

Callionymus boucheti, a new species of dragonet from New Ireland, Papua New Guinea, western Pacific Ocean, with the description of a new subgenus (Teleostei: Callionymidae)

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Abstract

Callionymus boucheti sp. nov. from northern New Ireland Province, Papua New Guinea, is described on the basis of seven specimens collected with dredges and trawls in about 72-193 m depth between northeastern New Hanover and off Kavieng. The new species is characterised within *Margaretichthys* subgen. nov. by a short head (3.5-3.7 in standard length); eye large (2.5-3.0 in head length); preopercular spine with a short, straight main tip, 5-7 curved serrae on its dorsal margin and a strong antrorse spine at its base, ventral margin smooth, slightly convex; first dorsal fin in male much higher than second dorsal fin, in female as high as second dorsal fin, with 4 spines, first spine with a long filament (male) or without a filament (female); second dorsal-fin distally straight, with 9 unbranched rays (last divided at base); anal fin with 8 unbranched rays (last divided at base); 21-23 pectoral-fin rays; caudal fin elongate, much longer in male than in female, nearly symmetrical (upper rays not much shorter than lower rays); no dark blotch near pectoral-fin base; first dorsal fin in male dark grey, anteriorly with oblique white streaks, posteriorly with white spots, in female also with a black blotch distally near third spine; anal fin distally black, margin of black area straight, black area wider in male than in female; caudal fin in male with 18-22 vertical streaks (in female with 8-11 vertical streaks); pelvic fin pale, without spots. The new species is compared with similar species. A key to the five species of *Margaretichthys* subgen. nov. is presented.

Keywords: Dragonets, New species, New subgenus, Checklist, Identification key, New Guinea.

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Introduction

Dragonets of the family Callionymidae are a group of benthic living fishes occurring in the upper 900 metres of all temperate, subtropical and tropical oceans of the world, and a few species found in estuarine and freshwater habitats (Fricke 1983a). They are characterised 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 which is 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 (Fricke 1983a, 2001). The Indo-Pacific species of the family were revised by Fricke (1983a), who distinguished 126 valid species. Fricke (2002), in a checklist of the callionymid fishes of the world, listed a total of 182 valid species in 10 genera. Subsequently, 14 additional species and one additional genus were described [*Callionymus kanakorum* and *Protogrammus antipodum* from New Caledonia (Fricke 2006), *Tonlesapia* and *Tonlesapia tsukawakii* from Cambodia (Motomura and Mukai 2006), *T. amnica* from Vietnam (Ng and Rainboth 2011), *Synchiropus tudorjonesi* from Papua, Indonesia (Allen and Erdmann 2012), *Callionymus profundus* from the northern Red Sea (Fricke and Golani 2013), *Diplogrammus paucispinis* from the eastern Red Sea (Fricke et al. 2014a), *Callionymus omanensis* from the northwestern Indian Ocean (Fricke et al. 2014b), *C. madangensis* from Papua New Guinea (Fricke 2014), *C. alisae* from New Ireland (Fricke 2016a), *C. petersi* from New Ireland (Fricke 2016b), *Synchiropus novaehiberniensis* from New Ireland (Fricke 2016c), *Protogrammus alboranensis* from the southwestern Mediterranean (Farias et al. 2016), *Synchiropus sycorax* from the Philippines (Tea and Gill 2016)], and *Eleutherochir mccaddeni* Fowler 1941 was removed from the synonymy of *E. opercularis* by Yoshigou et al. (2006), bringing the worldwide total to 197 species in the family.

In the most recent classification of callionymid fishes, Fricke (2002: 101) distinguished an undescribed

subgenus *Callionymus* (subgenus 7), formed by the former *Callionymus margaretae* species group, which included the species *C. australis* Fricke 1983 (Fricke 1983a: 398-402, fig. 117 as *C. margaretae australis*) from Western Australia, 65-100 m depth, and *C. margaretae* Regan 1905 (Regan 1905: 326, pl. C, fig. 3) from the northern Indian Ocean, known from depths of 22-107 m. The subgenus was previously alternatively classified as part of genus *Calliurichthys* by Nakabo (1982: 80).

Species of *Callionymus* (subgenus 7) live on soft bottoms on the continental shelf (known from depths of 22-107 m); 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 (J.T. Moyer, M. Zaiser Brownell, personal communication). Spawning usually takes place around dusk; the courting pair ascends and releases the eggs well above the ground, following a complex courtship behaviour where the spreading of the first dorsal-fin or flashing blue 'lights' (iridescent blue spots) are frequent motor patterns (J.T. Moyer, M. Zaiser Brownell, personal communication). The eggs and larvae are pelagic; during transformation into juveniles they shift to a benthic life style (Fricke et al. 2014b).

Several specimens of an undescribed species of the subgenus were collected during the KAVIENG 2014 expedition in northern New Ireland Province, Papua New Guinea. The subgenus is formally named and reviewed, two species are added, and the new species is described herein, bringing the total number of species known in the subgenus to 5.

Material 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 and Eschmeyer (2017a).

The data of the holotype are given first, followed by those of the paratypes, in square brackets. Methods follow Fricke (1983a); fin-ray counts follow Fricke (1983b), osteological methods follow Nakabo (1983). 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 colouration, 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) (Fricke 1988). Diagnoses of species of the new subgenus are compiled from Fricke (1983, 1993, 1998).

Species classification is based on Fricke (2002). Higher classification follows Nelson (2006); the more recent version of Nelson et al. (2016) is here not used due to numerous errors, omissions and inconsistencies; for details see Britz (2017). Nomenclature follows Eschmeyer et al. (2017). Reference and journal citations follow Fricke (2017) and Fricke and Eschmeyer (2017b).

Comparative material (subgenus *Margaretichthys* n. subgen.): *Callionymus australis* Fricke 1983: — CSIRO B2200 (holotype), Western Australia, off Dampier Archipelago). — CSIRO B2201 (1 paratype), Western Australia, off Dampier Archipelago). — CSIRO B2202 (6 paratypes), Western Australia, off Monte Bello Islands). — CSIRO CA2142 (1 paratype), Western Australia, off Monte Bello Islands). — WAM P.11841-001 (1 paratype), Western Australia, Shark Bay).

Callionymus margaretae Regan 1905: — BMNH 1904.5.25.151-152 (2 syntypes), Oman, Muscat. — BMNH 1911.2.23.31 (1), Persian Gulf. — CAS 34002 (32), India, Madras. — CAS 41390 (1), India, Vizagapatnam. — LACM 38129-23 (3), Pakistan, Karachi. — LACM 38306-1 (5), Pakistan, Karachi. — LACM 38312-1 (14), Pakistan, Baluchistan. — LACM 38313-1 (18), Pakistan, Baluchistan. — SMNS 8523 (1), Pakistan, Sindh. — SMNS 23505 (1), Thailand, Andaman Sea, west of Ko Lanta Yai Island (new record). — USNM 232268 (5), India, Cuddalore. — USNM 305945 (1), Somalia, Ras Binnah. — USNM 305906 (4), Somalia, Ras Hafun. — ZMH 5528 (12), India, off Cochin. — ZMH 5529 (1), India, off Cochin.

Callionymus rivatoni Fricke 1993: — MNHN 1993-0120 (holotype), Grande Terre, New Caledonia. — MNHN 1993-0121 (1 paratype), Grande Terre, New Caledonia. — SMNS 12271 (1 paratype), Grande Terre, New Caledonia. — SMNS 12272 (1 paratype), Grande Terre, New Caledonia. — SMNS 17863 (1), New Caledonia, Grande Terre. — SMNS 21226 (2), New Caledonia, Grande Terre. — SMNS 21228 (2), Chesterfield Islands. — SMNS 21236 (1), Chesterfield Bank. — SMNS 21237 (1), Chesterfield Bank. — SMNS 21238 (1), Chesterfield Islands. — SMNS 21239 (1), Chesterfield Islands. — SMNS 21246 (1), Chesterfield Islands. — SMNS 21247 (2), New Caledonia, Grande Terre. — SMNS 21252 (1), New Caledonia, Grande Terre. — SMNS 21266 (5), Chesterfield Bank. — SMNS 21277 (1), New Caledonia. — SMNS 21283 (5), Chesterfield Bank; SMNS 21284 (2), Chesterfield Islands. — SMNS 21285 (3), New Caledonia, Île Bélep. — SMNS 21290 (1), New Caledonia, Grande Terre. — SMNS 21303 (1), New Caledonia, Récifs d'Entrecasteaux. — SMNS 21305 (1), New Caledonia, Île des Pins. — SMNS 21314 (1), New Caledonia, Grande Terre. — SMNS 21316 (1), New Caledonia, Récifs du Sud.

Callionymus sereti Fricke 1998: — MNHN 1995-0523 (holotype), Futuna Island shelf, Wallis and Futuna. — SMNS 18824 (1 paratype), Futuna Island shelf, Wallis and Futuna.

Comparative material (New Guinea): *Anaora tentaculata* Gray 1835: — CAS 92051 (1), Madang. — NTM S.13680-024 (2), Madang.

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

Callionymus alisae Fricke 2016: — NTUM 11265 (holotype), 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), Madang. — 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 petersi Fricke 2016: — NTUM 11243 (holotype), New Ireland. — MNHN 2016-0004 (1 paratype), New Ireland. — NTUM 10987 (1 paratype), New Ireland. — NTUM 11267 (1), New Ireland. — NTUM 11373 (1 paratype), New Ireland. — NTUM 11486 (1 paratype), New Hanover.

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 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 novaehiberniensis Fricke 2016: — NTUM 11377 (holotype), New Ireland. — NTUM 11376 (1 paratype), New Ireland.

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.

Results

Systematic ichthyology: The present paper follows the classifications provided by Nelson (2006) and Laan et al. (2014):

Superclass Gnathostomata

Class Actinopterygii

Subclass Neopterygii

Division Teleostei

Order Perciformes

Suborder Callionymoidei

Family Callionymidae Bonaparte 1831

Genus *Callionymus* Linnaeus 1758

Subgenus *Callionymus* (*Margaretichthys*) new subgenus

Callionymus (subgen. 7): Fricke 2002: 101.

Type species: *Callionymus margaretae* Regan, 1905.

Gender: Masculine.

Diagnosis: A subgenus of the genus *Callionymus* with a small branchial opening in dorsal position; head short (3.5-4.3 in SL); eye moderate to large (2.3-3.8 in head length); preopercular spine with a short, straight main tip, 3-7 antrorse serrae on its dorsal margin, a strong antrorse spine at its base, ventral margin smooth, straight, slightly convex or slightly concave; supraorbital tentacle absent; two transverse lateral-line commissures on dorsal side of caudal peduncle; first dorsal-fin with 4 flexible spines, in the male usually much higher than second dorsal-fin, only the first spine filamentous, in the female slightly higher to as high as second dorsal fin, the first spine may be filamentous; second dorsal-fin distally straight, with 9 unbranched rays (last divided at base); anal fin with 8 unbranched rays (last divided at base); 16-23 pectoral-fin rays; caudal fin distally elongate, in the male more so than in the female, the 7 median rays branched, the median 2 branches longest but not filamentous; cranium depressed; lateral ethmoid not strongly depressed; supraethmoid with a large foramen in the centre; supraoccipital bearing a low crest; pterospheneid lacking an inward projection towards the brain cavity; nasal bones present; upper jaw protracted ventrally; anterior tip of premaxillary rounded; lower jaw strongly depressed; sesamoid articulars strongly curved, L-shaped; urohyal with the ventral ramus longer than the middle ramus, and anterior dorsal edge of middle ramus expands laterally, spoon-shaped; third branchiostegal ray attached to posterior abaxial face of ceratohyal; soft retrorse spine at posterodorsal end of opercle not filamentous; posttemporal notch opening vertically; anteroventral ramus of cleithrum well-developed, wide; coracoid with a large process at its dorsal margin, joined to ventral part of dorsal ramus of cleithrum; vertebrae 7+14; males with dark spots on the cheeks, and the thorax white, with a heart-shaped black blotch but without lines (thorax plain white in females); anal fin distally black.

Etymology: This new subgenus is named after its type species (*C. margaretae*), combined with the Greek word *ichthys* for fish. The type species was collected by F.W. Townsend, and was named by Regan (1905) after Mrs. Margaret Smith, who has "taken great interest in [Mr. Townsend's] collecting."

Comparisons: *Callionymus (Margaretichthys)* shares a preopercular spine with a straight main tip, small antrorse serrae at its dorsal margin, a strong antrorse spine at its base, but the ventral margin smooth, with the subgenera *Callionymus (Calliurichthys)*, *Callionymus (Pseudocalliurichthys)* and *Callionymus* (subgen. 5, 6 and 8 of Fricke 2002); other subgenera have either an upcurved main tip and curved points on the dorsal margin, the spine at the base absent, and/or points or serrae on the ventral margin. Within this group of subgenera, it differs from *Callionymus (Calliurichthys)* in the caudal fin of males which has only the middle two rays elongate (middle four rays elongate in subgenus *Calliurichthys*), and relatively few serrae dorsally on the preopercular spine (3-7, usually 4-6 in subgenus *Margaretichthys*; 6-13, usually 8-12 in subgenus *Calliurichthys*); from *Callionymus (Pseudocalliurichthys)* in the symmetrical caudal fin of males (asymmetrical in subgenus *Pseudocalliurichthys*, with the lower rays longer than the upper rays), and by the number of anal fin rays (total of 6-7 rays, formula v,1-vi,1 in subgenus *Margaretichthys*; total of 8 rays, formula vii,1 in subgenus *Pseudocalliurichthys*); from *Callionymus* (subgen. 5 of Fricke 2002, including *C. filamentosus*, *C. belcheri*, *C. doryssus* and related species) in the number of anal fin rays (total of 6-7 rays, formula v,1-vi,1 in subgenus *Margaretichthys*; total of 9-10 rays, formula viii,1-ix,1 in Subgenus 5), and in bearing small serrae on the dorsal margin of the preopercular spine (large serrae in Subgenus 5); from *Callionymus* (subgen. 6 of Fricke 2002, including *C. persicus* and related species) in the blotch on the male's thorax which is not surrounded by lines (surrounded by lines which often extend on the membrane connecting pelvic and pectoral fin in Subgenus 6); and from *Callionymus* (subgen. 8 of Fricke 2002, including *Callionymus scabriceps* and *C. colini*) in a filamentous first spine of the first dorsal fin in males (not filamentous in Subgenus 8), and a longer caudal fin of males (0.8-1.6 in SL in subgenus *Margaretichthys*; 1.6-2.1 in SL in Subgenus 8).

Checklist of species***Callionymus australis* Fricke 1983**

Northwestern Australian sawspine dragonet

Callionymus margaretae australis Fricke 1983: 402-408, figs. 118-119 (northwest of Dampier Archipelago, Western Australia, 19°44'S 116°02'E, 100 m depth; holotype: CSIRO B2200).

Diagnosis: A species of the subgenus *Callionymus* (*Margaretichthys*) n. subgen. with 4 dorsal-fin spines, 9 unbranched soft rays in second dorsal-fin (the last divided at base), 8 unbranched soft rays in anal fin (the last divided at base), 5-7 antrorse serrae dorsally on the preopercular spine (additional to the main tip an a strong antrorse spine at the base), caudal-fin length in the male 0.8-1.05 in SL, in female 1.5-2.0 in SL, preorbital length 2.4-3.7 in head, first dorsal fin with a short filament (first spine) in female (but with a long filament in male), first dorsal fin in female with a distal black blotch near third spine, otherwise spotted, upper lip dark, margin of blackish area on anal fin straight (blackish area narrow both anteriorly and posteriorly).

Distribution and habitat: Australia (Western Australia). Soft bottoms, 65-100 m depth.

***Callionymus boucheti* new species**

Bouchet's dragonet

Present paper.

Diagnosis: See below.

Distribution and habitat: Papua New Guinea (New Hanover, New Ireland). Soft bottoms, 10-193 m depth.

***Callionymus margaretae* Regan 1905**

Margaret's dragonet

Callionymus margaretae Regan 1905: 326, pl. 3, fig. 3 (Muscat, Oman, 15-30 fms [27-55 m] depth; syntypes: BMNH 1904.5.250.151-152, 2 specimens).

Diagnosis: A species of the subgenus *Callionymus* (*Margaretichthys*) n. subgen. with 4 dorsal-fin spines, 9 unbranched soft rays in second dorsal fin (the last divided at base), 8 unbranched soft rays in anal fin (the last divided at base), 3-6 antrorse serrae dorsally on the preopercular spine (additional to the main tip an a strong antrorse spine at the base), caudal-fin length in the male 1.3-2.0 in SL, in female 1.5-2.7 in standard length, preorbital length 2.0-3.1 in head, first dorsal fin with a long filament (first spine) in female (also with long filament in male), first dorsal fin in female without a black blotch, spotted, distal margin and filament dark, upper lip pale, margin of blackish area on anal fin oblique (blackish area narrower anteriorly but wider posteriorly).

Distribution and habitat: Somalia; Oman; Persian Gulf; Pakistan; India (Malabar coast; Bay of Bengal); Thailand (Andaman Sea). Soft bottoms, 22-107 m depth.

***Callionymus rivatoni* Fricke 1993**

Rivatton's dragonet

Callionymus rivatoni Fricke 1993: 365, fig. 1 A-C (Baie de Saint Vincent, New Caledonia, 15 m depth; Holotype: MNHN 1993-0120).

Diagnosis: A species of the subgenus *Callionymus* (*Margaretichthys*) n. subgen. with 4 dorsal-fin spines, 9 unbranched soft rays in second dorsal fin (the last divided at base), 8 unbranched soft rays in anal fin (the last divided at base), 4-6 antrorse serrae dorsally on the preopercular spine (additional to the main tip an a strong antrorse spine at the base), caudal-fin length in the male 1.5-1.6 in SL, in female 1.5-2.2 in standard length, preorbital length 2.8-4.0 in head, first dorsal fin without a filament in female (but with a filament on first spine

in male), first dorsal fin in both male and female with a black blotch distally on third spine, otherwise dusky, first membrane with four dusky streaks in female, upper lip pale, dark blotch present near pectoral-fin base, margin of blackish area on anal fin straight (blackish area in male broader than in female), pelvic fin with spots, caudal fin in male with 8-12 vertical streaks, in female with 6-10 vertical streaks.

Distribution and habitat: New Caledonia (Chesterfield Islands, Chesterfield Bank, Récifs d'Entrecastaux, Île Bélep, Grande Terre, Récifs du Sud, Île des Pins). Soft bottoms, 12-110 m depth.

Callionymus sereti Fricke 1998

Séret's dragonet

Callionymus sereti Fricke 1998: 6, fig. 2 (Futuna Island shelf, 14°19'30"S 178°04'18"W, 245-400 m depth; holotype: MNHN 1995-0523).

Diagnosis: A species of the subgenus *Callionymus* (*Margaretichthys*) n. subgen. with 4 dorsal-fin spines, 9 unbranched soft rays in second dorsal fin (the last divided at base), 8 unbranched soft rays in anal fin (the last divided at base), 6-8 antrorse serrae dorsally on the preopercular spine (additional to the main tip an a strong antrorse spine at the base), caudal-fin length in the male 0.93 in SL, in female 2.1 in standard length, preorbital length 2.6-3.4 in head, first dorsal fin without a filament in female (but with a long filament on first spine in male), first dorsal fin in female with a black blotch distally on third spine (in male with a very small black spot near tip), otherwise pale, with a few indistinct dark streaks in male, upper lip pale, no dark blotch near pectoral-fin base, anal fin plain whitish in both sexes, pelvic fin whitish without spots, caudal fin without vertical streaks.

Distribution and habitat: Wallis & Futuna (Futuna). Soft bottoms, 245-400 m depth.

Key to the species of the subgenus *Callionymus* (*Margaretichthys*)

- 1 First spine of first dorsal fin filamentous in females (filament may be short; also filamentous in males).....2
- First spine of first dorsal fin not filamentous in females (filamentous in males).....3
- 2 First dorsal fin with long filament in female (also with long filament in male); dorsal (or inner) margin of preopercular spine with 3-6 antrorse serrae; upper lip pale; first dorsal fin in female spotted, but without distal black blotch near third spine; margin of blackish area on anal fin oblique, blackish area narrower anteriorly but wider posteriorly; preorbital length 2.0-3.1 in head length.....*Callionymus margaretae*
- First dorsal fin with short filament in female (with long filament in male); dorsal (or inner) margin of preopercular spine with 5-7 antrorse serrae; upper lip dark; first dorsal fin in female spotted, and with distal black blotch near third spine; margin of blackish area on anal fin straight, blackish area narrow both anteriorly and posteriorly; preorbital length 2.4-3.7 in head length.....*Callionymus australis*
- 3 Male with black blotch distally around third spine of first dorsal fin; caudal fin in male with 0-12 vertical streaks (in female with 0-10 vertical streaks).....4
- Male without black blotch on first dorsal fin; caudal fin in male with 18-22 vertical streaks (in female with 8-11 vertical streaks).....*Callionymus boucheti*
- 4 Caudal-fin length in male 1.5-1.6 in SL (in female 1.5-2.2 in SL); caudal fin in male with 8-12 vertical streaks (in female with 6-10 vertical streaks); dark blotch present near pectoral-fin base; pelvic fin with spots; anal fin distally black in both sexes.....*Callionymus rivatoni*
- Caudal-fin length in male 0.9 in SL (in female 2.1 in SL); caudal fin without vertical streaks in both sexes; no dark blotch near pectoral-fin base; pelvic fin pale, without spots; anal fin pale in both sexes.....*Callionymus sereti*

***Callionymus boucheti* new species**

(Fig. 1, Tables 1-2)

Common name: Bouchet's dragonet*Callionymus* sp. 1: Fricke 2016a: 57, 63 (New Ireland, New Hanover). Fricke 2016c: 6, 22 (New Hanover).*Callionymus* sp.: Fricke 2016b: 52, 54 (New Hanover).**Holotype:** NTUM 11332, male, 58.3 mm SL; Papua New Guinea, New Ireland Province, northwest of New Hanover, 02°25.47'S 149°57.71'E - 02°25.81'S 149°57.09'E, 88-83 m depth, dredge, R/V Alis, St. DW4493-1 (PNG 3494), 6 Sept. 2014, 12:17-12:37 h.**Paratypes** (6 specimens, 40.9-59.2 mm SL): — MNHN 2016-0005, 1 male, 53.6 mm SL; Papua New Guinea, New Ireland Province, Kavieng District, eastnortheast of Bangatang, 18 km west of Kavieng, 02°35.75'S 150°37.9'E - 02°23.39'S 150°37.01'E, 60-72 m depth, trawl, R/V Alis, St. CP4455-17 (PNG 3106), 2 Sept. 2014. — NTUM 11192, 1 male, 42.2 mm SL; and 1 female, 44.6 mm SL; Papua New Guinea, New Ireland Province, Kavieng District, eastnortheast of Bangatang, 18 km west of Kavieng, 02°35.75'S 150°37.9'E - 02°23.39'S 150°37.01'E, 60-72 m depth, trawl, R/V Alis, St. CP4455-18-19 (PNG 3107, PNG 3108), 2 Sept. 2014. — NTUM 11229, 2 females, 51.0-59.2 mm SL; Papua New Guinea, New Ireland Province, Kavieng District, northeast of Bangatang, 14 km westnorthwest of Kavieng, 02°34.80'S 150°39.99'E - 02°33.41'S 150°41.34'E, 133-178 m depth, trawl, R/V Alis, St. CP4457-17-18 (PNG 3185, PNG 3186), 2 Sept. 2014. — NTUM 11487, 1 male, 40.9 mm SL; Papua New Guinea, New Ireland Province, Kavieng District, 3.7 km westnorthwest of Kavieng, 02°33.56'S 150°45.67'E - 02°32.92'S 150°46.53'E, 84-92 m depth, dredge, R/V Alis, St. DW4505-3 (PNG 3610), 7 Sept. 2014.**Other material:** — NTUM 11252, 1 male, 50.5 mm SL; Papua New Guinea, New Ireland Province, Kavieng District, 8.4 km westnorthwest of Kavieng, 02°32.72'S 150°43.20'E - 02°32.43'S 150°40.80'E, 193-197 m depth, trawl, R/V Alis, St. CP4459-2 (PNG 3233), 2 Sept. 2014 [preopercular spines missing]. — NTUM 11479, 1 female, 24.1 mm SL, Papua New Guinea, New Ireland Province, Kavieng District, Silver Sound, Bauddisson Island, 02°42.068'S 150°39.433'E, 6-10 m depth, trawl, R/V Alis, St. KD16 (PNG 3823), 11 June. 2014.**Diagnosis:** A species of the subgenus *Callionymus* (*Margaretichthys*) with a short head (3.5-3.7 in SL); eye large (2.5-3.0 in head length); preopercular spine with a short, straight main tip, 5 to 7 curved serrae on its dorsal margin and a strong antrorse spine at its base, ventral margin smooth, slightly convex; first dorsal fin in male much higher than second dorsal fin, in female as high as second dorsal fin, with 4 spines, first spine with a long filament (male) or without a filament (female); second dorsal-fin distally straight, with 9 unbranched rays (last divided at base); anal fin with 8 unbranched rays (last divided at base); 21-23 pectoral-fin rays; caudal fin elongate, much longer in male than in female, nearly symmetrical (upper rays not much shorter than lower rays); no dark blotch near pectoral-fin base; first dorsal fin in male dark grey, anteriorly with oblique white streaks, posteriorly with white spots, in female also with a black blotch distally near third spine; anal fin distally black, margin of black area straight, black area wider in male than in female; caudal fin in male with 18-22 vertical streaks (in female with 8-11 vertical streaks); pelvic fin pale, without spots.**Description:** D IV + viii,1 [IV + viii,1]; A vii,1 [vii,1]; P1 ii,17,ii (total 21; right pectoral fin damaged) [ii,17-19,ii (total 21-23)]; P2 I,5 [I,5]; C (ii),i,7,ii,(ii) [(ii),i,7,ii,(ii)]. Selected proportions are given in Table 2. Body elongate and depressed. Head depressed. Eye large. Interorbital narrow, 8.1 [8.2-10.7] in eye diameter. Preopercular spine with a straight main tip, seven [5 to 7] very small antrorse serrae on its dorsal margin and a strong antrorse spine at its base, ventral margin smooth, slightly convex (left preopercular spine missing in the holotype); preopercular spine formula 1 $\frac{7}{-}$ 1 [1 $\frac{5-7}{-}$ 1]. Cephalic lateral-line system with a forked suborbital branch, a preopercular branch, a supraoccipital commissure connecting lines of opposite sides, and a double commissure between the lines across the dorsal part of the caudal peduncle. Occipital region smooth, with two

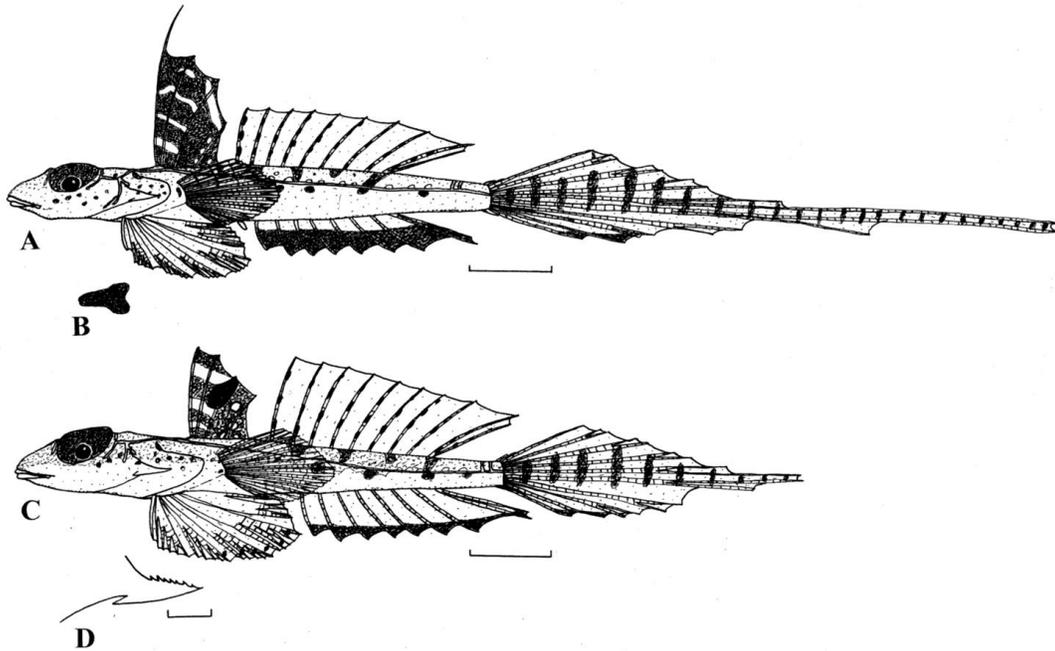


Figure 1. *Callionymus boucheti*. (A) NTUM 11332, holotype, male, 58.3 mm SL; Papua New Guinea, New Ireland Province, northwest of New Hanover. Lateral view, left side (scale=10 mm), (B) Black blotch on thorax, illustrated on the same level as it would be situated in Fig. 1A (scale=10 mm), (C) NTUM 11229, 1, paratype, female, 59.2 mm SL; Papua New Guinea, New Ireland Province, Kavieng District. Lateral view, left side (scale=10 mm) and (D) Left preopercular spine (scale=2 mm).

low, rugose bony protuberances. Body lateral-line system with few short branches. Urogenital papilla long in the male, not visible in the female.

First dorsal fin higher than second dorsal fin in the male, the first spine longest, bearing a filament; as high as second dorsal fin in female, without filaments. Second dorsal fin distally nearly straight, rays unbranched, the last divided at its base. Anal fin beginning on vertical through second membrane of second dorsal fin. Anal fin distally slightly convex; anal-fin rays unbranched, the last divided at its base. Pectoral fin reaching to base of fourth anal-fin membrane when adpressed. Pelvic fin reaching to base of second anal fin membrane when adpressed. Membrane connecting 5th pelvic-fin ray with pectoral fin base ending opposite ninth [ninth to tenth] pectoral-fin ray (counted from above). Caudal fin in male elongate, nearly symmetrical, without filaments; in the female also elongate but much shorter.

Colour immediately after collection: Head and body yellowish, light brown body pale, dorsally with narrow brown saddles and numerous white spots; sides of body with a row of brown spots. Snout yellow. Thorax in male holotype with a dark grey blotch which widens posteriorly, in female white; belly and lower sides of body white. Eye dark blue. First dorsal fin in the male holotype dark grey, with white lines, in the female with a large black blotch distally on third spine. Second dorsal fin yellow, with three small brown spots on each ray. Anal fin basally white, in male holotype distal half blackish, in female distal margin blackish. Caudal fin yellow, lower margin dark grey, in male holotype with up to 18-23 central vertical grey bands, in female with 8-11 such bands. Pelvic fin plain pale in the male holotype, in the female with a few distal grey spots. Pectoral fin pale, with a few very small brown spots in upper part.

Colour in preservative: Similar to fresh colouration, except that the yellowish colour fades to pale brown.

Sexual dimorphism: Males have an elongate urogenital papilla (not visible in females), a higher first dorsal fin with a filamentous first ray (without filaments in females), and a longer caudal fin.

Table 1. *Callionymus boucheti*, holotype and paratypes, Papua New Guinea, New Ireland: Meristic data (measurements in mm).

	NTUM 11332, holotype (male)	MNHN 2016-0005, NTUM 11192, 11487, 3 paratypes (males)	NTUM 11192, 11229 3 paratypes (females)
Standard length	58.3	40.9-53.6	44.6-59.2
Caudal-fin length	68.9	35.1-50.0	27.5-36.2
Predorsal(1) length	18.2	14.2-17.0	13.9-21.1
Predorsal(2) length	28.0	21.8-26.2	21.6-30.8
Preanal length	29.6	21.9-30.2	22.7-34.3
Prepelvic fin length	14.5	11.7-14.2	10.2-16.5
Prepectoral fin length	21.9	17.1-21.3	17.0-25.6
Length from tip of snout to end of preopercular spine	18.1	13.3-16.7	13.6-18.8
Head length	15.4	12.2-14.4	11.6-16.9
Body depth	6.2	4.5-4.9	4.4-6.4
Body width	9.6	7.3-10.3	8.1-12.2
Orbit diameter	5.7	4.1-5.6	4.7-6.4
Preorbital length	5.5	4.0-5.0	3.4-5.4
Bony interorbital	0.7	0.4-0.7	0.5-0.7
Caudal peduncle length	8.1	7.4-8.8	7.4-10.2
Caudal peduncle depth	2.7	2.0-2.4	2.1-2.9
Upper-jaw length	5.6	4.2-4.4	3.5-4.4
Urogenital papilla length	1.3	0.7-1.0	-
Length of left preopercular spine*	3.4	3.1-3.9	3.8-4.4
Length of 1st spine of first dorsal fin	20.4	9.4-15.8	6.9-10.9
Length of 2nd spine of first dorsal fin	14.0	7.1-8.2	6.3-10.4
Length of 3rd spine of first dorsal fin	11.8	6.1-7.2	5.6-8.1
Length of 4th spine of first dorsal fin	6.6	4.0-5.3	3.5-6.0
Length of 1st ray of second dorsal fin	7.3	7.2-10.0	7.8-10.9
Length of last ray of second dorsal fin	10.1	8.1-10.9	8.3-12.0
Length of 1st anal/fin ray	3.9	2.8-3.7	4.4-5.3
Length of last anal-fin ray	10.1	6.8-9.2	8.6-11.0
Pectoral-fin length (left side)	11.3	8.7-11.0	8.7-13.1
Length of pelvic-fin spine	4.0	3.0-3.2	2.7-5.2
Pelvic-fin length	16.1	11.9-15.2	14.3-18.8

*right spine in holotype

Distribution: The species is only known from northern New Ireland between northwest of New Hanover and off Kavieng (Figs. 2, 3). Adult specimens were collected at depths of 72-193 m; a subadult specimen was found at 6-10 m depth.

Etymology: This new species is named in honour of Philippe Bouchet (MNHN, Paris), appreciating the excellent organisation of numerous expeditions exploring the biodiversity of tropical seas, including the KAVIENG 2014 Expedition to New Ireland.

Comparisons: The new species is a member of the subgenus *Callionymus* (*Margaretichhys*) as defined above. It is similar to *C. australis* Fricke 1983 in bearing a filament on the first spine of the first dorsal fin, the male caudal fin extremely elongate, the female caudal fin moderately elongate, in having 5-7 small antrorse serrae on the dorsal margin of the preopercular spine, and some colour pattern details like spots in the suborbital region. The new species differs from *C. australis* in having the first dorsal fin membranes in the male much higher than the second dorsal fin (*vs.* slightly lower in *C. australis*), the absence of a black blotch dorsally on the pectoral-fin base (*vs.* black blotch present in both male and female *C. australis*), a total of 21-23 pectoral-fin rays (*vs.* 19-

Table 2. *Callionymus boucheti*, holotype and paratypes, Papua New Guinea, New Ireland: Selected proportions (given for the holotype first, followed by those of the paratypes, in square brackets) (SL=standard length).

	Proportion of SL	Proportion as percentage of SL
Caudal-fin length	0.8 [males 1.0-1.2; females 1.6-1.8]	118.2 [males: 82.6-101.7; females: 55.7-61.2]
Predorsal(1) length	3.2 [2.7-3.2]	31.2 [31.7-36.5]
Predorsal(2) length	2.1 [1.8-2.0]	48.0 [48.9-54.0]
Preanal length	2.0 [1.7-1.9]	50.8 [56.3-57.9]
Prepelvic fin length	4.0 [3.6-4.1]	24.9 [24.1-27.9]
Prepectoral fin length	2.7 [2.3-2.6]	37.6 [38.4-43.2]
Length from tip of snout to end of preopercular spine	3.2 [3.1-3.2]	31.0 [31.2-32.5]
Head length	3.8 [3.5-3.7]	26.4 [28.5-28.7]
Body depth	9.4 [8.6-11.4]	10.6 [8.8-11.6]
Body width	6.1 [4.8-6.0]	16.5 [16.7-20.6]
Orbit diameter	10.2 [9.2-10.0]	9.8 [10.0-10.8]
Preorbital length	10.6 [9.8-11.0]	9.4 [9.1-10.2]
Bony interorbital	83.3 [60.3-134.0]	1.2 [0.8-1.7]
Caudal peduncle length	7.2 [5.7-6.3]	13.9 [15.9-17.5]
Caudal peduncle depth	21.6 [20.4-24.3]	4.6 [4.1-4.9]
Upper-jaw length	10.4 [10.0-13.8]	9.6 [7.3-10.0]
Urogenital papilla length	44.8 [males: 42.2-58.4]	2.2 [males: 1.0-1.9]
Length of left preopercular spine*	17.1 [11.7-13.7]	5.8 [7.3-8.5]
Length of 1st spine of first dorsal fin	2.9 [males: 2.6-5.7; females: 5.4-5.8]	35.0 [males: 17.5-38.6; females: 17.2-18.4]
Length of 2nd spine of first dorsal fin	4.2 [males: 5.8-6.5; females: 5.7-6.0]	24.0 [males: 15.3-17.3; females: 16.7-17.6]
Length of 3rd spine of first dorsal fin	4.9 [males: 6.6-7.4; females: 7.0-7.4]	20.2 [males: 13.4-15.2; females: 13.6-14.3]
Length of 4th spine of first dorsal fin	8.8 [males: 10.0-10.1; females: 9.9-11.1]	11.3 [males: 9.9-10.0; females: 9.0-10.1]
Length of 1st ray of second dorsal fin	8.0 [males: 4.7-5.7; females: 5.4-5.7]	12.5 [males: 17.6-21.3; females: 17.4-18.4]
Length of last ray of second dorsal fin	5.8 [males: 4.7-5.0; females: 4.9-5.7]	17.2 [males: 19.8-21.1; females: 17.6-20.3]
Length of 1st anal-fin ray	14.9 [males: 11.4-15.3; females: 10.4-11.1]	6.7 [males: 6.5-8.8; females: 9.0-9.6]
Length of last anal-fin ray	5.8 [males: 5.8-6.2; females: 5.4-5.9]	17.3 [males: 16.1-17.3; females: 16.9-18.6]
Pectoral-fin length (left side)	5.2 [4.5-4.9]	19.4 [20.5-22.1]
Length of pelvic-fin spine	14.6 [11.4-16.8]	6.9 [6.0-8.8]
Pelvic-fin length	3.6 [3.2-3.5]	27.6 [28.4-31.8]

21 in *C. australis*), the plain pale male pelvic fin (*vs.* with groups of dark spots in *C. australis*), the distal two-thirds of the anal fin blackish in the male (*vs.* only distal one-fourth blackish in *C. australis*), and the caudal fin with 18-22 vertical grey streaks in the male (*vs.* with 13-18 vertical dark streaks in male *C. australis*). The new species is distinguished from *C. margaretae* by its longer caudal fin (*vs.* 0.8-1.2 in SL in *C. boucheti* n. sp., 1.3-1.0 in SL in *C. margaretae*), the first spine of the first dorsal fin not bearing a filament in the female (*vs.* filamentous in *C. margaretae*), the preopercular spine with 5-7 small antrorse serrae on its dorsal margin (*vs.* 3-6 serrae in *C. margaretae*), the absence of a dark blotch near the pectoral-fin base (*vs.* *C. margaretae* with a dark blotch), the border of the dark area on the anal fin straight (*vs.* oblique in *C. margaretae*, with the dark area

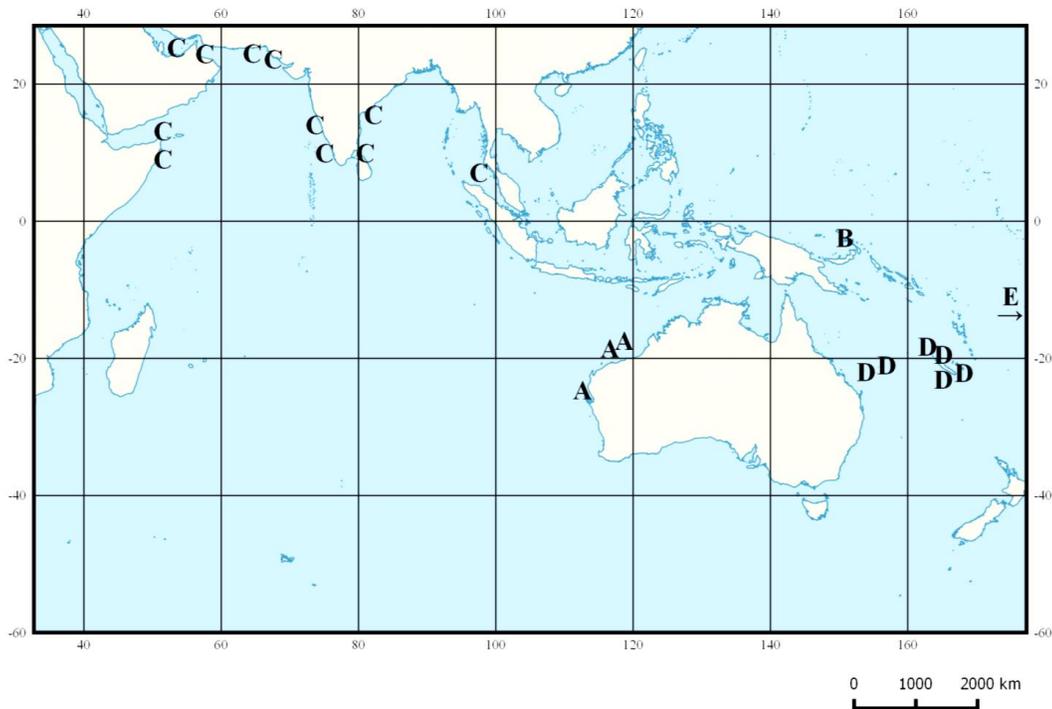


Figure 2. Geographical distribution of species in *Callionymus* (*Margaretichthys*) in the Indo-West Pacific. A: *Callionymus australis*, B: *Callionymus boucheti*, C: *Callionymus margaretae*, D: *Callionymus rivatoni* and E: *Callionymus sereti*.

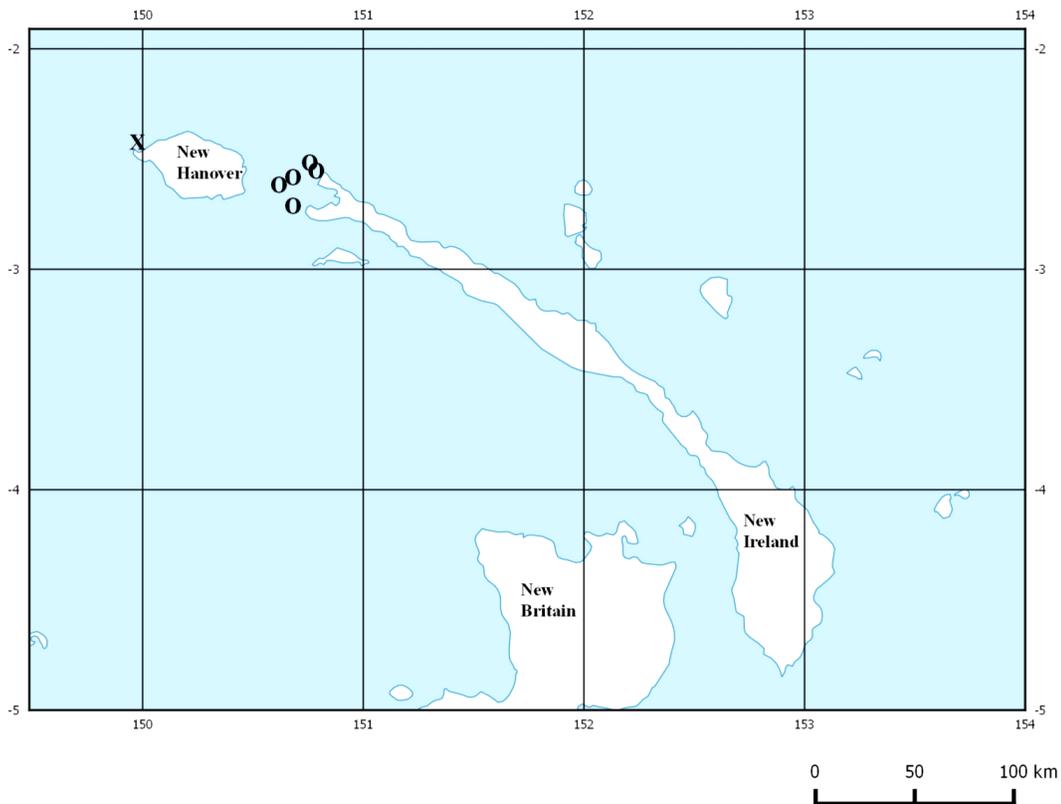


Figure 3. Western Pacific, Bismarck Archipelago, New Ireland (Papua New Guinea): distribution of *Callionymus boucheti* near northern New Ireland and New Hanover (X=Type locality, O=Other specimens).

anteriorly narrow and posteriorly wide), the second dorsal fin with a pale distal margin (*vs.* dark distal margin in *C. margaretae*), the male caudal fin with 18-22 vertical grey streaks (*vs.* with 6-10 vertical dark streaks in

C. margaretae), and the female caudal fin with 8-11 vertical grey streaks (*vs.* with 5-7 streaks in *C. margaretae*). It differs from *C. rivatoni* and *C. sereti* by the absence of a black blotch on the first dorsal fin of the male (*vs.* black blotch present distally around third spine in *C. rivatoni*), the caudal-fin length in males 1.0-1.2 in SL (*vs.* 1.5-1.6 in SL in *C. rivatoni*; 0.9 in SL in *C. sereti*), the caudal fin in male with 18-22 vertical streaks (*vs.* 8-12 in *C. rivatoni*; without streaks in *C. sereti*), the pectoral fin base without a dark spot (*vs.* dark spot present dorsally on pectoral-fin base in *C. rivatoni*), and a pale pelvic fin (*vs.* pelvic fin spotted in *C. rivatoni*). From other species of *Callionymus*, the new species is distinguished by the characters of the subgenus (see above).

Discussion

Adult specimens of the new species were collected at depths of 72-193 m; a subadult specimen was found at 6-10 m depth. This adult distribution ranges considerably deeper than that of most of the other species of the subgenus *Callionymus* (*Margaretichthys*), which were recorded from depth ranges down to 110 m (*C. rivatoni*), 107 m (*C. margaretae*) and 100 m (*C. australis*). Only *C. sereti* is known from deeper water at a minimum of 245 m depth. Apparently due to the deep occurrence, the orbit diameter tends to be larger than in the other species (orbit diameter 9.2-10.8 in SL; other species 9.4-13.3 in SL; *C. sereti*: 9.7 in SL).

Only a single species of the subgenus *Margaretichthys* is relatively widespread (*C. margaretae* in the northern Indian Ocean), while the other species occur in narrow, restricted distribution ranges. The typical habitat includes of soft bottom (mainly sand or gravel) on the deeper continental or insular shelf and upper slope (young specimens occurring shallower). Ecologically, all species either live in nutrient-rich oceanic habitats, either along the continental shelf or around high islands. The widespread species, *C. margaretae* is exclusively found in continental shelf waters. The species living around high islands, especially *C. boucheti* and *C. sereti*, are found in relatively deeper water than those along the continental shelf. Here, it is difficult to collect with trawls or dredges, so that the species may be more widespread than we know at present.

The new species is most similar to two species from the southwestern and South Pacific, species from New Caledonia (*C. rivatoni*) and Futuna (*C. sereti*). Deep sea barriers are separating the distribution ranges of these three species. Apparently, the larval dispersal is very limited in species of this subgenus, so that it is often impossible to cross the barrier to the next island group. This may be either due to a short pelagic stage, or to a stationary life of the larvae and postlarvae that prevents dispersal by ocean currents.

It seems interesting that species of the subgenus *Margaretichthys* are neither found in the high species diversity region nor its centre, i.e. the Indonesian/Philippine triangle (see Carpenter and Springer 2005). Here, the subgenus is apparently replaced by species of the subgenus 6 [subgenus 6 of Fricke 2002] (species related to *C. persicus*, especially *C. neptunius* and *C. superbus*). In Papua New Guinea, *C. (Margaretichthys) boucheti* is apparently restricted to the outer islands, while around the main island that is closely linked to the Indonesian/Philippine diversity centre it is apparently replaced by *C. zythros*, a member of subgenus 6 [subgenus 6 of Fricke 2002].

Subgenus *Margaretichthys* now comprises 5 species. Another species, *C. luridus* Fricke 1981 from Macclesfield Bank, South China Sea might also belong to this subgenus, but as the existing material was collected during the 19th century, fresh material is needed to detect the relevant characters. Unfortunately, recent expeditions to Macclesfield Bank by NTUM (Taipei) failed to collect additional specimens of this apparently very rare species.

In an alternative classification by Nakabo (1982), *C. boucheti* would be a member of the genus *Calliurichthys* Jordan & Fowler 1903. Here, *Calliurichthys* is treated as a subgenus of *Callionymus* (see introduction). The callionymid fish fauna of New Guinea now includes 30 species in 5 genera; 8 of these are known from New Ireland, including 4 endemic species (Fricke et al., in preparation).

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