# Twenty-four new species of Polycentropus (Trichoptera, Polycentropodidae) from Brazil 

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#### Abstract

Twenty-four new species of the caddisfly genus Polycentropus (Insecta: Trichoptera: Polycentropodidae) occurring in Brazil are diagnosed, described, and the male genitalia of each are illustrated. Eighteen of the new species are placed in the Polycentropus jorgenseni species complex of the Polycentropus gertschi group of New World Polycentropus sensu lato. Furthermore, 6 new species within the P. gertschi group (P. ancistrus $\mathbf{s p} . \mathbf{n} .$, P. boraceia sp. n., P. carioca sp. n., P. froeblichi sp. n., P. galharada sp. n., and $P$. graciosa sp. n.) are placed in an informal diagnostic cluster of species with P. urubici Holzenthal \& Almeida. Ten of the other $P$. gertschi group species form a second cluster of diagnostically similar species, the Polycentropus soniae cluster (P. caaete sp. n., P. carolae sp. n., P. cheliceratus sp. n., P. fluminensis sp. n., P. itatiaia sp. n., P. minero sp. n., P. santateresae sp. n., P. soniae sp. n., P. tripui sp. n., and P. virginiae sp. n.). Two of the remaining 8 new species are included in the $P$. jorgenseni species complex (P. cipoensis $\mathbf{s p} . \mathbf{n}$. and $P$. verruculus $\mathbf{s p . n}$.), while the remaining 6 are unique and cannot be placed in one of the groups at this time (P. acinaciformis sp. n., P. amphirhamphus sp. n., P. cachoeira sp. n., P. inusitatus sp. n., P. paprockii sp. n. and $P$. rosalysae sp. n.).


## Keywords

Trichoptera, Polycentropodidae, Polycentropus, caddisfly, new species, Neotropics, Brazil

## Introduction

Although cosmopolitan, Polycentropus is still not well known is South America. Flint et al. (1999) reported 64 species of Polycentropus for the Neotropics. Subsequently, only 14 species in the genus have been added, 1 each from Argentina (Angrisano and Sganga 2009), Brazil (Holzenthal and Almeida 2003) and Hispaniola (Flint and Sykora 2004), 2 each from Costa Rica (Chamorro-Lacayo 2003), Ecuador, and Venezuela (Hamilton and Holzenthal 2005), and 5 from Mexico (Barba-Alvarez and Bueno-Soria 2005). In their checklist of the caddisflies of Brazil, Paprocki et al. (2004) reported 378 species as of September, 2003. More than half (26) of the 46 species of polycentropodids included, were Cernotina. To date, the only named species of Polycentropus from Brazil is P. urubici Holzenthal \& Almeida (2003). No Polycentropus species have been added to the known Brazilian fauna since.

In this paper we add 24 new species to the list of Brazilian Polycentropus, 9 of which were previously described and illustrated in a dissertation on the New World species of Polycentropus sensu stricto (Hamilton 1986). The remaining 15 were collected as part of a survey of the caddisflies of southeastern and southern Brazil by Dr. Ralph Holzenthal and colleagues.

## Materials and methods

All material described here is based on pinned specimens, except as noted. While preparation of male genitalia occurred over many years, the procedures for clearing and illustrating the specimens generally followed those presented by Holzenthal and Andersen (2004).

Terminology used in describing male genitalia follows that of Hamilton (1986) and, particularly in regard to naming the parts of the preanal appendage, Chamorro and Holzenthal (2010). Paired appendages and the processes of these appendages (intermediate appendages, preanal appendages, and inferior appendages) are referred to in the singular in diagnoses and descriptions. Our interpretation of the shape and position of the mostly membranous tergum IX + X should not be considered absolute because the membranous nature of the segments makes their demarcation difficult to discern and their exact shapes subject to degree of inflation at the time of preservation or during the clearing process. Likewise, the membranous attachment between the intermediate and preanal appendages as well as the shape of the endothecal membranes are variable and our descriptions represent our best interpretation of their relative positions and shapes in the specimens we have studied. Because of their small size, the shapes of the endothecal and subphallic sclerites are difficult to discern, especially if deeply embedded in membranes; in particular the shape of the pedicel of the subphallic sclerite, if present, and the length of the arms that cradle the phallobase are often hard to discern. In P. carioca sp. n., P. boraceia sp. n., P. galharada sp. n., P. graciosa sp. n., P. froehlichi sp. n., and P. ancistrus sp. n., the base of the mesolateral process of the preanal appendage is lightly sclerotized, so its position relative to the mesoventral process is not fixed.

Females that were collected at the same location and date as described males are included in the type series, although the certainty of these associations awaits further investigation. Types are deposited in the collections of the Museo de Zoologia, Universidade do Sáo Paulo, São Paulo, Brazil (MZUSP), United States National Museum of Natural History, Washington, DC (NMNH), the Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil (UFRJ), the Universidade Federal do Bahia, Salvador, Brazil (UFBA), and the University of Minnesota Insect Collection, St. Paul, Minnesota, U.S.A. (UMSP), as indicated in the species description. The holotypes of $P$. minero sp. n. and P. carolae sp. n., are on long term loan to the NMHN from MZUSP.

## Phylogenetic considerations

Eighteen of the 24 new Brazilian species are clearly members of the Polycentropus gertschi group (hereafter referred to as the gertschi group). This group, as characterized by Hamilton (1986), comprises most of the Neotropical Polycentropus species. The gertschi group shares 3 synapomorphies: "(1) ventral process of phallobase is apicoventral in position, (2) each intermediate appendage free to its base and articulates basomesally on its preanal appendage, and (3) there is a sclerite formed in the membrane below and around the phallus that appears to support and guide this organ" (Hamilton and Holzenthal 2005). These 18 species are further placed in the Polycentropus jorgenseni species complex (hereafter referred to as the jorgenseni species complex) within the gertschi group, a clade that Hamilton (1986) characterized based on the occurrence of a dorsal sclerotized band in the endothecal membranes (often folded back into phallobase when endothecal membrane inverted). The remaining 6 new species, including Hamilton's (1986) "Polycentropus sp. n. 8" and "Polycentropus sp. n. 9," are more problematic in regard to group affinities based on characters employed by Hamilton (1986). All 6 species appear to lack the articulated intermediate appendages so evident in members of the gertschi group, but some of the 6 have other characters that suggest affinities to the group, including the endothecal sclerotic band in $P$. rosalysae sp. n. P. acinaciformis sp. n., and P. cachoeira sp. n. In lieu of a phylogenetic analysis, discussion of suggested affinities will be included in the diagnoses of the species.

In the following descriptions, the first 6 species (P. ancistrus sp. n., P. boraceia sp. n., P. carioca sp. n., P. froehlichi sp. n., P. galharada sp. n., and P. graciosa sp. n.) seem to demonstrate affinities to $P$. urubici Holzenthal \& Almeida (2003) based in particular on the shape of the preanal appendage. The mesolateral process of the preanal appendage is digitate and its base is narrowed and lightly sclerotized. As a result, its position relative to the rigid mesoventral process is not fixed. In addition, in these 6 species and $P$. urubici, the posteroventral region of the inferior appendage is short while the dorsolateral flange is relatively high and more elongate, forming a pointed process in most species. Also, these species have a vestiture of fine, black setae on the wings and lack the patches of pale setae so common in other Polycentropus. Unlike P. urubici, the intermediate appendage is long, often more than twice the length of the digitate
mesolateral process of the preanal appendage. In the diagnoses below, we refer to this diagnostic cluster of 7 species as the Polycentropus urubici cluster (hereafter referred to as the urubici cluster), although we do not intend to indicate that a phylogenetic analysis has occurred nor that this cluster be recognized as a formal clade.

The next 10 species descriptions, also species of the jorgenseni species complex are close to the recently described P. aguyje Angrisano and Sganga (2009) (P. caaete sp. n., P. carolae sp. n., P. cheliceratus sp. n., P. fluminensis sp. n., P. itatiaia sp. n., P. minero sp. n., P. santateresae sp. n., P. soniae sp. n., P. tripui sp. n., and P. virginiae sp. n.). These appear similar in the compact, often quadrate, lateral aspect of the interior appendage; the elongate, typically decurved intermediate appendage; and the shape of the preanal appendage in lateral view with its mesolateral process short and very broad and the mesoventral process more digitate. As in the urubici cluster, the wings appear solid black and lack pale patches of setae. For convenience, we will designate this diagnostically similar cluster of 11 species as the Polycentropus aguyje cluster (hereafter referred to as the aguyje cluster). As in the urubici cluster discussed above, the aguyje cluster should not be recognized as a formal clade.

Of the remaining 8 new Brazilian species, 2 species are clearly members of the jorgenseni species complex (P. cipoensis sp. n., and P. verruculus sp. n.), but are unique and not similar to members of the urubici and aguyje clusters. The final 6 species ( $P$. acinaciformis sp. n., P. amphirhamphus sp. n., $P$. cachoeira sp. n., P. inusitatus sp. n., P. paprockii sp. n., P. rosalysae sp. n.) cannot be placed in the jorgenseni species complex based on the synapomorphies identified by Hamilton (1986), although several show some similarities to the complex.

Ongoing investigations by Brazilian researchers and others (e.g., Chamorro and Holzenthal 2010) may add to our understanding of the phylogenetic relationships of these and other species of Neotropical Polycentropus. Clearly, Brazil has a poorly understood richness of species in the genus.

## Species descriptions

## Polycentropus boraceia Hamilton \& Holzenthal, sp. n.

 urn:lsid:zoobank.org:act:8B813827-03F9-4752-8D82-E0E79968F5F8 Fig. 1Polycentropus new species 7 Hamilton 1986: 93-94, 210; Fig. 6.10.

Description. Similar to P. urubici Holzenthal \& Almeida (2003) in general form, P. boraceia sp. n . is particularly distinct in the much greater length and shape of the intermediate appendage and the general shape of the inferior appendage. Most similar to $P$. galharada sp. n., the shape of the inferior appendage in lateral and posterior views provides distinctive features that separate P. boraceia sp. n. from P. galharada sp. n. as well as other species of the urubici cluster. In particular, the dorsolateral flange of the


Figure I. Polycentropus boraceia sp. n. Male genitalia: A lateral B dorsal C ventral D inferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ phallus, dorsal $\mathbf{G}$ subphallic sclerite, caudal.
inferior appendage is shorter and more dorsally rounded in lateral view and the mesoventral spine in posterior aspect is acute while in P. galharada sp. n. this spine is more angularly truncate.

Adult. Length of forewing (male) 6.1-8.8 mm. Body dark brown to black; dorsum of head and thorax dark brown, clothed with long, erect dark setae; base of forewing
with long, erect dark setae, general vestiture of forewing with fine black setae, lacking patches of pale setae; legs dark brown to black.

Male. Genitalia as in Fig. 1. Sternum IX in lateral view subtriangular, about 2/3 height of segment VIII; in ventral view quadrate, anterior corners sharply rounded, sides slightly constricted mesally, anterior margin moderately concave, posterior margin produced medially. Terga IX + X membranous. Intermediate appendage slightly sinuate, very long, length greater than height of abdomen, basal region turned laterad at base; in dorsal view nearly uniform in diameter throughout length, gradually narrowing apically. Mesolateral process of preanal appendage moderately long, digitate, apex rounded, at base narrowly joined to dorsal portion of mesoventral process; mesoventral process directed caudad, digitate, about $2 / 3$ length of mesolateral process. Inferior appendage in lateral view short, somewhat triangular; posteroventral margin acute below moderate caudal emargination; dorsolateral flange relatively high, rounded dorsally, apically tapered to rounded or sharp point, with prominent apicoventral point, exposed in lateral view; mesoventral spine present, narrow, in lateral view acute, positioned medially; in ventral view inferior appendage broad basally, slender, tapering apically, caudomesal spine prominent, acute; mesoventral spine hidden. Phallobase short; in lateral view apicoventral projection narrow, slightly longer than apical diameter of phallobase apex, with 2 points; separated by shallow median groove; endothecal sclerotic band somewhat broad, becoming less sclerotized apically; endothecal spines absent; phallotremal sclerite narrow in dorsal aspect. Subphallic sclerite Y-shaped, arms long, pedicel with narrow lateral expansions; narrow in lateral view, ventrally somewhat narrowed.

Holotype male: BRAZIL: São Paulo: Estação Biológica Boraceia, Riberão Coruja, 2.iv.1977, C.M. \& O.S. Flint, Jr. (UMSP000136631) (NMNH).

Paratypes: same data as holotype, 7 males (NMNH); Res. Casa Grande, Pedreira, 13.x.1974, Froehlich, 1 male (in alcohol) (NMNH); Res. Casa Grande, Riberão Coruja, 26.i.1974, Froehlich, 1 male, 1 female (in alcohol) (NMNH); Est. Biol. Paranapiacaba, 6.viii. 1963, Froehlich, 1 male (in alcohol) (NMNH); same, except 27.viii.1963, 1 male (in alcohol) (NMNH); Estação Biológica Boraceia, Rio Guaratuba, $23^{\circ} 40.039^{\prime}$ S, $45^{\circ} 53.759^{\prime} \mathrm{W}$, $775 \mathrm{~m}, 17 . \mathrm{iv} .1998$, Holzenthal, Melo, Froehlich, 1 male (UMSP); same, except 17.ix.2002, Blahnik, Prather, Melo, Froehlich, Silva, 1 male (UMSP).

Etymology. Named for Estação Biológica Boraceia, the biological station located on the forested slopes of the Serra do Mar, where the holotype was collected.

## Polycentropus galharada Hamilton \& Holzenthal, sp. n.

urn:lsid:zoobank.org:act:BF3019BD-3B2D-44FE-B25E-27FB65FBA33E
Fig. 2

Description. As noted in the diagnosis of P. boraceia, this new species and the other 5 new species of the urubici cluster are similar to, but distinct from $P$. urubici based on


Figure 2. Polycentropus galharada sp. n. Male genitalia: A lateral B dorsal $\mathbf{C}$ ventral $\mathbf{D}$ inferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ phallus, dorsal $\mathbf{G}$ subphallic sclerite, caudal $\mathbf{H}$ inferior appendage, variant, lateral.
the shape and length of the intermediate appendage as well as the shape of the inferior appendage. Separated from P. boraceia as noted above, P. galharada sp. n. also resembles P. froehlichi sp. n., P. ancistrus sp. n., and P. graciosa sp. n. in the shape of the inferior appendage. It is distinguished from these species in details of this organ, particularly in
the shape of the dorsolateral flange and the caudomesal spine in addition to the shapes and relative lengths of the processes of the preanal appendage.

Adult. Length of forewing (male) $7.5-8 \mathrm{~mm}$. Body dark brown to black; dorsum of head and thorax black, clothed with long, erect dark setae; base of forewing with long, erect black setae, general vestiture of forewing with fine black setae, lacking patches of pale setae; legs dark brown to black.

Male. Genitalia as in Fig. 2. Sternum IX in lateral view broadly subtriangular, about 3/4 height of segment VIII; in ventral view quadrate, anterior corners very broadly rounded, sides straight, anterior margin deeply concave, posterior margin slightly concave. Terga IX + X membranous, slightly sclerotized ventrally. Intermediate appendage gently curving ventromesad, very long, length much greater than height of abdomen, basal region slightly expanded; in dorsal view nearly uniform in diameter throughout length, gradually narrowing apically. Mesolateral process of preanal appendage moderately long, digitate, apex somewhat swollen, rounded, at base narrowly joined to dorsal portion of mesoventral process; mesoventral process directed dorsocaudad, digitate, about $2 / 3$ length of mesolateral process. Inferior appendage in lateral view moderately long, somewhat triangular; posteroventral margin acute below moderate (Fig. 2A) to deep (Fig. 2H) caudal emargination; dorsolateral flange low, somewhat straight with 2 shallow excavations of dorsal margin beyond midlength, apically tapered to sharp point, with prominent apicoventral point, exposed in lateral view; mesoventral spine present, narrow, in lateral view acute, positioned medially; in ventral view inferior appendage broad basally, slender, tapering apically, caudomesal spine prominent, acute; mesoventral spine hidden; apex angularly truncate. Phallobase moderately short; in lateral view apicoventral projection narrow, much longer than apical diameter of phallobase apex, with 2 points; separated by shallow median groove; endothecal sclerotic band somewhat broad, becoming less sclerotized apically; endothecal spines absent; phallotremal sclerite narrow in dorsal aspect. Subphallic sclerite Y-shaped, arms long, pedicel with broad lateral expansions; broad in lateral view, ventrally narrowed.

Holotype male: BRAZIL: Sáo Paulo: Parque Estadual de Campos do Jordão, Rio Galharada, $22^{\circ} 41.662^{\prime}$ S, $45^{\circ} 27.783^{\prime}$ W, 1530 m, 22.i.1998, Holzenthal, Froehlich, Paprocki (UMSP000033083) (MZUSP).

Paratypes: BRAZIL: Sáo Paulo: Parque Estadual de Campos do Jordão, Cachoeira Galharada, $22^{\circ} 41.735^{\prime} \mathrm{S}, 45^{\circ} 27.725^{\prime} \mathrm{W}, 1620 \mathrm{~m}, 7 . \mathrm{iii} .1996$, Holzenthal, Rochetti, Oliveira, 4 males, 1 female (UMSP); same, 15.x.1998, Paprocki \& Froehlich, 1 male, 2 females (UMSP); Parque Estadual de Campos do Jordão, Rio Galharada, $22^{\circ} 41.662^{\prime}$ S, $45^{\circ} 27.783^{\prime}$ W, $1530 \mathrm{~m}, 4-5 . \mathrm{iii} .1996$, Holzenthal \& Guahyba, 3 males (UFRJ); same, 22.i.1998, Holzenthal, Froehlich, Paprocki, 2 males (UFBA); Parque Estadual de Campos do Jordão, Campo do Meio, 22 41.750 'S, $45^{\circ} 29.448^{\prime} \mathrm{W}, 1500$ m, 6.iii.1996, Holzenthal \& Guahyba, 3 males (UMSP); same, 21.i.1998, Holzenthal, Froehlich, Paprocki, 1 male, 1 female (PUCMG); Rio Casquilho, 3.4 km NE Parque Estadual Campos do Jordão, $22^{\circ} 40.29^{\prime} \mathrm{S}, 45^{\circ} 27.7^{\prime} \mathrm{W}, 1550 \mathrm{~m}, 23 . \mathrm{i} .1998$, Holzenthal, Froehlich, Paprocki, 2 males (NMNH); Serra do Japi, Córrego da Ermida and small dam, $23^{\circ} 12^{\prime} \mathrm{S}, 47^{\circ} 00^{\prime} \mathrm{W}, 9-10 . x i i .1997$, Froehlich, 1 male (MZUSP).

Etymology. Named for the type locality.


Figure 3. Polycentropus froehlichi sp. n. Male genitalia: A lateral B dorsal C ventral $\mathbf{D}$ inferior appendages, caudal E phallus, lateral $\mathbf{F}$ phallus, dorsal $\mathbf{G}$ subphallic sclerite, caudal.

## Polycentropus froeblichi Hamilton \& Holzenthal, sp. n.

 urn:lsid:zoobank.org:act:AFA47C3D-3C4E-458E-9EDE-515F63157527 Fig. 3Description. Resembling P. galharada mainly in the shape of the preanal and inferior appendages, P. froeblichi sp. n. is distinguished from that species and the other species of the urubici cluster particularly by the phallobase where the apicoventral process is relatively thick at its base and is perpendicular to the axis of phallobase, when viewed laterally. Also, the base of the mesoventral process of the preanal appendage of $P$. froeblichi sp. n. is much broader than that of P. galharada.

Adult. Length of forewing (male) $7-7.5 \mathrm{~mm}$. Body black; dorsum of head and thorax black, clothed with long, black setae; base of forewing with long, erect black setae, general vestiture of forewing with fine black setae, lacking patches of pale setae; legs dark brown to black.

Male. Genitalia as in Fig. 3. Sternum IX in lateral view broadly subtriangular, about $2 / 3$ height of segment VIII; in ventral view slightly trapezoidal, anterior corners very broadly rounded, sides strongly constricted mesally, anterior margin moderately concave, posterior margin deeply and broadly concave. Terga IX + X membranous, slightly sclerotized ventrally; with several long, slender setae. Intermediate appendage slightly curved dorsad, very long, length much greater than height of abdomen, basal region slightly expanded; in dorsal view nearly uniform in diameter throughout length, gradually narrowing apically. Mesolateral process of preanal appendage moderately long, broadly digitate, apex rounded, at base narrowly joined to dorsal portion of mesoventral process; mesoventral process directed caudad, very broad basally, narrowing to irregularly rounded apex, about $1 / 2$ length of mesolateral process. Inferior appendage in lateral view moderately long, somewhat triangular; posteroventral margin protruding, rounded below shallow caudal emargination; dorsolateral flange low, slightly rounded dorsally, apically tapered to sharp inturned point, without caudomesal spine; mesoventral spine present, broad, in lateral view obtuse, positioned medially; in ventral view inferior appendage broad basally, slender, tapering apically; mesoventral spine hidden; apex acute. Phallobase short; in lateral view apicoventral projection moderately broad, slightly shorter than diameter of apical diameter of phallobase apex, with 2 points; separated by shallow median groove; endothecal sclerotic band somewhat broad, becoming less sclerotized apically; phallotremal sclerite wide in dorsal aspect. Subphallic sclerite Y-shaped, arms short, pedicel with narrow lateral expansions; broad in lateral view, ventrally somewhat narrowed.

Holotype male: BRAZIL: Santa Catarina: Morro da Igreja, Cachoeira Veu da Noiva, $28^{\circ} 04.595^{\prime}$ 'S, $49^{\circ} 31.090^{\prime} \mathrm{W}, 1300 \mathrm{~m}$, 5.iii.1998, Holzenthal, Froehlich, Paprocki (UMSP000033101) (MZUSP).

Paratypes: BRAZIL: Santa Catarina: Urubici, Cachoeira Avencal, $28^{\circ} 02.839^{\prime}$ S, $49^{\circ} 36.997^{\prime}$ W, $1260 \mathrm{~m}, 6$. iii. 1998 , Holzenthal, Froehlich, Paprocki, 1 male, 1 female (UMSP); same data as holotype, 1 male, 1 female (UMSP).


Figure 4. Polycentropus ancistrus sp. n. Male genitalia: A lateral B dorsal $\mathbf{C}$ ventral $\mathbf{D}$ inferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ phallus, dorsal $\mathbf{G}$ subphallic sclerite, caudal.

Etymology. Named for the great Brazilian aquatic entomologist, Dr. Claudio G. Froehlich, University of São Paulo, in recognition of his lifelong study of the aquatic insects of Brazil.

## Polycentropus ancistrus Hamilton \& Holzenthal, sp. n.

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Fig. 4

Description. Polycentropus ancistrus sp. n. most closely resembles P. froehlichi. It is distinguished from P. froehlichi and the other urubici cluster species by the strongly incurved and acute apices of the dorsolateral flange and caudomesal spine of the inferior appendage as well as the near equal length of both processes of the preanal appendage.

Adult. Length of forewing (male) 6 mm . Body brown; dorsum of head and thorax brown; legs stramineous.

Male. Genitalia as in Fig. 4. Sternum IX in lateral view nearly round, slightly greater than $1 / 2$ height of segment VIII; in ventral view slightly trapezoidal, anterior corners very sharply rounded, sides slightly convex, narrowed posteriorly, anterior margin shallowly concave, posterior margin shallowly concave. Terga IX + X membranous. Intermediate appendage straight, very long, length much greater than height of abdomen, basal region simple, not expanded; in dorsal view nearly uniform in diameter throughout length, gradually narrowing apically. Mesolateral process of preanal appendage moderately long, digitate, apex rounded, at base broadly joined to dorsal $1 / 2$ of mesoventral process; mesoventral process directed caudad, size and shape of mesolateral process, slightly shorter than length of mesolateral process. Inferior appendage in lateral view moderately long, somewhat triangular; posteroventral margin acute below shallow caudal emargination; dorsolateral flange low, slightly excavated medially, apically tapered to sharp inturned point, with prominent caudomesal spine, exposed in lateral view; mesoventral spine absent; in ventral view inferior appendage broad basally, slender, tapering apically, caudomesal spine prominent, acute. Phallobase moderately short; in lateral view apicoventral projection narrow, slightly longer than apical diameter of phallobase apex, with 2 points; separated by very shallow median groove; endothecal sclerotic band forming flanges within phallobase; phallotremal sclerite difficult to discern due to specimen condition. Subphallic sclerite Y-shaped, arms long, pedicel narrow; narrow in lateral view, ventrally somewhat narrowed.

Holotype male: BRAZIL: Sáo Paulo: Res. Casa Grande, Rib. Courja, á luz, 26.i.1974, Froehlich, (UMSP000131229) (in alcohol) (MZUSP).

Etymology. From the Greek ankistron for fishhook, in reference to the caudomesal spines on the inferior appendage of the male genitalia.

## Polycentropus graciosa Hamilton \& Holzenthal, sp. n.

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Fig. 5

Description. Among the 6 new species in the urubici cluster, $P$. graciosa sp. n. resembles P. boraceia, P. galharada, P. froehlichi, and $P$. ancistrus in the shape of the inferior appendage with the elongate dorsolateral flange. In P. graciosa sp. n., the dorsolateral


Figure 5. Polycentropus graciosa sp. n. Male genitalia: A lateral (inset, variant of inferior appendage apex) $\mathbf{B}$ dorsal $\mathbf{C}$ ventral $\mathbf{D}$ inferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ phallus, dorsal $\mathbf{G}$ subphallic sclerite, caudal.
flange of the inferior appendage is uniformly wide in lateral view and narrows relatively abruptly to a rounded or acute apex. Likewise, the caudomesal spine of the inferior appendage is absent, forming a rounded protrusion, and the mesoventral spine in posterior aspect is bifurcate unlike any of the aforementioned species.

Adult. Length of forewing (male) 7-8 mm. Body dark brown to black; dorsum of head and thorax black, clothed with long, black setae; base of forewing with long, erect black setae, general vestiture of forewing with fine black setae, lacking patches of pale setae; legs dark brown to black.

Male. Genitalia as in Fig. 5. Sternum IX in lateral view broadly subtriangular, about 3/4 height of segment VIII; in ventral view quadrate, anterior corners sharply rounded, sides slightly constricted mesally, anterior margin shallowly concave, posterior margin moderately concave with small, shallow convex medial region. Terga IX + X membranous. Intermediate appendage slightly curved dorsad, very long, length much greater than height of abdomen, basal region slightly expanded; in dorsal view nearly uniform in diameter throughout length, gradually narrowing apically. Mesolateral process of preanal appendage moderately long, digitate, apex roundly truncate, at base narrowly joined to dorsal portion of mesoventral process; mesoventral process directed caudad, broadly digitate, about $2 / 3$ length of mesolateral process. Inferior appendage in lateral view moderately long, somewhat triangular; posteroventral margin protruding, rounded below shallow caudal emargination; dorsolateral flange low, slightly rounded dorsally, apically tapered to rounded point, without caudomesal spine; mesoventral spine present, broad, in lateral view acute, bifurcate, positioned well caudad; in ventral view inferior appendage broad basally, slender, tapering apically; mesoventral spine prominent; apex acute, bifurcate. Phallobase moderately short; in lateral view apicoventral projection narrow, approximately equal to apical diameter of phallobase apex, with 2 points; separated by shallow median groove; endothecal sclerotic band somewhat broad, becoming less sclerotized apically; endothecal spines absent; phallotremal sclerite wide in dorsal aspect. Subphallic sclerite U-shaped, arms long, pedicel with narrow lateral expansions; broad in lateral view, ventrally somewhat narrowed.

Holotype male: BRAZIL: Paraná: Rio Cascata, Graciosa, road to Morretes, $25^{\circ} 20.214^{\prime} \mathrm{S}, 48^{\circ} 53.971^{\prime} \mathrm{W}, 750 \mathrm{~m}, 10.1 .1998$, Holzenthal, Melo, Almeida (UMSP000033088) (MZUSP).

Paratypes: same data as holotype, 2 males, 1 female (UMSP), 1 female (MZUSP); Paraná: Quatro Barras, $900 \mathrm{~m}, 31 . \mathrm{i} .1993$, V.O. Becker, 3 males, 2 females (NMNH).

Etymology. Named for the type locality, a river flowing through the lush Atlantic forest of the Serra da Graciosa, Paraná, Brazil.

## Polycentropus carioca Hamilton \& Holzenthal, sp. n.

 urn:lsid:zoobank.org:act:DDDEDD30-FF55-4D22-9D16-0D336CC94874 Fig. 6Description. Polycentropus carioca sp. n. is the most unusual of the species in the urubici cluster. In lateral view, the mesoventral process of the preanal appendage is nearly as wide as long, while in the other 6 species this process is always much narrower relative to its length. Also, in lateral view the inferior appendage in P. carioca sp. n. is short


Figure 6. Polycentropus carioca sp. n. Male genitalia: A lateral B dorsal C ventral D inferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ subphallic sclerite, caudal.
with the dorsolateral flange being compacted and rounded while the mesoventral spine in posterior view is large and erect.

Adult. Length of forewing (male) 7 mm . Body dark brown; dorsum of head and thorax dark brown, clothed with long, erect dark setae; base of forewing with long, erect dark setae, general vestiture of forewing with fine black setae, lacking patches of pale setae; legs dark brown to black.

Male. Genitalia as in Fig. 6. Sternum IX in lateral view nearly round, approximately $1 / 2$ height of segment VIII; in ventral view quadrate, anterior corners very broadly rounded, sides slightly constricted posteriorly, posterior margin moderately concave with small, shallow convex medial region. Terga IX + X mostly membranous with light dorsal sclerotization basally; with numerous scattered minute spicules. Intermediate appendage straight, very long, length greater than height of abdomen, basal region simple, not expanded; in dorsal view nearly uniform in diameter throughout length, gradually narrowing apically. Mesolateral process of preanal appendage moderately long, digitate, apex rounded, at base narrowly joined to dorsal portion of mesoventral process; mesoventral process directed ventrocaudad, broadly truncate, about $2 / 3$ length of mesolateral process. Inferior appendage in lateral view short, somewhat triangular; posteroventral margin protruding, rounded below shallow caudal emargination; dorsolateral flange relatively high, rounded dorsally, without caudomesal spine; mesoventral spine large, erect, narrow, in lateral view acute, positioned more basad; in ventral view inferior appendage rhomboidal, broadest apically; mesoventral spine with apex visible. Phallobase moderately short; much longer than apical diameter of phallobase apex, with 1 point; endothecal sclerotic band narrow, becoming less sclerotized apically; endothecal spines absent; phallotremal sclerite narrow in dorsal aspect. Subphallic sclerite Y-shaped, arms long, pedicel with broad lateral expansions; narrow in lateral view, ventrally somewhat narrowed.

Holotype male: BRAZIL: Rio de Janeiro: Parque Nacional da Serra dos Órgãos, Rio Beija-flor, $22^{\circ} 27.063^{\prime}$ S, $43^{\circ} 00.065^{\prime} \mathrm{W}, 1125 \mathrm{~m}, 27 . \mathrm{ii} .2002$, Holzenthal, Blahnik, Paprocki, Prather (UMSP000136602) (MZUSP).

Paratype: same data as holotype, 1 female (MZUSP).
Etymology. Carioca is the Portuguese demonym for the inhabitants of the city of Rio de Janeiro.

## Polycentropus fluminensis Hamilton \& Holzenthal, sp. n.

 urn:lsid:zoobank.org:act:A16AC0C6-F467-4EA0-90BB-004170F7F224Fig. 7
Polycentropus new species 1 Hamilton 1986: 85-86, 198; Fig. 6.4.

Description. Polycentropus fluminensis sp. n., and the other 9 species of the aguyje cluster show similarities in the shape of both processes of the preanal appendage, the strongly, often decurved intermediate appendage and the general appearance of the inferior appendage. Among the 10 species of this cluster, P. Aluminensis sp. n. has the shortest and most compact inferior appendage with a strongly reduced dorsolateral plane and the mesoventral process of the preanal appendage is notably broad and short, barely exceeding the mesoventral process.

Adult. Length of forewing (male) $6.5-7.5 \mathrm{~mm}$. Body dark brown to black; dorsum of head and thorax black, clothed with long, black setae; base of forewing with long,


Figure 7. Polycentropus fluminensis sp. n. Male genitalia: A lateral B dorsal $\mathbf{C}$ ventral $\mathbf{D}$ inferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ phallus, dorsal $\mathbf{G}$ phallobase, caudal $\mathbf{H}$ subphallic sclerite, caudal.
erect black setae, general vestiture of forewing with fine black setae, lacking patches of pale setae; legs dark brown to black.

Male. Genitalia as in Fig. 7. Sternum IX in lateral view broadly subtriangular, about $2 / 3$ height of segment VIII; in ventral view slightly trapezoidal, anterior cor-
ners sharply rounded, sides very slightly constricted mesally, anterior margin deeply concave, posterior margin slightly concave with broad, shallow convex medial region. Terga IX + X membranous. Intermediate appendage gently curving ventromesad, long, length slightly greater than height of abdomen, basal region slightly expanded; in dorsal view nearly uniform in diameter throughout length, gradually narrowing apically. Mesolateral process of preanal appendage short, apex rounded, with slight apicoventral extension, at base broadly joined to mesoventral process; mesoventral process directed caudad, digitate, equal in length to mesolateral process. Inferior appendage in lateral view very short, generally oval; dorsolateral flange very low, rounded dorsally, with prominent caudomesal spine, exposed in lateral view; mesoventral spine present, broad, in lateral view rounded, positioned well basad; in ventral view inferior appendage approximately oval, caudomesal spine prominent, acute. Phallobase moderately short; in lateral view apicoventral projection narrow, slightly longer than apical diameter of phallobase apex, with 1 point; endothecal sclerotic band narrow, ending in pair of small spines resembling a claw-hammer; endothecal spines absent; phallotremal sclerite wide in dorsal aspect. Subphallic sclerite Y-shaped, arms long, pedicel with broad lateral expansions; narrow in lateral view, ventrally somewhat broadened.

Holotype male: BRAZIL: Rio de Janeiro: $\mathrm{km} 17,18 \mathrm{~km} \mathrm{~S}$ of Teresopolis, 1180 m, 18-19.iv.1977, C.M. \& O.S. Flint, Jr. (UMSP000136606) (NMNH).

Paratypes: same data as holotype, 5 males, 2 females (NMNH); Minas Gerais: Parque Nacional do Caparaó, small trib to Rio Caparaó, Vale Verde, 2025.029'S, $41^{\circ} 50.767^{\prime} \mathrm{W}, 1350 \mathrm{~m}, 12-14.1 i i .2002$, Holzenthal, 1 male (in alcohol) (UMSP); Rio de Janeiro: Parque Nacional da Serra dos Órgãos, Rio Paquequer, $22^{\circ} 26.992^{\prime} \mathrm{S}$, 4259.899'W, 1000 m, 26.ii.2002, Holzenthal, Blahnik, Paprocki, Prather, 1 male (UMSP).

Etymology. The word fluminensis is derived from the Portuguese demonym for the inhabitants of the state of Rio de Janeiro.

## Polycentropus tripui Hamilton \& Holzenthal, sp. n.

 urn:lsid:zoobank.org:act:225395E4-9CDB-4227-9E44-7C1083734B80 Fig. 8Description. In lateral aspect, this species most closely resembles $P$. fluminensis, in the compactness of the inferior appendage and the breadth of the mesolateral process of the preanal appendage. In P. tripui sp. n., the dorsolateral flange of inferior appendage is larger and the mesoventral process of the preanal appendage is much broader in lateral aspect. The phallic apparatus provides several unique characters that separate this species from the other species described in this paper. The phallobase is very short and there is a very large U-shaped sclerite at the apex of the sclerotized band of the phallic membrane (typically found folded back within the phallobase).

Adult. Length of forewing (male) 6-6.5 mm. Body brown to dark brown; dorsum of head and thorax dark brown, clothed with long, erect dark setae; base of forewing


Figure 8. Polycentropus tripui sp. n. Male genitalia: A lateral B dorsal C ventral Dinferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ phallus, dorsal $\mathbf{G}$ subphallic sclerite, caudal.
with long, erect dark setae, general vestiture of forewing with fine brown setae, lacking patches of pale setae (in alcohol); legs brown.

Male. Genitalia as in Fig. 8. Sternum IX in lateral view subtriangular, about 2/3 height of segment VIII; in ventral view quadrate, anterior corners very broadly rounded, sides very slightly constricted mesally, anterior margin shallowly concave, posterior margin slightly concave with very broad, shallow convex medial region. Terga IX +X
membranous. Intermediate appendage gently curving ventromesad, moderate elongate, length about two-thirds height of sternum IX, basal region simple, not expanded; in dorsal view nearly uniform in diameter throughout length, gradually narrowing apically. Mesolateral process of preanal appendage short, apex truncate, with slight apicoventral extension, at base broadly joined to mesoventral process; mesoventral process directed caudad, broad, hatch-shaped, slightly shorter than length of mesolateral process. Inferior appendage in lateral view short, generally oval; dorsolateral flange very low, rounded dorsally, with prominent caudomesal spine, slightly exposed in lateral view; mesoventral spine present, narrow, in lateral view acute, positioned well basad; in ventral view inferior appendage approximately oval, caudomesal spine prominent, acute; mesoventral spine hidden. Phallobase very short; in lateral view apicoventral projection narrow, much shorter than diameter of apical diameter of phallobase apex, with 2 points; endothecal sclerotic band broad, very large hooked process, appearing U-shaped in dorsal view; endothecal spines absent; phallotremal sclerite wide in dorsal aspect. Subphallic sclerite Yshaped, arms short, pedicel with broad lateral expansions; broad in lateral view, ventrally somewhat broadened.

Holotype male: BRAZIL: Minas Gerais: Estação Ecológica de Tripuí, Córrego Tiririca, $20^{\circ} 23.009^{\prime} \mathrm{S}, 43^{\circ} 33.237^{\prime} \mathrm{W}, 19 . i i .1999$, Paprocki, Amarante, Salgado (UMSP000046917) (MZUSP).

Paratypes: BRAZIL: Minas Gerais: Two males (UMSP); same data as holotype, Estação Ecológica de Tripuí, Córrego Botafogo, $20^{\circ} 22.908^{\prime} \mathrm{S}, 43^{\circ} 33.615^{\prime} \mathrm{W}, 1100 \mathrm{~m}, 25 . x i .2001$, Holzenthal, Paprocki, Blahnik, Neto, 1 male (UMSP); Estação Ecológica do Tripuí, Córrego Tripuí, $20^{\circ} 23.364^{\prime} \mathrm{S}, 43^{\circ} 32.541^{\prime} \mathrm{W}, 1070 \mathrm{~m}, 1 . x i .1998$, Paprocki, Braga, Amarante, 1 male (UFRJ); same, except 21.xi.1998, Paprocki, Braga, Amarante, 1 male (MZUSP); Cachoeira do Abacaxi, Vale do Tropeiro, Ouro Preto, $20^{\circ} 12.270^{\prime} \mathrm{S}, 43^{\circ} 38.163^{\prime} \mathrm{W}, 1120 \mathrm{~m}$, 7.xi.2001, Holzenthal, Paprocki, Blahnik, Amarante, 1 male (UFBA).

Etymology. Named for the small stream in the ecological station of the same name, known for harboring an endemic species of onychophoran, Peripatus acacioi Marcus and Marcus. Tripui is the indigenous Tupi-Guarani word for fast or quick water.

## Polycentropus soniae Hamilton \& Holzenthal, sp. n.

 urn:lsid:zoobank.org:act:34524969-D2DC-4AD6-94A7-6523CBC47433 Fig. 9Description. Polycentropus soniae sp. n. most closely resembles $P$. fluminensis and $P$. tripui, particularly in the ventral aspect of the compact inferior appendage. It can be separated from these species by the angular dorsolateral flange of the inferior appendage and the narrower and rounded mesolateral process of the preanal appendage.

Adult. Length of forewing (male) 6-7 mm. Body dark brown to black; dorsum of head and thorax black, clothed with long, erect dark setae; base of forewing with long, erect black setae, general vestiture of forewing with fine black setae, lacking patches of pale setae; legs dark brown to black.


Figure 9. Polycentropus soniae sp. n. Male genitalia: A lateral B dorsal C ventral Dinferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ phallus, dorsal $\mathbf{G}$ subphallic sclerite, caudal.

Male. Genitalia as in Fig. 9. Sternum IX in lateral view broadly subtriangular, about 3/4 height of segment VIII; in ventral view trapezoidal, anterior corners broadly rounded, sides very slightly constricted mesally, anteriorly, posterior margin slightly concave with very broad, shallow convex medial region. Terga IX + X membranous. Intermediate appendage slightly curved on basal $1 / 3$ and relatively straight for remainder of length, long, length slightly greater than height of abdomen, basal region
slightly expanded; in dorsal view nearly uniform in diameter throughout length, gradually narrowing apically. Mesolateral process of preanal appendage very short, apex rounded, at base broadly joined to ventral $2 / 3$ of mesoventral process; mesoventral process directed caudad, broadly digitate, slightly shorter than length of mesolateral process. Inferior appendage in lateral view short, quadrate; dorsolateral flange low, straight dorsally, with prominent caudomesal spine, exposed in lateral view; mesoventral spine present, broad, in lateral view rounded, positioned more basad; in ventral view inferior appendage approximately oval, caudomesal spine prominent, acute; mesoventral spine hidden. Phallobase short; in lateral view apicoventral projection narrow, much shorter than diameter of apical diameter of phallobase apex, with 1 point; endothecal sclerotic band narrow, becoming rapidly less sclerotized toward apex; endothecal spines absent; phallotremal sclerite wide in dorsal aspect. Subphallic sclerite Y-shaped, arms long, pedicel with broad lateral expansions; broad in lateral view, ventrally narrowed.

Holotype male: BRAZIL: Paraná: Rio Mãe Catira, 10 km N Porto de Cima, $25^{\circ} 21.821^{\prime} \mathrm{S}, 48^{\circ} 52.473^{\prime} \mathrm{W}, 200 \mathrm{~m}, 8-9 . x i i .1997$, Holzenthal \& Huisman (UMSP000033175) (MZUSP).

Paratypes: BRAZIL: Paraná: same data as holotype, 10 males, 3 females (UFBA), 10 males, 3 females (UFRJ), 10 males, 3 females (MZUSP), 10 males, 2 females (NMNH), 20 males, 6 females (UMSP); trib. to Rio Mãe Catira, 10.5 km N Porto de Cima, $25^{\circ} 21.778^{\prime} \mathrm{S}, 48^{\circ} 52.590^{\prime} \mathrm{W}, 200 \mathrm{~m}, 10 . x i i .1997$, Holzenthal \& Huisman, 28 males, 2 females (UMSP).

Etymology. Named for Dr. Sonia N. Lazzari, professor of entomology at the Universidade Federal do Paraná, Curitiba, Brazil, in appreciation of her help and friendship during the junior author's studies in Brazil.

## Polycentropus cheliceratus Hamilton \& Holzenthal, sp. n.

 urn:lsid:zoobank.org:act:E09DE9A9-2B59-4D75-86B6-03A5EA4EEE81 Fig. 10Polycentropus new species 2 Hamilton 1986: 86-87, 199; Fig. 6.5.

Description. Very similar to $P$. minero sp. n., $P$. cheliceratus sp. n. can be distinguished from that species as well as the other 8 species of the aguyje cluster by the shape of the inferior appendage in both lateral and ventral views as well as the lateral aspect of the preanal appendage. Compared to $P$. minero sp. n., in lateral view, the caudoventral corner and the dorsoventral flange of the inferior appendage are less angular and the mesoventral spine is absent. Also, in P. cheliceratus sp. n. the mesolateral process of the preanal appendage is smaller in dorsoventral length and its mesoventral process is more slender and longer compared to the mesolateral process.

Adult. Length of forewing (male) $6.6-7.6 \mathrm{~mm}$. Body dark brown to black; dorsum of head and thorax black, clothed with long, black setae; base of forewing with long,


Figure 10. Polycentropus cheliceratus sp. n. Male genitalia: A lateral B dorsal C ventral Dinferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ phallus, dorsal $\mathbf{G}$ phallobase, caudal $\mathbf{H}$ subphallic sclerite, caudal.
erect black setae, general vestiture of forewing with fine black setae, lacking patches of pale setae; legs brown.

Male. Genitalia as in Fig. 10. Sternum IX in lateral view quadrate, about $2 / 3$ height of segment VIII; in ventral view slightly trapezoidal, anterior corners sharply rounded, sides very slightly constricted mesally, anterior margin deeply concave, posterior margin slightly concave with broad, shallow convex medial region. Terga IX + X membranous, slightly sclerotized ventrally. Intermediate appendage gently curving ventromesad, moderate elongated length about equal to height of sternum IX, basal region simple, not expanded; in dorsal view nearly uniform in diameter throughout length, gradually narrowing apically. Mesolateral process of preanal appendage short, apex rounded, at base broadly joined to mesoventral process; mesoventral process directed ventrad to rounded point, digitate, equal in length to mesolateral process. Inferior appendage in lateral view short, generally round; dorsolateral flange low, rounded dorsally, with prominent caudomesal spine, partially exposed in lateral view; mesoventral spine absent; in ventral view inferior appendage
approximately oval, caudomesal spine prominent, acute. Phallobase moderately short; in lateral view apicoventral projection narrow, slightly longer than apical diameter of phallobase apex, with 1 point; endothecal sclerotic band very narrow, becoming less sclerotized apically; endothecal spines absent; phallotremal sclerite narrow in dorsal aspect. Subphallic sclerite Y-shaped, arms long, pedicel narrow in posterior and lateral views.

Holotype male: BRAZIL: Rio de Janeiro: km 17, 18 km S of Teresopolis, 1180 m, 18-19.iv.1977, C.M. \& O.S. Flint, Jr. (UMSP000136614) (NMNH).

Paratypes: BRAZIL: same data as holotype, 1 male (NMNH); Rio de Janeiro: Nova Friburgo, municipal water supply, 950 m, 24.iv.1977, C.M. \& O.S. Flint, Jr., 3 males, 1 female (NMNH).

Etymology. From the Latin chela (Greek chele) for claw, in reference to the clawlike form of the inferior appendage of the male genitalia, particularly when viewed in ventral aspect.

## Polycentropus minero Hamilton \& Holzenthal, sp. n.

urn:lsid:zoobank.org:act:FE9BF381-404C-4B17-B98E-0699A5F2512D
Fig. 11
Polycentropus new species 5 Hamilton 1986: 90-91, 202; Fig. 6.8.

Description. Similar to $P$. cheliceratus, the more angular shape of the inferior appendage in lateral and ventral aspects as well as the lateral view of the preanal appendage with its larger mesolateral process and shorter, thick mesoventral process distinguishes P. minero sp. n. from it and other similar species of the aguyje cluster.

Adult. Length of forewing (male) 6.4-8.2 mm. Body dark brown; dorsum of head and thorax black; general vestiture of forewing with fine brown setae (in alcohol); legs brown.

Male. Genitalia as in Fig. 11. Sternum IX in lateral view subtriangular, about 3/4 height of segment VIII; in ventral view quadrate, anterior corners broadly rounded, sides slightly constricted anteriorly, anterior margin shallowly concave, posterior margin shallowly concave. Terga IX + X membranous. Intermediate appendage gently curving ventromesad, moderate elongate, length about two-thirds height of sternum IX, basal region slightly expanded; in dorsal view nearly uniform in diameter throughout length, gradually narrowing apically. Mesolateral process of preanal appendage short, apex rounded, with slight ventral extension, at base broadly joined to mesoventral process; mesoventral process directed ventrad to rounded point, broadly digitate, about $2 / 3$ length of mesolateral process. Inferior appendage in lateral view short, quadrate; dorsolateral flange low, straight dorsally, with prominent caudomesal spine, slightly exposed in lateral view; mesoventral spine present, narrow, in lateral view acute, positioned well basad; in ventral view inferior appendage quadrate, caudomesal spine prominent, acute; mesoventral spine hidden. Phallobase moderately short; in lateral view apicoventral projection narrow, slightly shorter than diameter of apical diameter of phallobase apex, with 1 point; endothecal sclerotic band narrow, becoming less scle-


Figure II. Polycentropus minero sp. n. Male genitalia: A lateral B dorsal $\mathbf{C}$ ventral $\mathbf{D}$ inferior appendages, caudal E phallus, lateral $\mathbf{F}$ phallus, dorsal $\mathbf{G}$ subphallic sclerite, caudal.
rotized apically; endothecal spines absent; phallotremal sclerite narrow in dorsal aspect. Subphallic sclerite Y-shaped, arms long, pedicel with broad lateral expansions; narrow in lateral view, ventrally narrowed.

Holotype male: BRAZIL: Minas Gerais: Serra do Cipo, Rio Capivara, 6.vii.1974, Froehlich, Shimizu, et al. (NMNH).

Paratypes: BRAZIL: same data as holotype, 1 female (NMNH); same, except 18.xii.1973, Froehlich, 4 males (NMNH); same except 9.ii.1974, Exp. Dep. Zool., 1 male, 2 females (NMNH).

Etymology. The name minero is the Portuguese demonym for the inhabitants of Minas Gerais, the Brazilian state where the type specimens were collected.

## Polycentropus carolae Hamilton \& Holzenthal, sp. n. urn:lsid:zoobank.org:act:870EB4ED-EAD0-4CE7-B59F-183A855BE85F

 Fig. 12Polycentropus new species 3 Hamilton 1986: 87-88, 200; Fig. 6.6.

Description. Polycentropus carolae sp. n. is most similar in many features to P. minero and $P$. caaete sp. n. In P. carolae sp. n., the mesoventral process of the preanal appendage slightly exceeds the mesolateral process, whereas in $P$. minero it is shorter and in P. caaete sp. n . it is much longer. Also, P. carolae sp. n. has a shallow excavation in the posterior margin of the inferior appendage while it is absent in $P$. minero and deeper in P. caaete sp. n. Finally, the triangular shape of the mesolateral process of the preanal appendage and the small claw-like structure at the apex of the endothecal sclerotic band are unique to this species in the 10 -species aguyje cluster.

Adult. Length of forewing (male) $5.4-6.7 \mathrm{~mm}$. Body dark brown to black; general vestiture of forewing with fine black setae, lacking patches of pale setae; legs brown.

Male. Genitalia as in Fig. 12. Sternum IX in lateral view subtriangular, about 3/4 height of segment VIII; in ventral view slightly trapezoidal, anterior corners broadly rounded, sides slightly constricted anteriorly, anterior margin moderately concave, posterior margin slightly concave with very broad, shallow convex medial region. Terga IX + X membranous. Intermediate appendage gently curving ventromesad, long, length slightly greater than height of sternum IX, basal region slightly expanded; in dorsal view nearly uniform in diameter throughout length, gradually narrowing apically. Mesolateral process of preanal appendage short, apex slightly triangular, at base broadly joined to mesoventral process; mesoventral process directed caudad, digitate, slightly exceeding length of mesolateral process. Inferior appendage in lateral view short, trapezoidal; posteroventral margin acute below shallow caudal emargination; dorsolateral flange relatively high, straight dorsally, partially exposed in lateral view; mesoventral spine present, broad, in lateral view acute, positioned more caudad; in ventral view inferior appendage approximately round, caudomesal spine hidden; mesoventral spine with apex visible. Phallobase moderately short; in lateral view apicoventral projection narrow, approximately equal to apical diameter of phallobase apex, with 1 point; endothecal sclerotic band narrow, apex terminating in simple claw; endothecal spines absent; phallotremal sclerite wide in dorsal aspect. Subphallic sclerite Y-shaped, arms long, pedicel with broad lateral expansions; narrow in lateral view, ventrally somewhat narrowed.


Figure I2. Polycentropus carolae sp. n. Male genitalia: A lateral B dorsal $\mathbf{C}$ ventral $\mathbf{D}$ inferior appendages, caudal E phallus, lateral $\mathbf{F}$ phallus, dorsal $\mathbf{G}$ subphallic sclerite, caudal.

Holotype male: BRAZIL: Rio de Janeiro: km 54, 26 km E Nova Friburgo, 410 m, 19.iv.1977, C.M. \& O.S. Flint, Jr. (UMSP000136621) (NMNH).

Paratypes: same data as holotype, 3 males, 1 female; same, except 25.iv.1977, 1 female; Rio de Janeiro: Cachoeiras de Macacu, 800 m, 15.x.1985, Miller, 1 male (NMNH); Parque Nacional da Serra dos Órgãos, Guapimirim, Trilha das Ruínas,
$22^{\circ} 29.679^{\prime}$ S, $42^{\circ} 59.729^{\prime} \mathrm{W}, 940 \mathrm{~m}, 28 . \mathrm{ii} .2002$, Blahnik \& Paprocki, 2 males (in alcohol) (UMSP).

Etymology. Named with affection for Mrs. Carol Flint in honor of her numerous and important collections of Trichoptera made over many years across Latin America.

## Polycentropus caaete Hamilton \& Holzenthal, sp. n.

 urn:lsid:zoobank.org:act:B7D82617-4287-44A9-BA7A-87539353276E Fig. 13Description. Polycentropus caaete sp. n. appears to be intermediate in appearance between $P$. carolae and $P$. itatiaia sp. n. in characters of the inferior appendage. The excavation of its posterior margin is deeper in $P$. caaete sp. n., but not as deep as in $P$. itatiaia sp. n.; the position of the caudomesal spine is similar to $P$. carolae, but it is near the upper apical corner in P. itatiaia sp. n.; and the mesoventral spine is more basad in $P$. caaete sp. n. than in the other 2 species. The relative lengths of the 2 processes of the preanal appendage will also separate $P$. caaete sp. n . from the other species. In the thickness of the apicoventral projection of the phallobase and the exposure of the caudomesal spine of the inferior appendage this species bears some resemblance to $P$. aguyje but can be separated by other details of the inferior and preanal appendages.

Adult. Length of forewing (male) $6-6.5 \mathrm{~mm}$. Body dark brown to black; dorsum of head and thorax black, clothed with long, erect dark setae; base of forewing with long, erect black setae, general vestiture of forewing with fine black setae, lacking patches of pale setae; legs dark brown to black.

Male. Genitalia as in Fig. 13. Sternum IX in lateral view broadly subtriangular, about $2 / 3$ height of segment VIII; in ventral view slightly trapezoidal, anterior corners sharply rounded, sides slightly constricted anteriorly, anterior margin shallowly concave, posterior margin slightly concave with very broad, shallow convex medial region. Terga IX + X membranous. Intermediate appendage long, gently curving ventromesad, length slightly greater than height of abdomen; in dorsal view basal region narrow with slightly expanded segment slightly distad, nearly uniform in diameter throughout length, gradually narrowing apically. Mesolateral process of preanal appendage very short, apex rounded, with slight ventral extension, at base broadly joined to medial portion of mesoventral process; mesoventral process directed caudad, broadly digitate, nearly 2 times the length of mesolateral process. Inferior appendage in lateral view short, quadrate; posteroventral margin rounded, protruding below caudal emargination; dorsolateral flange low, straight dorsally, with prominent caudomesal spine, partially exposed in lateral view; mesoventral spine present, broad, in lateral view acute, positioned more basad; in ventral view inferior appendage approximately oval, caudomesal spine hidden; mesoventral spine with apex visible. Phallobase moderately short; in lateral view apicoventral projection moderately broad, approximately equal to apical diameter of phallobase apex, with 1 point; endothecal sclerotic band narrow, becoming rapidly less sclerotized toward apex; endothecal spines absent; phallotremal


Figure 13. Polycentropus caaete sp. n. Male genitalia: A lateral B dorsal C ventral D inferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ phallus, dorsal $\mathbf{G}$ subphallic sclerite, caudal.
sclerite wide in dorsal aspect. Subphallic sclerite Y-shaped, arms short, pedicel with broad lateral expansions; broad in lateral view, ventrally narrowed.

Holotype male: BRAZIL: Santa Catarina: Parque Ecológica Spitzkopf, Rio Caeté above 1st falls, $27^{\circ} 00.35^{\prime}$ S, $49^{\circ} 06.70^{\prime}$ W, $170 \mathrm{~m}, 26 . x i .2003$, Holzenthal, Paprocki, Calor (UMSP000120814) (MZUSP).

Paratypes: same data as holotype, 2 males, 2 females (UMSP); Paraná: trib. to Rio Mãe Catira, 10.5 km . N Porto de Cima, $25^{\circ} 21.778^{\prime} \mathrm{S}, 48^{\circ} 52.590^{\prime} \mathrm{W}, 200 \mathrm{~m}$, 10.xii.1997, Holzenthal \& Huisman, 1 male (UMSP); São Paulo: Parque Estadual Intervales, Rio do Carmo, $24^{\circ} 18.983^{\prime} \mathrm{S}, 48^{\circ} 25.250^{\prime} \mathrm{W}, 560 \mathrm{~m}, 29 . \mathrm{ix} .2002$, Blahnik, Prather, Melo, Calor, 1 male (UFBA); Agua Comprida @ bridge, $24^{\circ} 17.591$ 'S, $48^{\circ} 25.102^{\prime} \mathrm{W}, 600 \mathrm{~m}, 30 . \mathrm{ix} .2002$, Blahnik, Prather, Melo, Calor, 2 males, 1 female (MZUSP); Estação Biológica de Boracéia, Rio Claro at bridge, $23^{\circ} 39.002^{\prime} \mathrm{S}$, $45^{\circ} 54.889^{\prime} \mathrm{W}, 815 \mathrm{~m}, 19 . i x .2002$, Blahnik, Prather, Melo, Silva, 1 male (UFRJ); small stream on São Paulo route $247,11 \mathrm{~km}$ SE Bananal, $22^{\circ} 45.684^{\prime} \mathrm{S}, 44^{\circ} 23.190^{\prime} \mathrm{W}, 675$ m, 23.ix.2002, Blahnik, Prather, Melo, Froehlich, Silva, 5 males (UMSP).

Etymology. From cad́-etê, the Tupi-Guarani word for the Atlantic forest of southeastern Brazil.

## Polycentropus itatiaia Hamilton \& Holzenthal, sp. n. urn:lsid:zoobank.org:act:C0F3E691-A6B2-453A-84FE-4C2C9A9A52E5

Fig. 14

Description. Most similar to $P$. aguyje and $P$. santateresae sp. n., $P$. itatiaia sp. n. differs in the shape and depth of the emargination in the posterior margin of the inferior appendage as well as the median position of the relatively low mesoventral spine of this appendage. The mesolateral process of the preanal appendage in $P$. itatiaia sp. n. is triangular, as it is in P. carolae, and the mesoventral process is shorter and directed more ventrad.

Adult. Length of forewing (male) 6-6.5 mm. Body dark brown; dorsum of head and thorax black, clothed with long, erect dark setae; base of forewing with long, erect black setae, general vestiture of forewing with fine black setae, lacking patches of pale setae; legs dark brown to black.

Male. Genitalia as in Fig. 14. Sternum IX in lateral view subtriangular, about $2 / 3$ height of segment VIII; in ventral view slightly trapezoidal, anterior corners sharply rounded, sides slightly convex, anterior margin shallowly concave, posterior margin slightly concave with very broad, shallow convex medial region. Terga IX + X membranous. Intermediate appendage slightly curved on basal $1 / 2$ and relatively straight for remainder of length, very long, length greater than height of abdomen, basal region slightly expanded; in dorsal view nearly uniform in diameter throughout length, gradually narrowing apically. Mesolateral process of preanal appendage very short, apex slightly triangular, at base broadly joined to medial portion of mesoventral process; mesoventral process directed ventrocaudad, digitate, slightly shorter than length of mesolateral process. Inferior appendage in lateral view short, quadrate; posteroventral margin rounded, protruding below deep caudal emargination; dorsolateral flange low, straight dorsally, with prominent caudomesal spine, slightly exposed in lateral view; mesoventral spine present, broad, in lateral view obtuse, positioned medially; in ventral view inferior appendage approximately round, caudomesal spine partially hidden, acute; mesoventral


Figure 14. Polycentropus soniae sp. n. Male genitalia: A lateral B dorsal $\mathbf{C}$ ventral $\mathbf{D}$ inferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ phallus, dorsal $\mathbf{G}$ subphallic sclerite, caudal.
spine hidden. Phallobase moderately short; in lateral view apicoventral projection narrow, approximately equal to apical diameter of phallobase apex, with 1 point; endothecal sclerotic band narrow, becoming less sclerotized apically; endothecal spines absent; phallotremal sclerite narrow in dorsal aspect. Subphallic sclerite Y-shaped, arms long, pedicel with broad lateral expansions; broad in lateral view, ventrally somewhat narrowed.

Holotype male: BRAZIL: Rio de Janeiro: Parque Nacional do Itatiaia, trib. to Rio Taquaral, $22^{\circ} 26.688^{\prime} \mathrm{S}, 44^{\circ} 36.464^{\prime} \mathrm{W}, 1320 \mathrm{~m}, 6 . i i i .2002$, Holzenthal, Blahnik, Prather (UMSP000136573) (MZUSP).

Paratypes: same data as holotype, 1 female (MZUSP); Parque Nacional do Itatiaia, Rio Campo Belo, trail to Véu da Noiva, $22^{\circ} 25.706^{\prime} \mathrm{S}, 44^{\circ} 37.1^{\prime} 1^{\prime} \mathrm{W}, 1310$ m, 5.iii.2002, Holzenthal, Blahnik, Paprocki, Prather, 1 male, 1 female (UFRJ); Parque Nacional do Itatiaia, Rio Campo Belo, $22^{\circ} 27.033^{\prime} \mathrm{S}, 44^{\circ} 36.818^{\prime} \mathrm{W}, 1300 \mathrm{~m}$, 7.iii.2002, Holzenthal, Blahnik, Paprocki, Prather, 5 males, 2 females (UMSP); Minas Gerais: Ibitipoca, sitio of Anestis Papadopolous, $21^{\circ} 43.227^{\prime} \mathrm{S}, 43^{\circ} 54.557^{\prime} \mathrm{W}, 1200 \mathrm{~m}$, 23.x. 2000 m, Paprocki, 2 males (UFBA).

Etymology. Named for Parque Nacional Itatiaia where the type specimens were collected. Itatiaia means "many-pointed rock" in Tupi-Guarani.

## Polycentropus santateresae Hamilton \& Holzenthal, sp. n. urn:lsid:zoobank.org:act:2FB21067-F8C9-443E-B40E-EBA9931300B1 <br> Fig. 15

Polycentropus new species 4 Hamilton 1986: 89-90, 201; Fig. 6.7.

Description. Polycentropus santateresae sp. n. is distinct in the shorter length of the intermediate appendage compared to other species of the aguyje cluster. The body of the mesolateral process of the preanal appendage is round and positioned on the dorsal half of its base. We have noted some variation in the lateral view of the inferior appendages of the material examined (Fig. 15A and 15 H ), but at this time we consider this within the range of variation for $P$. santateresae sp. n. This species, particularly the variant from Rio Caparaó in Minas Gerais, is most similar to $P$. aguyje in the shape of the caudal excavation of the inferior appendage and the shape of the mesolateral process of the preanal appendage. This species can be separated from P. aguyje based on the narrow shape of apicoventral projection of the phallobase and the hidden position of the caudomesal spine of the inferior appendage in lateral view.

Adult. Length of forewing (male) 5.5-6.5 mm. Body dark brown; dorsum of head and thorax black, clothed with long, erect dark setae; base of forewing with long, erect dark setae, general vestiture of forewing with fine black setae, lacking patches of pale setae; legs brown.

Male. Genitalia as in Fig. 15. Sternum IX in lateral view subtriangular, about 3/4 height of segment VIII; in ventral view trapezoidal, anterior corners broadly rounded, sides very slightly constricted mesally, anterior margin shallowly concave, posterior margin slightly concave with very broad, shallow convex medial region. Terga IX + X membranous. Intermediate appendage gently curving ventromesad, moderate elongate, length slightly less than height of sternum IX, basal region simple, not expanded; in dorsal view nearly uniform in diameter throughout length, gradually narrowing apically. Mesolateral process of preanal appendage short, apex rounded, with slight ventral


Figure 15. Polycentropus santateresae sp. n. Male genitalia: A lateral B dorsal C ventral Dinferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ phallus, dorsal $\mathbf{G}$ subphallic sclerite, caudal $\mathbf{H}$ inferior appendage, variant, lateral (Minas Gerais, Rio Caparaó).
extension, at base broadly joined to dorsal 1/2 of mesoventral process; mesoventral process directed caudad, digitate, equal in length to mesolateral process. Inferior appendage in lateral view short, quadrate; posteroventral margin acute below deep caudal emargination; dorsolateral flange relatively high, straight dorsally, hidden in lateral view;
mesoventral spine present, broad, in lateral view obtuse, positioned more basad; in ventral view inferior appendage quadrate, caudomesal spine prominent, acute; mesoventral spine hidden. Phallobase short; in lateral view apicoventral projection narrow, approximately equal to apical diameter of phallobase apex, with 1 point; endothecal sclerotic band narrow, becoming less sclerotized apically; endothecal spines absent; phallotremal sclerite narrow in dorsal aspect. Subphallic sclerite Y-shaped, arms long, pedicel with broad lateral expansions; narrow in lateral view, ventrally somewhat narrowed.

Holotype male: BRAZIL: Espirito Santo: 15 km SE Santa Teresa, Fazenda Santa Clara, 460 m, 22.iv.1977, C.M. \& O.S. Flint, Jr. (UMSP000136628) (NMNH)

Paratypes: BRAZIL: Minas Gerais: Rio Caparaó, Hotel Parque Caparaó, Alto Caparaó, $20^{\circ} 25.498^{\prime}$ S, $41^{\circ} 51.500^{\prime} \mathrm{W}, 830 \mathrm{~m}, 11-14 . i i i .2002$, Holzenthal, Blahnik, Paprocki, Prather, 1 male (UMSP)

Etymology. Named for the central Espirito Santo town of Santa Teresa near which this species was collected.

## Polycentropus virginiae Hamilton \& Holzenthal, sp. n. urn:lsid:zoobank.org:act:E2F15EC7-EF36-4DA1-BC4D-C44947FE8607 <br> Fig. 16

Description. Polycentropus virginiae sp. n. is readily distinguished from other aguyje cluster species by the shape of the inferior and preanal appendages. Specifically, the prominently visible recurved spine on the inferior appendage as well as the deep excavation below this spine and the large triangular flange lying dorsobasad of the spine are distinct. The mesolateral process of the preanal appendage is broad, low, and round, mostly closely resembling that of only P. caaete.

Adult. Length of forewing (male) 5.5-7 mm. Body dark brown to black; dorsum of head and thorax black, clothed with long, black setae; base of forewing with long, erect black setae, general vestiture of forewing with fine black setae, lacking patches of pale setae; legs dark brown to black.

Male. Genitalia as in Fig. 16. Sternum IX in lateral view broadly subtriangular, about 3/4 height of segment VIII; in ventral view slightly trapezoidal, anterior corners broadly rounded, sides very slightly constricted mesally, anteriorly, anterior margin moderately concave, posterior margin slightly concave with very broad, shallow convex medial region. Terga IX + X membranous. Intermediate appendage slightly curved on basal $1 / 2$ and relatively straight for remainder of length, very long, length greater than height of abdomen, basal region simple, not expanded; in dorsal view nearly uniform in diameter throughout length, gradually narrowing apically. Mesolateral process of preanal appendage very short, apex rounded, at base broadly joined to mesoventral process; mesoventral process directed caudad, digitate, 2 times the length of mesolateral process. Inferior appendage in lateral view short, trapezoidal; posteroventral margin rounded, protruding below deep caudal emargination; dorsolateral flange relatively high, protruding as rounded triangle, with prominent caudomesal spine, exposed in


Figure 16. Polycentropus virginiae sp. n. Male genitalia: A lateral $\mathbf{B}$ dorsal $\mathbf{C}$ ventral $\mathbf{D}$ inferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ phallus, dorsal $\mathbf{G}$ subphallic sclerite, caudal.
lateral view; mesoventral spine present, broad, in lateral view obtuse, positioned well basad; in ventral view inferior appendage approximately round, caudomesal spine partially hidden, acute; mesoventral spine with apex visible. Phallobase moderately short; in lateral view apicoventral projection moderately broad, much shorter than diameter
of apical diameter of phallobase apex, with 1 point; endothecal sclerotic band narrow, becoming less sclerotized apically; endothecal spines absent; phallotremal sclerite wide in dorsal aspect. Subphallic sclerite Y-shaped, arms long, pedicel with narrow lateral expansions; narrow in lateral view, ventrally somewhat narrowed.

Holotype male: BRAZIL: Minas Gerais: Córrego da Serra de Ouro Fino, Vale do Tropeiro, $20^{\circ} 12.371^{\prime} \mathrm{S}, 43^{\circ} 38.581^{\prime} \mathrm{W}, 1000 \mathrm{~m}, 8.8 .2000 \mathrm{~m}$, Paprocki, Salgado, Isaac (UMSP000046828) (MZUSP).

Paratypes: BRAZIL: Minas Gerais: Aldeia da Cachoeira das Pedras, $20^{\circ} 06.824^{\prime} \mathrm{S}$, $44^{\circ} 01.412^{\prime} \mathrm{W}, 925 \mathrm{~m}, 28-29 . i x .2000 \mathrm{~m}$, Paprocki \& Braga, 1 male (UMSP); Cachoeira do Abacaxi, Vale do Tropeiro, Ouro Preto, $20^{\circ} 12.270^{\prime} \mathrm{S}, 43^{\circ} 38.163^{\prime} \mathrm{W}, 1120 \mathrm{~m}$, 7.xi.2001, Holzenthal, Paprocki, Blahnik, Amarante, 1 male (in alcohol) (MZUSP); Rio Caparaó, Hotel Parque Caparaó, Alto Caparaó, $20^{\circ} 25.498^{\prime} \mathrm{S}, 41^{\circ} 51.500^{\prime} \mathrm{W}, 830$ m, 11-14.iii.2002, Holzenthal, Blahnik, Paprocki, Prather, 9 males, 3 females (UMSP); Parque Nacional do Caparaó, Rio Caparaó at Vale Verde, $20^{\circ} 25.029^{\prime} \mathrm{S}, 41^{\circ} 50.767^{\prime} \mathrm{W}$, 1350 m, 12-13.iii.2002, Holzenthal, Blahnik, Paprocki, Prather, 2 males (UFBA), 2 males (UFRJ), 1 male (NMNH).

Etymology. Named with affection for Virgina Braga, in recognition for her many years of friendship with the junior author and his family.

## Polycentropus cipoensis Hamilton \& Holzenthal, sp. n.

 urn:lsid:zoobank.org:act:E08F9BE7-0F1E-4E93-97B1-C83F6CA28B7FFig. 17
Polycentropus new species 6 Hamilton 1986: 91-93, 203; Fig. 6.9.

Description. Polycentropus cipoensis sp. n. is clearly a member of the jorgenseni species complex, but is otherwise easily separated from the other Neotropical Polycentropus by the inferior appendage which has a triangular base, but extends into a long, narrowed apex and a mesobasal process that is somewhat palmate in its posterior aspect. In addition, the intermediate appendage is short as are the 2 processes of the preanal appendage. The endothecal sclerotic band ends in a pair of prominent hooks, similar to, but larger, than those in P. fluminensis, P. tripui, P. carolae, and P. acinaciformis sp. n. The apicoventral process of the phallobase, while similar to that seen in other members of the jorgenseni species complex, is notably shorter and wider and the apical emargination is broadly u-shape.

Adult. Length of forewing (male) $5.8-7.0 \mathrm{~mm}$. Body brown to dark brown; dorsum of head and thorax dark brown, clothed with long, erect dark setae; base of forewing with long, erect dark setae, general vestiture of forewing with fine brown setae, lacking patches of pale setae (in alcohol); legs brown.

Male. Genitalia as in Fig. 17. Sternum IX in lateral view subtriangular, slightly greater than $1 / 2$ height of segment VIII; in ventral view trapezoidal, anterior corners sharply rounded, sides slightly constricted anteriorly, anterior margin shallowly concave, posterior margin slightly concave with broad, shallow convex medial region. Ter-


Figure 17. Polycentropus cipoensis sp. n. Male genitalia: A lateral B dorsal $\mathbf{C}$ ventral $\mathbf{D}$ inferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ phallus, dorsal $\mathbf{G}$ phallobase, caudal $\mathbf{H}$ subphallic sclerite, caudal.
ga IX + X membranous. Intermediate appendage slightly curved ventrad, short, length about one-half length of inferior appendage, basal region simple, not expanded; in dorsal view narrowly spindle-like. Mesolateral process of preanal appendage very short,
apex truncate, at base broadly joined to dorsal $1 / 2$ of mesoventral process; mesoventral process directed caudad, broadly truncate, slightly shorter than length of mesolateral process. Inferior appendage in lateral view long, slender; dorsolateral flange low, protruding as rounded triangle, without caudomesal spine; mesoventral spine present, narrow, in lateral view acute, positioned well basad; in ventral view inferior appendage narrowly triangular; mesoventral spine hidden. Phallobase very short; in lateral view apicoventral projection very broad, much shorter than diameter of apical diameter of phallobase apex, with 2 points; endothecal sclerotic band broad, ending in 2-prong hook; endothecal spines absent; phallotremal sclerite wide in dorsal aspect. Subphallic sclerite Y-shaped, arms long, pedicel short, broad; narrow in lateral view, ventrally somewhat broadened.

Holotype male: BRAZIL: Minas Gerais: Serra do Cipó, caminho da usina, 7.vii.1974, Froehlich, Shimizu, Carvalho (UMSP000131243) (in alcohol) (MZUSP).

Paratypes: BRAZIL: Minas Gerais: same data as holotype, except, km 110, 24.iv.1975, Froehlich, Carvalho, Shimizu, 1 male (in alcohol) (NMNH); Serra do Cipó, caminho da usina, Rio Capivara, 22.ix.1976, CGF, MAJC, GYS, 1 male, 1 female (in alcohol) (NMNH); same, except 18.xii.1973, Froehlich, 2 males (in alcohol) (NMNH); same, except 18.xii.1974, Froehlich, 1 male (in alcohol) (NMNH); same, except 18.iv.1975, Froehlich, 2 males, 4 females, (in alcohol) (NMNH); same, except afluente Rio Capivara, 19.iv.1975, Froehlich, Carvalho, Shimizu, 6 males, 2 females (in alcohol) (NMNH); Serra do Cipó, Cardeal Mota, Cachoeira Veu da Noiva, $19^{\circ} 18.912^{\prime} \mathrm{S}, 43^{\circ} 36.260^{\prime} \mathrm{W}, 800 \mathrm{~m}, 12 . x i .2001$, Holzenthal, Amarante, Blahnik, Paprocki, 8 males (UMSP), 1 male (in alcohol) (UMSP); Serra do Cipó, trib. to Rio Capivara, $19^{\circ} 14.396^{\prime} \mathrm{S}, 43^{\circ} 34.939^{\prime} \mathrm{W}, 1000 \mathrm{~m}, 18 . i i .1998$, Holzenthal \& Paprocki, 1 male (MZUSP); Serra do Cipó, Mãe d’Agua, Chapeu do Sol, $19^{\circ} 18.807^{\prime} \mathrm{S}, 43^{\circ} 35.665^{\prime} \mathrm{W}$, 1000 m, 17.ii. 1998, Holzenthal \& Paprocki, 1 male, 1 female (UFBA), 1 male, 1 female (UFRJ); km 110, Chapeu do Sol, á luz, 21.xii.1974, 1 male (NMNH); Sáo Paulo: Altinópolis, Fazenda São João da Mata, Rio Baguassu, $21^{\circ} 00.588^{\prime} \mathrm{S}, 47^{\circ} 28.900^{\prime} \mathrm{W}$, 745 m, 19-21.xi.2003, Holzenthal, Paprocki, Calor, 1 male (MZUSP).

Etymology. Named for Serra do Cipó, the mountain range where the species was collected.

## Polycentropus verruculus Hamilton \& Holzenthal, sp. n. urn:lsid:zoobank.org:act:E3AF8858-68AA-457D-BEE3-4BFFAEA60AF2

 Fig. 18Description. A member of the jorgenseni species complex, P. verruculus sp . n . is separated from others of this complex by the straight, blade-like intermediate appendage, the setose lateral knob on the mesolateral process of preanal appendage, and the very compact inferior appendage with its apicomesal tooth. Like P. cipoensis, the apicoventral process of the phallobase is broad and apically emarginated, but in P. verruculus sp . $n$. the process is much longer and the emargination $v$-shaped.


Figure 18. Polycentropus verruculus sp. n. Male genitalia: Alateral B dorsal $\mathbf{C}$ ventral $\mathbf{D}$ inferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ phallus, dorsal $\mathbf{G}$ phallobase, caudal $\mathbf{H}$ subphallic sclerite, caudal.

Adult. Length of forewing (male) 5.5 mm . Body pale brown to yellow; dorsum of head and thorax brown, clothed with long, erect brown setae; base of forewing with long, erect black setae, general vestiture of forewing with fine brown setae and many patches of pale setae scattered over surface; legs stramineous.

Male. Genitalia as in Fig. 18. Sternum IX in lateral view trapezoidal, slightly greater than $1 / 2$ height of segment VIII; in ventral view slightly trapezoidal, anterior corners very sharply rounded, sides slightly convex, anterior margin moderately concave, posterior margin slightly concave with small, shallow convex medial region. Terga IX + X mostly membranous with light dorsal sclerotization basally; with numerous scattered minute spicules and several long, slender setae. Intermediate appendage straight, moderate elongate, length equal to height of sternum IX, basal region simple, not expanded; in dorsal view with basal 2/3 blade-like, apical $1 / 3$ narrowed abruptly, apex acute. Mesolateral process of preanal appendage short, apex rounded, laterally with laterallydirected, setose, bulbous lobe. Mesoventral process of preanal appendage absent. Inferior appendage in lateral view short, quadrate; dorsolateral flange low, slightly rounded dorsally, with broad caudomesal spine, hidden in lateral view; mesoventral spine absent; in ventral view inferior appendage rhomboidal, broadest apically, caudomesal spine partially hidden, obtusely pointed. Phallobase moderately elongate; in lateral view apicoventral projection very broad, slightly longer than apical diameter of phallobase apex, with 2 points; separated by mesal v-shaped notch over apical $1 / 3$; endothecal sclerotic band very broad, becoming less sclerotized apically; endothecal spines absent; phallotremal sclerite narrow in dorsal aspect. Subphallic sclerite U-shaped, arms short, pedicel absent; narrow in lateral view, ventrally somewhat broadened.

Holotype male: BRAZIL: Minas Gerais: Rio Guanhães, downstream from Salto Grande dam, $19^{\circ} 06.289^{\prime} \mathrm{S}, 42^{\circ} 42.635^{\prime} \mathrm{W}, 20 . x .1998$, Paprocki (UMSP000046608) (MZUSP).

Paratype: BRAZIL: São Paulo: Altinópolis, Fazenda Sáo João da Mata, Rio Baguassu, $21^{\circ} 00.588^{\prime} \mathrm{S}, 47^{\circ} 28.900^{\prime} \mathrm{W}, 745 \mathrm{~m}, 19-21 . x i .2003$, Holzenthal, Paprocki, Calor, 1 male (UMSP)

Etymology. Diminutive form of the Latin word for wart, in reference to the wartlike structure on the preanal appendage.

## Polycentropus acinaciformis Hamilton \& Holzenthal, sp. n.

 urn:lsid:zoobank.org:act:17FF73EC-0951-40D8-AF4C-3094BAE1B8A8 Fig. 19Description. Polycentropus acinaciformis sp. n . appears to belong to the jorgenseni species complex based on the presence of the apicoventral process of the phallobase and the endothecal sclerotic band, but it lacks the intermediate appendages and there is no evidence of the subphallic sclerite. The decurved, blade-like mesolateral process of the preanal appendage as well as the shape of the inferior appendage and the claw-like process in the endotheca distinguish this species from other Neotropical Polycentropus.

Adult. Length of forewing (male) 6.5 mm . Body brown; dorsum of head and thorax brown, clothed with long, erect dark setae; base of forewing with long, erect dark setae, general vestiture of forewing with fine brown setae (in alcohol); legs brown.


Figure 19. Polycentropus acinaciformis sp. n. Male genitalia: A lateral B dorsal C ventral Dinferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ phallus, dorsal.

Male. Genitalia as in Fig. 19. Sternum IX in lateral view broadly subtriangular to oval, about $2 / 3$ height of segment VIII; in ventral view slightly trapezoidal, anterior corners very sharply rounded, sides slightly constricted mesally, anterior margin moderately concave, posterior margin shallowly concave. Terga IX + X membranous. Intermediate
appendage absent. Mesolateral process of preanal appendage very long, broadest at midpoint, apex acuminate, at base narrowly joined to dorsal portion of mesoventral process; mesoventral process directed ventrocaudad, digitate, less than $1 / 4$ length of mesolateral process. Inferior appendage in lateral view short, quadrate; dorsolateral flange very low, straight dorsally, with prominent caudomesal spine, exposed in lateral view; mesoventral spine absent; in ventral view inferior appendage broad basally, slender, tapering apically, caudomesal spine prominent, acute. Phallobase moderately elongate; in lateral view apicoventral projection narrow, approximately equal to apical diameter of phallobase apex, with 1 point; endothecal sclerotic band broad, ending in 2 recurved hooks; endothecal spines absent; phallotremal sclerite wide in dorsal aspect. Subphallic sclerite absent.

Holotype male: BRAZIL: Minas Gerais: Serra do Cipó, Capão da Mata, $19^{\circ} 19.347{ }^{\prime} \mathrm{S}, 43^{\circ} 32.249^{\prime} \mathrm{W}, 1170 \mathrm{~m}, 13-14 . i i .1998$, Holzenthal \& Paprocki (UMSP000033119) (MZUSP).

Paratype: BRAZIL: Minas Gerais: Parque Estadual do Rio Preto, trib to Rio Preto, $18^{\circ} 06.879^{\prime}$ S, $43^{\circ} 20.595^{\prime} \mathrm{W}, 700 \mathrm{~m}, 20 . \mathrm{v}$.1998 , Holzenthal \& Paprocki, 1 male (UMSP).

Etymology. From the Latin words acinaces (Greek akinakes) for scimitar and forma for shape, in reference to the sword-like shape of the mesolateral process of the preanal appendage.

## Polycentropus rosalysae Hamilton \& Holzenthal, sp. n.

 urn:lsid:zoobank.org:act:0B5B67EF-553D-4B71-B96A-A98472BB2CBC Fig. 20Description. Polycentropus rosalysae sp. n. is most similar to P. amphirhamphus sp. n . Both lack the intermediate appendage and have an ovoid inferior appendage with apicomesal spine, large triangular mesoventral process of the preanal appendage, and a strongly bifurcate apicomesal process of the phallobase. This species has the sclerotic endothecal band and the apicoventral process of the phallobase is broadly divided to its base. Further, the mesoventral process of the preanal appendage is broadly triangular and its mesolateral process is nearly square. These characters render it distinct from $P$. amphirhamphus sp. n. and other Neotropical Polycentropus.

Adult. Length of forewing (male) 6.5 mm . Body brown; dorsum of head and thorax brown, clothed with long, erect brown setae; base of forewing with long, erect brown setae, general vestiture of forewing with fine brown setae and many patches of pale setae scattered over surface; legs stramineous.

Male. Genitalia as in Fig. 20. Sternum IX in lateral view broadly subtriangular to oval, about 3/4 height of segment VIII; in ventral view trapezoidal, anterior corners very sharply rounded, sides very slightly constricted mesally, anterior margin deeply concave, posterior margin slightly concave with small, shallow convex medial region. Terga IX + X membranous. Intermediate appendage absent. Mesolateral process of preanal appendage short, apex broadly truncate, at base broadly joined to


Figure 20. Polycentropus rosalysae sp. n. Male genitalia: A lateral B dorsal $\mathbf{C}$ ventral $\mathbf{D}$ inferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ phallus, dorsal.
mesoventral process; mesoventral process directed caudad, broadly triangular, equal in length to mesolateral process. Inferior appendage in lateral view short, generally oval; dorsolateral flange low, rounded dorsally, with prominent caudomesal spine, slightly exposed in lateral view; mesoventral spine present, narrow, in lateral view acute, positioned medially; in ventral view inferior appendage quadrate, caudomesal spine mostly hidden, acute; mesoventral spine hidden. Phallobase very short; with paired apicolateral, spur-like, decurved processes on each side of phallobase
apex; endothecal sclerotic band narrow, becoming less sclerotized, broadened apically; endothecal spines absent; phallotremal sclerite wide in dorsal aspect. Subphallic sclerite absent.

Holotype male: BRAZIL: São Paulo: Parque Estadual de Campos do Jordão, Rio Galharada, $22^{\circ} 41.662^{\prime}$ S, $45^{\circ} 27.783^{\prime} \mathrm{W}, 1530 \mathrm{~m}, 4-5$.iii.1996, Holzenthal \& Guahyba (UMSP000035686) (MZUSP).

Etymology. Named with great honor for the late Dr. Rosalys Guahyba, whose friendship and help were instrumental in advancing our study of the Brazilian caddisfly fauna.

## Polycentropus amphirhamphus Hamilton \& Holzenthal, sp. n. urn:lsid:zoobank.org:act:A34C4195-7E85-4C32-B6F9-D80E6FC44C5F

 Fig. 21Polycentropus new species 8 Hamilton 1986: 149-150, 244; Fig. 7.1.
Description. This new species is similar to $P$. rosalysae in the general shape of the preanal and inferior appendages, lack of intermediate appendage, and the bifurcate apicomesal process of phallobase. The strongly bifurcate and extreme elongation of the apicomesal process of phallobase is the most distinctive feature of P. amphirhamphus sp. n., separating if from all other Neotropical Polycentropus. Additionally, the inferior appendage lacks the mesoventral spine seen in $P$. rosalysae and has a narrower mesoventral process and more ovoid mesolateral process of the preanal appendage compared to that species.

Adult. Length of forewing (male) $5.7-6.6 \mathrm{~mm}$. Body pale brown to yellow; dorsum of head and thorax brown; with long, erect setae, area of long, pale setae on vertex of head, darker on thorax; base of forewing with long, erect dark setae, general vestiture of forewing with fine brown setae and many patches of pale setae scattered over surface; legs brown.

Male. Genitalia as in Fig. 21. Sternum IX in lateral view teardrop-shaped, about 2/3 height of segment VIII; anterior corners broadly rounded, sides very slightly constricted mesally, anteriorly, anterior margin moderately concave, posterior margin slightly concave with small, shallow convex medial region. Terga IX + X membranous. Intermediate appendage absent. Mesolateral process of preanal appendage short, apex broadly triangular, at base broadly joined to dorsal $2 / 3$ of mesoventral process; mesoventral process directed caudad, very broad basally, narrowing rapidly to slender process, slightly exceeding length of mesolateral process. Inferior appendage in lateral view short, generally round; dorsolateral flange low, rounded dorsally, with prominent caudomesal spine, partially exposed in lateral view; mesoventral spine absent; in ventral view inferior appendage approximately oval, caudomesal spine prominent, rounded. Phallobase moderately elongate; with paired apicolateral, blade-like, decurved processes on each side of slightly compressed phallobase apex; endothecal sclerotic band


Figure 21. Polycentropus amphirhamphus sp. n. Male genitalia: A lateral B dorsal C ventral D inferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ phallus, dorsal.
absent; endothecal spines absent; phallotremal sclerite narrow in dorsal aspect. Subphallic sclerite absent.

Holotype male: BRAZIL: Rio de Janeiro: Nova Friburgo, municipal water supply, 950 m, 20.iv.1977, C.M. \& O.S. Flint, Jr. (UMSP000131231) (in alcohol). (NMNH).

Paratypes: BRAZIL: same data as holotype, 1 male (in alcohol) (NMNH); same, except 24.iv.1977, 1 male (NMNH); Santa Catarina: Urubici, Morro da Igreja, Cachoeira Veu da Noiva, $28^{\circ} 04.595^{\prime}$ S, $49^{\circ} 31.090^{\prime}$ W, 1300 m, 5.iii.1998, Holzenthal, Froehlich, Paprocki, 2 males; Sáo Paulo: Parque Estadual de Campos do Jordão, Rio Galharada, $22^{\circ} 41.662^{\prime} \mathrm{S}, 45^{\circ} 27.783^{\prime} \mathrm{W}, 1530 \mathrm{~m}, 13-15 . \mathrm{ix} .2002$, Blahnik, Prather, Melo, Huamantinco, 6 males (UMSP), 1 male (in alcohol) (MZUSP); Estação Biológica Boraceia, Rio Venerando, $23^{\circ} 39.185^{\prime} \mathrm{S}, 45^{\circ} 53.414^{\prime} \mathrm{W}, 850 \mathrm{~m}$, Blahnik, Prather, Melo, Froehlich, Silva, 1 male (in alcohol) (UMSP).

Etymology. From the Greek amphi for double and rhamphos for a curving beak or bill, in reference to the long, paired beaklike processes on the phallobase of the male genitalia.

## Polycentropus cachoeira Hamilton \& Holzenthal, sp. n. urn:lsid:zoobank.org:act:5A9E2969-A3D3-4001-BF8B-29AE7074D030

 Fig. 22Description. Polycentropus cachoeira sp. n. has some similarity to other Brazilian Polycentropus of the jorgenseni species complex. Most notable is the general shape of the phallus and its sclerotic endothecal band as well as the shape of the inferior appendage which resembles that of P. tripui except that it is more elongated in P. cachoeira sp. n . This species lacks the intermediate appendage and the subphallic sclerite found in other members of the species complex. Polycentropus cachoeira sp. n. is very similar to P. inusitatus sp. n. in the shape of most of the genitalic structures including a pair of large endothecal spines. The 2 species are reliably separated by details of the preanal appendage and phallus. The mesolateral and mesoventral processes of the preanal appendage are equally long in lateral view and broadly fused in P. cachoeira sp. n., while in P. inusitatus sp. n. the mesoventral process is markedly shorter and not so completely fused to the mesolateral process as seen in dorsal view. In P. cachoeira sp. n., the apicoventral process of the phallobase is undivided and there is an endothecal sclerotic band, whereas in P. inusitatus sp. n. the apex of the process is divided and the endothecal band is absent.

Adult. Length of forewing (male) 5 mm . Body brown to dark brown; dorsum of head and thorax brown, clothed with long, erect brown setae; base of forewing with long, erect brown setae, general vestiture of forewing with fine brown setae and many patches of pale setae scattered over surface; legs stramineous.

Male. Genitalia as in Fig. 22. Sternum IX in lateral view broadly subtriangular, about $2 / 3$ height of segment VIII; in ventral view slightly trapezoidal, anterior corners very broadly rounded, sides slightly constricted anteriorly, anterior margin nearly straight, posterior margin slightly concave with small, shallow convex medial region. Terga IX + X membranous, dorsum with several long, slender setae. Intermediate appendage absent. Mesolateral process of preanal appendage short, apex rounded, with acute caudal point, at base broadly joined to dorsal $1 / 2$ of mesoventral process; mesoventral process directed caudad, size and shape of mesolateral process, equal in length


Figure 22. Polycentropus cachoeira sp. n. Male genitalia: A lateral B dorsal $\mathbf{C}$ ventral $\mathbf{D}$ inferior appendages, caudal $\mathbf{E}$ phallus, lateral $\mathbf{F}$ phallus, dorsal.
to mesolateral process. Inferior appendage in lateral view moderately long, rhomboidal; dorsolateral flange low, straight dorsally, with prominent caudomesal spine, exposed in lateral view; mesoventral spine absent; in ventral view inferior appendage quadrate, caudomesal spine prominent, acute. Phallobase moderately elongate; in lateral view apicoventral projection broad, slightly longer than apical diameter of phallobase apex,
with 1 point; endothecal sclerotic band very broad, becoming less sclerotized apically; with pair of large endothecal spines; phallotremal sclerite wide in dorsal aspect. Subphallic sclerite absent.

Holotype male: BRAZIL: Santa Catarina: Urubici, Cachoeira Avencal, $28^{\circ} 02.839^{\prime}$ S, $49^{\circ} 36.997^{\prime}$ W, 1260 m , 6.iii.1998, Holzenthal, Froehlich, Paprocki (UMSP000033106) (MZUSP).

Paratypes: same data as holotype, 2 males (UMSP).
Etymology. Cachoeira is Portuguese for cascade or waterfall, in reference to the habitat where the species was collected.

## Polycentropus inusitatus Hamilton \& Holzenthal, sp. n. <br> urn:lsid:zoobank.org:act:C77C7962-C590-416E-8017-3ADA378D8011

Fig. 23
Polycentropus new species 9 Hamilton 1986: 140-142, 239; Fig. 6.45.
Description. Polycentropus inusitatus sp. n. is most similar to $P$. cachoeira, but may be differentiated from it by the absence of the endothecal sclerotic band, the divided apicoventral process of the phallobase, and the shorter mesoventral process of the preanal appendage.

Adult. Length of forewing (male) $5.5-5.8 \mathrm{~mm}$. Body brown; dorsum of head and thorax dark brown; forewings nearly denuded, membrane pale brown with white areas at $r-m, m, m-c u$ crossveins (in alcohol); legs paler apically.

Male. Genitalia as in Fig. 23. Sternum IX in lateral view trapezoidal, about 2/3 height of segment VIII; in ventral view slightly trapezoidal, anterior corners nearly angular, sides constriction anteriorly, anterior margin nearly straight, posterior margin slightly concave with very broad, shallow convex medial region. Terga IX + X membranous. Intermediate appendage absent. Mesolateral process of preanal appendage short, apex rounded, shorter ventrally, at base broadly joined to mesoventral process; mesoventral process directed caudad, broadly truncate, about $1 / 2$ length of mesolateral process. Inferior appendage in lateral view moderately long, rhomboidal; dorsolateral flange low, straight dorsally, with prominent caudomesal spine, exposed in lateral view; mesoventral spine absent; in ventral view inferior appendage rhomboidal, caudomesal spine prominent, acute. Phallobase short; in lateral view apicoventral projection broad, slightly shorter than diameter of apical diameter of phallobase apex, with 2 points; separated by narrow mesal split dividing apical $1 / 2$; endothecal sclerotic band absent; with pair of large endothecal spines; phallotremal sclerite narrow in dorsal aspect. Subphallic sclerite U-shaped, arms long, pedicel absent; very narrow in lateral view.

Holotype male: BRAZIL: Rio de Janerio: Brejo da Lapa, Itatiaia, Coll. Museum Nacional, R. J., no date (NMNH).

Paratype: same data as holotype, 1 male (NMNH).


Figure 23. Polycentropus inusitatus sp. n. Male genitalia: $\mathbf{A}$ lateral $\mathbf{B}$ dorsal $\mathbf{C}$ ventral $\mathbf{D}$ phallus, lateral $\mathbf{E}$ phallus, dorsal $\mathbf{F}$ subphallic sclerite, caudal.

The holotype and the paratype were sent to the senior author by Luiz S. W. Terra, Estacao Aquicola, Vila do Conde, Portugal.

Etymology. Latin for rare, uncommon, or unusual, in reference to our knowledge of only 2 specimens.

## Polycentropus paprockii Hamilton \& Holzenthal, sp. n.

 urn:lsid:zoobank.org:act:E26A63F6-3CC4-4913-96CC-8956F7E65F03Fig. 24
Description. Polycentropus paprockii sp. n. has several characteristics that suggest similarity to the 7 species of the urubici cluster. In particular, this similarity is suggested by the shape of the inferior appendage in all aspects, the notched apex of the apicoventral process of the phallobase, and the shape of the preanal appendage in dorsal view.


Figure 24. Polycentropus paprockii sp. n. Male genitalia: A lateral (inset, variant, inferior appendage, apex) $\mathbf{B}$ dorsal $\mathbf{C}$ ventral $\mathbf{D}$ inferior appendages, caudal $\mathbf{E}$ phallus, lateral (inset, apicoventral projection of phallobase, caudal) $\mathbf{F}$ phallus, dorsal $\mathbf{G}$ subphallic sclerite, caudal.

Polycentropus paprockii sp. n. lacks the endothecal sclerotic band, but has 2 prominent endothecal spines, which are not found in these other species. The species also lacks the intermediate appendage and the mesolateral process of the preanal appendage is not digitate as in species of the urubici cluster.

Adult. Length of forewing (male) 5-5.5 mm. Body brown; dorsum of head and thorax brown, clothed with long, erect brown setae; base of forewing with long, erect brown setae, general vestiture of forewing with fine brown setae and many patches of pale setae scattered over surface; legs stramineous.

Male. Genitalia as in Fig. 24. Sternum IX in lateral view subtriangular, about 2/3 height of segment VIII; in ventral view quadrate, anterior corners broadly rounded, sides slightly constricted posteriorly, anterior margin very shallowly concave, posterior margin moderately concave with small, shallow convex medial region. Terga IX + X membranous. Intermediate appendage absent. Mesolateral process of preanal appendage moderately long, apex triangular, expanded basally, at base broadly joined to dorsal $2 / 3$ of mesoventral process; mesoventral process directed caudad, broadly digitate, about $1 / 2$ length of mesolateral process. Inferior appendage in lateral view moderately long, somewhat triangular; posteroventral margin acute below shallow caudal emargination; dorsolateral flange low, slightly excavated medially, apically tapered to sharp, inturned point, with broad caudomesal spine, exposed in lateral view; mesoventral spine present, broad, in lateral view obtuse, positioned medially; caudomesal spine forming broad triangular base, obtusely pointed; mesoventral spine with apex visible; apex acute. Phallobase very short; in lateral view apicoventral projection moderately broad, slightly shorter than diameter of apical diameter of phallobase apex, with 2 points; separated by shallow median groove; endothecal sclerotic band absent; with pair of large endothecal spines; phallotremal sclerite wide in dorsal aspect. Subphallic sclerite U-shaped, arms long, pedicel short, broad; very narrow in lateral view.

Holotype male: BRAZIL: Minas Gerais: Parque Estadual do Rio Preto, Rio Preto, $18^{\circ} 06.993^{\prime} \mathrm{S}, 43^{\circ} 20.373^{\prime} \mathrm{W}, 650 \mathrm{~m}, ~ 19 . v .1998$, Holzenthal \& Paprocki (UMSP000033123) (MZUSP).

Paratypes: BRAZIL: Minas Gerais: Same data as holotype, 1 male (UMSP); Serra do Cipó, Capão da Mata, $19^{\circ} 19.347^{\prime}$ S, $43^{\circ} 32.249^{\prime} \mathrm{W}, 1170 \mathrm{~m}, 13-14.1 i .1998$, Holzenthal \& Paprocki, 1 male (UFBA); same, except $18^{\circ} 07^{\prime} 50^{\prime \prime} \mathrm{S}, 43^{\circ} 20^{\prime} 15^{\prime \prime} \mathrm{W}, 791 \mathrm{~m}$, 12.x. 2000 m, Paprocki, Amarante, Salgado, 1 male, 2 females (in alcohol) (MZUSP); same, except trib. to Rio Preto, $18^{\circ} 06.879$ 'S, $43^{\circ} 20.595^{\prime} \mathrm{W}, 700 \mathrm{~m}, 14 . x i .2001$, Holzenthal \& Paprocki, 1 male, 1 female (UMSP); spring trib. to Rio Macauba, near Pandeiros, $15^{\circ} 28.637^{\prime} \mathrm{S}, 44^{\circ} 44.627^{\prime} \mathrm{W}, 525 \mathrm{~m}$, Paprocki \& Blahnik, 1 male (in alcohol) (UFRJ); Rio Sáo Francisco @ BR 135, 8 km S Januaria, $15^{\circ} 35.823^{\prime} \mathrm{S}, 44^{\circ} 23.396^{\prime} \mathrm{W}$, 480 m , Holzenthal, Blahnik, Paprocki, Amarante, 2 males (in alcohol) (UMSP).

Etymology. Named in honor of the collector, Dr. Henrique Paprocki, professor of biology at the Pontifícia Universidade Católica de Minas Gerais, Belo Horizonte, Brazil; in recognition of his contribution to our knowledge of Brazilian caddisflies.

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caddisfly research at the University of Minnesota. As such, many people have contributed during the many manifestations of this project. For the species described in the senior author's dissertation, we acknowledge the substantial assistance and hospitality of Oliver S. Flint, Jr. and his wife Carol who collected and gathered many of the specimens as well as giving openly of their home during visits to the National Museum of Natural History. Also greatly appreciated is the support and encouragement provide by John C. Morse during the development, research, and writing of the dissertation by the senior author while at Clemson University, Clemson, South Carolina.

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## References

Angrisano EB, Sganga JV (2009) Two new species of Trichoptera from Salto Encantado Provincial Park (Misiones Province, Argentina). Aquatic Insects 31: 271-278.
Barba-Alvarez R, Bueno-Soria JL (2005) New species of the genus Polycentropus Curtis (Trichoptera: Polycentropodidae) from Mexico. Proceedings of the Entomological Society of Washington 107: 663-670.
Chamorro ML, Holzenthal RW (2010) Taxonomy and phylogeny of New World Polyplectropus Ulmer, 1905 (Trichoptera: Psychomyioidea: Polycentropodidae) with the description of 39 new species. Zootaxa 2582: 1-252.
Chamorro-Lacayo ML (2003) Seven new species of Polycentropodidae (Trichoptera) from Nicaragua and Costa Rica. Proceedings of the Entomological Society of Washington 105: 484-498.
Flint OS Jr, Holzenthal RW, Harris SC (1999) Catalog of the Neotropical Caddisflies (Trichoptera). Special Publication, Ohio Biological Survey, Columbus, Ohio, 239 pp.
Flint OS Jr, Sykora JL (2004) Caddisflies of Hispaniola, with special reference to the Dominican Republic (Insecta: Trichoptera). Annals of Carnegie Museum 73: 1-60.
Hamilton SW (1986) Systematics and biogeography of the New World Polycentropus sensu lato (Trichoptera: Polycentropodidae). PhD dissertation, Clemson, South Carolina, United States: Clemson University.
Hamilton SW, Holzenthal RW (2005) Five new species of Polycentropodidae (Trichoptera) from Ecuador and Venezuela. Zootaxa 810: 1-14.

Holzenthal RW, de Almeida GL (2003) New species of Polycentropodidae (Trichoptera) from southeastern and southern Brazil. Proceedings of the Entomological Society of Washington 105: 22-29.
Holzenthal RW, Andersen T (2004) The caddisfly genus Triaenodes in the Neotropics (Trichoptera: Leptoceridae). Zootaxa 511: 1-80.
Paprocki H, Holzenthal RW, Blahnik RJ (2004) Checklist of the Trichoptera (Insecta) of Brazil I. Biota Neotropica 4: 1-22.

# The species of the Neotropical genus Fractipons Townes, 1970 (Hymenoptera, Ichneumonidae, Cryptinae) 

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#### Abstract

In this paper, two new species of the Neotropical genus Fractipons Townes, 1970 (Hymenoptera, Ichneumonidae) are described. A new diagnosis for the genus, a re-description of Fractipons cincticornis Townes, 1970 and a key to known species are provided. New distribution records for the genus now include Argentina, Costa Rica, Panama and Peru.


## Keywords

Fractipons, new species, Hymenoptera, Ichneumonidae, Cryptinae, taxonomy, key

## Introduction

Fractipons Townes, 1970 is a small, little known Neotropical genus of Ichneumonidae of the subfamily Cryptinae belonging to the Chiroticina sensu Townes (1970). This subtribe was considered by Townes to be the most 'natural' of the subtribes, but subtribes of Phygadeuontini are currently not recognised (Yu et al. 2005) and recent
studies based on molecular methods discourage the use of the traditional subtribes of Townes (Laurenne et al. 2006). Nevertheless, no new regrouping of genera based on phylogenetic criteria has been proposed for Phygadeuontini, so we consider "Chiroticina" sensu Townes as a framework for the taxonomic position of Fractipons, based on the presence of an isolated mesopleural pit, which is the strongest single feature that characterizes this group (Townes 1970). Fractipons is close to Epelaspis Townes, 1970 and Mamelia Seyrig, 1952, in having the genal portion of the occipital carina reaching the base of the mandible, the median lobe of the mesoscutum without a median longitudinal groove, and the posterior transverse carina of the mesosternum interrupted in front of the mid coxae, but Fractipons is easily distinguishable from them by the apical transverse carina of the propodeum, strong and abruptly interrupted in the centre and forming lateral flat crests (Fig. 1). There is only one described species, the type species Fractipons cincticornis Townes, 1970 from Brazil (Townes 1970), but Townes also mentioned two more species that remained undescribed. Nothing is known about the biology of this genus. The aim of this work is to describe these two new species and to provide a key to the known species.

## Material and methods

In this work, sixty-five specimens preserved in the American Entomological Institute (Gainesville, Florida, USA), in the Florida State Collection of Arthropods (Department of Agriculture, Gainesville, Florida, USA) and in INBio (Santo Domingo de Heredia, Costa Rica), including type material of Fractipons cincticornis, have been studied. Morphological terminology follows Gauld (1991). Measurements used in descriptions were made as follows: head width is the maximum distance between the outline of the eyes in dorsal view; head length is measured from the anterior edge of the eye to the hind edge of the gena; body length is approximate because specimens are rarely in a natural position on pins (in females, ovipositor length is excluded). For the same reason we did not measure the length of the metasoma. Terminology used for describing body surface sculpture is based on Harris (1979). Townes (1970) described Fractipons based on his Lissaspis description, pointing out the differing characters. We provide a complete characterization of the genus based on Townes (1970) and new features.

Images were made with an Olympus M1060 digital camera attached to a Leica MZ12 stereomicroscope. The SEM images were taken using an Hitachi S-3000N (in low vacuum mode) in the University of Alicante, Spain.

The master map for distribution area was downloaded from http://picses.eu/ image/8730bd0d/

Type material is deposited in the entomological collections of the American Entomological Institute (AEIC), the Instituto Nacional de Biodiversidad (INBio), University of Alicante (Alicante, Spain, CEUA) and in the Florida State Collection of Arthropods (FSCA).

## Results

Fractipons Townes, 1970
Type species: Fractipons cincticornis Townes, 1970. Memoirs of the American Entomological Institute 12: 14. Holotype, $q$.

Diagnosis. Mesopleural impression below speculum consisting of an isolated pit which is some distance in front of mesopleural suture. Occipital carina reaching base of mandible. Median lobe of mesoscutum without median longitudinal groove. Posterior transverse carina of the mesosternum interrupted in front of mid coxae. Apical transverse carina of propodeum strong, abruptly interrupted medially and forming lateral flat crests (Fig. 1).

Description. Body moderately slender, $4.8-7.1 \mathrm{~mm}$, mostly smooth and polished. Head transverse. Flagellomeres of female conspicuously thickened from third flagel-


Figures I-3. Fractipons spp. I Propodeum of $F$. dasyscutum sp. n., dorsal view 2 Ventral flat part of female flagellum of $F$. cincticornis $\mathbf{3}$ Ovipositor tip of $F$. cincticornis, lateral view.
lomere, slightly thin towards apex, from tenth to penultimate flattened below; in this flat area with conspicuous setiferous sensillae (Fig. 2). Lower face finely and densely punctate, with small central prominence. Clypeus rather wide, apical margin sharp, straight or slightly arcuate. Malar space forming wide and deep granulate area (Figs 16, 18, 20). Mandible moderately tapered to apex, lower tooth shorter than upper tooth. Maxillary palpus reaching to ventral part of epicnemial carina. Occipital carina joining base of mandible, nearly angular on mid-dorsal part. Pronotal transverse groove without median longitudinal ridge. Epomia absent. Median lobe of mesoscutum without median longitudinal groove. Notauli rather weak, about $0.3-0.7$ as long as mesoscutum. Precutellar groove without traces of longitudinal carinae. Scutellum moderately convex, polished and smooth or very sparsely punctate, lateral carinae strong, extending about $0.8-0.9$ its length. Mesopleuron completely smooth and polished. Mesopleural impression below speculum consisting of an isolated pit some distance in front of mesopleural suture. Sternaulus weak on anterior 0.3-0.5, nearly absent posteriorly. Epicnemial carina reaching $0.7-0.9 \times$ height of mesopleuron, at upper margin weak or absent. Posterior transverse carina of mesosternum widely interrupted in front of each mid coxa, laterally elevated forming strong flat crest. Areolet open. Ramulus absent. Vein $2 m-c u$ weakly inclivous, with two bullae. Vein $c u-a$ opposite $R s+M$ or slightly basal. Hind wing with $M+C u$ moderately curved at apical 0.5 . Abscissa of $M+C u$ between $M$ and $C u_{1}$ longer than $c u-a$, strongly inclivous, $c u-a$ reclivous. Propodeum with anterior transverse carina strong and complete. Apical transverse carina of propodeum strong and abruptly interrupted medially, forming lateral flat crests (Fig. 1). Lateral longitudinal carina of propodeum only present apically, distad of crests. Lateromedian carina partially present in area basalis. Area superomedia absent. Pleural carina rounded and strong. Submetapleural carina forming anterior flat crest. Juxtacoxal carina absent. Propodeal spiracle elongate. First metasomal tergite smooth and polished, sometimes with sparse setiferous punctures, dorsally, laterally, upper face weakly convex, median dorsal and lateral carinae absent. Spiracle at the apical 0.46 . Postpetiole about $0.7-0.8$ times as long as maximum width (measured dorsally). Tergites 2-7 smooth and shiny with fine setiferous punctures. Epipleura of tergites 2 and 3 separated by crease, of tergite 4 not separated. Gastrocoelus wider than long, thyridium finely granulate. Ovipositor straight, with nodus, upper valve with five dorsal teeth, lower valve with three oblique notches and 4-5 small complete and transverse apical teeth (Fig. 3).

## Key to the species of Fractipons

1 Females (with conspicuous ovipositor)........................................................ 2

- Males............................................................................................................ 4

2 Mesoscutum with very dense setae (Fig. 10). Malar space about 0.7-0.8 times width of mandible base (Fig. 16). Lower rim of mandible expanded at base with rounded translucent area (Fig. 16) F. dasyscutum sp. n.

- Mesoscutum smooth and shiny, sometimes with sparse, short setae (Fig. 12) or more dense, long setae (Fig. 14). Malar space about 0.5 times width of
mandible base (Figs 18, 20). Basal, lower rim of mandible without conspicu-
ous translucent area.................................................................................. 3
3 Head black, mesosoma and metasoma orange (Fig. 4). Occipital carina conspicuously elevated, at least in genal section (Fig. 18). Mesoscutum with moderately sparse, long setae (Fig. 14) ...................... F. cincticornis Townes
- Body entirely yellow-orange (Fig. 7). Occipital carina not conspicuously elevated (Fig. 20). Mesoscutum smooth, sometimes with short and sparse setae (Fig. 12)
F. glabriusculus sp. n. Flagellum black with white band on segments 7(8)-12(13). Head black, mesosoma and metasoma orange, sometimes front part of mesosoma brownish (Fig. 5) F. cincticornis Townes
- Flagellum black, dark brown or partially orange at base, never with a white band. Body entirely orange (Figs 6, 9) .5
5 Mesoscutum with very dense setae (Fig. 11). Head in lateral view with upper part of gena straight and abruptly reduced (Fig. 24). Malar space about $0.6-$ 0.8 times width of mandible base (Fig. 17). Lower rim of mandible expanded at base, with rounded, translucent area (Fig. 17)...........F. dasyscutum sp. n.
- Mesoscutum smooth and shiny, sometimes with some short, sparse setae anteriorly (Fig. 13). Head in lateral view with upper part of gena rounded. (Fig. 25). Malar space about 0.3-0.4 times width of mandible base (Fig. 21). Basal, lower rim of mandible without conspicuous translucent area.
F. glabriusculus sp. n.


## Fractipons cincticornis Townes, 1970

Fractipons cincticornis Townes, 1970. Memoirs of the American Entomological Institute 12: 14. Holotype, $q$.

Diagnosis. Mesoscutum smooth and shiny, with moderately sparse long setae (Figs 14, 15). Malar space about $0.4-0.5$ times width of mandible base (Figs 18, 20). Basal lower rim of mandible without conspicuous translucent area. Head black, mesosoma and metasoma orange, sometimes front part of mesosoma brownish. Both male and female with white band on flagellomeres $7(8)-12(13)$ and $4-8$, respectively (Figs 4, 5). Occipital carina conspicuously elevated, at least in ventral section (Figs 18, 19).

Description. Female: Body length $6.0-7.1 \mathrm{~mm}$. Head $0.8-0.9 \mathrm{~mm}$ long, $1.4-1.8$ mm wide. Mesosoma $2.2-2.8 \mathrm{~mm}$ long, $1.0-1.3 \mathrm{~mm}$ wide (mesoscutum). Fore wing $4.7-6.0 \mathrm{~mm}$ long. Petiole $1.1-1.5 \mathrm{~mm}$ long. Ovipositor sheath $1.5-2.1 \mathrm{~mm}$ long.

Head: Transverse, 1.7-1.9 times as wide as long, mostly smooth and shiny, strongly constricted behind compound eyes. Antenna with 26-28 flagellomeres, conspicuously thickened from third flagellomere, slightly thin towards apex. First flagellomere 4.7-6.0 times as long as maximum width; flagellomeres from tenth to penultimate flattened below; in this flat area with conspicuous setiferous sensillae (Fig. 2). Gena


Figures 4-9. Habitus of Fractipons spp., lateral view. 4-5 F. cincticornis $\mathbf{4}$ female $\mathbf{5}$ male. 6-7 F. glabriusculus sp. n. $\mathbf{6}$ paratype male $\mathbf{7}$ holotype female. 8-9 F. dasyscutum sp. n. $\mathbf{8}$ holotype female $\mathbf{9}$ paratype male.


Figures I0-I5. Mesosoma, dorsal view. I0-II F. dasyscutum sp. n. $\mathbf{I O}$ female II male. I2-I3 F. glabriusculus sp. n. $\mathbf{1 2}$ female $\mathbf{1 3}$ male. $\mathbf{1 4 - 1 5}$ F. cincticornis $\mathbf{1 4}$ female $\mathbf{1 5}$ male.
$0.2-0.3$ times as long as eye (in dorsal view), with fine and dense setiferous punctures on lower half, upper part in lateral view nearly straight, strongly constricted. Occiput strongly depressed in centre. Lower face finely and densely punctate, with small central prominence, clypeus rather wide, almost flat, apical margin straight or slightly arcuate. Malar space with wide granulate groove, about $0.5-0.6$ times width of mandible base (Fig. 18). Posterior ocellus separated from eye by about 1.2-1.3 times its diameter. Space between posterior ocelli $0.6-0.8$ times their diameter. Occipital carina reaching base of mandible, conspicuously elevated, at least in genal section (Fig. 18), nearly


Figures 16-21. Head, frontal view. 16-I7 $F$. dasyscutum sp. n. (position of translucent area in mandible arrowed) $\mathbf{1 6}$ female $\mathbf{1 7}$ male. $\mathbf{1 8}-\mathbf{1 9}$ F cincticornis (occipital carina arrowed) $\mathbf{1 8}$ female $\mathbf{1 9}$ male 20-21 $F$ glabriusculus sp. n. (occipital carina arrowed) $\mathbf{2 0}$ female 21 male.
angular medially, dorsally. Mandible moderately tapered to apex, lower tooth shorter than upper tooth, finely granulate on basal half (Fig. 18). Maxillary palpus reaching to ventral part of epicnemial carina.

Mesosoma: Pronotal transverse groove without median longitudinal ridge. Epomia absent. Mesoscutum smooth and shiny with moderately sparse long setae (Fig. 14). Median lobe of mesoscutum without median longitudinal groove. Notauli slightly indicated anteriorly. Prescutellar groove without traces of longitudinal carinae. Scutel-
lum moderately convex, polished and smooth or very sparsely punctate, lateral carinae strong, extending about 0.8-0.9 its length. Mesopleuron completely smooth and polished. Mesopleural impression below speculum consisting of an isolated pit some distance in front of mesopleural suture. Sternaulus weak on anterior $0.3-0.4$, nearly absent posteriorly. Epicnemial carina reaching 0.8 times height of mesopleuron, weak or absent dorsally. Posterior transverse carina of mesosternum widely interrupted in front of each mid coxa, laterally elevated as flat low crest. Areolet of fore wing open. Marginal cell 2.8-3.0 times as long as deep. Ramulus absent. Vein $2 m-c u$ weakly inclivous, with two bullae. Vein cu-a opposite $R s+M$ or slightly basal. Abscissa of $\mathrm{Cu}_{1}$ between $1 m-c u$ and $C u_{1 a} 1.6-1.9$ times length of $C u_{1 b}$, both clearly inclivous. Hind wing with $M+C u$ moderately curved at apical 0.5 . Abscissa of $M+C u$ between $M$ and $C u_{1}$ strongly inclivous, $1.1-1.3$ times as long as $c u-a$ which is strongly reclivous. Hind femur about 5.1-5.3 as long as high. Propodeum with anterior transverse carina strong and complete, posterior transverse carina centrally absent and forming broad, low, flat crest, lateral longitudinal carina only present apically, distad of crests. Lateromedian carina partially present in area basalis. Area superomedia absent. Pleural carina rounded and strong. Submetapleural carina forming an anterior strong, flat crest. Juxtacoxal carina absent. Propodeal spiracle strongly elongate.

Metasoma: First metasomal tergite smooth and polished, sometimes with sparse setiferous punctures dorsally, laterally. Median dorsal and lateral carinae absent. Postpetiole about $0.7-0.8$ times as long as maximum width (measured dorsally). Second and remaining tergites polished, with very weak dense setiferous punctures. Gastrocoelus wider than long, thyridium finely granulate. Ovipositor straight, with nodus and five dorsal apical teeth on upper valve, lower valve with three oblique notches and $4-5$ small complete and transverse apical teeth (Fig. 3). Ovipositor sheaths 0.6-0.8 times as long as hind tibia.

Colour: Mesosoma and metasoma entirely yellowish orange. Head dark brown to black (Fig. 4). Mandibles, except base and teeth, clypeus apically, scape and pedicel and usually two spots on frontal orbits yellow or orange. Flagellum brown to blackish with a white band on flagellomeres $4-8$. Sometimes lower face partially orange tinged. Wing membrane with fine yellowish tinge (Fig. 4).

Male: Body length $6.0-7.0 \mathrm{~mm}$. Head $0.7-0.8 \mathrm{~mm}$ long and $1.3-1.6 \mathrm{~mm}$ wide. Mesosoma 2.0-2.6 mm long, $1.0-1.2 \mathrm{~mm}$ wide (maximum width of mesoscutum). Fore wing $4.8-5.3 \mathrm{~mm}$ long. Petiole $1.0-1.3 \mathrm{~mm}$ long.

Similar to female except as follows:
Head: Transverse, 1.9-2.0 times as wide as long, moderately constricted behind compound eyes. Antenna with 27-28 segments. Flagellum filiform, slightly tapered towards apex, first flagellomere 5.1-5.7 times as long as maximum width. Tyloids narrow and elevated on flagellomeres $11(12)-13(14,15)$, moderately wide at base (Figs 26, 27), with small secretory pores on top (see Isidoro et al. 1996; Bin et al. 1999; Bordera and Hernández-Rodríguez 2003; Steiner et al. 2010). Gena in dorsal view, rounded, $0.4-0.5$ times as long as eye, upper part less constricted. Malar space about 0.4-0.5 times as wide as basal width of mandible (Fig. 19). Posterior ocellus separated from


Figures 22-25. Head, lateral view (upper part of gena arrowed). 22-23 Females $\mathbf{2 2} F$. dasyscutum sp. n. $\mathbf{2 3}$ F. glabriusculus sp. n., 24-25 Males $\mathbf{2 4}$ F. dasyscutum sp. n. $\mathbf{2 5}$ F. glabriusculus sp. n.
eye by about 1.3-1.5 times its diameter. Space between posterior ocelli $0.5-0.6$ times their diameter.

Mesosoma: Marginal cell 2.8-3.1 times as long as deep. Abscissa of $M+C u$ between $M$ and $C u_{1}$ strongly inclivous, 1.3-1.6 times as long as $c u-a$, which is strongly reclivous. Hind femur about 5.5-5.7 as long as high.

Metasoma：Postpetiole 0．8－1．0 times as long as wide．Second and remaining ter－ gites with dense，fine setiferous punctures．

Colour：Antenna entirely dark brown with white ring on flagellomeres 7（8） $-12(13)$ ．Head black，sometimes widely yellowish or orange on lower face and／or on scape and pedicel below and／or also with two orange spots on facial orbits and frontal orbits．Pronotum dorsally and meoscutum brown to dark brown．Metasoma some－ times from postpetiole to at least tergite 5 brown－orange．Wing membrane with fine yellowish tinge（Fig．5）．

Material examined．Type material．Holotype female with labels as follows：Brazil， Teresópolis，13－III－1966，H．\＆M．Townes（AEIC）．Paratypes：Brazil， 1 §＇，Teresópolis， 9－III－1966，H．\＆M．Townes； $1 \sigma^{\top}$ ，same locality，10－III－1966，H．\＆M．Townes； 1 中， 2 ふた，same locality，11－III－1966，H．\＆M．Townes； 1 §，Campiña Grande near Cu－ ritiba，14－II－1966，H．\＆M．Townes； 1 中， 1 §，Rio de Janeiro，5－III－1966，H．\＆M． Townes； 1 \＆，Nova Teutonia，Santa Catarina，17－X－1952，Fritz Plaumann（all AEIC）．
 renga； 2 ふすべ，same locality，IX－1969，M．Avarenga； 2 ぶず，same locality，I－1972，M． Alvarenga（all AEIC）； $1 \jmath^{\lambda}$ ，S．Bocaina， 1650 m，S．J．Barreiro，XI－1968，Alvarenga \＆ Seabra（CEUA）．

Distribution．Brazil（Fig．32）．

## Fractipons glabriusculus sp．n．

urn：lsid：zoobank．org：act：FF28BED0－FF1F－47B5－B9AB－F26DA1DD5953

Diagnosis．Mesoscutum smooth and shiny，sometimes with some isolated，short setae （Figs 12，13）．Head in lateral view with upper part of gena rounded（Figs 23，25）． Female malar space 0.5 times width of mandible base（Fig．20），in male 0．3－0．4 times （Fig．21）．Body entirely yellow－orange，rarely in males darkened dorsally（Figs 6，7）． Flagellum dark brown to black，in female with wide band on flagellomeres 4－7（Fig． 7），male always without this band（Fig．6）．Occipital carina not conspicuously elevated （Figs 20，21）．

Description．Female：Body length $4.8-6.2 \mathrm{~mm}$ ．Head $0.6-0.8 \mathrm{~mm}$ long， $1.2-1.5$ mm wide．Mesosoma $1.8-2.1 \mathrm{~mm}$ long， $1.0-1.1 \mathrm{~mm}$ wide（mesoscutum）．Fore wing $4.4-4.8 \mathrm{~mm}$ long．Petiole $1.0-1.1 \mathrm{~mm}$ long．Ovipositor sheath $1.4-1.5 \mathrm{~mm}$ long．

Head：Transverse， 1.9 times as wide as long，mostly smooth and shiny，constricted and slightly rounded behind compound eyes．Antenna with 25 flagellomeres，conspic－ uously thickened from third flagellomere，slightly thin towards apex．First flagellomere 4．5－5．5 times as long as maximum width，flagellomeres from tenth to penultimate flattened below，in this flat area with conspicuous setiferous sensillae．Gena $0.25-0.35$ times as long as eye（in dorsal view），upper part in lateral view rounded（Fig．23）．Oc－ ciput moderately depressed in centre．Lower face finely，densely punctate，with small central prominence，clypeus rather wide，weakly convex，apical margin slightly arcuate． Malar space with wide granulate groove，about 0.5 times width of mandible base（Fig．


Figures 26-3 I. Male antenna. 26-27 F. cincticornis $\mathbf{2 6}$ tyloids on flagellum $\mathbf{2 7}$ tyloid strongly magnified, 28-29 F. glabriusculus sp. n. 28 tyloids on flagellum 29 tyloid strongly magnified, 30-3I F. dasyscutum sp. n. $\mathbf{3 0}$ tyloids on flagellum $\mathbf{3 1}$ tyloid strongly magnified.
20). Posterior ocellus separated from eye by about 1.3-1.4 times its diameter. Space between posterior ocelli $0.6-0.7$ times their diameter. Occipital carina joining base of mandible, not conspicuously elevated in genal region (Fig. 20), nearly angular medially, dorsally. Mandible moderately tapered towards apex, lower tooth shorter than upper tooth. Maxillary palpus reaching to ventral part of epicnemial carina.

Mesosoma: Pronotal transverse groove without median longitudinal ridge. Epomia absent. Mesoscutum smooth and shiny with very sparse and short setae (Fig. 12).

Median lobe of mesoscutum without median longitudinal groove. Notauli slightly indicated anteriorly. Prescutellar groove without traces of longitudinal carinae. Scutellum moderately convex, polished and smooth or very sparsely punctate, lateral carinae strong, extending about 0.8-0.9 times length. Mesopleuron completely smooth and polished. Mesopleural impression below speculum consisting of an isolated pit some distance in front of mesopleural suture. Sternaulus weak on anterior 0.3, almost absent on hind 0.7 . Epicnemial carina reaching 0.8 time height of mesopleuron, weak or absent at upper margin. Posterior transverse carina of mesosternum widely interrupted in front of each mid coxa, laterally forming low flat crest. Areolet of fore wing open. Marginal cell 2.6-2.7 times as long as deep. Ramulus absent. Vein 2m-cu weakly inclivous, with two bullae. Vein $c u-a$ opposite $R s+M$ or slightly basal. Abscissa of $C u_{1}$ between $1 m-c u$ and $C u_{1 a} 2.2$ times longer than $C u_{1 b}$, both clearly inclivous. Hind wing with $M+C u$ moderately curved at apical 0.45 . Abscissa of $M+C u$ between $M$ and $C u_{1}$ strongly inclivous, 1.3-1.4 times as long as $c u-a$ which is strongly reclivous. Hind femur about 5.0-5.3 as long as high. Propodeum with anterior transverse carina strong and complete, posterior transverse carina absent centrally, a broad low flat crest, lateral longitudinal carina only present apically, distad of crests. Lateromedian carina partially present in area basalis. Area superomedia absent. Pleural carina rounded and strong. Submetapleural carina forming anterior strong flat crest. Juxtacoxal carina absent. Propodeal spiracle elongate.

Metasoma: First metasomal tergite smooth, polished with some sparse setiferous punctures dorsally. Median dorsal and lateral carinae absent. Postpetiole about 0.7 times as long as maximum width (measured dorsally). Second and remaining tergites polished, with very weak dense setiferous punctures. Gastrocoelus wider than long, thyridium finely granulate. Ovipositor straight, with nodus and five dorsal apical teeth on upper valve, lower valve with three oblique notches and $4-5$ small complete and transverse apical teeth. Ovipositor sheaths 0.9-1.0 times length of hind tibia.

Colour: Body yellowish orange. Flagellum brown to blackish with a white band on flagellomeres 4-7. Sometimes mandibular teeth and hind tarsus slightly infuscated. Wing membrane with fine yellowish tinge (Fig. 7).

Male: Body length $4.1-6.0 \mathrm{~mm}$. Head $0.65-0.73 \mathrm{~mm}$ long, $1.2-1.3 \mathrm{~mm}$ wide. Mesosoma 1.9-2.0 mm long, $0.9-1.0 \mathrm{~mm}$ wide (at widest point of mesoscutum). Fore wing $4.3-4.7 \mathrm{~mm}$ long. Petiole $0.9-1.0 \mathrm{~mm}$ long.

Similar to female except as follows:
Head: Transverse, 1.8-1.9 times as wide as long. Antenna with 24-26 flagellomeres. Flagellum slightly and uniformly tapered to apex. First flagellomere 4.6-5.1 times as long as maximum width. Tyloids narrow and elevated on flagellomeres 10(11)-13(14) (Figs 28, 29), with small secretory pores. Gena $0.5-0.6$ times as long as eye, upper part conspicuously more rounded (Fig. 25). Malar space about $0.3-0.4$ times as wide as basal width of mandible (Fig. 21). Posterior ocellus separated from eye by about 1.2-1.3 times its diameter. Space between posterior ocelli $0.45-0.55$ times their diameter.

Mesosoma: Marginal cell 2.7-3.0 times as long as deep. Hind femur about 5.0-5.2 as long as high.


Figure 32. Distribution of Fractipons species.

Metasoma: Postpetiole 0.7-0.9 times as long as wide. Second and remaining tergites with dense, fine setiferous punctures.

Colour: Antenna without white ring. Flagellum entirely dark brown with scape, pedicel, annellus and base of first flagellomere ventrally yellow, dorsally orange. Wing membrane with fine yellowish tinge (Fig. 6).

Material examined. Type material. Holotype female with labels as follows: Argentina, Horco Molle near Tucumán, 7-13-III-1966, Lionel Stange (AEIC). Paratypes: Argentina, 1 Q, Horco Molle near Tucumán, 1-I-1966, H. \& M. Townes; $1 \delta^{\lambda}$, same locality, 8-15-I-1966, H. \& M. Townes (all AEIC); $1 \delta^{\lambda}$, same locality, 15-19-I-1966, Lionel Stange (CEUA); $1 \jmath^{\lambda}$, same locality, 18-I-1966, H. \& M. Townes; 1 q, same
locality, 7-13-III-1966, Lionel Stange; 1 Ə, 11 Km W. Las Cejas Tucumán, 3-18-XII1966, Lionel Stange; $1 \jmath^{\lambda}$, same locality, 7-26-III-1967, Lionel Stange; $1 \jmath^{\lambda}$, same locality, 16-29-IV-1967, Lionel Stange; 1 ठ $^{\lambda}$, same locality, 22-II/8-III-1968, Lionel Stange; $1 \jmath^{\AA}$, same locality, 9-III/11- IV-1968, Lionel Stange (all AEIC); 1 §, Jujuy, 13-I-1966, H. \& M. Townes (CEUA); 1 , same locality, 14-I-66, H. \& M. Townes. Brazil, 3
 M. Alvarenga; 1 Q , $1 \AA^{\lambda}$, Jatai, Goiás XI-1972, F. M. Oliveira; $1 ठ^{\lambda}$, Silva Jardin, Rio de Janeiro, VIII-1974, F. M. Oliveira (all AEIC).

Variation. A male from Jujuy, Argentina (14-I-1966), has the hind half of the head, pronotum and anterior part of the mesoscutum dark brown and the mesoscutum more punctate.

Distribution. Argentina, Brazil (Fig. 32).
Etymology. The species name refers to the scarcely hairy, almost glabrous scutum.

## Fractipons dasyscutum sp. n.

urn:lsid:zoobank.org:act:723B9F7C-E4E3-4565-A921-9625CE31A798

Diagnosis. Mesoscutum with very dense setae (Figs 10, 11). Malar space 0.6-0.8 times the width of the mandible base (Figs 16, 17). Mandible relatively concave at lower part of base, its external lower rim flatly expanded at the base, forming a translucent area (Figs 16, 17). Head in lateral view with upper part of gena straight and abruptly reduced (Figs 22, 24). Body entirely yellow-orange (Figs 8, 9), in males rarely the hind half of the head and the front part of the mesosoma dark brown. Flagellum dark brown to black, in female with a light yellow band on flagellomeres 4-8 (Fig. 8); in the male the flagellum is usually orange over 2-3 flagellomeres, never with a white band (Fig. 9).

Description. Female: Body length $5.0-6.2 \mathrm{~mm}$. Head $0.6-0.8 \mathrm{~mm}$ long, $1.3-1.6$ mm wide. Mesosoma $1.9-2.4 \mathrm{~mm}$ long, $0.8-1.1 \mathrm{~mm}$ wide (widest point of mesoscutum). Fore wing $4.2-5.0 \mathrm{~mm}$ long. Petiole $1.0-1.3 \mathrm{~mm}$ long. Ovipositor sheath $1.7-1.8 \mathrm{~mm}$ long.

Head: Transverse, 1.9-2.1 times as wide as long, mostly smooth and shiny, strongly constricted behind compound eyes. Antenna with 26-28 flagellomeres, conspicuously thickened from third flagellomere, slightly thin towards apex. First flagellomere 4.6-5.4 times as long as maximum width, flagellomeres from tenth to penultimate flattened below, in this flat area with conspicuous setiferous sensillae. Gena 0.1-0.2 times as long as eye (viewed from above), upper part in lateral view straight and abruptly reduced (Fig. 22). Occiput moderately depressed centrally. Lower face finely and densely punctate with small central prominence, clypeus rather wide, weakly convex, apical margin slightly arcuate. Malar space with wide granulate groove, about 0.7-0.8 times width of mandible base (Fig. 16). Posterior ocellus separated from eye about $1.3-1.5$ times its diameter. Space between posterior ocelli $0.5-0.7$ times their diameter. Occipital carina reaching base of mandible, moderately elevated ventrally, sligthly angulate medially, dorsally. Mandible moderately tapered towards apex, lower tooth
shorter than upper tooth, base relatively concave ventrally, external lower rim forming flat perpendicular extension, translucent at base (Fig. 16). Maxillary palpus reaching to ventral part of epicnemial carina.

Mesosoma: Pronotal transverse groove without median longitudinal ridge. Epomia absent. Mesoscutum smooth and shiny with very dense setae (Fig. 10). Median lobe of mesoscutum without median longitudinal groove. Notauli impressed, reaching level of tegula. Prescutellar groove without trace of longitudinal carinae. Scutellum moderately convex, polished and smooth or very sparsely punctate, lateral carinae strong, extending about $0.8-0.9$ its length. Mesopleurom completely smooth and polished. Mesopleural impression below speculum consisting of an isolated pit which is some distance in front of mesopleural suture. Sternaulus present on anterior 0.5 , evanescent towards hind half. Epicnemial carina reaching 0.7-0.9 times height of mesopleurum, at upper margin weak or absent. Posterior transverse carina of mesosternon widely interrupted in front of each mid coxa, laterally elevated as flat low crest. Areolet of fore wing open. Marginal cell 3.1-3.4 times as long as deep. Ramulus absent. Vein 2m-cu arched, weakly inclivous, with two bullae. Vein $c u-a$ opposite $R s+M$ or slightly basal. Abscissa of $C u_{1}$ between $1 m-c u$ and $C u_{1 a} 1.4-1.6$ times length of $C u_{1 b}$, both strongly inclivous. Hind wing with $M+C u$ moderately curved at apical 0.5 ; abscissa of $M+C u$ between $M$ and $C u_{1}$ strongly inclivous, $1.0-1.3$ times as long as $c u-a$, which is strongly reclivous. Hind femur about $4.8-5.2$ as long as high. Propodeum with anterior transverse carina strong and complete, posterior transverse carina absent centrally and forming strong, sub-triangular, flat crest joining lateral longitudinal carina, which is only present distad of crest. Lateromedian carina partially present in area basalis. Area superomedia absent. Pleural carina rounded and strong. Submetapleural carina forming anterior strong flat crest. Juxtacoxal carina absent. Propodeal spiracle elongate.

Metasoma: First metasomal tergite smooth, polished with some sparse setiferous punctures dorsally, laterally. Median dorsal and lateral carinae absent. Postpetiole about $0.7-0.8$ times as long as maximum width (measured dorsally). Second and remaining tergites polished, with very weak dense setiferous punctures. Gastrocoelus wider than long, thyridium finely granulate. Ovipositor straight, with nodus and five dorsal apical teeth on upper valve, lower valve with three oblique notches and 4-5 small complete, transverse apical teeth. Ovipositor sheath $0.8-1.2$ times as long as hind tibia.

Colour: Body entirely yellowish orange. Flagellum dark-brown to black, banded light yellow on flagellomeres 4-8, frequently orange basally. Sometimes mandibular teeth slightly infuscated. Wing membrane with fine yellowish tinge (Fig. 8).

Male: Body length $5.0-6.0 \mathrm{~mm}$. Head $0.6-0.8 \mathrm{~mm}$ long, $1.2-1.5 \mathrm{~mm}$ wide. Mesosoma 1.8-2.3 mm long, $0.9-1.0 \mathrm{~mm}$ wide (widest point of mesoscutum). Fore wing $4.7-5.6 \mathrm{~mm}$ long. Petiole $0.9-1.2 \mathrm{~mm}$ long.

Similar to female except as follows:
Head: Transverse, 1.7-2.0 times as wide as long, constricted and slightly rounded behind compound eyes. Antenna with 28-30 segments. Flagellum filiform, strongly tapered from base to apex, first flagellomere 4.2-5.2 times as long as maximum width. Tyloids on flagellomeres 10-14, laminar and widely expanded at base (Figs 30, 31),
with small secretory pores. Gena about $0.1-0.3$ times as long as eye (in dorsal view), upper part straight and moderately reduced (Fig. 24). Malar space about $0.6-0.8$ times as wide as basal width of mandible (Fig. 17). Posterior ocellus separated from eye by about 1.1-1.3 times its diameter. Space between posterior ocelli $0.5-0.9$ times their diameter.

Mesosoma: Marginal cell 2.6-2.8 times as long as deep. Hind femur about 4.6-5.0 as long as high.

Metasoma: Postpetiole 0.7-0.9 times as long as wide. Second and remaining tergites with dense, fine setiferous punctures.

Colour: Antenna without white ring. Scape, pedicel, anellus and usually first two (three) flagellomeres orange, remainder entirely dark brown. Wing membrane with fine yellowish tinge (Fig. 9).

Material examined. Type material. Holotype female with labels as follows: Costa Rica, Sector Cerro Cocori, Fca. de E. Rojas, 150 m, Provincia Limón, V-1993, E. Rojas, L.N. 286000 567500, CRI001, 347816 (INBIO). Paratypes: Costa Rica, 1 §, Sector Cerro Cocori, Fca. de E. Rojas, 150 m, Provincia Limón, E. Rojas, XI-1991, L.N. 286000 567500, CRI000, 466593; 2 우, same locality, E. Rojas, 28-V/15-VI-1992 L.N. 286000 567500, CRI000, 877427, CRI000, 877444; 2 q $q$, same locality, IV-1993, E. Rojas, L. N. 286000567500 CRI001, 346009, CRI001, 345291; 1 Q , Est. Hitoy Cerere, 100m, R. Cerere, Provincia Limón, G. Garballo, 7-26-I-1992, L-N 184200, 648800, CRI000, 864905; 1 q, Estación Pitilla, 700 m, 9 Km Santa Cecilia, P. N. Guanacaste, Prov. Guanacaste, 21-III/7-IV-1993, P. Ríos, L. N. 3302000, 380200, CRI001, 387323; $1 J^{\top}$, Sector San Ramón, P. N. Guanacaste, Prov Alaju, 620 m, 27-IV/23-V-1994, E. Araya, L.N. 318100 381900, CRI001, 899301; 1 P, Provincia Alajuela, Upala, PN. Volcán Tenorio, Estación El Pilón, 700-800 m, 9-IX-2008, J. A. Azofeifa, Tp. amarilla, L. N. 298212427913 \#94957, INB0004171693 (all INBIO); 1 q, Provincia Guanacaste, Sector Murcielago, 9 Km N. del Cerro Guachipellin, $20 \mathrm{~m}, 29-\mathrm{VI} / 27-\mathrm{VII}-1996$, M Araya, Tp. Malaise, L. N. 320650347200 \#7875, CRI002, 316566; 1 §, Estación Biológica las Alturas, 1500 m, Coto Brus, Prov. Puntarenas, M. Ramirez, III-1992, L-S 322500, 591300, CRI000, 980023; 1 Q, Provincia de Limón, Valle La Estrella, Banauito Lodge, 80 m, 20-21-V-2007, J. A. Azofeifa, J. Montero, Tp. Amarilla, L. N. 200889
 H. Janzen, Dry hill ( $1 \delta$ CEUA, $1 \circlearrowleft$ AEIC); $1 \delta$, same locality and collector, 6 -VI-1976, Riparian; $1 \Omega^{\lambda}$, same locality and collector, 10-VI-1977, Riparian; $1 \delta^{\lambda}$, same locality and collector, 27-VI-1977, Riparian; $10^{\lambda}$, same locality and collector, 5-VII-1977, Riparian; $2 \circlearrowleft^{\top}$ す。 same locality and collector, 4-XI-1977, Riparian; 1 §, same locality and collector, 21-VI-1978, Dry hill; 1 § $^{\text {J }}$, same locality and collector, 23-VII-1978, Dry Hill (all AEIC). Panama, $1 \circlearrowleft^{\lambda}$, Albrook Field Canal Zone, 25-IX-1937 (AEIC). Venezuela, $10^{\lambda}$, Monagas, 27 Km SW Caripe, 300 m, 19-31-VII-1987, S. \& J. Peck (CEUA). Peru, $1 \jmath^{\top}$, Dept. Huanuco, Tingo María, Rio Huallaga, 9-11-VII-1974, C. Porter \& L. Stange; 1 §, Dept. Huanuco, Cueva Las Pavas, 12-15-VII-1974, same collector (all FSCA).

Distribution. Costa Rica, Panama, Peru, Venezuela (Fig. 32).
Etymology. The species name refers to the densely hairy scutum (from "dasy" in Greek, meaning shaggy, markedly hairy).

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## References

Bin F, Wäckers F, Romani R, Isidoro N (1999) Tyloids in Pimpla turionellae (L.) are release structures of male antennal glands involved in courtship behaviour (Hymenoptera: Ichneumonidae). International Journal of Insect Morphology 28: 61-68.
Bordera S, Hernández-Rodríguez E (2003) Description of two new species of Enclisis (Hymenoptera: Ichneumonidae) and support for the secretory role of tyloids in ichneumonid males. European Journal of Entomology 100: 401-409.
Gauld ID (1991) The Ichneumonidae of Costa Rica, 1. Memoirs of the American Entomological Institute 47: 1-589.
Harris RA (1979) A glossary of surface sculpturing. State of California. Department of Food and Agriculture. Occasional Papers in Entomology 28: 1-31.
Isidoro N, Bin F, Colazza S, Vinson SB (1996) Morphology of antennal gustatory sensilla and glands in some parasitoid Hymenoptera with hypothesis on their role in sex and host recognition. Journal of Hymenoptera Research 5: 206-239.
Laurenne NM, Broad GR, Quicke DLJ (2006) Direct optimization and multiple alignment of 28 S D2-3 rDNA sequences: problems with indels on the way to a molecular phylogeny of the cryptine ichneumon wasps (Insecta: Hymenoptera). Cladistics 22: 442-473.
Steiner SM, Kropf C, Graber W, Nentwig W, Klopfstein S (2010) Antennal courtship and functional morphology of tyloids in the parasitoid wasp Syrphoctonus tarsatorius (Hymenoptera: Ichneumonidae: Diplazontinae). Arthropod Structure \& Development 39: 33-40.
Townes H (1970) Genera of Ichneumonidae, Part 2. Memoirs of the American Entomological Institute 12: 1-537.
Yu DS, van Achterberg K, Horstmann K (2005) World Ichneumonoidea 2004. Taxonomy, biology, morphology and distribution. Taxapad. Vancouver, Canada.

# Corrigenda: Discovery of the rare genus Blacometeorus Tobias, 1976 (Hymenoptera, Braconidae, Blacinae) in the Oriental part of China, with description of a new species 

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The published figure legend is as follows (WRONG):
Figures 1-10. Blacometeorus sinicus Chai \& Chen, sp. n. $q$, holotype. 1 antenna 2 head, frontal view $\mathbf{3}$ head, dorsal view $\mathbf{4}$ mesonotum, dorsal aspect 5 propodeum and metasomal tergite I-II, dorsal aspect $\mathbf{6}$ fore wing 7 hind wing $\mathbf{8}$ body, lateral view 9 hind leg 10 hind tarsus.

The CORRECT one is as follows:
Figures 1-10. Blacometeorus sinicus Chai \& Chen, sp. n. $q$, holotype. 1, head, dorsal view $\mathbf{2}$ head, frontal view $\mathbf{3}$ antenna $\mathbf{4}$ body, lateral view $\mathbf{5}$ hind leg $\mathbf{6}$ hind tarsus 7 fore wing $\mathbf{8}$ hind wing $\mathbf{9}$ mesonotum, dorsal aspect $\mathbf{1 0}$ propodeum and metasomal tergite I-II, dorsal aspect.

