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PARAPERCICOLA INFLATA N. SP. (COPEPODA, CHONDRACANTHIDAE) PARASITIC ON THE RED BIGEYE, *PRIACANTHUS MACRACANTHUS* CUVIER, FROM TAIWAN

BY

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ABSTRACT

A new species of chondracanthid copepod, *Parapercicola inflata* n. sp., parasitic in the nasal cavity of the red bigeye, *Priacanthus macracanthus* Cuvier, 1829, caught off the southern coast of Taiwan, is described. This is the second species of a recently established genus, *Parapercicola* Ho, Liu & Lin, 2011. It is distinguishable from its only known congener, *P. formosana* Ho, Liu & Lin, 2011, in having in the female (1) a short trunk that is distinctly wider than long, (2) a greatly inflated antennule, (3) a labrum with knobs on the free posterior margin, (4) a less reduced endopod in legs 1 and 2; and in the male in having (5) a spinulose terminal process on the caudal ramus and (6) a maxilliped with a patch of denticles on the second segment.

Key words. — Parasitic copepods, *Parapercicola*, red bigeye, Taiwan, Chondracanthidae

RÉSUMÉ

Une nouvelle espèce du copépode Chondracanthidae, *Parapercicola inflata* n. sp. parasite de la cavité nasale de *Priacanthus macracanthus* Cuvier, 1829, capturé au large de la côte Sud de Taiwan, est décrite. C'est la deuxième espèce du genre récemment établi, *Parapercicola* Ho, Liu & Lin, 2011. Il se distingue de son unique congénère, *P. formosana* Ho, Liu & Lin, 2011, en ayant chez la femelle (1) un tronc court qui est distinctement plus large que long, (2) une antennule largement dilatée, (3) un labre pourvu de noeuds sur son bord postérieur libre, (4) un endopodite des pattes 1 et 2, moins réduit; et chez le mâle (5) un processus terminal épineux sur la rame furcale, et (6) un maxillipède avec un groupe de denticules sur le second segment.

Mots clés. — Copépodes parasites, *Parapercicola*, *Priacanthus macracanthus*, Taiwan, Chondracanthidae

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INTRODUCTION

The red bigeye, *Priacanthus macracanthus* Cuvier, 1829, is a reef-associated marine fish found in western Pacific ranging from southern Japan to western Indonesia, including the Arafura Sea and Australia (Froese & Pauly, 2012). So far as we are aware, four species of parasitic copepods have been reported from this species of fish. They are: *Hatschekia quadrabdominalis* Yü, 1933 (reported as "*Hatschekia curvata* n. sp." by Yamaguti & Yamasu (1959)) from Aichi-ken, Japan; *Caligus priacanthi* Pillai, 1961 described from Malaya by Kazachenko (1975); *Caligus absens* Ho, Lin & Chen, 2000, described from Taiwan by Ho et al. (2000); and *Norion priacanthi* (Kirtisinghe, 1956), described from Taiwan by Ho et al. (2008). These four species of copepods are parasites of gill cavities, attaching either on the wall of the cavity or on the gill filaments. Recently, in the past two years, when examining the bigeyes caught off the southeast coast of Taiwan, we noticed a chondracanthid species living in the nasal cavities of *P. macracanthus*.

A species of chondracanthid, *Praecidochondria galatheae* Kabata, 1968, has been reported parasitic on another species of bigeye, *Priacanthus tayenus* Richardson, 1846, from Malaya by Kabata (1968). It is an oral cavity parasite attaching to the host's tongue. The general body form of our chondracanthids from Taiwan resembles the latter in having a short, stocky body bearing a relatively large head. However, close comparison between our chondracanthids and Kabata's *P. galatheae* shows that our chondracanthids cannot be assigned to *Praecidochondria* Kabata, 1968, because they are devoid of body processes in the trunk region and carrying two pairs of relatively unmodified legs on a moderately long neck. Unexpectedly, as it was found later, those chondracanthids obtained from the red bigeyes show principal characters of a recently established genus, *Parapercicola* Ho, Liu & Lin, 2011. Ho et al. (2011) proposed the latter taxon to accommodate a new form of chondracanthid, *Parapercicola formosana* Ho, Liu & Lin, 2011, which was found parasitic on a species of sandperch, *Parapercis multifasciata* Döderlein, 1884.

MATERIAL AND METHODS

Fish were purchased from the market in the Cheng-gong and Dong-shi Fishing Ports, where the catch of the day was unloaded. The fish were transferred in an icebox to the laboratory for parasitological examination. Copepod parasites found during the examination were removed and preserved in 70% ethanol. They were later cleared in 85% lactic acid for 1-2 h and dissected in a depression slide with lactic acid under a dissection microscope. The dissected body parts and appendages were examined in a drop of lactic acid (Humes & Gooding, 1964). Drawings

were made with the aid of a drawing tube fitted on an Olympus BH microscope. Measurements were taken after soaking the specimens in lactic acid and are given as mean values, with the range in parentheses.

RESULTS

Family CHONDRACANTHIDAE H. Milne Edwards, 1840
Genus *Parapercicola* Ho, Liu & Lin, 2011
Parapercicola inflata n. sp.
(figs. 1-5)

Material examined.— A total of 10 ♀♀ (4 of them carrying a ♂) in nasal cavities of *Priacanthus macracanthus* Cuvier, 1829, landed at Cheng-gong Fishing Port: 2 ♀♀ (1 of them carrying a ♂) from 2 host fish collected on 19 July 2010; 1 ♀ from 2 examined fish collected on 5 November 2010; 5 ♀♀ (2 of them carrying a ♂) from 3 (out of 5) host fish collected on 9 June 2011; and 2 ♀♀ (1 of them carrying a ♂) from 1 (out of 6) host fish collected on 20 June 2011; landed at Dong-shi Fishing Port: 1 ♀ from 16 examined fish collected on 12 September 2012; 1 ♀ from 22 examined fish collected on 21 September 2012; and 1 ♀ (carrying a ♂) from 10 examined fish collected on 25 September 2012. Holotype (USNM 1192974), Allotype (USNM 1192975) and 2 paratypes (USNM 1192976) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A.

Female (figs. 1-3).— Body (fig. 1A) 4.14 (3.56-4.62) mm long, with large head, moderately long neck, and short trunk. Head oviform, wider than long, 1.15 (0.98-1.30) × 1.77 (1.58-2.00) mm, with ventrally expanded antero-lateral protrusion in addition to pair of large, postero-lateral processes in oral region (fig. 1B). Neck moderate long and cylindrical (fig. 1A, B, C), comprising pedigers 1 and 2; measuring 1.38 (0.88-1.88) × 0.71 (0.58-0.84) mm. Trunk (fig. 1A, C) short, oviform, and without process; measuring 1.46 (1.30-1.66) × 2.48 (2.06-3.08) mm. Genital somite (fig. 1D) small, 293 (267-334) × 453 (390-506) μm, bearing minute seta and papilla tipped with 2 minute setae in egg sac attachment area. Abdomen (figs. 1D, 2A) much reduced, 35 (30-43) × 57 (51-62) μm, bearing pair of dorsal setules (fig. 2A). Caudal ramus (figs. 1D, 2A) drawn out into spiniform process, much longer than wide, 164 (149-173) × 25 (21-30) μm, armed with 3 setae, 2 lateral and 1 medial. Egg sac like a cigar-shaped structure and shorter than body (not shown in figures).

Antennule (fig. 2B) greatly inflated in basal region and quickly narrowed distally (fig. 2C); armature being (from proximal to distal) 1-1-1-2-3-7. Antenna (fig. 2D) 2-segmented; terminal segment sharply curved claw with 2 tiny basal setules and striation in bent region in addition to carrying largely reduced antennal tip (accessory antennule, fig. 2D) at base on lateral side; reduced antennal tip armed with 3 knobs and 3 obtuse setae. Labrum (fig. 2E) with 3 pairs of protrusions

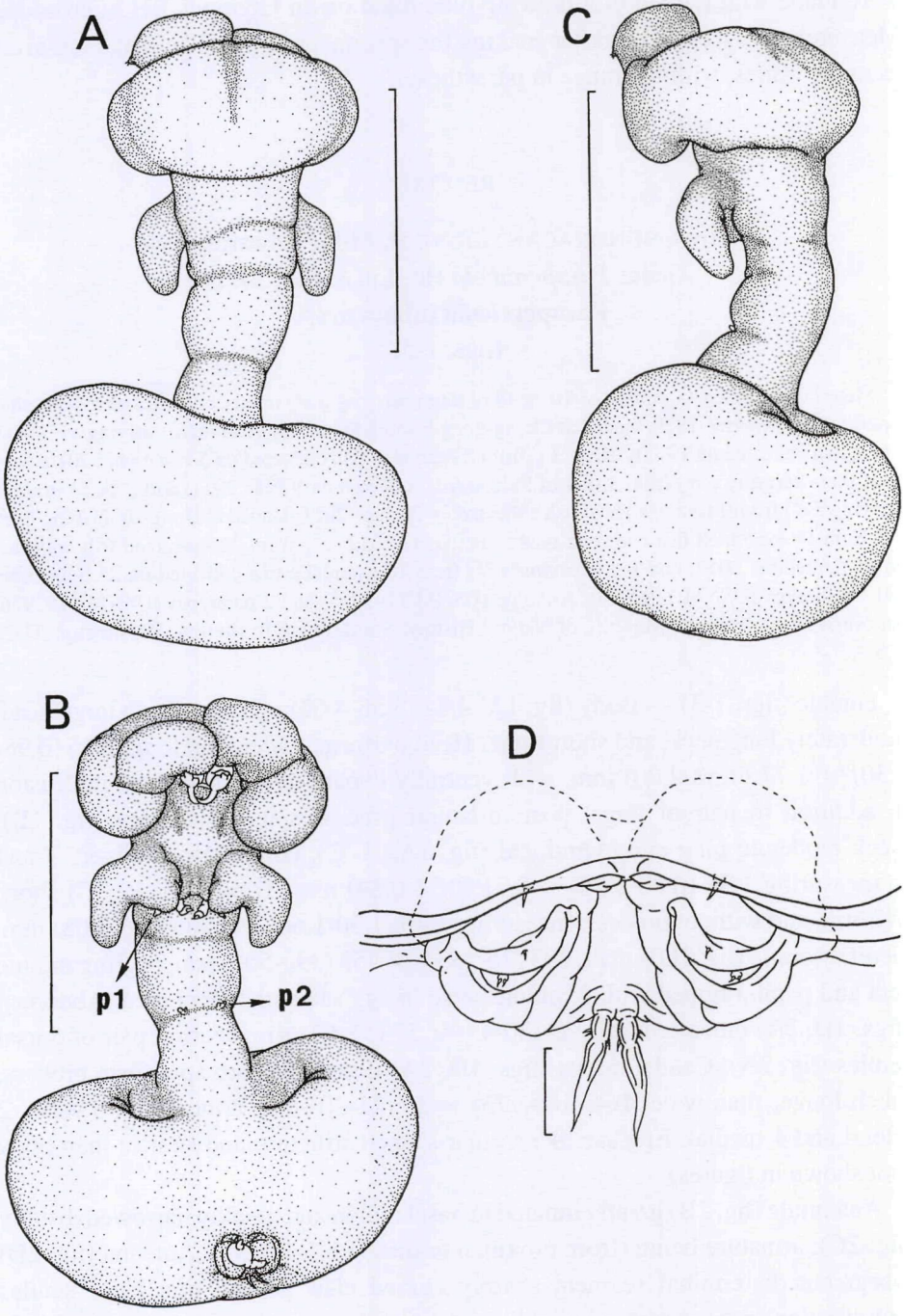

Fig. 1. *Parapercicola inflata* n. sp. adult female paratype. A, habitus, dorsal; B, habitus, ventral; C, habitus, lateral; D, genito-abdomen and caudal rami, ventral. Scale bars: A-C = 2 mm; D = 0.1 mm.

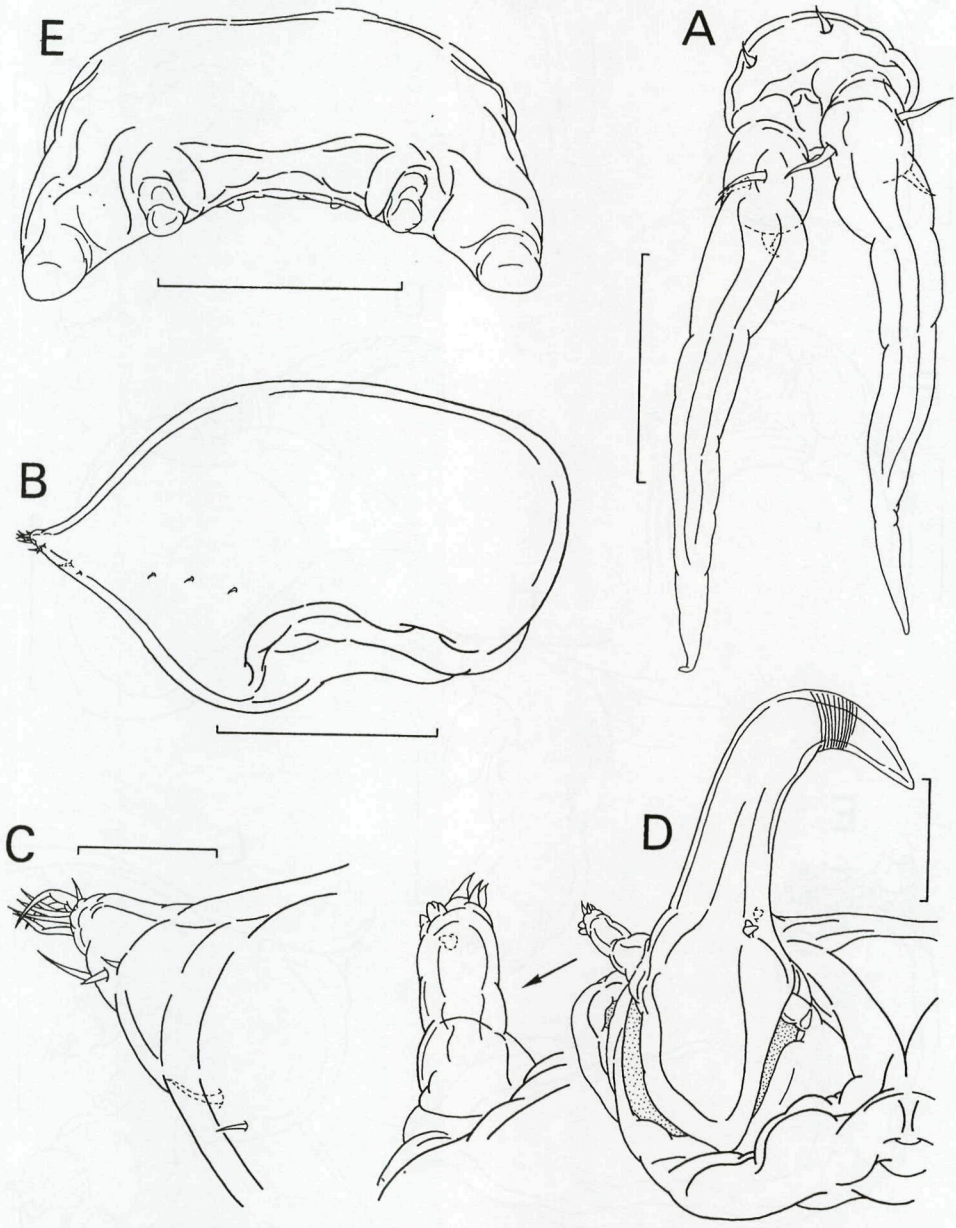

Fig. 2. *Parapercicola inflata* n. sp. adult female paratype. A, abdomen and caudal rami, dorsal; B, antennule; C, tip of antennule; D, antenna; E, labrum, ventral. Scale bars: A = 70 μm; B = 0.3 mm; C = 40 μm; D = 75 μm; E = 0.1 mm.

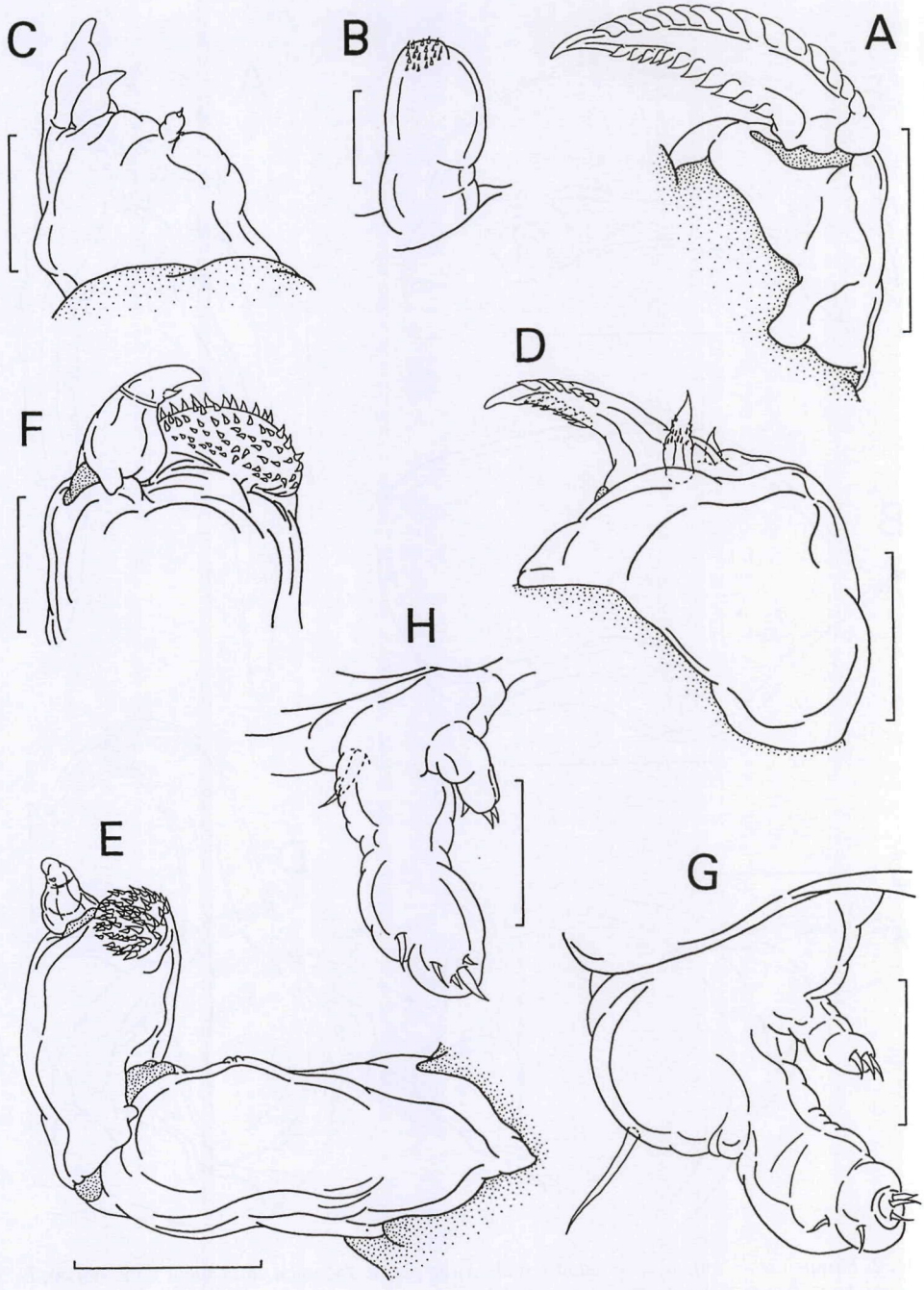

Fig. 3. *Parapercicola inflata* n. sp. adult female paratype. A, mandible; B, paragnath; C, maxillule; D, maxilla; E, maxilliped; F, distal part of maxilliped; G, leg 1; H, leg 2. Scale bars: A, D = 50 μm; B = 20 μm; C, F, G, H = 30 μm; E = 60 μm.

of various size on either side of free posterior margin. Mandible (fig. 3A) 2-segmented; terminal blade with 12 to17 teeth on convex (medial) side and 10 to 14 on concave (lateral) side. Paragnath (fig. 3B) a cylindrical knob tipped with patch of spinules. Maxillule (fig. 3C) lobate, armed with 3 unequal elements. Maxilla (fig. 3D) 2-segmented; first segment robust and unarmed; second segment process bearing in basal region 1 obtuse seta and 1 spiniform seta, and in subterminal region 2 rows of teeth. Maxilliped (fig. 3E) subchelate and 3-segmented; first segment large but unarmed; second segment slightly expanded distally and armed with a patch of denticles; terminal segment (fig. 3F) a small claw bearing tiny subterminal tooth. Both legs 1 (fig. 3G) and 2 (fig. 3H) biramous, lobate, and identically armed, with 1-1-3 on exopod and 1-2 on endopod.

Male (figs. 4-5).— Body (fig. 4A) 393 (368-439) μm long (including terminal spiniform process on caudal ramus), cephalosome moderately swollen, about 162 (149-181) μm wide and scattered with spinules. Genital somite (fig. 4B) with prominent ventrolateral ridges. Abdomen (fig. 4B) small, indistinguishably fused with genital somite and carrying pair of dorsal setae. Caudal ramus (fig. 4B) longer than wide, 66 (52-77) $\times$ 13 (11-14) μm, carrying 2 short and 2 long setae in basal region and tipped with large, spinulose spiniform process.

Antennule (fig. 4C) elongate and cylindrical; armature being 1-1-2-2-4-3-8. Antenna (fig. 4D) stocky, 2-segmented and armed as in female, but with relatively larger reduced antennal tip (accessory antennule) at basal region of terminal claw. Labrum (fig. 4E) with smooth posterior margin. Mandible (fig. 5A) with fewer teeth (than in female), 7 to 15 on convex (medial) side and 5 to 8 on concave (lateral) side. Paragnath (fig. 5B) and maxillule (fig. 5C) essentially as those in female. Maxilla (fig. 5D) 2-segmented as in female, but with only 2 teeth on terminal process. Maxilliped (fig. 5E) constructed as in female but different in having tiny medial protrusion in basal region of terminal hook (fig. 5F). Both legs bearing large outer seta on protopod. Leg 1 (fig. 5G) endopod much reduced, represented by small knob; exopod reduced to a process carrying 1 basal seta and tipped with 2 short setae. Leg 2 (fig. 5H) with more reduced exopod, which carries only 1 basal seta.

Etymology.— The specific name *inflata* is a Latin adjective meaning "puffed up" or "swollen". It alludes to the greatly swollen antennule in the present species.

Remarks.— In carrying the following combination of character states in the female: (1) a large head with a pair of postero-lateral process in oral region, (2) a moderately long neck transformed from first two pedigers, (3) a trunk devoid of body process, (4) an antennae with an reduced antennal tip (accessory antennule) at basal region of terminal hook, and (5) two pairs of reduced but unmodified legs, the chondracanthid parasites collected from the nasal cavities of

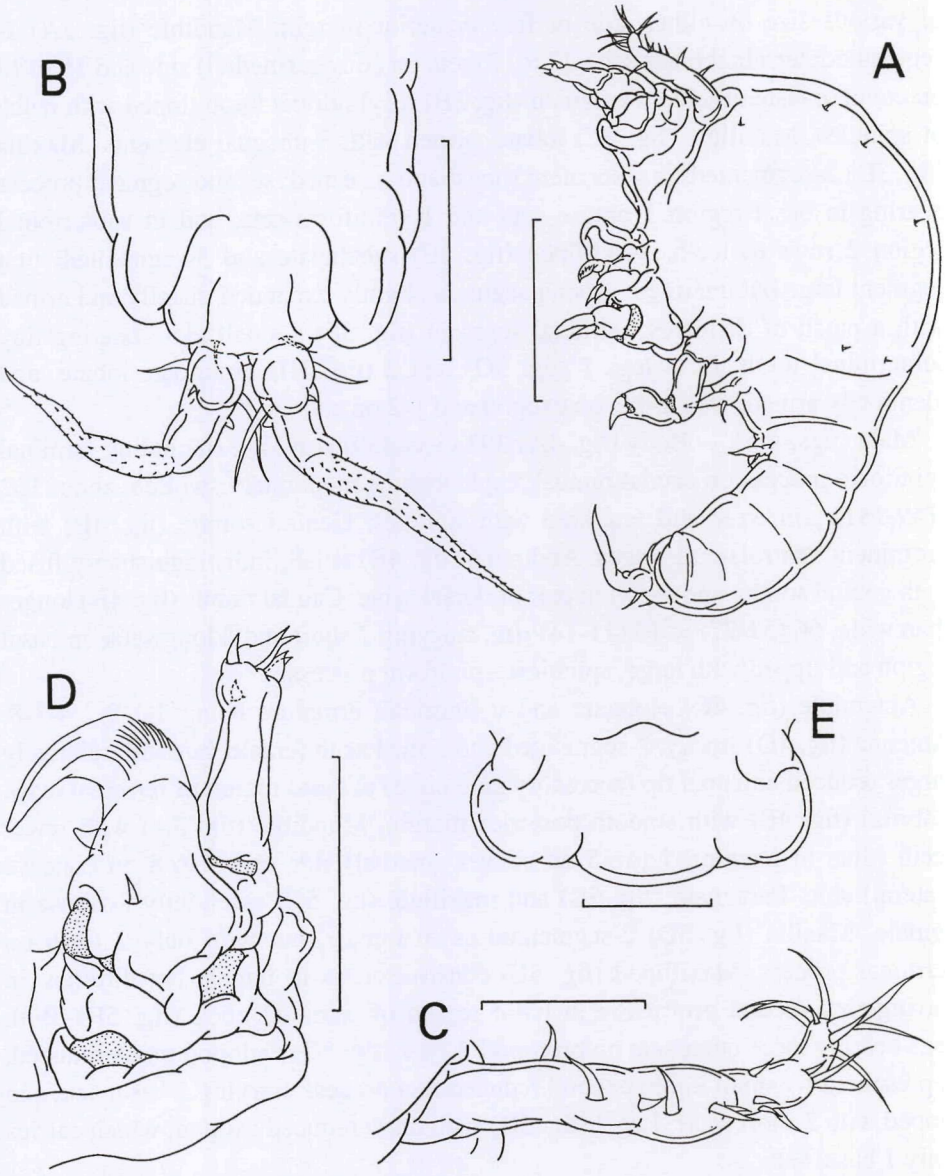

Fig. 4. *Parapercicola inflata* n. sp. adult male paratype. A, habitus, lateral; B, genito-abdomen, ventral; C, antennule; D, antenna; E, labrum, ventral. Scale bars: A = 0.1 mm; B, D = 40 μm; C = 30 μm; E = 20 μm.

the red bigeye are attributable to the genus *Parapercicola* Ho, Liu & Lin, 2011 as defined by Ho et al. (2011).

Parapercicola is a monotypic genus containing only *P. formosana* Ho, Liu & Lin, 2011. The latter is a parasite of *Parapercis multifasciata* Döderlein, 1884

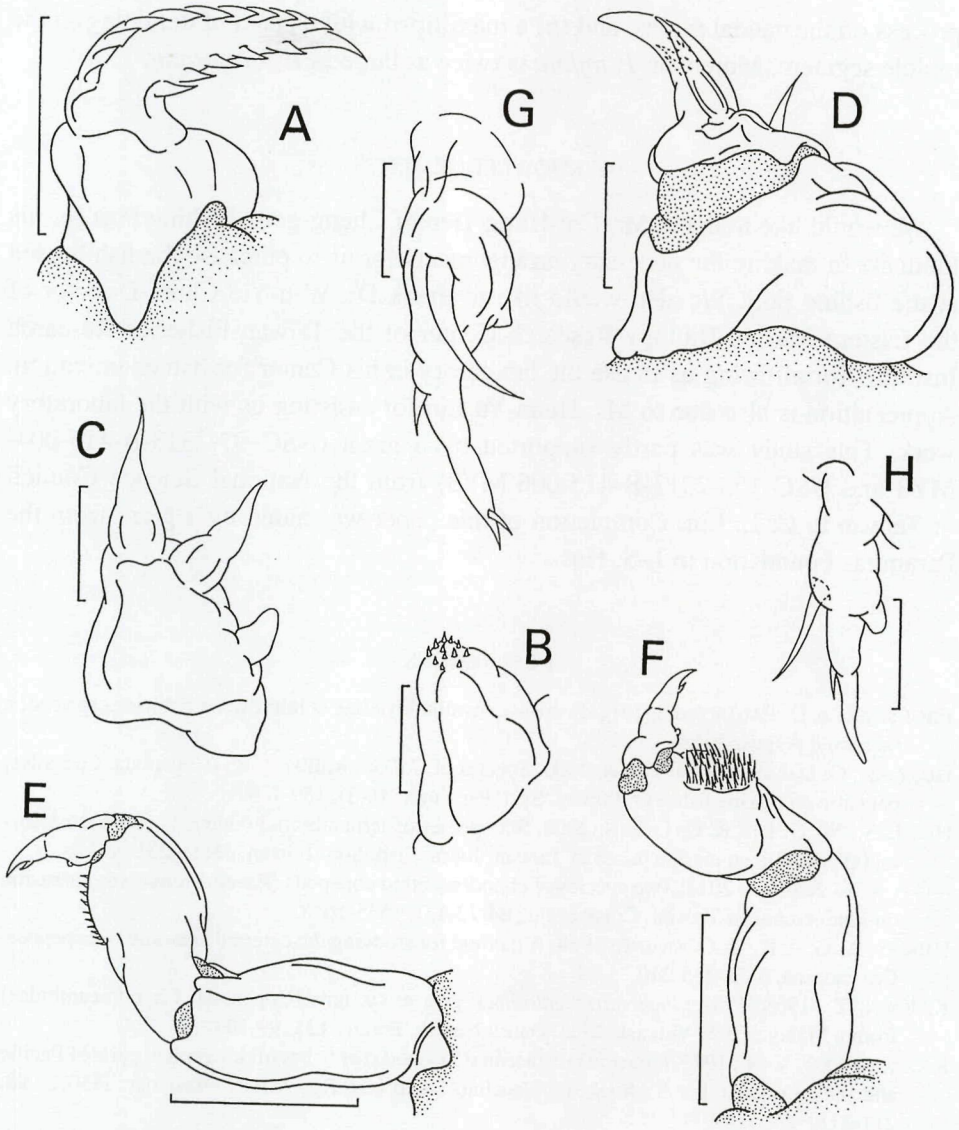

Fig. 5. *Parapercicola inflata* n. sp. adult male paratype. A, mandible; B, paragnath; C, maxillule; D, maxilla; E, maxilliped, lateral; F, maxilliped, medial; G, leg 1; H, leg 2. Scale bars: A, D = 20 μm; B, C, G, H = 10 μm; E, F = 30 μm.

living on the gill filaments of its host. So far, it has been known only from Taiwan. *Parapercicola inflata* is easily distinguished from its congener in having in the female by: (1) a short trunk, (2) a greatly inflated antennule, (3) a labrum with 3 knobs of various sizes on each side of the posterior free margin, (4) a less reduced endopod in both thoracic legs; and in the male in having (5) a spinulose terminal

process on the caudal ramus, and (6) a maxilliped with a patch of denticles on the middle segment. Moreover, *P. inflata* is twice as large as *P. formosana*.

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