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On the genus *Pseudosmittia* Edwards, 1932 from New Caledonia. I. Description of *P. noumeana*, *P. paniena* and *P. pouemboutana* spp. n. [Diptera, Chironomidae, Orthocladiinae]

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Keywords: Diptera Chironomidae, Genus *Pseudosmittia*, description of 3 sp. n., New Caledonia, conservation.

Male adult of three new *Pseudosmittia* species (*P. noumeana*, *P. paniena* and *P. pouemboutana* spp. n.) is described based on material collected by swift net and Malaise traps in riparian habitats bordering some coastal streams and rivers in New Caledonia. *P. noumeana* sp. n. appears to belong to a separate group (the *noumeana*-gr), based on the presence of an unusual pars ventralis. *P. paniena* sp. n. is easily separated from all other related congeners by the unusual following characters: shape of virga and gonostylus, humeral area with reticulation, humeral pit absent. However, on the basis of some common morphological similarity (anal point conical with lateral setae; inferior volsella digitiform), this new species appears to key beside *P. reyei* (Freeman, 1961), *P. tericristata* Ferrington & Sæther, 2011, *P. palauensis* (Tokunaga, 1964), *P. xanthostola* (Kieffer, 1911), *P. yapensis* (Tokunaga, 1964), which are members of the two known groups (*topei*-gr and *xanthosola*-gr) from Australia and Japan. *P. pouemboutana* sp. n. has a vestigial anal point, which resembles that of *P. paraspinispinata* Langton & Syrovatka, 2013 and *P. rostriformis* Makarchenko & Makarchenko, 2006. Worldwide, there are currently about 100 known *Pseudosmittia* species, of which only 2 species (*P. tericristata* and *P. reyei*) were reported from Australia by FERRINGTON & SÆTHER (2011). Consequently, the description of the three new species increases to 5 the total number of known species from the Australasian Region. Accordingly, they can be considered as biogeographic representative elements of New Caledonia. Remarks with key to known species from the Australasian Region are given.

Sur le genre *Pseudosmittia* Edwards, 1932 de Nouvelle-Calédonie. I. Description de *P. noumeana*, *P. paniena* and *P. pouemboutana* spp. n. [Diptera, Chironomidae, Orthocladiinae]

Mots-clés: Diptera Chironomidae, taxonomie, genre *Pseudosmittia*, description de 3 sp. n., Nouvelle-Calédonie, conservation.

L'adulte mâle de trois nouvelles espèces de *Pseudosmittia* (*P. noumeana*, *P. paniena* et *P. pouemboutana* spp. n.) est décrit à partir d'un matériel collecté au moyen d'un filet entomologique et de tentes Malaise dans des habitats en bordure de milieux ripicoles de cours d'eau côtiers de Nouvelle-Calédonie. La présence inhabituelle d'un pars ventralis chez *P. noumeana* sp. n. place cette espèce dans un nouveau groupe (le *noumeana*-gr). *P. paniena* sp. n. est facilement séparée de toutes les espèces apparentées par les caractères inhabituels suivants: forme de la virga et du gonostylus, aire humérale avec reticulation, creux huméral absent. Toutefois, sur la base de certaines similarités morphologiques (pointe anale conique, avec des soies latérales ; volselle

inférieure digitiforme), elle est proche de certaines espèces connues d'Australie et du Japon, en particulier : *P. reyei* (Freeman, 1961), *P. tericristata* Ferrington & Sæther, 2011, *P. palauensis* (Tokunaga, 1964), *P. xanthostola* (Kieffer, 1911), *P. yapensis* (Tokunaga, 1964) qui appartiennent à l'un des 2 groupes, *topei*-gr et *xanthostola*-gr. Actuellement, près de 100 espèces valides de *Pseudosmittia* sont connues à l'échelle mondiale, parmi lesquelles seulement deux (*P. tericristata* et *P. reyei*) sont citées d'Australie par FERRINGTON & SÆTHER (2011). Ces descriptions portent à 5 le nombre total d'espèces connues de la région Australasienne. Les trois nouvelles espèces peuvent être considérées comme des éléments biogéographiques représentatifs qui méritent des mesures de protection appropriées. Des commentaires sur leur position taxonomique et une clé pour les espèces connues de la Nouvelle-Calédonie sont fournis.

1. Introduction

On the basis of knowledge provided worldwide on the taxonomy, geographical distribution and ecology of the genus *Pseudosmittia* Edwards, 1932 (EDWARDS 1929, 1932, GOETGHEBUER 1940-1950, STRENZKE 1950, 1960, BRUNDIN 1956, FREEMAN 1958, 1959, 1961, TOKUNAGA 1964, ALBU 1968, SASA 1979, 1985, 1993, 1998, FREEMAN & CRANSTON 1980, CASPERS & REISS 1989, CRANSTON et al. 1989, WANG 1990, SASA & OKAZAWA 1992, SÆTHER & FERRINGTON 2003, SPIES & SÆTHER 2004, YAMAMOTO 2004, SÆTHER 2004, 2006, MAKARCHENKO & MAKARCHENKO 2006, 2008, 2011, LANGTON & PINDER 2007, FERRINGTON & SÆTHER 2011, ASHE & O'CONNOR 2012, LANGTON & SYROVATKA 2013, MAUAD et al. 2013, SÆTHER & SPIES 2013, MOUBAYED-BREIL et al. 2021), currently there are about 100 known valid species, which are distributed in thirteen groups.

A large material, collected between 1996 and 2023 in some riparian habitats bordering lower coastal rivers in New Caledonia, revealed the presence of three new *Pseudosmittia* species (*P. noumeana*, *P. paniena* and *P. pouemboutana* spp. n.), which are illustrated and described in the present paper. Some atypical characters found in the male adult allowed us to consider them as local biogeographical elements and biological indicators of the littoral wetlands of New Caledonia. Comments on their taxonomic position with key for known male adult from New Caledonia are given.

2. Material and methods

The studied material is composed of male adults collected between 1996 and 2023 by Malaise traps and swift net in some riparian habitats bordering down basin of streams and rivers delimited by the coastal ecosystem of New Caledonia. The material was preserved in 80-85% ethanol for the taxonomic examination and description. Information on the methodology of mounting and conservation of the type material is provided in MOUBAYED & LANGTON (2019). Morphological terminology and measurements of the imagines follow those of SÆTHER (1980) and FERRINGTON & SÆTHER (2011).

3. Results and descriptions

Pseudosmittia noumeana sp. n.

Material examined.

Holotype. New Caledonia. One male adult captured by swift net at the locality of Piro Amont, southern Nouméa city (166°41'36.8"E; 22°15'47.9"S); riparian habitat with wet soils and grasses surrounding the estuarine zone of the River Pirogues (Photo 1); site N° 57 as reported in MOUBAYED-BREIL et al. 2021 (Table VI); altitude 11 m; 21.X.2019 (N. Mary leg.).

Paratype. New Caledonia. One male adult captured by swift net, riparian habitats surrounding the River Coulée near the city of Nouméa (166°36'47.21"E; 22°12'49.61"S); site N° 93 as reported in MOUBAYED-BREIL et al. 2021 (Table VI); alt. 40 m; 07.XI.2012 (N. Mary leg.)..

Holotype (mounted on one slide) is deposited in the collections of the 'Musée cantonal de Zoologie, Palais de Rumine, 6 place de la Riponne, CH-1014 Lausanne (MZL), Switzerland'. The paratype is deposited in the collection of the senior author.

Etymology: the name *"noumeana"* refers to the capital Nouméa of New Caledonia, which is located in the southern part of the island.

Photo 1. Type-locality of *Pseudosmittia noumeana* sp. n. (photo N. Mary 21.X.2019).

Photo 1. Localité type de *Pseudosmittia noumeana* sp. n. (cliché N. Mary 21.X.2019).

Diagnostic characters

The long antennal setae, shape of palpomeres, anal point, inferior volsella, pars ventralis and gonostylus will separate the new species from other related members of the genus *Pseudosmittia*. Head. Eyes bare; frontal tubercle absent, suture of coronal triangle drop-like shaped; temporals 8. Antenna 732 µm long, densely covered with long setae (300-400 µm long), terminal segment 283 µm, apical seta absent, AR 0.63; clypeus shield shaped; palpomere 3 longer than segments 4 and 5, without sensilla coeloconica. Thorax. Lobes of antepronotum gaping. Wing. Veins R and R_1 with 10 and 3 setae. Legs. Sensilla chaetica present on tarsomeres ta_1-ta_5; pulvilli present. Abdomen. Tergites I-III with 2 transverse rows of 10 setae (anteriorly and posteriorly); tergite IX broadly sub-rectangular, dorsal hump absent, with 4 setae placed close to the base of anal point. Anal point cup-like basally, cylindrical distally, apex rounded, densely covered with macrotrichia, basal margin capital-L shaped, well-sclerotized. Transverse sternapodeme rounded, phallapodeme saw-like. Virga composed of 2 long spines. Gonocoxite distinctly truncate apically, basal junction with a characteristic tongue-like pars ventralis. Superior volsella well-developed. Inferior volsella double, dorsal lobe large, sub-rectangular, accessory lobe free distally, projecting downwards. Gonostylus massive distally, anterior side with orally directed fine setae, a characteristic semicircular hollow present pre-apically, posterior side projecting upwards distally; crista dorsalis pointed tooth shaped, located pre-apically.

Male imago

(n = 2; Figs 1A-J)

Medium sized species. Total length 1.75 mm; wing length 0.65 mm; TL/WL = 2.69. General colouration contrasting dark brown to blackish; head dark brown; antenna brownish; palpomeres 4 and 5 distinctly contrasting; thorax contrasting dark brown to blackish with blackish mesonotal stripes; legs and abdomen brownish; anal segment contrasting brown to blackish. Head (Fig. 1A). Eyes bare; frontal tubercle absent, median part of frontal margin concave, sutureof coronal triangle with a long drop-like appearance; temporals 8 including 5 inner and 3 outer verticals. Antenna 13-segmented, 732 µm long, segments 2-12 subequal (35 µm long), last flagellomere (Fig. 1B) 283 µm long, weakly clubbed, apical seta absent; densely covered with about 45-50 long setae (300-400 µm long), antennal groove reaching segments 2; AR 0.63. Clypeus (Fig. 1C) 75 µm long, 105 µm maximum width, shield shaped, with 9 setae in 2 rows. Palp 5-segmented, segments 1-2 and 4-5 fused; length (in µm) of segments: 10, 20, 85, 25, 45; palpomere 3 much longer than segments 4 and 5, linearly elongate, without sensilla coeloconica; segments 4-5 (Fig. 1D) having a teat appearance. Thorax. Lobes of antepronotum gaping; lateral antepronotals 5; acrostichals 2, prealars 3, scutellum with 6 setae (3 on each side of the midline). Wing. Brachiolum with 1 seta; subcosta overreaching fork of radius; costal expansion about 45 µm long; distribution of setae on veins: R, 10; R_1, 3 setae; squama bare. Legs. Length (in µm) of tibial spurs: PI, 45; PII, 40, 25; PIII, 45, 20. Sensilla chaetica present on tarsomeres ta_1-ta_5; pulvilli present. Length (µm) and proportions of prothoracic (PI), mesothoracic (PII) and metathoracic (PIII) legs (n =1) as in the following table:

	fe	**ti**	**ta_1**	**ta_2**	**ta_3**	**ta_4**	**ta_5**	**LR**	**BV**	**SV**	**BR**
PI	560	615	265	150	110	75	70	0,43	3,55	4.43	2.85
PII	565	520	210	115	95	60	65	0,40	3,87	5.16	2.40
PIII	615	635	320	185	170	95	80	0,50	2,96	3.91	2.50

" LR = Length of tarsomere ta_1 divided by length of tibia (ti); BV = Combined length of femur (fe), tibia and ta_1 divided by combined length of tarsomeres ta_2-ta_5; SV = Ratio of femur plus tibia to tarsomere ta_1; BR = Ratio of longest seta of ta_1 divided by minimum width of ta_1, measured one third from apex."

Abdomen. Hypopygium in dorsal and ventral view as in figures 1F-G (ventral view, Fig. 1G, with tergite IX and anal point omitted). Tergites I-III with 2 transverse rows of 10 setae located on anterior and posterior parts. Tergite IX about 95 µm long, 105 maximum wide, broadly subrectangular, dorsal hump absent; with 4 dorsal setae (Figs 1E-F) located near the base of the anal point (2 on each side). Laterosternite IX with 8 setae (4 on each side). Anal point (Fig. 1E, lateral; Fig. 1F, dorsal) 50 µm long; cup-like and distinctly enlarged at base, cylindrical distally, median and distal parts parallel-sided, apex rounded reaching tip of tergite IX; densely covered with blackish curved macrotrichia; sclerotized band at basal margin capital-L shaped, clearly visible in both lateral (Fig. 1E) and dorsal view (Fig. 1F). Apodemes (Fig. 1G); transverse sternapodeme semicircular, slightly projecting orally; phallapodeme well-developed, saw-like shaped. Virga (Figs 1F-G) about 20-25 µm long, composed of 2 long spines. Gonocoxite 140 µm long, 55 µm maximum width including inferior volsella, distinctly truncate apically; basal junction acute and parallel-sided in dorsal view (Fig. 1H), more open (Fig. 1G) with a characteristic tongue-like pars ventralis in ventral side (Fig. 1G); ventral margin with 10 stout inner setae. Superior volsella (Fig. H) well-bulged.

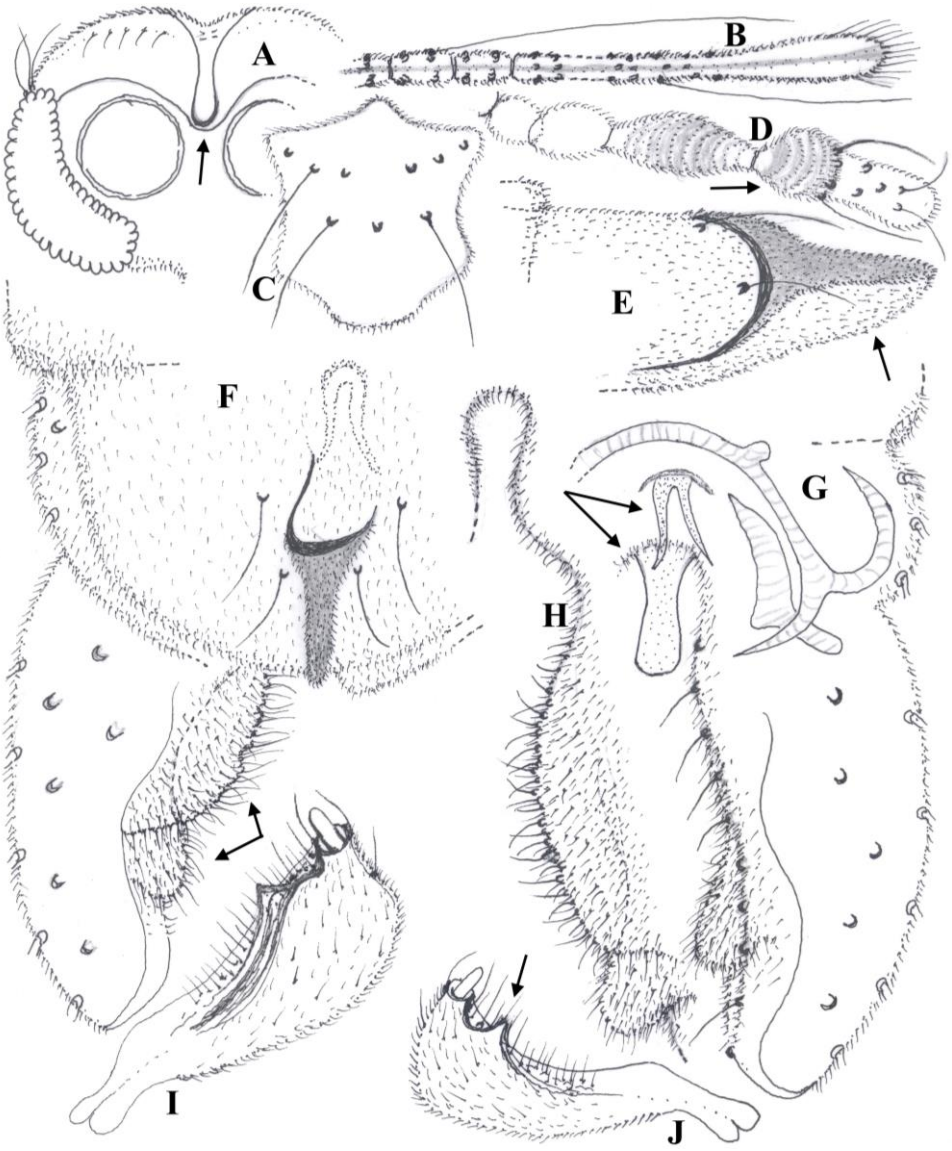


Figure 1. Male imago of *Pseudosmittia noumeana* sp. n. Head (left side, dorsal), frontal area, vertex and temporal setae (A); antenna, three last segments (B); clypeus (C); palpomeres 1-5 (D); tergite IX and anal point in lateral view (E); hypopygium in dorsal (F) and ventral view (G, with virga and pars ventralis); inferior volsella, right side (H); gonostylus at acute (I) and right angle (J). The arrows indicate some distinguishing characters.

Figure 1. Imago mâle de *Pseudosmittia noumeana* sp. n. Tête (côté gauche, vue dorsale), aire frontale, vertex et soies temporales (A) ; antenne, trois derniers segments (B) ; clypéus (C) ; palpomères 1-5 (D) ; tergite IX et pointe anale en vue latérale (E); hypopyge en vues dorsale (F) et ventrale (G, avec virga et pars ventralis) ; volselle inférieure, côté droit (H) ; gonostyle, angle aigu (I) et angle droit (J). Les flèches indiquent quelques caractères distinctifs.

Inferior volsella (Figs 1F-G, H), double; dorsal lobe 50 µm long, broadly rectangular, located medially, projecting inwards, covered with short and fine setae; ventral accessory lobe located distally, mostly covered by dorsal lobe, giving appearance of a typical marsupial pouch shaped, almost free apically. Gonostylus (Fig. 1I, acute angle; Fig. 1N, right angle), about 60 µm long, 20 µm maximum width; posterior part more massive and upwardly projecting; anterior side with orally directed fine setae, pre-apical part with a characteristic semicircular hollow; crista dorsalis well-developed, small pointed tooth shaped, located pre-apically; megaseta well-developed, located apically. HR 2.33; HV 2.92.

Female adult, pupal exuviae and larva: unknown.

Pseudosmittia paniena sp. n.

Material examined

Holotype. New Caledonia, Mont Panié. 1 male adult captured by swift net at the Tao waterfall (164°48'22.6530"E; 20°33'42.31.51"S); lotic habitat with dense carpet of bryophytes (Photo 2); site N° 15 as reported in MOUBAYED-BREIL et al. 2021 (Table VI); altitude 84 m;14.XI.2012 (N. Mary leg.).

Paratype. 1 male pharate adult, same locality and date as for holotype (N. Mary leg).

Holotype (mounted on one slide) is deposited in the collections of the 'Musée cantonal de Zoologie, Palais de Rumine, 6 place de la Riponne, CH-1014 Lausanne (MZL), Switzerland'. The paratypes is deposited in the collection of the senior author.

Etymology: the name *"paniena"* of the new species refers to the well known Mont Panié, which is located in northern New Caledonia.

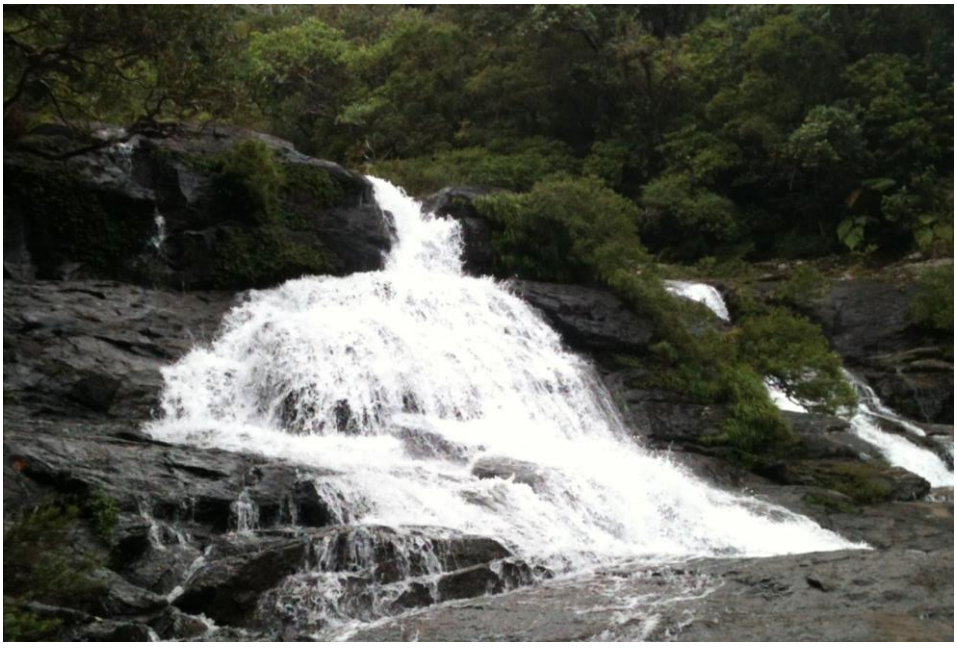


Photo 2. Type-locality of *Pseudosmittia paniena* sp. n. (photo N. Mary 14.XI.2012).

Photo 2. Localité type de *Pseudosmittia paniena* sp. n. (cliché N. Mary 14.XI.2012).

Diagnostic characters

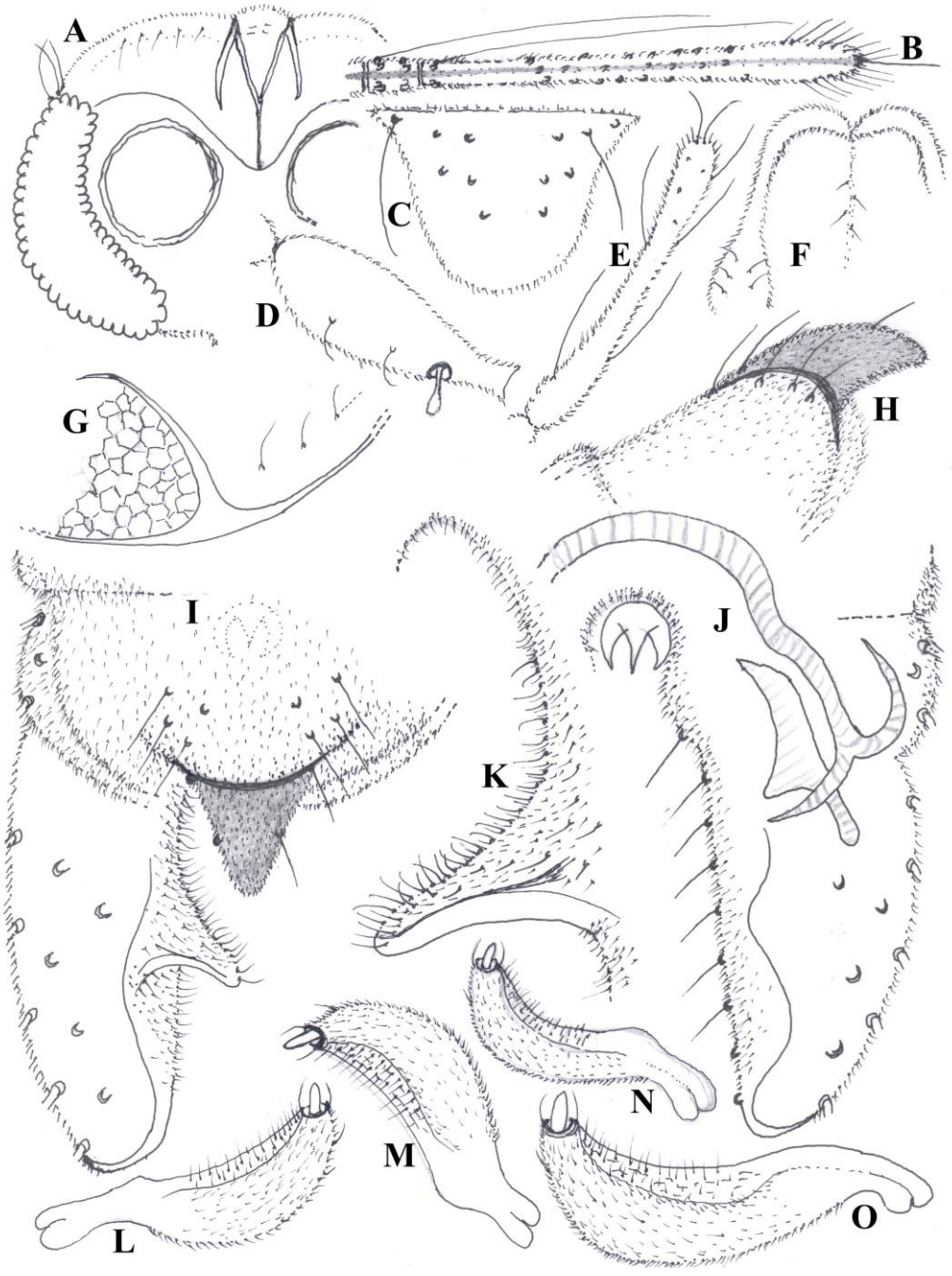
Based on the nearly similar shape of the anal point and inferior volsella, the Australian *Pseudosmittia* species *P. tericristata* Ferrington & Sæther, 2011 can be morphologically considered as the closest species to *P. paniena* sp. n. Both of them can be considered as sister-species. However, the following combination of characters will separate the new species from other members of the genus. Head. Eyes bare; frontal tubercle low, suture of coronal triangle with 1 lateral expansion; temporals 8. Antenna 570 µm long, weakly clubbed, densely covered with long setae (280-300 µm long), terminal segment 245 µm, apical seta present, AR 0.75; clypeus cup shaped; palpomere 3 with l spatulate sensilla coeloconica, terminal segment filiform with 2 curved apical setae. Thorax. Lobes of antepronotum strongly gaping; humeral area atypically with dense reticulation. Wing. All veins and squama bare. Legs. Pulvilli present; sensilla chaetica present on tarsomeres ta_1-ta_5. Abdomen. Tergite IX broadly semi-circular, dorsal hump absent; with 8 setae placed dorsally close to base of anal point. Anal point wide V-like shaped, conical to subtriangular, apex rounded, densely covered with macrotrichia; with 4 setae located laterally (2 at base, 2 at median part); basal margin rounded, with sclerotized band. Transverse sternapodeme thick and rounded, lateral expansions absent; phallapodeme saw-like. Virga horseshoe shaped, with 3 stout caudal spines (2 lateral, 1 median). Gonocoxite rounded apically; basal junction widely open dorsally, semi-circular ventrally. Superior volsella absent. Inferior volsella single, long stork-beck shaped, digitiform, strongly projecting inwards; proximal and median parts covered with setae, posterior side bare. Gonostylus slender, anterior side weakly concave, densely covered with orally directed fine setae; posterior side rounded, not projecting; crista dorsalis absent.

Male imago

(n = 2; Figs 2A-O)

Medium to big sized species. Total length 2.15 mm; wing length 0.86 mm; TL/WL = 2.50. General colouration contrasting brown to dark brown; head dark brown; antenna brownish; thorax brownish with dark brown mesonotal stripes; legs and abdomen brownish; anal segment contrasting brown to dark brown. Head (Fig. 2A). Eyes bare; frontal tubercle low, suture of coronal triangle with 1 lateral expansion; temporals 8 (5 inner and 3 outer verticals). Antenna 13-segmented, 732 µm long, segments 2-12 subequal (25 µm long), last flagellomere (Fig. 2B) 283 µm long, weakly clubbed, apical stout seta present; terminal segment densely covered with long setae of 280-300 µm long; antennal groove reaching segments 2; AR 0.75. Clypeus (Fig. 2C) 740 µm long, 150 µm maximum width, shield shaped, with 12 setae in 3 rows. Palp 5-segmented, segments 1-2 fused; palpomere 3 (Fig. 2D) with 1 spatulate sensilla coeloconica; terminal segment (Fig. 2E) filiform, bearing 2 apical curved setae; length (in µm) of segments: 15, 20, 55, 75, 92. Thorax. Lobes of antepronotum (Fig. 2F) strongly gaping, thicker basally, lateral antepronotals 5; acrostichals 4, dorsocentrals 9 uniserial, prealars 4; humeral area (Fig. 2G) with dense characteristic reticulation; scutellum with 6 setae (3 on each side of the midline). Wing. Brachiolum with 1 seta; subcosta overreaching fork of radius; costal expansion about 40 µm long; veins and squama bare. Legs. Length (in µm) of tibial spurs: PI, 35; PII, 40, 25; PIII, 40, 20. Pulvilli present; Sensilla chaetica absent on tibia, present on tarsomeres ta_1-ta_5. Length (µm) and proportions of prothoracic (PI), mesothoracic (PII) and metathoracic (PIII) legs (n =1) as in the following table:

	fe	**ti**	**ta_1**	**ta_2**	**ta_3**	**ta_4**	**ta_5**	**LR**	**BV**	**SV**	**BR**
PI	325	340	175	105	75	45	45	0,51	3.11	3.80	2.60
PII	365	370	205	110	100	50	50	0,55	3.03	3.59	2.20
PIII	380	415	215	105	95	55	50	0,52	3.31	3.70	2.40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P. 114. Figure 2. Male imago of *Pseudosmittia paniena* sp. n. Head (left side, dorsal), frontal area, vertex and temporal setae (A); antenna, two last segments (B); clypeus (C); palpomere 3 (D); palpomere 5 (E); lobes of antepronotum (F); humeral area (G); tergite IX and anal point in lateral view (H); hypopygium in dorsal (I) and ventral view (J); inferior volsella, right side (K); gonostylus (L-O) at right angle (L), lateral (M), acute (N) and obtuse angle (O). The arrows indicate some distinguishing characters.

P. 114. Figure 2. Imago mâle de *Pseudosmittia paniena* sp. n. Tête (côté gauche, vue dorsale), aire frontale, vertex et soies temporales (A) ; antenne, deux derniers segments (B) ; clypéus (C) ; palpomère 3 (D) ; palpomère 5 (E) ; lobes de l'antépronotum (F) ; aire humérale (G) ; tergite IX et pointe anale en vue latérale (H); hypopyge en vues dorsale (I) et ventrale (J); volselle inférieure, côté droit (K) ; gonostyle (L-O) à angle droit (L) latéral (M), angles aigu (M) et obtus (O). Les flèches indiquent quelques caractères distinctifs.

Abdomen. Hypopygium in dorsal and ventral view as in figures 2I-J (ventral view, Fig. 2J, with tergite IX and anal point omitted). Tergite IX about 50 µm long, 100 maximum wide, broadly semi-circular, dorsal setae 8 (Fig. 2I) located near the base of anal point (4 on each side); dorsal hump (Fig. 2H) absent. Laterosternite IX with 6 setae (3 on each side). Anal point (Figs 2H-I; Fig. 2H, lateral; Fig. 2I, dorsal) as long as wide (about 40 µm); broadly triangular to conical, wide V-like shaped, distinctly enlarged at base, apex rounded, not reaching tip of inferior volsella; densely covered with blackish curved macrotrichia; with 4 characteristic setae located laterally at base and median part; sclerotized band at basal margin rounded, clearly visible in both lateral (Fig. 2H) and dorsal view (Fig. 2I). Transverse sternapodeme thick and rounded basally, orally projecting, lateral expansions absent; phallapodeme well developed, saw-like. Virga typical horseshoe shaped, with 3 stout caudal spines (2 lateral, 1 median). Gonocoxite 165 µm long, 45 µm maximum width; apex rounded; basal junction widely open in dorsal view, semi-circular when viewed ventrally; inner ventral margin with 9 stout inner setae. Superior volsella (Fig. 2K) absent. Inferior volsella (Figs I-J, K) 25-30 µm long, 25 µm maximum width, single, long stork-beck shaped, strongly projecting inwards, with nearly straight sides; proximal and median areas distinctly covered with setae, caudal side and posterior margin unusually bare. Gonostylus as in Figs 2L-O (right angle, Fig. 2L; lateral, Fig. 2M; acute angle, Fig. 2N, obtuse angle, Fig. 2O), about 50 µm long, 20 µm maximum width; slender, linearly elongate, anterior side weakly concave, densely covered with orally directed short setae; posterior side rounded, not projecting; crista dorsalis absent; megaseta well-developed, located apically. HR 3.30; HV 3.50.

Female adult, pupal exuviae and larva: unknown.

Pseudosmittia pouemboutana sp. n.

Material examined

Holotype. New Caledonia, Pouembout stream. 1 male adult captured by swift net in some riparian habitat with wet soils and grasses surrounding the estuarine zone of the River Pouembout (Photo 3); 164°51'40.16"E / 21°08'33.42"S; altitude 5 m; 17.X.1997 (N. Mary leg.).

Paratype. 1 male adult, same locality and date as for holotype. 1 male adult, Kwé Néco stream at Thio village, site n° 41 in MOUBAYED-BREIL et al. 2021 (Table VI); alt. 117 m, 20.XI.1999 (N. Mary leg.).

Holotype (mounted on one slide) is deposited in the collections of the 'Musée cantonal de Zoologie, Palais de Rumine, 6 place de la Riponne, CH-1014 Lausanne (MZL), Switzerland'. The paratypes are deposited in the collection of the senior author.

Etymology: the name *"pouemboutana"* of the new species refers to the Pouembout stream, which is located in the Pacific Island of New Caledonia.

Photo 3. Type-locality of *Pseudosmittia pouemboutana* sp. n. (photo N. Mary 15.XI.2012).
Photo 3. Localité type de *Pseudosmittia pouemboutana* sp. n. (cliché N. Mary 15.XI.2012).

Diagnostic characters

The new species can be separated from other members of the genus by the following combination of characters. Head. Frontal tubercle low and rounded, suture of coronal triangle U-like to diapason shaped. Antenna 605 µm long, terminal segment 175 µm, apical seta present, AR 0.41; clypeus inversed helmet-like; palpomere 3 without sensilla coeloconica. Thorax. Lobes of antepronotum not gaping. Wing. Veins R and R_1 with 7 and 5 setae. Legs. Sensilla chaetica present on tarsomeres ta_1-ta_5; pulvilli absent. Abdomen. Tergite IX broadly semicircular, with 7 setae placed around the anal point. Anal point vestigial, pubescent apically. Transverse sternapodeme rounded, lateral expansion absent, phallapodeme saw-like. Virga tongue shaped. Gonocoxite rounded apically, ventral basal junction semicircular. Superior volsella low. Inferior volsella double, dorsal lobe broadly triangular with rounded apex, accessory lobe free distally, projecting downwards. Gonostylus massive distally, anterior side covered with orally directed fine setae, posterior side projecting upwards distally at right angle; crista dorsalis absent.

Male imago

(n = 2; Figs 3A-J)

Medium sized species. Total length 1.85 mm; wing length 0.55 mm; TL/WL = 3.36. General colouration contrasting pale brown to dark brown; head dark brown; antenna brownish; thorax brownish with blackish mesonotal stripes; legs and abdomen brownish; anal segment contrasting

brownish. Head (Fig. 3A). Eyes bare; frontal tubercle low, suture of coronal triangle with a diapason appearance; temporals 7 including 4 inner and 3 outer verticals. Antenna 13-segmented, 605 µm long, segments 2-12 subequal (35 µm long), last flagellomere (Figs 3B-C) 175 µm long, weakly clubbed, apical seta present; antennal groove reaching segments 2; AR 0.41. Clypeus (Fig. 3D) 65 µm long, 95 µm maximum width, inversed helmet, with 16 setae in 3 rows. Palp 5-segmented, segments 1-2 and 4-5 fused; length (in µm) of segments: 20, 35, 55, 65, 110; palpomere 3 with 1 sensilla clavata and 1 pre-apical needle-like sensilla coeloconica. Thorax. Lobes of antepronotum not gaping; lateral antepronotals 3; acrostichals 3 in 1 row, dorsocentrals 12, not decumbent, in 1-2 rows, prealars 4 uniserial, scutellum with 6 setae (3 on each side of the midline). Wing. Brachiolum with 1 seta; subcosta overreaching fork of radius; costal expansion about 65 µm long; distribution of setae on veins: R, 7; R_1, 5 setae; squama bare. Legs. Length (in µm) of tibial spurs: PI, 40; PII, 35, 25; PIII, 35, 20. Sensilla chaetica present on tarsomeres ta_1-ta_5; pulvilli absent. Length (µm) and proportions of prothoracic (PI), mesothoracic (PII) and metathoracic (PIII) legs (n =1) as in the following table:

	fe	**ti**	**ta_1**	**ta_2**	**ta_3**	**ta_4**	**ta_5**	**LR**	**BV**	**SV**	**BR**
PI	520	450	185	70	60	35	35	0.41	3.50	3.92	2.65
PII	410	530	270	85	75	40	35	0.51	3.22	3.60	3.20
PIII	480	415	235	120	115	50	40	0.57	2.86	3.51	3.50

Abdomen. Hypopygium in dorsal and ventral view as in figures 3E-F (ventral view, Fig. 3F, with tergite IX and anal point omitted). Tergites I-III with 2 transverse rows of 10 setae located on anterior and posterior parts. Tergite IX about 95 µm long, 105 maximum wide, broadly semicircular, lateral margin sinuous medially; with 7 dorsal setae (Fig. 3E) located antero-medially close to the anal point, 1 inserted anteriorly and 6 laterally (3 on each side). Laterosternite IX with 8 setae (4 on each side). Anal point (Fig. 3E) about 3 µm as long as wide, vestigial, pubescent apically. Apodemes (Fig. 3F); transverse sternapodeme not projecting orally, lateral expansion absent; phallapodeme well-developed, saw-like shaped. Virga (Figs 3E-G) tongue shaped. Gonocoxite 125 µm long, 55 µm maximum width including inferior volsella, apex rounded; basal junction circular in ventral side (Fig. 3F), acute and parallel-sided in dorsal view (Fig. 3H); inner ventral margin with 9 stout inner setae. Superior volsella (Fig. 3H) absent. Inferior volsella (Figs. 3E-F, H), double; dorsal lobe 70 µm long, 60 µm maximum width, broadly triangular with rounded apex, located medially, covered with short and fine setae; accessory lobe covered by dorsal lobe distally, giving appearance of a typical marsupial pouch shaped, distal part nearly free. Gonostylus (Fig. 3I, acute angle; Fig. 3J, right angle), about 70 µm long, 20 µm maximum width; posterior part more massive and upwardly projecting; anterior side covered with orally directed fine setae, pre-apical part with a characteristic semicircular hollow; crista dorsalis absent; megaseta well-developed, located apically. HR 1.79; HV 3.07.

Female adult, pupal exuviae and larva: unknown.

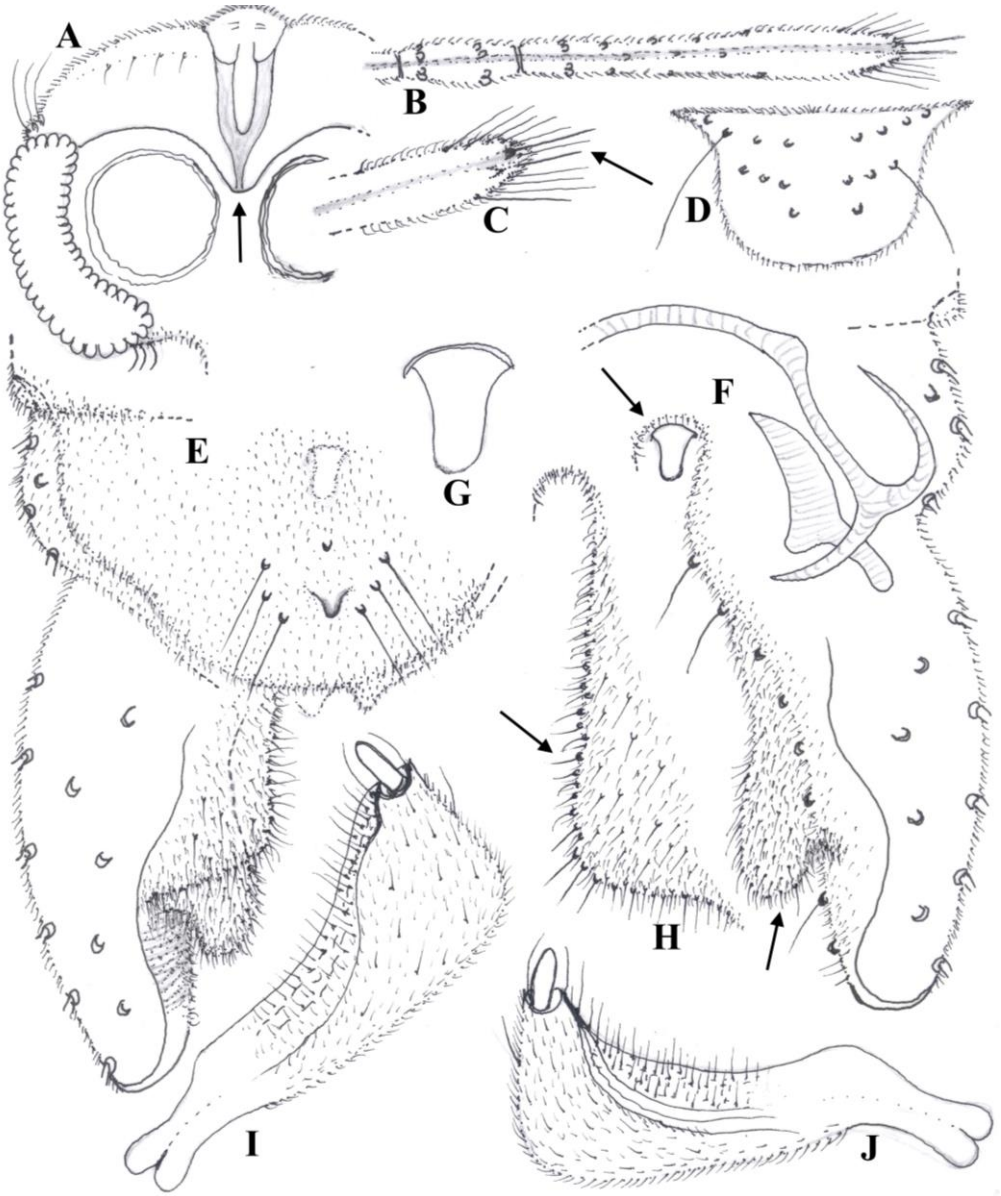

Figure 3. Male imago of *Pseudosmittia pouemboutana* sp. n. Head (left side, dorsal), frontal area, vertex and temporal setae (A); antenna, two last segments (B); apex of antenna (C); clypeus (D); hypopygium in dorsal (E) and ventral view (F, with virga); virga (G); inferior volsella, right side (H); gonostylus (I-J), at acute (I) and right angle (J). The arrows indicate some distinguishing characters.

Figure 3. Imago mâle de *Pseudosmittia pouemboutana* sp. n. Tête (côté gauche, vue dorsale), aire frontale, vertex et soies temporales (A) ; antenne, deux derniers segments (B) ; apex de l'antenne (C) ; clypéus (D) ; hypopyge en vue dorsale (E) et ventrale (F, avec virga) ; virga (G) ; volselle inférieure, côté droit (H) ; gonostyle (I-J), angle aigu (I) et angle droit (J). Les flèches indiquent quelques caractères distinctifs.

4. Remarks and differential diagnosis

Actually, the genus *Pseudosmittia* is widely distributed in the major zoogeographical Regions since the publication of the largest paper on the genus by FERRINGTON & SÆTHER (2011). Currently, there are about hundred known valid species worldwide, which are distributed in thirteen emended groups and subgroups. The richest group in number of species is the *angusta*-group, which is represented by 4 subgroups including a total of 30 species. At present, the genus still little known and poorly studied over the Australasian Region, where only 2 species (*P. tericristata* and *P. reyei*) were reported from Australia by FERRINGTON & SÆTHER (2011).

To date, only the generic level of *Pseudosmittia* was recorded in New Caledonia (MOUBAYED-BREIL et al. 2021). Accordingly, some larges investigations were implemented all over the Pacific Island of New Caledonia (Grande Terre), which revealed the presence of 3 new species (*P. noumeana*, *P. paniena* and *P. pouemboutana* spp. n.). The unusual shape of the anal point and inferior volsella in *P. paniena* sp. n. shows some close morphological similarities with that of the 2 reported species from Australia, in particular that of the closest one: *P. tericristata*.

Morphological affinities between the 3 new species and other related congeners including discussions and taxonomic remarks, which are briefly highlighted in the following differential diagnosis.

P. noumeana sp. n.

- The presence of a pars ventralis (Fig. 1G) represents a typical specific and unusual character in the genus *Pseudosmittia*; consequently, this species appears to belong to a separate group: the *noumeana*-gr;

- Anal point cylindrical, hairy, with enlarged base (Figs 1E-F), is similarly figured in *P. albipennis* (Goetghebuer, 1921), *P. simplex* Strenzke & Thienemann, 1942 and *P. topei* Lehmann, 1979.

P. paniena sp. n.

- On the basis of some common morphological similarity (anal point conical with lateral setae; inferior volsella digitiform), the male adult of *P. paniena* sp. n. resembles that of *P. reyei* (Freeman, 1961), *P. tericristata* Ferrington & Sæther, 2011, *P. palauensis* (Tokunaga, 1964), *P. xanthostola* (Kieffer, 1911), *P. yapensis* (Tokunaga, 1964), which key separately in one of the two known groups (*topei*-gr and *xanthosola*-gr) from both Australia and Japan..

- Common morphological characters including the broadly triangular to conical anal point with lateral setae and the digitiform to stork-like projecting inferior volsella (Figs 2H-I) are similarly observed in its closest Australian species *P. tericristata* (Figs 62E-F in FERRINGTON & SÆTHER 2011) and other known species from Japan, namely: *P. reyei* (Freeman, 1961), *P. tericristata* Ferrington & Sæther, 2011, *P. palauensis* (Tokunaga, 1964), *P. xanthosola* (Kieffer, 1911), *P. yapensis* (Tokunaga, 1964);

- Humeral area with reticulation (Fig. 2G), median location of inferior volsella (Figs 2I, K) and shape of both virga (Fig. 2J) and gonostylus (Figs 2L-O), will directly separate the new species from the cited above related species.

P. pouemboutana sp. n.

- Vestigial anal point (Fig. 3E) resembles that of *P. paraspinispinata* and *P. rostriformis*;

- Virga tongue shaped (Fig. 3E-G), is differently figured in *P. rostriformis*, which is inversed U-like shaped (Fig. 38 in MAKARCHENKO & MAKARCHENKO 2006; Fig. 61E in FERRINGTON & SÆTHER 2011).

Nevertheless, a combination of some differentiating features, found in the male adult of the 3 new species, will easily separate them from other related congeners, as highlighted in the following key to known male adult from New Caledonia.

Key to known male adult of *Pseudosmittia* species from New Caledonia

1. Anal point large and pubescent **2**

- Anal point very small, vestigial, not pubescent **3**

2. Inferior volsella single, stork-beck shaped, digitiform, located medially, antenna with apical stout seta; humeral area with reticulation; anal point conical, with 4 lateral setae; pars ventralis absent; virga semicircular to horseshoe shaped, with 3 short spines; crista dorsalis absent……..***P. paniena*** sp. n.

- Inferior volsella double, dorsal lobe broadly sub-rectangular; antenna without apical stout seta; humeral area without reticulation; anal point cylindrical, without lateral setae; virga consists of 2 long spines; pars ventralis present; crista dorsalis present, pointed tooth shaped…….***P. noumeana*** sp. n.

3. Inferior volsella double, dorsal lobe broadly triangular; antenna with apical stout seta; palpomere 3 with 1 spatulate sensilla coeloconica; virga tongue shaped; gonostylus projecting posteriorly; crista dorsalis absent .....***P. pouemboutana* s**p. n.

5. Ecology and geographical distribution

Male adults of the three new *Pseudosmittia* species were captured in the down basin of lower sectors of streams and rivers (Photos 1-3), where shaded riparian habitats enriched with aquatic and subaquatic plants represent the most favourable microhabitats for larval populations of the semiterrestrial species. Emergence is observed between September and October. The three new species could be more widely distributed in other littoral wetlands of New Caledonia, and therefore, can be considered as biogeographic local representative, which deserve greater consideration and conservation measure.

References

ALBU, P. 1968. *Pseudosmittia mathildae* sp. n. (Diptera, Chironomidae). *Annales Zoologici Fennici*, **5**: 4-5.

ASHE, P. & J.P. O'CONNOR. 2012. *A World Catalogue of Chironomidae (Diptera). Part 2. Orthocladiinae.* Irish Biogeographical Society & National Museum of Ireland, Dublin. 968 pp.

BRUNDIN, L. 1956. Zur Systematic der Orthocladiinae (Diptera, Chironomidae). *Report of the Institute of Freshwater Research, Drottningholm*. **37**: 5-185.

CASPERS, N. & F. REISS. 1989. Die Chironomidae der Türkei. Teil I: Podonominae, Diamesinae, Prodiamesinae, Orthocladiinae (Diptera, Nematocera, Chironomidae). *Entomofauna*, 10: 105-160.

CRANSTON, P.S., D. R. OLIVER & O.A. SÆTHER. 1989. The adult males of Orthocladiinae (Diptera, Chironomidae) of the Holarctic region - Keys and diagnoses. In Wiederholm, T. (ed.): *Chironomidae of the Holarctic region. Keys and diagnoses. Part 3 - Adult males*. *Entomologica Scandinavica. Supplement* **34**: 164-352.

EDWARDS, F. W. 1929. British non-biting midges (Diptera, Chironomidae). *Transactions of the Entomological Society of London*, **77**: 279-430.

EDWARDS, F. W. 1932. Recent literature. Faune de France: 23. Diptères: Chironomidae. IV. Par M. Goetghebuer, Paris (Lechevallier), 1932. *The entomologist*, **65**: 1-240.

FERRINGTON, L.C. JR. & O.A. SÆTHER. 2006. *Rhagosmittia* and *Trondia*, two new genera of Orthocladiinae from Oceania and Australia (Diptera, Chironomidae). *Aquatic Insects*, **28**(4): 243-250.

FERRINGTON, L.C. JR. & O.A. SÆTHER. 2011. A revision of the genera *Pseudosmittia* Edwards, 1932, *Allocladius* Kieffer, 1913, and *Hydrosmittia* gen. n. (Diptera, Chironomidae). *Zootaxa*, **2849**: 1-314.

FREEMAN, P. 1958. The Chironomidae (Diptera) of Africa south of the Sahara. Part II. *Bulletin of British Museum (Natural History), Entomology*, **4**: 287-368.

FREEMAN, P. 1959. The Chironomidae (Diptera) of the New Zealand. *Bulletin of the British Museum (Natural History), Entomology*, **7** (9): 393-437.

FREEMAN, P. 1961. The Chironomidae (Diptera) of Australia. *Australian Journal of Zoology*, **9**: 611-637.

FREEMAN, P. & P.S. CRANSTON. 1980. Family Chironomidae. Pp. 175-202 in '*Catalogue of the Diptera of the Afrotropical Region*', R.W. Crosskey (ed.), British Museum (Natural History).

GOETGHEBUER, M. 1940-1950. Tendipedidae (Chironomidae). f) Subfamily Orthocladiinae. A. Die Imagines. In Lindner, E. (Hrsg.): *Die Fliegen der Palaearktischen Region*. **13g**: 1-208 + XXIV Figs.

LANGTON, P.H & L.C.V. PINDER. 2007. *Keys to the adult males of Chironomidae of Britain and Ireland*. Volume 1 (Pp: 1-239) and volume 2 (Pp: 1-68). Freshwater Biological Association, Scientific Publication, n° **64**.

LANGTON, P.H & V. SYROVATKA. 2013. New chironomid pupal types from Norway, one with a male pharate adult: *Pseudosmittia paraspinispinata* n.sp. *Chironomus Journal of Chironomidae Research*, **26**: 29-32.

MAKARCHENKO, E. & M. MAKARCHENKO. 2006. Review of the genus *Pseudosmittia* Edwards (Diptera: Chironomidae: Orthocladiinae) from the Russian Far East. *Euroasian Entomological Journal*, **17** (2): 217-228.

MAKARCHENKO, E. & M. MAKARCHENKO. 2008. New findings of chironomids (Diptera, Chironomidae) in Far East and bordering territories. III. *Orthocladius* van der Wulp. *Euroasian Entomological Journal*, **7** (3): 243-262.

MAKARCHENKO, E. & M. MAKARCHENKO. 2011. Fauna and distribution of the Orthocladiinae (Diptera, Chironomidae) of the Russian Far East. Pp. 107-125 in: *Proceeding of the 17th International Symposium on Chironomidae*, 6-9 July, 2009, Nankai, China.

MAUAD, M., A. SIRI & M. DONATO. 2013. New species of *Pseudosmittia* Edwards, 1932 and new records of *Allocladius* Kieffer, 1913 (Diptera, Chironomidae, Orthocladiinae) from South America. *Zootaxa*, **3694** (5): 445-460.

MOUBAYED, J. & P.H. LANGTON. 2019. *Chaetocladius berythensis* sp. n., *C. calloensis* sp. n, *C. guardiolei* sp. n. and *C. parerai* sp. n., four relict species inhabiting glacial springs and streams in Eastern Pyrenees and Lebanon (Diptera, Chironomidae). *Chironomus Journal of Chironomidae Research*, **23**: 42-59.

MOUBAYED-BREIL, J., N. MARY & P. ASHE. 2021. Chironomidae connus de Nouvelle-Calédonie. I. Sites prospectés et premières données faunistiques (Diptera). *Ephemera*, **22** (2): 103-126.

SÆTHER, O.A. 1980. Glossary of chironomid morphology terminology (Diptera, Chironomidae). *Entomologica Scandinavica, Supplement*. **14**: 1-51.

SÆTHER, O.A. 2004. The Chironomidae (Diptera) of the Seychelles. *Annales de Limnologie*, **40**, 285–308.

SÆTHER, O.A. 2006. Japanese *Pseudosmittia* Edwards (Diptera: Chironomidae). Zootaxa, **1198**: 21–51.

SÆTHER, O.A. & M. SPIES. 2013. Fauna Europaea: Chironomidae. In Beuk, P. & T. Pape (eds): *Fauna Europaea: Diptera Nematocera. Version* 2.6. Internet data base at http://www.faunaeur.org [accessed February 2015].

SASA, M. 1979. A morphological Study of adults and immature stages of 20 Japanese species of the family Chironomidae (Diptera). *Research Report from the National Institute of Environmental studies*, **7**: 1-158.

SASA, M. 1985. Studies on Chironomid collected from the lakes of the Mount Fuji area (Diptera, Chironomidae). *Research Report, Institute of Environmental and Welfare Studies*: 1-156.

SASA, M. 1993. Studies on the chironomid midges (Yusurika) collected in Toyama and other areas of Japan. Part 5. The chironomids collected from lakes in the Aizu District (Fukushima). *Research Report from Toyama Prefectural Environmental Pollution Research Centre*, **1993**: 69–95.

SASA, M. 1998. Chironomid of Japan 1998. List of species recorded, and supplemented keys for identification. *Research Report from the National Institute of Environmental studies, Japan*,

SASA, M. & T. OKAZAWA. 1992. Studies on Chironomid midges (*Yusurika*) of Toga-Mura, Toyama. Part 2. The subfamily Orthocladiinae. *Research Report from the National Institute of Environmental studies*, **1992**: 92-204.

SPIES, M. & O.A. SÆTHER. 2004. Notes and recommendations on taxonomy and nomenclature of Chironomidae (Diptera). *Zootaxa*, **752**:1-90.

STRENZKE, K. 1950. Systematik, Morphologie und Ökologie der terrestrischen Chironomiden. *Archive für Hydrobiologie. Supplement*, **18**: 207-414.

STRENZKE, K. 1960. Terrestrische Chironomiden XIX-XXIII (Diptera, Chironomidae). *Deutsche Entomologische Zeitschrift*, **7**: 414-441.

TOKUNAGA, M. 1964. Insects of Micronesia Diptera: Chironomidae and Simuliidae. *Bernice P. Bishop Museum*, **12** (5): 485-628.

WANG, S. 1990. *Pseudosmittia aizaiensis*, a new species of Orthocladiinae (Diptera, Chironomidae) from Hunan Province of China. *Chinese Journal of Oceanology and Limnology*, **8**: 273-279.

YAMAMOTO, M. 2004. A catalogue of Japanese Orthocladiinae (Diptera, Chironomidae). *Makunagi, Acta Dipterologica*, **21**: 1-121.