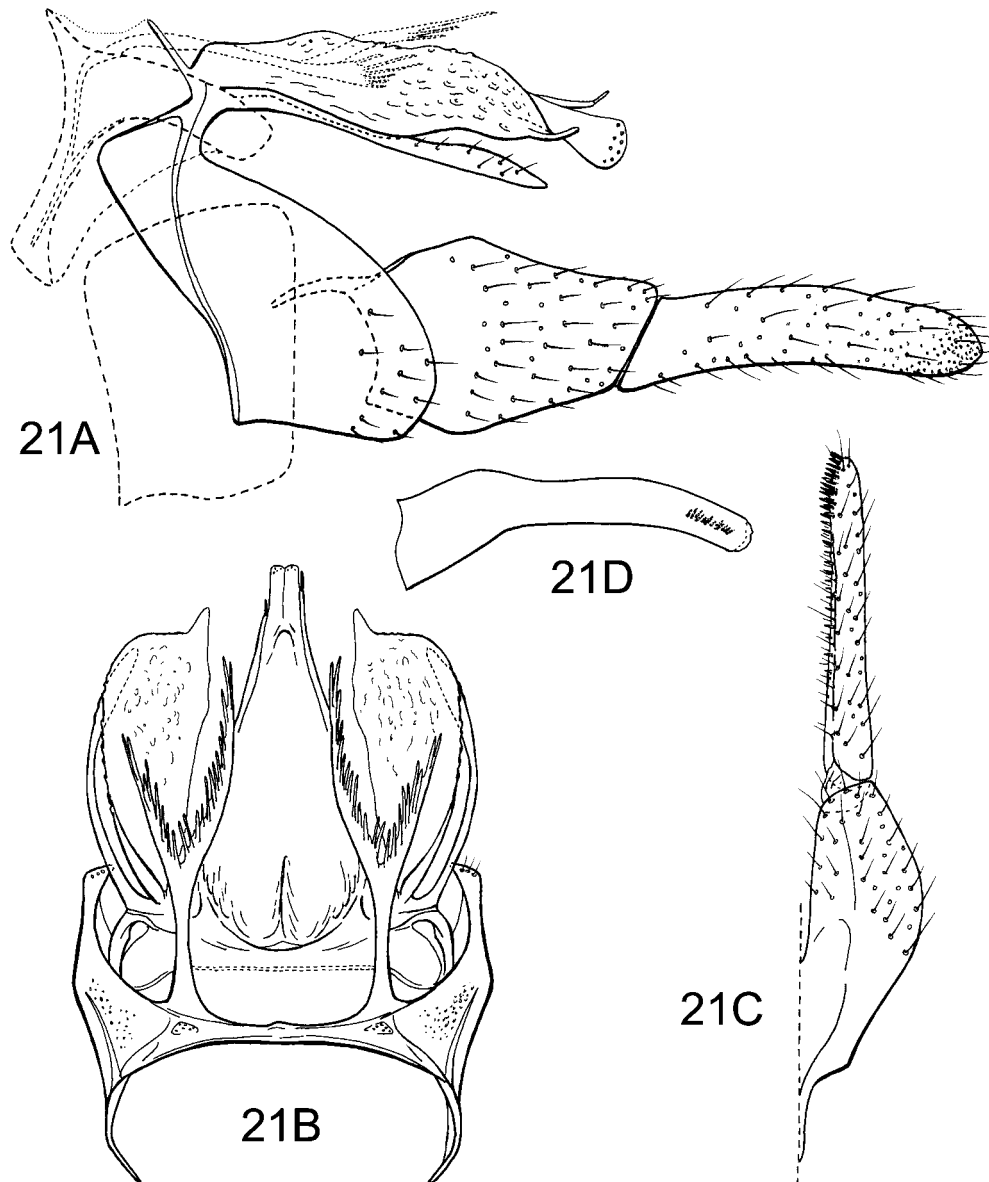
***Alterosa paprockii*, new species**

Fig. 21A–D

This is a distinctive species, unlikely to be confused with any other species of *Alterosa*. The highly modified, apically forked tergum VIII of the male and the dorsoventrally flat-

tened, plate-like appendages of tergum IX are unique within *Alterosa*. However the modified tergum VIII has a somewhat analogous counterpart in the Chilean species, *Sortosa duplex* (Schmid) and *S. dupliplex* (Flint).

Adult. Color overall, dark brown; legs, palps, and antennae slightly paler, wings irregularly mottled with small light brown spots. Male forewing 7.5 mm.



**FIGURE 21.** *Alterosa paprockii*, new species. Male genitalia: 21A—lateral view; 21B—dorsal view of segments IX and X; 21C—inferior appendage, dorsal view; 21D—phallic apparatus, lateral view.

Male genitalia. Tergum VIII with posteromesal margin deeply mesally excavate, with long paired rod-like projections, each forked at midlength and with flanking spines along inner margin of each branch. Sternum IX with anterolateral margin forming a rounded projection in dorsal half; posteroventral margin greatly produced, forming broadly rounded expansion; tergum IX greatly reduced, membranous or fused to base of tergum X. Tergum X tapered from base, basally with weakly developed mesal crest, apex sensillate, subacute as viewed dorsally, rounded and slightly enlarged in lateral view. Intermediate appendages appearing rod-like, each extending nearly length of tergum and terminating with distinct apical seta. Lateral margins of tergum IX heavily sclerotized, elongate, extending past preanal appendages, forming greatly enlarged, slightly scabrous, dorsoventrally flattened plates, extending nearly length of tergum X, apices acute. Preanal appendage narrow, constricted basally, elongate, with scant setae on lateral margin; apex acute, with apical seta not enlarged or modified. Inferior appendages elongate, linear, flattened on mesal surface; 1st article, in lateral view, about 2x as long as wide, tapering apically; 2nd article longer than 1st article, relatively narrow and uniform in width, scarcely narrower at base than apex of 1st article, distinctly flattened on mesal surface; apex rounded, with small pad of short, stiff apicomeresal setae and additional scattered short setae on mesal surface. Phallobase tubular, narrow, moderately elongate, angularly flexed and abruptly narrowed from basal third; endotheca (internally) with tract of numerous small spines.

**Holotype male: BRASIL: Minas Gerais:** Cachoeira do Abacaxi, Vale do Tropeiro, 20°12.270'S, 43°38.163'W, el 1120 m, 30.ix.2002, Paprocki, Braga, Salgado, (UMSP000091521) (MZUSP).

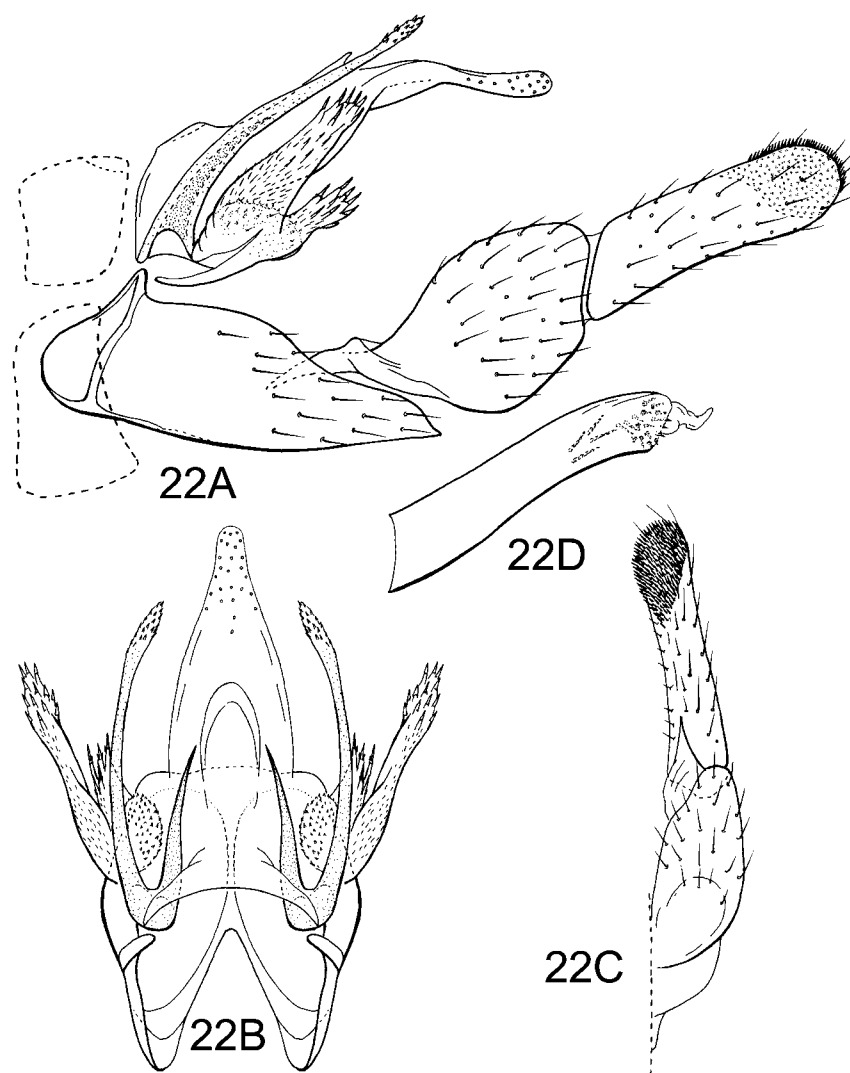
Etymology. I am pleased to name this species *paprockii* for Henrique Paprocki, my good friend and fellow trichopterist, who collected the holotype specimen of this very unusual species.

#### *Alterosa sanctaeteresae*, new species

Fig. 22A–D

This species is similar to *Alterosa escova*, *A. flinti*, *A. fluminensis*, and *A. marionii*, all of which have similarly developed inferior appendages and highly modified and enlarged preanal appendages armed with spine-like setae. From all except *A. flinti* (with which it occurs sympatrically), it differs in possessing elongate, apically setose lateral branches from the intermediate appendages. It differs from *A. flinti* primarily in the shape of the preanal appendage, which in *A. sanctaeteresae* is more elongate and bears a mesal pad-like process with short spines and a short apical process with spine-like setae.

Adult. Color overall, dark brown; legs, palps, and antennae slightly paler, wings irregularly mottled with small light brown spots. Male forewing 5.2 mm.



**FIGURE 22.** *Alterosa sanctaeteresae*, new species. Male genitalia: 22A—lateral view; 22B—dorsal view of segments IX and X; 22C—inferior appendage, dorsal view; 22D—phallic apparatus, lateral view.

Male genitalia. Tergum VIII with posteromesal margin slightly emarginate. Sternum IX with anterolateral margin broadly rounded; posteroventral margin greatly produced, extending sinuously from dorsum; tergum IX reduced, forming a mesal projection over base of tergum X, mesal projection fused to tergum X, forming distinct, dorsoventrally flattened, apically rounded projection. Tergum X narrow, basolateral margins weakly protruding, subparallel in basal half, converging apically, in lateral profile undulate; apex sensillate, rounded as viewed dorsally, not or scarcely enlarged in lateral view. Intermediate appendage heavily sclerotized, elongate, extending past preanal appendages, branched basally, both branches rod-like, mesal branch much shorter, with acuminate apex, lateral branch with apex subacute, with brush of short, stiff setae. Preanal appendage greatly

enlarged, wider at base than apex, moderately elongate, not greatly modified, with loose spike of spine-like setae at apical third; apex rounded, not abruptly narrowed; preanal appendage basally with flange-like process bearing cluster of prominent, stalked, spine-like setae, process largely mesal to preanal appendage, forming rounded papillate, pad-like process bearing brush of setae from posterior margin. Inferior appendages robust; 1st article, in lateral view, short, nearly as wide as long; 2nd article longer than 1st article, relatively wide, base nearly as wide as apex of 1st article, apex only slightly enlarged; apex rounded, with prominent pad of short, stiff apicomesal setae. Phallobase tubular, relatively short, narrowing apically, scarcely curved; endotheca with paired tracts of numerous short spines, spines slightly longer basally.

**Holotype male: BRAZIL: Espirito Santo:** 24 km SE of Santa Teresa, el 280 m, 22.iv.1977, C.M. & O. S. Flint, Jr., (UMSP000204555) (MZUSP).

**Etyymology.** This species is named *sanctaeteresae* after Santa Teresa, a municipality near the collection locality of the holotype specimen.

***Alterosa sanctipauli* (Flint), new combination**

Fig. 23A–D

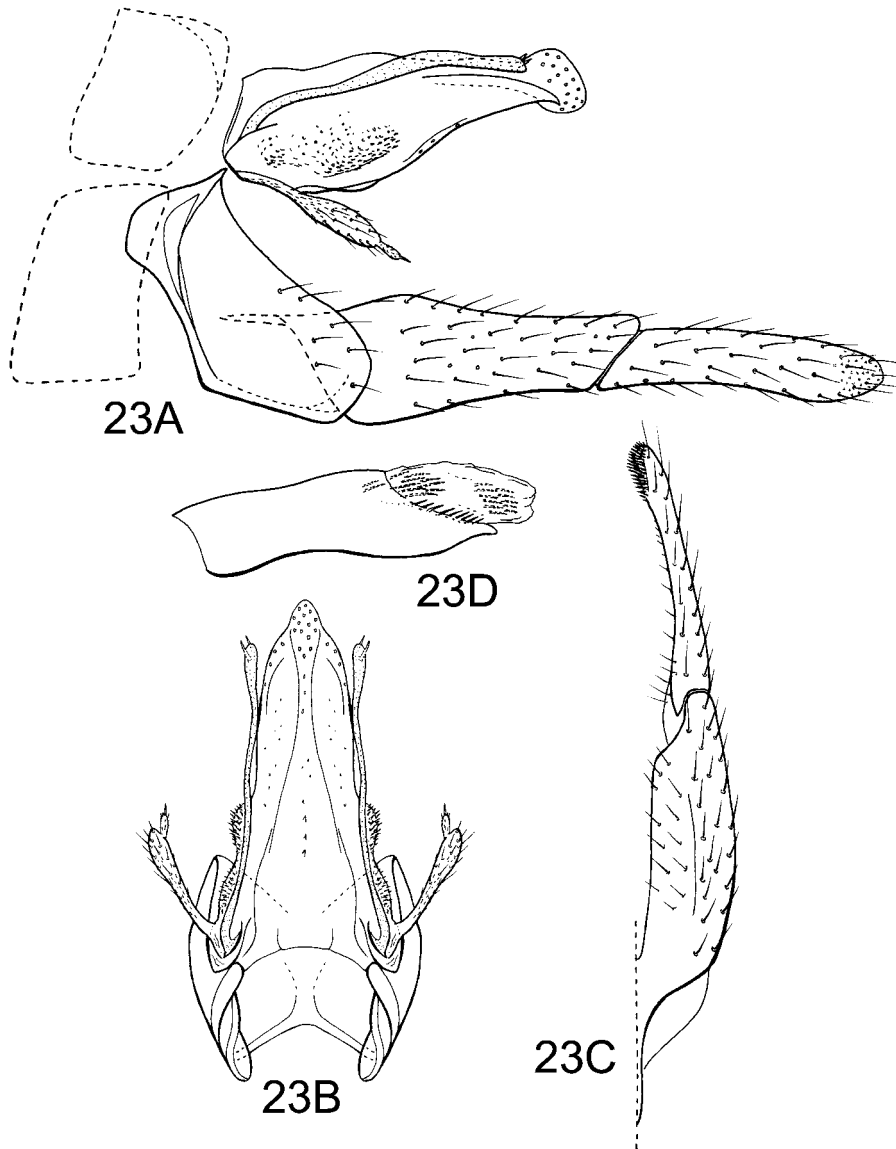
*Dolophilodes* (*Sortosa*) *sanctipauli* Flint 1971: 20.

*Alterosa sanctipauli* is similar to *A. intervalles*, resembling that species in the elongate, narrow, unbranched intermediate appendages. It differs in that the setae of the intermediate appendage in *A. sanctipauli* are few, short, and terminal, rather than elongate and located along the apicolateral margin. *Alterosa sanctipauli* also differs from *A. intervalles* in the shape of the apex of tergum X and absence of paired, spined longitudinal ridges found on the same structure.

**Adult.** Color in alcohol, brown. Male forewing 6 mm.

**Male genitalia.** Tergum VIII with posteromesal margin deeply emarginate, emargination V-shaped and extending more than half way to anterior margin. Sternum IX with anterolateral margin forming a rounded projection in dorsal half; posteroventral margin greatly produced, forming broadly rounded expansion; tergum IX greatly reduced, membranous or fused to base of tergum X. Tergum X with basolateral margins weakly protruding, apical half with margins subparallel, converging apically; rounded and distinctly enlarged in lateral view; tergum textured basolaterally, with scabrous cuticle and numerous small adpressed scale-like spines. Intermediate appendage heavily sclerotized, elongate, extending past preanal appendages, forming elongate rod-like projection, nearly as long as tergum X; apex rounded, terminating with 2 or 3 apical spine-like setae. Preanal appendage narrow, constricted basally, moderately elongate, not greatly modified, with scant setae and numerous minute seta-like spines; apex abruptly narrowed, forming subacuminate projection with distinct terminal seta. Inferior appendages elongate, linear, flattened

on mesal surface; 1st article, in lateral view, narrow, more than 2x as long as wide, tapering apically; 2nd article subequal in length to 1st article, narrow, relatively uniform in width, only slightly narrower at apex than apex of 1st article; apex rounded, with small pad of short, stiff apicomeresal setae. Phallobase tubular, relatively short and wide, scarcely curved; endotheca with numerous spines, most fine and relatively needle-like, in several apparent clusters.



**FIGURE 23.** *Alterosa sanctipauli* (Flint). Male genitalia: 23A—lateral view; 23B—dorsal view of segments IX and X; 23C—inferior appendage, dorsal view; 23D—phallic apparatus, lateral view.

**Material examined: BRAZIL: São Paulo:** —male *Holotype*, 3.xi.1961, E. J. Fittkau, (NMNH).

***Alterosa schadrackorum*, new species**

Fig. 24A–E

This species differs from all other species of *Alterosa* by the short, knob-like intermediate appendages, studded with numerous short sensilla or sensilla-like projections, and also by the relatively widened, but not distinctly truncate, apex of the 2nd article of the inferior appendage.

**Adult.** Color overall, including legs palps and antennae, dark brown; wings sparsely and irregularly mottled with small light brown spots. Male forewing 5–5.5 mm.; female 6.0 mm.

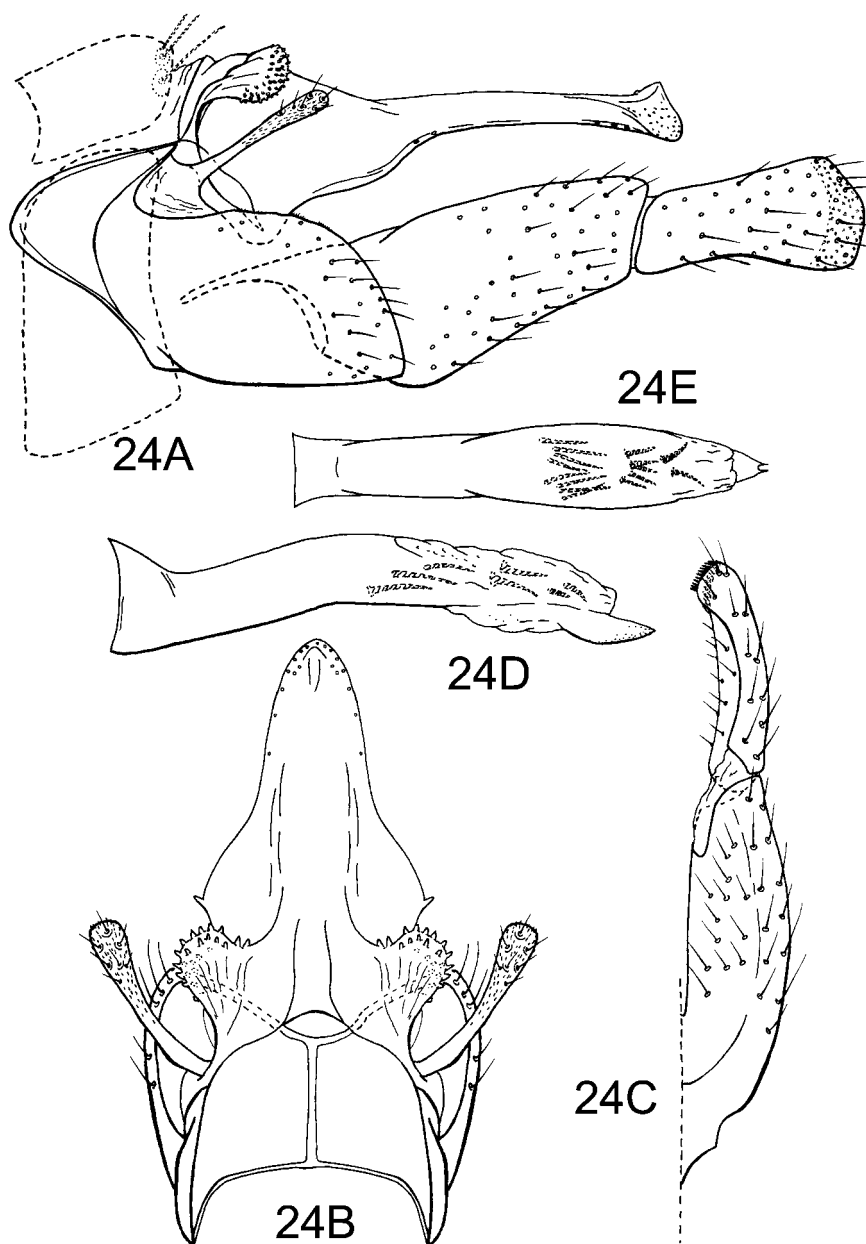
**Male genitalia.** Tergum VIII without posteromesal invagination. Sternum IX with anterolateral margin rounded and projecting, broadly apodeme-like; posterolateral margin distinctly invaginated dorsally, very broadly produced ventrally; tergum IX apparently absent. Tergum X elongate, relatively simple in structure, apex rounded and sensillate; preapically with acute, crest-like dorsal projection; basolaterally with broadly rounded wing-like expansions on either side, each expansion with acute spine-like projection at widest point. Intermediate appendage short, rounded, knob-like, apically with numerous short sensilla. Preanal appendage simple in structure, elongate narrow, slightly widened apically; surface with numerous minute seta-like scales and scattered setae, each in rather distinct dimple-like invagination. Inferior appendages elongate, relatively wide, 1st article slightly flattened on mesal surface, 2nd article distinctly, concavely so; 1st article, as viewed laterally, wide basally, tapering slightly to apex; 2nd article shorter and narrower than basal segment, widened apically, apex subequal in width to apex of 1st article, rounded in lateral view; apicomeral margin of 2nd article with pad of short peg-like setae, basomesal surface with several stout setae. Phallobase narrow, tubular, strongly flexed at base, gradually curved and narrowed apically; endotheca with numerous spines of different lengths, apparently arranged into several tracts; as viewed retracted in phallobase, with approximately 8 elongate basal spines, 7 shorter spines at midlength (2 strongly curved), and 6 small apical spines.

**Holotype male: BRAZIL: Santa Catarina:** Parque Ecológica Spitzkopf, Rio Caeté above 1st falls, 27°00.35'S, 49°06.70'W, el 170 m, 4.iii.1998, Holzenthal, Froehlich, Paprocki, (UMSP000033076) (MZUSP).

**Paratypes: BRAZIL: Santa Catarina:** —1 female, same locality data as holotype (MZUSP); —1 male, Parque Ecológica Spitzkopf, confl. Rio Ouro & Rio Caeté, 27°00.352'S, 49°06.693'W, el 140 m, 3.iii.1998, Holzenthal, Froehlich, Paprocki, (UMSP).

**Etymology.** This species is named *schadrackorum* in honor of Mr. Hans Schadrack and his father, Udo, a great lover of nature, who began maintaining Spitzkopf as a protected area.



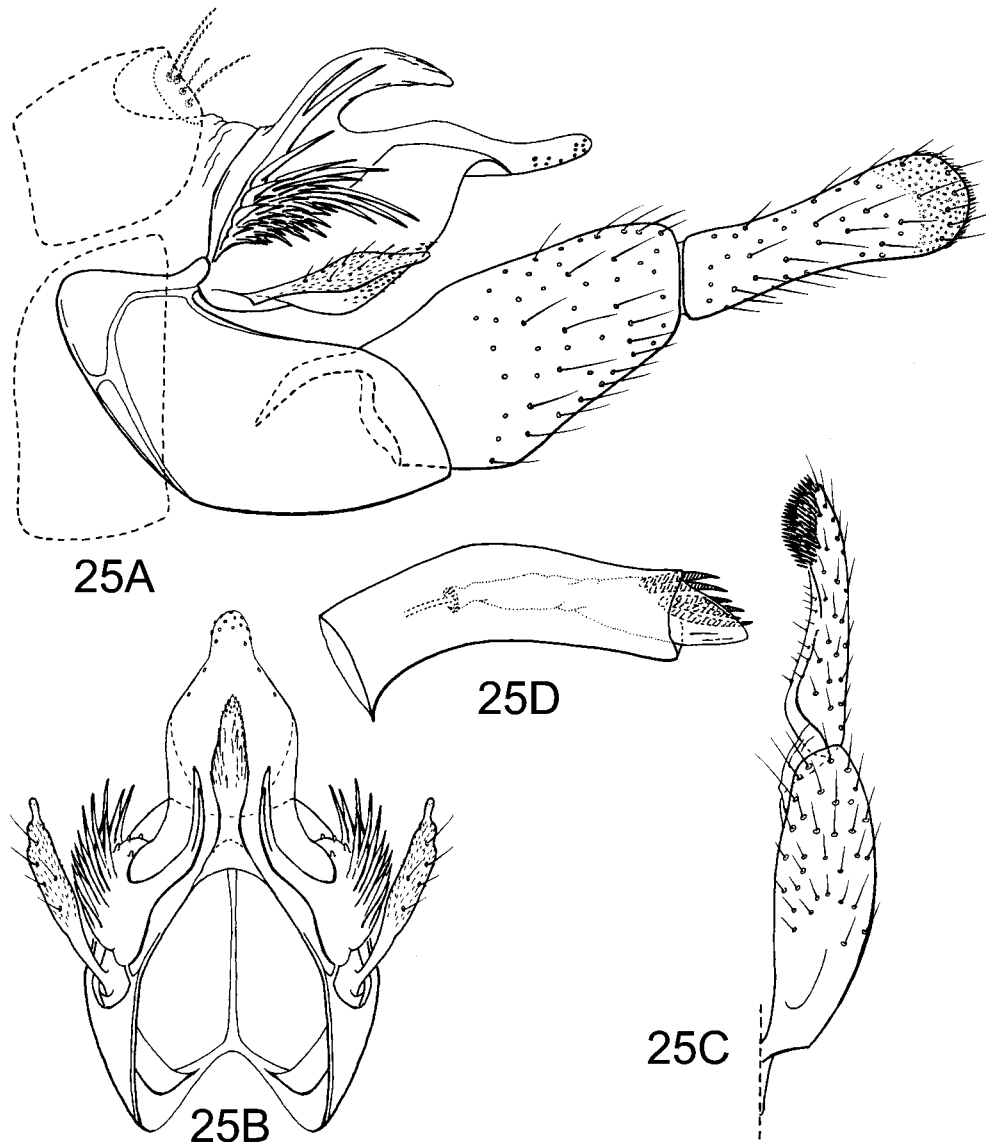


**FIGURE 24.** *Alterosa schadrackorum*, new species. Male genitalia: 24A—lateral view; 24B—dorsal view of segments IX and X; 24C—inferior appendage, dorsal view; 24D—phallic apparatus, lateral view; phallic apparatus, dorsal view.

*Alterosa tripuiensis*, new species

Fig. 25A–D

This species is unlike any other species of *Alterosa* and easily diagnosed by the structure of the intermediate appendages, which are unique in forming a compact cluster of elongate spines.



**FIGURE 25.** *Alterosa tripuiensis*, new species. Male genitalia: 25A—lateral view; 25B—dorsal view of segments IX and X; 25C—inferior appendage, dorsal view; 25D—phallic apparatus, lateral view.

Adult. Color overall, dark brown; legs, palps, and antennae slightly paler, wings irregularly mottled with small light brown spots. Male forewing 6–6.9 mm.; female 7.1–7.5 mm.

Male genitalia. Tergum VIII with posteromesal margin moderately emarginate, emargination V-shaped and extending no more than halfway to anterior margin. Sternum IX with anterolateral margin forming a rounded projection in dorsal half; posteroventral margin greatly produced, forming broadly rounded expansion; tergum IX reduced, forming a mesal projection over base of tergum X, mesal projection narrow, extending hood-like, with scabrous dorsal surface texture, but without spines. Tergum X with rounded lateral margins; apex sensillate, rounded as viewed dorsally, not or scarcely enlarged in lateral view; tergum basolaterally with minute spines. Intermediate appendage heavily sclerotized, comprised of short mesal projection with 2 or 3 elongate spines and basolateral cluster of elongate spines, decreasing in size ventrally. Preanal appendage narrow, constricted basally, moderately elongate, not greatly modified, with scant setae and numerous minute seta-like spines; apex abruptly narrowed, forming subacuminate projection, without apical seta. Inferior appendages robust; 1st article, in lateral view, about one and a half times longer than wide, tapering apically; 2nd article subequal in length to 1st article, relatively wide, enlarged apically; apex rounded, with prominent pad of short, stiff apicommesal setae. Phallobase relative short and evenly tubular, weakly curved at midlength; endotheca with about 5 or 6 large sclerotized spines.

**Holotype male: BRAZIL: Minas Gerais:** Estação Ecológica do Tripuí, Córrego Tripuí, 20°23.364'S, 43°32.541'W, el 1070 m, 21.xi.1998, Paprocki, Braga, Amarante, (UMSP000046796) (MZUSP).

**Paratypes: BRAZIL: Minas Gerais:** —1 male, same locality data as holotype (NMNH); —2 males, 2 females, Córrego da Serra de Ouro Fino, Vale do Tropeiro, 20°12.371'S, 43°38.581'W, el 1000 m, 8.x.2000, Paprocki, Salgado, Isaac, (MZUSP), (UMSP).

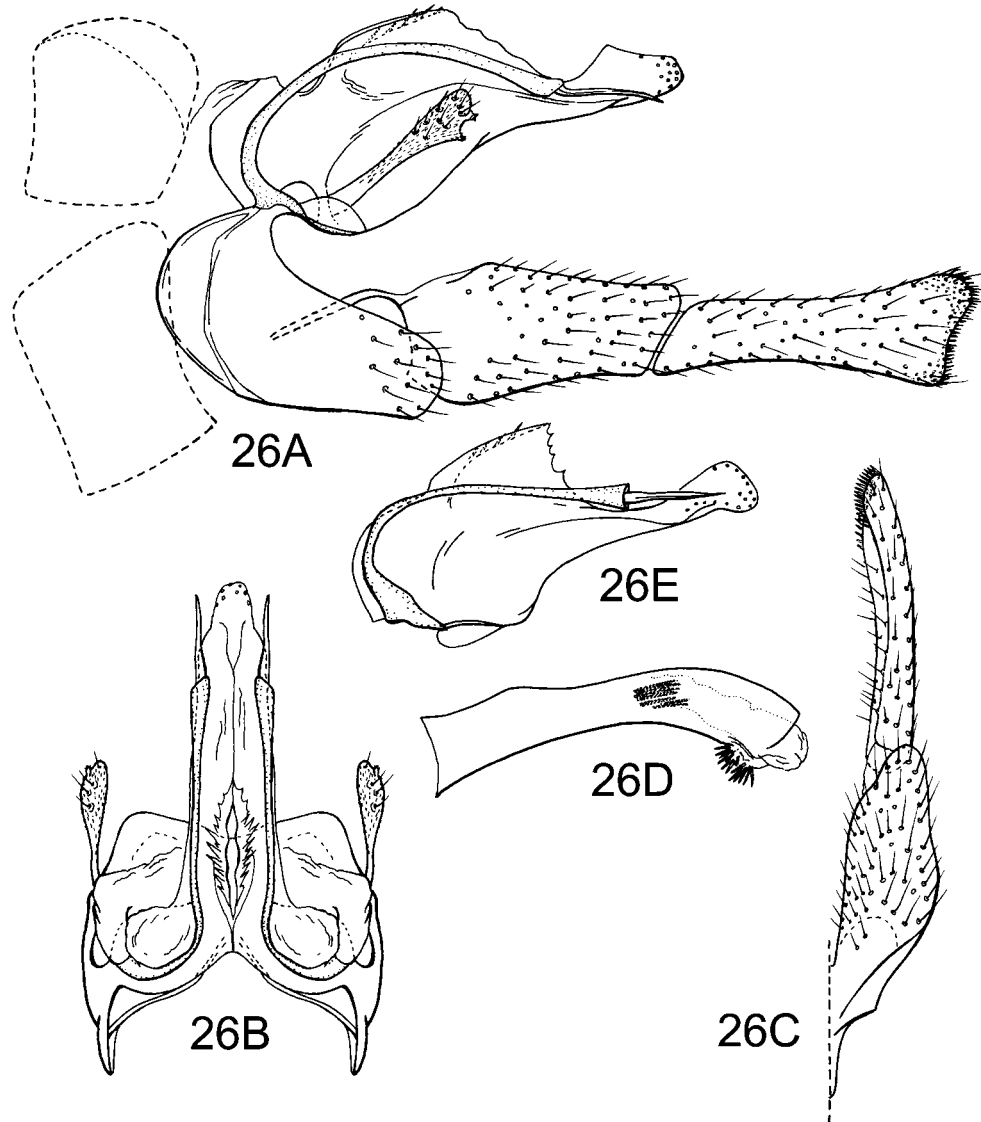
**Etymology.** This species is named *tripuiensis* after Estação Ecológica do Tripuí, the beautiful reserve where the holotype specimen was collected.

### ***Alterosa truncata*, new species**

Fig. 26A–E

This species is similar only to *A. schadrackorum* in having the apices of the inferior appendages broadened and truncate, but in *A. truncata* they are much more distinctly so. The relative lengths of the articles of the inferior appendages, as well as the overall structure of the genitalia of these two species are otherwise entirely dissimilar. An additional diagnostically unique character for *A. truncata* is the structure of the intermediate appendages, which are elongate, narrow, and arched, each terminating in a very prominent apical lance-like seta. There is some minor variation among populations in the structure of tergum X, as shown in Fig. 26A and 26E.

Adult. Color overall, dark brown; legs, palps, and antennae slightly paler, wings irregularly mottled with small light brown spots. Male forewing 5.5–7 mm.; female 6.1–7 mm.



**FIGURE 26.** *Alterosa truncata*, new species. Male genitalia: 26A—lateral view; 26B—dorsal view of segments IX and X; 26C—inferior appendage, dorsal view; 26D—phallic apparatus, lateral view; 26E—tergum X and intermediate appendage (variant), lateral view.

Male genitalia. Tergum VIII with posteromesal margin deeply emarginate, emargination V-shaped and extending more than half way to anterior margin. Sternum IX with anterolateral margin broadly rounded; posteroventral margin greatly produced, forming broadly rounded expansion; tergum IX greatly reduced, membranous or fused to base of

tergum X. Tergum X narrow, lateral margins subparallel; dorsally with mesally divided crest-like projection near base, with spine-like projections along each side of divided margin, apex of crest either undulate or serrate; apex sensillate, rounded as viewed dorsally, rounded and slightly enlarged in lateral view, or with angular preapical projection. Intermediate appendage heavily sclerotized, elongate, extending past preanal appendages, narrow rod-like, but with strong basal curvature, narrowly paralleling lateral margins of tergum X; apex acute, terminating in apical spine-like seta, seta prominent, lance-like. Preanal appendage narrow, constricted basally, moderately elongate, not greatly modified, with scant setae and numerous minute seta-like spines; apex rounded, without apical seta, but frequently with 1 or 2 short, blunt, preapical projections from the ventral surface, fringed apically with minute spines. Inferior appendages elongate, linear, flattened on mesal surface; 1st article, in lateral view, about 2x as long as wide, tapering apically; 2nd article subequal in length to 1st article, moderately wide, nearly as wide at base as apex of 1st article; apex enlarged and subtruncate, with fringing pad of short, stiff apicomeres setae. Phallobase tubular, narrow, moderately elongate, with moderate basal inflection and slight curvature; endotheca with 2 obvious tracts of fine spines, one of longer needle-like spines and the other (ventral) of paired patches of shorter spines.

**Holotype male: BRAZIL: Minas Gerais:** Estação Ecológica de Peti, Córrego Brucutu, 19°52.995'S, 43°22.452'W, 17.xi.1998, Paprocki, Amarante, (UMSP000046574) (MZUSP).

**Paratypes: BRAZIL: Minas Gerais:** —1 male, same locality data as holotype, (UMSP); —2 males, Rio Mainarte, bridge on Cibrão road, 20°27'258'S, 43°24.094'W, el 700 m, 19.ix.1998, Paprocki, Amarante, (MZUSP); —2 males, 2 females, Parque Nacional do Caparaó, Rio Caparaó at Vale Verde, 20°25.029'S, 41°50.767'W, el 1350 m, 12–13.iii.2002, Holzenthal, Blahnik, Paprocki, Prather, (UMSP); **São Paulo:** —1 male, 3 females, Cachoeira do Paredão, Lajeado, Serra do Bocaina, 22°43.533'S, 44°37.274'W, el 1550 m, Holzenthal, Blahnik, Paprocki, Prather, (MZUSP); —3 males, Cachoeira do Principe, Lajeado, Serra do Bocaina, 22°49.913'S, 44°37.418'S, el 1560 m, 4.iii.2002, Holzenthal, Blahnik, Paprocki, Prather, (UMSP); —1 male, Parque Nacional da Serra da Bocaina, small tributary on main park road, 22°46.585'S, 44°36.307'W, el 1560 m, 2–3.iii.2002, Holzenthal, Blahnik, Paprocki, Prather, (UMSP); —1 male, Estacion Biológica Boraceia, Ribeirão Venerando, 26.i.1974, Froehlich, (NMNH); —1 male, Casa Grande, Pedreira, 15.xi.1974, C. G. Froehlich, (NMNH).

**Etymology.** This species is named *truncata* for its diagnostic, apically flattened and truncate inferior appendages.

## PHYLOGENETIC CONSIDERATIONS

The principal I have used in recognition of genera in Philopotaminae is one of reciprocal monophyly. Although *Alterosa* itself seems to be monophyletic, it is always possible that

a monophyletic assemblage may fall within an established genus. What needs to be established for each taxon, reciprocally, is that the characters for inferring monophyly for one taxon are plesiomorphic in the other taxa. Establishing reciprocal monophyly for *Alterosa* is more difficult than it might seem, primarily because of the paucity of characters used to infer monophyly of the genera and the frequency of homoplasy for some characters. Flint (1971), when describing *Alterosa sanctipauli*, mentioned its similarity to *Thylakion*, but placed it in *Sortosa* because of its similar wing venation. However, the wing venation of both *Alterosa* and *Sortosa* is plesiomorphic. I have found no convincing character evidence for placing *Alterosa* either in or as sister taxon to *Sortosa*.

*Sortosa* itself is not well defined as a whole, although several species groups have been recognized within the genus (Ross 1956, Schmid 1964, Flint 1983). The problem was already evident to Ross (1956), who used the generalized structure of the species from Chile to establish the name of a prototype, the "*Sortosa* ancestor" from which other lineages within Philopotaminae evolved. At the time of Ross's revision, there were only three Chilean species in *Sortosa*, and already Ross referred to two distinct lineages. Schmid (1964) also suggested that two quite different lineages are included in *Sortosa*. The case for establishing monophyly of *Sortosa* has not been made any easier by the many additional species described since then, some very divergent in morphology. Characters used by Ross to infer the monophyly of *Sortosa* include the "bent and imbricate" base of the preanal appendage and the "short, deep clasper segments." Both of these characters are quite variably developed among species now placed in *Sortosa*, so that it is difficult to precisely define the nature of the similarity of these characters among the species, but I admit that there is some subjective similarity. The character easiest to define is the structure of the preanal appendage, which is fused basally to the dorsal margin of sternum IX in most species of *Sortosa*, producing the "bent and imbricate" character noted by Ross. In some species the preanal appendages appear not to be fused, but nevertheless are inserted at about the same position. This contrasts strongly with the position of the preanal appendages in most species of *Alterosa*, which are inserted at the base of tergum X, quite removed from the dorsolateral margin of sternum IX. In those species of *Alterosa* in which the preanal appendages are secondarily modified, the appendages are nevertheless inserted at about the same position. Although tenuous, I accept Ross's character evidence for monophyly of *Sortosa*. Needless to say, a revision of the genus would be a valuable contribution.

A character which deserves special attention because it characterizes all of the species of *Alterosa*, is the possession of intermediate appendages. Intermediate appendages appear in several lineages of Philopotaminae, including the genera *Philopotamus*, *Kisaura*, and *Thylakion*, as well as *Alterosa* and some species of *Sortosa*. It should be pointed out, however, that these structures differ in position and structure and it is unlikely that they are homologous among all of the taxa in which they occur. Similarity in position is a critical component for establishing homology. In *Alterosa* the intermediate appendages are

inserted mesally to the preanal appendages, whereas similar structures are inserted ventrolaterally to the preanal appendages in the majority of the other genera in which they occur. Only in the genus *Kisaura*, and the species *Sortosa pectinifera* Schmid 1958, *Sortosa spectabilis* Flint 1983, and *Thylakion crenophilus* Jacquemart and Statzner 1981 are intermediate appendages similarly positioned to those in *Alterosa*. *Kisaura* is well characterized as a genus by the pectinate second article of the inferior appendages and its overall similarity to *Alterosa* is not great. The possession of similarly positioned intermediate appendages is likely an independently derived apomorphy. The two species of *Sortosa* with intermediate appendages mesal to the preanal appendages both have their preanal appendages fused to the dorsal margin of sternum IX, thus possessing a defining apomorphy for *Sortosa*. Despite having similarly positioned intermediate appendages, the two species are very different from one another, both in the structure of the intermediate appendages and in the fact that one possesses ventral processes on sterna VII and VIII and the other lacks these processes. In as much as presence or absence of sternal processes is a character useful in defining different lineages within *Sortosa*, it is likely that the two species are neither related to *Alterosa* nor even closely related to one another. *Thylakion crenophilus* deserves special mention because its intermediate appendages are differently positioned from those of other species in *Thylakion*, and also because the species was described from Zaire, well removed from South Africa where the other species in the genus were described. The genus *Thylakion* itself is well defined by an apomorphic venational character, namely a reduction of the 2A vein of the forewing to a stub. Unfortunately, this character was not determined for *T. crenophilus* because it was described from a pharate pupa. It would be useful to reevaluate the placement of this species.

The genus *Thylakion* does share some similarities to *Alterosa*, as noted by Flint (1971). There is a general similarity in the shape of sternum IX, which is very greatly posteroventrally produced in both taxa. At present it is difficult to present a stronger case for allying *Alterosa* to *Sortosa* than to *Thylakion*, and this constitutes one of the rationalizations for establishing the genus *Alterosa*.

In summary, the only real defining character for *Sortosa*, preanal appendages more or less fused to the dorsal margin of sternum IX, is not present in *Alterosa*. In *Alterosa* the preanal appendages are inserted at the base of tergum X. The characteristic short and broad segments of the inferior appendages in *Sortosa*, discussed by Ross for the species known to him, are also not typical of the genus *Alterosa*. The defining characters for *Thylakion*, The reduction of the 2A vein of the forewing and the presence of intermediate appendages ventrolaterally to the preanal appendages, are also not present in *Alterosa*. In *Alterosa* the phallobase is tubular basally, lacking the basodorsal expansion usually present in philopotamids. The more primitive character state is definitely found in *Sortosa*, and probably also in *Thylakion*. Additionally *Alterosa* is characterized by having intermediate appendages positioned mesally to the preanal appendages, an acutely articulating dorsal margin of sternum IX, and elongate posteroventral development of the same segment.

These character apomorphies and similarities are taken to indicate the probable monophyly of *Alterosa*.

### Relationships within *Alterosa*

Characters useful for defining species relationships within *Alterosa* are primarily those of the male genitalia. Character polarity can be assessed most directly for those characters where the assumption of evolutionary progression from simple and generalized to complex and specialized can be applied. Species sharing what are implied to be derived character states are considered related. They are discussed below as five informally recognized species groups.

The ***sanctipauli* Group** includes those taxa with a rounded basal protuberance on tergum X on which the cuticle is scabrously developed (Figs. 7A,B; 8A,B). A scabrous development is exceptionally absent in *A. bocainae* (Fig. 6A,B), and both the lateral protuberance and scabrous cuticle are absent in *A. truncata* (Fig. 26A,B). Species in the *sanctipauli* Group also have the apex of tergum X longitudinally narrowed and developed into a crest-like process (Figs. 7A, 11A). Many of the species also have paired longitudinal, serrate ridges on tergum X (Figs. 7A,B; 17B), although this character is not consistently present among all species. A possibly plesiomorphic character similarity is the shape of the inferior appendages, which are elongate, linear (Figs. 5A,C; 16A,C). Species placed here with confidence include: *Alterosa beckeri*, *A. bocainae*, *A. boraceiae*, *A. caparaonensis*, *A. fimbriata*, *A. interuales*, *A. itatiaiae*, and *A. sanctipauli*. Of these, *A. caparaonensis*, *A. beckeri*, and *A. boraceiae* all have the intermediate appendages branched basally (Figs. 5A,B; 7A,B, 8A,B). A species less confidently placed in this group is *Alterosa truncata* (Fig. 26), without a basal scabrous protuberance on tergum X and with modified apices to the inferior appendages, but having paired longitudinal, serrate ridges on tergum X and also a tergum X with an apical crest-like development. Both of these latter characters are found within the *sanctipauli* Group and suggest the probable placement of *A. truncata* within this group.

Two species that have a general similarity to the *sanctipauli* Group include *Alterosa falcata* and *A. jordaensis*. These species greatly resemble each other in the peculiar development of their intermediate appendages, which are arched and curved apically and comparatively unarmed (Figs. 10A,B; 18A,B). Both species also have a small number of large phallic spines (Figs. 10D, 18D). They, however, lack the defining characters of the above group, as well as apomorphic characters that would place them in or near some other group. I have separated these two species as the ***falcata* Group**.

Another well-defined group is the ***marinonii* Group** including: *Alterosa escova*, *A. flinti*, *A. fluminensis*, *A. marinonii*, and *A. sanctaeteresae*. A defining character for the group includes the greatly modified and enlarged preanal appendages, which are widened basally and armed with stout, modified setae (Figs. 9A,B; 19A,B; 22A,B). Character sim-



ilarities include the shape and structure of the inferior appendages, which have their basal segments bulbously rounded and their apical segments widened, each possessing a large pad of apicomeresal setae (Figs. 9A,C; 22A,C), the structure of the intermediate appendages, which are similarly spine-like in all of the species (Figs. 9A,B; 13A,B), and the overall shape of segment IX (Figs. 9A, 13A, 19A). Two species, *A. flinti* and *A. sanctaeteresae*, have an elongate lateral branch from the intermediate appendage that terminates with a brush of setae (Figs. 12A,B; 22A,B).

A pair of superficially dissimilar species that nevertheless share some apomorphic character similarities include *Alterosa holzenthali* and *A. paprockii*. These are referred to here as the **holzenthali Group**. Both species have the posterolateral margin of tergum IX extending shelf-like over the base of tergum X (Figs. 15A,B; 21A,B) and both also have very narrow, pencil-like intermediate appendages closely apposed to the lateral margin of tergum X, each with a spine-like apical seta (Figs. 15B, 21B). The two species also have similarly developed inferior appendages, with the second article longer than the first and somewhat flattened on the mesal surface (Figs. 15C, 21C). Armature in the phallic apparatus is absent in *A. holzenthali* (Fig. 15D) and reduced in *A. paprockii* (Fig. 21D). While they are similar to each other, there are no obvious characters for placing these species within or near one of the other species groups.

The **guapimirim Group** is more heterogeneous than the other groups recognized above and it is possible that it may not prove to be monophyletic. I have placed here four species, *A. guapimirim*, *A. orgaosensis*, *A. schadrackorum*, and *A. tripuiensis*. The first two are very similar and are clearly closely related. Both have a similarly developed, bulbously enlarged tergum X (Figs. 14A, 20A), similar preanal appendages, each with its apex concave and bearing a stout spine (Figs. 14A,B; 20A,B), similar concavely cupped bases to tergum X (Figs. 14A, 20A), and similarly shaped inferior appendages, with the second articles much shorter than the first (Figs. 14A,C; 20A,C). A relationship of these species to *A. tripuiensis* is suggested by the development of the base of tergum IX, which is similarly laterally compressed and extends over the base of tergum X (Figs. 20A,B; 25A,B). General similarities of *A. schadrackorum* to *A. tripuiensis* suggested its probable placement in this group, as for instance an overall similarity of the shape of segment IX (Figs. 24A, 25A), a similarity of the inferior appendages, with the second article shorter than the first and widened apically (Figs. 24A,C; 25A,C), and the form of the intermediate appendages, which are very short and rounded in both species (Figs. 24A,B; 25A,B). The placement of both *Alterosa schadrackorum* and *A. tripuiensis* within the *guapimirim* Group is admittedly speculative.

## CONCLUDING COMMENTS

The number of taxa known in Philopotaminae is at least several times greater than when Ross did his study in 1956. In general, the subfamily is ready for a phylogenetic reassess-

ment, but such a comprehensive study was outside the scope of the current project, whose goal was primarily to describe the new species from southern and southeastern Brazil. It is quite possible that the total diversity within Philopotaminae, even at the genus level, has not yet come to light. A colleague, Fernando Muñoz (pers. com.) has 2 or 3 additional species from the Andean region of South America that cannot be easily placed to genus. New genera may need to be established to include them. The genera *Cryptobiosella*, *Xenobiosella*, *Dolomyia*, and *Dolopsyche* were all described within the last twenty years, and all are known from restricted localities. It is quite conceivable that additional undescribed genera exist. The diversity of species from the current inventory of southeastern Brazil would hardly have been imagined beforehand (although Flint commented already in 1983 that additional species from Brazil were known and undescribed). Like many of the species in Philopotaminae, most of these are from restricted localities and currently known from only a few specimens. Likely, many species and genera of Philopotaminae represent relicts from a world increasingly dominated by the species diverse lineages of *Chimarra* and *Wormaldia* (including the related lineages of *Gunungiella* and *Doloclones*). In the long term of evolution, some of these lineages may well be on their “way out.” Unfortunately, human alteration of the environment threatens to accelerate this process. It is a tribute to their persistence that these species have somehow managed to hang on and compete in their own ecologically specialized or geographically restricted niches. The story they have to tell about the evolution of the family makes their survival all the more remarkable and fascinating. Hopefully, efforts will be made to preserve these interesting species, which in their own way represent a kind of existing “Jurassic Park.”

#### ACKNOWLEDGMENTS

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