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## Redescription of *Microprosthema semilaeve* (von Martens, 1872) (Decapoda: Stenopodidea: Spongicolidae) and description of a new species of *Microprosthema* from Dry Tortugas, Florida

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### Abstract

*Microprosthema semilaeve*, a fairly common spongicolid shrimp of reefal habitats in the Western Atlantic and Caribbean is redescribed and figured based on type material and an additional 78 specimens from the majority of its known zoogeographical range. It is distinguished from the Indo-Pacific species of *M. validum* and an undescribed species of *Microprosthema* with which it has been confused in the literature by a number of morphological characters. A new species of *Microprosthema* from deeper waters off the Dry Tortugas and closely related to *M. inornatum* Manning & Chace, 1990, is described and illustrated. *Microprosthema jareckii* Martin, 2002 is synonymized with *M. manningi* Goy & Felder, 1988. A key to the Western Atlantic species of *Microprosthema* is presented.

**Key words:** *Microprosthema*, Spongicolidae, Western Atlantic Ocean, Caribbean Sea, Gulf of Mexico, Dry Tortugas, color pattern, new species

### Introduction

*Microprosthema semilaeve* was first described by E. von Martens (1872) from two specimens he found undescribed in the Berlin Museum and which he called *Stenopus semilaevis*. The same species was later described as new by Pocock (1890) under the name *Stenopusculus spinosus*. Balss (1915) showed that *Stenopusculus* was identical to *Microprosthema* Stimpson (1860). Holthuis (1946) was the first to show that the descriptions of von Martens and Pocock represented the same species, *Microprosthema semilaeve*. Several authors have identified *Microprosthema* from the coasts of India and Pakistan as either *M. validum* (Pillai 1962; Tirmizi & Kazmi 1979) or *M. semilaeve* (Mahadevan *et al.* 1962; Ranade 1973; Raje & Ranade 1978). These above-mentioned Indian and Pakistani specimens are neither *M. validum* nor *M. semilaeve* but represent an undescribed species of *Microprosthema* (de Saint-Laurent & Cleva 1981; Felder *et al.* 1985; Goy 1987; Goy & Felder 1988; Martin & Goy 2004). Due to this confusion in the literature, the short descriptions given by von Martens (1872), Pocock (1890) and Rankins (1898), and the absence of complete illustrations of *M. semilaeve*, a more thorough redescription is warranted.

This paper redescribes *M. semilaeve* based on the two original type specimens and 78 additional specimens collected from the majority of the species' known zoogeographical range. While examining 13 specimens of *M. semilaeve* collected off the Dry Tortugas, two specimens were found to differ morphologically, and they are here described as a new species. The distributions of the species of *Microprosthema* known from the Western Atlantic are reviewed, *M. jareckii* is synonymized with *M. manningi*, and a key to the Western Atlantic species in the genus is presented.

The specimens examined are deposited in the collections of the Zoologisches Museum, Berlin (ZMB); American Museum of Natural History, New York (AMNH); Museum of Comparative Zoology, Harvard University, Cambridge (MCZH); Florida Department of Natural Resources, Bureau of Marine Research, Marine

Research Laboratory, St. Petersburg (FSBCI); Florida Department of Natural Resources (IRCZM); Scripps Institute of Oceanography, Benthic Invertebrate Collection, La Jolla (SIO-BIC); University of Miami Marine Laboratory, Miami (UMML); University of Louisiana- Lafayette Zoological Collections, Lafayette (ULLZ); and National Museum of Natural History, Washington, D.C. (USNM). Counts of the teeth on the lateral margins of the antennal scale and uropods include the terminal tooth. Abbreviations used: cl, postorbital carapace length (in mm), ov, ovigerous.

## Systematics

### Spongicolidae Schram, 1986

#### *Microprosthema* Stimpson, 1860

##### *Microprosthema semilaeve* (von Martens, 1872)

(Figs. 1–8)

*Stenopus semilaevis* von Martens, 1872: 144.—Herrick, 1893: 352.—Rankin, 1898: 241–242, pl. 29, fig. 2.—A. Milne-Edwards & Bouvier, 1909: 263.—Schmitt, 1924: 86.—Schmitt, 1936: 373.—Schmitt, 1939: 28.

*Stenopusculus spinosus* Pocock, 1890: 523–524.

*Microprosthema spinosum*—Balss, 1915: 33.

*Microprosthema semilaeve*—Holthuis, 1946: 54–57, pl. III, fig. i.—Manning, 1961: 81.—Coelho, 1967/69: 252.—Williams *et al.*, 1969: 11.—Chace, 1972: 144.—Coelho & Ramos, 1972: 158.—Fausto-Filho, 1974: 6.—Fausto-Filho, 1975: 80.—Zeiller, 1974: 74, fig.—Fausto-Filho, 1980: 113, 117.—Rodriguez, 1980: 175, 179, fig. 51d.—Voss, 1980: 84–85, fig.—Felder *et al.*, 1985: 174.—Abele & Kim, 1986: 8, 282, 283, fig. c.—Markham *et al.*, 1990: 418.—Ramos-Porto, Austregésilo Filho & Lacerda, 1992: 35.—Alves & Ramos-Porto, 1994: 24.—Camp *et al.*, 1998: 139.—Coelho & Ramos-Porto, 1998: 323.—Ramos-Porto & Coelho, 1998: 109.—Álvarez *et al.*, 1999: 6.—Martinez Iglesias & Garcia Raso 1999: 544.—Boschii, 2000: 96.—Martin & Goy, 2004: 19–25, fig. 1–2.—Goy, 2005: 204.—McLaughlin *et al.*, 2005: 212, 270.—Tagliafico *et al.*, 2005: 91.—Coelho *et al.*, 2006: 47.—Alves, Ramos-Porto & Viana, 2008: 46.—Felder *et al.*, 2009: 1051.—Goy, 2010: 252, 256, fig. 65.21C.—Ortiz & Lalana, 2010: 22.—De Grave & Fransen, 2011: 250.

non *Microprosthema semilaeve*—Mahadevan, Rangarajan & Sankarankutty, 1962: 235–238, figs. 1–5.—Ranade, 1973: 570–572.—Raje & Ranade, 1978: 213–222, figs. 1–6.

**Material examined.** (1) female lectotype, cl 5.2, male paralectotype, cl 5.0, Antillen, leg. Werfel, ZMB 3006; (2) 1 female, cl 6.2, Andros, Island, Bahamas, March–April 1908, AMNH 4231; (3) 1 male, cl 4.1, north of sand pit, Piedra Priata Reef, Santo Domingo, 9 July 1933, AMNH 8757; (4) 1 male, cl 3.3, north end of El Cayo, Santo Domingo, 8 July 1933, AMNH 8758; (5) 1 female, cl 4.2, Piedra Priata Reef, Santo Domingo, 14 July 1933, AMNH 8759; (6) 1 ov. female, cl 4.6, Piedra Priata Reef, San Domingo, 10 July 1933, AMNH 8760; (7) 2 males, 7 females, 1 ov. female, cls 4.8, 6.1, 5.4, 5.7, 6.3, 6.8, 6.8, 7.0, 6.4, Havana, Cuba, leg. L. Howell Rivero, April 1937, det. F.A. Chace, Jr., MCZH 9746; (8) 1 male, 1 female, cls 5.8, 7.6, top of reef, Conch Bay, Andros, Bahamas, EJ-71-16, depth 0.6–6 m; leg. W.G. Lyons, 27 August 1971, det. S. Cobb, FSBCI 8082; (9) 1 female, cl 6.3, intertidal, found on artificial hard substrate, Seminole Shores seawall at point of subdivision, Indian River, Martin County, Florida, hand, rotenone, leg. L.E. Scotto, L.B. & G.R.K., 20 June 1974, det. R.H. Gore, IRCZM – 089:01251; (10) 1 male, cl 5.2, intertidal, worm reef, Walton Rocks, St. Lucie County, Florida, night, hand, leg. R.H. Gore & L. E. Scotto, 27 June 1975; det. R.H. Gore, IRCZM – 089: 02626; (11) 1 male, cl 3.0, reef 2 miles S of St. Lucie Inlet, ~ 1 mile offshore, Atlantic Ocean, Martin County, Florida, leg. P.A.H., det. K.A. Wilson, IRCZM- 089: 03321; (12) 1 male, cl 3.3, Niaklubir Island, Holandes Cay, San Blas Islands, Panama, 09° 35' 07" N 78° 44' 27" W, Collection TEPE 70-35, depth 0–1.2m., snorkel, R/V “Alpha Helix”, leg. W. Newman & S. Luke, 7 October 1970, (as *Odontozona* sp.), SIO – BIC 3068; (13) 1 ov. female, cl 7.2, Long Key, Dry Tortugas, leg. H. Doochin, 25 April 1948, det. F.A. Chace, Jr., UMML 32-348; (14) 1 ov. female, cl 5.3, Pigeon Rocks, British West Indies, leg. Voss, Williams & McKenney, 14 December 1957, UMML 32-1698; (15) 1 male, cl 5.8, Lesser Lameshur Bay, St. John, Virgin Islands, leg. Work & Kumpf, 10 June 1959, det. Thomas, UMML 32-1597; (16) 1 female, cl 4.1, Long Reef, Florida, leg. R.B. Manning, 6 June 1960, det. R.B. Manning, UMML 32-1787; (17) 1 male, 1 ov. female, cls 5.0, 4.7, Lesser Lameshur Bay, St. John, Virgin Islands, leg. L.P. Thomas, 7 December 1958, det. R. B. Manning, UMML 32-1234; (18) 1 male, cl 6.3, Long Reef, Dade County, Florida, leg. L.P. Thomas, 16 May 1959, det. R.

Manning, UMML 32-1995; (19) 1 ov. female, cl 5.0, reef front off Pajaros, Mexico, under dead coral, depth 0.6–1.2m., Texas A&I Alacran Expedition, leg. H.H. Hildebrand, 16 July 1959, ULLZ 2972; (20) 1 ov. female, cl 5.7, Carib Point, Roatan Island, Bay Islands, Honduras, under rocks in heavy surf, leg. E. Garcia, 7–8 August 1981, det. J.W. Goy, ULLZ 10700; (21) 1 female, cl 4.6, First Bight, Roatan Island, Bay Islands, Honduras, under rock, depth 0.9m., leg. E. Garcia, August 1982, det. J.W. Goy, ULLZ 10699; (22) 1 male, cl 5.9, Looe Key, Florida Keys, Florida, broken from coral rubble, depth 6–10m, leg. Felder, Goy, Lovett & Howell, 23 June 1984, det. J.W. Goy, ULLZ 9778; (23) 1 female, cl 6.0, Bird Key Reef, Tortugas, #3-31, 19 June 1931, USNM; (24) 1 male, cl 6.1, Bush Key Reef, Tortugas, #29-30, 23 July 1930, USNM; (25) 1 ov. female, cl 6.8, Bush Key Reef, Tortugas, #25-4, 5 June 1925, USNM; (26) 1 female, cl 6.5, Loggerhead Key, Tortugas, #7-32, under rock, leg. R.G. Stone, 20 June 1932, USNM; (27) 1 ov. female, cl 6.6, Tortugas, #24-31, 11 July 1931 USNM; (28) 1 male, 2 females (1 ov.), cls 6.0, 5.3, 5.7, west side of Loggerhead Key, Dry Tortugas, #8-32, leg. W.L. Schmitt, 21 June 1932, USNM 78407; (29) 1 male, 1 female, cls 6.9, 7.2, Bird Key Reef, Tortugas, Florida, leg. H.H. Darby, det. W.L. Schmitt, USNM 68473; (30) 1 female, cl 3.4, Hutchinson Island, Seminole Shores, Indian River, Martin County, Florida, seawall, hand, snorkel, rotenone, Indian River survey 137-74, leg. R.H. Gore, 20 June 1974, USNM 170124; (30) 1 male, 1 ov. female, cls 6.1, 6.3, Cat Island, Bahamas, Bennett's Creek, South Point, littoral, mangroves inside mouth of creek, leg. K. Gosner, 31 June 1968, det. F.A. Chace, Jr., USNM 128528; (31) 1 male, 2 females (1 ov.), cls 5.5, 5.5, 5.9, Abaco, Bahamas, U.S. Fisheries Commission Steamer "Albatross", USNM 23389; (32) 1 female, cl 5.2, Pelican Island, Barbados-Antigua Expedition, tide pools, State University of Iowa, 11 May 1918, det. W.L. Schmitt, USNM 68716; (33) 1 ov. female, cl 7.0, English Harbor, Barbados, University of Iowa, 1918, det. W.L. Schmitt, USNM 68789; (34) 1 female, cl 7.0, English Harbor, Barbados, #1 Nutting, University of Iowa Barbados-Antigua Expedition, 1918, det. W.L. Schmitt, USNM 57945; (35) 1 male, cl 4.4, St. Christopher, British West Indies, coral reef just off Windward Beach opposite Frigate Bay, associated with anemones (*Bartholomea annulata*), sta. 103-56 "Freelance", Smithsonian-Bredin Expedition, 12 April 1956, det. L.B. Holthuis, USNM 105282; (36) 1 ov. female, cl 7.6, Caribbean Sea, Lesser Antilles, Bonaire, depth 5–10 ft., leg. R.V. Harrison, 10 February 1975, det. F.A. Chace, Jr., USNM 155675; (37) 2 males, cls 4.1, 4.3, St. Lucia, British West Indies, Pigeon Island, near breakwater north of Pigeon Island Club, Smithsonian-Bredin Expedition Sta. #60-59, 15 April 1959, det. F.A. Chace, Jr., USNM 136536; (38) 1 ov. female, cl 6.1, Boekoeti Reef, Aruba (Oranjestad), between corals and coral debris on the "Scharrenfläche" #25, leg. P. Hennelich, 25 June 1930, det. W.L. Schmitt, USNM 67414; (39) 1 ov. female, cl 6.6, Dominica, British West Indies, west of Portsmouth, off Shingle Beach, depth 3–6ft., Smithsonian-Bredin Expedition Sta. 76-59, leg. Nicholson, Jordan & Finlay, 19 April 1959, det. F.A. Chace, Jr., USNM 136537; (40) 1 ov. female, cl 4.5, Antigua, British West Indies, reef off Black's Point, Falmouth Bay, Smithsonian-Bredin Expedition Sta. 113-59, leg. D.V. Nicholson, 30 April 1959, det. F.A. Chace, Jr., USNM 136540; (41) 1 female, cl 4.1, Carriacou, Grenadines, British West Indies, Tyrrell Bay, sand flats inside reef, Smithsonian-Bredin Expedition Sta. 17-56, leg. D.V. Nicholson, 16 March 1956, det. F.A. Chace, Jr., USNM 136531; (42) 1 male, cl 5.0, Barbuda, West Indies, east side of Cocoa Point, rotenone, Smithsonian-Bredin Expedition Sta. 102-59, 27 April 1959, det. F.A. Chace, Jr., USNM 136539; (43) 1 ov. female, cl 5.2, Anquilla, British West Indies, Sandy Island, depth 1.8–3.7m., Smithsonian-Bredin Expedition Sta. 54-58, 13 April 1958, det. F.A. Chace, Jr., USNM 136534; (44) 1 male, cl 5.2, Tobago, West Indies, west of Pigeon Point, sand flats off beach, Smithsonian-Bredin Expedition Sta. 31-59, 10 April 1959, det. F.A. Chace, Jr., USNM 136535; (45) 1 male, 1 female, cls 3.3, 3.9, Antigua, British West Indies, Charlotte Point, English Harbor, Smithsonian-Bredin Expedition Sta. 73-56, leg. Schmitt, Chace, Nicholson & Smith, 2 April 1956, det. F.A. Chace, Jr., USNM 136533; (46) 1 male, cl 6.0, Tobago Cays, Grenadines, British West Indies, west side of Borodol, coral rock, depth 0.9m, Smithsonian-Bredin Expedition Sta. 22-56, leg. D.V. Nicholson, 17 March 1956, det. F.A. Chace, Jr., USNM 136532; (47) 1 male, 1 female, cls 4.5, 4.5, Port Antonio, Jamaica, leg. J.E. Overden, USNM 4805; (48) 2 females, cls 4.8, 4.4, Jamaica, exchange from Marine Biological Laboratory, Woods Hole, Massachusetts, USNM 47358; (49) 2 males, cls 7.3, 2.7, Caribbean Sea, Ascension Bay, Quintana Roo, Mexico, along shore near Suliman Point, Smithsonian-Bredin Expedition Sta. 85-60, leg. Schmitt, Daiber, Bousfield, & Rehder, 17 April 1960, det. F.A. Chace, Jr., USNM 136541; (50) 1 male, cl 2.3, Caribbean Sea, Ascension Bay, Quintana Roo, Mexico, 183–274m. southwest of Suliman Point, sand shallows, depth 0.6–7.6m., Smithsonian-Bredin Expedition Sta. 87-60, leg. Bousfield, Daiber & Rehder, 17 April 1960, det. F.A. Chace, Jr., USNM 136542; (51) 3 males, 2 ov. females, cls 5.0, 6.6, 7.0, 5.5, 8.1, Caribbean Sea, Ascension Bay, Quintana Roo, Mexico, Suliman Point to 183 m. to southwest shore, Smithsonian-Bredin Expedition Sta. 95-60, leg. Schmitt, Bousfield & Daiber, 19 April 1960, det. F.A.

Chace, Jr., USNM 136543; (52) 1 male, 1 female, cls 4.3, 5.0, Old Providence Island, Colombia, shore, reef and tidepool collecting, Presidential Cruise 1938, Sta #30, leg. W.L. Schmitt, 6 August 1938, USNM 77864.

**Diagnosis.** Moderately small spongicolid shrimp with subcylindrical, depressed body, with few spinous processes; carapace covered with small, sometimes blunt spines, with cervical groove reaching far posteriorly; propodus and dactylus of third pereopod with distinct dorsal crista, numerous spinules along dorsal and ventral margins, surfaces of third pereopod covered with spinules, except ischium, spines and spinules on dorsal and ventral margins of carpus and meri; second pereopod with 1 or 2 spines anterodorsally on merus; first pereopod with all segments without spinules; transverse ridges on first and second abdominal somites; longitudinal ridge on uropodal endopodite with median spine; antennular peduncle with distinct, curved stylocerite; scaphocerite lobate with 4–6 very strong teeth on outer margin; first maxilliped with unsegmented or 3-segmented endopodite; body coloration red with white patches dorsally on carapace and abdomen; third maxilliped red; pereopods red, white at joints of segments and tips of dactyl.

**Redescription.** Lectotype (female, ZMB 3006). Rostrum (Fig. 1A, B) long, slightly deflexed, nearly reaching level of distal end of scaphocerite. Dorsal margin with 5 spines, ventrally with distal spine, laterally without spines.

Carapace (Fig. 1A, B) covered with small forwardly directed spinules. Cervical groove reaching far posteriorly, with 5 spinules along each lateral margin. Antennal, branchiostegal and hepatic spines present; 2 small pterygostomial spines present. Ventrolateral carapacial angle and brachiostegite slightly rounded.

Abdomen (Fig. 1B) broad, depressed, dorsally glabrous. First pleomere with posterior transverse ridge dorsally provided with row of setae; lateral margin of pleuron with anterior tooth. Second pleomere with median transverse ridge; lateral margin of pleuron broadly rounded. Third pleomere with transverse carina only evident at pleuron, which is laterally broadly rounded. Fourth and fifth pleomere with posterior margin near base of pleura with deep broad blunt incision; pleura broadly triangular with blunt top, each with short median carina. Sixth pleomere pleuron triangular, anterior margin rounded, posterior margin slightly concave. Thoracic sternites unarmed broadening from front to back.

Telson (Figs. 1B, 5C) slightly longer than uropods, truncately triangular. Dorsal surface with 2 longitudinal ridges, ending considerable distance before posterior margin, bearing 4 strong teeth and 2 long setae; 2 anterior spines present at base of telson. Lateral margin at each side provided with large median spine; posterior margin with 3 small spines; posterior half of telson fringed with plumose setae.

Eyes (Fig. 1B) well developed, cornea smaller, wider than peduncle. Facets, pigment distinct in cornea. Ophthalmic narrow, peduncle unarmed.

Basal segment of antennular peduncle (Figs. 1C, D) with short straight stylocerite. Middle, distal segments with some spinules. Both flagella short, provided with numerous plumose setae; upper flagellum with 18 aesthetascs, 2 on articles 3–11.

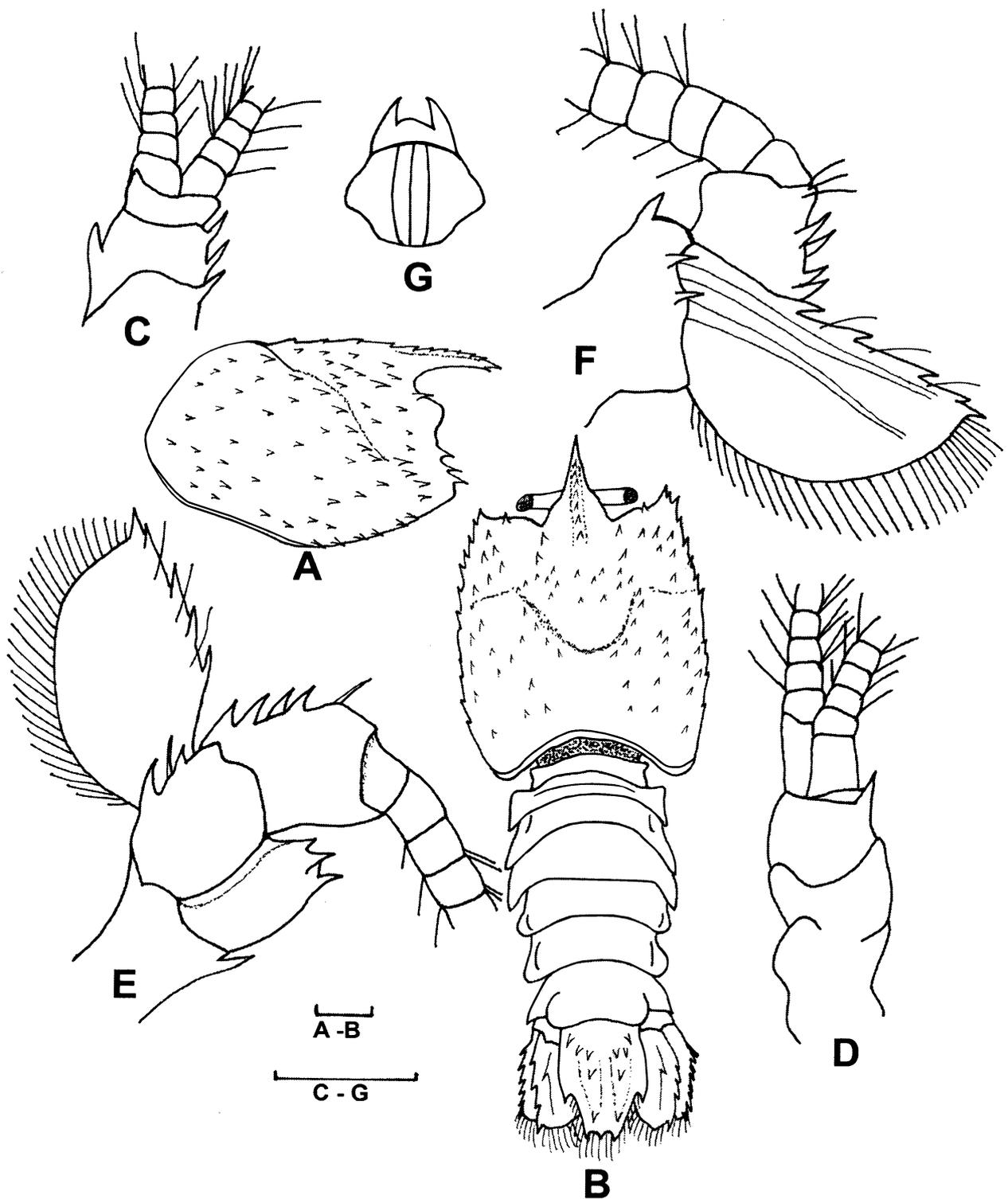
Antenna (Figs. 1E, F) with strong basal segment, outer margin ending in acute spine. Other segments of antennal peduncle with some spines. Scaphocerite reaching slightly beyond tip of rostrum, broad at base, tapering towards tip, outer margin straight, bearing 5 teeth, 3 plumose setae. Inner margin strongly convex, fringed with plumose setae. Dorsal surface with 2 distinct longitudinal carinae, ventral surface glabrous. Antennal flagellum well developed, extending slightly beyond abdominal somites, covered with numerous short plumose setae.

Epistome (Fig. 1G) triangular anteriorly with 2 stout submedian spines. Labrum normally developed. Paragnath bilobed with lobes separated by median fissure.

Mandible (Fig. 2A) robust with short, fused molar and incisor processes. Molar surface without teeth; incisor thickened with 7 small median teeth. Palp well developed, 3-segmented. Proximal segment with 3 small lateral plumose setae; middle segment with 5 small lateral plumose setae; distal segment broad, fringed with plumose setae.

Maxillule (Fig. 2B) with slender undivided endopodite bearing 5 lateral, 5 distal plumose setae. Proximal endite moderately broad, truncate distally with 3 plumose setae laterally, 5 compound spinose setae, 14 simple setae distally. Distal endite slightly broader, rounded distally bearing numerous simple setae.

Maxilla (Fig. 2C) with setose coxal and basal endites. Endopodite long, slender, not exceeding anterior margin of scaphognathite, 21 long plumose setae laterally and distally. Scaphognathite long, narrow, fringed with numerous plumose setae.

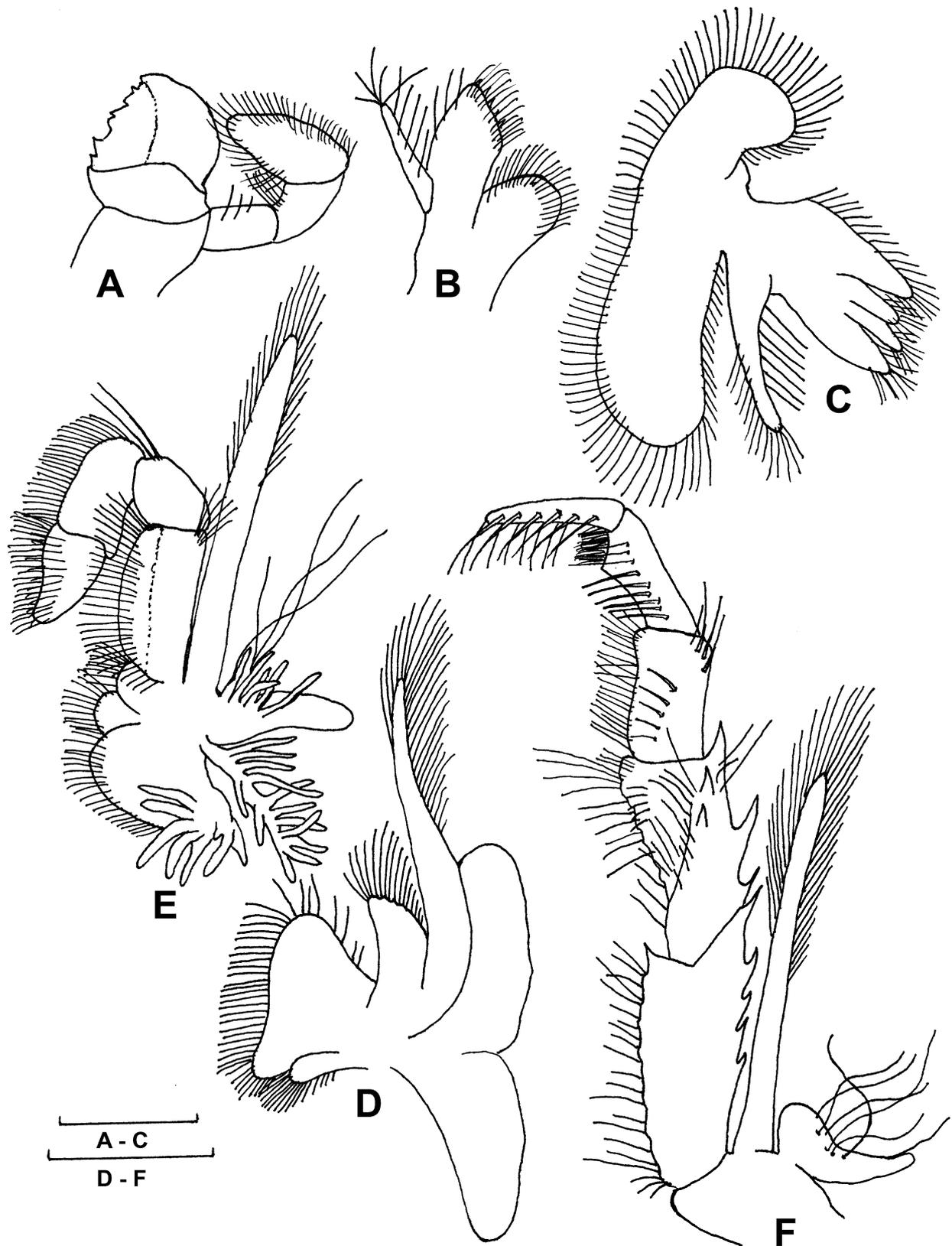


**FIGURE 1.** *Microprosthemella semilaeve* female lectotype, ZBM 3006: A, carapace, lateral view; B, dorsal view; C, antennule, dorsal view; D, antennule, ventral view; E, antenna and scaphocerite, ventral view; F, antenna and scaphocerite, dorsal view; G, epistome and labrum, ventral view. Scale bars = 1.0 mm.

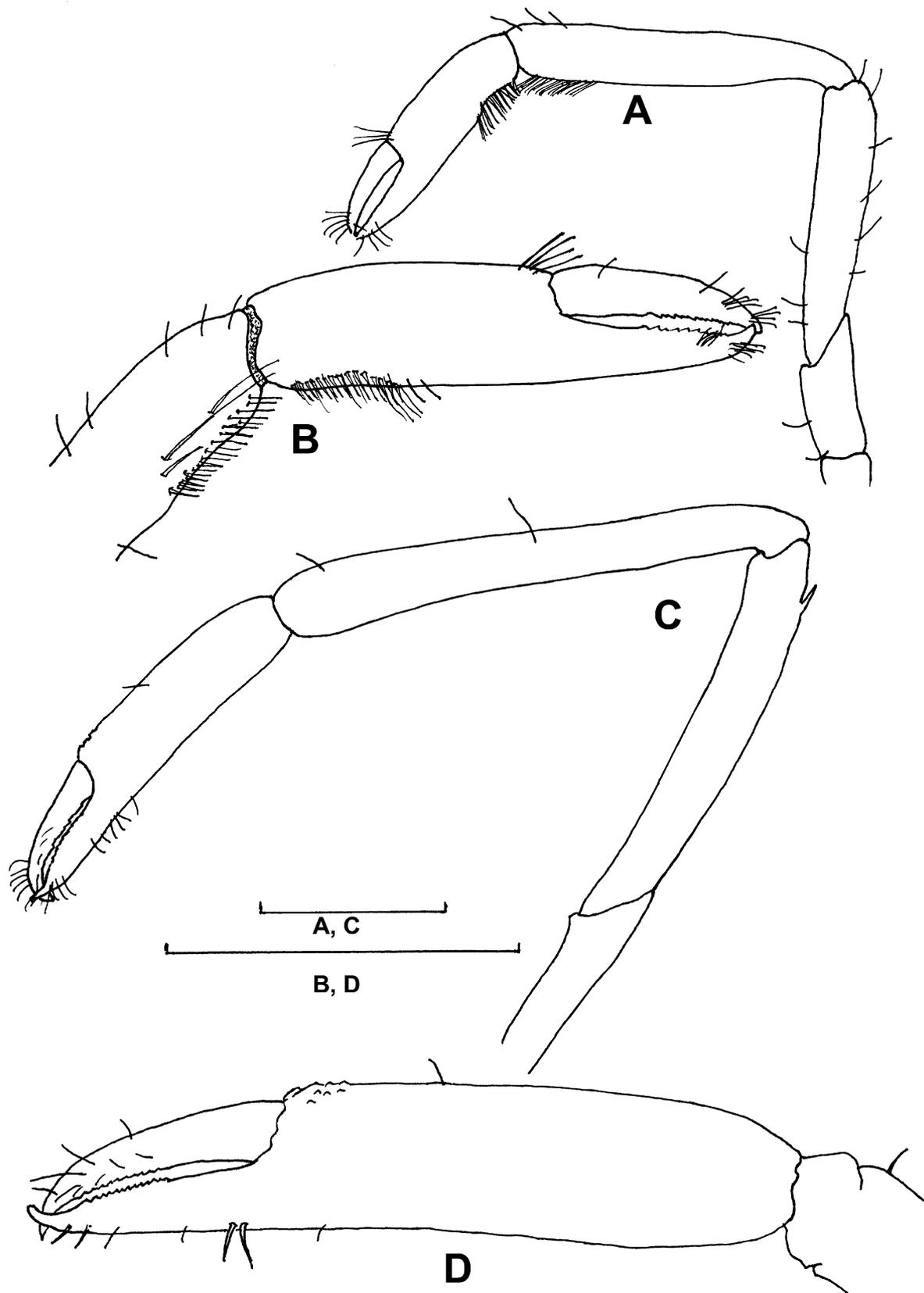
First maxilliped (Fig. 2D) with unsegmented endopodite bearing 16 plumose setae. Basipodite large, rounded anteriorly with slight concave outer border bearing dense fringe of plumose setae; coxopodite short, unilobed with numerous plumose setae. Exopodite well developed with numerous distal and lateral plumose setae.

Second maxilliped (Fig. 2E) with 4-segmented endopodite. Dactylus suboval with dense fringe of setae along distodorsal margin. Propodus slightly longer than dactylus, densely setose on dorsal margin. Carpus short, about half length of propodus, with 2 long simple setae at distodorsal angle. Merus 2 times length of dactylus, with

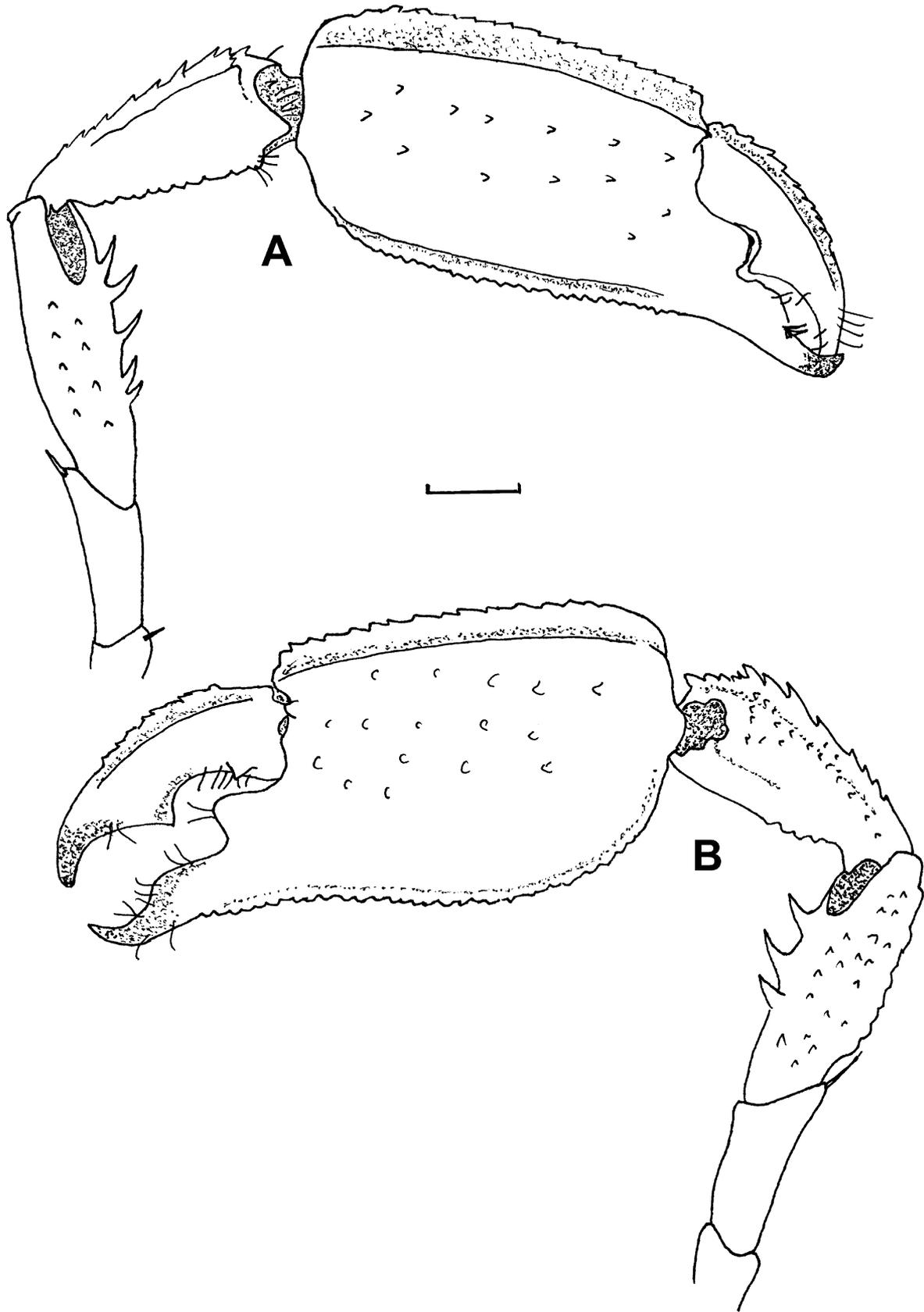
straight inner border bearing 6 long simple setae distally; outer border convex with numerous long simple setae. Ischium and basis short setose lobes; coxa larger, rounded with dense fringe of setae. Exopodite long, slender, undivided with distal half bearing 24 long plumose setae. Basipodite with 4 long, simple setae.



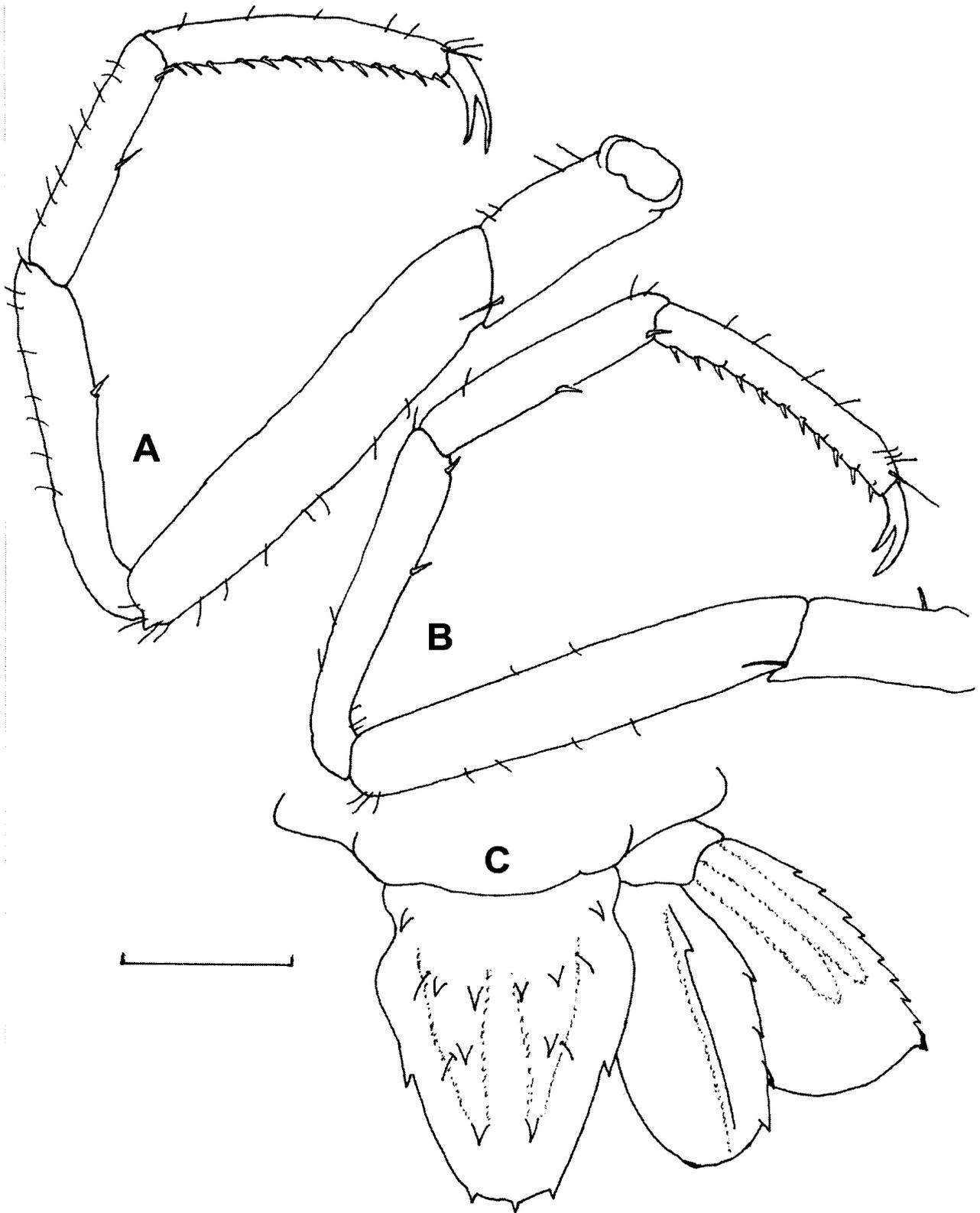
**FIGURE 2.** *Microsprosthema semilaeve* female lectotype, ZMB 3006: A, mandible, dorsal view; B, maxillule; C, maxilla; D, first maxilliped; E, second maxilliped; F, third maxilliped. Scale bars = 1.0 mm.



**FIGURE 3.** *Microprosthemella semilaeve* female lectotype, ZMB 3006: A, first pereiopod; B, first pereiopod carpus, propodus and dactylus; C, second pereiopod; D, second pereiopod propodus and dactylus. Scale bars = 1.0 mm.



**FIGURE 4.** *Microprosthema semilaeve* female lectotype, ZMB 3006: A, right third pereiopod; B, left third pereiopod. Scale bar = 1.0 mm.



**FIGURE 5.** *Microprosthemella semilaeve* female lectotype, ZMB 3006: A, fourth pereiopod; B, fifth pereiopod; C, telson and uropods. Scale bar = 1.0 mm.

Third maxilliped (Fig. 2F) endopodite strongly developed, 5-segmented. Dactylus slender with fringe of simple setae. Propodus slightly longer than dactylus, with numerous simple setae, setiferous organ distally on inner margin.

Carpus equal to dactylar length, with numerous simple setae. Merus about 2 times longer than carpus, robust, with 3 sharp spines on outer margin, 2 dorsomesial spines distally, numerous simple setae dorsomesially and on margins. Ischium robust, slightly longer than merus, with 5 spines on outer margin; distal spine, numerous simple setae on inner margin. Basis and coxa fused, unarmed. Exopodite long, slender, reaching middle of merus, with distal half fringed with numerous long, plumose setae. Epipod proximally rounded, tapering distally, with 7 long simple setae on outer margin.

First pereopod (Figs. 3A, B) small, slender, reaching past scaphocerite, all segments without spines. Fingers slightly compressed, with hooked tips, cutting edge indistinct with tiny series of small teeth. Fingers with small tufts of short setae; distodorsal extremity of palm with 4 long simple setae. Distoverventral part of carpus and proximoventral part of propodus provided with poorly developed setiferous organ. Carpus longest segment about 2 times propodal length, merus slightly shorter than carpus, ischium half of meral length; all these segments bear few short simple setae. Basis and coxa short, unarmed.

Second pereopod (Figs. 3C, D) similarly built as first, including setation, but longer. No setiferous organ present. Fingers slightly compressed, with hooked tips, small tufts of short setae, cutting edge indistinct with series of small teeth. Anterodorsal part of merus with 1 spine; distodorsal end of propodus with series of small, blunt tubercles; other segments glabrous. Carpus and merus of equal length, about twice propodal length.

Third pereopod (Fig. 4A, B) robust, largest, strongest of pereopods, reaching with entire carpus beyond scaphocerite. Fingers with sharp hooked crossing tips. Dactylus with dorsal crista and finely serrated edge; cutting edge with large triangular tooth midway, large spine proximally. Cutting edge of propodus with large, rounded tooth; palm of chela longest segment with distinct dorsal crista, serrate dorsal and ventral margins, scattered blunt spinules on rest of surface. Carpus half propodal length with dorsal carina, 10–12 spines on dorsal margin, serrate ventral margin, few scattered blunt spinules on surface. Merus equal carpal length with 3–5 strong ventral spines and scattered blunt spinules on rest of surface. Ischium 0.8 meral length without spinules, single long simple seta at distodorsal extremity.

Fourth and fifth pereopods (Figs. 5 A, B) long, slender, propodus undivided, carpus 2-segmented. Dactyli biunguiculate with unguis long, slightly curved, not separated from dactylar corpus. Propodi with ventral row of 11–13 movable spines, dorsally with few short setae. Carpi longest segment, 3 or 4 ventral movable spines, dorsally with few short setae. Meri slightly shorter than carpi with few short setae. Ischia short with proximal short ventral seta; bases, coxae short, unarmed.

First pleopod uniramous, others biramous, all lacking appendices. First pleopod smallest, with exopodite about twice length of basipodite, margins with dense fringe of plumose setae. Rami of other pleopods 1.5 times length of basipodite, margins of rami fringed with plumose setae.

Uropods (Figs. 1B, 5C) well developed, almost reaching tip of telson. Exopodite with outer margin slightly rounded, bearing 6–9 teeth; inner margin semicircular fringed with plumose setae; dorsal surface with 2 distinct longitudinal ridges without spinules. Endopodite subovate, outer margin with 4 teeth; inner margin fringed with plumose setae; dorsal surface with distinct median longitudinal ridge bearing strong spine.

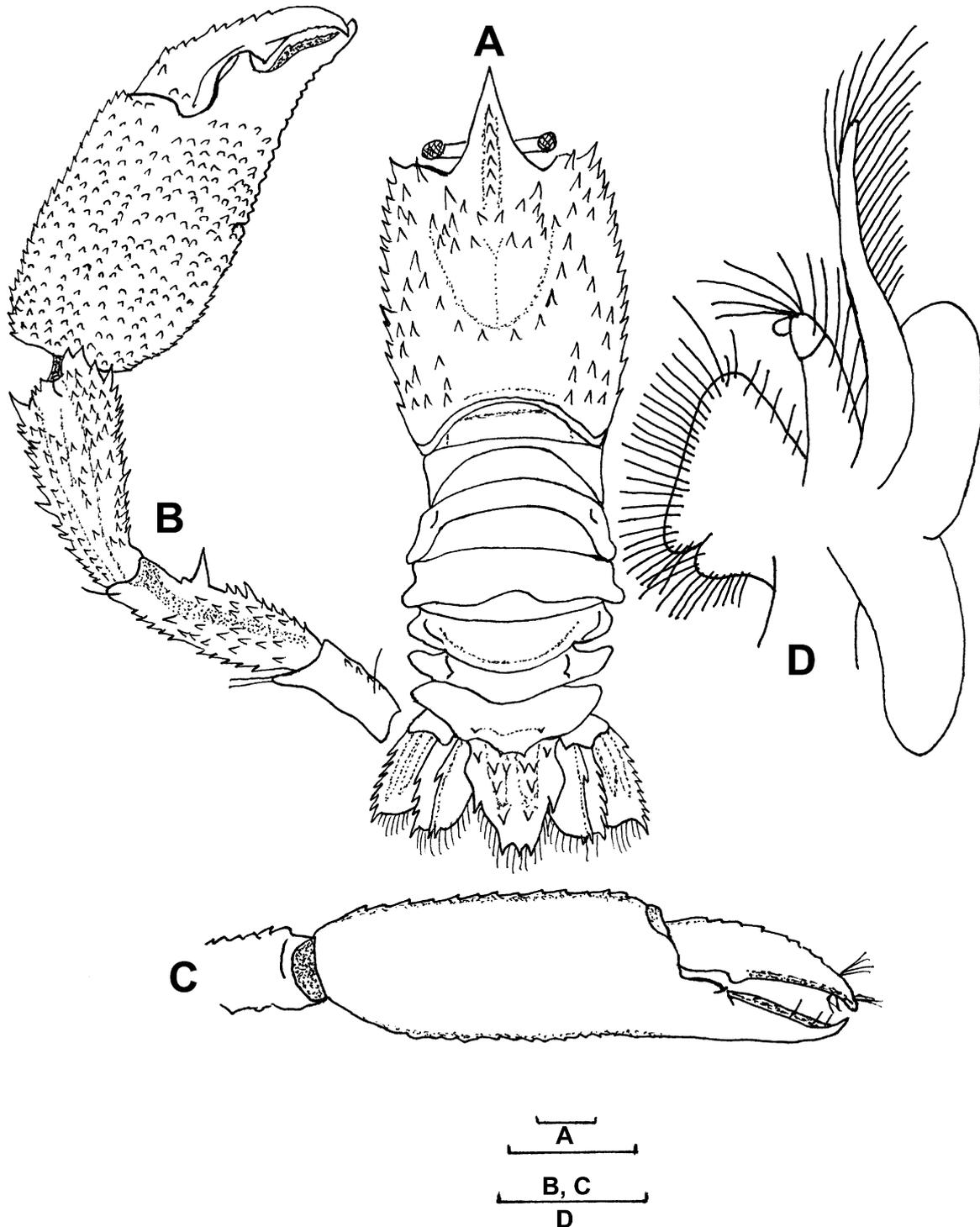
Branchial formula:

	Maxillipeds	Pereopods
	I II III	I II III IV V
Pleurobranchs	-- 1	1 1 1 1 1
Arthrobranchs	1 1 2	2 2 2 2 _
Podobbranchs	_ 1 _	-- -- -- --
Epipods	1 1 1	1 1 1 1 _
Exopods	1 1 1	-- -- -- --

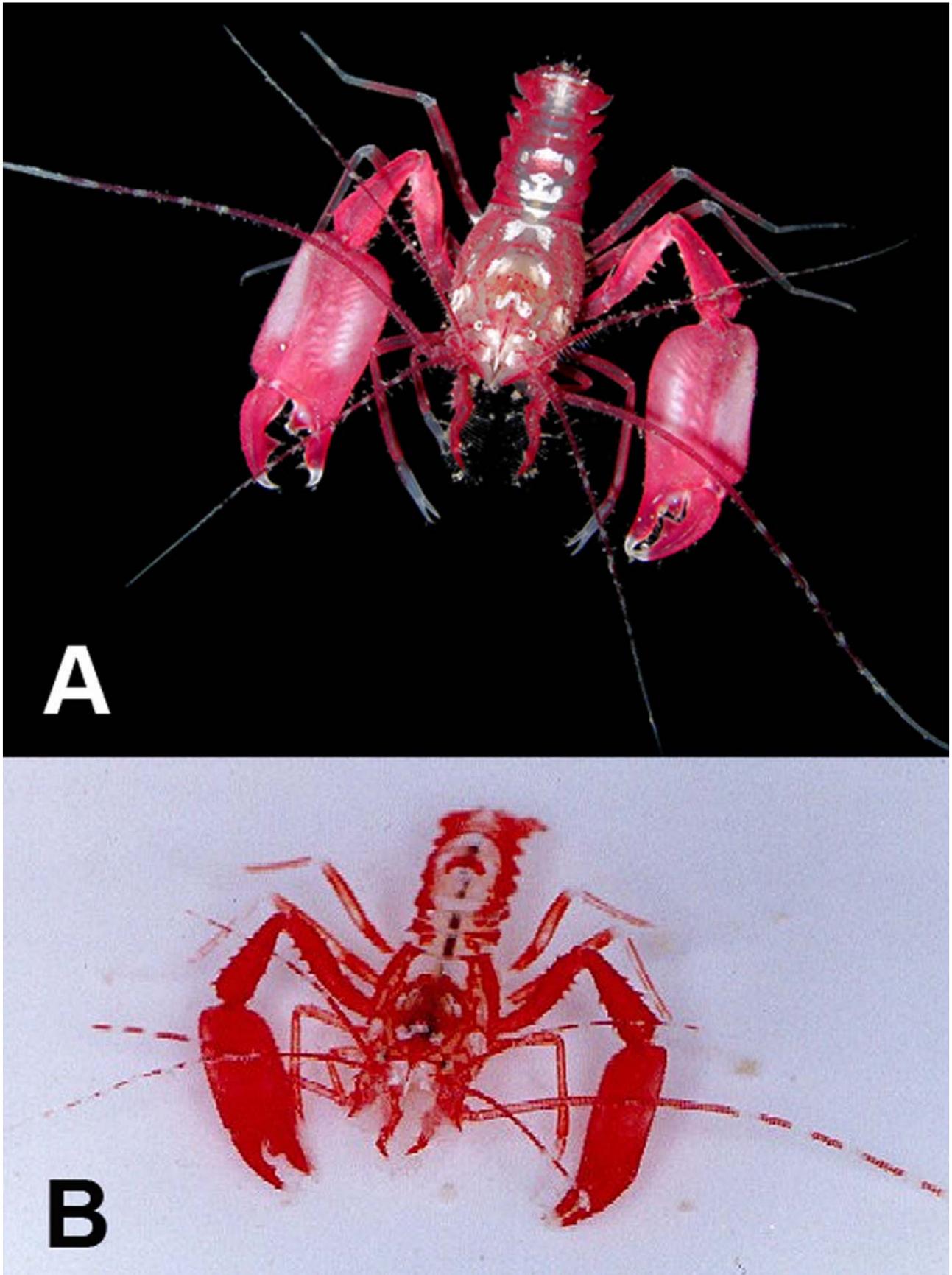
**Variations.** The species shows considerable variation in the number of body and appendage spines. Male specimens have the abdominal pleura more acute than the rounded ones of females; there is a ventral median spine on each male abdominal somite; male thoracic sternites 4–6 bear 2 submedian blunt spines; and males have 1 or 2 small distodorsal spines on the sixth abdominal somite (Fig. 6A). Spinination of the 3<sup>rd</sup> pereopod (Figs. 6B, C) shows much variation; that of the allotype (Fig. 6C) may be due to regeneration of a lost appendage. The endopodite of the 1<sup>st</sup> maxilliped (Fig. 6D) is 3-segmented in most of the specimens examined. Further variation is as follows: 4–11

rostral dorsal spines; 2 or 3 dorsomedial spinules on ophthalmic peduncle; 4–6 spines on outer margin of scaphocerite; 4–6 ischial outer margin spines on 3<sup>rd</sup> maxilliped; 2 or 3 meral outer margin spines on 3<sup>rd</sup> maxilliped; 1 or 2 anterodorsal meral spines on 2<sup>nd</sup> pereopod; 11–20 propodal movable ventral spines on 4<sup>th</sup> and 5<sup>th</sup> pereopods; 3 or 4 carpal movable spines on 4<sup>th</sup> and 5<sup>th</sup> pereopods; 7–16 teeth on outer margin of uropodal exopodite; and 3–6 teeth on outer margin of uropodal endopodite.

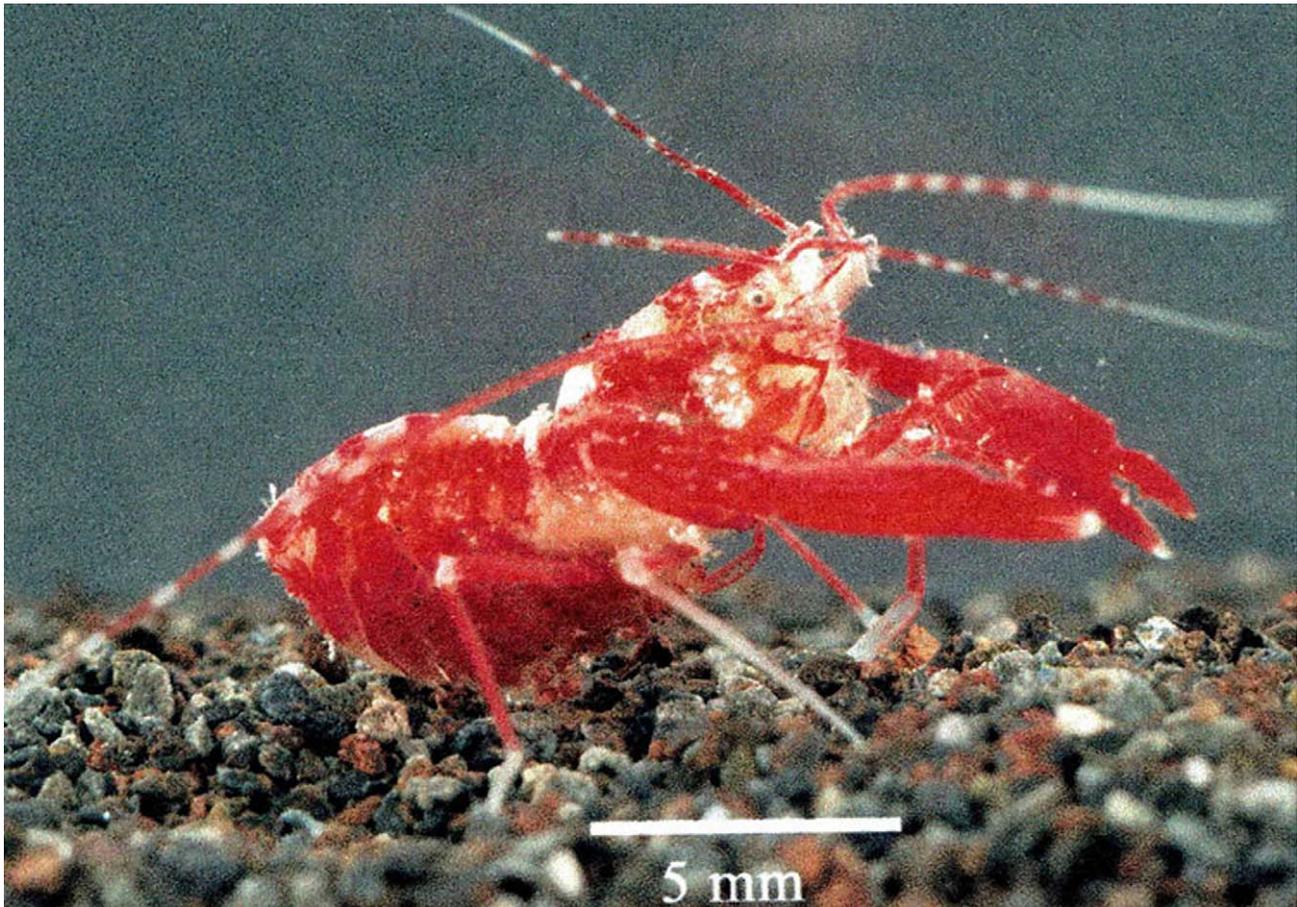
**Measurements.** (mm) Postorbital carapace length: females 1.9–5.9, males 1.0–6.0; carapace and rostrum length: females 3.4–8.1, males 2.3–7.0; total body length: females 7.2–20.9, males 5.1–17.7.



**FIGURE 6.** *Microprosthema semilaeve* male, ULLZ 9778: A, dorsal view; B, left third pereopod; C, male paralectotype ZMB 3006: left third pereopod; D, female, USNM 155675: first maxilliped. Scale bars = 1.0 mm.



**FIGURE 7.** *Microprosthema semilaeve*: A, male, Bocas del Toro, Panama, photo by Arthur Anker; B, male, Big Pine Key, Florida, photo by J.W. Goy.



**FIGURE 8.** *Microprosthema semilaeve*: female, Guana Island, British Virgin Islands, photo by J. W. Martin.

**Color pattern.** The color pattern of *Microprosthema semilaeve* is very consistent over its zoogeographic range (Figs. 7, 8). Manning (1961) gave a thorough description of this pattern from a specimen (UMML 32-1787) collected from Long Reef, Florida, which is not repeated here. In general, the body coloration is a deep red with white patches dorsally on the carapace and abdomen. The third maxillipeds are red and all the pereopods are red with white at the joints and tips of the dactyli. Zeiller (1974) presented a color photo of this species taken in association of the rough fileclam, *Lima scabra*, off southern Florida. The shrimp's coloration blended in very well with the scallop's red tentacles. Manning (1961) stated that this striking color pattern camouflages the shrimp quite well where it blends in completely with coral rocks encrusted with red foraminifera and coralline algae.

**Development.** Ovigerous females ranged in size from 3.0–4.1 mm postorbital carapace length, 9.3–20.9 mm total body length, and carried 67–565 eggs. Eggs at blastula with undifferentiated yolk cells were  $0.38 \times 0.41$  mm in size, while eggs with embryos having pigmented eyes and well developed appendages were  $0.43 \times 0.73$  mm in size. The prezoal and first zoal stages were described by Martin & Goy (2004).

**Distribution.** The type material for *Microprosthema semilaeve* was described by E. von Martens (1872) based on material in the Berlin Museum obtained from Mr. Wessel in Hamburg and collected in the West Indies. Von Martens did not design a holotype, so the female is herein designated the lectotype and the male a paralectotype. The species is known from numerous locations in the Caribbean and Gulf of Mexico (Fig. 9). Its range extends from Bermuda, along the east coast of Florida, through the Caribbean, Gulf of Mexico to the northeast coast of Brazil (Fernando de Noronha, Pernambuco, and Bahia).

**Habitat.** This species has been collected in coral rubble or under rocks down to depths less than 10 m, which is consistent for other members of the genus (Holthuis 1946). Specimens have also been taken in tide pools, on sand flats and in empty conch shells. One male specimen was collected in association with pink-tipped sea anemone, *Bartholomea annulata* and the species has been collected or observed numerous times amongst the red tentacles of the rough fileclam, *Lima scabra*, justifying its common name “crimson lima shrimp” (McLaughlin *et al.* 2005).

**Remarks.** *Microprosthema semilaeve* closely follows the definition of the genus *Microprosthema* Stimpson given by Holthuis (1946). It is most closely related to the eastern Pacific geminate species *M. emmiltum* Goy 1987, but differs in color, abdomen, uropods, and spination of the pereopods. Among the other species in the genus, *M. semilaeve* is similar to the Indo-West Pacific *M. validum*, with which it has been confused with in the past (Mahadevan *et al.* 1962).

*Microprosthema validum* differs markedly in coloration from *M. semilaeve*, has median longitudinal carinae on the 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> abdominal tergites, the scaphocerite is relatively narrow with 2 or 3 strong obtuse teeth on the outer margin, the 2<sup>nd</sup> pereopods bear 2–6 dorsal meral spines, and the uropodal endopodites do not have any dorsal spines. Comparison of the larval development of *M. semilaeve* (see Lebour 1941; Raje & Ranade 1978; Martin & Goy 2004) and *M. validum* (see Ghory, Siddiqui & Kazmi 2005) show they represent three different species. Indian and Pakistani specimens of *Microprosthema* identified as *M. semilaeve* (see Mahadevan *et al.* 1962; Ranade 1973; Raje & Ranade 1978) or *M. validum* (see Pillai 1962; Tirmizi & Kazmi 1979) represent an undescribed species of *Microprosthema* (Saint Laurent & Cleva 1981; Felder *et al.* 1985; Goy 1987; Goy & Felder 1988; Martin & Goy 2004).

The degree of morphological variation seen in *Microprosthema semilaeve* and compared to the degree of variation reported for *M. manningi* Goy & Felder, 1988 leads us to conclude that *M. jareckii* Martin, 2002 needs to be considered a junior synonym of *M. manningi*. The holotype of *M. jareckii* is ~10.5 mm total length while the smallest paratypes of *M. manningi* are 12.5 mm (USNM 77866a) and 13.7 mm (USNM 77865) total length. The body spination of these two paratypes of *M. manningi* is very similar to that of the holotype of *M. jareckii* and the morphology of the mouthparts of both species is essentially the same. The differences seen in *M. jareckii* are probably due to its smaller size.

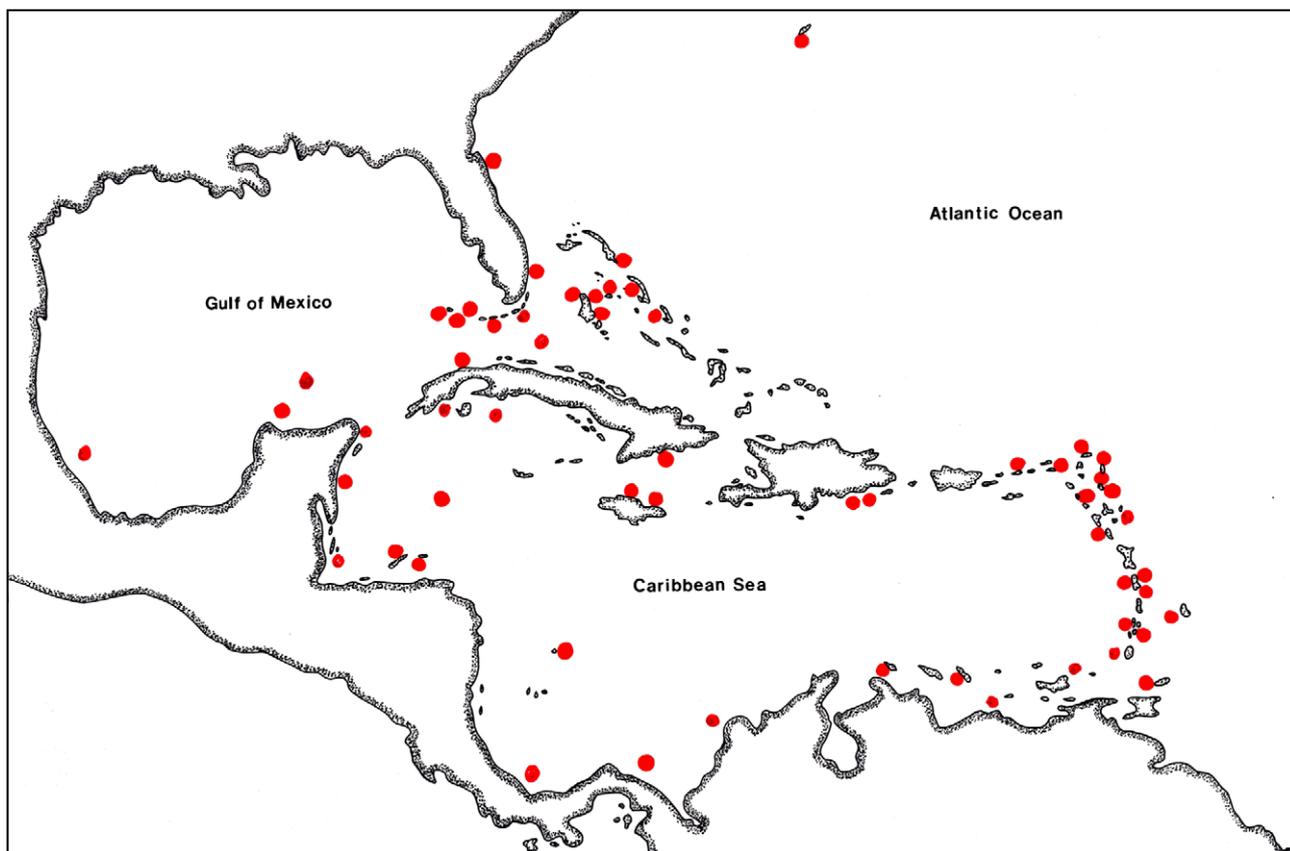


FIGURE 9. Caribbean and Gulf of Mexico distribution of *Microprosthema semilaeve*.

***Microprosthemella tortugasensis* sp. nov.**

(Figs. 10–12)

**Material examined.** female holotype, USNM 1153608, cl 5.6, male allotype, USNM 1153609, cl 3.4, south of Loggerhead Key, Dry Tortugas, depth 91.4 m, 7 August 1939.

**Diagnosis.** Moderately small spongicolid shrimp, with subcylindrical, depressed body, with few spinous processes; carapace covered with few small spines and long setae, cervical groove distinct; propodus of third pereopod with distinct dorsal crista, numerous spinules along dorsal margin; dorsal surface of abdominal somites glabrous third abdominal somite with distodorsal longitudinal median carina; all pereopods with numerous long setae; dactyli of fourth and fifth pereopods triunguiculate; scaphocerite lobate with 5 strong teeth on outer margin; uropodal endopodite with median longitudinal ridge ending in distal tooth.

**Description.** (holotype, female USNM 1153608). Rostrum (Figs. 10A, B) short, straight, reaching end of last segment of antennular peduncle. Dorsally with long setae; dorsal margin with 4 spines, ventrally small spine, laterally without spines.

Carapace (Fig. 10A, B) with few anteriorly directed spinules, dorsally with numerous long setae. Cervical groove distinct with 11 spinules around its border.

Large antennal spine, superior and inferior orbital spines, branchiostegal, and hepatic spines present; 4 small pterygostomial spines present. Ventrolateral carapacial angle rounded with row of 5 spinules.

Abdomen (Fig. 10B) broad, depressed, dorsally glabrous. First pleomere with anterior transverse ridge dorsally provided with row of setae, pleuron rounded. Second pleomere with median transverse ridge, pleuron broadly rounded. Third pleomere with distodorsal longitudinal carina, pleuron broadly rounded. Last 3 abdominal pleomeres ending with rounded overlapping pleura.

Telson (Fig. 10B) slightly longer than uropods, triangular. Dorsal surface with 2 longitudinal ridges, ending considerable distance before posterior margin, bearing 3 strong teeth; 2 small anterior spines present at telson base, large spine present anteriorly between longitudinal ridges. Lateral margin at each side provided with large median spine; posterior margin with 3 small spines; posterior half of telson fringed with plumose setae.

Eyes (Fig. 10A, B) well developed, cornea smaller than peduncle; facets, pigments distinct in cornea. Ophthalmic peduncle broad, with 3 dorsomesial spinules.

Basal segment of antennular peduncle (Fig. 10C) with short, straight stylocerite; ventrally distal spine, small rounded laminate process proximally.

Both flagella short, provided with numerous plumose setae; upper flagellum with 16 aesthetascs, 2 on articles 5–12.

Antennal peduncle (Fig. 10D) 2-segmented, basal segment strong, outer margin with 4 setae, inner margin with distinct rounded laminate process; distal segment with outer margin bearing 3 spines. Scaphocerite reaching far past tip of rostrum, lobate, narrow at base, outer margin slightly concave with 5 strong teeth; inner margin strongly convex, fringed with long plumose setae. Dorsal surface with straight longitudinal carina reaching about half its length. Antennal flagellum well developed, extending slightly beyond telson, covered with numerous long short plumose setae.

Epistome (Fig. 10E) straight anteriorly with 4 submedian spines separating median process with small knob. Labrum normally developed. Paragnath bilobed with spinose lobes separated by median fissure. Thoracic sternites broadening from front to back with 2 submedian blunt spinules on segments 4–6, none on segments 7–8.

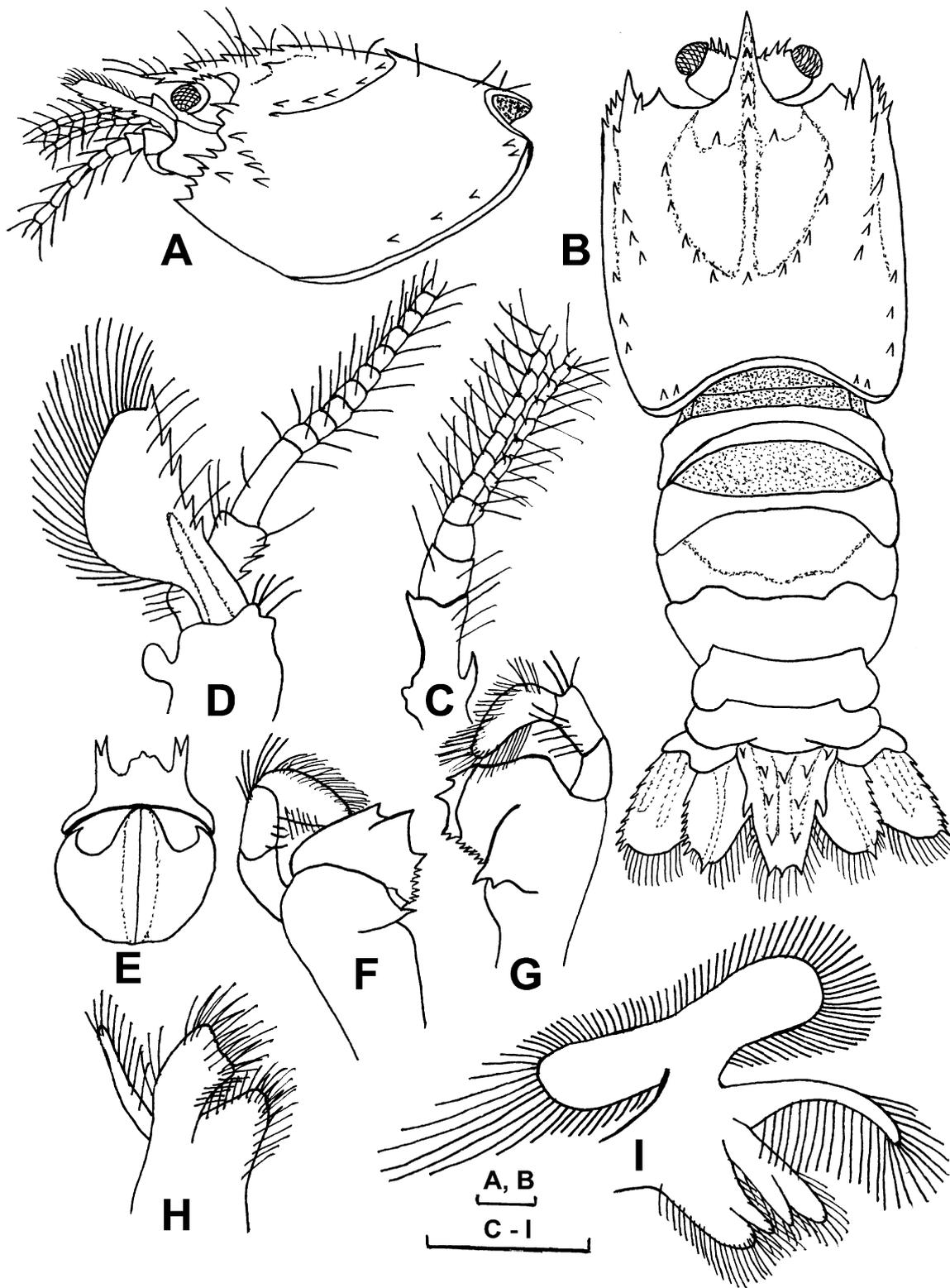
Mandible (Figs. 10F, G) robust with short, fused molar and incisor processes. Molar surface with 2 small teeth; incisor thickened with 3 large, 6 small submedian teeth. Palp well developed, 3-segmented; proximal segment naked, middle and distal segments covered with plumose setae.

Maxillule (Fig. 10H) with slender undivided endopodite bearing plumose setae. Proximal endite moderately broad, distally truncate with 3 plumose setae laterally, 8 compound plumose setae, 13 simple setae distally. Distal endite slightly broader, rounded with 4 compound plumose setae, numerous simple setae distally.

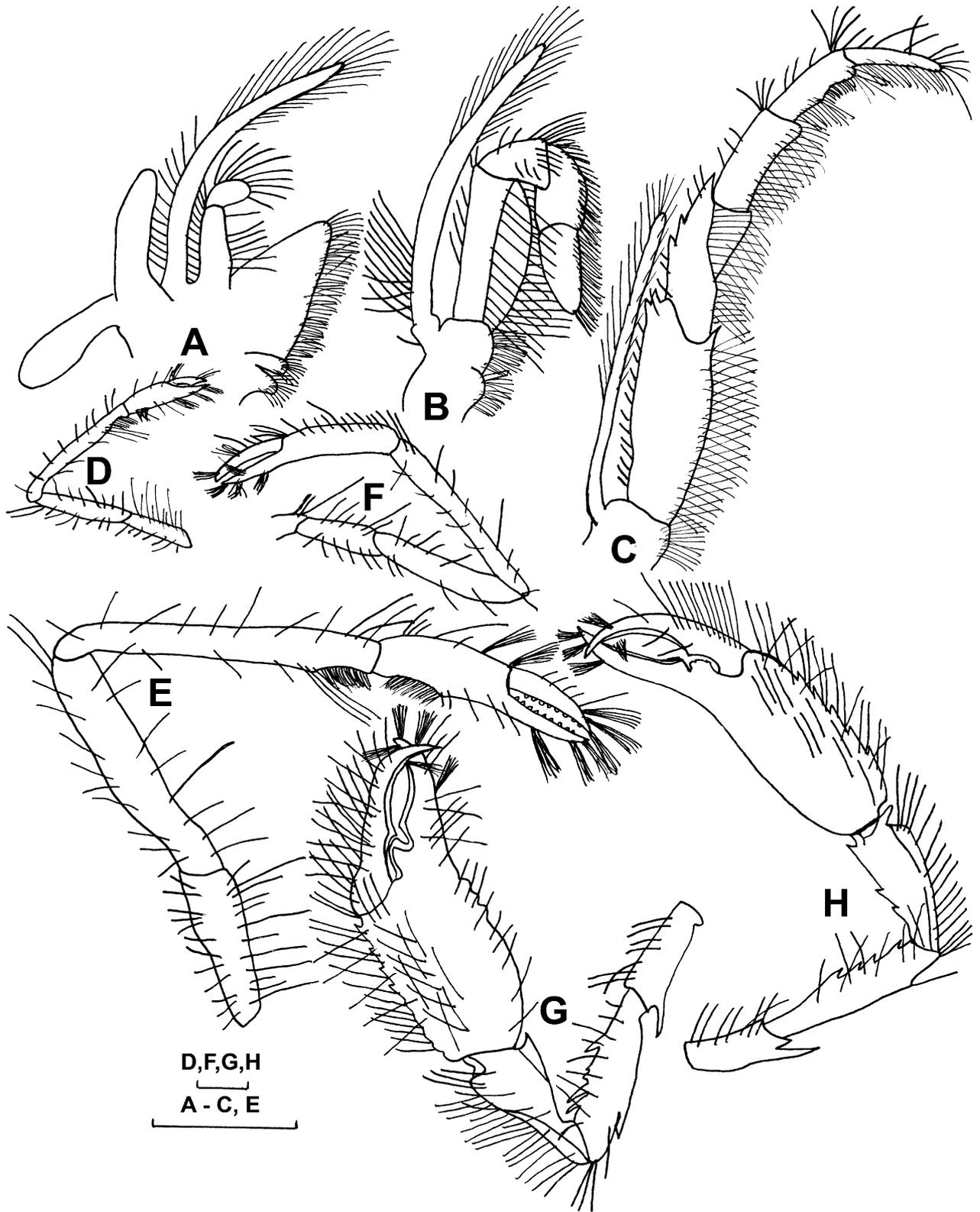
Maxilla (Fig. 10I) with setose coxal and basal endites. Endopodite long, slender with 26 long plumose setae laterally and distally. Scaphognathite long, narrow, fringed with numerous plumose setae.

First maxilliped (Fig. 11A) with 2-segmented endopodite; proximal segment long with 13 long plumose setae laterally, 7 shorter plumose setae on inner margin. Distal segment ovate with 9 long plumose setae. Basipodite large, rounded anteriorly, with straight outer border bearing dense fringe of plumose setae; coxopodite, bilobed,

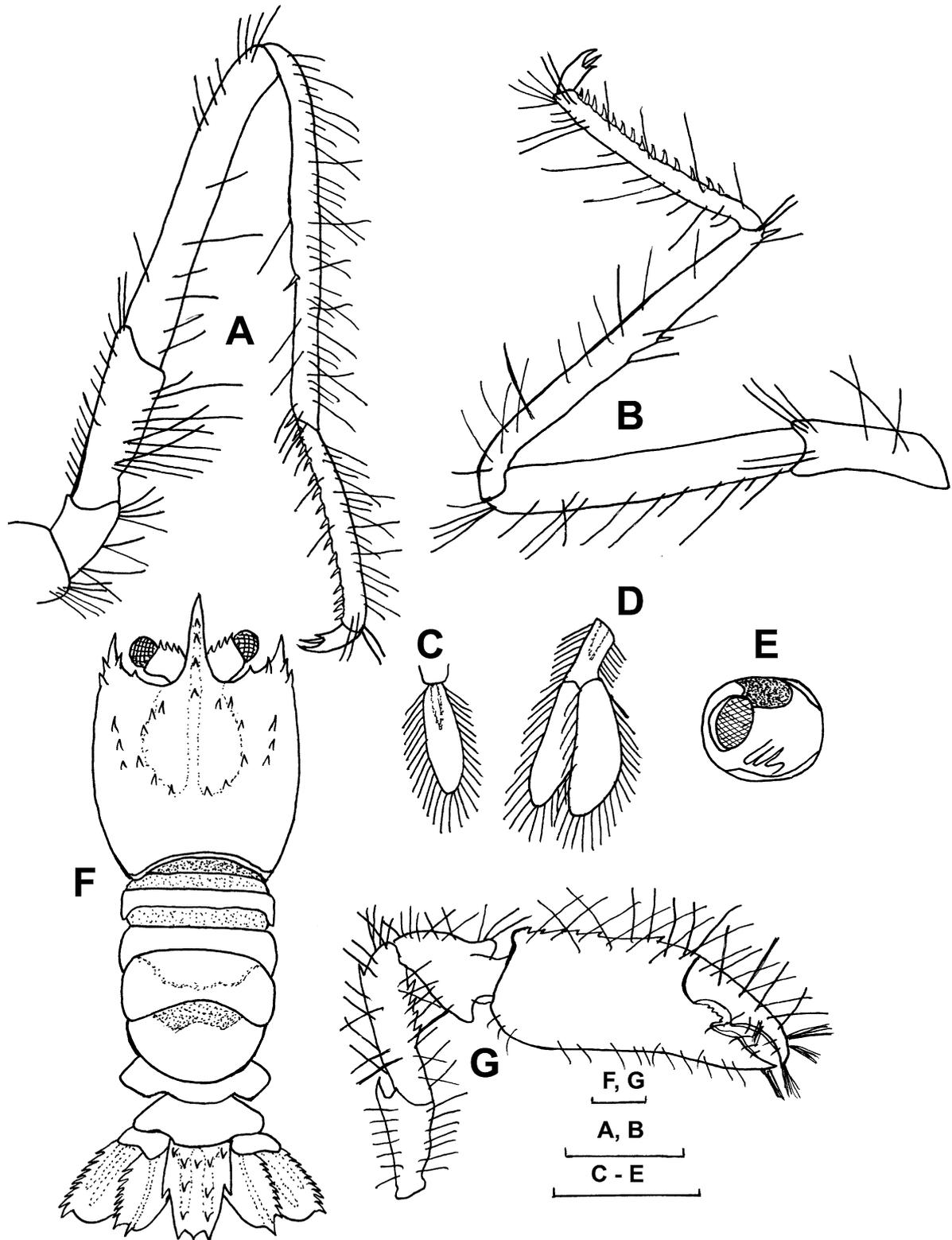
with each lobe bearing numerous plumose setae. Exopodite well developed, bearing 24 long plumose setae distally. Large epipod with slender pxoximal and distal lobes.



**FIGURE 10.** *Microprosthema tortugasensis* n. sp., female holotype, USNM 1153608: A, carapace, lateral view; B, dorsal view; C, antennule, dorsal view; D, antenna, dorsal view; E, epistome and labrum, ventral view; F, mandible, dorsal view; G, mandible, ventral view; H, maxillule; I, Maxilla. Scale bars = 1.0 mm.



**FIGURE 11.** *Microprosthemella tortugasensis* n. sp., female holotype, USNM 1153608: A, first maxilliped; B, second maxilliped; C, third maxilliped; D, first pereiopod; E, first pereiopod enlarged; F, second pereiopod; G, left third pereiopod; H, right third pereiopod. Scale bars = 1.0 mm.



**FIGURE 12.** *Microprosthema tortugasensis* n. sp., female holotype, USNM 1153608: A, fourth pereiopod; B, fifth pereiopod; C, first pleopod; D, second pleopod; E, embryonated egg; male allotype, USNM 1153609: F, dorsal view; G, left third pereiopod. Scale bars = 1.0 mm.

Second maxilliped (Fig. 11B) with 4-segmented endopodite. Dactylus suboval with dense fringe of setae along distodorsal margin. Propodus same length as dactylus, densely setose on dorsal margin. Carpus short with 9 simple setae distodorsally, few simple setae mesially. Merus twice dactylar length, with straight inner border bearing 6

simple setae; outer border convex with numerous long simple setae. Ischium and basis fused into setose lobe; coxa lobate with dense fringe of setae. Exopodite long, slender, undivided with distal third bearing 21 plumose setae, 12 long simple proximal setae.

Third maxilliped (Fig. 11C) endopodite strongly developed, 5-segmented. Dactylus slender with dense fringe of setae. Propodus slightly longer than dactylus, with numerous simple setae, setiferous organ distally on inner margin. Carpus equal to dactylar length, with numerous simple setae. Merus 1.5 carpal length, strong, with 3 spines, few simple setae on outer margin; inner margin with numerous simple setae. Ischium robust, almost twice meral length, with 2 small spines at distodorsal margin, numerous short simple setae along outer margin length; inner margin fringed with numerous long simple setae. Coxa short with dense fringe of setae. Exopodite long, slender, extending to middle of merus, with distal half bearing long plumose setae.

First pereopod (Figs. 11D, E) small, slender, reaching past scaphocerite, all segments without spines. Fingers slightly compressed, with hooked tips, cutting edges provided with 8 or 9 peg-like teeth. Fingers and distodorsal extremity of palm bearing small tufts of long setae. Distoventral part of carpus and proximoventral part of propodus with well developed setiferous organ, 3 long setae extending over carpal part of organ. Carpus longest segment, about twice propodal length, merus slightly shorter than carpus, ischium about half meral length. All segments bear numerous long simple setae.

Second pereopod (Fig. 11F) similarly built as first, including setation and lack of spines, but longer. No setiferous organ present. Carpus longest segment, about 1.5 times longer than propodus, merus slightly longer than propodus, ischium about 0.7 propodal length.

Third pereopod (Figs. 11G, H) robust, largest, strongest, reaching with entire carpus beyond scaphocerite, covered with numerous long simple setae. Palm of chela longest segment with dorsal crista bearing 4 or 5 small spines. Fingers elongate, with sharp, crossing tips, distally bearing small tufts of long setae. Dactylar cutting edge with distal chitinous ridge followed by large triangular tooth. Cutting edge of propodus with distal chitinous ridge with indentation to receive dactylar triangular tooth followed by elevated ridge bearing 5–8 tiny teeth. Carpus less than half propodal length, narrowing proximally, distodorsal margin with rounded tubercle; ventral margin with 1–3 spines. Merus slightly longer than carpus, dorsal margin with distal spine; ventral margin with 4 spines. Ischium half meral length with large spine at distodorsal margin. Basis and coxa short with no spines but few long simple setae.

Fourth and fifth pereopods (Figs. 12A, B) long, slender, propodus and carpus undivided. Dactyli trianguiculate with dorsal and ventral equal, accessory tooth on ventral margin half length of ventral unguis. Propodi with ventral row of 14 or 15 movable spines. Carpus longest segment, with 2 ventral movable spines. Merus almost as long as carpus; ischium, basis, and coxa short.

First pleopod (Fig. 12C) uniramous, second (Fig. 12D) to fifth biramous, all lacking appendices. First pleopod smallest, with exopodite about twice length of basipodite, dorsal surface of exopodite with longitudinal ridge, margin with dense fringe of plumose setae. Rami of second pleopod more than twice length of basipodite; basipodite with dorsal longitudinal ridge, margins of basipodite, rami fringed with plumose setae. Third to fifth pleopods generally similar, third largest of all pleopods, decreasing in size posteriorly.

Uropods (Fig. 10B) well developed, almost reaching end of telson. Exopodite with straight outer margin bearing 8 or 9 teeth; inner margin semicircular fringed with plumose setae; dorsal surface with 2 distinct longitudinal ridges without spinules. Endopodite subovate, outer margin with 6 or 7 teeth; inner margin fringed with plumose setae; dorsal surface with distinct median longitudinal ridge ending with strong spine.

Branchial formula same as *M. semilaeve* given above.

**Allotype.** (male USNM 1153609, Fig. 12F). Smaller than holotype, carapace spination not as dense as holotype, only 2 pterygostomial spines; abdominal pleura more acute, ventral median spine on each male abdominal pleomere; telson oblong; thoracic sternites 4–6 bear 3 submedian acute spines, 2 on sternites 7–8; rostrum with 3 dorsal spines; ophthalmic peduncle with 4 dorsal spinules; 3 spines on outer margin of 3<sup>rd</sup> maxilliped; 12–16 ventral movable spines on 4<sup>th</sup> and 5<sup>th</sup> pereopods; uropodal exopodite with 9 or 10 outer margin teeth, endopodite with 8 outer margin teeth.

**Measurements.** (mm) Postorbital carapace length: female 4.4, male 3.2; carapace and rostrum length: female 5.6, male 3.4; total body length: female 10.1, male 7.0.

**Development.** The female holotype was carrying 71 eggs (Fig. 12E) that were in a late stage of embryonic development measuring  $0.53 \times 0.73$  mm in size.

**Type locality.** Presently known only from south of Loggerhead Key, Dry Tortugas, Florida, U.S.A. at a depth of 91.4 m.

**Remarks.** *Microprosthema tortugasensis* closely follows the definition of the genus *Microprosthema* Stimpson given by Holthuis (1946). It is most closely related to the *M. inornatum* Manning & Chace 1990 but differs in the presence of transverse ridges in the 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> abdominal pleomeres, teeth on uropodal margins, and spination of the 3<sup>rd</sup> maxillipeds and pereopods. Among the other species in the genus *Microprosthema*, *M. tortugasensis* is similar to *M. granatense* Criales 1997 but differs by having stouter carapacial spines, less uropodal marginal teeth, and biunguiculate dactyli on the 4<sup>th</sup> and 5<sup>th</sup> pereopods. The triunguiculate 4<sup>th</sup> and 5<sup>th</sup> pereopod dactyli seen in *M. tortugasensis* is unique for the genus, but is present in some members of the spongicolid genera *Spongicola* and *Paraspongicola*. Most species of *Microprosthema* have been collected in shallow reefal habitats of less than 10 m. The type material of *M. tortugasensis* was collected at 91.4 m depth and the previous depth record for the genus was *M. validum* from 70 m depth (Holthuis 1946). However, a specimen of *M. inornatum* (ULLZ 7423) was recently collected at depths from 100–63 m from the northwest Gulf of Mexico, extending this species' range from Ascension Island in the South Atlantic Ocean.

### Key to the Western Atlantic species of *Microprosthema*

1. Propodus of 3rd pereopod without distinct dorsal crista, carpus of 4<sup>th</sup> and 5<sup>th</sup> pereopods without ventral movable spines . . . . . 2
- Propodus of third pereopod with distinct dorsal crista, carpus of 4<sup>th</sup> and 5<sup>th</sup> pereopods with 2–7 ventral movable spines . . . . . 3
2. Rostrum with 2 dorsal, 0 ventral teeth, lateral carina; mandibular palp 2-segmented . . . . . *M. looensis*
- Rostrum with 5 dorsal, 1 ventral teeth, no lateral carina; mandibular palp 3-segmented . . . . . *M. inornatum*
3. Carapace densely covered with numerous small spines, 2<sup>nd</sup> pereopod with 1–10 dorsal meral spines . . . . . 4
- Carapace covered with few small or large spines, 2<sup>nd</sup> pereopod with glabrous merus . . . . . 5
4. Dorsal surface of longitudinal carina of uropodal endopodite with strong spine; segments of mandibular palp glabrous . . . . .
- . . . . . *M. semilaeve*
- Dorsal surface of longitudinal carina of uropodal endopodite glabrous; middle segment of mandibular palp with 3 strong external spines . . . . . *M. manningi*
5. Dactyli of 4<sup>th</sup> and 5<sup>th</sup> pereopods biunguiculate, end of longitudinal carina of uropodal endopodite rounded . . . . . *M. granatense*
- Dactyli of 4<sup>th</sup> and 5<sup>th</sup> pereopods triunguiculate, longitudinal carina of uropodal endopodite ending in a strong spine . . . . .
- . . . . . *M. tortugasensis* **n. sp.**

### Acknowledgements

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