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New record of *Glossogobius laticeps* (Gobiiformes: Gobiidae) from Taiwan with notes on local congeneric species

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Abstract

In this study, the Taiwanese *Glossogobius giuris* population is proven to be a new western Pacific distributional record for *Glossogobius laticeps*. The new addition to Taiwanese *Glossogobius* fauna can be characterized by having longitudinal scale rows 33–35, transverse scale rows 9–11 and predorsal scale rows 22–24. Infraorbital papillae row *a* branched, and rows *b*, *cp*[1] and *cp*[2] in a patch of multiple minute papilla. Trunk distinctly pigmented with numerous longitudinal black streaks in juvenile and adult, tip of chin with two small patches of melanophores and mostly unpigmented medially. A more detailed description of the genotyped materials is provided, with a discussion of the species' distribution expansion.

Key words: *Glossogobius*, Gobiidae, new record, Taiwan

Introduction

The genus *Glossogobius* was established by Gill (1859) based on *Gobius platycephalus* Richardson, 1846, who was later tentatively treated as a probable junior synonym of *Glossogobius olivaceus* by Hoese & Hammer (2021). Members of this genus can be characterized by having: an elongated body form, almost cylindrical anteriorly and laterally compressed posteriorly, snout elongated with prominent lower jaw, gill opening rather large and a distinctly bilobed tongue. As Akihito & Meguro (1975) suggested, species of *Glossogobius* resemble each other greatly; therefore, identifying congeneric species relies on cephalic papillae patterns, blotching patterns and other detailed diagnostic characters. The Taiwanese *Glossogobius* was preliminarily reviewed by Cheng (2005) with external morphology examinations, caudal osteology, and mitogenomic approaches, and a total of 6 nominal species were recognised *viz. G. giuris* (Hamilton, 1822), *G. celebius* (Valenciennes, 1837), *G. olivaceus* (Temminck & Schlegel, 1845), *G. circumspectus* (Macleay, 1883), *G. bicirrhosus* (Weber, 1894), and *G. aureus* Akihito & Meguro, 1975. Another undescribed species is also reported.

As advanced techniques in molecular biology and mitogenomics were rapidly developed in the past few decades, accompanied by the rapid increase in the usage of the DNA barcoding method upon species identification, we now have an array of methods and rich genetic databases to resolve complex taxonomical problems. Several works regarding the taxonomy and genetics of *Glossogobius* has sprouted in the past few years (Hammer *et al.* 2023; Hoese & Hammer 2021; Zarei *et al.* 2023; Zarei *et al.* 2025), and most of these works were based on findings of Hammer *et al.* (2023), whom assessed the species boundaries of northern Australian *Glossogobius* species with nuclear and mitogenomic markers, resulting in the identification of 4 major lineages: *G. munroi* Hoese & Allen, 2012, *G. aureus*, and two sub-lineages in *G. giuris*, namely *giuris* A and B, that was subsequently designated as *G. laticeps* (*sensu* Hoese & Hammer 2021) and *G. giuris* (*sensu* Hoese & Hammer 2021), respectively (Hoese & Hammer 2021), and as *G. giuris* is proven by Hammer *et al.* (2021) to be part of a species complex, the diversity

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assessments of Taiwanese *Glossogobius* shall be re-examined and be treated with detail with both morphological and phylogenetic frameworks combined, and as more reliable studies being published, hope has shone upon this issue.

Employing the identification framework established by Hammer *et al.* (2021), together with detailed morphological examinations and phylogenetic assessments of newly collected specimens and selected historical material, we conclude that the taxa previously regarded as *Glossogobius giuris* is in fact *Glossogobius laticeps*; a redescription of this species is provided herein with comparative notes on morphologically similar congeners. The phylogenetic relationship of the Taiwanese *G. laticep*s population and its placement among congeners will be discussed in a separate study (Li *et al.* in prep.).

Materials and Methods

Samples of the examined specimens were primarily collected with baited fish traps. Captured specimens were taken back to lab immediately after capture to record both live and fresh post-mortem colorations. After photo records, the right pectoral fin was being clipped off and preserved in 95% EtOH for future molecular applications, and specimens were preserved in 10% formalin for fixation. Measurements of every collected individual were carried out by electronic callipers and scales to the nearest 0.01mm under dissecting microscope following the methods of Miller (1988) and Chen & Shao (1996), 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 & Miller (1991), for the papillae rows that are composed by more than one row of papillae will be referred to as a "multiple row". Abbreviations for meristic characters shown as follows: D1, first dorsal fin elements; D2, second dorsal fin elements; A, anal fin elements; P_1, pectoral fin elements; P_2, 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

Glossogobius aureus: NTOUP-2025-10-014, female, 1 (92.99 mm SL), Guandu Pier, Beitou District, Taipei City, Taiwan; coll. Hsien-En Li & Yao-Jin Wang, 9 September 2025; NTOUP-2025-10-015, female, 1 (67.80 mm SL), Guandu Pier, Beitou District, Taipei City, Taiwan; coll. Hsien-En Li & Yao-Jin Wang, 9 September 2025.

Taxonomy

Glossogobius laticeps **(De Vis, 1884)**

(寬頭叉舌鰕虎)

Figures 1–5

Eleotris laticeps De Vis, 1884: 692 (type: Queensland coast, Australia): Hoese & Hammer 2021: 83; Zarei *et al.* 2023: 38; Zarei *et al.* 2025: 585.

Materials Examined

NTOUP-2025-10-001, male, 1 (76.3 mm SL), Nangang River, tributary of Zhonggang River; coll. Hsien-En Li *et al*., 30 April 2023; NTOUP-2025-10-002, female, 1 (140.6 mm SL), Lagoon near Taijiang National Park, collected by local fisherman; unfroze and preserved by Hsien-En Li, 21 August 2019; NTOUP-2025-10-003, female, 1 (104.8 mm SL), Nangang River, tributary of Zhonggang River; coll. Hsien-En Li *et al*., 28 June 2023; NTOUP-2025-10-004, female, 1 (94.7 mm SL), Nangang River, tributary of Zhonggang River; coll. Hsien-En Li *et al*., 28 June 2023; NTOUP-2025-10-005, female, 1 (115.1 mm SL), Nangang River, tributary of Zhonggang River; coll. Hsien-En Li *et al*., 28 June 2023; NTOUP-2025-10-006, male, 1 (93.0 mm SL), Guandu Pier, Beitou District, Taipei City, Taiwan; coll. Hsien-En Li & Yao-Jin Wang, 9 September 2025; NTOUP-2025-10-007, male, 1 (65.4 mm SL), Nangang River, tributary of Zhonggang River; coll. Hsien-En Li *et al*., 28 June 2023; NTOUP-2025-10-008, male, 1

(76.6 mm SL), Nangang River, tributary of Zhonggang River; coll. Hsien-En Li *et al*., 28 June 2023; NTOUP-2025-10-010, male, 1 (84.8 mm SL), Nangang River, tributary of Zhonggang River; coll. Hsien-En Li *et al*., 9 February 2023; NTOUP-2025-10-011, female, 1 (99.7 mm SL), Nangang River, tributary of Zhonggang River; coll. Hsien-En Li *et al*., 28 June 2023.

Diagnosis

D. VI-I, 9; A. I, 8; P1. 20–21; P2. I, 5 LR. 33–35; TR. 9–11; Pred. 22–24; D-P. 7–8.

Body distinctly pigmented with numerous longitudinal black streaks in juvenile and adult; tip of chin with two small patches of melanophores and mostly unpigmented medially; pectoral fin base usually with two rod-like blotches; cheeks usually with two tear-like blotches present below eye.

Redescription

Morphometric percentages shown in Table 1. Body cylindrical with a slightly spindle-shaped profile, laterally compressed at caudal peduncle; head depressed; snout prolonged with a slight bony hump at dorso-anterior tip in most males; eyes situated dorsally, lined with the dorsal margin of snout. Lower lip protruding forward beyond upper lip. Mental frenum truncate without lobes or barbels. Tongue bilobed. Gill opening large, anterior end reaching the vertical of preopercle. Anterior nostril with a short tubular opening, posterior nostril in a single pore. Male urogenital papilla elongated with a pointed tip, whereas the female papilla is short, blunt, and bears a posterior notch. Vertebrae count 10+17=27 (10), P-V=3-22110.

Fins. D1 VI; D2 I, 9; A I, 8; P1 20 (5), 21(5); P2 I, 5. D1 with the second spine longest, almost but not filiformed, rarely reaching D2 origin when depressed. D2 base greater than anal fin base; D2 origin beyond anal fin origin. P1 oblong, anterior tip reaching the vertical of anus. Pelvic fins joined with fully developed frenum and membrane, round shaped; posterior P1 tip just reaching anus. Caudal fin oblong with slightly truncate upper and lower posterior margin.

Squamation. LR. 33 (6), 34 (2), 35 (2); TR. 9 (1), 10 (7), 11 (2); Pred. 22 (8), 23 (1), 24 (1); D-P. 7 (7), 8 (3). Body with large, pointy margined ctenoid scales with fine, small ctenii. Cycloid scales covering predorsal region, pectoral base, prepelvic and thoracic region and belly. Opercle with a patch of small cycloid scales located dorsally, about 27–43 in total number (Fig. 5).

Cephalic sensory organs. See figure 3 for canal pore and papillae row arrangements. Sensory canals present; anterior oculoscapular canal with paired pores σ, α, β, ρ, ω and single pores κ and λ; posterior oculoscapular canal with paired pores θ and τ; preopercle canal with paired pores γ, δ and ε. Infraorbital papillae rows in longitudinal pattern. Row *r* in a singular row, curved and continuous across snout transversely. Row *s* multiple, composed by 2–3 rows of papillae Condition of row *a* variable, in juvenile specimens (~50–60 mm SL) often singular or multiple with 2 rows of papillae whereas in subadults or adults (>100 mm SL) often present as multiple row with maximum 3 rows of papillae, branched just below the midpoint of orbit in all sizes, branching row ending posteriorly with

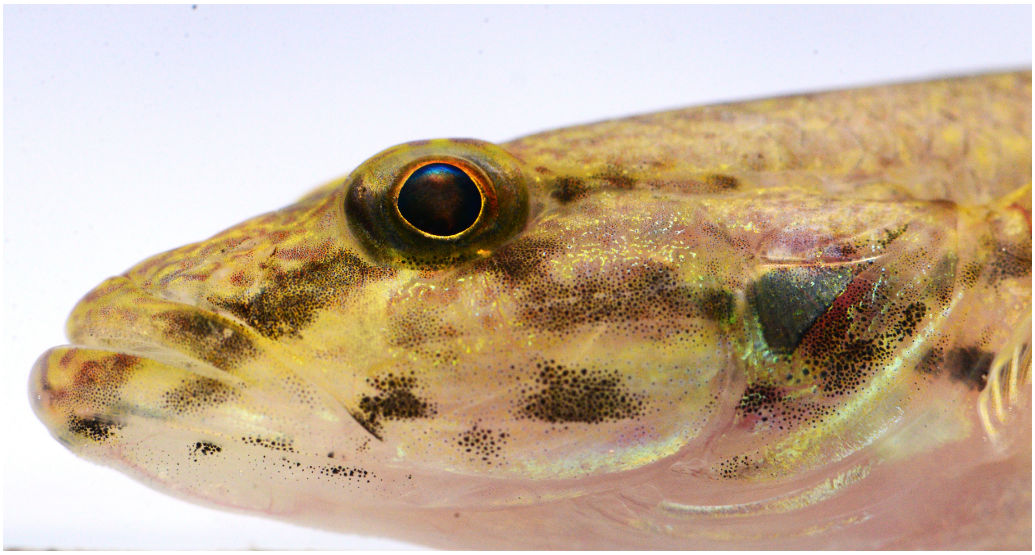

FIGURE 1. Live close-up shot of *Glossogobius laticeps* (NTOUP-2025-10-001, 76.3 mm SL) focusing on cephalic region.

singular row of papillae. Rows *c*, *d* and *e* in a singular row. Rows *b*, cp^1 and cp^2 in a patch of multiple minute papilla, composed by 2–3, 3–4 and 2–4 rows of papillae respectively. Rows *c*, cp^1, cp^2, *d* and *e* with their posterior ends reaching preopercle. Row *os* singular with an extra singular row above in all sizes, and often with numerous short singular rows in mature individuals. Row ot multiple with 1–2 transverse rows. Row *oi* singular. Adult individuals often with extra singular rows present at lower margin of opercle. Row *f* in a huge patch of minute papillae, not expanding beyond tip of chin.

Fresh colorations. See Figures 1 and 2 for live cephalic blotching patterns and fresh postmortem coloration. Body yellowish brown in juveniles, becoming dark brown in adults, with ventral surfaces paler. Head covered with numerous reddish-purple blotches. Three reddish-purple blotches present along the dorsal margin of the eye. A distinct black streak extends from the orbit to the upper tip of the preopercle. Two broad black streaks present below the eye: the upper streak running from the anterior margin of the eye to the upper lip, and the lower streak

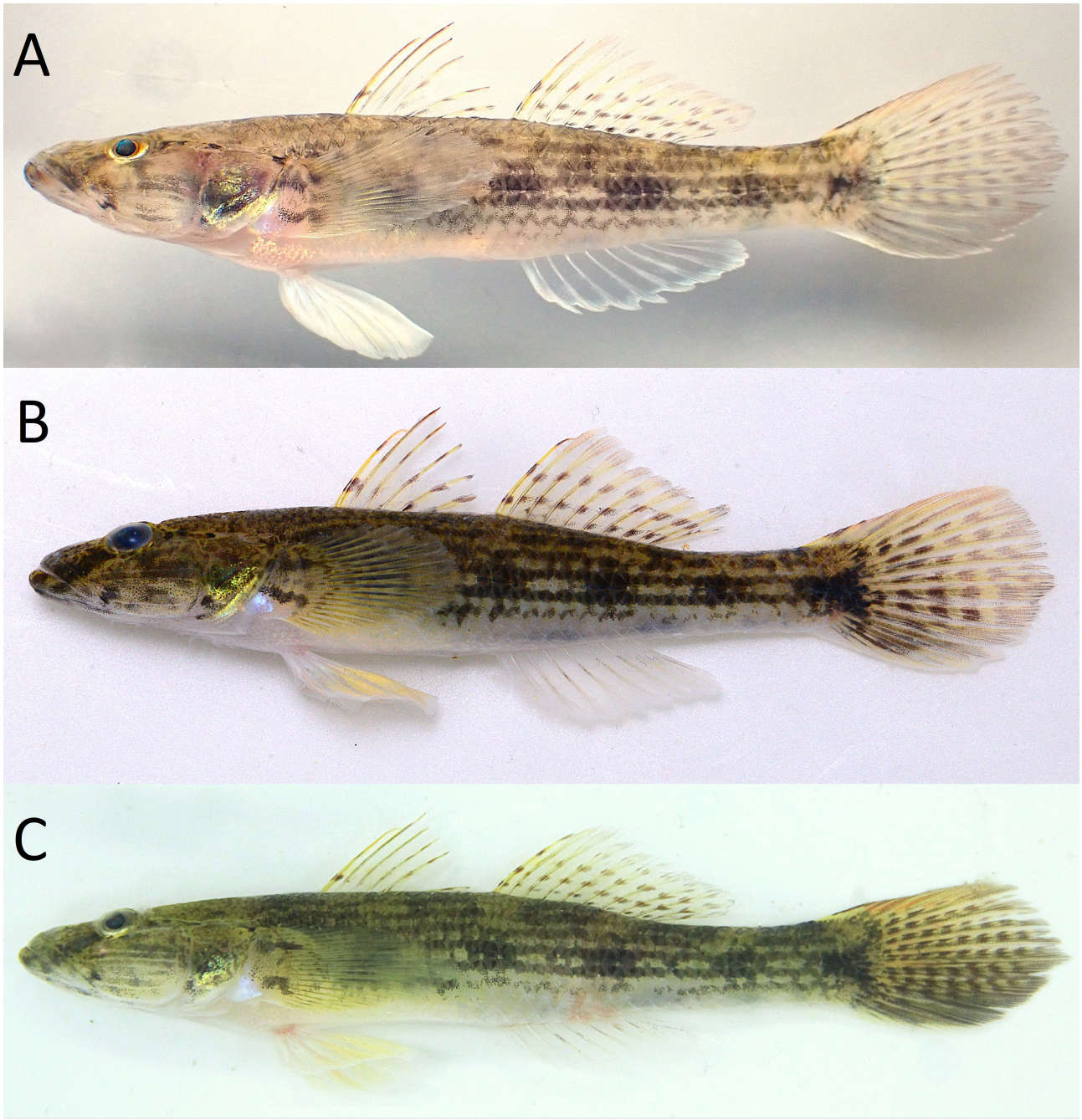

FIGURE 2. Fresh postmortem colorations of *Glossogobius laticeps* from different localities and different sizes A. subadult from Tamshui River (NTOUP-2025-10-006, 93.0 mm SL); B. juvenile from Zhonggang River (NTOUP-2025-10-001, 76.3 mm SL); C. adult from Zhonggang River (NTOUP-2025-10-011, 99.7 mm SL).

extending from the posteroventral margin of the eye to the midpoint of the preopercle, the two forming a median angle. Lower half of cheek with two blotches, one situated at the posterior end of the maxilla. Tip of chin bearing two small patches of melanophores (Fig. 4A), becoming obscure in adults (>90 mm SL) (Fig. 4B). A thin row of melanophores present along each side of the isthmus, also becoming obscure in adults (>90 mm SL) (Fig. 4A). Opercle with a metallic sheen when fresh (Fig. 2).

TABLE 1. Meristic counts and morphometric percentages of *Glossogobius laticeps* examined in this study. The morphometric percentage values were all rounded to the first decimal.

Species	*Glossogobius laticeps* De Vis, 1884	
Sex	♂	♀
D	VI-I, 9	
A	I, 8	
P1	20–21	
P2	I, 5	
LR	33–35	
TR	9–11	
Pred	22–24	
D-P	7–8	
n	5	5
% in SL		
Head length	29.5–32.6 (31.0)	28.2–31.1 (29.8)
Predorsal length	36.4–37.5 (36.9)	35.1–37.8 (36.6)
Snout to 2nd dorsal origin	55.3–58.0 (56.7)	55.1–57.7 (56.3)
Snout to anus	50.6–53.9 (52.6)	52.3–53.9 (53.1)
Snout to anal fin origin	57.5–60.4 (58.7)	57.2–59.8 (58.7)
Prepelvic length	31.4–33.7 (32.4)	30.9–33.6 (32.4)
Caudal peduncle length	22.7–25.4 (24.5)	23.3–26.6 (25.0)
Caudal peduncle depth	9.6–10.4 (10.1)	9.3–9.8 (9.6)
1st dorsal fin base length	14.2–17.4 (16.3)	16.3–18.6 (16.9)
2nd dorsal fin base length	19.4–21.1 (20.1)	19.0–21.2 (19.9)
Anal fin base length	15.0–18.3 (17.0)	16.4–17.1 (16.7)
Caudal fin length	26.0–31.6 (28.8)	24.2–27.5 (26.0)
Pectoral fin length	19.3–22.6 (21.0)	19.6–21.9 (20.9)
Pelvic fin length	19.9–22.8 (20.8)	18.3–20.1 (19.3)
Body depth at pelvic fin base	15.7–18.6 (17.1)	16.1–18.1 (17.0)
Body depth at anal fin base	15.7–17.4 (16.6)	15.8–16.6 (16.3)
Body width at anal fin base	10.5–12.1 (11.6)	9.7–13.1 (11.8)
Pelvic fin origin to anus	20.4–22.8 (21.2)	20.5–23.4 (21.5)
% in HL		
Head width in maximum	54.1–60.2 (56.3)	58.3–64.3 (61.4)
Head width at upper gill opening	39.7–42.6 (41.0)	39.7–45.3 (42.4)
Eye diameter	15.2–19.7 (16.9)	14.1–17.0 (15.3)
Bony interorbital width	2.6–4.9 (3.6)	3.4–6.3 (4.8)
Fleshy interorbital width	25.9–34.0 (29.8)	26.2–33.4 (29.6)
Snout length	30.6–34.4 (32.6)	37.3–41.4 (39.1)
Lower jaw length	35.1–38.1 (36.7)	33.5–37.2 (35.0)
Cheek depth	17.3–21.8 (19.9)	22.8–35.0 (26.7)
Postorbital length	47.1–51.7 (49.0)	45.8–56.6 (53.2)

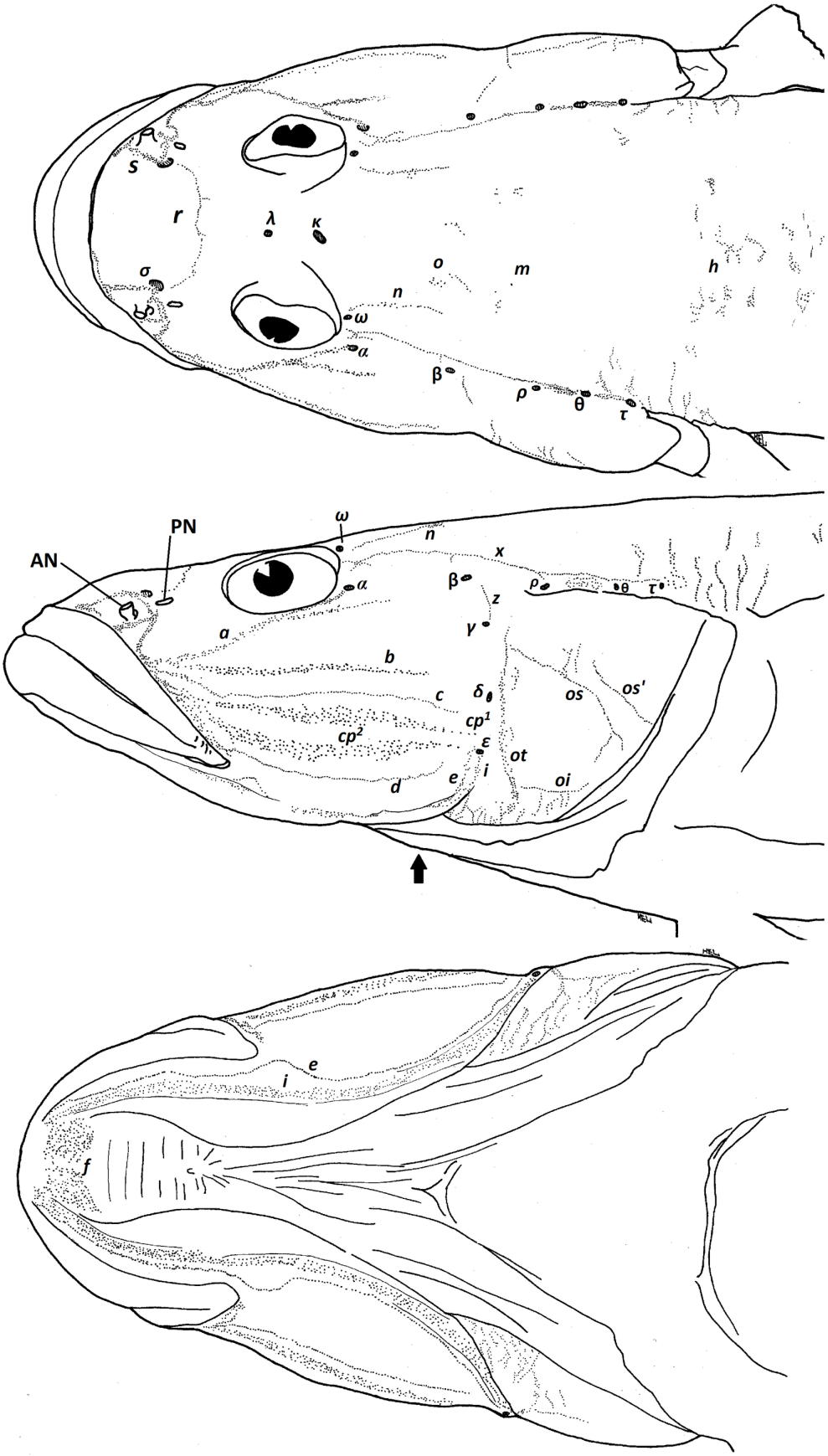

FIGURE 3. Head canal and sensory papillae arrangements of *Glossogobius laticeps* (NTOUP-2025-10-006, 93.0 mm SL). Arrows showing the anterior edge of gill slits. Scale bar = 1mm.

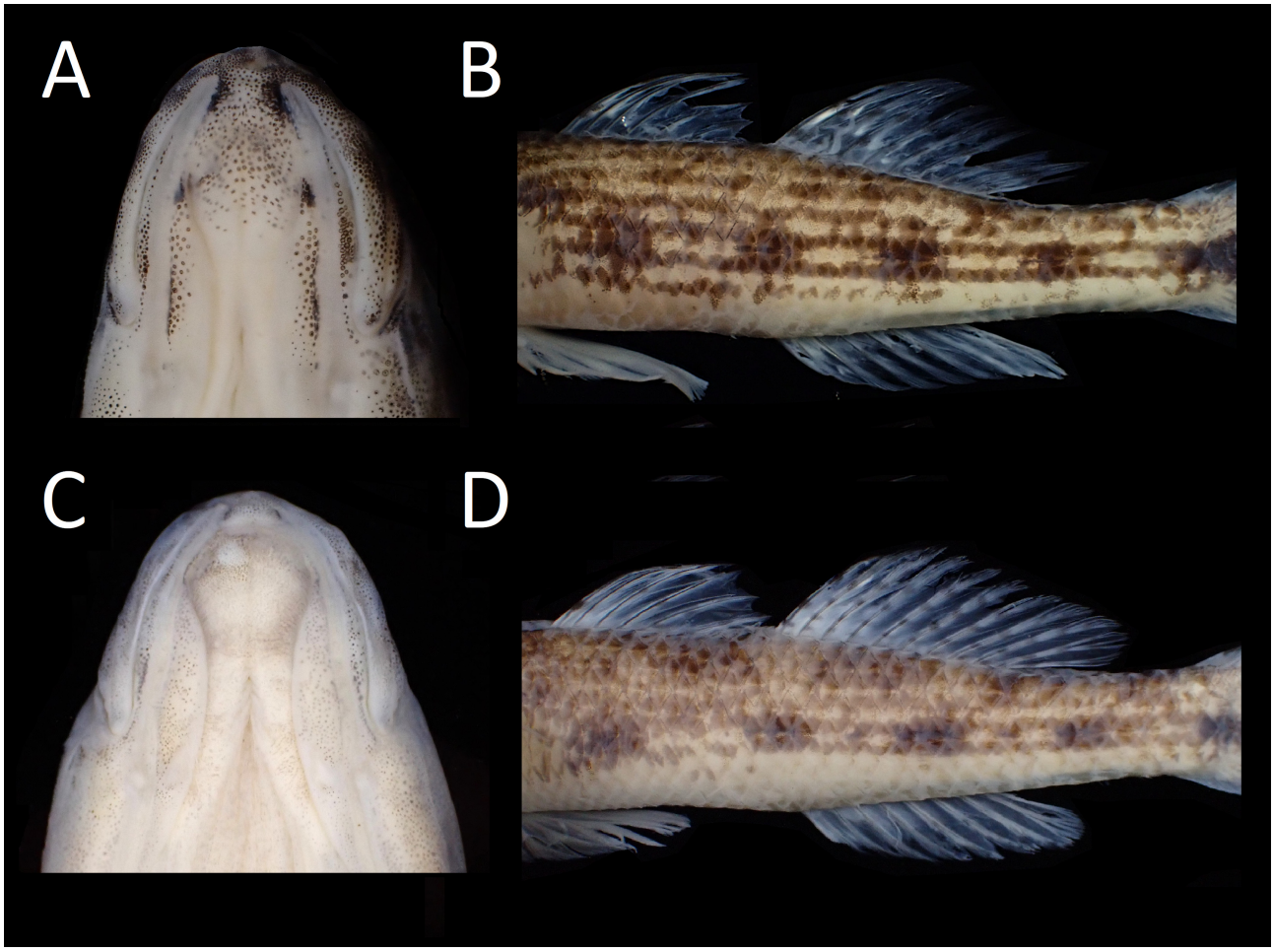

FIGURE 4. Chin and body pigmentations of *Glossogobius laticeps.* A–B. juvenile conditions (NTOUP-2025-10-001, 76.3 mm SL); C–D. adult conditions (NTOUP-2025-10-005, 115.1 mm SL).

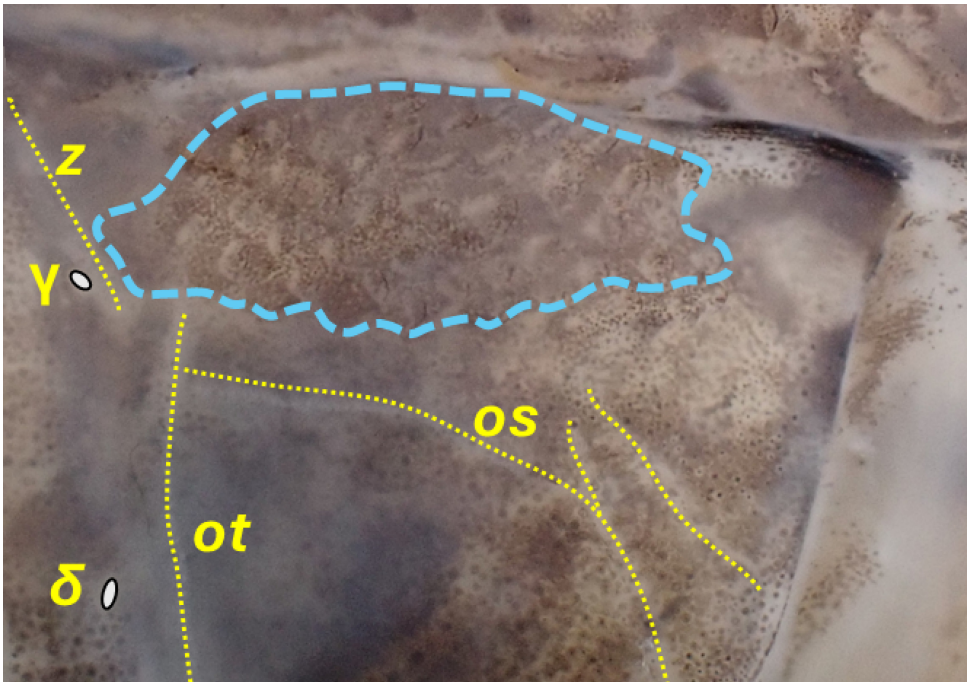

FIGURE 5. Opercle of *Glossogobius laticeps* (NTOUP-2025-10-005, 115.1 mm SL), with opercle squamations marked with blue dashed lines. White circle with black outline indicates canal pores, yellow dotted lines indicate papillae rows.

Body with five nearly rectangular blotches arranged latero-medially; the anteriormost blotch situated just posterior to the opercle and sometimes faint, the posteriormost blotch at the caudal-fin base and occasionally forming a triangular posterior extension. These rectangular blotches bordered dorsally and ventrally by a distinct longitudinal black streak extending from the axillary region to the posterior end of the caudal peduncle, accompanied by an additional 2–3 streaks along the dorsal side of the body and weaker streaks below the lateral midline (Fig. 4B, D). Body with 4–5 saddle-like blotches. Ventral region of body entirely blotchless. D1 with a distinct or diffuse black speck near the fin base at the first spine, and with 2–3 rows of black spots. D2 with a slightly orangish-purple margin and 2–3 rows of blackish-purple spots. Anal fin transparent with a white margin. Fleshy base of P1 with two rod-like spots; fin rays yellowish overall and lacking blotches. P2 whitish. Caudal fin with an orangish dorsal margin and white ventral margin; median portion of fin with 6–9 rows of dark brown spots (Fig. 2).

Preserved coloration. Body becoming yellowish; all bright coloration fading. Melanophore blotches turn distinct, retaining the general pattern of the fresh coloration.

Distribution and habitat

For Taiwanese populations, *Glossogobius laticeps* is so far only known from Northerneast and southeastern Taiwan (see discussions). Juvenile prefers brackish while adults (>90 mm SL) often inhabit freshwater habitats, and it is commonly seen to be sympatric species with other *Glossogobius* species such as *G. aureus.*

Comparisons

The *Glossogobius giuris* complex (*sensu* Hoese & Hammer 2021) is characterized by having papillae rows in multiples and having an indistinct truncate and lobe-less mental frenum. Taiwanese *Glossogobius* species belonging to this species complex includes the newly recorded *G. laticeps* and *G. olivaceus*, the two species can be immediately distinguished by adult blotching patterns of predorsal region (blotchless *vs.* possesses numerous distinct black specks), D1 (transparent with 3–4 rows of spots and a diffused blotch near fin base *vs.* orangish with two distinct blotches at 1st spine and 4–5 wavy black stripes), D2 (slightly orangish-purple margin and 2–3 rows of blackish-purple spots *vs.* orange margin and 4 rows of stripes), anal fin (transparent with white margin *vs.* dusky with creamy white margin), P1 (yellowish *vs.* dark grey), P2 (white *vs.* black) and other external morphology differences.

With the often-seen sympatric *G. aureus*, *G. laticeps* can be readily identified by having lesser predorsal scales (20–21 *vs.* 26–27), branched infraorbital row *a* (*vs.* always unbranched) extra opercle rows (*vs.* always single row *os* without extra rows) and trunk pigmentations (rectangular spots with numerous longitudinal streaks *vs.* elliptical spots with cloud-like mottled blotches dorsally).

Discussions

In this study, the Taiwanese population formerly identified as *Glossogobius giuris* is confirmed to represent the northwestern Pacific population of *G. laticeps*. Phylogenetic analyses further support this placement, with Taiwanese haplotypes clustering within the "*giuris* A" clade of Hammer *et al.* (2021) (Li *et al.* in prep.). The present findings, in concordance with Hammer *et al.* (2021), Zarei *et al.* (2023), and Zarei *et al.* (2025), indicate that *G. laticeps* possesses a broader western Pacific distribution than previously recognized, with our results extending its known range northwards.

The present study, which applies the identification framework of Hammer *et al.* (2021), represents only one component of a broader effort to resolve the taxonomic complexities of *Glossogobius* in Taiwan. Given Taiwan's biogeographic position in the northwestern Pacific, its local populations hold particular significance for elucidating the regional distributional patterns and evolutionary history of these amphidromous fishes.

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