COPEPODS OF THE FAMILY TAENIACANTHIDAE (CYCLOPOIDA) PARASITIC ON FISHES IN THE GULF OF MEXICO

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ABSTRACT

Taeniacanthus lagocephali Pearse from *Lagocephalus laevigatus* (Linnaeus), and *Taeniacanthodes gracilis* Wilson from *Paralichthys* sp., are redescribed on the basis of the type-specimens in the collection of the U. S. National Museum. *Taeniacanthus sabafugu* Yamaguti & Yamasu is synonymized with *T. lagocephali,* and *Taeniacanthodes gunteri* Causey is suggested as probably conspecific with *T. gracilis. Scolecicara humesi,* a new genus and species, is described from three female specimens taken from the gill filaments of *Porichthys porosissimus* (Cuvier & Valenciennes). The genus *Irodes* Wilson should be abandoned and its species transferred to other taeniacanthid genera.

INTRODUCTION

Five species of cyclopoid copepods have been reported to occur on fishes in the Gulf of Mexico and have been placed in the family Taeniacanthidae. They are: *Taeniacanthus lagocephali* Pearse, *Taeniacanthodes gracilis* Wilson, *T. gunteri* Causey, *Telson elongatus* Pearse, and *T. nicholsi* Causey. The first species was transferred to *Irodes* Wilson by Pillai (1963) and the last two species were removed to the Bomolochidae by Yamaguti (1963).

Upon the discovery of a new genus and species of taeniacanthid copepods parasitic on a fish in the Gulf of Mexico, I took this opportunity to reexamine the type-specimens of the above five species deposited in the U. S. National Museum. The results of this restudy of the first three species are given herewith, but those for the last two species have been given elsewhere (Ho, 1967), because the two species cannot be placed in the Taeniacanthidae.

All figures were drawn with the aid of a camera lucida. The letter after the explanation of each figure refers to the scale at which it was drawn. The abbreviations used are: A_1 = first antenna, A_2 = second antenna, MXH = maxillary hook, LM = labrum, MD = mandible, P = paragnath, MX_1 = first maxilla, MX_2 = second maxilla, MXPD = maxilliped, P_1 = leg 1, P_2 = leg 2, P_3 = leg 3, P_4 = leg 4, and P_5 = leg 5.

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reviewing the first draft of this report. He also wishes to thank Dr. Roger F. Cressey, Division of Crustacea, United States National Museum, Washington, D. C. for lending the United States National Museum collections of the type-specimens.

Family Taeniacanthidae Wilson, 1911
Genus *Taeniacanthus* Sumpf, 1871
Taeniacanthus lagocephali Pearse, 1952
Figs. 1-5

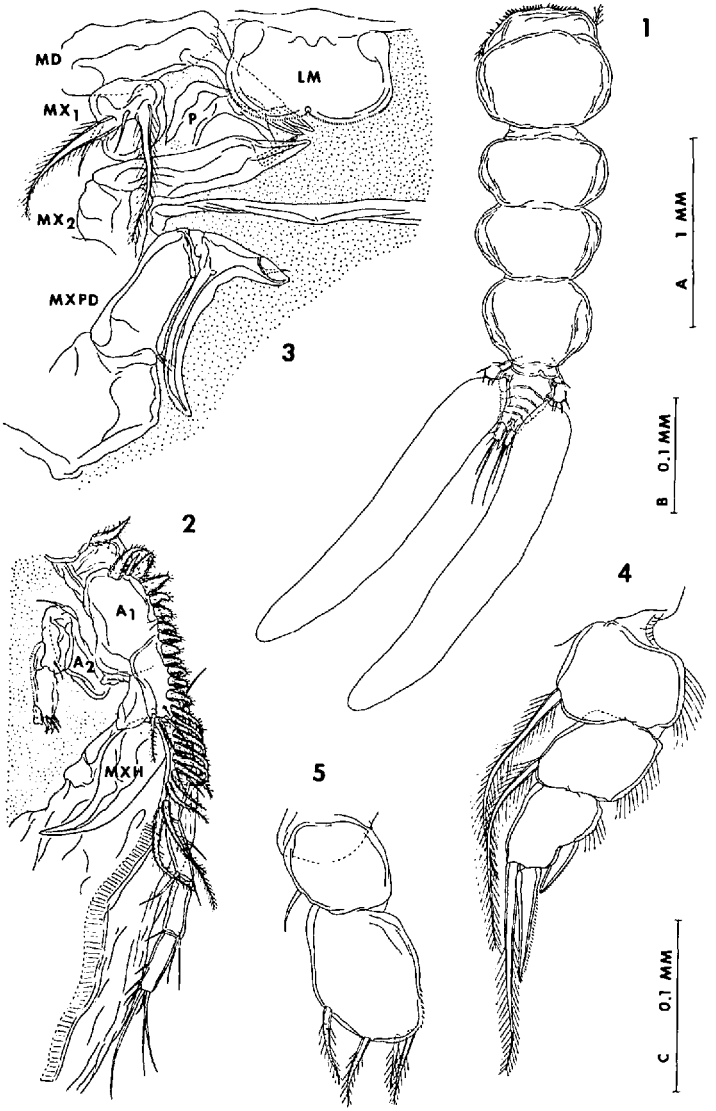
Taeniacanthus lagocephali Pearse, 1952: 8, figs. 1-4.—Yamaguti, 1963: 21.
T. sabafugu Yamaguti & Yamasu, 1959: 102, pl. IV, figs. 79-89.—Yamaguti, 1963: 21, pl. 19, fig. 6.
Irodes lagocephali Pillai, 1963: 124, fig. 7(A-M).

Material Examined.—One holotypic ♀ and 10 paratypic ♀♀ (all mounted on a slide and catalogued as USNM 92682) taken from gills of *Lagocephalus laevigatus* (Linnaeus) collected at "18 fath. off Padre Island, Texas."

Female.—Body (Fig. 1) typically taeniacanthiform, having cephalothorax and remaining three prosomal segments swollen and subequal in size. Cephalothorax flattened and hollowed ventrally, bearing a chitinous membrane laterally (Fig. 2). All cephalic appendages, except first antennae, housed in this ventral concavity. Urosome abruptly narrowed and short, only about one-fourth of prosomal length. Genital segment much wider than long. Four postgenital segments with their width gradually decreasing from in front backwards; first three segments much wider than long but anal segment nearly as long as wide. Caudal ramus bearing 6 setae: two long apical, one short subterminal in inner and outer corners, one short dorsal, and one short one on outer margin near center. Egg sac large, cigar-shaped. Individual eggs not discernible in mounted specimen in low magnification, thus, omitted in Figure 1.

Rostral area (Fig. 2) unarmed, but framed with strong sclerotizations. Maxillary hook (Fig. 2) large, located on anteroventral surface of cephalothorax dorsal to junction of first and second segments of first antenna.

First antenna (Fig. 2) five-segmented, with basal segment incompletely divided on ventral surface. Armature in these five segments: 20 (7 + 13), 9, 4, 3, and 8. Stout, haired setae on anteroventral surface of first and second segments forming a continuous row, with 14 in former and eight in latter segment. Second antenna (Fig. 2) three-segmented, of usual taeniacanthid type. First and second segments each armed with a distal inner seta. Third segment bearing a spatulate, proximally directed process on posteroventral surface of basal end, this process ornamented with a row of spinules, which continues distally along ventral surface of segment proper to tip. This segment armed terminally with one pectinate process, three curved claws, and four simple setae.



FIGURES 1-5. *Taeniacanthus lagocephali* Pearse, female: 1, body, dorsal (scale line A); 2, anterior part of cephalothorax, left side, ventral (scale line B); 3, mouth parts, ventral (scale line C); 4, endopod of leg 4, anterior (scale line C); 5, leg 5, lateral (scale line B).

Labrum (Fig. 3) notched at center, bearing spinules on posterior margin. Mandible (Fig. 3) two-segmented, terminal segment bearing two pointed processes. Paragnath (Fig. 3) a naked lobe. First maxilla (Fig. 3) armed with two long, plumose and two short, naked setae. Second maxilla (Fig. 3) two-segmented, bearing two terminal spiniform processes on second segment. A transverse sclerite running between and posterior to bases of second maxillae (Fig. 3). Maxillipid (Fig. 3) three-segmented; basal segment unarmed; second segment armed with two basal setae at inner corner; and terminal segment forming a long recurved hook with serrations on convex margin of distal portion and provided basally with a rod-shaped, medial projection bearing a weak spine dorsosubterminally.

Legs 1 to 4 with spine (Roman numerals) and setal (Arabic numerals) formulae as follows:

P_1	protopod 0-0; 1-1	exp 1-1; 7
		end 0-1; 0-1; 7
P_2	protopod 0-0; 1-0	exp 1-0; 1-1; 2,1,4
		end 0-1; 0-1; II,I,3
P_3	protopod 0-0; 1-0	exp 1-0; 1-1; 2,1,5
		end 0-1; 0-1; II,I,2
P_4	protopod 0-0; 1-0	exp 1-0; 1-1; 2,1,4
		end 0-1; 0-1; I,I,1

Inner surface of coxa and posterior outer surface of basis of all four legs finely pectinate. Ornamentation on rami as illustrated by Pillai (1963: fig. 7,H-K) for Indian *lagocephali*. Endopod of leg 4 as in Figure 4. Leg 5 (Fig. 5) two-segmented; proximal segment bearing a naked outer seta; distal segment bearing three terminal and one subterminal plumose setae and rows of denticles on distal inner surface.

Measurements (in mm).—Total length (excluding setae on caudal rami) 2.57; cephalothorax 0.69 × 0.78; second pedigerous segment 0.46 × 0.74; third pedigerous segment 0.44 × 0.72; fourth pedigerous segment 0.50 × 0.64; length of urosome 0.52.

Remarks.—The available type-specimens of this species are dehydrated and mounted on a slide in Canada balsam (not a satisfactory method for studying copepods). These mounted specimens are so wrinkled and distorted that I have found it impossible to illustrate the various parts of the body and its appendages.

A fairly good description and illustration of this species have been given by Pillai (1963), based on Indian specimens of *lagocephali*. Pillai, however, placed the species in the genus *Irodes* Wilson, instead of in the genus *Taeniacanthus* Sumpf. A discussion on the matter of transferring *lagocephali* back to the latter genus will be given in a later section. Pillai (1963) was inconsistent in his description (p. 124) and illustration (fig. 7,K) of the endopod of leg 4 for Indian specimens of *lagocephali*. He stated in the

description: "Fourth leg . . . third endopod segment narrowing distalwards and with two claws and one spine seta." However, in the illustration of leg 4, he showed "two claws" and two setae, i.e., one more seta was added to the inner surface of the segment. As to the other features, there is no significant difference between the Indian and the Gulf specimens of *lagocephali*.

Taeniacanthus sabafugu Yamaguti & Yamasu was reported from a swellfish, *Spheroides spadiceus* (Richardson), in the Inland Sea of Japan. It resembles both Indian and Gulf specimens of *lagocephali* in every significant point, and after a careful comparison of specimens of *T. lagocephali* with the description of *T. sabafugu* given by Yamaguti & Yamasu (1959), I am convinced that they are conspecific.

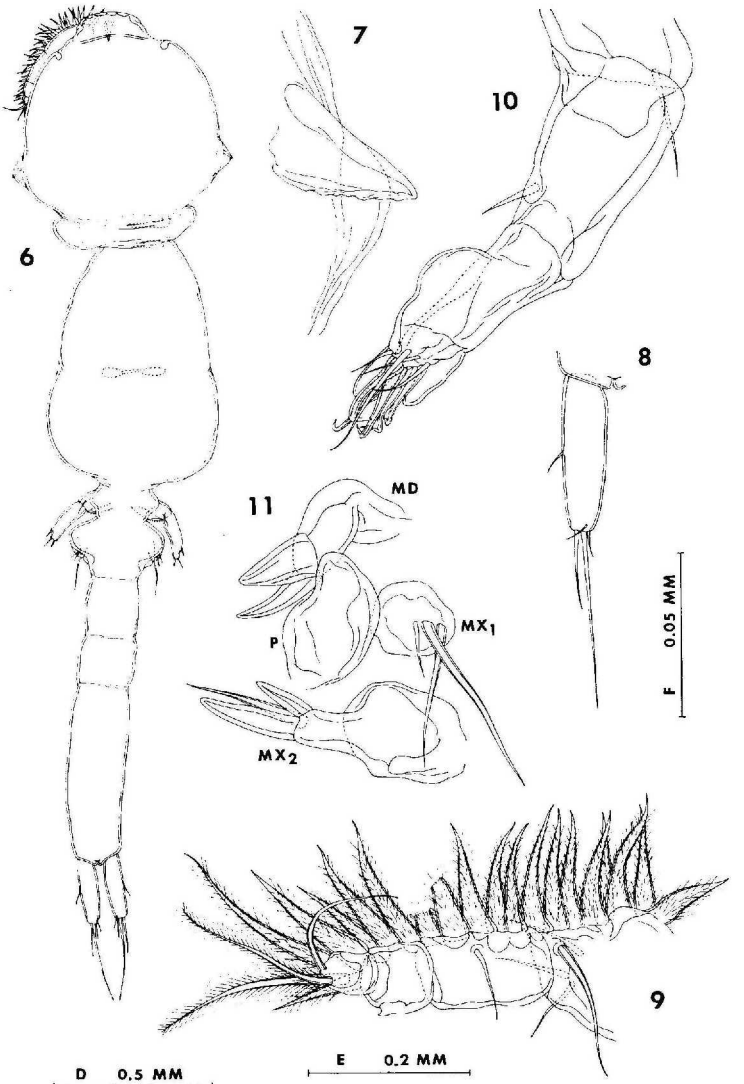
The species reported by Capart (1959: 63-64; fig. 1,a-b) as "? *Taeniacanthus carchariae* Sumpf, 1871" is probably also conspecific with the present species. Although Capart gave neither description nor illustrations of the appendages, his illustrations of the whole body (fig. 1,a-b) clearly indicate that the specimen is most closely related to *T. carchariae* and *T. lagocephali*. Since the host of Capart's species is the same species of swellfish that serves as the host of *lagocephali* in the Gulf of Mexico, I am inclined to regard his species as closer to *lagocephali* than to *carchariae* (whose host is a shark). Possibly Pearse's work (1952) was unknown to Capart at the time. This may have led him to identify the West African species as "? *Taeniacanthus carchariae* Sumpf, 1871" instead of as *Taeniacanthus lagocephali* Pearse, 1952.

Genus *Taeniacanthodes* Wilson, 1935
Taeniacanthodes gracilis Wilson, 1935
Figs. 6-17

Taenicanthodes gracilis Wilson, 1935: 337, pl. 2, figs. 23-25; pl. 3, figs. 26-29.—Yamaguti, 1963: 26, pl. 18, fig. 1(a-g).

Material Examined.—One holotypic ♀ (USNM 64034) "washed from coelom of *Paralichthys* sp.," collected at Dry Tortugas, Florida. (Wilson gave "flounder, *Paralichthys squamilentus*" for the host in his report of the present species, but the museum label records only the generic name of the host.)

Female.—Body (Fig. 6) elongate with prosome divided into three regions: a flattened, rounded head (= cephalothorax) with two lateral knobs, a short but wide neck (= second pedigerous segment), and a pear-shaped trunk (= third and fourth pedigerous segments). Frontal area rather well developed, bearing a strong spine ventrally on rostral area (Fig. 6). Lateral knob (Fig. 7) on head armed on anterior surface with a spine (0.12 mm long). Fifth pedigerous segment small, abruptly demarcated from trunk.



FIGURES 6-11. *Taeniacanthodes gracilis* Wilson, female: 6, body, with egg sacs omitted, dorsal (scale line D); 7, knob on cephalothorax, lateral (scale line C); 8, caudal ramus, dorsal (scale line E); 9, first antenna, with basal part of first segment omitted, anterior (scale line C); 10, second antenna, with basal segment not shown entire, outer (scale line F); 11, oral appendages, ventral (scale line F).

Genital segment (Fig. 6) protruded laterally, carrying the one long (0.12 mm) and two short setae of leg 6. Abdomen (Fig. 6) cylindrical, indistinctly three-segmented, last segment longer than first two segments together. Caudal ramus (Fig. 8) probably armed with six setae, the terminal outermost one apparently having been detached from the holotype. Egg sac (broken, and thus omitted in Figure 6) elongate, with each egg about 96 μ in diameter.

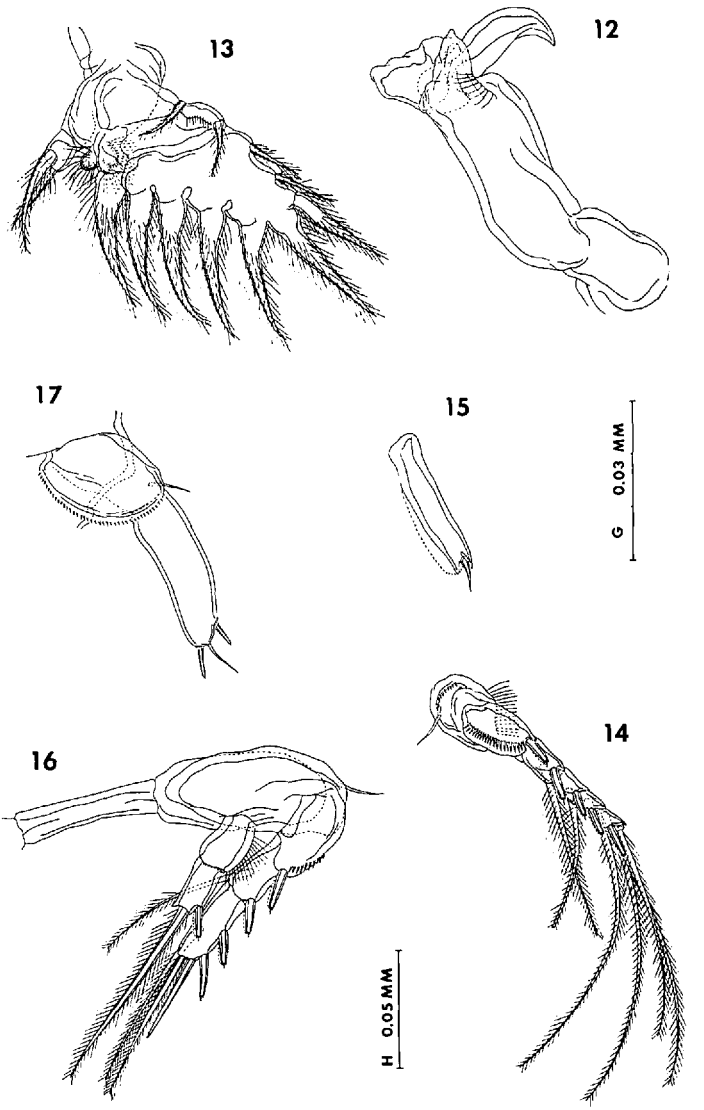
First antenna (Fig. 9) four-segmented. First segment longest and enlarged at base, with 12 stout, haired setae arranged in row on anteroventral margin, two haired but slender setae on anterodorsal margin, and four naked setae on distal surface (one dorsal and three ventral). Second segment bearing a row of six stout, haired setae on anteroventral margin, one naked seta on dorsal surface, and one very short seta on proximodorsal surface. Third segment armed with four stout, haired setae on anteroventral margin. Terminal segment very small, bearing one haired, one naked and two plumose setae. Second antenna (Fig. 10) three-segmented, with proximal segment longer than the two distal segments together. First and second segments bearing a subterminal seta. Terminal segment inflated posteriorly and armed with two blunt processes, five curved, weak, setiform claws, and four simple setae.

Mandible (Fig. 11) two-segmented, terminal segment bearing two spiniform processes. Paragnath (Fig. 11) a conical lobe. First maxilla (Fig. 11) armed with two long and one short setae. Second maxilla (Fig. 11) two-segmented, bearing two processes and one long seta terminally. Maxilliped (Fig. 12) three-segmented; second segment largest, bearing terminally a pointed process and an articulated, blunt, outer protrusion; terminal claw short, recurved distally.

Legs 1 to 4 with spine (Roman numerals) and setal (Arabic numerals) formulae as follows:

P_1	protopod 0-?; 1-?	exp 1-1; 8 end ?
P_2	protopod 0-?; 1-?	exp I-0; I-1; II,I,5 end 0-1; 0-?; ?
P_3	protopod 0-?; 1-?	exp I-0; I-1; II,I,5 end 0-0; I,1
P_4	protopod 0-0; 1-?	exp I-0; I-1; II,I,2 end 0-0; I,1

Leg 1 (Fig. 13) strongly flattened, as usual in taeniacanthid copepods. Spines on outer surfaces of legs 2 (Fig. 14), 3, and 4 (Fig. 16) having form shown in Figure 15. Endopod of leg 2 distinctly shorter than its exopod. Leg 5 (Fig. 17) two-segmented; basal segment bearing a ventral plate fringed with spinules and a subterminal seta on dorsal surface; distal segment armed with two spines and one seta.



FIGURES 12-17. *Taeniacanthodes gracilis* Wilson, female: 12, maxilliped, outer (scale line B); 13, leg 1, with protopod and exopod not shown entire, lateral (scale line B); 14, basis and exopod of leg 2, lateral (scale line B); 15, spine on leg 2, lateral (scale line G); 16, leg 4 and intercoxal plate, anteroventral (scale line H); 17, leg 5, ventral (scale line B).

Measurements (*in mm*).—Total length (excluding setae on caudal rami) 2.86; head (not including lateral knobs) 0.60 × 0.61; neck 0.11 × 0.41; trunk 0.78 × 0.52; genital segment 0.12 × 0.29; abdomen 0.92 × 0.81; caudal ramus 0.20 × 0.06.

Remarks.—The only known specimen of this species is incomplete, the right first antenna and the left legs 1, 2, and 3 having been removed, presumably by Wilson for detailed study.

Observation of the oral appendages without dissection, covered as they are with debris, is extremely difficult. A detailed and accurate account of these appendages could not be prepared, and the above descriptions and illustrations of them are necessarily incomplete. The armature on some legs could not be made out with certainty, since the legs are held nearly perpendicular to the body axis in the type-specimen, and an ideal anterior or posterior view of them is impossible. Those instances where the armature cannot clearly be observed are indicated with question marks in the formulae of the legs.

After clearing the type-specimen in lactic acid, I examined the anteroventral surface of the head with great care, trying to see if there is a pair of maxillary hooks. Since the right side was partially damaged during the removal of the first antenna by Wilson, the search for a maxillary hook was limited to the left side. Although I was not able to see it on the left side, because the left maxilliped overlaps and obscures the site where the maxillary hook is usually found, still I cannot say with certainty that the maxillary hook is absent.

Taeniacanthodes gunteri Causey, 1953

Taeniacanthodes gunteri Causey, 1953: 7, figs. 1-7; 1955: 3.—Yamaguti, 1963: 26, pl. 18, fig. 3.

Material Examined.—One holotypic ♀ (USNM 94094) from under surface of *Citharichthys spiloterus* Günther, collected at Port Aransas, Texas.

Remarks.—The type-specimen mounted on a slide is in such bad condition (opaque and covered with crystals) that the structure of the appendages and various parts of the body can hardly be observed. Those features which I could make out with certainty are: the presence of two knobs, as in the preceding species, on the lateral surface of the cephalothorax, and one seta and two spines on the free segment of leg 5.

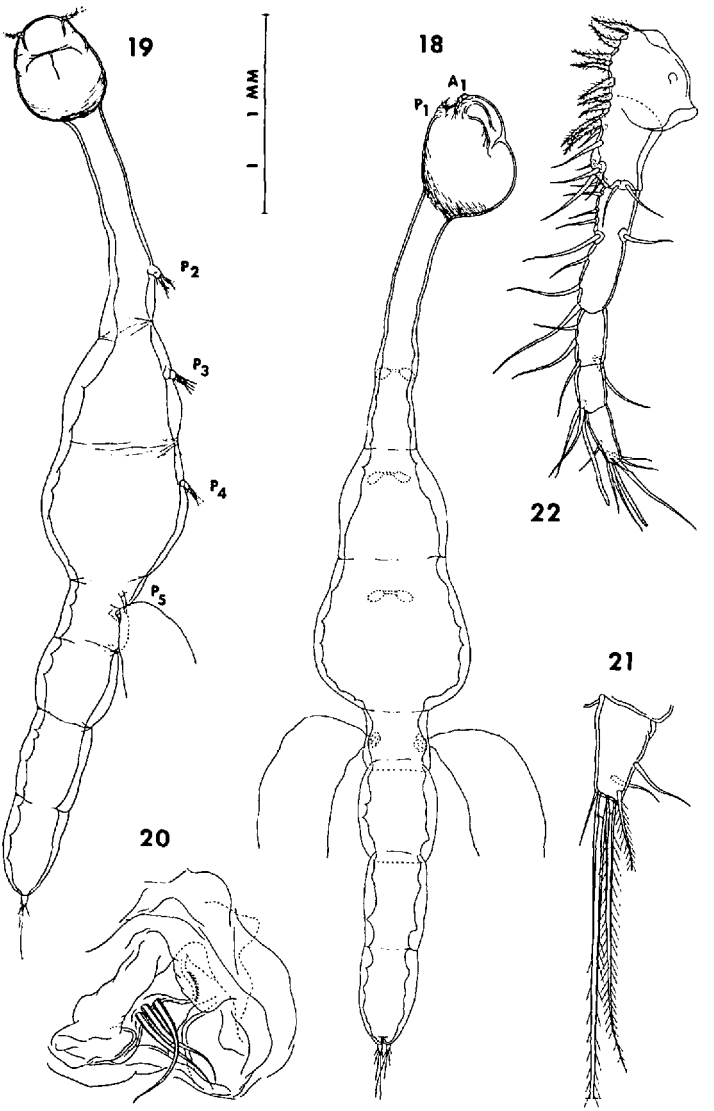
It appears that Causey's (1953: 7-8) establishment of *T. gunteri* is largely due to Wilson's (1935: 337-338) inadequate description of *T. gracilis*. Causey, in establishing *T. gunteri,* said that it differs from *T. gracilis* "in being smaller, in the shape of the cephalothorax, in the relative lengths of the two segments of the abdomen, the appearance of the eggs in the strings, and in the structure of the fifth leg."

Wilson (1935: 337) described the cephalothorax of *T. gracilis* as acorn-shaped; it is, however, really rather circular in dorsal view (see Fig. 6), as described by Causey for *T. gunteri.* Wilson gave no measurements for *T. gracilis,* Causey estimated the total length, based on the two scales on Wilson's plate 2, as "approximately, either 3.5 mm. or 6 mm." According to my restudy of the type-specimen, however, *T. gracilis* measures 2.86 mm and is not too much different from the 2.5-mm length of *T. gunteri.* Both Wilson and Causey recognized only two segments in the abdomen. The first segment of Wilson's *gracilis* actually includes the first and second segments, and that of Causey's *gunteri* is the real first segment; hence, they are not comparable. It is obvious that the second abdominal segment of *gunteri* actually represents the second and third segments together. Wilson failed to detect the basal segment of leg 5, which he described as "uniramous and one-segmented." My reexamination, however, shows that it is two-segmented (see Fig. 17) and similar to that of *gunteri.* The eggs in the strings in the mounted type-specimen of *T. gunteri* have a peculiar appearance, as Causey noted when he wrote "the inner margins show a diamond-shaped beaded string instead of a zigzag line." It is conceivable, however, that this appearance is an artifact, the two rows of eggs having become separated within the egg sac during the process of mounting.

Taking into account these apparent discrepancies cited by Causey, *T. gunteri* is not different from *T. gracilis.* Since it is impossible to study the detailed structure of the appendages in the mounted holotypic female of *T. gunteri,* a decisive synonymization should be postponed until a study of further collections of the parasite from *Citharichthys spilopterus* at Port Aransas, Texas, is made.

Genus **Scolecicara** n. gen.

Female.—Body elongate, modified. Cephalosome completely fused with first pedigerous segment, forming a small globose head. Second pedigerous segment forming an elongate neck. Third and fourth pedigerous segments fused and forming a guitar-shaped trunk. Urosome elongated, cylindrical, much narrower than trunk. Cephalic appendages together with maxillary hooks and first legs housed in a small pit on anteroventral surface of head. Caudal ramus bearing six elements. First antenna indistinctly seven-segmented. Second antenna three-segmented, terminal segment armed with pectinate processes, claws, and setae. Mandible two-segmented, with terminal segment carrying three elements. Paragnath present. First maxilla bearing three elements. Second maxilla two-segmented, with three processes on terminal segment. Maxilliped non-prehensile and modified. Legs 1 to 4 biramous, rami three-segmented, except first pair where the rami are two-segmented and flattened. Leg 5 two-segmented. Leg 6 represented by three setae at area of attachment of egg sac.



FIGURES 18-22. *Scolecicara humesi* n. sp., female: 18, body, with head region twisted, dorsal (scale line I); 19, body, with head region twisted, lateral (scale line I); 20, area of attachment of egg sac, and leg 6, ventral (scale line F); 21, caudal ramus, ventral (scale line H); 22, first antenna, dorsal (scale line H).

Male.—Unknown.

Etymology.—The name *Scolecicara,* a combination of σκώληξ = worm, and κάρα = head, alludes to the scolex-like head region. Gender neuter.

Type-species.—*Scolecicara humesi,* n. sp.

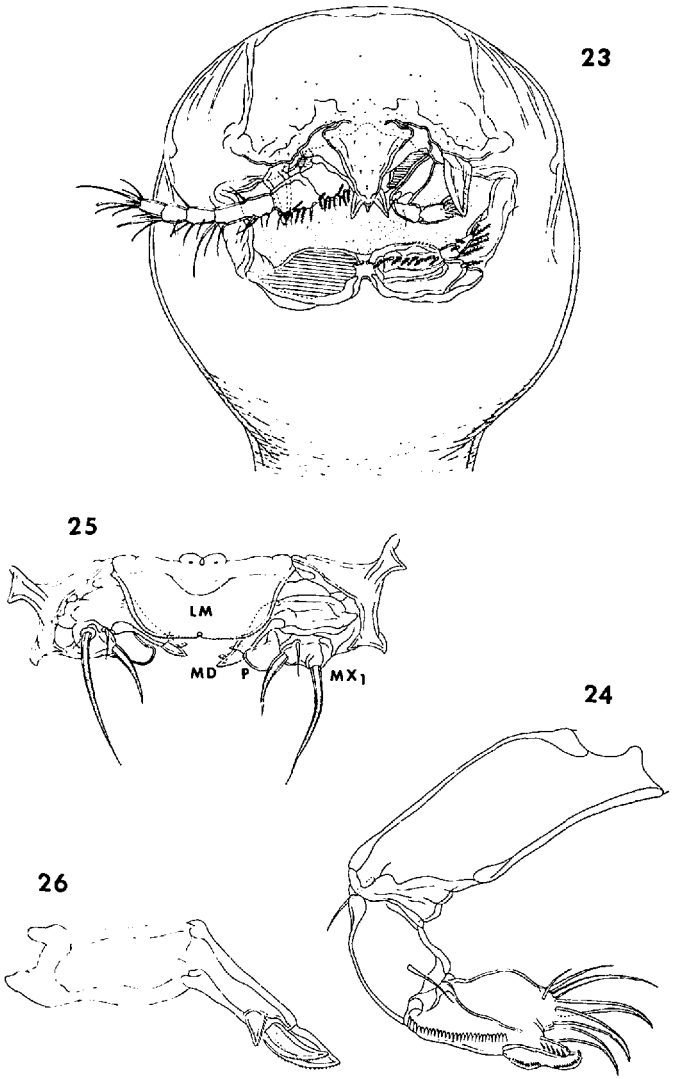
Scolecicara humesi n. sp.
Figs. 18-34

Material Examined.—Three ♀♀ taken from gill filaments of *Porichthys porosissimus* (Cuvier & Valenciennes) collected at St. George Sound, off Carrabelle, Florida, July 15, 1965. One specimen selected for holotype and deposited in the U. S. National Museum (USNM 119833), and remaining 2 specimens (1 dissected and other decapitated) in author's collection.

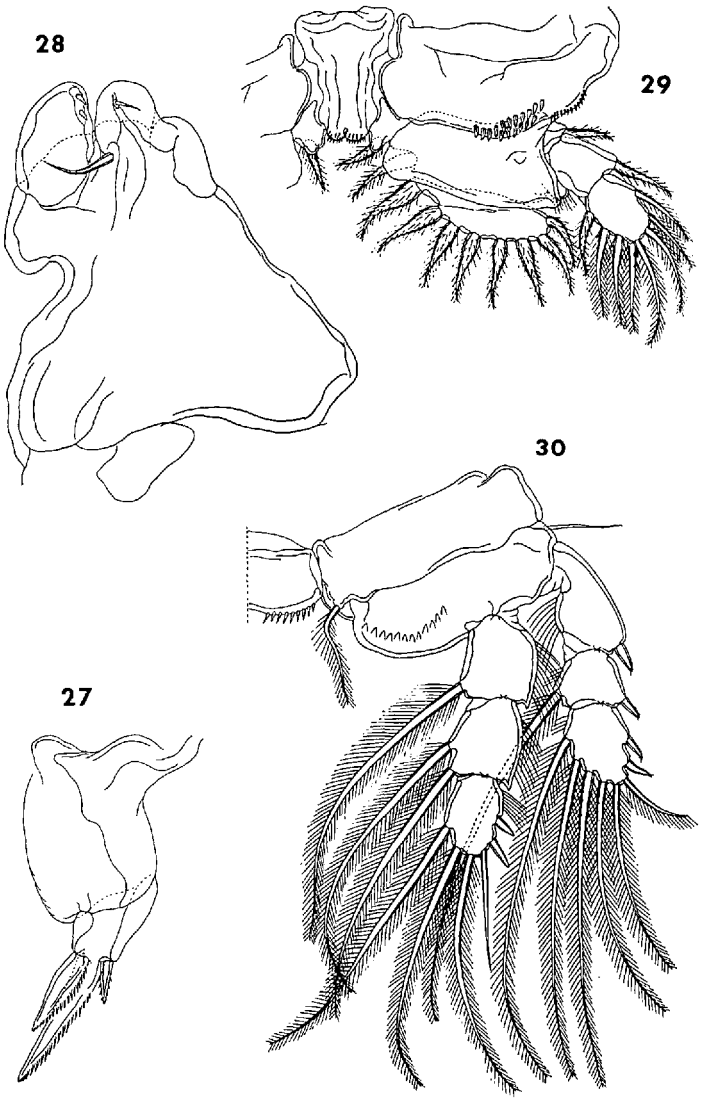
Female.—Body (Figs. 18, 19) modified, with prosome divided into three regions: head, neck, and trunk. Head globose dorsally and flattened ventrally, with a concavity (housing all cephalic appendages and first legs) on its anteroventral side. Sclerites on head as shown in Figure 19. Neck (prolonged second pedigerous segment) about half as wide as head, with its anterior portion twisted nearly 90° to the right. Degree of distortion lesser in holotype. Trunk guitar-shaped, composed of third and fourth pedigerous segments. Urosome (Figs. 18, 19) long and cylindrical, with three discernible postgenital segments. Incomplete lines of division between segments in metasome and urosome. Area of attachment of egg sac (Fig. 20) located on ventrolateral surface of genital segment, bearing the three long setae of leg 6. Eggs multiserate, all hatched, leaving an empty and broken sac still attached to genital segment. Caudal ramus (Fig. 21) small, 39 μ × 26 μ, carrying six setae, of which the two terminal ones are long and haired.

Rostrum (Fig. 23) well developed, conical, and tipped with three strong teeth. Maxillary hook (Fig. 23) stout and blunt, 56 μ long. First antenna (Fig. 22) seven-segmented, with first and second, and third and fourth segments incompletely fused. Armature on these seven segments: 5 (all haired), 13 (4 haired), 5, 3, 4, 2 + 1 aesthete, and 7 + 1 aesthete. Second antenna (Fig. 24) three-segmented, first and second segments each bearing a simple subterminal seta, but terminal segment armed with two pectinate processes, three claws, three setae, and a row of denticles on posteroventral margin of segment proper.

Mouth parts located deep in ventral concavity of head, invisible in ventral view. Labrum (Fig. 25) finely denticulated on posterior margin. Mandible (Fig. 26) two-segmented, terminal segment bearing three proc-



FIGURES 23-26. *Scolecicara humesi* n. sp., female: 23, head, with left first antenna, right second antenna, and right leg 1 omitted, ventral (scale line B); 24, second antenna, dorsal (scale line G); 25, oral area, ventral (scale line H); 26, mandible, dorsal (scale line G).



FIGURES 27-30. *Scolecicara humesi* n. sp., female: 27, second maxilla, anterior (scale line G); 28, maxilliped, inner (scale line G); 29, leg 1 and intercoxal plate, anterior (scale line F); 30, leg 2, anterior (scale line F).

esses of different size, which are denticulate only on one edge. Paragnath (Fig. 25) an unarmed, plump lobe. First maxilla (Fig. 25) a stout process bearing two long and one short setae. Second maxilla (Fig. 27) two-segmented, terminal segment produced terminally into a spinous process which bears spinules on one edge; segment itself armed with one pectinate, spinous process and one barbed, stout spine. Maxilliped (Fig. 28) non-prehensile, composed of a subtriangular basal segment and a small, knob-like terminal segment which bears two small elements; basal segment notched on outer edge and protruded distally into a blunt process which bears two unequal setae on outer surface.

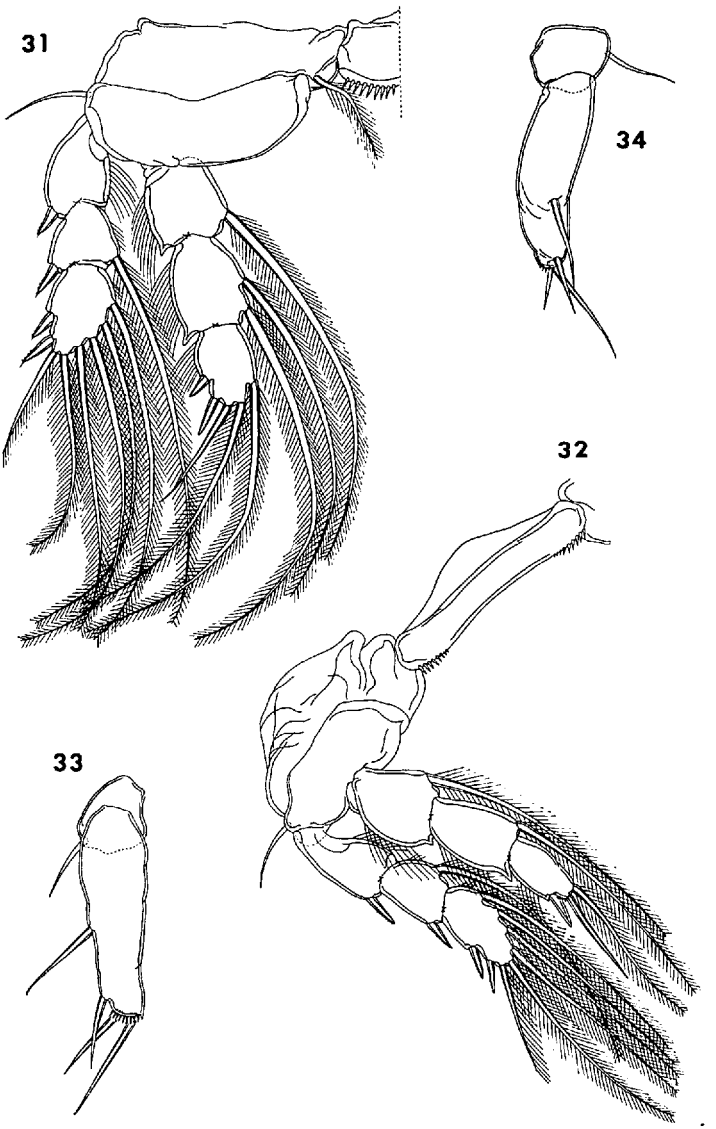
Legs 1 to 4 (Figs. 29, 30, 31, 32) with spine (Roman numerals) and setal (Arabic numerals) formulae as follows:

P_1	protopod 0-1; 1-1	exp 1-0; 8 end 0-1; 7
P_2	protopod 0-1; 1-0	exp I-0; I-1; II,I,5 end 0-1; 0-2; II,1,3
P_3	protopod 0-1; 1-0	exp I-0; I-1; II,I,5 end 0-1; 0-2; II,1,2
P_4	protopod 0-0; 1-0	exp I-0; I-1; II,I,5 end 0-1; 0-1; I,I,1

All intercoxal plates pectinate on posterior edge close to coxa. First coxa and second basis armed with teeth as indicated in Figures 29 and 30. Leg 5 (Figs. 33, 34) two-segmented, first segment 23 μ × 24 μ, carrying a subterminal outer seta; second segment, 65 μ × 23 μ, bearing four setae (one midouter, one subterminal, and two terminal) and a terminal row of spinules.

Measurements (in mm).—Total length (excluding setae on caudal rami) 3.90-4.30; head 0.44 × 0.39; urosome 1.60 × 0.38; width of neck 0.14, of portion across leg 2, 0.21; of anterior part of trunk, 0.56; and of posterior part of trunk, 0.78.

Remarks.—The new copepod has a characteristic highly modified body form. The most striking modification is the prolongation of the second pedigerous segment into a slender neck, which is about one-fourth of the body length. This type of modification has so far not been seen in any other genus of the Taeniacanthidae. The form of the maxilliped also serves as an important character in the establishment of the new genus. In having fused third and fourth pedigerous segments and an elongated, cylindrical abdomen, the new copepod resembles most closely *Taeniacanthodes gracilis*. However, the prolonged necklike second pedigerous segment, the globose head, the non-prehensile maxilliped, and the three-segmented endopod in legs 3 and 4 of *Scolecicara humesi* readily distinguish this new form from this related species.



FIGURES 31-34. *Scolecicara humesi* n. sp., female: 31, leg 3, anterior (scale line F); 32, leg 4 and intercoxal plate, anterior (scale line F); 33, leg 5, ventral (scale line F); 34, same, outer (scale line F).

Discussion on the Genus *Irodes* Wilson, 1911

When Wilson (1911) designated the subfamily Taeniacanthinae under the family Ergasilidae, he included in it four genera: *Taeniacanthus* Sumpf, *Anchistrotos* Brian, *Irodes* Wilson, and *Phagus* Wilson. The last two genera were created by Wilson to accommodate three transferred species: *Bomolochus gracilis* Heller (made the type-species of *Irodes*), *B. tetradonis* Bassett-Smith[1] (transferred to *Irodes*), and *B. muraenae* Brian (made the type-species of *Phagus*). Wilson also suggested that the taeniacanthids are most closely related to the bomolochids. However, the presence of maxillary hooks on the anteroventral surface of the cephalothorax and the structure and location of the maxillipeds in taeniacanthids clearly distinguish them from bomolochids. The subfamily was later promoted to the familial level by Wilson (1932).

The identification of taeniacanthid copepods is often difficult and one is sometimes puzzled in deciding to which genus a species belongs. This was first expressed by Scott (1929). Upon describing a new species, *Taeniacanthus wilsoni,* Scott (1929: 87) apparently was bewildered by the ambiguous definitions given by Wilson (1911) for *Taeniacanthus* and by Gurney (1927) for *Assecula.* The new species was, however, "placed in the genus *Taeniacanthus* . . . with some doubt."

Yamaguti also expressed difficulty in distinguishing species of *Irodes* from those of *Taeniacanthus,* as illustrated by his work on a species of *Taeniacanthus, T. tetraodontis* (Yamaguti). This species was first described by him in 1936 under the name "*Irodes tetraodontis* (Bassett-Smith, 1898) Wilson, 1911." Shiino (1957: 383), however, claimed that it is a species different from Bassett-Smith's *tetradonis* and gave it a new name, *Irodes yamagutii.* Two years later, however, Yamaguti & Yamasu (1959: 106) transferred Shiino's *I. yamagutii* (= Yamaguti's *I. tetraodontis*) to the genus *Taeniacanthus* with the following statement: "This species, however, does not belong to *Irodes* Wilson, 1911, according to Wilson's original definition of the genus." This transfer was not accepted by Pillai (1963: 110). He stated: "If *I. yamagutii* is a *Taeniacanthus, I. tetradontis* is very much so." Recently, Yamaguti (1963: 21) has called the same species "*T. tetraodontis* (Yamaguti)." Thus, his *I. tetraodontis,* Shiino's *I. yamagutii,* and Yamaguti & Yamasu's *T. yamagutii* all become synonyms of *T. tetraodontis.*

According to Wilson's (1911) original definition of the genus *Irodes,* the diagnostic characters for *Irodes* may be outlined as: Taeniacanthids with free prosomal segments much smaller than cephalothorax; prosomal

[1] This is the name used by Bassett-Smith (1898: 4) in his original description of the species. However, it was incorrectly quoted by Wilson (1911: 366, 386, 390) as *"Bomolochus tetrodontis"* and changed to *"Irodes tetraodontis"* by Yamaguti (1936: 4). Pillai (1963: 110, 111, 125) called it *"I. tetradontis."*

length about half of the entire body; and maxilliped "tipped with two or three plumose setae." So far as I am aware, there is no known species of taeniacanthid that can fit perfectly Wilson's definition of *Irodes,* not even the type-species which Wilson assigned to it. There are eight known species of taeniacanthids (*Taeniacanthus upenei* Yamaguti, *T. upenei upeneoides* Yamaguti, *T. indicus* Pillai, *T. narcini* Pillai, *Anchistrotos callionymi* Yamaguti, *A. sauridi* Pillai, *Echinosocius pectinatus* Humes & Cressey, and *E. dentatus* Humes & Cressey) which have their non-prehensile maxilliped armed (but not tipped) with (nonplumose) setae. Two of these eight species (*T. indicus* and *T. narcini*) have their prosome about half the length of the body, but their cephalothorax is not much larger than any of the free segments.

In his original description of the maxilliped of *Bomolochus gracilis,* Heller (1865: 158) wrote: "Es besitzt ein läangliches, verdicktes Basalglied, und ein inneres, langes, stielförmiges Endglied, das langs des ganzen Vorderrandes mit kurzen Stacheln besetzt ist. Nebstdem gewahrt man in der Tiefe noch einen Anhang, der aus zwei langen, spitzen, mit Wimpern besetzten Läppchen besteht." Therefore, it is evident that the maxilliped of the type-species of *Irodes* actually possesses a "stielförmiges Endglied," (see Heller, 1865: fig. 3,a) which in our modern terminology would be a "claw-like terminal segment," not unusual in taeniacanthids. It would have been better if Wilson had transferred it to the genus *Anchistrotos* instead of creating a new genus for it.

Pillai (1963: 111) argued that "*I. gracilis* and *I. tetradontis* can not go together under the same genus, and Wilson ought to have made *I. tetradontis* the type of *Irodes*." The genus *Irodes* was redefined by him as "first three free segments enlarged and subequal to the cephalothorax in size, the four together forming more than two-thirds the total length." This treatment of *Irodes,* however, can hardly be accepted, on the ground that the new definition embraces *Taeniacanthus carchariae* Sumpf, which is the type-species of *Taeniacanthus.* Pillai noted that if his new treatment of *Irodes* is accepted, *T. lagocephali* Pearse, 1952, *T. sabafugu* Yamaguti & Yamasu, 1959, and *T. kitamakura* Yamaguti & Yamasu, 1959 will have to be transferred to *Irodes,* and *T. lagocephali* was accordingly transferred by him.

Yamaguti (1963: 19) selected the structure of the first antenna as one of the two key characters which distinguish species of *Irodes* from those of *Taeniacanthus.* The first antenna of *Irodes* was redefined by him as "cylindrical, 4-segmented; basal segment widened but little, not flattened." With our increasing knowledge of the morphology of the taeniacanthid copepods, it becomes clear that the proximal two or three segments in the first antenna tend to fuse into a unit and appear somewhat enlarged and flattened. The degree of enlargement and flatness is difficult to define and

the lines of division between the segments are often so indistinct that they could have escaped the attention of earlier investigators. It is interesting to note that all species of taeniacanthids reported in the nineteenth century (*Taeniacanthus balistae* [Claus, 1864], *T. carchariae* Sumpf, 1871, *Irodes gracilis* [Heller, 1865], and *Anchistrotos ostracionis* [Richiardi, 1870]) were described as having four-segmented first antennae, and that no species has been reported in the twentieth century with such segmentation. The other key character used by Yamaguti for distinguishing *Irodes* from other taeniacanthids is the peculiar structure of the maxilliped, which was, as discussed above, improperly derived by Wilson (1911) from Heller's (1865) original description of *I. gracilis*.

Yamaguti's (1963: 21) treatment of the genus *Irodes* is quite different from that of Pillai (1963). Yamaguti retained *I. gracilis* in the genus and returned "*I. tetrodontis*," which was transferred from *Bomolochus* by Wilson (1911) and made the type-species of the genus by Pillai (1963), to the genus *Bomolochus*.

In conclusion, it seems apparent from the above discussion that the genus *Irodes* was founded on an erroneous recognition of the species *Bomolochus gracilis* Heller, 1865, and should be discarded. As to the hitherto included species, *I. gracilis* may be transferred to *Anchistrotos* and both *I. tetradonis* and *I. lagocephali,* to *Taeniacanthus*. Furthermore, as Yamaguti has already done, *I. yamagutii* should be synonymized with *"Irodes tetraodontis"* and transferred to *Taeniacanthus*.

Sumario

Copepodos de la Familia Taeniacanthidae (Cyclopoda) Parasitos de Peces Procedentes del Golfo de Mexico

Un re-examen de los ejemplares tipos en el U. S. National Museum de *Taeniacanthus lagocephali* Pearse procedentes de *Lagocephalus laevigatus* (Linnaeus), *Taeniacanthodes gracilis* Wilson procedente de *Paralichthys* sp. y *T. gunteri* Causey procedente de *Citharichthys spilopterus* Günther, ha revelado que la primer especie mencionada es válida en el género *Taeniacanthus* Sumpf y no debe ser transferida al género *Irodes* Wilson, como fue propuesto por Pillai (1963), y las dos últimas especies son probablemente conespecíficas. *Taeniacanthus sabafugu* Yamaguti & Yamasu es sinónima de *T. lagocephali. Scolecicara humesi,* un nuevo género y especie, es descrita basándose en tres ejemplares hembras tomados de los filamentos branquiales de *Porichthys porosissimus* (Cuvier & Valenciennes). El género *Irodes* Wilson debe ser descartado ya que fue establecido basándose en identificaciones erróneas de *Bomolochus gracilis* Heller, que fue establecida como la especie tipo por Wilson (1911).

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