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New *Tanytarsus* van der Wulp from the Brazilian Amazonia indicate clues to intrageneric relations (Diptera: Chironomidae)

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Abstract

Three new distinctive species of the genus *Tanytarsus* van der Wulp, 1874 are described from the Amazon rainforest, Brazil, and their systematic position is analysed. As a result, three new species groups are proposed. *Tanytarsus illustris* sp. nov. (Roraima) couples with *T. hirsutus* Trivinho-Strixino, Wiedenbrug *et da Silva*, 2015, both species featuring an elongated hypopygial anal tergite point lacking crests and spinulae, a strongly shortened digitus and a median volsella bearing two peculiar lamellae (the *Tanytarsus hirsutus* species group). *Tanytarsus insignis* sp. nov. (Amazonas) keys with *T. impar* Trivinho-Strixino *et Strixino*, 2004 and *T. magnus* Trivinho-Strixino *et Strixino*, 2004, all the species distinct in having an elongate superior volsella and digitus, a strong club-shaped inferior volsella and anal point lacking crests and/or spinulae (the *Tanytarsus impar* species group). *Tanytarsus insolens* sp. nov. (Amazonas) displays an extraordinarily structured, bilobed superior volsella, the character treated as diagnostic for a group proposed for this species and *T. kiche* Vinogradova, Riss *et Spies*, 2009 (the *Tanytarsus kiche* species group).

Key words: Diptera, Chironomidae, *Tanytarsus*, systematics, new species, Brazil

Introduction

Tanytarsus van der Wulp, 1874 is one of the most diverse genera within the family Chironomidae, with more than 300 species described worldwide (Ekrem 2003). To the Neotropical region over 50 specific names were registered, of which 35 have been reported from Brazil (Spies & Reiss 1996, Ekrem & Reiss 1999, Sanseverino *et al.* 2002, Trivinho-Strixino & Strixino 2004, Sanseverino & Fittkau 2006, Trivinho-Strixino & Sonoda 2006, Cranston 2007, Trivinho-Strixino & Strixino 2007, Vinogradova *et al.* 2009, Sanseverino & Trivinho-Strixino 2010, Giłka & Zakrzewska 2013, Mendes & Pinho 2014, Trivinho-Strixino *et al.* 2015, Trivinho-Strixino & Shimabukuro 2017); however, many of them wait to be validated (*cf.* Sanseverino 2006). Fittkau (1971) estimated that a total of 70 *Tanytarsus* species may occur in the Amazonia, but only 13 species of this genus have been recorded from this region to date. In this paper we describe three further interesting *Tanytarsus* species collected from the Amazon rainforest in Brazil, which due to their unusual structure take an interesting systematic position within the genus. A presented below analysis of morphological characters of the adult male genital apparatus, found as crucial in delimitation/definition of these new taxa, as well as those of the body and legs colouration, indicated three distinct species groups within the so far known Neotropical *Tanytarsus*.

Material and methods

The specimens were sampled using Malaise and light traps and preserved in 80% ethanol. Microscope slides were prepared using Euparal® or Canada balsam as the mounting medium according to the procedure outlined by Sæther (1969) and Giłka and Paasivirta (2009). The general morphological terminology follows Sæther (1980).

Measurements were made using the Cell D program, and a digital camera attached to an optic microscopic Olympus BX 51; the photographs were adjusted using the Helicon Focus 6 image stacking software. The type specimens are deposited in the Invertebrate Collection of the Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Amazonas, Brazil and in the Department of Invertebrate Zoology and Parasitology, University of Gdańsk, Poland (DIZP).

Systematics

Family: Chironomidae Newman, 1834

Subfamily: Chironominae Newman, 1834

Tribe: Tanytarsini Zavřel, 1917

Subtribe: Tanytarsina Zavřel, 1917

Genus: *Tanytarsus* van der Wulp, 1874

***Tanytarsus hirsutus* species group**

Members: *Tanytarsus hirsutus* Trivinho-Strixino, Wiedenbrug *et da Silva*, 2015; *Tanytarsus illustris* **sp. nov.**

Diagnosis. Anal point elongated, crests and spinulae absent. Digitus strongly shortened, in shape of tubercle. Median volsella short, with two lamellae: the larger—broadly falciform and the smaller—foliate.

***Tanytarsus illustris* sp. nov.**

(Figs 1A–F, 4A)

Type material: Holotype, adult male: BRAZIL, Roraima state, Serra da Mocidade (01°42'19"N / 61°47'10"W), 26–27 January 2016, light trap, J.M.C. Nascimento (INPA).

Derivatio nominis. From Latin *illustris* (distinctive, brilliant).

Diagnosis. Anal point slender, slightly broadened and notched at mid length, with semitransparent distal extension bearing apical knob. Stem of median volsella with two lamellae: anterior (larger) broadly falciform and posterior (smaller) foliate.

Description. Adult male (n = 1).

Body size and proportions. Total length 3.54 mm. Wing length 1.84 mm. Total length/wing length 1.92. Wing length/length of profemur 1.67.

Colouration. Eyes black. Antenna, head capsule and palp light brown. Scutal vittae, postnotum and anterior edge of preepisternum brown. Ground colour of thorax, scutellum and haltere yellowish. Fore leg: femur and tibia brown, darker at apex; ta_{1,5} light brown. Mid and hind legs: femora brown, with preapical bands slightly paler; tibiae brown; ta_{1,5} brownish yellow. Wing membrane with pale brownish undertone. Abdomen light brownish, hypopygium slightly darker.

Head. Eyes bare, with well developed dorsomedian extensions. Antenna with 13 flagellomeres; ultimate flagellomere 510 µm long; AR 0.96. Frontal tubercles absent. Tentorium 163 µm long. Temporal setae 14 on each side. Clypeus with 27 setae. Lengths of palpomeres 1–5 (in µm): 44, 46, 173, 160, 300.

Thorax. Ac 26; Dc 14–15 on each side, uniserial; Pa 5 on each side; Scts 15. Scutum projected anteriorly, overreaching anteprototum.

Wing. Typical of the genus, as shown in Fig. 4A. All veins and entire membrane below radial veins covered with macrotrichia. Brachiolum with 1 seta. VR_{Cu} 1.16.

Legs. Fore leg tibia with straight slender spur 26 µm long. Tibial combs of mid and hind legs separated; spurs of mid leg unequal: one markedly curved, 33 µm long, second slightly curved, 19 µm long; hind tibia with only one

slightly curved spur, 39 μm long. Basitarsus of mid leg with 4 hook-shaped sensilla chaetica. Lengths and proportions of legs as in Table 1.

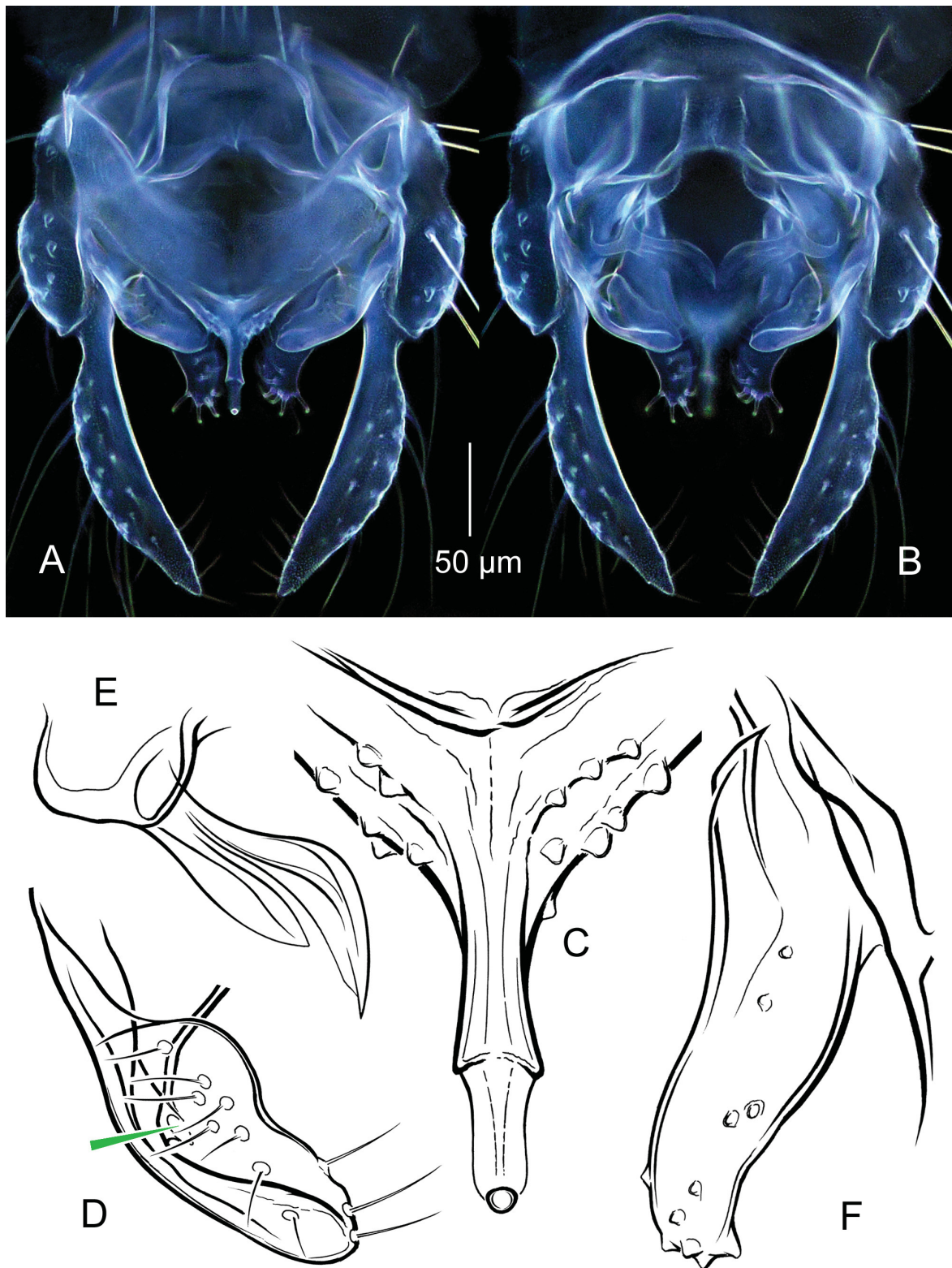


FIGURE 1. *Tanytarsus illustris* sp. nov., male. **A, B**—hypopygium in dorsal (**A**) and ventral aspect (**B**); **C**—anal point; **D**—superior volsella and digitus (green arrow); **E**—median volsella; **F**—inferior volsella (**C–F** magnified *ca.* 3–4 times relative to **A** and **B**).

TABLE 1. Lengths of leg segments (μm) and leg ratios of male *Tanytarsus illustris* sp. nov.

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV
p ₁	1108	535	1580	675	584	491	232	2.95	1.63	1.04
p ₂	1011	775	532	261	207	114	80	0.69	3.50	3.36
p ₃	1183	980	719	431	374	226	110	0.73	2.53	3.01

Hypopygium (Fig. 1). Tergite IX covered with minute microtrichia on entire surface and *ca.* 15 setae around base of anal point, with distinct hump in median position. Lateral teeth absent. Anal tergite bands V-shaped, slightly sinuous, broadly separated. Anal point strongly elongated (*ca.* 40 μm), narrowest at base (9 μm), slightly broadened and notched at mid length, with semitransparent distal extension bearing apical knob, anal crests and spinulae absent (Fig. 1A, C). Superior volsella elongated (55 μm), slightly narrowed at mid length, with 8–10 setae dorsally and 3 setae on median margin; digitus strongly shortened, in shape of tubercle (Fig. 1A, B, D). Stem of median volsella *ca.* 15 μm long, 10 μm wide at base, with two lamellae: anterior (larger) broadly falciform and posterior (smaller) foliate, arranged as shown in Fig. 1E. Inferior volsella *ca.* 90 μm long, robust, slightly S-shaped, with 10–11 strongly curved setae (Fig. 1A, B, F). Phallapodeme 110 μm long; transverse sternapodeme 70 μm long, with well developed oral projections. Gonocoxite 147 μm long. Gonostylus 150 μm long, broadest at mid length, evenly tapering to narrow tip. HR 0.98, HV 2.36.

Discussion. The presently proposed *hirsutus* group includes two species at least: *Tanytarsus hirsutus* and *T. illustris*. Adult males of both species are distinct in having the strongly shortened tubercle-shaped digitus and in the median volsella bearing two lamellae: the larger one is broad and falciform, whereas the smaller is foliate. Interestingly, the lamellae are arranged in an inverted configuration in these species, as shown in Fig. 1E and fig. 2d by Trivinho-Strixino *et al.* (2015). *Tanytarsus hirsutus* and *T. illustris* males are also distinct in strongly elongated anal tergite points lacking crests and spinulae, though the anal point structure in *T. illustris* is more sophisticated (*cf.* Fig. 1A, C and Trivinho-Strixino *et al.* 2015: fig. 2a, b). The two species also differ each other in size of the body and wing (but AR and legs proportions similar), palp length, head and thorax chaetotaxy, as well as in the tibial armature. Future exploring unknown life stages of the *hirsutus* group requires comparison of their members with *Tanytarsus* sp. 40 by Wiedenbrug and Ospina-Torres (2005), as suggested by Trivinho-Strixino *et al.* (2015).

Ecological notes. The male of *Tanytarsus illustris* was collected with a light trap in a mountainous region at about 1000 m altitude. The trap was left hanging over a small stream (1–2 meters wide), which had a sandy bed partially covered by decayed leaves from a dense riparian forest. The following physicochemical measurements of the water were taken: pH 6.1, temperature 19.5°C, conductivity 12 μS .

Tanytarsus impar species group

Members: *Tanytarsus impar* Trivinho-Strixino *et* Strixino, 2004; *Tanytarsus magnus* Trivinho-Strixino *et* Strixino, 2004; *Tanytarsus insignis* sp. nov.

Diagnosis. Anal point spinulae absent. Superior volsella elongated. Digitus long and curved. Inferior volsella strong and club-shaped. Legs with distinct colour band pattern; distal abdominal tergites darker, standing out from lightly coloured proximal ones.

Tanytarsus insignis sp. nov.

(Figs 2A–F, 4B)

Type material: Holotype, adult male: BRAZIL, Amazonas state, Puraquequara near Manaus (02°43'02"S / 59°54'04"W), 07 July 2015, Malaise trap, G.P.S. Dantas (INPA).

Derivatio nominis. From Latin *insignis* (distinguished, remarkable).

Diagnosis. Anal tergite bands Y-shaped. Anal point strongly elongated, parallel-sided, bearing narrow crests. Superior volsella elongated, bent and narrowed at mid length, with long slender distal part, apically rounded.

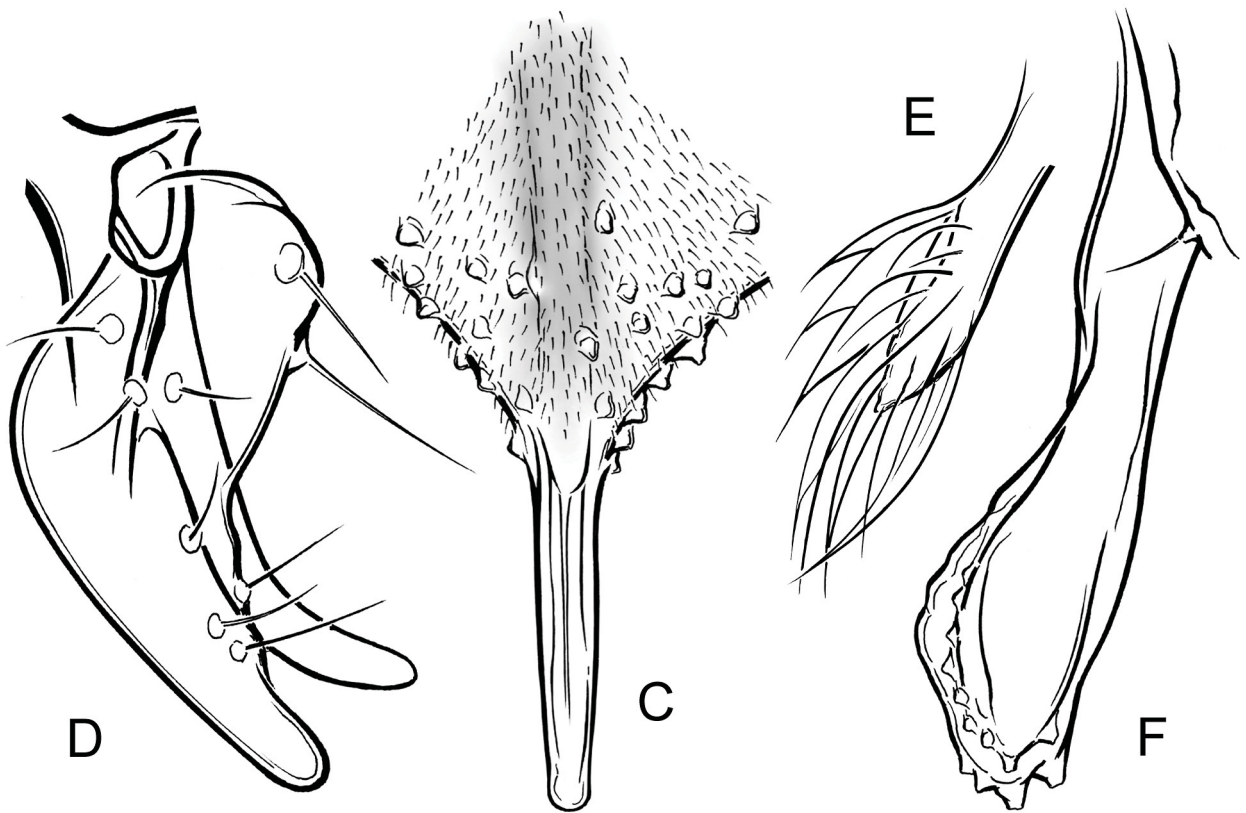
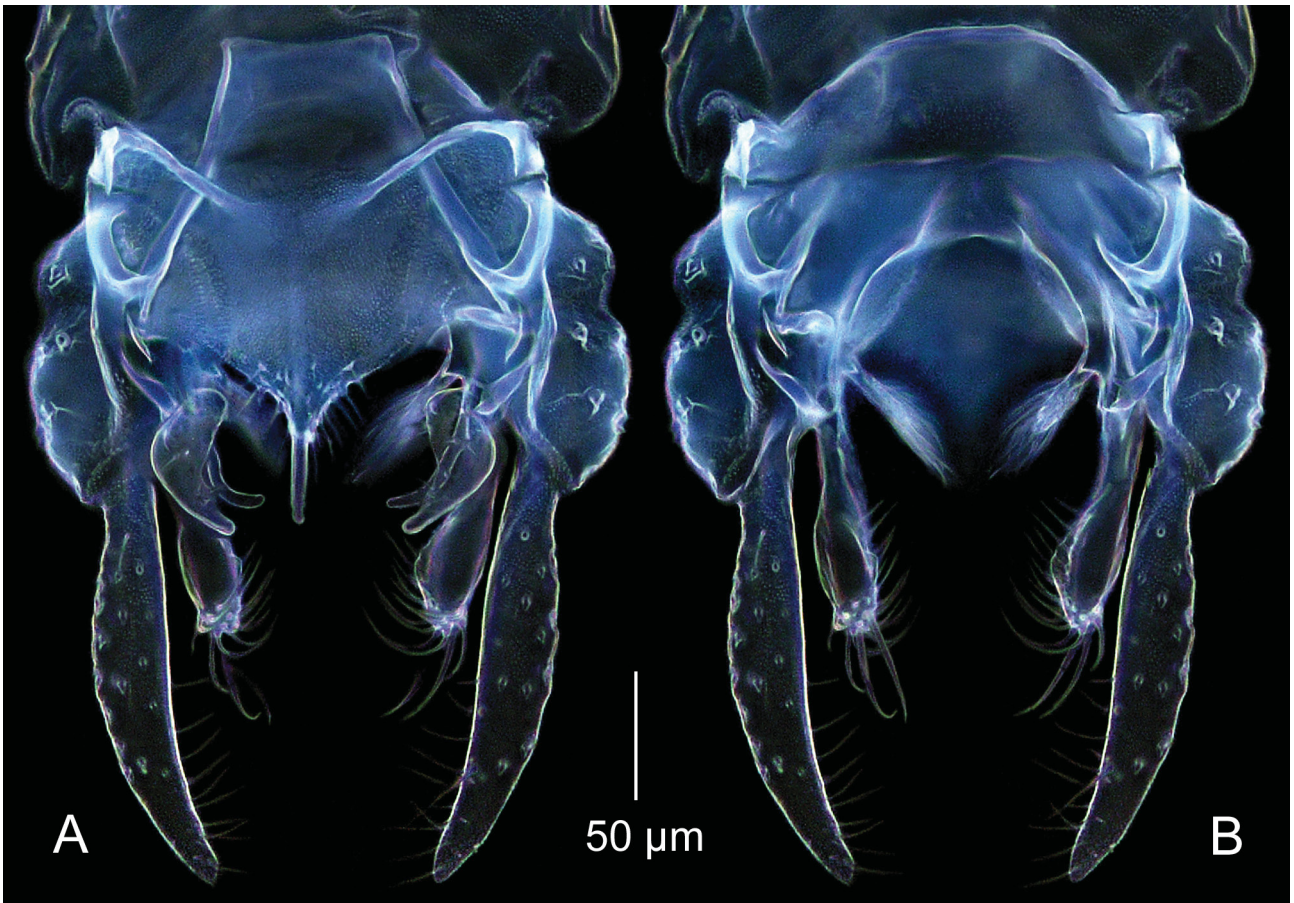


FIGURE 2. *Tanytarsus insignis* sp. nov., male. **A, B**—hypopygium in dorsal (**A**) and ventral aspect (**B**); **C**—anal point; **D**—superior volsella and digitus; **E**—median volsella; **F**—inferior volsella (**C–F** magnified *ca.* 3–4 times relative to **A** and **B**).

Description. Adult male (n = 1).

Body size and proportions. Total length 3.92 mm. Wing length 1.83 mm. Total length/wing length 2.14. Wing length/length of profemur 1.56.

Colouration. Eyes black. Antenna, head capsule, palp, scutal vittae, postnotum and sternum light brown. Ground colour of thorax, scutellum and haltere brownish yellow. Fore leg: femur yellow, dark-brown at apex; tibia brown; ta_1 light-brown, pale at base; ta_2 pale, light-brown at apex; $ta_{3,5}$ light-brown. Mid and hind legs: femora yellow, brown at apex; tibiae light-brown; $ta_{1,5}$ brownish yellow, ta_1 of mid leg with slightly darker apex. Wing membrane with pale brownish undertone. Abdomen brownish, TVI and TIX darker.

Head. Eyes bare, with well developed dorsomedian extensions. Antenna with 13 flagellomeres; ultimate flagellomere 754 μm long; AR 1.50. Frontal tubercles absent. Tentorium 272 μm long. Temporal setae 14 on each side. Clypeus with 39 setae. Lengths of palpomeres 1–5 (in μm): 40, 52, 145, 170, 285; third palpomere with 5 sensilla clavata subapically, 19 μm long.

Thorax. Ac 24, restricted to anterior region of scutum; Dc 11–13 on each side, uniserial; Pa 3–4 on each side; Scts 5. Scutum projected anteriorly, distinctly overreaching anteprepronotum.

Wing. Ellipse-shaped, as shown in Fig. 4B. All veins and almost entire membrane below radial veins covered with macrotrichia (except for base of media and anal cells). Brachiolum with 1 seta. VR_{Cu} 1.19.

Legs. Fore leg tibia with straight lanceolate spur 25 μm long. Tibial combs of mid and hind legs separated; spurs of mid leg unequal: one markedly bent, 45 μm long, second short and straight, 15 μm long; spurs of hind leg unequal: one larger, slightly bent, 58 μm long, second short and straight, 30 μm long. Basitarsus of mid leg without sensilla chaetica. Lengths and proportions of legs as in Table 2.

TABLE 2. Lengths of leg segments (μm) and leg ratios of male *Tanytarsus insignis* sp. nov.

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR	BV	SV
p_1	1180	585	1574	807	662	548	246	2.69	1.47	1.12
p_2	1023	802	541	295	192	127	80	0.67	3.41	3.37
p_3	1180	970	730	453	398	249	111	0.75	2.38	2.94

Hypopygium (Fig. 2). Tergite IX covered with microtrichia on entire surface, with *ca.* 25 setae around base of anal point. Lateral teeth single-lobed. Anal tergite bands Y-shaped, fading at junction and at base of anal point. Anal point strongly elongated (38 μm), narrow (7 μm wide), parallel-sided, with slightly swollen round tip, anal crests long and narrow, spinulae absent (Fig. 2A, C). Superior volsella strongly elongated (55 μm), stout at base, bent and narrowed at mid length, with long slender distal part, apically rounded, bearing *ca.* 10 setae arranged as shown in Fig. 2D; digitus *ca.* 50 μm long, curved and medially directed, parallel-sided, rounded apically (Fig. 2A, D). Stem of median volsella straight, *ca.* 30 μm long, 7 μm wide, slightly swollen at mid length, apically pointed, with 7–8 slender foliate and subulate lamellae (Fig. 2B, E). Inferior volsella *ca.* 100 μm long, club-shaped, narrow at base, with distinctly broadened head-like distal part bearing *ca.* 15 strong setae: 3 setae posteromedially directed, 11–12 anteromedially directed, incl. 6–7 setae arranged in row ventrally (Fig. 2B, F). Phallapodeme 134 μm long; transverse sternapodeme 61 μm long, with slight oral projections. Gonocoxite 145 μm long. Gonostylus 155 μm long, broadest at mid length, evenly tapering toward blunt apex. HR 0.93, HV 2.53.

Discussion. Trivinho-Strixino and Strixino (2004) described two distinctive species from the southeast of Brazil, *Tanytarsus impar* and *T. magnus*, peculiar in term of both the hypopygium structure and the body colouration. Adult males of the two species have the superior volsella more or less elongate, the digitus long and curved, the inferior volsella club-shaped and the anal point lacking spinulae. This set of characters was found in the male of *Tanytarsus insignis* as well, thus justifies the inclusion of the three relatives into the *impar* species group. The new species differs from its congeners by the strongly elongate anal point bearing narrow crests, the Y-shaped anal tergite bands and the elongate superior volsella—bent and narrowed at mid length (*cf.* Fig. 2 and Trivinho-Strixino & Strixino 2004: figs 2, 17).

Though intraspecific variations in the body colouration are usual in the majority of Tanytarsini adults, extraordinary (presumably constant) colour patterns are known from several Neotropical *Tanytarsus* species (*e.g.* Trivinho-Strixino *et al.* 2015: fig. 5a; see also the next species described below). The colouration of abdominal tergites as well as the leg colour band pattern found in males of the three species of the *impar* group are similar,

thus we suggest to treat them as characters supplementing the group diagnosis. The darker (brown) distal abdominal tergites (beginning from the VI tergite towards back) stand out from the proximal (yellow) ones (*cf.* Trivinho-Strixino & Strixino 2004: figs 1, 15), with slight differences in this pigmentation pattern in *Tanytarsus insignis* (tergites VI and IX darker).

Ecological notes. The adult males of *Tanytarsus insignis* and *T. insolens* (see below) were collected with Malaise traps acting over a first-order stream, surrounded with a dense riparian forest, whose bed was predominantly sandy, with presence of clay.

***Tanytarsus kiche* species group**

Members: *Tanytarsus kiche* Vinogradova, Riss *et* Spies, 2009; *Tanytarsus insolens* **sp. nov.**

Diagnosis. Superior volsella bilobed—consisted of anterior (ventral) and posterior (dorsal) projections. Digitus stout, extending far beyond superior volsella. Anal point bearing round crests flanking spinulae, with the most distal one separated from the others or enlarged, bar-shaped.

***Tanytarsus insolens* sp. nov.**

(Figs 3A–F; 4C)

Type material. Holotype, adult male: BRAZIL, Amazonas state, Puraquequara near Manaus (02°43'02"S / 59°54'04"W), 07 July 2015, Malaise trap, G.P.S. Dantas (INPA). Paratypes: 4 males (1 INPA, 3 DIZP), same data as for holotype except for date: 19 June 2015.

Derivatio nominis. From Latin *insolens* (unusual, extraordinary).

Diagnosis. Tergite IX with sparse long hair-like macrotrichia. Anal point triangular, bearing several spinulae, with the most distal one enlarged, bar-like. Anterior (ventral) projection of superior volsella finger-shaped, posterior (dorsal) projection narrowly triangular, pointed. Digitus large, lanceolate or knife-shaped, broadly fused with posterior projection of superior volsella. Median volsella with 4–5 subulate lamellae.

Description. Adult male (n = 5).

Body size and proportions. Total length 2.31–2.49 mm. Wing length 1.25–1.31 mm. Total length/wing length 1.80–1.98. Wing length/length of profemur 1.58–1.68.

Colouration. Eyes black. Antenna, palp, scutal vittae and postnotum brown. Head capsule, ground colour of thorax, scutellum, sternum and haltere yellow to light brown. Fore leg: coxa and trochanter yellow, femur and tibia brown. Mid and hind legs: coxae, trochanters and proximal half of femora yellow, distal half of femora, tibiae and tarsi brown. Wing veins brown, membrane with brownish undertone. Abdomen yellow, gradually becoming brown posteriorly; segments with darker margins dorsally (transversal bands), distinctly standing out from lighter background.

Head. Eyes bare, with well developed dorsomedian extensions. Antenna with 13 flagellomeres; ultimate flagellomere 405–440 µm long; AR 0.85–0.88. Frontal tubercles absent or in shape of minute swellings (*ca.* 2 µm). Tentorium 118–125 µm long. Temporal setae 7–10 on each side. Clypeus with 11–14 setae. Lengths of palpomeres 1–5 (in µm): 30–40, 36–48, 115–127, 107–119, 195–226; third palpomere with 2 sensilla clavata subapically, 10–12 µm long.

Thorax. Ac 11–20, restricted to anterior region of scutum; Dc 5–7 on each side, uniserial; Pa 1 on each side; Scts 5–6. Scutum projected and rounded anteriorly, overreaching antepnotum.

Wing. Obovate, with anal lobe strongly reduced, as shown in Fig. 4C. Almost all veins and entire membrane below radial veins covered with macrotrichia. Brachiolium with 1 seta. VR_{cu} 1.27–1.35.

Legs. Fore leg tibia with short lanceolate spur 8–15 µm long. Tibial combs of mid and hind legs separated, only one comb bearing slightly bent apically spur, 32–42 µm (mid leg) to 37–52 µm long (hind leg). Basitarsus of mid leg with 1–2 sensilla chaetica. Lengths and proportions of legs as in Table 3.

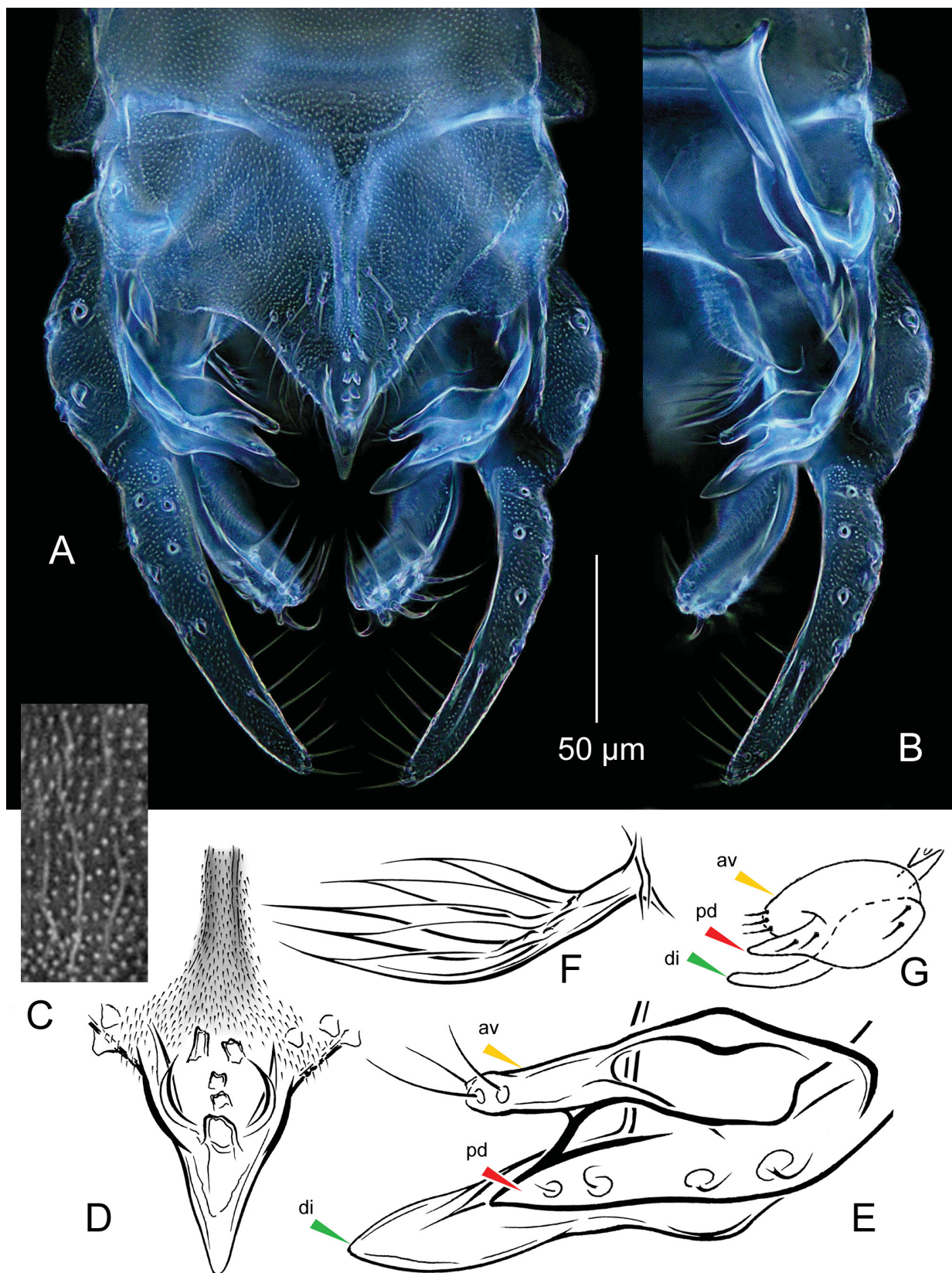


FIGURE 3. *Tanytarsus insolens* sp. nov. (A–F) and *T. kiche* Vinogradova, Riss *et* Spies, 2009 (G), male. A, B—hypopygium in dorsal (A) and ventral aspect (B); C—anterior region of anal tergite covered with microtrichia and hair-like macrotrichia; D—anal point (variation); E, G—superior volsella: anterior/ventral projection (av, yellow arrow), posterior/dorsal projection (pd, red) and digitus (di, green); F—median volsella [C–F magnified *ca.* 2–3 times relative to A and B; G out of scale, after Vinogradova *et al.* (2009)].

TABLE 3. Lengths of leg segments (μm) and leg ratios of male *Tanytarsus insolens* sp. nov.

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV
p ₁	755–808	360–397	–	–	–	–	–	–	–	–
p ₂	742–772	570–610	382–397	198–206	147–154	88–92	59–62	0.64–0.65	3.45–3.56	3.48–3.58
p ₃	778–823	706–750	457	305	281	165	81	0.64	2.36	3.30



FIGURE 4. Wing of male: *Tanytarsus illustris* sp. nov. (A), *Tanytarsus insignis* sp. nov. (B), *Tanytarsus insolens* sp. nov. (C).

Hypopygium (Fig. 3A–F). Tergite IX covered with dense short microtrichia on entire surface, sparse hair-like 10–15 μm long macrotrichia in anterior part (Fig. 3A, C) and 20–25 stout setae around base of anal point. Lateral teeth absent. Anal tergite bands Y-shaped, fading at base of anal point. Anal point triangular, with short round crests flanking 4–7 spinulae, with the most distal one enlarged, bar-like (Fig. 3A, D). Superior volsella bilobed: anterior (ventral) projection finger-shaped, with 3–4 apical/subapical setae, posterior (dorsal) projection narrowly triangular, pointed, bearing 4 short setae dorsally (2 proximal + 2 distal); digitus large, extending far beyond superior volsella, somewhat lanceolate or knife-shaped, broadly fused with posterior projection of superior volsella as shown in Fig. 3A, B, E. Stem of median volsella simple, 12–15 μm long, with 4–5 subulate lamellae (Fig. 3B, F). Inferior volsella 70–85 μm long, evenly curved and posteromedially directed, with distinct longitudinal ridge

dorsally. Phallapodeme 65–75 µm long; transverse sternapodeme 53–64 µm long, with well developed oral projections. Gonocoxite 102–109 µm long. Gonostylus 98–107 µm long, narrow, evenly curved and tapering toward blunt apex. HR 1.02–1.08, HV 2.17–2.52.

Discussion. The adult male of *Tanytarsus insolens* displays several distinct characters treated as diagnostic for a new group here proposed for this new species and *T. kiche*. The two species are unique in having the hypopygial superior volsella divided into two lobes or projections: anterior (ventral) and posterior (dorsal), and the stout digitus, extending far beyond the superior volsella. For homology of these structures in *Tanytarsus insolens* and *T. kiche*, see Fig. 3E and G. The round anal point crests flanking the spinulae, with the most distal one separated from the others or enlarged and bar-shaped are also characters common for the two species, so treated as supporting the group concept (cf. Fig. 3A, D and Vinogradova *et al.* 2009: fig. 2). Another extraordinary character found in males of *Tanytarsus insolens* are the long hair-like macrotrichia on the anal tergite (Fig. 3A, C). This peculiar character, however, does not appear in males of *Tanytarsus kiche* (Spies, pers. comm.), thus should be treated as an autapomorphy as long as it is known from *T. insolens* exclusively. The two representatives of the *kiche* group are distributed across Central America, from Mexico in the north through Panama (*T. kiche*) to the Brazilian Amazonia in the south (*T. insolens*).

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