

**PARASITIC COPEPODS ON THE FISHES OF THE GREAT BARRIER
REEF, AUSTRALIA. PART II. CALIGOIDA: *DISSONUS*,
LEPEOPHTHEIRUS, AND *DENTIGRYPUS***

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With Text-figures 1-9 and Table 1

In the second part of this series, we report various parasitic copepods belonging to the order Caligoida (excluding *Caligus* and *Caligoides*, which will be dealt with in a subsequent paper). Kabata (1965, 1966a, 1966b) has reported some species of *Dentigryps*, *Dissonus*, and *Lepeophtheirus* from the Great Barrier Reef. In the present paper, two species of *Dissonus* (*D. manteri* Kabata, 1966 and *D. heronensis* Kabata, 1966) and two species of *Dentigryps* (*D. ulua* Lewis, 1964 and *D. litus* Lewis, 1964) are recorded. A new species of *Lepeophtheirus*, which we propose to name *L. epinepheli*, is described. In addition, a redescription of *L. plectropomi* Nunes-Ruivo and Formanoir, 1956 is provided along with a discussion of Lewis' (1968) specimens from the Marshall Islands, which we believe is a new species and propose to name *L. kabatai*. *Anuretes anomalus* Pillai, 1967 is reported and proposed to be transferred to *Lepeophtheirus*. A full description is given for *L. epinepheli*; however, in the descriptions of the remaining three species of *Lepeophtheirus*, only those features that are different from *L. epinepheli* are mentioned. The validity of the genera *Anuretes* and *Dentigryps* is discussed.

A map of the Great Barrier Reef, showing the various islands from which the collections were made, is provided by Ho and Dojiri (1976). The taxonomic characters and the terminology used in the present descriptions of the species of *Lepeophtheirus* are taken from Kabata (1973).

Some specimens of *D. manteri*, *D. ulua*, and *L. plectropomi* are deposited, together with the type-specimens of *L. epinepheli* and *L. kabatai*, in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. The remaining specimens are kept in the senior author's collection.

We extend our appreciation to Dr. K. Rohde who sent us the collections, identified the fish hosts, and made available to us all pertinent data. We also thank Dr. A.G. Lewis for providing his specimens of *L. kabatai*.

Family Dissonidae

Dissonus manteri Kabata, 1966

(Figs. 1A, B)

Material examined: From *Plectropomus leopardus*: 1 ovigerous female from Heron Island, on 2 September, 1973; 1 female and 1 male from Wistari Reef, on 9 September, 1973, 4 ovigerous females, 2 nonovigerous females, 1 immature female, and 2 males from Wistari Reef, on 4 November, 1973; 3 ovigerous females, 1 nonovigerous female, 4 immature females, and 1 male from Wistari Reef, on 4 November, 1973; 1 female with eggs extruded, 2 nonovigerous females, and 3 males from Wistari Reef, on 11 November, 1973; 2 immature females from Heron Island, on 4 December, 1973; 3 ovigerous females, 1 nonovigerous female, 3 immature females, and 1 male from Wistari Reef, on 4 December, 1973; 1 ovigerous female and 1 male from Wistari Reef, on 4 December, 1973; 4 nonovigerous females and 1 immature female from Heron Island, on 28 January, 1974; 2 nonovigerous females, 2 immature females, and 3 males from Lizard Island, on 23 April, 1975; 6 ovigerous females, 3 nonovigerous females, 1 female (genital complex missing), and 1 male from Wistari Reef, on 29 May, 1974. From *Epinephelus fario*: 3 ovigerous females, 1 nonovigerous female, and 1 male from Lizard Island, on 26 April, 1975.

Remarks: Kabata (1966a) described *D. manteri* as a new species from "an unspecified serranid fish" collected off the coast of New Caledonia and from *Plectropomus maculatus* near Heron Island. The present specimens fall within the ranges of Kabata's New Caledonian and Australian specimens. Some dimensions of adult females and males are given below (in mm):

	female	male
Total length (excluding flange)	1.90-2.15	1.55-1.87
Carapace length (excluding frontal region)	.48- .58	.47- .56
Carapace width	.88-1.02	.76- .91
Free segments length	.60- .75	.53- .68
Genital segment length	.47- .58	.40- .47
Genital segment width	.46- .55	.27- .31
Abdomen length	.16- .20	.10- .18
Abdomen width	.12- .19	.15- .19
Egg sac length	.92-1.06	
Egg sac width	.20- .22	

Since Kabata provided an excellent description of *D. manteri*, only the dorsal view of the female (fig. 1A) and male (fig. 1B) are provided. The discovery of *D. manteri* on *Plectropomus leopardus* and *Epinephelus fario* constitutes two new host records, and suggests that this species of *Dissonus* is restricted to serranid fishes.

Dissonus heronensis Kabata, 1966

(Figs. 1C-E)

Material examined: 1 ovigerous female from *Abalistes stellaris* collected from the north edge of Wistari Reef near Heron Island, on 30 June, 1974.

Remarks: Kabata (1966a) originally described the male of *D. heronensis* from an "unspecified fish of the family Balistidae" collected off Heron Island. Lewis (1968) described the female from *Balistoides viridescens* taken from Eniwetok Atoll. The present specimen (fig. 1C) is larger than the Eniwetok specimens. The measurements of the Australian specimen are given below (in mm):

	female
Total length (excluding flange)	2.19
Carapace length (excluding frontal region)	.40
Carapace width	1.04
Free segments length	.81
Genital segment length	.67
Genital segment width	.55
Abdomen length	.20
Abdomen width	.28
Egg sac length	1.01
Egg sac width	.23

Since both Kabata (1966a) and Lewis (1968) described *D. heronensis* thoroughly, a full description is not repeated here. However, there are a few discrepancies which should be mentioned. Kabata and Lewis both record 10 bifid spines on the ventral surface of the genital segment, while the present specimen bears 12. Lewis also reports that his Eniwetok female specimen did not possess a small denticle on the terminal segment of the endopod of leg 1 which was present on Kabata's Australian male specimen. The present female possesses a prominent denticle (fig. 1D) on this segment. On the same individual, two denticles are present on the other endopod of leg 1 (fig. 1E). Lewis reports a "setule like accessory process" located proximally on the claw-like terminal process of the second antenna. The present specimen bears two naked setae; one is located proximally as reported by Lewis, and the other near the midregion of the claw.

Since Kabata (1966a) only had one specimen (a male) at his disposal, he was not certain about the details of the post-oral process, but suggested that this structure was of the "same type as that of *D. similis*". The present female supports Kabata's statement. Kabata's male possessed 3 small spinules on the second segment of the exopod of leg 1. Lewis described the Eniwetok female as possessing a coarsely frilled membrane, while the present specimen bears approximately 11 small spinules. The differences reported here may be due to sexual dimorphism (compared to Kabata's description) and geographic variation (in reference to Lewis' description).

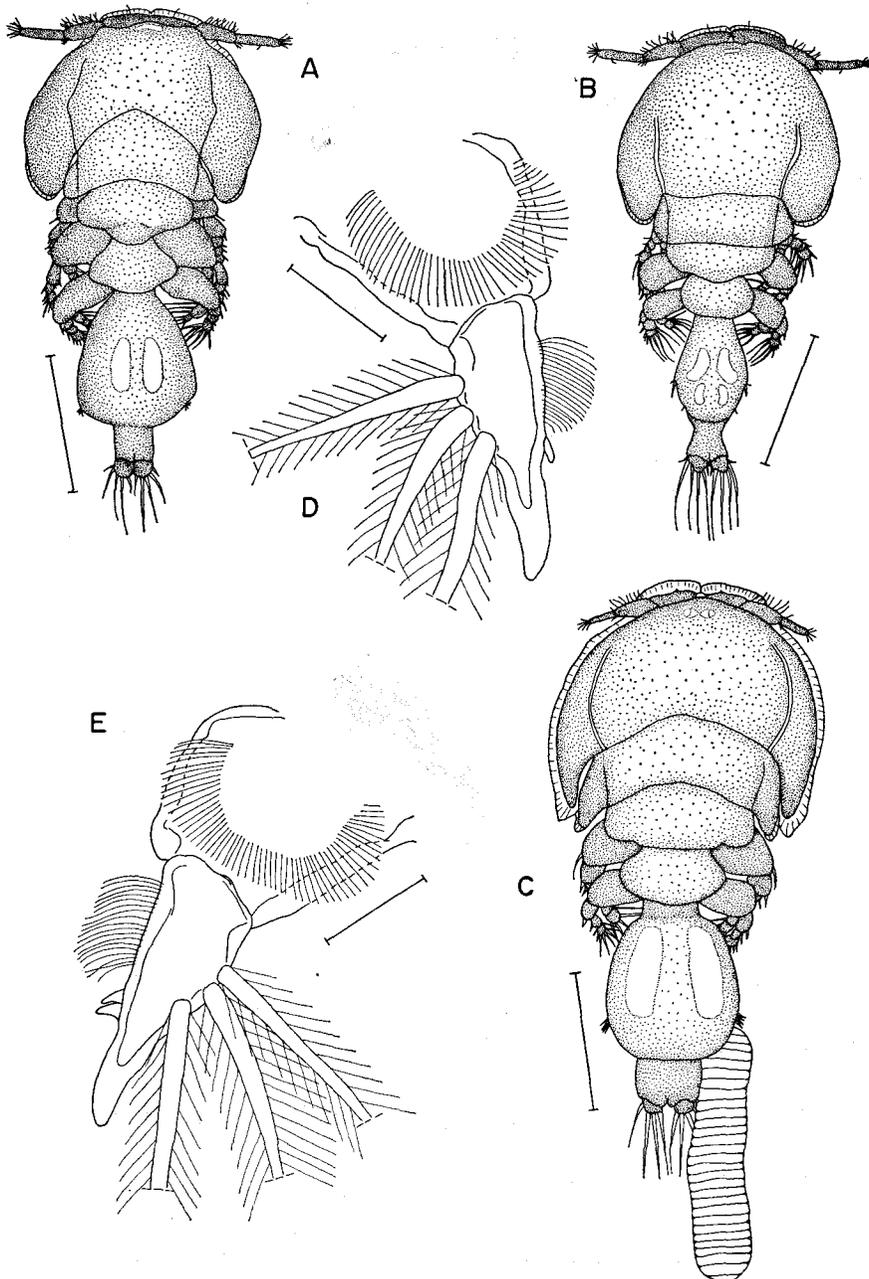


Fig. 1. *Dissonus manteri* Kabata and *D. heronensis* Kabata. *D. manteri*: A. female, dorsal; B. male, dorsal. *D. heronensis*: C. female, dorsal; D. left endopod of first leg, ventral; E. right endopod of first leg, ventral. Scale: 0.5 mm in A, B, C; 0.03 mm in D, E.

Family Caligidae

Lepeophtheirus epinepheli n. sp.

(Figs. 2-4)

Material examined: From *Cephalopholis cyanostigma*: 1 male from Eagle Island, on 1 May, 1975. From *Epinephelus hoedti*: 2 nonovigerous females from Heron Island, on 13 February, 1975. From *Epinephelus gilberti*: 1 pre-adult female from Heron Island, on 21 January, 1975; 1 nonovigerous female and 2 males from Wistari Reef, on 26 January, 1975; 1 nonovigerous female and 2 males from Wistari Reef, on 26 January, 1975; 1 male from Wreck Island, on 16 March, 1975; 1 ovigerous female from North Reef, on 31 March, 1975.

Female: The dorsal shield (fig. 2A) is subcircular, with the tips of the first antenna not extending to its lateral limits. It possesses shallow posterior sinuses and the free margin of the thoracic zone projects well beyond the posterior tips of the lateral zone. The free fourth pedigerous segment is rather narrow and possesses a small projection on its posterior lateral corners. The genital complex is subrectangular, about as long as or longer than the thoracic zone of the shield, and about as wide as long. The abdomen is longer than wide. The caudal ramus (fig. 2B) carries 4 long and 2 short plumose setae.

The first antenna (fig. 2C) is distinctly 2-segmented, with the stout basal segment bearing 25 setae and a sharp bifid process at its posterodistal corner. The second segment possesses a seta on the posterior margin at about midlength, and 12 setae and 1 aesthete at its tip. The second antenna (figs. 2D, E) is of the usual form. The postantennal process (fig. 2F) has a broad base, with a slightly curving process. The mandible (fig. 2G) is 3-segmented and tipped with 12 teeth. The first maxilla (fig. 2H) is bifid, with the lateral tine longer than the medial one. The second maxilla (fig. 3A) is of the usual form and has no small barb on the shorter terminal process. The maxilliped (fig. 3B) provides no diagnostic features. The sternal furca (fig. 3C) with a subrectangular box possesses horseshoe shaped tines that are bluntly rounded at their tips. The base of the plumose seta at the joint between the sympod and the exopod of the first leg (fig. 3D) is not covered by a protrusion, but a small sclerite bearing 2 minute hairs is present in this region. The endopod is small, bearing 2 apical processes. The terminal elements of the exopod (fig. 3E) are long and slender, with pinnate seta 4 shorter than claw 1 (seta 1 of Kabata, 1973). Claw 1 bears a single row of denticles, while claw 2 and 3 are armed with 2 rows and a secondary process at their distal ends. Only the spine of the third segment of the exopod of the second leg (fig. 3F) extends beyond the distal margin of the third segment. The exopod spine of the third leg (fig. 3G) is at the distal end of the basal swelling which possesses 2 naked setae. The distal end of the fourth leg (fig. 4A) is 3-segmented, with the middle seta of the terminal segment being the longest. The fifth leg (fig. 4B) is lobate, bearing 2 terminal and a lateral plumose setae. Another plumose seta is present just anterior to the base of this lobe. Measurements of both the females

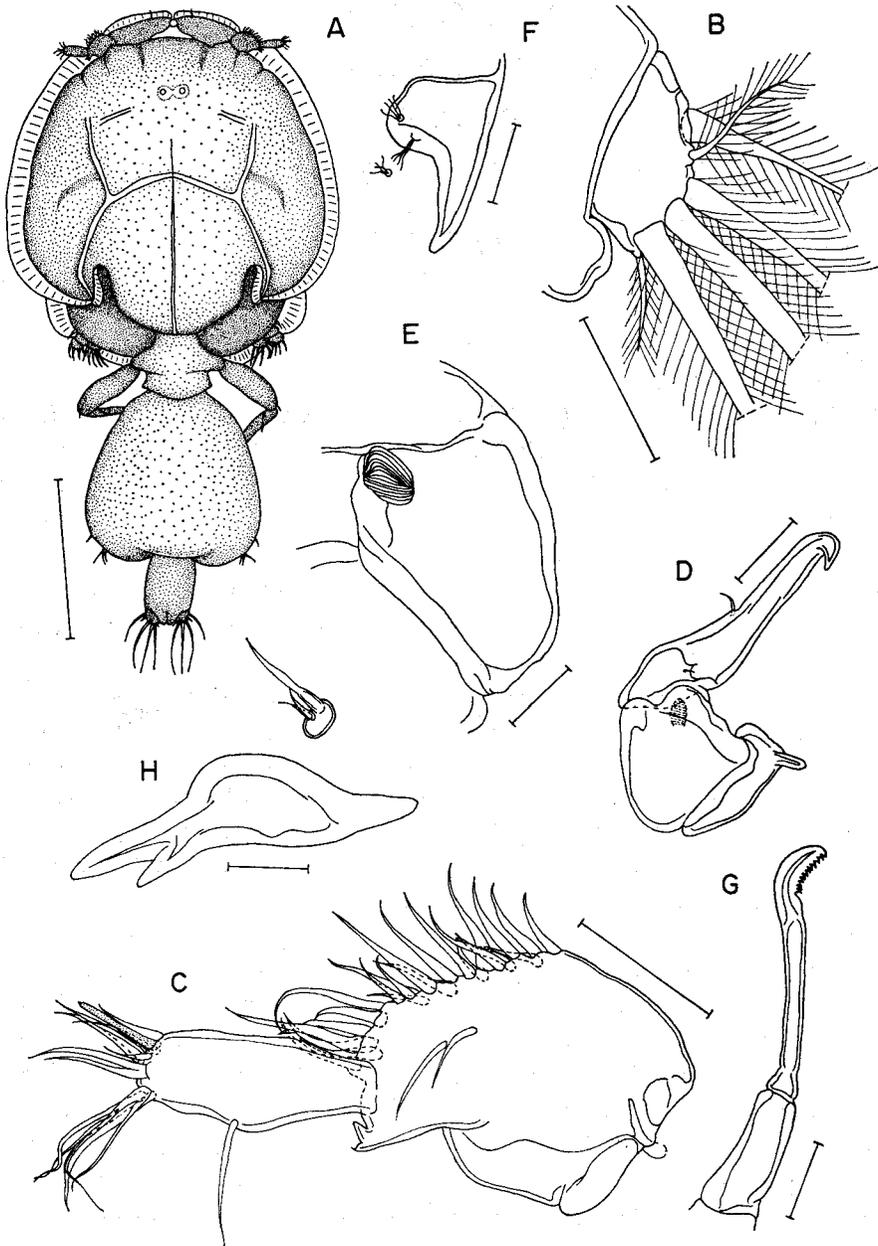


Fig. 2. *Lepeophtheirus epinepheli* n. sp., female. A. body, dorsal. B. caudal ramus, ventral. C. first antenna, dorsal. D. second antenna, ventral. E. middle segment of second antenna, dorsal. F. postantennal process, ventral. G. mandible, ventral. H. first maxilla, ventral. Scale: 1 mm in A; 0.1 mm in B, C, D; 0.05 mm in E, F, G, H.

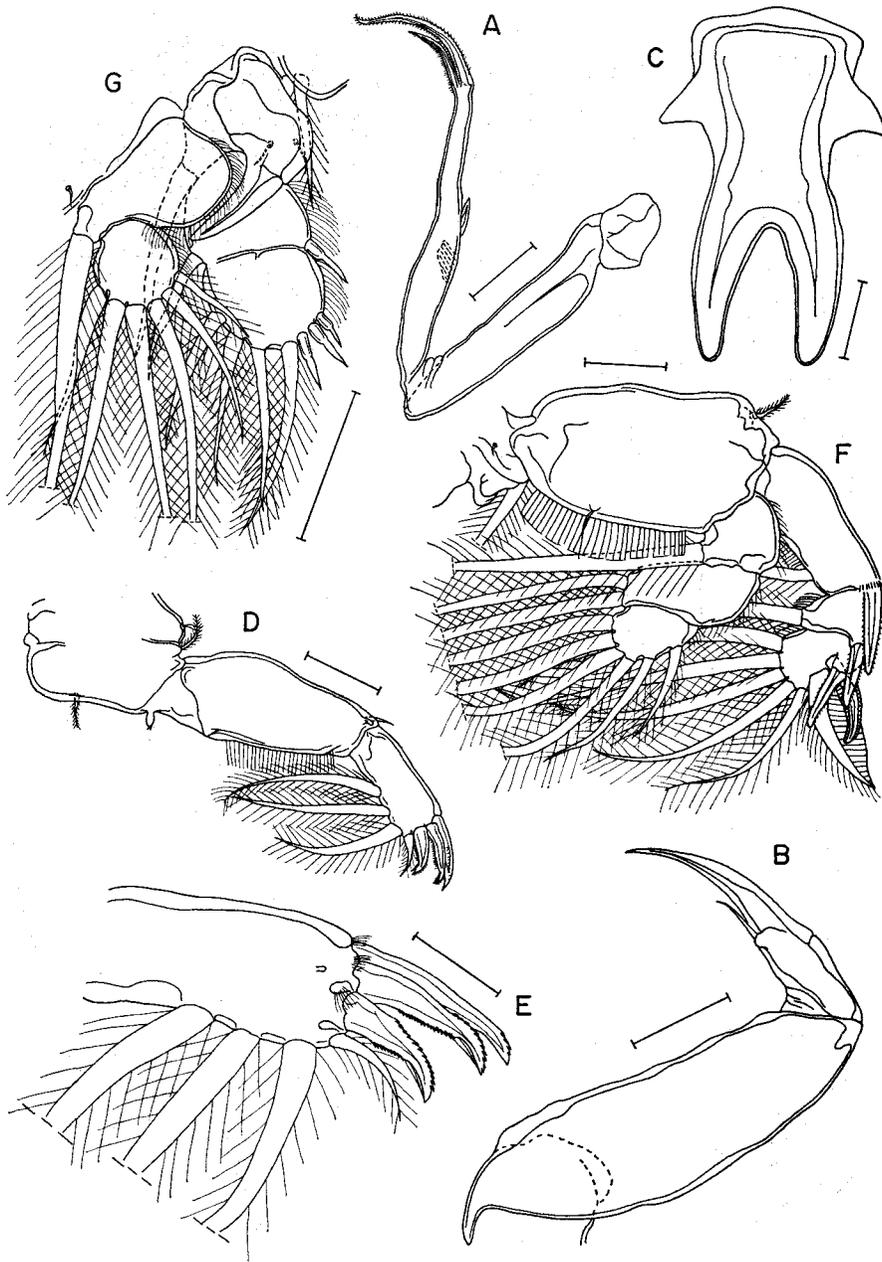


Fig. 3. *Lepeophtheirus epinepheli* n. sp., female. A. second maxilla, ventral. B. maxilliped, ventral. C. sternal furca, ventral. D. first leg, anterior. E. tip of exopod of first leg, anterior. F. second leg, ventral. G. third leg, ventral. Scale: 0.1 mm in A, B, D, F, G; 0.05 mm in C, E.

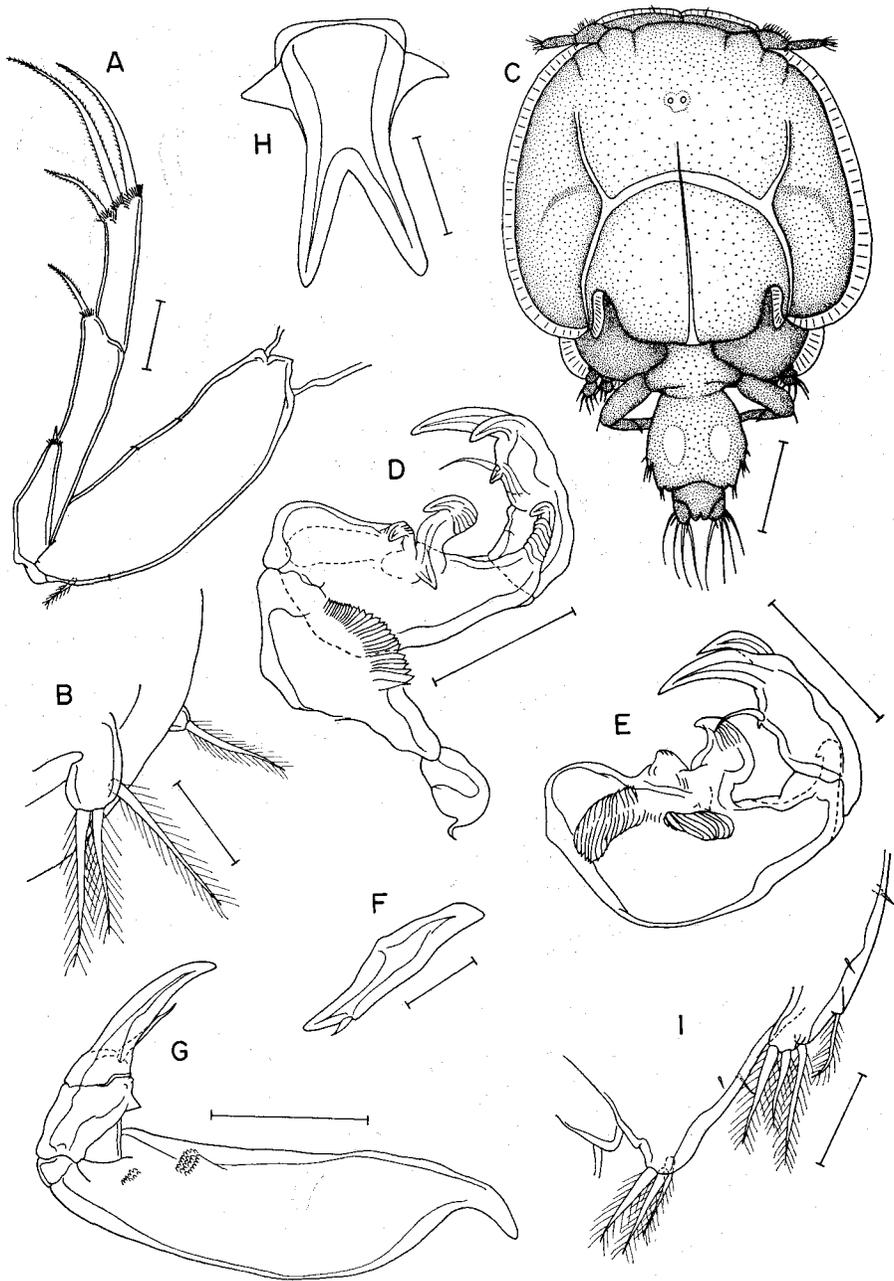


Fig. 4. *Lepeophtheirus epinepheli* n. sp. Female: A. fourth leg, ventral; B. fifth leg, ventral. Male: C. body, dorsal; D. second antenna, ventral; E. second antenna, dorsal; F. first maxilla, ventral; G. maxilliped, ventral; H. sternal furca, ventral; I. fifth and sixth legs, ventral. Scale: 0.1 mm in A, D, E, G; 0.05 mm in B, F, H, I; 0.3 mm in C.

and males are listed below (in mm):

	female	male
Total length (excluding marginal flange)	3.65-4.04	1.80-1.92
Cephalothorax length	2.01-2.10	1.22-1.27
Cephalothorax width	1.92-2.06	1.22-1.29
Genital segment length	.92-1.09	.35- .38
Genital segment width	.97-1.18	.34- .36
Abdomen length	.43- .51	.10- .12
Abdomen width	.32- .37	.20

Male: The cephalothorax (fig. 4C) is similar to the female. The genital segment is shorter than the thoracic region of the dorsal shield. The second antenna (fig. 4D) is 3-segmented. The first segment possesses a large corrugated adhesion pad. The middle segment bears 2 adhesion pads (fig. 4E) on its dorsal surface, a heavy triangular process, and 2 recurved accessory claws (the larger one is corrugated along its mid-outer region). In addition, a long recurved claw, which also has a corrugated surface, is present on its distal corner. The terminal claw possesses an accessory tine and a short slightly curved process below the long naked seta. The first maxilla (fig. 4F) consists of a single tine and a large denticle. The corpus of the maxilliped (fig. 4G) bears 2 patches of denticles. Also, a triangular process is present on the proximal corner of the subchela. The sternal furca (fig. 4H) is unlike

Table 1. Some differences in morphological features between *Lepeophtheirus epinepheli* and 12 species of its congeners with a short abdomen (about one-half or less than one-half of the genital segment) and the middle terminal claw of leg 4 being the longest. Two species that are unknown of their terminal armature on leg 4 are also included. The symbol "X" indicates difference and "?", unknown.

	♀								♂
	first maxilla	second maxilla	sternal furca	leg 1	leg 2	leg 3	leg 5	second antenna	
<i>L. bonaci</i> Pearse	X	?	X	?		?	X	?	
<i>L. breviventris</i> Fraser		X		X			X	X	
<i>L. chantoni</i> Gussev	X		X				X	X	
<i>L. christianensis</i> Wilson	?	?	X	X	?	?	?	X	
<i>L. cossyphy</i> Krøyer	?	?		?	?	X	X	?	
<i>L. elegans</i> Gussev	X		X				?	X	
<i>L. hapalogenyos</i> Yamaguti & Yamasu	X	X	X			X		X	
<i>L. hexagrammi</i> Gussev	X						X	X	
<i>L. interitus</i> Wilson*	X	?	X	?	?	?	?	?	
<i>L. paulus</i> Cressey	X			X	X	X		X	
<i>L. plotosi</i> Barnard*	?	?	X	?	?	?	X	?	
<i>L. sekii</i> Yamaguti						X	X	X	

*=terminal armature of fourth leg unknown

the female; the tines are more slender and divergent throughout its entire length than the female. The fifth leg (fig. 4I) is slender, with 3 plumose setae on the lateral margin, the fourth at its base, and 2 setules. The sixth leg (fig. 4I) is triangular, bearing 2 terminal and 1 subterminal plumose setae.

Remarks: We compared *L. epinepheli* with all species of this genus which are reported as possessing, on the fourth leg, the middle terminal element longest of the three and the abdomen one-half the length of the genital complex. Since some authors did not mention or figure the armature of the fourth leg, these species were also included in the comparison (table 1).

The fifth leg (fig. 4B) of the female has a unique shape which was not seen in any previously described species. The second antenna (fig. 4D) of the male is also uniquely distinct from all previous species, particularly the corrugated claw on the distal corner of the middle segment. The shape and extent of the 2 patches of denticles on the male maxilliped (fig. 4G) afford useful diagnostic characters and helps distinguish this species. It is noteworthy that the sternal furca of the female (fig. 3C) and of the male (fig. 4H) are different.

Lepeophtheirus plectropomi Nunes-Ruivo and Formanoir, 1956

(Figs. 5-6)

Material examined: From *Epinephelus megachir*: 1 pre-adult male from Wistari Reef, on 4 November, 1973. From *Plectropomus leopardus*: 2 immature specimens from Wistari Reef, on 4 November, 1973, 9 immature specimens from Wistari Reef, on 4 November, 1973; 7 ovigerous females, 6 nonovigerous females, 13 immature specimens, and 12 males from Wistari Reef, on 11 November, 1973; 1 male from Wistari Reef, on 5 January, 1974, 1 nonovigerous female from Wistari Reef, on 29 May, 1974; 1 ovigerous female from Wistari Reef, on 29 May, 1974.

Female: The dorsal shield (fig. 5A) is subcircular with moderately shallow posterior processes. The free margin of the thoracic zone extends well beyond the posterior tips of the lateral zone. Small projections are present on the posterolateral portion of the thoracic zone of the dorsal shield. The free fourth pedigerous segment is narrower than the genital segment, and is not clearly delimited from it. The genital complex is globular, wider than long, and shorter than the thoracic zone of the shield. The abdomen is less than one-half the length of the genital complex, and is a little wider than long. The postantennal process (fig. 5B) possesses a moderately expanded base with a slightly curving tine. The first maxilla (fig. 5C) is bifid, with the slightly curved medial tine a little shorter and more slender than the lateral one. The sternal furca (fig. 5D) consists of 2 blunt diverging tines. The exopod spine of leg 3 (fig. 5E) is terminally located on the basal swelling, which bears 3 naked setae (one is broken off in the figure). The second segment of the endopod carries only 5 plumose setae. The distal portion of the fourth leg is 3-segmented, with the first seta of the terminal segment (fig. 5F) the longest of the three. Seta 1 and seta 3 are both charac-

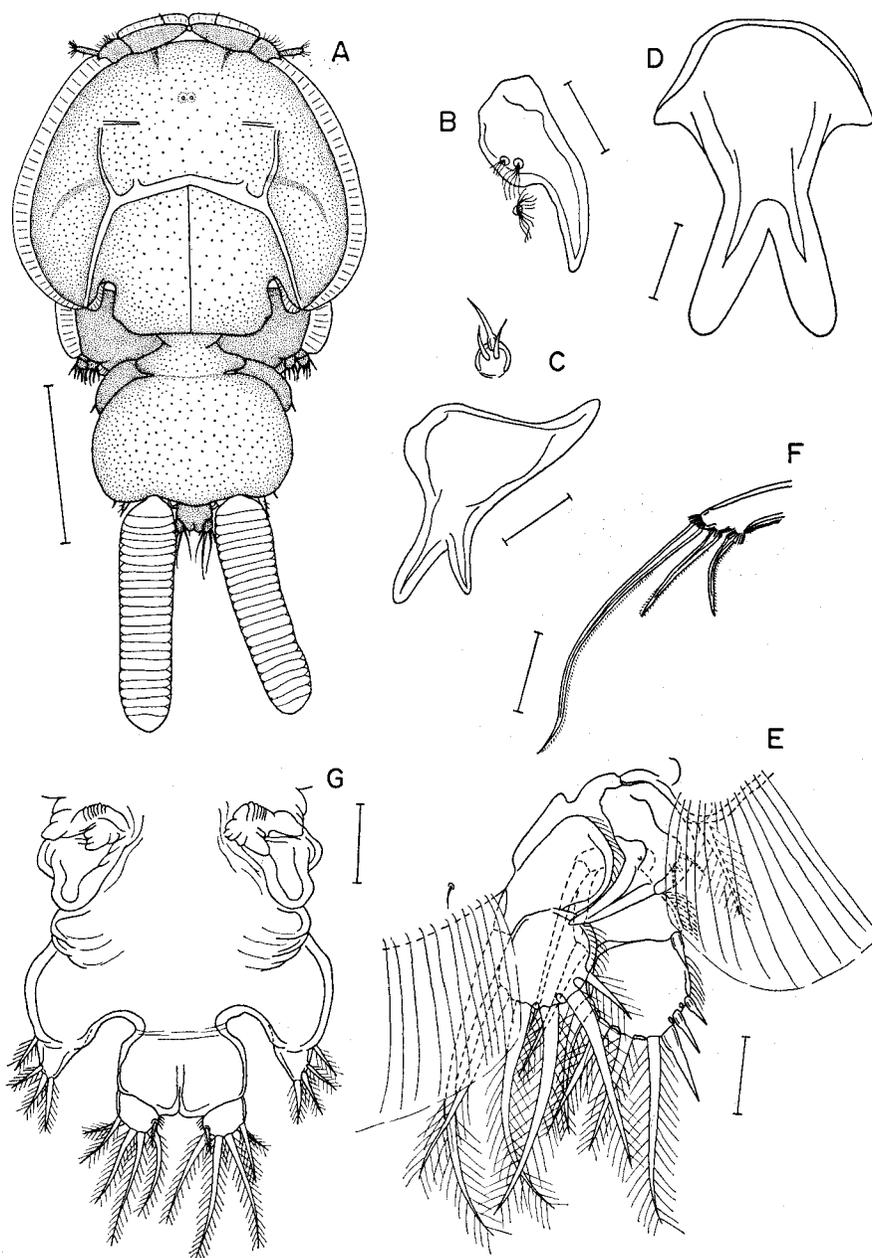


Fig. 5. *Lepeophtheirus plectropomi* Nunes-Ruivo & Formanoir, female. A. body dorsal. B. post-antennal process, ventral. C. first maxilla, ventral. D. sternal furca, ventral. E. third leg, ventral. F. terminal portion of fourth leg, ventral. G. genital complex of immature female, ventral. Scale: 1 mm in A; 0.05 mm in B, C, D, E; 0.01 mm in F.

teristically bent. Measurements of adult females and males are given below (in mm):

	female	male
Total length (excluding marginal flange)	2.84-3.42	1.60-1.82
Cephalothorax length	1.85-2.15	1.18-1.29
Cephalothorax width	1.82-2.13	1.13-1.29
Genital segment length	.67- .90	.24- .35
Genital segment width	.95-1.34	.25- .28
Abdomen length	.16- .48	.06- .10
Abdomen width	.19- .60	.13- .17
Egg sac length	1.41-3.42	

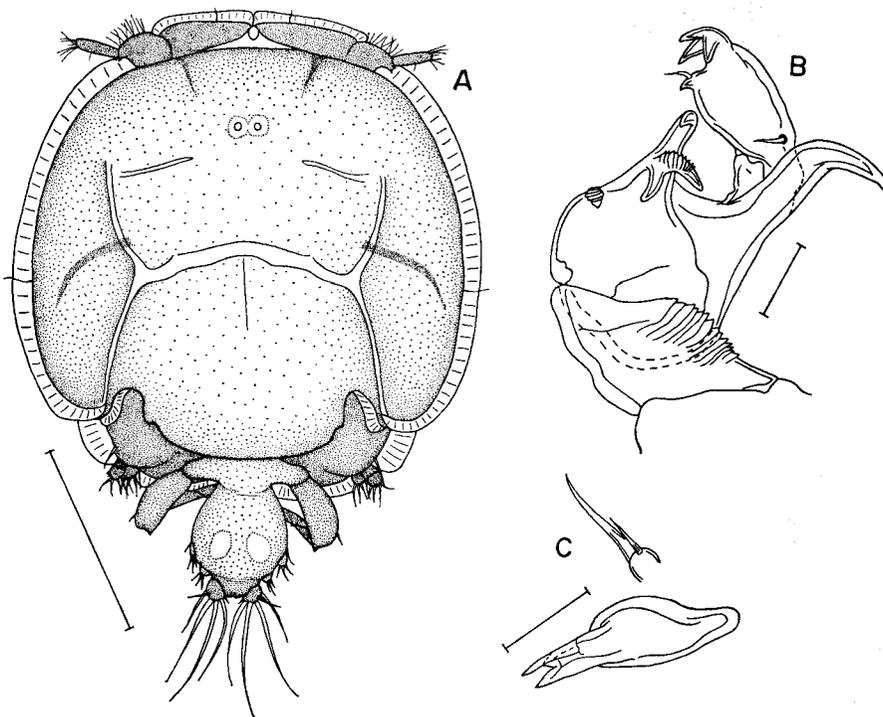


Fig. 6. *Lepeophtheirus plectropomi* Nunes-Ruivo & Formanoir, male. A. body, dorsal. B. second antenna, ventral. C. first maxilla, ventral. Scale: 0.5 mm in A; 0.05 mm in B, C.

The genital complex of a juvenile female (fig. 5G) possesses corrugated, irregularly shaped surfaces on its anterodorsal aspect, which is not present in the adult. A similar condition was reported by Shiino (1952) from *L. goniistii*.

Male: The cephalothorax (fig. 6A) is as in the female. Genital complex is one-half the length of the thoracic zone and is narrower than the lateral margins of the free fourth pedigerous segment. The second antenna (fig. 6B) is 3-segmented. The first segment carries a large adhesion pad. The middle segment bears 1 small

corrugated claw on the outer surface, 3 more claws (the middle one is corrugated), and 1 very large recurved claw at the distal end. The terminal segment possesses 1 naked seta proximally, and another seta near a small spine, which is situated close to the 3 terminal claws. The first maxilla (fig. 6C) consists of a broad base with 2 tines and a naked robust seta.

Remarks: Nunes-Ruivo and Formanoir (1956) first discovered this species from *Plectropomus maculatus* from Majunga, Madagascar. Kabata (1966b) then identified a single female from the same host fish collected off Heron Island. Lewis (1968) entertained some doubts to his identification of *L. plectropomi* taken from *Epinephelus fuscoguttatus* and *E. kohleri* from the Eniwetok Atoll.

Nunes-Ruivo and Formanoir gave an incomplete description, figuring only 3 appendages. Because of this cursory account, much confusion of the validity and subsequent identification of this species has occurred. Both Kabata (1966b) and Lewis (1968) entertained some doubts as to the identification of their specimens as *L. plectropomi*.

Although Kabata (1966b) could not describe his specimen with any detail because he had only one specimen at his disposal, it appears that his specimen is *L. plectropomi*. The measurements he cited for his Australian specimen falls within the ranges of our specimens. More importantly, in his dorsal view (Kabata, 1966b: fig. 2A) the posterolateral processes on the thoracic zone of the dorsal shield (fig. 5A) are present. Although the original authors did not illustrate these processes, it is believed that this was an oversight of the discoverers and is a diagnostic feature of *L. plectropomi*. The diagnostic features that distinguishes this species from all its congeners are, in addition to the processes on the thoracic zone, the bent nature of the first and third terminal elements on the fourth leg, the armament of the second segment of the endopod of leg 3, and the second antenna of the male.

Lewis' (1968) Eniwetok specimen is not *L. plectropomi*, but is a new species closely related to *L. plectropomi*. The description of this new species and a comparison between it and *L. plectropomi* are provided later.

Lepeophtheirus kabatai n. sp.

(Figs. 7A-F)

Material examined: 2 ovigerous and 1 nonovigerous females collected from *Epinephelus tauvina* (taxonomic status of this species of fish is not clear according to the Australian Museum), near Wilson Island, on 11 June, 1974.

Female: The cephalothorax (fig. 7A) is subcircular with shallow posterior sinuses and the free margin of the thoracic zone extending beyond the posterior tips of the lateral zone. The free fourth pedigerous segment is narrower than the genital complex. The latter is globular and is about the same length as the thoracic zone. The abdomen (fig. 7B) has a narrow anterior portion, and bulges outward in its midlength. In its dorsal aspect, the abdomen bears 4 setules and 2 haired papillae

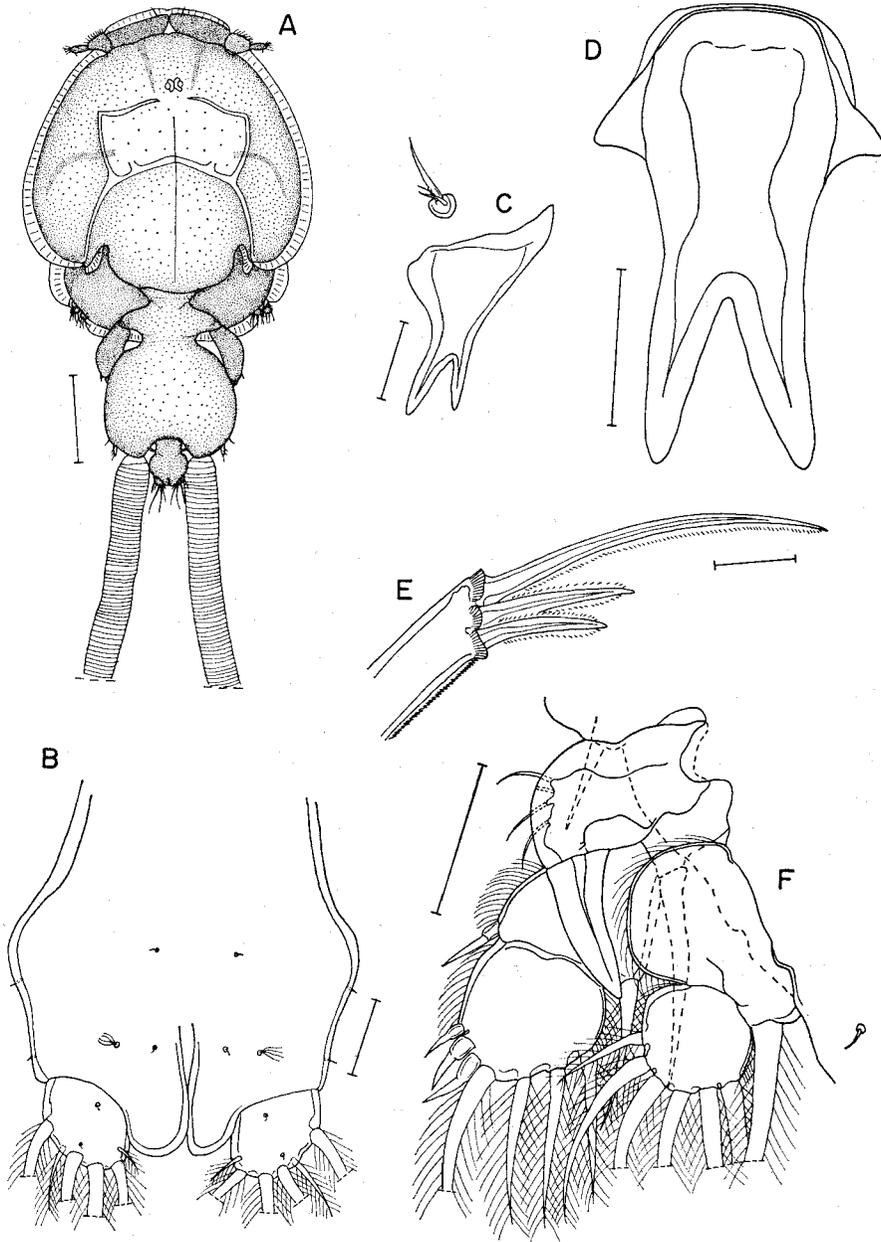


Fig. 7. *Lepeophtheirus kabatai* n. sp., female. A. body, dorsal. B. abdomen and caudal rami, dorsal. C. first maxilla, ventral. D. sternal furca, ventral. E. terminal portion of fourth leg, ventral. F. third leg, ventral. Scale: 1 mm in A; 0.1 mm in B, C, D, E, F.

medially, and 2 pairs of setules laterally. The caudal ramus (fig. 7B) is armed with 4 large plumose setae, 2 small plumose setae, and 2 dorsally situated setules.

The first maxilla (fig. 7C) possesses a broad base with 2 straight tines. The lateral tine is broader and longer than the medial one. The sternal furca (fig. 7D) consists of a subrectangular box with diverging tines. The exopod spine of the third leg (fig. 7E) is at the distal end of the basal swelling which bears 4 long naked setae (one is broken off in the figure). The second segment of the endopod is tipped with 6 plumose setae. The fourth leg (fig. 7E) is 3-segmented in the distal portion, with the inner seta the longest. Seta 1 and 3 are curved, but not bent as in *L. plectropomi* (fig. 5F). The measurements of the females are given below (in mm):

	female
Total length (excluding marginal flange)	5.39-5.82
Cephalothorax length	3.10-3.49
Cephalothorax width	3.07-3.28
Genital segment length	1.25-1.43
Genital segment width	1.57-1.71
Abdomen length	.49- .53
Abdomen width	.44- .49
Length of egg sac (end is broken off)	3.95

Male: Described by Lewis (1968) as *L. plectropomi*.

Remarks: Lewis (1968) redescribed with doubt *L. plectropomi* from *Epinephelus fuscoguttatus* and *E. kohleri* collected from the Eniwetok Atoll. We have obtained 3 mature female which were collected from *Epinephelus tauvina*?, the same genus of host from which Lewis described the species under discussion. Although there are no males in our collection, the description of the female provided by Lewis is identical to the present specimens, except the 2 terminal spines on the last segment of leg 1. In the present specimen the accessory spine (as in *L. epinepheli*) reaches the distal end of the spine. Although Lewis described a "membrane" as not reaching the distal end of the spine, examination of his material revealed that the membranes are actually spines which reach the distal ends of the spines.

A comparison between *L. kabatai* and *L. plectropomi* is listed below:

	<i>L. kabatai</i>	<i>L. plectropomi</i>
Sternal furca	sharp	blunt
Abdomen	protrudes outward in midregion	no protrusion
Male second antenna*	bifid tip	trifid tip
Male first maxilla*	1 tine+seta	2 tines+seta
Second segment of the endopod of leg 3	6 plumose setae	5 plumose setae
Leg 4	inner seta curved	inner seta bent inward at tip

* as described by Lewis (1968)

Lepeophtheirus anomalus (Pillai, 1967)

(Figs. 8A-F)

Material examined: 1 mature nonovigerous female collected from *Spilotichthys pictus* near Heron Island, on 24 November, 1973.

Remarks: Pillai (1967) originally described *Anuretes anomalus* from the gills of *Platax teira* "examined at Trivandrum". The Trivandrum specimens are larger (3 mm) than the present specimen. Some dimensions (in mm) are given below:

	female
Total length (excluding marginal flange)	1.35
Cephalothorax length	.87
Cephalothorax width	.75
Genital segment length	.36
Genital segment width	.45
Abdomen length	.03
Abdomen width	.08

In the Australian specimen (fig. 8A) the free margin of the thoracic zone does not cover the free fourth pedigerous segment as figured by Pillai (1966). The caudal ramus (fig. 8B) bears 6 plumose setae. The endopod of the first leg (fig. 8C) carries a small protuberance and hairs. The 3 terminal claws of leg 1 (fig. 8D) each possesses 2 rows of denticles, while claw 2 and 3 bear a secondary process at their distal ends. Pillai does not figure or mention a plumose seta on the inner margin and one on the outer margin of the first segment of the exopod of leg 3 (fig. 8E). The sixth leg (fig. 8F) carries 1 long terminal element, 3 plumose setae, and a short naked seta. All other appendages agree with the thorough description given by Pillai.

Dentigryps ulua Lewis, 1964

(Fig. 9A)

Material examined: 1 nonovigerous female taken from *Caranx ignobilis*, north-east of Heron Island, on 30 July, 1974.

Remarks: Lewis (1964) described this species from the external surface of "*Caranx melampygus?*" from Oahu, Hawaii. Since he provided a thorough description, it will not be repeated here. A dorsal view (fig. 9A) is provided. Some minor differences exist between the Hawaiian and Australian specimens. Lewis cited only 1 setule on the first segment of the sympod of leg 2; the Australian specimen has 2. Lewis also listed 4 naked spines on the exopod of leg 2; they are all membrane bound in the Australian specimen. These differences are attributed to geographic variation.

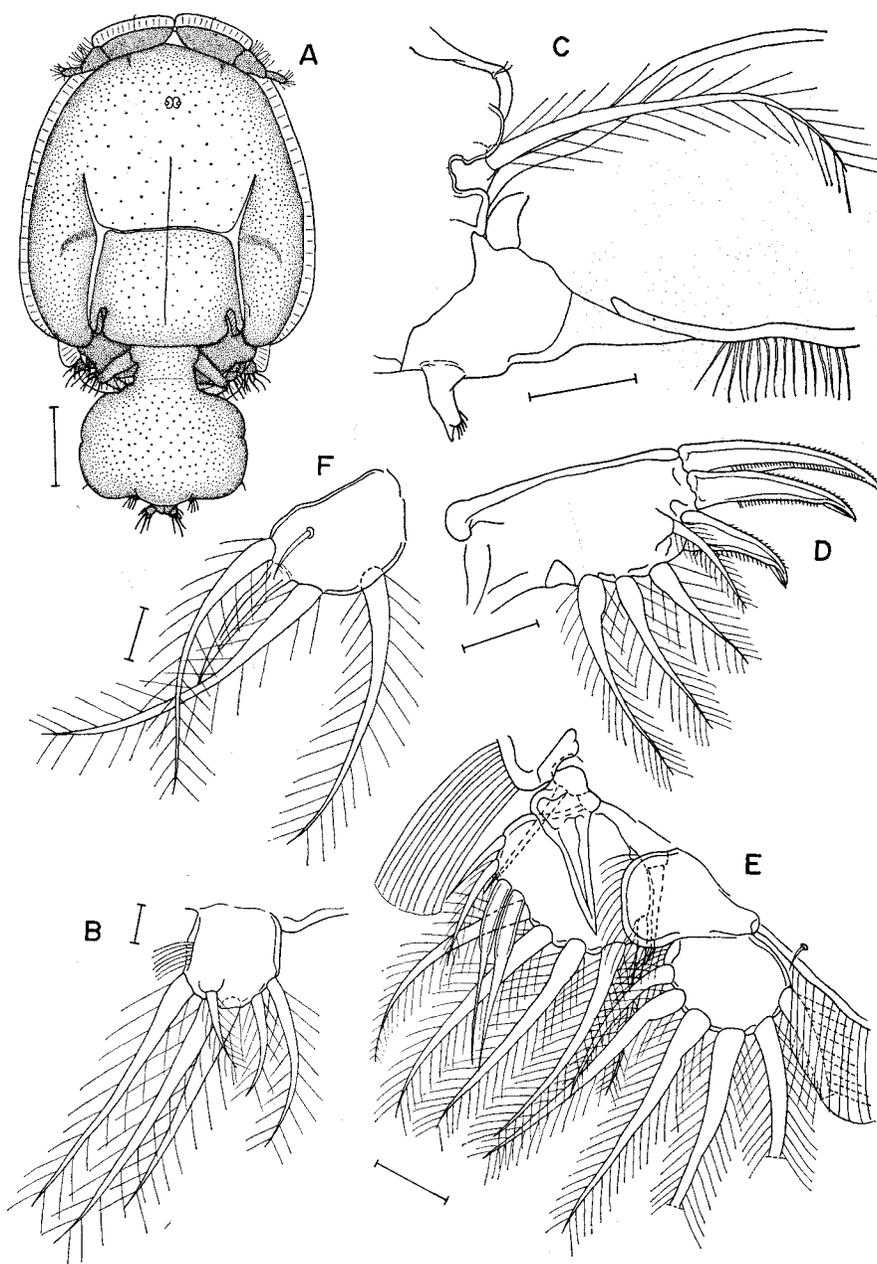


Fig. 8. *Lepeophtheirus anomalus* (Pillai), female. A. body, dorsal. B. caudal ramus, ventral. C. junction of sympod-exopod of first leg, ventral. D. terminal segment of first leg, ventral. E. third leg, ventral. F. sixth leg, ventral. Scale: 0.2 mm in A; 0.02 mm in B, C, D; 0.01 mm in E, F.

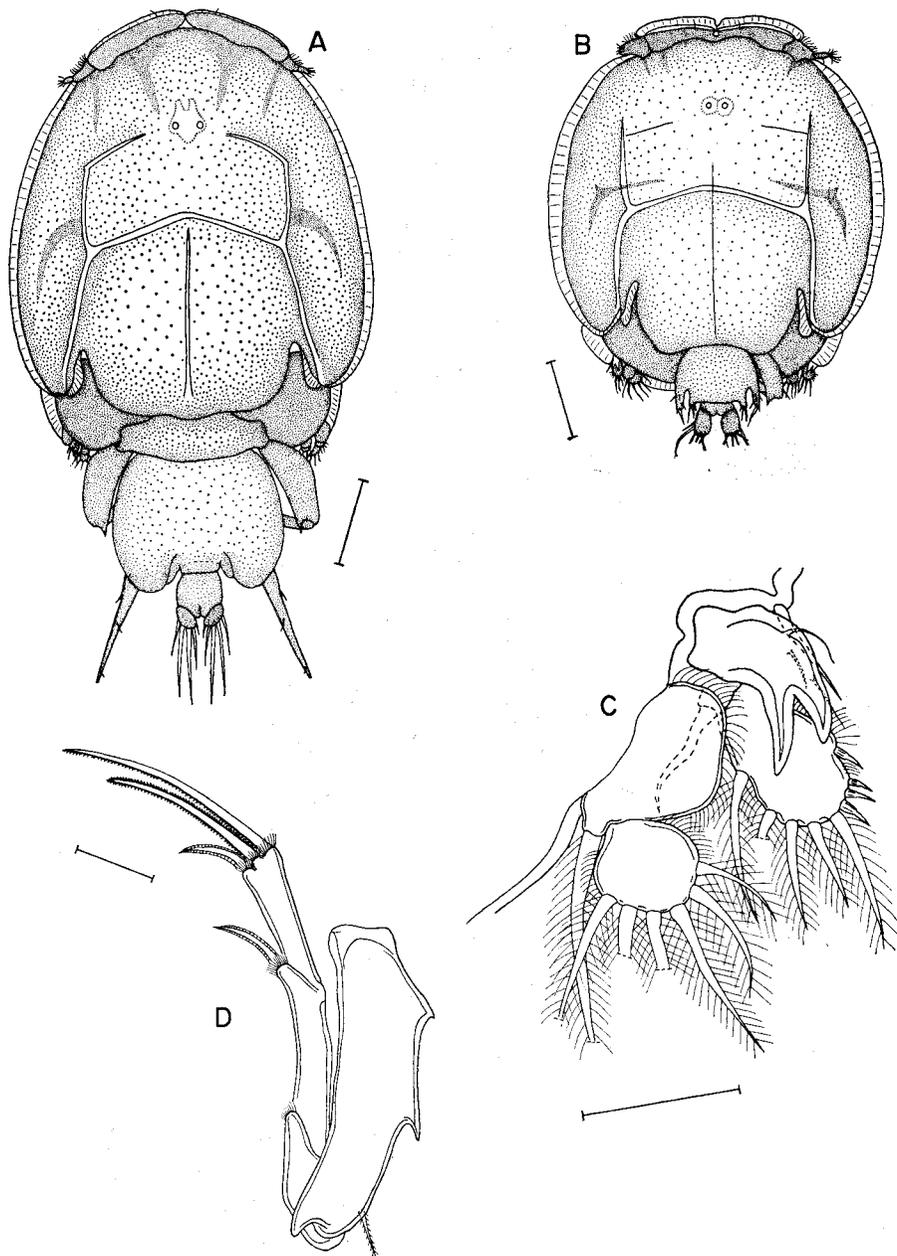


Fig. 9. *Dentigryps ulua* Lewis and *D. litus* Lewis. *D. ulua*: A. female, dorsal. *D. litus*: B. male, dorsal; C. third leg, ventral; D. fourth leg, ventral. Scale: 1 mm in A; 0.5 mm in B; 0.01 mm in C, D.

Dentigryps litus Lewis, 1964

(Figs. 9B-D)

Material examined: 1 male collected from *Plectropomus leopardus*, off Wistari Reef, on 1 May, 1974.

Remarks: Lewis (1964) described this species from *Plectropomus leopardus*, *Epinephelus fuscoguttatus*, *Aulostomus chinensis*, and *Balistoides viridescens*, collected from the Eniwetok Atoll. Kabata (1965) subsequently reported it from *Cromileptes altivelis* off Heron Island.

The present male specimen (fig. 9B) is somewhat larger than Kabata's Australian specimen, but falls within the ranges of measurement provided by Lewis with the exception of the genital segment width and abdominal length in which the present specimen is larger. The genital segment is affected by the state of maturity and the abdominal length of the present specimen includes the caudal laminae, which was excluded in Lewis' measurements. Some measurements of the Australian male specimen are given below (in mm):

	male
Total length (excluding marginal flange)	2.70
Carapace length	2.19
Carapace width	2.06
Genital segment length	.36
Genital segment width	.49
Abdomen length (including caudal laminae)	.25

Since both Lewis and Kabata provided excellent descriptions of *D. litus*, there is no need for a full description here. The present specimen (fig. 9B) is missing the terminal segment of the left first antenna, the left fourth leg, and the caudal setae which are partially broken off. Lewis reported *D. litus* as possessing no haired space between the proximalmost naked seta and the second on the last segment of the exopod of leg 3; however, the present specimen (fig. 9C) exhibits this characteristic. This structure is, therefore, very similar in appearance to *D. curtus* (Wilson, 1913). The exopod spine of the present specimen is not distinctly delimited from the basal swelling as figured by Lewis, thus giving the spine a bifid appearance. A diagnostic feature which Lewis failed to mention, although he did figure one, is the presence of two distally projected spine-like processes on the proximal segment of the fourth leg (fig. 9D).

Discussion of the Genera *Anuretes* and *Dentigryps*

Since the erection of the genus *Anuretes* by Heller (1865), much discussion of the taxonomic status of this genus has arisen (Heegaard, 1945; Shiino, 1954; and Pillai, 1966). The problem stems from the morphologic characters used to distinguish

Anuretes from *Lepeophtheirus*. The first of these features is that in *Anuretes* the free margin of the thoracic zone of the dorsal shield partially or completely covers the free fourth pedigerous segment. However, there are five species of *Anuretes* (*A. anomalus* Pillai, 1967; *A. furcatus* Capart, 1953; *A. heckeli* (Krøyer, 1863); *A. parvulus* Wilson, 1913; *A. perplexus* Bassett-Smith, 1898) which do not exhibit this characteristic. Apparently this morphologic character is not a good generic discriminant.

Shiino (1954) placed much emphasis on the segmentation of leg 4 in which *Anuretes* possesses 3 segments, while *Lepeophtheirus* bears 4. However, many species of *Lepeophtheirus* have been reported to have a 3-segmented leg 4, e.g. *L. bychowskyi* Gussev, 1951; *L. fallolunules* Lewis, 1967; *L. longispinosus* Wilson, 1908; *L. longiventralis* Yü and Wü, 1932; *L. natalensis* Kensley and Grindley, 1973; and *L. parvicurris* Fraser, 1920 among others.

The strongest emphasis has been placed on the great reduction or complete absence of the abdomen in *Anuretes*. The members of this genus exhibit a trend from completely absent (*A. brevis* Pearse, 1951 and *A. heckeli* (Krøyer, 1863)) to small but distinct abdomen (all other members). However, many species of *Lepeophtheirus* also have much reduced abdomens.

Anuretes exhibit other characteristics, such as a reduction of the first maxilla and the reduction or absence of the sternal furca. Although there are no species of *Lepeophtheirus* which lack the sternal furca, there are many that exhibit a reduction of the first maxilla to a single tine, e.g. *L. acutus* Heegaard, 1943; *L. clarionensis* Shiino, 1959; *L. curtus* Wilson, 1913; and *L. dissimulatus* Wilson, 1905 among others. It seems that the basis for which *Anuretes* is separated from *Lepeophtheirus* rests on rather unfirm grounds; therefore, *Anuretes* cannot be clearly delimited from *Lepeophtheirus*, except possibly *A. renalis*, *A. serratus*, and *A. brevis* which lack the sternal furca.

As suggested by Kabata (1965), the taxonomic value of the first maxilla, second maxilla, and the sternal furca must be reevaluated. Until this is done, the taxonomic status of *Anuretes* remains questionable. Therefore, we prefer to treat, at this time, the twelve species of caligids hitherto attributed to *Anuretes* as *Lepeophtheirus*.

The genus *Dentigryps*, as it was redefined by Lewis (1964), differs from *Lepeophtheirus* mainly in the "strongly projecting fifth leg" in the female. The strong development of this appendage approaches the degree seen in some members of Euryphoridae (*Alebion* and *Gloiopotes*). Since there are a few species of *Lepeophtheirus* possessing a pair of long fifth legs, Pillai (1966) questioned the validity of separating the species of *Dentigryps* from those of *Lepeophtheirus* and furthermore, Hewitt (1971) proposed to suppress the genus *Dentigryps* entirely.

Currently, there are about 110 species of caligids assigned to the genus *Lepeophtheirus* (including the species of *Anuretes*). Of these, only *L. lichiae* Barnard, 1948 and *L. spinifer* Kirtisinghe, 1937 are similar to the species of *Dentigryps* in having the fifth legs of the female as long as or longer than the genital complex, and projected posteriorly to or beyond the tip of the caudal ramus. Although the female of *L. goniüstii* Yamaguti, 1936; *L. hastatus* Shiino, 1950; and *L. plotosi* Barnard, 1948 have rather large fifth legs, they are not even one third the length of the genital complex.

Therefore, we suggest to retain the genus *Dentigryps* as redefined by Lewis (1964) and transfer to it *L. lichiae* and *L. spinifer*.

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