First Northern Hemisphere Record of a Poorly Known Armored Searobin Peristedion richardsi (Actinopterygii: Teleostei: Peristediidae) from Taiwan

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A single female specimen (197.2 mm standard length) of the armored searobin Peristedion richardsi Kawai, 2016, previously recorded only from Indonesian waters, but recently collected from Pingtung County, southern Taiwan, represents the largest example known and first Northern Hemisphere record of the species. A detailed description of the specimen is given, with notes on intraspecific variation in P. richardsi.

Key Words: Distribution, Dong-gang, Indonesia, description, morphology.

Introduction

The peristediid genus Peristedion Lacepède, 1801, widely distributed in the Indian, Pacific and Atlantic oceans, currently includes 24 valid species (Fricke et al. 2017), four of which (P. orientale Temminck and Schlegel, 1843, P. liorhynchus ( Günther, 1872), P. riversandersoni Alcock, 1894, and P. amblygenys Fowler, 1938) have previously been reported from Taiwanese waters (Ho et al. 2013; Kawai 2016).

During an ichthyofaunal survey of Taiwan, a single female specimen (197.2 mm standard length) of Peristedion, collected off Dong-gang, Pingtung County, southern Taiwan on 24 December 2018, was subsequently identified as P. richardsi Kawai, 2016, previously known from only four specimens (115–132 mm standard length) from the southern coast of Java and the Flores Sea, Indonesia (Kawai 2016). The Taiwanese specimen, herein described in detail, represents the largest specimen known and first Northern Hemisphere record of the species.

Materials and Methods

Counts and measurements followed Ono and Kawai (2014) and Kawai (2016). Terminology and counts for bony plates and barbels follow Yatou and Okamura (1985). Cranial spine terminology follows Miller (1967). Standard length is abbreviated as SL. Curatorial procedures followed Motomura and Ishikawa (2013). Institutional codes are as follows: the Hokkaido University Museum, Hakodate (HUMZ); the Kagoshima University Museum, Kagoshima (KAUM); Zoological Museum Amsterdam, Amsterdam (ZMA).
1st group with three barbels clustered on each side, 2nd with three, 3rd with four, 4th with four, 5th with four; and 6th with four (left) and five (right). Gill rakers on 1st arch comb-like. Gill membrane narrowly united to isthmus. Eye large. Interorbital concave. Single spine with ridge on opercle. No spines on nasal, lateral ethmoid and mesethmoid. Single ridge on 4th infraorbital below orbit. Frontal-1 spine strong. Frontal-2 spine minute. Parietal spine stout. Post-temporal spine weak. Bony plates on body primarily in four rows, each plate with single backwardly directed spine; dorsal row: 1st plate largest; backwardly directed spine on each plate decreasing in size posteriorly except for last two plates; upper lateral row: 26–37th plates with forwardly directed spine; 1st to 5th plates smaller, slanted obliquely downward; lower lateral row: terminating at caudal peduncle; 25–27th plates alternately sutured (as zigzag) with contralateral plates along ventral mid-line; ventral row: backwardly directed spine on each plate decreasing in size posteriorly, reducing to low ridge, except for last two plates; row of plates absent at caudal peduncle. Two large bony plates with low ridge anterior to anus. Dorsal fin originating level with anterior margin of 2nd plates of dorsal row, ending level with 28th plates. Anal fin originating level with 2nd plates of ventral row, ending just below end of dorsal-fin base. Tip of joined pectoral fin rays just reaching anus. Two detached pectoral-fin rays thick, upper ray much longer than lower ray. Tip of pelvic fin just reaching anus. Caudal fin weakly emarginated.

Coloration of preserved specimen (Fig. 1). Head, body and all fins light brown with grey vermiculate pattern posterodorsally on head, and dorsal and upper lateral bony plates. Dorsal fin edged with black. Pectoral fin with a central black spot and a black bar posteriorly. Peritoneum black. Fresh coloration unknown.

Distribution. Southern coast of Java and Flores Sea, Indonesia, and southern Taiwan (Kawai 2016; this study: Fig. 3).

Remarks. Examination of the Taiwanese specimen
First Taiwanese record of *Peristedion richardsi* (KAUM–I. 127304, 197.2 mm SL; Fig. 1) showed it to be a mature female, many relatively large-sized eggs (ca. 0.9 mm diameter) issuing from the cloaca. The specimen was clearly assignable to *Peristedion*, lacking teeth on the upper jaw and having the posterior pairs of bony plates in the contralateral lower lateral rows sutured along the midline, both being diagnostic of the genus as defined by Kawai (2008). Moreover, it agreed well with the diagnosis of *Peristedion richardsi* given by Kawai (2016), having the following features: dorsal row bony plates 32; upper lateral row bony plates 37; chin barbels 22 (total); anterior edge of 4th sensory pore of rostral projection located anterior to anterior edge of premaxilla; perifacial rim prominent, originating near anterior margin of lower jaw; spatulate rostral projections separated by very narrow interspace (projection width 1.6 times in interspace) (Fig. 2A, B), with straight margins basally on medial aspects; and upper free pectoral ray longer than joined rays.

However, the Taiwanese specimen differed from the Indo-Nesian type specimens of *P. richardsi* in having slightly higher counts of dorsal- and anal-fin rays (VIII, 23 dorsal-fin rays and 23 anal-fin rays vs. VIII, 22 and 22 in the former; Kawai 2016) and a vermiculate pattern on the dorsal surface (vs. no distinct pattern; Kawai 2016). Ranges of dorsal and anal-fin ray numbers greater than two have been reported in other congeners (*P. orientale*, *P. liorhynchus*, *P. riversandersoni*, and *P. amblygenys*; Ho et al. 2013; Ono and Kawai 2014; Kawai 2016), and similar color variations are known in *P. nierstraszi* Weber, 1913 (junior synonym of *P. riversandersoni*; Ho et al. 2013; Kawai 2016), suggesting that the above variations in *P. richardsi* are simply intraspecific. Although, the Taiwanese specimen also differed from the type specimens in 16 of 23 morphometric characters, such were likely due to ontogenetic proportional changes, the present specimen (197.2 mm SL) being much larger than the other known specimens (115–132 mm SL).

*Peristedion richardsi* is most similar to *P. amblygenys*, distributed in the East China and South China seas, including Taiwanese waters, and the Indian Ocean off Indonesia (Ho et al. 2013; Ono and Kawai 2014), both having the anterior edge of the 4th rostral projection sensory pore anterior to the anterior edge of the premaxilla, a prominent perifacial rim originating near the anterior lower-jaw margin, and rostral projections with a straight basal margin on the medial aspects (Kawai 2016). However, *P. richardsi* is distinguishable from *P. amblygenys* in having spatulate rostral projections (vs. triangular in *P. amblygenys*) with a very narrow interspace, the projection width 1.33–1.73 times in interspace (vs. moderate interspace, projection width 0.86–1.08 in interspace; Kawai 2016).
waters (Kawai 2016), the Taiwanese specimen represents the first Northern Hemisphere record of the species.

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**Table 1.** Counts and measurements of *Peristedion richardsi* expressed as percentages of standard length. Counts of paired fin, bony plates and barbels based on left side.

|                         | This study | Kawai (2016) |
|-------------------------|------------|--------------|
|                         | Taiwan     | Indonesia    |
|                         | Non-type specimen | Holotype | Other materials* |
| Standard length (SL; mm)| 197.2      | 127          | 115–132          |
| Counts                 |            |              |                 |
| Dorsal-fin rays        | VIII, 23   | VIII, 22     | VIII, 22        |
| Anal-fin rays          | 23         | 21           | 22              |
| Principal caudal-fin rays | 11      | 11           | 11–12           |
| Pectoral-fin rays (including free rays) | 14 | 13 | 14 |
| Pelvic-fin rays        | 1.5        | 1.5          | 1.5             |
| Bony plates in dorsal  | 32         | 32           | 31–33           |
| Bony plates in upper lateral | 37   | 37           | 37–38           |
| Bony plates in lower lateral | 27   | 27           | 27–28           |
| Bony plates in ventral | 26         | 25           | 26              |
| Bony plates before anus| 2          | 2            | 2               |
| Groups of barbels (lip + chin) | 3 + 6 | 3 + 6        | 3 + 6           |
| Branches on filamentous barbel | 31 | 23          | 26–33           |
| Total chin barbels     | 22         | 22           | 21–22           |
| Gill rakers on right side | 5 + 1 + 19 = 25 | 5 + 1 + 19 = 25 | 5 + 1 + 21–22 = 27–28 |
| Measurements (% of SL) |            |              |                 |
| Body depth             | 16.2       | 13.7         | 13.3–15.2       |
| Body width             | 13.2       | 11.2         | 9.7–13.0        |
| Head length            | 31.7       | 31.8         | 31.9–34.0       |
| Head depth             | 14.4       | 13.8         | 14.0–15.6       |
| Head width             | 20.9       | 21.6         | 23.9–24.8       |
| Snout to dorsal fin    | 30.2       | 31.8         | 32.4–33.5       |
| Snout to anus          | 40.1       | 41.1         | 40.3–41.9       |
| Snout length           | 13.3       | 14.2         | 14.5–15.5       |
| Rostral projection length | 10.4   | 11.1         | 9.4**           |
| Rostral projection width | 4.0     | 5.0          | 4.1–4.9         |
| Interspace between rostral projections | 2.5 | 2.9 | 2.8–3.7 |
| Filamentous barbel length | 12.0   | 13.5         | 13.6–14.6       |
| Upper-jaw length       | 11.2       | 12.1         | 12.0–12.9       |
| Lower-jaw length       | 11.8       | 12.8         | 12.0–12.9       |
| Orbital diameter       | 7.6        | 9.5          | 8.8–9.9         |
| Interorbital width     | 7.6        | 7.5          | 7.4–8.8         |
| Pectoral-fin length    | 17.2       | 18.2         | 16.2–18.2       |
| Upper detached pectoral-fin ray length | 17.9 | 24.2 | 21.2–24.7 |
| Lower detached pectoral-fin ray length | 14.9 | 20.3 | 18.6–20.3*** |
| Pelvic-fin length      | 17.0       | 17.3         | 17.2–18.5       |
| First dorsal spine length | 9.7    | 8.8          | 8.9–9.7         |
| Caudal-peduncle length | 10.5       | 11.1         | 9.8–11.0        |
| Caudal-peduncle depth  | 1.8        | 1.8          | 1.8–1.9         |

*Paratypes of *P. richardsi* (HUMZ 194549 and HUMZ 194573) and paralectotype of *P. nierstræsi* (ZMA 112.442); **without HUMZ 194573 and ZMA 112.442; ***without ZMA 112.442.
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