

Two New Species of Asterocheridae (Copepoda, Siphonostomatoida) from Korea

Il-Hoi Kim* and Jong-Geel Je¹

Department of Biology, College of Natural Sciences, Kangnung National University,
Kangnung 210-702, Korea;

¹Marine Biology Division, Korea Ocean Research and Development Institute, Ansan 425-600, Korea

Key Words:

Acontiphorus
Asteropontius
New copepod species
Korea
Asterocheridae
Copepoda

Two new species of Asterocheridae are described from Korean seas: *Acontiphorus pilosus* associated with a bryozoan of *Celeporina* sp. in the Sea of Japan and *Asteropontius bifurcatus* associated with the antipatharian *Antipathes japonicus* in Jeju Island in Korea Strait. A key to the species of *Acontiphorus* is provided.

Records of the Korean copepods of Asterocheridae are very few. Kim (1992) was the first to record on this copepod group, who reported *Scottomyzon gibberum* (T. and A. Scott, 1894) from various sea stars in Korea. Recently, Kim (1998) added four other asterocherid species to Korean fauna: *Asterocheres aestheticus* Ho, 1984 from the sponges, *Collocheres inaequalis* Ho, 1982 from the crinoid *Comanthus japonicus* (Muller), *Dermatomyzon nigripes* (Brady and Robertson, 1876) from washings of weeds and hydroids, *Orecturus excavatus* (Humes, 1989) from an octocoral of *Dendronephthya* sp. These five species have been the only known asterocherid copepods from Korea. In the present report, two more species are added to Korean copepod fauna: *Acontiphorus bifurcatus* n. sp. associated with a bryozoan of *Celeporina* sp. in the Sea of Japan, and *Asteropontius bifurcatus* n. sp. associated with the antipatharian *Antipathes japonicus* Brook in Jeju Island.

Before microscopic dissection and observation, copepod materials were immersed in lactic acid. Dissections were done using the reversed slide method (Humes and Gooding, 1964). The intact type materials have been deposited in the U.S. National Museum of Natural History, Smithsonian Institution. In the description of species all measurements were made invariably on one fully grown, large specimen of each sex. The body lengths were measured from the anterior tip of the cephalothorax to the posterior margin of the caudal rami of a selected large specimen, excluding the caudal setae. In the armature formula of legs 1-4 the Roman numerals indicate spines and the Arabic numerals represent setae.

Description of Species

Genus *Acontiphorus* Brady, 1880
Acontiphorus pilosus n. sp. (Figs. 1-3)

Materials examined: Twenty-five ♀♀, 3 ♂♂ from washings of a bryozoan, *Celleporina* sp. taken out from a fishing net, near Kangnung, on 10 April 1993. Holotype (♀), allotype (♂), and paratypes (22 ♀♀) have been deposited in the U.S. National Museum of Natural History, Smithsonian Institution. Dissected paratypes (2 ♀♀ and 2 ♂♂) are retained in the collection of the senior author.

Female: Body (Fig. 1A) 0.92 mm long. Maximum width 460 µm. Prosome 4-segmented, 640 µm long, becoming narrower posteriorly. Cephalothorax expanded, wider than long, semicircular, with rounded lateral margins. Urosome (Fig. 1B) 4-segmented. Fifth pedigerous somite 135 µm wide. Genital double-somite 125 × 130 µm, slightly wider than long, widest at anterior one-fifth, then becoming gradually narrower posteriorly, with posterolateral corners angular but not pointed or projected. First abdominal somite 38 × 76 µm. Second abdominal (anal) somite 38 × 68 µm, as long as the first, characteristically with 2 longitudinal rows of long setules on ventral surface (Fig. 1C). Caudal ramus 45 × 28 µm (1.61:1), slightly convergent, with hairs on outer lateral margin and 6 caudal setae, inner dorsal one of them naked and mounted on an elevation, and other 5 setae plumous.

Rostrum weak, with angular posterior tip. Antennule (Fig. 1D) 9-segmented, tapering, very short, densely setose, about 130 µm long or about 30% length of cephalosome, with setal formula: 2, 15, 7, 2, 8, 3, 1+1 aesthetasc, 5, and 8. Aesthetasc on seventh segment (=third segment from terminal) large, longer than whole

*To whom correspondence should be addressed.
Tel: 82-33-640-2312, Fax: 82-33-642-6124
E-mail: ihkim@knusun.kangnung.ac.kr

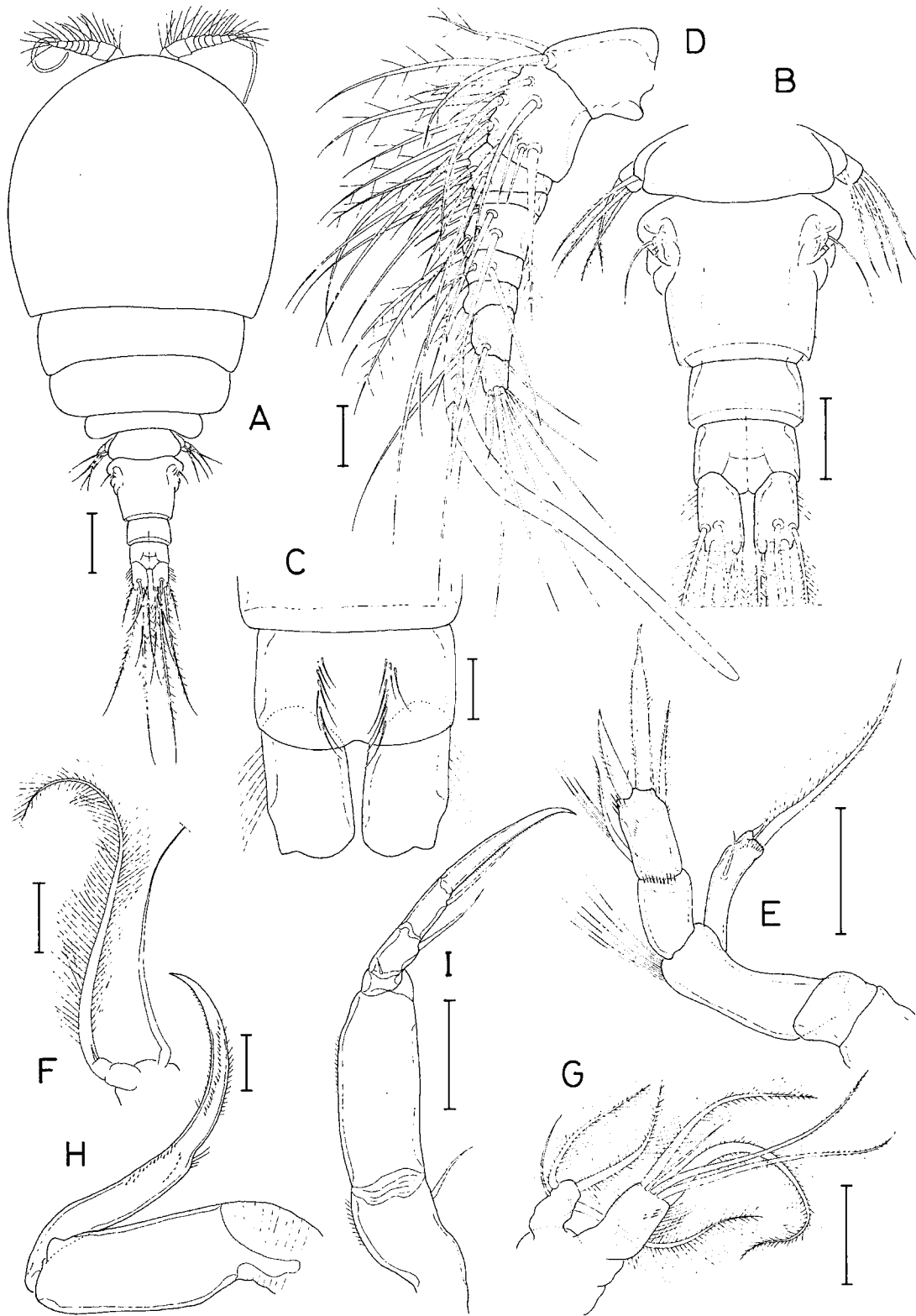


Fig. 1. *Acontiphorus pilosus* n. sp., female. A, Habitus, dorsal. B, Urosome, dorsal. C, Anal somite and caudal rami, ventral. D, Antennule. E, Antenna. F, Mandible. G, Maxillule. H, Maxilla. I, Maxilliped. Scale bars=0.01 mm(A), 0.05 mm (B, E-G), and 0.2 mm (C, D, H).

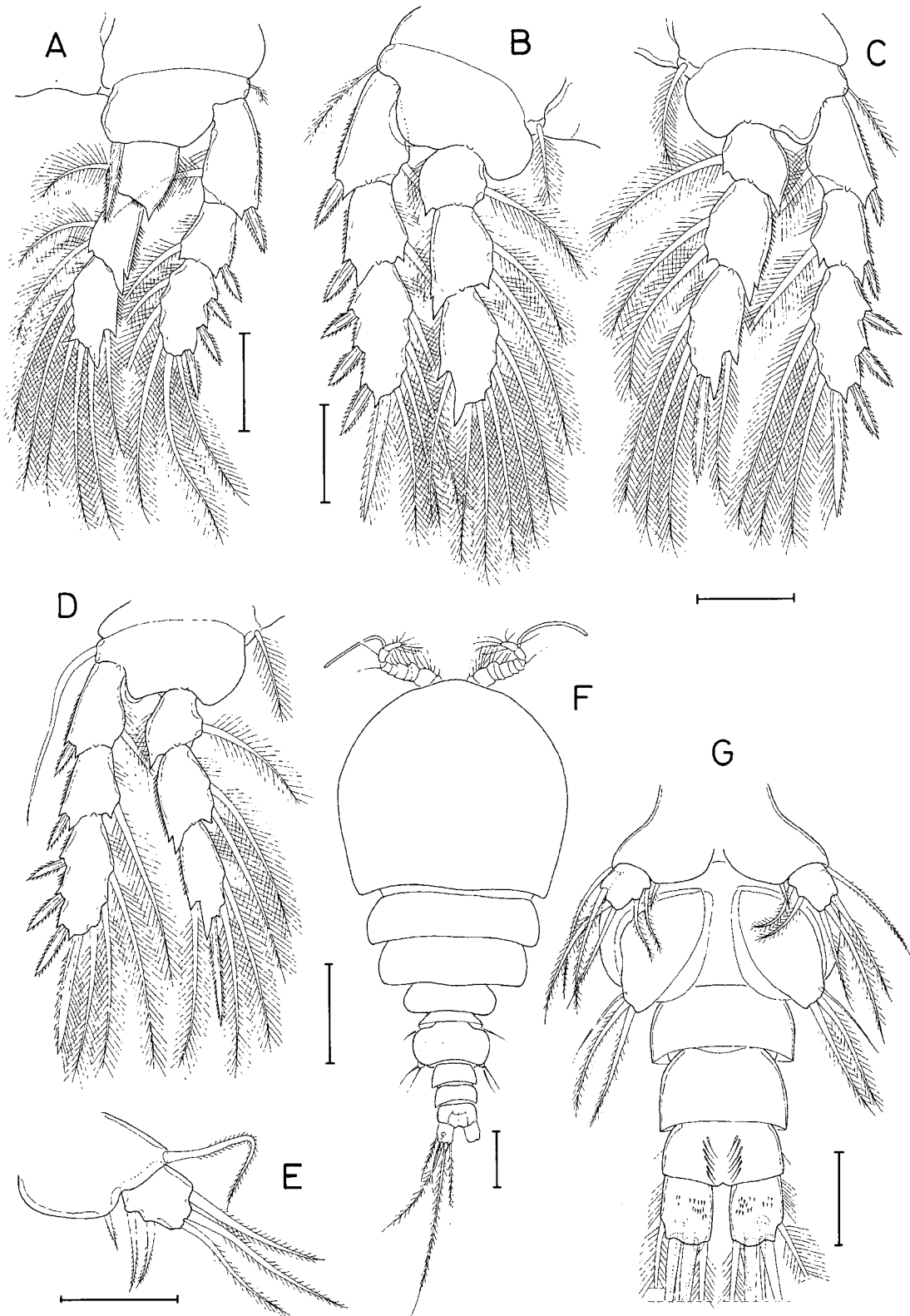


Fig. 2. *Acontiphorus pilosus* n. sp. female. A, Leg 1. B, Leg 2. C, Leg 3. D, Leg 4. E, Leg 5. Male: F, Habitus, dorsal. G, Urosome, ventral. Scale bars=0.05 mm (A-E, G) and 0.1 mm (F).

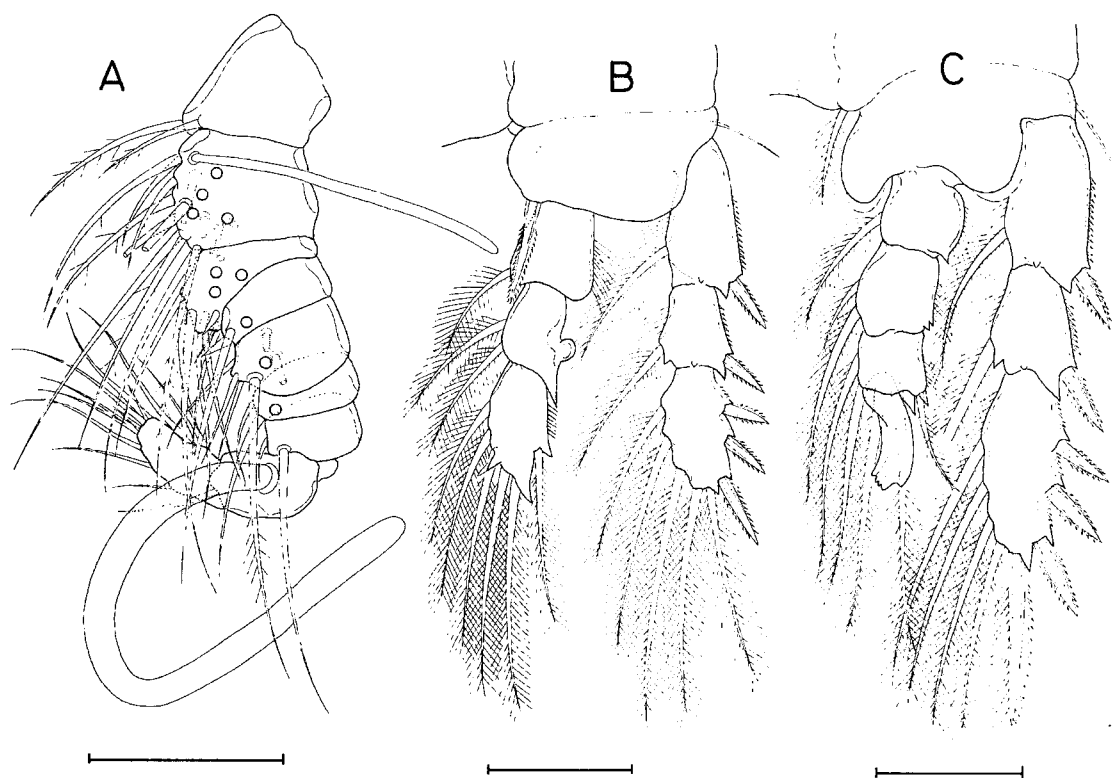


Fig. 3. *Acontiophorus pilosus* n. sp., male. A, Antennule (circles indicate the places of insertion of aesthetascs). B, Leg 1; C, Leg 2. Scale bars=0.05 mm.

segments combined; some of setae sparsely plumose. Antenna (Fig. 1E) mounted on a segmentlike elevation (=precoxa). Coxa 21 μ m long, distinctly wider than long and unarmed. Basis 60 μ m long, slightly constricted in the middle, with several long setules at inner distal corner. Exopod 1-segmented, 45 μ m long, distinctly longer than first endopodal segment, slightly curved, armed terminally with 1 large (100 μ m long) plumose seta and 1 small spiniform seta, and laterally 1 small seta. Endopod 2-segmented. First segment 30 μ m long, distally with small setules. Terminal segment 35 μ m long, armed with 5 setae: 2 terminal setae spiniform, thick, not flexible, 68 μ m and 38 μ m long, respectively, both with minute setules on surface, the inner one abruptly tapering in distal portion; other 3 setae composed of 1 minute terminal seta, 1 subterminal, plumose seta (40 μ m), and 1 long (about 50 μ m long) proximal seta, the latter with several long setules in the middle.

Siphon long, 737 μ m long, extending to posterior margin of genital double-somite. Mandible (Fig. 1F) consisting of long, thread-like stylet and palp. Mandibular palp short, indistinctly divided into 2 portions, armed terminally 1 minute and 1 large, plumose setae. Maxillule (Fig. 1G) bilobed. Inner lobe armed with 5 setae: 2 thick plumose setae, 2 slender, almost naked setae and 1 small, naked seta. Outer lobe smaller than inner lobe, armed with 4 setae, one of them small and naked. Maxilla (Fig. 1H) 2-segmented. First segment unarmed. Second segment without any seta, but distally with many

minute denticles and setules, consisting of wider basal and narrower, clawlike distal portions, although no division visible between two portions. Maxilliped (Fig. 1I) 5-segmented. First segment with 1 seta near inner distal corner and minute setules on outer surface. Second segment with minute setules on outer surface. Third segment small, with 1 minute distal seta. Fourth segment with 1 inner distal seta. Terminal segment armed with 1 claw and 1 inner distal seta. Claw longer than distal 3 segments combined, with minute spinules along concave margin.

Legs 1-4 with 3-segmented rami. Both rami of these 4 legs nearly equal in length. Second endopodal segment of these 4 legs with bicuspid process at outer distal corner. Leg 1 (Fig. 2A) without inner coxal seta. Inner spine on basis distinctly longer than first endopodal segment. Leg 2 (Fig. 2B) with 6 setae (1,5) on terminal endopodal segment, but leg 3 (Fig. 2C) with 4 setae and 1 spine (1,1,3) on this segment. Outer seta on basis of leg 4 (Fig. 2D) larger than those of other 3 legs and naked. Armature formula of these 4 legs are as follows:

- Leg 1: coxa 0-0; basis 1-1; exp. 1-1; 1-1; III,1,3;
enp. 0-1; 0-2; 1,5
Leg 2: coxa 0-1; basis 1-0; exp. 1-1; 1-1; III,1,4;
enp. 0-1; 0-2; 1,5
Leg 3: coxa 0-1; basis 1-0; exp. 1-1; 1-1; III,1,3;
enp. 0-1; 0-2; 1,1,3

Leg 4: coxa 0-1; basis 1-0; exp. 1-1; 1-1; III,1,3;
 enp. 0-1; 0-2; 1,1,2

Leg 5 (Fig. 2E) 2-segmented. Basal segment much wider than long, with 1 longer outer distal and 1 smaller inner distal setae. Free segment 30×28 μm, slightly longer than wide, with 5 setae: 3 on terminal and 2 on inner margin; Setae on inner margin shorter than terminal ones. Leg 6 consisting of 1 slender seta and 2 tiny spinules on genital field (Fig. 1B).

Egg sac 360×240 μm, containing 3 or 4 eggs.

Male: Body (Fig. 2F) resembling that of female. Length 0.84 mm. Urosome (Fig. 2G) 5-segmented. Fifth pedigerous somite 120 μm wide. Genital somite 140 μm wide, about twice wider than long. Three abdominal somites 35×80, 40×71, and 35×67 μm, respectively. First and second abdominal somites with angular posterolateral corners. Anal somite with 2 longitudinal rows of setules on ventral surface, as in female. Caudal ramus stockier than that of female, 35×31 (1.13:1), with small denticles on ventral surface in addition to 6 caudal setae.

Antennule (Fig. 3A) 9-segmented and distinctly geniculate between 7th and 8th segment. Basal 7 segments distinctly wider than distal 2. Armature formula: 2, 14+5 aesthetascs, 8+3 aesthetascs, 2+1 aesthetasc, 6+1 aesthetasc, 2+1 aesthetasc, 2, 1+1 aesthetasc, and 11. Aesthetasc on penultimate segment large, about as long as whole segments combined.

Antenna and mouth parts identical to those of female.

Legs 1 (Fig. 3B) and 2 (Fig. 3C) showing sexual dimorphism. Second endopodal segment of leg 1 with 1 circular tubercle on outer margin; inner distal corner of this segment sharply pointed. One of distal setae on terminal endopodal segment of leg 2 transformed to a large, tongue-like element.

Legs 3-5 as in female. Leg 6 represented by 2 plumose and 1 naked setae on distal portion of genital flap (Fig. 2G).

Etymology: The specific epithet *pilosus* is a Latin meaning "hairy". It alludes to the dense setation on the antennule.

Remarks: Nine species of the genus *Acontiphorus* Brady, 1880 had been known until Humes (1992) moved *A. bracatus* Stock and Kleeton, 1963 and *A. excavatus* Humes, 1989 to the genus *Orecturus* Humes (1992). Therefore this genus currently consists of seven species.

Acontiphorus pilosus n. sp. is related most closely to *A. zealandicus* Nicholls, 1944. Both species bear in common similar body size (more or less than 1.0 mm), no coxal seta on leg 1, six setae on the terminal endopodal segment of leg 2 (armature formula 1,2,3), compared to 1 spine and 5 setae *B* (armature formula 1,1,1,3; although it is unknown in *A. antennatus* Hasen,

1923 and *A. maldivensis* Sewell, 1949 in other species. The males are known only in *A. scutatus* (Brady and Robertson, 1873), *A. zealandicus* Nicholls, 1944 and the new species. It is certain that *A. scutatus* bears a non-geniculate male antennule, according to the illustrations by Giesbrecht (1899) and Sars (1915). In bearing of the geniculate male antennule, *A. pilosus* and *A. zealandicus* are similar to each other as well.

Acontiphorus pilosus may be distinguished from *A. zealandicus* and other congeners by the following: (1) The female antennule of *A. pilosus* is 9-segmented, while it is 11-segmented in *A. zealandicus*, *A. antennatus*, and *A. scutatus*, 13-segmented in *A. tynani* Eiselt, 1965, and 16-segmented in *A. armatus* Brady, 1880, *A. brevifurcatus* Stock (1966), and *A. maldivensis* Sewell, 1949. (2) The same armature formula of leg 5 of *A. pilosus* is revealed only in *A. scutatus*, according to the illustrations given by Giesbrecht (1899) and Sars (1915). In other species the armature formulae of this leg is 1,4 in *A. antennatus* and *A. maldivensis*, 2,4 in *A. brevifurcatus*, or 1,5 in *A. armatus*, *A. tynani*, and *A. zealandicus*. (3) *A. pilosus* has 5 and 4 setae, respectively, on the inner and outer lobes of the maxillule. In other species, this appendage bears 3 and 2, 4 and 4, 4 and 4, or 5 and 3 setae, respectively (unknown in *A. antennatus*).

The following is a key to the species that may be useful in distinguishing the species of the genus.

Key to the species of the genus *Acontiphorus*

1. Maxilla with a large seta on the second segment 2
 Maxilla without a large seta or with a tiny seta on the second segment 5
2. Female antennule 13-segmented *A. tynani*
 Female antennule 16-segmented 3
3. Basal segment of leg 5 armed with 2 setae
 *A. brevifurcatus*
 Basal segment of leg 5 armed with 1 seta 4
4. Inner lobe of maxillule with 3 setae; body length 1.5 mm *A. armatus*
 Inner lobe of maxillule with 4 setae; body 0.64 mm *A. maldivensis*
5. Caudal ramus at least 2.5 times as long as wide 6
 Caudal ramus 2 times as long as wide or less ... 7
6. Siphon relatively short, extending to genital double-somite *A. antennatus*
 Siphon very long, extending over caudal rami
 *A. scutatus*
7. Female antennule 11-segmented; basal segment of leg 5 armed with 1 seta *A. zealandicus*
 Female antennule 9-segmented; basal segment of leg 5 armed with 2 setae *A. pilosus*

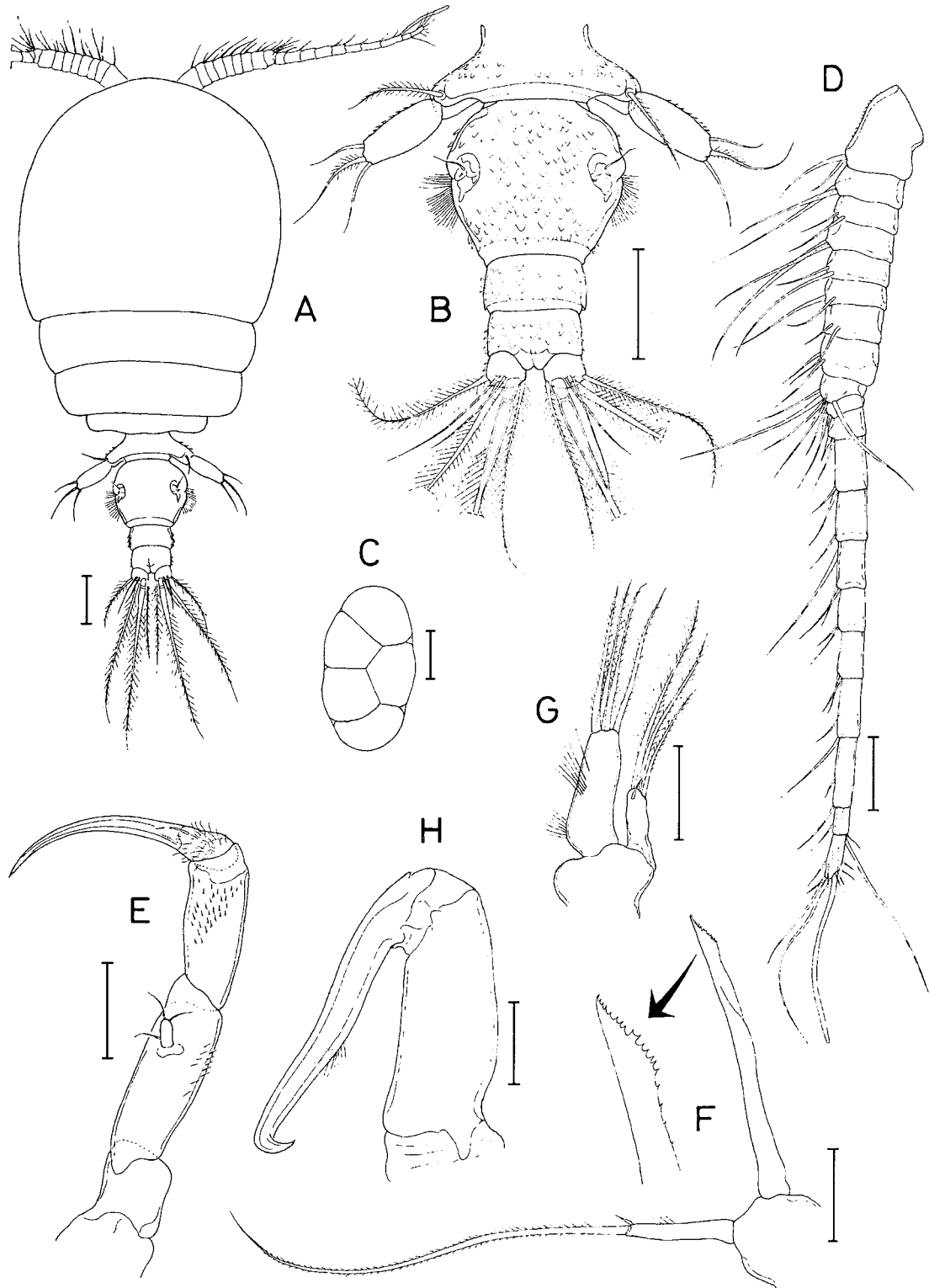


Fig. 4. *Asteropontius bifurcatus* n. sp., female. A. Habitus, dorsal. B. Urosome, dorsal. C. Egg sac. D. Antennule. E. Antenna. F. Mandible. G. Maxillule. H. Maxilla. Scale bars=0.05 mm (D-H) and 0.1 mm (A-C).

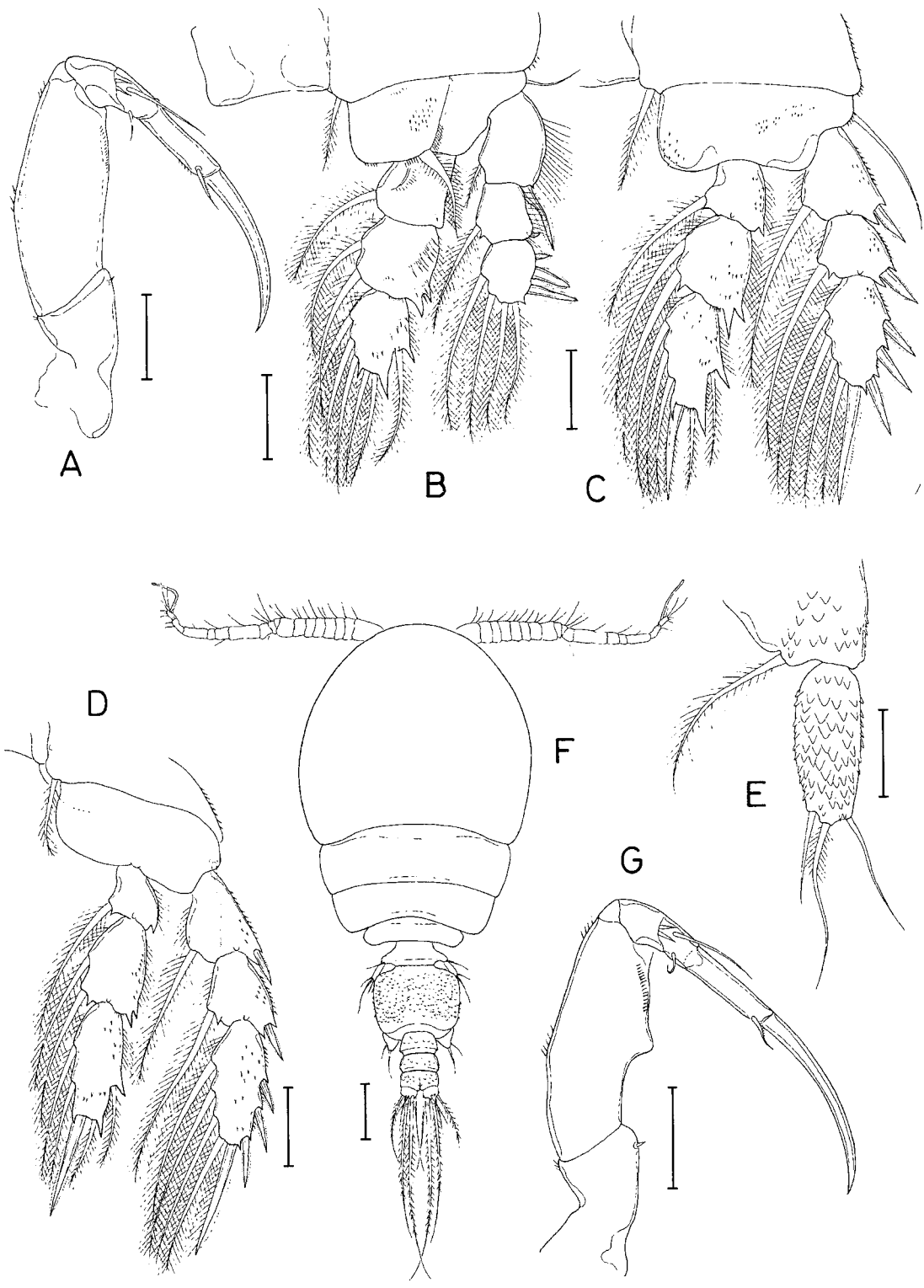


Fig. 5. *Asteropontius bifurcatus* n. sp. female. A, Maxillule. B, Leg 1. C, Leg 2. D, Leg 4. E, Leg 5. Male: F, Habitus, dorsal. G, Maxilliped. Scale bars=0.05 mm (A-E, G) and 0.1 mm (F).

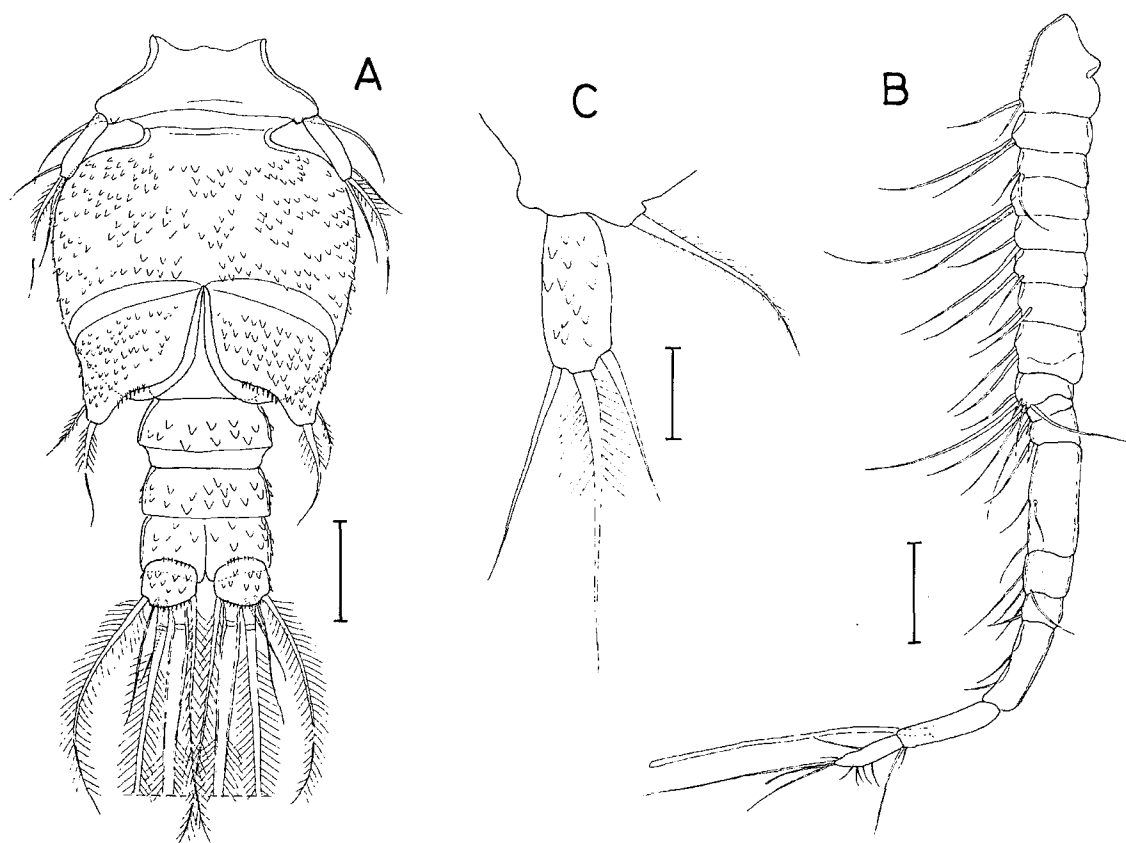


Fig. 6. *Asteropontius bifurcatus* n. sp., male. A, Urosome, ventral. B, Antennule. C, Leg 5. Scale bars=0.02 mm (C) and 0.05 mm (A, B).

Genus *Asteropontius* Thompson and Scott, 1903
Asteropontius bifurcatus n. sp. (Figs. 4-6)

Materials examined: Thirteen ♀♀, 7 ♂♂ from the antipatharian *Antipathes japonicus* Brook, off Sogwipo in Jeju Island, on 14 November 1997. Holotype (♀), allotype (♂), and paratypes (10 ♀♀ and 5 ♂♂) have been deposited in the U.S. National Museum of Natural History, Smithsonian Institution. Dissected paratypes (2 ♀♀, 1 ♂) are retained in the collection of the senior author.

Female: Body (Fig. 4A) 1.09 mm long. Maximum width 580 μm. Prosome 4-segmented, becoming narrower posteriorly. Cephalothorax 512 μm long, occupying about 65% length of whole prosome, rather expanded, with round lateral margins. Second and third pedigerous somites nearly identical in length. Fourth pedigerous somite distinctly shorter and narrower than preceding somite. Urosome (Fig. 4B) 4-segmented, with transparent scales covering surface of somites. Fifth pedigerous somite 195 μm wide and projecting laterally. Genital double-somite 145 × 165 μm, wider than long, nearly circular, with hairs on lateral margins near genital fields. Genital field located dorsolaterally in midlength of somite. Two abdominal somites 50 × 95 and 38 (measured along lateral margin) ×

87 μm, respectively. Posterior margin of anal somite fringed with fine spinules. Caudal ramus 30 × 38 μm (0.79:1), wider than long, with fine spinules on terminal margin. Two dorsal ones of 6 caudal setae naked and smaller than the others. Other 4 setae plumose. Inner larger one of 2 mid-terminal setae expanded proximally.

Antennule (Fig. 4D) 20-segmented and 563 μm long. Portion distal to 8th segment distinctly narrower than proximal portion. Setal formula: 2, 2, 2, 2, 2 (fifth), 2, 2, 2, 7, 2 (tenth), 2, 2, 2, 2, 2 (fifteenth), 2, 2, 2+1 aesthetasc, 3, and 9. First segment the longest, with minute spinules on anterior surface. Antenna (Fig. 4E) mounted on an elevation (=precoxa). Coxa 42 μm long and unarmed. Basis 100 × 37 μm, with minute setules on outer surface of distal portion. Exopod inserted near distal one-third length of basis, 1-segmented, shorter and nearly half as long as width of basis, not extending to distal margin of basis, with 1 lateral and 2 terminal setae. Endopod 2-segmented, First segment 75 × 33 μm, with a number of denticles on lateral surface and 1 distal seta. Second segment tapering, followed by a long claw, with hairs on lateral surface and 2 distal setae (each on opposite side).

Siphon short, about 175 μm long, conical, not extending to posterior margin of cephalosome. Mandible (Fig. 4F) consisting of stylet and palp. Stylet not taper-

ing; distal cutting edge diagonal to axis, with about 15 denticles of irregular size. Palp 1-segmented, about 36% length of stylet, distally with 1 long, pinnate seta (about 4 times as long as segment) and 1 small setule. Maxillule (Fig. 4G) bilobed, each lobe separated. Inner lobe about twice as long and wide as outer lobe, with 4 setae of identical size and setules on inner margin. Outer lobe with 3 long and 1 tiny setae. Maxilla (Fig. 4H) 2-segmented. First segment unarmed. Second segment with 1 small recurved cusp near base, transverse row of hairs in the middle (but without any seta), and followed by claw-like, strongly bent, distal portion. Maxilliped (Fig. 5A) consisting of 5 segments and terminal claw, with armature formula: 1, 0, 2, 1, 1+ claw. Seta at inner distal corner of first segment extremely tiny. Second segment slightly widened near middle, with minute spinules on inner distal and outer surfaces. Terminal claw about as long as 3 distal segment combined, evenly curved.

Leg 1 (Fig. 5B), leg 2 (Fig. 5C), leg 3 and leg 4 (Fig. 5D) with 3-segmented rami. Outer distal corner of second endopodal segment of legs 1-4 with bicuspid process. Leg 1 with longitudinal groove and membranous fringe on ventral surface of basis. Outer spine of first exopodal segment of leg 1 distinctly longer than second exopodal segment. Outer spine of second segment and basal spine of terminal segment of this ramus remarkably reduced in size. Most segments of rami of legs 1-4 with minute denticles scattered on ventral and dorsal surfaces. Armature formula of legs 1-4 as follows:

Leg 1: coxa 0-1; basis 1-1; exp. 1-1; 1-1; III,4;
enp. 0-1; 0-2; 1,5
Legs 2 & 3: coxa 0-1; basis 1-0; exp. 1-1; 1-1; III,1,4;
enp. 0-1; 0-2; 1,1,1,3
Leg 4: coxa 0-1; basis 1-0; exp. 1-1; 1-1; III,1,4;
enp. 0-1; 0-2; 1,1,1,2

Leg 5 (Fig. 5E) 2-segmented. Both segments covered with transparent scales. Basal segment with 1 long, plumose seta at distal corner. Free segment $94 \times 39 \mu\text{m}$ (2.41:1), nearly quadrangular, weakly tapering, with 3 terminal setae; the longest, middle one of these setae $101 \mu\text{m}$ long, and plumose in proximal third. Other 2 setae naked, outer one $55 \mu\text{m}$ and inner one $73 \mu\text{m}$. Leg 6 represented by 1 small setule and 2 tiny spinules in genital field (Fig. 4B).

Egg sac (Fig. 4C) $365 \times 205 \mu\text{m}$, usually containing 5-7 eggs.

Male: Body (Fig. 5F) resembling that of female. Urosome (Fig. 6A) 5-segmented. Fifth pedigerous somite $117 \mu\text{m}$ wide, distinctly narrower than genital somite. Genital somite about $142 \times 158 \mu\text{m}$. Three abdominal somites 37×70 , 25×66 , and $27 \times 68 \mu\text{m}$, respectively. Caudal ramus $25 \times 28 \mu\text{m}$ (0.89:1).

Antennule 17-segmented, weakly geniculate between

fifteenth and sixteenth segments, with armature formula: 2, 2, 2, 2, 2 (fifth), 2, 2, 2, 7, 2 (tenth), 2, 4, 2, 2, 2 (fifteenth), 2+1 aesthetasc, and 9+1 aesthetasc. Portion distal to eighth segment tapering. Aesthetasc on terminal segment very small, hardly differentiated from setae on same segment. Antenna as in female.

Maxilliped (Fig. 5G) different from that of female, in which second segment bearing a prominent, triangular process in the middle of inner margin. Other mouth organs as in female.

Armature formula of legs 1-4 identical to that of female. Free segment of leg 5 $35 \times 15 \mu\text{m}$ (2.33:1), slightly widened distally (Fig. 6C), otherwise identical to that of female. Leg 6 represented by 2 plumose setae on distal corner of genital flap (Fig. 6A), outer one of them smaller than the inner.

Etymology: The specific epithet *bifurcatus* alludes to the bicuspid outer distal corner of the second endopodal segment of legs 1-4.

Remarks: Stock (1975) recognized five species in the genus *Asteropontius* as valid and rejected other three species, *A. mycalei* Krishnaswamy, 1954, *A. littoralis* Ummerkutty, 1961 and *A. sewelli* Ummerkutty, 1961. Since then five more species have been added to this genus.

Asteropontius bifurcatus carries the armature formula of the terminal endopodal segments of legs 1-4 is III,4; 1,1,1,3; 1,1,1,3; and 1,1,1,2, respectively. This armature formula is shared with *A. bandicola* Humes, 1992, *A. corallophilus* Stock, 1966, and *A. iuxtus* Stock, 1989.

Asteropontius bifurcatus can be distinguished from *A. bandicola* by the larger body (only 0.74 mm long in the female of the latter) and by having three setae on the exopod of the antenna (two in *A. bandicola*) and a long seta (a short spine in *A. bandicola*) on the medial side of the basis of leg 1.

Asteropontius corallophilus differs from *A. bifurcatus*, because this species from Mauritius has a narrow female genital double-somite which is longer than wide (wider than long in *A. bifurcatus*) according to Stock's (1966) figure, and three setae (4 setae in *A. bifurcatus*) on the outer lobe of maxillule.

Asteropontius iuxtus also differs from the new species, because this West Indian species has the caudal rami longer than wide (ratio 1.2; shorter than wide in *A. bifurcatus*, with the ratio 0.88) and 5 terminal setae (4 in *A. bifurcatus*) on the inner lobe of the maxillule.

It is remarkable that among 10 congeners two species, *A. bandicola* and *A. latus*, both described by Humes (1992) from the Pacific, have the bicuspid outer distal corner of the second endopodal segment of legs 1-4, as in *A. bifurcatus* n. sp. Interestingly, all these three species were found from the antipatharians.

The species of *Asteropontius* have 19-segmented female antennules. The only exception of this segmentation is found in *A. corallophilus* Stock, 1966 in which

the distal-most segment is subdivided, giving an appearance as 20-segmented. In *A. bifurcatus* the distal-most segment of the same appendage is not subdivided and clearly 20-segmented.

References

- Brady GS and Robertson D (1873) Contributions to the study of the Entomostraca. No. VIII. On marine Copepoda taken in the west of Ireland. *Ann Mag Nat Hist* 4: 126-142.
- Giesbrecht W (1889) Die Asterocheriden des Golfes von Neapel und der angrenzenden Meeres-Abschnitte. *Fauna Flora Golf Neapel* 25: 1-217.
- Humes AG (1992) Copepoda associated with the thorny coral *Antipathes* (Antipatharia) in the Indo-Pacific. *J Nat Hist* 26: 709-744.
- Kim I-H (1992) Two species of Copepoda (Poecilostomatoida, Siphonostomatoida) associated with Asteroida in Korea. *Korean J Syst Zool* 8: 57-67.
- Kim I-H (1998) Illustrated Encyclopedia of Fauna and Flora of Korea. Vol 38. Cirripedia, Symbiotic Copepoda, and Pycnogonida. Ministry of Education of Korea, Seoul, pp 1-1038.
- Sars GO (1915) Copepoda Cyclopoida. Parts IX & X. Ascomyzontidae (concluded), Acontiphoridae, Myzopontiidae, Dyspontiidae, Artotrogidae, Cacerillidae. *Account Crustacea Norway* 6: 105-140, pls. 65-80.
- Stock JH (1966) Cyclopoida Siphonostoma from Mauritius (Crustacea, Copepoda). *Beaufortia* 13: 145-194.
- Stock JH (1975) Copepoda associated with West Indian Aciniaria and Corallimorpharia. *Stud Fauna Curacao Caribbean Isl* 48: 88-118.
- Stock JH (1987) Copepoda Siphonostomatoida associated with West Indian hermatypic corals. 1. Associates of Scleractinia: Faviianae. *Bull Mar Sci* 40: 464-483.

[Received July 20, 2000; accepted September 4, 2000]