Revision of the Taeniacanthuridae (Copepoda: Poecilostomatoida) Parasitic on Fishes and Sea Urchins

MASAHIRO DOJIRI and ROGER F. CRESSEY

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Revision of the Taeniacanthidae (Copepoda: Poecilostomatoida) Parasitic on Fishes and Sea Urchins

Masahiro Dojiri
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ABSTRACT

Dojiri, Masahiro, and Roger F. Cressey. Revision of the Taeniacanthidae (Copepoda: Poecilostomatoida) Parasitic on Fishes and Sea Urchins. Smithsonian Contributions to Zoology, number 447, 250 pages, 166 figures, 5 tables, 1987.—The poecilostome family Taeniacanthidae, copepods parasitic on marine fishes and sea urchins, currently consists of 14 genera and 91 species (including 14 new species described in this revision). Three genera (Clavisodalis, Echinirus, and Echinospicula) live in the esophagi of sea urchins. Eleven genera (the type genus Taeniacanthus, Anchistrotos, Cirrancanthus, Iodes, Metataeniacanthus, Nudisodalis, Phagus, Pseudotaeniacanthus, Scolicara, Taeniacanthodes, and Taeniastrotos) are parasites of marine fishes. Parataeniacanthus is placed in synonymy with Taeniacanthus, and two new genera (Cirrancanthus and Nudisodalis) are described. Keys are provided for all taeniacanthid genera and species parasitic on fishes (keys to the species of the genera associated with echinoids are found elsewhere).

A descriptive account of the external morphology of this family is given. The detailed morphology of the general habitus, rostral area, first and second antennae, postantennal process, oral appendages, and legs is discussed in relation to their taxonomic significance.

The first record of aggregative behavior of a poecilostome copepod is reported. Individuals of Taeniacanthodes gracilis form a cluster on the fins of their host, Paralichthys squamilentus. The individuals are arranged in single-file or a staggered pattern.

Taeniacanthids exhibit a high degree of host specificity at both the generic and specific levels. Host-parasite relationships between taeniacanthids and tetraodontiform fishes are discussed.

The known zoogeographic distribution suggests that the greatest diversity in genera and species of taeniacanthids occurs in the Indo-West Pacific. Taeniacanthus is the most ubiquitous genus, but more extensive collections for taeniacanthids must be made before conclusions on the distribution of these copepods can be reached.

Phylogenetic relationships within the bomolochiform complex, comprised of the Bomolochidae, Taeniacanthidae, and Tuccidae, are discussed. The Tuccidae is considered the most derived family. The Bomolochidae and Taeniacanthidae have a mosaic of plesiomorphic and apomorphic characters. A phylogenetic analysis must be done before conclusions can be made concerning familial relationships. The relationship of the Telsidae to the complex is discussed.

Host-parasite and parasite-host lists are included. Scanning electron micrographs of selected species are provided to augment the line drawings.
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Revision of the Taeniacanthidae  
(Copepoda: Poecilostomatoida) 
Parasitic on Fishes and Sea Urchins 

Masahiro Dojiri 
and Roger F. Cressey 

Introduction 
In 1983 the first author was awarded a Smithsonian postdoctoral fellowship originally intended to result in a generic revision of the parasitic copepod family Taeniacanthidae. As this work progressed we decided to work jointly to produce an expanded revision to include the redescriptions of poorly known species and descriptions of recently collected new species. This added effort has resulted in the work presented herein. 

The Taeniacanthidae, a family of poecilostomatoid copepods parasitic on marine fishes and sea urchins, is morphologically close to the Bomolochidae (cf. Dojiri and Humes, 1982; Humes and Dojiri, 1984) and was formerly placed in the Bomolochidae. However, in 1911 Wilson separated the taeniacanthids from the bomolochids. He grouped Taeniacanthus, Irodes, Phagus, and Anchistrotos in the subfamily Taeniacanthinae of the Ergasilidae, which also included the Ergasilinae and Bomolochinae. Later Wilson (1932) removed the taeniacanthids and bomolochids from the Ergasilidae and elevated each to familial status, i.e., Taeniacanthidae and Bomolochidae. Yamaguti (1963), however, considered the Taeniacanthinae as a subfamily of the Bomolochidae. In recent years the Taeniacanthidae has been considered a valid family distinct from the Bomolochidae (see Kabata, 1979). Until now the most recent study of the Taeniacanthidae has been that of Kabata (1979). 

In the present revision 14 genera consisting of 91 species, a few of which are poorly known, are currently recognized as valid. The 91 species include 14 new species described in this paper. Three of the genera (Clavisodalis, Echinirus, and Echinosocius) live in the esophagi of sea urchins (Dojiri and Humes, 1982; Humes and Dojiri, 1984). Eleven genera (the type genus Taeniacanthus and Anchistrotos, Cirracanthus, Irodes, Metataeniacanthus, Nudisodalis, Phagus, Pseudotaeniacanthus, Scolecicara, Taeniacanthodes, and Taeniastrotos) are parasites of marine fishes. Parataeniacanthus is rejected, and two new genera (Cirracanthus and Nudisodalis) are proposed. Phagus and Irodes, considered in the past as questionable or invalid genera (Ho, 1969; Kabata, 1979), are reestablished with revised diagnoses. Diagnoses for all 14 taeniacanthid genera are provided. 

Numerous fishes housed in the Smithsonian collections were examined by us for taeniacanthids. These fishes are identified in this revision by USNM catalog numbers in parentheses immediately following the species of host. 

All specimens were cleared in 85% lactic acid for a period of at least 24 hours before measurement and dissection. Copepods were examined by the wooden-slide procedure of Humes and Gooding (1964). All figures were drawn with the aid of a Wild drawing tube. Selected specimens were also examined with the Cambridge Stereoscan 250 Mk2 and the Hitachi S-570 scanning electron microscopes. 

Most material has been preserved in 70% ethanol and deposited in the Division of Crustacea of the National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560. Dissected specimens are in the collection of the first author. 

In the description of each species the interpodal plate, coxa, basis, and exopod of leg 3 are identical to those of leg 2 unless illustrated and described. We have used the term "intermediate spine" (abbreviated "int." in the armature formulae) for elements that appear to be morphologically intermediate between a seta and a spine. Although this term is somewhat ambiguous, we found that it is particularly
useful in describing the armature of the terminal endopod segment of leg 4. We purposely did not use the term for the armature of the exopods in order to retain consistency with other published works on taeniacanthids.

New species of the blenny genus *Cirrhipetes* reported as hosts in this revision are currently being described by Mr. Jeffrey T. Williams, Smithsonian Institution, Washington, D.C.

Descriptions and/or discussions of taeniacanthid species are arranged in alphabetical order immediately after the type-species of each genus. P1–P4 are abbreviations for legs 1–4. In the armature formulae of legs 1–4 Roman numerals represent spines, and Arabic numerals indicate setae. Other abbreviations used in the figures are explained in the figure legends.

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Our gratitude goes to Mr. Jeffrey T. Williams, National Museum of Natural History, Smithsonian Institution, for collecting seven new species of taeniacanthids from *Cirripetes* and *Exallia* and for helpful suggestions on current fish names and classification.

We also thank the following people for their contributions to this revision: Ms. Hillary Boyle Cressey for illustrations of some figures of *Metataeniacanthus synodi*, *Taeniacanthus balistae*, and *T. occidentalis*; Ms. Kelleen N. Flaherty, Department of Biological Sciences, The Florida State University, Tallahassee, Florida, for examining fishes for taeniacanthids; Ms. Heidi Wolf, Smithsonian Institution, for her expertise on the SEM; Mr. Michael R. Carpenter, Smithsonian Institution, for taking photographs of *Taeniacanthodes gracilis* clusters.

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Special thanks are warmly extended to Ms. Paula Rothman, Smithsonian Institution, who collected taeniacanthids from fishes, prepared specimens for SEM, prepared figure plates, and typed and helped edit the manuscript. Her efforts greatly improved the final form of this revision.

TAENIACANTHIDAE Wilson, 1911

EXTERNAL MORPHOLOGY

HABITUS.—Taeniacanthid females are characterized by the presence of a cephalothorax, usually four free pedigerous segments, a genital complex, and an abdomen with up to four segments. The cephalothorax is comprised of the cephalon, the maxilliped-bearing segment, and the first pedigerous segment. In *Taeniacanthus pseudorhombi* (Figure 75A) the first pedigerous segment remains free from the cephalosome (cephalon and maxilliped-bearing segment), whereas in *Clavidosalis* not only the first but the second pedigerous segment as well are either partially or completely fused to form the cephalothorax. Generally the cephalothorax is subcircular in outline, comprises about 25% of the total body length, and is the widest part of the body. The four leg-bearing segments decrease in width from anterior to posterior with the fifth pedigerous segment narrowest (e.g., Figure 5A). This typical taeniacanthid habitus is found in *Anchirostrotos*, *Cirrancanthus*, *Irodes*, *Nudisodalis*, *Taeniastrostrotos*, and most species of *Taeniacanthus*. The second, third, and fourth pedigerous segments in some species of *Taeniacanthus*, e.g., the type-species *T. carchariae*, *T. glomeratus*, and *T. lagocephali*, are similar in width to the cephalothorax and each pedigerous segment is somewhat globose in appearance (e.g., Figure 25A). The genital complex is usually subquadrangular, wider than long, and widest at midlength. In most taeniacanthid females the abdomen is 4-segmented and may be ornamented with rows of spines on the ventral surface. Frequently the male has one less abdominal segment than its female counterpart.

By changes in the proportions of the cephalothorax and various free segments, the general form of the taeniacanthid body changes significantly (Kabata, 1979). For example, in *Pseudotaeniacanthus coniferus* with the cephalothorax and free leg-bearing segments comprising a smaller fraction of the total body length combined with long abdominal segments, the long slender habitus results (Figure 141A). Conversely, *Taeniacanthus moa* (Figure 46A) has a robust appearance resulting from a large prosome (portion of the body anterior to the fifth pedigerous segment) and very short abdominal segments. Also, within a species the habitus may show variation, e.g., *Taeniacanthus kitamakura* (Figure 28A,B) and *Metataeniacanthus synodi* (Figure 127A,B).

In several species and genera of the Taeniacanthidae
slight alterations of the cephalothorax, fusion of various segments, and changes in the relative length of the abdomen results in a modified habitus. For example in species of *Metataeniacanthus*, which attach to the gills of fishes, the lateral regions of the cephalothorax are folded longitudinally, and so they are bent ventrally (Figure 162C). This modification results in a median longitudinal groove in which the gill filament of the host lies. The change in shape of the cephalothorax is an adaptation for attachment to a specific site on the host. The diminutive cephalothorax, slender trunk, and elongate abdomen give species of *Metataeniacanthus*, e.g., *M. synodi* (Figure 127A), a sleek, streamlined appearance. On the other hand species of *Taeniastratos*, which attach to the body surface of their hosts, are dorsoventrally flat, an adaptation that reduces resistance to water flowing over the body of the host. The cephalothorax is disproportionately large and probably acts as a suction cup aiding in adhesion to the host. The genera (*Claviosodalis*, *Echinurus*, and *Echinococcus*) associated with echinoids also have a rather “top-heavy appearance” due to the large cephalothorax and the reduction in size and number of abdominal segments (Kabata, 1979). In these three genera the enlargement of the cephalothorax results from the progressive incorporation of the second pedigerous segment. The number of abdominal segments are reduced to either three or two.

In *Taeniacanthodes gracilis* the third and fourth pedigerous segments are almost completely fused to form the trunk. This tagma is separated from the ovoid cephalothorax by a neck-like second pedigerous segment. The abdomen is long and slender. These alterations result in a modified habitus (Figure 145A) quite different from the typical taeniacanthid body described above. Both species of *Taeniacanthodes* also bear posterolateral processes or flaps on the cephalothorax (Figures 145D, 149B).

The most highly modified taeniacanthid body form is that of the monotypic *Solecicara*. Much of the external segmentation of the body has been lost. The cephalothorax is relatively small and bulbous, and is followed by a long cylindrical neck, apparently formed by the second pedigerous segment. The trunk is formed by the fusion of the third and fourth pedigerous segments. The posterior part of the body (urosome) is slender and cylindrical (see Ho, 1969).

**Caudal Ramus.**—The posteriormost abdominal segment (anal segment) bears the caudal rami. These structures have been termed the “caudal furca” in the past, and recently “uropods” by Bowman (1971). Although Kabata (1979, 1981) agreed with Bowman, there has not been a general acceptance of the use of “uropods” for these structures. In fact Bowman has abandoned the term in favor of “caudal ramus” in copepods (Bowman, personal communication). We have retained “caudal ramus” throughout this revision.

The caudal ramus (Figure 1B) is morphologically uniform throughout the Taeniacanthidae. It is usually located terminally on the anal segment, but in *Claviosodalis abbreviatus* it is inserted ventrally (see Dojiri and Humes, 1982). It is a quadrangular structure, usually longer than wide, occasionally ornamented with spinules on the ventral surface, and invariably carrying six setae. Its length/width ratio varies from species to species, but remains relatively constant within a species. It is therefore useful as a specific character, but not as a generic discriminant.

The arrangement of the six setae is highly predictable. There are two subterminal setae, one on the dorsal medial surface and the other at a lateral position. Four setae are located terminally. The two largest setae are the median terminal setae; these two setae are not only the longest and widest, but also are usually sclerotized at their bases. The remaining two terminal setae are the lateral (outer) terminal seta and the medial (inner) terminal seta.

**Rostral Area.**—The rostral region is a protuberant area located on the anteromedian margin of the cephalothorax. This region may be only slightly protuberant in dorsal view as in *Taeniacanthus alutieri* (Figure 5A) or conspicuously protuberant as in *Taeniacanthus acanthocephalae* (Figure 1A), *Taeniacanthodes gracilis* (Figure 145A–C), and *Taeniastratos californiensis* (Figure 155A).

There is a great deal of diversity in the structure of the ventral surface of the rostral area (Kabata, 1979). Five types of rostrum are found in the Taeniacanthidae. The simplest is composed of a sclerotized plate (Figures 5E, 161C,D), differing in shape and slightly in structure from species to species. This type of rostral area is found in *Taeniacanthus*, *Anchistrotos*, *Cirracanthus*, *Claviosodalis*, *Echinurus*, *Echinococcus*, *Irides*, *Meta taeniacanthus*, *Nudisodalis*, and *Phagus*. All these genera except *Phagus* also possess a postantennal process.

A corrugated shield-like structure is located on the ventral surface of the rostral area in species of *Taeniastratos* (Figure 155D). This structure may aid in attachment to the host.

*Taeniacanthodes* bears a ventromedian spiniform process on the rostral area (Figure 145G). Both species of this genus lack the postantennal process. The spiniform process on the rostral area may function like the postantennal process.

*Psuedotaeniacanthus*, another genus with no postantennal process, bears a Y-shaped sclerotized structure bearing numerous transverse ridges or hooklets (Figures 137D,E, 162D–F, and 163A,B). In four of the six species reported here there is a furca associated with the Y-shaped structure (Figures 137E, 162D–F).

*Solecicara* bears the postantennal process and the rostral tines (or spiniform processes). The rostral area bears three spiniform processes (a small medial one flanked by a pair of diverging tines).

**First Antenna.**—The first antennae lie on either side of the rostral area. They are usually 7-segmented, somewhat cylindrical, and largest in diameter at the base. Most taeniacanthids have a 7-segmented first antenna with the arma-
ture formula 5, 15, 5, 3, 4, 2 + 1 aesthetes, and 7 + 1 aesthete (e.g., Figure 6A). Although there are minor variations in this formula, involving the absence of one or two setae, these variations are restricted to a small number of species.

In almost all species of Taeniaeacanthidae the first antenna of the male is similar in structure and armature to that of the female. However, the male of Phagus muraenae has an additional seta on the fourth segment (indicated by the dot in Figure 133E).

There is a trend toward the reduction in the number of segments of the first antenna from seven to five. Three species of Taeniaeacanthus (T. ostracionis, T. petilus, and T. yamagutii) have a 6-segmented antenna (third and fourth segments fused) with the formula 5, 15, 8, 4, 2 + 1 aesthete, and 7 + 1 aesthete (e.g., Figure 59A). Although Ho (1969) considered the first antenna of Scolecticeps humesi indistinctly 7-segmented, his illustration clearly depicts a 6-segmented condition. Unlike the above species, the species of Irodes and Pseudoaeniacanthus congeri have the first and second segments fused to form a 6-segmented structure (e.g., Figures 112A, 138A). Taeniacanthodes and the majority of taeniaeacanthids associated with echinoids have a 5-segmented first antenna with the first and second segments fused and separated from the fused third and fourth segments.

SECOND ANTENNA.—This appendage is prehensile and bears a few claw-like spines at its tip. It is usually indistinctly 4-segmented, with the first and second segments each bearing a distal seta (Figure 6B). The third and fourth segments are clearly distinct in Pseudoaeniacanthus (e.g., Figure 138A). In many species, however, they are often incompletely or completely fused to each other. The third segment bears one claw-like spine and two pectinate processes. Each pectinate process may bear either a single row of spinules as in Taeniaeacanthus petilus (Figure 65D) or numerous rows as in Taeniaeacanthus comparatus (Figure 17D). Each process also has a small seta (setule). The fourth segment usually bears six elements. In most species the armature consists of two claw-like spines and four setae as in Taeniaeacanthus acanthocephalae (Figure 1E).

There are, however, departures from this generalized pattern. For example, in Taeniaeacanthus aluteri (Figure 6B) one of the usual four terminal setae is modified as a spine, so there are three spines and three setae at the tip. In addition the third and fourth segments are fused, and so the spine of the third segment is closely associated with the three spines of the terminal segment. The formula in this species is four claw-like spines and three setae. In Taeniaeacanthus pseudorhomphi (Figure 76A) none of the elements on the second antenna are sclerotized. Consequently, there are no spines, but instead seven setae at the tip.

POSTANTENNAL PROCESS.—This curved spiniform process (e.g., Figure 2A,B) is situated posterolaterally to the bases of the first antenna (see Figure 1C). It has been called a variety of names such as the “maxillary hook” by Wilson (1911), “first maxilla” by Shiino (1957a,b), “postantennal process” by Lewis (1967), “postantennal hook” by Cressey and Cressey (1979), and “postantennary process” by Kabata (1979). Because this structure is similar in morphology and position to the postantennal process in the Caligidae, we have adopted the term “postantennal process” (Dojiri, 1983).

The postantennal process varies in its length/width ratio and degree of curvature from species to species. The shape is relatively constant within a species. It is absent in Phagus, Pseudoaeniacanthus, and Taeniaeacanthodes.

LABRUM.—The labrum, or “upper lip,” is a ventral flap extending posteriorly and covering the mouth. It usually has a rounded posterior margin and is frequently ornamented with a posterior row of spinules (e.g., Figure 2C). In some species there is a median indentation on the posterior margin (e.g., Figure 6D). The shape of the labrum is modified from this general pattern in a few species. In Taeniaeacanthus williamsi it is quadrangular (Figure 92A), and in Metataeniacanthus synodi it is irregular in shape (Figure 127H).

MANDIBLE.—The mandible is the masticatory appendage of the taeniaeacanthids. The base of each mandible is located outside the labrum, but the distal part extends underneath the labrum. The main body of this appendage is highly sclerotized and slightly curved. In most species of taeniaeacanthids it is tipped with two subequal, spinulated blades (e.g., Figure 2B). A small accessory seta or process is associated with the secondary (shorter) blade in some species (e.g., Figures 2D, 6E) or is absent in other species (e.g., Figure 11B).

In the taeniaeacanthids associated with echinoids, there is a trend toward the reduction of the secondary blade (Humes and Dojiri, 1984). In Echininoscius the secondary blade is subequal in length to the primary blade. In some species of Clavisodalis, the blades are conspicuously unequal. The secondary blade is further reduced to a small process in other species of Clavisodalis and in Echinirus laxatus. Finally in Echinirus diadematis the secondary blade is absent, and only a large primary blade remains (see figure 11 of Humes and Dojiri, 1984).

PARAGNATH.—Each paragnath lies posterior to the mandible. It is a digitiform lobe in most taeniaeacanthid species, and is frequently ornamented with spinules. It may have additional processes giving it a slightly irregular shape as in Taeniaeacanthus petilus (Figure 66B). In Anchistrotos gobii the paragnath is tipped with a setiform process (Figure 101D). The shape and ornamentation of the paragnath is constant within a species.

The function of the paired paragnaths is not known, but they may help direct food toward the mouth.

FIRST MAXILLA.—Posterior to the paragnaths are the paired first maxillae. The first maxilla is a rounded setifer-
ous lobe. There can be as many as six setae as in species of Anchistrotos, e.g., A. gobii (Figure 101E), and Pseudotaeniacanthus, e.g., P. congeri (Figure 138F). Frequently there is a small, rounded sclerotized knob on the lobe as in A. gobii. In several species of Taeniacanthus parasitic on the blenny genus Cirripectes, a nipple-like process is present near the base of the second longest seta. This process is minute in Taeniacanthus digitiatus (Figure 20C) and T. papulosus (Figure 62E), but large and conspicuous in T. glomerous (Figure 26F) and T. pollicaris (Figure 72B).

The first maxilla of Cirracanthus, Irodus, Metataeniacan-
thus, Nudisodalis, Phagus, Taeniacanthodes, Taeniastrotos, and the majority of species of Taeniacanthus bears five setae. The number of setae is reduced to four in Echinosocius, and to three in Clavisodalis, Echinurus, and Scolecicara.

SECOND MAXILLA.—This paired appendage is situated between the first maxilla and the paired maxillipeds. It may function in grooming the other oral appendages.

It is a relatively conservative appendage (Humes and Dojiri, 1984), and is very similar in structure to the second maxilla of the Bomolochidae. Its structure varies slightly among various taeniacanthid genera, and it consists of two segments. The basal segment is robust and unarmed. The second segment is smaller than the first and bears two spinulated spines and one seta; one spine is usually indistinguisibly fused to the second segment and is referred to as a “terminal process” in this revision (e.g., Figure 1)

In its plesiomorphic state the exopod of leg 1 is 3-segmented usually with the formula of 1-0; 1-1; 6. This is a fundamental difference between these groups. On the other hand the claw of the maxilliped is sigmoid in Taeniastrotos, e.g., T. tragus (Figure 159H).

There appears to be a trend toward the reduction and eventual loss of the maxilliped in the females of the taeniacanthid genera. This trend, however, may have occurred more than once in the evolution of this family, as the reduction of the maxilliped may have occurred independently in a few taeniacanthid genera. We discuss below a progressive sequence based on the morphology of contemporary genera. We are not suggesting that this sequence is a depiction of the evolutionary history or close relationships of these taeniacanthid genera.

In Pseudotaeniacanthus congeri the terminal claw is not highly sclerotized but remains setiform (Figure 138H). It is most likely an ineffective prehensile structure. In Pseudo-
taeniacanthus coniferus (Figure 142E) and Phagus muraenae (Figure 134G) there are only four setae on the terminal segment, and no claw. Nudisodalis acicula also has no claw (Figure 131E). In species of Irodus, e.g., I. gracilis (Figures 113E, 116F), the claw is absent and the terminal segment is fused to the corpus. Reduction in the maxilliped has progressed further in Echinosocius where the corpus maxillipede is represented by a spindle-shaped swelling (Figure 161E). In Echinurus the maxilliped is absent in the females.

In the male it is a 4-segmented appendage with the corpus ornamented with rows of denticles and/or spinules. The third segment is small and unarmed. The fourth segment is a curved claw bearing denticles or teeth along the inner (concave) margin. The morphology of the maxilliped of the males does not vary greatly among taeniacanthid genera (compare Figures 9C, 115C, and 152B).

LEG 1.—Legs 1–4 are biramous and used primarily for locomotion. Leg 1 in some genera of the Taeniacanthidae, e.g., Taeniacanthodes and Taeniastrotos, forms the posterior margin of a cephalothoracic suction cup (e.g., Figure 158D). With the posterior border of the cephalothorax closed off by leg 1, the entire cephalothorax may function as a large sucker to aid in adhesion to the host.

In its plesiomorphic state the exopod of leg 1 is 3-
segmented usually with the formula of 1-0; 1-1; 7 as in Anchistrotos, Metataeniacanthus, Phagus, and several species of Taeniacanthus e.g., T. pseudorhombi (Figure 77E). This formula may vary as in Taeniacanthodes (e.g., Figure 147A) and Pseudotaeniacanthus (e.g., Figure 159B) with the formula 1-0; 1-1; 8. These latter two genera also have a 3-
segmented endopod, as does Taeniacanthus pseudorhombi. However, Taeniacanthodes and Pseudotaeniacanthus have the endopod armature 0-1; 0-1; 5, and T. pseudorhombi has 0-1; 0-1; 6. Anchistrotos, Metataeniacanthus, Phagus, and several
species of *Taeniacanthus* have a 3-segmented exopod, but only a 2-segmented endopod. The endopod armature of these taeniacanthids is usually 0-1; 7, e.g., *Metataeniacanthus synodi* (Figure 128c), except for species of *Anchistrotos* with 0-1; 6, e.g., *A. gobii* (Figure 102a). Six taeniacanthid genera have 2-segmented rami. They are *Cirrancanthus*, *Clavisodalis*, *Echinirus*, *Echinosocius*, *Irodes*, and *Nudisodalis*. There are seven to nine setae on the terminal (second) exopod segment, whereas the armature of the terminal endopod segment varies from six to eight. The species of *Taeniastrotos* have either 3-segmented (trimerous) rami as in *T. californiensis* (Figure 155b) or 2-segmented (bimerous) rami as in *T. tragus* (Figure 159i).

There are two major structural patterns for leg 1. The first pattern is exemplified by a broad interpodal plate, broad coxa and basis, and lamelliform rami (see figure 3 of Humes and Dohjiri, 1984). This pattern is found in the taeniacanthid genera parasitic on fishes and in *Echinosocius* associated with echinoids. The second pattern characteristic of *Clavisodalis* and *Echinirus* consists of simplified, less lamelliform rami than the first (see figure 4 of Humes and Dohjiri, 1984).

**LEGS 2 AND 3.**—The general structure of legs 2 and 3 is very similar. They are biramous and trimerous. The armature formula of the exopods of legs 2 and 3 is usually 1-0; 1-1; 0-1; 0-1 (or 0-2); 1-1; 1-1; 1-1; 1-1; 1-1 (or 0-2); 1-1; 2 in most taeniacanthid species. An inner coxal seta may be present on legs 2 and 3 in some species (e.g., figure 135a–c).

**LEGS 4.**—The exopod of leg 4 is similar to the exopod of legs 2 and 3. The major difference is found in some species of *Taeniastrotos*, e.g., *T. balistae* (Figure 155b) and *T. occidentalis* (Figures 56e, 57d) in which the terminal exopod segment is an elongate claw-like structure. The endopod of leg 4 is quite different from the endopods of legs 2 and 3. The terminal segment in most taeniacanthid species has three spines as in *Taeniastrotos acanthocepolae* (Figure 4a) or 4 spines as in species of *Anchistrotos*, *Echinirus*, *Irodes*, and *Phagus*, e.g., *A. gobii* (Figure 102e). The number of elements on this segment varies in *Pseudotaeniacanthus* and *Taeniastrotos*. The endopod of *Taeniastrotos* is 2-segmented, with the first segment unarmed and the terminal segment with two elements in *T. gracilis* (Figure 147e) or 3 elements as in *T. haakeri* (Figure 151b).

The exopod and endopod segments of legs 2–4 may be ornamented with spines, e.g., *Taeniacanthus moa* (Figures 48r, 49b,d,e). The spines of these segments are generally highly sclerotized and spinulated (serrated) along much of their lengths. The exopod spines may each be terminally or subterminally tipped with a setiform element (flagellum), e.g., *T. moa* (Figures 48r, 49d). In many species the exopod spines are not highly sclerotized, but remain setiform, e.g., *Taeniastrotos acanthocepolae* (Figure 3f).

**LEGS 5 AND 6.**—The paired leg 5 is located immediately posterior to the major body articulation in taeniacanthids. It is 2-segmented with a small first segment bearing one dorsolateral seta. The second segment is usually elongate and paddle-shaped as in *Taeniastrotos acanthocepolae* (Figure 4b,c), triangular in outline, e.g., *T. glomerus* (Figure 27i,j), or broad and lamelliform, e.g., *T. lagocephali* (Figure 36g,h). Although all species of *Irodes* possess a broad, oval second segment of leg 5, in general the length/width ratio and shape of this segment is not constant within a genus. The morphology of leg 5 appears to be a reliable specific character, but not a good generic discriminant. The second segment is generally tipped with four elements (spines and/or setae), but only three (two spines and one seta) in *Taeniastrotos*, e.g., *T. gracilis* (Figure 145e). Both segments of leg 5 may be ornamented with rows of spines as in *Taeniastrotos moa* (Figure 49f).

Leg 6 is highly reduced and is near the egg sac attachment area. It is represented by a process bearing three setae. This leg has not been extensively utilized in the taxonomy of the Taeniacanthidae. In general it appears not to be of much use as a generic character, but the relative lengths of the setae may differ from species to species, e.g., compare leg 6 of *Taeniastrotos anguillaris* (Figure 10b) with that of *T. moa* (Figure 46n).

### Key to Genera of Taeniacanthidae Females

1. Associated with echinoids .................................................. 2
   Parasitic on fishes .......................................................... 4
2. Second pedigerous segment partially or completely fused to cephalothorax .............. *Clavisodalis*
   Second pedigerous segment not fused to cephalothorax ........................................ 3
3. Maxilliped absent .......................................................... 3
   Maxilliped represented by pear-shaped swelling; distinct corpus and claw absent .......... *Echinosocius*
4. Second pedigerous segment long and slender, forming elongate neck; maxilliped bilobed terminally.  \textit{Scoleciacara}  
Second pedigerous segment not forming elongate neck; maxilliped not bilobed terminally.  \textit{Taeniatestrotos}

5. Rostral area with corrugated shield-like structure on ventromedian surface.  \textit{Taeniacanthodes}  
Rostral area without corrugated shield-like structure on ventromedian surface.  \textit{Scoleciacara}

6. Cephalothorax with pair of lateral spatulate processes on posteroventral surface.  \textit{Taeniacanthodes}  
Pair of lateral spatulate processes on posteroventral surface of cephalothorax absent; rostral area otherwise.  \textit{Parataeniacanthus}

7. Rostral area with Y-shaped sclerotized structure bearing transverse rows of hooklets or ridges.  \textit{Pseudotaeniacanthus}  
Rostral area otherwise.  \textit{Phagus}

8. Postantennal process absent.  \textit{Phagus}  
Postantennal process present.  \textit{Taeniacanthus}

9. Cephalothorax with ventrally directed lateral margins.  \textit{Metataeniacanthus}  
Cephalothorax without ventrally directed lateral margins.  \textit{Parataeniacanthus}

10. Second maxilla with 1 spinulated process and minute spine (spinule) on terminal segment.  \textit{Nudisodalis}, new genus  
Second maxilla otherwise.  \textit{Parataeniacanthus}

Maxilliped otherwise.  \textit{Parataeniacanthus}

12. Terminal segment (claw) of maxilliped absent or fused to corpus.  \textit{Irodes}  
Terminal segment of maxilliped distinct.  \textit{Parataeniacanthus}

13. Maxilliped claw with 2 long whip-like setae extending to or beyond distal limit of claw.  \textit{Anchistrotos}  
Maxilliped claw without 2 long whip-like setae.  \textit{Taeniacanthus}

\textit{Taeniacanthus} Sumpf, 1871


\textbf{Diagnosis.}—\textit{Female:} Cephalothorax with first pedigerous segment free, partially fused, or completely fused to cephalosome. Genital complex quadrangular, small; frequently widest at midlength. Abdomen 3- or 4-segmented. Caudal ramus with usual 6 setae.

Rostral area protuberant. First antenna 6- or 7-segmented; if 6-segmented, third and fourth segments fused. Second antenna 3- or indistinctly 4-segmented; third and fourth segments partially or completely fused. Postantennal process present. Labrum with rounded posterior margin; fringe of spinules on posterior border in majority of species. Mandible with 2 spinulated blades; accessory seta present or absent. Paragnath present. First maxilla a setiferous lobe frequently bearing small rounded knob. Second maxilla 2-segmented with 1 spinulated process and 1 or 2 spinulated spines. Maxilliped with distinct corpus; claw curving away from corpus in all but 3 species (see “Remarks”).

Legs 1-4 biramous with 2- or 3-segmented rami in leg 1 and 3-segmented rami in legs 2-4. Leg 5 2-segmented; second segment with spines and/or setae. Leg 6 represented by 3 setae in area of egg sac attachment.

\textit{Male:} Genital complex subquadrangular. Appendages similar to those in female except maxilliped sexually dimorphic. Maxilliped 4-segmented; first segment irregular in shape with 1 seta; second segment robust with 2 setae and row and/or patches of spinules along inner margin; third segment small and unornamented; fourth segment a claw usually with 3 setae and teeth along inner (concave) margin.

\textbf{Type-Species.}—\textit{Taeniacanthus carehariae} Sumpf, 1871.
**Remarks.**—*Taeniacanthus* was first proposed by Sumpf (1871) for the type-species *T. carchariae* (see “Remarks” for this species).

*Parataeniacanthus* was established by Yamaguti (1939). The validity of this genus was questioned by Pillai (1963). The main distinction, suggested by Yamaguti, between *Parataeniacanthus* and *Taeniacanthus* is that in the former the first pedigerous segment remains distinct from the cephalosome, but in the latter, this segment is completely fused to the cephalosome. Although the type-species *P. pseudorhombi* bears a free first pedigerous segment, other species that have been attributed to this genus clearly do not (e.g., *P. cyanoglossi* Rangnekar and Murti, 1960, and *P. longicervis* Pillai, 1963). In other species (i.e., *P. rotundiceps* Shiino, 1957; *P. miles* Pillai, 1963; *P. mimici* Yamaguti and Yamasu, 1959; and *P. platyphali* Yamaguti, 1939) the “free first pedigerous segment” may simply be the intersegmental area between the first and second pedigerous segments. In these four species the first pedigerous segment is probably incorporated into the cephalothorax.

*Parataeniacanthus* rotundiceps and *P. miles* appear to have the first pedigerous segment only incompletely fused to the cephalosome. In addition, these two species and *P. platyphali* have a 3-segmented exopod of leg 1. This feature is in common with the type-species; however, the type-species also has a distinctly 3-segmented endopod of leg 1.

This species complex shows progressive fusion of the first pedigerous segment with the cephalosome (see Pillai, 1963), and progressive fusion of the first two segments of the exopod and endopod of leg 1. Consequently, as no clear distinction can be made between *Parataeniacanthus* and *Taeniacanthus*, *Parataeniacanthus* should be considered a junior synonym of *Taeniacanthus*.

The most distinguishing feature of *Taeniacanthus* females is the shape of the maxilliped claw, which curves away from the corpus. Only members of *Clavisodalis* share this characteristic in the Taeniacanthidae. However, the two genera can easily be distinguished, because the second pedigerous segment of *Clavisodalis* is partially or completely fused with the cephalothorax, whereas this segment is completely free in *Taeniacanthus*. There are a few exceptions to the typical shape of the maxilliped claw of *Taeniacanthus* females: *T. inimici* (Yamaguti and Yamasu, 1959); *T. cyanoglossi* (Rangnekar and Murti, 1960); *T. longicaudus* Pillai, 1963; and *T. narcini* Pillai, 1963.

*Taeniacanthus cyanoglossi* (Rangnekar and Murti, 1960) (formerly included in *Parataeniacanthus*) and *T. longicaudus* Pillai, 1963, have been described as possessing a blunt maxilliped claw bearing one or two setae at the tip in the females. There are no other taeniacanthid species described with such a claw. These two species appear to be related and may constitute a new genus. The illustration of the maxilliped of the female of *T. narcini* provided by Pillai (1963) is similar in structure to *T. cyanoglossi* and *T. longicaudus*. However, Pillai described the maxilliped of the female of *T. narcini* as a triangular sclerotized area bearing one distal and two proximal setae with the claw absent. This description is very similar to that given by Dohjiri and Humes (1982) for species of *Echinocosocius*. However, we did not obtain any of these three species and so could not verify the original descriptions. These three species should be included in *Taeniacanthus* until the maxilliped and other appendages of these species are reexamined.

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**Key to Species of *Taeniacanthus* Females**

(*T. carchariae, T. coelus, T. tetradonis, T. wilsoni, and T. zeyopteri* are excluded from key because they are so poorly known)

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Species</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Mid-endopod segment of leg 2 with 2 inner setae [Figure 19b]</td>
<td>...</td>
</tr>
<tr>
<td>2</td>
<td>Mid-endopod segment of leg 2 with 1 inner seta [Figure 3a]</td>
<td>...</td>
</tr>
<tr>
<td>3</td>
<td>Mid-endopod segment of leg 3 with 1 inner seta [Figure 27b]</td>
<td>...</td>
</tr>
<tr>
<td>4</td>
<td>Mid-endopod segment of leg 3 with 2 inner setae [Figure 19c]</td>
<td>...</td>
</tr>
<tr>
<td>3</td>
<td>Terminal process and spinulated spine of second maxilla broad, lamelliform; small spine absent [Figure 93d,e]</td>
<td><em>T. williamsi</em>, new species</td>
</tr>
<tr>
<td>4</td>
<td>Terminal exopod segment of leg 4 with formula II, I, 4</td>
<td><em>T. cyanoglossi</em></td>
</tr>
<tr>
<td>5</td>
<td>Terminal exopod segment of leg 4 with formula other than II, I, 4 [Figures 19e, 21c, 41a]</td>
<td>...</td>
</tr>
<tr>
<td>6</td>
<td>Terminal exopod segment of leg 2 with formula III, I, 5</td>
<td>...</td>
</tr>
<tr>
<td>7</td>
<td>Terminal exopod segment of leg 2 with formula II, I, 5 [Figure 19b]</td>
<td>...</td>
</tr>
<tr>
<td>8</td>
<td>Terminal endopod segment of leg 4 with 3 elements (2 spines and 1 seta)</td>
<td><em>T. narcini</em></td>
</tr>
</tbody>
</table>
Terminal endopod segment of leg 4 with 4 elements (4 spines) ........................................... \textit{T. longicaudus}

7. Distal half of maxilliped claw lamelliform and triangular in outline \textit{T. inimici}
Maxilliped claw curved, not lamelliform [Figures 18d, 66e, 77d] .......................... 8

8. Maxilliped claw bifid at tip with each tine curved in opposite directions ........................ \textit{T. sauridae}
Maxilliped claw not bifid at tip .......................................................... 9

9. Maxilliped claw with small attenuate accessory process near tip (Figure 18d–f);
terminal exopod segment of leg 4 elongate (approximately 3 times longer than wide) [Figure 19e] ................................. \textit{T. comparatus}, new species
Maxilliped claw with accessory process absent; terminal exopod segment of leg 4 not elongate [Figure 21c] .......................... 10

10. First antenna 6-segmented [Figure 65c] ............................................. 11
First antenna 7-segmented [Figure 76a] ............................................. 12

11. Maxilliped claw with approximately 5 large teeth on convex margin ........................ \textit{T. dentatus}
Maxilliped claw without teeth [Figure 66e–h] ............................... \textit{T. petilus}, new species

12. Exopod of leg 1 incompletely or completely 3-segmented [Figures 77e, 88e] ............................. 13
Exopod of leg 1 2-segmented [Figure 63a] ............................................. 17

13. Endopod of leg 1 3-segmented [Figure 77e]; pectinate process near distal end of second antenna ovoid [Figure 76b,c] ................................. \textit{T. pseudorhomboi}
Endopod of leg 1 2-segmented [Figure 88e]; pectinate process near distal end of second antenna elongate [Figure 87d,f] ................................. 14

14. Both blades of mandible bilaterally spinulated [Figure 88a]; maxilliped claw with long slender process at base [Figure 88d] ................................. \textit{T. sebastianthydys}
Both blades of mandible unilaterally spinulated [Figure 42c]; maxilliped claw without long slender process at base [Figure 43d,e] ................................. 15

15. Maxilliped claw bluntly rounded [Figure 43d,e] ................................................. \textit{T. miles}
Maxilliped claw relatively sharply pointed [Figure 84e,f] ............................................. 16

16. Maxilliped claw with fine transverse striations along convex margin [Figure 84e,f]; accessory process on mandible extending beyond midlength of smaller blade [Figure 84a] ................................. \textit{T. rotundiceps}
Maxilliped claw with transverse flanges (or ridges) along convex margin [Figure 69d–f]; accessory process on mandible not reaching midlength of smaller blade [Figure 68g] ................................. \textit{T. platycephali}

17. Second segment of leg 5 with 4 setae [Figure 21e] ............................................. 18
Second segment of leg 5 with 1 or more spines [Figures 41c, 52e, 81f] ............................ 20

18. Tip of maxilliped claw sharply pointed [Figure 20d,e] ............................................. \textit{T. digitatus}, new species
Tip of maxilliped claw bluntly rounded [Figures 62h–j, 72e–h] ............................................. 19

19. Accessory process on mandible short and spiniform, extending only to base of blade [Figure 62c] ................................. \textit{T. papulosus}, new species
Accessory process on mandible long and setiform, extending to about midlength of blade [Figure 72a] ................................. \textit{T. pollicaris}, new species

20. Exopods of legs 3 and 4 with first segment bearing dorsal corrugated pads,
second segment slightly inflated, and third segment irregular in shape
[Figures 40c,d, 41a] ................................. \textit{T. longicervis}
Exopods of legs 3 and 4 otherwise [see leg 4, Figures 52e, 81d] ................................. 21

21. Accessory process on mandible present [Figure 51a]; spines on second segment of leg 5 blunt [Figure 52c,h] ................................. \textit{T. neopercis}
Accessory process on mandible absent [Figure 79c]; spines on second segment of leg 5 sharply pointed [Figure 81f] ................................. \textit{T. pteroiisi}

22. Terminal exopod segments of legs 2 and 3 with armature formulae II, I, 4 and II, I, 4 [Figures 3b, 48f] ................................. 23
Terminal exopod segments of legs 2 and 3 with armature formulae otherwise.

[Figures 12A, 54E] 25

23. Maxilliped claw with about 6–9 large transverse ridges along convex margin
[Figure 2H] T. acanthocepolae
Maxilliped claw with small spinules along convex margin [Figure 48C,D] 24

24. Exopods and endopods of legs 2–4 with rows of large spinules along outer margins [Figures 48F, 49B,D,E]; prosome ovoid, reminiscent of pill bug [Figure 46A] T. moa
Exopods and endopods of legs 2–4 without rows of large spinules along outer margins; prosome tapered posteriorly T. pectinatus

25. Terminal exopod segments of legs 2 and 3 with armature formulae II, I, 5 and II, I, 5 [see leg 2, Figure 54E] 26
Terminal exopod segments of legs 2 and 3 with armature formulae II, I, 4 [Figure 7E] and II, I, 5 [Figure 8B], respectively 27

26. Terminal exopod segment of leg 4 with armature formula II, I, 5 [Figure 55A] T. nudicauda, new species
Terminal exopod segment of leg 4 with armature formula II, I, 4 [Figure 12n] T. anguillaris

27. Short pectinate process of second antenna with several rows of spinules [Figure 6b] T. aluteri
Short pectinate process of second antenna with single row of spinules [Figure 13e] 28

28. Terminal exopod segment of leg 4 more than 3 times longer than wide, and curved outwardly [Figure 15B] T. balistae
Terminal exopod segment of leg 4 much less than 3 times longer than wide, and not curved [Figures 32A,B, 36D,E, 98G] T. similis, new species

29. Maxilliped claw with small rounded process at base of claw [Figure 14C,D] T. balistae
Maxilliped claw lacking small rounded process at base of claw [Figure 56C] T. similis

30. Anal segment with 3 to 4 rows of spinules on each side of ventral surface [Figure 56B]; terminal exopod segment of leg 2 with innermost spine twice length of outermost spine [Figure 56d] T. occidentalis
Anal segment with 7 to 8 rows of spinules on each side of ventral surface; terminal exopod segment of leg 2 with innermost spine only slightly longer (much less than 2x) than outermost spine [see Figure 14G of T. balistae] T. similis

31. Exopod spines of legs 2–4 relatively stout and sclerotized, each with terminal or subterminal flagellum [Figure 24C,E,G] T. fugu
Exopod spines of legs 2–4 attenuate and weakly sclerotized; terminal flagella absent [Figures 30E, 31D, 32A] T. fugu

32. Setae of terminal endopod segment of leg 2 not extending beyond distal limit of innermost spine [Figure 23e] T. fugu
At least two setae of terminal endopod segment of leg 2 extending beyond distal limit of innermost spine [Figure 98B] T. yamaguti

33. Terminal process of second maxilla stout (3x longer than wide) [Figure 97D,E]; maxilliped claw with conspicuous digitiform process at base [Figure 97E–H] T. yamaguti
Terminal process of second maxilla slender (6x longer than wide) [Figure 59G,H]; maxilliped claw with slight protuberance at base [Figure 60A–C] T. ostracionis

34. Terminal segment of second maxilla with 1 spinulated process and 1 large spine (almost reaching distal end of process) [Figure 34G,H] T. lagocephali
Terminal segment of second maxilla with 1 spinulated process, 1 small spine, and 1 small seta [Figure 29G,H] T. kitamakura
**Taeniacanthus carchariae Sumpf, 1871**


**DESCRIPTION.**—**Female:** See Sumpf (1871) for description.

**Male:** Unknown.

**REMARKS.**—*Taeniacanthus carchariae* was described by Sumpf (1871) from a species of the shark genus "Carcharias" (no longer considered a valid genus). In the illustration of the ventral view of this species Sumpf figured the maxilliped claw as curving away from the corpus. This feature is characteristic for the members of *Taeniacanthus*.

Since its discovery *T. carchariae* has not been redescribed and the details of its morphology still remain unknown. This is very unfortunate, because this species is the type of its genus. In an effort to examine Sumpf's material we wrote to D.E. Piff of the Zoologisches Institut der Universität Wien (Vienna). He informed us that the material was not there. Capart (1959) reported specimens of taeniacanthis that he tentatively identified as *T. carchariae* from the gill filaments of *Lagocephalus laevis*

**NUMBER 447**

*Taeniacanthus acentocepola* Yamaguti, 1939

**FIGURES 1-4**


**MATERIAL EXAMINED.**—13 females and 1 immature female from *Acentocepola limbata* Cuvier (USNM 130539) from Ningpo, China.

**DESCRIPTION.**—**Female:** Body as in Figure 1A. Total length 0.74 mm (0.66–0.78 mm) and greatest width 0.27 mm (0.23–0.33 mm) based on 8 specimens. Cephalothorax (Figure 1A), 244 × 258 μm (l × w), comprising approximately 30% of total length. Thoracic segments bearing legs 2, 3, and 4 similar in width. Genital complex wider than long 58 × 83 μm. Abdomen 3-segmented; segments from anterior to posterior 35 × 62 μm, 25 × 55 μm, and 32 × 44 μm (l × w); anal segment unornamented except with few setules. Caudal ramus, 36 × 19 μm (Figure 1B), with 6 naked setae.

Rostral area (Figure 1C) prominent dorsally. First antenna (Figure 1D) 7-segmented and slender; armature formula: 5, 15, 4, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 1F) apparently 4-segmented; first and second segments each with 1 distal seta; third segment with 1 curved, stout spine and 2 pectinate processes (longer one with distal seta, shorter one with hyaline seta at midlength); terminal segment with 2 curved, stout spines and 4 setae. Postantennal process (Figure 2A,B) long, curved, approximately 81–87 μm along its axis.

Labrum (Figure 2C) with rounded, spinulated, posterior margin. Mandible (Figure 2D) bearing 2 unequal blades, each spinulated along 1 margin, and 1 small accessory seta. Paragnath (Figure 2E) with long, slender distal portion and with long spines near base. First maxilla (Figure 2F) a lobe with 5 setae. Second maxilla (Figure 2G) with large sclerotized base; second segment with spinulated terminal process bearing 1 bilaterally spinulated spine and 1 slender seta. Maxilliped (Figure 2H) 3-segmented; first segment presumably without usual seta, but with a rounded protuberance; corpus with 2 naked setae; terminal segment a claw bearing a sharp conical projection with 1 seta at its base, 1 small seta located inside pit (depressed area), 1 rounded process near conical projection, and approximately 6–9 transverse flanges along curved portion.

Legs 1–4 (Figures 2, 3A–F, 4A) biramous. Spinal and setal formula as follows:

<table>
<thead>
<tr>
<th>Species</th>
<th>Coxae</th>
<th>Basal</th>
<th>Exopod 1</th>
<th>Exopod 2</th>
<th>Exopod 3</th>
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<tbody>
<tr>
<td>P₁</td>
<td>0-1</td>
<td>1-1</td>
<td>1-0</td>
<td>8</td>
<td>0-1; 7</td>
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<tr>
<td>P₂</td>
<td>0-0</td>
<td>1-0</td>
<td>1-0</td>
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<td>1-1; 1-4</td>
</tr>
<tr>
<td>P₃</td>
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<td>0-0</td>
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<td>1-0</td>
<td>1-1; 1-4</td>
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Interpodal plate of leg 1 (Figure 2I) with patch of spinules on convex posterior margin. Interpodal plates of legs 2 and 3 (Figure 3A,C) reentrant each with two rows of spinules. Interpodal plate of leg 4 (Figure 3E) with 2 patches of spinules on posterolateral margins. Coxa of leg 1 with row of spinules on outer margin; basis with striated flange and row of spinules on posterior margin near insertion of exopod. Coxae of legs 2–4 with rows of spinules (see Figure 3A); inner margin of basis of leg 2 with row of spinules, but these spinules absent in legs 3 and 4. First and second segments of exopods of legs 2–4 with minute spinules along outer margins. Terminal exopod segment of leg 2 (Figure 3B) with small digitiform process and semicircular row of spinules on distolateral corner. Exopod of leg 4 (Figure 3F) with inflated distomedial corner of terminal segment bearing digitiform process. Endopods of legs 2–4 with rows of spinules on outer margins of segments; spines spinulated (serrated). Leg 5 (Figure 4B,C) with 2 segments; first seg-
Figure 1.—*Taeniacanthus acanthoeopus* Yamaguti, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area, postantennal process, and first antenna, ventral; D, first antenna, ventral; E, second antenna, medial.
FIGURE 2.—*Taeniacephalus acanthoecephali* Yamaguti, female: A, postantennal process, ventral; B, same, ventral; C, labrum, ventral; D, mandible, anteromedial; E, paragnath, ventral; F, first maxilla, posterior; G, second maxilla, posteroventral; H, maxilliped, ventromedial; I, leg 1 and interpodal plate, ventral.
FIGURE 3.—Taeniacthus acanthocephalus Yamaguti, female: A, leg 2 and interpodal plate, ventral; B, leg 2, terminal exopod segment, ventral; C, leg 3, interpodal plate and proximal portions of basipods, ventral; D, leg 3 endopod, ventral; E, leg 4 interpodal plate and proximal portions of basipods, ventral; F, leg 4 exopod, ventral.
FIGURE 4.—*Taeniacanthus acanthocephalae* Yamaguti. Female: A, leg 4 endopod, ventral; B, leg 5, dorsal; C, same, ventral. Female variant: D, dorsal; E, postantennal process, ventral; F, maxilliped, ventromedial; G, leg 4 exopod, ventral.
ment with ventral row of spinules and 1 semipinnate dorsal seta; second segment, 63 \times 32 \mu m (l \times w), bearing 4 setae (3 setae bristled and sclerotized at bases); each seta with row of spinules at base; distomedial margin of segment with row of larger spinules. Leg 6 represented by 3 setae in area of egg sac attachment.

**Female Variant:** Three specimens from same lot with different body shape from remaining 10 specimens. All appendages as described above except those mentioned below.

Cephalothorax (Figure 4d) with different outline, measuring 262 \times 331 \mu m (l \times w), and thoracic segments bearing legs 2, 3, and 4 decreasing in width posteriorly. Postantennal process (Figure 4e) with slightly different shape and 56 \mu m along axis. Maxilliped claw (Figure 4f) with conical projection blunt; seta on projection very small; rounded process near blunt projection absent; and only about 6 transverse flanges along recurved portion of claw. Terminal exopod segment of leg 4 (Figure 4g) with elongate process on distolateral corner.

**Male:** Unknown.

**Remarks.—** *Taeniacanthus acanthocepola* was first collected and described by Yamaguti (1939) from the gills of *Acanthocepola limbata* at Koti and Maisaka, Japan.

The most distinctive features of this species are the 3-segmented abdomen and the structure of the maxilliped claw of the female (Yamaguti, 1939). Four other species of *Taeniacanthus* exhibit a 3-segmented abdomen. They are *T. cymoglossi* (Rangnekar and Murty, 1960); *T. moa* (Lewis, 1967); *T. pectinatus* Yamaguti and Yamasu, 1959; and *T. ostracionis* (Richardi, 1870). *Taeniacanthus acanthocepola* can be distinguished from these four species by the features of the maxilliped claw of the female. Another unusual feature of *T. acanthocepola* is the armature of the terminal exopod segment of leg 1. This segment bears either seven or nine setae in all species of *Taeniacanthus*, but eight in *T. acanthocepola*.

This species has not yet been reported outside the western North Pacific.

**Taeniacanthus aluteri** (Avdeev, 1977), new combination

**FIGURES 5-9**


**Material Examined.—** 1 female from *Abalistes stellatus* (Lacépède) (USNM 226659), from Philippines; 3 females, 1 immature female from *Abalistes stellatus* (USNM 142958) from Philippines; 2 females, 1 pair in copula, and 1 immature female from *Abalistes stellatus* (USNM 333189) from Philippines.

**Description.—** Female: Body form as in Figure 5a. Immature female with attached spermatophores as in Figure 5b. Total length (mature female) 1.32 mm (1.12–1.51 mm) and greatest width 0.55 mm (0.46–0.60 mm) based on 6 specimens. Cephalothorax wider than long, 368 \times 547 \mu m, comprising about \( \frac{1}{3} \)–\( \frac{1}{2} \) of total length. Thoracic segments bearing legs 2–5 free; segments decreasing in width from anterior to posterior. Genital complex (Figure 5c) wider than long, 106 \times 179 \mu m. Abdomen 4-segmented; segments from anterior to posterior 78 \times 120 \mu m, 74 \times 106 \mu m, 60 \times 101 \mu m, and 78 \times 97 \mu m (l \times w); anal segment with 3 rows of stout spinules on each side of anterovelbral surface and 1 row near insertion of each caudal ramus. Caudal ramus (Figure 5d) almost as long as wide, 58 \times 60 \mu m, and bearing 4 subterminal setae (outer pinnate setae with spinules at base) and 2 large terminal setae (each with 1 longitudinal row of spinules and 1 longitudinal row of pinnules).

Rostral area slightly pointed, bearing ventromedian sclerotized parts, and shaped as in Figure 5e. First antenna (Figure 6a) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 6b) 3-segmented; terminal segment with 1 long pectinate process bearing 1 small naked seta near distal end, 1 shorter pectinate process with hyaline setae near midlength, 4 spines, and 3 setae. Postantennal process (Figure 6c) a slightly curved process.

Labrum (Figure 6d) with hyaline balloon-like structure on anteromedian area, a pair of lateral depressed areas (pits), and a rounded, spinulated posterior margin. Mandible (Figure 6e) with 2 blades, each spinulated along 1 margin; subterminal blade with naked hyaline seta at base. Paragnath (Figure 6f) a pointed process with row of rounded denticles on inner margin and tipped with nipple-like structure. First maxilla (Figure 6g) a lobe bearing 2 long setae each with 2 rows of bristles (short pinnules), 3 smaller naked setae, and a rounded anterior knob. Second maxilla (Figure 6h) 2-segmented; terminal process with row of spinules and 2 bristled spinules near base. Maxilliped (Figure 7a–c) with corpus bearing 2 setae, each with 1 row of bristles; terminal segment with curved claw, 1 small rounded process near base, and 1 longer conical process near 2 bristled setae; claw (Figure 7c) with row of small spinules and 2 larger spinules at distal end.

Legs 1–4 (Figures 7d, e, 8a–d) biramous. Spinal and setal formula as follows:

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<td>Basis</td>
<td>1-1</td>
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<tr>
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<td>1-0; 9</td>
<td>1-0; 7</td>
<td>1-0; 4; 1-1; 1; 1-1; 5</td>
<td>1-0; 4; 1-1; 1; 1-1; 2</td>
</tr>
<tr>
<td>Exopod</td>
<td>1-0; 1-1</td>
<td>4</td>
<td>1-0; 1-1; 1-1; 1-1</td>
<td>1-0; 1-1; 1-1; 4</td>
</tr>
</tbody>
</table>

Interpodal plate of leg 1 (Figure 7d) with anterior margin only slightly wider than posterior and with rows of spinules on posterior border. Striated membrane present near
FIGURE 5.—*Taeniacthus aluteri* (Avdeev), female: A, dorsal; B, dorsal; C, genital area, dorsal; D, anal segment and caudal ramus, ventral; E, rostral area, ventral.
FIGURE 6.—Taenia canthus aluteri (Avdeev), female: A, first antenna, ventral; B, second antenna, medial; C, postantennal process, ventrolateral; D, labrum, ventral; E, mandible, anteromedial; F, paragnath, ventral; G, first maxilla, anterior; H, second maxilla, posteroventral.
Figure 7.—*Tenuicanthus aluteri* (Avdeev), female: A, maxilliped, anteroventral; B, same, anteromedial; C, maxilliped claw, anterior; D, leg 1 and interpodal plate, ventral; E, leg 2 and interpodal plate, ventral.
FIGURE 8.—*Taeniacanthus aluteri* (Avdeev), female: A, leg 2, terminal exopod segment, ventral; B, leg 3 and interpodal plate, ventral; C, leg 4, interpodal plate and proximal portions of basipods, ventral; D, leg 4 endopod, ventral; E, leg 5, ventral.
Figure 9.—*Taeniacanthus aluteri* (Avdeev), male: A, dorsal; B, genital area, ventral; C, maxilliped, anterior; D, leg 2 endopod, ventral; E, leg 3 exopod, ventral; F, leg 5, ventral.
inner seta of basis. Interpodal plates of legs 2–4 slightly different in shape (compare Figures 7e, 8b,c). Inner margin of basis of leg 2 with patch of spinules; these spinules absent on bases of legs 3 and 4. Exopod spines of legs 2–4 bristled and each bearing terminal whip-like flagellum; terminal segments of exopods of legs 2–4 each with small pit bearing a hyaline knob flanked by 2 spines between subterminal and terminal exopod spines; endopod spines as in Figures 7e, 8b,d. Leg 5 (Figure 8e) with 2 segments; first segment with dorsolateral seta and spinules on posterodorsal border; second segment 104 X 46 μm (l X w), with 3 bristled spines (each with spinules at base), a bristled seta, and an inner patch of spinules. Leg 6 (Figure 5c) represented by 3 setae near area of egg sac attachment.

**Male:** Body form as in Figure 9a. Total length 0.70 mm and greatest width 0.28 mm based on 1 specimen. Cephalothorax wider than long, 230 X 276 μm, comprising about 30% of total length. Genital complex (Figure 9b) wider than long, 85 X 106 μm. Abdomen 3-segmented; segments from anterior to posterior 35 X 69 μm, 25 X 62 μm, and 48 X 55 μm (l X w); anal segment with spinules as in female. Caudal ramus 34 X 19 μm.

Maxilliped (Figure 9c) 4-segmented; corpus with rows of rounded spinules and 2 naked setae; third segment small and unornamented; terminal segment a curved claw with 3 naked setae near base and serrations along inner margin.

Leg 2 endopod (Figure 9d) with rounded knob on outer margins of first and second segments. Leg 3 exopod (Figure 9e) with spines slightly stouter than in female; endopod with rounded knobs on first and second segments as in leg 2. Leg 5 (Figure 9f) similar to that in female except second segment 38 X 18 μm (l X w), and inner margin without patch of spinules.

**Remarks.**—This species was first described by Avdeev (1977) as Anchistrotos aluteri. It has not been redescribed since its discovery. This species is transferred from Anchistrotos to Taeniacanthus.

Avdeev collected this species of copepod from Alutera seriola in the Gulf of Carpentaria, Australia. Our specimens were collected from Abalistes stellatus from the Philippines.

The above description differs from Avdeev’s in a few details: (1) the maxilliped claw of the female is hooked in Avdeev’s specimens, not curved as in our specimens; (2) the base of the maxilliped claw of the female bears a truncate process in our specimens, but this process is absent in Avdeev’s material; and (3) the secondary blade of the mandible is much smaller in Avdeev’s specimens. Although there are differences between our specimens and those of Avdeev’s, we identify the present specimens as T. aluteri until a more detailed comparison of both the Philippine and Gulf of Carpentaria material is possible.

Both pectinate processes of the second antenna of Taeniacanthus aluteri are ornamented with numerous rows of spinules, whereas most species of Taeniacanthus bear a single row of spinules on one or both pectinate processes. This characteristic is shared with only nine other species of Taeniacanthus: T. comparatus, new species; T. digitatus, new species; T. glomeratus, new species; T. narcini Pillai, 1963; T. nudicauda, new species; T. papulosus, new species; T. pollicaris, new species; T. pseudorhombi (Yamaguti, 1939); and T. williamsi, new species. Taeniacanthus aluteri can be distinguished from all the above species except T. narcini by the presence of a flagellum at the tip of each exopod spine of legs 2–4. It can be distinguished from T. narcini by the shape of the maxilliped of the female. The latter species exhibits a very unusual maxilliped (see “Remarks” of Taeniacanthus, or Pillai, 1965).

### Taeniacanthus anguillaris (Devi and Shyamasundari, 1980), new combination

**FIGURES 10–12**

Irides anguillaris Devi and Shyamasundari, 1980:197.

**Material Examined.**—From Ploitos lineatus (Thunberg): 6 females from posterior gill chamber of host collected at Madras, India, by F.H. Berry on 23 September 1966; 2 females on throat and branchial chamber collected at Sri Lanka by C.C. Koenig on 3 April 1970; 1 female from anterior gill chamber collected at Cargados (Indian Ocean) by V.G. Springer on 3 April 1976; 1 female collected by C.C. Koenig on 5 April 1970; 7 females and 1 immature female from Philippine Islands on 8 June 1978; 2 females from Philippine Islands on 4 June 1978; 3 females from Philippine Islands on 14 June 1978; 2 females from posterior gill chamber from Philippine Islands on 6 June 1978; 1 female from posterior gill filament from Philippine Islands on 1–10 August 1906; 3 females on gill filaments and wall collected from Cheng Chau, China, by Dr. Herklots on 14 March 1931; 1 female from posterior gill chamber collected at Hong Kong, China, by J.E. Bromball on 14 January 1958; 1 female from anterior gill chamber from Hong Kong, China, in 1930; 3 females and 25 immature females collected in Moluccas by V.G. Springer on 1 March 1974; 2 females from Ethiopia (Red Sea) on 20 September 1971. Coll. “Menelik.”

**Description.**—**Female:** Body form as in Figure 10a. Total length 1.36 mm (1.07–1.65 mm) and greatest width 0.63 mm (0.53–0.72 mm) based on 6 specimens. Cephalothorax 400 X 611 μm, comprising more than 25% of total length. Thoracic segments bearing legs 2, 3 and 4 decreasing in width posteriorly. Genital complex (Figure 10b) wider than long, 124 X 193 μm. Abdomen 4-segmented; segments from anterior to posterior, 51 X 138 μm, 46 X 115 μm, 30 X 99 μm, and 81 X 90 μm (l X w); anal segment (Figure 10c) with 9 rows of spinules on each side of ventral surface and 1 row of spinules on posteroventral border near insertion of caudal ramus. Caudal ramus (Figure 10c) longer than wide, 40 X 23 μm, bearing 6 setae.
FIGURE 10.—*Taeniacanthus anguillaris* (Devi and Shyamasundari), female: A, dorsal; B, genital area, dorsal; C, anal segment and caudal ramus, ventral; D, rostral area and proximal portion of first antenna, ventral; E, first antenna, ventral; F, second antenna, medial; G, postantennal process, ventral.
FIGURE 11.—*Taeniacanthus anguillaris* (Devi and Shyamasundari), female: A, labrum, ventral; B, mandible, anteromedial; C, paragnath, dorsomedial; D, first maxilla, anterior; E, second maxilla, posteroventral; F, second maxilla, terminal segment, ventrolateral; G, maxilliped, dorsomedial; H, same, ventrolateral; I, leg 1 and interpodal plate, ventral.
FIGURE 12.—*Taeniacanthus anguillaris* (Devi and Shyamasundari), female: A, leg 2 and interpodal plate, ventral; B, leg 3 interpodal plate and proximal portions of basipods, ventral; C, leg 3 endopod, ventral; D, leg 4 and interpodal plate, ventral; E, leg 5, dorsal; F, same, ventral.
Rostral area (Figure 10d) with sclerotized ventromedian part. First antenna (Figure 10e) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 10f) 3-segmented; last segment with 4 spines, 3 setae, and 2 pectinate processes; shorter pectinate process with small hyaline seta at about midlength and larger pectinate process with 1 terminal seta. Post-antennal process (Figure 10g) a curved process.

Labrum (Figure 11a) with spinulated posterior margin. Mandible (Figure 11b) with 2 blades, each spinulated along 1 margin smaller blade only about ½ length of longer blade. Paragnath (Figure 11c) a pointed lobe with small protuberance near apex. First maxilla (Figure 11d) bearing 1 long seta with 1 row of bristles, 1 smaller bristled seta, 1 naked seta, and 1 minute knob (near base of bristled seta). Second maxilla (Figure 11e,f) 2-segmented; terminal segment with 1 spinulated process, 1 spinulated seta, and 1 small naked seta. Maxilliped (Figure 11g,h) presumably 2-segmented; corpus with 2 naked setae at about midlength; terminal segment a curved claw with 1 ventral rounded protuberance, 1 inner conical process, 1 naked seta, and an outer corrugated area starting from ½ claw length and extending to tip.

Legs 1–4 (Figures 11a, 12a–d) biramous. Spinal and setal formula as follows:

- **P1**: coxa 0-1, basis 1-1, exopod 1-0; 9 endopod 0-1; 7
- **P2**: coxa 0-0, basis 1-0, exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-1; II, 1, 3
- **P3**: coxa 0-0, basis 1-0, exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-1; II, 1, 2
- **P4**: coxa 0-0, basis 1-0, exopod 1-0; 1-1; II, 1, 4 endopod 0-1; 0-1; II, int.

Interpodal plate of leg 1 (Figure 11i) with convex spinulated posterior margin indented at midline. Interpodal plate of leg 2 (Figure 12a) about as long as wide, reentrant, and with 2 rows of spines on posterior margin. Interpodal plates of legs 3 and 4 wider than long, each with patch of spines on postero lateral corners. Coxae and bases of legs with rows of spines as in figures. Leg 2 with small patch of spines on inner margin of basis; this patch absent in legs 3 and 4 (compare Figure 12a with Figure 12b and 12h). Exopod spines of legs 2–4 slender, attenuate, and each bearing 1 row of bristles. Endopod spines of legs 2–4 stout. Leg 5 (Figure 12e,f) with 2 segments; first segment small with 1 naked dorsolateral seta and single ventral row of minute spines; second segment with spines on inner margin of ventral surface, 87 × 32 μm, bearing 3 spines (innermost one bristled along inner margin) and 1 naked seta; spines and seta with rows of minute spines at bases. Leg 6 (Figure 10h) represented by 3 naked setae in area of egg sac attachment.

**Male:** Unknown.

**Remarks.**—*Taeniacanthus anguillaris* was originally described from the gills of *Plotosus anguillaris* (Bloch) under the binomen *Irodus anguillaris* by Devi and Shyamasundari (1980). This species is transferred to *Taeniacanthus* because it bears a maxilliped claw that curves away from the corpus. This species can be distinguished from its congeners by the combination of three setae on the first maxilla and a stout, corrugated blunt maxilliped claw of the female.

*Taeniacanthus anguillaris* is reported from the Indo-West Pacific and the Red Sea.

**Taeniacanthus balistae** (Claus, 1864)

**Figures 15–16**

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FIGURE 13.—*Taeniacanthus balistae* (Claus), female: A, dorsal; B, anal segment and caudal rami, ventral; C, rostral area, ventral; D, first antenna, anteroventral; E, second antenna, inner; F, postantennal process, ventral. (A2 = second antenna.)
FIGURE 14.—*Taeniocanthus balistae* (Claus), female: A, oral area, ventral; B, mandible, anteromedial; C, maxilliped, ventral; D, maxilliped claw, posteroventral; E, leg 1 and interpodal plate, ventral; F, leg 2, ventral; G, leg 2, terminal exopod segment, ventral. (L = labrum, Md = mandible, P = paragnath, Mx1 = first maxilla, Mx2 = second maxilla.)
FIGURE 15.—Taeniacanthus balista (Claus). Female: A, leg 3 and interpodal plate, ventral; B, leg 4 and interpodal plate, ventral; C, leg 5, ventral. Male: D, dorsal; E, genital area, ventral; F, anal segment and caudal ramus, ventral.
Figure 16.—Taenia canthus balista (Claus). Male: A, maxilliped, anterior; B, same, posterior; C, leg 4 exopod, ventral; D, leg 5, dorsolateral. Female variant: E, leg 4 exopod, ventromedial. Male variant: F, maxilliped, anterior; G, leg 4 exopod, ventral.
posteroventral edge of anal segment near insertion of caudal ramus; specimens from *Stephanolepis hispidus* lacking these setules. Caudal ramus (Figure 13B) 2X longer than wide, 70 X 35 \( \mu m \), and with usual 6 setae.

Rostral area (Figure 13c) without distinct ventromedian sclerotized part. First antenna (Figure 13d) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 13e) presumably 4-segmented with third and fourth segments partially fused; first segment with long distal seta; second segment with 1 acuminate seta; third segment bearing 1 stout curved spine and 2 pectinate processes (longer one with subterminal seta, shorter one with seta at about midlength; terminal segment carrying 2 stout curved spines and 4 setae. Postantennal process (Figure 13f) with slender curved tine.

Labrum (Figure 14a) with postmedian indentation and spinules along posterior margin. Mandible (Figure 14b) with 2 unequal blades, each spinulated along 1 margin, and 1 small bristled seta. Paragnath (Figure 14a) a digitiform lobe bearing long setules (hairs) on proximal medial area and row of spinules at distal end. First maxilla (Figure 14a) a lobe with 5 bristled setae. Second maxilla (Figure 14a) 2-segmented; first segment robust; second segment with spinulated terminal process, a spinulated spine and 1 comparatively short seta (naked in specimens from *Stephanolepis hispidus*, but unilaterally bristled in specimens from *Diodon hystrix* and *Balistes capriscus*). Maxilliped (Figure 14c,d) 3-segmented; first segment (not included in figure) with usual distal seta; second segment (corpus) bearing 2 naked setae; third segment a strongly curved claw (Figure 14d) with an inner rounded protuberance, 1 small seta, 1 larger seta with bristles), row of teeth along concave margin, and 2 posterior rows of spinules.

Legs 1–4 (Figures 14e–g, 15a,b) biramous. Spinal and setal formula as follows:

<table>
<thead>
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<th>( P_1 )</th>
<th>( P_2 )</th>
<th>( P_3 )</th>
<th>( P_4 )</th>
</tr>
</thead>
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<td>coxa 0-0</td>
<td>coxa 0-0</td>
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<tr>
<td>basis 1-1</td>
<td>basis 1-0</td>
<td>basis 1-0</td>
<td>basis 1-0</td>
</tr>
<tr>
<td>exopod 1-0; 9</td>
<td>exopod 1-0; 1-1; II, I, 4</td>
<td>exopod 1-0; 1-1; II, I, 5</td>
<td>exopod 1-0; 1-1; 7 ((+ 2 ) setiform elements at tip)</td>
</tr>
<tr>
<td>endopod 0-1; 7</td>
<td>endopod 0-1; 0-1; II, I, 3</td>
<td>endopod 0-1; 0-1; II, I, 2</td>
<td>endopod 0-1; 0-1; II, int.</td>
</tr>
</tbody>
</table>

Interpodal plates of legs 1–4 (Figures 14f, 15a,b) with spinules on posterior margin. Coxa and basis of leg 1 (Figure 14e) with several rows of spinules. Coxae of legs 2–4 (Figures 14f, 15a,b) each with row of spinules on posterolateral corner. Leg 2 (Figure 14f) with 5 patches and leg 3 (Figure 15a) with 1 large patch of spinules on inner margins of bases. Terminal segments of exopods of legs 2 and 3 each with distolateral protrusion bearing 1 small spine (see Figure 14g). Exopod spines of legs 2 (Figure 14f) and 3 (Figure 15a) coarsely serrated and tipped with subterminal setules. Terminal exopod segment of leg 4 (Figure 15b) elongate, claw-like, and bearing 1 outer seta, a transparent membrane and 2 setiform elements at tip, a group of 3 setae, and 3 evenly spaced setae along inner margin. Legs 2 and 3 each with conical process on distolateral corner of second and third endopod segments. Endopod spines of legs 2–4 coarsely serrate. Outer margins of segments of exopods and endopods of legs 2–4 with rows of spines except second and third exopod segments of leg 4. Inner spinules of endopods of legs 2–4 much larger than outer spines.

Leg 5 (Figure 15c) 2-segmented; first segment with curved row of long spinules and 1 pinnate dorsolateral seta; second segment with patch of long spinules along inner margin and armed with 3 spinulated spines and 1 pinnate seta; spines and seta with rows of small spinules at bases. Leg 6 represented by 3 setae in area of egg sac attachment.

**Male:** Body as in Figure 15d. Total length 0.82 mm (0.75–0.95 mm) and greatest width 0.40 mm (0.39–0.40 mm) based on 7 specimens. Cephalothorax 308 X 396 \( \mu m \), comprising about 50% of total body length. Genital complex (Figure 15e) wider than long, 168 X 182 \( \mu m \). Abdomen 3-segmented; segments from anterior to posterior 34 X 108 \( \mu m \); 37 X 101 \( \mu m \), and 76 X 92 \( \mu m \) (1 X w); anal segment (Figure 15f) bearing 3 rows of large spinules on each side of anteroventral surface and row of spinules on posteroventral margin near insertion of each caudal ramus. Caudal ramus (Figure 15f) 50 X 32 \( \mu m \) (1 X w), and armed as in female; spines at base of outer terminal seta relatively larger than in female.

Maxilliped (Figure 16a,b) 4-segmented; first segment with 1 naked distal seta; second segment (corpus) bearing 1 row of spinules, 2 bristled setae, and patch of truncate denticles; third segment small and unornamented; terminal segment with 1 large anterior seta, 2 posterior setae (longer seta with bristles), row of teeth along concave margin, and 2 posterior rows of spinules.

Exopod of leg 4 (Figure 16c) with terminal segment not as elongate as in female. Leg 5 (Figure 16d) similar to that in female except second segment 51 X 25 \( \mu m \) (1 X w).

**Variant:** Specimens collected from *Alutera* sp. from the Philippine Islands differ slightly from the above description. Inner 4 setae of leg 4 exopod of female (Figure 16e) pinnate and longer than that described above. Truncate denticles on corpus of maxilliped of male in 1 long and 1 short row instead of large patch (compare Figure 16f with 16a). Terminal segment of leg 4 exopod of male (Figure 16g) not elongate.

**Remarks.—** Claus (1864) described *Eucanthus balistae* from a species of *Balistes*. His illustrations show the strongly curved (hooked) claw of the maxilliped and elongate, curved, terminal exopod segment of leg 4 of the female of this species. Wilson (1911) transferred *E. balistae* to *Anchistrotos*. Finally, this species was transferred to *Taeniacanthus* by Yamaguti (1963).

Yamaguti and Yamasu (1959) described a new species
Taeniacanthus longichel,a from six females parasitic on Cantherhines modestus (Günther) and three females on Alutera monoceros (Linnæus) collected from the Inland Sea, Japan. Shiino (1960) redescribed T. longichel,a from specimens he collected from Cantherhines modestus from Seto, Japan. According to the descriptions of Yamaguti and Yamazawa (1959) and Shiino (1960) it appears that T. longichel,a is probably synonymous with T. balistae.

Our description of the male of T. balistae is based on specimens collected from Diadon hystrix from the Gulf of Elat (Red Sea). It differs from the account given by Shiino (1960) mainly in the description of the terminal exopod segment of leg 4. In our specimens this process is noticeably shorter and stouter than in the corresponding segment of the female. In Shiino’s specimens the sexual dimorphism of this segment is not as pronounced.

Taeniacanthus occidentalis (Wilson, 1924) and T. similis, new species, are morphologically very similar to T. balistae. Both these species are also parasites of tetraodontiform fishes, T. occidentalis on Alutera and T. similis on Meuschenia. Taeniacanthus balistae is distinguished from these two species of copepods by the possession of the small rounded process at the base of the maxilliped claw of the female. This process is absent in T. occidentalis and T. similis.

**Taeniacanthus coelus** Wilson, 1922


**Description.**—Female: See Wilson (1922).

**Remarks.**—This is a very poorly known species. Wilson’s (1922) original description is not adequate for comparative purposes, because the details of the appendages were not illustrated nor discussed.

Wilson’s illustrations of legs 2–5 are considered questionable at best. The endopod of leg 3 is drawn as 2-segmented with the formula 1-1; II, I, 4 (all other species of Taeniacanthus exhibit 0-1; 0-1 or 0-2; II, I, 2). The figure of the terminal exopod segment of leg 4 shows a II, 3 arrangement (most species of Taeniacanthus have II, I, 4 or II, I, 5). Leg 5 is illustrated as having only one spine at the tip of the second segment (all species of Taeniacanthus probably have 4 elements). It is apparent that Wilson misinterpreted the armature of these legs. A few spines and setae were most likely broken off the legs during collecting or handling of the specimens.

The host for the type specimens of Taeniacanthus coelus was reported as “probably an elasmobranchian fish” by Wilson (1922). Later he reported more specimens of this species of copepod from a “sunfish” (Wilson, 1923). Both hosts were collected at Misaki, Japan.

We did not obtain the type specimens of Taeniacanthus coelus which are apparently housed in the Riksmuseum in Stockholm. Until the type material is reexamined in detail, the taxonomic status of this species remains uncertain.

**Taeniacanthus comparatus**, new species

**Figures 17–19**

**Material Examined.**—1 female holotype (USNM 228399) and 9 paratypes (females) (USNM 228400) from Cirripectes quagga (Fowler and Ball) collected at Réunion Island, Mascarene Islands, by M.M. Smith and J.E. Randall on 23 October 1973. Other material from C. quagga: 2 females from Tutuila Island, American Samoa. Parasitic copepods removed from gill chamber of hosts by J.T. Williams, National Museum of Natural History, Smithsonian Institution, Washington, D.C.

**Description.**—Female: Body as in Figure 17A. Total length 1.23 mm (1.10–1.33 mm) and greatest width 0.57 mm (0.47–0.65 mm) based on 9 specimens. Cephalothorax much wider than long, 357 x 555 μm, comprising less than 30% of total body length. Thoracic segments bearing legs 2, 3, and 4 decreasing in width posteriorly. Genital complex wider than long, 110 x 184 μm. Abdomen 4-segmented; segments from anterior to posterior 60 x 147 μm, 46 x 120 μm, 41 x 110 μm, and 78 x 92 μm; anal segment (Figure 17b) with 1 row of spinules (one specimen in collection with 2 rows) on each side of anteroventral surface. Caudal ramus (Figure 17b) longer than wide, 40 x 25 μm, and bearing 6 setae; dorsal and outer setae naked; outer terminal seta unornamented, but tipped with setiform element; inner terminal seta pinnate; outer median terminal seta with row of long pinnules on one side and short bristles along other; inner median terminal seta with 1 row of bristles.

Rostral area (Figure 17c) with somewhat circular sclerotized part with anterior, digitiform hyaline process on ventromedian surface. First antenna (Figure 17c) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 17d) apparently 3-segmented; first segment with distal seta relatively short; second segment with acuminate seta; third segment with long pectinate process tipped with 1 minute seta, 1 curved, club-shaped pectinate process bearing hyaline knob, and tipped with 3 spines and 4 setae. Postantennal process (Figure 17e) with strongly curved tine.

Labrum (Figure 17f) with pair of lateral digitiform processes, transparent cuticle, and row of spinules along posterior margin. Mandible (Figure 17g,h) equipped with 2 slightly subequal toothed blades and 1 bristled accessory seta. Paragnath (Figure 17i,j) ornamented with spinules and tipped with minute tubercle. First maxilla (Figure 18a) bearing 2 pinnate setae, 1 haired (pilose) seta, 2 small naked setae, and 1 rounded process carrying a nipple-like knob. Second maxilla (Figure 18b,c) 2-segmented; first segment an ill-defined sclerotized area; second segment (Figure 18c)
FIGURE 17.—*Taeniacanthus comparatus*, new species, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area and first antenna, ventral; D, second antenna, inner; E, postantennal process, ventral; F, labrum, ventral; G, mandible, anterior; H, same, posterior; I, paragnath, medial; J, same, anteromedial.
FIGURE 18.—*Taeniacanthus comparatus*, new species, female: A, first maxilla, posterior; B, second maxilla, ventral; C, second maxilla, terminal segment, ventrolateral; D, maxilliped, ventromedial; E, maxilliped claw, dorsal; F, same, ventral; G, leg 1 and interpodal plate, ventral.
**Figure 19.** — *Taeniacanthus comparatus*, new species, female: A, leg 2, interpodal plate and proximal portions of basipods, ventral; B, leg 2, ventral; C, leg 3 endopod, ventral; D, leg 4, interpodal plate and proximal portions of basipods, ventral; E, leg 4, ventral; F, leg 5, ventral.
with spinulated terminal process, spinulated spine, and 1 naked short spine. Maxilliped (Figure 18D–F) 3-segmented; first segment with usual naked seta; second segment (corpus) bearing 2 naked setae; terminal segment a claw (Figure 18E,F) with base possessing conical projection, 1 seta, 1 setule, and 1 rounded protuberance on proximal end of convex margin; distal end of claw armed with distally directed, attenuate process and covered with transparent cuticle.

Legs 1–4 (Figures 18G, 19A–E) biramous. Spinal and setal formula as follows:

<table>
<thead>
<tr>
<th></th>
<th>coxa</th>
<th>basis</th>
<th>exopod</th>
<th>endopod</th>
</tr>
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</tr>
<tr>
<td>P₃</td>
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<td>1-0</td>
<td>0-0; 1</td>
<td>0-2; 2, 1, 3</td>
</tr>
<tr>
<td>P₄</td>
<td>0-0</td>
<td>1-0</td>
<td>0-0; 1</td>
<td>1-1, 8 (+ nipple-tipped process)</td>
</tr>
</tbody>
</table>

Interpodal plate of leg 1 (Figure 18G) longer than wide, widest at anterior end, with spinulated convex posterior border indented at midline. Interpodal plates of legs 2–4 (Figure 19A.D) subtriangular patches of spinules on posterior margin. Coxa of leg 1 (Figure 18G) with relatively large digitiform process near junction with basis. Basis, exopod, and endopod of leg 1 with numerous rows of minute spinules. Inner margins of bases of legs 2–4 each with large patch of spinules. Exopod spines of legs 2 and 3 (see Figure 19B) not highly sclerotized. Exopod spines of leg 4 (Figure 19B) actually more like setae than spines; terminal exopod segment elongate and bearing small nipple-tipped process on distolateral corner. Endopod spines of legs 2 and 3 (Figure 19B,C) strongly curved, but relatively straight in leg 4 (Figure 19B). Leg 5 (Figure 19D) 2-segmented; first segment ornamented with several ventral rows of minute spinules and 1 dorsolateral seta; second segment longer than wide, 117 X 48 μm, with distomedial patch of spinules, and bearing 4 pinnate setae; ventral surface also equipped with 3 long curved rows of closely packed spinules. Leg 6 represented by 3 setae in area of egg sac attachment.

**Taeniacanthus cynoglossi** (Rangnekar and Murti, 1960), new combination


**DESCRIPTION.**—*Female:* See Rangnekar and Murti (1960).

**Male:** Unknown.

**REMARKS.**—*Taeniacanthus cynoglossi* is a poorly known species. It was originally described from a single female by Rangnekar and Murti (1960) under *Parataeniacanthus*, a genus now synonymized with *Taeniacanthus*. This parasite was collected from the branchial chamber of *Cynoglossus dispar* (Day) at Bombay, India.

Because the details of the appendages are not known for this species, a meaningful comparison with its congeners is not possible at this time. The terminal exopod segment of leg 2 of this species was reported to have the armature formula 4-5 (III, 1, 5 in our notation). Two congeners reported to share this unusual armature with this species are *T. longicaudus* Pillai, 1963, and *T. narcini* Pillai, 1963. *Taeniacanthus cynoglossi* can presumably be distinguished from these two species by differences in the claw of the maxilliped of the female and the armature of the terminal exopod segment of leg 4.

**Taeniacanthus dentatus** Sebastian, 1964


**DESCRIPTION.**—*Female:* See Sebastian (1964).

**Male:** Unknown.

**REMARKS.**—This species was first described from the branchial chamber of *Bembrops caudimaculata* Steindachner collected at Palk Bay, India, by Sebastian (1964). It has not been reported since its discovery.

As pointed out by Sebastian (1964) *Taeniacanthus acanthoeptolae* Yamaguti, 1939, *T. longicervis* (Pillai, 1963), *T. neopercis* Yamaguti, 1939, and *T. platycephali* (Yamaguti, 1939) bear several large teeth or transverse flanges along the convex margin of the maxilliped claw of the female. To this list is added *T. pteroisi* Shen, 1957. Within this group *T. dentatus* and *T. platycephali* have five teeth or flanges along the maxilliped claw, whereas the other three species have six to nine teeth.

**Taeniacanthus dentatus** is morphologically most similar to *T. platycephali* in the habitus, mouth appendages, legs, and the shape and ornamentation of the maxilliped claw of the female. *Taeniacanthus dentatus* may be synonymous with *T. platycephali*. The only discernible difference appears to be that *T. dentatus* has five “teeth” along the maxilliped claw instead of five transverse ridges (flanges) as in *T. platycephali*. This difference may be due to a misinterpretation of the morphology of the maxilliped by Sebastian. A reexamina-
tion of the type specimens of *T. dentatus* is needed before any conclusions concerning the taxonomic status of this species can be reached.

**Taeniacanthus digitatus**, new species

**Figures 20–22**

**Material Examined.**—1 female holotype (USNM 228401) and 3 paratypes (females) (USNM 228402) *Cirripectes perustus* Smith from Salomon Islands, Chagos Archipelago (05°18'53"S, 72°14'54"E), by Winterbottom and Emery on 16 March 1979.

**Material Examined of Variant.**—1 female from *Cirripectes* sp. D (to be named for V.G. Springer) from southern tip of Massas Island, Papua New Guinea (05°10'18"S, 145°51'24"E), on 6 November 1978. From *Cirripectes pe-


All parasitic copepods from above collection removed from gill chambers of hosts by J.T. Williams.

**Description.**—**Female:** Body as in Figure 20A. Total length 0.72–0.78 mm and greatest width 0.25–0.28 mm based on only 2 specimens. Cephalothorax wider than long, subcircular in outline, 197 × 263 μm, and comprising about 25% of total body length. Thoracic segments bearing legs 2, 3, and 4 decreasing in width posteriorly. Genital complex wider than long, 53 × 78 μm. Abdomen 4-segmented; segments from anterior to posterior 39 × 74 μm, 32 × 64 μm, 23 × 55 μm, and 34 × 48 μm; anal segment (Figure 20b) with 2 curved rows of spines on each side of anteroven- treal surface and 1 row of spines on posteriorMargin near insertion of each caudal ramus. Caudal ramus (Figure 20b) longer than wide, 26 × 18 μm, and carrying 4 naked setae and 2 large, spinulated, median terminal setae.

Arostral area, first and second antennae, labrum, mandible, paragnath, and second maxilla as in *Taeniacanthus glomerosus*, new species. First maxilla (Figure 20c) armed with 2 setae, each with 1 row of bristles, 2 smaller naked setae, 1 minute hyaline seta, and a lobe tipped with nipple-like process. Maxilliped (Figure 20d,e) seemingly 2-segmented with basal segment and corpus fused; basal portion of first segment with usual naked seta, and corpus area with 2 naked setae; second segment a curved claw with inner portion of base extended into conical projection bearing 1 seta; distal portion of claw (Figure 20e) bearing hyaline cuticle on outer margin.

Legs 1–4 with spinal and setal formula as follows:

<table>
<thead>
<tr>
<th>Leg</th>
<th>Exopod</th>
<th>Endopod</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>0-1</td>
<td>0-0</td>
</tr>
<tr>
<td>P2</td>
<td>0-0</td>
<td>0-0</td>
</tr>
<tr>
<td>P3</td>
<td>0-0</td>
<td>0-0</td>
</tr>
<tr>
<td>P4</td>
<td>0-0</td>
<td>0-0</td>
</tr>
</tbody>
</table>

Legs 1 and 2 as in *T. glomerosus* except endopod of leg 2 with terminal (innermost) spine smallest of 3 (Figure 20f). Inner margin of basis of leg 3 (Figure 20g) without patch of spines. Leg 3 exopod (Figure 21a) bearing hyaline conical process on distolateral corner of terminal segment; terminal segment of endopod with middle spine longest of 3. Interpodal plate of leg 4 (Figure 21b) similar to that of preceding leg except much more slender. Leg 4 exopod with small rounded process on distolateral corner of terminal segment (Figure 21c); endopod (Figure 21d) with very large, curved, unornamented terminal spine. Leg 5 (Figure 21e) 2-segmented; first segment possessing 2 curved rows of spines on posterior edge and 1 dorsolateral seta; second segment slender 69 × 25 μm, with distomedial patch of spines and 4 naked setae; setae with rows of spines at bases. Leg 6 represented by 3 setae in area of egg sac attachment.

**Male:** Body as in Figure 22a. Total length 0.59 mm (0.56–0.62 mm) and greatest width 0.22 mm based on 3 specimens. Cephalothorax wider than long, 184 × 216 μm, and comprising approximately 30% of total body length. Genital complex longer than wide, 83 × 71 μm. Abdomen 3-segmented; segments from anterior to posterior 44 × 53 μm, 41 × 48 μm, and 41 × 41 μm; anal segment (Figure 22b) with 1 row of spines on each side of anteroven- treal surface and 1 row near insertion of each caudal ramus. Caudal ramus (Figure 22b), longer than wide, 22 × 14 μm, and armed as in female.

Maxilliped (Figure 22c,d) 4-segmented; first segment with usual seta; second segment (corpus) carrying 1 long and 1 small setae and 1 row of spines; third segment small and unornamented; fourth segment a curved claw bearing 2 hyaline anterior setae. 1 large posterior seta, 1 proximal row of spines on inner margin, and 1 row of large teeth along concave margin. Terminal segment of endopod of leg 3 (Figure 22e) with relatively large spines. Leg 5 similar to that of female except smaller, 49 × 15 μm.

**Female Variant:** Specimens collected from *Cirripectes* sp. D and *C. stigmaticus* exhibited a few morphological variations from those described from *C. perustus*. 
FIGURE 20.—*Taeniacanthus digitatus*, new species, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, first maxilla, posterior; D, maxilliped, ventromedial; E, maxilliped claw, dorsal; F, leg 2 endopod, ventral; G, leg 3, interpodal plate and proximal portions of basipods, ventral.
FIGURE 21—*Taeniocanthus digiatus*, new species, female: A, leg 3, ventral; B, leg 4, interpodal plate and proximal portions of basipods, ventral; C, leg 4, terminal exopod segment, ventral; D, leg 4 endopod, ventral; E, leg 5, ventral.
Figure 22.—*Taeniaeothus digitatus*, new species. Male: A, dorsal; B, anal segment and caudal ramus, ventral; C, maxilliped, posterior; D, maxilliped, anterior; E, leg 3, terminal endopod segment, ventral. Female variant: F, maxilliped claw, ventral; G, leg 2, terminal exopod segment, ventral; H, leg 2, terminal endopod segment, ventral; I, leg 3, terminal endopod segment, ventral.
Maxilliped claw (Figure 22f) equipped with accessory process on convex surface at about midlength. Leg 2 exopod with hyaline conical process on outer distolateral of terminal segment (Figure 22G); process in specimens from Cirspectes perustus not as prominent. Endopods of legs 2 and 3 each with terminal spine longest of 3 (Figure 22H, I).

ETYMOLOGY.—The specific name digitatus, Latin for having fingers, alludes to the blunt, slender spine on the terminal endopod segment of leg 4 of the female.

REMARKS.—This new species differs from its congeners except Taeniacanthus pollicaris, new species, in having the slender, digitiform middle spine on the terminal endopod segment of leg 4. Although T. pollicaris has a similar spine, it is not greatly curved as in T. digitatus. Also the two species can easily be distinguished by the differences in the morphology of the maxillipeds of the females. In T. pollicaris the claw is stout and bluntly rounded at its tip, whereas in T. digitatus the claw is sharply pointed.

Taeniacanthus fugu Yamaguti and Yamasu, 1959


MATERIAL EXAMINED.—7 females, 2 damaged females, 2 males from Takifugu xanthopterus (Temminck and Schlegel) (USNM 75944), Japan.

DESCRIPTION.—Female: Body as in Figure 23A. Total length 3.53 mm (3.19–3.82 mm) and greatest width 1.12 mm (1.07–1.17 mm) based on 7 specimens. Cephalothorax 799 × 1043 μm, comprising about 25% of total body length. Thoracic segments bearing legs 2, 3, and 4 decreasing in width posteriorly. Genital complex wider than long, 202 X 173 /an (1 X w); anal segment (Figure 23B) 173 × 81 /an (1 X w), similar to that in T. yamagutii, absent in T. fugu (compare Figures 23H, 24A, B, and 99C, H).

Exopod and endopod spines and setae of legs 2–4 (Figure 24C–H) longer and more slender than those in T. yamagutii.

REMARKS.—Taeniacanthus fugu was collected from the gills of an unidentified species of Sphoeroides from the Inland Sea, Japan, and first described by Yamaguti and Yamasu (1959). Their description was based on only two males. The above description is the first for the female of Taeniacanthus fugu.

One of the most distinctive features of T. fugu is the stout terminal process of the second maxilla and the two reduced associated spines. Only two known species of Taeniacanthus share this feature with T. fugu. Both species, T. kitamakura Yamaguti and Yamasu, 1959, and T. yamagutii (Shiino, 1957), are parasitic on tetraodontiform fishes: T. kitamakura on Canthigaster and T. yamagutii on Sphoeroides and Takifugu.

Both Taeniacanthus fugu and T. yamagutii have a setiform element (flagellum) at the tip of each exopod spine of legs 2–4. This feature distinguishes these two species from T. kitamakura, which does not bear the flagella; additionally, the exopod spines of this species are not highly sclerotized, so these elements are slightly more setiform in appearance. The females of T. fugu and T. yamagutii are very similar in their morphology. The only difference is the relative lengths of the setae on the terminal endopod segment of leg 2. Admittedly this character is of dubious merit. However, the males of these species can be easily distinguished by the ornamentation of the maxilliped. Although these two species are morphologically similar, and have been collected from the same host genera Sphoeroides and Takifugu from the same general locality (Inland Sea, Japan), we recognize them as distinct species by differences in the maxilliped claw of the male.

Taeniacanthus glomerosus, new species

Taeniacanthus glomerosus, new species

FIGURES 25–27

MATERIAL EXAMINED.—1 female holotype (USNM 228403) and 3 female paratypes (USNM 228404) from...
Figure 23.—Taeniasanthis fugu Yamaguti and Yamasu. Female: A, dorsal; B, anal segment and caudal ramus, ventral; C, postantennal process, ventral; D, leg 2 exopod, ventral; E, leg 2, terminal endopod segment, ventral. Male: F, dorsal; G, postantennal process, ventral; H, maxilliped, anterolateral.
FIGURE 24.—*Taenia canthus* fugu Yamaguti and Yamasu, male: A, maxilliped, posterior; B, maxilliped claw, anterior; C, leg 2 exopod, ventral; D, leg 2 endopod, ventral; E, leg 3 exopod, ventral; F, leg 3, terminal endopod segment, ventral; G, leg 4 exopod, ventral; H, leg 4 endopod, ventral.
FIGURE 25.—*Taeniacanthus glomerosus*, new species, female: A, dorsal; B, lateral; C, genital area, dorsal; D, portion of uroosome, dorsal; E, anal segment and caudal ramus, ventral; F, first antenna, ventral; G, second antenna, medial.
FIGURE 26.—*Taeniocanthus glomerosus*, new species, female: A, postantennal process, ventral; B, labrum and paragnath, ventral; C, mandible, anteromedial; D, first maxilla, posterior; E, same, anterior; F, second maxilla, ventral; G, second maxilla, terminal segment, ventrolateral; H, second maxilla, terminal segment, ventral; I, maxilliped, ventromedial; J, same, ventrolateral; K, maxilliped claw, ventral; L, leg 1 and interpodal plate, ventral. (P = paragnath.)
Figure 27.—*Taeniacontus glomerosus*, new species, female: A, leg 2, interpodal plate and basipod, ventral; B, leg 2 exopod, ventral; C, leg 2 endopod, ventral; D, leg 3 endopod, ventral; E, leg 4, interpodal plate and proximal portions of basipods, ventral; F, leg 4 exopod, ventral; G, same, ventral; H, leg 4 endopod, ventral; I, leg 5, dorsal; J, same, ventral.
Cirripectes castaneus: Valenciennes collected at reef north of Vuro Island, Great Astrolabe, Fiji Islands, on *Te Vega* cruise 7 by Bolin and party, 8 May 1965. Other material from *Cirripectes castaneus*: 5 females from 4 hosts (collection data as in type material); 2 females from 2 hosts at reef approximately 0.8 km off Ishigaki City, Ishigaki, Ryukyu Islands, Japan, 22 May 1968; 2 females from 2 hosts of Great Banda Islands (04°34'S, 129°53'E); 1 female from Lizard Island, Queensland, Australia (14°35'S, 145°27'E), 27 November 1975; 2 females from Kwayulu Reef, 6.5 km north of Island Rock, South Africa, 28 July 1976. From *Cirripectes imitator* Williams: 13 females near Ch'uan-Fan-Shih, Taiwan, by V.G. Springer and party, 24 April 1968; 1 female from Okinawa Islands, Japan, 8 October 1980; 1 female from Shirahama, Wakayama Prefecture, Japan, 30 November 1973; 1 female from Skiaura, Chichijimi Island, Ogasawara Islands, 8 April 1974. From *Cirripectes* sp. T (to be named for B. Hutching): 3 females from North West Cape, Western Australia (22°12'S, 113°52'E), by G. Allen, 22 May 1980. From *Cirripectes* sp. U (to be named for C.R. Gilbert): 1 female from southwest tip of Isle Boddam, Salomon Group, Chagos Archipelago (05°21'05'S, 072°12'12°E). From *Cirripectes quagga*: 1 female from Tu-tuila Island, American Samoa. From *Cirripectes filamentosus* Alleyne and Macleay: 6 females from vicinity of Mahé, Seychelle Islands, by Bohlske and party, 4 February 1964; 1 female from west side of peninsula at Yeh-Liu, north shore of Taiwan, by J.E. Randall and party, 28 June 1978. From *Cirripectes auritus* Carlson: 2 females from Sodwana Bay, Zululand, South Africa, 4 April 1979 by P.C. Heemstra and T. Heemstra. From *Cirripectes variolosus* Valenciennes: 5 females from Falalap Islet, Ifalik Atoll, Caroline Islands (07°14'08"N, 144°27'28"E), 19 September 1953; 2 females from Unai Obyan Reef, Saipan, Mariana Islands (15°06'24"N, 145°44'03"E), 18 July 1956. From *Cirripectes stigmaticus*: 1 female from Babel Lukes Reef, Belau Islands (07°17'17"N, 134°30'56"E), 19 January 1959.

All parasitic copepods collected from preserved hosts by J.T. Williams.

**Description.—Female:** Body as in Figure 25A,B. Total length 0.79 mm (0.65-1.01 mm) and greatest width 0.32 mm (0.29-0.38 mm) based on 10 specimens. Cephalothorax wider than long, 244 × 345 μm, and comprising about 25% of total body length. Thoracic segments bearing legs 2, 3, and 4 not markedly decreasing in width posteriorly. Genital complex (Figure 25C,D) wider than long, 78 × 129 μm, not clearly separated from first abdominal segment. Abdomen (Figure 25b) 4-segmented; segments from anterior to posterior 67 × 138 μm, 51 × 101 μm, 28 × 83 μm, and 46 × 69 μm (1 × w); anal segment (Figure 25b) with 1 pair of longitudinal rows of spines on dorsal surface near median suture, 1 row of spines on each side of anteroventral surface, and 1 row near insertion of caudal ramus (Figure 25e). Caudal ramus (Figure 25e) longer than wide, 33 × 24 μm, and bearing 6 setae; 2 large median terminal setae, each with 1 row of bristles, other setae naked.

Rostral area as in *T. williamsi*. First antenna (Figure 25r) 7-segmented; armature formula 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 25c) similar to that in *T. williamsi* except armed terminally with 3 spines and 4 setae. Postantennal process (Figure 26a) with curved tine.

Labrum (Figure 26b) with single pair of lateral digitiform processes, a posteromedian hyaline lobe, and a spinulated posterior margin. Mandible (Figure 26c) bearing slightly subequal blades, each serrated along 1 margin, and 1 subterminal accessory seta. Paragnath (Figure 26b) an unornamented conical lobe. First maxilla (Figure 26d,e) bearing 5 setae and a large rounded process. Second maxilla (Figure 26f–h) 2-segmented; first segment a relatively large sclerotized area; second segment with spinulated terminal process, 1 long spinulated spine, and 1 shorter naked spine; shorter spine varying in length (compare Figure 26c with 26h). Maxilliped (Figure 26i–k) apparently 2-segmented with basal segment (with usual naked seta) fused to corpus, and corpus with 2 naked setae; terminal segment (Figure 26k) a curved claw bearing crenulate, hyaline, transverse flanges along distal convex margin, 2 conical processes and 1 seta at its base.

Legs 1–4 (Figures 26l, 27a–h) biramous. Spinal and setal formula as follows:

\[P_1 \text{ coxa } 0-1 \text{ basis } 1-1 \text{ exopod } 1-0; 9\]
\[\text{endopod } 0-1; 7\]

\[P_2 \text{ coxa } 0-0 \text{ basis } 1-0 \text{ exopod } 1-0; 1-1; 11, 1, 5\]
\[\text{endopod } 0-1; 0-1; 1-1; 1, 3\]

\[P_3 \text{ coxa } 0-0 \text{ basis } 1-0 \text{ exopod } 1-0; 1-1; 11, 1, 5\]
\[\text{endopod } 0-1; 0-1; 1-1; 1, 2\]

\[P_4 \text{ coxa } 0-0 \text{ basis } 1-0 \text{ exopod } 1-0; 1-1; 11, 1, 5\]
\[\text{endopod } 0-1; 0-1; 1, 5\]

Interpodal plates of legs 1–4 (Figures 26a, 27a,e) with spinules on posterior margin. Interpodal plate of leg 1 with convex posterior margin. Those of legs 2–4 reentrant. Coxa and basis of leg 1 with several rows of spinules and 1 hyaline digitiform process at junction of these 2 segments. Cosae and bases of legs 2–4 (Figure 27a,e) each armed with a few rows of spinules and 1 large patch of spinules on inner margin of basis. Terminal exopod segments of legs 2 and 3 each with a rounded protrusion on distolateral corner (see Figure 27b). Terminal exopod segment of leg 4 relatively long and slender in most specimens (Figure 27b), but otherwise relatively short and broad (Figure 27c). Exopod spines of legs 2–4 long and not highly sclerotized (see Figure 27b). Endopod spines small; terminal endopod segment of leg 4 (Figure 27b) subconical and with curved terminal spine. Most segments of rami of legs armed with rows of spinules except exopod of leg 4. Leg 5 (Figure 27e,f) with 2 segments partially fused dorsally; first segment ornamented with 2 curved rows of ventral spines and 1 dorsolateral seta;
second segment 90 × 50 μm (1 × w), tapered distally, bearing 2 patches of spinules on distomedial margin and armed with 3 setae and 1 unilaterally spinulated spine; 2 outer setae with row of spinules at base. Leg 6 (Figure 25c) represented by 3 naked setae in area of egg sac attachment.

**Male:** Unknown.

**ETYMOLOGY.**—The specific name *glomerosus*, Latin for ball-shaped, alludes to the spherically shaped cephalothorax and the hyaline balloon-like process on the first maxilla.

**REMARKS.**—The species of *Taeniacanthus* parasitic on two genera of blennies, *Cirripectes* and *Exallias*, exhibit a curved, ovoid pectinate process near the distal end of the second antenna. Both this process and the longer pectinate process running the length of the terminal segment each bear numerous rows of spinules. The only other species of *Taeniacanthus* with a similar ornamentation of the second antenna is *T. pseudorhombi* (Yamaguti, 1939); however, this species, having only seven setae at the tip of this appendage, is devoid of the claw-like spines present in the copepods parasitic on blennies.

Seven new species of *Taeniacanthus* parasitic on *Cirripectes* and *Exallias* are described in the present paper. They are *T. comparatus*, *T. digitatus*, *T. glomerosus*, *T. nudicauda*, *T. papulosus*, *T. pollicaris*, and *T. williamsi*. Within this group and armed with 3 setae and 1 unilaterally spinulated spine; 2 antennae. Both this process and the longer pectinate process and the hyaline balloon-like process on the first maxilla.

**Material Examined.**—6 females, 1 immature female, and 1 immature male from *Canthigaster rivulata* (Temminck and Schlegel) (USNM 152532) from Misaki, Japan.

**DESCRIPTION.**—**Female:** Body forms as in Figure 28A,B. Total length 2.05 mm (1.63–2.70 mm) and greatest width 0.86 mm (0.77–0.95 mm) based on 5 specimens. Cephalothorax 686 × 874 μm (1 × w), comprising approximately 25% of total body length. Genital complex (Figure 28c) wide than long, 188 × 291 μm. Abdomen 4-segmented; segments from anterior to posterior 120 × 230 μm, 115 × 189 μm, 64 × 170 μm, 156 × 170 μm (relaxed specimen; Figure 28a), and 115 × 244 μm, 92 × 193 μm, 55 × 184 μm, 147 × 138 μm (contracted specimen; Figure 28b) (1 × w); ventral surface of anal segment with proximal ½ covered by spinules and a posterior row of spinules (Figure 28d). Caudal ramus (Figure 28d) ventral surface without ornamentation, about 2.5 times as long as wide, 101 × 41 μm, and armed as in figure.

Rostral area (Figure 28e) unarmed. First antenna (Figure 28f) 7-segmented; armature formula as follows: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 29a) with third and fourth segments almost completely fused, with 2 pectinate processes (each with 1 seta), 3 claw-like spines and 4 setae; shorter pectinate process with small rounded spinules along outer edge; longer pectinate process with single row of longer, more pointed spinules. Postantennal process as in Figure 29b. Labrum (Figure 29c) with row of spinules along posterior edge. Mandible (Figure 29d) with 2 unequal blades; each spinulated along 1 margin, and a weak hyaline seta; 1 subconical process and 1 rounded process at base representing apophysis to which mandibular muscles attach. Paragnath (Figure 29e) with patch of short hairs on basal part. First maxilla (Figure 29f) with 2 long setae bearing short pinnules, a short seta with short plumosities, 2 short naked setae, and a knob-like process proximal to base of short plumose seta. Second maxilla (Figure 29g,h) terminal process with 2 short setae near midlength and 2 short rows of spinules distally. Maxilliped (Figure 30a,b) claw strongly curved with distal row of stout spinules along inner edge.

Legs 1–4 (Figures 30c–f, 31a–f, 32a–c) biramous. Spinal and setal formula as follows:

- **P1**
  - coxa 0-1
  - basis 1-1
  - endopod 1-0; 9
  - exopod 0-1; 7

- **P2**
  - coxa 0-0
  - basis 1-0
  - exopod 1-0; 1-1; II, I, 4
  - endopod 0-1; 0-1; II, I, 3

- **P3**
  - coxa 0-0
  - basis 1-0
  - exopod 1-0; 1-1; II, I, 5
  - endopod 0-1; 0-1; II, I, 2

- **P4**
  - coxa 0-0
  - basis 1-0
  - exopod 1-0; 1-1; II, I, 4
  - endopod 0-1; 0-1; II, int.

Leg 1 interpodal plate (Figure 30c) triangular, distal tip with 2 patches of spinules; coxa and basis with patches of spinules on ventral surface. Leg 2 interpodal plate (Figure 30m) bilobed; each lobe with spinules; basis with relatively large patch of spinules along inner margin; exopod spines...
FIGURE 28.—*Taeniacanthus kitamakura* Yamaguti and Yamasu, female: A, dorsal; B, dorsal; C, genital area, dorsal; D, anal segment and caudal rami, ventral; E, rostral area, ventral; F, first antenna, ventral.
FIGURE 29.—*Taeniacanthus kitamakura* Yamaguti and Yamasu, female: A, second antenna, medial; B, postantennal process, ventral; C, labrum, ventral; D, mandible, anteromedial; E, paragnath, ventromedial; F, first maxilla, anterior; G, second maxilla, posteroverentral; H, second maxilla, terminal segment, anteromedial.
Figure 30.—*Taeniacanthus kitamakura* Yamaguti and Yamasu, female: A, maxilliped, posterodorsal; B, maxilliped, anterodorsal; C, leg 1 and interpodal plate, ventral; D, leg 2, interpodal plate and basipod, ventral; E, leg 2 exopod, ventral; F, leg 2, spine of first exopod segment, dorsal.
Figure 31.—Tanniscanthus kitamakura Yamaguti and Yamasu, female: A, leg 2, terminal exopod segment, ventral; B, leg 2 endopod, ventral; C, leg 3, interpodal plate and proximal portions of basipods, ventral; D, leg 3 exopod, ventral; E, leg 3 endopod, ventral; F, leg 4, interpodal plate and basipod, ventral.
Figure 32.—*Taeniacthus* kitamakura Yamaguti and Yamasu, female: A, leg 4 exopod, ventral; B, leg 4, terminal exopod segment, ventral; C, leg 4 endopod, ventral; D, leg 5, dorsolateral; E, same, dorsal; F, same, ventromedial.
(Figure 30f) spined; last segment of exopod of leg 2 (Figure 31a) with hyaline process near outer distal corner; last segment of endopod (Figure 31b) bearing heavily sclerotized curved outer spine, a short adjacent spine and a long, straight, heavily sclerotized spine at tip in addition to usual setae. Leg 3 interpodal plate (Figure 31c) with posterior lobes bearing spinules; spinules on inner part of basis absent; exopod (Figure 31b) similar to that in leg 2 except bearing 5 setae on terminal segment; last segment of endopod (Figure 31e) with 3 heavily sclerotized spines, first one not as well developed as that of leg 2. Leg 4 interpodal plate (Figure 31f) with 2 patches of spinules; last segment of exopod somewhat elongate (Figure 32a,b); last segment of endopod (Figure 32c) bearing 2 stout outer spines and an intermediate spine. Leg 5 (Figure 32d–f) 2-segmented; first segment with 1 dorsolateral seta and 2 rows of spinules; second segment, $127 \times 62 \mu m$ (1 x w), with a subterminal outer seta, 3 terminal setae, and patches of spinules on ventral surface as indicated in Figure. Leg 6 represented by 3 setae (2 naked, 1 pinnate) in area of egg sac attachment (Figure 28c).

**Male:** See Izawa (1967).

**Remarks.**—This species was first described from the gills of *Canthigaster rivulata* collected at Sagami Bay, Japan, by Yamaguti and Yamasu (1959). Izawa (1967) described a new species *Taeniaeacanthus canthigasteri*, which he collected from the same host species at Wakayama and Mic, Japan. He cited several morphologic differences between his specimens and those described by Yamaguti and Yamasu. The differences listed by Izawa may be attributed to inaccurate observations by the respective authors or to intraspecific variation. Having carefully compared the two descriptions and examined material described above, we consider *T. canthigasteri* a junior synonym of *T. kitamakura*.

*Taeniaeacanthus fugu* Yamaguti and Yamasu (1959), and *T. yamagutii* (Shino, 1957) have a stout terminal process on the gills of *Canthigaster rivulata* (Richardson) from southern Japan. *Taeniaeacanthus kitamakura* (Pearse, 1952) has attenuate exopod spines of *Canthigaster rivulata* and *C. semilarva* (Richardson) and examined material described above, we consider *T. yamagutii*. *T. fugu* Yamaguti and Yamasu, 1959, and *T. canthigasteri* a junior synonym of *T. kitamakura*. *Taeniaeacanthus kitamakura* can be distinguished from the other two species by the absence of an elongate plate (Figure 33a,b). The anterior 83 X 190 $\mu m$, the cephalothorax globose, 528 X 770 $\mu m$, and comprising about 25% of total body length. The free thoracic segments globose and about equal in width and nearly as wide as cephalothorax. Genital complex wider than long, 176 X 275 $\mu m$. Abdomen 4-segmented; segments from anterior to posterior 83 X 190 $\mu m$, 49 X 169 $\mu m$, 31 X 153 $\mu m$, and 101 X 122 $\mu m$ (l x w). Anal segment (Figure 33c) with about 4 rows of spinules on each side of anteroventral surface and 1 row near insertion of each caudal ramus. Caudal ramus (Figure 32c) about twice as long as wide, 62 X 36 $\mu m$.

Rostral area (Figure 33f) with irregularly shaped, sclerotized, ventromedian part. First antenna (Figure 33e) 7-segmented; formula of armature: 5, 15, 5, 3, 4, 2 + 1 aesthetes, 7 + 1 aesthetes. Second antenna (Figure 34a) with third and fourth segments almost completely fused, and bearing 2 pectinate processes (each with 1 seta), 3 claw-like spines and 4 setae. Postantennal process (Figure 34b) stout and curved.

Labrum (Figure 34c) with row of spinules along reentrant posterior margin. Mandible (Figure 34d) with unequal blades, each spinulated along 1 margin, and prominent seta at base of shorter blade. Paragnath (Figure 34e) simple, with small patch of spinules near base. First maxilla (Figure 34f) with 2 naked setae, 2 subequal long setae (shorter one finely pinnate) and a short, stout finely plumose seta. Second maxilla (Figure 34g) with longest process serrate. Maxiliped claw (Figures 34i, 35a) with lateral process at base bearing subterminal spine and hyaline knob near outer angle; main part of claw slightly curved along most of length, sharply curved at tip with rows of spinules on distal third.

**Legs 1–4 (Figures 35b–f, 36a–f) biramous. Spinal and setal formula as follows:**

- **P1** coxa 0-1, basis 1-1, exopod 1-0: 9
  - endopod 0-1: 7
- **P2** coxa 0-0, basis 1-0, exopod 1-0: 1-1, 1-1, 1-1, 1-1, 1-1, 1-1, 1-1, 1-1, 1-1, 1-1
  - endopod 0-1: 0-1, 1-1, 1-1
- **P3** coxa 0-0, basis 1-0, exopod 1-0: 1-1, 1-1, 1-1, 1-1, 1-1, 1-1, 1-1, 1-1, 1-1
  - endopod 0-1: 0-1, 1-1, 1-1
- **P4** coxa 0-0, basis 1-0, exopod 1-0: 1-1, 1-1, 1-1, 1-1, 1-1, 1-1, 1-1, 1-1, 1-1
  - endopod 0-1: 0-1, 1-1, 1-1

**Leg 1** (Figure 35b) interpodal plate triangular, posterior margin with 2 patches of spinules, coxa and basis with rows.
FIGURE 33.—Taeniacenthus lagocephali Pearse, female: A, dorsal; B, dorsal; C, anal segment and caudal ramus, ventral; D, rostral area, ventral; E, first antenna, ventral.
FIGURE 34.—*Taenianthus lagocephali* Pearse, female: A, second antenna, medial; B, postantennal process, ventral; C, labrum, ventral; D, mandible, anteromedial; E, paragnath, ventral; F, first maxilla, anteroventral; G, second maxilla, posteroventral; H, second maxilla, terminal segment, posteroventral; I, maxilliped claw, anterior.
FIGURE 35.—Taenia canthus lagocephali Pearse, female: A, maxilliped, posterior; B, leg 1 and interpodal plate, ventral; C, leg 2, interpodal plate and basipod, ventral; D, leg 2 exopod, ventral; E, leg 2 endopod, ventral; F, leg 3, interpodal plate and proximal portion of basipod, ventral.
FIGURE 36.—*Taeniacanthus lagocephali* Pearse, female: A, leg 3 exopod, ventral; B, leg 3 endopod, ventral; C, leg 4, interpodal plate and proximal portions of basipods, ventral; D, leg 4 exopod, ventral; E, leg 4, terminal exopod segment, ventral; F, leg 4 endopod, ventral; G, leg 5, medial; H, same, lateral.
FIGURE 37.—*Taeniacanthus lagocephali* Pearse, male: A, dorsal; B, postantennal process, ventral; C, second maxilla, posteroventral; D, maxilliped, anterior; E, same, posterior; F, leg 2, spine of second exopod segment, ventral; G, leg 2, terminal endopod segment, ventral; H, leg 3, terminal endopod segment, ventral; I, leg 5, lateral.
of spinules on ventral surface. Leg 2 interpodal plate (Figure 35c) bilobed posteriorly; each lobe with a patch of spinules; patch of spinules on inner margin of basis; exopod (Figure 35b) with outer spines setiform, not heavily sclerotized, and bearing short spinules; row of spinules along outer edge of each segment; last segment with process at distolateral corner bearing hyaline element. Endopod (Figure 35e) with hairs and row of spinules on outer margins; last segment bearing 3 heavily sclerotized spines and 3 setae. Leg 3 interpodal plate (Figure 35f) with 2 patches of spinules on posterior margin, no spinules on inner surface of basipod; exopod (Figure 36a) similar to leg 2 except with 1 more seta on last segment; endopod (Figure 36b) similar to leg 2 except 1 less seta on last segment. Leg 4 interpodal plate (Figure 36c) with patches of spinules; exopod as in leg 3 except 1 less seta and bearing 2 hyaline elements at distolateral corner of last segment (Figure 36d,e); endopod (Figure 36f) with last segment bearing 2 outer fringed spines and 1–2 intermediate spines (specimen figured with 1, another specimen observed with 2). Leg 5 (Figure 36g,h) 2-segmented; first segment with pinnate dorsolateral seta and distal row of spinules; second segment, 99 × 78 μm, spatulate, bearing 1 subterminal and 3 terminal setae; 3 with short bristle-like pinnules and 1 with only single row; other rows and patches of spinules as in figures. Leg 6 represented by 3 setae at area of egg sac attachment.

Male: Body form as in Figure 37a. Total length 0.92 mm, and greatest width 0.29 mm. Cephalothorax slightly wider than long, 248 × 290 μm, comprising about 25% of total body length. Genital complex longer than wide, 152 × 133 μm. Abdomen 3-segmented; segments from anterior to posterior 62 × 85 μm, 46 × 76 μm, and 58 × 67 μm (l × w).

Appendages as in female except as follows. Postantennal process (Figure 37b) more slender than in female. Tip of second maxilla (Figure 37c) not as robust as in female. Maxilliped (Figure 37d,e) with inner margin of corpus bearing 2 setae and a patch of truncate spinules; claw with 4 setae near inner basal corner and distal ½ of inner margin serrated. Spines on last 2 segments of exopod of leg 2 (Figure 37f) each with distal flagellum; spines on last endopod segment of leg 2 (Figure 37g) differ from female as illustrated. Spines on last endopod segment of leg 3 (Figure 37h) not curved as in female. Leg 5 (Figure 37i) with rows of spines on both segments as figured; second segment 39 × 22 μm (l × w).

Remarks.—Pearse (1952) described Taenia canthus lagocephali from specimens obtained from the gills of Lagocephalus laevigatus collected off Padre Island, Texas. Pillai (1963) redescribed this species from specimens obtained from the branchial chamber of Lagocephalus lunaris (Bloch and Schneider) (reported as Gastrophysus lunaris) and Lagocephalus inermis (Temminck and Schlegel) from Trivandrum, India, and transferred it to Irodes. This species was subsequently transferred back to Taenia canthus by Ho (1969), with whom we are in agreement.

Taenia canthus sabafugu Yamaguti and Yamans, 1959, was described from Lagocephalus spadiceus (reported as Sphoeroides spadiceus) from the Inland Sea, Japan. Ho (1969) synonymized this species with T. lagocephali. We have examined specimens of T. lagocephali from both Lagocephalus laevigatus from the Gulf of Mexico and Lagocephalus spadiceus from Japan, and find no significant morphologic differences between the specimens. Taenia canthus sabafugu is considered a junior synonym of T. lagocephali.

This species is distinguished from its congeners by three characteristics: (1) three free thoracic segments equal in width to the cephalothorax, (2) terminal segment of second maxilla with stout terminal process and one spine subequal in length to process, and (3) a flexible, slender digitiform process at the tip of the maxilliped claw of the female.

Taenia canthus longicaudus Pillai, 1963


Description.—Female: See Pillai (1963).

Male: Unknown.

Remarks.—This species was first described by Pillai (1963) from the branchial chamber of Saurida tumbil (Bloch) at Trivandrum, India.

The spine of the second segment and the first (outermost) spine of the terminal segment of the exopod of leg 3 of Taenia canthus longicaudus are strongly curved as in Irodes gracilis (Heller, 1865). Also the terminal endopod segment of leg 4 bears four elements as in species of Irodes. However, the maxilliped claw is apparently present in T. longicaudus. This characteristic would exclude it from Irodes. Pillai (1963) has figured the maxilliped claw of T. longicaudus as an elongate structure curving slightly away from the corpus to which it is closely appressed. At the tip of the claw are two bristled setae. This is a very unusual structure for the maxilliped claw in species of Taenia canthus (see "Remarks" for the genus Taenia canthus). The morphology of the maxilliped of the female must be reexamined before a conclusion on the taxonomic status of this species is reached. Until then, T. longicaudus is here considered a member of Taenia canthus.

This species appears to be closely related to T. cynoglossi (Rangnekar and Murti, 1960) and T. narcini Pillai, 1965 (see "Remarks" for these two species).

Taenia canthus longicornis (Pillai, 1963), new combination

Figures 38–41

FIGURE 38.—*Taeniacanthus longicervis* (Pillai), female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area, ventral; D, first antenna, ventral; E, second antenna, medial.
FIGURE 39.—*Taeniacanthus longicervis* (Pillai), female: A, second antenna, distal portion, medial; B, postantennal process, ventral; C, labrum, ventral; D, mandible, anteromedial; E, paragnath, dorsomedial; F, first maxilla, anterior; G, second maxilla, posteroventral; H, maxilliped, ventromedial; I, maxilliped claw, anterior; J, same, posterior.
FIGURE 40.—*Taeniacthus longiceravis* (Pilai), female: A, leg 1 and interpodal plate, ventral; B, leg 2 and interpodal plate, ventral; C, leg 3 exopod, ventral; D, same, dorsal; E, leg 3 endopod, ventral; F, leg 4, interpodal plate and basipod, ventral.
FIGURE 41.—*Taeniactanus longicervis* (Pillai). Female: A, leg 4 exopod, dorsal; B, leg 4 endopod, ventral; C, leg 5, ventrolateral. Male: D, dorsal; E, genital area, ventral; F, maxilliped, anteromedial.
**Material Examined.**—From *Saurida undosquamis* (Richardson): 2 females from 16°16'N, 114°41'E (South China Sea); 3 females from 11°52'N, 92°49'E (AB Cruise 1); 3 females, 1 male, 1 immature female from 21°49'N, 68°55'E (AB Cruise 4B); 1 female, 1 male from 20°49'N, 69°41'E (AB Cruise 4B). From *Saurida elongata* (Temminck and Schlegel) (USNM 9450): 2 females from Hong Kong. (AB = R/V *Anton Bruun*.)

**Description.**—*Female:* Body as in Figure 38A. Total length 3.04 mm (2.21–3.80 mm) and greatest width 0.85 mm (0.62–1.02 mm) based on 10 specimens. Cephalothorax 790 × 940 μm (l × w), comprising approximately 25% of total length. First pedigerous segment completely fused to cephalothorax. Thoracic segments bearing legs 2, 3, and 4 decreasing in width posteriorly. Genital complex 282 × 432 μm (l × w). Abdomen 4-segmented; segments from anterior to posterior 329 × 310 μm, 320 × 282 μm, 235 × 235 μm, and 254 × 207 μm (l × w); anal segment (Figure 38B) with a row of spinules on each side of anteroventral surface and 2 membranous flaps near insertion of each caudal ramus. Caudal ramus (Figure 38B) 166 × 67 μm (l × w), bearing 6 setae (2 outer and 1 dorsal naked).

Rostral area (Figure 38c) with circular, sclerotized, ventromedian part between bases of first antenna. First antenna (Figure 38d) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figures 38e, 39a) apparently 4-segmented; first 2 segments each with 1 naked distal seta; third segment with 2 pectinate processes (longer one with small naked seta at tip, shorter one with small rounded hyaline knob at midlength); terminal segment with 2 spines and 5 setae. Postantennal process (Figure 39b) with slender, curved, attenuate tine.

Labrum (Figure 39c) with spinulated posterior margin and bearing truncate medial process on ventral surface. Mandible (Figure 39d) with 2 unequal blades, each spinulated along 1 margin, and 1 bristled seta. Paragnath (Figure 39e) with patch of spinules at base and 1 row of smaller spinules at midlength. First maxilla (Figure 39f) a lobe bearing 5 naked setae and 1 small knob. Second maxilla (Figure 39g) 2-segmented; first segment robust bearing rounded process near distomedial corner; terminal segment armed as in figure. Maxilliped (Figure 39h–j) 3-segmented; first segment with distomedial seta; second segment robust, bearing 2 inner proximal setae, and covered with curved creases; terminal segment a claw with 2 basal setae and 8–10 teeth.

**Legs 1–4** (Figures 40a–f, 41a,b) biramous. Spinal and setal formula as follows:

<table>
<thead>
<tr>
<th>Leg</th>
<th>Coxal</th>
<th>Basis</th>
<th>Endopod</th>
<th>Exopod</th>
</tr>
</thead>
<tbody>
<tr>
<td>P₁</td>
<td>0-1</td>
<td>1-0</td>
<td>0-0</td>
<td>0-0</td>
</tr>
<tr>
<td>P₂</td>
<td>0-0</td>
<td>1-0</td>
<td>0-0</td>
<td>0-0</td>
</tr>
</tbody>
</table>

Interpedal plate of leg 1 (Figure 40a) broad, somewhat triangular with spinules on posterior margin. Interpedal plates of legs 2 and 3 as in Figure 40b. Interpedal plate of leg 4 (Figure 40f) without ornamentation. Terminal segment of endopod of leg 1 (Figure 40a) with 2 outermost setae greatly reduced; second seta from lateral side superimposed on third seta. First exopod segment of leg 2 (Figure 40b) inflated. Segments of exopods of legs 3 (Figure 40c,d) and 4 (Figure 41a) protuberant with slightly crenulate margins; first segment with dorsal corrugated area. Endopod spines of legs 2–4 (Figures 40b,e, 41b) with single row of spinules on outer margins. Leg 5 (Figure 41c) with 2 segments; first segment small, bearing dorsolateral seta; second segment 177 × 129 μm (l × w), bearing 3 setae with 2 rows of bristles and 1 blunt spine with single row; setae and spine with spinules at bases. Leg 6 represented by 3 setae near egg sac attachment.

**Male:** Body as in Figure 41d. Total length 2.91–2.94 mm and greatest width 0.73–0.76 mm based on 2 specimens. Cephalothorax 602 × 790 μm (l × w), comprising about 20% of total body length. Genital complex (Figure 41e) wider than long 263 × 320 μm (l × w). Abdomen (Figure 41f) 4-segmented; segments from anterior to posterior, 282 × 263 μm, 273 × 244 μm, 216 × 207 μm, and 216 × 169 μm (l × w). Caudal ramus similar to that of female, but measuring 143 × 48 μm (l × w).

Maxilliped (Figure 41h) 4-segmented; first segment with 1 naked seta; second segment (corpus) with 2 naked setae and a row of large denticles; third segment small and unornamented; terminal segment a curved claw bearing 2 setae near base and approximately 15 teeth. All other appendages as in female.

**Remarks.**—*Taeniacanthus longierovis,* originally reported under *Parataeniacanthus,* was first described by Pillai (1963) from the branchial chamber of *Saurida tumbl.* Cressey and Cressey (1979) gave a partial redescriptions of this species from specimens collected from *Saurida undosquamis* (Richardson) and *Saurida elongata.* Our redescriptions are based on Cressey and Cressey’s material.

The female and male of this copepod exhibit an elongate, slender habitus. There are several characteristics of this species that distinguish it from its congeners: (1) a truncate median process on the ventral surface of the labrum, (2) the accessory seta on the mandible longer than the second (shorter) blade, (3) a slightly curved maxilliped claw of the female bearing several rigid teeth along the inner (convex) margin, (4) the inflated first exopod segment of leg 1, (5) two lateral setae of terminal endopod segment of leg 1 greatly reduced with second seta overlapping third seta, (6) the dorsal corrugated pad on the first exopod segments of legs 3 and 4, and (7) the irregularly shaped second and third exopod segments of legs 3 and 4.
**Taeniacanthus miles** (Pillai, 1963), new combination

*Parataeniacanthus miles* Pillai, 1963:118.

**Material Examined.**—2 females and 1 male (USNM 190664) from *Pterois miles* from Trivandrum, India, collected by Dr. N. Krishna Pillai, 3 December 1960.

**Description.**—*Female:* Body as in Figure 42A. Total length 2.38 mm and greatest width 0.61 mm (0.60–0.61 mm) based on 2 specimens. Cephalothorax 564 × 620 μm, comprising more than 25% of total length. First pedigerous segment fused to cephalothorax (intersegmental area between cephalothorax and second pedigerous segment may be mistaken for distinct first pedigerous segment). Genital complex 184 × 271 μm. Abdomen 4-segmented; segments from anterior to posterior 253 × 216 μm, 235 × 212 μm, 170 × 166 μm, and 138 × 147 μm (l × w); anal segment (Figure 42b) with 2 rows of spines on each side of anteroventral surface and 2 short rows of spines near insertion of each caudal ramus. Caudal ramus (Figure 42a) 115 × 51 μm, apparently bearing 6 setae (setae broken off on specimen figured; arrows indicate position of broken setae).

Rostral area (Figure 42c) with sclerotized ventromedian part between bases of first antenna. First antenna (Figure 42c) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 42a) with first 2 segments each with 1 naked distal seta; last part comprised of fused segments and bearing 2 pectinate processes (longer one with small distal seta and shorter one with hyaline process at midlength). Genital segments (Figure 42a) with 1 unilaterally spinulated spine and 2 bilaterally flanged spines in addition to 3 inner pinnate setae. Endopod of leg 3 (Figure 44c) similar to that of leg 2 except bearing only 2 inner pinnate setae (terminal spine broken off in specimens examined). Endopod of leg 4 (Figure 44e) terminating in 2 spinulated spines and a long intermediate spine with 2 rows of bristles. Leg 5 (Figure 44f) with 2 segments; first segment with 1 pinnate dorsolateral seta and a short row of spines; second segment 173 × 69 μm (l × w), possessing 3 spines (outer sides spinulated, inner sides with transparent membranes) and 1 simple (plumose) seta; single row of spines at base of each spine and a row of larger spines on distomedial corner of segment. Leg 6 represented by 3 setae near area of egg sac attachment.

*Male:* Body as in Figure 45A. Total length 1.11 mm and greatest width 0.36 mm based on 1 specimen. Cephalothorax 282 × 338 μm (l × w), comprising approximately 25% of total length. Genital complex 152 × 133 μm (l × w). Abdomen 3-segmented; segments from anterior to posterior, 78 × 81 μm, 69 × 74 μm, and 60 × 62 μm (l × w); anal segment (Figure 45b) with 3 rows of spines on each side of anteroventral surface and 2 rows of spines near insertion of each caudal ramus. Caudal ramus similar to that of female except measuring 56 × 22 μm (l × w).

Maxilliped (Figure 45c) 4-segmented; first segment with 1 seta; corpus with 2 naked inner setae and 2 rows of spines (1 along entire length of corpus; other from setae to distal end of corpus); third segment small and unornamented; terminal segment, a curved claw bearing 2 setae (third seta not observed, but may have been broken off on specimen examined), 2 triangular processes, and many teeth along concave margin.

Legs 1–4 similar to those in female except distomeral corners of first two segments of endopods of legs 2–4 (Figure 45d–f) with spiniform processes. Endopod spines of legs 2 and 3 sharply pointed with outer spines bilaterally spinulated, but terminal spines of both legs naked. Longest spine (intermediate spine?) of leg 4 naked. Leg 5 similar to that in female, but measuring 68 × 23 μm (l × w).

**Remarks.**—This copepod was originally described as
Figure 42.—Taenioanthis miles (Pilai), female: A, dorsal; B, anal segment and caudal rami, ventral (arrows indicate positions of missing setae); C, rostral area and first antenna, ventral; D, second antenna, medial; E, postantennal process, ventral; F, labrum, ventral; G, mandible, anteromedial. (R = rostral area, hp = hyaline process.)
FIGURE 43.—Taeniaeacanthus miles (Pillai), female: A, paragnaths and labial area, posteroventral; B, first maxilla, anterior; C, second maxilla, posteroventral; D, maxilliped, ventromedial; E, maxilliped claw, dorsal; F, leg 1 and interpodal plate, ventral; G, leg 2, interpodal plate and proximal portions of basipods, ventral. (P = paragnath, Li = labium.)
FIGURE 44.—*Taeniacanthus miles* (Pillai), female: A, leg 2 and interpodal plate, ventral; B, leg 3, interpodal plate and proximal portions of basipods, ventral; C, leg 3 endopod, ventral (arrow indicates position of missing spine); D, leg 4, interpodal plate and proximal portions of basipods, ventral; E, leg 4, ventral; F, leg 5, ventral.
FIGURE 45.—Taeniacanthus miles (Pillai), male: A, dorsal; B, anal segment and caudal ramus, ventral; C, maxilliped, anterior; D, leg 2 endopod, ventral; E, leg 3 endopod, ventral; F, leg 4 endopod, ventral.
**Taeniacanthus moa** (Lewis, 1967), new combination

**Figures 46–49**


**Material Examined.** —From gills of *Ostracion lentiginosum*: 1 holotype female (USNM 112866) and 2 paratype females (USNM 112867) from Rabbit Island, adjacent of Oahu, Hawaii, collected in 1960 by A.G. Lewis; 44 females from same host (USNM 82806–82807) collected at Fiji Islands; 2 females from same host (USNM 19261) from Honolulu, Hawaii; and 2 females from same host (USNM 231984) from Hawaii.

**Description.** —*Female*: Body heavily sclerotized and form as in Figure 46A. Total length 0.99 mm (0.91–1.07 mm) and greatest width 0.54 mm (0.53–0.55 mm) based on 10 specimens. Cephalothorax 357 X 536 µm, comprising more than 30% of total length. Cephalothorax together with thoracic segments bearing legs 2, 3, and 4 forming an oval shaped dorsal shield. Genital complex (Figure 46B,C) twice as wide as long, 87 X 179 µm. Abdomen (Figure 46C) 3-segmented; segments from anterior to posterior 53 X 129 µm, 53 X 113 µm, and 60 X 94 µm (l X w); anal segment (Figure 46D) with 3 rows of stout spinules on each side of anteroventral surface and 1 row of smaller spinules on posteroverentral margin near insertion of each caudal ramus. Caudal ramus (Figure 46D) stout, 41 X 28 µm, bearing 4 subterminal setae (semipinnate seta with minute spines at base) and 2 large terminal setae (each with single longitudinal row of spinules and bristles). Egg sac (drawn at same magnification as dorsal aspect of body) as in Figure 46E.

Rostral area (Figure 47A) somewhat triangular with ventromedian sclerotized part in shape of inverted T. First antenna (Figure 47B) 7-segmented; articular formula: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 47C) 3-segmented; last segment with long pectinate process bearing rounded process on distolateral region and 1 naked seta on distomedial portion; shorter pectinate process with hyaline seta; 3 spines, and 4 setae. Postantennal process (Figure 47D), slender and curved.

Labrum (Figure 47E) with rounded, spinulated posterior margin and single row of spinules on midventral surface. Mandible (Figure 47F) with 2 unequal blades, each spinulated along 1 margin; shorter blade with pinnate seta at base. Paragnath (Figure 47G) a process with a short row of spinules near base and a group of short hairs near apex. First maxilla (Figure 47H), a lobe bearing 2 large naked setae, 1 semipinnate seta, and 2 small naked setae. Second maxilla (Figure 48A) 2-segmented; terminal process with spinules and 1 naked spine and 1 bristled spine at its base. Maxilliped (Figure 48B–D) with robust corpus bearing 2 naked setae; terminal segment bearing curved claw and conical process; claw with minute spinules on distolateral (convex) margin and 1 small naked seta at base on anterior surface (Figure 48C); conical process with semipinnate seta near apex on posterior side (Figure 48D).

Legs 1–4 (Figures 48E,F, 49A–E) biramous. Spinal and setal formula as follows:

| P1 | coxa 0-1 basis 1-1 exopod 1-0; 9 endopod 0-1; 7 |
| P2 | coxa 0-0 basis 1-0 exopod 1-0; 1-1; II, 1, 4 endopod 0-1; 0-1; II, 1, 3 |
| P3 | coxa 0-0 basis 1-0 exopod 1-0; 1-1; II, 1, 4 endopod 0-1; 0-1; II, 1, 2 |
| P4 | coxa 0-0 basis 1-0 exopod 1-0; 1-1; II, 1, 4 endopod 0-1; 0-1; II, int. |

Interpodal plate of leg 1 (Figure 48E) broad, with spinules on posterior border, coxa and basis with numerous rows of small spinules. Posterior border of basis with row of large and small spinules forming continuous series near insertion of endopod. Interpodal plate of leg 2 (Figure 48F) with patches of spinules of various sizes; coxa with outer rounded protrusion, 2 rows of minute spinules; and a row of large spinules near junction with basis; basis with large, heavily sclerotized outer seta, an inner row of long spinules near interpodal plate, and rows of spinules near insertion of endopod. Exopod spinules of legs 2–4 each with row of spinules at base, serrations (or spinules) along outer margin, and a subterminal flagellum; endopod spines without flagella. Basis of leg 4 (Figure 49C) without inner patch of spinules near interpodal plate. Leg 4 exopod (Figure 49D) with comparatively long spines. Leg 5 (Figure 49F) with 2 segments; first segment with ventrolateral row of spinules and a dorsolateral whip-like seta; second segment, 81 X 41 µm (l X w), with 3 unilaterally bristled spines, 1 long, slender naked seta, and a patch of spinules on inner margin; spines

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**Note:** The above text is a natural representation of the document content. It is a detailed description of the specimen *Taeniacanthus moa*, including its morphology and the details of its appendages and body parts.
Figure 46.— *Taeniostomus moa* (Lewis), female: A, dorsal; B, genital area, dorsal; C, urosome, dorsal; D, anal segment and caudal ramus, ventral; E, egg sac, dorsal.
FIGURE 47.—*Taeniacthus moa* (Lewis), female: A, rostral area, ventral; B, first antenna, ventral; C, second antenna, medial; D, postantennal process, ventral; E, labrum, ventral; F, mandible, anteromedial; G, paragnath, posteroventral; H, first maxilla, anterior.
Figure 48.—*Taeniocanthus moa* (Lewis), female: A, second maxilla, posteroventral; B, maxilliped, anterior; C, maxilliped claw, anterior; D, same, posterior; E, leg 1 and interpodal plate, ventral; F, leg 2 and interpodal plate, ventral.
FIGURE 49.—*Taeniacanthus moa* (Lewis), female: A, leg 3, interpodal plate and proximal portions of basipods, ventral; B, leg 3 endopod, ventral; C, leg 4, interpodal plate and proximal portions of basipods, ventral; D, leg 4 exopod, ventral; E, leg 4 endopod, ventral; F, leg 5, ventral.
and seta with comb-like spinules at bases. Leg 6 (Figure 46B) represented by 3 setae near area of egg sac attachment, innermost seta about half length of outer 2.

**Male:** Unknown.

**Remarks.**—*Taeniacanthus moa* was described under the binomen *Anchistrotos moa* by Lewis (1967) from specimens collected from *Ostracion lentiginosum* near Oahu, Hawaii. This species of parasite was subsequently reported from the gills of *Ostracion cubicus* (reported as *O. tuberculatus* Linnaeus) from Heron Island, Great Barrier Reef, Australia (Ho and Dojiri, 1976).

As mentioned by Lewis, *T. moa* is most closely related to *T. ostracionis* (Richiardi, 1870). The relationship is suggested by the presence of a transverse sclerotized bar along the dorsal surface of the cephalothorax, the armature of the second antenna, the oral appendages, and the nature of the exopod spines of legs 2–4. The body of *T. moa* is much more highly sclerotized than *T. ostracionis*, and the terminal exopod segment of leg 3 of *T. moa* has the formula II, 1, 4 instead of II, 1, 5 in *T. ostracionis*. Also the basal process of the maxilliped claw is much more pronounced in *T. moa* than in *T. ostracionis*.

*Taeniacanthus narcini* Pillai, 1963

*Taeniacanthus narcini* Pillai, 1963: 114.

**Description.**—**Female:** See Pillai (1963).

**Male:** Unknown.

**Remarks.**—This species is known only from the original description by Pillai (1963). Two females of *Taeniacanthus narcini* were collected by the discoverer from the gills of *Narcine timlei* (Bloch and Schneider) at Trivandrum, India.

The maxilliped is rather unusual for *Taeniacanthus*. It is described by Pillai as “a triangular chitinous plate with one distal and two proximal setae, claw absent.” For a discussion of this appendage of *T. narcini*, see “Remarks” for *Taeniacanthus* in this paper.

Although Pillai (1963) described only three setae on the second segment of leg 5, the fourth seta is most likely present in this species as in all congeners. The seta was probably broken off in the specimens examined by Pillai.

This species apparently has the armature formula of III, 1, 5 on the terminal exopod segment of leg 2. Only two congeners, *T. cynglossi* (Rangnekar and Murti, 1960) and *T. longicaudus* Pillai, 1963, exhibit the same armature formula for this segment. The type specimens of all three species must be redescribed in detail before a morphologic comparison can be adequately made. The generic status of these three taeniacanthids is still questionable.

*Material Examined.*—4 females from *Parapercis sexfasciatus* (Temminck and Schlegel) from Kobe Market, Japan; 5 females from *P. sexfasciatus* from Japan.

**Description.**—**Female:** Body as in Figure 50A. Total length 1.34 mm (1.25–1.54 mm) and greatest width 0.52 mm (0.50–0.56 mm) based on 6 specimens. Cephalothorax 357 × 526 μm (l × w), comprising approximately 25% of total length. Thoracic segments bearing legs 2, 3, and 4 decreasing in width posteriorly. Genital complex wider than long, 97 × 138 μm. Abdomen 4-segmented; segments from anterior to posterior 92 × 104 μm, 78 × 97 μm, 60 × 90 μm, and 78 × 83 μm (l × w); anal segment (Figure 50B) unornamented. Caudal ramus (Figure 50B) 62 × 30 μm, bearing 6 setae; innermost seta with single row of short spinules.

**Rostral area** (Figure 50C) with ventromedian sclerotized part. First antenna (Figure 50C) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 50D) apparently 4-segmented; first and second segments each with distal seta; third segment with 2 pectinate processes (shorter one with small naked seta) and 1 stout spine; fourth segment with 2 stout spines and 4 setae. Postantennal process (Figure 50E) sharp and curved.

**Labrum** (Figure 50F) with median, hyaline, lobiiform process and spinulated posterior margin. Mandible (Figure 51A) with extremely unequal blades, each spinulated along 1 margin, and an accessory seta. Paragnath (Figure 51B) a curved digitiform process. First maxilla (Figure 51C) a lobe bearing 2 bristled and 2 smaller naked setae in addition to anterior knob. Second maxilla (Figure 51D) 2-segmented; first segment with distal rounded protrusion; second segment with proximal rounded protrusion, a spinulated terminal process, a spinulated spine, and 1 naked seta. Maxilliped (Figure 51E) 3-segmented; first segment with dorsal seta; second segment (corpus) with 2 naked setae; terminal segment a curved claw bearing large outer teeth (7 in figure), 1 large and 1 smaller conical processes, and 1 minute hyaline seta at base.

**Legs 1–4** (Figures 51G,H, 52A–F) biramous. Spinal and setal formula as follows:

<table>
<thead>
<tr>
<th>Leg</th>
<th>Coxa</th>
<th>Basis</th>
<th>Exopod</th>
<th>Endopod</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>0-1</td>
<td>1-1</td>
<td>1-0</td>
<td>0-1; 9</td>
</tr>
<tr>
<td>P2</td>
<td>0-0</td>
<td>1-0</td>
<td>1-0</td>
<td>0-1; 7</td>
</tr>
<tr>
<td>P3</td>
<td>0-0</td>
<td>1-0</td>
<td>1-0</td>
<td>0-1; 1-1, 1, 5</td>
</tr>
<tr>
<td>P4</td>
<td>0-0</td>
<td>1-0</td>
<td>1-0</td>
<td>0-1; 0-1-1, 1-1, 2</td>
</tr>
</tbody>
</table>

Interpodal plates of legs 1–4 (Figures 51G,H, 52D) with spinules on posterior margins. Interpodal plate of leg 1 with convex posterior margin indented at midline. Plates of legs 2–4 reentrant. Coxa of leg 1 (Figure 51G) with proximal conical process near insertion of coxal seta. Coxae and bases of legs 2–4 ornamented as in Figures 51H, 52D. Exopod
FIGURE 50.—*Taeniacanthus neopercis* Yamaguti, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area and first antenna, ventral; D, second antenna, medial; E, postantennal process, ventral; F, labrum, ventral. (R = rostral area.)
Figure 51.—Taeniacanthus neopercis Yamaguti, female: A, mandible, anteromedial; B, paragnath, dorsal; C, first maxilla, anterior; D, same, posterior; E, second maxilla, posteroverentral; F, maxilliped, ventromedial; G, leg 1 and interpodal plate, ventral; H, leg 2, interpodal plate and basipod, ventral.
FIGURE 52.—Taenia canthus neopercis Yamaguti, female: A, leg 2 exopod, ventral; B, leg 2 endopod, ventral; C, leg 3, terminal endopod segment, ventral; D, leg 4, interpodal plate and basipod, ventral; E, leg 4 exopod, ventral; F, leg 4 endopod, ventral; G, leg 5, dorsal; H, same, ventral.
spines of legs 2 and 3 with striated outer membranes. Exopod of leg 4 with conical protrusion on distolateral corner of terminal segment; exopod spines of leg 4 sparsely bristled on outer margins. Endopod spines of legs 2–4 with striated outer flanges. Spinules on outer margins of exopod and endopod segments of legs 2–4 minute and very difficult to see. Leg 5 (Figure 52g,h) with 2 segments; first segment small, unornamented, and bearing 1 dorsal naked seta; second segment 99 × 42 μm (l × w), bearing 3 apically rounded spines (spinulated only on distomedial margins) and 1 naked seta; each spine with row of spinules at base. Leg 6 represented by 3 setae in area of egg sac attachment.

**Male:** Unknown.

**Remarks.**—*Taeniacanthus neopercis* was described by Yamaguti (1939) from females collected from the gills of four species of *Neoperca* (a genus now considered a junior synonym of *Paraperca*), *N. aurantiaca* (Döderlein), *N. multifasciata* (Döderlein), *N. muronis* Tanaka, and *N. sexfasciata* (Temminck and Schlegel). The last-named species is synonymous with *Paraperca sexfasciatus*, the species of host from which our material was collected. All specimens are known from Japan.

Five species of *Taeniacanthus* in addition to *T. neopercis* lack ornamentation (spinules) on the ventral surface of the anal segment. They are *T. acanthocephalota* Yamaguti, 1939; *T. nudicauda*, new species; *T. petilus*, new species; *T. pteroisi* Shen, 1957; and *T. sauridae* Yamaguti and Yamasu, 1959. The maxilliped claw of the females may be used to distinguish these species.

The maxilliped claw of *T. neopercis* is most similar in structure to that of *T. pteroisi*: both species have numerous large teeth on the convex surface of a curved claw. These two species can be distinguished from each other by the second antenna, mandible (accessory seta absent in *T. pteroisi*), and second maxilla. The spines of the second segment of leg 5 are blunt in *T. neopercis*, but sharply pointed in *T. pteroisi*.

**Taeniacanthus nudicauda**, new species

**Figures 53–55**

**Material Examined.**—1 female holotype (USNM 228405), 1 allotype (USNM 228406), and 9 paratypes (females) (USNM 228407) from gill cavity of *Cirrhites albopectus* Ogilby collected from Terere Pool, Mangaia, Cook Islands (21°54’30”S, 157°58’00”W), 6 May 1958. Parasitic copepods removed from host by J. T. Williams.

**Description.**—**Female:** Body as in Figure 53A. Total length 1.07 mm (1.01–1.12 mm) and greatest width 0.51 mm (0.48–0.54 mm) based on 10 specimens. Cephalothorax wider than long, 320 × 498 μm, and comprising more than 25% of total body length. Thoracic segment bearing leg 2 much wider than those bearing legs 3 and 4. Genital complex much wider than long, 81 × 124 μm. Abdomen 4-segmented; segments from anterior to posterior 71 × 92 μm, 60 × 81 μm, 51 × 69 μm, and 60 × 55 μm (l × w); anal segment (Figure 53B) without spinules. Caudal ramus (Figure 53B) almost 2X longer than wide, 41 × 22 μm, and with usual 6 setae.

Rostral area (Figure 53C) with ventromedian sclerotized part. First antenna (Figure 53C) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthete, 7 + 1 aesthete. Second antenna as in *Taeniacanthus comparatus*, new species. Postantennal process (Figure 53D) with curved tine.

Labrum (Figure 53E) bearing single pair of lateral digitiform processes, row of minute spines, and a postmedian hyaline process. Mandible (Figure 53F) armed with 2 slightly subequal blades, each spinulated along 1 margin, and a bristled accessory seta. Paragnath (Figure 53G) a slender, unornamented lobe. First maxilla (Figure 53H) possessing 4 bristled setae and 1 very small, naked seta. Second maxilla (Figure 53I) 2-segmented; first segment a sclerotized area; second segment with slender, spinulated terminal process, 1 slender bristled spine, and 1 seta. Maxilliped (Figure 54A,B) 3-segmented; first segment with a few spinules and usual naked seta; second segment (corpus) bearing 2 relatively large, naked setae; third segment a claw, bent at midlength, with large conical projection, a rounded process, and semipinnate seta; distal portion of claw with several transparent flanges along convex margin.

Legs 1–4 (Figures 54C–H, 55A) biramous. Spinal and setal formula as follows:

\[
\begin{align*}
P_1 & : \text{coxa } 0-0 & \text{basis } 1-1 & \text{exopod } 1-0; 9 \\
P_2 & : \text{coxa } 0-0 & \text{basis } 1-0 & \text{exopod } 1-0; 1-1; II, I, 5 \\
P_3 & : \text{coxa } 0-0 & \text{basis } 1-0 & \text{exopod } 1-0; 1-1; II, I, 3 \\
P_4 & : \text{coxa } 0-0 & \text{basis } 1-0 & \text{exopod } 1-0; 1-1; II, I, 5 \\
\end{align*}
\]

Interpodal plates of legs 1–4 (Figure 54C,D,E,F,H) with spinules on posterior margins; spinules of leg 1 in 2 oval patches; spinules of leg 2 (Figure 54I) loosely spaced. Coxa of leg 1 (Figure 54C) with relatively large hyaline process near junction with basis. Coxae and bases of legs 1–4 bearing rows of spinules. Inner margin of basis of leg 2 (Figure 54D,E) ornamented with patch of spinules; leg 3 with single row of spinules (Figure 54F); and leg 4 without spinules on inner margin of basis (Figure 54H). Exopod spines of legs 2–4 not heavily sclerotized. Terminal exopod segment of leg 4 (Figure 55A) subtriangular and bearing minute tubercle on distolateral corner; endopod spines with flanges on outer margins. Leg 5 (Figure 55B) with 2 segments; first segment with 2 curved ventral rows of spinules and 1 long whip-like dorsolateral seta; second segment 87 × 34 μm (l × w), with distomedial row of long spinules and rows of shorter spinules at bases of usual 4 setae (3 setae sclerotized at bases and bristled). Leg 6 represented by 3 setae in area of egg sac attachment.
Figure 53.—*Taeniaeana* sp. new species, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area and first antenna, ventral; D, postantennal process, ventral; E, labrum, ventral; F, mandible, anteromedial; G, paragnath, dorsomedial; H, first maxilla, posterior; I, second maxilla, ventral.
FIGURE 54.—Taeniocanthus nudicauda, new species, female: A, maxilliped, ventral; B, same, dorsolateral; C, leg 1 and interpodal plate, ventral; D, leg 2, interpodal plate and proximal portions of basipods, ventral; E, leg 2, ventral; F, leg 3, interpodal plate and proximal portions of basipods, ventral; G, leg 3 endopod, ventral; H, leg 4, interpodal plate and proximal portions of basipods, ventral.
FIGURE 55.—*Taeniaeuchus nudicauda*, new species. Female: A, leg 4, ventral; B, leg 5, ventral. Male: C, dorsal; D, maxilliped, anterior; E, same, posterior; F, leg 2 endopod, ventral; G, leg 3 endopod, ventral.
Male: Body as in Figure 55c. Total length 0.68 mm and greatest width 0.25 mm based on 1 specimen. Cephalothorax 184 × 250 μm (l × w), and comprising more than 25% of total body length. Genital complex slightly longer than wide 90 × 83 μm. Abdomen 3-segmented; segments from anterior to posterior 51 × 55 μm, 48 × 48 μm, and 41 × 44 μm (l × w); anal segment as in female. Caudal ramus similar to that in female except smaller, 27 × 15 μm. 

Maxilliped (Figure 55d) 4-segmented; first segment with 1 naked distal seta; second segment (corpus) bearing 2 bristled setae on inner margin, 1 patch of large denticles on anteromedial surface, 1 patch of small spinules on anterior surface, 2 large isolated denticles on anteromedial surface at proximal end, and 1 row of spinules on posterior surface; third segment small and unornamented; fourth segment a curved claw with 2 anterior setae, 1 large posterior seta; concave margin of claw with single row of small spinules or teeth followed by a few larger teeth, and tipped with a few small spinules.

Second endopod segment of leg 2 and second and third endopod segments of leg 3 with lateral subconical outgrowths (Figure 55f.g); third endopod segment of leg 2 with lateral digitiform process. Leg 5 as in female except smaller, 65 × 23 μm (l × w). All other appendages as in female.

ETYMOLOGY.—The specific name nudicauda, from the Latin nudus (naked), plus cauda (tail), alludes to the unornamented anal segment of this species.

REMARKS.—The combination of the absence of ornamentation on the ventral surface of the last abdominal segment, the presence of several rows of spinules on both pectinate processes on the second antenna, and a strongly bent maxilliped claw of the female distinguishes Taeniacanthus nudicauda, new species, from its congeners.

In addition to T. nudicauda, six species of Taeniacanthus are parasitic on the blenny genera Cirrhipetes and Exallias. These species, T. digitatus, T. comparatus, T. glomerous, T. papulosus, T. pollicaris, and T. williamsi, possess a papilla on the first maxilla. Taeniacanthus nudicauda can be distinguished from these closely related species by the absence of the papilla.

Taeniacanthus occidentalis (Wilson, 1924), new combination

FIGURES 56, 57


MATERIAL EXAMINED.—5 females (USNM 54138) and 3 females (USNM 56613) from gills of Alutera schoepfi (Walbaum) collected at Woods Hole, Massachusetts, 13 July 1911 and 24 August 1926. Both lots labeled as "type-material." 24 females from 4 lots obtained from Alutera schoepfi (Walbaum) from Charlotte Harbor, Florida. 3 females from Alutera heudelotii off Sanibel, Florida.

DESCRIPTION.—Female: Body as in Figure 56a. Total length 1.71 mm (1.58–1.84 mm), greatest width 0.56 mm (0.54–0.59 mm) based on 3 type specimens. Cephalothorax wider than long, 432 × 611 μm, and comprising approximately 25% of total body length. Thoracic segments bearing legs 2, 3, and 4 decreasing slightly in width posteriorly. Genital complex wider than long, 133 × 202 μm. Abdomen 4-segmented; segments from anterior to posterior 101 × 152 μm, 78 × 129 μm, 41 × 115 μm, and 78 × 101 μm (l × w); anal segment (Figure 56b) with 4 rows of large spinules on each side of anterventral surface and 1 short row of small spinules on posteroventral margin near insertion of each caudal ramus. Caudal ramus (Figure 56b) 64 × 35 μm (l × w), and bearing usual 6 setae.

Postantennal process as described for Charlotte Harbor specimens (see below). Maxilliped (Figure 56c) without conical process on inner margin of base of claw.

Terminal exopod segment of leg 2 (Figure 56d) without prominent lobe on distolateral corner; terminal exopod spine (spine 3 of terminal segment) relatively much longer than in Taeniacanthus balistae. Leg 4 (Figure 56e) with terminal segment not as slender and elongate as in T. balistae; exopod spines heavily sclerotized, serrated and each spine tipped with flagellum. Leg 5 as in Charlotte Harbor specimens (see below).

All other appendages as in T. balistae.


Female Variant: Specimens collected from Charlotte Harbor, Florida, differ slightly from the above description. Body as in Figure 57a.

Anal segment (Figure 57b) with only 3 rows of spinules on each side of anteroventral surface; spinules near base of caudal ramus absent. Postantennal process (Figure 57c) strongly curved.

Leg 4 exopod (Figure 57d) bearing outer setae (not spines). Leg 5 (Figure 57e) similar to that described for T. balistae, except ventromedial patch of spinules sparse.

REMARKS.—This species was first described as Anchistrotos occidentalis by Wilson (1924) from the gills of the orange filefish Alutera schoepfi collected at Woods Hole, Massachusetts. Wilson (1932) subsequently gave a brief second account of this species. A detailed redescriptions was published by Humes and Rosenfield (1960) based on 50 females and 1 male from the type host from Woods Hole.

Taeniacanthus occidentalis is morphologically similar to T. balistae (Claus, 1864) and T. similis, new species. All three species are parasites of tetraodontiform fishes. Taeniacanthus occidentalis may be distinguished from T. balistae by the absence of a rounded process at the base of the maxilliped claw of the female. It may be distinguished from T. similis by the presence of three to four rows of spinules on each side of the ventral surface of the anal segment (T. similis...
FIGURE 56.—Taeniacanthus occidentalis (Wilson), female: A, dorsal; B, anal segment and caudal rami, ventral; C, maxilliped, posterior; D, leg 2, terminal exopod segment, ventral; E, leg 4 exopod, ventral.
Figure 57.—*Taeniocanthus occidentalis* (Wilson), female: A, dorsal; B, anal segment and caudal rami, ventral; C, postantennal process, ventral; D, leg 4, ventral; E, leg 5, ventral.
with seven to eight rows of spinules on each side) and the length of the innermost spine of the terminal exopod segment of leg 2. This spine is at least twice the length of the outermost spine of the same exopod segment in *T. occidentalis*, but much less than twice the length in *T. similis*.

**Taeniacanthus ostracionis** (Richardi, 1870), new combination

**FIGURES** 58-61

*Bomolochus ostracionis* Richardi, 1870:49.

**MATERIAL EXAMINED.**—11 females from the gill areas of *Lactoria cornuta* Linnaeus (USNM 176885) Queensland, Australia.

**DESCRIPTION.**—Female: Body form as in Figure 58A. Total length 1.08 mm (0.93–1.33 mm), width 0.55 mm (0.50–0.65 mm), based on 10 specimens. Cephalothorax 400 × 534 μm (l × w), comprising about 40% of total body length. Thoracic segments bearing legs 2–4 decreasing in width posteriorly. Segment bearing leg 5, genital complex, abdomen, and caudal rami as in Figure 58C. Genital complex nearly twice as wide as long, 92 × 166 μm; dorsolateral margin as in Figure 58C. Abdomen 3-segmented; segments from anterior to posterior 60 × 127 μm, 58 × 115 μm, and 87 × 97 μm (l × w); anal segment (Figure 58D) with 3 rows of stout spines on each side of anteroventral surface and single row near posteroventral margin near insertion of each caudal ramus. Caudal ramus (Figure 58D) longer than wide, 58 × 30 μm, with 6 setae arranged as in figure.

Egg sac oval, containing about 70 eggs.

Rostral area (Figure 59A) with ventromedian sclerotized part wide anteriorly, narrowing abruptly, then forming a roughly diamond-shaped structure. First antenna (Figure 59A) 6-segmented; formula for armature: 5, 15, 8, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 58E) 3-segmented with last portion consisting of 2 fused segments and bearing 2 pectinate processes (each with 1 seta), 3 spines, and 4 setae. Postantennal process (Figure 59B) slightly curved.

Labrum (Figure 59C) with median and posterior rows of spinules. Mandible (Figure 59D) with unequal blades, each spinulated along 1 margin, and a subterminal seta with short pinnules. Paragnath (Figure 59E) small with few spinules at tip, a hyaline inner edge, and posterior edge heavily sclerotized. First maxilla (Figure 59F) with 5 setae as in figure. Second maxilla (Figure 59G,H) 2-segmented; second segment (Figure 59H) bearing a short, naked subterminal seta, a longer spinulated spine, and a long terminal process bearing 2 rows of spines. Maxilliped (Figure 60A–C) apparently 2-segmented; first segment (corpus) with 2 naked setae; terminal claw as long as corpus; base of claw heavily sclerotized with inner portion protruding and bearing a short semipinnate seta; tip of claw somewhat curved and serrate at tip (see Figure 60B,C).

Legs 1–4 (Figures 60D–F, 61A–D) biramous. Spinal and endopod 0-1; 0-0 2-segmented; second endopod 0-1; 0-1; II, I, 4 endopod 0-1; 0-1; II, 1, 3

**P**₂ coxa 0-0 basis 1-0 exopod 1-0; I-1; II, I, 4 endopod 0-1; 0-1; II, I, 5 endopod 0-1; 0-1; II, I, 2

**P**₃ coxa 0-0 basis 1-0 exopod 1-0; I-1; II, I, 4 endopod 0-1; 0-1; II, int.

Interpodal plate of leg 1 (Figure 60B) triangular with 3 to 4 rows of stout spines on distal portion. Ventral surface of coxa and basis of leg 1 with small patches of spinules as in figure; row of spines along ventral margin at base of endopod. Interpodal plate of leg 2 (Figure 60E) with a double row of stout spines (absent at midline); coxa with rows of spines on ventral surface; basis with rows of spines along posterior margin (innermost with much longer spines); segments of rami with outer and distal rows of spines. Leg 3 (Figure 61B) similar to leg 2 except interpodal plate (Figure 61A) with more rows of spinules and differences in spinal and setal formula of rami. Leg 4 interpodal plate as in Figure 61B; rest of leg as in leg 2 except coxa with median row of spinules and reduced armature of endopod as in figure. Leg 5 (Figure 61E) second segment about twice as long as wide, 92 × 44 μm; second segment with 2 stout outer spines, a terminal seta and a stout terminal spine (rows of stout spines at bases of spines). Leg 6 represented by 3 setae at area of egg sac attachment (Figure 58B).

Male: Unknown.

**REMARKS.**—This species was first described as *Bomolochus ostracionis* by Richardi (1870) from *Ostracion cornutus* (now considered *Lactoria cornuta*) collected near Mozambique. Wilson (1911) transferred *B. ostracionis* to *Anchistrotos*. Our revised diagnoses of *Anchistrotos* and *Taeniacanthus* indicates that this species should be removed from the former genus and included in *Taeniacanthus*.

*Taeniacanthus ostracionis* is morphologically most similar to *T. moa*. Both species have a transverse sclerotized bar along the cephalothorax. They also have other morphologic characters in common. A discussion on these two species is presented in the “Remarks” for *T. moa*.

**Taeniacanthus papulosus**, new species

**FIGURES** 62-64

**MATERIAL EXAMINED.**—1 female holotype (USNM 228408), 1 allotype (USNM 228409), and 7 paratypes (females) (USNM 228410) from gill cavity of *Exallias brevis* (Kner) collected at Fiji by Winterbottom and Emery; 6
FIGURE 58.—Taeniacanthus ostracionis (Richiardi), female: A, dorsal; B, genital area, dorsal; C, urosome, dorsal; D, anal segment and caudal ramus, ventral; E, second antenna, medial.
FIGURE 59.—Taeniacanthus ostracions (Richardi), female: A, rostral area and first antenna, ventral; B, postantennal process, ventral; C, labrum, ventral; D, mandible, anteromedial; E, paragnath, ventromedial; F, first maxilla, anterior; G, second maxilla, posteroventral; H, second maxilla, terminal segment, anterior.
FIGURE 60.—*Taeniacthys ostracionis* (Richardi), female: A, maxilliped, posterior; B, maxilliped claw, posteroverentral; C, same, antoverentral; D, leg 1 and interpodal plate, ventral; E, leg 2 and interpodal plate, ventral; F, leg 2, spine of first exopod segment, ventral.
Figure 61.—*Taeniacanthus ostracionis* (Richardi), female: A, leg 3, interpodal plate and proximal portions of basipods, ventral; B, leg 3, ventral; C, leg 4 endopod, ventral; D, leg 4, interpodal plate and proximal portions of basipods, ventral; E, leg 5, ventral.
Figure 62.—*Taeniacthus papulosus*, new species, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, mandible, anterior; D, paragnath, dorso medial; E, first maxilla, posterior; F, second maxilla, poster oventral; G, second maxilla, terminal segment, ventrolateral; H, maxillipeds, ventromedial; I, maxillipeds claw, dorsal; J, same, ventromedial. (pt = rounded protuberance, pr = rounded protrusion.)
FIGURE 63.—*Taeniacanthus papulosus*, new species, female: A, leg 1 and interpodal plate, ventral; B, leg 2, interpodal plate and proximal portions of basipods, ventral; C, leg 2, ventral; D, leg 3 endopod, ventral; E, leg 4, interpodal plate and proximal portions of basipods, ventral.
Figure 64. — *Taeniocaridus papulosus*, new species. Female: A, leg 4, terminal exopod segment, ventral; B, leg 4 endopod, ventral; C, leg 5, ventral. Male: D, dorsal; E, maxilliped, anterior; F, same, posterior; G, leg 2 endopod, ventral; H, leg 3 endopod, ventral; I, leg 5, ventral.
females from *Exallias brevis* collected at Lizard Island, Queensland, Australia (14°35'S, 145°36'E). Parasitic copepods removed from hosts by J.T. Williams.

**DESCRIPTION.**—*Female:* Body as in Figure 62A. Total length 1.38 mm (1.35–1.47 mm) and greatest width 0.65 mm (0.60–0.71 mm) based on 8 specimens. Cephalothorax wider than long, 320 × 564 μm, and comprising about 25% of total body length. Thoracic segments bearing legs 2, 3, and 4 decreasing in width posteriorly. Genital complex 108 × 80 μm (l × w). Abdomen 3-segmented; segments from anterior to posterior 83 × 115 μm, 78 × 97 μm, 46 × 87 μm, and 64 × 74 μm (l × w). Abdomen 4-segmented; segments from anterior to posterior 48 × 55 μm, 41 × 48 μm, and 34 × 39 μm (l × w); anal segment (Figure 62B) with 1 curved row of spines on each side of anteroventral surface and 1 row of spines near insertion of each caudal ramus. Caudal ramus (Figure 62B) longer than wide 41 × 26 μm, and bearing usual 6 setae.

Rostral area, first antenna, second antenna, postantennal process, and labrum as in *Taeniacanthus nudicauda*. Mandible (Figure 62C) with 2 slightly subequal spinulated blades (subterminal blade bilaterally spinulated at distal end) and 1 short, stout accessory spine. Paragnath (Figure 62D) tipped with small tubercle. First maxilla (Figure 62E) a lobe bearing 5 naked setae and 1 hyaline digitiform process. Second maxilla (Figure 62F,G) 2-segmented; first segment a large sclerotized area; second segment with inner spiniform process, spinulated terminal process, 1 spinulated spine, and 1 short weak spine (seta?). Maxillipeds (Figure 62H–J) 2-segmented with first and second segments fused; basal area of first segment with usual distal seta and corpus with 2 naked setae; terminal segment a curved claw (Figure 62J) with 2 rounded protrusions flanking 1 naked seta at base, 1 rounded protuberance on outer margin of claw near base, and numerous hyaline transverse membranes (corrugated pad) along convex margin.

Legs 1–4 (Figures 63A–E, 64A,B) biramous. Spinal and setal formula as follows:

- **P₁** coxa 0-1 basis 1-1 exopod 1-0; 9 endopod 0-1; 7
- **P₂** coxa 0-0 basis 1-0 exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-2; II, 1, 3
- **P₃** coxa 0-0 basis 1-0 exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-2; II, 1, 3
- **P₄** coxa 0-0 basis 1-0 exopod 1-0; 1-1, II, 1, 5 endopod 0-1; 0-1; 1-0, II, int.

Interpodal plates of legs 1–4 (Figure 63A,B,E) with spinules on posterior margins; interpodal plate of leg 4 (Figure 63E) much more slender than those in preceding legs. Coxa of leg 1 (Figure 63A) with 1 hyaline process and 2 conical spiniform processes near coxal seta and interpodal plate. Coxae and bases of legs 1–4 ornamented with rows of spinules. Inner margins of bases of legs 2 and 3 (see Figure 63B) each with large patch of spinules. Leg 4 without spinules on inner margin of basis (Figure 63E). Exopod spines of legs 2–4 long, slender, and not heavily sclerotized. Terminal exopod segments of legs 2–4 each with slight protuberance on distolateral corner; this area bearing hyaline process and 2 minute tubercules in leg 4 (Figure 64A). Endopod spines with flanges on outer margins. Leg 5 (Figure 64C) 2-segmented; first segment with 2 curved ventral rows of spinules and 1 dorsolateral seta; second segment 91 × 38 μm (l × w), with distomedial row of long spinules and 4 rows of shorter spines at bases of 4 setae. Leg 6 represented by 3 setae in area of egg sac attachment.

**Male:** Body as in Figure 64D. Total length 0.62 mm, greatest width 0.19 mm based on 1 specimen. Cephalothorax 163 × 191 μm, comprising approximately 25% of total body length. Genital complex 108 × 80 μm (l × w). Abdomen 3-segmented; segments from anterior to posterior 48 × 55 μm, 41 × 48 μm, and 34 × 39 μm (l × w); anal segment as in female. Caudal ramus similar to that in female, 24 × 15 μm; outer terminal seta (Figure 64D) sclerotized at base (spiniform) and tipped with setiform element.

Maxilliped (Figure 64E,F) 4-segmented; first segment with usual distal seta; second segment (corpus) bearing 2 naked setae and 2 rows of spinules; third segment small and unornamented; fourth segment a curved claw armed with 2 anterior setae, 1 large posterior seta, and 2 proximal rows of small teeth followed by single row of increasingly larger teeth and tipped with a few small teeth.

Legs 2 and 3 endopods (Figure 64G,H) armed with rounded processes on outer margins of second and third segments, and long, slender spines. Leg 5 (Figure 64I) similar to that in female except smaller; second segment 46 × 14 μm (l × w).

**ETYMOLOGY.**—The specific name *papulosus*, Latin for pimply or covered with pustules, alludes to the small conical process at the tip. Four congeners share this character: *T. anguillaris* (Devi and Shyamasundari, 1980); *T. miles* and *T. nudicauda*, new species; and *T. pollicaris*, new species.

**REMARKS.**—*Taeniacanthus pectinatus* Yamaguti and Yamasu, 1959 has a strongly curved maxilliped claw of the female with a bluntly rounded tip. Four congeners share this character: *T. anguillaris* (Devi and Shyamasundari, 1980); *T. miles* (Pillai, 1963); *T. nudicauda*, new species; and *T. pollicaris*, new species. *Taeniacanthus papulosus* may be distinguished from *T. nudicauda* and *T. anguillaris* by the absence of the conical process at the base of the maxilliped claw of the female. *Taeniacanthus pollicaris*, as the specific name implies, has a much stouter maxilliped claw of the female than *T. papulosus*. Finally, *T. papulosus* may be distinguished from *T. miles* by the presence of several rows of spinules on both pectinate processes of the second antenna (only a single row on each process in *T. miles*).

*Taeniacanthus pectinatus* Yamaguti and Yamasu, 1959

**DESCRIPTION.**—*Female:* See Yamaguti and Yamasu (1959).

**Male:** Unknown.
**Remarks.**—This species was first described by Yamaguti and Yasasu (1959) from one female parasitic on the gills of Sphoeroides sp. collected in the Inland Sea, Japan.

The second maxilla and maxilliped of the females of Taeniacanthus pectinatus and T. yamagutii (Shiino, 1957), also a parasite of Sphoeroides from the Inland Sea, suggest that these two species are closely related. According to Yamaguti and Yasasu, the two species may be distinguished by the armature of legs 3 and 4. The exopod of leg 3 of T. pectinatus exhibits the armature formula of II, I, 4, whereas that of T. yamagutii is II, I, 5. The exopod of leg 4 of T. yamagutii has a II, I, 4 armature, but T. pectinatus was reported as II, I, 2, a very unusual armature for taeniacanthids. Because the original description of T. pectinatus was based on only one female, presumed to be mature, it is possible that two or three setae may have been broken off the specimen during collection. It is also just as likely that the specimen was aberrant. In any case, a detailed redescription of T. pectinatus is needed before conclusions on the validity of this species is reached.

**Taeniacanthus petilus, new species**

_Figures 65–67_

**Material Examined.**—2 females (1 female holotype, USNM 228411) from Platycephalus crocodilus from Ungwama (Formosa) Bay, Kenya (Paperna collection #M-563).

**Description.**—Female: Body form as in Figure 65A. Total length 2.64 mm (2.52–2.77 mm) and greatest width 0.62 mm (0.61–0.63 mm) based on 2 specimens. Cephalothorax 385 × 630 μm, comprising approximately 15% of total body length. First pedigerous segment fused to cephalothorax. Thoracic segments bearing legs 2, 3, and 4 decreasing in width posteriorly. Genital complex 197 × 273 μm (l × w). Abdomen 4-segmented; segments from anterior to posterior 291 × 216 μm, 273 × 193 μm, 197 × 143 μm, and 244 × 133 μm (l × w); anal segment (Figure 65B) ornamented ventrally. Caudal ramus (Figure 65B) 159 × 58 μm (l × w), bearing 6 setae; 2 outer and 1 dorsal setae naked.

Rostral area (Figure 65C) with ventromedian sclerotized part between bases of first antenna. First antenna (Figure 65C) 6-segmented; armature formula: 5, 15, 8, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 65D) with first 2 segments each with 1 naked distal seta; last portion comprised of fused segments and bearing 2 pectinate processes, 3 spines, and 4 setae. Postantennal process (Figure 65E) with broad base and curved fine.

Labrum (Figure 65F) with spines on posterior margin. Mandible (Figure 66A) with 2 unequal blades, each spiculated along 1 margin, and 1 naked seta. Paragnath (Figure 66B) an irregularly shaped lobe. First maxilla (Figure 66C) a lobe bearing 5 setae and 1 anterior knob; 3 larger setae each fringed with 2 transparent membranes. Second maxilla (Figure 66D) 2-segmented; first segment robust; terminal segment with spinulated process and 2 bristled spines (setae). Maxilliped (Figure 66E-H) 3-segmented; first segment with inner seta; second segment (corpus) robust, with conspicuous outer bulge, semicircular row of spines, and 2 inner setae; terminal segment a short claw (Figure 66G,H) with 2 setae near base.

Legs 1–4 (Figure 67A–E) biramous. Spinal and setal formula:

- **P₁**: coxa 0-1 basis 1-1 exopod 1-0; 1-1; 7 endopod 0-1; 7
- **P₂**: coxa 0-0 basis 1-0 exopod 1-0; 1-1; II, I, 5 endopod 0-1; 0-2; II, I, 3
- **P₃**: coxa 0-0 basis 1-0 exopod 1-0; 1-1; II, I, 5 endopod 0-1; 0-2; II, I, 2
- **P₄**: coxa 0-0 basis 1-0 exopod 1-0; 1-1; II, I, 5 endopod 0-1; 0-1; II, int.

Interpodal plate of leg 1 (Figure 67A) broad anteriorly but tapered at spinulated posterior margin. Interpodal plates of legs 2–4 with spines on posterior borders. Coxa of leg 1 (Figure 67A) with small conical process near small patch of spines. Exopods of legs 2–4 (see Figure 67B) with weakly sclerotized spines; terminal segments of exopods each with small digitiform process on distalateral corner. Endopods of legs 2–4 (Figure 67B,C,E) with blunt ornamented spines except spines of leg 4 unilaterally spinulated (intermediate spine bristled). Leg 5 (Figure 67F) with 2 segments; first segment bearing dorsolateral seta; second segment 216 × 81 μm (l × w), with 3 bristled blunt spines and 1 naked seta; 2 outer spines with single rows of minute spines at bases; terminal spine with patch of larger spines at base. Leg 6 represented by 3 setae near area of egg sac attachment.

**Male:** Unknown.

**Etymology.**—The specific name _petilus_, Latin for thin or slender, alludes to the slender body of the female.

**Remarks.**—The body of Taeniacanthus petilus, new species, is elongate and slender with the cephalothorax comprising only about 15% of the total body length (about 25% in the majority of congeners). The short sigmoid maxilliped claw and the semicircular row of spines on the corpus of the maxilliped of the female distinguishes this species from all its congeners.

**Taeniacanthus platycephali** (Yamaguti, 1939), new combination

_Figures 68–70_


**Material Examined.**—1 female (USNM 190503) from Platycephalus indicus (Linnaeus) from Kojima Bay, Japan collected by Tran The Do, 24 March 1980. 2 females collected by K. Rhode from Pt. Macquarie, Australia, on 9
FIGURE 65.—Taeniacanthus petilus, new species, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area and first antenna, ventral; D, second antenna, medial; E, postantennal process, ventral; F, labrum, ventral.
FIGURE 66.—Taeniacthus petilus, new species, female: A, mandible, anteromedial; B, paragnath, ventral; C, first maxilla, posterior; D, second maxilla, posteroventral; E, maxilliped, ventromedial; F, same, ventromedial; G, maxilliped claw, ventral; H, same, dorsal. (ob = outer bulge.)
Figure 67.—*Taeniacanthus petilus*, new species, female: A, leg 1 and interpodal plate, ventral; B, leg 2 and interpodal plate, ventral; C, leg 3 endopod, ventral; D, leg 4, interpodal plate and proximal portions of basipods, ventral; E, leg 4 endopod, ventral; F, leg 5, ventral.
Figure 68.—*Taeniacanthus platycephali* (Yamaguti), female: A, dorsal; B, anal segment and caudal rami, ventral; C, rostral area and first antenna, ventral; D, second antenna, medial; E, postantennal process, ventral; F, labrum, ventral; G, mandible, anteromedial.
Figure 69.—*Taeniopontus platycephali* (Yamaguti). Female: A, paragnath, ventral; B, first maxilla, posteroomedial; C, second maxilla, posteroverentral; D, maxilliped, ventromedial; E, maxilliped claw, dorsal; F, same, ventral; G, leg 1 and interpodal plate, ventral; H, leg 2 and interpodal plate, ventral.
FIGURE 70.—*Taeniacthus platycephali* (Yamaguti), female: A, leg 3, interpodal plate and proximal portions of basipods, ventral; B, leg 3 exopod, ventral; C, leg 3 endopod, ventral; D, leg 4, interpodal plate and proximal portions of basipods, ventral; E, leg 4 endopod, ventral; F, leg 5, ventral.
January 1980 from *P. ceruleopunctatus* McCullough.

**DESCRIPTION.**—Female: Body as in Figure 68A. Total length 2.84 mm and greatest width 0.71 mm based on 1 specimen. Cephalothorax $583 \times 743 \mu m (l \times w)$, comprising approximately 20% of total body length. Thoracic segments bearing legs 2 and 3 similar in width; segment bearing leg 4 slightly narrower. Genital complex wider than long, 253 $\times$ 308 $\mu m$. Abdomen 4-segmented; segments anterior to posterior 313 $\times$ 290 $\mu m$, 331 $\times$ 281 $\mu m$, 235 $\times$ 239 $\mu m$, and 244 $\times$ 179 $\mu m (l \times w)$; anal segment (Figure 68B) with 1 row of spinules on each side of anteroventral surface and 1 short row of spinules near insertion of each caudal ramus. Caudal ramus (Figure 68B) 200 $\times$ 60 $\mu m (l \times w)$, bearing 6 setae (right side of specimen examined bearing 7 setae).

Rostral area (Figure 68C) a ventromedian sclerotized part bearing an anterior digitiform projection. First antenna (Figure 68C) 7-segmented; third and fourth segments only partially separated; armature formula: 5, 15, 5, 3, 4, 2, 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 68D) apparently 4-segmented; first and second segments each with 1 distal seta; third segment partially fused with fourth segment and bearing 2 pectinate processes (longer one with distal seta and shorter one with small, digitiform hyaline seta) and 1 stout spine; terminal segment with 2 stout spines and 4 setae. Postantennal process (Figure 68E), a slender curved structure.

Labrum (Figure 68F) with rounded posterior margin bearing flange and row of spinules. Mandible (Figure 68G) with 2 unequal blades, each spinulated along 1 margin, and 1 small seta. Paragnath (Figure 68A) with attenuated tip. First maxilla (Figure 69A) a lobe with 5 setae and 1 anterior knob (dotted area in Figure 69B). Second maxilla (Figure 69C) 2-segmented; first segment a large sclerotized base; second segment with spinulated terminal process bearing 1 long spinulated spine and 1 short unilaterally spinulated spine. Maxilliped (Figure 69D–F) 3-segmented; first segment bearing 1 seta; second segment (corpus) with 2 naked setae; terminal segment with 2 stout spines and 4 setae. Postantennal process (Figure 68E), a slender curved structure.

Labrum (Figure 68F) with rounded posterior margin bearing flange and row of spinules. Mandible (Figure 68G) with 2 unequal blades, each spinulated along 1 margin, and 1 small seta. Paragnath (Figure 68A) with attenuated tip. First maxilla (Figure 69A) a lobe with 5 setae and 1 anterior knob (dotted area in Figure 69B). Second maxilla (Figure 69C) 2-segmented; first segment a large sclerotized base; second segment with spinulated terminal process bearing 1 long spinulated spine and 1 short unilaterally spinulated spine. Maxilliped (Figure 69D–F) 3-segmented; first segment bearing 1 seta; second segment (corpus) with 2 naked setae; terminal segment a claw (Figure 69E,F) bearing 1 basal seta and 5 transverse rounded processes.

Legs 1–4 (Figures 69G, I, 70A–E) biramous. Spinal and setal formula as follows:

<table>
<thead>
<tr>
<th></th>
<th>coxa</th>
<th>exopod</th>
<th>endopod</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>0-1</td>
<td>0-1</td>
<td>0-1</td>
</tr>
<tr>
<td>P2</td>
<td>0-0</td>
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<td>P3</td>
<td>0-0</td>
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<td>0-1</td>
</tr>
<tr>
<td>P4</td>
<td>0-0</td>
<td>0-0</td>
<td>0-1</td>
</tr>
</tbody>
</table>

Interpodal plate of leg 1 (Figure 69G), longer than wide, bearing patch of spinules on posterior margin. Interpodal plates of legs 2–4 (Figures 69H, 70A, D) wider than long, and each bearing row of spinules on each postero lateral corner. Basis of leg 1 with rows of spinules and 2 rows of finely striated flanges. Outer margins of coxae of legs 2–4 with rows of minute spinules. Bases of legs 2–4 each bearing row of minute spinules near insertion of endopod and patch of larger spinules on inner margin. Exopod spines of legs 2–4 minutely bristled. Leg 2 with additional spine located at intersegmental area between second and third exopod segment (apparently aberrant) (see Figure 69H, arrow). Terminal exopod segments of legs 2–4 each with small digitiform process on distolateral corner (see Figures 69H, 70B). Second and third endopod segments with semicircular rows of spinules on outer margins. Endopod spines relatively short and spinulated on outer margins. Leg 5 (Figure 70F) with 2 segments; first segment with 1 distal seta; second segment 154 $\times$ 64 $\mu m (l \times w)$, bearing 3 spines and 1 seta; 2 outer spines bilaterally flanked by thin flanges and terminal spine bilaterally spinulated; all 3 spines with minute spinules at bases; distomedial margin of segment with patch of larger spinules. Leg 6 represented by 3 setae near area of egg sac attachment.

**Male:** Unknown.

**REMARKS.**—*Taeniacanthus platycephali*, first described by Yamaguti (1939) as *Parataeniacanthus*, was collected from the branched chamber of *Platycephalus indicus* from Japan.

The elongate slender habitus, mouth appendages, legs, and the structure of the maxilliped claw of the female suggest that this species is closely related to *T. dentatus* Sebastian, 1964 (see "Remarks" for *T. dentatus*).

**Taeniacanthus pollicaris, new species**

**Figures 71–74**

**MATERIAL EXAMINED.**—1 female holotype (USNM 228412), 1 allotype (USNM 228413), and 17 paratypes (15 females, 2 males) (USNM 228414) from *Cirripectes fuscoguttatus* Strasburg and Schultz collected at Niuatoputapu Island, Tonga Islands (16°00'S, 175°53'W), on *Te Vega* Cruise 7, 31 May 1965. Other material from *Cirripectes fuscoguttatus*: 12 females, 1 male from Target Beach, Unai Lualau Katan between Pontan Lualau Katan and Punat Halaihai, Kagman area, Saipan, Mariana Islands, 19 July 1956; 4 females from east side of reef of Kayangel Island, Belau Islands (08°05'04''N, 134°43'45''E), 27 August 1956; 17 females from Makatea, Tuamotu Archipelago by J.E. Randall, 15 March 1956; 9 females, 1 male from west side of Fagasa Bay, Tutuila Island, American Samoa, by W.J. Baldwin, September 1974; 2 females from surge channels and coraline ridge of outer reef, Touhou Island of Kapingamarangi Atoll (01°04'45''N, 154°48'58''E), 28 June 1954; 4 females from just south of cut between large outstanding rock and Ch'uan-Fan-Shih, Taiwan, by V.G. Springer, 24 April 1968; 6 females from Tangan Point, Guam, Mariana Islands, 9 October 1968. From *Cirripectes filamentosus*: 12 females from northwest corner of North
FIGURE 71.—*Taeniacanthus pollicaris*, new species, female: A, dorsal; B, dorsal; C, anal segment and caudal ramus, dorsal; D, same, ventral; E, rostral area, ventral; F, first antenna, ventral; G, postantennal process, ventral; H, oral area, ventral. (A1 = first antenna, L = labrum, P = paragnath, Mxl = first maxilla.)
Figure 72.—Tamiaancanthus pollicaris, new species, female: A, mandible, anteromedial; B, first maxilla, posterolateral; C, second maxilla, ventrolateral; D, second maxilla, terminal segment, ventral; E, maxilliped, dorsolateral; F, same, ventromedial; G, maxilliped claw, dorsal; H, same, ventral; I, leg 1 and interpodal plate, ventral.
Figure 73.—*Taeniacthus pollicaris*, new species, female: A, leg 2, interpodal plate and basipod, ventral; B, leg 2 exopod, ventral; C, leg 2 endopod, ventral; D, leg 3, interpodal plate and proximal portion of basipod, ventral; E, leg 3 endopod, ventral; F, leg 4, interpodal plate and proximal portion of basipod, ventral; G, leg 4, terminal endopod segment, ventral; H, leg 4 endopod, ventral.
FIGURE 74.—Taeniacanthus pollicaris, new species. Female: A, leg 5, dorsal; B, same, ventral. Male: C, dorsal; D, anal segment and caudal ramus, ventral; E, postantennal process, ventral; F, maxillipedia, posterior; G, same, anterior; H, leg 2, terminal endopod segment, ventral; I, leg 3, terminal endopod segment, ventral; J, leg 5, ventral.
DESCRIPTION.—Female: Body as in Figure 71A,B. Total length 1.00 mm (0.87–1.09 mm) and greatest width 0.48 mm (0.41–0.59 mm) based on 6 specimens. Cephalothorax (Figure 71A) wider than long, 313 × 446 μm, comprising more than 2% of total length. Thoracic segment bearing leg 2 much wider than following two segments, 189 × 423 μm. Several specimens with relatively broader cephalothorax, 317 × 583 μm, and second pedigerous segment, 198 × 536 μm (l × w) (Figure 71B). Genital complex wider than long, 87 × 120 μm. Abdomen 4-segmented; segments from anterior to posterior 60 × 99 μm, 55 × 83 μm, 39 × 76 μm, and 55 × 67 μm (l × w); anal segment (Figure 71C) with single pair of longitudinal rows of spines adjacent to median suture on dorsal surface and a pair of posterodorsal rows of spines continuing to ventral surface near insertion of caudal rami; ventral surface of anal segment (Figure 71D) with 1 curved row of spines on each side of anteroventral surface. Caudal rami almost completely fused to anal segment dorsally (Figure 71C), 40 × 27 μm (l × w), and bearing 4 naked setae and 2 large, bristled, median terminal setae (bristles on longest seta not shown in figure).

Rostral area with ventromedian sclerotized part as in Figure 71E. First antenna (Figure 71F) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna as in Taeniactanus glomerosus. Postantennal process (Figure 71G) strongly curved.

Labrum (Figure 71H) with spinulated posterior margin. Mandible (Figure 72A) with 2 almost equal blades, each spinulated along 1 margin, and a bristled accessory seta. Paragnath (Figure 71H) an attenuate lobe. First maxilla (Figures 71H, 72B) bearing 2 large setae, 1 naked seta, 1 pinnate seta, a small naked seta, and 1 large conical process. Second maxilla (Figure 72C,D) 2-segmented; first segment a large sclerotized area; second segment bearing articulated terminal process, a spinulated spine, and 1 relatively transparent seta. Maxilliped (Figure 72E–H) apparently 2-segmented with basal segment fused to corpus; base with usual seta and corpus area with usual 2 naked setae; terminal segment (Figure 72G,H) with spinulated spine at base and very blunt claw, distally covered with transparent cuticle.

Legs 1–4 (Figures 72I, 73A–H) biramous. Spinal and setal formula as follows:

- \( P_1 \) coxa 0-0 basis 0-1 exopod 0-0; 9
- \( P_2 \) coxa 0-0 basis 1-0 exopod 1-0; 1-1; 1-1; 1
- \( P_3 \) coxa 0-0 basis 1-0 endopod 0-1; 0-2; 1; 1, 3
- \( P_4 \) coxa 0-0 basis 1-0 endopod 1-0; 1-1; 1-1; 1, 5

Interpodal plates of legs 1–4 (Figures 72I, 73A,D,F) spinulated on posterior margins. Interpodal plate of leg 1 with convex posterior margin. Plate of leg 2 bearing nearly straight posterior margin; plates of legs 3 and 4 slightly reentrant. Coxae, basis, exopod, and endopod of leg 1 with a few rows of spines as in Figure 72I. Coxae and bases of legs 2–4 (Figures 73A,D,F) each with a few rows of spines; inner margins of bases of legs 2 and 3 (Figure 73A,D) each with patch of spines, basis of leg 4 without inner patch of spines (Figure 73F). Terminal segments of exopods of legs 2–4 each with rounded protuberance on distolateral corner (see Figure 73H); exopod spines long, slender, and not highly sclerotized. Endopod spines of legs 2 and 3 not ornamented, but with flanges (Figure 73C,E). Terminal endopod spine (intermediate spine) of leg 4 (Figure 73G) approximately 2× length of outer spine of terminal segment; several specimens with terminal spine rounded at tip and 4X longer than blunt outer spine (Figure 73H). All segments of rami of legs 2–4 with outer rows of spines. Leg 5 (Figure 74A,B) 2-segmented; first segment with 2 curved rows of spines and 1 dorsolateral seta; second segment, 81 × 32 μm, ornamented with distomedial patch of spines, and bearing 2 naked and 2 bristled setae; setae with curved rows of spines at bases. Leg 6 represented by 3 setae in area of egg sac attachment.

Male: Body as in Figure 74C. Total length 0.68 mm (0.60–0.75 mm) and greatest width 0.22 mm (0.21–0.24 mm) based on 4 specimens. Cephalothorax wider than long, 166 × 212 μm, and comprising less than 25% of total body length. Genital complex longer than wide, 101 × 76 μm. Abdomen 3-segmented, segments from anterior to posterior 48 × 51 μm, 51 × 48 μm, and 44 × 41 μm (l × w); anal segment (Figure 74B) unornamented. Caudal ramus (Figure 74D) longer than wide, 31 × 17 μm, bearing 1 naked dorsal seta, 1 naked outer seta, 1 notched outer terminal seta, 1 inner seta with 1 row of bristles, and 2 large median setae, each with 1 row of bristles.
Postantennal process (Figure 74k) with more slender tine than in female. Maxilliped (Figure 74r,c) 4-segmented; first segment with 1 naked seta; second segment (corpus) armed with 2 pinnate setae, 1 row of spinules, and 1 row of rounded denticles; third segment small and unornamented; fourth segment a curved claw carrying 2 anterior setae, 1 posterior seta, and row of teeth along concave margin. Endopod spines of legs 2 and 3 (Figure 74h,i) pointed at tips, not blunt as in female. Leg 5 (Figure 74j) similar to that in female except more slender 51 × 15 μm.

ETYMOLOGY.—The specific name pollicaris, Latin for of the thumb, alludes to the stubby thumb-like claw of the maxilliped of the female.

REMARKS.—The general habitus (second pedigerous segment nearly as wide as the cephalothorax and much wider than the following two thoracic segments), the notched outer terminal seta of the caudal ramus of the male, the large conical process of the first maxilla, and the stout, apically rounded maxilliped claw of the female are distinctive characters of this species.

*Taeniacanthus pollicaris* is closely related to *T. comparatus*, *T. digitatus*, *T. glomerosus*, *T. nudicauda*, *T. papulosus*, and *T. williamsi*. One character they share is the ovoid pectinate process on the distal end of the second antenna. All seven species are parasitic on the Blenniidae, specifically the genera *Cirripespectes* and *Exallias*. *Taeniacanthus pollicaris* can easily be distinguished from its congeners by the thumb-like maxilliped claw of the female.

*Taeniacanthus pseudorhombi* (Yamaguti, 1939), new combination

FIGURES 75–78


MATERIAL EXAMINED.—1 female from *Pseudohombus cinnamoneus* (Temminck and Schlegel) (USNM 59768) collected in Japan.

DESCRIPTION.—Female: Body form as in Figure 75A. Total length and width 1.70 × 0.43 mm based on 1 specimen. Cephalothorax wider than long, 331 × 442 μm, comprising about 20% of total length. First pedigerous segment distinct from cephalothorax. Thoracic segments bearing legs 2–5 free; segments decreasing in width from anterior to posterior. Genital complex (Figure 75B) wider than long, 115 × 198 μm. Abdomen indistinctly segmented; entire abdomen very long and slender, 658 × 152 μm; posterior portion of abdomen (Figure 75C) with 1 row of spinules on each side of ventral surface and 1 row near insertion of each caudal ramus. Caudal ramus (Figure 75C,D) longer than wide, 81 × 38 μm, bearing 6 setae.

Rostral area (Figure 75E) torn during dissection, but possessing an acuminate-shaped ventromedian, sclerotized part. First antenna (Figure 76A) 7-segmented; armature formula: 5, 13, 5, 3, 4, 2 + 1 aesthete and 7 + 1 aesthete. Second antenna (Figure 76B,C) 3-segmented; last segment with 1 long pectinate process bearing 1 small naked seta at distal end, 1 ovoid pectinate process, and 7 naked setae. Postantennal process (Figure 76D) curved, but broken at tip on specimen examined.

Labrum (Figure 76E) with semicircular posterior margin carrying a row of long spinules. Mandible (Figure 76F) with 2 blades, each spinulated along 1 margin. Paragnath (Figure 77A) a lobed structure with rows of small spinules on dorsal surface. First maxilla (Figure 77B) a lobe bearing 2 robust setae, 2 setae, 2 relatively small setae, and 1 rounded anterior knob (represented by dotted line in figure). Second maxilla (Figure 77C) 2-segmented; terminal process with rows of spinules and 2 bristled spines at base. Maxilliped (Figure 77B) 3-segmented; first segment with 1 naked seta; second segment robust with 2 naked setae and corrugated area near distal end; terminal segment a curved claw.

Legs 1–4 (Figures 77E,F, 78A–D) biramous. Spinal and setal formula as follows:

<table>
<thead>
<tr>
<th>Leg</th>
<th>Coxo-Basal Por</th>
<th>Endopod</th>
<th>Exopod</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>0-1 basis 1-1</td>
<td>exopod 1-0; 1-1; 7</td>
<td>endopod 0-1; 0-1; 6</td>
</tr>
<tr>
<td>P2</td>
<td>0-0 basis 1-0</td>
<td>exopod 1-0; 1-1; 1-1; 1-5</td>
<td>endopod 0-1; 0-2; 1-1; 1-3</td>
</tr>
<tr>
<td>P3</td>
<td>0-0 basis 1-0</td>
<td>exopod 1-0; 1-1; 1-1; 1-5</td>
<td>endopod 0-1; 0-2; 1-1; 1-2</td>
</tr>
<tr>
<td>P4</td>
<td>0-0 basis 1-0</td>
<td>exopod 1-0; 1-1; 1-1; 1-5</td>
<td>endopod 0-1; 0-1; 1-1</td>
</tr>
</tbody>
</table>

Interpodal plate of leg 1 (Figure 77E) somewhat triangular, with long slender spinules on posterior border. Outer seta of basis very stout. Exopod spines of legs 2–4 attenuate, not highly sclerotized, and bearing minute bristles (spinules). Endopod spines with serrated membranous flanges on outer margin. Leg 5 (Figure 78E) with 2 segments; first segment possessing 1 naked seta; second segment much longer than wide, 131 × 34 μm, and bearing 3 bristled spines and 1 slender naked seta; a patch of spinules present on distomedial portion of segment. Leg 6 (Figure 75B) represented by 5 naked setae at area of egg sac attachment.

Male: Unknown.

REMARKS.—This species was first described by Yamaguti (1939) and established as the type-species of *Parataeniacanthus*. For reasons given in the “Remarks” for *Taeniacanthus*, we have relegated *Parataeniacanthus* to synonymy with *Taeniacanthus*.

*Taeniacanthus pseudorhombi* was collected from the gills of *Pseudohombus cinnamoneus* at Koti, Japan. Our specimens are from the same species of host.

This species may be distinguished from all its congeners by the general habitus (first pedigerous segment free from cephalothorax), 13 setae on the second segment of the first antenna, the armature of the second antenna (no claw-like spines), and 3-segmented rami of leg 1.
Figure 75. — *Taenia canthus pseudorhombi* (Yamaguti), female: A, dorsal; B, genital area, dorsal; C, anal segment and caudal rami, ventral; D, caudal ramus, ventral; E, rostral area, ventral.
FIGURE 76.—*Taeniacanthus pseudorhombi* (Yamaguti), female: A, first antenna, ventral; B, second antenna, medial; C, same, lateral; D, postantennal process, ventral; E, labrum, ventral; F, mandible, anteromedial.
FIGURE 77.—*Taeniacanthus pseudorhombi* (Yamaguti), female: A, paragnath, dorsal; B, first maxilla, posterior; C, second maxilla, anterior; D, maxilliped, ventral; E, leg 1 and interpodal plate, ventral; F, leg 2 and interpodal plate, ventral.
Figure 78. — *Taeniacanthus pseudorhombi* (Yamaguti). Female: A, leg 2, terminal endopod segment, ventral; B, leg 3, terminal endopod segment, ventral; C, leg 4, interpodal plate, ventral; D, leg 4 endopod, ventral; E, leg 5, dorsal.
**Taeniacanthus pteroisi** Shen, 1957

**Figures 79–82**


*Parataeniacanthus russelli* Devi and Shyamasundari, 1980:199. [New synonymy.]

**Material Examined.**—1 female and 2 males from *Pterois volitans* (Linnaeus) (Paperna collection #E-67) from the Gulf of Elat; 1 immature female, 2 males, and 1 immature male from *Pterois macrurus* (Paperna collection #M-620) from the Gulf of Elat.

**Description.**—Female: Body as in Figure 79A. Total length and width 2.17 x 0.75 mm based on 1 specimen. Cephalothorax 536 x 743 \( \mu \text{m} \) (1 x w), comprising about 25% of total length. Thoracic segments bearing legs 2, 3, and 4 decreasing in length posteriorly. Genital complex wider than long, 184 x 281 \( \mu \text{m} \), comprising less than 25% of total length. Genital complex (Figure 80A) 7-segmented; armature formula: 15, 5, 3, 4, 2+1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 79B) without spinules. Caudal ramus (Figure 79B) slender, 126 x 37 \( \mu \text{m} \) (1 x w), and armed with 3 semipinate setae and 3 naked setae.

Rostral area (Figure 79C) with longitudinal sclerotized bar on ventral surface near bases of first antenna. First antenna (Figure 79C) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 79D) apparently 3-segmented; terminal segment with 1 very robust spine, 6 setae (3 largest setae slightly sclerotized), and 2 pectinate processes (shorter process with rounded hyaline knob at about midlength; longer process with small naked setae at tip). Postantennal process (Figure 79E) with a rather slender curved spine.

Labrum (Figure 79F) with spinulated posterior margin. Mandible (Figure 79G) with 2 unequal blades, each spinulated along 1 margin; smaller subterminal blade with 3 small teeth on anterior margin. Paragnath (Figure 79H) an unornamented process. First maxilla (Figure 80A) a lobe with 2 setae (each with 1 row of bristles), 3 naked smaller setae, and 1 rounded knob. Second maxilla (Figure 80B) 2-segmented; terminal segment with 2 spinulated spines and 1 small naked spine. Maxilliped (Figure 80C–E) with robust corpus bearing 2 setae (1 broken off in specimen and represented by dotted line in figure); claw armed with 2 naked setae near base and having a corrugated (or rugose) convex margin (Figure 80D, E).

Legs 1–4 (Figures 80F–H, 81A–E) biramous. Spinal and setal formula as follows:

\[
\begin{align*}
P_1 & \text{ coxa 0-0} & \text{ basis 1-0} & \text{ exopod 1-0; 1-1; 2; 3; 4; 5; 6; 7; 8; 9} \\
P_2 & \text{ coxa 0-0} & \text{ basis 1-0} & \text{ exopod 0-1; 0-2; 0-3; 0-4; 0-5; 0-6; 0-7; 0-8; 0-9} \\
P_3 & \text{ coxa 0-0} & \text{ basis 1-0} & \text{ exopod 1-0; 1-1; 2; 3} \\
\end{align*}
\]

Interpodal plates of legs 1–4 with spinules on posterior margins; that of leg 1 with convex posterior margin slightly indented at midline. Plates of legs 2–4 reentrant. Outer seta of basis of leg 1 acuminate (Figure 80G). Right endopod of leg 1 3-segmented; left endopod 2-segmented in specimen examined. Coxae and bases of legs 2–4 with spinules. Exopod spines of legs 2 and 3 long, slender, and finely bristled. Exopod spines of leg 4 as in Figure 81E. Endopod spines of legs 2–4 minutely spinulated. Outer margins of exopods and endopods of legs 2–4 with rows of spinules. Leg 5 (Figure 81F, G) with 2 segments; first segment small and armed with 1 bristled seta; second segment, 145 x 64 \( \mu \text{m} \) (1 x w), bearing 2 spinulated spines, 1 bristled seta, and 1 pinnate seta in addition to rows of spinules. Leg 6 represented by 3 setae in area of egg sac attachment.

**Male:** Body form as in Figure 82A. Total length 0.84 mm (0.76–0.91 mm) and greatest width 0.29 mm (0.28–0.33 mm) based on 4 specimens. Cephalothorax 262 x 322 \( \mu \text{m} \) (1 x w), comprising less than 25% of total length. Genital complex (Figure 82B) as wide as long, 124 x 120 \( \mu \text{m} \). Abdomen 3-segmented; segments from anterior to posterior 46 x 81 \( \mu \text{m} \), 37 x 69 \( \mu \text{m} \), 55 x 60 \( \mu \text{m} \) (1 x w); anal segment (Figure 82C) with 2 curved rows of spines on each side of anteroventral surface. Caudal ramus (Figure 82C) slender, 50 x 18 \( \mu \text{m} \) (1 x w), bearing 6 naked setae.

Mandible (Figure 82D) with 2 stout, slightly subequal blades, each minutely spinulated along 1 margin. Maxilliped (Figure 82E–F) apparently 4-segmented; first segment with 1 naked seta; second segment (corpus) robust, with 2 naked setae, a row of spinules, and a corrugated area; third segment small and unornamented; terminal segment a curved claw bearing 3 naked setae, a proximally directed tooth, and a serrate convex margin.

Interpodal plate of leg 1 (Figure 82C) much broader than long as compared to that in female. Leg 5 (Figure 82H) with second segment 55 x 20 \( \mu \text{m} \) (1 x w), much more slender than in female.

**Remarks.**—*Taeniacanthus pteroisi* was first described by Shen (1957) from females collected from the gills of *Pterois russelli* Bennett from Konchung, Hainan Island, China. *Parataeniacanthus russelli* Devi and Shyamasundari, 1980, collected from the same species of host from the Waltair coast of India, appears to be synonymous with *T. pteroisi*. Because our attempts to obtain type specimens of *P. russelli* were unsuccessful, we could not verify this synonymy.

Six species of *Taeniacanthus* are known to lack ornamentation (spinules) on the ventral surface of the anal segment. They are *T. acanthocoelear* Yamaguti, 1939; *T. neopercis* Yamaguti, 1939; *T. nudicauda*, new species; *T. petiulus*, new species; *T. pteroisi* Shen, 1957; *T. sauridae* Yamaguti and Yamashita, 1959. *Taeniacanthus pteroisi* may be distinguished from its five congeners by the structure of the maxilliped claw of the female.
FIGURE 79.—Taeniacanthus pteroisi (Shen), female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area and first antenna, ventral; D, second antenna, medial; E, postantennal process, ventral; F, labrum, ventral; G, mandible, anteromedial; H, paragnath, ventral. (R = rostral area.)
FIGURE 80.—Taeniacanthus pteroisi (Shen), female: A, first maxilla, anterior; B, second maxilla, posteroventral; C, maxilliped, ventrolateral; D, maxilliped claw, ventral; E, same, dorsal; F, leg 1 and interpodal plate, ventral; G, leg 1, outer seta of basis, ventral; H, leg 2 and interpodal plate, ventral.
Figure 81.—*Taeniacthus pterosi* (Shen), female: A, leg 2, terminal endopod segment, ventral; B, leg 3, interpodal plate and proximal portion of basipod, ventral; C, leg 3 endopod, ventral; D, leg 4 and interpodal plate, ventral; E, leg 4, spine of first exopod segment, ventral; F, leg 5, dorsal; G, same, ventral.
FIGURE 82.—*Taeniacthus pteroisi* (Shen), male: A, dorsal; B, genital area, ventral; C, anal segment and caudal ramus, ventral; D, mandible, anteromedial; E, maxilliped, posterior; F, same, anterior; G, leg 1, interpodal plate, ventral; H, leg 5, ventral.
**Taeniacanthus rotundiceps** (Shiino, 1957), new combination


**Material Examined.** — From *Pseudoblennius percoideus* Günther: 1 female and 5 males; 1 female, 2 males, and 3 copepods; and 1 female, 2 immature females, 7 males, and 1 copepodid; from Japan.

**Description.** — Female: Body as in Figure 83A. Total length 2.64 mm (2.49–2.89 mm) and greatest width 0.84 mm (0.78–0.91 mm) based on 3 specimens. Cephalothorax 573 × 780 µm, comprising approximately 25% of total length. First pedigerous segment fused to cephalothorax (intersegmental area between cephalothorax and second pedigerous segment may be mistaken for distinct first pedigerous segment). Genital complex 175 × 294 µm. Abdomen 4-segmented; segments from anterior to posterior 175 × 230 µm; 221 × 230 µm; 175 × 207 µm; and 202 × 179 µm; anal segment (Figure 83B) with rows of spines on anteroventral surface and 2 membranous flaps near insertion of each caudal ramus. Caudal ramus (Figure 83B) 168 × 55 µm, bearing 6 setae; 1 dorsal and 2 outer setae naked.

Rostral area (Figure 83C) with circular, ventromedian, sclerotized part between bases of first antenna (similar to that of *Taeniacanthus pseudohorombi*). First antenna (Figure 83C) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 83D) with first 2 segments each with 1 naked distal seta; last portion comprised of fused segments and bearing 2 pectinate processes (longer one with small distal seta and shorter one with hyaline seta at midlength) and 3 spines and 4 setae. Postantennal process (Figure 83E) with stout curved spine.

Labrum (Figure 83F) with spines on posterior margin. Mandible (Figure 84A) with 2 unequal blades, each spinulated along 1 margin, and 1 bristled seta. Paragnath (Figure 84B) a lobe, constricted at about ½ length, with a digitiform process at tip. First maxilla (Figure 84C) bearing 5 naked setae and 1 knob. Second maxilla (Figure 84D) 2-segmented; first segment robust and unarmed; second segment with spinulated terminal process and 2 bristled spines. Maxilliped (Figure 84E,F) 3-segmented; first segment apparently lacking seta; second segment (corpus) with cuticular creases on ventral surface and bearing 2 inner setae; terminal segment (Figure 84F) a large curved claw with corrugations along convex surface and 1 large and 1 minute seta near base.

Legs 1–4 (Figures 84G, 85A–G) biramous. Spinal and setal formula as follows:

\[
\begin{align*}
& \text{P}_1 \quad \text{coxa} \ 0-0 \quad \text{basis} \ 1-0 \quad \text{endopod} \ 0-1; 1-1; 7 \\
& \text{P}_2 \quad \text{coxa} \ 0-0 \quad \text{basis} \ 1-0 \quad \text{endopod} \ 0-1; 1-1; 2-1; 1, 5 \\
& \text{P}_3 \quad \text{coxa} \ 0-0 \quad \text{basis} \ 1-0 \quad \text{endopod} \ 0-1; 1-1; 2-1; 1, 5
\end{align*}
\]

Interpodal plate of leg 1 (Figure 84C) with spines on convex posterior margin; those of legs 2–4 (Figure 85A,C,F) reentrant with patch of spines on each posterolateral margin. Inner margins of bases of legs 2–4 (Figure 85A,C,F) with spines. Exopods of legs 2 and 3 (Figure 85A) similar in shape and armature; terminal exopod segment of leg 4 (Figure 85G) slightly different shape than those of legs 2 and 3; small digitiform processes on distolateral corners of exopods of legs 2–4. Spines of endopod of leg 2 (Figure 85B) blunt and unilaterally spinulated except terminal spine with additional dorsal row of spines (not shown in Figure 85B). Terminal spine of endopod of leg 3 (Figure 85E) strongly curved and sharply pointed. Last segment of endopod of leg 4 (Figure 85G) with 2 relatively sharp spines and a long, bristled intermediate spine. Leg 5 (Figure 85H) with 2 segments; first segment with dorsolateral seta; second segment 179 × 60 µm (l × w), with 2 spines and 2 naked setae; lateral spine flanked with 2 transparent membranes, and medial spine bilaterally spinulated; each spine with spinules at bases; and distomeral border with patch of larger spines. Leg 6 represented by 3 setae near egg sac attachment.

**Male:** Body as in Figure 86A. Total length 1.41 mm (1.33–1.56 mm) and greatest width 0.48 mm (0.45–0.53 mm) based on 10 specimens. Cephalothorax 367 × 461 µm (l × w), comprising more than 25% of total length. Genital complex 147 × 166 µm (l × w). Abdomen 3-segmented; segments from anterior to posterior 106 × 115 µm, 115 × 106 µm, and 124 × 97 µm (l × w); anal segment (Figure 86B) with 3 curved rows of spines on each side of anteroventral surface, and small membranous flap near insertion of each caudal ramus. Caudal ramus (Figure 86B) similar to that of female, 97 × 30 µm.

Maxilliped (Figure 86C) 4-segmented; first segment with 1 naked seta; corpus with 2 naked inner setae, 1 row of spines (along entire length of corpus), and 1 row of denticles (from setae to distal end of corpus); third segment small and unornamented; terminal segment a curved claw bearing 3 setae near base, 1 large triangular process near midlength and numerous teeth along concave margin.

Legs 1–4 similar to those in female except distolateral corner of endopod segments of legs 2–4 (Figure 86D–F) each with a conspicuous spiniform process. Endopod spines of legs 2 and 3 (Figure 86D,F) curved. All other appendages as in female.

**Remarks.** — This species was first described under the binomen *Parataeniacanthus rotundiceps* from the buccal cavity, gill filament, and branchial chamber of *Pseudoblennius percoideus* collected at Seto, Wakayama, Japan.

Six species of *Taeniacanthus*, in addition to *T. rotundiceps*, have a 3-segmented exopod of leg 1. They are *T. longicaudus* Pillai, 1963; *T. miles* (Pillai, 1963); *T. petilus*, new
FIGURE 83.—*Taeniacanthus rotundiceps* (Shiino), female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area and first antenna, ventral; D, second antenna, medial; E, postantennal process, ventral; F, labrum, ventral. (R = rostral area, mf = membranous flaps.)
Figure 84.—*Taeniocanthus rotundiceps* (Shiino), female: A, mandible, anteroventral; B, paragnath, dorso-medial; C, first maxilla, anteroventral; D, second maxilla, posteroventral; E, maxilliped, ventrolateral; F, maxilliped claw, anteroventral; G, leg 1 and interpodal plate, ventral.
Figure 85.—Taeniacanthus rotundiceps (Shiino), female: A, leg 2 and interpodal plate, ventral; B, leg 2, endopod spines, ventral; C, leg 3, interpodal plate and proximal portions of basipods, ventral; D, leg 3 endopod, ventral; E, leg 3, innermost endopod spine, ventral; F, leg 4, interpodal plate and proximal portions of basipods, ventral; G, leg 4, ventral; H, leg 5, ventral.
FIGURE 86. — Taenia canthus rotundiceps (Shiino), male: A, dorsal; B, anal segment and caudal ramus, ventral; C, maxilliped, posteromedial; D, leg 2 endopod, ventral; E, leg 3 endopod, ventral; F, leg 4 endopod, ventral. (mf = membranous flap.)
species; *T. platycephali* (Yamaguti, 1939); *T. pseudorhombi* (Yamaguti, 1939); and *T. sebastichthydis* Yamaguti, 1939. *Taeniacanthus rotundiceps* may be distinguished from these six congeners by the structure of the maxilliped claw of the female. The shape and corrugations of the maxilliped claw of *T. rotundiceps* are very similar to those of *T. sebastichthydis*, but the latter species bears a long, slender conical process at the base of the claw. This process is greatly reduced in *T. rotundiceps*.

*Taeniacanthus sauridae* Yamaguti and Yamasu, 1959


**DESCRIPTION.**—Female: See Yamaguti and Yamasu (1959) and Cressey and Cressey (1979).

**Male:** See Cressey and Cressey (1979).

**REMARKS.**—This species was originally described by Yamaguti and Yamasu (1959) from four females collected from the gill filaments of *Saurida argyrophanes* (Richardson), now considered a synonym of *Saurida undosquamis*, from the Inland Sea, Japan.

Cressey and Cressey (1979) provided a partial redescriptions of the female and description of the male of *Taeniacanthus sauridae* based on specimens collected from *Saurida gracilis* (Quoy and Gaimard), *S. longimanus* Norman, and *Saurida undosquamis* from the Philippines and the Andaman Sea.

*Taeniacanthus sauridae* may be distinguished from all congeners by the unique bifurcate maxilliped claw of the female.

*Taeniacanthus sebastichthydis* Yamaguti, 1939

**Figures 87–89**


**MATERIAL EXAMINED.**—2 females (USNM 190501) from *Sebastes inermis* (Cuvier) collected in Kojima Bay, Japan, 13 May 1980 by Tran The Do.

**DESCRIPTION.**—Female: Body as in Figure 87A. Total body length 2.10 mm (2.07–2.12 mm) and greatest width 0.76 mm (0.73–0.79 mm) based on 2 specimens. Cephalothorax wider than long, 639 × 752 μm, comprising about 30% of total body length. Genital complex wider than long, 169 × 263 μm. Abdomen 4-segmented; segments from anterior to posterior 156 × 189 μm, 152 × 179 μm, 120 × 147 μm, and 120 × 129 μm (l × w); anal segment (Figure 87B) with 2 rows of spines on each side of anterodorsal surface. Caudal ramus (Figure 87B) more than 2X longer than wide, 97 × 41 μm, and bearing 6 setae (2 median terminal setae and innermost terminal seta pinnate).

Rostral area (Figure 87C) bearing circular sclerotized part with an anterior extension on ventromedian surface. First antenna (Figure 87C) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 87D,E) 4-segmented; first and second segments each with 1 naked distal seta; third segment with 2 pectinate processes (longer process with distal seta, shorter process with hyaline seta at about midlength), and 1 stout curved spine; terminal segment (Figure 87E) carrying 2 large articulated spines and 4 setae. Postantennal process (Figure 87F) with curved time.

Labrum (Figure 87G) with transparent membrane ventrally covering row of spines on rounded posterior margin. Mandible (Figure 88A) with 2 unequal spinulated blades (each blade with large serrations along anterior margin at proximal end) and a hyaline accessory seta. Paragnath a simple lobe. First maxilla (Figure 88B) a rounded process with 5 setae and 1 anterior knob. Second maxilla (Figure 88C) 2-segmented; first segment large and unarmed; second segment with spinulated terminal process bearing 1 spinulated spine and 1 seta with 1 row of bristles. Maxilliped (Figure 88D) apparently 3-segmented; first segment not examined (lost during dissection); second segment (corpus) covered with corrugations or wrinkles (may represent artifact of preservation) and bearing 2 naked setae; terminal segment a curved claw with 2 naked setae and a large conical process at base, and corrugations along entire length of convex surface.

Legs 1–4 (Figures 88E,F, 89A–D) biramous. Spinal and setal formula as follows:

- **P₁** coxa 0-1 basis 1-1 exopod 1-0; 1-1; 7 endopod 0-1; 1-1; 7
- **P₂** coxa 0-0 basis 1-0 exopod 1-0; 1-1; 7 endopod 0-1; 1-1; 7
- **P₃** coxa 0-0 basis 1-0 exopod 1-0; 1-1; 7 endopod 0-1; 1-1; 7
- **P₄** coxa 0-0 basis 1-0 exopod 1-0; 1-1; 7 endopod 0-1; 1-1; 7

Interpodal plate of leg 1 (Figure 88E) with spines on convex posterior margin; those of legs 2–4 (Figure 89A,C,D) with patch of spines on each posterolateral margin. Coxa of leg 1 (Figure 88E) with longitudinal corrugations; basis of leg 1 with spines as in figure. Coxae of legs 2–4 each with 1 row and 1 patch of spines near distolateral corner; bases of these legs with patches of spines on inner margins. Terminal exopod segment of leg 4 (Figure 89D) slightly more elongate than those on legs 2 and 3 and bearing small rounded process on distolateral corner; exopod spines only weakly sclerotized. Endopod spines of legs 2–4 spinulated except terminal curved spine of leg 3 endopod (Figure 89B).

Leg 5 (Figure 89E) with 2 segments; first segment with ventral row of minute spines and 1 dorsolateral seta; second segment 129 × 60 μm (l × w), bearing a patch of large spines on distomedial corner. 2 outer spines with membranous flanges along distal half, 1 semipinnate seta.
Figure 87.—Taeniarchus sebastikhidis Yamaguti, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area and first antenna, ventral; D, second antenna, medial; E, second antenna, distal portion, lateral; F, postantennal process, ventral; G, labrum, ventral.
FIGURE 88.—*Turniacanthus sebastichthydis* Yamaguti, female: A, mandible, anteromedial; B, first maxilla, anterior; C, second maxilla, posteroventral; D, maxilliped, ventrolateral; E, leg 1 and interpodal plate, ventral; F, leg 2, ventral.
FIGURE 89.—*Taeniocanthus sebastianhydis* Yamaguti, female: A, leg 2, interpodal plate and proximal portions of basipods, ventral; B, leg 3 endopod, ventral; C, leg 4, interpodal plate and proximal portions of basipods, ventral; D, leg 4, ventral; E, leg 5, ventral.
and 1 terminal spine with 2 rows of spinules; each spine with a row of minute spinules at base. Leg 6 represented by 3 setae in area of egg sac attachment.

**Male:** Unknown.

**Remarks.**—Yamaguti (1939) first described *Taeniacanthus sebastichthydis* from the gills of *Sebastichthys oblongus* (Gunther) from the Sea of Japan. In the same paper he described another new species, *T. sebestisci*, which he collected from the gill filament of *Sebastiscus marmoratus* (Cuvier and Valenciennes) from Ise Bay, Japan.

The description of *T. sebestisci* is very similar to that of *T. sebastichthydis*. In fact the former species is most likely synonymous with *T. sebastichthydis*. Unfortunately, even though these two nominal species are morphologically very similar, Yamaguti did not give a comparison between the two. We propose that *T. sebestisci* be considered a junior synonym of *T. sebastichthydis*. Unfortunately, our attempts to locate Yamaguti's type specimens were unsuccessful.

As mentioned in the “Remarks” section of *Taeniacanthus rotundiceps*, the 3-segmented exopod of leg 1 and shape and corruptions of the maxilliped claw of the female of *T. sebastichthydis* are two morphologic characters shared with *T. rotundiceps*. However, the presence of a long, slender conical process at the base of the maxilliped claw of the female of *T. sebastichthydis* distinguishes it from *T. rotundiceps*.

### Taeniacanthus similis, new species

Figures 90, 91

**Material Examined.**—1 female holotype (USNM 228415), 1 allotype (USNM 228416), and 4 paratypes (females) (USNM 228417) from *Meuschienia convexirostris* (Gunther) from New Zealand; 1 female from *Cantherhines hippocrepis* from Kangaroo Island, Australia. From *Alutera scripta* (Osbeck): 1 male from Philippine Islands; 1 female, 1 male from Netherlands Indies.

**Description.**—**Female:** Body as in Figure 90A. Total body length 1.85 mm (1.75–2.00 mm) and greatest width 0.83 mm (0.80–0.88 mm) based on 4 specimens. Cephalothorax wider than long, 564 x 874 µm, comprising approximately 30% of total body length. Thoracic segments bearing legs 2, 3, and 4 decreasing in width posteriorly. Genital complex (Figure 91D) 141 x 179 µm. Abdomen 3-segmented; segments from anterior to posterior 74 x 138 µm, 55 x 124 µm, and 78 x 110 µm (1 x w).

Maxilliped (Figure 91E) 4-segmented; first segment with usual distal seta; second segment (corpus) bearing single row of spinules, 1 long and 1 short rows of denticles, and 2 naked setae; third segment small and unornamented; terminal segment a claw (Figure 91F) with 3 setae (shortest of 3 setae hyaline) near base, and bearing small teeth and a few rows of minute spinules along concave margin.

**Etymology.**—The specific name similis, Latin for like or resembling, alludes to this species' resemblance to *Taeniacanthus balistae* and *T. occidentalis*.

**Remarks.**—This new species is closely related to *Taeniacanthus balistae* (Claus, 1864) and *T. occidentalis* (Wilson, 1924). All three species are parasites of tetraodontiform fishes.

*Taeniacanthus similis* may be distinguished from *T. balistae* by the absence of a small rounded process at the base of the maxilliped claw of the female. The new species is distinguished from *T. occidentalis* by the presence of seven to eight interrupted rows of spinules on the ventral surface of the anal segment (three to four interrupted rows in *T. occidentalis*). In addition, the relative lengths of the exopod spines of leg 2 are different between these two species (see “Remarks” for *T. occidentalis*).

*Taeniacanthus similis* was collected from the Indo-West Pacific, whereas *T. occidentalis* is known only from the western North Atlantic. *Taeniacanthus balistae* appears to be the most widespread of the three species, being reported from the North Atlantic, North Pacific, and the Red Sea.

### Taeniacanthus tetradoronicus (Bassett-Smith, 1898)

*Bomolochus tetradoronicus* Bassett-Smith, 1898:4.

*Bomolochus tetradoronicus* Wilson, 1911:390.


*Taeniacanthus tetradoronicus.*—Kabata, 1979:78.
FIGURE 90.—*Taeniacanthus similis*, new species, female: A, dorsal; B, postantennal process, ventral; C, labrum, ventral; D, mandible, anteromedial; E, first maxilla, anterior; F, second maxilla, posteroventral.
Figure 91.—*Taeniacanthus similis*, new species. Female: A, maxilliped, posterior; B, leg 4 exopod, dorsal.
Male: C, dorsal; D, genital area, ventral; E, maxilliped, anterior; F, maxilliped claw, posterior.
DESCRIPTION.—Female: See Bassett-Smith (1898).
Male: Unknown.

REMARKS.—This species was first described as *Bomolochus tetradonis* by Bassett-Smith (1898) from "*Tetrodon oblongus,*" probably *Takifugu oblongus* (Bloch) from Bombay. Wilson (1911) transferred the species to his newly established *Irodes.* We agree with Yamaguti (1963) and Kabata (1979) that this species belongs in *Taeniacanthus.*

Yamaguti (1936) described a taeniacanthid species collected from "*Tetrodontid fishes*" off Japan and identified them as *Irodes tetradonis.* Apparently he considered these Japanese specimens to be conspecific with Bassett-Smith's "*Bomolochus tetradonis.*" However, Shiino (1957a, 1959) considered Yamaguti's specimens and his own from *Spheroidea pachygaster* (Müller and Troschel) (reported as *S. alboplumbeus* and *Takifugu niphobles* (Jordan and Snyder) from Japan to be different from Bassett-Smith's "*Bomolochus tetradonis.*" Shiino believed that the Japanese specimens were representatives of a new species and named the species *Irodes yamagutii* in honor of the discoverer. Yamaguti and Yamasu (1959) transferred Shiino's *Irodes yamagutii* to *Taeniacanthus.*

Ho (1969) considered the Japanese specimens, *Taeniacanthus yamagutii* (Shiino, 1957), to be synonymous with Bassett-Smith's *T. tetradonis* (Bassett-Smith, 1898) from Bombay. Although it is clear that Yamaguti's (1936) description of *Irodes tetradonis* is based upon the same species as that described by Shiino (1957a) as *Irodes yamagutii,* it is not certain that the Bombay specimens originally described as "*Bomolochus tetradonis*" (now considered *Taeniacanthus tetradonis*) by Bassett-Smith (1898) are the same as the Japanese specimens described by Yamaguti (1936) and redescribed by Shiino (1957a). Because Bassett-Smith's specimens were not examined, and because we did not collect specimens from Bombay, a decision on the synonymy of Bassett-Smith's *Taeniacanthus tetradonis* and *T. yamagutii* is postponed.

*Taeniacanthus williamsi,* new species

Figs. 92-95

MATERIAL EXAMINED.—From *Cirripectes castaneus*: 1 female holotype (USNM 228418) and 11 female paratypes (USNM 228419) from 5 hosts collected at Kawazu Reef, 6.5 km north of Island Rock, South Africa, 28 July 1976; 3 females from 2 hosts collected just north of Port St. Louis Harbor, Mauritius, on *Anton Bruun* Cruise 6 by B. Nafpaktitus, 13 June 1964; 5 females from off west coast of Villa Bourbon, Réunion (Mascarene Islands), by Y. Plessis and J. Bertard, 21 October 1973; 2 females from 2 hosts collected 4.8 km east of Steamer Point Harbor, Gold Mohor Bay, Aden (12°46'N, 044°59'15"E), by Talbot, 21 December 1964; 8 females from 7 hosts collected at Lizard Island, Queensland, Australia (14°35'S, 145°27'21"E), 27 November 1975; 6 females from 5 hosts collected at reef north of Vuro Island, Great Astrolabe, Fiji Islands, on *Te Vega* Cruise 7 by Colin and party, 8 May 1965; 3 females from 3 hosts collected at reef approximately 1/2 mile off Ishigaki City, Ishigaki, Ryukyu Islands, Japan, 22 May 1968; 1 female from Great Banda Island (04°34'S, 129°53'E). From *Cirripectes castaneus*: 3 females from Ras Muhammed, southern end of Sinai Peninsula, Red Sea, by J.E. Randall, O. Gon, and A. Levy, 19 September 1975. From *Cirripectes imitator*: 2 females from Taiwan near Ch'un-Fan-Shih by V.G. Springer, 24 April 1968. From *Cirripectes sp. D*: 1 female from Philippine Islands near Tonga Point, Siquijor Island (09°13.5'N, 123°28.2'E), by L. Knapp and party. From *Cirripectes auritus*: 3 females, 2 males from Sodwana Bay, Zululand, South Africa, by P.C. Heemstra and T. Heemstra, 4 September 1979; 1 female, 1 male from Sodwana Bay, Zululand, South Africa, by P.C. Heemstra and T. Heemstra, 4 April 1979. From *Cirripectes variolosus*: 1 female from reef off east side of Faautuai Village, Moorea Lagoon, Moorea, Society Islands, 12 August 1956; 1 female from Falalap Islet, Ifalik Atoll, Caroline Islands (07°14'08"N, 144°27'28"E), 19 September 1953; 2 females from Unai Obyan Reef, southwest side of island, east of Puntan Unai Obyan, Saipan, Mariana Islands (15°06'24"N, 145°44'03"E), 18 July 1956. From *Cirripectes stigmaticus*: 1 female from Babel Lakes Reef approximately 2 km southwest of entrance to Toagel Mid Passage, Belau Islands (07°07'17"N, 134°30'56"E), 19 January 1959; 3 females from off Cape Melville, Queensland, Australia (14°56'S, 144°36"E), 9 February 1979. From *Cirripectes imitator*: 1 female from Chichijima Island, Ogasawara Islands, Japan, 8 April 1974.

MATERIAL EXAMINED OF VARIANT.—From *Cirripectes filamento-us*: 2 females from Tagauayan Island (Cuyo Island), Palawan Province, Philippine Islands (10°57'48"N, 121°13'32"E); 2 females from Guadalcanal near Honiara, Solomon Islands (09°22'S, 159°52'E), 11 July 1973; 1 female from Suluag Island, Sulu Province, Philippine Islands, 22 June 1948; 1 female from northwest corner of North Oxley Island, Northern Territory, Australia (11°00'S, 132°49'E), 20 October 1982 by H. Larson and R. Williams. From *Cirripectes quagga*: 2 females from 2 hosts collected at Tutuila Island, American Samoa. From *Cirripectes perustus*: 2 females from Peros Banhas on drop-off near pass between Isle Anglaise and Isle Maniapate, Chagos Archipelago (05°25'04"S, 071°13'32"E); 2 females from Guadalcanal near Honiara, Solomon Islands (09°22'S, 159°52'E), 11 July 1973; 1 female from Suluag Island, Sulu Province, Philippine Islands, 22 June 1948; 1 female from northwest corner of North Oxley Island, Northern Territory, Australia (11°00'S, 132°49'E), 20 October 1982 by H. Larson and R. Williams. From *Cirripectes polyzona*: 1 female from rocky shore on south side of island off San Shien Tai (North of Cheng Kung), east coast of Taiwan, by Randall and party, 12 July 1978; 2 females from fringing reef on north side of Tutuila, American Samoa, by B.
FIGURE 92.—*Taeniaeanthus williamsi*, new species, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area, ventral; D, first antenna, ventral; E, second antenna, medial; F, postantennal process, ventral; G, labrum, paragnath and position of mandible, ventral. (A1 = first antenna, Md = mandible, P = paragnath.)
FIGURE 93.—Taeniacanthus williamsi, new species, female: A, mandible, anteromedial; B, first maxilla, ventral; C, same, posterior; D, second maxilla, posteroventral; E, second maxilla, terminal segment, anterolateral; F, maxilliped, ventrolateral; G, maxilliped claw, ventral; H, same, dorsal; I, leg 1 and interpodal plate, ventral; J, leg 2, interpodal plate and proximal portions of basipods, ventral.
FIGURE 94.—*Taeniacanthus williamsi*, new species, female: A, leg 2, ventral; B, leg 3, interpodal plate and proximal portions of basipods, ventral; C, leg 5 endopod, ventral; D, leg 4, interpodal plate and proximal portions of basipods, ventral; E, leg 4, terminal exopod segment, ventral; F, leg 4 endopod, ventral; G, leg 5, ventral.
FIGURE 95.—*Taeniocanthus williamsi*, new species. Male: A, dorsal; B, leg 5 and genital area, ventral; C, labrum, ventral; D, second maxilla, posteroverentral; E, maxilliped, anterior; F, same, posterior. Female variant: G, anal segment and caudal ramus, ventral; H, leg 2 endopod, ventral; I, leg 5, ventral.

Above material collected from branchial chambers and pseudobranchs of preserved species of *Cirripectes* by J.T. Williams.

**DESCRIPTION.**—**Female:** Body as in Figure 92A. Total length 1.02 mm (0.85–1.18 mm) and greatest width 0.57 mm (0.53–0.64 mm) based on 10 specimens. Cephalothorax more than 2x wider than long, 310 × 649 μm, and comprising approximately 30% of total body length. Thoracic segment bearing leg 2 much wider than those bearing legs 3 and 4. Epimera of cephalothorax and second pedigerous segment distinct. Genital complex wider than long, 85 × 138 μm. Abdomen 4-segmented; segments from anterior to posterior 51 × 120 μm, 39 × 101 μm, 28 × 85 μm, and 44 × 71 μm (l × w); anal segment (Figure 92B) bearing 2 curved rows of spines on each side of anteroventral surface. Caudal ramus (Figure 92b) slightly longer than wide, 28 × 23 μm, and carrying 4 naked setae and 2 large, bristled, median terminal setae.

Rostral area (Figure 92c) with rounded anteromedian process and an irregularly shaped sclerotized part ventromedially. First antenna (Figure 92b) 7-segmented; armature formula: 5, 15, 5, 3, 4, 1 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 92e) tripartite (third and fourth segments almost completely fused); first segment with usual distal seta; second segment carrying 1 acuminate seta distally; terminal portion bearing 2 pectinate processes with numerous rows of spines (shorter process with hyaline knob) and 3 curved spines and 5 setae. Postantennal process (Figure 92f) curved.

Labrum (Figure 92g) truncate, with anteromedian hyaline lobe (balloon-like structure), and bearing spines along posterior margin. Mandible (Figure 93a) with 2 spinulated acuminate blades of almost equal length (lower blade slightly longer) and 1 bristled hyaline seta. Paragnath (Figure 92g) haired (setulated) at base. First maxilla (Figure 93b,c) with a few lobes, 4 setae (smallest one pinnate), and 1 minute nipple-like process near base of second longest seta. Second maxilla (Figure 93d,e) 2-segmented; first segment a sclerotized area; second segment (Figure 93e) bearing broad terminal process and broad unilaterally spinulated spine; terminal process and spine broad due to thick transparent cuticle. Maxilliped (Figure 93f–h) 3-segmented; first segment with small seta; second segment (corpus) carrying 2 large naked setae; third segment (Figure 93g,h) with 3 rounded knobs and 1 seta on its base and terminating in a curved claw; claw ornamented with numerous crenulated transverse flanges.

Legs 1–4 (Figures 93l,j, 94a–f) biramous. Spinal and setal formula as follows:

| P1 | coxa 0-1 basis 1-1 | exopod 1-0; 3 endopod 0-1; 7 |
| P2 | coxa 0-0 basis 1-0 | exopod 0-0; 1-1; II, 1, 3 endopod 0-1; 0-2; II, 1, 3 |
| P3 | coxa 0-0 basis 1-0 | exopod 0-0; 1-1; II, 1, 5 endopod 0-1; 0-1; II, 1, 2 |
| P4 | coxa 0-0 basis 1-0 | exopod 0-0; 1-1; II, 1, 5 endopod 0-1; 0-1; II, 1, int. |

Interpodal plates of legs 1–4 (Figures 93l,j, 94b,d) spinulated along posterior margin; that of leg 1 with convex posterior margin slightly indented at midline. Plates of legs 2–4 reentrant. Coxae and bases of legs 2–4 with spines as in Figure 94a,b,d. Leg 2 basis bearing large patch of spines on inner margin; this patch absent in legs 3 and 4, except on leg 3 of specimens from *Cirripectes perustus*. Outer margins of segments of exopods and endopods of legs 2–4 bearing rows of minute spines. Exopod spines of legs 2–4 quite flexible, not heavily sclerotized. Distolateral corner of terminal exopod segment of leg 4 (Figure 94e) possessing 1 small setiform process and 2 minute spines. Endopod spines of leg 4 (Figure 94f) not spinulated, but bearing transparent membranes along flanks. Leg 5 (Figure 94g) with 2 segments; first segment with 2 rows of spines along distal margin and 1 dorsolateral seta; second segment longer than wide, 59 × 29 μm, bearing 2 spinulated spines, 2 long slender setae, and rows of spines. Leg 6 represented by 3 setae in area of egg sac attachment.

**Male:** Body as in Figure 95a. Total length 0.85 mm (0.76–0.89 mm) and greatest width 0.30 mm (0.29–0.31 mm) based on 3 specimens. Cephalothorax wider than long, 258 × 317 μm, and comprising less than 30% of total body length. Genital complex (Figure 95b) wider than long, 106 × 113 μm. Abdomen 3-segmented; segments from anterior to posterior 46 × 83 μm, 39 × 76 μm, and 46 × 60 μm (l × w). Caudal ramus similar to that in female except smaller, 26 × 20 μm (l × w).

Labrum (Figure 95c) without spines along posterior margin. Second maxilla (Figure 95d) bearing bilaterally spinulated terminal process and spines. Maxilliped (Figure 95e,f) 4-segmented; first segment irregularly shaped and carrying usual naked seta; second segment (corpus) robust, bearing 2 rows of small spines, corrugated patch (or rounded denticles), and 2 naked setae; third segment small and unornamented; terminal segment a claw armed with 2 anterior setae, 1 posterior seta, and numerous teeth along concave margin. Leg 5 (Figure 95b) similar to that in female except slightly smaller, 50 × 21 μm (l × w). All other appendages as in female.

**Variant:** Anal segment (Figure 95c) bearing 3 curved rows of spines on each side of anteroventral surface and
1 row of minute spinules on posterolateral margin near insertion of each caudal ramus. Mid-endopod segment of leg 2 (Figure 95t) with formula 0-1 instead of usual 0-2. Second segment of leg 5 (Figure 95i) with outermost seta shorter than that described above.

ETYMOLOGY.—This species is named in honor of Jeffrey T. Williams, Smithsonian Institution, who collected numerous species of parasitic copepods from Cirripedes for this revision.

REMARKS.—The structure of the maxilliped claw of the female of *Taeniacanthus williamsi*, with its numerous crenulated transverse flanges, is very similar to that of *T. glomeratus*, new species, also a parasite of Cirripedes. The shape of the labrum, mandible, first maxilla, second maxilla, and shape of the endopod spines of legs 2–4 may be used to distinguish these two species. The spatulate shape of the terminal process and spine of the second maxilla of *T. williamsi* is distinctive for this species.

*Taeniacanthus wilsoni* A. Scott, 1929


DESCRIPTION.—**Female:** See A. Scott (1929) and Kabata (1979).

**Male:** Unknown.

REMARKS.—The original description by A. Scott (1929) of this species was based on females obtained from the gills of *Raja fullonica* Linnaeus collected in the Irish Sea. Kabata (1979) partially redescribed the poorly preserved holotype specimens.

A detailed redescription of *Taeniacanthus wilsoni* is needed before a meaningful morphologic comparison with its congeners can be made.

*Taeniacanthus yamagutii* (Shiino, 1957)

**Figures 96–99**


**MATERIAL EXAMINED.**—4 females, 2 males (USNM 190509) from *Takifugu rubripes* (Temminck and Schlegel) from Kojima Bay, Japan, 11 November 1980 by Tran The Do.

**DESCRIPTION.**—**Female:** Body as in Figure 96A. Total length 2.49 mm (2.12–2.70 mm) and greatest width 1.10 mm (1.07–1.12 mm) based on 3 specimens. Cephalothorax 432 × 1128 μm (l × w), comprising less than 20% of total body length. Thoracic segments bearing legs 2, 3, and 4 relatively large and decreasing in width posteriorly. Genital complex (Figure 96b) wider than long, 226 × 348 μm, with rows of spinules on posteroventral margin. Abdomen 4-segmented; segments from anterior to posterior 169 × 310 μm, 141 × 282 μm, 75 × 244 μm, and 207 × 216 μm (l × w); anal segment (Figure 96c) with varying number of rows of spinules on anteroventral surface (1 specimen with 3 rows on right side and 4 rows on left side; 2 specimens with 5 rows on right side and 4 rows on left side); posteroventral margin of anal segment with 1 row of spines near insertion of each caudal ramus. Caudal ramus (Figure 96c) 161 × 69 μm (l × w), bearing 6 setae; 2 large median terminal setae finely bristled; outermost terminal seta with short row of spines at base.

Rostral area (Figure 96d) with sclerotized ventromedian part. First antenna (Figure 96e) 6-segmented; armature formula: 5, 15, 8, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 96f) 4-segmented; first segment with attenuate distal seta; second segment with acuminate distal seta; third segment bearing 2 pectinate processes (longer process with 1 naked seta near distal end, shorter process with 1 digitiform hyaline process near proximal end) and 1 large curved spine; fourth segment with 2 large curved spines and 4 setae. Postantennal process (Figure 96g) with relatively short, only slightly curved.

Labrum (Figure 96h) possessing 2 median protuberances on ventral surface and medially incised, spinulated posterior margin. Mandible (Figure 97a) bearing 2 unequal blades, each spinulated along 1 margin, and 1 large, finely bristled hyaline seta. Paragnath (Figure 97a) a lobe with a digitiform tip. First maxilla (Figure 97c) with 5 setae (2 setae small) and 1 anterior knob. Second maxilla (Figure 97d,e) 2-segmented; first segment an ill-defined sclerotized area; second segment (Figure 97f) with bilaterally denticulate terminal process (only 1 row shown in figure) bearing 2 finely bristled spines. Maxilliped (Figure 97g–h) 3-segmented; first segment large, carrying 1 naked seta near articulation with second segment; second segment (corpus) with 2 naked setae; terminal segment a claw (Figure 97g,h) bearing 2 rows of denticles on convex surface, 1 seta near base and 1 subterminal spinulated seta (or spine?) on rounded digitiform process.

Legs 1–4 (Figures 97j, 98A–H) biramous. Spinal and setal formula as follows:

\[
P_1 \text{ coxa 0-1 basis 1-1 exopod 1-0; 9 endopod 0-1; 7}
\]

\[
P_2 \text{ coxa 0-0 basis 1-0 exopod 1-0; 1-1; II, 1, 4 endopod 0-1; 0-1; II, 1, 3}
\]

\[
P_3 \text{ coxa 0-0 basis 1-0 exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-1; II, 1, 2}
\]

\[
P_4 \text{ coxa 0-0 basis 1-0 exopod 1-0; 1-1; II, 1, 4 endopod 0-1; 0-1; II, int.}
\]

Interpodal plates of legs 1–4 (Figures 97j, 98c,f) spinulated on posterior margins; that of leg 1 with V-shaped posterior margin. Plates of legs 2–4 reentrant and each bearing patch of spinules on protuberant posteralateral
FIGURE 96.—*Taeniacanthus yamagutii* (Shiino), female: A, dorsal; B, genital complex and leg 5, ventral; C, anal segment and caudal ramus, ventral; D, rostral area, ventral; E, first antenna, ventral; F, second antenna, medial; G, postantennal process, ventral; H, labrum, ventral.
FIGURE 97.—Taeniacthys yamagutii (Shiino), female: A, mandible, anterior; B, paragnath, dorsolateral; C, first maxilla, anterior; D, second maxilla, posteroventral; E, second maxilla, terminal segment, lateral; F, maxilliped, ventromedial; G, maxilliped claw, dorsal; H, same, ventromedial; I, leg 1 and interpodal plate, ventral; J, leg 2, interpodal plate and basipod, ventral.
FIGURE 98.—*Taeniacthus yamagutii* (Shiino), female: A, leg 2 exopod, ventral; B, leg 2 endopod, ventral; C, leg 3, interpodal plate and proximal portions of basipods, ventral; D, leg 3 exopod, ventral; E, leg 3 endopod, ventral; F, leg 4, interpodal plate and proximal portions of basipods, ventral; G, leg 4 exopod, ventral; H, leg 4 endopod, ventral.
FIGURE 99.—*Taeniaanthus yamaguti* (Shiino). Female: A, leg 5, dorsolateral; B, same, ventrolateral. Male: C, dorsal; D, genital area, ventral; E, second maxilla, terminal segment, posterovernteral; F, maxilliped, medial; G, same, anterior; H, same, posterior; I, leg 5, ventrolateral.
corners. Coxa of leg 1 (Figure 97i) with 1 small conical process near inner coxal seta; coxa and basis of leg 1 with spinules as in Figure 97i. Coxae of legs 2–4 (see Figure 97j) each with row of spinules on distolateral corner. Basis of leg 2 (Figure 97j) ornamented with a patch of spinules on inner surface and with a row of smaller spinules along posterior margin; spinules on inner surface of basis absent in legs 3 and 4 (Figure 98c,f). Exopods and endopods of legs 2–4 with spinules on outer margins of segments. Exopod spines of legs 2–4 (see Figure 98a) each bearing serrated flanges and terminal flagellum. Terminal segments of exopods of legs 2 and 3 (Figure 98a,d) each exhibiting slightly inflated distolateral corner with 1 small spine; terminal segment of exopod of leg 4 (Figure 98g) longer and more slender than exopods of legs 2 and 3 and bearing 2 spinules on distolateral corner. Endopod spines of legs 2–4 (Figure 98k,e,h) with serrated flanges except outermost spine of leg 2 naked. Leg 5 (Figure 99a,b) with 2 segments; first segment with 1 naked seta and spinules on posteroverentral margin; second segment 79 × 42 μm (l × w), bearing 3 spinulated spines and 1 naked seta; each spine with row of relatively large spinules at base; dorsomedial margin of segment with patches of spinules along entire length. Leg 6 represented by 3 setae in area of egg sac attachment.

**Male:** Body form as in Figure 99c. Total length 1.83 mm (1.82–1.84 mm) and greatest width 0.68 mm (0.67–0.69 mm) based on 2 specimens. Cephalothorax wider than long, approximately 376 × 667 μm, comprising about 20% of total body length. Genital complex (Figure 99d) slightly wider than long, 244 × 263 μm, and bearing numerous rows of spinules on posteroventral surface near genital opening. Abdomen 3-segmented; segments from anterior to posterior 124 × 193 μm, 120 × 179 μm, and 184 × 156 μm (l × w); anal segment with 4–5 rows of spinules on each side of anteroventral surface (usually 4); posteroventral surface of anal segment as in female. Caudal ramus as in female except smaller, 129 × 55 μm (l × w).

Appendages as in female except for those features mentioned below. Terminal segment of second maxilla (Figure 99e) more slender than that of female. Maxilliped (Figure 99r–t) 4-segmented; first segment large, carrying 1 naked distal seta; second segment (corpus with row of spinules along inner margin and a semicircular group of spinules as in Figure 99f; spinules not present in Figure 99h); third segment small and unornamented; fourth segment a curved claw with 2 anterior and 1 posterior setae, a conical process, denticles along concave (inner) margin and a trifid protuberance associated with a hyaline balloon-like structure tipped with a digitiform process. Leg 5 (Figure 99a) similar to that in female except second segment 110 × 51 μm (l × w).

**Remarks.—** *Taeniacanthus yamagutii* was originally described by Yamaguti (1936) as *Irodes tetradonis* (Bassett-Smith, 1898). Shiino (1957a) proposed that Yamaguti’s specimens were not conspecific with the species described by Bassett-Smith, and so established a new species, *Irodes yamagutii*. This species was later transferred to *Taeniacanthus* by Yamaguti and Yamasu (1959). Although Ho (1969) synonymized *T. yamagutii* with Bassett-Smith’s *T. tetradonis*, we feel that a definite decision on the synonymy is premature (see “Remarks” for *T. tetradonis* for a detailed discussion).

*Taeniacanthus yamagutii* is most closely related to *T. fugu* and *T. kitamakura*. For distinguishing characters of these three species, refer to “Remarks” for *T. fugu*.

**Taeniacanthus zeugopteri** (T. Scott, 1902), new combination

*Bomolochus zeugopteri* T. Scott, 1902:290.—Wilson, 1911:368.—Scott and Scott, 1913:40.


**Description.—** Female and Male: See Leigh-Sharp (1939) and Kabata (1979).

**Remarks.—** *Taeniacanthus zeugopteri* was originally described as *Bomolochus zeugopteri* by T. Scott (1902). This species was transferred to *Anchistrotos* and redescribed by Leigh-Sharp (1939). It is parasitic on the flatfish *Zeugopterus punctatus* (Bloch), where it is attached to the upper body surface of the dorsal and ventral fins (Leigh-Sharp, 1939; Kabata, 1979).

A detailed redescription of this species is needed before comparisons with its congeners can be adequately made. Kabata (1979, fig. 79) illustrated the maxilliped of the female of this species with the claw only slightly curved away from the corpus. The two long whip-like setae on the claw are very similar to those found on species of *Anchistrotos*. However, until a detailed redescription is made the taxonomic status of *Taeniacanthus zeugopteri* remains uncertain. (See “Remarks under discussion of *Anchistrotos*.”)

**Anchistrotos Brian, 1906**

*Bomolochus (Anchistrotos) Brian, 1906:32.


**Diagnosis.—** Female: Cephalothorax subcircular in outline with first pedigerous segment fused to cephalosome. Abdomen 4-segmented. Caudal ramus with 6 setae. Rostral area protuberant and bearing ventromedian sclerotized plate. First antenna 6- or 7-segmented. Second antenna 3- or indistinctly 4-segmented with third and fourth segments partially or completely fused. Postantennal process a curved spiniform hook. Labrum and paragnath present. Mandible with 2 spinulated unequal blades; accessory
seta absent. First maxilla a lobe bearing 6 setae. Second maxilla 2-segmented; second segment with 1 spinulated process and 2 elements (spines and/or setae). Maxilliped claw with 2 long whip-like setae.

Legs 1–4 biramous. Leg 1 with distinctly or indistinctly 3-segmented exopod and 2-segmented endopod; terminal endopod segment with 6 setae. Legs 2–4 with 3-segmented rami. Terminal endopod segment of leg 4 with 4 elements. Leg 5 with 4 elements on second segment. Leg 6 represented by 3 setae in area of egg sac attachment.

Male: Genital segment suboval. Except for maxilliped, appendages similar to those of female.

Type-Species.—Bomolochus (Anchistrotos) gobii Brian, 1906.

Remarks.—Anchistrotos was originally established as a subgenus of Bomolochus by Brian (1906) for B. gobii, and subsequently elevated to generic status by Wilson (1911). Wilson’s generic diagnosis included an important taxonomic feature of this genus: “Maxillipeds . . . made up of a large basal joint and a curved terminal claw, sometimes bearing long setae.” However, the taxonomic importance of the long setae associated with the maxilliped claw was then not known. Other attempts at providing revised diagnoses for Anchistrotos led to ambiguities with other taeniacanthid genera, in particular Taeniacanthus (see Lewis, 1967; Kabata, 1979). Although Pillai (1963) and Kabata (1979) questioned the validity of Anchistrotos, our examination of the type-species A. gobii and its congeners, along with the transfer of non-Anchistrotos species from this genus, has revealed a group of species sharing numerous morphologic features. The characteristics they share distinguish them from other taeniacanthid genera, and warrant the retention of this genus.

According to Do and Ho (1983), 17 nominal species of Anchistrotos have been described. To this list is added A. lucipetus Holmes, 1985 and A. caligiformis (Gurney, 1927). The latter species is transferred from Assecula, considered here as a junior synonym of Anchistrotos (see Kabata, 1979:73). Only six species are retained in this genus. The remaining species are transferred to other taeniacanthid genera.

Anchistrotos laqueus Leigh-Sharpe, 1935, A. kojimensis Do and Ho, 1983, A. onosi (T. Scott, 1902), A. gobii Brian, 1906, A. caligiformis (Gurney, 1927), and A. lucipetus Holmes, 1985, are closely related. These species lack an accessory seta on the mandible, and also have six setae on the first maxilla. In addition, they have a 2-segmented endopod of leg 1 with the terminal segment bearing six setae and four spines on the terminal endopod segment of leg 4. Another important feature is the presence of two whip-like setae on the claw of the maxilliped of the female.

There are two species, Anchistrotos zeugopteri (T. Scott, 1902) and Taeniacanthus wilsoni A. Scott, 1929, that bear two long setae on the maxilliped claw of the female. Unfortunately, the details of the appendages could not be ascertained from the literature. These two species are included in Taeniacanthus until more is known about their external morphology.

**Key to Species of Anchistrotos Females**

1. Claw of maxilliped reduced to short spiniform process bearing 2 setae near its base (1 modified seta extremely long and whip-like) [Figure 101g] ................. A. gobii
   Claw of maxilliped not reduced .................................. 2
2. Distal half of maxilliped claw setiform (flexible) [Figure 104t] .... A. laqueus
   Entire maxilliped claw rigid ...................................... 3
3. Outer seta of basis of leg 1 short, blunt, and almost as wide as long .......... 4
   Outer seta of basis of leg 1 attenuate ................................ 5
4. Maxilliped claw curved; longest seta approximately twice length of claw ..... A. lucipetus
   Maxilliped claw hooked; longest seta approximately 1½ times length of claw ................................................................. A. onosi
5. Two pairs of ventral, spiniform processes posterior to rostral area ........ A. caligiformis
   Two pairs of ventral, spiniform processes posterior to rostral area absent ................................................................. A. kojimensis

**Anchistrotos gobii** Brian, 1906

*Figures* 100–102, 161A,B

*Bomolochus (Anchistrotos) gobii* Brian, 1906:32.


Material Examined.—3 ovigerous and 1 nonovigerous females from *Gobius cobitis* (USNM 198899) collected in Lebanon.

Description.—Female: Body as in Figure 100A. Total length 1.31 mm (1.21–1.37 mm) and width 0.53 mm (0.52–0.55 mm) based on 3 specimens. Cephalothorax 442 × 545
Figure 100.—Anchistrotos gobii Brian, female: A, dorsal; B, genital area, dorsal; C, anal segment and caudal ramus, ventral; D, egg sac, lateral; E, rostral area and first antennae, ventral; F, first antenna, anterodorsal; G, first antenna, distal two segments, anterodorsal; H, second antenna, medial. (A2 = second antenna.)
FIGURE 101.—Anchistrotus gobii Brian, female: A, postantennal process, ventral; B, labrum, ventral; C, mandible, anteromedial; D, paragnath, dorsal; E, first maxilla, anterior; F, second maxilla, anteromedial; G, maxilliped, ventral; H, cephalothorax, ventral. (R = rostral area, A1 = first antenna, A2 = second antenna, pap = postantennal process, L = labrum, Md = mandible, P = paragnath, Mx1 = first maxilla, Mx2 = second maxilla, Mxpd = maxilliped, P1 = leg 1.)
Figure 102.—Anchistrotus gobii Brian, female: A, leg 1 and interpodal plate, ventral; B, leg 2 and interpodal plate, ventral; C, leg 2 exopod, ventral; D, leg 3 and interpodal plate, ventral; E, leg 4 and interpodal plate, ventral; F, leg 5, dorsal.
μm (l x w), consisting of cephalosome and first pedigerous segment, and comprising approximately 1/6 of total body length. Pedigerous segments decreasing in width markedly from second to fifth segments. Genital complex wider than long, 120 x 138 μm. Each genital area (area of egg sac attachment) with 3 setae (Figure 100b). Abdomen 4-segmented from anterior to posterior 69 x 87 μm, 64 x 83 μm, 41 x 76 μm, and 74 x 69 μm (l x w); anal segment without ornamentation. Caudal ramus (Figure 100c) tapered distally, 62 x 34 μm (l x w) and bearing 6 setae. Egg sac (Figure 100d) oval, 483 x 78 μm, containing about 21 eggs.

Rostral area (Figure 100e) distinct, with ventromedian sclerotized part. First antenna (Figure 101r.g) distinctly 7-segmented; formula for armature: 5, 15, 5, 3, 4, 2 + 1 aesthetes, and 7 + 1 aesthete. Second antenna (Figure 100m) 3-segmented, with formula 1, 1, 7 (3 claw-like spines and 4 large setae). Inner margin of third segment spinulated with 1 setule at terminal end. Distalateral side of segment with pectinate process bearing small setule at midlength. Postantennal process (Figure 101a) strongly curved, slender, with oval pit on base.

Labrum (Figure 101b) with rounded posteroventral margin with row of spinules. Mandible (Figure 101c) with 2 unequal blades, each spinulated along 1 margin. Paragnath (Figure 101d) with attenuate, hyaline terminal process. First maxilla (Figure 101b) a lobe bearing 2 large bristled setae, 4 smaller naked setae, and 1 sclerotized knob. Second maxilla (Figure 101f) 2-segmented; first segment robust with 1 terminal seta; second segment with 2 spinulated spiniform processes and 1 naked seta. Maxilliped (Figures 101g, 161a,b) apparently 2-segmented; first segment bearing 2 naked, short setae on inner margin; second segment (Figure 161a,b) an elongate, whip-like process possessing 1 naked seta and conical, sclerotized process at base: whip-like process representing modified seta and conical process a reduced claw. Arrangement of cephalothoracic appendages as in Figure 101h.

Leg 1 (Figure 102a) with 3-segmented exopod and 2-segmented endopod. Legs 2-4 (Figure 102b-e) with 3-segmented rami. Seta and setal formula as follows:

<table>
<thead>
<tr>
<th></th>
<th>coxa</th>
<th>basis</th>
<th>exopod</th>
<th>endopod</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>0-1</td>
<td>1-1</td>
<td>1-0; 1-1; 7</td>
<td>0-1; 6</td>
</tr>
<tr>
<td>P2</td>
<td>0-1</td>
<td>1-0</td>
<td>1-0; 1-1; 5</td>
<td>0-1; 2-2; 1, 2</td>
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<td>1-0</td>
<td>1-0; 1-1; 5</td>
<td>0-1; 0-2; 2, 1</td>
</tr>
<tr>
<td>P4</td>
<td>0-0</td>
<td>1-0</td>
<td>1-0; 1-1; 5</td>
<td>0-1; 0-1; 1-1; IV</td>
</tr>
</tbody>
</table>

Intercoxal plates of legs 1-4 (Figure 102a,b,d,e) each with row of spinules on posterior margin; that of leg 1 with convex posterior margin. Plates of legs 2 and 3 reentrant; plate of leg 4 with nearly straight posterior margin. Exopod spines of legs 3 and 4 similar to those of leg 2 (Figure 102c). Leg 5 (Figure 102f) with 1 naked dorsal seta. Second segment 71 x 39 μm (l x w). Outermost and innermost spines with few spinules at bases. Medial 2 processes represented by 1 spine and 1 seta. Leg 6 represented by 3 naked setae on genital area (Figure 100b).

Male: Unknown.

Remarks.—Anchistrotos gobii was first described by Brian (1906) under the binomen Bomolochus gobii (subgenus Anchistrotos), which he collected from Gobius capito Cuvier and Valenciennes at Naples, Italy. Wilson (1911) elevated Anchistrotos from subgeneric to generic status. Wilson was correct in assuming that Brian’s description of a male of this species was really a female. The male of Anchistrotos gobii remains unknown.

We have interpreted the relatively short spiniform process on the terminal segment of the maxilliped as representing a reduced claw, and the long whip-like element as a modified seta indistinguishably fused to the terminal segment. The relative positions of these two elements warrant this interpretation. The morphology of the maxilliped, specifically the terminal segment, is the diagnostic character of this species.

Anchistrotos caligiformis (Gurney, 1927), new combination

Assecula caligiformis Gurney, 1927:477.—A. Scott, 1929:87.

Description.—Female: See Gurney (1927).

Male: Unknown.

Remarks.—Gurney (1927) described a new genus and species Assecula caligiformis from one female collected from “weeds” at Port Said, Egypt. This species bears a protuberant rostral area, six setae on the first maxilla, two long whip-like setae on the maxilliped claw, 3-segmented exopod and 2-segmented endopod of leg 1, six setae on the terminal endopod segment of leg 1, and four elements on the terminal endopod segment of leg 4. This species is transferred to Anchistrotos, whose species possess all these characteristics. The “second joint” of the first maxilla was misinterpreted by Gurney; it is simply the paragnath.

Anchistrotos caligiformis is morphologically similar to A. onosi (T. Scott, 1902) and A. luciptetus Holmes, 1985. It can be distinguished from these two species and all other congeners by the presence of two pairs of spiniform processes located on the posteroventral surface of the rostral area.

Anchistrotos caligiformis was not found attached to a host, but found in seaweed. Because all other species of Anchistrotos, except A. luciptetus Holmes, 1985, are known to be parasitic on fishes, the solitary female specimen of A. caligiformis is most likely a parasite of a fish.

Anchistrotos kojimensis Do and Ho, 1983

Anchistrotos kojimensis Do and Ho, 1983:1.
DESCRIPTION.—Female: See Do and Ho (1983).

Male: Unknown.

REMARKS.—Do and Ho (1983) described Anchistrotos kojimensis collected from the branchial cavity of the yellow goby Acanthogobius flavimanus (Temminck and Schlegel) from Kojima Bay, Japan.

As noted by the discoverers, A. kojimensis can be distinguished from its congeners by the shape of the maxilliped seta; third segment with 2 pectinate processes (longer one apparently 4-segmented; first 2 segments each with a distal aesthete, and 7 + 1 aesthete. Second antenna (Figure 103F) with usual seta; second segment (corpus) with 2 naked setae; terminal segment a sigmoidal claw bearing rounded denticles and 2 whip-like setae (one fused to base of claw).

Legs 1–4 (Figures 104F, 105A–D) biramous. Spinal and setal formula as follows:

\[
P_1 \text{ coxa } 0-1 \text{ basis } 1-0 \text{ exopod } 1-0; 1-1; 7 \\
P_2 \text{ coxa } 0-1 \text{ basis } 1-0 \text{ exopod } 1-0; 1-1; 1, 1, 5 \\
P_3 \text{ coxa } 0-0 \text{ basis } 1-0 \text{ exopod } 1-0; 1-1; 1, 1, 5 \\
P_4 \text{ coxa } 0-0 \text{ basis } 1-0 \text{ exopod } 1-0; 1-1; 1, 1, 5 \\
\]

Interpodal plates of legs 1–4 (Figures 104F, 105A,C) with spines on posterior margins; that of leg 1 with convex posterior margin. Plates of legs 2 and 3 reentrant; plate of leg 4 with relatively straight posterior margin. Outer seta of basis of leg 1 (Figure 104F); blunt and stout. Cephalothorax (Figure 105A) with rows of spinules on distolateral margins and proximal areas near junction with bases. Exopods of legs 2–4 with outer margins of segments with minute spines; exopod spines of legs 2–4 (see Figure 105A) not highly sclerotized, and bearing minute bristles. Endopods of legs 2–4 (Figure 105A,B,D) with minute spines on outer margins of segments; second segment of endopods of legs 2 and 3 with outer spiniform processes and long inner spines. Endopod spines of legs 2 and 3 (see Figure 105A) bilaterally spinulated. Endopod of leg 4 (Figure 105D) with outermost spine having a hyaline membrane; terminal spine bilaterally spinulated; intermediate spine unilaterally spinulated (bristled) and semipinnate; innermost spine naked. Leg 5 (Figure 105E) with 2 segments; first segment with ventral row of distal spines and a sparsely pinnate seta; second segment 72 X 38 μm (l x w), bearing 3 setae, each with 1 row of bristles, and 1 naked seta (each seta with row of minute spinules at base), and with longer spinules on distomedial corner near base of innermost seta. Leg 6 represented by 3 setae in area of egg sac attachment.

Male: Unknown.

REMARKS.—Anchistrotos laqueus was first described by Leigh-Sharpe (1935). The specimens upon which his description was based were collected from the gills of Serranus cabrilla at Plymouth, England. Kabata (1979) gave a short
Figure 103.—Anchistrolos laqueus Leigh-Sharpe, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, egg sac, dorsal; D, rostral area and first antenna, ventral; E, second antenna, medial; F, postantennal process, ventral; G, labrum, ventral.
FIGURE 104.—Anchistrodon laqueus Leigh-Sharpe, female: A, mandible, anteromedial; B, paragnath, ventral; C, first maxilla, ventral; D, second maxilla, ventral; E, maxilliped, ventral; F, leg 1 and interpodal plate, ventral.
Figure 105.—Anchistrotus laqueus Leigh-Sharpe, female: A, leg 2 and interpodal plate, ventral; B, leg 3 endopod, ventral; C, leg 4, interpodal plate and proximal portions of basipods, ventral; D, leg 4 endopod, ventral; E, leg 5, ventrolateral.
two setae that extend beyond the distal limit of the claw. In addition, A. onosi has serrate exopod spines, each tipped with a terminal flagellum, in legs 2–4. Its congeners possess relatively weak (slightly sclerotized and flexible) exopod spines.

**Cirracanthus, new genus**

**Diagnosis.**—Female: Cephalothorax with first pedigerous segment fused to cephalosome. Genital segment relatively small. Abdomen 4-segmented. Caudal ramus with usual 6 setae.


Legs 1–4 biramous. Leg 1 with 2-segmented rami. Legs 2–4 with 3-segmented rami. Terminal segment of endopod of leg 4 with 3 elements (spines and setae). Leg 5 with 4 setae on second segment. Leg 6 represented by 3 setae in area of egg sac attachment.

**Male:** Unknown.

**Etymology.**—The generic name is a combination of the Latin *cirrus* (curl) plus *acanthus* (a common suffix in the Taeniactanidae, meaning thorn), alluding to the curved claw of the maxilliped of the female of this genus.

**Type-Species.**—*Taeniactatus monacanthi* Yamaguti, 1939.

**Remarks.**—*Cirracanthus monacanthi* (Yamaguti, 1939), parasitic on *Monacanthus* and *Stephanolepis* and *Cirracanthus spinosus*, new species, parasitic on *Chaetoderma*, represent a new genus that is distinguished from other taeniactanid genera primarily by the shape of the maxilliped claw of the female. The claw of these two species curves toward the corpus of the maxilliped resulting in a subchelate appendage. However, the claw of the maxilliped of the females of the majority of taeniactanids curves away from the corpus. This structural distinction is fundamentally different from all other taeniactanid genera. In addition to the shape of the maxilliped claw, these two species possess a similar shape and armature of the second antenna, an accessory seta or process on the mandible, 5 setae on the first maxilla, 2 digitiform processes on the tip of the terminal exopod segment of leg 4, and 4 setae (instead of the usual 3 spines and 1 seta) on the second segment of leg 5. Both these species are parasitic on monacanthid hosts (Tetraodontiformes).
Key to Species of Cirracanthus Females

Terminal exopod segment of leg 3 with armature formula 1, 1, 4 [see leg 2, Figure 107i] ........................................... C. monacanthi

Terminal exopod segment of leg 3 with armature formula 1, 1, 5 [Figure 111b] .................................................. C. spinosus, new species

---

Cirracanthus monacanthi (Yamaguti, 1939), new combination

FIGURES 106–108


Material examined.—15 females from Stephanolepis cirrhifer (Temminck and Schlegel) (USNM 71531) collected at Misaki, Japan; 3 females from Stephanolepis sp. (USNM collection) from Tokyo, Japan; 1 female from Stephanolepis sejifer Bennett (USNM 50747) from Japan; 3 females from Monacanthus chinensis (Osbeck) (USNM 130719) from Asia; 3 females from Monacanthus chinensis (USNM 145418 and 145419) from Kowloon, Hong Kong, China.

Description.—Female: Body form as in Figure 106A. Total length 1.43 mm (1.31–1.54 mm) and greatest width 0.53 mm (0.52–0.56 mm) based on 6 specimens. Cephalothorax 386 × 536 μm, comprising about 25% of total length. Thoracic segments bearing legs 2, 3, and 4 decreasing in width posteriorly. Genital complex wider than long, 120 × 166 μm. Abdomen 4-segmented; segments from anterior to posterior 64 × 120 μm, 55 × 106 μm, 41 × 92 μm, and 74 × 83 μm (l × w); anal segment of specimens from Monacanthus chinensis with 9 rows of spines on ventral surface (only 6 rows of spines on right side and 7 rows on left side of anal segment from Stephanolepis cirrhifer; second and third segments of spinules continuous across midline of anal segment; Figure 106A). Caudal ramus (Figure 106B) longer than wide, 49 ×26 μm, bearing 6 setae; inner lateral seta with row of spines at base.

Rostral area (Figure 106C) with slightly triangular ventromedian part. First antenna (Figure 106C) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2+1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 106D) apparently 3-segmented, although folds in cuticle make last segment appear 3-segmented; last segment with 3 stout spines, 4 setae, and 2 pectinate processes; each pectinate process with 1 small seta. Postantennal process (Figure 106E) curved.

Labrum (Figure 106F) with bilobed, spinulated posterior margin and hyaline balloon-like structure on anterior margin. Mandible (Figure 106G) with 2 blades, each spinulated along 1 margin, and a subterminal, pedunculate, pyriform process. Paragnath (Figure 107A) with small denticle near tip. First maxilla (Figure 107B) a lobe bearing 1 long and 4 comparatively short pinnate setae. Second maxilla (Figure 107C,D) 2-segmented; terminal segment with 2 spinulated spines, and 1 small naked seta. Maxilliped (Figure 107E,F) apparently 3-segmented; first segment broad with 1 naked seta; second segment (corpus) slender with 2 naked setae near proximal end and 1 rounded ovoid process near distal end; terminal segment a curved claw with 1 naked seta, 1 rounded knob and 1 small accessory process (Figure 107E) or 2 rounded knobs and 2 accessory processes (Figure 107F).

Legs 1–4 (Figures 107G–I, 108A–F) biramous. Spinal and setal formula as follows:

\[
P_1 \quad \text{coxa 0-0} \quad \text{basis 1-0} \quad \text{endopod 0-1; 9 exopod 0-1; 7 endopod 0-1; 1-1; 2-1, 4 endopod 0-1; 1-1; 1-1, 2-1}
\]

Interpodal plate of leg 1 (Figure 107G) broad, somewhat triangular, with 2 patches of spinules on posterior border; patches of spinules meet at midline of plate. Interpodal plates of leg 2 (Figure 107H) and leg 3 about as long as wide, medially indented, and each with 2 patches of spinules on posterior margin. Interpodal plate of leg 4 (Figure 108C) approximately 6× wider than with 2 subtriangular patches of spinules on ventral surface. Coxae and bases of legs 2–4 ornamented with spinules. Exopod spines of legs 2 and 3 with serrate flanges and each spine bearing a subterminal flagellum (see Figure 107I). Lateral endopod spines of legs 2–4 (Figure 108A,B,F) with serrate flanges along outer edges; terminal spines of legs 2–4 stout. Third segment of exopod of leg 4 (Figure 108D,E) with 2 small digitiform processes terminal. Outer margins of exopod segments with rows of spinules. Outer and inter-segmental margins of endopods of legs 2–4 with rows of spinules. Leg 5 (Figure 108G–I) with 2 segments; first segment small and armed with a row of spines and 1 naked seta; second segment, 81 × 30 μm, with 3 bristled setae and 1 naked seta, and several rows of spinules. Leg 6 (Figure 106A) represented by 3 setae in area of egg sac attachment.

Male: Unknown.

Remarks.—Cirracanthus monacanthi was originally described under the binomen Taeniacanthus monacanthi by Yamaguti (1939) from the gills of Monacanthus cirrifer Bennett (= Stephanolepis cirrhifer) caught near Japan.
FIGURE 106.—Cirracenthus monacanthi (Yamaguti), female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area and first antenna, ventral; D, second antenna, medial; E, postantennal process, ventral; F, labrum, ventral; G, mandible, anteromedial. (R = rostral area.)
FIGURE 107.—Cirranthus monacanthi (Yamaguti), female: A, paragnath, ventral; B, first maxilla, anterior; C, second maxilla, ventral; D, second maxilla, terminal segment, anterior; E, maxilliped, ventral; F, same, ventral; G, leg 1 and interpodal plate, ventral; H, leg 2, interpodal plate and basipod, ventral; I, leg 2 exopod, ventral.
FIGURE 108.—Cirracanthus monacanthi (Yamaguti), female: A, leg 2 endopod, ventral; B, leg 3 endopod, ventral; C, leg 4, interpodal plate and basipod, ventral; D, leg 4 exopod, ventral; E, leg 4, terminal exopod segment, ventral; F, leg 4 endopod, ventral; G, leg 5, dorsal; H, same, outer; I, same, medial.
**Cirracanthus monacanthi** can be distinguished from its only known congener **C. spinosus** by several features (Table 1).

**Cirracanthus spinosus**, new species

**Figures 109–111**

**Material Examined.**—1 female holotype (USNM 228420) and 6 female paratypes (USNM 228421) from Chaetoderma penicilligera (USNM 176890) collected from the Great Barrier Reef, Australia.

**Description.**—Female: Body as in Figure 109a. Total length 1.18 mm (1.05–1.27 mm) and greatest width 0.43 (0.40–0.44 mm) based on 6 specimens. Cephalothorax 341 × 451 μm (l x w), comprising approximately 25% of total body length. Thoracic segments bearing legs 2, 3, and 4 decreasing slightly in width posteriorly. Genital complex wider than long, 104 × 156 μm. Abdomen 4-segmented; segments from anterior to posterior 73 × 117 μm, 57 × 99 μm, 36 × 86 μm, and 65 × 78 μm (l x w); anal segment (Figure 109b) with varying number of anteroventral rows of spinules: 3 specimens with 3 rows on each side, 2 specimens with 3 rows on left side and 4 rows on right side, 1 specimen with 4 rows on right side and 3 rows on left side, and 1 specimen with 4 rows on left side and 5 rows on right side. Caudal ramus (Figure 109b), longer than wide, 36 × 26 μm, and bearing 6 setae (outermost and dorsal setae naked).

Rostral area (Figure 109c) with ventromedian sclerotized part. First antenna (Figure 109d) 7-segmented, with third and fourth segments partially fused; armature formula as follows: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 109e) 4-segmented; first segment with long, slender distal seta; second segment with apically rounded seta bearing small needle-like process; third segment with 2 pectinate processes (longer process with sinuous medial margin bearing 1 distal seta, and shorter process with small hyaline seta near midlength) and 1 stout curved spine; terminal segment with 2 stout curved spines and 4 setae (1 of these setae sclerotized at base, thus spiniform). Postantennal process (Figure 109f,g) with slightly curved tine.

Labrum (Figure 109h) with anteromeral hyaline lobe and spinulated, rounded posterior margin. Mandible (Figure 110a) with 2 unequal blades, each spinulated along 1 margin, and an accessory seta. Paragnath (Figure 110b) a digitiform lobe tipped with 2 small denticles. First maxilla (Figure 110c) bearing 5 pinnate setae. Second maxilla (Figure 110d) 2-segmented; first segment a sclerotized area; second segment with spinulated terminal process bearing 2 setae, each with 1 row of bristles. Maxilliped (Figure 110e,f) 3-segmented; first segment possessing 1 small naked seta; second segment (corpus) with 2 naked setae near proximal end; third segment a claw bearing 1 naked seta and numerous denticles.

Legs 1–4 (Figures 110g,h, 111a–e) biramous. Spinal and setal formula as follows:

<table>
<thead>
<tr>
<th>Species</th>
<th>Accessory element on mandible</th>
<th>Small rounded process on distal corner of corpus maxillipeds of female</th>
<th>Exopod of leg 3</th>
<th>Terminal endopod spine of legs 2 and 3</th>
<th>Arrangement of spines on second segment of leg 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. monacanthi</td>
<td>pedunculate, pyriform process</td>
<td>present</td>
<td>II, I, 4</td>
<td>stout, blunt</td>
<td>rows</td>
</tr>
<tr>
<td>C. spinosus</td>
<td>small, attenuate seta</td>
<td>absent</td>
<td>II, I, 5</td>
<td>attenuate</td>
<td>patches</td>
</tr>
</tbody>
</table>
FIGURE 109.—*Cirracanthus spinosus*, new species, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area, ventral; D, first antenna, ventral; E, second antenna, medial; F, postantennal process, ventral; G, same, ventral; H, labrum, ventral.
FIGURE 110.—*Cirra canthus spinosus*, new species, female: A, mandible, anteromedial; B, paragnath, medial; c, first maxilla, anterior; D, second maxilla, posteroverentral; E, maxilliped, posterior; F, same, anterior; G, leg 1 and interpodal plate, ventral; H, leg 2 and interpodal plate, ventral.
Figure 111.—Cirracanthus spinosus, new species, female: A, leg 3, interpodal plate and proximal portions of basipods, ventral; B, leg 3 exopod, ventral; C, leg 3 endopod, ventral; D, leg 4 and interpodal plate, ventral; E, leg 4, terminal exopod segment, ventral; F, leg 5, dorsal; G, same, ventral.
second segment, 112 × 42 μm, with ventromedial patch of relatively large spines, and bearing 2 naked and 2 semipinnate setae (each seta with row of small spines at base). Leg 6 represented by 3 setae in area of egg sac attachment.

**Male:** Unknown.

**Etymology.**—The specific name *spinosus*, Latin for thorny, alludes to the spines on the anal segment and leg 5.

**Remarks.**—*Cirracanthus spinosus*, new species, can readily be distinguished from the type-species *C. monacanthi* by the spinal and setal formula of leg 3. The terminal exopod segment of this leg in *C. monacanthi* exhibits the formula of II, 1, 4. *Cirracanthus spinosus* displays II, 1, 5. There are other characteristics that distinguish these two species (Table 1).

This species was collected from a monacanthid host as was its congener.

**Clavisodalis Humes, 1970**


**Diagnosis.**—**Female:** Body elongate. Cephalothorax with first pedigerous segment completely fused with cephalosome. Second pedigerous segment either partially or completely fused with cephalothorax. Abdomen 2-, 3-, or 4-segmented. Caudal ramus with usual 6 setae.

Rostral area weakly developed. First antenna 5-segmented (first-second segments and third-fourth segments fused); setae lightly plumose. Second antenna 3-segmented (third and fourth segments fused); terminal segment with 5 claw-like spines. Postantennal process present. Labrum with rounded, spinulated posterior margin. Mandible with two unequal blades. Paragnaths present. First maxilla with 3 setae. Second maxilla 2-segmented; terminal segment with spinulated process and 2 elements. Maxilliped with claw curving away from corpus (*C. heterocentroti* Humes, 1970, with only slightly curved claw).

Leg 1 with 2-segmented rami. Legs 2-4 with 3-segmented rami. Leg 5 2-segmented; second segment with 4 setae. Leg 6 represented by 3 setae in area of egg sac attachment.

**Male:** Body similar to that of female. Second pedigerous segment not fused with cephalothorax. Appendages as in female except maxilliped with robust corpus with either slight or prominent protrusion opposing terminal claw. Leg 6 possibly represented by small seta on ventrolateral flap of genital segment.

**Type-Species.**—*Clavisodalis heterocentroti* Humes, 1970.

**Remarks.**—Since the discovery of *Clavisodalis heterocentroti* from the pencil urchin *Heterocentrotus trignonarius* (Lamarck) at Enewetak Atoll, Marshall Islands, six species have been described in this genus. They are *C. abbreviatus* Dojiri and Humes, 1982; *C. dilatatus* Dojiri and Humes, 1982; *C. parvibullatus* Dojiri and Humes, 1982; *C. salmacidis* Humes, 1980; *C. sentifer* Dojiri and Humes, 1982; and *C. tenuis* Dojiri and Humes, 1982. All seven species have been collected exclusively from sea urchins in the Indo-West Pacific.

*Clavisodalis* can be distinguished from all other taeniacanthid genera by a combination of features: (1) second pedigerous segment fused with the cephalothorax in the female, (2) 5-segmented first antenna, (3) first maxilla with only 3 setae, (4) reduced plumosities on the setae of the first antenna and legs 1–4, and (5) a maxilliped claw curving away from the corpus and carrying large spines along the convex margin in the female. For detailed descriptions and key to the species of *Clavisodalis*, see Dojiri and Humes (1982).

**Clavisodalis salmacidis Humes, 1980**


**Material Examined.**—5 females from esophagus of *Asthenosoma variatum* Grube (USNM E4199) collected at Sulu Archipelago near Siasi, Celebes Sea.

**Remarks.**—Humes (1980) described *Clavisodalis salmacidis* from the esophagus of *Salmacis belli* Döderlein in Moreton Bay, Queensland, Australia. Subsequent records have been reported from the same host and locality (Dojiri and Humes, 1982). The present material represents new host and locality records for this species.

The first antenna has the formula 20, 8, 4, 2 + 1 aesthete, and 7 + 1 aesthete. The specimens in our collection show minor differences from those of Humes (1980) and Dojiri and Humes (1982). These differences are: (1) presence of a short row of spines on the ventromedial surface of the labrum, (2) second maxilla with unilaterally spinulated spines, (3) legs 2–4 each with two rows of spines on the outer margin of the coxa, and (4) leg 3 with patch of spines on the outer margin of the first endopod segment. These differences are considered minor and may be attributed to geographic variation.

**Echinirus Humes and Cressey, 1961**


**Diagnosis.**—**Female:** Cephalothorax with first pedigerous segment fused to cephalosome. Thoracic segments carrying legs 2–5 free. Abdomen 3-segmented. Caudal ramus with 6 setae.

Rostral area weakly developed. First antenna 6-segmented (first and second segments fused). Second antenna 3- or indistinctly 4-segmented; terminal segment with 3 claw-like spines. Postantennal process present. Labrum present. Mandible with spinulated blade; second blade either very small or absent. Paragnaths present. First maxilla bearing 3 setae and a lamelliform process (knob). Second maxilla
2-segmented; second segment with 2 spinulated spines. Maxilliped absent.

Leg 1 with 2-segmented rami. Legs 2–4 with 3-segmented rami. Leg 4 with terminal endopod segment with 4 elements. Leg 5 2-segmented. Leg 6 represented by 3 setae in area of egg sac attachment.

**Male:** Body similar to that of female. Appendages as in female except maxilliped present; corpus rather stout, with or without prominent protrusion opposing curved claw.

**TYPE-SPECIES.**—**Echinirus laxatus** Humes and Cressey, 1961.

**REMARKS.**—The type-species of *Echinirus* was collected from the sea urchin *Diadema setosum* (Leske) at Nossi-Bé, Madagascar, and described by Humes and Cressey (1961). The only other species described in this genus is *E. diadematis* Jacob-Judah, 1975, associated with *Diadema setosum* in the Gulf of Elat (Red Sea).

The two known species of *Echinirus* can easily be distinguished from all other taeniacanthids by the absence of the maxilliped of the female. For a detailed morphologic comparison of *E. laxatus* and *E. diadematis*, see Jacob-Judah (1975), and for a key to the species see Dojiri and Humes (1982).

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**Echinosocius Humes and Cressey, 1961**


**DIAGNOSIS.**—Female: Cephalothorax subcircular in outline with first pedigerous segment fused to cephalosome. Genital segment small. Abdomen 3- or 4-segmented. Caudal ramus with usual 6 setae.

Rostral area protuberant with ventromedian sclerotized plate. First antenna 6-segmented with first and second segments fused. Second antenna 3- or indistinctly 4-segmented; third and fourth segments partially or completely fused. Postantennal process present. Labrum with rounded posterior margin. Mandible with 2 spinulated blades; accessory seta absent. Paragnath terminating in digitiform process. First maxilla with 5 setae and 1 knob. Second maxilla 2-segmented with 1 spinulated process and 2 spinulated spines. Maxilliped with distinct corpus bearing 2 setae; corpus with rounded distal end carrying 1 or 2 setae; claw absent.

Legs 1–4 biramous with 2-segmented rami in leg 1 and 3-segmented rami in legs 2–4. Legs 2 and 3 each with inner seta on coxa. Terminal segment of endopod of leg 4 with 4 elements (spines and setae). Leg 5 very broad, suboval in outline. Leg 6 represented by 3 setae in area of egg sac attachment.

**Male:** Genital segment subquadrangular. Except for maxilliped, appendages similar to those in female.

**TYPE-SPECIES.**—**Bomolochus gracilis** Heller, 1865.

**REMARKS.**—Wilson (1911) proposed the genus *Irodes* and established as its type-species *I. gracilis* (Heller, 1865), formerly known as *Bomolochus gracilis*. One of the diagnostic features of this genus mentioned by Wilson is the absence of the maxilliped claw in the female. Unfortunately, in the same paper, Wilson transferred *Bomolochus tetradosis* Bassett-Smith, 1890, to *Irodes*. This inclusion was incorrect because this species possesses a prehensile claw on the maxilliped. Since then, *I. yamagutii* Shimo, 1957, and *I. angulolaris* Devi and Shyamasundari, 1980, have been added to this genus. These three species belong to *Taeniacanthus,*
whose members bear a prehensile maxilliped in the female with the claw curving away from the corpus.

Although Ho (1969) and Kabata (1979) rejected the genus *Irodes*, the discovery of other taeniacanthid species that share certain features with *I. gracilis* (see below) and a revised generic diagnosis warrant the retention of this genus.

*Taeniacanthus upenei* Yamaguti, 1954, *Anchistrotos sauridi* Pillai, 1963, *Anchistrotos gracilis* (Heller, 1865), and *Anchistrotos callionymi* Yamaguti, 1939, are assigned to *Irodes* along with one new species *I. remipes*. The main diagnostic character that distinguishes these five species from the remaining taeniacanthid genera is the absence of a maxilliped claw in the female. The members of this genus bear a distinct corpus, but instead of a claw the maxilliped terminates in a rounded process. In *Echinosocius*, a taeniacanthid genus associated with Echinoidea, the maxilliped of the female is represented by a pear-shaped swelling bearing a slender ridge with 3 setae (Dojiri and Humes, 1982). In *Echinirus*, another genus associated with sea urchins, the maxilliped is absent. There appears to be an evolutionary trend in the reduction of the maxilliped from *Irodes*, which lacks a claw but retains a distinct corpus to *Echinosocius*, which lacks a distinct corpus but bears a pear-shaped swelling, and finally to *Echinirus*, which lacks the maxilliped altogether.

We could not obtain specimens of *Anchistrotos callionymi* and consequently could not reexamine this species. However, the other features of this species (i.e., segmentation of the first antenna, absence of the maxilliped claw, and armature of legs 2–4) suggest that this species should be included in *Irodes*.

The members of this genus share a number of other morphologic features. The first antenna is only 6-segmented because the first and second segments are fused. *Taeniacanthus yamagutii*, *T. fugu*, *T. ostriacionis*, *T. onosi*, and *T. narcini* also have a 6-segmented first antenna but in these species the third and fourth segments have become fused, resulting in the 6-segmented condition. The segmentation of the first antenna of *T. coelus* and *T. dentatus* could not be ascertained from the literature.

In addition to the above two characteristics, which are unique to *Irodes*, a combination of other features distinguish this genus from the remaining taeniacanthid genera. They lack the accessory seta on the mandible, 5 setae and a small rounded knob on the first maxilla, presence of inner coxal seta on legs 2 and 3, and 4 elements (setae and/or spines) on the terminal segment of the endopod of leg 4. *Irodes callionymi* has been reported by Yamaguti (1939) to have a 3-segmented abdomen (4-segmented in other species of this genus) and only 7 setae on the terminal exopod segment of leg 1 (9 setae in congeners).

**Key to Species of Irodes Females**

1. Terminal endopod segment of leg 4 with innermost element (seta) approximately same length as shortest spine [Figure 114c] 
   1. *I. gracilis*
   2. Spine of second segment and outermost spine of third segment of exopod of leg 3 strongly curved (resembling hooks) [Figure 117e] 
   3. Outermost spine of terminal endopod segment of leg 4 minute [Figure 123d] 
   4. Leg 2 exopod with second and third (terminal) segments each with a short, wide serrated spine tipped with flagellum [Figure 125l] 

   
   

   **Irodes gracilis** (Heller, 1865)

   **FIGURES** 112–115, 161f, 162a–b

   *Bomolochus gracilis* Heller, 1865:157.—Bassett-Smith, 1899:442.


Material Examined.—1 female (holotype) (USNM 43517) and 2 females (paratypes) (USNM 42261) Taenia canellans flagellans from gills of hammerhead shark Sphyra zygaena Linnaeus collected in Montego Bay, Jamaica, 4 July 1910 by C.B. Wilson. 2 females (type specimens) (USNM 38587) from vent of Sphyra tiburo Linnaeus at Beaufort, North Carolina, summer 1905, by C.B. Wilson. From Sphyra lewini (Griffith and Smith): 1 immature female, 2 immature males from Java; 17 females, 2 males from Nossi Bé, Madagascar, 1 April 1964; 4 females, 1 male from Nossi Bé, Madagascar, 16 April 1964; 55 females, 1 immature female from Nossi Bé, Madagascar, 16 April 1964; 36 females, 1 immature female, 2 males from Nossi Bé, Madagascar, 21 March 1964; 4 females from Nossi Bé, Madagascar, 27 March 1964; 3 females from Nossi Bé, Madagascar, 20 April 1964. From Carcharhinus maculipinnis (Poey): 1 female from Nossi Bé, Madagascar, 22 March 1964; 3 females from Nossi Bé, Madagascar, 27 March 1964; 1 female from Nossi Bé, Madagascar, 27 March 1964. 62 females, 1 immature female, 2 males from cloaca of Sphyra diptana Springer at Nossi Bé, Madagascar, 21 March 1964. 4 females from Rhynchobatus djiddensis (Forskål) at Nossi Bé, Madagascar, 21 March 1964; 1 female from Carcharhinus leucas (Müller and Henle) at Nossi Bé, Madagascar, 2 May 1964. 10 females from Rhizoprionodon acutus (Ruppell) at Nossi Bé, Madagascar, 30 March 1964; 2 females, 1 male from Chiloscyllium indicum (Gmelin) at Trivandrum, India, by N.K. Pillai, 14 March 1961.

Description.—Female: Body as in Figure 112A. Total length 2.09 mm (1.68-2.31 mm) and greatest width 0.74 mm (0.71-0.78 mm) based on 10 specimens. Cephalothorax wider than long, 498 × 686 μm, and comprising approximately 25% of total body length. Thoracic segments bearing legs 2, 3, and 4 gradually decreasing in width posteriorly. Genital complex (Figure 112B) wider than long 207 × 291 μm. Abdomen 4-segmented; segments from anterior to posterior 143 × 175 μm, 115 × 161 μm, 78 × 138 μm, and 133 × 129 μm (l × w); anal segment (Figure 112C,D) unarmed. Caudal ramus (Figure 112C,D) longer than wide 115 × 48 μm, and bearing 6 setae; dorsal seta and lateral seta naked, remaining setae bristled; outer terminal seta with rows of spinules at base.

Rostral area (Figure 112E) with 2 small rounded processes at anteroventral region and a large, ventromedian, bifid sclerotized part bearing transverse shelf-like protuberance. First antenna (Figure 112F) 6-segmented; armature formula: 20, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 112G) indistinctly 4-segmented; first segment long and slender with long distal seta; second segment carrying single acuminate hyaline seta; third segment bearing 1 curved stout spine and 2 pectinate processes (longer process tipped with 1 minute distal seta, and shorter process bearing 1 seta at midlength); terminal segment not clearly delimited from third segment, and bearing 2 stout curved spines and 4 naked setae. Postantennal process (Figure 113A) with relatively short curved tine.

Labrum (Figure 113B) with spinulated, rounded posterior margin and a median indentation. Mandible (Figure 113C,D) with 2 spinulated blades; subterminal blade long and with 3 rows of rounded spinules (denticles); terminal blade shorter and bearing only 1 row of spinules. Paragnath (Figure 113E,F) a slender digitiform process bearing spinules on inner and outer margin. Labial area (Figure 113G) with rows of spinules. First maxilla (Figure 113G) a lobe with 2 large bristled setae, 1 small bristled seta, 2 small naked setae, and 1 rounded anterior knob. Second maxilla (Figure 113H) 2-segmented; first segment a bipartite sclerotized base; second segment small with 1 small naked seta near base, 2 spinulated spines, and a spinulated terminal process tipped with a setiform process; terminal process not fused to second segment, but articulated. Maxilliped (Figures 113I, 161F) 3-segmented, although all 3 segments partially fused; first segment broad and bearing 1 naked seta; second segment (corpus) with large rounded protuberance near base and 2 large naked setae; third segment very small, rounded and bearing 2 small naked setae.

Legs 1-4 (Figures 113J, 114A-G) biramous. Spinal and setal formula as follows:

\[
P_1 \text{ coxa } 0-1 \quad \text{basis } 1-1 \quad \text{exopod } 1-0; 9 \quad \text{endopod } 0-1; 7
P_2 \text{ coxa } 0-1 \quad \text{basis } 1-0 \quad \text{exopod } 1-0; 1-1; 3, 1, 5 \quad \text{endopod } 0-1; 0-2; 3, 1, 3
P_3 \text{ coxa } 0-1 \quad \text{basis } 1-0 \quad \text{exopod } 1-0; 1-1; 3, 1, 5 \quad \text{endopod } 0-1; 0-2; 3, 1, 2
P_4 \text{ coxa } 0-0 \quad \text{basis } 1-0 \quad \text{exopod } 1-0; 1-1; 3, 1, 5 \quad \text{endopod } 0-1; 0-1; 3, 1, 1
\]

Interpodal plate of leg 1 (Figure 113J) with broad anterior portion and slender, haired posterior portion. Interpodal plate of leg 2 (Figure 114A) with bump, each bearing row of spinules, on either side of posterior margin; interpodal plates of legs 3 and 4 without ornamentation. Basis of leg 1 (Figure 113J) with row of spinules at articulation with endopod; endopod with short rows of minute spinules at bases of 5 setae (2 innermost setae without ornamentation at bases). Leg 2 coxa and basis (Figure 114A) with short rows of minute spinules; coxae and bases of legs 3 and 4 (Figure 114D,G) without spinules. Exopods and endopods of legs 2-4 with spinules along outer margin of each segment. Leg 2 exopod with first 4 spines as in Figure 114A,B and each bearing 2 rows of serrated flanges (Figure 114C); third spine of terminal exopod segment (Figure 114A) slender, irregularly curved, and bearing 2 rows of spinules on dorsal surface (not seen in ventral view). Endopod of leg 2 (Figure 114A) with distolateral margin of second segment with spiniform process (not articulated); terminal segment with 2 small conical spines, each bearing 2 short rows of spinules, and a relatively long spinulated terminal spine. Leg 3 exopod with spine of second segment and first (out-
Figure 112. — *Irodes gracilis* (Heller), female: A, dorsal; B, genital area, dorsal; C, caudal rami, dorsal; D, same, ventral; E, rostrum, ventral; F, first antenna, ventral; G, second antenna, medial.
FIGURE 113.—*Irodes gracilis* (Heller), female: A, postantennal process, ventral; B, labrum, ventral; C, mandible, anteromedial; D, same, posterior; E, labrum and paragnaths, ventral; F, paragnath, ventral; G, first maxilla, anterior; H, second maxilla, anterior; I, maxilliped, ventral; J, leg 1 and interpodal plate, ventral.
FIGURE 114.—Irodes gracilis (Heller), female: A, leg 2 and interpodal plate, ventral; B, leg 2, outer margin of second exopod segment, ventral; C, leg 2, spine of first exopod segment, dorsal; D, leg 3, ventral; E, leg 3, spine of second exopod segment, ventral; F, leg 3, second outer spine of terminal endopod segment, ventral; G, leg 4, ventral; H, leg 5, dorsal; I, same, medial.
Figure 115.—*Irodes gracilis* (Heller), male: A, dorsal; B, genital area, ventral; C, maxilliped, posterior; D, leg 3 exopod, ventral; E, leg 3 endopod, ventral; F, leg 5, dorsomedial; G, spermatophore, ventral.
**Sphyrna lewini**

Bomolochus gracilis by Heller, but was subsequently transferred to *Irodes* by Wilson (1911) and finally to *Anchistrotos* by Ho (1969).

Our specimens (1 immature female and 2 immature males) from the same species of host and from the same locality as that of Heller’s material are conspecific with the specimens described as *Taeniacanthus albidus* by Wilson (1911), *T. flagellans* by Wilson (1913), and *T. indicus* by Pillai (1963). The most distinguishing features that these four nominal species share are the large curved spines of the second and third exopod segments of leg 3, the broad lamelliform leg 5, and the absence of a prehensile claw of the maxilliped of the female. These characteristics are illustrated by the authors of these nominal species except the maxilliped of *“Bomolochus gracilis”* by Heller. Although Ho (1969) stated that Heller described a “claw-like terminal segment” on the maxilliped of *“Bomolochus gracilis,”* Heller’s (1865) illustration of this appendage is labeled “mp.” In present day terminology this appendage is the second maxilla, not the maxilliped. Heller’s figure 3a to which Ho referred is indeed the second maxilla. Consequently, Heller never figured the maxilliped of this species. Perhaps because of the absence of the maxilliped claw, this appendage was inconspicuous. It seems that the maxilliped was simply overlooked by Heller in his description.

The similarities of their external morphology, host preferences, and geographic distribution indicate that the above four species are synonymous. Because Heller’s (1865) binomen *“Bomolochus gracilis”* antedates the others and because we transfer this species back to *Irodes*, the valid name becomes *Irodes gracilis* (Heller, 1865).

**Irodes remipes**, new species

**FIGURES 116–120**

**Material Examined.**—From *Plotosus lineatus*: 1 female holotype (USNM 228422) and 3 paratypes (females) (USNM 228423) from throat and gill chamber of host collected near Sri Lanka, 3 April 1970 by Koenig, C.C.; 1 female from Moluccas, 1 March 1974 by V.G. Springer; 1 immature female, 1 male from Philippines, 6 July 1978.

**Material Examined of Variant.**—2 females from *Cnidoglanis macrocephalus* collected at Preston Point, Swan River, Western Australia, by R.J. Slack, 18 January 1965; 2 females from *C. macrocephalus* collected northeast of Rottnest Island, Western Australia.

**Description.**—**Female:** Body as in Figure 116A. Total length 0.91 mm (0.86–1.02 mm) and greatest width 0.35 mm (0.32–0.39 mm) based on 5 specimens. Cephalothorax wider than long, 299 X 317 μm, comprising about 33% of total body length. Thoracic segments bearing legs 2 and 3 almost equal in width, but fourth pedigerous segment noticeably narrower. Genital complex (Figure 116B) much
FIGURE 116.—*Irodes remipes*, new species, female: A, dorsal; B, leg 5 and genital area, dorsal; c, anal segment and caudal ramus, ventral; D, rostral area and first antenna, ventral; E, second antenna, medial; F, postantennal process, ventral; G, labrum, ventral; H, mandible, anteromedial; I, paragnath, dorsomedial; J, first maxilla, anterior.
FIGURE 117.—*Irodes remipes*, new species, female: A, second maxilla, posteroverentral; B, maxilliped, ventral; C, leg 1 and interpodal plate, ventral; D, leg 2 and interpodal plate, ventral; E, leg 3, ventral; F, leg 4 and interpodal plate, ventral.
FIGURE 118.—Irodes remipes, new species. Female: A, leg 5, ventral. Male: B, dorsal; C, leg 5 and genital area, ventral; D, maxilliped, anterolateral; E, same, posteromedial; F, leg 3 exopod, ventral; G, leg 3 endopod, ventral; H, leg 4 endopod, ventral.
Figure 119.—*Irodes remipes*, new species, female variant: A, dorsal; B, anal segment and caudal ramus, ventral; C, first maxilla, posterior; D, leg 2 exopod, ventral.
Figure 120.—Iridea remipes, new species, female variant: A, leg 2 endopod, ventral; B, leg 5 endopod, ventral; C, leg 4 endopod, ventral; D, leg 5, ventral; E, same, ventrolateral.
wider than long, 81 X 124 μm. Abdomen 4-segmented; segments from anterior to posterior 51 X 76 μm, 39 X 64 μm, 21 X 53 μm, and 39 X 51 μm (l X w); anal segment (Figure 116c) without anteroventral spinules, but bearing a single row of minute spinules near insertion of each caudal ramus. Caudal ramus longer than wide, 27 X 19 μm, and bearing 6 setae (smaller median terminal seta with 1 row of bristles).

Rostral area (Figure 116d) with ventromedian sclerotized part. This sclerotized area consisting of 2 parts; anterior portion with 2 converging sclerotized ridges forming V-shaped structure (appearing as broad spine in whole mount); posterior portion somewhat oval in outline. First antenna (Figure 116A) 6-segmented; armature formula as follows: 20, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 116e) 4-segmented; first segment with long, slender distal seta; second segment carrying small naked seta; third segment with 1 stout curved spine and 2 pectinate processes (longer process with small seta near distal end; shorter process with hyaline seta near midlength); terminal segment bearing 2 stout curved spines and 4 slender setae. Postantennal process (Figure 116f) with broad base and relatively stout, short time.

Labrum (Figure 116g) with slightly curved, spinulated posterior margin. Mandible (Figure 116h) with 2 unequal blades, each spinulated along 1 margin; subterminal blade with several rows of spinules at proximal end. Paragnath (Figure 116i) a relatively slender digitiform process tipped with 2 spinules. First maxilla (Figure 116j) a lobe carrying 5 setae and 1 anterior knob. Second maxilla (Figure 117a) 2-segmented; first segment a large base; second segment with spinulated terminal process bearing 2 spinulated spines near base. Maxilliped (Figure 117b) non-prehensile; first segment with 1 naked seta; terminal segment bearing a conical protuberance proximally, 2 naked setae, and 1 small seta subterminally.

Legs 1–4 (Figure 117c–f) biramous. Spinal and setal formula as follows:

<table>
<thead>
<tr>
<th>P1</th>
<th>coxa 0-1</th>
<th>basis 1-0</th>
<th>exopod 1-0</th>
<th>endopod 0-1: 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2</td>
<td>coxa 0-1</td>
<td>basis 1-0</td>
<td>exopod 1-0, 1-1: II, I, 5</td>
<td>endopod 0-1: 2-1, II, I, 1</td>
</tr>
<tr>
<td>P3</td>
<td>coxa 0-1</td>
<td>basis 1-0</td>
<td>exopod 1-1, 1-1: II, I, 5</td>
<td>endopod 0-1: 2-1, II, I, 2</td>
</tr>
<tr>
<td>P4</td>
<td>coxa 0-0</td>
<td>basis 1-0</td>
<td>exopod 1-0, 1-1: II, I, 5</td>
<td>endopod 0-1: 2-1, II, int. 1</td>
</tr>
</tbody>
</table>

Interpodal plates of legs 1–4 (Figure 117c,d,f) spinulated on posterior margins; that of leg 1 with convex posterior margin. Plates of legs 2–4 reentrant. Leg 1 (Figure 117c) with single row of spinules located near base of outer seta of basis. Coxae and bases of legs 2–4 (Figure 117d–f) each with a few single rows of spinules. First 3 spines of exopods of legs 2 and 4, and spine of first exopod segment of leg 3 short, bilaterally spinulated, and each tipped with flagellum (see Figure 117d). Second spine of terminal exopod segments of legs 2–4 naked; spine of second exopod segment and outermost spine of terminal exopod segment of leg 3 (Figure 117e) each strongly curved with flagellum subterminally located. Terminal endopod segments of legs 2 and 3 with 2 outer spines very small and spinulated. Leg 3 endopod with second segment bearing outer spiniform process. Endopod of leg 4 with terminal segment bearing 1 seta, 1 intermediate spine, and 2 spines. Leg 5 (Figure 118a) with 2 segments; first segment with 1 semipinnate dorsal seta and single ventral row of spinules; second segment inflated, 71 X 60 μm (l X w), bearing 3 spines (only weakly sclerotized) and 1 bristled seta; spinules on outer margin near innermost spine; middle spine with row of minute spinules at base. Leg 6 (Figure 118b) represented by 3 naked setae equal in length at area of egg sac attachment.

Female Variant: Body as in Figure 119a. Total length 799 μm and greatest width 299 μm based on 1 specimen. Cephalothorax wider than long, 258 X 299 μm, and comprising approximately 32% of total body length. Genital complex (Figure 118c) wider than long, 83 X 99 μm. Abdomen 3-segmented; segments from anterior to posterior 51 X 69 μm, 44 X 62 μm, and 41 X 53 μm (l X w). Caudal ramus similar to that of female except smaller 25 X 18 μm.

Maxilliped (Figure 118d,e) 4-segmented; first segment with 1 long, slender naked seta; corpus with 2 naked setae, and 1 row of large overlapping denticles (scales), and anterior rows of small spines; third segment small and unornamented; terminal segment with 1 anterior, 1 inner, and 2 posterior setae at proximal end and bearing large denticles along distal half of concave margin.

Legs 1–4 similar to those of female. Leg 3 with second and third exopod spines not strongly curved as in female (Figure 118f), but as in first exopod spine. Endopods of legs 3 and 4 (Figure 118g,h) each with second segment bearing larger spiniform process on outer margin. Leg 5 (Figure 118c) with second segment not inflated, 39 X 17 μm (l X w). All other appendages as in female.

Female Variant: Body as in Figure 119a. Total length 1.14 mm (1.03–1.23 mm) and greatest width 0.44 mm (0.40–0.47 mm) based on 4 specimens. Cephalothorax wider than long, 331 X 386 μm, comprising approximately 30% of total body length. Thoracic segments bearing legs 2, 3, and 4 decreasing in width posteriorly. Genital complex wider than long, 92 X 129 μm. Abdomen 4-segmented; segments from anterior to posterior 64 X 92 μm, 53 X 81 μm, 32 X 71 μm, and 62 X 64 μm (l X w); anal segment (Figure 119b) with 3 rows of spinules on each side of anteroventral surface, and 1 row of spinules on each posteriorventral margin near insertion of caudal ramus. Caudal ramus (Figure 119b) longer than wide, 43 X 27 μm, bearing 3 rows of spinules (1 row of small spines at base of outer terminal seta), and carrying 3 naked setae. 1 semipinnate...
seta, and 2 bristled, large median terminal setae.

Rostral area as in *Irodes remipes*. All appendages as in *I. remipes* except where mentioned. First maxilla (Figure 119c) similar to that in *I. remipes* except setae longer. Exopod and endopod spines of legs 2–4 (Figures 119D, 120A–C) slightly longer than those in *I. remipes*. Spiniform processes on distolateral corners of second endopod segments of legs 3 and 4 (Figure 120B,C) larger than their counterparts in *I. remipes*. Leg 5 (Figure 120D,E) with more rows of spines; spines larger than those in *I. remipes*.

**ETYMOLOGY.**—The specific name *remipes*, from Latin *remus* (oar) plus *pes* (foot), alludes to the broad lamellate second segment of leg 5.

**REMARKS.**—*Irodes remipes* bears strongly curved spines on the second and third exopod segments of leg 3, as in *I. gracilis*. However, *I. remipes* can easily be distinguished from the type-species *I. gracilis* by the V-shaped sclerotized ridges on the ventral surface of its rostral area, by differences in the second maxilla and maxilliped, and by differences in the relative lengths of the elements (spines and setae) of the third endopod segment of leg 4.

Because the morphologic differences between the Australian specimens and the ones from Sri Lanka, Moluccas, and Philippines are relatively minor, we consider the specimens from Australia as representing geographic variants of *Irodes remipes*.

*Irodes sauridi* (Pillai, 1963), new combination

**Figures 121–123**


Anchistrotos upenri Devi and Shyamasundari, 1980:204. [New synonymy.]

**MATERIAL EXAMINED.—**7 ovigerous and 3 nonovigerous females from *Upeneus vitatus* (Forsskål) from Neendakaraj, Kerala State, India. 2 females, 1 male, and 6 copepodids from *Parupeneus cyclostomus* (Lacépède) from Malindi, Kenya.

**DESCRIPTION.**—*Female*: Body as in Figure 121A. Total length 0.82 mm (0.78–0.85 mm), width 0.33 mm (0.32–0.35 mm) based on 7 specimens. Cephalothorax comprising about 25% of total length, wider than long, 267 × 216 μm. Pedigerous segments bearing legs 2, 3, and 4 decreasing in width posteriorly. Last pedigerous segment, genital complex, abdomen, and caudal rami as in Figure 121B. Area of egg sac attachment as in Figure 121C. Genital complex wider than long, 67 × 108 μm. Abdomen 4-segmented; segments from anterior to posterior 48 × 90 μm, 39 × 81 μm, 21 × 67 μm, and 37 × 60 μm (l × w). Ventral surface of anal segment with 4 rows of spines in anterior portion arranged as in Figure 121D and a row of spines near insertion of each caudal ramus. Caudal ramus longer than wide, 25 × 19 μm, with 6 setae arranged as in Figure 121D; ventral surface without ornamentation.

Egg sac oval, containing about 25 eggs.

Rostral area (Figure 121E) with ventromedian sclerotized part. First antenna (Figure 121E) 6-segmented (first and second segments fused); armature formula: 20, 4, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 121F) 3-segmented; last portion comprised of fused segments and bearing 2 pectinate processes (each with 1 seta) and 3 claw-like spines and 4 setae. Postantennal process (Figure 121G) slightly curved, bearing 3 small tubercles near base.

Labrum (Figure 121H) with rounded posteroverentral margin with row of spines. Mandible (Figure 121I) with 2 extremely unequal blades, each spinulated along 1 margin. Paragnath (Figure 121J) with patch of spines on ventral surface (see Figure 122C). First maxilla (Figure 121K) bearing 2 long naked setae, 1 short semipinnate seta, a small rounded knob, and 2 short naked setae. Second maxilla (Figure 122C) 2-segmented; second segment bearing 1 short spinulated spine, 1 longer seta with short inner pinnules and terminal process spinulated along inner margin. Maxilliped (Figure 122D) without terminal claw, but terminating in rounded protrusion bearing 1 small seta; inner margin of basal segment with 2 naked setae. Oral area as in Figure 122C. Arrangement of cephalothoracic appendages as in Figure 122D.

Legs 1–4 (Figures 122E, 123A–D) biramous. Spinal and setal formula as follows:

<table>
<thead>
<tr>
<th>Appendage</th>
<th>Coxa</th>
<th>Basis</th>
<th>Exopod</th>
</tr>
</thead>
<tbody>
<tr>
<td>P₁</td>
<td>0-1</td>
<td>1-1</td>
<td>0-1; 9</td>
</tr>
<tr>
<td>P₂</td>
<td>0-1</td>
<td>1-0</td>
<td>0-1; 7</td>
</tr>
<tr>
<td>P₃</td>
<td>0-1</td>
<td>1-0</td>
<td>0-1; 6</td>
</tr>
<tr>
<td>P₄</td>
<td>0-0</td>
<td>1-0</td>
<td>0-1; 4</td>
</tr>
</tbody>
</table>

Interpodal plate of leg 1 (Figure 123A) broad anteriorly but tapered posteriorly; 2 ovoid bumps bearing spines on posterior margin. Interpodal plates of legs 2–4 with spines on posterior margin (see Figure 123B). Leg 1 endopod (Figure 122E) with patch of spines near outer margin of last segment. Leg 2 (Figure 123B) with ventral row of spines between origins of rami; outer margin of first exopod segment with distal patch of setules (hairs). Leg 3 (Figure 123C) as in leg 2 except lacking spines on basis, and second spine (seta?) of terminal exopod segment pinnate; other differences noted in formula. Leg 4 (Figure 123D) as in leg 3 except lacking hairs on outer margin of first endopod segment; other differences noted in formula. Leg 5 (Figure 123E,F) first segment small with outer semipinnate seta and distolateral patch of spines; second segment 67 × 53 μm (l × w), with 2 subterminal setae (1 inner, 1 outer) and 2 terminal setae; setae about equal in length; segment and setae armed as in Figures. Leg 6 represented by 3 setae on genital complex (Figure 121C).

**Male**: Unknown.
FIGURE 121.—_Irodes sauridi_ (Pillai), female: A, dorsal; B, urosome, ventral; C, genital area, dorsal; D, anal segment and caudal rami, ventral; E, rostral area and first antenna, ventral; F, second antenna, medial; G, postantennal process, ventral; H, labrum, ventral; I, mandible, anteromedial; J, paragnath, dorsal; K, first maxilla, anterior.
Figure 122.—*Irodes sauridi* (Pillai), female: A, second maxilla, posteroventral; B, maxilliped, ventromedial; C, oral area, ventral; D, cephalothorax, ventral; E, leg 1, ventral. (R = rostral area, A1 = first antenna, A2 = second antenna, pap = postantennal process, L = labrum, Md = mandible, P = paragnath, Mx1 = first maxilla, Mx2 = second maxilla, Mxpd = maxilliped, P1 = leg 1.)
Figure 123.—_Irodes sauridi_ (Pillai), female: A, leg 1, interpodal plate, ventral; B, leg 2 and interpodal plate, ventral; C, leg 3, ventral; D, leg 4, ventral; E, leg 5, dorsal; F, same, ventral.
Survey of India proved to be unsuccessful, we could not obtain *Anchistrotos sauridi* Pillai, 1963. Our attempt to obtain *Anchistrotos upenei* Devi and Shyamasundari, 1980, was not successful. Another possibility is that all these specimens represent one very variable species. The mean total length of our specimens falls in *A. upenei*.

Irodes sauridi (Pillai, 1963) (formerly known as *Anchistrotos sauridi*) and *A. upenei* Devi and Shyamasundari, 1980, were both collected from *Upeneus vitatus* (Forskal) in Indian waters. The terminal (third) segment of the endopod of leg 4 in both species descriptions are identical; they both have three terminal spines and a minute outer spine at about midlength. Although Pillai (1963) only described and illustrated the three terminal spines for *I. sauridi*, Avdeev (1977) reported the presence of the minute outer spine in this species. In almost all other respects the two nominal species seem to be identical. However, they are described as differing in the armature of the exopods of legs 2 and 4. *Irodes sauridi* is reported to have II, I, 5 and III, I, 5 on the terminal segments of the exopods of legs 2 and 4, respectively, whereas *A. upenei* apparently exhibits the reverse condition of III, I, 5 and II, I, 5. Our material exhibits the armature formulae of II, I, 5 and II, I, 5 for these two legs (Table 2). In addition, the total length of *I. sauridi* is reported to be more than twice the length of *A. upenei*. The mean total length of our specimens falls in between the range of these two nominal species, although much closer to *A. upenei*.

These reported differences could be due to incorrect observations and interpretations of the external morphology of these species by the respective authors. More probable, however, is that the descriptions were based on aberrant specimens. Another possibility is that all these specimens represent one very variable species.

As the occurrence of two very closely related species of parasitic copepod on the same species of fish from the same locality is highly unlikely, we suggest that *Anchistrotos upenei* Devi and Shyamasundari, 1980, be considered a junior synonym of *Irodes sauridi*. Because our attempt to obtain the type specimens of these two species from the Zoological Survey of India proved to be unsuccessful, we could not verify our proposed synonymy.

There are three diagnostic characters that distinguish *Irodes sauridi* from its congeners. They are (1) first three exopod spines of legs 2–4 are very small, (2) terminal endopod spines of legs 2 and 3 are curved, and (3) outermost endopod spine of leg 4 is minute.

### Irodes upenei (Yamaguti, 1954), new combination

**Figures 124–126**

*Anchistrotos parupeneus* Devi and Shyamasundari, 1980:206. [New synonymy.]

**Material Examined.**—3 females from the gills of *Parupeneus indicus*, Sri Lanka fish market; 212 females, 36 males, 24 immature females, 6 immature males from *Parupeneus barbierinus* (Lacépède) from Gulf of Elat; 195 females, 12 males, 3 immature females from *Parupeneus macronema* (Lacépède) from Gulf of Elat; 17 females, 3 males, and 2 immature females from *Parupeneus cyclostomus*, Kenya (collected by A. Paperna); 12 females, 2 males, and 2 immature females from *Parupeneus barrelienis*, Gulf of Elat (collected by A. Paperna); 11 females, 1 immature female from *Parupeneus pleurospilus*, Gulf of Elat (collected by A. Paperna); 3 females and 3 males from *Mulloidichthys auriflamma*, Gulf of Elat (collected by A. Paperna).

**Description.**—Female: Body form as in Figure 124A,B. Total length 0.71 mm (0.66–0.78 mm) and greatest width 0.31 mm (0.28–0.32 mm) based on 10 Gulf of Elat specimens; total length 0.58 mm (0.55–0.62 mm) and greatest width 0.21 mm (0.20–0.22 mm) based on 3 Sri Lanka specimens. Cephalothorax comprising about 40% of total length; in Sri Lanka specimens (Figure 124A) cephalothorax longer than wide, 253 × 225 µm; in Gulf of Elat specimens (Figure 124B), cephalothorax wider than long, 304 × 359 µm. Remaining measurements based on Sri Lanka material.

### Table 2—Several characteristics of taeniacanthid species reported from species of Upeneus, Saurida, and Parupeneus

<table>
<thead>
<tr>
<th>Species (original binomen)</th>
<th>MXPD claw (female)</th>
<th>Total Length (in mm)</th>
<th>Terminal segment</th>
<th>Host(s) and locality</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Anchistrotos sauridi</em> Pillai, 1963</td>
<td>absent</td>
<td>1.6</td>
<td>II, I, 5</td>
<td><em>Upeneus vitatus</em> and <em>Saurida tumbil</em> (India)</td>
</tr>
<tr>
<td><em>Anchistrotos upenei</em> Devi and Shyamasundari, 1980</td>
<td>absent</td>
<td>0.7</td>
<td>III, I, 5 II, I, 5</td>
<td><em>Upeneus vitatus</em> (India)</td>
</tr>
<tr>
<td><em>Taeniacanthus upenei</em> Yamaguti, 1954</td>
<td>absent</td>
<td>0.65–0.74</td>
<td>II, I, 5 II, I, 5</td>
<td><em>Upeneus sp.</em> (Macassar, Celebes)</td>
</tr>
<tr>
<td><em>Anchistrotos parupeneus</em> Devi and Shyamasundari, 1980</td>
<td>absent</td>
<td>0.99</td>
<td>II, I, 5 II, I, 5</td>
<td><em>Parupeneus indicus</em> (India)</td>
</tr>
<tr>
<td>Our specimens</td>
<td>absent</td>
<td>0.82 (0.78–0.85)</td>
<td>II, I, 5 II, I, 5</td>
<td><em>Upeneus vitatus</em> (India)</td>
</tr>
<tr>
<td><em>Taeniacanthus sauridae</em> Yamaguti and Yamazaki, 1959</td>
<td>large, bifid at tip</td>
<td>1.8–1.9</td>
<td>II, I, 5 II, I, 5</td>
<td><em>Saurida argyrophanes</em> (Indian Sea, Japan)</td>
</tr>
</tbody>
</table>
FIGURE 124.—Irodes upenei (Yamaguti), female: A, dorsal; B, dorsal; C, leg 5 and genital area, dorsal; D, anal segment and caudal rami, ventral; E, rostral area and first antenna, ventral; F, second antenna, medial.
Figure 125.—Irodes upenei (Yamaguti), female: A, postantennal process, ventral; B, labrum, ventral; C, mandible, anteromedial; D, same, anteromedial; E, paragnath, ventral; F, first maxilla, posterior; G, second maxilla, posteroventral; H, maxilliped, medial; I, same, medial; J, cephalothorax, ventral; K, leg 1 and interpodal plate, ventral; L, leg 2, ventral; M, leg 3 endopod, ventral. (R = rostral area, A1 = first antenna, A2 = second antenna, pap = postantennal process, L = labrum, Md = mandible, P = paragnath, Mx1 = first maxilla, Mx2 = second maxilla, Mxpd = maxilliped, P1 = leg 1.)
FIGURE 126.—Irides upenei (Yamaguti). Female: A, leg 4 endopod, ventral; B, same, ventral; C, leg 4, terminal endopod segment, ventral; D, leg 5, dorsal. Male: E, dorsal; F, genital area and portion of abdomen, ventral; G, posterior portion of urosome, ventral; H, maxilliped, posteromedial; I, same, anterolateral; J, leg 5, ventrolateral.
Genital complex (Figure 124c) wider than long, 48 × 80 μm. Abdomen 4-segmented; segments from anterior to posterior 30 × 62 μm, 23 × 53 μm, 13 × 48 μm, and 23 × 44 μm (l × w); anal segment (Figure 124d) with short row of spinules near insertion of each caudal ramus. Caudal ramus (Figure 124d) longer than wide, 27 × 16 μm, bearing a row of spinules along posteroventral border, and armed with setae as in figure; caudal rami partially contracted into anal segment as are setae into rami in specimen figured due to harsh influence of preservative.

Rostral area (Figure 124e) with somewhat irregularly shaped triangular part. First antenna (Figure 124e) 6-segmented. Formula for armature: 20, 4, 5, 4, 2 + 1 aesthete, 7 + 1 aesthete. Second antenna (Figure 124e) with third and fourth segments fused and bearing 2 pectinate processes (each with 1 seta), 3 claw-like spines, 3 naked setae and 1 greatly reduced seta. Postantennal process (Figure 125A) somewhat curved.

Labrum (Figure 125b) without ornamentation. Mandible (Figure 125c,d) with unequal blades; both blades with sub-apical processes; larger blade finely serrate. Paragnath (Figure 125e) a simple lobe. First maxilla (Figure 125f) with 2 long naked setae, 3 short naked setae, and a small knob near bases of short setae. Second maxilla (Figure 125g) with terminal process bearing row of spinules along outer edge and with 2 unequal spines at base. Maxilliped (Figure 125h.i) claw absent; rounded terminal protuberance with 2 naked setae; 2 longer setae on corpus. Ventral aspect of head as in Figure 125j.

Legs 1–4 (Figures 125k–m, 126a–c) biramous. Spinal and setal formula as follows:

\[
\begin{align*}
P_1 & : \text{coxa } 0-1, \text{ basis } 1-1, \text{ exopod } 1-0, 9, \text{ endopod } 0-1, 7 \\
P_2 & : \text{coxa } 0-1, \text{ basis } 1-0, \text{ exopod } 0-1, 1-1, 1, 1, 5, \text{ endopod } 0-1, 1, 1, 2 \\
P_3 & : \text{coxa } 0-1, \text{ basis } 1-0, \text{ exopod } 0-1, 1-1, 1, 1, 5, \text{ endopod } 0-1, 1, 1, 2 \\
P_4 & : \text{coxa } 0-1, \text{ basis } 1-0, \text{ exopod } 0-1, 1-1, 1, 1, 5, \text{ endopod } 0-1, 1, 1, 2 \\
\end{align*}
\]

Leg 1 interpodal plate (Figure 125k) triangular with bilobed posterior process bearing spinules. Leg 2 exopod (Figure 125l) with second and third segments each with a short wide spine; third segment with 2 normally developed spines in addition to usual setae. Leg 3 endopod (Figure 125m) with 2 setae on last endopod segment; rest of leg 3 as in leg 2. Leg 4 endopod (Figure 126a–c) with last segment with variation as indicated in figures. Leg 5 (Figure 126d) second segment, 40 × 40 μm, spatulate with all setae about equal in length; short row of spinules at base of inner seta. Leg 6 represented by 3 setae at area of egg sac attachment (Figure 124c).

**Male:** Body form as in Figure 126e. Total length 0.43 mm (0.41–0.45 mm) and greatest width 0.16 mm (0.16–0.17 mm) based on 10 Gulf of Elat specimens. Cephalothorax comprises about 30% of total length. Genital complex (Figure 126f) wider than long, 50 × 61 μm. Abdomen 3-segmented; segments from anterior to posterior 21 × 44 μm, 13 × 40 μm, and 16 × 35 μm (l × w); anal segment (Figure 126g) with 2 rows of spinules on each side of anteroventral surface. Maxilliped (Figures 126h.i) claw with row of knobs on proximal inner margin; tip rugose. Leg 5 (Figure 126j) with second segment longer than wide, 22 × 9 μm, bearing 3 setae. Other appendages as in female.

**REMARKS:**—Yamaguti (1954) described *Irodes upenei* under the binomen *Taeniacanthus upenei* from the gills of an unidentified species of *Upeneus* from the Celebes. Subsequent to Yamaguti’s discovery, Devi and Shyamasundari (1980) collected and described *Anchistrotos parupenei* from the gills of *Parupeneus indicus* from the Waltair coast of India. *Anchistrotos parupenei* is most likely synonymous with *Irodes upenei* Yamaguti, 1954. The most convincing evidence for this synonymy is the similarity in the morphology of legs 2–4 of these two nominal species, specifically the exopod and endopod spines. The outer spine of the terminal endopod segment of leg 4 is relatively large and conspicuous, not minute as in *Irodes sauridi*.

*Mettaenaicanthus* Pillai, 1963


**DIAGNOSIS.**—Female: Cephalothorax consisting of cephalosome and first pedigerous segment, comprising only a small portion of total body length, and bearing ventrally directed lateral margins. Egg sac attachment area ventrolaterally located on genital segment. Abdomen about half total body length. Caudal ramus bearing 6 setae.

Rostral area with weakly developed ventral part. First antenna 7-segmented. Second antenna indistinctly 4-segmented; third and fourth segments almost completely fused; fourth segment with 2 spines. Postantennal process present. Labrum with slightly V-shaped posterior margin. Mandible with 2 unequal spinulated spines. Paragnath and first maxilla present. Second maxilla 2-segmented with 1 terminal process and 2 elements (spines or setae). Maxilliped with a short claw closely appressed to corpus.

Legs 1–4 biramous. Rami of legs 3-segmented except endopod of leg 1 2-segmented. Leg 5 with 4 setae on second segment. Leg 6 represented by 3 setae in area of egg sac attachment.

**Male:** Lateral margins of cephalothorax not directed ventrad. Abdomen 3-segmented. Except for maxilliped, appendages similar to those in female.

**TYPE-SPECIES.** —*Mettaenaicanthus synodi* Pillai, 1963.

**REMARKS:**—There are 10 species of *Mettaenaicanthus* currently recognized as valid. The second author has col-
lected a new species of this genus from Synodus usitatus Cressey from Bali. However, since there is only one female in the collection, we have decided not to dissect and describe this species at this time.

The members of this genus attach to the gill filaments of synodontid fishes (lizardfishes). Metataeniacanthus appears to be restricted to the Indo-West Pacific (see Cressey and Cressey, 1979, for a revision of this genus).

Key to Species of Metataeniacanthus Females

1. Last exopod segments of legs 2 and 3 lacking sensillae; parasitic on gills and pseudobranch of Synodus hoshinonis Tanaka M. nudus
   Last exopod segments of legs 2 and 3 with sensilla(s) at bases of spines ... 2

2. Last exopod segments of legs 2 and 3 with single sensillum at base of each spine; parasitic on gills of S. variegatus (Lacépède) M. vulgaris
   Last exopod segments of legs 2 and 3 with paired sensillae at base of each spine ...

3. Abdomen visibly segmented; parasitic on gills of Trachinocephalus myops (Schneider) M. synodi
   Abdomen not visibly segmented ... 4

4. Longest seta of leg 5 longer than second segment ....... 5
   Longest seta of leg 5 shorter than second segment ....... 6

5. Last exopod segment of leg 4 with 4 spines, 3 setae; parasitic on gills of S. englemani Schultz M. epigri
   Last exopod segment of leg 4 with 3 spines, 4 setae; parasitic on gills of S. hoshinonis Tanaka M. pacificus

6. Last exopod segment of leg 4 with 3 spines, 4 setae .... ... 7
   Last exopod segment of leg 4 with 4 spines, 3 setae .... .... 8

7. Innermost seta of leg 5 shorter than adjacent seta; parasitic on gills and pseudobranch of Synodus (undescribed species) M. indiscretus
   Innermost seta of leg 5 slightly longer than adjacent seta; parasitic on gills and pseudobranch of S. macrops Tanaka M. aquilonius

8. Ventral surface of abdomen, between insertion of caudal rami, with prominent spinules; parasitic on gills of S. indicus Day M. gibbsi
   Ventral surface of abdomen, between insertion of caudal rami, with no ornamentation ...

9. Leg 4 exopod heavily sclerotized, last segment ending in pointed tip; parasitic on pseudobranch of S. variegatus (Lacépède) M. solidus
   Last exopod segment of leg 4 not heavily sclerotized, bent dorsally; parasitic on gills and pseudobranch of S. jaculum Russell and Cressey M. coneigri

Metataeniacanthus synodi Pillai, 1963

Figures 127–129


Material examined.—2 females (paratypes) (USNM 190665) collected from gills of Synodus indicus Day at Trivandrum, India, 15 March 1961 by Dr. N. Krishna Pillai. Remaining specimens from gills of Trachinocephalus myops (Forster): 4 females from India; 2 females from Formosa Strait; 1 female from Philippines; 4 females from Gulf of Thailand (12°32'N, 100°46'E). All material previously reported by Cressey and Cressey (1979).

Description.—Female: Body as in Figure 127A, B. Total length 1.99 mm (1.84–2.10 mm) and greatest width 0.42 mm (0.39–0.43 mm) based on 4 specimens. Cephalothorax 348 × 425 μm (l × w), comprising about 12% of body length, with ventrally directed lateral margins as in M. coneigri (Figure 162c). Thoracic segments bearing legs 2, 3, and 4 exhibiting no segmental sutures (Figure 127A) or having clear demarcation between segments (Figure 127B); two body types probably representing relaxed and contracted specimens. Genital complex (Figure 127C) 122 ×
FIGURE 127.—*Metataeniacanthus synodi* Pillai, female: A, dorsal; B, dorsal; C, leg 5 and genital area, ventrolateral; D, caudal ramus, ventral; E, first antenna, ventral; F, second antenna, medial; G, postantennal process, ventral; H, labrum, ventral.
FIGURE 128.—*Metataeniacanthus synodi* Pillai, female: A, mandible, anterior; B, paragnath, anterior; C, first maxilla, anterior; D, second maxilla, anteroventral; E, maxilliped, ventromedial; F, maxilliped claw, anterior; G, leg 1 and interpodal plate, ventral; H, leg 2, interpodal plate and proximal portions of basipods, ventral; I, leg 2, ventral.
FIGURE 129.—*Metataenianthus synodi* Pillai, female: A, leg 2 endopod, distal two segments, ventral; B, leg 3, interpodal plate and proximal portions of basipods, ventral; C, leg 3, ventral; D, leg 4, interpodal plate and proximal portions of basipods, ventral; E, leg 4 exopod, ventral; F, leg 4 endopod, ventral; G, leg 5, ventrolateral.
301 μm (I × w), fused to abdomen. Abdomen 4-segmented, comprising approximately half of total body length; segments from anterior to posterior 432 × 329 μm, 329 × 273 μm, 179 × 207 μm, 115 × 141 μm (I × w); anal segment without ornamentation. Caudal ramus (Figure 127d) longer than wide, 78 × 32 μm, and bearing 6 setae (innermost setae semipinnate).

Rostral area with weakly sclerotized ventromedian part. First antenna (Figure 127e) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 127f) apparently 4-segmented; first segment with long slender distal seta; second segment with short, stout seta near distal end; third segment with 2 pectinate processes (longer process with small distal seta, and shorter process with small seta at about midlength), and 1 large curved spine; terminal segment with 2 large curved spines and 4 setae. Postantennal process (Figure 127g) with curved tine.

Labrum (Figure 127h) with V-shaped, spinulated posterior margin. Mandible (Figure 128a) with 2 unequal blades, each spinulated along 1 margin. Paragnath (Figure 128b) a lobe with a short digitiform tip and 1 row of spinules. First maxilla (Figure 128c) with 5 setae and 1 anterior knob. Second maxilla (Figure 128d) 2-segmented; first segment a sclerotized base; second segment with spinulated terminal process, 1 bilaterally spinulated spine, and 1 naked seta. Maxilliped (Figure 128e) presumably 3-segmented with first and second segments fused; first segment with distal seta; second segment (corpus) with 2 naked setae; third segment (Figure 128f) a short claw bearing 1 naked seta and 1 minute setule.

Legs 1–4 (Figures 128g–i, 129a–f) biramous. Spinal and setal formula as follows:

<table>
<thead>
<tr>
<th>Species</th>
<th>Exopod of leg 2</th>
<th>Exopod of leg 3</th>
<th>Exopod of leg 4</th>
<th>Endopod of leg 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>M. aquilonius</td>
<td>II, 1, 4</td>
<td>II, 1, 4</td>
<td>II, 1, 4</td>
<td>III</td>
</tr>
<tr>
<td>M. copepigi</td>
<td>II, 1, 4</td>
<td>II, 1, 4</td>
<td>III, 1, 3</td>
<td>III</td>
</tr>
<tr>
<td>M. epigoni</td>
<td>II, 1, 5</td>
<td>II, 1, 5</td>
<td>III, 1, 3</td>
<td>III</td>
</tr>
<tr>
<td>M. gibbsi</td>
<td>II, 1, 4</td>
<td>II, 1, 4</td>
<td>III, 1, 3</td>
<td>III</td>
</tr>
<tr>
<td>M. indeterius</td>
<td>II, 1, 4</td>
<td>II, 1, 4</td>
<td>II, 1, 4</td>
<td>II</td>
</tr>
<tr>
<td>M. nudus</td>
<td>II, 1, 5</td>
<td>II, 1, 5</td>
<td>II, 1, 5</td>
<td>III</td>
</tr>
<tr>
<td>M. pacificus</td>
<td>II, 1, 5</td>
<td>II, 1, 5</td>
<td>II, 1, 4</td>
<td>III</td>
</tr>
<tr>
<td>M. solidus</td>
<td>II, 1, 4</td>
<td>II, 1, 4</td>
<td>III, 1, 3</td>
<td>III</td>
</tr>
<tr>
<td>M. synodi</td>
<td>II, 1, 5</td>
<td>II, 1, 4</td>
<td>II, 1, 5</td>
<td>III</td>
</tr>
<tr>
<td>M. vulgaris</td>
<td>II, 1, 5</td>
<td>II, 1, 5</td>
<td>II, 1, 5</td>
<td>II</td>
</tr>
</tbody>
</table>

Interpodal plates of legs 1–4 (Figures 128g,h, 129b,d) with spinules on posterior margins. Basis of leg 1 (Figure 128g) with 1 row of spinules at junction with endopod. Second and third segments of exopods of legs 2 and 3 (Figures 128i, 129c) with spiniform processes along outer margins near base of spines; exopod of leg 4 (Figure 129e) without such spiniform processes, but with rows of spinules; terminal exopod segment of leg 2 with 2 long setules at base of outermost seta. Endopods of legs 2–4 (Figures 128i, 129c,f) with rows of spinules on outer margins of segments; endopod spines of legs 2 and 3 spinulated as in Figure 129a and 129c, respectively; endopod spines of leg 4 (Figure 129f) not spinulated, but bearing membranous flanges. Leg 5 (Figure 129g) with 2 segments; first segment with 1 naked seta; second segment 122 × 58 μm, with 4 naked setae (2 outermost setae each with 1 row of spinules at base; innermost seta with 2 rows of spinules). Leg 6 (Figure 127c) represented by 3 setae at area of egg sac attachment.

Male: Unknown.

Remarks.—Pillai (1963) described *Metaetaeniacanthus synodi* from the gills of *Synodus indicus* at Trivandrum, India. Although many specimens of *Synodus indicus* were examined by Cressey and Cressey (1979), they did not obtain this species of parasitic copepod from the type host. However, they did collect *M. synodi* from the gills of another species of lizardfish, *Trachinocryptus myops*. Apparently, *T. myops* appears to be the preferred host of *M. synodi*.

Cressey and Cressey (1979) described the last exopod segment of leg 3 of *M. synodi* as possessing the formula III, 5. Their original folder on this species contains two pencil illustrations of leg 3. One is apparently an illustration of the third leg of a paratype (donated to the National Museum of Natural History by Dr. N. Krishna Pillai) with the formula III, 5 (or II, I, 5 in our notation). The other pencil illustration shows the third leg from specimens taken from *Trachinocryptus myops* with the formula II, I, 4 as in our description.

Our examination of the remaining two paratypes has revealed that *M. synodi* exhibits the formula II, I, 4. In addition, all specimens examined from Cressey and Cressey's collection exhibit the II, I, 4 formula. Presumably the illustration of leg 3 provided in their paper was drawn from an aberrant specimen.

*Metaetaeniacanthus synodi* can be distinguished from its congeners based on a visibly segmented abdomen, and the formulae II, I, 5 and II, I, 4 of the terminal exopod segments of legs 2 and 3 respectively (Table 3).
Nudisodalis, new genus

DIAGNOSIS.—Female: Cephalothorax with first pedigerous segment fused with cephalosome. Abdomen 4-segmented. Caudal ramus with usual 6 setae.

Rostral area protuberant bearing ventromedian sclerotized plate. First antenna 7-segmented. Second antenna indistinctly 4-segmented; third and fourth segments partially fused. Postantennal process a curved spiniform structure. Labrum with spinulated, medially indented posterior margin. Mandible with spinulated subequal blades; accessory seta absent. Paragnath and first maxilla present. Second maxilla 2-segmented; second segment with single spinulated process. Maxilliped with slender corpus; terminal segment small, bearing 2 rounded processes; prehensile claw absent.

Legs 1–4 biramous. Leg 1 with 2-segmented rami. Legs 2–4 with 3-segmented rami. Terminal segment of endopod of leg 4 with 3 elements. Leg 5 with 4 setae on second segment. Leg 6 represented by 3 setae in area of egg sac attachment.

Male: Unknown.

ETYMOLOGY.—The generic name is a combination of Latin nudus (naked), alluding to the absence of the 2 spines usually associated with the terminal process of the second maxilla and the absence of a prehensile claw on the maxilliped of the female, and sodalis (companion), alluding to the organisms parasitic relationship with its host.

TYPE-SPECIES.—Nudisodalis acicula, new species.

REMARKS.—The monotypic genus Nudisodalis can be distinguished from all other taeniactanid genera by the structure of the second maxilla and maxillipeds. Although species of Irodes also lack a prehensile claw on the maxilliped of the female, Nudisodalis acicula bears a terminal segment that articulates with the corpus maxillipeds. The terminal segment of the maxilliped appears to be absent (or completely fused with the corpus) in all the species of Irodes. The terminal process of the second maxilla of N. acicula is long and slender and bears a minute spine at its base.

Nudisodalis acicula, new species

FIGURES 130–132

MATERIAL EXAMINED.—1 female holotype (USNM 228424) and 8 paratypes (females) (USNM 228425) from Pervagor spilosomus (Bleeker) collected at Oahu, Hawaii.

DESCRIPTION.—Female: Body as in Figure 130A. Total length 0.99 mm (0.94–1.07 mm) and greatest width 0.50 mm (0.47–0.53 mm) based on 9 specimens. Cephalothorax wider than long, 385 X 550 µm, and comprising approximately 33% of total body length. Genital complex (Figure 130B) wider than long, 101 X 148 µm. Abdomen 4-segmented; segments from anterior to posterior 52 X 109 µm, 47 X 91 µm, 29 X 78 µm, and 44 X 68 µm (l X w); anal segment (Figure 130C) with 5 rows of large spinules on each side of ventral surface and bearing 1 row of small spinules on posteroventral margin near insertion of each caudal ramus. Caudal ramus (Figure 130C) longer than wide, 36 X 21 µm, and bearing 4 naked setae, 2 median terminal setae (each with 1 row of bristles), 1 rounded posterodorsal flap (process) and 1 rounded posteroventral flap.

Rostral area (Figure 130B) with ventromedian sclerotized part. First antenna (Figure 130B) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 130E) indistinctly 4-segmented with third and fourth segments partially fused; first segment with usual distal seta; second segment with hyaline acuminate seta; third segment bearing 1 stout curved spine and 2 pectinate processes (longer process with small subterminal seta and 1 row of relatively long spinules, and shorter process with small spinules and 1 small seta located at proximal third of process); terminal segment armed with 2 stout curved spines and 4 setae. Postantennal process (Figure 130F) with bent time.

Labrum (Figure 130C) with anteromedian hyaline process and medially indented, spinulated posterior margin. Mandible (Figures 130H, 131A) bearing 2 slightly subequal blades, each spinulated along 1 margin; accessory seta absent. Paragnath (Figure 131B) with rounded proximal inner lobe and 2 spinules at tip of main lobe. First maxilla (Figure 131C) with 5 bristled setae. Second maxilla (Figure 131D) 2-segmented; first segment a large sclerotized area; second segment with long, slender, spinulated terminal process bearing 1 minute spine (spinae) at base. Maxilliped (Figure 131E) 3-segmented; first segment relatively large, but without distal seta; second segment (corpus) slender and bearing 2 bristled setae near proximal end; third segment non-prehensile, and bearing 2 conical processes and 2 naked setae.

Legs 1–4 (Figures 131F,G, 132A–F) biramous. Spinal and setal formula as follows:

\[
\begin{align*}
P_1 & : \text{coxa 0-1, basis 1-1} & \text{exopod 1-0; 9} & \text{endopod 0-1; 7} \\
P_2 & : \text{coxa 0-0, basis 1-0} & \text{exopod 1-0; 1-1; II, 1; 4} & \text{endopod 0-1; 0-1; II, 1, 3} \\
P_3 & : \text{coxa 0-0, basis 1-0} & \text{exopod 1-0; 1-1; II, 1; 4} & \text{endopod 0-1; 0-1; II, 1, 2} \\
P_4 & : \text{coxa 0-0, basis 1-0} & \text{exopod 1-0; 1-1; II, 1; 4} & \text{endopod 0-1; 0-1; 1-1, int.}
\end{align*}
\]

Interpodal plate of leg 1 (Figure 131I) subtriangular with bilobed, spinulated posterior margin. Interpodal plates of legs 2–4 (Figures 131G, 132A,C) spinulated along posterior margins; that of leg 2 slightly wider than long and indented at midline of posterior margin; interpodal plates of legs 3 and 4 much wider than long and with relatively straight posterior margins. Coxa of leg 1 (Figure 131I) with single row of spinules near outer margin; coxa and basis with rows of striated flanges. Coxae and bases of legs 2–4 spinulated (see Figure 131G). Basal setae of legs 2–4 long, whip-like, and each heavily sclerotized at base (see Figure 131G).
FIGURE 130.—Nudisodalis acicula, new species, female: A, dorsal; B, genital area, dorsal; C, anal segment and caudal ramus, ventral; D, rostral area and first antenna, ventral; E, second antenna, medial; F, post antennal process, ventral; G, labrum, ventral; H, mandible, anteromedial. (R = rostral area.)
**Figure 151.** — *Nudisodalis acicula*, new species, female: A, mandible, distal portion, ventral; B, paragnath, ventral; C, first maxilla, anterior; D, second maxilla, ventral; E, maxilliped, ventromedial; F, leg 1 and interpodal plate, ventral; G, leg 2 and interpodal plate, ventral.
FIGURE 132.—Nudisodalis acicula, new species, female: A, leg 3, interpodal plate and proximal portions of basipods, ventral; B, leg 3 endopod, ventral; C, leg 4, interpodal plate and proximal portions of basipods, ventral; D, leg 4 exopod, ventral; E, leg 4, terminal exopod segment, ventral; F, leg 4 endopod, ventral; G, leg 5, dorsal; H, same, ventral.
Exopod spines of legs 2 and 3 coarsely serrated along outer margins and each spine tipped with setiform element (see Figure 132(e)). Terminal exopod segment of leg 4 (Figure 132(e)) subtriangular in outline and tipped with digitiform process; exopod spines (setae?) very weakly sclerotized. Endopod spines of legs 2–4 (Figures 131c, 132b, d) coarsely serrated. Exopods and endopods of legs 2–4 bearing rows of spinules along outer margins of segments. Leg 5 (Figure 132g,h) 2-segmented; first segment with ventral row of spine and 1 semi-pinnate, dorsolateral seta; second segment slender, 70 X 26 μm (l X w), with sparse patch of spinules on ventromedial surface and 4 long slender setae (2 setae naked, 1 with row of bristles, and 1 with 2 rows of bristles); each seta with single row of small spinules at its base. Leg 6 (Figure 130b) represented by 3 setae (2 long spiny, 1 short naked) in area of egg sac attachment.

Male: Unknown.

ETYMOLOGY.—The specific name acicula, Latin for sharp-pointed or needle-like, alludes to the long slender terminal process of the second maxilla.

REMARKS.—This species was collected from the monacanthid Perupagor spilosomus at Oahu, Hawaii. It can be distinguished from all other taeniacanthid species by the presence of four setae on the terminal segment of the maxilliped of the female. The maxilliped of the female is the most distinctive for this genus. The maxilliped does not have a prehensile claw; the terminal segment is incompletely fused to the corpus and bears four setae.

Four taeniacanthid genera (Irodos, Nudisodalis, Pseudotaeniacanthus, and Scolecicara) exhibit a distinct corpus of the maxilliped without a prehensile claw. The maxilliped of the female of Scolecicara is bilobed, which is unique in the Taeniacanthidae. In Irodos the terminal segment appears to be absent (or completely fused to the corpus) and bears one or two setae at its tip. Nudisodalis has a terminal segment that articulates with the corpus. Also the type-species of Nudisodalis bears a long, slender terminal process on the second maxilla.

**Phagus** Wilson, 1911


DIAGNOSIS.—Female: Cephalothorax with first pedigerous segment fused to cephalosome. Abdomen 4-segmented, all segments with ventral spinules. Caudal ramus with 6 setae.


Legs 1–4 biramous. Leg 1 with exopod 3-segmented; endopod 2-segmented. Legs 2–4 with 3-segmented rami. Terminal segment of leg 4 with 4 elements. Leg 5 with 4 elements on last segment. Leg 6 represented by 3 setae in area of egg sac attachment.

Male: Similar to female except maxilliped strongly prehensile and abdomen 3-segmented.

TYPE-SPECIES.—*Bomolochus muraenae* Brian, 1906.

REMARKS.—The monotypic genus *Phagus* was originally established by Wilson (1911) with *Bomolochus muraenae* as the type-species. The validity of this genus was questioned by Kabata (1979). However, our redescription of the type-species suggests that *Phagus* is valid.

Although there are several unusual characters that distinguish *Phagus muraenae* from other taeniacanthids (see "Remarks" for this species), the combination of the absence of the postantennal process and the structure of the maxilliped of the female is the most distinctive for this genus. The maxilliped does not have a prehensile claw; the terminal segment is incompletely fused to the corpus and bears four setae.

Four taeniacanthid genera (*Irodos, Nudisodalis, Pseudotaeniacanthus*, and *Scolecicara*) exhibit a distinct corpus of the maxilliped without a prehensile claw. The maxilliped of the female of *Scolecicara* is bilobed, which is unique in the Taeniacanthidae. In *Irodos* the terminal segment appears to be absent (or completely fused to the corpus) and bears one or two setae at its tip. *Nudisodalis* has a terminal segment that articulates with the corpus. Also the type-species of *Nudisodalis* bears a long, slender terminal process on the second maxilla.

*Phagus* and *Pseudotaeniacanthus* have (1) a distinctly or indistinctly 4-segmented second antenna, (2) absence of postantennal process, and (3) a 3-segmented exopod and distinctly or partially 3-segmented endopod of leg 1. In addition, three species of *Pseudotaeniacanthus* (*P. coniferus* new species; *P. muraenae* Devi and Shyamasundari, 1980; and *P. puhi* Lewis, 1967) have a terminal segment of the maxilliped of the female represented by a process, similar to the condition found in *Phagus*. *Phagus* appears to be closely related to *Pseudotaeniacanthus*. Species of both genera have a predilection for Anguilliformes as their hosts.

*Phagus* may be distinguished from *Pseudotaeniacanthus* by the absence of the Y-shaped sclerotized structure bearing curved spinules or transverse ridges on the rostral area, and by the presence of four setae on the terminal segment of the maxilliped of the female.

**Phagus muraenae** (Brian, 1906)

FIGURES 133–136


MATERIAL EXAMINED.—7 females, 2 immature females, 4 males from *Muraena helena* from Port Said, Egypt; 1 female, 2 males from *Muraena helena* (USNM 143502) from Livorno, Italy.

DESCRIPTION.—Female: Body form as in Figure 133A. Total length 1.80 mm (1.70–1.96 mm) and greatest width 0.80 mm (0.77–0.85 mm) based on 3 specimens. Cephalo-
Numbers of needles (see Figure 133b) wider than long, 156 X 276 μm. Abdomen (Figure 133c) 4-segmented; segments from anterior to posterior 129 X 212 μm, 124 X 179 μm, 92 X 152 μm, and 133 X 129 μm (l X w), each bearing row of spinules on posteroverentral margin; anal segment with additional row of spinules on anteroverentral margin (Figure 133d). Caudal ramus (Figure 133g) longer than wide, 74 X 44 μm, and with a short row of spinules on posteroverentral surface; all six terminal and subterminal setae naked.

Rostral area (Figure 133x) with ventromedian sclerotized ridges. First antenna (Figure 133x) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 133y,c) 3-segmented; terminal segment with 1 long pectinate process bearing 1 small naked seta near distal end, 1 shorter pectinate process with hyaline seta near midlength, 4 spines and 3 setae. Postantennal process absent.

Labrum (Figure 134a) with row of small spinules along posterior edge. Mandible (Figure 134b) with 2 blades, each spinulized along 1 margin; subterminal blade with small bristled seta near base. Paragnath (see Figure 134a) a pointed process with a short row of spinules on posterior margin near tip. First maxilla (Figure 134c,d) bearing 2 long, naked setae, a short finely pinnate seta, 2 short naked setae, and a rounded anterior knob. Second maxilla (Figure 134e,f) 2-segmented; terminal process with rows of spinules; 2 stout spines at base of terminal process, each bearing 2 rows of spinules. Maxilliped (Figure 134g) bearing 4 stout setae near tip and 2 setae on inner margin; all setae naked.

Legs 1–4 (Figures 134h, 135a–f) biramous. Spinal and setal formula as follows:

- P1 coxa 0-1 basis 1-1 exopod 1-0; 1-1; 7 endopod 0-1; 7
- P2 coxa 0-1 basis 1-0 exopod 1-0; 1-1; III, I, 5 endopod 0-1; 0-2; II, I, 3
- P3 coxa 0-1 basis 1-0 exopod 1-0; 1-1; II, I, 5 endopod 0-1; 0-2; II, I, 1, 2
- P4 coxa 0-0 basis 1-0 exopod 1-0; 1-1; II, I, 4 endopod 0-1; 0-1; IV (or II, 2 int.)

Posterior margin of interpodal plate of leg 1 (Figure 134h) with indentation at midline; each side with a row of long setules. Endopod of leg 1 (Figure 134h) 2-segmented, but terminal segment with partial division; conspicuous rounded lobe on inner surface of last endopod segment with small hyaline seta. Interpodal plates of legs 2–4 each with a medially interrupted row of scales tipped with varied numbers of needles (see Figure 135a,c,f). Exopod spines on legs 2–4 (see Figure 135b,d,f) heavily sclerotized and spinulated on lateral and medial margins. First endopod segment of leg 2 (Figure 135b) with small spiniform process on distolateral margin; second segment with larger process on distolateral margin; last segment (Figure 135b) with 2 outer heavily sclerotized spines each bearing row of spinules at base, a long terminal spine and 3 terminal to inner setae. Endopod of leg 3 similar to that of leg 2 except having additional spine medial to long terminal spine and lacking 1 inner seta (Figure 135e). Leg 5 (Figure 136a) basal segment with long outer seta and prominent patch of spinules along distal margin; terminal segment with 3 long spines (all nearly equal in length; each spine with patch of spinules at base) and a longer, naked seta. Leg 6 (Figure 133b) represented by 3 setae near area of egg sac attachment.

Male: Body form as in Figure 136b. Total length 0.88 mm (0.82–0.93 mm) and greatest width 0.36 mm (0.33–0.37 mm) based on 4 specimens. Cephalothorax wider than long, 276 X 345 μm, comprising approximately 25% of total body length. Genital complex 115 X 124 μm (l X w). Abdomen 3-segmented; segments from anterior to posterior 51 X 97 μm, 48 X 81 μm, 64 X 69 μm (l X w); anal segment ornamented as in female. Caudal ramus 41 X 25 μm.

First antenna with additional seta on fourth segment (indicated by dot in Figure 133e). Maxilliped (Figure 136c) 4-segmented, corpus with row of blade-like spinules along inner margin, 2 setae near base, and a patch of prominent spines at distolateral corner; claw with 3 setae and a row of round-tipped spinules along inner margin. Legs 1–4 as in female except last endopod segment of leg 3 (Figure 136d) with "displaced" spine more robust than in female. Leg 5 as in Figure 136e; terminal segment 61 X 25 μm (l X w).

Remarks.—This species was originally discovered and named Bomolochus muraenae by Richiardi (1880) and subsequently cited by Garus (1885) and Brian (1903). However, Richiardi never described this species. Brian (1906) was the first to describe B. muraenae. Later Wilson (1911) made it the type-species for Phagus. The above redescription is the first detailed taxonomic account of this species.

There are several taxonomic characters in combination that distinguish Phagus muraenae from all other taeniancanthids. They are (1) second pedigerous segment of female wider than cephalothorax, (2) rows of ventral spinules on all abdominal segments, (3) absence of postantennal process, (4) conspicuous inner lobe on the distal portion of endopod of leg 1, (5) terminal exopod segment of leg 2 with armature formula III, I, 5, (6) terminal endopod segment of leg 3 with formula II, I, I, 2, (7) terminal endopod segment of leg 4 with 4 elements, and (8) 3-segmented exopod and incompletely 3-segmented endopod of leg 1. Most of these characters are not unique to P. muraenae; however, orna-
FIGURE 133.—Phagus muraenae (Brian), female: A, dorsal; B, genital area, dorsal; C, genital complex and postgenital segments, ventral; D, anal segment and caudal ramus, ventral; E, rostral area and first antenna, ventral; F, second antenna, medial; G, second antenna, distal portion, lateral. (R = rostral area.)
FIGURE 134.—*Phagus muraenae* (Brian), female: A, labrum and paragnaths, ventral; B, mandible, antero-medial; C, first maxilla, anterior; D, same, posterior; E, second maxilla, posteroventral; F, second maxilla, distal portion, ventral; G, maxilliped, ventral; H, leg 1 and interpodal plate, ventral. (P = paragnath, s = spinules.)
Figure 135.—*Phagus muraena* (Brian), female: A, leg 2, interpodal plate and proximal portions of basipods, ventral; B, leg 2 and interpodal plate, ventral; C, leg 3, interpodal plate and proximal portion of basipod, ventral; D, leg 3 exopod, ventral; E, leg 3 endopod, ventral; F, leg 4 and interpodal plate, ventral.
Figure 136. *Phagus muraena* (Brian). Female: A, leg 5, ventral. Male: B, dorsal; C, maxilliped, anterior; D, leg 3, terminal endopod segment, ventral; E, leg 5, ventral.
mentation of all four abdominal segments (character 2) is not found in any known species of the Taeniacanthidae.

**Pseudotaeniacanthus** Yamaguti and Yamasu, 1959


Legs 1–4 biramous with 3-segmented rami (exopod of leg 1 reported to be 2-segmented for *P. muraenesocis* and *P. puhi*). Endopod of leg 1 lamelliform. Leg 5 with 4 setae on second segment. Leg 6 represented by 3 setae in area of egg sac attachment.

**Male:** Appendages similar to those in female except maxilliped having robust corpus bearing prominent protrusion on inner margin opposing claw. Leg 6 represented by seta on posteroventral flap of genital segment.

**TYPE-SPECIES.**—*Pseudotaeniacanthus congeri* Yamaguti and Yamasu, 1959.

**REMARKS.**—*Pseudotaeniacanthus* is distinguished from all other taeniacanthid genera by the combination of a Y-shaped sclerotized structure bearing curved spinules on the rostral area, 4-segmented second antenna with 4 terminal spines, absence of postantennal process, and lamelliform endopod of leg 1. All species of *Pseudotaeniacanthus* have been recorded from species of Anguilliformes except the single male from *Acanthurus gahhm* Forsskål (= *A. nigricans* Linnaeus) reported by Lewis (1968) from Enewetak Atoll. However, we consider this record as probably representing an accidental infestation.

**Key to Species of Pseudotaeniacanthus Females**

1. Terminal exopod segment of leg 4 with armature of II, I, 4 [Figure 143E] 
   *P. coniferus*, new species
   Terminal exopod segment of leg 4 with armature of II, I, 5 [see leg 2, Figure 139b] .......................... 2
2. Terminal endopod segment of leg 4 with 3 elements (setae and/or spines) [Figure 140b] .......................... 3
   Terminal endopod segment of leg 4 with 4 elements .......................... 5
3. Terminal segment of maxilliped of female a setiform claw-like structure [Figure 138i] .......................... *P. congeri*
   Terminal segment of maxilliped of female a process bearing 2 setae .......................... 4
4. Terminal endopod segment of leg 3 with 3 elements .......................... *P. muraenesocis*
   Terminal endopod segment of leg 3 with 5 elements .......................... *P. puhi*
5. Exopod of leg 1 with armature of 1-0; 1-1; 6 .......................... *P. longicauda*
   Exopod of leg 1 with armature of 1-0; 1-1; 8 .......................... *P. species* 
   (see Lewis, 1968)

**Pseudotaeniacanthus congeri** Yamaguti and Yamasu, 1959

*Figuress* 137–140, 162d–f, 163, 164a


**MATERIAL EXAMINED.**—4 females, 1 male (USNM 190500) from *Astroconger myriaster* (Breevoort) collected at Kojima Bay, Japan, by Tran The Do on 13 May 1980.

**DESCRIPTION.**—Female: Body as in Figures 137a and 164a. Total length 1.58 mm (1.37–1.75 mm) and greatest width 0.50 mm (0.47–0.52 mm) based on 4 specimens. Cephalothorax 432 × 517 μm (l × w) (excluding lateral processes, comprising approximately 25% of total length, and bearing a pair of spatulate lateral processes (Figure 137b) and transparent membrane. Thoracic segments bearing legs 2, 3, and 4 decreasing in width posteriorly. Genital complex 92 × 189 μm (l × w). Abdomen 4-segmented; segments from anterior to posterior 193 × 156 μm, 133 × 124 μm, 92 × 106 μm, and 110 × 101 μm (l × w); anal segment (Figure 137c) with 1 row of spinules on each side.
Figure 137.—*Pseudotaeniocentrus congeri* Yamaguti and Yasuma, female: A, dorsal; B, cephalothorax, lateral portion, ventral; C, anal segment and caudal rami, ventral; D, cephalothorax, ventral; E, rostral area, ventral. (R = rostral area, A1 = first antenna, A2 = second antenna, L = labrum, Md = mandible, P = paragnath, Mx1 = first maxilla, Mx2 = second maxilla, Mxpd = maxillipeds, IPP of P1 = interpodal plate of leg 1, P1 = leg 1, tm = transparent membrane, lp = lateral process.)
FIGURE 138.—*Pseudotaeniacanthus congeri* Yamaguti and Yamasu, female; A, first antenna, anteroventral; B, second antenna, lateral; C, second antenna, distal three segments, medial; D, mandible, posterior; E, paragnath, ventromedial; F, first maxilla, anterior; G, second maxilla, posteroventral; H, same, posterior; I, maxilliped, ventral; J, leg 1, ventral.
FIGURE 139.—Pseudoturnia canthos Yamaguti and Yamase, female: A, leg 1, interpodal plate, ventral; B, leg 1 exopod, ventral; C, leg 1 endopod, ventral; D, leg 2 and interpodal plate, ventral; E, leg 2, outer spine of first exopod segment, ventral; F, leg 2, terminal endopod segment, ventral; G, leg 3, interpodal plate, ventral.
Figure 140.—Pseudotaeniacanthus congeri Yamaguti and Yamasu. Female: A, leg 3, terminal endopod segment, ventral; B, leg 4 endopod, ventral; C, leg 5, dorsal. Male: D, dorsal; E, genital area, ventral; F, rostral area, ventral; G, maxilliped, posterior; H, same, distal portion, anterior; I, leg 5, dorsal; J, same, lateral; K, spermatophore, lateral.
of anteroventral surface and 2 rows of spinules near insertion of each caudal ramus. Caudal ramus (Figure 137c) 58 × 35 μm (l × w), bearing 6 setae; all setae naked except innermost seta with 1 row of bristles.

Rostral area (Figures 137D,E, 162d–f) with pair of fang-like tines and several (5–6) rows of spinules (Figure 163A,B) on each of a pair of obliquely angled sclerotized structures. First antenna (Figure 138A) 6-segmented; armature formula: 18 (1 of these a setule), 4, 3, 4, 2 + 1 aesthetes, and 7 + 1 aesthete. Second antenna (Figure 138B,C) apparently 4-segmented; first 2 segments each with 1 long, naked, distal seta; third segment with 2 pectinate processes (1 with a hyaline process, 1 with naked seta near tip) and 1 spine; terminal segment with 4 spinules and 3 setae.

Labrum (Figure 137d) a membranous flap without ornamentation. Labial area with single row of spinules. Mandible (Figures 138D, 163C) with 2 unequal blades, each spinulated along 1 margin. Paragnath (Figure 138E) with a patch of spinules on inner surface. First maxilla (Figures 138F, 163d) a lobe bearing 4 naked setae and 2 bristled setae. Second maxilla (Figure 138G,H) 2-segmented; first segment robust, bearing distal rounded protuberance tipped with 1 spiniform process; second segment with 2 spinulated spines and 2 naked setae. Maxillipeds (Figures 138I, 163E,F) 3-segmented; first segment a sclerotized area bearing 1 seta; second segment (corpus) with 2 small setae on inner margin at about midlength; terminal segment bearing attenuate setiform process with 1 long seta, having 1 row of bristles at base.

Legs 1–4 (Figures 138J, 139A–G, 140A,B) biramous. Spinal and setal formula as follows:

\[
\begin{align*}
P_1 & \quad \text{coxa } 0-1 \quad \text{basis } 1-0 \quad \text{exopod } 1-0; 1-1; 8 \\
& \quad \text{endopod } 0-1; 0-1; 5 \\
P_2 & \quad \text{coxa } 0-1 \quad \text{basis } 1-0 \quad \text{exopod } 1-0; 1-1; 2, 1, 5 \\
& \quad \text{endopod } 0-1; 0-2; 1, 4 \\
P_3 & \quad \text{coxa } 0-1 \quad \text{basis } 1-0 \quad \text{exopod } 1-0; 1-1; 2, 1, 5 \\
& \quad \text{endopod } 0-1; 0-2; 1, 1 \\
P_4 & \quad \text{coxa } 0-1 \quad \text{basis } 1-0 \quad \text{exopod } 1-0; 1-1; 2, 1, 5 \\
& \quad \text{endopod } 0-1; 0-1; 1H
\end{align*}
\]

Interpodal plate of leg 1 (Figure 139A) broad, bearing membranous flange on posterior margin; those of legs 2–4 (Figure 139D,G) with spinules on posterior margin. Coxal seta of leg 1 (Figure 138J) with large spiniform process on doro-medial surface. Coxal seta of leg 2 (Figure 139B) relatively small and naked; coxal setae of legs 3 and 4 (see Figure 139C) long and pinnate. Coxal bases and spinules of legs 2–4 each with several rows of spinules. Exopod spines of legs 2–4 (see Figure 139A) long, attenuate, and bristled. Endopod of leg 1 (Figures 138J, 139C) a broad, spatulate structure. Endopod spines of legs 2–4 (Figures 139F, 140A,B) slender. Leg 5 (Figure 140C) with 2 segments; first segment small, bearing doro-solateral seta; second segment, 113 × 74 μm (l × w) bearing 4 setae (slightly sclerotized at bases), and spinules at base of innermost seta. Leg 6 represented by 3 setae near area of egg sac attachment.

**Male:** Body as in Figure 140D. Total length 0.64 mm and greatest width 0.22 mm based on 1 specimen. Cephalothorax 161 × 225 μm (l × w), comprising about 25% of total length. Genital complex (Figure 140F) longer than wide, 101 × 92 μm. Abdomen 4-segmented; segments from anterior to posterior 37 × 97 μm, 28 × 44 μm, 21 × 44 μm, and 37 × 44 μm (l × w). Caudal ramus similar to that of female, but measuring 26 × 15 μm (l × w).

Rostral area (Figure 140F) similar to that of female except obliquely angled sclerotized structures each with 3 curved spiniform processes instead of rows of small spinules. Maxillipeds (Figure 140G,H) 4-segmented; first segment with 1 naked seta; second segment (corpus) with large digitiform process bearing corrugated area and 2 naked setae; third segment small and unornamented; terminal segment a curved claw with 1 row of spinules and 1 row of cuticular folds; usual seta on claw not present (presumably broken off in specimen).

Leg 5 (Figure 140I, j) with second segment 21 × 13 μm (l × w) and armed as in Figure 140J. Leg 6 (Figure 140K) represented by 1 long naked seta on posteroventral genital flap.

Spermatophore (Figure 140K) 72 × 21 μm (l × w) excluding neck region.

**Remarks.**—*Pseudotaeniacanthus congeri* was collected from the gills of "Conger myriaster Breevoort" from the Inland Sea of Japan and described by Yamaguti and Yamashita (1959). It can be distinguished from all other known species of *Pseudotaeniacanthus* by the diagnostic characters outlined in Table 4.

This species bears a small protuberance tipped with a spiniform process at the distal end of the first segment of the second maxilla. A second, apparently unique, character is a large spiniform process on the doro-medial surface of the coxa of leg 1. These two morphologic characters have not yet been described for other species of this genus.

**Pseudotaeniacanthus coniferus, new species**

**FIGURES** 141–144

**Material Examined.**—1 female holotype (USNM 228426), 1 allotype (USNM 228427), and 2 paratypes (females) (USNM 228428) collected from *Muraena* sp. in the Gulf of Eilat.

**Description.**—**Female:** Body as in Figure 141A. Total length 3.63 mm (3.47–3.73 mm) and greatest width 0.64 mm (0.61–0.69 mm) based on 3 specimens. Cephalothorax 489 × 602 μm (l × w), comprising approximately 14% of total length. First pedigerous segment fused to cephalothorax although cuticular crease present.

Genital complex (Figure 141B) bearing 2 conical processes (Figure 141C) on each side near area of egg sac attachment, 299 × 396 μm (including conical process) and
TABLE 4.—Diagnostic characters of the species of *Pseudotaeniacanthus*.

<table>
<thead>
<tr>
<th>Species</th>
<th>Rostral area</th>
<th>Terminal segment of MPXDP</th>
<th>Exopod of leg 1</th>
<th>Terminal endopod segment of leg 2</th>
<th>Terminal endopod segment of leg 3</th>
<th>Terminal endopod segment of leg 4</th>
<th>Terminal endopod segment of leg 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>P. congeri</em></td>
<td>rows of hooklets + furca</td>
<td>a setiform claw-like structure</td>
<td>1-0; 1-1; 8</td>
<td>5 elements</td>
<td>5 elements</td>
<td>II, 1, 5</td>
<td>III</td>
</tr>
<tr>
<td><em>P. coniferus</em></td>
<td>rows of hooklets</td>
<td>a process with 2 setae</td>
<td>1-0; 1-1; 8</td>
<td>5 elements</td>
<td>5 elements</td>
<td>II, 1, 4</td>
<td>III</td>
</tr>
<tr>
<td><em>P. maupinensis</em></td>
<td>rows of hooklets + furca</td>
<td>a process with 2 setae</td>
<td>1-0; 1-0; 10</td>
<td>6 elements</td>
<td>5 elements</td>
<td>II, 1, 5</td>
<td>I, l, 1</td>
</tr>
<tr>
<td><em>P. puhi</em></td>
<td>rows of hooks</td>
<td>a process with 2 setae</td>
<td>1-0; 1-0; 10</td>
<td>6 elements</td>
<td>6 elements</td>
<td>II, 1, 5</td>
<td>IV</td>
</tr>
<tr>
<td><em>P. longicauda</em></td>
<td>rows of transverse</td>
<td>a setiform claw-like structure</td>
<td>1-0; 1-1; 6</td>
<td>6 elements</td>
<td>6 elements</td>
<td>II, 1, 5</td>
<td>IV</td>
</tr>
<tr>
<td><em>P. sp. male</em></td>
<td>row of transverse ridges</td>
<td>+ furca</td>
<td>1-0; 1-1; 8</td>
<td>6 elements</td>
<td>5 elements</td>
<td>II, 1, 5</td>
<td>I, 2, 1</td>
</tr>
</tbody>
</table>

299 × 262 μm (excluding process) (l × w). Abdomen 4-segmented; segments from anterior to posterior 396 × 294 μm, 488 × 285 μm, 391 × 230 μm, and 649 × 175 μm (l × w); anal segment (Figure 141b) unornamented. Caudal ramus (Figure 141b), 310 × 64 μm (l × w), bearing 6 naked setae.

Rostral area (Figure 141e) with sclerotized bars bearing hooklets. First antenna (Figure 141f,g) 7-segmented; armature formula: 5 + conical process, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 142a) 4-segmented; first and second segments each with distal seta; second segment bearing 2 pectinate processes (1 tipped with a seta, other with hyaline knob) and 1 stout spine; terminal segment with 4 spines and 3 setae.

Labrum with unornamented, rounded posterior margin. Mandible (Figure 142b) with 2 terminal blades, each spinulated along 1 margin; no accessory seta present. Paragnath (Figure 142c) a spinulated lobe. First maxilla (Figure 142c) bearing 2 large bristled setae and 4 smaller naked setae. Labial area (Figure 142c) with spinules. Second maxilla (Figure 142d) 2-segmented; first segment moderately robust and unarmed; second segment tipped with 4 naked setae. Maxilliped (Figure 142e) apparently 3-segmented (basal segment fused to ventral surface of body), basal seta present; corpus with 2 smaller naked setae; third segment not distinctly separated from corpus, non-prehensile, and bearing 2 naked setae.

Legs 1–4 (Figures 142f, 143a–e) biramous. Spinal and setal formula as follows:

- **P. coniferus:**
  - coxa 0-1 basis 1-1 (setule) exopod 1-0; 1-1; 8
  - endopod 0-1; 0-1; 5
  - exopod 1-0; 1-1; 11, 1, 5
  - endopod 0-1; 0-2; 1, 4
- **P. puhi:**
  - coxa 0-1 basis 1-0 exopod 1-0; 1-1; 11, 1, 5
  - endopod 0-1; 0-2; 1, 1, 2
- **P. longicauda:**
  - coxa 0-1 basis 1-0 exopod 1-0; 1-1; 11, 1, 4
  - endopod 0-1; 0-1; 11, 1, 5 (or 3 int.)

Interpodal plate of leg 1 (Figure 142f) broad, bearing membranous flange on posterior margin. Coxae, bases, and outer margins of segments of exopods and endopods of legs 2–4 with rows of conspicuous spinules; spinules on coxae and bases noticeably larger than those on rami. Leg 5 (Figure 143f) with 2 segments; first segment armed with 1 naked seta; second segment, 145 × 174 μm (l × w), bearing 4 setae (3 setae slightly sclerotized at bases); innermost seta with row of spinules at origin. Leg 6 (Figure 141b) represented by 3 setae near area of egg sac attachment.

**Male:** Body as in Figure 144a. Total length 2.21 mm and greatest width 0.49 mm based on 1 specimen. Cephalothorax 400 × 460 μm (l × w), comprising about 20% of total length. Genital complex (Figure 144b) 207 × 235 μm (l × w). Abdomen 4-segmented; segments from anterior to posterior, 207 × 193 μm, 221 × 170 μm, 170 × 147 μm, and 290 × 115 μm (l × w). Caudal ramus similar to that of female except measuring 177 × 46 μm (l × w).

First maxilla (Figure 144c) with 6 setae. Maxilliped (Figure 144d,e) presumably 4-segmented; first segment without distal seta (maybe broken off on specimen examined); corpus robust with 2 naked inner setae and a large denticulated digitiform protrusion; third segment small and unarmed; terminal segment a claw (Figure 144e) bearing 2 setae and 1 row of several small teeth.

Leg 5 (Figure 144f) with 2 segments; first segment with 1 naked dorsomedial seta; second segment, 51 × 38 μm (l × w), bearing 3 slightly sclerotized setae (2 bristled, 1 naked) and 1 naked seta; innermost seta with row of spinules at base. Leg 6 (Figure 144b) represented by 1 naked seta on posteroventral flap of genital complex.

**ETYMOLOGY.—**The specific name *coniferus*, Latin for conifer, alludes to the presence of conical processes near the area of egg sac attachment on the genital segment and on the first segment of the first antenna.

**REMARKS.—**The body of *Pseudotaeniacanthus coniferus* is conspicuously more slender than in other species of the genus. The female of this species is at least twice as long (mean total length = 3.63 mm) as compared to other species of this genus (mean total length ranging from 1.15 to 1.58 mm). This species can also be easily distinguished from its congeners by the presence of three unique morphologic
FIGURE 141.—*Pseudotaeniacanthus coniferus*, new species, female: A, dorsal; B, genital area, ventral; C, egg sac attachment area, dorsal; D, anal segment and caudal rami, ventral; E, rostral area, ventral; F, first antenna, ventral; G, first antenna, proximal three segments, ventral.
FIGURE 142.—Pseudotaeniocanthus coniferus, new species, female: A, second antenna, medial; B, mandible, anteromedial; C, first maxilla, paragnaths and labial area, ventral; D, second maxilla, dorsomedial; E, maxilliped, ventral; F, leg 1 and interpodal plate, ventral. (P = paragnath.)
FIGURE 143.—*Pseudotaeniacanthus coniferus*, new species, female: A, leg 1 exopod, ventral; B, leg 1 endopod, ventral; C, leg 2 and interpodal plate, ventral; D, leg 3 endopod, ventral; E, leg 4 and interpodal plate, ventral; F, leg 5, ventral.
FIGURE 144.—*Pseudotaeniacanthus coniferus*, new species, male: A, dorsal; B, genital area, ventral; C, first maxilla, anteromedial; D, maxilliped, anteromedial; E, maxilliped claw, posteromedial; F, leg 5, ventral.
characters: (1) conical process on the genital segment, (2) conical process on the first segment of the first antenna, and (3) an armature formula of 11, 1, 4 on the terminal exopod segment of leg 4.

**Pseudotaeniacanthus longicauda** Pillai and Hameed, 1974


**DESCRIPTION.**—Female and Male: See Pillai and Hameed (1974).

**REMARKS.**—*Pseudotaeniacanthus longicauda* was described by Pillai and Hameed (1974) from the body surface of *Pisodonophis cancridorus* (Richardson) from Trivandrum, India.

This species appears to be closely related to *Pseudotaeniacanthus* sp. described by Lewis (1968) (see Pillai and Hameed, 1974). The rostral area of these two species bears rows of transverse ridges (adhesion pads) and a pair of furca-like processes on the Y-shaped sclerotized structure. In addition, they are the only two species of *Pseudotaeniacanthus* that have four elements on the terminal endopod segment of leg 4. However, they can be distinguished from each other by the armature of the terminal endopod segment of leg 3 (six elements in *P. longicauda* and five elements on *P. sp.*) and by the armature of the terminal endopod segment of leg 4 (4 spines in *P. longicauda*, and two spines and two setae in *P. sp.*) (see Table 4).

**Pseudotaeniacanthus longicauda** can be distinguished from its congeners by the presence of only six setae on the terminal exopod segment of leg 1 (Table 4).

**Pseudotaeniacanthus muraenesocis** Devi and Shyamasundari, 1980

*Pseudotaeniacanthus muraenesocis* Devi and Shyamasundari, 1980:201.

**DESCRIPTION.**—Female and Male: See Devi and Shyamasundari (1980).

**REMARKS.**—*Pseudotaeniacanthus muraenesocis* was described by Devi and Shyamasundari (1980) from the gills of *Muranaesos talabonoides* (Bleeker) collected off the Waltair coast, India.

This species can be distinguished from its congeners by the presence of only three elements ("a small spine, a pectinate spine, and a stout spine . . .") on the terminal endopod segment of leg 3 (Table 4) (Devi and Shyamasundari, 1980).

**Pseudotaeniacanthus puhi** Lewis, 1967


**DESCRIPTION.**—Female and Male: See Lewis (1967).

**REMARKS.**—Lewis (1967) described *Pseudotaeniacanthus puhi* from the gill cavity of a "Brown Moray" and "Green Moray" kept in the Honolulu Aquarium, Hawaii.

The most distinctive morphologic features of this species are the armature of the terminal endopod segment of leg 4 (1, 1, 1) (Table 4) and the general habitus (second, third, and fourth pedigerous segments almost equal in width to cephalothorax).

One adult female paratype (USNM 112865) was examined by us. We conclude that Lewis (1967) misinterpreted the maxilliped as the second maxilla in the female. The true second maxilla is a very small 2-segmented appendage similar in structure to those found in other species of *Pseudotaeniacanthus*.

**Scoleicara Ho, 1969**


Rostral area conical, carrying 3 spiniform processes on ventral surface. First antenna 6-segmented with third and fourth segments fused. Second antenna 3-segmented with third and fourth segments almost completely fused. Postantennal process present. Labrum present. Mandible with 2 subequal blades; accessory process present. Maxilliped 2-segmented; terminal segment bearing 1 process and 2 spines. Maxilliped non-prehensile.

Legs 1–4 biramous. Leg 1 with 2-segmented rami. Legs 2–4 with 3-segmented rami. Leg 4 with terminal endopod segment with 3 elements. Leg 5 2-segmented; second segment with 4 elements. Leg 6 represented by 3 setae in area of egg sac attachment.

**Male:** Unknown.

**TYPE-SPECIES.**—*Scoleicara humesi* Ho, 1969.

**REMARKS.**—This monotypic genus was established by Ho (1969), with *Scoleicara humesi* as its type-species, and was collected from the gill filaments of *Porichthys porosissimus* (Cuvier and Valenciennes) off Carabelle, Florida.

*Scoleicara* can be distinguished from all other taeniacanthid genera by (1) the unique habitus of its type-species (subspherical cephalothorax, elongate neck, pear-shaped trunk, and cylindrical urosome), (2) the unique rostral area, and (3) the unique morphology of the non-prehensile maxilliped. For a detailed description of *S. humesi*, see Ho (1969).
Taeniacanthodes Wilson, 1935


**Diagnosis.**—**Female:** Cephalothorax suboval with first pedigerous segment fused to cephalosome, and possessing pair of lateral processes on posteroventral surface. Genital segment broadest at midregion. Abdomen 3-segmented. Pair of lateral processes on posteroventral surface. Genital pedigerous segment fused to cephalosome, and possessing tinctly 5-segmented. Second antenna indistinctly 4-segmented; third and fourth segments partially fused; fourth segment with 4 curved spines. Postantennal process absent. Labrum with rounded posterior margin. Mandible with 2 unequal spinulated blades. First maxilla and paragnath present. Second maxilla 2-segmented and tipped with 2 spinulated spines and 1 spinulated process. Maxilliped with robust curved claw.

**Male:** Genital segment subquadrangular. Rostral area with anteriorly directed ventromedian spiniform process. Base of first antenna bearing curved spiniform process adjacent to proximal seta. Maxilliped subchelate with denticated curved claw. Spine of first segment of exopod of leg 3 large and curved. Leg 6 represented by spine on posteroventral flap of genital segment.

**Type-Species.**—**Taeniacanthodes gracilis** Wilson, 1935.

**Remarks.**—**Taeniacanthodes** was established by Wilson (1935). The type-species *T. gracilis* was collected at Dry Tortugas, Florida. *Taeniacanthodes gunteri* Causey, 1953, is synonymous with the type-species as suspected by Ho (1969) for discussion on synonymization see “Remarks” section for *T. gracilis* in this paper.

Although Kabata (1979) expressed doubts as to the placement of *Taeniacanthodes haakeri* Ho, 1972, within this genus, the redescription of *T. gracilis* reveals that this species is closely related to *T. haakeri* and should be placed within the same genus.

The two known valid species of *Taeniacanthodes* are parasitic on species of flatfishes belonging to the families Bothidae and Pleuronectidae. Although Dojiri (1977) reported the California tonguefish *Symphurus atricauda* (Jordan and Gilbert), the white croaker *Genyonemus lineatus* (Ayers), and the northern anchovy *Engraulis mordax* Girard as hosts of *Taeniacanthodes* species, the records are considered to represent accidental infestations.

The species of *Taeniacanthodes* exhibit a predilection for the membranes between the fin rays. *Taeniacanthodes gracilis* has been found in the Gulf of Mexico and *T. haakeri* off the coast of southern California.

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**Key to Species of Taeniacanthodes Females**

Terminal endopod segments of legs 3 and 4 each with 2 elements (setae and/or spines [Figure 147D,E]) ............................................................... *T. gracilis*

Terminal endopod segments of legs 3 and 4 each with 3 elements [Figure 151C,D] .............................................................................. *T. haakeri*

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**Taeniacanthodes gracilis** Wilson, 1935

*Figures* 145–148, 164a–f, 165a, 166


**Material Examined.**—1 female holotype (USNM 64034) “washed from coelom of *Paralichthys* sp.”, another label in museum jar reads “*Paralichthys denitatus*” from Dry Tortugas, Florida (Wilson listed “*Paralichthys squamilentus*” as the host for this species in his original account of *T. gracilis*); 2 females from base of fin rays of *Paralichthys squamilentus* Jordan and Gilbert collected by W.H. Longley south of Tortugas, Florida, 26 June 1932; 170 females, 15 males, 3 couples in copula, and 3 copepodids from fins of *Paralichthys squamilentus* (host identified by M. Lester) caught off east Florida (27°12’N, 80°00’W), 6 March 1964; 1 female holotype of *Taeniacanthodes gunteri* (USNM 94094) from surface of *Citharichthys spiloterus* Günther collected at Port Aransas, Texas.

**Description.**—**Female:** Body form as in Figure 145A–C. Total length 2.50 mm (2.38–2.63 mm) and greatest width 0.49 mm (0.45–0.55 mm) based on 10 specimens. Cephalothorax (Figure 164b) longer than wide, 564 × 479 μm (excluding lateral processes), suboval, with pair of lateral processes on posteroventral surface (Figure 145d), and comprising approximately 20% of total body length. Thoracic segment bearing leg 2 relatively small; segments bearing legs 3 and 4 exhibiting various degrees of fusion (compare
FIGURE 145.—*Taeniacthoetes gracilis* Wilson, female: A, dorsal; B, dorsal; C, dorsal; D, cephalothorax, posterolateral corner, ventral; E, leg 5 and genital area, ventral; F, anal segment and caudal ramus, ventral; G, rostral area, ventral.
FIGURE 146.—*Taeniacthanthodes gracilis* Wilson, female: A, first antenna, ventral; B, second antenna, medial; c, labrum, ventral; d, mandible, anteromedial; e, paragnath and labial area, ventral; f, first maxilla, anterior; g, second maxilla, posteroventral; h, maxilliped, anterior; i, maxilliped claw, anterior.
FIGURE 147.—Taeniacthodes gracilis Wilson. Female: A, leg 1 and interpodal plate, ventral; B, leg 2 and interpodal plate, ventral; C, leg 2 endopod and interpodal plate, ventral; D, leg 3 and interpodal plate, ventral; E, leg 4 and interpodal plate, ventral. Male: F, dorsal.
Figure 148.—*Taeniacanthodes gracilis* Wilson, male: A, legs 5 and 6, ventral; B, anal segment and caudal ramus, ventral; C, rostral area, ventral; D, maxilliped, posterior; E, maxilliped claw, anterior; F, leg 3 exopod, ventral; G, leg 3, first and second exopod segments, dorsal.
Figure 145A,B, and C), differences presumably due to differences in state of maturity of specimens. Genital complex (Figure 145E) much wider than longer, 179 × 281 μm, and widest at midlength. Abdomen 3-segmented; segments from anterior to posterior 184 × 156 μm, 147 × 156 μm and 524 × 166 μm (l × w); anal segment (Figure 145F) without spinules, but with several setules near lateral and posterior margins. Caudal ramus (Figure 145G) longer than wide, 179 × 53 μm, and bearing usual 6 setae (2 median terminal and 1 inner terminal setae pinnate).

Rostral area (Figures 145G, 164C) distinct, bearing large, ventromedian spiniform process and 2 circular sclerotized parts. First antenna (Figure 146A) indistinctly 5-segmented; armature formula: 20, 8, 5, 2 + 1 aesthetes, and 7 + 1 aesthetes. Second antenna (Figure 146B) 4-segmented with third and fourth segments partially fused; first segment tipped with long naked seta; second segment bearing relatively long seta; third segment with 1 slender curved spine and 2 pectinate processes (third process absent). Maxilliped (Figure 148D,E) represented by bristled spine on posterior edge; basis of leg 1 carrying small naked seta at base. Leg 1 with interpodal plate (Figure 147A) bearing minute spinules along posterior edge; basis of leg 1 carrying small naked inner seta; exopod of leg 1 with short row of spinules at base of first 3 outer setae of terminal segment. Leg 2 (Figure 147B,C) with unornamented interpodal plate; coxa with long setules on outer distolateral and inner seta sclerotized and stout; basis carrying numerous long setules and outer row of small spinules. Distolateral corners of coxae of legs 3 and 4 (Figure 147D,E) each bearing row of spinules. First segments of exopods of legs 2–4 each with 2 rows of spinules; outer row with rounded spinules; posterolateral row with smaller, sharper spinules. Exopod spines of legs 2–4 spinulated and each tipped with flagellum (see Figure 164D,E). Outer margins of exopods and endopods of legs 2–4 with rows of spinules (see Figures 164F, 165A). Endopod spines of legs 3 and 4 also spinulated and each tipped with flagellum. Leg 5 (Figure 145E) 2-segmented; first segment fringed with rounded scales and carrying 1 naked dorsolateral seta; second segment much longer than wide, 136 × 41 μm, and with 2 spinulated spines each tipped with flagellum, and 1 slender naked seta; each spine with row of sharp spinules at base. Leg 6 (Figure 145E) represented by 3 setae in area of egg sac attachment.

Male: Body as in Figure 147F. Total length 1.09 mm (0.98–1.25 mm) and greatest width 0.52 mm (0.29–0.39 mm) based on 10 specimens. Cephalothorax longer than wide, 368 × 317 μm (excluding lateral processes), and comprising about 33% of total length. Thoracic segments bearing legs 2, 3, and 4 decreasing in width posteriorly. Genital complex longer than wide, 175 × 133 μm, and with 1 row of spinules along posterolateral flap near leg 6 (Figure 148A). Abdomen 3-segmented; segments from anterior to posterior, 97 × 69 μm, 78 × 69 μm, and 97 × 62 μm (l × w); anal segment (Figure 148B) bearing 1 row of spinules on each side of posterolateral margin near insertion of caudal ramus. Caudal ramus (Figure 148B) longer than wide, 76 × 27 μm, with usual 6 setae; 2 rows of spinules at bases of setae (1 located at base of outer terminal seta; other curved and situated between bases of 2 median terminal setae).

Rostral area (Figure 148C) with small, hyaline (not sclerotized) anteriorly directed process on ventromedian surface. First antenna (Figure 148C) similar to that in female except with small curved spiniform process on basal region. Pair of small, oval, sclerotized areas posterior to bases of first antenna where spiniform processes occur in male of T. haakeri. Maxilliped (Figure 148D,E) 4-segmented; first segment bearing 1 naked seta; second segment (corpus) bearing irregularly shaped protuberance proximally and 1 large rounded flap at midlength; terminal segment a stout claw (Figure 146I) carrying 1 small naked seta at base. Legs 1–4 (Figure 147A–E) biramous. Spinal and setal armature formula as follows:

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<tr>
<td>P1</td>
<td>coxa 0-1</td>
<td>basis 1-1</td>
<td>exopod 1-0; 1-1; 8</td>
<td>endopod 0-1; 0-1; 5</td>
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<tr>
<td>P2</td>
<td>coxa 0-1</td>
<td>basis 1-0</td>
<td>exopod 1-0; 1-1; III, l, 5</td>
<td>endopod 0-1; 0-2; II, 4</td>
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<td>P3</td>
<td>coxa 0-0</td>
<td>basis 1-0</td>
<td>exopod 1-0; 1-1, II, I, 5</td>
<td>endopod 0-0; I, l</td>
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<tr>
<td>P4</td>
<td>coxa 0-0</td>
<td>basis 1-0</td>
<td>exopod 1-0; 1-1; II, I, 2</td>
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Leg 1 with interpodal plate (Figure 147A) bearing minute spinules along posterior edge; basis of leg 1 carrying small naked inner seta; exopod of leg 1 with short row of spinules at base of first 3 outer setae of terminal segment. Leg 2 (Figure 147B,C) with unornamented interpodal plate; coxa...
ENGLISH SOLE—Paralichthys californicus

Taeniocanthodes haakeri, new species, from 33°37.0'N, 117°59.3'W, 7 April 1976; 1 female, 1 immature female, 26 copepodids at 33°37.0'N, 117°59.3'W, 8 October 1975; 2 females at 33°36.0'N, 117°59.8'W, 7 April 1976; 1 female, 1 copepodid at 33°35.7'N, 117°59.8'W, 18 August 1976; 29 females, 1 copepodid at 33°34.5'N, 117°57.6'W, 7 April 1976; 23 females, 1 immature female, 26 copepodids at 33°34.5'N, 117°57.6'W, 18 August 1976; 5 females, 1 copepodid at 33°35.8'N, 118°03.8'W, 7 April 1976; 11 females at 33°34.6'N, 118°00.5'W, 18 August 1976; 10 females, 2 copepodids at 33°36.3'N, 118°03.5'W, 18 August 1976.

From English sole Parophrys vetulus Girard: 1 female at 33°34.5'N, 117°57.6'W, 14 January 1976; 2 females at 33°34.5'N, 117°57.6'W, 7 April 1976; 1 female at 33°36.0'N, 117°57.8'W, 7 April 1976; 1 immature female, 1 copepodid at 33°35.7'N, 117°59.8'W, 18 August 1976. From bigmouth sole Hippoglossina stomata Eigenmann and Eigenmann: 1 female at 33°34.6'N, 118°00.5'W, 18 August 1976; 1 female at 33°36.3'N, 118°03.5'W, 18 August 1976. From California halibut Paralichthys californicus (Ayres): 3 females at 33°37.0'N, 117°59.3'W, 7 April 1976. From longfin sanddab Citharichthys xanthistigma Gilbert: 1 female at 33°35.7'N, 117°59.8'W, 7 April 1976. From speckled sanddab Citharichthys stigmaeus Jordan and Gilbert: 1 female, 2 copepodids at 33°37.0'N, 117°59.3'W, 7 April 1976; 1 female at 33°37.0'N, 117°59.3'W, 18 August 1976; 1 female at 33°35.7'N, 117°59.8'W, 7 April 1976. From white croaker Genyonemus lineatus (Ayres): 1 female at 33°37.0'N, 117°59.3'W, 7 April 1976; 1 female, 1 immature female at 33°34.5'N, 117°57.6'W, 7 April 1976. From northern anchovy Engraulis mordax Girard: 1 female at 33°37.0'N, 117°59.3'W, 8 October 1975.

DESCRIPTION.—Female: Body as in Figure 149A. Total length 1.51 mm (1.37-1.63 mm) and greatest width 0.48 mm (0.45-0.51 mm) based on 10 specimens. Cephalothorax wider than long, 470 X 517 µm, somewhat triangular, and bearing pair of lateral processes on posteroventral surface (Figure 149B). Thoracic segments carrying legs 2 and 3 of about equal width, but segment with leg 4 much narrower. Genital complex (Figure 149c) wider than long, 147 X 244 µm. Abdomen 3-segmented; segments from anterior to posterior 92 X 120 µm, 97 X 115 µm, and 239 X 110 µm (l X w); anal segment (Figure 149d) longer than preceding 2 segments combined, and bearing 1 row of spines on each side of posteroventral margin near insertion of caudal ramus. Caudal ramus (Figure 149d) more than 2 times longer than wide, 96 X 35 µm, and bearing 6 setae and several spines on posterior margin.

Rostral area (Figure 149e) distinct, bearing median, posteriorly directed ventral spiniform process. First antenna (Figure 149f) 5-segmented; armature formula: 20, 8, 5, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 149g) similar to that in T. gracilis except spines on longer pectinate process larger and curved spines on terminal...
Figure 149. *Taeniacanthodes haakeri* Ho, female: A, dorsal; B, cephalothorax, posterolateral corner, ventral; C, genital area, ventral; D, anal segment and caudal ramus, ventral; E, rostral area, ventral; F, first antenna, ventral; G, second antenna, medial. (Mxp d = maxilliped, P1 = leg 1.)
FIGURE 150.—*Taeniactholes haakeri* Ho, female: A, labrum, ventral; B, mandible, anteromedial; C, paragnath and labial area, ventral; D, first maxilla, anteromedial; E, same, anterior; F, same, posterior; G, second maxilla, posteroventral; H, maxilliped, anterior; I, same, posterior; J, maxilliped claw, anterior; K, leg 1, interpodal plate, ventral; L, leg 1, ventral.
Figure 151.—*Taeniacthodes haakeri* Ho. Female: A, leg 2 and interpodal plate, ventral; B, leg 2 endopod, ventral; C, leg 3 and interpodal plate, ventral; D, leg 4 and interpodal plate, ventral; E, leg 5, ventral. Male: F, dorsal.
FIGURE 152.—Taeniacthodes haakeri Ho, male: A, legs 5 and 6, ventral; B, anal segment and caudal ramus, ventral; C, rostral area and basal portions of first antenna, ventral; D, maxilliped, posterior; E, maxilliped claw, basal portion, posterior; F, leg 3 exopod, ventral; G, spermatophore, ventral.
segment relatively longer. Postanential process absent.

Labrum (Figure 150A) similar to that in *T. gracilis*. Mandible (Figure 150B) similar to that in *T. gracilis*. Paragnath (Figure 150C) a lobe with row of spinules along inner margin, and terminating as a pointed process. Labial area (Figure 150C) with numerous rows of spinules. First maxilla (Figure 150D–F) carrying 1 large, bristled seta, 2 naked setae, 2 small naked setae, and 1 anterior knob. Second maxilla (Figure 150G) as in *T. gracilis*. Maxilliped (Figure 150H–J) 3-segmented; first segment relatively small and irregular in shape; second segment (corpus) bearing 2 small setae and transparent flap on inner surface; terminal segment similar to that in *T. gracilis*.

Legs 1–4 (Figures 150K–L, 151A–D) biramous. Spinal and setal formula as follows:

- **P<sub>1</sub>**
  - coxa 0-1
  - basis 1-1
  - exopod 1-0; 1-1; 8
  - endopod 0-1; 0-1; 5

- **P<sub>2</sub>**
  - coxa 0-1
  - basis 1-0
  - exopod 1-0; 1-1, II, 1, 5
  - endopod 0-1; 0-2; II, 1, 1, 2

- **P<sub>3</sub>**
  - coxa 0-0
  - basis 1-0
  - exopod 1-0; 1-1, II, 1, 4
  - endopod 0-0; 1, 1, 1

- **P<sub>4</sub>**
  - coxa 0-0
  - basis 1-0
  - exopod 1-0; 1-1, II, 1, 3
  - endopod 0-0; III (or I, 2 int.)

Leg 1 (Figure 150K,1) similar to that of *T. gracilis* except setae slightly stouter. Leg 2 (Figure 151A,B) with interpretoral plate, coxa, and basis similar to *T. gracilis*. Distolateral corners of coxae of legs 3 and 4 (Figure 151C,D) each bearing row of long spinules. First segments of exopods of legs 2–4 each bearing 2 rows of spinules (best seen in Figure 151A); outer row consisting of longer, blunter spinules; posterolateral row consisting of much shorter, sharper spinules. Endopods of legs 2–4 (Figure 151B,D) with rows of short, sharp spinules. Outer spines of exopods of legs 2–4 spinulated and each tipped with flagellum. Leg 5 (Figure 151E) 2-segmented; first segment as in *T. gracilis*; second segment much longer than wide 133 × 37 μm and bearing 1 naked spine, 1 slender naked seta, and 1 spinulated spine; each spine with row of rounded scales at base and flagellum at tip. Leg 6 represented by 3 setae in area of egg sac attachment (observable in ventral view, see Figure 149c).

**Male:** Body as in Figure 151F. Total length 0.68 mm and greatest width 0.25 mm based on 2 specimens. Cephalothorax longer than wide, 304 × 253 μm (excluding posterolateral processes), and comprising approximately 45% of total body length. Genital complex (Figure 152A) wider than long, 90 × 97 μm and bearing row of spinules near leg 6. Abdomen 3-segmented; segments from anterior to posterior 35 × 60 μm, 32 × 55 μm, and 69 × 55 μm (l × w); anal segment (Figure 152B) with 1 curved row of spinules on each side of antroversal surface and 1 row on posteroverental margin near insertion of caudal ramus. Caudal ramus (Figure 152B) longer than wide, 39 × 21 μm, bearing 6 setae and 1 subterminal row of spinules.

Rostral area (Figure 152C) with small, anteriorly directed spiniform process on ventromedian surface. First antenna (Figure 152C) similar to that in female except carrying large curved claw-like process on basal region. Pair of short, conical, spiniform processes posterior to bases of first antenna. Maxilliped (Figure 152D,E) 4-segmented; first segment carrying 1 naked seta; second segment (corpus) possessing 2 naked setae and single curved row of sharp spinules; third segment small and unornamented; terminal segment a curved claw (Figure 152E) bearing 1 naked posterior seta, 1 minute rounded process on posterior surface near seta, 2 small anterior setae, and teeth along concave margin (2 rows of teeth at distal end). Exopod spines of leg 3 (Figure 152F) relatively longer than those in female. Leg 5 (Figure 152A) 26 × 9 μm (l × w). Leg 6 (Figure 152A) represented by bristled spine on posteroverentral flap of genital opening. All other appendages as in female.

Spermatophore (Figure 152G) 83 × 33 μm (l × w) (excluding neck).

**Remarks.**—Ho (1972) first described the female of *Taeniacanthodes haakeri* from the California halibut *Paralichthys californicus* from Anaheim Bay, California. The present description is the first published account of the male of *T. haakeri*.

This species can readily be distinguished from the type-species *T. gracilis* Wilson by the conspicuous difference in general habitus (compare Figures 149A and 145A–C).

*Taeniastrotos Cressey, 1969*


**Diagnosis.**—**Female:** First pedigerous segment fused with cephalosome to form cephalothorax. Abdomen 4-segmented. Caudal ramus with usual 6 setae.

Rostral area protuberant with corrugated shield-like structure on ventral surface. First antenna 7-segmented. Second antenna with third and fourth segments almost completely fused, thus appearing 3-segmented. Postanential process present. Labrum with rounded posterior margin. Mandible with 2 unequal spinulated blades. Paragnath and first maxilla present. Second maxilla bearing 1 terminal process and 2 setae (or spines). Maxilliped with relatively small corpus and a sigmoid claw. Legs 1–4 biramous. Leg 1 with 2- or 3-segmented rami; endopod of leg 1 with terminal segment carrying 5 or 6 setae. Legs 2–4 with 3-segmented rami. Leg 5 bearing 4 setae (or spines) on second segment. Leg 6 represented by 3 setae in area of egg sac attachment.

**Male:** Body similar to that in female except abdomen 3-segmented. Genital segment with posteroverental flap. Except for maxilliped, appendages similar to those in female. Maxilliped subchelate with denticulated curved claw.

**Type-Species.**—*Taeniastrotos californiensis* Cressey, 1969.
Yamaguti, 1939, from the body surface A. pleuronichthydis alabrax nebulifer (Girard) at La Jolla, California. A new corrugated shield-like structure on the ventral surface of Nemipterus mulloides chinocephalus myops species of collected from the lizardfish Tra-

Taeniastrotos commodate collected from Taeniastrotos californiensis Par-

(REMARKS.—Cressey (1969) established this genus to accommodate Taeniastrotos californiensis collected from Paralabrax nebulifer (Girard) at La Jolla, California. A new species of Taeniastrotos collected from the lizardfish Trachinoecephalus myops and Nemipterus mulloides is described below.

The most distinguishing feature of this genus is the corrugated shield-like structure on the ventral surface of the rostral area. In addition, the sigmoid claw of the maxilliped of the female is unusual within the Taeniacanthidae.

Two species formerly included in the genus Anchistrotos, A. pleuronichthydis Yamaguti, 1939, from the body surface of Pleuronichthys cornutus (Temminck and Schlegel) and Verasper variegatus (Temminck and Schlegel) and A. trachuri Avdeev, 1977, from Trachurus trachurus (Linnaeus), share a number of significant morphologic features with Taeniastro-

Key to Species of Taeniastrotos Females

1. Four elements (setae and/or spines) on terminal endopod segment of leg 4 ⋯ 2
2. Terminal endopod segment of leg 4 with either 2 or 3 elements [Figures 156D, 160E] .............................................................. 3
3. First maxilla with 1 broad seta and usual setae ⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯⋯ T. pleuronichthydis
4. First maxilla with slender setae ..................................... T. trachuri
5. Terminal endopod segment of leg 4 with 2 elements [Figure 156D] .............................................................. T. californiensis
6. Terminal endopod segment of leg 4 with 3 elements [Figure 160E] .............................................................. T. tragus, new species

Taeniastrotos californiensis Cressey, 1969

FIGURES 153–157, 165B–F

Material Examined.—From body surface of Paralabrax nebulifer (Girard); 1 holotype female (USNM 126240) and 7 female paratypes (USNM 126241) at La Jolla, California, 2 October 1968; 32 females (USNM 172170) and 2 couples in copula (USNM 172169) collected at Huntington Beach, California, 22 August 1972 by D.L. Schultz; 3 couples in copula and 1 free male (USNM 172171) collected at Long Beach, California, 5 May 1978 by D.L. Schultz.

Description.—Female: Body form as in Figure 153A. Total length 1.27 mm (1.21–1.30 mm) and greatest width 0.52 mm (0.50–0.54 mm) based on 7 specimens. Cephalo-
thorax 498 X 508 μm (l X w), comprising more than 30% of total length. Thoracic segments bearing legs 2, 3, and 4 decreasing in width posteriorly. Genital complex (Figure 153B) wider than long, 69 X 161 μm. Abdomen 4-segmented; segments from anterior to posterior 58 X 81 μm, 58 X 69 μm, 51 X 62 μm, and 67 X 62 μm (l X w); anal segment (Figure 153C) with a row of spinules along poster-

Rostral area (Figures 153D, 165B,C) with a somewhat triangular pad-like process bearing transparent corrugated membrane on ventral surface. First antenna (Figure 153E,F) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figures 153G, 154A) 3-segmented; last segment with 3 articulated spines, 4 setae (largest seta semiappendante), and 2 pectinate processes; each pectinate process with 1 small seta. Postantennal process (Figure 154B) stout and curved.

Labrum (Figure 154C) with slight depression (pit) on each posterolateral corner, but without spinules. Labium possibly represented by 2 pairs of rounded processes posterior to labrum. Mandible (Figure 154B) with 2 terminal blades; shorter blade spinulately along 1 margin; longer blade apparently naked. Paragnath (Figure 154C) a rounded, unornamented lobe. First maxilla (Figure 154E,F) a lobe bearing 3 small naked setae, a long plumose seta, a broad seta with 1 row of spinules, and a rounded knob. Second maxilla (Figure 154G) 2-segmented; terminal segment with 2 naked
FIGURE 153.—Taeniastrotos californiensis Cressey, female: A, dorsal; B, genital area, dorsal; C, caudal ramus, ventral; D, cephalothorax, anterior portion, ventral; E, first antenna, anteroventral; F, first antenna, distal two segments, anterodorsal; G, second antenna, medial. (R = rostral area, A1 = first antenna, A2 = second antenna, pap = postantennal process, L = labrum.)
Figure 154.—*Taeniastrolus californiensis* Cressey, female: A, second antenna, distal portion, medial; B, postantennal process, ventral; C, labrum, paragnaths, and labium, ventral; D, mandible, anteromedial; E, first maxilla, anterior; F, same, posterior; G, second maxilla, posterolateral; H, maxilliped, medial; I, same, dorsal. (d = depression (pit), Li = labium, P = paragnath.)
Figure 155. *Taeniastrotos californiensis* Cressey, female: A, maxillipeds and sternal area, ventral; B, leg 1 and interpodal plate, ventral; C, leg 2 and interpodal plate, ventral; D, leg 2 exopod, ventral; E, leg 2 endopod, ventral. (Mxp = maxilliped, IPP of P1 = interpodal plate of leg 1.)
Figure 156.—*Taeniastrotos californiensis* Cressey, female: A, leg 3, interpodal plate and proximal portion of basipod, ventral; B, leg 3, ventral; C, leg 3, terminal endopod segment, ventral; D, leg 4 endopod, ventral; E, leg 5, dorsal; F, same, posterodorsal.
FIGURE 157.—*Tarniastrotus californiensis* Cressey, male: A, dorsal; B, genital area, ventral; C, anal segment and caudal ramus, ventral; D, maxilliped, anteromedial; E, leg 5, posterodorsal.
unequal setae and 1 spinulated seta. Maxilliped (Figures 154D,E, F165D) presumably 2-segmented; corpus with distinct ridge and 3 naked setae; terminal segment a curved claw carrying 1 short and 1 long naked seta. Area between unequal setae and 1 spinulated seta. Maxilliped (Figures 155B–E, F156A–D) biramous. Spinal and setal formula as follows:

- **P1**: coxa 0-1 basis 1-1
  - exopod 1-0; 1-1; 7
  - endopod 0-1; 0-1; 5
- **P2**: coxa 0-1 basis 1-0
  - exopod 1-0; 1-1; 1-1; 5
  - endopod 0-1; 0-1; 2; 0-1; 3
- **P3**: coxa 0-1 basis 1-0
  - exopod 1-0; 1-1; 1-1; 5
  - endopod 0-1; 0-2; 0-2; 0-1; 5
- **P4**: coxa 0-1 basis 1-0
  - exopod 1-0; 1-1; 1-1; 5
  - endopod 0-1; 0-1; 0-1; 1 (or 1, int.)

Interpodal plate of leg 1 (Figure 155B) broad, somewhat triangular with spinules on posterior border. Interpodal plates of legs 2–4 (see Figures 155c, 156a) with striated membrane on posterior border. Coxa and basis of leg 2 with rows of stout spinules. Leg 2 exopod with first 3 spines serrate, second spine of terminal segment spinulated, and third spine of terminal segment slightly setiform and semipinnate (Figure 155D); endopod with spiniform process on postero-lateral margin of second segment and outer 2 spines of terminal segment (Figure 155E) spinulated and each with terminal flagellum. Bases of legs 3 (Figure 156a) and 4 (Figure 165f.e) each with semicircular row of spatulate spines. Leg 3 rami (Figure 156b) similar to leg 2, but terminal segment of endopod (Figure 156c) with only 1 small flagellated spine, 1 long spinulated spine, and 2 setae. Leg 4 as in leg 3 except for endopod as in Figure 156d. Leg 5 (Figure 156e,f) with 2 segments; first segment small and armed with a row of spinules and 1 semipinnate seta; second segment, 72 × 38 μm, with an inner row of spinules, inner and outer bristled spines, and 2 terminal pinnate setae. Leg 6 (Figure 153b) represented by 3 setae in area of egg sac attachment.

**Male:** Body form as in Figure 157a. Total length 0.89 mm (0.81–0.95 mm) and greatest width 0.34 mm (0.32–0.36 mm) based on 4 specimens. Cephalothorax 368 × 345 μm, approximately 25% of total length. Genital complex (Figure 157b) 69 × 87 μm, wider than long. Abdomen 3-segmented; segments from anterior to posterior 58 × 64 μm, 55 × 58 μm, and 58 × 51 μm (l × w); anal segment (Figure 157c) with 1 row of large spines on each side of anteroventral surface and 1 row of small spinules on postero-ventral margin near insertion of each caudal ramus. Caudal ramus (Figure 157c) much longer than wide, 51 × 20 μm, similar to that in female.

First antenna similar to that in female except additional seta on fourth segment (indicated by dot in Figure 153c). Maxilliped (Figure 157b) 4-segmented; first segment with 1 naked seta; second segment robust, with 2 naked setae and rows of small spinules; third segment small and unornamented; terminal segment a curved claw with 4 naked basal setae, a serrate inner margin, and a protrusion on inner margin at about midlength of claw. Leg 5 (Figure 157e) 58 × 20 μm, similar to that in female except 3 spines and 1 seta on second segment.

**Remarks.**—This species was first described by Cressey (1969) from the body surface of the barred sand bass Paralabrax nebulifer (Girard) collected at La Jolla, California, and has not yet been collected outside of southern California.

The presence of only two elements (one spine and one intermediate spine) on the terminal endopod segment of leg 4 is distinctive of Taeniastrotos californiensis. Taeniastrotos trachuri bears two spines and one seta whereas the other two species, T. trachuri and T. pleuronichthydis, carry 4 elements on this segment (Table 5).

**Taeniastrotos pleuronichthydis** (Yamaguti, 1939), new combination


**Description**—Female: See Yamaguti (1939).

**Male:** Unknown.

**Remarks.**—This species was originally described in the genus Anchistrotos by Yamaguti (1939) from the body surfaces of Pleuronichthys cornutus (Temminck and Schlegel) and Verasper variegatus from Japan.

We have transferred this species to Taeniastrotos because it shares several important features with T. californiensis and/or T. tragus, e.g., the general body shape, the sigmoid maxilliped of the female, and broad seta of the first maxilla. Because we could not obtain specimens of T. pleuronichthydis, we could not determine the presence or absence of the ventral shield-like rostral area.

**Taeniastrotos pleuronichthydis** can be distinguished from its congeners by several characteristics (Table 5).

**Taeniastrotos trachuri** (Avdeev, 1977), new combination


**Description**—Female: See Avdeev (1977).

**Male:** Unknown.

**Remarks.**—Avdeev (1977) first described this species

**Table 5.**—Diagnostic characters of the species of Taeniastrotos.

<table>
<thead>
<tr>
<th>Species</th>
<th>Broad seta on first maxilla</th>
<th>Accessory process of MXPD of female</th>
<th>Number of elements on terminal endopod segment of leg 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T. californiensis</strong></td>
<td>present</td>
<td>absent</td>
<td>2</td>
</tr>
<tr>
<td><strong>T. tragus</strong></td>
<td>absent</td>
<td>present</td>
<td>3</td>
</tr>
<tr>
<td><strong>T. pleuronichthydis</strong></td>
<td>present</td>
<td>present</td>
<td>4</td>
</tr>
<tr>
<td><strong>T. tachuri</strong></td>
<td>absent</td>
<td>present</td>
<td>4</td>
</tr>
</tbody>
</table>
under the binomen *Anchistrotos trachurus* from the gills of *Trachurus trachurus* collected at Sri Lanka.

Although we did not examine specimens of this species, we transfer it to *Taeniastrotos* because of the ventral shield-like rostral area and sigmoid claw of the maxilliped of the female illustrated by Avdeev (1977).

This species can be distinguished from its congeners by several characteristics (Table 5).

**Taeniastrotos tragus, new species**

*Figures* 158-160

**Material Examined.**—1 female holotype (USNM 228429) and 7 paratypes (females) (USNM 228430) from body surface (between scales) of *Trachinocephalus myops* by A. Chandran at Trivandrum, India. 1 female from *Nemipodites mulloides* from Taiwan.

**Description.**—*Female:* Body as in Figure 158A. Total length 1.41 mm (1.35–1.49 mm) and greatest width 0.47 mm (0.45–0.49 mm) based on 8 specimens. Cephalothorax 432 × 478 μm (l × w), comprising more than 30% of total length. Thoracic segments bearing legs 2, 3, and 4 decreasing only slightly posteriorly. Genital complex (Figure 158B) with row of spinules at base of each caudal ramus. Caudal ramus (Figure 158C), 58 × 39 μm, bearing 6 setae; dorsal and 2 large terminal setae bristled (or pinnate); innermost terminal seta with short row of spinules at base.

Rostral area (Figure 158D,E) with corrugated shield-like structure. First antenna (Figure 159A) 7-segmented; distal 2-segments reduced in size; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthetes, and 7 + 1 aesthetes. Second antenna (Figure 159B) apparently 4-segmented with third and fourth segments almost completely fused; first 2-segments each with distal seta; third segment with 2 pectinate processes (1 with seta near midlength of process and 1 with seta near tip); terminal segment with 6 setae. Postantennal process (Figure 159C) stout and curved.

Labrum (Figure 159D) with spinulated posterior margin. Labial area with rows of spinules as in Figure 159D. Mandible (Figure 159E) with 2 unequal blades, each spinulated along 1 margin, and a bristled seta. Paragnath (Figure 159F) a rounded lobe bearing small patch of spinules near base. First maxilla (Figure 160A) with 5 setae and an anterior knob. Second maxilla (Figure 159F,G) with large base; second segment with spinulated terminal process and 2 bristled spines. Maxilliped (Figure 159H) with 2 long, naked setae on corpus; terminal segment a sigmoid-shaped claw with 2 naked setae near proximal end and an accessory process near distal end.

Legs 1–4 (Figures 159I, 160B–E) biramous. Spinal and setal formula as follows:

- **P₁** coxa 0-1 basis 1-1 exopod 1-0; 9
  endopod 0-1; 6
- **P₂** coxa 0-0 basis 1-0 exopod 1-0; 1-1; II, 1-5
  endopod 0-1; 0-2; II, 1-3
- **P₃** coxa 0-0 basis 1-0 exopod 1-0; 1-1; II, 1-5
  endopod 0-1; 0-2; II, 1-2
- **P₄** coxa 0-0 basis 1-0 exopod 1-0; 1-1; II, 1-5
  endopod 0-1; 0-1; II, 1-1

Interpodal plate of leg 1 (Figure 159I) with long and short spinules on posterior margin. Interpodal plates of legs 2–4 with spinules on posterior margins (see Figure 160B). Rows of spinules near insertion of coxal seta and area of basis between exopod and endopod. Coxae and first exopod segments of legs 2–4 (see Figure 160B) bearing large patches of spinules. Exopod spines of legs 2–4 not highly sclerotized. First two endopod segments with outer and posterior rows of spinules (Figure 160B–E); endopod spines with outer flanges (Figure 160C–E). Leg 5 (Figure 160F,G) with 2 segments; first segment small, bearing 1 dorsal bristled seta and row of spinules; second segment, 122 × 74 μm (l × w), carrying 4 bristled setae (all 4 setae sclerotized at bases); 3 setae with spinules at bases (Figure 160G). Leg 6 (Figure 158B) represented by 3 setae near area of egg sac attachment.

**Male:** Unknown.

**Etymology.**—The specific name *tragus*, Greek for small front lobe at the opening of the ear, alludes to the ventrolateral flap on the genital segment near the egg sac attachment area.

**Remarks.**—This new species can be distinguished from its congeners by the characteristics shown in Table 5.

*Taeniastrotos tragus* was collected from the body surface of its hosts as was *T. californiensis*.

**Aggregative Behavior of Taeniacanthodes gracilis**

Records of *Pandarus satyrus* Dana, 1852 (a parasitic copepod belonging to the Pandaridae), occurring in clusters on blue sharks, *Prionace glauca*, have been reported by Cressey, 1967, and Benz, 1981. In addition, other species of the Pandaridae have been observed to exhibit aggregative behavior (Benz, 1981). Scott and Scott (1913), Boxshall (1974), and Kabata (1979) reported clusters of the caligid *Lepeophtheirus pectoralis* (Müller). All these reports dealt with aggregations of parasitic copepods belonging to the order Siphonostomatoida. Fryer (1966) discussed gregarious behavior in lernaeids, highly modified cyclopoid copepods parasitic on freshwater fishes, and branchiurans.

We found 170 females, 15 males, 3 copulating pairs, and 3 copepods of *Taeniacanthodes gracilis* in an aggregation (cluster) (Figure 166A) on the fins of *Paralichthys squamileatus* from off the east coast of Florida (27° 12’N, 80° 00’W). This is the first record of aggregative behavior reported for...
FIGURE 158.—*Taeniastratos tragus*, new species, female: A, dorsal; B, genital area, dorsal; C, caudal ramus, ventral; D, cephalothorax, ventral; E, rostral area, ventral. (R = rostral area, A1 = first antenna, A2 = second antenna, pap = postantennal process, L = labrum, Md = mandible, P = paragnath, Mx1 = first maxilla, Mx2 = second maxilla, Mxpd = maxilliped, P1 = leg 1.)
FIGURE 159.—*Taeniastratos tragus*, new species, female: A, first antenna, ventral; B, second antenna, medial; C, postantennal process, ventral; D, labrum, paragnaths, and labial area, ventral; E, mandible, anteromedial; F, second maxilla, anterior; G, second maxilla, terminal segment, anterior; H, maxilliped, ventral; I, leg 1 and interpodal plate, ventral. (L = labrum, P = paragnath, Li = labium.)
FIGURE 160.—Taeniastrodon tragus, new species, female: A, first maxilla, anterior; B, leg 2 and interpodal plate, ventral; C, leg 2, distal two endopod segments, ventral; D, leg 3 endopod, ventral; E, leg 4 endopod, ventral; F, leg 5, dorsal; G, same, ventral.
parasitic copepods of the order Poecilostomatoida.

There are apparently two different arrangements of the copepods in the clusters. One arrangement is single-file (Figure 166b): the cephalothorax of one copepod is directly in line with and beneath the genital complex of the copepod immediately anterior to it. The second pattern represents a staggered arrangement (Figure 166c,d) and is identical to that reported by Benz (1981) for Pandarurus satyrus. In this arrangement the lateral parts of the cephalothorax of one copepod are underneath the lateral regions of the genital complexes of the two copepods directly anterior to it.

Benz (1981) suggested several biological advantages to the aggregative behavior shown by pandarids:

1. The aggregation results in efficient utilization of a limited and highly desirable resource, i.e., “optimal attachment site.”
2. The arrangement may protect copepods from predation by decreasing chances of dislodgement by the predator.
3. The arrangement increases attachment by the copepod to the host and thereby decreases the chances of dislodgement as water passes over the copepods when the host is swimming.
4. The aggregation may facilitate reproduction by increasing the chances of male-female contact, particularly in view of the paucity of males.

Although the way in which these clusters of Taeniacanthodes gracilis are formed is not known, Boxshall (1974) suggested that the aggregated distribution of Lepeophtheirus pectoralis on its host Pleuronectes platessa Linnaeus is related to the clustered distribution of the free-swimming infective larvae of the parasite. The predilection for a specific attachment site with its limited area in combination with the possible aggregated distribution of the infective larvae of T. gracilis could explain the resultant formation of clusters by this species of copepod.

Fryer (1966), however, reported various larval stages of Lernaea in close proximity to adults on the hosts, two species of Tilapia. The cluster of parasites apparently did not all belong to the same cohort, and so were not the result of a single encounter between the host and one group of infective larvae. He reasoned that subsequent infective larval lernaeids may be attracted by previously attached lernaeids. The process by which this attraction may occur is not yet known.

Zoogeographic Distribution

Before discussing the zoogeography of taeniacanthid genera, we should point out that there are two geographically important areas where extensive collections for parasitic copepods have not been conducted. These are the subequatorial coast of South America and the west coast of Africa. Because of these gaps it is difficult to draw definitive conclusions on circumglobal distributions. Those parasites that are host specific are, of course, restricted to host distributions. In most cases not enough data are available to know if the parasites are found throughout the host range.

The most widespread genus is Taeniacanthus, which has been recorded from British waters and all major subtropical and tropical areas except the eastern Pacific. Irides has been recorded from the Red Sea and the Indo-West Pacific and western Atlantic oceans. Both Pseudotaeniacanthus and Metaataeniacanthus have been recorded from the Red Sea and Indo-West Pacific. Anchistrotos has been reported from the Mediterranean, western North Pacific, and eastern North Atlantic. Those genera with more restricted distributions are Cirracanthus from the western Pacific, and Taeniacanthodes from the eastern Pacific and Gulf of Mexico. Solecicara is known from a single collection from the Gulf of Mexico. Taeniastratos, first described from off California, has also been recorded from India to Japan. Species of Taeniastratos are so far known only from the body surface of the host. This habitat would account for the few collections of these parasites. Most preserved hosts undoubtedly have lost the copepods during handling and preservation. We suspect that careful examination of freshly collected hosts would result in several more new Taeniastratos species.

The three genera (Clavisodalis, Echiniris, and Echinoccius) parasitic in echinoids are restricted to the Indo-West Pacific and the Red Sea (Dojiri and Humes, 1982).

Host Specificity

Taeniacanthid copepods exhibit a relatively high degree of host specificity at both the generic and specific levels for most parasites. Metaataeniacanthus (10 species) is so far known only from Indo-Pacific species of Synodus, with each copepod species specific to one host species. This specificity enabled the second author to sort out the host species and publish a revision of Indo-West Pacific Synodus (Cressey, 1981). The closely related genera Pseudotaeniacanthus (5 species) and Phagus (1 species) are known only from Anguilliformes (eels) with the single exception of one male specimen of Pseudotaeniacanthus (unnamed and not included in species count) from an Hawaiian Acantharus (Lewis, 1968). The three genera Clavisodalis (7 species), Echiniris (3 species), and Echinoccius (6 species) are known only from Indo-West Pacific and Red Sea sea urchins, with the last two genera so far known only from species of Diadema. Cirracanthus (2 species) and Nudisodalis (1 species) are known only from the tetradontiform family Monacanthidae. Solecicara (1 species) has been collected only from Porichthys. Taeniacanthodes (with 2 exceptions, Engraulis and Genyonomus) are known only from pleuronectiform fishes.

Genera less host specific are as follows: Anchistrotos (6 species) so far have been described from the Gadidae,
Serranidae, and Gobiidae; *Irodes* (5 species) from various elasmobranchs and the teleost families Plotosidae, Mullidae, and Callionymidae; *Taeniacanthus* (40 species) from a wide variety of fishes including both elasmobranchs and teleosts; and *Taeniostrotos* (4 species) from the teleost families Pleuronectidae, Serranidae, Carangidae, Synodontidae, and Nemipteridae.

Previous reports have alluded to the derivation of some copepod groups parasitic on fishes from ancestors associated with invertebrates. Fossil parasitic copepods found on a Lower Cretaceous fish (Cressey and Patterson, 1973) appear to be intermediate between siphonostome copepods associated with invertebrates (e.g., Ascomyzontidae) and the more apomorphic siphonostomes (e.g., *Dichelesthium*) parasitic on fishes. Ho (1984) suggested a possible origin of the Chondracanthidae, highly modified poecilostomatoid copepods parasitic on marine demersal fishes, from *Scambicornus*-like sabelliphilids, relatively unmodified poecilostomatoid copepods associated with holothurians. The taeniacanthids parasitic on Indo-West Pacific sea urchins, however, appear more apomorphic than their relatives parasitic on fishes. This may indicate their derivation from taeniacanthids parasitic on fishes, perhaps a secondary invasion back to invertebrates.

One copepod group of particular interest is the taeniacanthids parasitic on tetraodontiform fishes. Tyler (1980) presented a phylogenetic tree of the families of tetraodontiforms. An analysis of the taeniacanthids found on those families indicates a relatively high degree of host specificity.

The taeniacanthids found on these hosts can be separated into six groups. Those species groups are (1) *Taeniacanthus aluteri*, *balistae*, and similis; (2) *T. aluteri*; (3) *T. fugi*, *kaitamakura*, *lagocephali*, *pectinatus*, *tetradseni*, and *yamagutii*; (4) *T. ostrationis* and *moe*; (5) *Cirracontus monacanthi* and *spinosus*; and (6) *Nudisodalis acicula*.

If these groups of related parasites are superimposed on Tyler's phylogeny of tetraodontiform families, each group of related parasites is restricted to a host family with one interesting exception. The parasite *Taeniacanthus balistae*, common on the Monacanthidae, was also collected from a balistid and a diodontid. It was noted, however, that specimens from each of these collections from a non-monacanthid host showed consistent morphological variation within the two groups (see discussion of *T. balistae*). This might indicate that an ancestral form of *T. balistae* was once present on a host ancestral to the Balistidae, Monacanthidae, and Diodontidae. Tyler's phylogeny indicates the Triacanthodidae as ancestral to the three derived families. We examined specimens of triacanthodid fishes present in USNM collections, but so far have not recovered parasitic copepods. We plan at some future time to examine more hosts housed in other museums. In addition, phylogenetic analysis of the taeniacanthids may be useful in understanding the phylogeny of both parasites and hosts. Further speculation on the evolution of this host-parasite relationship is deferred until a more comprehensive study is completed.

**Host-Parasite List**

(Compiled from Dojiri and Humes, 1982; Cressey and Cressey, 1979; this revision and literature cited herein; * = accidental or infrequent infestation.)

<table>
<thead>
<tr>
<th>Echinoderm class</th>
<th>Echinoderm order</th>
<th>Echinoderm family</th>
<th>Echinoderm genus</th>
<th>Host details</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Echinodermata</td>
<td>Echinodermidae</td>
<td>Diadematidae</td>
<td><em>Claviodalis</em></td>
<td><em>Claviodalis parvobulatus</em></td>
<td>Irodes gracilis</td>
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<td></td>
<td><em>Heterocentrotus mammillatus</em></td>
<td>Rhioprinodon acutus</td>
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<td><em>Claviodalis abbreviatus</em></td>
<td>Irodes gracilis</td>
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<td><em>Heterocentrotus trigeri</em></td>
<td>Hemicyclidae</td>
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<td><em>Claviodalis heterocentro</em></td>
<td>Chiloscyllium indicum</td>
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<td>Elasmobranchs</td>
<td><em>Irodes gracilis</em></td>
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<td>Rajiformes</td>
<td>Sphyrna diapliana</td>
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<td>Rajidae</td>
<td>Irodes gracilis</td>
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<td><em>Raja fullonica</em></td>
<td>Sphyrna lewini</td>
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<td></td>
<td><em>Taeniacanthus wilsoni</em></td>
<td>Irodes gracilis</td>
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<td>Rhinobatiformes</td>
<td>Sphyrna tiburo</td>
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<td><em>Rhinobatus djdendisis</em></td>
<td>Irodes gracilis</td>
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<td><em>Irodes gracilis</em></td>
<td><em>Carcharias lamia</em> (unidentified shark)</td>
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<td>Torpediniformes</td>
<td><em>Taeniacanthus carischiere</em></td>
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<td></td>
<td><em>Torpedinidae</em></td>
<td>Unidentified elasmobranch</td>
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<td><em>Narcine timlés</em></td>
<td><em>Taeniacanthus coelus</em></td>
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<td><em>Taeniacanthus narci</em></td>
<td>Teleosts</td>
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<td>Carccharhiniformes</td>
<td>Asquilliformes</td>
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<td><em>Carcharhinus lewias</em></td>
<td>&quot;Brown Moray&quot;</td>
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<td></td>
<td><em>Irodes gracilis</em></td>
<td>Pseudotaeniacanthus puhi</td>
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<td></td>
<td><em>Carcharhinus maculipinnis</em></td>
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</tr>
</tbody>
</table>
"Green Moray"

Pseudotaeniacanthus puki
Muraena helena
Phagus muraena
Muraena sp.
Pseudotaeniacanthus coniferus
Muraenosocidae
Muraenosox talamoneoides
Pseudotaeniacanthus muraenosocis
Congridae
Astroconger myriaster
Pseudotaeniacanthus congeri
Ophichthidae
Pisodonophis cancrivorus
Pseudotaeniacanthus longicauda
Congridae
Engraulis mordax
Taeniacthodes haakeri*

Myctophiformes

Scorpaenidae
Inimicus japonicus
Taeniacthossus inimici
Pterois miles
Taeniacthossus miles
Pterois macrurus
Taeniacthossus pterois
Pterois russelli
Taeniacthossus pterois
Pterois volitans
Taeniacthossus pterois
Sebastes criniger
Taeniacthossus sebasticthysdis
Sebasticthys oblongus
Taeniacthossus sebasticthysdis
Sebastianus marmoratus
Taeniacthossus sebasticthysdis

Platycephalidae
Platycephalus crocodilus
Taeniacthossus petiulus
Platycephalus ceruleopunctatus
Taeniacthossus platycephali
Platycephalus indicus
Taeniacthossus platycephali

Gobidae
Pseudoblenius percoides
Taeniacthossus rotundiceps

Perciformes

Serranidae
Paralabrax nebulifer
Taeniacthossus californiensis
Serranus cabrilla
Anchistrostus laqueus
Serranus scriba
Anchistrostus laqueus
Carangidae
Trachurus trachurus
Taeniacthossus trachuri
Cromileptidae
Nemipterus mulloides
Taeniacthossus tragusa

Sciaenidae
Genyonemus lineatus
Taeniacthossus haakeri*

Mullidae
Mullloidichthys auriflamma
Irodes upenii
Parupeneus barberinus
Irodes upenii
Parupeneus barbatus
Irodes upenii
Parupeneus cyclostomus
Irodes sauridi
Irodes upenii
Parupeneus indicus
Irodes upenii
Parupeneus macronema

Irodes upenii
Parupeneus pleurospilus
Irodes upenii
Upenius vitatus
Irodes sauridi
Irodes upenii
Upenius sp.
Irodes upenii

Cepolidae
Acanthocephela imbatiana
Tauriscanthus acanthocephalae

Mugilidae
Parapercis aurantiaca
Tauriscanthus neopercis
Parapercis multifasciata
Tauriscanthus neopercis
Parapercis marmoratus
Tauriscanthus neopercis
Parapercis sexfasciata
Tauriscanthus neopercis

Percophidae
Bembrops caudimaculata
Tauriscanthus dentatus

Blenniidae
Cirrincipites aboapicis
Tauriscanthus nudaicauda

Cirrincipites auritus
Tauriscanthus glomeratus
Tauriscanthus williami
Cirrincipites castaneus
Tauriscanthus glomeratus
Tauriscanthus williami
Cirrincipites cholomatus
Tauriscanthus pollicaris
Tauriscanthus williami
Cirrincipites fuscoguttatus
Tauriscanthus pollicaris
Cirrincipites imitator
Tauriscanthus glomeratus
Tauriscanthus williami
Cirrincipites percutus
Tauriscanthus digitatus
Tauriscanthus williami
Cirrincipites polyzona
Tauriscanthus pollicaris
Tauriscanthus williami
Cirrincipites quagga
Tauriscanthus comparatus
Tauriscanthus glomeratus
Tauriscanthus williami
Cirrincipites stigmaticus
Tauriscanthus digitatus
Tauriscanthus glomeratus
Tauriscanthus williami
Cirrincipites variolus
Tauriscanthus glomeratus
Tauriscanths williami
Cirrincipites sp. D (to be named for V. G. Springer)
Tauriscanthus digitatus
Tauriscanthus williami
Cirrincipites sp. T (to be named for
B. Hutchins)

Taeniacanthus glomerosus
Gobies (to be named for C.R. Gilbert)

Taeniacanthus glomerosus
C. irripectes
sp. U (to be named for C.R. Gilbert)

Taeniacanthus glomerosus
Exallias brevis

Taeniacanthus pseudorhombi

Gobiidae

Acantogobius flavimanus
Anchistrotos hejmenensis
Gobius capito (= pagonellus)
Anchistrotos gobii
Gobius cobitis
Anchistrotos gobii

Acanturidae

Acanthurus nigricans
Pseudotaeniacanthus

Pleuronectiformes

Bothidae

Citharichthys spilopterus
Taeniacanthodes gracilis
Citharichthys stigmaeus
Taeniacanthodes haakeri
Citharichthys xanthostigma
Taeniacanthodes haakeri

Paralichthyidae

Paralichthys californicus
Taeniacanthodes haakeri
Paralichthys lethostigma
Taeniacanthodes gracilis
Paralichthys squamidentatus
Taeniacanthodes gracilis
Pseudorhombus cinnamoneus
Taeniacanthodes pseudorhombi

Pleuronectidae

Hippoglossoma stomata
Taeniacanthodes haakeri
Parophrys vetulus
Taeniacanthodes haakeri
Pleuronectes cornutus
Taeniasius troton Pleuronectis macrocephalus

Cynoglossiidae

Cynoglossus dispar
Taeniacanthus cynoglossi
Symphurus atricauda
Taeniacanthodes haakeri

Tetraodontiformes

Monacanthidae

Alutera heudeloti
Taeniacanthus balistae
Taeniacanthus occidentalis
Alutera monoeros
Taeniacanthus balistae
Alutera schoepfi
Taeniacanthus occidentalis
Alutera scripta
Taeniacanthus similis
Alutera seriola
Taeniacanthus aluteri
Alutera sp.
Taeniacanthus balistae
Monacanthus chinensis
Cirrachenhus monocanthi
Pervasor spinulosus
Nudisolais acicula
Stephanolepis cirrhifer
Cirrachenhus monocanthi
Stephanolepis hispidus
Taeniacanthus balistae
Stephanolepis setifer
Cirrachenhus monocanthi
Stephanolepis sp.
Cirrachenhus monocanthi

Balistidae

Abalistes stellatus
Taeniacanthus aluteri
Balistes capriscus
Taeniacanthus balistae
Balistes carolinensis
Taeniacanthus balistae
Balistes vetulus
Taeniacanthus balistae

Ostraciidae

Lactoria cornuta
Taeniacanthus ostracionis
Ostracion cubanus
Taeniacanthus moa
Ostracion lentiginosus
Taeniacanthus moa

Unidentified "sunfish"

Host Unknown

Anchistrotos caligiformis
Anchistrotos lucipetus

Stephanolepis setifer
Stephanolepis sp.

Cirrachenhus spinulosus
Charodera melanichthys
Cladiodalis abbreviatus
Heterocentrotus maximilanius
Cladiodalis dilatatus
Diadema setosum
Cladiodalis heterocentrotus

PARASITE-HOST LIST

(In alphabetical order; * = accidental or infrequent infestation.)
Heterocentrotus trigonarius
Echinometra mathaei
Clypeolithus salmaeulis
Clypeolithus varium
Salmasicus belli
Clypeolithus sentifer
Diadema setosum
Diadema sp.
Clypeolithus tenuis
Heterocentrotus mammillatus

Echinus diadematus
Diadema setosum
Echinus lataxus
Diadema setosum
Echinus sp.
Diadema sp.
Echinous dus dentatus
Diadema setosum
Echinous elatensis
Diadema setosum
Echinous fimbritus
Diadema setosum
Echinous guilocus
Diadema setosum
Echinous intermedius
Diadema setosum
Echinous niveus
Diadema sp.

Irodos callionymo
Callionymus altivelis
Irodos gracilis
Carcharinus leucas
Carcharinus maculipinnis
Chiloscyllium indicum
Rhizoprionodon acutus
Rhinobatidae dyedensis
Sphyrna diapana
Sphyrna lewini
Sphyrna tiburo
Sphyrna vanga

Irodos remipes
Cnidoglanis macrocephalus
Pristis lineatus
Irodos sauridi
Purpuru nactus cyclostomus
Saurida tumbil
Upenerus vitatus
Irodos upeeri
Multistichus auriflamma
Parupeneus barberinus
Parupeneus barbatus
Parupeneus cyclostomus
Parupeneus indicus
Parupeneus macronema
Parupeneus pleurospilus
Upenerus citatus
Upenerus sp.

Metaetanacanthus aquilonius
Synodus macrops
Metaetanacanthus copepieri
Synodus fasciatus

Metaetanacanthus epigri
Synodus englemanni
Metaetanacanthus gibbi
Synodus indicus
Metaetanacanthus indiscretus
Synodus sp.
Metaetanacanthus nudus
Synodus hoshinonis
Metaetanacanthus pacificus
Synodus variegatus
Metaetanacanthus solidus
Synodus variegatus

Nudisodalis arcuata
Percogor spilosmus

Phagus muraena
Murana helena
Pseudoetanacanthus confiferus
Murana sp.
Pseudoetanacanthus congeri
Astrocoergus myriaster
Pseudoetanacanthus longicauda
Pisodonophis cancrivorus
Pseudoetanacanthus muremoseis
Murenoseus talahoneoides
Pseudoetanacanthus puli
“Brown Moray”
“Green Moray”
Pseudoetanacanthus sp.
Acanthus nigrancus

Soleiscara humesi
Porichthys poroissimus

Taeniacanthodes gracilis
Citharichthys spilopterus
Paralichthys lebostigma
Paralichthys squamolentus
Taeniacanthodes haakeri
Citharichthys stigmaeus
Citharichthys xanthostigma
Engraulis mordax*
Genyonemus lineatus*
Hippoglossina stomaata
Paralichthys californiensis
Parophrys vetulus
Pleuronichthys verticalis
Symphurus auricauda

Taeniacanthus acanthocepholar
Acanthocephola limbata
Taeniacanthus alutarius
Abalistes stellatus
Alutera seriola
Taeniacanthus anguillaris
Pristis lineatus
Taeniacanthus baluster
Alutera breviflora
Alutera monoceros
Alutera sp.

Balistes capriscus
Balistes carbonensis
Balistes vetula
Balistes sp.
Cantrellines modestus
Cantrellines paulus
Diadon hystrix
Stephanolepis hispidus
Stephanoleps setifer

Taeniacanthus carcharias
“Carcharias lama”
Lagocephalus laevigatus (doubtful
record by Capart, 1959)

Taeniacanthus coelus
Unidentified elasmobranch
Unidentified “sunfish”

Taeniacanthus comparatus
Cirrhipetrae quagga

Taeniacanthus cygnolosus
Gynoglossus dispar

Taeniacanthus dentatus
Bembrops caudimaculata

Taeniacanthus digitatus
Cirrhipetra vulgaris
Cirrhipetrae stigmaticus
Cirrhipetrae sp. D (to be named for
V.G. Springer)

Taeniacanthus fugu
Takifugu xanthopterus
Spheroidei sp.

Taeniacanthus glomeratus
Cirrhipetrae auritae
Cirrhipetrae castaneus
Cirrhipetrae filamentarius
Cirrhipetrae simia
Cirrhipetrae quagga
Cirrhipetrae stigmaticus
Cirrhipetrae variolous
Cirrhipetrae sp. T (to be named for
B. Hutching)
Cirrhipetrae sp. U (to be named for
C.R. Gilbert)

Taeniacanthus inimici
Inimici japonici

Taeniacanthus kaimakura
Canthigaster rivulata

Taeniacanthus lagophthalmi
Lagocephalus inermis
Lagocephalus laevigatus
Lagocephalus lunaris
Lagocephalus spadiceus

Taeniacanthus longicaudus
Saurida tumbil

Taeniacanthus longirostris
Saurida elongata
Saurida tumbil
Saurida undosquamis

Taeniacanthus miles
Pterois miles

Taeniacanthus moa
Ostracion rubicu
Ostracion leniginosus

Taeniacanthus neopcephali
Narcine timlea

Taeniacanthus neoprisca
Parapercis aurantiaca

Metataeniacanthus aquilonius
Synodus macrops

Metaetanacanthus copepieri
Synodus fasciatus
Relationships within the Bomolochiform Complex

The bomolochiform complex consists of the Bomolochidae, Taeniactinidae, and Tucidae. These three families are presumed to be closely related. They share the following diagnostic characters that clearly distinguish this family:

1. Metamorphosis occurs in the female resulting in a highly modified body. Neither the Taeniactinidae nor Bomolochidae undergo metamorphosis (Ho, 1967). The habitus of the adult female taeniactinid (with two exceptions) and bomolochid (except Tegobomolochus, see Izawa, 1976) exhibit a relatively unmodified body, a habitus once known as "cyclopoid" (see Kabata, 1979).

2. A rudimentary urosome is present. As noted by Ho (1967) the fifth pedigerous segment, genital complex, and abdominal segments are all fused into one structure, a genito-abdomen. This tagma comprises less than 10 percent of the total length of the adult individual. In taeniactinids and bomolochids the urosome consists of a distinct fifth segment, genital complex, and usually three or four abdominal segments collectively comprising about 30 percent of the total body length.

3. There is a reduction in the number of segments of the rami of legs 2-4. The rami of leg 2 are only 2-segmented. The exopods of legs 3 and 4 are 2-segmented, but the endopods are 1-segmented. In taeniactinids and bomolochids the rami of legs 2-4 are usually 3-segmented. In some species a few rami may be 2-segmented, but none are 1-segmented.

4. Leg 5 is rudimentary, and represented by a setiferous lobe. Taeniactinids and bomolochids usually have a 2-segmented leg 5.

The Bomolochidae and Taeniactinidae are closely related (see Kabata, 1979; Dojiri and Humes, 1982; Humes and Dojiri, 1984). This relationship is mirrored in their shared taxonomic history. In fact, the taeniactinids were not considered a group separate from the bomolochids until Wilson (1911) recognized that the two were distinct. He designated the groups as the subfamilies Taeniactininae and Bomolochinae within the family Ergasilidae and later
The modified bodies of *Taeniacanthodes gracilis* and *Scoleciara*, the diverse morphology of the rostral area and maxilliped, and the progressive reduction and eventual loss of the maxilliped in some taeniacanthid genera are considered apomorphic characters. The modified body of *Tegobomolochus nasicola*, the lateral position of the maxilliped, the fusion of segments and the presence of modified setae of the first antenna, and the reduction in the number of segments of the rami of the legs of the Bomolochidae, however, are also considered apomorphic features. Because both families exhibit a mosaic of plesiomorphic and apomorphic features, a conclusion on which family of the two is more derived is difficult to draw at this time. A phylogenetic analysis of the bomolochiform complex may help shed light on this problem.

*Tuccidae* is probably more closely related to the Taeniacanthidae than the Bomolochidae. This conclusion is based on several features: (1) modified habitus found in both families; this similarity could, however, be the result of convergent evolution; (2) the presence of a ventromedian spiniform process in the rostral area of *Tucca* and *Taeniacanthodes*; (3) the second maxilla with three elements on the second segment in *Tucca* and most species of the Taeniacanthidae; and (4) position of the maxilliped of the female posterior instead of lateral to the oral appendages.

A possible member of the bomolochiform complex is the Telsidae. This family, established by Ho (1967) with *Telson elongatus* Pearse, 1952, as its type-species, appears to be related to the families of the complex. The mandible is similar to those found in the bomolochiform complex. The maxilliped is located posterior to the mouthparts; consequently, this family is similar to the Taeniacanthidae in this respect. Although there are some similarities in the morphology of the Telsidae and the bomolochiform complex, the Telsidae differs from the families of this complex by having a protuberant ventral surface of the cephalothorax, a prehensile second maxilla, an unmodified (not lamelliform) leg 1, and elongate, digitiform, unsegmented rami of leg 4.


Tyler, J.C.

Vervoort, W.

Wilson, C.B.


Yamaguti, S.


Yin, W.Y.


FIGURE 161.—Scanning electron micrographs: A, maxilliped of female Anchistrotos gobii Brian; B, detail of same; C, cephalothorax of female Echinoseius gulicolus Dojiri and Humes; D, detail of rostral area of E. gulicolus; E, maxilliped of female E. gulicolus; F, maxilliped of female Irodes gracilis (Heller).
FIGURE 162.—Scanning electron micrographs: A, legs 3 and 4 of female *Irodes gracilis* (Heller); B, spine of terminal exopod segment of leg 3 of female *I. gracilis*; C, cephalothorax of female *Metataeniactanus conepigri* Cressey and Cressey; D, rostral area of female *Pseudotaeniactanus congeri* Yamaguti and Yamasu; E, detail of same; F, same, slightly different view.
FIGURE 163.—Scanning electron micrographs: A, rows of hooklets on rostral area of female *Pseudoturnia-canthus congeri* Yamaguti and Yamasu; B, same, different view; C, mandible of female *P. congeri*; D, first maxilla of female *P. congeri*; E, maxilliped of female *P. congeri*; F, same.
FIGURE 164.—Scanning electron micrographs: A, posterior portion of cephalothorax and anterior abdominal segments of female *Pseudotaeniacanthus congeri* Yamaguti and Yamasu; B, cephalothorax of female *Taeniacanthodes gracilis* Wilson; C, rostral area of *T. gracilis*; D, tip of innermost spine of terminal exopod segment of leg 2 of female *T. gracilis*; E, outer spine (spine II) of terminal exopod segment of leg 2 of female *T. gracilis*; F, leg 4 endopod of female *T. gracilis*. 
FIGURE 165.—Scanning electron micrographs: A, detail of spinules on leg 4 endopod of female *Taeniactanthodes gracilis* Wilson; B, rostral area of female *Taeniastrotus californiensis* Cressey; C, same; D, maxilliped of female *T. californiensis*; E, leg 2 endopod and basipods of legs 3 and 4 of female *T. californiensis*; F, spinules on basipod of leg 4 of female *T. californiensis*. 
FIGURE 166.—Cluster of female *Taeniaeothodes gracilis* Wilson: A, low magnification of cluster of *T. gracilis* on fin of *Paralichthys squamimentus*; B, single-file arrangement of *T. gracilis* within cluster; C, staggered arrangement of *T. gracilis* within cluster; D, same, magnified view.
REQUIREMENTS FOR SMITHSONIAN SERIES PUBLICATION

Manuscripts intended for series publication receive substantive review within their originating Smithsonian museums or offices and are submitted to the Smithsonian Institution Press with Form SI-36, which must show the approval of the appropriate authority designated by the sponsoring organizational unit. Requests for special treatment—use of color, foldouts, case-bound covers, etc.—require, on the same form, the added approval of the sponsoring authority.

Review of manuscripts and art by the Press for requirements of series format and style, completeness and clarity of copy, and arrangement of all material, as outlined below, will govern, within the judgment of the Press, acceptance or rejection of manuscripts and art.

Copy must be prepared on typewriter or word processor, double-spaced, on one side of standard white bond paper (not carbon or xerox), in loose sheets (not stapled or bound), and erasable, within margins, submitted as ribbon copy (not letterpress), with double spaced, on one side of standard white bond paper (not carbon or xerox), in loose sheets (not stapled or bound), and accompanied by original art. Minimum acceptable length is 30 pages.

Front matter (preceding the text) should include: title page with only title and author and no other information; abstract page with author, title, series, etc., following the established format; table of contents with indents reflecting the hierarchy of heads in the paper; also, foreword and/or preface, if appropriate.

First page of text should carry the title and author at the top of the page; second page should have only the author’s name and professional mailing address, to be used as an unnumbered footnote on the first page of printed text.

Center heads of whatever level should be typed with initial caps of major words, with extra space above and below the head, but with no other preparation (such as all caps or underline, except for the underline necessary for generic and specific epithets). Run-in paragraph heads should use period/dashes or colons as necessary.

Tabulations within text (lists of data, often in parallel columns) can be typed on the text page where they occur, but they should not contain rules or numbered table captions.

Formal tables (numbered, with captions, boxheads, stubs, rules) should be submitted as carefully typed, double-spaced copy separate from the text; they will be typeset unless otherwise requested. If camera-copy use is anticipated, do not draw rules on manuscript copy.

Taxonomic keys in natural history papers should use the aligned-couplet form for zoology and may use the multi-level indent form for botany. If cross referencing is required between key and text, do not include page references within the key, but number the keyed-out taxa, using the same numbers with their corresponding heads in the text.

Synonymy in zoology must use the short form (taxon, author, year:page), with full reference at the end of the paper under Literature Cited. For botany, the long form (taxon, author, abbreviated journal or book title, volume, page, year, with no reference in “Literature Cited”) is optional.

Text-reference system (author, year:page used within the text, with full citation in “Literature Cited” at the end of the text) must be used in place of bibliographic footnotes in all Contributions Series and is strongly recommended in the Studies Series: “(Jones, 1910:122)” or “Jones (1910:122).” If bibliographic footnotes are required, use the short form (author, brief title, page) with the full citation in the bibliography.

Footnotes, when few in number, whether notative or bibliographic, should be typed on separate sheets and inserted immediately after the text pages on which the references occur. Extensive notes must be gathered together and placed at the end of the text in a notes section.

Bibliography, depending upon use, is termed “Literature Cited,” “References,” or “Bibliography.” Spell out titles of books, articles, journals, and monographic series. For book and article titles use sentence-style capitalization according to the rules of the language employed (exception: capitalize all major words in English). For journal and series titles, capitalize the initial word and all subsequent words except articles, conjunctions, and prepositions. Transliterate languages that use a non-Roman alphabet according to the Library of Congress system. Underline (for italics) titles of journals and series and titles of books that are not part of a series. Use the parentheses colon system for volume (number): pagination: “(10(2):5–9).” For alignment and arrangement of elements, follow the format of recent publications in the series for which the manuscript is intended. Guidelines for preparing bibliography may be secured from Series Section, SI Press.

Legends for illustrations must be submitted at the end of the manuscript, with as many legends typed, double-spaced, to a page as convenient.

Illustrations must be submitted as original art (not copies) accompanying, but separate from, the manuscript. Guidelines for preparing art may be secured from Series Section, SI Press. All types of illustrations (photographs, line drawings, maps, etc.) may be intermixed throughout the printed text. They should be termed Figures and should be numbered consecutively as they will appear in the monograph. If several illustrations are treated as components of a single composite figure, they should be designated by lowercase italic letters on the illustration; also, in the legend and in text references the italic letters (underlined in copy) should be used: “Figure 9b,” Illustrations that are intended to follow the printed text may be termed Plates, and any components should be similarly lettered and referenced: “Plate 9b.” Keys to any symbols within an illustration should appear on the art rather than in the legend.

Some points of style: Do not use periods after such abbreviations as “mm,” “ft,” “USNM,” “NNE.” Spell out numbers “one” through “nine” in expository text, but use digits in all other cases if possible. Use of the metric system of measurement is preferable; where use of the English system is unavoidable, supply metric equivalents in parentheses. Use the decimal system for precise measurements and relationships, common fractions for approximations. Use day/month/year sequence for dates: “9 April 1976.” For months in tabular listings or data sections, use three-letter abbreviations with no periods: “Jan, Mar, Jun,” etc. Omit space between initials of a personal name: “J.B. Jones.”

Arrange and paginate sequentially every sheet of manuscript in the following order: (1) title page, (2) abstract, (3) contents, (4) foreword and/or preface, (5) text, (6) appendixes, (7) notes section, (8) glossary, (9) bibliography, (10) legends, (11) tables. Index copy may be submitted at page proof stage, but plans for an index should be indicated when manuscript is submitted.