



## ***Callionymus petersi*, a new species of dragonet from New Ireland, Papua New Guinea, western Pacific Ocean (Teleostei: Callionymidae)**

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### **Abstract**

A new species of dragonet, *Callionymus petersi* from northern New Ireland Province, Papua New Guinea, is described on the basis of five specimens collected with dredges and trawls in about 181–207 m depth from off northwestern New Hanover and off Kavieng. The new species is characterized within the subgenus *Bathycallionymus* by a short head (3.9–4.3 in SL); eye large (2.1–2.3 in head length); preopercular spine with a long, slightly upcurved main tip, a small antrorse serra followed by two large curved points on its dorsal margin and a strong antrorse spine at its base, ventral margin smooth, slightly concave; first dorsal fin higher than second dorsal fin in the male, slightly lower than second dorsal fin (female), with 4 spines, first spine filamentous (male only); second dorsal-fin high, distally convex (male) or low, distally nearly straight (female), with 9 unbranched rays (last divided at base); anal fin with 9 unbranched rays (last divided at base); 18 pectoral-fin rays; caudal fin elongate (male), the two median rays unbranched, elongate but barely filamentous (male), or distally rounded, without filaments (female); pectoral-fin base with a large dark blotch; sides of body with a series of dark blotches, each of the anterior blotches broken into 2–4 vertical dark streaks; first dorsal fin with a large ocellated black blotch extending over the second and third membranes (male), or mostly confined to the third membrane (female); second dorsal fin pale (male) or spotted with grey; anal fin distally dark (male), with distal dark spots (female); caudal fin with a grey streak in lower section (male), or lowermost membrane black (female). The new species is compared with similar species. Revised keys to callionymid fish species of New Guinea, as well as of the subgenus *Bathycallionymus*, are presented.

**Key words:** taxonomy, ichthyology, systematics, fishes, identification key.

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## Introduction

Dragonets of the family Callionymidae are a group of benthic-living fishes occurring in the upper 900 m of all temperate, subtropical, and tropical oceans of the world, and a few species found in estuarine and freshwater habitats. They are characterized by a depressed body; a triangular head when seen from above; the eyes large, situated dorsally on the head; the presence of a preopercular spine bearing additional points and/or serrae; the gill opening reduced to a small pore; swimbladder absent; two dorsal fins, the first with thin flexible spines, the second with soft rays; and jugular pelvic fins which are separated from each other, but each connected with the pectoral-fin base by a membrane. The Indo-Pacific species of the family were revised by Fricke (1983a), who distinguished 126 valid species from the area, including three species from the Mascarenes. Fricke (2002), in a checklist of the callionymid fishes of the world, listed a total of 182 valid species in 10 genera. Subsequently, ten additional species were described, i.e. *Callionymus kanakorum* and *Protogrammus antipodum* from New Caledonia (Fricke 2006), *Tonlesapia tsukawakii* from Cambodia (Motomura & Mukai 2006), *T. amnica* from Vietnam (Ng & Rainboth 2011), *Synchiropus tudorjonesi* from Papua, Indonesia (Allen & Erdmann 2012), *Callionymus profundus* from the northern Red Sea (Fricke & Golani 2013), *Diplogrammus paucispinis* from the eastern Red Sea (Fricke *et al.* 2014a), *Callionymus omanensis* from the northwestern Indian Ocean (Fricke *et al.* 2014b), *Callionymus madangensis* from Papua New Guinea by Fricke (2014), *Callionymus alisae* from New Ireland by Fricke (2016a), and *Eleutherochir mccaddeni* Fowler, 1941 was removed from the synonymy of *E. opercularis* by Yoshigou *et al.* (2006), bringing the worldwide total to 193 species in the family.

Fricke (1981: 350) defined the *kaianus* species-group of the genus *Callionymus* as having a combination of large eyes, four flexible spines in the first dorsal-fin, nine rays each in the second dorsal and anal fins, one or two median unbranched caudal-fin rays which are often filamentous, a characteristic shape of the preopercular spine with a small antrorse barb in addition to one to three larger curved points on the dorsal margin, and (usually) a characteristic black blotch on the third membrane of the first dorsal fin. He distinguished 13 species in the group, most of which are endemic in small distribution ranges within the Indo-West Pacific. Nakabo (1982: 86) described the genus *Bathycallionymus* with *Callionymus kaianus* Günther, 1880 as the type species. Fricke (2002: 99) treated *Bathycallionymus* (the former *kaianus* species-group) as a subgenus of the genus *Callionymus*, and distinguished 18 species; reasons for the treatment as a subgenus rather than a genus, including the monophyly of the *Callionymus*-clade, the invalidity of Nakabo's alternative classification, and the preference for nomenclatural stability were discussed by Fricke (2002: 7–8). Fricke (2006) described *Callionymus kanakorum*, another member of the subgenus, from New Caledonia, and later (Fricke *et al.* 2011) recorded the species from Espiritu Santo, Vanuatu. Fricke & Golani (2013) described *Callionymus profundus* from the northern Red Sea. *Callionymus omanensis* from off Oman, northwestern Indian Ocean, was described by Fricke *et al.* (2014b).

Species of the subgenus *Bathycallionymus* live on deeper soft bottoms on the continental slope or on seamounts; they bury in the substrate, usually only leaving the eyes visible. Callionymid fishes typically occur in harem groups, with one male controlling a larger home range living together with several females. Spawning usually takes place around dusk; the courting pair ascends and releases the eggs well above the substrate, following a complex courtship behaviour where the spreading of the first dorsal fin or flashing blue 'lights' (iridescent blue spots) are frequent motor patterns. The eggs and larvae are pelagic; during transformation into juveniles they shift to a benthic life style.

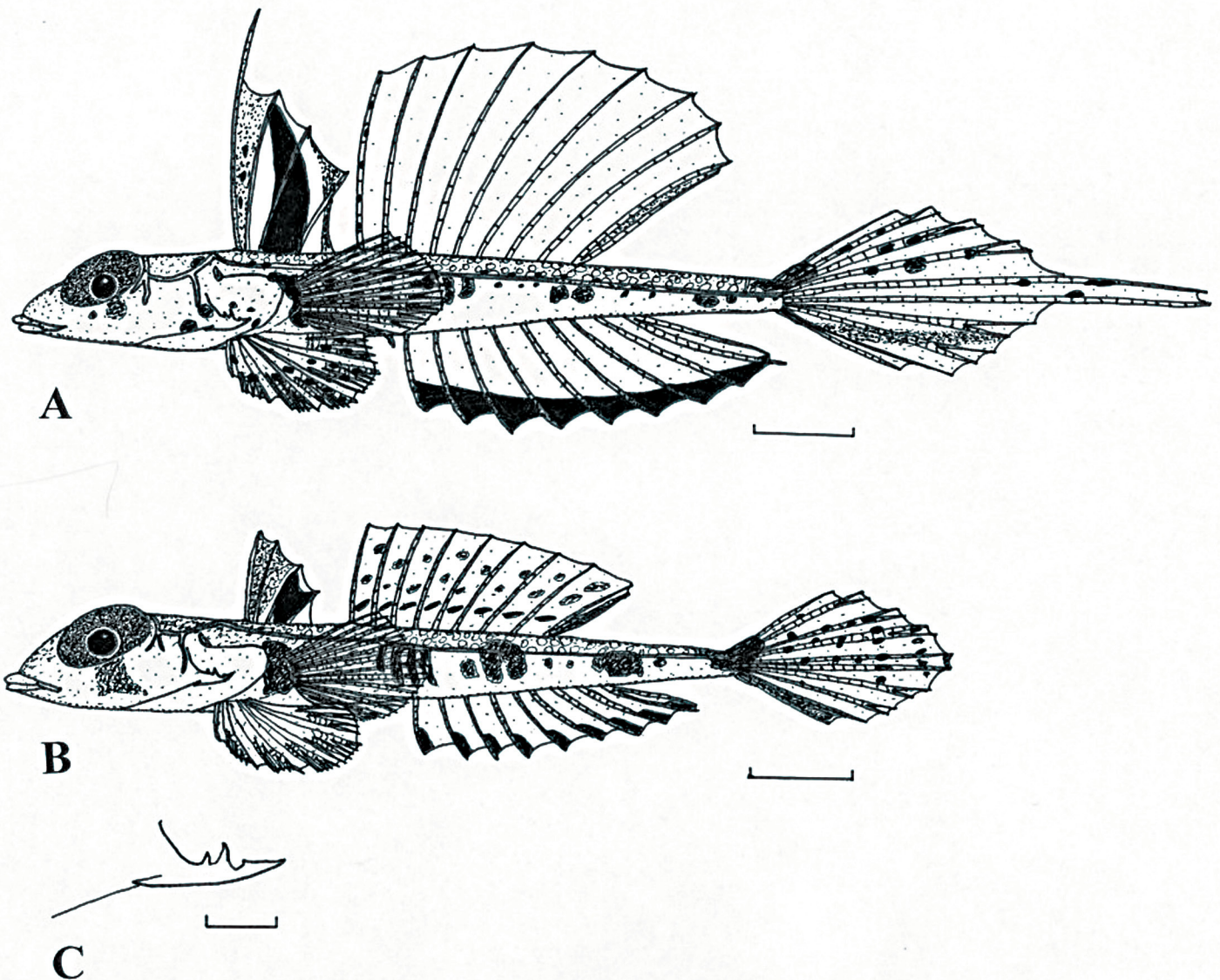
Five specimens of an undescribed species of the subgenus, which was previously identified as *Callionymus calauropomus* (*non* Richardson, 1844) by Peters (1877: 841), and was treated as *Callionymus moretonensis* (*non* Johnson, 1971) by Fricke (1981: 359), were trawled in deep water off northern New Ireland, Papua New Guinea. The new species is described herein, bringing the total number of species known in the subgenus to 22.

## Materials and Methods

The holotype and paratypes of the new species are deposited in the National Taiwan University, University Museum, Taipei, Taiwan (NTUM), and the Muséum national d'Histoire naturelle, Paris (MNHN). Comparative materials are listed below. Abbreviations of museum collections (see below) follow Fricke & Eschmeyer (2016a).

The data for the holotype are given first, followed by those of the paratypes in brackets. Methods follow Fricke (1983a); fin-ray counts follow Fricke (1983b). The starting point for length measurements is the middle of the upper lip. The standard length (measured from the tip of the upper lip to the middle of the urohyal/caudal fin base) is abbreviated SL. The predorsal (1) length is measured from the middle of the upper lip to the base of the first spine of the first dorsal fin; the predorsal (2) length correspondingly to the base of the first ray of the second dorsal fin. The last ray of the second dorsal and anal fins is always divided at its base; counts in the key include this divided ray as one. In the identification keys, males and females are keyed out separately only if there are significant differences between male and female morphology and coloration, and if females of two different species are more similar to each other than to the males of the same species. In callionymid fishes, sexes are easily externally distinguished by the presence of an enlarged urogenital papilla in the male (which is small or absent in the female).

Species classification is based on Fricke (2002). Nomenclature follows Eschmeyer *et al.* (2016). References and journals follow Fricke (2016b) and Fricke & Eschmeyer (2016b). The distribution map was produced using QGIS Version 2.12.2.



**Figure 1.** *Callionymus petersi*, n. sp., NTUM 11243, holotype, male, 74.7 mm SL, Papua New Guinea, New Ireland Province, 11.5 km west of Kavieng; A: Lateral view, left side (scale indicates 10 mm). NTUM 11373, paratype, female, 71.4 mm SL, Papua New Guinea, New Ireland Province, 7 km northwest of Kavieng; B: Lateral view, left side (scale indicates 10 mm); C: Left preopercular spine (scale indicates 2 mm).

## *Callionymus petersi*, n. sp.

Peters's Dragonet

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Figures 1–3; Tables 1 & 2.

*Callionymus calauropomus* (non Richardson, 1844) Peters 1877: 841 (New Ireland).

*Callionymus moretonensis* (non Johnson, 1971) Fricke 1981: 359 (in part: New Ireland material only).

**Holotype.** NTUM 11243, male, 74.7 mm SL, Papua New Guinea, New Ireland Province, 11.5 km west of Kavieng, 2°33.33' S 150°41.45' E–2°33.32' S 150°43.18' E, 180–181 m depth, trawl, R/V *Alis*, St. CP4458-11, Sept. 2, 2014, 14:44–15:30 h.

**Paratypes.** MNHN 2016-0004, male, 89.5 mm SL, Papua New Guinea, New Ireland Province, 8.5 km west-northwest of Kavieng, 2°32.72' S 150°43.20' E–2°32.43' S 150°40.80' E, 193–197 m depth, trawl, R/V *Alis*, St. CP4459-1, Sept. 2, 2014. NTUM 10987, male, 80.6 mm SL, Papua New Guinea, New Ireland Province, Kavieng District, 9.8 km northeast of Bangatang, 2°32.13' S 150°39.14' E–2°33.36' S 150°40.58' E, 195–198 m depth, dredge, R/V *Alis*, St. DW4252-1, Apr. 24, 2014. NTUM 11486, female, 56.6 mm SL, Papua New Guinea, New Ireland Province, northwest of New Hanover, 2°24.64' S 149°58.74' E–2°25.32' S 149°57.79' E, 155–120 m depth, trawl, R/V *Alis*, St. CP4490-2, Sept. 6, 2014. NTUM 11373, female, 71.4 mm SL, Papua New Guinea, New Ireland Province, 7 km northwest of Kavieng, 2°32.31' S 150°44.206' E–2°30.31' S 150°44.04' E, 191–290 m depth, trawl, R/V *Alis*, St. CP4503-7, Sept. 7, 2014.

**Other material.** NTUM 11267, female, 36.9 mm SL, Bismarck Sea, Papua New Guinea, New Ireland Province, off southwest coast of Manne Island, 2°44.24' S 150°38.55' E–2°45.24' S 150°37.72' E, 207–550 m depth, trawl, R/V *Alis*, St. CP4469-1, Sept. 3, 2014 [preopercular spines missing]. ZMB 9399, (2), 35.0–81.9 mm SL, New Ireland, R/V *Gazelle*, July, 1875.

**Diagnosis.** A species of the subgenus *Callionymus* (*Bathycallionymus*) with a short head (3.9–4.3 in SL); eye large (2.1–2.3 in head length); preopercular spine with a long, slightly upcurved main tip, a small antrorse serra followed by two large curved points on its dorsal margin and a strong antrorse spine at its base, ventral margin smooth, slightly concave; first dorsal fin higher than second dorsal fin in the male, slightly lower than second dorsal fin (female), with 4 spines, first spine filamentous (male only); second dorsal-fin high, distally convex (male) or low, distally nearly straight (female), with 9 unbranched rays (last divided at base); anal fin with 9 unbranched rays (last divided at base); 18 pectoral-fin rays; caudal fin elongate (male), the two median rays unbranched, elongate but barely filamentous (male), or distally rounded, without filaments (female); pectoral-fin



**Figure 2.** *Callionymus petersi*, n. sp., MNHN 2016-0004, paratype, male, 89.5 mm SL, Papua New Guinea, New Ireland Province, 8.5 km westnorthwest of Kavieng. Photograph taken immediately after collection (scale indicates 20 mm) (Jhen-Nien Chen).



TABLE 1

*Callionymus petersi*, n. sp., holotype and paratypes, Papua New Guinea, New Ireland  
Morphometric data (measurements in mm)

	Holotype (male) NTUM 11243	Paratypes (2 males) MNHN 2016-0004 NTUM 10987	Paratypes (2 females) NTUM 11373 NTUM 11486
Standard length	74.7	80.6–89.5	56.6–71.4
Caudal-fin length	42.2	40.4	17.6–20.7
Predorsal (1) length	22.0	23.6–25.8	17.5–22.9
Predorsal (2) length	33.7	34.4–36.0	25.8–33.2
Preanal length	37.8	39.4–41.7	28.6–39.2
Prepelvic fin length	20.5	19.3–20.8	14.8–19.7
Prepectoral fin length	27.7	28.7–29.3	20.7–27.2
Length from tip of snout to end of preopercular spine	22.6	22.0–23.1	14.6–21.3
Head length	18.7	18.8–22.7	13.3–18.2
Body depth	8.3	8.0–9.5	4.9–7.4
Body width	10.3	13.0–15.4	9.2–14.8
Orbit diameter	8.1	9.2–9.8	6.3–9.1
Preorbital length	4.5	5.1–5.3	2.9–3.9
Bony interorbital	0.7	0.5–0.8	0.5–0.8
Caudal peduncle length	13.2	15.8–17.2	9.8–12.4
Caudal peduncle depth	2.7	3.4–3.5	2.0–2.5
Upper-jaw length	5.6	6.3–6.5	4.3–5.8
Urogenital papilla length	2.7	2.9–3.0	—
Length of left preopercular spine [right spine in holotype]	5.0	5.3–5.5	3.9–4.5
Length of first spine of first dorsal fin	23.7	27.0	7.0–8.9
Length of second spine of first dorsal fin	16.6	16.6	7.0–8.1
Length of third spine of first dorsal fin	13.2	11.7–14.0	5.2–6.2
Length of fourth spine of first dorsal fin	9.8	6.5–8.9	3.6–4.3
Length of first ray of second dorsal fin	17.9	18.8–21.9	8.3–10.4
Length of last ray of second dorsal fin	17.3	16.0–19.1	7.5–9.8
Length of first anal-fin ray	7.8	7.3–8.4	5.4
Length of last anal-fin ray	14.7	12.0–14.2	6.1–7.5
Pectoral-fin length (left side)	14.5	14.8–16.8	13.4
Length of first pelvic-fin spine	3.6	4.2–5.2	3.8
Pelvic-fin length	19.8	19.7–23.0	19.5

TABLE 2

*Callionymus petersi*, n. sp., holotype and paratypes, Papua New Guinea, New Ireland  
Proportions (given for the holotype first, followed by those of the paratypes, in brackets).

	Proportion of standard length	Proportion as percentage of standard length
Caudal-fin length	1.8 [males 2.0; females 3.2–3.4]	56.5 [males: 50.1; females: 29.0–31.1]
Predorsal (1) length	3.4 [3.1–3.5]	29.4 [28.8–32.1]
Predorsal (2) length	2.2 [2.2–2.6]	45.1 [42.7–46.5]
Preanal length	2.0 [1.8–2.1]	50.6 [46.6–54.9]
Prepelvic fin length	3.6 [3.6–4.3]	27.4 [23.2–27.6]
Prepectoral fin length	2.7 [2.6–3.0]	37.1 [32.7–38.1]
Length from tip of snout to end of preopercular spine	3.3 [3.4–3.9]	30.2 [25.8–29.8]
Head length	4.0 [3.9–4.3]	25.0 [23.3–25.4]
Body depth	9.0 [9.4–11.7]	11.1 [8.7–10.6]
Body width	7.2 [4.8–6.2]	13.8 [16.1–20.7]
Orbit diameter	9.2 [7.8–9.1]	10.8 [10.9–12.7]
Preorbital length	16.6 [15.8–19.5]	6.0 [5.1–6.3]
Bony interorbital	106.7 [70.8–161.2]	0.9 [0.6–1.4]
Caudal peduncle length	5.7 [5.1–5.8]	17.7 [17.4–19.6]
Caudal peduncle depth	27.7 [23.7–28.6]	3.6 [3.5–4.2]
Upper-jaw length	13.3 [12.3–13.8]	7.5 [7.3–8.1]
Urogenital papilla length	27.7 [males: 27.8–29.8]	3.6 [males: 3.4–3.6]
Length of left preopercular spine	14.9 [14.5–16.9]	6.7 [5.9–6.9]
Length of first spine of first dorsal fin	3.2 [males: 3.2; females: 8.0–8.1]	31.7 [males: 30.2; females: 12.4–12.5]
Length of second spine of first dorsal fin	4.5 [males: 5.4; females: 8.1–8.8]	22.2 [males: 18.5; females: 11.3–12.4]
Length of third spine of first dorsal fin	5.6 [males: 6.4–6.9; females: 10.9–11.5]	17.7 [males: 14.5–15.6; females: 8.7–9.2]
Length of fourth spine of first dorsal fin	7.6 [males: 10.1–12.4; females: 15.7–16.6]	13.1 [males: 8.1–9.9; females: 6.0–6.4]
Length of first ray of second dorsal fin	4.2 [males: 4.1–4.3; females: 6.8–6.9]	24.0 [males: 23.3–24.5; females: 14.6–14.7]
Length of last ray of second dorsal fin	4.3 [males: 4.7–5.0; females: 7.3–7.5]	23.2 [males: 19.8–21.3; females: 13.2–13.3]
Length of first anal-fin ray	9.6 [males: 10.6–11.0; females: 10.5–13.2]	10.4 [males: 9.1–9.4; females: 7.6–9.5]
Length of last anal-fin ray	5.1 [males: 6.3–6.7; females: 9.3–9.5]	19.7 [males: 14.9–15.9; females: 10.5–10.8]
Pectoral-fin length (left side)	5.2 [5.3–5.4]	19.4 [18.4–18.8]
Length of first pelvic-fin spine	20.3 [15.5–21.3]	4.8 [4.7–6.4]
Pelvic-fin length	3.8 [3.7–4.1]	26.6 [24.4–27.3]

base with a large dark blotch; sides of body with a series of dark blotches, each of the anterior blotches broken into 2–4 vertical dark streaks; first dorsal fin with a large ocellated black blotch extending over the second and third membranes (male), or mostly confined to the third membrane (female); second dorsal fin pale (male) or spotted with grey; anal fin distally dark (male), with distal dark spots (female); caudal fin with a grey streak in lower section (male), or lowermost membrane black (female).

**Description.** D IV + viii,1 [IV + viii,1]; A viii,1 [viii,1]; P1 ii,14,ii (total 18; right pectoral fin damaged) [i-ii,14,ii (total 17–18)]; P2 I,5 [I,5]; C (i),i,3,ii,2,ii,(ii) [(i),i,3,ii,2,ii,(ii)]. Proportions are given in Table 2.

Body elongate and depressed. Head depressed. Eye large. Interorbital narrow, 11.6 [18.2–18.4] in eye diameter. Preopercular spine with a long, upcurved main tip, ventral margin smooth, base with a strong antrorse spine, one small antrorse barb and one large curved point followed by a smaller curved point on dorsal margin; preopercular spine formula  $1-\frac{3}{1}-1$  [ $1-\frac{3}{1}-1$ ]. Cephalic lateral-line system with a forked suborbital branch, a preopercular branch, a supraoccipital commissure connecting lines of opposite sides, and another commissure between lines across dorsal part of caudal peduncle. Occipital region smooth. Body lateral-line system with few short branches. Urogenital papilla long in male, not visible in female.

First dorsal fin higher than second dorsal fin in male, first spine longest, bearing a filament; nearly as high as second dorsal fin in female, without filaments. Second dorsal fin high in male, distally convex, but lower in female, distally nearly straight; rays unbranched, last divided at base. Anal fin beginning on vertical through third membrane of second dorsal fin. Anal fin distally slightly convex, in male larger than in female; anal-fin rays unbranched, last divided at base. Pectoral fin reaching to base of first or second anal-fin membrane when adpressed. Pelvic fin small, not reaching anal-fin base when adpressed. Membrane connecting 5<sup>th</sup> pelvic-fin ray with pectoral-fin base ending opposite 7<sup>th</sup> [7<sup>th</sup> to 8<sup>th</sup>] pectoral-fin ray (counted from above). Caudal fin in male elongate, nearly symmetrical, two (unbranched) median rays longest but without filaments; in female also elongate but much shorter.

**Color immediately after collection.** (Fig. 2) Head and body light brown, body pale, ventrally whitish, dorsally with numerous white spots, anteriorly with large yellow patches; sides of body with a row of brown blotches, anteriorly arranged in groups of 3–4 vertical streaks, posteriorly double. Snout light brown. Eye dark blue, dorsal rim yellow. Pectoral-fin base with a large, dark grey blotch. First dorsal fin of male yellow, with a large oblique black blotch extending over second and third membranes, blotch surrounded by white; in female a heart-shaped black blotch mainly on third membrane. Second dorsal fin yellow, in female grey spots. Anal fin basally white, in male distal margin blackish, in female distal black spots behind tips of fin rays. Caudal fin dorsally yellow, ventrally white, male with a horizontal grey streak in the lower part, in female lowermost membrane blackish, upper part with irregular brown spots interspersed with white spots. Pelvic fin pale, fin rays yellow, membranes in male with brown spots. Pectoral fin pale, male with vertical rows of grey spots in upper part.

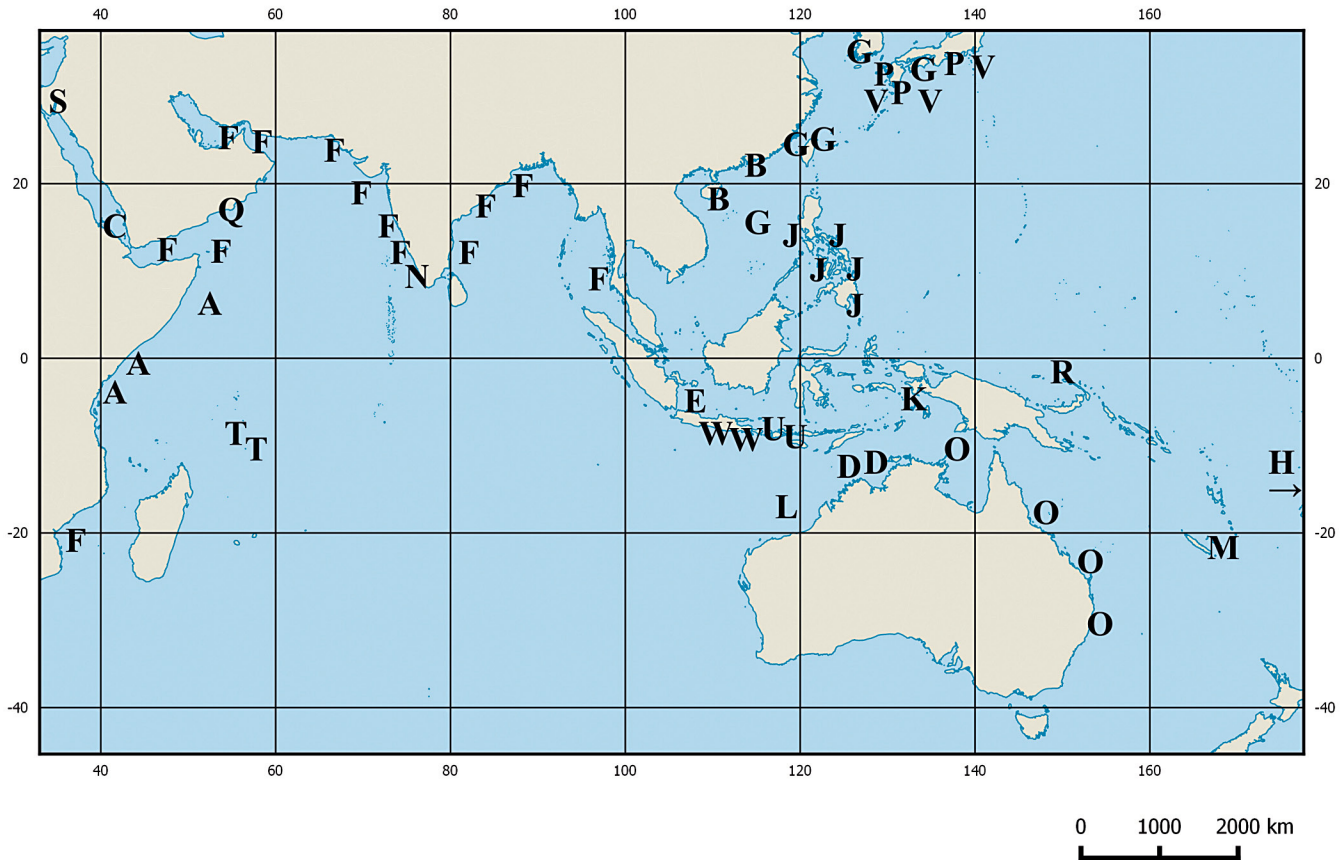
**Color in preservative.** Similar to fresh coloration, except that yellowish color fades to pale brown, and white spots disappear.

**Sexual dimorphism.** Males have an elongate urogenital papilla (not visible in females), a higher first dorsal fin with a filamentous first ray (lower and without filaments in females), higher second dorsal and anal fins (second dorsal fin distally convex in males, nearly straight in females), a longer caudal fin, and coloration differences on the first dorsal and anal fins.

**Distribution.** The species is known only from northern New Ireland between northwest of New Hanover and off Kavieng (Fig. 3). The species was trawled and dredged at depths of 155–207 m.

**Etymology.** The new species is named in honor of the late Wilhelm Carl Hartwig Peters (b. Apr. 22, 1815, Koldenbüttel, Schleswig-Holstein, Germany; d. Apr. 20, 1883, Berlin), professor at the University of Berlin and director of the ZMB and of Zoological Garden in Berlin. Peters described the fishes collected by S.M.S. *Gazelle* in New Ireland in July, 1875, and was the first to observe this new species (although he misidentified it as *Callionymus calauropomus* [non Richardson, 1844]). Among many other species, he also discovered and described the species now known as *Synchiropus marmoratus* (Peters, 1855) from Mozambique and *S. picturatus* (Peters, 1877) from West Papua, Indonesia.

**Comparisons.** The new species is a member of the subgenus *Callionymus* (*Bathycallionymus*) as defined by Fricke (1981: 350, as the *Callionymus kaianus* group; 2002: 99) and Nakabo (1982: 86) (see introduction).



**Figure 3.** Geographical distribution of species of the subgenus *Callionymus* (*Bathycallionymus*) in the Indo-West Pacific. A: *Callionymus africanus*, B: *C. altipinnis*, C: *C. bentuviai*, D: *C. bifilum*, E: *C. bleekeri*, F: *C. carebares*, G: *C. formosanus*, H: *C. futuna*, J: *C. guentheri*, K: *C. kaianus*, L: *C. kailolae*, M: *C. kanakorun*, N: *C. kotthausi*, O: *C. moretonensis*, P: *C. ochiaii*, Q: *C. omanensis*, R: *C. petersi*, S: *C. profundus*, T: *C. regani*, U: *C. semeiophor*, V: *C. sokonumeri*, W: *C. whiteheadi*.

It is part of a group with the second dorsal fin very high in males, distally convex (other species in this group include *C. altipinnis*, *C. bifilum*, *C. formosanus*, and *C. semeiophor*). Other species of the subgenus *Callionymus* (*Bathycallionymus*) have a lower second dorsal fin in males, which is distally nearly straight. The new species is distinguished from *C. bifilum* by the male's first dorsal fin with a large black blotch on the second and third membranes (restricted to the third membrane in *C. bifilum*), the pectoral-fin base with a large dark blotch (pale in *C. bifilum*), and the sides of the body with a series of large dark blotches broken into groups of 2–4 vertical streaks (pale, without blotches in *C. bifilum*). The new species differs from *C. formosanus* and *C. semeiophor* in the male caudal fin with elongate third and sixth rays, the middle two rays unbranched and very long, but barely filamentous (distally convex, third and sixth rays not elongate, the middle two rays unbranched, with one or two long filaments, in male *C. formosanus* and *C. semeiophor*); the pale anterior distal part of the second dorsal fin (black in *C. formosanus*); the long main tip of the preopercular spine (short in *C. semeiophor*); and the preopercular spine with a long main tip and two curved points additional to one small antrorse barb on its dorsal side (with a short main tip and one large curved point additional to one small antrorse barb on its dorsal side in *C. altipinnis*).

From other species of *Callionymus*, the new species is distinguished by the characters of the subgenus (see above).

A key to the species of the subgenus *Callionymus* (*Bathycallionymus*) is presented below.

An additional key to callionymid fish species of New Guinea is presented following the subgenus key, to distinguish *Callionymus petersi* n. sp. from potentially co-occurring species.



## Key to the Species of the Subgenus *Bathycallionymus* of the Genus *Callionymus*

- 1a. Dorsal margin of preopercular spine with a small antrorse barb additional to large, curved points; head in SL more than 3.2 .....2
- 1b. Dorsal margin of preopercular spine usually without a small antrorse barb additional to large, curved points; head in SL 2.7–3.1 (northern Indian Ocean) .....*Callionymus carebares* Alcock, 1890
- 2a. Second dorsal and anal fins very high, distal margins convex .....3
- 2b. Second dorsal and anal fins relatively low, distal margins straight .....9
- 3a. First spine of first dorsal fin filamentous .....4
- 3b. First spine of first dorsal fin not filamentous .....8
- 4a. Preopercular spine with two curved points (additional to one small antrorse barb) on its dorsal side .....5
- 4b. Preopercular spine with one large curved point (additional to one small antrorse barb) on its dorsal side .....*Callionymus altipinnis* Fricke, 1981
- 5a. Caudal fin with elongate third and sixth rays, the middle two rays unbranched and very long, but barely filamentous .....6
- 5b. Caudal fin distally convex, third and sixth rays not elongate, the middle two rays unbranched, with one or two long filaments .....7
- 6a. Second dorsal fin with a large black blotch that is confined to the third membrane; pectoral-fin base pale; sides of body pale, without blotches .....*Callionymus bifilum* Fricke, 2000
- 6b. Second dorsal fin with a large black blotch on second and third membranes; pectoral-fin base with a large dark blotch; sides of body with a series of large dark blotches broken into groups of 2–4 vertical streaks ..  
.....*Callionymus petersi*, n. sp. (male)
- 7a. First dorsal fin with a large black blotch covering most of third membrane, but without a black blotch on first membrane; lower half of caudal fin with a black band .....*Callionymus formosanus* Fricke, 1981
- 7b. First dorsal fin with a large black blotch distally on second and third membranes, and a small black blotch distally on first membrane; second dorsal fin with vertical dark streaks; lower half of caudal fin pale, without a black band .....*Callionymus semeiophor* Fricke, 1983
- 8a. Main tip of preopercular spine long and slender; distal half of anal fin black, tips of fin rays white; distal margin of caudal fin regularly shaped; black blotch on third membrane of first dorsal fin relatively large, central in position, not reaching distal margin (Philippines) .....*Callionymus guentheri* Fricke, 1981

8b.	Main tip of preopercular spine short; anal fin with a distal black streak on each membrane, distal two-thirds of membrane and tips of fin rays dark brown; distal margin of caudal fin irregularly shaped; black blotch on third membrane of first dorsal fin very small, extremely distal in position (Japan) .....	<i>Callionymus sokonumeri</i> Kamohara, 1936
9a.	Caudal fin convex, without filaments .....	10
9b.	Caudal fin convex or slightly pointed, with one or two filaments .....	18
10a.	Anal fin with a narrow distal yellow margin or colourless; sides of body with a row of indistinct brownish blotches or without blotches .....	11
10b.	Anal fin with a dark brown or black margin; sides of body with a row of small distinct black blotches ....	12
11a.	First spine of first dorsal fin with a long filament, more than twice as long as second spine (western Indonesia) .....	<i>Callionymus bleekeri</i> Fricke, 1983
11b.	First spine of first dorsal fin not filamentous, about as long as second spine (southwestern Indian Ocean) .....	<i>Callionymus regani</i> Nakabo, 1979
12a.	Main tip of preopercular spine long and slender .....	13
12b.	Main tip of preopercular spine short .....	14
13a.	First dorsal fin with a black blotch reaching from first to third membranes (male), or two black blotches on second and third membranes (female); lowermost membrane of caudal fin pale .....	<i>Callionymus kotthausi</i> Fricke, 1981
13b.	First dorsal fin with a black blotch confined to third membrane; lowermost membrane of caudal fin dark ..	<i>Callionymus petersi</i> , n. sp. (female)
14a.	First spine of first dorsal fin filamentous; pelvic fin distally spotted .....	15
14b.	First spine of first dorsal fin not filamentous; pelvic fin distally with a dark area, but not spotted .....	16
15a.	First spine of first dorsal fin with a relatively long filament, at least 1.5 times as long as second spine; upper half of caudal fin spotted, but without a distal dark bar (Wallis and Futuna) .....	<i>Callionymus futuna</i> Fricke, 1998
15b.	First spine of first dorsal fin with a relatively short filament, at most 1.2 times as long as second spine; upper half of caudal fin not spotted, but with a small distal dark bar (New Caledonia) .....	<i>Callionymus kanakorum</i> Fricke, 2006
16a.	First dorsal fin much higher than second dorsal fin, first spine more than 1.5 times longer than first ray of second dorsal fin (northern Australia) .....	<i>Callionymus kailolae</i> Fricke, 2000
16b.	First dorsal fin only slightly higher than second dorsal fin, first spine not more than 1.2 times longer than first ray of second dorsal fin .....	17

- 17a. Preopercular spine with one dorsal point (additional to a small antrorse barb); pectoral-fin base with a large dark brown area; back marbled with olive green in fresh specimens; opercle with large white spots; lower part of caudal fin distally black; second dorsal fin with a basal row of dark blotches (western Indonesia) ..... *Callionymus whiteheadi* Fricke, 1981
- 17b. Preopercular spine with two dorsal points (additional to a small antrorse barb); pectoral-fin base with two black streaks; back yellowish brown, with white blotches surrounded by semicircular dark bands; opercle with small dark spots; lower part of caudal fin with a broad curved dark band, but distally colorless; second dorsal fin without a basal row of blotches or spots (East Africa) .....  
..... *Callionymus africanus* (Kotthaus, 1977) (female)
- 18a. First spine of first dorsal fin with a long filament ..... 19
- 18b. First spine of first dorsal fin without a filament ..... 21
- 19a. Main tip of preopercular spine short, largest point on its dorsal margin with a basal hook; second dorsal fin colorless, with transverse white lines; sides of body with a row of distinct black blotches (Indonesia) .....  
..... *Callionymus kaianus* Günther, 1880
- 19b. Main tip of preopercular spine long and slender, largest point on its dorsal margin without a basal hook; second dorsal fin with rows of blotches; sides of body with a row of indistinct brownish blotches ..... 20
- 20a. Anal fin with a dark margin; second dorsal-fin with two rows of white blotches and a distal dark margin; main tip of preopercular spine about 2.5–3.0 times longer than largest point on the dorsal side; body with light blotches edged with semicircular dark lines; northeastern Australia .....  
..... *Callionymus moretonensis* Johnson, 1971
- 20b. Anal fin pale, without a dark margin; second dorsal-fin with a basal and 2–3 more distal rows of dark spots; main tip of preopercular spine about 1.0–1.5 times longer than largest point on the dorsal side; body with minute blackish spots forming rings and blotches (Japan) ..... *Callionymus ochiaii* Fricke, 1981
- 21a. Caudal fin with two long filaments which are nearly twice as long as remainder of fin; southern Red Sea ..  
..... *Callionymus bentuviai* Fricke, 1981
- 21b. Caudal fin with one or two relatively short filaments which are not longer than the remainder of the fin... 22
- 22a. Preopercular spine with two curved points (additional to small antrorse barb) on dorsal side (Indian Ocean or western Pacific) ..... 23
- 22b. Preopercular spine with one curved point (additional to small antrorse barb) on dorsal side ..... 25
- 23a. First dorsal fin with a large dark area, with a branch reaching anteriorly to first spine; second dorsal fin with vertical dark streaks (Indonesia) ..... *Callionymus semeiophor* Fricke, 1983 (female)
- 23b. First dorsal fin with a black blotch on third membrane (rarely with an additional blotch on the same membrane), occasionally reaching from second to fourth spines; second dorsal fin with rows of dark and/or white spots (but without vertical dark streaks) ..... 24

- 24a. Cephalic lateral line in postorbital region with a long branch running downwards; first dorsal fin with a large black blotch basally on the third membrane, with one or two branches reaching to second membrane; pectoral-fin base with two dark streaks; anal fin with a distal black margin (usually including tips of fin rays); caudal fin without two median transverse black lines; second dorsal fin with a basal, a median, and a distal row of light spots and two median rows of black spots (East Africa) ..... *Callionymus africanus* (Kotthaus, 1977)
- 24b. Cephalic lateral line in postorbital region without a long branch; first dorsal fin with a relatively small distal black blotch on the third membrane; pectoral-fin base with a dark area; distal half of anal fin black, tips of fin rays white; caudal fin with two median transverse black lines; second dorsal fin with a basal and a median row of black spots (Philippines) ..... *Callionymus guentheri* Fricke, 1981 (female)
- 25a. Pectoral-fin rays 17; preopercular spine slender, distance of the two dorsal points more than the length of the longest point (Fig. 4A); pelvic fin dark, with a black blotch basally on second ray; first dorsal fin (male) with a basal black blotch reaching from first to fourth membranes; dorsal half of caudal fin with four oblique dark streaks (southern Oman, northwestern Indian Ocean) ..... *Callionymus omanensis* Fricke, Jawad & Al-Mamry, 2014
- 25b. Pectoral-fin rays 18–20; preopercular spine stout, distance of the two dorsal points less than the length of the longest point (Fig. 4B); pelvic fin pale, with a few dark spots; first dorsal fin (male) with a basal black blotch reaching from second to third membranes; dorsal half of caudal fin pale, with a few dark spots (northern Gulf of Aqaba, Red Sea) ..... *Callionymus profundus* Fricke & Golani, 2013

### Key to the Species of the Family Callionymidae of New Guinea

- 1a. Opercle with a free flap of skin ..... 2
- 1b. Opercle without a free flap of skin ..... 3
- 2a. Body with lateral fold of skin below LL; lower lip without fleshy papillae; A rays unbranched ..... *Diplogrammus goramensis* (Bleeker, 1858)
- 2b. Body without lateral fold of skin below LL; dorsal margin of lower lip with a row of erect fleshy papillae; A rays branched ..... *Eleutherochir opercularis* (Valenciennes in Cuvier & Valenciennes, 1837)
- 3a. Sides of body with a number of small dermal cirri; few but relatively large teeth on the jaws ..... *Anaora tentaculata* Gray, 1835
- 3b. Sides of body without small dermal cirri; many small villiform teeth in bands in the jaws ..... 4
- 4a. Snout shorter than eye diameter; soft D rays branched (in specimens longer than 3 cm); gill opening sub-lateral; no antrorse spine present at preopercular spine base ..... (*Synchiropus*) 5
- 4b. Snout equal to, or longer than, eye diameter; soft D rays unbranched; gill opening dorsal; antrorse spine at base of preopercular spine ..... (*Callionymus*) 15

5a.	Color in life bright red with black pectoral-fin base; first dorsal fin in male without ocelli, but with four oblique ocellated bands reaching from first to third membranes; first dorsal fin in female mainly black .....	<i>Synchiropus tudorjonesi</i> Allen & Erdmann, 2012	
5b.	Color in life not bright red with black pectoral-fin base; first dorsal fin in males not as described above, if ocellated bands are present, then not reaching the first membrane; first dorsal fin in female not mainly black .....		6
6a.	Preopercular spine with one or two dorsal points additional to main tip .....		7
6b.	Preopercular spine with three to five dorsal points additional to main tip .....		12
7a.	Preopercular spine with one dorsal point additional to main tip .....		8
7b.	Preopercular spine with two dorsal points additional to main tip .....	<i>Synchiropus bartelsi</i> Fricke, 1981	
8a.	Sides of body with a series of large ocelli .....	<i>Synchiropus circularis</i> Fricke, 1984	
8b.	Sides of body without ocelli .....		9
9a.	Lateral line with two ventral branches below the occipital region; in males first dorsal fin with ocelli on second and third membranes .....	<i>Synchiropus stellatus</i> Smith, 1963	
9b.	Lateral line without ventral branches below the occipital region; in males first dorsal fin with ocelli on first and second membranes .....		10
10a.	Anal-fin rays unbranched, the last divided at its base; first spine of first dorsal fin in male much longer than 4 <sup>th</sup> spine .....	<i>Synchiropus orstom</i> Fricke, 2000	
10b.	Anal-fin rays branched (occasionally except for the first), the last divided at its base; first spine of first dorsal fin in male not much longer than 4 <sup>th</sup> spine .....		11
11a.	Body color overall red in life; first dorsal fin in male usually with 2 (rarely 3) ocelli; caudal fin with irregular blotches in 3–4 vertical bands .....	<i>Synchirus moyeri</i> Zaiser & Fricke, 1985	
11b.	Body color overall brown in life; first dorsal fin in male usually with 4 (rarely 3–6) ocelli; caudal fin blotches in 2 vertical bands .....	<i>Synchirus ocellatus</i> (Pallas, 1770)	
12a.	Distal margin of second dorsal fin straight or concave; rays of second dorsal fin unbranched (except last which is divided at base) .....	<i>Synchiropus claudiae</i> Fricke, 1990	
12b.	Distal margin of second dorsal fin convex; rays of second dorsal fin branched (last divided at base) .....		13
13a.	Pectoral-fin rays 21; first spine of first dorsal fin in male without a filament .....	<i>Synchiropus</i> sp. (to be described by R. Fricke)	
13b.	Pectoral-fin rays 28–35; first spine of first dorsal fin in male with a long filament .....		14



14a.	Caudal peduncle depth less than 5.6 in SL; interorbital more than 1.8 in eye; brown, with blue lines and spots .....	<i>Synchiropus splendidus</i> (Herre, 1927)
14b.	Caudal peduncle depth more than 5.7 in SL; interorbital less than 1.5 in eye; olive green (preserved: light blue), with large ocellated dark olive blotches .....	<i>Synchiropus picturatus</i> (Peters, 1877)
15a.	Lower margin of preopercular spines with antrorse serrae .....	<i>Callionymus alisae</i> Fricke, 2016
15b.	Lower margin of preopercular spines without antrorse serrae .....	16
16a.	Upper margin of preopercular spine with small antrorse serrae .....	17
16b.	Upper margin of preopercular spine with large curved points .....	26
17a.	Second dorsal fin with seven or eight rays (the last divided at base) .....	18
17b.	Second dorsal fin with nine rays (the last divided at base) .....	20
18a.	Second dorsal fin with seven rays (the last divided at base); anal fin with six rays (the last divided at base) .....	<i>Callionymus brevianalis</i> Fricke, 1983
18b.	Second dorsal fin with eight or nine rays (the last divided at base); anal fin with seven rays (the last divided at base).....	19
19a.	Caudal fin in male nearly not asymmetrical, length of upper rays similar to lower rays; first dorsal fin in male plain dark grey .....	<i>Callionymus madangensis</i> Fricke, 2014
19b.	Caudal fin in male strongly asymmetrical, upper rays much shorter than lower rays; first dorsal fin in male light, with a few indistinct dark spots .....	<i>Callionymus pleurostictus</i> Fricke, 1982
20a.	Anal fin with nine rays (the last divided at its base) .....	21
20b.	Anal fin with eight rays (the last divided at its base) .....	22
21a.	First spine of first dorsal fin in male detached from second spine, with a long filament; ventral margin of preopercular spine convex .....	<i>Callionymus filamentosus</i> Valenciennes in Cuvier & Valenciennes, 1837
21b.	First spine of first dorsal fin in male connected with second spine, not filamentous; ventral margin of preopercular spine concave .....	<i>Callionymus belcheri</i> Richardson, 1844
22a.	Caudal fin in male extremely elongate, at least nearly as long as standard length .....	23
22b.	Caudal fin in male relatively short, at most half of standard length .....	<i>Callionymus colini</i> Fricke, 1993

23a.	First to third dorsal-fin spines in male with filaments .....	<i>Callionymus neptunius</i> (Seale, 1910)	
23b.	Filament only on first dorsal-fin spine, or none .....		24
24a.	First dorsal-fin spine in male with filament .....	<i>Callionymus</i> sp. (to be described by R. Fricke)	
24b.	Dorsal-fin spines without filaments in both sexes .....		25
25a.	Dorsal margin of preopercular spine with 7–10 antrorse serrae; third membrane of first dorsal fin with large black blotch .....	<i>Callionymus afilum</i> Fricke, 2000	
25b.	Dorsal margin of preopercular spine with 5–6 antrorse serrae; third membrane of first dorsal fin without black blotch .....	<i>Callionymus zythros</i> Fricke, 2000	
26a.	Anal fin with seven rays .....		27
26b.	Anal fin with 8–10 rays .....		28
27a.	First dorsal fin in male low, first spine at most with a short filament ....	<i>Callionymus russelli</i> Johnson, 1976	
27b.	First dorsal fin in male very high, first spine with a long filament ....	<i>Callionymus enneactis</i> Bleeker 1879	
28a.	Preopercular spine dorsally with a small antrorse barb followed by two large curved points; median two caudal-fin rays unbranched .....	<i>Callionymus petersi</i> , n. sp.	
28b.	Preopercular spine dorsally without an antrorse barb but with several large curved points; median caudal-fin rays branched .....		29
29a.	At least first and second spines of first dorsal fin in male with long filaments .....		30
29b.	First dorsal fin without filaments .....	<i>Callionymus macdonaldi</i> Ogilby, 1911	
30a.	Only first and second spines of first dorsal fin filamentous in male .....	<i>Callionymus keeleyi</i> Fowler, 1941	
30b.	First dorsal fin high in male, all four spines filamentous .....	<i>Callionymus octostigmatus</i> Fricke, 1981	

**Discussion.** *Callionymus petersi* n. sp. was collected at depths of 155–207 m, on the insular slope of northern New Ireland. It probably lives all around New Ireland, but the other areas were not sampled to check its presence.

Most of the species of the subgenus *Callionymus* (*Bathycallionymus*) have narrow, restricted distribution ranges, while just a few are more widespread (i.e. *C. africanus*, *C. carebares*, *C. formosanus*, *C. guentheri*, *C. moretonensis*). None of the species is truly wide-ranging in the Indo-West Pacific. The typical habitat comprises soft bottom (mainly sand or coral gravel) on seamounts or on the upper continental or insular slope. Ecologically, the species usually occupy nutrient-rich oceanic habitats of continents or high islands.

The new species is most similar to species from Western Australia (*C. bifilum*), the northwestern Pacific (*C. formosanus*), the South China Sea (*C. altipinnis*), and western Indonesia (*C. semeiophor*). Barriers separating the distribution ranges of *C. petersi* n. sp. from those of neighboring species are unknown; however, *C. petersi* is not found in other parts of New Guinea, so it is possible that former tectonic events in northwestern and northeastern New Guinea isolated *C. petersi* and prevented its dispersal. *Callionymus bifilum*, a species that is restricted to a region farther south off Western Australia, may be prevented from dispersal farther north by climate, i.e. warmer weather and water temperature in New Ireland during the winter.

In an alternative classification by Nakabo (1982), *Callionymus petersi* n. sp. would be a member of the genus *Bathycallionymus*. Here, *Bathycallionymus* is treated as a subgenus of *Callionymus* (see above).

The callionymid fish fauna of New Guinea now comprises 31 species: 9 of these are known from New Ireland Province (see second identification key). Thus far, eight species endemic to Papua New Guinea are known: *Callionymus colini* from the Port Moresby region, *Callionymus madangensis* and *C. zythros* from Madang, *C. alisae*, *C. petersi* n. sp., and *Callionymus* sp. from New Ireland, *Synchiropus claudiae* from eastern New Guinea (Madang and Port Moresby), and *Synchiropus* sp. from New Ireland. The callionymid endemism rate therefore amounts to 25.8%, which is relatively very high. New Ireland plays a special role for callionymids as a center of endemism; five of the eight callionymids endemic to New Guinea occur at New Ireland, and four are endemic to New Ireland. New Ireland appears to have an overall high endemism rate for fishes: a checklist of the fish species is in preparation by R. Fricke and collaborators.

#### **Comparative material (subgenus *Bathycallionymus* Nakabo, 1982):**

*Callionymus africanus*: ZMH 5533 (holotype), seamount NE of Mombasa, Kenya; BMNH 1939.5.24.1422 (1 specimen), near Zanzibar, Tanzania; RMNH 19984 (6 specimens), seamount on Chain Ridge, off Somalia; ZMH 5534 (30 paratypes), seamount NE of Mombasa, Kenya.

*Callionymus altipinnis* (all China): MSL 0001 (holotype), Hong Kong; CAS 46967 (10 paratypes), Hainan; CAS 46968 (1 paratype), Hainan; CAS 46969 (1 paratype), Hainan.

*Callionymus bentuviai* (all Eritrea, southern Red Sea): HUI 9935 (holotype); HUI 6674 (2 specimens); HUI 6675 (1 specimen); HUI 8068 (2 paratypes); HUI 10463 (2 specimens); ZMH 5532 (2 paratypes).

*Callionymus bifilum*: CSIRO CA.3532 (holotype), Joseph Bonaparte Gulf, Western Australia; BMNH 1892.1.14.26–27 (2 paratypes), Holothuria Bank, Western Australia.

*Callionymus bleekeri*: RMNH 4872 (holotype), Java, Indonesia.

*Callionymus carebares*: BMNH 1890.11.28.18–24 (7 syntypes), Ganjam, India; MNHN 1890-0335-0340 (6 syntypes), Ganjam, India; ZSI F.12740–F.12741 (2 syntypes), Ganjam, India; ZSI F.12742 and F.12858 (15 syntypes), Ganjam, India; AMS I.28730-001 (1 specimen), Maputo, Mozambique; BMNH 1903.5.14.34 (1 specimen), Karachi, Pakistan; BMNH 1904.5.25.218–220 (3 specimens), Sea of Oman, Oman; BMNH 1939.5.24.1384 (1 specimen), Gulf of Oman, Oman; BMNH 1939.5.24.1385–1409 (24 specimens), Arabian Sea; BMNH 1939.5.24.1410–1421 (15 specimens), Gulf of Aden, Yemen; FMNH 5740 (1 specimen), Sea of Oman, Oman; IRSN 1797 (2 specimens), Bay of Bengal, India; SMNS 23508 (1 specimen), Thailand, Andaman Sea (new record).

*Callionymus formosanus*: CAS 46972 (holotype), Pescadores Strait, Taiwan.

*Callionymus futuna* (all Wallis and Futuna, Futuna Island shelf): MNHN 1995-0521 (holotype); MNHN 1995-0522 (2 paratypes); SMNS 18823 (1 paratype).

*Callionymus guentheri* (all Philippines): BMNH 1879.5.14.567 (holotype), Zamboanga; CAS 32668 (2

paratypes), Batangas, Luzon; CAS 32801 (1 paratype), Marinduque; CAS 32897 (11 paratypes), Batangas, Luzon; CAS 32905 (7 paratypes), Camarines Sur; CAS 32916 (5 paratypes), Quezon, Luzon; CAS 32997 (1 paratype), Balayan Bay; CAS 33067 (1 paratype), Luzon; CAS 33703 (1 paratype), Balayan Bay; CAS 33864 (3 paratypes), Camarines Sur; CAS 33879 (1 paratype), Marinduque; CAS 34074 (1 paratype), Marinduque; CAS 34154 (7 paratypes), Marinduque; CAS 34190 (2 paratypes), Ragay Gulf; CAS 34197 (9 paratypes), Camarines Sur; CAS 34205 (1 paratype), Marinduque; CAS 34272 (1 paratype), Ragay Gulf; CAS 34278 (4 paratypes), Marinduque; CAS 34286 (3 paratypes), Marinduque; CAS 34401 (1 paratype), Balayan Bay; CAS 34426 (1 paratype), Batangas, Luzon; CAS 34468 (1 paratype), Balayan Bay; CAS 46966 (4 paratypes), Quezon; SMNS 8510 (2 specimens), Occidental Mindoro; SMNS 9097 (1 specimen), Occidental Mindoro; USNM 150916 (1 specimen), Cabuyan Grande Island.

*Callionymus kaianus* (all Kai Islands, Maluku, Indonesia): BMNH 1879.5.14.565 (holotype); ZMUC P.6498 (1 specimen); ZMUC P.6499 (1 specimen).

*Callionymus kailolae*: AMS I.22807-021 (holotype), north of Port Hedland, Western Australia.

*Callionymus kanakorum*: MNHN 2000-5519 (holotype), Grande Terre, New Caledonia; SMNS 8550 (1 paratype), Grande Terre, New Caledonia; SMNS 12047 (1 paratype), Grande Terre, New Caledonia.

*Callionymus kotthausi*: ZMH 5535 (holotype), Cochin, India; ZMH 5536 (11 paratypes), Cochin, India.

*Callionymus moretonensis* (all Australia): AMS I.15608-001 (holotype), Cape Moreton, Queensland; CAS 24764–24767 (4 paratypes), Cape Moreton, Queensland; QM I.9156–I.9157 (2 paratypes), Cape Moreton, Queensland; SMNS 12172 (5 specimens), Arafura Sea, Northern Territory; SMNS 12173 (8 specimens), Arafura Sea, Northern Territory; SMNS 14791 (13 specimens), off Newcastle, New South Wales; WAM P.25739-003 (1 specimen), Cape Moreton, Queensland.

*Callionymus ochiaii*: FAKU 23261 (holotype), Kagoshima Prefecture, Japan; FAKU 23257–23260 and 23275 (5 paratypes), Kagoshima Prefecture, Japan; USNM 160485 (1 specimen), Goto Island, Japan.

*Callionymus omanensis*: SMF 34898 (holotype), off Salalah City, Oman.

*Callionymus profundus*: HUI 16989 (holotype), Eilat, Israel, Gulf of Aqaba, Red Sea.

*Callionymus regani* (all Saya de Malha Bank, western Indian Ocean): HUMZ 72408 (holotype); BMNH 1908.3.23.263 (1 specimen); HUMZ 72325 (1 paratype); HUMZ 72359 (1 paratype); HUMZ 42405 and 42407 (2 paratypes); HUMZ 73395 (1 paratype); HUMZ 73448–73449 (2 paratypes); HUMZ 73681 (1 paratype).

*Callionymus semeiophor*: NTM S.10764-001 (holotype), Sumbawa, Indonesia; NTM S.10760-002 (1 paratype), Lombok, Indonesia.

*Callionymus sokonumeri*: NSMT P.21026–21027 (2), Mimase, Japan; NSMT P.23873 (1), Kagoshima, Japan.

*Callionymus whiteheadi*: BMNH 1980.6.20.1 (holotype), Bali, Indonesia; BMNH 1980.11.25.2 (1 paratype), Java, Indonesia.

### **Comparative material (New Guinea):**

*Anaora tentaculata* Gray, 1835: CAS 92051 (1), Madang; NTM S.13680-024 (2), Madang.

*Callionymus* sp. (to be described by R. Fricke): NTUM 11332 (1), New Hanover.

*Callionymus afilum* Fricke, 2000: KFRS F.01705 (1), Bramble Cay; KFRS F.02709 (1), Yule Island.

*Callionymus alisae* Fricke, 2016: NTUM 11265 (1), New Ireland.

*Callionymus belcheri* Richardson, 1844: BMNH 1879.5.14.570 (1); KFRS 0969 (2), Kinikini Bay; USNM 243034 (2), Sepik.

*Callionymus brevianalis* Fricke, 1983: WAM P.29595-021 (1), Madang.

*Callionymus colini* Fricke, 1993: SMNS 12260 (holotype), Port Moresby; BPBM 34754 (2 paratypes), Port Moresby; SMNS 12261 (1 paratype), Port Moresby; SMNS 12263 (2 paratypes), Port Moresby.

*Callionymus enneactis* Bleeker, 1879: CAS 63291 (2), Madang; CSIRO B.1583 (1), Sek; SMF uncat. (1), Madang; SMNS 8541 (4), Port Moresby; SMNS 8548 (5), Port Moresby; SMNS 8553 (1), Port Moresby; SMNS 11564 (2), Port Moresby; SMNS 11566 (3), Port Moresby; SMNS 11567 (1), Port Moresby; SMNS 11568 (1), Port Moresby; SU 39953 (1), East Sepik; USNM 228958 (6), Milne Bay; USNM 228964 (1), Port Moresby; USNM 236385 (21), Hermit Islands; USNM 236390 (1), Madang; USNM 243037 (1), Trobriand Islands; USNM

243040 (4), Port Moresby.

*Callionymus filamentosus* Valenciennes in Cuvier & Valenciennes, 1837: KFRS F.1709 (3), Yule Island; KFRS 3050 (2), Oreke.

*Callionymus keeleyi* Fowler, 1941: KFRS F.2151 (1), Port Moresby.

*Callionymus macdonaldi* Ogilby, 1911: SMNS 21194 (1), West Papua, mouth of Ajkwa River; SMNS 21195 (2), West Papua, mouth of Minajerwi River.

*Callionymus madangensis* Fricke, 2014: NTUM 10146 (holotype), Papua New Guinea; NTUM 11405 (1), New Ireland; NTUM 11431 (1), New Ireland; NTUM 11441 (1), New Ireland.

*Callionymus neptunius* (Seale, 1910): ZMB 12674 (2), New Britain.

*Callionymus octostigmatus* Fricke, 1981: USNM 243033 (1), Cape Ward Hunt; USNM 243041 (2), Cape Ward Hunt.

*Callionymus pleurostictus* Fricke, 1982: WAM P.30366-016 (1), Madang.

*Callionymus russelli* Johnson, 1976: USNM 232259 (3), Daru.

*Callionymus zythros* Fricke, 2000: BPBM 38532 (holotype), Madang; NTUM uncat. (3), Madang.

*Diplogrammus goramensis* (Bleeker, 1858): SMF 34879 (1), Madang; USNM 236387 (2), Ninigo Islands; USNM 236388 (1), Ninigo Islands; WAM P.30366-011 (1), Madang.

*Eleutherochir opercularis* (Valenciennes in Cuvier & Valenciennes, 1837): BPBM 15731 (3), New Britain; KFRS 1766 (1), Bougainville; KFRS 3749 (1), Yule Island.

*Synchiropus* sp. (to be described by R. Fricke): NTUM 11377 (1), New Ireland; NTUM 11376 (1), New Ireland.

*Synchiropus bartelsi* Fricke, 1981: BMNH 1982.6.18.2 (1), New Britain; WAM P.30365-005 (1), Madang.

*Synchiropus circularis* Fricke, 1984: WAM P.30633-002 (1), Madang.

*Synchiropus claudiae* Fricke, 1990: SMNS 9048 (holotype), Madang; SMNS 8466 (1), Port Moresby; SMNS 8479 (1), Port Moresby; SMNS 9049 (2), Madang.

*Synchiropus ocellatus* (Pallas, 1770): AMS I.17504-012 (2), New Britain; SMNS 8473 (1), Port Moresby; SMNS 8475 (1), Port Moresby; SMNS 8476 (1), Port Moresby; USNM 236386 (3), Ninigo Islands; WAM P.30358-007 (1), Madang; ZMB 13291 (1), Finschhafen.

*Synchiropus orstom* Fricke, 2000: NTUM 10611 (2), Sandaun; NTUM 10691 (1), West Sepik; NTUM 11101 (1), New Hanover.

*Synchiropus picturatus* (Peters, 1876): ZMB 4770 (1), Salawaty.

*Synchiropus splendidus* (Herre, 1927): BMNH 1974.5.25.3557 (1), Madang; USNM 236383 (2), Hermit Islands; USNM 236384 (2), Ninigo Islands.

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## References

- Allen, G.R. & Erdmann, M.V. (2012) A new species of dragonet (*Synchiropus*: Callionymidae) from Indonesia. *Aqua, International Journal of Ichthyology*, 18, 9–14.
- Eschmeyer, W.N., Fricke, R. & van der Laan, R. [Eds.] (2016) CATALOG OF FISHES: GENERA, SPECIES, REFERENCES (<http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp>) Electronic version accessed 16 May 2016.
- Fricke, R. (1981) The *kaianus*-group of the genus *Callionymus* (Pisces: Callionymidae), with descriptions of six new species. *Proceedings of the California Academy of Sciences (Series 4)*, 42 (14), 349–377.
- Fricke, R. (1983a) *Revision of the Indo-Pacific genera and species of the dragonet family Callionymidae (Teleostei)*. Braunschweig, J. Cramer, x + 774 pp.
- Fricke, R. (1983b) A method of counting caudal fin rays of actinopterygian fishes. *Braunschweiger Naturkundliche Schriften*, 1, 729–733.
- Fricke, R. (2002) Annotated checklist of the dragonet families Callionymidae and Draconettidae (Teleostei: Callionymoidei), with comments on callionymid fish classification. *Stuttgarter Beiträge zur Naturkunde, Serie A (Biologie)*, 645, 1–103.
- Fricke, R. (2006) Two new species and a new record of dragonets from New Caledonia (Teleostei: Callionymidae). *Stuttgarter Beiträge zur Naturkunde, Serie A (Biologie)*, 696, 1–14.
- Fricke, R. (2014) *Callionymus madangensis*, a new species of dragonet from Papua New Guinea, southwestern Pacific Ocean (Teleostei: Callionymidae). *Journal of the Ocean Science Foundation*, 13, 1–15.
- Fricke, R. (2016a) *Callionymus alisae*, a new species of dragonet from New Ireland, Papua New Guinea, western Pacific Ocean (Teleostei: Callionymidae). *FishTaxa*, 1, 55–66.
- Fricke, R. [Ed.] (2016b) REFERENCES. (<http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp>). Electronic version accessed 27 May, 2016.
- Fricke, R., Bogorodsky, S.V. & Mal, A.O. (2014a) Review of the genus *Diplogrammus* (Teleostei: Callionymidae) of the Red Sea, with description of a new species from Saudi Arabia. *Journal of Natural History*, 48, 2419–2448.
- Fricke, R., Earle, J. L., Pyle, R. L. & Séret, B. (2011) Checklist of the fishes. In: Bouchet, P., Le Guyader, H. & Pascal, O. (Eds.) *The natural history of Santo*. Paris (MNHN, PNI), Marseille (PNI), pp. 343–409.
- Fricke, R. & Eschmeyer, W.N. (2016a) GUIDE TO FISH COLLECTIONS. (<http://researcharchive.calacademy.org/research/ichthyology/catalog/collections.asp>). Electronic version accessed 27 May, 2016.
- Fricke, R. & Eschmeyer, W.N. (2016b) JOURNALS. (<http://researcharchive.calacademy.org/research/ichthyology/catalog/journals.asp>). Electronic version accessed 27 May, 2016.
- Fricke, R. & Golani D. (2013) *Callionymus profundus* n. sp., a new species of dragonet from the Gulf of Aqaba (Gulf of Eilat), Red Sea (Teleostei: Callionymidae). *Stuttgarter Beiträge zur Naturkunde A, Neue Serie*, 6, 277–285.
- Fricke, R., Jawad, L.A. & Al-Mamry, J.M. (2014b) *Callionymus omanensis*, a new species of dragonet from Oman, north-western Indian Ocean (Teleostei: Callionymidae). *Journal of Fish Biology*, 2014, 1–17.

- Motomura, H. & Mukai, T. (2006) *Tonlesapia tsukawakii*, a new genus and species of freshwater dragonet (Perciformes: Callionymidae) from Lake Tonle Sap, Cambodia. *Ichthyological Exploration of Freshwaters*, 17, 43–52.
- Nakabo, T. (1982) Revision of the genera of dragonets (Pisces, Callionymidae). *Publications of the Seto Marine Biological Laboratory*, 27, 77–131.
- Ng, H.H. & Rainboth, W.J. (2011) *Tonlesapia amnica*, a new species of dragonet (Teleostei: Callionymidae) from the Mekong delta. *Zootaxa*, 3052, 62–68.
- Peters, W. (C.H.) (1877) Übersicht der während der von 1874 bis 1876 unter der Commando des Hrn. Capitän z. S. Freiherrn von Schleinitz ausgeführten Reise S.M.S. *Gazelle* gesammelten und von der Kaiserlichen Admiralität der Königlichen Akademie der Wissenschaften übersandten Fische. *Monatsberichte der Königlichen Preussischen Akademie der Wissenschaften zu Berlin*, 1876, 831–854.
- Yoshigou, H., Ohta, I. & Yoshino, T. (2006) First record of a callionymid fish, *Eleutherochir mccaddeni*, from Japan. *Japanese Journal of Ichthyology*, 52, 189–193.