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A NEW CALIGIFORM COPEPOD (SIPHONOSTOMATOIDA: DISSONIDAE) PARASITIC ON *SERIOLA HIPPOS* FROM WESTERN AUSTRALIAN WATERS, WITH NEW RECORDS AND MORPHOLOGICAL VARIATION FOR *DISSONUS NUDIVENTRIS* AND *DISSONUS SIMILIS*, AND AN UPDATED KEY TO THE SPECIES OF *DISSONUS*

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ABSTRACT: *Dissonus hoi* n. sp. is described from female and male specimens collected from the nasal cavities of a Samson Fish (*Seriola hippos* Günther) captured off Rottnest Island, Western Australia. Adult female *D. hoi* are distinguished from their congeners by possessing the following combination of characters: (1) a quadrangular genital complex, (2) ventral spines on the genital complex, (3) pair of postantennal processes, (4) a sternal furca, (5) 1-segmented abdomen, and (6) convoluted, uniseriate egg strings. New records and intraspecific morphological variation are also given for *Dissonus nudiventris* collected from Australia, and *Dissonus similis* collected from the tropical western Pacific. A key to the valid species of *Dissonus* is provided.

Dissonus was established by Wilson (1906) within the Euryphorinae of the Caligidae to accommodate *Dissonus spinifer* collected from an unknown host in Sri Lanka (*D. spinifer* was later reported from the Starry Toadfish *Tetrodon stellatus* [= *Arothron stellatus* (Bloch and Schneider)] by Pillai, 1985). Yamaguti (1963) subsequently transferred this copepod genus into the Dissonidae, which can be distinguished from other caligiform groups, e.g., Pandaridae, Cecropidae, Trebiidae, and Caligidae, by the combination of 3 free leg-bearing segments and absence of dorsal thoracic and genital plates. In addition to *D. spinifer*, 9 other dissonids have been described so far: *Dissonus glaber* Kurtz, 1924, *Dissonus furcatus* Kirtisinghe, 1950, *Dissonus ruvetti* Nunes-Ruivo and Fourmanoir, 1956, *Dissonus nudiventris* Kabata, 1965, *Dissonus heronensis* Kabata, 1966, *Dissonus manteri* Kabata, 1966, *Dissonus similis* Kabata, 1966, *Dissonus kapuri* (Ummerkutty, 1970), and *Dissonus pastinum* Deets and Dojiri, 1990. Dissonids are restricted to the Indo-West Pacific region and have been collected from elasmobranchs and teleosts, except for *D. kapuri*, which was collected from seaweed. Very little is known about dissonid biology and ecology apart from the early life history studies of *D. nudiventris* and *D. manteri* (Anderson and Rossiter, 1969; Bennett, 1999), as well as pathological effects caused by the attachment and feeding activities (Bennett and Bennett, 1994, 2001) of the larval, preadult, and adult stages of *D. manteri*, to the gill filaments of their host, *Plectropomus leopardus* (Lacépède).

Samson Fish, *Seriola hippos* Günther, are large carangids (150 cm total length [TL]) found in warm temperate waters along inshore habitats of Australia, Norfolk Island, and New Zealand. Samson Fish are distributed discontinuously in Australian waters from Moreton Bay on the northeast coast to Montague Island off the southeast coast and from Marion Bay in South Australia to Shark Bay in Western Australia (Kailola et al., 1993). Until now, only 3 parasitic copepods have been reported from *S. hippos*: *Caligus lalandei* Barnard, 1948 from Northland, New Zealand (Jones, 1988), *Caligus spinosus* Yamaguti, 1939 (= *C. aesopus* Wilson, 1921), and *Parapetalus spinosus* Byrnes, 1986 from Coffs Harbour, New South Wales, Australia (Byrnes, 1986). Examination of the nasal cavities from *S. hippos* captured off Rottnest Island, Western Australia, revealed a new species of *Dissonus*, which is described in this article. New host or locality records (or both), along with remarks on morphological discrepancies compared with the original descriptions, are also given for *D. nudiventris* and *D. similis*. Lastly, a revised identification key to the species of *Dissonus* is provided.

MATERIALS AND METHODS

Fifteen female and 2 male copepods of the new species were removed from the nasal cavities of a Samson fish caught by recreational fishermen off Rottnest Island, Western Australia on 15 March 2002. A total of 168 female and 47 male *D. nudiventris* were collected by Stanley Wilson on 16 May 1962 from *Heterodontus portusjacksoni* (Meyer) off the New South Wales coast, Australia. Forty-one female and 17 male *D. nudiventris* were also collected on 7 June 1962 from *H. portusjacksoni* off the South Australian coast. *Dissonus similis* was collected from the following tetraodontid hosts in the Australian Museum (AM) in June 2003 and the California Academy of Sciences (CAS) in July 2003; 6 female and 5 male copepods from *Arothron meleagris* (Lacépède) (AM I.39265-002) collected from Guam on 12 May 1967; 6 female and 11 male copepods from *Arothron nigropunctatus* (Bloch and Schneider) (AM I.33701-011) collected from the Great Barrier Reef, Australia on 13 January 1993; 1 male copepod from *A. nigropunctatus* (AM I.40112-014) collected from the Philippines on 17 May 2000; 1 male copepod from *A. nigropunctatus* (AM I.17096-014) collected from New Guinea on 8 June 1970; 2 female and 4 male copepods from *A. stellatus* (Bloch and Schneider) (AM I.17088-055) collected from New Guinea on 29 May 1970; 3 female and 3 male copepods from *Arothron hispidus* (Linneaus) (CAS SU 26609) collected from the Philippines on 21 August 1931. Copepod parasites removed from the fish hosts were preserved in 70% ethanol. Syntypes of *D. nudiventris* (2 damaged females, 160 males, and 197 juveniles total in 4 lots) from the South Australian Museum (SAM C4169–C4172) and voucher specimens of male *D. similis* (9 males total in 4 lots) from the National Museum of Natural History, Smithsonian Institution (USNM 120742–120745) were examined intact. All preserved specimens were soaked in 85% lactic acid for at least 24 hr before examination using an Olympus BH-2 compound microscope. The female holotype, 2 female paratypes, and the male allotype were measured with an ocular micrometer. Measurements given in the description are in millimeters and, for the female, are expressed as the mean followed by the range in parentheses. Body appendages of 3 female paratypes and the male paratype were dissected. Intact specimens and dissected appendages were examined using the wooden slide procedure of Humes and Gooding (1964). Drawings were made with the aid of a camera lucida. The terminology follows Huys and Boxshall (1991). The identification key to *Dissonus* spp. is modified from Kabata (1966) and Pillai (1976).

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DESCRIPTIONS

Dissonus hoi n. sp.

(Figs. 1–4)

Adult female: Body as in Figure 1A. Total length (excluding setae on caudal rami) 5.18 (4.71–5.73). Cephalothorax suborbicular, 2.50 (2.31–2.72) long and 2.71 (2.59–2.86) wide (excluding marginal membrane); tips of antennules not extending beyond widest margin of cephalothorax; lateral zones extending to posterior margin of second free leg-bearing segment; sensory pit located at posterior end of lateral zones. Second pedigerous segment about 3 times wider than long, 0.50 (0.41–0.66) × 1.46 (1.41–1.52), and bearing lateral plates. Third pedigerous segment wider than long, 0.47 (0.46–0.49) × 1.46 (1.32–1.57), with nearly parallel anterior and posterior margins. Fourth pedigerous segment 0.47 (0.41–0.56) long × 1.34 (1.20–1.46) wide, with tapered lateral margins and an uneven posterior margin. Genital complex quadrangular, wider than long, 1.54 (1.34–1.81) × 1.95 (1.78–2.05), and bearing 7 anteromedial spines (some specimens with 5 or 8 anteromedial spines) and 2 lateral spines (Fig. 1B); anteromedial spines are bifid, midlateral spines are simple (Fig. 1C). Abdomen 1-segmented, length and width nearly equal, 0.75 (0.73–0.79) × 0.77 (0.72–0.83), and slightly constricted at midpoint (Fig. 1D). Caudal ramus longer than wide, 0.31 (0.27–0.37) × 0.25 (0.23–0.26), bearing medial row of setules, 4 long apical plumose setae, 1 short ventrolateral pinnate seta, and 1 short dorsomedial pinnate seta (Fig. 1D). Egg strings long, uniseriate, and convoluted (egg strings became less convoluted and eventually broke apart in lactic acid).

Antennule 2-segmented (Fig. 1E). First segment wider at base than distal end and carrying 27 anteroventral plumose setae (first seta minute). Second segment cylindrical, armed with 1 subapical seta on posterior margin and 11 setae plus 2 aesthetascs on the distal margin (Fig. 1F). Antenna 3-segmented (Fig. 1G). First segment longer than second segment; first 2 segments unarmed; terminal segment a curved claw bearing 2 naked setae. Postantennal process small, with slightly curved tip and carrying 2 basal papillae (proximal papilla bearing 5 short setules and distal papilla bearing 1 small and 3 long setules) (Fig. 2A); another papilla bearing 3 setules located medial to postantennal process. Mandible separated into 3 parts by 2 annulations (Fig. 2B); terminal part bearing 12 teeth (based on 3 pairs of mandibles) on medial margin. Maxillule biramous (Fig. 2C). Exopod unimerous, rodlike, with 3 apical, unequal naked setae. Endopod unimerous, styliform and bearing subterminal swelling on dorsal surface and a minute terminal seta. Subtriangular sclerotized process located posteromedial to maxillule (Fig. 2D); distal end of process covered with tightly packed ridges on dorsal and ventral surface (dorsal ridges not drawn). Maxilla 2-segmented and brachiform (Fig. 2E). Proximal segment unarmed and longer than distal segment. Distal segment with a subapical tuft of setules and 2 unequal apical elements (calamus and canna); calamus ornamented with strips of serrated membranes along both edges; canna approximately one-half length of calamus and ornamented with nonserrated membrane along edges. Maxilliped 3-segmented, strongly developed, and subchelate (Fig. 2F). Corpus bearing short spine on medial surface and 2 prominent dorsal ridges; supporting bar attached to base of corpus; transparent membrane also attached to corpus, extending from the base to posterior margin of anterior dorsal ridge. Shaft shorter than terminal claw; claw with small basoventral seta, 2 dorsal sclerotized flanges along inner margin, and covered with fine ridges at distal end. Sternal furca with bulbous box, wider at base than at distal end (Fig. 2G); tines long, slim, and parallel; tips of tines extending beyond intercoxal sclerite of first leg.

Armature on rami of legs 1–4 as follows (Roman and Arabic numerals indicating spines and setae, respectively).

	Sympod	Coxa	Basis	Exopod	Endopod
Leg 1	1-1	—	—	I-0; III, 1, 3	0-0; 3
Leg 2	—	0-1	1-0	I-1; I-1; III, 5	0-1; 0-2; 6
Leg 3	—	0-1	1-0	I-1; I-1; III, 5	0-1; 0-2; 4
Leg 4	—	0-1	1-0	I-1; I-1; III, 5	0-1; 0-2; 3

Leg 1 biramous (Fig. 3A). Sympod with sclerotized flange on inner margin and 1 midlateral and 1 posteromedial pinnate seta. Exopod 2-segmented. First segment with large outer spine and row of setules on posterior margin; spine with denticulated inner margin and pecten at base. Second segment bearing 6–13 lateral spiniform processes, 2 stout lateral spines, 1 long lateral spine, 1 apical pinnate seta, 3 long inner plumose setae, and inner row of setules; first spine with small pecten at base; first 2 spines with flange on both margins. Endopod 2-segmented. First segment with crescent-shaped sclerotized flange on ventral surface. Second segment with rows of outer setules, 5–8 apical spiniform processes, and 3 inner plumose setae. One specimen with an extra plumose seta on second endopodal segment (Fig. 3B). Leg 2 biramous (Fig. 3C). Intercoxal sclerite with striated membrane on posterior margin. Coxa-basis bearing prominent sclerotized protuberance on dorsolateral surface and sclerotized flange on ventral surface. Coxa with inner plumose seta; basis with outer pinnate seta and row of setules on posterior margin. Exopod 3-segmented. First segment with large, curved outer spine, long inner plumose seta, and inner row of setules; outer spine bearing denticulated inner margin and a basal pecten. Second segment with 11–17 spiniform processes on lateral margin, an outer spine, an inner plumose seta, and an inner row of setules; outer spine with basal pecten and finely denticulated margins. Third segment bearing 4–8 lateral spiniform processes, 2 unequal outer spines (first spine longer than second spine), 1 apical seta with pinnate inner and membranous outer margins, 5 inner plumose setae, and inner row of setules; first spine with basal pecten; both spines with fine denticles on margins. Endopod 3-segmented. First segment with several outer rows of setules and inner plumose seta. Second segment with several outer rows of setules, 2 inner plumose setae, and inner row of setules. Third segment with short row of outer setules and 6 plumose setae. Leg 3 biramous (Fig. 3D). Intercoxal sclerite with striated membrane on posterior margin. Coxa-basis bearing prominent sclerotized protuberance on dorsolateral surface and sclerotized flange on ventral surface. Coxa with inner plumose seta; basis with stout outer seta and striated membrane on posterior margin. Exopod 3-segmented. First segment with outer spine, long inner plumose seta, and inner row of setules; outer spine bearing fine denticles on margins and basal pecten. Second segment with 5–8 spiniform processes on lateral margin, a large outer spine, an inner plumose seta, and an inner row of setules; outer spine with pecten at base and finely den-

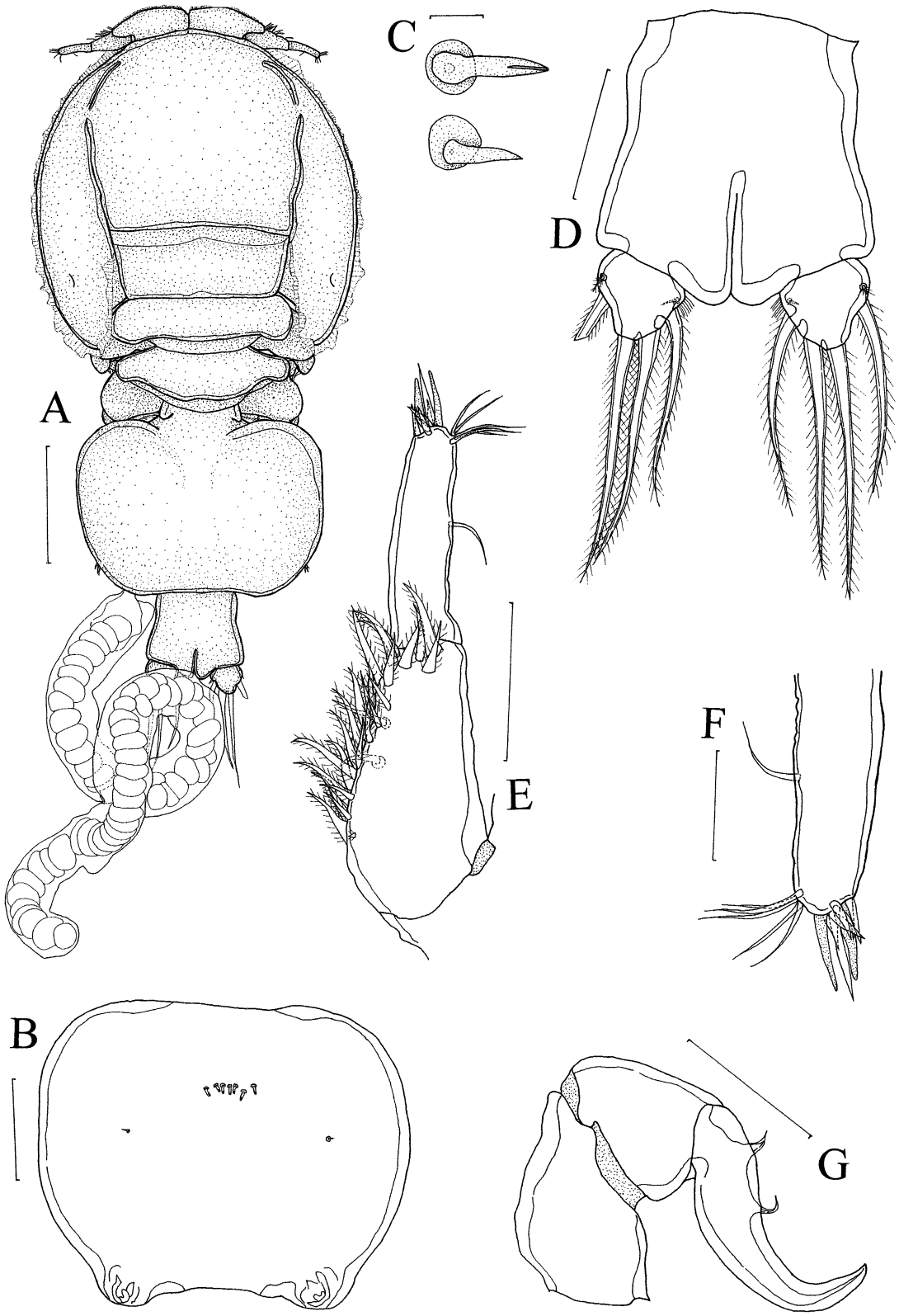

FIGURE 1. *Dissonus hoi* n. sp., adult female. (**A**) General habitus, dorsal view. (**B**) Genital complex, ventral view. (**C**) Anteromedial spine (top) and lateral spine (bottom) on genital complex. (**D**) Abdomen and caudal rami, ventral view. (**E**) Antennule, ventral view. (**F**) Terminal segment of antennule, ventral view. (**G**) Antenna, ventral view. Bars: A = 1.00 mm; B = 0.60 mm; C = 0.025 mm; D = 0.40 mm; E, G = 0.20 mm; F = 0.10 mm.

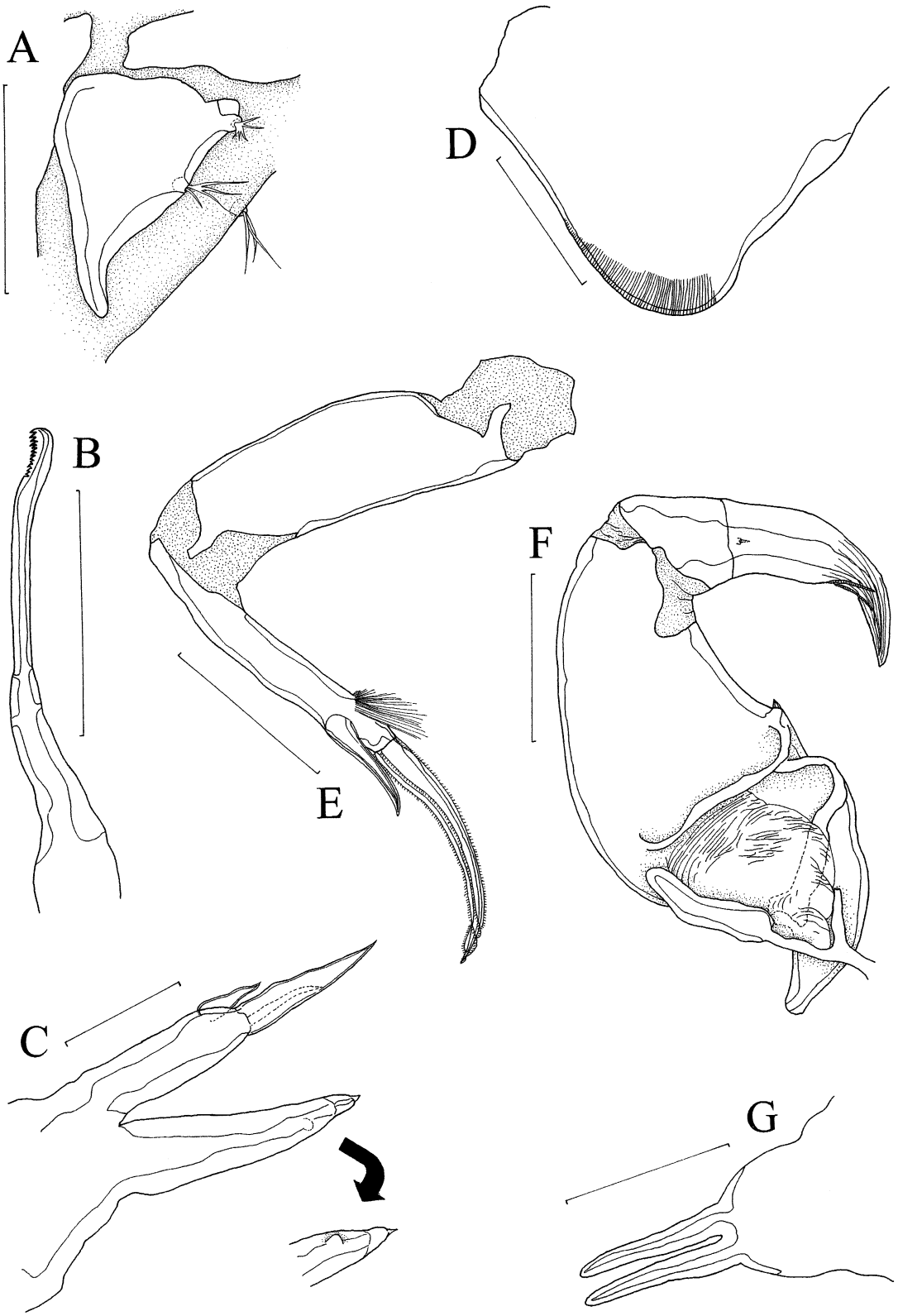

FIGURE 2. *Dissonus hoi* n. sp., adult female. (**A**) Postantennal process, ventral view. (**B**) Mandible, ventral view. (**C**) Maxillule, ventral view (call-out shows dorsal view of distal end of endopod). (**D**) Sclerotized process posteromedial to maxillule, ventral view. (**E**) Maxilla, ventral view. (**F**) Maxilliped, dorsal view. (**G**) Sternal furca, ventral view. Bars: A, D = 0.10 mm; B, G = 0.20 mm; C = 0.075 mm; E = 0.30 mm; F = 0.40 mm.

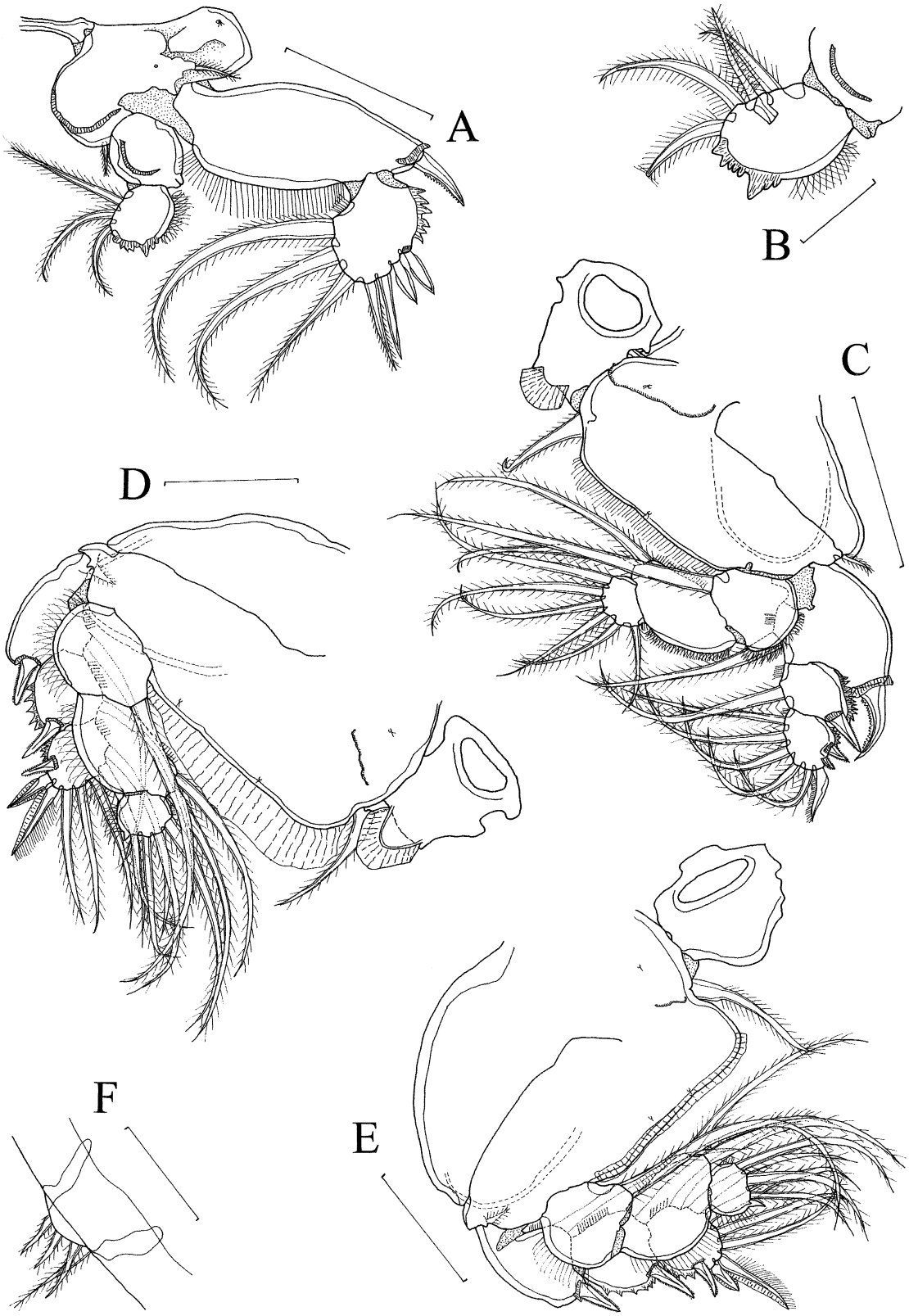

FIGURE 3. *Dissonus hoi* n. sp., adult female. (**A**) Leg 1, ventral view. (**B**) Abnormal second endopodal segment of leg 1, ventral view. (**C**) Leg 2, ventral view. (**D**) Leg 3, ventral view. (**E**) Leg 4, ventral view. (**F**) Leg 5, ventral view. Bars: A, D, E = 0.30 mm; B, F = 0.10 mm; C = 0.40 mm.

ticulated margins. Third segment bearing 4–5 lateral spiniform processes, 2 unequal outer spines (first spine shorter than second spine), 1 apical seta with pinnate inner and membranous outer margins, 5 inner plumose setae, and inner row of setules; first spine with fine denticles on margins and pecten at base; second spine with flange on margins. Endopod 3-segmented. First segment with several outer rows of setules and inner plumose seta. Second segment with several lateral rows of setules, 2 inner plumose setae, and inner row of setules. Third segment with several rows of outer setules, 1 spiniform process, 4 plumose setae, and short inner row of setules. Leg 4 biramous (Fig. 3E). Striated membrane absent on intercoxal sclerite. Coxa-basis bearing prominent sclerotized protuberance on dorsolateral surface and small sclerotized flange on ventral surface. Coxa with inner plumose seta; basis with stout outer seta and narrow striated membrane on posterior margin. Exopod 3-segmented. First segment with large outer spine, long inner plumose seta, and inner row of setules; outer spine bearing fine denticles on both margins and pecten on base. Second segment with 5–10 spiniform processes on lateral margin, a large outer spine, an inner plumose seta, and an inner row of setules; outer spine with pecten at base and finely denticulated margins. Third segment bearing 5–7 lateral spiniform processes, 2 outer spines, 1 apical seta with pinnate inner and membranous outer margins, 5 inner plumose setae, and inner row of setules; first spine with fine denticles on margins and pecten at base; second spine with flange on margins. Endopod 3-segmented. First segment with outer row of setules and inner plumose seta. Second segment with lateral row of setules, 2 inner plumose setae, and inner row of setules. Third segment with row of outer setules, 1 spiniform process, 3 plumose setae, and short inner row of setules. Leg 5 vestigial, represented by 4 pinnate setae (Fig. 3F).

Adult male: Body as in Figure 4A. Total length (excluding setae on caudal rami) 4.56. Cephalothoracic shield (excluding marginal membrane) 2.08 long and 2.27 wide. Second pedigerous segment 0.50 long × 1.19 wide, bearing lateral plates. Third pedigerous segment 0.44 long × 1.12 wide. Fourth pedigerous segment 0.47 long × 1.08 wide. Genital complex, 1.15 long × 1.14 wide, with 4 anterior bifid spines and 3–4 lateral bifid spines (Fig. 4B). Abdomen 1-segmented, 0.59 long × 0.74 wide, constricted near anterior margin. Caudal ramus 0.23 long × 0.25 wide. Appendages of the adult male are similar to those of the adult female with the following exceptions. Antenna 3-segmented (Fig. 4C). First segment shortest and unarmed. Second segment with small adhesion pad on distomedial surface. Terminal segment forming claw and equipped with 2 setae. Maxillule biramous as in female (Fig. 4D). Exopod unimerous, rodlike, with 3 unequal, apical naked setae. Endopod unimerous, cylindrical, with rounded protuberance at tip and a subterminal lateral process bearing a minute seta at tip. Sclerotized flanges on female maxilliped claw absent in male maxilliped. Leg 5 (Fig. 4E) and 6 (Fig. 4F) vestigial; former bearing 4 pinnate setae, whereas the latter represented by 3 pinnate setae.

Taxonomic summary

Type host: Seriola hippos Günther, 1876 (Perciformes: Carangidae).

Infection site: Nasal cavity.

Type locality: Off Rottnest Island, Western Australia (32°00′S, 115°30′E).

Material deposited: Female holotype (Western Australian Museum [WAM] C 33227), male allotype (WAM C 33806), and 4 female paratypes (WAM C 33228) deposited in the WAM. Remaining paratypes (intact and dissected) retained in the collection of the authors.

Etymology: This species is named in honor of Dr. Ju-Shey Ho, a leading authority on copepod associates and parasites of invertebrate and vertebrate animals, for his constant encouragement and mentorship in our copepod studies.

Remarks

Among female members of *Dissonus*, *D. hoi* n. sp. closely resembles *D. nudiventris* and *D. pastinum*, both of which are parasites of Horn Sharks (*Heterodontus* spp.). It shares with *D. nudiventris* and *D. pastinum* the following characteristics: a sclerotized process posteromedial to the maxillule, a sternal furca, and 1-segmented abdomen. However, the new species is readily distinguished from *D. nudiventris* and *D. pastinum* in the shape of the genital complex (ovoid in *D. nudiventris* and *D. pastinum* rather than quadrangular), possession of a postantennal process (absent not only in *D. nudiventris* and *D. pastinum*, but in other congeners as well), and spines on the ventral surface of the genital complex (spines absent in *D. nudiventris* and *D. pastinum*).

Other features unique to *D. hoi* are the site of infection and the egg string shape. All members of *Dissonus*, except for *D. kapuri* (found on seaweeds), have been collected from the external body surface, gills, and branchial chambers of their elasmobranch and teleost hosts. However, *D. hoi* was collected from the nasal cavity of its host. The uniseriate egg strings are straight for all ovigerous female dissonids, except for *D. hoi*, which possess uniseriate egg strings that are long and convoluted (coiled). Although having convoluted, uniseriate egg strings is unique for *D. hoi* within the Dissonidae, this character can also be found in other siphonostome families parasitic on vertebrates, namely the families Cecropidae, e.g., *Entepherus* Bere, 1936, Lernanthropidae, e.g., *Aethon* Krøyer, 1837, *Norion* Nordmann, 1864, *Sagum* Wilson, 1913, and Pennellidae, e.g., *Haemobaphes* Steenstrup and Lütken, 1861, *Lernaeocera* Blainville, 1822, *Lernaeolophus* Heller, 1865, *Phrixocephalus* Wilson, 1908.

The male antenna of *D. furcatus*, *D. glaber*, *D. heronensis*, *D. kapuri*, *D. manteri*, *D. nudiventris*, *D. similis*, and *D. spinifer* has been characterized as a 3-segmented appendage, with the first 2 segments being unarmed and the terminal segment forming a claw and bearing 2 setae and an accessory tine. It should be noted that the male has not been described for *D. pastinum* and the male appendages of *D. ruvetti* were neither described nor drawn by Nunes-Ruivo and Fourmanoir (1956). Nonetheless, the male antenna of *D. hoi* differs among its known male congeners in having an adhesion pad on the second segment and lacking an accessory tine on the terminal segment.

Dissonus nudiventris Kabata, 1965

(Fig. 5)

Taxonomic summary

Host: Heterodontus portusjacksoni (Meyer, 1793) (Heterodontiformes: Heterodontidae).

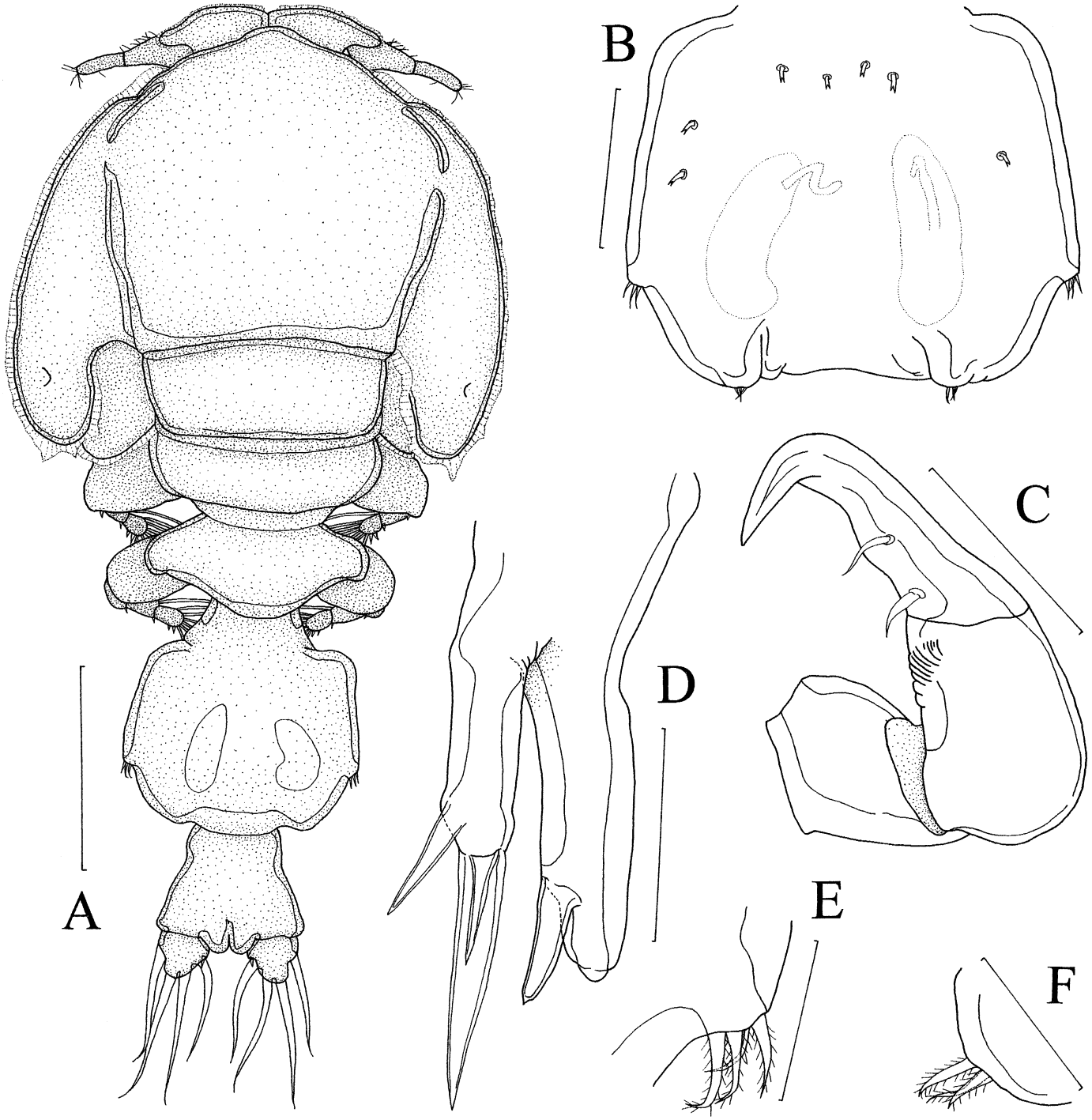

FIGURE 4. *Dissonus hoi* n. sp., adult male. (**A**) General habitus, dorsal view. (**B**) Genital complex, ventral view. (**C**) Antenna, ventral view. (**D**) Maxillule, ventral view. (**E**) Leg 5, ventral view. (**F**) Leg 6, ventral view. Bars: A = 1.00 mm; B = 0.40 mm; C = 0.20 mm; D, E, F = 0.10 mm.

Infection site: Not recorded.

Locality: Eight miles south from Ulladulla, Australia (35°21′S, 150°27′E), and 25 miles south of Adelaide, in the Gulf of St. Vincent, South Australia (34°33′S, 138°21′E).

Material deposited: Voucher specimens (52 ♀♀ and 26 ♂♂) deposited in the (C WAM 33829–C 33833). Remaining specimens retained in the collection of the authors.

Other collections of D. nudiventris: From *H. portusjacksoni* collected in Hobart, Tasmania and Port Willunga, in the Gulf of St Vincent, South Australia (Kabata, 1965); from *H. portus-*

jacksoni, *Emissola antarctica* (= *Mustelus antarcticus* Günther), and *Trygonorhina fasciata guanerius* (= *T. fasciata* Müller and Henle) at Port Willunga, South Australia (Kabata, 1966).

Remarks

Specimens of *D. nudiventris* (Fig. 5A) collected off Ulladulla represent a new locality record. In addition, specimens off Ulladulla and Adelaide differ from Kabata's (1965) original description in several respects. Kabata stated that the appendages of the 2 sexes were not significantly different. He described the terminal segment of the antenna as a hook bearing 2 setae and a secondary hooklet (tine) on the inner margin. In our female specimens, the terminal segment of the antenna lacks the secondary tine (Fig. 5B). Kabata also indicated that the endopod of the maxillule is longer than the exopod, and is distally divided into a lateral process equipped with a small terminal spine and a larger inner process with the tip possibly broken off. The endopod of the maxillule in our female specimens consists of a dentiform process equipped with a small terminal element and a subterminal, pyramid-shaped hyaline knob (Fig. 5C). Unfortunately, we could not confirm if the differences reported above are due to either natural variation or inaccuracies in the original description because the 2 adult female syntypes in lots SAM C4170 and C4171 were considerably damaged, both specimens missing the prosome (cephalothorax plus the free leg-bearing segments). However, it should be noted that the male maxillule in our specimens conforms to Kabata's description.

One structure not observed by Kabata (1965), but present in our male and female specimens, as well as the male syntypes in all 4 lots, is a suboval sclerotized process situated posteromedial to the maxillule (Fig. 5D). A similar structure is present in *D. hoi* and *D. pastinum*. The sternal furca as described by Kabata (1965) bears 2 long, pointed, divergent tines with an irregular outline on the inner margin. In some of our female specimens, the sternal furca is small with short, parallel rounded tines (Fig. 5E). Nevertheless, the sternal furca in the majority of our male and female specimens agrees with Kabata's description, except each tine bears a flange at the distal end (Fig. 5F). The flange on each tine is present in the male syntypes in all 4 lots, so this characteristic was overlooked by Kabata.

Dissonus similis Kabata, 1966

(Fig. 6)

Taxonomic summary

Host: Arothron hispidus (Linnaeus, 1758) (Tetraodontiformes: Tetraodontidae); *A. meleagris* (Lacépède, 1798); *A. nigropunctatus* (Bloch and Schneider, 1801); *A. stellatus* (Bloch and Schneider, 1801).

Infection site: Gills, branchial cavity wall, and gill arch of *A. hispidus*; body surface and branchial cavity wall of *A. meleagris*; branchial cavity wall of *A. nigropunctatus*; branchial cavity wall and gill arch of *A. stellatus*.

Locality: Jolo Island, Philippines (5°58′N, 121°06′E) for *A. hispidus*; Ipao Beach, Guam (13°27′N, 144°47′E) for *A. meleagris*; ''Reef 11–102,'' Great Barrier Reef, Australia (11°27′S, 143°58′E), Baco Island, Philippines (13°28′N, 120°10′E) and Trobriand Island, New Guinea (8°50′S, 151°05′E) for *A. nigropunctatus*; Madang, New Guinea (5°10′S, 145°51′E) for *A. stellatus*.

Material deposited: A total of 14 ♀♀ and 22 ♂♂ deposited in the Australian Museum (P 66582, P 66583, P 67859, P 67860, P 67862); 3 ♀♀ and 3 ♂♂ deposited in the Department of Invertebrate Zoology in the CAS (CAS 168602).

Other collections of D. similis: from *Spheroides hamiltoni* (= *Tetractenos hamiltoni* (Richardson)) off Green Island, Queensland (Kabata, 1966); from *A. meleagris* at Eniwetok Atoll (Lewis, 1968).

Remarks

The specimens from the Philippines, New Guinea, Guam, and the northern Great Barrier Reef constitute new locality records. Furthermore, *A. hispidus*, *A. nigropunctatus*, and *A. stellatus* represent new host records for *D. similis*. It appears that *D. similis* is not only restricted to the tropical western Pacific, but also is highly host specific to tetraodontiform fishes of the family Tetraodontidae. The male specimens of *D. similis* in this study (Fig. 6A) vary slightly from the description of the male given by Lewis (1968). He described the male maxillule as a lobate projection lacking an adhesion surface and bearing 3 naked basal setules and an elongate, slightly curved spine with a minute nodule on the distal inner surface. The male maxillule in this study differs from Lewis' (1968) description in that the lobate projection bears an adhesion surface on the dorsal surface (not drawn in Fig. 6B, and also observed in our female specimens and the females described by Kabata [1966]), and the spine, most likely representing the dentiform process of the endopod, bears a subterminal lateral process (Fig. 6B). This subterminal lateral process was absent in the single male voucher specimen in lot USNM 120744 but was observed in 3 of the 5 males in lot USNM 120742, 1 of 2 males in lot USNM 120743, and the single male in lot USNM 120745. Therefore, Lewis failed to observe this structure. The lateral process is a very delicate structure, and in all likelihood broke off the maxillule in the other 4 male voucher specimens.

Key to *Dissonus* spp.

1. Sternal stylet present 2
   Sternal furca present 3
   No sternal furca or stylet 6
2. Sternal stylet cylindrical, genital complex with 1 transverse and 2 longitudinal rows of spines . . . . . *D. kapuri*
   Sternal stylet conical, genital complex with a semicircle of spines . . . . . *D. manteri*
3. Abdomen 1-segmented 4
   Abdomen 2-segmented . . . . . *D. ruvetti*
4. Ventral side of genital complex with spines . . . . . *D. hoi*
   Ventral side of genital complex without spines 5
5. Tuft of long setules present on crista of the maxilla . . . . . *D. nudiventris*
   Scalelike spinules on crista of the maxilla . . . . . *D. pastinum*
6. Ventral side of genital complex with spines 7
   Ventral side of genital complex without spines . . . . . *D. glaber*
7. Ventral side of genital complex with simple spines . . . *D. spinifer*
   Ventral side of genital complex with forked spines 8
8. Ventral side of genital complex with 10 forked spines in 1 transverse and 2 longitudinal rows . . . . . *D. heronensis*
   Ventral side of genital complex with a semicircle of numerous forked spines 9
9. Spines confined to anterior 1/3 of genital complex . . . *D. furcatus*
   Spines extending over anterior 2/3 of genital complex . . *D. similis*

Note that Pillai (1968) described a single male copepod collected from the gills of a ray (*Trygon* sp.) in Trivandrum, south

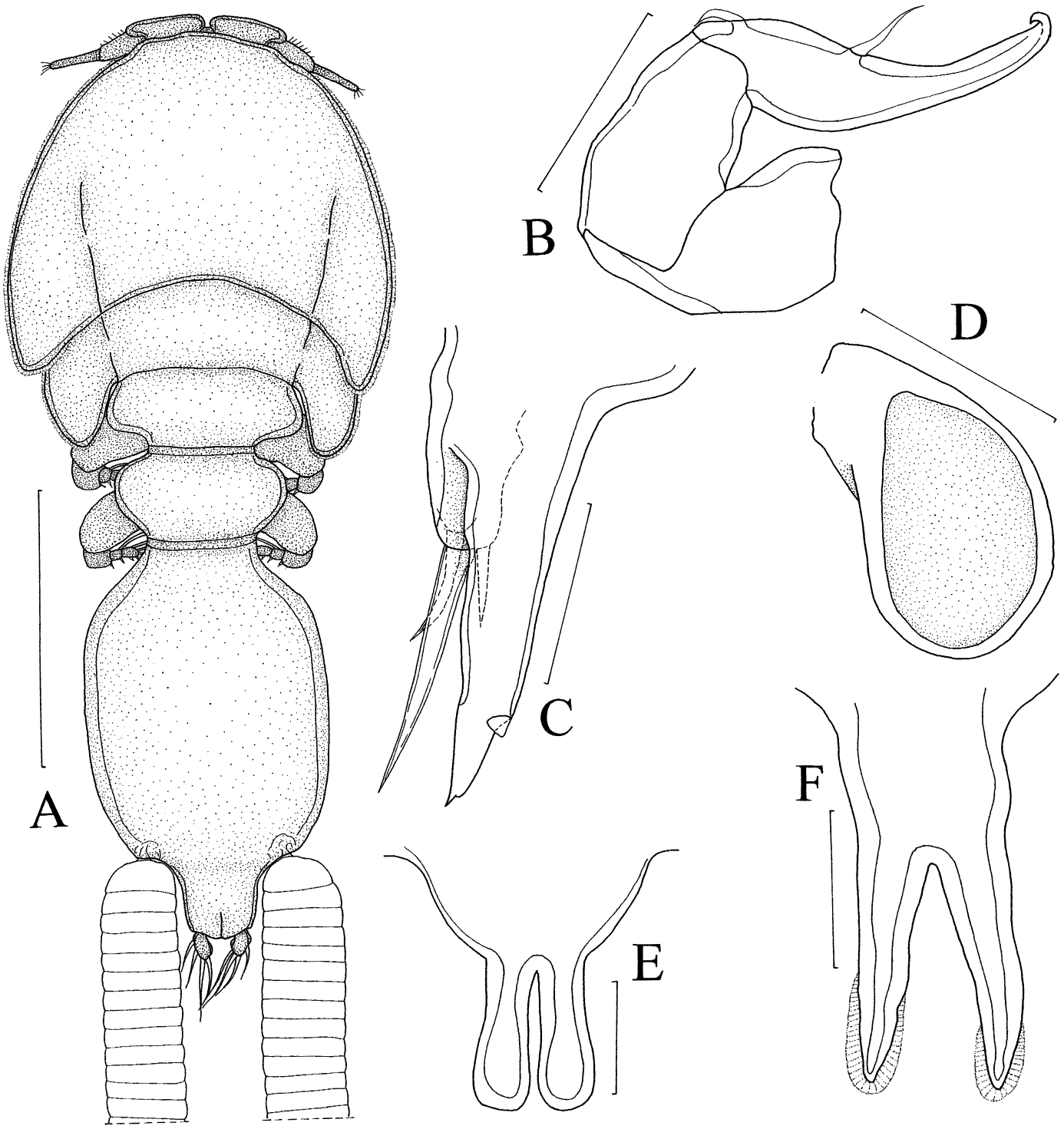

FIGURE 5. *Dissonus nudiventris* Kabata, 1965, adult female. (**A**) General habitus, dorsal view. (**B**) Antenna, ventral view. (**C**) Maxillule, ventral view. (**D**) Sclerotized process posteromedial to maxillule, ventral view. (**E**) Sternal furca, ventral view. Adult male. (**F**) Sternal furca, ventral view. Bars: A = 1.00 mm; B, D, F = 0.10 mm; C, E = 0.05 mm.

India, and designated it under *Dissonus* without giving it a specific name. This male copepod possesses some features not present in any other male dissonid, namely an abdominal region that is longer than the cephalothorax (abdomen much shorter than cephalothorax in dissonids), long caudal rami (short in dissonids), spines situated apically on the last exopodal segment of leg 1 (spines are laterally positioned in dissonids), and a 2-segmented endopod on leg 4 (3-segmented endopod in dissonids). It is evident that this male copepod does not belong to the genus *Dissonus*, but rather, more closely resembles *Trebius*

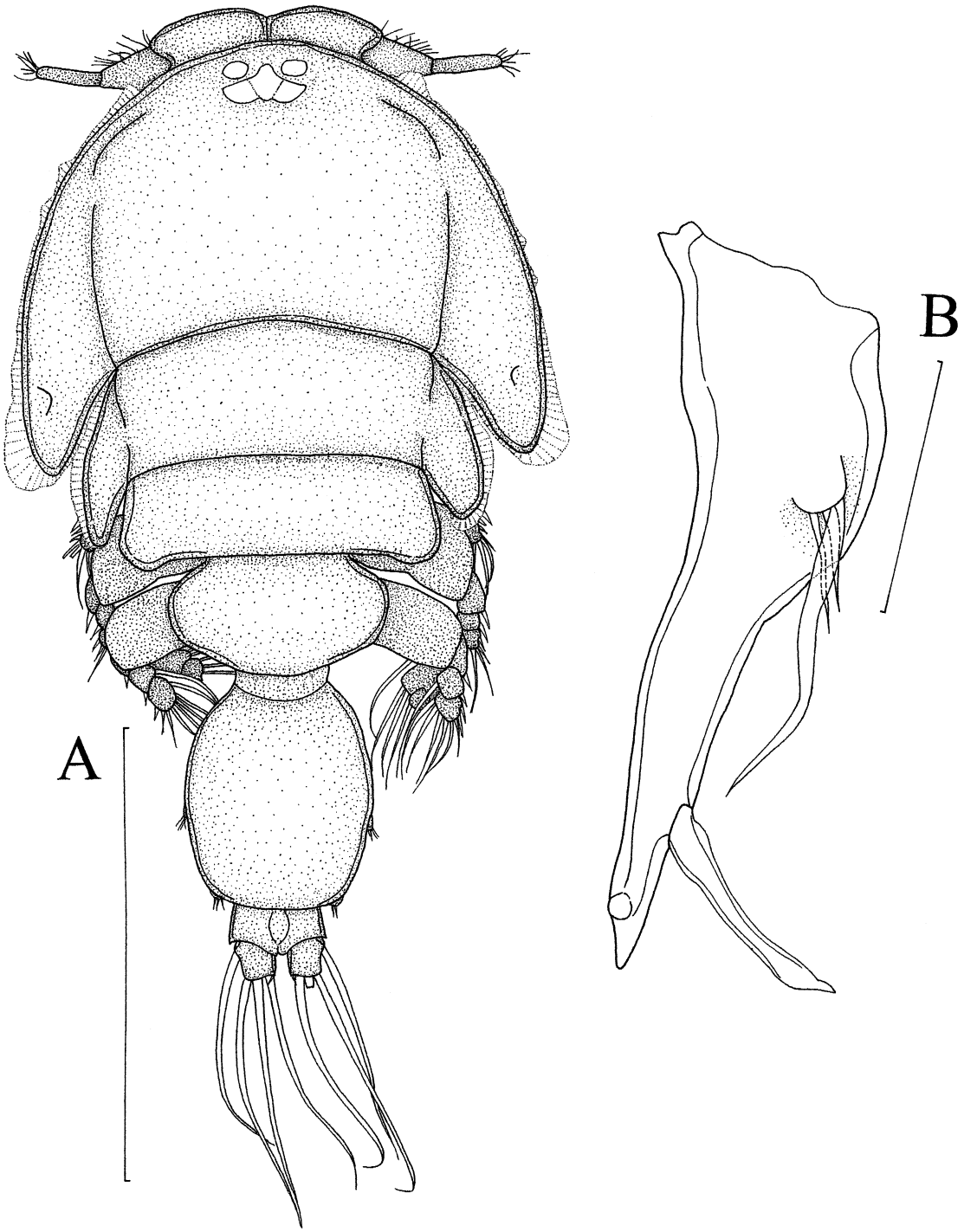

FIGURE 6. *Dissonus similis* Kabata, 1966, adult male. (**A**) General habitus, dorsal view. (**B**) Maxillule, ventral view. Bars: A = 1.00 mm; B = 0.05 mm.

Krøyer, 1838. However, the absence of a postantennal process and the presence of 2-segmented endopod on leg 4 exclude this copepod from the genus *Trebius*. Because this copepod cannot be placed into any caligiform genus with absolute certainty, we treat this copepod as a *species indeterminatum* until further material can be collected and described from *Trygon* sp.

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