BEAUFORTIA

SERIES OF MISCELLANEOUS PUBLICATIONS

ZOOLOGICAL MUSEUM OF THE UNIVERSITY OF AMSTERDAM

No. 229 Volume 17 April 28, 1970

Revision of the genera of the Chondracanthidae, a copepod family parasitic on marine fishes

JU-SHEY HO

Abstract

Two subfamilies and 30 genera are recognized. They are: in the Chondracanthinae, *Acanthochondria, Acanthochondrites, Andreina**, *Berea, Blias, Brachiochondria**, *Ceratochondria, Chondracanthodes, Chondracanthus, Diocus, Heterochondria, Humphreysia, Immanthe, Juanettia, Lateracanthus**, *Medesicaste, Neobrachiochondria**, *Praecidochondria**, *Prochondracanthopsis**, *Prochondracanthus**, *Protochondracanthus**, *Protochondria, Pseudacanthocanthopsis**, *Pseudoblias**, *Pseudochondracanthus, Rhynchochondria**, *Scheherazade*, and *Strabax*; and in the Lernentominae, *Brachiochondrites** and *Lernentoma*. A redescription of the type-species, based as far as possible on type specimens, is given for all of the above genera except the 12 genera marked with an asterisk. The following 12 genera are rejected: *Acanthocanthopsis, Alimeda, Barnardia, Chondracanthopsis, Disphaerocephalus, Oralien, Parapharodes, Protochondracanthoides, Pseudochondracanthoides, Rylovia, Trichthacerus*, and *Triphyllacanthus*. A new form, *Protochondria longicauda* n. g. & n. sp., is described.

Introduction

The modern classification of the family Chondracanthidae was established by Oakley (1927, 1930). He transferred the family from the order Lernaeopodoida to the order Cyclopoida, divided the family into two subfamilies, rejected some apparently non-chondracanthid and poorly defined old genera, and subdivided the *Chondracanthus*-complex into six genera. The family was then composed of 13 genera and 38 species. Since that time, the Chondracanthidae has grown rapidly in number with 25 new genera and 131 new species having been added.

The Chondracanthidae as it now stands is fairly well-defined within the poecilostome Cyclopoida. The structure of the mouth parts and the known larval stages in the life history (see Heegaard, 1947) clearly indicate that this family does not belong to the order Lernaeopodoida where it has been so often placed. The classification within the family is, however, still unstable. The characters that have been applied to define genera are mostly derived solely from the female and are based on the disposition of the body

Received: September 6, 1969

processes in various body regions; in only a few genera are the features of the appendages incorporated. The fact that 20 out of 36 genera listed by Yamaguti (1963) under the family Chondracanthidae are monotypic makes one wonder if the classification within the family has been overly split, or, in other words, if the various arrangements of the body processes on the female have been weighted too heavily in defining generic taxa.

The principal purposes of this revisional study are to present further evidence for placing the Chondracanthidae in the Cyclopoida, to clarify confusion existing in the taxonomy of the family, and to institute a workable classification of the chondracanthid copepods. In the present study the fine structure of the various appendages and certain characteristic features of the type-species, such as tagmatization, number and disposition of body processes in the female, and certain decisive features in the male (such as the absence of the first antenna, presence of an accessary antennule in the second antenna, the number of the thoracic legs present, etc.) were studied in detail to form the basis for a revision of the genera.

The specimens studied in this work were collected by the author from Apalachee Bay, Florida, and aboard R/V "Oregon" (during Cruise 105), R/V "Albatross IV" (during Cruise 66-3), and R/V "Anton Bruun" (during Cruise 16), and loaned from the following museums (the abbreviation in parentheses after the name of each museum will be used throughout in later citation): United States National Museum (USNM), Washington, D.C.; Swedish State Museum of Natural History (SSM), Stockholm; South African Museum (SAM), Capetown; Zoölogisch Museum (ZMA), Amsterdam; and Universitetets Zoologiske Museum (UZM), Copenhagen.

In all cases, the alcoholized specimens were cleared in lactic acid for at least three days before studying. The wooden slide procedure devised by Humes & Gooding (1964) was used to study the whole mount of the dwarf male and the dissected appendages of both sexes. The male was dissected in lactic acid directly on the wooden slide, but the female appendages were first removed in a depression slide and then transferred to a wooden slide for examination.

All drawings were made with the aid of a camera lucida at various magnifications. In order to make a drawing in an ideal view, the specimen (or the dissected part) was placed in position in lactic acid on a thin film of vaseline smeared on the bottom of a watch-glass or a depression slide. All measurements are in millimeters, unless otherwise indicated.

The letter in parentheses after the explanation of each figure refers to the scale at which the figure was drawn. The abbreviations used are as in the following:

A′	= first antenna	A″	= second antenna
Cr	= caudal ramus	Li	= labium
Lr	= labrum	Md	= mandible
Mx′	= first maxilla	Mx″	= second maxilla
Mxp	= maxilliped	P	= paragnath
P′	= leg 1	P″	= leg 2

ACKNOWLEDGEMENTS

I wish to thank Dr. Arthur G. Humes (Department of Biology, Boston University, Boston) for arranging financial support for this study from his grants (GB 1809, GB 5838, and GB 8381X) from the National Science Foundation of the United States. The great majority of the specimens used in these studies were loaned from various museums by arrangement with Dr. Torben Wolff (Universitetets Zoologiske Museum, Copenhagen), Dr. Roy Oleröd (Swedish State Museum of Natural History, Stockholm), Dr. Jan H. Stock (Zoölogisch Museum, Amsterdam), Mr. B. Kensley (South African Museum, Capetown), and Dr. Roger F. Cressey (U.S. National Museum, Washington, D.C.). Dr. Edward Chin, the Director of the Southeastern Pacific Biological Oceanographic Program, made it possible for me to participate Cruise 16 of R/V "Anton Bruun". The Bureau of Commercial Fisheries, Fish and Wildlife Service, gave me the opportunity to collect parasitic copepods on board R/V "Albatross IV" (during Cruise 66-3) and R/V "Oregon" (during Cruise 105).

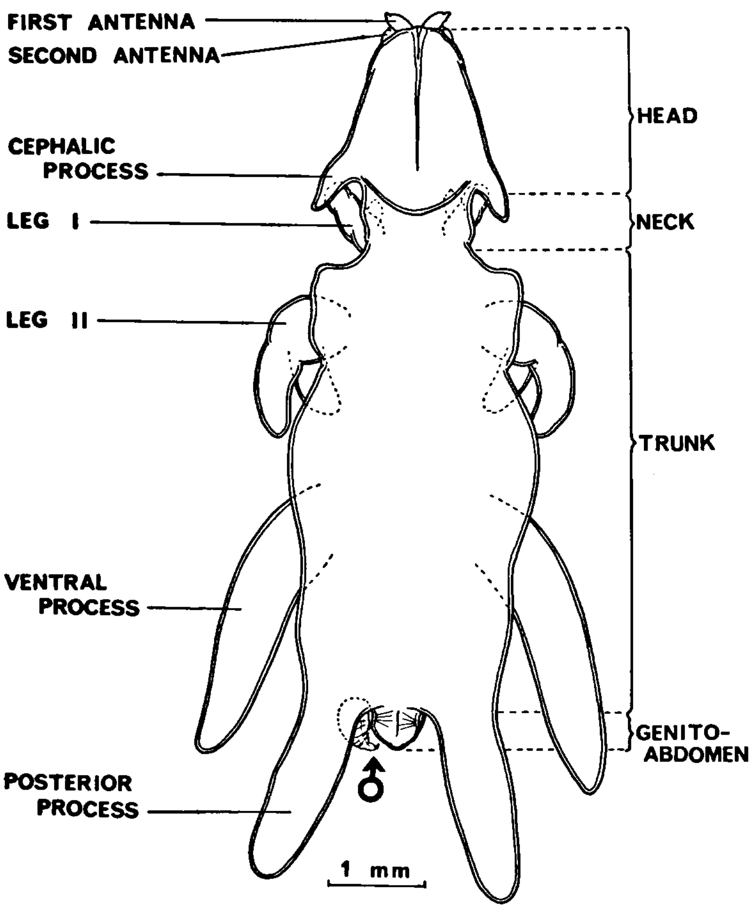
FAMILY CHONDRACANTHIDAE H. MILNE EDWARDS, 1840

The essential diagnostic characters of this family are: 1) the transformed female carrying a pygmy male on the posteroventral surface of its trunk. 2) the use of the modified second antenna (uncinate, bifurcate, trifurcate, or clavate) and/or the modified and enlarged head as the attaching apparatus, 3) the presence of the poecilostome type of mouth parts with the falcate mandible bilaterally denticulated in its distal portion, and 4) the possession of an usually modified and reduced number of thoracic legs.

Although a complete life history is still unknown, it seems probable, judging from our scanty information, that the parasites live on only one host. The nauplius and first copepodid stages are free-living, but the larva attaches to a particular fish host and molts to the sexually differentiated second copepodid. The male copepodid then attaches to an immature young female, which has already become modified, and remains attached to her for the rest of his life.

The body of a fully grown female is always many times larger than the male, and, as a rule, one female carries one male, but exceptions are known to occur, such as in *Rhynchochondria longa*, where as many as eight males were found attached to a single female. The pygmy male always attaches to the posteroventral surface of the female trunk, where there is usually a pair of vermiform or very small surficial processes which the male clasps with his second antennae. The transformed female body is divisible into four regions: head, neck, trunk, and genito-abdomen (see text fig. 1). These four regions, however, are not always distinct and, moreover, the number of somites in one region in a given genus is not necessarily homologous with the number of somites in other genera, except the last division, which is invariably made up of the genital segment plus abdomen.

In most genera belonging to the subfamily Chondracanthinae, the head



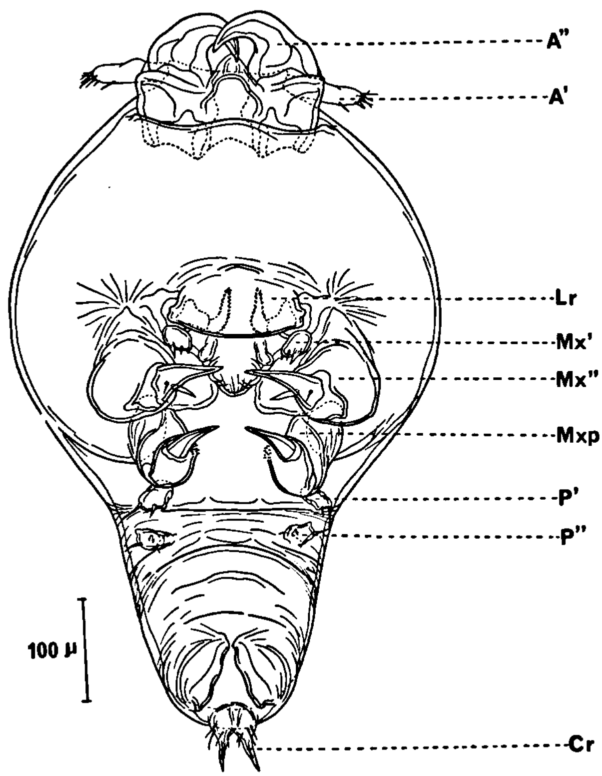
TEXT FIG. 1. Female of *Chondracanthus merluccii* (Holten), dorsal.

region consists of only the cephalosome (= cephalon plus the somite of the maxillipeds), but in some genera the first pedigerous segment is incorporated. The mouth is usually located on the posteroventral surface of the head, but in the members of the subfamily Lernentominae, it is characteristically found at the junction of the neck and the trunk; thus, the head region is only the anterior portion of the cephalon. This is the chief morphological difference between the two subfamilies.

The neck region, the slender or somewhat narrower portion of the body, is extremely variable in its components. It is the prolonged postantennal portion of the cephalon in *Lernentoma* and *Brachiochondrites*, the first pedigerous segment in *Blias*, the first plus the second pedigerous segments in *Lateracanthus*, and the intersegmental area between the first and the second pedigerous segments in *Rhynchochondria*.

The trunk region is usually made of fused third and fourth pedigerous segments. Its form changes in accordance with the number and the maturity of the ova contained, and, because it contains the ova, it was frequently incorrectly called the "genital segment". The different appearances of the neck and trunk regions so frequently encountered in the preserved specimens are due, in addition to the state of maturity, to the different state of contraction of the paired dorsal and ventral muscle-bands at the time of fixation. Thus, an extended specimen may look superficially quite different from a contracted conspecific specimen, and it is very unfortunate that among the 65 desecribed and/or transferred species of the genus *Acanthochondria,* some of them were established solely on the basis of this difference in body appearance.

Although the mature male (see text fig. 2) is not as modified in the female, it still exhibits some features that are not observed in the other male cyclopoids. The cephalothorax is always much swollen and globose, and the remaining parts of the body have the form of a "tail" which is curved ventrally. The metamerism of the body is usually rather indistinct, but in primitive forms, like *Diocus, Juanettia,* and *Rhynchochondria,* it is as distinct as in typical free-living cyclopoids. There is no appreciable major articulation between the fourth and the fifth pedigerous segment as in a typical cyclopoid,



TEXT FIG. 2. Male of *Acanthochondria cornuta* (Müller), ventral.

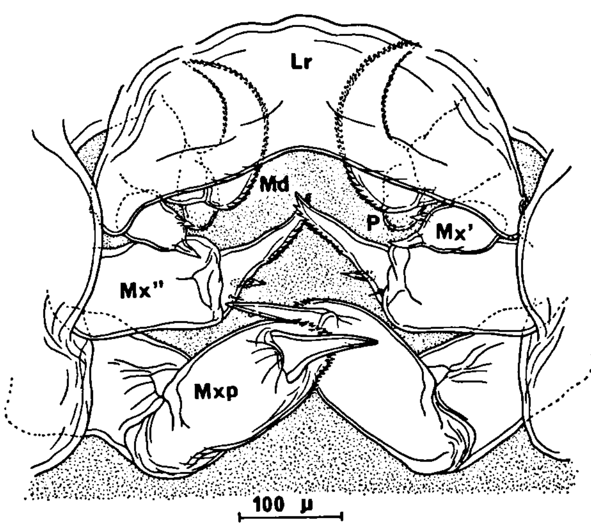
and except in the above mentioned three primitive genera, the fifth pedigerous segment has completely lost ist identity.

Although female chondracanthids are so diversified in their body form and body processes, they are, nevertheless, remarkably similar in their oral appendages, which unmistakably imply their natural grouping and close affinity with other poecilostome cyclopoids. Moreover, this distinctive homogeneity in the oral appendages is one of the principal features on the basis of which I (Ho, in press) have removed the subfamily Pharodinae Illg, 1948, from the Chondracanthidae and supported Yamaguti (1963) in transferring the genus *Juanettia* back to the Chondracanthidae.

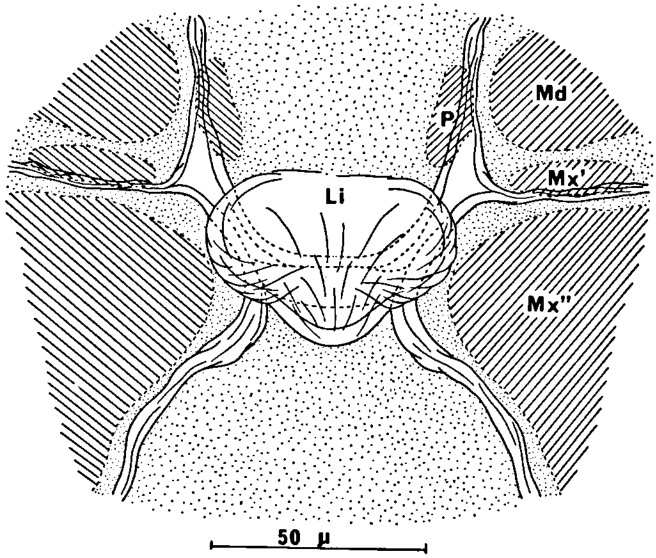
As in many other groups of parasitic copepods, a continuous gradation from primitiveness toward specialization is exhibited in the appendages. Curiously enough, however, the oral appendages (see text figs. 3, 4) remain comparatively unaffected. Therefore, the degree of specialization is to be sought in the appendages other than the oral ones.

As a rule, the pygmy male retains more primitive features than the transformed female. This is conceivably because the male is permanently carried by the female and receives less selective presure from the environment, thus, exhibiting less adaptive radiation than its carrier. If this is really the case, then it would not be difficult to understand why so many male chondracanthids lack specific, or even generic, differences seen in their female carriers.

The first antenna in the primitive form is distinctly segmented, and the number of segments is a generic character. The transformed female first antenna is always fleshy and in some cases cylindrical or in other cases with a swollen base and a cylindrical smaller terminal portion. Most of the setae are lost, but the terminal 8 elements are usually present. The male first antenna is



TEXT FIG. 3. Oral appendages of female *Acanthochondria cornuta* (Müller).



TEXT FIG. 4. Oral area of female *Acanthochondria cornuta* (Müller) with appendages removed.

usually more primitive in its structure, being slender, cylindrical and armed with more elements than in the female.

There are two major forms of the second antenna, one uncinate and the other nonuncinate (bifurcate, trifurcate, or clavate). In primitive forms, there is a structure of unknown origin called the "accessary antennule" located proximally on the outer wurface of the terminal hook. It has been called "exopod" by some authors, but in the absence of ontogenetically supported evidence, the term "accessary antennule" is adopted here.

Both labrum and labium are present in the chondracanthids. The labrum is a rectangular plate-like structure with rounded, sometimes protruded, corners. Sexual dimorphism is seen in some species where the male possesses a median knob on anterior surface. The possession of fine denticles on the posterior (dorsal) surface close to the margin of the labrum is a specific character. The labium is a lobate structure located behind the mouth opening between the bases of the second maxillae. It is in some cases multilobated.

The mandible is the most unique and characteristic appendage of the Chondracanthidae. It is bipartite, with the distal lanceolate part bilaterally serrated. The teeth on the convex (inner) side are larger and more numberous than those on the concave (outer) side, and, without exception, sexual dimorphism is seen in the size and the number of these teeth, being relatively larger and fewer in the male. Both rows of teeth do not reach the tip and the outer row always starts from the posterior (dorsal) surface and then gradually goes outward to the concave margin.

The paragnath is a lobate structure bearing spinules. It has its own location in the oral area, and is by no means associated with the mandible. Therefore, this lobate structure can not be the mandibular palp.

The first maxilla is also a lobate structure. The difference in the ornamentation (spinulation) and armature (number of terminal setae) is a specific rather than a generic character. The interpretation of this oral appendage in the problem of serial homology in chondracanthid appendages is exceedingly controversial. Because of misconceptions about this appendage, the terminology of the following two pairs is consequentially affected. It has been called the mandibular palp or exopod of the mandible. Oakley (1930) and Heegaard (1947) considered that the first maxilla is absent in the chondracanthids. The true first maxilla was designated by Heegaard, however, as the second maxilla. Thus, he upset the terminology of the true second maxilla, which was called by him the first maxilliped, and of the true maxilliped, designated by him the second maxilliped.

The second maxilla is usually the largest oral appendage. It is 2-segmented, consisting of a voluminous, unarmed basal segment and a curved process-like terminal segment. The latter is armed on the basal portion with a small spinule and spiniform seta and terminally has a row of variable number of teeth along the convex (inner) margin. Sexual dimorphism is usually found in this row of teeth, which is either completely absent or reduced to only a few teeth in the male.

The maxilliped is a 3-segmented appendage. The first segment is unarmed; the second segment is armed with several rows of teeth on the distal inner surface; and the terminal segment is a short, uncinate process bearing one to several hooklets on its inner surface.

The thoracic legs show the widest range of variation among chondracanthid appendages. In the most primitive form, the male of *Juanettia cornifera*, all six pairs of thoracic legs are retained, but in *Brachiochondria, Heterochondria*, and *Pseudochondracanthus*, all legs are absent in the male. According to our present knowledge of chondracanthid appendages, the original structure of the leg is apparently biramous with bimerous rami. The specialization occurs in the fusion of the segments, the loss of the armature, and the transformation of the whole leg into a lobe-like structure. The modified legs are unilobate, bilobate, or even trilobate, but nevertheless, they are distinguishable from the similar body processes by the possession of muscle bands and a seta, which is the original outer seta on the basis of the protopod. Different parts of the same leg may assume different states of transformation, such as in *Blias, Chondracanthodes, Lateracanthus, Protochondria*, etc., where the protopod has completely transformed into a lobe or sac-like structure but both rami are only slightly modified, assuming a short, blunt stud carrying some elements. In still other genera, such as *Diocus, Humphreysia, Prochondracanthopsis, Pseudacanthocanthopsis*, and *Scheherazade*, the female has very rudimentary legs, which are merely very small knobs armed with a few elements.

The caudal ramus in primitive forms, such as *Juanettia, Prochondracanthus, Protochondria*, and *Rhynchochondria*, has six elements. However, in most genera, the number is reduced to only four elements, with three basal setae and one terminal spiniform process. It is conceivable that the spiniform process is the transformed termino-inner element and the basal portion bearing the setae is the caudal ramus proper.

Rejected genera

As presently conceived, the family Chondracanthidae consists of two subfamilies and thirty genera, of which one is new to science. There are, however, twelve old genera considered here to be rejected. The reasons for such treatment are given under each genus in the following:

Acanthocanthopsis Heegaard, 1945. — This genus was established by Heegaard (1945 : 20) to include the species *quadratus* on the ground that the first antenna is bifurcated. He also suggested the inclusion in this genus of *Chondracanthus cottunculi* Rathbun, 1886, which has a large, fleshy, triangular first antenna. As we know now, the modified, fleshy first antenna in the chondracanthids varies in appearance in different congeneric species. In the absence of important discrepancies in other appendages, however, the erection of a new genus is, in my opinion, not justifiable, and I see no reason why the species *quadratus* can not be placed in the genus *Chondracanthus*.

Alimeda Heegaard, 1962. — From Heegaard's (1962 : 155, figs. 27—36) description and illustrations of *A. orientalis*, taken from the gills of a tectibranch gastropod (*Aplysia* sp.), one can tell without the slightest doubt that he was dealing with a species of *Lichomolgus*-group (Lichomolgidae) and not a new genus and species of Chondracanthidae as claimed by him.

Barnardia Yamaguti, 1963. — Following the cursory original description of *Chondracanthus colligens* Barnard, 1955, Yamaguti (1963 : 280) erected for it a new genus, *Barnardia*, based on its unusual feature of having a prolonged first pedigerous segment. My reexamination of the type specimens of *Ch. colligens* deposited in SAM revealed that the degree of prolongation is quite different among the twelve examined specimens. This prolongation is apparently a definitive character, but in the absence of structural differences in the appendages, I consider it as a species of *Chondracanthus*.

Chondracanthopsis Wilson, 1932 — It is very regrettable that when Wilson (1932) created this genus to accommodate *Chondracanthus nodosus* (Müller, 1776), he did not realize that the type-species of the genus *Chondracanthus*, *Ch. zei* Delaroche, 1811, also has the same characteristic trilobate legs, and cited this character as the major discrepancy between the genera *Chondracanthus* and *Chondracanthopsis*. I agree with Kabata (1968 : 328) in suppressing the genus *Chondracanthopsis* and returning the species *nodosus* to *Chondracanthus*. Two other species of *Chondracanthus* have so far been claimed to belong to this genus. They are: *Ch. cottunculi* Rathbun, 1886 (see Oakley, 1930: 196) and *Ch. dogieli* Gusev, 1951 (see Markewitsch, 1956 : 101). These two species together with *Chondracanthopsis multituberculatus* Markewitsch, 1956 should accordingly be placed in *Chondracanthus*.

Disphaerocephalus Oakley, 1930. — The peculiarity of *Chondracanthus ornatus* T. Scott, 1900 in having a bilobate leg 1 and a trilobate leg 2 is apparently the primary reason that Oakley (1930) established for it a separate genus. I have examined many specimens of *D. ornatus* deposited in UZM and discovered that actually both legs 1 and 2 are trilobate, not just leg 2 alone. Thus, as far as the structure of the legs are concerned, *Ch. ornatus* is not generically different from *Ch. zei* and *Ch. nodosus*. The only other species of *Disphaerocephalus*, *D. horridus* (Heller, 1868), which was transferred to this genus by Delamare-Deboutteville & Nunes-Ruivo (1952), should be placed back in its originally proposed genus *Chondracanthus*.

Oralien Bassett-Smith, 1899. — Oakley (1927) made a great contribution to our knowledge of chondracanthid copepods in clarifying the greatest confusion concerning three old genera, namely, *Lernentoma* de Blainville, 1822; *Medesicaste* Krøyer, 1863; and *Oralien* Bassett-Smith, 1899. According to him, *Oralien* differs from *Lernentoma* mainly in having two pairs of "lateral processes" and "tripartite, rounded" legs. However, after examining the specimens of *O. triglae* and comparing them with the specimens of *L. asellina* deposited in USNM, UZM, SAM, and SSM, I found that the genus *Oralien* should be synonymized with the genus *Lernentoma*, for the so-called "tripartite" legs in *O. triglae* are in reality not such, but merely have the outer protopodal surface slightly swollen. As to the difference in the number of "lateral processes" in the trunk region, this feature is of specific difference rather than of the generic rank. Thus, the species name *O. triglae* (de Blainville, 1822) is here proposed to be a synonym of *Lernentoma trigla* de Blainville, 1822.

Parapharodes Shiino, 1960. — The establishment of this genus was largely due to our incomplete information of the genus *Diocus*, in which the fine structure of various appendages has never been studied. I have reexamined the specimens of *D. gobinus* (Müller, 1776) in Krøyer's collection of copepods deposited in UZM and have found that each pair of appendages in both sexes is respectively similar to that found in *Parapharodes sadoensis* Shiino, 1960 and *P. semilunaris* Kabata & Gusev, 1966. The general form of the body and the body processes in both genera are also identical. Consequently, *Parapharodes* is here synonymized with *Diocus* Krøyer, 1863.

Protochondracanthoides Yamaguti, 1963. — This genus was erected by Yamaguti (1963: 291) to accomodate an incompletely known species of *Chondracanthus*, *Ch. angustatus* Heller, 1868, taken from *Uranoscopus scaber* Linnaeus in the Mediterranean. This species is different from most of the species of *Chondracanthus* in having an elongate, cylindrical body. Heller's (1868 : 230) description of *Ch. angustatus* did not mention whether or not there were legs present and nothing is known of the male. Since the structure of the legs as well as details of the cephalic appendages are important generic characters in the chondracanthids, the validity of *Protochondracanthoides* can not be verified until the true nature of them is brought to light. Until then, it seems to be better to return *angustatus* to the genus *Chondracanthus*.

Pseudochondracanthoides Yamaguti, 1963. — This genus was proposed by Yamaguti (1963 : 293) to acommodate the species *Pseudochondracanthus hexaceraus* Wilson, 1935, because it is different from *P. diceraus* Wilson

1908 in having three pairs of "horns" in the head region. However, as discussed previously, the number of processes in a given body region is not necessarily a generic character. Furthermore, my reexamination of the type specimens of both *P. diceraus* and *P. hexaceraus* has shown that they are actually congeneric species, as far as other features in the appendages are concerned. This will be discussed later in more detail in connection with the account of the genus *Pseudochondracanthus.*

Rylovia Markewitsch, 1940. — The type-species *R. argatula* Markewitsch, 1940 is apparently a species of *Acanthochondria* with its long head slightly constricted at the middle, a condition that also exists in *A. dilatata* Shiino, 1955. Since the postantennal region is not prolonged into a long neck to insert into the host tissue, it is not attributable to the subfamily Lernentominae as proposed by Markewitsch. Furthermore, its resemblance to species of *Acanthochondria* in the cephalic appendages, general body form, posterior processes, and the bilobate condition of thoracic legs suggest that it belongs to *Acanthochondria.*

Trichthacerus Krøyer, 1863. — This genus was rejected by Oakley (1930 : 185) and restored by Yamaguti (1963 : 296) without giving any reason. From Krøyer's (1863 : 264, pl. XIV fig. 7, a-f) description and illustrations of the type-species *T. peristedii,* this form is in reality an aberrant species of Chondracanthidae, particularly so because of the presence of five pairs of appendages on the trunk region. However, judging from the general body form and especially the structure of the second antennae, it seems to me that *T. peristedii* is a species of *Blias.* At any rate, until we know the true structure of the appendages of *T. peristedii,* this genus should not be considered as a valid one in the Chondracanthidae. Dr. Torben Wolff has informed me that the type specimens of *T. peristedii* are unfornately not to be found in Krøyer's collection.

Triphyllacanthus Oakley, 1930. — After having rejected the genus *Trichthacerus,* Oakley (1930 : 200) erected this genus to accomodate the species *molestus* which was described by Heller (1868 : 233) under the rejected genus. This treatment was accepted by Bere (1936) and she added to it another species, *T. ancoralis.* Yamaguti (1963 : 280), however, removed the latter species to his newly created genus *Berea* and retained only the type-species in *Triphyllacanthus.* I have examined the type-specimens and many other specimens of *T. ancoralis* and have found that it is quite different from *T. molestus* in having non-tripartite second antennae and rather small but lobate thoracic legs. Therefore, Yamaguti's *Berea* is valid. On the other hand, a comparative study of specimens of *Blias prionoti* with Heller's original description of *T. molestus* has shown further that *molestus* is actually a species of *Blias* and highly probably conspecific with *prionoti.* The nature of second antenna and the two pairs of legs support this synonymization.

Key to subfamilies and genera

Keys to the chondracanthid genera have been previously presented by Wilson (1932), Tripathi (1960), and Yamaguti (1963). These keys, however, are not only out of date, but also impossible to use, because some of the characters employed are incorrect, being either inadequately described in the original descriptions or misinterpreted in the keys. Moreover, in these three existing keys, a separate key is given for the males, which I do not think necessary. Since the pygmy male is characteristically attached permanently to its female partner, an identification of the female will automatically lead to the identity of the male. There are some males whose partners definitely belong to different genera, yet these males are indistinguishable from each other, for example, the males of *Acanthochondria, Acanthochondrites, Berea,* and *Lernentoma.*

Since there is such an intimate association of the male with the female, certain distinct features of males can be used in the key for identifying females. In the following key, all the characters used apply to an ovigerous female, unless indicated otherwise.

1a. Head region composed of only antennal portion of cephalosome; neck region prolonged and bearing mouth parts at its posterior end (Lernentominae) . . 26
b. Head region consisting of entire cephalosome or cephalosome plus pedigerous segment(s); neck region may or may not be prolonged; mouth parts always located in head region (Chondracanthinae) 2
2a. Trunk region with outgrowths in form of processes, protrusions, or knobs; posterior processes present (rarely absent) 3
b. Trunk region without outgrowths; with or without posterior processes . . . 11
c. Trunk with aliform lateral expansions and dorsal processes; posterior processes absent . . . . *Praecidochondria* Kabata, 1968
3a. Neck region greatly prolonged 4
b. Neck region morderately long, short, or indistinct 5
4a. Trunk with lateral processes but neck region smooth . *Strabax* Nordmann, 1864
b. Trunk without lateral process but neck region with lateral expansion . . . . *Medesicaste* Krøyer, 1863
5a. One pair of unmodified or rudimentary legs present 6
b. More than one pair of legs present, either modified or unmodified 8
6a. Both sexes with accessary antennule on second antenna 7
b. Both sexes without accessary antennule on second antenna . . . . *Protochondracanthus* Kirtisinghe, 1950
7a. Female trunk bearing a pair of anteriorly directed dorsal processes in front; male with 6 pairs of legs . . . . *Juanettia* Wilson, 1921
b. Female trunk without such processes; male with only 2 pairs of legs . . . . *Neobrachiochondria* Kabata, 1969
8a. Three pairs of unmodified legs present, all biramous; both sexes with an accessary antennule . . . . *Rhynchochondria* Ho, 1947
b. Two pairs of legs present, either lobate or rudimentary; accessary antennule either present or absent (when present, only in male) 9
9a. Second antenna T-shaped; abdomen absent . . . . . *Diocus* Krøyer, 1863
b. Second antenna uncinate; abdomen present 10
10a. Two pairs of legs modified, large, either trilobate or bilobate . . . . *Chondracanthus* Delaroche, 1811
b. Two pairs of legs partially modified, with sac-like protopod and rod-like rami . . . . *Chondracanthodes* Wilson, 1932
c. Two pairs of legs rudimentary, very small . . . . *Pseudacanthocanthopsis* Yamaguti & Yamasu, 1959
11a. Posterior processes present 12
b. Posterior processes absent 16

12a. No legs present; male with two pairs of legs . . *Immanthe* Leigh-Sharpe, 1934
b. One or two pairs of modified legs present; male with or without legs . . . 13
13a. One pair of modified legs present; male without first antennae and legs . . . . *Pseudochondracanthus* Wilson, 1908
b. Two pairs of modified legs present; male with first antennae and legs . . . 14
14a. Both pairs of legs partially modified, with lobate protopod and rod-like rami; male with accessary antennule . . . . *Lateracanthus* Kabata & Gusev, 1966
b. Both pairs of legs modified, male without accessary antennule 15
15a. Legs bilobate, parasitic on teleosts . . . . . *Acanthochondria* Oakley, 1930
b. Legs unilobate, parasitic on elasmobranchs . . *Acanthochondrites* Oakley, 1930
16a. No legs present . . . . *Brachiochondria* Shiino, 1957
b. One, two or three pairs of legs present, either rudimentary or modified . 17
17a. Only one pair of rudimentary legs present, very small 18
b. More than one pair of legs present 19
18a. Head region with two pairs of lateral processes; neck region not prolonged . . . . *Humphreysia* Leigh-Sharpe, 1934
b. Head region without processes; neck region greatly prolonged . . . . *Scheherazade* Leigh-Sharpe, 1934
19a. Three pairs of unmodified, biramous legs present . . . . *Prochondracanthus* Yamaguti, 1939
b. Two pairs of legs present, modified or unmodified 20
20a. Two pairs of unmodified, biramous legs present . . . . *Andreina* Brian, 1939
b. Two pairs of modified legs present, either lobate or rudimentary 21
21a. Second antenna bifurcate; male with only one pair of legs . . . . *Ceratochondria* Yü, 1935
b. Second antenna uncinate, clavate, or trifurcate; male with two pairs of legs or without legs 22
22a. Second antenna not uncinate; male with two pairs of legs 23
b. Second antenna uncinate; male with two pairs of legs or without legs . . . 24
23a. Both pairs of legs partially modified; with lobate protopod and rod-like rami; male with accessary antennule . . . . *Blias* Krøyer, 1863
b. Both pairs of legs modified, bilobate; male without accessary antennule . . . . *Berea* Yamaguti, 1963
24a. Legs modified, unilobate; male without legs . . . . *Heterochondria* Yü, 1935
b. Legs rudimentary, bilobate, or partially modified; male with two pairs of legs 25
25a. Both sexes with accessary antennule on second antenna; legs partially modified, with rod-like rami . . . . *Protochondria* n. gen.
b. Both sexes without accessary antennule; legs rudimentary . . . . *Prochondracanthopsis* Shiino, 1960
c Both sexes without accessary antennule; legs modified, with very small knob-like endopod . . . . *Pseudoblias* Heegaard, 1962
26a. Head region with lateral expansion; both pairs of legs bilobate . . . . *Lernentoma* de Blainville, 1822
b. Head region without lateral expansion; both pairs of legs unilobate . . . . *Brachiochondrites* Markewitsch, 1940

Account on the valid genera

A redescription of the type-species is given on the following pages of only those genera in which the specimens of the type-species have been accessible to me. However, in order to avoid repetition, no redescription is attempted for those genera in which the type-species has been well characterized in its original description.

The use of words like "as in usual form", "as in usual chondracanthid", or similar phrases, implies correspondence with the generalized chondracanthid features that have been described above.

In this study, a female adult is not considered mature until it has completed transformation and produced egg sacs. It is called adult when it has passed the copepodid stages and has begun transformation. Therefore, in the following description, the word "female" or the symbol "♀" signify the mature adult; or when combined with the word "young", the immature adult.

The number of male specimens examined is not indicated in the following descriptions, because the male is always attached to the female. Examining a female will naturally lead to study at least one male.

Subfamily Chondracanthinae H. Milne Edwards, 1840

Female. — Body modified, with or without processes on head, neck, or trunk. Attaching to host solely by means of modified second antenna (except *Strabax* and probably *Medesicaste*), which is uncinate, clavate, lanceolate with trifurcate tip, or T-shaped. Mouth parts located in head region. Neck region, if present, may or may not be elongated.

Male. — Dwarf, cyclopiform or non-cyclopiform, permanently attached to female by means of modified uncinate second pair of antennae.

Remarks. — Although the genus *Medesicaste* has been placed in the Lernentominae since the subdivision of Chondracanthidae proposed by Oakley in 1927, my reexamination of the specimens of *M. penetrans* Heller, 1868 has shown that the so called prolonged neck region in this genus is actually composed of the transformed pedigerous segments and not the postantennal region as in the Lernentominae. Hence, the genus *Medesicaste* is here removed to the Chondracanthinae.

Genus **Acanthochondria** Oakley, 1927

Lernaea - Müller, 1776 : 227 (refers to *L. cornuta* only).
Anops Oken, 1815: 357 (refers to *A. cornuta* only).
Lernentoma de Blainville, 1822: 441 (refers to *L. cornuta* only).
Chondracanthus - of various authors prior to 1927 (in part).
Acanthochondria Oakley, 1927: 466.
Rylovia Markewitsch, 1940: 12.

Female. — Head consisting of cephalosome only; first two (rarely one) pedigerous segment forming neck region, and remaining pedigerous segments of prosome fused into trunk. Body processes, when present, only in cephalic region and posterior corners of trunk (namely, posterior processes). Abdomen large, globose, broadly fused with genital segment. Caudal ramus a spiniform process armed with 3 setae at basal region. Egg sacs cylindrical, rarely convoluted; egg multiseriate. First antenna fleshy, cylindrical, or greatly swollen. Second antenna 2-segmented, terminal segment uncinate. Mandible falcate, bipartite, with bilaterally denticulated distal portion. Paragnath a small fleshy lobe armed with spinules. First maxilla a small lobe bearing 2 or 3 elements. Second maxilla 2-segmented, terminal segment a process armed with 2 elements at basal portion and with a row of teeth on posterior surface of terminal process. Maxilliped 3-segmented, terminal segment a small claw. Legs 1 and 2 present, modified, bilobate; protopod bearing an outer seta.

Male. — Cephalosome fused with first pedigerous segment, globose, and much larger than remaining parts of body. Metamerism of body indistinct. Genital segment and abdomen fused. Caudal ramus as in female. First antenna slender, cylindrical. Second antenna and oral appendages essentially as in female, except having fewer teeth in mandible and second maxilla, or, completely absent in the latter. Legs 1 and 2 modified, with sac-like protopod carrying a long outer seta; rami represented by tiny knob, either unarmed or tipped with setules.

Type-species. — *A. cornuta* (O.F. Müller, 1776).

Remarks. — This genus is so far the largest one in the family, containing 65 nominal species (39 described and 26 transferred). The large number of species in a genus is of course the result of successful adaptive diversification, but in this case, it is, at least in part, due (1) to the failure of some previous investigators to recognize variant features which are actually individual and non-specific, and (2) to inadequate and incomplete original descriptions which misled subsequent investigators to describe new species from specimens actually belonging to known species. Through my study, I have found that the proportion and the structure of the head, the general appearance of the first antenna and the two pairs of legs, and certain fine structural differences in the oral appendages are fairly reliable for identifying the species. Since these features have not been described in detail in many species of *Acanthochondria,* an enumeration of valid species requires reexamination of every type specimen.

It is appropriate and also necessary here to take up again the old, unsolved problem concerning the identity of particularly two species of *Acanthochondria, cornuta* (Müller, 1776) and *flurae* (Krøyer, 1863), for a solution to this problem will enable us to understand more about this genus and, in turn, give us a better way of identifying its contained species.

The species *A. cornuta* was nominated by O. F. Müller in 1776 under the name "*Lernaea cornuta*", but its description was not given by him until 1788. Since then, it has been redescribed by von Nordmann (1832), Baird (1850), van Beneden (1851), Krøyer (1863), Vogt (1877), T. Scott (1900), and T. Scott & A. Scott (1913). The questionable species *A. flurae* was first described by Krøyer (1863); it has been redescribed by T. Scott (1900), T. Scott & A. Scott (1913), and Wilson (1932). A search into the literature revealed that Bassett-Smith (1899 : 492) was the first person who regarded *A. flurae* (together with *A. soleae*) as synonymous with *A. cornuta.* This treatment was accepted by Brian (1906) who reasoned that *A. flurae* and *A. soleae* were merely varities of *A. cornuta.* Both Hansen (1923) and Heegaard (1947) have argued that *A. flurae* and *A. cornuta* were simply phenotypes of the same species. Those copepodologists (a great majority) who believe *A. flurae* to be distinct from *A. cornuta* recognize that the difference in the trunk, short and broad in the former (see figs. 1, 3) and long and slender in the latter (see fig. 4), is a specific character. Another distinguishing feature considered by the splitters is that of the host specificity, namely, *A. flurae* occurring chiefly on *Drepanopsetta platessoides* Gill and *A. cornuta* on *Pleuronectes platessa* Linnaeus. However, the fact that both *A. flurae* and *A. cornuta* have been reported on *Glyptocephalus cynoglossus* (Linnaeus), *Platichthys flessus* (Linnaeus), and *Lepidorhombus shiffiagonis* (Walbaum) may imply that their specificity is not as strict as has been thought. Moreover, as pointed out by Hansen (1923 : 43), individuals of apparently *cornuta*-form have been found on *D. platessoides* and of *flurae*-form, on *P. platessa*, and some intermediate forms have also been found mixed together.

Kabata (1959) claimed that some ecological differences (fecundity and site preference on the host) exist between *A. cornuta* and *A. flurae*. This conclusion was reached with the premise of recognizing in existence a clear-cut host specificity. In his study, all 31 specimens collected from *P. platessa*, regardless of their length/width ratio ranging from 2.8 to 5.0 (mean ratio 3.6), were treated as *A. cornuta*, and those 106 specimens from *D. platessoides*, with length/width ratio ranging from 1.9 to 3.3 (mean ratio 2.5), as *A. flurae*, because a statistical analysis showed the significance of difference between these groups of ratio to be at 0.001 level. However, as having been mentioned above, since the length/width ratio in the chondracanthid female changes due to maturation and contraction at the time of fixation, it is certainly not an ideal criterion for measuring the degree of speciation. And, moreover, if one realizes that some of Kabata's specimens identified as *A. flurae* are actually *cornuta*-form (which would have been called *A.cornuta*, if they happened to be found on *P. platessa* instead of *D. platessoides*), one would not hesitate to cast doubts upon the conclusion that Kabata (1959 : 260) has reached.

I thought the best approach to attack this old problem would be to re-examine the type specimens of *A. flurae* and compare them with the specimens of *A. cornuta* which were studied by Krøyer at the time when he described *A. flurae*.

In Krøyer's original collection of chondracanthid copepods, there is only one lot of *A. flurae* containing two specimens taken from *D. platessoides*. One of them, illustrated in figs. 1 and 2, is broken on the right posterior side of the trunk with the right posterior process completely detached, but the other one, illustrated in fig. 3, is reasonably intact and carries a male and part of an egg sac. It appears to me that the specimen illustrated in fig. 1 is the same one as illustrated by Krøyer (1863) in his pl. XIII figs. 6a and 6b. I have removed the left first antenna, second antenna, first leg, second leg, and the entire mouth parts of this specimen for the study of their fine structure.

There are two lots of *A. cornuta* in Krøyer's collection, one of them containing 9 ovigerous and 3 young females taken from *P. platessa* and the other containing 4 ovigerous females taken from *D. platessoides*. In spite of their unmistakable *flurae*-form of the trunk, the latter 4 specimens were labeled by Krøyer as "*Chondracanthus cornutus* Müll.". Of the 9 ovigerous females in the former, three are definitely *flurae*-form, in appearance very close to the one illustrated in fig. 3 (a syntype of *A. flurae*). This *flurae*-form of *A. cornuta* was apparently also recognized by Krøyer who illustrated one of the specimens in his pl. XIII fig. 7c. One of the six ovigerous *cornuta*-forms was illustrated in figs. 4 and 5. The egg sacs of these ovigerous females are nearly as long as the body, but there is one *cornuta*-form with a pair of very short egg sacs which are even less than half of the body length. I have dissected one specimen of each form for comparative studies of the appendages.

I was not able to detect any significant morphological differences in these three sets of dissected appendages. Consequently, as far as the morphology of the appendages is concerned, *A. flurae* is not distinctive from *A. cornuta* and the two should be considered as one species. If this opinion is accepted, then one has to regard *A. cornuta* as polymorphic, with a long, slender *cornuta*-form; a short, broad *flurae*-form; and intermediate forms, regardless of their hosts. This polymorphism is so far not known to be associated with either ecological differences or geographical distribution of the hosts.

It is worth noting here that the polymorphism of *A. cornuta* can be expressed early in the young adult stage. The three young adults in Krøyer's collection resemble the one illustrated in fig. 7, being of *cornuta*-form, while the only young adult from Massachussetts Bay differs in being *flurae*-form (see fig. 8). The significance of this difference expressed in the young adult is, at the present state of our knowledge, impossible to assess, but it definitely suggests that a comparative study on the growth and transformation of *Acanthochondria* can probably enable us to find a decisive solution to the problem of distinctness between *A. cornuta* and *A. flurae*. Until then, however, I shall consider that these two forms are conspecific.

If one keeps in mind the occurrence of polymorphism in the species of *Acanthochondria* and then makes a comparative study of the descriptions of the 65 known species of this genus, one will find that there are quite a number of described species which bear a great deal of resemblance to one another and probably represent the same species.

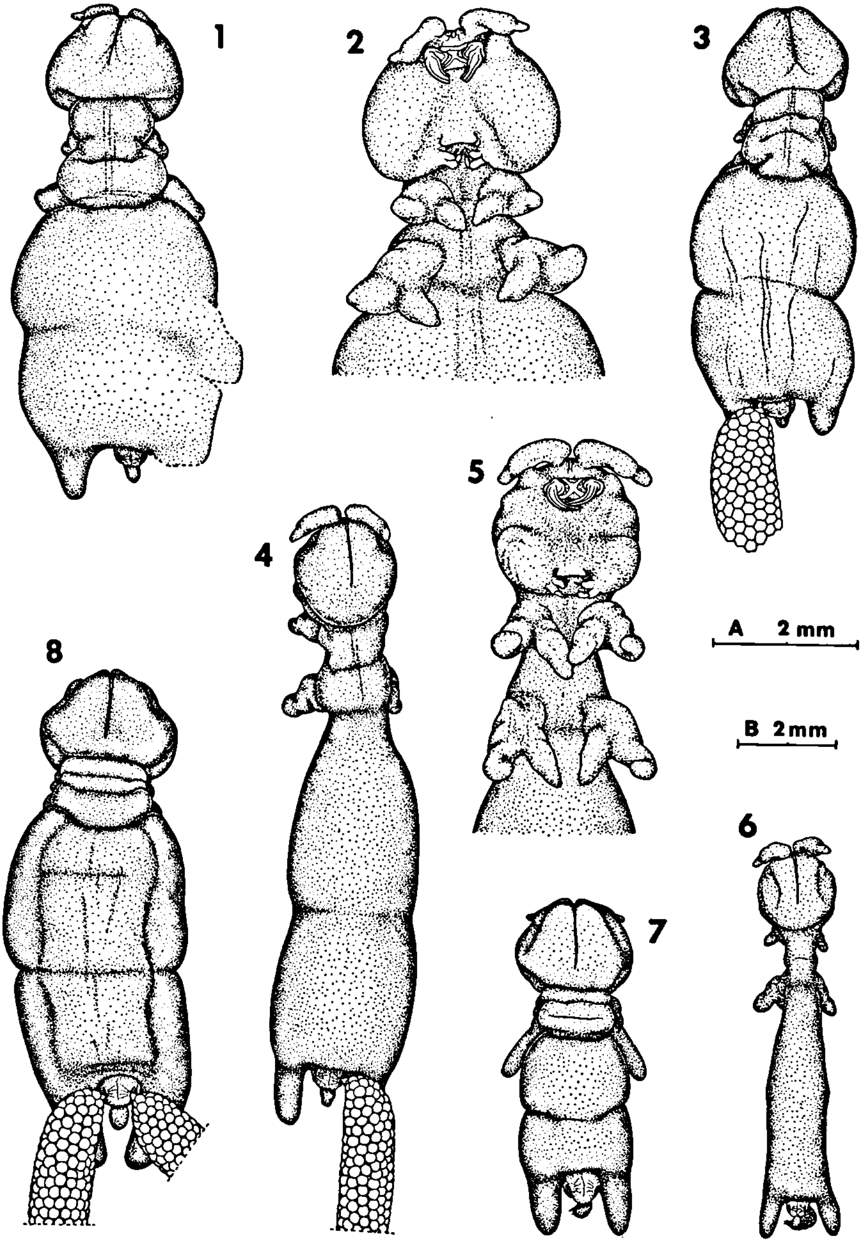
Acanthochondria cornuta (Müller, 1776). Figs. 8—33.

Lernaea cornuta Müller, 1776: 227; 1788: 40, pl. xxxiii fig. 6.

Anops cornuta; Oken, 1815: 357, fig. 3.

Lernentoma cornuta; de Blainville, 1822: 441, Baird, 1850: 328, pl. xxxv fig. 2. T. Scott, 1891: 306.

Chondracanthus cornutus; Cuvier, 1830: 258. Von Nordmann, 1832: 111, pl. ix figs. 5—10. Burmeister, 1833: 325. Krøyer, 1837: 196; 1863: 323, 329, pl. xiii figs. 7a—7d. H. Milne Edwards, 1840: 500, pl. 40 figs. 18—22. Van Beneden, 1851: 108, pl. iv figs. 1—4; 1861: 151. Heller, 1866: 755. Olsson, 1868: 29, fig. 12. Vogt, 1877: 78, pl. vi figs. 4—8. Richiardi, 1880: 151. Stossich, 1880: 252. Valle, 1880: 72. Bassett-Smith, 1896: 161; 1899: 491. T. Scott, 1900: 164, pl. vii figs. 1—31; 1906: 371. A. Scott, 1901: 351; 1929: 102. Thompson & A. Scott, 1903: 294. Brian, 1906: 96, pl. vii fig. 5. Norman & A. Scott, 1906: 217. T. Scott & A. Scott, 1913: 168, pl. xlvii figs. 1—2; pl. lii fig. 5; pl. liii figs. 1—9. Stephensen, 1913: 342. Stock, 1915: 71. Wilson, 1920: 51; 1922: 6. Hansen, 1923: 43. Bere, 1930: 424, pl. i figs. 1—3. Rose & Vaissière, 1952: 171.



FIGS. 1—8. *Acanthochondria cornuta* (Müller), female. 1, Krøyer's syntype of *Ch. flurae*, dorsal (A); 2, anterior portion of the same, ventral (B); 3, another-Krøyer's syntype of *Ch. flurae*, dorsal (A); 4, a *cornuta*-form with neck region extended, dorsal (A); 5, anterior portion of the same, ventral (B); 6, young female, dorsal (A); 7, young female, dorsal (A); 8, a *cornuta*-form with neck region contracted, dorsal (A).

Ch. flurae Krøyer, 1863: 323, 330, pl. xiii figs. 6a—6b. T. Scott, 1900: 166, pl. vii figs. 32—34; 1906: 371. T. Scott & A. Scott, 1913: 171, pl. xlvii fig. 5; pl. lii figs. 1—11. A. Scott, 1929: 103.

Ch. depressus T. Scott, 1905: 114, pl. vi figs. 7—13; 1906: 372. T. Scott & A. Scott, 1913: 172, pl. xli figs. 2—4; pl. lvi figs. 1—7. El Saby, 1930: 110.

Ch. depressus var. *oblongus* T. Scott, 1905: 115, pl. vi figs. 14—17.

Acanthochondria cornuta; Oakley, 1930: 189, figs. 3A—3B. Wilson, 1935b: 787. Van Oorde-de Lint & Schuurmans Stekhoven, 1936: 109, fig. 55. Stephensen, 1913: 342. Heegaard, 1947a: 157, pl. xv—xix figs. 111—149; 1947b: 4, figs. 1—7. Kabata, 1959: 249, fig. 1A. Bresciani & Lützen, 1962: 405. Yamaguti, 1963: 276, pl. 239 fig. 1. Kietisinghe, 1964: 50. Pillai, 1967: 1573.

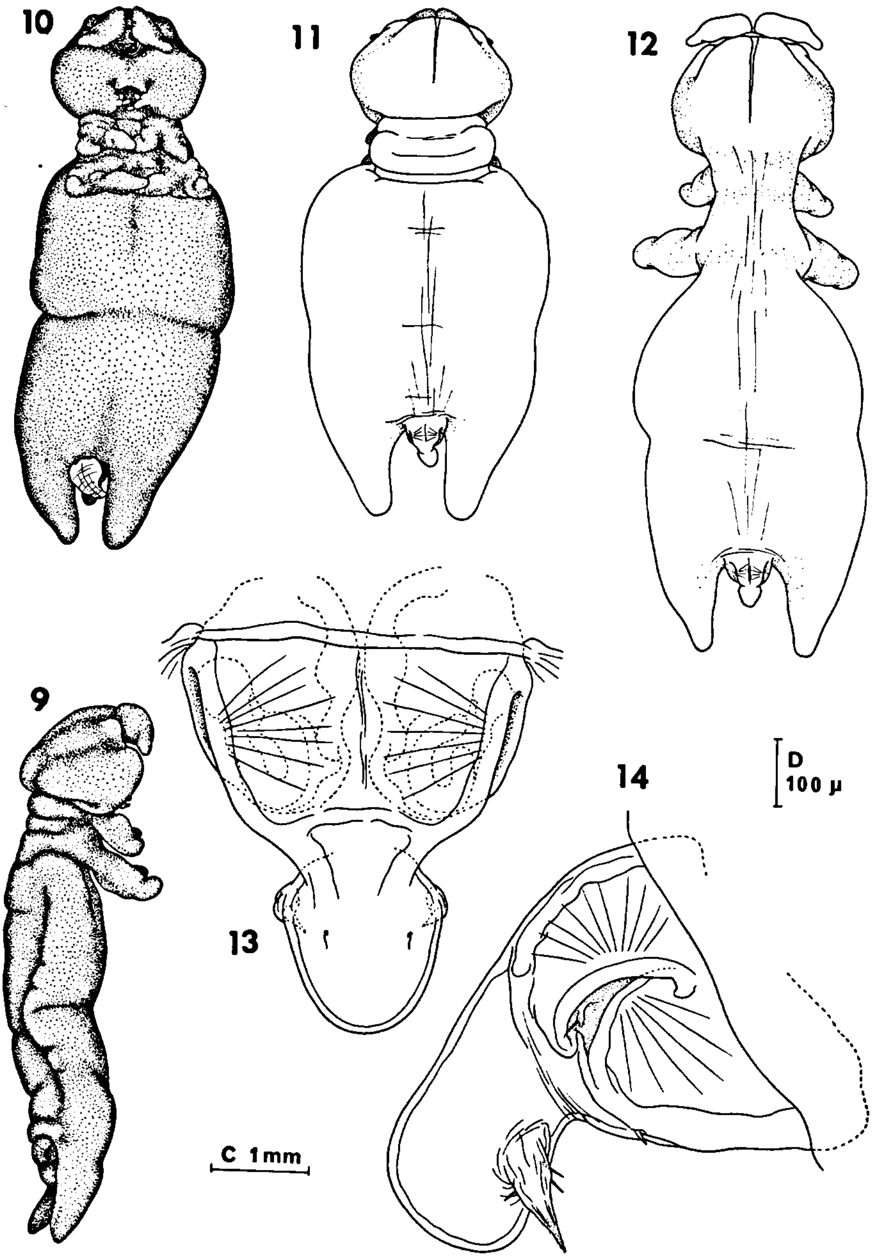
A flurae; Oakley, 1930: 192, figs. 5E—5G. Wilson, 1932: 502, pl. xxxvii figs. f—n. Van Oorde-de Lint & Schuurmans Stekhoven, 1936: 111, fig. 56. Ronald, 1958: 5. Kabata, 1959: 249, fig. 1B. Yamaguti, 1963: 277, pl. 239 fig. 5. O'Riordon, 1966: 375.

A. depressa; Oakley, 1930: 191, figs. 4B, 4E. Wilson, 1932: 503, fig. 299a. El Saby, 1933: 861, pl. i figs. 1—6. Schuurmans Stekhoven, 1934: 361; 1936: 4. Van Oorde-de Lint & Schuurmans Stekhoven, 1936: 109, fig. 55. Kabata, 1959: 249. Yamaguti, 1963: 276, pl. 239 fig. 4.

A. depressa var. *oblongata*; Yamaguti, 1963: 277.

Material examined. — From UZM: 9 ♀ and 3 young ♀ on *Platessa vulgaris* L., Kattegat, Denmark; 4 ♀ on *Hippoglossoides plattessoides* (Fabricus), Greenland; 2 ♀ on "*Platessa halm.*", 1869; 17 ♀ on flounder, 1886; 1 ♀ on *Microstomus kitt* (Walbaum), 1895; 3 ♀ on gills of flounder, 1920. From SSM: 1 ♀ on gills of flounder (No. 55); 2 ♀ on gills of *Pleuronectes flesus* (No. 89); 1 ♀ on gills of *Hippoglossoides limandoides* (Fabricus) (No. 215); 2 ♀ on gills of Flounder (No. 235); 2 ♀ on *P. flesus,* 1899 (labelled as *Ch. depressus,* No. 383). From USNM: 1 ♀ on gills of *H. plattessoides,* Massachusetts Bay, 1878 (No. 60530); 1 ♀ on gills of *Glyptocephalus* sp., Mass. Bay, 1878 (No. 60531); 1 ♀ on gills of *Hippoglossoides* sp., Mass. Bay, 1878 (labeled as *A. depressa,* No. 60532); 10 ♀ in branchial cavities of *Hippoglossus hippoglossus* (L.), Middleton Island, Alaska, September 2, 1914 (No. 60533); 2 ♀ in branchial cavities of halibut, Middleton Island, Alaska (mixed with 8 ♀ of *A. sixteni,* No. 60540); 1 ♀ on gills of *P. quadrituberculatus,* Pallas, Alaska, October 31, 1940 (labeled as *A. depressa,* No. 79694); 1 ♀ on operculum of *H. plattessoides,* Holland, June 30, 1950 (No. 92756); 1 ♀ on gills of *P. flesus,* Holland, June 30, 1950 (labeled as *A. depressa,* No. 92765); 1 ♀ on gills of *P. flesus,* Holland, July 27, 1950 (No. 92763). From author's collection (collected during Cruise 66-3 of R/V Albatross IV): 10 ♀ and 1 young ♀ on bases of gill arches of *H. plattessoides,* Sta. 1—1 (41°43'N 69°43'W → 41°47'N 69°45'W), Sta. 2—2 (41°38'N 68°35'W → 41°40'N 68°37'W). Sta. 4—2 (42°32'N 66°09'W → 42°32' N 66°04'W), and Sta. 5—3 (41°47'N 69°33'W). → 41°47' 69°31'W); 1 ♀ on bases of gill arches of *Glyptocephalus cynoglossus* (L.), Sta. 3—4 (42°13'N 66°42'W → 42°12'N 66°45'W).

Female. — Body (figs. 8—12) varying in size and shape in different states of maturity and contraction. Head wider than long, being slightly protruded in anterior corners and swollen laterally; dorsal surface with longitudinal median sclerite. Second pedigerous segment with transverse furrow on tergal area. Trunk with or without lateral indentation (which indicates division between third and fourth pedigerous segments; extent of this indentation changing with state of maturity). Posterior processes either parallel (fig. 11) or slightly convergent (fig. 8). Genital segment (figs. 13, 14) attached to postero-dorsal surface of trunk and carying 2 elements: one setiform located in egg sac attachment area and another spiniform on midventral surface. Abdomen



FIGS. 9—14. *Acanthochondria cornuta* (Müller), female. 9, a *cornuta*-form with neck region contracted, lateral (A); 10, same ,ventral (A); 11, a *flurae*-form with neck region contracted, dorsal (A); 12, a *flurae*-form with neck region extended; dorsal (C); 13, genito-abdomen, dorsal (D); 14, same, lateral (D).

(figs. 13, 14) globular, bearing a pair of setules on dorsal surface. Caudal ramus (figs. 14, 15) attached to anteroventral surface of abdomen, with 3 setae (1 dorsal, and 2 ventral) and 1 knob on basal portion; terminal portion an attenuated process bearing spinules. Egg sac (figs. 8, 11) cylindrical, longer than body.

First antenna (figs. 16, 17) fleshy, enlarged, and flattened dorsoventrally, with small, conical terminal portion carrying 12 (2-2-8) setules. Second antenna (fig. 18) 2-segmented, terminal segment a slender, recurved hook.

Labrum (see text fig. 3) with a small conical protrusion on lateral surface; posterior margin smooth. Mandible (fig. 19) 2-segmented, terminal segment with 45 teeth on convex side and 40 teeth on concave side. Paragnath (fig. 20) apparently bilobate, only ventral lobe bearing setules. First maxilla bearing 3 different elements as shown in fig. 21. Second maxilla (fig. 22) 2-segmented; first segment robust and unarmed; second segment an attenuated process bearing 1 small, simple seta, 1 large spinulose seta and a row of teeth (ranging from 10 to 15) on posterior surface (in some specimens, a single tooth seen on anterior surface close to tip). Maxilliped (fig. 23) 3-segmented; first segment unarmed, second segment with rows of denticles distributed in two patches, and terminal segment a claw with a small hooklet. A conical median lobe located between bases of second maxillae probably representing labium (see text fig. 4).

Both leg 1 (fig. 24) and leg 2 (fig. 25) bilobate and bearing spinules; outer seta on protopod small. Leg 2 apparently larger than leg 1.

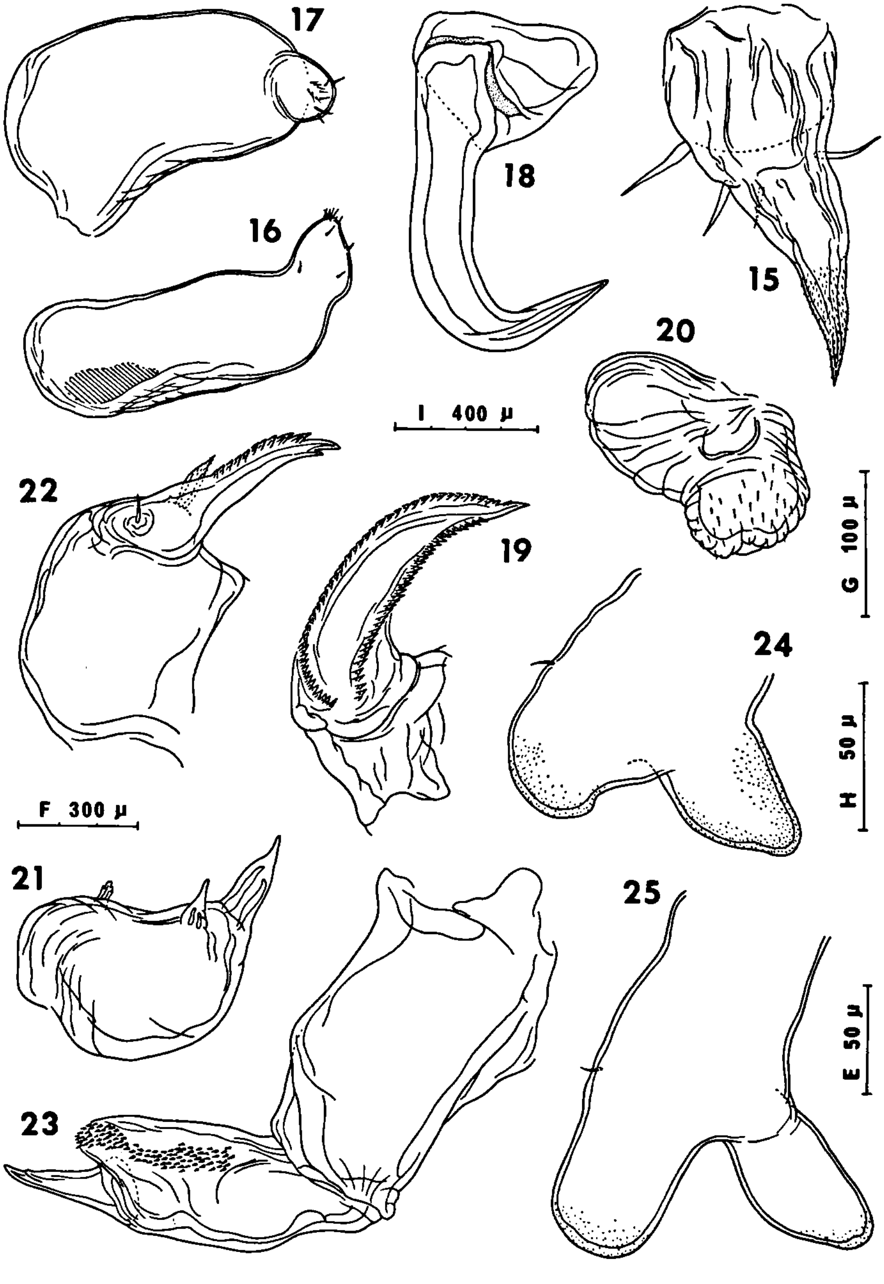
Measurements. — Body 6.59—7.35; head 1.50 × 1.78; genital segment 0.48 × 0.54; abdomen 0.29 × 0.22; egg sacs 10.69 and 10.78; egg 230 μ.

Male. — Body (figs. 26, 27) 0.94 × 0.44, with swollen cephalosome and cylindrical metasome and urosome. Main body flexure located between first and second pedigerous segments. A single setule on lateral surface of third pedigerous segment. No distinct division between metasome and urosome. Genital segment bearing usual ventrolateral ridges, but no setae representing leg 6 seen on them. Abdomen greatly reduced, and indistinguishably fused with genital segment; carrying a pair of setae on dorsal surface. Caudal ramus as in female, but smaller and with much more slender distal process.

First antenna (fig. 28) elongate, cylindrical, and indistinctly tripartite, with armature of 1-1-2-2-8. In some instances, first antenna on one side or both sides atrophied as shown in fig. 29. Second antenna (figs. 28, 29) 2-segmented first segment stout, squarish, and bearing a seta; second segment a recurved hook bearing 2 setae (one inner and other outer). Rostral area with median protrusion located between bases of first and second antennae (see text fig. 2).

Labrum, labium paragnath, first maxilla, and maxilliped as in female. Mandible bearing fewer (10 on concave side and 15 on convex side) but larger teeth than in female. Second maxilla (fig. 31) different from that of female in having naked terminal process.

Leg 1 (fig. 32) saccular and rather rectangular, with protopod bearing a



FIGS. 15—25. *Acanthochondria cornuta* (Müller), female. 15, caudal ramus, lateral (E); 16, first antenna, posterior (F); 17, same, dorsal (F); 18, second antenna, dorsal (D); 19, Mandible, dorsal (G); 20, paragnath, ventral (H); 21, first maxilla, antero-inner (E); 22, second maxilla, ventral (G); 23, maxilliped, anterodorsal (G); 24, leg 1, posterior (I); 25, leg 2, anterior (I).

long outer seta. Exopod a small lobe bearing 1 to 4 elements (usually 3) and endopod a small unarmed conical lobe. Leg 2 (fig. 33) also saccular; protopod with median constriction and bearing a long outer seta; exopod tipped with 2 setules.

Remarks. — An interesting morphological difference in the spinulation of the legs was discovered during the course of this study between the *cornuta*-form and the *flurae*-form specimens from Denmark. That is, there are more and coarser spinules covering the legs in the *flurae*-form than in the *cornuta*-form. This difference is detectable only after clearing the specimens in lactic acid. Curiously, however, the same kind of morphological difference is not found in specimens from North American waters.

A. depressa was described by T. Scott (1905) as characteristically having coarse spinules on the legs, a condition exactly like that observed in the European specimens of *flurae*-form. I have examined the specimens of *A. depressa* deposited in USNM and have found that they are actually *flurae*-form of *A. cornuta*, and that the so called "*A. depressa* v. *oblongata*" is an intermediate form.

There are quite a number of species of *Acanthochondria* which, as far as can be learned from their cursory descriptions, seem to be conspecific with *A. cornuta*. These include species such as *A. barnardi* Capart, 1959, *A. chilomycteri* (Thomson, 1889), *A. compacta* Markewitsch, 1957, *A. deltoidea* (Fraser, 1920), *A. gemina* Heegaard, 1962, etc. Some of these are *cornuta*-form, others *flurae*-form, and still others, intermediate form.

Genus **Acanthochondrites** Oakley, 1930

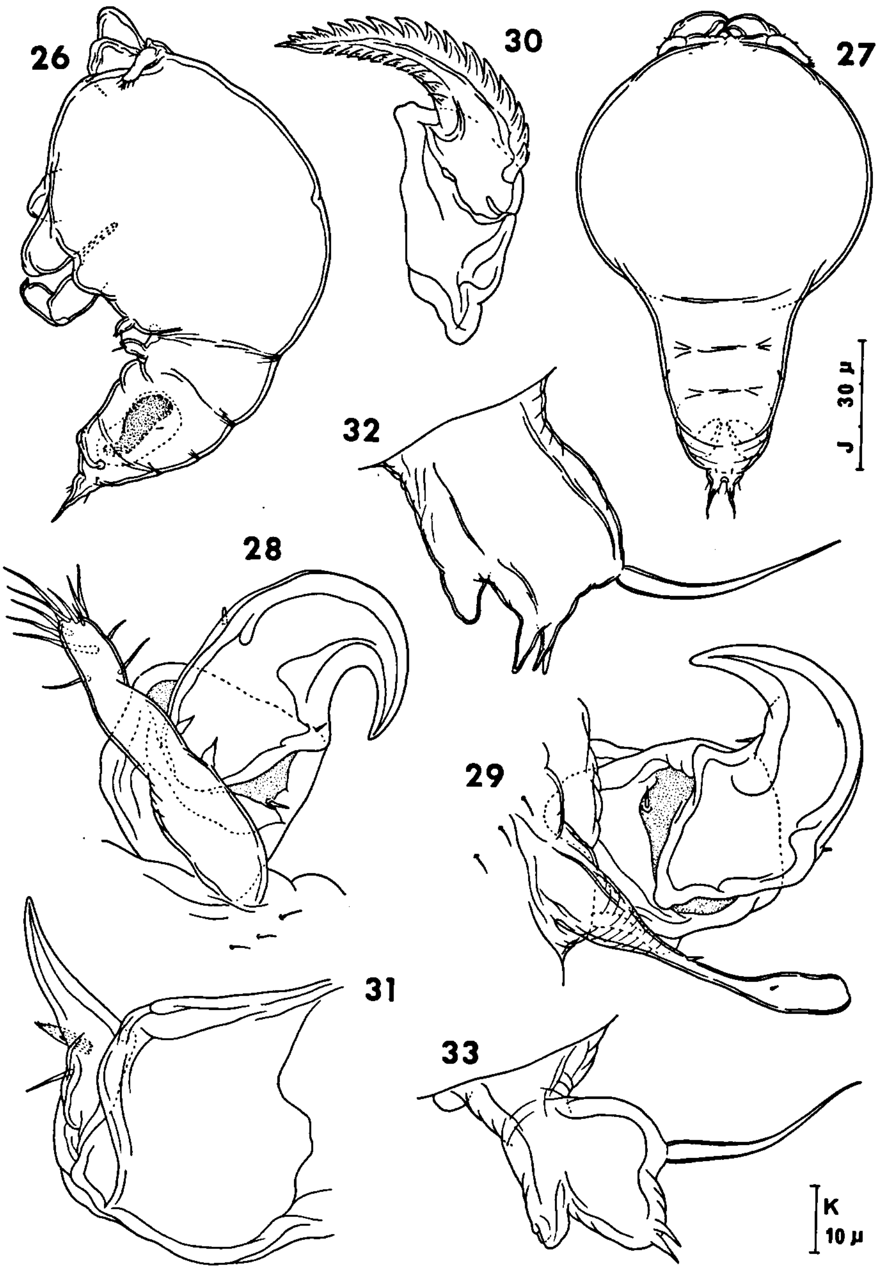
Chondracanthus - Olsson, 1868: 30 (refers to *Ch. annulatus* only).
Acanthochondrites Oakley, 1930: 195.

Female. — Body long, cylindrical, and inflated. Head consisting of cephalosome only; first pedigerous segment forming neck region; and remaining metasomal segments fused into a large trunk, which is trilobate posteriorly, with genito-abdomen attached posteroventrally to the median lobe. Egg sac longer than body, egg multiseriate. All appendages in cephalosome essentially similar to those of *Acanthochondria*. Two pairs of thoracic legs modified, unilobate.

Male. — Indistinguishable from *Acanthochondria*.

Type-species. — *A. annulatus* (Olsson, 1868).

Remarks. — This is the only chondracanthid genus whose species occur exclusively on elasmobranchs. This genus is, as indicated in its generic name, most closely related to *Acanthochondria*. It is distinguishable from the latter, however, in having a median knob at the posterior end of the trunk and two pairs of unilobate thoracic legs. The latter character is shared with only two other genera, namely, *Brachiochondrites* and *Heterochondria*. Although four different species have been recognized in this genus, they in fact belong to one species occurring in different geographical areas.



FIGS. 26—33. *Acanthochondria cornuta* (Müller), male. 26, body, lateral (D); 27, same, dorsal (D); 28, first and second antennae, dorsal (H); 29, atrophied first antenna and normal second antennae, dorsal (H); 30, mandible, dorsal (J); 31, second maxilla, postero-outer (H); 32, leg 1, anterior (K); 33, leg 2, posterior (K).

Upon suppressing the genus *Chondracanthopsis* and realizing "the awkward fact" existing in the species of *Chondracanthus* (with both bilobate and trilobate conditions of legs), Kabata (1968 : 328) raised a question about the validity of a distinction between the genera *Acanthochondrites* and *Acanthochondria*, since they are separated mainly on the structure of the legs, being unilobate in the former and bilobate in the latter. However, if one looks more closely into the differences between the unilobate leg and the bilobate leg, and between the bilobate leg and the trilobate leg, it will become evident that the difference in the former condition is far greater than that in the latter condition. A unilobate leg represents a modified, uniramous leg, while a trilobate leg represents a biramous leg having an outgrowth on the outer surface of the protopodal portion. The difference between the unilobate (uniramous) and the bilobate (biramous) legs is, therefore, more fundamental and significant, and indicates a major change in the course of evolution.

Acanthochondrites annulatus (Olsson, 1868). Figs. 34—49.

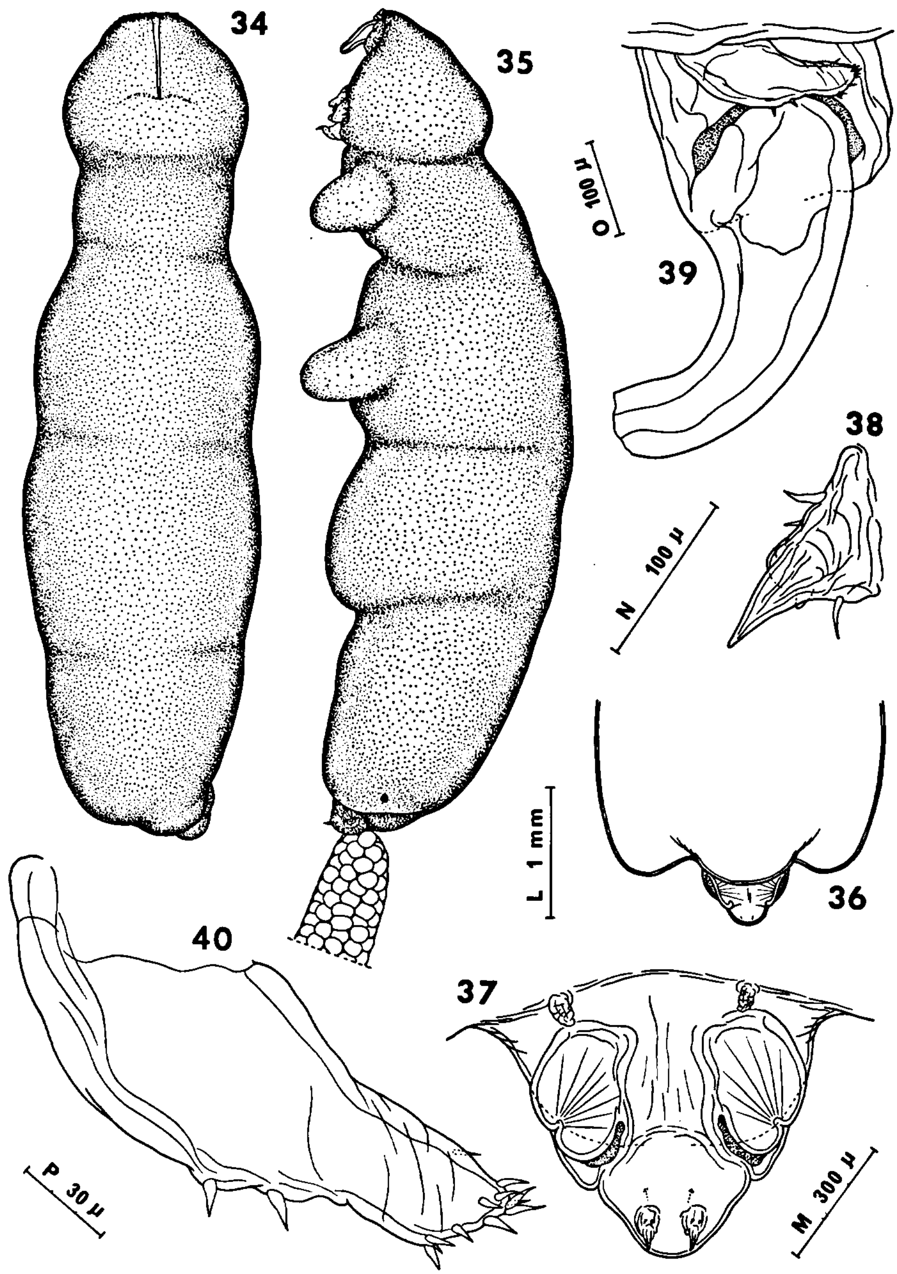
Chondracanthus annulatus Olsson, 1868: 30, pl. ii figs. 13—15. T. Scott, 1900: 164, pl. vii figs. 46—51. Brian, 1906: 97. Norman & Brady, 1909: 405. T. Scott & A. Scott, 1913: 169, pl. xx fig. 9, pl. xlvii fig. 3, pl. lvi figs. 8—10; Rose & Vaissière, 1952: 171.
Ch. laevirajae Valle, 1880: 73. Stossich, 1880: 253.
Ch. inflatus Bainbridge, 1909: 47, pl. ix figs. 9—15. Bere, 1930: 426, pl. i fig. 4.
Acanthochondrites annulatus; Oakley, 1930: 195. Leigh-Sharpe, 1933: 114. Van Oorde-de Lint & Schuurmanns Stekhoven ,1936: 11, fig. 59. Markewitsch, 1956: 98. Yamaguti, 1963: 279, pl. 241 fig. 8.
A. japonicus Gusev, 1951: 406, pl. vii figs. 1—12. Markewitsch, 1956: 99, pl. 48. Yamaguti, 1963: 280, pl. 242 fig. 1.

Material examined. — From. UZM: 1 ♀ on gills of *Raja batis*, Norway, September 8, 1867. From SSM: 1 ♀ on gills of *R. batis*, Norway. (No. 91). From USNM: 2 ♀ on gills of *R. laevis* Mitchell, South Harpswell, Maine, July 15, 1913 (No. 60578).

Female. — Body (figs. 34, 35) rather long and plump. Cephalosome separated from first pedigerous segment, which is smaller than the following segments. Second, third, and fourth pedigerous segments fused to form trunk, with slight indentation at intersegmental regions. Posterior end of trunk (fig. 36) trilobate, with median lobe carrying genito-abdomen, which is preceded by a pair of vermiform processes (fig. 37). Abdomen (fig. 37) short, carrying a pair of dorsal setules. Caudal ramus (fig. 38) indistinctly bipartite: basal part carrying 3 setae (1 dorsal and 2 ventral) and 1 knob, and terminal part a bluntly pointed, smooth process. Egg sac cylindrical and longer than body.

First antenna (figs. 39, 40) minute, with slightly swollen basal portion: armature as in typical chondracanthid, namely, with 2 elements on basal expanded portion and 12 on terminal and subterminal portion. Second antenna (fig. 39) 2-segmented, terminal segment a recurved hook (broken in the specimen figured).

Labrum (fig. 41) with both posterior corners protruded into a small lobe;



FIGS. 34—40. *Acanthochondrites annulatus* (Olsson), female. 34, body, dorsal (B); 35, same, lateral (B); 36, posterior end of body, dorsal (L); 37, genito-abdomen, ventral (M); 38, caudal ramus, lateral (N); 39, first and second antennae, dorsal (O); 40, first antenna, dorsal (P).

posterior margin smooth; tiny lobate sclerite on lateral margin. Mandible (fig. 42) with comparatively fewer teeth, only 21 on convex side and 19 on concave side. Paragnath (fig. 43) a small lobe armed with setules. First maxilla (fig. 44) tipped with 2 elements. Second maxilla (fig. 45) essentially as in *Acanthochondria*, bearing about 9 teeth on terminal process. Maxilliped (fig. 46) with rather short and stubby segments, armature as in typical form.

Leg 1 (fig. 47) and leg 2 (fig. 48) a simple, cylindrical lobe carrying a small outer seta.

Measurements. — Body 10.11; head 1.38 $\times$ 1.98; genital segment 0.41 $\times$ 0.65; abdomen 0.30 $\times$ 0.37; egg sacs 17.69 and 16.89; egg 292 μ.

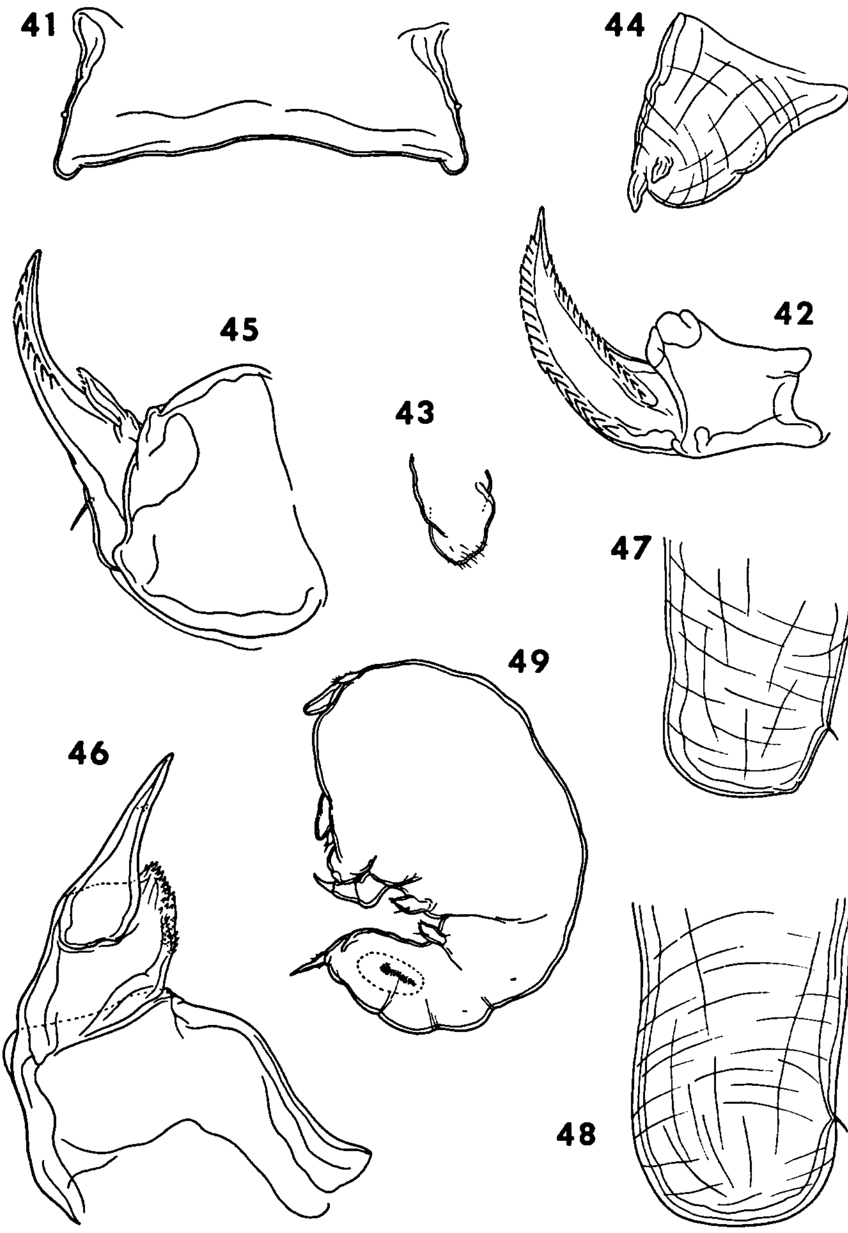
Male. — Body (fig. 49) 1.44 $\times$ 0.65, strongly recurved. First antenna rather short and cylindrical. Second antenna a recurved hook without accessary antennule. Labrum, paragnath, first maxilla, and maxilliped as in female. Mandible as in female but bearing fewer and relatively larger teeth. Second maxilla with smooth terminal process, other armature as in female. Two pairs of thoracic legs as in *Acanthochondria*. Caudal ramus as in female.

Remarks. — This species of chondracanthid is so far known only from elasmobranchs in the Northern Hemisphere. The parasite is usually found on the gills or in the nasal cavities of skates (Rajidae, Rajiformes), but Leigh-Sharpe (1933 : 114) has reported it in the cloaca of a shark, *Galeus vulgaris* Flaming (Lamniformes), from Plymouth, England.

Ch. inflatus was claimed by Bainbridge (1909) to be different from *Ch. annulatus* in two important points: the absence of first antennae and the lack of posterior processes. However, after examining the "cotype" of *Ch. inflatus*, Norman & Brady (1909 : 405) confirmed that it was not different from *Ch. annulatus*. Bere (1930) reclaimed their distinctness, for she found two females from the gills of *R. laevis* resembling to Bainbridge's *Ch. inflatus* in every respect.

One of the two specimens of *A. annulatus* in USNM is abnormally developed in the posterior end of its trunk, as shown in figs. 34 and 35, in lacking posterior processes and the right posterior corner. This specimen is much larger (10.11 mm) than the other normally developed one, which is only 7.76 mm long. The posterior end of the trunk of the latter is not as distinctly trilobate as in the European ones (from UZM and SSM), but rather close to what Bere (1930) has illustrated in her pl. 1 fig. 4. Since the first antenna of this chondracanthid is extremely small, it was probably overlooked by both Bainbridge and Bere. It is noteworthy that Bainbridge's only specimen of *Ch. inflatus* is apparently a young female without fully developed posterior processes, for it is only 5 mm long and without egg sacs, and, moreover, she has stated on p. 45 that: "the ova inside the body were not fully developed". It is, therefore, presumed here that Bainbridge's *Ch. inflatus* is a young form of *A. annulatus* and Bere's *Ch. inflatus* is a misidentification for *A. annulatus*.

A. japonicus was described by Gusev (1951) as lacking the first pair of antennae, but in his pl. 7 fig. 4, they were clearly illustrated together with



FIGS. 41—49. *Acanthochondrites annulatus* (Olsson). Female: 41, labrum, ventral (O); 42, mandible, dorsal (N); 43, paragnath, ventral (N); 44, first maxilla, anteroventral (N); 45, second maxilla, dorsal (N); 46, maxilliped, ventral (N); 47, leg 1, anterior (M); 48, leg 2, anterior (M). Male: 49, body, lateral (M).

the second antennae. Since there are no significant discrepancies left between it and the species under consideration, *A. japonicus* is here proposed as a synonym of *A. annulatus*.

Genus **Andreina** Brian 1939

Andreina Brian, 1939: 184.

Female. — Body elongate, subcylindrical, and without appreciable segmentation. Head region slightly swollen, consisting of cephalosome only. Neck region absent. Pedigerous segments and genital segment fused into a long cylindrical trunk. No body processes present. Abdomen attached to posterior end of trunk, carrying a pair of caudal rami. Egg sacs cylindrical, shorter than body; eggs multiseriate. First antenna without distinct segmentation, armature as in usual chondracanthid form. Second antenna uncinate. Mandible, first maxilla, second maxilla, and maxilliped essentially as in *Acanthochondria*. Two pairs of unmodified, biramous legs present.

Male. — Dwarf, not strongly arched as in typical form. Cephalothorax larger than remaining parts of body. Metamerism on body rather distinct. Caudal ramus lanceolate, rather slender and long. Cephalic appendages essentially as in female. Two pairs of thoracic legs minute and uniramous.

Type-species. — *A. synapturae* Brian, 1939.

Remarks. — So far only one species (parasitic on the gills of a sole, *Synaptura lusitanica* from the coast of Belgian Congo) is known in this genus. The elongate cylindrical body without processes in the female is the most distinctive feature of this parasite. The possession of two pairs of unmodified thoracic legs serves further to distinguish it from the other genera that typically lacks body processes, such as *Blias* and *Heterochondria*.

Yamaguti (1963 : 218) has established a new order Andreinidea to acommodate this genus on the grounds that it resembles the "lernaeid" but is different from it "fundamentally in the female not being permanently fixed to her host, and the male being dwarfed and attached to the female". However, if one takes into consideration the cyclopoid form of the mouth parts, the structure of the two pairs of antennae, together with the fact that the dwarf male is permanently attached to the modified female, one would definitely keep the genus *Andreina* in the family Chondracanthidae as originally treated by Brian (1939). I can see no reasons for excluding *Andreina* from the Chondracanthidae.

Genus **Berea** Yamaguti, 1963

Berea Yamaguti, 1963: 281.
Triphyllacanthus - Bere, 1936: 608 (refers to *T. ancoralis* only).
Pseudochondracanthus - Causey, 1955a: 10 (refers to *P. nellcauseyae* only).
Acanthochondria - Pearse, 1952: 223 (refers to *A. tenuis* only).

Female. — Body oblong, cylindrical. Head consisting of cephalosome only. Neck region (= first pedigerous segment) indistinct. Second, third, and fourth pedigerous segments fused into a large, cylindrical trunk. No body processes present, but anterior corners of head expanded laterally into a spherical protrusion. Genito-abdomen and caudal ramus as in usual form. First antenna modified, fleshy, and carrying usual chondracanthid armature. Second antenna clavate, with small recurved hook. Oral appendages as in *Acanthochondria*. Two pairs of bilobate thoracic legs present.

Male. — Indistinguishable from *Acanthochondria*.

Type-species. — *B. ancoralis* (Bere, 1936).

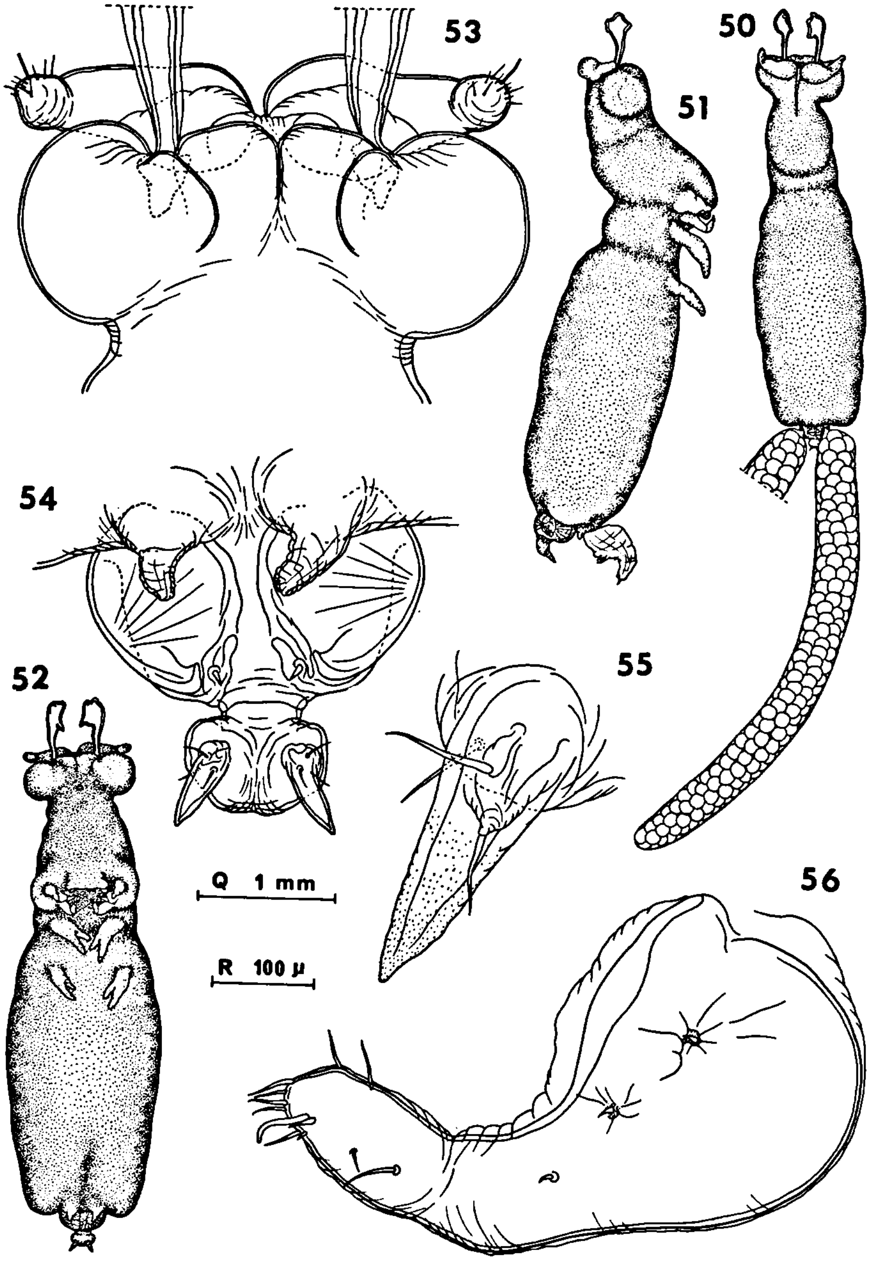
Remarks. — This is a monotypic genus consisting of a species distinguished in having a non-uncinate second pair of antennae and lacking processes on the body. Two other chondracanthid genera, *Blias* and *Diocus*, which also have non-uncinate second antenna, can easily be distinguished from this genus by the possession of an accessary antennule in the male second antenna and non-lobata legs in the female.

Berea ancoralis (Bere, 1936). Figs. 50—71.

Triphyllacanthus ancoralis Bere, 1936: 608, pl. 11 figs. 266—283. Pearse, 1952: 227.
Pseudochondracanthus nellcauseyae Causey, 1955a: 10, pl. 2 figs. 8—12. Yamaguti, 1963: 294.
Acanthochondria tenuis Pearse, 1952: 223, figs. 97—102. Causey, 1955a: 12. Yamaguti, 1963: 278.
Berea ancoralis, Yamaguti, 1963: 281, pl. 243 figs. 1a—1c.

Material examined. — From USNM: 1 ♀ (holotype) on gills of *Ogocephalus* sp., Englewood, Florida (No. 69845); 3 ♀, Lemon Bay and vicinity, Fla., 1934—35 (No. 79088); 1 ♀ on *O. nasutus* (C. & V.). Alligator Harbor, Fl., April 25, 1952 (holotype of *A. tenuis* Pearse, No. 93695); 1 ♀, Pasacagoula, Mississippi (holotype of *P. nellcauseyae* Causey, No. 97618); 1 ♂, Pascagoula, Miss. (allotype of *P. nellcauseyae* Causey, No. 97619); 3 ♀ on *O. radiatus* Mitchill, Pascagoula, Miss. (paratypes of *P. nellcauseyae* Causey, No. 97621); 1 ♀, Pascagoula, Miss. From author's collection: 20 ♀ and 9 young ♀ on tips of gill filements of *O. radiatus*, Marsh's Sound, off Panacea, Fla., July 24, 1965; 2 ♀ and 1 young ♀ on same host, Wilson Beach, Fla., July 16, 1965.

Female. — Body (figs. 50—52) elongate, cylindrical. Head composed of cephalosome only, bearing a pair of lateral globular lobes at anterior portion (fig. 53); posterior portion swollen and protruding posteroventrally (fig. 51), bearing a pair of lateral vermiform processes (figs. 51, 52); median sclerite extending from bases of antennae backward to about center on dorsal surface. First pedigerous segment narrower than head and following thoracic segments. Second pedigerous segment together with remaining thoracic segments fused into trunk, which carries a pair of vermiform processes at midposterior end (see fig. 54). Genital segment (fig. 54) with egg sac attachment area opened on dorsolateral surface. Abdomen (fig. 54) distinctly separated from genital segment by an abruptly narrowed portion. Caudal ramus (fig. 55) covered with refractile points on its distal half and bearing 3 setules on its proximal portion; ramus attached obliquely to posteroventral surface of abdomen. Egg sacs longer than body, with rather few rows of eggs.



FIGS. 50—56. *Berea ancoralis* (Bere), female. 50, Body, dorsal (Q); 51, same, lateral (Q); 52, same, ventral (Q); 53, anterior end of head, dorsal (D); 54, posterior end of body and genito-abdomen, ventral (R); 55, caudal ramus, ventral (H); 56, first antenna, anteroventral (G).

First antenna (fig. 56) unsegmented, with basal portion greatly enlarged and distal half narrowed and turned ventrally; armature being 1-1-1-2-2-8. Second antenna (fig. 57) clavate, with distal surface showing corrugations leading to a spinous margin and with a distinct sharp, small spine on disto-inner surface; entire appendage enclosed in a membranous sheath.

Labrum (fig. 58) with naked posterior margin. Mandible (fig. 59) 2-segmented, terminal segment falcate, with a row of about 60 teeth along posterior margin and another row of about 45 teeth on anterior margin; both rows not reaching tip. Paragnath (fig. 60) an elongated lobe with a small lobe on ventro-inner surface of base, distal surface bearing spinules. First maxilla (fig. 61) an oval lobe, bearing 2 elements at tip and a small protrusion on inner surface of base. Second maxilla (fig. 62) 2-segmented, first segment robust and unarmed, second a blunt process bearing 1 naked small and 1 barbed, large seta on anterodorsal surface. Maxilliped (fig. 63) 3-segmented, proximal segment with spinules on inner surface, middle segment bearing 2 patches of denticles on inner and distal surfaces, and terminal segment a claw bearing a hooklet.

Leg 1 (fig. 64) bilobate, covered with fine hairs; protopod bearing an outer seta and a tiny protrusion on inner surface close to base; exopod larger than endopod and armed with 3 tiny, blunt spinules on distal portion. Leg 2 (fig. 65) as in leg 1, only smaller.

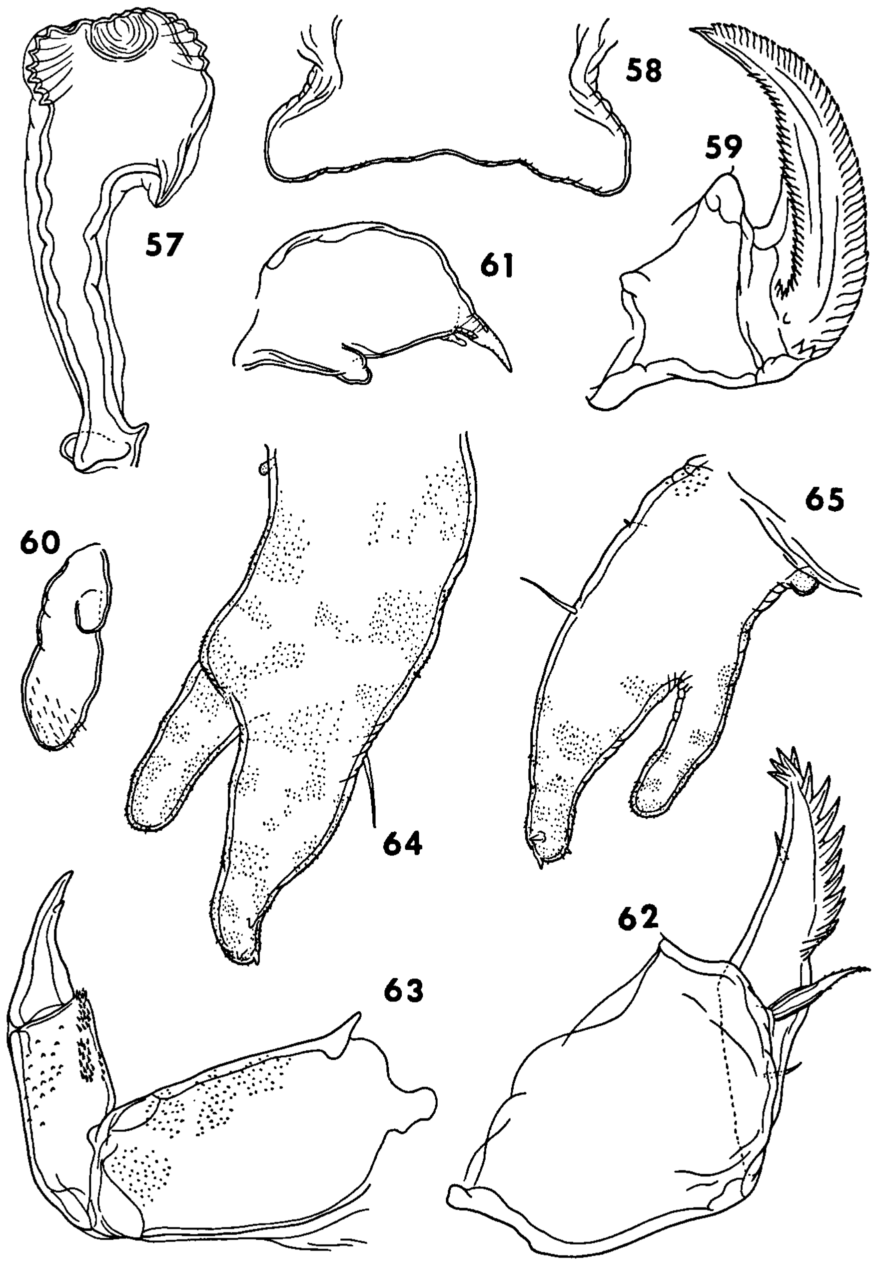
Measurements. — Body 3.87; head 1.31 × 0.68; genital segment 0.21 × 0.34; abdomen 0.11 × 0.14; egg sacs 4.65 and 4.81; egg 160 μ.

Male. — Body (fig. 66) 0.63 × 0.25, strongly arched cephalosome and metasome; widest portion located in posterior part of cephalosome. Division between cephalosome and first pedigerous segment distinct, indicated by a depression on dorsal surface. Metasomal portion incompletely 3-segmented. Last body segment a fused urosome. Genital segment (fig. 67) carrying a small seta on each ventrolateral corner, probably representing leg 6. Abdomen (fig. 67) very short, much wider than long, bearing a pair of setae on dorsal surface. Caudal ramus (fig. 67) as in female.

First antenna (fig. 68) elongate, armed with rather long setae, armature being 1-1-1-2-2-8. Second antenna (fig. 69) 2-segmented, of usual chondracanthid form. Labrum and mouth parts as in female except smaller in size, and usual sexual dimorphism in mandible and second maxilla (with 7 teeth on posterior surface but 3 on anterodorsal surface).

Leg 1 (fig. 70) biramous, protopod armed with a long outer seta and a small lobe on inner basal portion; exopod armed with 2 obtuse spines, of which one is bifurcated; endopod a rounded lobe tipped with a small element. Leg 2 (fig. 71) smaller than leg 1, armature of protopod as in leg 1; exopod carrying only 1 bifurcate spine and endopod a small conical lobe without armature.

Remarks. — Only two of the nine non-ovigerous females collected from Marsh's Sound carried a male. These females differ from ovigerous females in having shorter body ranging from 2.39 tot 2.97 mm. The females car-



FIGS. 57—65. *Berea ancoralis* (Bere), female. 57, second antenna, inner (R); 58, labrum, ventral (G); 59, mandible, dorsal (H); 60, paragnath, ventral (H); 61, first maxilla, posterior (H); 62, second maxilla, dorsal (H); 63, maxilliped, inner (E); 64, leg 1, anterolateral (G); 65, leg 2, posterior (G).

rying no males are further different from the male-carrying females in having the head nearly twice as wide as the trunk. This implies simply that the size of the trunk grows with age.

The reexamination of Causey's type specimens has revealed that his new species *Pseudochondracanthus nellcauseyae* is apparently conspecific with *B. ancoralis*. Causey (1955a) incorrectly interpreted the first pair of legs "maxillipeds". This mistake apparently led him to treat his specimens as a new species of *Pseudochondracanthus*, a genus which characteristically has only one pair of legs. Another species, *Acanthochondria tenuis*, reported by Pearse (1952a), is also conspecific with *B. ancoralis*. Reexamination of the type specimens has disclosed that the second pair of antennae were broken and do not have "a curved terminal claw" as described by Pearse (1952 : 224).

This species is so far known only on bat-fishes (*Ogocephalus* spp.) in the Gulf of Mexico.

Genus **Blias** Krøyer, 1863

Blias Krøyer, 1863: 264.
Trichthacerus Krøyer, 1863: 266.
Triphyllacanthus Oakley, 1930: 200.
Tuccopsis Pearse, 1952: 13.

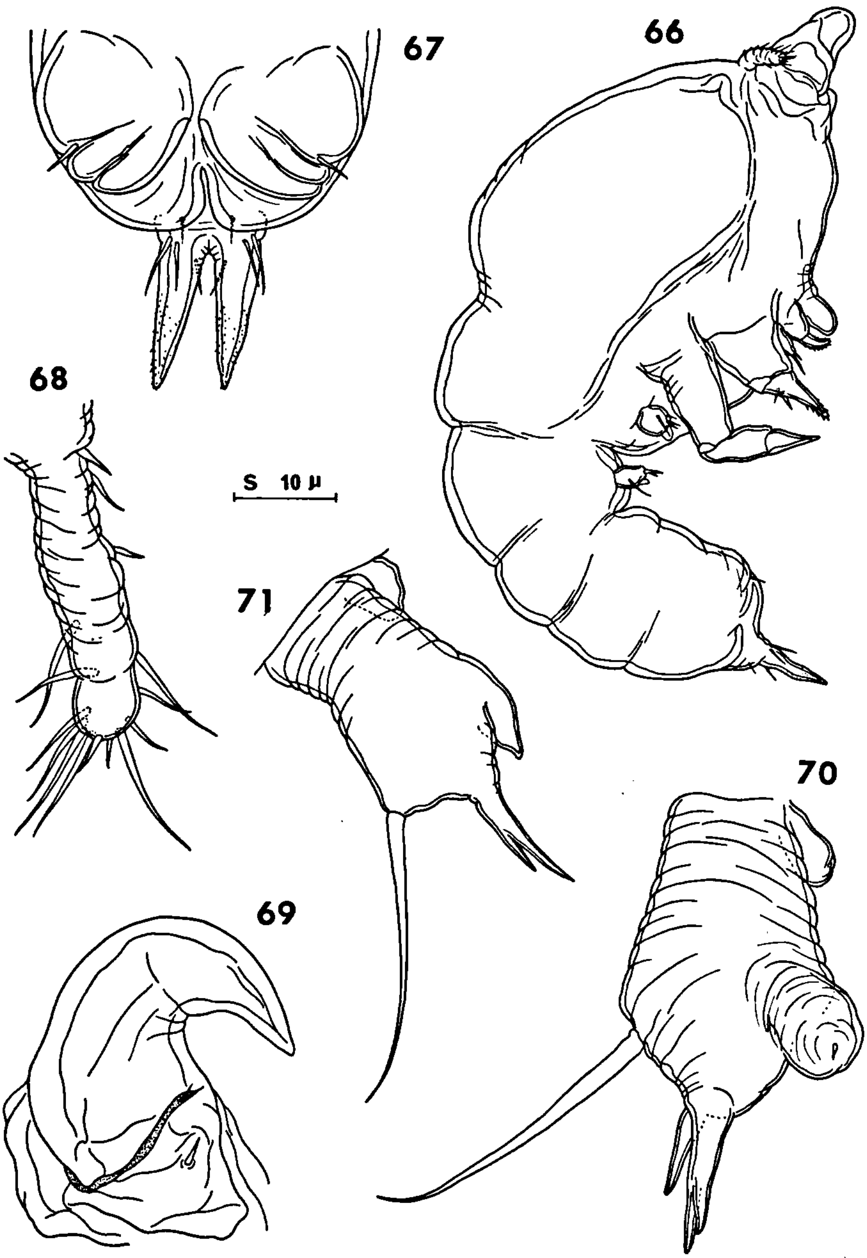
Female. — Body rather short and plump. Cephalosome forming head and first pedigerous segment, a short neck. Remaining metasomal segments fused into a plump trunk. Body processes absent. Genito-abdomen small. Caudal ramus of primitive form, armed with 6 elements. Egg sac much longer than body. First antenna very small, lobate. Second antenna lanceolate, with trifurcate tip. Mandible falcate and bilaterally denticulated. Paragnath absent. First maxilla a knob bearing 2 elements. Second maxilla 2-segmented, terminal segment a process bearing 2 setae and 2 pectinate lamellae. Maxilliped 3-segmented, terminal segment unguiform. Legs 1 and 2 modified, biramose, with large, swollen protopod and rather unmodified rami. Leg 6 represented by 2 setules in egg sac attachment area in genital segment.

Male. — Dwarf, stubby, with indistinct metamerism. Caudal ramus as in female. First antenna slender and cylindrical, bearing usual chondracanthid armature. Second antenna uncinate, with accessary antennule. Oral appendages as in female. Legs 1 and 2 modified, with both rami indistinguishable. Leg 6 represented by 2 setules at posterior corner of genital segment.

Type-species. — *B. prionoti* Krøyer, 1863.

Remarks. — The most remarkable feature of this genus is the trifurcate second pair of antennae. The modified plump body without processes is also very distinctive. So far, only one species is known, a parasite primarily of sea-robins (*Prionotus* spp.).

The reason for synonymizing the genera *Trichthacerus* and *Triphyllacanthus* with this genus has been given in the previous section. The genus *Tuccopsis* will be discussed later in connection with the description of *B. prionoti*.



FIGS. 66—71. *Berea ancoralis* (Bere), male. 66, body, lateral (G); 67, posterior end of body, ventral (H); 68, first antenna, dorsal (K); 69, second antenna, dorsal (J); 70, leg 1, anterolateral (S); 71, leg 2, anterior (S).

Blias prionoti Krøyer, 1863. Figs. 72—93.

Blias prionoti Krøyer, 1863: 336, pl. xii figs. 5a—5f. Bassett-Smith, 1899: 491. Oakley, 1930: 198. Wilson, 1932: 493, fig. 296. Pearse, 1947: 14. Carvalho, 1951: 142. Causey, 1955a: 9; 1955b: 7, figs. 1—7. Vervoort, 1962: 98. Yamaguti, 1963: 281, pl. 243 fig. 3.

Trichthacerus peristedii Krøyer, 1863: 338, pl. xiv figs. 7a—7f. Bassett-Smith, 1899: 491. Yamaguti, 1963: 296, pl. 262 fig. 2.

T. molestus Heller, 1868: 233, pl. xxiii figs. 5, 5a, 6. Bassett-Scmith, 1899: 491.

Triphyllacanthus molestus; Oakley, 1930: 200. Yamaguti, 1963: 297, pl. 262 fig. 3.

Tuccopsis pinguis Pearse, 1952: 14 figs. 28—37. Yamaguti, 1963: 44, pl. 45 fig. 2.

Tucca sp. Pearse, 1952: 12, figs. 23—27.

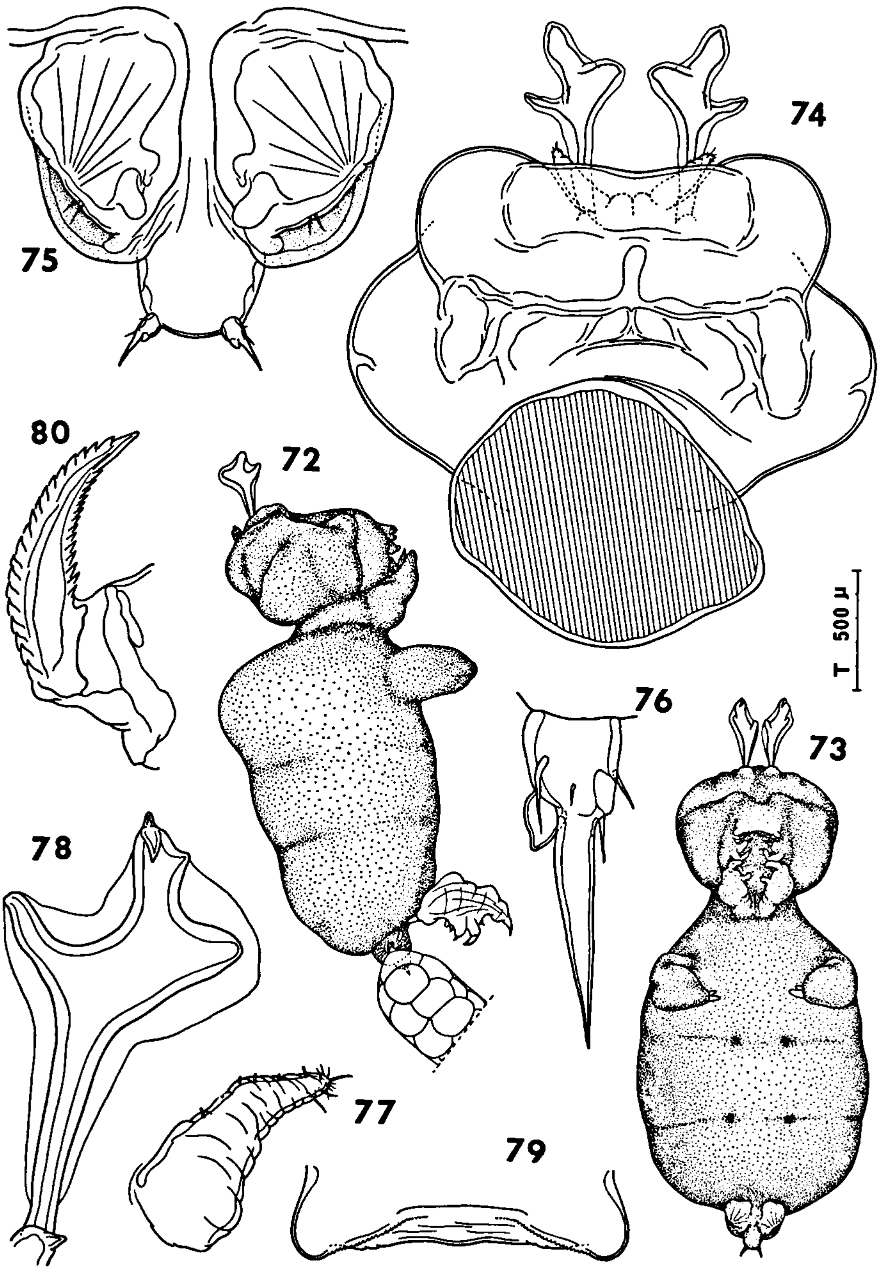
Material examined. — From UZM: 1 ♀ (type) on gills of *Prionotus punctatus* (Bloch), Brazil. From USNM: 1 ♀ on gills of *Prionotus* sp., Woods Hole, Mass., June, 1940 (No. 59774); 2 ♀ on *P. carolinus* (L.), Beaufort, N.C., July, 1946 (No. 83194); 1 ♀ on *P. striatus* (C. & V.), Woods Hole, Mass., August 17, 1950 (No. 91199); 2 ♀ on *P. martis* Ginsberg, Port Aransas, Texas (type of *Tuccopsis pinguis* Pearse, No. 92684); 5 ♀ on gills of *P. pectoralis* Breeker, Port Aransas, Texas (type of *T. pinguis*, No. 92685); 12 ♀ on gills of *Prionotus* sp., Pascagoula, Miss. (No. 96038). From author's collection; 6 ♀ on gills of *P. scitulus* Jordan, Carrabelle Sound, Fla., July 18, 1965: 5 ♀ on gills of *P. tribulus* (Cuvier), Sta. 5774 (28°21'N 80°05'W) of R/V Oregon Cruise 105; 1 ♀ on wall of operculum of *Stephanolepis hispidus* (L.), Sta. 5771 (29°38'N 80° 12'W) of same cruise; 1 ♀ on gill of *P. quiescens* Jordan & Bollman, Sta. 624D (04°53'S 81°17'W of Anton Bruun Cruise 16; 3 ♀ on gills of *Hemianthias peruanus* (Steindachner), Sta. 624E (04°57'S 81°23'W) of same cruise.

Female. — Body (figs. 72, 73) stubby and smooth, without processes or knobs. Head (fig. 74) nearly truncate anteriorly and expanded dorsally and laterally. Neck short and stout. Trunk longer than wide, with swollen antero-dorsal portion. Genital segment (fig. 75) quadrate ,wider than long, carrying 2 setules at posteroventral corner probably representing leg 6. Abdomen (fig. 75) small, completely fused anteriorly with genital segment. Caudal ramus (fig. 76) bearing 6 elements: 4 setules, 1 long terminal spiniform element, and 1 stout, blunt knob. Egg sac cylindrical, nearly twice as long as body, with only several rows of eggs.

First antenna (fig. 77) very small, rather cylindrical, armature being: 1-1-1-1-1-2-1-8. Second antenna (fig. 78) a heavily sclerotized trifurcate process covered with a membrane, bearing a small tooth on medial surface at basal portion. Medial branch of terminal process ending in 2 hooklets.

Labrum (fig. 79) with fine denticles on posterior surface. Mandible (fig. 80) falcate and bilaterally denticulate, with 19 to 21 larger teeth on posterior margin and 14 to 17 smaller teeth on anterior margin. First maxilla (fig. 81) a small knob tipped with 2 short elements. Second maxilla (fig. 82) 2-segmented, with unguiform terminal segment carrying 2 elements (1 spiniform and other setiform) and 2 pectinate lamellae (see fig. 83). Maxilliped (fig. 84) 3-segmented; second segment armed with rows of teeth and unguiform terminal segment bearing a hooklet.

Leg 1 (fig. 85) located in neck region. Segments of protopod fused and enlarged, with 1 outer seta and 1 inner tiny knob. Exopod with 5 spiniform processes and 1 setule; endopod with 1 blunt process and 1 setule; and both



FIGS. 72—80. *Blias prionoti* Krøyer, female. 72, body, lateral (T); 73, same, ventral (T); 74, head, dorsal (D); 75, genito-abdomen, ventral (G); 76, caudal ramus, dorsal (K); 77, first antenna, anterior (G); 78, second antenna, ventro-inner (G); 79, labrum, dorsal (G); 80, mandible, dorsal (H).

rami bearing fine hairs on outer and distal surfaces. Leg 2 (fig. 86) larger than leg 1, with segments of protopod fused, swollen, arched, and carrying 1 small outer setule on distal surface. Exopod (fig. 87) bearing 5 blunt processes and endopod (fig. 87) only 2.

Measurements. — Body 2.31; head 0.49 × 0.17; genital segment 1.18 × 0.26; abdomen 62 × 90 μ; egg sacs 4.68 and 4.92; egg 151 μ.

Male. — Body (fig. 88) 0.47 × 0.31, rather short and stubby. Genital segment (fig. 89) swollen, wider than long, carrying 2 tiny setules at postero-ventral corner probably representing leg 6. Abdomen (fig. 89) rather flattened. Caudal ramus (fig. 89) as in female.

First antenna (figs. 90, 91) elongate, cylindrical; armature: 1-1-1-2-2-1-8. Second antenna (fig. 90) uncinate, with a large accessary antennule tipped with 2 elements.

Mouth parts as in female, only smaller in size and exhibiting usual sexual dimorphism in mandible and second maxilla which has fewer teeth on the two terminal lamellae.

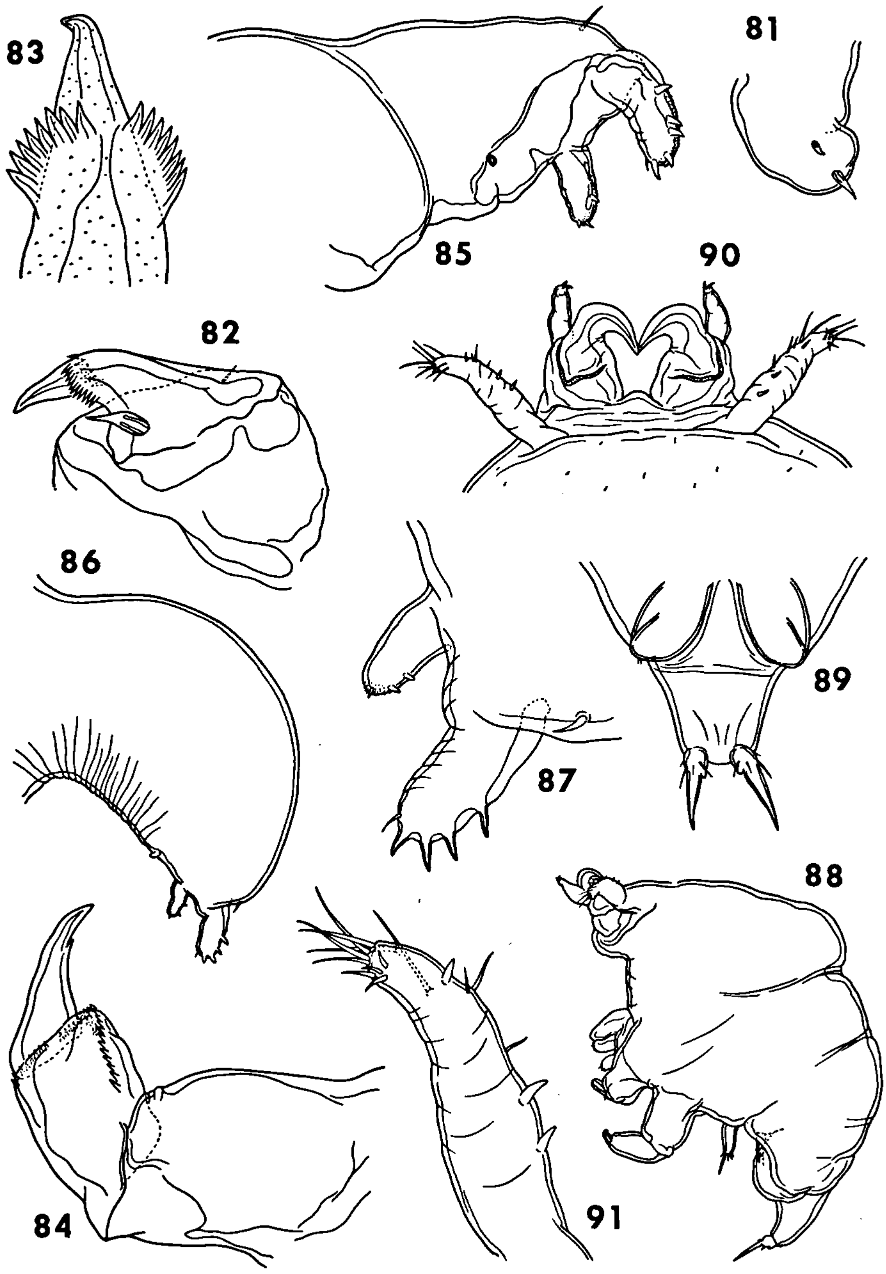
Leg 1 (fig. 92) an elongate process, bearing 1 tooth-like process on inner surface, 1 long outer seta on distal corner, and 5 elements (with 1 bifurcate) on disto-iner corner. Leg 2 (fig. 93) different from leg 1 in having smaller size and only 2 elements (with 1 bifurcate) on disto-inner corner.

Remarks. — Krøyer's type specimen of this species has broken into three pieces, with the anteriormost piece containing the antennal portion still attached to a fragment of gill filament. Fortunately, however, all appendages have remained intact, except the rami of leg 2. I have made a comparative study of this Brazilian specimen with the North American specimens and the Peruvian specimens, and have detected no significant morphological differences.

A reexamination of Causey's specimens (USNM 96038) has disclosed that he made several mistakes in his study of the external morphology of this species (Causey 1955b): the first maxillae in the female were overlooked, and. thus, the second maxillae were incorrectly interpreted as "maxillae", the true maxillipeds as "second maxillae", and the first pair of legs as "maxillipeds". The "maxillipeds" illustrated in his fig. 3 are unmistakably the same pair of appendages here illustrated in fig. 85 as leg 1. He also overlooked the first pair of antennae and stated that these appendages were absent.

A reexamination of Pearse's type specimens (USNM 92684 and 92685) of *Tuccopsis pinguis* has shown that Causey (1955b: 11) was correct in suggesting their identity with *B. prionotus*. It is interesting to note that in the seven specimens of *T. pinguis* mounted on two slides deposited in USNM, all have the characteristic second antennae detached, thus, Pearse was misled to place them under the family Bomolochidae. However, even with the absence of the second antennae, such important features as the modified body, the transformed thoracic legs, the mouth parts, and the attachment of a dwarf male on the posterior part of the body are all unmistakably chondracanthid features.

This species is primarily a parasite of sea robins (*Prionotus* spp.). Although I have recorded it from other fishes it is probably accidental on them.



FIGS. 81—91. *Blias prionoti* Krøyer. Female: 81, first maxilla, anterior (H); 82, second maxilla, posterior (H); 83, terminal portion of second maxilla, ventral (K); 84, maxilliped, anterior (H); 85, leg 1, anterior (G); 86, leg 2, anterior (R); 87, rami of leg 2, anterior (H). Male: 88, body, lateral (R); 89, posterior end of body, ventral (E); 90, rostral area, first, and second antennae, dorsal (G); 91, first antenna, dorsal (J).

Genus **Brachiochondria** Shiino, 1957

Brachiochondria Shiino, 1957: 383.

Female. — Body small and stubby. Head consisting of cephalosome only and divisible into two portions ventrally: a depressed anterior portion (bearing a pair of ventrally turned lateral processes, in addition to two pairs of antenna) and a swollen posterior portion (bearing mouth parts). All metasomal segments fused into a small spherical trunk without processes. A distinct constriction between head and trunk. Genito-abdomen very small, carrying a pair of small, blunt caudal rami. Egg sac sausage-shaped, slightly shorter than body. First antenna fleshy, swollen. Second antenna uncinate. Oral appendages mostly as in typical chondracanthid form, except second maxilla which has a bilaterally denticulated terminal process. Legs absent.

Male. — Dwarf and arched. Cephalothorax indistinctly separated from trunk and occupying most parts of body. Metamerism on body indistinct. Caudal rami as in female. First antenna absent. Second antenna uncinate (with accessary antennule?). Oral appendages as in female, except second maxilla, which has simple terminal process. Legs absent.

Type-species. — *B. pinguis* Shiino, 1957.

Remarks. — Two species are so far known in this genus, but the second species, *B. higanfugu*, is very likely conspecific with the type-species, judging from the description presented by Yamaguti & Yamasu (1959: 133—134). This genus of parasite is known to occur only on the swellfish (*Spheroides* spp.). It is characteristic in having a small body (only about 2 mm long) and lacking thoracic legs all together. Two other genera, *Immanthe* and *Strabax*, also have no thoracic legs, but these can be easily distinguished from *Brachiochondria* by the possession of posterior processes on the trunk.

In Shiino's (1957 : 387, fig. 52) original description of the male of *B. pinguis*, a structure like an accessary antennule (tipped with a short spine) was found on the dorsal surface close to the base of the second antenna. If this is really the case, then the genus *Brachiochondria* would be the ninth genus of chondracanthids in which only the male shows primitiveness in retaining this probably remnant of the exopod seen in the second antenna of the copepodid.

Genus **Ceratochandria** Yü, 1935.

Chondracanthus - Krøyer, 1863: 246 (refers to *Ch. brevicollis* only).
Ceratochondria Yü, 1935: 1.
Pseudochondracanthus - Yamaguti, 1939: 541 (refers to *P. longitruncus* only).

Female. — Body elongate and cylindrical. Head composed of cephalosome only, with rounded lateral swellings. First pedigerous segment narrowed, forming neck region, with or without a dorsal process; remaining pedigerous segments fused into a long cylindrical trunk, without processes. Genital segment as in usual, but abdomen very small. Caudal ramus with large basal portion. Egg sac sausage-shaped. First antenna fleshy. Second antenna bifurcate. Oral appendages of usual form. Leg 1 bilobate; leg 2 biramous, small, and rudimentary.

Male. — As in *Acanthochondria,* except having only one pair of very rudimentary legs.

Type-species. — *C. brevicollis* (Krøyer, 1863).

Remarks. — This is the only known genus of chondracanthids in which the second antenna is bifurcated. The possession of one large lobate leg and another very small rudimentary leg in the female and only one pair of rudimentary legs in the male is also very characteristic. The specimen described by Yamaguti (1939) as *Pseudochondracanthus longitruncus* is very probably a species belonging to this genus. A discussion on this matter will be given in the account of the genus *Pseudochondracanthus.*

Ceratochondria brevicollis (Krøyer, 1863). Figs. 94—98.

Ceratochondria brevicollis Yü, 1935: 2. Yamaguti, 1963: 282, pl. 245 fig. 2.
Chondracanthus brevicollis Krøyer, 1863: 246, pl. xiii figs. 3a—3d. Bassett-Smith, 1899: 493. Yü & Wu, 1932: 60, pl. iii figs. 1—7.

Material examined. — From UZM: 1 ♀ (holotype) on an unknown host from Moluccas, East Indies.

Female. — Body (fig. 94) long and cylindrical. Head (fig. 95) distinctly longer than wide, with rounded lateral bulges in both front and rear. First pedigerous segment narrower than head, bearing a distinct dorsal process (fig. 94). Trunk region consisting of fused second, third, and fourth pedigerous segments, long, cylindrical, and lacking processes. Genital segment (fig. 96) wider than long, with a pair of blunt, hyaline elements on midventral surface as in most species of chondracanthids. Abdomen (fig. 96) very small, bearing a pair of setules on dorsal surface. Caudal ramus (fig. 96) with large rectangular basal portion bearing 3 setules and 1 conical knob; terminal portion a pointed process. Egg sac broken, only a few rows of eggs seen.

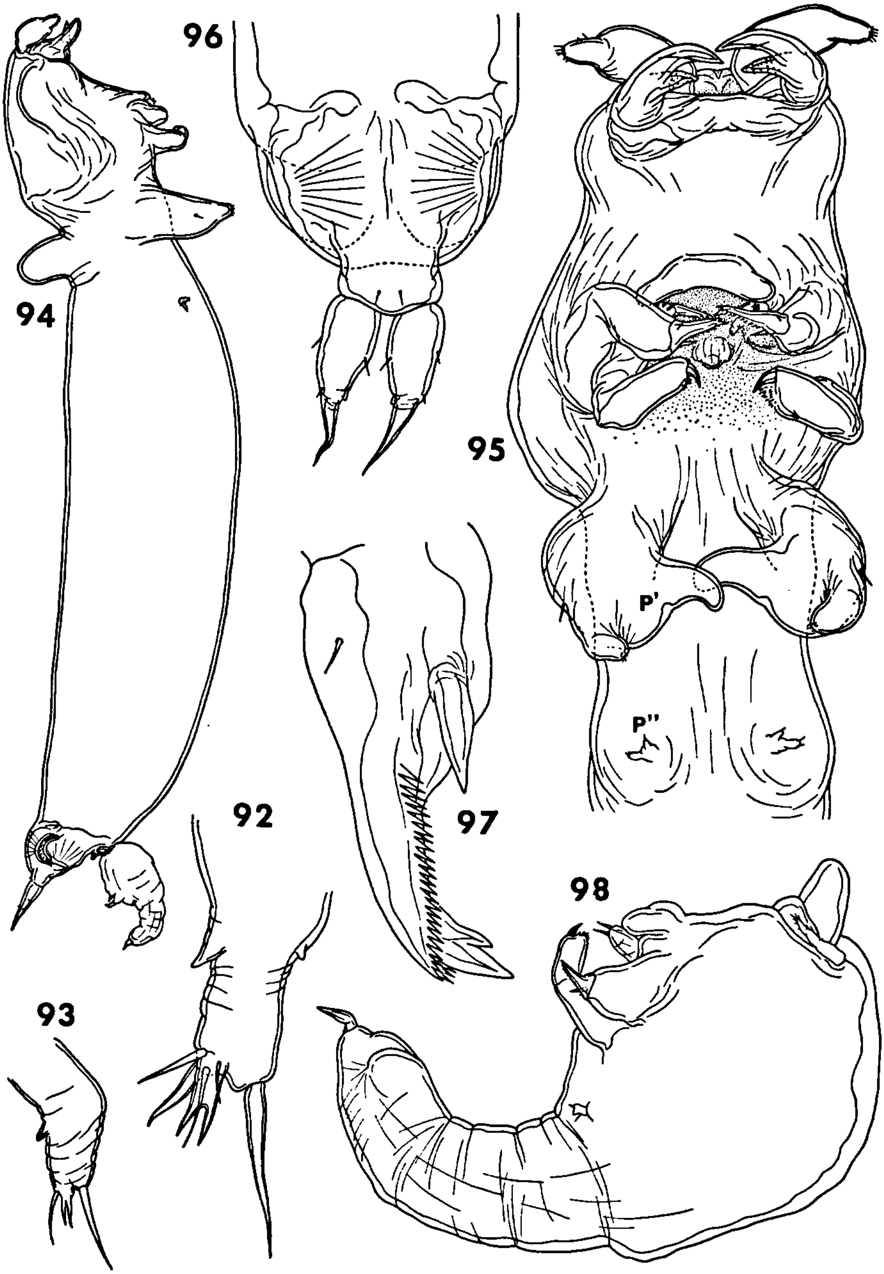
First antenna (fig. 95) fleshy, with swollen, large basal portion and a small, setiferous terminal portion. Second antenna (fig. 99) 2-segmented; proximal segment of usual from, but distal segment bifurcated to form two processes, the smaller proximal process covered with fine spinules.

Labrum, mandible, paragnath, first maxilla, and maxilliped of usual form. Second maxilla (fig. 97) with terminal process armed with a row of fine, pointed spines on one side and large subterminal tooth on other side.

Leg 1 (fig. 95) modified, with a large lobate protopod carrying an outer seta and two small lobate rami; exopod tipped with 5 spinules and endopod naked. Leg 2 (fig. 95) greatly reduced, its exopod tipped with 2 spinules and its endopod with 1 spinule.

Measurements. — Body 2.08 (excluding first antenna and caudal ramus); head 0.52 $\times$ genital segment 132 $\times$ 165 μ; abdomen 33 $\times$ 72 μ.

Male. — Body (fig. 98) of usual form with first pedigerous segment com-



FIGS. 92—93. *Blias prionoti* Krøyer, male. 92, leg 1, anterior (K); 93, leg 2, anterior (K).

FIGS. 94—98. *Ceratochondria brevicollis* (Krøyer). Female: 94, body of holotype, lateral (F); 95, anterior portion of the same, ventral (R); 96, posterior portion of the same, dorsal (G); 97, terminal segment of second maxilla, ventral (K). Male: 98, body of allotype, lateral (E).

pletely fused with cephalosome. Cephalothorax larg, globose; remaining part of body forming a curved, cylindrical "tail". Caudal ramus as in female. First antenna slender and indistinctly segmented. Second antenna uncinate. Oral appendages fundamentally as in female. Leg 1 rudimentary, of usual form. Other legs absent.

Remarks. — There is but one specimen of this species represented in Krøyer's collection deposited in UZM, and, most unfortunately, the egg sacs are broken and the trunk has been compressed laterally. Since this is the only known specimen of *C. brevicollis,* no dissection has been made to attempt a complete redescription. Nevertheless, the above partial description is sufficient to show some distinctive features of this species, and to clarify the doubt that was cast by Yü (1935 : 2) on the identity of the Moluccas' *brevicollis* and the Chinese *brevicollis.*

This species can be easily distinguished from the only known other species of the genus, *C. longitrunca* (Yamaguti, 1939), by the possession of a dorsal process in the neck region.

Genus **Chondracanthodes** Wilson, 1932

Lernaea - Müller, 1776: 226 (refers to *L. radiata* only).
Anops Oken, 1815: 357 (refers to *A. radiatus* only).
Entomoda Lamarck, 1816: 233 (refers to *E. radiata* only).
Lernentoma de Blainville, 1822: 440 (refers to *L. radiata* only).
Chondracanthus - Krøyer, 1963: 251 (refers to *Ch. radiatus* only).
Chondracanthodes Wilson, 1932: 506.

Female. — Body large and plump. Head consisting of cephalosome only, with or without processes. Neck region very short, consisting of first pedigerous segment and bearing a large, dorsal expansion. Trunk consisting of fused second, third, and fourth pedigerous segments, bearing in addition to a posterior process, two lateral processes and one posteromedian expansion. Genito-abdomen and caudal ramus of form usual in chandracanthids. Legs 1 and 2 modified with sowllen protopod and rather small rod-like rami.

Male. — Dwarf and arched. Metamerism distinct only in posterior parts of body. Caudal ramus as in female. First antenna cylindrical, with usual armature. Second antenna uncinate, bearing accessary antennule. Mouth parts essentially as in female and showing usual sexual dimorphism in mandible and second maxilla. Legs 1 and 2 biramous, rather unmodified, with rod-like rami.

Type-species. — *Ch. deflexus* Wilson, 1932.

Remarks. — This genus is closely related to the genus *Chondracanthus,* but it differs from the latter primarily in having a rather primitive condition of the thoracic legs in ooth sexes. While the species of *Chondracanthus* typically have modified lobate legs in the females and reducted legs with rudimentary rami in the male, the members of this genus are distinguished in having rather unmodified or unreduced rod-shaped short rami in both females and males.

The presence of an accessary antennule in the male antenna is also characteristic.

Up to the present, six species of *Chondracanthodes* are known. They are, in addition to the type-species: *bulbosus* Kabata, 1965; *lotellae* (Thomsen, 1889) (transferred by Wilson, 1935); *radiatus* (Müller, 1776) (transferred by Yamaguti, 1963); *rickettsi* Wilson, 1935; and *tuberofurcatus* Kabata & Gusev, 1966. However, I have examined the specimens of *Ch. lotella* and *Ch. rickettsi* deposited in USNM and have found that the former species is in reality a species of *Chondracanthus* and the latter is conspecific with Ch. deflexus. Consequently, there are only four valid species in the genus *Chondracanthodes*.

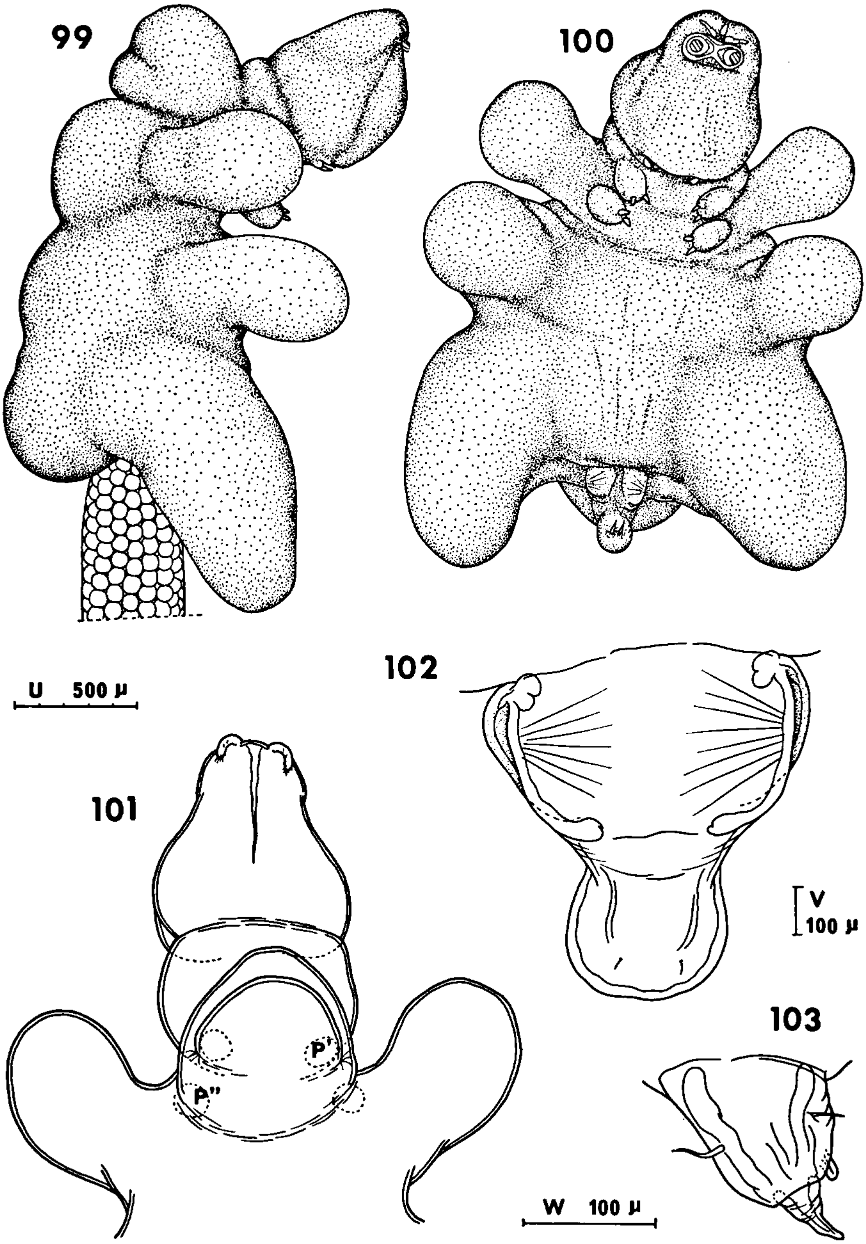
Chondracanthodes deflexus Wilson, 1932. Figs. 99—118.

Chondracanthodes deflexus Wilson, 1932: 506, pl. 28 figs. a—n.
Ch. rickettsi Wilson, 1935b: 787, pl. 29 figs. 69—73, pl. 30 figs. 74—78.
Chondracanthoides deflexus; Oakley, 1930: 199. Yamaguti, 1963: 283, pl. 245 figs. 1 (a—b).
Ch. rickettsi; Yamaguti, 1963: 284, pl. 246 fig. 3.
Chondracanthus radiatus; Brian, 1912: 34, pl. v figs. 6, 7, pl. xi figs. 1a—1d, 2a—2g.

Material examined. — From USNM: 1 ♀ (type) on gill of *Macrurus bairdii* Goode & Bean, Woods Hole, Mass., July 18, 1883 (No. 59779); 1 ♀ on gill of *M. bairdii*, Woods Hole, Mass., 1883 (No. 6116); 1 ♀ on same host and from same locality, 1883 (No. 6117); 1 ♀ on same host and from same locality, 1884 (No. 8455); 1 ♀ on gill of same host and from same locality, 1884 (No. 60538); 1 ♀ on gill of same host and from same locality, 1883 (No. 60539); 1 ♀ in gill cavity of *Malacocephalus abyssorum*, southern Calif. (type of *Ch. rickettsi* Wilson, No. 60536); 6 ♀ in gill cavity of *M. abyssorum*, southern Calif. (paratypes of *Ch. rickettsi* Wilson, No. 60537).

Female. — Body (figs. 99, 100) short and stout. Head (fig. 101) narrow anteriorly but wide and globose posteriorly, its anterior margin protruded into a small rostrum (see fig. 105). First pedigerous segment very narrow, forming a distinct neck region (figs. 99, 101) and bearing a large dorsal expansion (with median indentation assuming a bilobed condition) on its posterior surface. Remaining metasomal segments fused into a trunk. Both second and third pedigerous segments bearing a large, bluntly rounded lateral process. Posterior corner of trunk forming a large, blunt posterior process, and its central portion also protruded into a large median lobe. Cephalon deflexed ventrally in preserved specimens (see fig. 99), degree of flexion variable. Genito-abdomen (figs. 102, 104) short and stout, attached to trunk posteroventrally. Genital segment (fig. 104) bearing a pair of blunt, hyaline setules on ventral surface close to abdomen, which bears a pair of setules on dorsal surface. Caudal ramus (fig. 103) short and stout, proximal portion bearing 3 elements (1 dorsal and 2 ventral, one of which is a conical protrusion), and distal portion a naked spiniform process. Egg sac long, cylindrical, with many rows of eggs.

First antenna (fig. 105) small, cylindrical, armature being: 1-1-1-2-2-8; one of the terminal 8 elements large, spiniform. Second antenna (fig. 105) 2-segmented, terminal segment a recurved hook.



FIGS. 99—103. *Chondracanthodes deflexus* Wilson, female. 99, body, lateral (U); 100, same, ventral (U); 101, anterior part of body, dorsal (U); 102, genito-abdomen, dorsal (V); 103, caudal ramus, lateral (W).

Labrum (fig. 106) with a posteromedial sinus and protruded lateral corners; posterior margin smooth. Mandible (fig. 107) 2-segmented, falcate terminal segment bearing 34 to 36 larger teeth on convex side and 30 to 32 smaller teeth on concave side. Paragnath (fig. 108) a small lobe bearing setules. First maxilla (fig. 108) bearing 2 elements and a median basal lobe. Second maxilla (fig. 10♀) 2-segmented, terminal segment armed with 2 elements at proximal portion and 2 rows of teeth (9 and 3) on distal portion. Maxilliped (fig. 106) of typical chondracanthid form.

Leg 1 (fig. 110) biramous, with inflated protopod carrying a small outer seta and with cylindrical, obtuse endopod and exopod unarmed. Surface of legs covered with fine denticles. Leg 2 similar to leg 1.

Measurements. — Body 8.68; head 0.60 × 0.68; genital segment 0.47 × 0.69; abdomen 0.29 × 0.44; egg sacs 7.25 and 7.54; egg 205 μ.

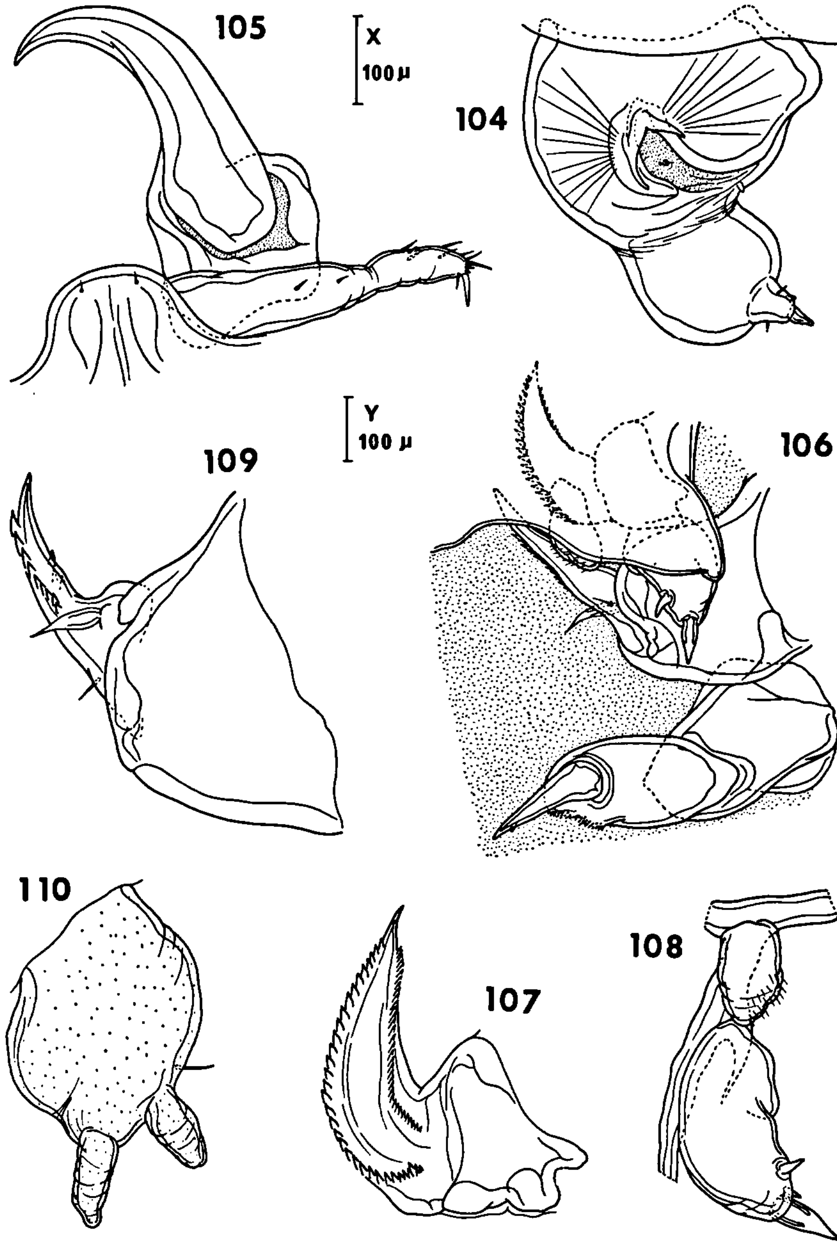
Male. — Body (fig. 111) 1.53 × 0.66, with typical chondracanthid flexure in anterior portion of metasome. Metamerism on body rather distinct. A setule on lateral surface of fourth pedigerous segment, which houses the anterior portion of spermatophores (fig. 112). Genital segment (fig. 112) nearly as long as wide. Abdomen (fig. 112) 1-segmented, narrower than preceding segment, bearing a pair of setules on dorsal surface. Caudal ramus (fig. 112) as in female.

First antenna (fig. 113) long and cylindrical, with armature different from usual chondracanthid form, being 1-1-1-1-2-2-8. Second antenna (fig. 114) 2-segmented, proximal segment with a hyaline setule on dorsomedial surface and distal segment a recurved hook bearing an accessary antennule (tipped with 3 elements) on outer surface and a hyaline seta on inner surface. A median protrusion located between bases of second antennae.

Labrum (fig. 115) bearing a median sclerotized protrusion on anterior surface and a conical protrusion on each lateral margin. Posterior margin convex and unarmed. Mandible (fig. 115) as in female, but with relatively larger and fewer teeth. Paragnath (fig. 115) large and without spinules. First maxilla (fig. 115) bearing 3 elements which are different from those in female. Second maxilla (fig. 116) with typical sexual dimorphism in having simple, smooth terminal process. Maxilliped as in female.

Both pair of legs (figs. 117, 118) biramous, with non-swollen protopod carrying a long outer seta and a duct orifice on anterior surface of basis. First exopod (fig. 117) armed with 5 spines, and second exopod (fig. 118), 3 spines; both rami proper terminating in a spiniform protrusion. Endopods unarmed, having only a patch of spinules on outer-distal surface. Surface of legs sparsely covered with spinules.

Remarks. — I have examined with great care the type and paratypes of *Ch. rickettsi* in USNM, but could find no significant difference between them and the specimens of *Ch. deflexus*, except the size of the body. Their differences in size are as follows:



FIGS. 104—110. *Chondracanthodes deflexus* Wilson, female. 104, genito-abdomen, lateral (V); 105, rostrum, first, and second antennae, anterior (X); 106, mouth parts, ventral (Y); 107, mandible, dorsal (N); 108, paragnath and first maxilla, anteroventral (N); 109, second maxilla, dorsal (N); 110, leg 1, anterior (Y).

		Ch. deflexus	*Ch. rickettsi*
Largest ♀	Body	8.68 × 5.34	13.92 × 6.97
	Egg sacs	7.25, 7.54	15.47 × 15.80
Smallest ♀	Body	6.68 × 4.06	12.43 × 5.58
	Egg sacs	2.03, 2.54	— —
Male		1.53 × 0.66	1.86 × 0.70

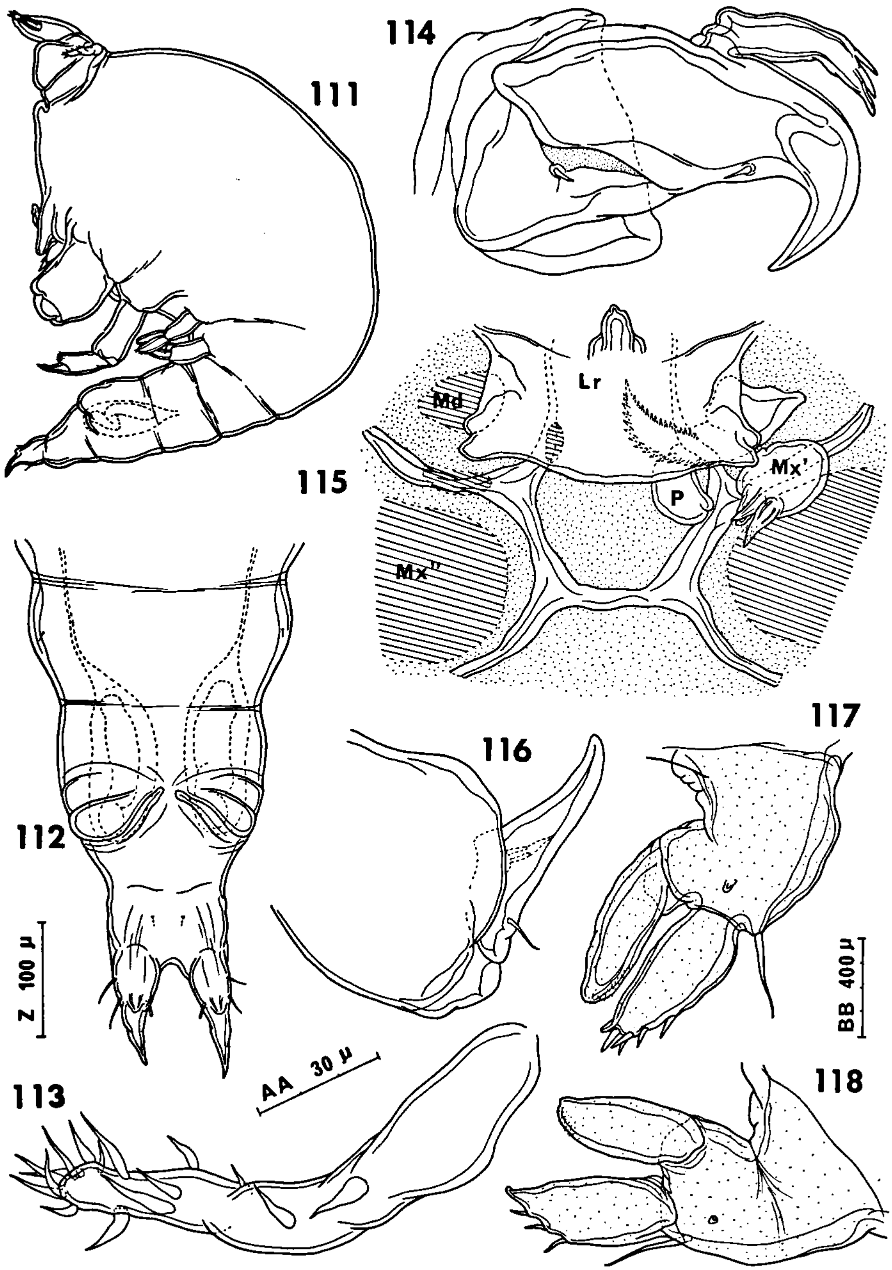
Although the size differences are rather remarkable, I am inclined to consider them as representing geographical variations. Such differences in the body size and the length of egg sacs in the fully grown females of conspecific specimens occurring in different geographical locations is not uncommon among parasitic copepods, particularly in those whose adult females have transformed bodies. For instance, the specimens of *Tucca impressus* Krøyer from the Atlantic coast of North America are larger (body length 2.80 mm and egg sac 3.65 mm) than those found in the Gulf of Mexica (body length 1.67 mm and egg sac 1.22) and in the Caribbean (body length 1.77 mm, egg sac 1.54 mm) (Ho, 1967b).

Ch. deflexus is close to *Ch. bulbosus* Kabata, 1965 in having a pair of very small and rather cylindrical first antennae and no cephalic processes in the head. *Ch. deflexus* is distinguished from it in having the clavate lateral processes much smaller than the posterior processes. In *Ch. bulbosus* these processess are conical and more or less uniform in size with the posterior processes. It is worth noting that *Ch. bulbosus* was described as having the first pedigerous segment incorporated with the cephalosome in forming the head.

Genus **Chondracanthus** Delaroche, 1811

Lernaea - Müller, 1776: 227 (refers to *L. nodosa* only).
Chondracanthus Delaroche, 1811: 270.
Anops Oken, 1815: 357 (refers to *A. nodosa* only).
Entomoda Lamarck, 1816: 233 (refers to *E. nodosa* only).
Lernacantha de Blainville, 1822: 442.
Disphaerocephalus Oakley, 1930: 197.
Chondracanthopsis Wilson, 1932: 508.
Acanthocanthopsis Heegaard, 1945: 20.
Barnardia Yamaguti, 1963: 280.
Protochondracanthoides Yamaguti, 1963: 293.

Female. — Head consisting of cephalosome only, with or without processes. First one or two peidgerous segments narrower than the following segments, thus forming a neck region; remaining pedigerous segments enlarged, forming trunk region. Body processes present, variable in number and arrangement in different species. Genital segment and abdomen fused into an unit attached to posteroventral surface of trunk. Caudal ramus spiniform, bearing 3 or 4 elements on basal portion. Egg sac cylindrical, or twisted; eggs multiseriate.



FIGS. 111—118. *Chondracanthodes deflexus* Wilson, male. 111, body, lateral (V); 112, urosome, ventral (Z); 113, first antenna, anterodorsal (AA); 114, second antenna, anterodorsal (BB); 115, mouth parts, ventral (N); 116, second maxilla, ventral (N); 117, leg 1, anterior (BB); 118, leg 2, anterior (BB).

First antenna fleshy, cylindrical, or swollen. Second antenna 2-segmented, with uncinate terminal segment. Mandible with terminal falciform portion bilaterally denticulated. Paragnath a small lobe armed with spinules. First maxilla a small lobe bearing 2 or 3 elements. Second maxilla 2-segmented, terminal segment bearing a row of teeth and 2 elements. Maxilliped 3-segmented, terminal segment a small claw. Legs 1 and 2 modified, fleshy, either bilobate or trilobate; protopods carrying an outer seta.

Male. — Cephalosome fused with first pedigerous segment, globose. Metamerism on body rather indistinct. Genital segment and abdomen indistinguishably fused. Caudal ramus as in female. First antenna cylindrical and slender. Second antenna uncinate, with or without accessary process. Oral appendages essentially as in female, except for usual sexual dimorphism in mandible and second maxilla. Legs 1 and 2 transformed, rudimentary, with sac-like protopod carrying a long outer seta and small lobate rami tipped with few elements.

Type-species. — *Ch. zei* Delaroche, 1811.

Remarks. — This genus as it now stands is still quite heterogenic in its constituents, in spite of subdivisions of the genus having been proposed by Oakley (1930) and Yü (1935). It is interesting to note that since its erection by Delaroche in 1811, 79 species of *Chondracanthus* have been named, but only 23 of them are remain valid in the genus. Of the removed species, 25 of them are synonymized with other species of *Chondracanthus* and the remaining 31 species are transferred to 9 subsequently created genera.

Kabata (1968 : 328) has called attention to "the awkward fact" of the leg structure existing in this genus. He pointed out that "of all the species of *Chondracanthus* known at the present time, there are only two with the peculiar tripartite leg structure". From my study on the transformation of *Chondracanthus ornatus* T. Scott, which is another species with tripartite legs formerly referred to another genus *Disphaerocephalus*, I have found that at the beginning of transformation of the adult female, both legs are unmistakably bilobate, but, as the copepod grows and transforms further by developing more body processes, the outer surface of the protopodal region shows a hump, which grows into a distinct digitiform process. This process together with the original bilobate condition of leg makes it appear trilobate. Thus, the so-called "awkward fact" of the structural difference in the legs is not as fundamental and significant as the difference between the uniramous (unilobate) and the biramous (bilobate) condition (as between *Acanthochondrites* and *Acanthochondria*), and, in my opinion, should not be used as basis for subdivision of *Chondracanthus*.

The real awkward fact in species of *Chondracanthus* is the presence of an accessary antennule in the male second antenna of only two species: *Ch. cottunculi* Rathbun, 1886 and *Ch. pinguis* Wilson, 1912. However, as discussed above, without knowledge of the true nature of this accessary antennule, it is much too venturesome to use this feature as a measure for subdivision of this genus.

Chondracanthus zei Delaroche, 1811. Figs. 119—122.

Chondracanthus zei Delaroche, 1811: 270, pl. ii figs. 2, a—c. Lamarck, 1816: p. 682. Guérin-Meneville, 1829—1843, pl. ix fig. 9. Burmeister, 1833: 325. Krøyer, 1835: 196. Baird 1850: 327, pl. xxxv fig. 1. Van Beneden, 1851: 110, pl. iv figs. 5—7; 1861: 152, Vogt, 1877: 80, pl. v figs. 5—8. Richiardi, 1880: 151. Valle, 1880: 73. Stossich, 1880: 253. T. Scott, 1892: 262; 1906: 372. Bassett-Smith, 1896: 162. Brian, 1906: 98. Norman & Scott, 1906: 217. T. Scott & A. Scott, 1913: 177, pl. xli fig. 5, pl. lvi fig. 13. A. Scott, 1929: 102. Oakley, 1930: 187. Leigh-Sharpe, 1926: 383; 1934b: 113. Van Oorde-de Lint & Schuurmans Stekhoven, 1936: 109, fig. 50. Yamaguti, 1939: 533, pl. xxxv fig. 17: 1963: 272, pl. 248 fig. 4. Rose & Vaissiére, 1952: 171. Capart, 1959: 111. Krishnaswamy, 1959: 263. O'Riordan, 1966: 375. Kabata, 1968a: 328, figs. 74, 75.

Ch. zeus; Bassett-Smith, 1899: 495. T. Scott, 1900: 167, pl. viii fig. 1.

Lernacantha delarochiana de Blainville, 1822: 442, figs. 13, a—b. Desmarest, 1825: 350.

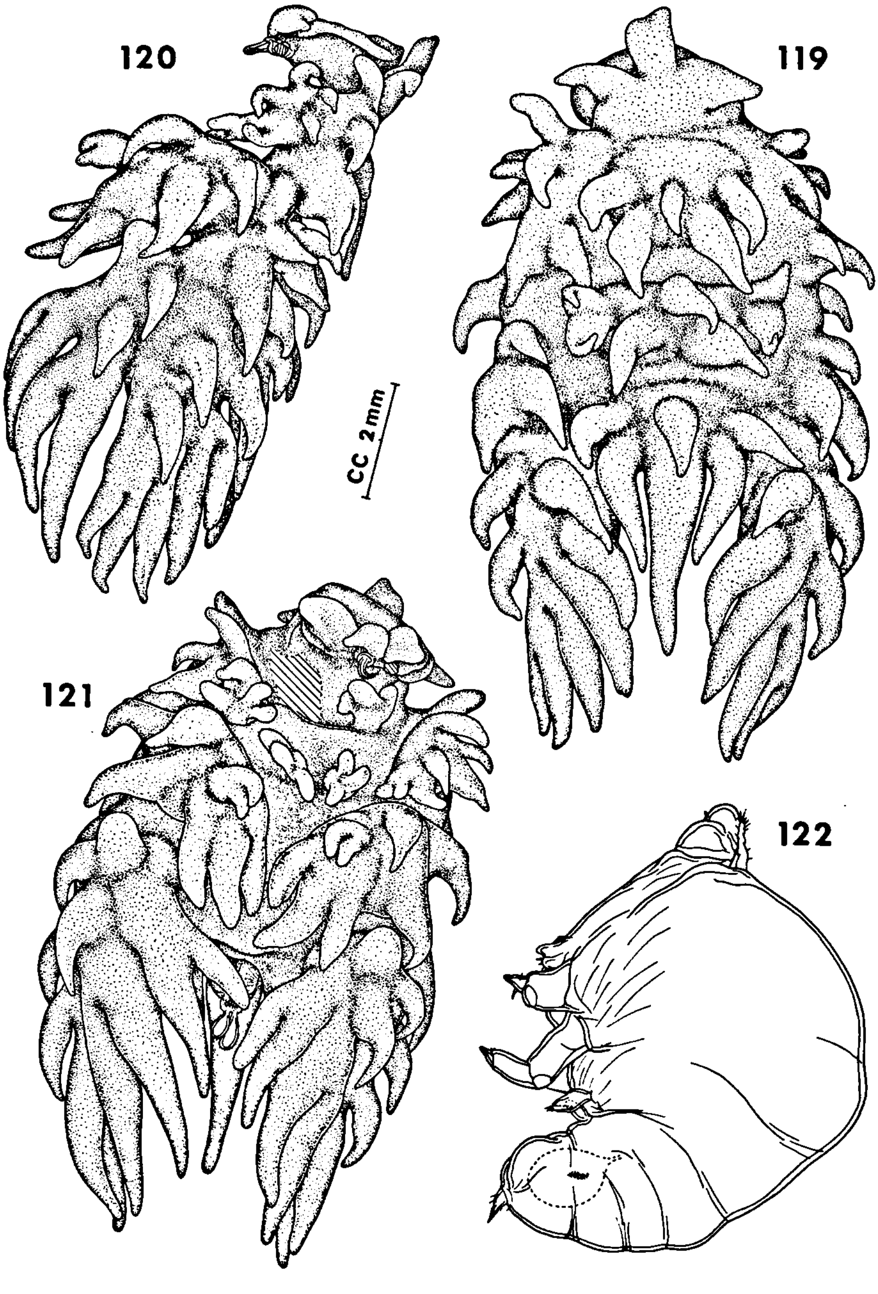
Material examined. — From SSM: 1 ♀ on *Zeus faber* L., Skagen, Denmark, November, 1891 (No. 263). From UZM: 1 ♀ from Cornwall, England, November 10, 1917.

Female. — Body (figs. 119—121) large, with numerous processes. Head (deflected ventrally in both alcoholized specimens examined) distinctly wider than long, with swollen lateral surfaces but without processes. First pedigerous segment smaller than following segments, bearing 3 dorsal processes; remaining pedigerous segments fused into a voluminous multilobate trunk, with each segment still identifiable by the three patches of dorsal processes (see fig. 119). Second and third pedigerous segments (on trunk region) bearing three main sets of processes: dorsal, anteroventral, and posterolateral. Dorsal set of both segments consisting of 5 processes (see fig. 119) (1 median and 2 lateral on each side), which are simple in the second pedigerous segment, but in the third pedigerous segment the two anterolateral ones are bifurcated. Anteroventral set of second peidgerous segment consisting of 8 small processes (with 1 of them bifurcate), but that of third pedigerous segment consisting of 7 larger processes (with 1 bifurcate). Posterolateral set of second pedigerous segment consisting of 2 processes and that of third pedigerous segment consisting of 3 processes. Fourth peidgerous segment bearing a set of 6 simple dorsal processes (fig. 119), with the large posteromedial one greatly extended backwards. Posterior process multilobate, apparently divided into two main sets (see fig. 120), the dorsal set consisting of 8 processes, and the ventral set, 7 processes. No processes found on midventral portion of trunk. Two pairs of legs modified, trilobate.

Measurements. — Body 11.03; head 1.86 × 2.88.

Male. — Body (fig. 122) stout, 0.76 in length, with swollen cephalothorax much larger than remainder of body. Abdomen very small and indistinctly fused with genital segment. Caudal ramus as in most species of *Acanthochondria* First antenna filiform, more setose than in female. Second antenna uncinate. Labrum with a small median knob. Second maxilla without teeth on terminal process. Two pairs of rudimentary modified legs present, both bearing a long outer seta on protopod; leg 1 apparently larger than leg 2.

Remarks. — Unfortunately, because of the scarcity of specimens, I was



FIGS. 119—122. *Chondracanthus zei* Delaroche. Female: 119, body, dorsal (CC); 120, same, lateral (CC); 121, same ventral (CC). Male: 122, body, lateral (D).

not able to make dissections and carry out a study of the fine structure of the appendages, which so far as I am aware has never been done on this species.

The large number and the complex arrangement of the body processes in *Ch. zei* easily distinguishes this species from all others of the genus.

The species named *Lernacantha delarochiana* by de Blainville (1822 : 442) is apparently identical with this species. Blainville stated that his species was first found in the Mediterranean by Delaroche. De Blainville's statement that it was found on "les branches du thon" and his further statement that it was found also on the gills of *Squalus* are highly doubtful, for *Ch. zei* has been known so far only on the fishes of the family Zeidae.

Bassett-Smith (1899) listed *Ch. tuberculatus* von Nordmann, 1832 as one of the synonyms of *Ch. zei*, and his opinion was followed by *Yamaguti* (1963 : 272). Von Nordmann's specimen was taken from the "Kiemenhaut" of "*Taenianotus (Coryphaena) torvus*" (= *Congiopodus torbus* (Walbaum)) in South Africa, and he stated that it was most closely related to *Ch. zei*. I have studied very carefully the original description of *Ch. tuberculatus* (von Nordmann, 1832 : 181—121; no illustration given) and have found that it is not at all conspecific with *Ch. zei*, but rather close to what Barnard (1955 : 288) has described as *Ch. congiopodi*. A reexamination of the type specimens of *Ch. congiopodi* has revealed that *Ch. tuberculatus* is a senior synonym of *Ch. congiopodi*.

Genus **Diocus** Krøyer, 1863

Lernaea - Müller, 1776: 226 (refers to *L. gobina* only).
Anops Oken, 1815: 357 (refers to *A. gobina* only).
Entomoda Lamarck, 1816: 233 (refers to *E. gobina* only).
Lernentoma de Blainville, 1822: 440 (refers to *L. gobina* only).
Diocus Krøyer, 1863: 259.
Parapharodes Shiino, 1960a: 92.

Female. — Body with short and wide (transversely elongated) trunk bearing large processes. Head small, consisting of cephalsome and first pedigerous segment, with or without a pair of small processes. Remaining pedigerous segment fused into trunk, which is divided into an anterior narrower portion and a posterior horseshoeshaped portion with large posterior processes; two pairs of lateral processes present. Genital segment much wider than long, but abdomen extremely small or indistinct. Caudal ramus with long, slender, terminal processes. Egg sacs cylindrical, straight or spirally twisted. First antenna filiform, distinctly segmented. Second antenna with T-shaped terminal segment. Oral appendages of usual form. Two pairs of leg rudiments present, very small.

Male. — Dwarf, arched; with rather distinct metamerism on body. Abdomen small. Caudal ramus as in female. First antenna distinctly segmented and more setose than in female. Second antenna uncinate, with accessary antennule. Oral appendages as in female, with usual sexual dimorphism in mandible. Legs present, except leg 4; all rudimentary.

Type-species. — *D. gobinus* (Müller, 1776).

Remarks. — The chief distinguishing characters of this genus are the filiform and segmented first antenna, the hammer-like (or T-shaped) second antenna, the horseshoe-shaped posterior portion of the trunk in the female, and the possession of all leg rudiments except leg 4 in the male. The genus as it stands now contains four species, namely, in addition to the type-species, *D. frigidus* Hansen, 1923, *D. sadoensis* (Shiino, 1960), and *D. semiluaris* (Kabata & Gusev, 1966).

Diocus gobinus (Müller, 1776). Figs. 123—146.

Lernaea gobina Müller, 1776: 226; 1788: 39, pl. xxxiii fig. 3. Krøyer, 1835: 280, pl. ii fig. 8, pl. iii figs. 12 a—d.

Anops gobina; Oken, 1815: 357.

Entomoda gobina; Lamarck, 1816: 233.

Lernentoma gobina; de Blainville, 1822: 440.

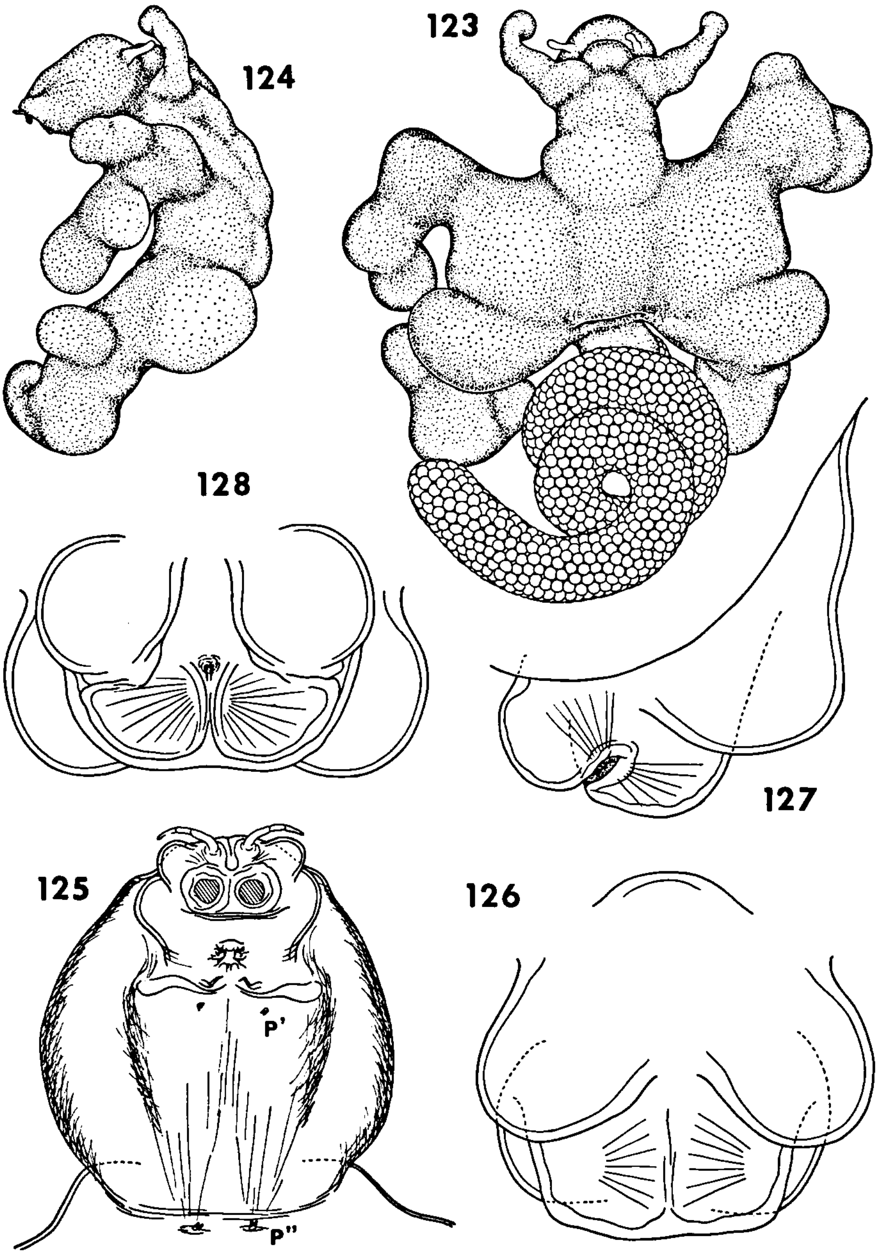
Diocus gobinus; Krøyer, 1863: 259. Steenstrup & Lütken, 1861: 423, pl. xv fig. 39. Bassett-Smith, 1899: 495. Stephensen, 1913: 340. Wilson, 1920: p. 7. Hansen, 1923: 48, pl. iii figs. 7 A—C. Oakley, 1930: 199. Yamaguti, 1963: 285, pl. 250 fig. 3.

Material examined. — From UZM: 4 ♀ from Greenland; 8 ♀ and 6 young ♀ in branchial cavity of *Gymnocanthus tricuspis* (Reihnard), Greenland; 8 ♀ and 1 young ♀ on *G. tricuspis*, Godhavn, Greenland. From SSM: 1 ♀ and 1 young ♀ on *G. tricuspis*, Greenland (No. 536).

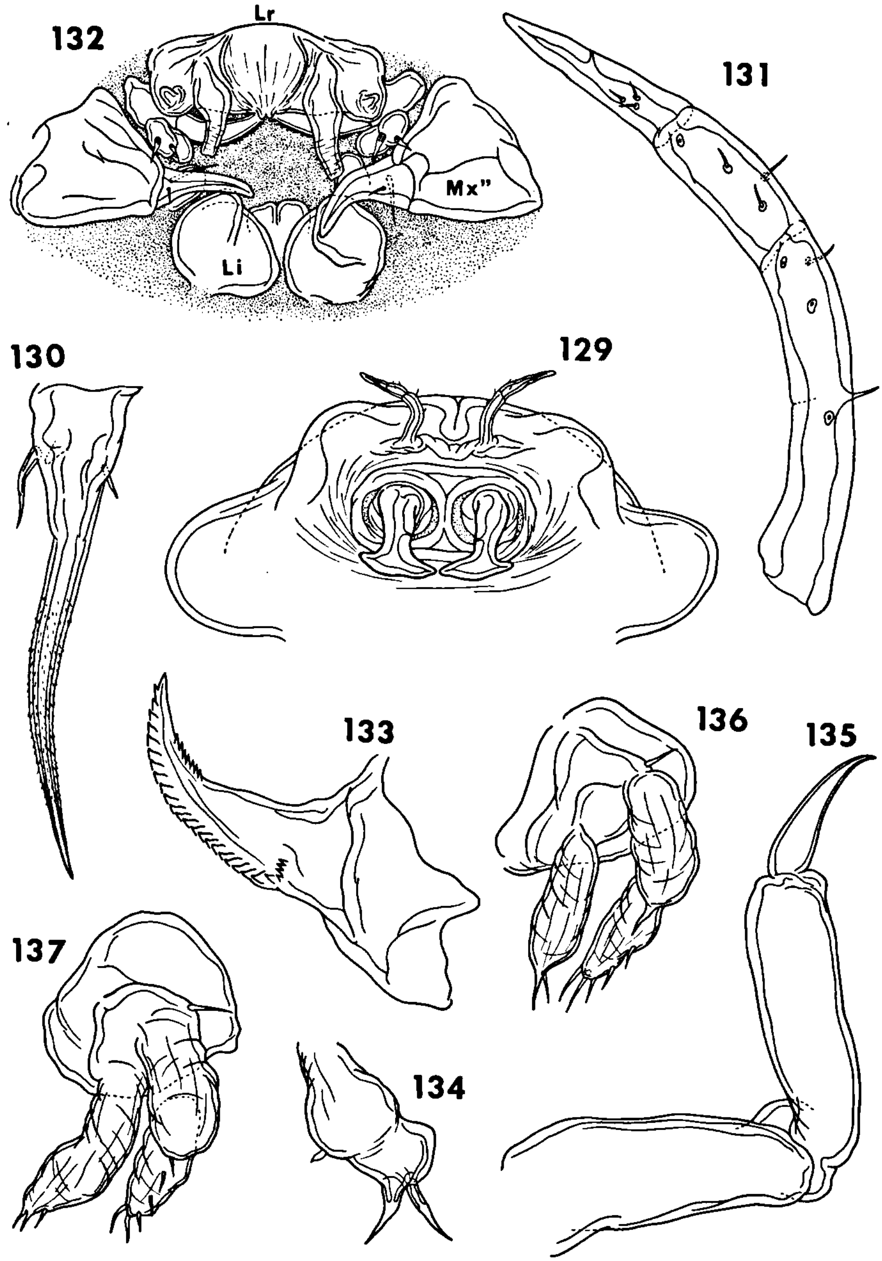
Female. — Body (figs. 123, 124) with head strongly deflected ventrally in alcoholized specimens. Cephalosome very small, occupying only a small portion of head (see fig. 125), bearing 2 pairs of well-sclerotized lateral swellings. First pedigerous segment greatly enlarged, globose, and forming most of head, having a pair of small short processes on posterodorsal surface. Second pedigerous segment forming cylindrical neck (or narrowed anterior portion of trunk), and bearing a pair of simple lateral processes (see figs. 123, 149). Third and fourth pedigerous segments fused into a short but wide trunk, bearing 2pairs of irregular processes (one anterolateral and other posterolateral) with various swellings. Genital segment (figs. 126—128) much wider than long, bearing two dorsal and two ventral rounded swellings. Abdomen extremely indistinct, with caudal rami attached to midventral surface of genital segment (fig. 128). Caudal ramus (fig. 130) of usual form, bearing 3 elements in basal portion and a slender, long spinulose terminal process. Egg sac (fig. 123) cylindrical, longer than body and twisted.

First antenna (figs. 129, 131) filiform and slender; 3-segmented but with indication of division on first and third segments suggesting an original 5-segmented condition; arrangement of setae seen on these five original segments being: 2, 3, 4, 3, and 0. Second antenna (fig. 129) 2-segmented, basal segment of usual form, but terminal segment forming a T-shaped anchoring apparatus.

Oral appendages very small, situated close to antennal region of head (owing to smallness of cephalosome). Labrum (fig. 132) ususual in having a pair of lateral knobs and another pair of annulated filamentous processes



FIGS. 123—128. *Diocus gobinus* (Müller), female. 123, body, dorsal (A); 124, same, lateral (A); 125, head, ventral (T); 126, genito-abdomen, dorsal (I); 127, same, lateral (I); 128, same, ventral (I).



FIGS. 129—137. *Diocus gobinus* (Müller), female. 129, anterior part of head, antero-ventral (F); 130, caudal ramus, posterior (J); 131, first antenna, antero-ventral (E); 132, oral, area, ventral (E); 133, mandible, posterior (J); 134, first maxilla, posterior (J); 135, maxilliped, antero-inner (J); 136, leg 1, anterior (J); 137, leg 2, anterior (J).

(broken in the specimen drawn); median region swollen. Mandible (fig. 133) of usual form, bearing 27 teeth on convex side and only 7 on concave side. Paragnath (fig. 132) a small naked lobe. First maxilla (fig. 134) bilobate, bearing 3 elements. Second maxilla (fig. 132) 2-segmented, of usual form, but terminal process without teeth. Maxilliped (fig. 135) long and slender, located unusually far from mouth opening (see fig. 125): all 3 segments naked.

Two pairs of biramous, rudimentary legs present (fig. 125), first pair located in head region close to maxillipeds and second pair in neck region just behind posterior end of head. Both legs 1 (fig. 136) and 2 (fig. 137) with bimerous exopod and unimerous endopod; armature as follows:

P1	prop 0—0; 1—0	exp 1—0; 5	P2	prop 0—0; 1—0	exp 1—0; 5
		enp 2			enp 3

Measurements. — Body 8.26; head 1.60 × 1.46; genital segment 0.92 × 1.17; egg 208 μ.

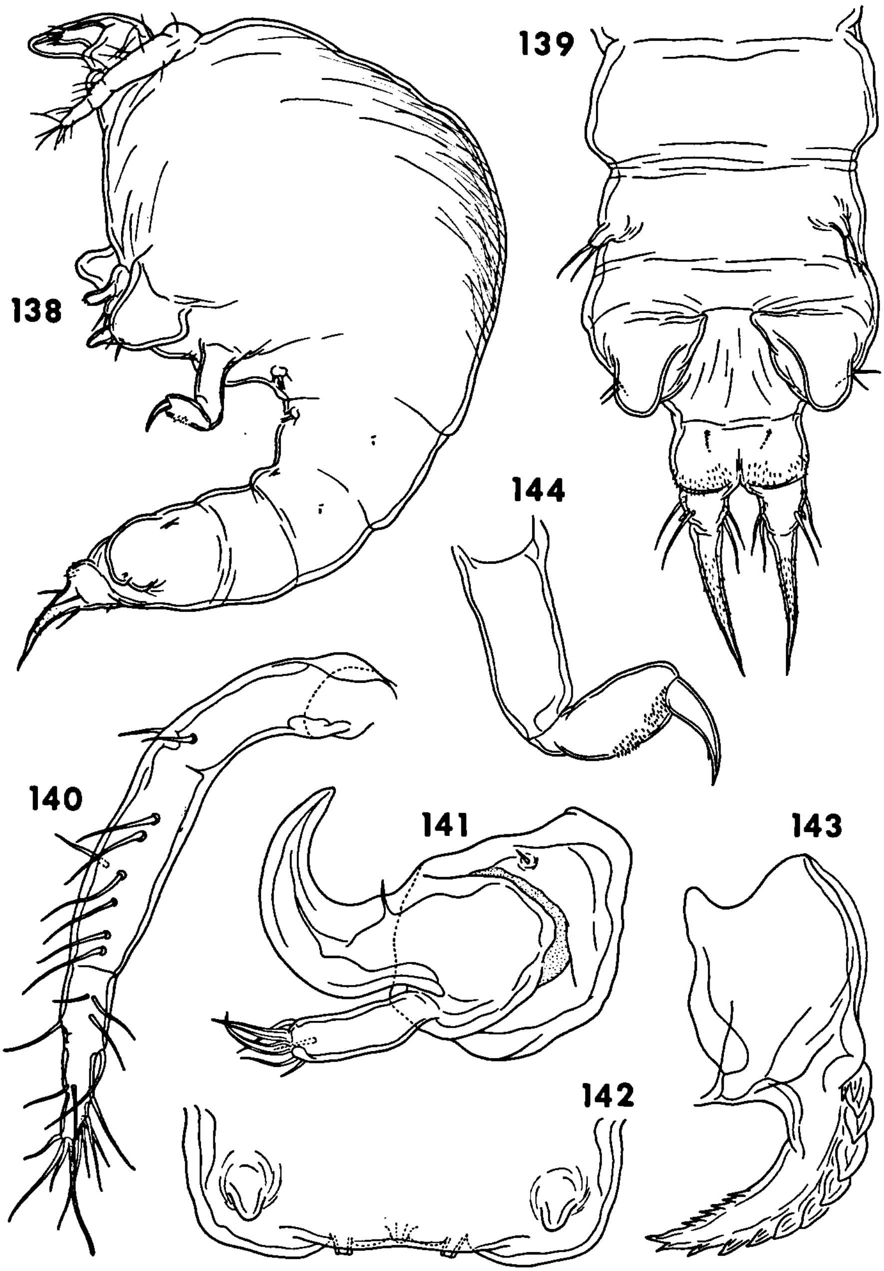
Male. — Body (fig. 138) dwarf, with rather distinct metamerism and completely fused cephalosome and first pedigerous segment. Second and third pedigerous segments bearing 2 setules on lateral surface. Genital segment (fig. 139) distinctly wider than long. Abdomen (fig. 139) short and wide, bearing a pair of setules on dorsal surfaces and patches of spinules on both dorsal and ventral surfaces of posterior region. Caudal ramus (fig. 139) as in female, but 2 more setae added.

First antenna (fig. 140) shaped as in female, but better segmented and more setose, armature being: 2, 7, 5, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (fig. 141) 2-segmented, with terminal segment an usual recurved hook; both segments bearing a setule; accessary antennule tipped with 6 elements (2 of them spiniform).

Labrum (fig. 142) essentially as in female, but less accentuated. Mandible (fig. 143) different from female in having only 12 teeth on convex side and 6 on concave side. Paragnath, first maxilla, and second maxilla as in female. Maxilliped (fig. 144) having usual form of armature in last two segments.

Leg 1 (fig. 145) biramous, both rami with forked tip; protopod bearing a long outer seta and exopod 3 short outer setae. Leg 2 (fig. 146) also biramous, but with more reduced rami; exopod carrying only 1 seta and endopod represented by a simple, pointed protrusion. Leg 3 (fig. 147) reduced to a knob tipped with 2 unequal setae. Leg 4 absent. Leg 5 (fig. 139) a small knob bearing 2 subequal setae and leg 6 (fig. 139) represented by 2 setae on postero-ventral flap of genital segment.

Remarks. — Among the females which I examined, only one ovigerous female and another young female have all the cephalic appendages and two pairs of thoracic legs intact. The second antennae are broken in all the remaining specimens and the thoracic legs are detached in many of them. One of the young females (fig. 148) in the collection of UZM is apparently the youngest one that I have ever seen. Its body processes are still simple pro-



FIGS. 138—144. *Diocus gobinus* (Müller), male. 138, body, lateral (R); 139, urosome, ventral (E); 140, first antenna, anterodorsal (H); 141, second antenna, anterior (H); 142, labrum, ventral (J); 143, mandible, posterior (K); 144, maxilliped, antero-inner (H).

trusions without the swellings observed in a fully grown adult. A slightly older young female is shown in fig. 149, which has already developed certain swellings on the body processes and approaches more closely the typical appearance of a mature adult.

Genus **Heterochondria** Yü, 1935

Chondracanthus - Krøyer, 1835: 203 (refers to *Ch. crassicornis* only).
Heterochondria Yü, 1935: 2.
Pseudochondracanthus - Pillai, 1964: 79 (refers to *P. longitruncus* only).

Female. — Body elongate, cylindrical. Head consisting of cephalosome, with lateral swellings. Neck region composed of first and second pedigerous segments. Third and fourth pedigerous segments fused into a cylindrical trunk, without processes. Genito-abdomen and caudal ramus of usual form. Egg sac cylindrical. First antenna fleshy. Second antenna uncinate. Oral appendages as in usual form. Two pairs of legs modified, unilobate.

Male. — Indistinguishable from *Acanthochondria*, except in lacking all legs.

Type-species. — *H. longicephala* (Yü & Wu).

Remarks. — The most outstanding features of this genus are the absence of processes in the trunk region and the possession of modified, unilobate legs. Two other chondracanthid genera, *Acanthochondrites* and *Brachiochondrites*, are also known to have unilobate legs. They differ, hawever, from this genus in having a apir of posterior processes on the trunk. In addition, the former is exclusively found on elasmobranchs, and the latter has a long, slender neck.

Five species are attributable to this genus. They are, in addition to the type-species: *similis* (Yü & Wu, 1932), *crassicornis* (Krøyer, 1835), *longa* Tripathi, 1960, and *pillaii* (Pillai, 1964, n. com.). *H. longa* is a rather doubtful species, for its first pair of legs are "biramous and each ramus indistinctly two jointed" (Tripathi, 1960: 53). However, without examination of the type specimen, I consider it best to keep this Indian species in *Heterochondria* as originally proposed.

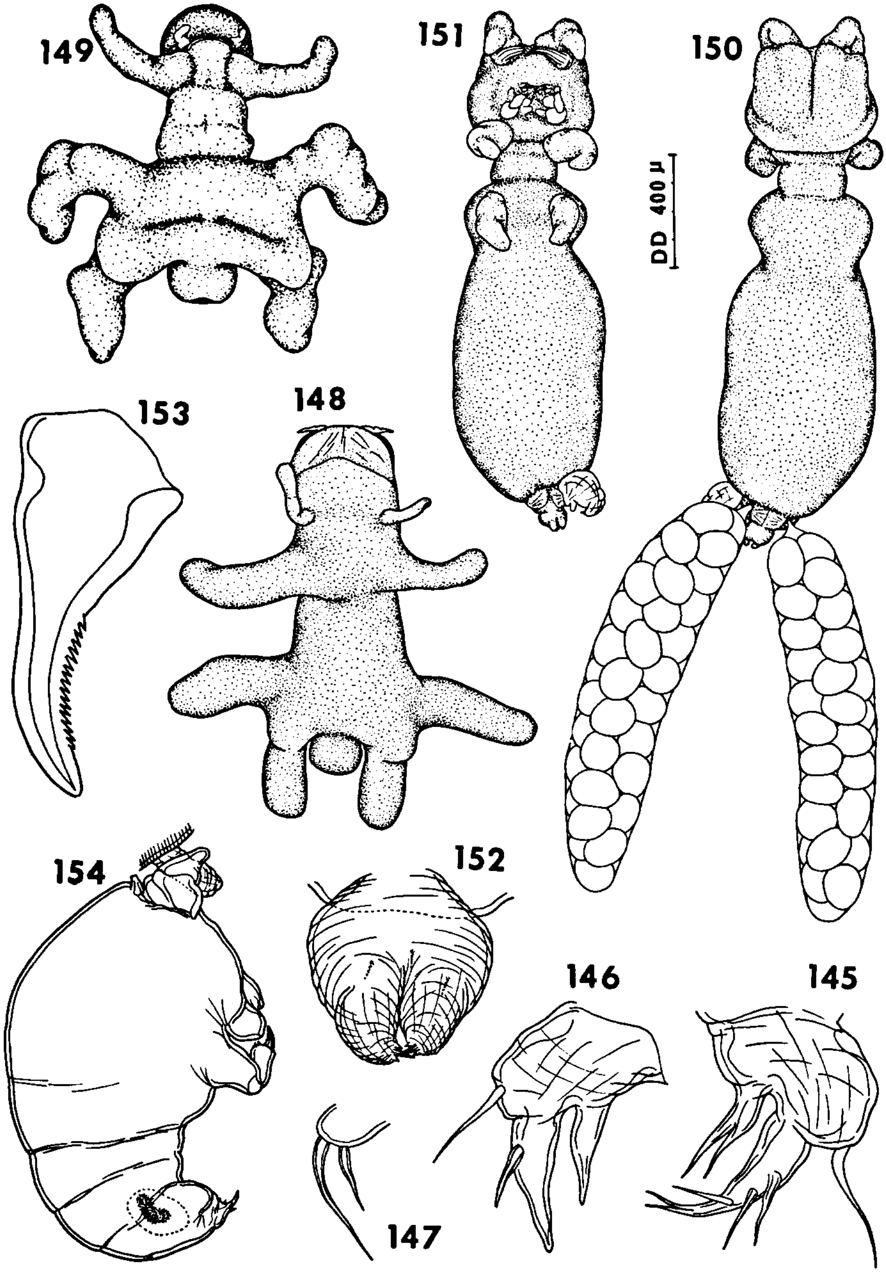
A redescription of *H. crassicornis* is given in the following for it is the first known species of this genus.

Heterochondria crassicornis (Krøyer, 1835). Figs. 150—154

Chondracanthus crassicornis Krøyer, 1835: 203, pl. ii fig. 10. H. Milne Edwards, 1840: 501. Bassett-Smith, 1899: 495.
Acanthochondria crassicornis Oakley, 1930: 186. Wilson, 1935: 347. Yamaguti, 1963: 276.

Material examined. — From UZM: 2 ♀ on *Labrus* sp., West Indies. From USNM: 1 ♀ on gill of *Pomacentrus planifrons* (C. & V.), Dry Tortugas, Fla., June 28, 1907.

Female. — Body (figs. 150, 151) small, rather long and plump. Head a little wider than long, with rounded and slightly protruded posterior corners.



FIGS. 145—149. *Diocus gobinus* (Müller). Male: 145, leg 1, anterior (K); 146, leg 2, anterior (K); 147, leg 3, ventral (K). Young female: 148, body, dorsal (Q); 149, body of slightly older one, dorsal (A).

FIGS. 150—154. *Heterochondria crassicornis* (Krøyer). Female: 150, body, dorsal (DD); 151, same, ventral (DD); 152, abdomen and caudal rami, ventral (N); 153, terminal claw of maxilliped, ventral (J). Male: 154, body, lateral (N).

First pedigerous segment narrower than cephalosome and slightly constricted at middle. Second pedigerous segment wider than the first. Remaining segments of metasome fused into a cylindrical trunk. Posterior end of trunk rounded, without processes, but bearing ventrally a pair of vermiform processes (to the left one of which the dwarf male clasps by means of its second antennae). Genito-abdomen attached posterodorsally to trunk. Abdomen (fig. 152) carrying 3 setules (instead of the usual 2) on dorsal surface. Caudal ramus (fig. 152) a lobe tipped with 3 spiniform elements, the middle one of which is much longer than the other two. Egg sac slightly shorter than body, with 4 rows of large eggs.

First antenna large, fleshy, strongly bent ventrally, with much swollen proximal portion and with shorter, conical distal portion. Second antenna, mandible, and paragnath of usual form. First maxilla bearing two elements. Second maxilla with bilaterally denticulated terminal process. Maxilliped constructed as in usual pattern but characteristically bearing a row of denticles on each side of shaft of terminal claw (fig. 153). A small, rounded lobe situated just laterally between bases of first and second maxillae, and another one located medially between bases of second maxilla and maxilliped (see fig. 151).

Two pairs of legs unilobate (fig. 151), both carrying an outer seta and tipped with 3 small spinules.

Measurements. — Body 2.24; head 0.39 × 0.46; genital segment 0.10 × 0.27; abdomen 0.09 × 0.11; egg sac 2.06, 202; egg 148 μ.

Male. — Body (fig. 154) very small, only 296 × 65 μ. First antenna atrophied in the only known specimen. Second antenna of a typical chondracanthid form without accessary antennule. Oral appendages as in female, except usual sexual dimorphism. Caudal ramus as in female. All thoracic legs absent.

Remarks. — The absence of processes on the body and the presence of unilobate thoracic legs in the female, and the absence of all thoracic legs in the male undoubtedly place this species in the genus *Heterochondria*.

I have examined the two ovigerous type specimens of *H. crassicornis* described by Krøyer (1835) and deposited in UZM. One of them has the head and the first pedigerous segment completely removed (presumably by Krøyer). The intact specimen (2.09 mm long), unfortunately, has the right side of trunk abnormally shrunken. As far as I can see, Wilson's specimen from Tortugas is identical with Krøyer's specimens from the West Indies.

Genus **Humphreysia** Leigh-Sharpe, 1934

Humphreysia Leigh-Sharpe, 1934a: 14.

Female. — Body rather flattened. Head consisting of cephalosome and first pedigerous segment, bearing 2 pairs of ventral processes. Remaining pedigerous segments fused into a shield-like trunk, without processes. Genital segment as in usual form but abdomen very indistinct. Caudal ramus with long slender, terminal process. Egg sac unknown. First antenna large, fleshy, with large digitiform proximal process. Second antenna 2-segmented, terminal segment unknown, but bearing an accessary antennule. Oral appendages as in usual form, except second maxilla which has bilaterally denticulated terminal process. One pair of rather unmodified legs present.

Male. — Unknown.

Type-species. — *H. floreata* Leigh-Sharpe, 1934.

Remarks. — Only one species is known in this genus. It is distinctive in having the following combination of characters in the female: with accessary antennule in the second antenna, a bilaterally denticulated terminal process in the second maxilla, only one pair of unmodified legs, absence of posterior process, and inconspicuous abdomen.

Humphreysia floreata Leigh-Sharpe, 1934. Figs. 155—167.

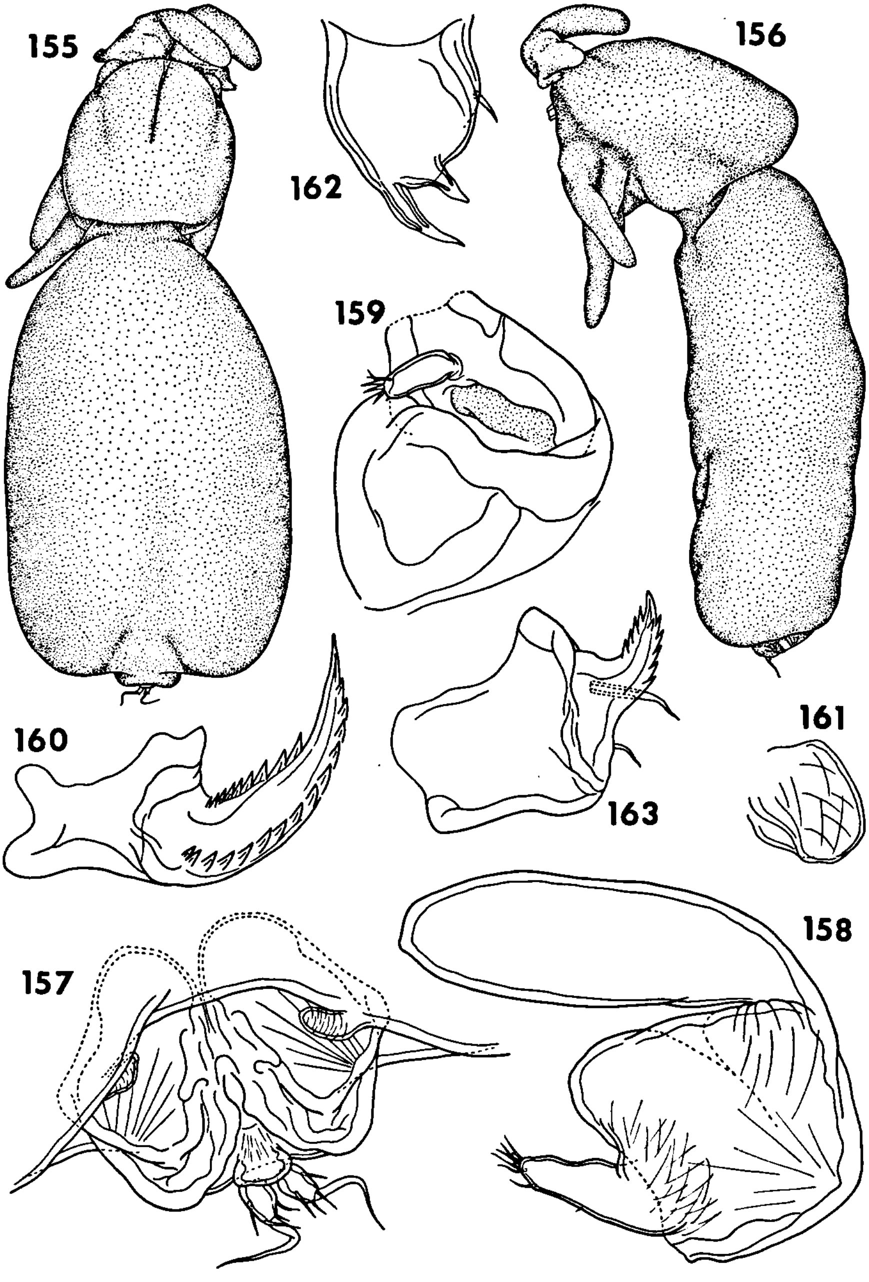
Humphreysia floreata Leigh-Sharpe, 1934a: 14, figs. 10, 11. Yamaguti, 1963: 287, pl. 252 fig. 3.

Material examined. — From ZMA: 1 ♀ (holotype) on isthmus of *Neobythites malayanus* Weber, from Saleh Bay, Sumbawa (Sta. 312 of Siboga Expedition).

Female. — Body (figs. 155, 156) rather small and flattened. Head (fig. 164) longer than wide, bearing 2 pairs of closely associated lateral processes on ventral surface; anterior corner with small rounded protrusion. All pedigerous segments, except first one, fused into a shield-like trunk, with narrowed anterior end assuming a neck region; posterior corner rounded, but not protruded into posterior process. A pair of small protrusion on posteroventral surface of trunk near genito-abdomen (see fig. 157). Genital segment (fig. 157) slightly wider than long. Abdomen (fig. 157) extremely small. Caudal ramus (fig. 157) bearing 4 setae on basal portion; terminal process long, slender, and naked. Egg sac unknown.

First antenna (fig. 158) with voluminous basal portion bearing a large sausage-shaped process (deflected in the one illustrated) at antero-inner corner and a small protrusion on postero-outer corner armed with usual 8 setae at its tip. Second antenna (fig. 159) 2-segmented, bearing accessary antennule; terminal segment broken.

Labrum (fig. 165) unusually shaped and reminiscent of *Diocus gobinus* and *Juanettia cornifera*; different, however, in having shorter pair of median processes. Mandible (fig. 160) bearing 14 teeth on convex side and 9 on concave side. Paragnath (fig. 161) a small naked lobe. First maxilla (fig. 162) bearing 3 elements. Second maxilla (fig. 163) 2-segmented, second segment a short pointed process bearing 2 setae on basal portion; its distal portion bilaterally denticulated (5 teeth on posterior side and 4 on anterior side), another single tooth on ventral surface. Maxilliped (fig. 166) 3-segmented; first segment unarmed; second segment bearing a patch of rather coarse spinules in



FIGS. 155—163. *Humphreysia floreata* Leigh-Sharpe, female. 155, body of holotype, (I); 156, same, lateral (I); 157, genito-abdomen, ventral (G); 158, first antenna, anterodorsal (G); 159, second antenna, lateral (H); 160, mandible, posterodorsal (K); 161, paragnath, anterior (K); 162, first maxilla, anterior (K); 163, second maxilla, ventral (J).

its protruded medio-distal corner; terminal segment a recurved claw bearing a hooklet.

Leg 1 (fig. 167) biramose, rather small. Exopod larger than endopod, armature as follows: prop 0—0, 1—0; exp 1—0, 7; enp 0—0, 4.

Measurements. — Body 2.21 (including first antenna); head 0.73 (excluding first antenna) × 0.46; genital segment 0.18 × 0.24; abdomen 19 × 44 μ.

Male. — Unknown.

Remarks. — In his original description of the present species, Leigh-Sharpe (1934 : 15) interpreted the two closely associated lateral processes on ventral surface of head as leg 2. However, since there is no common stem for these two processes and no outer seta was found on either of them, they are here considered as ordinary cephalic processes.

Genus **Immanthe** Leigh-Sharpe, 1934

Immanthe Leigh-Sharpe, 1934a: 15.

Female. — Body with small head, large trunk, and indistinct neck region. Head consisting of cephalosome only, bearing a pair of small posteroventral processes. All pedigerous segments fused into a bell-shaped trunk, with its posterior corners protruded into large blunt processes. First pedigerous segment bearing a transversely elongated plate-like structure on ventral surface. Genital segment large, but abdomen inconspicuous. Caudal ramus with long, slender terminal process. Egg sac unknown. First antenna swollen, fleshy. Second antenna unknown. Oral appendages of usual form, except maxilliped which is unknown. Legs absent.

Male. — Dwarf. Body with distinct metamerism. Cephalosome separated from first pedigerous segment. Epimeral areas of metasomal segments well-formed. Abdomen inconspicuous. Caudal ramus as in female. First antenna cylindrical. Second antenna uncinate, with accessary antennule. Oral appendages as in usual form, except maxilliped, which has a lash-like terminal segment. Two pairs of very rudimentary legs present.

Type-species. — *I. campanulata* Leigh-Sharpe, 1934.

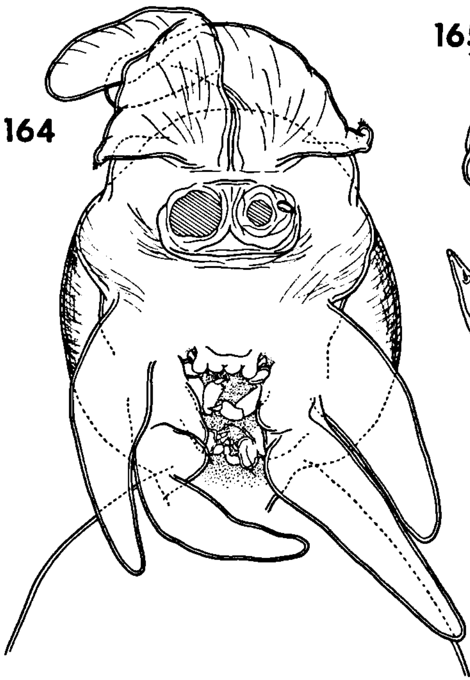
Remarks. — Only one species is known in this genus. It is distinctive in having the following combination of characters: no legs in the female, with accessary antennule in male second antenna, trunk of female with only one pair of posterior processes, and abdomen inconspicuous in both sexes.

Immanthe campanulata Leigh-Sharpe, 1934. Figs. 168—174.

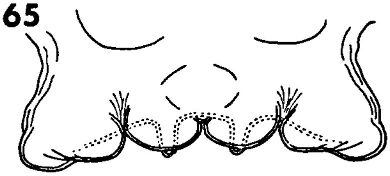
Immanthe campanulata Leigh-Sharpe, 1934a: 15, figs. 12, 13. Yamaguti, 1963: 288, pl. 251 fig. 2.

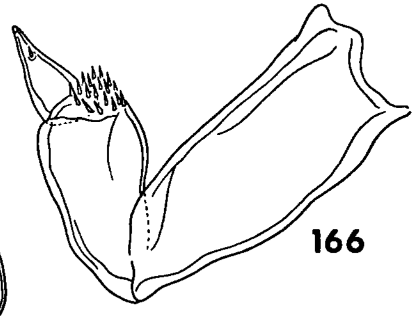
Material examined. — From ZMA: 1 ♀ (holotype) on *Paracentropogon aeglefinus* Weber, Lobetobi Strait, East Indies (Sta. 306 of Siboga Expedition).

164



165

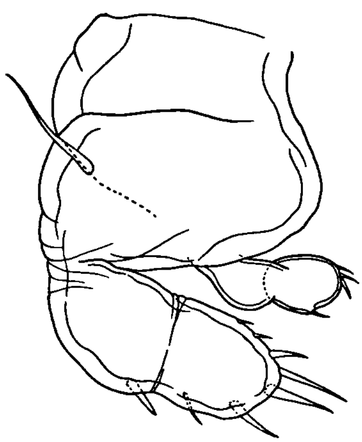




166

168

167



FIGS. 164—167. *Humphreysia floreata* Leigh-Sharpe, female. 164, head, ventral (D); 165, labrum, ventral (H); 166, maxilliped, antero-inner (J); 167, leg 1, antero-outer (K).

FIG. 168. *Immanthe campanulata* Leigh-Sharpe, female (holotype), dorsal (T).

Female. — Body (figs. 168, 169) without distinct neck-region. Head wider than long, with expanded lateral areas and bearing a pair of small ventral processes on posterior surface. Trunk large, with rounded anterior corners and protruded posterior corners, its ventral surface bearing a shield-like plate in midanterior region. Genital segment (fig. 170) large, wider than long, bearing pair of closely associated setules on anteroventral surface. Abdomen inconspicuous. Caudal ramus (fig. 170) very small; basal portion bearing 3 setules and terminal portion a long setiform process. Egg sac unknown.

First antenna fleshy, swollen, tipped with setae. Second antenna (broken) and other cephalic appendages concealed in a pit behind the bases of first antennae (see fig. 169). Mandible, paragnath, first maxilla, and second maxilla as in male. Maxilliped not seen (detached?). Legs absent.

Measurements. — Body 2.98; head 0.58 × 0.88; genital segment 0.35 × 0.42.

Male. — Body (fig. 171) with distinct metamerism. Rostral area bearing a conical process. Cephalosome not fused with first pedigerous segment and all metasomal segments with well-formed, rounded epimeral areas. Abdomen inconspicuous.

First antenna long, cylindrical, and setose. Second antenna (fig. 172) 2-segmented; terminal segment a small recurved hook bearing an accessary antennule, which is tipped with a spiniform element and 2 setae.

Labrum (fig. 173) with smooth unornamented posterior margin. Mandible and paragnath of usual form (fig. 173). First maxilla (fig. 173) slightly bilobate, tipped with 2 large elements. Second maxilla (fig. 173) of typical form, but terminal process having only one large tooth close to tip. Maxilliped (fig. 173) 3-segmented; first two segments large and unarmed; terminal segment prolonged into a lash-like process.

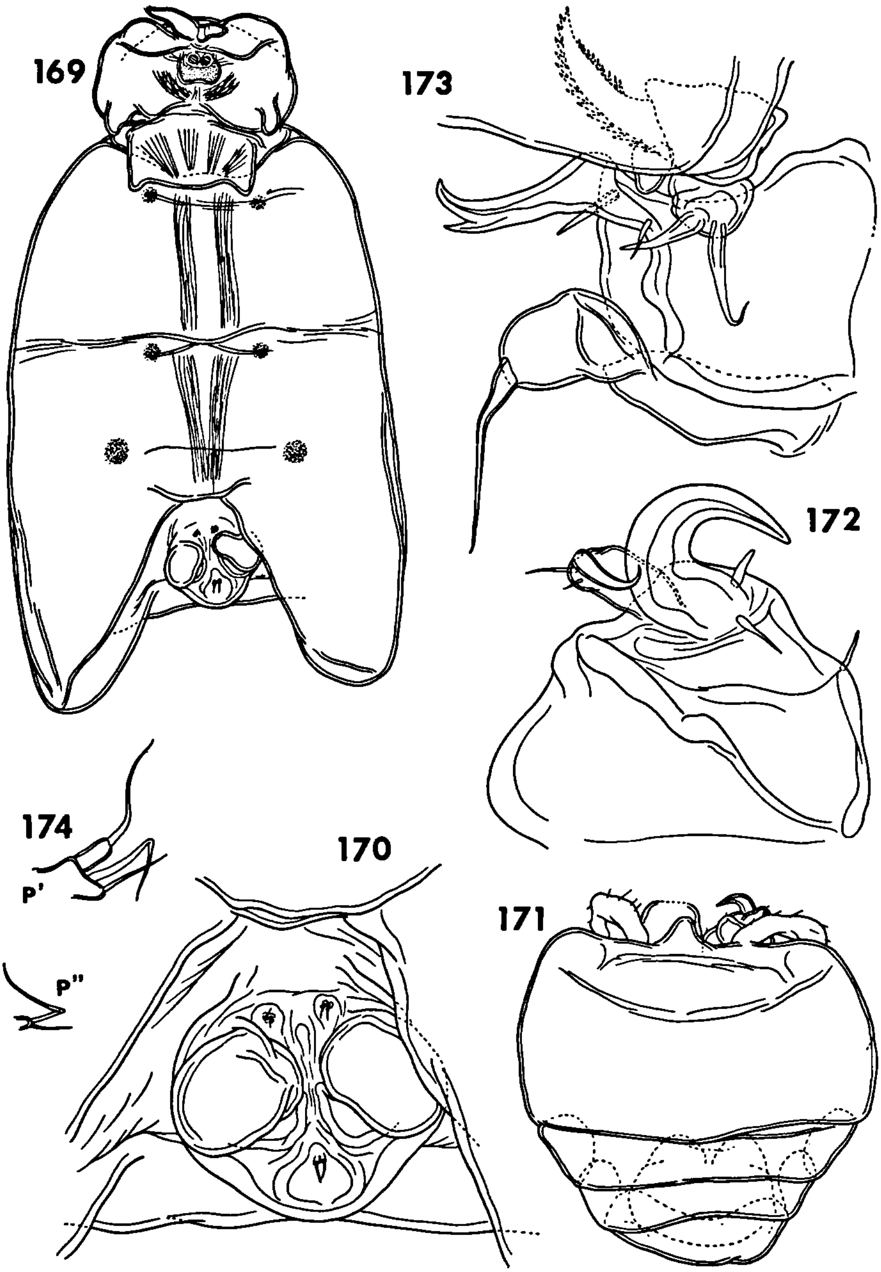
Two pairs of very small leg rudiments present; first pair bearing 3 elements and second pair, 2 elements (fig. 174).

Remarks. — Since the only known specimen of this species was mounted in Canada balsam on a slide, its general body form illustrated in figs. 168 and 169 should be treated with considerable reservation. The shield-like plate on the ventral surface close to the anterior end of the trunk was interpreted by Leigh-Sharpe (1934a : 16) as the modified first thoracic leg, but this, in my opinion, is highly improbable, because there is no seta present.

Genus **Juanettia** Wilson, 1921

Juanettia Wilson, 1921: 70.

Female. — Body small and rather flattened. Head consisting of cephalosome and first pedigerous segment, bearing one pair of bilobate posterolateral processes and another single median process on ventral surface in postoral region. Second, third, and fourth pedigerous segments fused into trunk, bearing,



FIGS. 169—174. *Immanthe campanulata* Leigh-Sharpe, Female: 169, body of holotype, (T); 170, genito-abdomen, ventral (D). Male: 171, body of allotype, dorsal (G); 172, second antenna, anterior (K); 173, oral area, ventral (K); 174, legs 1 and 2, ventral (K).

in addition to posterior processes, 2 pairs of lateral processes and 1 pair of anterodorsal processes directed forward. Genito-abdomen carrying a pair of primitive caudal rami bearing 6 elements. First antenna with large fleshy basal portion and a small segmented and armed terminal portion. Second antenna uncinate, bearing an accessary antennule. Labrum unusual in having posterior processes. Mandible falcate and bilaterally denticulated. Paragnath present. First maxilla armed with 3 elements. Second maxilla 2-segmented, terminal segment a curved, slender, and attenuated process bearing a row of teeth. Maxilliped 3-segmented, armature as usual in chondracanthids. Leg 1 biramous, unmodified, with 2-segmented rami. Other legs absent.

Male. — Unmodified, cyclopiform, with distinct metamerism. First pedigerous segment fused with cephalosome. Three postgenital segments present. Caudal ramus as in female. First antenna 5-segmented. Second antenna uncinate, bearing accessary antennule and 3 setae. Labrum with ornamented posterior margin. Oral appendages as in female, except second maxilla which, as usual in male chondracanthids, bears 2 elements on the basal portion of the smooth terminal process. Legs 1—6 present; first three legs biramous, with 2-segmented rami; fourth leg uniramous and bimerous; fifth leg represented by 2 setae; and sixth leg, 1 spine and 2 setae.

Type-species. — *J. cornifera* Wilson, 1921.

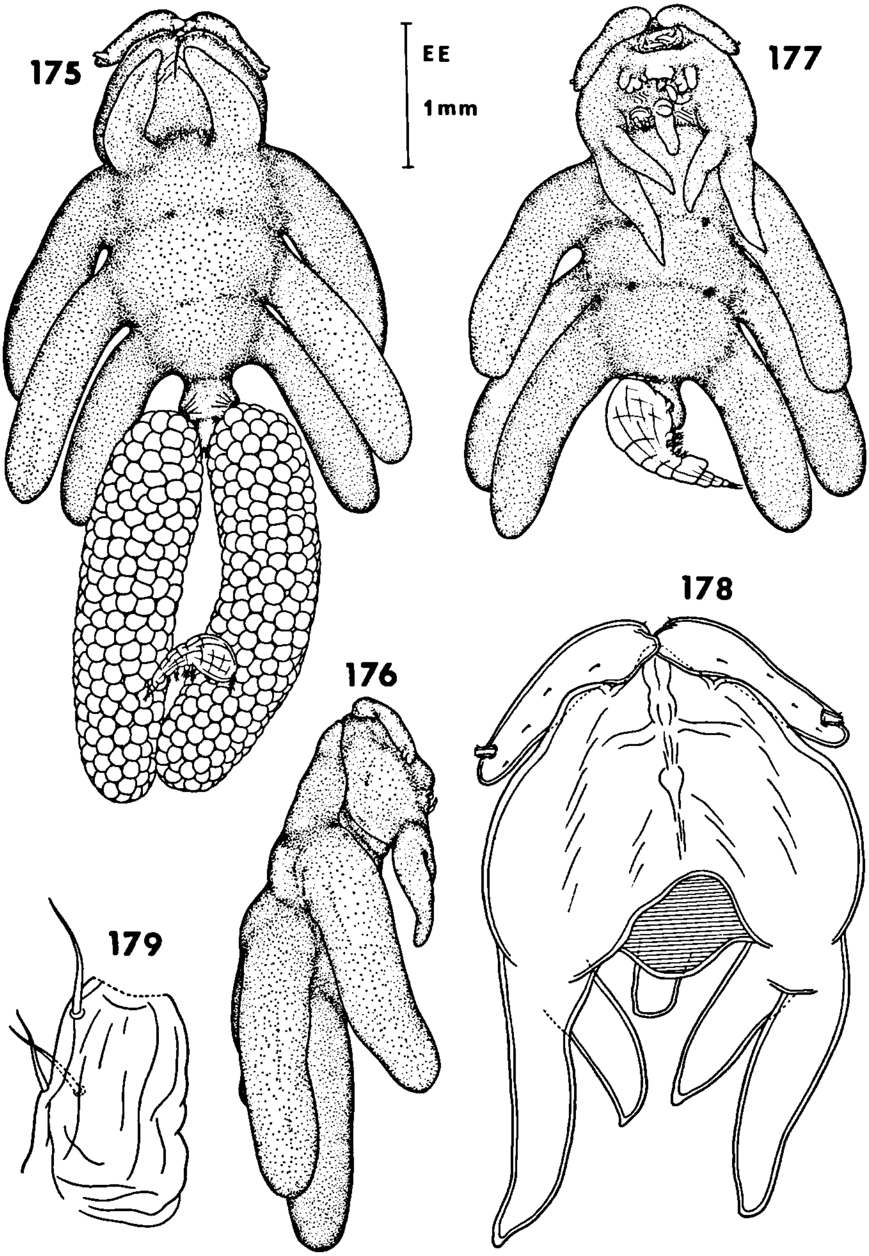
Remarks. — When Wilson (1921) established this genus to include his new species *cornifera*, he misinterpreted the true second maxilla as the mandible and described it as "shaped like those of the *Lernaepodidae*". However, his observation that "the upper and lower lips do not form a sucking tube" made him hesitate to place the genus under the family Lernaepodidae. Consequently, he concluded that the genus "must constitute a family by itself". His opinion was adopted by Oakley (1930) and Gurney (1933), but not by Yamaguti (1963). Although Yamaguti was correct in placing this genus in the Chondracanthidae, he did not give convincing evidence to support such a transfer. In order to clarify this problem and controversy, I have dissected one of each sex of type specimens deposited in SSM, and have found that the true mandible has in reality a typical chondracanthid form. I have also found the other oral appendages. Thus, Yamaguti's (1963) treatment of this genus is fully justified.

Juanettia cornifera Wilson, 1921. Figs. 175—204.

Juanettia cornifera Wilson, 1921: 70, pl. ii figs. 1—6, pl. iii fig. 7. Yamaguti, 1963 288, pl. 252 fig. 1.

Material examined. — From SSM: 1 ♀ (paratype) on gills of *Serranus humeralis,* Juan Fernendez Is., Dec. 16, 1916 (No. 700).

Female. — Body (figs. 175—177) rather small and flattened. Head (fig. 178) distinctly wider than long, bearing ventrally 1 bifurcated and bluntly pointed process on each posterolateral corner, a simple median process in postoral region just between bases of leg 1, and a pair of small lobes located antero-



FIGS. 175—179. *Juanettia cornifera* Wilson, female. 175, body of syntype, dorsal (EE); 176, same, lateral (EE); 177, same, ventral (EE); 178, head, dorsal (I); 179, terminal portion of first antenna, dorso-inner (J).

lateral to oral area (fig. 180). Neck merely a constriction between head and trunk (see fig. 178). Trunk bearing 2 long blunt lateral processes on each side and pair of similar posterior processes; a pair of bluntly pointed short processes on anterodorsal surface directed forward over head region. Genital segment (fig. 181) slightly wider than long. Abdomen (fig. 181) oval, bearing a pair of setules (see fig. 182) on posterodorsal surface. Caudal ramus (figs. 182, 183) about 1.5 times longer than wide, bearing 1 long terminal element and 5 short, naked seta as shown in fig. 183. Egg sac (fig. 175) sausage-shaped, with many rows of eggs.

First antenna (fig. 178) large, swollen, and fleshy, carrying subdistally a segmented portion on dorsal surface; fleshy portion slightly bilobate at base and armed with 5 setae; segmented portion (fig. 179) broken in paratype. Second antenna (fig. 184) 2-segmented; terminal segment a slender, recurved hook, bearing an accessary antenule armed with 7 elements.

Labrum (fig. 187) very similar to *Diocus gobinus* in having a pair of vermiform knobs and annulated filamentous processes on posterior margin. Mandible (fig. 188), small, with terminal falcate portion bearing 20 larger teeth on convex side and 18 much smaller teeth on concave side. Paragnath (fig. 185) a simple lobe armed with spinules. First maxilla armed with 3 different elements as shown in fig. 189. Second maxilla (fig. 190) 2-segmented; basal segment large und unarmed; terminal segment a slender, attenuated, S-shaped process, armed with a row of 14—15 teeth. Maxilliped (fig. 186) slender, 3-segmented; first segment unarmed, second segment bearing a patch of spinules on disto-inner surface; terminal segment a small claw bearing 3 hooklets.

Leg 1 (fig. 191) biramose, rami 2-segmented. Aramture; prop 0—1; 1—0; exp 1—0; III,I,4; enp 0—1; I,5. Other legs absent.

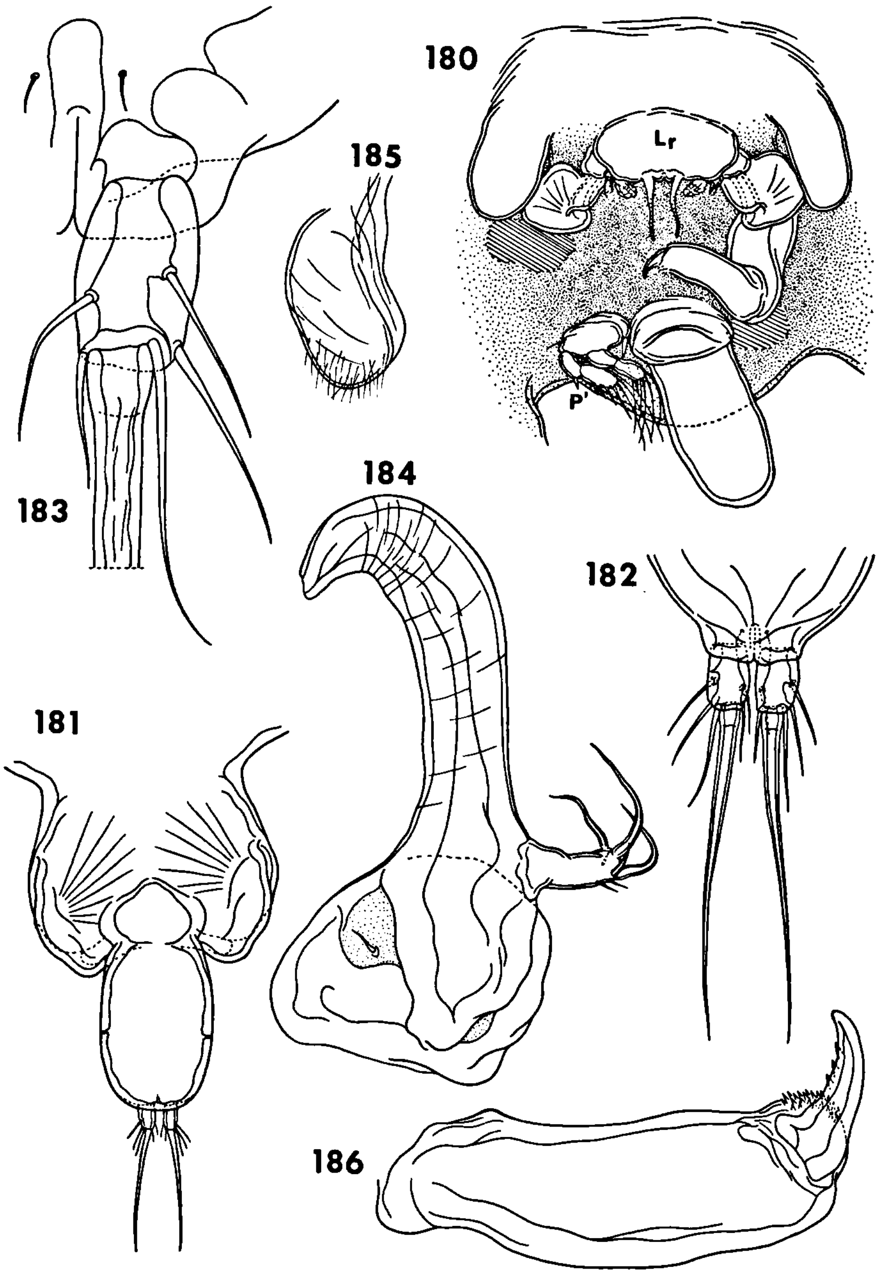
Measurements. — Body 2.86; head 0.57 × 1.12; genital segment 0.31 × 0.38; abdomen 0.26 × 0.17; egg sacs 2.80 and 3.06.

Male. — Body (figs. 192, 193) cyclopiform, measuring 1.18 × 0.52. Urosome (fig. 196) slightly shorter than half of prosome. Genital segment (fig. 196) wider than long, with usual posteroventral flaps carrying leg 6. Abdomen (fig. 196) 3-segmented, with a pair of seta on dorsal surface of anal segment. Caudal ramus (fig. 196) as in female.

First antenna (fig. 197) 5-segmented; armature; 2, 12, 5, 3, and 7 + 1 aesthete. Second antenn.a (fig. 198) 2-segmented, armature as in female, except with 2 more setae on basal portion of terminal hook.

Labrum (fig. 194) ornamented differently from female. Mandible, paragnath, first maxilla, and maxilliped as in female. Second maxilla (fig. 199) with terminal segment different from female in having 2 elements on basal portion and segment proper a smooth, bluntly pointed process.

First three pairs of legs (figs. 201—203) biramose, but leg 4 (fig. 195) uniramose; all with 2-segmented rami. Formula on these legs as follows:



FIGS. 180—186. *Juanettia cornifera* Wilson, female. 180, posterior portion of head, ventral (D); 181, genito-abdomen, dorsal (D); 182, posterior end of abdomen and caudal rami, ventral (G); 183, caudal ramus, dorsal (J); 184, second antenna, anterior (G); 185, paragnath, ventral (J); 186, second segment and terminal hook of maxilliped, inner (H).

P1 prop 0—1; 1—0 exp I—0; III,5 (or III,I,4)
enp 0—1; I,5
P2 prop 0—1; 1—0 exp I—0; II,I (or 1), 5
enp 0—1; II,I,4
P3 prop 0—1; 1—0 exp I—0; I,I,5
enp 0—1; I,3
P4 prop 0—1; 1—0 exp I—0; I,5

Leg 5 (fig. 204) represented by 2 elements in posterolateral corner of first urosomal segment. Leg 6 (fig. 200) represented by 1 naked lateral seta, 1 ventral, barbed spine, and 1 ventral barbed long seta.

Remarks. — The above redescription is, unfortunately, incomplete in lacking information on the number of segments and their armature in the segmented terminal portion of the female first antenna. The paratypic female examined is also incomplete in having the right maxilliped and the left first legs detached, but, fortunately, the remaining parts are intact. The female carried two males on its body, one attached to the usual position as shown in fig. 177, and the other one (smaller, 0.9 × 0.40) clinging to right egg sac as shown in fig. 175.

This species is most peculiar in having a highly modified female carrying very little modified cyclopiform male. The structure of the female second maxilla is also quite different from the usual form seen in the chondracanthids.

Genus **Lateracanthus** Kabata & Gusev, 1966

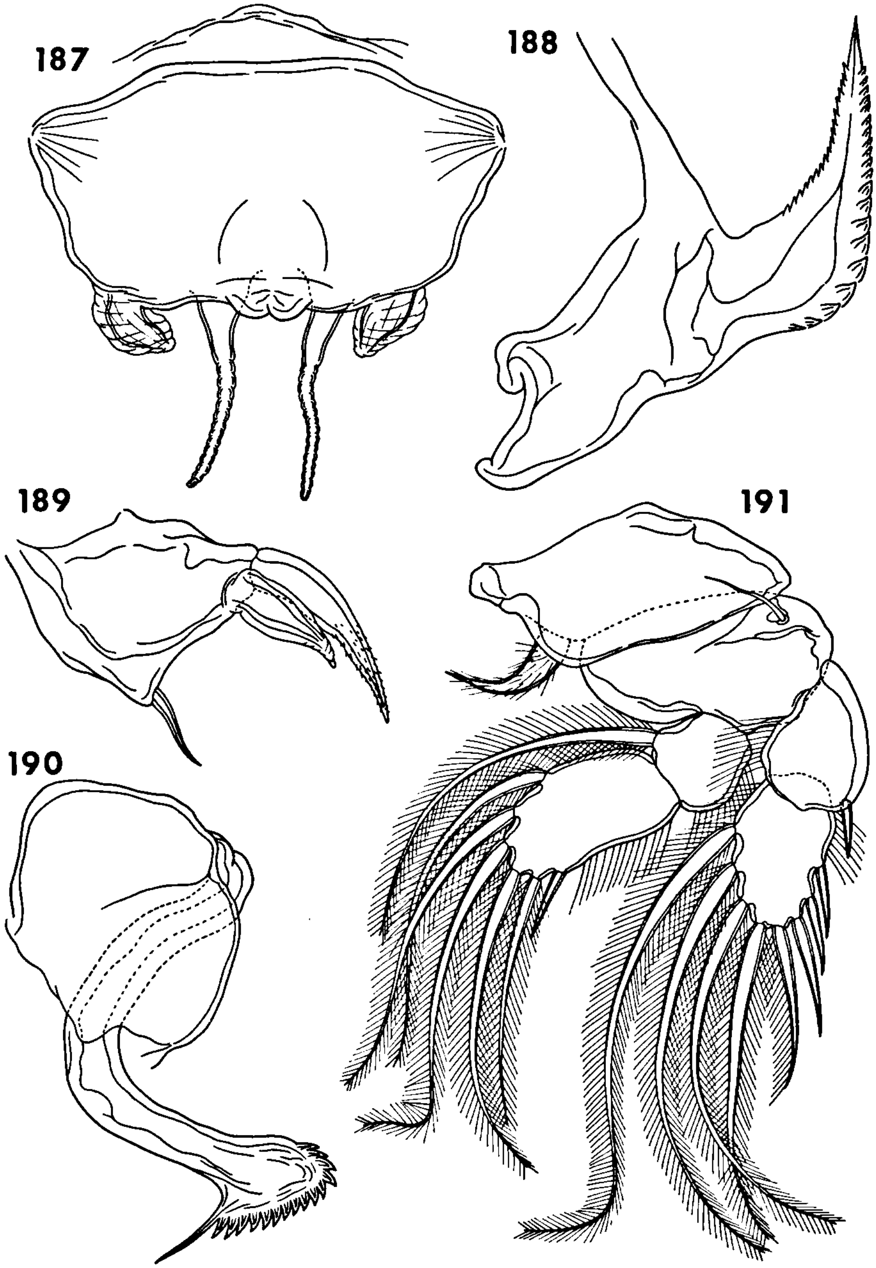
Lateracanthus Kabata & Gusev, 1966: 185.

Female. — Head consisting of cephalosome only, bearing a pair of long processes at posterolateral corners. First and second pedigerous segments fused into neck, with each segment bearing a pair of lateral processes only. Genito-abdomen and caudal ramus as in typical form. Egg sacs cylindrical, long. First antenna fleshy. Second antenna uncinate. Oral appendages as usual in chondracanthids. Two pairs of legs present, located on bases of lateral processes in neck region, with protopods indistinguishably fused with processes; rami short cylindrical.

Male. — Dwarf, of usual chondracanthid form. Metamerism rather distinct. Caudal ramus as in female. First antenna elongate, cylindrical, without distinct segmentation. Second antenna uncinate, bearing an accessary antennule. Oral appendages essentially as in female, with usual sexual dimorphism shown in mandible and terminal process of second maxilla. Two pairs of legs biramous, rather unmodified.

Type-species. — *L. quadripedis* Kabata & Gusev, 1966.

Remarks. — When Kabata and Gusev (1966) established this genus to accommodate a new species *quadripedis*, they suggested that *Chondracanthus macrurus* Brady, 1883 is congeneric, based on their re-examination of the only known type specimen taken by the "Challenger" expedition. Brady's species differs from *L. quadripedis* in having only one pair of legs in the



FIGS. 187—191. *Juanettia cornifera* Wilson, female. 187, labrum, ventral (E); 188, mandible, dorsal (J); 189, first maxilla, ventro-inner (J); 190, second maxilla, ventral (E); 191, leg 1, posterior (H).

neck region. While the number of body processes may vary among different congeneric species, the number of thoracic legs present is always constant in a given genus. Since the body processes are of secondary derivation, making their appearance during the course of transformation, their growth may be suppressed through unknown environmental conditions. This, when it occurs, results in an abnormal number of body processes, unusual shape or length, or asymmetrical appearance in varius parts of the body. In the case of *Ch. macrurus*, since the legs are so intimately associated with the lateral processes in the neck region, a suppression of the growth of the former will conceivably affect the appearance of the latter. Thus, I fully recognize *Ch. macrurus* as a species of *Lateracanthus*, consider that it is probably an aberrant specimen.

Genus **Medesicaste** Krøyer 1863

Medesicaste Krøyer, 1863: 386.

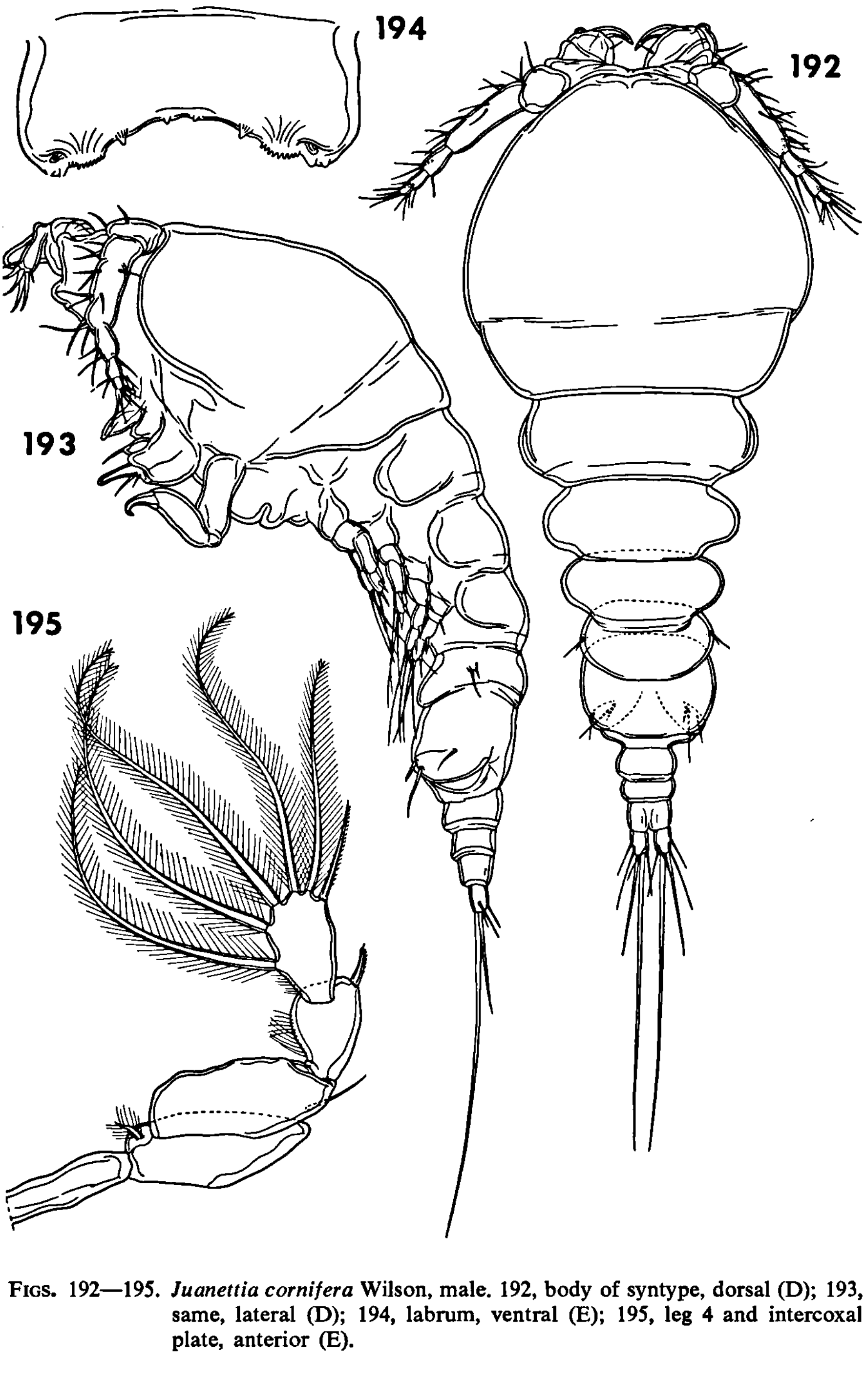
Female. — Head very small, consisting of cephalosome only. Neck greatly elongated, with lateral expansions. Trunk rather small and flattened dorsoventrally, bearing a pair of anterior knobs and posterior processes. Genito-abdomen of usual form. Caudal ramus unknown. Egg sac cylindrical; eggs multiseriate. First antenna small, cylindrical. Second antenna uncinate. Oral appendages of usual form. Leg 1 rudimentary, located at anterior end of neck; other legs absent.

Male. — of typical form, but differing from males of *Acanthochondria* in absence of first antennae and abdomen.

Type-species. — *M. triglarum* Krøyer, 1863.

Remarks. — When Oakley (1927 : 464) established the subfamily Lernentominae, which was suggested to include the present genus, he examined the "headless" type specimen of Krøyer's *M. triglarum*, and "reconstructing the head end from Krøyer's figure", he gave a diagnosis of the genus. (This specimen unfortunately no longer exists in Krøyer's collections deposited in UZM). *M. penetrans*, which was better described by Heller (1868 : 235—237), with the oral region located definitely in the head region, was suspected by Leigh-Sharpe & Oakley (1927 : 457) to be a species of *Rebelula* (Sphyriidea), particularly *R. bouvieri* (Quidor, 1912) having "lost its posterior processes". As has been pointed out by Barnard (1955 : 301), the resemblance of *M. penetrans* to *R. bouvieri* "seems to be exaggerated". From my examination of specimens of *M. penetrans* from SAM, I can see no reasons why Heller's *penetrans* can not be placed in the same genus with Krøyer's *triglarum*.

It is rather difficult to understand why Oakley (1927) would place a genus like *Medesicaste*, whose species do not have their "mouth at base of neck", in the Lernentominae. The "headless" type specimen of *M. triglarum* re-examined by him is apparently the same one as illustrated by Krøyer (1863) in his pl. xvii figs. 1c and 1b, which still has the lager part of the neck remaining attached to the trunk. If the mouth were located at the base of the neck in



FIGS. 192—195. *Juanettia cornifera* Wilson, male. 192, body of syntype, dorsal (D); 193, same, lateral (D); 194, labrum, ventral (E); 195, leg 4 and intercoxal plate, anterior (E).

this specimen, it would certainly have been mentioned as such in Oakley's (1927 : 464) diagnosis of the genus. Since neither Krøyer nor Oakley stated this, I strongly believe that the genus *Medesicaste* ought to be placed in the Chondracanthinae and not in the Lernentominae.

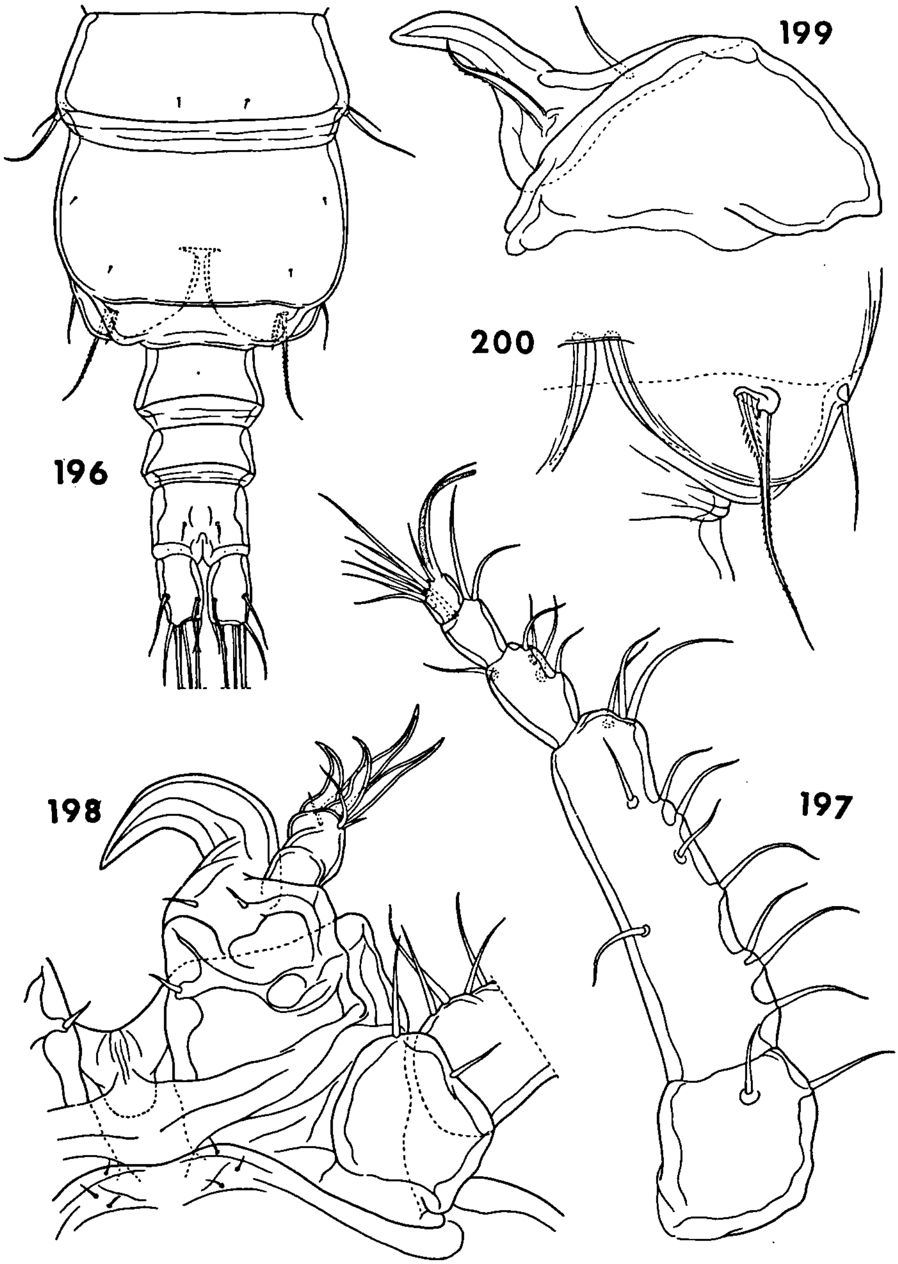
Leigh-Sharpe & Oakley (1927) have made a great contribution in clarifying some great confusion regarding the identity of *Lernentoma asellina*, *L. triglae*, and *M. triglarum*. The confusion had been so great that they were unable to tell which species the particular author was regarding to without examining the specimens. Some authors, such as Valle (1880), Bassett-Smith (1899), T. Scott & A. Scott (1913), and Brian (1906), even assumed that these three species represented one species.

It is perhaps necessary here to mention briefly some important morphological features of the present genus, in order to justify its transfer. I have examined the two South African specimens of *M. penetrans* taken from *Trigla capensis*. Both specimens were studied by the late Dr. K. H. Barnard and deposited in SAM. The intact female shown in figs. 205, 206 and 209 is kept in alcohol, but it at some time has apparently been dehydrated. The other specimen is broken at the neck, with its anterior part mounted in balsam on a slide and the posterior part kept in alcohol. A single male (shown in fig. 208), also mounted on a slide, was presumably taken from the broken female, for the intact female still carries two males in the genital area (see fig. 206).

The head of *M. penetrans* is very small, and very probably corresponds to the part named as "bulla" by Krøyer in his specimen of *M. triglarum*. This portion of the body carries all the cephalic appendages (see fig. 205). The extremely elongated neck region is probably the transformed first and second pedigerous segments. The paired aliform expansions in *M. penetrans* are located at about the middle of the neck, but in *M. triglarum* are found closer to the head. The trunk is small and flattened dorsoventrally, bearing anteriorly a pair of rounded knobs and posteriorly a median expansion and a pair of posterior processes. The intact female specimen is 19.06 mm long, but its trunk is only 3.81 × 3.53 mm.

The first antenna (fig. 207) is small and cylindrical, bearing only a few elements. The second antenna (fig. 207) has unmistakably a chondracanthid form, with a rather small uncinate distal segment. Although I was not able to study (through dissection) the fine structure of the oral appendages, from what I can see on the slide (the cephalic appendages of the broken female), they are certainly of typical chondracanthid form. I have dissected one of the two males attached to the intact female, and found that its oral appendages (fig. 210) are of typical form. Although Heller (1868) has clearly described and illustrated the presence of a rudimentary leg 1, I was not able to see it on the South African specimens. However, this does not necessarily mean that it is wanting in the specimens examined.

The general appearance of the pygmy male (fig. 208) is typically chondracanthid. The male is quite distinctive, however, in having a much larger cephalothorax and wanting the first antenna and the abdomen.



FIGS. 196—200. *Juanettia cornifera* Wilson, male. 196, urosome, dorsal (G); 197, first antenna, dorsal (E); 198, rostral area and second antenna, antero-dorsal (E); 199, second maxilla, posterior (H); 200, leg 6, ventral (H).

Neobrachiochondria Kabata, 1969

Neobrachiochondria Kabata, 1969: 501.

Female. — Body small and stubby. Head consisting of cephalosome and first pedigerous segment; ventrally divisible into two portions as in *Brachiochondria*. Trunk short and squarish. A distinct constriction between head and trunk. Body processes present in both head and trunk regions. Abdomen indistinct, broadly fused with genital segment. Egg sac sausage-shaped, longer than body. First antenna fleshy, swollen. Second antenna uncinate and bearing an accessary antennule. Oral appendages as in typical chondracanthid form, except second maxilla which has a bilaterally denticulated terminal process. Only leg 1 present; biramous and rather unmodified.

Male. — Of a typical form with accessary antennule on second antenna and two pairs of rather unmodified, biramous legs.

Type-species. — *N. quadrata* Kabata, 1969.

Remarks. — *N. quadrata*, the only known species of the genus from Australia, is so far the smallest known chondracanthid, measuring only 1.20—1.40 mm. This genus, as indicated in its generic name, resembles most closely *Brachiochondria*. Some salient discrepancies between the females of these two genera are as follows:

	Brachiochondria	*Neobrachiochondria*
Posterior processes	—	+
Accessary antennule on A2	—	+
Number of legs present	—	1

In addition to these, the male of *Brachiochondria* is different in the complete absence of the first antennae and the thoracic legs.

Praecidochondria Kabata, 1968

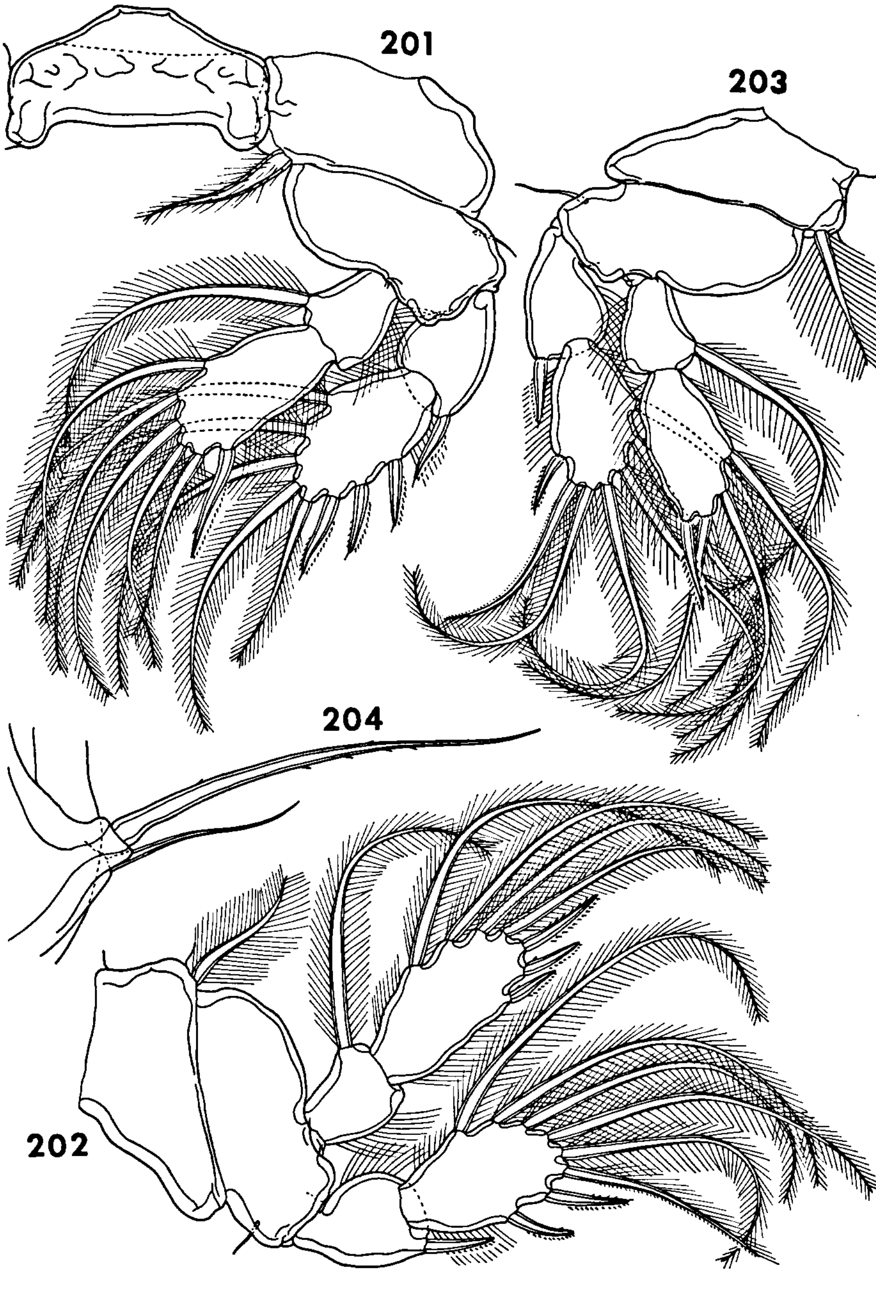
Praecidochondria Kabata, 1968: 99.

Female. — Body small and stubby. Head consisting of cephalosome and first pedigerous segment, with ventral processes. Neck moderately long. Trunk short, wider than long, with aliform lateral expansions and a pair of dorsal processes. Genito-abdomen located subterminally on ventral surface of trunk. Egg sac unknown. First antenna swollen, fleshy. Second antenna unknown. Oral appendages presumably as in usual form. One pair of peg-like very reduced legs present.

Male. — Unknown.

Type-species. — *P. galatheae* Kabata, 1968.

Remarks. — Only one species represented by a single female (from Malaya) is known for this genus. However, inspite of our scanty knowledge of this species, there are some unique features which sets it apart from the rest of



FIGS. 201—204. *Juanettia cornifera* Wilson, male. 201, leg 1 and intercoxal plate, anterior (E); 202, leg 2, anterior (E); 203, leg 3, anterior (E); 204, leg 5, ventral.

known chondracanthid genera. These features are: the genito-abdomen being located subterminally on the ventral surface of the trunk, the possession of only one pair of extremely reduced legs, and the aliform lateral expansions of the trunk. It is worth noting that the forward placing of the genito-abdomen to the midventral surface of the trunk is one of the characteristic features of the family Pharodidae (see Ho, in press), which was formerly considered as a subfamily of Chondracanthidae.

Genus **Prochondracanthopsis** Shiino, 1960

Prochondracanthopsis Shiino, 1960b: 518.

Female. — Body small, cylindrical. Head consisting of cephalosome only, with processes. First and second pedigerous segments fused into a neck, and third and fourth pedigerous segments forming a cylindrical trunk without processes. Genito-abdomen of usual form. Caudal ramus a spiniform process. Egg sac sausage-shaped. First antenna fleshy. Second antenna uncinate. Oral appendages as in usual form. Two pairs of extremely reduced legs, represented by very small laminae without armature.

Male. — Similar to *Acanthochondria*, except possessing two pairs of very reduced, laminate, and unarmed legs.

Type-species. — *P. quadricornutus* Shiino, 1960.

Remarks. — When Shiino (1960b) erected this genus, he placed in it two species. However, the second species, *P. bicornutus*, was later correctly removed to the genus *Pseudacanthocanthopsis* by Yamaguti (1963). Thus, only one species is now known in this genus.

The most striking feature of this genus is the possession of two pairs of very reduced, small legs. This condition is also found in the genus *Diocus*, but this genus, having a T-shaped second antenna, body processes in the female, and an accessary antennule in the male second antenna, can be easily distinguished from *Prochondracanthopsis*.

Genus **Prochondracanthus** Yamaguti 1939

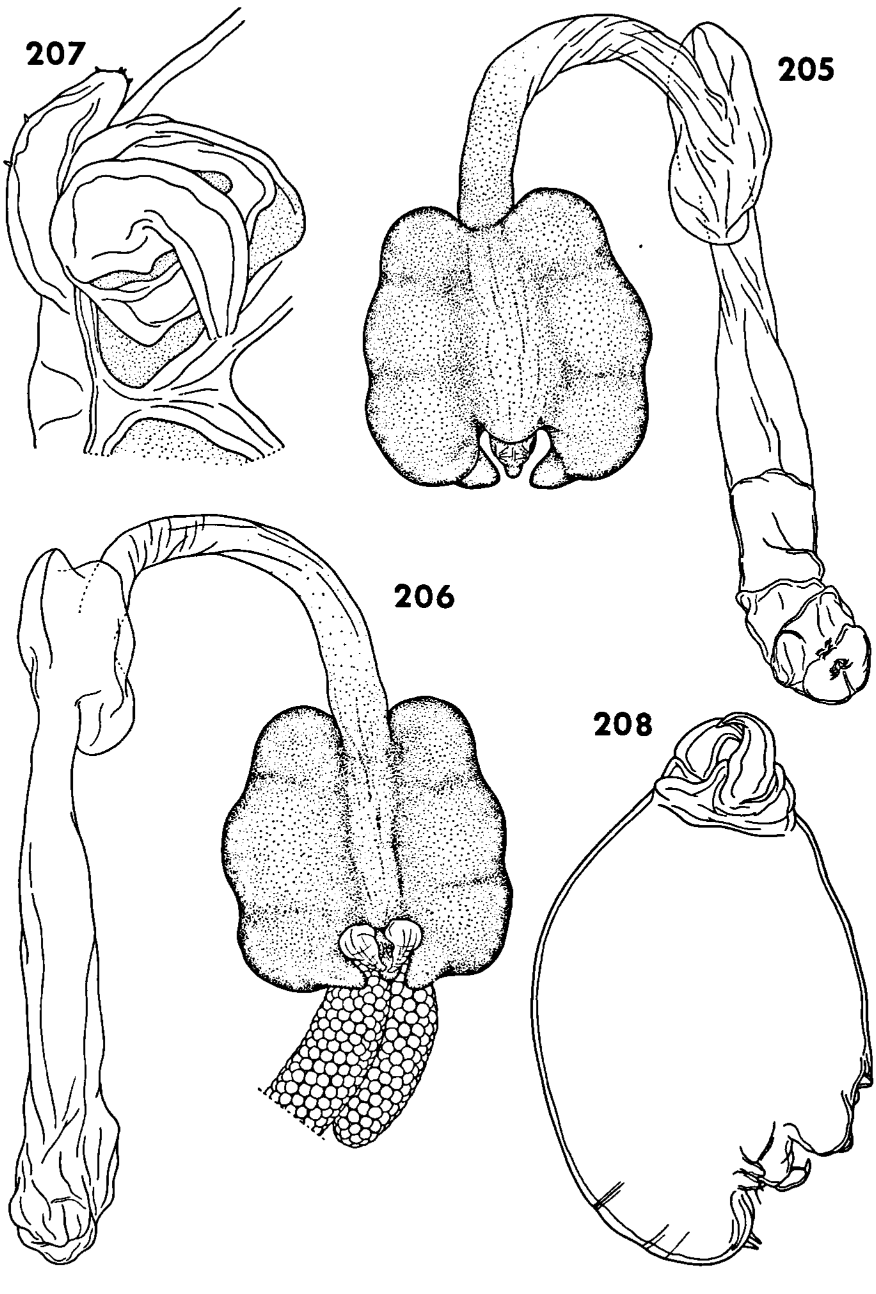
Prochondracanthus Yamaguti, 1939: 548.

Female. — Head composed of cephalosome and first pedigerous segment, and bearing small processes. Second, third, fourth, and fifth pedigerous segments fused to form an elongate, cylindrical trunk without processes. Genito-abdomen of usual form. Caudal ramus bearing 6 elements. First antenna 5-segmented. Second antenna uncinate, with accessary antennule. Oral appendages of usual form. First two pairs of legs biramous, with bimerous rami, and unmodified. Leg 3 biramous, with unimerous rami. Leg 4 represented by 1 seta and leg 5, by 3 setae.

Male. — Unknown.

Type-species. — *P. haliichthydis* Yamaguti, 1939.

Remarks. — When Yamaguti (1939) erected the genus *Prochondracanthus*,



FIGS. 205—208. *Medesicaste penetrans* Heller. Female: 205, body, dorsal (with neck and head turned ventrally) (A); 206, same, ventral (A); 207, rostral area, first, and second antennae, anteroventral (E). Male: 208, body, lateral (D).

he included the following three species: *haliichthydis* (made type-species), *alaeopis*, and *neopercis*. Since then, no more species have been added to this genus. These three species resemble each other in the female in having (according to Yamaguti's original descriptions) the cephalon fused with the first pedigerous segment and the remaining segments fused into a trunk and constricted off from the cephalothorax, and in lacking processes on the trunk.

The type-species is only known from the female. It is characterized by having three pairs of unmodified, biramous legs, and accessary antennule on the second antenna, and six elements on the caudal rami. Both *alaeopis* and *neopercis* were described by Yamaguti as having only two pairs of unmodified, biramous legs; the accessary antennule being present in the latter species but not mentioned for the former species; and, possession of only four elements on the caudal ramus. Therefore, the genus *Prochondracanthus* is a heterogenic taxon in which the degree of variation is too great to be embraced in a single genus. It is, consequently, here suggested that *alaeopis* and *neopercis* should be removed from *Prochondracanthus* and transferred to the newly erected genus *Protochondria*.

In his original description of *P. alaeopis*, Yamaguti (1939: 547—548) did not state clearly whether or not there is an accessary antennule on the second antenna, but in his diagnosis for the genus *Prochondracanthus*, he stated (1939 : 548): "Second antenna uncinate, directed forward, with accessary antennule at its base or without it". Since both *haliichthydis* and *neopercis* were either described or illustrated as possessing an accessary antennule, the words "without it" in the generic diagnosis must have been written for the inclusion of *P. alaeopis*. If this is really the case, then, the transfer of *P. alaeopis* to the genus *Protochondria* would be difficult. It is noteworthy that the male *P. alaeopis* was illustrated (in pl. xliv fig. 103) with an accessary antennule on the second antenna. An accessary antennule in the female may have been overlooked or detached, since Yamaguti (1939 : 546) stated: "second antennae broken distally".

In short, it seems justifiable to treat, at the present, the genus *Prochondracanthus* as monotypic and transfer both *P. alaeopis* and *P. neopercis* to the genus *Protochondria*.

Genus **Protochondracanthus** Kirtisinghe, 1950

Chondracanthus - Heller, 1868: 231 (refers to *Ch. alatus* only).
Protochondracanthus Kirtisinghe, 1950: 85.

Female. — Body elongate, cylindrical. Head composed of cephalosome, with processes. All pedigerous segments fused into a long cylindrical trunk, bearing 2 pairs of lateral processes in anterior region and a pair of posterior processes at posterior end. Genito-abdomen and caudal ramus of usual form. Egg sac long, cylindrical. First antenna with modified, fleshy basal portion and a small knoblike setiferous terminal portion. Second antenna uncinate. Oral appendages as usual. Leg 1 unmodified, biramous, with unimerous rami. Other legs absent.

Male. — As in *Acanthochondria,* except only one pair of legs.

Type-species. — *P. alatus* (Heller, 1868).

Remarks. — Although Kirtisinghe (1956 : 20) has withdrawn his original proposition of the genus *Protochondracanthus* that he made in 1950, Yamaguti (1963) was correct in restoring it.

As Kirtisinghe (1956 : 21) has pointed out, Heller's (1868) original description and figures of *Ch. alatus* are "inextricably confused with another species," *Ch. angustatus.* This confusion can be easily solved, however, if one reverses fig. 2 with fig. 3 in Heller's plate xiii, without changing the legends.

The type-species has been described by Heller (1868), Kirtisinghe (1950), and Pillai (1964) as having two pairs of legs, with the first pair being modified to a lobate structure. A careful study of their illustrations and descriptions has revealed, however, that what have been called the first legs are actually the usual body processes and the unmodified second pair of legs is in reality the true leg 1. This possession of only one pair of unmodified legs is why I consider that *Ch. alatus* ought to be separated from the genus *Chondracanthus,* not because of having all pedigerous segments fused into an "unsegmented trunk" as considered by Yamaguti (1963 : 268).

Yamaguti's (1963 : 292) reasoning that *psettodes* Kirtisinghe, 1950 is different from *alatus* (Heller, 1868) is apparently unjustifiable, because both Kirtisinghe (1950) and Pillai (1964) have illustrated their specimens (supposedly *psettodes*) with two pairs of lateral processes at the anterior part of the trunk as in *alatus.*

Genus **Protochondria** gen. nov.

Prochondracanthus Yamaguti, 1939: 548 (in part).

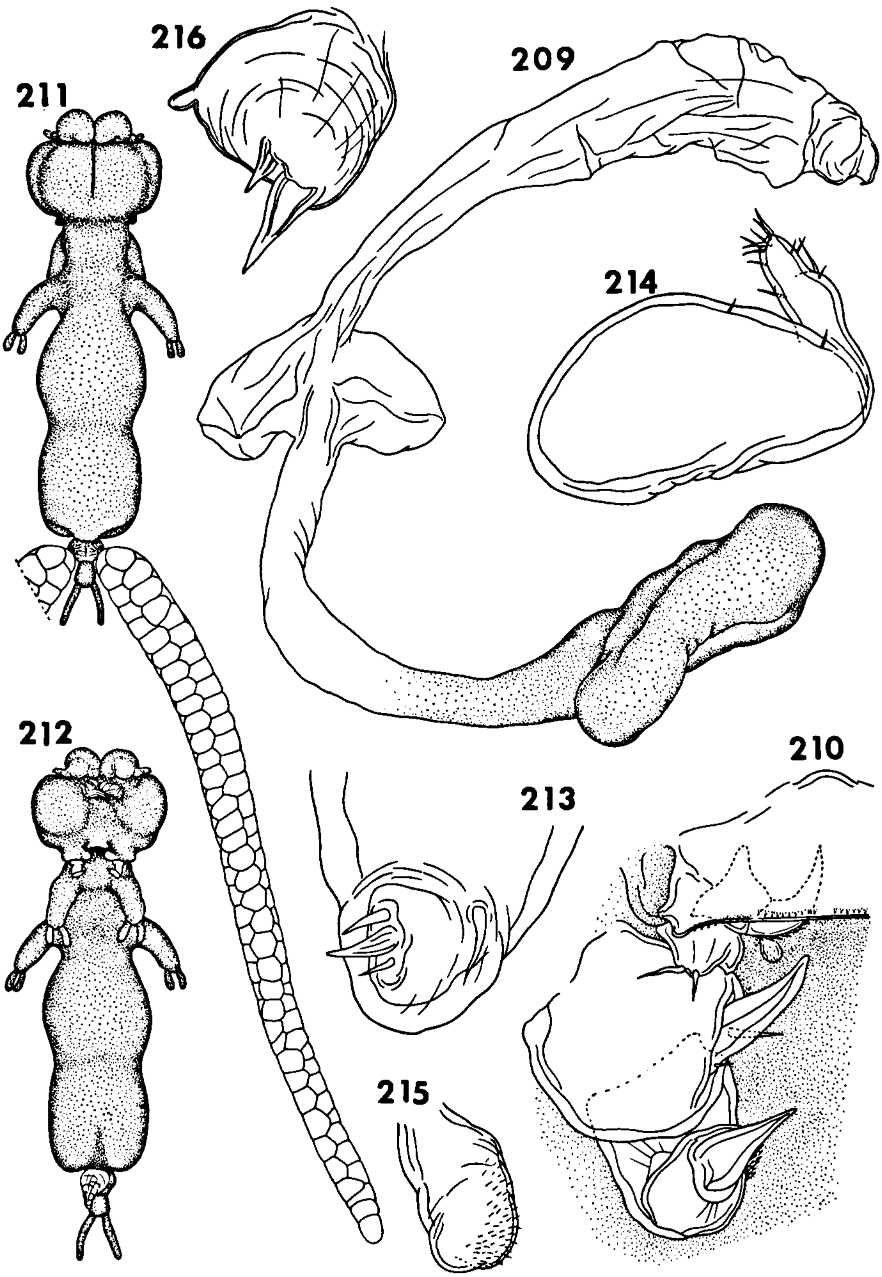
Female. — Body long, cylindrical. Head consisting of cephalosome only. First and second pedigerous segments fused into neck; third and fourth pedigerous segments fused into trunk. Body processes absent. Genito-abdomen of usual form. Caudal ramus bearing 4 to 6 elements. Cephalic appendages essentially as in typical form, except for second antenna, which possesses an accessary antennule. Two pairs of legs present, with unmodified rami.

Male. — Body of usual chondracanthid form, dwarf and arched. Caudal ramus not prolonged as in female, but rather styliform. First antenna fleshy, cylindrical, without segmentation. Second antenna uncinate, with accessary antennule. Mouth parts as in female. Two pairs of legs lacking a distinct endopod; protopod swollen and carrying a long outer seta.

Type-species. — *P. longicauda* sp. nov.

Etymology. — Combination of *proto* = first, and *chondria* = cartilage, alluding to the primitiveness in the second antenna (with an accessary antennule), legs (with unmodified rami), and the caudal ramus (with 6 elements). Gender feminine.

Remarks. — The general appearance of the female of this genus is strikingly similar to *Heterochondria* and *Prochondracanthus* in having an elongate, cy-



FIGS. 209—210. *Medesicaste penetrans* Heller. Female: 209, body, lateral (with neck and head turned ventrally) (A). Male: 210, oral area, ventral (E).

FIGS. 211—216. *Protochondria longicauda* n.g., n. sp., female. 211, body, dorsal (Q); 212, same, ventral (Q); 213, tip of caudal ramus, ventral (K); 214, first antenna, anterior (R); 215, paragnath, inner (J); 216, first maxilla, anteroventral (J).

lindrical body without processes in the trunk region. The species of *Heterochondria* can, however, be easily distinguished by the absence of an accessary antennule and the presence of two modified, unilobate legs. The genus *Prochondracanthus* is to be regarded as more primitive than this genus, since it has three pairs of unmodified, biramous legs. As has been discussed in the "Remarks" under the genus *Prochondracanthus*, both *P. alaeopis* Yamaguti, 1939 and *P. neopercis* Yamaguti, 1939 should be transferred to this genus.

Protochondria longicauda sp. nov. Figs. 211—235.

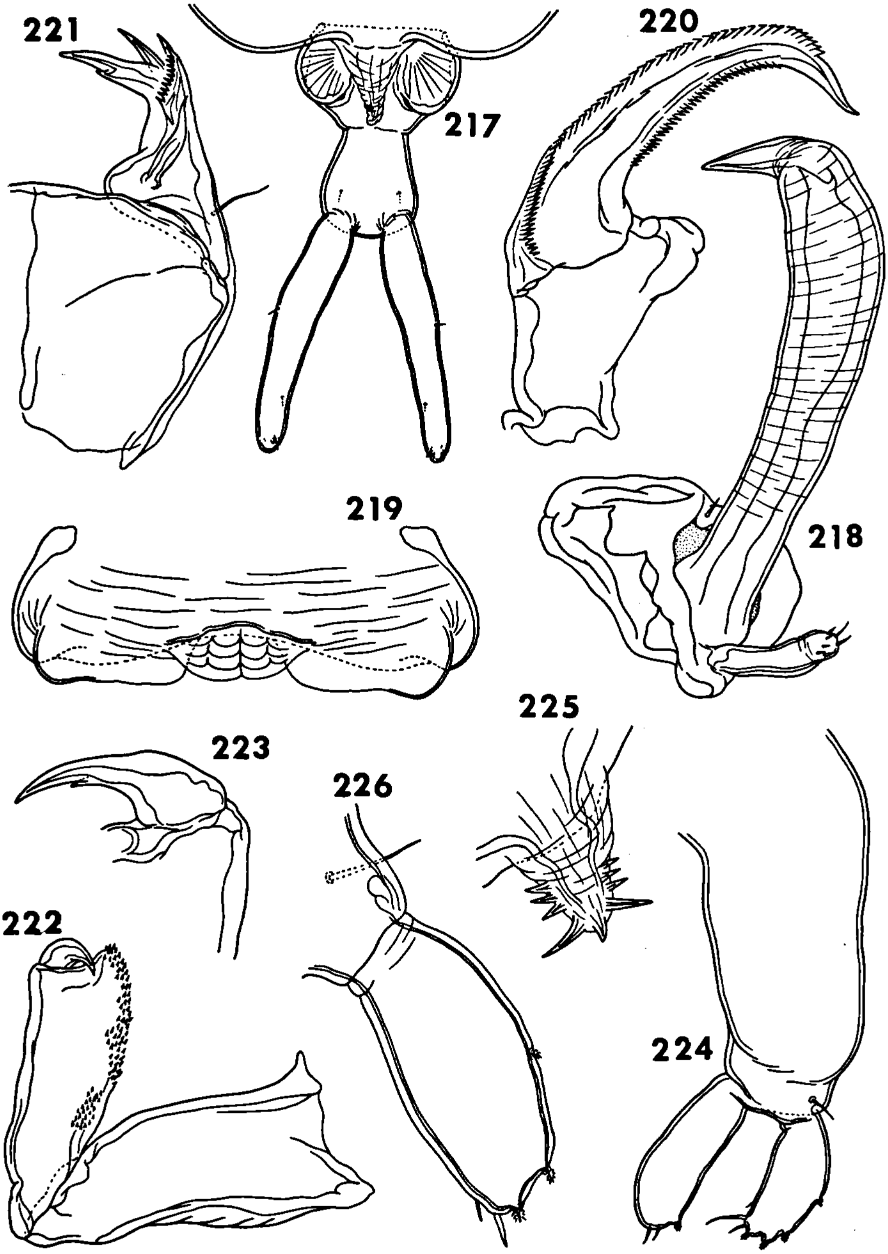
Material examined. — From author's collection: all on gill filaments of *Hippoglossina bollmanni* Gilbert, caught during Cruise 16 of R/V "Anton Bruun" in Sta. 640B (07°03'S 80°45'W, 1 ♀), Sta. 641A (06°55'S 80°45', 7 ♀), and Sta. 43A (07°24'S 80°39'W, 10 ♀ and 3 young ♀).

One ovigerous female from Sta. 634A has been selected as holotype, and the male attached to it as allotype. Holotype, allotype, and 12 paratypes (6 ♀ each with a ♂ attached to it) deposited in the USNM.

Female. — Body (figs. 211, 212) rather *Acanthochondria*-form. Head consisting of only cephalosome, large, with fleshy and swollen lateral surface. Area lateral to second amxillae protruded into a small knob; another protrusion located posterolateral to bases of second antennae (see fig. 212). First pedigerous segment not well demarcated from head. Trunk somewhat guitar-shaped, without posterior processes, but having a single median process (fig. 217) at posterior margin of ventral surface (to which the male attaches, see fig. 212). Genital segment (fig. 217) wider than long, but abdomen (fig. 217) slightly longer than wide. The latter carrying a pair of setules on dorsal surface. Caudal ramus (fig. 217) long and cylindrical, bearing 6 elements, of which four (one of them rather spiniform) are located terminally on an indistinctly set-off lobe (see fig. 213), one on lateral surface at about one-fourth from the tip, and another one on lateral surface at about middle. Egg sac (fig. 211) with four rows of eggs, but decreasing to one row terminally.

First antenna (fig. 214) with greatly swollen basal portion and a short, cylindrical terminal portion which is indistinctly bipartite and coming from the posteroventral surface of the globose basal portion; armature being 1-1-3-2-8. Second antenna (fig. 218) 2-segmented, with an accessary antennule bearing 7 elements, terminal segment greatly elongated, but not strongly recurved.

Labrum (fig. 219) with membranous posterior margin and a central flap showing scale-like sculpturing. Mandible (fig. 220) bearing about 68 fine teeth on convex margin and 35 teeth on concave margin. Paragnath (fig. 215) a small fleshy lobe bearing fine setules. First maxilla (fig. 216) bearing 3 elements of different appearance as shown in figure. Second maxilla (fig. 221) 2-segmented; first segment greatly swollen and without armature; second segment bearing 2 setae on basal portion, a row of about 13 different size teeth on postero-inner margin, and a short tooth at anterosubterminal portion.



FIGS. 217—226. *Protochondria longicauda* n.g., n. sp., female. 217, genito-abdomen, ventral (D); 218, second antenna, posterior (E); 219, labrum, ventral (E); 220, mandible, dorsal (J); 221, second maxilla, dorsal (H); 222, maxilliped, antero-inner (E); 223, terminal hook of maxilliped, inner (J); 224, leg 1, posterior (R); 225, spinous element on leg 1 ventral (S); 226, exopod of leg 2, anterior (E).

Maxilliped (fig. 222) having rather slender first and second segments and a small terminal claw, which bears a hooklet.

Two pairs of legs similar in their general appearance, both having a large, sac-like propopod carrying an outer seta and two rather unmodified rod-like rami. Armature of leg 1 (fig. 224) being: III,I,3 (or 2) on exopod and I,2 on endopod; but in leg 2, being II,I,2 on exopod (fig. 226) and I, 1 (or same as in leg 1) on endopod. Spiniform element (fig. 225) on rami peculiar in having a membranous base with sclerotized barbules on its shaft.

Measurements. — Body 2.82—3.44; head 0.60 × 0.91; genital segment 165 × 242 μ; abdomen 169 × 143 μ; egg sacs 4.92 and 5.07; egg 195 μ.

Male. — Body (fig. 227) measuring 0.41 × 0.20, with relatively distinct metamerism. Cephalosome (fig. 228) globose, forming the widest portion of body and bearing a median protrusion in rostral area between bases of second antennae. Caudal rami (fig. 229) not clearly delimited from abdomen, nearly 3 times longer than wide; 4 subterminal elements different from female in having the greatly elongated spiniform element with spinulose tip and another element represented by a tiny knob.

First antenna (fig. 230) bipartite, with armature as in female. Second antenna (fig. 231) with accessary antennule armed with seven elements; terminal segment short and strongly recurved.

Labrum different from female in lacking the membranous posterior margin and sculptured median flap. Mandible with 36 fine teeth on convex margin and 21 on concave margin. Second maxilla (fig. 232) fundamentally as in female, but having fewer and rather evenly sized teeth on terminal segment. Maxilliped (fig. 233) of slightly different shape than in female.

Both legs 1 (fig. 234) and 2 (fig. 235) with swollen protopod carrying a long outer seta and a very indistinct endopod. First exopod tipped with 4 long setae, but the second, with 3 small elements.

Etymology. — *longicauda* = long tail, alluding to the greatly elongated caudal rami.

Remarks. — The possession of only a single process on the posteromedian surface of trunk in this species is rather peculiar, for in all other species of chondracanthids that I have observed, there is always a pair of such processes to one of which the male attaches.

Genus **Pseudacanthocanthopsis** Yamaguti & Yamasu, 1959

Pseudacanthocanthopsis Yamaguti & Yamasu, 1959: 136.
Pseudacanthopsis Yamaguti & Yamasu, 1960: 137.

Female. — Body short, small, and wide. Head consisting of cephalosome, with processes. First and second pedigerous segments fused into neck. Third and fourth pedigerous segments fused to form a short, wide trunk, bearing posterior processes. Genito-abdomen and caudal ramus of usual form. Egg sacs cylindrical. First antenna fleshy. Second antenna uncinate. Mouth parts of usual form, except second maxilla which terminates in a simple process without teeth. Leg 1 lobate, small; leg 2 reduced to a small knob.

Male. — Dwarf, with distinct metamerism. First pedigerous segment fused with cephalosome. Caudal ramus bearing 4 elements, with long slender terminal seta. First antenna 5-segmented. Second antenna uncinate with accessary antennule. Oral appendages essentially as in female. First two pairs of legs biramous and unmodified. Fifth and sixth legs represented by simple seta. Other legs absent.

Type-species. — *P. apogonis* Yamaguti & Yamasu, 1959.

Remarks. — There are three species of chondracanthids belonging to this genus. In addition to the type-species, there are: *P. secunda* Yamaguti & Yamasu, 1960 and *P. bicornutus* (Shiino, 1960b). The male is unfortunately known only in the last species, from which the above diagnosis of the male was made.

When Yamaguti & Yamasu (1960) described *P. secunda*, the generic name was incorrectly presented as "*Pseudacanthopsis*". Consequently, it becomes a synonym of the genus.

This genus closely resembles *Acanthochondria* in its general appearance. It is different in the female, however, in having very small, reduced legs and in the male in the possession of an accessary antennule on the second antenna.

Genus **Pseudoblias** Heegaard, 1962

Pseudoblias Heegaard, 1962: 152.

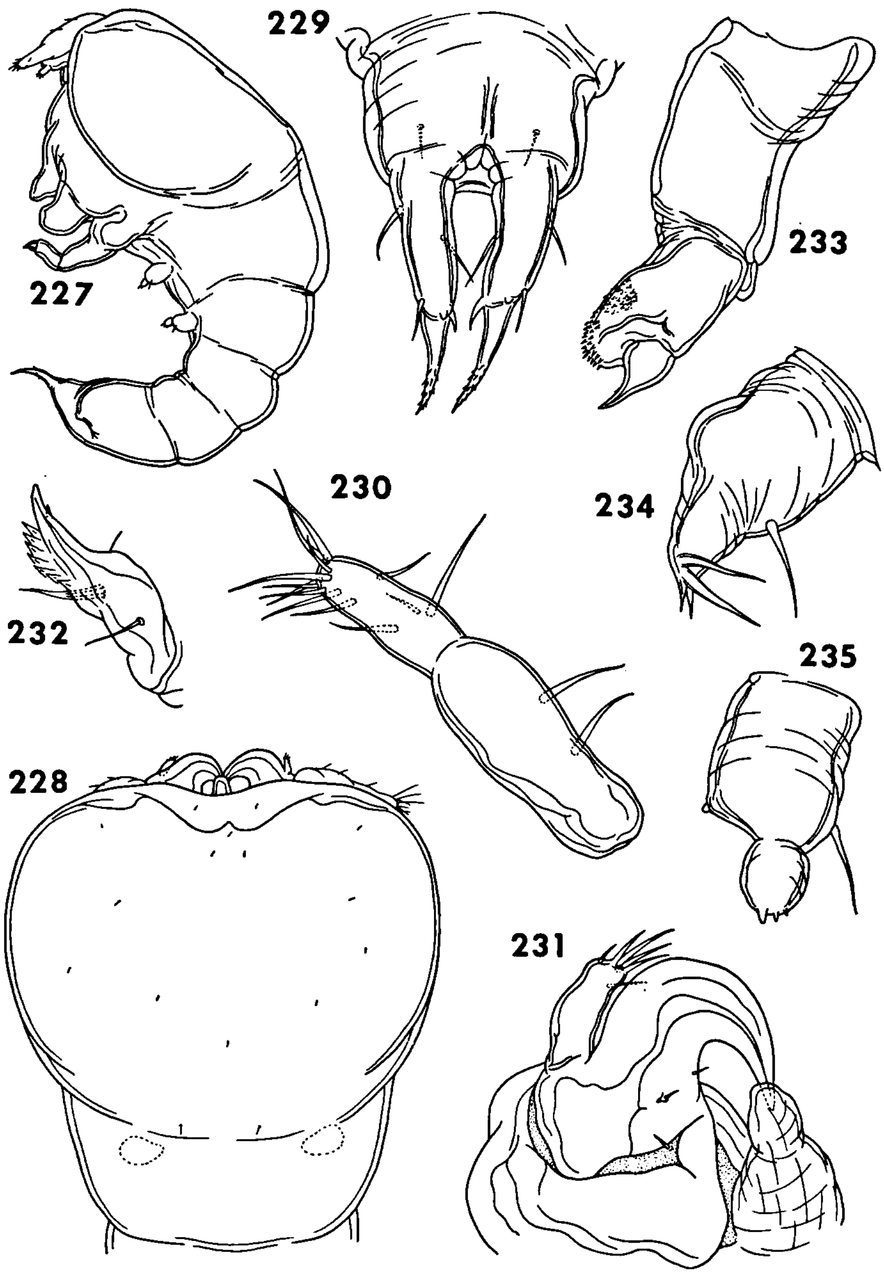
Female. — Body cylindrical. Head consisting of cephalosome only. Pedigerous segments fused into cylindrical trunk without appreciable neck region. Body processes absent. Genito-abdomen and caudal ramus of usual form. Egg sac cylindrical, with four rows of eggs. First antenna modified, fleshy. Second antenna uncinate. Mandible and first maxilla as in usual form. Second maxilla with a striated, broad flange instead of a row of denticles in the terminal segment. Maxilliped with subchelate tip. Two pairs of modified, bilobate legs; both endopods very small, knob-like.

Male. — See remarks.

Type-species. — *P. lyrifera* Heegaard, 1962.

Remarks. — The above generic diagnosis of the female was made based entirely on Kabata's (1969) redescription of *P. lyrifera*. It is very unfortunate that the male was only briefly mentioned in the original description and the one redescribed by Kabata is not an adult but still in its copepodid stage. The condition of having a modified adult female carrying a copepodid male is not unique to *P. lyrifera*. Such a condition is apparently not uncommon, since it has been reported in the following 5 species of chondracanthids: *Acanthochondria cornuta* (by Heegaard, 1947 : 158—167), *A. albigutta* (by Pearse, 1952 : 225), *Diocus gobinus* (by Hansen, 1923 : 48—49), *Neobrachiochondria quadrate* (by Kabata, 1969 : 501—506), and *Protochondracanthus alatus* (by Pillai, 1964 : 76).

This genus is undoubtedly most close to the genus *Heterochondria*. Had it not been redescribed by Kabata, I would have transferred *P. lyrifera* to the



FIGS. 227—235. *Protochondria longicauda* n.g., n.sp., male. 227, body, lateral (G); 228, cephalothorax, dorsal (E); 229, abdomen and caudal rami, ventral (K); 230, first antenna, anterodorsal (K); 231, second antenna, anterodorsal (K); 232, terminal segment of second maxilla, ventral (K); 233, maxilliped, ventro-outer (K); 234, leg 1, anterolateral (S); 235, leg 2, postero-inner (S).

latter. The main difference between these two genera is in the possession of a greatly reduced endopod in the legs of the female *Pseudoblias*. If the accessary antennule on the second antenna of the copepodid male of *P. lyrifera* is proved to be also the case in the adult, then, the difference between *Heterochondria* and *Pseudoblias* is even greater.

Genus **Pseudochondracanthus** Wilson, 1908

Pseudochondracanthus Wilson, 1908: 436.
Pseudochondracanthoides Yamaguti, 1963: 294.

Female. — Head consisting of cephalosome, but first pedigerous segment may be incorporated, bearing 1 or 2 pairs of processes. Trunk region formed by fused second, third, and fourth pedigerous segments, without processes, except having protruded posterolateral corners. Genital segment of usual form, but abdomen very indistinct, being obscured by greatly enlarged caudal ramus, which lacks the usual distinct terminal spiniform process. Egg sac sausage-shaped, with only a few rows of eggs. First antenna fleshy, swollen. Second antenna uncinate. Labrum, paragnath, first maxilla and maxilliped of usual form. Mandible bilaterally armed with many fine teeth. Terminal process of second maxilla also bilaterally armed. Leg 1 present, modified and bilobate. Other legs absent.

Male. — Dwarf, general appearance as usual in chondracanthids. Metamerism rather indistinct. Abdomen indistinct as in female. Caudal ramus with bifurcate tip. First antenna absent. Second antenna uncinate. Oral appendages as in female. All legs absent.

Type-species. — *P. diceraus* Wilson, 1908.

Remarks. — The most distinctive feature of this genus is the possession of only one pair of legs in the female and the absence of legs entirely in the male. The male is also peculiar in lacking first antennae. The dentation of the mandible and the bilaterally denticulated terminal process on the second maxilla is also quite different from the usual form. Since these distinctive features of the type-species are also seen in *P. hexaceraus* Wilson, 1935, Yamaguti's (1963) creation of a new genus *Pseudochondracanthoides* for Wilson's *hexaceraus* is not recognized here.

This genus is similar to *Brachiochondria* in having a peculiar armature on the terminal process of the second maxilla and in lacking the first antenna and all legs in the male.

Up to the present, 7 species of chondracanthids have been described under this genus. They are, in addition to *P. diceraus* and *P. hexaceraus* : *elongatus* Pearse, 1952; *longitruncus* Yamaguti, 1939; *murtii* Rangnekar & Rangnekar, 1954; *nellcauseyae* Causey, 1955; and *pseudorhombi* Yamaguti, 1939. I have examined the type specimens of *P. elongatus* and *P. nellcauseyae* and have found that the former species is conspecific with *P. diceraus* and the latter species, with *Berea ancoralis*.

P. longitruncus apparently does not belong to this genus, for there are two pairs of legs present in the female and one pair in the male. According to Yamaguti's description (1939 : 541—542, pl. xi figs. 62—65, pl. xli figs. 66—71), this species is attributable to the genus *Ceratochondria*, but since the second antenna is unknown (broken in the single known specimen) and nothing was mentioned about a dorsal process in the neck region, it is difficult to make a decisive transfer. Nevertheless, the possession of a large, modified first leg; a small, rudimentary second leg; the fine structure of the oral appendages and caudal ramus; and the presence of one pair of legs in the male, all indicate that Yamaguti's *longitruncus* is a species of *Ceratochondria*.

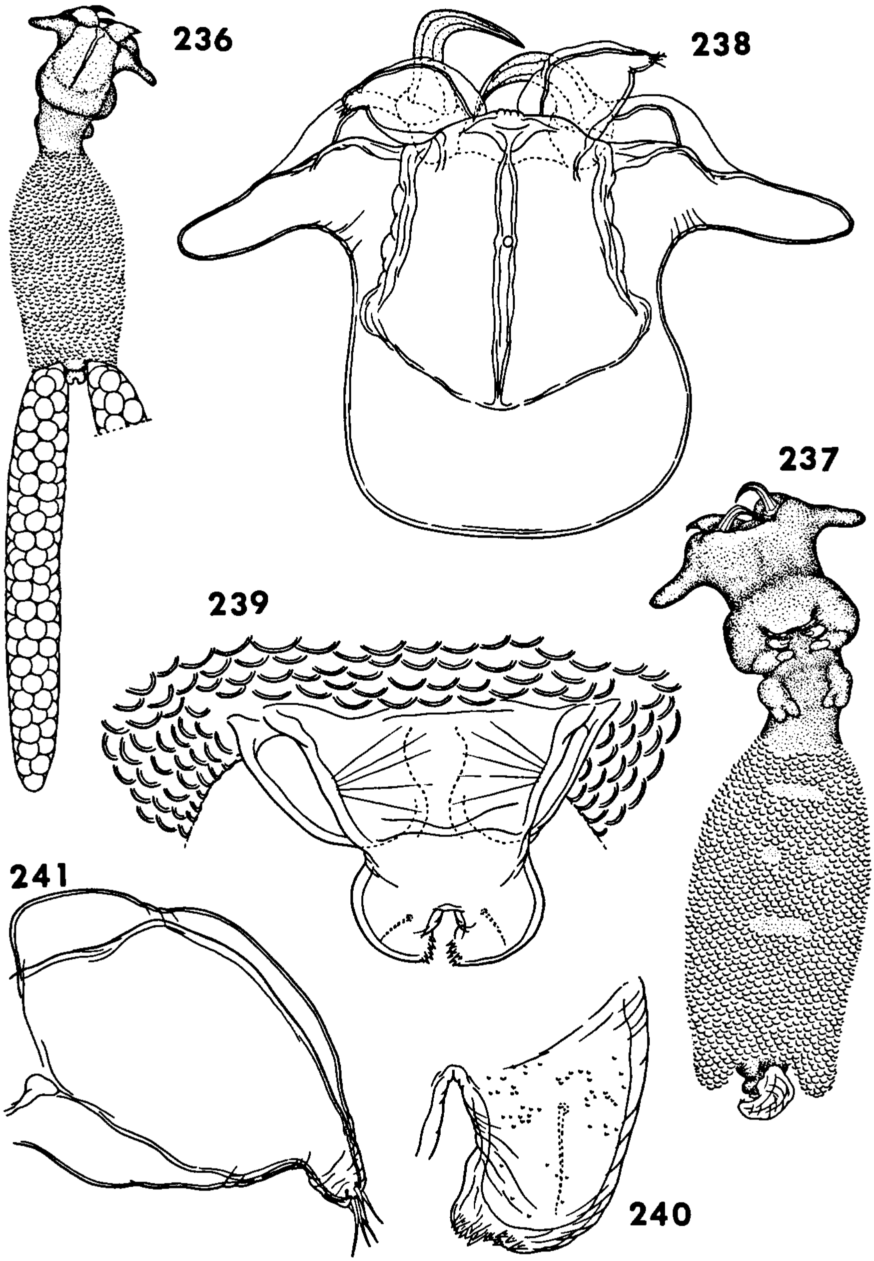
The specimens described by Pillai (1964) as *P. longitruncus* are quite different from the one originally described by Yamaguti. The possession of two pairs of unilobate legs in the female and no legs in the male, however, suggest its affinity with the species of *Heterochondria*. Accordingly, I propose a new name *H. pillaii* for Pillai's *P. longitruncus*. The single specimen of "*Pseudochondracanthus* sp." of Pillai (1964 : 81—82, figs. 149—150) resembles more *P. longitruncus* of Yamaguti than the one that he described as *P. longitruncus*. Hence, Pillai's "*Pseudochondracanthus* sp." ought to be transferred to *Ceratochondria* but not to *Heterochondria*.

Pseudochondracanthus diceraus Wilson, 1908. Figs. 236—251.

Pseudochondracanthus diceraus Wilson, 1908: 436, pl. lxvii figs. 19—27; 1932: 496, figs. 297(a, b). Oakley, 1930: 200. Bere, 1936: 608. Pearse, 1947: 14. Yamaguti, 1963: 295, pl. 262 figs. 1(a—f).
Pseudochondracanthus elongatus Pearse, 1952: 222, figs. 93—96.

Material examined. — From USNM: (all found on gills of *Sphaerodes maculatus* (Bloch & Schneider) unless otherwise mentioned) 37 ♀, Woods Hole, Mass., September 9, 1905 (No. 38602, type); 4 ♀, Woods Hole, Mass., August 17, 1906; (No. 38604); 2 ♀ on fins of puffer, La Jolla, Calif. (No. 38581); 4 ♀ and 12 young ♀, Woods Hole, Mass., July 16, 1923 (No. 56639); 60 ♀, Woods Hole, Mass., September 15, 1908 (No. 60544); 21 ♀ and 1 young ♀, Lemon Bay, Fla., 1934-35 (No. 79183); 3 ♀, Woods Hole, Mass. (labelled as *Tucca corpulentus*, No. 79595); 4 ♀, Beaufort, N.C., June 26, 1946 (No. 84011); 3 ♀, Beaufort, N.C., June 2, 1946 (No. 84012); 6 ♀, Beaufort, N.C., June 3, 1946 (No. 84013); 8 ♀, Beaufort, N.C., June 3, 1946 (No. 84014); 5 ♀, Beaufort, N.C., June 4, 1946 (No. 84015); 1 ♀, Beaufort, N.C., June 10, 1946 (No. 84016); 6 ♀, Beaufort, N.C., June 29, 1946 (No. 84017); 1 ♀ Beaufort, N.C., June 14, 1946 (No. 84019); 10 ♀, Beaufort, N.C., June 14, 1946 (No. 84020); 2 ♀, Woods Hole, Mass., August 26, 1946 (No. 84021); 3 ♀, Woods Hole, Mass., August 12, 1946 (No. 84230); 9 ♀, Woods Hole, Mass., August 12, 1950 (No. 81209); 8 ♀, Woods Mole, Mass., August 8, 1950 (No. 91210); 9 ♀, Woods Hole, Mass., August 18 ,1950 (No. 91211); 10 ♀, Woods Hole, Mass., August 16, 1950 (No. 91212); 1 ♀ on *S. spengleri* (Bloch), Beaufort, N.C., February 20, 1950 (No. 90726); 1 ♂ on *S. spengleri*, Aligator Harbor, Fla., May 16, 1952 (Allotype of *P. elongatus*, No. 93696); 5 ♀ on *S. spengleri*, Alligator Harbor, Fla., May 16, 1952 (types of *P. elongatus*, No. 93698). From author's collection: 14 ♀ on gills of *S. trichocephalus* (Cope), Carrabelle Sound, Fla., July 24, 1965; 3 ♀ on gills of *S. trichocephalus*, Marsh's Sound, off Panacea, Fla., July 18, 1965.

Female. — Body (figs. 236, 237) elongate, cylindrical. Head (fig. 238) composed of cephalosome only, bearing a pair of cephalic processes on



FIGS. 236—241. *Pseudochondracanthus diceraus* Wilson, female. 236, body, dorsal (Q); 327, body, ventral (T); 238, head, dorsal (D); 239, posterior end of body, dorsal (G); 240, caudal ramus, dorsal (H); 241, first antenna, dorsal (E).

anterolateral corners and a distinct carapace on dorsal surface; posterior portion swollen and bulging ventrally (see fig. 237), with mouth located on its summit. First pedigerous segment representing neck region, narrower than head and trunk. Remaining pedigerous segment fused into trunk, which is covered with scale-like sclerotization and bears a pair of blunt, short posterior processes on posterolateral corners. Genital segment (fig. 239) wider than long, with egg sac attachment area situated on dorsolateral surface. Abdomen (fig. 239) and caudal rami (fig. 240) indistinguisably fused, the latter carrying a seta on ventral surface and tipped with many fine spiniform projections. Egg sacs (fig. 236) sausage-shaped, longer than body, bearing only a few rows of eggs.

First antenna (fig. 241) fleshy, with greatly enlarged basal portion; small, conical, distal portion carrying 7 setules. Second antenna (see fig. 238) slender and uncinate.

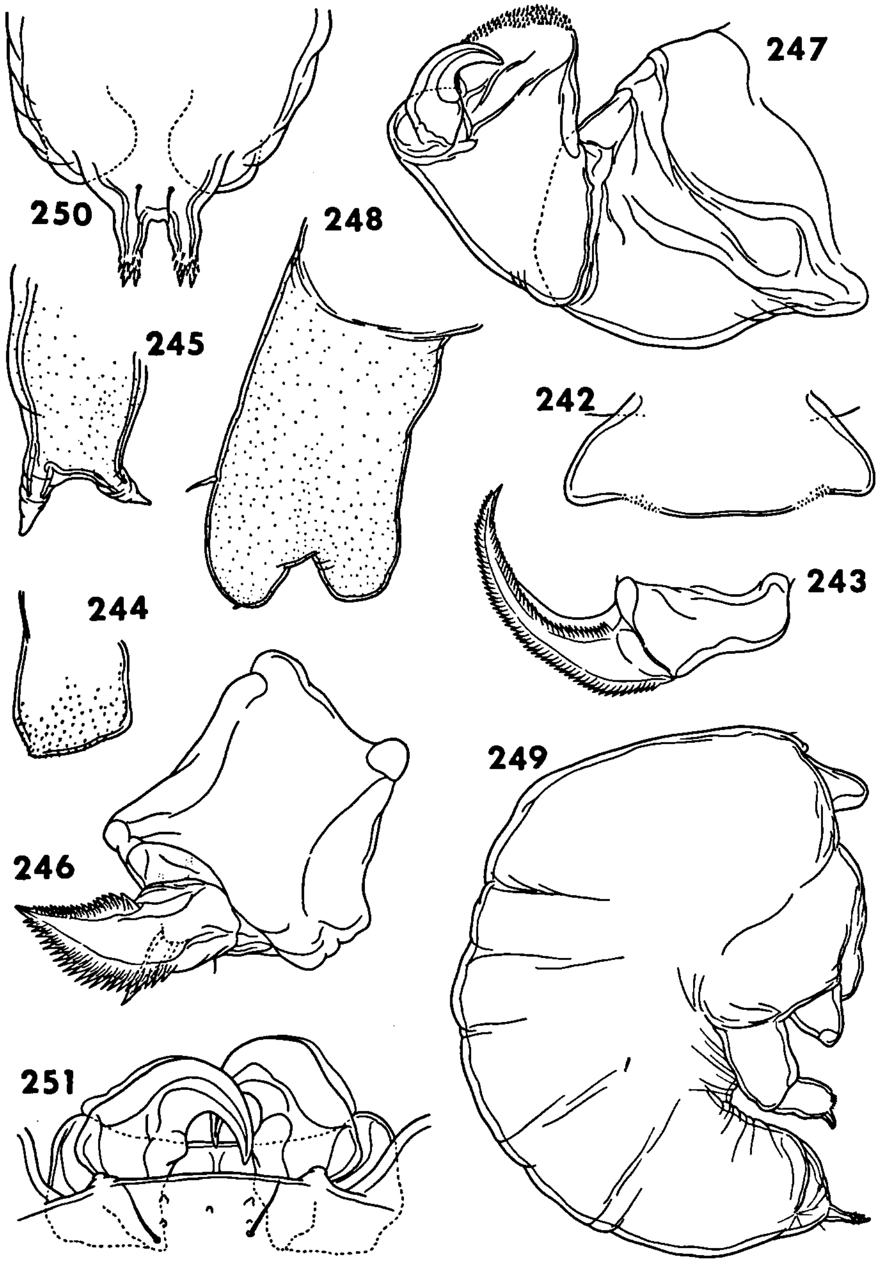
Labrum (fig. 242) of usual form, bearing 2 patches of spinules on posterior margin. Mandible (fig. 243) 2-segmented, distal segment falcate, and armed with about 56 teeth on convex side and 34 on concave side. Paragnath (fig. 244) a small lobe bearing fine spinules. First maxilla (fig. 245) covered with spinules and tipped with 2 elements. Second maxilla (fig. 246) 2-segmented, basal segment large, subrectangular; distal segment falcate, bilaterally denticulated, and bearing a large spiniform seta and a small setule at basal portion. Maxilliped (fig. 247) 3-segmented, robust; first segment unarmed, second segment protruded at disto-inner corner into a knob covered with short spines, and third segment a short strongly curved claw without hooklet.

Leg 1 (fig. 248) bilobate, covered with fine spinules; protopod carrying an outer seta and much larger and longer than either rami. Exopod tipped with a small blunt setule, but endopod unarmed.

Measurements. — Body 2.71; head 0.75 × 0.62; genital segment 0.18 × 0.25; abdomen 0.08 × 0.13; egg sacs 3.04 and 3.06; egg 120 μ.

Male. — Body (fig. 249) small and robust, 0.36 × 0.17. Cephalosome greatly enlarged and globose, its volume more than half of entire body. Urosome strongly curved ventrally, with genital segment, abdomen, and caudal rami completely fused (see fig. 250). One setule on lateral surface of first pedigerous segment and 2 on dorsal surface of abdominal region. Caudal ramus (fig. 250) a short cylindrical process forked terminally and covered with membranous spiniform projections as in female. Rostral area (fig. 251) truncate, bearing 2 small protrusions (remnants of first antennae?) and a pair of setules. Second antenna (fig. 251) robust, uncinate. Labrum and mouth parts as in female, except usual sexual dimorphism. Legs absent.

Remarks. — *P. elongatus* was defined by Pearse (1952) as having the caudal rami, the first leg, and the shape of male cephalon different from the type-species. Reexamination of type specimens of both *P. diceraus* and *P. elongatus* has revealed, however, that these differences are in reality due to Wilson's (1908) inadequate description and illustrations of the former



FIGS. 242—251. *Pseudochondracanthus diceraus* Wilson. Female: 242, labrum, ventral (G); 243, mandible, dorsal (H); 244, paragnath, posterior (J); 245, first maxilla, anterior (J); 246, second maxilla, posterior (H); 247, maxilliped, posterior (E); 248, leg 1, posterior (G). Male: 249, body, lateral (E); 250, posterior end of body, dorsal (J); 251, rostral area and second antennae, dorsal (J).

and not genuine specific discrepancies. Hence, *elongatus* is here synonymized with *diceraus.*

This species differs remarkably from other known species of *Pseudochondracanthus* in having the trunk region covered with scale-like sclerotization. Its possession of only one pair of fairly large cephalic processes is also distinct from *P. hexacerus* Wilson, 1935, and *P. pseudorhombi* Yamaguti, 1939.

Genus **Rhynchochondria** Ho, 1967

Rhynchochondria Ho, 1967: 406.

Female. — Cephalosome fused with first pedigerous segment and separated from rest of body by a distinct neck, which is the intersegmental portion between first and second pedigerous segments. Rostrum snout-like; another long process located immediately behind leg 1 on ventral surface of head. Second, third, and fourth pedigerous segments fused into a square trunk, bearing small, fused, genital segment and abdomen at posterior end. Caudal ramus present. First antenna indistinctly 6-segmented; second antenna uncinate, with accessary antennule. Mandible falcate and bilaterally denticulated. Paragnath present. First maxilla a knob bearing 4 elements. Second maxilla 2-segmented, terminal segment armed with strong teeth. Maxilliped 3-segmented, terminal segment unguiform. Legs 1 to 3 biramous, rami 2-segmented. Leg 4 absent. Leg 5 and 6 present.

Male. — Dwarf, with distinct metamerism on body. Single postgenital segment. Caudal ramus and cephalic appendages as in female. First three pairs of legs biramous, rami 2-segmented, except third endopod, where it is 1-segmented. Leg 4 absent. Leg 5 and leg 6 present.

Type-species. — *R. longa* Ho, 1967.

Remarks. — The most distinctive feature of this genus is, as indicated in its generic name, the possession of a large snout-like rostral process (figs. 260, 261) and a trilobated swelling, with the middle lobe prolonged into a large process, located behind leg 1. The possession of three pairs of unmodified, biramous legs in both sexes is also characteristic. These unmodified legs together with the possession of an accessary antennule on the second antenna and the unmodified caudal ramus in both sexes indicate that the genus is a primitive chondracanthid.

Genus **Scheherazade** Leigh-Sharpe, 1934

Scheherazade Leigh-Sharpe, 1934a: 16.

Female. — Body elongate and distinctly divided into anterior long slender portion and posterior large elliptical portion. Head and neck regions not clearly marked off. No body processes present. Genital segment large, but abdomen indistinct. Caudal ramus with small, slender terminal process. Egg sac unknown. First antenna unknown. Second antenna uncinate, with very small accessary atennule. Oral appendages as in usual form. One pair of very small, rudimentary legs present, located near mouth parts.

Male. — Unknown.

Type-species. — *S. scheherazade* Leigh-Sharpe, 1934.

Remarks. — Only one species is known in the genus. It is distinctive in its general appearance in having an elongated, slender neck sharply marked off from the large elliptical trunk.

Scheherazade scheherazade Leigh-Sharpe, 1934. Figs. 252—259.

Scheherazade scheherazade Leigh-Sharpe, 1934a: 16, figs. 14—16. Yamaguti, 1963: 295, pl. 259 figs. 3.

Material examined. — From ZMA: 1 ♀ (holotype) on skin of *Symphurus (Aphoristia) elongatus* Günther, from Flores Sea (Sta. 314 of Siboga Expedition).

Female. — Body (figs. 252, 253) greatly elongated, with long slender anterior part (neck region) turned slightly leftward; head region indistinguishable from this narrowed neck, which is sharply constricted from the long elliptical trunk. No body processes present. Dorsal surface of cephalosome (fig. 254) with indistinct median rib. Genital segment (fig. 255) nearly as long as wide. Abdomen indistinct (see fig. 255). Caudal ramus (fig. 255) with rod-like basal portion bearing 4 broken elements; terminal process (broken) small and slender. Right caudal ramus detached in holotype. A pair of small knobs and a pair of setules on ventral surface of trunk just in front of genital segment (fig. 255). Egg sac unknown.

First antenna unknown (detached in holotypic specimen; see fig. 254). Second antenna (figs. 254, 256) 2-segmented and bearing a very small accessary antennule tipped with 2 setules; terminal segment a recurved hook with a small knob on concave side close to tip. Rostral area with a blunt protrusion (see figs. 254, 256).

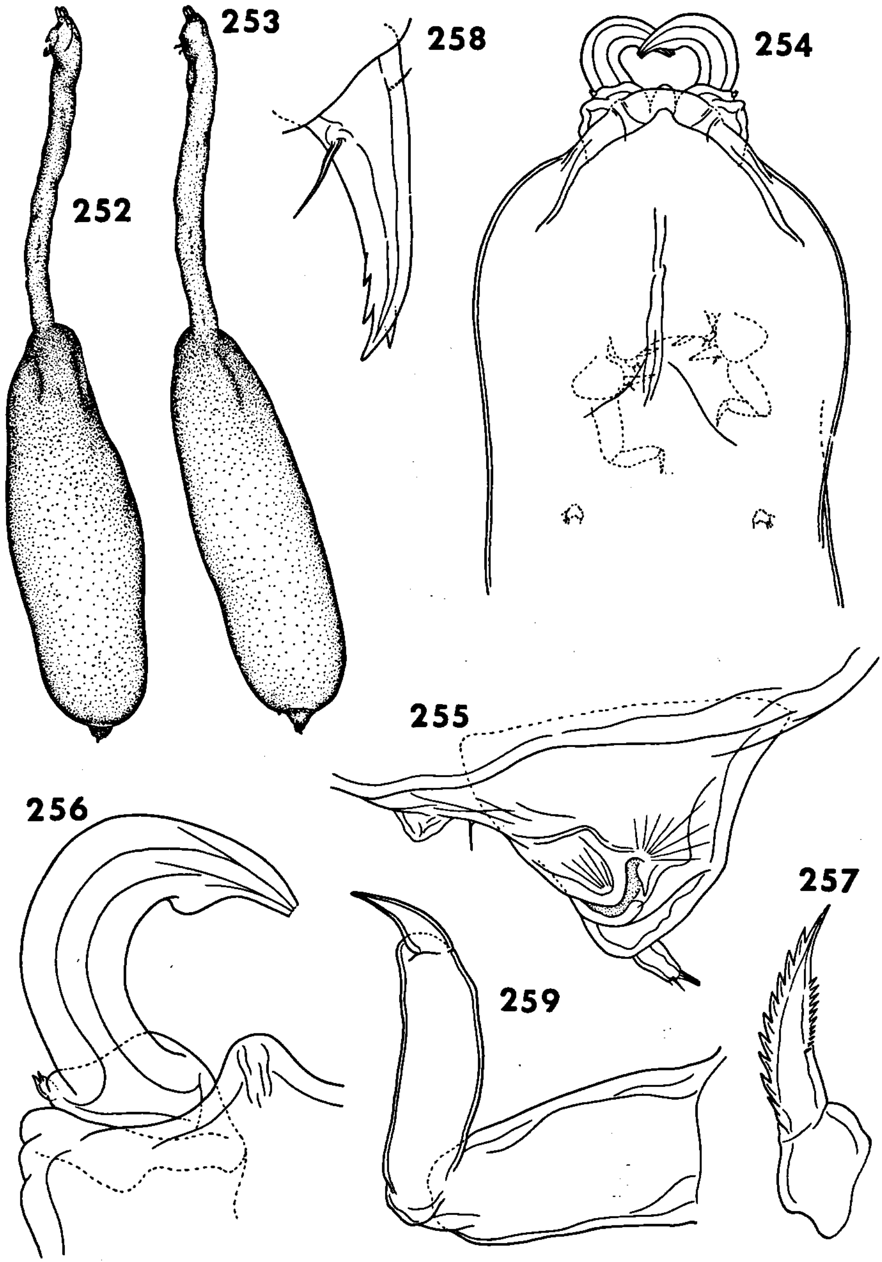
Labrum of usual form and with naked posterior margin. Mandible (fig. 257) with 9 teeth on convex side and 11 fine ones on concave side. Paragnath not seen. First maxilla a small lobe tipped with 2 setae. Second maxilla 2-segmented, terminal segment (fig. 258) bearing 2 setae on basal portion and 3 teeth (2 on one side and 1 on other side) on subterminal portion. Maxilliped (fig. 259) 3-segmented, slender and unarmed.

Leg 1 very small, bilobate (see fig. 254); protopodal portion bearing 1 outer setule, exopod tipped with 3 setules, and endopod, with 1 setule.

Measurements. — Body 5.43; genital segment 183 $\times$ 187 μ.

Male. — Unknown.

Remarks. — The only known specimen of *S. scheherazade* is incomplete in having the first pair of antennae completely detached, although it was described by Leigh-Sharpe (1934 : 17) as "3-articled, all provided with setae, the second the longest, the distal very small".



FIGS. 252—259. *Scheherazade scheherazade* Leigh-Sharpe, 1934, female, 252, body of holotype (with head turned to the left), dorsal (Q); 253, same, lateral (Q); 254, head, dorsal (G); 255, genito-abdomen, lateral (G); 256, second antenna, ventral (J); 257, mandible, posterior (S); 258, terminal segment of second maxilla, antero-inner (S); 259, maxilliped, outer (K).

Genus **Strabax** von Nordmann, 1864

Strabax von Nordmann, 1864: 477.

Female. — Body form unusual in having large rectangular head attached to slender long neck in a hammer-like form. Head region apparently consisting of cephalosome and first one or two pedigerous segments; bearing 3 pairs of large knob-like expansions. Trunk very small, bearing 1 pair of unilobate lateral process, 1 pair of bilobate ventral processes, 1 pair of unilobate posterior processes, and a single unilobate posteromedial process. Genital segment with 2 spherical ventral expansions. Abdomen absent. Caudal ramus unknown. Egg sac sausage-shaped, with many rows of eggs. First antenna absent. Second antenna uncinate, very small. Oral appendages of usual form. Legs absent.

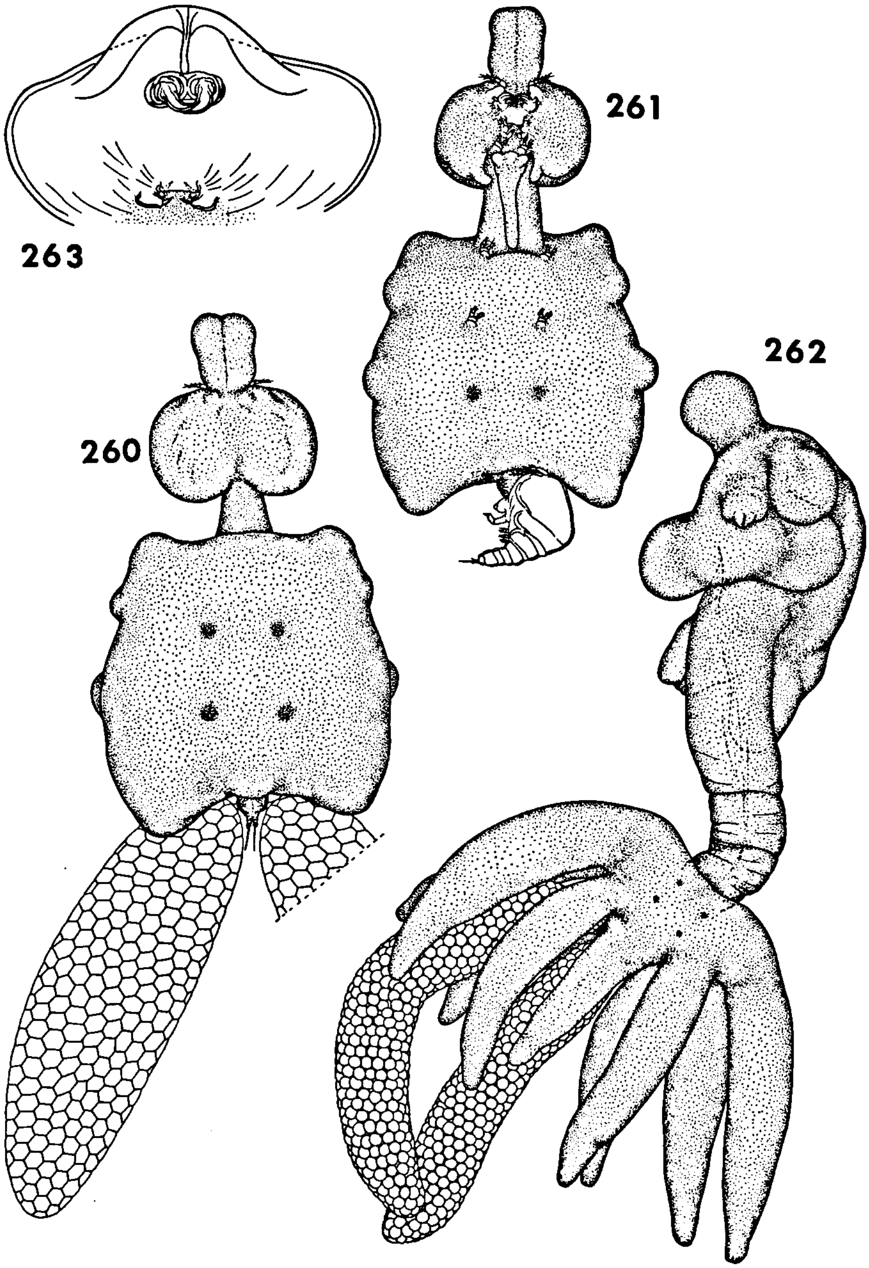
Male. — Dwarf, with rather distinct metamerism on body. Cephalosome completely fused with first pedigerous segment. Abdomen small, bearing rows of spinules on lateral and posteroventral margins. Caudal ramus spiniform, bearing 3 elements on base. First antenna distinctly 5-segmented. Second antenna uncinate, with accessary antennule. Oral appendages of usual form with sexual dimorphism in mandible and second maxilla. Legs present, except leg 4; all rudimentary.

Type-species. — *S. monstrosus* von Nordmann, 1864.

Remarks. — Only one species is known in this genus. It has been reported repeatedly from various places in the Mediterranean and in the eastern North and South Atlantic Ocean, since its first report by von Nordmann in 1864 from Freiburg, Germany. Since the appendages of the modified female have, however, never been described in detail, the correct assignment of this species in the classification of parasitic copepods is difficult. Von Nordmann, in erecting this genus, was very much perplexed as to what family it belonged, because the male has definitely a chondracanthid form but the female (neither cephalic appendages nor thoracic legs having been found) is rather *Pennella*-like. Valle (1880) is the first person who definitely placed the genus *Strabax* in the Chondracanthidae, but Oakley (1930: 185) rejected it and Barnard (1948 : 1955a) placed it in the category of *incertae sedis*. Although Yamaguti (1963) correctly restored it to the Chondracanthidae, knowledge of the female appendages is fundamental for the support of such treatment.

A careful reexamination of the South African specimen deposited in SAM has revealed that the female appendages are indeed greatly reduced, with the first antenna and all thoracic legs being absent, but the second antenna and the oral appendages are still undoubtedly of chondracanthid form.

The method of attachment to the host in *S. monstrosus* is, curiously enough, entirely different from the other species of the subfamily Chondracanthinae. It embeds its whole head inside the host tissue just like the members of the other subfamily Lernentominae.



FIGS. 260—261. *Rhynchochondria longa* Ho, female. 260, body of holotype, dorsal (EE); 261, same, lateral (EE).

FIGS. 262—263. *Strabax monstrosus* von Nordmann, female. 262, body, dorsal, with head turned ventrally (A); cephalosome, ventral (F).

Strabax monstrosus von Nordmann, 1864

Strabax monstrosus von Nordmann, 1864: 478, pl. vi figs. 1—10. Richiardi, 1880: 151. Valle, 1880: 247. Brian, 1899: 11; 1906: 95; 1908: 17; 1912: 33, pl. v figs. 4, 5, pl. viii figs. 7, 8. Bassett-Smith, 1899: 490. Barnard, 1948: 253, fig. 8; 1955a: 303, figs. 32 (a—d). Nunes Ruivo, 1954: 4, figs. 2, 3. Delamare-Debouteville & Nunes-Ruivo, 1958: 231, fig. 11, Capart, 1959; 112. Yamaguti, 1963: 296, pl. 261 fig. 1.

Material examined. — From SAM: 1 ♀ embedded in upper corner of gill chamber of *Scorpaenodes guamensis* (Quoy & Gaimard), from Port St. Johns, South Africa.

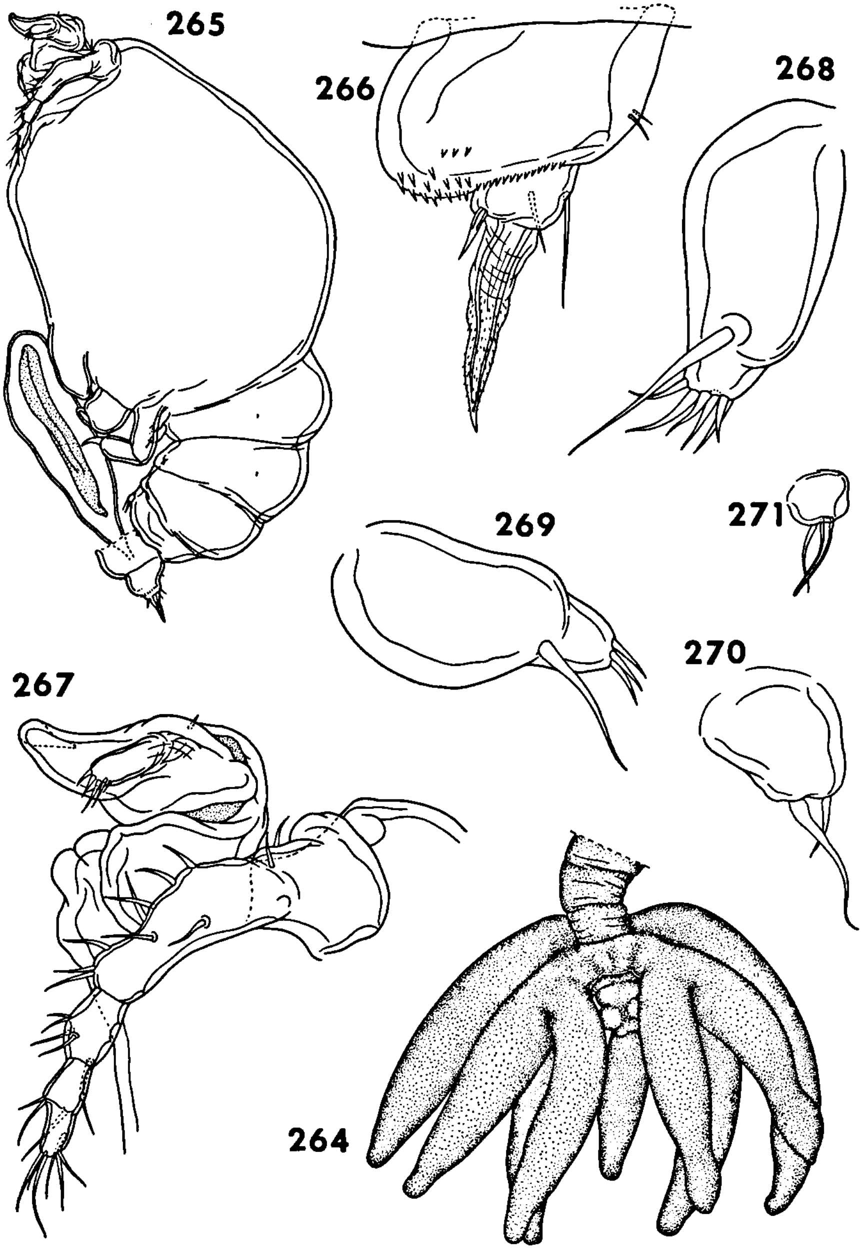
Female. — Body (figs. 262, 264) distinctly divided into three regions and assuming a T-shape. Head large and rectangular (in dosal view); bearing 3 pairs of large knob-like swellings (1 anterior, 1 ventral, and 1 posterior). Cephalosomal portion (fig. 263) very small, located on antero-ventral surface of head between anterior and ventral pairs of swellings (see fig. 262). First pedigerous segment prolonged into a slender neck, which is attached more or less perpendicular to the head at the place between the ventral and the posterior swellings. Third and fourth pedigerous segments fused into a small trunk which bears 2 pairs of unilobate processes on dorsal surface, 1 pair of bilobate processes on ventral surface, and a single unilobate process on posterior surface. Genital segment (fig. 264) attached proximally to ventral surface of posteromedial process; bearing 2 spherical ventral expansions. Abdomen absent. Caudal ramus not seen. Egg sac sausage-shaped, with many rows of eggs.

First antenna absent. Second antenna (fig. 263) very small, uncinate. Oral appendages (fig. 263) of usual chondracanthid form, but apparently with rather fewer teeth on the mandible and the second maxilla. Maxilliped not seen. Legs absent.

Measurements. — Body 9.86; head 4.84 × 1.59; egg sacs 5.49 and 4.93; egg 129 μ.

Male. — Body (fig. 265) broken at genital segment and exposing one of the two spermatophores; about 0.92 in length. Cephalothorax large and elliptical. Genital segment small. Abdomen (fig. 266) bearing a pair of setules on dorsal surface and a few rows of spinules on lateral and ventral surfaces around posterior margin. Caudal ramus (fig. 266) of usual form. First antenna (fig. 267) 5-segmented, armature: 2, 8, 5, 3, and 6. Second antenna (fig. 267) uncinate, with accessary antennule tipped with 6 elements. Labrum with denticles along posterior margin. Mandible falcate, with usual bilaterally denticulated terminal blade. First maxilla bearing 2 long, barbed seta. Second maxilla having only 2 teeth on terminal process. Maxilliped of usual form.

Both leg 1 (fig. 268) and leg 2 (fig. 269) bearing long outer seta on protopodal region and without distinct endopod. Leg 1 tipped with more elements than leg 2. Leg 3 (fig. 270) represented by a knob tipped with 2 unequal setae. Leg 4 absent. Leg 5 (fig. 271) a small aquarish segment tipped with 2 elements (1 spiniform and other setiform). Leg 6 represented by 2 setules on the posteroventral flap of genital segment (see fig. 265).



FIGS. 264—271. *Strabax monstrosus* von Nordmann. Female: 264, posterior portion of body, ventral (A). Male: 265, body (with posterior end broken), lateral (D); 266, abdomen and caudal ramus, lateral (J); 267, first and second antennae, lateral (E); 268, leg 1, lateral (K); 269, leg 2, lateral (K); 270, leg 3, lateral (K); 271, leg 5, lateral (H).

Remarks. — Since only one of each sex was available for my study, a dissection has not been made to study the fine structure of their appendages. Although the above redescription is incomplete in lacking the details of many appendages, it confirms this species as a chondracanthid.

Subfamily Lernentominae Oakley, 1927

Female. — Body modified, with lateral expansion on head and processes on trunk, but no process on neck region, which is always prolonged. Attaching to host by inserting entire head and most part of neck into host tissue. Second antenna uncinate. Mouth parts located at basal portion of neck close to trunk.

Male. — Indistinguishable from non-cyclopiform Chondracanthinae.

Remarks. — When Oakley (1927) proposed the establishment of this subfamily, he included in it three genera: *Lernentoma, Medesicaste*, and *Oralien*. Later in 1940, Markewitsch added to it two more genera: *Brachiochondrites* and *Rylovia*. However, only two of these five genera, namely *Lernentoma* and *Brachiochondrites*, are here retained. The genus *Medesicaste* is transferred to the other subfamily and the genera *Oralien* and *Rylovia* are rejected.

Genus **Brachiochondrites** Markewitsch, 1940

Brachiochondrites Markewitsch, 1940: 12.

Female. — Head small, without distinct expansions or processes. Neck very long and slender, bearing mouth at its basal portion. Pedigerous segments fused into trunk, with rounded lateral and posterior processes. Genito-abdomen and caudal ramus of usual form. Egg sac narrow, thread-like, with multiseriate eggs. First antenna fleshy. Second antenna uncinate. Oral appendage as usual. Two pairs of legs modified, unilobate.

Male. — As in *Acanthochondria*, except bearing accessary antennule in second antenna.

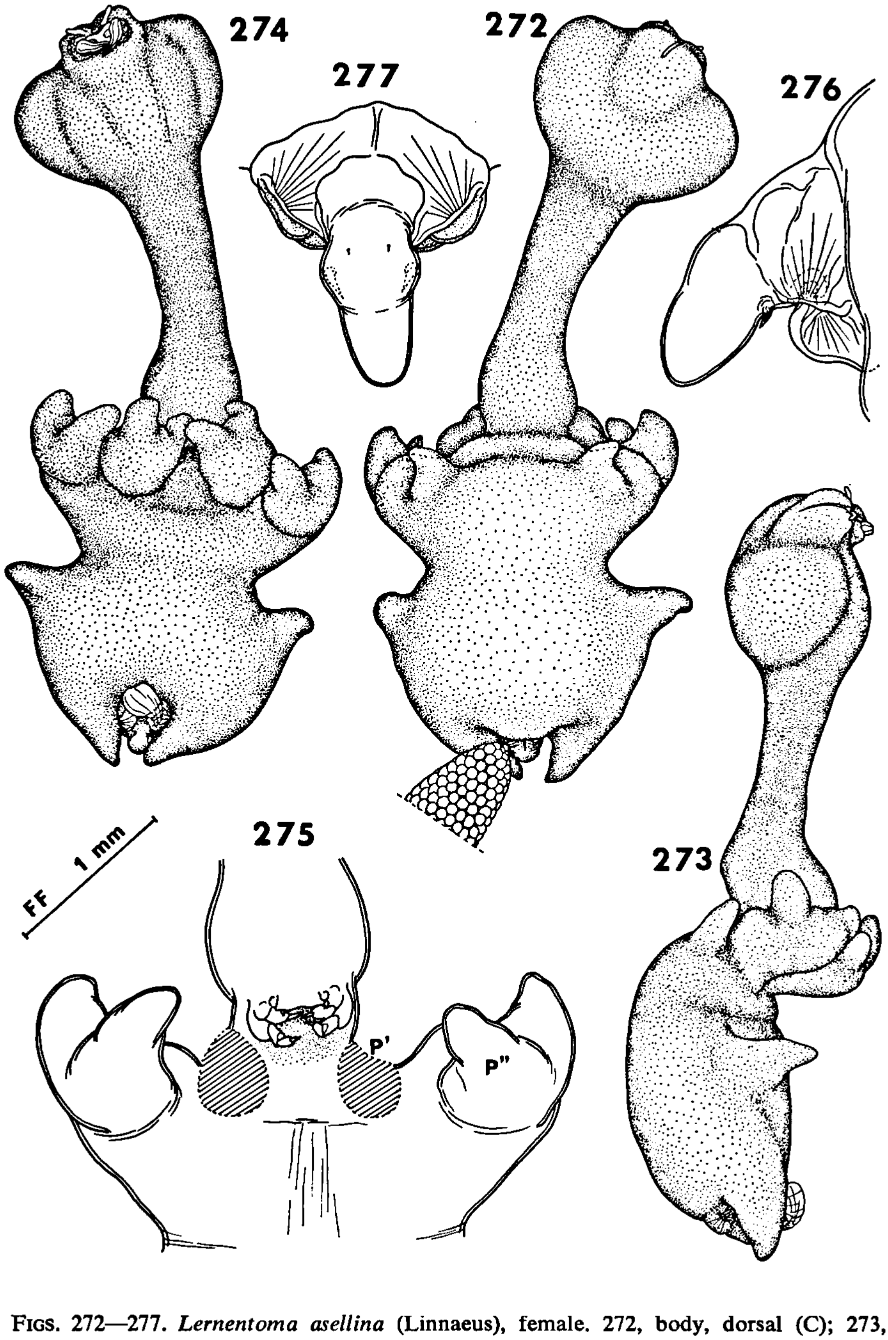
Type-species. — *B. longicollis* Markewitsch, 1940.

Remarks. — The main differences between this genus and *Lernentoma* are in the absence of cephalic processes and presence of unilobate legs in the female and bearing an accessary antennule in the male in this genus. Only one species is known, parasitic on gills of *Lepidion* spp.

Genus **Lernentoma** de Blainville, 1822

Lernaea - Linnaeus, 1758: 655 (refers to *L. asellina* only).
Lernentoma de Blainville, 1822: 441.
Chondracanthus - Krøyer, 1838: 135 (refers to *Ch. triglae* only).
Oralien Bassett-Smith, 1899: 489.

Female. — Body with long neck and stubby trunk. Head region consisting of antennal portion of cephalosome, with lateral expansions. Neck region long, resulting from prolonged postantennal portion, with mouth parts located



FIGS. 272—277. *Lernentoma asellina* (Linnaeus), female. 272, body, dorsal (C); 273, same, lateral (C); 274, same, ventral (C); 275, portion between neck and trunk, ventral (FF); 276, genito-abdomen, lateral (M); 277, same, dorsal (M).

at its posterior end. All four pedigerous segments fused into a stubby trunk bearing lateral and posterior processes. Genito-abdomen and caudal ramus as in typical form. Egg sac long, cylindrical. First antenna very small, fleshy. Second antenna uncinate. Oral appendages of typical form. Two pairs of modified, bilobate legs.

Male. — Indistinguishable from *Acanthochondria.*

Type-species. — *L. asellina* (Linnaeus, 1758).

Remarks. — Only two species are known in this genus. They are parasitic primarily in the branchial cavities (on the wall or on gills) of the fishes of the genus *Trigla* (Triglidae). It is interesting to note that this genus of parasites is found only on this group of fishes occurring in European and African waters. Although Wilson (1932 : 495) has recorded a single specimen of "*Oralien triglae* (Blainville)" from the gills of a gurnard off Martha's Vineyard, Massachussetts, his identification of this particular specimen (deposited in USNM) is incorrect. I have reexamined it and found that it is in reality a specimen of *Rebelula bouvieri* (Quidor, 1912). Wilson has given figures of both sexes of this species (1932 : 494), but his fig. 296b (female) is apparently a copy of Oakley's (1927) fig. 3B and his fig. 296c (male), of Oakley's (1927) fig. 5. Moreover, the specimen in the USNM was inconsistently labeled by him as "*Medesicaste triglarum*".

Lernentoma asellina (Linnaeus, 1758). Figs. 272—294.

Lernaea asellina Linnaeus, 1758: 655.

Lernentoma asellina; de Blainville, 1822: 441, pl. lxii fig. 12. Oakley, 1927: 465, fig. 7A. Van Oorde-de Lint & Schuurmans Stekhoven, 1936: 106, fig. 47. Yamaguti, 1963: 298, pl. 263 fig. 4.

Chondracanthus triglae Krøyer, 1838: 135, pl. iii figs. 3(a—c). Guérin, 1840, pl. ix fig. 8. Milne Edwards, 1840: 502 (in part).

Ch. gurnardi Olsson, 1868: 31. Van Beneden, 1870, pl. ii fig. 2. Yamaguti, 1963: 273.

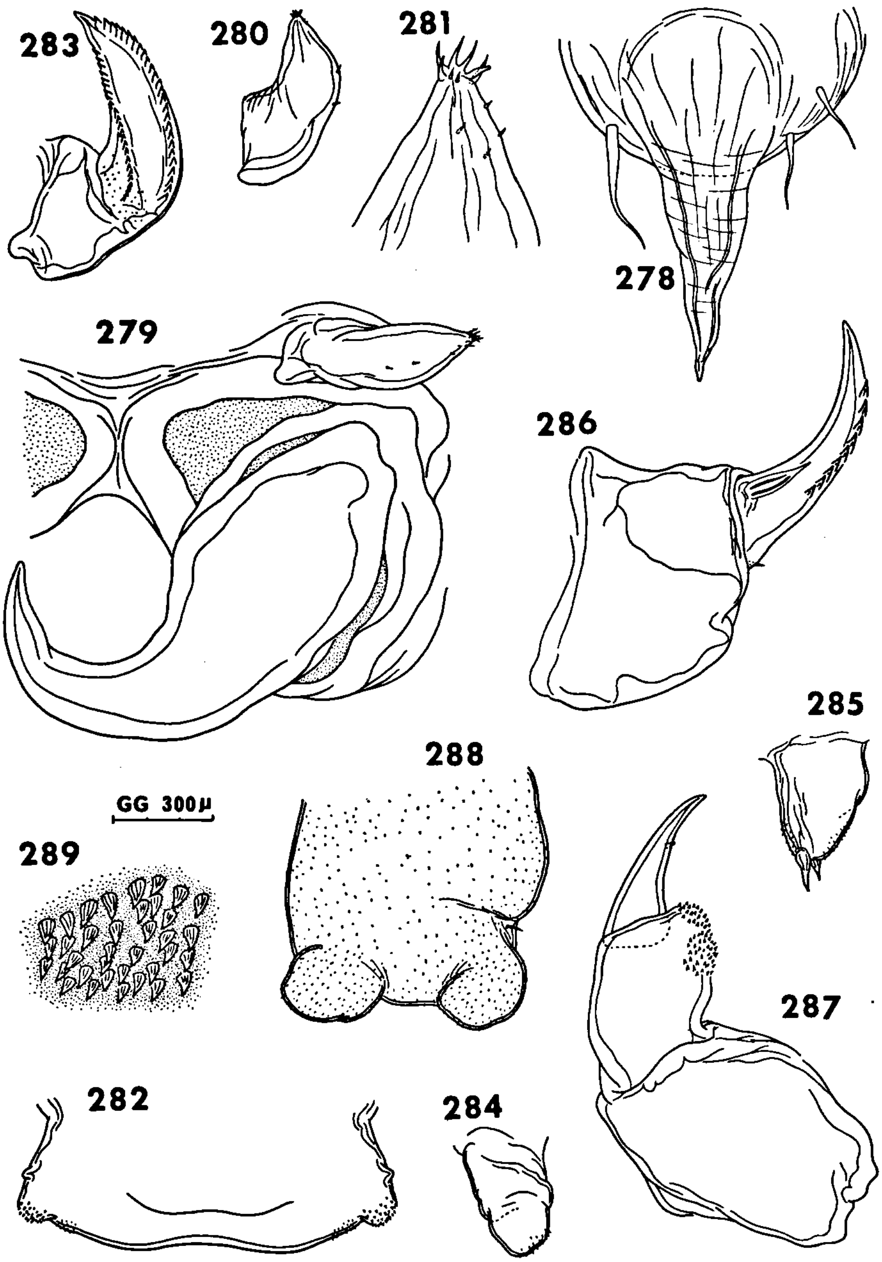
Medesicaste asellinum; T. Scott & A. Scott, 1913: 184, pl. lii fig. 6, pl. lvii figs. 18—19 (in part). Leigh-Sharpe, 1922: 214, figs. 1—7. A. Scott, 1929: 104 (in part).

M. triglarum; Valle, 1880: 71 (n part). Brian, 1906: 94 (in part).

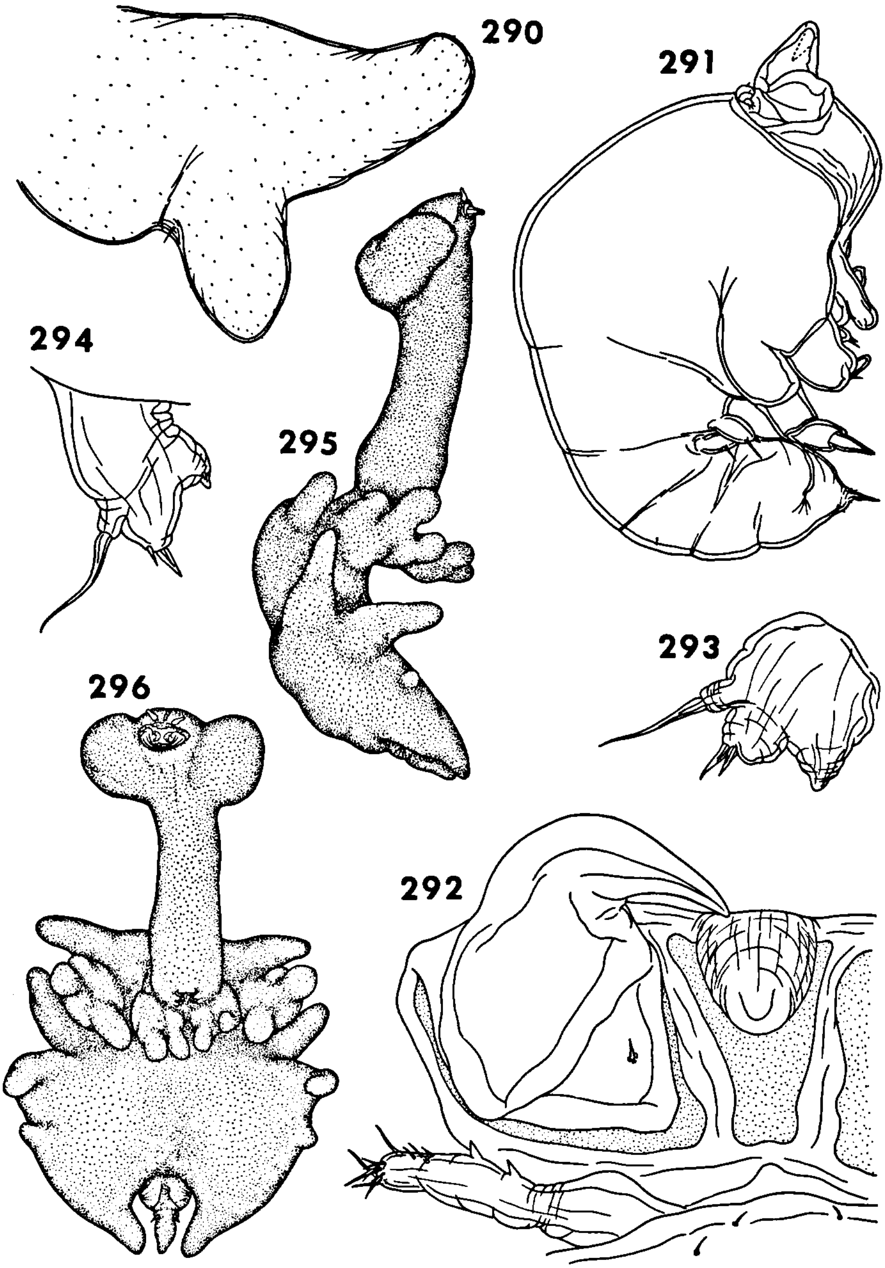
Oralien asellinus; Bassett-Smith, 1899: 490, pl. xxvi figs. 1, 1a—1c (in part). T. Scott, 1900: 163, pl. vii figs. 16—18. Norman & T. Scott, 1906: 218.

Material examined. — From USNM: 4 ♀ on gills of *Trigla gurnardus* L., English coast (No. 69777). From UZM: (all on gills of *T. gurnardus*) 3 ♀, outside Denmark, 1864 (labeled as *Medesicaste asellinum*); 1 ♀, outside Denmark, 1861 (labeled as *M. asellinum*); 1 ♀, Cornwall, England (labeled as *Chondracanthus asellinus*); 1 ♀, Pesteihav, Denmark (labeled as *Ch. triglae*); 1 ♀, Kattegate, Denmark (labeled as *Ch. triglae*); 1 ♀, Dowrige, Denmark (labeled as *Oralien trigla*). From SSM: (all on gills of *T. gurnardus*) 1 ♀, Sweden, July 15, 1888 (labeled as *Ch. gurnardi*, No. 552); 3 ♀, Sweden, 1895 (labeled as *Ch. triglae*, No. 094).

Female. — Body (figs. 272—274) rather long, resulting from prolonged postantennal region of cephalosome. Head with spherical lateral expansions and short median dorsal sclerite (see fig. 272). Neck with bulbous swelling at base, where the mouth parts are located (see fig. 275). Trunk swollen, with



FIGS. 278—289. *Lernentoma asellina* (Linnaeus), female. 278, caudal ramus, lateral (AA); 279, first and second antennae, anterior (Z); 280, first antenna, dorsal (Z); 281, tip of first antenna, dorsal (AA); 282, labrum, ventral (W); 283, mandible, dorsal (N); 284, paragnath, postero-outer (N); 285, first maxilla, outer (N); 286, second maxilla, dorsal (N); 287, maxilliped, antero-inner (N); 288, leg 1, antero-inner (GG); 289, denticles on surface of leg 1 (AA).



FIGS. 290—294. *Lernentoma asellina* (Linnaeus). Female: 290, leg 2, antero-inner (GG). Male: 291, body, lateral (O); 292, rostral area, first and second antennae, anterodorsal (Y); 293, leg 1, anterior (AA); 294, leg 2, anterior (AA).

FIGS. 295—296. *Lernentoma triglae* de Blainville, female. 295, body, ventral (B); 296, same lateral (B).

median constriction dividing it into two portions; anterior portion carrying legs 1 and 2, and bearing a short process on anterolateral corner just dorsal to leg 2; posterior portion bearing 1 lateral process and 1 posterior process. Genital segment (figs. 276, 277) much wider than long. Abdomen (figs. 276, 277) oblong, bearing a pair of small setules on dorsal surface close to anterior end. Caudal ramus (fig. 278) attached ventrally to abdomen at anterior surface; with 3 basal setae and a naked terminal process. Egg sac (fig. 272) long, cylindrical, with many rows of eggs.

First antenna (figs. 279—281) extremely small, fleshy, tipped with 8 elements, and with another 4 on subterminal surface. Second antenna (fig. 279) 2-segmented; terminal segment a recurved hook.

Labrum (fig. 282) with smooth posterior margin, but bearing small denticles on protrusion in corner and a small knob on lateral surface. Mandible (fig. 283) 2-segmented, terminal segment falcate, bearing 26 to 27 larger teeth on convex side and 24 to 26 smaller teeth on concave side. Paragnath (fig. 284) a small lobe bearing setules on terminal surface. First maxilla (fig. 285) a lobate structure armed with 2 elements and some spinules. Second maxilla (fig. 286) of typical form, bearing 2 usual basal elements and a row of 9 teeth on terminal process. Maxilliped (fig. 287) 3-segmented, armature as in typical form.

Leg 1 (fig. 288) with large, swollen protopod sparsely covered with denticles and bearing a small outer seta; both exopod and endopod densely covered with denticles (fig. 289). Leg 2 (fig. 290) larger than leg 1, located postero-outer to leg 1 (see fig. 275). Protopod bearing a small outer and some denticles; endopod much larger than exopod, both sparsely covered with denticles.

Measurements. — Body 9.34—9.45; head 2.01 × 2.28; genital segment 0.23 × 0.53; abdomen 0.38 × 0.22; egg sacs 6.89 and 6.81; egg 189 μ.

Male. — Body (fig. 291) indistinguishable from *Acanthochondria*, measuring 0.83 × 0.37. Caudal ramus as in female. First antenna (fig. 292) cylindrical and slender; armature being 1-1-2-2-8. Second antenna (fig. 292) as in typical form. Labrum as in female, but bearing a small median knob in front as in some species of the other subfamily. Mouth parts as in female, exexcept usual sexual dimorphism in mandible and second maxilla (having only 4 teeth on terminal process). Leg 1 (fig. 293) and leg 2 (fig. 294) essentially as in Chondracanthinae, with protopod bearing a long outer seta, exopod a lobe tipped with 2 elements, and endopod a small conical knob.

Remarks. — This species differs from *L. trigla* de Blainville, 1822 (the only known other species of this genus) in having only one pair of lateral processes on the portion of the trunk posterior to the middle constriction.

For the sake of justifying the rejection of the genus *Oralien* and the transfer of the species *O. triglae* to this genus, I have taken this opportunity to include figures of the entire body of *L. trigla* in two different views (figs. 295, 296). This species was made by Oakley (1927) the type-species of the genus *Oralien*, on the basis of its difference from *L. asellina* in having "tripartite, rounded" legs. However, my reexamination of the specimens of *L. trigla* deposited in SSM, UZM and SAM has shown that they are in reality not as trilobated as seen in *Ch. zei* or *Ch. nodosus*, but merely have the outer surface of the protopodal portion comparatively swollen (see figs. 295, 296). The same kind of swelling, but to a lesser extent, is also seen in the legs of *L. asellina* (see figs. 288, 290). I have studied the fine structure of the appendages of *L. trigla* and compared them with those of *L. asellina*, but have detected no significant morphological differences of generic rank.

REFERENCES

BAIRD, W.
1850 The natural history of the British Entomostraca : 1—364. (Ray Soc., London).
BARNARD, K. H.
1948 New records and descriptions of new species of parasitic Copepoda of South Africa. — Ann. Mag. nat. Hist., (12) **1** (4) : 242—254.
1955 South African parasitic Copepoda. — Ann. S. Afr. Mus., **41** (5) : 223—312.
BASSETT-SMITH, P. W.
1896 A list of the parasitic Copepoda of fish obtained at Plymouth. — J. Mar. biol. Ass. U.K., (N.S.) **4** : 155—163.
1899 A systematic description of parasitic Copepoda found on fishes, with an enumeration of the known species. — Proc. zool. Soc. London, **1899** : 438—507.
BENEDEN, P. J. VAN
1851 Récherches sur quelques Crustacés inférieurs. — Ann. Sci. natur., (3) (zool.) **16** : 71—131.
1861 Crustacés. In: Récherches sur la faune littorale de Belgique, **2** : 1—180. (Bruxelles).
1870 Les poissons des côtes de Belgique, leurs parasites et leurs commensaux : 1—100. (Bruxelles).
BERE, R.
1930 The parasitic copepods of the fish of the Passamaquoddy region. — Contr. Canad. biol. Fish., (N.S.) **5** (13) : 423—430.
1936 Parasitic copepods from Gulf of Mexico fish. — Amer. Midl. Natural., **17** (3) : 577—625.
BLAINVILLE, H. M. D. DE
1822 Mémoire sur les Lernées (Lernaea, Lin.). — J. Phys. Chim. Hist. natur., **95** : 372—380, 437—477.
BRADY, G. S.
1883 Report on the Copepoda obtained by H. M. S. Challenger, during the years 1873—1876. — Challenger Rept., (Zool.), **8** : 132—138.
BRESCIANI, J. & J. LÜTZEN
1962 Parasitic copepods from the west coast of Sweden including some new or little known species. — Vidensk. Medd. Dansk naturh. Foren., **124** : 367—408.
BRIAN, A.
1899 Crostacei parassiti dei pesci dell'Isola d'Elbe, 2. — Atti soc. Ligustica Sc. nat. geogr., Genova, **10** : 1—11.
1906 Copepodi parassiti dei pesci d'Italia: 1—187. (Genova).
1908 Note préliminaire sur les Copépodes parasites des poissons provenant des campagnes scientifiques de S.A.S. le Prince Albert Ier de Monaco ou déposés dans les collections du Musée Océanographique. — Bull. Inst. océanogr., **110** : 1—18.

1912 Copépodes parasites des poissons et des échinides provenant des campagnes scientifiques de S.A.S. le Prince Albert Ier de Monaco (1886—1910). — Rés. Camp. sci., Monaco, **38** : 1—58.

1939 Copépodes parasites recueillis par M. E. Darteville à l'embouchure du fleuve Congo. — Rev. Zool. Bot. Afr., **32** (2): 176—198.

BURMEISTER, H.

1833 Beschreibung einiger neuen oder weniger bekannten Schmarotzerkrebse, nebst allgemeinen Betrachtungen über die Gruppe, welcher sie angehören. — Act. Acad. Naturf., **17** (1) : 271—336.

CAPART, A.

1959 Copépodes parasites. In: Résults Expédition océanographique Belge dans les Eaux Côtières Africaines de l'Atlantique sud (1948—1949). — Inst. Roy. Sci. nat. Belg., **3** (5) : 57—126.

CARVALHO, J. DE P.

1951 Notas sôbre alquns Copépodos parasitos de Peixes marítimos da costa do Estado de São Paulo. — Bol. Inst. Paulista oceanogr., **2** (2): 135—144.

CAUSEY, D.

1955a Parasitic Copepoda from Gulf of Mexico fish. — Occ. Pap. mar. Lab., Louisiana State Univ. **9** : 1—19.

1955b The external morphology of Blias prionoti Krøyer, a copepod parasite of the sea robins (Prionotus). — Publ. Inst. mar. Sci., **4** (1): 7—12

CUVIER, G. L.

1830 Le régne animal (nouvelle edit.), **4** : 189—202.

DELAMARE-DEBOUTTEVILLE, C. & L. P. NUNES RUIVO

1952 Copépodes parasites des poissons de Banyuls (2). — Vie Milieu, **3** (3): 292—300.

1958 Copépodes parasites des poissons Mediterraneens (4). — Vie Milieu, **9** (2) : 215—235.

DELAROCHE, M. F.

1811 Sur deux animaux vivant sur les branches des poissons. — Nouv. Bull. Sci. philomat., **2** : 270—272.

DESMAREST, A. G.

1825 Considérations générales sur la classe des Crustacés, et description des espèces de ces animaux, qui vivant dans la mer, sur les côtes ou dans les eaux douces de la France : 1—446. (Paris).

EL SABY, M. K.

1930 On the complemental male of Chondracanthus depressus (T. Scott). — Lancaster Sea-Fish. Lab., **38**, in: Proc. Trans. Liverpool biol. Soc., **45** : 110—115.

1933 The internal anatomy of several parasitic Copepoda. — Proc. zool. Soc. London, **1933** : 861—869.

GUÉRIN-MENEVILLE, F. E.

1820-1844 Crustacés, **2**. In: Iconographie du Régne animal. (Paris).

GURNEY, R.

1933 British freshwater Copepoda, **3**. Cyclopoida and Caligoida: 1—384. (Ray Soc., London).

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.

HEEGAARD, P. E.

1945 Some parasitic copepods from fishes in the Upsala University collections. — Ark. Zool., **35** (18) : 1—27

1947a Contribution to the phylogeny of the Arthropoda. — Spolia zool. Mus., Hauniensis, **8** : 1—236.

1947b Discussion of the mouth appendages of the copepods. Ark. Zool., **40** (3) : 1—8.

1962 Parasitic Copepoda from Australian waters. — Rec. Aust. Mus., **25** (9) : 149—234.

HELLER, C.

1866 Carciologische Beiträge zur Fauna des Adriatischen Meeres. — Verh. zool.-bot. Ges., Wien, **15** : 723—760.

1868 Crustaceen. In: Reise der Österreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859 unter den Befehlen des Commodores B. von Wüllerstorfurbair, (Zool.) **2** (3) : 1—280. (Wien)

HO, J. S.

1967a A new cyclopoid copepod (Chondracanthidae) parasitic on the armored sea robin from the Florida Straits. — J. Parasit., **53** (2) : 406—411.

1967b Cyclopoid copepods of the genus Tucca (Tuccidae), parasitic on diodontid and tetraodontid fishes. — U.S. Fish Wildl. Ser., Fish. Bull., **66** (2): 285—298.

(in press) Pharodes Wilson, 1935, a genus of cyclopoid copepods (Pharodidae) parasitic on marine fishes. — J. nat. Hist.,

HUMES, A. G. & R. U. GOODING

1964 A method for studying the external anatomy of copepods. — Crustaceana, **6** (3) : 238—240.

KABATA, Z.

1959 Ecology of the genus Acanthochondria Oakley (Copepoda parasitica). — J. mar. biol. Ass. U.K., **38** : 249—262.

1965 Parasitic Copepoda of fishes. — B.A.N.Z.A.R.E. Rep., (B) (Zool. & Bot.) **8** (6) : 5—16.

1968a Some Chondracanthidae (Copepoda) from fishes of British Columbia. — J. Fish. Res. Bd. Canada, **25** (2) : 321—345.

1968b Praecidochondria galatheae gen. et sp. nov. (Copepoda, Chondracanthidae) from a Malayan fish. — Vidensk. Medd. Dansk naturh. Foren., **131** : 99—103.

1969 Copepoda parasitic on Australian fishes, 9. Family Chondracanthidae. — J. nat. Hist., **3** : 497—507.

KIRTISINGHE, P.

1950 Parasitic copepods of fish from Ceylon, 3. — Parasitology, **40** (1—2): 77—86.

1956 Parasitic copepods of fish from Ceylon, 4. — Parasitology, **46** (1—2): 14—21.

1964 A review of the parasitic copepods of fish recorded from Ceylon with descriptions of additional forms. — Bull. Fish. Res. Sta., Ceylon, **17** (1) : 45—133.

KRØYER, H.

1835 Om snyltekrebsene, isaer med hensyn til den Danske Fauna. — Naturh. Tidsskr., **1** (2) : 172—208; **1** (3) : 252—304.

1838 Idem (continued). — Naturh. Tidsskr., **2** (1) : 8—52; 131—157.

1863 Bidrag til Kundskab om Snylterkrebsene. — Naturh. Tidsskr., **3** (2) : 75—426.

LAMARCK, J. B. P. DE

1816 Histoire naturelle des animaux sans vertèbres, **5** : 1—612. (Paris).

LEIGH-SHARPE, W. H.

1922 A parasitic copepod of the genus Medesicaste Krøyer. — Parasitology, **14** (2) : 214—219.

1926 A list of parasitic copepods found at Plymouth, with a note on the bulla of Clavella devastatrix. — Parasitology, **18** (4) : 384—386.

1933 A second list of parasitic copepods of Plymouth, with a description of three new species. — Parasitology, **25** (1): 113—118.
1934a The Copepoda of the Siboga Expedition, 2. Commensal and parasitic Copepoda. — Siboga Exped. Monogr., **29B** : 1—43.
1934b A third list of parasitic Copepoda of Plymouth, with notes. — Parasitology, **26** (2): 112—113.

LEIGH-SHARPE, W. H. & C. L. OAKLEY
1927 Lernentominae, a new subfamily of Chondracanthidae (Crustacea: Copepoda) with a description of Oralien triglae (Blainville, 1822). — Parasitology, **19** (4): 455—467.

LINNAEUS, C.
1758 Systema Naturae (10th Ed.): 1—823. (Stockholm).

MARKEWITSCH, A. P.
1940 New species of parasitic Copepoda. — Depov. Akad. Nauk. SSSR, **11**: 11—21.
1956 Parasitic Copepoda of fish of SSSR : 1—259.

MILNE EDWARDS, H.
1840 Histoire naturelle des Crustacés, comprenent l'anatomie, la physiologie et la classification de ces animaux, **3**: 1—604. (Paris).

MÜLLER, O. F.
1776 Zoologiae Danicae prodromus, seu animalium Daniae et Norvegiae indigenarium characteres, nomina, et synonym imprimis popularium : 1—282. (Havniae).
1788 Zoologia Danica, seu animalium Daniae et Norvegiae rariorum ac minus norotum, descriptions et historia, **1**: 1—52. (Havniae).

NORDMANN, A. VON
1832 Mikrographische Beiträge zur Naturgeschichte der wirbellosen Thiere: 1—150. (Berlin).
1864 Neue Beiträge zur Kenntnis Parasitischer Copepoden. — Bull. Soc. Impér. Natural. Moscou, **37** (4): 461—520.

NORMAN, C. A. M. & G. S. BRADY
1909 The Crustacea of Northumberland and Durham. — Trans. nat. Hist. Soc. Northumberland, Durham Newcastle-upon-Tyne, (N.S.) **3** (2): 252—417.

NORMAN, C. A. M. & T. SCOTT
1906 The Crustacea of Devon and Cornwall: 1—232. (William Wesley & Son, London).

NUNES-RUIVO, L.
1954 Résultats des Campagnes du „Prof. Lacaze-Duthiers", 1. Algérie 1952. Copépodes parasites de Poissons. — Vie Milieu, Suppl. **3**: 115—138.

OAKLEY, C. L.
1927 See LEIGH-SARPE & OAKLEY, 1927.
1930 The Chondracanthidae (Crustacea : Copepoda); with a description of five new genera and one new species. — Parasitology, **22** (2): 182—201.

OKEN, L.
1815-1816 Lehrbuch Naturgeschichte, (3, Zool.) **2**: 181, 357.

OLSSON, P.
1868-69 Prodromus faunae Copepodorum parasitantium Scandinaviae. — Acta Univ. Lundensis, Math. Naturh., **8**: 1—49.

OORDE-DE LINT, G. M. VAN & J. H. SCHUURMANS STEKHOVEN, Jr.
1936 Copepoda Parasitica. — Tierwelt Nord- Ostsee, **31** (10c): 73—197.

O'RIORDAN, C. E.
1966 Parasitic copepods in the collections of the National Museum of Ireland. — Proc. Roy. Irish Acad., **64** (B) (20): 371—378.

PEARSE, A. S.
1947 Parasitic copepods from Beaufort, North Carolina. — J. Elisha Mitchell sci. Soc., **63** (1): 1—16.

1952 Parasitic crustaceans from Alligator Harbor, Florida. — J. Florida Acad. Sci., **15** (4): 187—243.

PILLAI, N. K.

1964 A miscellaneous collection of copepods parasitic on South Indian fishes. — J. mar. biol. Ass. India, **6** (1): 61—83.

1967 Copepods parasitic on Indian marine fishes - a review. — Proc. Symp. Crustacea, **5**: 1556—1680.

RANGNEKAR, M. P. & P. G. RANGNEKAR

1951 Preliminary note on some specimens of Pseudochondracanthus sp. (?) from the fish, Tetradon oblongus (Bl. & Sch). — J. Univ. Bombay, **20** (3): 39—40.

1954 Pseudochondracanthus murtii n. sp. (Copepoda) parasitic on the fish Tetradon oblongus. — Proc. Indian Congr., **41** (3), Sec. 7 : 174.

RATHBUN, R.

1886 Description of parasitic Copepoda belonging to the genera Pandarus and Chondracanthus. — Proc. U.S. nation. Mus., **9**: 310—324.

RICHIARDI, S.

1880 Contribuzione alla fauna d'Italia, 1. Catalogo sistematico dei Crostacei che vivona ful corpo degli animali acauatici. In: Catalog degli Espositori e delle Cose Esposte, Espozitione internazionale di Pesca in Berlina: 147—152. (Pisa).

RONALD, K.

1958 The metazoan parasites of the Heterosomata of the Gulf of St. Lawrence, 3. Copepoda parasitica. — Canad. J. Zool., **36** (1): 1—6.

ROSE, M. & R. VAISSIÈRE

1952 Catalogue préliminaire des Copépodes de l'Afrique du Nord. — Bull. Soc. Hist. nat. Afr. Nord, **43**: 164—176.

SCHUURMANS STEKHOVEN, J. H., Jr.

1934 Zur Sinnesphysiologie der parasitären Copepoden Lepeophtheirus pectoralis. (O. F. Müller) und Acanthochondria depressa (T. Scott). — Z. Parasitenk., **7**: 336—362.

SCOTT, A.

1901 Some additions to the fauna of Liverpool Bay, collected May 1st, 1900 to April 30th, 1901. — Proc. Trans. Liverpool biol. Soc., **15**: 342—352.

1929 The copepod parasites of Irish Sea fishes. — Proc. Trans. Liverpool biol. Soc., **43**: 81—118.

SCOTT, T.

1891 Additions to the fauna of the Firth of Forth. — Ann. Rep. Fish. Bd. Scotland, (3) **9**: 300—310.

1892 Additions to the fauna of the Firth of Forth. — Ann. Rep. Fish. Bd. Scotland (3) **10**: 244—272.

1900 Notes on some crustacean parasites of fishes. — Ann. Rep. Fish. Bd. Scotland, (3) **18**: 144—188.

1905 Observations on some parasites of fishes new or rare in Scottish waters. — Ann. Rep. Fish. Bd. Scotland, (3) **23**: 108—115.

1906 A catalogue of land, fresh-water, and marine Crustacea found in the Basin of the River Forth and its estuary. — Proc. Roy. physic. Soc., Edinburgh, **16**: 267—386.

SCOTT, T. & A. SCOTT

1913 The British parasitic Copepoda, **1**: 1—152. (Ray Soc., London).

SHIINO, S. M.

1955 Copepods parasitic on Japanese fishes, 9. Family Chondracanthidae, subfamily Chondracanthinae. — Rep. Fac. Fish., pref. Univ. Mie, **2** (1): 70—111.

1957 Copepods parasitic on Japanese fishes, 14. Three species from Spheroides

alboplumbeus (Richardson). — Rep. Fac. Fish., pref. Univ. Mie, **2** (3) 376—391.
1960a A new parasitic copepod of the family Chondracanthidae Parapharodes sadoensis gen. nov. et sp. nov., from the Sea of Japan. — Crustaceana, **1** (2) : 92—99.
1960b Two new parasitic copepods belonging to a new genus Prochondracanthopsis (Chondracanthidae). — Rep. Fac. Fish., pref. Univ. Mie, **3** (3) : 518—526.

STEENSTRUP, J. J. S. & C. F. LÜTKEN
1861 Bidrag til Kundskab om det aabne havs snyltekrebs og Lernaeer samt om nogle andre nye eller hidtil kun ufulstaendigt kjendte parasitiske Copepoder. — Kgl. Danske Vidensk. Skr. (naturh. math. Afdel.), **5** : 341—342.

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

STOCK, V.
1915 On some of the parasitic copepods of the Bay of Fundy fish. — Contr. Canad. Biol. (1911-14), **1** : 69—71.

STOSSICH, M.
1880 Prospetto della fauna del mare Adriatico, 3. Class V. Crustacea. — Boll. Soc. Adriatica Sci. natur., Trieste, **6** : 178—271.

THOMPSON, I. C. & A. SCOTT
1903 On the Copepoda collected by Professor Herdman, at Ceylond, in 1902. — Ceylon Pearl Oyster Fish., **1** (suppl. Reps. 7) : 227—307.

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

TRIPATHI, Y. R.
1960 Parasitic copepods from Indian fishes. I. Family Chondracanthidae Milne Edwards, 1840. — J. zool. Soc. India, **12** (1) : 51—59.

VALLE, A.
1880 Crostacei parassiti dei pesci del mare Adriatico. — Boll. Soc. Adriatica Sc. natur., **6** (1) : 245—247.

VERVOORT, W.
1962 A review of the genera and species of Bomolochidae (Crustacea, Copepoda), including the description of some old and new species. — Zool. Verhand., **56** : 1—111.

VOGT, C.
1877 Récherches côtières. — Mém. l'Inst. nat. Genevois, **13** : 1—104.

WILSON, C. B.
1908 North American parasitic copepods: A list of those found upon the fishes of the Pacific coast, with description of new genera and species. — Proc. U.S. nation. Mus., **35** : 431—481.
1912 Parasitic copepods from Nanaimo, British Columbia, including eight species new to science. — Contr. Canad. Biol. mar. biol. Stat. Canada, **9** : 85—101.
1920 Report on the parasitis Copepoda collected during the Canadian Arctic Expedition, 1913-18. — Rep. Canad. Arctic Exped., 1913-18, **7**, Crustacea, pt. L : 3L—16L.
1921 Report on the parasitic Copepods collected during survey of the Juan Fernandez Islands 1916—1917. — Nat. Hist. Juan Fernandez & Easter Isl., **3** : 69—74.
1922 Parasitic copepods from Japan, including five new species. — Ark. Zool., **14** (10) : 1—17.
1932 The copepods of the Woods Hole region, Massachusetts. — Bull. U.S. nation. Mus., **158** : 1—634.
1935a Parasitic copepods from the Dry Tortugas. — Pap. Tortugas Lab., **29** : 329—347.

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

YAMAGUTI, S.

1939 Parasitic copepods from fishes of Japan, 6, Lernaeopodoida I. — Vol. jub. Prof. Sadao Yoshida, **2**: 529—578.

1963 Parasitic Copepoda and Branchiura of fishes: 1—1104. (Interscience publishers, New York, London, Sydney).

YAMAGUTI, S. & T. YAMASU

1959 Parasitic copepods from fishes of Japan with description of 26 new species and remarks on two known species. — Biol. J. Okayama Univ., **5** (3/4): 89—165.

1960 Two new species of copepods parasitic on Japanese fishes. — Publ. Seto mar. biol. Lab., **8** (1): 137—140.

YÜ, S. C.

1935 Studies on the parasitic copepods of China belonging to the family Chondracanthidae. — Bull. Fan mem. Inst. Biol., **6** (1): 1—15.

YÜ, S. C. & H. W. WU

1932 Parasitic copepods of the flat-fishes from China. — Bull. Fan mem. Inst. Biol., **3** (4): 55—75.

Dr. JU-SHEY HO
Biological Science Centre — Boston University
2 Cummington Street
Boston, Mass. 02215 — U.S.A.

For sale at the Administration of the Zoological Museum of the University of Amsterdam

Price Hfl. 30,00 (Dutch florins)