

A new record of the whiteface waspfish *Richardsonichthys leucogaster* (Richardson, 1848) in Taiwanese waters (Actinopterygii: Scorpaeniformes: Tetrarogidae)

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Abstract

A whiteface waspfish *Richardsonichthys leucogaster* (Richardson, 1848) was recently collected off Southwestern Taiwan, representing the first record from Taiwan and the northernmost record of this species. It can be distinguished from other tetrarogids in its 1) naked body, 2) lateral line running below the dorsal-fin base, 3) gill slit's upper end being located near the dorsal fin base, 4) dorsal-fin ray counts (XIII, 7), and 5) pelvic-fin ray counts (I, 5). A detailed description of this specimen has been provided herein.

Keywords: biodiversity, ichthyology, Scorpaeniformes, taxonomy, waspfish

Introduction

The Indo-West Pacific waspfish family Tetrarogidae is characterized by species whose 1) skin at the gill opening is not broadly connected to the isthmus, 2) lacrimal bones are mobile and not bound to the suborbital bone, 3) pectoral-fin rays at the lower portion are not separated from the remainder, and 4) body and head spines are compressed (Poss, 1999; Chungthanawong and Motomura, 2021). Currently, 44 species within 18 genera are considered valid (Chungthanawong and Motomura, 2022; Fricke et al., 2023).

Among them, *Richardsonichthys leucogaster* (Richardson, 1848) is the only member of *Richardsonichthys* (Smith, 1958), which is widely distributed in the Indo-West Pacific Ocean. It can be distinguished from other genera/species by its naked body, dorsal-fin ray counts (XIII, 7), pelvic-fin ray counts (I, 5), presence of palatine teeth, position of its dorsal-fin origin anterior to the posterior margin of the eye, lateral line running below the dorsal-fin base, and upper end of gill slit nearly reaching the dorsal-fin base (Chungthanawong and Motomura, 2021).

Recently, a single waspfish was collected off Ke-Tzu-Liao fish market in Southwestern Taiwan, and it was identified as *R. leucogaster* based on possessing these characteristics. The present specimen, which is described in detail below, represents the first record of this species in Taiwan.

Materials and methods

The specimen was collected by bottom trawl and observed in the associated bycatch at the Ke-Tzu-Liao fish market in Southwestern Taiwan by the second author. The specimen was fixed in 10% formalin in tap water for one week and subsequently transferred to 70% ethanol for long-term storage. The methods for taking counts followed Motomura (2004), with pseudobranchial filaments additionally quantified. The measurement methods followed Motomura et al. (2008) and Chungthanawong and Motomura (2018). The last two dorsal- and anal-fin rays were divided at the base and thus counted as a single ray. Counts were taken from the left side of the specimen unless the character was obscured, in which case the right side was inspected. Gill rakers and pseudobranchial filaments were quantified from the right side. Vertebrae counts were determined from X-rays. Measurements were made with 150-mm digital calipers,

rounding to the nearest 0.1 mm. Standard length (SL) and head length (HL) are given for certain relative measurements, and the specimen was deposited at the Pisces Collection of the National Museum of Marine Biology and Aquarium, Taiwan (NMMB-P).

Results

Family Tetraogidae

Richardsonichthys leucogaster

(Richardson, 1848)

English name: Whiteface waspfish

New Chinese name: 白腹里氏真裸皮鮠

Figs. 1-2 & Tables 1-2.

Apistes leucogaster Richardson, 1848:5, pl. 5, Figs. 1-2. (Original description. Type locality: Sea of China [no precise locality given]).

Tetraogea darnleyensis Alleyne and Macleay, 1877:278, pl. 6. (Type locality: Erub [= Darnley] Island, 9°35'00"S, 143°46'00"E, Torres Strait, Queensland, Australia): Allen et al., in Hoese et al., 2006:902 (listed).

Tetraogea leucogaster (Richardson, 1848): Allen and Swainston, 1988:50 (in part).

Richardsonichthys leucogaster

(Richardson, 1848): Paxton et al., 1989:447 (in part). Randall et al., 1990:80 (in part). Allen, 1997:78 (in part). Randall et al., 1997:80 (in part). Poss, 1999:2333 (listed). Poss, in Randall and Lim, 2000:605 (listed). Mandrytsa, 2001:278

(analysis of lateral-line system). Hutchins, 2001:27 (listed). Allen and Adrim, 2003:30 (listed). Allen et al., 2003:381 (in part). Adrim et al., 2004:119 (listed). Randall, 2005:129 (in part). Allen et al., in Hoese et al., 2006:902 (listed). Prokofiev, 2008:304 (in part). Motomura, in Kimura et al., 2009:70 (in part). Fricke et al., 2011:380 (listed). Motomura, in Matsunuma et al., 2011:67 (in part). Larson et al., 2013:84 (listed). Kwik and Lim, 2020:18 (in part). Poss, in Heemstra et al., 2022:555 (in part).

Material examined.

NMMB-P38306, 45.4 mm SL, off Ke-Tzu-Liao (ca. 22°42'53"N, 120°13'12"E), Kaohsiung, Southwestern Taiwan, 10 Dec. 2022, bottom trawl, collected by Y.-C. Chen.

Description of NMMB-P38306.

Meristic and morphometric data are provided in Tables 1-2.

Body Dorsal-fin elements XIII, 7, first three spines situated on top of skull, all soft rays branched; pectoral-fin elements 15, upper and lower most rays unbranched, others branched; pelvic-fin elements I, 5; anal-fin elements III, 6, all soft rays branched; principal caudal-fin rays 7+6; procurrent caudal-fin rays 2 dorsally and 3 ventrally; gill rakers on outer face of first gill arch 2+1+7=10, all forming bumps; pseudobranchial filaments 16; lateral-line pores 12;

vertebrae 10+14=24.

Body slightly elongated, its depth 2.8 in SL; body compressed, anterior width 5.2 in SL, and becoming progressively more compressed posteriorly. Head moderate: length 2.4 in SL, width 1.9 in HL; anterior profile of head slightly curved. Entire body without scales; small tentacles present on pupil. Lateral line singular, complete, and with large pores running along dorsal profile, slightly below dorsal-fin base. Swim bladder absent.

Two pairs of nasal openings; anterior nostril rounded and situated above tip of premaxilla; posterior nostril tubular, with single dermal flap and situated in front of eye. Eyes moderately large, width 3.0 in HL; bony rim of orbit forming ridge on

Tab. 1. Meristic characters of the examined specimen of *Richardsonichthys leucogaster* (Richardson, 1848) from Taiwan (NMMB-P38306).

| Character | Value |
|---------------------------|----------|
| Dorsal-fin elements | XIII, 7 |
| Pectoral-fin elements | 15 |
| Anal-fin elements | III, 6 |
| Pelvic-fin elements | I, 5 |
| Caudal-fin elements | 2+7+6+3 |
| Gill rakers | 2+1+7=10 |
| Pseudobranchial filaments | 16 |
| Lateral-line pores | 12 |
| Vertebrae | 10+14=24 |

Tab. 2. Morphometric characters of the examined specimen of *Richardsonichthys leucogaster* (Richardson, 1848) from Taiwan (NMMB-P38306). Abbreviations: A=anal-fin; D=dorsal-fin; HL=head length; SL=standard length.

| Characters | Value | | | | |
|--------------------------|-------|------|-------|-------|-------|
| SL (mm) | 45.4 | | | | |
| | | % SL | % HL | in SL | in HL |
| HL | 18.7 | 41.3 | | 2.4 | |
| Head width | 10 | 22.1 | 53.4 | 4.5 | 1.9 |
| Body depth | 16.2 | 35.6 | 86.3 | 2.8 | 1.2 |
| Body width | 8.7 | 19.1 | 46.3 | 5.2 | 2.2 |
| Snout length | 4 | 8.8 | 21.4 | 11.3 | 4.7 |
| Orbital length | 6.2 | 13.7 | 33.2 | 7.3 | 3 |
| Postorbital length | 10.4 | 22.9 | 55.4 | 4.4 | 1.8 |
| Interorbital length | 3.2 | 7 | 16.9 | 14.4 | 5.9 |
| Suborbital length | 2.7 | 5.8 | 14.1 | 17.1 | 7.1 |
| Upper-jaw length | 9.1 | 20.1 | 48.7 | 5 | 2.1 |
| Maxillary depth | 3.3 | 7.2 | 17.5 | 13.8 | 5.7 |
| Predorsal length | 8.3 | 18.3 | 44.4 | 5.5 | 2.3 |
| Prepectoral length | 17.7 | 38.9 | 94.2 | 2.6 | 1.1 |
| Prepelvic length | 17.2 | 37.8 | 91.6 | 2.6 | 1.1 |
| Preanal length | 30 | 66.2 | 160.2 | 1.5 | 0.6 |
| 1 st D spine | 5 | 10.9 | 26.4 | 9.2 | 3.8 |
| 2 nd D spine | 8.1 | 17.9 | 43.4 | 5.6 | 2.3 |
| 3 rd D spine | 8.6 | 18.8 | 45.6 | 5.3 | 2.2 |
| 4 th D spine | N/A | | | | |
| 5 th D spine | 7.2 | 15.9 | 38.5 | 6.3 | 2.6 |
| 6 th D spine | 9.3 | 20.4 | 49.4 | 4.9 | 2 |
| 7 th D spine | N/A | | | | |
| 8 th D spine | N/A | | | | |
| 9 th D spine | 8.1 | 17.9 | 43.3 | 5.6 | 2.3 |
| 10 th D spine | 11 | 24.3 | 58.9 | 4.1 | 1.7 |
| 11 th D spine | 7.7 | 16.9 | 40.8 | 5.9 | 2.4 |
| 12 th D spine | 8.3 | 18.3 | 44.2 | 5.5 | 2.3 |
| 13 th D spine | 11.8 | 26.1 | 63.2 | 3.8 | 1.6 |
| Longest D ray | 9 | 19.8 | 47.8 | 5.1 | 2.1 |
| D length | 33.8 | 74.5 | 180.5 | 1.3 | 0.6 |
| 1 st A spine | 3.3 | 7.2 | 17.5 | 13.9 | 5.7 |
| 2 nd A spine | 5.1 | 11.3 | 27.4 | 8.8 | 3.6 |
| 3 rd A spine | 7.7 | 16.9 | 41 | 5.9 | 2.4 |
| Longest A ray | 8.7 | 19.2 | 46.6 | 5.2 | 2.1 |
| A length | 12.8 | 28.3 | 68.5 | 3.5 | 1.5 |
| Pectoral-fin length | 14.2 | 31.4 | 76 | 3.2 | 1.3 |
| Pelvic-fin spine length | 11.4 | 25 | 60.6 | 4 | 1.7 |
| Pelvic-fin length | 7.7 | 16.9 | 41 | 5.9 | 2.4 |
| Caudal-fin length | 12.3 | 27.2 | 65.8 | 3.7 | 1.5 |
| Caudal-peduncle depth | 4.2 | 9.2 | 22.4 | 10.8 | 4.5 |
| Caudal-peduncle length | 6.7 | 14.7 | 35.5 | 6.8 | 2.8 |

upper portion. Ascending process of premaxilla well developed. Interorbital space narrow, its width 2.0 in orbit diameter; interorbital ridges with two nearly parallel, moderately developed ridges that diverge anteriorly, their tips and ends forming small lumps; median interorbital ridge absent.

Nasal, supraocular, and supracleithral spines absent. Parietal, nuchal, pterotic, and posttemporal bones forming ridges but without distinct spines. Suborbital bone forming three low ridges; both upper and median ridges extending posteriorly to near base of uppermost preopercular spine. Preopercle with five simple spines, uppermost longest and protruding from skin, its posterior tip not reaching to margin of opercle; 2nd to 4th spines short and embedded in skin. Opercle with two crests forming V shape but not connected anteriorly, their endings without distinct spines. Upper end of gill opening bearing single dermal flap on opercle, ending below horizontal through upper margin of eye. Lacrimal bone movable, with two simple spines; anterior spine short, directed postero-ventrally; posterior spine long, directed backwards, its posterior tip not reaching posterior margin of upper jaw. Mouth moderately large (upper-jaw length 2.1 in HL), terminal, and slightly oblique; posterior margin of maxilla not reaching vertical through posterior margin of orbit; surface of maxilla smooth and lacking

ridge. Upper and lower jaws with villiform teeth; vomer and palatines with villiform teeth. Lips thin and without papillae. Symphyseal knob present, short, and blunt, its surface edentate.

Gill rakers on outer face of all four arches blunt and forming bumps. Inner rakers also forming bumps and present on outer three arches. Fourth gill arch connected to body, without slit between 4th gill arch and 5th ceratobranchial. Large, somewhat triangular villiform tooth patch on 5th ceratobranchial. Large, teardrop-like villiform tooth patch on third pharyngobranchial.

Otolith

Sagittal otolith (Fig. 2) rather large, length 19.8% HL; its shape elliptic, length/depth ratio 1.89. Both dorsal and ventral margins smoothly curved; posterior margin entire and convex, no pseudo-excisure or pseudo-rostrum; distal surface slightly concave; proximal surface slightly convex; sulcus groove shallow, narrow, and ostial; both colliculums absent; both crista superior and crista inferior poorly developed and forming very low ridges; rostrum convex, its margin rather blunt; antirostrum poorly developed; notch on excisure present but indistinct; dorsal depression rather deep and broad; ventral depression absent.

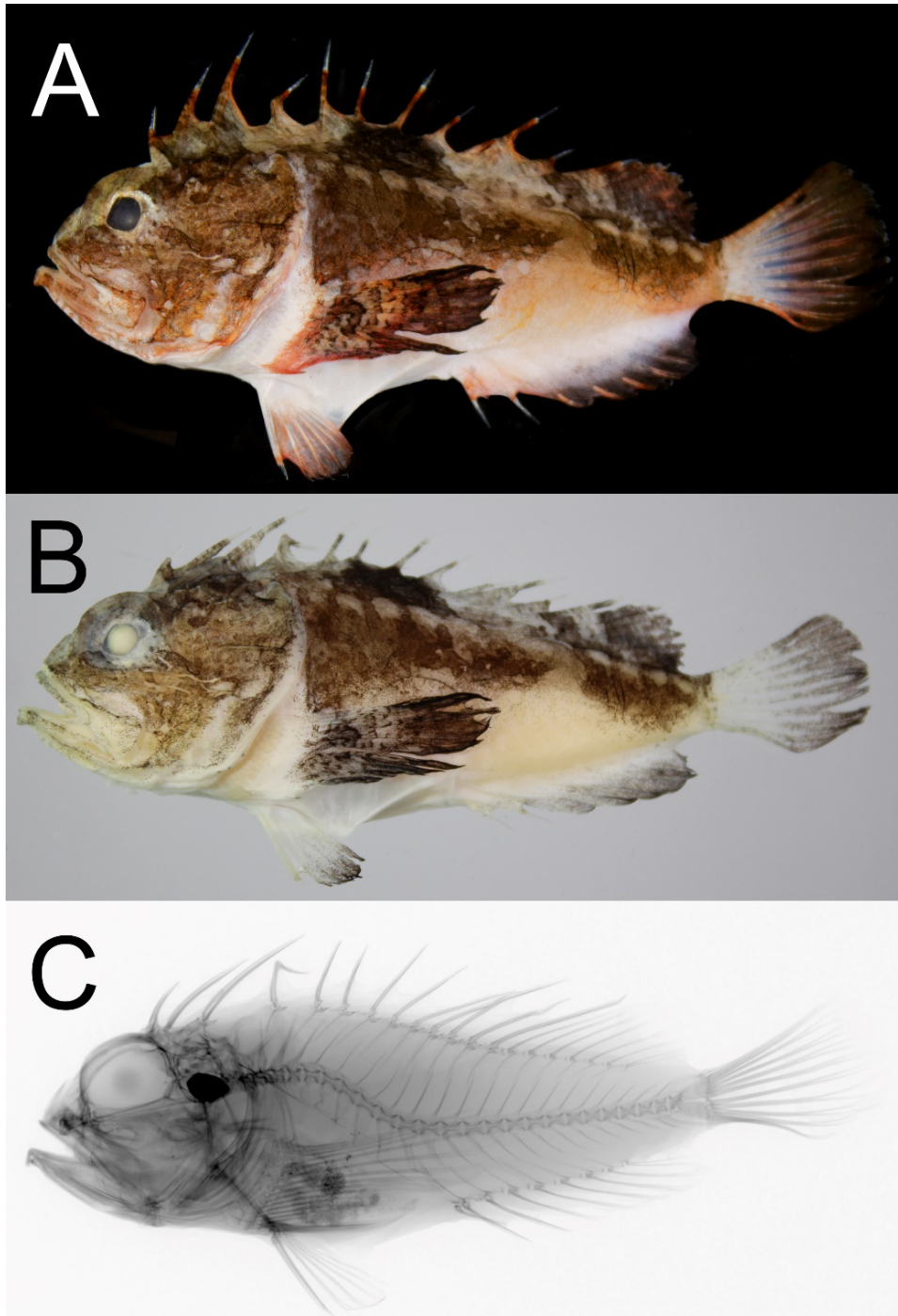


Fig. 1. *Richardsonichthys leucogaster* (Richardson, 1848) from Taiwan (NMMB-P38306, 45.4 mm SL). A. Fresh condition. B. Preserved condition. C. X-ray.

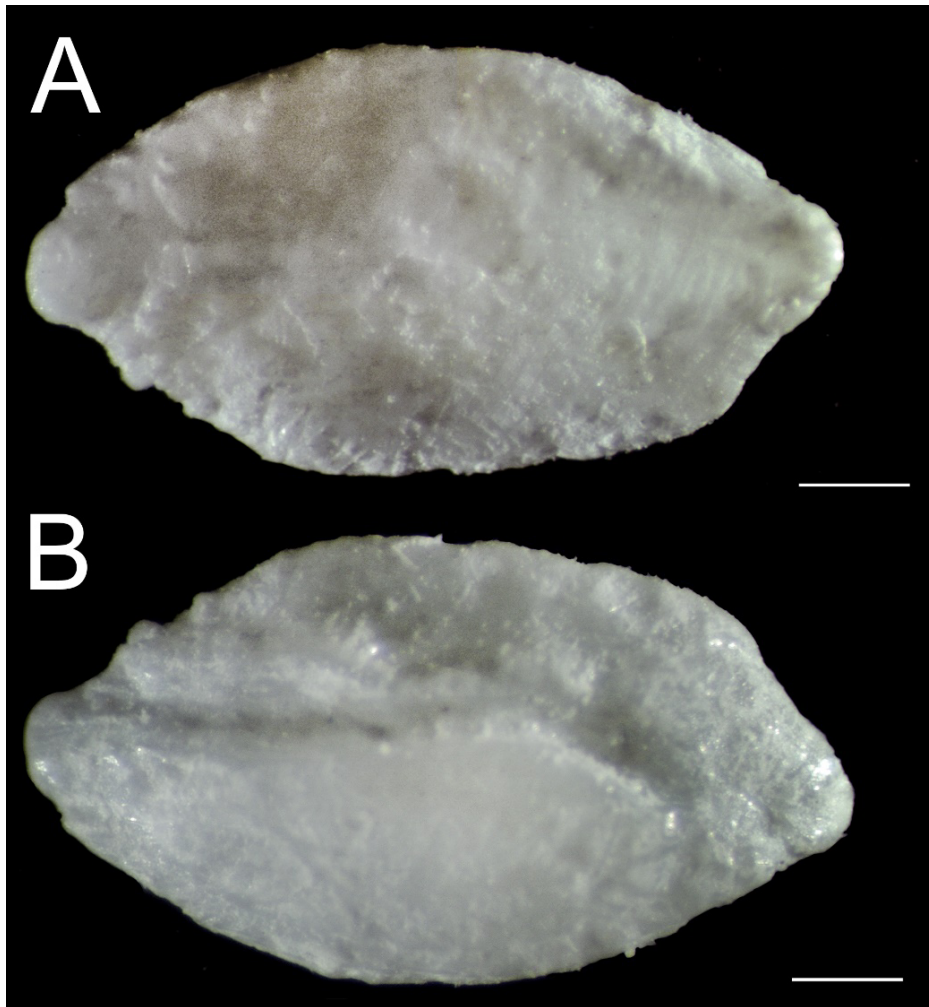


Fig. 2. Right sagittal otolith of *Richardsonichthys leucogaster* (Richardson, 1848) from Taiwan (NMMB-P38306, 45.4 mm SL). A. Distal face. B. Proximal face. Anterior to left. Scale bar=500 μ m.

Coloration

When fresh (Fig. 1A), body orange tinted with brown patches; lower jaw, gular, isthmus, and abdomen all white; lateral-line pores also white. Pectoral fin orange, with brown vermicular patterns and brown margin; pelvic, anal, and caudal fins

slightly reddish; dorsal fin variegated, with two brown blotches on spiny portion and two brown bands on soft-ray portion. When preserved (Fig. 1B), body brownish, with abdominal region, lower jaw, gular, and isthmus whitish. Head, pectoral fin, distal half of caudal fin, anal fin, and tip of

pelvic fin all dark brown. Oral cavity, including underside of tongue and peritoneum, white.

Distribution

Widespread in the Indo-West Pacific, including Taiwan (this study), South China Sea (Adrim et al., 2004), Singapore (Kwik and Lim, 2020), Indonesia (Allen and Adrim, 2003), Australia (e.g., Allen, 1997; Allen et al., 2006; Larson et al., 2013), west coast of Thailand (Motomura, 2009), and South Africa (Poss, 2022).

Remarks

The present study agrees well with the diagnostic characters provided by Chungthanawong and Motomura (2021), and we conclude our specimen to be *R. leucogaster*. Among the tetrarogid genera recorded in Taiwan (Shao, 2023), *R. leucogaster* can be distinguished in its XII–XIII dorsal-fin spines (vs. >XIII in *Ablabys*, *Ocosia*, & *Paracentropogon*; Chungthanawong and Motomura, 2021); 14–17 pectoral-fin rays (vs. 10–11 in *Paracentropogon*); I, 5 pelvic-fin rays (vs. I, 4 in *Paracentropogon*); 9–14 lateral-line pores (vs. >14 in *Neocentropogon*, *Paracentropogon*, & *Snyderina*); presence of palatine teeth (vs. absent in *Snyderina*); small cirri or tentacles on the eyes (vs. absent in all other genera); lateral line running near dorsal-fin base (vs. well-separated in all other genera); and upper end of gill slit positioned near dorsal-fin

base (vs. well-separated in all other genera).

The specimen was collected alongside shallow-water species, such as Leignathidae spp. and Platycephalidae spp., via bottom trawling. According to prior reports (Allen et al., 2003; Motomura, 2011; Poss, 2022), this species inhabits sandy bottoms or coral reefs at depths <90 m. Together with this information, we hypothesize that the specimen was collected shallower than 90 m. It is a nocturnal species and buries itself in the sand during the day (Kuiter and Tonzuka, 2001).

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