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

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MASAHIRO DOJIRI
and
ROGER F. CRESSEY

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY · NUMBER 447

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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 *Echinosocius*) live in the esophagi of sea urchins. Eleven genera (the type genus *Taeniacanthus, Anchistrotos, Cirracanthus, Irodes, Metataeniacanthus, Nudisodalis, Phagus, Pseudotaeniacanthus, Scolecicara, Taeniacanthodes,* and *Taeniastrotos*) are parasites of marine fishes. *Parataeniacanthus* is placed in synonomy with *Taeniacanthus,* and two new genera (*Cirracanthus* 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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Contents

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

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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 *Cirripectes* 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. P_1–P_4 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 *Cirripectes* and *Exallias* 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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The first author (M.D.) acknowledges the Smithsonian Institution for the postdoctoral fellowship during which this study was undertaken.

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 *Clavisodalis* 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 *Anchistrotos, Cirracanthus, Irodes, Nudisodalis, Taeniastrotos,* 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. glomerosus,* 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 spinules 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 *Taeniastrotos,* 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 (*Clavisodalis, Echinirus,* and *Echinosocius*) 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 *Scolecicara.* 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 *Clavisodalis 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 aluteri* (Figure 5A) or conspicuously protuberant as in *Taeniacanthus acanthocepolae* (Figure 1A), *Taeniacanthodes gracilis* (Figure 145A–C), and *Taeniastrotos californiensis* (Figure 153A).

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, Clavisodalis, Echinirus, Echinosocius, Irodes, Metataeniacanthus, 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 *Taeniastrotos* (Figure 153D). 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.

Pseudotaeniacanthus, 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).

Scolecicara 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 aesthete, 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 Taeniacanthidae 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 *Taeniacanthus* (*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 *Scolecicara humesi* indistinctly 7-segmented, his illustration clearly depicts a 6-segmented condition. Unlike the above species, the species of *Irodes* and *Pseudotaeniacanthus congeri* have the first and second segments fused to form a 6-segmented structure (e.g., Figures 112A, 138A). *Taeniacanthodes* and the majority of taeniacanthids 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 *Pseudotaeniacanthus* (e.g., Figure 138B). 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 *Taeniacanthus petilus* (Figure 65D) or numerous rows as in *Taeniacanthus 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 *Taeniacanthus acanthocepolae* (Figure 1E).

There are, however, departures from this generalized pattern. For example, in *Taeniacanthus 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 *Taeniacanthus pseudorhombi* (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, Pseudotaeniacanthus,* and *Taeniacanthodes.*

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 *Taeniacanthus 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 taeniacanthids. 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 taeniacanthids it is tipped with two subequal, spinulated blades (e.g., Figure 2D). 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 taeniacanthids associated with echinoids, there is a trend toward the reduction of the secondary blade (Humes and Dojiri, 1984). In *Echinosocius* 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 taeniacanthid species, and is frequently ornamented with spinules. It may have additional processes giving it a slightly irregular shape as in *Taeniacanthus 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 digitatus* (Figure 20C) and *T. papulosus* (Figure 62E), but large and conspicuous in *T. glomerosus* (Figure 26E) and *T. pollicaris* (Figure 72B).

The first maxilla of *Cirracanthus, Irodes, Metataeniacanthus, 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, Echinirus,* 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 indistinguishably fused to the second segment and is referred to as a "terminal process" in this revision (e.g., Figure 11E).

Although considered a relatively conservative appendage, the second maxilla of a few species has diverged from the general structural pattern. For example, *Pseudotaeniacanthus congeri* (Figure 138G,H) and *P. coniferus* (Figure 142D) each have four elements at the tip of the second maxilla. The terminal process is very stout and the two associated elements are extremely small in *Taeniacanthus kitamakura* (Figure 29G,H) and *T. yamagutii* (Figure 97D,E). In *Nudisodalis acicula* the second segment bears only one long whip-like terminal process, in addition to a minute seta.

MAXILLIPED.—The maxilliped in the majority of taeniacanthid genera is a paired, subchelate, sexually dimorphic appendage. It is usually one of two major prehensile structures, the other one being the second antenna. In general it is 3-segmented in the female with the first segment irregular in shape, relatively small, and carrying a naked seta. The second segment, also known as the corpus maxillipedis (Kabata, 1979), is a robust segment bearing two setae. The third segment is a curved claw, frequently armed with spinules or large teeth. Because there is considerable diversity in structure among taeniacanthid females, this appendage is a good generic discriminant.

The females of the majority of species of *Taeniacanthus, Clavisodalis,* and *Anchistrotos* possess a maxilliped claw that curves away from the corpus, e.g., *Taeniacanthus balistae* (Figure 14C). In *Anchistrotos gobii* (Figures 101G, 161A,B), however, the claw is reduced to a conical process bearing a large whip-like seta. In *Cirracanthus* and *Taeniacanthodes* the claw of the female curves toward, not away from, the corpus, e.g., *Cirracanthus spinosus* (Figure 110F) and *Taeniacanthodes gracilis* (Figure 146H). 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 138I). It is most likely an ineffective prehensile structure. In *Pseudotaeniacanthus 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 *Irodes,* e.g., *I. gracilis* (Figures 113I, 161F), 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 maxillipedis is represented by a spindle-shaped swelling (Figure 161E). In *Echinirus* 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 152D).

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 139B) 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 128G), except for species of *Anchistrotos* with 0-1; 6, e.g., *A. gobii* (Figure 102A). Six taeniacanthid genera have 2-segmented rami. They are *Cirracanthus, 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 Dojiri, 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 Dojiri, 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 I-0; I-1; II, I, 4 (or II, 1, 5), e.g., *Taeniacanthus aluteri* (Figures 7E; 8B). The terminal exopod segment of leg 2 is III, I, 5 in *Phagus* (Figure 135B) and several species of *Taeniacanthus* (*T. cynoglossi, T. longicaudus,* and *T. narcini*). The endopod of leg 2 usually exhibits the formula 0-1; 0-1 (or 0-2); II, I, 3. Leg 3 endopod is 0-1; 0-1 (or 0-2); II, 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).

LEG 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 *Taeniacanthus,* e.g., *T. balistae* (Figure 15B) 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 *Taeniacanthus 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 *Taeniacanthodes* 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 151D).

The exopod and endopod segments of legs 2–4 may be ornamented with spinules, e.g., *Taeniacanthus moa* (Figures 48F, 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 48F, 49D). In many species the exopod spines are not highly sclerotized, but remain setiform, e.g., *Taeniacanthus 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 *Taeniacanthus acanthocepolae* (Figure 4B,C), triangular in outline, e.g., *T. glomerosus* (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 *Taeniacanthodes,* e.g., *T. gracilis* (Figure 145E). Both segments of leg 5 may be ornamented with rows of spinules as in *Taeniacanthus 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 *Taeniacanthus anguillaris* (Figure 10B) with that of *T. moa* (Figure 46B).

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 ..... ***Echinirus***
   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 ..... ***Scolecicara***
   Second pedigerous segment not forming elongate neck; maxilliped not bilobed terminally 5
5. Rostral area with corrugated shield-like structure on ventromedian surface [Figures 153D,165B,C] ..... ***Taeniastrotos***
   Rostral area without corrugated shield-like structure on ventromedian surface 6
6. Cephalothorax with pair of lateral spatulate processes on posteroventral surface [Figure 145D]; rostral area with posteriorly directed ventromedian spiniform process [Figures 145G, 164C] ..... ***Taeniacanthodes***
   Pair of lateral spatulate processes on posteroventral surface of cephalothorax absent; rostral area otherwise 7
7. Rostral area with Y-shaped sclerotized structure bearing transverse rows of hooklets or ridges [Figures 137E, 162D–F] ..... ***Pseudotaeniacanthus***
   Rostral area otherwise 8
8. Postantennal process absent ..... ***Phagus***
   Postantennal process present 9
9. Cephalothorax with ventrally directed lateral margins [Figure 162C] ..... ***Metataeniacanthus***
   Cephalothorax without ventrally directed lateral margins 10
10. Second maxilla with 1 spinulated process and minute spine (spinule) on terminal segment [Figure 131D] ..... ***Nudisodalis,*** new genus
    Second maxilla otherwise 11
11. Maxilliped with claw curved toward corpus [Figure 107E,F] ..... ***Cirracanthus,*** new genus
    Maxilliped otherwise 12
12. Terminal segment (claw) of maxilliped absent or fused to corpus [Figure 113I] ..... ***Irodes***
    Terminal segment of maxilliped distinct 13
13. Maxilliped claw with 2 long whip-like setae extending to or beyond distal limit of claw [Figures 101G, 104E] ..... ***Anchistrotos***
    Maxilliped claw without 2 long whip-like setae ..... ***Taeniacanthus***

Taeniacanthus Sumpf, 1871

Taeniacanthus Sumpf, 1871:17.—Wilson, 1911:387.—Pillai, 1963:111.—Izawa, 1967:29.—Ho, 1969:127.—Kabata, 1979:68, 77.—Dojiri and Humes, 1982:429.

Parataeniacanthus Yamaguti, 1939:409.—Shiino, 1957b:428.—Pillai, 1963:111.—Sebastian, 1964:96.—Kabata, 1979:68.—Devi and Shyamasundari, 1980:200.—Dojiri and Humes, 1982:429. [New synonymy.]

DIAGNOSIS.—*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.

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.

TYPE-SPECIES.—*Taeniacanthus carchariae* 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. cynoglossi* Rangnekar and Murti, 1960, and *P. longicervis* Pillai, 1963). In other species (i.e., *P. rotundiceps* Shiino, 1957; *P. miles* Pillai, 1963; *P. inimici* Yamaguti and Yamasu, 1959; and *P. platycephali* 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. platycephali* 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. cynoglossi* (Rangnekar and Murti, 1960); *T. longicaudus* Pillai, 1963; and *T. narcini* Pillai, 1963.

Taeniacanthus cynoglossi (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. cynoglossi* 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 Dojiri and Humes (1982) for species of *Echinosocius*. 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.

Key to Species of *Taeniacanthus* Females

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

1. Mid-endopod segment of leg 2 with 2 inner setae [Figure 19B] 2
   Mid-endopod segment of leg 2 with 1 inner seta [Figure 3A] 22
2. Mid-endopod segment of leg 3 with 1 inner seta [Figure 27D] 3
   Mid-endopod segment of leg 3 with 2 inner setae [Figure 19C] 4
3. Terminal process and spinulated spine of second maxilla broad, lamelliform; small spine absent [Figure 93D,E] ..... ***T. williamsi,*** new species
   Terminal process and spinulated spine of second maxilla lanceolate; small spine present [Figure 26F–H] ..... ***T. glomerosus,*** new species
4. Terminal exopod segment of leg 4 with formula II, I, 4 ..... ***T. cynoglossi***
   Terminal exopod segment of leg 4 with formula other than II, I, 4 [Figures 19E, 21C, 41A] 5
5. Terminal exopod segment of leg 2 with formula III, I, 5 6
   Terminal exopod segment of leg 2 with formula II, I, 5 [Figure 19B] 7
6. Terminal endopod segment of leg 4 with 3 elements (2 spines and 1 seta] .... ***T. narcini***

Terminal endopod segment of leg 4 with 4 elements (4 spines) ..... ***T. longicaudus***

7. Distal half of maxilliped claw lamelliform and triangular in outline] ***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 ..... ***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] ..... ***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 ..... ***T. dentatus***

Maxilliped claw without teeth [Figure 66E–H] ..... ***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] ..... ***T. pseudorhombi***

Endopod of leg 1 2-segmented [Figure 88E]; pectinate process near distal end of second antenna elongate [Figure 87D,E] 14

14. Both blades of mandible bilaterally spinulated [Figure 88A]; maxilliped claw with long slender process at base [Figure 88D] ..... ***T. sebastichthydis***

Both blades of mandible unilaterally spinulated [Figure 42G]; maxilliped claw without long slender process at base [Figure 43D,E] 15

15. Maxilliped claw bluntly rounded [Figure 43D,E) ..... ***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] ..... ***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] ..... ***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, 52G, 81F] ...20

18. Tip of maxilliped claw sharply pointed [Figure 20D,E] ..... ***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] ..... ***T. papulosus,*** new species

Accessory process on mandible long and setiform, extending to about midlength of blade [Figure 72A] ..... ***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] ..... ***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 52G,H] ..... ***T. neopercis***

Accessory process on mandible absent [Figure 79G]; spines on second segment of leg 5 sharply pointed [Figure 81F] ..... ***T. pteroisi***

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 12D] ..... ***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] 29

Terminal exopod segment of leg 4 much less than 3 times longer than wide, and not curved [Figures 32A,B, 36D,E, 98G] 31

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] 30

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 2×) than outermost spine [see Figure 14G of *T. balistae*] ..... ***T. similis,*** new species

31. Exopod spines of legs 2–4 relatively stout and sclerotized, each with terminal or subterminal flagellum [Figure 24C,E,G] 32

Exopod spines of legs 2–4 attenuate and weakly sclerotized; terminal flagella absent [Figures 30E, 31D, 32A] 34

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] 33

33. Terminal process of second maxilla stout (3× longer than wide) [Figure 97D,E]; maxilliped claw with conspicuous digitiform process at base [Figure 97F–H] ..... ***T. yamagutii***

Terminal process of second maxilla slender (6× 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

Taeniacanthus carchariae Sumpf, 1871:7.—Wilson, 1911:388; 1922:8.—Capart, 1959:63.—Yamaguti, 1963:20.—Kabata, 1979:78.

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. Piffl of the Zoologisches Institut der Universitat Wien (Vienna). He informed us that the material was not there. Capart (1959) reported specimens of taeniacanthids that he tentatively identified as *T. carchariae* from the gill filaments of *Lagocephalus laevigatus* (Linnaeus). Ho (1969) doubted Capart's identification mainly because of the differences in hosts (Kabata, 1979). We agree with Ho: Capart's specimens may have been *T. lagocephali*.

As mentioned by Kabata (1979) the most distinctive feature of *T. carchariae* is the habitus. In the majority of species of *Taeniacanthus* the second through the fourth pedigerous segments decrease in width posteriorly. However, in *T. carchariae* these segments are not much narrower than the cephalothorax. Two species, *T. lagocephali* Pearse, 1952, and *T. glomerosus*, new species, have a similar habitus. Unfortunately, because the details of the appendages of *T. carchariae* are unknown, comparisons with its congeners cannot be made adequately. A detailed redescription of *T. carchariae* is badly needed.

Taeniacanthus acanthocepolae Yamaguti, 1939

FIGURES 1–4

Taeniacanthus acanthocepolae Yamaguti, 1939:401; 1963:20.—Kabata, 1979:78.

MATERIAL EXAMINED.—13 females and 1 immature female from *Acanthocepola 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 1E) 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 spinules 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 2I, 3A–F, 4A) biramous. Spinal and setal formula as follows:

P_1	coxa 0-1	basis 1-1	exopod I-0; 8 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 4 endopod 0-1; 0-1; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 4 endopod 0-1; 0-1; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 4 endopod 0-1; 0-1; II, int.

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 endopod. 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-

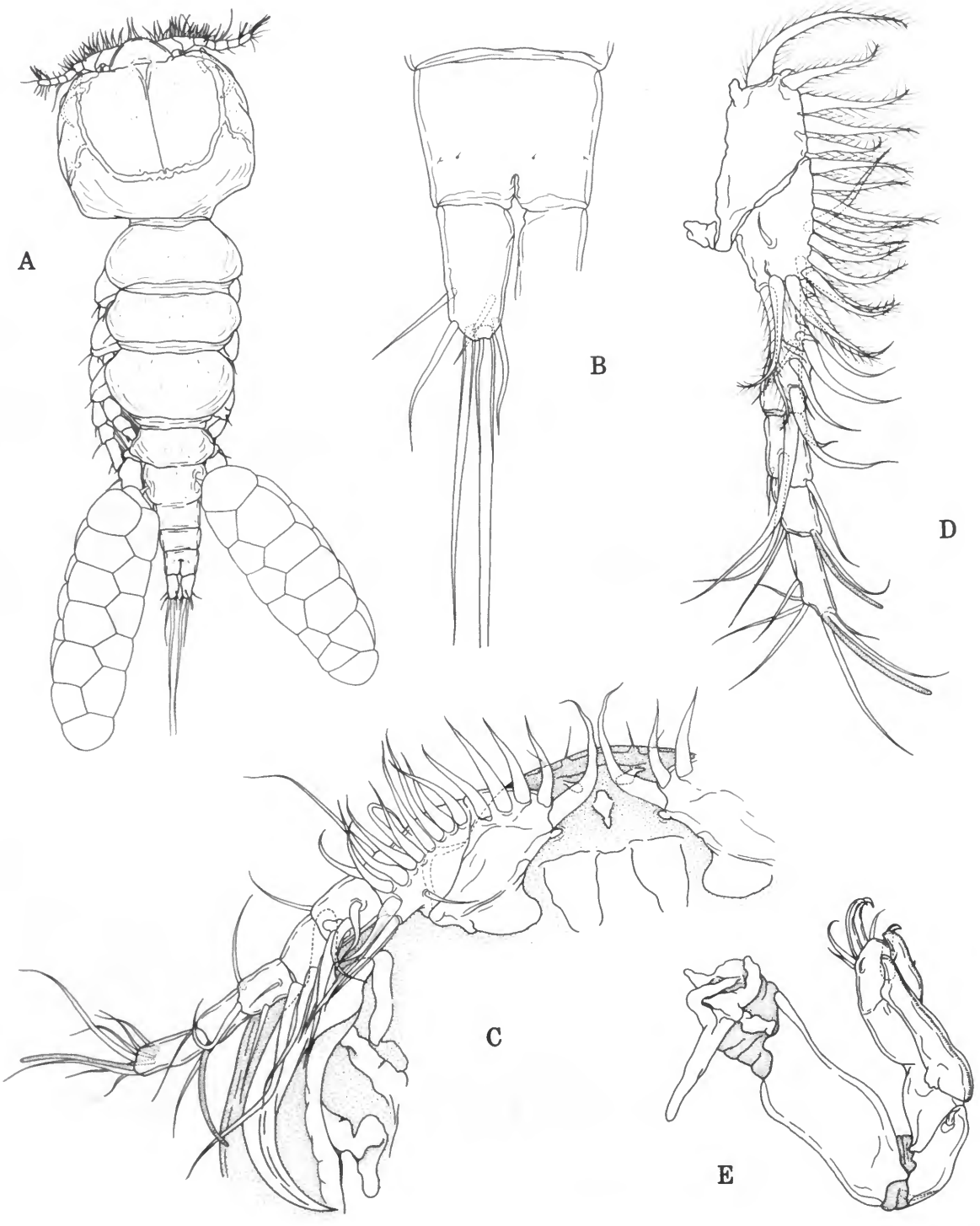

FIGURE 1.—*Taeniacanthus acanthocepolae* Yamaguti, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area, postantennal process, and first antenna, ventral; D, first antenna, ventral; E, second antenna, medial.

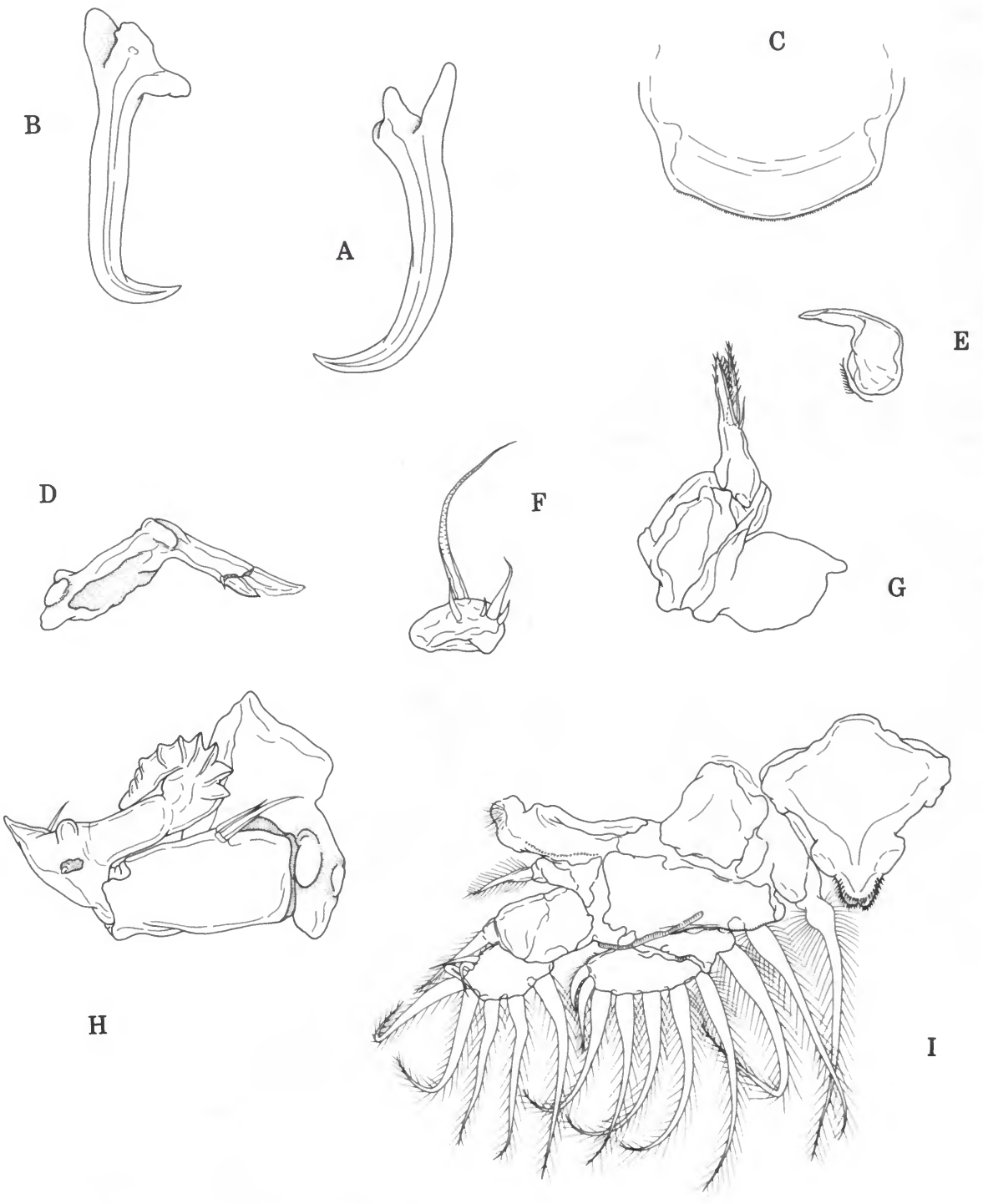

FIGURE 2.—*Taeniacanthus acanthocepolae* Yamaguti, female: A, postantennal process, ventral; B, same, ventral; C, labrum, ventral; D, mandible, anteromedial; E, paragnath, ventral; F, first maxilla, posterior; G, second maxilla, posteroventral; H, maxilliped, ventromedial; I, leg 1 and interpodal plate, ventral.

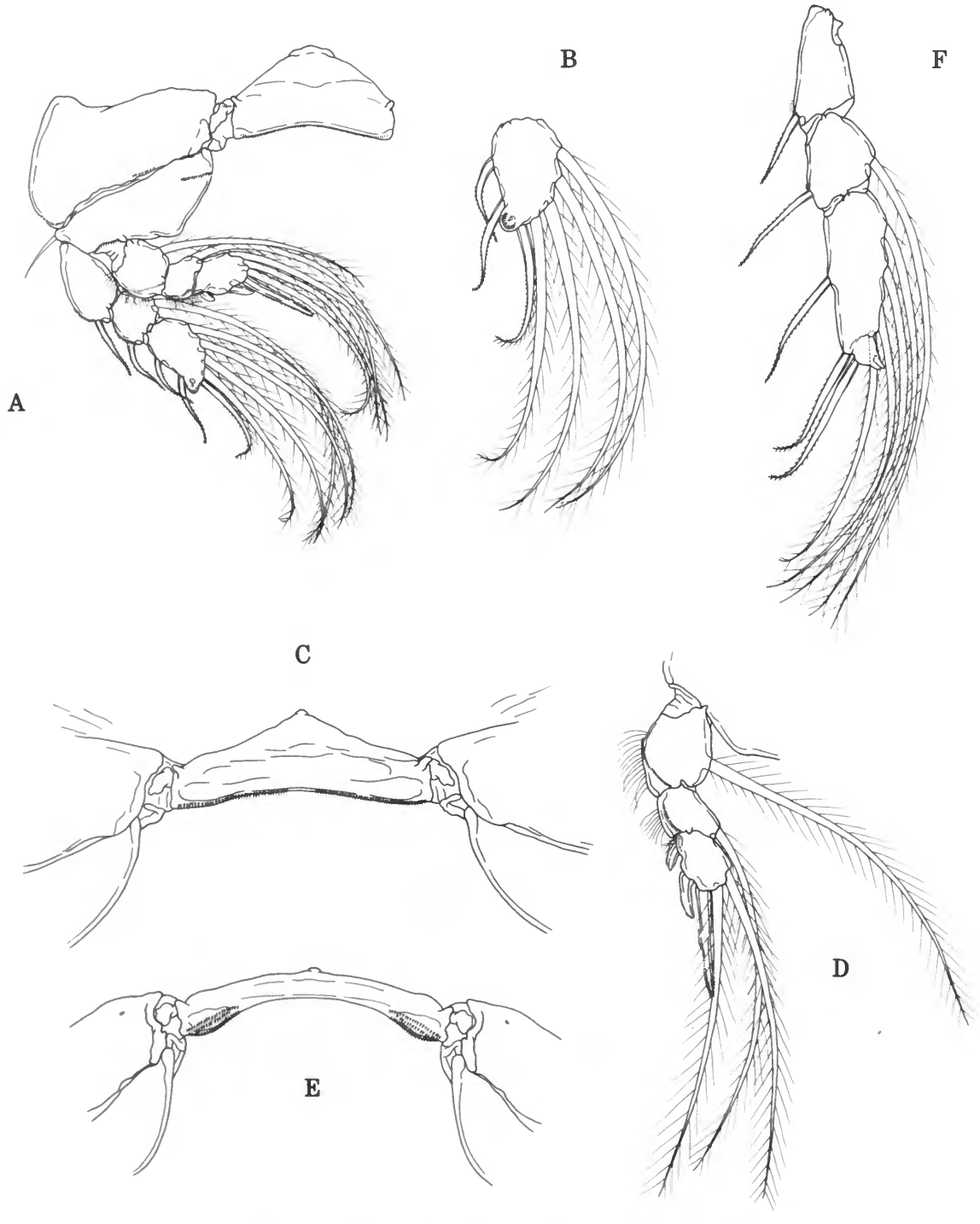

FIGURE 3.—*Taeniacanthus acanthocepolae* Yamaguti, female: A, leg 2 and interpodal plate, ventral; B, leg 2, terminal exopod segment, ventral; C, leg 3, interpodal plate and proximal portions of basipods, ventral; D, leg 3 endopod, ventral; E, leg 4 interpodal plate and proximal portions of basipods, ventral; F, leg 4 exopod, ventral.

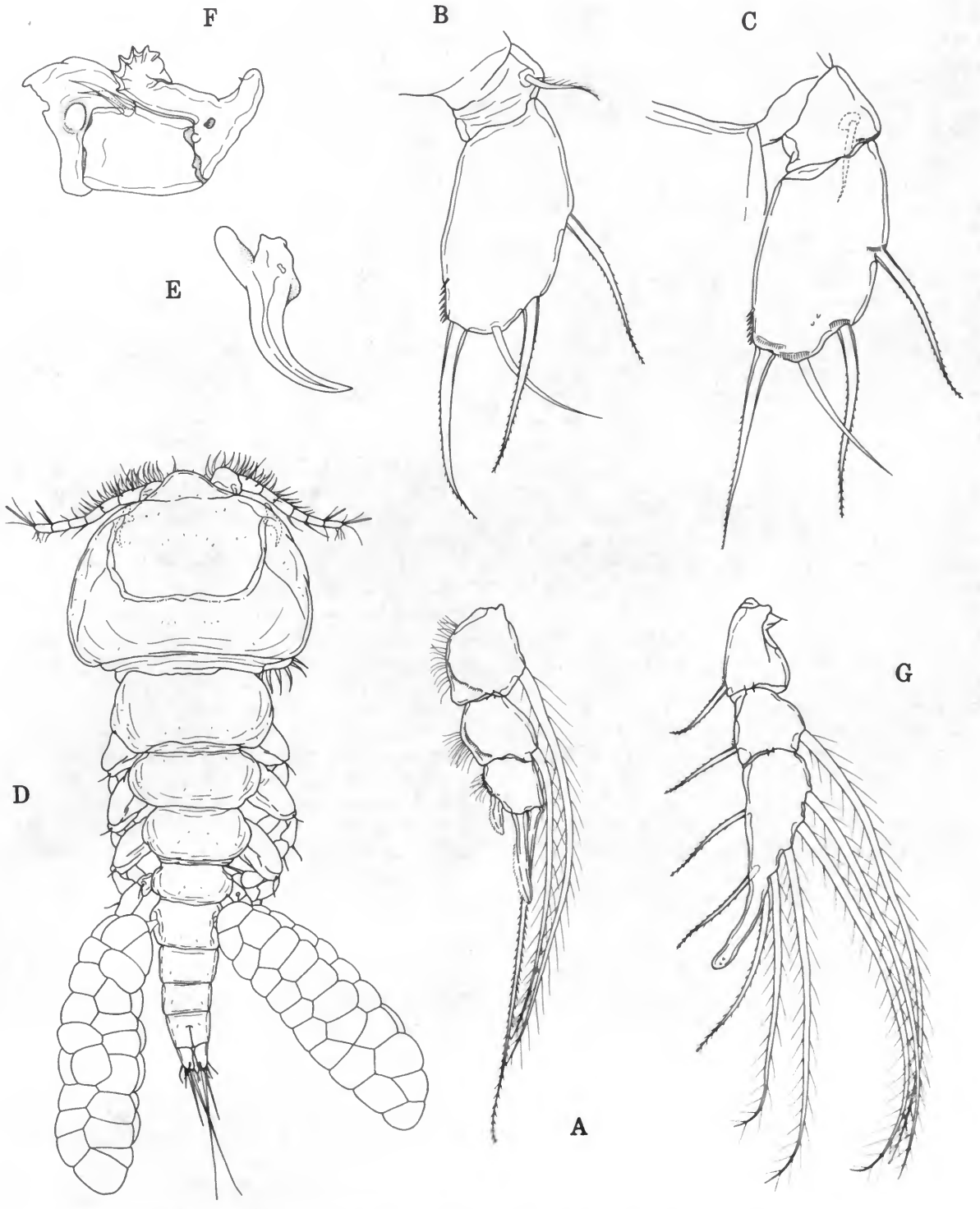

FIGURE 4.—*Taeniacanthus acanthocepolae* Yamaguti. Female: A, leg 4 endopod, ventral; B, leg 5, dorsal; C, same, ventral. Female variant: D, dorsal; E, postantennal process, ventral; F, maxilliped, ventromedial; G, leg 4 exopod, ventral.

ment with ventral row of spinules and 1 semipinnate dorsal seta; second segment, 63 × 32 μm (l × 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 × 331 μm (l × w), and thoracic segments bearing legs 2, 3, and 4 decreasing in width posteriorly. Postantennal process (Figure 4E) with slightly different shape and 56 μm 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 acanthocepolae* 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. cynoglossi* (Rangnekar and Murti, 1960); *T. moa* (Lewis, 1967); *T. pectinatus* Yamaguti and Yamasu, 1959; and *T. ostracionis* (Richiardi, 1870). *Taeniacanthus acanthocepolae* can be distinguished from these four species by the features of the maxilliped claw of the female. Another unusual feature of *T. acanthocepolae* 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. acanthocepolae*.

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

Taeniacanthus aluteri (Avdeev, 1977), new combination

FIGURES 5–9

Anchistrotos aluteri Avdeev, 1977:132.

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 × 547 μm, comprising about ¼–⅓ 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 × 179 μm. Abdomen 4-segmented; segments from anterior to posterior 78 × 120 μm, 74 × 106 μm, 60 × 101 μm, and 78 × 97 μm (l × w); anal segment with 3 rows of stout spinules on each side of anteroventral surface and 1 row near insertion of each caudal ramus. Caudal ramus (Figure 5D) almost as long as wide, 58 × 60 μm, and bearing 4 subterminal setae (outer pinnate seta 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 seta 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 rows of spinules and 2 bristled spines 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 larger 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:

P_1	coxa 0-1	basis I-1	exopod I-0; 9 endopod 0-1; 7
P_2	coxa 0-0	basis I-0	exopod I-0; I-1; II, I, 4 endopod 0-1; 0-1; II, I, 3
P_3	coxa 0-0	basis I-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-1; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 4 endopod 0-1; 0-1; II, int.

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

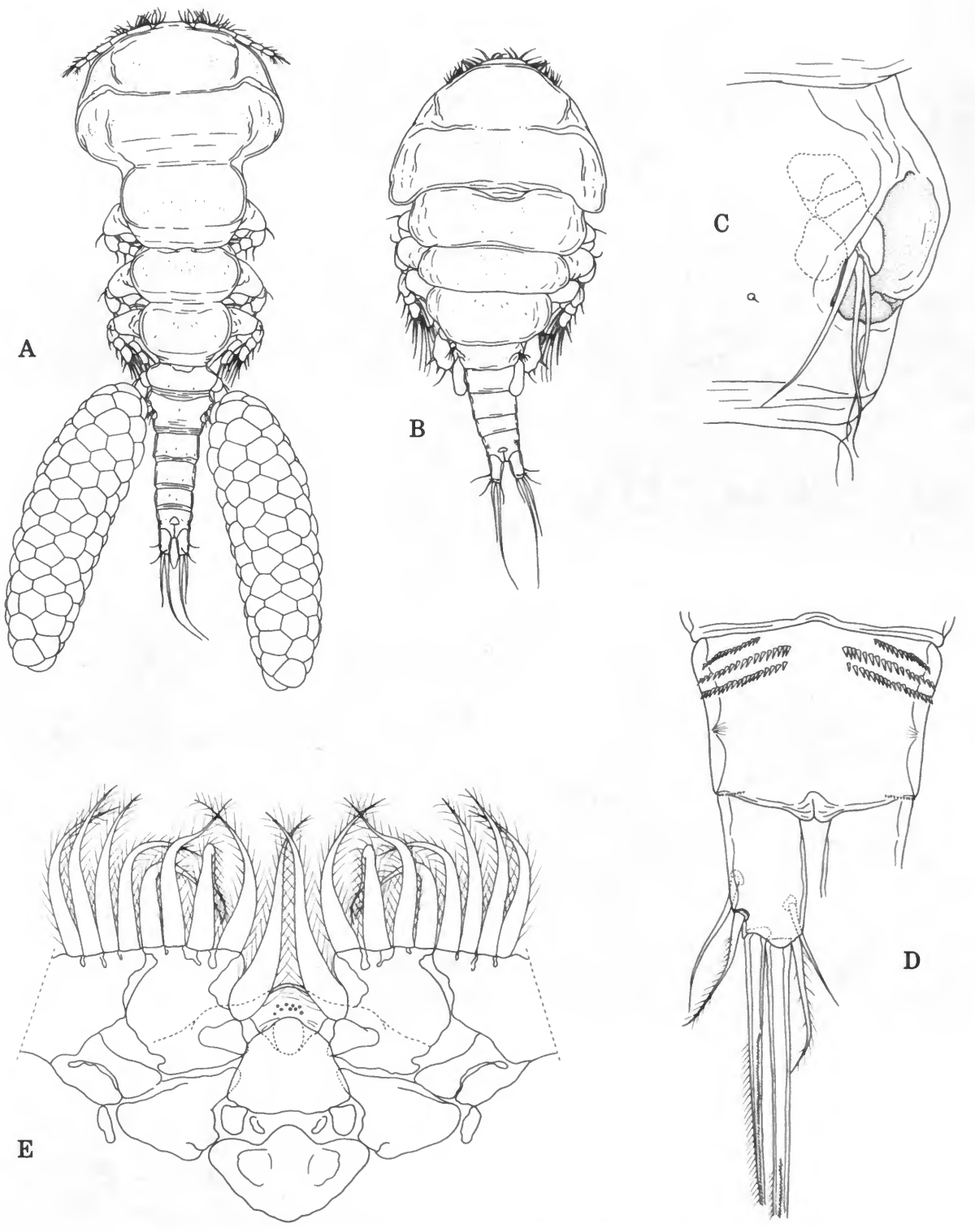

FIGURE 5.—*Taeniacanthus aluteri* (Avdeev), female: A, dorsal; B, dorsal; C, genital area, dorsal; D, anal segment and caudal ramus, ventral; E, rostral area, ventral.

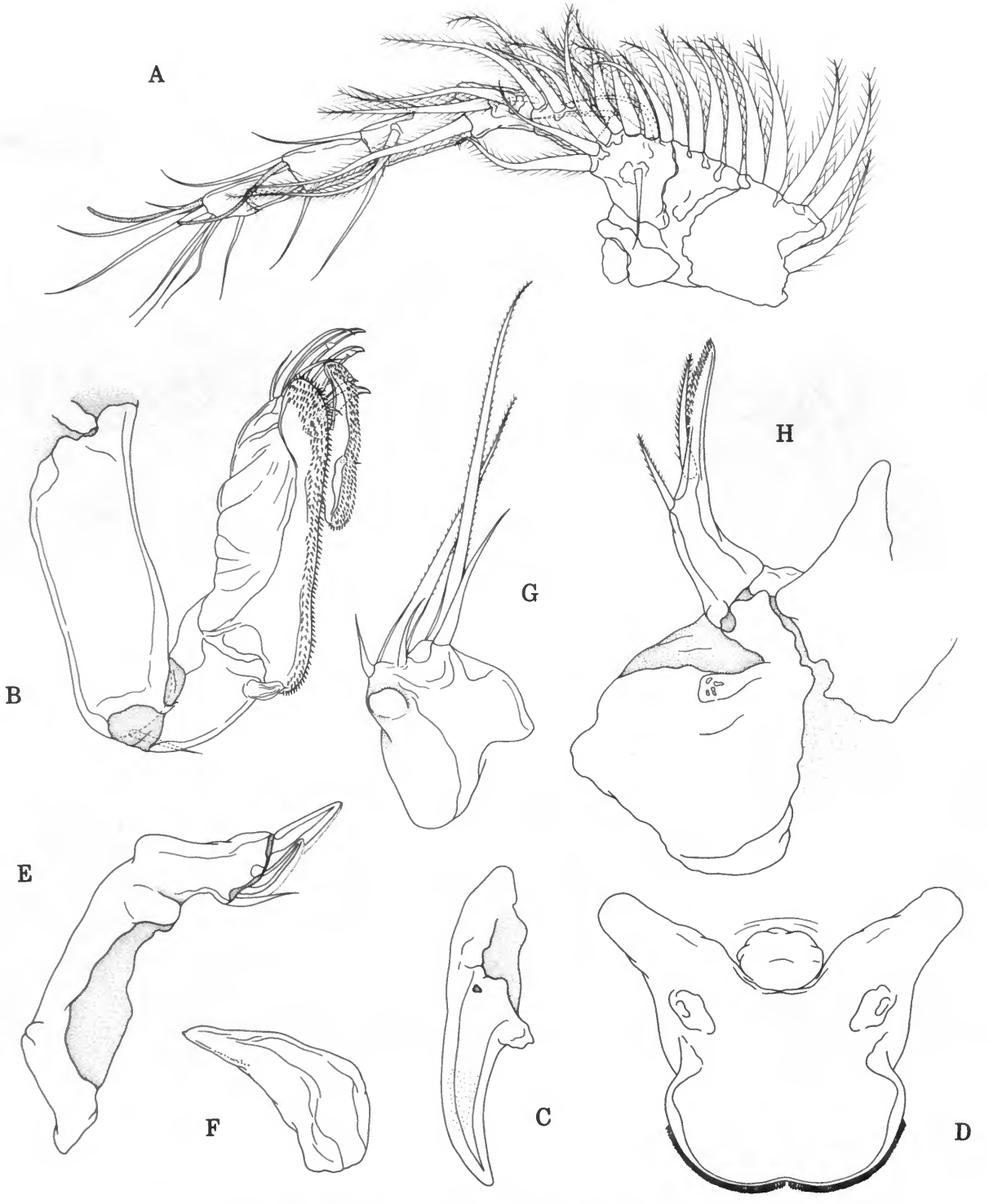

FIGURE 6.—*Taeniacanthus aluteri* (Avdeev), female: A, first antenna, ventral; B, second antenna, medial; C, postantennal process, ventrolateral; D, labrum, ventral; E, mandible, anteromedial; F, paragnath, ventral; G, first maxilla, anterior; H, second maxilla, posteroventral.

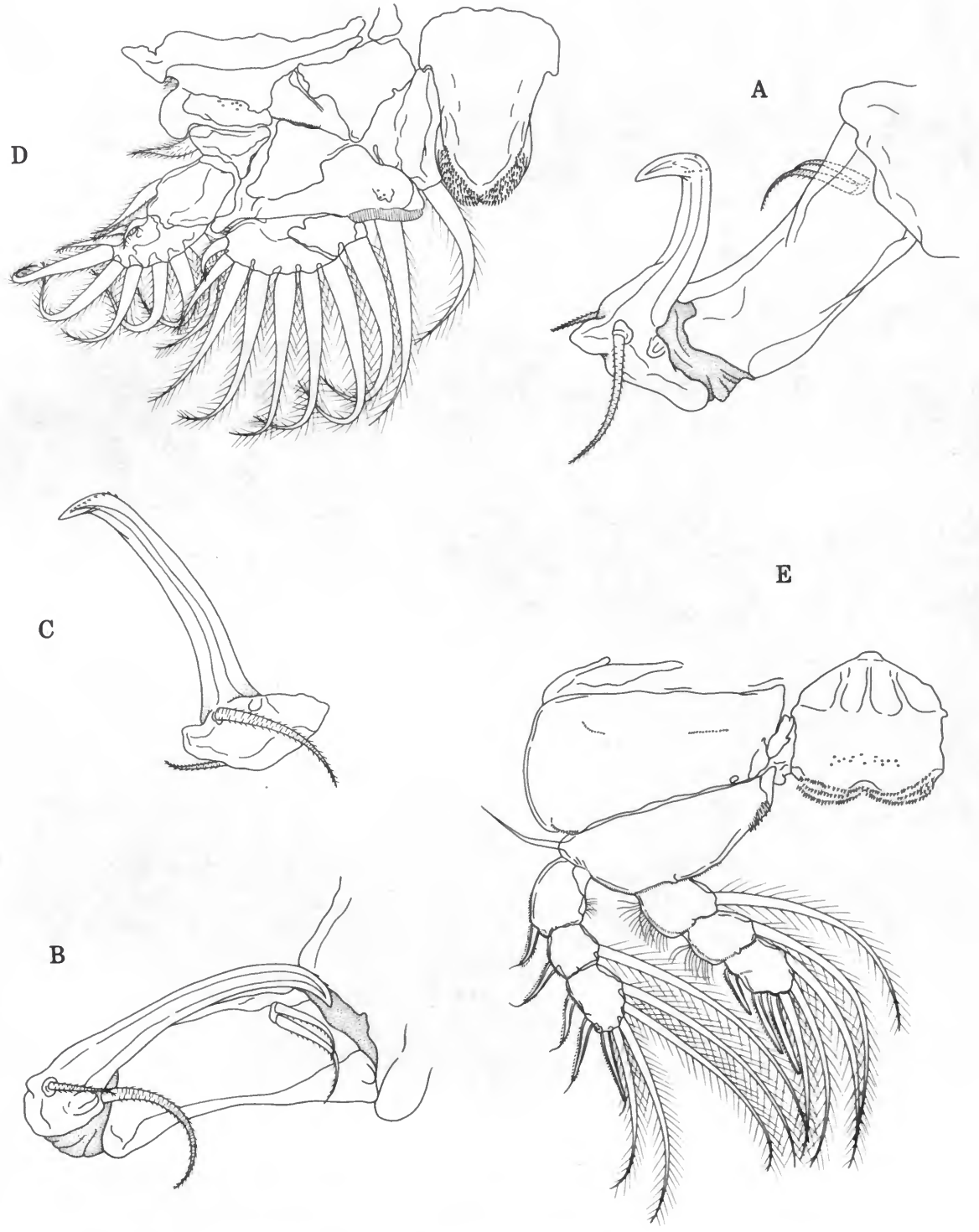

FIGURE 7.—*Taeniacanthus aluteri* (Avdeev), female: A, maxilliped, anteroventral; B, same, anteromedial; C, maxilliped claw, anterior; D, leg 1 and interpodal plate, ventral; E, leg 2 and interpodal plate, ventral.

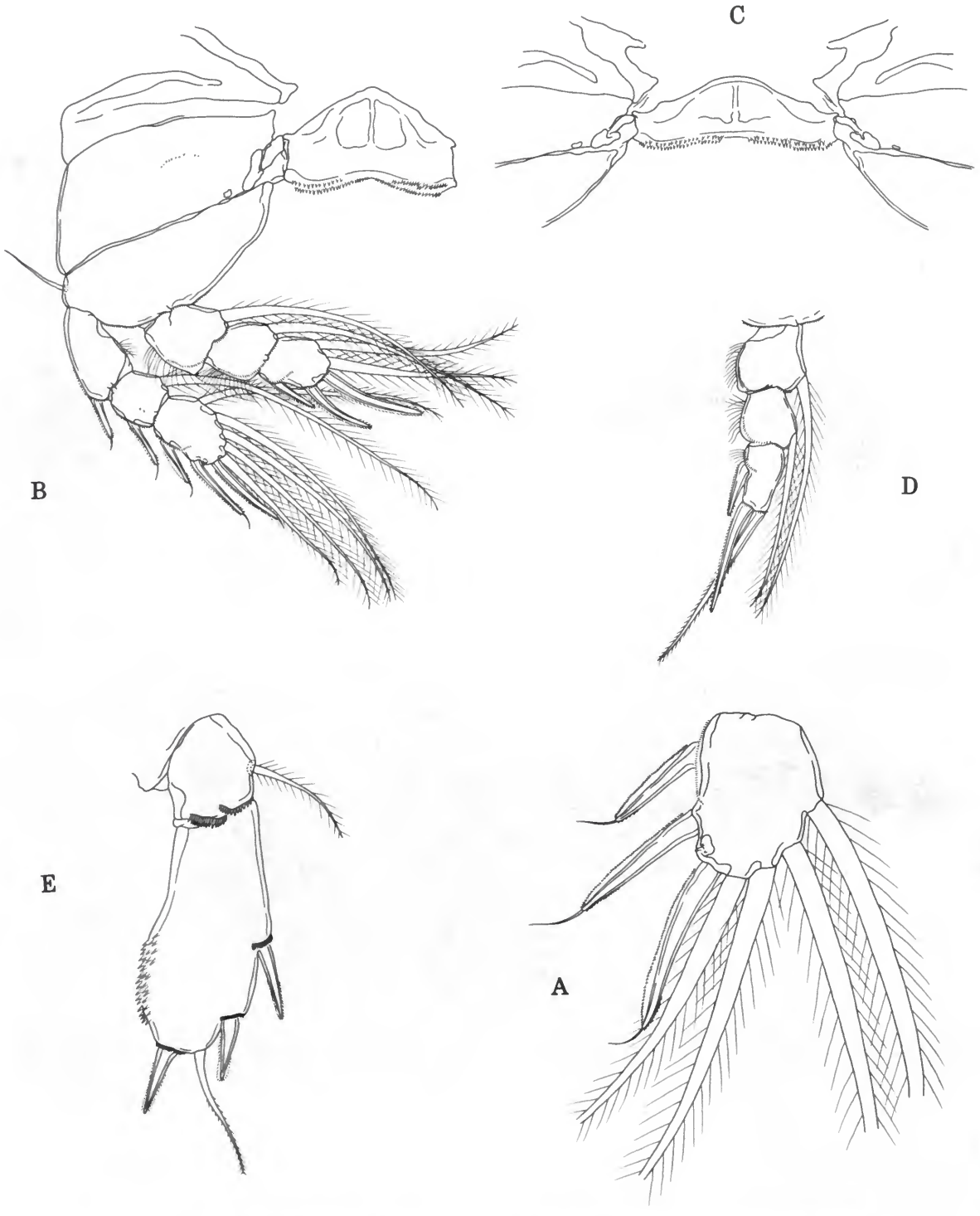

FIGURE 8.—*Taeniacanthus aluteri* (Avdeev), female: A, leg 2, terminal exopod segment, ventral; B, leg 3 and interpodal plate, ventral; C, leg 4, interpodal plate and proximal portions of basipods, ventral; D, leg 4 endopod, ventral; E, leg 5, ventral.

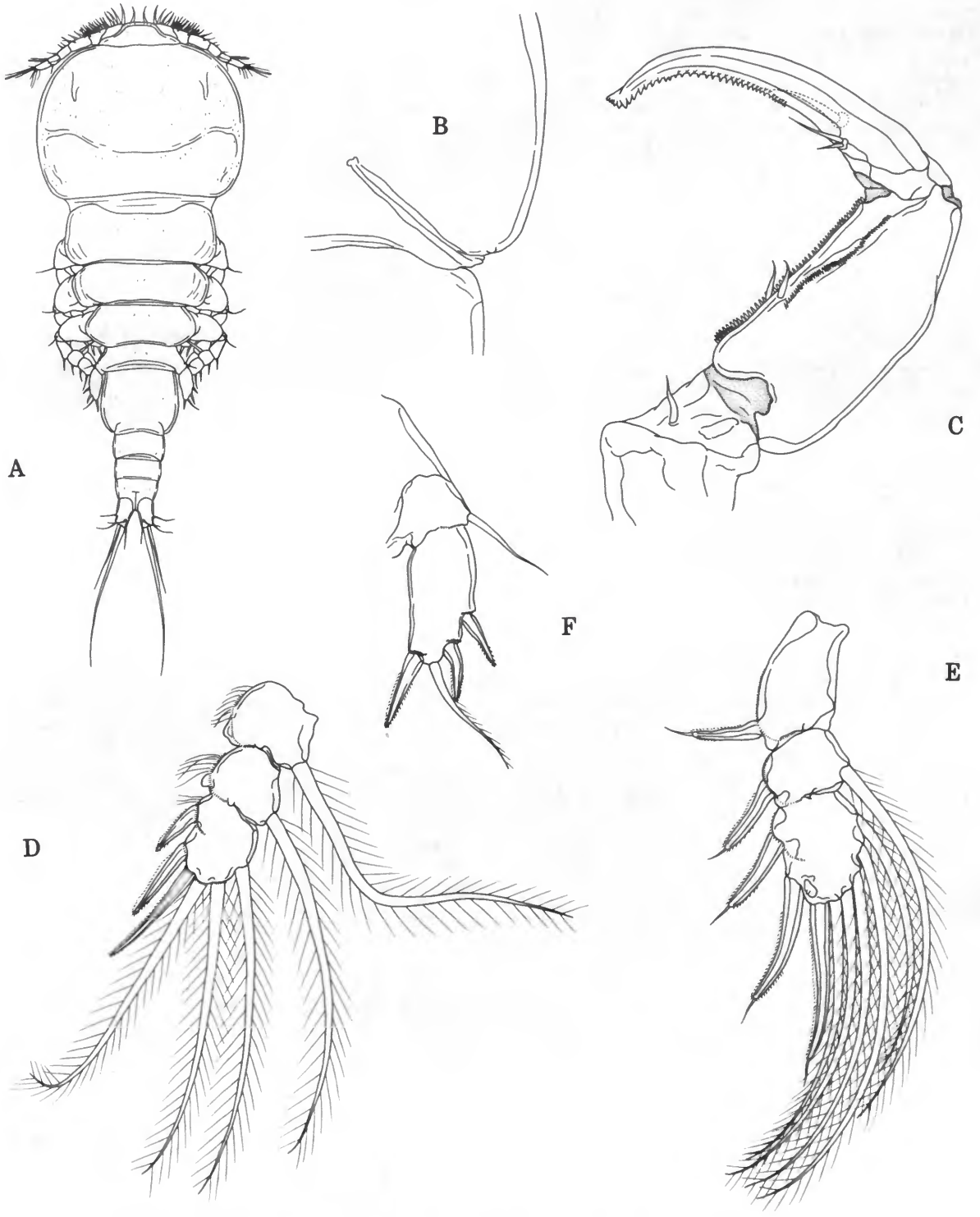

FIGURE 9.—*Taeniacanthus aluteri* (Avdeev), male: A, dorsal; B, genital area, ventral; C, maxilliped, anterior; D, leg 2 endopod, ventral; E, leg 3 exopod, ventral; F, leg 5, ventral.

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 spinules 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 posteroventral border; second segment 104 × 46 μm (l × 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 × 276 μm, comprising about 30% of total length. Genital complex (Figure 9B) wider than long, 85 × 106 μm. Abdomen 3-segmented; segments from anterior to posterior 35 × 69 μm, 25 × 62 μm, and 48 × 55 μm (l × w); anal segment with spinules as in female. Caudal ramus 34 × 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 × 18 μm (l × 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. glomerosus*, 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, 1963).

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

FIGURES 10–12

Irodes anguillaris Devi and Shyamasundari, 1980:197.

MATERIAL EXAMINED.—From *Plotosus 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 × 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 × 193 μm. Abdomen 4-segmented; segments from anterior to posterior, 51 × 138 μm, 46 × 115 μm, 30 × 99 μm, and 81 × 90 μm (l × 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 × 23 μm, bearing 6 setae.

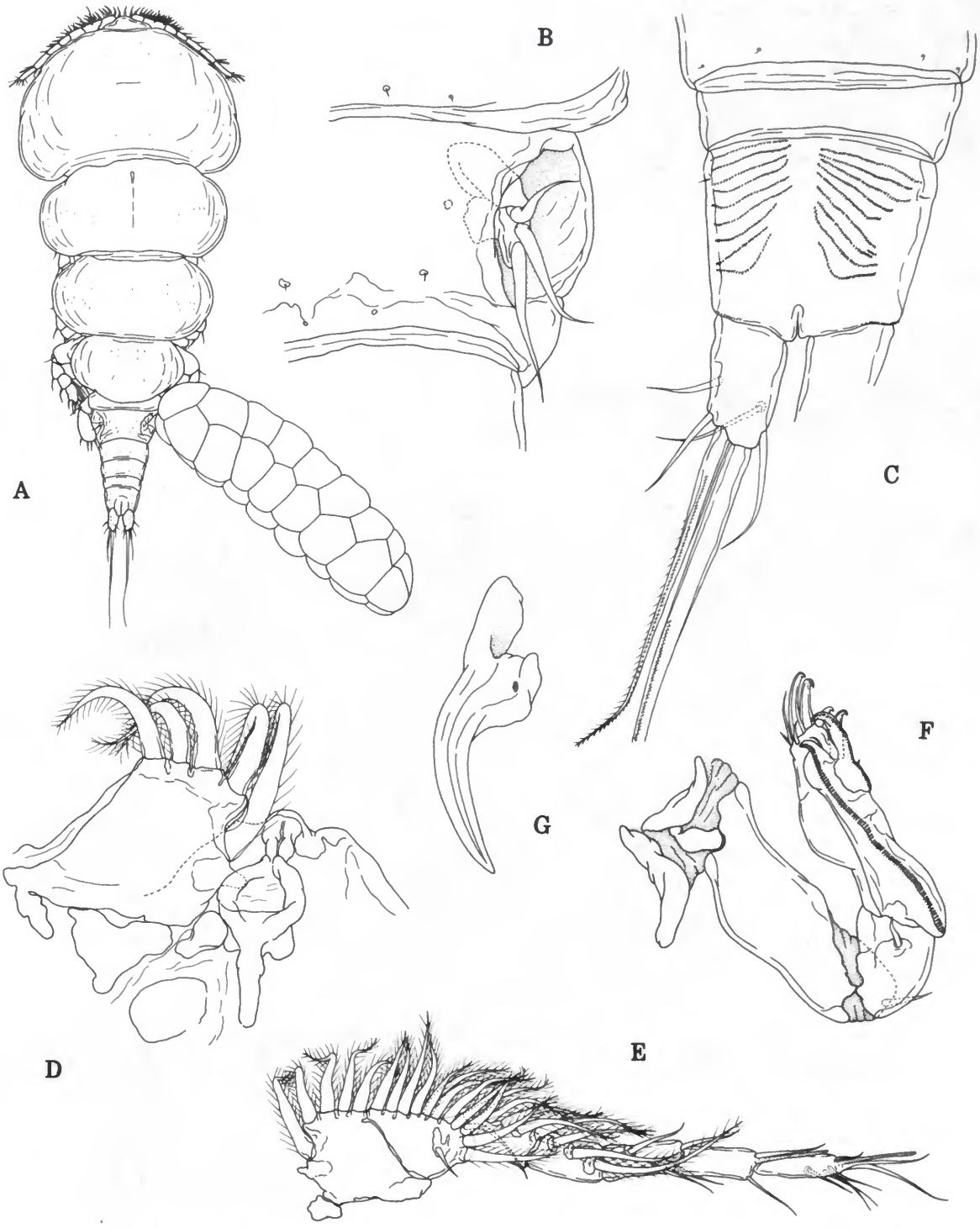

FIGURE 10.—*Taeniacanthus anguillaris* (Devi and Shyamasundari), female: A, dorsal; B, genital area, dorsal; C, anal segment and caudal ramus, ventral; D, rostral area and proximal portion of first antenna, ventral; E, first antenna, ventral; F, second antenna, medial; G, postantennal process, ventral.

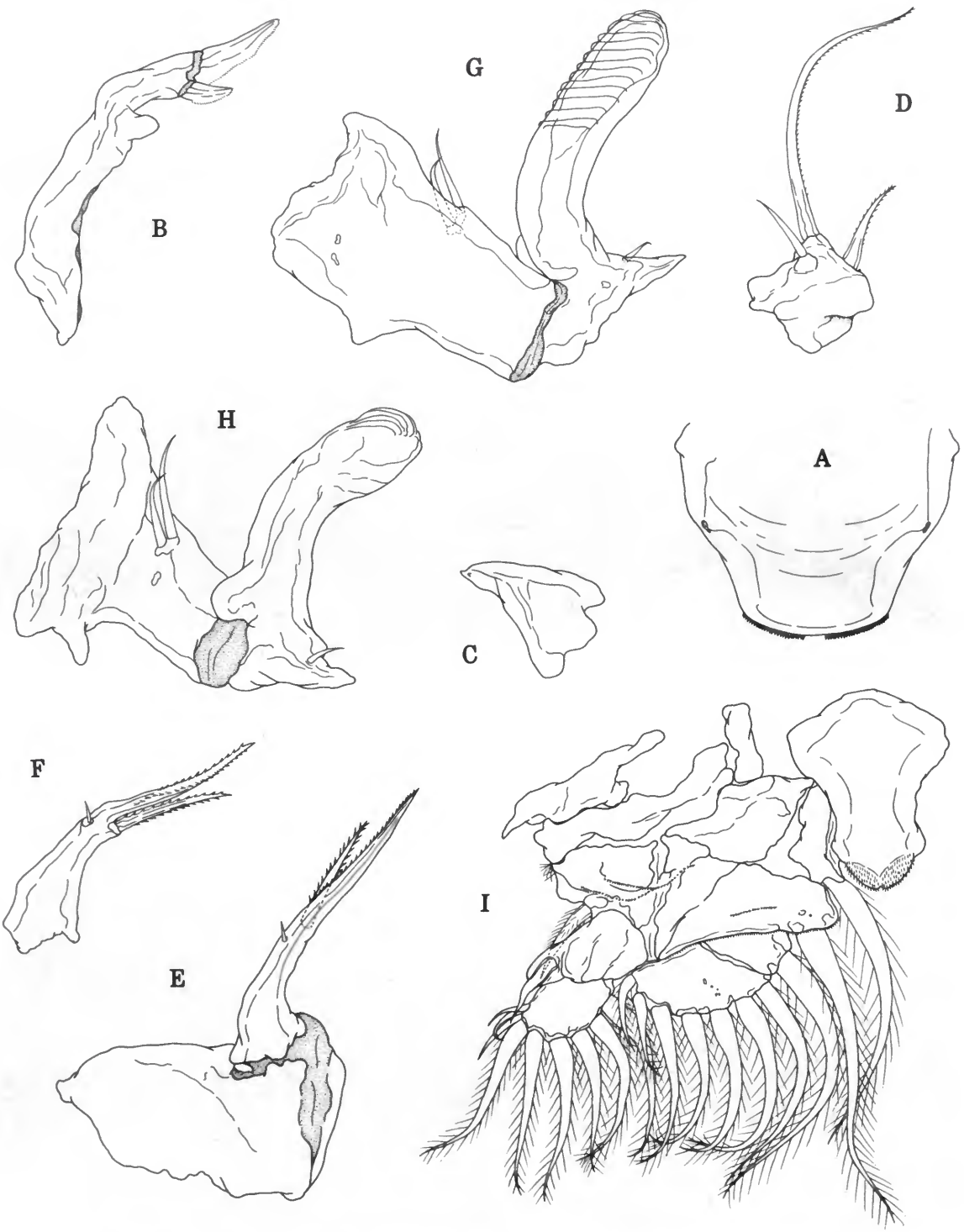

FIGURE 11.—*Taeniacanthus anguillaris* (Devi and Shyamasundari), female: A, labrum, ventral; B, mandible, anteromedial; C, paragnath, dorsomedial; D, first maxilla, anterior; E, second maxilla, posteroventral; F, second maxilla, terminal segment, ventrolateral; G, maxilliped, dorsomedial; H, same, ventrolateral; I, leg 1 and interpodal plate, ventral.

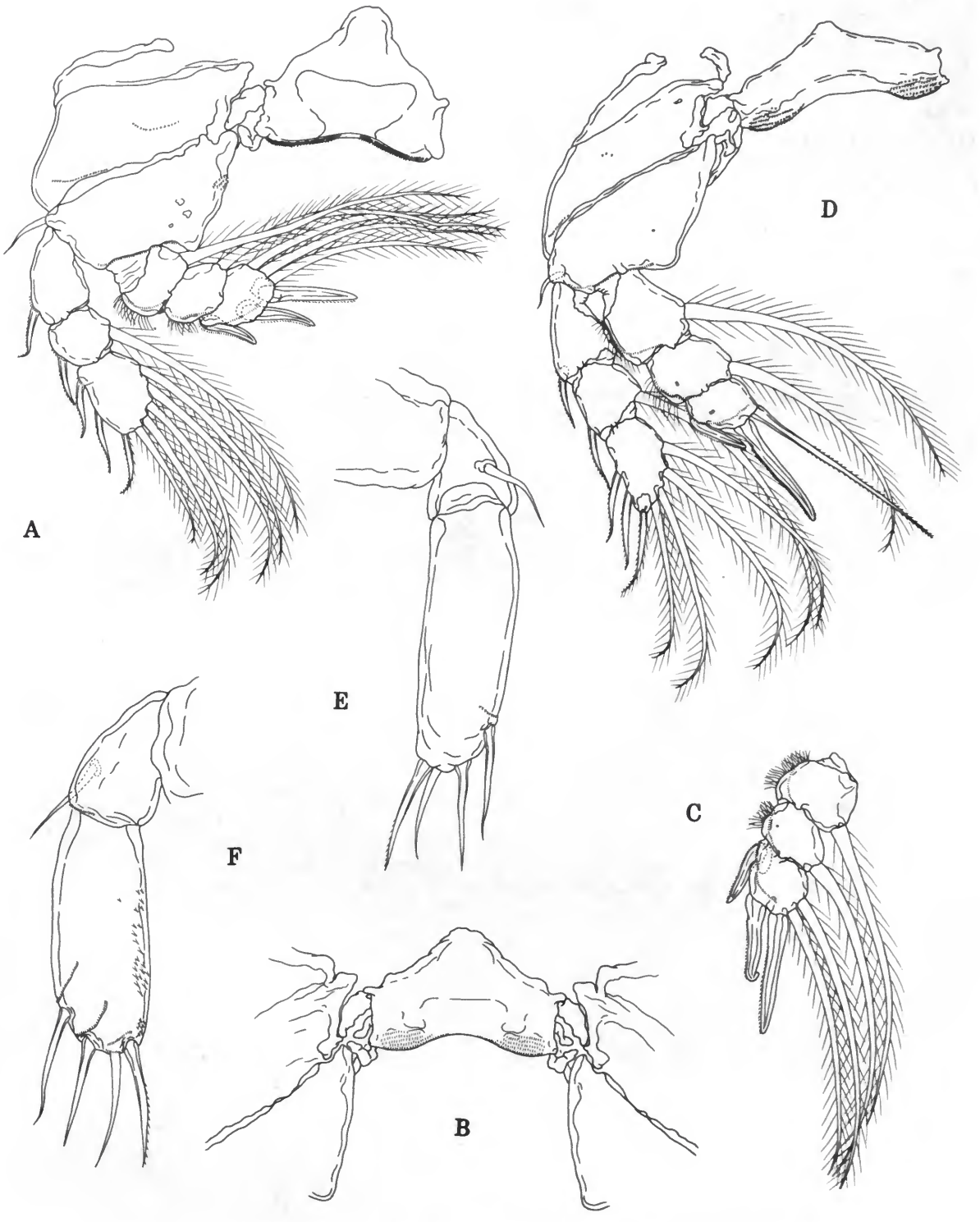

FIGURE 12.—*Taeniacanthus anguillaris* (Devi and Shyamasundari), female: A, leg 2 and interpodal plate, ventral; B, leg 3 interpodal plate and proximal portions of basipods, ventral; C, leg 3 endopod, ventral; D, leg 4 and interpodal plate, ventral; E, leg 5, dorsal; F, same, ventral.

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 subterminal seta. Postantennal 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 ⅔ claw length and extending to tip.

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

P_1	coxa 0-1	basis 1-1	exopod I-0; 9 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-1; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-1; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 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 spinules on posterior margin. Interpodal plates of legs 3 and 4 wider than long, each with patch of spinules on posterolateral corners. Coxae and bases of legs with rows of spinules as in figures. Leg 2 with small patch of spinules on inner margin of basis; this patch absent in legs 3 and 4 (compare Figure 12A with Figure 12B and 12D). 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 spinules; second segment with spinules 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 spinules at bases. Leg 6 (Figure 10B) 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 *Irodes 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 13–16

Eucanthus balistae Claus, 1864:378.—Richiardi, 1880:148.—Carus, 1885:353.—Brian, 1906:25.

Anchistrotos balistae.—Wilson, 1911:392.—Rose and Vaissière, 1952:172.—Kabata, 1979:74.

Taeniacanthus balistae.—Yamaguti, 1963:20.

Taeniacanthus longichela Yamaguti and Yamasu, 1959:99.—Shiino, 1960:507.—Yamaguti, 1963:21.—Kabata, 1979:78. [New synonymy.]

MATERIAL EXAMINED.—5 females (2 collections) from *Stephanolepis hispidus* (Linnaeus) from Charlotte Harbor, Florida; 5 females from *Balistes capriscus* Gmelin from St. George's Bay, Lebanon; 16 females and 2 males from *Alutera heudelotii* Hollard from Belgium; 2 females, 2 males from *Stephanolepis setifer* from Haiti; 48 females, 7 males from *Diodon hystrix* Linnaeus from Khibek, Gulf of Elat. From *Alutera monoceros* Linnaeus: 1 female from Marivales, Philippine Islands; 3 females, 2 males from Hainan, China. From *Alutera* sp.: 12 females from Philippine Islands; 1 female from Philippine Islands; 1 couple in copula from Visayan, Philippine Islands, by Knapp and party; 3 females, 5 males, 9 immature females from Philippine Islands (11°38′20″N, 123°58′38″E) on 5–6 June 1978. Thirty-four females, 1 couple in copula from *Balistes carolinensis* Gmelin (USNM 185775) from Alabama (south of Mobile Bay). Eleven females, 1 immature female from *Balistes capriscus* Gmelin (USNM 278580) from Sidi Bou Said (Gulf of Tunis). One female from *Balistes vetula* Linnaeus from Carrie Bow Cay, Belize, November, 1984. From *Cantherhines pullus* (Ranzani): 9 females (2 collections) from Carrie Bow Cay, Belize by R.F. Cressey on 10 and 11 March 1986.

DESCRIPTION.—*Female:* Body as in Figure 13A. Total length 1.45 mm (1.28–1.72 mm) and greatest width 0.57 mm (0.49–0.68 mm) based on 4 specimens. Cephalothorax wider than long, 470 μm in length, and comprising about 30% of total body length. Thoracic segments bearing legs 2, 3, and 4 decreasing in width posteriorly. Genital complex wider than long, 118 × 218 μm. Abdomen 4-segmented; segments from anterior to posterior 65 × 177 μm, 53 × 147 μm, 35 × 141 μm, and 82 × 129 μm (l × w); anal segment (Figure 13B) with 9 rows of spinules on right side and 8 rows of spinules on left side of anteroventral surface; specimens from *Balistes capriscus* with rows of spinules on

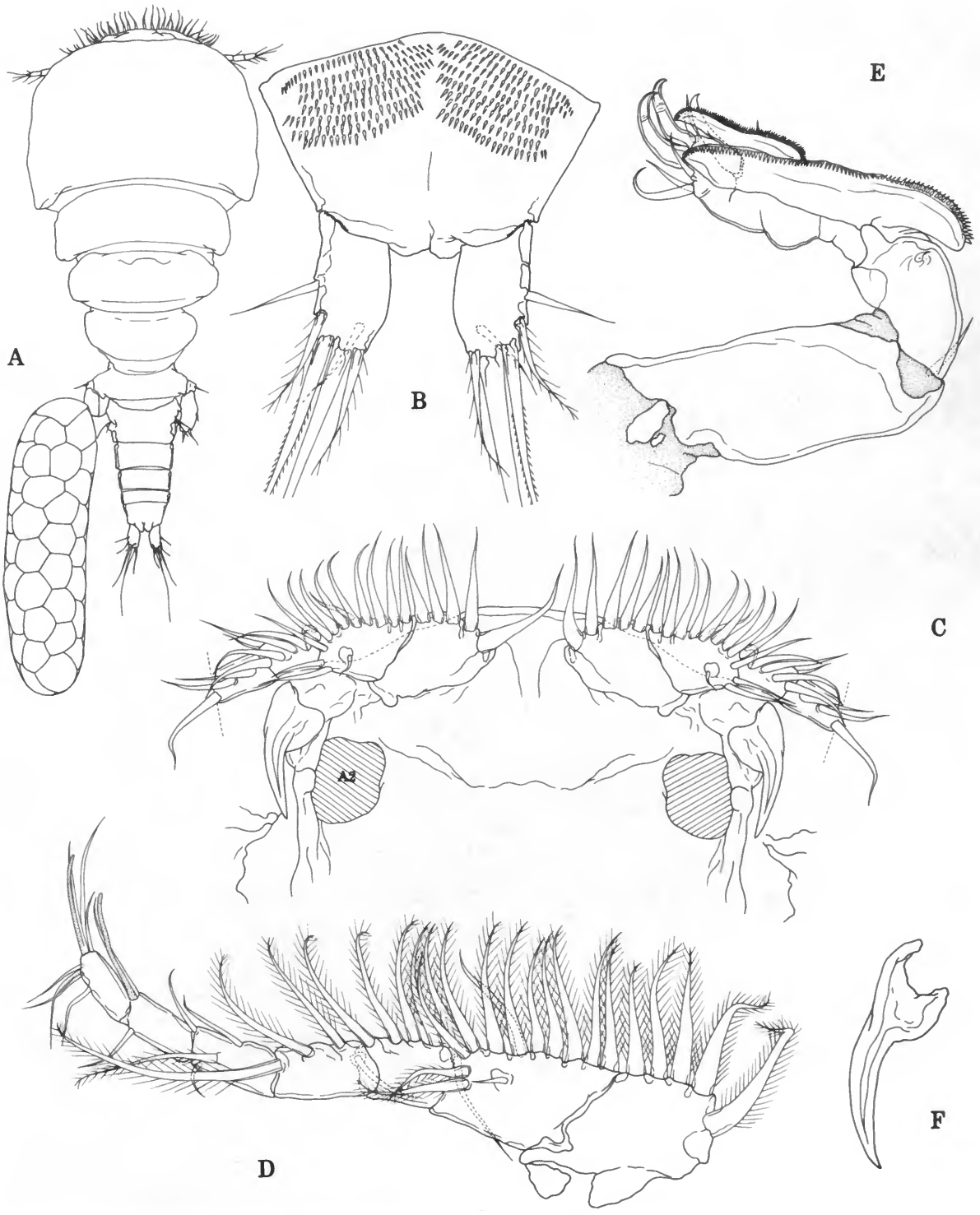

FIGURE 13.—*Taeniacanthus balistae* (Claus), female: A, dorsal; B, anal segment and caudal rami, ventral; C, rostral area, ventral; D, first antenna, anteroventral; E, second antenna, inner; F, postantennal process, ventral. (A2 = second antenna.)

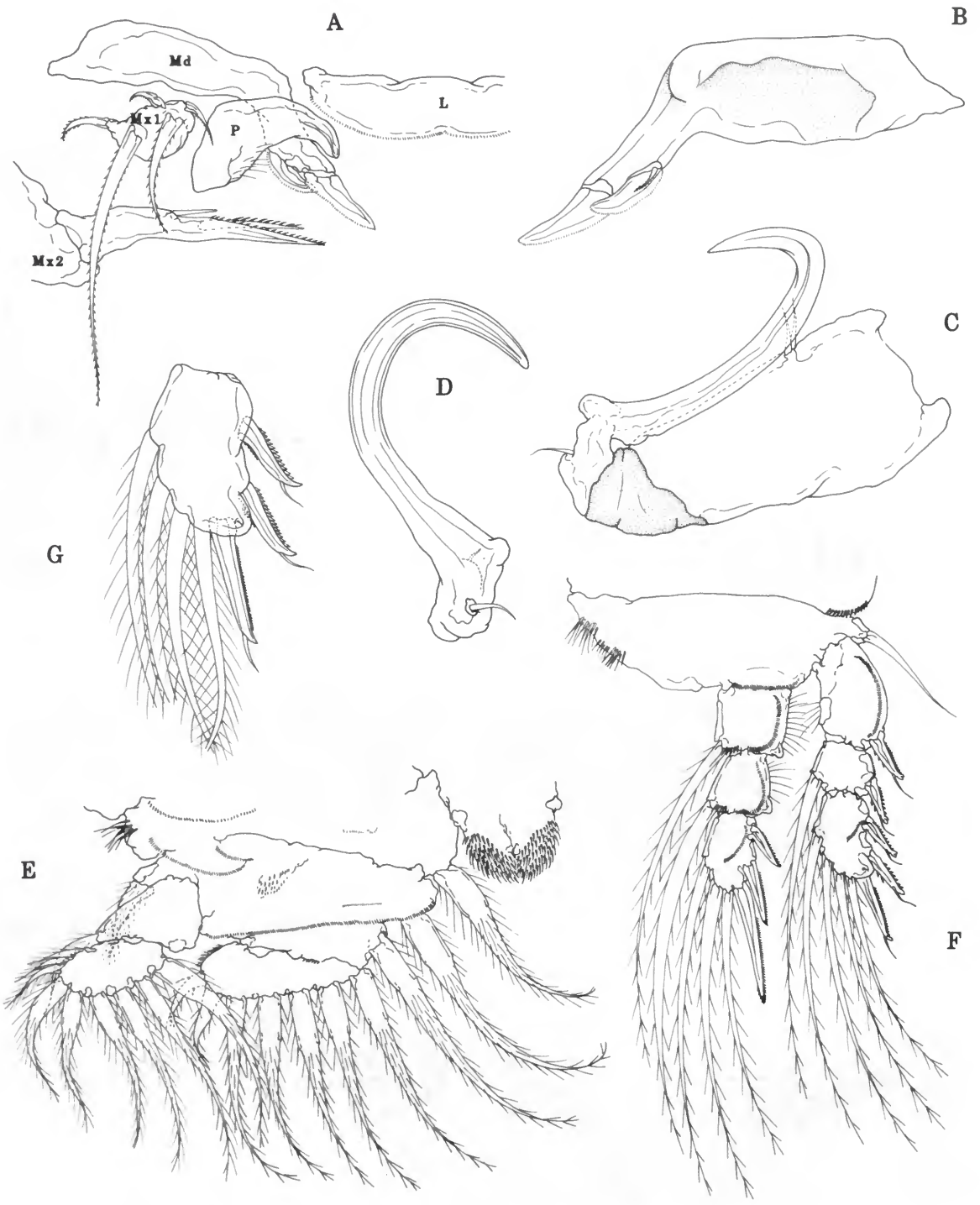

FIGURE 14.—*Taeniacanthus balistae* (Claus), female: A, oral area, ventral; B, mandible, anteromedial; C, maxilliped, ventral; D, maxilliped claw, posteroventral; E, leg 1 and interpodal plate, ventral; F, leg 2, ventral; G, leg 2, terminal exopod segment, ventral. (L = labrum, Md = mandible, P = paragnath, Mx1 = first maxilla, Mx2 = second maxilla.)

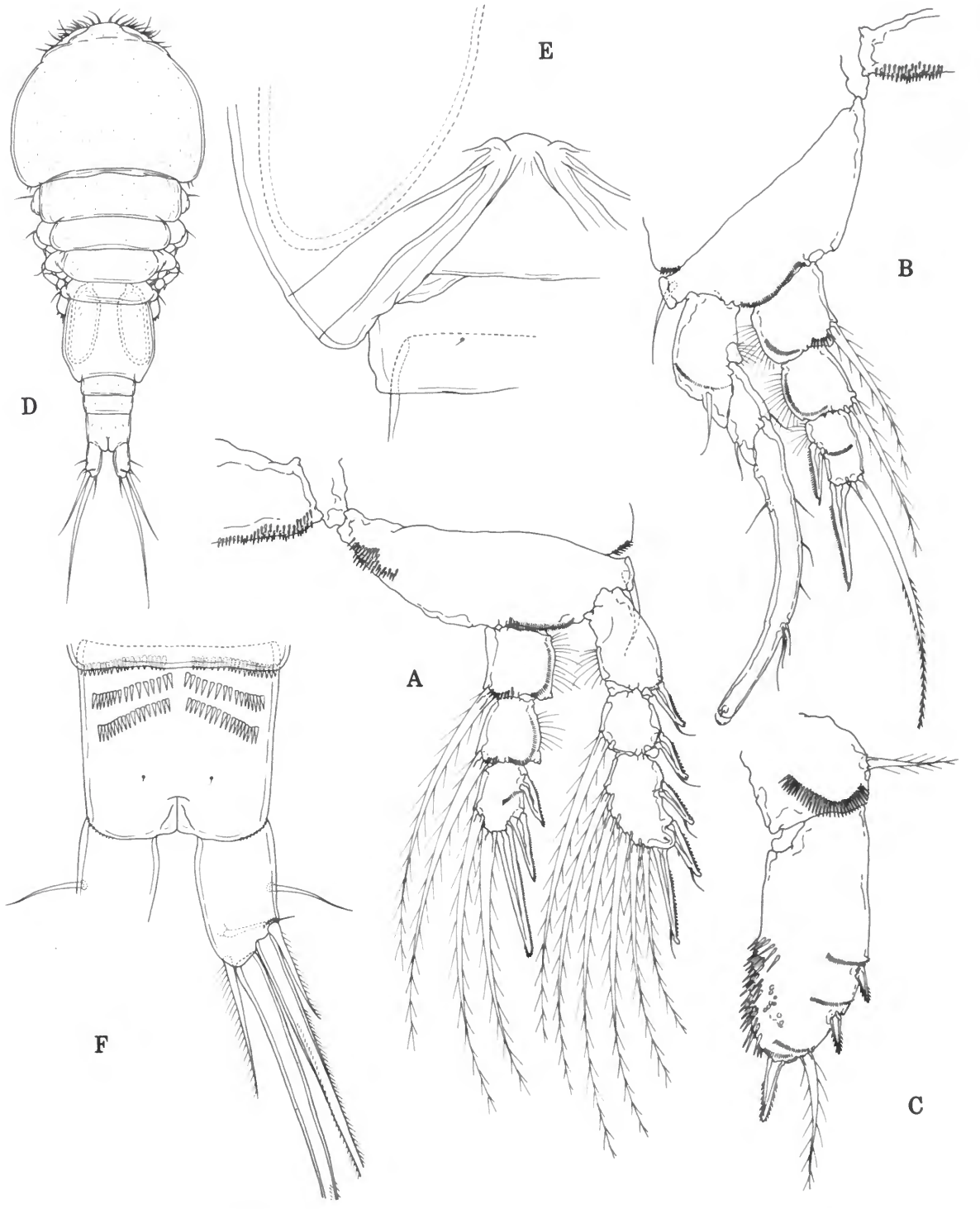

FIGURE 15.—*Taeniacanthus balistae* (Claus). Female: A, leg 3 and interpodal plate, ventral; B, leg 4 and interpodal plate, ventral; C, leg 5, ventral. Male: D, dorsal; E, genital area, ventral; F, anal segment and caudal ramus, ventral.

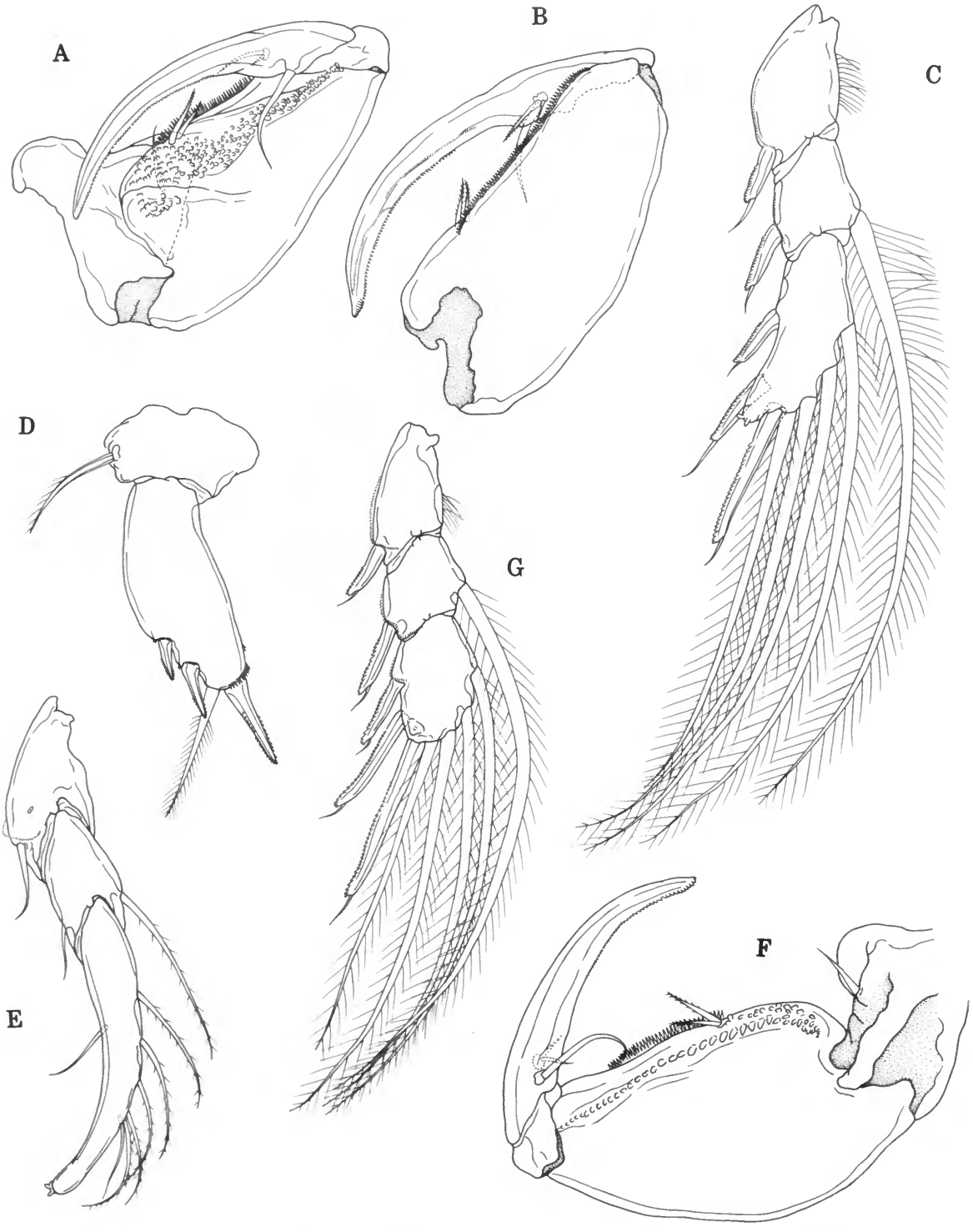

FIGURE 16.—*Taeniacanthus balistae* (Claus). Male: A, maxilliped, anterior; B, same, posterior; C, leg 4 exopod, ventral; D, leg 5, dorsolateral. Female variant: E, leg 4 exopod, ventromedial. Male variant: F, maxilliped, anterior; G, leg 4 exopod, ventral.

posteroventral edge of anal segment near insertion of caudal ramus; specimens from *Stephanolepis hispidus* lacking these spinules. Caudal ramus (Figure 13B) 2× longer than wide, 70 × 35 μm, 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 posteromedian 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 associated setule.

Legs 1–4 (Figures 14E–G, 15A,B) biramous. Spinal and setal formula as follows:

P_1	coxa 0-1	basis 1-1	exopod 1-0; 9 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, I, 4 endopod 0-1; 0-1; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, I, 5 endopod 0-1; 0-1; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; 1-1; 7 (+ 2 setiform elements at tip) endopod 0-1; 0-1; II, int.

Interpodal plates of legs 1–4 (Figures 14E, 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 3 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 spinule (see Figure 14G). Exopod spines of legs 2 (Figure 14F) and 3 (Figure 15A) coarsely serrate 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 spinules except second and third exopod segments of leg 4. Inner spinules of endopods of legs 2–4 much larger than outer spinules. 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 (0.75–0.93 mm) and greatest width 0.40 mm (0.39–0.40 mm) based on 7 specimens. Cephalothorax 308 × 396 μm, comprising about 30% of total body length. Genital complex (Figure 15E) wider than long, 168 × 182 μm. Abdomen 3-segmented; segments from anterior to posterior 34 × 108 μm; 37 × 101 μm, and 76 × 92 μm (l × 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 × 32 μm (l × w), and armed as in female; spinules 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 × 25 μm (l × 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 longichela from six females parasitic on *Cantherhines modestus* (Günther) and three females on *Alutera monoceros* (Linnaeus) collected from the Inland Sea, Japan. Shiino (1960) redescribed *T. longichela* from specimens he collected from *Cantherhines modestus* from Seto, Japan. According to the descriptions of Yamaguti and Yamasu (1959) and Shiino (1960) it appears that *T. longichela* is probably synonymous with *T. balistae*.

Our description of the male of *T. balistae* is based on specimens collected from *Diodon 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 segment 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

Taeniacanthus coelus Wilson, 1922:6; 1923:4.—Yamaguti, 1963:21.—Kabata, 1979:78.

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

Male: Unknown.

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 I-1; II, 1, 4 (all other species of *Taeniacanthus* exhibit 0-1; 0-1 or 0-2; II, 1, 2). The figure of the terminal exopod segment of leg 4 shows a II, 3 arrangement (most species of *Taeniacanthus* have II, 1, 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 × 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 × 184 μm. Abdomen 4-segmented; segments from anterior to posterior 60 × 147 μm, 46 × 120 μm, 41 × 110 μm, and 78 × 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 × 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)

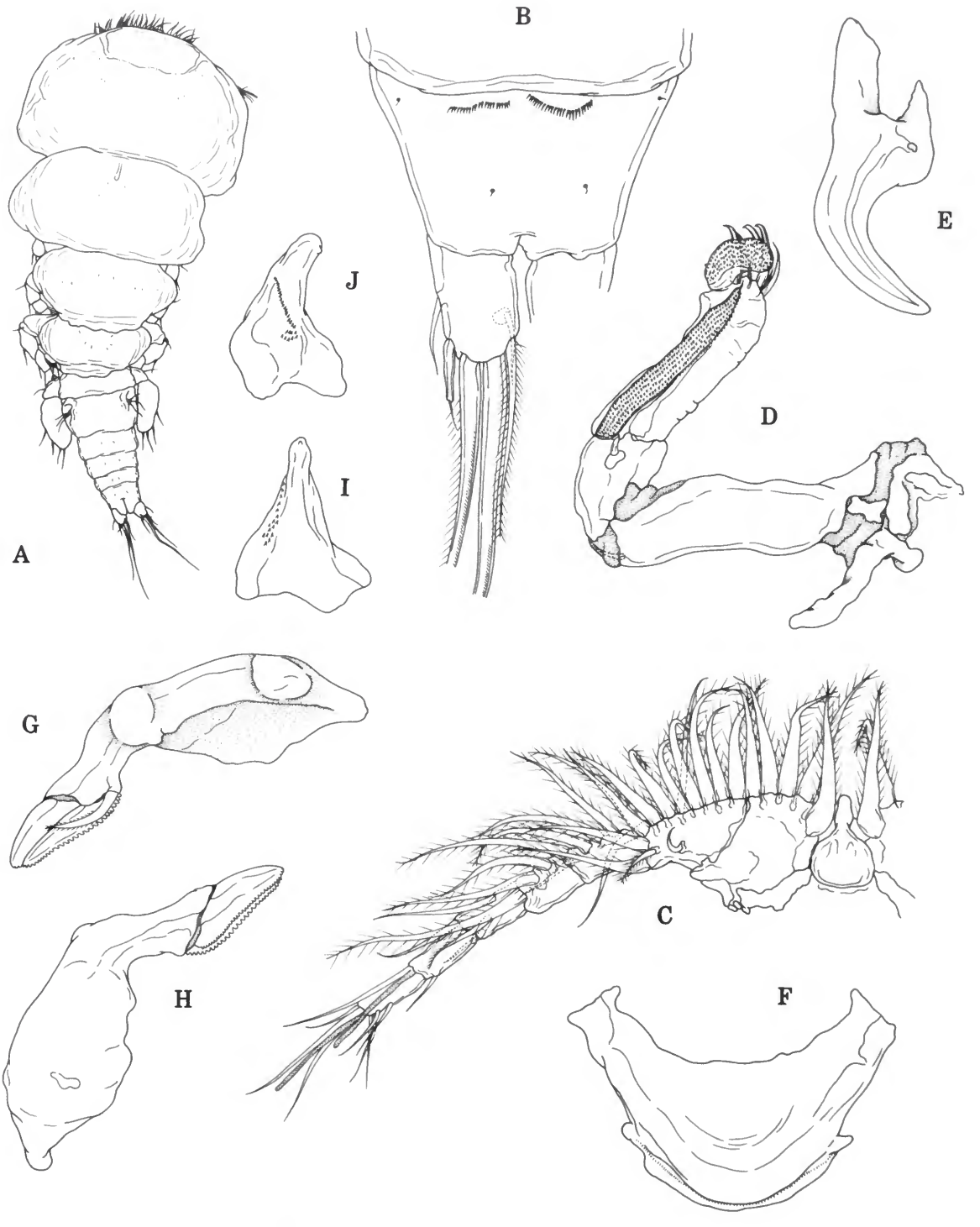

FIGURE 17.—*Taeniacanthus comparatus*, new species, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area and first antenna, ventral; D, second antenna, inner; E, postantennal process, ventral; F, labrum, ventral; G, mandible, anterior; H, same, posterior; I, paragnath, medial; J, same, anteromedial.

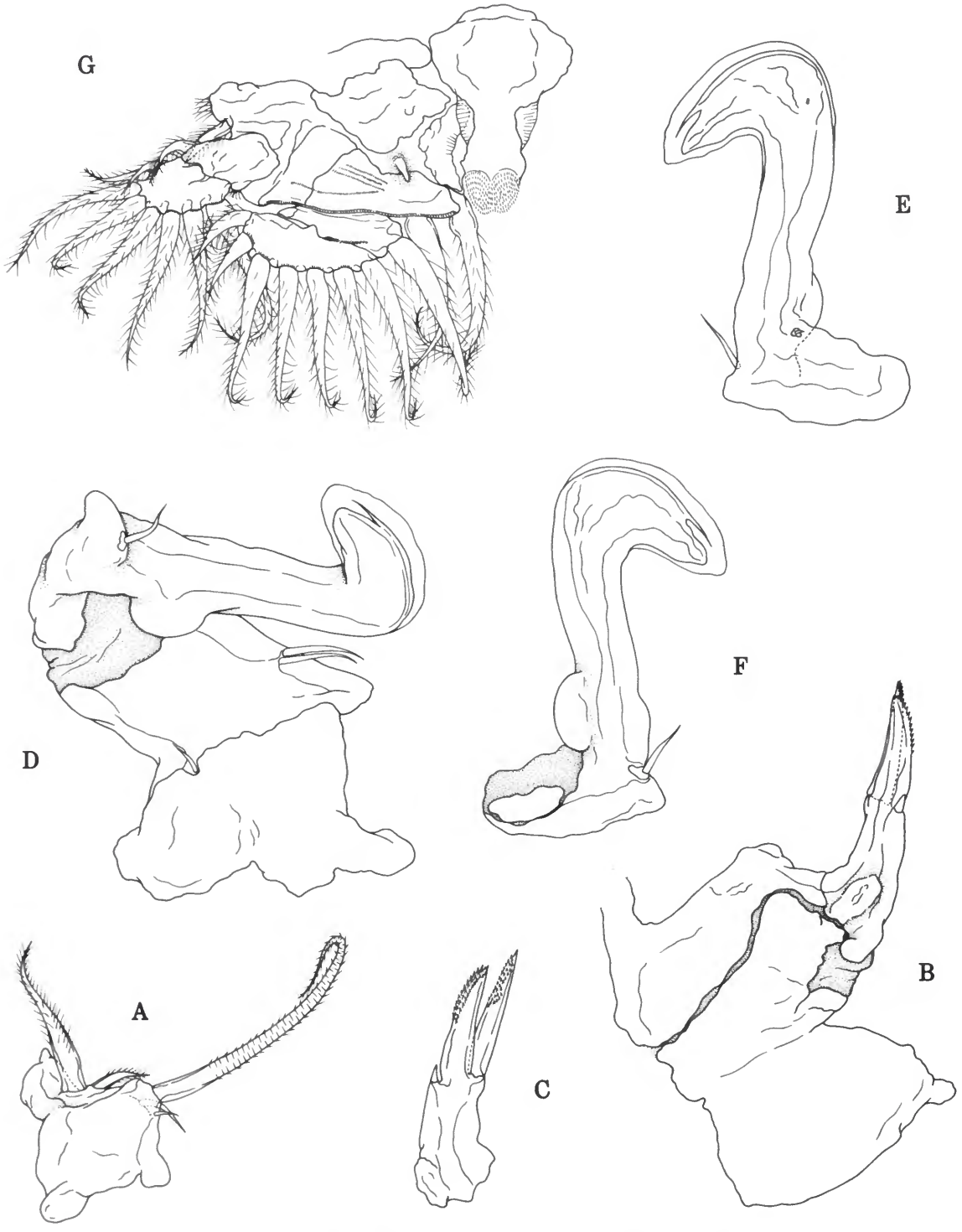

FIGURE 18.—*Taeniacanthus comparatus*, new species, female: A, first maxilla, posterior; B, second maxilla, ventral; C, second maxilla, terminal segment, ventrolateral; D, maxilliped, ventromedial; E, maxilliped claw, dorsal; F, same, ventral; G, leg 1 and interpodal plate, ventral.

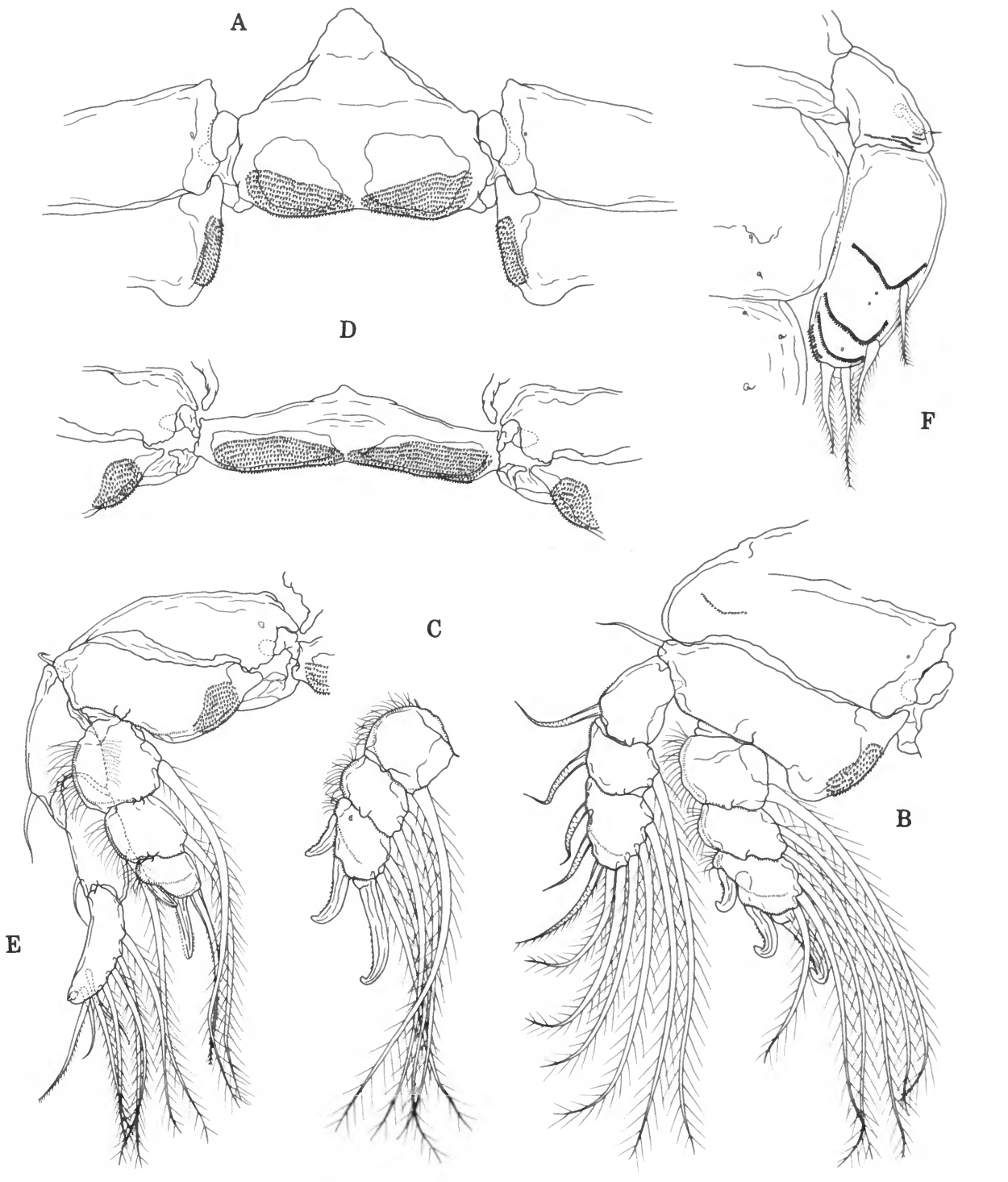

FIGURE 19.—*Taeniacanthus comparatus*, new species, female: A, leg 2, interpodal plate and proximal portions of basipods, ventral; B, leg 2, ventral; C, leg 3 endopod, ventral; D, leg 4, interpodal plate and proximal portions of basipods, ventral; E, leg 4, ventral; F, leg 5, ventral.

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:

P_1	coxa 0-1	basis 1-1	exopod 1-0; 9 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod 1-0; I-1; II, I, 5 endopod 0-1; 0-2; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod 1-0; I-1; II, I, 5 endopod 0-1; 0-2, II, I, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; 1-1; 8 (+ nipple-tipped process) endopod 0-1; 0-1; II, int.

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 19E) 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 19E). Leg 5 (Figure 19F) 2-segmented; first segment ornamented with several ventral rows of minute spinules and 1 dorsolateral seta; second segment longer than wide, 117 × 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.

Male: Unknown.

ETYMOLOGY.—The specific name *comparatus,* Latin for couple or pair, alludes to the two blades of the mandible, which are almost equal in length.

REMARKS.—The rounded process tipped with a nipple-like knob on the first maxilla is not unique to *T. comparatus.* Similar papillae are found in *T. digitatus, T. glomerosus, T. papulosus, T. pollicaris,* and *T. williamsi,* all five new species parasitic on the blenny genera *Cirripectes* and *Exallias.* The distally directed, attenuate process near the tip of the stout maxilliped claw of the female distinguishes *Taeniacanthus comparatus* from its congeners.

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

Parataeniacanthus cynoglossi Rangnekar and Murti, 1960:206.

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

Taeniacanthus dentatus Sebastian, 1964:94.—Kabata, 1979:78.

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 acanthocepolae* 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 perustus:* 1 female from Madang Harbor, off southern edge of Massas Island, Papua New Guinea, by B.B. Collette on 26 May 1970. From *Cirripectes stigmaticus* (Strasburg and Schultz): 2 females from leeward side of Lizard Island, Queensland, Australia (14°35′S, 145°36′E), on 26 November 1975; 1 female from Alite Reef off Malaita, Solomon Islands, by J.E. Randall and G.R. Allen on 24 July 1973; 1 female from Babel Lukes Reef, Belau Islands (formerly Palau Islands) (07°17′17″N, 134°30′56″E), on 19 January 1959; 5 females, 3 males from off Cape Melville, Queensland, Australia (14°56′S, 144°36′E), on 9 February 1979; 2 females from coral patches in harbor of Espiritu Santos Island, Vanuatu, by Chapman and party on 27 April 1944; 1 female from east side on outer reef of Suva Harbor entrance, Fiji, by B.A. Carlson in July 1975.

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 spinules on each side of anteroventral surface and 1 row of spinules on posteroventral margin 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.

Rostral 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:

P_1	coxa 0-1	basis 1-1	exopod 1-0; 9
			endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, I, 5
			endopod 0-1; 0-2; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, I, 5
			endopod 0-1; 0-2; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, I, 5
			endopod 0-1; 0-1; II, 1

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 spinules. 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 spinules on posterior edge and 1 dorsolateral seta; second segment slender 69 × 25 μm, with distomedial patch of spinules and 4 naked setae; setae with rows of spinules 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 spinules on each side of anteroventral 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 spinules; third segment small and unornamented; fourth segment a curved claw bearing 2 hyaline anterior setae, 1 large posterior seta, 1 proximal row of spinules 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.*

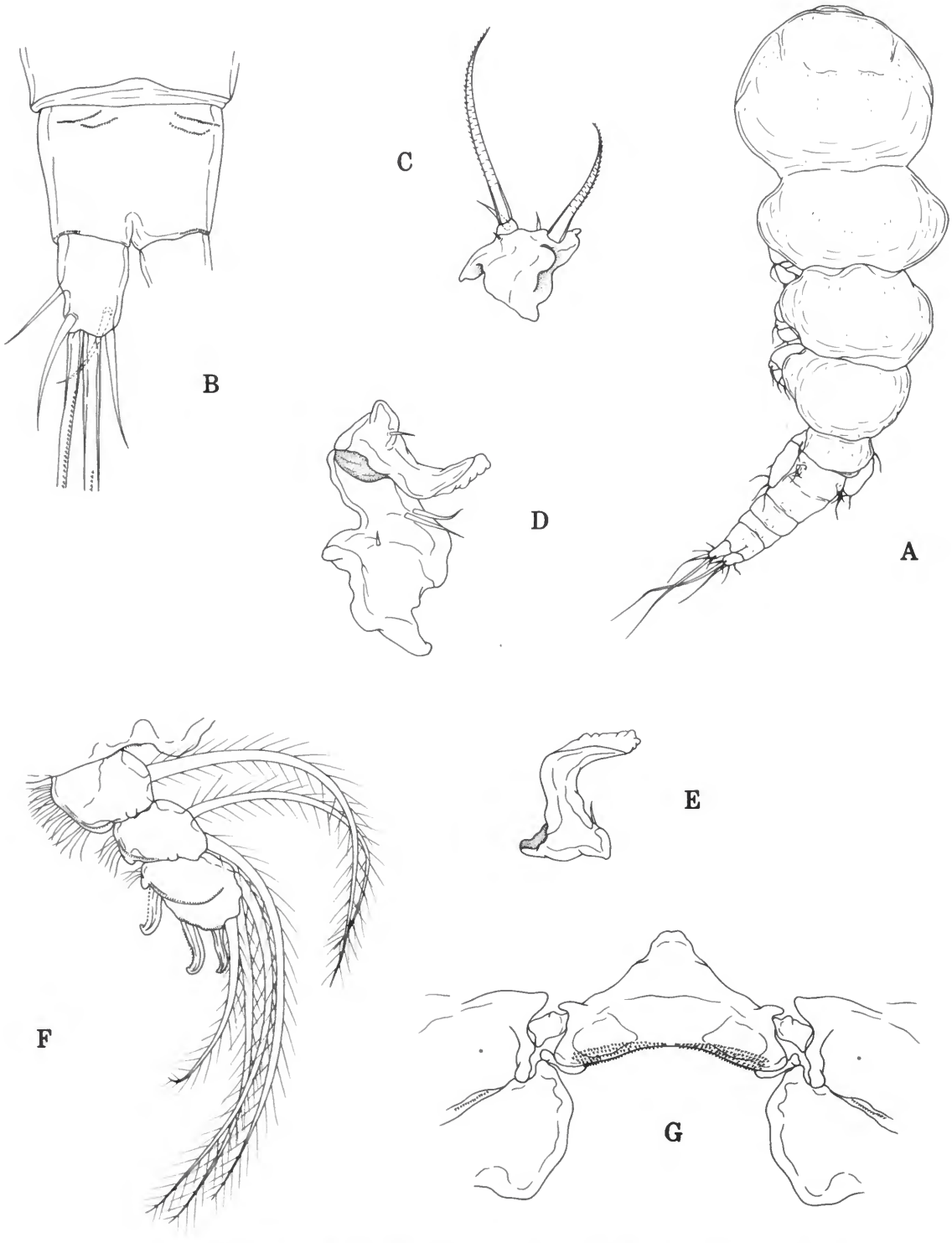

FIGURE 20.—*Taeniacanthus digitatus,* new species, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, first maxilla, posterior; D, maxilliped, ventromedial; E, maxilliped claw, dorsal; F, leg 2 endopod, ventral; G, leg 3, interpodal plate and proximal portions of basipods, ventral.

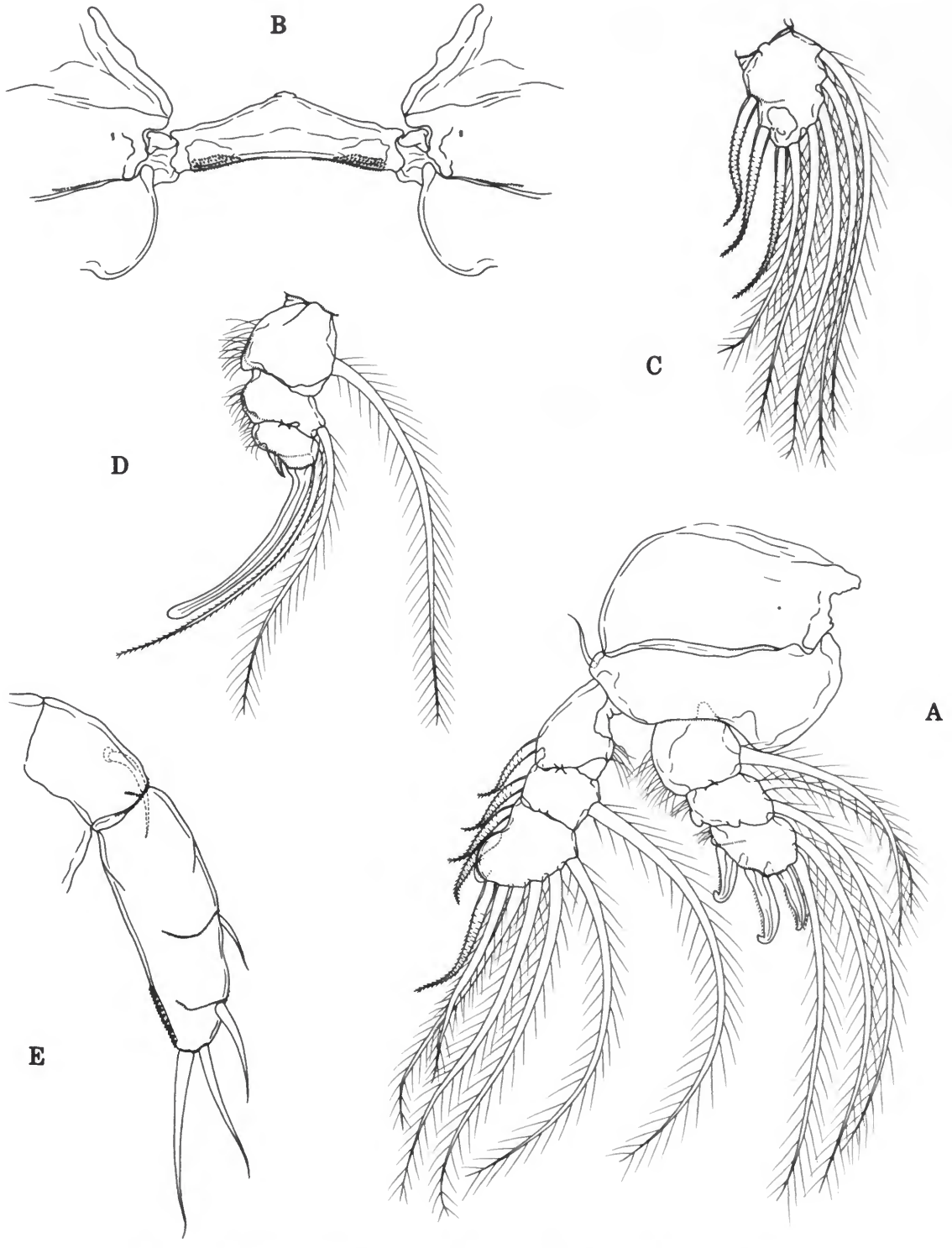

FIGURE 21.—*Taeniacanthus digitatus,* new species, female: A, leg 3, ventral; B, leg 4, interpodal plate and proximal portions of basipods, ventral; C, leg 4, terminal exopod segment, ventral; D, leg 4 endopod, ventral; E, leg 5, ventral.

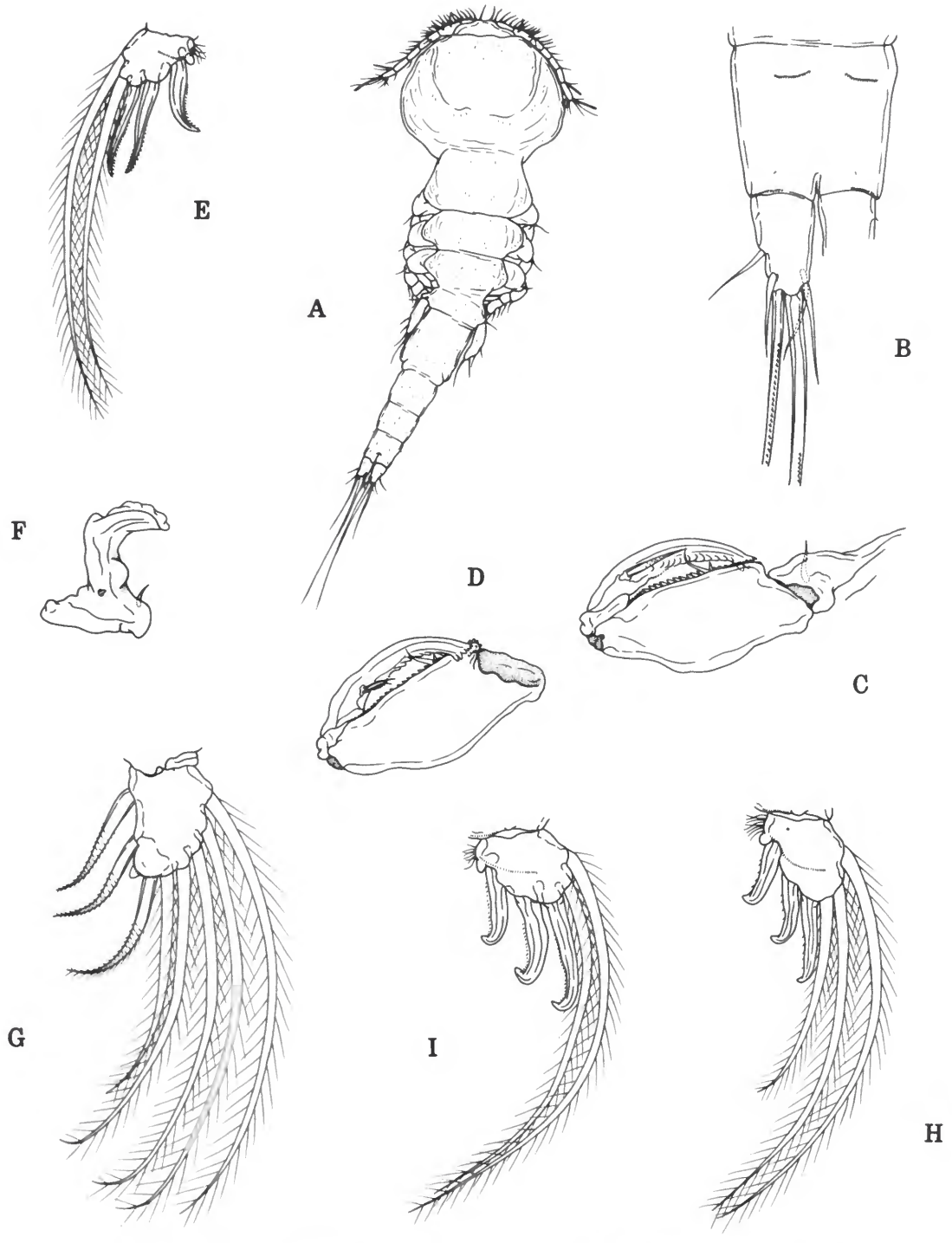

FIGURE 22.—*Taeniacanthus digitatus*, new species. Male: A, dorsal; B, anal segment and caudal ramus, ventral; C, maxilliped, posterior; D, maxilliped, anterior; E, leg 3, terminal endopod segment, ventral. Female variant: F, maxilliped claw, ventral; G, leg 2, terminal exopod segment, ventral; H, leg 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 *Cirripectes 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

FIGURES 23, 24

Taeniacanthus fugu Yamaguti and Yamasu, 1959:94.—Yamaguti, 1963:21.—Kabata, 1979:78.

MATERIAL EXAMINED.—7 females, 2 damaged females, 2 males from *Takifugu xanthopterus* (Temminck and Schlegal) (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 × 336 μm. Abdomen 4-segmented; segments from anterior to posterior 193 × 290 μm, 179 × 244 μm, 124 × 235 μm, and 262 × 216 μm (l × w); anal segment (Figure 23B) with varying number of rows of spinules on anteroventral surface (2 specimens with 4 rows on right side and 5 rows on left side; 1 specimen with 5 and 4; 1 specimen with 4 and 4; and 1 specimen with 5 and 5); posteroventral margin of anal segment with 2 patches of spinules. Caudal ramus (Figure 23B) 173 × 81 μm (l × w), similar to that in *Taeniacanthus yamagutii* except outer terminal seta with long row of spinules at base.

All appendages as in *Taeniacanthus yamagutii* except for those mentioned below. Postantennal process (Figure 23C) slightly stouter. Leg 2 in most specimens examined is similar to that in *T. yamagutii* with terminal exopod segment with II, 1, 4, except 2 specimens with II, 1, 5 (Figure 23D). Terminal endopod segment of leg 2 (Figure 23E) with ornamentation on spines; size of pinnate setae slightly different from those of *T. yamagutii* (compare Figures 23E and 98B).

Male: Body as in Figure 23F. Total length 1.67 mm (1.65–1.68 mm) × 0.43 mm (0.41–0.44 mm) based on 2 specimens. Cephalothorax wider than long, 395 × 442 μm, comprising little less than 25% of total body length. Genital complex longer than wide, 230 × 207 μm. Abdomen 3-segmented; segments from anterior to posterior 152 × 143 μm, 133 × 133 μm, and 156 × 120 μm (l × w); anal segment ornamented as in female. Caudal ramus as in female except 85 × 44 μm (l × w).

All appendages as in male of *Taeniacanthus yamagutii* except where noted. Postantennal process (Figure 23G) with long, slender tine. Maxilliped claw (Figures 23H, 24A,B) with 2 anterior setae and 1 posterior, 1 row of large denticles, and 1 row of smaller denticles (row curved proximally); trifid protuberance associated with hyaline structure and conical process both present in *T. yamagutii,* absent in *T. fugu* (compare Figures 23H, 24A,B, and 99G,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

FIGURES 25–27

MATERIAL EXAMINED.—1 female holotype (USNM 228403) and 3 female paratypes (USNM 228404) from

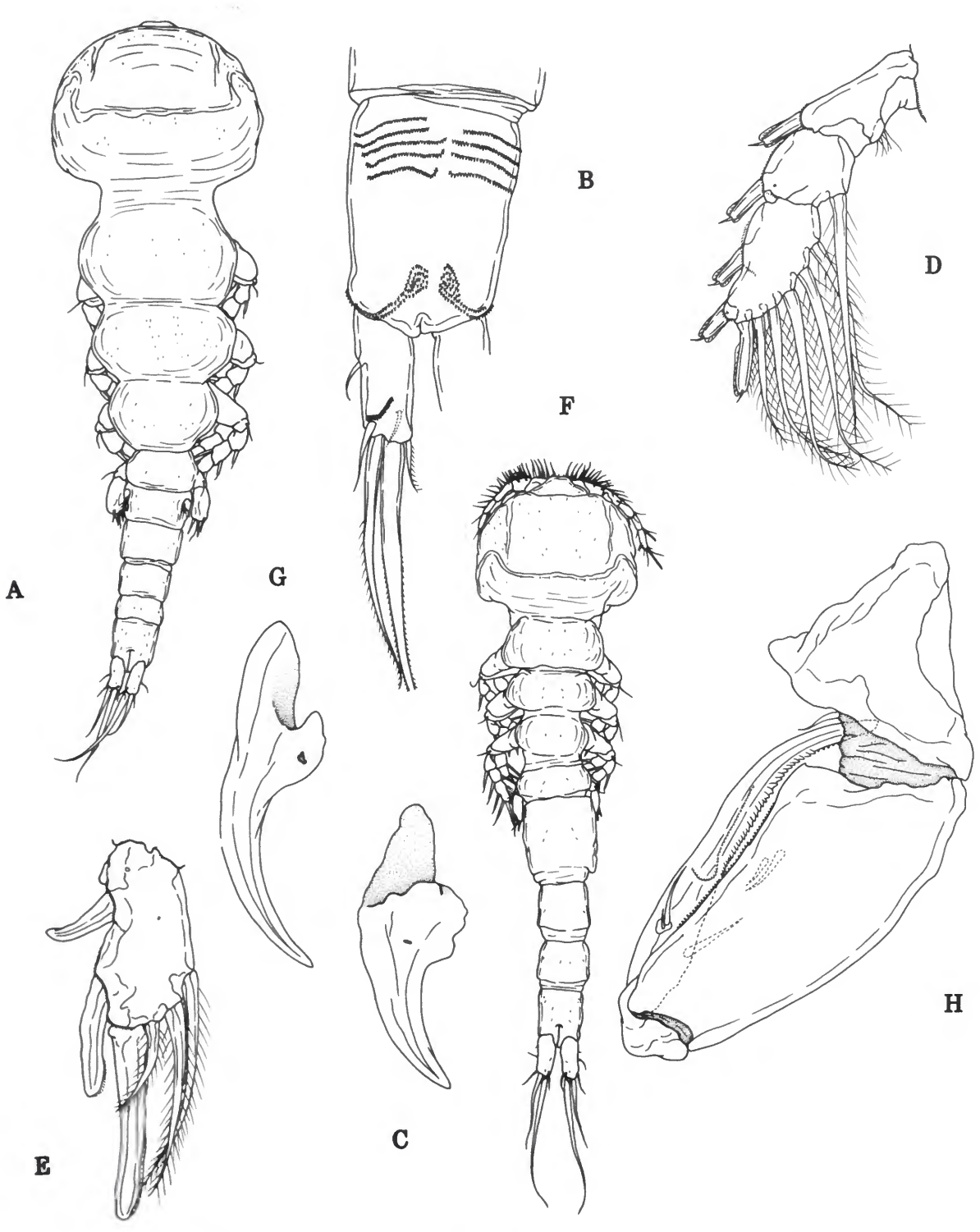

FIGURE 23.—*Taeniacanthus fugu* Yamaguti and Yamasu. Female: A, dorsal; B, anal segment and caudal ramus, ventral; C, postantennal process, ventral; D, leg 2 exopod, ventral; E, leg 2, terminal endopod segment, ventral. Male: F, dorsal; G, postantennal process, ventral; H, maxilliped, anterolateral.

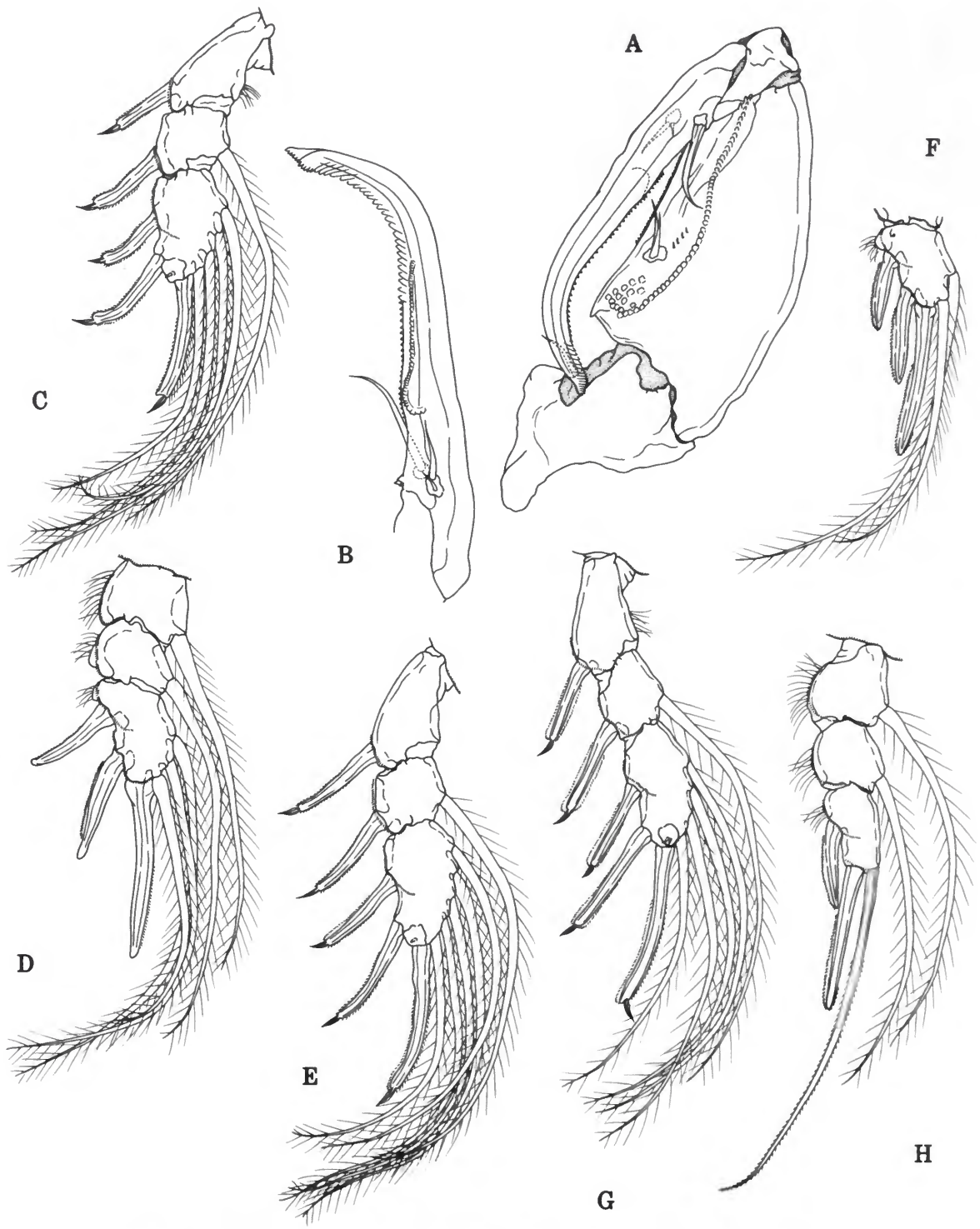

FIGURE 24.—*Taeniacanthus fugu* Yamaguti and Yamasu, male: A, maxilliped, posterior; B, maxilliped claw, anterior; C, leg 2 exopod, ventral; D, leg 2 endopod, ventral; E, leg 3 exopod, ventral; F, leg 3, terminal endopod segment, ventral; G, leg 4 exopod, ventral; H, leg 4 endopod, ventral.

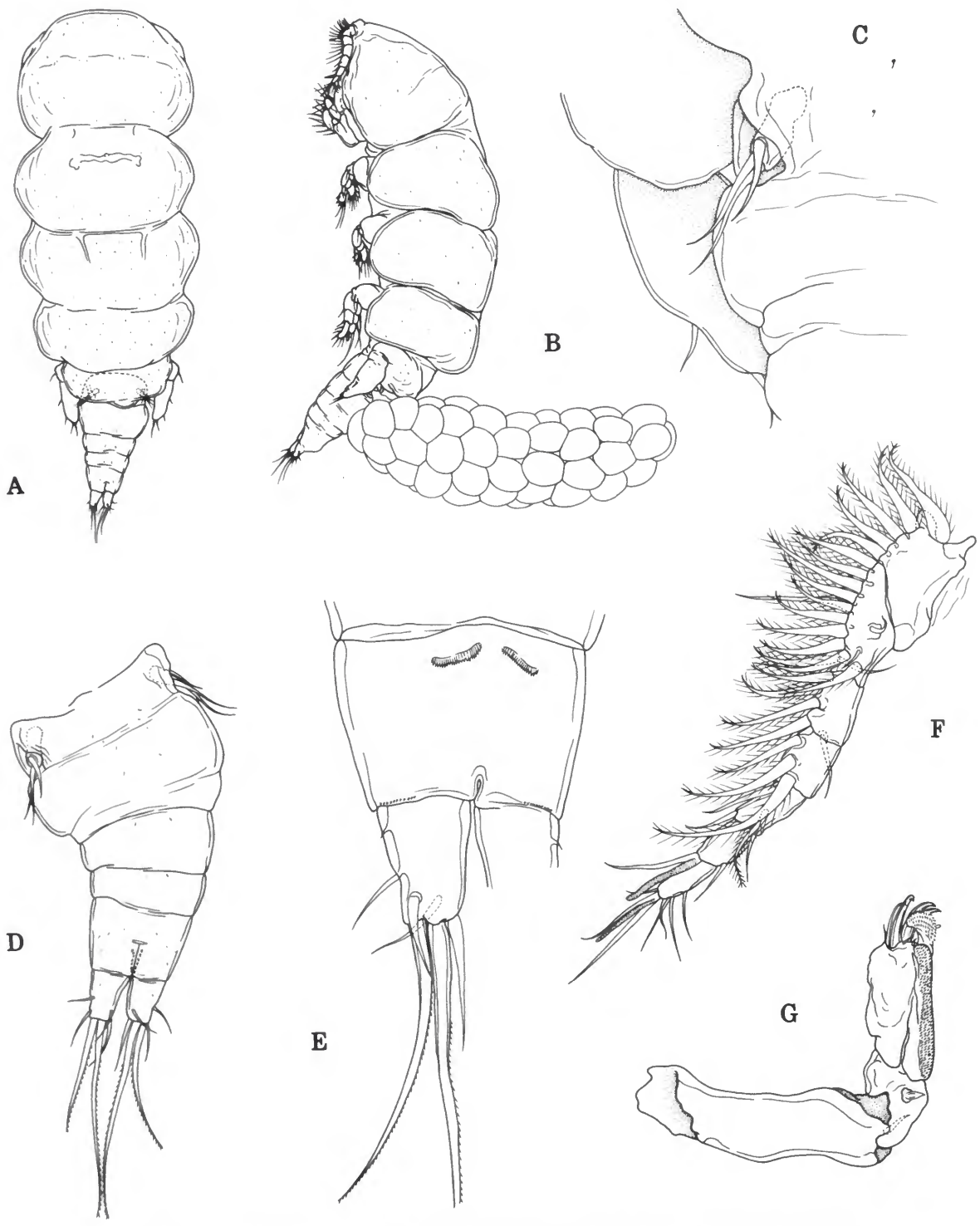

FIGURE 25.—*Taeniacanthus glomerosus*, new species, female: A, dorsal; B, lateral; C, genital area, dorsal; D, portion of urosome, dorsal; E, anal segment and caudal ramus, ventral; F, first antenna, ventral; G, second antenna, medial.

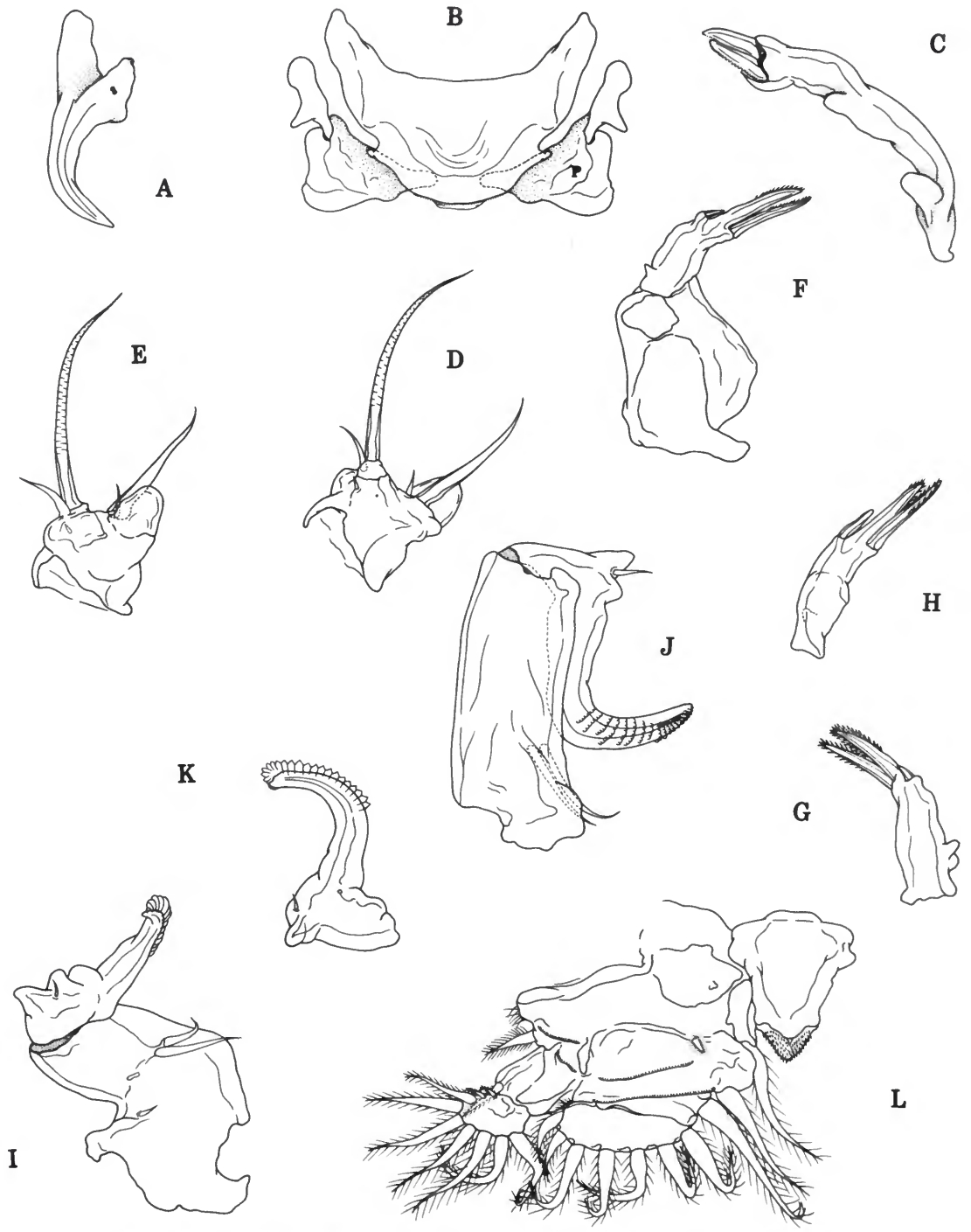

FIGURE 26.—*Taeniacanthus glomerosus*, new species, female: A, postantennal process, ventral; B, labrum and paragnath, ventral; C, mandible, anteromedial; D, first maxilla, posterior; E, same, anterior; F, second maxilla, ventral; G, second maxilla, terminal segment, ventrolateral; H, second maxilla, terminal segment, ventral; I, maxilliped, ventromedial; J, same, ventrolateral; K, maxilliped claw, ventral; L, leg 1 and interpodal plate, ventral. (P = paragnath.)

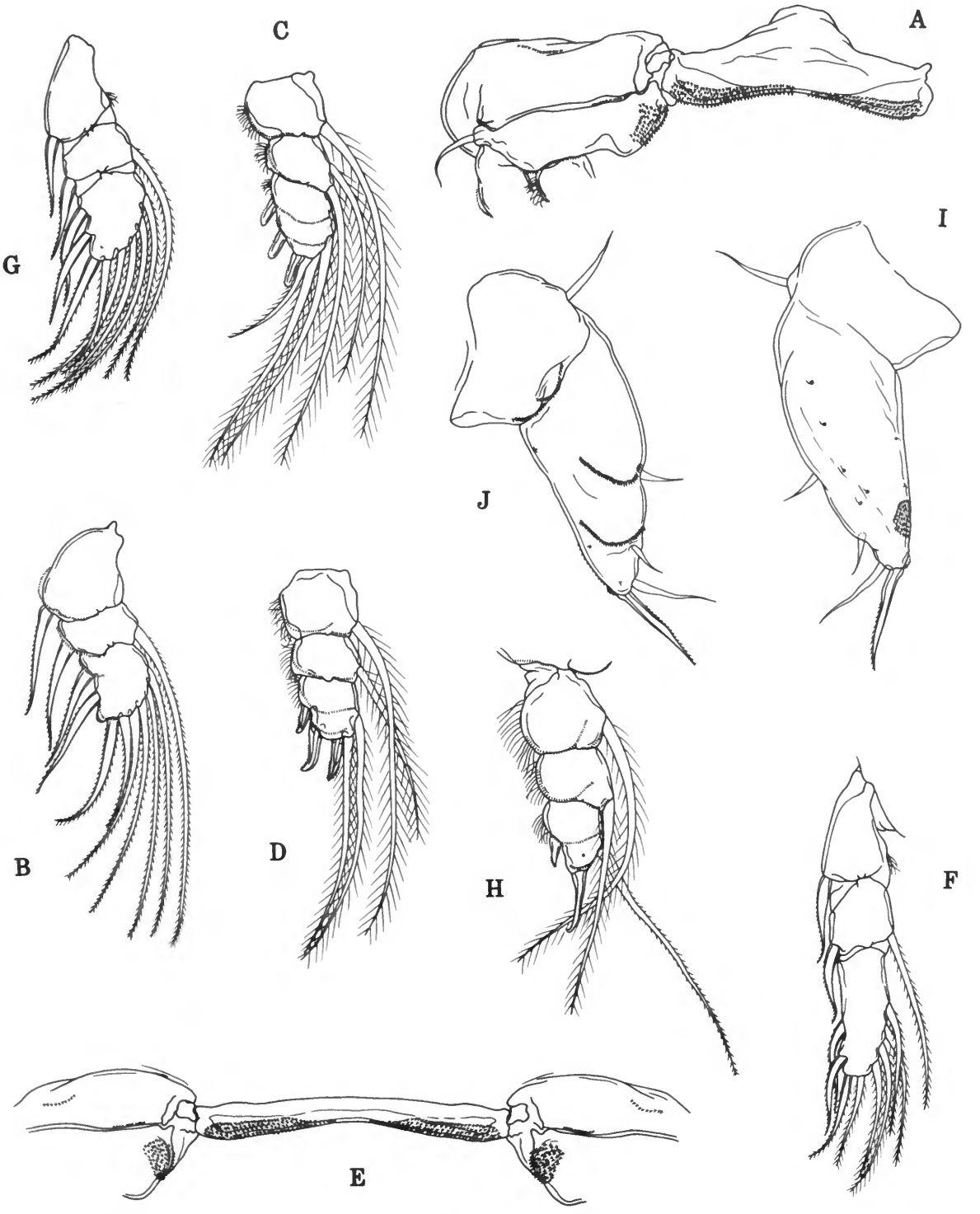

FIGURE 27.—*Taeniacanthus glomerosus*, new species, female: A, leg 2, interpodal plate and basipod, ventral; B, leg 2 exopod, ventral; C, leg 2 endopod, ventral; D, leg 3 endopod, ventral; E, leg 4, interpodal plate and proximal portions of basipods, ventral; F, leg 4 exopod, ventral; G, same, ventral; 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 from 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 Kwazulu 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 Tutuila Island, American Samoa. From *Cirripectes filamentosus* Alleyne and Macleay: 6 females from vicinity of Mahé, Seychelle Islands, by Bohlke 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 25D) 4-segmented; segments from anterior to posterior 67 × 138 μm, 51 × 101 μm, 28 × 83 μm, and 46 × 69 μm (l × w); anal segment (Figure 25D) with 1 pair of longitudinal rows of spinules on dorsal surface near median suture, 1 row of spinules 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 25F) 7-segmented; armature formula 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 25G) 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 spiine varying in length (compare Figure 26G 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	coxa 0-1	basis 1-1	exopod 1-0; 9 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, I, 5 endopod 0-1; 0-2; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, I, 5 endopod 0-1; 0-1; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, I, 5 endopod 0-1; 0-1; II, int.

Interpodal plates of legs 1–4 (Figures 26A, 27 A,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 27F), but otherwise relatively short and broad (Figure 27G). Exopod spines of legs 2–4 long and not highly sclerotized (see Figure 27B). Endopod spines small; terminal endopod segment of leg 4 (Figure 27H) 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 27I,J) with 2 segments partially fused dorsally; first segment ornamented with 2 curved rows of ventral spinules and 1 dorsolateral seta;

second segment 90 × 50 μm (l × 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 there is a wide diversity in the shape of the maxilliped claw of the female. *Taeniacanthus glomerosus* and *T. williamsi* have morphologically similar maxillipeds. They can be readily distinguished by differences in the shape of the terminal process and the number and shape of the spines of the second maxilla.

Taeniacanthus inimici (Yamaguti and Yamasu, 1959), new combination

Parataeniacanthus inimici Yamaguti and Yamasu, 1959:108.—Yamaguti, 1963:24.

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

Male: Unknown.

REMARKS.—This species, first described from the gills of *Inimicus japonicus* Cuvier and Valenciennes from the Inland Sea of Japan by Yamaguti and Yamasu (1959), has a very distinctive maxilliped claw in the female. The claw of *Taeniacanthus inimici* is stout and triangular in outline, unlike the claws of any of its congeners. This structure, in addition to a very stout seta of the first maxilla, distinguishes *T. inimici* from all other species of *Taeniacanthus*.

Taeniacanthus kitamakura Yamaguti and Yamasu, 1959

FIGURES 28–32

Taeniacanthus kitamakura Yamaguti and Yamasu, 1959:97.—Yamaguti, 1963:21.—Kabata, 1979:78.

Taeniacanthus canthigasteri Izawa, 1967:29.—Kabata, 1979:78. [New synonymy.]

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 (l × 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 × 138μm (contracted specimen; Figure 28B) (l × w); ventral surface of anal segment with proximal ⅔ 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 poterior 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:

P_1	coxa 0-1	basis 1-1	exopod I-0; 9 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 4 endopod 0-1; 0-1; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-1; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod I-0; I-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 30D) bilobed; each lobe with spinules; basis with relatively large patch of spinules along inner margin; exopod spines

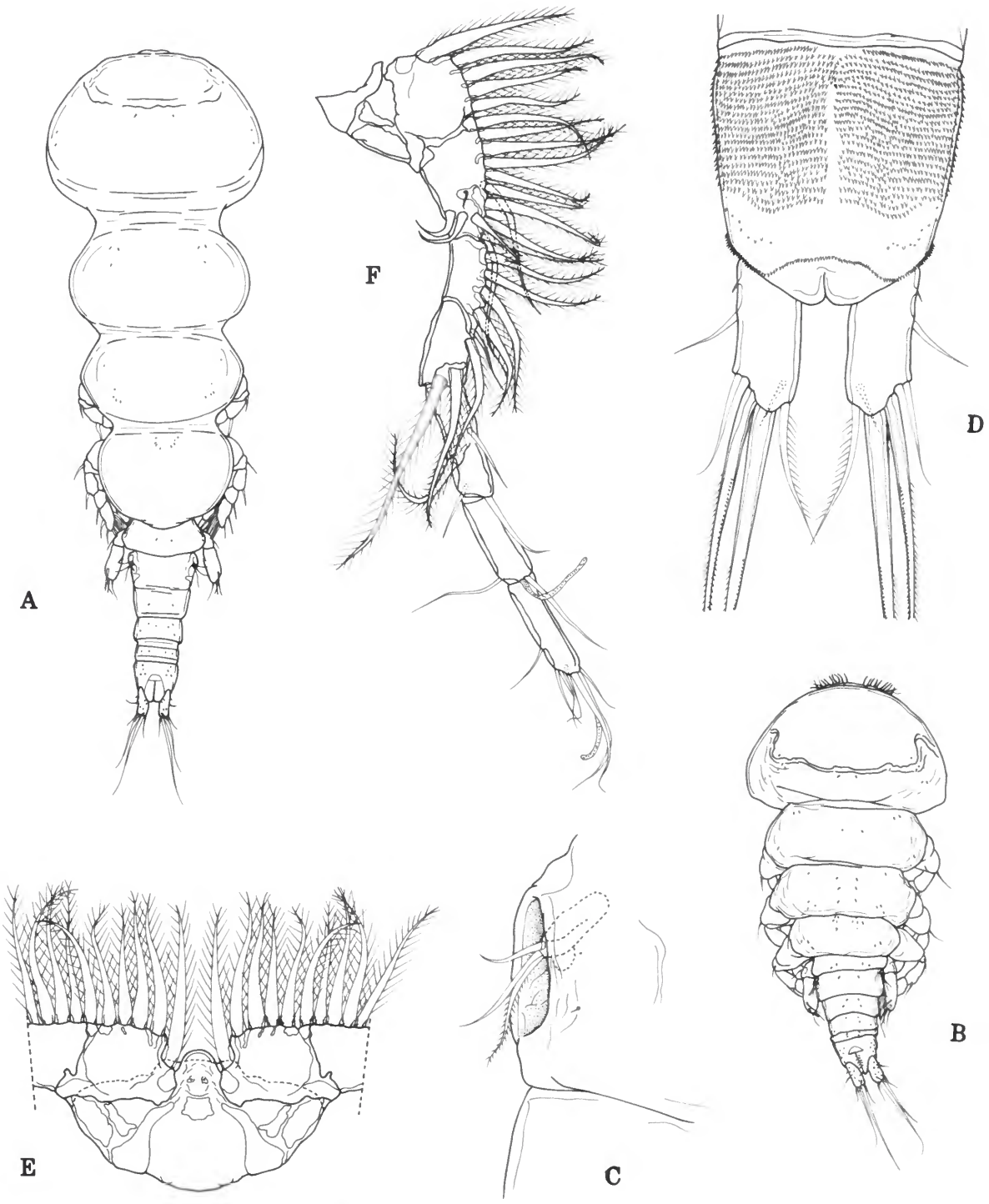

FIGURE 28.—*Taeniacanthus kitamakura* Yamaguti and Yamasu, female: A, dorsal; B, dorsal; C, genital area, dorsal; D, anal segment and caudal rami, ventral; E, rostral area, ventral; F, first antenna, ventral.

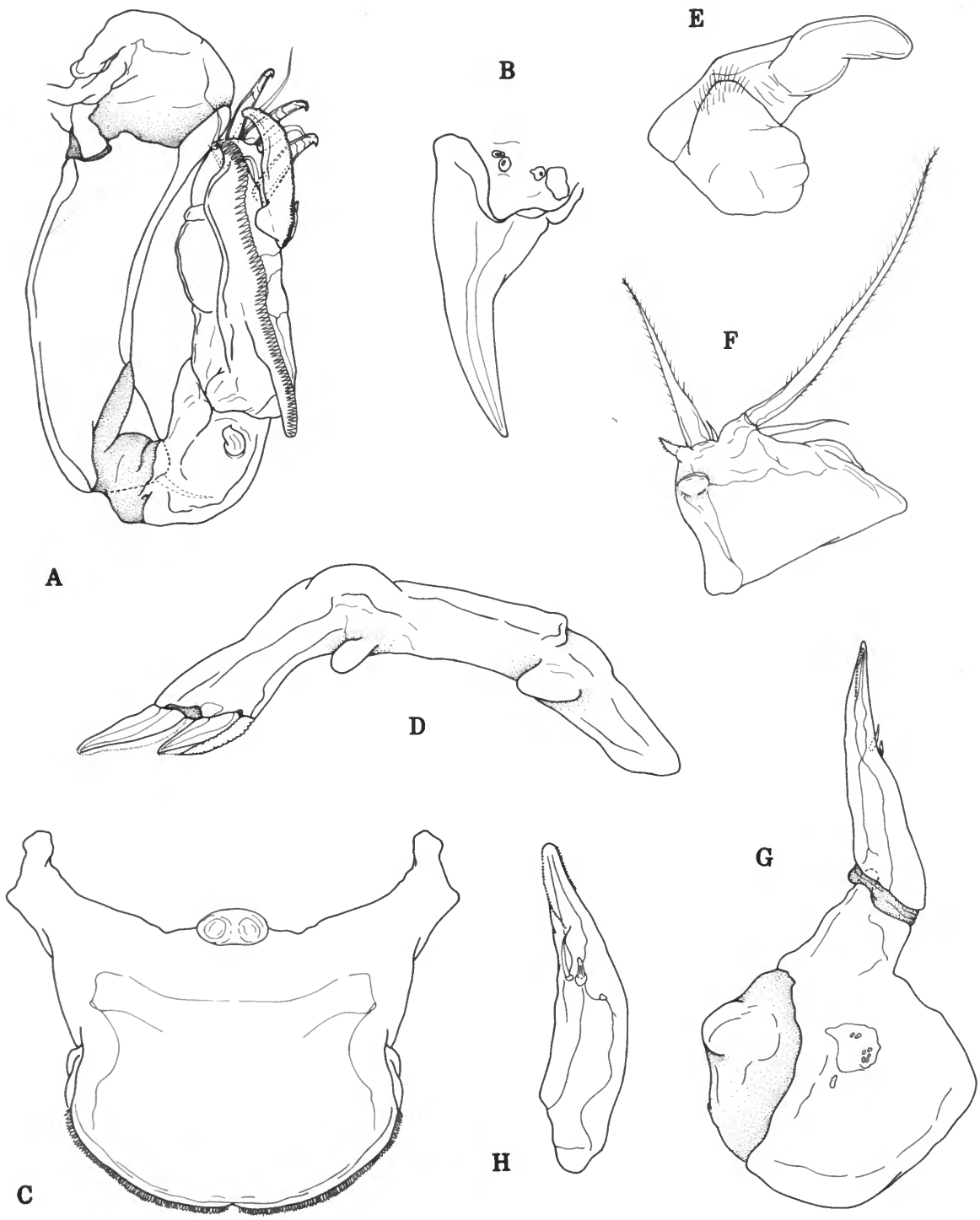

FIGURE 29.—*Taeniacanthus kitamakura* Yamaguti and Yamasu, female: A, second antenna, medial; B, postantennal process, ventral; C, labrum, ventral; D, mandible, anteromedial; E, paragnath, ventromedial; F, first maxilla, anterior; G, second maxilla, posteroventral; H, second maxilla, terminal segment, anteromedial.

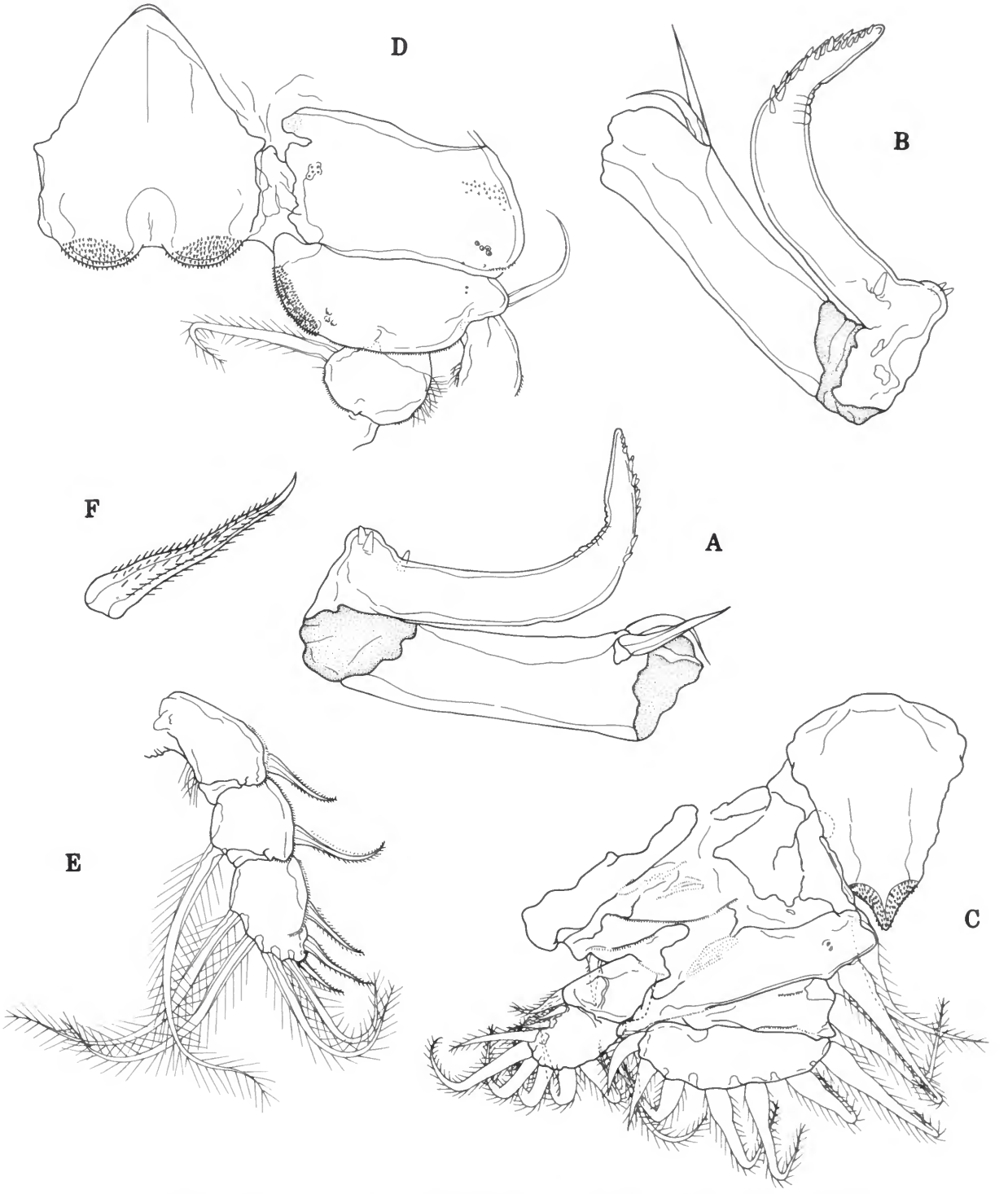

FIGURE 30.—*Taeniacanthus kitamakura* Yamaguti and Yamasu, female: A, maxilliped, posterodorsal; B, maxilliped, anteroventral; C, leg 1 and interpodal plate, ventral; D, leg 2, interpodal plate and basipod, ventral; E, leg 2 exopod, ventral; F, leg 2, spine of first exopod segment, dorsal.

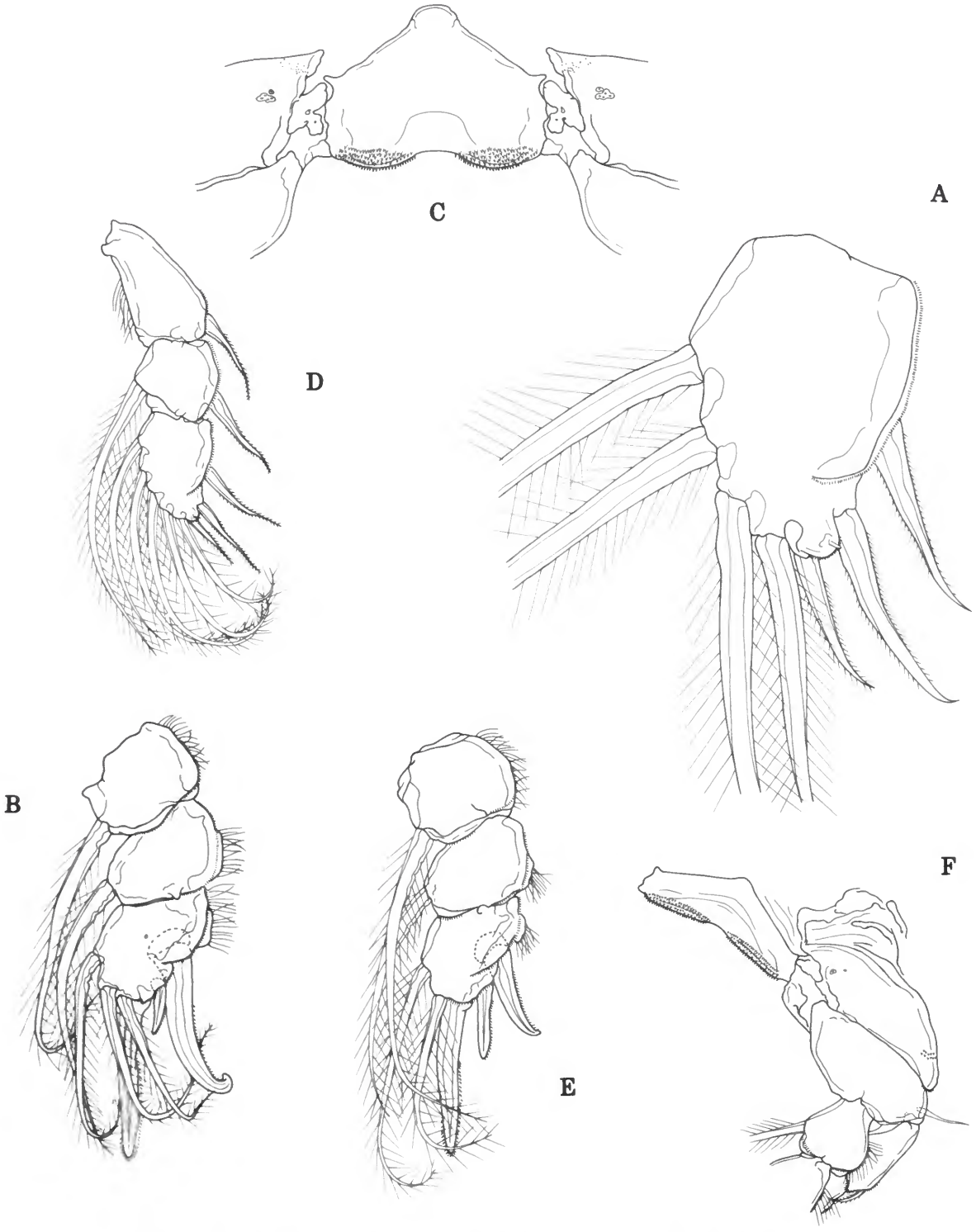

FIGURE 31.—*Taeniacanthus kitamakura* Yamaguti and Yamasu, female: A, leg 2, terminal exopod segment, ventral; B, leg 2 endopod, ventral; C, leg 3, interpodal plate and proximal portions of basipods, ventral; D, leg 3 exopod, ventral; E, leg 3 endopod, ventral; F, leg 4, interpodal plate and basipod, ventral.

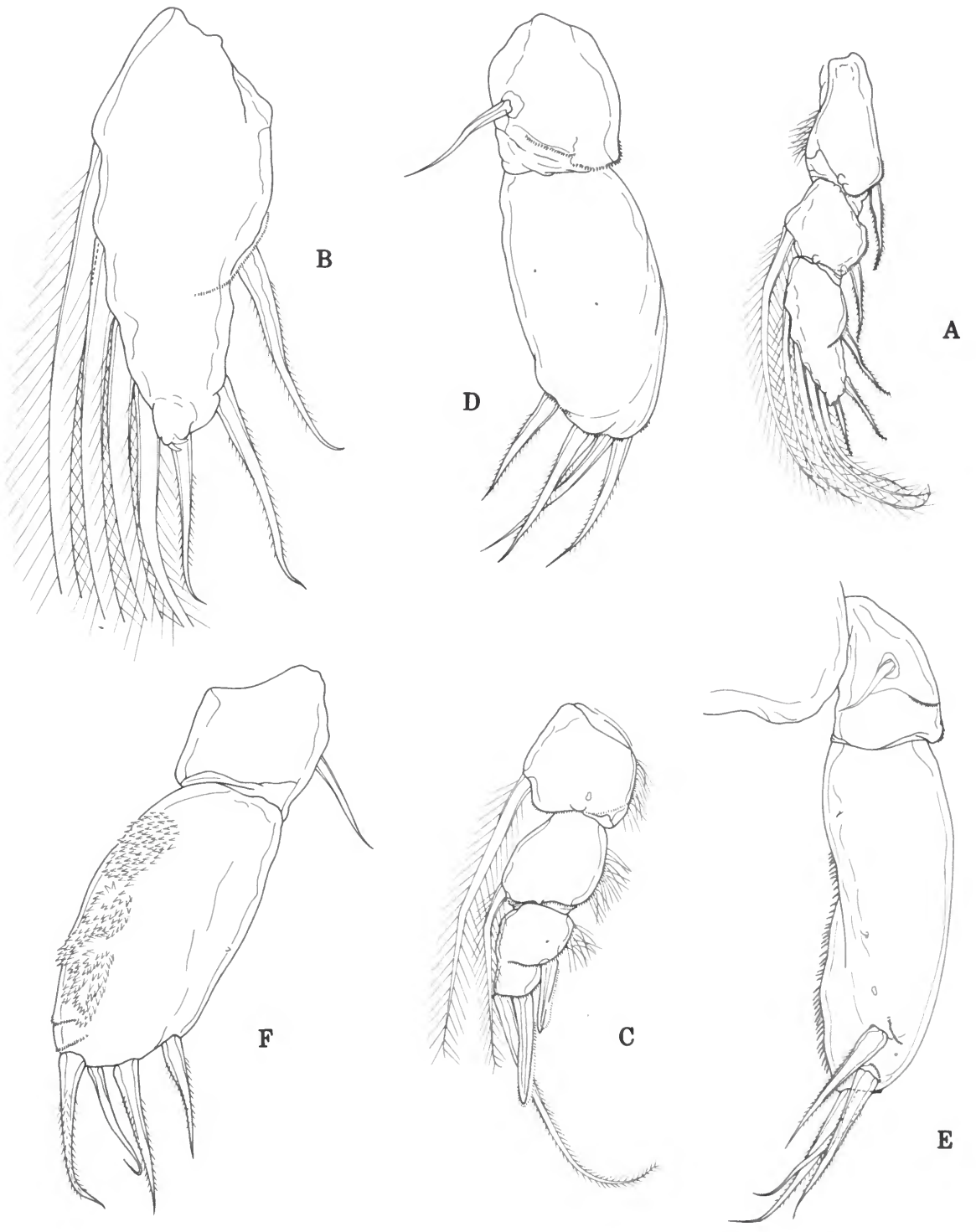

FIGURE 32.—*Taeniacanthus kitamakura* Yamaguti and Yamasu, female: A, leg 4 exopod, ventral; B, leg 4, terminal exopod segment, ventral; C, leg 4 endopod, ventral; D, leg 5, dorsolateral, E, same, dorsal; F, same, ventromedial.

(Figure 30F) spinulated; 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 31D) similar to that in leg 2 except baering 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 × 62 μm (l × 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 *Taeniacanthus canthigasteri*, which he collected from the same host species at Wakayama and Mie, 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*.

Taeniacanthus fugu Yamaguti and Yamasu, 1959, and *T. yamagutii* (Shiino, 1957) have a stout terminal process on the second maxilla with both associated elements (two spines or one spine and one seta) greatly reduced in size as in *T. kitamakura*. All three species are parasites of tetraodontiform fishes. *Taeniacanthus kitamakura* can be distinguished from the other two species by the absence of an elongate digitiform process at the base of the maxilliped claw in the female. This process is present in *T. fugu* and *T. yamagutii*. In addition, *T. kitamakura* has attenuate exopod spines of legs 2–4, whereas the other two species bear relatively stout, blunt exopod spines, each tipped with a setiform process (flagellum).

Taeniacanthus lagocephali Pearse, 1952

FIGURES 33–37

Taeniacanthus lagocephali Pearse, 1952:8.—Ho, 1969:112.—Kabata, 1979:78.

Taeniacanthus sabafugu Yamaguti and Yamasu, 1959:102.—Yamaguti, 1963:21.

Irodes lagocephali.—Pillai, 1963:124.

MATERIAL EXAMINED.—From *Lagocephalus spadiceus* (Richardson): 4 females from host (USNM 49850); 1 female, 2 immature females, and 1 male from same host (USNM 71881); 1 male from same host (USNM 71879); 1 immature female from same host (USNM 49850); all hosts from Japan. From *Lagocephalus laevigatus:* 1 female, 1 immature female, 1 pair in copula, and 3 males from Brazil; 2 females, 5 immature females, 6 males and 3 immature males from Mississippi and Alabama (hosts: USNM 185870, 185928); 2 females and 2 males from Gulf of Mexico off Texas.

DESCRIPTION.—*Female:* Body form as in Figure 33A,B. Total length 2.20 mm (1.98–2.41 mm) and greatest width 0.81 mm (0.77–0.84 mm) based on 4 specimens. Cephalothorax globular, 528 × 770 μm, and comprising about 25% of total body length. Three free thoracic segments globose and about equal in width and nearly as wide as cephalothorax. Genital complex wider than long, 176 × 275 μm. Abdomen 4-segmented; segments from anterior to posterior 83 × 190 μm, 49 × 169 μm, 31 × 153 μm, and 101 × 122 μm (l × 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 33C) about twice as long as wide, 62 × 36 μm.

Rostral area (Figure 33D) with irregularly shaped, sclerotized, ventromedian part. First antenna (Figure 33E) 7-segmented; formula of armature: 5, 15, 5, 3, 4, 2 + 1 aesthete, 7 + 1 aesthete. 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,H) with longest process serrate. Maxilliped 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:

P_1	coxa 0-1	basis 1-1	exopod 1-0; 9
			endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 4
			endopod 0-1; 0-1; II, 1, 3
P_3	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 5
			endopod 0-1; 0-1; II, 1, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 4
			endopod 0-1; 0-1; II, int.

Leg 1 (Figure 35B) interpodal plate triangular, posterior margin with 2 patches of spinules, coxa and basis with rows

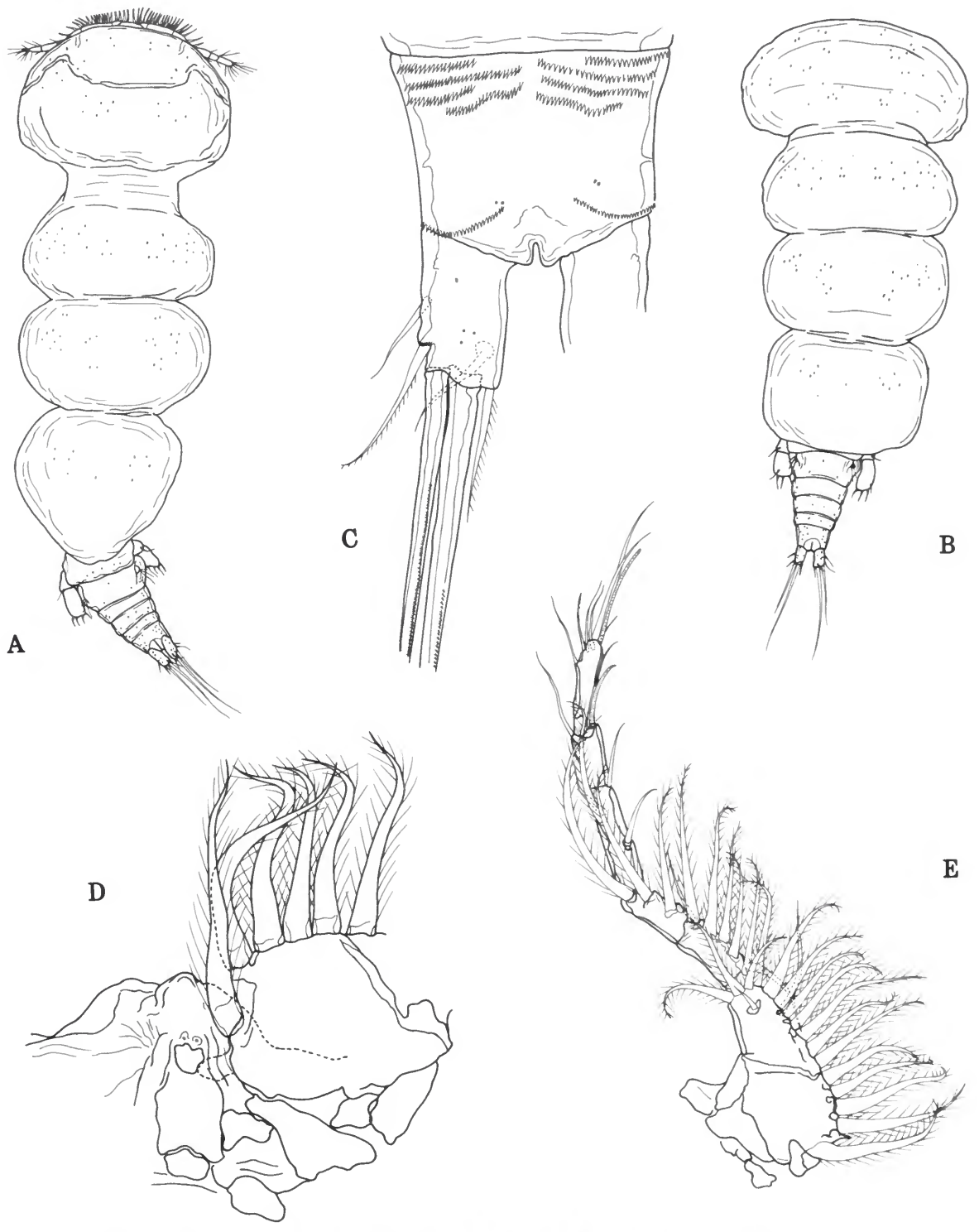

FIGURE 33.—*Taeniacanthus lagocephali* Pearse, female: A, dorsal; B, dorsal; C, anal segment and caudal ramus, ventral; D, rostral area, ventral; E, first antenna, ventral.

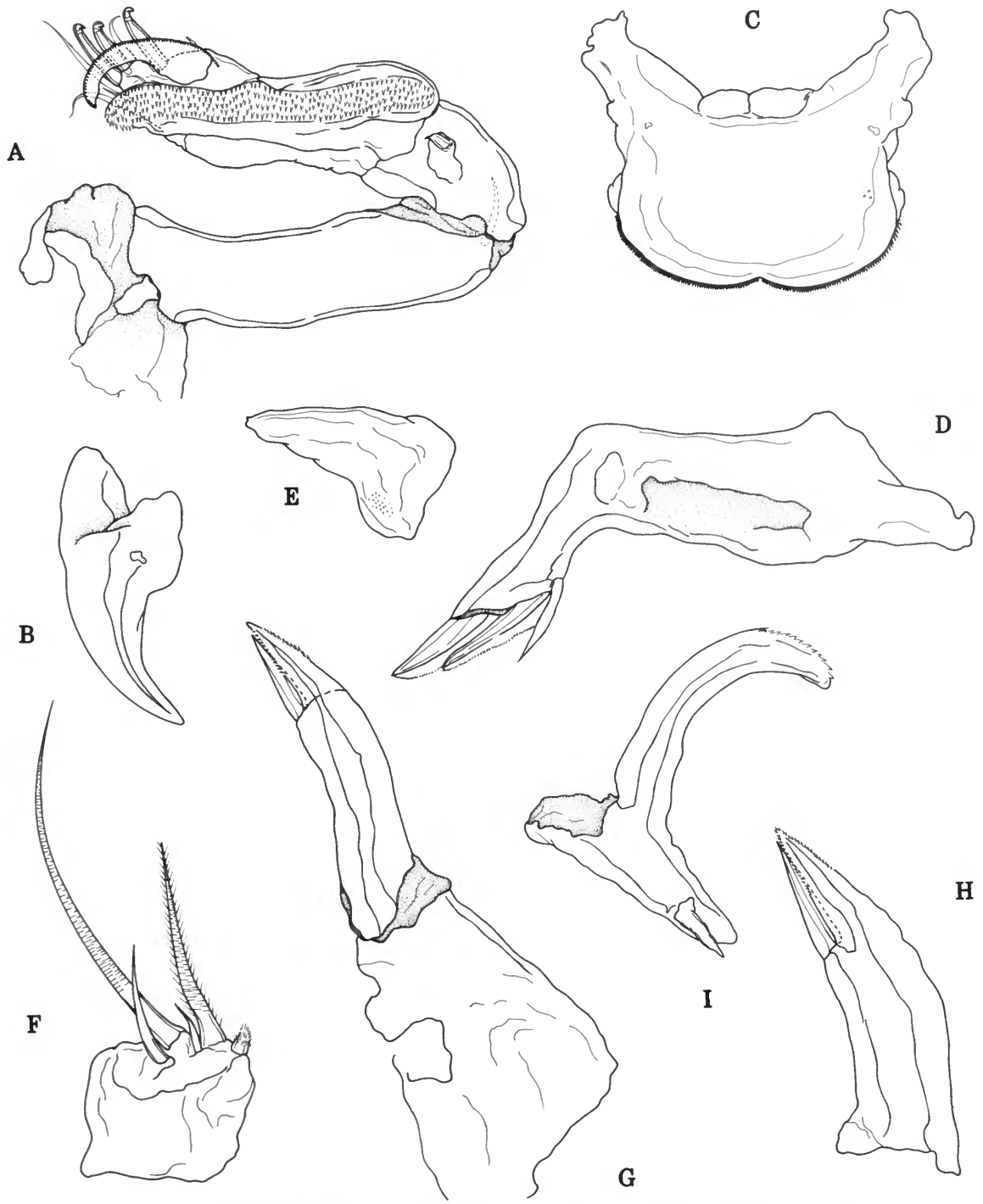

FIGURE 34.—*Taeniacanthus lagocephali* Pearse, female: A, second antenna, medial; B, postantennal process, ventral; C, labrum, ventral; D, mandible, anteromedial; E, paragnath, ventral; F, first maxilla, anteroventral; G, second maxilla, posteroventral; H, second maxilla, terminal segment, posteroventral, I, maxilliped claw, anterior.

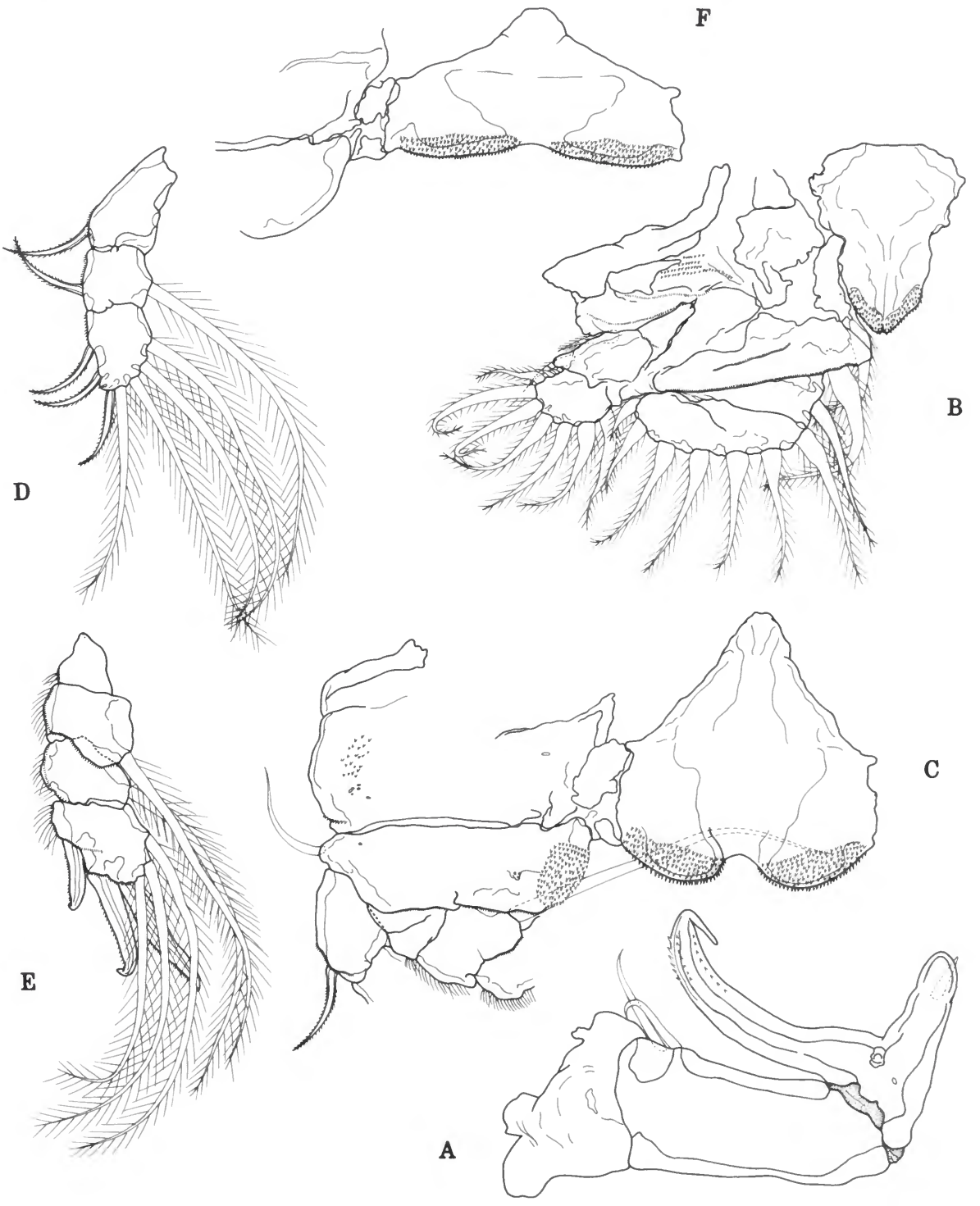

FIGURE 35.—*Taeniacanthus lagocephali* Pearse, female: A, maxilliped, posterior; B, leg 1 and interpodal plate, ventral; C, leg 2, interpodal plate and basipod, ventral; D, leg 2 exopod, ventral; E, leg 2 endopod, ventral; F, leg 3, interpodal plate and proximal portion of basipod, ventral.

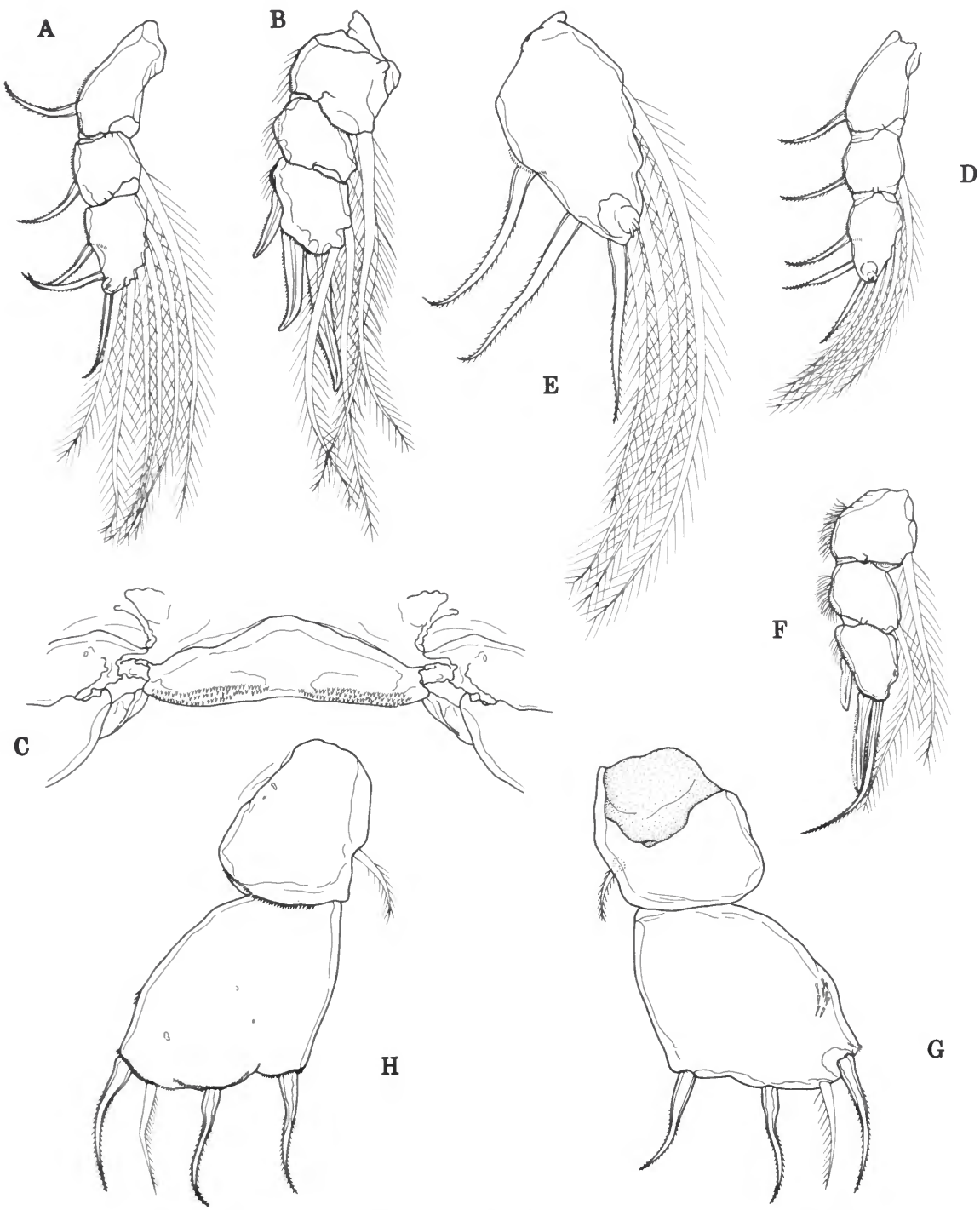

FIGURE 36.—*Taeniacanthus lagocephali* Pearse, female: A, leg 3 exopod, ventral; B, leg 3 endopod, ventral; C, leg 4, interpodal plate and proximal portions of basipods, ventral; D, leg 4 exopod, ventral; E, leg 4, terminal exopod segment, ventral; F, leg 4 endopod, ventral; G, leg 5, medial; H, same, lateral.

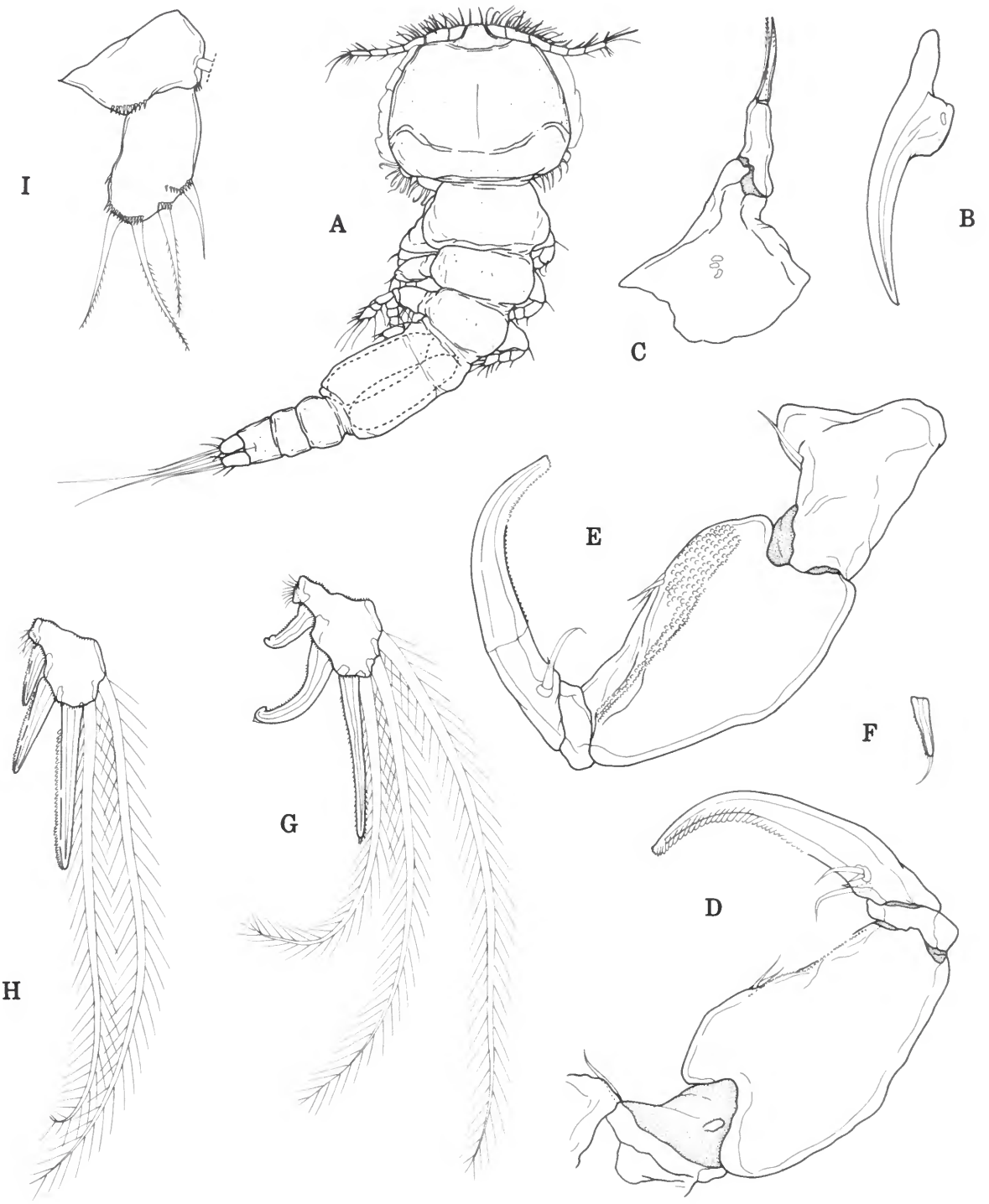

FIGURE 37.—*Taeniacanthus lagocephali* Pearse, male: A, dorsal; B, postantennal process, ventral; C, second maxilla, posteroventral; D, maxilliped, anterior; E, same, posterior; F, leg 2, spine of second exopod segment, ventral; G, leg 2, terminal endopod segment, ventral; H, leg 3, terminal endopod 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 35D) 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 ⅔ 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 *Taeniacanthus 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 *Taeniacanthus* by Ho (1969), with whom we are in agreement.

Taeniacanthus sabafugu Yamaguti and Yamasu, 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. *Taeniacanthus 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.

Taeniacanthus longicaudus Pillai, 1963

Taeniacanthus longicaudus Pillai, 1963:116.—Kabata, 1979:78.

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 *Taeniacanthus 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 *Taeniacanthus* (see "Remarks" for the genus *Taeniacanthus*). 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 *Taeniacanthus*.

This species appears to be closely related to *T. cynoglossi* (Rangnekar and Murti, 1960) and *T. narcini* Pillai, 1963 (see "Remarks" for these two species).

Taeniacanthus longicervis (Pillai, 1963), new combination

FIGURES 38–41

Parataeniacanthus longicervis Pillai, 1963:120.—Cressey and Cressey, 1979:13.

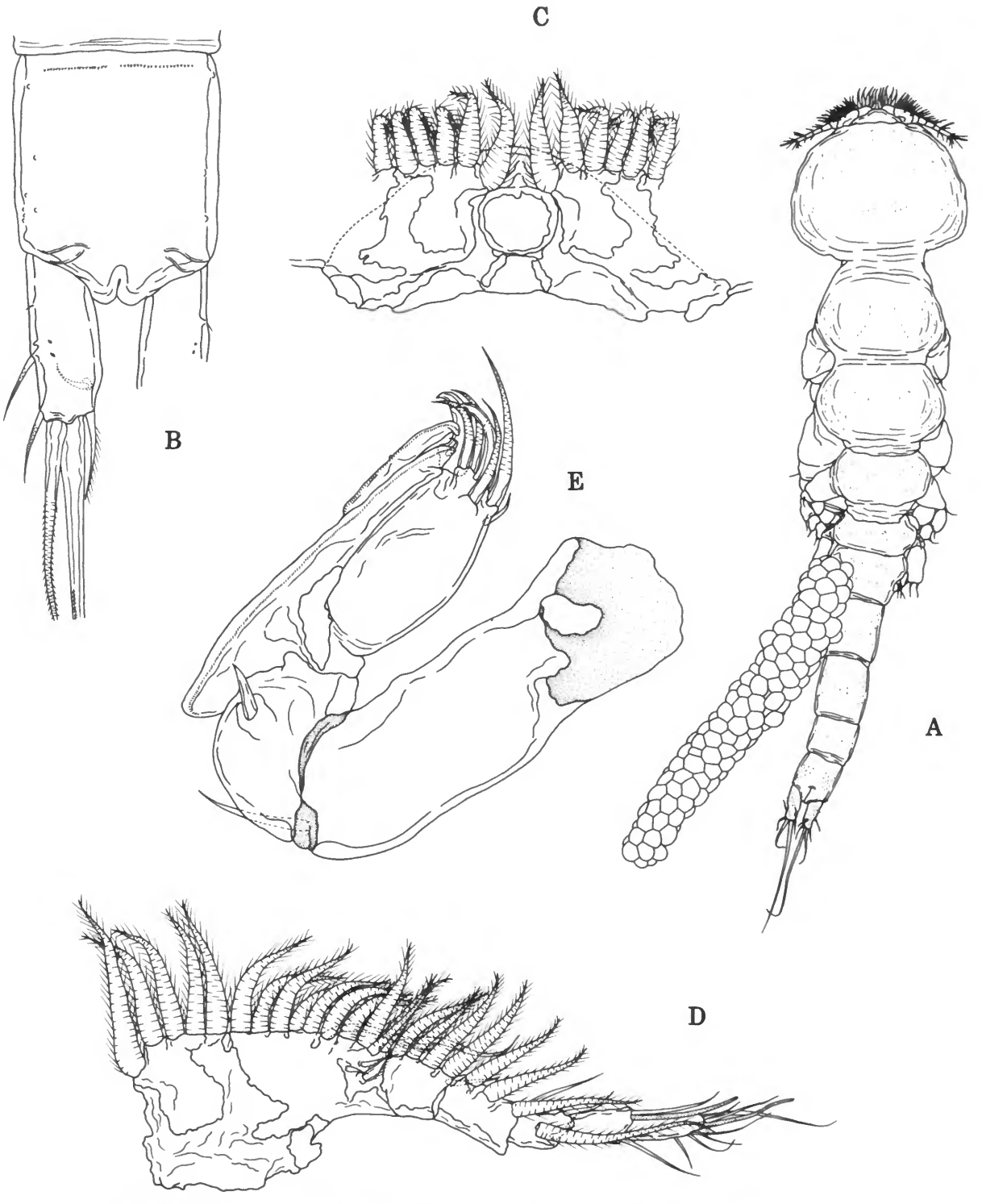

FIGURE 38.—*Taeniacanthus longicervis* (Pillai), female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area, ventral; D, first antenna, ventral; E, second antenna, medial.

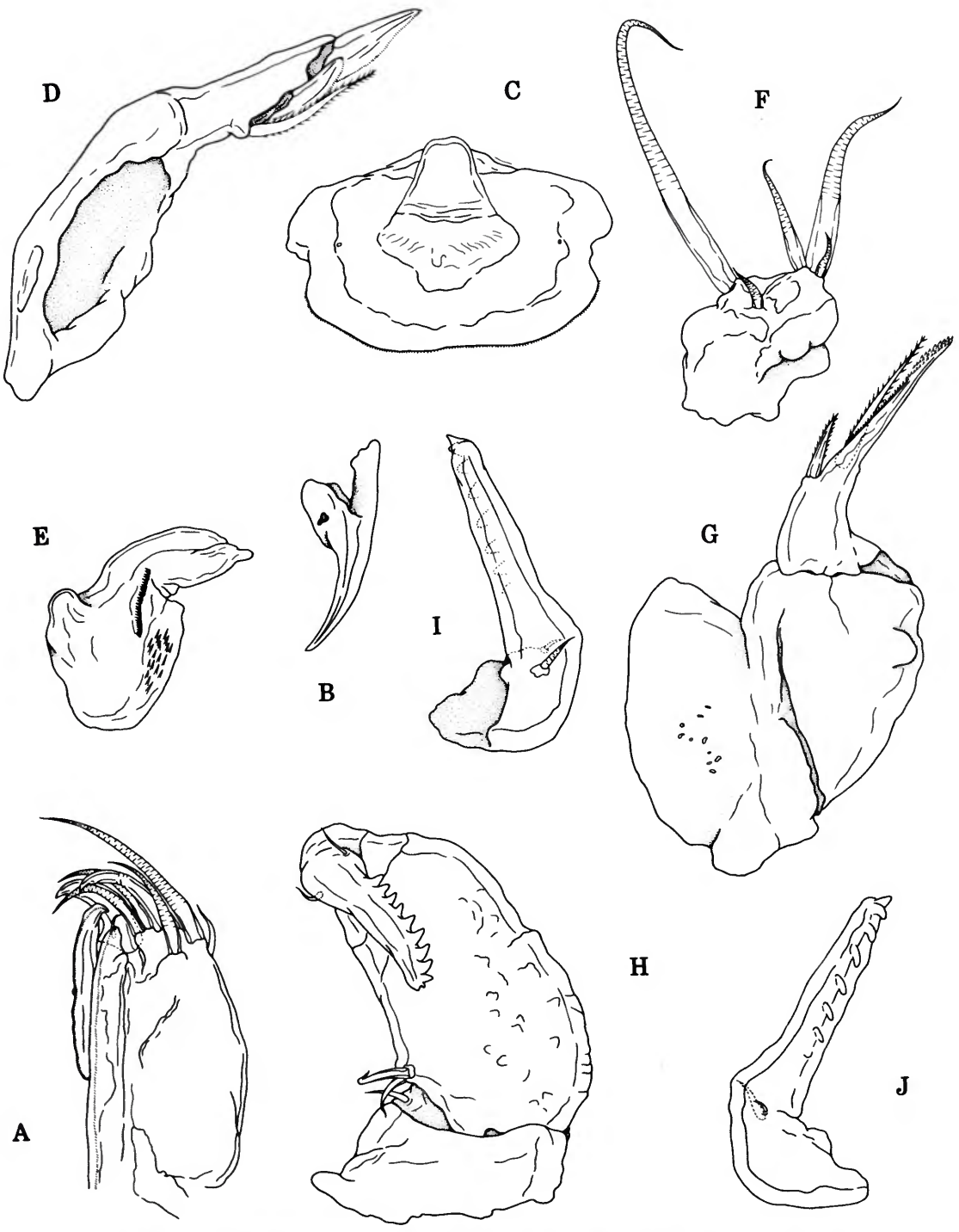

FIGURE 39.—*Taeniacanthus longicervis* (Pillai), female: A, second antenna, distal portion, medial; B, postantennal process, ventral; C, labrum, ventral; D, mandible, anteromedial; E, paragnath, dorsomedial; F, first maxilla, anterior; G, second maxilla, posteroventral; H, maxilliped, ventromedial; I, maxilliped claw, anterior; J, same, posterior.

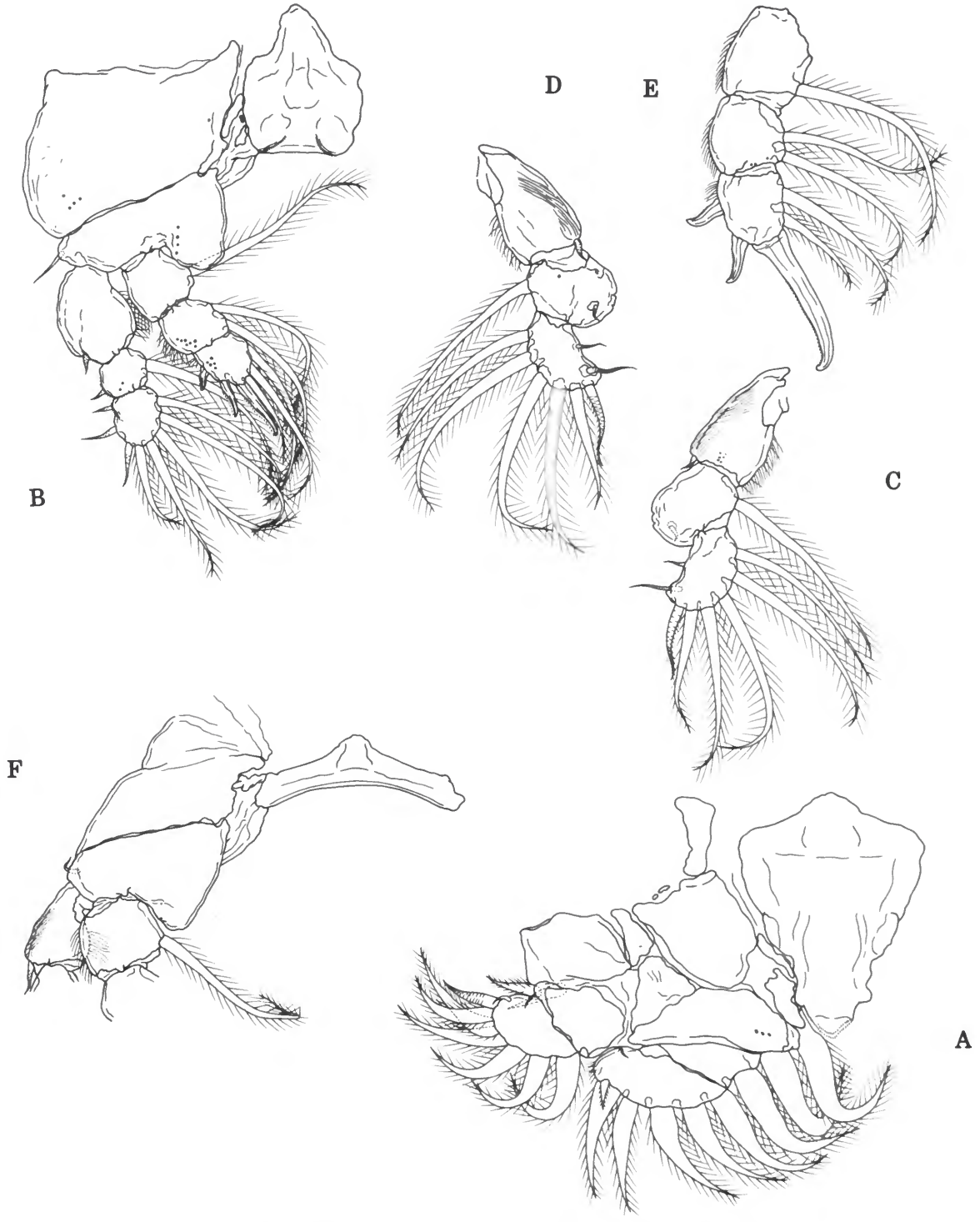

FIGURE 40.—*Taeniacanthus longicervis* (Pillai), female: A, leg 1 and interpodal plate, ventral; B, leg 2 and interpodal plate, ventral; C, leg 3 exopod, ventral; D, same, dorsal; E, leg 3 endopod, ventral; F, leg 4, interpodal plate and basipod, ventral.

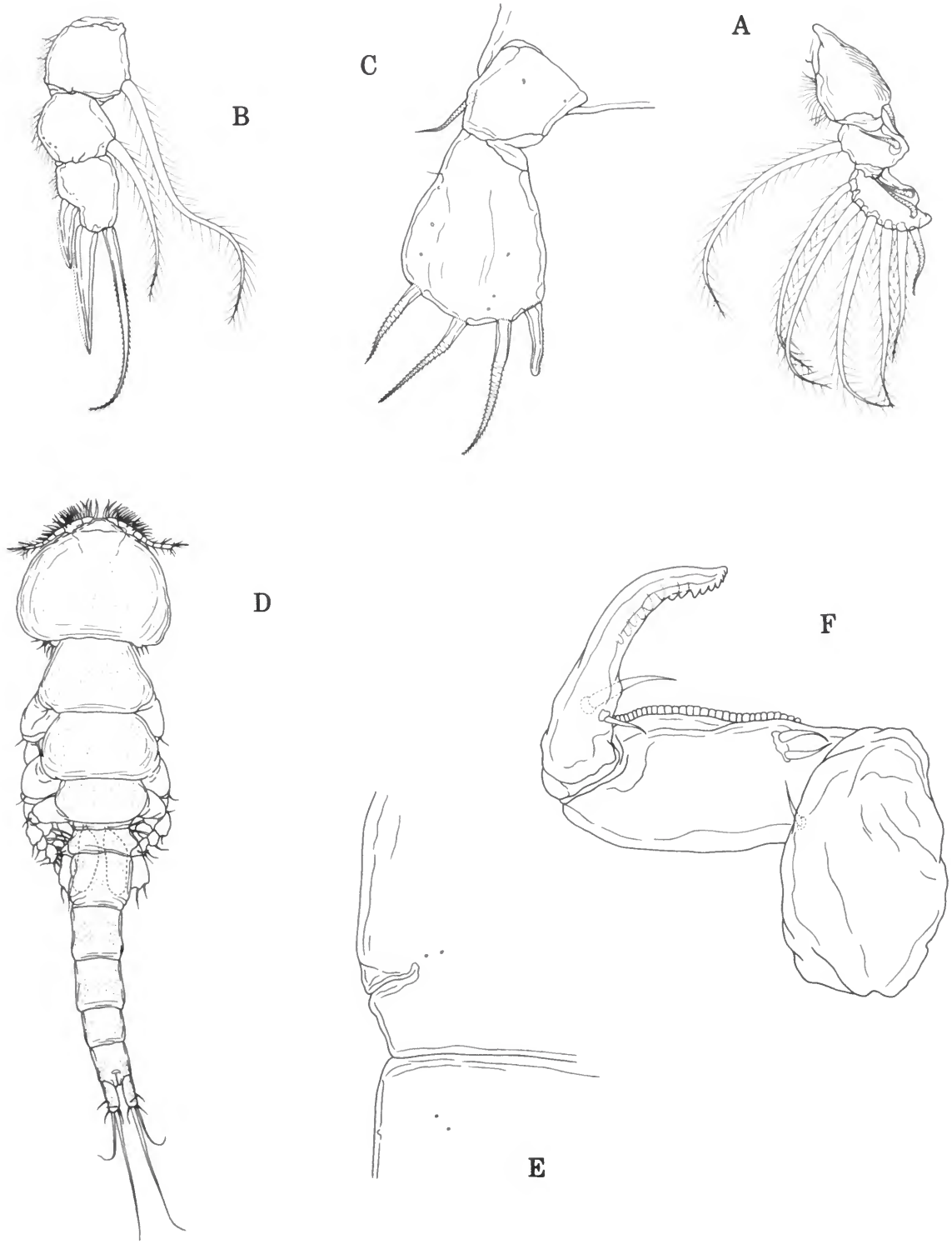

FIGURE 41.—*Taeniacanthus longicervis* (Pillai). Female: A, leg 4 exopod, dorsal; B, leg 4 endopod, ventral; C, leg 5, ventrolateral. Male: D, dorsal; E, genital area, ventral; F, maxilliped, anteromedial.

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 1 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:

P_1	coxa 0-1	basis 1-1	exopod I-0; 9 endopod 0-1; 7 (2 greatly reduced)
P_2	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-2; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-2, II, I, 2
P_4	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-1; II, int.

Interpodal plate of leg 1 (Figure 40A) broad, somewhat triangular with spinules on posterior margin. Interpodal plates of legs 2 and 3 as in Figure 40B. Interpodal 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 crenulated 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 41D) 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 41F) 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 longicervis*, originally reported under *Parataeniacanthus*, was first described by Pillai (1963) from the branchial chamber of *Saurida tumbil*. Cressey and Cressey (1979) gave a partial redescription of this species from specimens collected from *Saurida undosquamis* (Richardson) and *Saurida elongata*. Our redescription is 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

FIGURES 42–45

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 spinules on each side of anteroventral surface and 2 short rows of spinules near insertion of each caudal ramus. Caudal ramus (Figure 42B) 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 42D) with first 2 segments each with 1 naked distal seta; last part comprised of fused segments amd bearing 2 pectinate processes (longer one with small distal seta and shorter one with hyaline process at midlength), and 1 stout and 2 slender spines and 4 setae. Postantennal process (Figure 42E) with sharply pointed, curved tine.

Labrum (Figure 42F) with transparent membrane overlapping row of long spinules on posterior margin. Mandible (Figure 42G) with 2 unequal blades, each spinulated along 1 margin, and 1 seta with 1 row of bristles. Paragnath (Figure 43A) an unornamented lobe. Labial area (Figure 43A) with patches of spinules. First maxilla (Figure 43B) bearing 2 long, bristled setae, 3 shorter naked setae, and 1 sclerotized knob. Second maxilla (Figure 43C) 2-segmented; first segment robust and unarmed; second segment with spinulated terminal process and 1 long spinulated spine and 1 shorter naked spine. Maxilliped (Figure 43D,E) 3-segmented; first segment a sclerotized area bearing 1 naked seta (not figured in illustration); corpus with 1 naked and 1 bristled seta; third segment, a curved claw (Figure 43E) with transverse cuticular creases along convex margin; setae found at base of claw in most species of taeniacanthids not observed (may be absent in this species or broken off in specimens examined).

Legs 1–4 (Figures 43F,G, 44A–E) biramous. Spinal and setal formula as follows:

P_1	coxa 0-1	basis 1-1	exopod 1-0; 1-1; 7 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-2; II, 1, 3
P_3	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-2; II, 1, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-1; II, int.

Interpodal plate of legs 1–4 (Figures 43F,G, 44B,D) with patches of spinules on posterior margins. Interpodal plate of leg 1 with protuberant posterior margin. Interpodal plates of legs 2–4 reentrant. Inner margins of bases of legs 2–4 with patches of spinules. Exopods of legs 2–4 similar in shape and armature except terminal segment of exopod of leg 4 (Figure 44E) slightly more slender and bearing a small digitiform process on distolateral corner. Terminal segment of endopod of leg 2 (Figure 44A) 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 spinules; second segment 173 × 69 μm (l × w), possessing 3 spines (outer sides spinulated, inner sides with transparent membranes) and 1 haired (pilose) seta; single row of spinules at base of each spine and a row of larger spinules 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 only 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 spinules on each side of anteroventral surface and 2 rows of spinules 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 spinules (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 distolateral 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

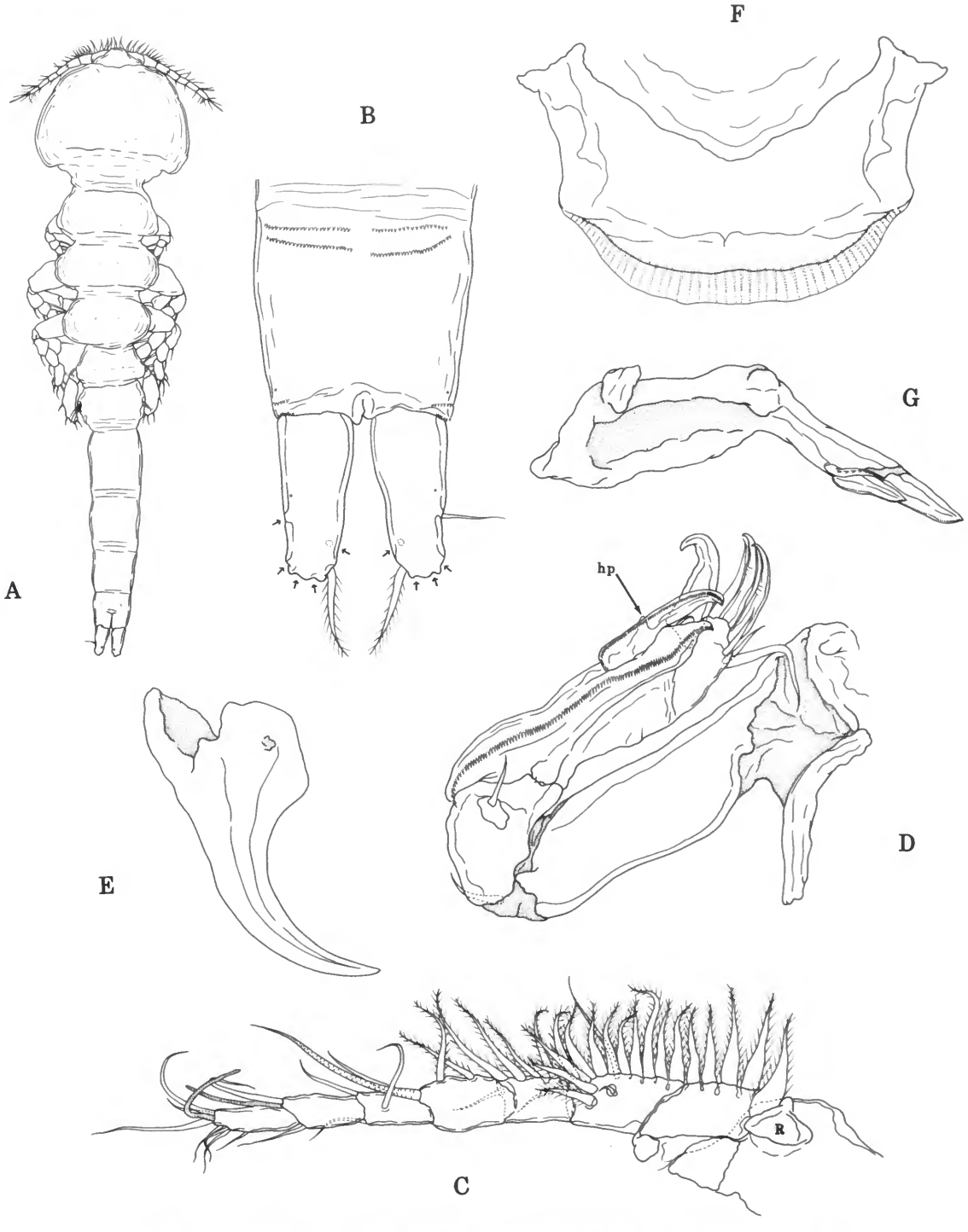

FIGURE 42.—*Taeniacanthus miles* (Pillai), female: A, dorsal; B, anal segment and caudal rami, ventral (arrows indicate positions of missing setae); C, rostral area and first antenna, ventral; D, second antenna, medial; E, postantennal process, ventral; F, labrum, ventral; G, mandible, anteromedial. (R = rostral area, hp = hyaline process.)

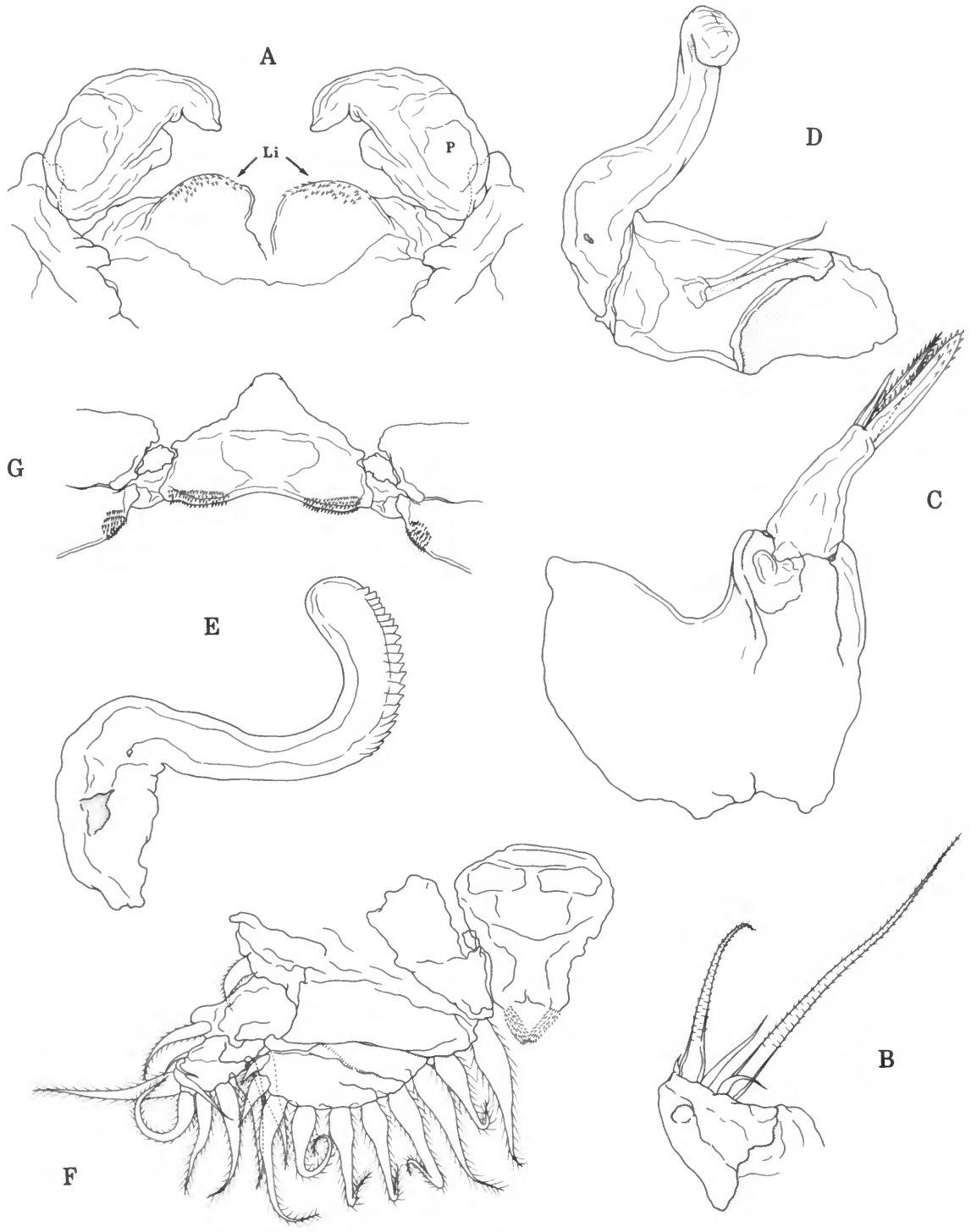

FIGURE 43.—*Taeniacanthus miles* (Pillai), female: A, paragnaths and labial area, posteroventral; B, first maxilla, anterior; C, second maxilla, posteroventral; D, maxilliped, ventromedial; E, maxilliped claw, dorsal; F, leg 1 and interpodal plate, ventral; G, leg 2, interpodal plate and proximal portions of basipods, ventral. (P = paragnath, Li = labium.)

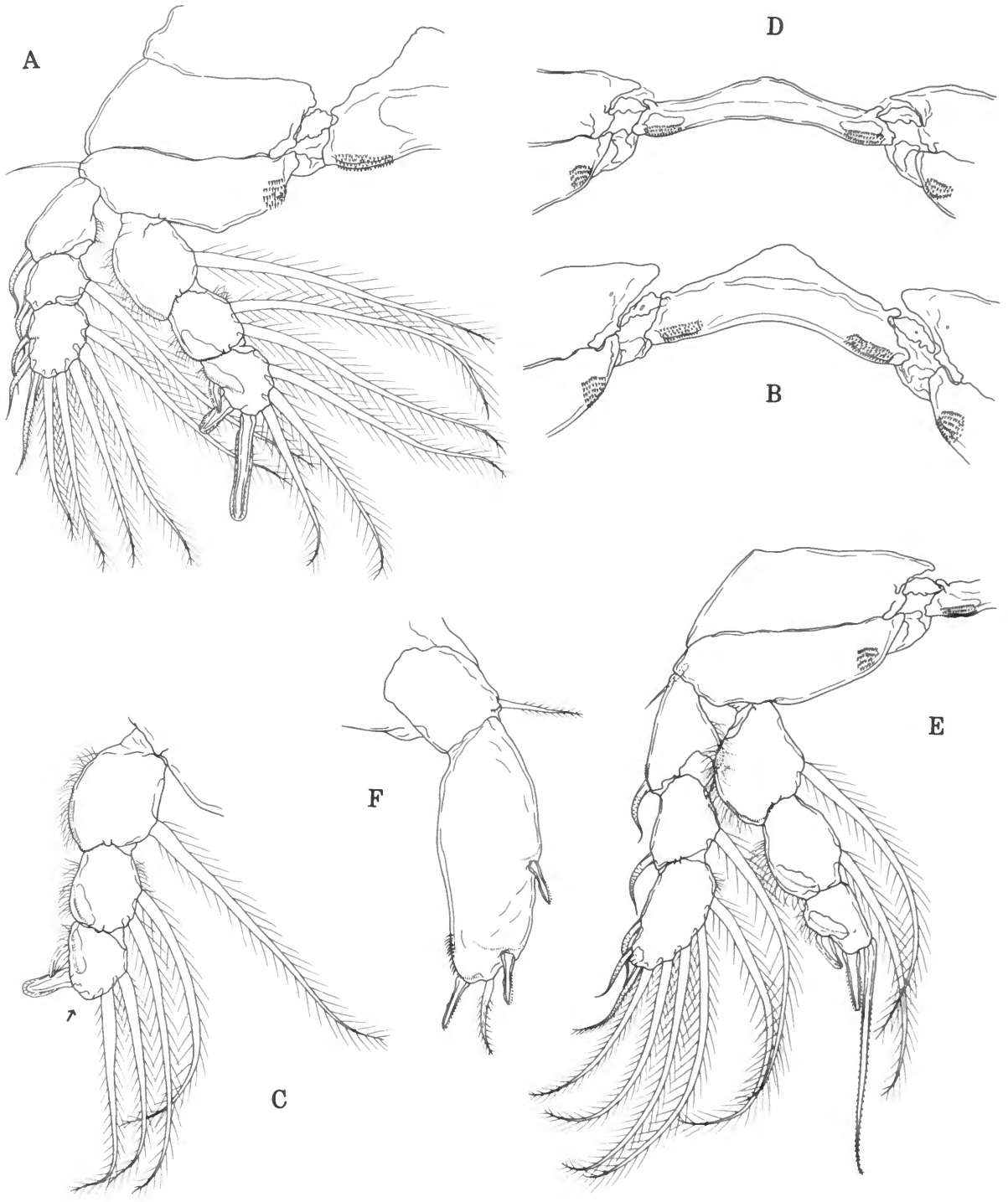

FIGURE 44.—*Taeniacanthus miles* (Pillai), female: A, leg 2 and interpodal plate, ventral; B, leg 3, interpodal plate and proximal portions of basipods, ventral; C, leg 3 endopod, ventral (arrow indicates position of missing spine); D, leg 4, interpodal plate and proximal portions of basipods, ventral; E, leg 4, ventral; F, leg 5, ventral.

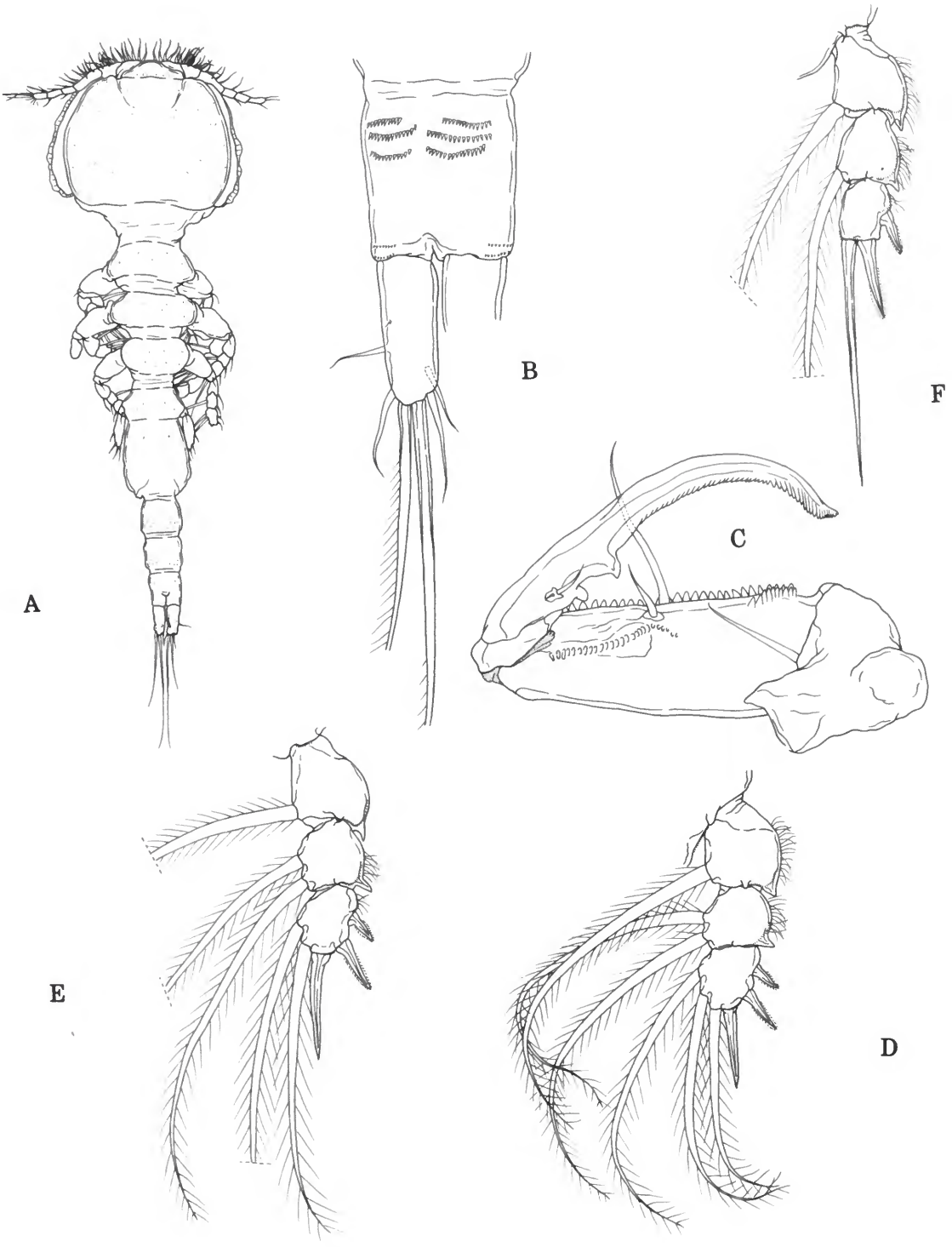

FIGURE 45.—*Taeniacanthus miles* (Pillai), male: A, dorsal; B, anal segment and caudal ramus, ventral; C, maxilliped, anterior; D, leg 2 endopod, ventral; E, leg 3 endopod, ventral; F, leg 4 endopod, ventral.

Parataeniacanthus from the branchial chamber of *Pterois miles* by Pillai (1963). Material donated to the National Museum of Natural History, Smithsonian Institution, by Dr. N. Krishna Pillai was used as a basis for our description.

The description given above differs in several details from that provided by Pillai (1963), specifically in the segmentation and armature of the first antenna and leg 1. In addition, the morphology of the oral appendages is reported in more detail in the present account than in the original description.

The female of *Taeniacanthus miles* has a strongly curved maxilliped claw, which terminates in a bluntly rounded tip. Four congeners possess an apically rounded maxilliped claw: *T. anguillaris* (Devi and Shyamasundari, 1980); *T. nudicauda*, new species; *T. papulosus*, new species; and *T. pollicaris*, new species. This appendage of *T. miles* is morphologically most similar to that of *T. papulosus*. However, it may be distinguished from these four species by a more elongate, slender habitus, a 3-segmented exopod of leg 1, only seven setae on terminal exopod segment of leg 1, and relatively blunt endopod spines of legs 2 and 3.

Taeniacanthus moa (Lewis, 1967), new combination

FIGURES 46–49

Anchistrotos moa Lewis, 1967:10.—Ho and Dojiri, 1976:259.—Kabata, 1979:74.

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 × 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 × 179 μm. Abdomen (Figure 46C) 3-segmented; segments from anterior to posterior 53 × 129 μm, 53 × 113 μm, and 60 × 94 μm (l × w); anal segment (Figure 46D) with 3 rows of stout spinules on each side of anteroventral surface and 1 row of smaller spinules on posteroventral margin near insertion of each caudal ramus. Caudal ramus (Figure 46D) stout, 41 × 28 μm, bearing 4 subterminal setae (semipinnate seta with minute spinules 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; armature 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:

P_1	coxa 0-1	basis 1-1	exopod 1-0; 9 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 4 endopod 0-1; 0-1; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 4 endopod 0-1; 0-1; II, I, 2
P_4	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 spines 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 × 41 μm (l × w), with 3 unilaterally bristled spines, 1 long, slender naked seta, and a patch of spinules on inner margin; spines

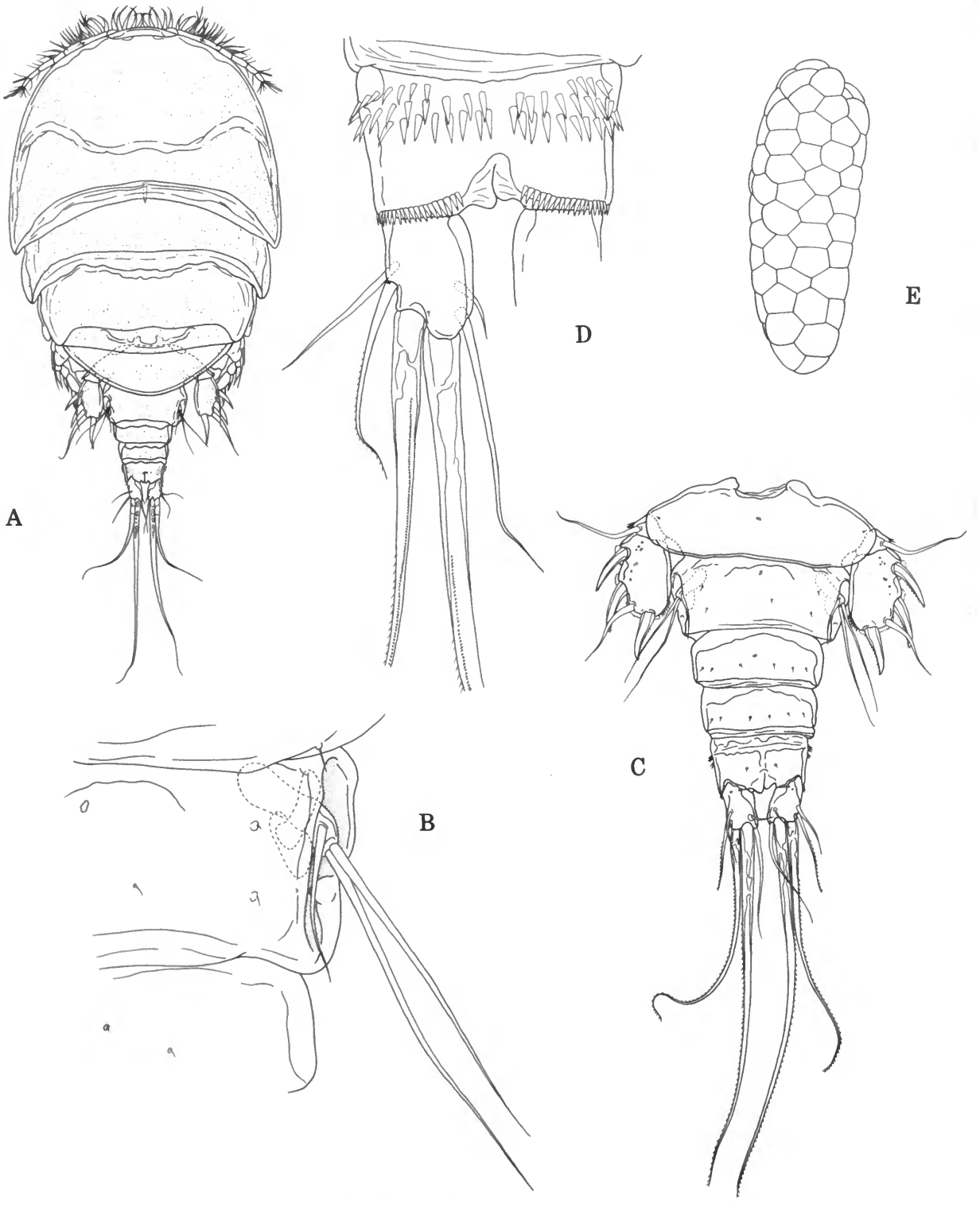

FIGURE 46.—*Taeniacanthus moa* (Lewis), female: A, dorsal; B, genital area, dorsal; C, urosome, dorsal; D, anal segment and caudal ramus, ventral; E, egg sac, dorsal.

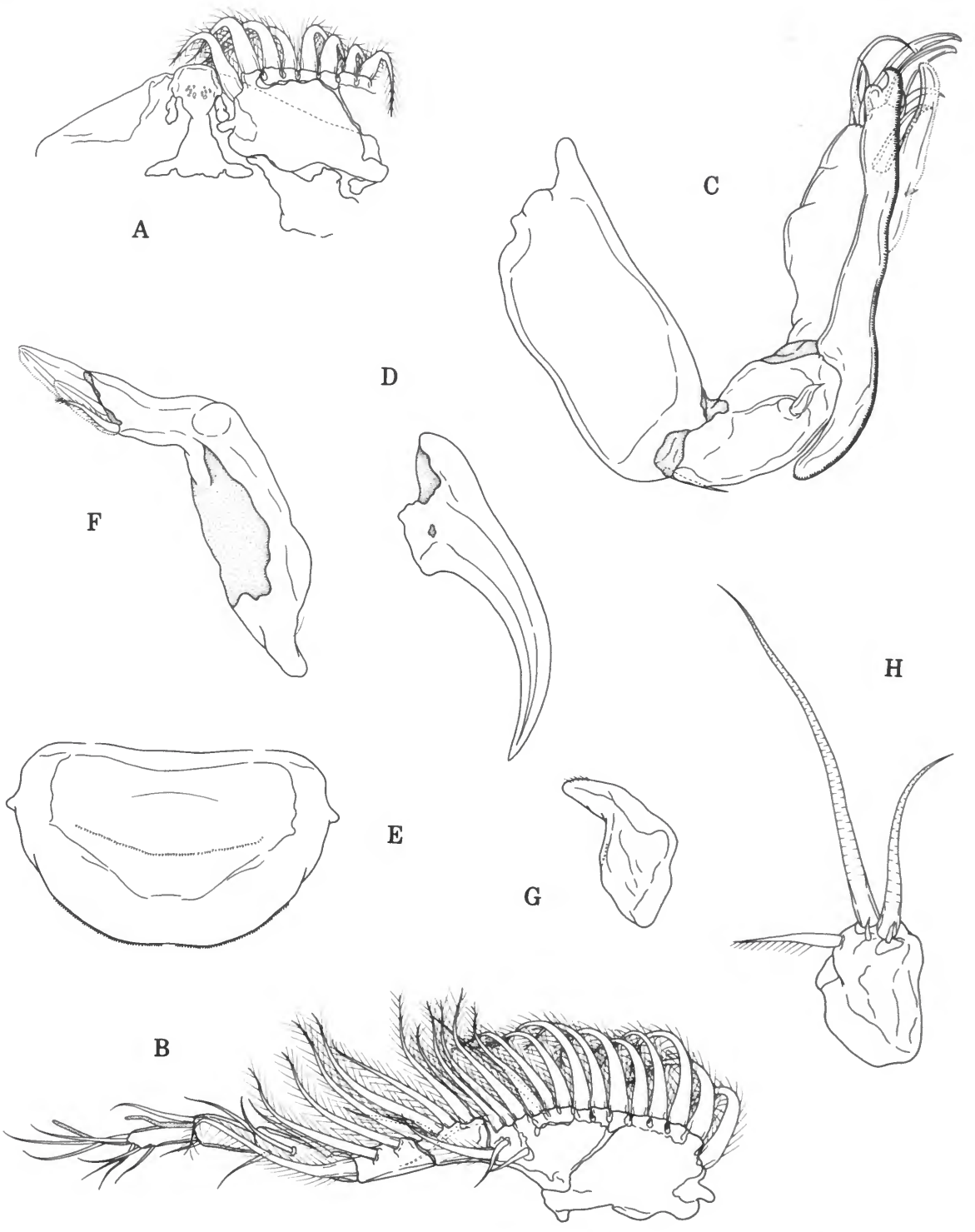

FIGURE 47.—*Taeniacanthus moa* (Lewis), female: A, rostral area, ventral; B, first antenna, ventral; C, second antenna, medial; D, postantennal process, ventral; E, labrum, ventral; F, mandible, anteromedial; G, paragnath, posteroventral; H, first maxilla, anterior.

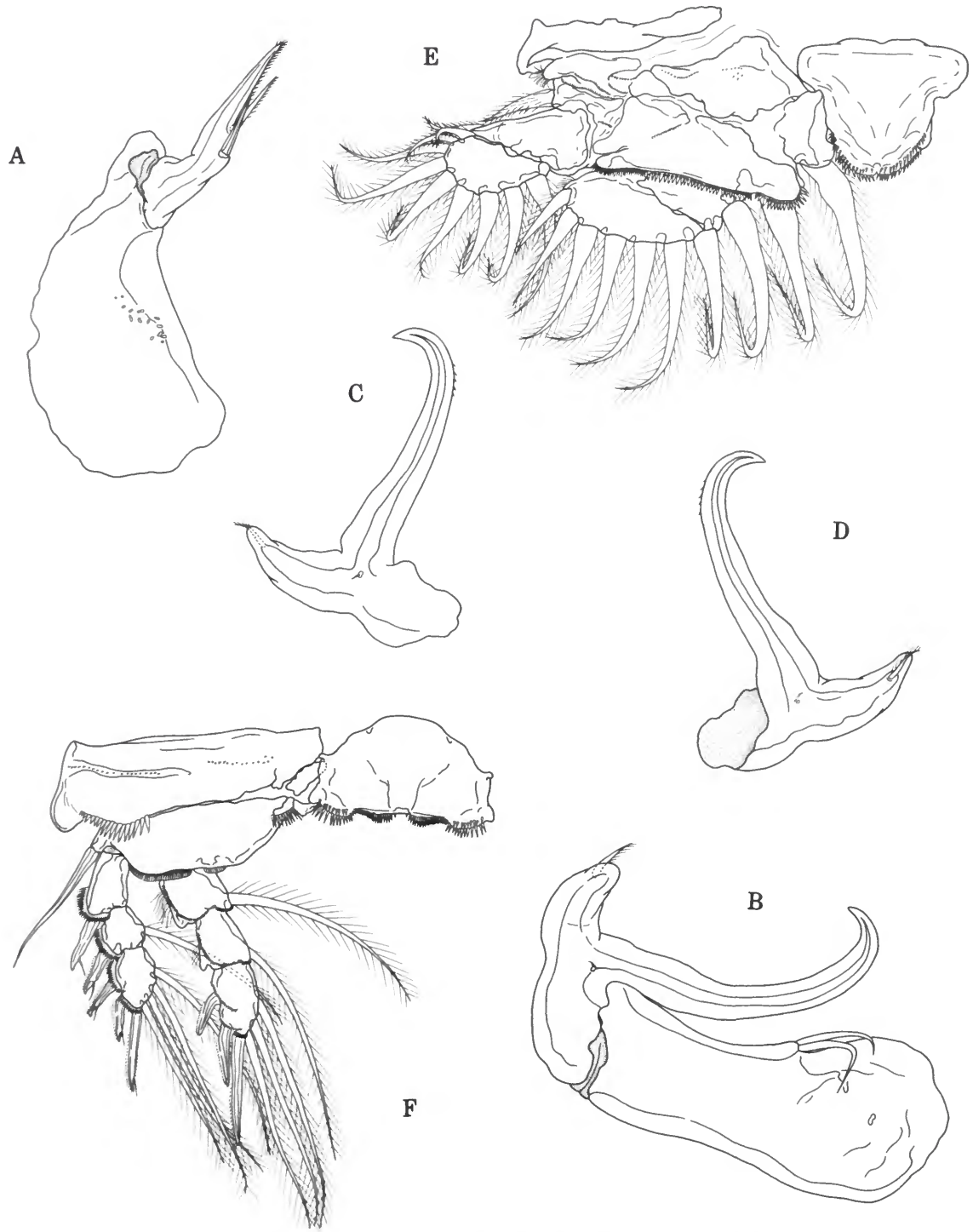

FIGURE 48.—*Taeniacanthus moa* (Lewis), female: A, second maxilla, posteroventral; B, maxilliped, anterior; C, maxilliped claw, anterior; D, same, posterior; E, leg 1 and interpodal plate, ventral; F, leg 2 and interpodal plate, ventral.

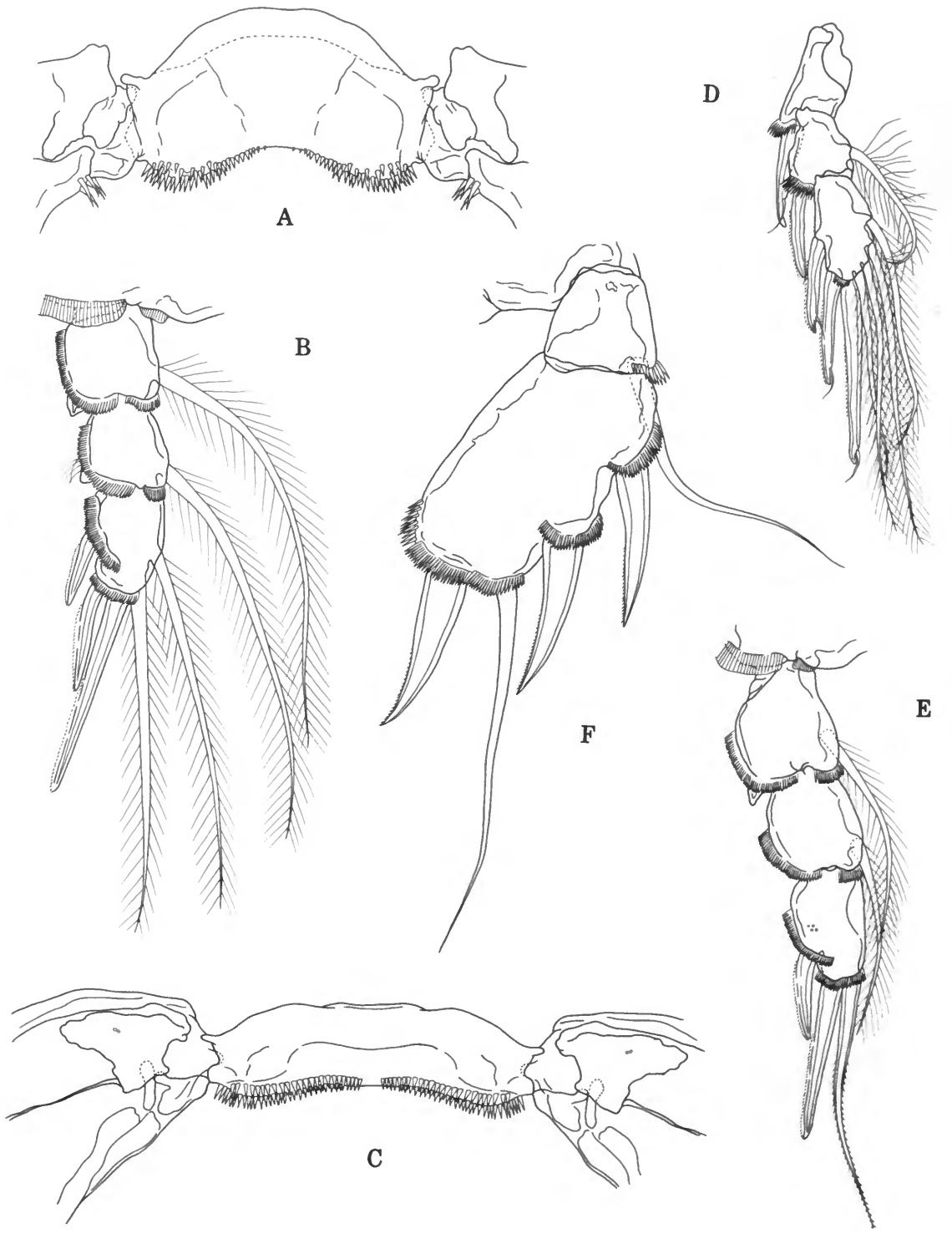

FIGURE 49.—*Taeniacanthus moa* (Lewis), female: A, leg 3, interpodal plate and proximal portions of basipods, ventral; B, leg 3 endopod, ventral; C, leg 4, interpodal plate and proximal portions of basipods, ventral; D, leg 4 exopod, ventral; E, leg 4 endopod, ventral; F, leg 5, ventral.

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, I, 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, I, 5 on the terminal exopod segment of leg 2. Only two congeners, *T. cynoglossi* (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.

Taeniacanthus neopercis Yamaguti, 1939

FIGURES 50–52

Taeniacanthus neopercis Yamaguti, 1939:403.—Yamaguti, 1963:21.—Kabata, 1979:78.

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 (1.23–1.54 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 pinnules.

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, lobiform 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,D) a lobe bearing 2 bristled and 2 smaller naked setae in addition to anterior knob. Second maxilla (Figure 51E) 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 51F) 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), I large and 1 smaller conical processes, and I minute hyaline seta at base.

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

P_1	coxa 0-1	basis 1-1	exopod 1-0; 9 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-2; II, 1, 3
P_3	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-2; II, 1, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-1; II, int.

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

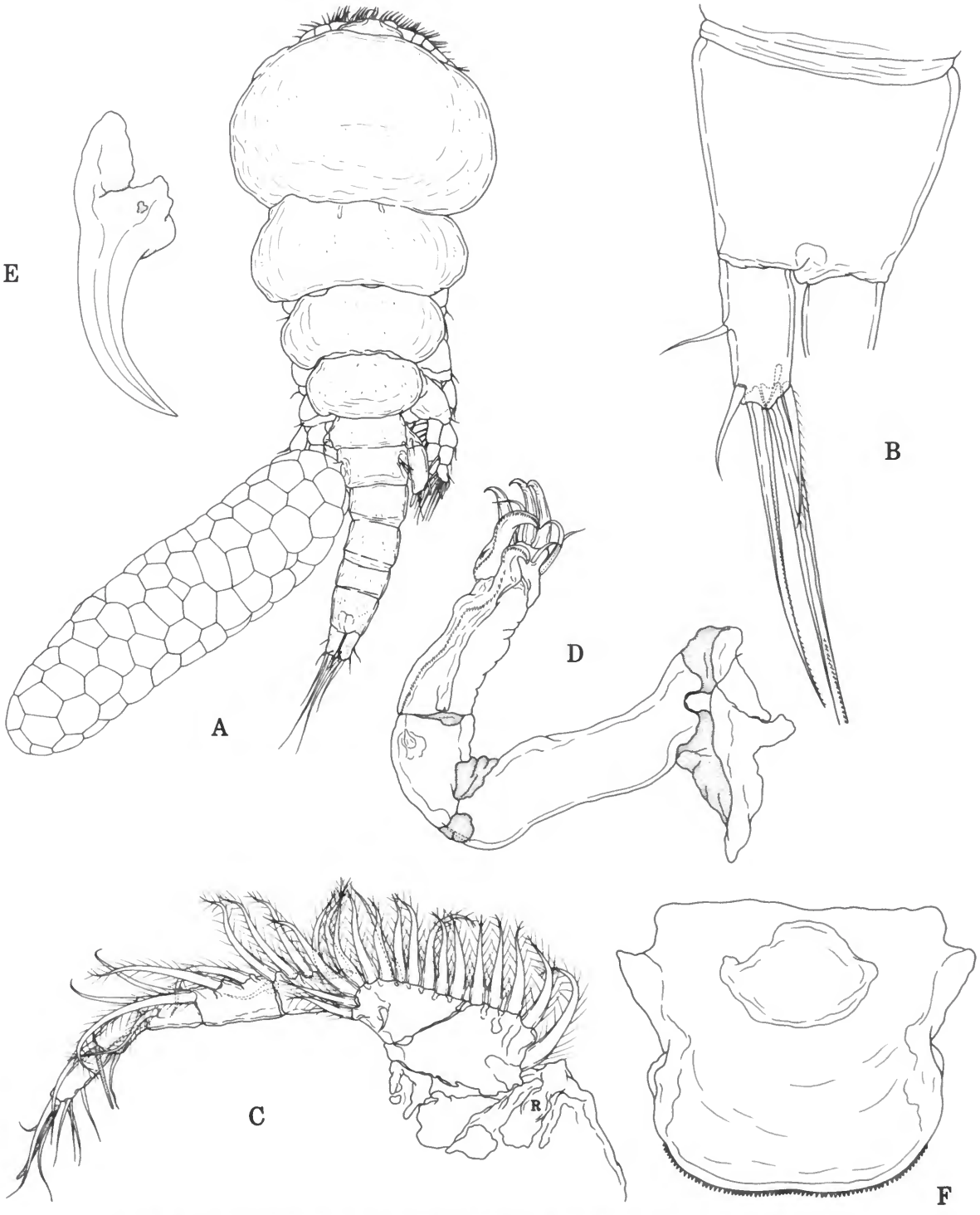

FIGURE 50.—*Taeniacanthus neopercis* Yamaguti, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area and first antenna, ventral; D, second antenna, medial; E, postantennal process, ventral; F, labrum, ventral. (R = rostral area.)

FIGURE 51.—*Taeniacanthus neopercis* Yamaguti, female: A, mandible, anteromedial; B, paragnath, dorsal; C, first maxilla, anterior; D, same, posterior; E, second maxilla, posteroventral; F, maxilliped, ventromedial; G, leg 1 and interpodal plate, ventral; H, leg 2, interpodal plate and basipod, ventral.

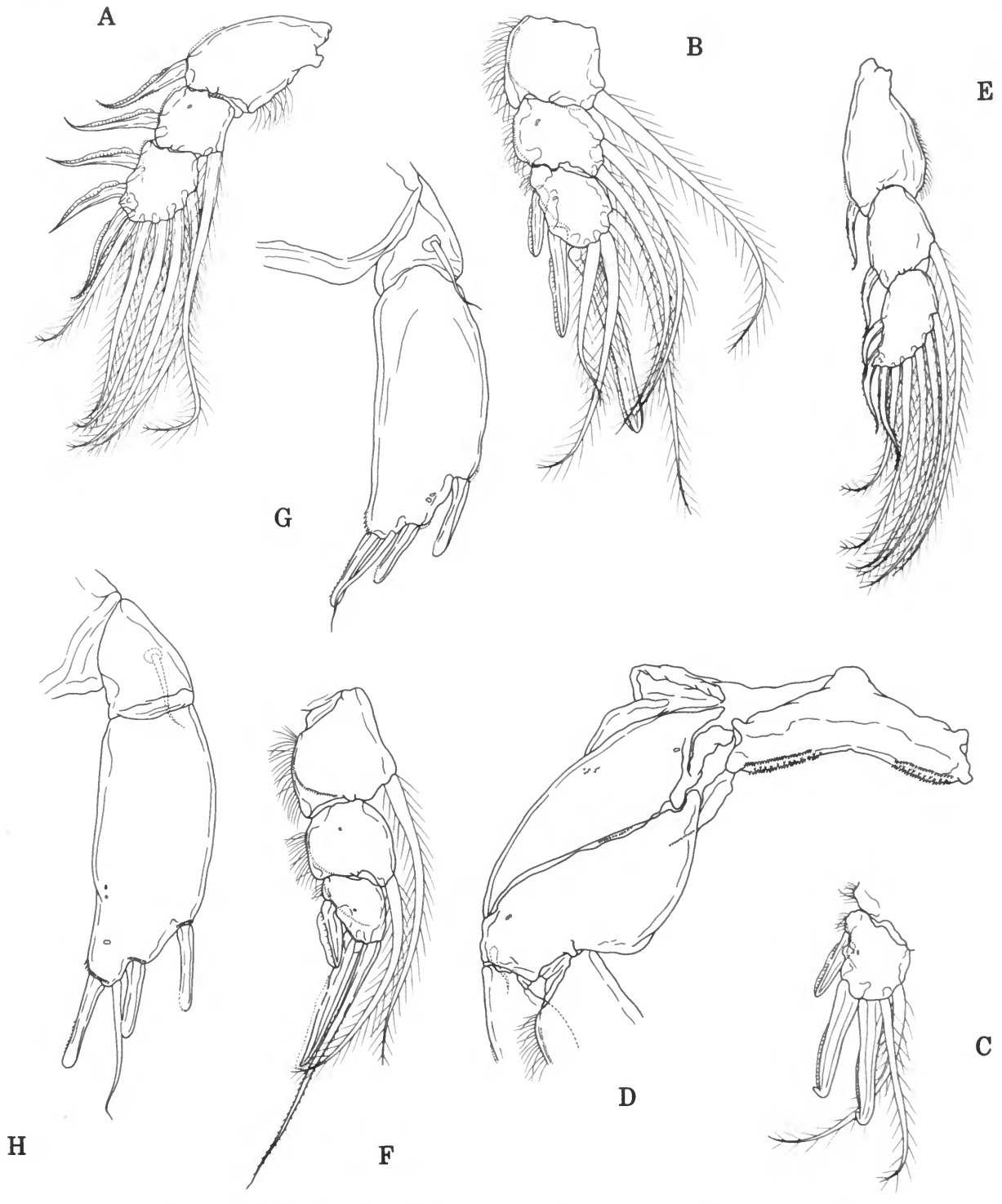

FIGURE 52.—*Taeniacanthus neopercis* Yamaguti, female: A, leg 2 exopod, ventral; B, leg 2 endopod, ventral; C, leg 3, terminal endopod segment, ventral; D, leg 4, interpodal plate and basipod, ventral; E, leg 4 exopod, ventral; F, leg 4 endopod, ventral; G, leg 5, dorsal; H, same, ventral.

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 *Neopercis* (a genus now considered a junior synonym of *Parapercis*), *N. aurantiaca* (Döderlein), *N. multifasciata* (Döderlein), *N. muronis* Tanaka, and *N. sexfasciata* (Temminck and Schlegel). The last-named species is synonymous with *Parapercis 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. acanthocepolae* 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 *Cirripectes alboapictus* 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, 69 × 81 μm, 51 × 69 μm, and 60 × 55 μm (l X w); anal segment (Figure 53B) without spinules. Caudal ramus (Figure 53B) almost 2× 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 spinules, and a posteromedian 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:

P_1	coxa 0-1	basis 1-1	exopod 1-0; 9 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod 1-0; I-1; II, I, 5 endopod 0-1; 0-1; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod 1-0; I-1; II, I, 5 endopod 0-1; 0-1; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; I-1; II, I, 5 endopod 0-1; 0-1; II, int.

Interpodal plates of legs 1–4 (Figure 54C,D,F,H) with spinules on posterior margins; spinules of leg 1 in 2 oval patches; spinules of leg 2 (Figure 54D) 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.

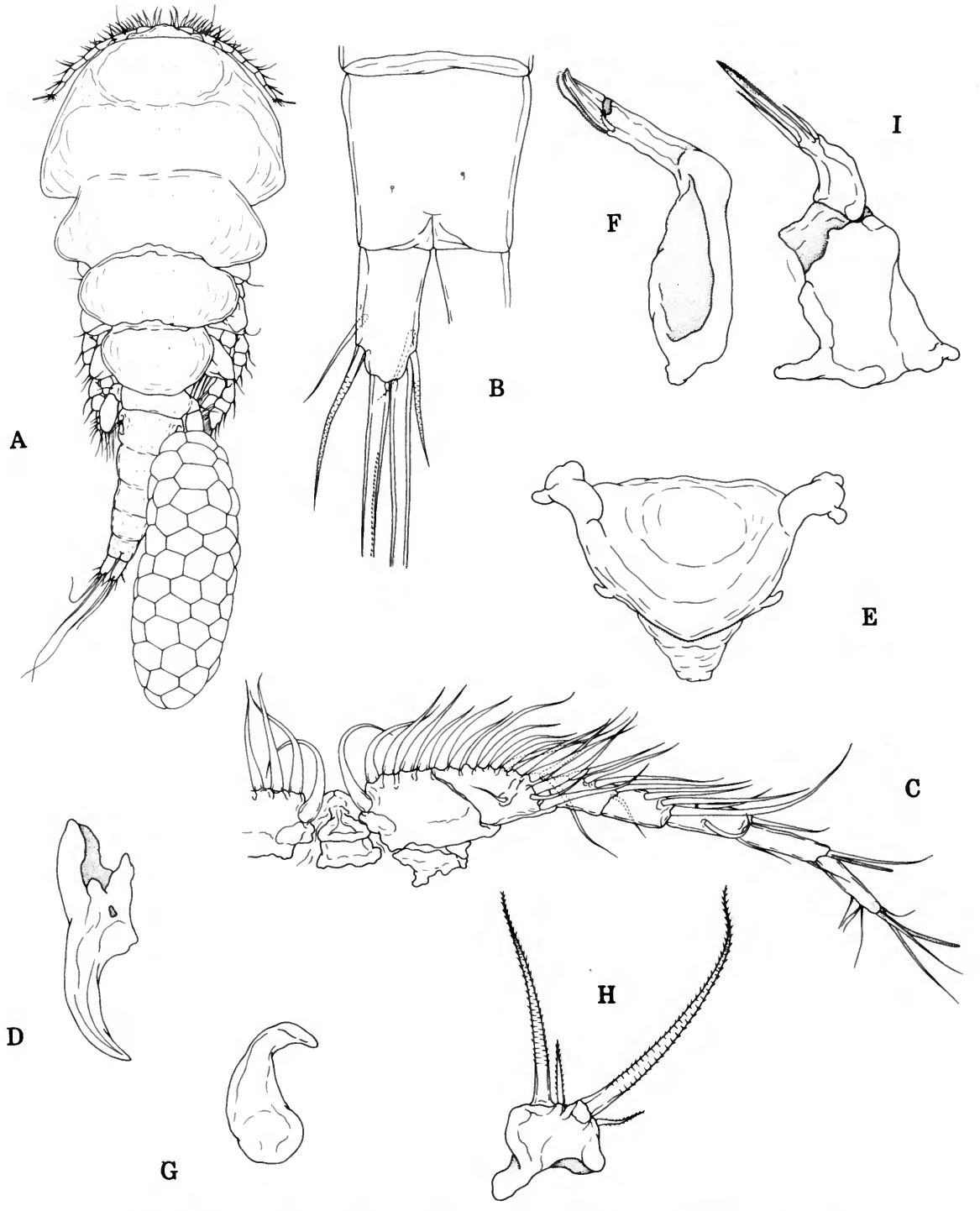

FIGURE 53.—*Taeniacanthus nudicauda*, new species, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area and first antenna, ventral; D, postantennal process, ventral; E, labrum, ventral; F, mandible, anteromedial; G, paragnath, dorsomedial; H, first maxilla, posterior; I, second maxilla, ventral.

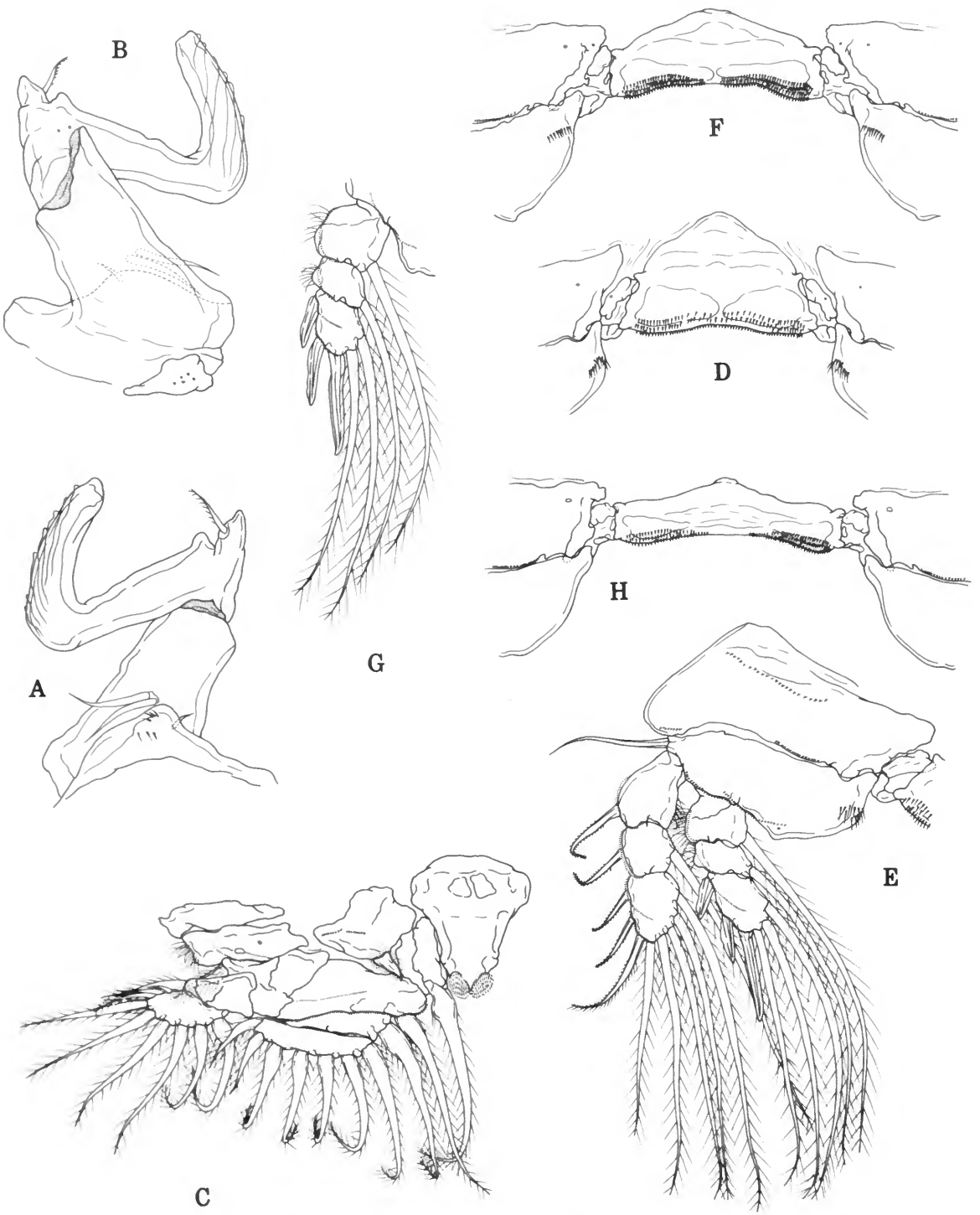

FIGURE 54.—*Taeniacanthus nudicauda*, new species, female: A, maxilliped, ventromedial; B, same, dorsolateral; C, leg 1 and interpodal plate, ventral; D, leg 2, interpodal plate and proximal portions of basipods, ventral; E, leg 2, ventral; F, leg 3, interpodal plate and proximal portions of basipods, ventral; G, leg 3 endopod, ventral; H, leg 4, interpodal plate and proximal portions of basipods, ventral.

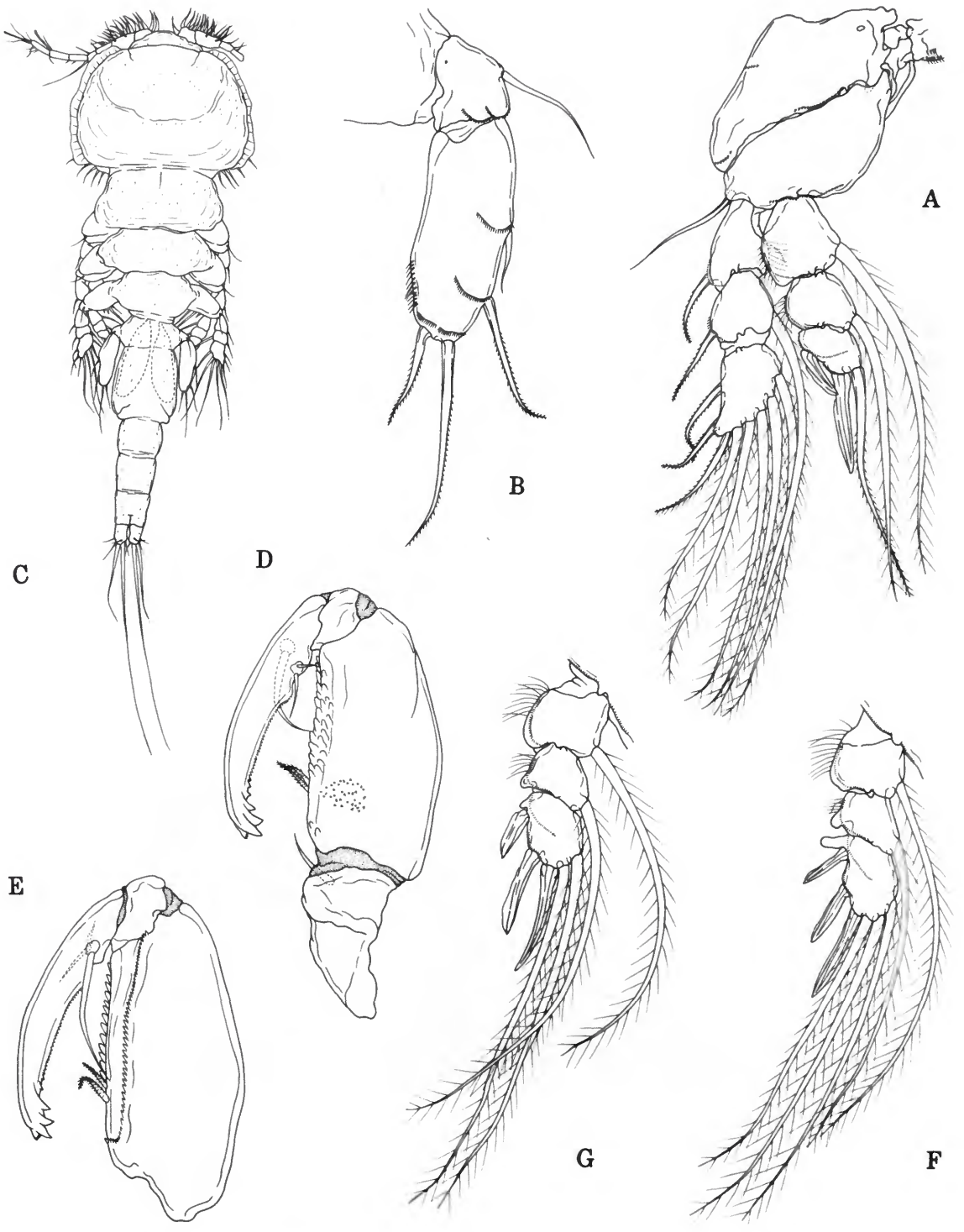

FIGURE 55.—*Taeniacanthus nudicauda*, new species. Female: A, leg 4, ventral; B, leg 5, ventral. Male: C, dorsal; D, maxilliped, anterior; E, same, posterior; F, leg 2 endopod, ventral; G, leg 3 endopod, ventral.

Male: Body as in Figure 55C. Total length 0.68 mm and greatest width 0.25 mm based on 1 specimen. Cephalothorax 184 × 230 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 *Cirripectes* and *Exallias.* These species, *T. digitatus, T. comparatus, T. glomerosus, 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

Anchistrotos occidentalis Wilson, 1924:6.—Wilson, 1932:385.—Humes and Rosenfield, 1960:179.—Yamaguti, 1963:22.—Kabata, 1979:74.

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 anteroventral 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.*

Male: See Humes and Rosenfield (1960).

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 redescription 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*

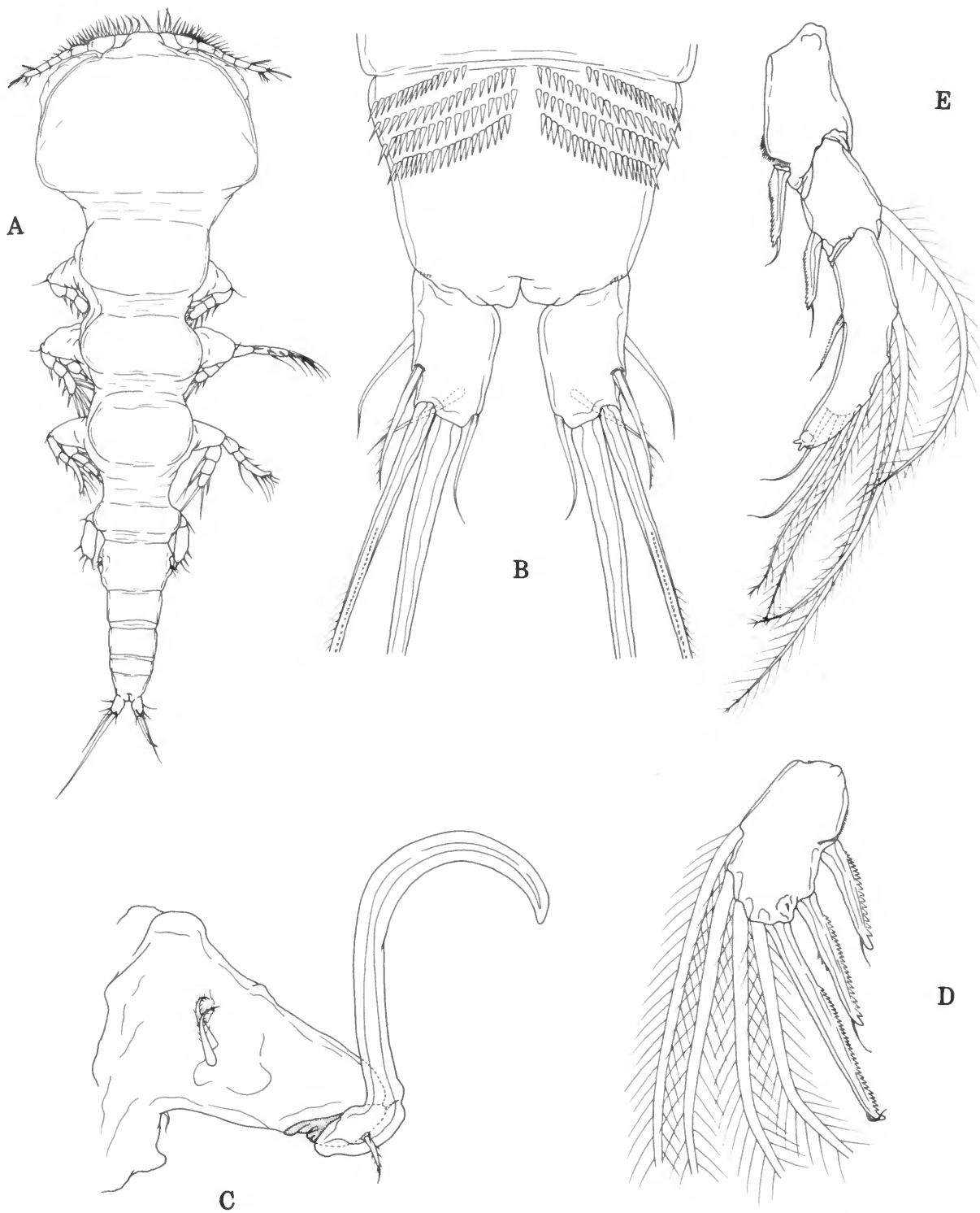

FIGURE 56.—*Taeniacanthus occidentalis* (Wilson), female: A, dorsal; B, anal segment and caudal rami, ventral; C, maxilliped, posterior; D, leg 2, terminal exopod segment, ventral; E, leg 4 exopod, ventral.

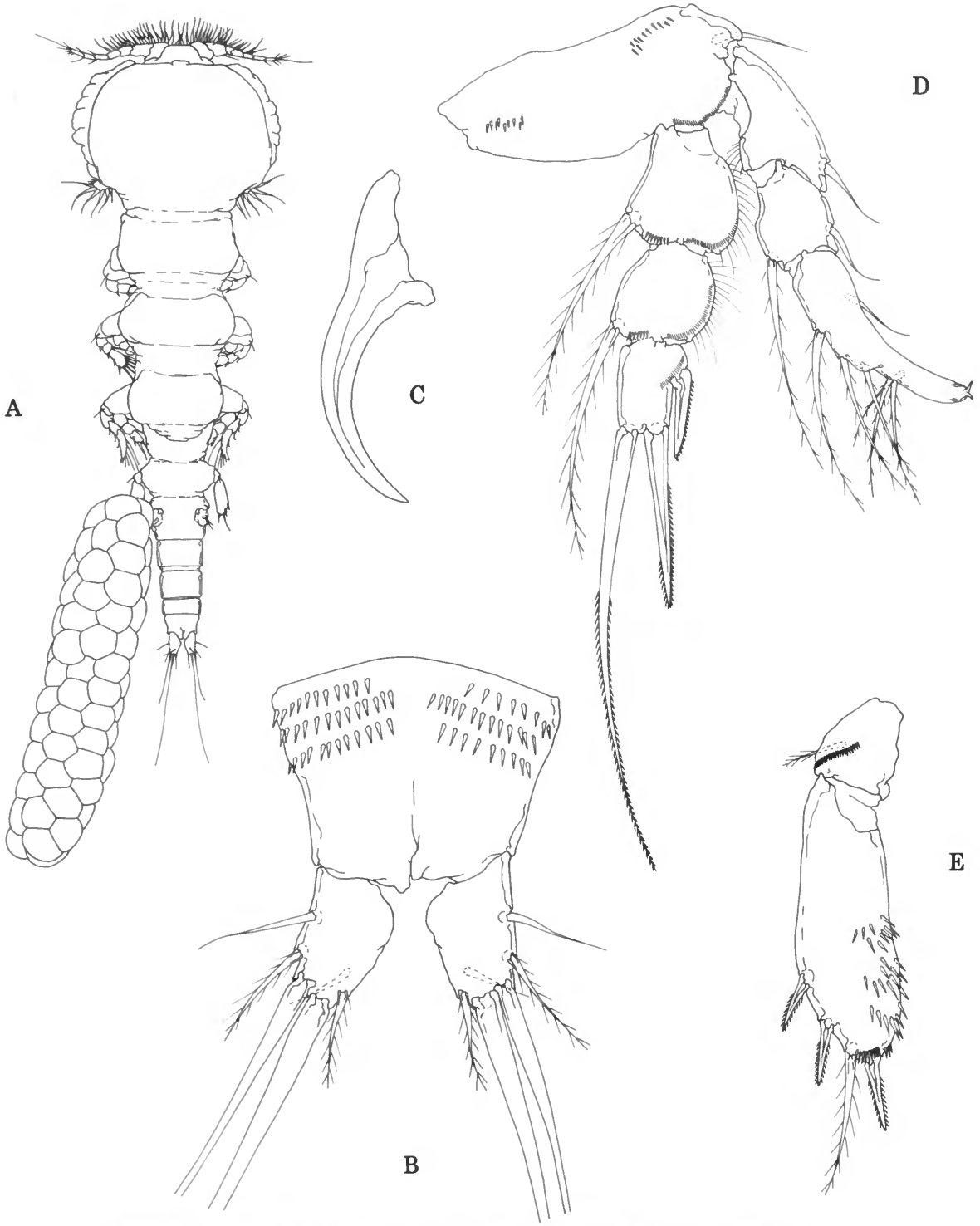

FIGURE 57.—*Taeniacanthus occidentalis* (Wilson), female: A, dorsal; B, anal segment and caudal rami, ventral; C, postantennal process, ventral; D, leg 4, ventral; E, leg 5, ventral.

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 (Richiardi, 1870), new combination

FIGURES 58–61

Bomolochus ostracionis Richiardi, 1870:49.
Anchistrotos ostracionis.—Wilson, 1911:392.—Barnard, 1955:234.—Yamaguti, 1963:22.—Kabata, 1979:74.

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 spinules 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 spinules. 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

P_1	coxa 0-1	basis 1-1	exopod 1-0; 9 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 4 endopod 0-I; 0-1; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod I-0; 1-1; II, I, 5 endopod 0-I; 0-1; II, I, 2
P_4	coxa 0-0	basis I-0	exopod I-0; 1-1; II, I, 4 endopod 0-I; 0-1; II, int.

Interpodal plate of leg 1 (Figure 60D) triangular with 3 to 4 rows of stout spinules on distal portion. Ventral surface of coxa and basis of leg 1 with small patches of spinules as in figure; row of spinules 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 spinules on ventral surface; basis with rows of spinules along posterior margin (innermost with much longer spinules); segments of rami with outer and distal rows of spinules. 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 61D; 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 spinules 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 Richiardi (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

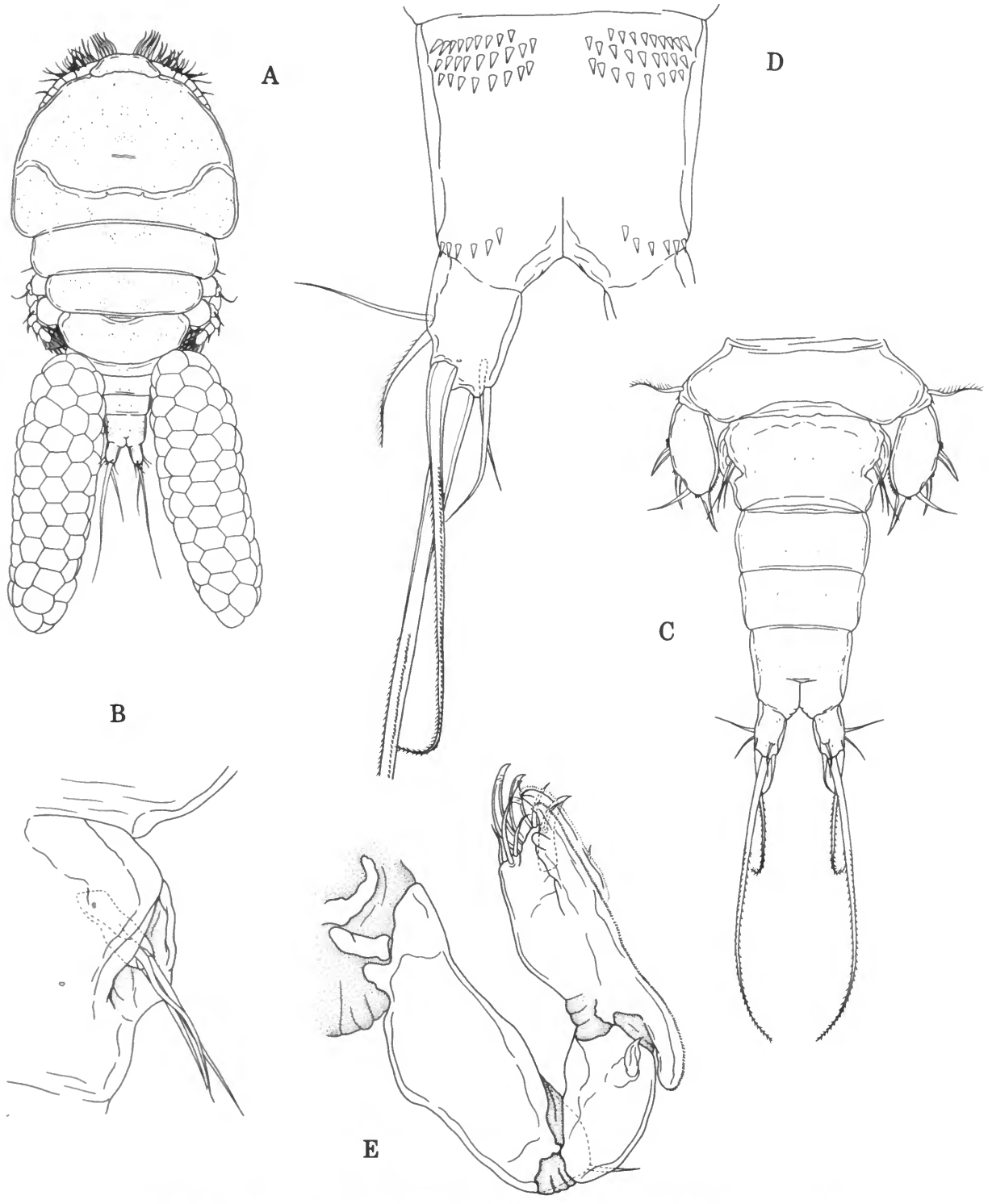

FIGURE 58.—*Taeniacanthus ostracionis* (Richiardi), female: A, dorsal; B, genital area, dorsal; C, urosome, dorsal; D, anal segment and caudal ramus, ventral; E, second antenna, medial.

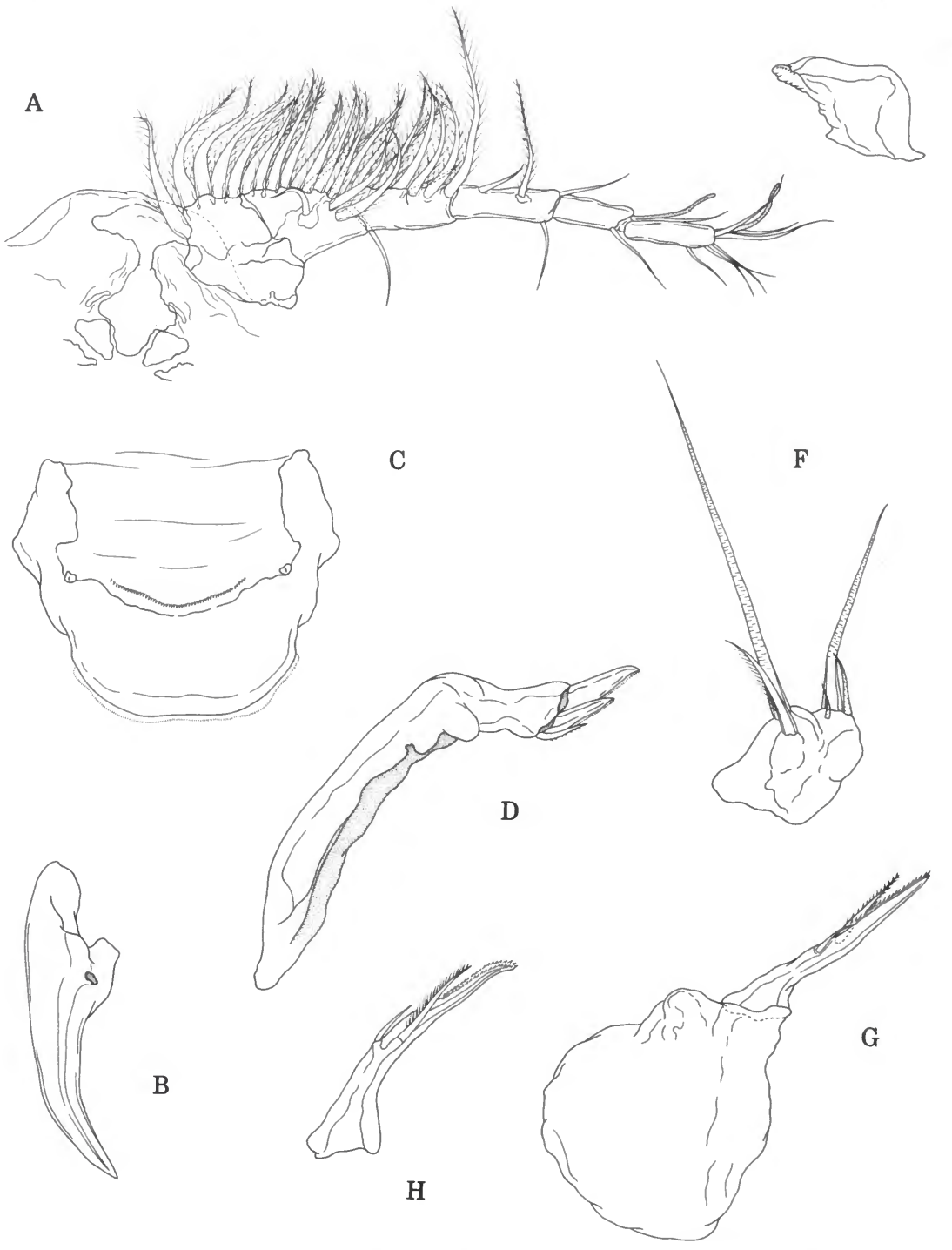

FIGURE 59.—*Taeniacanthus ostracionis* (Richiardi), female: A, rostral area and first antenna, ventral; B, postantennal process, ventral; C, labrum, ventral; D, mandible, anteromedial; E, paragnath, ventromedial; F, first maxilla, anterior; G, second maxilla, posteroventral; H, second maxilla, terminal segment, anterior.

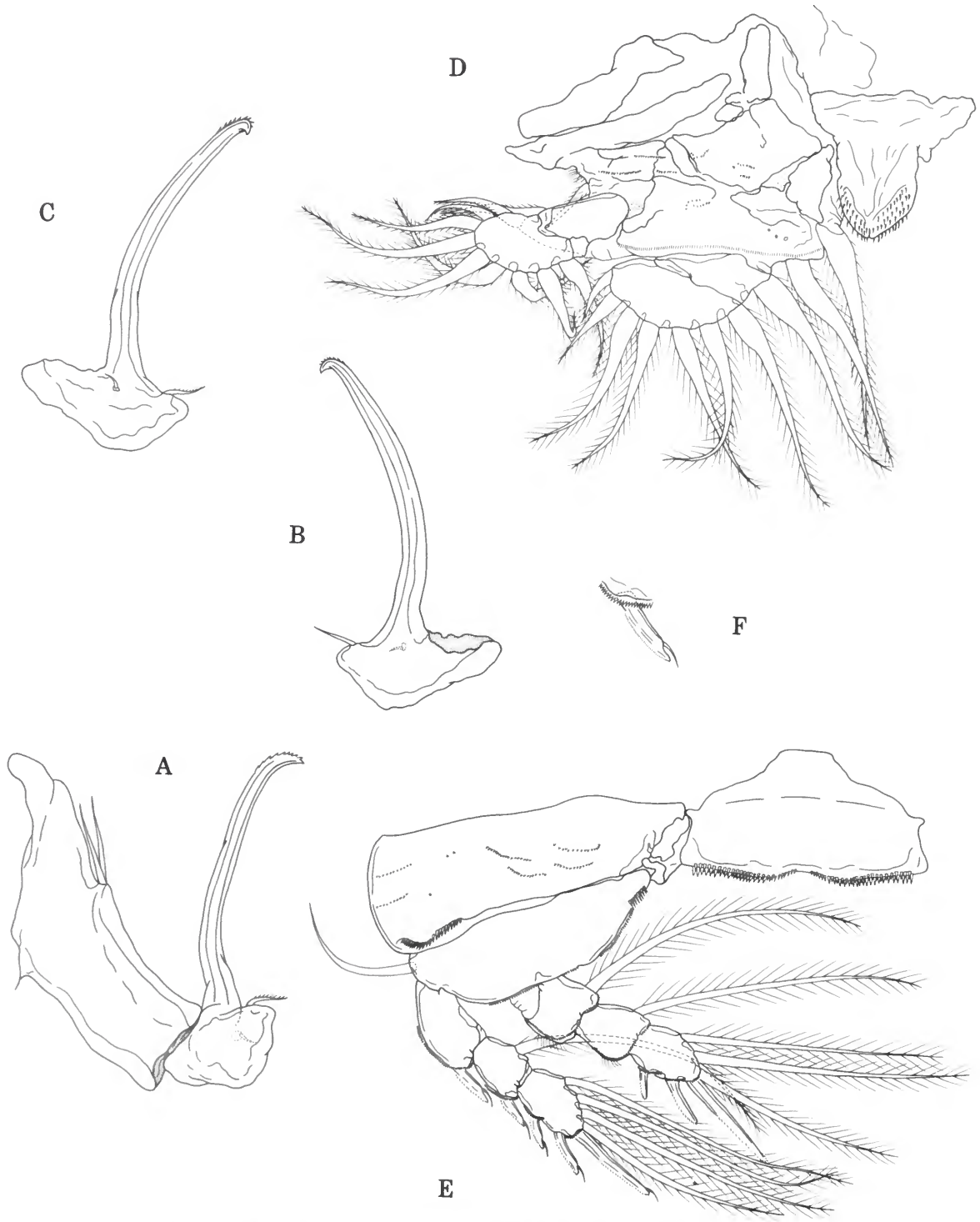

FIGURE 60.—*Taeniacanthus ostracionis* (Richiardi), female: A, maxilliped, posterior; B, maxilliped claw, posteroventral; C, same, anteroventral; D, leg 1 and interpodal plate, ventral; E, leg 2 and interpodal plate, ventral; F, leg 2, spine of first exopod segment, ventral.

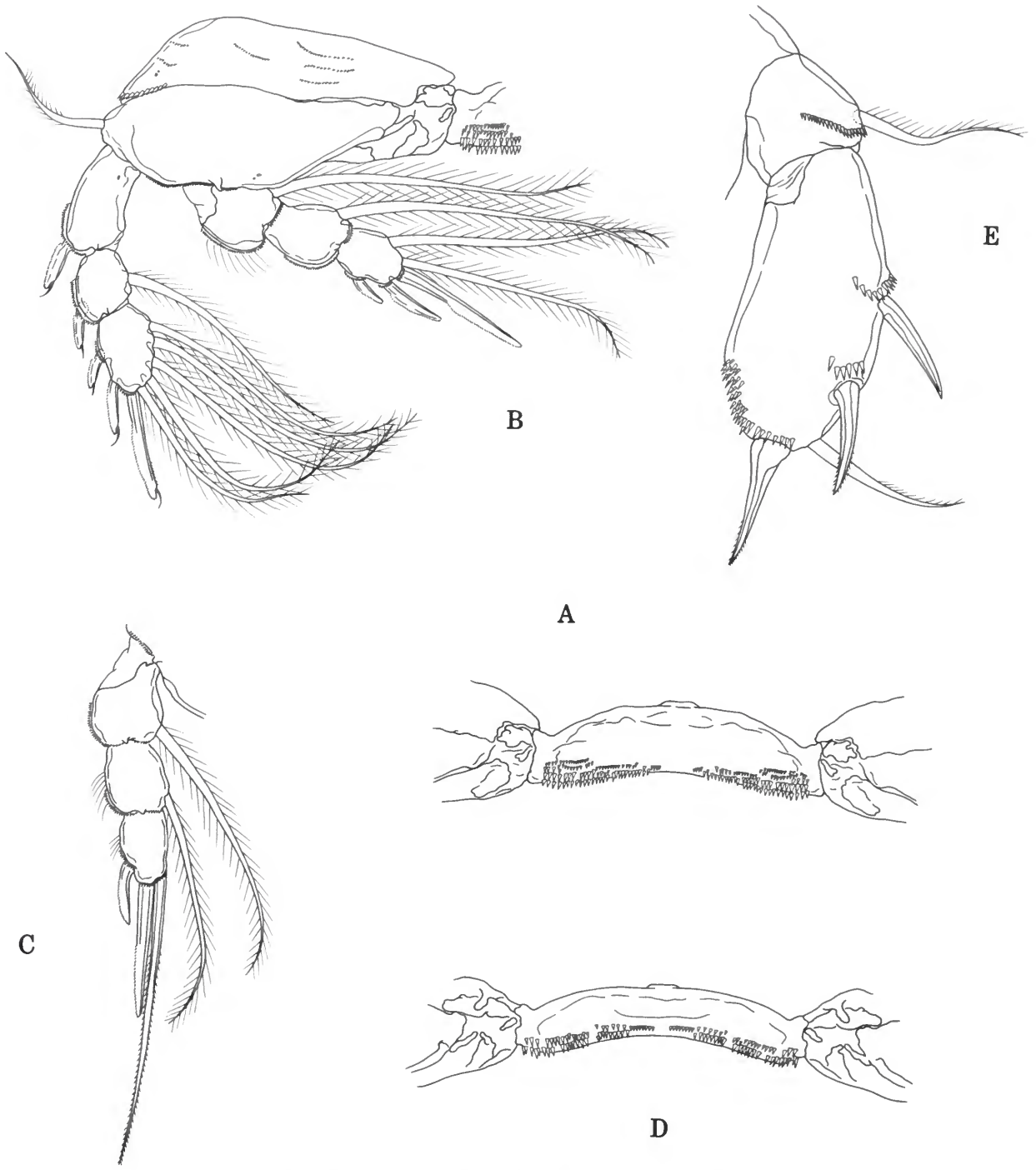

FIGURE 61.—*Taeniacanthus ostracionis* (Richiardi), female: A, leg 3, interpodal plate and proximal portions of basipods, ventral; B, leg 3, ventral; C, leg 4 endopod, ventral; D, leg 4, interpodal plate and proximal portions of basipods, ventral; E, leg 5, ventral.

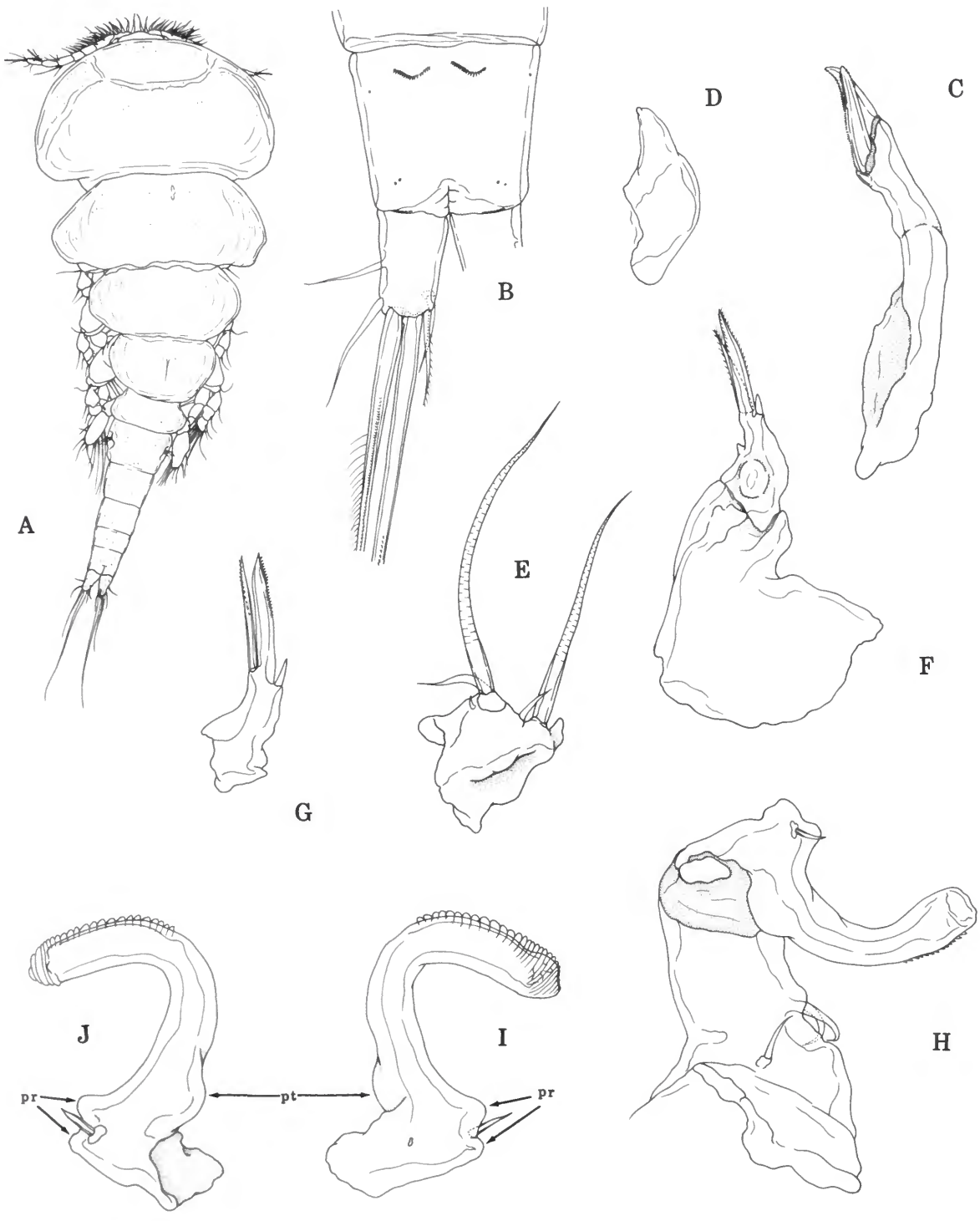

FIGURE 62.—*Taeniacanthus papulosus*, new species, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, mandible, anterior; D, paragnath, dorsomedial; E, first maxilla, posterior; F, second maxilla, posteroventral; G, second maxilla, terminal segment, ventrolateral; H, maxilliped, ventromedial; I, maxilliped claw, dorsal; J, same, ventromedial. (pt = rounded protuberance, pr = rounded protrusions.)

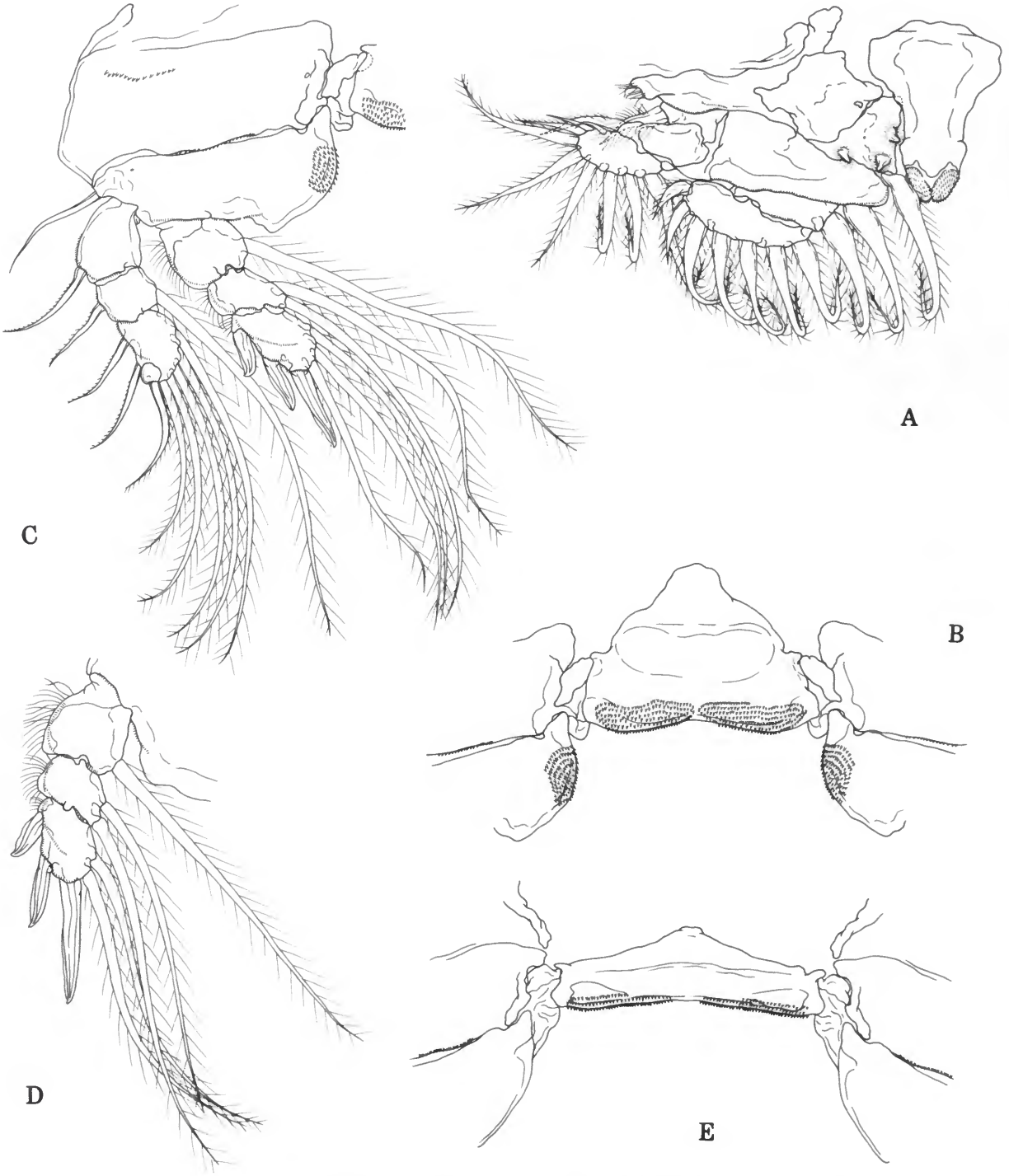

FIGURE 63.—*Taeniacanthus papulosus,* new species, female: A, leg 1 and interpodal plate, ventral; B, leg 2, interpodal plate and proximal portions of basipods, ventral; C, leg 2, ventral; D, leg 3 endopod, ventral; E, leg 4, interpodal plate and proximal portions of basipods, ventral.

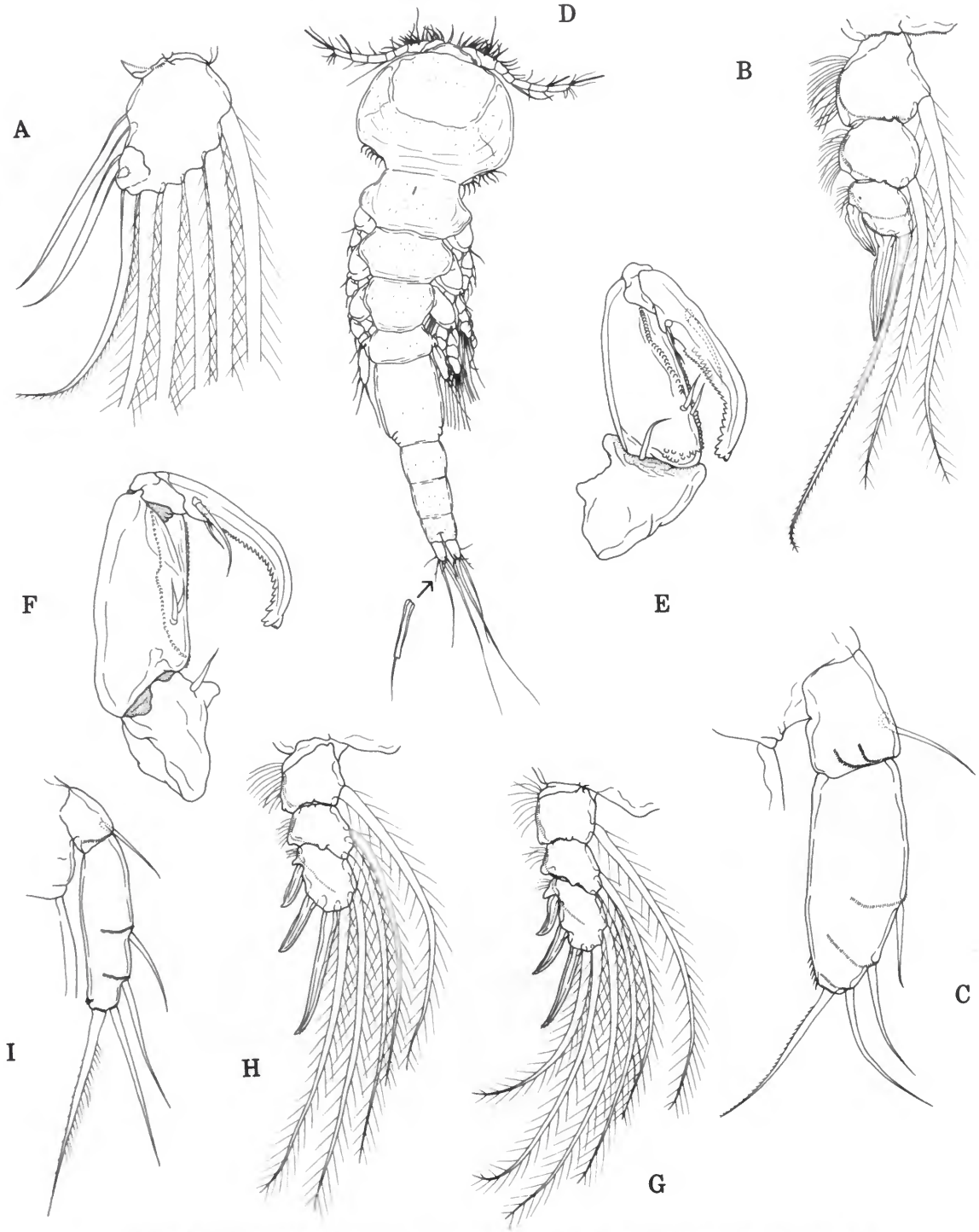

FIGURE 64.—*Taeniacanthus papulosus*, new species. Female: A, leg 4, terminal exopod segment, ventral; B, leg 4 endopod, ventral; C, leg 5, ventral. Male: D, dorsal; E, maxilliped, anterior; F, same, posterior; G, leg 2 endopod, ventral; H, leg 3 endopod, ventral; I, leg 5, ventral.

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 129 × 161 μm (l × w). Abdomen 4-segmented; segments from anterior to posterior 83 × 115 μm, 78 × 97 μm, 46 × 87 μm, and 64 × 74 μm (l × w); anal segment (Figure 62B) with 1 curved row of spinules on each side of anteroventral surface and 1 row of spinules 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?). Maxilliped (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 62I,J) 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:

P_1	coxa 0-1	basis 1-1	exopod 1-0; 9 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, I, 5 endopod 0-1; 0-2; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, I, 5 endopod 0-1; 0-2; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; 1-1, II, I, 5 endopod 0-1; 0-1; 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 tubercles 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 spinules 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 accessory process near the blades of the mandible and the hyaline process on the first maxilla.

REMARKS.—*Taeniacanthus papulosus* 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

Taeniacanthus pectinatus Yamaguti and Yamasu, 1959:101.—Yamaguti, 1963:21.—Kabata, 1979:78.

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

Male: Unknown.

REMARKS.—This species was first described by Yamaguti and Yamasu (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 Yamasu, 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, 1, 4, whereas that of *T. yamagutii* is II, 1, 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) unornamented 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 tine.

Labrum (Figure 65F) with spinules on posterior margin. Mandible (Figure 66A) with 2 unequal blades, each spinulated 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 spinules, 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 for-

P_1	coxa 0-1	basis 1-1	exopod 1-0; 1-1; 7 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-2; II, 1, 3
P_3	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-2; II, 1, 2
P_4	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 spinules on posterior borders. Coxa of leg 1 (Figure 67A) with small conical process near small patch of spinules. Exopods of legs 2–4 (see Figure 67B) with weakly sclerotized spines; terminal segments of exopods each with small digitiform process on distolateral corner. Endopods of legs 2–4 (Figure 67B,C,E) with blunt unornamented 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 spinules at bases; terminal spine with patch of larger spinules 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 spinules 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

Parataeniacanthus platycephali Yamaguti, 1939:408; 1963:24.

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

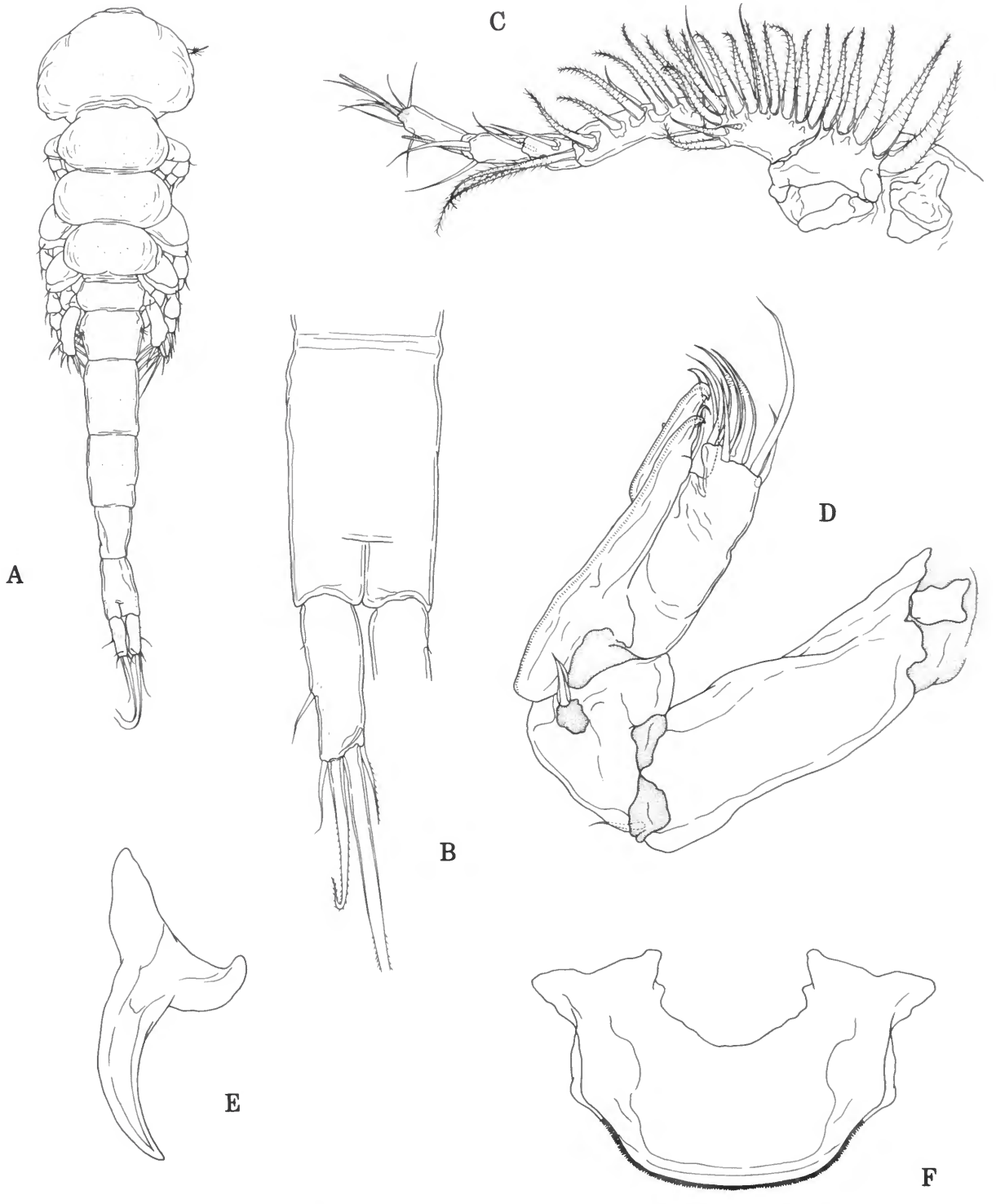

FIGURE 65.—*Taeniacanthus petilus*, new species, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area and first antenna, ventral; D, second antenna, medial; E, postantennal process, ventral; F, labrum, ventral.

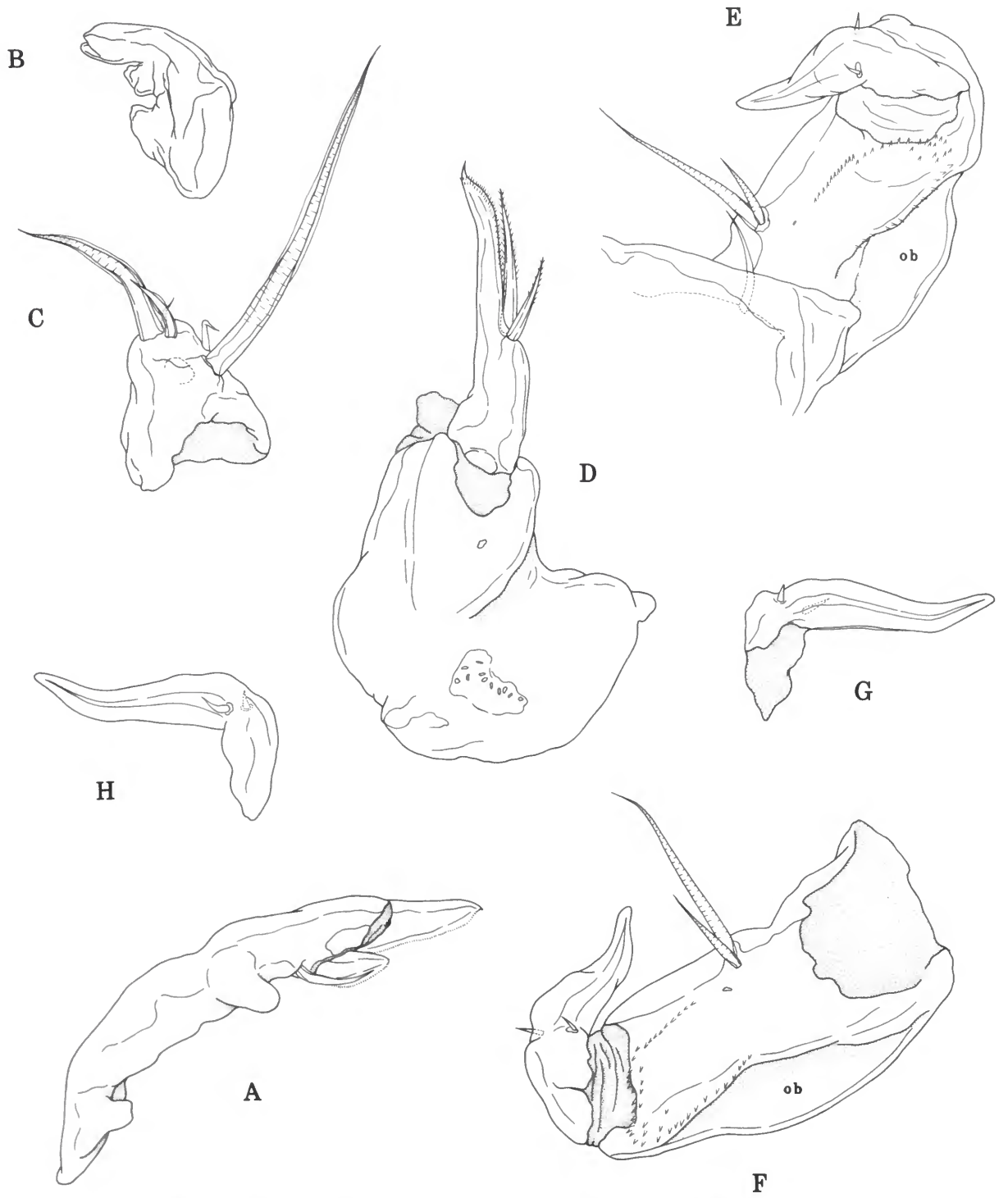

FIGURE 66.—*Taeniacanthus petilus*, new species, female: A, mandible, anteromedial; B, paragnath, ventral; C, first maxilla, posterior; D, second maxilla, posteroventral; E, maxilliped, ventromedial; F, same, ventromedial; G, maxilliped claw, ventral; H, same, dorsal. (ob = outer bulge.)

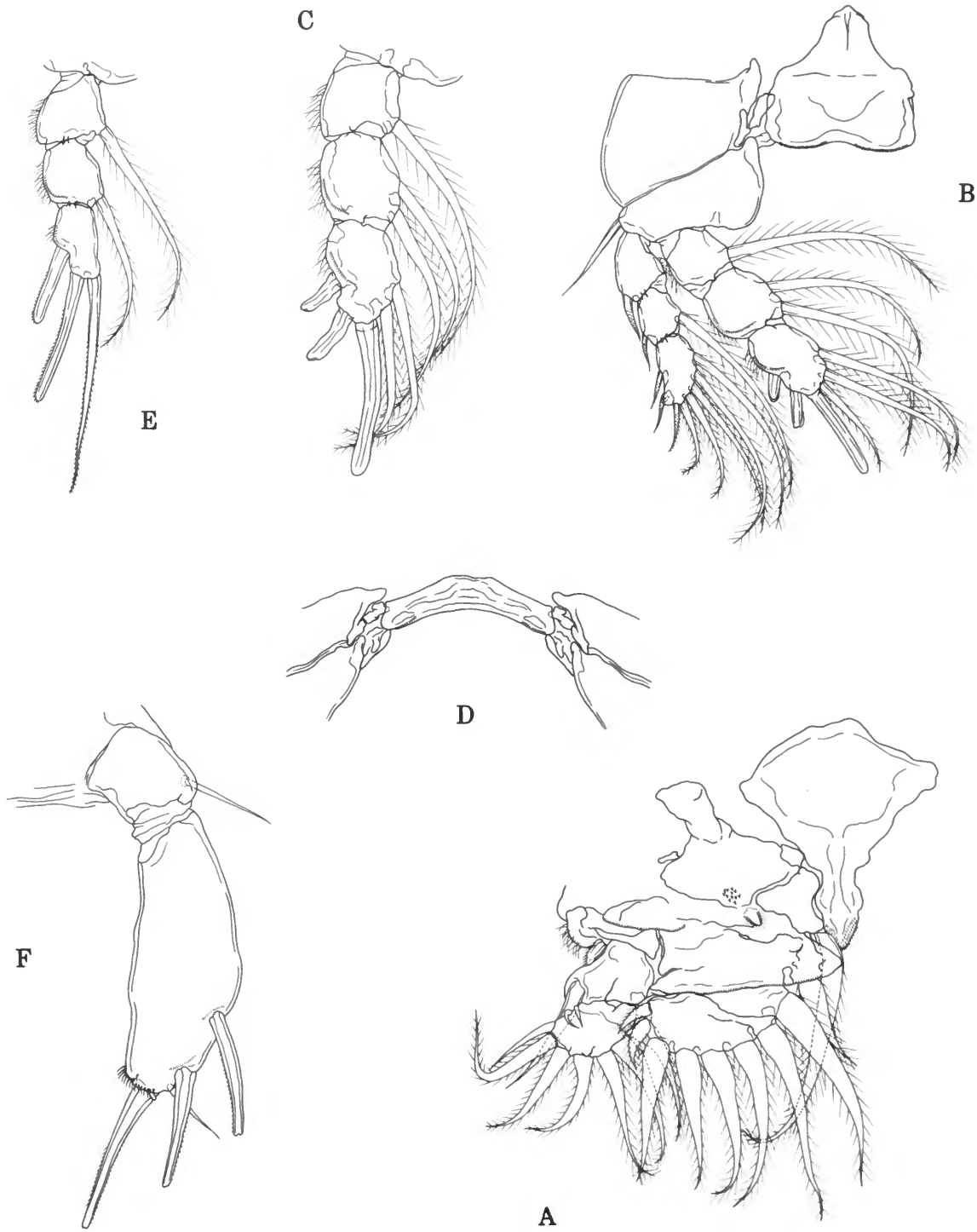

FIGURE 67.—*Taeniacanthus petilus*, new species, female: A, leg 1 and interpodal plate, ventral; B, leg 2 and interpodal plate, ventral; C, leg 3 endopod, ventral; D, leg 4, interpodal plate and proximal portions of basipods, ventral; E, leg 4 endopod, ventral; F, leg 5, ventral.

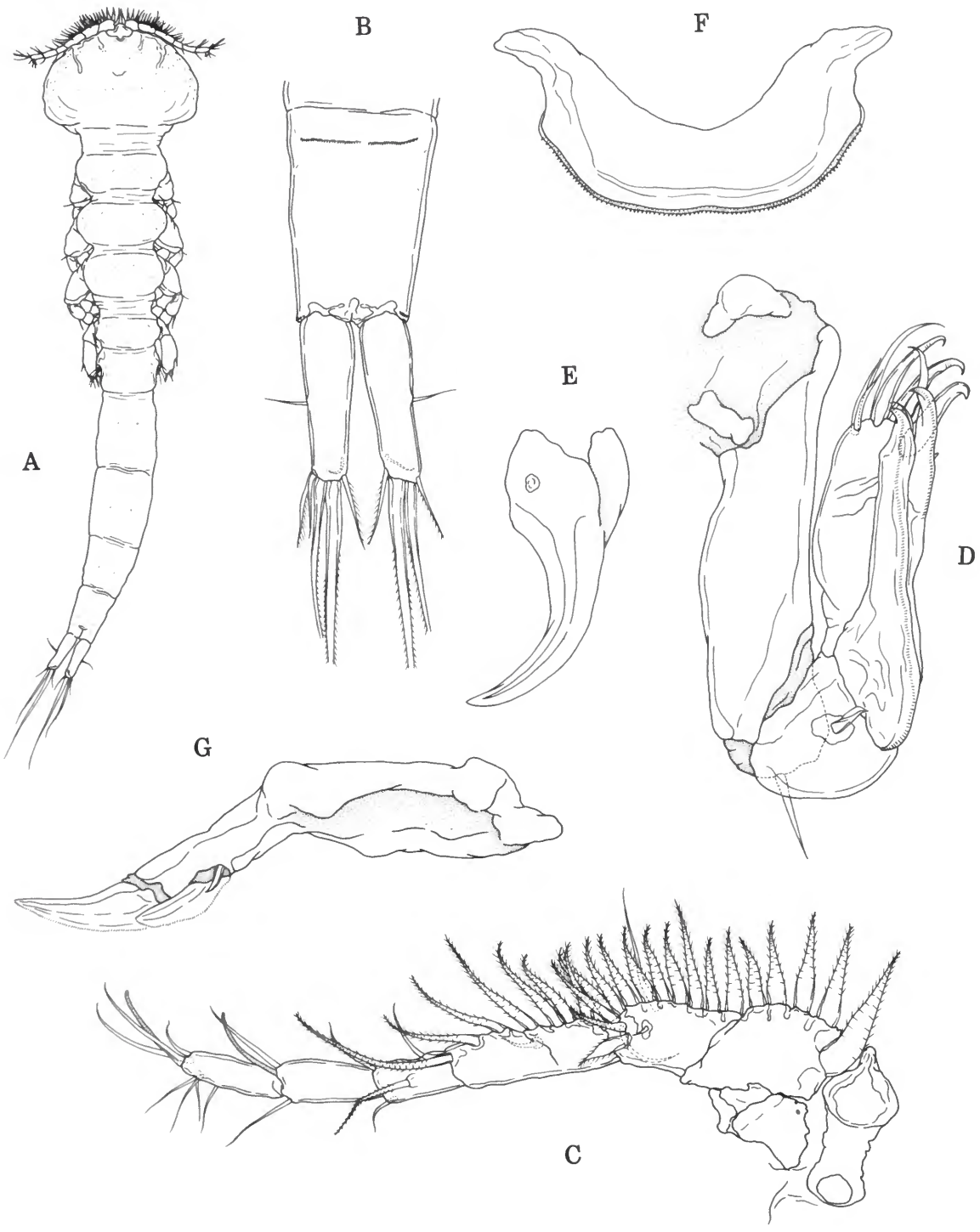

FIGURE 68.—*Taeniacanthus platycephali* (Yamaguti), female: A, dorsal; B, anal segment and caudal rami, ventral; C, rostral area and first antenna, ventral; D, second antenna, medial; E, postantennal process, ventral; F, labrum, ventral; G, mandible, anteromedial.

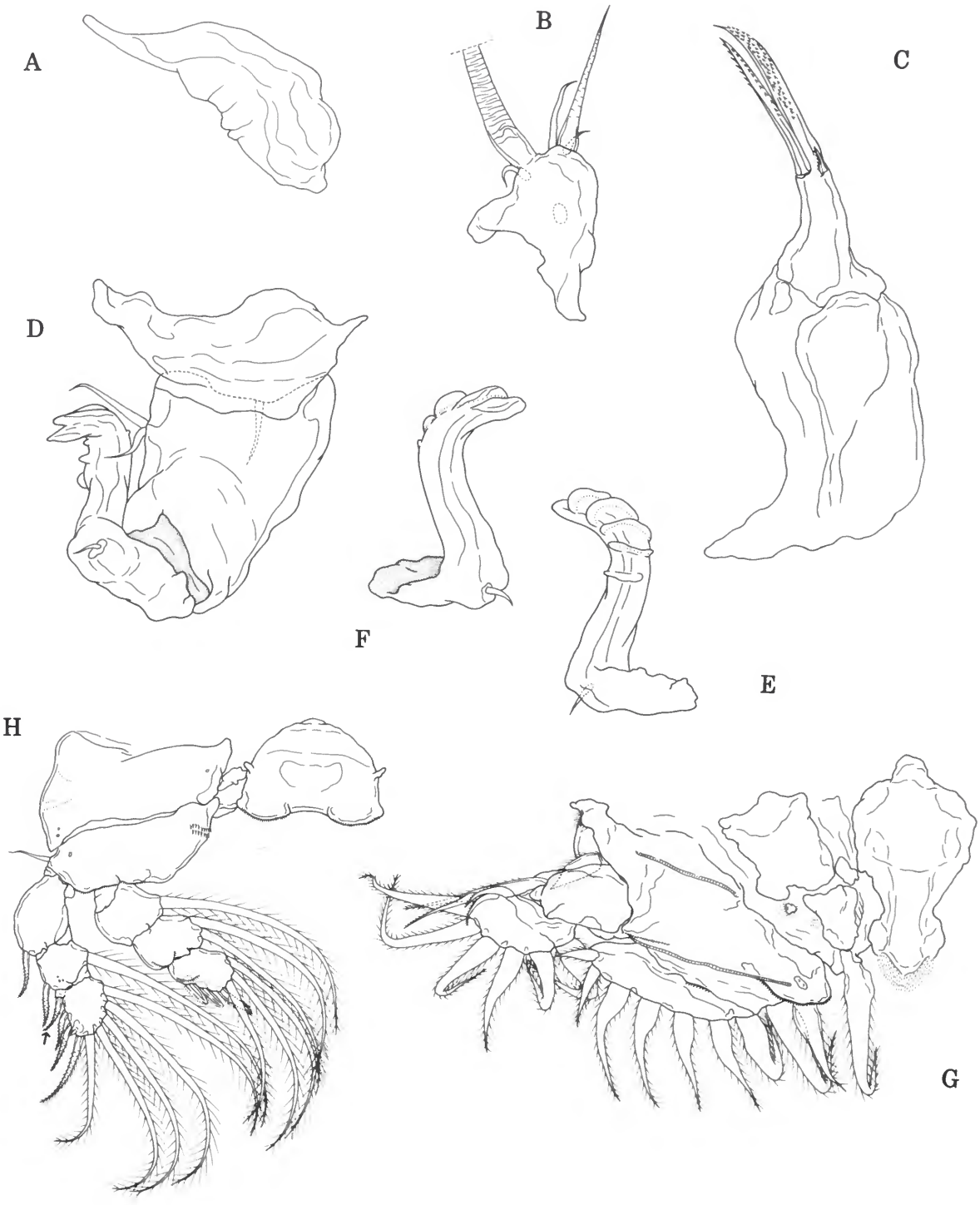

FIGURE 69.—*Taeniacanthus platycephali* (Yamaguti), female: A, paragnath, ventral; B, first maxilla, posteromedial; C, second maxilla, posteroventral; D, maxilliped, ventromedial; E, maxilliped claw, dorsal; F, same, ventral; G, leg 1 and interpodal plate, ventral; H, leg 2 and interpodal plate, ventral.

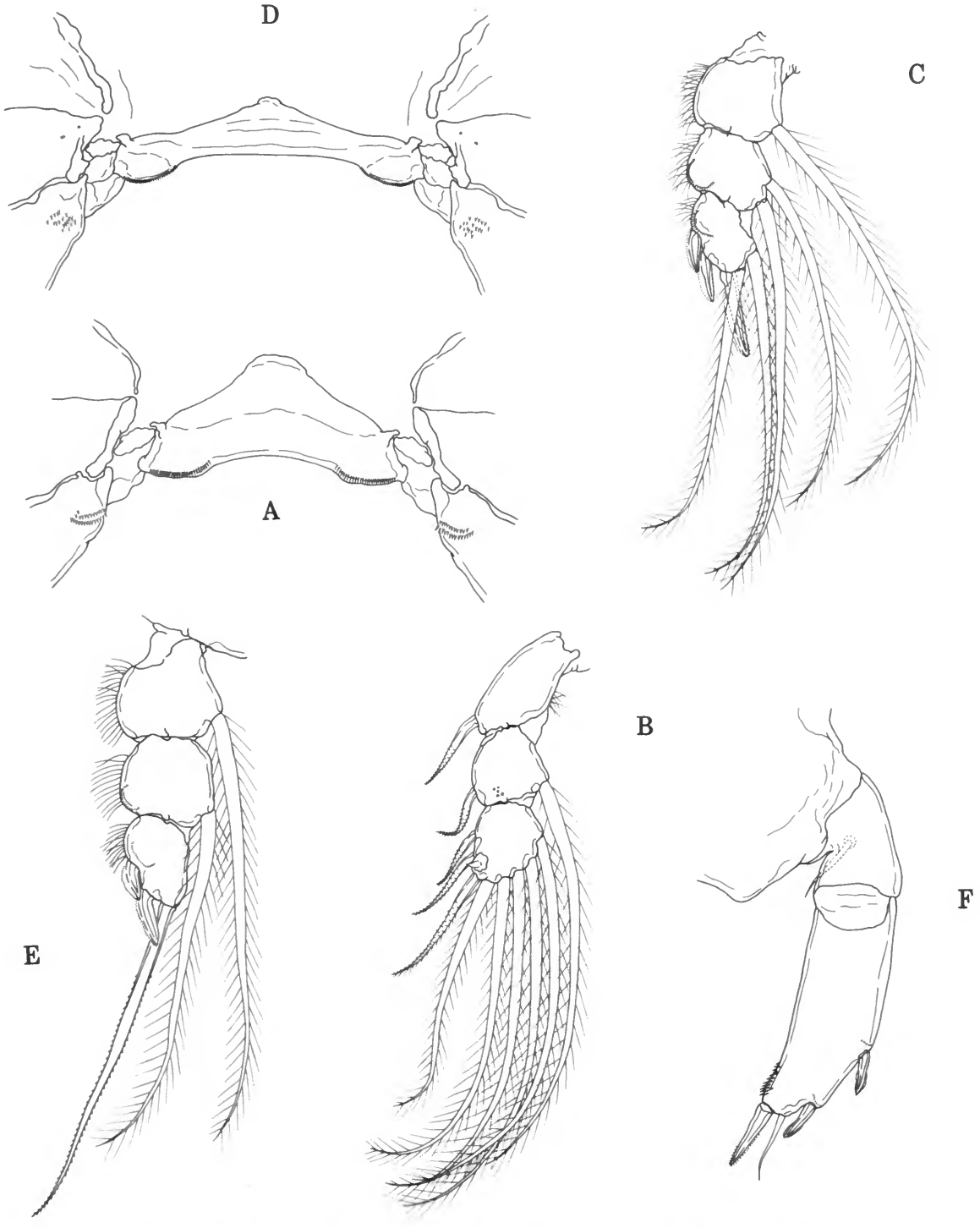

FIGURE 70.—*Taeniacanthus platycephali* (Yamaguti), female: A, leg 3, interpodal plate and proximal portions of basipods, ventral; B, leg 3 exopod, ventral; C, leg 3 endopod, ventral; D, leg 4, interpodal plate and proximal portions of basipods, ventral; E, leg 4 endopod, ventral; F, leg 5, ventral.

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 × 743 μm (l × 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 × 308 μm. Abdomen 4-segmented; segments from anterior to posterior 313 × 290 μm, 331 × 281 μm, 235 × 239 μm, and 244 × 179 μm (l × 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 × 60 μm (l × 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 69A) with attenuated tip. First maxilla (Figure 69B) 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,H, 70A–E) biramous. Spinal and setal formula as follows:

P_1	coxa 0-1	basis 1-1	exopod I-0; I-1; 7 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 (or III, I, 5) endopod 0-1; 0-2; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-2; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-1; II, int.

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 posterolateral 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 × 64 μm (l × 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 seta near area of egg sac attachment.

Male: Unknown.

REMARKS.—*Taeniacanthus platycephali*, first described by Yamaguti (1939) as *Parataeniacanthus*, was collected from the branchial 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 Laulau Katan between Pontan Laulau Katan and Puntan 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 coralline 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 Tanguissan Point, Guam, Mariana Islands, 9 October 1968. From *Cirripectes filamentosus:* 12 females from northwest corner of North

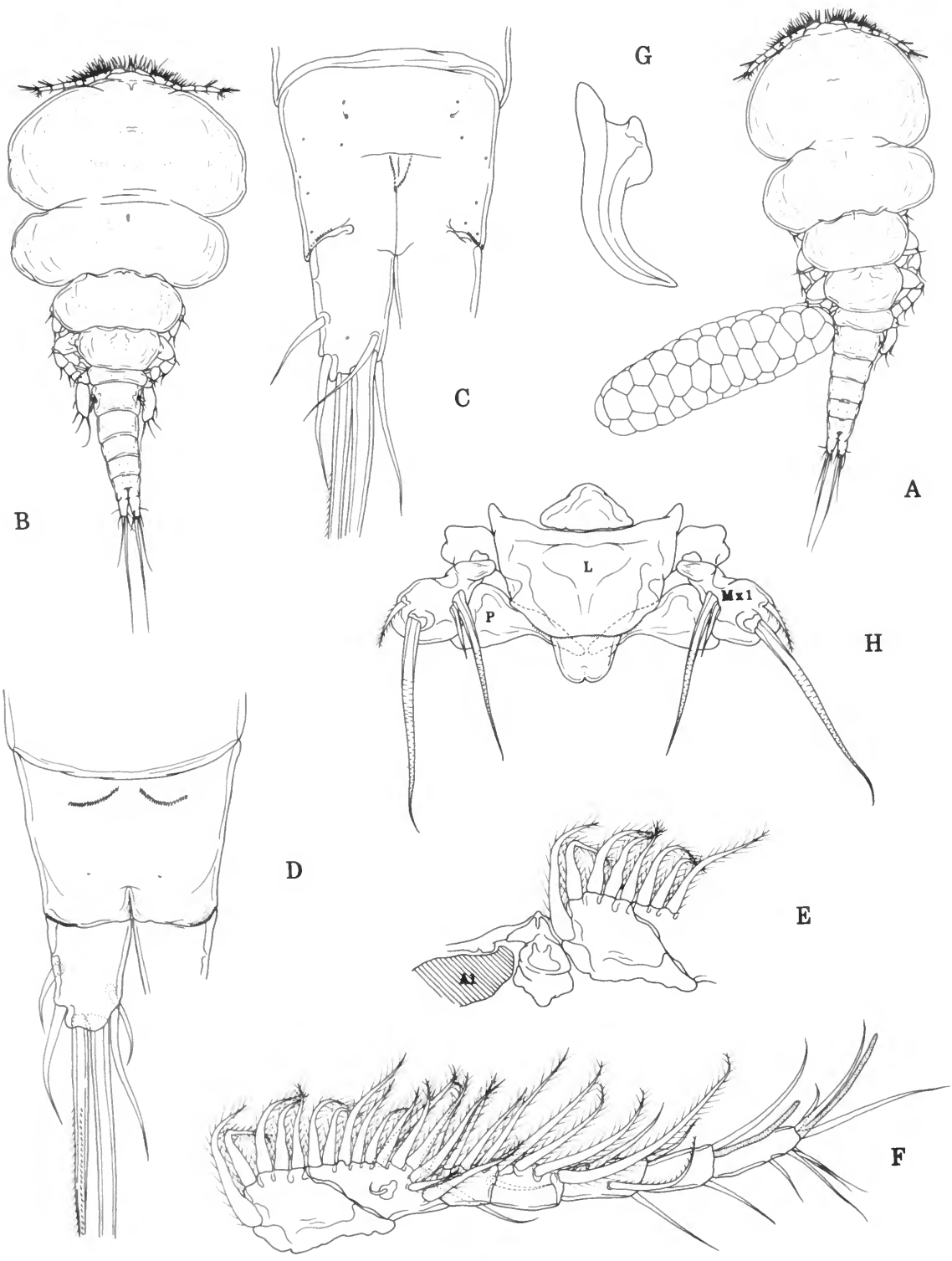

FIGURE 71.—*Taeniacanthus pollicaris*, new species, female: A, dorsal; B, dorsal; C, anal segment and caudal ramus, dorsal; D, same, ventral; E, rostral area, ventral; F, first antenna, ventral; G, postantennal process, ventral; H, oral area, ventral. (A1 = first antenna, L = labrum, P = paragnath, Mx1 = first maxilla.)

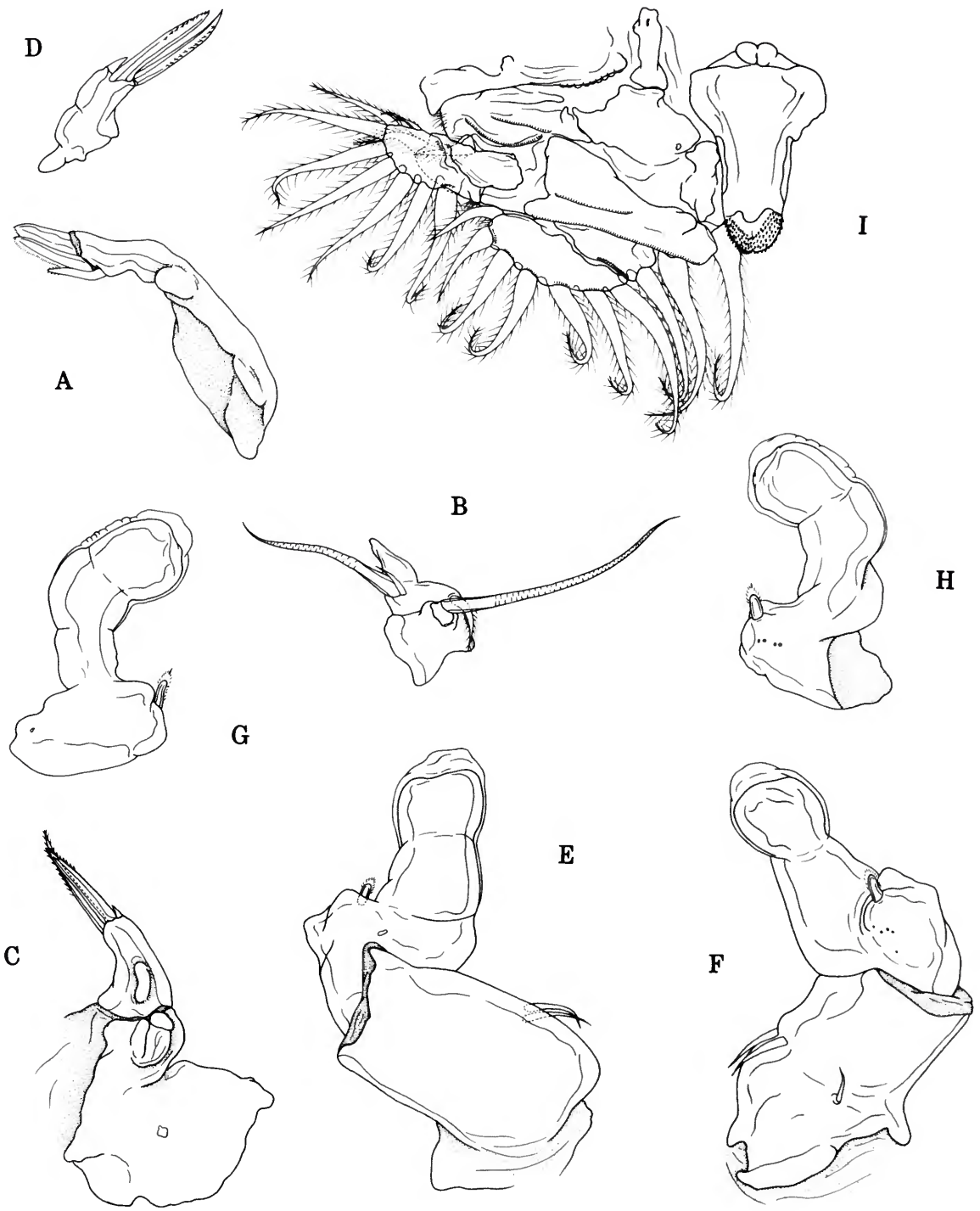

FIGURE 72.—*Taeniacanthus pollicaris*, new species, female: A, mandible, anteromedial; B, first maxilla, posterolateral; C, second maxilla, ventrolateral; D, second maxilla, terminal segment, ventral; E, maxilliped, dorsolateral; F, same, ventromedial; G, maxilliped claw, dorsal; H, same, ventral; I, leg 1 and interpodal plate, ventral.

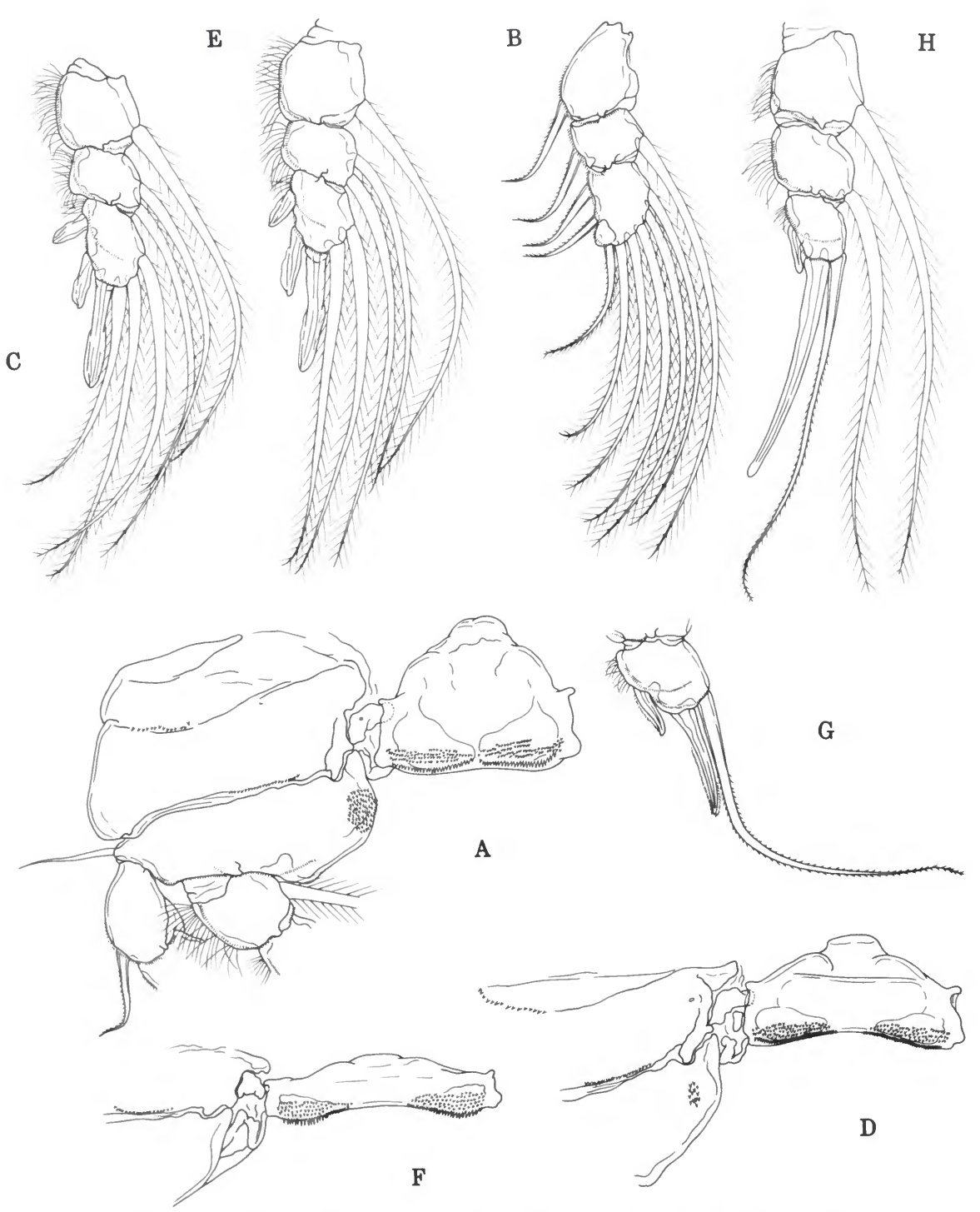

FIGURE 73.—*Taeniacanthus pollicaris*, new species, female: A, leg 2, interpodal plate and basipod, ventral; B, leg 2 exopod, ventral; C, leg 2 endopod, ventral; D, leg 3, interpodal plate and proximal portion of basipod, ventral; E, leg 3 endopod, ventral; F, leg 4, interpodal plate and proximal portion of basipod, ventral; G, leg 4, terminal endopod segment, ventral; H, leg 4 endopod, ventral.

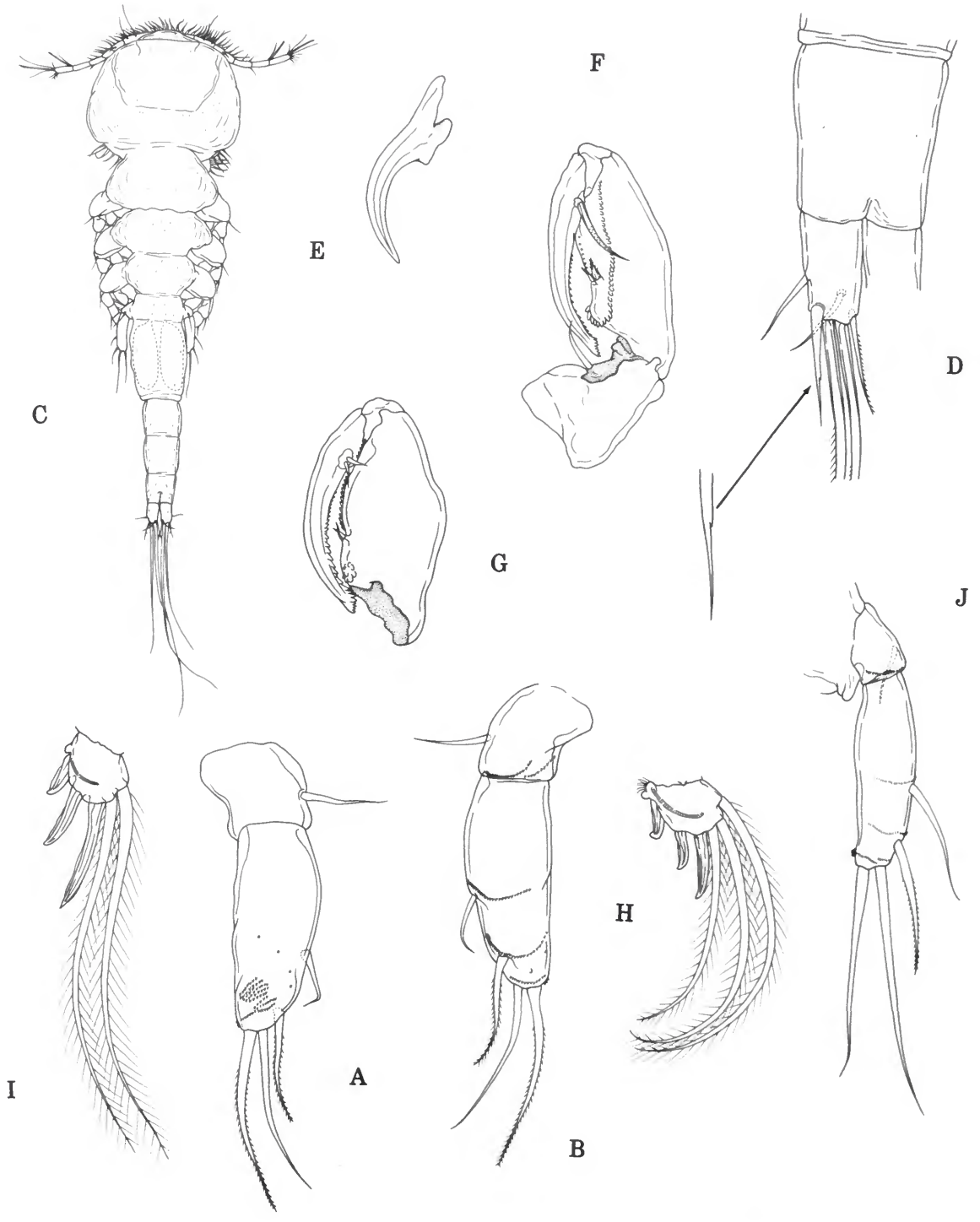

FIGURE 74.—*Taeniacanthus pollicaris*, new species. Female: A, leg 5, dorsal; B, same, ventral. Male: C, dorsal; D, anal segment and caudal ramus, ventral; E, postantennal process, ventral; F, maxilliped, posterior; G, same, anterior; H, leg 2, terminal endopod segment, ventral; I, leg 3, terminal endopod segment, ventral; J, leg 5, ventral.

Oxley Island, Northern Territory, Australia (11°00′S, 132°49′E), by H. Larson and R. Williams, 20 October 1982; 10 females from Kendrew Island, Dampier Archipelago, Western Australia, Australia, by J.E. Randall and party, 16 October 1973. From *Cirripectes polyzona* Bleeker: 1 female from outer edge of ocean reef of Rijili Island, Marshall Islands, 9 August 1955; 5 females from fringing reef, north side of Tutuila, American Samoa, by B. Carlson, 20 August 1976; 5 females from rocky shore on south side of island off San Shien Tai (north of Cheng Kung), east coast of Taiwan, by J.E. Randall and party, 12 July 1978; 2 females from Isle Poule, Peros Banhos, Chagos Archipelago (05°24′25″S, 071°45′58″E); 1 female from Sabangan Beach, Agno, Philippines, 26 June 1981; 1 female from lagoon, NW side of Laumua Island, Solomon Islands, 7 November 1964; 1 immature female from outer edge of ocean reef, Rijili Island, Enewetak Atoll, 9 August 1955. From *Cirripectes chelomatus* Williams and Maugé: 6 females from outside of One Tree Lagoon, One Tree Island, Australia, by Talbot and party, 26 November 1969. All copepods removed from gill chambers of hosts by J.T. Williams.

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 25% 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 spinules adjacent to median suture on dorsal surface and a pair of posterodorsal rows of spinules continuing to ventral surface near insertion of caudal rami; ventral surface of anal segment (Figure 71D) with 1 curved row of spinules on each side of anteroventral surface. Caudal ramus 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 *Taeniacanthus 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 0-1	basis 1-1	exopod 1-0; 9 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-2; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-2; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod I-0; I-1; II, 1, 5 endopod 0-1; 0-1; II, int.

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. Coxa, basis, exopod, and endopod of leg 1 with a few rows of spinules as in Figure 72I. Coxae and bases of legs 2–4 (Figure 73A,D,F) each with a few rows of spinules; inner margins of bases of legs 2 and 3 (Figure 73A,D) each with patch of spinules, basis of leg 4 without inner patch of spinules (Figure 73F). Terminal segments of exopods of legs 2–4 each with rounded protuberance on distolateral corner (see Figure 73B); 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 4× longer than blunt outer spine (Figure 73H). All segments of rami of legs 2–4 with outer rows of spinules. Leg 5 (Figure 74A,B) 2-segmented; first segment with 2 curved rows of spinules and 1 dorsolateral seta; second segment, 81 × 32 μm, ornamented with distomedial patch of spinules, and bearing 2 naked and 2 bristled setae; setae with curved rows of spinules 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 74D) 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 74E) with more slender tine than in female. Maxilliped (Figure 74F,G) 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 *Cirripectes* 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

Parataeniacanthus pseudorhombi Yamaguti, 1939:406; 1963:24.

MATERIAL EXAMINED.—1 female from *Pseudorhombus 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 × 132 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 posssessing 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 77D) 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:

P_1	coxa 0-1	basis 1-1	exopod 1-0; I-1; 7 endopod 0-I; 0-1; 6
P_2	coxa 0-0	basis 1-0	exopod I-0; I-1; II, 1, 5 endopod 0-1; 0-2; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-2; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-1; II, 1

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 3 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 *Pseudorhombus 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.

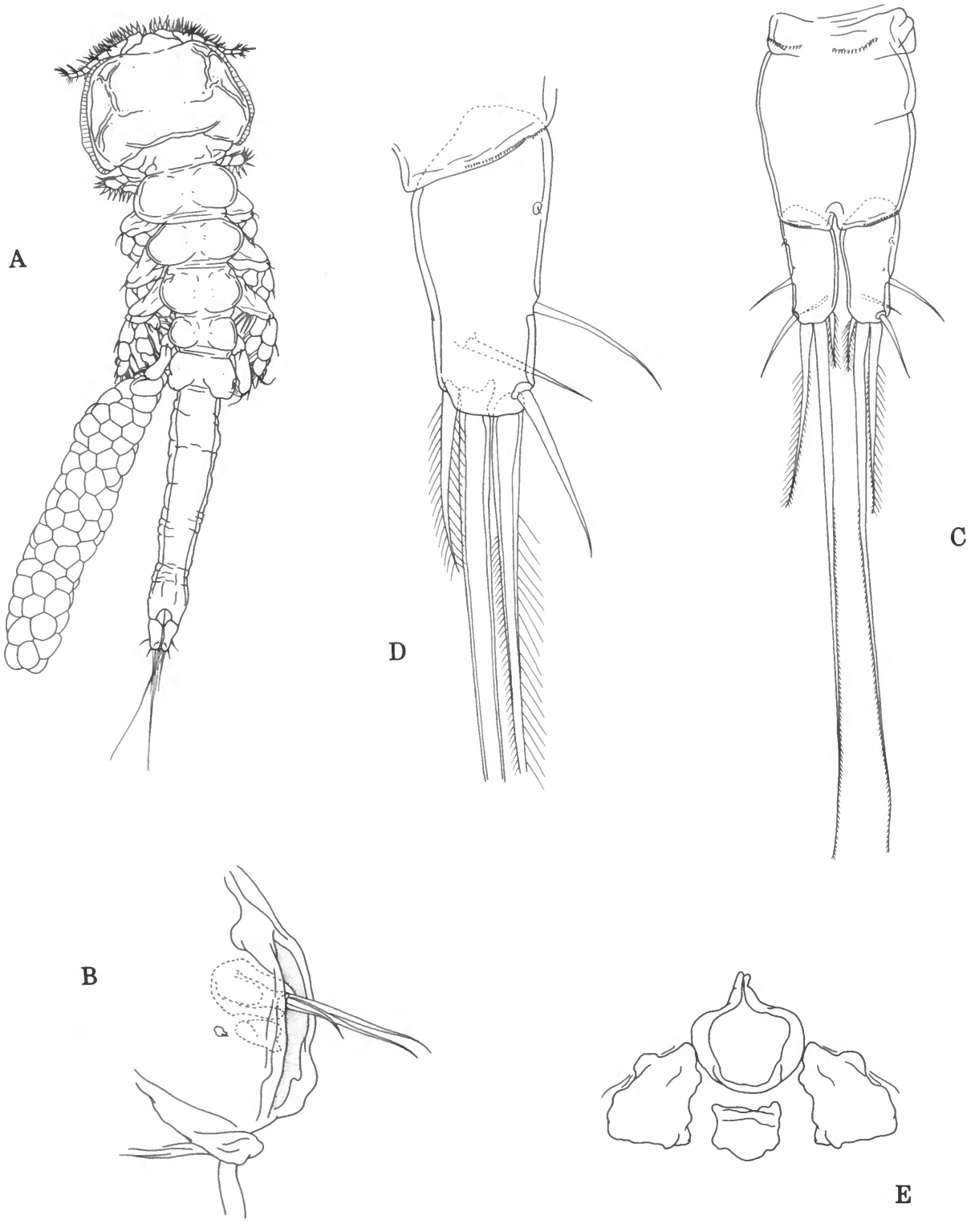

FIGURE 75.—*Taeniacanthus pseudorhombi* (Yamaguti), female: A, dorsal; B, genital area, dorsal; C, anal segment and caudal rami, ventral; D, caudal ramus, ventral; E, rostral area, ventral.

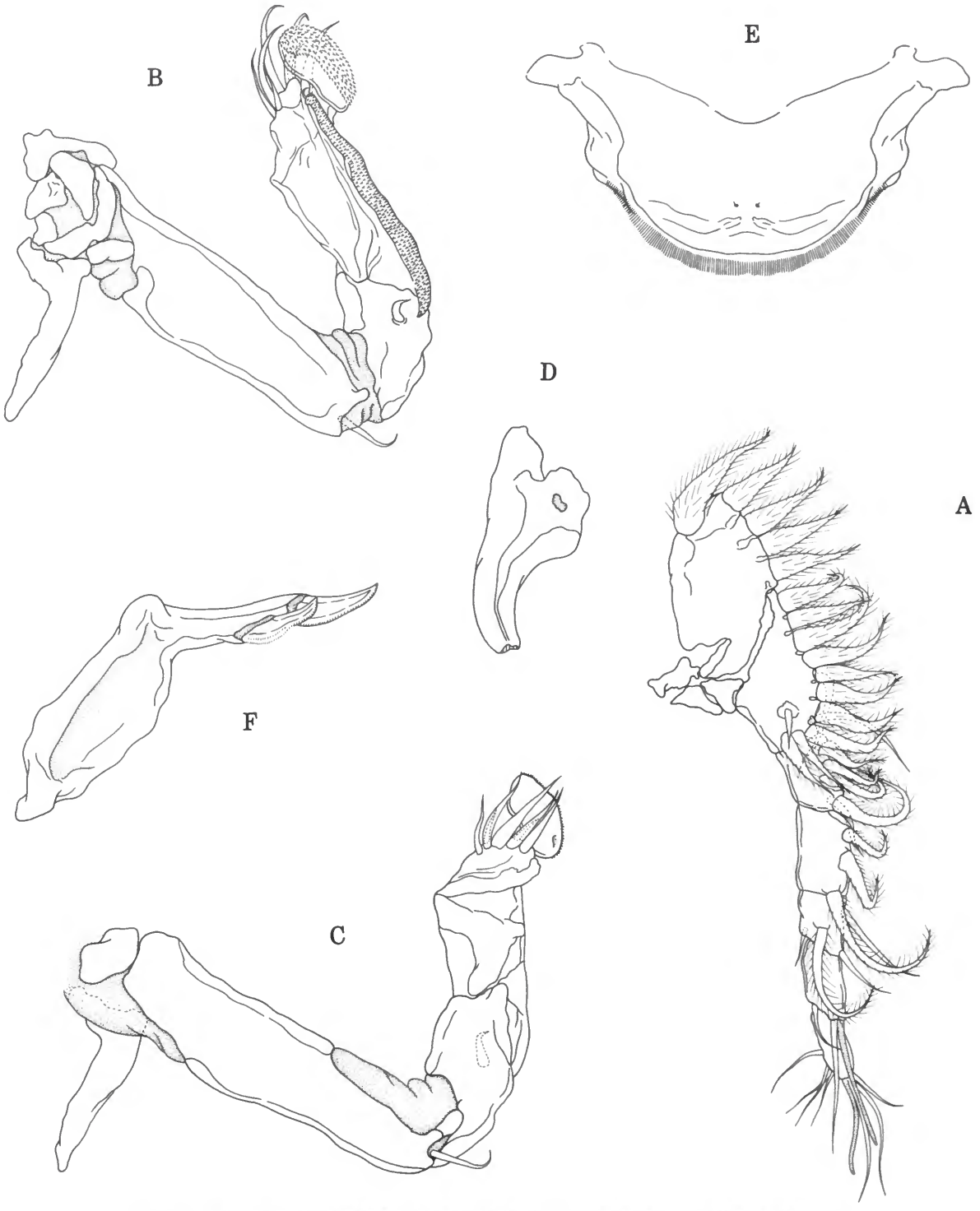

FIGURE 76.—*Taeniacanthus pseudorhombi* (Yamaguti), female: A, first antenna, ventral; B, second antenna, medial; C, same, lateral; D, postantennal process, ventral; E, labrum, ventral; F, mandible, anteromedial.

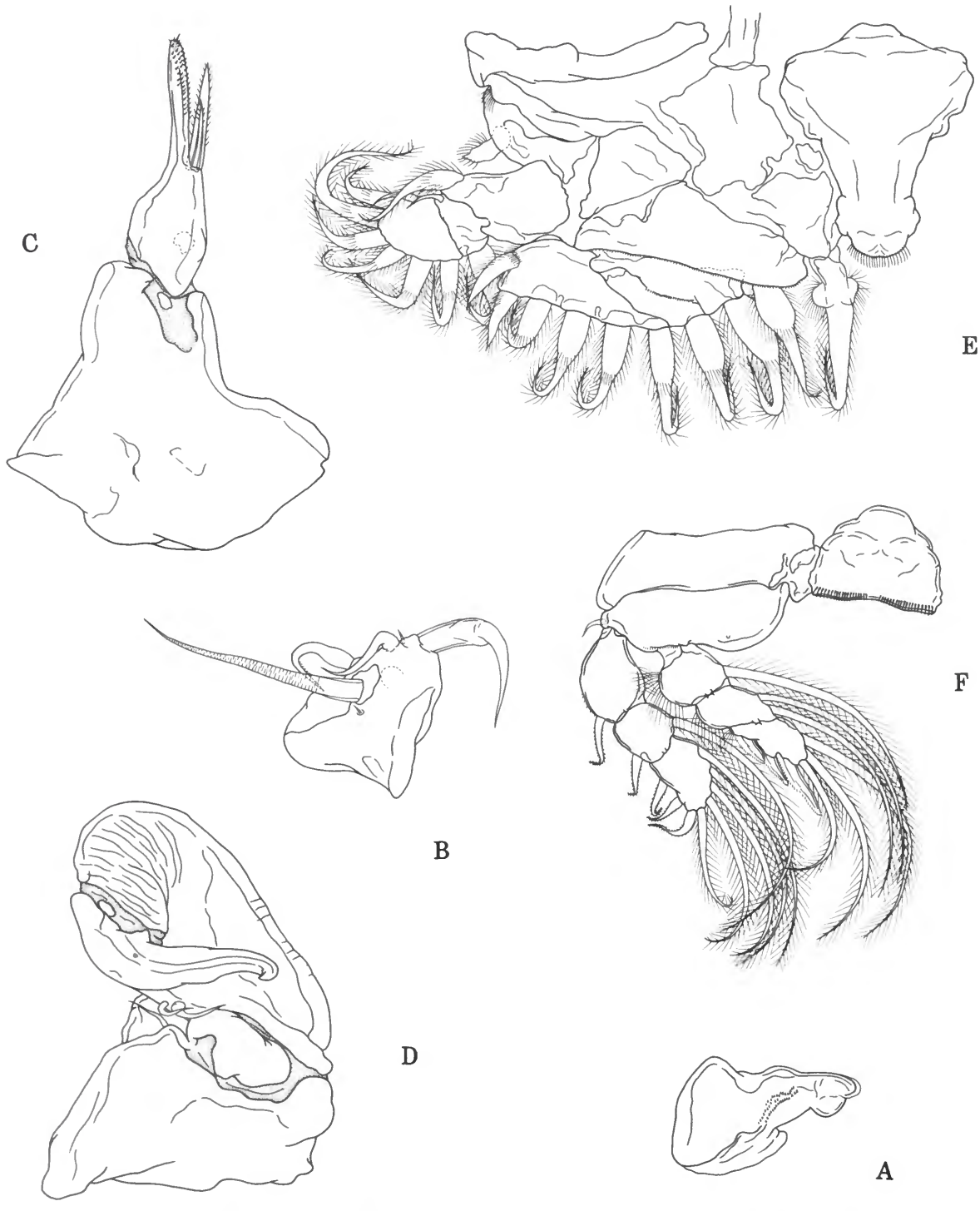

FIGURE 77.—*Taeniacanthus pseudorhombi* (Yamaguti), female: A, paragnath, dorsal; B, first maxilla, posterior; C, second maxilla, anterior; D, maxilliped, ventral; E, leg 1 and interpodal plate, ventral; F, leg 2 and interpodal plate, ventral.

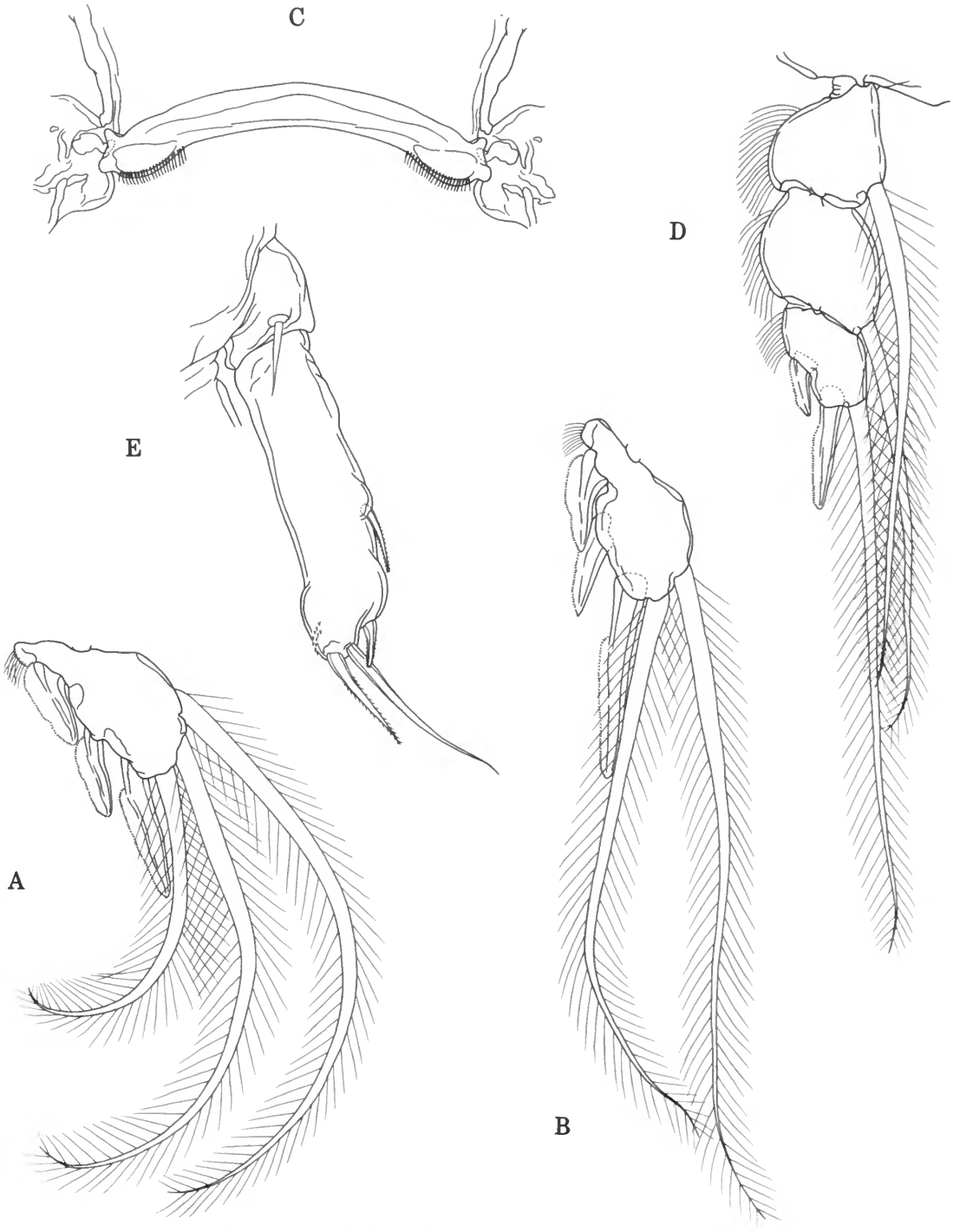

FIGURE 78.—*Taeniacanthus pseudorhombi* (Yamaguti), female: A, leg 2, terminal endopod segment, ventral; B, leg 3, terminal endopod segment, ventral; C, leg 4, interpodal plate, ventral; D, leg 4 endopod, ventral; E, leg 5, dorsal.

Taeniacanthus pteroisi Shen, 1957

FIGURES 79–82

Taeniacanthus pteroisi Shen, 1957:312.—Yamaguti, 1963:21.—Kabata, 1979:78.

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 × 743 μm (l × 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 × 281 μm. Abdomen 4-segmented; segments from anterior to posterior 166 × 202 μm, 147 × 175 μm, 120 × 156 μm, and 147 × 129 μm (l × w); anal segment (Figure 79B) without spinules. Caudal ramus (Figure 79B) slender, 126 × 37 μm (l × w), and armed with 3 semipinnate 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 seta at tip). Postantennal process (Figure 79E) with a rather slender curved tine.

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:

P_1	coxa 0-1	basis 1-1	exopod 1-0; 9 endopod 0-1; 0-1; 6 or 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-2; II, 1, 3
P_3	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-2; II, 1, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-1; II, int.

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 × 64 μm (l × 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 × 322 μm (l × w), comprising less than 25% of total length. Genital complex (Figure 82B) almost as wide as long, 124 × 120 μm. Abdomen 3-segmented; segments from anterior to posterior 46 × 81 μm, 37 × 69 μm, 55 × 60 μm (l × w); anal segment (Figure 82C) with 2 curved rows of spinules on each side of anteroventral surface. Caudal ramus (Figure 82C) slender, 50 × 18 μm (l × 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 82G) much broader than long as compared to that in female. Leg 5 (Figure 82H) with second segment 55 × 20 μm (l × 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. acanthocepolae* Yamaguti, 1939; *T. neopercis* Yamaguti, 1939; *T. nudicauda,* new species; *T. petilus,* new species; *T. pteroisi* Shen, 1957; *T. sauridae* Yamaguti and Yamasu, 1959. *Taeniacanthus pteroisi* may be distinguished from its five congeners by the structure of the maxilliped claw of the female.

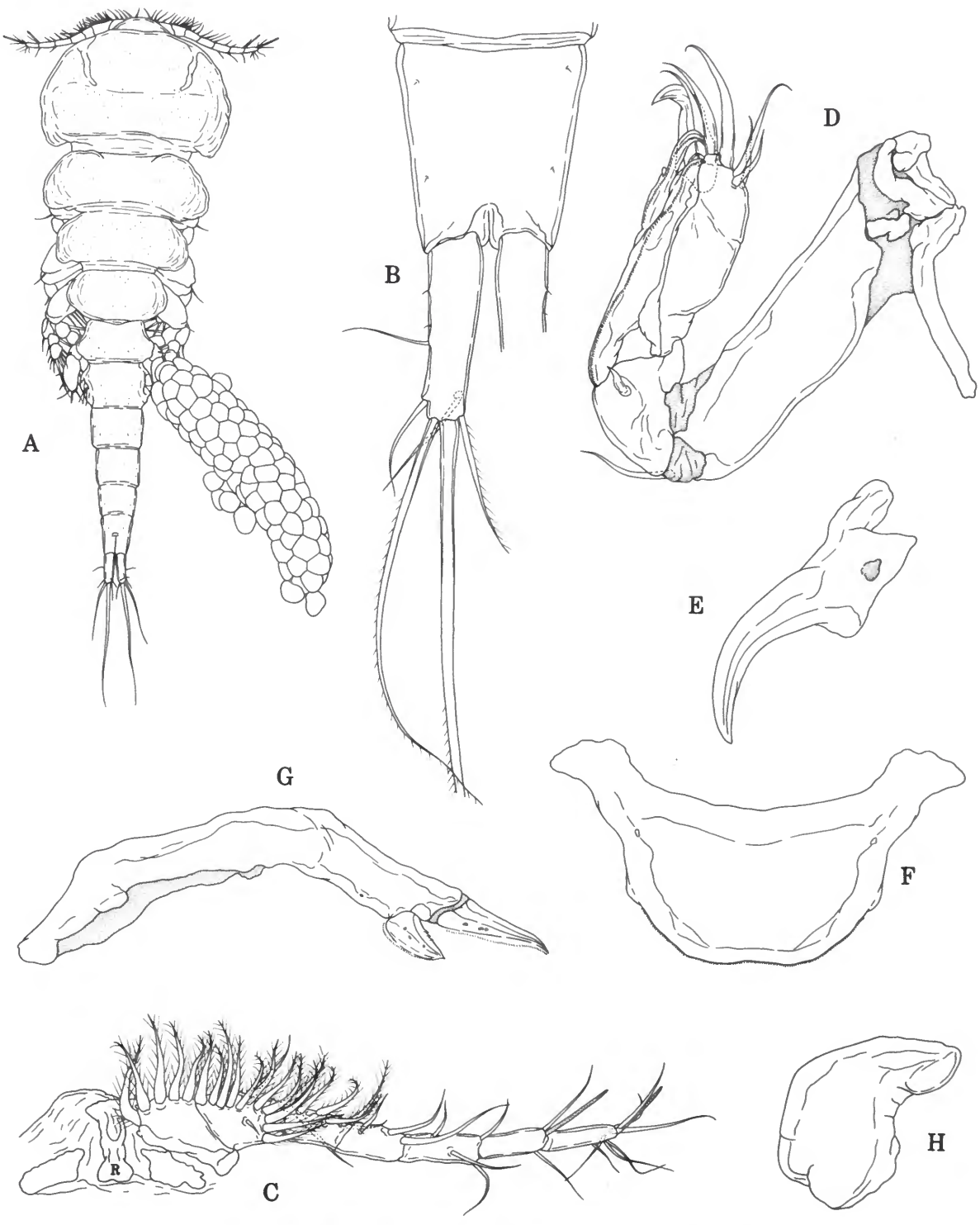

FIGURE 79.—*Taeniacanthus pteroisi* (Shen), female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area and first antenna, ventral; D, second antenna, medial; E, postantennal process, ventral; F, labrum, ventral; G, mandible, anteromedial; H, paragnath, ventral. (R = rostral area.)

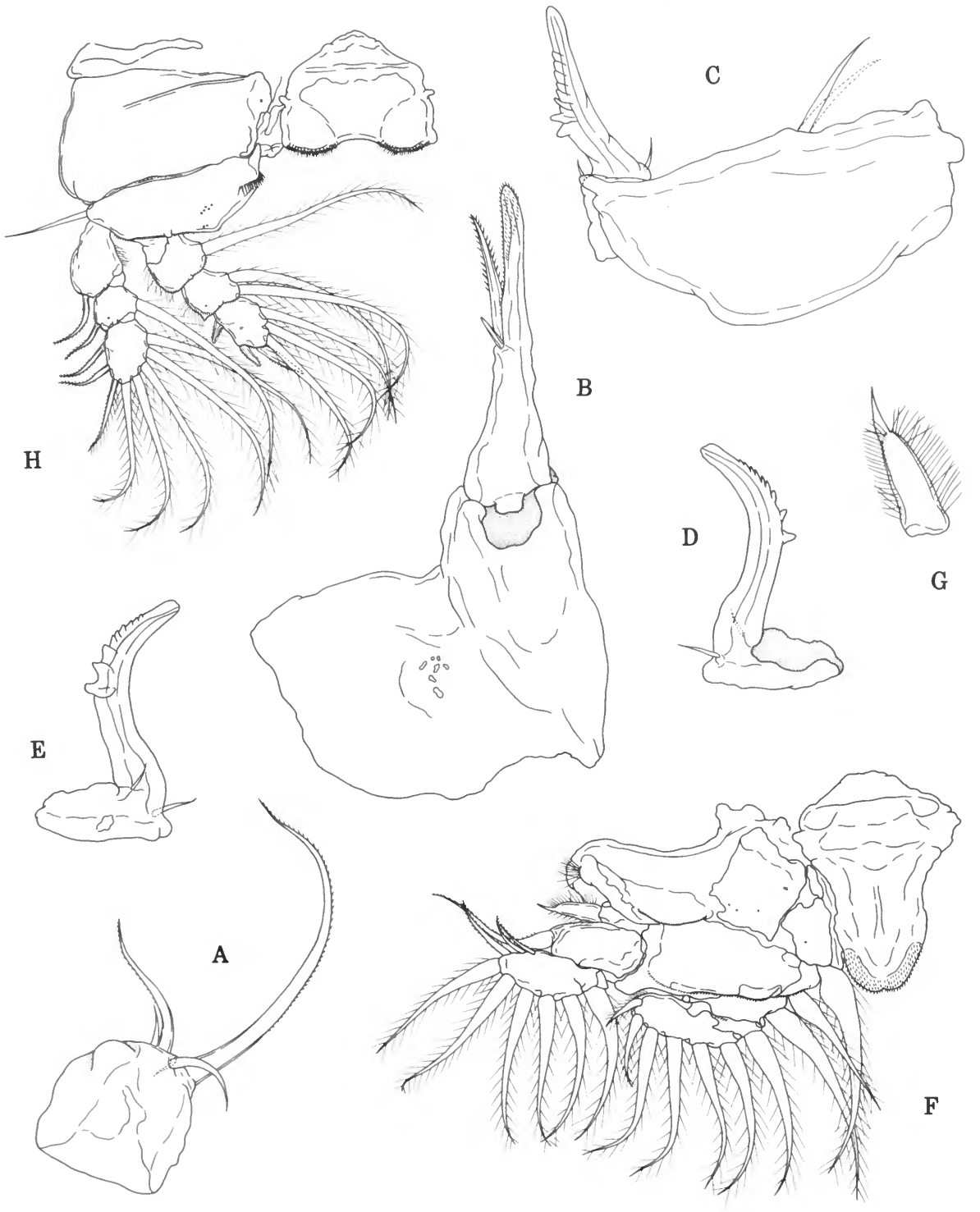

FIGURE 80.—*Taeniacanthus pteroisi* (Shen), female: A, first maxilla, anterior; B, second maxilla, postero-ventral; C, maxilliped, ventrolateral; D, maxilliped claw, ventral; E, same, dorsal; F, leg 1 and interpodal plate, ventral; G, leg 1, outer seta of basis, ventral; H, leg 2 and interpodal plate, ventral.

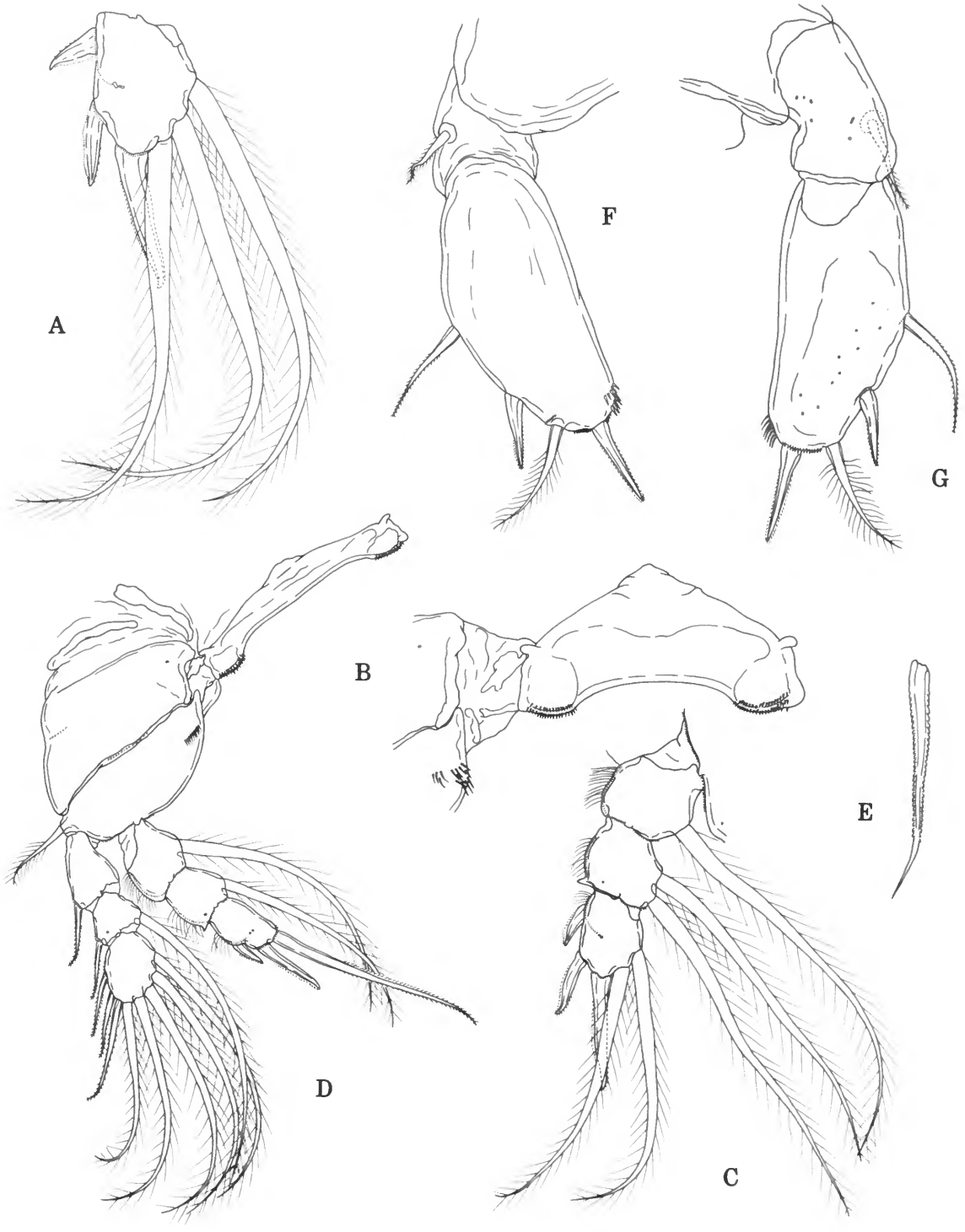

FIGURE 81.—*Taeniacanthus pteroisi* (Shen), female: A, leg 2, terminal endopod segment, ventral; B, leg 3, interpodal plate and proximal portion of basipod, ventral; C, leg 3 endopod, ventral; D, leg 4 and interpodal plate, ventral; E, leg 4, spine of first exopod segment, ventral; F, leg 5, dorsal; G, same, ventral.

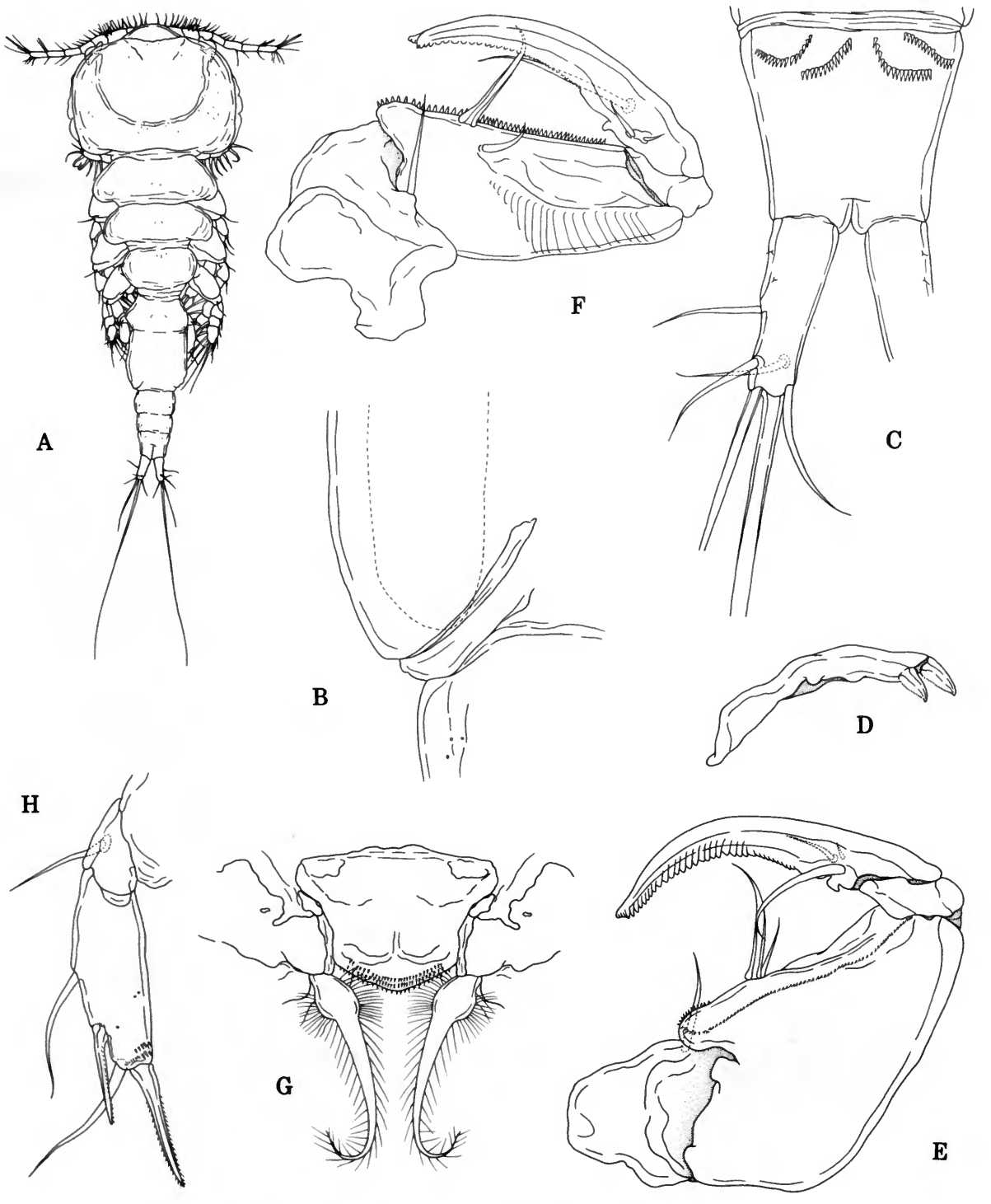

FIGURE 82.—*Taeniacanthus pteroisi* (Shen), male: A, dorsal; B, genital area, ventral, C, anal segment and caudal ramus, ventral; D, mandible, anteromedial; E, maxilliped, posterior; F, same, anterior; G, leg 1, interpodal plate, ventral; H, leg 5, ventral.

Taeniacanthus rotundiceps (Shiino, 1957), new combination

FIGURES 83–86

Parataeniacanthus rotundiceps Shiino, 1957b:422.—Yamaguti, 1963:24.

MATERIAL EXAMINED.—From *Pseudoblennius percoides* Günther: 1 female and 5 males; 1 female, 2 males, and 3 copepodids; 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 spinules 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 pseudorhombi*). 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 tine.

Labrum (Figure 83F) with spinules 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 ⅔ 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:

P_1	coxa 0-1	basis 1-1	exopod 1-0; 1-1; 7 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-2; II, 1, 3
P_3	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-2; II, 1, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 5 endopod 0-1; 0-1; II, int.

Interpodal plate of leg 1 (Figure 84G) with spinules on convex posterior margin; those of legs 2–4 (Figure 85A,C,F) reentrant with patch of spinules on each posterolateral margin. Inner margins of bases of legs 2–4 (Figure 85A,C,F) with spinules. 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 spinules (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 distomedial border with patch of larger spinules. 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 spinules 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 spinules (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,E) 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 percoides* 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

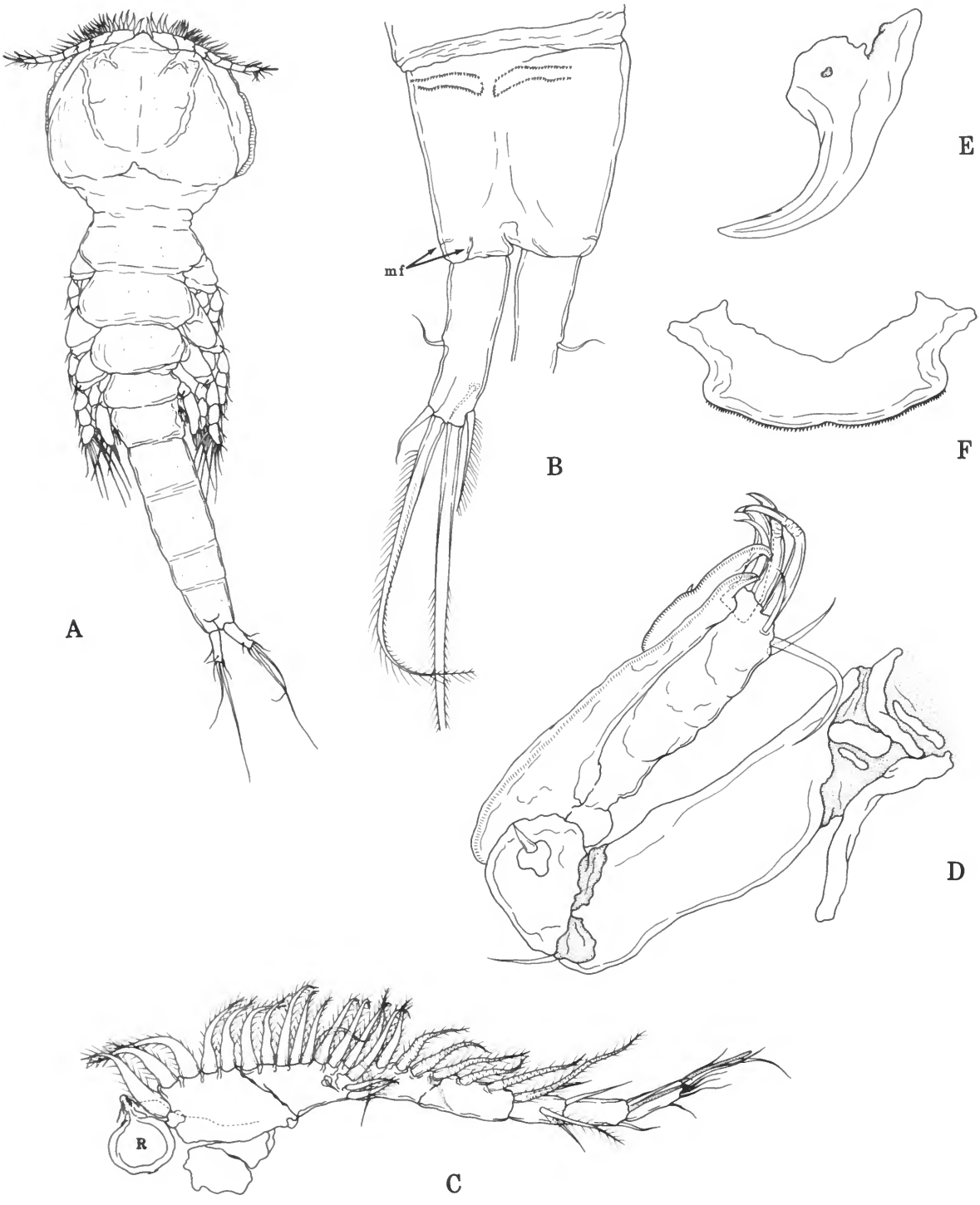

FIGURE 83.—*Taeniacanthus rotundiceps* (Shiino), female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area and first antenna, ventral; D, second antenna, medial; E, postantennal process, ventral; F, labrum, ventral. (R = rostral area, mf = membranous flaps.)

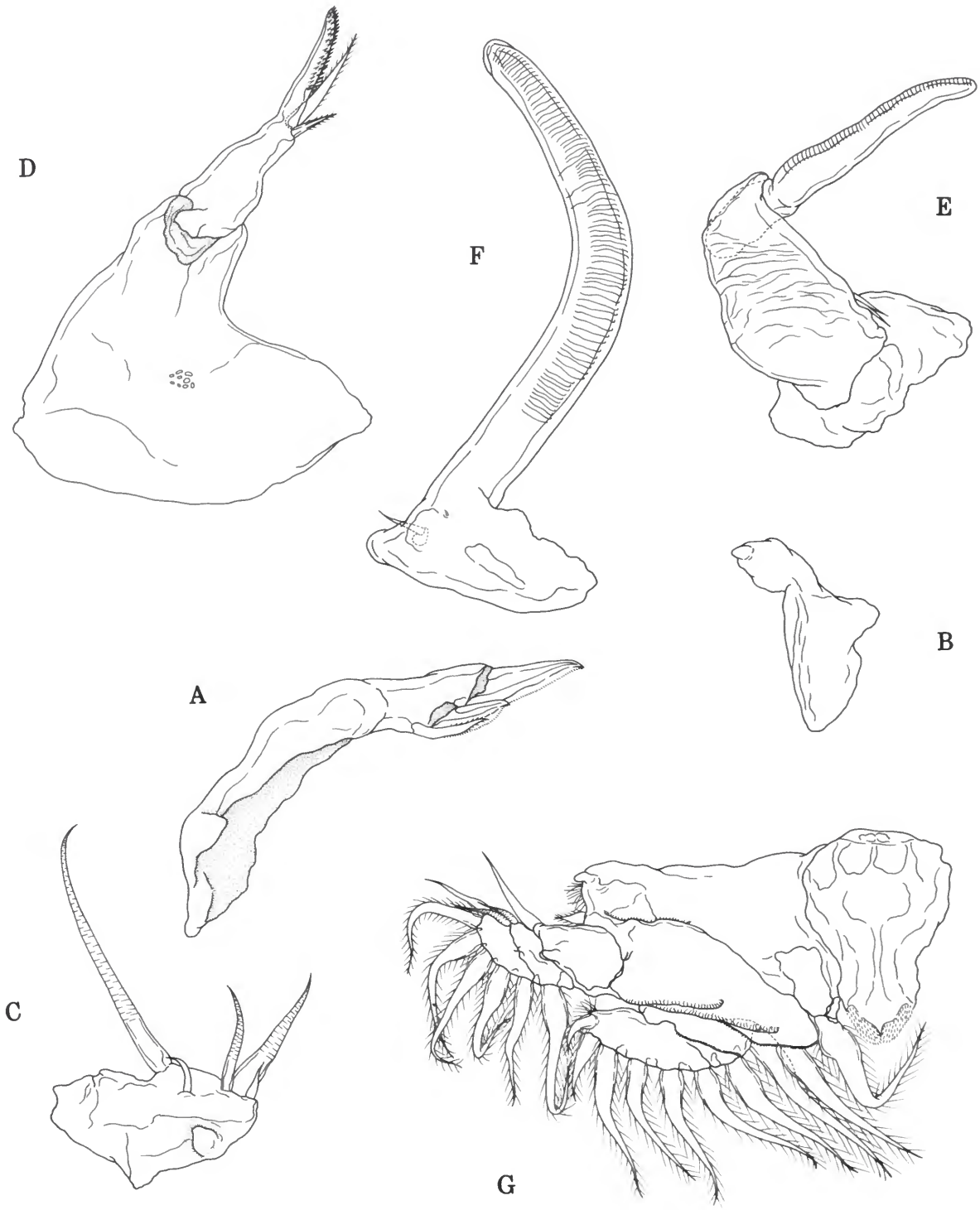

FIGURE 84.—*Taeniacanthus rotundiceps* (Shiino), female: A, mandible, anteroventral; B, paragnath, dorsomedial; C, first maxilla, anteroventral; D, second maxilla, posteroventral; E, maxilliped, ventrolateral; F, maxilliped claw, anteroventral; G, leg 1 and interpodal plate, ventral.

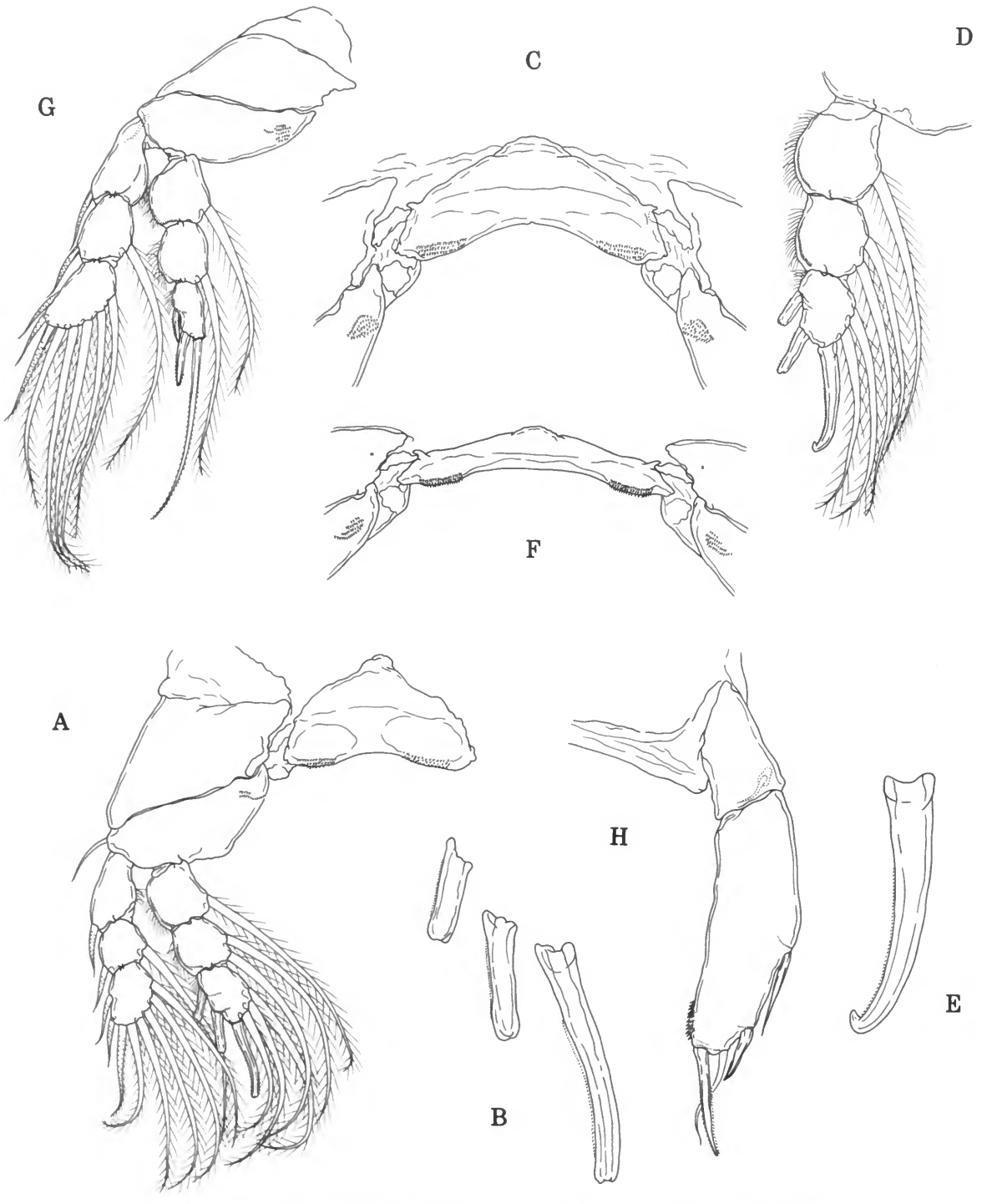

FIGURE 85.—*Taeniacanthus rotundiceps* (Shiino), female: A, leg 2 and interpodal plate, ventral; B, leg 2, endopod spines, ventral; C, leg 3, interpodal plate and proximal portions of basipods, ventral; D, leg 3 endopod, ventral; E, leg 3, innermost endopod spine, ventral; F, leg 4, interpodal plate and proximal portions of basipods, ventral; G, leg 4, ventral; H, leg 5, ventral.

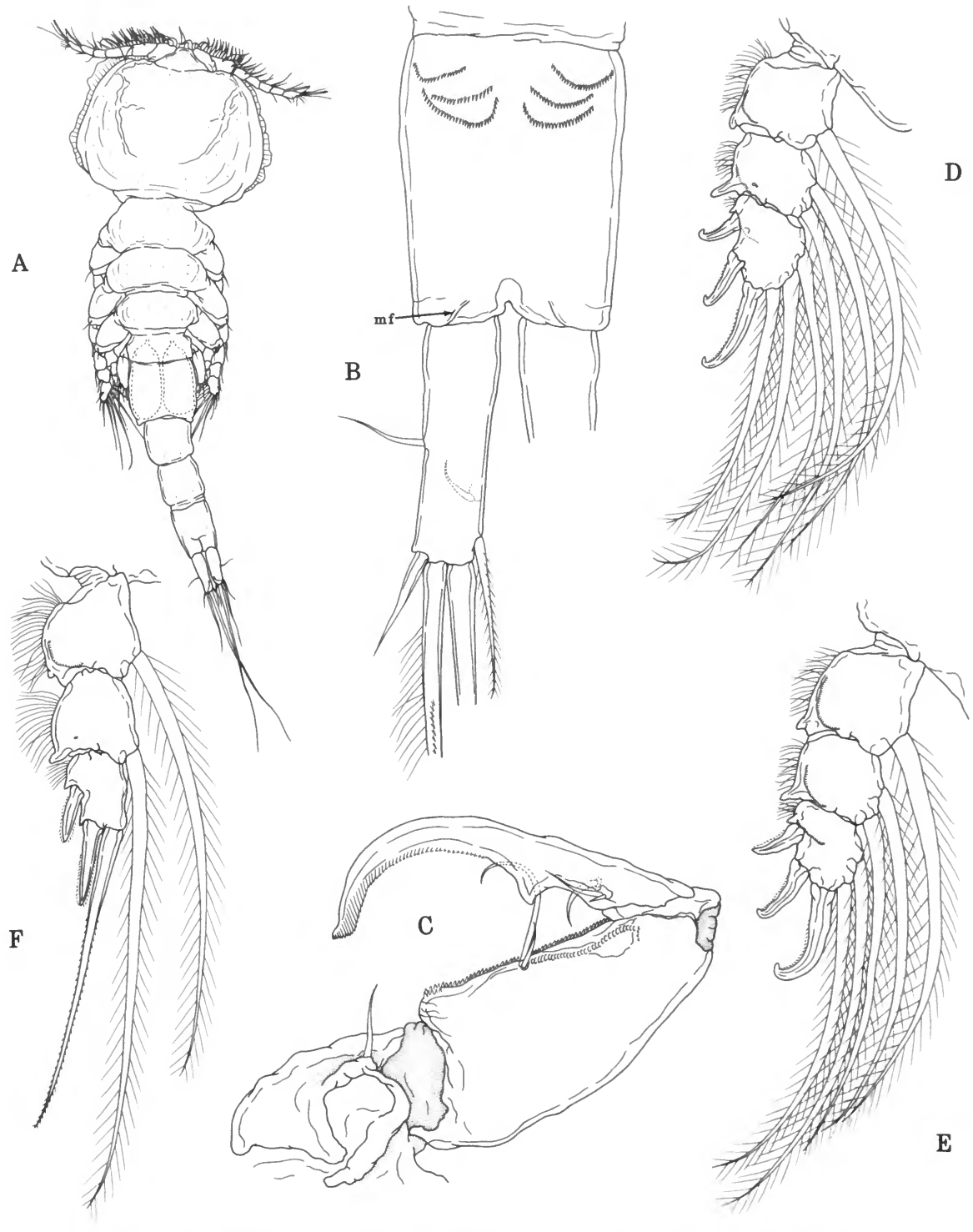

FIGURE 86.—*Taeniacanthus rotundiceps* (Shiino), male: A, dorsal; B, anal segment and caudal ramus, ventral; C, maxilliped, posteromedial; D, leg 2 endopod, ventral; E, leg 3 endopod, ventral; F, leg 4 endopod, ventral. (mf = membranous flap.)

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

Taeniacanthus sauridae Yamaguti and Yamasu, 1959:106.—Yamaguti, 1963:21.—Cressey and Cressey, 1979:14.—Kabata, 1979:78.

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 redescription 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

Taeniacanthus sebastichthydis Yamaguti, 1939:399.—Shen, 1957:313.—Yamaguti, 1963:21.—Kabata, 1979:78.

Taeniacanthus sebastisci Yamaguti, 1939:405; 1963:21.—Kabata, 1979:78. [New synonymy.]

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 aout 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 spinules on each side of anteroventral surface. Caudal ramus (Figure 87B) more than 2× 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 tine.

Labrum (Figure 87G) with transparent membrane ventrally covering row of spinules 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:

P_1	coxa 0-1	basis 1-1	exopod I-0; I-1; 7 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-2, II, I, 3
P_3	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-2; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-1; II, int.

Interpodal plate of leg 1 (Figure 88E) with spinules on convex posterior margin; those of legs 2–4 (Figure 89A,C,D) with patch of spinules on each posterolateral margin. Coxa of leg 1 (Figure 88E) with longitudinal corrugations; basis of leg 1 with spinules as in figure. Coxae of legs 2–4 each with 1 row and 1 patch of spinules near distolateral corner; bases of these legs with patches of spinules 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 spinules and 1 dorsolateral seta; second segment 129 × 60 μm (l × w), bearing a patch of large spinules on distomedial corner, 2 outer spines with membranous flanges along distal half, 1 semipinnate seta,

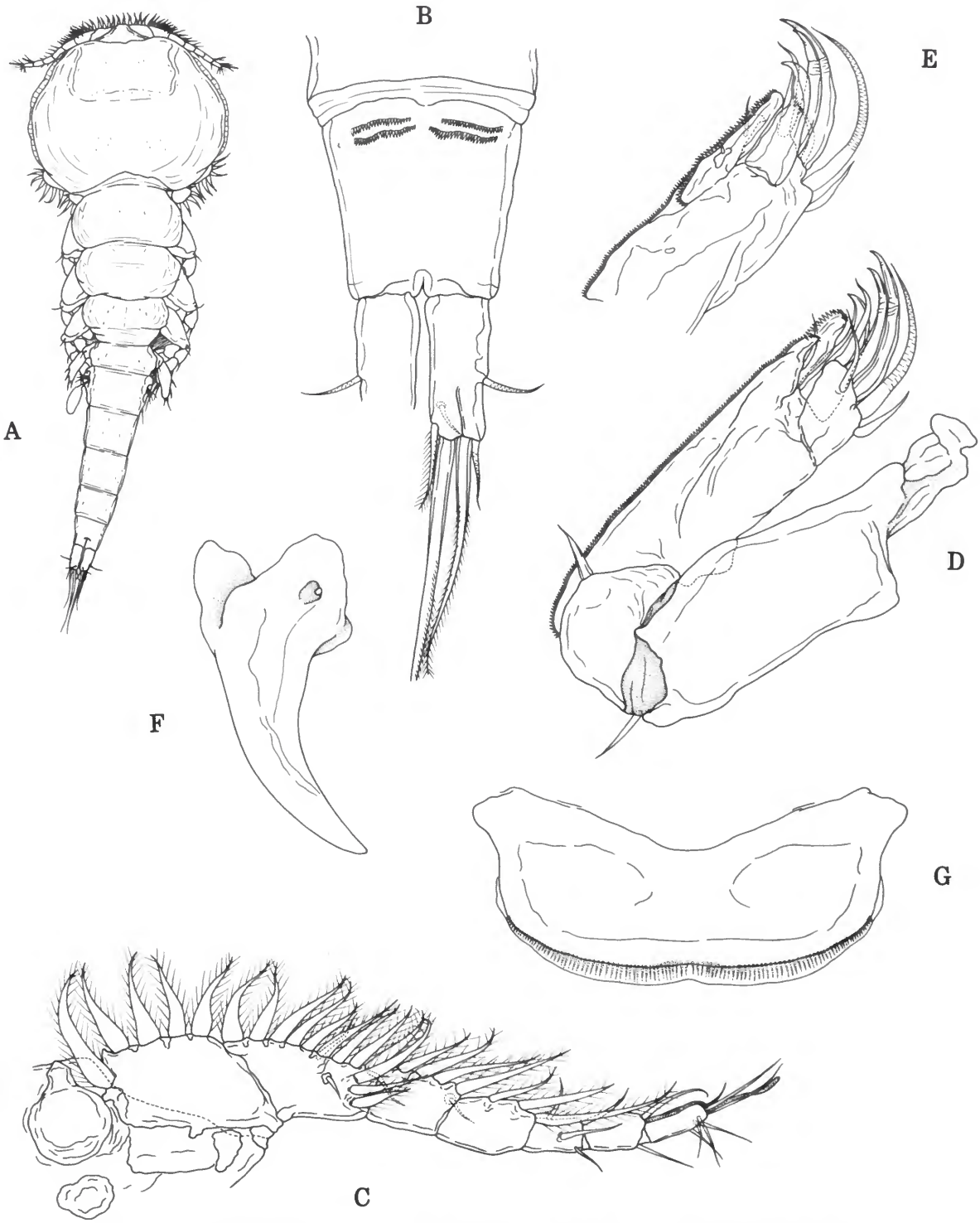

FIGURE 87.—*Taeniacanthus sebastichthydis* Yamaguti, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area and first antenna, ventral; D, second antenna, medial; E, second antenna, distal portion, lateral; F, postantennal process, ventral; G, labrum, ventral.

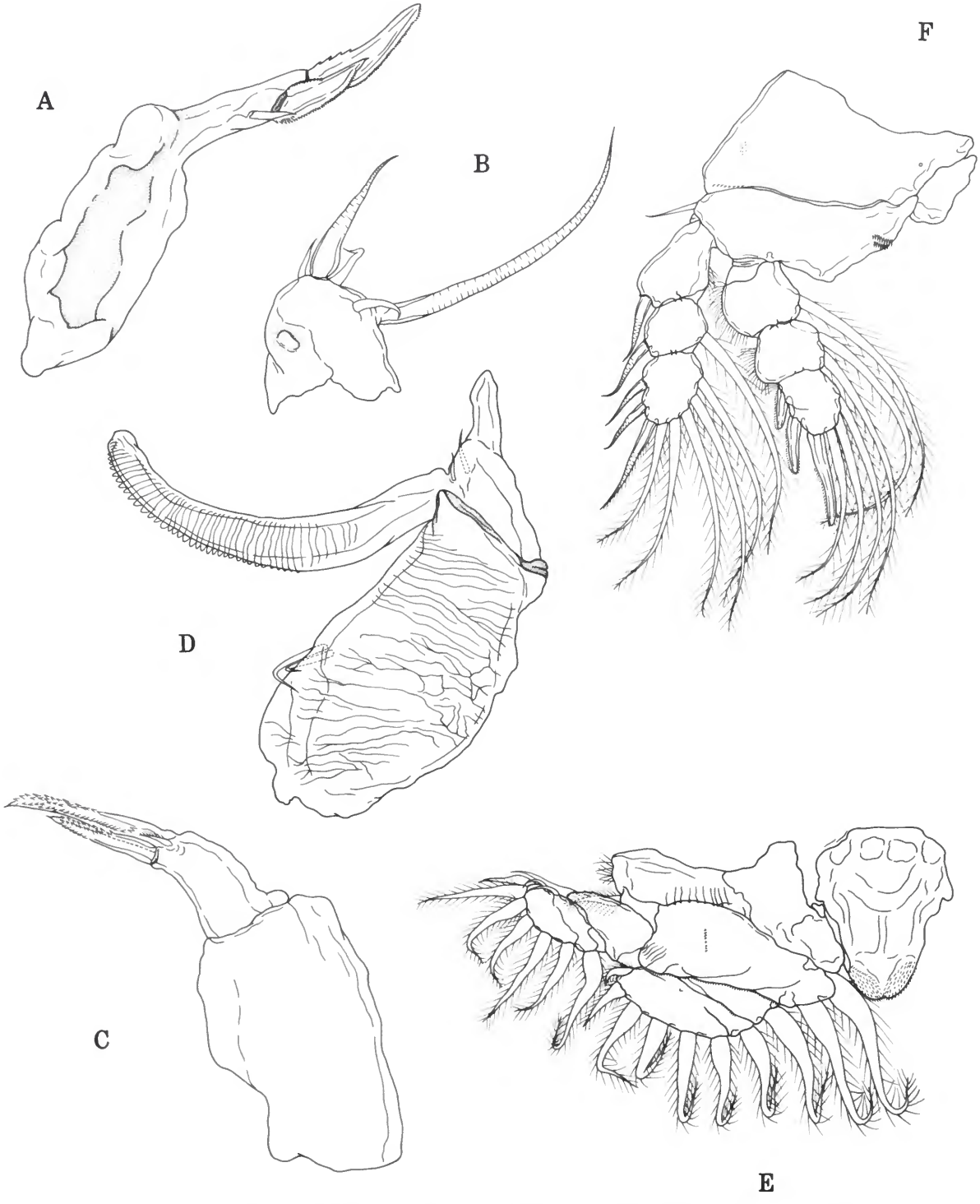

FIGURE 88.—*Taeniacanthus sebastichthydis* Yamaguti, female: A, mandible, anteromedial; B, first maxilla, anterior; C, second maxilla, posteroventral; D, maxilliped, ventrolateral; E, leg 1 and interpodal plate, ventral; F, leg 2, ventral.

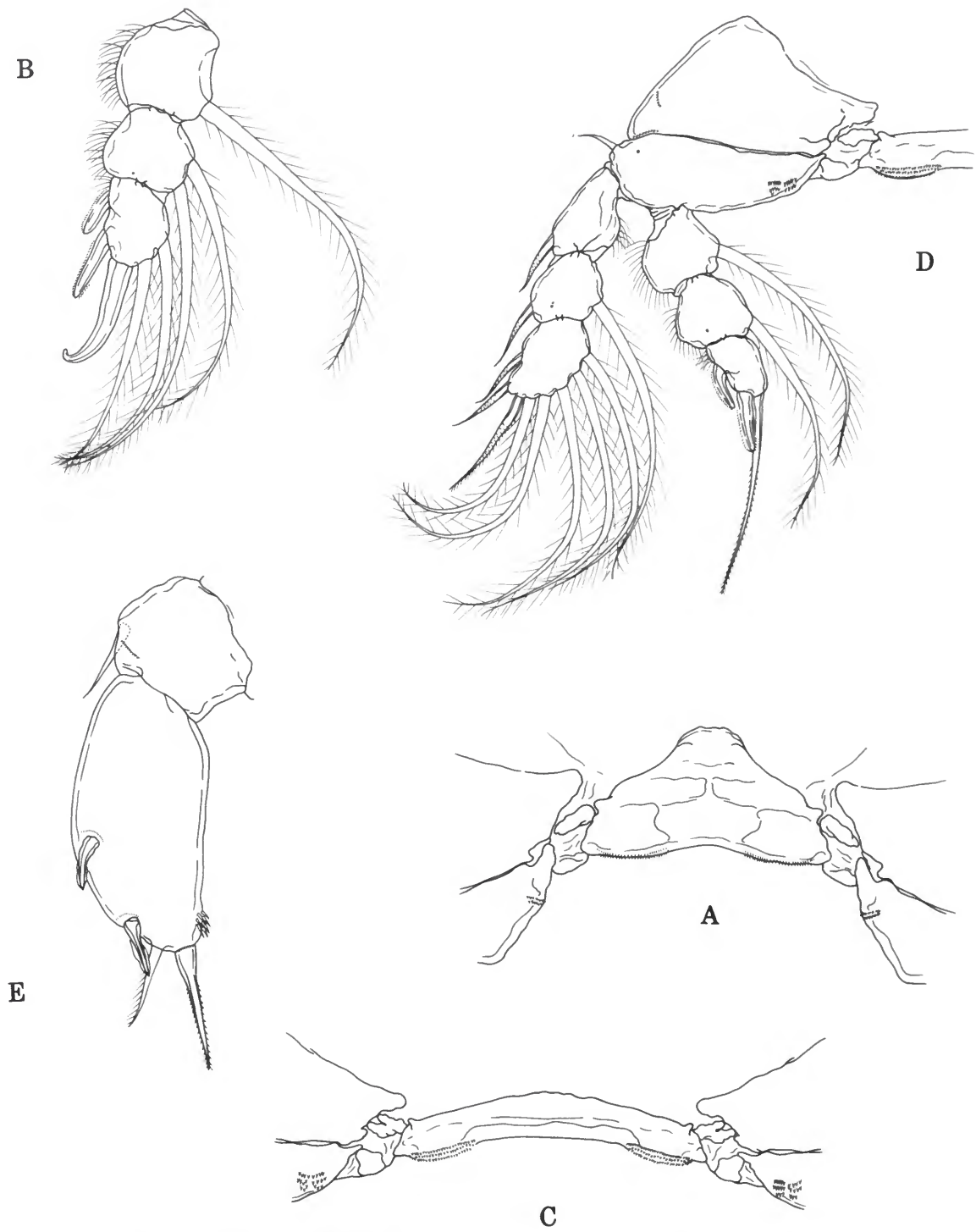

FIGURE 89.—*Taeniacanthus sebastichthydis* Yamaguti, female: A, leg 2, interpodal plate and proximal portions of basipods, ventral; B, leg 3 endopod, ventral; C, leg 4, interpodal plate and proximal portions of basipods, ventral; D, leg 4, ventral; E, leg 5, ventral.

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. sebastisci,* which he collected from the gill filament of *Sebastiscus marmoratus* (Cuvier and Valenciennes) from Ise Bay, Japan.

The description of *T. sebastisci* 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. sebastisci* 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 corrugations 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 *Meuschenia convexirostris* (Günther) 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 Netherland 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 × 874 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, 143 × 253 μm. Abdomen 4-segmented; segments from anterior to posterior 78 × 198 μm, 64 × 175 μm, 46 × 152 μm, and 106 × 138 μm (l × w); anal segment with 7–8 rows of spinules on each side of ventral surface.

Postantennal process (Figure 90B) with relatively small base and long slender tine. Labrum (Figure 90C) ornamented with spinules along posterior margin and pair of small lateral processes covered by transparent membrane. Mandible (Figure 90D) similar to that in *Taeniacanthus balistae* except accessory seta relatively longer. First maxilla (Figure 90E) with 5 setae and 1 anterior knob, similar to that described for *T. balistae.* Second maxilla (Figure 90F) as in *T. balistae* except naked accessory seta relatively longer. Maxilliped (Figure 91A) with first 2 segments as in *T. balistae* (compare with Figure 14C,D); claw strongly curved, but lacking inner rounded protuberance of *T. balistae* (compare Figure 91A with 14D). Exopod of leg 4 (Figure 91B) with terminal segment approximately 5× longer than wide and bearing pinnate inner setae. All other appendages as in *T. balistae.*

Male: Body as in Figure 91C. Total length 1.27 mm (1.26–1.30 mm) and greatest width 0.46 mm (0.43–0.51 mm) based on 3 specimens. Cephalothorax 376 × 517 μm (l × w) and comprising approximately 30% of total body length. Genital complex (Figure 91D) 141 × 179 μm. Abdomen 3-segmented; segments from anterior to posterior 74 × 138 μm, 55 × 124 μm, and 78 × 110 μm (l × w).

Maxilliped (Figure 91E,F) 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 tetradonis (Bassett-Smith, 1898)

Bomolochus tetradonis Bassett-Smith, 1898:4.
Bomolochus tetrodontis Wilson, 1911:390.
Irodes tetrodontis Wilson, 1911:390.
Irodes tetraodontis Gusev, 1951:397.—Markevich, 1956:81. [Not Yamaguti, 1936:4.]
Irodes tetradontis Pillai, 1963:110.
Taeniacanthus tetraodontis.—Yamaguti, 1963:21.—Ho, 1969:127.
Taeniacanthus tetradonis.—Kabata, 1979:78.

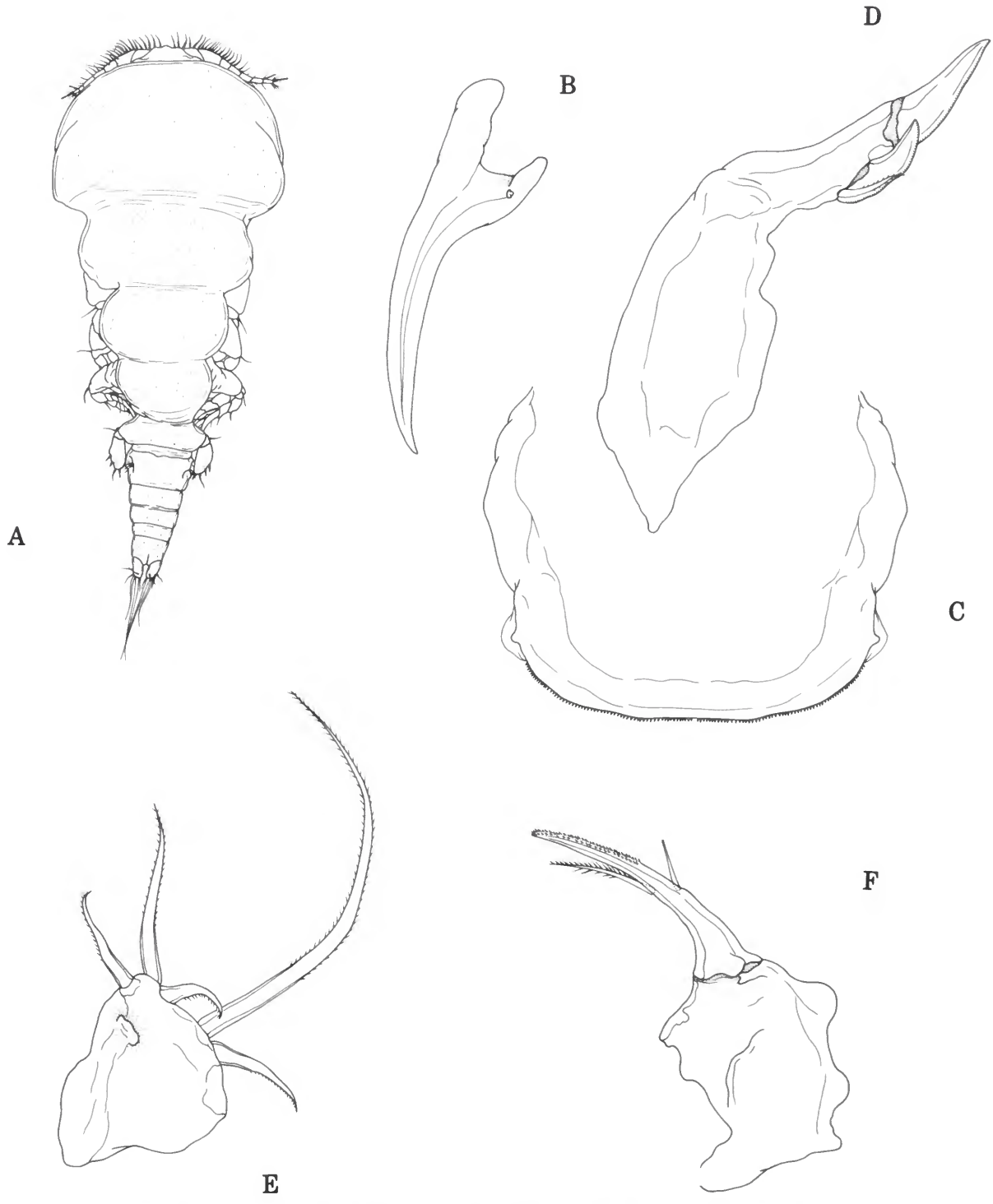

FIGURE 90.—*Taeniacanthus similis*, new species, female: A, dorsal; B, postantennal process, ventral; C, labrum, ventral; D, mandible, anteromedial; E, first maxilla, anterior; F, second maxilla, posteroventral.

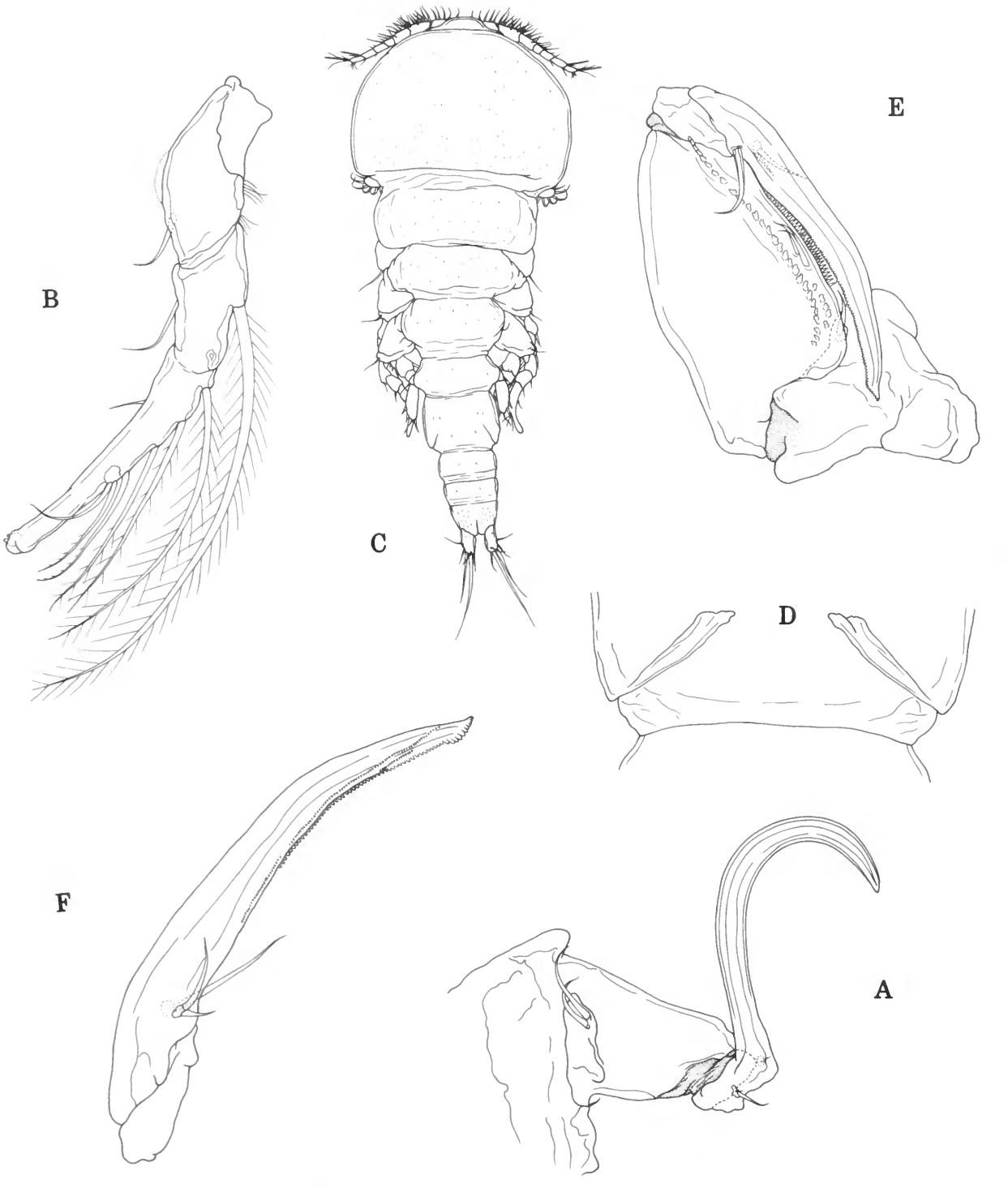

FIGURE 91.—*Taeniacanthus similis*, new species. Female: A, maxilliped, posterior; B, leg 4 exopod, dorsal. Male: C, dorsal; D, genital area, ventral; E, maxilliped, anterior; F, maxilliped claw, posterior.

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 "Tetraodontid fishes" off Japan and identified them as *Irodes tetraodontis.* 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 *Sphoeroides 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 *T. tetradonis* (Bassett-Smith, 1898) from Bombay. Although it is clear that Yamaguti's (1936) description of *Irodes tetraodontis* 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. yamaguti* is postponed.

Taeniacanthus williamsi, new species

FIGURES 92–95

MATERIAL EXAMINED.—From *Cirripectes castaneus:* 1 female holotype (USNM 228418) and 11 female paratypes (USNM 228419) from 5 hosts collected at Kwazulu 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; 3 females from off west coast of Villa Bourbon, Réunion (Mascarene Islands), by Y. Plessics and J. Bertard, 21 October 1973; 2 females from 2 hosts collected 4.8 km east of Steamer Point Harbor, Gold Mohur 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′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 ½ 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'uan-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 Faatuai 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 Lukes 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 filamentosus:* 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 Siluag 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 Mantpatre, Chagos Archipelago (05°25′04″S, 071°44′54″E), by R. Winterbottom and A. Emery; 2 females from inner lagoon (northeast side) of middle of Three Brothers, Great Chagos Bank, Chagos Archipelago (06°08′24″S, 071°31′52″E), by R. Winterbottom and A. Emery. 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.

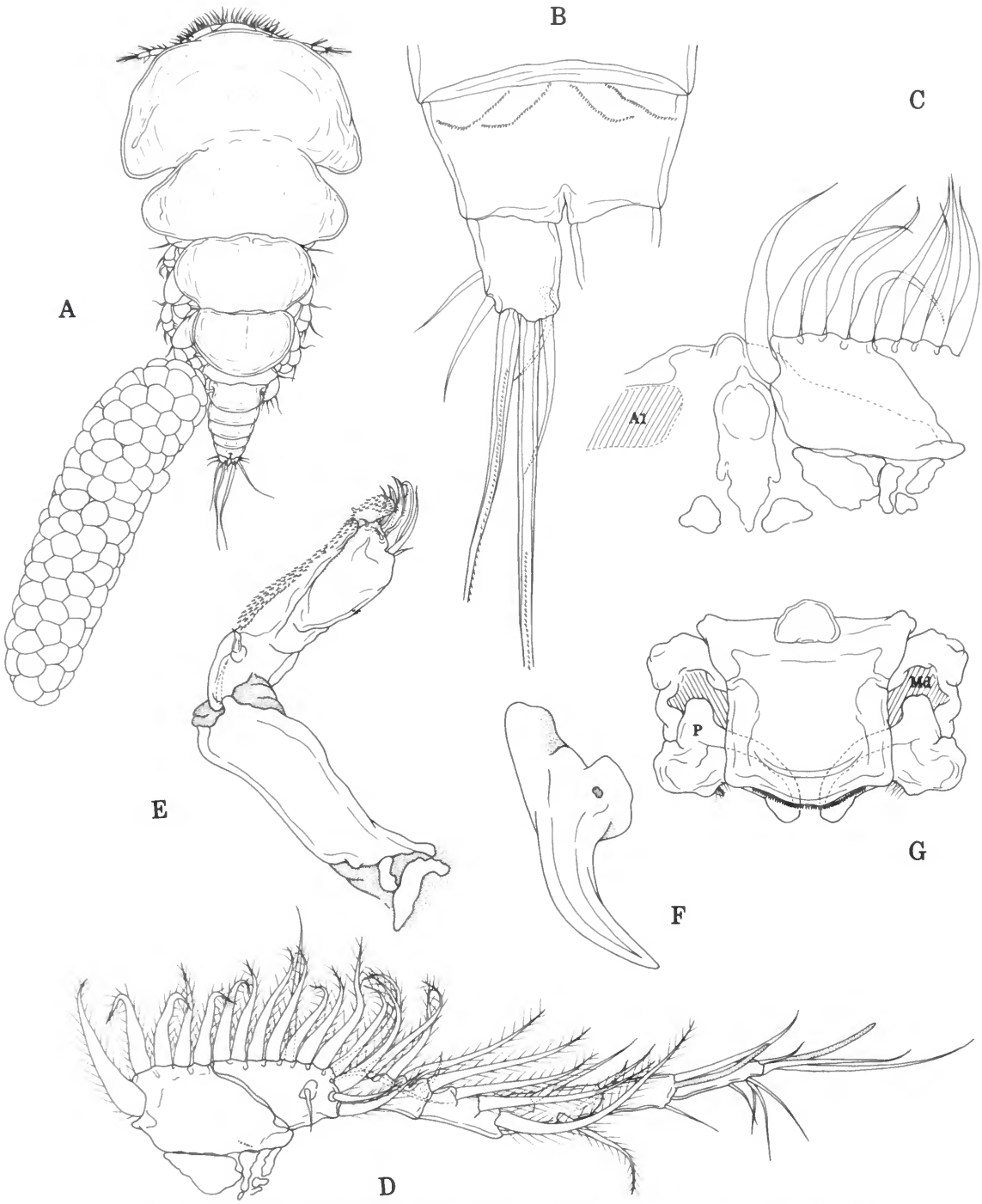

FIGURE 92.—*Taeniacanthus williamsi*, new species, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area, ventral; D, first antenna, ventral; E, second antenna, medial; F, postantennal process, ventral; G, labrum, paragnath and position of mandible, ventral. (A1 = first antenna, Md = mandible, P = paragnath.)

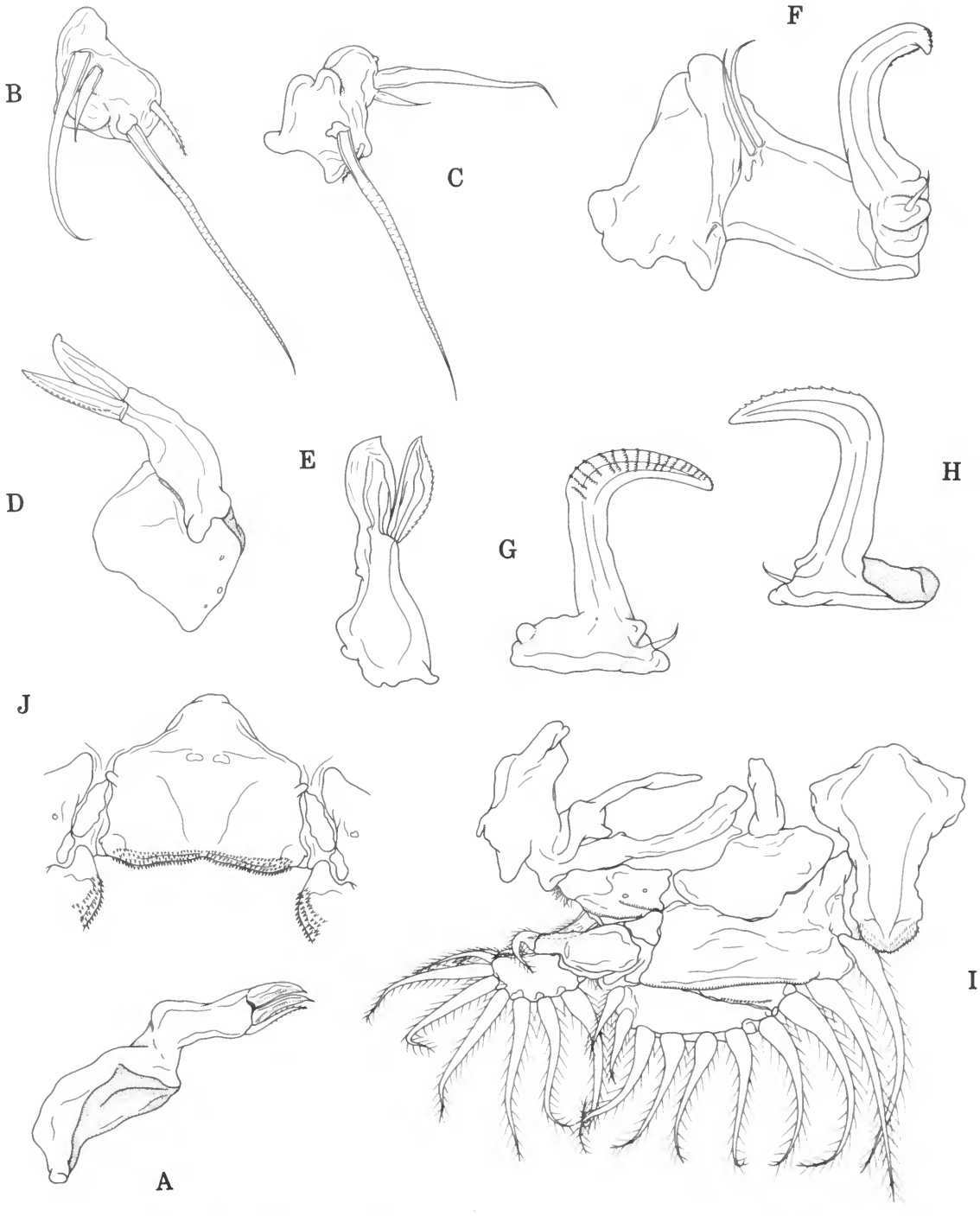

FIGURE 93.—*Taeniacanthus williamsi*, new species, female: A, mandible, anteromedial; B, first maxilla, ventral; C, same, posterior; D, second maxilla, posteroventral; E, second maxilla, terminal segment, anterolateral; F, maxilliped, ventrolateral; G, maxilliped claw, ventral; H, same, dorsal; I, leg 1 and interpodal plate, ventral; J, leg 2, interpodal plate and proximal portions of basipods, ventral.

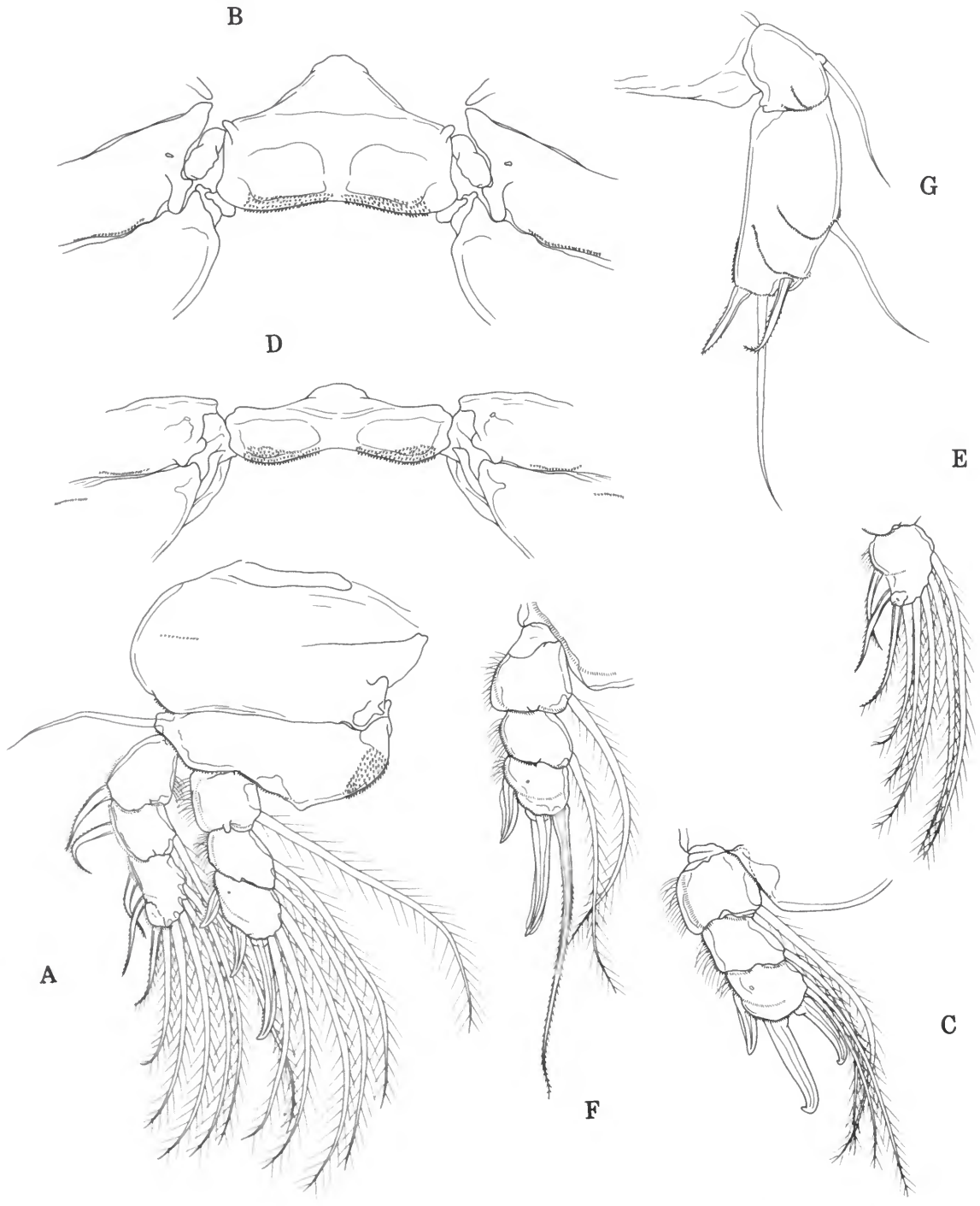

FIGURE 94.—*Taeniacanthus williamsi*, new species, female: A, leg 2, ventral; B, leg 3, interpodal plate and proximal portions of basipods, ventral; C, leg 3 endopod, ventral; D, leg 4, interpodal plate and proximal portions of basipods, ventral; E, leg 4, terminal exopod segment, ventral; F, leg 4 endopod, ventral; G, leg 5, ventral.

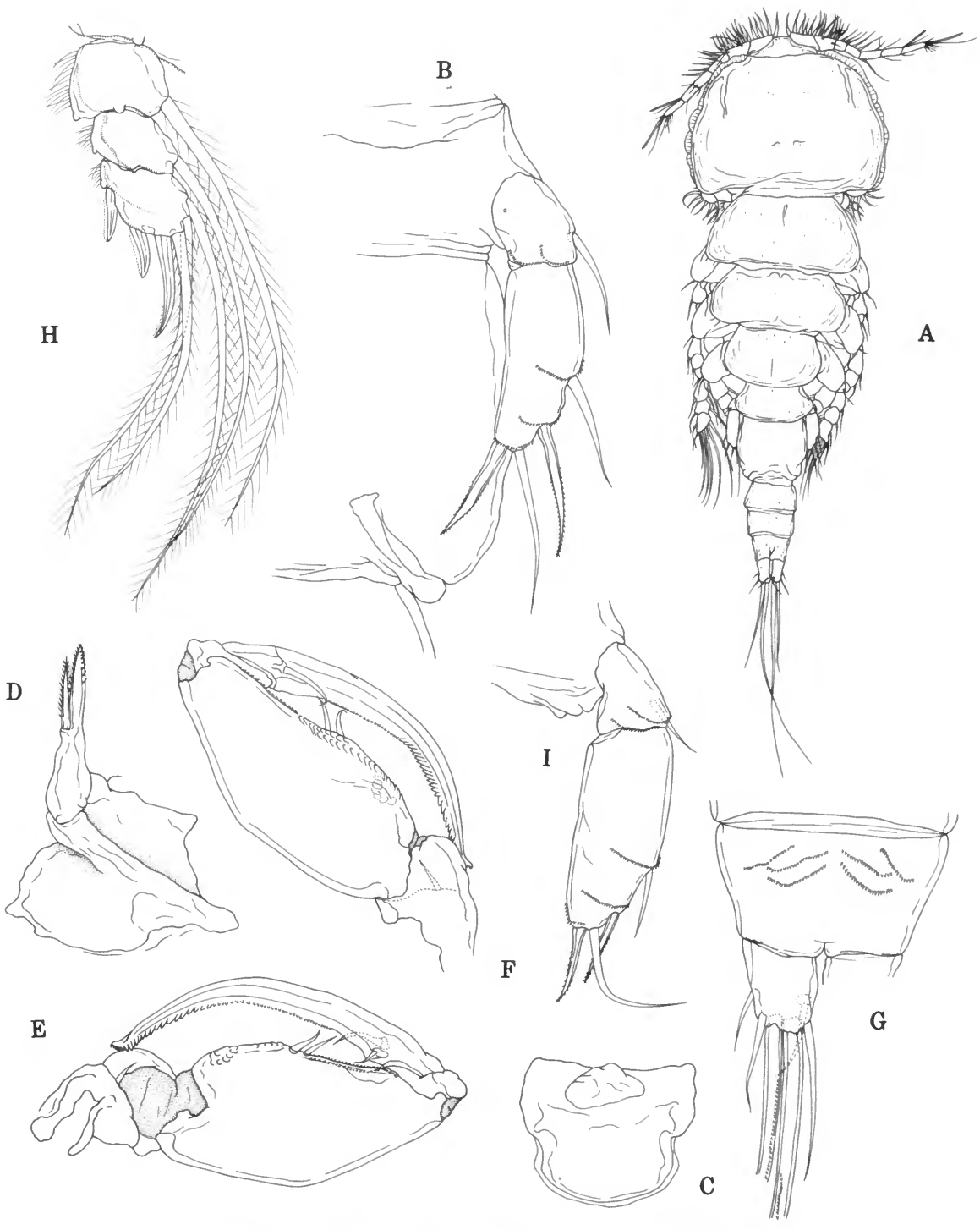

FIGURE 95.—*Taeniacanthus williamsi*, new species. Male: A, dorsal; B, leg 5 and genital area, ventral; C, labrum, ventral; D, second maxilla, posteroventral; E, maxilliped, anterior; F, same, posterior. Female variant: G, anal segment and caudal ramus, ventral; H, leg 2 endopod, ventral; I, leg 5, ventral.

Carlson, 20 August 1976. From *Cirripectes polyzona:* 1 male from Lizard Island, Queensland, Australia (14°41′S, 145°26′E), coral bottom, 1–8 m, 27 January 1975; 4 females from Station 60–96, GVF Reg. 2113, off southern tip of Poulo Cecir de Mer, western shore, Ilot du Sud, Viet Nam (10°29′15″N, 108°57′30″E), 10 March 1960. From *Cirripectes chelomatus:* 2 females from outside of One Tree Lagoon, One Tree Island, Australia, by Talbot and party, 26 November 1969.

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 2× 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 spinules 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 92D) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 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 spinules (shorter process with hyaline knob) and with 3 curved spines and 5 setae. Postantennal process (Figure 92F) curved.

Labrum (Figure 92G) truncate, with anteromedian hyaline lobe (balloon-like structure), and bearing spinules 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 93I,J, 94A–F) biramous. Spinal and setal formula as follows:

P_1	coxa 0-1	basis 1-1	exopod 1-0; 9 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod 1-0; I-1; II, I, 5 endopod 0-1; 0-2; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod 1-0; I-1; II, I, 5 endopod 0-1; 0-1; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; I-1; II, I, 5 endopod 0-1; 0-1; II, int.

Interpodal plates of legs 1–4 (Figures 93I,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 spinules as in Figure 94A,B,D. Leg 2 basis bearing large patch of spinules 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 spinules. 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 spinules. 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 spinules 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 spinules. 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 spinules 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 spinules, 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 95G) bearing 3 curved rows of spinules 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 95H) 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 *Cirripectes* 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. glomerosus,* new species, also a parasite of *Cirripectes*. 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

Taeniacanthus wilsoni A. Scott, 1929:84.—Yamaguti, 1963:22.—Kabata, 1979:79.

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 whole-mount type 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

Irodes tetraodontis sensu Yamaguti, 1936:4 [not *Bomolochus tetradonis* Bassett-Smith, 1898].—Ho, 1969:127. [Not Gusev, 1951; not Markevich, 1956.]

Irodes yamagutii Shiino, 1957a:376; 1959:371.—Yin, 1962:37.—Pillai, 1963:110.—Ho, 1969:127.

Taeniacanthus yamagutii.—Yamaguti and Yamasu, 1959:104.—Ho, 1969:127.

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 spinules 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 spinules 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 tine, 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 97B) 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 97E) with bilaterally denticulate terminal process (only 1 row shown in figure) bearing 2 finely bristled spines. Maxilliped (Figure 97F–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 97I,J, 98A–H) biramous. Spinal and setal formula as follows:

P_1	coxa 0-1	basis I-1	exopod I-0; 9 endopod 0-I; 7
P_2	coxa 0-0	basis I-0	exopod I-0; I-1; II, I, 4 endopod 0-I; 0-I; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-I; 0-I; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 4 endopod 0-I; 0-I; II, int.

Interpodal plates of legs 1–4 (Figures 97I,J, 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 posterolateral

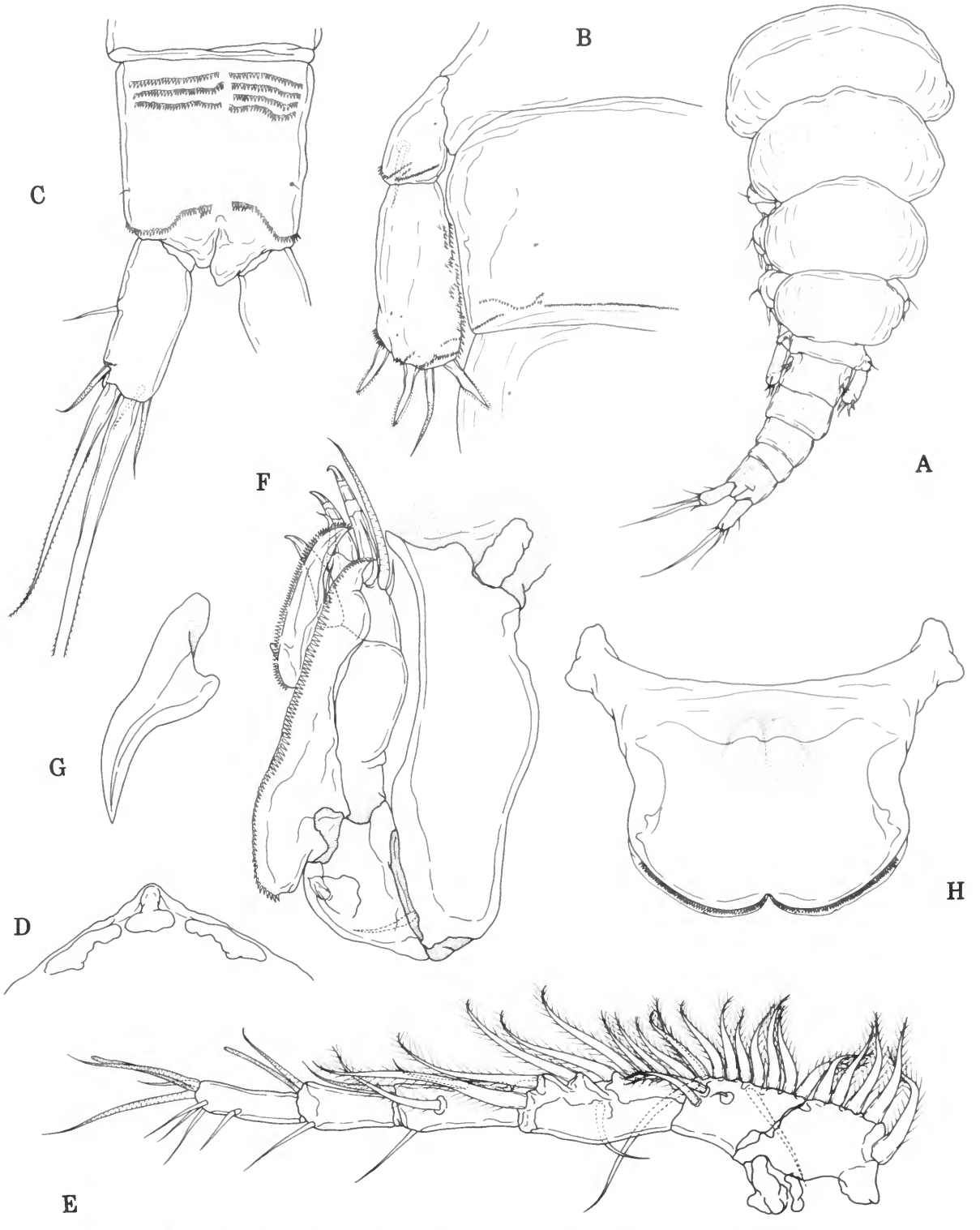

FIGURE 96.—*Taeniacanthus yamagutii* (Shiino), female: A, dorsal; B, genital complex and leg 5, ventral; C, anal segment and caudal ramus, ventral; D, rostral area, ventral; E, first antenna, ventral; F, second antenna, medial; G, postantennal process, ventral; H, labrum, ventral.

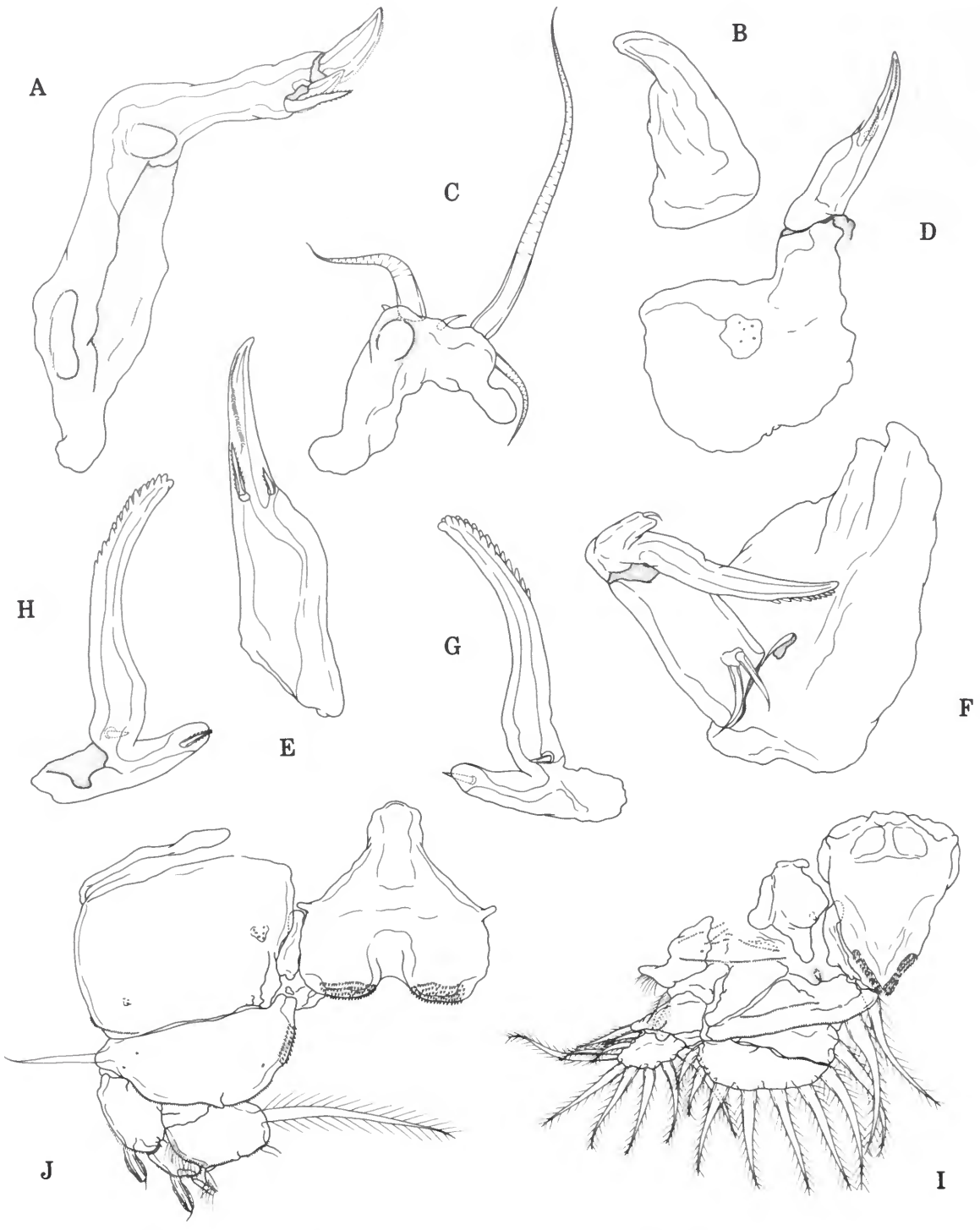

FIGURE 97.—*Taeniacanthus yamagutii* (Shiino), female: A, mandible, anterior; B, paragnath, dorsolateral; C, first maxilla, anterior; D, second maxilla, posteroventral; E, second maxilla, terminal segment, lateral; F, maxilliped, ventromedial; G, maxilliped claw, dorsal; H, same, ventromedial; I, leg 1 and interpodal plate, ventral; J, leg 2, interpodal plate and basipod, ventral.

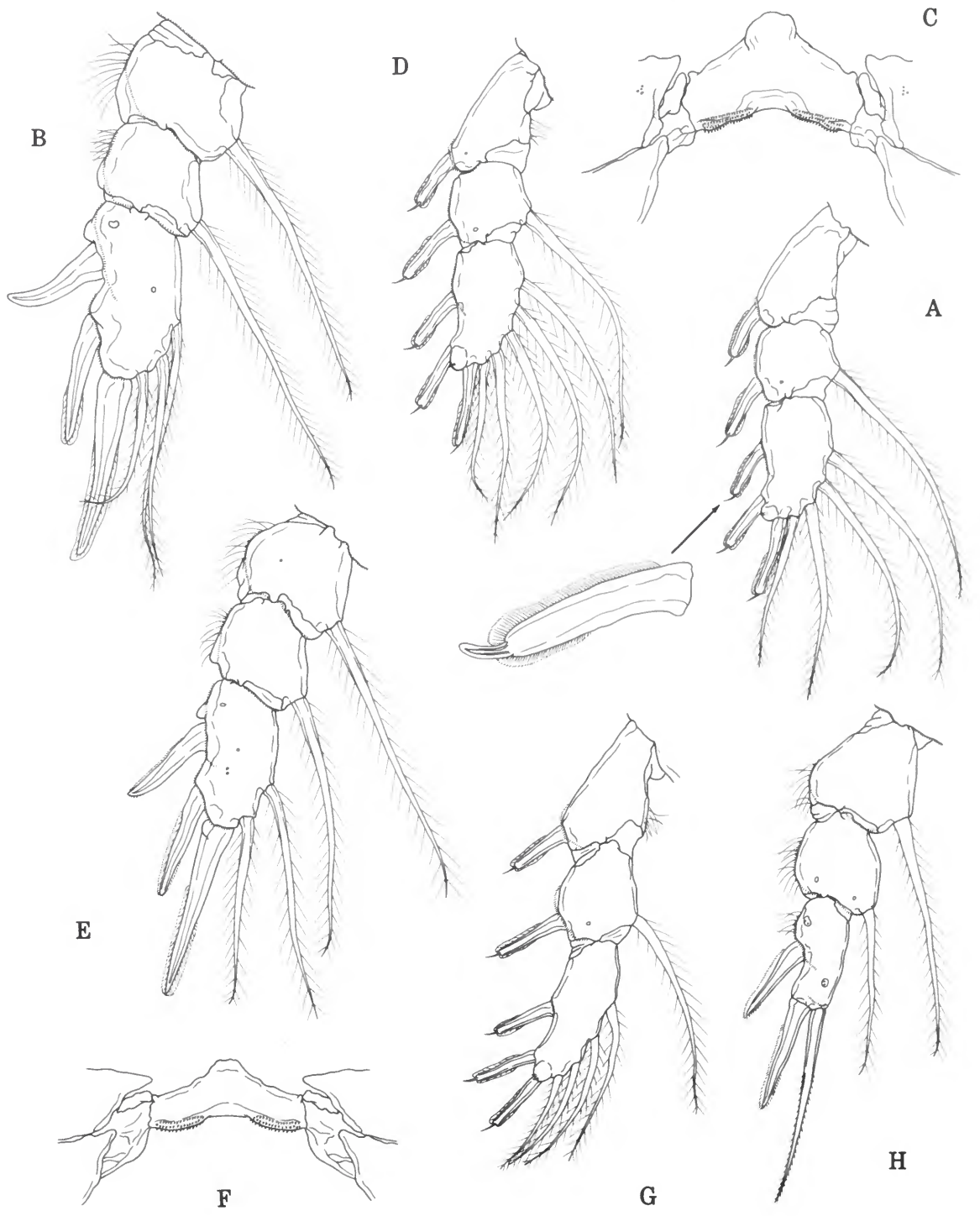

FIGURE 98.—*Taeniacanthus yamagutii* (Shiino),female: A, leg 2 exopod, ventral; B, leg 2 endopod, ventral; C, leg 3, interpodal plate and proximal portions of basipods, ventral; D, leg 3 exopod, ventral; E, leg 3 endopod, ventral; F, leg 4, interpodal plate and proximal portions of basipods, ventral; G, leg 4 exopod, ventral; H, leg 4 endopod, ventral.

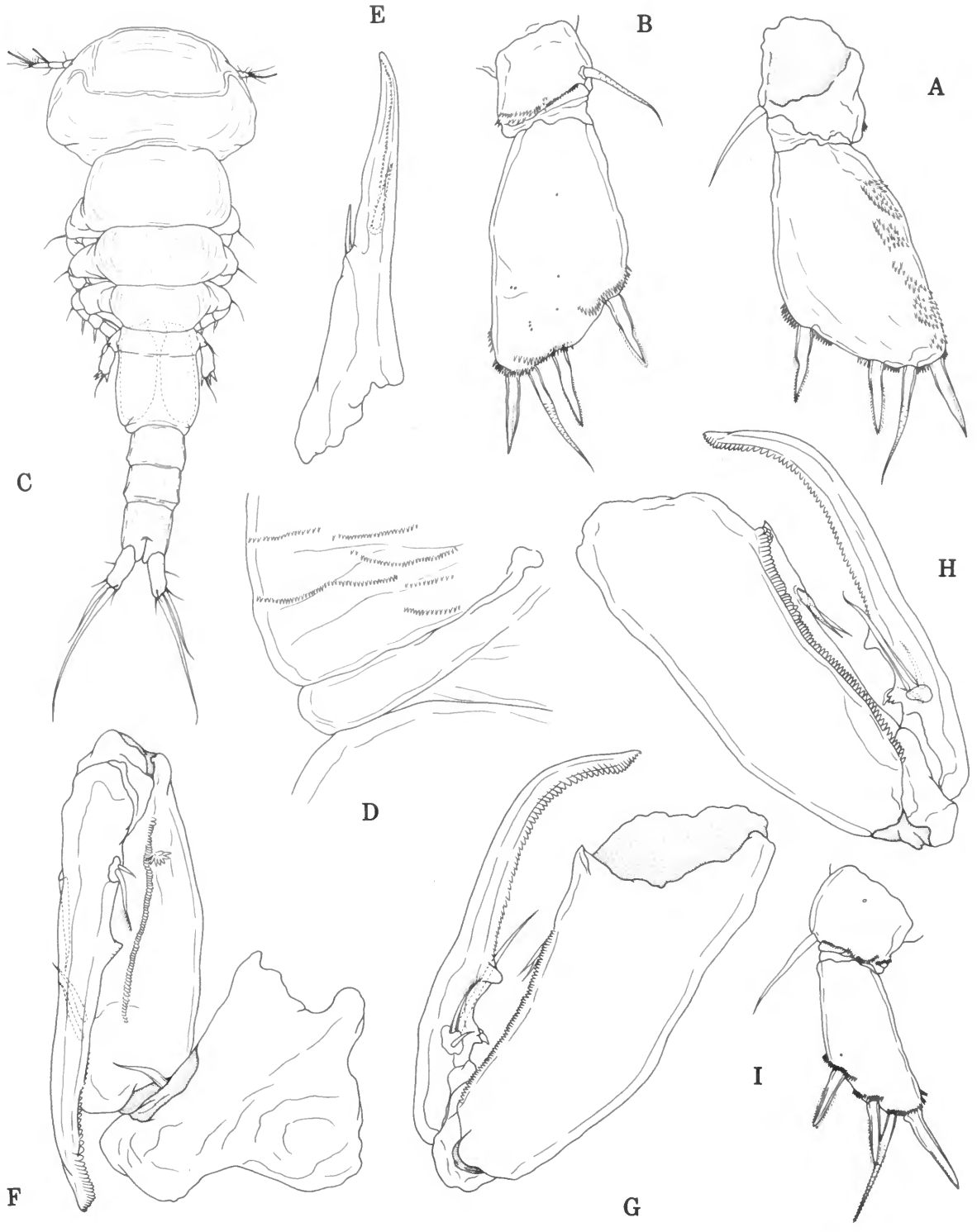

FIGURE 99.—*Taeniacanthus yamagutii* (Shiino). Female: A, leg 5, dorsolateral; B, same, ventrolateral. Male: C, dorsal; D, genital area, ventral; E, second maxilla, terminal segment, posteroventral; F, maxilliped, medial; G, same, anterior; H, same, posterior; I, leg 5, ventrolateral.

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 spinule; 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 98B,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 posteroventral 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 99F–H) 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 99I) similar to that in female except second segment 110 × 51 μm (l × w).

REMARKS.—*Taeniacanthus yamagutii* was originally described by Yamaguti (1936) as "*Irodes tetraodontis* (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.

Anchistrotos zeugopteri.—Leigh-Sharpe, 1939:166.—Yamaguti, 1963:23.—Kabata, 1979:77.

DESCRIPTION.—*Female and Male:* See Leigh-Sharpe (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-Sharpe (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-Sharpe, 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.

Anchistrotos.—Wilson, 1911:391.—Leigh-Sharpe, 1935:266; 1939:166.—Rounds, 1960:485.—Humes and Rosenfield, 1960:185.—Pillai, 1963:111.—Lewis, 1967:9.—Kabata, 1979:68, 74.—Dojiri and Humes, 1982:429.—Do and Ho, 1983:4.

Assecula Gurney, 1927:477.—A. Scott, 1929:87.—Ho, 1969:127.—Kabata, 1979:73. [New synonymy.]

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 104E] . . . . ***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.
Anchistrotos gobii.—Wilson, 1911:392.—Rose and Vaissière, 1952:172.—Vervoort, 1962:97.—Yamaguti, 1963:22.—Kabata, 1979:74.

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

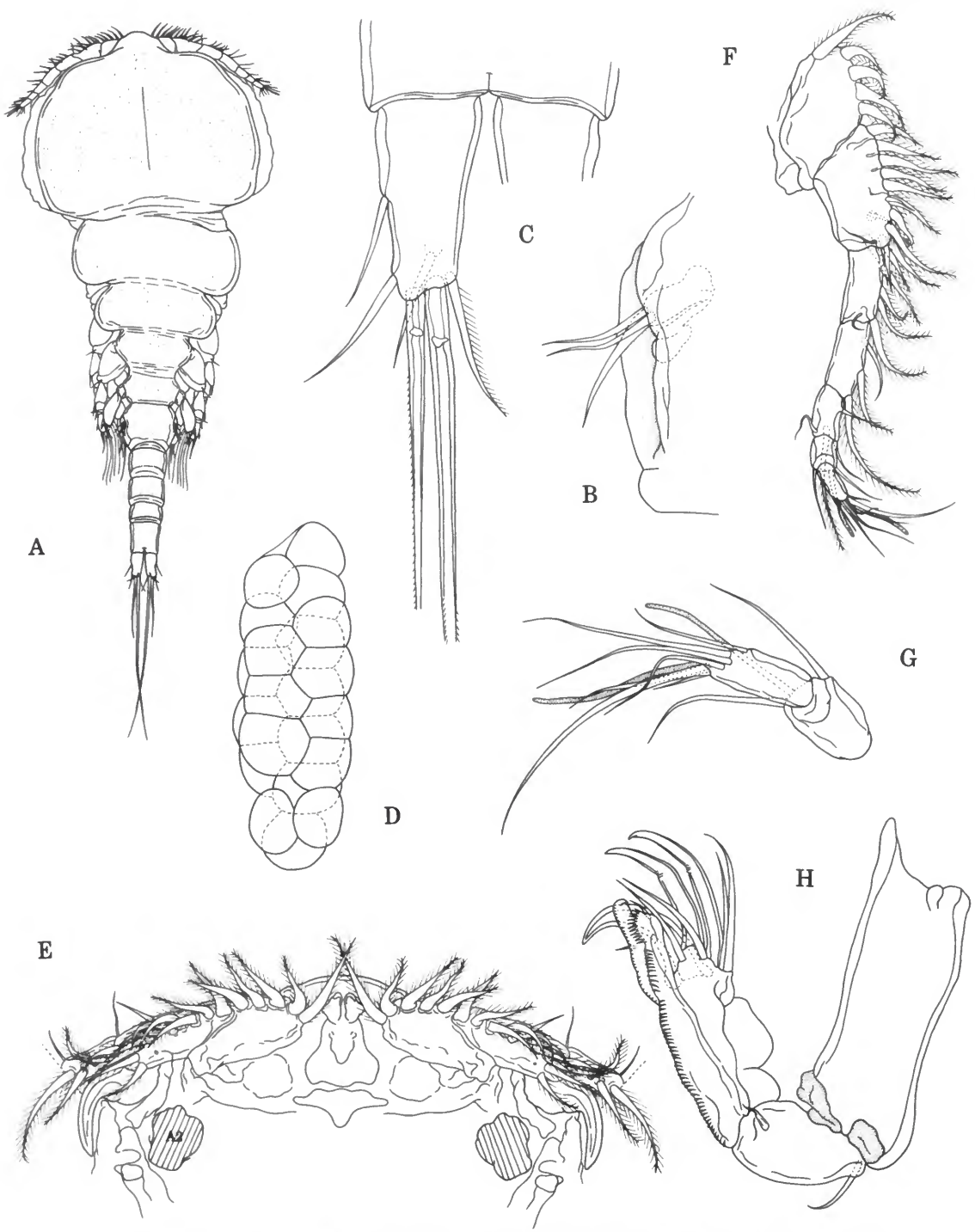

FIGURE 100.—*Anchistrotos gobii* Brian, female: A, dorsal; B, genital area, dorsal; C, anal segment and caudal ramus, ventral; D, egg sac, lateral; E, rostral area and first antennae, ventral; F, first antenna, anterodorsal; G, first antenna, distal two segments, anterodorsal; H, second antenna, medial. (A2 = second antenna.)

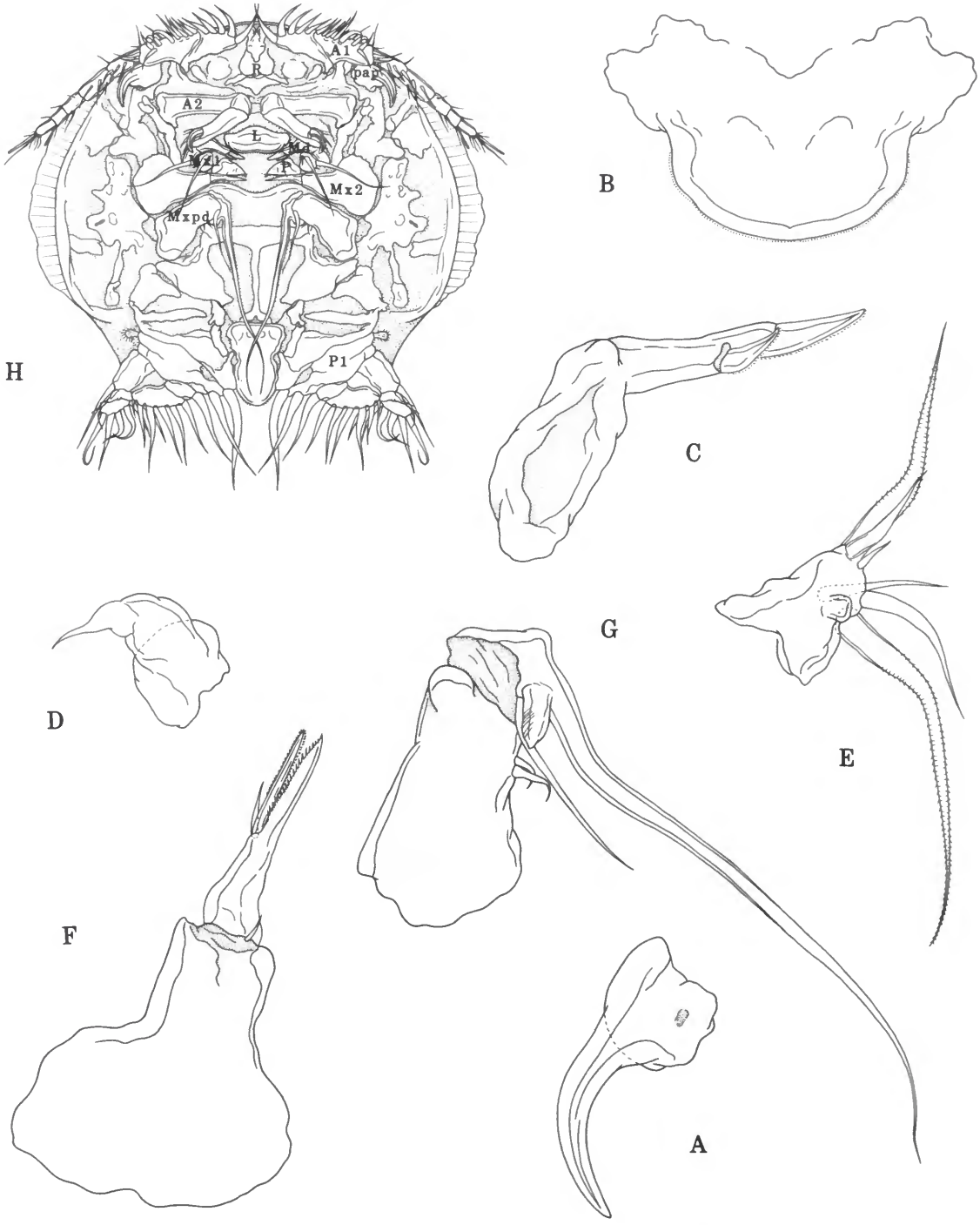

FIGURE 101.—*Anchistrotos gobii* Brian, female: A, postantennal process, ventral; B, labrum, ventral; C, mandible, anteromedial; D, paragnath, dorsal; E, first maxilla, anterior; F, second maxilla, anteromedial; G, maxilliped, ventral; H, cephalothorax, ventral. (R = rostral area, A1 = first antenna, A2 = second antenna, pap = postantennal process, L = labrum, Md = mandible, P = paragnath, Mx1 = first maxilla, Mx2 = second maxilla, Mxpd = maxilliped, P1 = leg 1.)

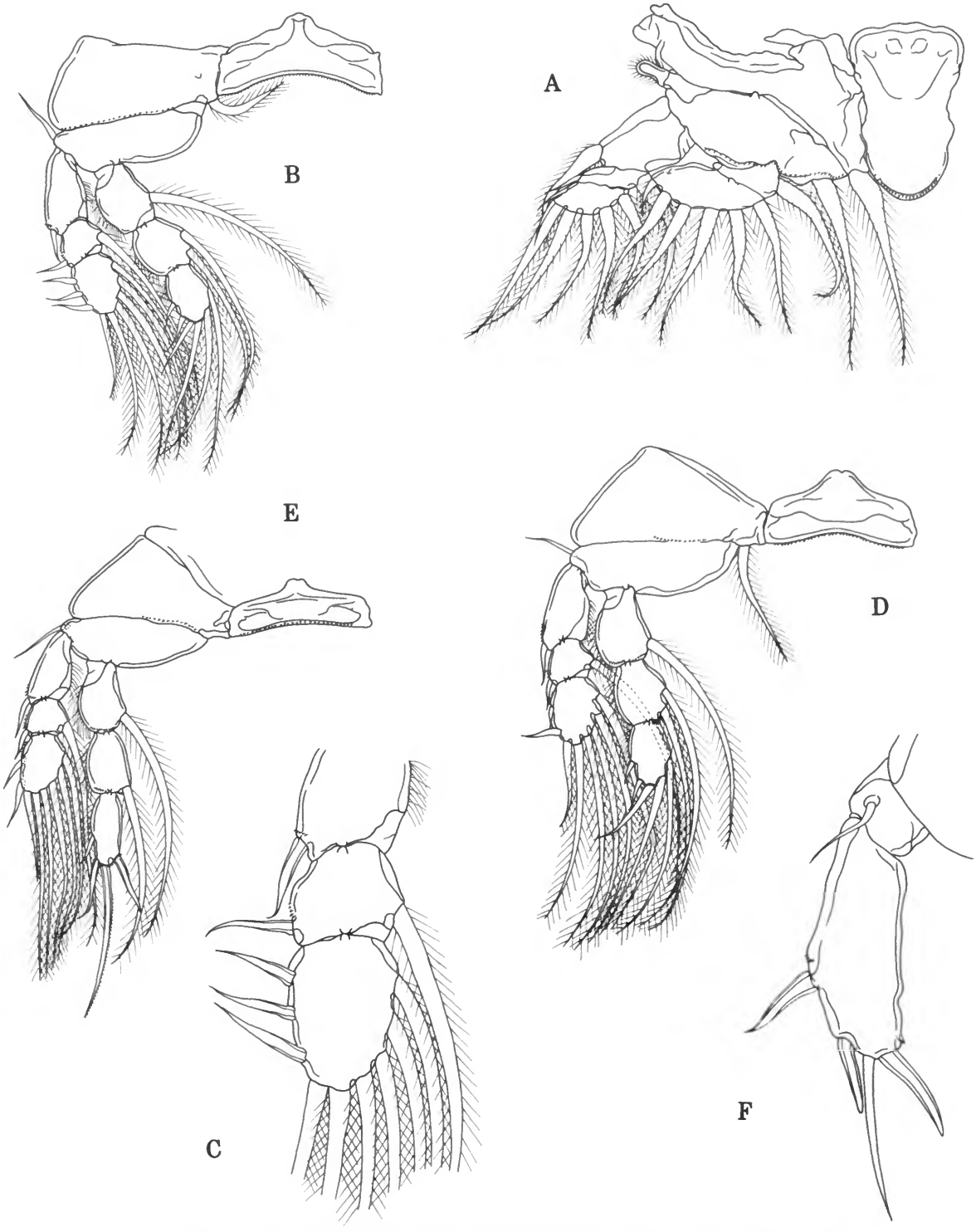

FIGURE 102.—*Anchistrotos gobii* Brian, female: A, leg 1 and interpodal plate, ventral; B, leg 2 and interpodal plate, ventral; C, leg 2 exopod, ventral; D, leg 3 and interpodal plate, ventral; E, leg 4 and interpodal plate, ventral; F, leg 5, dorsal.

μm (l × w), consisting of cephalosome and first pedigerous segment, and comprising approximately ⅓ of total body length. Pedigerous segments decreasing in width markedly from second to fifth segments. Genital complex wider than long, 120 × 138 μm. Each genital area (area of egg sac attachment) with 3 setae (Figure 100B). Abdomen 4-segmented from anterior to posterior 69 × 87 μm, 64 × 83 μm, 41 × 76 μm, and 74 × 69 μm (l × w); anal segment without ornamentation. Caudal ramus (Figure 100C) tapered distally, 62 × 34 μm (l × w) and bearing 6 setae. Egg sac (Figure 100D) oval, 483 × 78 μm, containing about 21 eggs.

Rostral area (Figure 100E) distinct, with ventromedian sclerotized part. First antenna (Figure 100F,G) distinctly 7-segmented; formula for armature: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 100H) 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. Distolateral 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 101E) 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. Spinal and setal formula as follows:

P_1	coxa 0-1	basis 1-1	exopod 1-0; I-1; 7 endopod 0-1; 6
P_2	coxa 0-1	basis 1-0	exopod 1-0; I-1; III, I, 5 endopod 0-1; 0-2; II, 1, 3
P_3	coxa 0-1	basis 1-0	exopod 1-0; I-1; II, I, 5 endopod 0-1; 0-2, II, 1, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; I-1; II, 1, 5 endopod 0-1; 0-1; IV

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 first segment small, quadrangular, with 1 naked dorsal seta. Second segment 71 × 39 μm (l × 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. lucipetus* 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. lucipetus* 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 claw. In this species the claw is only slightly curved and only one of the two setae extends beyond the distal limit of the claw. Although Do and Ho (1983) described the second segment of the maxilliped as bearing three setae (unusual, if not unique, in the Taeniacanthidae), we question whether the proximalmost seta might not arise from the first (basal) segment, which may lie underneath the second segment (corpus).

Anchistrotos laqueus Leigh-Sharpe, 1935

FIGURES 103–105

Anchistrotos laqueus Leigh-Sharpe, 1935:266.—Leigh-Sharpe, 1939:170.—Rounds, 1960:485.—Yamaguti, 1963:22.—Kabata, 1979:76.
Anchistrotos hamatus Rounds, 1960:485; 1962:247. [New synonymy.]
Anchistrotos hematus Rounds, 1960:485.—Yamaguti, 1963:22. [New synonymy.]

MATERIAL EXAMINED.—From *Serranus scriba* Linnaeus: 1 female, 2 immature females collected at Livarno, Italy; 1 female from 35°48′N, 05°45′W; 1 female from Bay of Naples. From *Serranus cabrilla* Linnaeus: 3 females from Haifa Bay, Israel; 4 females off Tunisia (36°57′N, 10°28′E). From *Ciliata mustela* Linnaeus: 1 female from Baltic Sea, south of Elsinore; 1 female from England.

DESCRIPTION.—*Female:* Body as in Figure 103A. Total length 0.93 mm (0.89–0.95 mm) and greatest width 0.39 mm (0.36–0.41 mm) based on 3 specimens. Cephalothorax 254 × 395 μm (l × w), indistinctly separated from second pedigerous segment, 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, 87 × 106 μm. Abdomen 4-segmented; segments from anterior to posterior 51 × 76 μm, 46 × 69 μm, 30 × 62 μm, and 44 × 55 μm (l × w); anal segment (Figure 103B) unornamented. Caudal ramus (Figure 103B) longer than wide, 36 × 21 μm, and bearing 6 setae; innermost and 2 large terminal setae unilaterally barbed. Egg sac (Figure 103C) with eggs multiserially arranged.

Rostral area (Figure 103D) with circular sclerotized part on ventral surface. First antenna (Figure 103D) 7-segmented; armature formula as follows: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 103E) apparently 4-segmented; first 2 segments each with a distal seta; third segment with 2 pectinate processes (longer one with small distal seta, and shorter one with seta at midlength) and 1 large curved spine; terminal segment with 2 large curved spines and 4 setae. Postantennal process (Figure 103F) a sharp curved process.

Labrum (Figure 103G) somewhat truncate with row of spinules on medial region of posterior margin. Mandible (Figure 104A) with 2 unequal blades, each spinulated along 1 margin. Paragnath (Figure 104B) a lobe bearing a tuft of setules at base. First maxilla (Figure 104C) with 2 rounded knobs and 6 setae (1 large seta and 1 smaller seta each with 2 rows of bristles). Second maxilla (Figure 104D) 2-segmented; first segment a large sclerotized area; second segment with spinulated terminal process and 2 pinnate setae. Maxilliped (Figure 104E) apparently 3-segmented; first segment 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	coxa 0-1	basis 1-1	exopod I-0; I-1; 7 endopod 0-1; 6
P_2	coxa 0-1	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-2; II, I, 3
P_3	coxa 0-1	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-2; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-1; IV (or II, int., I)

Interpodal plates of legs 1–4 (Figures 104F, 105A,C) with spinules 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. Coxae of legs 2–4 (see Figure 105A,C) 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 spinules; 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 spinules on outer margins of segments; second segment of endopods of legs 2 and 3 with outer spiniform processes and long inner spinules. 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 spinules and a sparsely pinnate seta; second segment 72 × 38 μm (l × 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

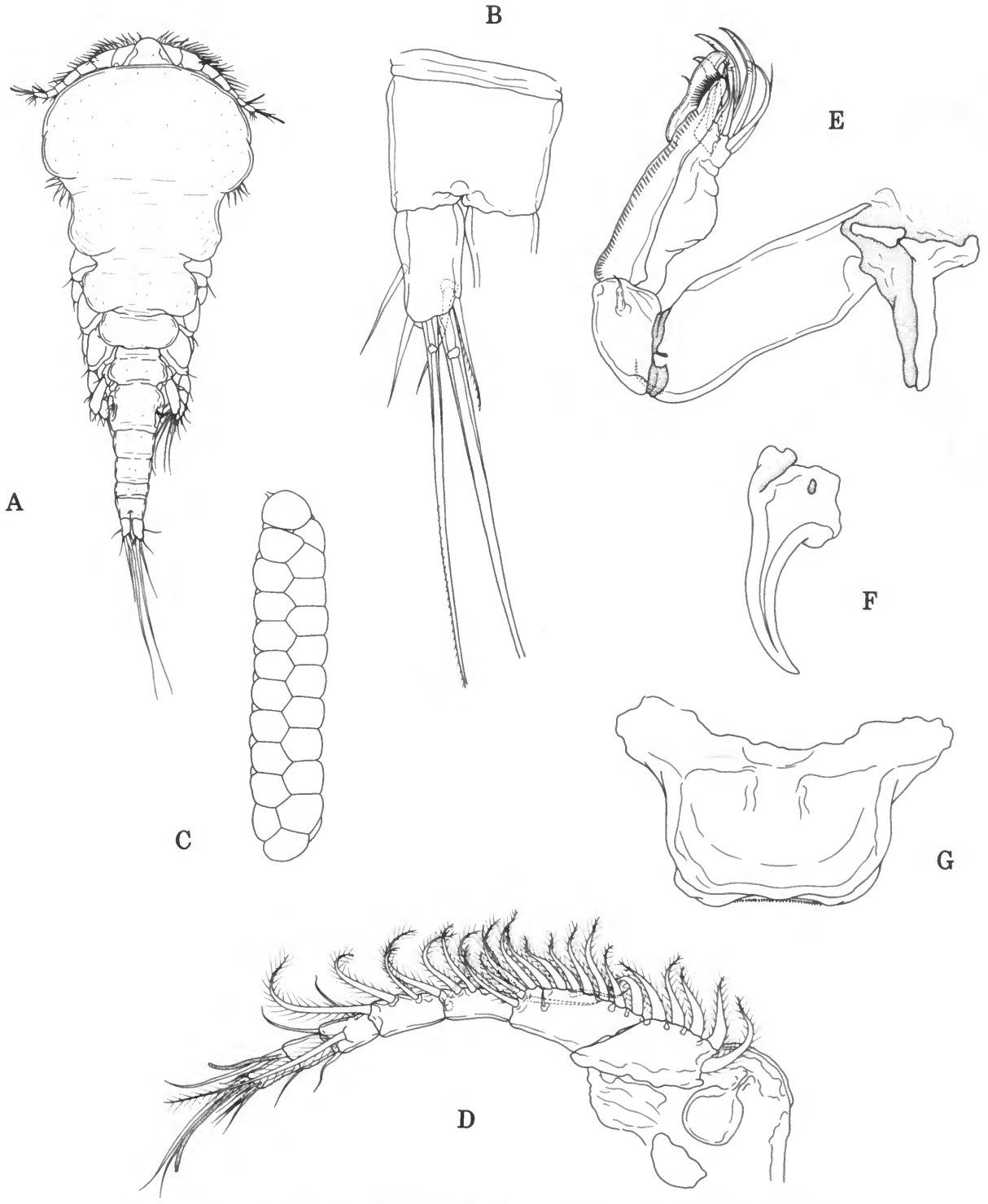

FIGURE 103.—*Anchistrotos laqueus* Leigh-Sharpe, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, egg sac, dorsal; D, rostral area and first antenna, ventral; E, second antenna, medial; F, postantennal process, ventral; G, labrum, ventral.

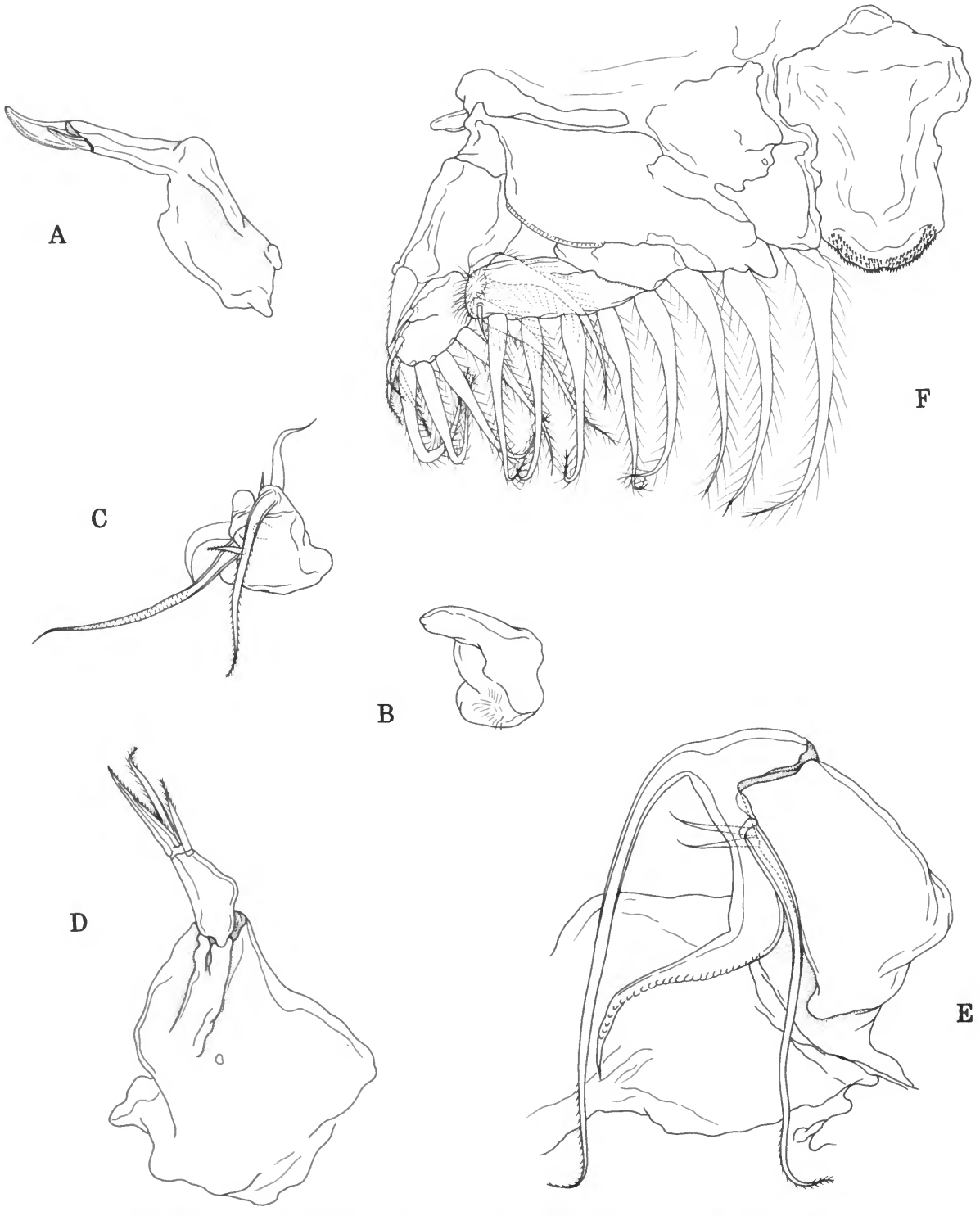

FIGURE 104.—*Anchistrotos laqueus* Leigh-Sharpe, female: A, mandible, anteromedial; B, paragnath, ventral; C, first maxilla, ventral; D, second maxilla, ventral; E, maxilliped, ventral; F, leg 1 and interpodal plate, ventral.

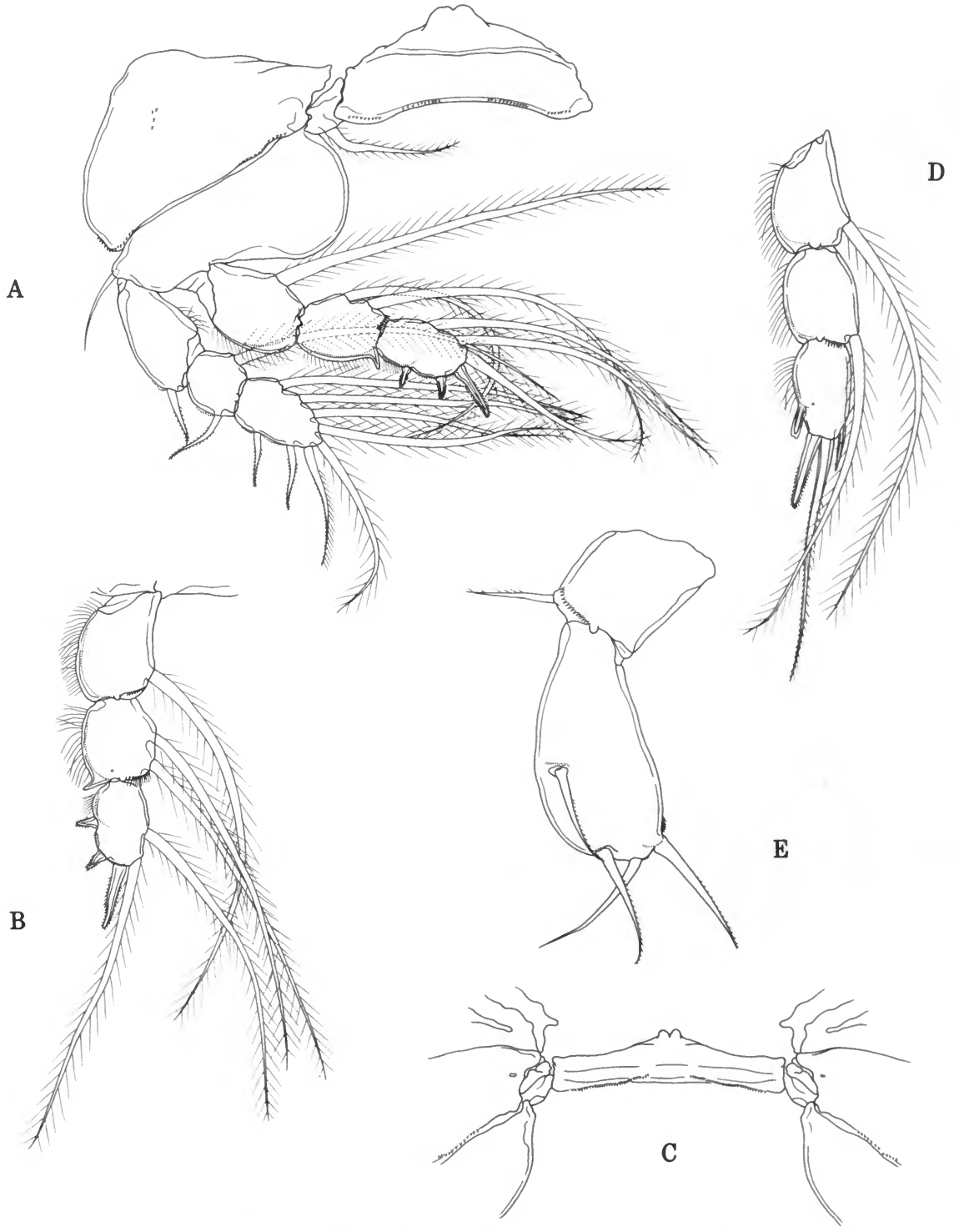

FIGURE 105.—*Anchistrotos laqueus* Leigh-Sharpe, female: A, leg 2 and interpodal plate, ventral; B, leg 3 endopod, ventral; C, leg 4, interpodal plate and proximal portions of basipods, ventral; D, leg 4 endopod, ventral; E, leg 5, ventrolateral.

redescription of this species from "one wholemount specimen, which did not allow a study of its morphological details." Upon examination of new material, we have provided a detailed redescription of this species and conclude that *Anchistrotos hamatus* Rounds, 1960, collected from *Serranus scriba* from the Adriatic, is synonymous with the species first described by Leigh-Sharpe.

The most distinguishing character of this species is the denticulate claw of the maxilliped of the female, which appears setiform at its distal half, and the two extremely long setae near the base of the claw; both these setae extend beyond the distal tip of the claw.

Anchistrotos lucipetus Holmes, 1985

Anchistrotos lucipetus Holmes, 1985:18.

DESCRIPTION.—*Female and Male:* See Holmes (1985).

REMARKS.—*Anchistrotos lucipetus* was collected with an underwater light trap at Lough Ine, Ireland, and described by Holmes (1985) who presumed that the copepods had detached from their hosts and were collected during a free-swimming state. This is not an unreasonable assumption, because other species of parasitic copepods (e.g., caligids) display this behavior.

This species is morphologically very similar to *A. onosi* (T. Scott, 1902) and *A. caligiformis* (Gurney, 1927). However, *A. lucipetus* can be distinguished from these two species by the length of the longest seta on the maxilliped of the female; this seta is at least twice the length of the claw. In addition, the maxilliped claw of the male is unusual in that it is strongly bent at midlength (Holmes, 1985).

Anchistrotos onosi (T. Scott, 1902)

Bomolochus onosi T. Scott, 1902:289; 1906:361.—Wilson, 1911:368.—Scott and Scott, 1913:39.—Oorde-de Lint and Schuurmans Stekhoven, 1936:104.

Anchistrotos onosi.—Stock, 1953:9.—Yamaguti, 1963:22.—Kabata, 1979: 75.

DESCRIPTION.—*Female and Male:* See Kabata (1979).

REMARKS.—*Anchistrotos onosi,* originally described under the binomen *Bomolochus onosi* by T. Scott (1902), was transferred to *Anchistrotos* by Stock (1953). This species was redescribed by Stock (1953) and more recently by Kabata (1979). The two known hosts for this species are *Ciliata mustela* and *Rhinonemus cimbrius* Jordan (formerly included in *Onos* and commonly known as rocklings) (Kabata, 1979). *Anchistrotos onosi* has so far been reported only from the Firth of Forth, Firth of Clyde, Moray Firth, and the Shetlands (northern British waters) (T. Scott, 1902; Stock, 1953; Kabata, 1979).

This species can be distinguished from its congeners by the structure of the maxilliped claw of the female. The claw is rigid (highly sclerotized and strongly curved), and bears 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.

Rostral area slightly protuberant with ventromedian sclerotized plate. First antenna 7-segmented. Second antenna indistinctly 4-segmented. Postantennal process a curved spiniform structure. Labrum bearing anteromedial balloon-like process and spinulated posterior margin. Mandible with 2 spinulated blades and an accessory seta. Paragnath a digitiform process. First maxilla a lobe bearing 5 setae. Second maxilla 2-segmented with 1 spinulated process and 2 spinulated spines. Maxilliped with 2 setae on corpus; claw curved toward corpus resulting in subchelate appendage.

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 Taeniacanthidae, meaning thorn), alluding to the curved claw of the maxilliped of the female of this genus.

TYPE-SPECIES.—*Taeniacanthus 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 taeniacanthid 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 taeniacanthids curves away from the corpus. This structural distinction is fundamentally different from all other taeniacanthid 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 II, I, 4 [see leg 2, Figure 107I] ..... ***C. monacanthi***

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

Cirracanthus monacanthi (Yamaguti, 1939), new combination

FIGURES 106–108

Taeniacanthus monacanthi Yamaguti, 1939:402.—Shiino, 1959:372.—Yamaguti, 1963:21.

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 setifer* 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 spinules on ventral surface (only 6 rows of spinules on right side and 7 rows on left side of anal segment of specimens from *Stephanolepis cirrhifer;* second and third rows of spinules continuous across midline of anal segment; Figure 106B). Caudal ramus (Figure 106B) longer than wide, 49 x26 μm, bearing 6 setae; inner lateral seta with row of spinules 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	coxa 0-1	basis 1-1	exopod I-0; 9 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 4 endopod 0-1; 0-1; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 4 endopod 0-1; 0-1; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 4 endopod 0-1; 0-1; II, int.

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 long 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 terminally. 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 spinules 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.

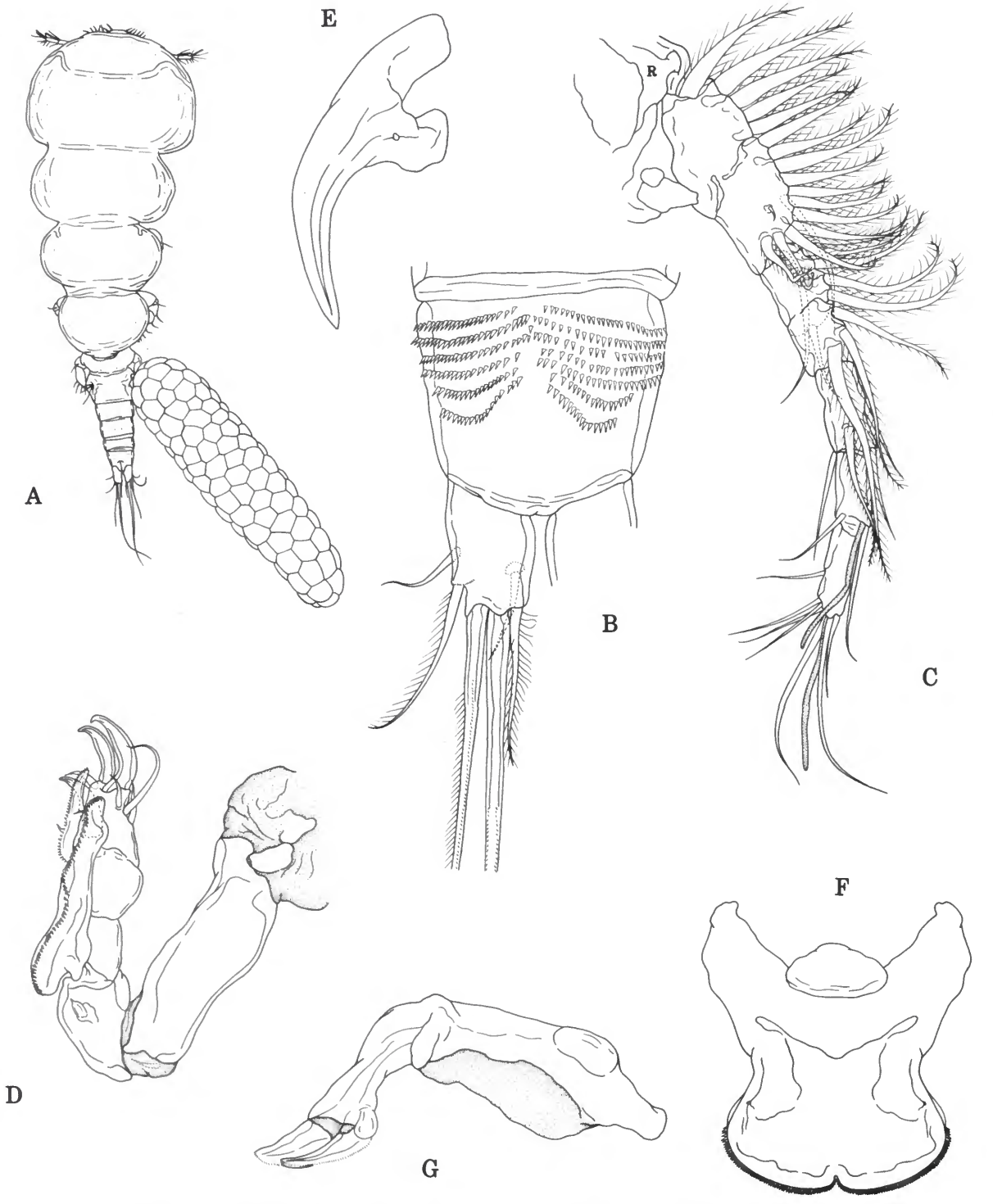

FIGURE 106.—*Cirracanthus monacanthi* (Yamaguti), female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area and first antenna, ventral; D, second antenna, medial; E, postantennal process, ventral; F, labrum, ventral; G, mandible, anteromedial. (R = rostral area.)

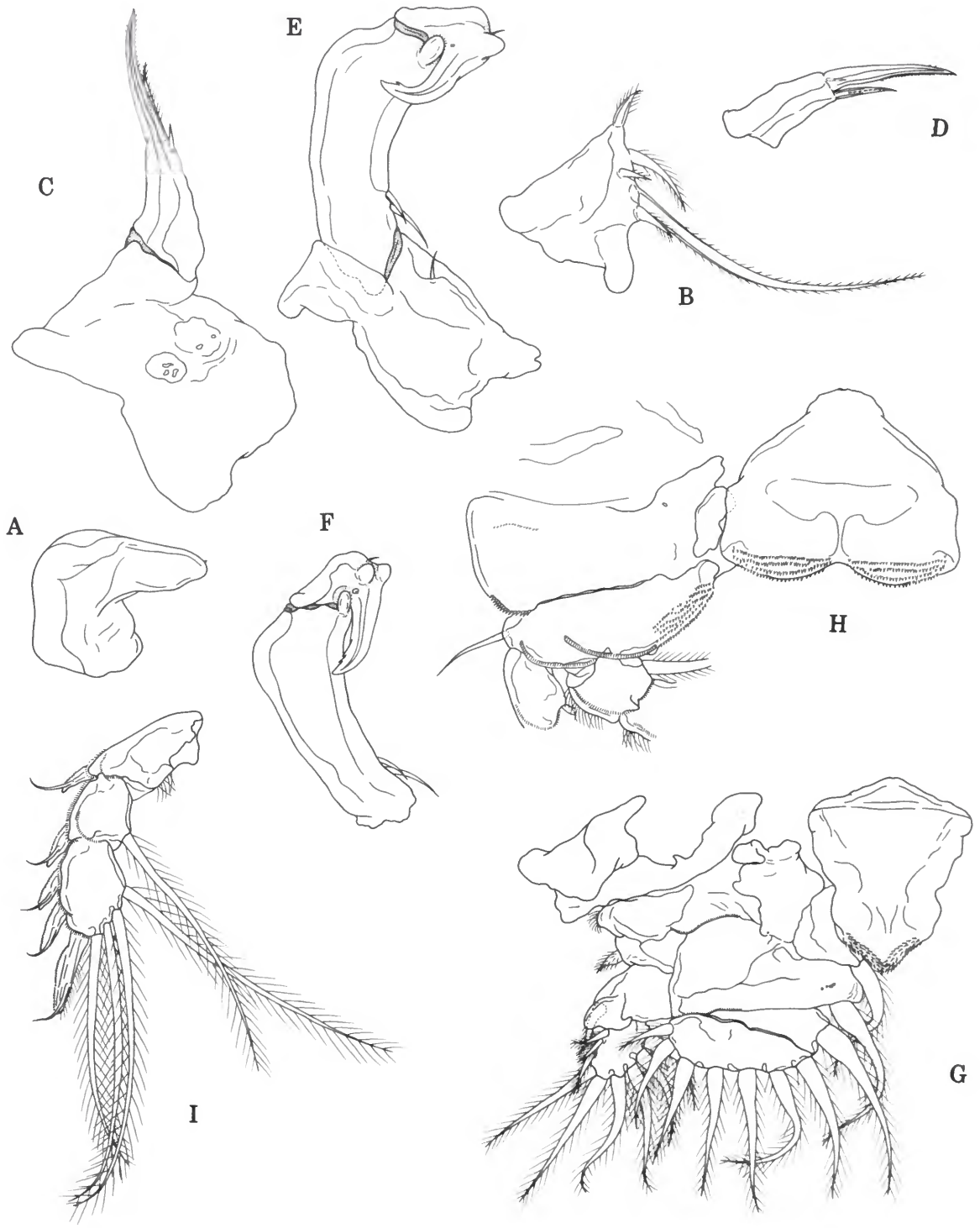

FIGURE 107.—*Cirracanthus monacanthi* (Yamaguti), female: A, paragnath, ventral; B, first maxilla, anterior; C, second maxilla, ventral; D, second maxilla, terminal segment, anterior; E, maxilliped, ventral; F, same, ventral; G, leg 1 and interpodal plate, ventral; H, leg 2, interpodal plate and basipod, ventral; I, leg 2 exopod, ventral.

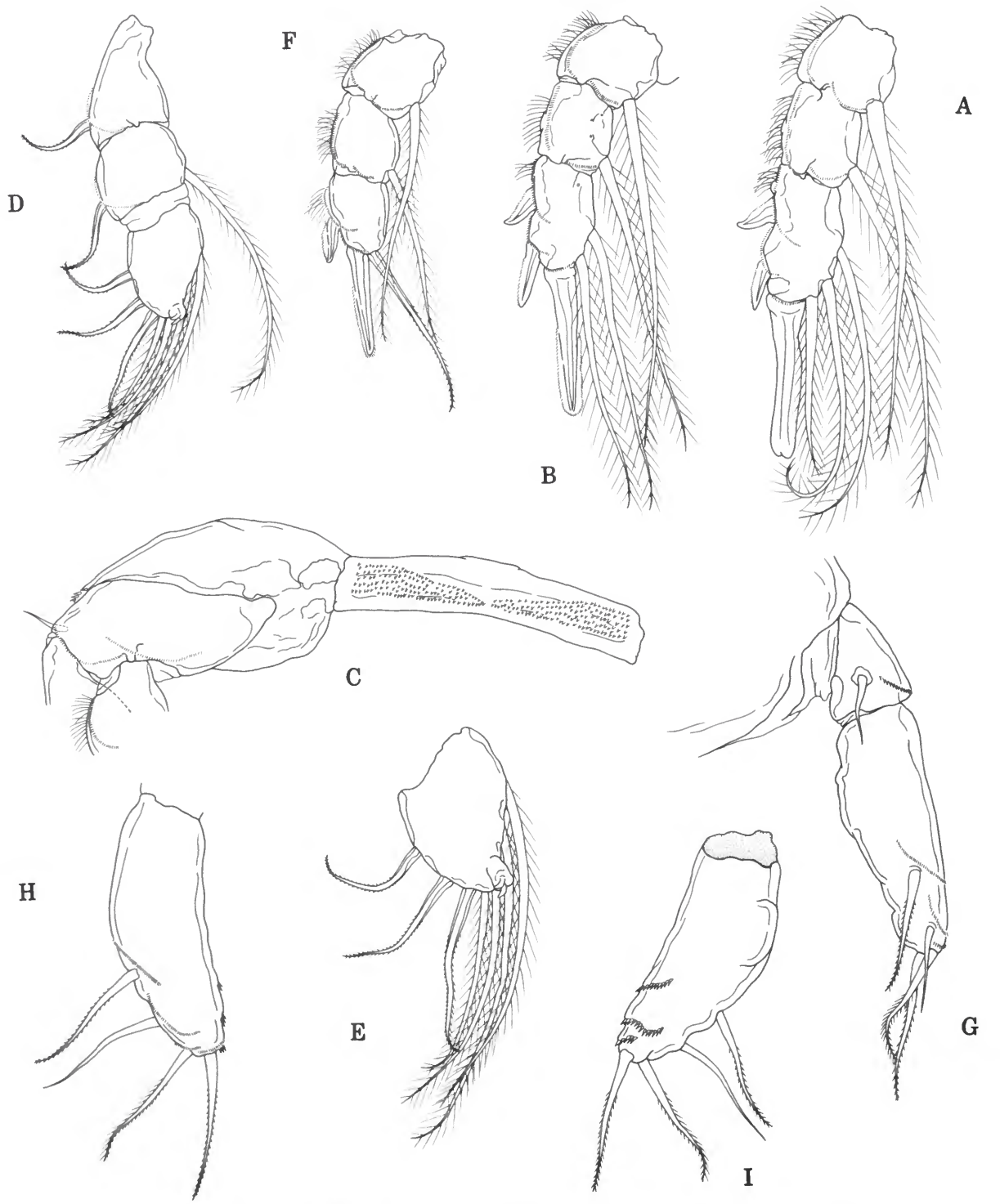

FIGURE 108.—*Cirracanthus monacanthi* (Yamaguti), female: A, leg 2 endopod, ventral; B, leg 3 endopod, ventral; C, leg 4, interpodal plate and basipod, ventral; D, leg 4 exopod, ventral; E, leg 4, terminal exopod segment, ventral; F, leg 4 endopod, ventral; G, leg 5, dorsal; H, same, outer; I, same, 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 × 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 × 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 anteromedial 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:

P_1	coxa 0-1	basis 1-1	exopod 1-0; 9 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, I, 4 endopod 0-1; 0-1; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, I, 5 endopod 0-1; 0-1; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, I, 4 endopod 0-1; 0-1; II, 1

Interpodal plates of legs 1–4 (Figures 110G,H, 111A,D) with patches of spinules on posterior margins; that of leg 1 with V-shaped posterior margin indented at midline. Plate of leg 2 with posterior margin deeply indented at midline, thus margin bilobed; plates of legs 3 and 4 reentrant. Basis of leg 2 (Figure 110H) with patch of spinules on inner margin; these spinules absent on basis of leg 3 (Figure 111A) and leg 4 (Figure 111D). Spinules on outer margins of exopod segments of legs 2 and 3 not observed, but present on exopod of leg 4 (Figure 111D). Distolateral corner of terminal segment of exopod of leg 4 with 2 small digitiform processes (Figure 111E). Exopod spines of legs 2–4 (Figures 110H, 111B,D) spinulated on outer margins and each tipped with a flagellum. Endopods of legs 2 and 3 (Figures 110H, 111C) with outer corners of second and third segments bearing truncate protuberances. Outer margins of endopod segments of legs 2–4 (Figures 110H, 111C,D) with rows of minute spinules. Endopod spines of legs 2–4 spinulated on outer margins. Leg 5 (Figure 111F,G) with 2 segments; first segment with semipinnate seta and a ventral row of spinules;

TABLE 1.—Diagnostic characters of the two known species of *Cirracanthus*.

Species	Accessory element on mandible	Small rounded process on distal corner of corpus maxillipedis of female	Exopod of leg 3	Termal endopod spine of legs 2 and 3	Arrangement of spinules on second segment of leg 5
C. monacanthi	pedunculate, pyriform process	present	II, I, 4	stout, blunt	rows
C. spinosus	small, attenuate seta	absent	II, I, 5	attenuate	patches

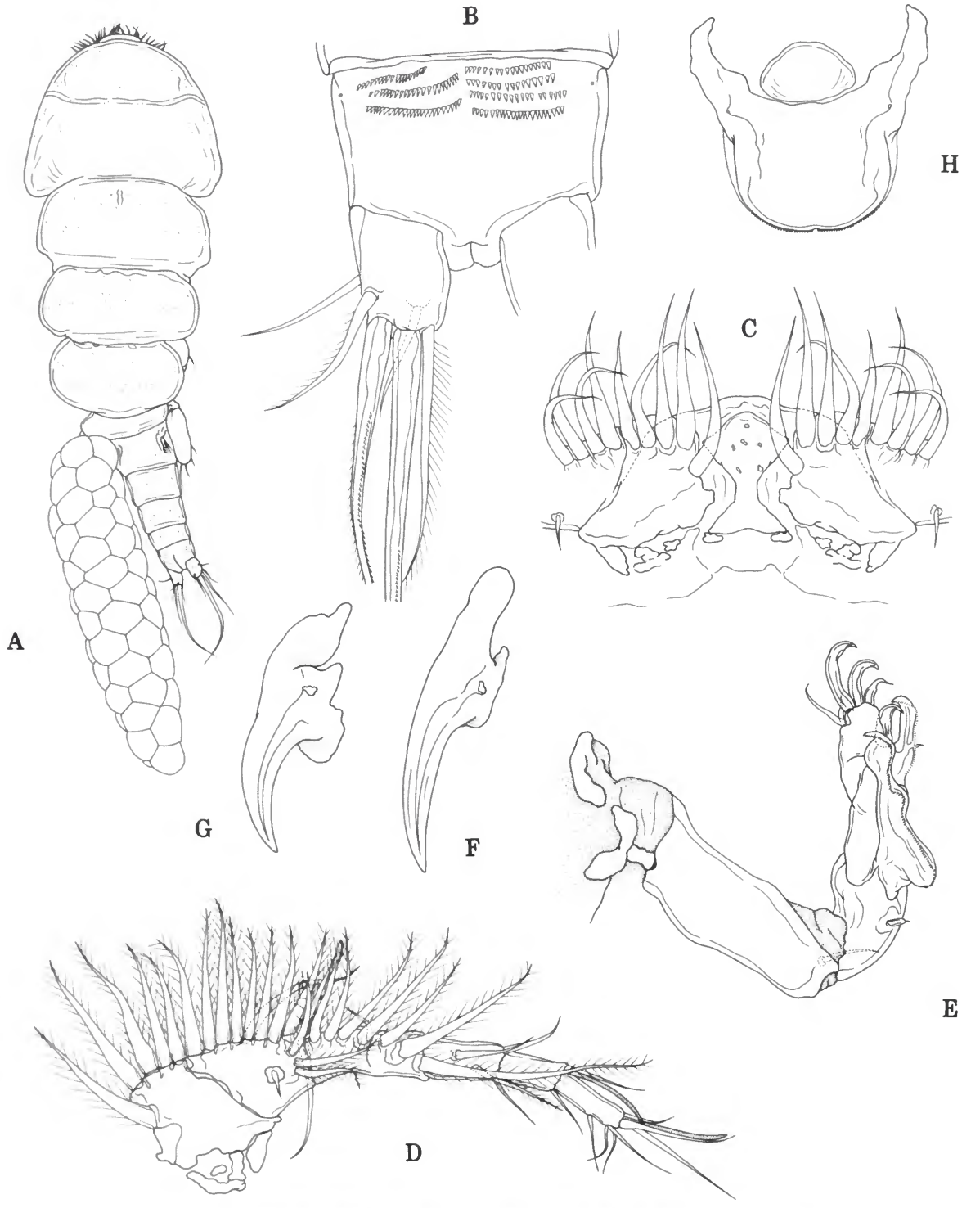

FIGURE 109.—*Cirracanthus spinosus*, new species, female: A, dorsal; B, anal segment and caudal ramus, ventral; C, rostral area, ventral; D, first antenna, ventral; E, second antenna, medial; F, postantennal process, ventral; G, same, ventral; H, labrum, ventral.

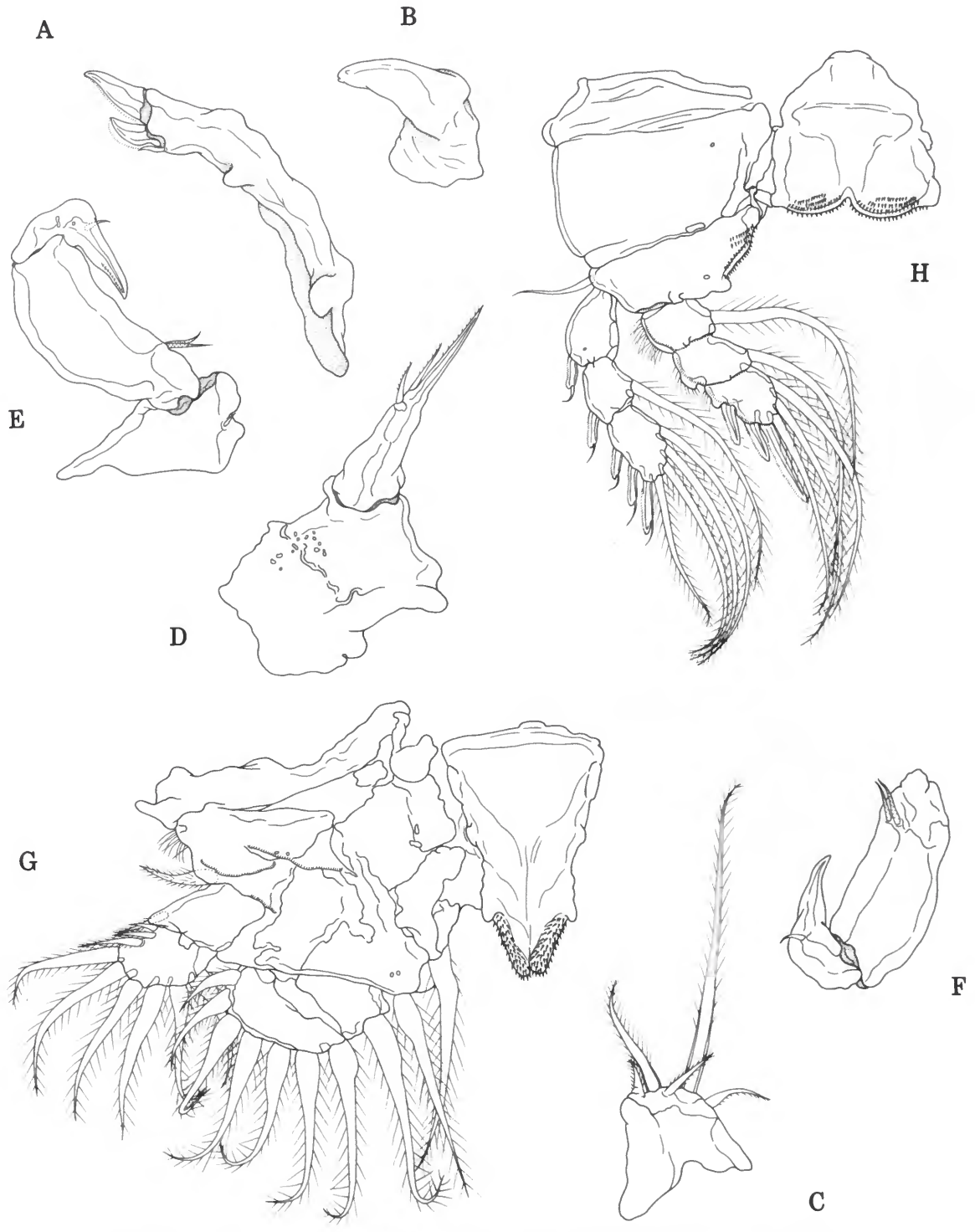

FIGURE 110.—*Cirracanthus spinosus*, new species, female: A, mandible, anteromedial; B, paragnath, medial; C, first maxilla, anterior; D, second maxilla, posteroventral; E, maxilliped, posterior; F, same, anterior; G, leg 1 and interpodal plate, ventral; H, leg 2 and interpodal plate, ventral.

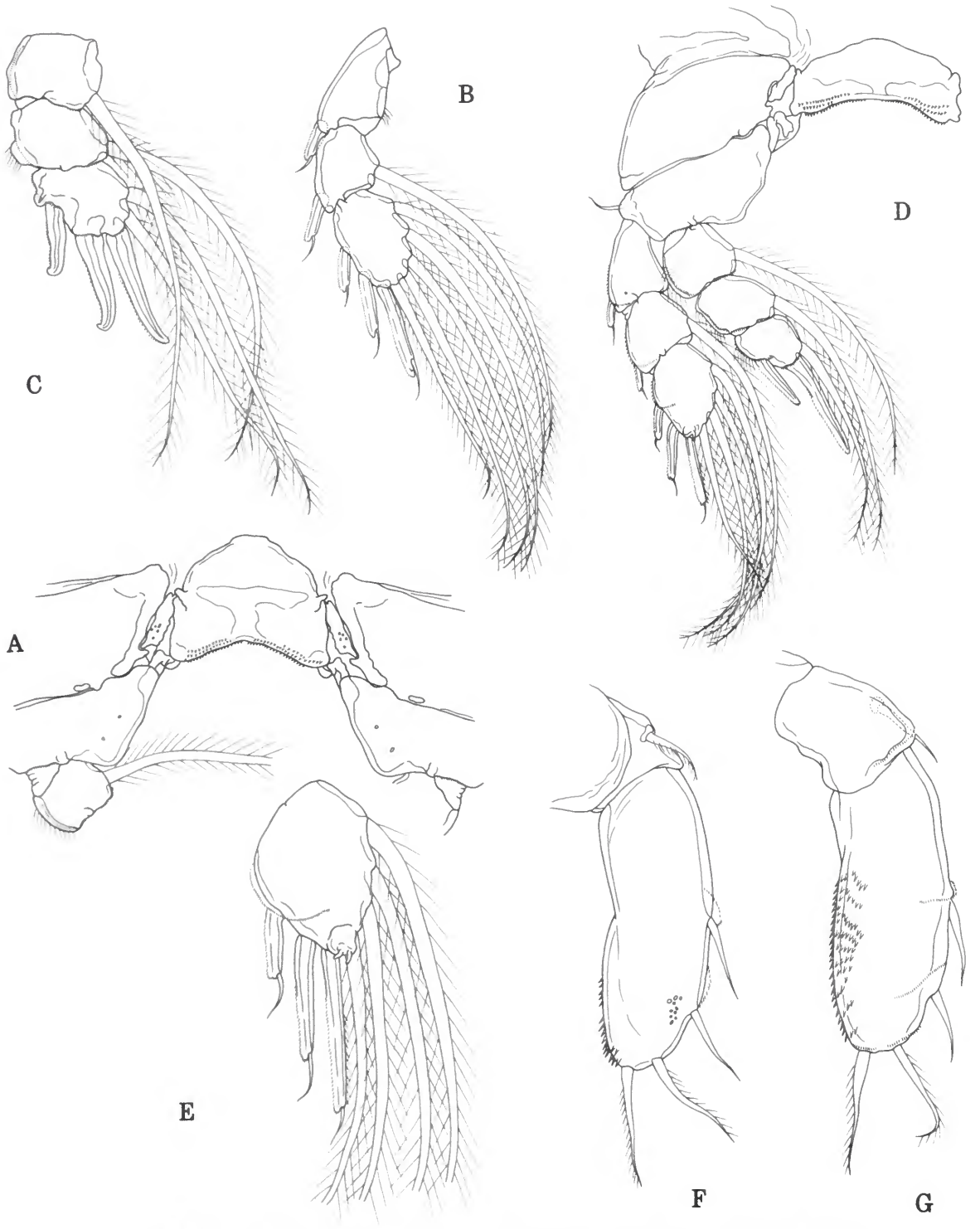

FIGURE 111.—*Cirracanthus spinosus*, new species, female: A, leg 3, interpodal plate and proximal portions of basipods, ventral; B, leg 3 exopod, ventral; C, leg 3 endopod, ventral; D, leg 4 and interpodal plate, ventral; E, leg 4, terminal exopod segment, ventral; F, leg 5, dorsal; G, same, ventral.

second segment, 112 × 42 μm, with ventromedial patch of relatively large spinules, and bearing 2 naked and 2 semipinnate setae (each seta with row of small spinules 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 spinules 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, I, 4. *Cirracanthus spinosus* displays II, I, 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

Clavisodalis Humes, 1970:575.—Kabata, 1979:70.—Humes, 1980:171.—Dojiri and Humes, 1982:382.—Humes and Dojiri, 1984:258.

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 3 claw-like spines. Postantennal process present. Labrum with rounded, spinulated posterior margin. Mandible with two unequal blades. Paragnath 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 trigonarius* (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 spinules 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

Clavisodalis salmacidis Humes, 1980:171.—Dojiri and Humes, 1982:414.

MATERIAL EXAMINED.—5 females from esophagus of *Asthenosoma varium* 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 spinules on the ventromedial surface of the labrum, (2) second maxilla with unilaterally spinulated spines, (3) legs 2–4 each with two rows of spinules on the outer margin of the coxa, and (4) leg 3 with patch of spinules 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

Echinirus Humes and Cressey, 1961:17.—Humes, 1970:583.—Kabata, 1979:70.—Dojiri and Humes, 1982:430.—Humes and Dojiri, 1984:258.

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. Paragnath 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).

Echinosocius Humes and Cressey, 1961

Echinosocius Humes and Cressey, 1961:1.—Humes, 1970:583.—Kabata, 1979:70.—Dojiri and Humes, 1982:416.—Humes and Dojiri, 1984:258.

DIAGNOSIS.—*Female:* Cephalothorax with first pedigerous segment fused with cephalosome. Entire cephalothorax forming attachment disc. Genital segment not greatly swollen with egg sacs dorsolaterally attached. Abdomen 3-segmented. Caudal ramus with 6 setae.

Rostral area weakly developed. First antenna 5-segmented. Second antenna 3-segmented (third and fourth segments fused); terminal segment with 3 claw-like spines. Postantennal process present. Labrum somewhat truncate. Mandible with 2 spinulated blades. Paragnath present. First maxilla with 4 setae and 1 small knob-like process. Second maxilla 2-segmented; terminal segment with 2 spines and 1 seta. Maxilliped a pear-shaped swelling with a slender ridge with three setae; claw absent. Leg 1 with 2-segmented rami. Legs 2–4 with 3-segmented rami. Leg 5 2-segmented; second segment with 4 elements. Leg 6 represented by 3 setae in area of egg sac attachment.

Male: Body similar to that in female. Appendages as in female except maxilliped 4-segmented; inner margin of second segment (corpus) with spines; terminal segment a denticulated claw. Leg 5 with sexually dimorphic setae.

TYPE-SPECIES.—*Echinosocius pectinatus* Humes and Cressey, 1961.

REMARKS.—*Echinosocius* was first described by Humes and Cressey (1961) and included the type-species *E. pectinatus* Humes and Cressey, 1961, and *E. dentatus* Humes and Cressey, 1961. Both species were collected from Nossi-Bé, Madagascar. Since its discovery, three additional species have been described: *E. elatensis* Jacob-Judah, 1975, from the Gulf of Elat; *E. finitimus* Dojiri and Humes, 1982, from New Caledonia; and *E. gulicolus* Dojiri and Humes, 1982, from New Caledonia (see Figure 161C–E). All five known species of this genus have been collected from the echinoid *Diadema setosum* (Leske).

The most diagnostic character of this genus is the nonprehensile maxilliped of the female, with no distinct corpus or claw. It is reduced to a pear-shaped swelling bearing a slender protrusion (ridge) with 3 setae (see Figure 161C,E). For a key to the species of *Echinosocius* see Dojiri and Humes (1982).

Irodes Wilson, 1911

Irodes Wilson, 1911:390.—Pillai, 1963:110.—Ho, 1969:127.—Kabata, 1979:73.—Devi and Shyamasundari, 1980:198.

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 tetradonis* Bassett-Smith, 1890, to *Irodes.* This inclusion was incorrect because this species possesses a prehensile claw on the maxilliped. Since then, *I. yamagutii* Shiino, 1957, and *I. anguillaris* 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. ostracionis, 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 are absence of 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 114G] ..... ***I. gracilis***
   Terminal endopod segment of leg 4 with innermost element (spine) second longest of 4 elements [Figures 118H, 123D, 126A] 2
2. Spine of second segment and outermost spine of third segment of exopod of leg 3 strongly curved (resembling hooks) [Figure 117E] ..... ***I. remipes,*** new species
   Spine of second segment and outermost spine of terminal segment of exopod of leg 3 not strongly curved [Figure 123C] 3
3. Outermost spine of terminal endopod segment of leg 4 minute [Figure 123D] ..... ***I. sauridi***
   Outermost spine of terminal endopod segment of leg 4 conspicuous [Figure 126A–C] 4
4. Leg 2 exopod with second and third (terminal) segments each with a short, wide serrated spine tipped with flagellum [Figure 125L] ..... ***I. upenei***
   Leg 2 exopod with second and third (terminal) segments having spines slender and attenuate ..... ***I. callionymi***

Irodes gracilis (Heller, 1865)

FIGURES 112–115, 161F, 162A,B

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

Irodes gracilis.—Wilson, 1911:390.—Pillai, 1963:110.—Yamaguti, 1963:23.

Anchistrotos gracilis.—Ho, 1969:129.—Kabata, 1979:74.

Taeniacanthus albidus Wilson, 1911:388.—Yamaguti, 1963:20.—Kabata, 1979:78. [New synonymy.]

Taeniacanthus flagellans Wilson, 1913:206.—Wilson, 1922:8.—Yamaguti, 1963:21.—Kabata, 1979:78. [New synonymy.]

Taeniacanthus indicus Pillai, 1963:112.—Kabata, 1979:78. [New synonymy.]

MATERIAL EXAMINED.—1 female (holotype) (USNM 43517) and 2 females (paratypes) (USNM 42261) *Taeniacanthus flagellans* from gills of hammerhead shark *Sphyrna zygaena* Linnaeus collected in Montego Bay, Jamaica, 4 July 1910 by C.B. Wilson. 2 females (type specimens) (USNM 38587) from vent of *Sphyrna tiburo* Linnaeus at Beaufort, North Carolina, summer 1905, by C.B. Wilson. From *Sphyrna 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 *Sphyrna diplana* Springer at Nossi Bé, Madagascar, 21 March 1964. 4 females from *Rhynchobatus djiddensis* (Forsskål) 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) unornamented. 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 row 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 113E) 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	coxa 0-1	basis 1-1	exopod 1-0; 9 endopod 0-1; 7
P_2	coxa 0-1	basis 1-0	exopod I-0; I-1; III, 1, 5 endopod 0-1; 0-2; II, 1, 3
P_3	coxa 0-1	basis 1-0	exopod 1-0; I-1; II, 1, 5 endopod 0-1; 0-2, II, 1, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; I-1; II, 1, 5 endopod 0-1; 0-1; II, int, 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-

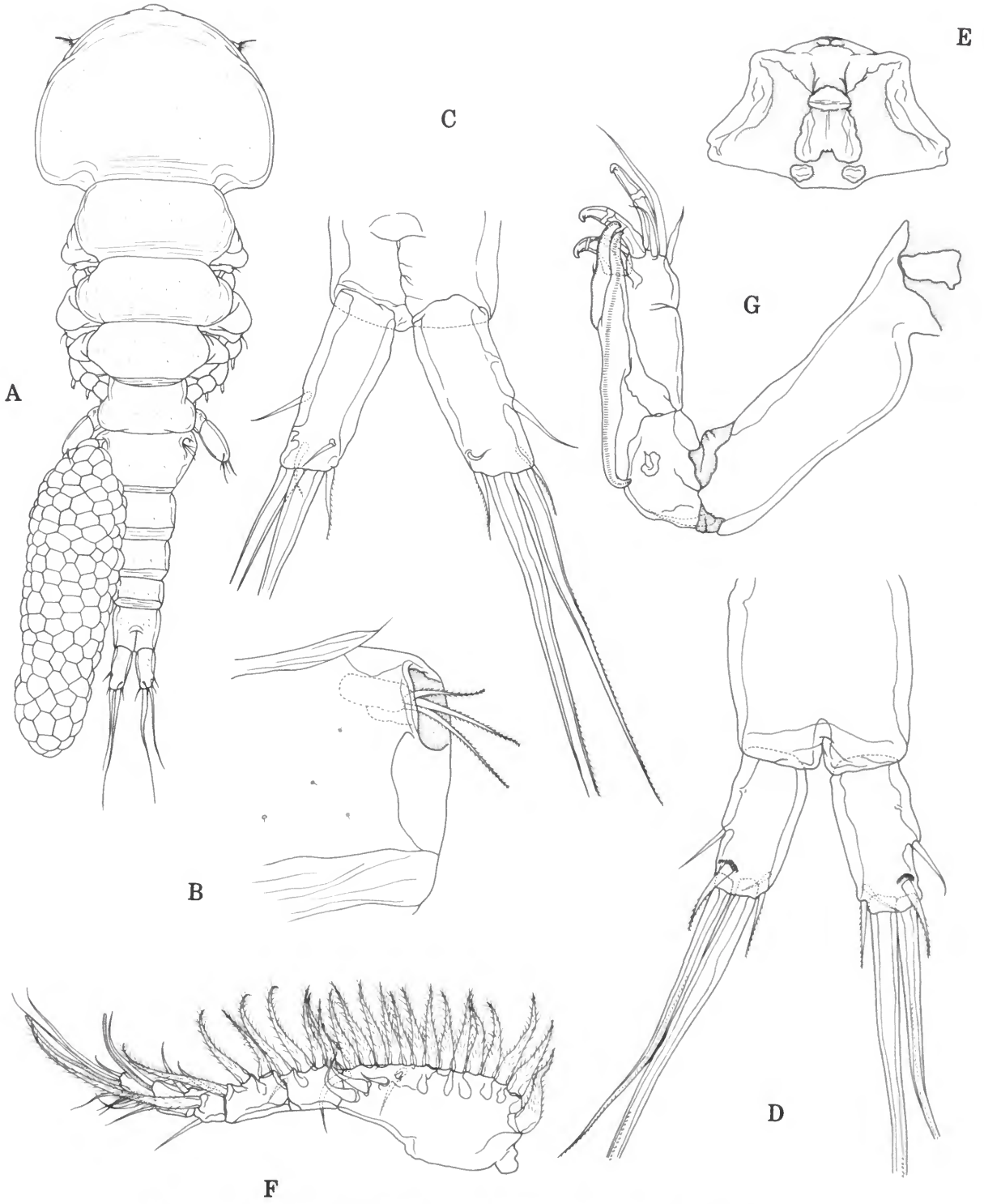

FIGURE 112.—*Irodes gracilis* (Heller), female: A, dorsal; B, genital area, dorsal; C, caudal rami, dorsal; D, same, ventral; E, rostrum, ventral; F, first antenna, ventral; G, second antenna, medial.

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.

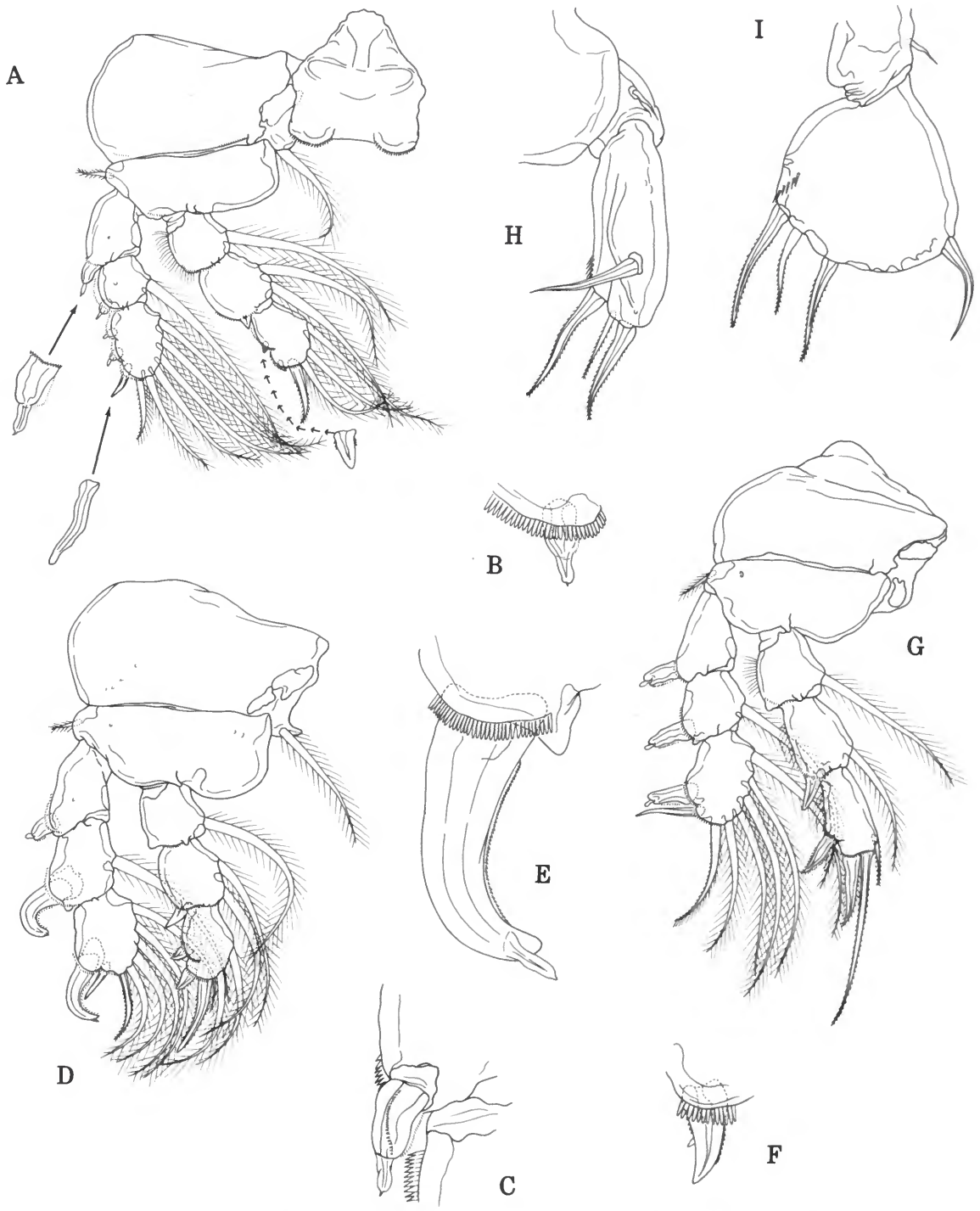

FIGURE 114.—*Irodes gracilis* (Heller), female: A, leg 2 and interpodal plate, ventral; B, leg 2, outer margin of second exopod segment, ventral; C, leg 2, spine of first exopod segment, dorsal; D, leg 3, ventral; E, leg 3, spine of second exopod segment, ventral; F, leg 3, second outer spine of terminal endopod segment, ventral; G, leg 4, ventral; H, leg 5, dorsal; I, same, medial.

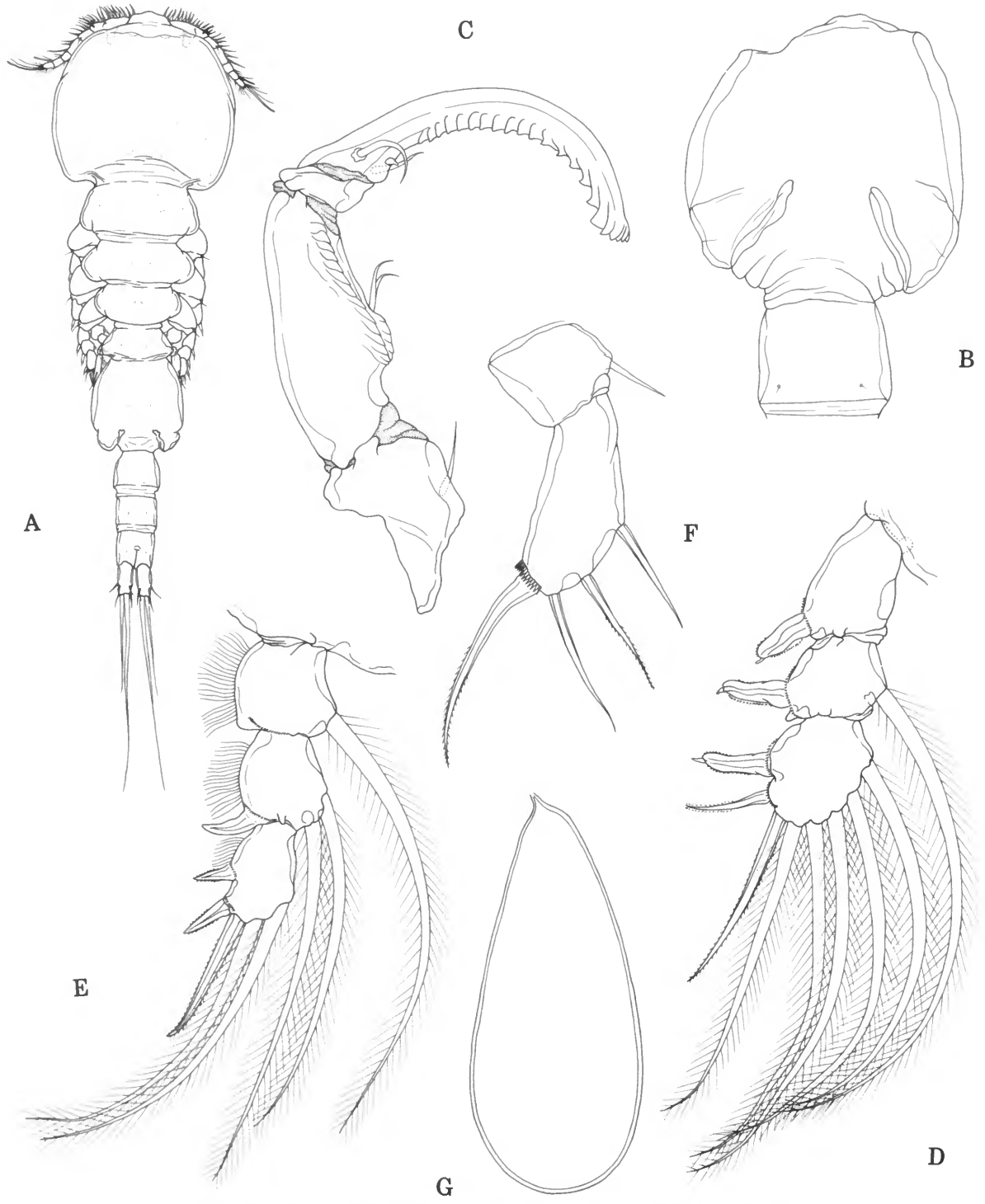

FIGURE 115.—*Irodes gracilis* (Heller), male: A, dorsal; B, genital area, ventral; C, maxilliped, posterior; D, leg 3 exopod, ventral; E, leg 3 endopod, ventral; F, leg 5, dorsomedial; G, spermatophore, ventral.

ermost) spine of terminal segment strongly curved, bilaterally spinulated (outer row of spinules on dorsal surface not seen in ventral view), and each with subterminal flagellum (see Figures 114D,E, 162A,B). Endopod of leg 3 with second outer spine of terminal segment bearing row of spinules on outer and inner margins in addition to markedly larger tooth on outer margin (Figure 114F). Leg 4 exopod (Figure 114G) similar to that of leg 3 except second and third spines not strongly curved. Endopod of leg 4 with distolateral spiniform process of second segment much larger than those on legs 2 and 3; terminal segment with 2 stout bilaterally spinulated spines, 1 long spinulated intermediate spine, and 1 small bristled seta. Leg 5 (Figure 114H,I) with 2 segments; first segment small, unornamented and possessing 1 naked dorsolateral seta; second segment inflated, concave on surface nearest genital complex, 133 × 117 μm (l × w), with 1 row of spinules on inner margin, and bearing 2 bristled spines, 1 bristled seta, and 1 naked spine. Leg 6 (Figure 112B) represented by 3 bristled setae in area of egg sac attachment.

Male: Body as in Figure 115A. Total length 1.23 mm (1.09–1.35 mm) and greatest width 0.40 mm (0.36–0.46 mm) based on 7 specimens. Cephalothorax slightly wider than long, 350 × 368 μm, and comprising more than 25% of total length. Thoracic segments bearing legs 2, 3, and 4 decreasing in width posteriorly. Genital complex (Figure 115B) longer than wide, 189 × 179 μm. Abdomen 3-segmented; segments from anterior to posterior 87 × 90 μm, 69 × 81 μm, and 74 × 71 μm (l × w). Caudal ramus similar to that in female except smaller, 24 × 13 μm (l × w).

Maxilliped (Figure 115C) 4-segmented; first segment with 1 slender naked seta; second segment (corpus) carrying corrugated pad (overlapping plates) and 2 naked setae; third segment small and unornamented; terminal segment a curved claw bearing 1 posterior seta, 1 anterior seta, 1 hyaline process on inner margin, and numerous large plate-like teeth along concave margin. Leg 3 exopod (Figure 115D) with second and third spines not hooked as in female (compare with Figure 114D). Second segment of endopod of leg 3 (Figure 115E) with spiniform process much more curved than that of female; terminal segment with 2 pinnate setae relatively longer than in female. Leg 5 (Figure 115F) with 2 segments; first segment with relatively longer dorsolateral seta; second segment 56 × 24 μm (l × w) and not inflated as in female. All other appendages as in female. Spermatophore as in Figure 115G.

REMARKS.—From our examination of the literature and the type specimens of *Taeniacanthus albidus* Wilson, 1911, and *T. flagellans* Wilson, 1913, these two species and *T. indicus* Pillai, 1963, are synonymous. Prior to the descriptions of these three species, Heller (1865) described a species of taeniacanthid from *Zygaena malleus* Valenciennes (= *Sphyrna lewini*) from Java. This species was named *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^2." 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 × 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

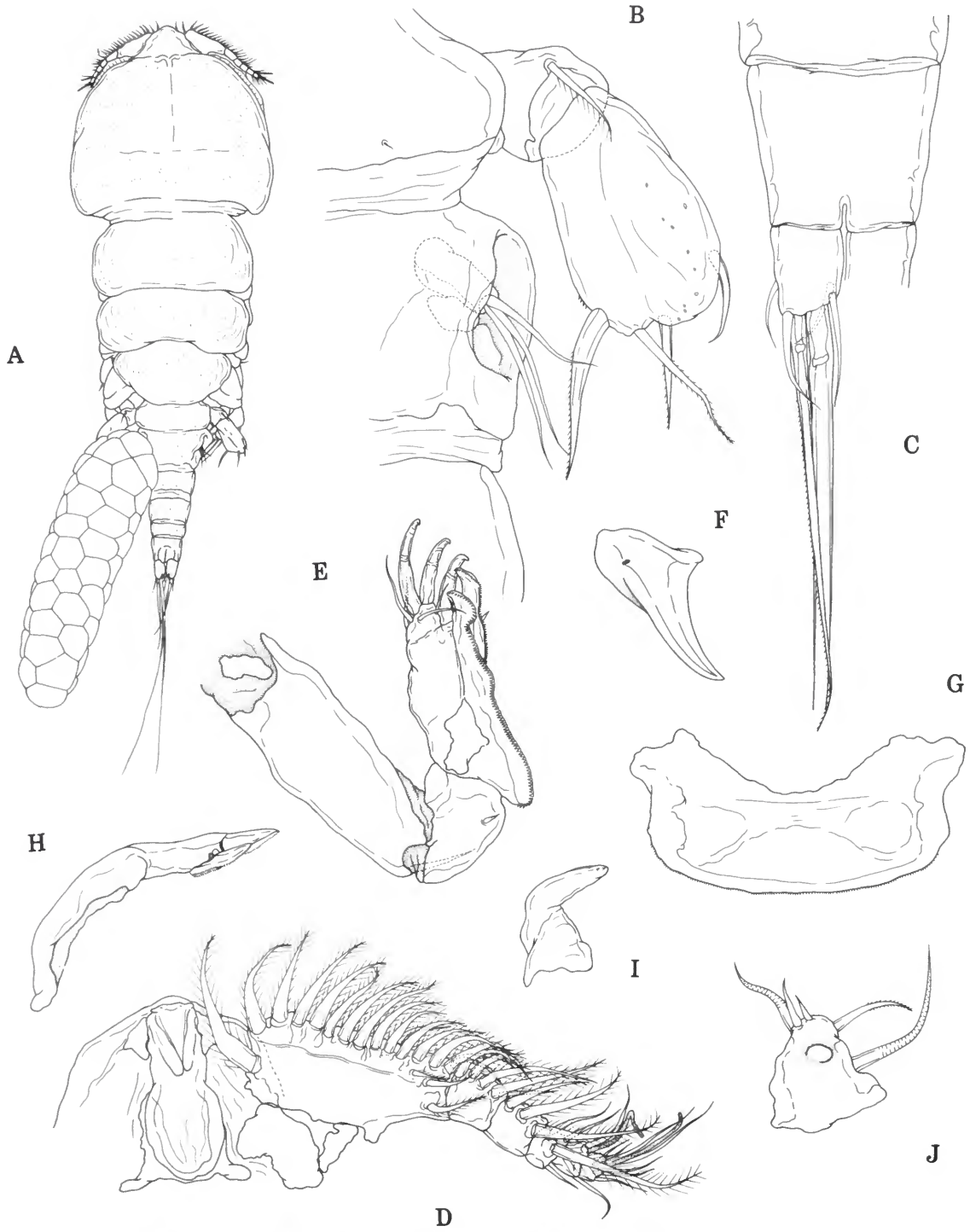

FIGURE 116.—*Irodes remipes*, new species, female: A, dorsal; B, leg 5 and genital area, dorsal; C, anal segment and caudal ramus, ventral; D, rostral area and first antenna, ventral; E, second antenna, medial; F, postantennal process, ventral; G, labrum, ventral; H, mandible, anteromedial; I, paragnath, dorsomedial; J, first maxilla, anterior.

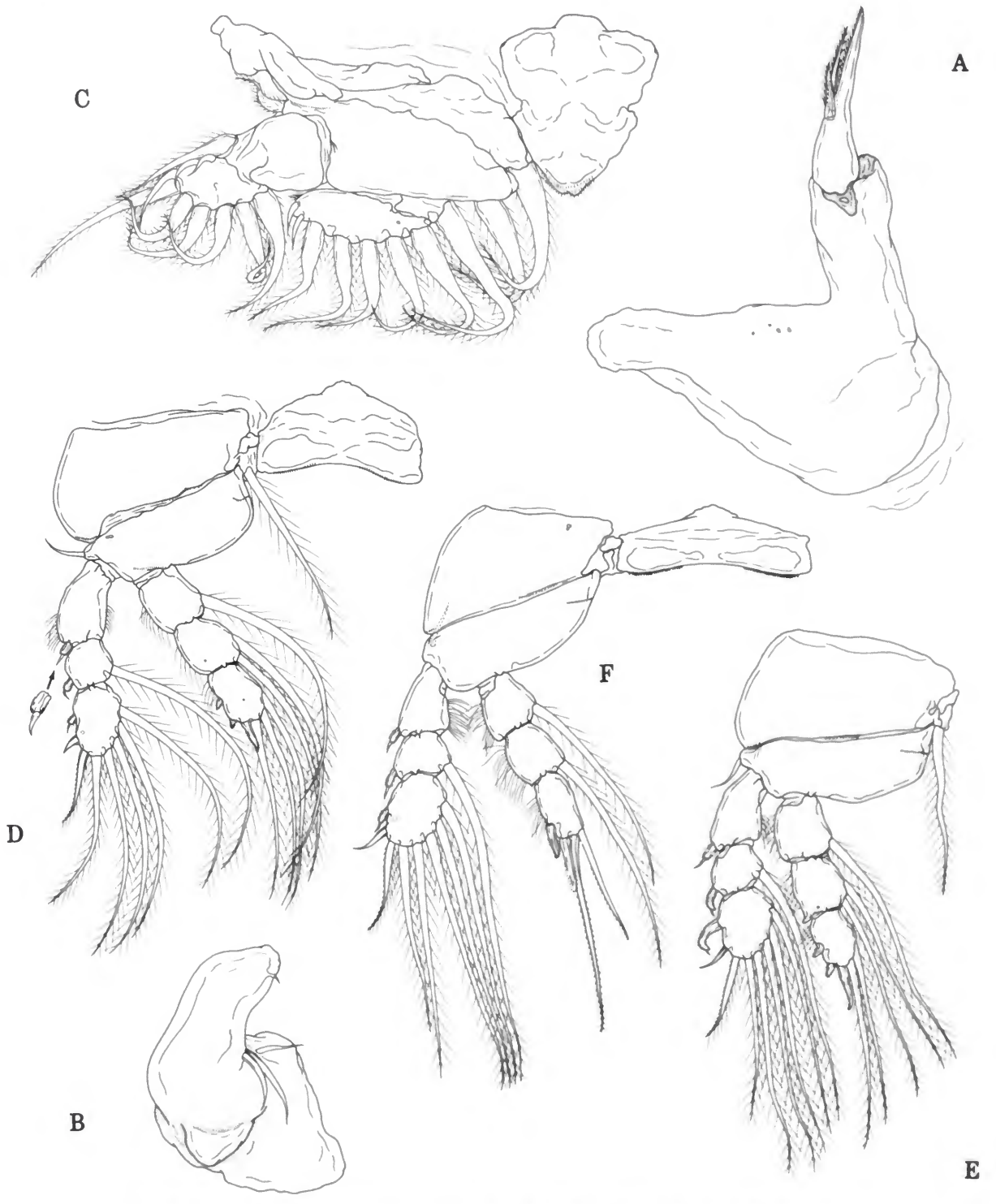

FIGURE 117.—*Irodes remipes*, new species, female: A, second maxilla, posteroventral; B, maxilliped, ventral; C, leg 1 and interpodal plate, ventral; D, leg 2 and interpodal plate, ventral; F, leg 3, ventral; F, leg 4 and interpodal plate, ventral.

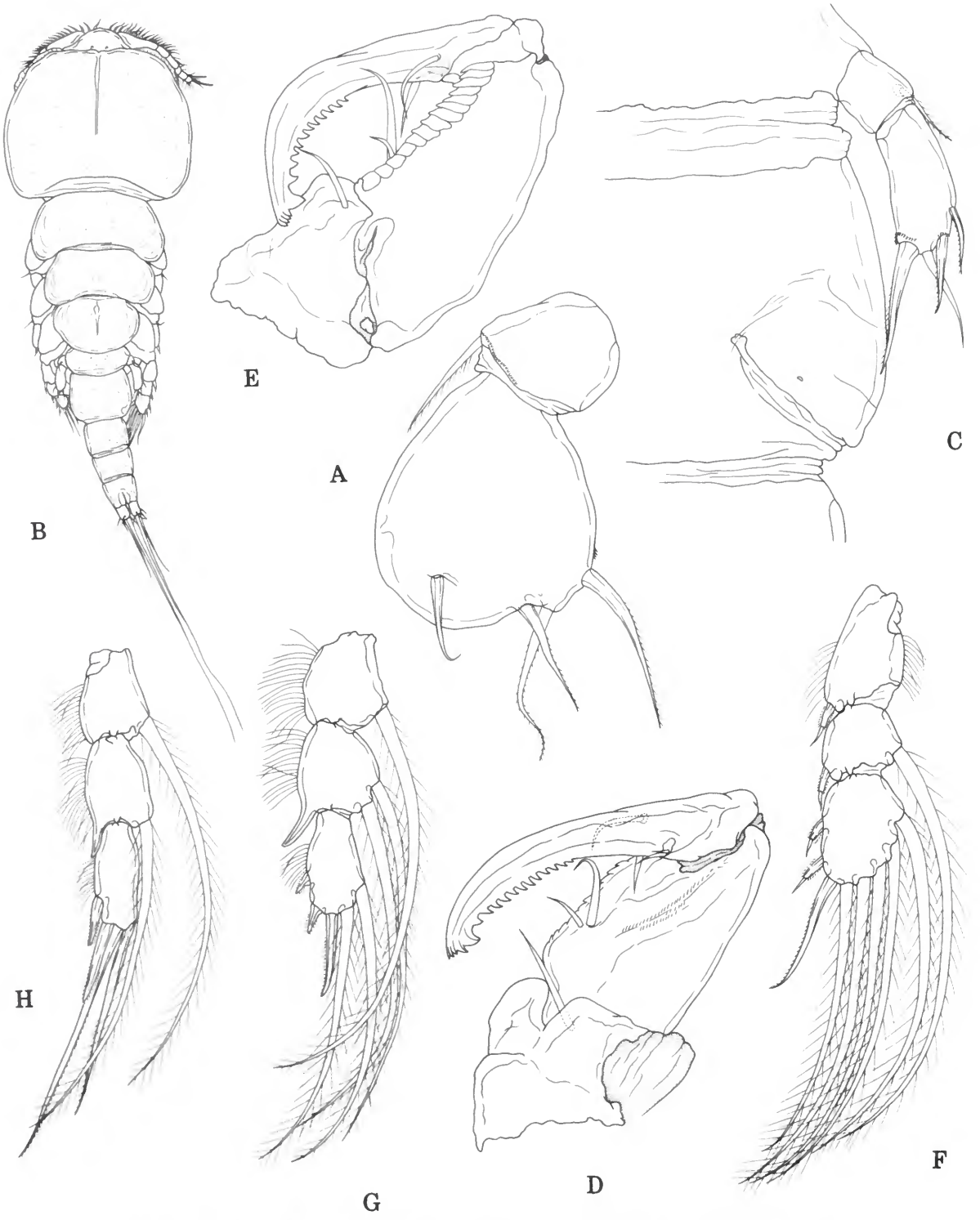

FIGURE 118.—*Irodes remipes*, new species. Female: A, leg 5, ventral. Male: B, dorsal; C, leg 5 and genital area, ventral; D, maxilliped, anterolateral; E, same, posteromedial; F, leg 3 exopod, ventral; G, leg 3 endopod, ventral; H, leg 4 endopod, ventral.

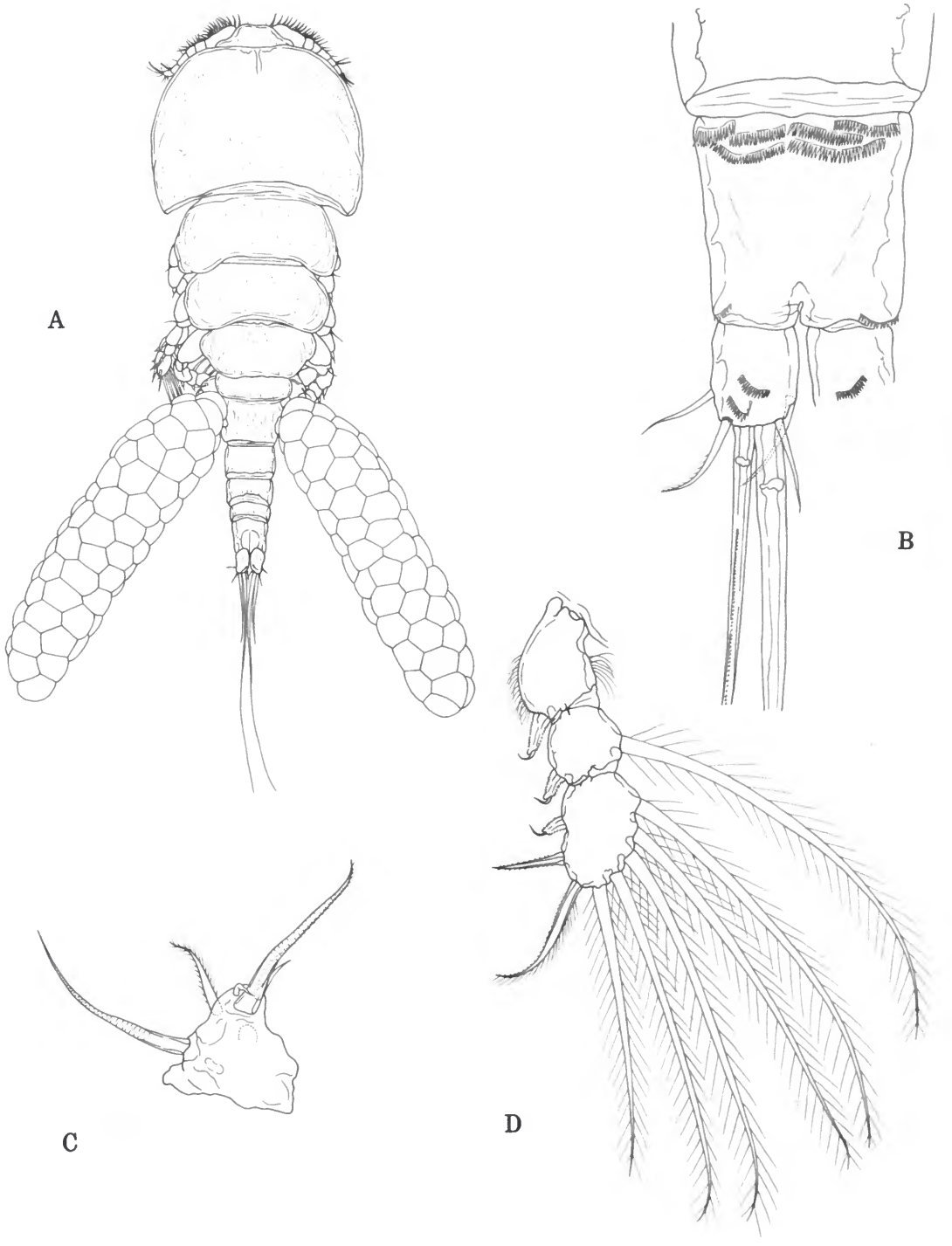

FIGURE 119.—*Irodes remipes*, new species, female variant: A, dorsal; B, anal segment and caudal ramus, ventral; C, first maxilla, posterior; D, leg 2 exopod, ventral.

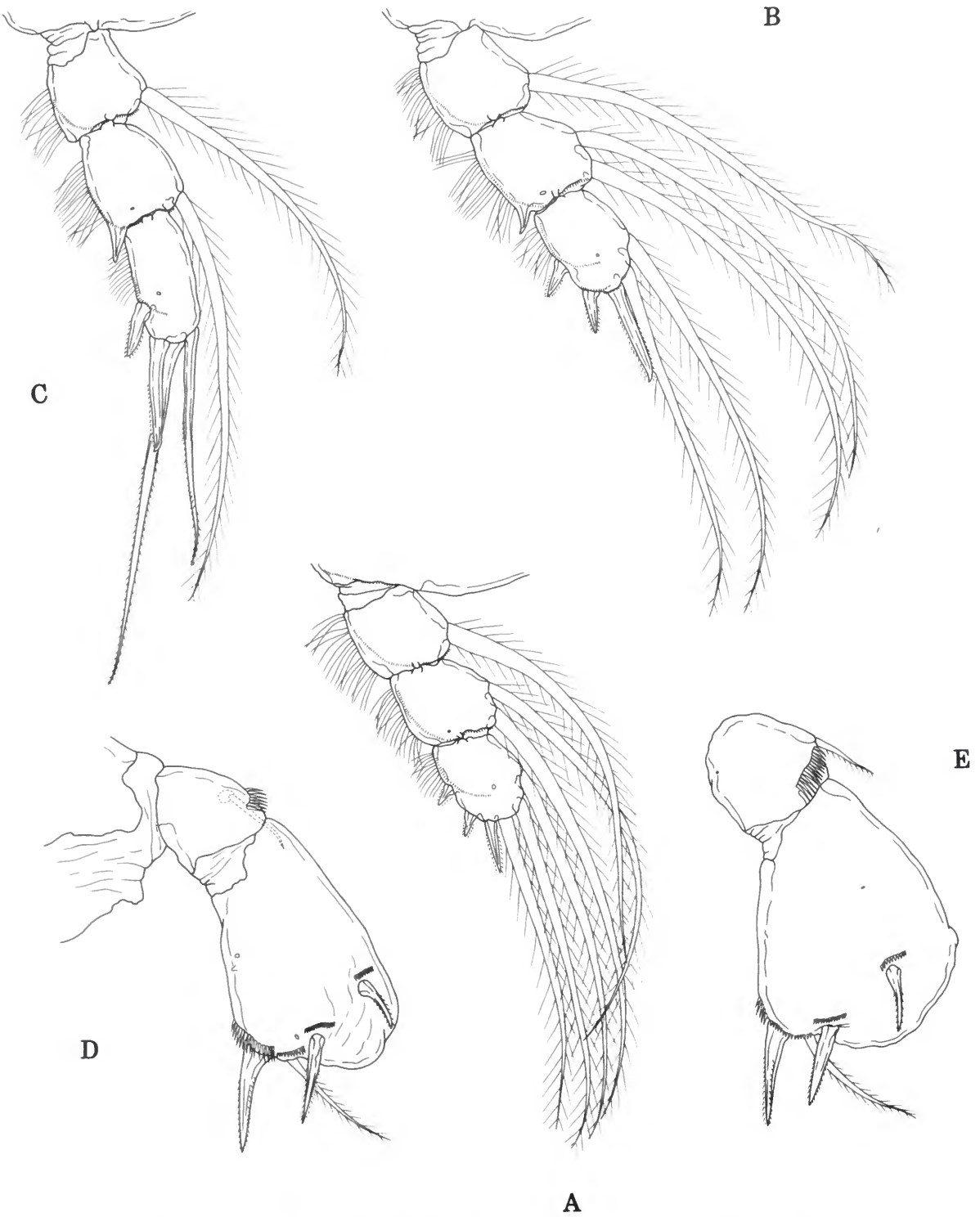

FIGURE 120.—*Irodes remipes*, new species, female variant: A, leg 2 endopod, ventral; B, leg 3 endopod, ventral; C, leg 4 endopod, ventral; D, leg 5, ventral; E, same, ventrolateral.

wider than long, 81 × 124 μm. Abdomen 4-segmented; segments from anterior to posterior 51 × 76 μm, 39 × 64 μm, 21 × 53 μm, and 39 × 51 μm (l × 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 × 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 tine.

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:

P_1	coxa 0-1	basis 1-1	exopod 1-0; 9 endopod 0-1; 7
P_2	coxa 0-1	basis 1-0	exopod 1-0; 1-1; II, I, 5 endopod 0-1; 0-2; II, I, 3
P_3	coxa 0-1	basis 1-0	exopod 1-0; 1-1; II, I, 5 endopod 0-1; 0-2; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, I, 5 endopod 0-1; 0-1; II, int., 1

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 × 60 μm (l × 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 116B) represented by 3 naked setae equal in length at area of egg sac attachment.

Male: Body as in Figure 118B. Total length 799 μm and greatest width 299 μm based on 1 specimen. Cephalothorax wider than long, 258 × 299 μm, and comprising approximately 32% of total body length. Genital complex (Figure 118C) wider than long, 83 × 99 μm. Abdomen 3-segmented; segments from anterior to posterior 51 × 69 μm, 44 × 62 μm, and 41 × 53 μm (l × w). Caudal ramus similar to that of female except smaller 25 × 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 spinules; 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 × 17 μm (l × 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 × 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 × 129 μm. Abdomen 4-segmented; segments from anterior to posterior 64 × 92 μm, 53 × 81 μm, 32 × 71 μm, and 62 × 64 μm (l × w); anal segment (Figure 119B) with 3 rows of spinules on each side of anteroventral surface, and 1 row of spinules on each posteroventral margin near insertion of caudal ramus. Caudal ramus (Figure 119B) longer than wide, 43 × 27 μm, bearing 3 rows of spinules (1 row of small spinules 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 spinules; spinules 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 seta) 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 sauridi Pillai, 1963:126.—Avdeev, 1977:132.—Kabata, 1979:74.
Anchistrotos upenei Devi and Shyamasundari, 1980:204. [New synonymy.]

MATERIAL EXAMINED.—7 ovigerous and 3 nonovigerous females from *Upeneus vittatus* (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 spinules in anterior portion arranged as in Figure 121D and a row of spinules 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 posteroventral margin with row of spinules. Mandible (Figure 121I) with 2 extremely unequal blades, each spinulated along 1 margin. Paragnath (Figure 121J) with patch of spinules 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 122A) 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 122B) 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:

P_1	coxa 0-1	basis 1-1	exopod 1-0; 9 endopod 0-1; 7
P_2	coxa 0-1	basis 1-0	exopod 1-0; I-1; II, I, 5 endopod 0-1; 0-2; II, I, 3
P_3	coxa 0-1	basis 1-0	exopod 1-0; I-1; II, I, 5 endopod 0-1; 0-2; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; I-1; II, I, 5 endopod 0-1; 0-1; IV (or II, int., I)

Interpodal plate of leg 1 (Figure 123A) broad anteriorly but tapered posteriorly; 2 ovoid bumps bearing spinules on posterior margin. Interpodal plates of legs 2–4 with spinules on posterior margin (see Figure 123B). Leg 1 endopod (Figure 122E) with patch of spinules near outer margin of last segment. Leg 2 (Figure 123B) basis with ventral row of spinules 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 spinules 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 spinules; second segment 67 × 53 μm (l × w), with 2 subterminal setae (1 inner, 1 outer) and 2 terminal setae; setae all about equal in length; segment and setae armed as in Figures. Leg 6 represented by 3 setae on genital complex (Figure 121C).

Male: Unknown.

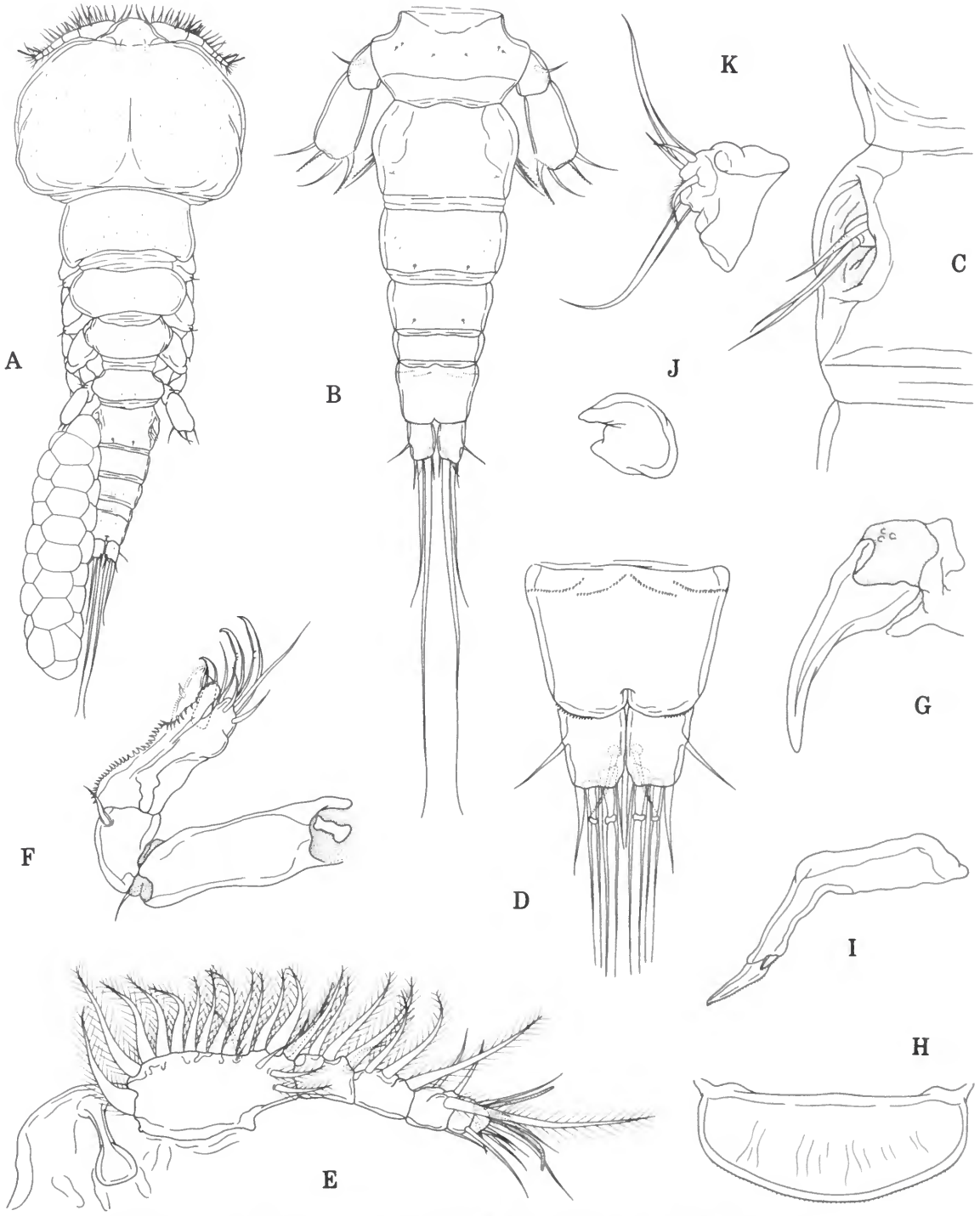

FIGURE 121.—*Irodes sauridi* (Pillai), female: A, dorsal; B, urosome, ventral; C, genital area, dorsal; D, anal segment and caudal rami, ventral; E, rostral area and first antenna, ventral; F, second antenna, medial; G, postantennal process, ventral; H, labrum, ventral; I, mandible, anteromedial; J, paragnath, dorsal; K, first maxilla, anterior.

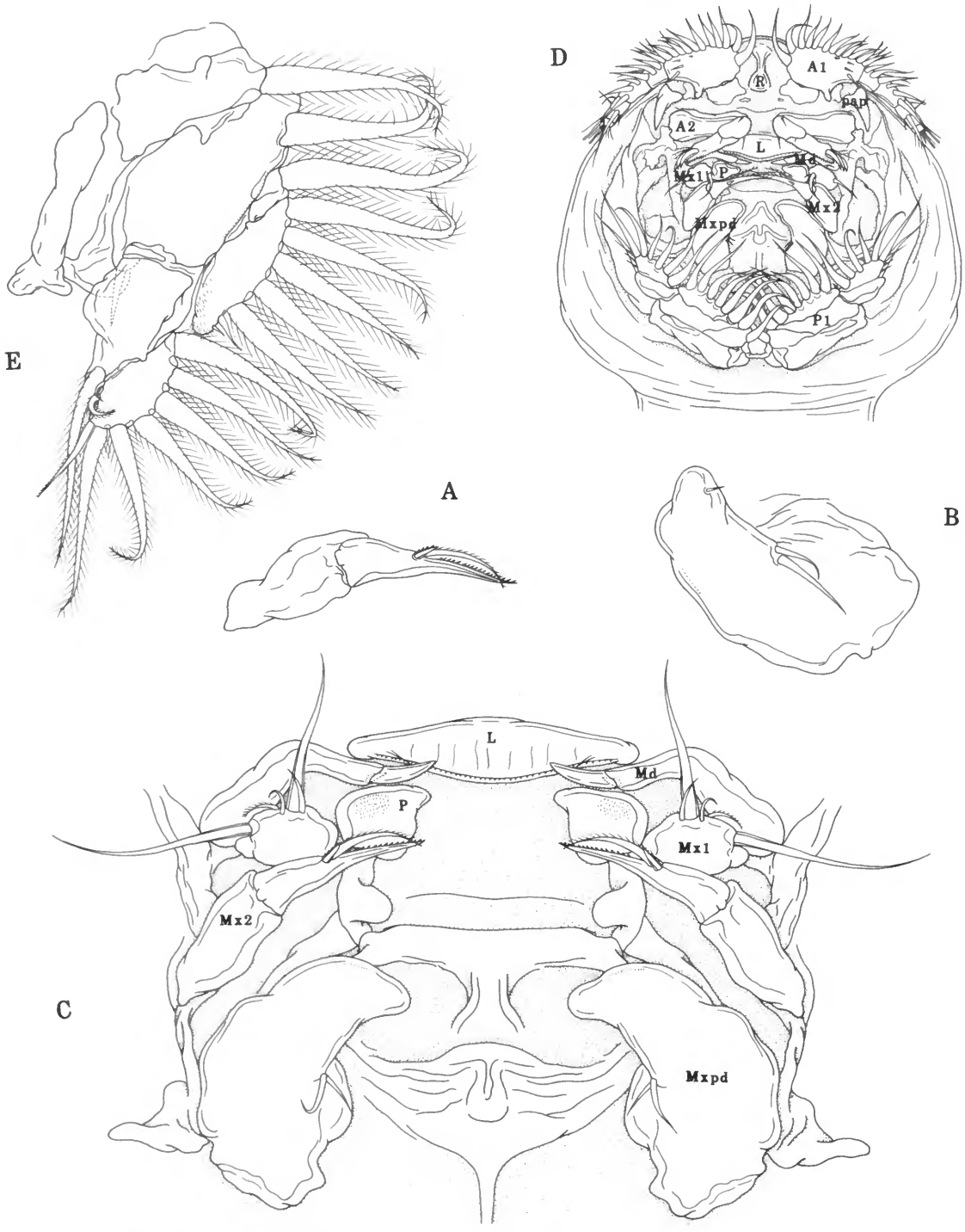

FIGURE 122.—*Irodes sauridi* (Pillai), female: A, second maxilla, posteroventral; B, maxilliped, ventromedial; C, oral area, ventral; D, cephalothorax, ventral; E, leg 1, ventral. (R = rostral area, A1 = first antenna, A2 = second antenna, pap = postantennal process, L = labrum, Md = mandible, P = paragnath, Mx1 = first maxilla, Mx2 = second maxilla, Mxpd = maxilliped, P1 = leg 1.)

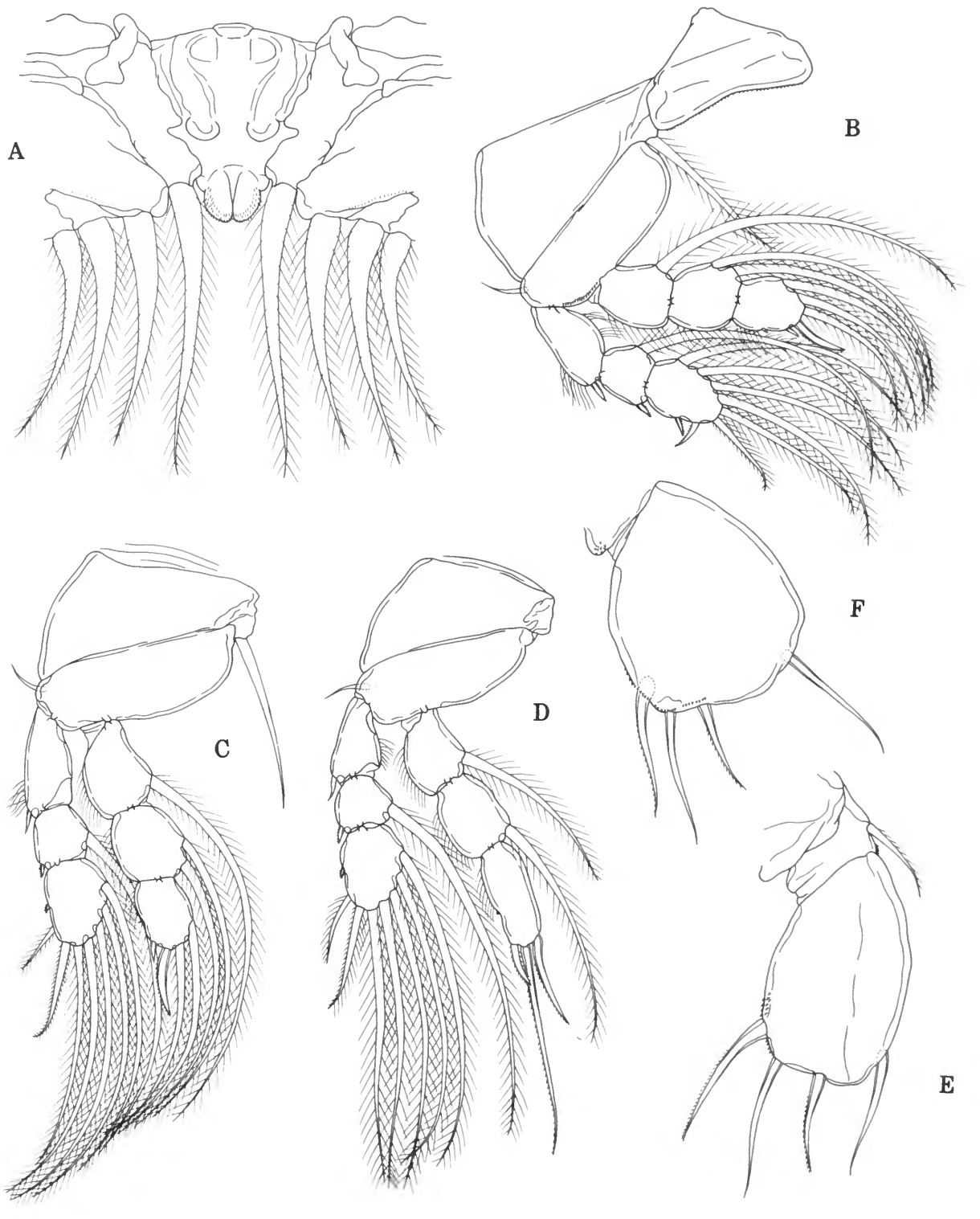

FIGURE 123.—*Irodes sauridi* (Pillai), female: A, leg 1, interpodal plate, ventral; B, leg 2 and interpodal plate, ventral; C, leg 3, ventral; D, leg 4, ventral; E, leg 5, dorsal; F, same, ventral.

TABLE 2.—Several characteristics of taeniacanthid species reported from species of *Upeneus*, *Saurida*, and *Parupeneus*.

Species (original binomen)	MXPD claw (female)	Total Length (in mm)	Terminal segment			Host(s) and locality
			Exopod of leg 2	Exopod of leg 4	Endopod of leg 4	
Anchistrotos sauridi Pillai, 1963	absent	1.6	II, I, 5	III, I, 5	IV (outer spine minute)	*Upeneus vittatus* and *Saurida tumbil* (India)
Anchistrotos upenei Devi and Shyamasundari, 1980	absent	0.7	III, I, 5	II, I, 5	IV (outer spine minute)	*Upeneus vittatus* (India)
Taeniacanthus upenei Yamaguti, 1954	absent	0.65–0.74	II, I, 5	II, I, 5	IV (outer spine conspicuous)	*Upeneus* sp. (Macassar, Celebes)
Anchistrotos parupeneus Devi and Shyamasundari, 1980	absent	0.99	II, I, 5	II, I, 5	IV (outer spine conspicuous)	*Parupeneus indicus* (India)
Our specimens	absent	0.82 (0.78–0.85)	II, I, 5	II, I, 5	IV (outer spine minute)	*Upeneus vittatus* (India)
Taeniacanthus sauridae Yamaguti and Yamasu, 1959	large, bifid at tip	1.8–1.9	II, I, 5	II, I, 5	II, 1	*Saurida argyrophanes* (Inland Sea, Japan)

REMARKS.—*Irodes sauridi* (Pillai, 1963) (formerly known as *Anchistrotos sauridi*) and *A. upenei* Devi and Shyamasundari, 1980, were both collected from *Upeneus vittatus* (Forsskål) 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, 1, 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, 1, 5. Our material exhibits the armature formulae of II, I, 5 and II, 1, 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

Taeniacanthus upenei Yamaguti, 1954:377; 1963:21.—Kabata, 1979:78.
Anchistrotos parupenei 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 barberinus* (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 barleenius*, 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.

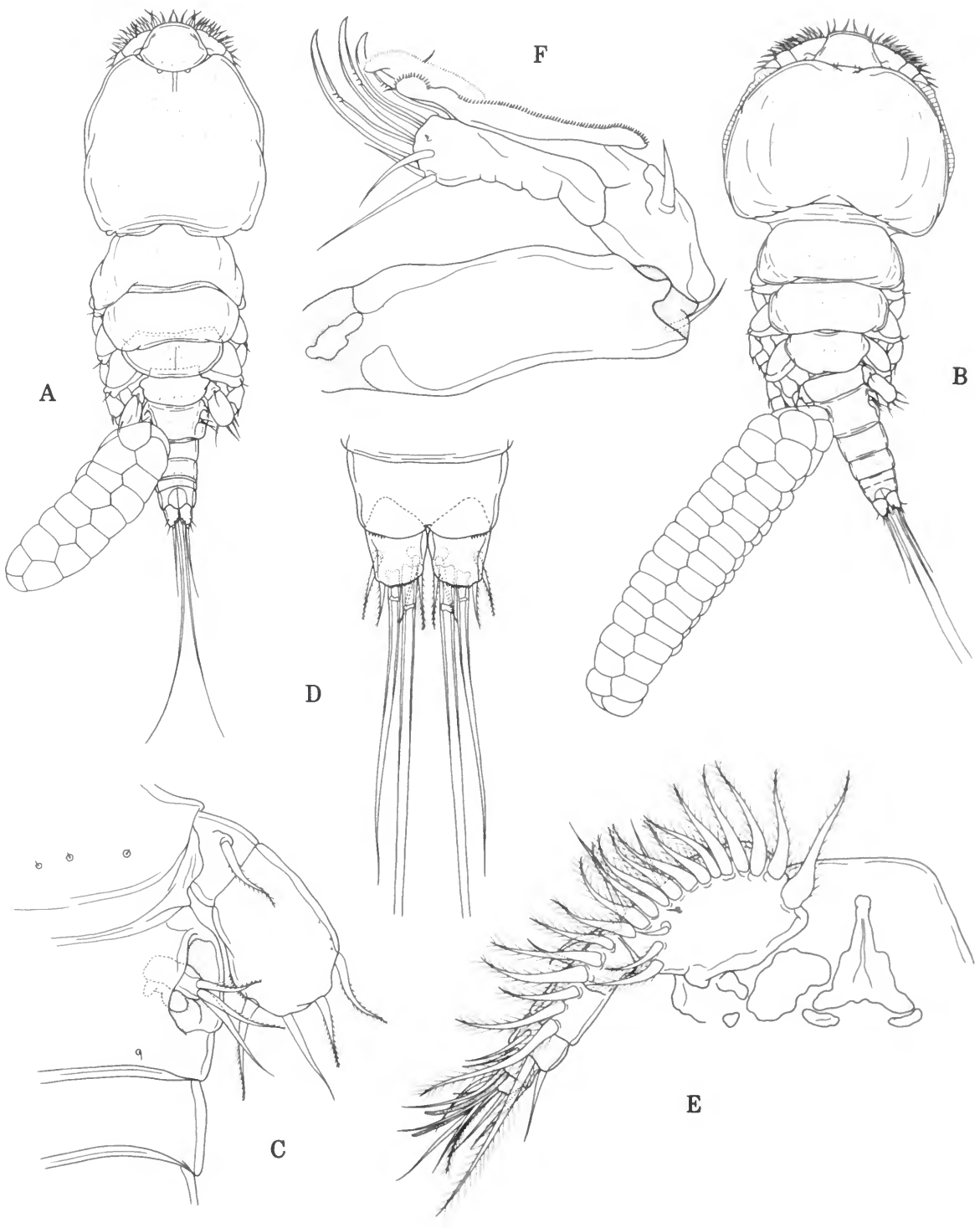

FIGURE 124.—*Irodes upenei* (Yamaguti), female: A, dorsal; B, dorsal; C, leg 5 and genital area, dorsal; D, anal segment and caudal rami, ventral; E, rostral area and first antenna, ventral; F, second antenna, medial.

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.)

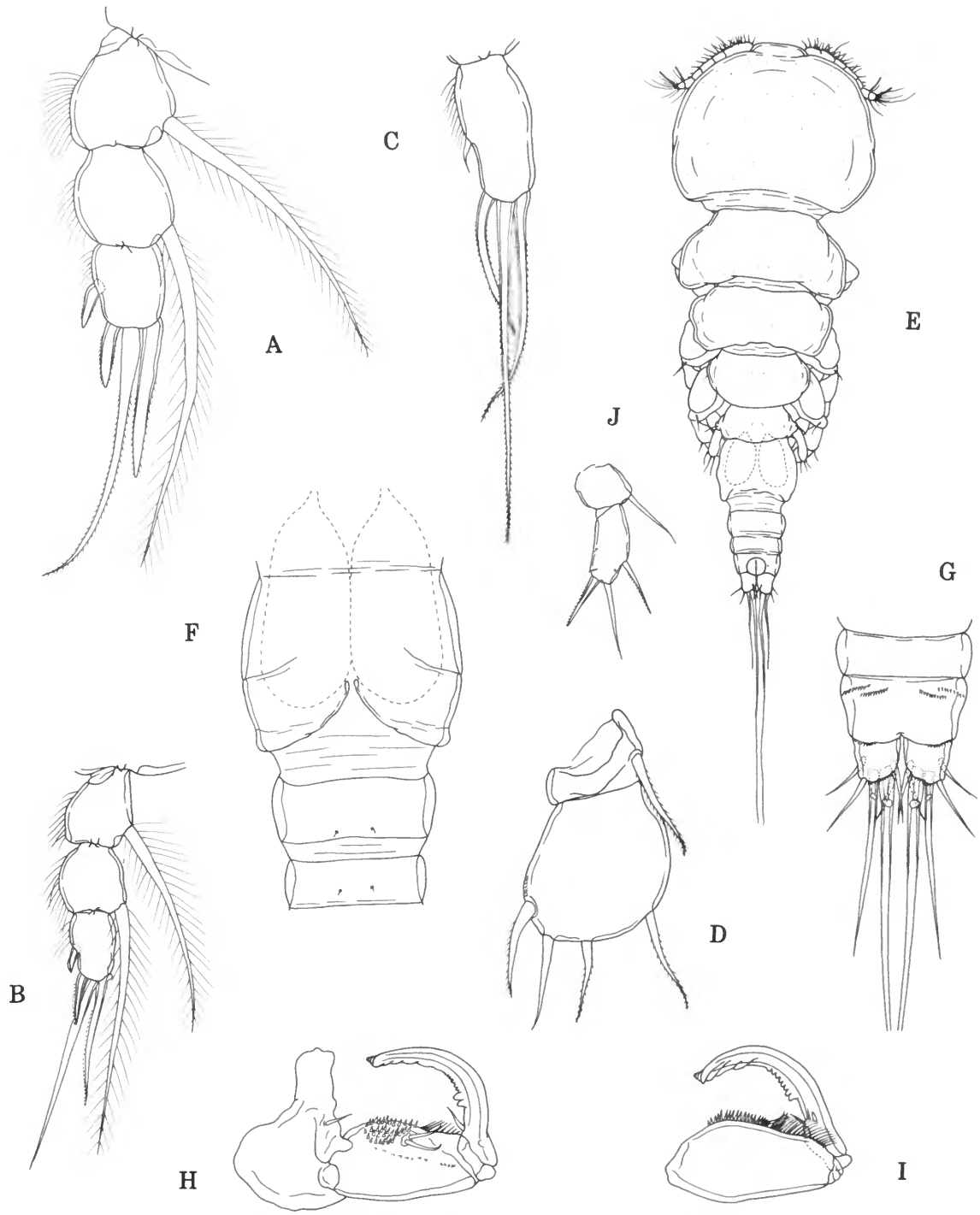

FIGURE 126.—*Irodes upenei* (Yamaguti). Female: A, leg 4 endopod, ventral; B, same, ventral; C, leg 4, terminal endopod segment, ventral; D, leg 5, dorsal. Male: E, dorsal; F, genital area and portion of abdomen, ventral; G, posterior portion of urosome, ventral; H, maxilliped, posteromedial; I, same, 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, 3, 4, 2 + 1 aesthete, 7 + 1 aesthete. Second antenna (Figure 124F) 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 subapical 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:

P_1	coxa 0-1	basis 1-1	exopod 1-0; 9 endopod 0-1; 7
P_2	coxa 0-1	basis 1-0	exopod 1-0; I-1; II, I, 5 endopod 0-1; 0-2; II, I, 3
P_3	coxa 0-1	basis 1-0	exopod 1-0; I-1; II, I, 5 endopod 0-1; 0-2; II, I, 2
P_4	coxa 0-1	basis 1-0	exopod 1-0; I-1; II, I, 5 endopod 0-1; 0-2, IV (or II, int., I)

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*.

Metataeniacanthus Pillai, 1963

Metataeniacanthus Pillai, 1963:122.—Cressey and Cressey, 1979:2.—Kabata, 1979:68.

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.—*Metataeniacanthus synodi* Pillai, 1963.

REMARKS.—There are 10 species of *Metataeniacanthus* 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(e) at bases of spines 2
2. Last exopod segments of legs 2 and 3 with single sensilla 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
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
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. conepigri***

Metataeniacanthus synodi Pillai, 1963

FIGURES 127–129

Metataeniacanthus synodi Pillai, 1963:122.—Cressey and Cressey, 1979:3.—Kabata, 1979:68.

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 × 423 μm (l × w), comprising about 12% of body length, with ventrally directed lateral margins as in *M. conepigri* (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 ×

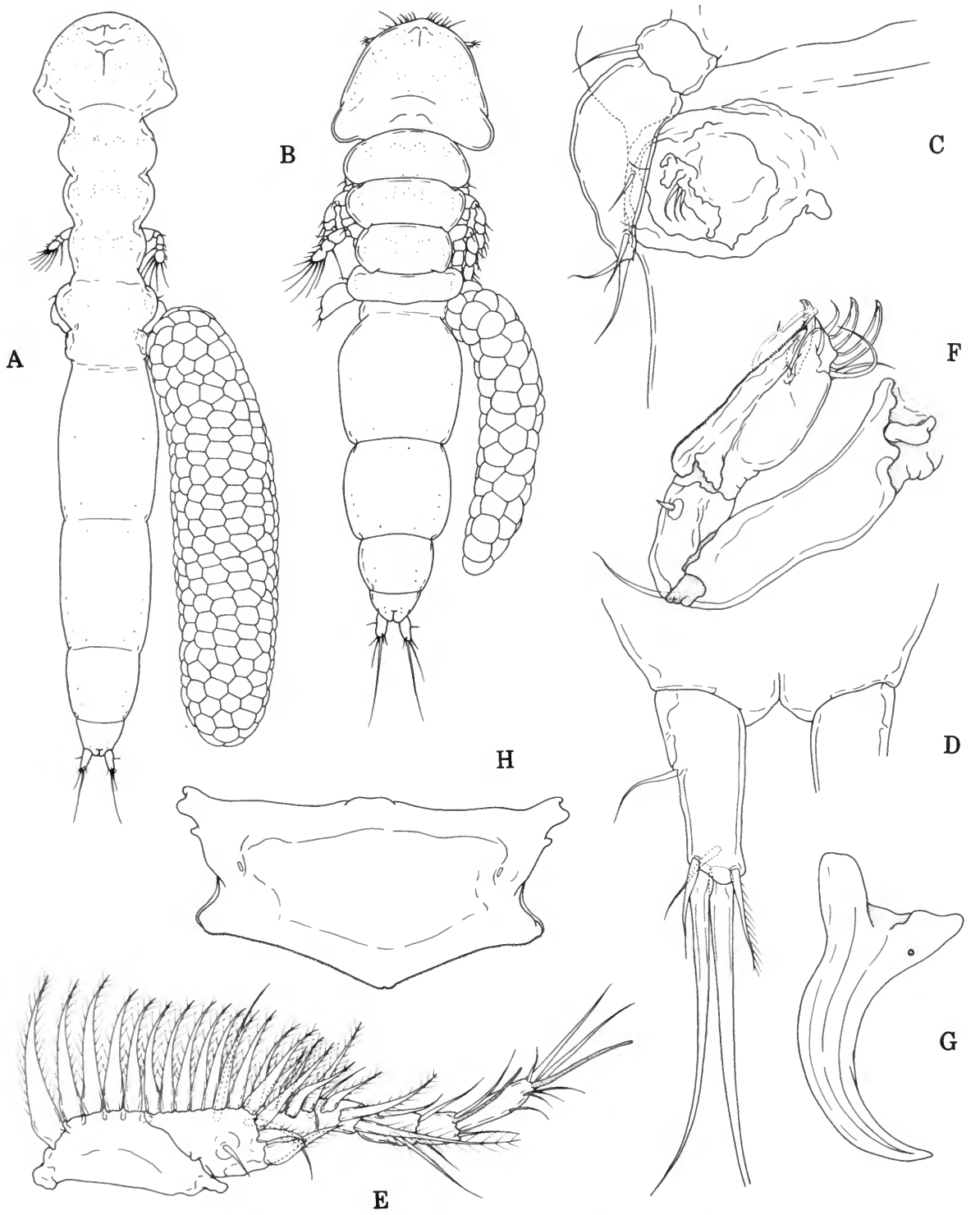

FIGURE 127.—*Metataeniacanthus synodi* Pillai, female: A, dorsal; B, dorsal; C, leg 5 and genital area, ventrolateral; D, caudal ramus, ventral; E, first antenna, ventral; F, second antenna, medial; G, postantennal process, ventral; H, labrum, ventral.

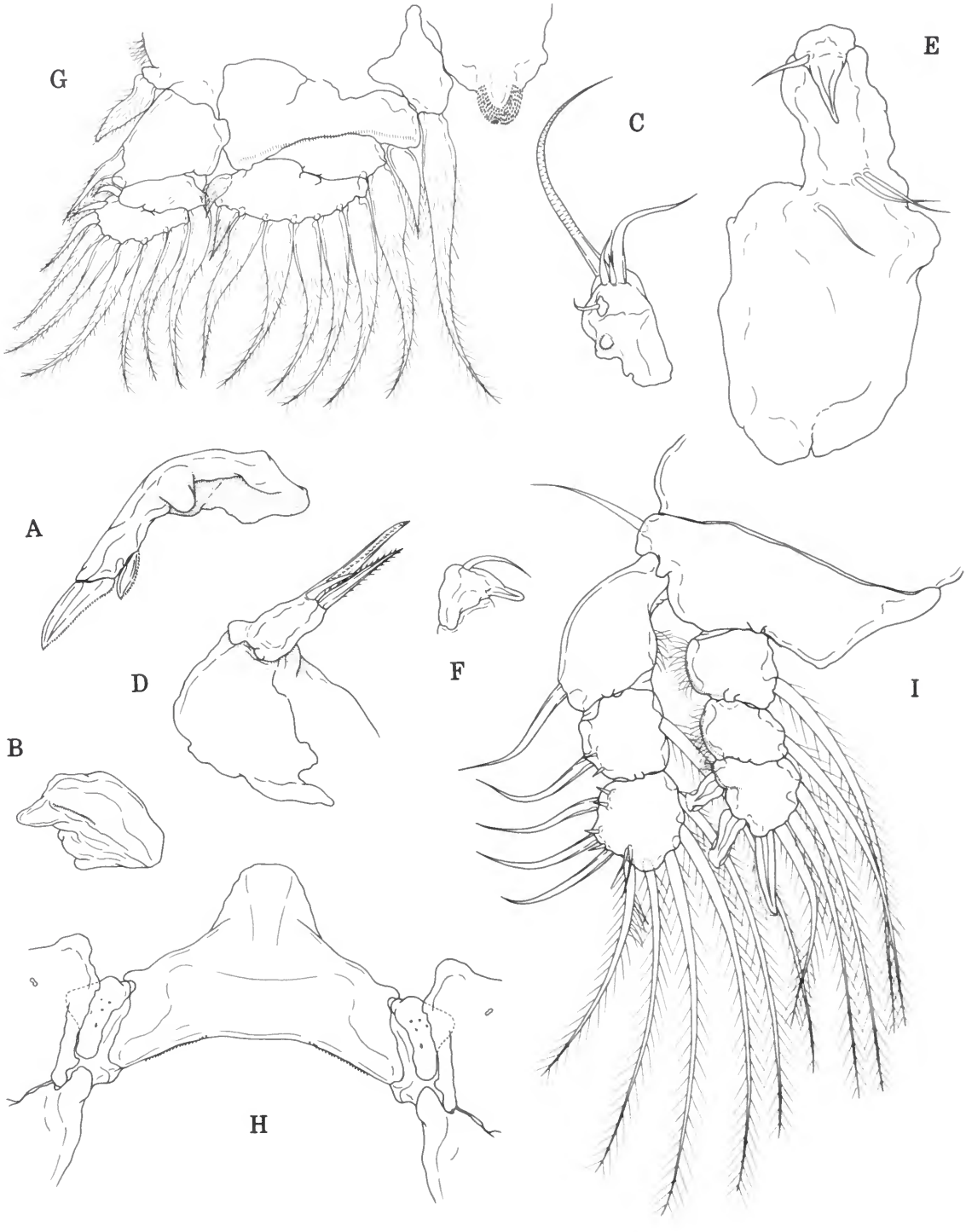

FIGURE 128.—*Metataeniacanthus synodi* Pillai, female: A, mandible, anterior; B, paragnath, anterior; C, first maxilla, anterior; D, second maxilla, anteroventral; E, maxilliped, ventromedial; F, maxilliped claw, anterior; G, leg 1 and interpodal plate, ventral; H, leg 2, interpodal plate and proximal portions of basipods, ventral; I, leg 2, ventral.

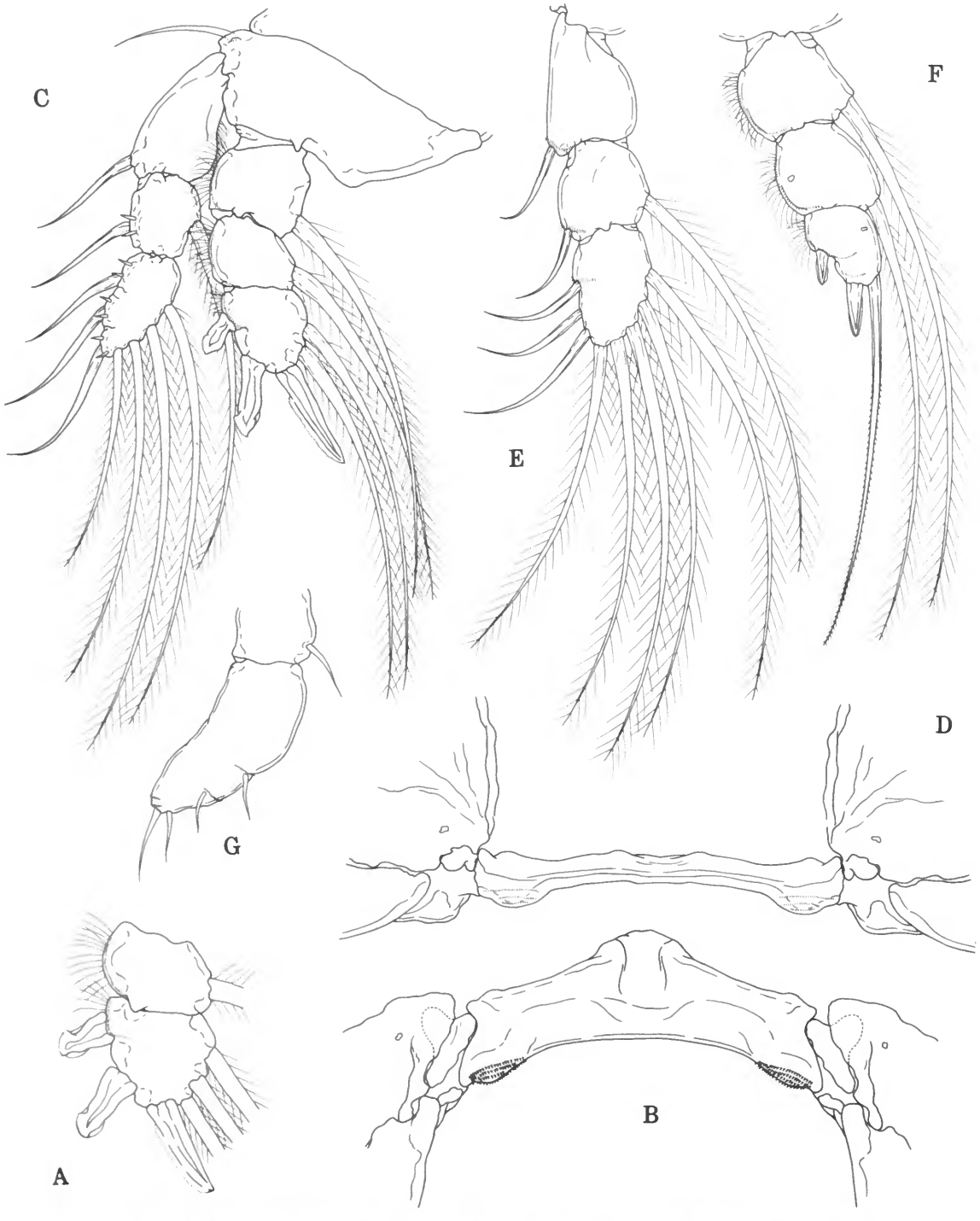

FIGURE 129.—*Metataeniacanthus synodi* Pillai, female: A, leg 2 endopod, distal two segments, ventral; B, leg 3, interpodal plate and proximal portions of basipods, ventral; C, leg 3, ventral; D, leg 4, interpodal plate and proximal portions of basipods, ventral; E, leg 4 exopod, ventral; F, leg 4 endopod, ventral; G, leg 5, ventrolateral.

301 μm (l × 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 (l × 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,F) 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:

P_1	coxa 0-1	basis 1-1	exopod 1-0; 1-1; 7 endopod 0-1; 7
P_2	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, I, 5 endopod 0-1; 0-1, II, I, 3
P_3	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, I, 4 endopod 0-1; 0-1; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, I, 5 endopod 0-1; 0-1; III (or II, int.)

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 *Metataeniacanthus 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, *Trachinocephalus 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 *Trachinocephalus 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.

Metataeniacanthus 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).

TABLE 3.—Spinal and setal formulae of the last segments of the exopods of legs 2–4 and endopod of leg 4 of species of *Metataeniacanthus*.

Species	Exopod of leg 2	Exopod of leg 3	Exopod of leg 4	Endopod of leg 4
M. aquilonius	II, I, 4	II, I, 4	II, I, 4	III
M. conepigri	II, I, 4	II, I, 4	III, I, 3	III
M. epigri	II, I, 5	II, I, 5	III, I, 3	III
M. gibbsi	II, I, 4	II, I, 4	III, I, 3	III
M. indiscretus	II, I, 4	II, I, 4	II, I, 4	II
M. nudus	II, I, 5	II, I, 5	II, I, 5	III
M. pacificus	II, I, 5	II, I, 5	II, I, 4	III
M. solidus	II, I, 4	II, I, 4	III, I, 3	III
M. synodi	II, I, 5	II, I, 4	II, I, 5	III
M. vulgaris	II, I, 5	II, I, 5	II, I, 5	II, I

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 taeniacanthid genera by the structure of the second maxilla and maxilliped. 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 maxillipedis. 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 spinule 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 × 550 μm, and comprising approximately 33% of total body length. Genital complex (Figure 130B) wider than long, 101 × 148 μm. Abdomen 4-segmented; segments from anterior to posterior 52 × 109 μm, 47 × 91 μm, 29 × 78 μm, and 44 × 68 μm (l × 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 × 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 130D) with ventromedian sclerotized part. First antenna (Figure 130D) 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 tine.

Labrum (Figure 130G) 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 (spinule) 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 nonprehensile, and bearing 2 conical processes and 2 naked setae.

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

P_1	coxa 0-1	basis I-1	exopod I-0; 9 endopod 0-I; 7
P_2	coxa 0-0	basis I-0	exopod I-0; I-1, II, I, 4 endopod 0-I; 0-I; II, I, 3
P_3	coxa 0-0	basis I-0	exopod I-0; I-I; II, I, 4 endopod 0-I; 0-I; II, I, 2
P_4	coxa 0-0	basis I-0	exopod I-0; I-I; II, I, 4 endopod 0-I; 0-I; II, int.

Interpodal plate of leg 1 (Figure 131F) 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 131F) 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).

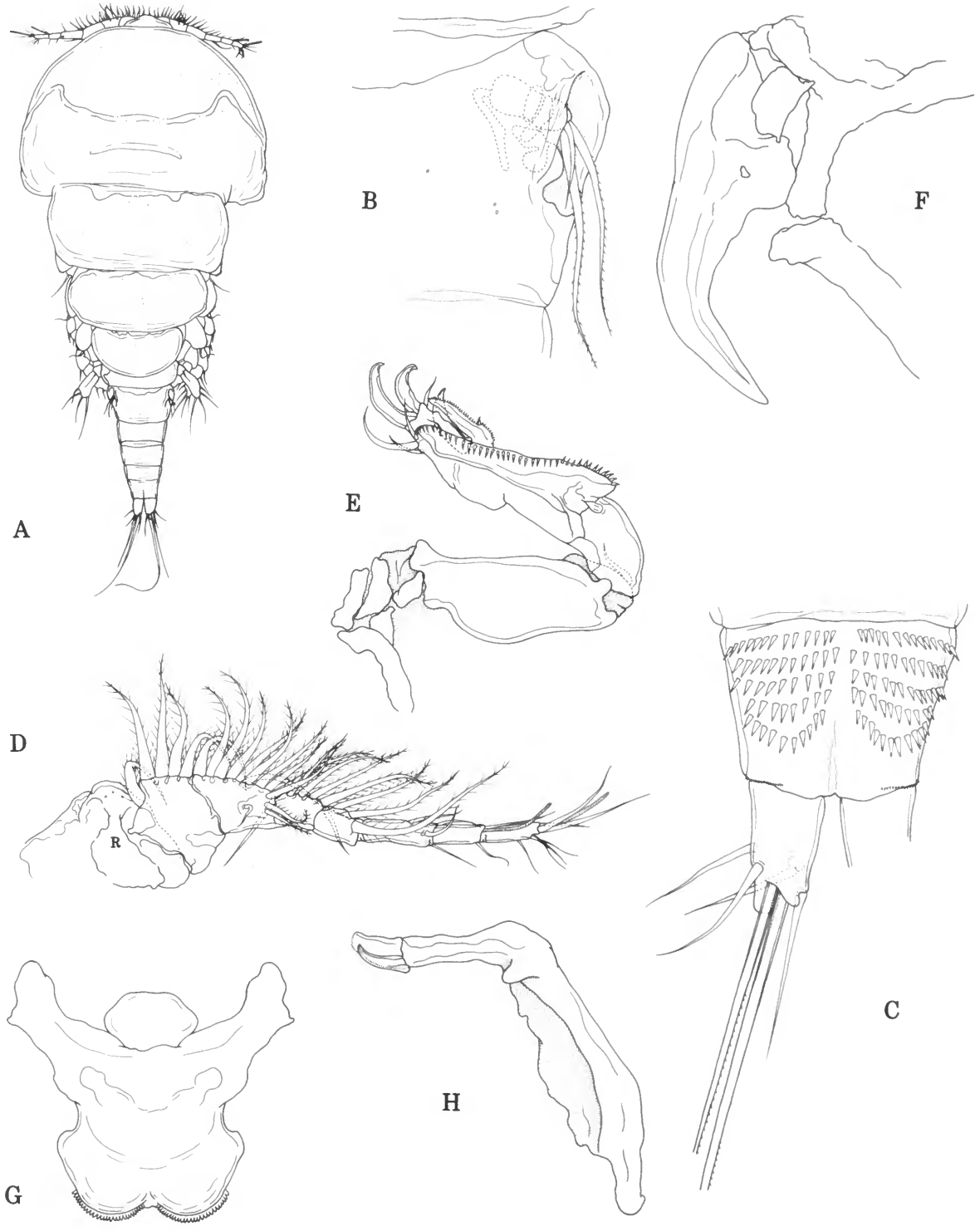

FIGURE 130.—*Nudisodalis acicula*, new species, female: A, dorsal; B, genital area, dorsal; C, anal segment and caudal ramus, ventral; D, rostral area and first antenna, ventral; E, second antenna, medial; F, postantennal process, ventral; G, labrum, ventral; H, mandible, anteromedial. (R = rostral area.)

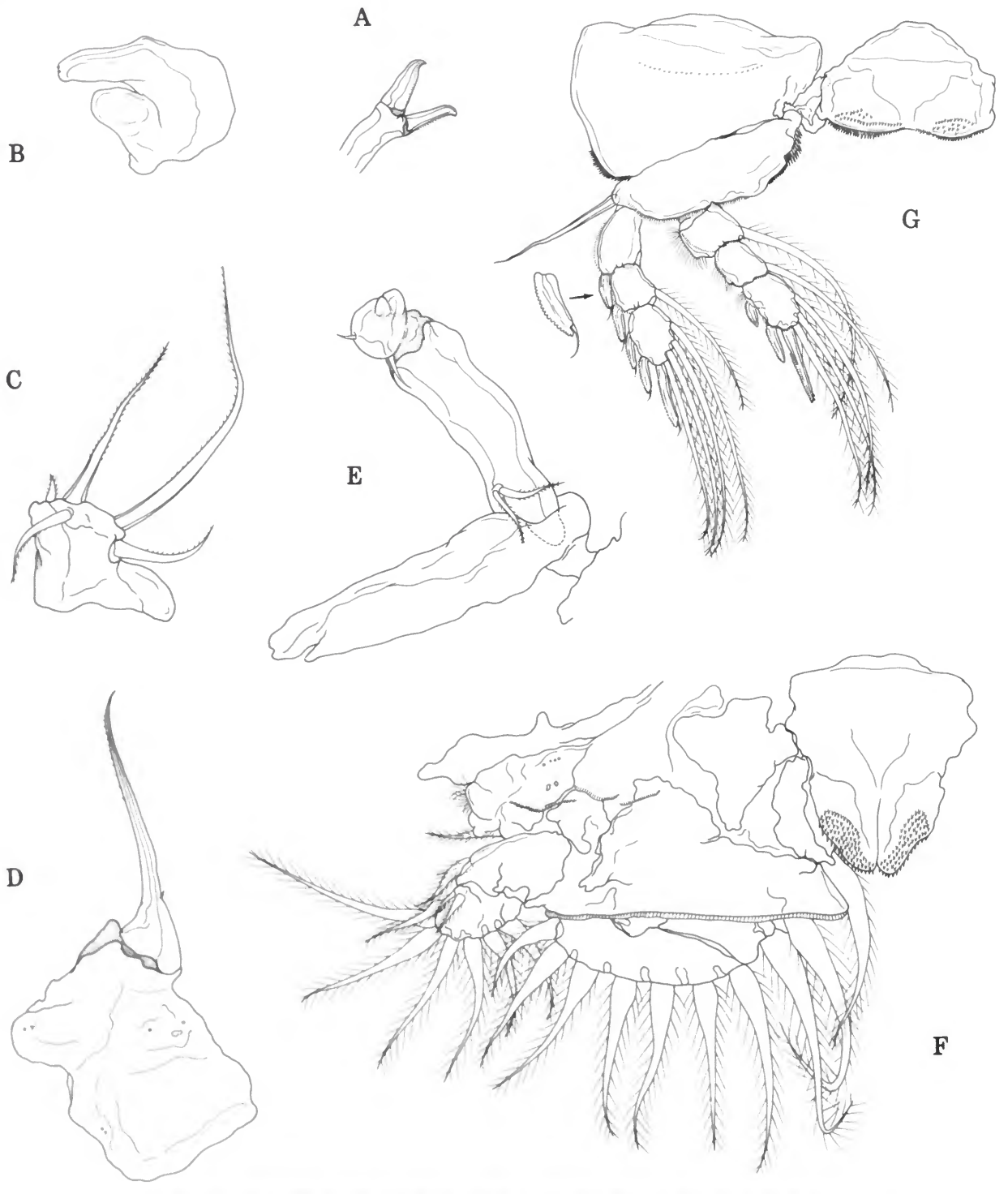

FIGURE 131.—*Nudisodalis acicula*, new species, female: A, mandible, distal portion, ventral; B, paragnath, ventral; C, first maxilla, anterior; D, second maxilla, ventral; E, maxilliped, ventromedial; F, leg 1 and interpodal plate, ventral; G, leg 2 and interpodal plate, ventral.

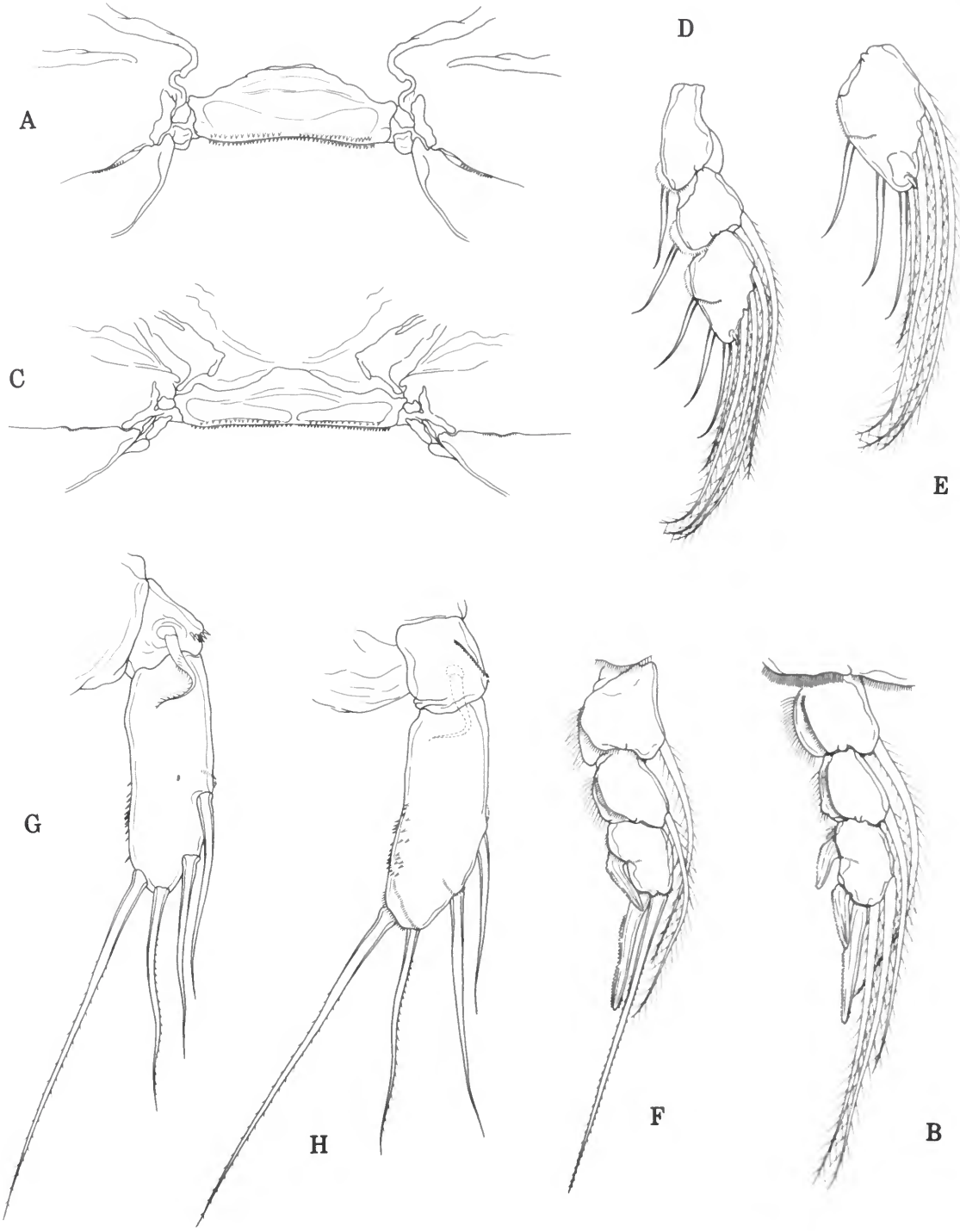

FIGURE 132.—*Nudisodalis acicula*, new species, female: A, leg 3, interpodal plate and proximal portions of basipods, ventral; B, leg 3 endopod, ventral; C, leg 4, interpodal plate and proximal portions of basipods, ventral; D, leg 4 exopod, ventral; E, leg 4, terminal exopod segment, ventral; F, leg 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 131G). Terminal exopod segment of leg 4 (Figure 132E) subtriangular in outline and tipped with digitiform process; exopod spines (setae?) very weakly sclerotized. Endopod spines of legs 2–4 (Figures 131G, 132B,F) 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 spinules and 1 semipinnate, dorsolateral seta; second segment slender, 70 × 26 μm (l × 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 spinulated, 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 *Pervagor spilosomus* at Oahu, Hawaii. It can be distinguished from all other taeniacanthid species by the presence of a lanceolate terminal process of the second maxilla and a non-prehensile terminal segment of the maxilliped (see "Remarks" section of *Nudisodalis*).

Phagus Wilson, 1911

Phagus Wilson, 1911:391.—Rose and Vaissiere, 1952:172.—Yamaguti, 1963:24.—Ho, 1969:127.—Kabata, 1979:73.

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

Rostral area not prominent. First antenna 7-segmented. Second antenna incompletely 4-segmented. Postantennal process absent. Mandible with 2 spinulated unequal blades. Paragnath present. First maxilla a setiferous lobe. Second maxilla 2-segmented; second segment bearing a spinulated terminal process and 2 spinulated spines. Terminal segment of maxilliped incompletely fused to corpus and bearing 4 setae at tip.

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: Similiar 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 (*Irodes, 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 *Irodes* 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. muraenesocis* 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

Bomolochus muraenae Brian 1906:28.—Ho, 1969:127.—Kabata, 1979:73.
Phagus muraenae.—Wilson, 1911:391.—Rose and Vaissiere, 1952:172.—Yamaguti, 1963:25.

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-

thorax wider than long, 479 × 789 μm comprising about ¼ of total body length. Thoracic segments bearing legs 2–5 free; segments decreasing in width from anterior to posterior; segment bearing leg 5 much smaller than anterior segments, dorsum not shield-like. Genital complex (Figure 133B) wider than long, 156 × 276 μm. Abdomen (Figure 133C) 4-segmented; segments from anterior to posterior 129 × 212 μm, 124 × 179 μm, 92 × 152 μm, and 133 × 129 μm (l × w), each bearing row of spinules on posteroventral margin; anal segment with additional row of spinules on anteroventral margin (Figure 133D). Caudal ramus (Figure 133D) longer than wide, 74 × 44 μm, and with a short row of spinules on posteroventral surface; all six terminal and subterminal setae naked.

Rostral area (Figure 133E) with ventromedian sclerotized ridges. First antenna (Figure 133E) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Figure 133F,G) 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 spinulated 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:

P_1	coxa 0-1	basis 1-1	exopod 1-0; I-1; 7 endopod 0-1; 7
P_2	coxa 0-1	basis 1-0	exopod 1-0; I-1; III, I, 5 endopod 0-1; 0-2; II, I, 3
P_3	coxa 0-1	basis 1-0	exopod 1-0; I-1; II, I, 5 endopod 0-1; 0-2; II, I, I, 2
P_4	coxa 0-0	basis 1-0	exopod 1-0; I-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 × 345 μm, comprising approximately 25% of total body length. Genital complex 115 × 124 μm (l × w). Abdomen 3-segmented; segments from anterior to posterior 51 × 97 μm, 48 × 81 μm, 64 × 69 μm (l × w); anal segment ornamented as in female. Caudal ramus 41 × 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 × 25 μm (l × w).

REMARKS.—This species was originally discovered and named *Bomolochus muraenae* by Richiardi (1880) and subsequently cited by Carus (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 taeniacanthids. 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, 1, 5, (6) terminal endopod segment of leg 3 with formula II, 1, 1, 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-

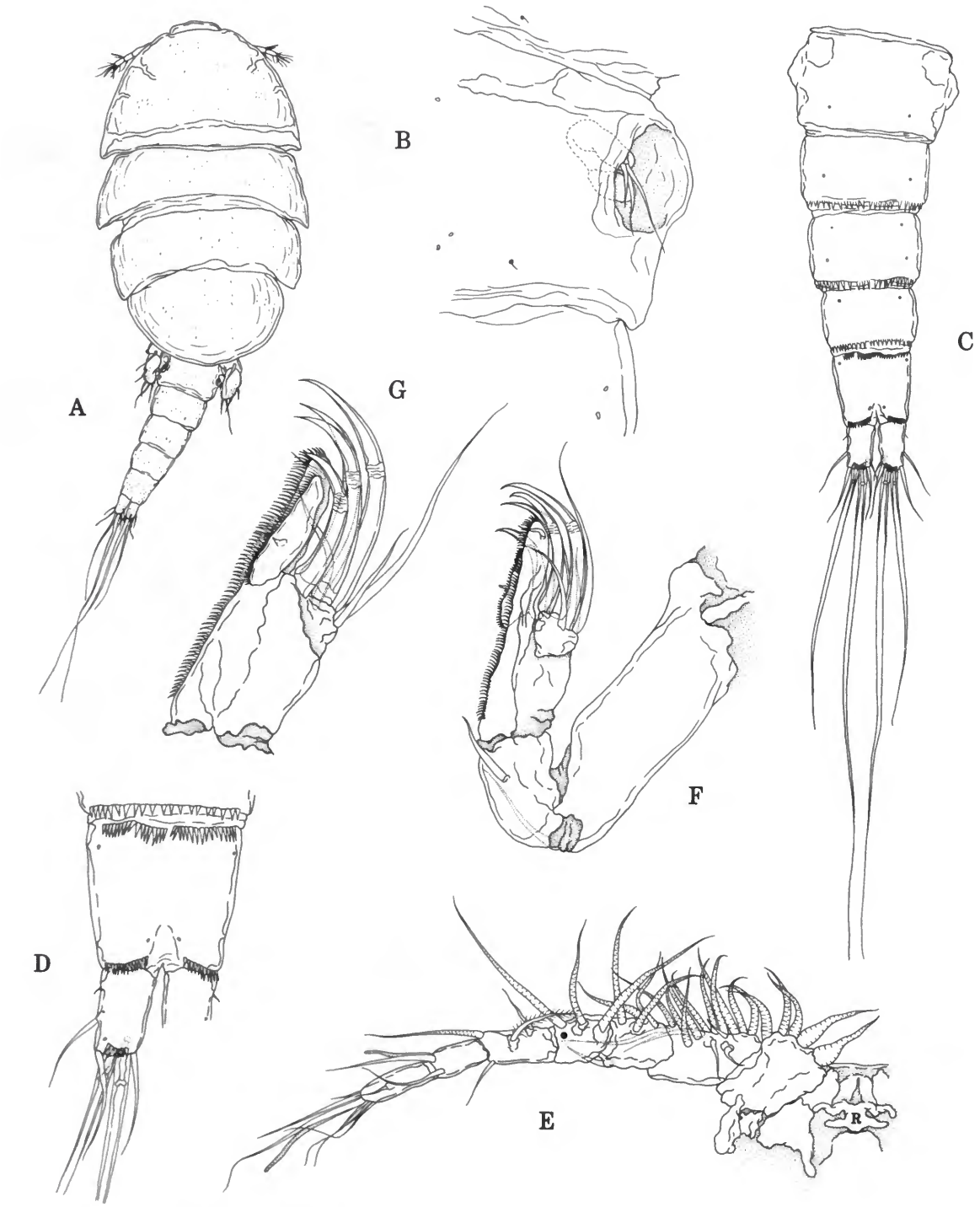

FIGURE 133.—*Phagus muraenae* (Brian), female: A, dorsal; B, genital area, dorsal; C, genital complex and postgenital segments, ventral; D, anal segment and caudal ramus, ventral; E, rostral area and first antenna, ventral; F, second antenna, medial; G, second antenna, distal portion, lateral. (R = rostral area.)

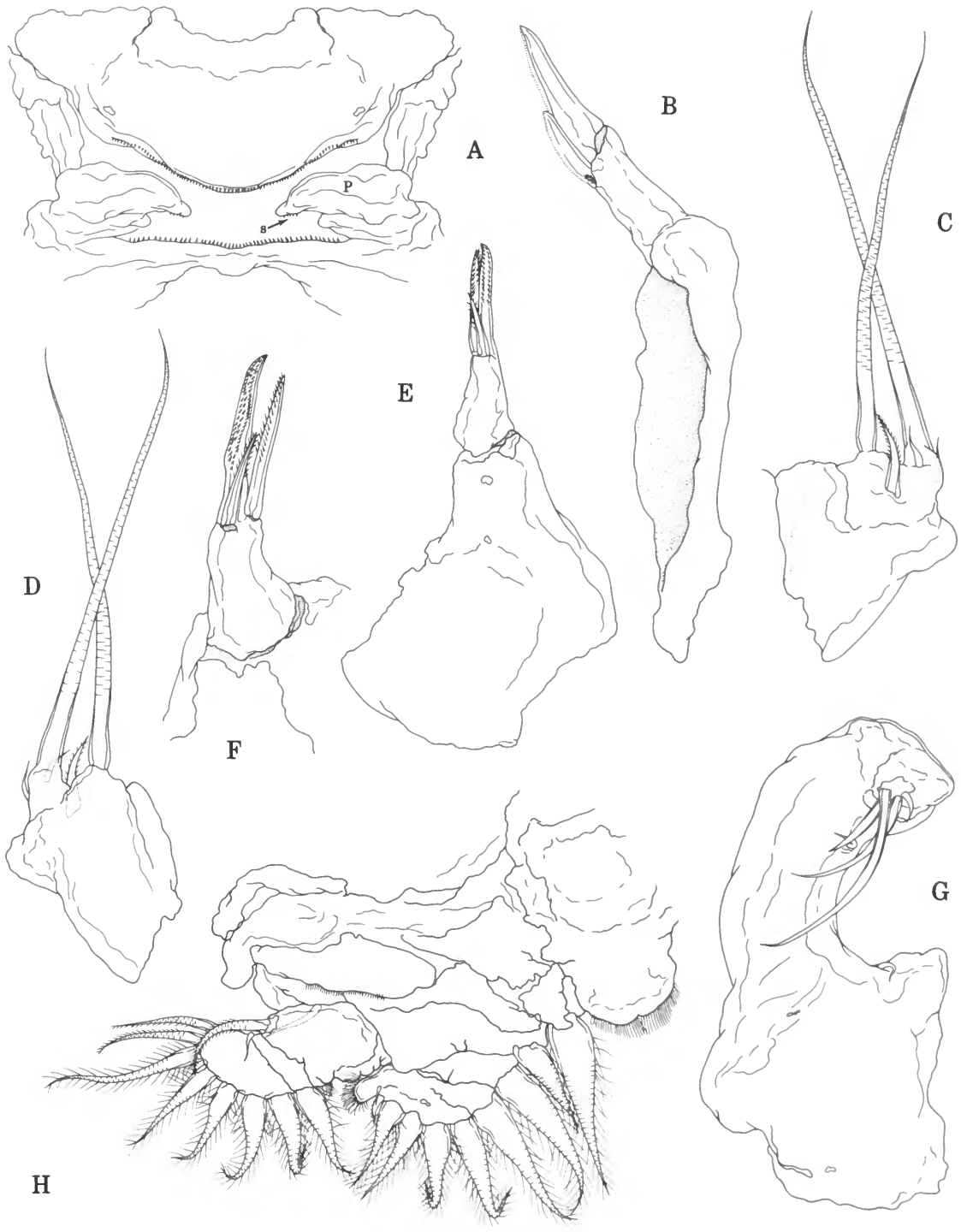

FIGURE 134.—*Phagus muraenae* (Brian), female: A, labrum and paragnaths, ventral; B, mandible, anteromedial; C, first maxilla, anterior; D, same, posterior; E, second maxilla, posteroventral; F, second maxilla, distal portion, ventral; G, maxilliped, ventral; H, leg 1 and interpodal plate, ventral. (P = paragnath, s = spinules.)

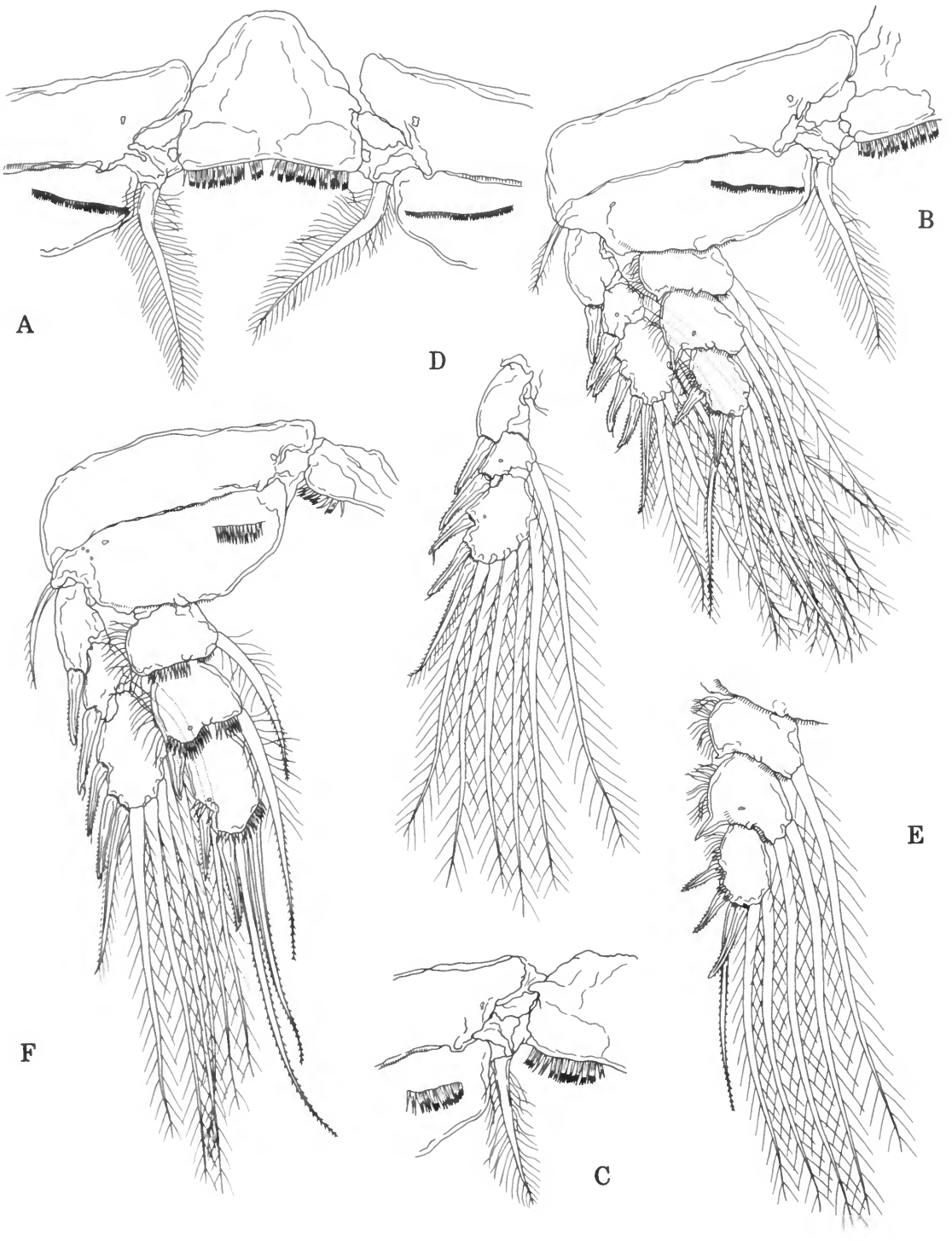

FIGURE 135.—*Phagus muraenae* (Brian), female: A, leg 2, interpodal plate and proximal portions of basipods, ventral; B, leg 2 and interpodal plate, ventral; C, leg 3, interpodal plate and proximal portion of basipod, ventral; D, leg 3 exopod, ventral; E, leg 3 endopod, ventral; F, leg 4 and interpodal plate, ventral.

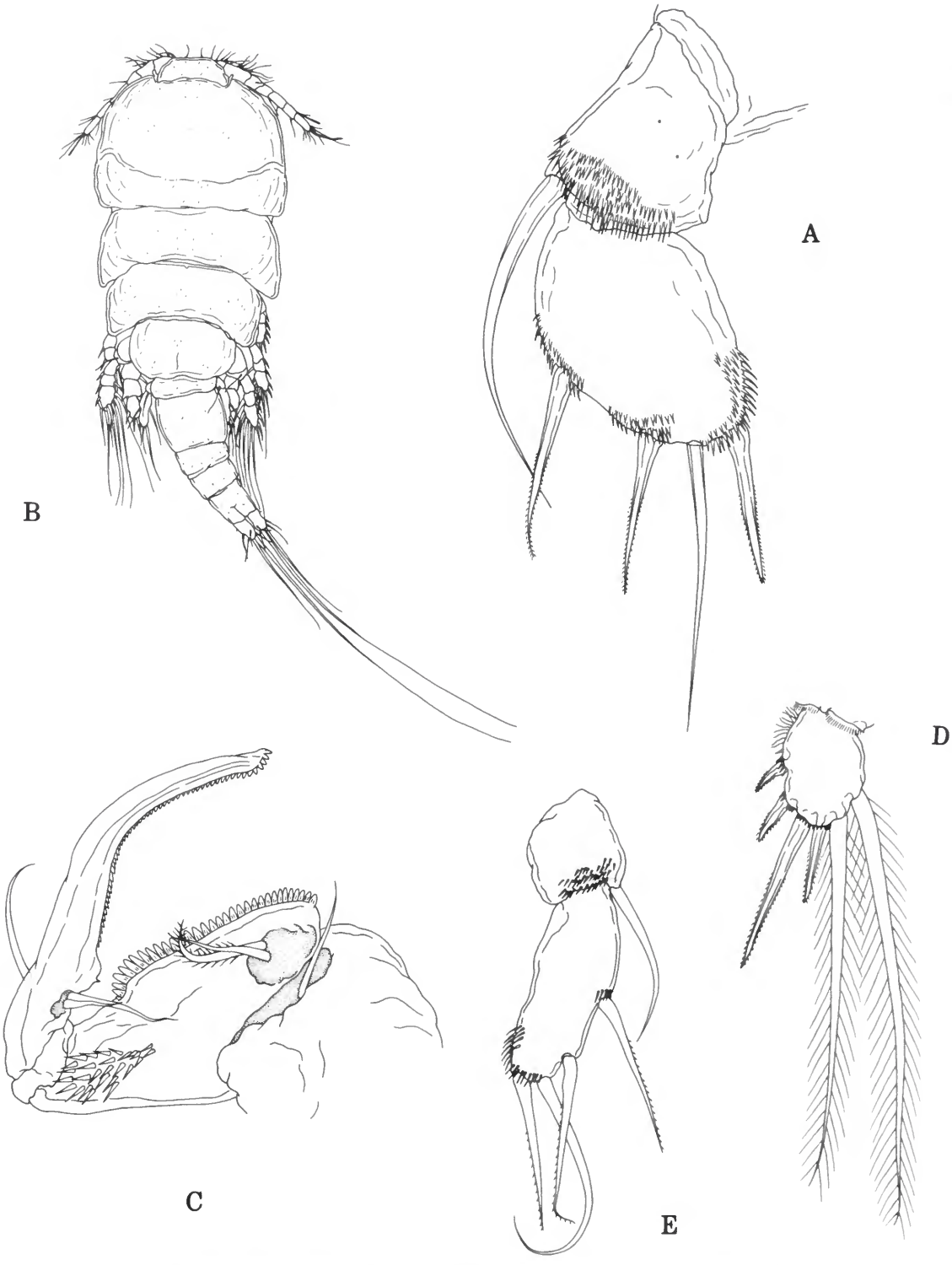

FIGURE 136.—*Phagus muraenae* (Brian). Female: A, leg 5, ventral. Male: B, dorsal; C, maxilliped, anterior; D, leg 3, terminal endopod segment, ventral; E, leg 5, ventral.

mentation of all four abdominal segments (character 2) is not found in any known species of the Taeniacanthidae.

Pseudotaeniacanthus Yamaguti and Yamasu, 1959

Pseudotaeniacanthus Yamaguti and Yamasu, 1959:111.—Lewis, 1967:5.—Pillai and Hameed, 1974:180.—Kabata, 1979:68.

DIAGNOSIS.—*Female:* Body elongate, with first pedigerous segment fused to cephalosome. Abdomen long, slender, and 4-segmented. Caudal ramus bearing 6 setae.

Rostral area with Y-shaped sclerotized structure bearing numerous hooklets (curved spinules). First antenna 7-segmented; first two segments occasionally fused; segments slender. Second antenna 4-segmented; terminal segment with 4 claw-like spines. Postantennal process absent. Labrum with rounded posteroventral margin. Mandible with 2 subequal, spinulated blades. Paragnath present. First maxilla a rounded lobe bearing setae. Second maxilla 2-segmented. Maxilliped non-prehensile with weak, non-sclerotized terminal process.

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 139D] 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

FIGURES 137–140, 162D–F, 163, 164A

Pseudotaeniacanthus congeri Yamaguti and Yamasu, 1959:109.—Yamaguti, 1963:25.—Lewis, 1967:9.—Pillai and Hameed, 1974:181.—Devi and Shyamasundari, 1980:203.

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 process), 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

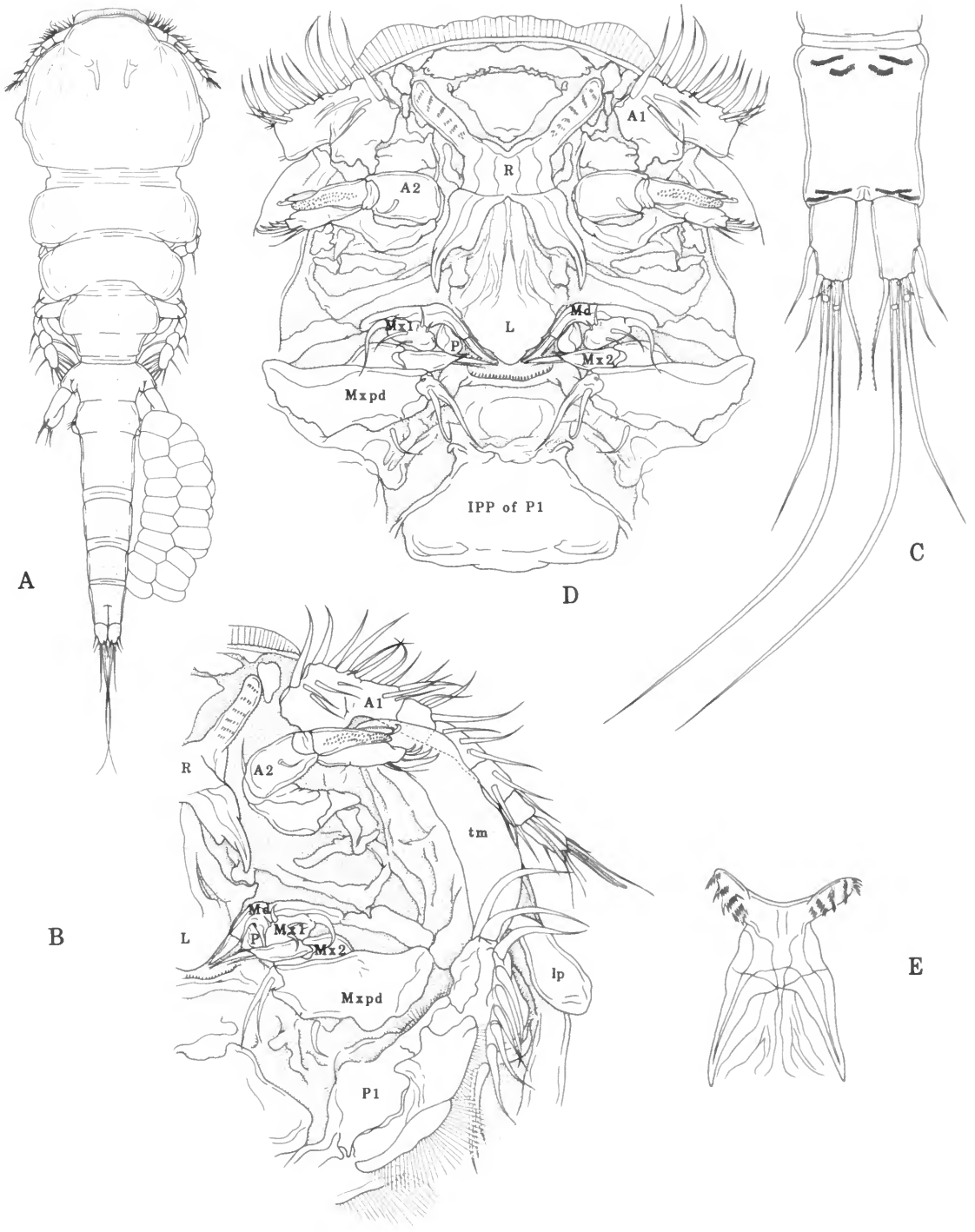

FIGURE 137.—*Pseudotaeniacanthus congeri* Yamaguti and Yamasu, female: A, dorsal; B, cephalothorax, lateral portion, ventral; C, anal segment and caudal rami, ventral; D, cephalothorax, ventral; E, rostral area, ventral. (R = rostral area, A1 = first antenna, A2 = second antenna, L = labrum, Md = mandible, P = paragnath, Mx1 = first maxilla, Mx2 = second maxilla, Mxpd = maxilliped, IPP of P1 = interpodal plate of leg 1, P1 = leg 1, tm = transparent membrane, lp = lateral process.)

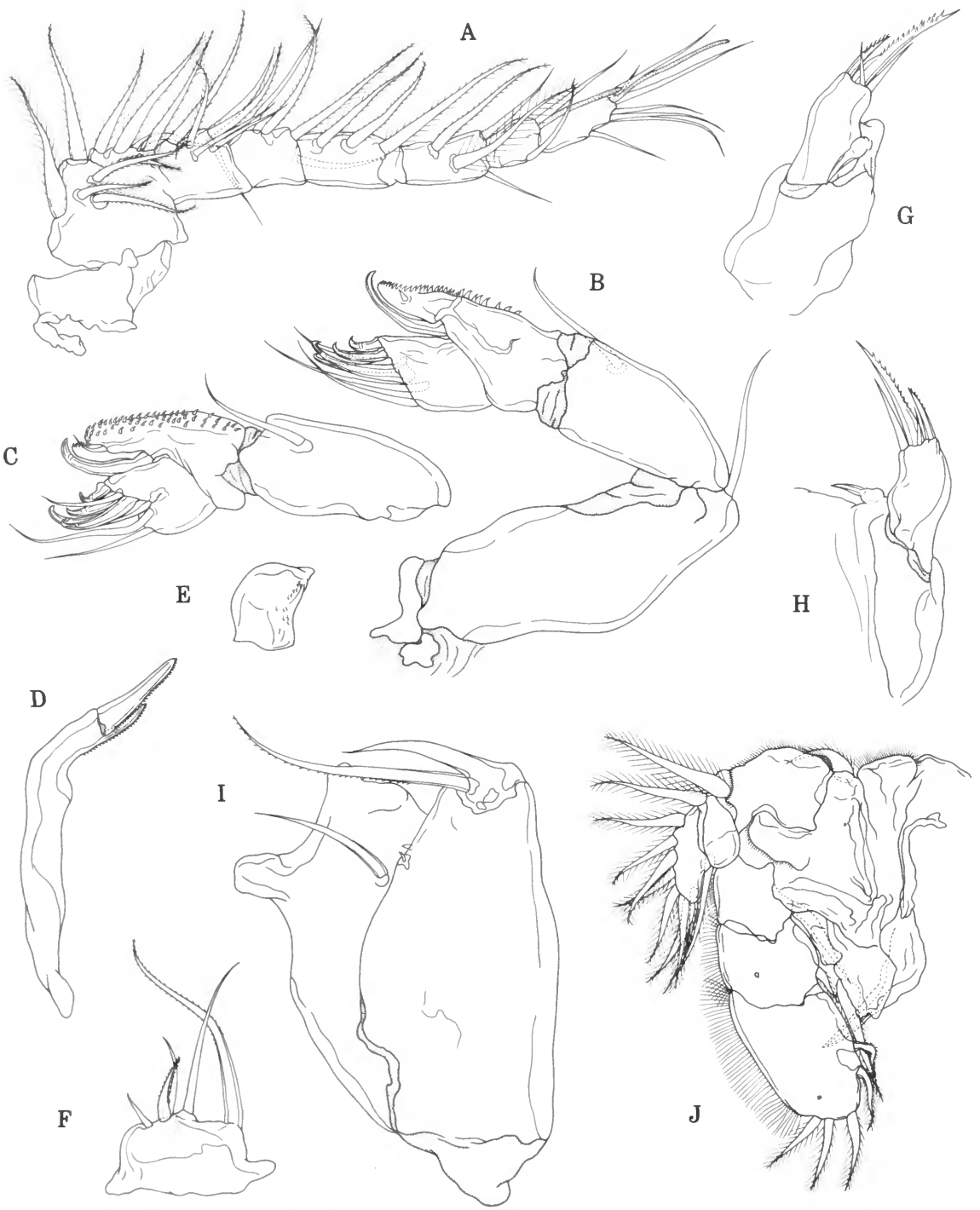

FIGURE 138.—*Pseudotaeniacanthus congeri* Yamaguti and Yamasu, female: A, first antenna, anteroventral; B, second antenna, lateral; C, second antenna, distal three segments, medial; D, mandible, posterior; E, paragnath, ventromedial; F, first maxilla, anterior; G, second maxilla, posteroventral; H, same, posterior; I, maxilliped, ventral; J, leg 1, ventral.

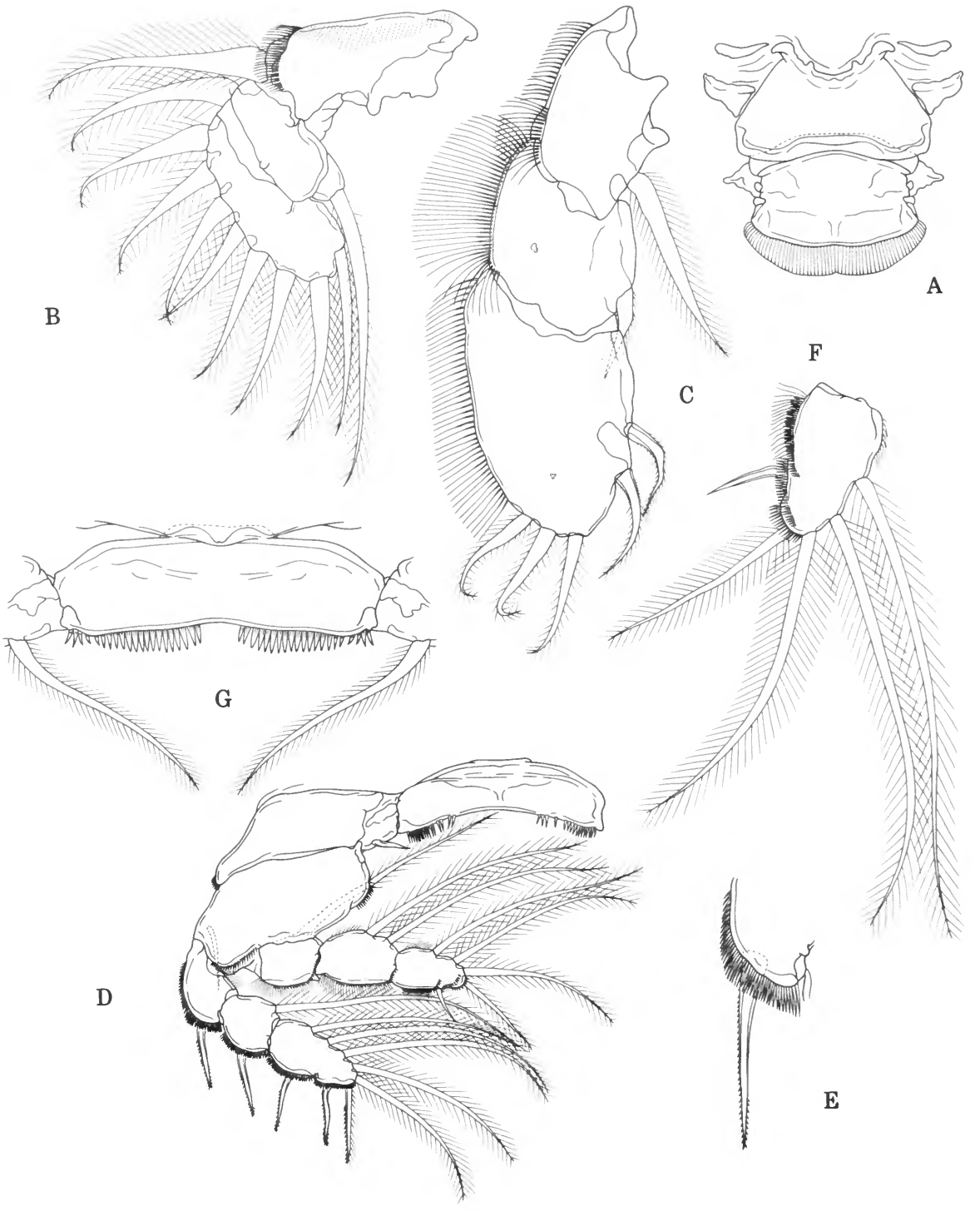

FIGURE 139.—*Pseudotaeniacanthus congeri* Yamaguti and Yamasu, female: A, leg 1, interpodal plate, ventral; B, leg 1 exopod, ventral; C, leg 1 endopod, ventral; D, leg 2 and interpodal plate, ventral; E, leg 2, outer spine of first exopod segment, ventral; F, leg 2, terminal endopod segment, ventral; G, leg 3, interpodal plate, ventral.

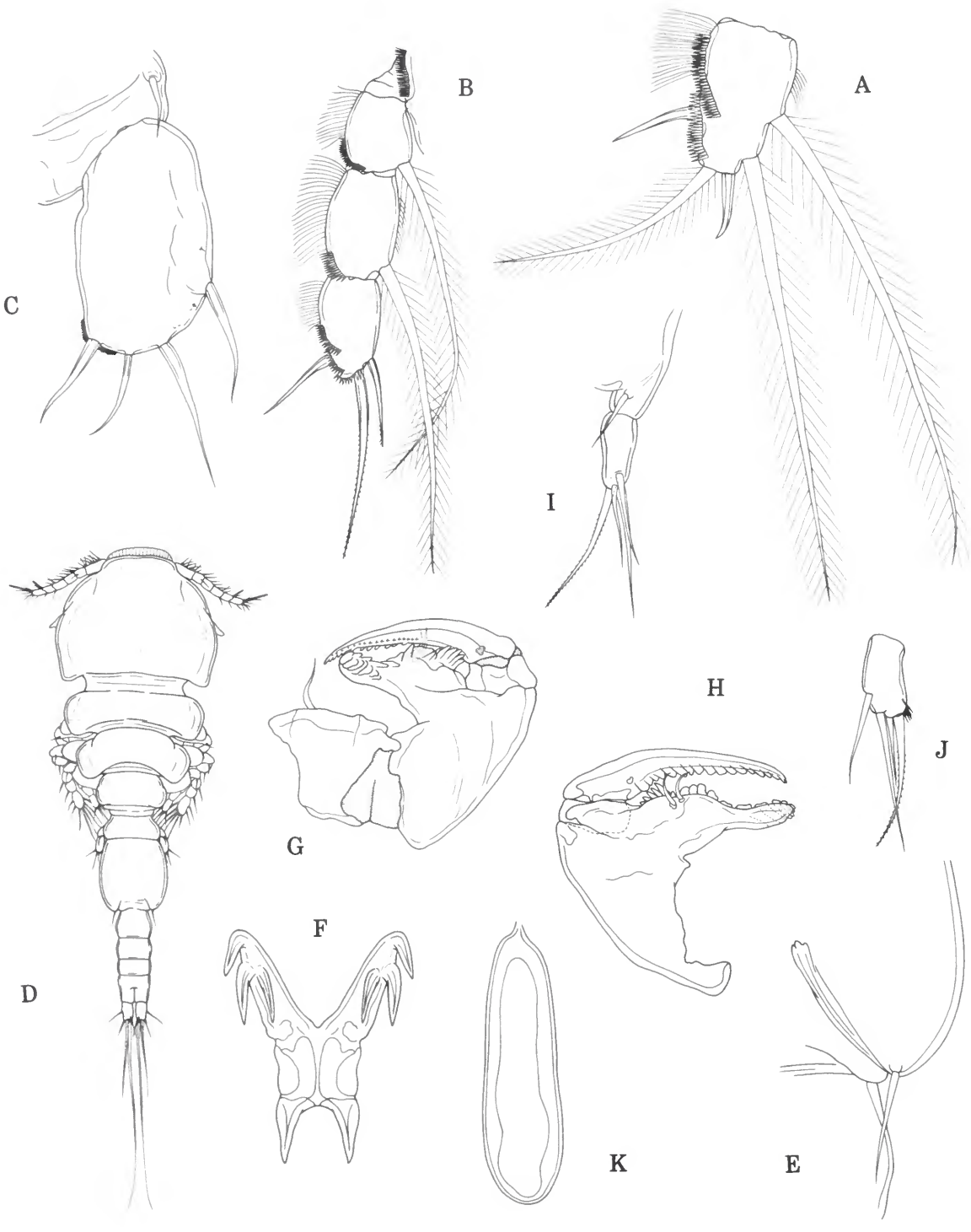

FIGURE 140.—*Pseudotaeniacanthus congeri* Yamaguti and Yamasu. Female: A, leg 3, terminal endopod segment, ventral; B, leg 4 endopod, ventral; C, leg 5, dorsal. Male: D, dorsal; E, genital area, ventral; F, rostral area, ventral; G, maxilliped, posterior; H, same, distal portion, anterior; I, leg 5, 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 aesthete, 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 spines 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. Maxilliped (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:

P_1	coxa 0-1	basis 1-0	exopod I-0; I-1; 8 endopod 0-1; 0-1; 5
P_2	coxa 0-1	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-2; I, 4
P_3	coxa 0-1	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-2; I, I, I, 2
P_4	coxa 0-1	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-1; III

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. Coxa of leg 1 (Figure 138J) with large spiniform process on dorsomedial surface. Coxal seta of leg 2 (Figure 139D) relatively small and naked; coxal setae of legs 3 and 4 (see Figure 139G) long and pinnate. Coxae and bases of legs 2–4 each with several rows of spinules. Exopod spines of legs 2–4 (see Figure 139E) 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 dorsolateral 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 140E) 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. Maxilliped (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 140E) 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 Yamasu (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 dorsomedial 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 Elat.

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*.

Species	Rostral area	Terminal segment of MXPD	Exopod of leg 1	Terminal endopod segment of leg 2	Terminal endopod segment of leg 3	Terminal exopod segment of leg 4	Terminal endopod segment of leg 4
P. congeri	rows of hooklets + furca	a setiform claw-like structure	1-0; 1-1; 8	5 elements	5 elements	II, I, 5	III
P. coniferus	rows of hooklets	a process with 2 setae	1-0; 1-1; 8	5 elements	5 elements	II, I, 4	III
P. muraenesocis	rows of hooklets + furca	a process with 2 setae	1-0; 10	5 elements	3 elements	II, I, 5	III
P. puhi	rows of hooklets	a process with 2 setae	1-0; 10	5 elements	5 elements	II, I, 5	I, I, I
P. longicauda	rows of transverse ridges + furca	a setiform claw-like structure	1-0; 1-1; 6	6 elements	6 elements	II, I, 5	IV
P. sp. male	row of transverse ridges + furca		1-0; 1-1; 8	6 elements	5 elements	II, I, 5	I, 2, I

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 141D) unornamented. Caudal ramus (Figure 141D), 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_1	coxa 0-1	basis 1-1 (setule)	exopod 1-0; 1-1; 8
			endopod 0-1; 0-1; 5
P_2	coxa 0-1	basis 1-0	exopod 1-0; 1-1; II,I,5
			endopod 0-1; 0-2; I, 4
P_3	coxa 0-1	basis 1-0	exopod 1-0; 1-1; II,I,5
			endopod 0-1; 0-2; II,I,2
P_4	coxa 0-1	basis 1-0	exopod 1-0; 1-1; II,I,4
			endopod 0-1; 0-1; III (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 × 147 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 bearing cones, 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

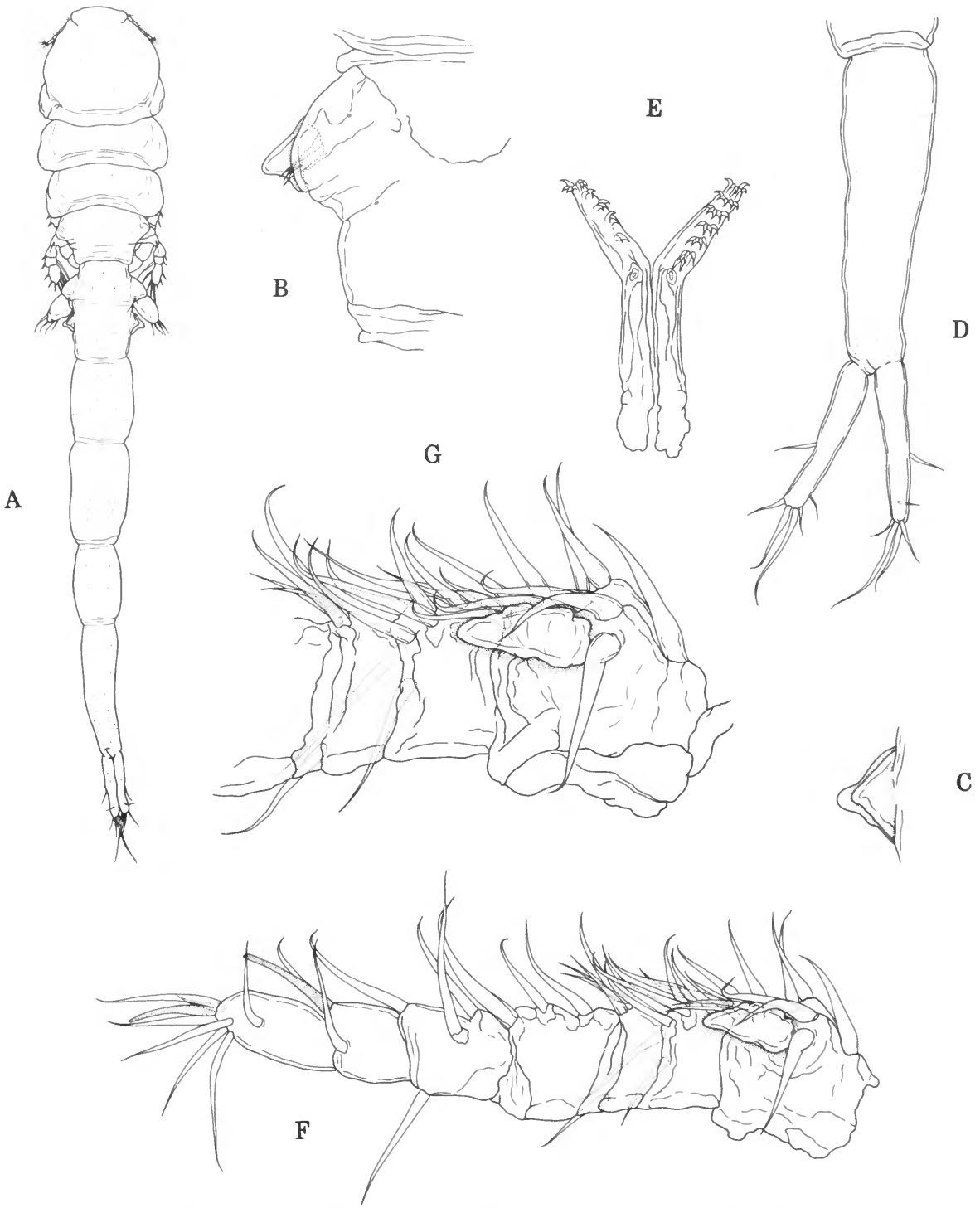

FIGURE 141.—*Pseudotaeniacanthus coniferus,* new species, female: A, dorsal; B, genital area, ventral; C, egg sac attachment area, dorsal; D, anal segment and caudal rami, ventral; E, rostral area, ventral; F, first antenna, ventral; G, first antenna, proximal three segments, ventral.

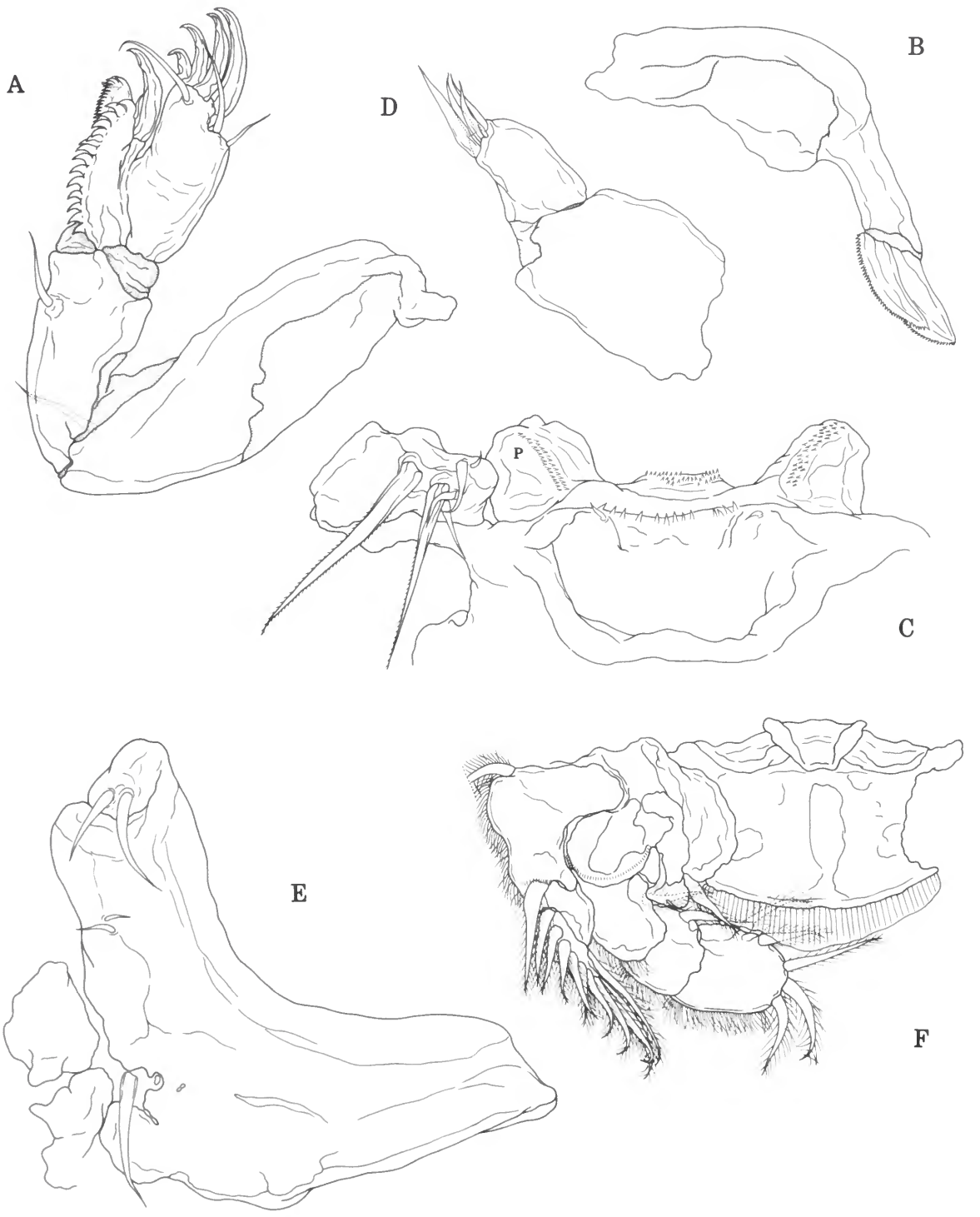

FIGURE 142.—*Pseudotaeniacanthus coniferus*, new species, female: A, second antenna, medial; B, mandible, anteromedial; C, first maxilla, paragnaths and labial area, ventral; D, second maxilla, dorsomedial; E, maxilliped, ventral; F, leg 1 and interpodal plate, ventral. (P = paragnath.)

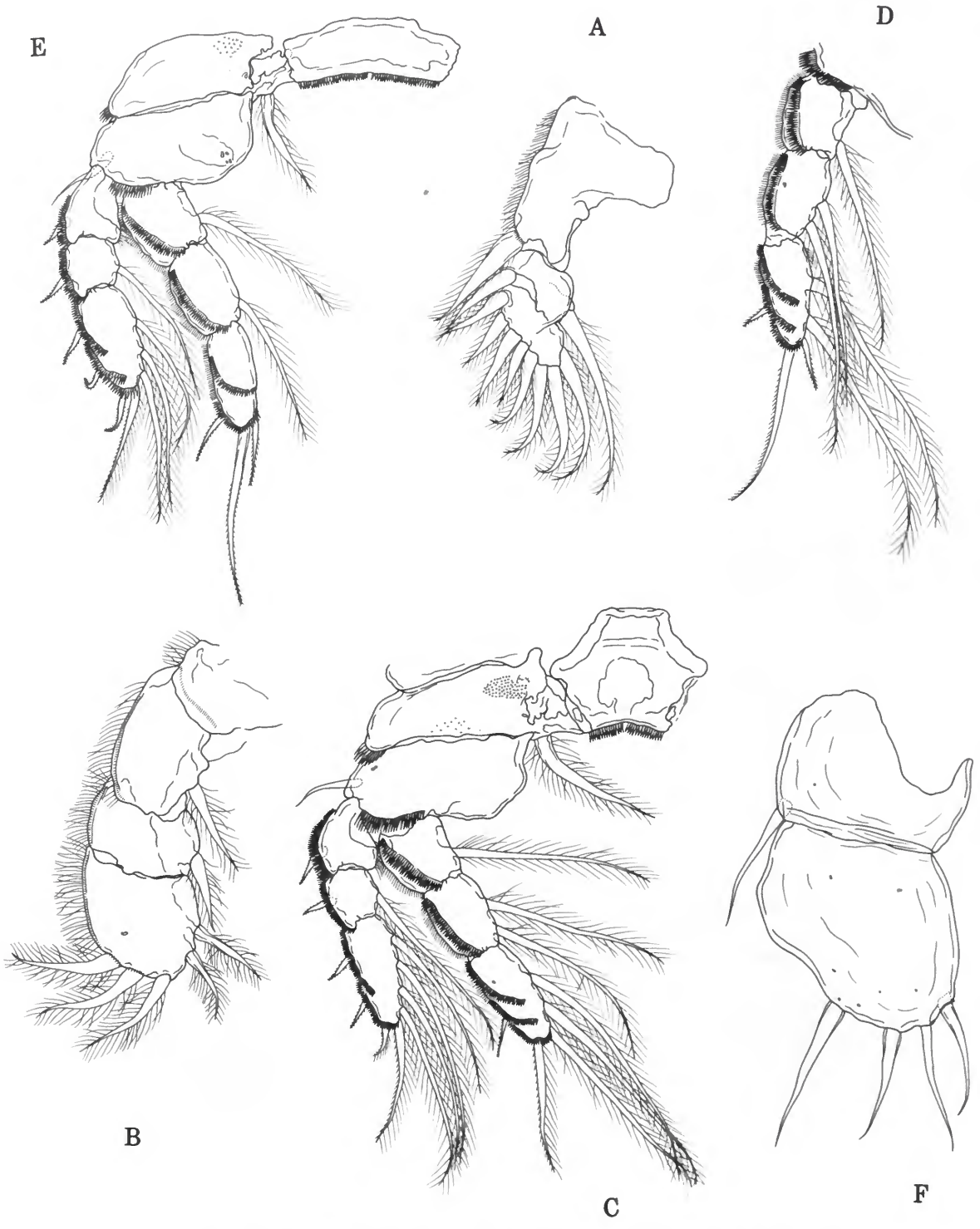

FIGURE 143.—*Pseudotaeniacanthus coniferus*, new species, female: A, leg 1 exopod, ventral; B, leg 1 endopod, ventral; C, leg 2 and interpodal plate, ventral; D, leg 3 endopod, ventral; E, leg 4 and interpodal plate, ventral; F, leg 5, ventral.

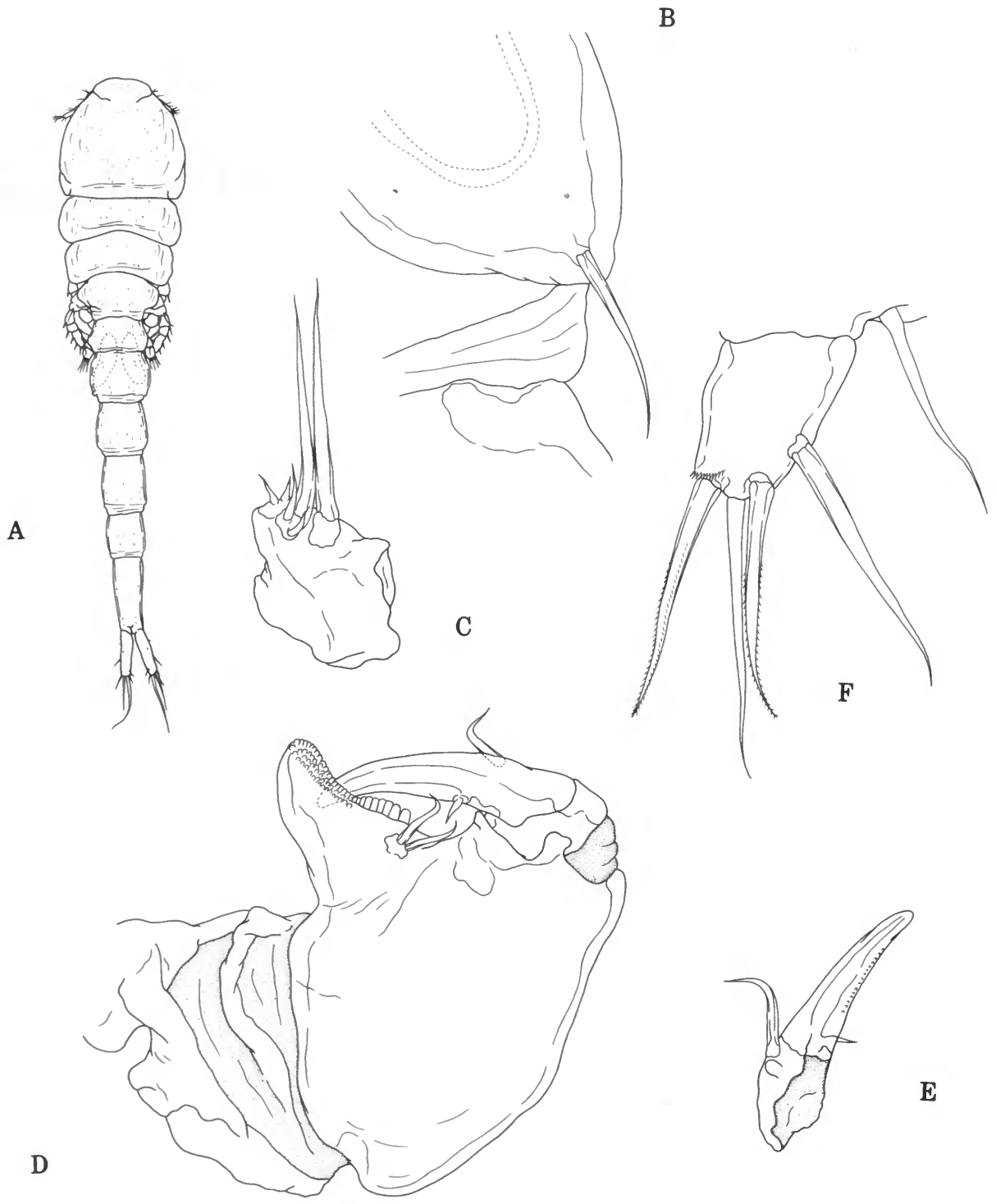

FIGURE 144.—*Pseudotaeniacanthus coniferus*, new species, male: A, dorsal; B, genital area, ventral; C, first maxilla, anteromedial; D, maxilliped, anteromedial; E, maxilliped claw, posteromedial; F, leg 5, ventral.

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 II, I, 4 on the terminal exopod segment of leg 4.

Pseudotaeniacanthus longicauda Pillai and Hameed, 1974

Pseudotaeniacanthus longicauda Pillai and Hameed, 1974:175.—Devi and Shyamasundari, 1980:203.

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

REMARKS.—*Pseudotaeniacanthus longicauda* was described by Pillai and Hameed (1974) from the body surface of *Pisoodonophis cancrivorus* (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 *Muraenesox talabonoides* (Bleeker) collected off the Waltair coast, India.

This species can be distinguished from its congers 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

Pseudotaeniacanthus puhi Lewis, 1967:5.—Pillai and Hameed, 1974:181.—Devi and Shyamasundari, 1980:203.

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.*

Scolecicara Ho, 1969

Scolecicara Ho, 1969:120.—Kabata, 1979:69.—Dojiri and Humes, 1982:429.

DIAGNOSIS.—*Female:* Body slender. Cephalothorax subspherical with first pedigerous segment fused to cephalosome. Oral appendages located in cavity in anteroventral area of cephalothorax. Second pedigerous segment comprising elongate neck. Trunk pear-shaped and formed from fusion of third and fourth pedigerous segments. Urosome slender, cylindrical. Abdomen 3-segmented. Caudal ramus bearing usual 6 setae.

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. Paragnath present. First maxilla a setiferous lobe. Second maxilla 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.—*Scolecicara humesi* Ho, 1969.

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

Scolecicara 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

Taeniacanthodes Wilson, 1935:336.—Yamaguti, 1963:26.—Kabata, 1979:68.

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. Caudal ramus with usual 6 setae.

Rostral area of female with posteriorly directed ventromedian spiniform process. First antenna distinctly or indistinctly 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.

Legs 1–4 biramous with 3-segmented rami except endopods of legs 3 and 4 only 2-segmented. First endopod segment of legs 3 and 4 with no armature. Leg 5 with 2 spines and 1 seta on second segment. Leg 6 represented by 3 setae in area of egg sac attachment.

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 denticulated 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* "washed from coelom of *Paralichthys* sp." 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 haakeri*, these 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.

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***

Taeniacanthodes gracilis Wilson, 1935

FIGURES 145–148, 164B–F, 165A, 166

Taeniacanthodes gracilis Wilson, 1935:337.—Yamaguti, 1963:26.—Ho, 1969:115.—Kabata, 1979:68.

Taeniacanthodes gunteri Causey, 1953:7; 1955:3.—Yamaguti, 1963:26.—Ho, 1969:119. [New synonymy.]

MATERIAL EXAMINED.—1 female holotype (USNM 64034) "washed from coelom of *Paralichthys* sp."; another label in museum jar reads "*Paralichthys dentatus*" 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 spilopterus* 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.—*Taeniacanthodes 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.

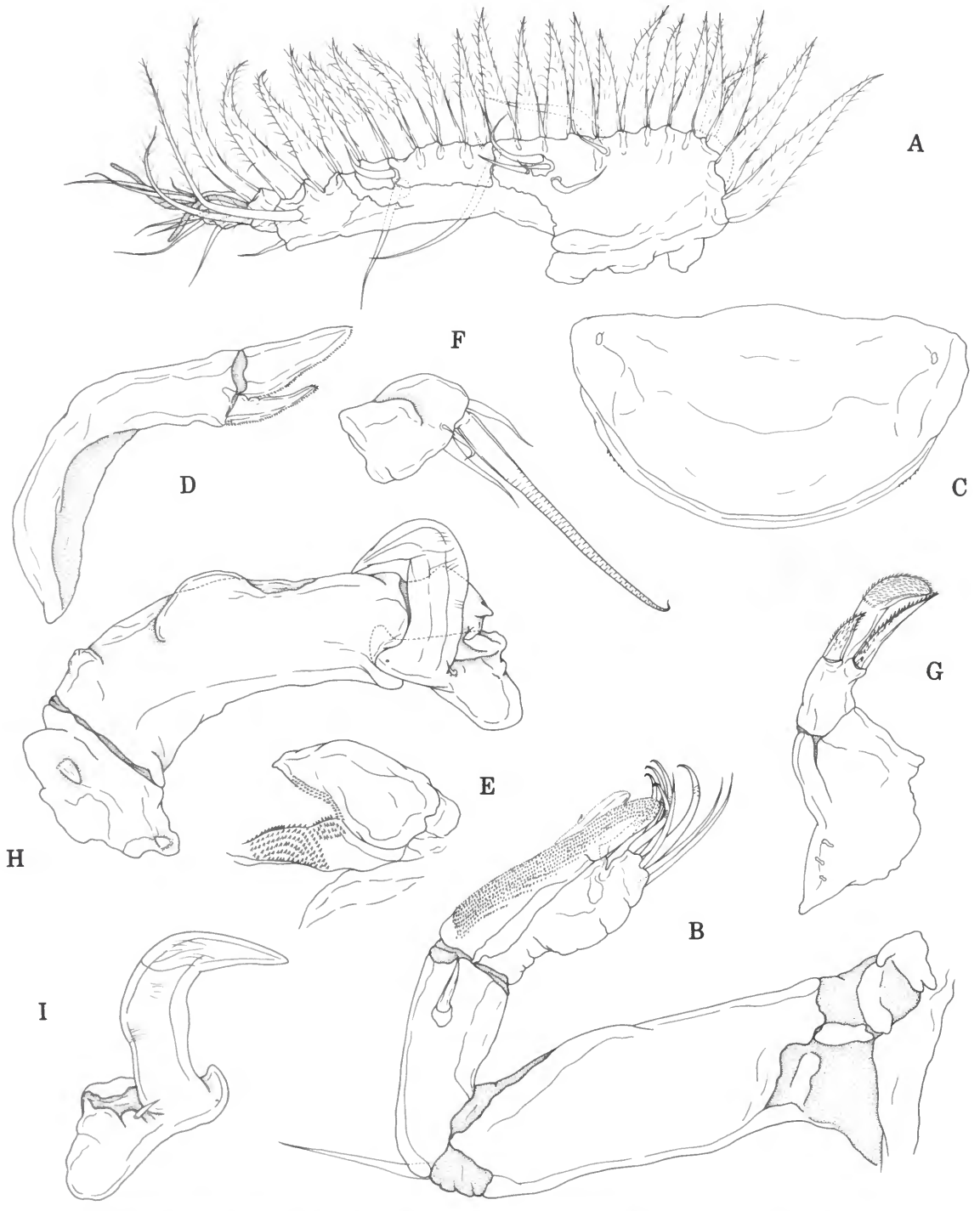

FIGURE 146.—*Taeniacanthodes gracilis* Wilson, female: A, first antenna, ventral; B, second antenna, medial; C, labrum, ventral; D, mandible, anteromedial; E, paragnath and labial area, ventral; F, first maxilla, anterior; G, second maxilla, posteroventral; H, maxilliped, anterior; I, maxilliped claw, anterior.

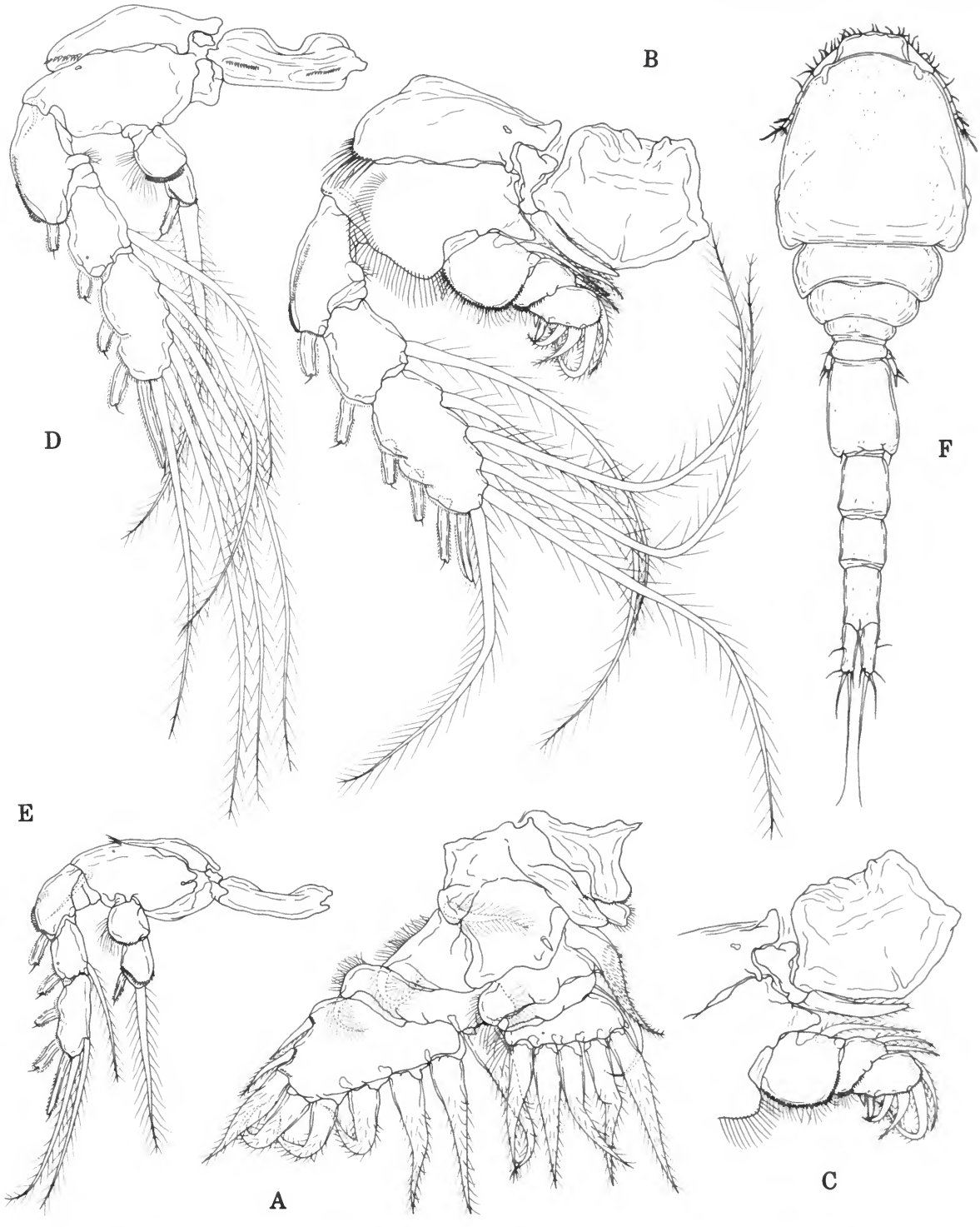

FIGURE 147.—*Taeniacanthodes gracilis* Wilson. Female: A, leg 1 and interpodal plate, ventral; B, leg 2 and interpodal plate, ventral; C, leg 2 endopod and interpodal plate, ventral; D, leg 3 and interpodal plate, ventral; E, leg 4 and interpodal plate, ventral. Male: F, dorsal.

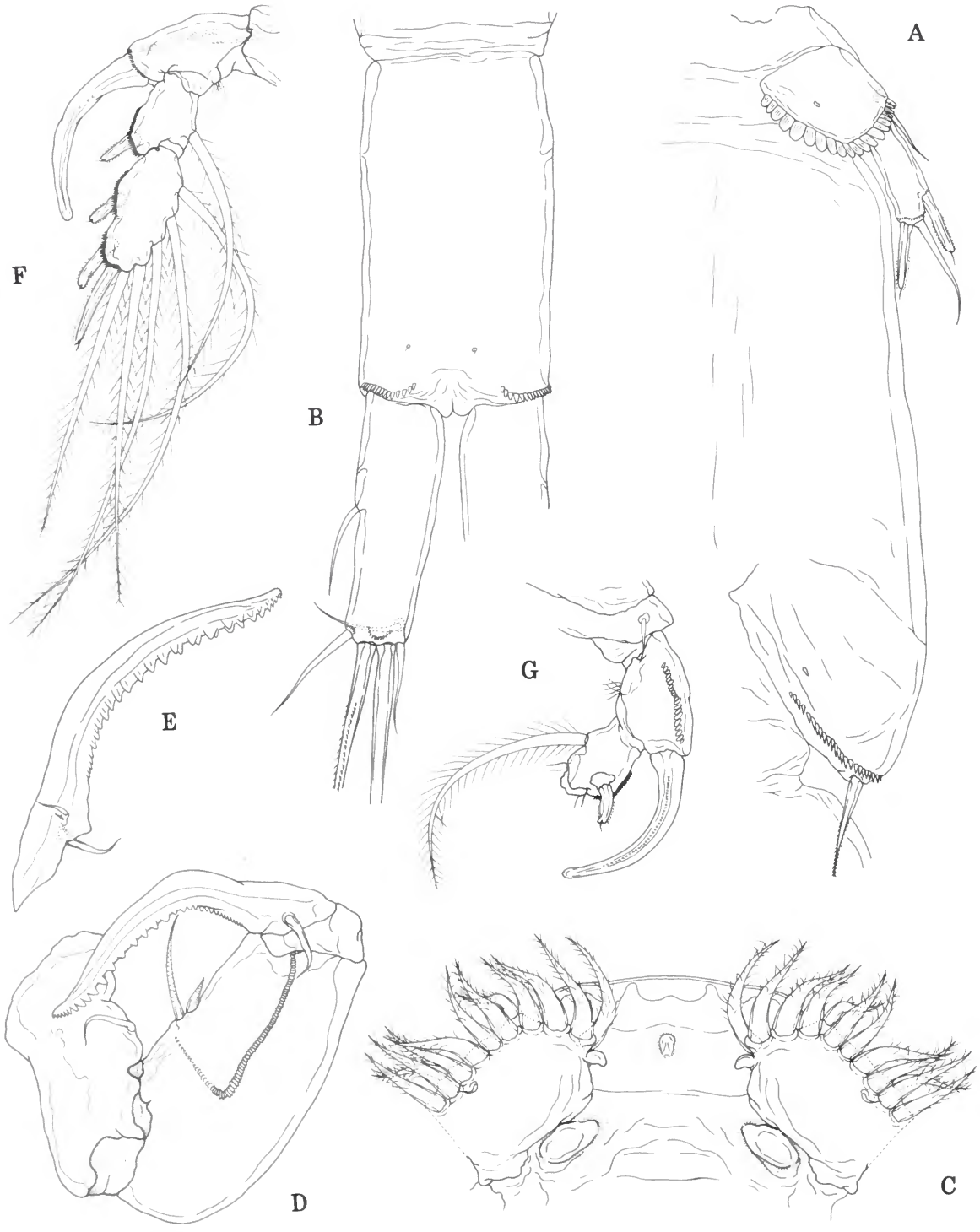

FIGURE 148.—*Taeniacanthodes gracilis* Wilson, male: A, legs 5 and 6, ventral; B, anal segment and caudal ramus, ventral; C, rostral area, ventral; D, maxilliped, posterior; E, maxilliped claw, anterior; F, leg 3 exopod, ventral; G, leg 3, first and second exopod segments, dorsal.

Figure 145A,B, and C), differences presumably due to differences in state of maturity of specimens. Genital complex (Figure 145E) much wider than long, 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 145F) 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 aesthete, and 7 + 1 aesthete. 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 (longer process with numerous rows of small spinules and 1 distal seta; shorter process with 1 seta at about midlength); terminal segment small and carrying 4 slender curved spines and 3 setae. Postantennal process absent.

Labrum (Figure 146C) with rounded posterior margin fringed by transparent membrane, and bearing short row of small spinules on each side. Mandible (Figure 146D) with 2 unequal blades, each spinulated along 1 margin. Paragnath (Figure 146E) a pointed lobe bearing a few rows of spinules along inner margin. Labial area (Figure 146E) with numerous rows of spinules. First maxilla (Figure 146F) with 5 setae and 1 anterior knob. Second maxilla (Figure 146G) 2-segmented; first segment a sclerotized area; second segment with 2 spinulated spines and spinulated terminal process (not completely fused to second segment). Maxilliped (Figure 146H,I) 3-segmented; first segment small and bearing 2 spiniform processes; 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 formula as follows:

P_1	coxa 0-1	basis 1-1	exopod 1-0; 1-1; 8 endopod 0-1; 0-1; 5
P_2	coxa 0-1	basis 1-0	exopod 1-0; 1-1; III, 1, 5 endopod 0-1; 0-2; II, 4
P_3	coxa 0-0	basis 1-0	exopod 1-0; 1-1, II, 1, 5 endopod 0-0; 1, 1
P_4	coxa 0-0	basis 1-0	exopod 1-0; 1-1; II, 1, 2 endopod 0-0; 1, 1

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 0.32 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 posteroventral 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 posteroventral 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) with 1 short, stout seta and 1 longer more slender seta, and curved row of rounded spinules; third segment small and unornamented; terminal segment a curved claw (Figure 148E) bearing 1 large posterior seta, 2 smaller anterior setae, and numerous teeth (2 rows along distal third of claw) along inner (concave) margin. Spine of first segment of exopod of leg 3 (Figure 148F,G) extremely large and curved, extending past midlength of terminal exopod segment, and possibly used to clasp female during copulation. Leg 5 (Figure 148A) much longer than wide, 32 × 9 μm. Leg 6 (Figure 148A) represented by bristled spine on posteroven-

tral flap of genital opening. All other appendages as in female.

REMARKS.—Wilson (1935) first described *Taeniacanthodes gracilis* from a species of *Paralichthys* from Dry Tortugas, Florida. Although Wilson reported *Paralichthys squamilentus* as the host of this species, the label in the museum jar reads "*Paralichthys dentatus* (Linnaeus)." We collected all our new material from *Paralichthys squamilentus* (see "Aggregative Behavior of *Taeniacanthodes gracilis*"). Subsequent to Wilson's description of *T. gracilis,* Causey (1953) described another species of *Taeniacanthodes, T. gunteri,* from the body surface of *Citharichthys spilopterus* Günther collected at Port Aransas, Texas. Ho (1969) suspected that *T. gunteri* may be a junior synonym of *T. gracilis*. The slide of Causey's holotypic female (USNM 94094) was examined. However, as noted by Ho, the specimen was in such poor condition on the slide that examination was difficult. We dissolved the mounting medium and cleared the specimen in lactic acid. Detailed examination of the holotype of *T. gunteri* (now preserved in ethanol) revealed that Causey's specimen is the same species as that described earlier by Wilson as *T. gracilis*. Consequently, *T. gunteri* must be considered a junior synonym of *T. gracilis*.

There are several characteristics that distinguish the type-species from the only other known species of *Taeniacanthodes, T. haakeri* Ho, 1972: (1) general habitus of the female (second pedigerous segment narrower than cephalothorax, third and fourth pedigerous segment almost completely fused, and elongate abdomen in *T. gracilis*), (2) armature of legs 3 and 4 (see leg formula), and (3) the spine of the first segment of the exopod of leg 3 in the male of *T. gracilis* is extremely large and curved.

This is the first description of the male of *T. gracilis.*

Taeniacanthodes haakeri Ho, 1972

FIGURES 149–152

Taeniacanthodes haakeri Ho, 1972:996; 1975:70.—Dojiri, 1977:117.—Kabata, 1979:68.

MATERIAL EXAMINED.—1 female holotype (USNM 140784) and 10 female paratypes (USNM 140786) from fins of California halibut *Paralichthys californicus* (Ayres) collected in Anaheim Bay, California, 10 January 1971 by J.-S. Ho. From horneyhead turbot *Pleuronichthys verticalis* Jordan and Gilbert: 1 female, 1 copepodid at 33°36′N, 117°57.8′W, 8 October 1975; 2 females at 33°36.0′N, 117°.57.8′W, 7 April 1976; 1 female, 1 immature female at 33°37.0′N, 117°59.3′W, 14 January 1976; 45 females, 1 immature female, 12 copepodids at 33°37.0′N, 117°59.3′W, 7 April 1976; 62 females, 6 immature females, 12 copepodids, 1 male at 33°37.0′N, 117°59.3′W, 18 August 1976; 137 females, 2 immature females, 60 copepodids, 2 couples in copula at 33°35.7′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 xanthostigma* 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. From California tonguefish *Symphurus atricauda* (Jordan and Gilbert): 1 female 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′W, 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 × 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 × 244 μm. Abdomen 3-segmented; segments from anterior to posterior 92 × 120 μm, 97 × 115 μm, and 239 × 110 μm (l × w); anal segment (Figure 149D) longer than preceding 2 segments combined, and bearing 1 row of spinules on each side of posteroventral margin near insertion of caudal ramus. Caudal ramus (Figure 149D) more than 2 times longer than wide, 96 × 35 μm, and bearing 6 setae and several spinules 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 spinules on longer pectinate process larger and curved spines on terminal

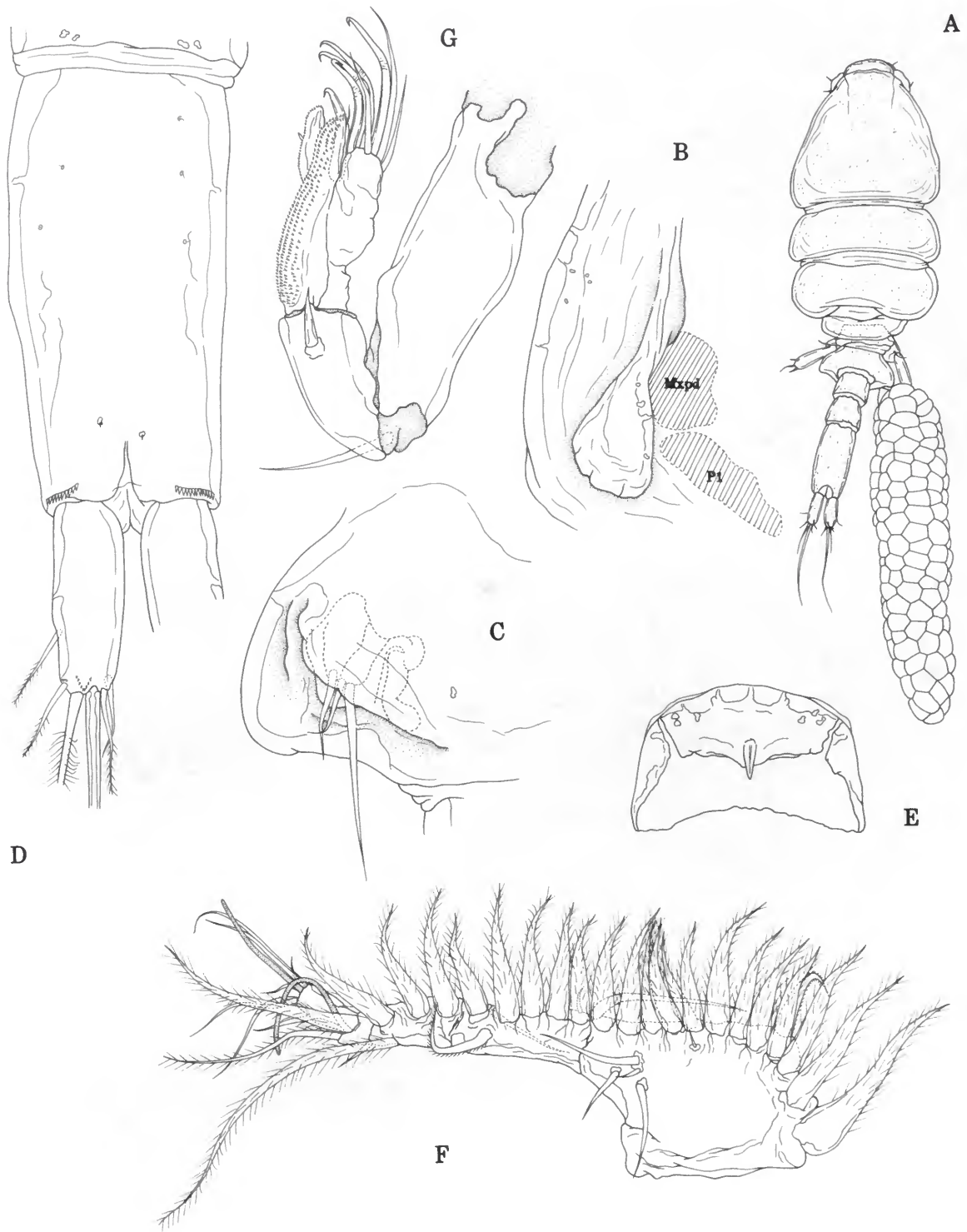

FIGURE 149.—*Taeniacanthodes haakeri* Ho, female: A, dorsal; B, cephalothorax, posterolateral corner, ventral; C, genital area, ventral; D, anal segment and caudal ramus, ventral; E, rostral area, ventral; F, first antenna, ventral; G, second antenna, medial. (Mxpd = maxilliped, P1 = leg 1.)

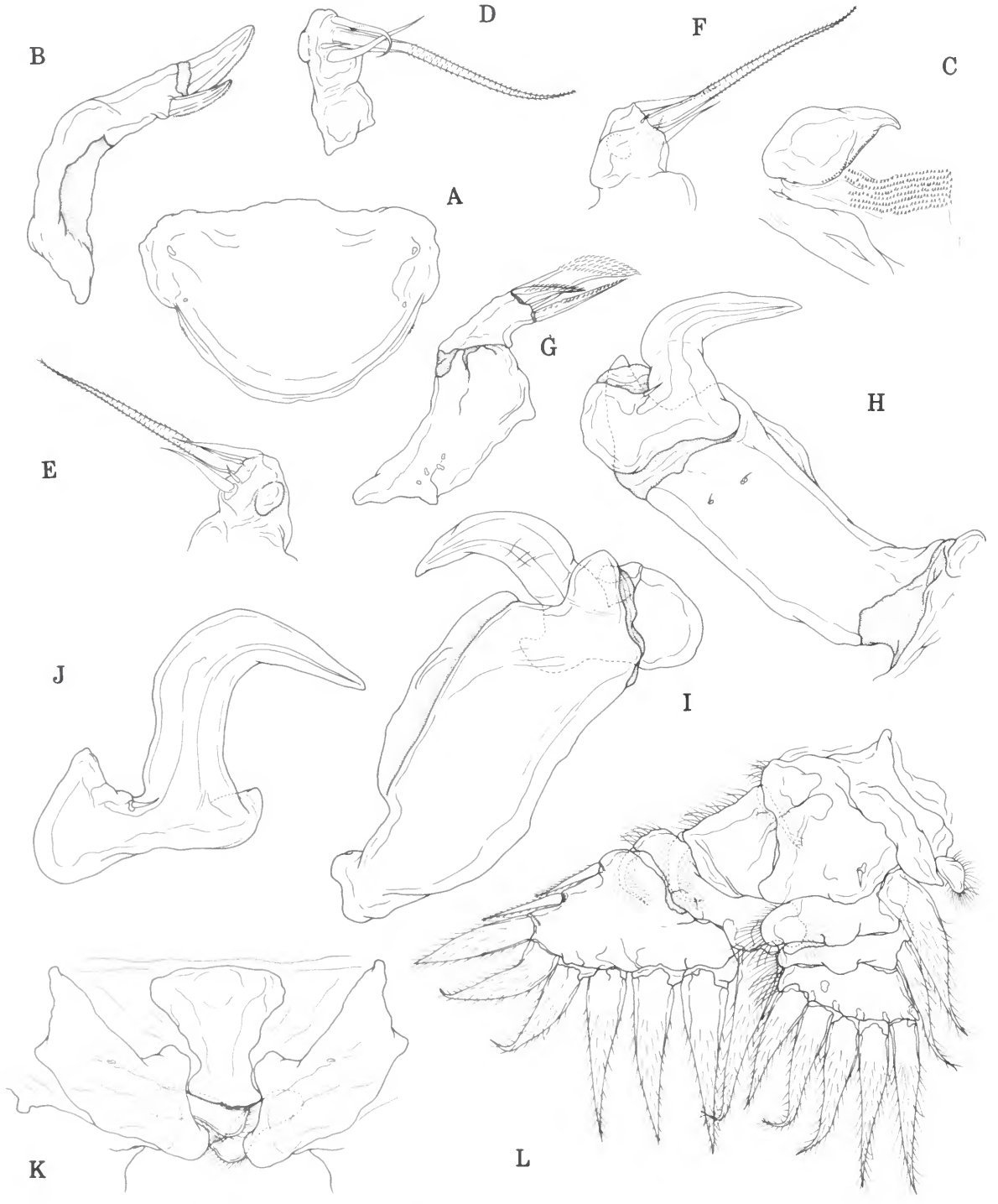

FIGURE 150.—*Taeniacanthodes haakeri* Ho, female: A, labrum, ventral; B, mandible, anteromedial; C, paragnath and labial area, ventral; D, first maxilla, anteromedial; E, same, anterior; F, same, posterior; G, second maxilla, posteroventral; H, maxilliped, anterior; I, same, posterior; J, maxilliped claw, anterior; K, leg 1, interpodal plate, ventral; L, leg 1, ventral.

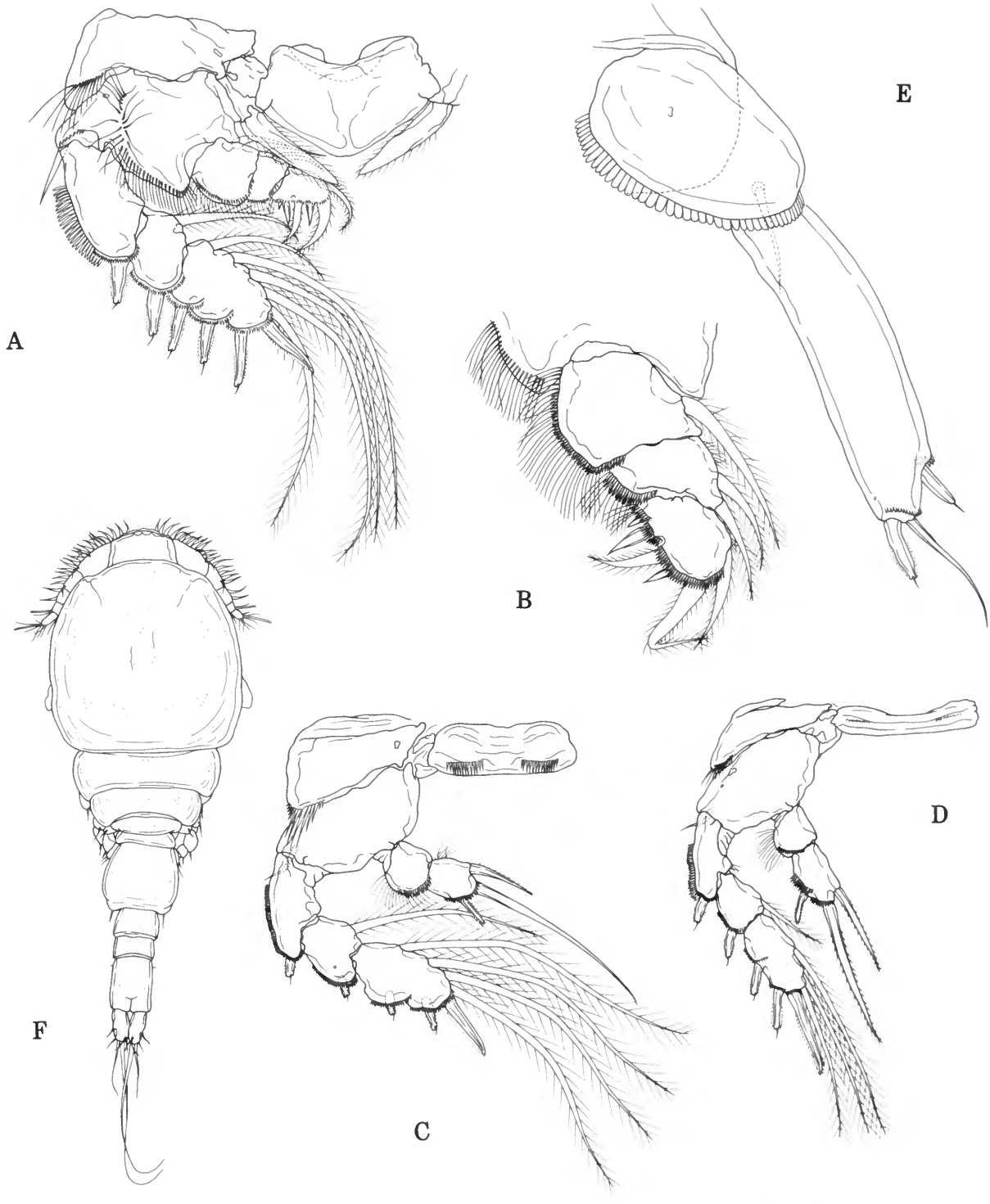

FIGURE 151.—*Taeniacanthodes haakeri* Ho. Female: A, leg 2 and interpodal plate, ventral; B, leg 2 endopod, ventral; C, leg 3 and interpodal plate, ventral; D, leg 4 and interpodal plate, ventral; E, leg 5, ventral. Male: F, dorsal.

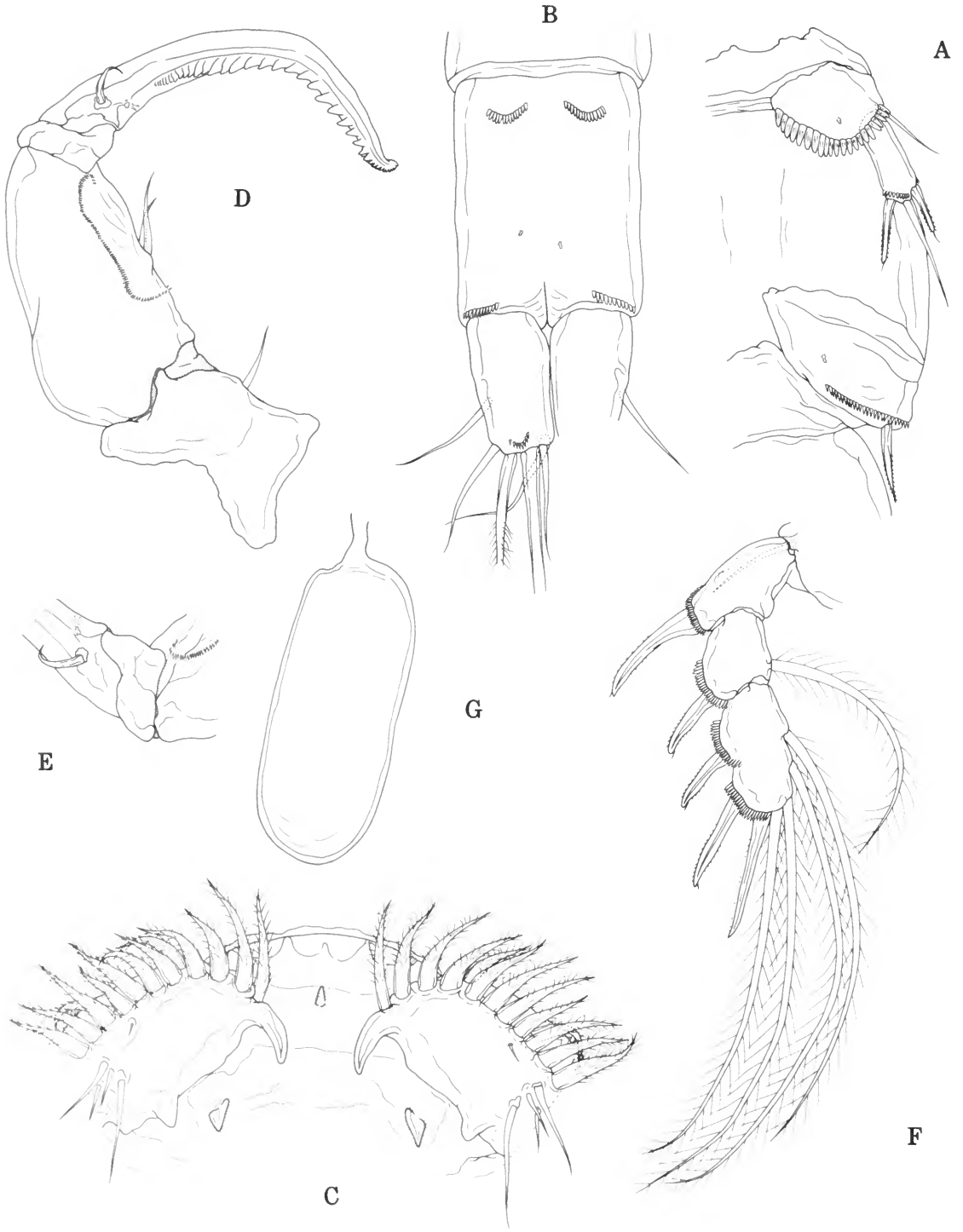

FIGURE 152.—*Taeniacanthodes haakeri* Ho, male: A, legs 5 and 6, ventral; B, anal segment and caudal ramus, ventral; C, rostral area and basal portions of first antenna, ventral; D, maxilliped, posterior; E, maxilliped claw, basal portion, posterior; F, leg 3 exopod, ventral; G, spermatophore, ventral.

segment relatively longer. Postantennal 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_1	coxa 0-1	basis I-1	exopod I-0; I-1; 8 endopod 0-I; 0-I; 5
P_2	coxa 0-1	basis I-0	exopod I-0; I-I, III, I, 5 endopod 0-I; 0-2; II, I, I, 2
P_3	coxa 0-0	basis I-0	exopod I-0; I-I, II, I, 4 endopod 0-0; I, I, I
P_4	coxa 0-0	basis I-0	exopod I-0; I-1, II, I, 3 endopod 0-0; III (or 1, 2 int.)

Leg 1 (Figure 150K,L) similar to that of *T. gracilis* except setae slightly stouter. Leg 2 (Figure 151A,B) with interpodal 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 (Figures 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 × 53 μm (l × w); anal segment (Figure 152B) with 1 curved row of spinules on each side of anteroventral surface and 1 row on posteroventral 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 posteroventral 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

Taeniastrotos Cressey, 1969:409.—Kabata, 1979:68.

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. Postantennal 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 posteroventral flap. Except for maxilliped, appendages similar to those in female. Maxilliped subchelate with denticulated curved claw.

TYPE-SPECIES.—*Taeniastrotos californiensis* Cressey, 1969.

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 *Trachinocephalus 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 *Taeniastrotos*. Both species exhibit a general habitus including a protuberant rostral area similar to that of the other two species of *Taeniastrotos*. A very important characteristic that these two species have in common with *Taeniastrotos* is a sigmoid-shaped maxilliped claw on the female. Also *Anchistrotos pleuronichthydis* bears an inflated seta on the first maxilla identical to that seen in *Taeniastrotos californiensis*. *Anchistrotos trachuri* carries a ventral shield-like structure on the rostral area reminiscent of that found in *Taeniastrotos*. Unfortunately, we were not successful in collecting or obtaining specimens of either of these two species. However, as there are important similarities among *A. pleuronichthydis* and *A. trachuri* with other species of *Taeniastrotos*, these two species are included in *Taeniastrotos*.

Key to Species of *Taeniastrotos* Females

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

Taeniastrotos californiensis Cressey, 1969

FIGURES 153–157, 165B–F

Taeniastrotos californiensis Cressey, 1969:410.

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. Cephalothorax 498 × 508 μm (l × 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 × 161 μm. Abdomen 4-segmented; segments from anterior to posterior 58 × 81 μm, 58 × 69 μm, 51 × 62 μm, and 67 × 62 μm (l × w); anal segment (Figure 153C) with a row of spinules along posteroventral border near insertion of caudal ramus. Caudal ramus (Figure 153C) longer than wide, 78 × 30 μm, bearing a short row of spinules on ventral posterior margin, and armed with 6 setae.

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 semipinnate), 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 154D) with 2 terminal blades; shorter blade spinulated 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

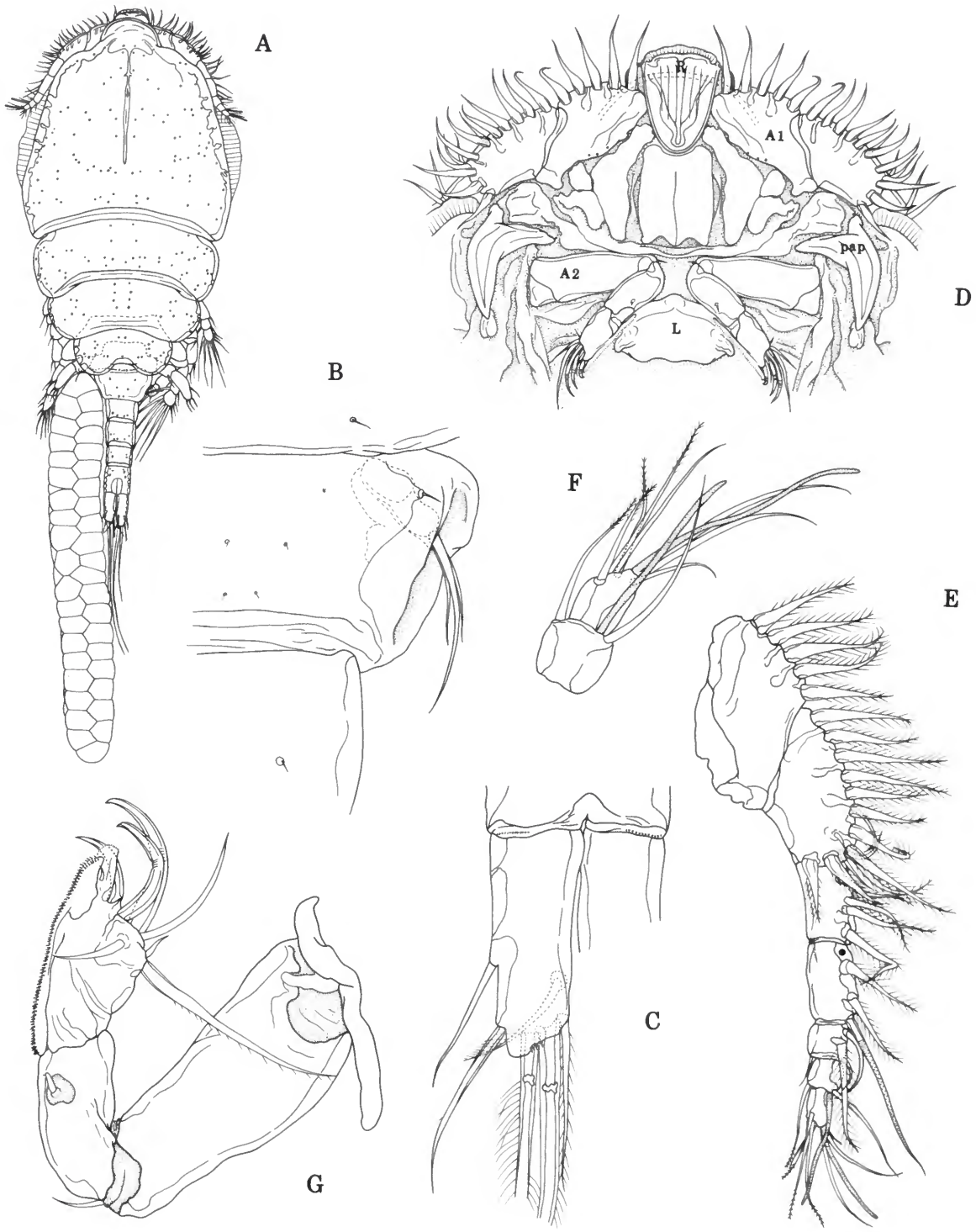

FIGURE 153.—*Taeniastrotos californiensis* Cressey, female: A, dorsal; B, genital area, dorsal; C, caudal ramus, ventral; D, cephalothorax, anterior portion, ventral; E, first antenna, anteroventral; F, first antenna, distal two segments, anterodorsal; G, second antenna, medial. (R = rostral area, A1 = first antenna, A2 = second antenna, pap = postantennal process, L = labrum.)

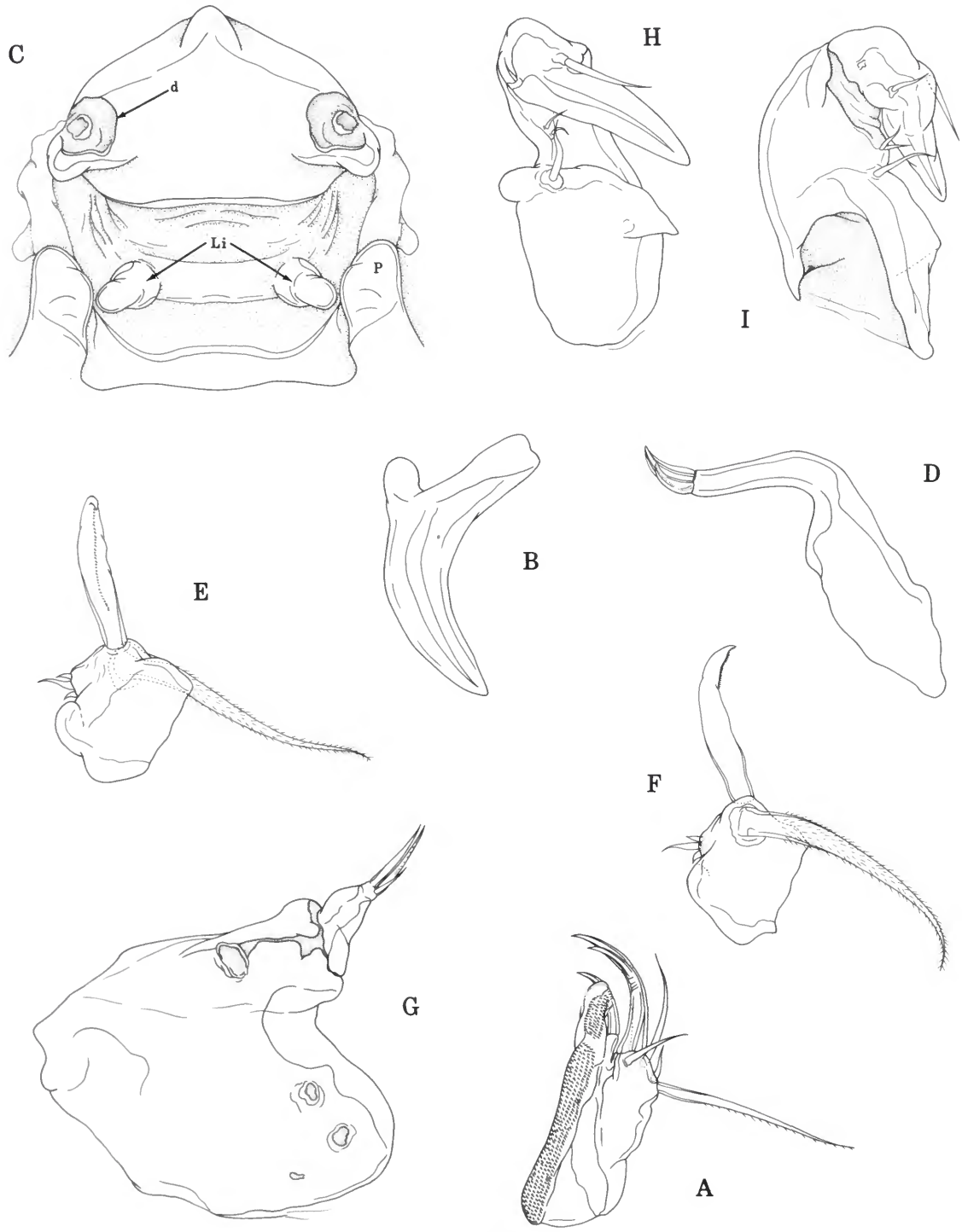

FIGURE 154.—*Taeniastrotos californiensis* Cressey, female: A, second antenna, distal portion, medial; B, postantennal process, ventral; C, labrum, paragnaths, and labium, ventral; D, mandible, anteromedial; E, first maxilla, anterior; F, same, posterior; G, second maxilla, posteroventral; H, maxilliped, medial; I, same, dorsal. (d = depression (pit), Li = labium, P = paragnath.)

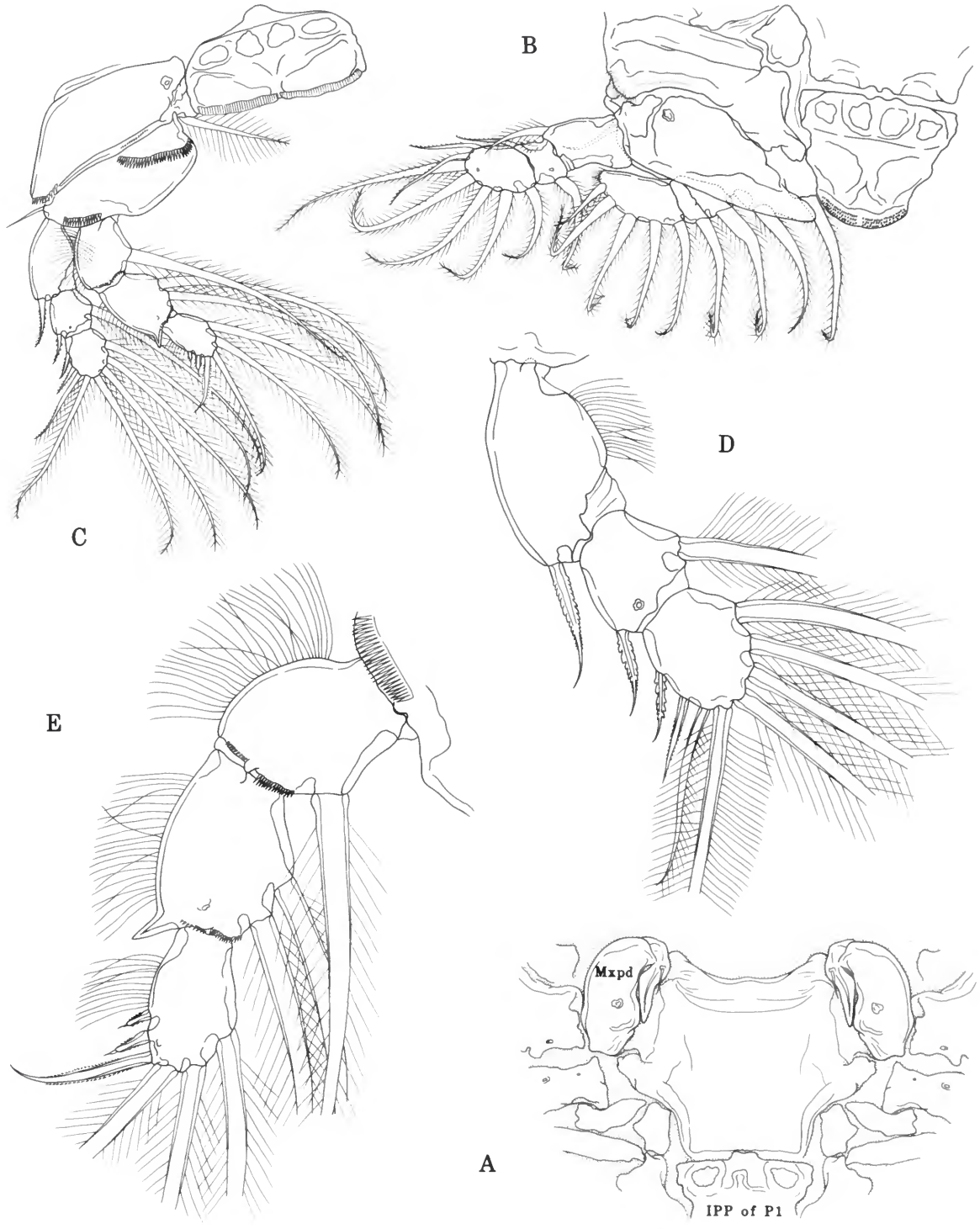

FIGURE 155.—*Taeniastrotos californiensis* Cressey, female: A, maxillipeds and sternal area, ventral; B, leg 1 and interpodal plate, ventral; C, leg 2 and interpodal plate, ventral; D, leg 2 exopod, ventral; E, leg 2 endopod, ventral. (Mxpd = maxilliped, IPP of P1 = interpodal plate of leg 1.)

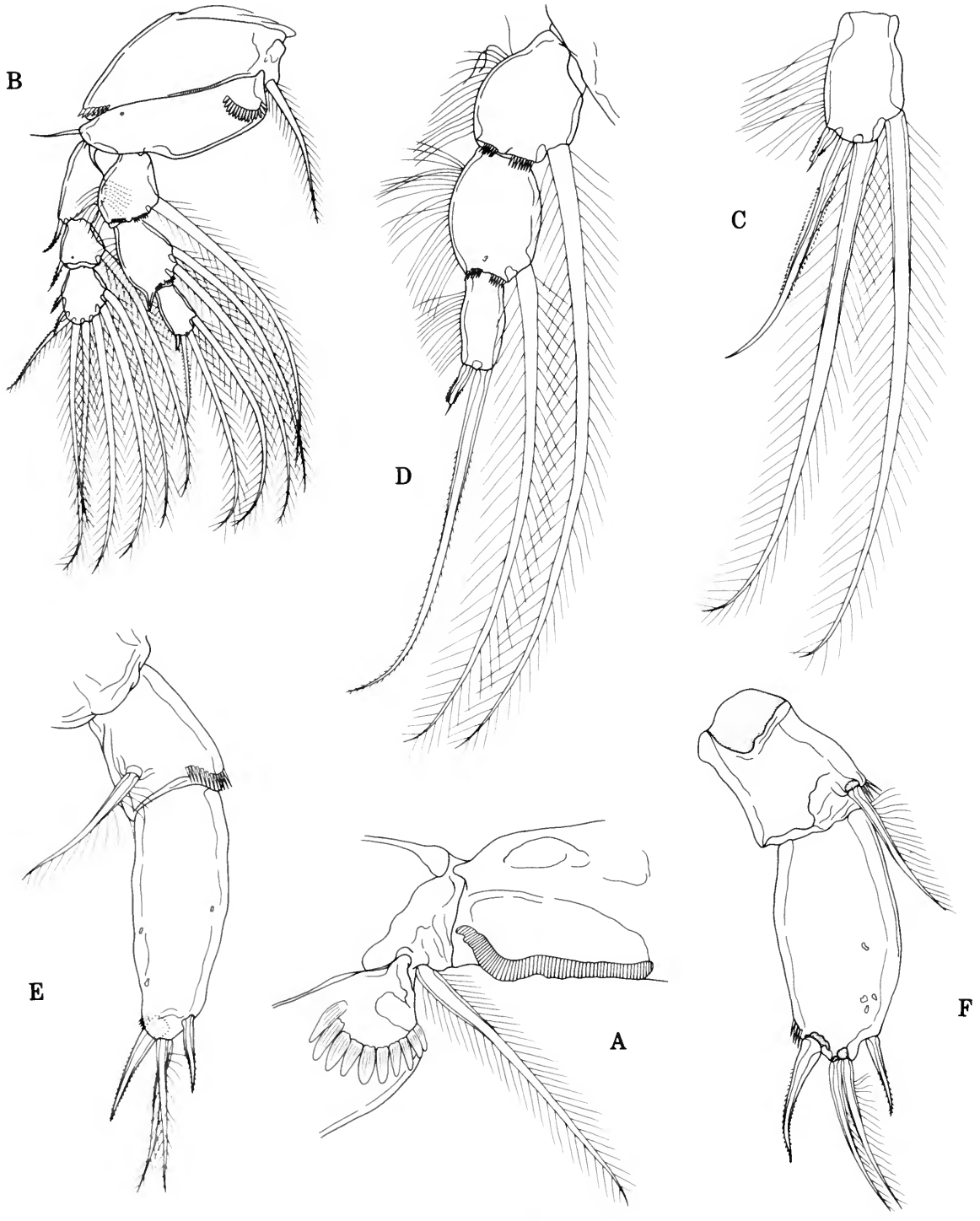

FIGURE 156.—*Taeniastrotos californiensis* Cressey, female: A, leg 3, interpodal plate and proximal portion of basipod, ventral; B, leg 3, ventral; C, leg 3, terminal endopod segment, ventral; D, leg 4 endopod, ventral; E, leg 5, dorsal; F, same, posterodorsal.

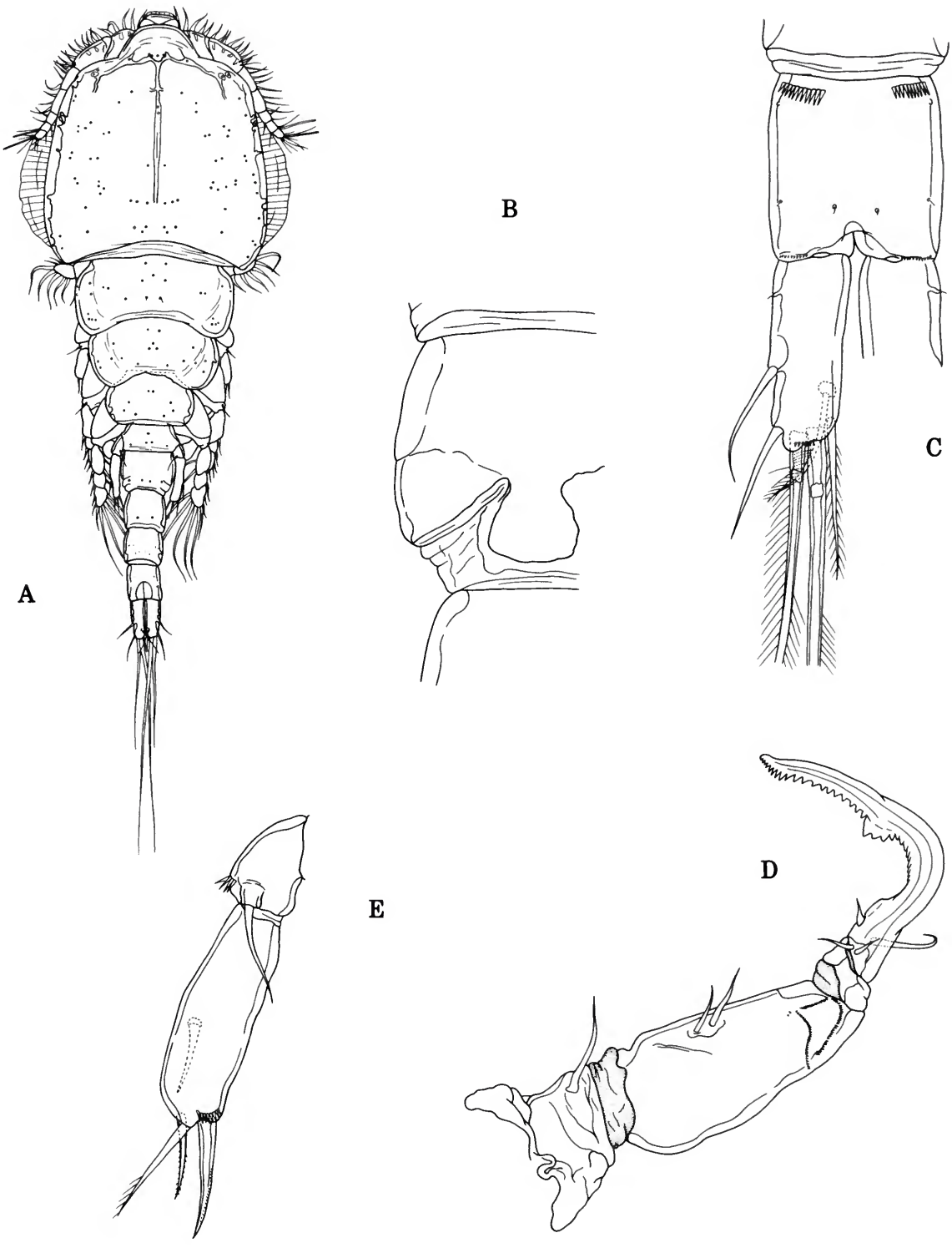

FIGURE 157.—*Taeniastrotos californiensis* Cressey, male: A, dorsal; B, genital area, ventral; C, anal segment and caudal ramus, ventral; D, maxilliped, anteromedial; E, leg 5, posterodorsal.

unequal setae and 1 spinulated seta. Maxilliped (Figures 154H,I, 165D) 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 maxillipeds as in Figure 155A.

Legs 1–4 (Figures 155B–E, 156A–D) biramous. Spinal and setal formula as follows:

P_1	coxa 0-1	basis 1-1	exopod 1-0; 1-1; 7 endopod 0-1; 0-1; 5
P_2	coxa 0-1	basis 1-0	exopod I-0; I-1; II, 1, 5 endopod 0-1; 0-2; II, I, 3
P_3	coxa 0-1	basis 1-0	exopod 1-0; I-1; II, 1, 5 endopod 0-1; 0-2; II, 2 (or I, int., 2)
P_4	coxa 0-1	basis 1-0	exopod I-0; I-1; II, 1, 5 endopod 0-1; 0-1; II (or I, 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 posterolateral 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 165E,F) 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 spinules on each side of anteroventral surface and 1 row of small spinules on posteroventral 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 157D) 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 tragus* 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

Anchistrotos pleuronichthydis Yamaguti, 1939:410; 1963:23.

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 claw of the 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

Anchistrotos trachuri Avdeev, 1977:135.

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

Male: Unknown.

REMARKS.—Avdeev (1977) first described this species

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

Species	Broad seta on first maxilla	Accessory process of MXPD of female	Number of elements on terminal endopod segment of leg 4
T. californiensis	present	absent	2
T. tragus	absent	present	3
T. pleuronichthydis	present	present	4
T. tachuri	absent	absent	4

under the binomen *Anchistrotos trachuri* 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 *Nemipterus 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) 97 × 198 μm. Abdomen 4-segmented; segments from anterior to posterior 74 × 104 μm, 69 × 99 μm, 53 × 90 μm, and 81 × 83 μm (l × w); anal segment (Figure 158C) 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 aesthete, and 7 + 1 aesthete. 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 159D) 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:

P_1	coxa 0-1	basis 1-1	exopod I-0; 9 endopod 0-1; 6
P_2	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-2; II, I, 3
P_3	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-2; II, I, 2
P_4	coxa 0-0	basis 1-0	exopod I-0; I-1; II, I, 5 endopod 0-1; 0-1; II, I

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 copepodids of *Taeniacanthodes gracilis* in an aggregation (cluster) (Figure 166A) on the fins of *Paralichthys squamilentus* from off the east coast of Florida (27°12′N, 80°00′W). This is the first record of aggregative behavior reported for

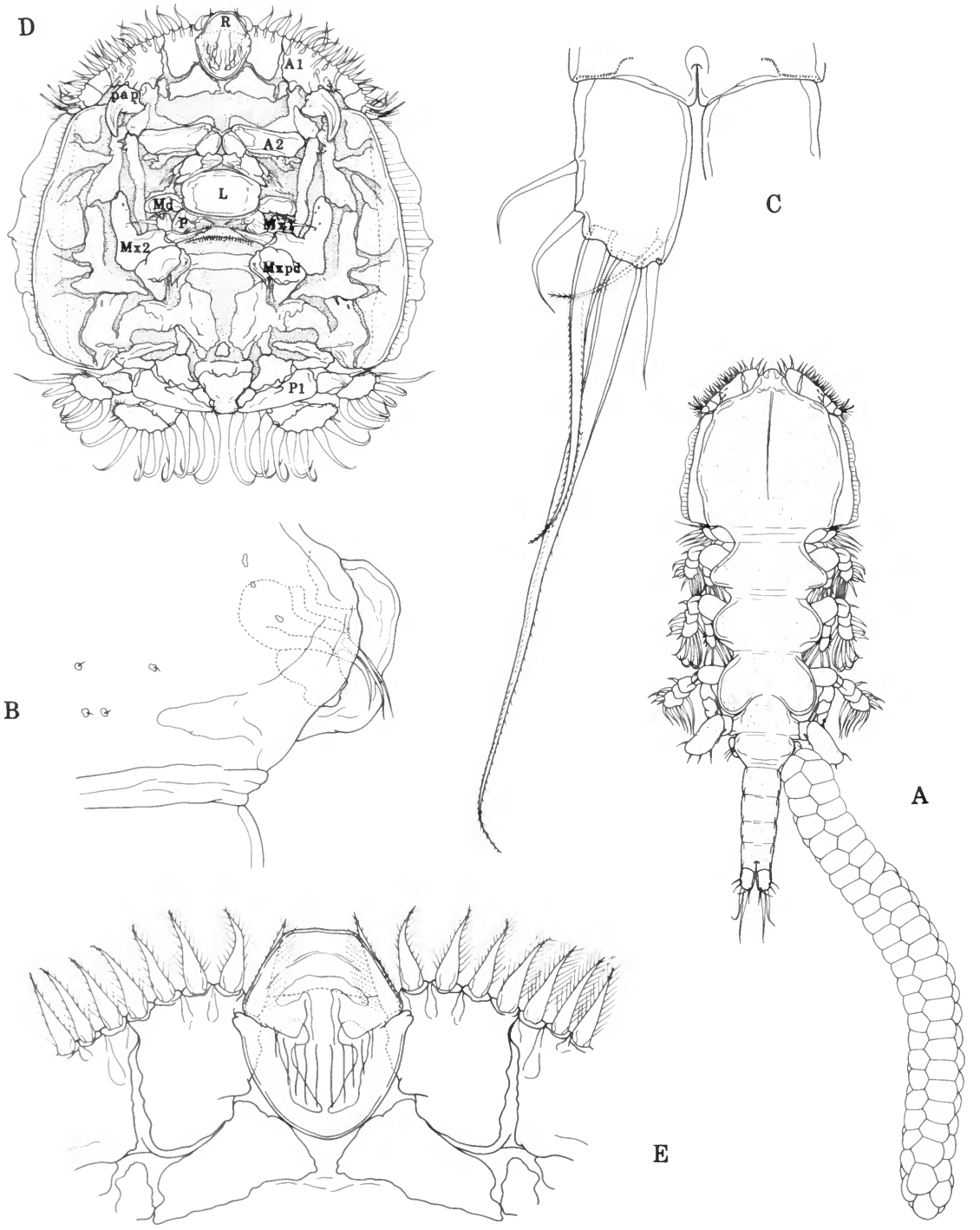

FIGURE 158.—*Taeniastrotos tragus*, new species, female: A, dorsal; B, genital area, dorsal; C, caudal ramus, ventral; D, cephalothorax, ventral; E, rostral area, ventral. (R = rostral area, A1 = first antenna, A2 = second antenna, pap = postantennal process, L = labrum, Md = mandible, P = paragnath, Mx1 = first maxilla, Mx2 = second maxilla, Mxpd = maxilliped, P1 = leg 1.)

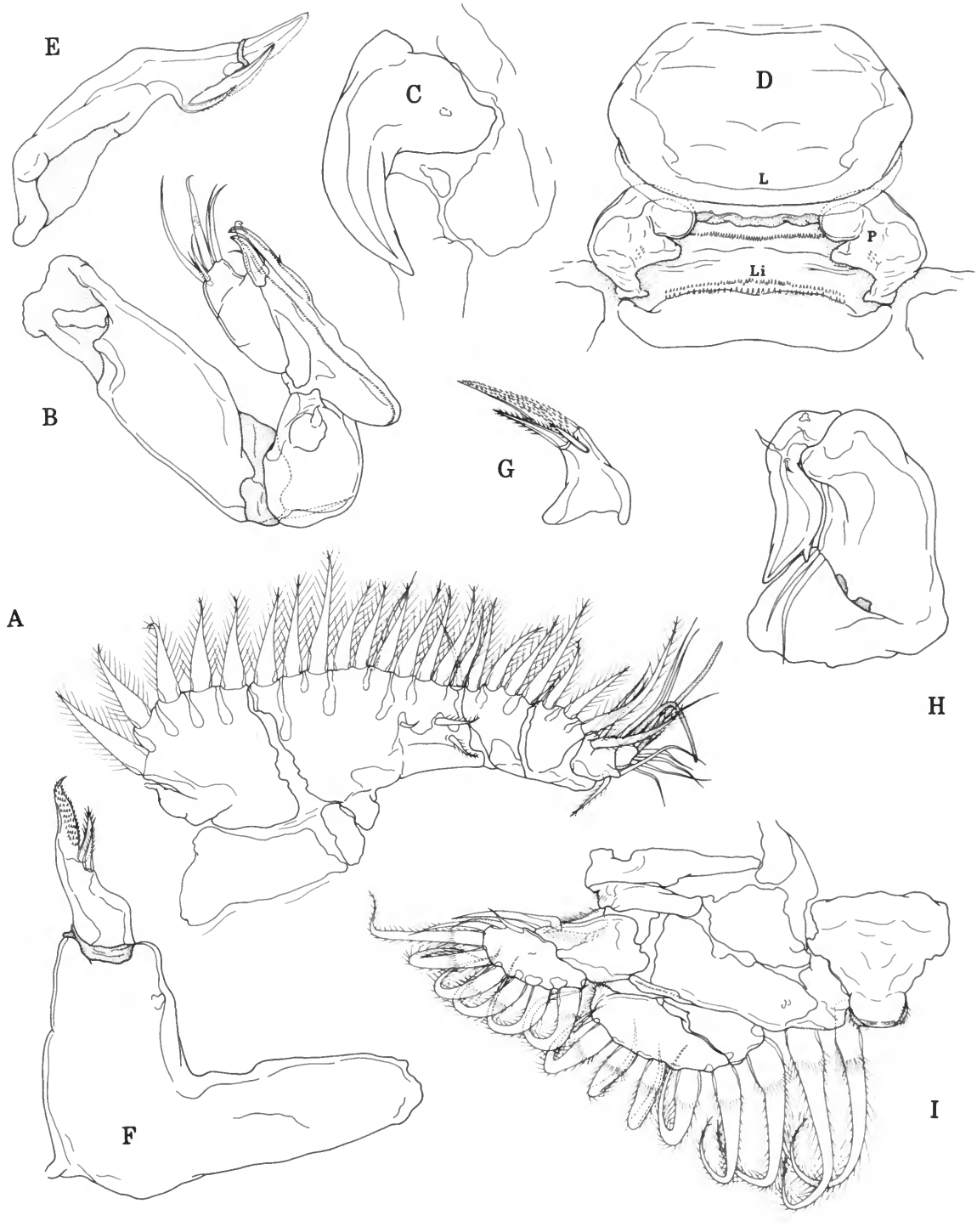

FIGURE 159.—*Taeniastrotos tragus*, new species, female: A, first antenna, ventral; B, second antenna, medial; C, postantennal process, ventral; D, labrum, paragnaths, and labial area, ventral; E, mandible, anteromedial; F, second maxilla, anterior; G, second maxilla, terminal segment, anterior; H, maxilliped, ventral; I, leg 1 and interpodal plate, ventral. (L = labrum, P = paragnath, Li = labium.)

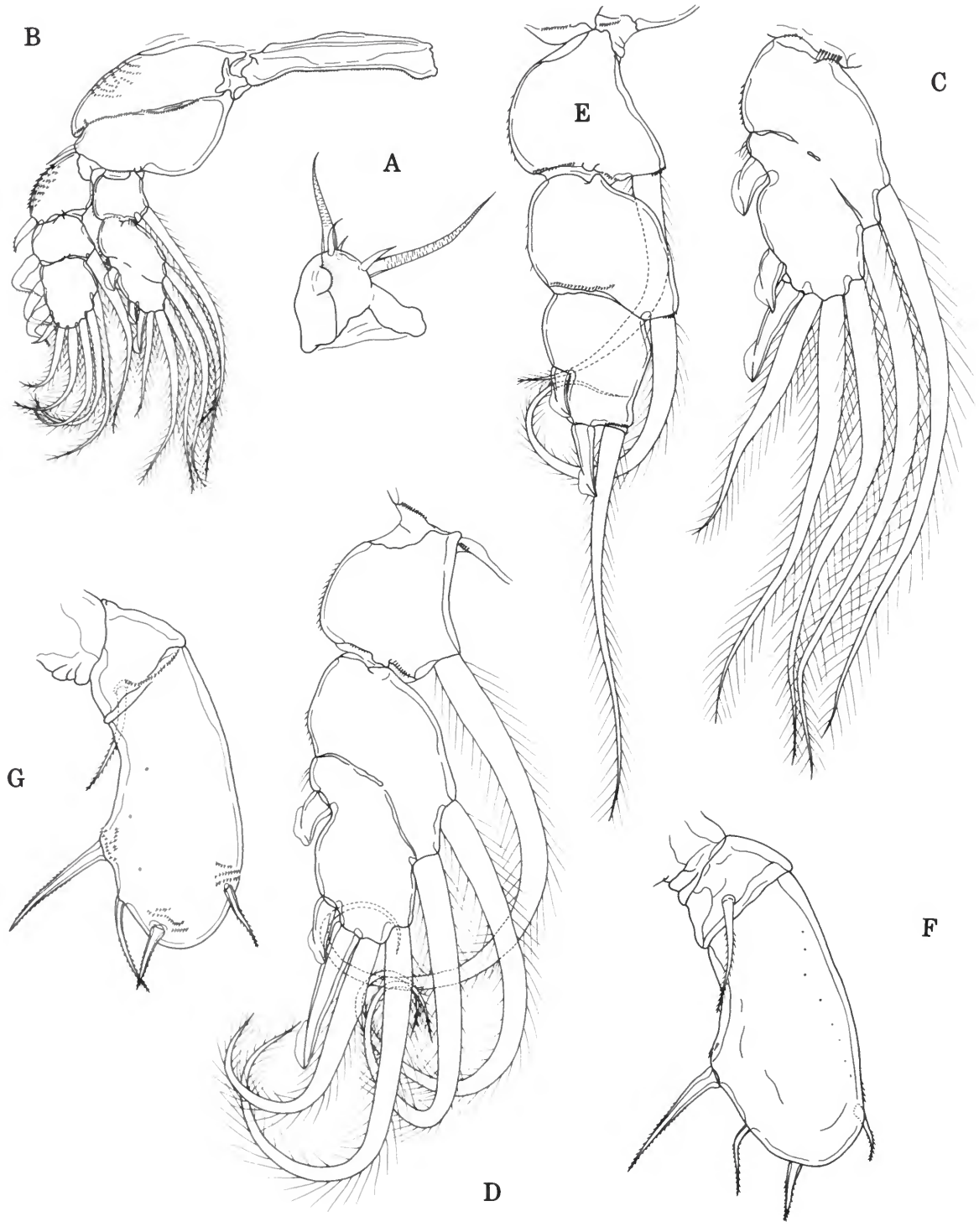

FIGURE 160.—*Taeniastrotos tragus*, new species, female: A, first maxilla, anterior; B, leg 2 and interpodal plate, ventral; C, leg 2, distal two endopod segments, ventral; D, leg 3 endopod, ventral; E, leg 4 endopod, ventral; F, leg 5, dorsal; G, same, ventral.

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 *Pandarus 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. *Irodes* has been recorded from the Red Sea and the Indo-West Pacific and western Atlantic oceans. Both *Pseudotaeniacanthus* and *Metataeniacanthus* 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. *Scolecicara* is known from a single collection from the Gulf of Mexico. *Taeniastrotos,* first described from off California, has also been recorded from India to Japan. Species of *Taeniastrotos* 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 *Taeniastrotos* species.

The three genera (*Clavisodalis, Echinirus,* and *Echinosocius*) 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. *Metataeniacanthus* (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 *Acanthurus* (Lewis, 1968). The three genera *Clavisodalis* (7 species), *Echinirus* (3 species), and *Echinosocius* (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 tetraodontiform family Monacanthidae. *Scolecicara* (1 species) has been collected only from *Porichthys. Taeniacanthodes* (with 2 exceptions, *Engraulis* and *Genyonemus*) 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 *Taeniastrotos* (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. fugu, kitamakura, lagocephali, pectinatus, tetradonis,* and *yamagutii;* (4) *T. ostracionis* and *moa;* (5) *Cirracanthus 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.)

Echinoderms
  Echinoidea
    Echinothuriidae
      Asthenosoma varium
        Clavisodalis salmacidis
    Diadematidae
      Diadema setosum
        Clavisodalis dilatatus
        Clavisodalis sentifer
        Echinirus diadematis
        Echinirus laxatus
        Echinosocius dentatus
        Echinosocius elatensis
        Echinosocius finitimus
        Echinosocius gulicolus
        Echinosocius pectinatus
      Diadema sp.
        Clavisodalis sentifer
        Echinirus sp.
        Echinosocius sp.
    Temnopleuridae
      Salmacis belli
        Clavisodalis salmacidis
    Echinometridae
      Echinometra mathaei
        Clavisodalis parvibullatus
      Heterocentrotus mammillatus
        Clavisodalis abbreviatus
        Clavisodalis tenuis
      Heterocentrotus trigonarius
        Clavisodalis heterocentroti

Elasmobranchs
  Rajiformes
    Rajidae
      Raja fullonica
        Taeniacanthus wilsoni
  Rhinobatiformes
    Rhynchobatidae
      Rhynchobatus djiddensis
        Irodes gracilis
  Torpediniformes
    Torpedinidae
      Narcine timlei
        Taeniacanthus narcini
  Carcharhiniformes
    Carcharhinidae
      Carcharhinus leucas
        Irodes gracilis
      Carcharhinus maculipinnis
        Irodes gracilis
      Rhizoprionodon acutus
        Irodes gracilis
    Hemiscylliidae
      Chiloscyllium indicum
        Irodes gracilis
    Sphyrnidae
      Sphyrna diplana
        Irodes gracilis
      Sphyrna lewini
        Irodes gracilis
      Sphyrna tiburo
        Irodes gracilis
      Sphyrna zygaena
        Irodes gracilis
  "*Carcharias lamia*" (unidentified shark)
      Taeniacanthus carchariae
  Unidentified elasmobranch
      Taeniacanthus coelus

Teleosts
  Anquilliformes
    Muraenidae
      "Brown Moray"
        Pseudotaeniacanthus puhi

"Green Moray"
Pseudotaeniacanthus puhi
Muraena helena
Phagus muraenae
Muraena sp.
Pseudotaeniacanthus coniferus
Muraenesocidae
Muraenesox talabonoides
Pseudotaeniacanthus muraenesocis
Congridae
Astroconger myriaster
Pseudotaeniacanthus congeri
Ophichthidae
Pisoodonophis cancrivorus
Pseudotaeniacanthus longicauda
Clupeiformes
Engraulidae
Engraulis mordax
*Taeniacanthodes haakeri**
Myctophiformes
Synodontidae
Saurida elongata
Taeniacanthus longicervis
Taeniacanthus sauridae
Saurida gracilis
Taeniacanthus sauridae
Saurida longimanus
Taeniacanthus sauridae
Saurida tumbil
*Irodes sauridi**
Taeniacanthus longicaudus
Taeniacanthus longicervis
Saurida undosquamis
Taeniacanthus longicervis
Taeniacanthus sauridae
Synodus englemani
Metataeniacanthus epigri
Synodus hoshinonis
Metataeniacanthus nudus
Metataeniacanthus pacificus
Synodus indicus
Metataeniacanthus gibbsi
Synodus jaculum
Metataeniacanthus conepigri
Synodus macrops
Metataeniacanthus aquilonius
Synodus variegatus
Metataeniacanthus solidus
Metataeniacanthus vulgaris
Synodus sp.
Metataeniacanthus indiscretus
Trachinocephalus myops
Metataeniacanthus synodi
Taeniastrotos tragus
Siluriformes
Plotosidae
Cnidoglanis macrocephalus
Irodes remipes
Plotosus anguillaris
Taeniacanthus anguillaris
Plotosus lineatus
Irodes remipes
Taeniacanthus anguillaris
Gadiformes
Gadidae
Ciliata mustela
Anchistrotos laqueus
Anchistrotos onosi
Rhinonemus cimbrius
Anchistrotos onosi
Batrachoidiformes
Batrachoididae
Porichthys porosissimus
Scolecicara humesi
Scorpaeniformes
Scorpaenidae
Inimicus japonicus
Taeniacanthus inimici
Pterois miles
Taeniacanthus miles
Pterois macrurus
Taeniacanthus pteroisi
Pterois russelli
Taeniacanthus pteroisi
Pterois volitans
Taeniacanthus pteroisi
Sebastes inermis
Taeniacanthus sebastichthydis
Sebastichthys oblongus
Taeniacanthus sebastichthydis
Sebastiscus marmoratus
Taeniacanthus sebastichthydis
Platycephalidae
Platycephalus crocodilus
Taeniacanthus petilus
Platycephalus ceruleopunctatus
Taeniacanthus platycephali
Platycephalus indicus
Taeniacanthus platycephali
Cottidae
Pseudoblennius percoides
Taeniacanthus rotundiceps
Perciformes
Serranidae
Paralabrax nebulifer
Taeniastrotos californiensis
Serranus cabrilla
Anchistrotos laqueus
Serranus scriba
Anchistrotos laqueus
Carangidae
Trachurus trachurus
Taeniastrotos trachuri
Nemipteridae
Nemipterus mulloides
Taeniastrotos tragus
Sciaenidae
Genyonemus lineatus
*Taeniacanthodes haakeri**
Mullidae
Mulloidichthys auriflamma
Irodes upenei
Parupeneus barberinus
Irodes upenei
Parupeneus barleenius
Irodes upenei
Parupeneus cyclostomus
Irodes sauridi
Irodes upenei
Parupeneus indicus
Irodes upenei
Parupeneus macronema
Irodes upenei
Parupeneus pleurospilus
Irodes upenei
Upeneus vittatus
Irodes sauridi
Irodes upenei
Upeneus sp.
Irodes upenei
Cepolidae
Acanthocepola limbata
Taeniacanthus acanthocepolae
Mugiloididae
Parapercis aurantiaca
Taeniacanthus neopercis
Parapercis multifasciata
Taeniacanthus neopercis
Parapercis muronis
Taeniacanthus neopercis
Parapercis sexfasciata
Taeniacanthus neopercis
Percophidae
Bembrops caudimaculata
Taeniacanthus dentatus
Blenniidae
Cirripectes alboapicalis
Taeniacanthus nudicauda
Cirripectes auritus
Taeniacanthus glomerosus
Taeniacanthus williamsi
Cirripectes castaneus
Taeniacanthus glomerosus
Taeniacanthus williamsi
Cirripectes chelomatus
Taeniacanthus pollicaris
Taeniacanthus williamsi
Cirripectes filamentosus
Taeniacanthus glomerosus
Taeniacanthus pollicaris
Taeniacanthus williamsi
Cirripectes fuscoguttatus
Taeniacanthus pollicaris
Cirripectes imitator
Taeniacanthus glomerosus
Taeniacanthus williamsi
Cirripectes perustus
Taeniacanthus digitatus
Taeniacanthus williamsi
Cirripectes polyzona
Taeniacanthus pollicaris
Taeniacanthus williamsi
Cirripectes quagga
Taeniacanthus comparatus
Taeniacanthus glomerosus
Taeniacanthus williamsi
Cirripectes stigmaticus
Taeniacanthus digitatus
Taeniacanthus glomerosus
Taeniacanthus williamsi
Cirripectes variolosus
Taeniacanthus glomerosus
Taeniacanthus williamsi
Cirripectes sp. D (to be named for V.G. Springer)
Taeniacanthus digitatus
Taeniacanthus williamsi
Cirripectes sp. T (to be named for

B. Hutchins)
Taeniacanthus glomerosus
Cirripectes sp. U (to be named for C.R. Gilbert)
Taeniacanthus glomerosus
Exallias brevis
Taeniacanthus papulosus
Callionymidae
Callionymus altivelis
Irodes callionymi
Gobiidae
Acanthogobius flavimanus
Anchistrotos kojimensis
Gobius capito (= *paganellus*)
Anchistrotos gobii
Gobius cobitis
Anchistrotos gobii
Acanthuridae
Acanthurus nigricans
Pseudotaeniacanthus sp.
Pleuronectiformes
Bothidae
Citharichthys spilopterus
Taeniacanthodes gracilis
Citharichthys stigmaeus
Taeniacanthodes haakeri
Citharichthys xanthostigma
Taeniacanthodes haakeri
Paralichthyidae
Paralichthys californicus
Taeniacanthodes haakeri
Paralichthys lethostigma
Taeniacanthodes gracilis
Paralichthys squamilentus
Taeniacanthodes gracilis
Pseudorhombus cinnamoneus
Taeniacanthus pseudorhombi
Pleuronectidae
Hippoglossina stomata
Taeniacanthodes haakeri
Parophrys vetulus
Taeniacanthodes haakeri
Pleuronichthys cornutus
Taeniastrotos pleuronichthydis
Pleuronichthys verticalis
Taeniacanthodes haakeri
Verasper variegatus
Taeniastrotos pleuronichthydis
Zeugopterus punctatus
Taeniacanthus zeugopteri
Cynoglossidae
Cynoglossus dispar
Taeniacanthus cynoglossi
Symphurus atricauda
Taeniacanthodes haakeri
Tetraodontiformes
Monacanthidae
Alutera heudelotii
Taeniacanthus balistae
Taeniacanthus occidentalis
Alutera monoceros
Taeniacanthus balistae
Alutera schoepfi
Taeniacanthus occidentalis
Alutera scripta
Taeniacanthus similis
Alutera seriola
Taeniacanthus aluteri
Alutera sp.
Taeniacanthus balistae
Cantherhines hippocrepis
Taeniacanthus similis
Cantherhines modestus
Taeniacanthus balistae
Cantherhines pullus
Taeniacanthus balistae
Chaetoderma penicilligera
Cirracanthus spinosus
Meuschenia convexirostris
Taeniacanthus similis
Monacanthus chinensis
Cirracanthus monacanthi
Pervagor spilosomus
Nudisodalis acicula
Stephanolepis cirrhifer
Cirracanthus monacanthi
Stephanolepis hispidus
Taeniacanthus balistae
Stephanolepis setifer
Cirracanthus monacanthi
Taeniacanthus balistae
Stephanolepis sp.
Cirracanthus monacanthi
Balistidae
Abalistes stellatus
Taeniacanthus aluteri
Balistes capriscus
Taeniacanthus balistae
Balistes carolinensis
Taeniacanthus balistae
Balistes vetula
Taeniacanthus balistae
Balistes sp.
Taeniacanthus balistae
Diodontidae
Diodon hystrix
Taeniacanthus balistes
Tetraodontidae
Canthigaster rivulata
Taeniacanthus kitamakura
Lagocephalus inermis
Taeniacanthus lagocephali
Lagocephalus laevigatus
Taeniacanthus carchariae (doubtful record by Capart, 1959)
Taeniacanthus lagocephali
Lagocephalus lunaris
Taeniacanthus lagocephali
Lagocephalus spadiceus
Taeniacanthus lagocephali
Takifugu niphobles
Taeniacanthus yamagutii
Takifugu oblongus
Taeniacanthus tetradonis
Takifugu pardalis
Taeniacanthus yamagutii
Takifugu rubripes
Taeniacanthus yamagutii
Takifugu xanthopterus
Taeniacanthus fugu
Taeniacanthus yamagutii
Sphoeroides pachygaster
Taeniacanthus yamagutii
Sphoeroides sp.
Taeniacanthus fugu
Taeniacanthus pectinatus
Taeniacanthus yamagutii
Ostraciidae
Lactoria cornuta
Taeniacanthus ostracionis
Ostracion cubicus
Taeniacanthus moa
Ostracion lentiginosum
Taeniacanthus moa

Unidentified "sunfish"
Taeniacanthus coelus

Host Unknown
Anchistrotos caligiformis
Anchistrotos lucipetus

Parasite-Host List

(In alphabetical order; * = accidental or infrequent infestation.)

Anchistrotos caligiformis
Host unknown
Anchistrotos gobii
Gobius capito
Gobius cobitis
Anchistrotos laqueus
Ciliata mustela
Serranus cabrilla
Serranus scriba

Anchistrotos lucipetus
Host unknown
Anchistrotos onosi
Ciliata mustela
Rhinonemus cimbrius

Cirracanthus monacanthi
Monacanthus chinensis
Stephanolepis cirrhifer
Stephanolepis setifer
Stephanolepis sp.
Cirracanthus spinosus
Chaetoderma penicilligera
Clavisodalis abbreviatus
Heterocentrotus mammillatus
Clavisodalis dilatatus
Diadema setosum
Clavisodalis heterocentroti

Heterocentrotus trigonarius
Clavisodalis parvibullatus
Echinometra mathaei
Clavisodalis salmacidis
Asthenosoma varium
Salmacis belli
Clavisodalis sentifer
Diadema setosum
Diadema sp.
Clavisodalis tenuis
Heterocentrotus mammillatus

Echinirus diadematis
Diadema setosum
Echinirus laxatus
Diadema setosum
Echinirus sp.
Diadema sp.
Echinosocius dentatus
Diadema setosum
Echinosocius elatensis
Diadema setosum
Echinosocius finitimus
Diadema setosum
Echinosocius gulicolus
Diadema setosum
Echinosocius pectinatus
Diadema setosum
Echinosocius sp.
Diadema sp.

Irodes callionymi
Callionymus altivelis
Irodes gracilis
Carcharhinus leucas
Carcharhinus maculipinnis
Chiloscyllium indicum
Rhizoprionodon acutus
Rhynchobatus djiddensis
Sphyrna diplana
Sphyrna lewini
Sphyrna tiburo
Sphyrna zygaena
Irodes remipes
Cnidoglanis macrocephalus
Plotosus lineatus
Irodes sauridi
Parupeneus cyclostomus
*Saurida tumbil**
Upeneus vittatus
Irodes upenei
Mulloidichthys auriflamma
Parupeneus barberinus
Parupeneus barleenius
Parupeneus cyclostomus
Parupeneus indicus
Parupeneus macronema
Parupeneus pleurospilus
Upeneus vittatus
Upeneus sp.

Metataeniacanthus aquilonius
Synodus macrops
Metataeniacanthus conepigri
Synodus jaculum
Metataeniacanthus epigri
Synodus englemani
Metataeniacanthus gibbsi
Synodus indicus
Metataeniacanthus indiscretus
Synodus sp.
Metataeniacanthus nudus
Synodus hoshinonis
Metataeniacanthus pacificus
Synodus hoshinonis
Metataeniacanthus solidus
Synodus variegatus
Metataeniacanthus synodi
Trachinocephalus myops
Metataeniacanthus vulgaris
Synodus variegatus

Nudisodalis acicula
Pervagor spilosomus

Phagus muraenae
Muraena helena
Pseudotaeniacanthus coniferus
Muraena sp.
Pseudotaeniacanthus congeri
Astroconger myriaster
Pseudotaeniacanthus longicauda
Pisoodonophis cancrivorus
Pseudotaeniacanthus muraenesocis
Muraenesox talabonoides
Pseudotaeniacanthus puhi
"Brown Moray"
"Green Moray"
Pseudotaeniacanthus sp.
Acanthurus nigricans

Scolecicara humesi
Porichthys porosissimus

Taeniacanthodes gracilis
Citharichthys spilopterus
Paralichthys lethostigma
Paralichthys squamilentus
Taeniacanthodes haakeri
Citharichthys stigmaeus
Citharichthys xanthostigma
*Engraulis mordax**
*Genyonemus lineatus**
Hippoglossina stomata
Paralichthys californicus
Parophrys vetulus
Pleuronichthys verticalis
Symphurus atricauda
Taeniacanthus acanthocepolae
Acanthocepola limbata
Taeniacanthus aluteri
Abalistes stellatus
Alutera seriola
Taeniacanthus anguillaris
Plotosus anguillaris
Plotosus lineatus
Taeniacanthus balistae
Alutera heudelotii
Alutera monoceros
Alutera sp.
Balistes capriscus
Balistes carolinensis
Balistes vetula
Balistes sp.
Cantherhines modestus
Cantherhines pullus
Diodon hystrix
Stephanolepis hispidus
Stephanolepis setifer
Taeniacanthus carchariae
"Carcharias lamia"
Lagocephalus laevigatus (doubtful record by Capart, 1959)
Taeniacanthus coelus
Unidentified elasmobranch
Unidentified "sunfish"
Taeniacanthus comparatus
Cirripectes quagga
Taeniacanthus cynoglossi
Cynoglossus dispar
Taeniacanthus dentatus
Bembrops caudimaculata
Taeniacanthus digitatus
Cirripectes perustus
Cirripectes stigmaticus
Cirripectes sp. D (to be named for V.G. Springer)
Taeniacanthus fugu
Takifugu xanthopterus
Sphoeroides sp.
Taeniacanthus glomerosus
Cirripectes auritus
Cirripectes castaneus
Cirripectes filamentosus
Cirripectes imitator
Cirripectes quagga
Cirripectes stigmaticus
Cirripectes variolosus
Cirripectes sp. T (to be named for B. Hutching)
Cirripectes sp. U (to be named for C.R. Gilbert)
Taeniacanthus inimici
Inimicus japonicus
Taeniacanthus kitamakura
Canthigaster rivulata
Taeniacanthus lagocephali
Lagocephalus inermis
Lagocephalus laevigatus
Lagocephalus lunaris
Lagocephalus spadiceus
Taeniacanthus longicaudus
Saurida tumbil
Taeniacanthus longicervis
Saurida elongata
Saurida tumbil
Saurida undosquamis
Taeniacanthus miles
Pterois miles
Taeniacanthus moa
Ostracion cubicus
Ostracion lentiginosum
Taeniacanthus narcini
Narcine timlei
Taeniacanthus neopercis
Parapercis aurantiaca

Parapercis multifasciata
Parapercis muronis
Parapercis sexfasciata
Taeniacanthus nudicauda
Cirripectes alboapictus
Taeniacanthus occidentalis
Alutera heudelotii
Alutera schoepfi
Taeniacanthus ostracionis
Lactoria cornuta
Taeniacanthus papulosus
Exallias brevis
Taeniacanthus pectinatus
Sphoeroides sp.
Taeniacanthus petilus
Platycephalus crocodilus
Taeniacanthus platycephali
Platycephalus ceruleopunctatus
Platycephalus indicus
Taeniacanthus pollicaris
Cirripectes chelomatus
Cirripectes filamentosus
Cirripectes fuscoguttatus
Cirripectes polyzona
Taeniacanthus pseudorhombi
Pseudorhombus cinnamoneus
Taeniacanthus pteroisi
Pterois macrurus
Pterois russelli
Pterois volitans
Taeniacanthus rotundiceps
Pseudoblennius percoides
Taeniacanthus sauridae
Saurida elongata
Saurida gracilis
Saurida longimanus
Saurida undosquamis
Taeniacanthus sebastichthydis
Sebastes inermis
Sebastichthys oblongus
Sebastiscus marmoratus
Taeniacanthus similis
Alutera scripta
Cantherhines hippocrepis
Meuschenia convexirostris
Taeniacanthus tetradonis
Takifugu oblongus
Taeniacanthus williamsi
Cirripectes auritus
Cirripectes castaneus
Cirripectes chelomatus
Cirripectes filamentosus
Cirripectes imitator
Cirripectes perustus
Cirripectes polyzona
Cirripectes quagga
Cirripectes stigmaticus
Cirripectes variolosus
Cirripectes sp. D (to be named for V.G. Springer)
Taeniacanthus wilsoni
Raja fullonica
Taeniacanthus yamagutii
Takifugu niphobles
Takifugu pardalis
Takifugu rubripes
Takifugu xanthopterus
Sphoeroides pachygaster
Sphoeroides sp.
Taeniacanthus zeugopteri
Zeugopterus punctatus
Taeniastrotos californiensis
Paralabrax nebulifer
Taeniastrotos pleuronichthydis
Pleuronichthys cornutus
Verasper variegatus
Taeniastrotos trachuri
Trachurus trachurus
Taeniastrotos tragus
Trachinocephalus myops
Nemipterus mulloides

Relationships within the Bomolochiform Complex

The bomolochiform complex consists of the Bomolochidae, Taeniacanthidae, and Tuccidae. These three families are presumed to be closely related. They share the following characters: (1) indistinctly 4-segmented second antenna with two pectinate processes, claw-like spines, and setae; (2) mandible with two subequal spinulated blades; (3) second maxilla bearing spinulated elements; (4) an indented (concave) ventral surface of the cephalothorax; and (5) lamelliform leg 1.

We consider the most modified or derived family of this complex to be the Tuccidae, consisting of one species *Tucca impressus* Krøyer, 1837, which is parasitic on Western Atlantic diodontid and tetraodontid fishes (see Ho, 1967). Wilson (1911) recognized the morphologic affinities with the bomolochids and included *Tucca* in the subfamily Bomolochinae. This genus was later placed in a separate subfamily, Tuccinae, by Vervoort (1962). Yamaguti (1963) later elevated the Tuccinae to familial status. Ho (1967) redescribed the only known species of the Tuccidae and provided diagnostic characters that clearly distinguish this family from the Bomolochidae. He did not, however, compare it to the Taeniacanthidae.

The morphologic characters that reflect the derived nature of this family are listed below.

1. Metamorphosis occurs in the female resulting in a highly modified body. Neither the Taeniacanthidae nor Bomolochidae undergo metamorphosis (Ho, 1967). The habitus of the adult female taeniacanthid (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 taeniacanthids and bomolochids the urosome consists of a distinct fifth pedigerous segment, distinct 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 taeniacanthids 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. Taeniacanthids and bomolochids usually have a 2-segmented leg 5.

The Bomolochidae and Taeniacanthidae 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 taeniacanthids 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 Taeniacanthinae and Bomolochinae within the family Ergasilidae and later

elevated them to familial status (Wilson, 1932).

The two families can be distinguished by a number of characters. The habitus of the adult females of the Bomolochidae is considered unmodified. The prosome consists of a cephalothorax and second through fourth pedigerous segments. Although the lengths and widths of these segments may vary among the genera, thus resulting in varied facies, the general habitus is mostly "cyclopoid" or unmodified poecilostomatoid body form. The exception to the typical bomolochid habitus is *Tegobomolochus nasicola* Izawa, 1976, which is suboval in outline and has large aliform plates on second, third, and fourth pedigerous segments. The Taeniacanthidae, however, exhibit fusion and elongation of various pedigerous and abdominal segments. Taeniacanthids have a greater diversity in body shape (habitus) than bomolochids. *Taeniacanthodes gracilis,* for example, exhibits a highly modified habitus. The most modified taeniacanthid body is that of *Scolecicara,* having the second pedigerous segment very elongate and the third and fourth pedigerous segments fused to form a pyriform trunk (see Ho, 1969).

The rostral area of the bomolochids can be armed with a pair of rostral tines. These tines are essentially spiniform processes located on the rostral area. They are not present in all bomolochids, but when present, they are morphologically uniform. The taeniacanthid rostral area is morphologically very diverse, and usually represents generic variation (see discussion on "rostral area").

Also, the setae on the basal segment of the first antenna are modified in many bomolochid genera, and not in the taeniacanthids. Several genera of the Taeniacanthidae bear postantennal processes. These structures are absent in the Bomolochidae.

Perhaps the most consistent and conspicuous difference separating these two families is the position of the maxillipeds in the females. The maxillipeds in the Taeniacanthidae are located directly posterior to the other mouth parts as in the majority of free-living and parasitic copepods. However, the maxillipeds are displaced laterally in the Bomolochidae. The bomolochid maxilliped is morphologically uniform with a terminal sigmoid claw. The maxillipeds of the taeniacanthids, on the other hand, are greatly varied (see discussion on "maxilliped").

The rami of legs 2–4 of the Taeniacanthidae are 3-segmented, except the 2-segmented endopods of legs 3 and 4 in *Taeniacanthodes.* The rami of these legs in some genera of the Bomolochidae (e.g., *Pumiliopes* and *Pumiliopsis;* see Kabata, 1979) are 2-segmented. Bomolochids show a greater degree of reduction in the number of segments of legs 2–4.

The modified bodies of *Taeniacanthodes gracilis* and *Scolecicara,* 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.

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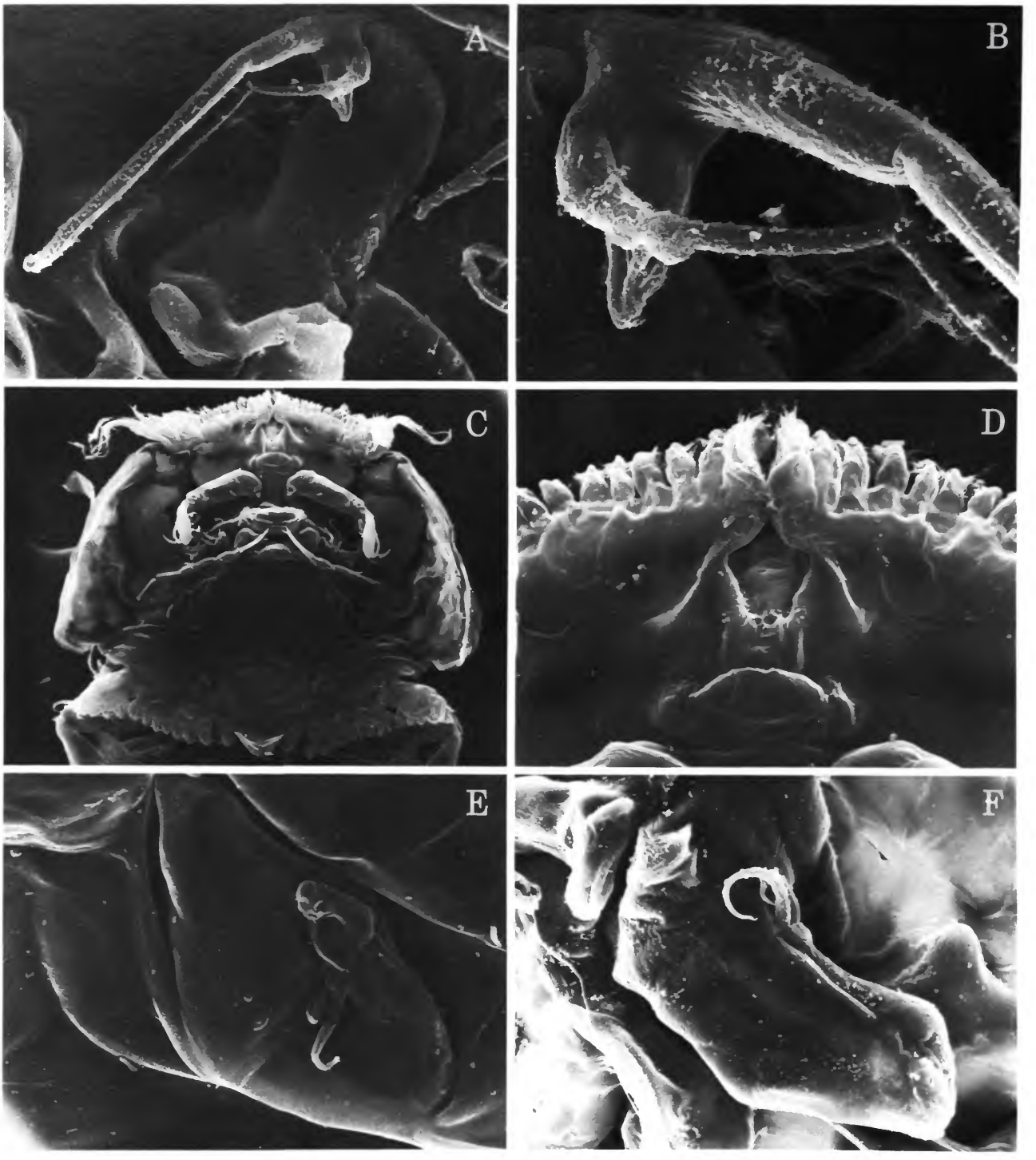

FIGURE 161.—Scanning electron micrographs: A, maxilliped of female *Anchistrotos gobii* Brian; B, detail of same; C, cephalothorax of female *Echinosocius gulicolus* Dojiri and Humes; D, detail of rostral area of *E. gulicolus;* E, maxilliped of female *E. gulicolus;* F, maxilliped of female *Irodes gracilis* (Heller).

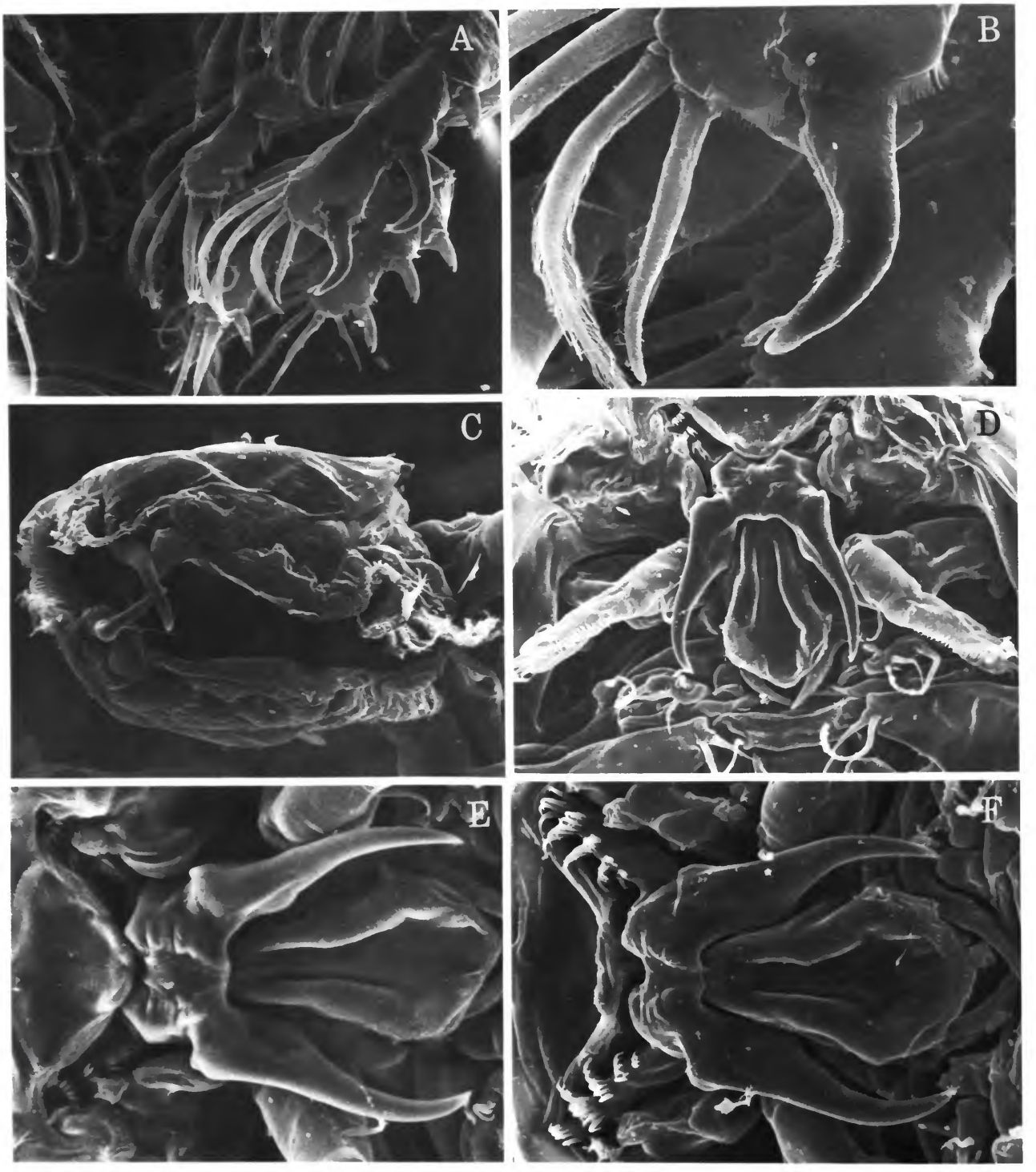

FIGURE 162.—Scanning electron micrographs: A, legs 3 and 4 of female *Irodes gracilis* (Heller); B, spine of terminal exopod segment of leg 3 of female *I. gracilis*; C, cephalothorax of female *Metataeniacanthus conepigri* Cressey and Cressey; D, rostral area of female *Pseudotaeniacanthus congeri* Yamaguti and Yamasu; E, detail of same; F, same, slightly different view.

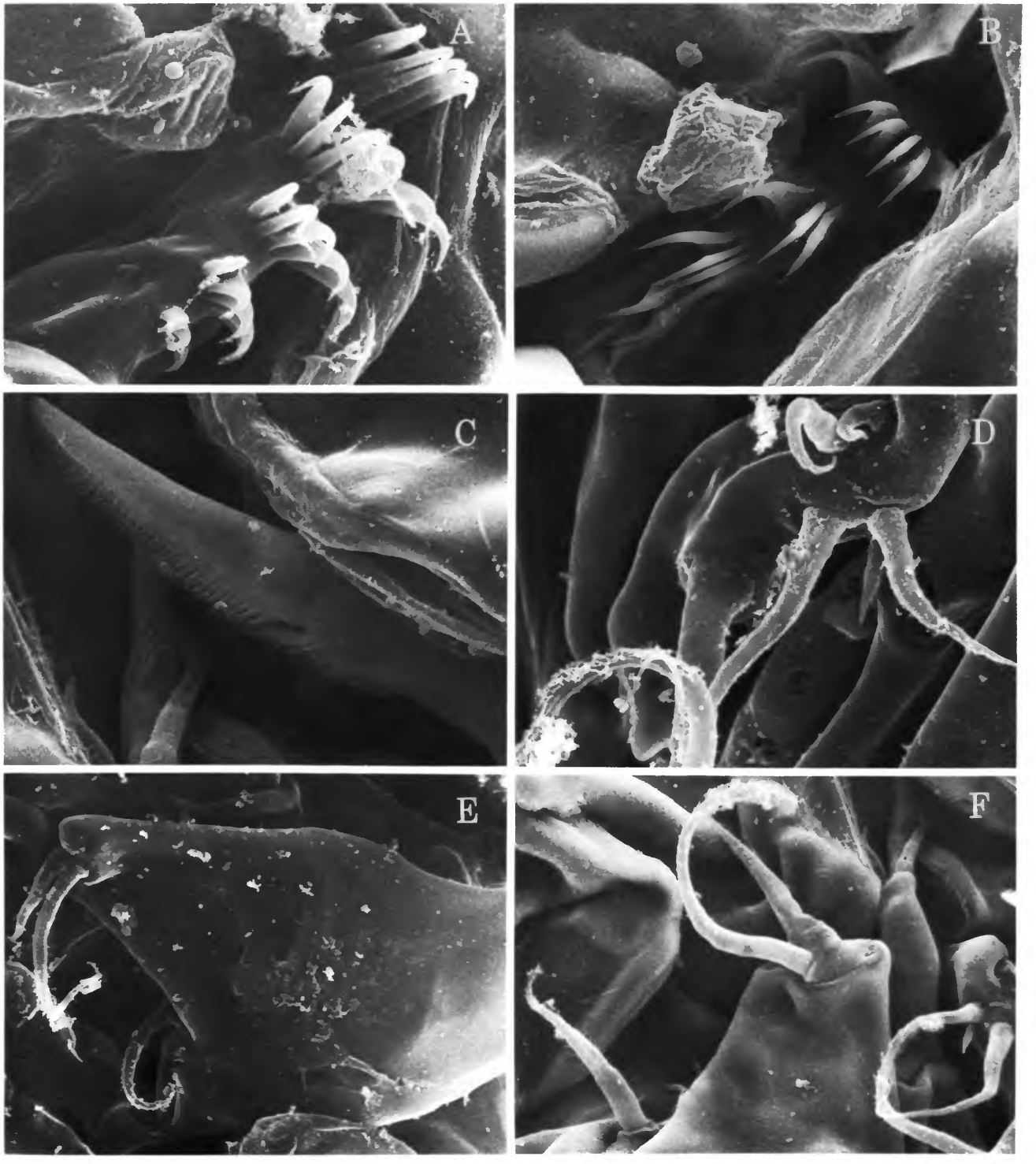

FIGURE 163.—Scanning electron micrographs: A, rows of hooklets on rostral area of female *Pseudotaeniacanthus congeri* Yamaguti and Yamasu; B, same, different view; C, mandible of female *P. congeri;* D, first maxilla of female *P. congeri;* E, maxilliped of female *P. congeri;* F, same.

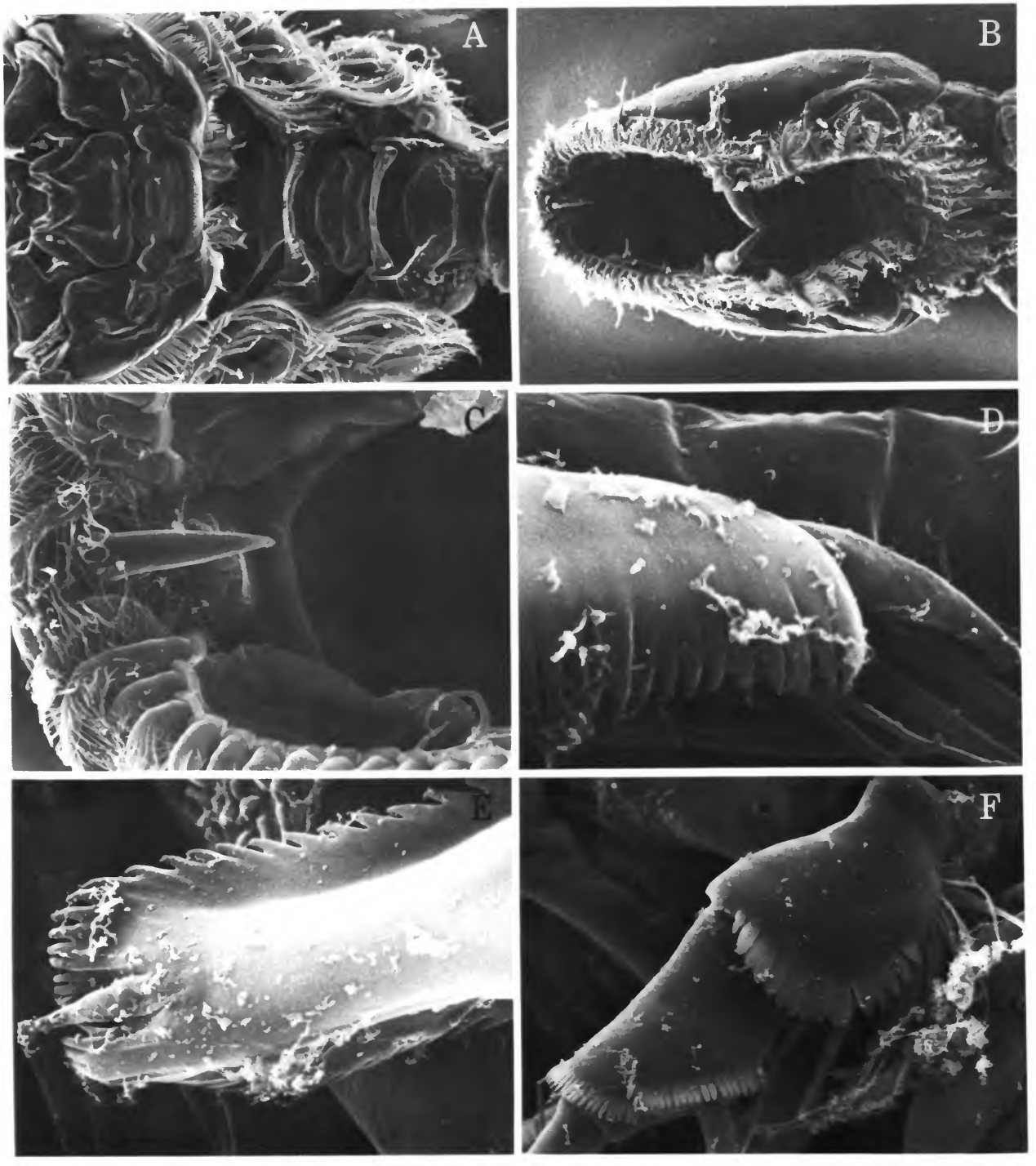

FIGURE 164.—Scanning electron micrographs: A, posterior portion of cephalothorax and anterior abdominal segments of female *Pseudotaeniacanthus congeri* Yamaguti and Yamasu; B, cephalothorax of female *Taeniacanthodes gracilis* Wilson; C, rostral area of *T. gracilis;* D, tip of innermost spine of terminal 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.*

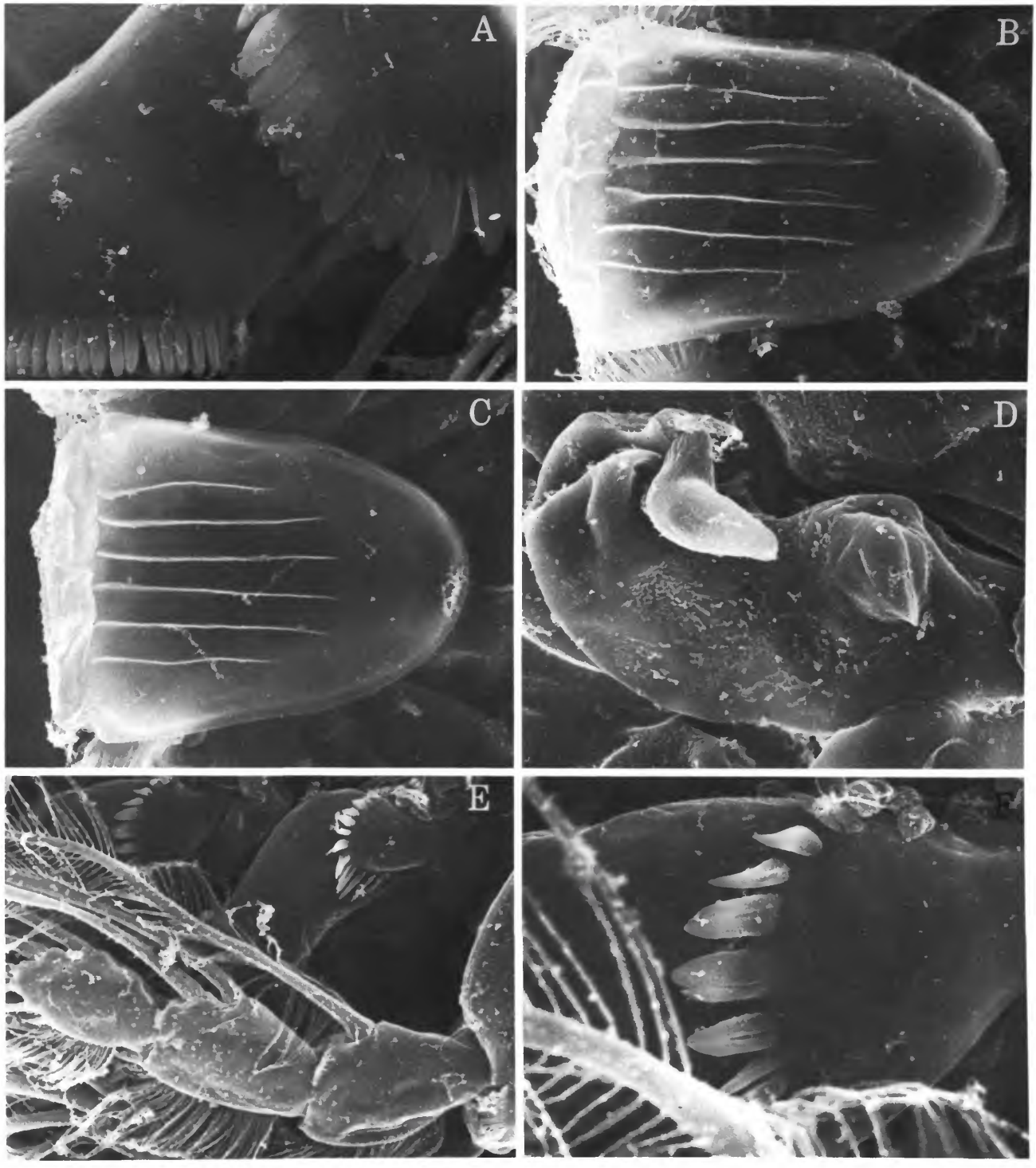

FIGURE 165.—Scanning electron micrographs: A, detail of spinules on leg 4 endopod of female *Taeniacanthodes gracilis* Wilson; B, rostral area of female *Taeniastrotos californiensis* Cressey; C, same; D, maxilliped of female *T. californiensis;* E, leg 2 endopod and basipods of legs 3 and 4 of female *T. californiensis;* F, spinules on basipod of leg 4 of female *T. californiensis*.

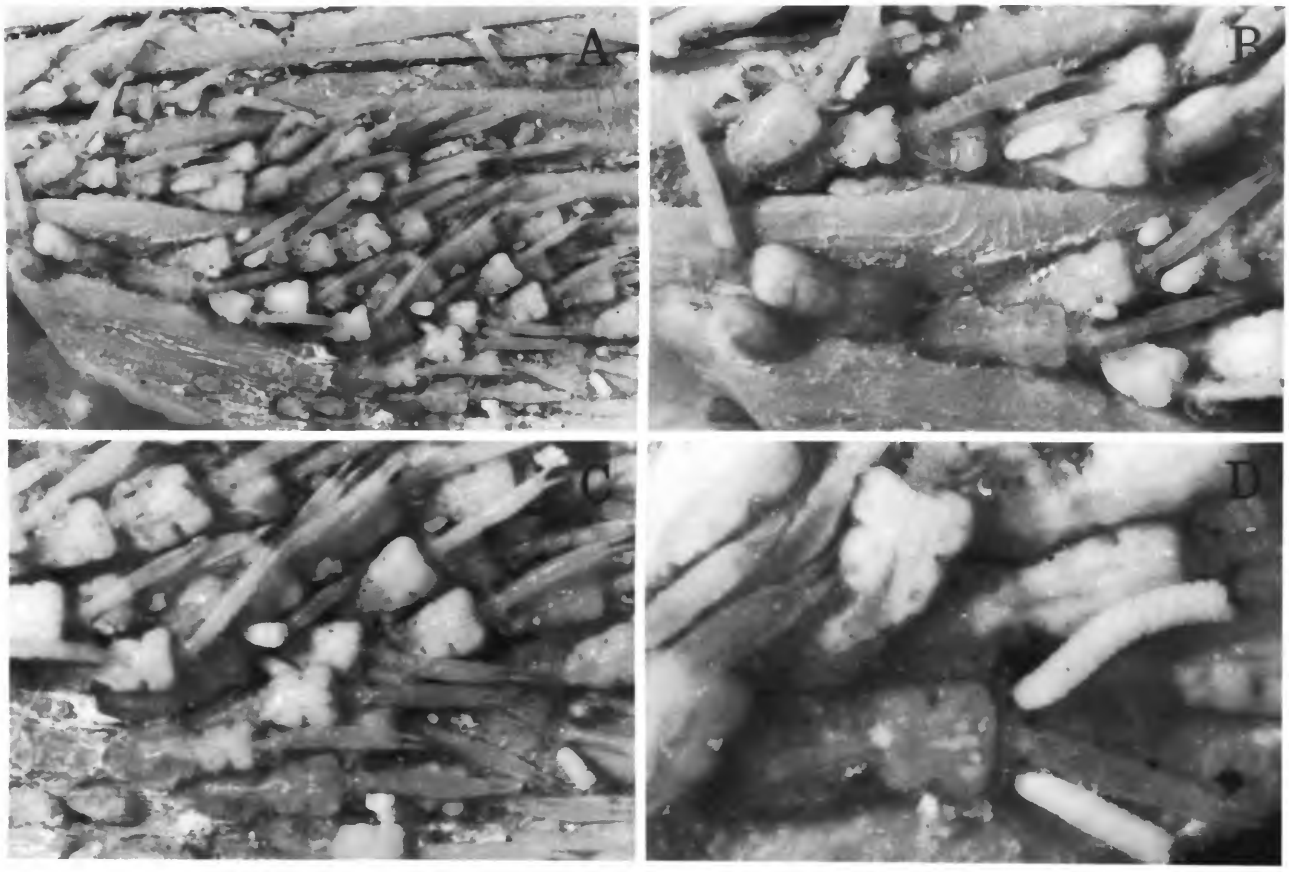

FIGURE 166.—Cluster of female *Taeniacanthodes gracilis* Wilson: A, low magnification of cluster of *T. gracilis* on fin of *Paralichthys squamilentus;* B, single-file arrangement of *T. gracilis* within cluster; C, staggered arrangement of *T. gracilis* within cluster; D, same, magnified view.

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