

TWO NEW NEOTROPICAL CHIRONOMINAE GENERA (DIPTERA: CHIRONOMIDAE)

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Abstract

Claudiotendipes n. gen. and *Sigmoitendipes* n. gen. are described and figured based on adults, pupae and larvae. Two species are included in *Claudiotendipes*: the type species, *C. froehlichii* n. sp. from Bahia, Rio de Janeiro, São Paulo and Santa Catarina States in Brazil; and *C. epleri* n. sp. from Costa Rica. Five species are included in *Sigmoitendipes*, all from Brazil: the type species, *S. susanae* n. sp. from São Paulo, Mato Grosso, Amazonas and Pará States; *S. fittkaii* n. sp. from Mato Grosso and Pará; *S. reissi* n. sp. from São Paulo; and *S. oliveirai* n. sp. and *S. spiesi* n. sp., both from Mato Grosso. A cladistic analysis grouped the two new genera with *Beardius*, *Oukuriella* and *Endotribelos*. Keys to the males of the two new genera are presented.

Introduction

The subfamily Chironominae comprises approximately 50% of the chironomid species described from the Neotropical region, which is more than twice the share of any other subfamily (e.g. Spies and Reiss 1996: table 1). In the fauna of Brazil, the largest country in the region, the proportion increases to about 60% (335 of 566 scientifically named species, Pinho 2016), whereas the second largest subfamily stands at less than 25% (134 species in Orthocladiinae). Chironominae larvae are found in a wide range of aquatic and semiaquatic habitats, but are relatively more abundant in standing and slow-flowing lowland waters than at lotic sites in mountainous areas.

During the first half of the 1960's, the late E. J. Fittkau made extensive collections in various parts of the Amazon region; this vast amount of chironomid material is now housed in the Zoologische Staatssammlung in Munich, Germany. Fittkau (2001) wrote: "the numbers of 'new species' and 'new genera' increased with each new light catch.

I stopped this work when we had reached the number of 500 new species and 50 new genera, as well as a number of familiar genera". Fittkau (1971) suggested that at least 1000 species of Chironomidae live in the Amazon. Since then, many new species and several new genera have been described. In Brazil alone, for example, 32 Chironominae genera with more than 330 species are recognized (Pinho 2016). Even so, much of Fittkau's material still awaits analysis and publication, and the knowledge of Brazilian chironomids remains fragmentary.

Below we describe a new genus, *Sigmoitendipes*, based partly on material collected by Fittkau in the Amazon, and partly on more recent material gathered from several other Brazilian regions. The description is based on males, pupae and larvae, and five new species are recognized. *Claudiotendipes* n. gen. is described from material collected in the Brazilian Atlantic Forest (Mata Atlântica) as well as Costa Rica. Keys to the males of both genera are provided, and their relations among the Chironominae are evaluated based on a cladistic analysis.

Material and methods

Specimens, identification and terminology

Except for the material obtained on loan, specimens examined were preserved in alcohol and later mounted on slides in Canada balsam or Euparal following the procedure outlined by Sæther (1969); some slide-mounted specimens borrowed from Zoologische Staatssammlung München (ZSM) were not cleared in KOH. Since there are no identification keys which cover southern hemisphere chironomid fauna, identification of material was completed using keys for Central American and Holarctic genera (Pinder and Reiss 1986, Cranston et al. 1989, Spies et al. 2009, Epler et al. 2013). Comparison to descriptions of austral Chironominae genera not included in these keys, such

as *Tapajos* Trivinho-Strixino, Silva *et* Oliveira (from Trivinho-Strixino *et al.* 2013), *Nilodosia* Kieffer, *Imparipecten* Freeman (from Cranston and Hardwick 1996), *Conochironomus* Freeman (from Cranston and Hare 1995) and *Xylochironomus* Cranston (from Cranston 2006) were also conducted. Diagnoses of both new genera were then prepared considering differential characters from all of these sources. The descriptive terminology follows Sæther (1980), with some additions and modifications from Epler *et al.* (2013). Measurement results are given as ranges, followed by the mean when four or more specimens were measured, followed by the number of specimens measured (n) in parenthesis.

Type material

The type materials are housed in the following museums (listed in alphabetical order):

INPA – Instituto Nacional de Pesquisas da Amazônia, Manaus, Brazil.

MZUFBA – Museu de Zoologia da Universidade Federal da Bahia, Salvador, Brazil.

MZUSP – Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil.

UFSC – Entomological Collection, Universidade Federal de Santa Catarina, Florianópolis, Santa Catarina, Brazil.

ZMBN – Department of Natural History, University Museum of Bergen, University of Bergen, Bergen, Norway.

ZSM – Zoologische Staatssammlung München, Munich, Germany.

Phylogenetics

To assess the phylogenetic positions of the new genera we used a matrix with 119 characters in 71 taxa (Appendix 1) that is based on the data in Cranston (2003, 2006) (matrix kindly made available by request) plus data on *Beardius* Reiss *et* Sublette (from Pinho *et al.* 2013), *Oukuriella* Epler (from Fusari *et al.* 2013), *Endotribelos* Grodhaus (from Grodhaus 1987, Roque and Trivinho-Strixino 2008), *Claudiotendipes* n. gen. and *Sigmoitendipes* n. gen. (from present study). The character states for *Nilothauma* Kieffer were revised according to Mendes and Andersen (2008). ‘Gen. A’ refers to an undescribed Afrotropical genus with wood mining larvae (Cranston 2006).

The matrix was edited in Mesquite (Maddison and Maddison 2009), the analyses were performed in TNT software (Goloboff *et al.* 2008b), and the character distribution was visualized in Winclada

(Nixon 1999–2002). All characters were treated as unordered under the implied weighting searches (Goloboff 1993). Heuristic tree searches were run with the tree bisection and reconnection (TBR) branch swapping algorithm (1000 replications, random seed = 0). A TNT script (propk.run, written by Salvador Arias) calculated the appropriate value for the k constant (for details, see Goloboff *et al.* 2008a); it returned a value of $k = 15.263673$ for the data set selected for the analysis.

Characters and character states

Larvae

1. *Dorsal surface of head*: (0) S 3 on same plate as S 4 and S 5 (clypeus fused to frons); (1) S 3 not on same plate as S 4 and S 5 (clypeus separate from frons).

2. *Labral sclerites*: (0) only one sclerite expressed; (1) sclerites 1 and 2 present.

3. *Frontal fenestra or pit*: (0) present; (1) absent.

4. *Antennal segment 2*: (0) undivided; (1) divided.

5. *Antennal segments beyond style*: (0) three; (1) two; (2) four.

6. *Antennal blade extent*: (0) not to apex of flagellum; (1) to or beyond apex.

7. *Accessory blade*: (0) short; (1) subequal to segment 2; (2) absent.

8. *Blade insertion*: (0) apex of segment 1; (1) mid segment 2; (2) more apical.

9. *Style*: (0) short or absent; (1) extending to mid segment 3.

10. *Lauterborn organs*: (0) opposite; (1) alternate on segments 2 and 3; (2) absent.

11. *Lauterborn organ pedicel*: (0) absent; (1) < one third of segment 3; (2) > one third of segment 3.

12. *Antennal seta*: (0) absent; (1) present.

13. *Antennal pedestal*: (0) low; (1) elongate.

14. *Antennal pedestal apex*: (0) rounded; (1) with spur or palmate projection.

15. *Labral seta S I*: (0) simple; (1) palmate to plumose.

16. *S I bases*: (0) separate; (1) fused.

17. *Labral S II*: (0) simple; (1) plumose.

18. *Labral S IV*: (0) small (normal); (1) strongly developed, on pedestal.

19. *Labral lamella*: (0) comb-like; (1) reduced; (2) absent.

20. *Labral lamella*: (0) single; (1) divided; (2) absent.
21. *Seta praemandibularis*: (0) simple; (1) branched.
22. *Pecten epipharyngis*: (0) three separate scales; (1) one fused plate.
23. *Pecten epipharyngis*: (0) smooth; (1) toothed in one plane; (2) toothed in multiple planes.
24. *Premandible teeth*: (0) one to three; (1) > three.
25. *Premandible inner (bluntly rounded) teeth*: (0) none; (1) one; (2) two.
26. *Mandible dorsal tooth*: (0) present; (1) absent.
27. *Mandible inner teeth*: (0) four; (1) three; (2) two.
28. *Pecten mandibularis*: (0) present; (1) reduced; (2) absent.
29. *Seta subdentalis*: (0) simple; (1) bifid to plumose; (2) absent.
30. *Seta subdentalis extending to*: (0) proximal inner tooth of mandible; (1) middle inner teeth; (2) apex of mandible.
31. *Seta interna*: (0) present; (1) absent.
32. *Seta subdentalis*: (0) inserted dorsally; (1) inserted ventrally.
33. *Outer mentum*: (0) normal; (1) outer three teeth offset.
34. *Median mental tooth*: (0) trifid; (1) simple or double.
35. *Mentum coloration*: (0) all dark; (1) medially pale, contrasting with lateral parts; (2) all pale.
36. *Seta submenti*: (0) simple; (1) plumose; (2) bifid.
37. *Segment XI*: (0) without ventral tubules; (1) with ventral tubules.
38. *Mandibular basal striae*: (0) absent; (1) present.
39. *Mentum anterior margin*: (0) convex; (1) concave.
40. *Ventromental plate anterior margin*: (0) smooth; (1) crenulated.
- Pupae**
41. *Cephalic tubercles*: (0) absent; (1) present.
42. *Frontal warts*: (0) absent; (1) present.
43. *Frontal setae*: (0) absent; (1) present.
44. *Thoracic horn branches*: (0) one; (1) two to three; (2) four to eight; (3) multiple (plumose).
45. *Basal ring of thoracic horn*: (0) single, medially constricted; (1) kidney-shaped; (2) simple, rounded to elliptical; (3) absent.
46. *Tracheal branches*: (0) single; (1) double; (2) triple; (3) absent.
47. *Prealar tubercle*: (0) absent; (1) present.
48. *Scutal tubercle*: (0) absent; (1) present.
49. *Precorneal setae*: (0) two; (1) three.
50. *Anteprenotal setae*: (0) none; (1) one; (2) two; (3) three.
51. *Dorsocentral setae*: (0) three; (1) four.
52. *Wing sheath "nose"*: (0) absent; (1) present.
53. *Abdominal tergite I*: (0) bare; (1) with spinules.
54. *Hook row on tergite II*: (0) continuous; (1) interrupted.
55. *Extent of hook row on tergite II*: (0) > half segment width; (1) subequal to half segment width; (2) < half segment width.
56. *Conjunctive IV/V*: (0) bare; (1) with spinules.
57. *Pedes spurii A*: (0) absent; (1) on parasternite IV only; (2) on more than one parasternite.
58. *Pedes spurii B on segment I*: (0) absent; (1) present.
59. *Pedes spurii B on segment II*: (0) absent; (1) present.
60. *Segment I*: (0) with lateral projections; (1) without lateral projections.
61. *Segment VIII posterolateral spur/comb*: (0) absent; (1) with one more or less dominant tooth; (2) with multiple subequal teeth.
62. *Abdominal segment IV taeniate lateral setae (LS)*: (0) absent; (1) present.
63. *Segment V LS*: (0) absent; (1) present.
64. *Segment VI LS*: (0) absent; (1) present.
65. *Segment VII LS*: (0) absent; (1) present.
66. *Segment VIII LS*: (0) absent; (1) present.
67. *Segment VIII LS number*: (0) three; (1) four; (2) five; (3) none.
68. *Abdominal segment O setae*: (0) absent; (1) one dorsal + one ventral; (2) two dorsal + one ventral; (3) two dorsal + two ventral; (4) one ventral only.

69. *Lateral setae origins*: (0) none on intersegmental conjunctives; (1) some L_4 on one or more conjunctives.
70. *Anal lobe fringe*: (0) absent; (1) single layer, sparse; (2) single layer, complete; (3) multiple layer, complete.
71. *Dorsal setae on tergite IX or anal lobe*: (0) present; (1) absent.
72. *Male genital sac length relative to anal lobe*: (0) shorter; (1) subequal; (2) longer.
73. *Tergite III (IV-) anterior transverse spine band*: (0) present; (1) absent.
74. *Tergite III (IV-) posterior transverse spine band*: (0) present; (1) absent.
- Adults**
75. *Male antennal flagellomeres*: (0) thirteen; (1) eleven or fewer.
76. *Frontal tubercles*: (0) absent; (1) present.
77. *Palp*: (0) normal (about as long as head); (1) distinctly shortened.
78. *Eye*: (0) bare; (1) hairy.
79. *Anteprenotum lobes dorsomedially*: (0) lobes fused; (1) lobes separated.
80. *Anteprenotal lobe dorsal narrowing*: (0) absent; (1) clearly present.
81. *Scutum anterior extension*: (0) absent; (1) present.
82. *Scutal tubercle*: (0) present; (1) absent.
83. *Acrostichal setae*: (0) present; (1) absent.
84. *Fore tibial scale*: (0) subtriangular; (1) rounded to flat and scarcely developed.
85. *Fore tibial scale*: (0) with projecting spur or spine; (1) without projection.
86. *Fore tibial apex*: (0) with comb; (1) without comb.
87. *Mid and hind tibial combs*: (0) separated; (1) contiguous.
88. *Mid tibial combs*: (0) each with one spur; (1) one with spur; (2) both unspurred.
89. *Hind tibial combs*: (0) each with one spur; (1) one with spur; (2) both unspurred.
90. *Mid leg sensilla chaetica*: (0) present; (1) absent.
91. *Hind leg sensilla chaetica*: (0) present; (1) absent.
92. *Pulvillus relative length*: (0) subequal to claw; (1) half-length of claw; (2) absent.
93. *Wing cell membrane setae*: (0) present; (1) absent.
94. *FCu position*: (0) proximal, opposite or slightly distal to RM; (1) distinctly distal to RM.
95. *Anal lobe of wing*: (0) distinct; (1) weak to absent.
96. *RM direction relative to R_{4+5}* : (0) continuous in more or less straight line; (1) oblique.
97. *Squamal fringe*: (0) complete; (1) reduced; (2) absent.
98. *Abdominal tergite setosity*: (0) dense; (1) sparse.
99. *Anal tergite bands*: (0) meeting; (1) separate; (2) absent.
100. *Median anal tergite setae*: (0) present; (1) absent.
101. *Apical anal tergite setae*: (0) present; (1) absent.
102. *Anal point*: (0) present; (1) absent.
103. *Superior volsella base*: (0) more or less transverse, pad-like, setose; (1) not pad-like.
104. *Median volsella*: (0) present; (1) absent.
105. *Inferior volsella*: (0) elongate, setose; (1) reduced, with few setae.
106. *Transverse sternapodeme anterolateral corners*: (0) with projections; (1) rounded.
107. *Inferior volsella isolated, strong, (sub)apical seta(e)*: (0) present; (1) absent.
108. R_{2+3} : (0) ending halfway between R_1 and R_{4+5} ; (1) ending nearer R_{4+5} ; (2) weak or absent.
109. R_{4+5} and costa ending: (0) above or distal to apex of M_{1+2} ; (1) proximal to apex of M_{1+2} .
110. *Dorsomedial extension of eye*: (0) strong; (1) weak; (2) absent.
111. *Female genital dorsomesal lobe, oromesal "group shagreen"*: (0) absent; (1) present.
112. *Floor beneath vagina formed by sternite VIII*: (0) absent; (1) present.
113. *Apodeme lobe microtrichia*: (0) absent; (1) present.
114. *Segment X setae*: (0) present; (1) absent.
115. *Labial macrotrichia*: (0) absent; (1) present.

116. *Male superior volsella*: (0) present; (1) vestigial or absent.

117. *Inferior volsella*: (0) present; (1) vestigial or absent.

118. *Gonostylus proximal section*: (0) without distinct swelling; (1) distinctly swollen.

119. *Joint between gonocoxite and gonostylus*: (0) rigid; (1) flexible.

Results

Systematics

Chironominae relationships have been assessed by Sæther (1977) using morphological data, proposing the tribes Tanytarsini, Pseudochironomini and Chironomini (Fig. 1A). Cranston et al. (2012) analysed molecular data from four genes using mixed-model Bayesian and maximum likelihood inference methods, and suggested Chironomini is paraphyletic because it includes Tanytarsini and Pseudochironomini (Fig. 1B). Also, *Shangomyia* Sæther et Wang, sister to all remaining Chironominae, could deserve a tribe or subfamily rank together

er with *Xiaomyia* Sæther et Wang. The cladistic analyses performed here resulted in a cladogram (Fig. 2) where Tanytarsini and Chironomini are sister tribes. *Shangomyia* Sæther et Wang grouped with *Nandeva* Wiedenbrug et Fittkau within *Stenochironomus* complex as found in Cranston (2003) from a previous version of the present data matrix. Since information about *Nandeva* Wiedenbrug et Fittkau larva is unavailable and morphology of pupae and adults of *Shangomyia* Sæther et Wang are uninformative and very divergent, the inclusion of these genera in the *Stenochironomus* complex is very doubtful.

The clade (*Sigmoitendipes* n. gen. (*Endotribelos* (*Claudiotendipes* n. gen. (*Beardius*, *Oukuriella*))) is recognized by the combination of some homoplastic synapomorphies in the pupa (absence of scutal tubercle, presence of pedes spurii B and abdominal segment VIII posterolateral spur with one more or less dominant tooth) and adult (mid leg without sensilla chaetica).

As 16 out of 40 of the larval characters could not be extracted from the single larval specimen of

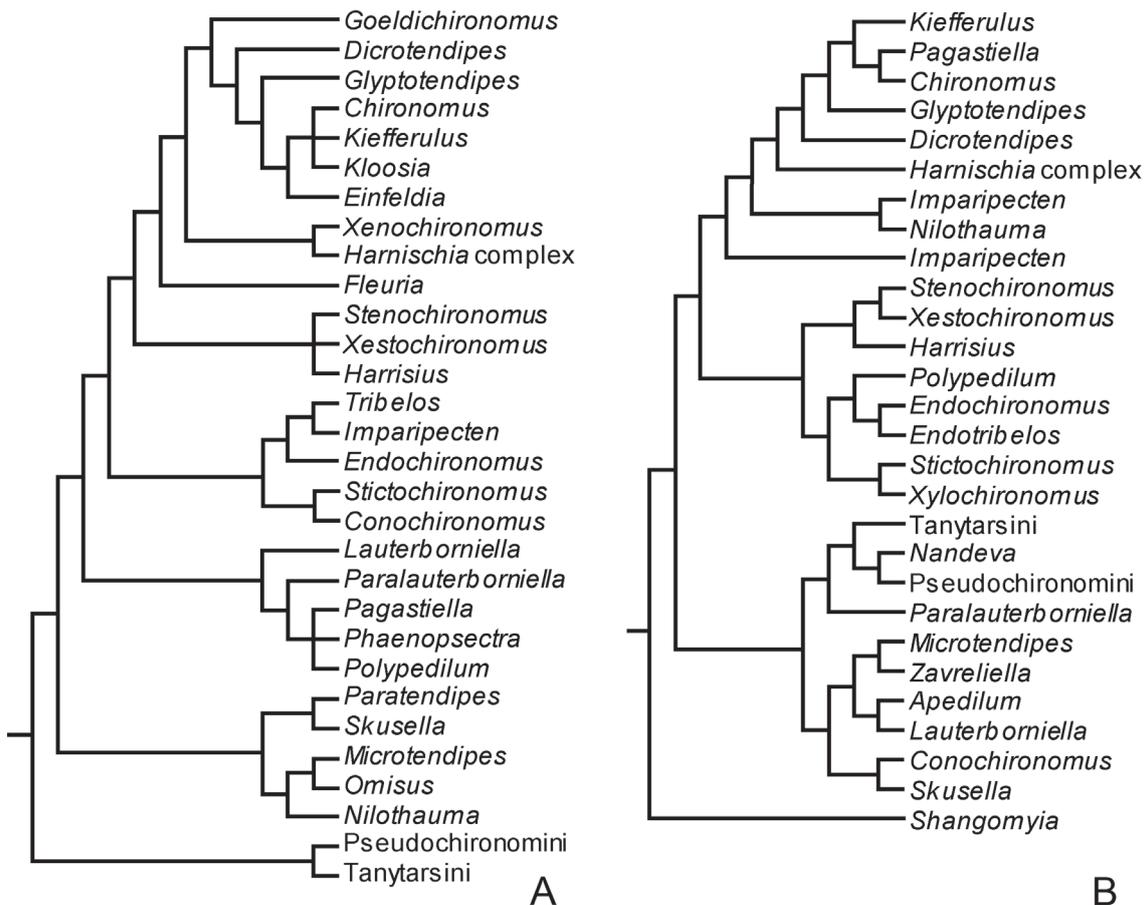


Figure 1. Previous hypotheses of phylogenetic relationships among taxa sampled for the ongoing analysis: A, From Sæther (1977). B, From Cranston et al. (2012).

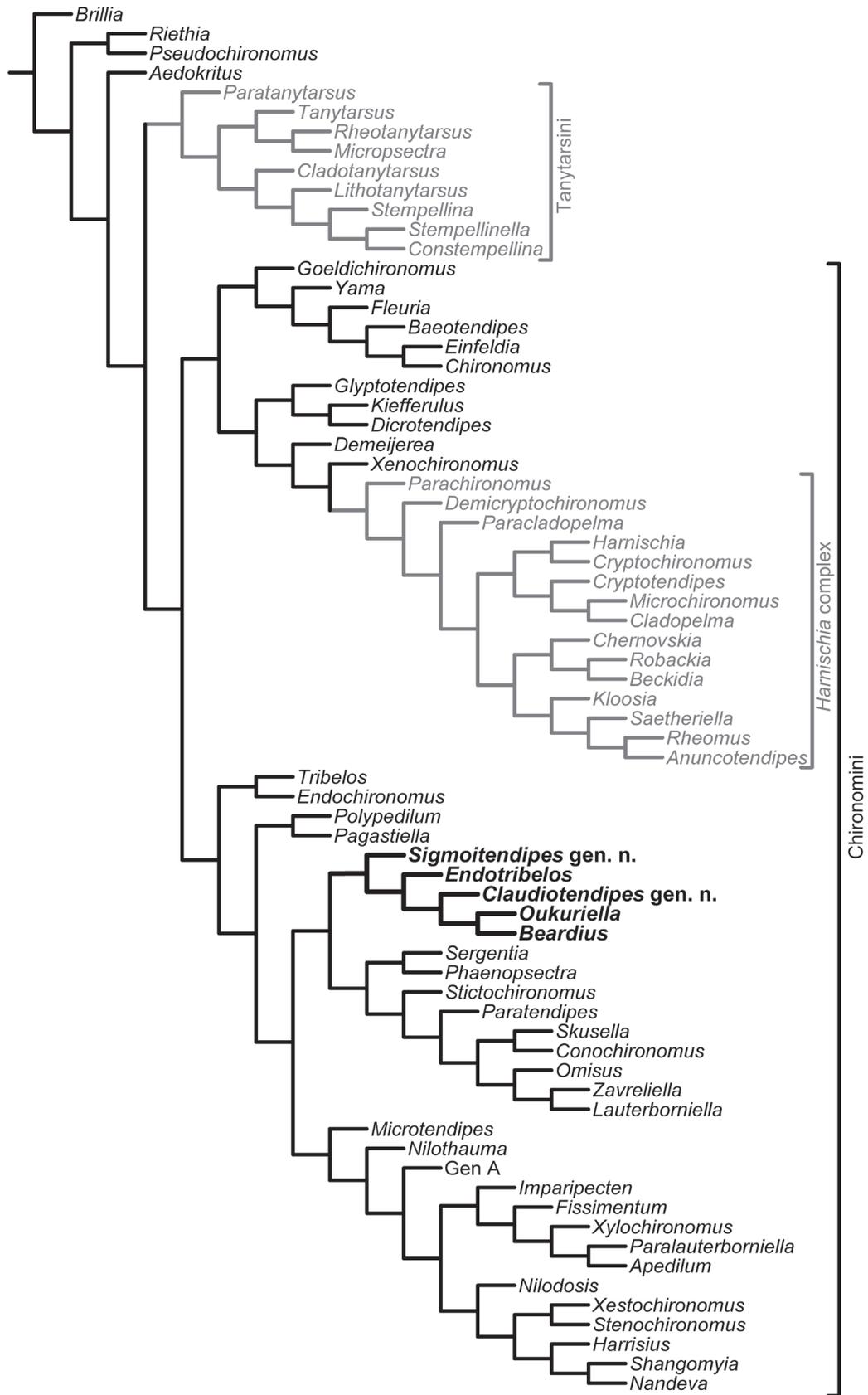


Figure 2. Cladogram obtained from data matrix performing search using implied weighting of characters ($k=15.263673$).

Sigmoitendipes studied, this relationship hypothesis should be viewed as tentative and will likely improve as more larval material becomes available and more Chironomini genera are included in the data matrix.

Taxonomy

Claudiotendipes new genus

<http://zoobank.org/4377891C-B29C-4CB5-8171-180517119AAA>

Type species: *Claudiotendipes froehlich* n. sp.

Other included species: *Claudiotendipes epleri* n. sp.

Etymology: Named in honor of Professor Dr. Claudio G. Froehlich for his many important contributions to aquatic entomology and for initiating, with all his kindness and knowledge, the formation of many Brazilian research groups in ecology and systematics of aquatic insects. The suffix *-tendipes*, is a common ending among Chironominae genera. For the purposes of nomenclature, the gender of the genus name is masculine.

Diagnostic characters: The males can be separated from all other Chironomini by the combination of an antenna with 13 segments, antennal ratio 0.3–1.1; squama bare; wings lacking markings; fore tibia with weakly developed, shallow scale without spur; mid- and hind tibiae with short, fused combs, with single spur; anal tergite bands separate; setae on tergite IX restricted to posterior margin; anal point long, parallel-sided to weakly spatulate; superior volsella digitiform without basomedial group of setae; median volsella reduced to single setae; and inferior volsella apically forked.

The pupa can be separated from all other Chironomini except *Paratendipes* by the combination of a thoracic horn with few branches; cephalic tubercles and frontal setae present; tergites II–VI with anterior bands of weak shagreen; large pedes purii B on segment II; segment II with 2–3 non-taeniate L setae, segments III–IV each with 3 non-taeniate L setae; and anal lobe with fringe and dorsal seta. It can be separated from *Paratendipes* by the bare conjunctive III/IV.

The larva can be separated from all other Chironomini except *Omisus* and *Paratendipes* by the combination of a plumose S I; mentum with four pale median teeth, the inner pair of which are smaller and shorter; and antenna with 6 segments and alternate Lauterborn organs. It can be separated readily from *Omisus* and *Paratendipes* by the presence of 3 inner teeth on the mandible; the shape of the ventromental plates; and the simple

pecten epipharyngis with about 12 teeth.

Generic description

Male. Small to medium sized species, with wing length 1.0–2.0 mm.

Coloration. Whitish to pale yellowish, wing translucent without dark markings.

Antenna. With 13 flagellomeres. AR 0.28–1.13.

Head. Eyes bare, with well-developed dorsomedial extension containing either 5 or 6 ommatidia in each lateral facet diagonal. Frontal tubercle absent. Temporal setae 9–13, uniserial, composed of 3–5 strong inner verticals, 2–4 weak outer verticals and 2–4 weak postorbitals. Clypeus with 8–14 strong setae. Palp with 5 segments, not shortened; third palpomere with 2–6 sensilla subapically, sometimes grouped in pit, longest 11–20 μm long.

Thorax. Anteprenotal lobes separated medially; each lobe narrowing dorsally, with 0–1 lateral seta. Scutum overreaching anteprenotum, tubercle absent. Acrostichals 6–13, all decumbent, starting close to anteprenotum. Dorsocentrals 7–15, uniserial; prealars 2–3; supraalars absent. Scutellum with 5–9 setae, uni- to partly biserial.

Wing. VR 1.16–1.26. Wing membrane bare, with fine punctation. Anal lobe absent to weakly developed. Costa not extended, reaching wing tip; R_{2+3} ending close to apex of R_1 ; FCu distal to RM. Brachiolum, R, R_1 and R_{4+5} with setae, remaining veins bare. Squama bare.

Legs. Fore tibia with weakly developed, shallow scale without spur. Mid and hind tibiae with short, fused combs, with single spur per tibia. Pseudospurs and sensilla chaetica absent. Pulvilli vestigial. LR₁ 1.33–1.46.

Abdomen. Tergites and sternites with sparse, irregular setation. Segment VIII subtriangular, tapering anteriorly.

Hypopygium. Anal tergite bands separate, ending slightly above or reaching base of anal point. Tergite IX in dorsal view (Figs 3F, 6F) with posterior margin subtriangular, with few marginal setae to each side of anal point only. Anal point parallel-sided to weakly spatulate, one-third to one-fourth the length of gonostylus, with microtrichia at base only. Laterosternite IX without or at most with three setae. Transverse sternapodeme well developed, nearly straight, with slightly higher lateral corners. Phallapodeme narrow. Superior volsella without setose base, curved to nearly straight, tapering towards apex, without microtrichia, with two dorsal-lateral and two distal-medial setae. Me-

dian volsella possibly represented by one to two setae on single, small protuberance. Inferior volsella apically foot-shaped, with microtrichia, with 5–7 simple setae on main branch and 3–5 simple or apically split setae on side branch. Gonostylus well developed, with simple setae along inner margin, and with or without apical field of elongate trichia along inner margin. HR 0.85–1.13.

Female. Unknown.

Pupa and larva. See description under *C. froehlichii*.

Remarks

Larvae of *Claudiotendipes* n. gen. have been recorded repeatedly in studies of Brazilian lotic systems as morphotypes unassigned to genus, provisionally named “aff. *Omisus*” (Sanseverino and Nessimian 1998; Suriano and Fonseca-Gessner 2004; Henriques-Oliveira et al. 2003a, 2003b), “cf. *Omisus*” (Henriques-Oliveira et al. 1998), “cf. *Paratendipes*” (Sanseverino and Nessimian 2008) or “prox. *Paratendipes*” (Trivinho-Strixino 2011). However, such overall resemblance to *Omisus* and *Paratendipes* does not reflect close phylogenetic relationship (Fig. 2).

Key to males in *Claudiotendipes* n. gen.

1. Anal point weakly spatulate, wing length about 1.7 mm, AR = 1.0. Bahia, Rio de Janeiro, São Paulo, and Santa Catarina States, Brazil. *C. froehlichii* n. sp.

– Anal point parallel-sided, wing length about 1.0 mm, AR = 0.28. Guanacaste Province, Costa Rica. *C. epleri* n. sp.

Claudiotendipes froehlichii new species

<http://zoobank.org/087B77F5-597F-46B0-A5B9-0A96804EBC71>

Type material: *Holotype*: BRAZIL, Bahia, Camacan, Serra Bonita, córrego 1, 15°23'28"S, 39°33'56"W, 820 m a.s.l., 31.vii.2008, Malaise trap, AR Calor, L Lecci, LC Pinho, RA Moretto, 1 male with larval and pupal exuviae (reared) (MZUSP). *Paratypes*: BRAZIL, Bahia, Camacan, Serra Bonita, córrego 3, 15°23'02"S, 39°34'10"W, 805 m a.s.l., 01–04.viii.2008, Malaise trap, AR Calor, L Lecci, LC Pinho, RA Moretto, 2 males (MZUSP); as previous except córrego 2, 15°23'10"S, 39°34'03"W, 819 m a.s.l., 01.viii.2008, hand net, 1 male (MZUFBA); as previous except Barreiras, Rio de Janeiro, Cachoeira Acaba Vida, 11°53'40"S, 45°36'06"W, 722 m a.s.l., 14.x.2008, light trap, AR Calor, RL Mariano, S Mateus, 1 male (MZUFBA). Rio de Janeiro: Teresópolis,

is, P4A-P514, 22°26'51"S, 43°00'48"W, 1453 m a.s.l., E Shimabukuro, 1 male (MZUSP). São Paulo: Ubatuba, Pico do Corcovado, P1M-C50, 23°27'52"S, 45°11'55"W, 222 m a.s.l., E Shimabukuro, 1 male (MZUSP); Estação Ecológica Boracéia, Salesópolis, Rio Claro, poço Verde, 10.x.2004, light trap, CG Froehlich et al., 3 males (ZMBN); as previous except 18.ix.2002, AS Melo, CG Froehlich, RL Mariano, A. Prather, R Blatnik, 1 male (ZMBN); as previous except córrego Venerando, 12.xii.2001, CG Froehlich et al., 1 male (MZUSP); as previous except Parque Estadual Campos do Jordão, Campos do Jordão, córrego Galharada, 22°41'40"S 45°27'36"W, 757 m a.s.l., 03.x–03.xi.2005, Malaise trap, MR Spies, 1 male (INPA); as previous except 20.viii.2006, light trap, LS Lecci, 1 male (INPA). Santa Catarina: Parque Estadual da Serra Furada, Grão-Pará, 28°11'28"S 49°23'30"W, 508 m a.s.l., #01, 13.x.2012, light trap, LC Pinho, AC Ganzer, LS Gomes, AG Parise, 1 male (UFSC); Urubici, Rio Canoas, 28°01'41"S 49°22'36"W, 1014 m a.s.l., #29, 08.i.2013, light trap, LC Pinho, MC Novaes, MF Haddad, 3 males (UFSC).

Etymology: Like the genus name, the specific epithet honors Dr. Claudio G. Froehlich.

Diagnostic characters: See key.

Description

Male (n = 8–10, except when otherwise stated). Total length 2.33–3.05, 2.79 (6) mm. Wing length 1.39–1.99, 1.69 mm. Total length / wing length 1.63–2.05, 1.79 (6). Wing length / length of profemur 1.72–2.02, 1.88.

Coloration. All whitish, wings hyaline without markings.

Antenna. AR 0.91–1.13, 1.04. Ultimate flagellomere 407–514, 461 µm long.

Head (Fig. 3A). Temporal setae 9–13, 12; including 3–4, 4 inner verticals, 2–5, 4 outer verticals, and 3–4, 4 postorbitals. Clypeus with 9–14, 11 setae. Frontal tubercle indicated as paler area to small knob. Tentorium, stipes and cibarial pump as in Figure 3B. Tentorium 115–152, 136 µm long; 29–37, 33 µm wide. Stipes 106–118, 113 µm long; 27(1) µm wide. Palp segment lengths (in µm): 24–30, 27; 26–38, 35; 118–158, 140; 104–148, 128; 159–230, 197. Third palpomere with 2–4, 3 sensilla, longest 13–20, 15 µm long.

Thorax (Fig. 3C). Anteprepronotum with 0–1, 0 seta. Dorsocentrals 9–15, 11; acrostichals 6–13, 10, all decumbent, starting close to anteprepronotum; prealars 2–3, 2. Scutellum with 5–9, 6 setae, uniserial.

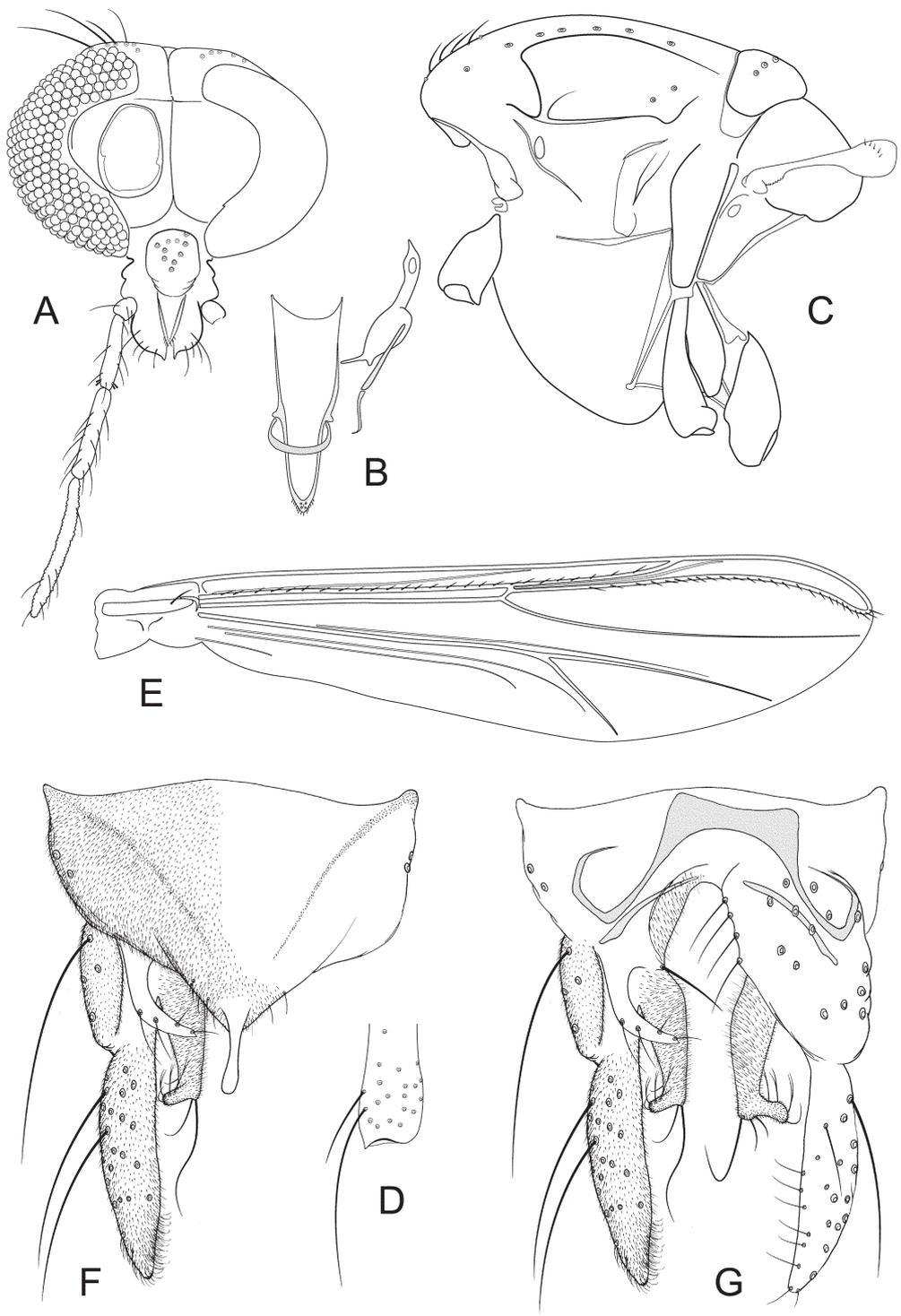


Figure 3. *Claudiotendipes froehlichii* n. sp., male. A, Head. B, Tentorium, stipes and cibarial pump. C, Thorax. D, Apex of fore tibia. E, Wing. F, Hypopygium, dorsal view. G, Hypopygium with anal point and tergite IX removed, dorsal aspect to the left and ventral aspect to the right.

Wing (Fig. 3E). VR 1.16–1.24, 1.21. Brachiolum with 1–2, 1 setae; R 15–24, 19; R₁ with 6–11, 9; R₄₊₅ with 23–36, 31 setae; other veins and cells bare. Squama bare.

Legs (Fig. 3D). Scale of fore tibia 6–9, 8 µm long; spur of mid tibia 41–52, 48 µm long; spur of hind tibia 47–66, 54 µm long. Comb on mid tibia 12–20, 18 µm long; comb on hind tibia 16–27, 22 µm long. Width at apex of fore tibia 49–59, 54 µm; of mid tibia 48–57, 52 µm; of hind tibia 52–64, 58 µm. Lengths and proportions of legs as in Table 1.

Hypopygium (Figs 3F, G). Tergite IX covered with microtrichia, with 3–6, 4 setae to each side of base of anal point; anal tergite bands ending slightly above base of anal point. Laterosternite IX with 0–3, 2 setae. Anal point weakly spatulate, 23–39, 28 µm long, 10–14, 13 µm wide at base, 4–6, 5 µm wide medially, 7–10, 8 µm wide near apex. Transverse sternapodeme 41–61, 53 (7) µm long, nearly straight. Phallapodeme 54–70, 67 (7) µm long. Gonocoxite 91–122, 106 (7) µm long. Superior volsella 38–48, 40 µm long, 11–15, 13 µm wide at base, 3–8, 4 wide at apex, with 2 dorsal and 2 lateral setae. Median volsella with 1–2, 1 setae. Inferior volsella 59–82, 64 µm long, 15–25, 19 µm wide at base, 6–9, 7 µm wide at apex, with 4–5, 5 simple setae, 1–2, 1 stout apical seta on main branch and 3–5, 4 apically split setae on side-branch. Gonostylus 96–120, 105 µm long. HR 0.85–1.13, 1.02 (7). HV 2.91–2.98 (3).

Female. Unknown.

Pupa (exuviae, n = 1). Total length 3.19 mm.

Coloration. Exuviae pale with brownish caudolateral spur.

Cephalothorax. Frontal apotome (Fig. 4A) subtriangular, 340 µm long, 296 µm wide. Frontal setae 144 µm long. Thorax (Fig. 4B) 695 µm long. Thoracic horn (Fig. 4C) with 4 branches. Dorsal anteprenotal seta hair-like, about 53 µm long; lateral anteprenotal hair-like, not measurable. Precorneals close together, hair-like, both about 30 µm long. Dc₁ 31 µm long, Dc₂ 35 µm long, Dc₃ 33 µm long, Dc₄ 21 µm long; Dc₁ 1 µm in front of Dc₂, Dc₂ 117 µm in front of Dc₃, Dc₃ 29 µm in front of Dc₄. Wing sheath 1.07 mm long, without nose or pearl row.

Abdomen (Fig. 4D). Tergites I and IX bare; tergites II–IV with median field of fine shagreen and anterior band of slightly stronger shagreen, tergite IV with median field barely separated from anterior band; tergite V with continuous median, fine shagreen; tergite VI with widely separated anterior and posterior transverse fields of fine shagreen; tergites VII–VIII with anterolateral patches of fine shagreen. Sternites bare. Hook row on tergite II with 26 caudal hooklets in single, 148 µm wide row. Conjunctive IV/V with about 120 spinules in 4–5 rows. Pedes spurii B well developed posteriorly on segment II; pedes spurii A lacking. Segment VIII caudolateral spur (Fig. 4E) 160 µm long, with 3 strong apical teeth.

Abdominal setation. Segment I without L setae, segment II with 2–3 non-taeniate L setae, segments III–IV each with 3 non-taeniate L setae, segments V–VIII each with 4 taeniate LS setae. Dorsal and oral ('O') setae apparently present on segments II–VII, segments I and VIII apparently each with single pair of dorsal setae.

Anal lobe. Fringe with 18 taeniae. Male genital sac

Table 1. Lengths (in µm) and proportions of legs of *Claudiotendipes froehlichii* n. sp., male (n = 9).

	fe	ti	ta₁	ta₂
p₁	746–1032, 912	663–847, 793	958–1160, 1104	451–566, 472
p₂	847–1050, 963	682–903, 793	438–553, 505	175–249, 214
p₃	903–1133, 1021	737–958, 843	626–774, 717	332–424, 363
	ta₃	ta₄	ta₅	LR
p₁	359–456, 389	270–350, 309	74–92, 85	1.33–1.44, 1.39
p₂	129–175, 157	83–111, 96	37–55, 45	0.57–0.69, 0.64
p₃	258–295, 273	140–175, 158	46–64, 57	0.81–0.88, 0.85
	BV	SV	BR	
p₁	2.05–2.29, 2.16	1.47–1.61, 1.54	2.4–3.3, 2.7	
p₂	4.16–4.81, 4.43	3.42–3.70, 3.48	2.9–4.7, 3.6	
p₃	2.76–3.22, 3.03	2.51–2.70, 2.60	4.4–7.0, 5.3	

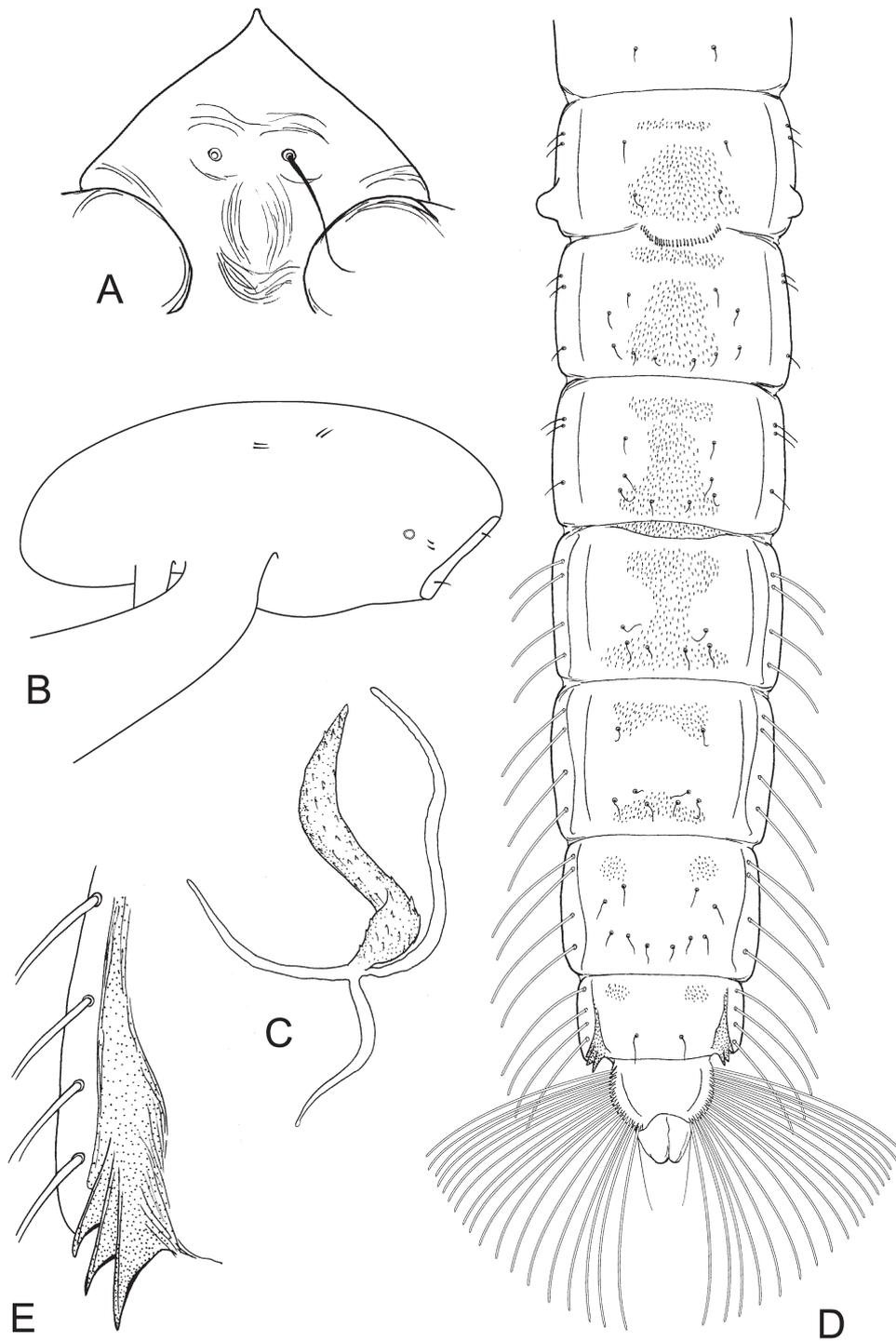


Figure 4. *Claudiotendipes froehlichii* n. sp., pupa. A, Frontal apotome. B, Thorax. C, Thoracic horn. D, Abdomen. E, Caudolateral spur.

overreaches anal lobe by 76 μ m.

Larva (cast skin, n = 1). Total length not measurable. Head capsule 340 μ m long. Postmentum 115 μ m long.

Coloration. Head capsule yellowish brown with

postoccipital margin, teeth of mandible and lateral teeth of mentum darker brown.

Head. Antenna as in Figure 5B. Antenna with 6 segments; AR 1.06; length of antennal segments (in μ m): 113, 35, 37, 8, 17, 10; blade 73 μ m long;

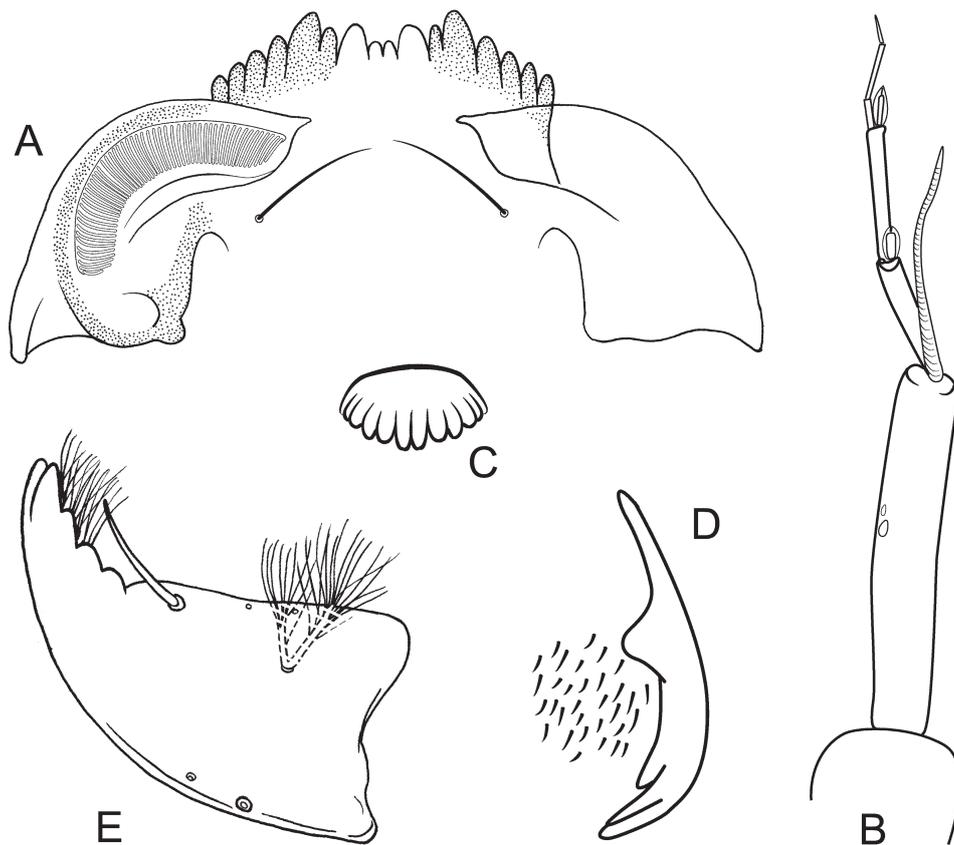


Figure 5. *Claudiotendipes froehlichii* n. sp., larva. A, Mentum and ventromental plates. B, Antenna. C, Pecten epipharyngis. D, Premandible. E, Mandible.

Lauterborn organs about 8 μm long; ring organ 58 μm from base in first segment. Pecten epipharyngis (Fig. 5C) consisting of single plate with 12 teeth; 17 μm wide. Premandible (Fig. 5D) 81 μm long. Mandible (Fig. 5E) 94 μm long with pale dorsal tooth and 3 inner teeth. Seta subdentalis well developed; seta interna with 2 main branches. Mentum (Fig. 5A) 83 μm wide, with 8 pairs of mental teeth; median pair short, pale yellowish brown; first lateral about twice as long, pale yellowish brown; second lateral about equally long, darker brown; third lateral about three times as long as median, darker brown; 4–7 lateral pairs gradually shorter, darker brown. Ventromental plate (Fig. 5A) curved, 66 μm wide, distance between plates 35 μm .

Abdomen. Procercus with 12 anal setae. Posterior parapods each with 13 claws.

Distribution and ecology

This species is apparently widely distributed along the Atlantic rainforest in Brazil, ranging from 220 m to over 1450 m altitude between latitudes 11° and 28°S. The larva was collected in leaf debris in a first order stream which flows through a forested

area in Serra Bonita, Bahia State. Similar conditions occur at other localities where adults were collected in light or Malaise traps.

Claudiotendipes epleri new species

<http://zoobank.org/F16C55CF-A514-4379-B19D-50640527FE08>

Type material: *Holotype:* COSTA RICA, Guanacaste, Guanacaste Conservation Area, Cerro Cacao, Rio San Josecito, 1000 m a.s.l., 4–5.v.1993, Malaise trap, T Andersen, 1 male (ZMBN).

Etymology: Named after Dr. John H. Epler for his many contributions to the taxonomy and ecology of chironomids from the New World.

Diagnostic characters: See key.

Description

Male (n = 1). Total length 1.73 mm. Wing length 1.02 mm. Total length / wing length 1.69. Wing length / length of profemur 1.91.

Coloration. Antenna and legs pale yellowish; head, thorax and abdomen whitish; wings hyaline without markings.

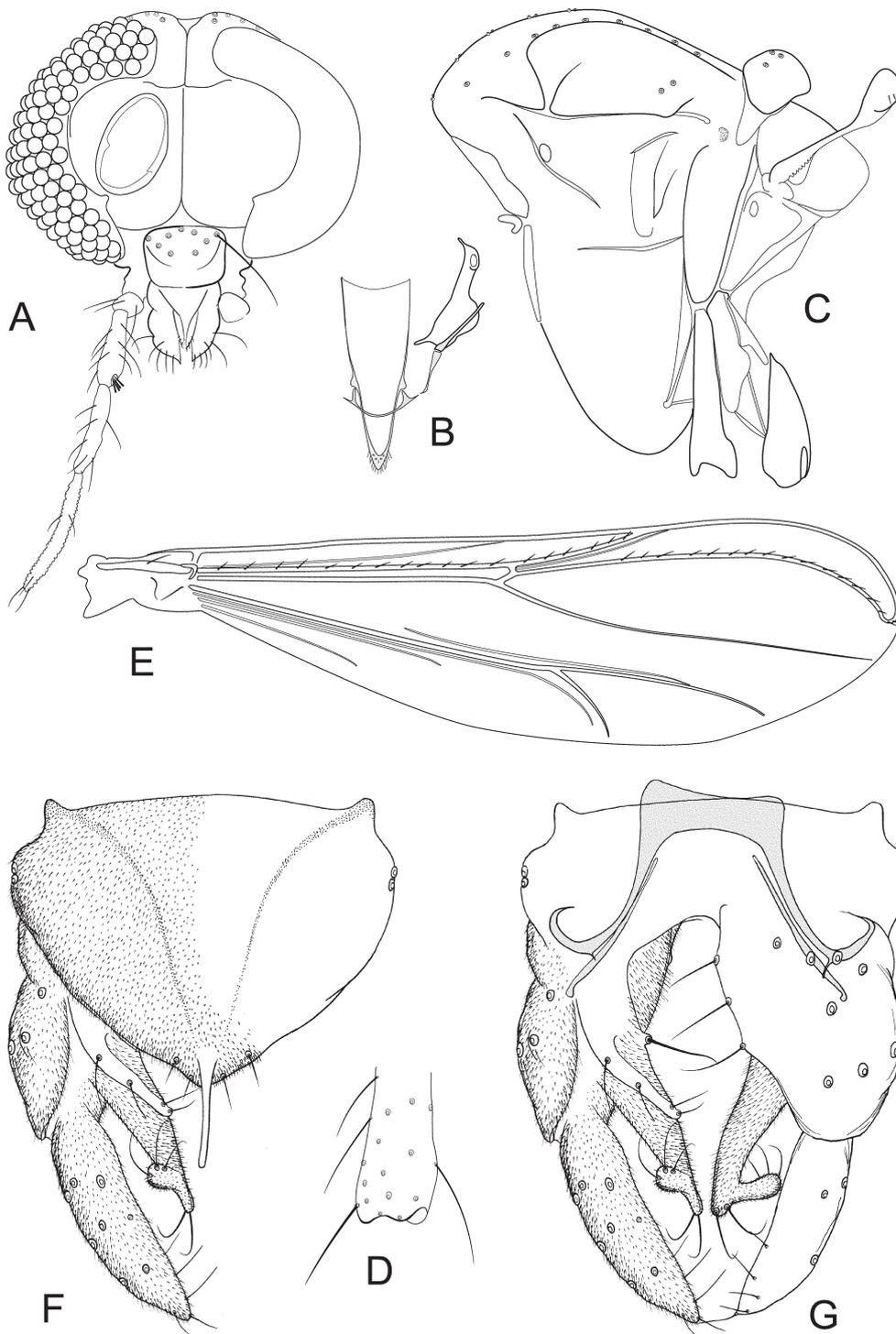


Figure 6. *Claudiotendipes epleri* n. sp., male. A, Head. B, Tentorium, stipes and cibarial pump. C, Thorax. D, Apex of fore tibia. E, Wing. F, Hypopygium, dorsal view. G, Hypopygium with anal point and tergite IX removed, dorsal aspect to the left and ventral aspect to the right.

Antenna. AR 0.28. Ultimate flagellomere 96 μm long.

Head (Fig. 6A). Temporal setae 9 including 5 inner verticals, 2 outer verticals, and 2 postorbitals. Clypeus with 8 setae. Frontal tubercle barely indicated as pale area. Tentorium, stipes and cibarial pump as in Figure 6B. Tentorium 73 μm long, 18 μm wide. Stipes 61 μm long. Palp segment lengths (in μm): 16, 23, 64, 70, 107. Third palpomere with 6 sensilla, 4 of which in pit, longest 11 μm long.

Thorax (Fig. 6C). Anteprenotum bare. Dorsocentrals 7; acrostichals 7, all decumbent, starting close to anteprenotum; prealars 2. Scutellum with 6 setae, partly biserial.

Wing (Fig. 6E). VR 1.26. Brachiolum with 1 seta, R with 13, R_1 with 5, R_{4+5} with 19 setae, other veins and cells bare. Squama bare.

Legs (Fig. 6D). Scale of fore tibia 11 μm long; spur of mid tibia 32 μm long, of hind tibia 35 μm long. Comb on mid tibia 10 μm long, of hind tibia 12 μm long. Width at apex of fore tibia 30 μm , of mid tibia 34 μm , of hind tibia 36 μm . Lengths and proportions of legs as in Table 2.

Hypopygium (Figs 6F, G). Tergite IX covered with microtrichia, with 2 setae to each side of base of anal point; anal tergite bands reaching base of anal point. Laterosternite IX with 1 seta. Anal point nearly parallel-sided, 19 μm long, 3 μm wide. Transverse sternapodeme 29 μm long, nearly straight. Phallapodeme 38 μm long. Gonocoxite 59 μm long. Superior volsella 27 μm long, 6 μm wide at base, 4 μm wide at apex, with 2 dorsal and 2 lateral setae. Median volsella with 1 seta. Inferior volsella 39 μm long, 13 μm wide at base, 3 μm wide at apex, with 2 simple setae and 1 stout apical seta on main branch and 4 simple setae on side-branch. Gonostylus 54 μm long. HR 1.08. HV 3.21.

Female and immatures. Unknown.

Distribution and ecology

This species is only known from Guanacaste Conservation Area in northwestern Costa Rica where it was collected in a Malaise trap at a small, shallow river with stony bottom at 1000 m altitude.

Sigmoitendipes new genus

<http://zoobank.org/E0F0B0ED-CC75-4162-9DDC-915166283F7B>

Type species: *Sigmoitendipes susanae* n. sp.

Other included species: *Sigmoitendipes fittkai* n. sp., *S. oliveirai* n. sp., *S. reissi* n. sp. and *S. spiesi* n. sp.

Etymology: The specific epithet refers to the shape of the superior volsella resembling the lower-case Greek letter sigma. The suffix *-tendipes* is a common ending among Chironominae genera. For the purposes of nomenclature, the gender of the genus name is masculine.

Diagnostic characters

The males can be separated from all other Chironomini by the combination of an antenna with 13 segments, antennal ratio about 2.0; squama with 5–11 setae; wings lacking markings; fore tibia with well-developed, bearded scale, comb of mid tibia with one spur, comb of hind tibia with two spurs; anal tergite bands weak, adjacent to anterior tergite margin, in some species with short median longitudinal extension; setae on tergite IX restricted to posterior margin and/or base of anal point; anal point strong, spatulate; superior volsella complex, composed of a median or ventral, rounded or subrectangular part densely covered with microtrichia and carrying a few setae in some species, and of a dorsal to apical part with several strong setae and in some species with sparse microtrichia, dorsal part with apex more or less hooked; inferior volsella near mid-length with bluntly triangular dorsal lobe.

The pupa shares with those of some other Chironomini the combination of long, robust frontal setae; well-developed, conical cephalic tubercles; strongly plumose thoracic horns; anterior, transverse bands of shagreen on tergites II–VI; robust, longitudinal anal combs; and no dorsal setae on the anal lobes. It can be separated by having only one median anteprenotal seta, and 5 LS setae on segment VIII.

The larva has a six-segmented antenna with a single well-developed Lauterborn organ on the sec-

Table 2. Lengths (in μm) and proportions of legs of *Claudiotendipes epleri* n. sp., male (n = 1).

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
p₁	534	378	553	272	190	138	40	1.46	2.32	1.65	2.8
p₂	571	433	253	101	83	55	28	0.58	4.71	3.96	3.8
p₃	605	449	–	–	–	–	–	–	–	–	–

ond segment; the mandible has one dorsal, one apical and four inner teeth, with the seta subdentalis long, slender and straight; the mentum with 8 pairs of equally sclerotized teeth, the first lateral teeth larger than the median pair, the second lateral teeth smaller than both their immediate neighbours, and the further lateral teeth decreasing progressively to a minute seventh tooth; and the ventromental plates slightly wider than the mentum, and separated by the width of 4–5 mental teeth.

Generic description

Male. Medium sized species, wing length 1.9–2.2 mm.

Coloration. Body brown, wing translucent without dark markings.

Antenna. With 13 flagellomeres. AR 1.93–2.27.

Head. Eyes bare, with well-developed dorsomedial extension, with 6–7 ommatidia in first transverse row. Frontal tubercle indicated as paler area to small knob. Temporal setae 10–30, partly biserial, composed of 2–4 inner verticals, 5–15 outer verticals and 3–13 postorbitals. Clypeus with 10–25 strong setae. Palp with 5 segments, not shortened; third palpomere with 3–8 sensilla subapically, longest 22–27 µm long.

Thorax. Anteprenotal lobes narrowly separated medially, each lobe narrowing dorsally. Scutum not overreaching anteprenotum, tubercle absent or weak. Acrostichals 5–10, erect, starting some distance from anteprenotum. Dorsocentrals 5–11, uniserial; prealars 2–5; supraalar absent. Scutellum with 7–13 setae, uniserial to partly biserial.

Wing. VR 1.07–1.13. Wing membrane bare, with fine punctuation. Anal lobe well developed. Costa not extended, ending opposite to M_{1+2} ; R_{2+3} ending in proximal 1/3 between apices of R_1 and R_{4+5} ; FCu slightly distal to RM. Brachiolum, R, R_1 and R_{4+5} with setae, remaining veins bare. Squama with 5–11 setae.

Legs. Apex of fore tibia with rounded, unspurred scale, with long beard. Mid- and hind tibiae with fused combs, mid tibia with single spur, hind tibia with two spurs. With one pair of pseudospurs on ta_1 – ta_3 on mid- and hind legs; sensilla chaetica apparently absent. Pulvilli simple, lobe-shaped, shorter than claw. LR₁ 1.51–1.71.

Abdomen. Tergites and sternites moderately to densely setose with irregular setae. Segment VIII tapering slightly anteriorly.

Hypopygium. Anal tergite bands weak, following anterior margin of tergite. Tergite IX with posterior

margin subtriangular, with few marginal setae to each side of anal point only. Anal point long, spatulate, with microtrichia at base only. Laterosternite IX with few setae. Transverse sternapodeme narrow, straight or sinuous, without oral projection. Phallapodeme normal. Superior volsella without setose base, complex; with median or ventral, rounded or subrectangular lobe densely covered with microtrichia, with or without a few apical setae; with dorsal to apical lobe, without or with sparse microtrichia, with several strong setae, apically hooked with apex projecting laterad. Median volsella absent. Inferior volsella long, with narrow base; medially with bluntly triangular, dorsal lobe; apical one-half widened, subrectangular to bluntly subtriangular, with several strong, orally directed setae, distally with one or two longer setae projecting caudally. Gonostylus long, rather stout, widest in apical one-half, subapically with row of short, strong setae along inner margin. HR 0.73–0.95.

Female. Unknown.

Pupa and larva. See description under *S. susanae*.

Remarks

Larvae of *Sigmoitendipes* n. gen. may represent the morphotype “*Endotribelos* sp. 2” (Trivinho-Strixino 2011), with which it appears to share the six-segmented antenna with well-developed Lauterborn organs on the second segment, the mentum with 16 dark teeth of alternating sizes, and the wide ventromental plates. However, the information available on larvae in *Sigmoitendipes* n. gen. are insufficient for reliable identification with that morphotype. Moreover, the pupal anal comb with about 30 minute teeth that is visible in a pre-pupa of “*Endotribelos* sp. 2” (S. Trivinho-Strixino, pers. comm.) appears to suggest distinct genera.

Key to males in *Sigmoitendipes* n. gen.

1. Dorsal lobe of superior volsella subtriangular, broad, with at most the very tip slightly curved. Mato Grosso State. *S. oliveirai* n. sp.
 – Dorsal lobe of superior volsella narrow, strongly curved. 2
2. Superior volsella with median, rounded lobe with microtrichia, not reaching apex of volsella. 3
 – Superior volsella with ventral, subrectangular lobe with microtrichia, reaching apex of volsella. 4
3. Apical, hooked part of superior volsella with sparse microtrichia and about 10 setae; hook moderately strong. São Paulo, Mato Grosso, Amazonas

and Pará States..... *S. susanae* n. sp.

– Apical, hooked part of superior volsella without microtrichia, with 4 setae; hook very strong. São Paulo State. *S. reissi* n. sp.

4. Ventral, subrectangular lobe of superior volsella narrow, without seta. Mato Grosso and Pará States. *S. fittkaui* n. sp.

– Ventral, subrectangular lobe of superior volsella comparatively wide, with 2 apical setae. Mato Grosso State. *S. spiesi* n. sp.

***Sigmoidipus susanae* new species**

<http://zoobank.org/5F79CF91-9117-4B94-8804-1D4D7DE88CAE>

Type material: *Holotype*: BRAZIL, São Paulo, Ribeirão Preto, Lago Monte Alegre, 21°11'S 47°43'W, 9.v.2000, 500 m a.s.l., HF Mendes, 1 male with larval and pupal exuviae (reared) (MZUSP). *Paratypes*: BRAZIL, São Paulo, Parque Estadual da Serra do Mar, São Luís do Paraitinga, Núcleo Santa Virgínia, 14.iv.2009, light trap, R Mariano, LS Lecci, G Schulz, 1 male (UFSC). Amazonas: Coari (BOGPM), Urucu, igarapé Martha, 04°51'50"S 65°04'45"W, 05–06.xi.2007, Pennsylvania trap, SRM Couceiro, 9 males (MZUSP, ZMBN); as previous except: 16–21.xi.2007, 1 male (UFSC). Mato Grosso: Nova Xavantina area, igarapé Garapuat, expedition camp I, 24–27.viii.1965, Brundin net, EJ Fittkau, 1 male (ZSM - A565-4). Pará: near border to Suriname, Parque Indígena Tumucumaque, igarapé Okueima, 18.iv.1962, at light, EJ Fittkau, 1 male (ZSM - A371-1); as previous except: Parque Indígena Tumucumaque, “Kumadueni”, onça site, 19.iv.1962, 1 male (ZSM - A377); as previous except: Rio Paru, Malloca Apicó, 14.iv.1962, 1 male (ZSM - A366-1); as previous except: between Furo Maripanema and Rio Curuçá near the Atlantic Ocean, igarapé 7 km from Curuçá, 13.viii.1953, H Sioli, 1 male (ZSM).

Etymology: Named in honor of Professor Dr. Susana Trivinho-Strixino for her numerous contributions to the knowledge of Brazilian chironomids.

Diagnostic characters: See key.

Description

Male (n = 7–9, except when otherwise stated). Total length 4.44–5.15, 4.89 mm. Wing length 1.87–2.12, 2.00 mm. Total length / wing length 2.34–2.51, 2.44. Wing length / length of profemur 1.40–1.48, 1.44.

Coloration. Thorax brown, head and abdomen light brown, legs pale brown. Wing translucent.

Antenna. AR 2.13–2.27, 2.20. Ultimate flagellomere 882–972, 927 µm long.

Head (Fig. 7A). Temporal setae 20–29, 22; including 2–4, 3 inner verticals, 8–14, 10 outer verticals, partly biserial, and 8–13, 10 postorbitals. Clypeus with 14–25, 21 setae. Frontal tubercle indicated as paler area to small knob. Tentorium, stipes and cibarial pump as in Figure 7B. Tentorium 144–160, 152 µm long; 39–49, 44 µm wide. Stipes 129–160, 142 µm long; 6–10, 8 µm wide. Palp segment lengths (in µm): 37–41, 40; 45–57, 53; 82–90, 87; 92–113, 106; 123–148, 136. Third palpomere with 3–5, 4 sensilla, longest 23–27, 25 µm long.

Thorax (Fig. 7C). Anteprenotum without setae. Dorsocentrals 5–7, 6; acrostichals apparently 6–10, 8, erect, starting some distance from anteprenotum; prealars 3. Scutellar setae 10–13, 11, partly biserial.

Wing (Fig. 8A). VR 1.09–1.13, 1.10. Brachiolum with 2 setae; R 26–34, 29; R₁ with 21–26, 25; R₄₊₅ with 30–37, 34 setae, other veins and cells bare. Squama with 6–11, 9 setae.

Legs (Figs 7D–F). Scale of fore tibia 47–55, 52 µm long; spur of mid tibia 57–62, 59 µm long including 29–36, 32 µm long comb; spurs of hind tibia 46–52, 50 µm and 40–46, 42 µm long including 29–33, 30 µm long comb. Width at apex of fore tibia 59–65, 63 µm; of mid tibia 61–68, 64 µm; of hind tibia 66–75, 70 µm. Lengths and proportions of legs as in Table 3.

Hypopygium (Figs 8B, C). Tergite IX covered with microtrichia; laterosternite IX with 2–5, 3 setae. Anal point 29–33, 31 µm long, 5–7, 6 µm wide at base, 11–14, 13 µm wide subapically, with 3–8, 6 setae to each side of the base, of which about half on the ventral side. Transverse sternapodeme 46–55, 50 µm long, concave. Phallapodeme 99–108, 103 µm long. Gonocoxite 164–178, 170 µm long. Superior volsella (Fig. 8D) boot-shaped, 94–108, 101 µm long, medially with partly double, rounded, setose lobe, apical part sparsely setose, with 10–14, 12 setae, apex recurved. Inferior volsella 131–149, 138 µm long; 23–26, 24 µm wide at base; 11–14, 12 µm wide at its narrowest; with 19–23, 21 µm long dorsal, bluntly triangular projection, starting 69–77, 73 µm from base; apically subrectangular, 18–21, 20 µm wide; with 14–19, 16 simple setae, longest apical seta 76–87, 80 µm long. Gonostylus 201–230, 219 µm long. HR 0.73–0.85, 0.78. HV 2.16–2.46, 2.28.

Female. Unknown.

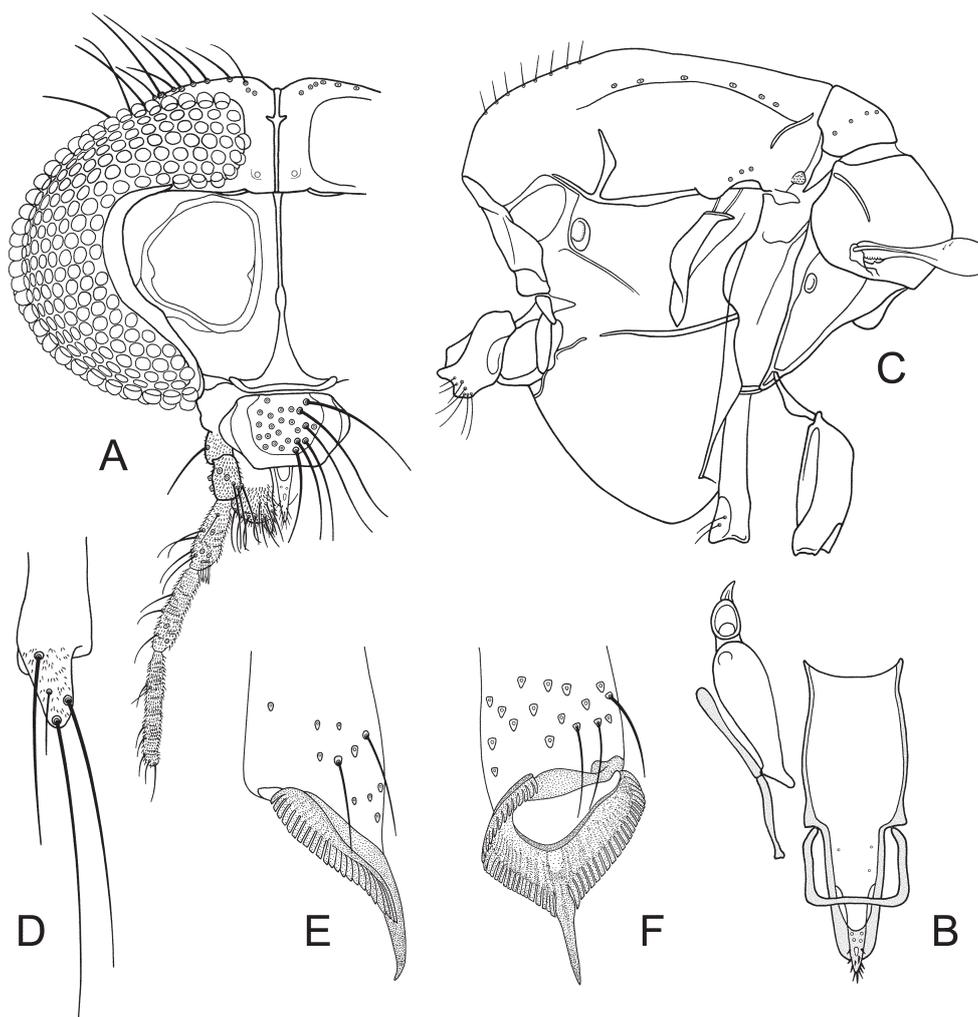


Figure 7. *Sigmoidendipes susanae* n. sp., male. A, Head. B, Tentorium, stipes and cibarial pump. C, Thorax. D, Scale of fore tibia. E, Comb of mid tibia, lateral view. F, Comb of mid tibia, posterior view.

Table 3. Lengths (in μm) and proportions of legs of *Sigmoidendipes susanae* n. sp., male (n = 5–7).

	fe	ti	ta ₁	ta ₂
p ₁	1442–1504, 1467	1030–1112, 1071	1607–1710, 1664	845–886, 873
p ₂	1257–1360, 1314	1071–1174, 1133	639–701, 676	412–433, 422
p ₃	1463–1648, 1566	1092–1215, 1154	948–1030, 993	556–618, 593
	ta ₃	ta ₄	ta ₅	LR
p ₁	659–700, 676	597–639, 622	210–227, 221	1.51–1.60, 1.55
p ₂	267–288, 284	144–165, 152	41–52, 45	0.58–0.61, 0.60
p ₃	474–515, 503	247–268, 251	62–72, 67	0.85–0.87, 0.86
	BV	SV	BR	
p ₁	1.74–1.78, 1.76	1.49–1.55, 1.53	3.2–3.4, 3.3	
p ₂	3.33–3.56, 3.46	3.55–3.73, 3.62	3.8–4.6, 4.1	
p ₃	2.57–2.67, 2.62	2.70–2.78, 2.74	5.6–13.1, 8.4	

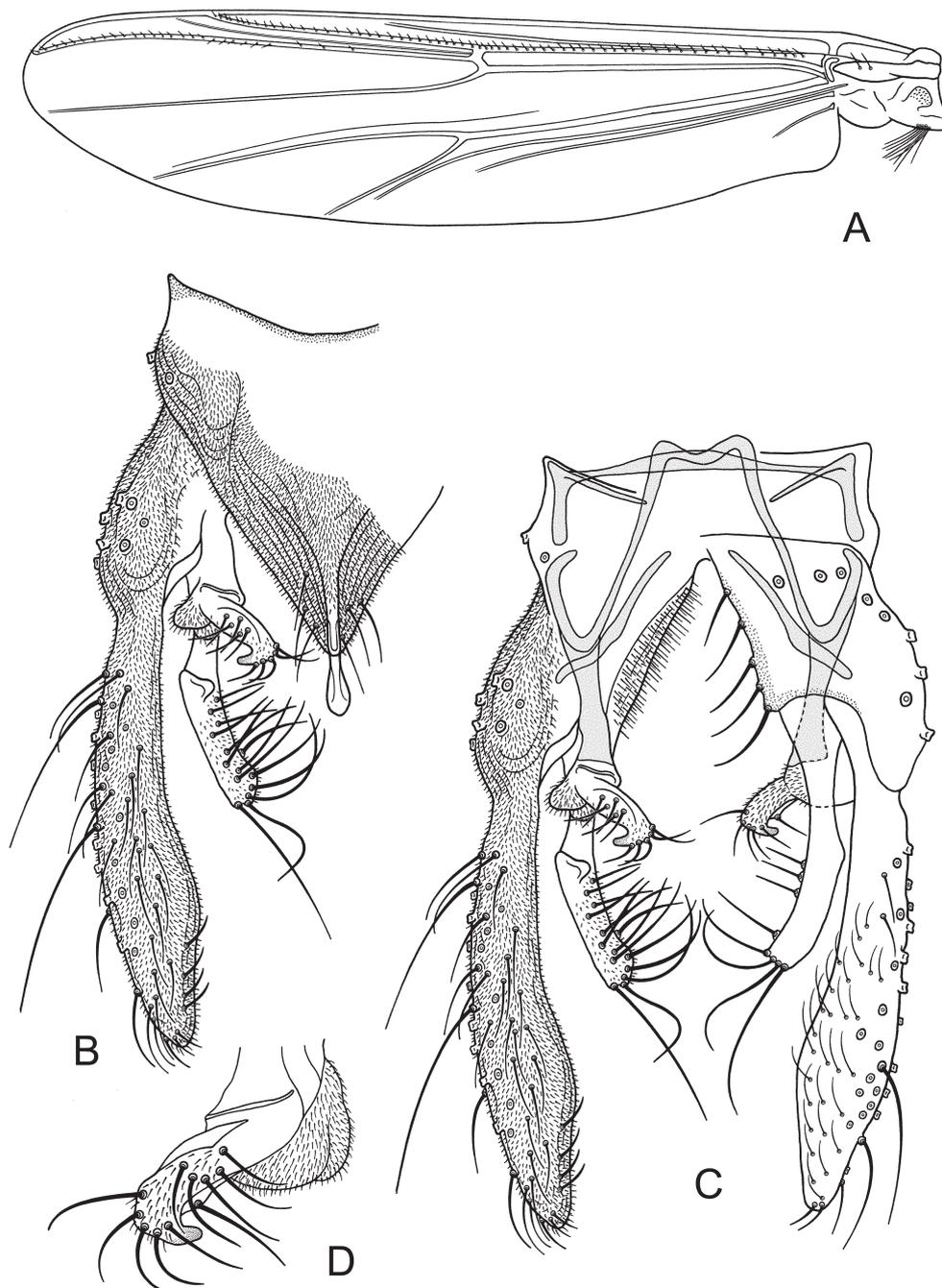


Figure 8. *Sigmoidendipes susanae* n. sp., male. A, Wing. B, Hypopygium, dorsal view. C, Hypopygium with anal point and tergite IX removed, dorsal aspect to the left and ventral aspect to the right. D, Superior volsella.

Pupa (exuviae, n = 1). Total length 3.54 mm.

Coloration. Exuviae with light brown cephalothorax, wing sheath pale brown with slightly darker margins, abdominal segments VI–VII pale brown, caudolateral spur brown.

Cephalothorax (Fig. 9B). Frontal apotome (Fig. 9A) subtriangular, with wrinkles, 368 μ m long, 332 μ m wide. Cephalic tubercle conical, 36 μ m long,

frontal setae 65 μ m long. Median antepronotal slightly taeniate, about 83 μ m long. Precorneals close together, both slightly taeniate, anterior precorneal about 48 μ m long, posterior precorneal about 83 μ m long. Dc₁ 62 μ m long, Dc₂ 76 μ m long, Dc₃ 73 μ m long, Dc₄ 78 μ m long; Dc₁ 54 μ m in front of Dc₂, Dc₂ 225 μ m in front of Dc₃, Dc₃ 39 μ m in front of Dc₄. Wing sheath 1.44 mm long, without nose or pearl row.

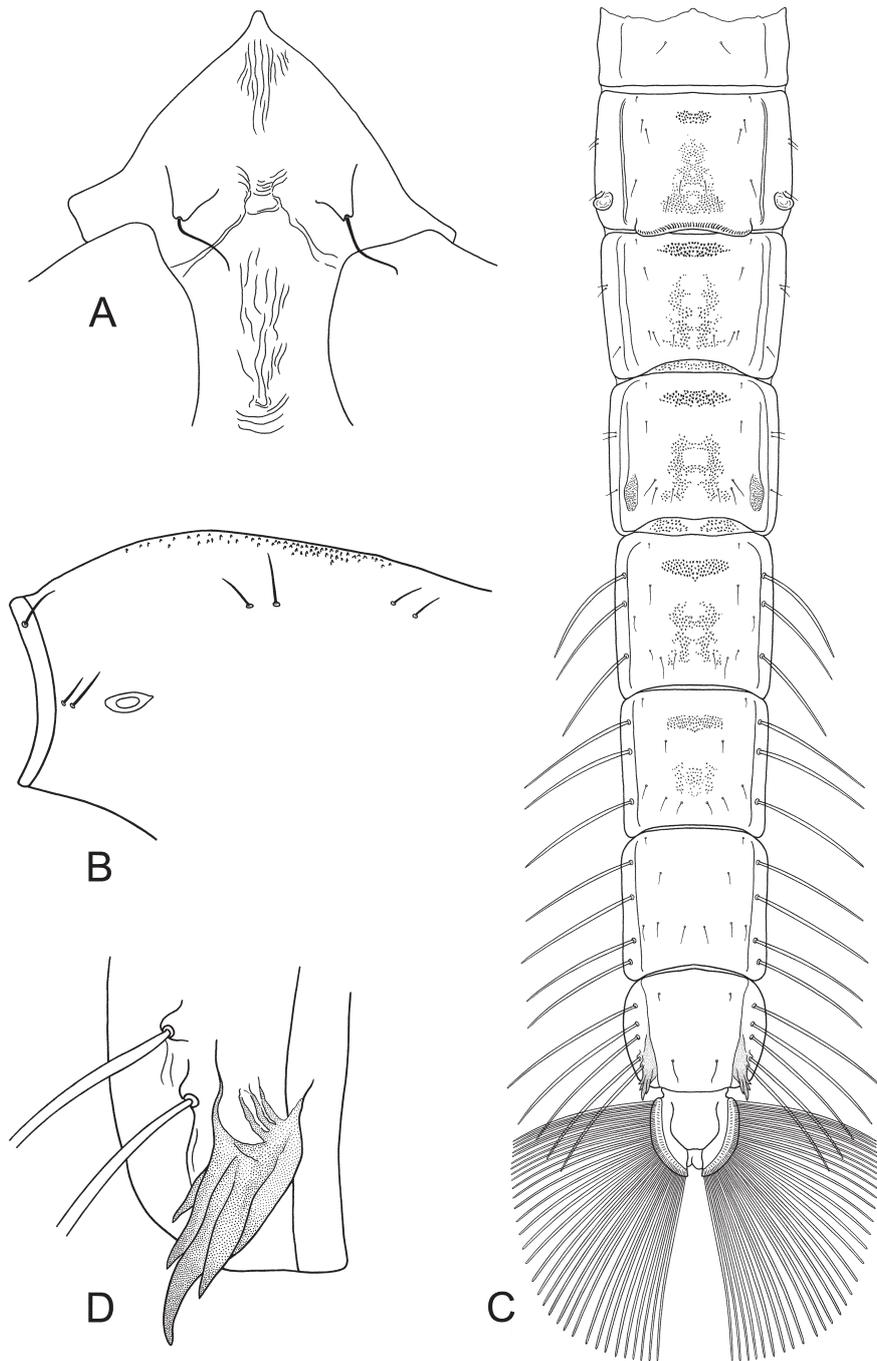


Figure 9. *Sigmoidendipes susanae* n. sp., pupa. A, Frontal apotome. B, Thorax. C, Abdomen. D, Caudolateral spur.

Abdomen (Fig. 9C). Tergite I bare, tergites II–VI each with 4 rows of strong spinules in anterior-medial band, tergites II–V each with medial anterior to posterior patches of finer shagreen, tergite VI with posterior patch of fine shagreen, tergites VII–VIII without spinules. Tergite II with 38 caudal hooklets in single, 388 μm wide row. Spinules on conjunctive III/IV in 3–4 rows; on conjunctive

IV/V in 5–6 rows in separate, lateral patches. Pedes spurii A well-developed posterior on segment IV; indicated on segment V. Pedes spurii B well-developed posterior on segment II. Caudolateral spur (Fig. 9D) 145 μm long, with 1 strong apical tooth and 3 weaker teeth.

Abdominal setation. Segment I without lateral setae; segments II–IV each with 3 short, hair-like

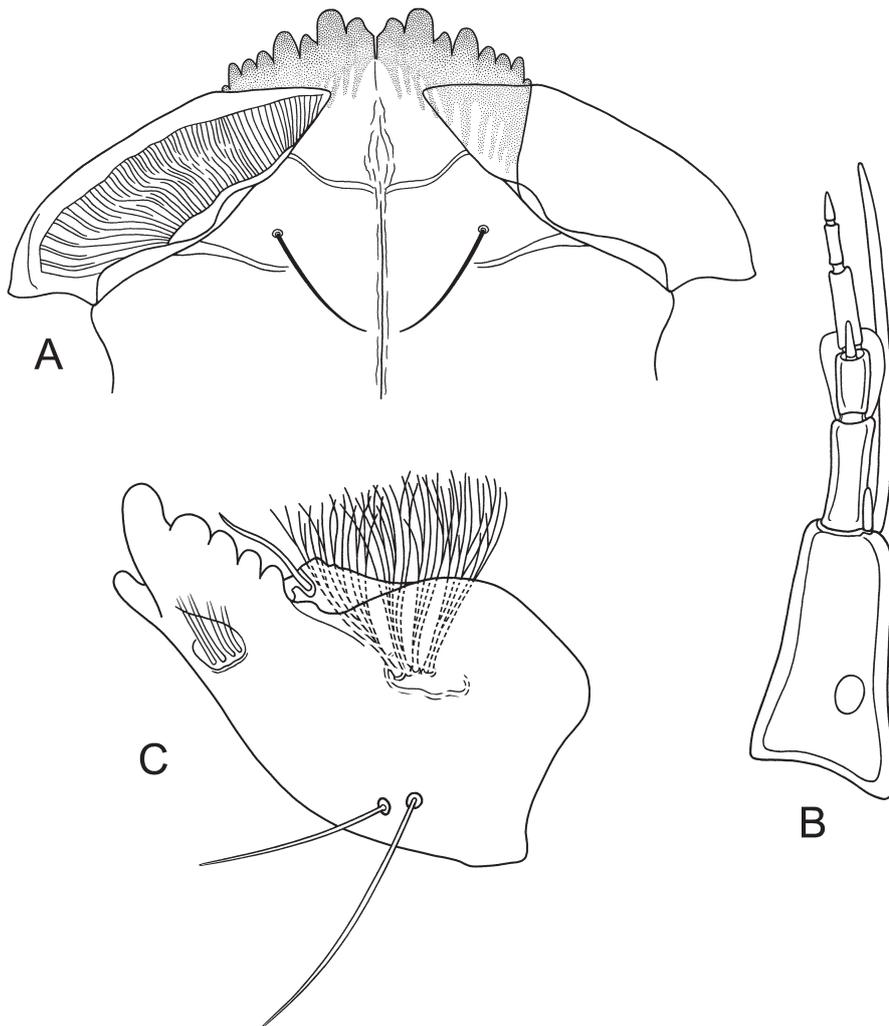


Figure 10. *Sigmoitendipes susanae* n. sp., larva. A, Antenna. B, Mandible. C, Mentum and ventromental plates.

lateral setae; segments V–VI each with 3 taeniae; segment VII with 4 taeniae; segment VIII with 5 taeniae.

Anal lobe. Anal lobe fringe with 47 taeniae. Male genital sac overreaches anal lobe by 82 μm .

Larva (exuviae, $n = 1$). Total length not measurable. Head capsule 420 μm long. Postmentum 180 μm long.

Coloration. Head capsule brown with teeth of mentum and mandible and postoccipital margin dark brown.

Head. AR 0.93; antennal (Fig. 10B) segment lengths (in μm): 57, 22, 10, 8, 11, 10. Basal antennal segment 30 μm wide; ring organ 18 μm from base; blade 67 μm long; accessory blade 7 μm long; Lauterborn organ 18 μm long. Pecten epipharyngis and premandible not discernible. Mandible (Fig. 10C) 135 μm long, with 1 apical, 1 apical and 4 inner teeth; seta subdentalis 36 μm

long, slender and straight; setae interna prominent. Mentum (Fig. 10A) 124 μm wide, with 8 pairs of teeth; pair of median teeth 19 μm wide, first lateral tooth larger than median tooth, second lateral tooth smaller than first lateral tooth, third lateral tooth larger than second lateral tooth, fourth to sixth lateral teeth decrease progressively to a minute seventh tooth. Ventromental plate (Fig. 10A) 142 μm wide; distance between plates 39 μm ; median apices of plates pointing towards each other. Ratio of ventromental plate / mentum 1.15. Setae submenti 55 μm long.

Abdomen. Not measurable.

Distribution and ecology

Found in São Paulo, Mato Grosso, Amazonas and Pará states. Fittkau collected the species using Brundin nets in shallow Amazonian forest streams of first, second or third order in evergreen tropical inundation forest. The streams were 1–2 m wide, shallow, flowing, and with bottoms of sand and

leaves. During the flood season the water level in the streams rose up to approximately 4 m higher.

***Sigmoitendipes fittkaui* new species**

<http://zoobank.org/F054E059-AEC3-4B2F-B436-282BDD1EA14A>

Type material: *Holotype:* BRAZIL, Pará, Rio Cururu, Missão São Francisco (Missão Cururu), 07°33'51"S, 57°44'23"W, 6.ii.1961, at light at the mission building, EJ Fittkau, 1 male (ZSM - A 88-11). *Paratype:* BRAZIL, Mato Grosso, Rio Tuatuari near Posto Leonardo, 12°11'55"S, 53°22'51"W, 3.ix.1965, at light, EJ Fittkau, 1 male (ZSM - A 573-5).

Etymology: Named in honor of the late Professor Dr. Ernst Josef Fittkau for his many contributions to the taxonomy and ecology of Neotropical chironomids.

Diagnostic characters: See key.

Description

Male (n = 1–2). Total length 4.47–4.57 mm. Wing length 1.98–2.04 mm. Total length / wing length 2.19–2.31. Wing length / length of profemur 1.48–1.55.

Coloration. Thorax brown; head, legs and abdomen paler brown. Wing translucent.

Antenna. AR 2.07–2.10. Ultimate flagellomere 890–931 µm long.

Head. Temporal setae 18–22, partly biserial, including 3–4 inner verticals, 8–9 outer verticals and apparently 6–8 postorbitals. Clypeus with 11–14 setae. Tentorium 144–154 µm long; 41–45 µm wide. Stipes 135–139 µm long; 12–14 µm wide. Palp segment lengths (in µm): 33–35, 49–51, 84–88, 105–113, 166–176. Third palpomere with 4–5 sensilla, longest 22–24 µm long.

Thorax. Anteprenotum without setae. Dorsocentrals 6–7, acrostichals not discernible, prealars

2–3. Scutellum with 8–9 setae.

Wing (Fig. 11A). VR 1.12–1.13. Brachiolum with 1–2 setae, R 25–26, R₁ with 23–26, R₄₊₅ with 21–27 setae, other veins and cells bare. Squama with 5–7 setae.

Legs. Scale of fore tibia 49–51 µm long, spur of mid tibia 54–57 µm long including 30–32 µm long comb, spurs of hind tibia 50–52 µm long and 44–46 µm long including 29–30 µm long comb. Width at apex of fore tibia 55–58 µm, of mid tibia 57–58 µm, of hind tibia 62–66 µm. Lengths and proportions of legs as in Table 4.

Hypopygium (Figs 11B, C). Tergite IX covered with microtrichia; laterosternite IX with 1–3 setae. Anal point spatulate, 48–55 µm long, 9–10 µm wide at base, 15–16 µm wide subapically, with 5–8 setae to each side of the base, of which about half on the ventral side. Transverse sternapodeme 39–46 µm long, straight. Phallapodeme 86–88 µm long. Gonocoxite 162–170 µm long. Superior volsella in dorsal view (Fig. 11D) straight, 91–95 µm long; ventral lobe subrectangular; dorsal lobe slightly shorter, with bare, hooked posterior projection and 4–5 lateral setae. Inferior volsella 133–148 µm long, 18–21 µm wide at base, 9–10 µm wide at its narrowest, with 17–19 µm long, rounded dorsal projection starting 66–77 µm from base; distal half tapering, 21–23 µm wide basally, 8–10 µm wide subapically, with 17–19 simple setae, longest apical seta 59–62 µm long. Gonostylus 193–197 µm long. HR 0.83–0.89. HV 2.32–2.35.

Female and immatures. Unknown.

Distribution and ecology

Collected in Mato Grosso and Pará States.

***Sigmoitendipes oliveirai* new species**

<http://zoobank.org/24D6FE7B-6AE9-43A1-952C-FB9EC05739A3>

Type material: *Holotype:* BRAZIL, Mato Gros-

Table 4. Lengths (in µm) and proportions of legs of *Sigmoitendipes fittkaui* n. sp., male (n = 1–2).

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄
p ₁	1277–1339	927–989	1607	845	618	536
p ₂	1133–1215	1009–1092	639–700	391–412	268–288	124–144
p ₃	1545–1627	1112–1174	948	597	494	247
	ta ₅	LR	BV	SV	BR	
p ₁	185	1.64	1.80	1.45	3.7	
p ₂	42–65	0.63–0.64	3.32–3.38	3.30–3.36	3.8–3.9	
p ₃	103	0.81	2.60	2.96	6.1	

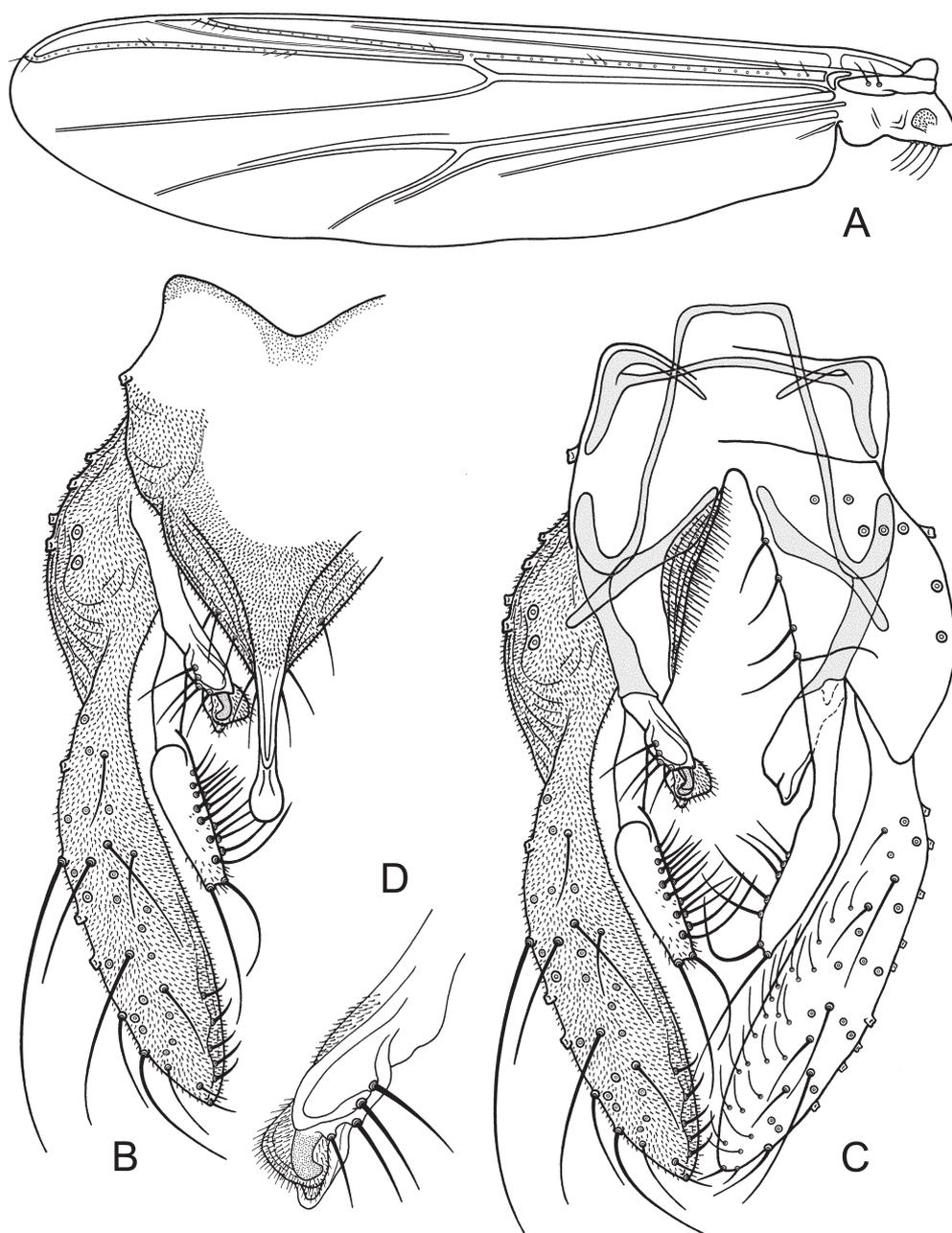


Figure 11. *Sigmoidendipes fittkai* n. sp., male. A, Wing. B, Hypopygium, dorsal view. C, Hypopygium with anal point and tergite IX removed, dorsal aspect to the left and ventral aspect to the right. D, Superior volsella.

so, Ribeirão Cascalheira, Fazenda Campina Grande, Rio Suiaçu, 12°48'35"S 52°06'56"W, 10.x.2007, light trap, LC Pinho et al., 1 male (MZUSP).

Etymology: Named after the late Dr. Sebastião José de Oliveira for his pioneering studies on the taxonomy of Brazilian chironomids.

Diagnostic characters: See key.

Description

Male (n = 1). Total length 4.53 mm. Wing length

1.97 mm. Total length / wing length 2.30. Wing length / length of profemur 1.43.

Coloration. Thorax brown; head, legs and abdomen paler brown. Wing translucent.

Antenna. AR 2.19. Ultimate flagellomere 946 μ m long.

Head. Temporal setae 24 including 2 inner verticals, 11 outer verticals and 11 postorbitals. Clypeus with 14 setae. Frontal tubercle indicated as paler area. Tentorium 144 μ m long, 35 μ m wide.

Stipes 169 μm long, 12 μm wide. Palp segment lengths (in μm): 45, 47, 72, 100, 167. Third palpomere with 3 sensilla, longest 17 μm long.

Thorax. Anteprenotum without setae. Dorsocentrals 7, acrostichals apparently absent, prealars 2. Scutellum with 8 setae in single row.

Wing (Fig. 12A). VR 1.10. Brachiolum with 1 seta, R with 27, R₁ with 23, R₄₊₅ with 25 setae, other veins and cells bare. Squama with 5 setae.

Legs. Scale of fore tibia 55 μm long; spur of mid tibia 52 μm long including 20 μm long comb; spurs of hind tibia 50 μm and 45 μm long including 22 μm long comb. Width at apex of fore tibia 60 μm ; of mid tibia 57 μm ; of hind tibia 62 μm . Lengths and proportions of legs as in Table 5.

Hypopygium (Figs 12B, C). Tergite IX covered with microtrichia; laterosternite IX with 1 seta. Anal point spatulate, 65 μm long, 20 μm wide at base, 17 μm wide subapically, with 4 setae to each side of the base of which 1 on the ventral side. Transverse sternapodeme 47 μm long, straight. Phallapodeme 87 μm long. Gonocoxite 147 μm long. Superior volsella (Fig. 12D) 62 μm long, with somewhat rounded, 45 μm long, 40 μm wide, setose lobe with 3 apical setae; with 62 μm long dorsal lobe with 4 outer and 1 inner setae, slightly hooked at apex. Inferior volsella 144 μm long; 25 μm wide at base; 10 μm wide at its narrowest; with 10 μm long, dorsal, rounded projection, starting 85 μm from base; apically subtriangular, 20 μm wide; with 16 simple setae, longest apical seta 57 μm long. Gonostylus 199 μm long. HR 0.74. HV 2.27.

Female and immatures. Unknown.

Distribution and ecology

Only known from Mato Grosso, where it was collected in a light trap at a fast flowing river with mostly rocky bottom sediments.

Table 5. Lengths (in μm) and proportions of legs of *Sigmoitendipes oliveirai* n. sp., male (n = 1).

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
p ₁	1379	946	1586	837	670	611	207	1.68	1.68	0.60	2.7
p ₂	1162	1044	660	394	276	138	58	0.63	3.31	3.34	4.2
p ₃	1527	1143	936	571	453	246	99	0.82	2.63	2.85	5.0

Table 6. Lengths (in μm) and proportions of legs of *Sigmoitendipes reissi* n. sp., male (n = 1).

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
p ₁	1298	865	1483	845	659	577	165	1.71	1.62	1.46	3.6
p ₂	1236	1071	721	433	288	124	62	0.67	3.34	3.20	3.3
p ₃	1545	1133	–	–	–	–	–	–	–	–	–

Sigmoitendipes reissi new species

<http://zoobank.org/996D3689-1C37-4109-97FE-77C5FBBF15817>

Type material: *Holotype:* BRAZIL, São Paulo, São Simão, Ribeirão Águas Claras, ponte Tio Zito, 19.i.2003, light trap, T Andersen, HF Mendes, 1 male (MZUSP).

Etymology: Named in honor of the late Dr. Friedrich Reiss for his many contributions to the taxonomy and ecology of Neotropical chironomids.

Diagnostic characters: See key.

Description

Male (n = 1). Total length 5.08 mm. Wing length 2.20 mm. Total length / wing length 2.31. Wing length / length of profemur 1.70.

Coloration. All pale brown. Wing translucent.

Antenna. AR 2.07. Ultimate flagellomere 964 μm long.

Head. Temporal setae apparently 27, partly biserial, including 4 inner verticals, 15 outer verticals and 8 postorbitals. Clypeus with 15 setae. Frontal tubercle indicated as paler area. Tentorium 177 μm long, 47 μm wide. Stipes 159 μm long, 10 μm wide. Palp segment lengths (in μm): 48, 69, 80, 108, 137. Third palpomere with 8 sensilla, longest 23 μm long.

Thorax. Anteprenotum without setae. Dorsocentrals 11, acrostichals apparently 5, prealars 4. Scutellum with 10 setae, partly biserial.

Wing (Fig. 13A). VR 1.07. Brachiolum with 2 setae, R with 29, R₁ with 28, R₄₊₅ with 38 setae, other veins and cells bare. Squama with 7 setae.

Legs. Scale of fore tibia 55 μm long; spur of mid tibia 58 μm long including 29 μm long comb; spurs

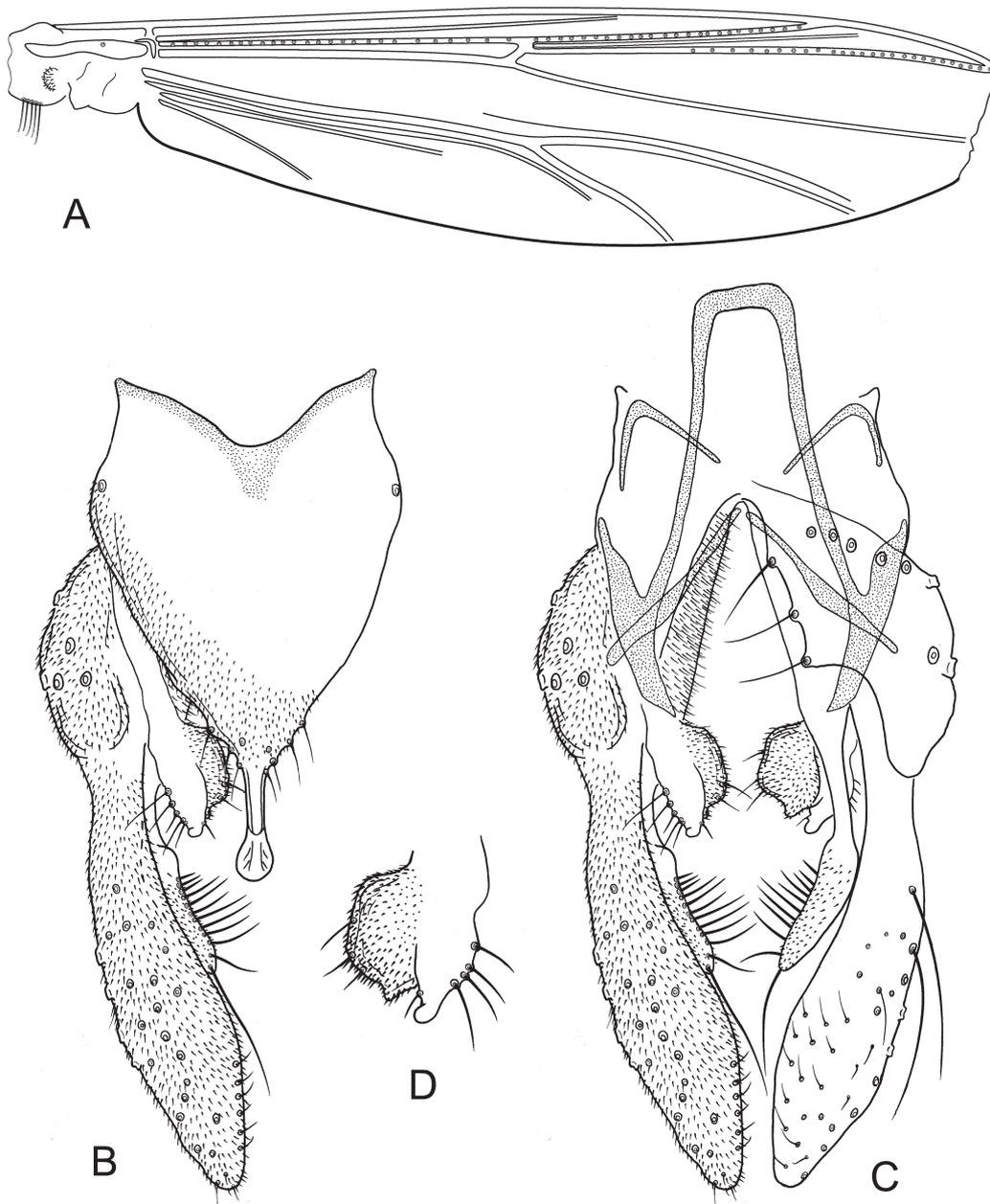


Figure 12. *Sigmoitendipes oliveirai* n. sp., male. A, Wing (tip missing). B, Hypopygium, dorsal view. C, Hypopygium with anal point and tergite IX removed, dorsal aspect to the left and ventral aspect to the right. D, Superior volsella.

of hind tibia 55 μm long and broken, including 30 μm long comb. Width at apex of fore tibia 61 μm ; of mid tibia 64 μm ; of hind tibia 72 μm . Lengths and proportions of legs as in Table 6.

Hypopygium (Figs 13B, C). Tergite IX covered with microtrichia; laterosternite IX with 2 setae. Anal point spatulate, 68 μm long, 23 μm wide at base, 7 μm wide medially, 15 μm wide subapically, with 5 setae to each side of the base of which 2 on the ventral side. Transverse sternapodeme 55 μm long, concave. Phallapodeme 97 μm long. Gonocoxite 201 μm long. Superior volsella (Fig. 13D)

83 μm long, medially with rounded, setose lobe, apically with 30 μm long, hooked, bare projection with 4 strong setae. Inferior volsella 162 μm long; 19 μm wide at base; 10 μm wide at its narrowest; with 36 μm long, dorsal, bluntly triangular projection, starting 87 μm from base; apically subrectangular, 15 μm wide; with 17 simple setae, longest apical seta 110 μm long. Gonostylus 211 μm long. HR 0.95. HV 2.41.

Female and immatures. Unknown.

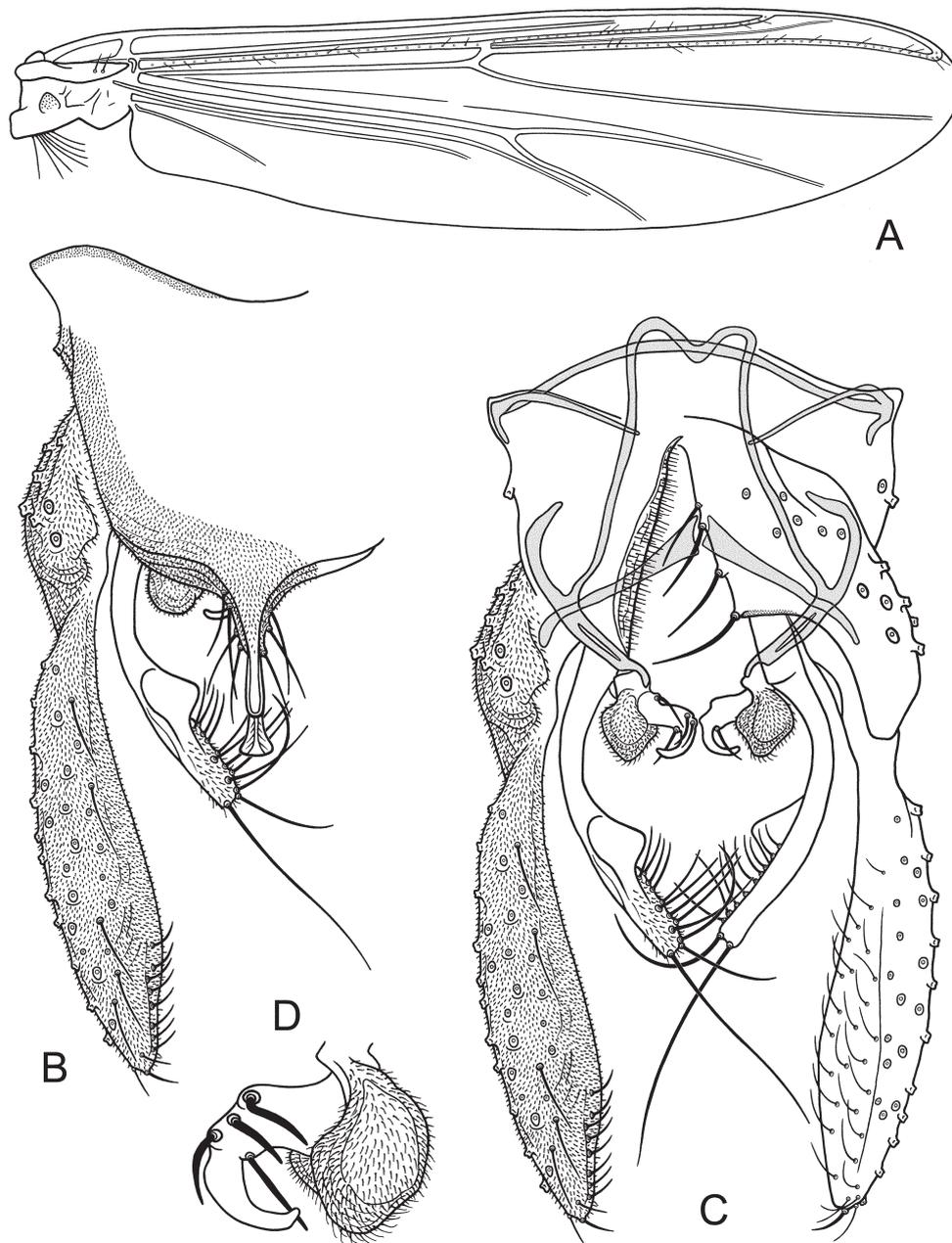


Figure 13. *Sigmoitendipes reissi* n. sp., male. A, Wing. B, Hypopygium, dorsal view. C, Hypopygium with anal point and tergite IX removed, dorsal aspect to the left and ventral aspect to the right. D, Superior volsella.

Distribution and ecology

Only known from São Paulo State, where it was collected in a light trap at a small, rather slow flowing river with mostly fine bottom sediments.

Sigmoitendipes spiesi new species

<http://zoobank.org/E46663A0-94FA-4039-BE72-224D1FD45D21>

Type material: *Holotype:* BRAZIL, Mato Grosso, Nova Xavantina, Fazenda Sr. Queté, Córrego Cachoeira, 14°32.817'S 52°31.395'W, 16.x.2007, light trap, LC Pinho et al., 1 male (MZUSP). *Para-*

type: BRAZIL, Mato Grosso, Nova Xavantina, Fazenda Sr. Queté, Córrego Voadeira, 14°41.577'S 52°27.203'W, 13.x.2007, 1 male (UFSC).

Etymology: Named after Martin Spies for his important contributions to the taxonomy and ecology of Neotropical chironomids.

Diagnostic characters: See key.

Description

Male (n = 1–2). Total length 4.64–5.52 mm. Wing length 2.00–2.12 mm. Total length / wing length 2.38–2.60. Wing length / length of profemur 1.74–1.78.

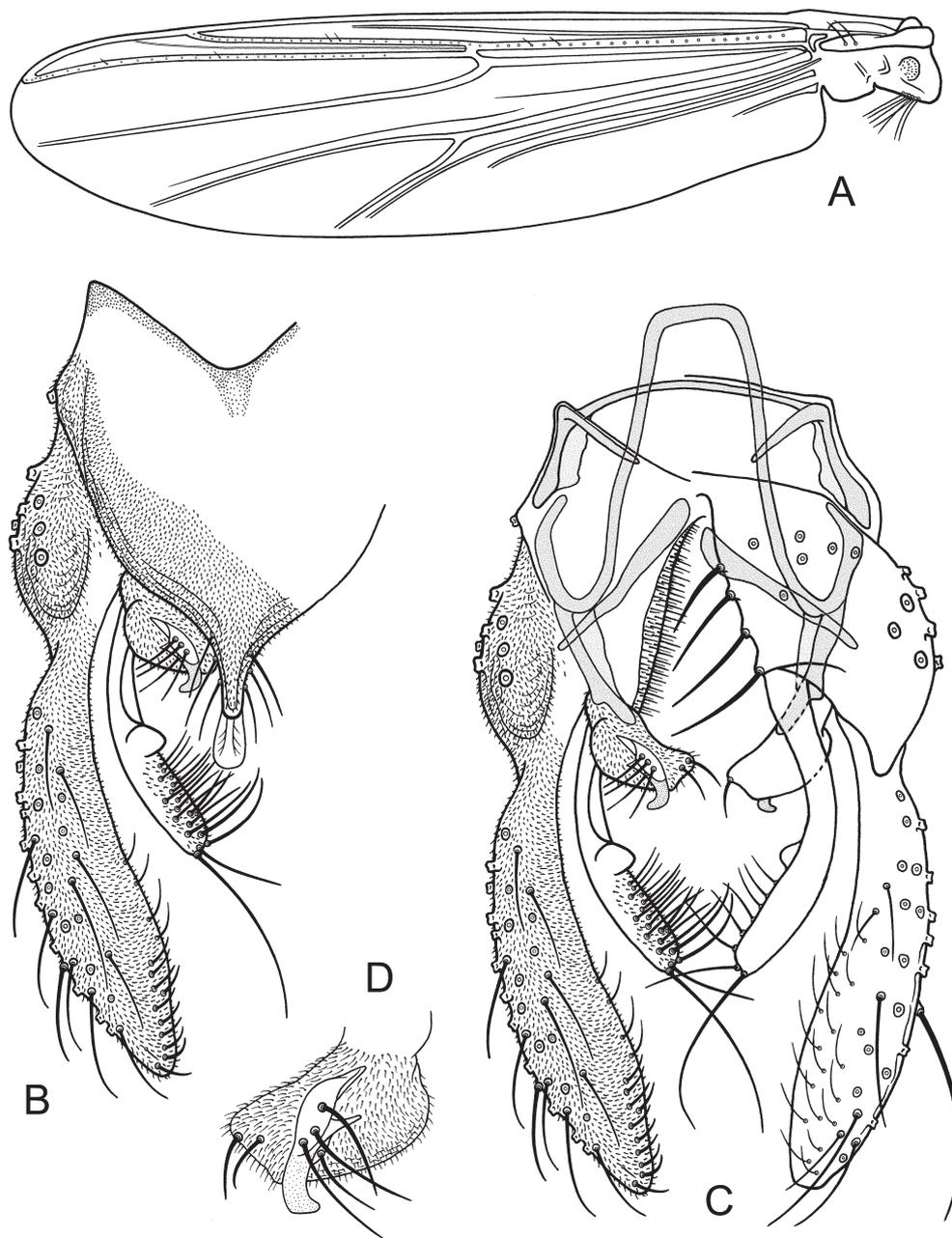


Figure 14. *Sigmoitendipes spiesi* n. sp., male. A, Wing. B, Hypopygium, dorsal view. C, Hypopygium with anal point and tergite IX removed, dorsal aspect to the left and ventral aspect to the right. D, Superior volsella.

Coloration. Thorax brown; head, legs and abdomen paler brown. Wing translucent.

Antenna. AR 1.93–1.95. Ultimate flagellomere 867–915 μm long.

Head. Temporal setae 11–14 including 3 inner verticals, 5 outer verticals and 3–6 postorbitals. Clypeus with 15 setae. Frontal tubercle indicated as paler area. Tentorium 147–156 μm long, 35–37 μm wide. Stipes 155–180 μm long; 11–12 μm wide. Palp segment lengths (in μm): 41–45, 52–72, 87–96, 107–111, 172. Third palpomere with

5–6 sensilla, longest 25–27 μm long.

Thorax. Antepronotum without setae. Dorsocentrals 6–7, acrostichals apparently 6, prealars 3–5. Scutellum with 7–9 setae in single row.

Wing (Fig. 14A). VR 1.12. Brachiolum with 2 setae, R with 25–26, R_1 with 27–28, R_{4+5} with 30–31 setae, other veins and cells bare. Squama with 8 setae.

Legs. Scale of fore tibia 50–55 μm long; spur of mid tibia 55–65 μm long including 25–37 μm long

Table 7. Lengths (in μm) and proportions of legs of *Sigmoitendipes spiesi* n. sp., male (n = 1).

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
p ₁	1298	927	–	–	–	–	–	–	–	–	–
p ₂	1215	1051	701	412	288	144	41	0.67	3.35	3.24	3.3
p ₃	1524	1092	968	556	433	227	82	0.89	2.76	2.70	–

comb; spurs of hind tibia 52–54 μm and 45–47 μm long including 25–29 μm long comb. Width at apex of fore tibia 55–57 μm ; of mid tibia 60–62 μm ; of hind tibia 65–70 μm . Lengths and proportions of legs as in Table 7.

Hypopygium (Figs 14B, C). Tergite IX covered with microtrichia; laterosternite IX with 2 seta. Anal point spatulate, 29–37 μm long, 10–11 μm wide at base, 15–17 μm wide subapically, with 7–8 setae to each side of the base of which 3–4 on the ventral side. Transverse sternapodeme 44–50 μm long, straight. Phallapodeme 100–106 μm long. Gonocoxite 169–189 μm long. Superior volsella (Fig. 14D) 89–109 μm long, with subrectangular, 47–55 μm long, 27–33 μm wide, setose lobe with 2–3 apical setae; with 40–47 μm long, apically hooked, dorsal lobe with 4 setae. Inferior volsella 144–159 μm long; 20–21 μm wide at base; 10–11 μm wide at its narrowest; with 25–27 μm long, dorsal, rounded projection, starting 82–88 μm from base; apically subrectangular, 15–18 μm wide; with 18–19 simple setae, longest apical seta 85–97 μm long. Gonostylus 199–219 μm long. HR 0.85–0.86. HV 2.33–2.52.

Female and immatures. Unknown.

Distribution and ecology

Only known from Mato Grosso State, where it was collected in a light trap at a small, rather slow flowing stream with mostly fine bottom sediments.

Acknowledgements

We are indebted to Dr. Claudio G. Froehlich, Dr. Susana Trivinho-Strixino and Dr. Ângela M. Sanseverino for comments on the manuscript. We are also indebted to Dr. Neusa Hamada for the loan of material of *Sigmoitendipes* n. gen. from the project “Insetos aquáticos: biodiversidade, ferramentas ambientais e a popularização da ciência para melhoria da qualidade de vida humana no estado do Amazonas” [supported by PRONEX–CNPq (MCT)–FAPEAM and INPA (MCT)], to Dr. Carlos J. E. Lamas, for the loan of material from the project “Limites geográficos e fatores causais de endemismo na Floresta Atlântica em Diptera” [supported by the BIOTA–FAPESP, proc. 03/12074–9], to FAPESC for financing the project “Insetos aquáticos do Parque Estadual da Serra Furada,

SC” (proc. 11323/2012–9), to Martin Spies for the loan of material of *Sigmoitendipes* from the ZSM, and to Dr. Adolfo R. Calor, Dr. Sidnei Mateus, Dr. Rodolfo Mariano and Dr. Lucas S. Lecci for providing material and help during fieldwork. The authors also wish to thank the Willi Hennig Society for the free availability of the TNT program. Gladys Ramirez made most of the slide preparations.

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