



## *Callogobius williamsi*, a new species of goby (Teleostei: Gobiidae) from the Marquesas Islands, with notes on the status of all nominal *Callogobius* species

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### Abstract

*Callogobius williamsi* new species is described from the 32.9 mm SL holotype and 29 paratypes (6.9–32.5 mm SL) from the Marquesas Islands, South Pacific Ocean. *Callogobius williamsi* is distinguished from all other known *Callogobius* species by the following combination of characters: scales mostly cycloid, ctenoid scales, if present, restricted to the mid-lateral caudal peduncle, 23–26 (mode 25) scales in lateral series, preopercular papillae row (Row 20) absent, and the interorbital canal with pores B', D, and F' present. *Callogobius williamsi* belongs to a group of 23 nominal species (the *hasseltii* group) that are hypothesized to be monophyletic based on the shared presence of narrow and closely spaced dorsal processes of the cleithrum and an elongate caudal fin (greater than head length in specimens over 20 mm SL). Following the species description is a discussion of the status of all nominal species of *Callogobius* including a table that provides provisional status for all species correctly assigned to the genus.

**Key words:** Gobiiformes, French Polynesia, type specimens, taxonomy, systematics

### Introduction

The genus *Callogobius* Bleeker is notoriously challenging for taxonomists. Many species cannot be clearly distinguished by colouration and commonly used meristic characters. Moreover, *Callogobius* tend to have fragile skin and specimens are usually damaged during and after collection and preservation, making data collection difficult or impossible for many characters. To date, *Callogobius* has had no comprehensive treatment (Delventhal & Mooi 2013). There are about 47 nominal species (Fricke *et al.* 2022) and numerous undescribed species. The descriptions of new *Callogobius* species often take years due to the time and effort required to obtain adequate numbers of well-preserved specimens needed to clearly distinguish the new species from known taxa.

However, there are a few undescribed species with very distinctive morphology and/or limited geographic range. In 2013, Dr. Jeffrey Williams (formerly of the National Museum of Natural History) brought to the attention of the first author 25 specimens of a morphologically distinct species that he had collected and photographed from the Marquesas Islands in 2008 and 2011. Subsequently, we found five additional specimens at the Bishop Museum (Hawaii) amongst previous collections from the Marquesas Islands. To our knowledge, this species has not been collected in other areas of French Polynesia. In this paper, we describe this species as new.

### Material and Methods

Abbreviations for institutional codes follow Fricke & Eschmeyer (2022). Methods for morphometrics and meristics follow Delventhal & Mooi (2013) and Delventhal *et al.* (2016). Where possible, measurements and meristic data were taken from X-rays. Terminology for sensory pores follows Akihito & Meguro (1977). Descriptive names for pores and canals are modified from Takagi (1957) following Delventhal *et al.* (2016). Terminology and methods for

describing sensory papillae rows follow Delventhal & Mooi (2013), with the following exception: the preopercular row (Row 20) is described as present or absent following Akihito & Ikeda (2021) rather than continuous or discontinuous with the transverse opercular row (Row 21). All specimens >20 mm SL were used for morphometrics. All formalin-fixed specimens >15 mm SL were employed for meristics and pore/papillae row observations; bilateral counts were made, if possible.

***Callogobius williamsi* sp. nov.**

(Figs. 1–9, Table 1)

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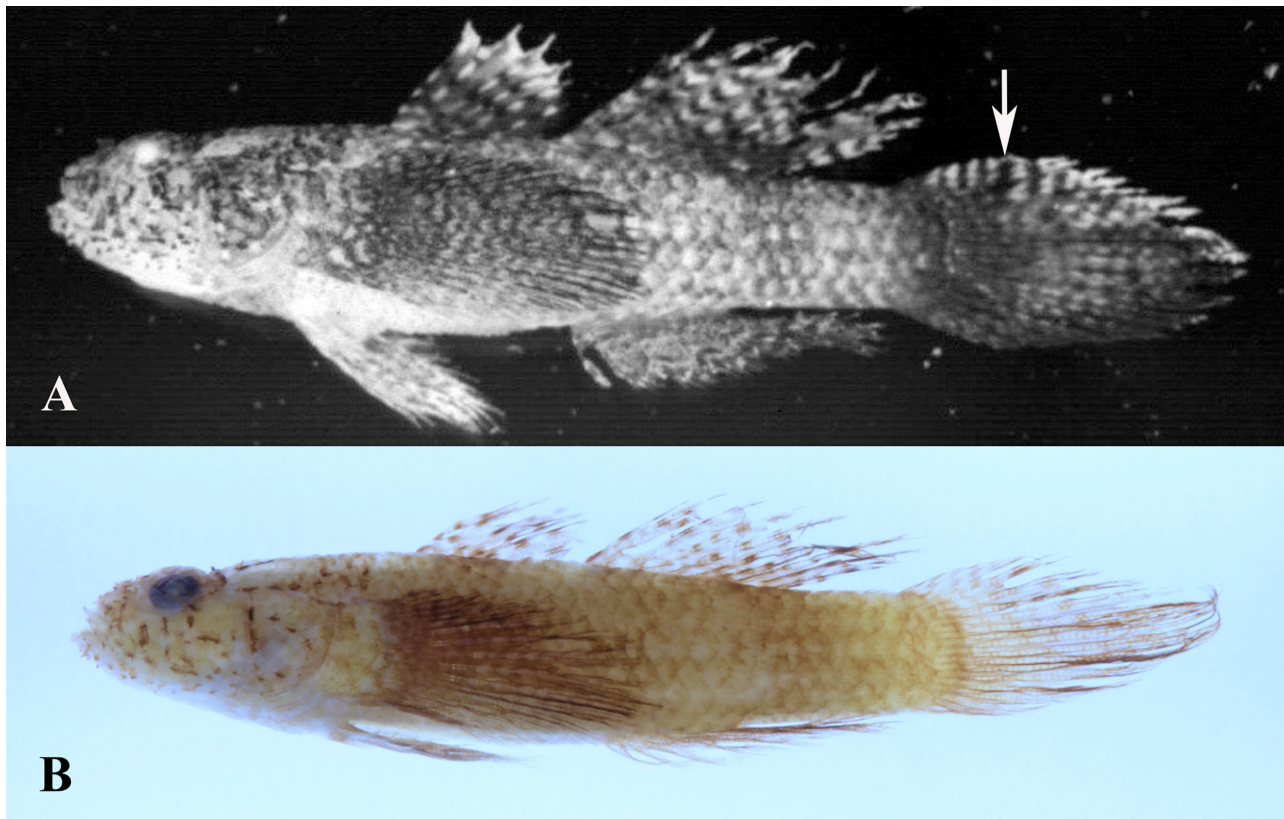
**Holotype.** USNM 409430, female, 32.9 mm SL, Marquesas, Fatu Hiva, Mahitoa point, on southwest side of island, on outer rock wall sloping to a flat rubble shelf at about 27 m, 10°32'04" S, 138°40'55" W, rotenone, depth 7–27 m, J.T. Williams, S. Planes, E. Delrieu-Trottin, P. Sasal & J. Mourier. 9 Nov. 2011, right pectoral fin removed for tissue sample, tissue voucher specimen number MARQ-430 (Fig. 1).



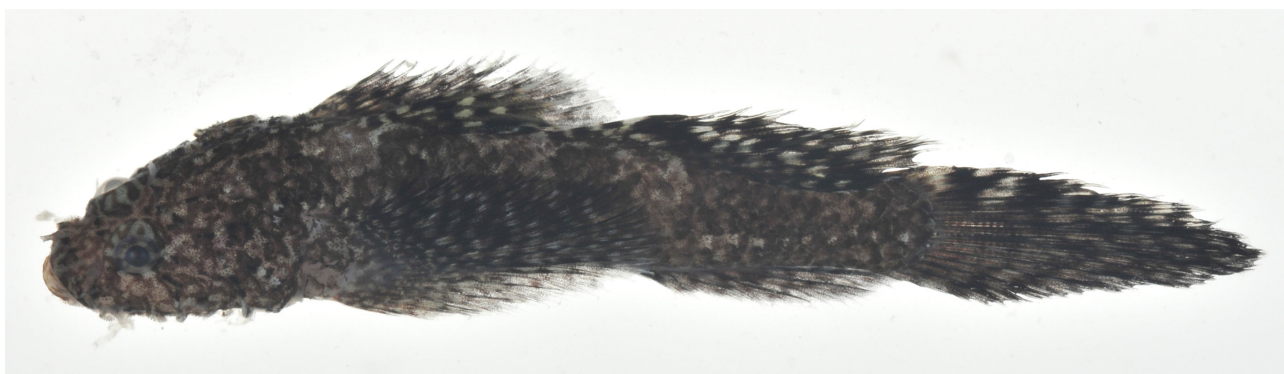
**FIGURE 1.** *Callogobius williamsi* sp. nov., holotype, USNM 409430, female, 32.9 mm SL, fresh colouration. The pale grey film behind the eyes and below the throat is mucus. Note that the right pectoral fin is prominently visible extending over the back of the specimen and should not be confused with the first dorsal fin, which is pressed against the back. A patch of scales is missing posterior to the origin of the second dorsal fin on the caudal peduncle, resulting in lighter colouration in that area. The darker area on the caudal fin, indicated by the arrow, partially blends into the brown pattern of the fin. Photo by J.T. Williams.

**Paratypes** (29 specimens, 6.9–32.5 mm SL). BPBM 12078, 4 specimens, 1 male, 21.9 mm SL (Figs. 2, 8), 3 females, 15.2–24.1 mm SL, Marquesas, Hiva Oa, Head of Tahauku Bay, rocky shore and black sand, rotenone, depth 0–3 feet, J. & H. Randall, G. & A. Haywood & D. Bryant, 25 Apr. 1971; BPBM 12752, female, 30.5 mm SL, Marquesas, Nuku Hiva, west side of Sentinelle de l'Est, rocky slope, no sand, quinaldine, depth 75 feet; J. Randall & D. Cannoy, 17 May 1971; USNM 409094, male, 31.5 mm SL, same collection data as USNM 412487, right pectoral fin removed for tissue sample, tissue voucher specimen number MARQ-094 (Fig. 3); USNM 409095, male, 30.9 mm SL, same collection data as USNM 412487, right pectoral fin removed for tissue sample, tissue voucher specimen number MARQ-095; USNM 410662, female, 25.5 mm SL, cleared and stained, same collection data as USNM 412487; USNM 411060, male, 21.9 mm SL, Marquesas, northwest side of Mohotane Island, in a tiny partially protected cove, with about 6 foot swell breaking on point; rock wall extending from near shore break to about 20 m, collection made at base of rock wall and on sand and rubble at base. 9°57'01" S, 138°49'55" W, rotenone, depth 6–20 meters, J.T. Williams & S. Planes, 15 Oct. 2008, EtOH fixed, right pectoral fin removed for tissue sample, tissue voucher specimen number MOH-129 (Fig. 4); USNM 411406, male, 32.5 mm SL, Marquesas, Hiva Oa, northeast end of island on north side of Cap Matafenua, sand and rubble flat at the base of a rock wall at about 28 m. 9°44'32" S, 138°48'32" W, rotenone, 3–30 meters, J.T. Williams, S. Planes, E. Delrieu-Trottin, P. Sasal, J. Mourier, 12 Nov. 2011; USNM 412009, juvenile, 11.5 mm SL, Marquesas, west coast of Mohotane Island, south of small bay in center of island, rocky point at south end of cove with about 8-foot swell, collection made along vertical rock wall and at base of rocky point in cave, 9°59'34" S, 138°50'13" W, rotenone, depth 6–25 meters, J.T.

Williams & S. Planes, 17 Oct. 2008; USNM 412081, female?, 16.7 mm SL, same collection data as USNM 412009, EtOH fixed, posterior 1/3 of specimen removed for tissue sample, tissue voucher specimen number MOH-211 (Fig. 5); USNM 412180, male?, 10.5 mm SL, same collection data as USNM 412009, EtOH fixed; USNM 412487, 16 specimens, 6.9–32.3 mm SL, 6 females (26.0 mm SL, Figs. 7, 9), 2 males (32.3 mm SL, Fig. 6), 8 juveniles, Marquesas, Nuku Hiva, Hatihou [Hatihe'u], 8°49'30" S, 140°03'50" W, rotenone, depth 3–6 meters, J.T. Williams, S. Planes, E. Delrieu-Trottin, P. Sasal, J. Mourier, M. Veuille, R. Galzin, T. Lison de Loma & G. Mou-Tham, 27 Oct. 2011.



**FIGURE 2.** *Callogobius williamsi* sp. nov., paratype, BPBM 12078, male, 21.9 mm SL: **A.** Fresh pattern from black and white photograph, arrow indicates dark area on anterodorsal portion of caudal fin. Photo by J.E. Randall; **B.** Preserved pattern after 50 years in isopropyl alcohol. Photo by R.D. Mooi.



**FIGURE 3.** *Callogobius williamsi*, sp. nov., paratype, USNM 409094, male, 31.5 mm SL, fresh colouration, dorsolateral view. The pale brown film at either side of the mouth is mucus. Note that the right pectoral fin is prominently visible extending over the back of the specimen and should not be confused with the first dorsal fin. Photo by J.T. Williams.



**FIGURE 4.** *Callogobius williamsi*, **sp. nov.**, paratype, USNM 411060, male, 21.9 mm SL, fresh colouration, with some superficial damage (missing scales and torn fin membranes). Note that the left pectoral fin extends dorsally over the back and should not be confused with the first dorsal fin. The black spot on the upper portion of the caudal fin indicated by the arrow. Photo by J.T. Williams.



**FIGURE 5.** *Callogobius williamsi* **sp. nov.**, paratype, USNM 412081, subadult, 16.7 mm SL, fresh colouration. Note that this is a dorsoventral view; the right pectoral fin extends dorsally and should not be confused with the first dorsal fin which is also discernible. Photo by J.T. Williams.

**Diagnosis.** *Callogobius williamsi* is distinguished from all other known *Callogobius* species by the following combination of characters: most or all scales cycloid, ctenoid scales (if present) restricted to mid-lateral region of caudal peduncle, 23–26 (usually 24 or 25) scales in lateral series; pelvic frenum present; preopercular papillae row (Row 20) absent; interorbital canal present with pair of pores B', single pore D, and pair of pores F'.

**Description.** Holotype values indicated by an asterisk. Parentheses enclose number of type specimens with the particular value, counts made on both sides when applicable or possible. Dorsal fin rays VI, I,9 (20\*); anal fin rays I,7 (20\*), I,6 (1); pectoral fin rays 17 (7\*), 18 (19), 19 (7); pelvic fin rays I,5 (44\*); segmented caudal fin rays i7+i7i (1), i8+i7i (18\*), 9+i8 (1); procurrent rays 4+i3 (12), 4+i4 (7\*); scales in lateral series 23 (4\*), 24 (13), 25 (14\*), 26 (3); predorsal scales 9 (1), 10 (8), 11 (9\*); transverse scales 9 (1), 10 (5\*), 11 (3); vertebral count 10+i16 (based on x-rays of 10\* adult specimens).

See Table 1 for selected morphometrics.

Scales large and deciduous, with distinctly outlined centres; most or all scales cycloid depending on individual; ctenoid scales, if present, usually only 2–3 on each side on mid-lateral region of caudal peduncle (Fig. 8). Ctenii, when present, roughly triangular and pointed (not elongate) in groups of 1–10. Scales present in spaces between papillae rows on cheeks, preoperculum, and operculum, on lateral side of pectoral-fin bases, prepelvic and predorsal regions, and belly.

Teeth (based on one cleared and stained specimen, USNM 410662, 25.5 mm SL female) conical and slender; outer teeth on upper jaw slightly enlarged and curved; several tightly packed irregular rows of inner teeth decrease in number and converge posteriorly. Outer teeth in lower jaw slightly enlarged anteriorly; rows converged into single row posteriorly. Tongue (based on USNM 410662) moderately slender with blunt tip.

**TABLE 1.** Selected morphometrics of the holotype and paratypes of *C. williamsi*; SL in mm, other values as percentage of standard length (SL) or head length (HL), as indicated, with the average and ranges provided in parentheses for the paratype series.

Sex	Holotype	Paratypes >20.0 mm SL
	F	6 M, 9 F
Standard length (SL)	32.9	20.0–32.5
Head length (% of SL)	30	32 (29–36)
Head depth (% of HL)	54	49 (45–54)
Head width (% of HL)	63	64 (54–73)
Interorbital width (% of HL)	6	6 (4–7)
Predorsal-fin distance (% of SL)	38	39 (38–41)
Preanal-fin distance (% of SL)	61	62 (60–64)
Prepelvic-fin distance (% of SL)	32	32 (28–34)
Pectoral-fin length (% of SL)	36	34 (32–39)
Pelvic-fin length (% of SL)	23	25 (24–28)
Caudal-fin length (% of SL)	32	36 (32–42)
Caudal-peduncle depth (% of SL)	13	13 (12–14)

Anterior nostril moderately wide tube, reaching almost to outer edge of upper lip; posterior nostril upright tube of equal or just slightly shorter length. Two specimens over 15.0 mm SL appear to be missing both nostrils on one side.

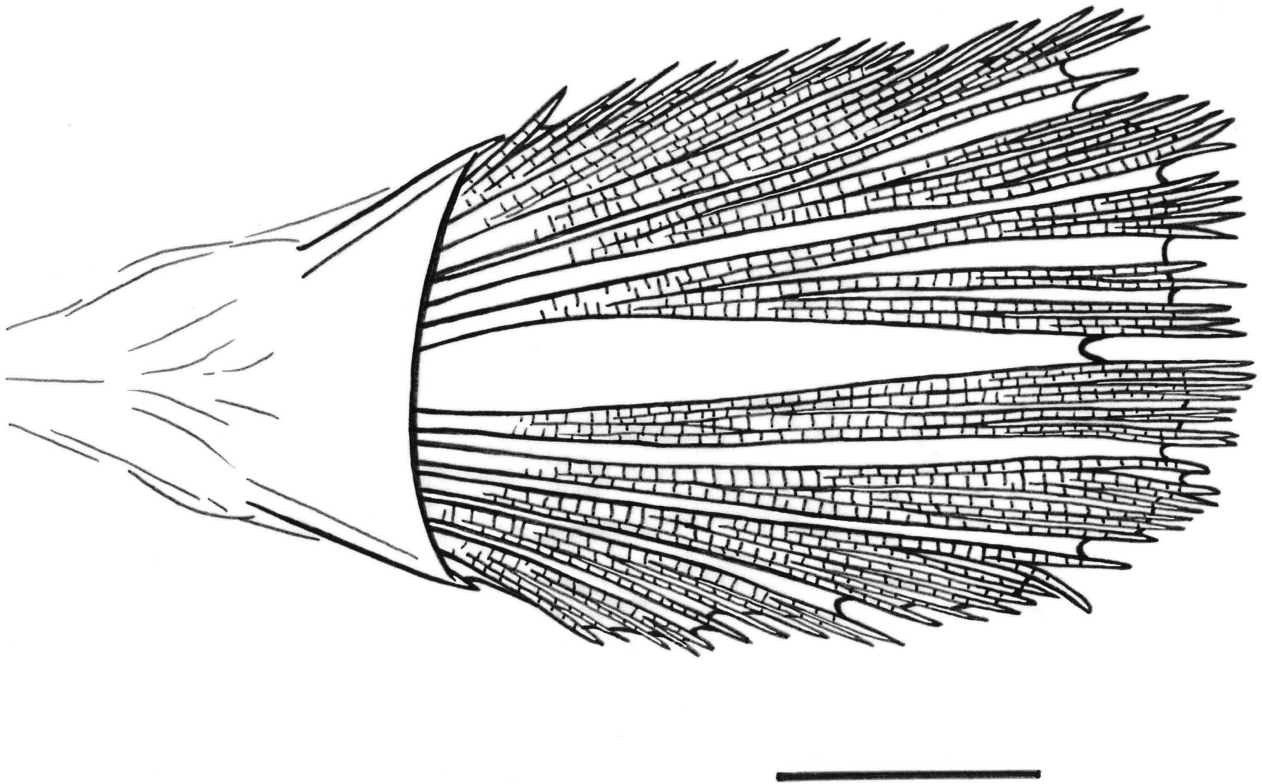
Pelvic fins fully united forming disc, connecting membrane delicate and damaged on most specimens. All segmented pelvic-fin rays branched. Pelvic frenum present (Fig. 6).

Urogenital papilla unpigmented in both sexes. Very long, slender in males; broad in females, without lateral projections (Fig. 7).

Head pores: The following pores normally present in specimens above 15.0 mm SL. Interorbital canal with only five pores present: pair of posterior nasal pores (B'), single posterior interorbital pore (D), pair of anterior otic pores (F'). All specimens lack posterior portion of interorbital canal, preopercular canal, and temporal canal. Unusually high number of irregular pore patterns, even in specimens over 15.0 mm SL; in 6 of 17 specimens, anterior otic pore appears absent on one side; one specimen apparently without either posterior nasal pore. Pores present on larger juveniles (8.6–11.5 mm SL), sometimes with incompletely developed canals; absent on smaller juveniles (4.8–6.5 mm SL).

Papillae row configuration (Fig. 9): Based on 17 specimens above 15.0 mm SL, observations recorded on each side where possible. Unusually high number of irregular papillae row patterns, most (at least 11 out of 17 specimens above 15.0 mm SL) with at least one irregularity, such as asymmetrical arrangements or rows with one or more breaks. Numbers of specimens observed with particular patterns are provided in parentheses; holotype values marked by an asterisk.

Postnasal rows (Row 2) separate and not joined across midline (16\*) or irregular (1). Anterior suborbital row (Row 9) does not reach eye (34\*) (space between row and eye about one-half length of row in most specimens); mid suborbital row (Row 10) does not reach eye (29) (space between row and eye more than one-sixth length of row) or nearly reaches eye (5\*) (space between row and eye less than one-sixth length of row). Posterior suborbital rows (Row 11) separate with dorsal segment extending posteriorly beyond ventral segment (33\*) or irregular (1). Longitudinal maxillary row (Row 14) unbroken (31\*) or broken and irregular (3), extending posteriorly below (but not beyond) transverse cheek row (Row 13), which is short. Longitudinal mandibular row (Row 15) unbroken (32\*) or broken and irregular (2). Approximately 11 (4\*), 12 (29\*), or 13 (1) transverse mandibular rows (Row 16) on each lower jaw; counts other than 12 unusual. Postorbital rows (Row 17) short and not joined, less than 3/4 length of distance from dorsal mid-line to bony edge of cranium (33\*) or irregular (1). Preopercular row (Row 20) absent (34\*).

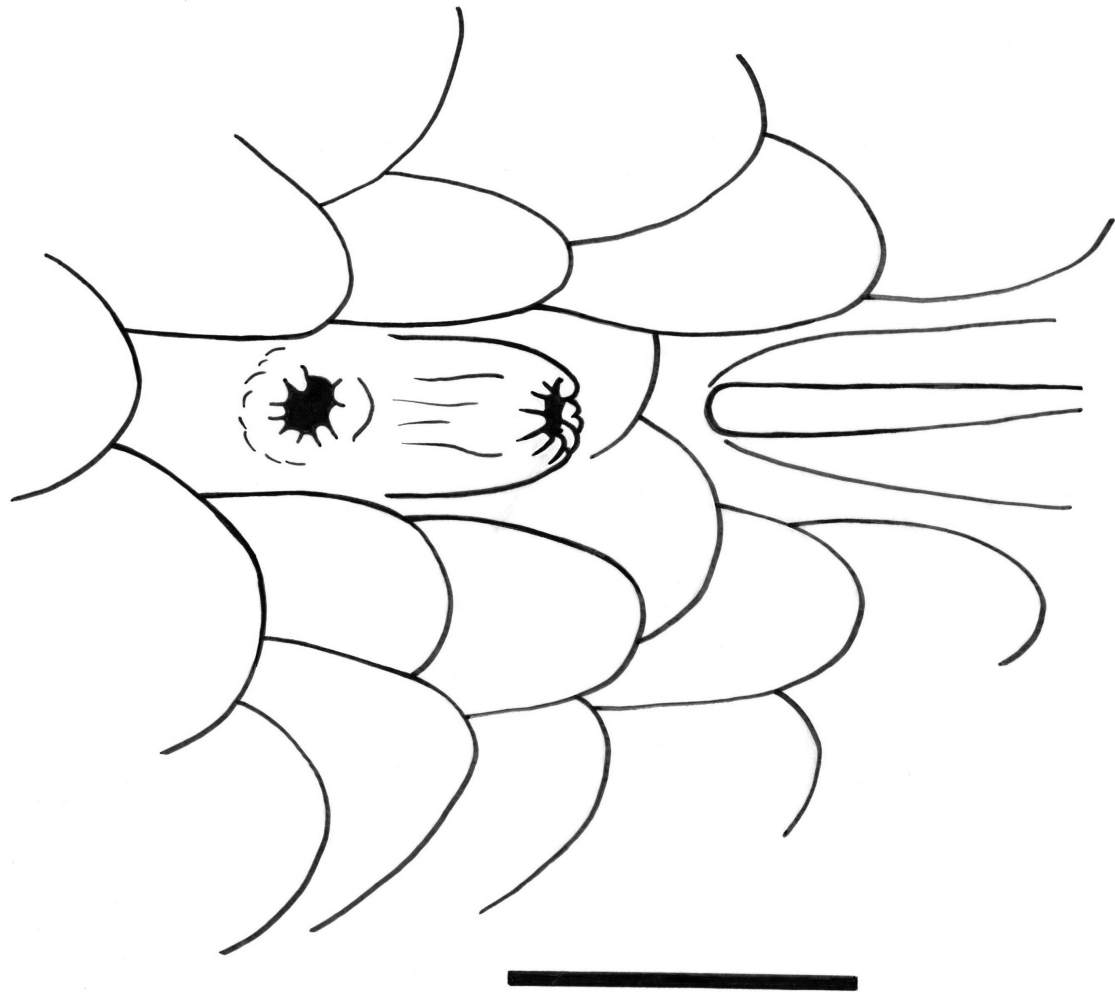


**FIGURE 6.** Ventral view of the pelvic fin of *Callogobius williamsi* sp. nov., paratype, USNM 412487, male, 32.3 mm SL. Scale bar = 2 mm. Illustration by R.D. Mooi.

Colour in preservative: Large specimens with intact scales and skin generally appear darkly mottled or speckled brown throughout head, body, and fins. Smaller specimens or those with missing scales may appear pale with mottling. General colour pattern consists of dark brown dorsal bars on lighter brown speckled body, but bars may blend into background colouration. Head markings poorly defined, consisting of wavy, reticulating patterns of dark and light brown. Ventral region of head lightly pigmented. Papillae rows more distinctly pigmented than surrounding regions. Dark bar (about 3–4 scales wide) extends dorsally over operculum and pectoral-fin base, towards first dorsal-fin spine. Dorsal bar (about 4 scales wide) extends below first dorsal fin; does not cross belly. Belly relatively pale. Narrow (about 2 scales wide), sometimes curved or irregular bar extends ventrally to mid-flank region below first 3–4 second dorsal-fin elements; Large irregular blotch present on each side anterior and ventral to bar. Wide, slanted bar (about 4–5 scales wide) extends below posterior portion of second dorsal fin to posterior edge of anal fin and around anterior portion of caudal peduncle; bar narrows ventrally. Narrower bar (about 3 scales wide) encircles posterior caudal peduncle, edge of hypural plate, and proximal regions of caudal fin. First dorsal fin dark with wavy horizontal lines and reticulations, lighter near spine tips. Second dorsal fin with broad wavy horizontal lines, blotches, and reticulations; very dark line starting at mid-upper anterior edge sloping posteroventrally. Caudal fin dark with wavy vertical markings, converging near upper anterior edge, sometimes appearing spot-like. Pectoral fins darkly mottled with wavy vertical markings. Pelvic and anal fins dark with fine speckles; posterior portion of anal fin with slanted wavy dark lines.

Fresh colouration: Similar to preserved specimens, with some specimens exhibiting yellowish pigment in lighter areas of fins, head, and body. Caudal markings often converging anterodorsally, sometimes creating caudal spot but often difficult to distinguish.

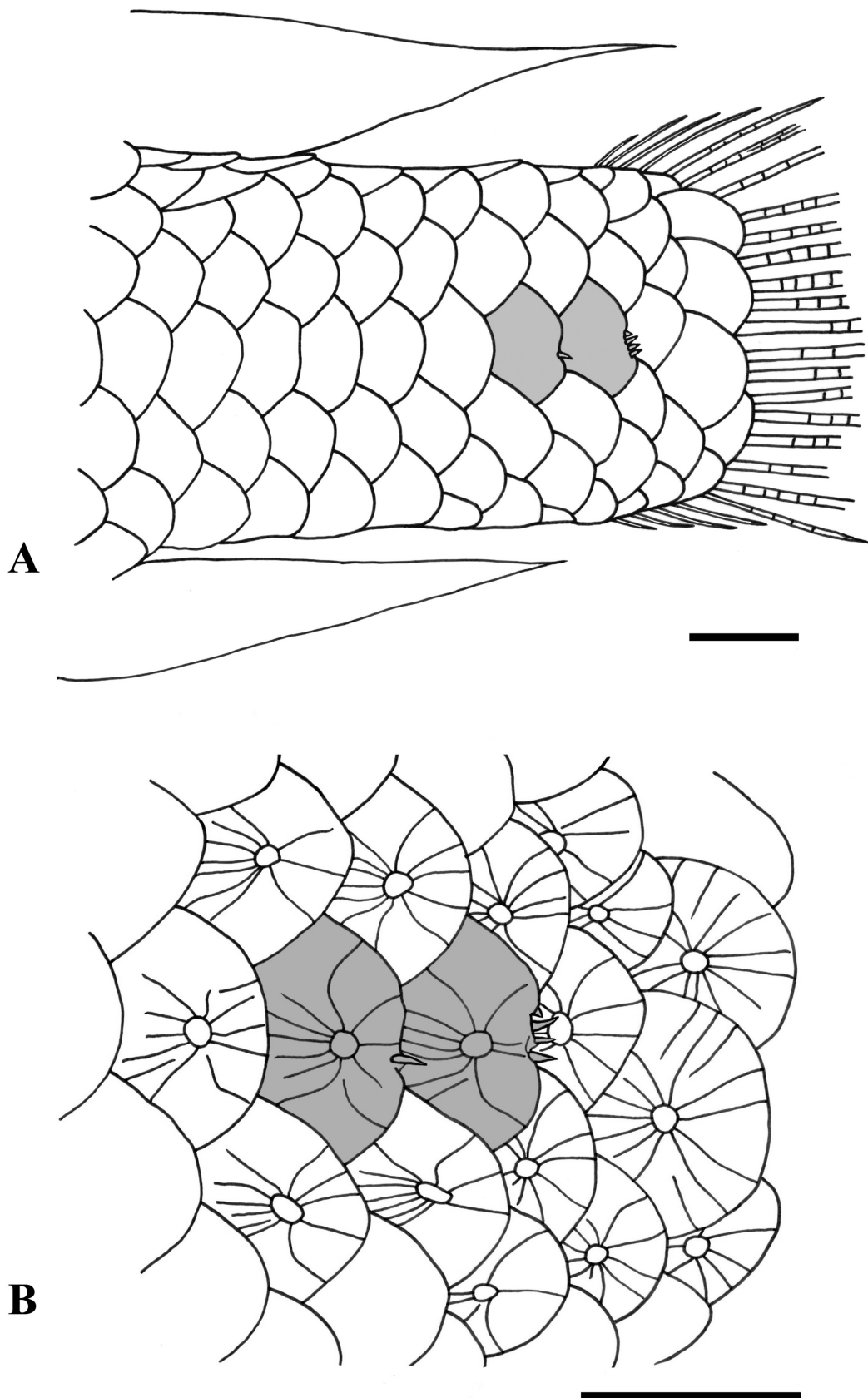
**Etymology.** Named in honour of Dr. Jeffrey Williams who collected the holotype and recognized it as a new species. Suggested vernacular name: Williams’s flapheaded goby.



**FIGURE 7.** Ventral view of the urogenital papilla of *Callogobius williamsi* sp. nov., paratype, USNM 412487, female, 26.0 mm SL. Scale bar = 1 mm. Illustration by R.D. Mooi.

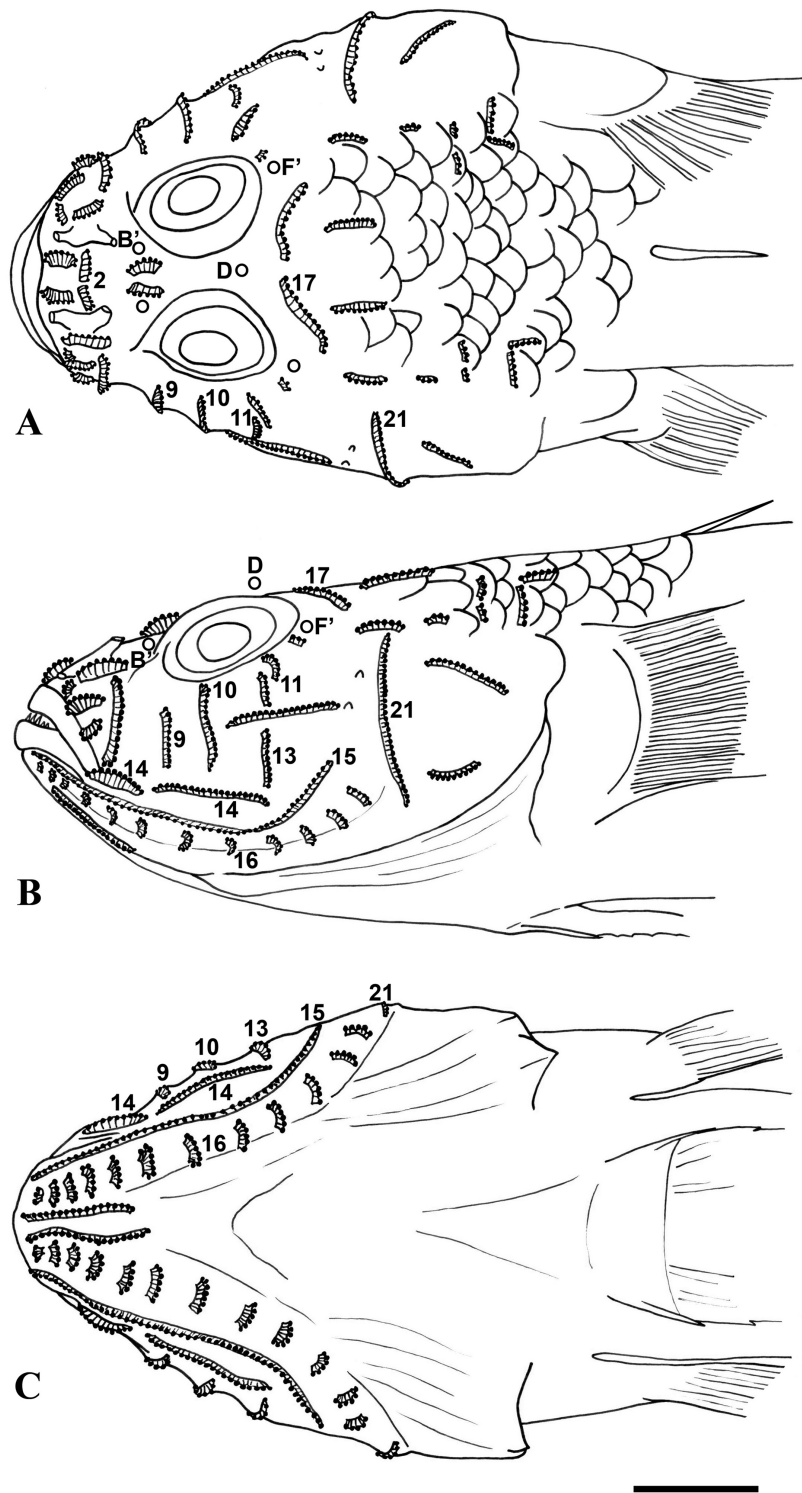
**Distribution and habitat.** Collected only from the Marquesas Islands, a region known for a high level of endemism (Randall & Earle 2000; Delrieu-Trottin *et al.* 2015). J. Williams (pers. comm.) collected this species in areas of dark grey to black rock walls, where water tends to be cooler due to upwelling. His team did not collect this species in sheltered coral reefs. J. Williams (pers. comm.) reports spreading rotenone along the rocky slope and on the sandy area at the base of the rocky slope or wall. The specimens would come out and drop onto the sandy area where divers would gather them.

**Comparisons.** At least two other species of *Callogobius* occur in French Polynesia, *Callogobius sclateri* (Steindachner, 1879) and a species provisionally identified as *C. maculipinnis* (Fowler, 1918) (awaiting a review of the *maculipinnis* species group; see Delventhal *et al.* 2016). *Callogobius williamsi* is distinguished from *C. sclateri* by its mostly dark body colour vs. distinct contrasting bars, a darker area or black spot present on the caudal fin (not always visible due to dark fin colouration) vs. black spot absent on the caudal fin, pelvic fins united with a frenum vs. separate without a frenum, preopercular row (Row 20) absent vs. present, few or no ctenoid scales present vs. ctenoid scales distributed over the posterior portion of the body, and caudal fin usually longer than head length vs. shorter than head length. *Callogobius williamsi* is distinguished from all species in the *C. maculipinnis* species group by a darker area or black spot present on the caudal fin (not always visible due to dark fin colouration) vs. black spot absent on the caudal fin, preopercular and temporal canals absent vs. preopercular and temporal canals present, chin with 11 or more transverse mandibular papillae rows (Row 16) vs. chin with 4 or fewer transverse mandibular papillae rows (Row 16), few or no ctenoid scales present vs. ctenoid scales distributed over the posterior portion of the body, and caudal fin usually longer than head length vs. shorter than head length in specimens > 20 mm SL. See species diagnosis for characters distinguishing *C. williamsi* from all other known species of *Callogobius*.



**FIGURE 8.** Distribution of ctenoid scales on the mid-lateral region of the caudal peduncle of *Callogobius williamsi* **sp. nov.**, paratype, BPBM 12078, male, 21.9 mm SL: **A.** General view, ctenoid scales in grey; **B.** Detailed view of scale morphology of the same specimen. Ctenoid scales shown in grey, scale architecture shown only for complete scales. Scale bars = 1 mm. Illustrations by R.D. Mooi.





**FIGURE 9.** Sensory pore and papillae pattern on the head of *Callogobius williamsi* **sp. nov.**, paratype, USNM 412487, female, 26.0 mm SL: **A.** Dorsal view. **B.** Lateral view. **C.** Ventral view. Letter abbreviations of sensory pores follow Akihito & Meguro (1977) and descriptive names are modified from Takagi (1957) following Delventhal *et al.* (2016). Papillae row numbering follows Akihito & Meguro (1977) and descriptive names are from Delventhal & Mooi (2013). Sensory pores: B' = posterior nasal; D = posterior interorbital; F' = anterior otic. Papillae rows: 2 = postnasal; 9 = anterior suborbital; 10 = mid suborbital; 11 = posterior suborbital; 13 = transverse cheek; 14 = longitudinal maxillary; 15 = longitudinal mandibular; 16 = transverse mandibular; 17 = postorbital; 21 = transverse opercular. Note: The longitudinal maxillary row (Row 14) is divided into two segments in this specimen; in most specimens of *C. williamsi*, this row is continuous. The majority of *C. williamsi* specimens we have examined have at least one papillae row with atypical arrangement. Scale bar = 2 mm. Illustrations by R.D. Mooi.

## Discussion

Delventhal & Mooi (2018) included *C. williamsi* (which they referred to as sp. 20) in a cladistic analysis of the intrarelationships of *Callogobius* using morphological characters. Their analysis supported the monophyly of a subgroup of species, which they referred to as the *hasseltii* group, based on the shared presence of an elongate caudal fin (greater than head length in specimens more than 20 mm SL) and narrow, closely-spaced dorsal processes of the cleithrum. In addition, all known species in the *hasseltii* group share 10 or more transverse mandibular rows (Row 16) on each side, lack the preopercular row (Row 20), and lack a temporal canal, although these characters are not unique to the *hasseltii* group and are found in some species of other *Callogobius* groups. A black spot on the caudal fin has only been observed in members of the *hasseltii* group, but it is not shared by all members. The *hasseltii* group is the most species-rich within *Callogobius*, and the most varied in terms of body size, body shape, and habitat. The following nominal species are included in the *hasseltii* group: *C. amikami* Goren, Miroz & Baranes, 1991, *C. andamanensis* Menon & Chatterjee, 1974, *C. badia* (Herre, 1935), *C. bothriorrhynchus* (Herzenstein, 1896), *C. clitellus* McKinney & Lachner, 1978a, *C. coelidotus* (Sauvage, 1880), *C. crassus* McKinney & Lachner, 1984, *C. depressus* (Ramsay & Ogilby, 1886), *C. dori* Goren, 1980, *C. falx* Fujiwara, Suzuki & Motomura, 2021, *C. gobiosoma* (Whitley, 1931), *C. hasseltii* (Bleeker, 1851), *C. hastatus* McKinney & Lachner, 1978a, *C. insolita* (Whitley, 1928), *C. mannarensis* Rangarajan, 1970, *C. moroana* (Seale, 1908), *C. mucosus* (Günther, 1872), *C. okinawae* (Snyder, 1908), *C. plumatus* (Smith, 1959), *C. productus* (Herre, 1927), *C. sheni* Chen, Chen & Fang, 2006, *C. stellatus* McKinney & Lachner, 1978b, *C. tanegasimae* (Snyder, 1908). Most undescribed *Callogobius* species will probably be placed in this group.

## Notes on the status of nominal *Callogobius*

During our ongoing research on the taxonomy and phylogenetics of *Callogobius*, we reviewed the literature and examined the majority of extant *Callogobius* type specimens to determine the status of each nominal species. In Table 2, we list species included in *Callogobius* by McKinney & Lachner (1978a) and all subsequently described species that are presently considered members of the genus by Fricke *et al.* (2022); nominal species are listed alphabetically by species name, but in the original combination with their initial generic assignment. When discussing *Callogobius* species names in the text of this section, we first refer to them using the original combination, but subsequently use their current generic assignment. Our general conclusion is that the majority of nominal species are likely distinct (and their names should not be considered junior synonyms) but we withhold formal redescription until additional material collected near the original type locality can be located and examined.

**TABLE 2.** Nominal species of *Callogobius*, their current or provisional classification, catalog numbers and status of type material (examined/not examined by the present authors, missing, or destroyed). All species marked as “Uncertain” under the “Current classification” column include in parentheses a possible senior synonym. However, it is probable that many of these uncertain species will prove to be valid with continued investigation.

Nominal species	Current classification	Type material
<i>Callogobius albipunctatus</i> Akihito & Ikeda 2021	<i>C. albipunctatus</i>	NSMT-P 132735 (examined)
<i>Callogobius amikami</i> Goren, Miroz & Baranes 1991	<i>C. amikami</i>	TAU P-10321 (examined)
<i>Callogobius andamanensis</i> Menon & Chatterjee 1974	<i>C. andamanensis</i>	ZSI F7105/2 (examined)
<i>Macgregorella badia</i> Herre 1935	Uncertain ( <i>C. hasseltii</i> )	FMNH 17373 (examined)
<i>Callogobius bauchotae</i> Goren 1979	Uncertain ( <i>C. maculipinnis</i> )	MNH 1976-0184 (examined)
<i>Mucogobius bifasciatus</i> Smith 1958	<i>C. bifasciatus</i>	SAIAB 235 (examined)
<i>Gobius bothriorrhynchus</i> Herzenstein 1896	Uncertain ( <i>C. hasseltii</i> )	ZIN 9684 (examined)
<i>Callogobius centrolepis</i> Weber 1909	<i>C. centrolepis</i>	ZMA 111745 (examined)
<i>Drombus clarki</i> Goren 1978	<i>C. clarki</i>	HUJ 10065 (examined)
<i>Callogobius clitellus</i> McKinney & Lachner 1978a	<i>C. clitellus</i>	USNM 209249 (examined)

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**TABLE 2.** (Continued)

Nominal species	Current classification	Type material
<i>Gobius coelidotus</i> Sauvage [ex Cuvier & Valenciennes] 1880	Uncertain ( <i>C. hasseltii</i> )	MNH 0000-2968 (examined)
<i>Callogobius crassus</i> McKinney & Lachner 1984	<i>C. crassus</i>	USNM 220088 (examined)
<i>Gobius depressus</i> Ramsay & Ogilby 1886	<i>C. depressus</i>	AMS B.9758 (examined)
<i>Callogobius dori</i> Goren 1980	<i>C. dori</i>	BMNH 1978.9.8.7 (examined)
<i>Callogobius dorsomaculatus</i> Akihito & Ikeda 2021	<i>C. dorsomaculatus</i>	NSMT-P 132738 (examined)
<i>Callogobius falx</i> Fujiwara, Suzuki & Motomura 2021	<i>C. falx</i>	OMNH-P 33597 (not examined)
<i>Mucogobius flavobrunneus</i> Smith 1958	<i>C. flavobrunneus</i>	SAIAB 211 (examined)
<i>Mucogobius gobiosoma</i> Whitley 1931	<i>C. mucosus</i> (see Hoese 2018)	AMS I.11480 (not examined)
<i>Eleotris hasseltii</i> Bleeker 1851	<i>C. hasseltii</i>	RMNH 1852 (examined)
<i>Callogobius hastatus</i> McKinney & Lachner 1978a	<i>C. hastatus</i>	USNM 216811 (examined)
<i>Gobiomorphus illotus</i> Herre 1927	Uncertain ( <i>C. sclateri</i> )	BSMP 11531 (destroyed)
<i>Gunnamatta insolita</i> Whitley 1928	<i>C. mucosus</i> (see Hoese 2018)	AMS IA.2517 (not examined)
<i>Macgregorella intonsa</i> Herre 1927	<i>C. okinawae</i>	BSMP 3575 (destroyed)
<i>Drombus irrasus</i> Smith 1959	Uncertain ( <i>C. maculipinnis</i> )	SAIAB 186 (examined)
<i>Intonsagobius kuderi</i> Herre 1943	Uncertain ( <i>C. maculipinnis</i> )	SU 36815 (examined)
<i>Drombus maculipinnis</i> Fowler 1918	<i>C. maculipinnis</i>	ANSP 47549 (examined)
<i>Callogobius mannarensis</i> Rangarajan 1970	<i>C. mannarensis</i>	CMFRI 102 (missing)
<i>Magregorella moroana</i> Seale 1910	Uncertain ( <i>C. hasseltii</i> )	BSMP 3575 (destroyed)
<i>Gobius mucosus</i> Günther 1872	<i>C. mucosus</i>	BMNH 1871.9.13.169 (examined)
<i>Callogobius nigromarginatus</i> Chen & Shao 2000	Uncertain ( <i>C. maculipinnis</i> )	ASIZP 057693 (missing)
<i>Doryptena okinawae</i> Snyder 1908	<i>C. okinawae</i>	USNM 62240 (examined)
<i>Callogobius pilosimentum</i> Delventhal, Mooi, Bogorodsky & Mal 2016	<i>C. pilosimentum</i>	SMF 35756 (examined)
<i>Drombus plumatus</i> Smith 1959	<i>C. plumatus</i>	SAIAB 208 (examined)
<i>Galera producta</i> Herre 1927	<i>C. productus</i>	BSMP 7417 (destroyed)
<i>Macgregorella santa</i> Herre 1935	<i>C. okinawae</i>	FMNH 17374 (examined)
<i>Eleotris sclateri</i> Steindachner 1879	<i>C. sclateri</i>	NMW 30901 (examined)
<i>Callogobius sheni</i> Chen, Chen & Fang 2006	<i>C. sheni</i>	MNNB P6980 (examined)
<i>Callogobius shunkan</i> Takagi 1957	<i>C. shunkan</i>	LFBKU (examined)
<i>Callogobius snelli</i> Koumans 1953a	Uncertain ( <i>C. maculipinnis</i> )	RMNH 20289 (examined)
<i>Doryptena snyderi</i> Fowler 1946	<i>C. okinawae</i>	ANSP 72078 (examined)
<i>Callogobius stellatus</i> McKinney & Lachner 1978b	<i>C. stellatus</i>	USNM 217429 (examined)
<i>Callogobius swifti</i> Allen, Erdmann & Brooks 2020	<i>C. swifti</i>	WAM P.35048 (not examined)
<i>Doryptena tanegasimae</i> Snyder 1908	<i>C. tanegasimae</i>	USNM 62241 (examined)
<i>Callogobius trifasciatus</i> Menon & Chatterjee 1976	Uncertain ( <i>C. flavobrunneus</i> )	ZSI F 7144/2 (examined)
<i>Drombus tutuilae</i> Jordan & Seale 1906	<i>C. tutuilae</i>	USNM 51770 (examined)
<i>Intonsagobius vanaclevei</i> Herre 1950	Uncertain ( <i>C. maculipinnis</i> )	USNM 202513 (examined)
<i>Callogobius winterbottomi</i> Delventhal & Mooi 2013	<i>C. winterbottomi</i>	ROM 58914 (examined)

The first described goby species to subsequently be placed in *Callogobius* is *Eleotris hasseltii* Bleeker, 1851 (type locality, Anjer, Java, Indonesia), based on one specimen (about 53 mm SL, calculated from Bleeker's description and drawing). The specimens considered to be syntypes (RMNH 1852) include three individuals (45.0 mm SL male, 41.7 mm female, 37.9 mm male) of the *C. hasseltii* species complex (see below); there is no evidence that they were

collected from the same locality and more than one species may be included (NRD, pers. obs). Fricke *et al.* (2022) also listed RMNH 6190 as possible types, but we are not aware of evidence for this. This lot of four specimens includes three species, including one specimen of *C. okinawae* (36.6 mm SL, male), two of the *C. hasseltii* species complex (38.5 mm SL female, 38.5 mm SL male) and an unidentifiable *Callogobius* (45.6 mm SL female) (NRD, pers. obs.). Only the largest specimen of either lot can be considered likely candidates for the holotype, but the specimen of RMNH 1852 has its mouth open in the position as shown in the original illustration (Bleeker 1851: fig. 13) and its morphometrics more closely match those of the drawing, taking shrinkage into account (about 15%). Examination of additional material suggests that what has been identified as *C. hasseltii* is a complex of several widespread, similar-looking species that may also differ regionally. We therefore choose to withhold a redescription of this species, awaiting access to more material collected in the vicinity of the type locality.

The holotype and only specimen of *Gobius bothriorrhynchus* Herzenstein, 1896 (type locality, Philippines) appears similar to at least one species of the presumed *C. hasseltii* syntypes; however, the condition of the specimen (like many other older *Callogobius* specimens) is poor and it is difficult to determine with confidence. We consider the status of *C. bothriorrhynchus* uncertain and will revisit it as more material becomes available. Koumans (1940) examined the holotype of *Macgregorella moroana* Seale, 1910 (type locality, Jolo, Jolo Island, Sulu Province, Philippines) and considered it a synonym of *C. hasseltii*; it was subsequently destroyed. We consider its status uncertain. Likewise, the types of *Macgregorella badia* Herre, 1935 (type locality, Ovalau Island, Fiji) and *Gobius coelidotus* Sauvage, 1880 (type locality, Java, Indonesia) appear to be specimens of a *hasseltii*-like species and these names have been considered synonyms of *C. hasseltii* (Akihito & Meguro, 1975), but we consider their status uncertain. The holotype of *C. coelidotus* is consistent in meristics and other discernible characters with *C. hasseltii*, and both were collected from Java. However, multiple distinct *hasseltii*-like species have been found in other regions, so we prefer to withhold synonymization of *C. coelidotus* until *C. hasseltii* is formally redescribed, preferably with the inclusion of fresh specimens from near the type localities.

The holotype of *Eleotris sclateri* Steindachner, 1879 (type locality, Society Islands, French Polynesia) is in remarkably good condition considering its age. *Drombus tutuilae* Jordan & Seale, 1906 (type locality, Pago Pago, American Samoa) was previously considered a synonym of *C. sclateri* by Koumans (1953b) and by McKinney & Lachner (1984). The holotype (USNM 51770) is small and in very poor condition, but Delventhal & Mooi (2013) were able to demonstrate that it differs from *C. sclateri* and represents a distinct species. It appears to be part of a poorly defined species complex that also includes *C. centrolepis* Weber, 1909 (type locality, Tandjong Lajar, Bawean Island, Sulawesi, Indonesia). Examination of the type of *C. centrolepis* (ZMA 111745) suggests that it is most likely distinct, although we have not been able to rule out that it is a synonym of *C. tutuilae* (because of the poor condition of both specimens). Several possible undescribed species similar to *C. tutuilae* and *C. centrolepis* exist; they are usually relatively small, easily damaged, sparsely collected and often lack clearly distinguishing characteristics (NRD, pers. obs.).

*Doryptena okinawae* Snyder, 1908 (type locality, Naha, Okinawa Island, Japan) represents a distinctively shaped and coloured species, easily distinguished from other *Callogobius* species by the papillae pattern. The types of *Macgregorella intonsa* Herre, 1927 (type locality, near Saub, Cotabato Province, Mindanao, Philippines) were destroyed; Koumans (1940) considered it a synonym of *C. hasseltii*, but we follow Akihito & Meguro (1975) in recognizing this species as a synonym of *C. okinawae* based on the illustration and description. *Macgregorella santa* Herre, 1935 (type locality, Hog Harbor, Espiritu Santo Island, Vanuatu) has been considered a synonym of *C. okinawae* by Akihito & Meguro (1975) and others; we have examined the holotype (FMNH 17374) and agree with their assessment.

*Callogobius trifasciatus* Menon & Chatterjee, 1976 (type locality, Mayabunder, Middle Andaman Island, Andaman Islands) was synonymised with *Mucogobius flavobrunneus* Smith, 1958 (type locality, Pinda, Mozambique) by McKinney & Lachner (1984). However, specimens identified as *C. flavobrunneus* differ in colour pattern throughout their range, so we consider this synonymy tentative, pending further investigation. According to Central Marine Fisheries Research Institute (CMFRI) staff, the type material of *Callogobius mannarensis* Rangarajan, 1970 (type locality, Vedalai, Gulf of Mannar, India) was not available for examination during NRD's 2007 visit to India and is presumed missing. However, the distinctiveness of this species is well corroborated, based on the description and non-type material.

The holotype of *Galera producta* Herre, 1927 (type locality, Puerto Galera, Mindoro, Philippines) was destroyed in World War II (Fricke & Eschmeyer 2022) but examined by Koumans (1940: 183, 208). He recognized it as a

*Callogobius* and corrected the species epithet to agree in gender to be *C. productus* (Herre). It was considered a synonym of the Japanese species *C. tanegasimae* (Snyder, 1908) by Chen *et al.* (1996) and Kottelat (2013), but is presently considered valid as *C. producta*. We have found that *tanegasimae*-like *Callogobius* are variable geographically; we infer that the Philippine specimens are distinct and tentatively recognize this Herre species valid as *C. productus*.

We have not examined the types of *Gunnamatta insolita* Whitley, 1928 (type locality, Port Hacking, New South Wales, Australia) or *Mucogobius gobiosoma* Whitley, 1931 (type localities, Albany District and Fremantle, Western Australia; incorrectly listed as Port Jackson, New South Wales, Australia in Fricke *et al.* [2022]). Hoese & Larson (1994) and Hoese & Larson (2006) considered *G. insolita* a synonym of *Gobius depressus* Ramsay & Ogilby, 1886 (type locality, Port Jackson, Sydney, New South Wales, Australia) and *M. gobiosoma* a synonym of *Gobius mucosus* Günther, 1872 (type locality, Adelaide, South Australia). However, Hoese (2018) determined both of these Whitley species, *Gunnamatta insolita* and *Mucogobius gobiosoma*, to be synonyms of *C. mucosus*.

Delventhal *et al.* (2016) discussed the status of *maculipinnis*-like nominal species: *Callogobius bauchotae* Goren, 1979 (type locality, Eniwetak Island, Marshall Islands), *Drombus irrasus* Smith, 1959 (type locality, Conant Reef, Mahé, Seychelles), *Intonsagobius kuderer* Herre, 1943 (type locality, Jolo, Sulu Province, Philippines), *Drombus maculipinnis* Fowler, 1918 (type locality, Philippines), *C. nigromarginatus* Chen & Shao, 2000 (type locality, Keehui, Taitung County, Taiwan), *C. shunkan* Takagi, 1957 (type locality, Matsugaura, Chiran, Kagoshima Prefecture, Japan), *C. snelli* Koumans, 1953a (type locality, Morotai Island, Molucca Islands, Indonesia) and *Intonsagobius vancheve* Herre, 1950 (type locality, Dumaguete, Negros Oriental, Philippines). They described a new species, *C. pilosimentum* Delventhal, Mooi, Bogorodsky & Mal, 2016 (type locality, Farasan Island, Saudi Arabia). They suggested that a substantial number (possibly most) of these species will be demonstrated to be distinct following additional investigation. Such an investigation will be challenging, however, due to the continuous variation of some external characters within this species complex and the fragile nature of most specimens. Two described species within this complex are readily distinguished from the others; *C. pilosimentum* which has a characteristic papillae pattern on the chin (normally 4, rather than 3 transverse mandibular rows [Row 16] on each side) (Delventhal *et al.* 2016), and *C. shunkan* which differs slightly in body shape, colouration, and meristics. *Callogobius shunkan* is currently being redescribed by colleagues at the Biological Laboratory of the Imperial Palace (BLIP).

In addition to the species already discussed, we recognize the following to be distinct species of *Callogobius* with no synonyms: *Callogobius albipunctatus* Akihito & Ikeda, 2021 (type locality, Agonoura, Zamami-jima, Okinawa Prefecture, Japan), *Callogobius amikami* Goren, Miroz & Baranes, 1991 (type locality, Eilat, Israel), *Callogobius andamanensis* Menon & Chatterjee, 1974 (type locality, Curlow Island, Middle Andaman Island, Andaman Islands), *Mucogobius bifasciatus* Smith, 1958 (type locality, Pemba Island, Tanzania), *Drombus clarki* Goren, 1978 (type locality, El-Tor, Sinai, Egypt), *Callogobius clitellus* McKinney & Lachner, 1978a (type locality, Krankett Island, Madang Harbor, Papua New Guinea), *Callogobius crassus* McKinney & Lachner, 1984 (type locality, Massas Island, Papua New Guinea), *Callogobius dori* Goren, 1980 (type locality, Suakin, Red Sea State, Sudan), *Callogobius dorsomaculatus* Akihito & Ikeda, 2021 (type locality, Agonoura Bay, Zamami-jima, Okinawa Prefecture, Japan), *Callogobius falx* Fujiwara, Suzuki & Motomura, 2021 (type locality, Naura Bay, Ishigaki Island, Yaeyama Islands, Okinawa Prefecture, Japan), *Callogobius hastatus* McKinney & Lachner, 1978a (type locality, Koror Island, Palau), *Drombus plumatus* Smith, 1959 (type locality, Cape Delgado, Mozambique), *Callogobius sheni* Chen, Chen & Fang, 2006 (type locality, Yu-Fu Tsun, Liu-Chiu Shiang, Shiao-Liu-Chiu Island, Pingtung County, Taiwan), *Callogobius stellatus* McKinney & Lachner, 1978b (type locality, Flores Island, Indonesia), *Callogobius swifti* Allen, Erdmann & Brooks, 2020 (type locality, Lawadi Village, Milne Bay Province, Papua New Guinea), *Doryptena tanegasimae* Snyder, 1908 (type locality, Tanegashima, Osumi Islands, Japan) and *Callogobius winterbottomi* Delventhal & Mooi, 2013 (type locality, Moheli Bay, Comoro Islands).

McKinney & Lachner (1978a) listed five species originally placed in *Callogobius* that lacked the distinctive pattern of sensory papillae ridges. *Callogobius atratus* Griffin, 1933 (type locality, Cable Bay, Mangonui County, New Zealand) was provisionally placed in *Gobiopsis* by Lachner & McKinney (1979) based on what they viewed as similarities in body shape and sensory system. We examined the osteology of this species and found no evidence of a relationship between this species and species of *Gobiopsis sensu stricto*. However, we were unable to find evidence suggesting another generic placement, so we provisionally retain this species in *Gobiopsis* awaiting additional phylogenetic study of *Gobiopsis* and possible related genera. *Callogobius melanoptera* Visweswara Rao, 1971 (type

locality, Godavari Estuary, India) was moved to *Egglestonichthys* by Larson & Hoese (1997). *Callogobius seshaiyai* Jacob & Rangarajan, 1960 (type locality, Porto Novo, India) appears to be a species of *Mangarinus* Herre, based on examination of the types (NRD, pers. obs.; D. Hoese, unpubl.); there are several undescribed species of *Mangarinus* in Southeast Asia, and the genus requires revision. *Callogobius liolepis* Bleeker in Koumans, 1931 (type locality, Ambon, Molucca Islands, Indonesia) is likewise not a species of *Callogobius*, but rather a senior synonym of *Gobiopsis aporia* Lachner & McKinney 1978 (Delventhal & Mooi 2014). *Callogobius ocellatus* Herre, 1935 (type locality, Ovalau Island, Fiji) is a synonym of *Cryptocentrus strigiliceps* (Jordan & Seale, 1906) (Hoese 2019).

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