

## Three Species of Caligid Copepods (Siphonostomatoida) Parasitic on Marine Fishes Collected off Tai-dong, Taiwan

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### ABSTRACT

Three species of caligid copepods (Siphonostomatoida) were found parasitic on marine fishes caught off east (Pacific) coast of Taiwan. The species of parasites and their hosts are: *Caligus glandifer* Shiino, 1954 in the gill cavity of the red comefish, *Fistularia petimba* Lacepède; *Lepeophtheirus etelisi* n. sp. on the body surface of the flame snapper, *Etelis coruscans* Valenciennes; and *Pseudanuretes papemai* Kabata and Deets, 1988 on the body surface of the Emperor angelfish, *Pomacanthus semicirculatus* (Block). While one of them is new to science the other two species are reported for the first time outside of their respective type locality.

**Key words:** Parasitic copepods, Siphonostomatoida, Caligids, Marine fish, Taiwan.

### INTRODUCTION

Up to the present, 64 species of sea lice (Copepoda, Caligidae) have been reported from the marine fishes of Taiwan (Ho and Lin, 2004; 2007; Ho *et al.*, 2007; 2008; Lin and Ho, 2007). However, due to previous emphasis in examination of fishes occurring off the west coast of Taiwan, more and more unrecorded parasitic copepods are discovered from the fishes caught and landed at fishing ports on the east (Pacific) coast of Taiwan. In this paper we shall report three species of sea lice taken off Tai-dong located on the southeast coast of Taiwan. One of them, *Lepeophtheirus etelisi*, is new to science and the other two species, *Caligus glandifer* Shiino, 1954 and *Pseudanuretes papemai* Kabata and Deets, 1988, are rare parasite. The former is to be reported for the first time outside of Japan and the latter, outside of the Gulf of Aqaba. Furthermore,

while ten genera and 64 species of caligids have been reported from Taiwan, this is the first time to report the occurrence of the species of *Pseudanuretes* from Taiwan.

### MATERIALS AND METHODS

The fish were purchased from the market in Tai-dong fishing port where the catch of the day was unloaded. The fish were then transferred in an icebox to the laboratory for examination of the copepod parasites. Copepod parasites removed from the host's gill cavities or body surface were preserved in 70% ethanol. They were later cleared in 85% lactic acid for 1 to 2 hours before dissection in lactic acid. Examination of the dissected parts and appendages under the compound microscope were carried out on a wooden slide following the procedure given by Humes and Gooding (1964). All drawings were made with the aid

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of a camera lucida and measurements were taken after soaking the specimens in lactic acid. In case where there are more than 10 specimens, a range of measured values based on 10 randomly selected specimens is given in parentheses in addition to the mean value.

## RESULTS

### *Caligus glandifer* Shiino, 1954 (Figs. 1-2)

*Caligus glandifer* Shiino, 1954: 154; Shiino, 1956: 239; Yamaguti, 1963: 53.

*Material examined:* 1 ♀ from gill cavity of red cornetfish, *Fistularia petimba* Lacepède, caught and landed at Tai-dong fishing port on 2 April 2008.

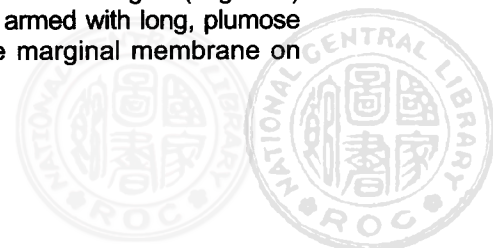
*Female:* Body (Fig. 1A) 5.06 mm long, excluding setae on caudal rami. Cephalothoracic shield subcircular, 2.48 mm long and 2.20 mm wide (excluding marginal hyaline membranes). Fourth pediger distinctly wider than long, 0.26 x 0.78 mm. Genital complex distinctly longer than wide, 1.98 x 1.46 mm, with large, round, posterior protrusion on both sides of abdomen. Abdomen indistinctly 2-segmented; proximal segment wider than long, 0.26 x 0.40 mm, and so as distal segment, 0.24 x 0.34 mm. Caudal ramus (Fig. 1H) longer than wide, 260 x 120 µm, and armed with 3 short, subterminal setae and 3 long, terminal setae in addition to a papilla tipped with a setule on dorsal surface and a row of long setules on medial margin. Egg sac not seen. Antennule (Fig. 1B) 2-segmented; proximal segment armed with 23 setose and 2 simple setae on anterodistal surface in addition to 2 setose setae on dorsal side; distal segment moderate long, about one-half length of proximal segment, armed with 1 subterminal seta on posterior margin and 11 setae plus 2 aesthetascs on distal margin. Antenna (Fig. 1C) 3-segmented; proximal segment smallest and unarmed; middle segment subrectangular and bearing sculptured protrusion on disto-outer corner; distal segment a strongly curved claw with seta on outer margin in basal and middle region.

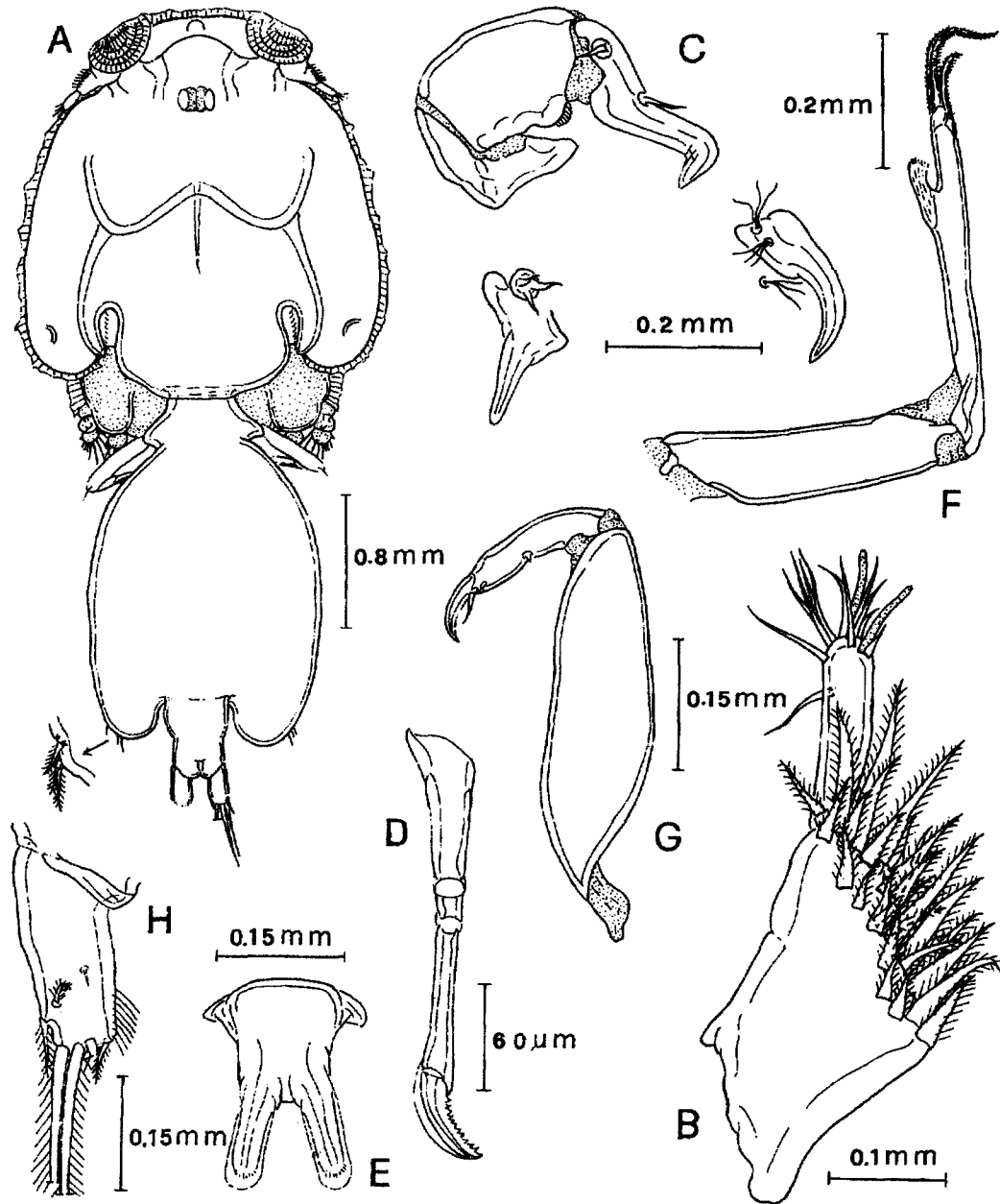
Basal part of postantennal process (Fig. 1C) with 2 papillae with each bearing 3 setules; another similar papilla nearby on sternum; process slender, gently curved, and heavily sclerotized. Mandible (Fig. 1D) comprising 4 sections; with 12 teeth on medial margin of distal blade. Maxillule (Fig. 1C) comprising obtuse, dentiform process bearing at its base a papilla with 3 small setae. Maxilla (Fig. 1F) 2-segmented; proximal segment (lacertus) unarmed; slender distal segment (brachium) carrying large, subterminal process with frayed tip and 2 unequal elements (short canna and long calamus) terminally. Corpus of maxilliped (Fig. 1G) long and smooth without armature; subchela with long sheath bearing small, medial seta and short terminal claw bearing a basal, setiform barbell. Sternal furca (Fig. 1E) with subrectangular box with basal ears; tines straight, with blunt tip.

Armature of rami of legs 1-4 as follows (Roman numerals indicating spines and Arabic numerals, setae):

	Exopod	Endopod
Leg 1	1-0; IV,3	(vestigial)
Leg 2	I-1; I-1; II, I, 5	0-1; 0-2; 6
Leg 3	I-0; I-1; III, 4	0-1; 6
Leg 4	I-0; I, III	(absent)

Leg 1 (Fig. 2A) coxa with papilla on outer margin bearing 2 setules; basis with long, outer and short, inner plumose setae; vestigial endopod a stubby lobe tipped with 2 tiny setae; first segment of exopod with row of setules on posterior edge and small, spiniform outer seta; middle 2 of 4 terminal elements on terminal segment of exopod with accessory process (Fig. 2B). Leg 2 (Fig. 2C) coxa small, with spinule-bearing papillae on ventral surface and large, plumose inner seta; basis with small, naked outer seta and a long medial setule; both outer and medial edges of protopod fringed with large marginal membrane; first exopodal segment with large membrane folded on dorsal side; entire outer margin of endopodal segments fringed with setules. Leg 3 (Fig. 2D) protopod (apron) armed with long, plumose outer seta; large marginal membrane on

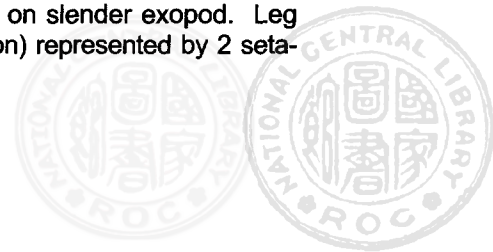




**Fig. 1.** *Caligus glandifer* Shiino, female. A: habitus, dorsal; B: antennule, ventral; C: antenna, postantennal process, and maxillule, ventral; D: mandible; E: sternal furca; F: maxilla; G: maxilliped; H: caudal ramus, ventral.

outer and posterior edges in addition to 2 single setule-bearing papillae at basal region of posterior membrane. Outer edge anterior to membrane corrugated. Leg 4 (Fig. 2E)

protopod with terminal, outer, plumose seta; pectens on exopod segments at insertion of each of 4 spines on slender exopod. Leg 5 (Fig. 1A insertion) represented by 2 seta-



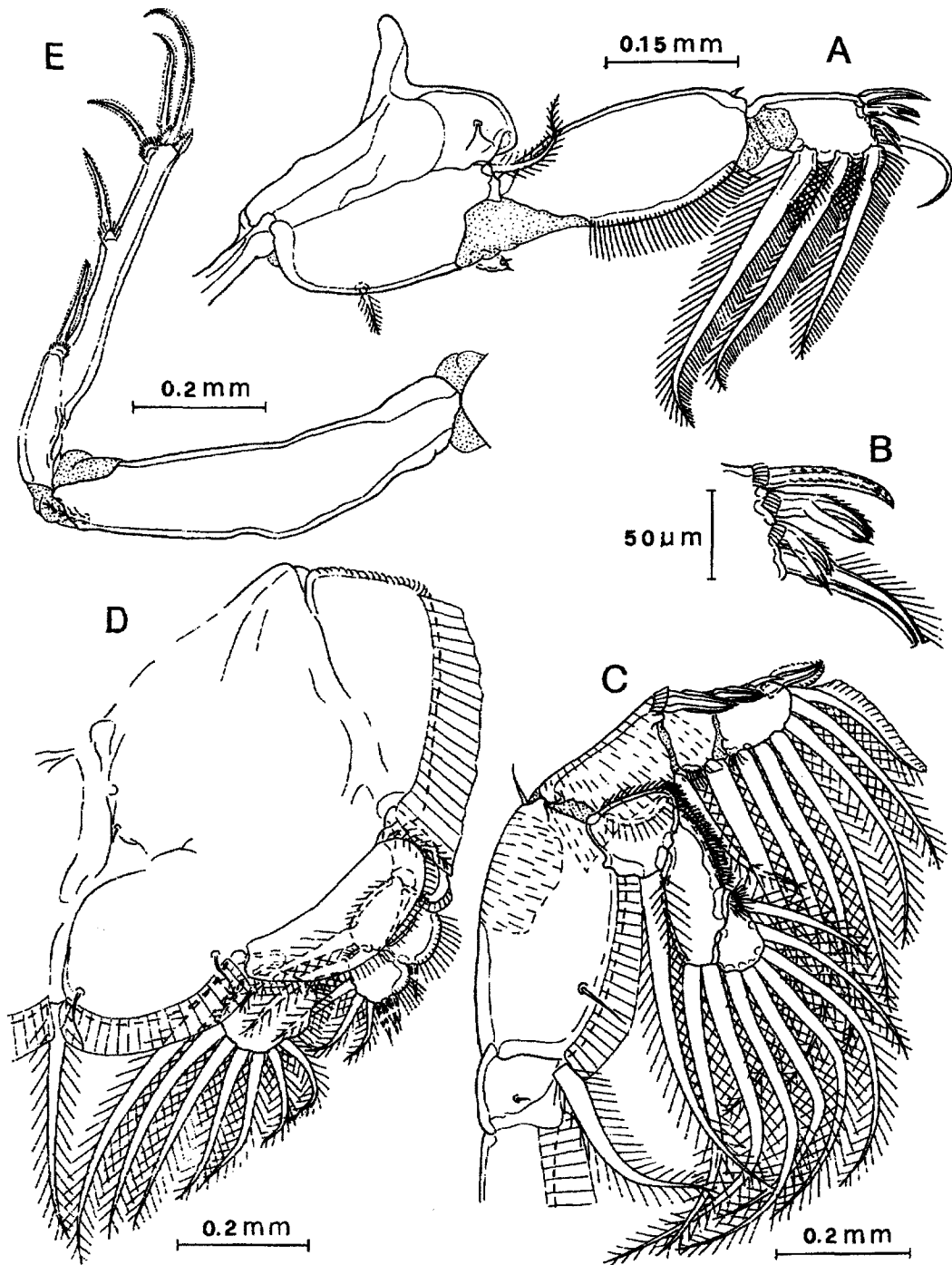


Fig. 2. *Caligus glandifer* Shiino, female. A: leg 1, ventral; B: tip of leg 1 exopod, ventral; C: leg 2, ventral; D: leg 3, ventral; E: leg 4, ventral.



bearing papillae located on posterolateral margin of genital complex, anterior one bearing single, pinnate seta and posterior one, 2 pinnate setae.

*Male:* Not seen.

*Remarks:* This is a rare species of sea louse. In his original description, Shiino (1954) found only one adult female and it has not been found since then. Although the original description was brief containing only "the points indispensable for their devinition," it was later supplemented with more information based on the type specimen (Shiino, 1956). Close comparison with those two descriptions revealed that the specimen from Taiwan is conspecific with Shiino's (1954, 1956) species obtained from the mirror dory, *Zenopsis nebulosa* (Temminck & Schlegel), in Japan. Thus, our discovery of this species from the red cornetfish (*Fistularia petimba*) of Taiwan constitutes a new host record in addition to the new locality. It should be mentioned here that the red cornetfish from Mi-tuo on the west coast of Taiwan is known to carry another species of sea lice, *Caligus fistulariae* Yamaguti, 1936 (Ho *et al.* 2008).

The general appearance of the sea louse called *Caligus belones* Krøyer, 1863 by Delamare-Deboutteville & Nunes-Ruivo (1958) and by Dorman & Holmes (1991) is different from that of the original description given by Krøyer (1863). The length of the abdomen of the specimens found by the later four authors is less than one-half of the genital complex and with swollen proximal part, while the abdomen in the original description is greater than one-half length of the genital complex. For this matter, the two specimens of the later reports are closer to *C. glandifer* than they are to *C. belones*. Nevertheless, they are distinguishable from *C. glandifer* in having a pair of broad caudal rami and a stubbier exopod on leg 4. The specimens of *C. belones* reported by Delamare-Deboutteville & Nunes-Ruivo (1958) from the Mediterranean and reported by Dorman & Holmes (1991) off the south coast of Ireland, to our opinion, may represent a new species.

Another species of *Caligus*, *C. deformis*

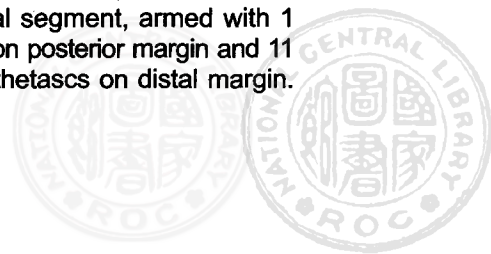
Brian, 1924, also shows general appearance resembling that of *C. glandifer*. It was found parasitic on the black seabream, *Spondyliosoma cantharus* (Linnaeus) (reported as "*Cantharus lineatus*"), by Brian (1924) off Mauritania. Since it was poorly described there is no basis for making further comparison.

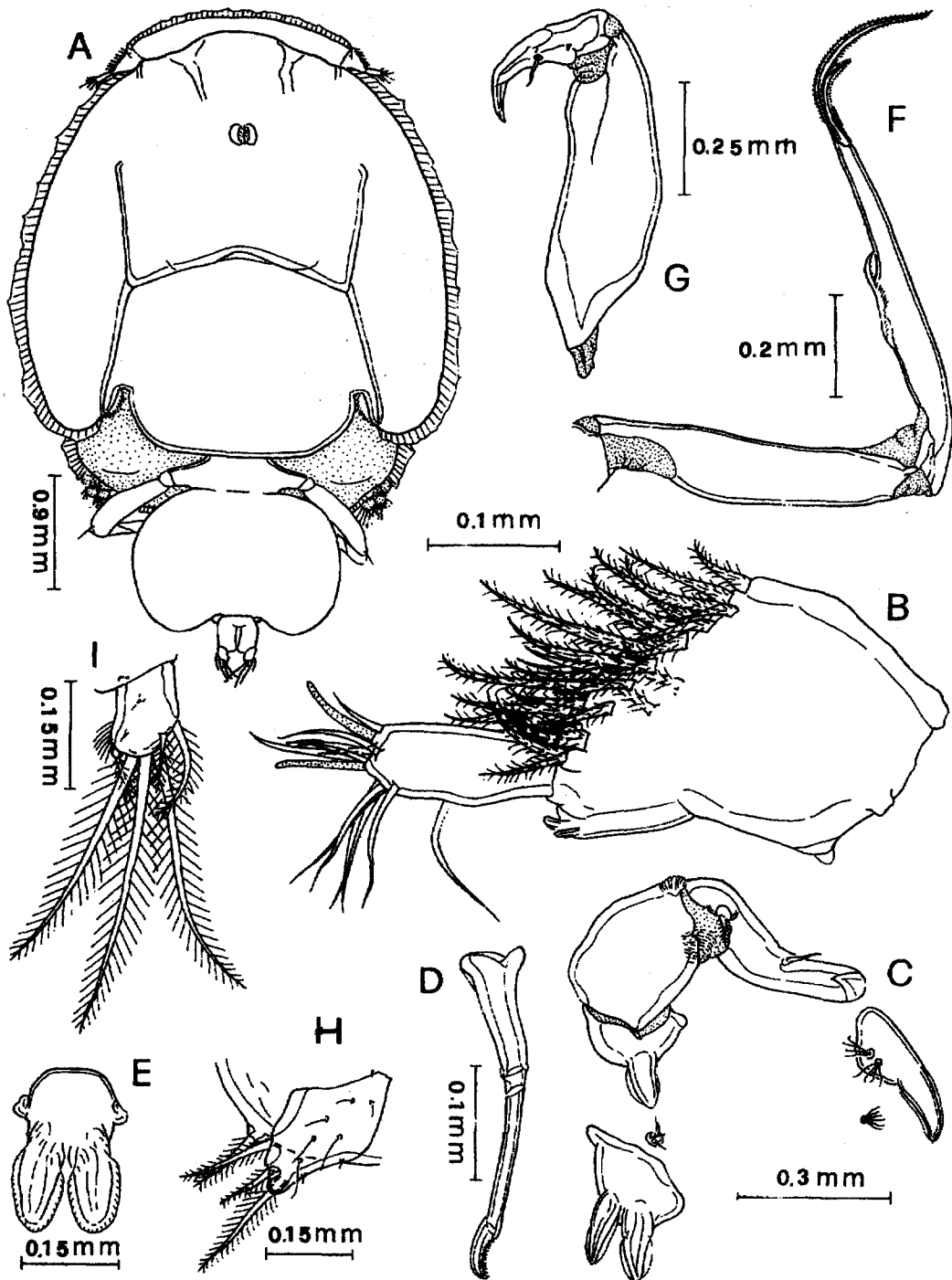
***Lepeophtheirus etelisi* n. sp.**  
(Figs. 3-4)

*Material examined:* 3 ♀♀ on body surface of 2 flame snappers, *Etelis coruscans* Valenciennes, caught and landed at Tai-dong fishing port. One ♀ selected as holotype and deposited in the US National Museum of Natural History, Smithsonian Institution, Washington DC and remaining paratypes kept in the author's (CLL) collection. The transaction number of the above mentioned holotype is 2047798.

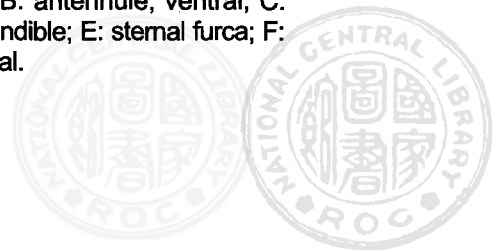
*Female:* Body (Fig. 3A) 4.98 (4.96-5.00) mm long, excluding setae on caudal rami. Cephalothoracic shield subcircular, 3.39 (3.32-3.44) mm long and 3.16 (3.06-3.30) mm wide (excluding marginal hyaline membranes). Fourth pediger distinctly wider than long, 0.24 (0.22-0.26) x 1.01 (1.00-1.02) mm. Genital complex distinctly wider than long, 1.13 (1.06-1.22) x 1.65 (1.54-1.70) mm, with largely round postero-lateral corners. Abdomen small, 1-segmented, and slightly longer than wide, 0.31 (0.28-0.34) x 0.29 (0.28-0.30) mm. Caudal ramus (Fig. 3I) longer than wide, 124 (122-130) x 84 (81-89) μm, and armed with 3 short, subterminal setae and 3 long, terminal setae in addition to a papilla tipped with a setule on dorsal and ventral surface, respectively, and a row of long setules on medial margin. Egg sac not seen.

Antennule (Fig. 3B) 2-segmented; proximal segment armed with 23 setose and 2 simple setae on anterodistal surface in addition to 2 setose setae on dorsal side; posterodistal corner armed with 2 blunt tipped spines; distal segment short, about one-half length of proximal segment, armed with 1 subterminal seta on posterior margin and 11 setae plus 2 aesthetascs on distal margin.





**Fig. 3.** *Lepeophtheirus etelisi* n. sp., female. A: habitus, dorsal; B: antennule, ventral; C: antenna, postantennal process, and maxillule, ventral; D: mandible; E: sternal furca; F: maxilla; G: maxilliped; H: leg 5, ventral; I: caudal ramus, ventral.





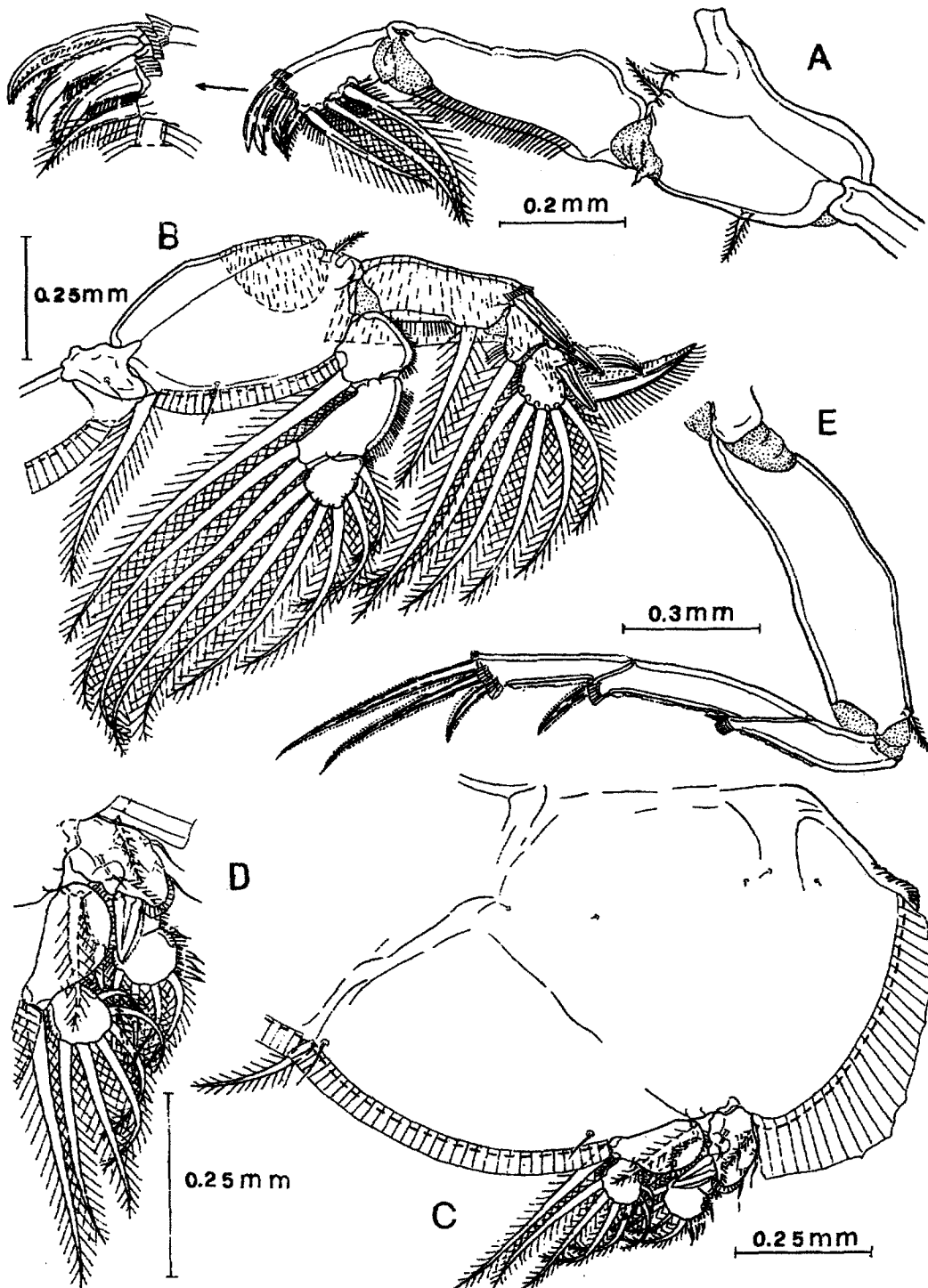
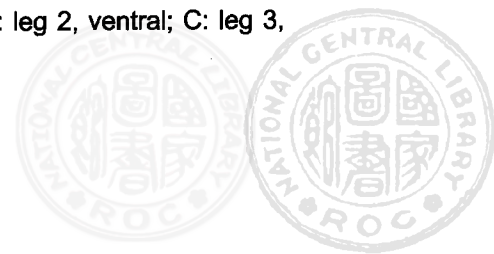


Fig. 4. *Lepeophtheirus etelisi* n. sp., female. A: leg 1, ventral; B: leg 2, ventral; C: leg 3, ventral; E: leg 4, ventral.



Antenna (Fig. 3C) 3-segmented; proximal segment smallest, bearing large, blunt, medial protrusion with narrow membrane on both side; middle segment subrectangular, with sculptured distal comers; distal segment a strongly curved claw with seta on outer margin in basal and middle region. Basal part of postantennal process (Fig. 3C) carrying 2 papillae with each bearing 4 setules; another similar papilla nearby on sternum; process heavily sclerotized and bearing membrane on both side. Mandible (Fig. 3D) comprising 4 sections; with 12 teeth on medial margin of distal blade. Maxillule (Fig. 3C) comprising a large base bearing 2 obtuse, dentiform process and carrying at its basal region a papilla with 3 small setae. Maxilla (Fig. 3F) 2-segmented; proximal segment (lacertus) unarmed; slender distal segment (brachium) carrying large, medial lamella with frayed edge and 2 unequal elements (short canna and long calamus) terminally. Corpus of maxilliped (Fig. 3G) long and smooth without armature; subchela with short sheath bearing small, medial seta and short, pointed terminal claw bearing a basal, setiform barbell. Sternal furca (Fig. 3E) with small, subrectangular box bearing tiny basal ears; tines stout, with blunt tip and corrugated edges.

Armature of rami of legs 1-4 as follows (Roman numerals indicating spines and Arabic numerals, setae):

	Exopod	Endopod
Leg 1	1-0; III, 1, 3	(vestigial)
Leg 2	I-1; I-1; II, I, 5	0-1; 0-2; 6
Leg 3	I-0; I-1; III, 4	0-1; 6
Leg 4	I-0; I-0; III	(absent)

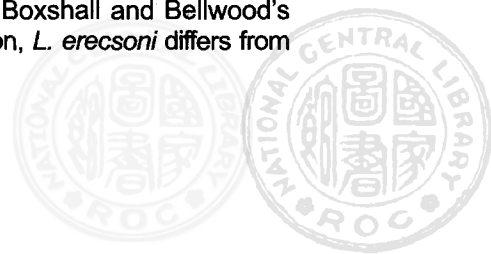
Leg 1 (Fig. 4A) coxa with papilla on outer margin bearing 2 setules; basis with an outer and another inner plumose setae; vestigial endopod a vermiform process without armature; first segment of exopod with row of setules on posterior edge and small, spiniform outer seta; middle 2 of 4 terminal elements on terminal segment of exopod with accessory process (see insertion in Fig. 4A). Leg 2 (Fig. 4B) coxa small, with spinule-bearing papillae on ventral surface and large,

plumose inner seta; basis with small, pinnate outer seta and a long medial setule; both outer and medial edges of protopod fringed with large marginal membrane; first exopodal segment with large membrane folded on dorsal side; entire outer margin of endopodal segments fringed with setules. Leg 3 (Fig. 4C) protopod (apron) armed with long, plumose outer and inner seta; large marginal membrane on outer and posterior edges in addition to 2 single setule-bearing papillae at basal region of posterior membrane; outer edge anterior to membrane corrugated. Proximal segment of exopod expand laterally and fringed with a narrow membrane (Fig. 4D). Leg 4 (Fig. 4E) protopod with terminal, outer, plumose seta; pectens on exopod segments at insertion of each of 4 spines on slender exopod. Leg 5 represented by 2 protrusions in posterolateral region of genital complex (Fig. 3H), anterior smaller one tipped with 1 plumose seta and posterior larger one tipped with 3 plumose setae in addition to several setule-bearing papillae.

*Male:* Not seen.

*Remarks:* The present new species is characteristic in having a combination of the following six character states: (1) the genital complex is wider than long, (2) the abdomen is tiny, only slightly longer than the length of the fourth pediger, (3) the antennule bears a pair of teeth in the posterodistal corner of its basal segment, (4) the maxillule has two tines on its dentiform process, (5) each one of the middle two of the terminal four elements at the tip of leg 1 carries an accessory process, and (6) the armature of leg 4 is I-0; I-0; III. About 100 species of *Lepeophtheirus* are currently known. Of which the following six species share with the new species the above mentioned six character states: *L. erecsoni* Thomson, 1890; *L. goniistii* Yamaguti, 1936; *L. kabatai* Ho & Dojiri, 1977; *L. oblitus* Kabata, 1973; *L. shiinoi* Prabha & Pillai, 1986; and *L. tuberculatus* Kim, 1993. However, the new species is not conspecific with anyone of them in the exhibition of certain, significant, specific differences.

According to Boxshall and Bellwood's (1981) redescription, *L. erecsoni* differs from





*L. etelesi* in having (1) a well-developed posterolateral lobes on the genital complex, (2) a pair of pointed tines on the sternal furca, and (3) a conspicuous barb on the canna of the maxilla. *Lepeophtheirus goniistii* was described by Yamaguti (1936) and redescribed by Shiino (1952) in having (1) a pair of conical protrusions on posterior margin of the genital complex, (2) a pair of pointed tines on the sternal furca, (3) a bifurcate (instead of a simple) spine on the proximal segment of the exopod of leg 3, and (4) leg 5 protruded out of the posterolateral corners of the genital complex. *Lepeophtheirus kabatai* was described by Ho & Dojiri (1977) and redescribed by Prabha and Pillai (1986) in having (1) a pear-shaped abdomen, (2) a long sternal furca with pointed tines, (3) the middle spine at the tip of leg 4 only about half length of the medial spine, and (4) leg 5 protruded out of the posterolateral corners of the genital complex.

*Lepeophtheirus oblitus* is a parasite of rockfish off British Columbia, Canada (Kabata, 1973). It differs from the present new species in having (1) a 2-segmented abdomen, (2) all four elements at the tip of leg 1 naked, and (3) the medial terminal spine on leg 4 about as long as (instead of longer than) the segment carrying it. Prabha and Pillai's (1986) description of *L. shiinoi* shows that it is different from *L. etelesi* in having (1) a differently constructed maxillule, (2) a pair of pointed tines on the sternal furca, and (3) the middle terminal spine on leg 4 longer (instead of shorter) than the medial terminal spine. Lastly, the species from Korea (Kim, 1993), *L. tuberculatus*, is different from the present new species in having (1) a genital complex with straight sides, (2) a pair of tubercles in front of the base of the sternal furca; and (3) a leg 4 with short (instead of long and slender) exopod.

***Pseudanuretes papernai* Kabata and Deets, 1988  
(Figs. 5-7)**

*Pseudanuretes papernai* Kabata and Deets, 1988: 680.

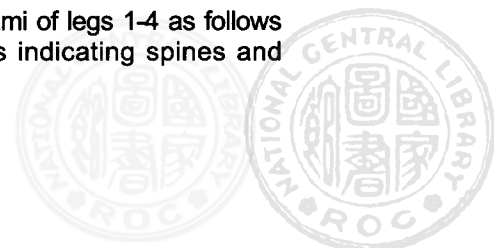
*Material examined*: 24 ♀♀ and 4 ♂♂ on

body surface of 2 out of 3 Emperor angelfish, *Pomacanthus semicirculatus* (Bloch), landed at Tai-dong fishing port on 28 June 2005.

*Female*: Body (Fig. 5A) small, 1.01 (0.92-1.08) mm long (excluding setae on caudal rami). Cephalothoracic shield longer than wide and truncate posteriorly, 721 (689-753) x 595 (559-640)  $\mu\text{m}$  (excluding marginal hyaline membranes). Fourth pediger distinctly wider than long, 35 (32-41) x 167 (162-178)  $\mu\text{m}$ , in most cases hidden under cephalothoracic shield in dorsal view. Genital complex and abdomen fused, oval in shape, and wider than long, 299 (203-381) x 390 (284-486)  $\mu\text{m}$ . Caudal ramus (Fig. 5G) tiny, as long as wide, 16 x 16  $\mu\text{m}$ ; armed with 5 short and 1 long pinnate setae in addition to a row of long setules on medial margin.

Antennule (Fig. 5B) 2-segmented; proximal segment armed with 25 setose and 2 simple setae on anterodistal surface in addition to 2 setose setae on dorsal side; distal segment slender, armed with 1 seta on middle posterior margin and 11 setae plus 2 aesthetascs on distal margin. Antenna (Fig. 5C) 3-segmented; proximal segment smallest, but bearing a prominent, pointed, medial spine; middle segment subrectangular and unarmed; distal segment a sharply pointed claw strongly curved at tip and armed with a large secondary tine in middle region in addition to 2 setae respectively in basal and middle region. Postantennal process lacking. Mandible (Fig. 5D) comprising 4 sections; with 12 teeth on medial margin of distal blade. Maxillule (Fig. 5C) reduced to a small papilla bearing 2 unequal setae. Maxilla (Fig. 5F) 2-segmented; proximal segment (lacertus) unarmed; slender distal segment (brachium) carrying a naked, subterminal canna and a bilaterally pinnate, terminal calamus. Long and attenuated maxillary whip (Fig. 5F) located by maxilla. Corpus of maxilliped (Fig. 5E) slightly inflated and smooth without armature; subchela short, with small medial seta and short, pointed, stubby terminal claw bearing a basal, setiform barbell and a medial seta. Sternal furca absent.

Armature of rami of legs 1-4 as follows (Roman numerals indicating spines and



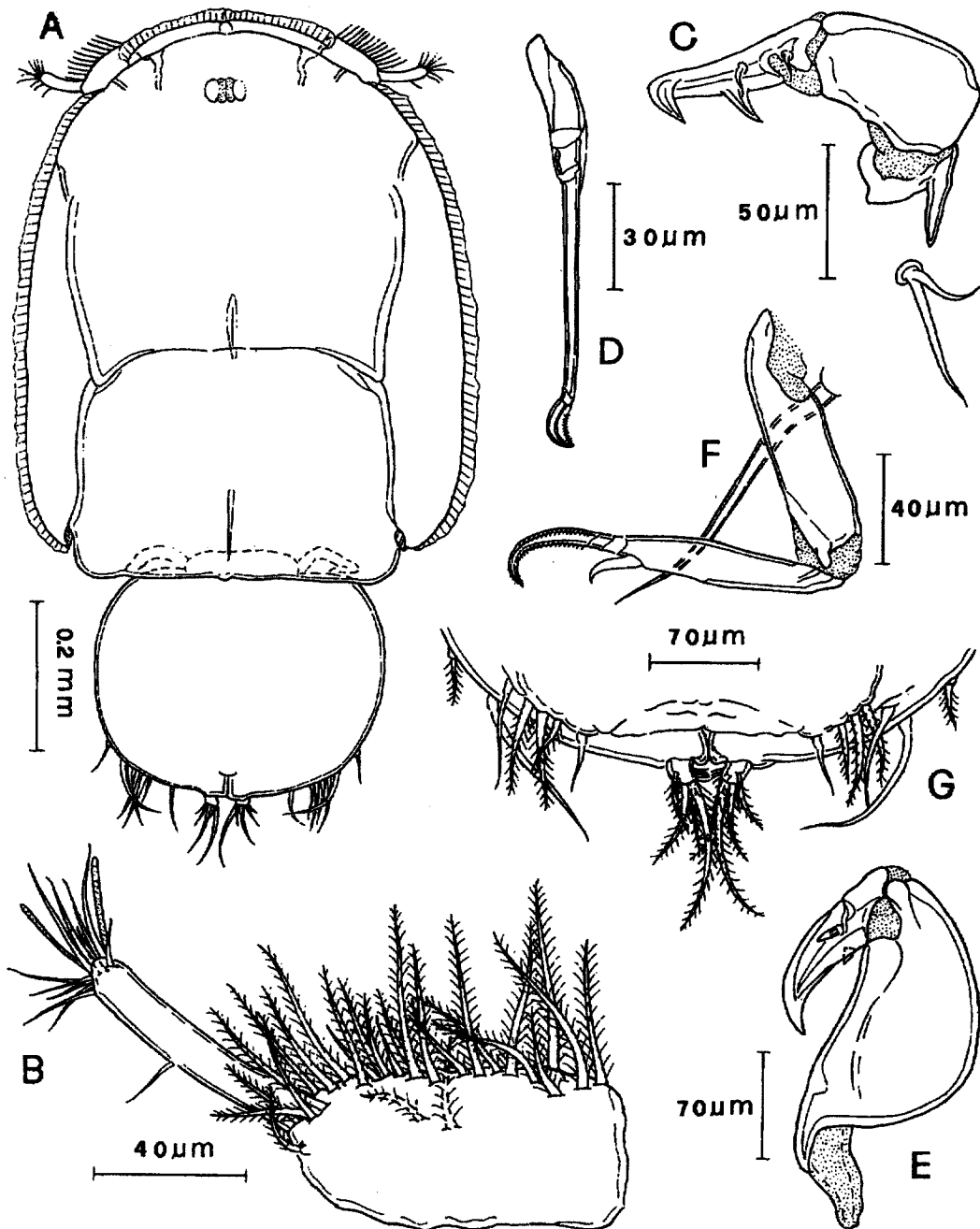
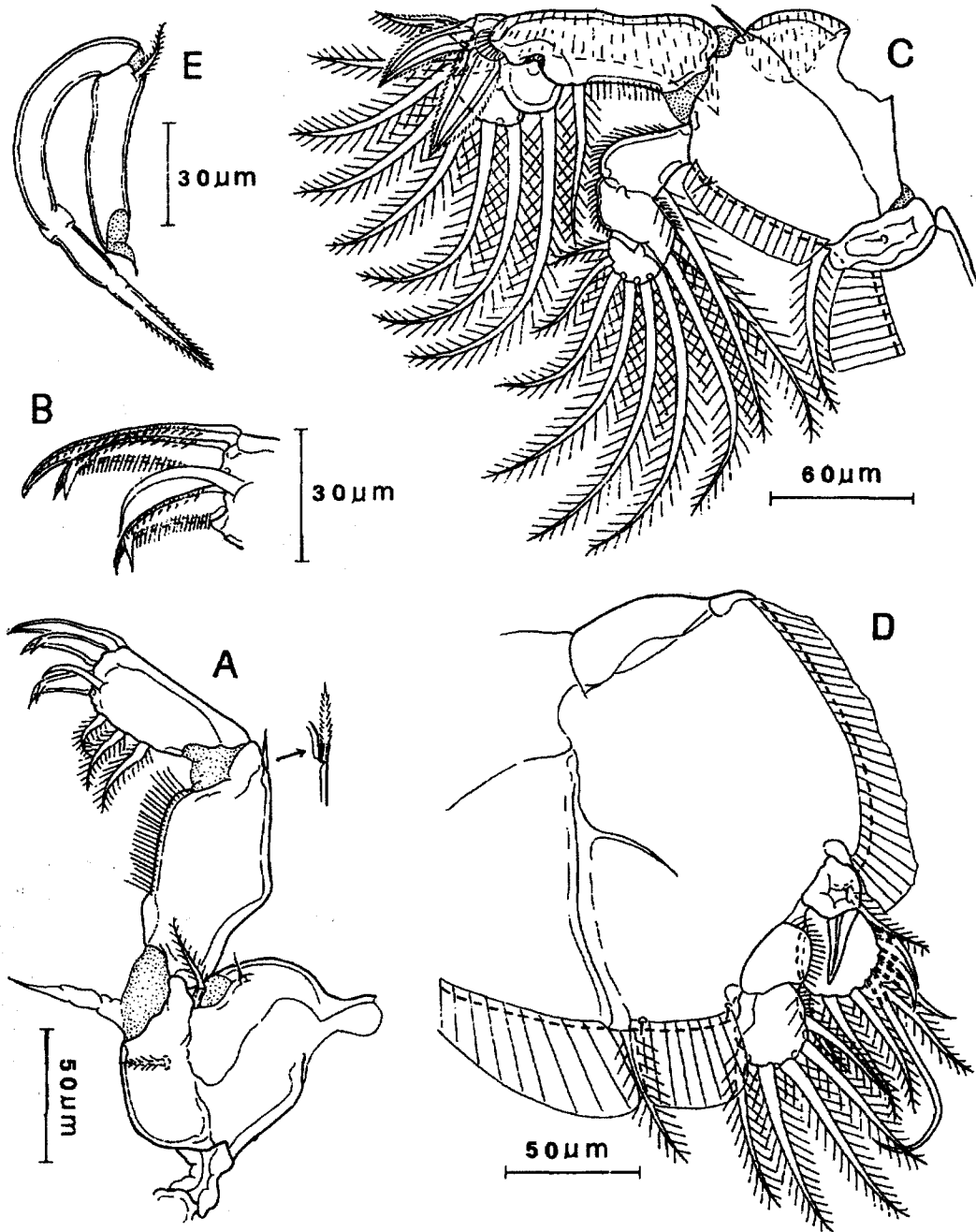


Fig. 5. *Pseudanuretes papemai* Kabata & Deets, female. A: habitus, dorsal; B: antennule, ventral; C: antenna and maxillule, ventral; D: mandible; E: maxilliped; F: maxilla, ventral; G: posterior margin of genital complex, ventral.



**Fig. 6.** *Pseudanuretes papernai* Kabata & Deets, female. A: leg 1, ventral; B: tip of leg 1 exopod, ventral; C: leg 2, ventral; D: leg 3, ventral; E: leg 4, ventral.



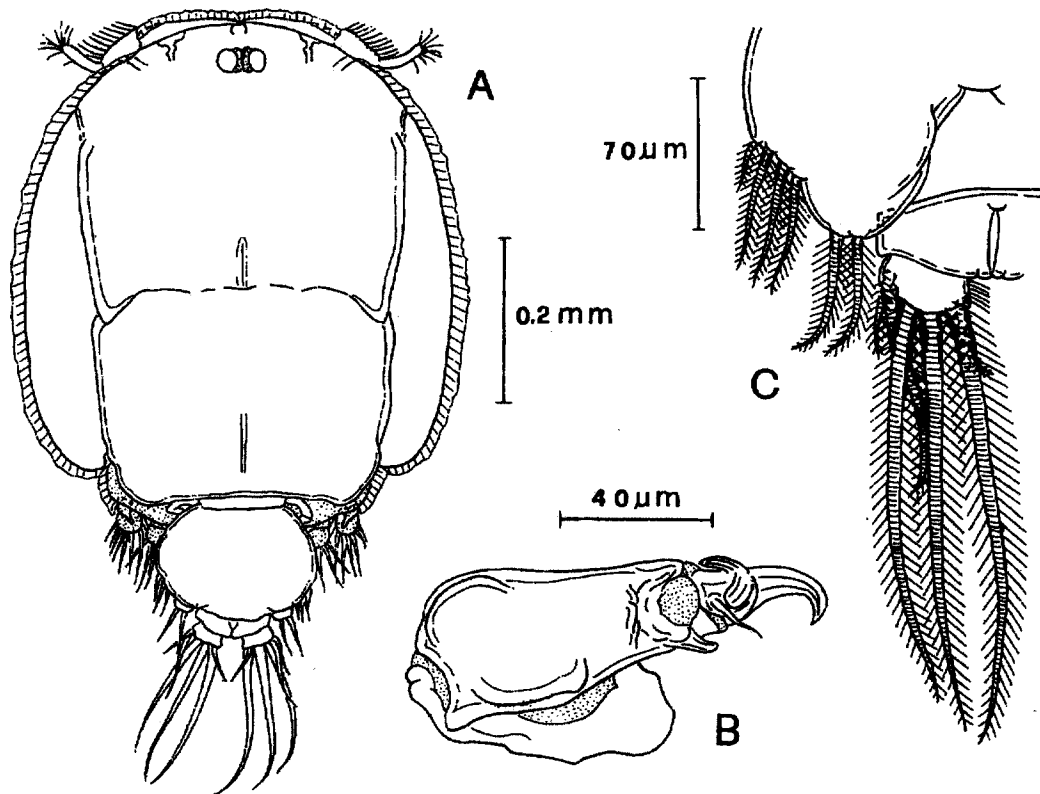


Fig. 7. *Pseudanuretes papemai* Kabata & Deets, male. A: habitus, dorsal; B: antenna, ventral; C: right side of posterior part of genital complex, abdomen, and caudal ramus, ventral.

Arabic numerals, setae):

	Exopod	Endopod
Leg 1	1-0; III, 1, 3	(vestigial)
Leg 2	I-1; I-1; I, 6	0-1; 0-2; 6
Leg 3	I-0; IV, 4	5
Leg 4	I	(absent)

Leg 1 (Fig. 6A) coxa with papilla on outer margin bearing a single setule; basis with an outer and another inner pinnate setae; vestigial endopod long, acuminate, and unarmed; first segment of exopod with row of setules on posterior edge and small, spiniform outer seta; middle 2 of 4 terminal elements on terminal segment of exopod with accessory process (Fig. 6B), 4th element naked. Leg 2 (Fig. 6C) coxa small, with spinule-bearing papillae in center of ventral surface and large, plumose seta

on posterior margin; basis with small, naked outer seta and a medial setule on a papilla by posterior marginal membrane; both outer and medial edges of protopod fringed with large marginal membrane; first exopodal segment large, with large membrane folded on dorsal side; entire outer margin of endopodal segments fringed with setules. Leg 3 (Fig. 6D) protopod (apron) armed with long, plumose outer and inner seta; large marginal membrane on outer and posterior edges in addition to 2 small, single setule-bearing papillae at basal region of posterior membrane; velum small, fringed with setules on posterior margin. Leg 4 (Fig. 6E) reduced; protopod with terminal, outer, pinnate seta; exopod indistinctly 2-segmented, proximal segment long and curved inward; terminal segment continued into a bilaterally pinnate, spiniform element.

Leg 5 (Fig. 5G) represented by a raised area on ventral side of genital complex fringed with 3 pinnate and 1 naked setae. Leg 6 (Fig. 5G) represented by a short pinnate and 2 long, naked setae on the posterolateral side of genital complex.

**Male:** Body (Fig. 7A) small, 778 (761-810)  $\mu\text{m}$  long (excluding setae on caudal rami). Cephalothoracic shield shaped as in female, slightly longer than wide, 606 (583-616)  $\times$  573 (543-608)  $\mu\text{m}$  (excluding marginal hyaline membranes). Fourth pediger wider than long, 24 (24-24)  $\times$  128 (122-130)  $\mu\text{m}$ . Genital complex wider than long, 144 (138-154)  $\times$  211 (203-219)  $\mu\text{m}$ , carrying legs 5 and 6 at its posterolateral corner. Abdomen (Fig. 7C) short and wide, 32 (32-32)  $\times$  95 (89-97)  $\mu\text{m}$ . Caudal ramus (Fig. 7C) distinctly wider than long, 26 (24-32)  $\times$  41 (41-41)  $\mu\text{m}$ , armed with 2 short, 1 medium, and 3 long plumose setae in addition to a row of setules on medial margin. Antenna (Fig. 7B) 3-segmented; proximal segment small and unarmed; middle segment largest, with corrugated pad on medial surface in central and terminal regions; distal segment ending in 3 spatula-like plates with 1 seta in basal region. Leg 5 (Fig. 7C) represented by 1 short and 3 long pinnate setae on posterolateral margin of genital complex. Leg 6 (Fig. 7C) represented by posterolateral lobe tipped with 2 long pinnate setae posterior to leg 5.

**Remarks:** With Kabata and Deets' (1988) suggestion to remove *Pseudanuretes schmitti* Rangnekar, 1957 from this genus; Dojiri's (1983) opinion to transfer *Anuretes parvulus* Wilson, 1913 into *Pseudanuretes*; and Ho and Lin's (2000) action to transfer both *Anuretes chelatus* Prabha et Pillai, 1986 and *Anuretes feddorni* Price, 1968 into *Pseudanuretes*, currently, nine species of caligids are found in this genus. They can be easily divided into two groups according to the structure of the fourth pair of legs. In one group the leg 4 is terminated into a single spear-like structure and the other group, tipped with either 1 or 2 setae. *Pseudanuretes parvulus* was so poorly described in the original report, it is impossible to determine to which group

it belongs. However, in order to make thorough, further comparison, it is here treated as a member of the former group. The species from Taiwan belongs to the first group together with *P. chaetodonti* Yamaguti, 1936; *P. fortipedis* Kabata, 1965; and *P. pomacanthodi* Prabha & Pillai, 1983.

The specimens from Taiwan differ from the above mentioned three species of the same group in having its proximal outer spine on the exopod of leg 3 appearing as a conical process instead of an abruptly attenuated spine. It differs further from *P. parvulus* and *P. pomacanthodi* in having 1,6 (instead of 1,7) armature on the terminal segment of leg 2 exopod; and from *P. chaetodontis* in having a longer maxillary whip and a longer leg 4.

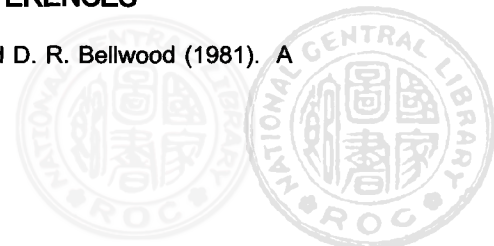
It should be pointed out that the specimens of *P. papernai* from Taiwan show certain differences from Kabata and Deets' (1988) original description of the species. The differences are seen in (1) the shape of the genital complex, (2) the fine structures of the terminal four elements at the tip of leg 1, (3) the ornamentation on the outer 4 setae on the terminal segment of leg 3 exopod, and (4) the armature of leg 6. Inasmuch as the type locality of *P. papernai* (in the Gulf of Aqaba) is so far away from Taiwan, these minor differences are treated here as nothing but exhibition of certain geographical difference. The host of this parasite in the original description, *Pomacanthus imperator* (Bloch), is a congener of the host from Taiwan.

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## 從臺灣的台東海水魚體上收集到三種屬於 吸管口目的寄生魚虱橈足類

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三種屬於吸管口目的魚虱橈足類，從臺灣的東海岸(屬於太平洋)的海水魚體上發現。此三種寄生蟲的蟲種及其宿主的名稱分別為：寄生在馬鞭魚(*Fistularia Petimba* Lacepède) 鰓腔的 *Caligus glandifer* Shiino, 1954；寄生在長尾濱鯛(*Etelis coruscans valenciennes*) 體表的世界新種 *Lepeophtheirus etelisi*；以及在疊波棘蝶魚 [*Pamacanthus semicircularatus* (Block)] 體表寄生的 *Pseudanuretes papernai* Kabata and Deets, 1988。其中一種為世界新種，另二種均為再次被發現的記錄。

**關鍵詞：**寄生橈足類，吸管口目，魚虱類，海水魚，臺灣。

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