

First record of *Hemiramphus archipelagicus* (Beloniformes: Hemiramphidae) from Taiwan

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Abstract

A single individual of the halfbeak *Hemiramphus archipelagicus* Collette & Parin, 1978 (Hemiramphidae) was recently collected off the southwestern coast of Taiwan, representing the first Taiwanese specimen and, furthermore, the northernmost record of this species; it was previously thought to only extend as far north as the Philippines. It is also the third species of *Hemiramphus* recorded from Taiwan. A detailed description of this specimen, as well as a key to Taiwanese *Hemiramphus* spp., have been provided herein.

Key words: halfbeak, *Hemiramphus archipelagicus*, ichthyology, marine biogeography, Taiwan, taxonomy

Introduction

Hemiramphus archipelagicus Collette & Parin, 1978 (Beloniformes: Hemiramphidae) is an Indo-Pacific fish species that is distributed from the west coast of India to western Polynesia; its range was once thought to extend as far northwards as the

Philippines (Collette & Parin, 1978; Collette, 1999). However, a single halfbeak specimen was recently collected from off the southwestern coast of Taiwan and identified as *H. archipelagicus*, thereby representing the northernmost record for this species. It furthermore represents the first record of *H.*

archipelagicus from Taiwan and only the third Taiwanese species from the genus *Hemiramphus* [alongside *Hemiramphus far* (Forsskål, 1775) and *Hemiramphus lutkei* Valenciennes, 1847] (Collette & Parin, 1978; Collette & Su, 1986; Collette, 1999). This new *H. archipelagicus* specimen is described in detail below, and a key has been generated for the three Taiwanese species of *Hemiramphus*.

Materials and Methods

Methods for counts and proportional measurements followed Collette & Su (1986). All measurements, including standard length (SL), were made with digital calipers to the nearest 0.1 mm. Osteological characters, including vertebral counts, were observed from a radiograph. Curatorial procedures for the specimens followed Motomura & Ishikawa (2013). Institutional codes are as follows: Kagoshima University Museum, Kagoshima, Japan (KAUM) and National Museum of Marine Biology & Aquarium, Pingtung, Taiwan (NMMB).

Results

Family Hemiramphidae

Hemiramphus Cuvier, 1816

Hemiramphus archipelagicus Collette & Parin, 1978

New Taiwanese name: 島鰾 (Figure 1a)

Specimen examined. NMMB-P28580, 230.8 mm SL, off Ke-tzu-liao, Kaohsiung, southwestern Taiwan (purchased at Ke-tzu-

liao Fish Market), 8 Feb. 2018.

Description of Taiwanese specimen.

Dorsal-fin rays 14; anal-fin rays 12; pectoral-fin rays 12; pelvic-fin rays 6; gill rakers on first gill arch 7+22=29; gill rakers on second gill arch 4+16=20; pre-dorsal scales 36; vertebrae 36+16=52. Morphometrics (expressed as percentage of SL): lower-jaw length 30.4; head length 21.7; pectoral-fin length 16.6; distance between anterior-most points of pectoral-fin insertion and pelvic-fin insertion 46.6; distance between anterior-most point of pelvic-fin insertion to center of caudal-fin base 32.5; dorsal-fin base 15.9; anal-fin base 10.3; snout length 7.5; orbit diameter 5.0; bony interorbital distance 5.3; upper-jaw length 5.5; upper-jaw width 5.1; lower-jaw length 30.8; body depth 16.1; body width 9.6 (59.6% of body depth).

Body sub-cylindrical, cross-sectionally shaped like an inverted triangle. Dorsal profile rising slowly from snout tip to above the pectoral-fin insertion, thereafter parallel to body axis to dorsal-fin origin before lowering slowly to uppermost caudal-fin base. Both dorsal and ventral profile of lower jaw straight. Ventral profile arch-like from below snout tip to lower-most point of caudal-fin base. Lower jaw anteriorly elongated and depressed. Upper jaw relatively long (length 107.8% of its width), triangular in dorsal view; upper surface scaleless. Dense, minute, conical teeth on both jaws. Tongue and vomer without teeth.



Figure 1. Fresh specimens of three species of the genus *Hemiramphus* collected from off Ke-tzu-liao, southwestern Taiwan (purchased at Ke-tzu-liao Fish Market). A: *Hemiramphus archipelagicus*, NMMB-P28580, 230.8 mm SL. B: *Hemiramphus far*, KAUM-I. 110314, 210.4 mm SL. C: *Hemiramphus lutkei*, NMMB-P27853, 181.1 mm SL.

Eye and iris round, located slightly above body axis. Nostrils in oval-shaped nasal fossa. No preorbital ridge. Posterior margins of preopercle and opercle smooth. Gill rakers long and slender. Pseudobranchial filaments present. Body scales large, cycloid, thin, and deciduous. Lateral line originating from below pectoral-fin insertion, closely following ventral profile and terminating on lower caudal-fin base; ascending branch terminating on lower-most point of pectoral-fin insertion.

Uppermost point of pectoral-fin insertion slightly posterior to posterior tip of opercle, (lower than snout tip). Posterior tip

of pectoral fin not reaching pelvic-fin insertion. Pelvic fin short and posterior to mid-body length; posteriorly depressed fin not reaching anus. Dorsal and anal fins located on posterior-most quarter of body. Anus slightly posterior to dorsal-fin origin. Anal fin origin just below sixth dorsal-fin ray origin. Posterior-most point of anal-fin base slightly anterior to posterior-most point of dorsal-fin base. Anal fin profile descending from anal-fin origin to third anal-fin ray, thereafter elevated to posterior tip of fin. Caudal fin deeply forked.

Color when fresh. Lateral surface of body uniformly whitish-silver, with a dark

green dorsum. Lower jaw black with reddish anterior tip. Pectoral, pelvic, and anal fins translucent, with melanophores on fin rays. Dorsal fin translucent; distal margin dark green. Caudal fin pale green; posterior margin blackish. Iris silver. Pupil black.

Distribution. *Hemiramphus archipelagicus* is distributed in the Indo-Pacific from the western coast of India, eastwards to Polynesia, and northwards to Taiwan (Collette & Parin, 1978; Collette, 1999; Matsunuma, 2013; Gaje, 2017; this study).

Remarks. The Taiwanese specimen was assignable to the genus *Hemiramphus*, as defined by Collette & Parin (1978), Collette & Su (1986), and Collette (1999), based on the absence of scales on the upper jaw and preorbital ridge. It also closely matched the diagnostic features of *H. archipelagicus* given by Collette & Parin (1978) and Collette (1999), i.e., body without spots, pectoral fin short (6.0 in SL (16.6% of SL)), 29 gill rakers on first gill arch, 36 predorsal scales, and outer margin of dorsal fin dark. Although Collette & Parin (1978) and Collette (1999) gave the body width of *H. archipelagicus* as 1.8 to 2 times (50.0–55.6%) the body depth, the present specimen was slightly broader (59.6% of depth). However, the proportional values given by Collette & Parin (1978) and Collette (1999) were based on specimens 147–220 mm SL, smaller than ours (230.8 mm SL); this relative difference

in length/depth ratio may, then, be simply related to minor size differences in the examined specimens.

Three species of *Hemiramphus*-viz. *H. archipelagicus*, *H. far* (Forsskål, 1775), and *H. lutkei* (Valenciennes, 1847) are known from the northwestern Pacific (Collette & Parin, 1978; Collette & Su, 1986; Collette, 1999; Aizawa & Doiuchi, 2013; Hata, 2017, 2018), the latter two having previously been recorded in Taiwanese waters (Shen & Wu, 2011; Aizawa & Doiuchi, 2013; Chiang et al., 2014). Lovejoy et al. (2004) suggested a genetically close relationship between *Oxyporhamphus* and *Hemiramphus*. Although Fricke et al. (2014, 2018) and Shao (2018) included *Oxyporhamphus convexus convexus* (Weber & de Beaufort, 1922) in the genus *Hemiramphus*, Aizawa & Doiuchi (2013) and Tashiro (2018) chose not to due to distinct morphological differences between the two genera. Despite Aizawa and Doiuchi (2013) indicating that future limits of *Obyporhamphus* will be likely changed, we follow their recognition of *Hemiramphus*.

Hemiramphus archipelagicus can be distinguished from *H. far* (Figure 1b) in that the latter possesses black vertical bars on the body. *H. archipelagicus* can be distinguished from *H. lutkei* (Figure 1c) in that the former possesses fewer gill rakers on the first gill arch (6-8+19-24=25-32 in *H. archipelagicus* vs. 9-14 + 24-32=33-46 in *H. lutkei*), as well as fewer predorsal scales (29-39, and usually fewer than 37, vs. 35-43, and usually more than 37, in *H. lutkei*) and a shorter pectoral

fin [5.8-6.8 times in SL (14.7-17.2% SL) vs. 4.5-5.4 times in SL (18.5-22.2% SL) in *H. lutkei*: Collette & Parin, 1978; Collette & Su, 1986; Collette, 1999].

The northern limit of the distributional range of *H. archipelagicus* was previously thought to be the Philippines (Collette & Parin, 1978; Collette & Su, 1986; Collette, 1999); this species had not been recorded from Taiwanese waters, nor had it been included in the most thorough, up-to-date Taiwanese ichthyofaunal database (Shao, 2018). Therefore, the specimen described herein represents the first record of *H. archipelagicus* from Taiwan and, consequently, the northernmost record of this species.

Key to species within the genus *Hemiramphus* recorded in Taiwan. The genus is diagnosed by the following characteristics: upper jaw without scales, body *not* ribbon-like, vomer and tongue without teeth, nasal papilla rounded, anterior margin of upper jaw forming a prominent triangular projection, pectoral fin shorter than 28% of the SL, and absence of preorbital ridge. The following key is based on Collette & Parin (1978), Collette & Su (1986), and Collette (1999).

1a. Pectoral fins relatively long, 4.5 to 5.4 times in SL (18.5-22.2% SL; extending past the anterior margin of the nasal fossa when folded forwards); gill rakers on first gill arch 33-46, usually more than 35; predorsal scales 35-43, usually more than

37.....*H. lutkei*

1b. Pectoral fins short, 5.2 to 6.8 times in SL (14.7-19.2% SL% SL; not reaching anterior margin of nasal fossa when folded forwards); gill rakers on first gill arch 25-36, usually fewer than 34; predorsal scales 29-39, usually fewer than 372

2a. Dorsal fin without well-developed anterior lobe, pigmented on distal margin; adults without spots on side of body.....*H. archipelagicus*

2b. Dorsal fin with well-developed anterior lobe, pigmented anteriorly; adults with 3 to 9 (usually 4 to 6) short, dark, vertical bars on side of body.....*H. far*

Comparative material (Figures 1-3).

Hemiramphus far: KAUM-I. 110314, 210.4 mm SL, Ke-tzu-liao, Kaohsiung, south-western Taiwan, 14 Dec. 2018 (Figure 1b).

Hemiramphus lutkei: NMMB-P27583, 181.1 mm SL, Ke-tzu-liao, Kaohsiung, southwestern Taiwan, 9 Dec. 2017 (Figure 1c).

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