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A review of the *Taeniacanthus balistae* species group (Crustacea: Copepoda: Taeniacanthidae), with descriptions of two new species

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Abstract

The *Taeniacanthus balistae* species group is characterized by two displaced elements on an outwardly curved and elongated terminal exopodal segment of leg 4. Members of this group parasitize tetraodontiform fishes. The group is reviewed herein based on both new material collected from tetraodontiform fishes and re-examination of voucher specimens housed at the Smithsonian Institution, U.S.A. Five species are considered valid in this group, including two new species described here, *Taeniacanthus dojirii* **sp. nov.** from diodontid hosts collected from the Indo-West Pacific and *Taeniacanthus ryukyuensis* **sp. nov.** from balistid hosts collected from the Ryukyu Islands, Japan. *Taeniacanthus dojirii* **sp. nov.** differs from other members of the group by having in the female stout spines on the terminal endopodal segment of legs 2 to 4 and on the exopod of leg 5, as well as highly reduced setae on the last two exopodal segments of leg 4. *Taeniacanthus ryukyuensis* **sp. nov.** differs from other members of the group by having in the female 16–18 incomplete rows of spinules on the anal somite, minute teeth on the straight terminal claw of the maxilliped and well-developed spinulated flanges on the rami of legs 2 to 4. Supplemental morphological observations, as well as new host and locality records for *Taenicanthus balistae* (Claus, 1864) and *Taeniacanthus similis* Dojiri & Cressey, 1987, are also provided.

Key words: fish parasite, Tetraodontiformes, taxonomy, host-specificity

Introduction

Currently 23 copepod species of Taeniacanthidae have been reported from fish hosts belonging to six families of Tetraodontiformes (Table 1). Among these 23 species, *Taeniacanthus balistae* (Claus, 1864), *T. occidentalis* (Wilson, 1924) and *T. similis* Dojiri & Cressey, 1987 belong to a well-defined group, called here the *Taeniacanthus balistae* species group. The diagnostic feature of this group is the presence of an outwardly curved and elongated terminal exopodal segment of leg 4. Also, most piscicolous taeniacanthids have two outer spines (one proximal and one subapical), one apical spine and three to five inner setae on the terminal exopodal segment of leg 4, but the outer subapical and apical elements are displaced toward the inner apical margin in members of this group (compare Dojiri & Cressey's (1987) Fig. 15B of *T. balistae* with Tang *et al*.'s (2011a) Fig. 3F of *Taeniacanthus larsonae* Tang, Uyeno & Nagasawa, 2011a).

Dojiri & Ho (1987) reported several variable characters in their female specimens of *T. similis* collected from *Diodon holocanthus* Linnaeus, 1758 (Diodontidae) off Sado Island, Japan. They refrained from establishing a new species for these specimens as they believed a thorough study of the taeniacanthids parasitic on tetraodontiform fishes was required to understand the *Taeniacanthus* species complex occurring on these fishes. In this study, we review the *Taeniacanthus balistae* species group based on a large collection of new material from tetraodontiform fishes and supplemented with Dojiri & Cressey's (1987) voucher specimens of *T. balistae*, *T. occidentalis*, and *T. similis*. Moreover, we describe two new species of the *Taeniacanthus balistae* species group, as well as include supplemental morphological information and new host and locality records for *T. balistae* and *T. similis*.

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TABLE 1. List of species of Taeniacanthidae reported from tetraodontiform fishes.

Copepod	Host family
Cirracanthus monacanthi (Yamaguti, 1939)	Monacanthidae
Cirracanthus spinosus Dojiri & Cressey, 1987	Monacanthidae
Nudisodalis acicula Dojiri & Cressey, 1987	Monacanthidae
Saging cebuana Uyeno, Tang & Nagasawa, 2013	Monacanthidae
Taeniacanthus aluteri (Avdeev, 1977)	Balistidae
Taeniacanthus balistae (Claus, 1864)	Balistidae, Monacanthidae, Diodontidae
Taeniacanthus brayae Tang, Uyeno & Nagasawa, 2011b	Monacanthidae
Taeniacanthus fugu Yamaguti & Yamasu, 1959	Tetraodontidae
Taeniacanthus kiemae Tang, 2011	Tetraodontidae
Taeniacanthus kitamakura Yamaguti & Yamasu, 1959	Tetraodontidae
Taeniacanthus lagocephali Pearse, 1952	Tetraodontidae
Taeniacanthus larsonae Tang, Uyeno & Nagasawa, 2011a	Ostraciidae
Taeniacanthus mcgroutheri Tang, Uyeno & Nagasawa, 2011b	Monacanthidae
Taeniacanthus moa (Lewis, 1967)	Ostraciidae
Taeniacanthus occidentalis (Wilson, 1924)	Balistidae
Taeniacanthus ostracionis (Richiardi, 1870)	Ostraciidae
Taeniacanthus pectinatus Yamaguti & Yamasu, 1959	Tetraodontidae
Taeniacanthus similis Dojiri & Cressey, 1987	Monacanthidae, Diodontidae
Taeniacanthus tetradonis (Bassett-Smith, 1898)	Tetraodontidae
Taeniacanthus thackerae Tang, Uyeno & Nagasawa, 2011a	Aracanidae, Ostraciidae
Taeniacanthus yamagutii (Shiino, 1957)	Tetraodontidae
Umazuracola elongatus Ho, Ohtsuka & Nakadachi, 2006	Monacanthidae
Umazuracola geminatus Kim & Moon, 2013	Monacanthidae

Materials and methods

Fresh fish samples were caught by line and/or spearfishing in the North Pacific Ocean and East China Sea off the Ryukyu Islands, Japan and in the Sea of Japan off Yuinohama and Echizen, Japan, while those from the Seto Inland Sea (off Itsukaichi, Japan) were purchased at a fishing port. Preserved triggerfish, filefish, boxfish and porcupinefish specimens accessioned at the following museums were also inspected for parasitic copepods: Australian Museum (AM), Sydney, Australia; California Academy of Sciences (CAS), San Francisco, U.S.A.; Museum and Art Gallery of the Northern Territory (MAGNT), Darwin, Australia; Natural History Museum of Los Angeles County (LACM), Los Angeles, U.S.A; and Western Australian Museum (WAM), Perth, Australia. Each infected museum fish is identified in the following copepod systematic account by the institution abbreviation and catalogue number in parentheses, when available, immediately after the host species name. Copepods were removed from the hosts with fine forceps and preserved in 70% ethanol. Dojiri & Cressey's (1987) voucher specimens of *T. balistae*, *T. occidentalis*, and *T. similis* were also borrowed from the National Museum of Natural History (USNM), Smithsonian Institution, U.S.A., for comparative purposes. Additional copepod material collected in Australian waters was kindly made available by Dr Brian Jones (Ministry for Primary Industries, New Zealand).

Preserved copepod specimens were soaked in lactic acid for a minimum of 24 h prior to examination using an Olympus SZ60 dissection microscope and Olympus BX50 compound microscope. Selected specimens were measured intact using an ocular micrometer and/or dissected and examined according to the wooden slide procedure of Humes & Gooding (1964). Measurements given are the mean and standard deviation. Selected intact specimens and dissected appendages were drawn with the aid of a drawing tube. Morphological terminology

follows Dojiri & Cressey (1987) and Huys & Boxshall (1991), fish names conform to FishBase (Froese & Pauly 2016) and the Catalog of Fishes database (Eschmeyer 2015), and biogeographic realms used herein follow those of Spalding *et al*. (2007). References for the authorities of fish genus and species names were lifted from Eschmeyer (2015). Type and/or voucher material is deposited at AM, CAS, LACM, MAGNT, WAM, and the National Museum of Nature and Science (NSMT), Tsukuba, Japan.

Results

Family Taeniacanthidae Wilson, 1911

Genus *Taeniacanthus* Sumpf, 1871

Taeniacanthus balistae (Claus, 1864)

(Fig. 1)

Eucanthus balistae Claus, 1864: Claus (1864: 378), Richiardi (1880: 148), Carus (1885: 353), Brian (1906: 25).
Anchistrotos balistae (Claus, 1864): Wilson (1911: 392), Rose & Vaissière (1952: 172), Kabata (1979: 74).
Taeniacanthus balistae: Yamaguti (1963: 20), Ho & Rokicki (1987: 1028), Dojiri & Cressey (1987: 26), Dojiri & Ho (1987: 33), Radujkovic & Raibaut (1989: 238), Honma & Kitami (1995: 26), Raibaut *et al*. (1998: 199), Alves *et al*. (2005: 71), Lin & Ho (2006: 178), Tang *et al*. (2011b: 33), Ho & Lin (2012: 553), Özak *et al*. (2012: 6), Uyeno *et al*. (2013: 521).
Taeniacanthus longichela Yamaguti & Yamasu, 1959: Yamaguti & Yamasu (1959: 99), Shiino (1960: 507), Yamaguti (1963: 21), Kabata (1979: 78), Reimer (1987: 506).

Material examined. Our specimens: 11 ♀, six ♂ and one copepodid, ex one *Aluterus scriptus* (Osbeck, 1765), North Pacific Ocean, off Henza Island, Ryukyu Islands, Japan, 25 May 2007; 30 ♀, ten ♂ and one copepodid, ex two *Canthidermis maculata* (Bloch, 1786), Sea of Japan, Yuinohama, Tottori Prefecture, Japan, 31 December 2007; one ♀, one ♂ and six copepodids (AM P65246), ex one *C. maculata* (AM I41972-003), Coral Sea, 6 May 1997; one ♂ (CAS 175289), ex *Stephanolepis hispidus* (Linnaeus, 1766) (CAS 59360), Pernambuco, Brazil, 6 December 1944; one ♀, one ♂ and one copepodid (CAS 175273), ex one *Stephanolepis setifer* (Bennett, 1831) (CAS SU64592), Pernambuco, Brazil, 9 November 1944; two ♀, four ♂ and one copepodid (LACM CR1962-081.1), ex one *S. setifer* (LAC 6277), Jamaica, 15 May 1962.

USNM specimens: 14 ♀, four ♂ and three copepodid vouchers (USNM 229373), ex *Alutera heudelotii* (Hollard, 1855) (= *Aluterus heudelotii* Hollard, 1855) (USNM 195916), Belgium, collection date unknown; three ♀ and one ♂ vouchers (USNM 241743), ex *Aluterus scriptus*, Carrie Bow Cay, Belize, 5 March 1988; one ♀ and one ♂ vouchers (USNM 229421), identified originally as *Taeniacanthus similis* by Dojiri & Cressey (1987), ex *Alutera scripta* (Osbeck, 1765) (= *Aluterus scriptus*), Netherlands East Indies, collection date unknown; one ♂ voucher (USNM 229422), identified originally as *T. similis* by Dojiri & Cressey (1987), ex *Alutera scripta* (= *Aluterus scriptus*), Philippine Islands, collection date unknown; three ♀ vouchers (USNM 227996), ex *Balistes capriscus* Gmelin, 1789, St. Georges Bay, Lebanon, collection date unknown; 32 ♀ and one ♂ vouchers (USNM 229379), ex *Balistes carolinensis* Gmelin, 1789 (= *Balistes capriscus*) (USNM 185775), Alabama (south of Mobile Bay), collection date unknown; 11 ♀ and one copepodid vouchers (USNM 229378), ex *B. capriscus* (USNM 278580), Sidi Bou Said (Gulf of Tunis), collection date unknown; two ♀ vouchers (USNM 228660), ex *Cantherhines pullus* (Ranzani, 1842), Carrie Bow Cay, Belize, 10 March 1986; six ♀ vouchers (USNM 228661), ex *C. pullus*, Carrie Bow Cay, Belize, 11 March 1986; one ♂ voucher (USNM 241742), ex *C. pullus*, Carrie Bow Cay, Belize, 3 December 1986; one ♀ voucher (USNM 229383), ex *Stephanolepis hispidus*, Charlotte Harbor, Florida, November 1972.

Description of adult female. See Dojiri & Cressey (1987).

Supplemental description of adult male. Total body length (excluding caudal setae) 910 ± 230 µm; greatest body width 349 ± 75 µm (n = 4) (Fig. 1A). Maxilliped (Fig. 1B–C) subchelate, 4-segmented (syncoxa not drawn); basis bearing long discontinuous row of truncate denticles along posteromedial margin, several short rows of truncate denticles on proximomedial surface, two medial bristled setae and long row of spinules along anteromedial margin; proximal endopodal segment short, unarmed; claw (distal endopodal segment) long, with long naked posterior seta, two subequal anterior setae (one bristled, one naked), one minute setule on basal concave

margin, row of denticles along concave margin and row of minute teeth on anterior surface. Leg 4 exopod armature formula variable: I-0; 1-1; 1, 6 (Fig. 1D) or I-0; I-0; I, II+4 (not figured) in specimens from *Canthidermis maculata*; I-0; I-1; 1, 6 (Fig. 1E) in specimen from *Stephanolepis hispidus*; 1-0; 1-1; 1, 6, I-0; 1-0; 1, 6, or I-0; I-1; 1, 6 in specimens from *Stephanolepis setifer* (one specimen with I-0; I-1; 1, 6 on right leg and I-0; 1-1; 1, I+5 (Fig. 1F) on left leg).

Attachment site. Branchial cavity wall and gill filaments.

Remarks. This species was described originally by Claus (1864) as *Eucanthus balistae* collected from an unidentified species of *Balistes* Linnaeus, 1758 captured in Helgoland, but was transferred, first to *Anchistrotos* Brian, 1906 by Wilson (1911), and then later to *Taeniacanthus* by Yamaguti (1963). Dojiri & Cressey (1987), Ho & Rokicki (1987) and Lin & Ho (2006) provided a redescription of *Taeniacanthus balistae*.

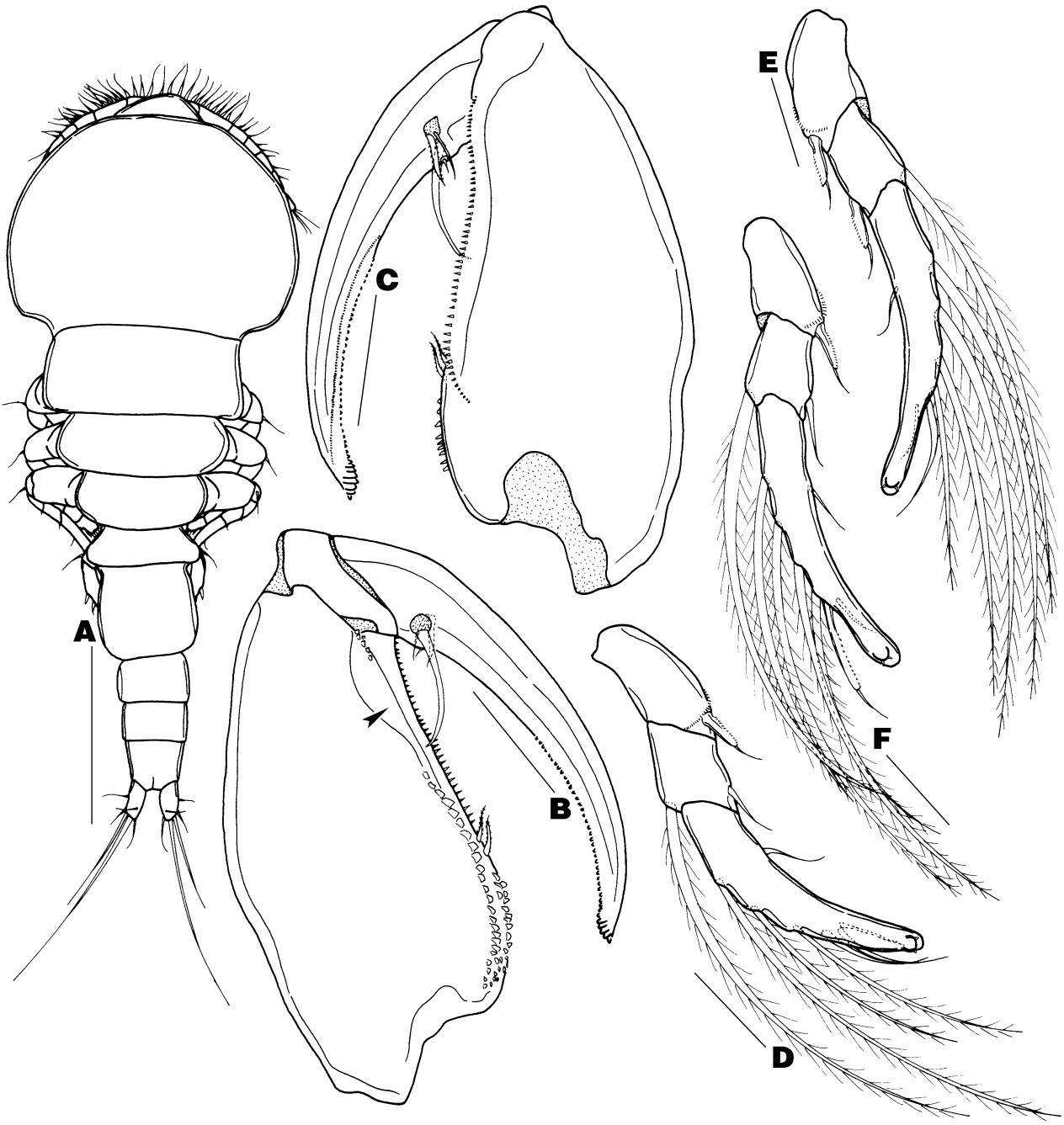

FIGURE 1. *Taeniacanthus balistae* (Claus, 1864) (male). A, habitus, dorsal; B, maxillipedal segments 2–4 (arrowhead indicates gap in the row of denticles), posterior; C, same, anterior; D–F, leg 4 exopod, anterior. Scale bars: A = 0.20 mm; B–F = 25 µm.

Dojiri & Cressey (1987) described the male of *T. balistae* based on specimens collected from *Diodon hystrix* Linnaeus, 1758 from the Gulf of Elat. They also reported a male variant removed from an unidentified species of *Alutera* Oken, 1817 (= *Aluterus* Cloquet, 1816) from the Philippines. The latter form differs from the former by having one long and one short row of truncate denticles instead of a large patch of truncate denticles on the posteromedial surface of the maxillipedal basis (see Figs. 3B, 5B). By contrast, the maxillipeds in our male specimens, as well as those from Dojiri & Cressey's *T. balistae* vouchers from *Aluterus heudelotii*, *Aluterus scriptus*, *Balistes capriscus* and *Cantherhines pullus* and Dojiri & Cressey's *T. similis* vouchers from *Aluterus scriptus*, consistently have a long *discontinuous* row and a few short rows of truncate denticles on the posteromedial surface of the basis (Fig. 1B). It is now evident that Dojiri & Cressey's (1987) *Taeniacanthus* specimens from *Aluterus* sp. and *D. hystrix* are not conspecific with *T. balistae*, but rather represent, respectively, *T. similis* and an undescribed species (see Remarks section of the first new taxon described below). Furthermore, *T. balistae* may be distinguished unequivocally from other members of the *T. balistae* species group, including the two new species described below, by the presence of a discontinuous row and a few short rows of truncate denticles posteromedially on the maxillipedal basis of the male.

Taeniacanthus occidentalis (Wilson, 1924)

Anchistrotos occidentalis Wilson, 1924: Wilson (1924: 6; 1932: 385), Humes & Rosenfield (1960: 179), Yamaguti (1963: 22), Kabata (1979: 74).

Taeniacanthus occidentalis: Dojiri & Cressey (1987: 84), Lin & Ho (2006: 182), Tang *et al*. (2011b: 34), Uyeno *et al*. (2013: 521).

Material examined. 29 ♀ vouchers (USNM 229405–229407, 229409, 229377), ex *Alutera schoepfi* (Walbaum, 1792) (= *Aluterus schoepfii* (Walbaum, 1792)), Charlotte Harbor, Florida, collection date unknown; three ♀ vouchers (USNM 229408), ex *A. schoepfi* (= *A. schoepfii*), Sanibel, Florida, collection date unknown.

Description of adult female. See Humes & Rosenfield (1960) and Dojiri & Cressey (1987).

Description of adult male. See Humes & Rosenfield (1960).

Attachment site. Gill filaments.

Remarks. *Taeniacanthus occidentalis* was originally described as *Anchistrotos occidentalis* by Wilson (1924) for female specimens collected from the Orange filefish *Aluterus schoepfii* (as *Alutera schoepfi*) at Woods Hole, Massachusetts, U.S.A. Humes & Rosenfield (1960) redescribed the female in detail and provided the first description of the male based on specimens collected from the type host and type locality. Dojiri & Cressey (1987) subsequently transferred this species to *Taeniacanthus* and provided supplemental descriptions of the female.

Taeniacanthus occidentalis is considered a valid species. It may be distinguished from other members of the *T. balistae* species group, including the two new species described below, by the following features: 1) having an apical spine that is at least twice as long as the proximal outer spine on the terminal exopodal segment of leg 2 in both sexes; 2) having relatively longer spines, particularly the outer subapical spine, on the free exopodal segment of leg 5 of the male; and 3) lacking a distolateral rounded lobe on the terminal exopodal segment of legs 2 and 3 in both sexes.

Taeniacanthus similis Dojiri & Cressey, 1987
(Figs. 2–3)

Taeniacanthus similis: Dojiri & Cressey (1987: 128), Lin & Ho (2006: 182), Tang *et al*. (2011b: 34), Uyeno *et al*. (2013: 521).
nec *Taeniacanthus similis*: Dojiri & Ho (1987: 36).

Material examined. Our specimens: seven ♀ and one ♂, ex one *Aluterus monoceros* (Linnaeus, 1758), Seto Inland Sea, Itsukaichi, Hiroshima Prefecture, Japan, 1 November 2005; one ♀ (CAS 175267), ex *Al. monoceros* (CAS 34945), Philippines, 1966; three ♀ (CAS 175299), ex one *Al. monoceros* (CAS 45953), Batang, Philippines, 25 April 1948; 12 ♀ (CAS 175287), ex one *Al. monoceros* (CAS 206492), Gulf of Thailand, 22 April 1961; one ♀ (WAM C38747), ex *Al. monoceros* (WAM P.31928.001), unknown locality and date; four ♀ (AM P65238), ex one

Anacanthus barbatus Gray, 1830 (AM I20827-014), Cape York, Queensland, Australia, 15 February 1979; three ♀ and one ♂ (AM P65239), ex one *An. barbatus* (AM I34399-037), Cape Clinton, Queensland, Australia, 26 October 1993; three ♀ (1 damaged) (MAGNT Cr014943), ex one *An. barbatus* (MAGNT S.13274-001), Booby Island, Queensland, Australia, 29 November 1991; one ♀ (AM P65245), ex *Cantherhines pardalis* (Rüppell, 1837) (AM I19642-001), North Bondi, New South Wales, Australia, 27 March 1977; three ♀ and one ♂ (WAM C38698), ex one *Cantheschenia longipinnis* (Fraser-Brunner, 1941) (WAM P.25341.008), Pt. Peron, Western Australia, 8 January 1964; three ♀, one ♂ and one copepodid (WAM C38696), ex one *Can. longipinnis* (WAM P.9183.001), Shark Bay, Western Australia, 1960; ten ♀ and two ♂ (WAM C38635, C38739), ex one *Can. longipinnis* (WAM P.9184.001), Albany, Western Australia, 1959; five ♀ (WAM C38640, C38761), ex one *Caprichthys gymnura* McCulloch & Waite, 1915 (WAM P.21571.001), Augusta, Western Australia, 4 October 1972; three ♀ (WAM C38570), ex one *Cap. gymnura* (WAM P.26917.001), Great Australian Bight, 18 February 1978; two ♀ (WAM C38650), ex one *Cap. gymnura* (WAM P.29035.001), Sandy Hook Island, Western Australia, 26 July 1986; eight ♀ and one ♂ (WAM C38565), ex one *Eubalichthys caeruleoguttatus* Hutchins, 1977 (WAM P.27226.003), Rankin Bank, Western Australia, 9 March 1981; one ♀ (WAM C38688), ex *E. caeruleoguttatus* (WAM P.32448.002), Shark Bay, Western Australia, 7 March 2003; 36 ♀ (WAM C38644, C38675–C38676, C38732–C38734), ex three *E. caeruleoguttatus* (WAM P.25928.001), Muiron Island, Western Australia, August 1977; 11 ♀ (WAM C38601), ex one *E. caeruleoguttatus* (WAM P.32449.007), Shark Bay, Western Australia, 7 March 2003; eight ♀, two ♂ and one copepodid (WAM C38716), ex unknown number of *Meuschenia australis* (Donovan, 1824), near Androssan, South Australia, 7 June 1962, donated by Dr Brian Jones; two ♀ (WAM C38648), ex one *Meuschenia freycineti* (Quoy & Gaimard, 1824) (WAM P.27117.005), Merimbula Lake, New South Wales, Australia, 16 February 1981; six ♀ and one copepodid (WAM C38645, C38750), ex one *M. freycineti* (WAM P.26035.001), Sydney, New South Wales, Australia, February 1978; six ♀, one ♂ and one copepodid (WAM C38558), ex one *Meuschenia galii* (Waite, 1905) (WAM P.5203.001), Beagle Island, Western Australia, March 1962; seven ♀ and one copepodid (AM P65257), ex one *Meuschenia hippocrepis* (Quoy & Gaimard, 1824) (AM I20163-007), Kangaroo Island, South Australia, 4 March 1978; one ♂ (AM P65258), ex *Meuschenia trachylepis* (Günther, 1870) (AM I35578-006), Wooli Wooli River, New South Wales, Australia, 13 September 1994; five ♀, two ♂ and one copepodid (AM P65260), ex one *M. trachylepis* (AM I38447-018), Mummunga Lake, New South Wales, Australia, 19 January 1979; two ♀ (AM P65262), ex one *M. trachylepis* (AM I42573-008), Port Stephens, New South Wales, Australia, 20 January 2000; two ♀ and one ♂ (AM P65259), ex one *M. trachylepis* (AM I36222-006), Botany Bay, New South Wales, Australia, 9 April 1992; one ♂ (AM P65261), ex *M. trachylepis* (AM I40842-015), Rozelle Bay, New South Wales, Australia, 4 May 2001; three ♀ (AM P65269), ex one *Paraluteres prionurus* (Bleeker, 1851) (AM I22578-026), Escape Reef, Queensland, Australia, 28 October 1981; two ♀ (AM P65268), ex one *P. prionurus* (AM I20956-055), Cape York, Queensland, Australia, 23 February 1979; two ♀ and one copepodid (CAS 175478), ex one *P. prionurus* (CAS SU68435), Jolo, Philippines, 2 August 1931; four ♀ (WAM C38600, C38720–C38721), ex one *Pseudomonacanthus peroni* (Hollard, 1854) (WAM P.30239.034), Exmouth Gulf, Western Australia, 24 March 1991; two ♀ (WAM C38557), ex one *P. peroni* (WAM P.26220.001), Indian Ocean, 23 June 1978; 100 ♀, 21 ♂ and 20 copepodids (WAM C38572–C38573, C38710, C38722–C38726), ex three *P. peroni* (WAM P.31990.001), Quobba, Western Australia, 13 April 1976; two ♀, three ♂ and five copepodids (WAM C38571), ex one *P. peroni* (WAM P.9179.001), Shark Bay, Western Australia, June 1958; two ♀ (AM P65282), ex one *P. peroni* (AM I33648-001), New South Wales, Australia, 25 March 1992; three ♀ (AM P65280), ex one *P. peroni* (AM I20771-071), Captain Billy Creek, Queensland, Australia, 18 February 1979; 39 ♀ and one ♂ (AM P65281), ex one *P. peroni* (AM I25938-003), Quobba, Western Australia, April 1976; 12 ♀ (WAM C38634), ex one *P. peroni* (WAM P.32318.003), Shark Bay, Western Australia, 7 October 2002; one ♀ (WAM C38586), ex *P. peroni* (WAM P.32393.003), Shark Bay, Western Australia, 24 February 2003; one ♂ (AM P65241), ex *Scobinichthys granulatus* (Shaw in White, 1790) (AM I40866-014), Darling Harbour, New South Wales, Australia, 18 May 2001.

USNM specimens: one ♀ voucher (USNM 229381), originally identified as *Taeniacanthus balistae* by Dojiri & Cressey (1987), ex *Alutera monoceros* (= *Aluterus monoceros*), Marivales, Philippines, collection date unknown; one ♀, two ♂ and three copepodid vouchers (USNM 229382), originally identified as *T. balistae* by Dojiri & Cressey (1987), ex *Alutera monoceros* (= *Aluterus monoceros*) (USNM 94781), Hainan, China, collection date unknown; two ♀, four ♂ and nine copepodid vouchers (USNM 227995), originally identified as *T. balistae* by Dojiri & Cressey (1987), ex *Alutera* (= *Aluterus*) sp., Philippine Islands, 5–6 June 1978; ten ♀ and two copepodid vouchers (USNM 229375), originally identified as *T. balistae* by Dojiri & Cressey (1987), ex *Alutera* (= *Aluterus*) sp., Philippines, collection date unknown.

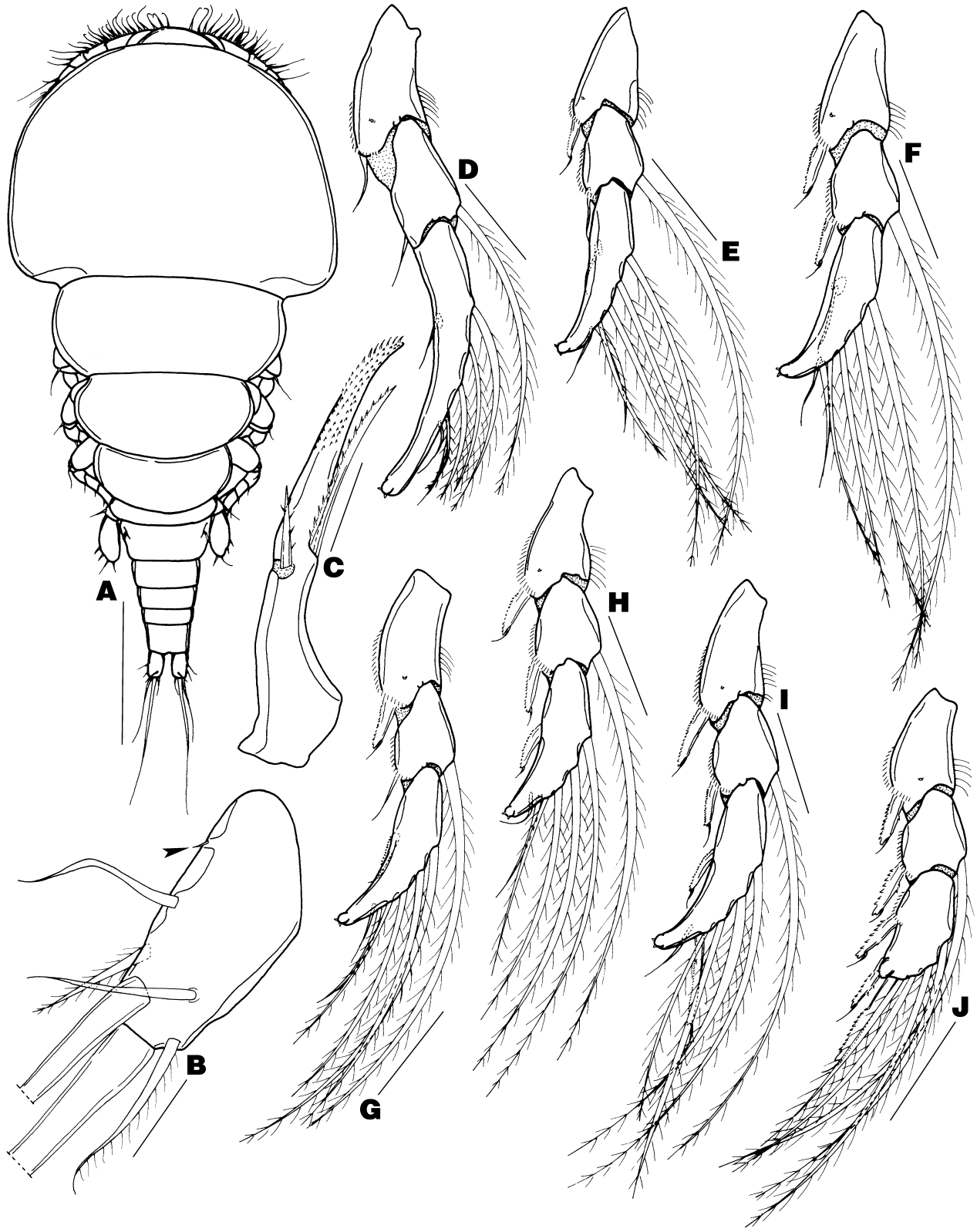

FIGURE 2. *Taeniacanthus similis* Dojiri & Cressey, 1987 (female). A, habitus, dorsal; B, caudal ramus (arrowhead indicates seta I), dorsal; C, terminal segment of maxilla, ventral; D–J, leg 4 exopod, anterior. Scale bars: A = 0.30 mm; B–C = 25 μm; D–J = 50 μm.

Supplemental description of adult female. Total body length (excluding caudal setae) 1.46 ± 0.17 mm; greatest body width 0.76 ± 82 mm (n = 7) (Fig. 2A). Caudal ramus (Fig. 2B) bears seven setae (seta I minute). Terminal segment of maxilla (Fig. 2C) bearing spinulated terminal process, long unilaterally spinulated spine and short seta (bristled in specimens from *Aluterus monoceros, Anacanthus barbatus* and *Cantheschenia longipinnis*; naked in specimens from other hosts). Leg 4 exopod armature formula 1-0; 1-1; 1, 6 in specimen(s) from *Cantherhines pardalis*, *Meuschenia australis*, *Meuschenia freycineti*, *Meuschenia hippocrepis* and *Meuschenia trachylepis*, I-0; 1-1; 1, 6 in specimens from *Paraluteres prionurus*, and variable in specimens from other hosts (Fig. 2D–J; Table 2). Armature formula between right and left leg 4 exopods differs in some specimens from *Eubalichthys caeruleoguttatus* and *Pseudomonacanthus peroni*. Terminal exopodal segment of leg 4 extremely elongate (four times longer than wide), moderately elongate (nearly three times longer than wide), or not elongate (Fig. 2D, H, J).

TABLE 2. Frequency distributions of armature formulae on both leg 4 exopods of female *Taeniacanthus similis* Dojiri & Cressey, 1987 collected from various tetraodontiform fishes.

Host	Copepod armature formula						
	1-0; 1-1; 1, 6	I-0; 1-1; 1, 6	I-0; 1-1; I, 6	I-0; I-1; 1, 6	I-0; I-1; I, 6	I-0; I-1; I, I+5	I-0; I-1; II, I, 4
Aluterus monoceros (Linnaeus, 1758)	20	4	—	—	—	—	—
Anacanthus barbatus Gray, 1830	8	2	—	—	—	—	—
Cantheschenia longipinnis (Fraser-Brunner, 1941)	14	2	—	—	—	—	—
Eubalichthys caeruleoguttatus Hutchins, 1977	16	13	1	5	6	10	3
Meuschenia galii (Waite, 1905)	4	—	—	—	1	1	—
Pseudomonacanthus peroni (Hollard, 1854)	42	24	—	9	12	5	35
Caprichthys gymnura McCulloch & Waite, 1915	8	2	—	—	—	—	—

Supplemental description of adult male. Total body length (excluding caudal setae) 625 ± 17 μm; greatest body width 279 ± 7 μm (n = 5) (Fig. 3A). Maxilliped (Fig. 3B–C) subchelate, 4-segmented (syncoxa not drawn); basis bearing long row of truncate denticles along posteromedial margin, short row of truncate denticles on proximomedial surface, two medial bristled setae and long row of spinules along anterior margin; proximal endopodal segment short, unarmed; claw (distal endopodal segment) armed with long naked posterior seta, two subequal anterior setae (one naked, one bristled), minute setule on concave margin, row of denticles along concave margin and anterior row of minute teeth.

Leg 4 exopod armature formula 1-0; 1-1; 1, 6 in specimen(s) from *Anacanthus barbatus*, *Meuschenia australis*, *Meuschenia trachylepis* and *Scobinichthys granulatus* (Fig. 3D). One specimen from *M. trachylepis* with I-0; I-1; I, II+4 on left leg (Fig. 3E) and 1-0; I-1; 1, II+4 on right leg (Fig. 3F), while one specimen from *M. australis* with I-0; I-1; 1, II+4 on both legs (not figured). Specimens from other hosts with leg 4 exopod armature I-0; I-1; II, I, 4 (Fig. 3G). Terminal exopodal segment of leg 4 very elongate (over three times longer than wide), moderately elongate (about two times longer than wide), or not elongate (Fig. 3D–E, G).

Attachment site. Branchial cavity wall and gill filaments.

Remarks. *Taeniacanthus similis* was discovered by Dojiri & Cressey (1987) from three monacanthid fish hosts, *Meuschenia convexirostris* (Günther, 1870) (= *Meuschenia australis* (Donovan, 1824)) from New Zealand, *Meuschenia hippocrepis* (as *Cantherhines hippocrepis*) from Kangaroo Island, Australia, and *Aluterus scriptus* (as *Alutera scripta*) from the Philippine Islands and Netherlands East Indies (= Indonesia). Dojiri & Ho (1987) subsequently reported several variable characters in their female specimens of *T. similis* collected from *Diodon holocanthus* off Sado Island, Japan. Comparisons between Dojiri & Cressey's (1987) *Taeniacanthus* voucher specimens and Dojiri & Ho's (1987) illustrations of *T. similis* with our material indicated that 1) *T. similis* is a valid species; 2) Dojiri & Cressey's *T. similis* specimens from *A. scriptus* are in reality *T. balistae* as mentioned above; 3) Dojiri & Cressey's *T. balistae* specimens from *Aluterus monoceros* and *Aluterus* sp. are in fact *T. similis*; and 4) Dojiri & Ho's material represent an undescribed species (see Remarks section of the next taxon). Among members of the *T. balistae* species group, including the two new species described below, *T. similis* and *T. balistae* are the most morphologically similar. However, *T. similis* may be distinguished unmistakably from *T. balistae* by the presence of one long and one short row of truncate denticles on the posteromedial surface of the maxillipedal basis of the male.

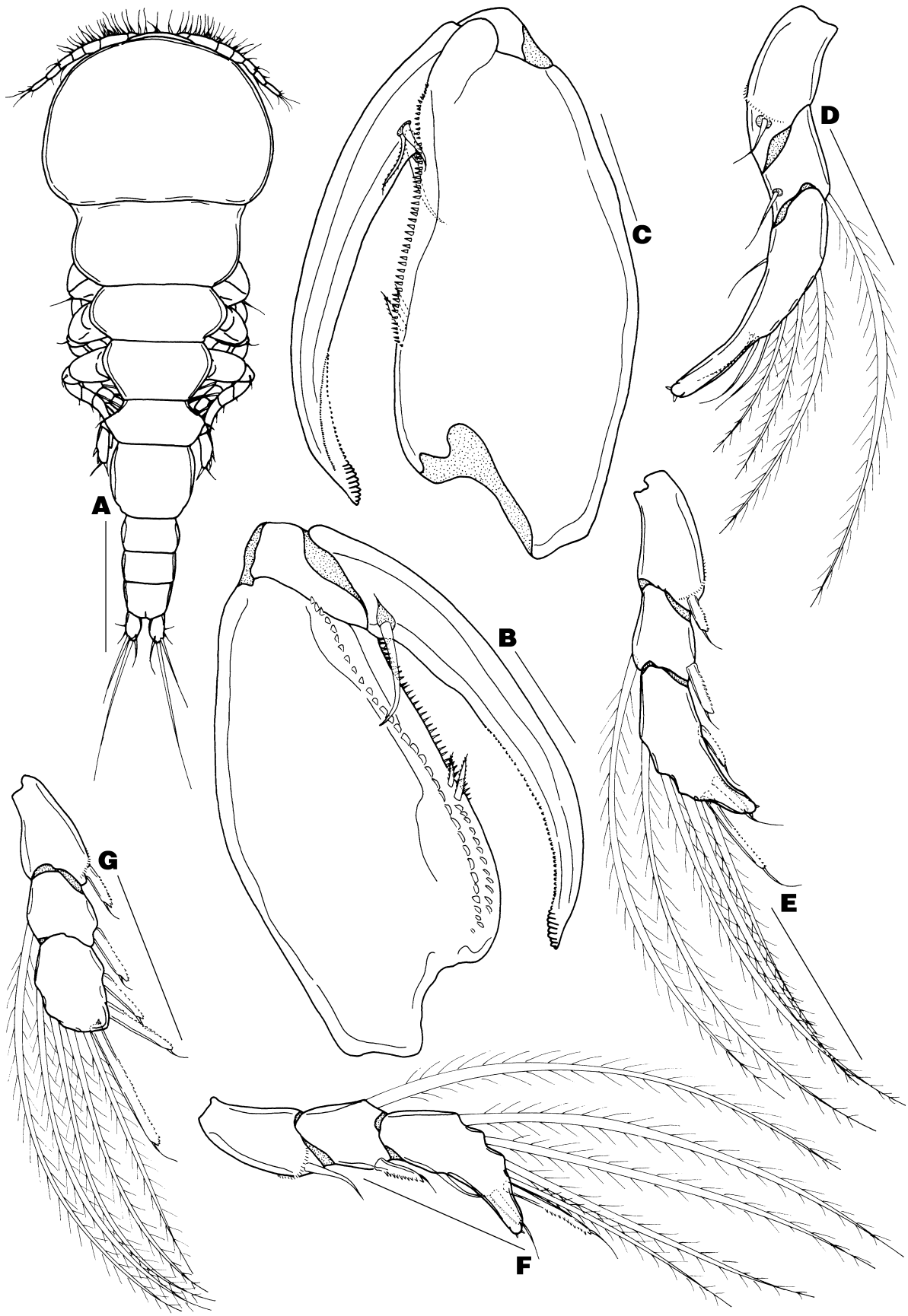

FIGURE 3. *Taeniacanthus similis* Dojiri & Cressey, 1987 (male). A, habitus, dorsal; B, maxillipedal segments 2–4, posterior; C, same, anterior; D–G, leg 4 exopod, anterior. Scale bars: A = 0.20 mm; B–C = 25 μm; D–G = 50 μm.

***Taeniacanthus dojirii* sp. nov.**
(Figs. 4–5)

Taeniacanthus balistae (Claus, 1864): Dojiri & Cressey (1987: 26 [in part]).
Taeniacanthus similis Dojiri & Cressey, 1987: Dojiri & Ho (1987: 36).

Type material. Holotype ♀ (AM P.65255), allotype ♂ (AM P.75515), and 14 paratype ♀ (AM P.75516–P.75519), ex one *Cyclichthys hardenbergi* (de Beaufort, 1939) (AM I5557-264), Gulf of Carpentaria, Queensland, 7 May 1964.

Other material examined. Our specimens: eight ♀, ex two *Diodon holocanthus* Linnaeus, 1758, Sea of Japan, Echizen, Fukui Prefecture, Japan, 25 February 2007.

USNM specimens: five ♂ vouchers (USNM 227997), originally identified as *Taeniacanthus balistae* by Dojiri & Cressey (1987), ex *Diodon hystrix*, Gulf of Elat, Red Sea, collection date unknown; 35 ♀ and one ♂ vouchers (no USNM No. on vial label), originally identified as *T. balistae* by Dojiri & Cressey (1987), ex *D. hystrix*, Gulf of Elat, Red Sea, collection date unknown.

Description of adult female. Total body length (excluding caudal setae) 1.71 ± 0.15 mm; greatest body width 0.83 ± 0.05 mm (n = 5) (Fig. 4A). Ventral surface of anal somite with 8–10 discontinuous rows of spinules. Caudal ramus (Fig. 4B) with seven setae (seta I minute). All appendages similar to those in *T. balistae* (see Dojiri & Cressey 1987), except for the following. Maxillipedal claw (endopod) (Fig. 4C) with bristles on large proximal seta and typically without basal rounded protuberance. Endopod of legs 2–3 (Fig. 4E, F) without distolateral protrusion on first segment and bearing stout spines on terminal segment. Inner seta on middle segment and most setae on terminal segment of leg 4 exopod highly reduced (Fig. 4G). Spines on terminal endopodal segment of leg 4 stout (Fig. 4H). Leg 5 (Fig. 4I) 2-segmented; protopod unornamented, bearing dorsolateral pinnate seta; free exopodal segment ornamented with ventromedial patch of spinules and row of minute spinules at base of pinnate seta and three short spines.

Description of adult male. Total body length (excluding caudal setae) 1.02 ± 0.06 mm; greatest body width 407 ± 3 μm (n = 2) (Fig. 5A). Anal somite with 3–4 interrupted rows of spinules (not figured). Maxilliped (Fig. 5B–C) subchelate, 4-segmented (syncoxa not drawn); basis armed with two medial bristled setae and ornamented with several long rows of truncate denticles along posteromedial margin, large patch of truncate denticles on proximomedial surface and long row of spinules along anterior margin; proximal endopodal segment short, unarmed; terminal claw (distal endopodal segment) armed with long posterior seta, two unequal anterior setae (longer seta bristled, shorter seta naked), minute basal setule on concave margin, row of denticles along concave margin and anterior row of minute teeth.

Endopod of legs 2–3 (Fig. 5D–E) with distolateral protrusion on first two segments and relatively slim spines on last segment. Leg 4 exopod (Fig. 5F) with armature I-0; I-1; II, I, 4; terminal segment also not as elongate as that of female. Leg 4 endopod (Fig. 5G) with relatively slim spines on terminal segment. Leg 5 free exopodal segment (Fig. 5H) slimmer and bearing more elongate spines and fewer ventromedial spinules than those of female.

Variability. Five female specimens with small basal protuberance on maxillipedal claw (Fig. 4D).

Attachment site. Branchial cavity wall, gill filaments and inner operculum.

Etymology. The species is named for Dr Masahiro Dojiri (Environmental Monitoring Division LA Sanitation, City of Los Angeles) in recognition of his outstanding contribution to the systematics of the Taeniacanthidae.

Remarks. Our specimens are identical to those of Dojiri & Cressey (1987) from *Diodon holocanthus* from the Red Sea and match Dojiri & Ho's (1987) brief description of the female of *Taeniacanthus similis* from *D. holocanthus* from Japan. Altogether these specimens differ from other members of the *T. balistae* species group, including the new species described below, by having in the female 1) stouter spines on the terminal endopodal segment of legs 2–4; 2) extremely reduced setae on the middle and terminal exopodal segments of leg 4; 3) a naked protopod and shorter spines on the exopod of leg 5; and in the male 4) several long rows and a large patch of truncate denticles on the maxillipedal basis. We propose *Taeniacanthus dojirii* **sp. nov.** to accommodate the specimens from diodontid hosts based on these numerous morphological differences.

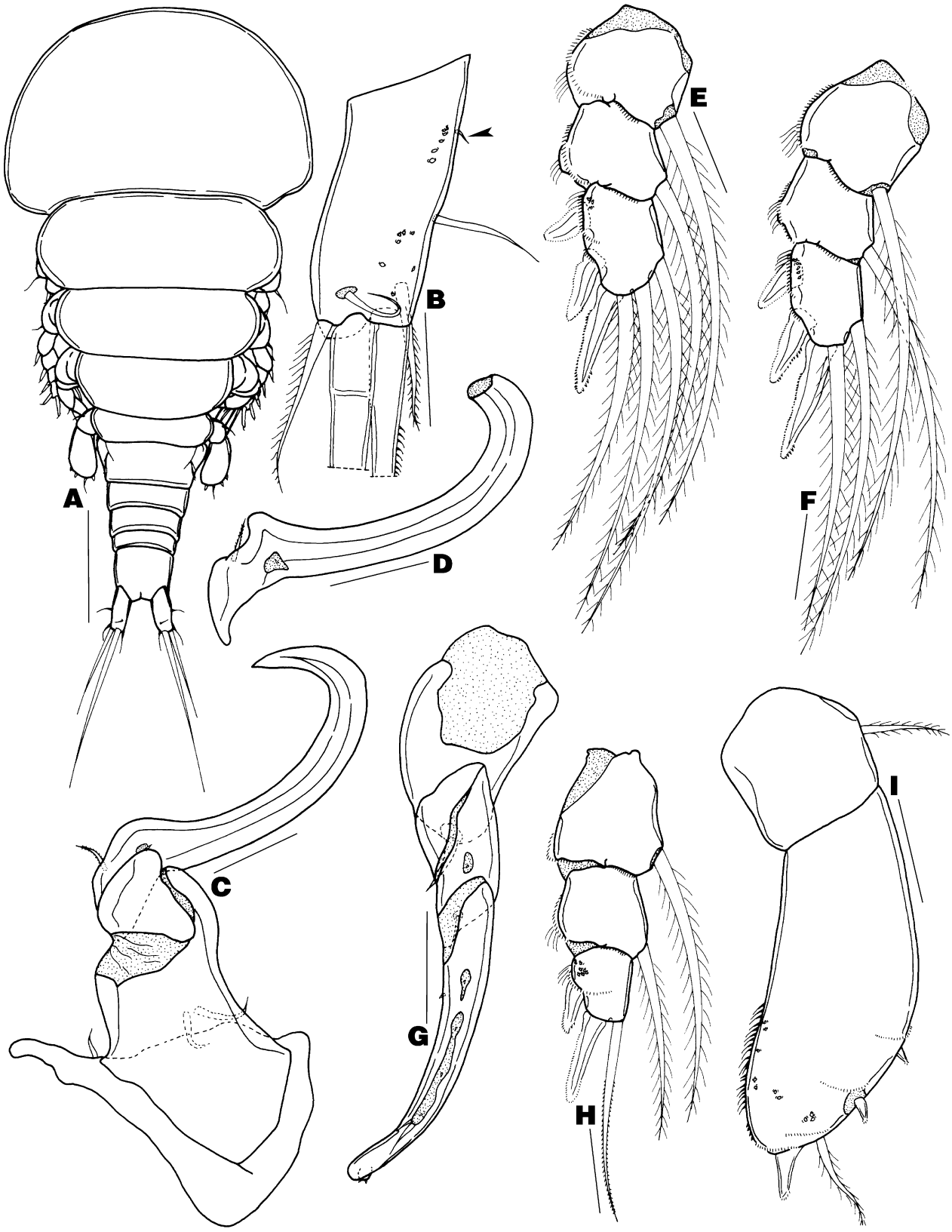

FIGURE 4. *Taeniacanthus dojirii* **sp. nov.** (female). A, habitus, dorsal; B, caudal ramus (arrowhead indicates seta I), dorsal; C, maxilliped, posterior; D, maxillipedal claw, posterior; E, leg 2 endopod, anterior; F, leg 3 endopod, anterior; G, leg 4 exopod, posterior; H, leg 4 endopod, anterior; I, leg 5, lateral. Scale bars: A = 0.30 mm; B–I = 50 μm.

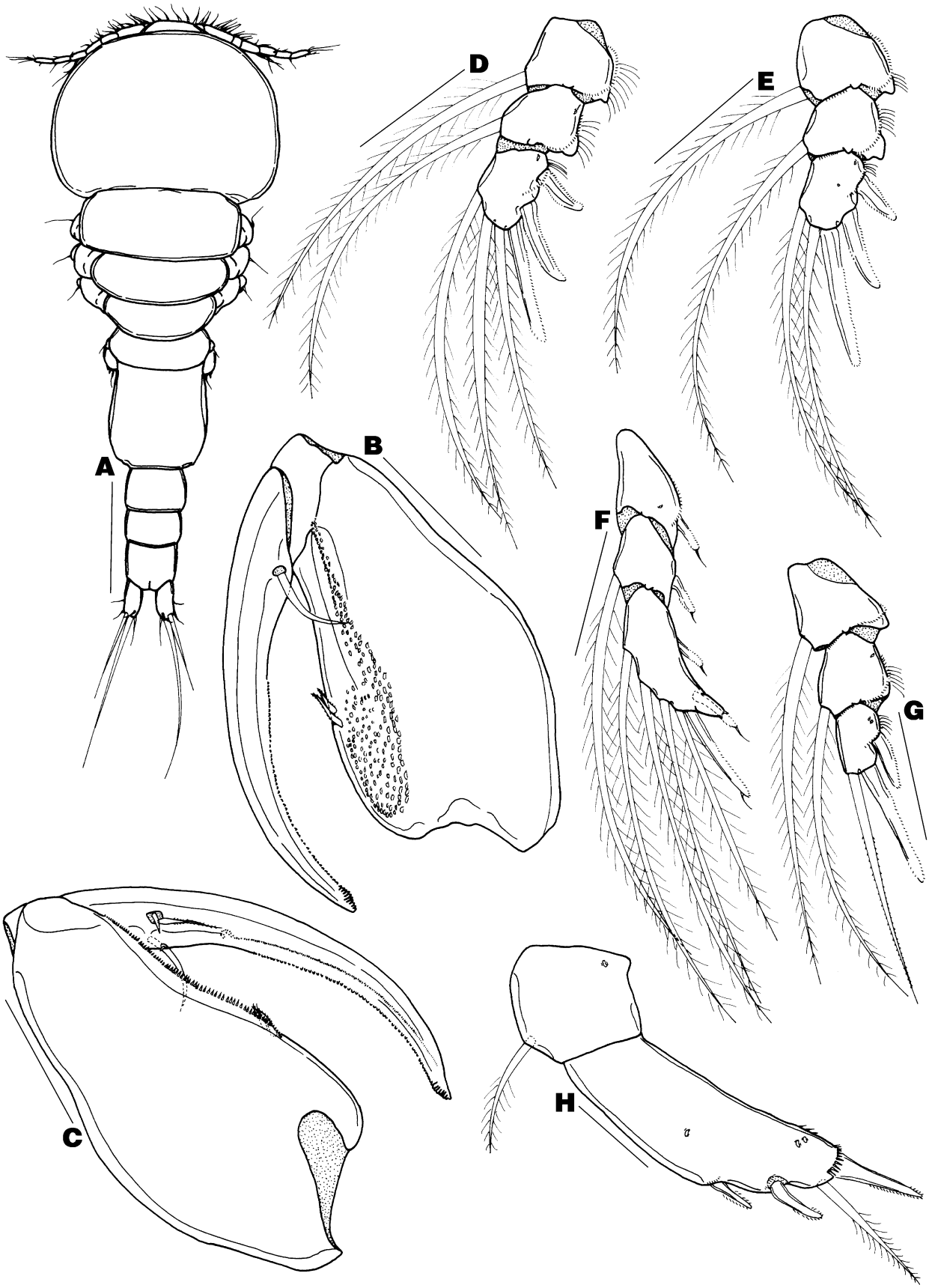

FIGURE 5. *Taeniacanthus dojirii* **sp. nov.** (male). A, habitus, dorsal; B, maxillipedal segments 2–4, posterior; C, same, anterior; D, leg 2 endopod, anterior; E, leg 3 endopod, anterior; F, leg 4 exopod, anterior; G, leg 4 endopod, anterior; H, leg 5, lateral. Scale bars: A = 0.20 mm; B–G = 50 μm; H = 25 μm.

***Taeniacanthus ryukyuensis* sp. nov.**
(Figs. 6–10)

Type material. Holotype ♀ (NSMT-Cr 23945), allotype ♂ (NSMT-Cr 23946) and one paratype ♀ (NSMT-Cr 23947), ex one *Sufflamen bursa* (Bloch & Schneider, 1801), North Pacific Ocean, off Ankyaba, Kakeroma-jima Island, Ryukyu Islands, Japan, 27 May 2007.

Other material examined. four ♀ (NSMT-Cr 23948) and one ♂ (NSMT-Cr 23949), ex one *S. bursa,* East China Sea, off Cape Maeda, Okinawa-jima Island, Ryukyu Islands, Japan, 15 August 2006; one ♀ (NSMT-Cr 23950) and one ♂ (NSMT-Cr 23951), ex one *Rhinecanthus verrucosus* (Linnaeus, 1758), East China Sea, off Miyagi, Okinawa-jima Island, Ryukyu Islands, Japan, 18 August 2006; one ♀ (NSMT-Cr 23952) and one ♂ (NSMT-Cr 23953), ex one *Sufflamen chrysopterum* (Bloch & Schneider, 1801), East China Sea, off Yonaguni-jima Island, Ryukyu Islands, Japan, 8 July 2007.

Description of adult female. Total body length (excluding caudal setae) 2.05 ± 0.18 mm; greatest body width 1.05 ± 0.05 mm (n = 8) (Fig. 6A). Prosome composed of cephalothorax (cephalosome combined with first pedigerous somite) and three free, successively narrower pedigerous somites. Urosome shorter than prosome, comprised of fifth pedigerous somite, genital somite and four free abdominal somites. Genital somite wider (372 ± 21 μm) than long (138 ± 25 μm). Abdomen 414 ± 26 μm long and 279 ± 16 μm wide; third abdominal somite shortest; ventral surface of anal somite (Fig. 6B) with 16–18 interrupted rows of spinules. Caudal ramus (Fig. 6B) longer (106 ± 7 μm) than wide (59 ± 4 μm), bearing seven setae; seta I minute and naked; setae II–VI plumose; seta VII naked.

Antennule (Fig. 6C) incompletely 7-segmented (articulation between ancestral segments I–V and VI–XIII indistinct); armature formula: 5, 14, 5, 3, 4, 2 + 1 aesthetasc and 7 + 1 aesthetasc. Antenna (Fig. 6D) indistinctly 4-segmented (articulation between second and third endopodal segments indistinct); coxobasis bearing distal naked seta; first endopodal segment with inner distal naked seta; second endopodal segment bearing two unequal pectinate processes (each ornamented with row of spinules) and inner distal claw-like spine; third endopodal segment apically bearing three claw-like spines and three unequal naked setae. Postantennal process (Fig. 6E) with wide base and pointed tine.

Labrum (Fig. 6F) wider than long, with spinules along emarginated posterior margin. Mandible (Fig. 7A) with terminal blade and subterminal naked seta and blade; each blade finely serrated along inner margin. Paragnath (Fig. 7B) digitiform and naked. Maxillule (Fig. 7C) lobate, bearing five setae (one naked, two plumose and two hirsute). Maxilla (Fig. 7D) 2-segmented; syncoxa with surface pits; basis armed with spinulated terminal process and two naked setae. Maxilliped (Fig. 7E) 3-segmented; syncoxa bearing inner distal naked seta; basis armed with two inner proximal naked setae; terminal (endopod) segment a long straight claw, bearing two naked basal setae and minute teeth along distal half of inner margin.

Legs 1–4 biramous (Figs. 7F, 8A, C, 9A), with 2-segmented rami on leg 1 and 3-segmented rami on legs 2–4. Armature on rami of legs 1–4 as follows (Roman numerals = spines; Arabic numerals = setae; int. = intermediate spine):

	Coxa	Basis	Exopod	Endopod
Leg 1	0-1	1-1	1-0; 9	0-1; 7
Leg 2	0-0	1-0	I-0; I-1; II, I, 4	0-1; 0-1; II, I, 3
Leg 3	0-0	1-0	I-0; I-1; II, I, 5	0-1; 0-1; II, I, 2
Leg 4	0-0	1-0	I-0; I-1; 1, 6	0-1; 0-1; II, int.

Leg 1 (Fig. 7F) coxa, basis and rami flattened and expanded. Intercoxal sclerite with two lateral patches of spinules. Coxa naked; basis ornamented with setules along outer margin and rows of minute spinules proximally and distally; first exopodal segment with setules on inner distal corner; second endopodal segment with setules on outer distal corner.

Leg 2 (Fig. 8A, B) intercoxal sclerite longer than wide, with two patches of spinules along distal margin. Coxa with spinules on outer distal corner; basis with patch of spinules along inner margin and spinulated flange along distal margin. First exopodal segment with two lateral spinulated flanges and medial row of setules; second exopodal segment with three lateral spinulated flanges; third exopodal segment with lateral spinulated flange and

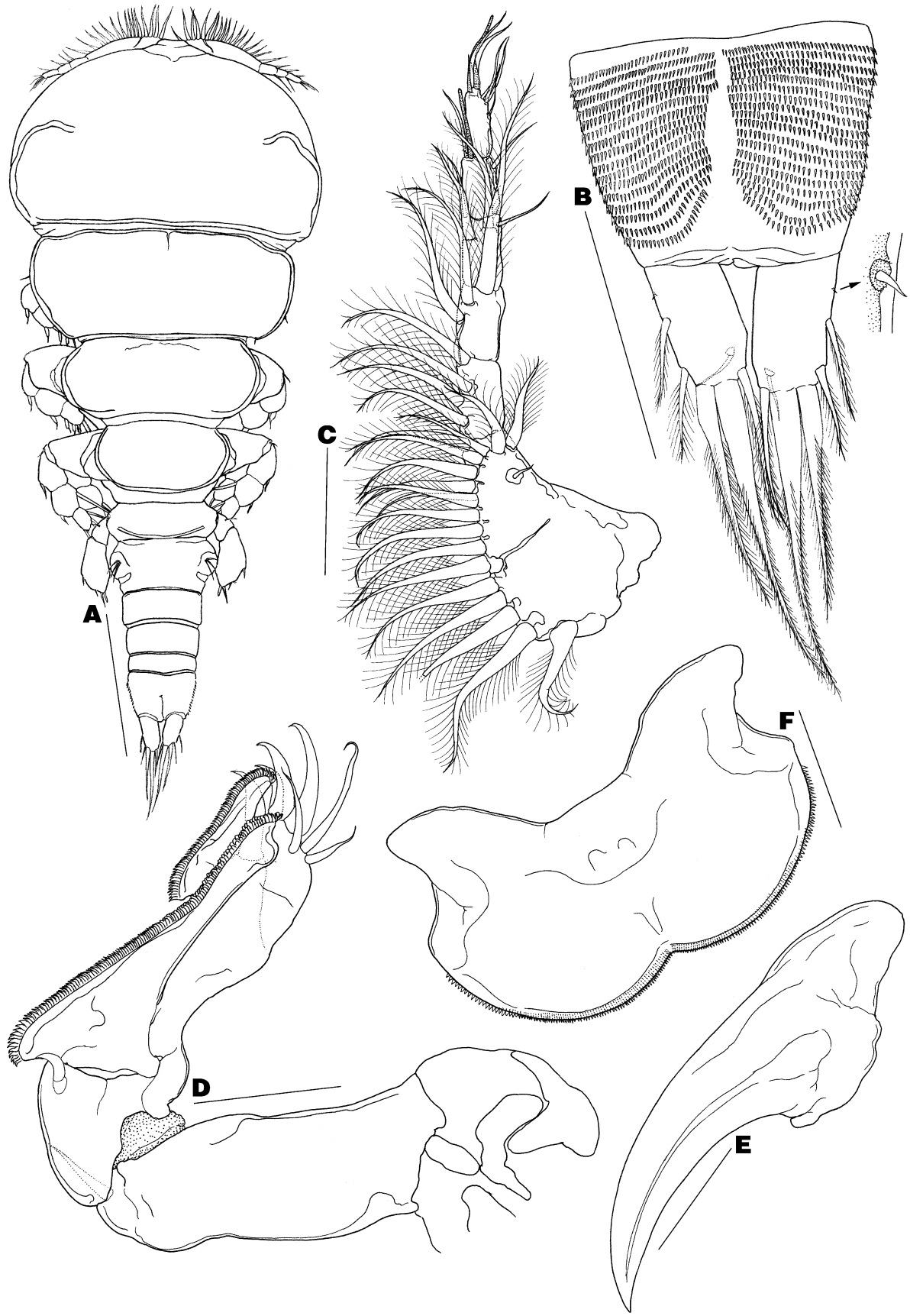

FIGURE 6. *Taeniacanthus ryukyuensis* **sp. nov.** (female). A, habitus, dorsal; B, anal somite and caudal rami with enlarged view of seta I, ventral; C, antennule, ventral; D, antenna, posterior; E, postantennal process, ventral; F, labrum, anterior. Scale bars: A = 0.50 mm; B = 0.20 mm; C = 0.10 mm; D–F = 50 μm.

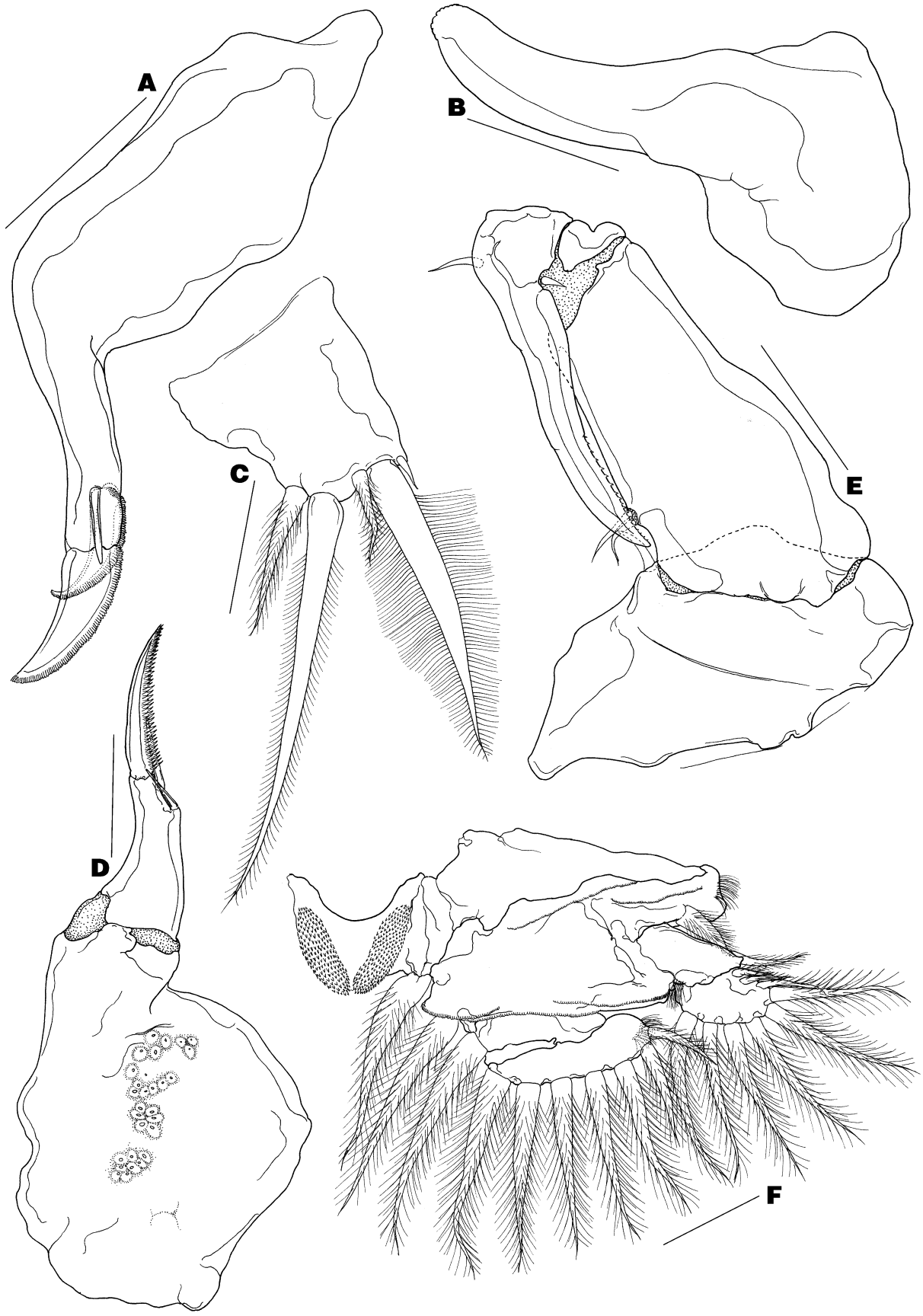

FIGURE 7. *Taeniacanthus ryukyuensis* **sp. nov.** (female). A, mandible, ventral; B, paragnath, ventral; C, maxillule, anterior; D, maxilla, ventral; E, maxilliped, ventral; F, leg 1, anterior. Scale bars: A, C–E = 50 μm; B = 30 μm; F = 0.10 mm.

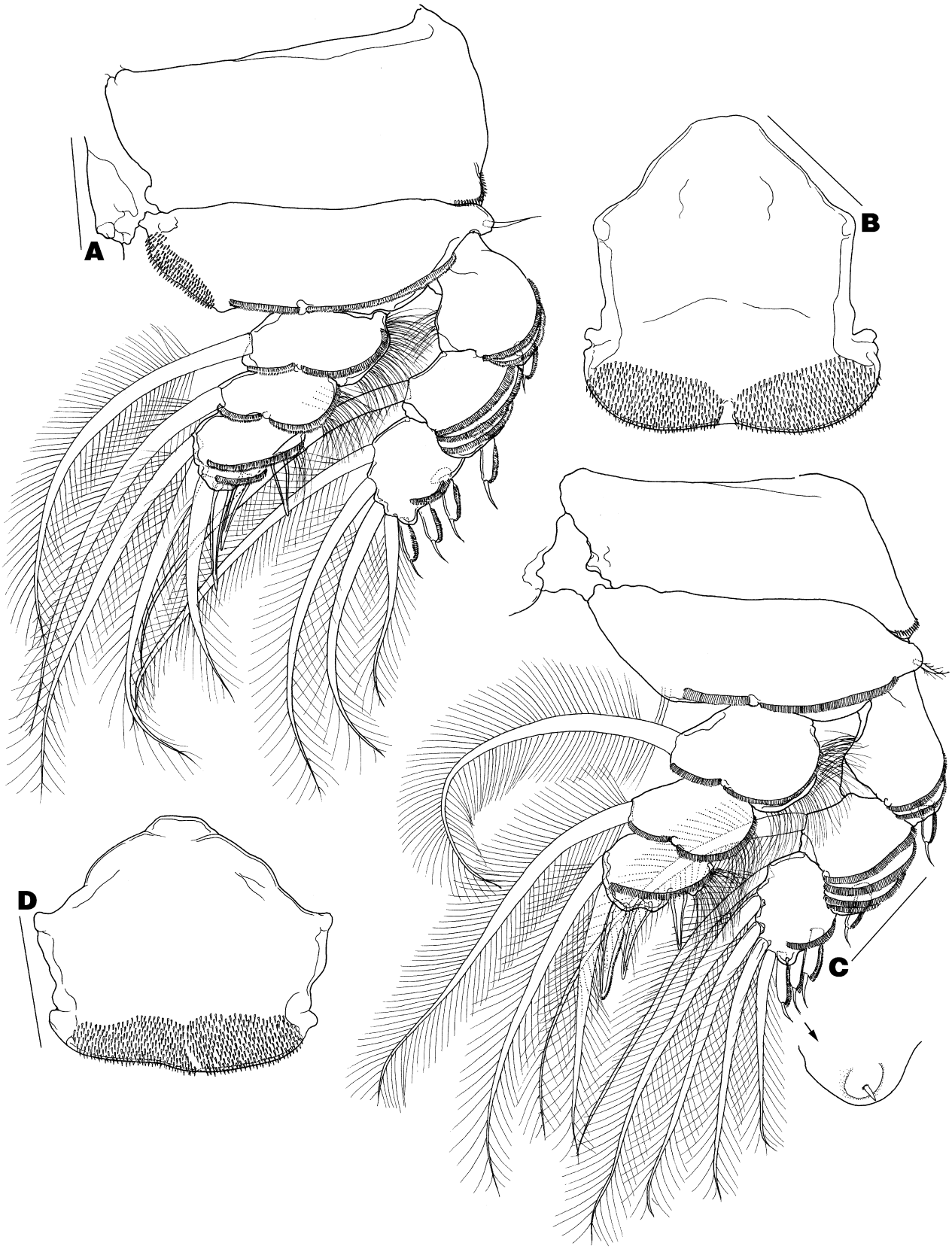

FIGURE 8. *Taeniacanthus ryukyuensis* **sp. nov.** (female). A, leg 2, anterior; B, leg 2 intercoxal sclerite, anterior; C, leg 3 with enlarged view of outer distal corner of terminal exopodal segment, anterior; D, leg 3 intercoxal sclerite, anterior. Scale bars = 0.10 mm.

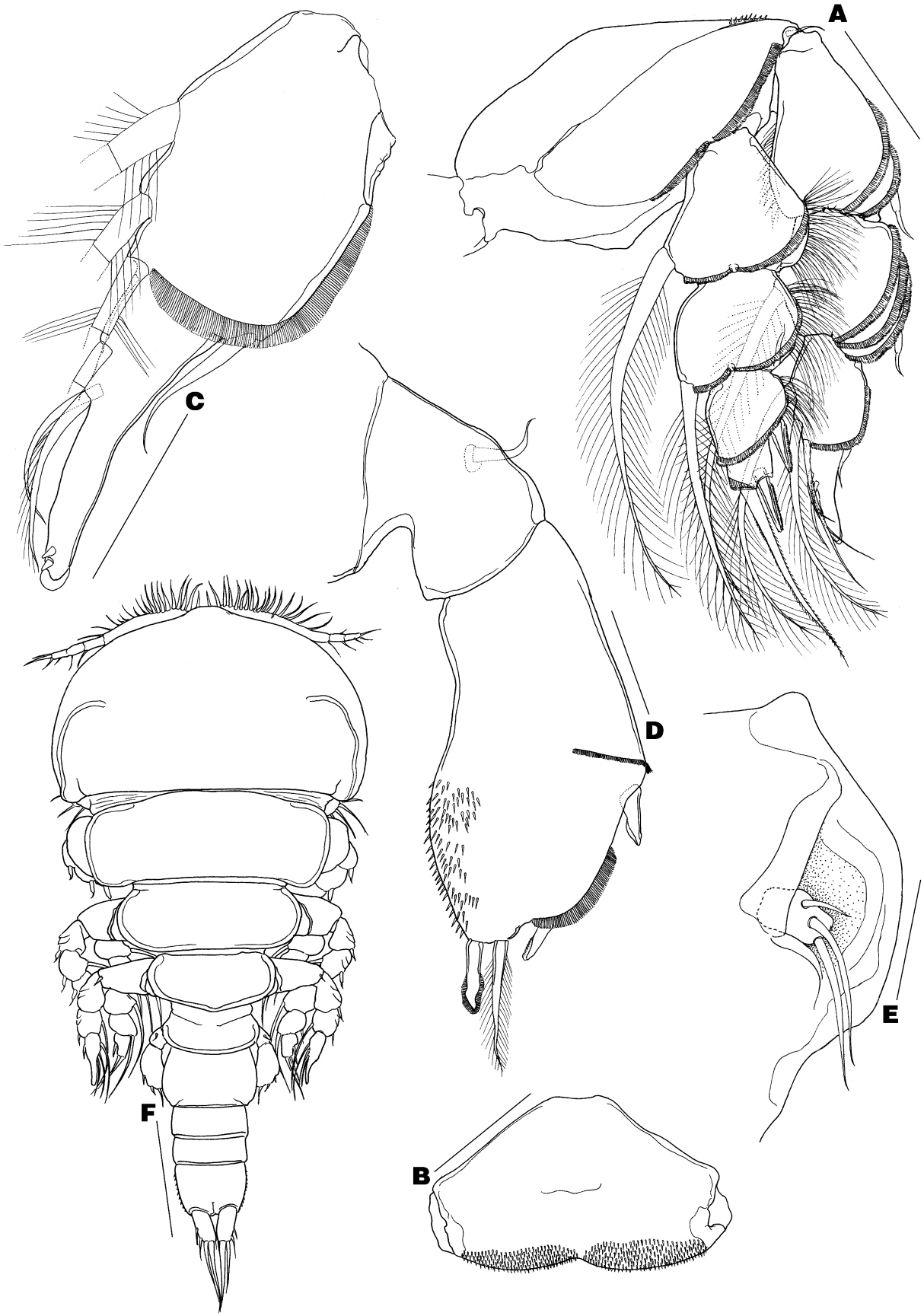

FIGURE 9. *Taeniacanthus ryukyuensis* **sp. nov.** (female: A–E; male: F). A, leg 4, anterior; B, leg 4 intercoxal sclerite, anterior; C, distal exopodal segment of leg 4, anterior; D, leg 5, ventral; E, leg 6, dorsal; F, habitus, dorsal. Scale bars: A–B = 0.10 mm; C–E = 50 μm; F = 0.30 mm.

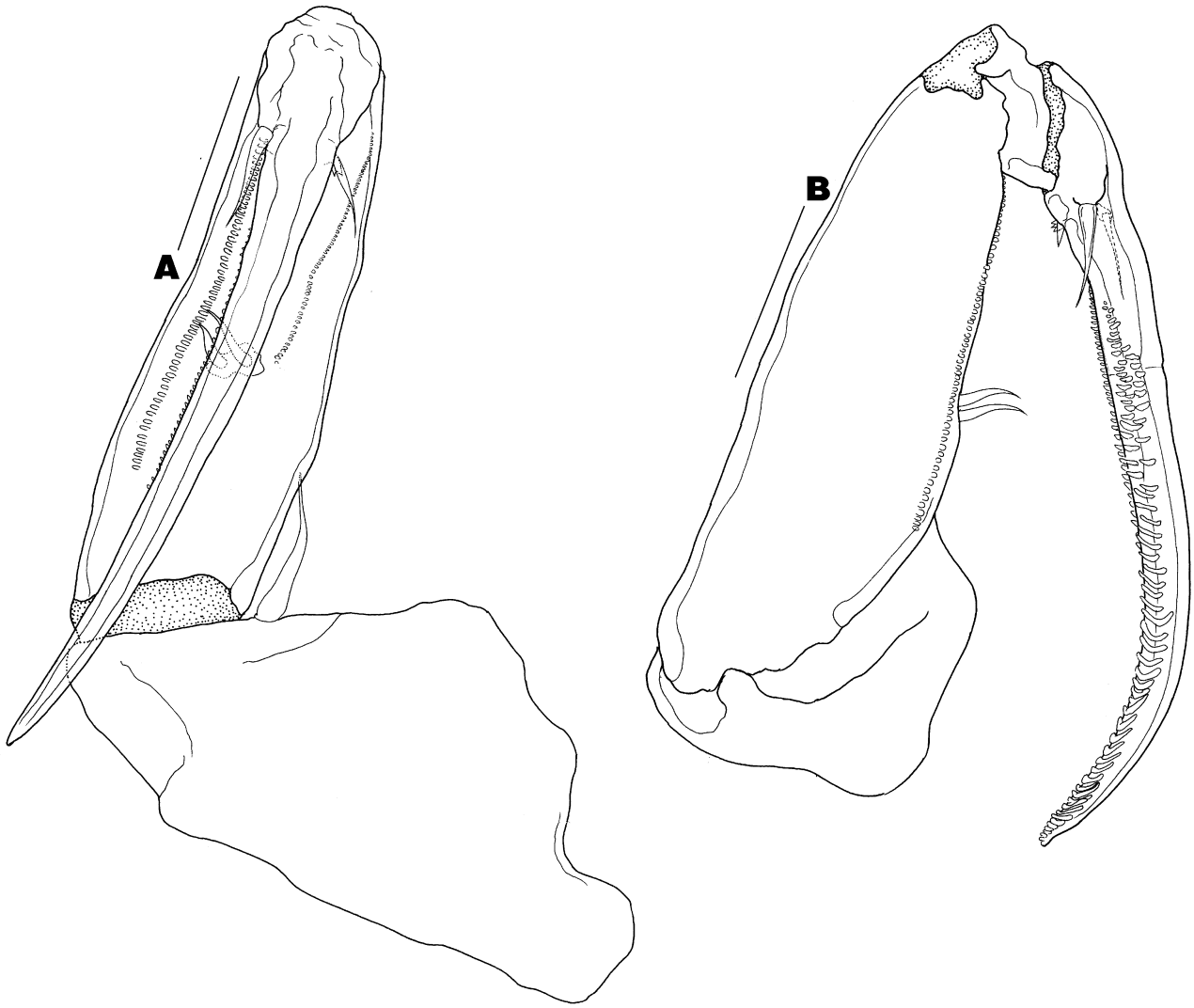

FIGURE 10. *Taeniacanthus ryukyuensis* **sp. nov.** (male). A, maxilliped, medial; B, same, posterior. Scale bars = 50 μm.

small lobe on outer distal corner. Each exopodal spine with spinulated outer margin and terminal flagellum. First two endopodal segments with outer row of setules and lateral and inner distal spinulated flanges; third endopodal segment with two outer spinulated flanges and short outer row of setules. All endopodal spines naked.

Leg 3 (Fig. 8C, D) intercoxal sclerite shorter than that of leg 2, with two patches of spinules along distal margin. Coxa, basis and rami similar to those of leg 2, except inner margin of basis lacks spinules, outer distal lobe on third exopodal segment with minute setule and innermost spine on third endopodal segment with spinulated outer margin.

Leg 4 (Fig. 9A–C) similar to leg 3, except intercoxal sclerite wider than long, exopodal spines naked and weakly sclerotized; third exopodal segment elongated distally with two small conical elements apically; and third endopodal segment with inner distal setiform spine and lateral spinules on other two spines.

Leg 5 (Fig. 9D) uniramous, 2-segmented. Protopodal segment armed with dorsolateral naked seta. Free exopodal segment with patch of spinules along distal half of inner margin, one outer and one distal spinulated flanges and four elements (one naked and two spinulated spines plus one plumose seta).

Leg 6 (Fig. 9E) vestigial, represented by three unequal naked setae on dorsolateral surface of genital somite.

Description of adult male. Total body length (excluding caudal setae) 1.60 ± 0.14 mm; greatest body width 806 ± 84 μm (n = 4) (Fig. 9F). Urosome comprised of fifth pedigerous somite, genital double-somite, and three free abdominal somites. Genital double-somite wider (243 ± 26 μm) than long (146 ± 22 μm). Abdomen 291 ± 18 μm long and 198 ± 14 μm wide. Anal somite ornamented as in female. Caudal ramus longer (85 ± 14 μm) than wide (46 ± 7 μm).

Maxilliped (Fig. 10A–B) 4-segmented; syncoxa bearing large naked inner seta; basis elongate, armed with two naked medial setae and two longitudinal rows of small truncate denticles; first endopodal segment small, unarmed; second segment elongate, distally curved, bearing two long naked setae, one small spiniform seta and one small trifurcate process proximally, and numerous crescentic denticles along concave margin.

Variability. One female with armature II, I, 5 on terminal exopodal segment of right leg 2. Another female with armature I-0; I-2; II, I, 3 on terminal exopodal segment of left leg 3.

Attachment site. Branchial cavity wall and gill filaments.

Etymology. The specific name alludes to the species' distribution among the Ryukyu Islands of Japan.

Remarks. The new species is a member of the *T. balistae* species group as it has the characteristic displaced setae on the elongated terminal exopodal segment of leg 4. *Taeniacanthus ryukyuensis* **sp. nov.** may be distinguished from other members of the group by the following features: 1) 16–18 (vs. 3–9) incomplete rows of spinules on the female anal somite; 2) minute teeth on the relatively straight maxillipedal claw of the female; 3) well-developed spinulated flanges on the rami of legs 2–4; and 4) slender basis and numerous crescentic denticles on the maxillipedal claw of the male.

Discussion

Taxonomy. *Taeniacanthus balistae* is morphologically very similar to *T. similis*. Dojiri & Cressey (1987) suggested that *T. balistae* may be distinguished from *T. similis* (and *T. occidentalis*) by the presence of a small rounded process at the base of the maxillipedal claw of the female. This was a reliable feature in the present study. We must add, however, that this rounded process was absent in the maxillipeds of Lin & Ho's (2006) female specimens of *T. balistae* from *Aluterus monoceros* from Taiwan. Variability in the structure of the maxillipedal claw in the female occurs in other species such as *T. dojirii* **sp. nov.** described above. We agree that Lin & Ho's specimens are conspecific with *T. balistae* as their male specimens have the characteristic discontinuous row and a few short rows of truncate denticles on the posteromedial surface of the maxillipedal basis. Differences in the morphology of the maxilliped of the male have been used to separate other closely related taeniacanthid species. For example, *T. fugu* Yamaguti & Yamasu, 1959 is morphologically very similar to *T. yamagutii* (Shiino, 1957). Although both species are parasitic on pufferfishes (Tetraodontidae), *T. fugu* may be distinguished unequivocally from *T. yamagutii* by the absence of a trifid protuberance and conical process on the maxillipedal claw of the male (Dojiri & Cressey 1987).

Dojiri & Cressey (1987) synonymized *T. longichela* Yamaguti & Yamasu, 1959 with *T. balistae*. Lin & Ho (2006) noted that the validity of *T. longichela* should be reconsidered as Yamaguti & Yamasu's (1959) and Shiino's (1960) illustrations of this species do not show a rounded process at the base of the maxillipedal claw of the female. It is presently too difficult to evaluate the validity of *T. longichela* based on the available descriptions and illustrations of the species. As such, we follow Dojiri & Cressey's treatment of *T. longichela* as a junior synonym of *T. balistae* pending examination of *T. longichela* type specimens.

Host-specificity and geographical distribution. Members of the *T. balistae* species group exhibit variable levels of host-specificity and geographic distributions (Table 3). *Taeniacanthus balistae* is a low host-specific and wide ranging species. It was reported from five species of Balistidae and seven species of Monacanthidae collected in the Temperate Northern Pacific, Central Indo-Pacific, Temperate Northern Atlantic and Tropical Atlantic realms. Likewise, *T. similis* was collected from 14 species of Monacanthidae and one species of Ostraciidae from the Temperate Northern Pacific, Central Indo-Pacific and Temperate Australasia realms. By contrast, *T. dojirii* **sp. nov.** was found on three species of Diodontidae from the Central Indo-Pacific and Western Indo-Pacific realms, *T. occidentalis* was recorded from two species of *Aluterus* from the east coast of the U.S.A. and *T. ryukyuensis* **sp. nov.** was discovered on three species of Balistidae from the Ryukyu Islands.

The biogeographical pattern of *T. balistae* reveals distinguishing trends regarding the evolutionary history of its hosts. The present distribution pattern of *T. balistae* as described above indicates that at least some tetraodontiform lineages (*i.e*., Balistidae and Monacanthidae) were distributed historically in the late palaeotethys. This supports the hypothesis proposed by Santini & Tyler (2003) that the Tetraodontiformes were originally distributed throughout the shallow-waters of the Tethys Sea. This further suggests that associations between taeniacanthid copepods and tetraodontiform fishes had formed prior to the closure of the Tethys Sea (*ca*. 23 Mya) (Briggs 1996).

TABLE 3. Tetraodontiform hosts and locality records of members of the *Taeniacanthus balistae* species group.

Copepod	Host family	Host species	Locality	Reference
Taeniacanthus balistae	Balistidae	*Balistes capriscus* Gmelin, 1789	Lebanon	Dojiri & Cressey (1987)
			Gulf of Tunis	Dojiri & Cressey (1987)
			Africa	Ho & Rokicki (1987)
			Brazil	Alves *et al.* (2005)
			U.S.A.	Dojiri & Cressey (1987)
			Mediterranean	Radujkovic & Raibaut (1989); Raibaut *et al.* (1998)
		Balistes rotundatus Marion de Procé, 1822	Japan	Dojiri & Ho (1987)
		Balistes vetula Linnaeus, 1758	Belize	Dojiri & Cressey (1987)
		Balistes sp.	Helgoland	Claus (1864)
		Canthidermis maculata (Bloch, 1786)	Coral Sea	Present study
			Japan	Present study
	Monacanthidae	*Aluterus heudelotii* Hollard, 1855	Belgium	Dojiri & Cressey (1987)
		Aluterus monoceros (Linnaeus, 1758)	Japan	Yamaguti & Yamasu (1959)
			Taiwan	Lin & Ho (2006)
		Aluterus scriptus (Osbeck, 1765)	Indonesia	Dojiri & Cressey (1987)[1]
			Philippines	Dojiri & Cressey (1987)[1]
			Japan	Present study
			Belize	Present study
		Cantherhines pullus (Ranzani, 1842)	Belize	Dojiri & Cressey (1987)
		Stephanolepis hispidus (Linnaeus, 1766)	Brazil	Present study
			U.S.A.	Dojiri & Cressey (1987)
		Stephanolepis setifer (Bennett, 1831)	Brazil	Present study
			Jamaica	Present study
			Haiti	Dojiri & Cressey (1987)
		Thamnaconus modestus (Günther, 1877)	Japan	Yamaguti & Yamasu (1959); Shiino (1960)
Taeniacanthus dojirii **sp. nov.**	Diodontidae	*Cyclichthys hardenbergi* (de Beaufort, 1939)	Australia	Present study
		Diodon holocanthus Linnaeus, 1758	Japan	Dojiri & Ho (1987)[2]; Present study
		Diodon hystrix Linnaeus, 1758	Red Sea	Dojiri & Cressey (1987)[3]
Taeniacanthus occidentalis	Monacanthidae	*Aluterus heudelotii* Hollard, 1855	U.S.A.	Dojiri & Cressey (1987)

……*continued on the next page*

TABLE 3. (Continued)

Copepod	Host family	Host species	Locality	Reference
		Aluterus schoepfii (Walbaum, 1792)	U.S.A.	Wilson (1924); Humes & Rosenfield (1960); Dojiri & Cressey (1987)
Taeniacanthus ryukyuensis **sp. nov.**	Balistidae	*Rhinecanthus verrucosus* (Linnaeus, 1758)	Japan	Present study
		Sufflamen bursa (Bloch & Schneider, 1801)	Japan	Present study
		Sufflamen chrysopterum (Bloch & Schneider, 1801)	Japan	Present study
Taeniacanthus similis	Monacanthidae	*Aluterus monoceros* (Linnaeus, 1758)	Philippines	Dojiri & Cressey (1987)[4]; Present study
			Thailand	Present study
			Japan	Present study
			China	Dojiri & Cressey (1987)[4]
		Aluterus sp.	Philippines	Dojiri & Cressey (1987)[4]
		Anacanthus barbatus Gray, 1830	Australia	Present study
		Cantherhines pardalis (Rüppell, 1837)	Australia	Present study
		Cantheschenia longipinnis (Fraser-Brunner, 1941)	Australia	Present study
		Eubalichthys caeruleoguttatus Hutchins, 1977	Australia	Present study
		Meuschenia australis (Donovan, 1824)	Australia	Present study
			New Zealand	Dojiri & Cressey (1987)
		Meuschenia freycineti (Quoy & Gaimard, 1824)	Australia	Present study
		Meuschenia galii (Waite, 1905)	Australia	Present study
		Meuschenia hippocrepis (Quoy & Gaimard, 1824)	Australia	Dojiri & Cressey (1987); Present study
		Meuschenia trachylepis (Günther, 1870)	Australia	Present study
		Paraluteres prionurus (Bleeker, 1851)	Australia	Present study
			Philippines	Present study
		Pseudomonacanthus peroni (Hollard, 1854)	Australia	Present study
		Scobinichthys granulatus (Shaw in White, 1790)	Australia	Present study
	Ostraciidae	*Caprichthys gymnura* McCulloch & Waite, 1915	Australia	Present study

[1]Specimens were reported as *T. similis* by Dojiri & Cressey (1987), but were subsequently identified as *T. balistae* in the present study.
[2]Specimens were reported as *T. similis* by Dojiri & Ho (1987), but were subsequently considered as *T. dojirii* **sp. nov.** in the present study.
[3]Specimens were reported as *T. balistae* by Dojiri & Cressey (1987), but were subsequently identified as *T. dojirii* **sp. nov.** in the present study.
[4]Specimens were reported as *T. balistae* by Dojiri & Cressey (1987), but were subsequently identified as *T. similis* in the present study.

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