

On the genus *Thienemanniella* Kieffer, 1911 from New Caledonia. I. Description of *T. neocaledonica*, *T. noumeana* and *T. sarrameana* spp. n. [Diptera, Chironomidae, Orthocladiinae]

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Keywords: Diptera Chironomidae, *Thienemanniella neocaledonica*, *T. noumeana*, *T. sarrameana* spp. n., conservation.

A large material of Chironomidae composed of adults, pupae, pupal exuviae and larvae were collected between 1996 and 2022 in New Caledonia (Grande Terre) using Surber, drift and swift nets and Malaise traps. Examination of the captured imagines revealed the presence of three new *Thienemanniella* species (*T. neocaledonica* sp. n., *T. noumeana* sp. n. and *T. sarrameana* sp. n.), which are described. Typical common unusual characters of the three new species are: antenna 10-segmented; transverse sternapodeme straight; phallapodeme bifid to tong shaped. Main differentiating characters are: - in *T. neocaledonica* sp. n. (antenna 385 µm long, AR 0.28, superior volsella absent, only the inferior volsella with hooked apex); - in *T. noumeana* sp. n. (antenna 285 µm long, AR 0.50, superior and inferior volsella differently shaped); - in *T. sarrameana* sp. n. (antenna 425 µm long, AR 0.37, superior and inferior volsella similarly shaped, both are triangular with pointed apex, gonostylus massive). Therefore, the three new species appear to belong to local biogeographic representatives, which deserve greater consideration and conservation measures. To date, the genus *Thienemanniella* is represented worldwide by 55 valid species, of which only one (*T. trivittata* Goetghebuer, 1935) is reported from the Australasian Region. Consequently, the current 3 descriptions increase the total number, worldwide of known *Thienemanniella* species to 58. Comments on their taxonomic position, ecology with key to known male adult from New Caledonia are highlighted.

Sur le genre *Thienemanniella* Kieffer, 1911 de Nouvelle-Calédonie. I. Description de *T. neocaledonica*, *T. noumeana* et *T. sarrameana* spp. n. [Diptera, Chironomidae, Orthocladiinae]

Mots-clés : Diptera Chironomidae, *Thienemanniella neocaledonica*, *T. noumeana*, *T. sarrameana* spp. n., conservation.

Un important matériel de Chironomidae composé d'adultes, de nymphes, d'exuvies nymphales et de larves a été collecté entre 1996 et 2022 en Nouvelle-Calédonie au moyen de filets (type Surber, entomologique et dériveur) et de tentes Malaise. L'examen des adultes capturés a révélé la présence de trois nouvelles espèces de *Thienemanniella* (*T. neocaledonica*, *T. noumeana* et *T. sarrameana* spp. n.) qui sont décrites ici. Les caractères inhabituels communs aux trois espèces sont : antenne avec 10 segments ; partie transversale du sternapodeme rectiligne ; phallapodeme bifide en forme de pince. Les principaux caractères distinctifs sont : *T. neocaledonica* sp. n. avec : antenne de 385 µm de long, AR 0.26, volselle supérieure absente, volselle

inférieure avec apex crochu ; *T. noumeana* sp. n. avec antenne de 285 µm de long, AR 0.50, volselles supérieure inférieure de formes différentes ; *T. sarrameana* sp. n. avec antenne de 425 µm de long, AR 0.37, volselles supérieure et inférieure semblables, de forme triangulaire avec apex crochu, gonostyle massif. Les trois nouvelles espèces peuvent être assimilées à des éléments biogéographiques représentatifs à l'échelle locale, qui méritent de grandes mesures de conservation. À ce jour, le genre *Thienemanniella* est représenté mondialement par 55 espèces valides, dont une seule (*T. trivittata* Goetghebuer, 1935) est connue de la région australasienne. Les trois présentes descriptions portent donc à 58 le nombre total d'espèces. Des commentaires sur leur position taxonomique, leur écologie et une clé de détermination pour les adultes mâles connus de Nouvelle-Calédonie sont ajoutés.

1. Introduction

The genus *Thienemanniella* Kieffer, 1911 has actually a worldwide distribution since its establishment. Known species from the Nearctic were described by HESTENES & SÆTHER (2000) while those reported from East Asia and Afrotropical regions were reviewed by FU et al. (2010a, b). On the basis of knowledge provided in the literature on the taxonomy, geographical distribution and ecology of the known *Thienemanniella* species (KIEFFER 1911, EDWARD 1929, GOETGHEBUER 1940-1950, BRUNDIN 1947, 1956, FREEMAN 1959, 1961, TOKUNAGA 1964, SCHLEE 1968, FREEMAN & CRANSTON 1980, CRANSTON et al. 1989, SASA & OKAZAWA 1992, LINDEGAARD 1995, SASA & SUSUKI 1999, 2000, HESTENES & SÆTHER 2000, SPIES & SÆTHER 2004, YAMAMOTO 2004, MAKARCHENKO & MAKARCHENKO 2006, 2008, 2011, LANGTON & PINDER 2007, FU et al. 2009, 2010a, 2010b, 2020, ASHE & O'CONNOR 2012, FU & SÆTHER 2012, SÆTHER & SPIES 2013, WIEDENBRUG et al. 2013, MOUBAYED-BREIL et al. 2021), the genus is represented worldwide by 55 valid species, of which: 31 species from the Palearctic, 9 from the Nearctic, 8 from the Neotropical, 17 from the Oriental, 6 from the Afrotropical and 1 from the Australasian Regions.

In this paper, the male adult of 3 new *Thienemanniella* species (*T. neocaledonica* sp. n., *T. noumeana* sp. n. and *T. sarrameana* sp. n.) is described. A combination of some atypical characters (shape of the frontal area of head, basal part of phallapodeme, shape of both superior and inferior volsella) allowed us to consider them as local biogeographical elements, which deserve greater conservation measures. Type-locality of the 3 new species is provided in MOUBAYED-BREIL et al. 2021 (Table VI): site n° 15 for *T. neocaledonica* sp. n., site n° 93 for *T. noumeana* sp. n. and site n°39 for *T. sarrameana* sp. n. A key to known male adults from New Caledonia with comments on the taxonomic position and ecology of the new species are given.

2. Material and methods

A large material composed of adults, pupae, pupal exuviae and larvae were collected between 1996 and 2022 in New Caledonia, using Surber, drift, and swift nets. Additional several adults were also captured by Malaise traps placed close to the most representative habitats of the Island. After preservation in 80-85% ethanol, the studied material was examined and mounted on slides following the procedure outlined by SÆTHER (1969) and MOUBAYED & LANGTON (2019). The morphological nomenclature and measurements of various ratios of the imagines follow those of SÆTHER (1980), LANGTON & PINDER (2007) and FU et al. (2010a, 2010b).

3. Results and descriptions

Thienemanniella neocaledonica sp. n.

Material examined

Holotype. New Caledonia, Mont Panié. One male adult captured by swift net around Tao stream, at Tao waterfall, (164°48'22.65" E; 20°33'42.32"S); lotic and lentic habitats surrounding the waterfall of Tao, Mont Panié (Photo 1); site N° 15 as reported in MOUBAYED-BREIL et al. 2021 (Table VI); altitude 84 m, 14.XI.2012 (N. Mary leg.).

Paratype. One male 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 paratype is deposited in the collection of the senior author.

Etymology: the name "*neocaledonica*" refers to the Island of New Caledonia.

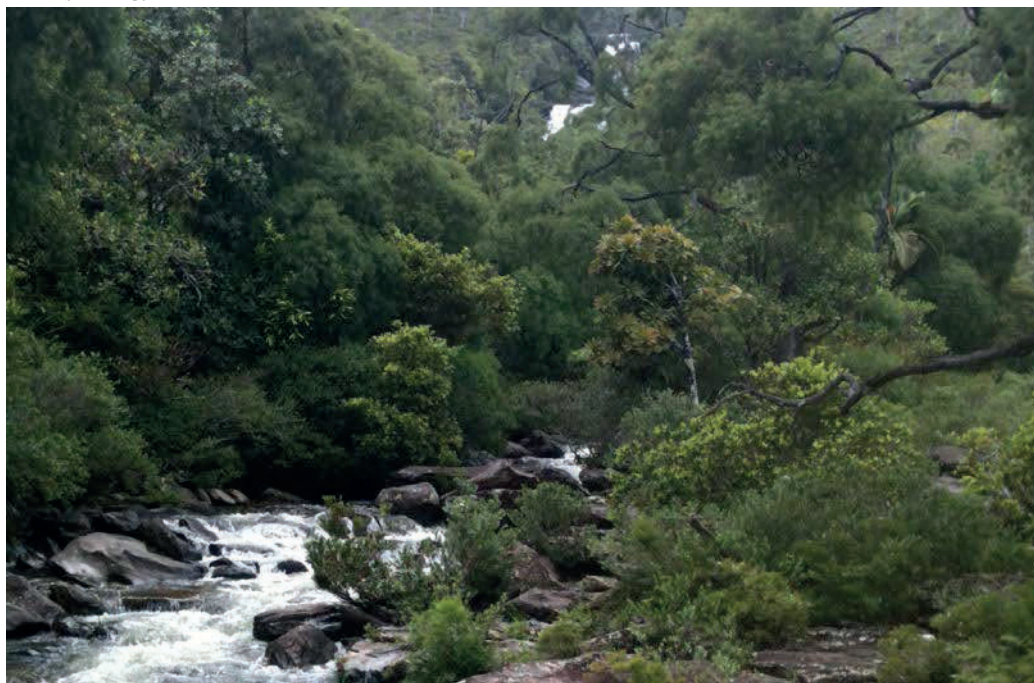


Photo 1. Type-locality of *Thienemanniella neocaledonica* sp. n. (photo N. Mary 14.XI.2012).

Photo 1. Localité type de *Thienemanniella neocaledonica* sp. n. (cliché N. Mary 14.XI.2012).

Diagnostic characters

The new species is distinguished from other related congeners by a combination of characters. Eyes densely pubescent; frontal part with 2 proximal lateral expansions; antenna 10-segmented, 385 μm long, terminal segment 80 μm long, segments 2-9 subequal; AR 0.26; clypeus bathtub shaped, with 15 setae; palpomere 3 typically spherical. Lobes of antepnotum gaping, antepnotals 3, acrostichals 2, dorsocentrals 11, preallars 3, scutellum with 2 setae. Tergite IX semicir-

cular with 26 setae located in 2 circular rows; laterosternite IX with 4 setae; transverse sternapodeme straight; phallapodeme typical tong shaped basally, strongly curved medially; superior volsella absent; inferior volsella placed medially, protruding, broad triangle shaped with rounded appearance edge, apex distinctly hooked; gonostylus slender, anterior side covered with fine orally directed setae; megaseta curved, apex pointed.

Male imago

(n = 2; Figs 1A-K)

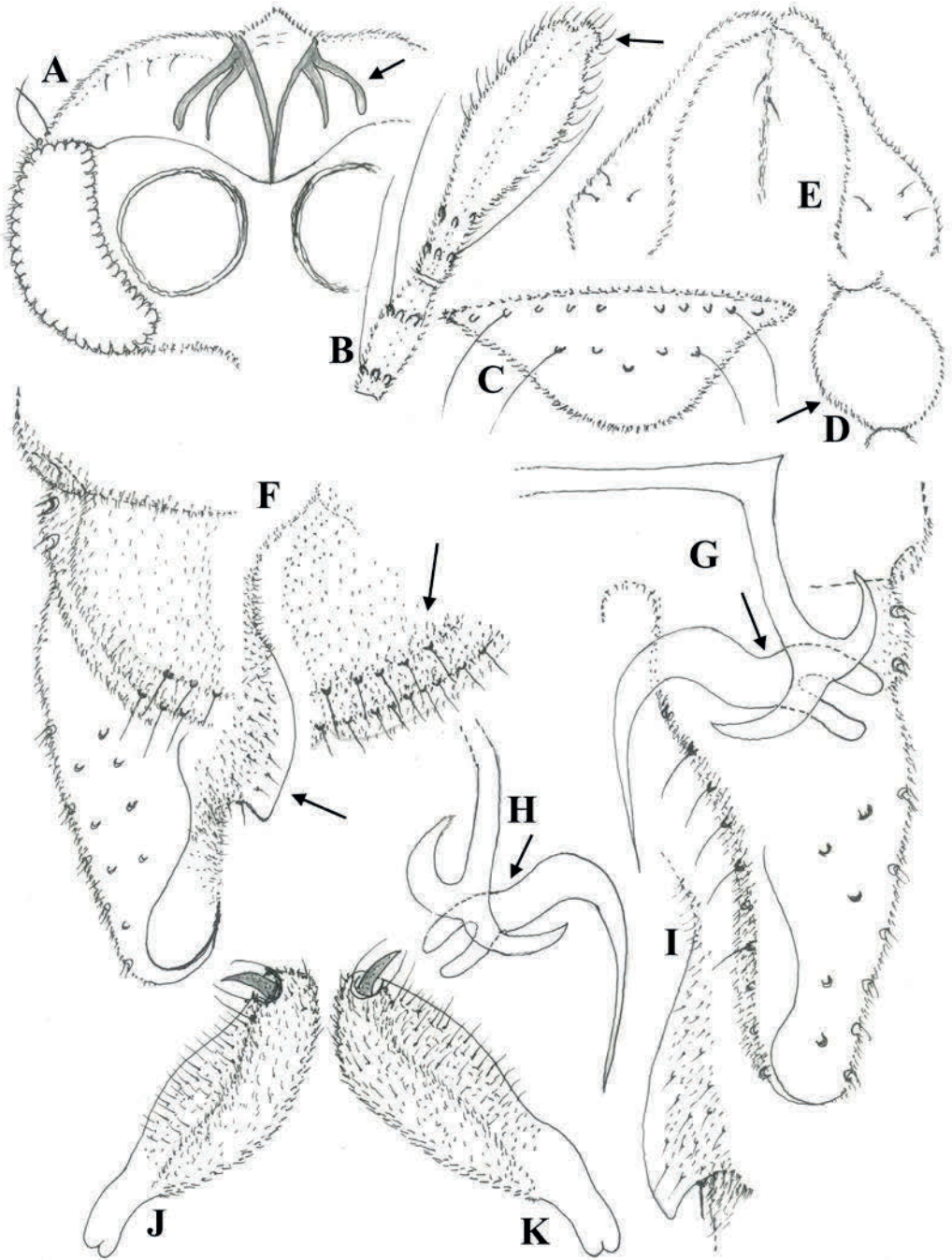
Small sized species. Total length 1.45 mm; wing length 0.65 mm; TL/WL = 2.23. General colouration contrasting brown to dark brown. Head dark brown, coronal triangle darker; antenna brownish. Thorax distinctly contrasting dark brown with dark mesonotal stripes. Legs brownish. Abdomen with segments I-V brownish, segments VI-VIII darker; anal segment contrasting brown to dark brown. Head (Fig. 1A). Eyes with dense pubescence; frontal margin with a triangular tubercle; suture of coronal triangle regularly thin, with 2 lateral sclerotized bands located distally; coronals 2. Temporals 6 including 4 inner and 2 outer verticals. Antenna 13-segmented, 385 μm long; last flagellomere (Fig. 1B) 85 μm long, bearing an apical small characteristic rectangular expansion; segments 2-9 subequal, each 35 μm long; antennal groove reaching segment 2; AR 0.28. Clypeus (Fig. 1C) 40 μm long, 80 μm maximum width; typical bathtub shaped, with 15 setae in 2 rows. Palp 5-segmented; length (in μm) of segments 1-5: 5, 10, 30, 55, 85; palpomere 3 (Fig. 1D) spherical, sensilla coeloconica absent; segment 4 rectangular, segment 5 linearly elongate and slender. Thorax. Lobes of antepnotum slightly gaping, lateral antepnotals consist of 3 short setae; acrostichals 2, starting close to base of scutum; dorsocentrals 11 in 1 row; prealars 3 uniserial; humeral pit absent; preepisternum bare; scutellum with 2 setae (1 on each side of the midline). Wing. Brachiolium with 1 seta; subcosta overreaching the fork of radius, costa with 12 setae; veins and squama bare; maximum wide 290 μm , VR 1.40. Legs. Length (in μm) of tibial spurs: PI, 30; PII, 25 and 25; PIII, 30, 25. Sensilla chaetica present on tarsomeres ta_1 - ta_5 of PI-PIII. 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	335	325	215	65	35	20	30	0,66	5,83	3,07	2.10
PII	335	330	230	110	65	30	35	0,70	3,73	2,89	1.70
PIII	265	270	180	55	30	20	25	0,67	5,50	2,97	2.15

“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.”

P. 43. Figure 1. Male imago of *Thienemanniella neocaledonica* sp. n. Head (left side, dorsal), frontal area, vertex and temporal setae (A); antenna, two last segments (B); clypeus (C); palpomere 3 (D); lobes of antepnotum with acrostichals (E); hypopygium in dorsal (F) and ventral view (G); apodemes (H); inferior volsella, right side (I); gonostylus at acute (J) and obtuse angle (K). The arrows indicate some distinguishing characters.

P. 43. Figure 1. Imago mâle de *Thienemanniella neocaledonica* sp. n. Tête (côté gauche, vue dorsale), aire frontale, vertex et soies temporales (A) ; antenne, deux derniers segments (B) ; clypéus (C) ; palpomère 3 (D) ; lobes de l'antépronotum avec soies acrosticales (E) ; hypopyge en vue dorsale (F) et ventrale (G) ; volselle inférieure, côté droit (I) ; gonostyle, angle aigu (J) et angle obtus (K). Les flèches indiquent quelques caractères distinctifs.



Abdomen. Hypopygium as in Figs 1F (dorsal) and 1G (ventral, with tergite and sternite IX removed). Tergite IX broadly semicircular, posterior margin not bilobed medially, with 26 setae located in 2 rows close to the posterior margin (anterior row with 10 setae, posterior one with 16). Laterosternite IX with 4 setae (2 on each side). Apodemes as in Figs 1G-H. Transverse sternapodeme linearly straight, coxapodeme slightly curved inwardly. Phallapodeme is *Thienemanniella*-type, typically tong shaped at base, concaved medially and strongly narrowing distally; basal part joint to caudal part of sternapodeme placed in both anterior and posterior sides. Gonocoxite 90 μm long, with rounded apex; dorsal and ventral sides without sclerotization; ventral side with 10 stout inner setae; dorsal junction (Fig. 1F) widely open. Superior volsella absent. Inferior volsella (Figs 1F, I) 35 μm long, 15 μm maximum width, placed medially, strongly protruding, broadly triangular with rounded appearance edge, inner margin bare. Gonostylus (Figs 1J-K) 35 μm long, linearly elongate, anterior side densely covered with orally directed setae, posterior side covered with microtrichia and fine setae; megaseta 6-7 μm long, well-developed, inwardly curved with pointed apex. HR (length of gonocoxite divided by length of gonostylus) 2.57; HV (total length divided by length of gonostylus X 10) 4.14.

Female adult: unknown.

Pupae, pupal exuviae and larva: known but not described.

Thienemanniella noumeana sp. n.

Material examined

Holotype. New Caledonia, River Coulée. One male adult captured by swift net, (166°36'47.21"E; 22°12'49.61"S); lotic habitats with stones and gravels surrounding the River Coulée near the city of Nouméa (Photo 2); site N° 93 as reported in MOUBAYED-BREIL et al. 2021 (Table VI); alt. 40 m; 07.XI.2012 (N. Mary leg.).



Photo 2. Type-locality of *Thienemanniella noumeana* sp. n. (photo N. Mary 07.XI.2012).

Photo 2. Localité type de *Thienemanniella noumeana* sp. n. (cliché N. Mary 07.XI.2012).

Paratypes. 2 male adults, 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'. Remaining paratypes are 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.

Diagnostic characters

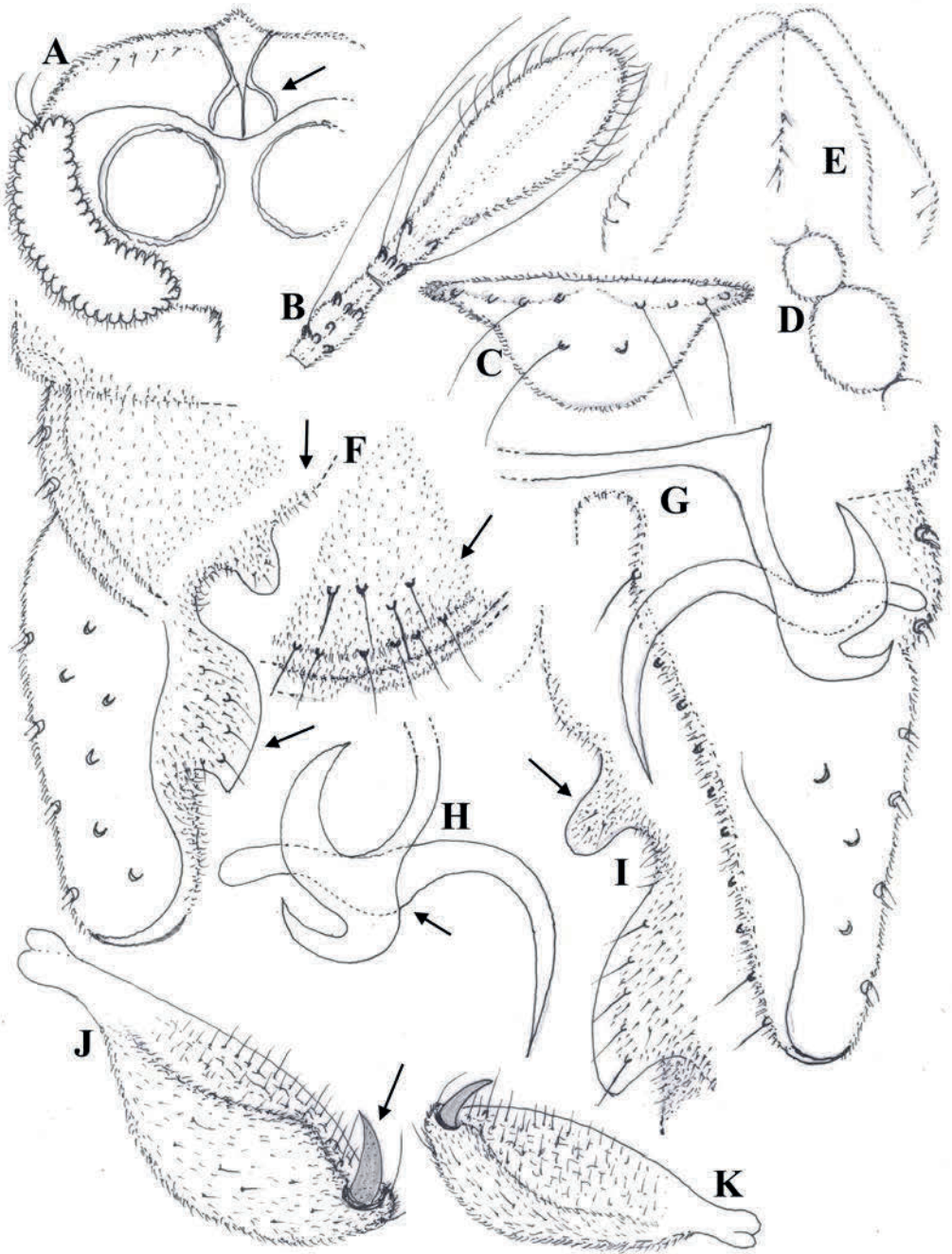
The following distinguished characters will separate this new species from other related congeners. Eyes densely hairy; frontal part with 1 distal lateral expansion; antenna 10-segmented, 285 μm long, terminal segment 95 μm long; segments 2-9 subequal, each 30 μm long; AR 0.50; clypeus bathtub shaped, with 10 setae; palp 5-segmented, palpomeres 2-3 spherical. Lobes of antepnotum gaping, antepnotals 2, acrostichals 4, dorsocentrals 9, preallars 3, scutellum with 2 setae. Tergite IX semicircular, posterior margin not bifid, with 12 setae including 8 located in 1 circular posterior row; laterosternite IX with 4 setae; transverse sternapodeme straight; phallapodeme open tong shaped at base, concaved medially; superior volsella thumb-like, small; inferior volsella large, placed medially, protruding, broadly triangular with rounded appearance edge, apex distinctly hooked; gonostylus elongate, distally massive, anterior side covered with fine orally directed setae; megaseta curved, apex sharply pointed.

Male imago

(n = 3; Figs 2A-K)

Medium sized species. Total length 1.75 mm; wing length 0.95 mm; TL/WL = 1.84. General colouration brownish to dark brown. Head contrasting brown to dark brown; antenna, legs and abdomen brownish; thorax brownish with dark brown mesonotal stripes; anal segment contrasting brown to dark brown. Head (Fig. 2A). Eyes densely hairy; frontal tubercle low, triangular; suture of coronal triangle with 1 lateral expansion located distally; coronals 2. Temporals 6 including 4 inner and 2 outer verticals. Antenna 13-segmented, 285 μm long; last flagellomere (Fig. 2B) 95 μm long, well-clubbed; segments 2-9 subequal, each 35 μm long; antennal groove reaching segment 2; AR 0.50. Clypeus (Fig. 2C) 30 μm long, 95 μm maximum width, typical bathtub shaped, with 10 setae in 2 rows. Palp 5-segmented; length (in μm) of segments 1-5: 15, 20, 35, 55, 85; palpomeres 2-3 (Fig. 2D), spherical to ovoid, sensilla coeloconica absent. Thorax. Lobes of antepnotum (Fig. 2E) gaping, with 2 short lateral antepnotals; acrostichals 4; dorsocentrals 9 in 1 row; prealars 3 uniserial; humeral pit absent; preepisternum bare; scutellum with 2 setae (1 on each side of the midline). Wing. Brachiolum with 1 seta; subcosta reaching the fork of radius, costa with 16-17 setae; veins and squama bare; maximum wide 400 μm , VR 1.35. Legs. Length (in μm) of tibial spurs: PI, 35; PII, 30 and 20; PIII, 35, 20. Tarsomere 4 of PII heart shaped; sensilla chaetica 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	310	215	85	55	30	35	0,69	4,15	2,95	2.10
PII	375	325	220	105	65	30	35	0,68	3,91	3,18	2.85
PIII	370	355	250	135	65	30	40	0,70	3,61	2,90	1.50



P. 46. Figure 2. Male imago of *T. noumeana* sp. n. Head (left side, dorsal), frontal area, vertex and temporal setae (A); antenna, two last segments (B); clypeus (C); palpomeres 2-3 (D); lobes of antepnotum with acrostichals (E); hypopygium in dorsal (F) and ventral view (G); apodemes (H); inferior volsella, right side (I); gonostylus at obtuse (J) and right angle (K). The arrows indicate some distinguishing characters.

P. 46. Figure 2. Imago mâle de *T. noumeana* sp. n. Tête (côté gauche, vue dorsale), aire frontale, vertex et soies temporales (A) ; antenne, deux derniers segments (B) ; clypéus (C) ; palpomère 3 (D) ; lobes de l'antépronotum avec soies acrosticales (E) ; hypopyge en vue dorsale (F) et ventrale (G) ; volselle inférieure, côté droit (I) ; gonostyle, angle obtus (J) et angle droit (K). Les flèches indiquent quelques caractères distinctifs.

Abdomen. Hypopygium as in Figs 2F (dorsal) and 2G (ventral, with tergite and sternite IX removed). Tergite IX broadly semicircular, posterior margin not bilobed medially; with 12 setae (4 located on posteromedian part and 8 close to the posterior margin). Laterosternite IX with 4 setae (2 on each side). Apodemes as in Figs 2G-H. Transverse sternapodeme linearly straight. Phallapodeme is *Thienemanniella*-type, typical open tong shaped basally, strongly concaved medially and sharply narrowing distally; basal part joint to caudal part of sternapodeme placed in both anterior and posterior sides. Gonocoxite 105 µm long, with rounded apex; dorsal and ventral sides without sclerotization; ventral side with 10 stout inner setae; dorsal junction (Fig. 2F) acutely open. Superior and inferior volsella differently shaped, superior one 8 µm long, 7 µm maximum width, thumb shaped; inferior volsella (Figs 2F, I) 25 µm long, 15 µm maximum width, large, placed medially, strongly protruding, broadly triangular with rounded appearance edge, with 4-5 medium sized setae placed in a circular row close to the inner margin bare, which is bare. Gonostylus (Figs 2J-K) 40 µm long, slightly massive distally, anterior side densely covered with orally directed setae, posterior side covered with microtrichia and fine setae; megaseta 6-7 µm long, well-developed, inwardly curved with pointed apex. HR 3.50; HV 4.38.

Female adult: unknown.

Pupae, pupal exuviae and larva: known but not described.

Thienemanniella sarrameana sp. n.

Material examined

Holotype. New Caledonia, Sarraméa Captage. 1 male adult captured by swift net around Sarraméa stream, at Sarraméa Captage (165°51'52.20"E; 21°38'14.64"S); lotic and lentic habitats with riparian aquatic plants surrounding the down basin of Sarraméa stream (Photo 3); site 39 as reported in MOUBAYED-BREIL et al. 2021 (table VI); alt. 144 m; 09.XI.2012 (N. Mary leg.).

Paratype. 1 male paratype 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 paratype is deposited in the collection of the senior author.

Etymology: the name "*sarrameana*" refers to the site of Sarraméa Captage, which is located in New Caledonia.

Diagnostic characters

T. sarrameana sp. n. is easily separated from other members of the genus *Thienemanniella* by the following distinguishing characters. Eyes pubescent; frontal part with 1 row of characteristic lateral expansion located at base of the coronal triangle; antenna 10-segmented, 425 µm long, terminal segment 115 µm long, segments 2-9 subequal; AR 0.37; clypeus bathtub shaped, with 14

setae; palpomeres 2-3 ovoid. Lobes of antepronotum gaping, anteprenotals atypically absent, acrostichals 2, dorsocentrals 9, preallars 4, scutellum with 2 setae. Tergite IX semicircular, posterior margin not bifid, with 12 setae including 6 located in one circular posterior row; laterosternite IX with 4 setae (2 on each side); transverse sternapodeme straight; coxapodeme inwardly curved; phallapodeme typical tight tong shaped basally, convex medially and narrowing distally. Superior and inferior volsella similarly shaped, superior volsella much smaller; inferior volsella larger, placed medially, protruding, broadly triangular with rounded appearance edge, apex hooked; gonostylus distinctly massive, anterior side covered with fine orally directed setae; megaseta curved, apex sharply pointed.

Male imago

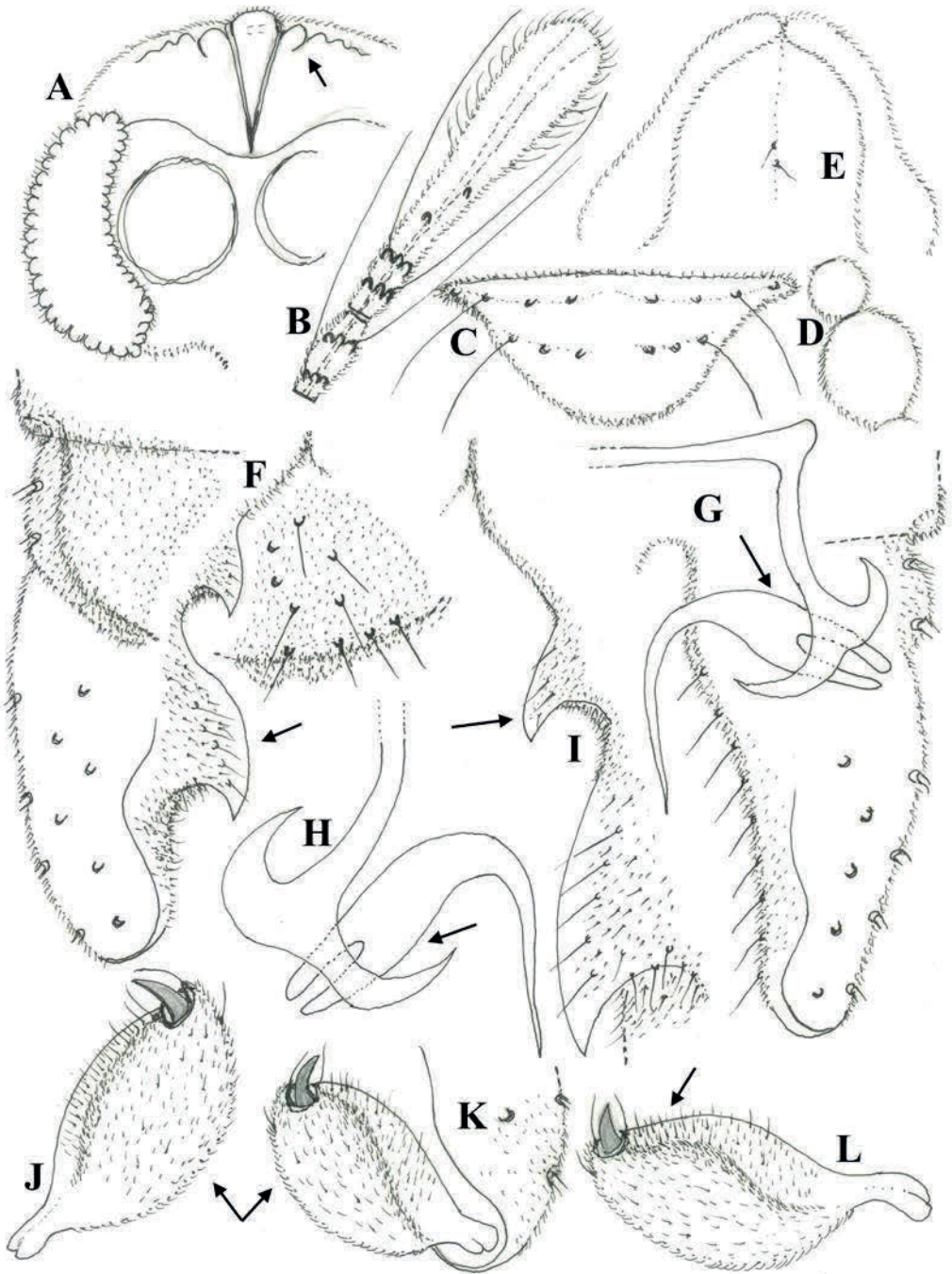
(n = 2; Figs 3A-L)

Small sized species. Total length 1.25 mm; wing length 0.61 mm; TL/WL = 2.05. General colouration pale brown to brown. Head, antenna and legs brownish. Thorax brownish, weakly contrasting with brown mesonotal stripes. Abdomen with segments I-V brownish, segments VI-VIII darker; anal segment brownish. Head (Fig. 3A). Eyes densely hairy; frontal tubercle rounded and low; suture of coronal triangle with 1 lateral uniserial expansion located basally; coronals 2. Temporals absent. Antenna 13-segmented, 425 μm long; last flagellomere (Fig. 3B) 115 μm long, well-clubbed, densely covered with short sensilla chaetica; segments 2-9 subequal, each 35 μm long; antennal groove reaching segment 2; AR 0.37. Clypeus (Fig. 3C) 40 μm long, 85 μm maximum width, typical bathtub shaped, with 14 setae in 2 rows. Palp 5-segmented; length (in μm) of segments 1-5: 10, 15, 25, 40, 65; palpomeres 2-3 (Fig. 3D), spherical to ovoid, sensilla coeloconica absent. Thorax. Lobes of antepronotum (Fig. 3E) gaping, lateral anteprenotals unusually absent; acrostichals 2; dorsocentrals 9 in 1 row; preallars 4 uniserial; humeral pit absent; preepisternum bare; scutellum with 2 setae (1 on each side of the midline). Wing. Brachiolum with 1 seta; subcosta reaching the fork of radius; costa 225 μm long, with 12 setae; veins and squama bare; maximum wide 200 μm , VR 2.0. Legs. Length (in μm) of tibial spurs: PI, 25; PII, 25 and 20; PIII, 30 and 25. Tarsomere 4 of PI-PIII bifid apically; sensilla chaetica present on tarsomeres ta_1 - ta_5 of PI-PIII. 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	275	235	175	55	35	20	25	0,74	5,07	2,91	2.25
PII	255	215	115	65	45	25	30	0,53	3,55	4,09	1.85
PIII	245	260	160	85	40	25	30	0,62	3,69	3,16	2.20

P. 49. Figure 3. Male imago of *Thienemanniella sarrameana* sp. n. Head (left side, dorsal), frontal area, vertex and temporal setae (A); antenna, two last segments (B); clypeus (C); palpomeres 2-3 (D); lobes of antepronotum with acrostichals (E); hypopygium in dorsal (F) and ventral view (G); apodemes (H); inferior volsella, right side (I); gonostylus at acute (J-K) and right angle (L). The arrows indicate some distinguishing characters.

P. 49. Figure 3. Imago mâle de *Thienemanniella sarrameana* sp. n. Tête (côté gauche, vue dorsale), aire frontale, vertex et soies temporales (A) ; antenne, deux derniers segments (B) ; clypéus (C) ; palpomère 3 (D) ; lobes de l'antépronotum avec soies acrosticales (E) ; hypopyge en vue dorsale (F) et ventrale (G) ; volselle inférieure, côté droit (I) ; gonostyle, angle aigu (J-K) et angle droit (L). Les flèches indiquent quelques caractères distinctifs.



Abdomen. Hypopygium as in Figs 3F (dorsal) and 3G (ventral, with tergite and sternite IX removed). Tergite IX broadly semicircular, posterior margin not bilobed medially; with 12 setae (6 located on posteromedian part and 8 close to the posterior margin). Laterosternite IX with 4 setae (2 on each side). Apodemes as in Figs 3G-H. Transverse sternapodeme linearly straight. Phallapodeme is *Thienemanniella*-type, typical tight tong shaped basally, convex medially; basal part joint to caudal part of sternapodeme placed in both anterior and posterior sides. Gonocoxite 100 μm long, with rounded apex; dorsal and ventral sides without sclerotization; ventral side with 11 stout inner setae; dorsal junction (Fig. 3F) moderately open. Superior and inferior volsella similarly shaped, both broadly triangular shaped with rounded appearance edge and hooked apex. Superior one, smaller, 7 μm long and 5 μm maximum width. Inferior one larger, 25 μm long and 15 μm maximum width, edge with 5-6 setae placed in a vertical row, inner margin bare. Gonostylus (Figs 3J-L) 35 μm long, distinctly massive, anterior side densely covered with orally directed setae, posterior side covered with microtrichia and fine setae; megaseta 6-7 μm long, well-developed, inwardly curved, apex sharply pointed. HR 2.57; HV 3.57.

Female adult: unknown.

Pupae, pupal exuviae and larva: known but not described.



Photo 3. Type-locality of *Thienemanniella sarrameana* sp. n. (photo N. Mary 09.XI.2012).

Photo 3. Localité type de *Thienemanniella sarrameana* sp. n. (cliché N. Mary 09.XI.2012).

4. Remarks

To date, the genus *Thienemanniella* comprises worldwide 55 valid species, of which only one (*T. trivittata* Goetghebuer, 1935) is reported from the Australasian Region. Consequently, the current 3 descriptions increase the total number of known *Thienemanniella* species worldwide to 58 and to 4 from the Australasian Region.

On the basis of some morphological similarities observed between the 3 new species and other related members of the genus [namely: *T. lutea* Edwards, 1924; *T. triangula* Fu et al., 2010; *T. sichuana* Fu et al., 2010; *T. vittata* (Edwards, 1924); *T. acuticornis* (Kieffer, 1912); *T. tusimuefea* Sasa & Suzuki, 1999; *T. xena* (Roback, 1957)], they appear to key morphologically into 2 separate groups of *Thienemanniella* species: *T. noumeana* sp. n., to the *neocaledonica*-group, while *T. noumeana* sp. n. and *T. sarrameana* sp. n. (considered here as sister species), both seem to belong to one and same group of species: the *noumeana*-group.

In addition, the following relevant common and distinguishing characters will easily separate them one from another and both from all other related congeners:

- Typical unusual common characters are: antenna 10-segmented; transverse sternapodeme straight; phallapodeme markedly bifid at base;

- Typical main differentiating characters are:

- in *T. neocaledonica* sp. n. (antenna 385 μm long, AR 0.26, superior volsella absent, inferior volsella with hooked apex, gonostylus slender);

- in *T. noumeana* sp. n. (antenna 285 μm long, AR 0.50, superior and inferior differently shaped, digitiform and small in the superior one, triangular with hooked apex in the inferior one, gonostylus massive distally);

- in *T. sarrameana* sp. n. (antenna 425 μm long, AR 0.37, superior and inferior volsella similarly shaped, both are triangular with hooked apex, superior volsella much smaller, gonostylus entirely massive).

Accordingly, the three new species appear to belong to local biogeographic representatives of New Caledonia and the Australasian Region. Nevertheless, a combination of the relevant distinguishing characters are also highlighted in the following key to known male adult of *Thienemanniella* species from New Caledonia.

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

1. Superior volsella absent; inferior volsella present medially, broadly triangular shaped, hooked apically with rounded appearance edge, large; AR 0.26..... *T. neocaledonica* sp. n.

- Superior and inferior volsella present; differently or similarly shaped; AR > 0.302

2. Superior and inferior volsella differently figured; superior one thumb shaped, smaller; inferior one broadly triangular shaped, hooked apically with rounded appearance edge, large; gonostylus more massive distally; AR 0.50*T. noumeana* sp. n.

- Superior and inferior volsella similarly shaped, both broadly triangular shaped, hooked apically; inferior volsella much larger; gonostylus entirely massive; AR 0.37....*T. sarrameana* sp. n.

5. Ecology and geographical distribution

Larvae of *T. neocaledonica* sp. n., *T. noumeana* sp. n. and *T. sarrameana* sp. n. are typically oxybiontic and were encountered around and along both rhithral and potamal of mountainous and lowland streams and rivers. Pristine rifles and waterfalls (Photos 1-3) including hygroptetric faces and hyporheic zones, where emerged and submerged stones covered with bryophytes and microalgae, sandy to gravely substrata enriched in interstices and porous spaces beneath the stream bed,

represent the most favourite habitats for their larval populations. Such species appear to belong to a typical biological indicator of pristine sectors streams and rivers. It may be biogeographic representatives of global warming and local climate change, and therefore deserve greater consideration and conservation measures.

Emergence is mainly observed in November for *T. neocaledonica* sp. n., *T. noumeana* sp. n. and *T. sarrameana* sp. n.

Geographical distribution of the three new species is likely believed to be more widespread in similar aquatic habitats over the coastal ecosystem of New Caledonia.

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