Zootaxa 5738 (1): 115–126
https://www.mapress.com/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

https://doi.org/10.11646/zootaxa.5738.1.15
http://zoobank.org/urn:lsid:zoobank.org:pub:CB2E6F9C-4402-4B17-AB77-623F264D9353

New records of two flap-headed gobies of genus *Callogobius* (Gobiiformes: Gobiidae) from Taiwan with an updated artificial key of Taiwanese congeners

HSIEN-EN LI [1] & I-SHIUNG CHEN[1,2*]
[1]*Institute of Marine Biology, National Taiwan Ocean University, Keelung, 202301, Taiwan, R.O.C.*
[2]*Center for Excellence of the Oceans, National Taiwan Ocean University, Keelung, 202301, Taiwan, R.O.C.*
seanlee22@hotmail.com; https://orcid.org/0000-0002-5964-3292
**Corresponding author: iscfish@gmail.com; https://orcid.org/0000-0002-4190-7720*

Abstract

Herein, we give vouchered new records upon two *Callogobius* from Taiwan; they are *C. shunkan* Takagi, 1957 and *C. stellatus* McKinney & Lachner 1978b. These records represent the southward and northward extension of the species' previous geographical distribution, respectively. Detailed descriptions of their morphology, sensory canal and papillae patterns, and fresh colorations are given, and an artificial dichotomous key to all 11 *Callogobius* species is also provided to aid in related research.

Key words: Species distribution, *Callogobius*, Gobiidae, new record, Taiwan

Introduction

The genus *Callogobius* Bleeker, 1874 is a tropical marine teleost belonging to the diverse family of Gobiidae, distributed in mostly marine, rarely brackish habitats of the Indo-Pacific region. For the generic diversity, there were over 40 nominal species of *Callogobius* described (Fricke *et al.* 2025), and quite possibly there are more undescribed ones that require intensive survey and research to unveil (Delventhal & Mooi 2023; Li & Chen 2024). With its members' often cryptic and nocturnal behaviours and fragile, vulnerable preserved specimens, the taxonomy of this genus is rather difficult and always considered as a challenge (Delventhal *&* Mooi 2013), requiring extensive effort to resolve related taxonomy problems.

After years of SCUBA surveys targeting the coastal coral reef ichthyofauna, we've recorded 9 species of *Callogobius* from surrounding waters of Taiwan, *viz. C. hasseltii* (Bleeker, 1851), *C. sclateri* (Steindachner, 1879), *C. okinawae* (Snyder, 1908), *C. tanegasimae* (Snyder, 1908), *C. flavobrunneus* (Smith, 1958), *C. clitellus* McKinney & Lachner, 1978a, *C. nigromarginatus* Chen & Shao, 2000, *C. sheni* Chen, Chen & Fang, 2006, and *C. aquilus* Li & Chen, 2024, a recently described new species obtained from southeastern Taiwan. Except for the estuarine species *C. tanegasimae*, all recorded *Callogobius* species inhabit shallow, warm coralline waters around Taiwan.

In this paper, we officially report specimen-vouchered new records of two *Callogobius* species that we came across during recent surveys: they were *C. shunkan* Takagi, 1957 and *C. stellatus* McKinney & Lachner, 1978b. Interestingly, these records both represent the geographical extensions of their own previous records. Additionally, we provide an updated artificial diagnostic key to nominal *Callogobius* species distributed in Taiwanese waters as a reference to future studies in related fields.

Materials and Methods

Samples examined were collected with hand nets during SCUBA diving sessions, all collected specimens were immediately fixed in 10% formalin after the right pectoral fin being clipped off for future applications in phylogenetic research, then photographed to record freshest colorations post-mortem. Specimens were then preserved in 75%

Accepted by S.-C. Wang: 25 Nov. 2025; published: 30 Dec. 2025

EtOH for long term storage. Measurements of every collected individual were done by electronic callipers and scales to the nearest 0.01mm following the methods of Li and Chen (2024), osteological characters were observed with radiographs and identified following Birdsong *et al.* (1988), naming system for cephalic sensory papillae and pore system followed Sanzo (1911) and Wongrat and Miller (1991). Abbreviations for meristic characters shown as follows: D, dorsal fin elements; D1, first dorsal fin elements; D2, second dorsal fin elements; A, anal fin elements; P1, pectoral fin elements; P2, pelvic fin elements; LR, longitudinal scale rows; TR, transverse scale rows; D-P, scale rows between D1 origin and upper P_1 base; Pred, predorsal scales; V, vertebral counts; P-V, dorsal pterygiophore formula. SL, standard length.

Comparative materials

Callogobius nigromarginatus: NTOUP2007-12-201, 1, 46.7 mm SL, Wanlitong, Hengchun Township, Pingtung County; coll. I-Shiung Chen *et al.*, 9 Aug. 2006. NTOUP2007-07-066, 1, 25.6 mm SL, Kihaw Fishing Port, Chenggong Township, Taitung County; coll. I-Shiung Chen *et al.*, 18 Aug. 2006. NTOUP2020-07-020, 1, 21.7 mm SL, Longdong Bay, Gongliao District, New Taipei City; coll. Hsien-En Li & Tonisman Harefa, 13 Jul. 2020. NTOUP2021-02-039, 2, 19.3–39.0 mm SL, Kihaw Fishing Port, Chenggong Township, Taitung County; coll. Tonisman Harefa *et al.*, 24 Feb. 2021. NTOUP2021-08-004, 1, 28.1 mm SL, Mao'ao Bay, Gongliao District, New Taipei City; coll. Hsien-En Li *et al.*, 3 Aug. 2021. NTOUP2021-09-026, 3, 34.6–35.5 mm SL, Kihaw Fishing Port, Chenggong Township, Taitung County; coll. Hsien-En Li *et al.*, 24 Sep. 2021. NTOUP2021-09-023, 1, 34.6 mm SL, Xiaogang Fishing Port, Chenggong Township, Taitung County; coll. Hsien-En Li *et al.*, 24 Sep. 2021. NTOUP2021-09-029, 2, 37.7–41.2 mm SL, Kihaw Fishing Port, Chenggong Township, Taitung County; coll. Hsien-En Li *et al.*, 25 Sep. 2021. NTOUP2021-11-004, 3, 30.3–36.2 mm SL, Kihaw Fishing Port, Chenggong Township, Taitung County; coll. Tonisman Harefa *et al.*, 4 Nov. 2021. NTOUP2021-11-005, 1, 44.2 mm SL, Kihaw Fishing Port, Chenggong Township, Taitung County; coll. Tonisman Harefa *et al.*, 6 Nov. 2021. NTOUP2021-12-021, 8, 23.8–43.0 mm SL, Kihaw Fishing Port, Chenggong Township, Taitung County; coll. Tonisman Harefa *et al.*, 21 Dec. 2021. NTOUP2022-01-001, 8, 22.7–53.7 mm SL, Wanlitong, Hengchun Township, Pingtung County; coll. Hsien-En Li *et al.*, 21 Jan. 2022. NTOUP2022-01-002, 1, 37.9 mm SL, Wanlitong, Hengchun Township, Pingtung County; coll. Hsien-En Li *et al.*, 22 Jan. 2022. NTOUP2022-01-056, 2, 39.0–44.6 mm SL, Hongchaikeng Fishing Port, Hengchun Township, Pingtung County; coll. Hsien-En Li *et al.*, 22 Jan. 2022. NTOUP2022-10-013, 4, 29.2–38.9 mm SL, Tanzu Fishing Port, Hengchun Township, Pingtung County; coll. Hsien-En Li *et al.*, 2 Oct. 2022. NTOUP2023-01-003, 3, 29.7–39.9 mm SL, Kihaw Fishing Port, Chenggong Township, Taitung County; coll. Hsien-En Li *et al.*, 12 Jan. 2023. NTOUP2023-04-016, 1, 29.2 mm SL, Wanlitong, Hengchun Township, Pingtung County; coll. Tonisman Harefa *et al.*, 8 Apr. 2023. NTOUP2023-04-017, 1, 51.8 mm SL, Tanzu Fishing Port, Hengchun Township, Pingtung County; coll. Hsien-En Li *et al.*, 9 Apr. 2023. NTOUP2023-11-005, 4, 25.7–36.2 mm SL, Kihaw Fishing Port, Chenggong Township, Taitung County; coll. Hsien-En Li & Muhammad Cesar Brilliandi, 6 Nov. 2023. NTOUP2023-11-006, 1, 36.9 mm SL, Kihaw Fishing Port, Chenggong Township, Taitung County; coll. Hsien-En Li & Muhammad Cesar Brilliandi, 7 Nov. 2023.

Taxonomy

Callogobius Bleeker, 1874

Callogobius shunkan Takagi, 1957
(俊寬硬皮鰕虎)
Figures 1–3

Callogobius shunkan Takagi, 1957: 112, Fig. 4 (Holotype: TUFLFB 38063, Matsugaura, Kagoshima Prefecture, Japan)—Delventhal & Mooi, 2013: 156 (comparative material); Akihito *et al*., 2013: 1397 (key); An *et al.,* 2020: 252 (Jejudo Island, Korea); Goto *et al.*, 2022: 1 (description); Delventhal & Mooi, 2023: 459 (species account).

Callogobius snelliusi (not Koumans, 1953)—Akihito & Meguro, 1977: 119 (description); Akihito, 1984: 264 (species count, Japan).

Materials Examined

NTOUP201506-26, 4, 22.3–48.8 mm SL, locality unknown; coll. I-Shiung Chen *et al.*, 25 Jun. 2015. NTOUP200606-624, 1, 45.5 mm SL, Longdong Bay, Gongliao District, New Taipei City; coll. I-Shiung Chen *et al.*, 15 Jun. 2006. NTOUP200710-016, 1, 32.2 mm SL, waters near Chaojing Ocean Park, Zhongzheng District, Keelung City; coll. I-Shiung Chen *et al.*, 31 Jul. 2007. NTOUP200710-021, 1, 30.5 mm SL, waters near Chaojing Ocean Park, Zhongzheng District, Keelung City; coll. I-Shiung Chen *et al.*, 31 Jul. 2007. NTOUP202006-125, 2, 33.0–33.6 mm SL, Longdong Bay, Gongliao District, New Taipei City; coll. Hsien-En Li *et al.*, 3 Jun. 2020. NTOUP202006-127, 1, 47.5 mm SL, waters near Chaojing Ocean Park, Zhongzheng District, Keelung City; coll. Yu-Yang Shia & Tonisman Harefa, 24 Jun. 2021. NTOUP202007-121, 4, 19.6–41.8 mm SL, Longdong Bay, Gongliao District, New Taipei City; coll. Hsien-En Li & Tonisman Harefa, 3 Jul. 2020. NTOUP202007-130, 1, 43.8 mm SL, Longdong Bay, Gongliao District, New Taipei City; coll. Hsien-En Li *et al.*, 21 Jul. 2020. NTOUP202007-133, 4, 27.0–40.4 mm SL, Longdong Bay, Gongliao District, New Taipei City; coll. Hsien-En Li *et al.*, 23 Jul. 2020. NTOUP202008-281, 1, 39.9 mm SL, waters near NTOU, Zhongzheng District, Keelung City; coll. Hsien-En Li *et al.*, 21 Aug. 2021. NTOUP202106-389, 1, 38.7 mm SL, waters near NTOU, Zhongzheng District, Keelung City; coll. Hsien-En Li *et al.*, 27 Aug. 2021. NTOUP202106-013, 3, 26.5–47.8 mm SL, Mao'ao Bay, Gongliao District, New Taipei City; coll. Hsien-En Li *et al.*, 7 Jun. 2021. NTOUP202106-022, 1, 37.1 mm SL, Xiaoxianglan, Gongliao District, New Taipei City; coll. Tonisman Harefa & De-Yi Hong, 10 Jun. 2021. NTOUP202107-045, 1, 38.7 mm SL, Mao'ao Bay, Gongliao District, New Taipei City; coll. Tonisman Harefa & De-Yi Hong, 7 Jul. 2021. NTOUP202107-005, 1, 41.6 mm SL, Longdong Bay, Gongliao District, New Taipei City; coll. Tonisman Harefa & De-Yi Hong, 29 Jul. 2021. NTOUP202107-103, 1, 30.6 mm SL, Dong'ao Bay, Nan'ao Township, Yilan County; coll. Tonisman Harefa & De-Yi Hong, 30 Jul. 2021. NTOUP202108-122, 2, 19.4–36.3 mm SL, Longdong Bay, Gongliao District, New Taipei City; coll. Hsien-En Li *et al.*, 5 Aug. 2021. NTOUP202108-129, 4, 30.3–38.4 mm SL, Mao'ao Bay, Gongliao District, New Taipei City; coll. Hsien-En Li *et al.*, 9 Aug. 2021. NTOUP202109-131, 1, 47.3 mm SL, Longdong Bay, Gongliao District, New Taipei City; coll. Hsien-En Li *et al.*, 6 Sep. 2021. NTOUP202202-034, 1, 32.6 mm SL, Longdong Bay, Gongliao District, New Taipei City; coll. Hsien-En Li *et al.*, 2 Feb. 2022. NTOUP202203-038, 7, 27.9–45.5 mm SL, Longdong Bay, Gongliao District, New Taipei City; coll. Hsien-En Li *et al.*, 2 Feb. 2022.

Diagnosis

D2 I, 9–11; A I, 7–9; P1 16–19; LR 28–32; TR 9–11; Pred 7–9; D-P 4–6.

Three brown blotches present along lateral side of the body (much distinct in juveniles or freshly dead specimens). D1 golden to ochre in colour, marked with about three white oblique wavy stripes. D2 dark ochre with two rows of white oblique spots. Anal fin black, while fades to transparent white at base with a black margin post-mortem.

FIGURE 1. Fresh postmortem coloration of *Callogobius shunkan* (NTOUP202008-281, 39.9 mm SL).

Descriptions

Morphometric proportions are presented in table 1. Body slightly elongate, cylindrical anteriorly, and laterally compressed toward caudal peduncle. Head slightly depressed; head width greater than depth. Multiple papillose dermal ridges present on the cheek, lower jaw, and operculum, arranged both transversely and longitudinally. Mouth slightly oblique; posterior end of gape not reaching through vertical point of the anterior margin of orbit. Upper lip slightly thicker than lower lip; inner edge of lower lip lined with short, velvety papillae. All teeth conical without specialized forms. Anterior and posterior nostrils both tubular; anterior nostril reaches upper lip when compressed. Genital papillae in males slender and elongate, extending to 1st anal-fin spine; in females, papilla short, stout, and blunt-ended. Vertebrae counts 10+26=26, P-V=3-22110.

Fins. See table 2 for frequencies of fin element counts. D1 slightly triangular, 1st and 2nd spines longest, filamentous elongation of the 2nd spine occasionally present in mature males; posterior margin slightly curved in some mature individuals. D2 sub-rectangular; posterior soft rays elongated in mature individuals. Anal fin with short base; posterior rays elongated, reaching near posterior margin of caudal peduncle when depressed. P1 slightly ovate, reaching the vertical point of anal fin origin. P2 fused, forming a well-developed disc, posterior tip does not reach anus; connecting membrane and frenum both fully developed.

Squamation. See Table 2 for frequencies of scale counts. Cycloid scales coverage extending posteriorly from the operculum to the first dorsal fin and from abdomen to anus. Mixed patches of cycloid and ctenoid scales present laterally beneath first dorsal fin; from midbody to caudal peduncle, ctenoid scales dominate, bearing numerous fine ctenii. Large cycloid scales with distinctly outlined centre embedded between dermal ridges of cheek, on predorsal region, and ventral side of head, extending anteriorly to vertical point of orbit. Small cycloid scales present from orbit to pectoral base. Fleshy base of pectoral and pelvic fins covered with a few large cycloid scales.

Cephalic sensory organ. See figure 3 for canal pore and papillae row arrangements. Anterior oculoscapular canal bears paired pores σ (anterior orbital margin), and single pores λ and κ (interorbital region), all with short tubular openings (pore λ absent in 5 of 43 specimens). Postorbital portion of anterior oculoscapular canal with paired pores ω and α. Paired pores β and ρ located just above posterior margin of preopercle. Preopercular canal with paired pores γ, δ, and ε, each with short tubular openings. Postorbital canal contains paired pores θ and τ. Anterior infraorbital and preopercular canals not continuous. All papillae rows located on dermal ridges. Anterior orbital row r divided into r^1 (adjacent to nasal tube) and r^2 (antero-interorbital region), the latter further subdivided into left and right rows. Postorbital row *n* bilaterally divided. Paired row *h* not located on a raised ridge and divided into anterior and posterior sections. Cheek rows *b* and *d* intersect vertical row *4* below eye, dividing it into *4s* (further subdivided into $4s^1$ and $4s^2$) and *4i*. Rows *d* and *e* interrupted between rows *1* and *2*, forming segments d^1, d^2, e^1, and e^2. Rows *z* and *ot* remain unfused. Row *i* comprises 3 short transverse dermal ridges and a single row of 20–23 papillae. Row *f* consists of 2 longitudinal rows of papillae symmetrically aligned on anterior lower jaw.

Fresh coloration. See figure 1 for fresh postmortem coloration and figure 2 for underwater *in situ* coloration. Body overall brown, with abdominal region greyish white. Three prominent triangular brown blotches aligned laterally: one beneath D1 and two beneath D2, each reaching the base of corresponding fin. Head and lips brown, mottled with irregular pale yellow to white blotches. Elevated dermal ridges marked alternately in dark brown and white. Iris with 5 radiating dark brown stripes; orbit encircled by alternating orange-brown and white pigment. D1 ochre with approximately three oblique white stripes or blotches. D2 fin dark yellow to black with white margin and 2 rows of oblique white spots. P1 dark brown with scattered white spots and white margins. P2 dark brown to black; in faded individuals, entire fin becomes white except for a retained black tip. Anal fin black in fresh individuals; faded specimens show white base with black margin. Caudal fin dark brown with white-edged margin and 3–4 transverse rows of white spots extending to mid-fin.

Preserved colorations. All light markings fade to greyish-white. Dark body markings become brownish and may blend with background coloration in specimens not fixed in cold formalin.

Distribution and habitat

Callogobius shunkan was previously recorded from the northwestern Pacific region including coastal areas of Japan and Korea (An *et al.* 2020; Goto *et al.* 2022), and its new distribution in Taiwan was exclusively from the northeastern coastal waters not exceeding 15 meters deep. It prefers to inhabit crevices among coral reef rocks in the subtidal zone.

FIGURE 2. A *Callogobius shunkan* (uncatalogued individual) out of its crevice hideout at 15m depth of Longdong Bay, 6 Nov. 2023.

Remarks

Current distribution record of *Callogobius shunkan* in Taiwan marks the southernmost limit of its known global range, however Sadovy and Cornish (2000) had documented a *Callogobius* collected from Port Shelter (牛尾海) that closely resembles *C. shunkan* based on the figures given (pp. 244, unnumbered figure), but the species was identified as *C. maculipinnis* (Fowler, 1918), examinations upon this collection may confirm the identity of this *Callogobius* and possibly will extend the distribution of *C. shunkan* southwards. Among the *Callogobius* species found in Taiwan, *C. shunkan* can be distinguished primarily by the sensory papillae row *i*, which bears only 3 transverse rows of cutaneous ridges (*vs.* >10 in other species), it most resembles *C. nigromarginatus* but can be differentiated from the latter by the 1st and 2nd spines of D1 being the longest (*vs.* 3rd spine longest), more transverse scale row counts (9–11, modally 10 *vs.* 7–9, modally 8) and predorsal scale counts (7–9, modally 8 *vs.* 5–6, modally 5), and the papillose fleshy ridges rows *z* and *ot* not fusing (*vs.* rows *z* and *ot* fusing into a single row *z*+*ot*).

This species was previously misidentified as the apparently closely related *C. snelliusi* Koumans, 1953 in Japanese literatures (Akihito & Meguro 1977; Akihito 1984). In the original descriptions of *C. shunkan* (Takagi 1957), it was differentiated from *C. snelliusi* by having lower body depth (18% of SL *vs.* 25% of SL), smaller eye diameter (20% of HL *vs.* 33% of HL), longer snout (approx. 1.6 times of eye diameter vs. slightly shorter than eye diameter), and differences in fin ray counts (D2 I, 10 *vs.* I, 8; A I, 8 *vs.* I, 6). Akihito *et al.* (2013), upon examination of the holotype of *C. shunkan* (NSMT-P110000, formerly TUFLFB 38063) and syntypes of *C. snelliusi* (RMNH 20289), concluded that the 2 species can be further distinguished by the extent of scale coverage on ventral side of head (extending to the vertical point of preopercle *vs.* to the vertical point of the anterior margin of eye) and by the size and number of scales covering the head (numerous small scales *vs.* fewer, larger scales). Based on the morphological characteristics of "*C. snelliusi*" addressed by Shen (1993)—D VI–I, 10; A I, 8; P1 14—it is likely that this record represents a misidentification of *C. shunkan*, and the notable difference in pectoral fin element counts (14 vs. 16–19) is presumed to be a result of counting error. Delventhal & Mooi (2018) reported possible intraspecific variation in the fusion state of the sensory papillae rows *z* and *ot*, but no such variation was observed in the specimens examined in this study, all specimens examined exhibits the fusion of rows *z* and *ot*.

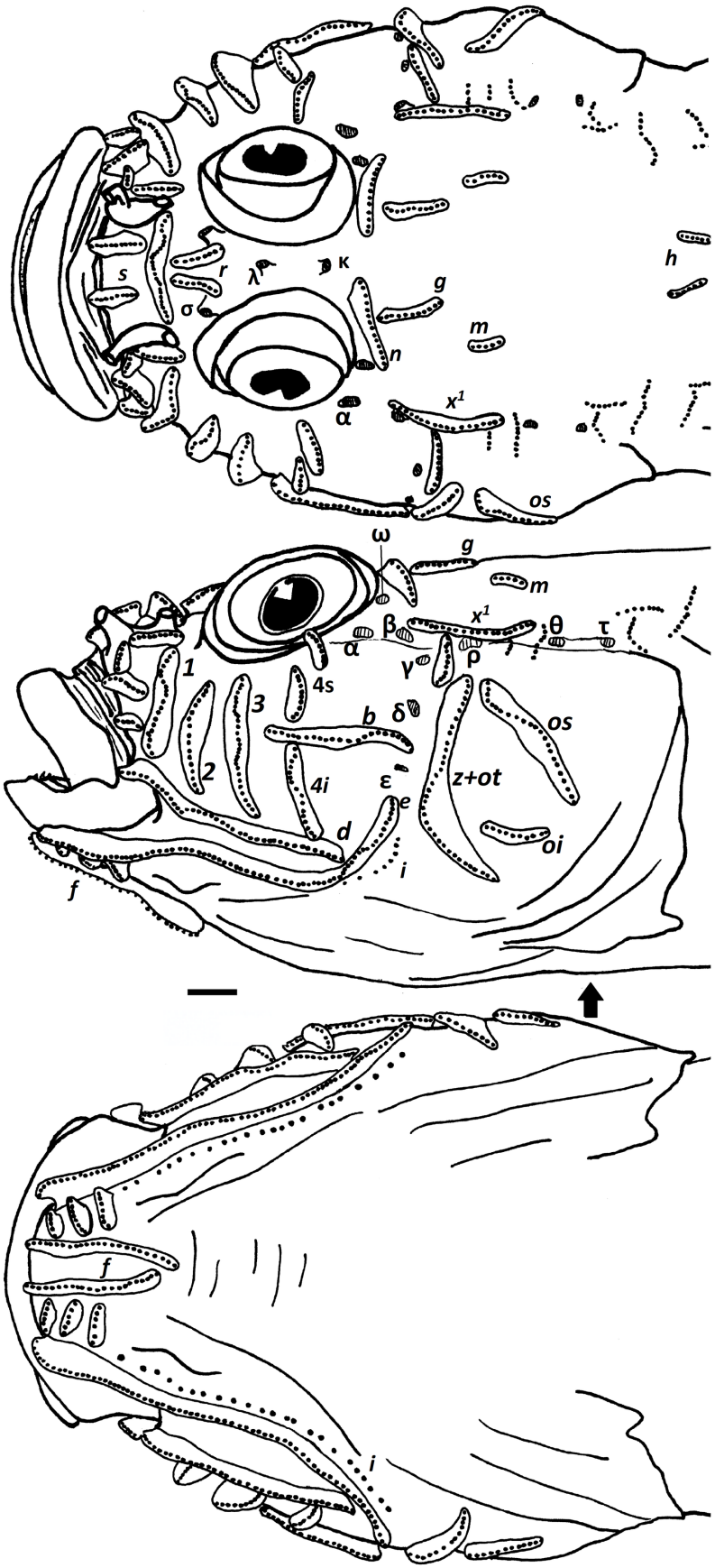

FIGURE 3. Head canal and sensory papillae arrangements of *Callogobius shunkan* (NTOUP202109-132, 50.5 mm SL). AN, anterior nostril; PN, posterior nostril. Arrows showing the anterior edge of gill slits. Scale bar = 1 mm.

***Callogobius stellatus* McKinney & Lachner, 1978b**
(星斑硬皮鰕虎)
Figures. 4–5

Callogobius stellatus McKinney & Lachner, 1978b: 716, Figs. 1, 3 (Holotype: USNM 217429, Flores Island, Lesser Sunda Islands, Indonesia)—Delventhal & Mooi, 2013: 156 (comparative material); Fujiwara *et al.*, 2021: 261 (comparative description); Delventhal & Mooi, 2023: 458 (species account).

Materials Examined

NTOUP202210-001, 1, 28.5 mm SL, Wanlitong, Hengchun Township, Pingtung County; coll. Hsien-En Li *et al*., 1 Oct. 2022. NTOUP202304-001, 1, 27.4 mm SL, Wanlitong, Hengchun Township, Pingtung County; coll. Hsien-En Li *et al.*, 10 Apr. 2023.

Diagnosis

D2 I, 10; A I, 8; P1 17; LR 35–36; TR 12–13; Pred 0.

Body white with several mottled brown spots; 2 diagonal stripes present below eye, both narrower than eye diameter; P1 with black-margined orange spots; both dorsal fins and caudal fin bear large blackish brown spots, with fin rays colored orange within the spotted areas.

Descriptions

Morphometric proportions are presented in table 1. Body elongated; anterior portion slightly cylindrical, becoming laterally compressed posteriorly from mid-body to caudal peduncle. Head depressed, width greater than length. Transverse and longitudinal dermal ridges present on cheeks, lower jaw, and operculum. Mouth small, obliquely directed downward; posterior margin not reaching vertical through anterior margin of eye. Teeth conical, not enlarged. Anterior and posterior nostrils short, tubular. Urogenital papilla slender and pointed in males; short and blunt in females. Vertebrae counts 10+26=26, P-V=3-22110.

Fins. See table 2 for frequencies of fin element counts. The 3rd spine of D1 longest; height of D1 slightly greater than D2. D2 with gently rounded posterior margin, fin base longer than that of the anal fin. Posterior rays of anal fin elongated. P1 oval, posterior tips reaching vertical point of anal fin origin. P2 with well-developed connecting frenum; 5th soft ray longest. Soft rays united by a broad membrane, forming an elongate adhesive disc. Caudal fin slightly longer than head, oval with a sub-lanceolate posterior tip.

Squamation. See Table 2 for frequencies of scale counts. Scales completely cycloid, restricted to the body. Predorsal region, nape, fleshy pectoral fin base and axillary region naked. Scale coverage begins at vertical point of first dorsal fin origin. Cycloid scales on caudal region were slightly larger.

FIGURE 4. Fresh postmortem coloration of *Callogobius stellatus* (NTOUP202304-001, 27.4 mm SL).

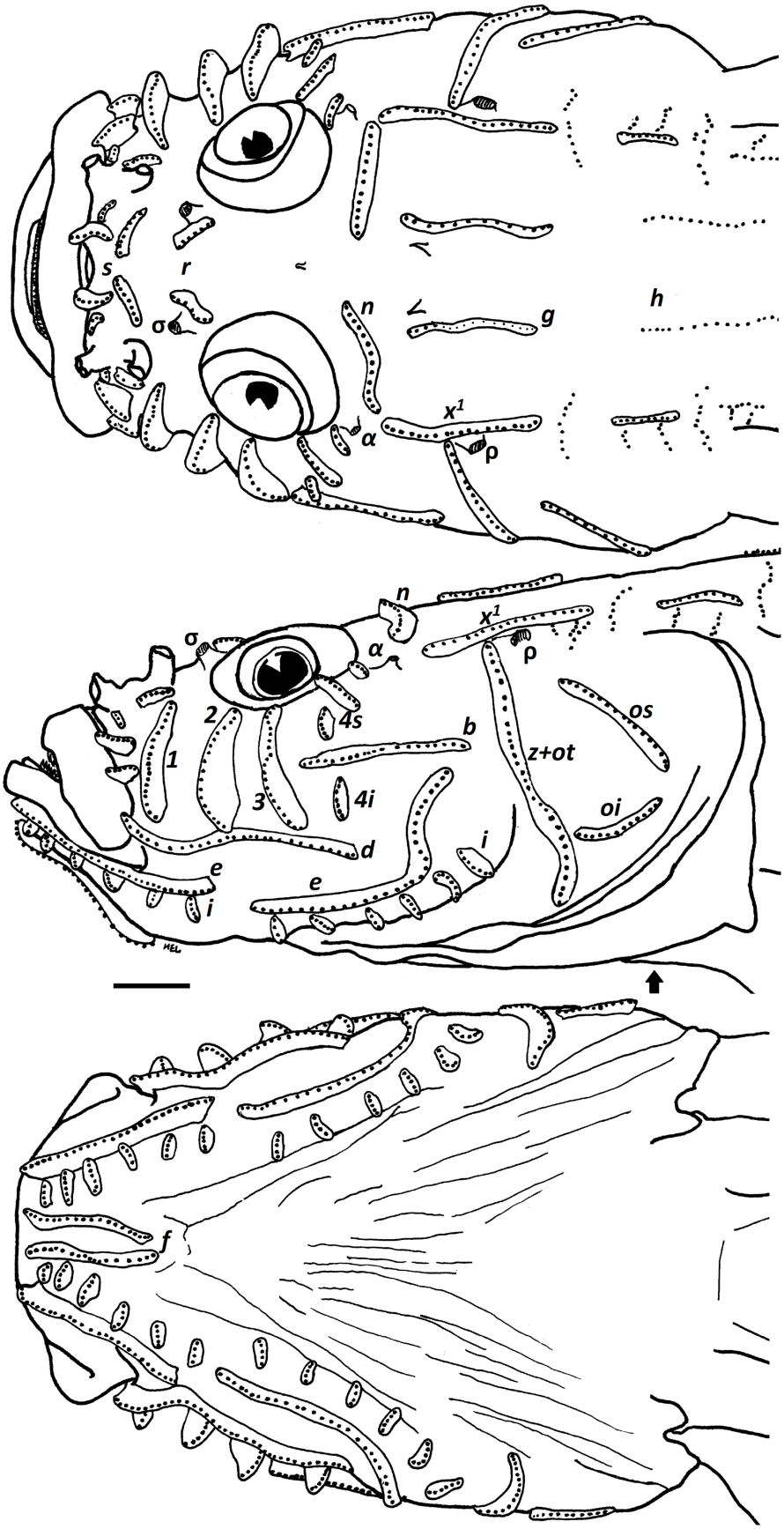

FIGURE 5. Head canal and sensory papillae arrangements of *Callogobius stellatus*, (NTOUP202210-001, 28.5 mm SL). Arrows showing the anterior edge of gill slits. Scale bar = 1 mm.

TABLE 1. Morphometric measurements of the two *Callogobius* species newly recorded in this study. All values were rounded to the second decimal.

Species	*Callogobius shunkan*		*Callogobius stellatus*	
Sex	♂	♀	♂	♀
n	23	20	1	1
SL (mm)	19.41–48.84	22.31–43.79	27.39	28.52
Percent in standard length (%)				
Head length	29.01–33.18 (30.95)	29.22–35.08 (31.91)	26.63	27.37
Predorsal length	30.72–42.48 (38.10)	36.93–42.46 (39.92)	35.37	35.21
Snout to 2nd dorsal origin	41.66–64.88 (57.51)	57.04–63.07 (59.60)	57.29	57.64
Snout to anus	53.82–63.77 (57.11)	50.53–63.65 (58.33)	59.24	59.76
Snout to anal fin origin	58.68–66.05 (61.69)	57.47–69.13 (63.23)	65.53	64.00
Prepelvic length	28.56–35.74 (31.32)	27.36–35.20 (32.16)	28.34	29.19
Caudal peduncle length	23.04–31.61 (26.75)	22.13–30.13 (25.98)	16.45	17.76
Caudal peduncle depth	10.87–13.08 (12.08)	9.03–13.24 (11.72)	10.45	10.66
1st dorsal fin base	14.48–19.53 (17.19)	15.35–20.35 (17.34)	19.98	20.33
2nd dorsal fin base	21.25–25.34 (23.71)	20.35–26.97 (23.52)	30.61	28.74
Anal fin base	10.64–17.42 (15.21)	12.64–17.09 (14.71)	18.04	18.56
Caudal fin length	23.57–32.63 (27.77)	22.70–31.33 (27.79)	40.65	39.78
Pectoral fin length	26.54–30.58 (27.94)	20.95–30.12 (26.23)	27.89	29.52
Pelvic fin length	21.03–25.68 (22.78)	20.30–25.09 (22.42)	26.98	24.17
Body depth at pelvic fin base	14.32–17.77 (16.05)	14.43–20.92 (17.16)	15.28	14.55
Body depth at anal fin base	13.43–17.69 (15.46)	12.93–17.75 (15.12)	12.93	13.08
Body width at anal fin base	8.45–13.24 (10.88)	9.23–12.82 (11.13)	9.52	11.33
Pelvic fin origin to anus	22.21–31.58 (25.77)	23.71–29.09 (26.32)	28.53	29.24
Percent in head length (%)				
Head width in maximum	67.68–77.43 (73.36)	70.18–79.19 (74.63)	72.69	77.66
Posterior-most head width	42.19–49.82 (45.99)	39.34–47.12 (44.08)	50.72	55.73
Eye diameter	16.80–24.62 (19.40)	15.12–27.17 (20.53)	15.72	15.11
Bony interorbital width	8.74–11.04 (9.85)	7.21–10.80 (9.40)	18.95	18.12
Fleshy interorbital width	40.82–42.76 (41.56)	45.68–48.78 (47.65)	38.60	36.86
Snout length	25.20–34.56 (29.00)	23.60–36.88 (30.33)	35.37	36.55
Lower jaw length	18.17–29.06 (24.77)	24.41–31.38 (29.01)	19.90	18.59
Cheek depth	21.38–36.82 (28.50)	20.74–35.22 (26.60)	30.27	27.44
Postorbital length	41.60–52.45 (48.26)	40.34–48.63 (45.13)	54.93	55.69

Cephalic sensory organ. See figure 5 for canal pore and papillae row arrangements. Anterior infraorbital canal with paired pores σ (at anterior orbital margin), opening tubular; no pores between eyes, but a small papilla located near presumed pore κ position. Posterior to orbit, paired pores α present with a short row of papillae on adjacent dermal ridge. Further posteriorly, paired pores ρ located above preopercular canal. Preopercular and posterior infraorbital canals absent. All papillae rows located on dermal ridges. Postorbital row *n* divided into left and right sections. Row *o* absent, but 2 barbel-like projections present in its expected position. Row *r* divided into r^1 (adjacent to nasal tube) and r^2 (anterior interorbital region), both further divided into left and right. Cheek with transverse rows *b* and *d* intersecting vertical row *4*, forming *4s* (further divided into $4s^1$ and $4s^2$) and *4i*. Row *e* interrupted vertically at position of row *2*, forming e^1 and e^2. Rows *z* and *ot* fused into a single *z+ot* ridge. Row *h* continuous, not located on ridge. Row *i* consists of 12 short transverse ridges, each bearing 4–5 papillae. Lower jaw tip with paired longitudinal papillae row *f*.

TABLE 2. Meristic frequencies of the two *Callogobius* species newly recorded in this study. Average values were rounded to the first decimal.

Species/	D2 ray				A ray				P_1 ray					LR								
characters	9	10	11	x	7	8	9	x	16	17	18	19	x	28	29	30	31	32	⋯	35	36	x
C. shunkan	1	41	1	10	1	32	10	8.2	7	21	14	1	17.2	3	2	9	4	25	-	-	-	31.1
C. stellatus	-	2	-	10	-	2	-	8	-	2	-	-	17	-	-	-	-	-	-	1	1	35.5

.....continued below

TABLE 2. (Continued)

Species/	TR						Pred						D-P						
characters	9	10	11	12	13	x	0	⋯	7	8	9	x	0	⋯	4	5	6	x
C. shunkan	12	30	1	-	-	9.7	-	-	14	24	5	7.8	-	-	32	6	5	4.4
C. stellatus	-	-	-	1	1	12.5	2	-	-	-	-	0	2	-	-	-	-	0

Fresh coloration. See figure 4 for fresh postmortem colorations. Body white. Four main dark brown blotches on lateral body: a large triangular blotch below D1 extending ventrally; a posteriorly slanted saddle-shaped blotch below D2, from about 5th soft ray to end of base; a transverse band at caudal peduncle, slightly wider than eye; and irregular dark brown markings between 1st and 2nd blotches. Mouth corner and upper lip tinged with orange. Diagonal black stripes present from anterior orbital margin to snout, and from posterior orbital margin to posterior edge of preopercle. A horizontal black stripe connects anterior orbital margins. All stripes are narrower than eye diameter. A large orange blotch present on operculum. A black blotch on posterior edge of operculum; another large black blotch on nape with straight anterior margin and slightly arched posterior margin, tapering downward toward opercular margin. Both dorsal fins and caudal fin white, each with distinct markings: black base coloration with vivid orange pigmentation restricted to fin rays. D1 with vertical black band between 3rd and 5th spines. D2 with slightly oblique black band between 5th and 8th soft rays, orange hue near base, and a posterior black blotch (more prominent in females). Caudal fin with broad central transverse black band, slightly narrower than head length. Anal fin and P2 white, unmarked. P1 white, with a central orange spot outlined in black near the fleshy base.

Distribution and habitat

Callogobius stellatus was previously recorded from the northwestern Pacific and Eastern Indian Ocean, and its distribution in Taiwan was exclusively from the southern tip of the island, inhabiting between rubbles and dead coral debris in coastal waters not exceeding 10 meters deep.

Remarks

This species is a new record for Taiwan discovered in this study and represents the northernmost known record for this species to date. Among the Taiwan *Callogobius* species, this species can primarily be distinguished from others by having more than 10 rows of short skin ridges along the sensory papillae (*vs.* only 3 transverse rows of skin ridges in other species). Additionally, it can be differentiated from other Taiwanese *Callogobius* species by the absence of preopercular canal pores (*vs.* 2 or 3 paired pores present).

Among all described *Callogobius* species, this species stands out due to its unique body coloration and morphological features. It is most similar to *Callogobius mannarensis* Rangarajan, 1970 described from India. Although the meristic traits overlap extensively between the two and are difficult to distinguish, based on specimen photographs of *C. mannarensis* collected from its type locality (USNM 214113 & FMNH 78808) shown in McKinney and Lachner (1978b), the two species can be best differentiated by the pattern of the postorbital stripe (the stripe runs obliquely downward to the posterior margin of the preopercle *vs.* the stripe runs horizontally backward connecting the spots on the opercle and nape), the brown blotch at the origin of the second dorsal fin (saddle-shaped blotch present *vs.* blotches slightly blurred or indistinct), and the pattern of the pectoral fin spot (with a prominent ocellus *vs.* ocellus indistinct).

Revised artificial key of the 11 nominal species of *Callogobius* from Taiwan

1a.	Pelvic fin frenum absent	**2**
1b.	Pelvic fin frenum present	**4**
2a.	Body with distinct, saddle-like blotches	***C. clitellus***
2b.	Body with irregular patches of pigmentation	**3**
3a.	Ctenoid scales covering till pectoral fin base; body ivory	***C. sclateri***
3b.	Ctenoid scales covering till vertical position of D2; body brown	***C. flavobrunneus***
4a.	Pelvic fins completely fused into cup-shaped sucker	**5**
4b.	Pelvic fins partially fuse, connecting membrane with a notch	**6**
5a.	Caudal fin length greater that head length	**7**
5b.	Caudal fin length lesser that head length	**8**
6a.	Dorsal fins with wide interspace; body dark brown	***C. okinawae***
6b.	Dorsal fins with little interspace; body whitish	**9**
7a.	D2 I, 10; body white with dark brown blotches	***C. stellatus***
7b.	D2 I, 13–15; body brownish with mottled blotches	***C. tanegasimae***
8a.	Anal fin ray mostly 7; Pred 5–6; D2 base without black spot	***C. nigromarginatus***
8b.	Anal fin ray mostly 8; Pred 7–9; D2 base with black spot	***C. shunkan***
9a.	Paired pore ω present; body with scarce ctenoid scales covering at caudal peduncle	***C. hasseltii***
9b.	Lacking paired pore ω; ctenoid scales covering anteriorly till D1 base	**10**
10a.	Anterior oculoscapular canal present; markings behind eye interrupted	***C. aquilus***
10b.	Anterior oculoscapular canal absent; markings behind eye not interrupted	***C. sheni***

Acknowledgements

This research is partially funded by the National Academy of Marine Research. The first author would like to thank Mr. Jun-Zhong He, Mr. Lin-Tai Ho, Mr. Tonisman Harefa, and Mr. Muhammad Cesar Brilliandi for their companionship and assistance throughout SCUBA diving sessions. We would also like to thank Dr. Shih-Pin Huang of Biodiversity Research Centre, Academia Sinica for providing curatorial help on specimen examinations.

References

Akihito, P. (1984) Suborder Gobioidei. *In*: Masuda, H., Amaoka, K., Araga, C., Uyeno, T. & Yoshino, T. (Eds.), *The fishes of the Japanese Archipelago*. Tokai University Press, Tokyo, pp. 236–238.

Akihito & Meguro, K. (1977) Five species of the genus *Callogobius* found in Japan and their relationships. *Japanese Journal of Ichthyology*, 24 (2), 113–127. [in Japanese, English abstract]

Akihito, Sakamoto, K., Ikeda, Y. & Sugiyama, K. (2013) Gobioidei. *In*: Nakabo, T. (Ed.), *Fishes of Japan with pictorial keys to the species. 3rd Edition*. Tokai University Press, Tokyo, pp. 1347–1608. [in Japanese]

An, J.H., Kim, B.J. & Kim, S.K. (2020) First record of a goby, *Callogobius shunkan* (Perciformes: Gobiidae) from the southern coastal waters of Jejudo Island, Korea. *Korean Journal of Ichthyology*, 32, 251–256. https://doi.org/10.35399/ISK.32.4.7.

Birdsong, R.S., Murdy, E.O. & Pezold, F.L. (1988) A study of the vertebral column and median fin osteology in gobioid fishes with comments on gobioid relationships. *Bulletin of Marine Science*, 42 (2), 174–214.

Bleeker, P. (1851) Over eenige nieuwe soorten van Blennioïden en Gobioïden van den Indischen Archipel. *Natuurkundig Tijdschrift voor Nederlandsch Indië*, 1 (3), 236–258.

Bleeker, P. (1874) Esquisse d'un système naturel des Gobioïdes. *Archives Néerlandaises de Sciences Exacte et Naturelles*, 9, 289–331.

Chen, I-S., Chen, J.-P. & Fang, L.-S. (2006) A new marine goby of genus *Callogobius* (Teleostei: Gobiidae) from Taiwan. *Ichthyological Research*, 53 (3), 228–232. https://doi.org/10.1007/s10228-006-0338-2

Chen, J.-P. & Shao, K.-T. (2000) *Callogobius nigromarginatus*, a new species of goby (Pisces: Gobiidae) from Taiwan. *Bulletin of Marine Science*, 66 (2), 457–466.

Delventhal, N.R. & Mooi, R.D. (2013) *Callogobius winterbottomi*, a new species of goby (Teleostei: Gobiidae) from the Western Indian Ocean. *Zootaxa*, 3630 (1), 155–164. https://doi.org/10.11646/zootaxa.3630.1.6

Delventhal, N.R. & Mooi, R.D. (2023) *Callogobius williamsi*, a new species of goby (Teleostei: Gobiidae) from the Marquesas Islands, with notes on the status of all nominal *Callogobius* species. *Zootaxa*, 5339 (5), 449–464. https://doi.org/10.11646/zootaxa.5339.5.3

Fowler, H.W. (1918) New and little-known fishes from the Philippine Islands. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 70, 2–71.
Fricke, R., Eschmeyer, W.N. & Van der Laan, R. (Eds.) (2025) Eschmeyer's Catalog of Fishes: Genera, Species, References. Electronic Version. Available from: https://www.researchgate.net/publication/303633861_Catalog_of_Fishes_Genera_Species_References (accessed 23 June 2025)
Fujiwara, K., Suzuki, T. & Motomura, H. (2021) *Callogobius falx*, a new species of goby from southern Japan. *Zootaxa*, 5048 (2), 253–264.
https://doi.org/10.11646/zootaxa.5048.2.6
Goto, K., Mano, H., Nagaya, S., Fukui, Y., Yokooka, K. & Henmi, Y. (2022) First records of *Callogobius shunkan* Takagi, 1957 (Perciformes: Gobiidae) from Kyoto Prefecture, Japan. *Ichthy, Natural History of Fishes of Japan*, 26, 1–3.
Koumans, F.P. (1953) Biological results of the Snellius expedition. XVI. The Pisces and Leptocardii of the Snellius expedition. *Temminckia, Leiden*, 9, 177–275.
Li, H.-E. & Chen, I-S. (2024) Descriptions of a new species of *Callogobius* with a congeneric new record and comments on previous records of the genus from Taiwan. *Zootaxa*, 5550 (1), 159–173.
https://doi.org/10.11646/zootaxa.5550.1.16
McKinney, J.F. & Lachner, E.A. (1978a) Two new species of *Callogobius* from Indo-Pacific waters (Teleostei: Gobiidae). *Proceedings of the Biological Society of Washington*, 91 (1), 203–215.
McKinney, J.F. & Lachner, E.A. (1978b) A new species of gobiid fish, *Callogobius stellatus*, from Flores Island, Indonesia. (Teleostei: Gobiidae). *Proceedings of the Biological Society of Washington*, 91 (3), 715–723.
Rangarajan, K. (1970) A new species of *Callogobius* (family Gobidae: Pisces) from Gulf of Mannar, India. *Journal of the Marine Biological Association of India*, 10 (2), 347–353.
Sadovy, Y. & Cornish, A.S. (2000) *Reef fishes of Hong Kong*. Hong Kong University Press, Hong Kong, 321 pp.
https://doi.org/10.1515/9789882202634
Sanzo, L. (1911) Distribuzione delle papille cutanee (organi ciatiforme) e suo valore sistematico nei gobi. *Mittheilungen aus der Zoologischen Station zu Neapal*, 20, 249–328.
Shen, S.-C. (1993) *Fishes of Taiwan*. National Taiwan University Press, Taipei, 960 pp.
Smith, J.L.B. (1958) The fishes of the family Eleotridae in the western Indian Ocean. *Ichthyological Bulletin, Department of Ichthyology, Rhodes University*, 11, 137–163, pls. 1–3.
Snyder, J.O. (1908) Descriptions of eighteen new species and two new genera of fishes from Japan and the Riu Kiu Islands. *Proceedings of the United States National Museum*, 35 (1635), 93–111.
https://doi.org/10.5479/si.00963801.1635.93
Steindachner, F. (1879) Ichthyologische Beiträge (VIII). *Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften. Mathematisch-Naturwissenschaftliche Classe*, 80, 119–191.
Takagi, K. (1957) Descriptions of some new gobioid fishes of Japan, with a proposition on the sensory line system as a taxonomic appliance. *Journal of the Tokyo University of Fisheries*, 43 (1), 97–126.
Wongrat, P. & Miller, P.J. (1991) The innervation of head neuromast rows in eleotridine gobies (Teleostei: Gobiidae). *Journal of Zoology*, 225, 27–42.
https://doi.org/10.1111/j.1469-7998.1991.tb03799.x