CYCLOPOID COPEPODS OF THE FAMILY CHONDRACANTHIDAE PARASITIC ON NEW ZEALAND MARINE FISHES

JU-SHEY HO

Department of Biology, California State University,
Long Beach, California 90840 U.S.A.

With Text-figures 1–10

Chondracanthidae is a family of highly transformed cyclopoid copepods that are found exclusively on marine demersal fish. Although a complete life history of this family of copepods is still unknown, it seems, judging from the available information of their larval development, that the parasites do not require an intermediate host. Both adult and larva are found in the oral-branchial cavity of the fish, attaching to the host tissue by their powerful, hook-like second antenna. Although a few species are known to live in the nasal cavity, they have not been found on the body surface or fins of the fish. The male is characteristically dwarf and attaches to the genital area of the female throughout its life. In many species, the transformed female has a pair of small processes on the posteroventral surface of the trunk just in front of the genital segment. The pigmy male holds on to one of these two processes by its transformed hook-like second antennae.

Our information on the chondracanthid copepods of New Zealand is particularly scanty. In 1889, George M. Thomson described three species of *Chondracanthus* and that is all we know of the chondracanthids from New Zealand. In 1970, while I was making a study on the chondracanthid copepods deposited in the South African Museum in Cape Town, South Africa, one species, *Chondracanthus colligens* Barnard, from *Genypterus capensis* (Smith), was suspected to be conspecific with one of the three New Zealand *Chondracanthus*, *C. genypteri*. Since the original description by Thomson contains no information on the fine structures of the appendages, a reexamination of the type-specimens was felt necessary. Dr. Gordon C. Hewitt at the Victoria University of Wellington, New Zealand has kindly responded to my request and made arrangement for sending to me Thomson's type material together with his collections of chondracanthid copepods.

The eighteen vials of copepods received from Dr. Gordon contained, in addition to Thomson's three species, one new species and three other species hitherto only known from Japan and U.S.A. I would like to take this opportunity to thank Dr. Hewitt for making available to me these interesting chondracanthid specimens of New Zealand. All specimens were returned to him to be deposited in the Dominion Museum, Wellington, New Zealand.

Publ. Seto Mar. Biol. Lab., XXII (5), 303–319, 1975. (Article 21)

Acanthochondria incisa Shiino, 1955

(Fig. 1)

Material examined: Four females, each carrying a male, attached to roof of mouth and gill rakers of *Helioclennus percoides*, caught by J. Collins off Pt. Haswell. One female carrying a male found on *Ruboralga cardinalis*, taken from Wellington Harbour on 2 April, 1961.

Remarks: Since this species has been excellently described by Shiino (1955), a detailed description based on the New Zealand materials seems unnecessary. However, there are some minor variations that need to be mentioned. The head (figs. 1A, B), measuring 1.55 × 1.04 mm, is proportionately longer than in the Japanese

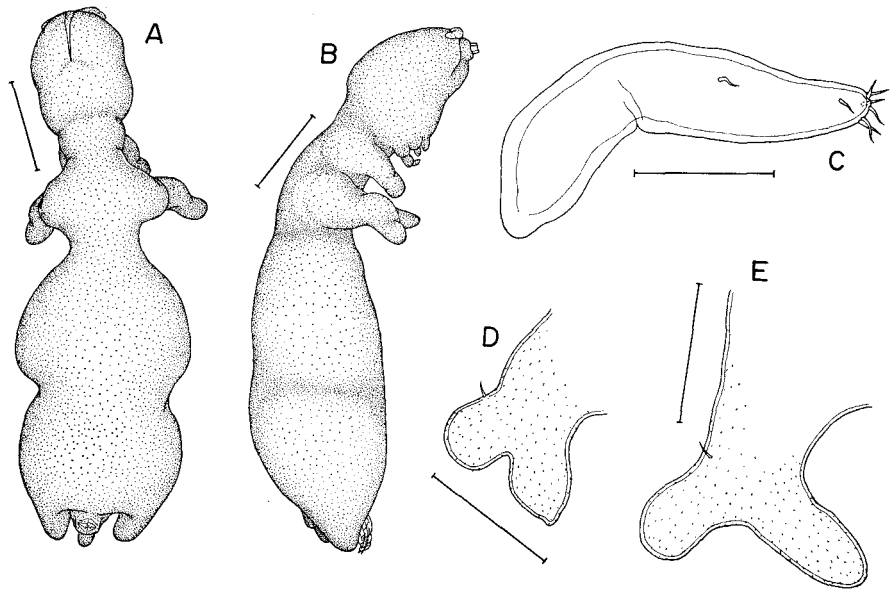

Fig. 1. *Acanthochondria incisa* Shiino, female. A. body, dorsal. B. same, lateral. C. first antenna. D. leg 1. E. leg 2. Scale: 1 mm in A, B; 0.5 mm in C, D, E.

specimens (1.25 × 1.08 mm). The first antenna (fig. 1C) is small and filiform. The two pairs of modified legs (figs. 1D, E) are covered with very fine spinules. There are 26 teeth on the convex side and 28 teeth on the concave side of the mandible. The terminal process of second maxilla is armed with a row of 15 teeth.

It should be pointed out that the New Zealand specimens also bear a great deal of resemblance to *Acanthochondria constricta* Shiino, 1955, in the general body form and details of the appendages. It seems that the specimens described as *A. constricta* is perhaps an extended (as opposed to contracted) specimens of *A. incisa*. These two species were described by Shiino (1955) in the same article, with *A. incisa* appeared before *A. constricta*. However, in spite of their apparent closeness, Shiino failed to make any comparison of the two species in his "Remarks" to *A. constricta*. Both

species were collected from Owase, Mie-ken, Japan, with *A. incisa* on *Helioclennus dactylopterus* and *A. constricta* on *Doederleinia berycoides*. The different host preference, if exists, is perhaps the only difference between these two copepods.

Chondracanthus distortus Wilson, 1922

(Fig. 2)

Material examined: Four females, each carrying a male, on *Cottus novaezealandiae*, from "Manter's Coll. 186a". Ten females, each carrying a male, from mouth and gills of "John Dory", caught by J. Mokoy in Northwest Bay on 14 January, 1969.

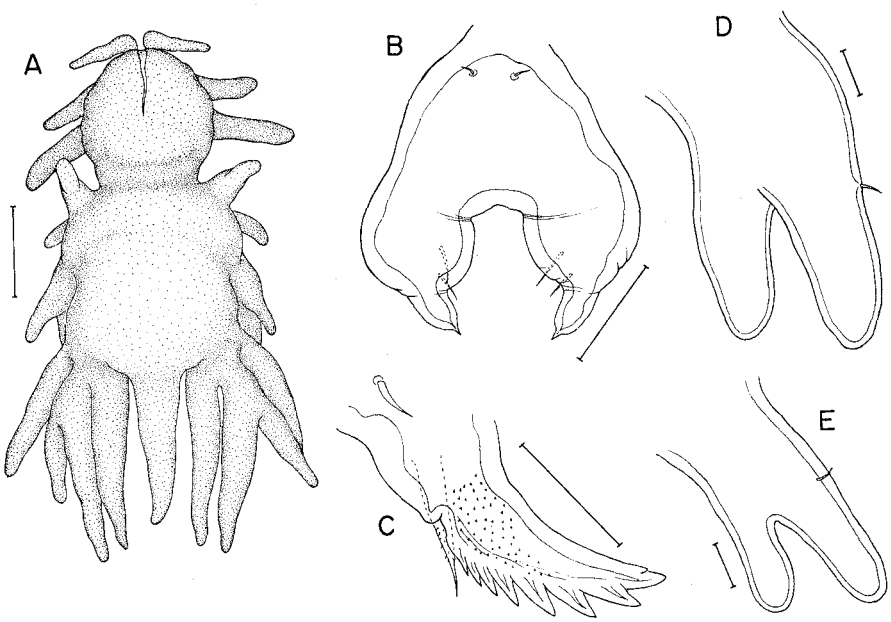

Fig. 2. *Chondracanthus distortus* Wilson, female. A. body, dorsal. B. abdomen and caudal rami, dorsal. C. terminal process of second maxilla. D. leg 1. E. leg 2. Scale: 1 mm in A; 0.1 mm in B, D. E; 0.05 mm in C.

Remarks: Since this species was fairly well described by Wilson (1922) and excellently redescribed by Shiino (1955), no detailed description of New Zealand specimens was attempted.

Like the present species, there are several species of *Chondracanthus* that are characteristic in bearing elaborate body processes, yet, *C. distortus* is distinguished from all of these in lacking any processes along the mid-dorsal part of the trunk (fig. 2A). Some other characteristic features of this species are: the structure of abdomen and caudal rami (fig. 2B), the presence of a patch of denticles on the terminal process of second maxilla (fig. 2C), and having leg 1 (fig. 2D) larger than leg 2 (fig. 2E).

Chondracanthus genypteri Thomson, 1889

(Figs. 3–4)

Material examined: Fifteen females, with eleven of them carrying a male, on "ling" caught off Cape Terakeral on 31 January, 1961. Two females on gill of "ling" caught at Oaro on 26 December, 1963. Six females, each carrying a male, collected by J. Ardley from Waitangs, Chathan Island in 1946. One female carrying

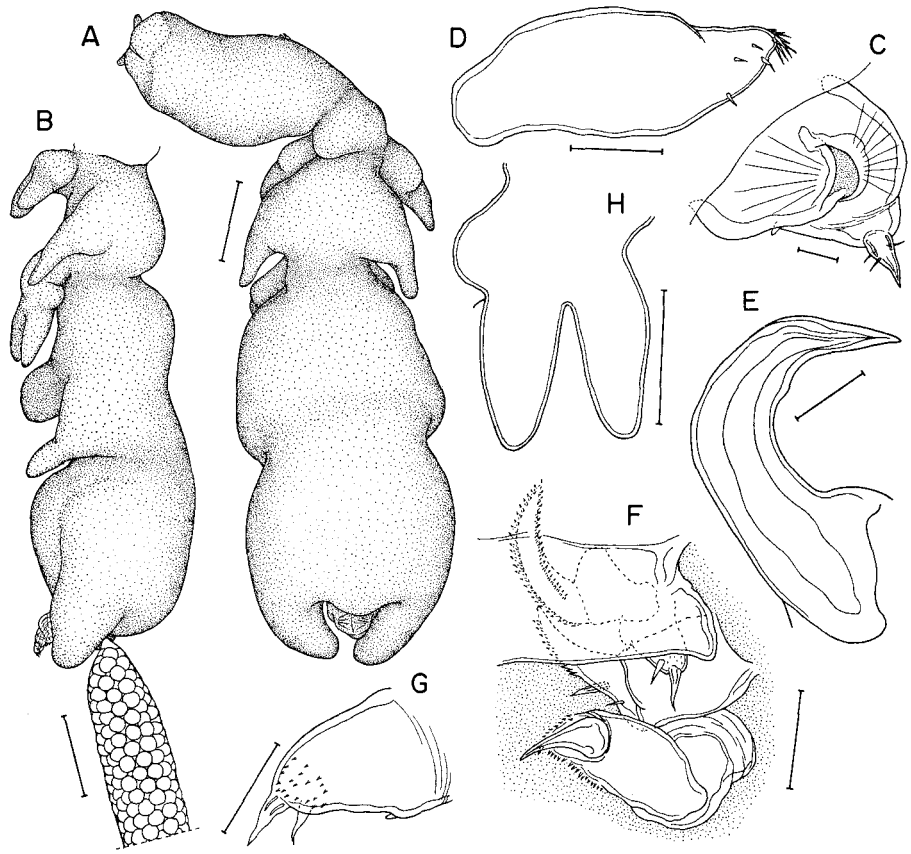

Fig. 3. *Chondracanthus genypteri* Thomson, female. A. body, dorsal. B. trunk, lateral. C. genito-abdomen. lateral. D. first antenna. E. second antenna. F. mouth parts. G. first maxilla. H. leg 1. Scale: 1 mm in A, B; 0.1 mm in C, D, E, F; 0.05 mm in G; 0.5 mm in H.

a male found on gill of *Genypterus blacodes*, from Nagahuranga, Wellington on 5 July, 1953. One female from inside operculum of *G. blacodes* caught at Nagahuranga, Wellington on 5 July, 1953.

Female: The body (figs. 3A, B) is long. The head is distinctively longer than wide, with the mouth parts placed at a distance from the antennal region. The first pedigerous somite is the smallest of all the body regions and bears no process. The second pedigerous somite carries a pair of postero-lateral processes. The trunk

bears a pair of lateral processes in its middle portion (fig. 3B), a small ventral protrusion in the anterior half, a large ventral swelling in the posterior half, and a pair of blunt posterior processes. The genital segment (fig. 3C) carries a pair of small elements on the midventral surface. The abdomen (fig. 3C) is much smaller than the genital segment. The caudal ramus (fig. 3C) is modified into a spiniform process carrying three setae. The egg sac is shorter than the body, containing many rows of eggs.

The first antenna is remarkably small (see fig. 3A), with setae arranged in a usual form of 2–2–8 in the terminal portion (fig. 3D). The second antenna (fig. 3E) is a single recurved hook. The labrum (fig. 3F) has smooth posterior margin. The mandible bears a row of 30–32 teeth on the convex side and another row of 27–31 teeth on the concave side. The paragnath is a small, fleshy lobe bearing spinules. The first maxilla (fig. 3G) is armed with three unequal elements and a patch of spinules. The second maxilla (fig. 3F) has a row of 17–19 teeth and two

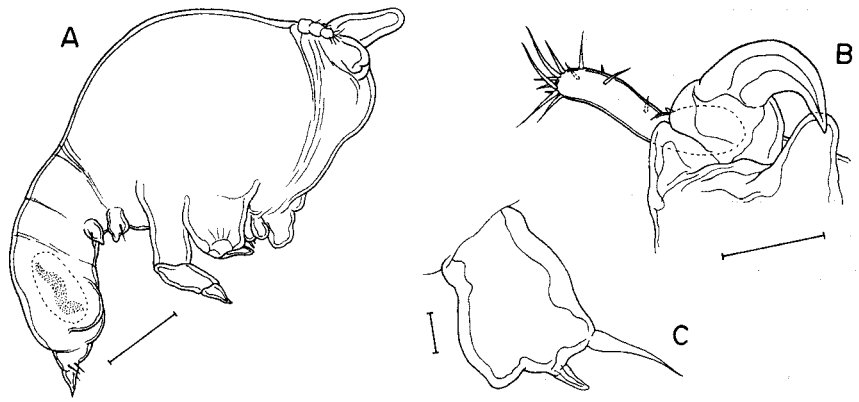

Fig. 4. *Chondracanthus genypteri* Thomson, male. A. body, lateral. B. first and second antennae. C. leg 2. Scale: 0.1 mm in A; 0.05 mm in B; 0.01 mm in C.

unequal elements on the distal segment. The maxilliped (fig. 3F) is 3-segmented; the first segment is unarmed but the second segment bears two patches of spinules and the terminal claw carries a hooklet on its inner side. Leg 1 (fig. 3H) has a prominent protrusion on the outer surface of the protopod just dorsal to the outer seta. The two rami are about equally developed. Leg 2 is similar to leg 1 and about same size.

Measurements: Body, 5.13–8.27 mm; head, 2.26×1.32 mm; genital segment, 386×498 μm; abdomen, 103×169 μm; longest egg sac 5.59 mm; and egg, 208 μm.

Male: The body (fig. 4A) measures 766×315 μm, with a greatly swollen cephalothorax. A pair of developing spermatophores are seen inside the genital segment after the specimen was cleared in lactic acid. Metamerism on the body is rather distinct. The genital segment has a pair of ventral ridges. The abdomen is extremely short and the caudal ramus is as in the female. The first antenna (fig. 4B) is filiform, bearing the usual armature of 1–1–2–2–8. The second antenna (fig. 4B) is a robust, recurved hook. There is a protrusion on the head located

between the bases of the two second antennae (fig. 4B). The labrum has smooth posterior margin as in the female. The mandible bears a row of 23 teeth on the convex side and another row of 14 teeth on the concave side. The first maxilla is as in the female but the second maxilla is different in having only two teeth on the terminal process. The maxilliped shows no sexual dimorphism. Leg 1 (fig. 4C) is slightly larger than leg 2. Both legs have a stout outer seta and two simple rami.

Remarks: As it was pointed out before by Ho (1972), *C. genypteri* is most closely related to *C. colligens* Barnard, which is known from South Africa on *Genypterus capensis*. The most remarkable similarity of these two species is in their long head, with the antennal region and mouth parts separated wide apart. This unique characteristic, along with the lack of cephalic process and the presence of two pairs of lateral processes on the trunk, makes these two species of copepods even more closely related. However, the South African species can be easily distinguished from the New Zealand species by the possession of a long ventral process on the third pedigerous somite (anterior half of the trunk).

Chondracanthus lotellae Thomson, 1889

(Figs. 5–6)

Material examined: Four females, each carrying a male, from buccal and gill cavities of "red cod", caught off Oaro on 1 January, 1964. Two females, each carrying a male, on gills of "red cod", caught off Sandy Bay on 2 August, 1966. Two females each carrying a male, on gills of "red cod", caught off Port Ligar, Pelorus Sound on 3 August, 1966. Two females, each carrying a male, on gills of "red Cod", from George M. Thomson's collection in Otago Museum. Two ovigerous females, each carrying a male, on gills of *Physiculus bacchus*, donated by George M. Thomson to United States National Museum, Washington, D.C.

Female: The body (figs. 5A, B) bears several large, blunt processes. The head is distinctly wider than long and protrudes out as a small process at each posterolateral corner (fig. 5A). The first pedigerous somite forms the neck region and bears a large dorsal lobe, which is slightly bilobate in some specimens. The second, third, and fourth pedigerous somites are fused to form the trunk and each carries a large dorsal process along its middorsal line. The lateral process on the second pedigerous somite is characteristically bilobated, but that of the third pedigerous somite is simple. The fourth pedigerous segment produces posteriorly into a pair of large, blunt processes. There is no process or protrusion on the ventral surface of the trunk. The genital segment (fig. 5C) has the egg sac attachment area situated dorsolaterally and carries a pair of small hyaline setae at midventral region. The lobate abdomen (fig. 5C) carries a pair of caudal rami, which is a spiniform process bearing three setae at the base. A fully grown egg sac is more than twice as long as the body and contains several rows of small eggs.

The first antenna (fig. 5D) is a fleshy, lobate structure distinctly divisible into

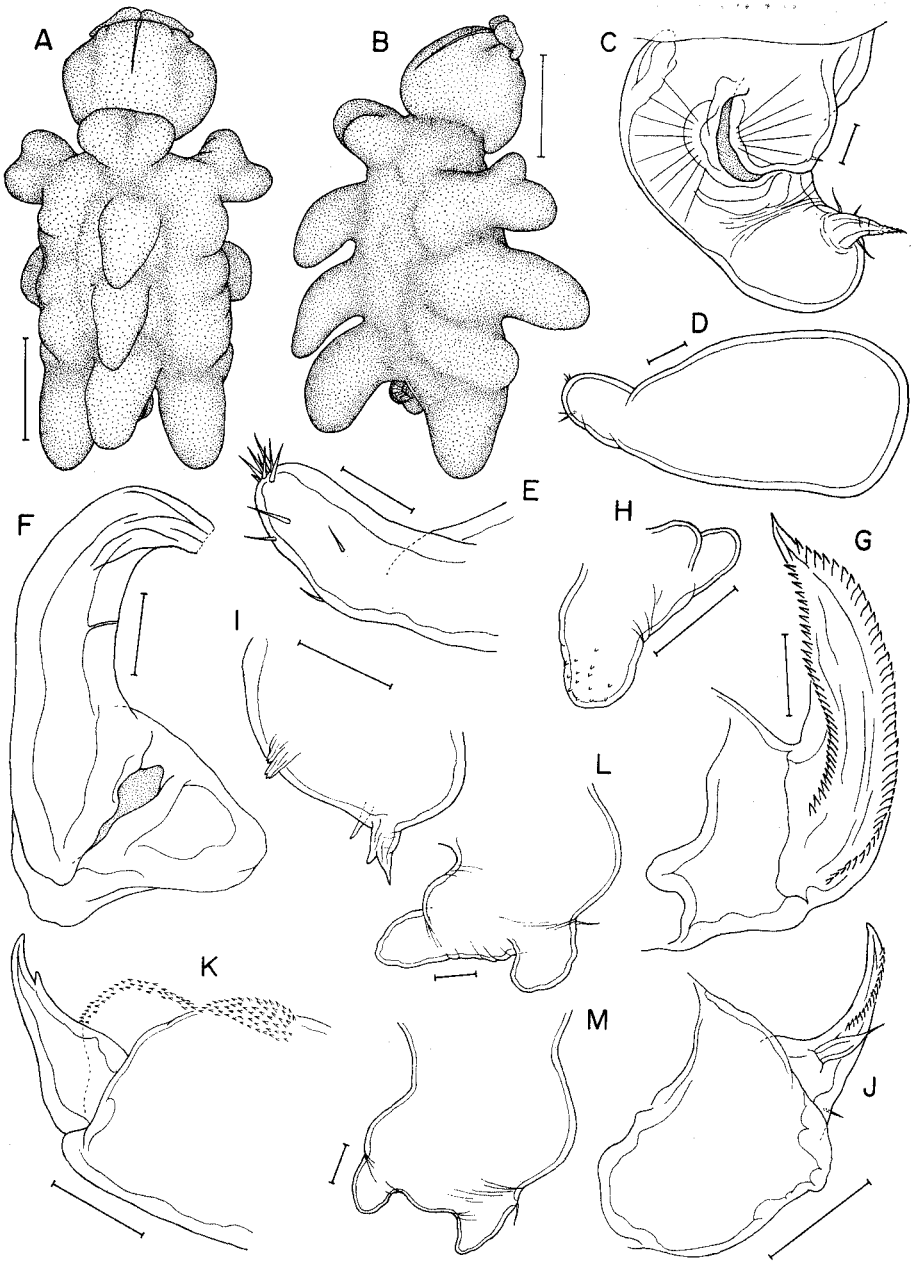

Fig. 5. *Chondracanthus lotellae* Thomson, female. A. body, dorsal. B. same, lateral. C. genito-abdomen, lateral. D. first antenna. E. tip of first antenna. F. second antenna. G. mandible. H. paragnath. I. first maxilla. J. second maxilla. K. tip of maxilliped. L. leg 1. M. leg 2. Scale: 1 mm in A, B; 0.1 mm in C, D, E, F, J, L, M; 0.05 mm in G, H, I, K.

a large, broad base and a small, cylindrical terminal. The former part is naked but the later part (fig. 5E) is armed with three groups of setae in 2–2–8. The second antenna (fig. 5F) is a simple recurved hook without setae. The labrum has smooth posterior surface without any ornaments. The mandible (fig. 5G) bears a row of 40–42 teeth on the convex side and another row of 25–34 teeth on the concave side. Two additional teeth were seen on the four dissected mandibles on the ventral surface close to the concave side. The paragnath (fig. 5H) is trilobate, but spinules are seen only on the largest distal lobe. The first maxilla is a fleshy lobe bearing three different elements as shown in fig. 5I. The second maxilla (fig. 5J) bears, in addition to two unequal setae, a row of 14–16 teeth on the terminal process. The

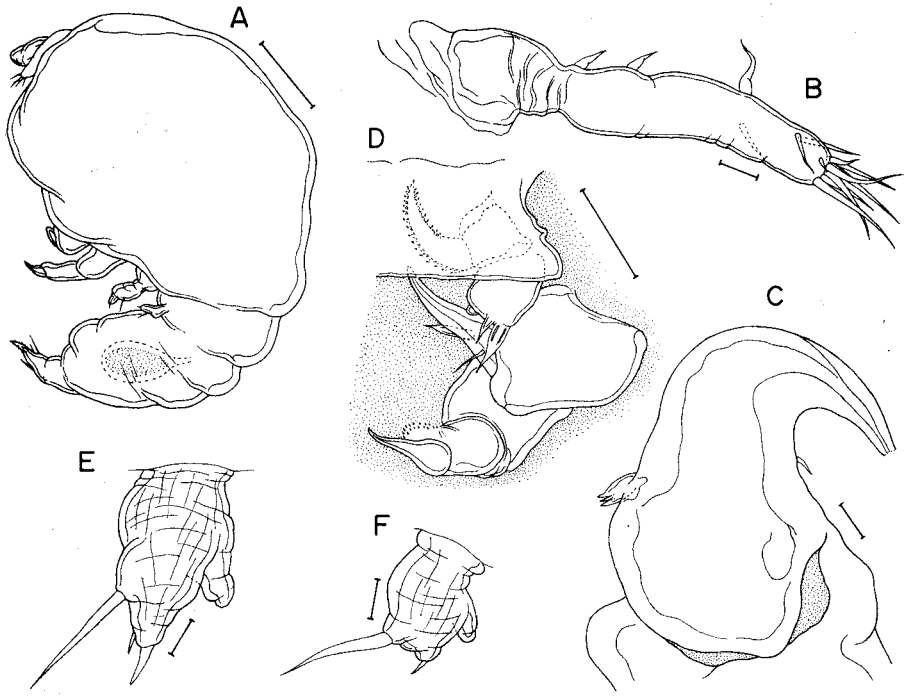

Fig. 6. *Chondracanthus lotellae* Thomson, male. A. body, lateral. B. first antenna. C. second antenna. D. mouth parts. E. leg 1. F. leg 2. Scale: 0.1 mm in A; 0.01 mm in B, C, E, F; 0.05 mm in D.

maxilliped is 3–segmented, the armature on the second and third segments (fig. 5K) is typical of the chondracanthid. Both leg 1 (fig. 5L) and leg 2 (fig. 5M) are small, with bulbous protopod and small rami. A minute outer seta is present on the outer-distal surface of the protopod, which has a distinct outer bulge.

Measurements: Body 4.05–6.15 mm; head 1.22×1.51 mm; genital segment $517 \times 714\ \mu$m; abdomen $282 \times 347\ \mu$m; longest egg sac 14.25 mm; and egg, $163\ \mu$m.

Male: The body (fig. 6A) measures $782 \times 376\ \mu$m. The globose cephalothorax includes the first pedigerous somite. The second, third, and fourth pedigerous somites are rather distinct. The genital segment is identified with a pair of ventral ridges.

The abdomen is very short, bearing a pair of small setule on the dorsal surface. The caudal ramus is similar to the female. The first antenna (fig. 6B) is cylindrical and elongate, with the usual armature of 1–1–2–2–8. The second antenna (fig. 6C) has an accessory antennule tipped with three elements, the inner surface of the terminal hook also bears a simple seta. The labrum (fig. 6D) has smooth posterior margin. The mandible bears a row of 10 teeth on the concave surface and another row of 21 teeth on the convex surface. The additional two teeth found on the female mandible is also present. The first maxilla (fig. 6D) is different from female in having simple rather than bifid elements. The second maxilla (fig. 6D) shows the usual sexual dimorphism in lacking a row of teeth on the terminal process. The maxilliped is as in the female. Leg 1 (fig. 6E) is larger than leg 2 (fig. F) and differs from it in having two elements on exopod.

Remarks: In the summer of 1967, while making a revisional study of the chondracanthid copepods in the Smithsonian Institution, Washington, D. C., I found two vials of copepods labelled as "*Chondracanthus lotellae* Thomson". One of them (USNM 60510) contained specimens that were presented to the museum by George M. Thomson from New Zealand. It is very likely that these specimens were part of the material from which the original description of *C. lotellae* was made. The other vial (USNM 59781) contained 27 specimens that were collected at Point Mulgram on the west coast of Alaska from the "gills of *Cottus polyacanthocephalus*". They were reported by Wilson (1935) under a different species name, "*Chondracanthodes lotellae* (Thomson)", and the host name was changed to "*Myoxocephalus acanthocephalus*". A closer examination of these Alaskan specimens had revealed that they are actually *Chondracanthus irregularis*, which has been reported several times from the cold-temperate waters of North Pacific (Fraser, 1920; Gusev, 1951; Markevich, 1956; Kabata & Gusev, 1966; and Kabata, 1968).

In regard to the number and disposition of the body processes, the present species resembles most the two North Pacific species: *Chondracanthus pinguis* Wilson, 1912 and *C. polymixiae* Yamaguti, 1939. The former is known from both North America and Japan but the latter is only known from Japan. Although Kabata (1968) has expressed doubt on the validity of *C. polymixiae* and suggested its reexamination, but based on Yamaguti's (1939) original description, it is different from *C. pinguis* in lacking an accessory antennule on the male second antenna.

C. lotellae can be easily distinguished from *C. pinguis* by the inconspicuous posterolateral knob on the head and the shape of both legs 1 and 2 in the female. It can also be easily separated from *C. polymixiae* in having large, long dorsal processes on the female trunk and an accessory antennule on the male second antenna.

Chondracanthodes radiatus (Müller, 1776)

(Fig. 7)

Material examined: One female from inner side of operculum of a *Macrurus*

carinatus caught at 45°16'S 171°49'E (Sta. E414 of New Zealand Oceanographic Institute), 999 m deep and on 11 October, 1965.

Remarks: The only known specimen (figs. 7A–C) is unfortunately broken into head and trunk at the neck region. Due to the scarcity of the specimen, no attempt was made to dissect and study the fine structure of the appendages.

This species is so far only known to occur on the macrurids from the North Atlantic (Müller, 1776; Krøyer, 1863; Stephens, 1913; Wilson, 1920; Hansen, 1923; and Ho, 1971). The present record lends a support to Ho's (1975) recent finding that copepod parasites of deep-sea fishes have extremely wide geographical distribution.

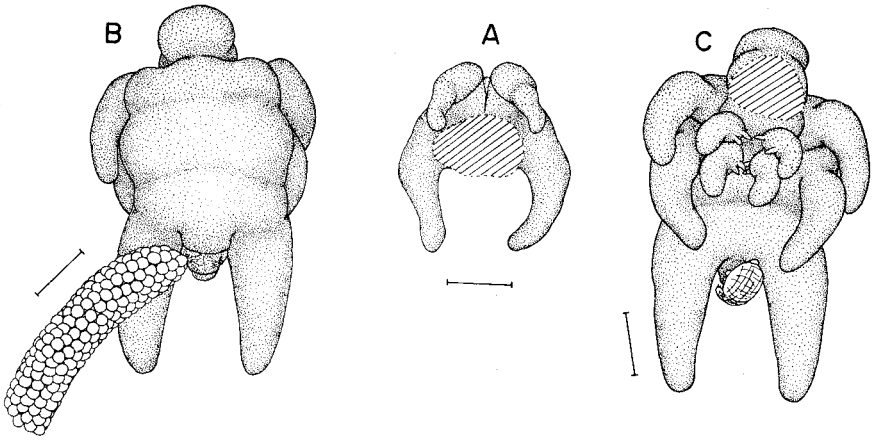

Fig. 7. *Chondracanthodes radiatus* (Müller), female. A. head, dorsal. B. trunk, dorsal. C. same, ventral. Scale: 1 mm in all.

Prochondracanthus platycephali n. sp.

(Figs. 8–9)

Material examined: Eleven females, each carrying a male, from "aligator flathead (*Platycephalus*)" caught off Castle Point in 1965. Most of the specimens in the vial are distorted.

Female: The body (fig. 8A) has a distinct, but small head and a large, voluminous trunk. The head consists of the cephalosome and the first pedigerous segment. The lateral surface of the oral area is expanded outward and posteriorly to form a blunt lobe and on its posterior base the first pair of legs are found. The neck region is distinct, it is formed by the constricted inter-segmental part between the first and the second pedigerous somite. The second, third, and fourth pedigerous somites are completely fused and transformed into a large, sac-like trunk with two prominent lateral constrictions. The genital segment (fig. 8B) is clearly separated from the abdomen which carries a pair of unmodified caudal ramus on its posterior surface. The caudal ramus (fig. 8B) carries 6 elements, with the largest terminal one about

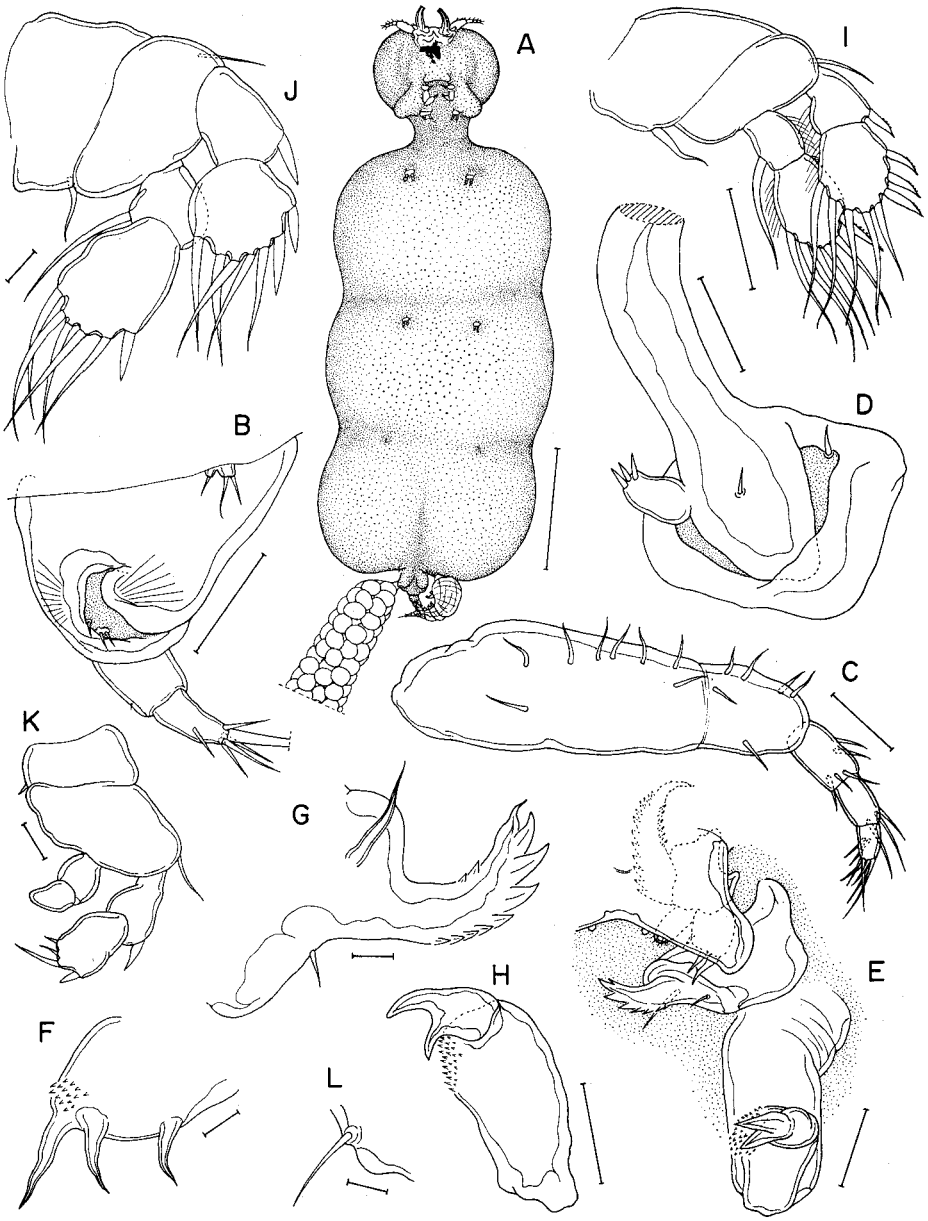

Fig. 8. *Prochondracanthus platycephali* n. sp., female. A. body, ventral. B. genito-abdomen, lateral. C. first antenna. D. second antenna. E. mouth parts. F. first maxilla. G. terminal process of second maxilla. H. terminal parts of maxilliped. I. leg 1. J. leg 2. K. leg 3. L. leg 4. Scale: 1 mm in A, B; 0.05 mm in C, D, E, H, I; 0.01 mm in F, G, J, K, L.

three times as long as the ramus. The egg sac is longer than the body, containing several rows of eggs.

The first antenna (fig. 8C) is cylindrical and clearly 5–segmented; the armature is 8, 6, 5, 3, and 8. One of the 8 elements on the last segment is an aesthete, which share a common stem with the longest terminal seta. The second antenna (fig. 8D) is 2–segmented; the basal, broad segment carries a seta and the terminal, recurved hook carries a small seta and an accessory antennule tipped with three elements. The labrum (fig. 8E) has its concave posterior surface bearing two small knobs in the center. The mandible (fig. 8E) bears a row of 6 teeth on the concave side and another row of 12 teeth on the convex side. The paragnath (fig. 8E) is a simple lobe tipped with few spinules. The first maxilla (fig. 8F) bears three simple setae and a patch of spinules. The second maxilla (fig. 8G) has its terminal segment armed with 2 unequal setae at the proximal portion and a row of 8 teeth on the posterior surface and another row of 2 teeth on the anterior surface of the distal process. The maxilliped (fig. 8E) is 3–segmented; the first segment is the largest but unarmed; the second segment is armed with a patch of spinules on its disto-inner surface; and the terminal segment (fig. 8H) is a forked claw bearing one hooklet. It seems the hooklet-bearing spine is the major claw and the other one is an auxiliary claw developed from the basal part of the terminal segment. The first three pairs of legs (figs. 8I, J, K) are biramous with 2–segmented rami. The formulae on these legs are as follows (Roman numerals indicates spines and Arabic numerals, setae):

Leg 1	coxa 0–1 basis 1–0	exp I–0; III, I, 4
		enp 0–1; I, 5
Leg 2	coxa 0–1 basis 1–0	exp I–0; II, 5
		enp 0–1; I, 5
Leg 3	coxa 0–1 basis 1–0	exp I–0: I, 3
		enp 0–0; 0

Leg 4 (fig. 8L) is extremely reduced, simply represented by a simple seta. Leg 5 is located at the posteroventral surface of the trunk just in front of the genital segment. It is represented by a bipartite lobe tipped with 3 setae. Leg 6 is probably represented by the 3 setae in the lateral pit on the genital segment (fig. 8B) to where the egg sac is also attached.

Measurements: Body 4.84×1.69 mm; head 827×951 μm; genital segment 235×248 μm; abdomen 282×347 μm; caudal ramus 57×33 μm; egg sacs 6.88 and 6.76 mm; and egg 164 μm.

Male: The body (fig. 9A) is a typical cyclopiform and measures 752×263 μm. The first pedigerous segment is incorporated into the cephalothorax. The urosome (fig. 9B) is about half the length of the prosome. The genital segment is much wider than long, with usual posteroventral flaps carrying leg 6. The abdomen is clearly 2–segmented. The caudal ramus (fig. 9B) is as in the female. The first antenna shows no sexual dimorphism. The second antenna (fig. C) is different from females in having 2 setae and a much larger accessory antennule tipped with 5 elements. The mouth parts are similar to the female, except certain dimorphism

found in the armature of the mandible and the second maxilla. The mandible, while having same number of teeth on the concave side as in the female, bears a row of 15 teeth on the convex side. The second maxilla (fig. 9D) has only 4 teeth on the posterior surface of the terminal process. The first two pairs of legs are similar to the female, but the third pair (fig. 9E) is different in having unimerous rami and a formula of coxa 0–0, basis 1–0, exp II–5, and enp 1. Legs 4, 5, and 6 (fig. 9B) are similar to the female.

Remarks: According to Ho (1970), *Prochondracanthus* is a monotypic genus, with its only known species, *P. haliichthydis* Yamaguti, 1939 occurring on the gill of *Hoplichthys gilberti* Jordan & Richardson in the North Pacific off the coast of Japan. The present new species, thus, becomes the second species of the genus. Some of the

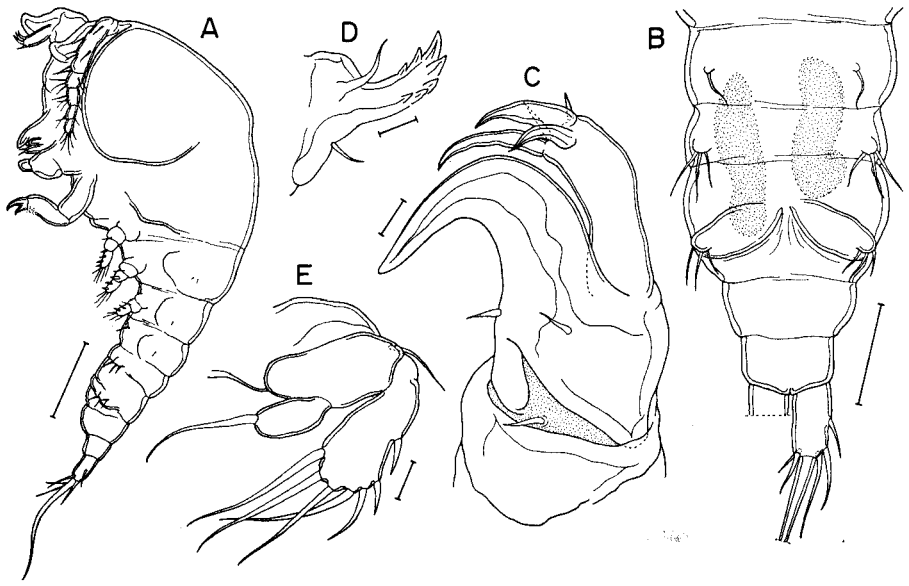

Fig. 9. *Prochondracanthus platycephali* n. sp., male. A. body, lateral. B. urosome, ventral. C. second antenna. D. terminal process of second maxilla. E. leg 3. Scale: 0.1 mm in A; 0.05 mm in B; 0.01 mm in C, D, E.

most convincing features that attribute the New Zealand specimens to the genus *Prochondracanthus* are the presence of (1) an unmodified, 5–segmented first antenna, (2) an accessory antennule on the second antenna, (3) a bifurcate terminal claw on the maxilliped, (4) three pairs of rather unmodified, biramous legs, (5) a pair of unmodified caudal ramus, and (6) absence of any processes on the trunk. The host of the New Zealand specimens (Platycephalidae) is also closely related to the host of Japanese specimen, Hoplichthidae.

The present species can be separated from the type-species in having a proportionately smaller head and a bimerous third leg without armature on the endopod. The male is not known in the type-species, hence, the present report of the male of *P. platycephali* contributes certain important information to our understanding of

this interesting genus. *Prochondracanthus* is the only genus of chondracanthid where both male and female have six pairs of similar types of legs. We know that the sexual dimorphism expressed in the number of mandibular teeth is typical in the chondracanthid copepods and the rule is: the female mandible bears more teeth. However, the male of *P. platycephali* is quite unique in that its mandible has the same number of teeth on the concave side with the female but more teeth on the convex side than in the female.

Pseudochondracanthus chilomycteri (Thomson, 1889)

(Fig. 10)

Material examined: One female from the gill of porcupine fish collected by G. C. Hewitt at Kapiti Island on 3 February, 1967. Eleven females and a juvenile, with four of them carrying a male, from the mouth of porcupine fish collected by A. Hamilton.

Female: The body (fig. 10A, B) is relatively short and stout. The head consists of only the cephalosome bearing two pairs of ventrolateral processes. The first pedigerous somite forms the neck region and the remaining pedigerous somites are fused into a squarish trunk, which bears two small knobs on each lateral surface and a pair of short, blunt posterior processes. The genital segment (fig. 10C) is much wider than long, with a large attachment area of egg sac on each side of the segment. The abdomen (fig. 10C) is extremely short and indistinguishable fused with the caudal rami, which is a broad, lobate structure tipped with a spine. There are a pair of setae on both dorsal and ventral surface of this abdomen-caudal rami complex. The egg sac (fig. 10B) is small, sausage-shaped, and contains several rows of eggs.

The first antenna (fig. 10D) is fleshy, with a greatly enlarged base. The appendage is armed with only 4 setae at the tip of the terminal, small, cylindrical part. The second antenna (fig. 10E) is a 2–segmented, hook-like structure carrying a seta on the basal segment. The labrum (fig. 10F) has a smooth psterior surface. The mandible (fig. 10G) bears on its terminal falcate segment a row of nearly 200 teeth on the concave side and another row of more than 200 teeth on the convex side. The first maxilla (fig. 10F) is a simple lobe tipped with two unequal elements. The second maxilla (fig. 10H) is 2–segmented; the basal segment is large, subrectangular, and unarmed; the terminal segment protrudes out into a falcate process carrying one small seta, a large spine bearing spinules, and a row of numerous small teeth on both anterior and posterior surfaces. The maxilliped (fig. 10F, I) is 3–segmented; the basal segment is the largest but unarmed; the middle segment has on its inner surface a large bulge bearing spinules; and the terminal segment is represented by a claw carrying a hooklet on its inner surface. Only leg 1 (fig. 10J) is present, it is a fleshy, bilobate process carrying a seta on the outer surface.

Measurements: Body 5.76×2.39 mm; head 1.76×1.34 mm; genital segment 395×621 μm; abdomen 122×263 μm; egg sacs 2.35 and 3.16 mm; egg 191 μm.

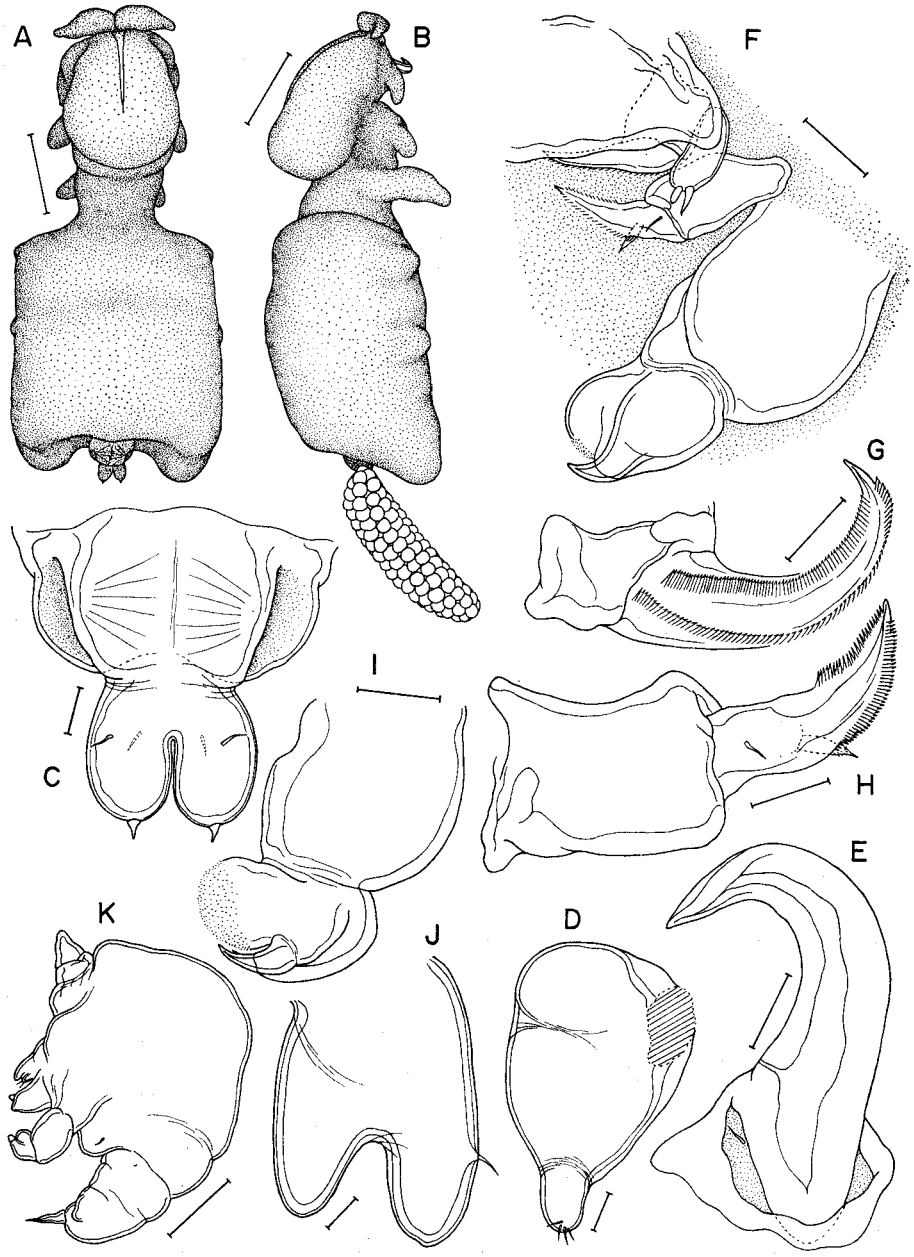

Fig. 10. *Pseudochondracanthus chilomycteri* (Thomson). Female. A. body, dorsal. B. same, lateral. C. genito-abdomen, dorsal. D. first antenna. E. second antenna. F. mouth parts. G. mandible. H. second maxilla. I. maxilliped. J. leg 1. Male. K. body, lateral. Scale: 1 mm in A, B; 0.1 mm in D, E, F, I, J, K; 0.05 mm in G, H.

Male: The body (fig. 10K), measuring 526×211 μm, has a large cephalothorax and a small metasome and urosome complex. The caudal ramus is a simple, unarmed process. The first antenna is lacking. The second antenna and oral appendages are similar to those in the female, except the usual dimorphism of having fewer teeth on the mandible and the second maxilla. No legs are present, but the small seta located on the posteroventral surface of the cephalothorax probably represents the remnent of leg 1.

Remarks: The present species was first described by Thomson (1889) under the name "*Chondracanthus chilomycteri*", based on the specimens taken from the mouth of the porcupine fish, *Chilomycterus jaculiferus*, collected by A. Hamilton at Napier, New Zealand. Oakley (1930) inadvertently transfered it to the genus *Acanthochondria* and was followed by Yamaguti (1963) by calling it "*Acanthochondria chilomycteri* (Thomson, 1889)". Apparently, Thomson's type materials were deposited in the Otago Museum and a reexamination of them revealed that it is actually a species of *Pseudochondracanthus*.

According to Ho (1970), there are only four species known in the genus *Pseudochondracanthus*. They are *diceraus* Wilson, 1908; *hexaceraus* Wilson, 1935; *murtii* Rangnekar & Rangnekar, 1954; and *pseudorhombi* Yamaguti, 1939. *P. chilomycteri* resembles most closely *P. hexaceraus*, both have a squarish trunk, two pairs of cephalic processes, and a pair of short, sausage-shaped egg sacs. The New Zealand species is, however, distinguishable from the Gulf of Mexico species in having (1) a large number of teeth on the mandible and the second maxilla, (2) a swollen second segment of the maxilliped covered with spinules, (3) a short leg with large, blunt rami, and (4) a caudal ramus tipped with a simple, small spine.

REFERENCES

Fraser, C.M., 1920. Copepods parasitic on fish from the Vancouver Island Region. Trans. Royal Soc. Canada, Ser. 3, 13(5): 45–68.

Gusev, A.V., 1951. Parasitic copepods of some marine fishes. Akad. Nauk USSR zool. Inst. Parazit. 13: 394–463.

Hansen, A.V., 1923. Crustacea Copepoda, 2. Copepoda parasita and semiparasita. Danish Ingolf-Exped. 3(7): 1–92.

Ho, J.S., 1970. Revision of the genera of the Chondracanthidae, a copepod family parasitic on marine fishes. Beaufortia, zool. Mus. Univ. Amsterdam, 17(229): 105–213.

————, 1971. Parasitic copepods of the family Chondracanthidae from fishes of eastern North America. Smithsonian Contrib. Zool. 87: 1–39.

————, 1972. Copepods of the family Chondracanthidae (Cyclopoida) parasitic on South African marine fishes. Parasitol. 65(1): 147–158.

————, 1975. Copepod parasites of deep-sea fish off the Galapagos Islands. Parasitol. 70 (3): 359–375.

Kabata, Z., 1968. Some Chondracanthidae (Copepoda) from fishes of British Columbia. J. Fish. Res. Bd. Canada, 25(2): 321–345.

Kabata, Z. & A.V. Gusev, 1966. Parasitic Copepoda of fishes from the collection of the Zoological Institute in Leningrad. J. Linnean Soc. London, (Zool.), 46(309): 155–207.

Krøyer, H., 1863. Bidrag til Kundskab om Synlterkrebsene. Naturh. Tidsskr. 3(2): 75–426.

Müller, O.F., 1776. Zoologiae Danicae prodromus, seu animalium Daniae et Norvegiae indigenarium characteres, nomina, et synonum imprimis popularium. Havniae. 282 p.

Oakley, C.L., 1930. The Chondracanthidae (Crustacea: Copepoda): with a description of five new genera and one new species. Parasitol. 22(2): 182–201.

Shiino, S.M., 1955. Copepods parasitic on Japanese fishes, 9. Family Chondracanthidae, subfamily Chondracanthinae. Rep. Fac. Fish., Pref. U. Mie, 2: 70–111.

Stephensen, K., 1913. Grønlands Krebsdyr og Pycnogonider (Conspectus Crustaceorum et Pycnogonidorum Groenlandiae). Medd. Grønland, 22: 335–351.

Thomson, G.M., 1889. Parasitic Copepoda of New Zealand with description of new species. Trans. New Zealand Inst. 22: 353–376.

Wilson, C.B., 1920. Report on the parasitic Copepoda collected during the canadian Arctic Expedition 1913–18. Rep. Canadian Arctic Exped. 1913–18, 7, Crustacea, pt. L: 3L–16L.

————, 1922. Parasitic copepods from Japan, including five new species. Ark. Zool. 14(10): 1–17.

————, 1935. Parasitic copepods from the Pacific coast. Amer. Midl. Natural. 16(5): 776–797.

Yamaguti, S., 1939. Parasitic copepods from fishes of Japan. Part 6, Lernaeopodoida, I. Vol. Jubilae Prof. S. Yoshida, 2: 529–578.

————, 1963. Parasitic Copepoda and Branchiura of Fishes. Interscience, New York, 1104 p.