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Redescription of the male of *Tanymecosticta filiformis* (Ris, 1898) from New Britain, Papua New Guinea, including the first description of the female (Odonata: Isostictidae)

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Abstract

The male of *Tanymecosticta filiformis* (Ris, 1898) from New Britain island, Papua New Guinea, previously known only from the incomplete male holotype specimen, is redescribed based on specimens collected during recent odonatological surveys, and the female is described for the first time. Comparative notes on *T. fissicollis* (Liefstinck, 1932) from mainland New Guinea are added.

Key words: Damselfly, Zygoptera, redescription, New Britain, Papua New Guinea

Introduction

Tanymecosticta filiformis is a poorly known isostictid species which was described by Ris in 1898 as *Isosticta filiformis* from New Britain, Papua New Guinea, based on an incomplete male specimen lacking its anal appendages. The holotype (Fig. 1a,b), collected by Friedrich Dahl at Ralum, New Britain, Papua New Guinea, is housed in the collection of the Museum für Naturkunde, Berlin/Germany (ZMB) (Turiault 2017). Almost exactly one century after Dahl had collected the holotype, the author collected two male specimens during his odonatological survey in Papua New Guinea in 1997 (Gassmann, 2015). Based on these specimens from New Britain's Gazelle Peninsula, and on further specimens collected during the Conservation International Nakanai Mountains RAP in 2009 (Gassmann & Richards, 2011), the male of *T. filiformis* is redescribed, and a first description of the female is provided. Beside *T. filiformis*, the largely Papuan genus *Tanymecosticta* currently contains five additional species (Paulson et al., 2021); these are: *T. capillaris* Liefstinck, 1959, from Yamdena island (Tanimbar Islands, Moluccas, Indonesia), *T. fissicollis* (Liefstinck, 1932) from mainland New Guinea, *T. jejuna* Liefstinck, 1959, from Western New Guinea including Misool Island, *T. leptalea* Liefstinck, 1959, from Woodlark Island, and *T. simonae* Liefstinck, 1969, from the Kei Islands (Moluccas, Indonesia). Buden (2018) reports on an extralimital record of an unidentified *Tanymecosticta* species from Kwajalein Atoll in the Marshall Islands (Micronesia) but considers it to be the result of human-mediated transport. The present paper contributes to the knowledge of *T. filiformis*. Comparative notes on specimens of *T. fissicollis* collected in Madang and Morobe Provinces in 1997 are added.

Material and methods

Descriptive terminology of odonate wing venation follows the modified Tillyard-Fraser system (Watson & O'Farrell 1991). Colouration, if not differently stated, is described from

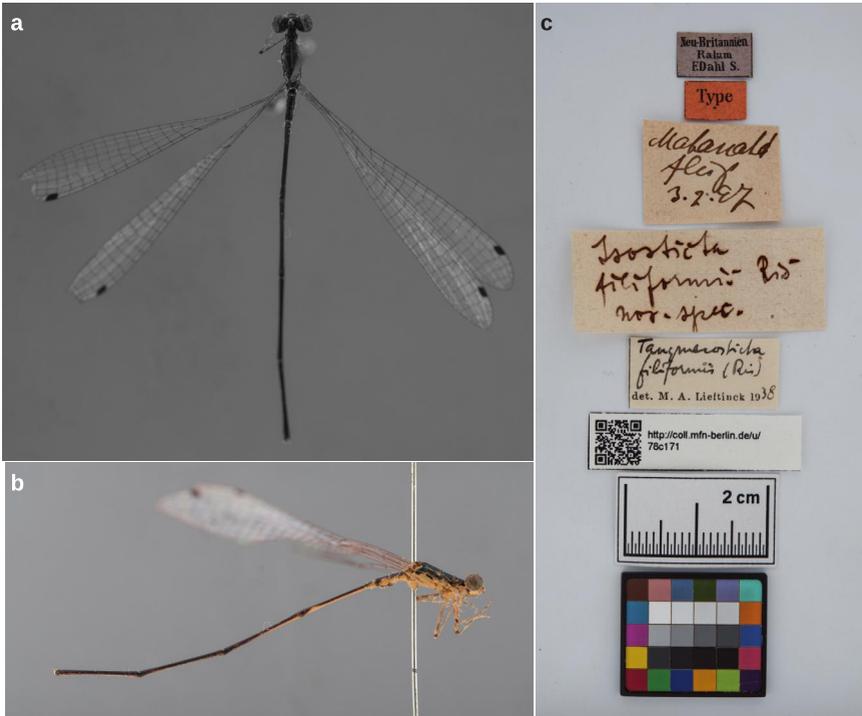


Figure 1. Male holotype of *Isosticta filiformis* Ris, 1898, currently: *Tanymecosticta filiformis* (Ris, 1898), in the collection of the Natural History Museum (Museum für Naturkunde), Berlin (ZMB): a) dorsal view; b) lateral view; c) labels; ©MfN-Berlin/Turiauxt.

preserved specimens. Measurements of wing length and abdomen were taken with a precision of 0.5 mm. Stacking photography was done by using a ZEISS SteREO Discovery.V20 microscope applying the ZEN software. All voucher specimens are deposited in the collection of the Naturalis Biodiversity Center (RMNH), Leiden.

Taxonomic part

Tanymecosticta filiformis (Ris, 1898)

Figs 1a,b; 2a-c; 3a-c; 5a; 6a; 7a,c; 8a,b; 11.

Isosticta filiformis Ris, 1898: 325–326 (description holotype ♂); 1900: 196 (repetition of original description; sample locality Matanata River), plate X, fig. 15 (wing base holotype ♂); Ris, 1915: 121 (catalogue Odonata New Guinea region). Schmidt, 1938: 324 (checklist Odonata Oceania), 336 (distribution *Isosticta* species Melanesian subregion [table]).

Stenosticta filiformis, Lieftinck, 1932: 557 (comparison with *S. fissicollis*, placed in *Stenosticta*).

Tanymecosticta filiformis, Lieftinck, 1949a: 82 [references, type examined, generic status, comparative note on ♂ prothorax]; Lieftinck 1949b: 323 (distribution Bismarck Islands [table]), 335 (references, differential diagnosis *T. fissicollis*); Lieftinck 1975: 144 (generic status). Fliedner, 2021: 42 (notes on etymology); Gassmann 2015: 35-36 (new records East New Britain Province, note on distribution/habitat); Gassmann & Richards, 2011: 62 (new records Nakanai Mts.), 64 (checklist); Kalkman & Orr, 2013: 113 (checklist New Guinea region); Michalski, 2012: 130 (key to *Tanymecosticta* species); Turiault, 2017: 352 (note on holotype ♂ in ZMB).

Specimens examined. Papua New Guinea, East New Britain Province, New Britain: 2♂♂, small creek at Keravat Road, ca. 40 m a.s.l., 11.-12.vi.1997. 1♂ (in alcohol), Nakanai Mountains, nr. Camp I (Lamas), site II, 7.iv.2009, 10.20 a.m., leg. D. Gassmann, Conservation International Rapid Biodiversity Assessment 2009. 1♀, Nakanai Mountains, nr. Camp I (Lamas), site III (?), 8.iv.2009, leg. D. Gassmann, Conservation International Rapid Biodiversity Assessment 2009. All in RMNH.

Redescription of the male.

(Based on Gazelle Peninsula specimen from Keravat Road figured in Figs 2a-c, leg. 11.vi.1997; variation described from the remaining two male specimens).

Head. Labium yellow-white. Labrum with a deep and distinctly circular upper depression; lower part of labrum dirty-yellow, upper part including the median depression shiny black, the border in between diffuse dirty-orange. Area between mouth parts and eyes bright yellow, this colouration continuing in a narrow yellow line along eye margin, widening again between eyes and antennal sockets, respectively. Clypeus dark metallic-green. Frons black, its lower part with a pair of oblique elongate dirty-yellow spots which do not touch each other medially. Dorsal part of head, including antennal scapi, largely dark metallic-green; area between eyes and antennae at the level of scapus and basal half of pedicellus shiny black, continuing along eye margin, framing the dark-metallic area. Antennal sockets bright yellow; antennal pedicellus dark brown intermingled with yellow; flagellum dark brown (Fig. 2a-c). Rear of head bright yellow, intermingled with diffuse patches of medium to dark brown.

Thorax. Prothorax with median lobe unmodified and flat in lateral view; posterior lobe rather trapezoid, its posterior margin extending into two (in lateral view: Fig. 7a) almost spoon-shaped but elongate branches, roughly forming an 'U' in dorsal view (Fig. 7c); pronotum largely dark metallic-green, its corner areas yellow; a transverse yellow stripe dividing prothorax in lateral view; the area below that stripe dark green metallic except for a yellow spot covering most of the posterior lower area, fading out antero-dorsally in a narrow stripe (Fig. 2c). Synthorax with anterior end of dorsal carina distinctly raised in lateral view (Fig. 7a); ground colour largely bright yellow, with upper part of synthorax dark metallic-green as shown in Figs 2a-c; a distinct elongate dark spot situated in the center of metepisternum, at the level of, and posterior to, metepisternal spiracle. Underside of synthorax bright yellow, except for some median brown areas.

Legs dirty yellow, with traces of black on submedian and subdistal parts of femora, especially in the hind legs, providing the impression of diffuse rings around femur; distinct and conspicuous black markings proximal to the joints between femora and tibiae (figs 2a-c).

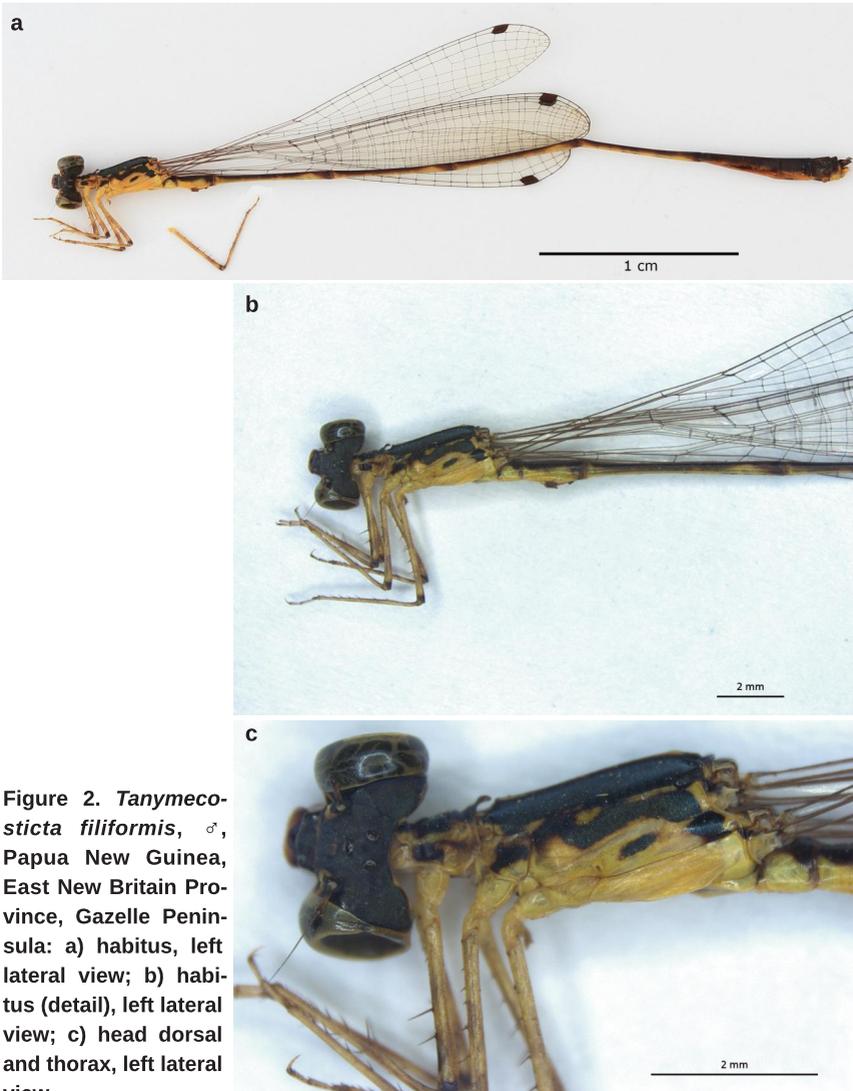


Figure 2. *Tanymecosticta filiformis*, ♂, Papua New Guinea, East New Britain Province, Gazelle Peninsula: a) habitus, left lateral view; b) habitus (detail), left lateral view; c) head dorsal and thorax, left lateral view.

Wings. Very slender, with narrow tips; hyaline (Fig. 2a). FW with 14-15 Px ; HW with 12 Px. Pterostigma rhombic, with posterior distal corner smooth, distinctly rounded; inner part dark brown, surrounded by a fine yellow-white line; frame black (Fig. 5a).

Abdomen. S1 to S6 with lower parts pale yellow, upper parts diffuse black, with yellow colouration extending dorsally in subcaudal areas of segments; S7 to S10 largely black, the brighter ventral areas dark orange; S 10 black, intermingled with weak traces of what might have been a bright lateral marking, lower posterior part of segment bright yellow (Figs

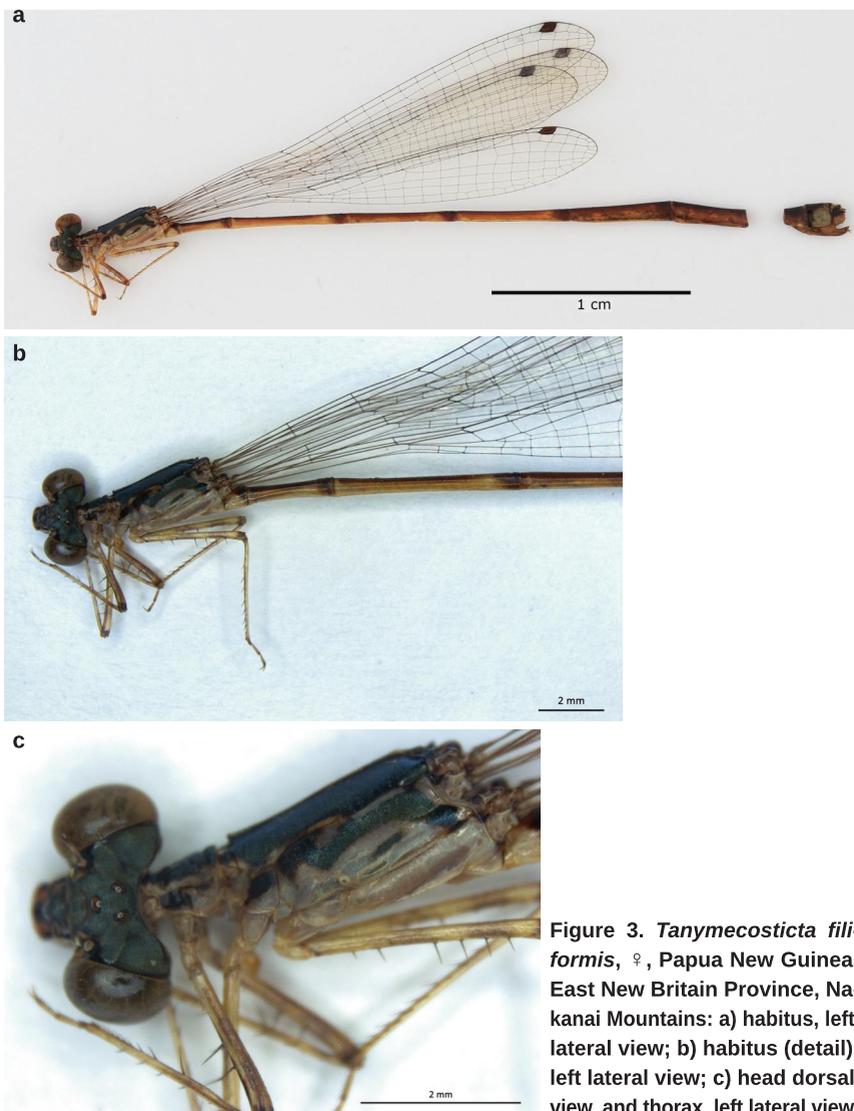


Figure 3. *Tanymecosticta filiformis*, ♀, Papua New Guinea, East New Britain Province, Nakanai Mountains: a) habitus, left lateral view; b) habitus (detail), left lateral view; c) head dorsal view, and thorax, left lateral view.

2a, 6a). S10 with posterior dorsal edge distinctly depressed (Fig. 6a). Superior anal appendages about two times the length of S10, sinuate, their apices distinctly but rather smoothly kinked down- and inwards; superior appendages crossed in dorsal view, moderately sickle-shaped, terminal third with inner edge straight; outer sides largely black-brown, inner sides dirty yellow. Inferior appendages with a robust base, otherwise needle-like, pointed; bright yellow, intermingled with brownish-grey. Inferior appendages slightly shorter than superiors (Fig. 6a).

Genital ligula. Not examined.

Variation. FW with 13-15 Px; HW with 11-12 Px (n=3).

Measurements. ♂ FW length 21.5-23.0 mm, HW length 20.5-21.5 mm; Abdomen length (incl. apps.) 35.0-36.5 mm (n=2).

Female (supposition; first description).

Very similar to male in colouration. However, a few differences are given below.

Head. Labium entirely pale yellow, tips of mandibles dark-brown. Labrum with lower part dirty yellow-orange, upper part with diffuse dark-brown spots, i.e. one median and two lateral ones, the dirty yellow colouration filling the space between them. Genae yellow-white, with traces of black. Ante- and postclypeus black, except for two sublateral diffuse brownish markings on the latter. Upper surface of head largely dark grey with a metallic-green hue; ocelli surrounded by a black ring-like marking, respectively; compound eyes flanked by a black line, respectively, the latter somewhat widening anteriorly in dorsal view. Antennae with scapus black except for a distal thin yellow line; (right) pedicellus light brown, with diffuse subbasal and distal dark (?) marking; left pedicellus and both flagella lacking in the present specimen. Vertex with a pair of suboval spots connecting the lateral ocelli with the eye margin (Fig. 3c). Rear of head largely yellow-white, central parts brownish.

Thorax. Prothorax with median lobe unmodified, flat; posterior pronotal lobe short, not distinctly raised in lateral view (Fig. 3c), its posterior margin in dorsal view simple, smoothly rounded (Fig. 8a); pronotum and upper parts of pleura dark metallic green, lower parts of pleura whitish-brown with a hue of purple, except for a dark metallic green marking (Fig. 3c) shaped as in the male.

Legs dirty yellow-white, intermingled with black, those traces of black becoming more distinct on the submedian and subdistal parts of femora, especially in the hind legs; distinct black markings proximal to the joints between femora and tibiae (Fig. 3b).

Synthorax with anterior edge of dorsal carina distinctly raised in lateral view (Fig. 3c); colour pattern similar to the male except for the more distinct brownish line roughly joining the anterior part of humeral suture; mesepimeron green-metallic except for the following light coloured areas: a light grey spot arising from the submedian humeral suture and directed anteriorly; a line of same colour, roughly extending along the posterior part of humeral suture, not reaching ante-alar ridge. Synthoracic sides below and between the dark metallic colouration pale turquoise (original colouration?), rather not yellow as in the male. Underside of synthorax yellow-white.

Wings. Wings clear, transparent (Fig. 3a), with 14-15 Px in FW, 11-12 Px in HW. Pterostigma as in the male but slightly shorter (Fig. 5b), inner part medium brown.

Abdomen. S1 black dorsally, whitish ventrally, the border between black and white running roughly diagonally from anterior upper margin of segment to posterior lower margin in lateral view; S2 to 5 similar to male; S6 to S8 entirely darkened (Fig. 3a); S9 black, except for a large grey (turquoise?) spot covering almost entire pleurum, respectively (Fig. 8b). Valvae reaching beyond cerci for about half the length of the latter, brown-black; S 10, including cerci, black.

Measurements. FW length 23.5 mm, HW length 22.0 mm; Abdomen length (incl. valvae) 33.0 mm (n=1).

Variation. In the male specimen from Lamas (Nakanai Mountains) the lower halves of pleura of S 8 and S 9 are covered by a light blue marking, respectively; traces of this colour can also be seen on S 10 (the specimen is stored in alcohol, and its colours have apparently faded to some degree).

Differential diagnosis. The male of *T. filiformis* is closest to *T. fissicollis* (Fig. 6b) and *T. simonae* with regard to the structure of its anal appendages, particularly with regard to the apical part of the superior appendage which is distinctly bent in- and downwards (Fig. 6a); different from the latter species, however, in which the superior appendages reach beyond the inferiors for almost a third of the latter's length, the superior appendages of *T. filiformis* hardly reach beyond the inferiors (Fig. 6a). In *T. filiformis*, the kinked apical part of superior appendage appears to be slightly shorter, less abruptly bent in dorsal view and with its inner side rather straight, vs. slightly convex as in *T. fissicollis* and *T. simonae*. The U-shaped distal protuberance of the posterior pronotal lobe of *T. filiformis* (Fig. 7a,c) is most similar to that of *T. simonae* from the Kei Islands but the branches appear to be slightly longer than in the latter species and their tips tend to slightly turn inwards (fig. 7c). Since the females of *T. jejuna* and *T. fissicollis* were not before the author during the present study, a thorough differential diagnosis of female *T. filiformis* is impossible at the present time. Referring to Lieftinck's (1932; 1959) descriptions and illustrations of those two species, however, we may conclude that the female of *T. filiformis* appears to be slightly larger than that of *T. fissicollis* and *T. jejuna*, although only a few specimens were available for measurements in *T. jejuna* (4 specimens: Lieftinck 1959) and *T. filiformis* (one specimen: this paper). The female posterior pronotal lobe, where known, appears to be simple and rounded in all species but is weakly carinate longitudinally in *T. jejuna* according to Lieftinck (1959). The pterostigma of female *T. filiformis* is similar to *T. fissicollis* but, like the latter, markedly shorter than in *T. jejuna* in which the pterostigma is almost twice as long as wide (Lieftinck, 1959).

Remarks. Interestingly, in the original description of the male holotype, Ris (1898; 1900) did not describe the peculiar structure of the posterior pronotal lobe (which later would become the key character for distinguishing the genus' species) in detail. Lieftinck (1949a), referring to his examination of the type from about a decade earlier, described the posterior lobe as 'rather trapezoidal in shape, bearing only very short, slightly divergent, roundish lateral protuberances [...]'. From the photographs of the holotype (Figs 1a,b), the open fork-like structure, as described above, may be well recognized.

Habitat. The author encountered this species at a shady streamlet in the Gazelle peninsula near the street leading to Keravat (Gassmann, 2015). In the Nakanai Mountains, this species was found at a site of a medium-sized streambed with remnant pools (Gassmann & Richards, 2011).

Elevation. Ca. 40 to 200 m.

Distribution. New Britain.

Tanymecosticta fissicollis (Lief tinck, 1932)

Figs 4a-c; 5c; 6b; 7b,d; 11.

Stenosticta fissicollis Lief tinck 1932: 555-557 (orig. description holotype ♂, genotype *Stenosticta*), figs 48a-b (♂ pronotum, wing base), fig. 49 (♂ synthorax), fig. 50 (genital ligula), fig. 51 (♂ apps.); Lief tinck, 1935: 300 (genus name preoccupied, changed to *Tanymecosticta*).

Tanymecosticta fissicollis, Lief tinck, 1949a: 82 (references, distribution Tanimbar islands), 258 [catalogue Papuan region]; Lief tinck 1959: 281 (table distribution northern New Guinea), fig. 12 (pterostigma ♂ Hollandia), fig. 33 (inf. apps. ♂ Hollandia); Lief tinck 1971: 88 (note on lecto- and allotype RMNH, Humboldt Bay area); Gassmann 2015: 36, 42 (distribution, new records), table 3 (first record Papua New Guinea), figs 10a-b (habitat); Kalkman & Orr, 2013: 47 (figs ♂ habitus, pronotum, apps.), 113 (checklist New Guinea region). Michalski, 2012: 128-131: (characters, key to *Tanymecosticta* species).

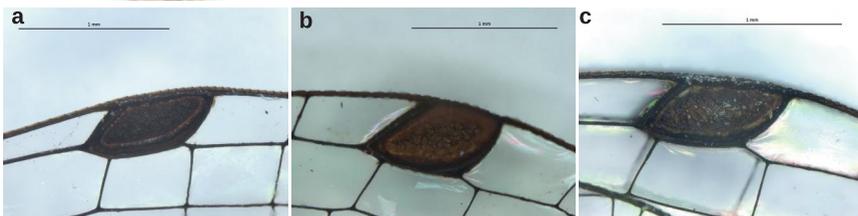
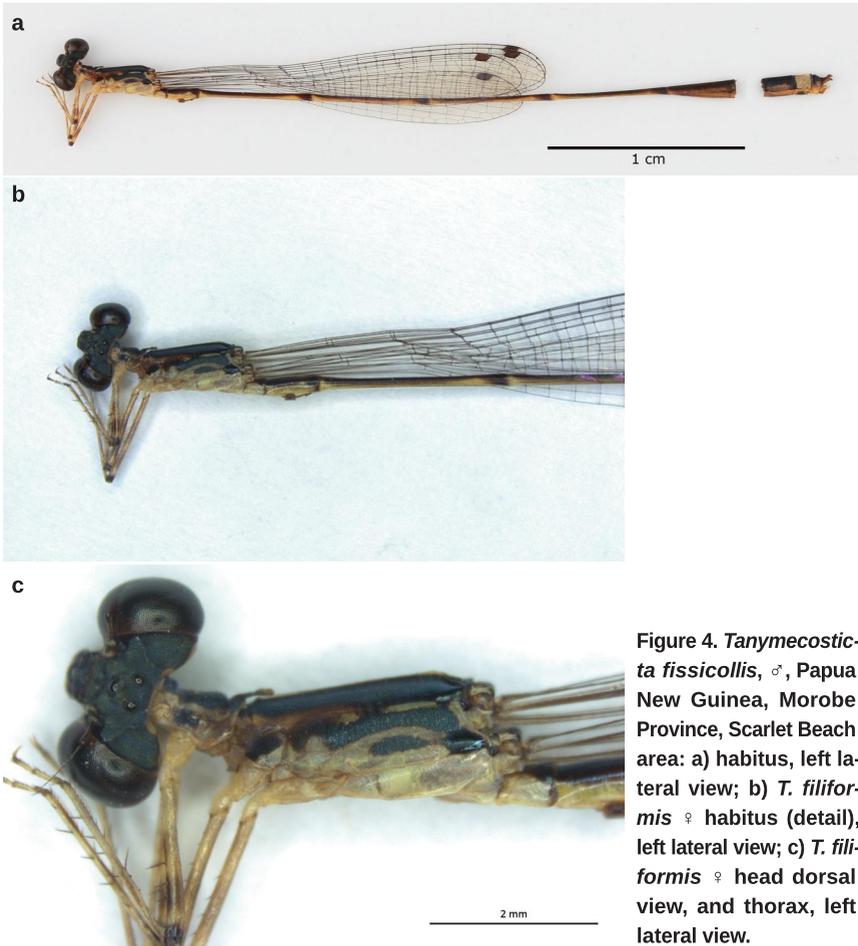
Specimens examined. Papua New Guinea: 1 ♂, Madang Province, Kau Wildlife Area, 3.vii.1997, leg. D. Gassmann; 1 ♂, Morobe Province, Huon Peninsula, broad, partly deep rocky creek at Scarlet Beach, pH = 8, Position E 6°28'40.6" S 147°50'18.2", 30.v.1997, leg. D. Gassmann. All in RMNH.

Variation. The thoracic colour pattern in both male specimens largely agrees with Lief tinck's (1932) illustration of the holotype from Hollandia (= Jayapura) (Figs 4a-c). The dark metallic-green colouration of pro- and synthorax is slightly more extensive in the specimen from Kau Wildlife Area (Madang Province) than in the figured specimen from Scarlet Beach (Morobe Province: southern Huon Peninsula). In the latter, the median protuberance of the posterior pronotal lobe terminally forms a fork-like structure of which the two branches describe a near-closed circle in dorsal view (Figs 7b,d), similar to Lief tinck's illustration of the same structure in the holotype (1932: 553 [fig. 48]). In the specimen from Kau Wildlife Area, the tips of both branches are directed more anteriorly and upwards so that the terminal structure is less circular, a condition Lief tinck (1932) describes from some males of the type series. In the Scarlet Beach specimen, the dorsolateral turquoise-blue marking on abdominal segment 9 covers almost the entire surface of that segment, leaving only a narrow anterior and posterior black line in lateral view; in the specimen from Kau Wildlife, the marking is less extensive, leaving an anterior black space of 1/4 to 1/2 the length of S9. FW with 12-13 Px, HW with 10 Px (n=2).

Genital ligula. Not examined. Lief tinck provided an illustration of the ligula (1932: 556 [fig. 50]).

Measurements. FW length 20.0-20.5 mm, HW length 18.5-19.0 mm; Abdomen length (incl. apps.) 33.5-34.5 mm (n=2).

Habitat. Lowland aquatic habitats in primary and secondary rainforest. The author encountered this species in areas with pools and small shady streamlets (Kau Wildlife Area, northwest to Madang) as well as in areas where waterfalls and rocky streams were at least nearby (Scarlet Beach, north to Finschhafen); both areas were not avoid of occasional human disturbance.



Elevation. 50–200 m.

Distribution. Northern and northeastern New Guinea.



Figure 6. Male anal appendages: a) *T. filiformis*, Gazelle Peninsula, left lateral view; b) *T. fissicollis*, Scarlet Beach, right lateral view (mirror-image).

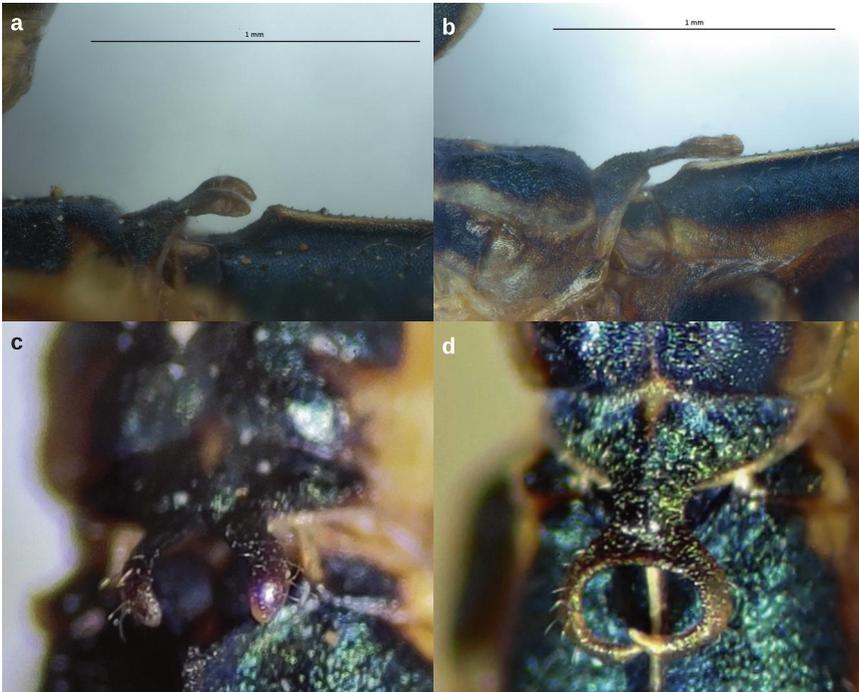


Figure 7. Male posterior pronotal lobe: a) *T. filiformis*, right lateral view (mirror-image); b) *T. fissicollis*, left lateral view; c) *T. filiformis*, dorsal view, not on scale; d) *T. fissicollis*, dorsal view, not on scale.

Remarks. The two males collected by the author in northeastern Papua New Guinea in 1997 appear to be the only published records of this species to date apart from Lieftinck's type series from Hollandia (= Jayapura); they also were the first specimens of *T. fissicollis* to be recorded from Papua New Guinea (Gassmann, 2015).

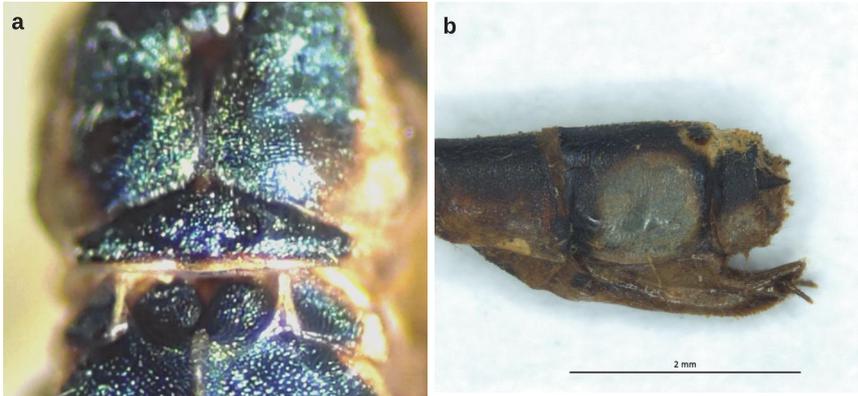


Figure 8. *T. filiformis*, ♀, New Britain, Nakanai Mountains: a) female posterior pronotal lobe, dorsal view; b) terminal abdominal segments S8-S10, left lateral view.



Figure 9. Kau Wildlife Area in Madang Province. *Tanymecosticta fissicollis* was found here. Photo: D. Gassmann.



Figure 10. The author 1997 in Kau Wildlife Area near Baitabag Village. Photo: H. Wasel

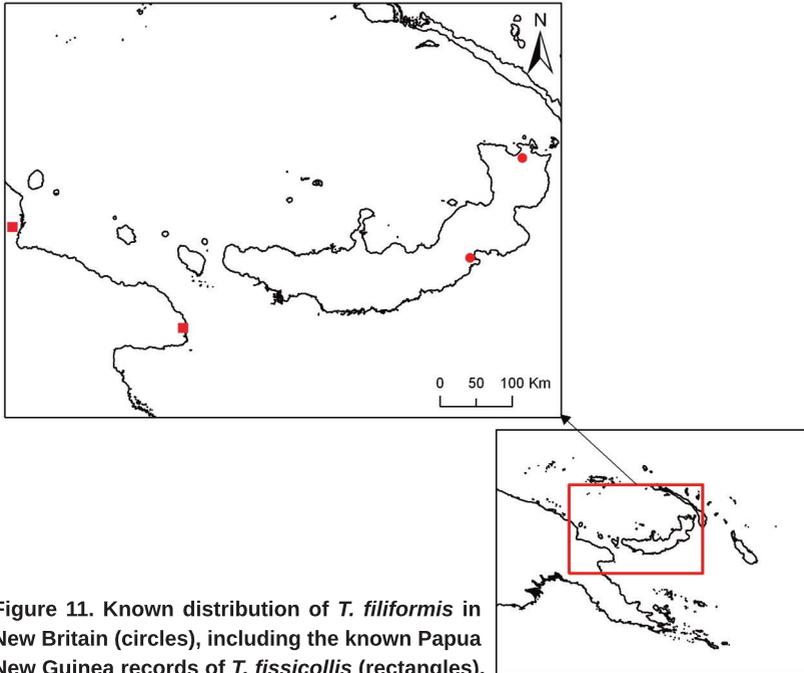


Figure 11. Known distribution of *T. filiformis* in New Britain (circles), including the known Papua New Guinea records of *T. fissicollis* (rectangles).

Differential diagnosis. As already suggested by Liefertinck (1969), the male of *T. fissicollis* is most similar to *T. simonae* from the Kei islands with regard to its anal appendages. The strongly modified distal part of its posterior pronotal lobe (Fig. 7b,d), however, is most similar to the likewise near-circular structure in *T. capillaris* from the Moluccas.

Discussion

Apparently, prior to the preparation of the present paper, *Tanymecosticta filiformis* had never been illustrated apart from a drawing of the wing base of the male holotype by Ris (1900). The figures here thus represent the first illustrations of the species' main characters, the more so as undamaged specimens were available to the author.

As already stated by other authors (e.g. Liefertinck, 1959), males of the genus *Tanymecosticta* are rather uniform in their habitus and general appearance and thus presumably closely related. This also applies to the male anal appendages, which are described here for the first time for *T. filiformis*. In contrary, the peculiarly modified posterior pronotal lobe of male *Tanymecosticta* is a valuable taxonomic and distinguishing character; its function, however, remains subject to speculation.

Liefertinck (1969), when describing *T. simonae*, apparently considered that species most closely related to *T. leptalea*, based on the shape of the posterior pronotal lobe, and surprisingly not to *T. filiformis* of which he had examined the type specimen in 1938. However, relating to

Lieftinck's (1969) own illustration of the posterior pronotal lobe of *T. simonae*, the author considers this structure most similar to that of *T. filiformis*. The same holds for the anal appendages of the two species (those of *T. filiformis* had not been known to Lieftinck at his time).

After *T. fissicollis* and *T. jejuna*, the female of *T. filiformis* is the third of its genus to have been described; the females of *T. capillaris*, *T. leptalea* and *T. simonae* still remain unknown. A future full taxonomic revision of the genus *Tanymecosticta*, likely to include newly discovered species of this rather seclusive damselflies, should especially focus on distinguishing features within the female gender.

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