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Zoological Studies **44**(3): 337-346 (2005)

Zoological Studies

Caudacanthus, a New Genus for *Caudacanthus narcini* (Pillai 1963) comb. nov. (Poecilostomatoida: Taeniacanthidae), a Parasitic Copepod of Batoid Fishes (Chondrichthyes: Elasmobranchii) from the Indo-West Pacific

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(Accepted May 2, 2005)

Danny Tang and Matthew D. Johnston (2005) *Caudacanthus*, a new genus for *Caudacanthus narcini* (Pillai 1963) comb. nov. (Poecilostomatoida: Taeniacanthidae), a parasitic copepod of batoid fishes (Chondrichthyes: Elasmobranchii) from the Indo-West Pacific. *Zoological Studies* **44**(3): 337-346. A new genus, *Caudacanthus*, is established for the species previously known as *Irodes narcini* (Pillai 1963) based on a redescription of newly collected material from the west and east coasts of Australia. *Caudacanthus narcini* (Pillai 1963) comb. nov. is distinguished from other members of the Taeniacanthidae by possession of (1) spinules on the ventral surface of each abdominal somite, (2) a maxilliped with a short terminal claw pressed close to the basis, (3) inner coxal seta on legs 2 and 3, and (4) a caudal ramus with a distolateral, bifid spine bearing a flagellum. A description of male *C. narcini* is provided for the first time. http://zoolstud.sinica.edu.tw/Journals/44.3/337.pdf

Key words: Copepoda, Taeniacanthidae, Elasmobranch, *Caudacanthus*, Parasite.

Taeniacanthus Sumpf, 1871 (Poecilostomatoida: Taeniacanthidae) contains 38 recognized species, all of which have been collected from elasmobranch or teleost hosts. The distinguishing diagnostic feature of females of this genus is the possession of a distinct maxilliped claw, which predominantly curves away from the preceding segment (Dojiri and Cressey 1987). Pillai (1963) described a new taeniacanthid under the binomen *Taeniacanthus narcini* collected from the blackspotted numbfish *Narcine timlei* (Bloch and Schneider) at Trivandrum, India, even though it appeared to lack a maxilliped claw. Due to this peculiar feature of *T. narcini*, Dojiri and Cressey (1987) questioned the generic status of *T. narcini* but tentatively recognized it as a member of *Taeniacanthus* until type specimens could be redescribed. Ho et al. (1999) later transferred *T. narcini* to *Irodes* Wilson, 1911 (a confamilial genus characterized by possession of a maxilliped without a terminal claw) based on a modified, but not markedly more-detailed, description of *T. narcini* by Pillai (1985). This paper redescribes *I. narcini* based on newly collected material, and the male is also described for the 1st time. Furthermore, since this species possesses a unique combination of morphological characters not shared by any other taeniacanthid, we propose a new genus to accommodate it.

MATERIALS AND METHODS

Specimens used in this study were kindly forwarded to us by Dr. Brian Jones, and were collected by us from banded numbfish *Narcine westraliensis* McKay loaned from the Western Australian Museum (WAM). All preserved copepod specimens were soaked in lactic acid, into which a few lignin pink crystals had been dis-

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solved, for 24 h prior to examination using an Olympus BX-50 compound microscope. Nine female and 5 male specimens were measured using an ocular micrometer. Seven female and 2 male specimens were dissected and examined according to the wooden slide procedure of Humes and Gooding (1964). Drawings were made with the aid of a camera lucida.

Five female specimens were examined under a high vacuum using scanning electron microscopy (SEM). Specimens were dehydrated in a graded ethanol series, critical point-dried, carbon sputter-coated, mounted on aluminum stubs, and examined with a LEO VP FEGSEM at 3 kV at the Centre for Microscopy and Microanalysis (CMM), The University of Western Australia. Anatomical terminology follows Dojiri and Cressey (1987) and Huys and Boxshall (1991).

RESULTS

Caudacanthus gen. nov.

Diagnosis

Female: Body elongate. Cephalothorax subcircular; cephalosome fused with 1st pedigerous somite. Abdomen 4-segmented, each segment with spinules on posteroventral margin. Caudal ramus with 5 setae and 1 terminally bifid spine. Rostral area with ventromedian sclerotized plate. Antennule 7-segmented. Antenna 4-segmented. Postantennal process present. Labrum spinulated on posterior margin. Mandible with 2 spinulated blades and an accessory element. Paragnath present. Maxillule lobate, bearing 6 setae. Maxilla 2-segmented, last segment with 1 spinulated process and 2 spinulated elements. Maxilliped indistinctly 3-segmented, last segment with short claw closely appressed to preceding segment. Legs 1~4 biramous. Leg 1 with 2-segmented rami, legs 2~4 with 3-segmented rami. Inner coxal seta present on legs 2 and 3. Terminal segment of leg 4 endopod with 3 elements. Leg 5 two-segmented, distal segment with 4 elements. Leg 6 vestigial, represented by 3 setae.

Male: Body shape similar to that of female. Abdomen 3-segmented. Maxilliped 4-segmented, strongly prehensile; 2nd segment ornamented with denticles; last segment denticulated along inner margin. Leg 6 absent.

Type species: *Caudacanthus narcini* (Pillai 1963) comb. nov.

Etymology: The generic name is a combination of the Latin *caud* (= tail) and *acanthus* (= a common suffix in the Taeniacanthidae, meaning spine), referring to the unique spinal element on the distolateral margin of the caudal ramus.

Caudacanthus narcini (Pillai 1963) gen. nov., comb. nov.

(Figs. 1-7)

Taeniacanthus narcini Pillai 1963: 114, Pillai 1985: 107.
Irodes narcini (Pillai 1963): Ho et al. 1999: 126.

Materials examined: 40 females and 7 males from a "ray" captured on 21 Apr. 1962, off the coast of Tweed Heads, eastern Australia (28°11'S, 153°33'E), by Stanley Wilson; 1 male from gills of banded numbfish *Narcine westraliensis* McKay captured in 1960 in Shark Bay, Western Australia (25°30'S, 113°30'E), by R. J. McKay. Seven female and 2 male voucher specimens deposited in the Australian Museum (AM P.68531 and AM P.68532), and 1 male deposited in the Western Australian Museum (WAM C34428). The remaining specimens (intact and dissected) are kept in the senior author's collection.

Female: Body as in figure 1A. Total length (excluding setae on caudal rami) 3.47 ± 0.34 (2.94~4.10) mm. Prosome 1.77 mm long and 1.03 mm wide. Cephalothorax composed of cephalosome fused with 1st pedigerous somite, rounded anteriorly. Second pedigerous somite 940 μm wide; remaining pedigerous somites decreasing in width posteriorly. Genital somite subquadrangular, wider (445 μm) than long (336 μm). Abdomen (Fig. 1B) 1.09 mm long and 382 μm wide, composed of 4 free somites; 1st 3 abdominal somites bearing row of spinules on posteroventral margin; ventral surface of anal somite (Figs. 1B, 2A) with 2 interrupted rows of spinules anteriorly and 1 short and 1 long row of spinules on each side of posterior midline. Caudal ramus (Figs. 1C, 2A) longer (132 μm) than wide (75 μm), bearing 1 apical spine and 1 midlateral, 1 subapical, and 3 apical setae; inner apical seta short and semipinnate; median apical setae long, each bearing an outer longitudinal row of barbules and an inner longitudinal row of small spinules; apical spine highly sclerotized, bifurcated apically (Fig. 1C) or subapically (Figs. 1D, 2B) and bearing a distal flagellum; row of spinules on ventrolateral surface near insertion of apical spine.

Rostral area (Fig. 1E) with ventromedian sclerotized plate bearing 2 anterior, medially directed,

rounded processes and a posterior transverse plate. Antennule (Fig. 3A) 7-segmented; armature formula: 5, 15, 5, 3, 4, 2 + 1 aesthetasc and 7 + 1 aesthetasc; most anterodistal seta on terminal segment sharing common base with aesthetasc (Fig. 3B). Antenna (Fig. 3C) composed of elongate coxobasis and 3 endopodal segments (endopodal segments 2 and 3 indistinctly separated); coxobasis with long seta on outer distal margin; 1st endopodal segment 1/3 length of coxobasis, bearing 1 inner seta; 2nd endopodal segment bearing 1 stout claw-like spine and 2 unequal pectinate processes (each pectinate process with 1 minute seta and row of spinules); terminal segment short, bearing 1 claw-like spine and 5 unequal setae. Postantennal process (Fig. 3D) curved with crenulated inner margin near distal end.

Labrum (Fig. 3E) spinulated on posterior margin; several rows of minute spinules present on posteroventral surface. Mandible (Fig. 3F) with 2 articulated blades and an accessory seta; apical blade spinulated along posterior margin; subapical blade with several rows of spinules on proximal surface and spinulated along posterior margin. Paragnath (Fig. 3G) digitiform with 2 patches of spinules near base and a row of spinules medially. Maxillule (Fig. 4A, B) lobate, bearing a sclerotized ridge on posterior surface, 1 long and 1 minute outer setae, 2 short and 2 long inner setae, and an anterior knob-like process; 4 inner setae finely pinnate arising from large anterior protrusion; long outer seta semipinnate. Maxilla (Fig. 4C) 2-segmented; 1st segment (syncoxa) bearing 1 small distal seta; 2nd segment (basis) with 1 spinulated terminal process and 2 spinulated setae. Maxilliped (Figs. 2C, D, 4D) 3-segmented (all 3 segments partially fused); 1st segment (syncoxa) large, bearing spatulate medial protuberance and 1 naked seta; 2nd segment (basis) bearing 2 proximal naked setae; a short claw on terminal segment appressed to basis, carrying 2 long naked setae and 1 small hyaline seta.

Legs 1~4 biramous (Figs. 4E, 5A-F). Armature on rami of legs 1~4 as follows (Roman numerals indicate spines; Arabic numerals indicate setae; int. indicates an intermediate spine):

	Coxa	Basis	Exopod	Endopod
Leg 1	0-1	1-1	1-0; 9	0-1; 7
Leg 2	0-1	1-0	I-0; I-1; III, I, 5	0-1; 0-2; II, I, 3
Leg 3	0-1	1-0	I-0; I-1; II, I, 5	0-1; 0-2; II, I, 2
Leg 4	0-0	1-0	I-0; I-1; II, I, 5	0-1; 0-1; I, 2 int.

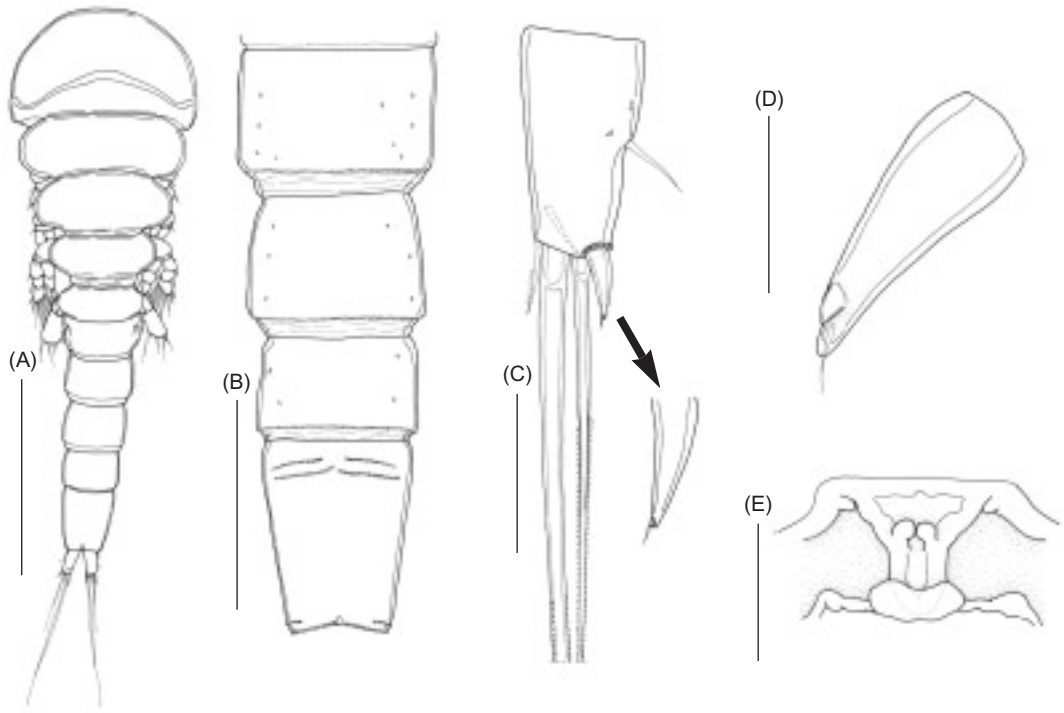

Fig. 1. *Caudacanthus narcini* (Pillai 1963), female. (A) Habitus, dorsal view; (B) abdominal somites, ventral view; (C) caudal ramus, ventral view; (D) caudal ramus spine, ventral view; (E) rostral area, ventral view. Scale bars: 1.00 mm in A; 400 μm in B; 100 μm in C, E; 25 μm in D.

Leg 1 (Fig. 4E) protopodal segments and rami flattened. Intercoxal sclerite diamond-shaped, deeply notched at midpoint, with spinulated posterior margin; basis with row of spinules on posterior border. Inner margin of 1st exopodal segment with short row of setules. Terminal endopodal segment bearing 5 long and 2 short setae; lobate outer margin bearing large patch of setules. Right leg of 1 specimen with 6 setae on terminal endopodal segment (Fig. 4F). Leg 2 (Fig. 5A) intercoxal sclerite with row of spinules along convex posterior edge; coxa bearing large spinules on distolateral margin and row of small spinules on lateral and posterior margins; basis with small patch of spinules on inner margin and row of spinules on posterior edge. Outer margin of exopodal and endopodal segments with row of spinules; row of setules present on inner margin of 1st exopodal segment and outer margin of 1st 2 endopodal segments; spine of 1st exopodal segment spinulated along lateral margins and tipped with flagellum (Fig. 5B); spines on 2nd and 3rd exopodal segments with hyaline tip and spinulated margins (Fig. 5C). Margins of outer and middle spines on distal endopodal segment spinulated; inner spine with several small teeth on distomedial edge and spinulated along outer edge. Leg 3 (Fig. 5D) intercoxal sclerite with row of spinules on the reentrant posterior margin; coxa similar to that of leg 2; basis with short row of spinules on posterior margin and lacking patch of spinules on inner margin. Ornamentation on exopod and endopod similar to that on leg 2; exopodal spines similar to those on leg 2; distal tips of outer and

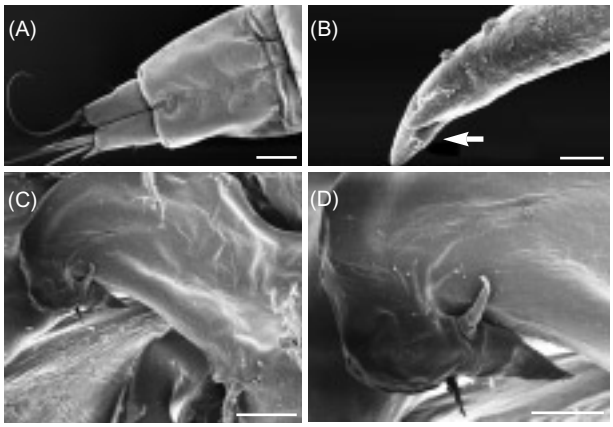

Fig. 2. *Caudacanthus narcini* (Pillai 1963), scanning electron micrographs, female. (A) Anal somite and caudal rami. ventral view; (B) caudal ramus spine (arrow indicates position of missing flagellum); (C) maxilliped, posterior view; (D) terminal segment of maxilliped, posterior view. Scale bars: 150 μm in A; 4 μm in B; 50 μm in C; 17 μm in D.

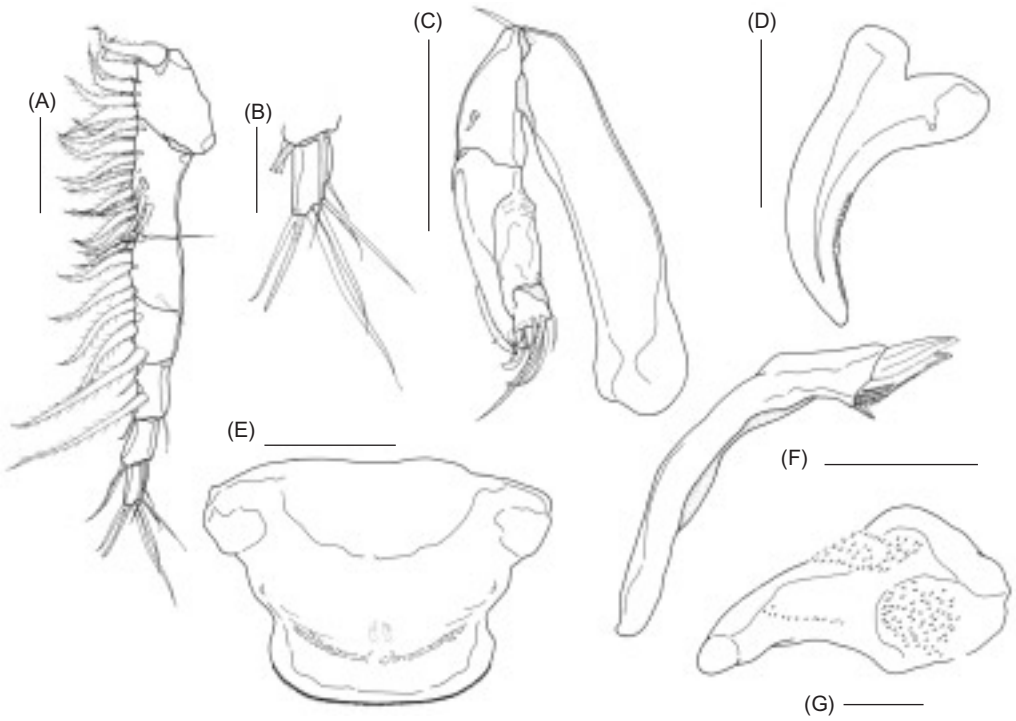

Fig. 3. *Caudacanthus narcini* (Pillai 1963), female. (A) Antennule, ventral view; (B) terminal segment of antennule, ventral view; (C) antenna, medial view; (D) postantennal process, medial view; (E) labrum, ventral view; (F) mandible, posterior view; (G) paragnath, ventral view. Scale bars: 100 μm in A, C~F; 50 μm in B; 25 μm in G.

middle spines on terminal endopodal segment blunt. Leg 4 (Fig. 5E) intercoxal sclerite approximately 4 times wider than long, with row of spinules on distolateral margin; coxa and basis similar to those on leg 3. Ornamentation on exopod and endopod similar to that on leg 2, except for very short row of setules also present on outer proximal margin of terminal endopodal segment; spine on 1st exopodal segment similar to that on leg 2; spines on last 2 exopodal segments considerably slimmer than those on legs 2 and 3, and attenuate at tip; outer spine on last endopodal segment also slim and attenuate at tip; inner intermediate spine about 2/3 length of outer intermediate spine. One specimen with 4 distal elements on right and left terminal endopodal segments (Fig. 5F). Leg 5 (Fig. 6A, B) uniramous, 2-segmented. First segment (protopod) with 1 dorsolateral naked seta and minute spinules on posterolateral surface. Free exopodal segment with 3 spinulated spines and 1 naked seta; each element with row of large spinules at base; numerous pores present on medial surface. Leg 6 (Fig. 6C) vestigial, represented by 3 unequal naked setae in egg sac attachment area.

Male: Body as in figure 6D. Total length (excluding setae on caudal rami) 1.49 ± 0.09 (1.34~1.57) mm. Prosome 685 μm long and 454 μm wide. Second pedigerous somite 410 μm wide; remaining pedigerous somites decreasing in width posteriorly. Genital somite longer (241 μm) than wide (233 μm). Abdomen 437 μm long and 152 μm wide, composed of 3 free somites; ventral surface of abdominal somites ornamented as in female. Caudal ramus longer (63 μm) than wide (38 μm), bearing similar elements as in female.

Maxillule (Fig. 6E, F) with anterior protrusion less developed than in female; seta adjacent to anterior knob-like process considerably larger relative to lobate base compared to that in female. Maxilliped (Figs. 6G, H) 4-segmented; 1st segment irregularly shaped, bearing 1 naked seta; 2nd segment elongate, bearing 2 naked setae, a row of rounded denticles on medial margin and row of small denticles on anterior surface; 3rd segment small, unarmed; last segment elongate and strong-

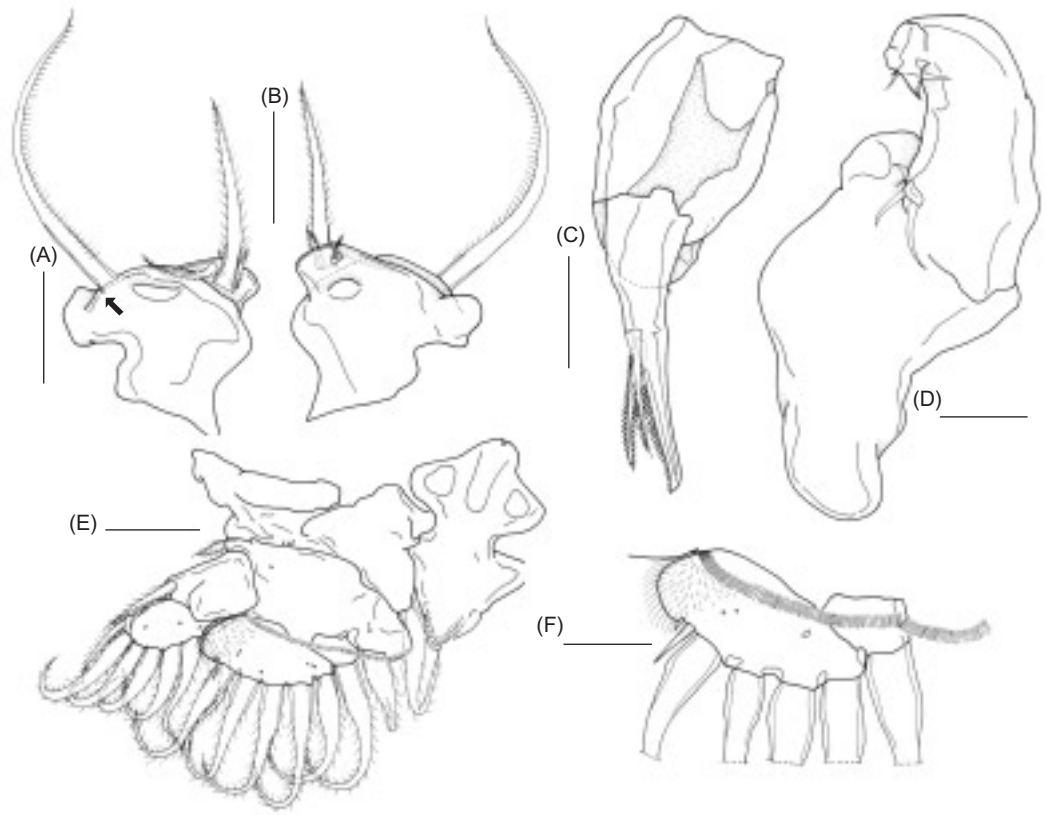

Fig. 4. *Caudacanthus narcini* (Pillai 1963), female. (A) Maxillule, posterior view (arrow pointing to minute seta); (B) maxillule, anterior view; (C) maxilla, ventral view; (D) maxilliped, posteromedial view; (E) leg 1, anterior view; (F) abnormal leg 1 endopod, anterior view. Scale bars: 50 μm in A~D, F; 100 μm in E.

ly curved, bearing 3 proximal setae, an inner basal tooth, and a row of small blunt denticles on inner (curved) margin.

Exopodal spines on middle and distal segments of legs 2 (Fig. 7A) and 3 (Fig. 7B) with more-conspicuous hyaline tip than in female. Innermost spine on terminal exopodal segment of legs 2~4 with row of pinnules on inner margin (Fig. 7A-C). Outer and middle spines on last endopodal segment of legs 2 (Fig. 7D) and 3 (Fig. 7E) slimmer than those in female, bearing hyaline tip. Inner spine on last endopodal segment of legs 2 (Fig. 7D) and 3 (Fig. 7E) lacking teeth on distomedial margin. Leg 5 (Fig. 7F, G) with well-developed posterolateral spinules on protopodal segment; protopodal seta with pinnules on anterior border; free exopodal segment slimmer than that in female, lacking numerous pores on medial surface; seta longer than free exopod segment; innermost spine longer than protopodal and exopod segments combined.

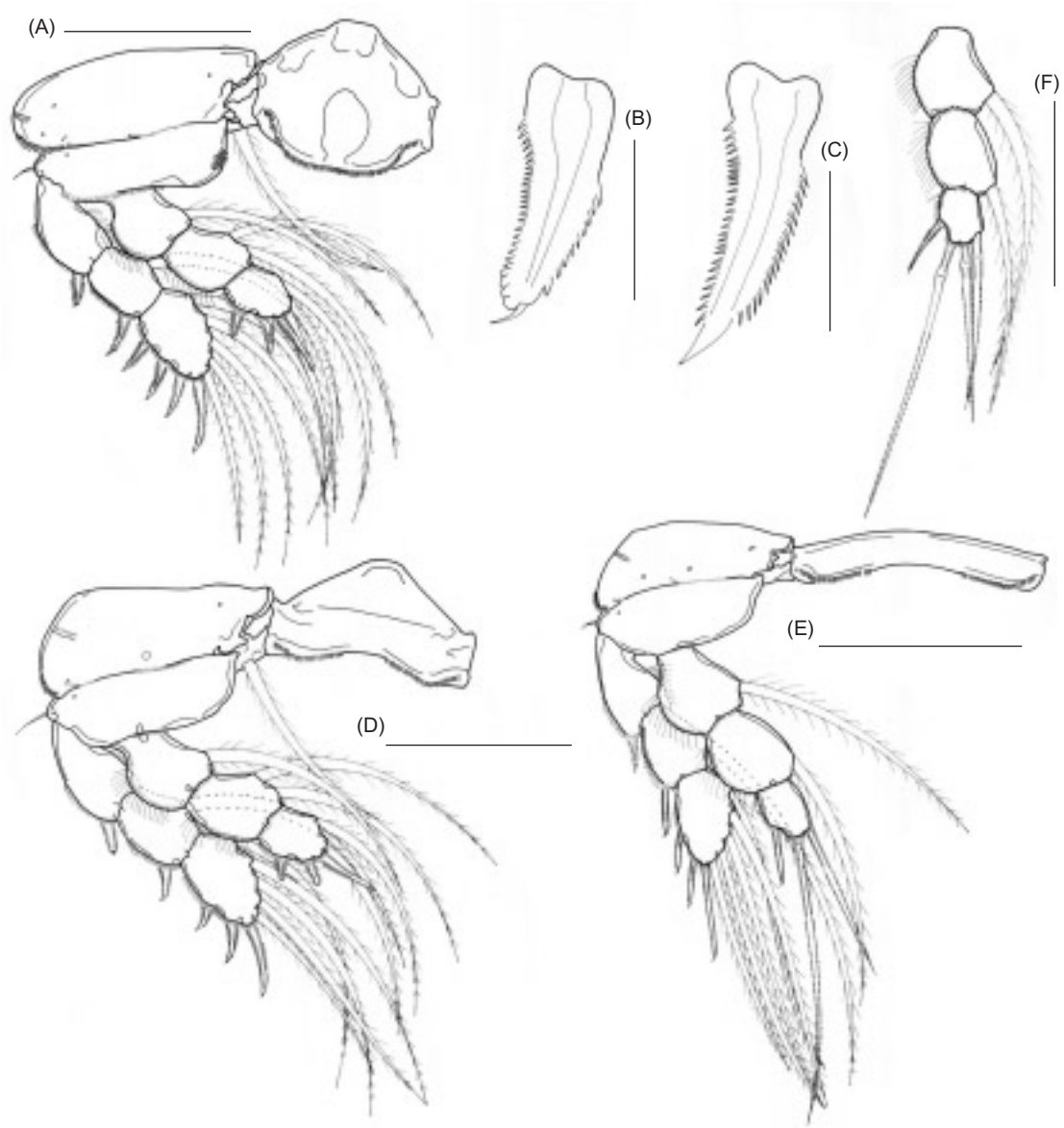

Fig. 5. *Caudacanthus narcini* (Pillai 1963), female. (A) Leg 2, anterior view; (B) 1st exopodal spine, anterior view; (C) 2nd exopodal spine, anterior view; (D) leg 3, anterior view; (E) leg 4, anterior view; (F) abnormal leg 4 endopod, anterior view. Scale bars: 200 μm in A, D~F; 25 μm in B, C.

DISCUSSION

Comparison of our material with other members of the Taeniacanthidae indicates general conformity with Pillai's (1963) original description and drawings of *Taeniacanthus narcini* in terms of the general habitus and the armature and general morphology of legs 2~4. However, a number of discrepancies exist between our observations and Pillai's comments on the fine morphological details of *T. narcini* (Table 1), which we attribute to Pillai's oversights and incorrect observations, as follows.

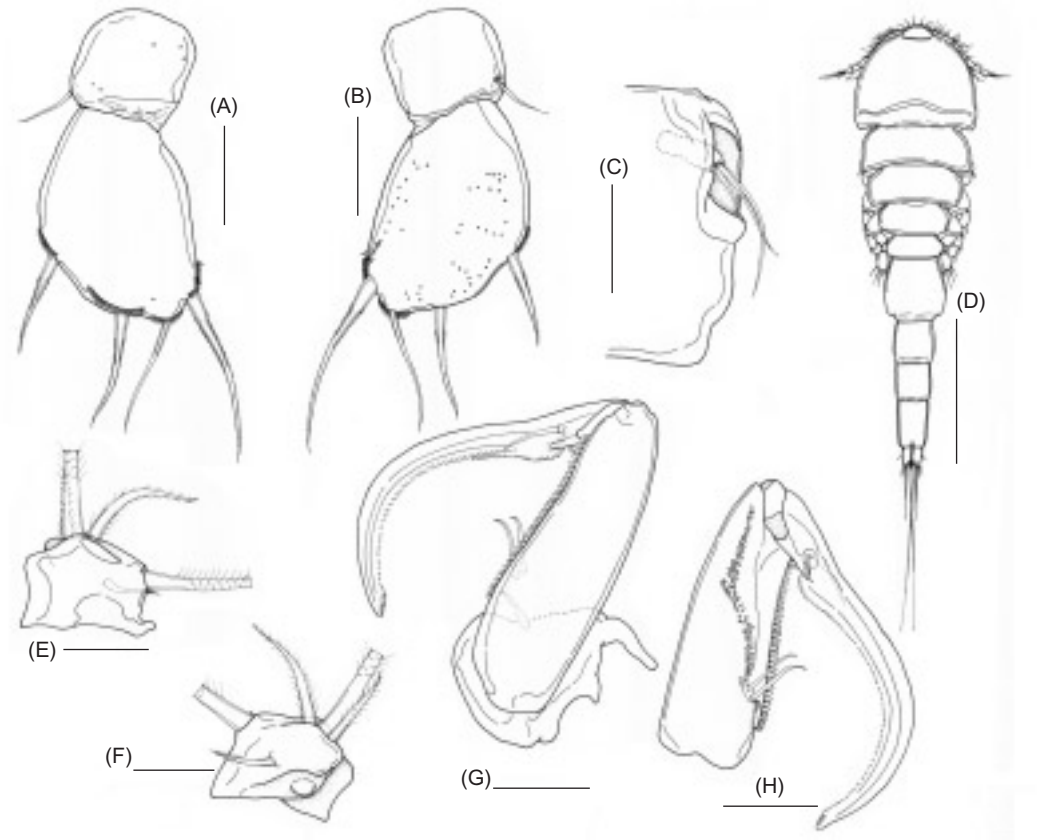

Fig. 6. *Caudacanthus narcini* (Pillai 1963), female (A~C), male (D~H). (A) Leg 5, lateral view; (B) leg 5, medial view; (C) leg 6, dorsal view; (D) habitus, dorsal view; (E) maxillule, posterior view; (F) maxillule, anterior view; (G) maxilliped, posterior view; (H) last 3 segments of maxilliped, anterior view. Scale bars: = 100 μm in A~C; 500 μm in D; 25 μm in E, F; 50 μm in G, H.

Table 1. Comparison of the morphological features of *Caudacanthus narcini* (Pillai 1963) given in Pillai (1963) and the present study

Character	Pillai (1963)	Present study
Spinules on each abdominal somite	Not observed	Present
Distolateral spine on caudal ramus	Not observed	Present
Antennule	6-segmented	7-segmented
Pectinate processes of antenna	With several rows of spinules	With 1 row of spinules
Terminal segment of antenna	With 4 claws	With 1 claw
Mandible	Without accessory seta	With accessory seta
Maxillule	With 4 setae	With 6 setae
Maxilla	With 2 terminal elements	With 3 terminal elements
Maxilliped	Without terminal claw	With short terminal claw
Leg 1 exopod (1st segment)	Inner seta present	Inner seta absent
Leg 1 exopod (terminal segment)	5 setae	9 setae
Leg 1 endopod	Trimerous	Bimerous

Features present in our specimens, such as the spinules on the abdominal somites, the 2 additional elements (1 short and 1 minute) on the maxillule, the accessory seta on the mandible, and the 3rd terminal element on the maxilla, were probably overlooked by Pillai. Furthermore, the number of antennular segments, the spinulation pattern on the pectinate processes of the antenna and the type of elements (claws or setae) on the last antennal segment of *C. narcini* were most likely misinterpreted by Pillai. The distolateral spine on the caudal ramus, a diagnostic feature present in our specimens, was not mentioned or drawn in Fig. 2A of Pillai (1963), but this structure most likely was broken off in his specimens. In some of our specimens, the short claw on the distal end of the maxilliped was obscured from view because it was pressed close to the anterior surface of the basis rather than to the medial or posteromedial surface of the basis. This may explain why Pillai failed to observe the claw on the maxilliped of his specimens. Pillai (1963) clearly misinterpreted both the setation pattern of the exopod of leg 1 and the segmentation of the endopod of leg 1 in his specimens of *C. narcini*. The plesiomorphic condition of leg 1 is a biramous, trimerous appendage with an armature formula of 0-1 for the coxa, 1-1 for the basis, 1-0; 1-1; 7 for the exopod, and 0-1; 0-1; 6 for the endopod (Dojiri and Cressey 1987). Therefore, a 2-segmented exopod is formed from either fusion of the 2nd and 3rd segments or by the failure of the 2nd and 3rd segments to separate, both events leading to a formula of 1-0; 9. Similarly, a 2-segmented endopod is produced from either fusion of the 2nd and 3rd segments or by the failure of the 2nd and 3rd seg-

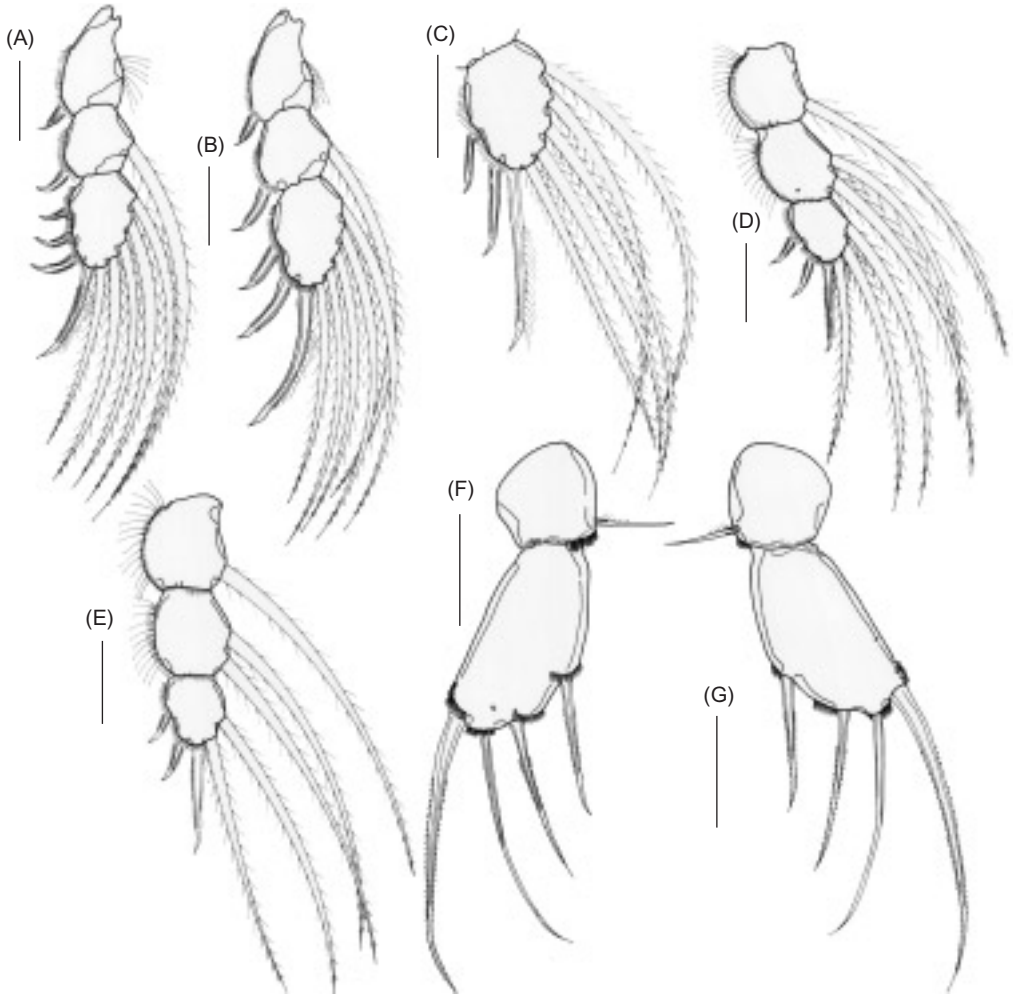

Fig. 7. *Caudacanthus narcini* (Pillai 1963), male. (A) Leg 2 exopod, anterior view; (B) leg 3 exopod, anterior view; (C) terminal segment of leg 4 exopod, anterior view; (D) leg 2 endopod, anterior view; (E) leg 3 endopod, anterior view; (F) leg 5, lateral view; (G) leg 5, medial view. Scale bars: 50 μm for all drawings.

ments to separate, both conditions resulting in a formula of 0-1; 7. The inner seta on the 1st segment of the exopod of leg 1 in the specimens described by Pillai is actually the innermost seta on the 2nd segment. Moreover, the 3 short outer setae normally present on the 2nd segment of the exopod were most likely broken off the specimens examined by Pillai. The 3-segmented condition of the endopod of leg 1 as described by Pillai is in fact only a 2-segmented ramus. His "1st segment" is actually the basis, his "2nd segment" corresponds to the 1st endopodal segment, and the distal inner seta on his "2nd segment" represents the innermost seta on the last endopodal segment. The 2 outermost setae on the terminal endopodal segment were most likely overlooked by Pillai, since they are considerably smaller than the inner 5 setae.

Given that our specimens and Pillai's (1963) material were collected from the same host genus (*Narcine*) and the aforementioned dissimilarities between our observations and those of Pillai's notwithstanding, we consider our material from the western and eastern coasts of Australia to be con-

Table 2. Comparison of morphological features* between *Caudacanthus narcini* (Pillai, 1963), *Anchistrotos* Brian, 1906, *Phagus* Wilson, 1911, *Pseudotaeniacanthus* Yamaguti et Yamasu, 1959, *Scolecicara* Ho, 1969, and *Taeniastrotos* Cressey, 1969

Character	*C. narcini*	*Anchistrotos*	*Phagus*
2nd pedigerous somite long and slender	Not expressed	Not expressed	Not expressed
3rd and 4th pedigerous somites fused	Not expressed	Not expressed	Not expressed
No. of abdominal somites	4	4	4
Spinules on all abdominal somites	Expressed	Not expressed	Expressed
Elements on caudal ramus	5 setae, 1 bifid spine	6 setae	6 setae
Rostral area	Sclerotized plate	Sclerotized plate	Sclerotized plate
Antennule	7 segments	7 segments	7 segments
Antenna	Indistinctly 4-segmented	3 segments	3 segments
Postantennal process	Present	Present	Absent
Mandible	2 blades + accessory seta	2 blades	2 blades + accessory seta
Maxillule	6 elements	6 elements	5 elements
Terminal segment of maxilliped	Short claw appressed to basis	Long claw with 2 long whip-like setae	Claw absent, fused to basis
Leg 4 inner coxal seta	Absent	Absent	Absent
Leg 4 endopod (terminal segment)	3 elements	4 elements	4 elements

Character	*Pseudotaeniacanthus*	*Scolecicara*	*Taeniastrotos*
2nd pedigerous somite long and slender	Not expressed	Expressed	Not expressed
3rd and 4th pedigerous somites fused	Not expressed	Expressed	Not expressed
No. of abdominal somites	4	3	4
Spinules on all abdominal somites	Not expressed	Not expressed	Not expresse
Elements on caudal ramus	6 or 7 setae	6 setae	6 seta
Rostral area	Y-shaped sclerotized structure	Conical with 3 processes	Triangular, corrugated pad
Antennule	6 segments	6 segments	7 segments
Antenna	4 segments	3 segments	3 segments
Postantennal process	Absent	Present	Present
Mandible	2 blades	2 blades + accessory seta	2 blades ± accessory seta
Maxillule	4, 5, or 6 elements	3 elements	4 or 5 elements
Terminal segment of maxilliped	Weak, non-sclerotized	Knob-like	Distinct claw (generally sigmoid shaped)
Leg 4 inner coxal seta	Present	Absent	Present or absent
Leg 4 endopod (terminal segment)	3 or 4 elements	3 elements	2, 3, or 4 elements

*Morphological characters compiled from Ho (1969), Dojiri and Cressey (1987), Johnson and Kabata (1995), Montú and Boxshall (1997), and the present study.

specific with his Indian specimens. Unfortunately, we could not verify this since an attempt to obtain the type specimens of *T. narcini* from the collection of the Zoological Survey of India was unsuccessful. We are reluctant to establish a new species at this time pending examination of type material or collection of new specimens from the type host.

With the possession of a short terminal claw on the maxilliped, the species *narcini* does not conform to the genus *Irodes*. In fact, this species possesses the following combination of character states different not only from *Taeniacanthus*, a genus in which it was originally placed, but from other taeniacanthid species as well: (1) presence of spinules on the ventral surface of each abdominal somite; (2) a maxilliped with a short terminal claw pressed close to the basis; (3) the presence of an inner coxal seta on legs 2 and 3; and (4) a caudal ramus with a distolateral, bifid spine bearing a flagellum. Therefore, we propose a new genus, *Caudacanthus*, to accommodate this species.

While the aforementioned 4 characters define *C. narcini*, some species within the other taeniacanthid genera exhibit one or more of these characters. For instance, out of the 90 recognized taeniacanthid species, only 2 species, *Taeniacanthus comparatus* Dojiri et Cressey, 1987 and *Taeniacanthus papulosus* Dojiri et Cressey, 1987, have been reported to possess a flagellum on the outer terminal seta of the caudal ramus. These 2 closely related species can be distinguished from *C. narcini* by pronounced differences in the cephalothoracic appendages, the armature pattern of legs 2~4, and the ornamentation of the abdominal somites and outer terminal element of the caudal ramus. Species of *Anchistrotos* Brian, 1906, *Phagus* Wilson, 1911, *Pseudotaeniacanthus* Yamaguti et Yamasu, 1959, *Scolecicara* Ho, 1969, and *Taeniastrotos* Cressey, 1969 (except for *Taeniastrotos tragus* Dojiri et Cressey, 1987) possess an inner coxal seta on legs 2 and 3 similar to that on *C. narcini*. However, these 6 genera can be discriminated from *C. narcini* based on marked differences in the general habitus, cephalothoracic appendages, leg 4 armature, ornamentation of the abdominal somites, and type of elements on the caudal ramus (Table 2). Members of *Metataeniacanthus* Pillai, 1963 also possess a maxilliped bearing a terminal claw that is closely appressed to the basis, but differs from *C. narcini* in having a cephalothorax with ventrally directed lateral margins, an abdomen roughly 1/2 the total body length, postgenital ornamentation on the anal somite only, 6 setae on the caudal ramus, a 3-segmented exopod of leg 1, and the absence of an inner coxal seta on legs 2 and 3. In view of these differences, we consider the establishment of a new taeniacanthid genus to be warranted.

Acknowledgments: We are indebted to Drs. Brian Jones and Brenton Knott for critically reviewing the 1st draft of this manuscript, B. Jones for placing the material collected by S. Wilson at our disposal, and Glenn Moore for arranging the loan of the banded numbfish. We also thank the School of Animal Biology and the Centre for Microscopy and Microanalysis at The University of Western Australia for use of their laboratory and SEM facilities.

REFERENCES

Dojiri M, RF Cressey. 1987. Revision of the Taeniacanthidae (Copepoda: Poecilostomatoida) parasitic on fishes and sea urchins. Smithson. Contrib. Zool. **447:** 1-250.

Ho JS. 1969. Copepods of the family Taeniacanthidae (Cyclopoida) parasitic on fishes in the Gulf of Mexico. Bull. Mar. Sci. **19:** 111-130.

Ho JS, IH Kim, O Sey. 1999. New species of *Irodes* (Copepoda, Taeniacanthidae) parasitic on goatfish from Kuwait, with a key to the species of *Irodes*. Pak. J. Mar. Sci. **8:** 123-129.

Humes AG, RU Gooding. 1964. A method for studying the external anatomy of copepods. Crustaceana **6:** 238-240.

Huys R, GA Boxshall. 1991. Copepod evolution. London: The Ray Society.

Johnson SC, Z Kabata. 1995. Two new copepod species of the genus *Pseudotaeniacanthus* Yamaguti and Yamasu, 1959 (Poecilostomatoida: Taeniacanthidae), parasitic on moray eels in the Red Sea. Can. J. Fish. Aquat. Sci. **52:** 166-174.

Montú MA, GA Boxshall. 1997. A new species of *Taeniastrotos* Cressey (Copepoda: Poecilostomatoida) from southern Brazil. Syst. Parasitol. **36:** 109-114.

Pillai NK. 1963. Copepods of the family Taeniacanthidae parasitic on South Indian fishes. Crustaceana **6:** 110-128.

Pillai NK. 1985. Fauna of India: parasitic copepods of marine fishes. Calcutta: Technical and General Press.

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