

Siphonostomatoid Copepoda (Crustacea) Associated with Invertebrates from Tropical Waters

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ABSTRACT

Siphonostomatoid copepods associated with marine invertebrates are described from tropical waters of the West Indies and Madagascar. They belong to the families Asterocheridae (7 new genera and 39 new species), Dinopontiidae (one new species), and Nanaspidae (one new species). New taxa of the Asterocheridae are 14 species of *Asterocheres* (*Asterocheres unioviger* n. sp., *A. trisetatus* n. sp., *A. bahamensis* n. sp., *A. tricuspis* n. sp., *A. plumosus* n. sp., *A. peniculatus* n. sp., *A. oricurvus* n. sp., *A. planus* n. sp., *A. sensilis* n. sp., *A. indivisus* n. sp., *A. nudicoxus* n. sp., *A. tenuipes* n. sp., *A. galeatus* n. sp., and *A. fastigatus* n. sp.); 3 species of *Hetairosynella* n. gen. (*Hetairosynella bifurcata* n. sp.; *H. angulata* n. sp.; *H. aculeata* n. sp.); 15 species of *Asteropontius* (*Asteropontius capillatus* n. sp., *A. membranulatus* n. sp., *A. plumatus* n. sp., *A. parvipes* n. sp., *A. humesi* n. sp., *A. angulatus* n. sp., *A. latioriger* n. sp., *A. magnisetiger* n. sp., *A. pinnatus* n. sp., *A. trifilis* n. sp., *A. orcafer* n. sp., *A. bilinguis* n. sp., *A. dentatus* n. sp., *A. minutisetiger* n. sp., and *A. bispinifer* n. sp.); *Collocherides minutus* n. sp.; *Cyclocheres sensilis* n. gen. n. sp.; *Stenomyzon edentatum* n. gen. n. sp.; *Cephalocheres flagellatus* n. gen. n. sp.; *Humesimyzon pusillum* n. gen. n. sp.; *Thermocheres validus* n. gen. n. sp.; and *Gascardama longisiphonata* n. gen. n. sp. New taxa of the remaining two families are *Stenopontius spinulatus* n. sp. in the Dinopontiidae and *Stephopontius ahni* n. sp. in the Nanaspidae. *Asterocheres crinoidicola* Humes, *Asteropontius genodon* Stock, and *Asteropontius ungelatus* Stock are redescribed. *Asteropontius goniopora* Kim is reported as a new record from Madagascar. A key to species of *Asteropontius* is provided.

Key words: Copepoda, Siphonostomatoida, Madagascar, West Indies, association, invertebrates, new genera, new species

INTRODUCTION

The species of the copepod order Siphonostomatoida are mostly symbiotic and many of them utilize marine invertebrates as hosts such as sponges, cnidarians, and echinoderms (Bandera and Huys, 2008).

The late Dr. Arthur G. Humes described about 700 new copepod species, including 128 species of siphonostomatoids, but left much copepod material unexamined (Huys and Boxshall, 2001). This unexamined copepod material turned out to contain at least 157 new species (Kim, 2003, 2004a, b, c, d, 2005a, b, c, 2006, 2007a, b, 2009), including 41 new species to be described herein. In the present paper 45 siphonostomatoid copepods are reported from the West Indies and Madagascar, as follows:

Family Asterocheridae

1. *Asterocheres crinoidicola* Humes, 2000 from a crinoid in Jamaica.

2. *Asterocheres unioviger* n. sp. from the sea urchin *Eucidaris tribuloides* (Lamarck) in Bimini, Bahamas.
3. *Asterocheres trisetatus* n. sp. from a sponge in the Bahamas
4. *Asterocheres bahamensis* n. sp. from a sponge in the Bahamas
5. *Asterocheres tricuspis* n. sp. from a sponge in Barbados.
6. *Asterocheres plumosus* n. sp. from a sponge in the Bahamas.
7. *Asterocheres peniculatus* n. sp. from a sponge in the Bahamas.
8. *Asterocheres oricurvus* n. sp. from sponges and compound tunicates in Jamaica.
9. *Asterocheres planus* n. sp. from a sponge in Madagascar.
10. *Asterocheres sensilis* n. sp. from a sponge in Madagascar.
11. *Asterocheres indivisus* n. sp. from the alcyonacean coral *Cespitularia erecta* Macfadyen in Madagascar.
12. *Asterocheres nudicoxus* n. sp. from the stoloniferan coral *Tubipora musica* L. in Madagascar.
13. *Asterocheres tenuipes* n. sp. from a sponge (*Agelas* sp.) in Madagascar.
14. *Asterocheres genodon* Stock, 1966 from a sponge in Madagascar.

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15. *Asterocheres galeatus* n. sp. from the scleractinian coral *Platygyra daedala* (Ellis and Solander) in Madagascar.
 16. *Asterocheres fastigatus* n. sp. from a sponge in Barbados.
 17. *Hetairosynella bifurcata* n. gen. n. sp. from a sponge in Jamaica and Puerto Rico.
 18. *Hetairosynella angulata* n. sp. from a sponge in Jamaica.
 19. *Hetairosynella aculeata* n. sp. from a sponge in the Bahamas.
 20. *Asteropontius ungelatus* Stock, 1975 from the actiniarian *Stoichactis anemone* (Ellis) in Jamaica and Puerto Rico.
 21. *Asteropontius capillatus* n. sp. from a scleractinian coral (*Meandrina* sp.) in Barbados.
 22. *Asteropontius membranulatus* n. sp. from the scleractinian coral *Seriatophora subseriata* Ehrenberg in Madagascar.
 23. *Asteropontius plumatus* n. sp. from the scleractinian coral *Seriatophora subseriata* Ehrenberg in Madagascar.
 24. *Asteropontius parvipes* n. sp. from a scleractinian coral (*Favia* sp.) in Madagascar.
 25. *Asteropontius humesi* n. sp. from a scleractinian coral of *Porites* sp. in Madagascar.
 26. *Asteropontius angulatus* n. sp. from a scleractinian coral (*Echinopora* sp.) and the scleractinian corals *Lobophyllia hemprichii* (Ehrenberg) and *Echinopora gemmacea* (Lamarck) in Madagascar.
 27. *Asteropontius latioriger* n. sp. from the scleractinian corals *Fungia* cf. *scruposa* Klunzinger and *Alveopora* sp. in Madagascar.
 28. *Asteropontius magnisetiger* n. sp. from the scleractinian coral *Stylophora pistillata* (Esper) in Madagascar.
 29. *Asteropontius pinnatus* n. sp. from a scleractinian corals of the genus *Acropora* in Madagascar.
 30. *Asteropontius trifilis* n. sp. from the scleractinian coral *Merulina ampliata* (Ellis & Sollander) in Madagascar.
 31. *Asteropontius goniopora* Kim, 2007 from a scleractinian coral (*Goniopora* sp.) in Madagascar.
 32. *Asteropontius orcafer* n. sp. from the scleractinian coral *Hydnophora tenella* Quelch in Madagascar.
 33. *Asteropontius bilinguis* n. sp. from the scleractinian corals *Acropora cytherea* Dana and *Acropora corymbosa* (Lamarck) in Madagascar.
 34. *Asteropontius dentatus* n. sp. from the scleractinian coral *Lobophyllia hemprichii* (Ehrenberg) in Madagascar.
 35. *Asteropontius minutisetiger* n. sp. from an antipatharian coral (*Antipathes* sp.) in Madagascar.
 36. *Asteropontius bispinifer* n. sp. from a scleractinian coral (*Favites* sp.) in Madagascar.
 37. *Collocherides minutus* n. sp. from an ophiuroid in Madagascar.
 38. *Cyclocheres sensilis* n. gen. n. sp. from a sponge in Barbados.
 39. *Stenomyzon edentatum* n. gen. n. sp. from a sponge in Puerto Rico.
 40. *Cephalocheres flagellatus* n. gen. n. sp. from the scleractinian coral *Echinopora gemmacea* (Lamarck) in Madagascar.
 41. *Humesimyzon pusillum* n. gen. n. sp. from the scleractinian coral *Psammocora contigua* (Esper) in Madagascar.
 42. *Thermocheres validus* n. gen. n. sp. from a sponge in Madagascar.
 43. *Gascardama longisiphonata* n. gen. n. sp. from the scleractinian coral *Stylophora mordax* (Dana) in Madagascar.
- Family Dinopontiidae
44. *Stenopontius spinulatus* n. sp. from a sponge (*Prianos* sp.) in Madagascar.
- Family Nanaspididae
45. *Stephopontius ahni* n. sp. from the holothurian *Mertensiothuria fuscocinerea* (Jaeger) in Madagascar.

MATERIALS AND METHODS

Copepod material studied in the present work were collected by the late A. G. Humes from Madagascar in 1960, 1963, 1964, and 1967 and by A. G. Humes and R. U. Gooding from the West Indies in 1959 and 1962. The specimens have been preserved in ethanol. Before dissection and microscopic observation, specimens were immersed in lactic acid for at least 30 minutes. Lengths of copepod specimens were measured from the anterior apex of cephalothorax to caudal rami, excluding caudal setae. All figures were drawn with the aid of a drawing tube attached to the light microscope. Collection data, including names of hosts, are followed from Dr. Humes' collection notes.

In the description of appendages, the terms inner and outer lobes of maxillule are used instead of the praecoxal endite and palp, respectively. In the maxilla the terms proximal segment and distal claw are used instead of the syncoxa and basis. Ivanenko and Ferrari (2003) interpreted the endopod of siphonostomatoid maxilliped as it is basically 4-segmented, which is adopted in this work. For this appendage, the terms first to sixth segments are used instead of syncoxa, basis, and 4-segmented endopod. The epicuticular scales which usually cover the surface of the urosome of asterocherid copepods are shown as spinules on the lateral margins.

Type specimens have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C., United States.

DESCRIPTIONS

Order Siphonostomatoida Burmeister, 1835

Family Asterocheridae Giesbrecht, 1899

Genus *Asterocheres* Boeck, 1859

Diagnosis (redefined). Asterocheridae. Body with ovoid or discoid prosome. Urosome 4-segmented in female and 5-segmented in male. Antennule of female basically 21-segmented with large aesthetasc on 18th segment; distal 3 segments frequently fused to become 1 or 2 segments. Antenna with 1-segmented exopod and 3-segmented endopod bearing distal claw or spine. Oral cone short or elongate, siphon-like. Mandible consisting of apically pointed stylet and 1- or 2-segmented palp bearing 2 distal setae. Maxillule bilobed, basically with 5 setae on inner lobe and 4 setae on outer lobe. Maxilla 2-segmented; distal segment forming claw. Maxilliped 6-segmented, with basic armature formula 1, 1 (or 0), 2, 1, 1, 1+claw. Legs 1-4 with 3-segmented exopod and endopod. Basis of leg 1 with 1 outer seta and 1 inner seta (armature formula 1-1). Inner seta on coxa of leg 4 lacking or vestigial, rarely prominent and plumose. Armature formula of third exopodal segment of female: III,2,2 for leg 1 and III,I,4 for legs 2-4. Armature formula of third endopodal segment of female: 1,2,3 for legs 1 and 2; 1,1+I,3 for leg 3; and 1,1+1,2 for leg 4. Second endopodal segment of legs 1-3 with 2 inner setae; that of leg 4 with 1 or 2 setae. Free segment of leg 5 with 3 setae, one of which usually small or obsolete. Sexual dimorphism occurring in legs 1-3 or none. *Remarks.* *Asterocheres* is the largest genus in the Asterocheridae, with at least 72 nominal species. Many species of the genus were poorly or incompletely described (Humes, 1996b; Boxshall and Halsey, 2004). The number of species in the genus has been differently counted: 48 species by Malt (1991) or at least 42 species by Boxshall and Huys (1994), but Humes (1996) recognized only 36 species which had been described in sufficient detail. Bandera and Huys (2008) removed *A. mucronipes* Stock, 1960 to the new genus *Stockmyzon* that they proposed. Recently, Bandera and Conradi (2009a) re-examined the type specimens of four poorly described species of *Asterocheres*, *A. abyssi* (Hansen, 1923) and *A. intermedius* (Hansen, 1923), *A. suberitis* Giesbrecht, 1897, and *A. tenerus* (Hansen, 1923). They treated *A. abyssi* as invalid and the other three species as valid. Bandera and Conradi (2009b) synonymized *A. violaceus* Claus, 1889 with *A. echinicola* (Norman, 1868) and redescribed *A. kervillei* Canu, 1898.

It is necessary to consider the validity of the nominal species of *Asterocheres*. At present the definition of the genus needs to be strict, especially in the setation on the rami of legs 1-4. Before describing species, the 72 nominal species

are sorted to valid species, incompletely described species which are hardly comparable with congeners, and species inquirendae which are hardly considered to belong to *Asterocheres*, as follows:

Valid species in the genus *Asterocheres* (45 species)

aesthetes Ho, 1984
astroidicola Conradi, Bandera and Lopez-Gonzalez, 2006
boeckii (Brady, 1880)
brevisurculus Kim, 2005
bulbosus Malt, 1991
canui Giesbrecht, 1897
complexus Stock, 1960
corneliae Schirl, 1973
crinoidicola Humes, 2000
dentatus Giesbrecht, 1897
dysideae Humes, 1996
echinicola (Norman, 1868)
ellisi Hamond, 1968
eniwetakensis Humes, 1997
flustrae Ivanenko and Smurov, 1997
genodon Stock, 1966
halichondriae Stock, 1966
hirsutus Bandera, Conradi and Lopez-Gonzalez, 2005
hongkongensis Malt, 1991
jeanyeatmanae Yeatman, 1970
kervillei Canu, 1898
latus (Brady, 1872)
lilljeborgi Boeck, 1859
madeirensis Bandera, Conradi and Lopez-Gonzalez, 2007
maxillatus Stock, 1987
minutus (Claus, 1889)
neptuni Johnsson, 2001
pilosus Kim, 2004
proboscideus Stock, 1966
reginae Boxshall and Huys, 1994
rotundus Malt, 1991
scutatus Stock, 1966
serrulatus (Humes, 1996)
simplex Schirl, 1973
simulans (Scott, 1898)
siphonatus Giesbrecht, 1897
stimulans Giesbrecht, 1897
stocki Nair and Pillai, 1984
suberitis Giesbrecht, 1897
tenerus (Hansen, 1923)
tenuicornis Brady, 1910
tubiporae Kim, 2004
urabensis Kim, 2004
ventricosus (Brian, 1928)
walteri Kim, 2004

Incompletely described species of *Asterocheres* (15 species)

The original and other records for the following species reveal very limited taxonomic information, which hardly allow a comparison with other species. Bandera and Conradi (2009a) re-examined the type specimen of *A. intermedius* (Hansen, 1923) but only the antennule and antenna could be observed. They mentioned that it could be differentiated from congeners by its 21-segmented antennule, siphon extending beyond the insertion of leg 1, and genital double-somite that is longer than wide. However, I treat it as an incompletely described species due to the unknown morphology of mouthparts and legs.

abyssi (Hansen, 1923)

alter Eiselt, 1965

bacescui Marcus, 1965

garridoi Varela, Ortiz and Lalana, 2007

indicus Sewell, 1949

intermedius (Hansen, 1923)

major Thompson and Scott, 1903

manaarensis Thompson and Scott, 1903

micheli (Gurney, 1927)

minor Thompson and Scott, 1903

orientalis Sewell, 1949

ovalis Sewell, 1949

parvus Giesbrecht, 1897

renaudi Canu, 1891

uncinatus (Kricagin, 1873)

Species inquirendae in *Asterocheres* (12 species)

The following 12 species are hardly recognizable as members of *Asterocheres* and need to be re-examined for morphological details before the determination of generic positions (for descriptions of these species, see Nair and Pillai, 1984; Johnsson, 1998, 2001, 2002, and 2006):

abrolhensis Johnsson, 1998

aplysinus Johnsson, 2002

bimbarrensis Jonsson, 2006

crenulatus Johnsson, 1998

longisetosus Nair and Pillai, 1984

lunatus Johnsson, 1998

paraboeki Johnsson, 1998

picinguabensis Johnsson, 2001

spinopaulus Johnsson, 1998

spongus Johnsson, 2002

tetrasetosus Johnsson, 1998

unicus Johnsson, 2001

It is impossible to place the above 12 species in any of the known genera of the Asterocheridae for the following reasons.

(1) The basis of leg 1 was described to have an inner spine (rather than a seta): *abrolhensis*, *crenulatus*, *paraboeki*,

spinopaulus, *tetrasetosus*, *spongus*, and *bimbarrensis*.

(2) The third exopodal segment of leg 2 was described to have 3 spines and 5 setae (formula II,I,5, rather than III,I,4): *lunatus*, *paraboeki*, *spinopaulus*, *tetrasetosus*, and *aplysinus*.

(3) The third exopodal segment of leg 3 was described to have 3 spines and 5 setae (formula II,I,5, rather than III,I,4): *abrolhensis*, *paraboeki*, *spinopaulus*, *tetrasetosus*, and *unicus*.

(4) The third endopodal segment of leg 3 was described to have 6 setae (formula 1,2,3, rather than 1,1+I,3): *longisetosus*, *abrolhensis*, *lunatus*, *paraboeki*, *spinopaulus*, *tetrasetosus*, *picinguabensis*, *unicus*, and *aplysinus*.

(5) The third exopodal segment of leg 4 was described to have 3 spines and 5 setae (II,I,5, rather than III,I,4): *abrolhensis*, *paraboeki*, *spinopaulus*, *tetrasetosus*, and *aplysinus*.

(6) The third endopodal segment of leg 4 was described to reveal the armature formula 1,I+1,2 or 1,II,2 (rather than 1,1+I,2): *tetrasetosus*, *unicus*, *aplysinus*, *spongus*, and *bimbarrensis*.

Asterocheres crinoidicola Humes, 2000 (Figs. 1-3)

Material examined. 24 ♀♀, 33 ♂♂ from 17 individuals of a crinoid, Maiden Cay, Jamaica, 6 September 1959, collected by A. G. Humes and R. U. Gooding.

Redescription. Female. Body (Fig. 1A) with moderately broad prosome. Mean body length 755 µm (720-793 µm), based on 10 specimens. Body length of dissected specimen 776 µm. Prosome 529 µm long. Cephalothorax 333 × 424 µm. Urosome (Fig. 1B) 4-segmented. Fifth pedigerous somite 109 µm wide. Genital double-somite 117 × 103 µm, with roundly convex anterior part and narrower, slightly tapering posterior part, and 7-8 setules on lateral margin; genital area positioned near midway of somite. Two free abdominal somites 46 × 62 and 38 × 56 µm, respectively. Caudal ramus 22 × 26 µm (0.85 : 1), with short inner margin, longer outer margin, and 1 scale on posteroventral margin (Fig. 1C).

Rostrum tapering posteriorly, with obscure posterior apex (Fig. 1D). Antennule 426 µm and 20-segmented; proximal segments distinctly broader than distal segments; segments with 2 setae, except for 8 setae on ninth, 2+aesthetasc on eighteenth, and 11 on last segments; all setae naked. Antenna (Fig. 1F) slender; coxa unarmed; basis 77 × 27 µm. Exopod small, 7 × 4.5 µm, with 2 distal and 1 lateral setae. Endopod 3-segmented, with armature formula 0, 1, and 3+claw; first segment 108 × 18 µm; inner seta on third segment well-developed, but 2 outer setae very small; terminal claw slender, 90 µm long.

Oral cone 145 × 79 µm, somewhat truncated, and extending to middle of maxillipedal insertions. Mandible (Fig. 1H) consisting of stylet and palp. Stylet 126 µm long. Palp in-

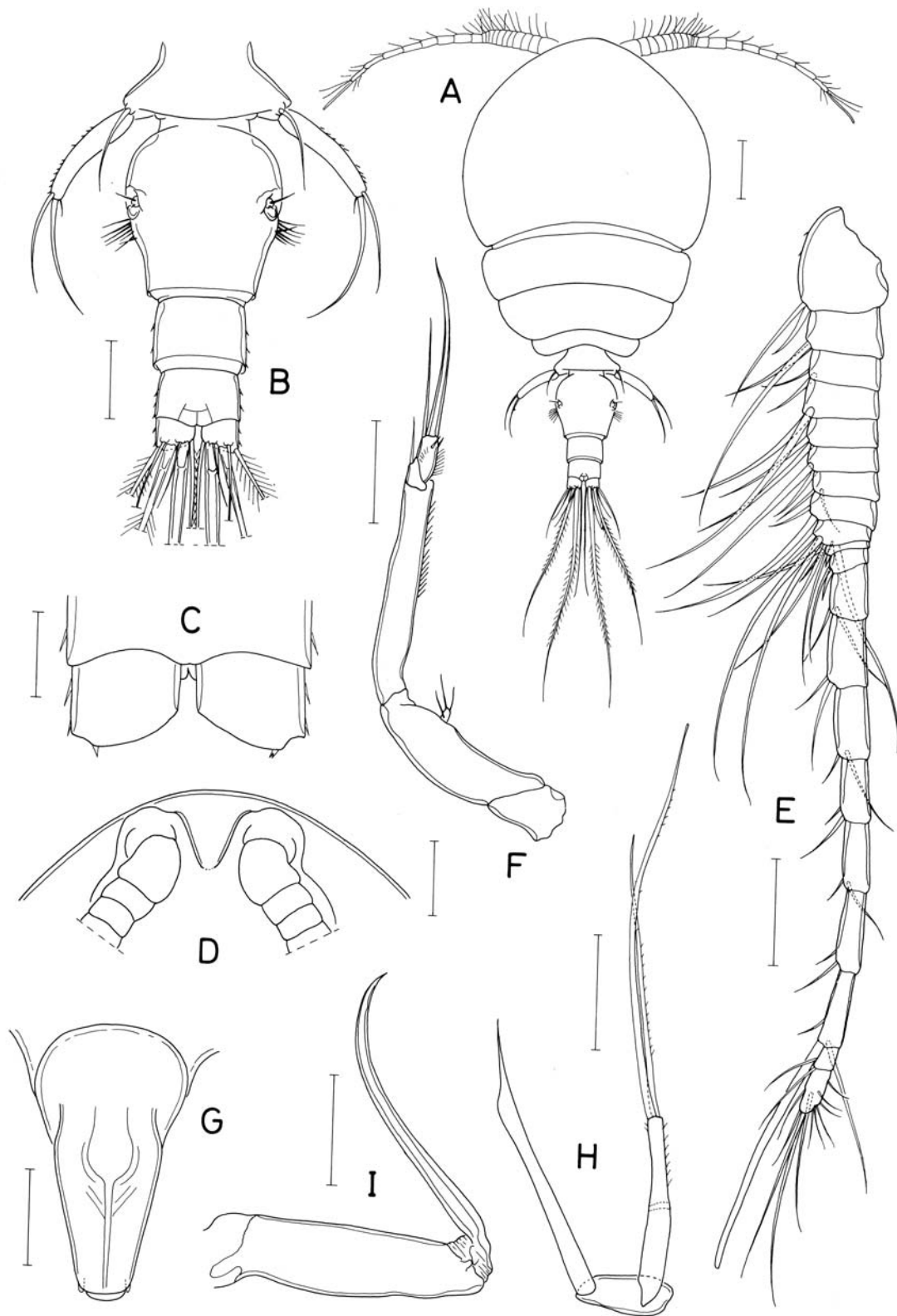


Fig. 1. *Asterocheres crinoidicola* Humes, female. A, habitus, dorsal; B, urosome, dorsal; C, caudal rami, ventral; D, rostral area, ventral; E, antennule; F, antenna; G, oral cone; H, mandible; I, maxilla. Scales: A, 0.1 mm; B, D-I, 0.05 mm; C, 0.02 mm.

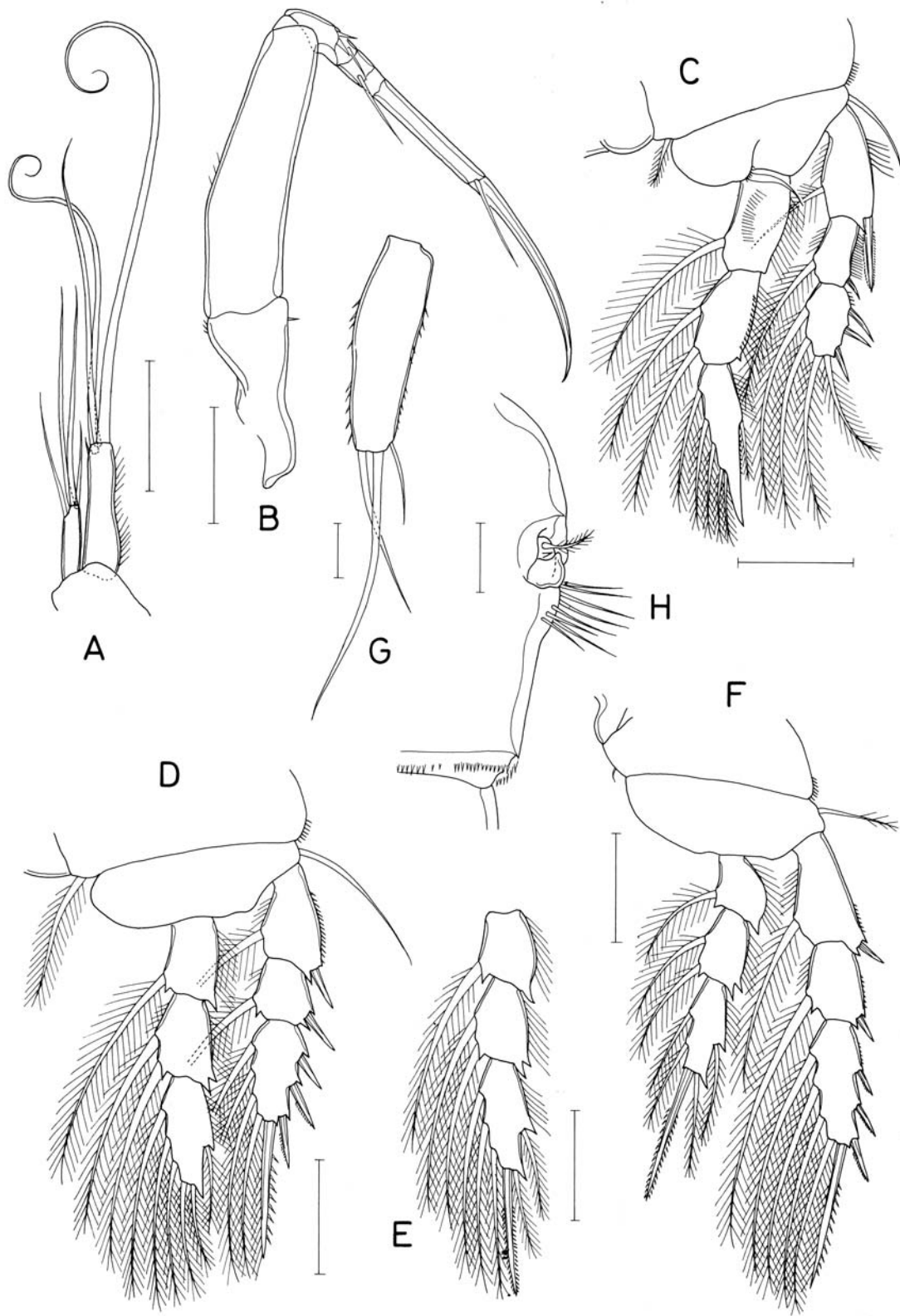


Fig. 2. *Asterocheres crinoidicola* Humes, female. A, maxillule; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, right lateral margin of genital double-somite, dorsal. Scales: A-F, 0.05 mm; G, H, 0.02 mm.

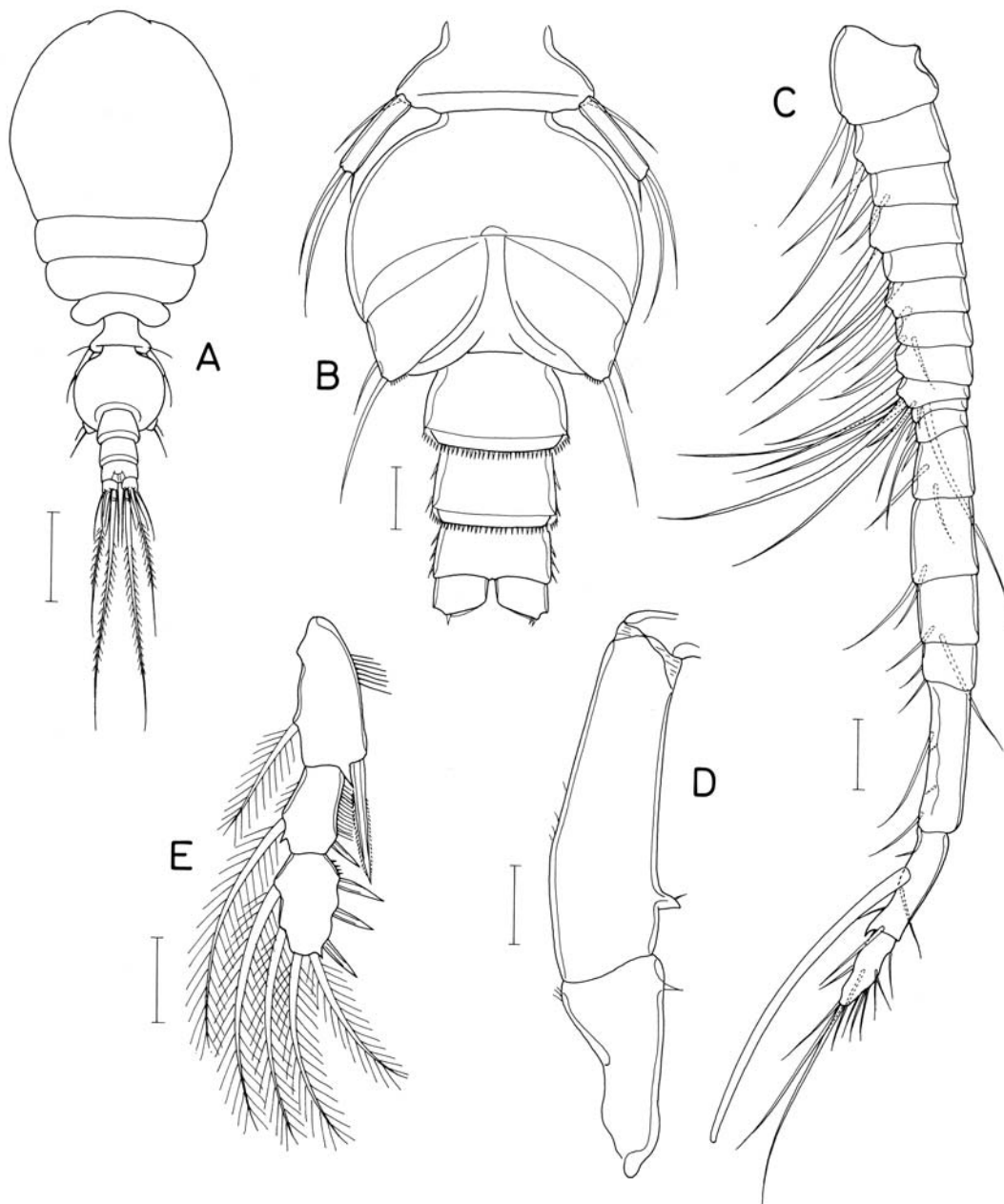


Fig. 3. *Asterocheres crinoidicola* Humes, male. A, habitus, dorsal; B, urosome, ventral; C, antennule; D, proximal part of maxilliped; E, endopod of leg 1. Scales: A, 0.1 mm; B-E, 0.02 mm.

distinctly 2-segmented, each segment 43 and 38 μm ; 2 terminal setae 174 and 123 μm , respectively. Maxillule (Fig. 2A) bilobed. Inner lobe 52 \times 14 μm ; distal half distinctly narrower than proximal half; distally with 2 minute and 3 large setae (latter 206, 136, and 121 μm , respectively). Outer lobe 28 \times 7 μm , its 4 distal setae 84, 84, 48, and 35 μm , respectively. Maxilla (Fig. 2I) 2-segmented and slender, with smooth distal claw. Maxilliped (Fig. 2B) slender and 6-seg-

mented, with armature formula 1, 0, 2, 1, 1, and 1+claw; second segment 125 \times 35 μm , with its distal 2/3 tapering; terminal segment and claw characteristically elongated; claw 97 μm long.

Legs 1-4 with 3-segmented rami. Third endopodal segment of leg 1 narrowed, with prolonged distal process; outer spine on first exopodal segment 33 μm long; inner seta on basis relatively small and naked. Inner seta on coxa of leg 4 vesti-

gial, hardly visible; terminal spine on endopod 64 μm long. Armature formula of legs 1-4 as follows:

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

Free segment of leg 5 (Fig. 2G) 78 \times 25 μm (ratio 3.12 : 1), with spinules on lateral margins and 3 distal setae (60, 102, and 30 μm from outer to inner). Leg 6 consisting of 1 plumose seta and 1 spinule in genital area (Fig. 2H).

Male. Body (Fig. 3A) similar in form to that of female. Mean body length 551 μm (535-566 μm), based on 10 specimens. Body length of dissected specimen 541 μm . Prosome 342 μm long. Cephalothorax 231 \times 249 μm . Urosome (Fig. 3B) 5-segmented. Fifth pedigerous somite 70 μm wide. Genital somite 80 \times 105 μm , subcircular in dorsal view. Three abdominal somites 35 \times 51, 27 \times 44, and 18 \times 42 μm , respectively. Caudal ramus 13 \times 18 μm .

Rostrum as in female. Antennule 285 μm and 18-segmented; armature formula of ninth, sixteenth, seventeenth, and last segments 8, 4, 2+aesthetasc, and 11; other segments with 2 setae each. Antenna as in female.

Oral cone, mandible, maxillule, and maxilla as in female. Second segment of maxilliped with beak-like proximal process bearing minute setule subapically (Fig. 3D).

Outer spine on first exopodal segment of leg 1 30 μm long and extending over the posterior border of second segment (Fig. 3E). Legs 2-4 as in female. Leg 5 similar in shape to that of female. Leg 6 represented by 2 very unequal setae on genital flap (Fig. 3B).

Remarks. In the original record of this species by Humes (2000), the type specimens were measured 0.89 mm (0.82-0.92 mm) long in the female and 0.63 mm (0.61-0.64 mm) in the male. In the present specimens the lengths are 755 μm (720-793 μm) in the female and 551 μm (535-566 μm) in the male. Despite of the size difference, the two samples belong to the same species considering to their sharing of the following features: the free segment of female leg 5 is elongated; the first endopodal segment of antenna is elongated; the inner lobe of the maxillule bears 3 large distal setae; the female genital-double somite bears 7 or 8 setules on the lateral margin; and the third endopodal segment of leg 1 bears a prolonged terminal process. The inner seta on the coxa of leg 4, which was not noticed by Humes (2000), is present, although it is vestigial. Some discrepancies are found between the original description and the specimens examined in the present study. Humes described that the female anten-

nule of type specimens was 19-segmented, with an aesthetasc on the penultimate segment but in the present specimens, it is 20-segmented, with an aesthetasc on the antepenultimate segment. Unlike the original description, in the present specimens the inner lobe of the maxillule bears 5 distal setae (3 setae in the original description), and the free segment of female leg 5 is 3.12 times as long as wide (recorded as 5.0 times in the original description). These discrepancies are thought to be artifacts.

***Asterocheres unioviger* n. sp. (Figs. 4, 5)**

Material examined. 76 ♀♀, 26 ♂♂ from *Eucidaris tribuloides* (Lamarck), off Lerner Marine Laboratory, Bimini, Bahamas, 29 May 1959, collected by A. G. Humes and R. U. Gooding. Holotype (♀), allotype (♂), and paratypes (73 ♀♀, 23 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 2 ♂♂) are retained in the collection of the author.

Other material examined. 6 ♀♀, 1 ♂ from *Eucidaris tribuloides* (Lamarck), from the west side of Cabo Rojo, Puerto Rico, at a depth of about 0.6 m, 24 August 1959, collected by A. G. Humes and R. U. Gooding; 25 ♀♀, 12 ♂♂ from the same species of sea urchin, at a depth of about 0.6 m, Drunken Man's Cay, Jamaica, 28 August 1959, collected by A. G. Humes and R. U. Gooding.

Female. Body (Fig. 4A) very small. Mean body length 396 μm (387-403 μm), based on 10 specimens. Body length of dissected specimen 398 μm . Maximum width 221 μm . Prosome 265 μm long. Cephalothorax 179 μm long and moderately expanded. Urosome (Fig. 4B) 4-segmented. Genital double-somite 54 \times 58 μm and posteriorly tapering, with about 12 minute spinules on lateral margin. Two abdominal somites 25 \times 35 and 25 \times 36 μm , respectively. Anal somite with 1 or 2 large transparent scales on inner side of postero-dorsal margin (Fig. 4B) and serrate posteroventral margin (Fig. 4C). Caudal ramus 12 \times 15 μm (0.8 : 1), with serrate posteroventral margin (Fig. 4C) and 6 setae. Egg sac (Fig. 4D) 144 \times 113 μm , containing a single egg.

Rostrum small, longer than wide and tapering (Fig. 4E). Antennule 134 μm long, 19-segmented, and gradually narrower distally; first segment with setules on anterior margin; terminal segment with trace of articulation; each segment with 2 setae, except for 7 on ninth, 2+aesthetasc on eighteenth, and 13 on last segments; all setae naked. Antenna (Fig. 4G) with small and unarmed coxa; basis gradually broadened distally and 37 \times 13 μm , with several tuft of minute spinules. Exopod about 4.7 \times 2.7 μm , with 2 distal and 1 lateral setae. Endopod 3-segmented; first segment 26 \times 8.7 μm and unarmed, with setules on distal part of outer

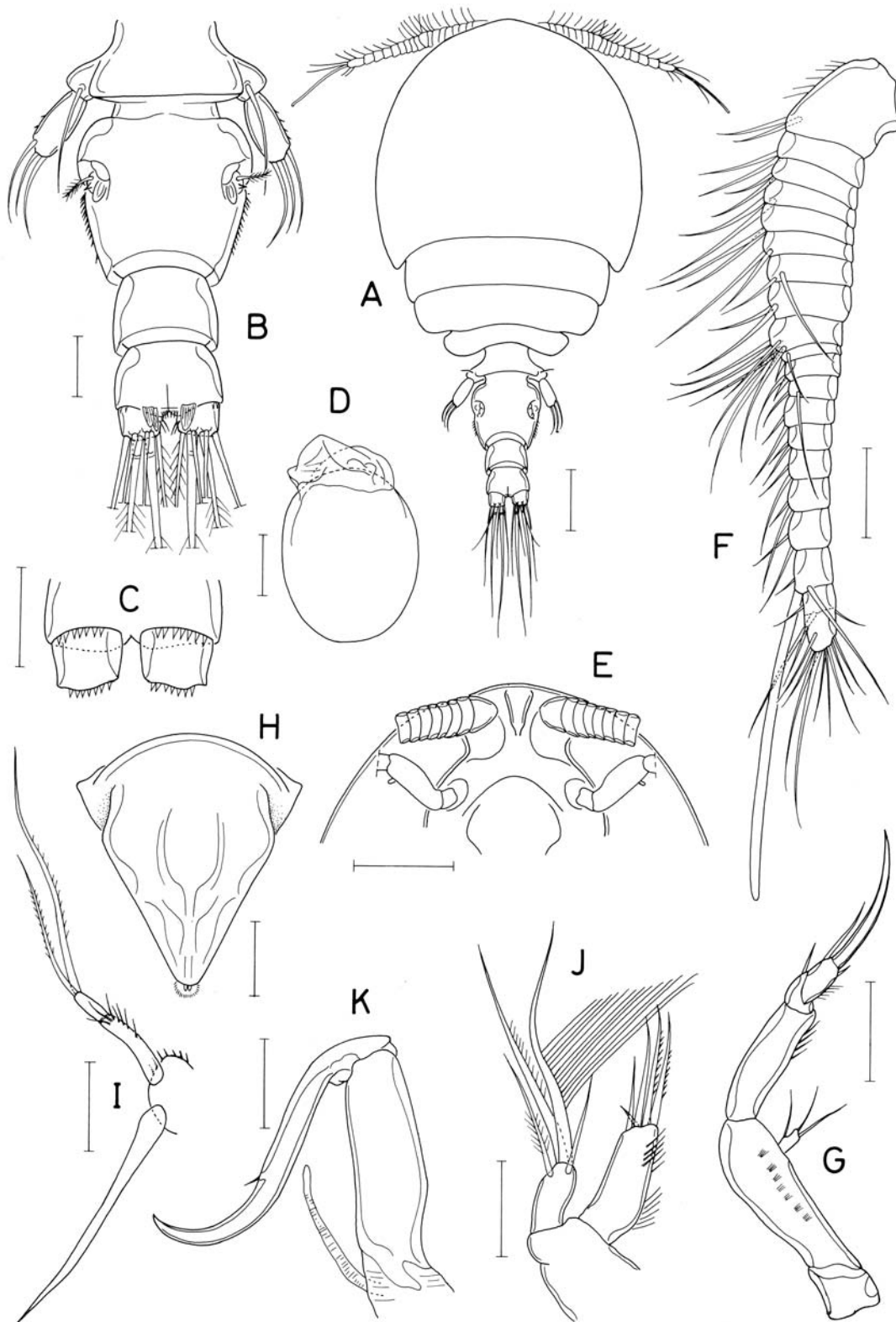


Fig. 4. *Asterocheres unioviger* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, caudal rami, ventral; D, egg sac; E, rostral area, ventral; F, antennule; G, antenna; H, oral cone; I, mandible; J, maxillule; K, maxilla. Scales: A, D, E, 0.05 mm; B, C, F-K, 0.02 mm.

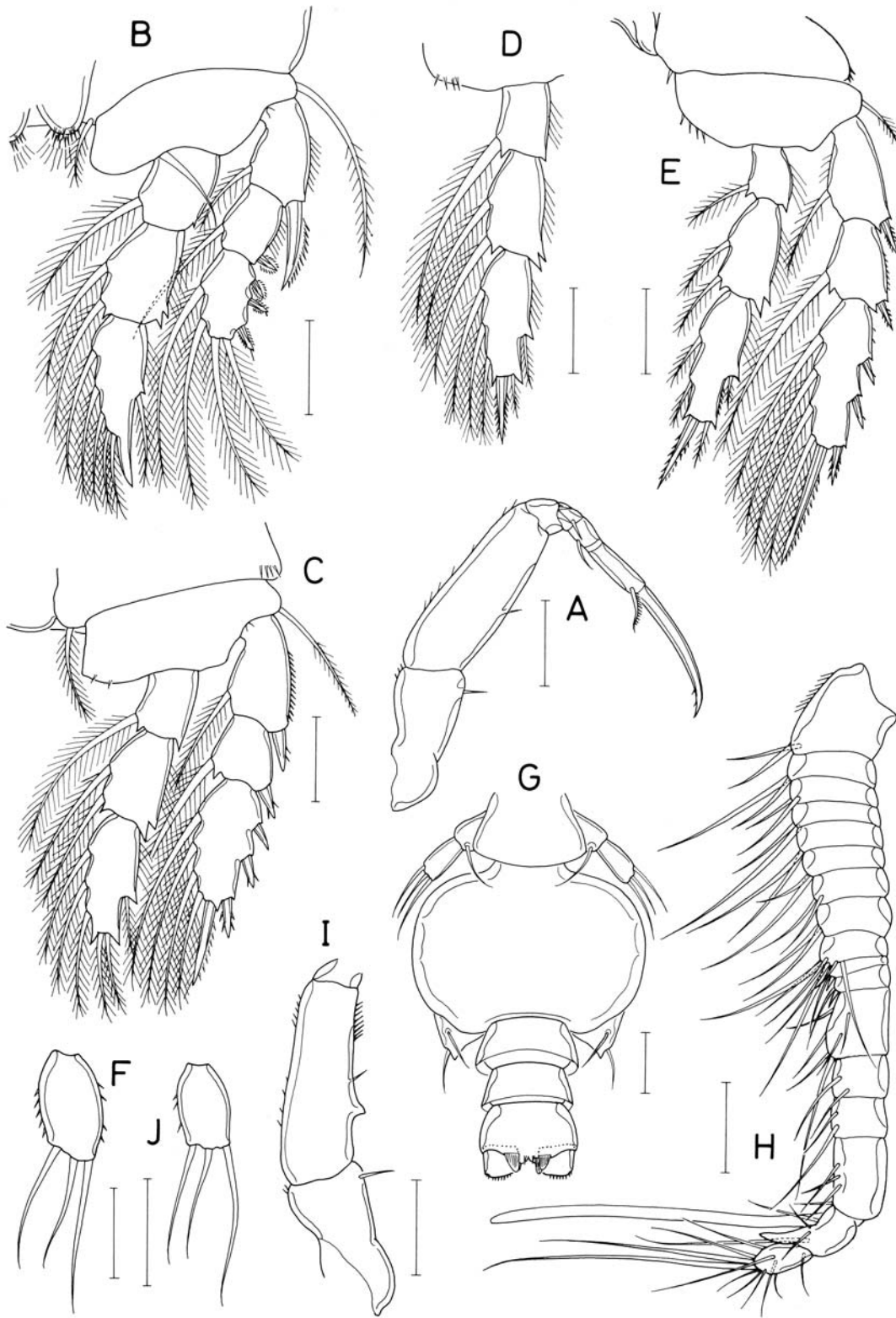


Fig. 5. *Asterocheres unioviger* n. sp. Female: A, maxilliped; B, leg 1; C, leg 2; D, endopod of leg 3; E, leg 4; F, free segment of leg 5. Male: G, urosome, dorsal; H, antennule; I, proximal part of maxilliped; J, free segment of leg 5. Scales: 0.02 mm for all.

margin; second segment with 1 inner seta; third segment with minute outer distal and larger inner distal setae; terminal claw 30 μm long and evenly curved.

Oral cone (Fig. 4H) 67 \times 47 μm , broad, flat, strongly tapering and extending to middle of maxillipedal insertions. Mandible (Fig. 4I) with stylet being 59 μm long. Mandibular palp 2-segmented; first segment 16 μm long and second 8 μm long; 2 terminal setae 57 and 35 μm , respectively. Maxillule (Fig. 4J) bilobed; inner lobe about 25 \times 11 μm , with 5 distal setae, 4 larger one of them 24, 26, 23, and 16 μm long; outer lobe 15 \times 8 μm , with 2 large (54 and 50 μm) and 2 smaller (28 and 21 μm) setae, largest characteristic in bearing row of long setules unilaterally. Maxilla (Fig. 4K) with proximal, aesthetasc-like element on proximal segment; distal claw with small setule on concave margin. Maxilliped (Fig. 5A) 6-segmented, with armature formula 1, 1, 2, 1, 1, and 1+claw; minute seta on second segment located in middle of inner margin.

Legs 1-4 with 3-segmented rami. Leg 1 (Fig. 5B) with prolonged distal process on third endopodal segment; outer spine on first exopodal segment 19 μm . Leg 2 (Fig. 5C) with angular inner distal corner of basis. Second endopodal segment of legs 1-4 with bicuspid outer distal process. Leg 4 (Fig. 5E) with rudimentary inner seta on coxa. Armature formula of legs 1-4 as follows:

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

Free segment of leg 5 (Fig. 5F) 25 \times 14 μm , with convex lateral margins bearing several spinules; 3 distal setae naked and 30, 27, and 34 μm , respectively, from outer to inner. Leg 6 represented by 1 plumose seta and 1 spinule in genital area (Fig. 4B).

Male. Body narrower than that of female. Mean body length 349 μm (335-363 μm), based on 10 specimens. Urosome (Fig. 5G) 5-segmented. Genital somite 50 \times 78 μm , with round margins. Three abdominal somites 15 \times 34, 13 \times 31, and 20 \times 32 μm , respectively. Caudal ramus 10 \times 12 μm .

Rostrum as in female. Antennule (Fig. 5H) 146 μm long and 17-segmented; number of setae 7 on ninth, 6 on twelfth, 5 on fifteenth, 4+aesthetasc on sixteenth, 11 on last, and 2 on each of the other segments. Antenna as in female.

Oral cone, mandible, maxillule, and maxilla as in female. Maxilliped with second segment bearing proximal process and subdistal spinules on inner margin (Fig. 5I).

Legs 1-4 as in female. Free segment of leg 5 (Fig. 5J) 16

\times 9 μm . Leg 6 represented by 2 setae on genital flap.

Etymology. The specific name *unioviger* is derived from Latin words *unicus* (one, only), *ovum* (an egg), and *gero* (to carry). It alludes to the presence of only a single egg in the egg sac of the new species.

Remarks. The closest relative of *Asterocheres unioviger* n. sp. is apparently *A. pilosus* Kim, 2004 which is associated with the sea urchin *Eucidaris thouarsii* on the Pacific coast of Panama (Kim, 2004a). These copepod relatives share the following important features: the antennule is 19-segmented in the female; one of the apical setae on the outer lobe of maxillule is large and unilaterally plumose with long hairy setules; the maxilliped bears 1 small setule on the inner margin of the second segment; and the third endopodal segment of leg 1 bears a distal elongation. It is presumed that *A. unioviger* and *A. pilosus* have diverged since the formation of the Panama isthmus (about 300 million years ago) from a common ancestor which was probably associated with a sea urchin ancestral to both *Eucidaris tribuloides* living in the West Indies and *E. thouarsii* living on the Pacific coast of Panama. Despite the close similarity between the two copepod species, they can be distinguished from each other on the basis of the following differences: (1) the body length of *A. pilosus* is 458-500 μm in the female and 392-435 μm in the male, compared to 387-403 μm in the female and 335-363 μm in the male of *A. unioviger*; (2) the first antennular segment of *A. pilosus* is armed with 1 plumose and 1 naked setae (versus 2 naked setae in *A. unioviger*); (3) there is no inner seta on the coxa of leg 1 in *A. pilosus* (present in *A. unioviger*); (4) the inner distal corner of the basis of leg 2 is rounded in *A. pilosus*, but angular in *A. unioviger*.

Asterocheres trisetatus n. sp. (Figs. 6-8)

Material examined. 53 ♀♀, 8 ♂♂ from washings of an unidentified sponge, off Lerner Marine Laboratory, Bimini, Bahamas, 29 May 1959, collected by A. G. Humes and R. U. Gooding. Holotype (♀), allotype (♂), and paratypes (50 ♀♀, 6 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 1 ♂) are retained in the collection of the author.

Female. Body (Fig. 6A) small. Mean body length 592 μm (550-631 μm), based on 10 specimens. Body length of dissected specimen 588 μm . Prosome ovoid and 394 \times 321 μm . Cephalothorax 265 μm long, with pointed posterolateral corners. Urosome (Fig. 6B) 4-segmented. Fifth pedigerous somite 94 μm wide. Genital double-somite 85 \times 121 μm (0.70 : 1), strongly expanded laterally, rhomboidal, widest at 47% region, with about 11 small setules and 2 scales on lateral margin posterior to genital area. Two free abdominal

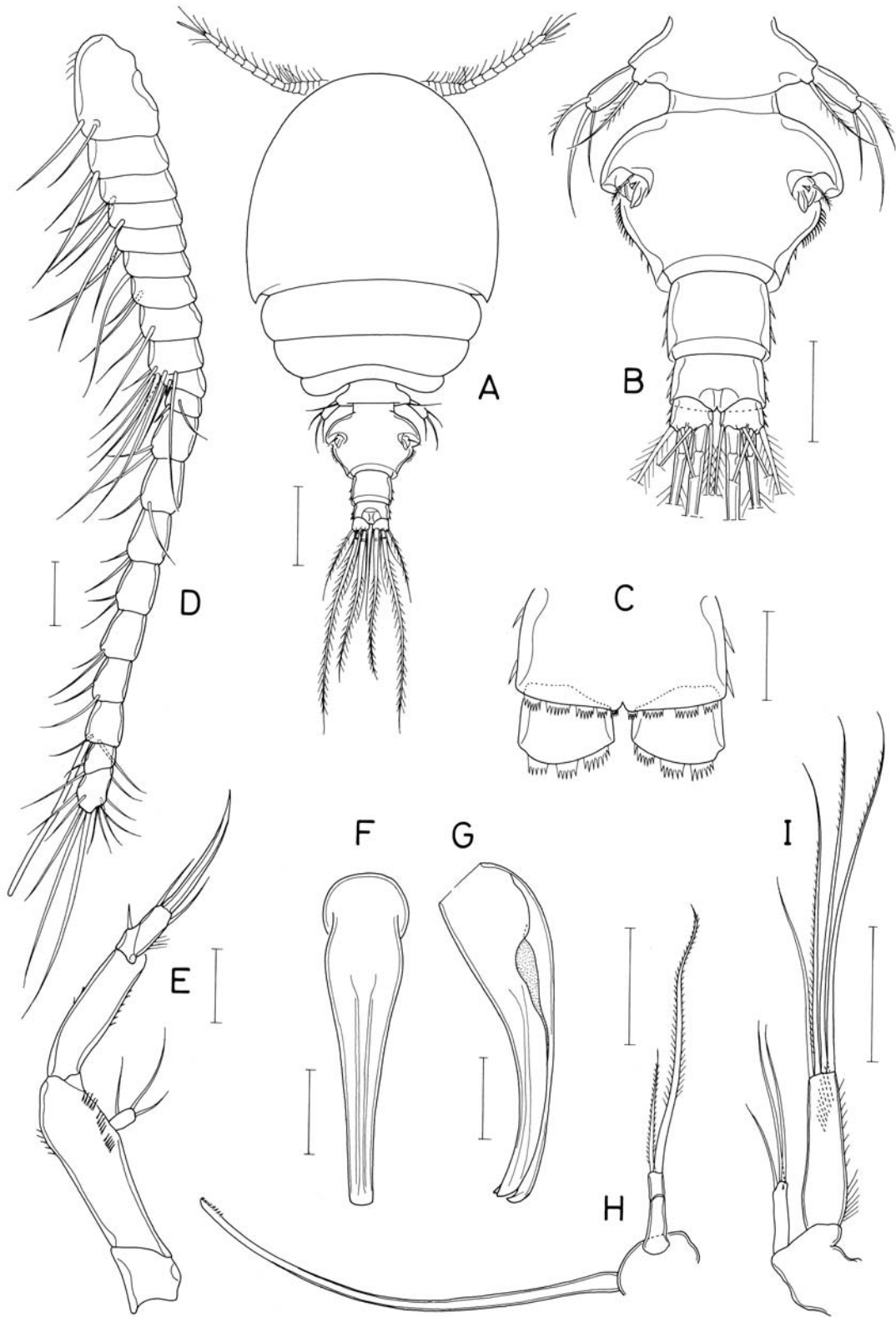


Fig. 6. *Asterocheres trisetatus* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, caudal rami, ventral; D, antennule; E, antenna; F, oral siphon, ventral; G, oral siphon, lateral; H, mandible; I, maxillule. Scales: A, 0.1 mm; B, F-I, 0.05 mm; C, D, E, 0.02 mm.

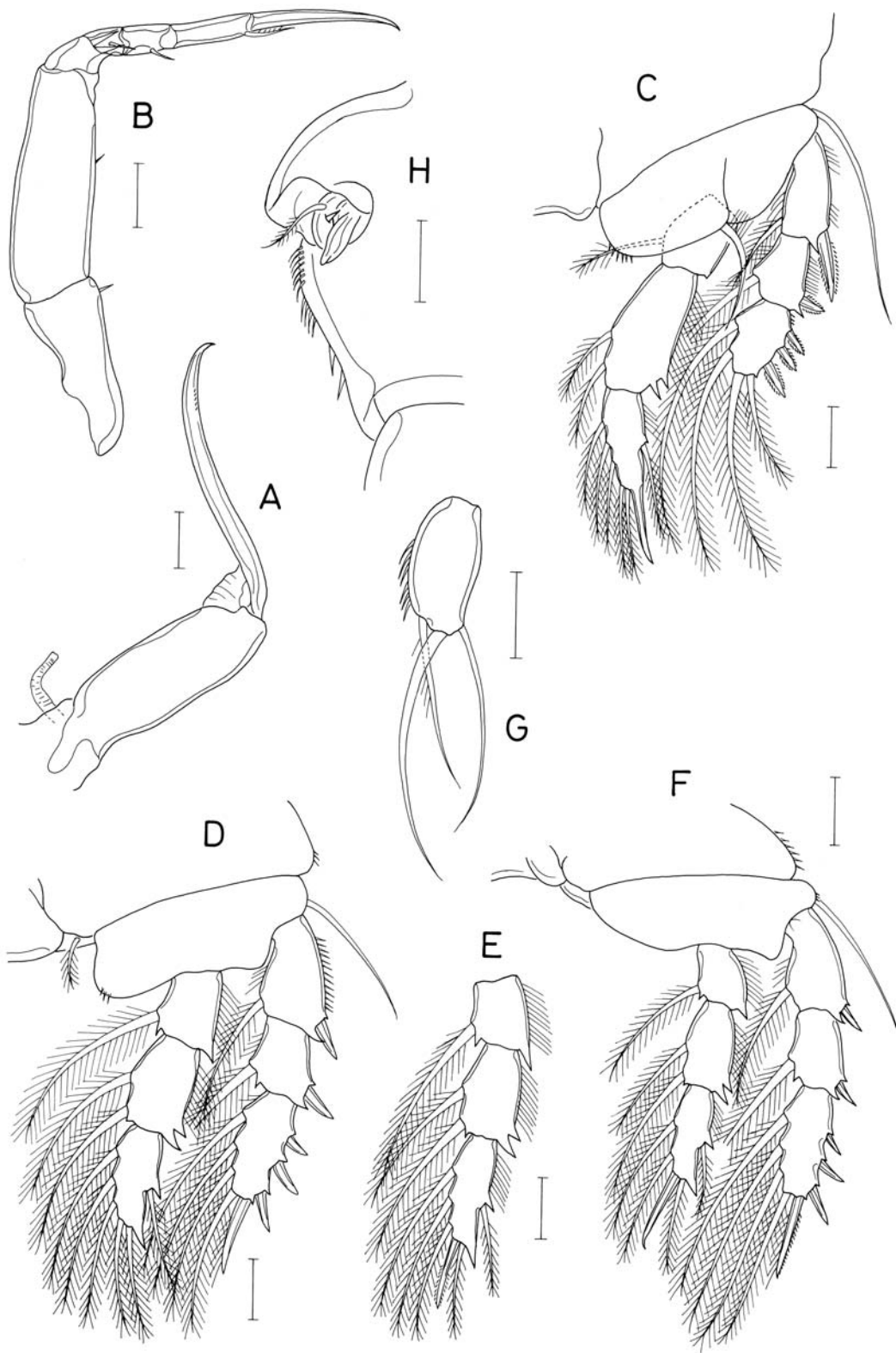


Fig. 7. *Asterocheres trisetatus* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, left genital area, dorsal. Scales: 0.02 mm for all.

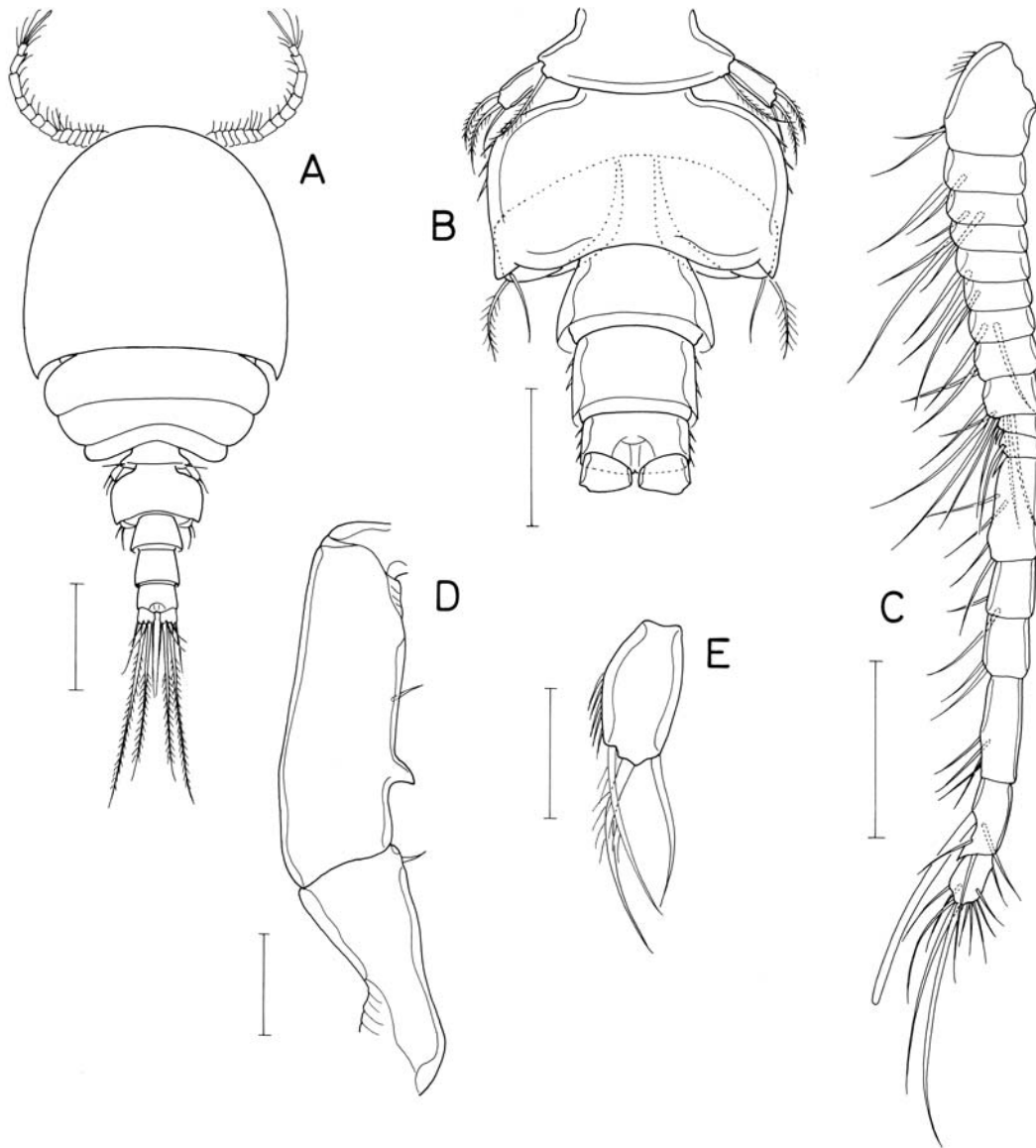


Fig. 8. *Asterocheres trisetatus* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, proximal segments of maxilliped; E, free segment of leg 5. Scales: A, 0.1 mm; B, C, 0.05 mm; D, E, 0.02 mm.

somites 42×52 and $29 \times 48 \mu\text{m}$, respectively. Anal somite and caudal rami with serrate scales on posteroventral margin (Fig. 6C). Caudal ramus $18 \times 21 \mu\text{m}$ ($0.86 : 1$), with 6 setae; outer one of two median terminal setae $250 \mu\text{m}$, characteristically longer than inner one ($191 \mu\text{m}$) (Fig. 6A).

Rostrum as broad ridge, without posterior margin. Antennule (Fig. 6D) $254 \mu\text{m}$ long and 20-segmented; ninth segment with 7 setae, eighteenth with 2 setae+aesthetasc, and last with 11 setae; other segments with 2 setae each. Antenna (Fig. 6E) with small coxa; basis $54 \times 18 \mu\text{m}$, with 3 patches of minute spinules near base of exopod. Exopod 1-segment-

ed, $7 \times 4 \mu\text{m}$, with 2 distal and 1 lateral setae. Endopod 3-segmented, with armature formula 0, 1, 2+claw; first segment $41 \times 12 \mu\text{m}$; terminal claw $38 \mu\text{m}$.

Oral cone (Fig. 6F, G) $200 \times 47 \mu\text{m}$, weakly tapering, curved inwardly in lateral view, and reaching insertions of maxillipeds. Mandible (Fig. 6H) with long stylet of $191 \mu\text{m}$ long and several denticles subapically. Mandibular palp 2-segmented; proximal and distal segments each 25 and $10 \mu\text{m}$; 2 distal setae 118 and $53 \mu\text{m}$. Maxillule (Fig. 6I) bilobed. Inner lobe $56 \times 16 \mu\text{m}$, slightly tapering, armed distally with 4 slender setae (136, 132, 118, and $76 \mu\text{m}$, respectively).

Outer lobe $25 \times 6 \mu\text{m}$, with 3 distal setae (61, 59, and $35 \mu\text{m}$, respectively). Maxilla (Fig. 7A) with proximal, aesthetasc-like element on proximal segment; distal claw slender and as long as proximal segment. Maxilliped (Fig. 7B) 6-segmented, with armature formula 1, 1, 2, 1, 1, and 1+claw; second segment $73 \times 25 \mu\text{m}$, with vestigial seta on inner margin; terminal claw $47 \mu\text{m}$.

Legs 1-4 with 3-segmented rami (Fig. 7C-F) and bicuspid outer distal process on second endopodal segment. Legs 1 and 4 without inner seta on coxa. Endopod of leg 1 distinctly longer than exopod, with prolonged, spiniform distal process on third segment. Armature formula of legs 1-4 as follows:

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

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

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

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

Leg 5 consisting of dorsolateral seta on fifth pedigerous somite and free segment; free segment (Fig. 7G) $32 \times 16 \mu\text{m}$, with slightly convex lateral margins, scales on outer margin, 2 naked distal setae (larger one $62 \mu\text{m}$) and 1 subdistal, weakly plumose seta. Leg 6 represented by 1 plumose seta and 1 small spinule in genital area (Fig. 7H).

Male. Body (Fig. 8A) similar to that of female. Mean body length $485 \mu\text{m}$ ($454\text{--}512 \mu\text{m}$), based on 10 specimens. Body length of dissected specimen $475 \mu\text{m}$. Urosome (Fig. 8B) 5-segmented. Fifth pedigerous somite $72 \mu\text{m}$ wide. Genital somite $56 \times 107 \mu\text{m}$, much wider than long, and nearly quadrangular. Three abdominal somites 30×58 , 32×46 , and $22 \times 40 \mu\text{m}$, respectively. Caudal ramus $15 \times 19 \mu\text{m}$.

Rostrum and antenna as in female. Antennule (Fig. 8C) $248 \mu\text{m}$ and 17-segmented; ninth segment with 7 setae, twelfth and fifteenth with 4 setae each, sixteenth with 3 setae+aesthetasc, and last with 11 setae, other segments with 2 setae each.

Maxilliped with prominent proximal process on second segment (Fig. 8D). Other mouth organs as in female.

Legs 1-4 as in female. Free segment of leg 5 (Fig. 8E) similar in shape to that of female, $22 \times 12 \mu\text{m}$. Leg 6 represented by 1 plumose and 1 naked setae on genital flap (Fig. 8B).

Etymology. The specific name *trisetatus* is derived from the Latin *tris* (three) and *saeta* (seta), alluding to the presence of only three distal setae on the outer lobe of maxillule.

Remarks. In three known species of *Asterocheres*, leg 1 bears, like *A. trisetatus* n. sp., a distal prolongation on the third endopodal segment. They may be called “*crinoidicola* group” which consists of *A. crinoidicola* Humes, 2000, *A. pilosus* Kim, 2004, *A. unioviger* above, and the new species.

Asterocheres trisetatus n. sp. is distinguished from those three species and probably all congeners by the reduced inner median terminal seta on caudal ramus, which is shorter than the nearby outer median terminal seta, and by the absence of an inner seta on the coxa of leg 1. The possession of only 4 distal setae (loss of one small seta) on the inner lobe and 3 setae (loss of one small seta) on the outer lobe of maxillule may also be a remarkable trait of the new species.

It is notable that the body form of *A. trisetatus* is very similar to that of *Gomumucheres angularis* Humes, 1996 known from the Moluccas (Humes, 1996b). But this similarity is superficial, because the two species show fundamental differences in leg morphology.

Asterocheres bahamensis n. sp. (Figs. 9-11)

Material examined. 33 ♀♀, 5 ♂♂ from washings of an unidentified sponge, off Lerner Marine Laboratory, Bimini, Bahamas, 29 May 1959, collected by A. G. Humes and R. U. Gooding. Holotype (♀), allotype (♂), and paratypes (30 ♀♀, 3 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 1 ♂) are retained in the collection of the author.

Other material examined. 110 ♀♀, 20 ♂♂ from washings of a sponge, off Lerner Marine Laboratory, Bimini, Bahamas, 29 May 1959, collected by A. G. Humes and R. U. Gooding.

Female. Body (Fig. 9A) with broad, flat prosome and small urosome. Mean body length $641 \mu\text{m}$ ($604\text{--}663 \mu\text{m}$), based on 10 specimens. Body length of dissected specimen $649 \mu\text{m}$, and maximum width $435 \mu\text{m}$. Prosome $467 \mu\text{m}$ long. Epimera of second and third pedigerous somites with membrane along the lateral margins. Third pedigerous somite with strongly concave posterior margin. Urosome (Fig. 9B) 4-segmented. Genital double-somite $77 \times 115 \mu\text{m}$, strongly expanded laterally, with short and narrower posterior part, 6 lateral setules (3 small and 3 large), followed by 2 patches of spinules (6 and 5 spinules) on lateral margin posterior to genital area (Figs. 9B, 10H); genital area located midway of somite. Two free abdominal somites 25×53 and $35 \times 50 \mu\text{m}$, respectively. Anal somite with serrate posteroventral margin. Caudal ramus (Fig. 37C) $20 \times 22 \mu\text{m}$, with 6 setae, and serrate posteroventral margin.

Rostrum strongly tapering and forming short and narrow posterior ridge (Fig. 9D). Antennule (Fig. 9E) $285 \mu\text{m}$ long and 19-segmented; armature formula of second, ninth, seventeenth, and last segments 4, 7, 2+aesthetasc, and 11; other segments with 2 setae; second segment with vestige of articulation on anterior side. Antenna (Fig. 9F) with naked coxa; basis $61 \times 18 \mu\text{m}$, with row of spinules near base of exopod. Exopod $8 \times 4 \mu\text{m}$, with 2 distal and 1 lateral setae.

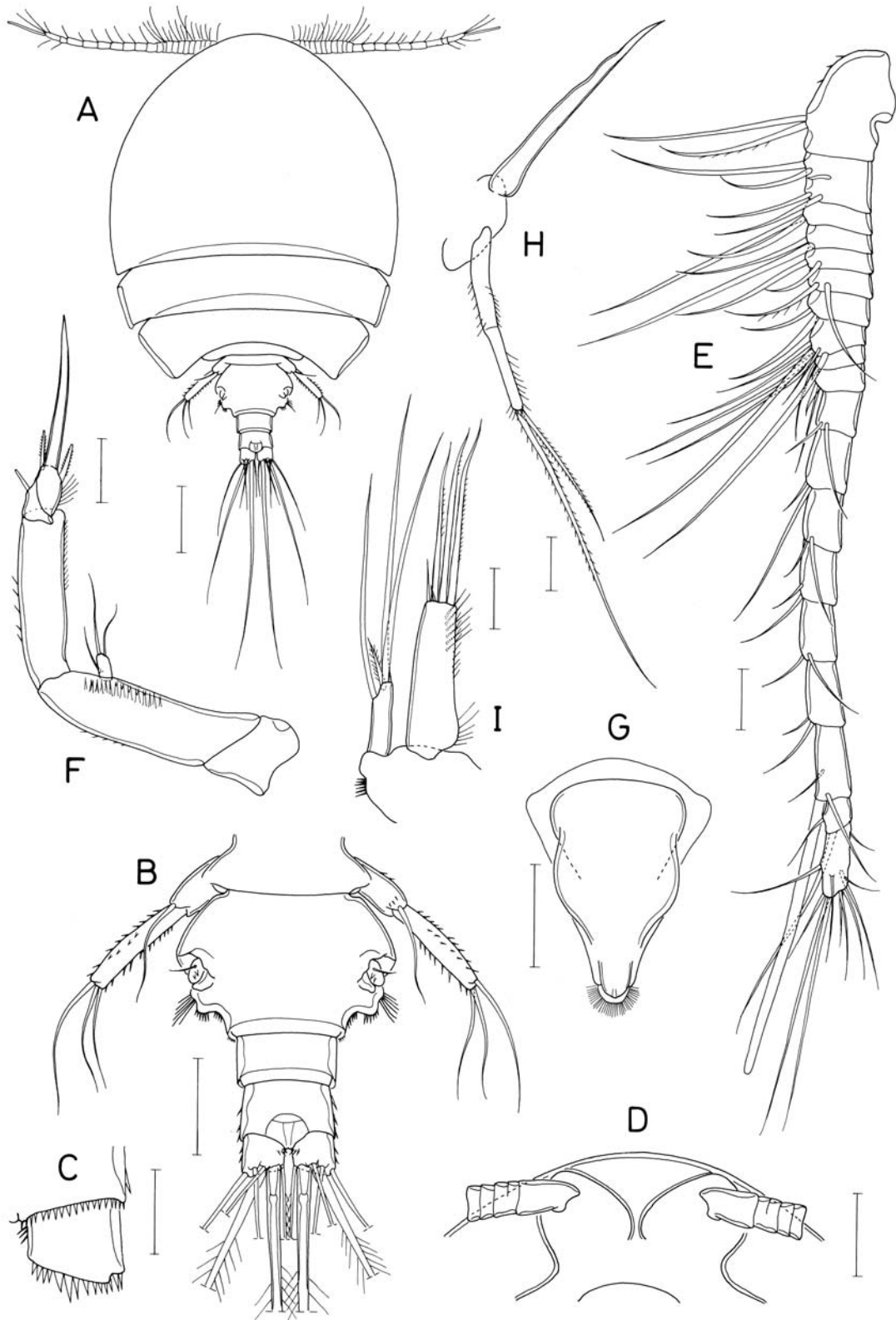


Fig. 9. *Asterocheres bahamensis* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, left caudal ramus, ventral; D, rostral area, ventral; E, antennule; F, antenna; G, oral cone; H, mandible; I, maxillule. Scales: A, 0.1 mm; B, D, 0.05 mm; C, E-I, 0.02 mm.

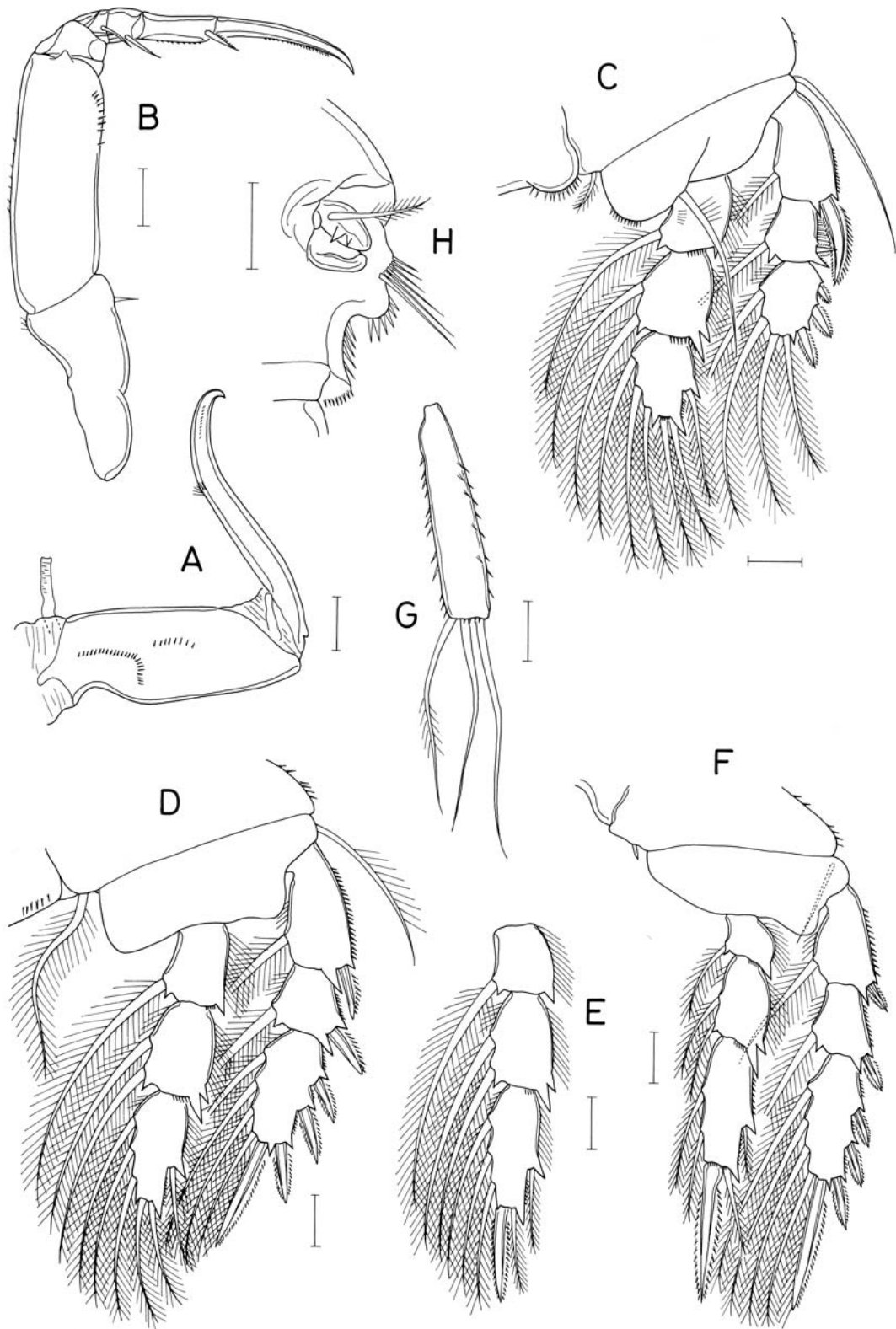


Fig. 10. *Asterocheres bahamensis* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, right genital area, dorsal. Scales: 0.02 mm for all.

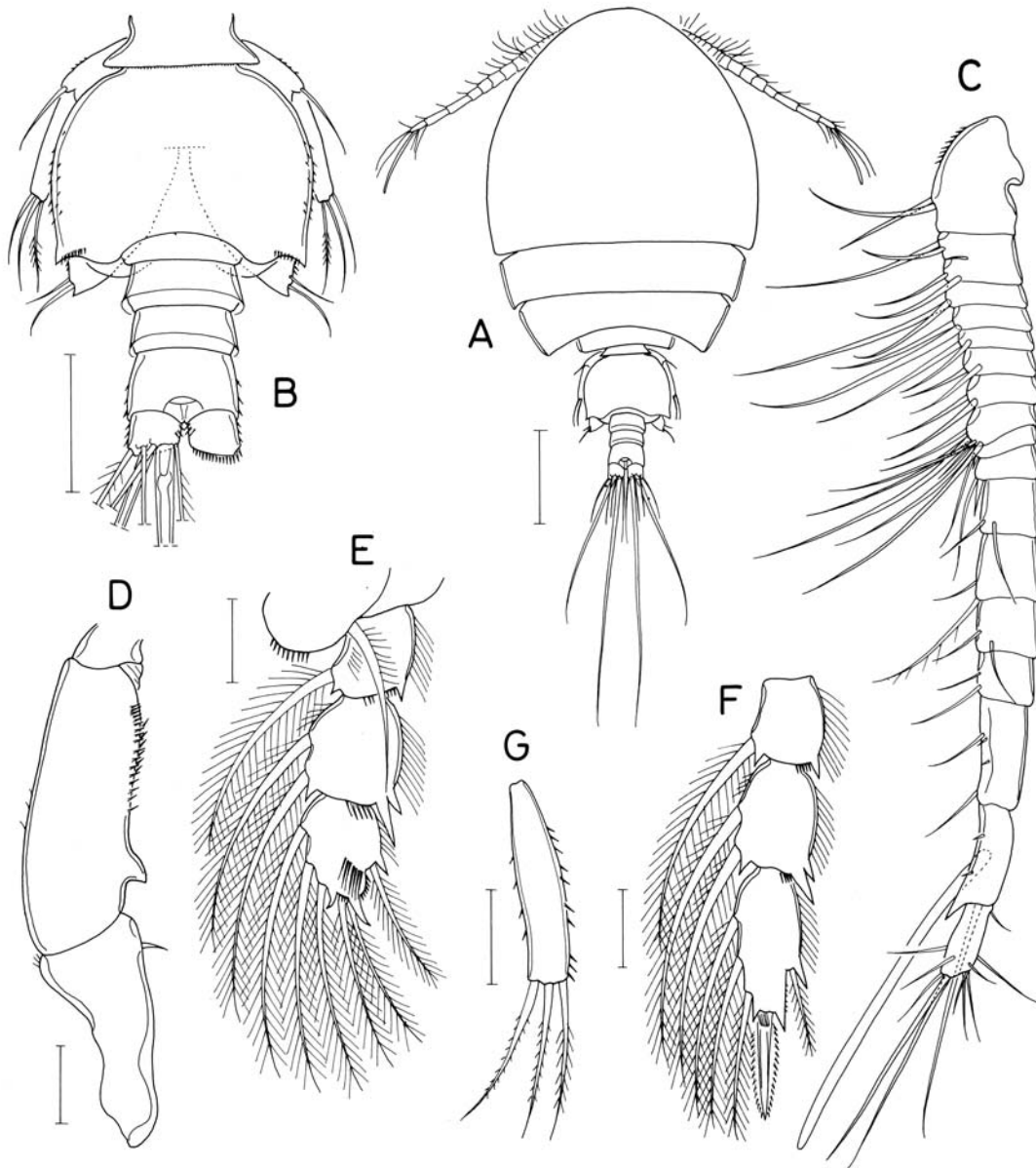


Fig. 11. *Asterocheres bahamensis* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, proximal segments of maxilliped; E, endopod of leg 1; F, endopod of leg 3; G, free segment of leg 5. Scales: A, 0.1 mm; B, 0.05 mm; C-G, 0.02 mm.

Endopod 3-segmented; first segment $53 \times 15 \mu\text{m}$, with fine spinules on margins; second and third segment with 1 and 2 blunt setae, respectively; terminal claw $49 \mu\text{m}$, spiniform, and shorter than first endopodal segment.

Oral cone with proximal constriction, strongly tapering in distal half, $111 \times 67 \mu\text{m}$, and reaching anterior margin of maxillipedal insertions. Mandible (Fig. 9H) consisting of stylet and palp; stylet $90 \mu\text{m}$ long and apically pointed, with-

out denticles. Mandibular palp 2-segmented, each segment 38 and $32 \mu\text{m}$; 2 terminal setae 118 and $60 \mu\text{m}$, respectively. Maxillule (Fig. 9I) bilobed. Inner lobe $52 \times 18 \mu\text{m}$, distally with 2 small and 3 larger setae (latters 64 , 60 , and $54 \mu\text{m}$). Outer lobe $25 \times 7 \mu\text{m}$, distally with 4 setae (87 , 97 , 75 , and $18 \mu\text{m}$). Maxilla (Fig. 10A) 2-segmented; proximal segment with tubular proximal element and 2 rows of minute spinules; disal claw with tuft of setules near $3/5$ region of convex side.

Maxilliped (Fig. 10B) 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; second segment $88 \times 32 \mu\text{m}$, with spinules on outer margin and distal part of inner margin; terminal claw $53 \mu\text{m}$, with fine spinules along concave margin.

Legs 1-3 with 3-segmented rami and bicuspid outer distal process on second endopodal segment (Fig. 10C-F). Outer spine on first exopodal segment of leg 1 $34 \mu\text{m}$ long. Leg 4 with rudimentary inner seta on coxa; terminal spine of endopod $56 \mu\text{m}$. Armature formula of legs 1-4 as follows:

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

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

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

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

Leg 5 2-segmented; first segment distinct but not articulated from somite, with 1 dorsal seta; free segment (Fig. 10G) $73 \times 16 \mu\text{m}$ (4.56 : 1), gradually broadened distally, with spinules on all margins and 3 distal setae (82, 72, and $68 \mu\text{m}$ from outer to inner). Leg 6 probably represented by 1 plumose seta and 2 small spinules in genital area (Fig. 10H).

Male. Body (Fig. 11A) narrower than that of female. Mean body length $527 \mu\text{m}$ (520-535 μm), based on 5 specimens. Prosome $371 \mu\text{m}$ long. Cephalothorax $257 \times 298 \mu\text{m}$. Urosome (Fig. 11B) 5-segmented. Genital somite $71 \times 96 \mu\text{m}$, with pointed posterolateral corners and spinules on lateral margins. Three abdominal somites 17×45 , 15×40 , and $27 \times 40 \mu\text{m}$, respectively. Caudal ramus $17 \times 18 \mu\text{m}$.

Antennule (Fig. 11C) $248 \mu\text{m}$ long and 17-segmented; armature formula of second, ninth, fifteenth, sixteenth, and last segments 4, 7, 4, 3+aesthetasc, and 11, respectively. Rostrum and antenna as in female.

Maxilliped with proximal process on second segment (Fig. 11D). Other mouth organs as in female.

Endopod of leg 1 (Fig. 11E) with oblique row of setules near base of outer seta on third segment. Third endopodal segment of leg 3 with armature formula 1,I,3 (Fig. 11F), lacking outer distal seta but with small pecten at base of distal spine. Legs 2 and 4 as in female.

Free segment of leg 5 (Fig. 11G) $44 \times 9 \mu\text{m}$; three distal setae plumose and identical in length ($34 \mu\text{m}$). Leg 6 represented by 2 setae on genital flap (Fig. 11B).

Etymology. The specific name *bahamensis* is derived from the geographical name Bahamas where the type specimens were found.

Remarks. The basal number of segments of female antennule in *Asterocheres* is 21. The reduction of antennular segments occurs mainly in distal part. In many previous descriptions where the female antennule is described as 19-

or 20-segmented, the tenth segment was frequently overlooked due to its shortness or obscure delimitation. In *Asterocheres bahamensis* n. sp. the female antennule is in reality 19-segmented due to the fusions of segments between the original second and third and between two terminal segments. Thirteen species of *Asterocheres* are recorded to have 19-segmented female antennules. Of these, only in two species the free segment of leg 5 is elongated, four times or more as long as wide. They are *A. eniwetakensis* Humes 1997 and *A. serrulatus* (Humes, 1996). Although Humes (2000) recorded *Asterocheres crinoidicola* Humes, 2000 as it had similar traits, a re-examination of newly obtained specimens showed that the female antennule is 20-segmented and the free segment of leg 5 is 3.12 times longer than wide, as redescribed in this paper. *Asterocheres eniwetakensis* and *A. serrulatus* show the following differences from the new species.

In *A. eniwetakensis* the body is narrower, the genital double-somite and caudal rami are distinctly longer than wide, the mandibular palp (including its distal setae) is nearly as long as the stylet, legs 1-4 reveal no sexual dimorphism, and leg 4 bears a plumose inner coxal seta.

In *A. serrulatus* the cephalothorax is distinctly wider than the metasomites, the second endopodal segment of leg 1 bears an unicuspid outer distal process, leg 4 bears a plumose inner seta on the coxa, the caudal ramus is ornamented with a large, triangular process on the posteroventral margin, and the maxillule bears a very small outer lobe.

Other conspicuous features of *A. bahamensis* may be (1) the maxillule is armed with 3 large and 2 small setae on the inner lobe; (2) the lateral margin of the genital double-somite is ornamented with 6 unequal setules and posteriorly 2 groups of 5 or 6 spinules; (3) legs 1 and 3 reveal sexual dimorphism, the third endopodal segment of leg 3, in pariticular, exhibits different armature with sexes.

Asterocheres tricuspis n. sp. (Figs. 12-14)

Material examined. 14 ♀♀, 8 ♂♂ from a gray sponge, at the depth of 3 m, Six Men's Bay, Barbados, 8 July 1959, collected by A. G. Humes and R. U. Gooding. Holotype (♀), allotype (♂), and paratypes (11 ♀♀, 5 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 2 ♂♂) are retained in the collection of the author.

Female. Body (Fig. 12A) with very broad prosome and small urosome. Mean body length $691 \mu\text{m}$ (661-708 μm), based on 10 specimens. Body length of dissected specimen $706 \mu\text{m}$, and maximum width $518 \mu\text{m}$. Prosome flat, $535 \mu\text{m}$ long, and consisting of cephalothorax and second to fourth pedigerous somite. Cephalothorax $355 \mu\text{m}$ long, with pointed

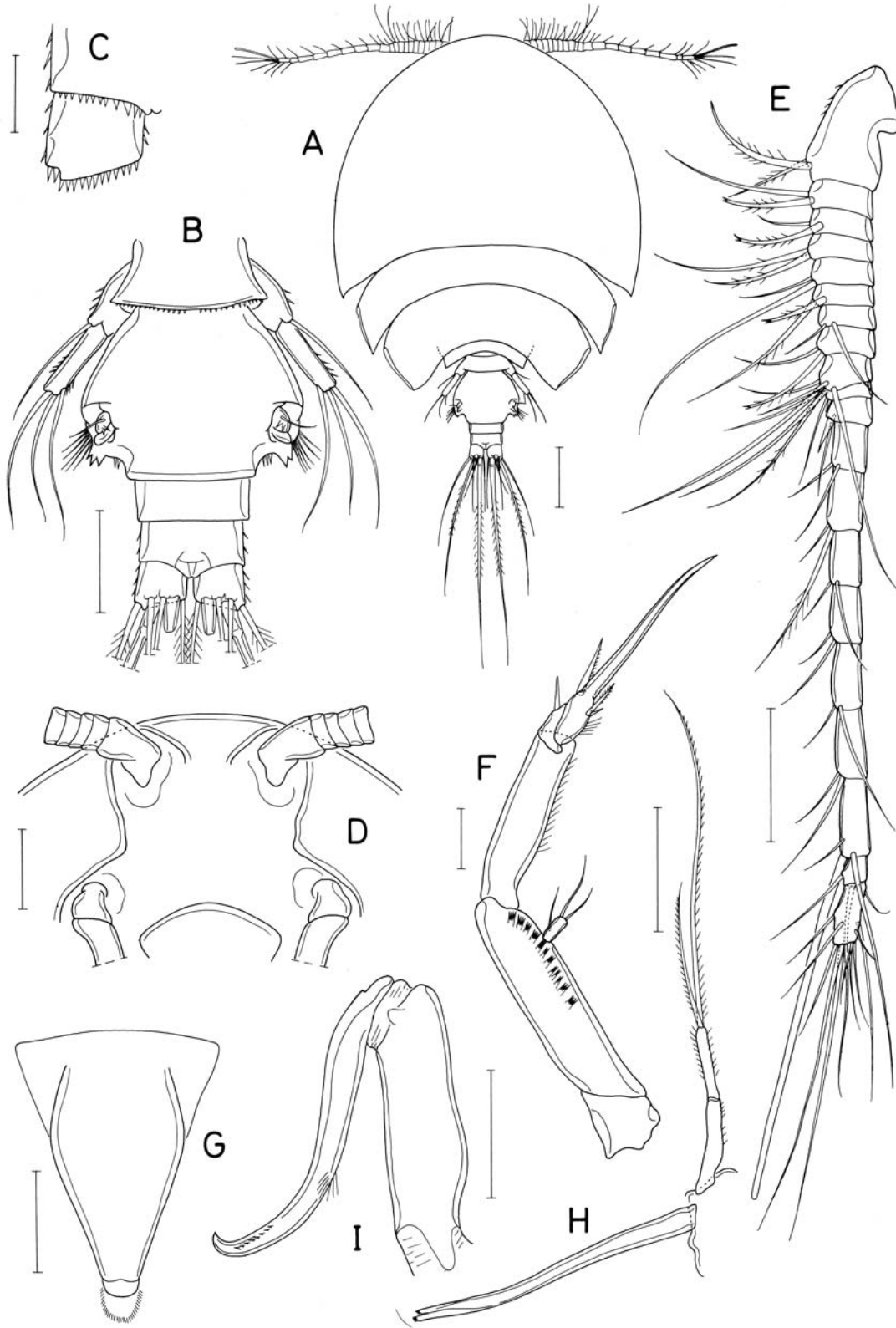


Fig. 12. *Asterocheres tricuspis* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, right caudal ramus, ventral; D, rostral area, ventral; E, antennule; F, antenna; G, oral cone; H, mandible; I, maxilla. Scales: A, 0.1 mm; B, D, E, G-I, 0.05 mm; C, F, 0.02 mm.

posterolateral corners. Epimeral portion of second and third pedigerous somites curved backwards; lateral margin of both somites marginated with narrow membrane. Second pedigerous somite distinctly shorter than third, with pointed posterolateral corners. Fourth pedigerous somite markedly small. Urosome (Fig. 12B) 4-segmented. Fifth pedigerous somite 76 μm wide, with pointed posterolateral corners. Genital double-somite 85 \times 107 μm , strongly expanded laterally, roughly trapezoidal, consisting of broad anterior part and short, narrower posterior part, widest at place posterior to middle, with 2- to 4-forked processes at posterolateral corners of broad anterior part, followed by 2 or 3 spinules, and 5-6 setules near genital area (Figs. 12B, 13H); genital area located dorsolaterally at 66% region of length of somite. Two free abdominal somites 19 \times 56 and 27 \times 51 μm , respectively. Anal somite with serrate posteroventral margin. Caudal ramus 23 \times 25 μm , with serrate posteroventral margin and 6 setae; inner median terminal seta largest and 351 μm long.

Rostrum short, broad, and strongly tapering, without posterior margin (Fig. 12D). Antennule (Fig. 12E) 332 μm long and 20-segmented; some setae on anterior segments plumose and bifurcated at tip; setal numbers 2 on each segment, except for 7 on ninth segment, 2+aesthetasc on eighteenth, and 11 on last. Antenna (Fig. 12F) with short, naked coxa; basis 77 \times 21 μm , with row of pectinate scales (or spinules) on outer side. Exopod 1-segmented, 9 \times 4 μm , with 2 distal and 1 lateral setae. Endopod 3-segmented with armature formula 0, 1, and 3+claw; first segment 60 \times 15 μm ; terminal claw 62 μm long, not articulated from terminal segment.

Oral cone (Fig. 12G) roughly ovoid, about 132 \times 67 μm , widest at proximal 30% region, strongly tapering distally, and extending to middle of maxillipedal insertions. Mandible (Fig. 12H) with stylet of 121 μm length. Mandibular palp 2-segmented, proximal and distal segments 38 and 29 μm , respectively; 2 distal setae weakly plumose, and 141 and 59 μm long, respectively. Maxillule (Fig. 13A) bilobed. Inner lobe 54 \times 18 μm , apically with 1 small and 4 larger setae (latter 69, 72, 71, and 51 μm). Inner lobe 22 \times 7 μm , with 4 distinct distal setae (80, 67, 56, and 28 μm , respectively). Maxilla (Fig. 12I) with unornamented proximal segment; distal claw with tuft of setules near middle and minute spinules subdistally. Maxilliped (Fig. 13B) 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; second segment 100 \times 29 μm , with spinules near middle of outer margin and on distal part of inner margin; terminal claw 76 μm long.

Legs 1-4 with 3-segmented rami (Fig. 13C-F). Leg 1 with unusually large inner seta on basis extending far beyond outer margin of exopod; outer spine on first exopodal segment 28 μm ; outer spine on second segment and proximal

outer spine on third segment very small. Second endopodal segment of legs with bifurcate outer distal process. Leg 4 with small and naked inner seta on coxa; terminal seta on endopod spiniform and 32 μm , nearby spine 55 μm . Armature formula of legs 1-4 as follows:

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

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

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

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

Leg 5 bimerous; free segment (Fig. 13G) 44 \times 13 μm , with spinules on distal half of outer margin, and 1 subdistal seta (85 μm) and 2 weakly plumose distal setae (outer one 87 μm and inner one 73 μm). Leg 6 represented by 1 plumose seta and 1 small spinule in genital area (Fig. 13H).

Male. Body (Fig. 14A) similar to that of female but slightly narrower. Mean body length 485 μm (482-518 μm), based on 8 specimens. Dissected specimen 518 μm long, and maximum width 333 μm . Prosome 380 μm long. Cephalothorax 272 μm long. Urosome (Fig. 14B) 5-segmented. Fifth pedigerous somite 52 μm wide. Genital somite 63 \times 88 μm , with pointed posterolateral corners. Three abdominal somites 17 \times 46, 13 \times 42, and 25 \times 40 μm , respectively. Caudal ramus 19 \times 18 μm .

Rostrum as in female. Antennule (Fig. 14C) 281 μm and 18-segmented; ninth segment with about 7 setae, sixteenth with 4 setae, seventeenth with 2 setae, 1 aesthetasc and anterodistal process, last with 11 setae, other segments with 2 setae each. Antenna as in female.

Oral cone, mandible, maxillule, and maxilla as in female. Maxilliped with inner proximal process on second segment (Fig. 14D).

Leg 1 with oblique row of spinules on third endopodal segment (Fig. 14E). Legs 2-4 as in female.

Free segment of leg 5 27 \times 9 μm , with 2 distal plumose setae (outer one 43 and inner one 40 μm) and 1 subdistal naked seta (48 μm). Leg 6 represented by 2 setae on genital flap (Fig. 14B).

Etymology. The specific name *tricuspis*, Latin meaning "having three points", alludes to the presence of the usually trifurcate process on both sides of the genital double-somite in the female.

Remarks. The most striking feature of *Asterocheres tricuspis* n. sp. is probably the possession of an enlarged inner seta on the coxa of leg 1, which is as long as the endopod and extends far beyond the outer margin of the exopod. Similar enlargement of this seta has not been reported yet in *Asterocheres*.

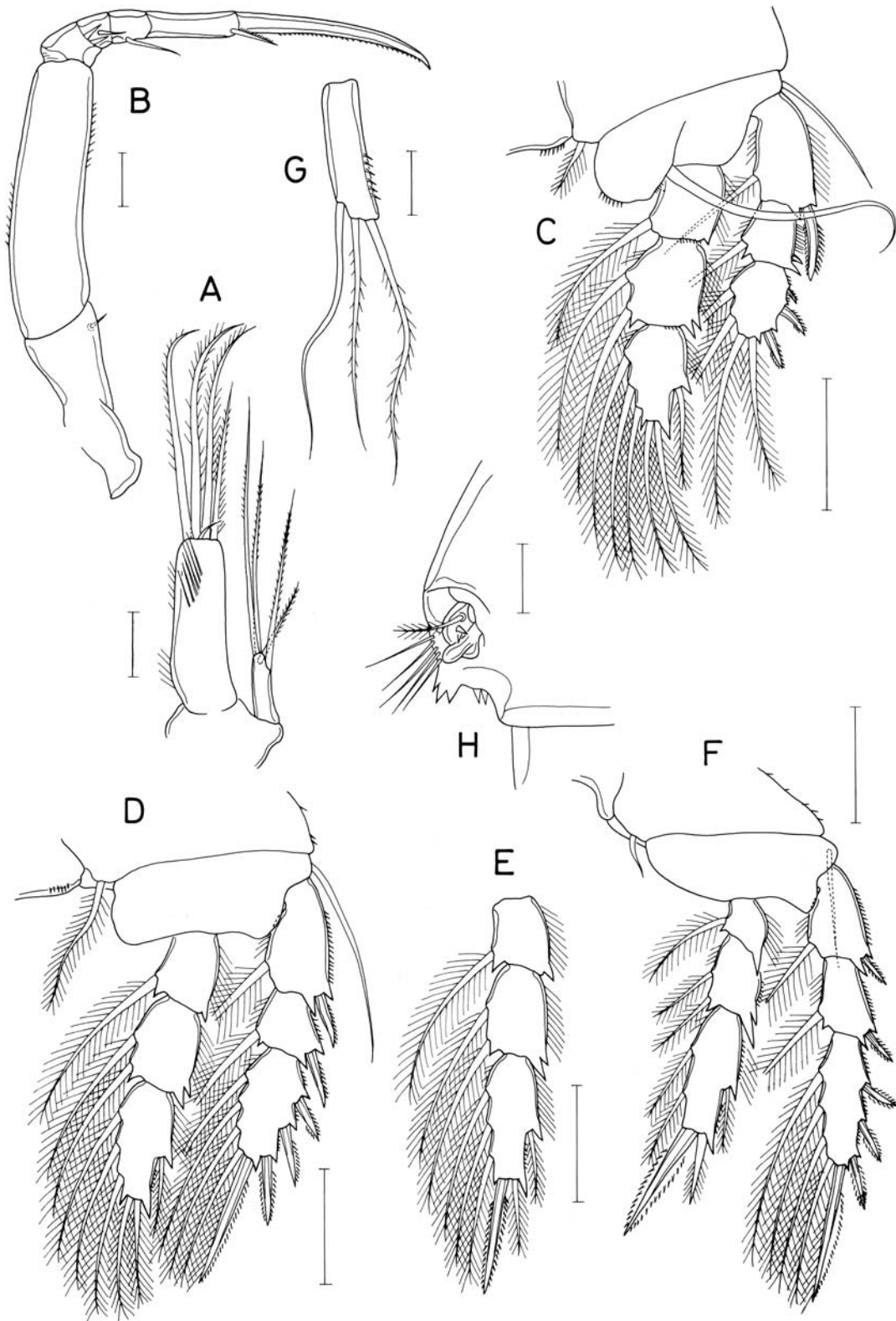


Fig. 13. *Asterocheres tricuspis* n. sp., female. A, maxillule; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, left genital area, dorsal. Scales: A, B, G, H, 0.02 mm; C-F, 0.05 mm.

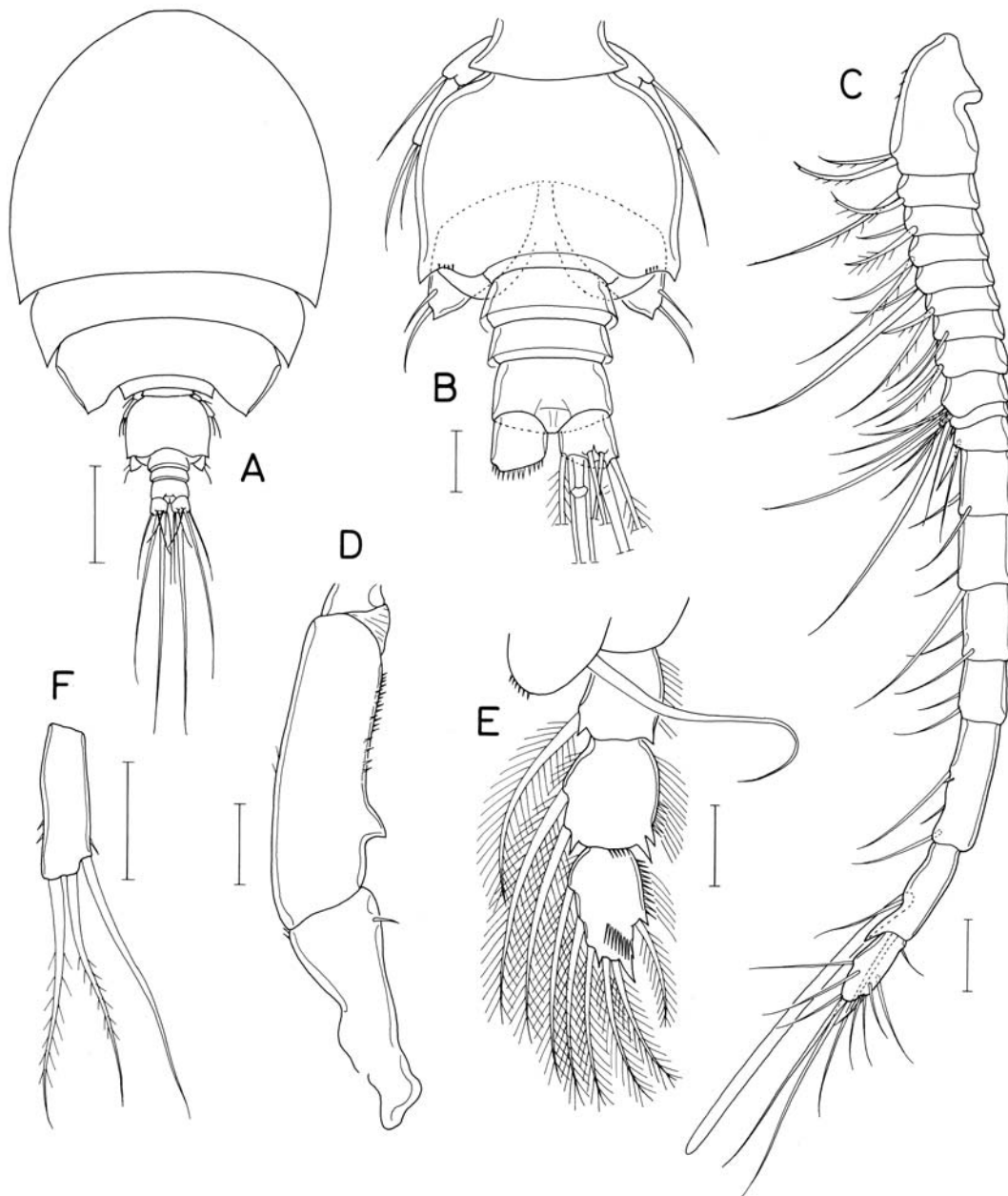


Fig. 14. *Asterocheres tricuspis* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, proximal segments of maxilliped; E, endopod of leg 1; F, free segment of leg 5. Scales: A, 0.1 mm; B-F, 0.02 mm.

The ornamentation on the lateral margins of the genital double-somite has been generally ignored in the taxonomy of the Asterocheridae, but appears to be valuable. The number of setules or spinules is quite consistent within a species but variable with species. *Asterocheres tricuspis* has, as another distinguishing feature, 5 or 6 setules and 2-4 cusps on each lateral margin.

The presence of minute spinules on the distal half of the

inner margin of the second maxillipedal segment and several bifurcate setae on the antennule are also considered to be important features of the new species.

***Asterocheres plumosus* n. sp. (Figs. 15-17)**

Material examined. 22 ♀♀, 12 ♂♂ from a blackish brown, smooth encrusting sponge, off Lerner Marine Laboratory,

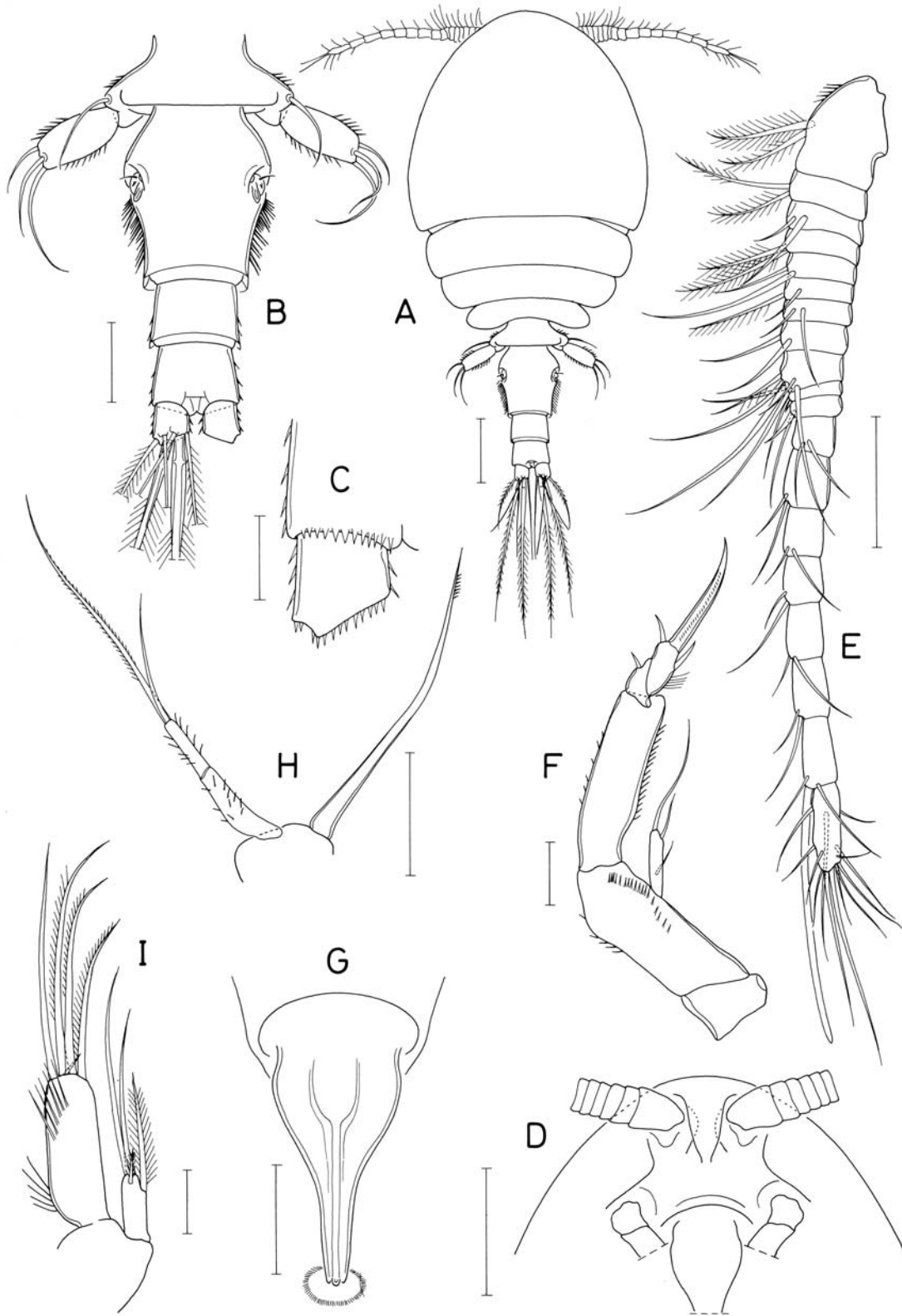


Fig. 15. *Asterocheres plumosus* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, right caudal ramus, ventral; D, anterior part of cephalothorax, ventral; E, antennule; F, antenna; G, oral siphon; H, mandible; I, maxillule. Scales: A, D, 0.1 mm; B, E, G, H, 0.05 mm; C, F, I, 0.02 mm.

Bimini, Bahamas, 1 June 1959, collected by A. G. Humes and R. U. Gooding. Holotype (♀), allotype (♂), and paratypes (19♀, 9♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2♀, 2♂) are retained in the collection of the author.

Female. Body (Fig. 15A) relatively small. Body length 694 µm (635–745 µm), based on 10 specimens. Body length of dissected specimen 735 µm, and maximum width 375 µm. Prosome ovoid and 485 µm long. Cephalothorax 327 µm long, occupying about 67% of the length of prosome. Urosome (Fig. 15B) 4-segmented. Genital double-somite 111 × 93 µm (1.19 : 1), widest across anterior 1/3 region, with about 19 thick setules on posterior half of lateral margin (Figs. 18B, 19H). Genital area located slightly anterior to middle of somite. Two free abdominal somites 40 × 58 and 47 × 57 µm, respectively. Anal somite with serrate posteroventral margin. Caudal ramus (Fig. 15C) 25 × 23 µm (1.09 : 1), with serrate posteroventral margin.

Rostrum small and tapering, with obscure posterior margin (Fig. 15D). Antennule (Fig. 15E) 306 µm long and 19-segmented; number of setae: 7 on 9th segment, 2+aesthetasc on 18th, 13 on terminal, and 2 on other segments; several setae on proximal segments plumose; first segment with setules on anterior margin. Antenna (Fig. 15F) with small and unarmed coxa; basis with spinules near base of exopod and inner side. Exopod elongate, 20 × 4 µm, with 1 lateral and 2 distal unequal setae. Endopod 3-segmented; first segment 57 × 17 µm, with spinules on margins but unarmed; second segment with 1 inner seta; third segment with 2 setae and spiniform terminal claw of 40 µm length.

Oral cone (Fig. 15G) 134 × 59 µm, forming siphon along distal 1/3 and extending to insertions of maxillipeds. Mandible (Fig. 15H) consisting of stylet and palp. Stylet 132 µm long, with teeth subdistally. Mandibular palp 2-segmented; proximal and distal segments 40 and 25 µm, respectively; 2 terminal setae 110 and 55 µm. Maxillule (Fig. 15I) bilobed. Inner lobe 48 × 18 µm, with setules on surface and 4 large apical setae (75, 81, 63, and 53 µm, respectively, from inner to outer) and 1 minute seta. Outer lobe 21 × 8 µm, with 4 setae (66, 54, 37, and 11 µm, respectively), subdistal 2 of them plumose. Maxilla (Fig. 16A) 2-segmented; proximal segment with aesthetasc-like proximal element, row of fine spinules, and distally 1 fleshy process; distal claw bearing spinules and setules subdistally. Maxilliped (Fig. 16B) 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; second segment 79 × 35 µm, with fine spinules distally on inner margin; third segment with spinules on outer margin; sixth segment with spinules on inner margin; claw 46 µm long.

Legs 1–4 with 3-segmented rami (Fig. 16C–F). Leg 1 with

spinules on inner distal corner of basis; outer spine on first exopodal segment 30 µm long. Second endopodal segment of legs 1–4 with bicuspid outer distal process. Leg 4 (Fig. 16F) with very rudimentary inner seta on coxa; terminal spine on third endopodal segment 46 µm long. Armature formula of legs 1–4 as follows:

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

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

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

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

Free segment of leg 5 (Fig. 16G) 60 × 30 µm, with convex lateral margins; 3 terminal setae 38, 66, and 70 µm from outer to inner. Leg 6 represented by 1 seta and 1 small spinule on genital area (Fig. 16H).

Male. Body (Fig. 17A) narrower than that of female. Mean body length 569 µm (545–590 µm), based on 10 specimens. Urosome (Fig. 17B) 5-segmented. Genital somite 90 × 131 µm, much wider than long, with spinules on lateral margins; genital flap posteriorly with 2 setae, several setules, and 1 small pointed process. Three abdominal somites 19 × 50, 20 × 46, and 38 × 48 µm, respectively. Caudal ramus 23 × 21 µm.

Rostrum as in female. Antennule (Fig. 17C) 260 µm long and 18-segmented; each segment with 2 setae, except for 7 on ninth, 4 on sixteenth, 3+aesthetasc on seventeenth, and 11 on last segments. Antenna as in female.

Oral cone, mandible, maxillule, and maxilla as in female. Maxilliped (Fig. 17D) with second segment bearing large proximal process, slightly bulged area bearing granules, and row of fine setules subdistally on inner side; third segment with 2 small setae; fourth to sixth segments with 1 seta each; terminal claw weakly curved, with fine spinules on concave margin.

Leg 1 with spinules on third endopodal segment (Fig. 17E). Leg 3 with third endopodal segment (Fig. 17F) bearing large spiniform inner process, 1 spine, and 4 setae (armature formula 1,I,3). Legs 2 and 4 as in female.

Free segment of leg 5 (Fig. 17G) 33 × 15 µm; three distal setae 25, 33, and 41 µm from outer to inner. Leg 6 represented by 2 setae on genital flap (Fig. 17B).

Etymology. The specific name *plumosus* (“downy” in Latin) refers to the presence of several plumose setae on proximal segments of antennule.

Remarks. The unique nature of the sexual dimorphism exhibited on leg 3 may justify the proposal of *Asterocheres plumosus* as new species, which is the presence of a large spiniform process on the outer side of the third endopodal

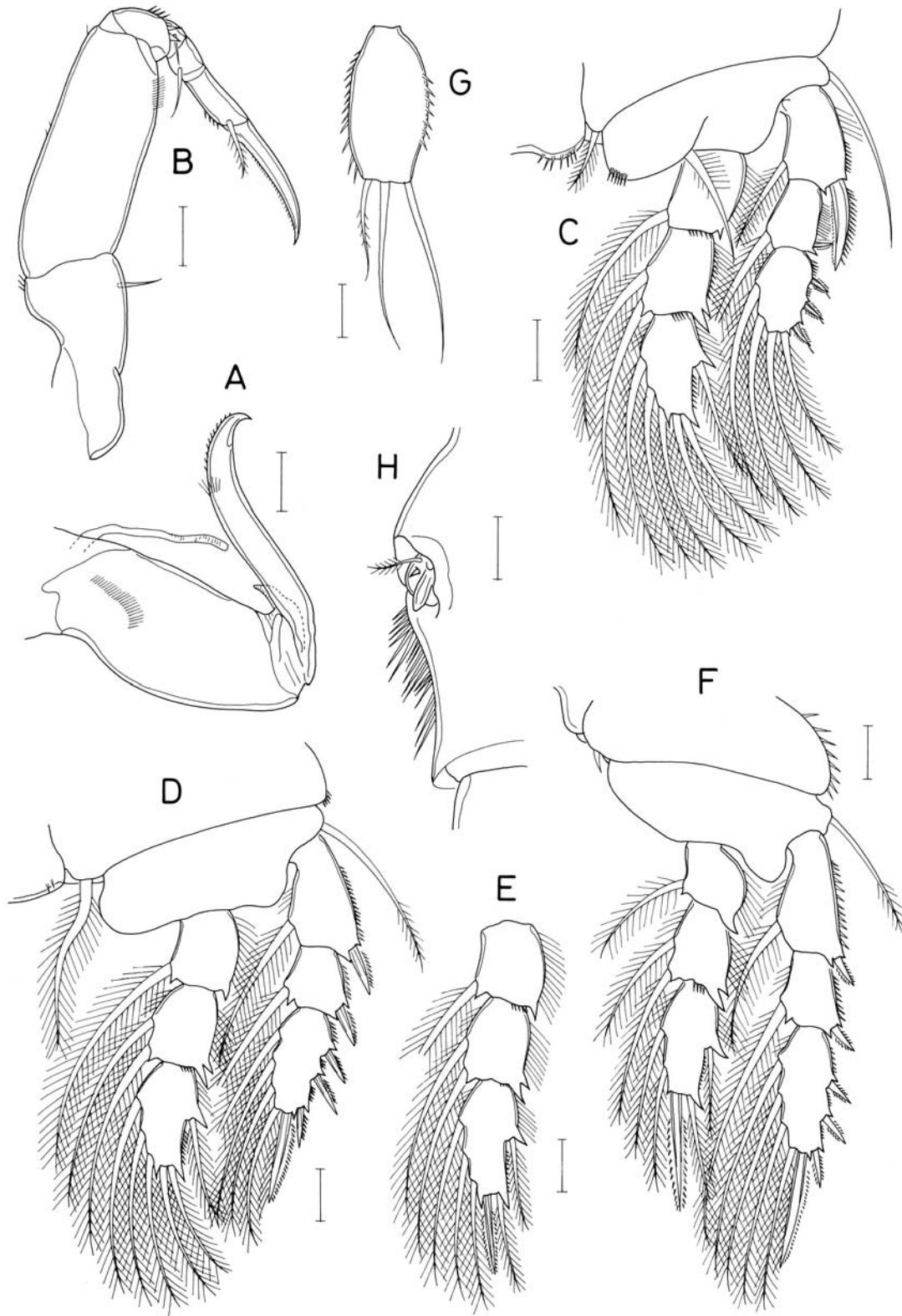


Fig. 16. *Asterocheres plumosus* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, left genital area, dorsal. Scales: 0.02 mm for all.

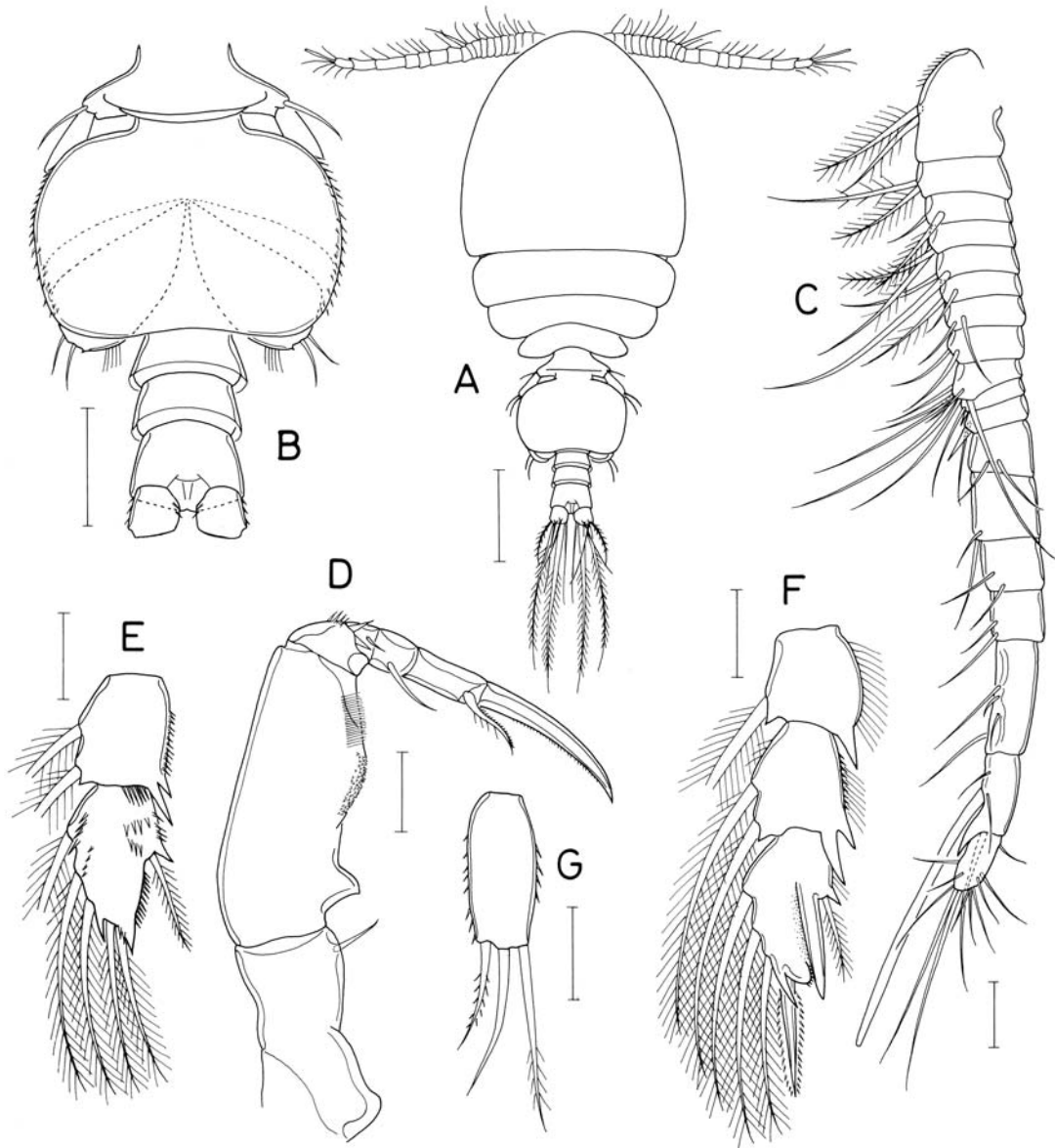


Fig. 17. *Asterocheres plumosus* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, maxilliped; E, second and third endopodal segments of leg 1; F, endopod of leg 3; G, free segment of leg 5. Scales: A, 0.1 mm; B, 0.05 mm; C-G, 0.02 mm.

segment in the male. A similar sexual dimorphism within *Asterocheres* has been recorded only in *A. urabensis* Kim, 2004, but the spiniform process of this Pacific species is much more smaller than that of *A. plumosus*. *Asterocheres urabensis* is not similar to the new species in many other aspects.

Many species of *Asterocheres* are known only by the female, therefore, only female characters are usable for comparison of these species. *Asterocheres plumosus* has 19-segmented antennules. This feature is shared by 15 species of

the genus and six of which are known to have a large aesthetasc on the penultimate segment: *A. brevisurculus* Kim, 2005, *A. hongkongensis* Malt, 1991, *A. lilljeborgi* Boeck, 1859, *A. pilosus* Kim, 2004, *A. walteri* Kim, 2004, and *A. unioviger* Kim described in this paper. These six species can be distinguished from the new species by their following features.

In *Asterocheres brevisurculus* Kim, 2005 the mandibular palp is 1-segmented, the free segment of leg 5 is rectangular, and the rostrum is broad and triangular.

In *A. hongkongensis* Malt, 1991 the genital double-somite is wider than long, the third endopodal segment of leg 2 was recorded to have a distal spine (armature formula 1,1+I,3) (Malt, 1991). Because the latter feature is unusual for *Asterocheres*, it needs to be confirmed. If the original description is correct, it may well be incorporated in different genus.

In *A. lilljeborgi* Boeck, 1859 the prosome is expanded. Sars (1917) described 18-segmented antennule of this species (recorded as *A. asterocheres*), but his illustration shows 19-segmented condition, as in *A. plumosus*. However, in this species known from Europe leg 4 lacks an inner seta on coxa, the oral cone is evenly tapering, and the caudal ramus is about twice as long as wide, as illustrated by Sars (1917).

In *A. pilosus* Kim, 2004 the body is small (458-500 μm long in the female), the outer lobe of maxillule bears a specialized seta, the third endopodal segment of leg 1 bears a beak-like prologation, the coxa of leg 1 bears no inner seta, and the first segment of antennule bears a single plumose seta.

In *A. walteri* Kim, 2004 the genital double-somite is wider than long, the setae on endopodal segments of antenna are large, longer than the half length of distal claw, the outer lobe of maxillule bears large naked setae, the setae on the proximal segments of antennule are large and naked, and the rostrum is obscure.

In *A. unioviger* Kim described above the oral cone is broad and evenly tapering, the outer lobe of maxillule bears a specialized seta, the body is small (only 387-403 μm long in the female), and the third endopodal segment of leg 1 bears a prolonged process.

In addition, the 18 or 19 spinules on the lateral margin of genital double-somite, the presence of several spinules on the outer margin of the third maxillipedal segment, and the elongate exopod of antenna are also important features of *A. plumosus*.

***Asterocheres peniculatus* n. sp. (Figs. 18-20)**

Material examined. 47 ♀♀, 19 ♂♂ from a dull saffron sponge, Pigeon Cay, Bimini, Bahamas, 7 June 1959, collected by A. G. Humes and R. U. Gooding. Holotype (♀), allotype (♂), and paratypes (44 ♀♀, 16 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 2 ♂♂) are retained in the collection of the author.

Female. Body (Fig. 18A) with moderately broad prosome. Mean body length 723 μm (690-780 μm), based on 10 specimens. Body length of dissected specimen 780 μm , and maximum width 432 μm . Prosome 540 μm long and consisting of cephalothorax and second to fourth pedigerous somites. Second and third pedigerous somites fringed with narrow membrane along lateral margins of epimera. Urosome (Fig.

18B) 4-segmented. Fifth pedigerous somite 124 μm wide. Genital double-somite 95 \times 114 μm , wider than long, with narrower posterior part; genital areas located dorsolaterally in midlength of somite; lateral margin ornamented with 6-9 setules near genital area and 3-6 spinules posterior to genital area (Figs. 18B, 20B). Two free abdominal somites 37 \times 63 and 46 \times 61 μm , respectively. Anal somite with spinules on posteroventral margin (Fig. 18C). Caudal ramus 28 \times 29 μm , with scales (or spinules) on all margins (Fig. 18C) and 6 setae, largest of latter 352 μm long. Egg sac (Fig. 18D) containing 2 or 3 eggs, each egg 123 μm in diameter.

Rostrum strongly tapering and forming short ridge posteriorly (Fig. 18E). Antennule (Fig. 18F) 352 μm long and 21-segmented; first segment with minute spinules on anterior margin; some setae on proximal segments plumose or blunt with minute setule at tip; segments with 2 setae, except for 7 setae on ninth, 2 setae+aesthetasc on eighteenth, 4 setae on twentieth, and 7 setae on last segments. Antenna (Fig. 18G) with small coxa; basis with longitudinal row of bifurcate or trifurcate spinules (or scales) near base of exopod and minute spinules on inner margin. Exopod 11 \times 5 μm , with 2 terminal and 1 lateral setae. Endopod 3-segmented; first segment 59 \times 15 μm ; second and third segments with 1 and 2, weakly bifurcate setae, respectively; terminal claw 48 μm , shorter than first segment.

Oral cone forming siphon distally (Fig. 18H), 231 μm long, 37 μm in maximum width, and reaching insertions of leg 1. Mandible (Fig. 18I) consisting of slender, pointed stylet of 217 μm long and palp. Palp 2-segmented; first segment 28 μm and second 17 μm ; 2 distal setae 143 and 70 μm , respectively. Maxillule (Fig. 19A) bilobed. Inner lobe 61 \times 18 μm ; with 5 setae, 4 large ones of which 131, 130, 118, and 70 μm , respectively. Outer lobe small, 22 \times 6 μm , with 4 distal setae of 63, 60, 59, and 23 μm , respectively; subdistal one of which thicker than others and directed inwards. Maxilla (Fig. 19B) with aesthetasc-like element on proximal part of proximal segment; distal claw nearly as long as proximal segment, with 1 tuft of setules near middle and fine spinules subdistally. Maxilliped (Fig. 19C) 6-segmented; first segment with thin and rather long inner distal seta; second segment 88 \times 32 μm , with nearly parallel lateral margins, minute spinules on outer side, and row of minute spinules subdistally on inner margin; third to sixth segments armed respectively with 2, 1, 1, and 1 setae; terminal claw 51 μm , with spinules on concave margin.

Legs 1-4 with 3-segmented rami and bicuspid outer distal process on second endopodal segment (Fig. 19D-G). Outer seta on basis of legs 1-3 large. Leg 1 with spinules on inner side of basis; outer spine on first exopodal segment broad and 33 μm long. Leg 4 with small, naked inner seta on coxa; outer terminal seta on third endopodal segment spiniform,

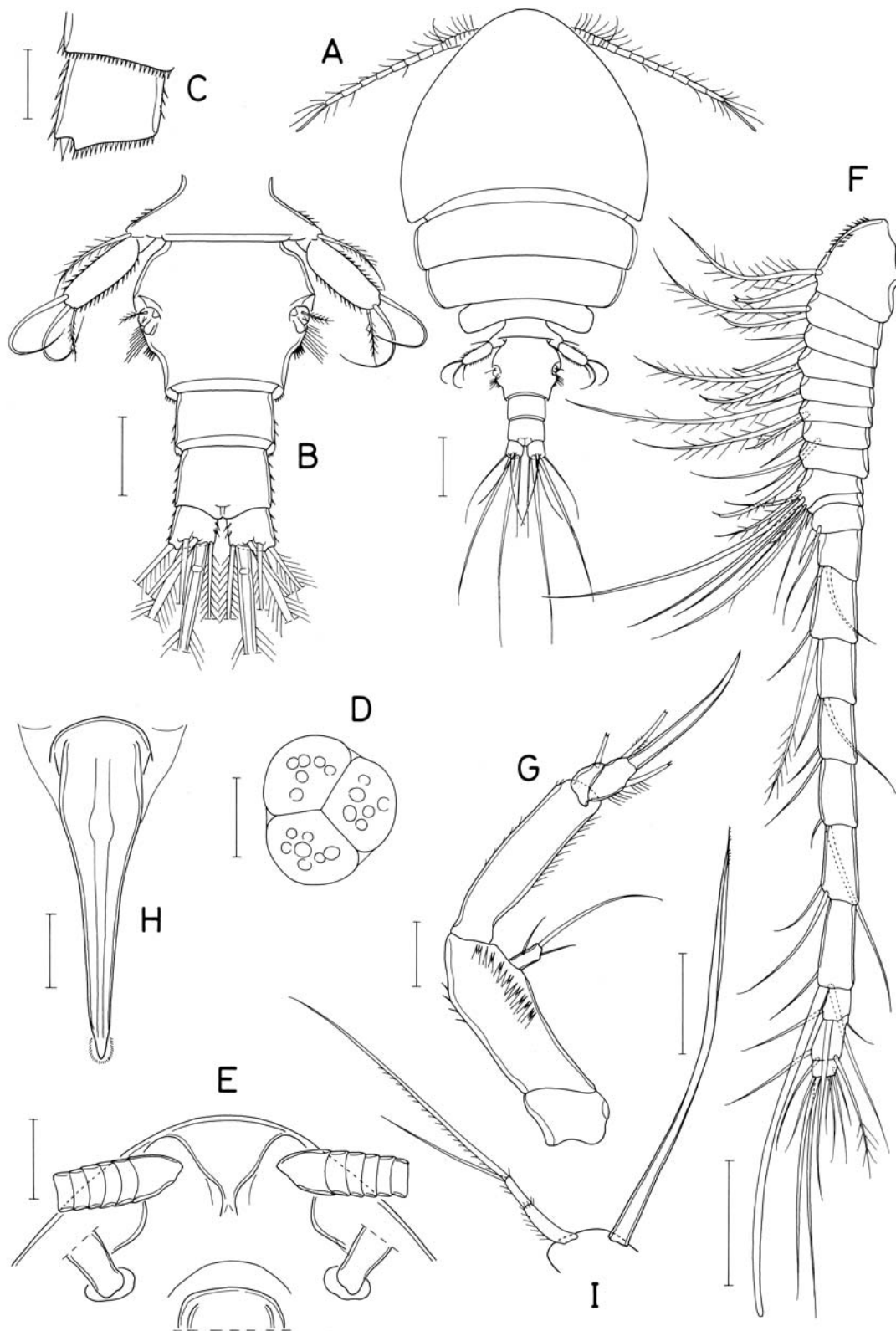


Fig. 18. *Asterocheres peniculatus* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, right caudal ramus, ventral; D, egg sac; E, rostral area, ventral; F, antennule; G, antenna; H, oral siphon; I, mandible. Scales: A, D, 0.1 mm; B, E, F, H, I, 0.05 mm; C, G, 0.02 mm.

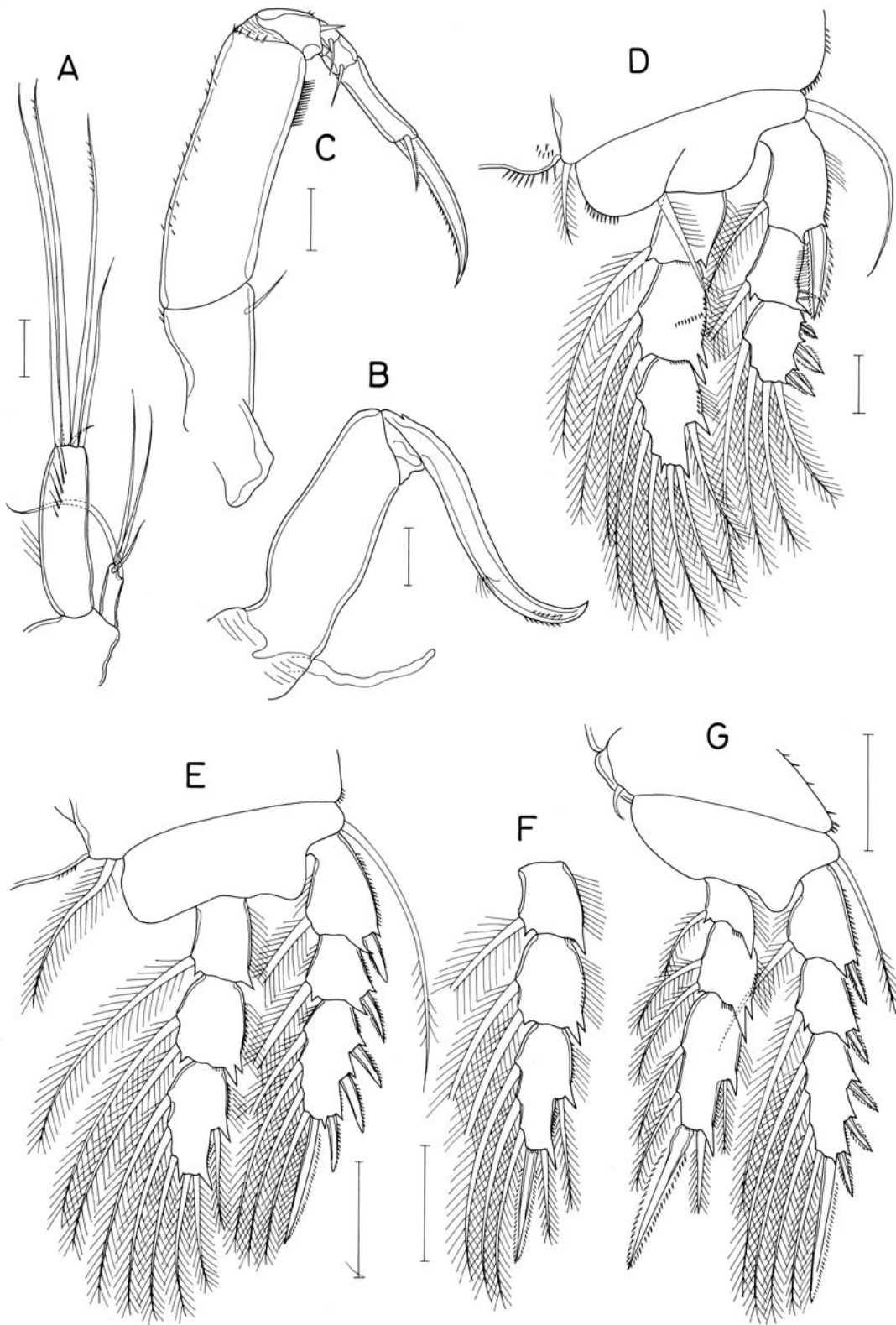


Fig. 19. *Asterocheres peniculatus* n. sp., female. A, maxillule; B, maxilla; C, maxilliped; D, leg 1; E, leg 2; F, endopod of leg 3; G, leg 4. Scales: A-D, 0.02 mm; E-G, 0.05 mm.

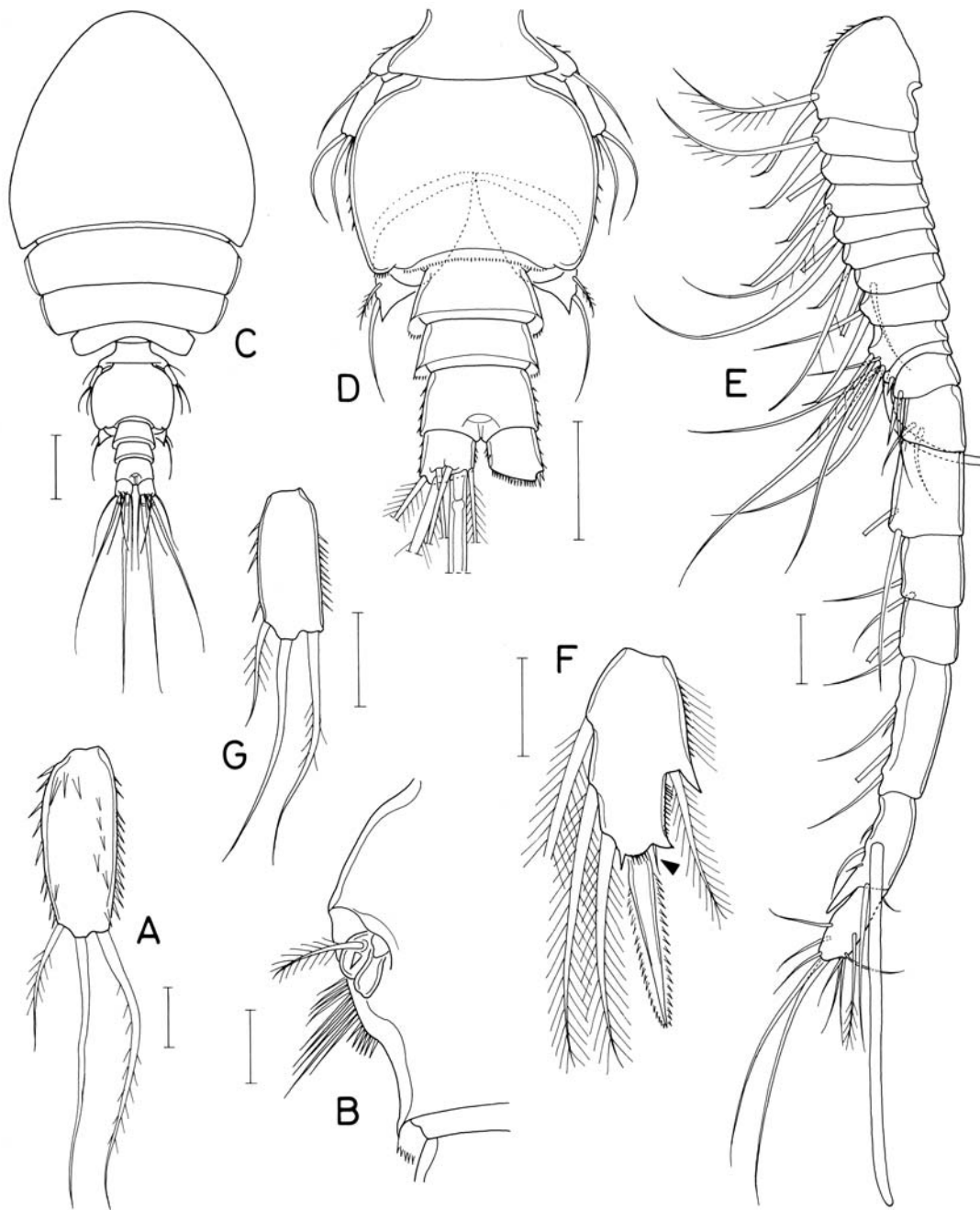


Fig. 20. *Asterocheres peniculatus* n. sp. Female: A, free segment of leg 5; B, left genital area, dorsal. Male: C, habitus, dorsal. D, urosome, dorsal; E, antennule; F, third endopodal segment of leg 3; G, free segment of leg 5. Scales: A, B, E-G, 0.02 mm; C, 0.1 mm; D, 0.05 mm.

and nearby spine 65 μm long. Armature formula of legs 1-4 as in preceding species.

Free segment of leg 5 (Fig. 20A) 62 \times 25 μm (2.48 : 1), with spinule-like scales on all surfaces; 3 distal setae 96, 89, and 43 μm long from outer to inner. Leg 6 represented by 1 plumose setae and 1 small spinule in genital area (Fig. 20B).

Male. Body (Fig. 20C) similar to that of female. Mean body length 584 μm (549-615 μm), based on 10 specimens. Prosome 412 μm long, and maximum width 307 μm . Urosome (Fig. 20D) 5-segmented. Fifth pedigerous somite 71 μm wide. Genital somite 76 \times 105 μm . Three abdominal somites 25 \times 57, 20 \times 53, and 32 \times 50 μm , respectively. Caudal ramus

22 × 22 μm.

Rostrum as in female. Antennule (Fig. 20E) 282 μm long and 18-segmented; third, fifth, seventh, tenth, thirteenth, fifteenth, and sixteenth segments with 1 truncate seta each, that of tenth large and directed posteriorly; ninth segment with 7 setae, sixteenth with 4, seventeenth with 4 and 1 aesthetasc, last with 11, other segment with 2 setae. Antenna as in female.

Oral cone, mandible, maxillule, maxilla like those of female. Maxilliped with inner proximal process on second segment.

Leg 3 with vestigial outer terminal seta (indicated by arrowhead in Fig. 20F) or this seta lacking. Legs 1, 2, and 4 as in female. Free segment of leg 5 (Fig. 20G) 32 × 14 μm (2.29 : 1), its 3 distal setae 51, 50, and 23 μm from outer to inner. Leg 6 represented by 2 unequal setae on genital flap (Fig. 20D).

Etymology. The specific name *peniculatus* is derived from the Latin *peniculus* (brush) and alludes to the brush-like ornamentation on the distal part of inner margin of the second maxillipedal segment.

Remarks. About 21 species of *Asterocheres* display, as *A. peniculatus* n. sp., a combination of characters that the female antennule is 20- or 21-segmented and the mandibular palp is 2-segmented. In eight of these 21 species the oral cone is short, extending between maxilliped and leg 2, as follows: *A. neptuni* Johnsson, 2001, *A. echinicola* (Norman, 1868), *A. boeckii* (Brady, 1880); *A. genodon* Stock, 1966, *A. latus* (Brady, 1872), *A. complexus* Stock, 1960, *A. urabensis* Kim, 2004, and *A. hirsutus* Bandera, Conradi and Lopez-Gonzalez, 2005.

Most of these species can be differentiated from *A. peniculatus*, because their caudal rami are distinctly longer than wider, except for *A. boeckii* and *A. genodon*.

Asterocheres boeckii differs from *A. peniculatus* in having the more expanded prosome, the narrower genital double-somite which is as long as wide, the rostrum with rounded posterior margin, a single inner seta on the second endopodal segment of leg 4, and only two distal setae on the free segment of leg 5, according to the description and figures made by Sars (1915),

Asterocheres genodon also differs from *A. peniculatus* in having a cusp-like process on the lateral margins of genital double-somite, a longer free segment of leg 5, which is more than three times as long as wide, a long terminal claw of maxilliped, which is more than twice as long as the terminal segment, and the distal claw of maxilla, which is much longer than proximal segment (Stock, 1966a).

The new species reveals characteristic sexual dimorphisms on the antennule and leg 3. In the male antennule one of setae on the third, fifth, seventh, tenth, thirteenth, fifteenth, and

sixteenth segments is truncated, rod-shaped. The truncate seta on the tenth segment is, in particular, large and directed to the posterior margin of antennule. Another characteristic dimorphism, occurring on leg 3, is the absence or degeneration of the outer distal seta of the third endopodal segment. Similar dimorphism of leg 3 is observable in *A. walteri* Kim, 2004 which is, otherwise, different from *A. peniculatus* in other aspects. *Asterocheres walteri* was recorded as an associate of a sea star in the Pacific coast of Panama (Kim, 2004a).

Asterocheres oricurvus n. sp. (Figs. 21-23)

Material examined. 7 ♀♀, 9 ♂♂ from washings of sponges and compound tunicates, Port Royal, Jamaica, 2 September 1959, collected by A. G. Humes and R. U. Gooding. Holotype (♀), allotype (♂), and paratypes (5 ♀♀, 7 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (1 ♀, 1 ♂) are retained in the collection of the author.

Female. Body (Fig. 21A) rather narrow. Mean body length 810 μm (754-862 μm), based on 7 specimens. Body length of dissected specimens 800 μm, and maximum width 423 μm. Prosome 521 μm long. Third and fourth pedigerous somites fringed with narrow membrane along lateral margins. Urosome (Fig. 21B) 4-segmented. Fifth pedigerous somite 133 μm wide. Genital double-somite 133 × 112 μm (1.19 : 1), consisting of broader, roundly expanded anterior part and tapering posterior part, with 10 spinules of different lengths on lateral margin posterior to genital area (Figs. 21B, 22H); genital area located in middle of somite. Two free abdominal somites 43 × 67 and 43 × 62 μm, respectively. Anal somite and caudal rami with scales on posteroventral margin (Fig. 21C). Caudal ramus 27 × 28 μm, with 6 setae.

Rostrum as small, indistinct, weakly tapering ridge (Fig. 21D). Antennule (Fig. 21E) 369 μm and 20-segmented; segments armed each with 2 setae, except for 7 setae on ninth segment, 2 setae+aesthetasc on eighteenth, and 11 setae on last; several setae on proximal segments weakly plumose. Antenna (Fig. 21F) slender, with small coxa; basis 67 × 23 μm, with row of small spinules near exopod. Exopod 17 × 5.4 μm, with 2 distal and 1 lateral setae. Endopod 3-segmented, with armature formula 0, 1, and 2+claw; first segment 77 × 14 μm; terminal claw 57 μm.

Oral cone (Fig. 21G, H) forming long siphon, strongly curved in lateral view (Fig. 21H), 427 μm long, extending to insertions of leg 4, 81 μm in maximum width at base, 19 μm in minimum width. Mandible (Fig. 21I) consisting of long, thread-like stylet and shorter palp. Stylet 394 μm, with teeth distally. Mandibular palp 2-segmented; proximal and distal segments 49 and 43 μm each; 2 distal setae equal in size, 97 and 95 μm, respectively. Maxillule (Fig. 21K) bilobed. Inner

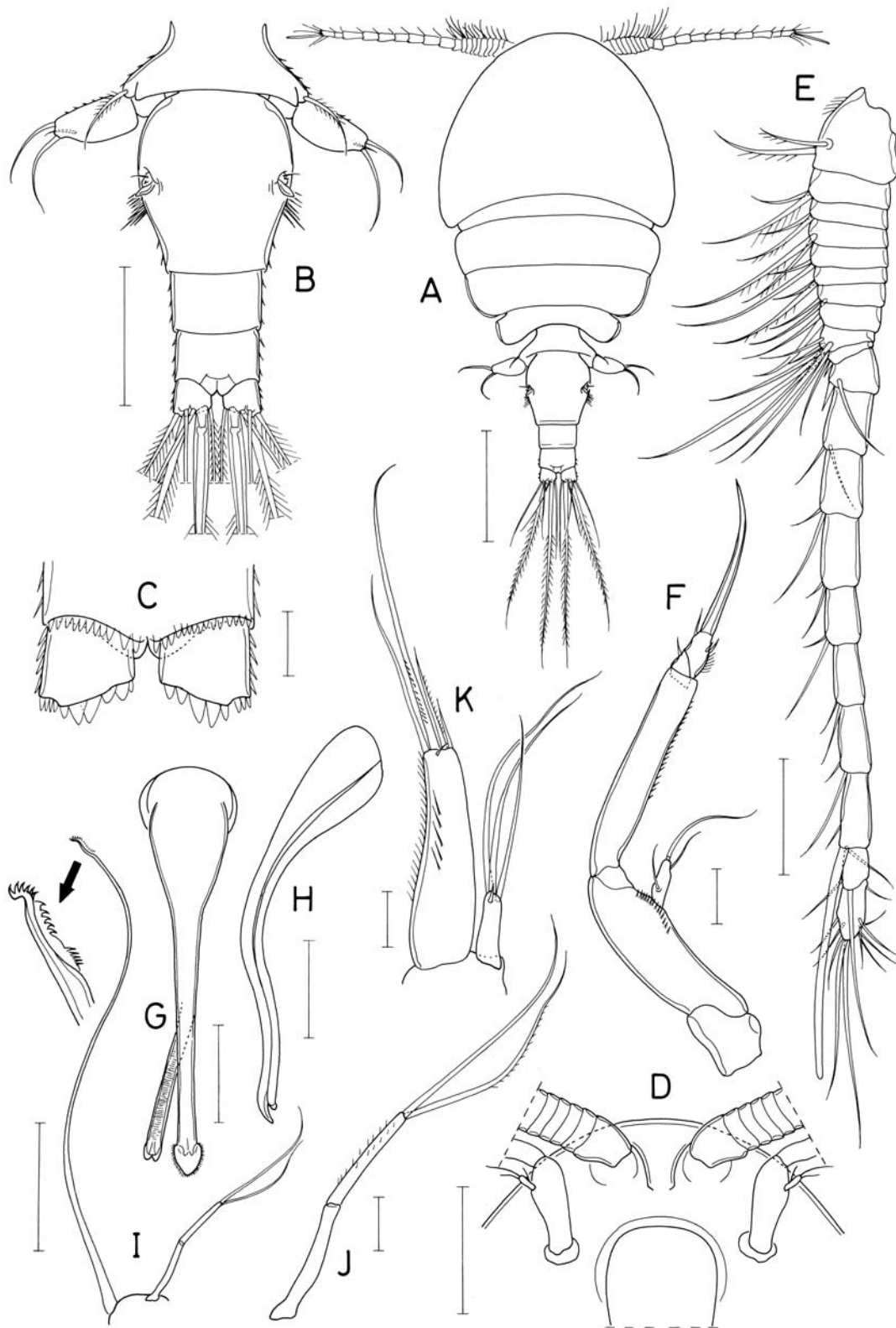


Fig. 21. *Asterocheres oricurvus* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, caudal rami, ventral; D, rostral area, ventral; E, antennule; F, antenna; G, oral siphon, ventral; H, oral siphon, lateral; I, mandible; J, mandibular palp; K, maxillule. Scales: A, 0.2 mm; B, D, G-I, 0.1 mm; C, F, J, K, 0.02 mm; E, 0.05 mm.

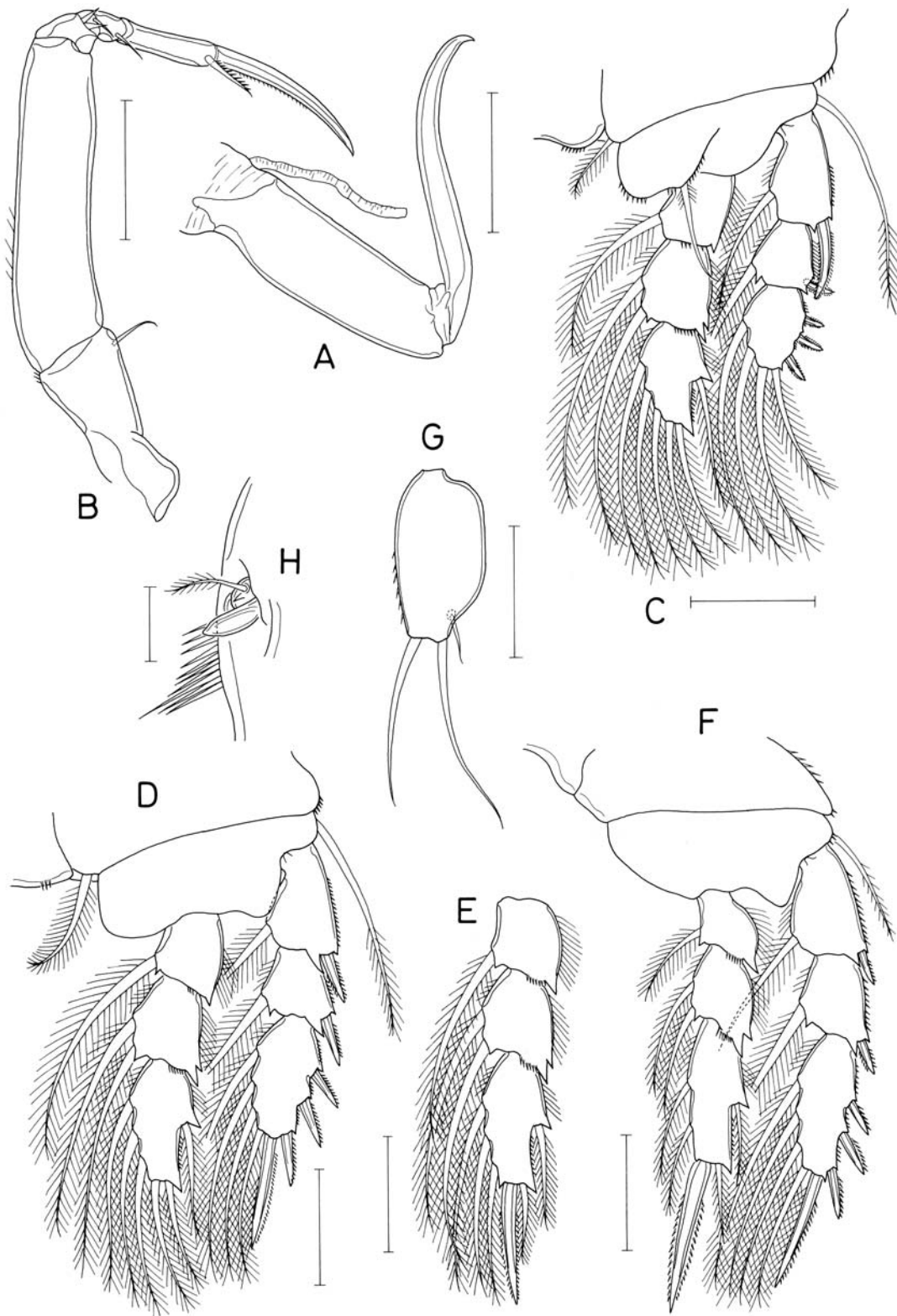


Fig. 22. *Asterocheres oricurvus* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, left genital area, dorsal. Scales: A-G, 0.05 mm; H, 0.02 mm.

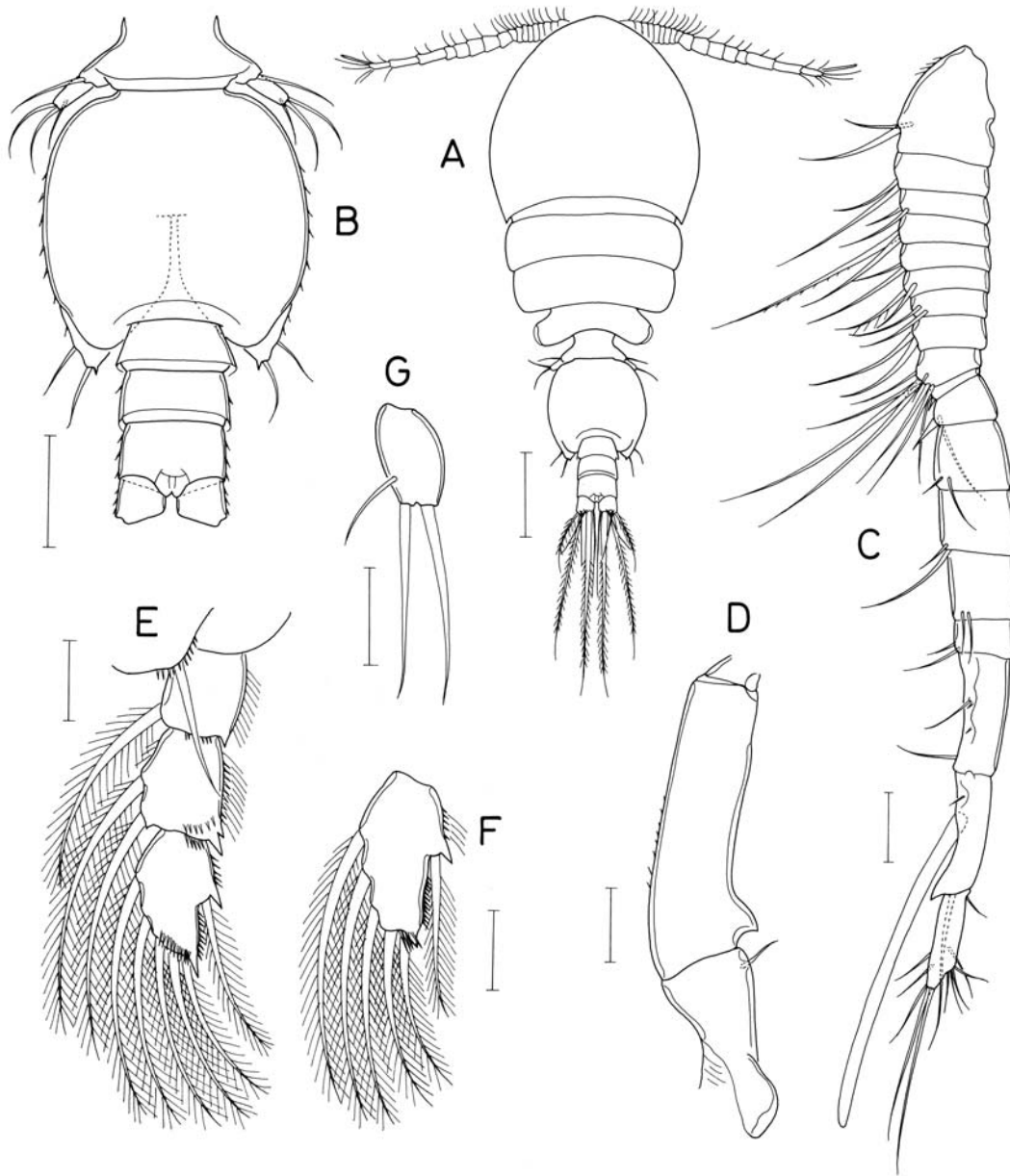


Fig. 23. *Asterocheres oricurvus* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, proximal segments of maxilliped; E, endopod of leg 1; F, third endopodal segment of leg 2; G, free segment of leg 5. Scales: A, 0.1 mm; B, 0.05 mm; C-G, 0.02 mm.

lobe $78 \times 24 \mu\text{m}$, distinctly tapering, with 1 minute and 4 distinct, unequal setae (68, 107, 38, and $19 \mu\text{m}$ from inner to outer). Outer lobe $28 \times 8 \mu\text{m}$, its 4 distal setae 98, 79, 68, and $6 \mu\text{m}$, respectively. Maxilla (Fig. 22A) with proximal, aesthetasc-like element on proximal segment; distal claw smooth. Maxilliped (Fig. 22B) 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; second segment $112 \times 31 \mu\text{m}$; terminal claw $63 \mu\text{m}$.

Legs 1-4 with 3-segmented rami and bicuspid inner distal

process on second endopodal segment (Fig. 22C-F). Outer spine on first exopodal segment of leg 1 $32 \mu\text{m}$. Leg 4 (Fig. 22F) without inner seta on coxa; terminal spine on third endopodal segment $68 \mu\text{m}$, longer than third endopodal segment, and much longer than nearby seta. Armature formula of legs 1-4 as follows:

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

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

enp. 0-1; 0-2; 1,2,3

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

enp. 0-1; 0-2; 1,1+I,3

Leg 4: coxa 0-0; basis 1-0; exp. I-1; I-1; III,I,4;

enp. 0-1; 0-2; 1,1+I,2

Leg 5 consisting of dorsolateral seta on fifth pedigerous somite and free segment; free segment $65 \times 34 \mu\text{m}$, with expanded inner margin, spinules on distal half of outer margin, 2 naked distal setae (inner one $78 \mu\text{m}$ and outer one $65 \mu\text{m}$) and 1 small subdistal seta ($19 \mu\text{m}$). Leg 6 represented by 1 plumose seta and 1 small spinules in genital area (Fig. 22H).

Male. Body (Fig. 23A) distinctly narrower than that of female. Mean body length $603 \mu\text{m}$ ($585\text{--}625 \mu\text{m}$), based on 8 specimens. Body length of dissected specimen $594 \mu\text{m}$, and maximum width $255 \mu\text{m}$. Prosome $374 \mu\text{m}$ long. Urosome (Fig. 23B) 5-segmented. Fifth pedigerous somite $81 \mu\text{m}$ wide. Genital somite $102 \times 118 \mu\text{m}$, subcircular. Three abdominal somites 24×54 , 24×49 , and $33 \times 47 \mu\text{m}$, respectively. Caudal ramus $22 \times 22 \mu\text{m}$.

Rotrum and antenna as in female. Antennule (Fig. 23C) $279 \mu\text{m}$ and 18-segmented; numbers of setae: 7 on ninth segment, 4 on sixteenth, 2+aesthetasc on seventeenth, 11 on last, and 2 on other segments.

Maxilliped with distinct proximal process (located close to basal border of segment) on second segment (Fig. 23D). Other mouth organs as in female.

Endopod of legs 1 and 2 with spinule-bearing outer and distal margins (Fig. 23E, F). Free segment of leg 5 (Fig. 23G) $23 \times 13 \mu\text{m}$, with 2 distal (42 and $40 \mu\text{m}$) and 1 smaller inner ($18 \mu\text{m}$) setae. Leg 6 represented by 2 naked setae on genital flap (Fig. 23B).

Etymology. The specific name *oricurvus* is derived from the Latin *oris* (mouth) and *curvus* (bent). It alludes to the bent oral cone of the new species.

Remarks. The most conspicuous feature of *Asterocheres oricurvus* n. sp. seems to be the long siphon which extends to the insertions of leg 4. In species of *Asterocheres* the siphon or oral cone seldom extends over leg 2, except in four known species: *A. proboscideus* Stock 1966, *A. siphonatus* Giesbrecht, 1897, *A. stimulans* Giesbrecht, 1897, and *A. stocki* Nair and Pillai, 1984. These four species can be differentiated from *Asterocheres oricurvus* by their traits as follows:

Asterocheres proboscideus has the genital double-somite which is wider than long and the 1-segmented mandibular palp.

Asterocheres siphonatus has, according to the description and figures of Sars, 1915 (as *Ascomyzon lilljeborgi*), the outer lobe of maxillule which is longer than a half length of inner lobe, the more thinner siphon which extends over the insertions of leg 4, and the free segment of female leg 5

which is nearly elliptical and bears only two distal setae.

Asterocheres stimulans has an expanded prosome, a 18-segmented female antennule, the inner lobe of maxillule bearing long setae, three of which are more than twice as long as the lobe, and a prolonged distal process on the third endopodal segment of legs 2 and 3 (Giesbrecht, 1899).

Asterocheres stocki has a 1-segmented mandibular palp and the second endopodal segment of legs 1-4 bearing unicuspid outer distal process.

There are three additional characteristic features typifying *A. oricurvus*: first, the siphon is clearly curved in lateral view; second, the distal setae on the inner lobe of the maxillule is distinctly unequal in size; third, the mandibular palp is thin and its two distal setae are long and equal in size.

Asterocheres planus n. sp. (Figs. 24-26)

Material examined. 9 ♀♀, 7 ♂♂ from a red globular sponge, at a depth of 40 m, Banc de Cinq Mètres, southwest of Nosy Bé, Madagascar, 19 August 1964, collected by A. G. Humes. Holotype (♀), allotype (♂), and paratypes (7 ♀♀, 5 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (1 ♀, 1 ♂) are retained in the collection of the author.

Female. Body (Fig. 24A) with flat and disc-shaped prosome. Mean body length $917 \mu\text{m}$ ($835\text{--}958 \mu\text{m}$), based on 9 specimens. Body length of dissected largest specimen $958 \mu\text{m}$, and maximum width $613 \mu\text{m}$. Prosome circular, $667 \mu\text{m}$ long. Cephalothorax $479 \mu\text{m}$ long, much wider than long, occupying about 70% length of prosome, with slightly angular posterolateral corners. Fourth pedigerous somite with linear or convex (usually convex) posterior margins. Urosome (Fig. 24B) 4-segmented. Fifth pedigerous somite $163 \mu\text{m}$ wide. Genital double-somite roughly hexagonal, $156 \times 146 \mu\text{m}$, widest at anterior 35% region, with about 12 long setules followed by 4 spinules on lateral margins posterior to genital areas (Fig. 25I); genital area located slightly anterior to midway of somite (in 40% region). Two free abdominal somites 56×85 and $67 \times 77 \mu\text{m}$, respectively. Caudal ramus (Fig. 25A) $35 \times 32 \mu\text{m}$ (1.09 : 1), with spinules and serrate scales on posteroventral margin. Egg sac (Fig. 24C) about $285 \times 219 \mu\text{m}$; each egg $115 \mu\text{m}$ in diameter.

Rostrum triangular, strongly tapering and directed ventrally. Antennule (Fig. 24E) long, $468 \mu\text{m}$, and 20-segmented; segments with 2 setae each, except for 8 setae on ninth, 2+aesthetasc on eighteenth, and 11 on last segments; one of setae plumose on first, thirteenth, and last segments, other setae naked. Antenna (Fig. 24F) with small coxa; basis with row of spinules near exopod. Exopod 1-segmented, slender, $20 \times 4 \mu\text{m}$, with 2 distal and 1 lateral setae. Endopod 3-seg-

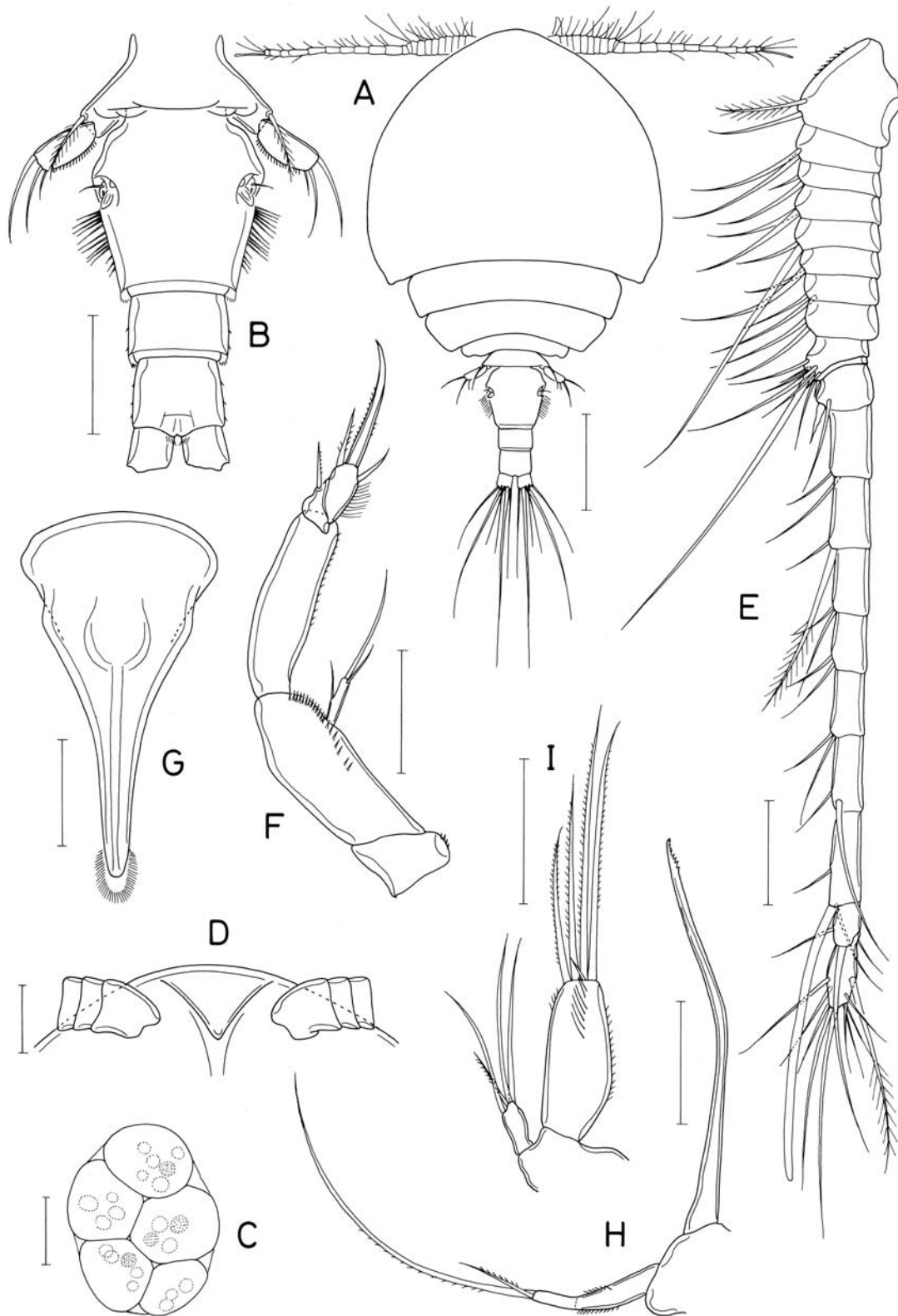


Fig. 24. *Asterocheres planus* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, egg sac; D, rostral area, ventral; E, antennule; F, antenna; G, oral siphon; H, mandible; I, maxillule. Scales: A, 0.2 mm; B, C, 0.1 mm; D-I, 0.05 mm.

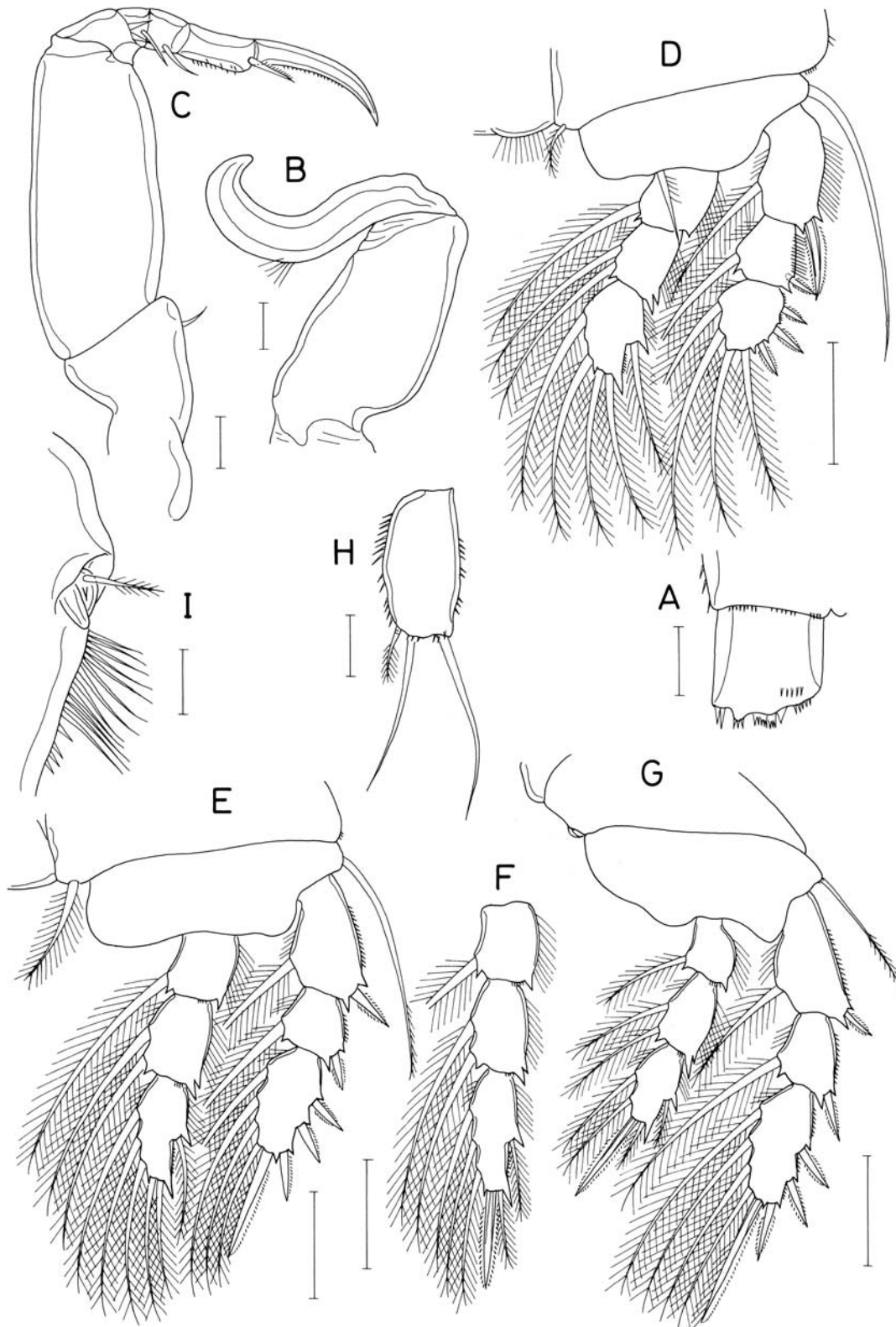


Fig. 25. *Asterocheres planus* n. sp., female. A, caudal ramus, ventral; B, maxilla; C, maxilliped; D, leg 1; E, leg 2; F, endopod of leg 3; G, leg 4; H, free segment of leg 5; I, right side of genital double-somite, dorsal. Scales: A-C, H, I, 0.02 mm; D-G, 0.05 mm.

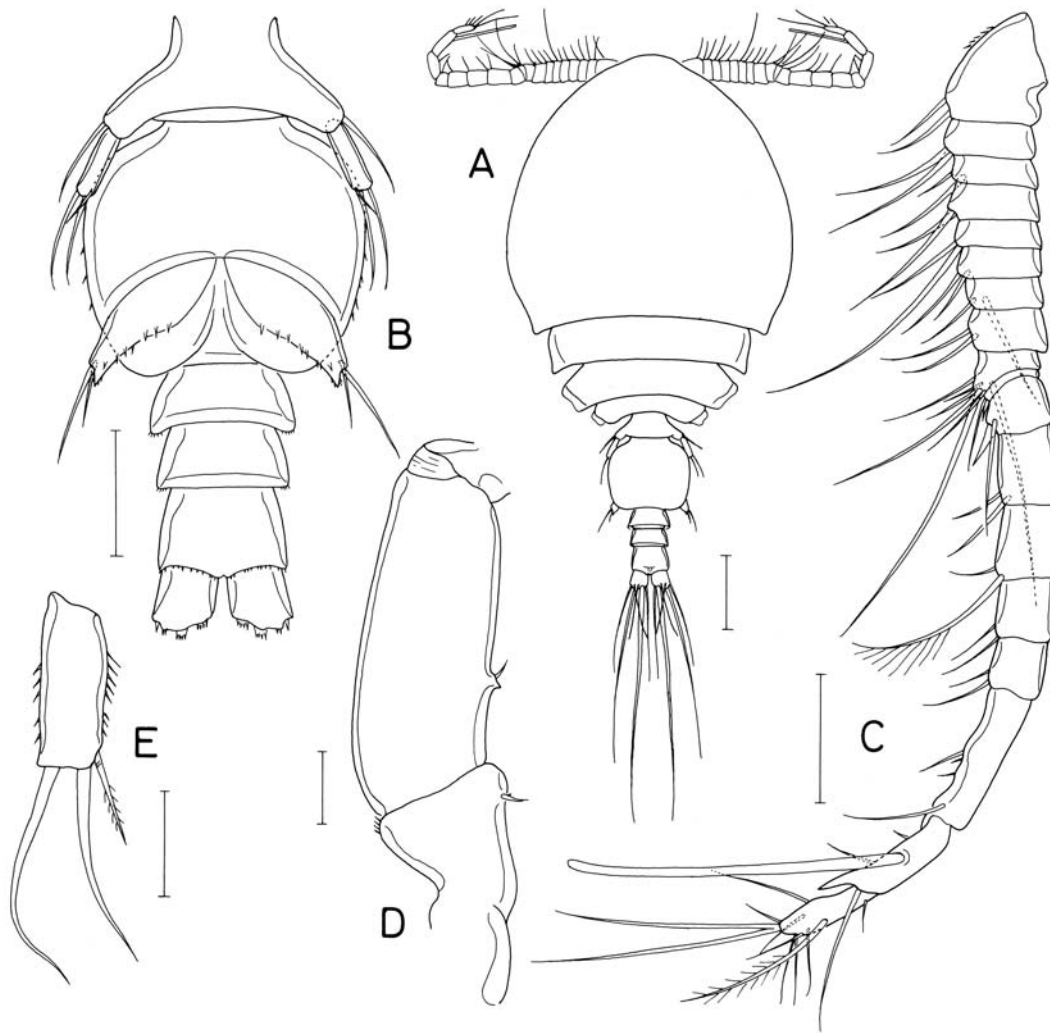


Fig. 26. *Asterocheres planus* n. sp., male. A, habitus, dorsal; B, urosome, ventral; C, antennule; D, proximal segments of maxilliped; E, free segment of leg 5. Scales: A, 0.1 mm; B, C, 0.05 mm; D, E, 0.02 mm.

mented; first segment $75 \times 23 \mu\text{m}$, with minute spinules on outer margin; second and third segments with 1 and 2 setae each; terminal claw $52 \mu\text{m}$ long.

Oral cone (Fig. 24G) forming siphon distally, $170 \times 92 \mu\text{m}$, and extending to middle of maxillipedal insertions. Mandible (Fig. 24H) consisting of thin stylet and palp. Stylet $160 \mu\text{m}$ long, bent in middle, with minute teeth apically. Mandibular palp 1-segmented, with 2 very unequal setae; palp and larger distal seta combined $185 \mu\text{m}$, longer than stylet. Maxillule (Fig. 24I) bilobed. Inner lobe $54 \times 27 \mu\text{m}$, distally with 4 distinct setae (91, 95, 71, and $54 \mu\text{m}$ from inner to outer) and 1 minute seta. Outer lobe small, $18 \times 8 \mu\text{m}$, with 4 distal setae (58, 59, 47, and $23 \mu\text{m}$, respectively), Maxilla (Fig. 25B) massive; proximal segment unarmed; distal claw strongly curved, with tuft of setules near middle. Maxilliped (Fig.

25C) stout and 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; second segment $113 \times 52 \mu\text{m}$ and naked; terminal segment with minute spinules on inner margin; terminal claw $56 \mu\text{m}$ long.

Legs 1-4 with 3-segmented rami (Fig. 25D-G). Outer seta on basis of legs 1-3 enlarged. Outer spine of first exopodal segment of leg 1 $33 \mu\text{m}$ long. Outer distal corner of second endopodal segment of legs 1-4 with bicuspid process. Intercoxal plate of leg 1 with setules on posterior margin, but those of legs 2-3 naked. Leg 4 with very small and naked inner seta on coxa; terminal spine on endopod $44 \mu\text{m}$; nearby seta distinctly smaller than terminal spine. Armature formula of legs 1-4 as in preceding species.

Free segment of leg 5 (Fig. 25H) $50 \times 26 \mu\text{m}$, with spinules on lateral and distal margins and 3 distal setae (72, 55, and

19 μm from outer to inner), inner smaller one of which plumose. Leg 6 represented by 1 plumose seta and 1 small spinule in genital area (Fig. 25I).

Male. Body (Fig. 26A) distinctly narrower than that of female. Body length of dissected specimen 742 μm . Prosome 496 μm long. Second to fourth pedigerous somites fringed with membrane on lateral margins. Urosome (Fig. 26B) 5-segmented. Fifth pedigerous somite 97 μm wide. Genital somite nearly circular, 99 \times 113 μm . Three abdominal somites 23 \times 58, 26 \times 52, and 35 \times 52 μm , respectively. Caudal ramus 27 \times 23 μm .

Rostrum as in female. Antennule (Fig. 26C) 395 μm and 18-segmented; each segment with 2 setae, except for 7 setae on ninth, 4 on sixteenth, 2+aesthetasc on seventeenth, and 11 on last segments; one of setae on thirteenth and last segments plumose. Antenna as in female.

Oral cone, mandible, maxillule, and maxilla as in female. Second segment of maxilliped with small inner process bearing small setule on its distal edge (Fig. 26D).

Legs 1-4 as in female. Free segment of leg 5 (Fig. 26E) 33 \times 13 μm ; largest one of 3 distal setae 47 μm . Leg 6 represented by 2 unequal setae on genital flap (Fig. 26B).

Etymology. The specific name *planus*, a Latin meaning "flat", alludes to the dorsoventrally flat body of the new species.

Remarks. In the genus *Asterocheres* about 14 known species have a 1-segmented mandibular palp and about 13 known species have an expanded, disk-shaped prosome in the female. The combination of these two features is shared only by *A. planus* n. sp. and *A. scutatus* Stock, 1966. *Asterocheres scutatus* differs from *A. planus* in having the caudal ramus which is wider than long and the genital double-somite which is much wider than long (Stock, 1966b).

The slender exopod of the antenna of *A. planus* is noticeable, because very few species in *Asterocheres* were recorded to have an exopod which is three times or more as long as wide. Examples of such a slender exopod are recorded or illustrated in *A. echinicola* (Norman, 1868), *A. ellisi* Hamond, 1968, *A. dysidae* Humes, 1996, *A. flustrae* Ivanenko and Smurov, 1997, *A. pilosus* Kim, 2004, *A. plumosus* n. sp., and *A. fastigatus* n. sp. Of these, only the former two species, *A. echinicola* (Norman, 1868) and *A. ellisi*, are comparable further with *A. planus*, because the remaining five species are known to have two-segmented mandibular palp, unlike *A. planus*.

Asterocheres planus differs from *A. echinicola*, because in the latter species the female antennule is 21-segmented, the inner lobe of the maxillule includes a plumose enlarged seta, and leg 1 exhibits a sexual dimorphism (Bandera and Conradi, 2009b; Bocquet et al., 1963).

Asterocheres planus differs also from *A. ellisi*, because in the latter species the female antennule is 21-segmented, the

oral cone extends over leg 1, the mandibular palp (plus its setae) is shorter than the stylet, and leg 4 lacks an inner seta on the coxa (Hamond, 1968).

Other significant features of *A. planus* may be the stout maxilla and maxilliped, the strongly curved distal claw of maxilla, and the characteristic shape of the second maxillipedal segment of the male.

Asterocheres sensilis n. sp. (Figs. 27-29)

Material examined. 14 ♀♀, 15 ♂♂ from a flat red-orange encrusting sponge of the intertidal, Pointe Mahatsinjo, Nosy Bé, Madagascar, 21 August 1960, collected by A. G. Humes. Holotype (♀), allotype (♂), and paratypes (11 ♀♀, 13 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 1 ♂) are retained in the collection of the author.

Female. Body (Fig. 27A) with broad prosome. Mean body length 721 μm (660-760 μm), based on 10 specimens. Body length of dissected specimen 720 μm , and maximum width 431 μm . Prosome 500 μm long. Cephalothorax 293 μm long, and much wider than long. Urosome (Fig. 27B) 4-segmented. Fifth pedigerous somite 130 μm wide. Genital double-somite 105 \times 120 μm , 1.14 times wider than long, with laterally expanded anterior part and tapering posterior part; genital areas located dorsolaterally posterior to midway of somite; lateral margin with 7 or 8 hair-like setules at place posterior to genital area (Fig. 28G). Two abdominal somites 35 \times 63 and 36 \times 56 μm , respectively. Anal somite with serrate posteroventral margin (Fig. 27C). Caudal ramus (Fig. 27C) 25 \times 26 μm , distally broadened, with dense spinules on posteroventral margin and 6 setae.

Rostrum weakly developed without posterior margin (Fig. 27D). Antennule (Fig. 27E) 309 μm long and 20-segmented; first segment with fine spinules on anterior margin; segments with 2 setae each, except for 7 setae on ninth segment, 2+aesthetasc on nineteenth, and 11 on last. Antenna (Fig. 27F) with short coxa bearing several setules on outer margin; basis with row of spinules near base of exopod. Exopod 1-segmented, 8 \times 5 μm , with 2 distal and 1 lateral setae. Endopod 3-segmented, with armature formula 0, 1, 3+claw; one of 3 setae on terminal segment minute; first segment with setules on lateral margins; terminal claw 50 μm long, as long as first segment.

Oral cone 162 \times 58 μm , widest at proximal 25% region, evenly tapering along distal 75% length, and extending slightly beyond insertions of maxillipeds (Fig. 27D). Mandible (Fig. 27G) with stylet of 163 μm long; palp 1-segmented, slender, and 42 \times 6 μm , its 2 distal setae well-developed, 128 and 73 μm , respectively. Maxillule (Fig. 27H) bilobed;

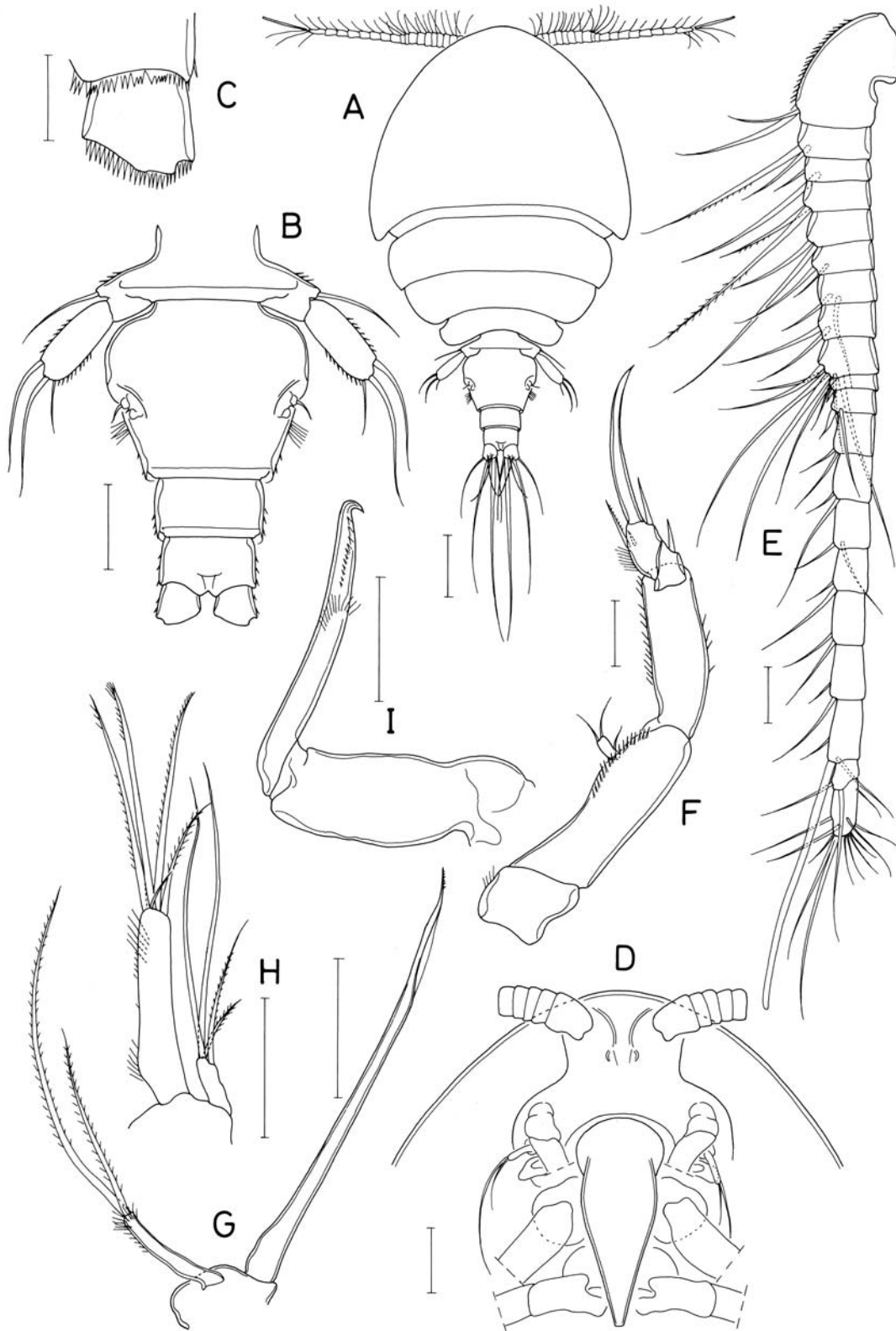


Fig. 27. *Asterocheres sensilis* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, caudal ramus, ventral; D, cephalic area, ventral; E, antennule; F, antenna; G, mandible; H, maxillule; I, maxilla. Scales: A, 0.1 mm; B, D, G-I, 0.05 mm; C, E, F, 0.02 mm.

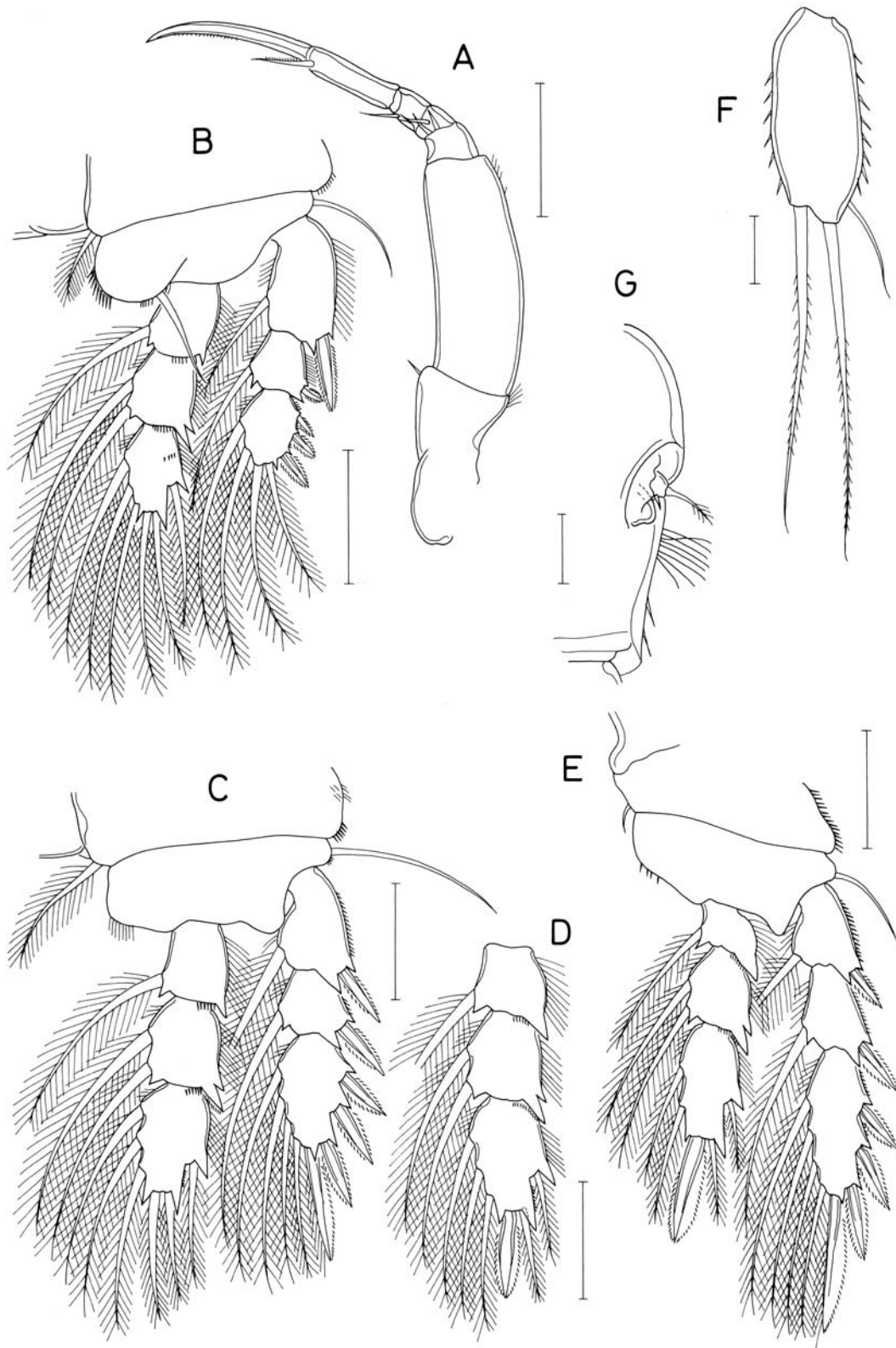


Fig. 28. *Asterocheres sensilis* n. sp., female. A, maxilliped; B, leg 1; C, leg 2; D, endopod of leg 3; E, endopod of leg 4; F, free segment of leg 5; G, right side of genital double-somite, dorsal. Scales: A-E, 0.05 mm; F, G, 0.02 mm.

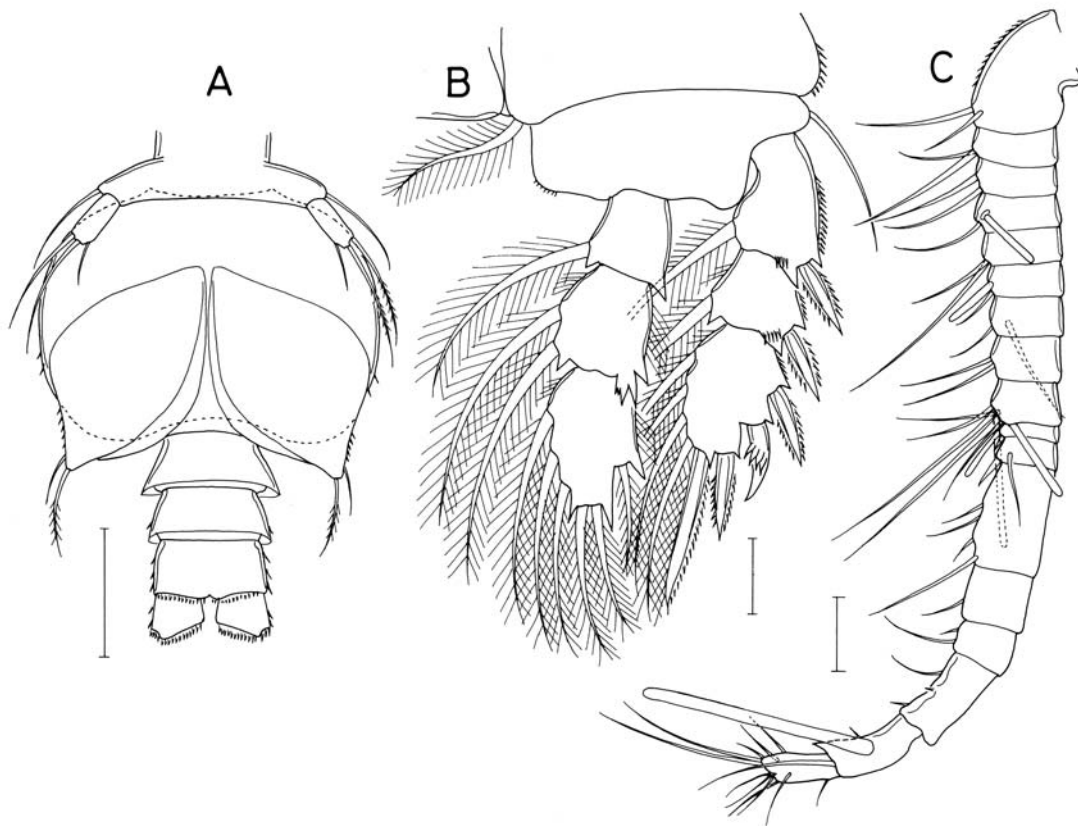


Fig. 29. *Asterocheres sensilis* n. sp., male. A, urosome, ventral; B, leg 2; C, antennule. Scales: A, 0.05 mm; B, C, 0.02 mm.

inner lobe slender, $70 \times 16 \mu\text{m}$, distally with 1 small and 4 larger setae (latters 81, 83, 79, and $45 \mu\text{m}$ long from inner to outer); outer lobe small, $21 \times 7 \mu\text{m}$, with 4 distal setae (104, 106, 55, and $25 \mu\text{m}$ respectively). Maxilla (Fig. 27I) with distal claw bearing setules and spinules in distal half. Maxilliped (Fig. 28A) 6-segmented; first segment with small inner distal seta; second segment slightly narrowed distally and unarmed; third to sixth segments with 2, 1, 1, 1, setae, respectively; terminal claw $62 \mu\text{m}$ long, about 1.7 times as long as terminal segment, with fine spinules on concave margin.

Legs 1-4 segmented and armed as in preceding species. Second endopodal segment of legs 1-4 with bicuspid outer distal process (Fig. 28B-E). Outer spine on first exopodal segment of leg 1 $28 \mu\text{m}$ long. Inner seta on coxa of leg 4 small and naked. Terminal spine on endopod of same leg $46 \mu\text{m}$ long. Outer seta on coxa of legs 1-4 naked.

Free segment of leg 5 (Fig. 28F) $62 \times 26 \mu\text{m}$ (2.38 : 1), with spinules on lateral margins and distally 2 large, weakly plumose setae (88 and $93 \mu\text{m}$, respectively) and 1 small naked inner seta ($32 \mu\text{m}$). Leg 6 represented by 1 plumose seta and 1 spinule in genital area (Fig. 28G).

Male. Body narrower than that of female. Body length of

dissected specimen $557 \mu\text{m}$. Prosome $360 \times 283 \mu\text{m}$. Urosome (Fig. 29A) 5-segmented. Fifth pedigerous somite $89 \mu\text{m}$ wide. Genital somite $90 \times 132 \mu\text{m}$, relatively large. Three abdominal somites 22×53 , 21×48 , and $23 \times 44 \mu\text{m}$. Caudal ramus $17 \times 21 \mu\text{m}$.

Rostrum as in female. Antennule (Fig. 29C) 17-segmented; fourth, sixth, and tenth segments with 1 seta and 1 aesthetasc, respectively; ninth with 5 setae and 2 aesthetascs; sixteenth with 2 setae and 1 aesthetasc; terminal segment with 11 setae; other segments with 2 setae each; aesthetascs on proximal segments short and rod-shaped. Antenna as in female. Oral cone, mandible, maxillule, and maxilla as in female. Maxilliped not different from that of female, either, without proximal process on second segment.

Leg 2 (Fig. 29B) with second outer spine of third exopodal segment ornamented with 4 cusps in the middle; outer distal process of second endopodal segment characteristically trifurcate. Legs 1, 3, and 4 as in female.

Leg 5 with free segment being $22 \mu\text{m}$ long. Leg 6 as 2 unequal setae on genital flap.

Etymology. The specific name *sensilis* (a Latin meaning "sensitive") alludes to the presence of several additional aesthe-

tascs on the male antennule.

Remarks. *Asterocheres sensilis* n. sp. exhibits the following combination of characters: (1) the mandibular palp is 1-segmented; (2) the antennule is 20-segmented; (3) the distal claw of antenna is almost as long as the first endopodal segment. This combination of characters of the new species is shared by two congeners *A. aesthetes* Ho, 1984 and *A. corneliae* Schirl, 1973. However, these two congeners differ from the new species in showing the following features.

Asterocheres aesthetes has a mandibular palp (including its apical setae) which is longer than the stylet, the female antennule bearing the aesthetasc on the fourth segment from distad, and the maxilla bearing a tubular element on the proximal segment (Ho, 1984).

Asterocheres corneliae has an oral cone forming distally a long siphon, the innermost seta on the free segment of leg 5 is larger than the nearby seta; the male antennule has only a single aesthetasc (Schirl, 1973).

The identity of *A. sensilis* may be confirmed further by the following features: (1) the male antennule bears a short, rod-shaped aesthetascs, one on the fourth, sixth, and tenth segments and two on the ninth segment. These aesthetascs showed no variability in size in the specimens observed; (2) male leg 2 bears a trifurcate outer distal process of the second endopodal segment of leg 2 and four cusps on the second outer spine of the third exopodal segment; (3) the maxilliped is not sexually dimorphic, i.e., the male maxilliped bears no inner proximal process on the second segment, which occurs very frequently in males of the *Asterocheridae*.

***Asterocheres indivisus* n. sp. (Figs. 30-32)**

Material examined. 36 ♀♀, 18 ♂♂ from the alcyonacean coral *Cespitularia erecta* Macfadyen, at a depth of 12 m, harbor at Hellville, Nosy Bé, Madagascar, 4 August 1967, collected by A. G. Humes. Holotype (♀), allotype (♂), and paratypes (33 ♀♀, 15 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 2 ♂♂) are retained in the collection of the author.

Other material examined. 15 ♀♀, 10 ♂♂, from *Cespitularia erecta*, at a depth of 24 m, Banc des Frères, near Isles Mitsio, northeast of Nosy Bé, Madagascar, 17 August 1967, collected by A. G. Humes.

Female. Body (Fig. 30A) with moderately broad prosome. Mean body length 833 µm (780-841 µm), based on 10 specimens. Body length of figured specimen 833 µm, and maximum width 344 µm. Prosome 458 µm long. All prosomal somites with rounded lateral corners. Urosome (Fig. 30B) 4-segmented. Fifth pedigerous somite 127 µm wide. Genital double-somite 99 × 102 µm, with anterior 40% region ex-

panded laterally and remaining narrower, slightly tapering posterior region; lateral margin posterior to genital area with 6 or 7 thick spinules (Figs. 30B, 31G); genital area located dorsolaterally slightly anterior to midlength of somite. Two free abdominal somites 39 × 64 and 35 × 56 µm, respectively. Caudal ramus 21 × 24 µm (0.88 : 1), with 6 setae.

Rostrum broad, without posterior margin (Fig. 30C). Antennule (Fig. 30D) 370 µm long and 20-segmented, but segmentation incomplete between last 2 segments; segments with 2 setae each, except for the ninth with 7 setae, eighteenth with 2 setae plus aesthetasc, and last with 13 setae; all setae naked; first segment with few spinules on anterior margin. Antenna (Fig. 30E) with short coxa bearing several spinules on outer margin; basis 58 × 23 µm, with a row of spinules. Exopod 1-segmented and 15 × 5 µm, with 2 distal and 1 lateral setae. Endopod 3-segmented; first segment 55 × 14 µm, with setules on outer margin; second segment with 1 distal seta; third segment with 2 small distal setae and setules on outer margin; terminal claw 48 µm long, shorter than first endopodal segment.

Oral cone (Fig. 30F) flat, broad, strongly tapering along distal 2/3, 102 × 62 µm, and extending slightly before maxillipedal insertions. Mandible (Fig. 30G) consisting of stylet (104 µm) and 1-segmented palp; palp slender, 68 × 5 µm, with spinules at margins and 2 subequal distal setae, 90 and 80 µm long, respectively. Maxillule (Fig. 30H) bilobed; inner lobe about 48 × 17 µm, with 1 small and 4 larger setae (the latter 55, 59, 51, and 37 µm long respectively from inner to outer); outer lobe 23 × 7 µm, with 4 setae (42, 42, 35, and 18 µm long, respectively). Maxilla (Fig. 30I) with aesthetasc-like element on proximal segment; distal claw smooth and distally curved. Maxilliped (Fig. 31A) 6-segmented; first segment with 1 inner seta; second segment unarmed, 85 × 29 µm, with minute spinules on outer margin; third to sixth segments armed with 2, 1, 1, and 1 setae, respectively; terminal claw 57 µm long, about twice as long as sixth segment.

Legs 1-4 with 3-segmented rami (Fig. 31B-E). Legs 1 and 4 with small naked inner seta on coxa. Terminal spine on third endopodal segment of leg 4 52 µm long. Armature formula of legs 1-4 as follows:

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

Free segment of leg 5 (Fig. 31F) nearly ovoid, 48 × 25 µm (1.92 : 1), with spinules on lateral margins and distally 3 naked setae (105, 119, and 28 µm, from outer to inner), two

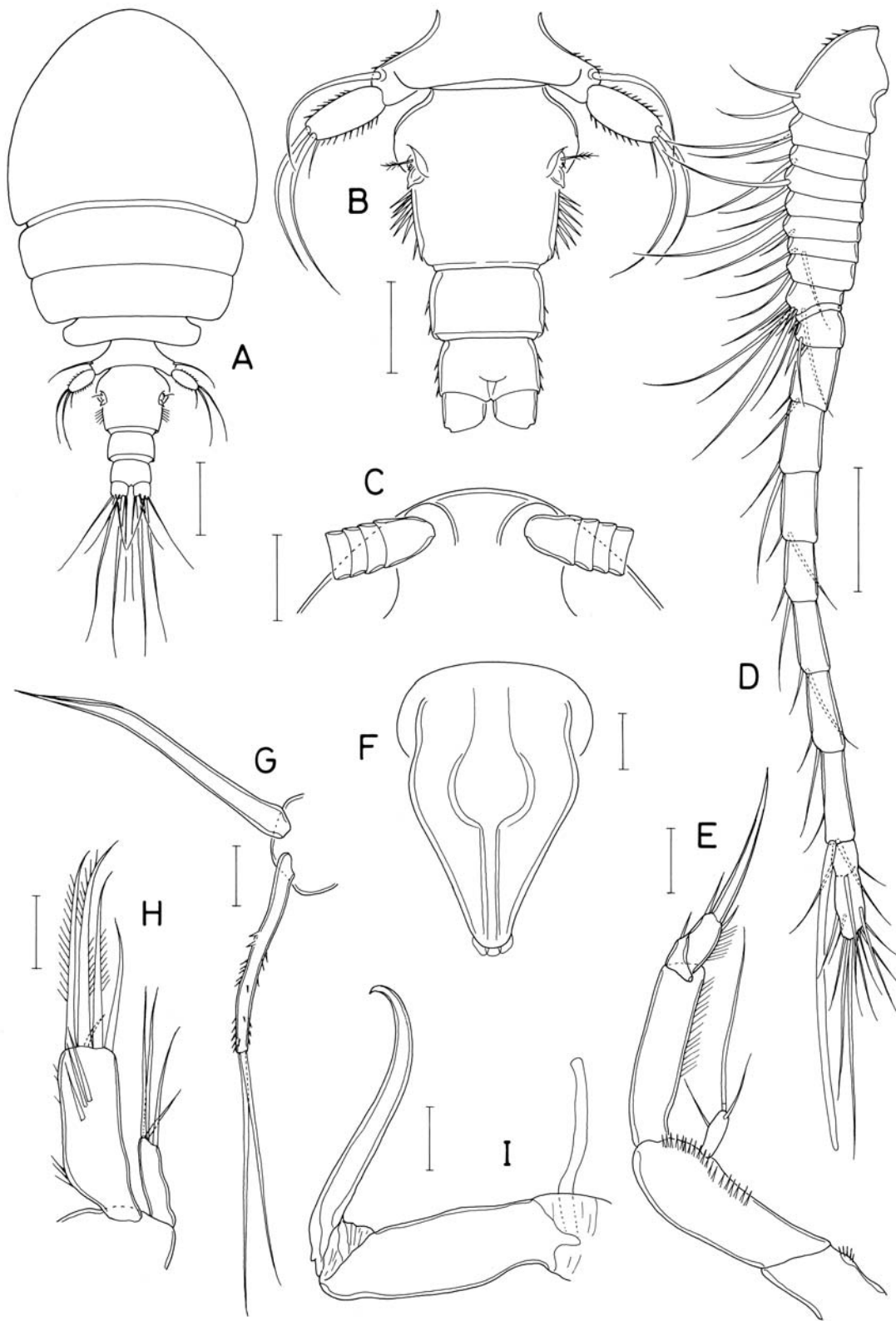


Fig. 30. *Asterocheres indivisus* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, rostral area, ventral; D, antennule; E, antenna; F, oral cone; G, mandible; H, maxillule; I, maxilla. Scales: A, 0.1 mm; B-D, 0.05 mm; E-I, 0.02 mm.

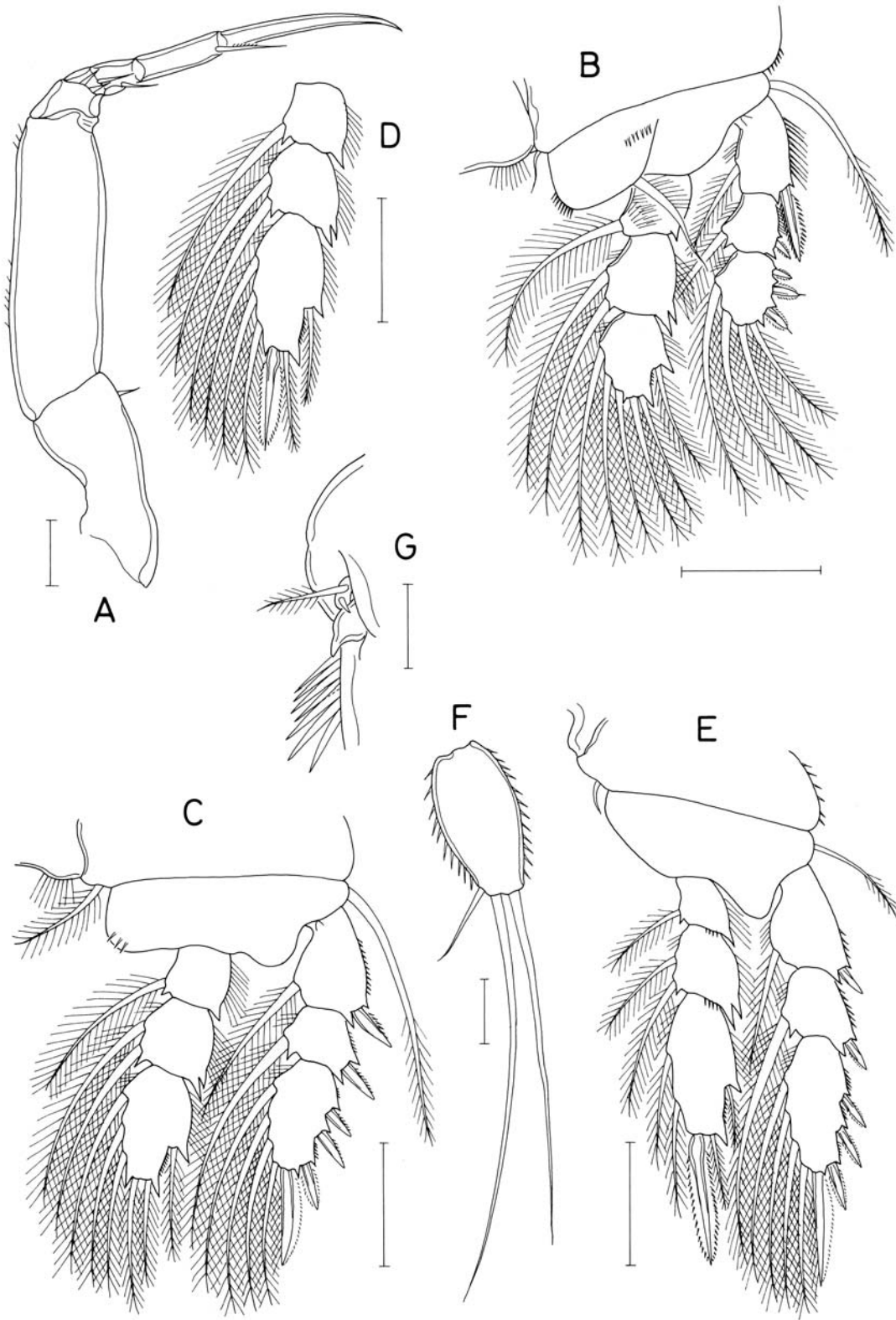


Fig. 31. *Asterocheres indivisus* n. sp., female. A, maxilliped; B, leg 1; C, leg 2; D, endopod of leg 3; E, leg 4; F, free segment of leg 5; G, left genital area. Scales: A, F, G, 0.02 mm; B-E, 0.05 mm.

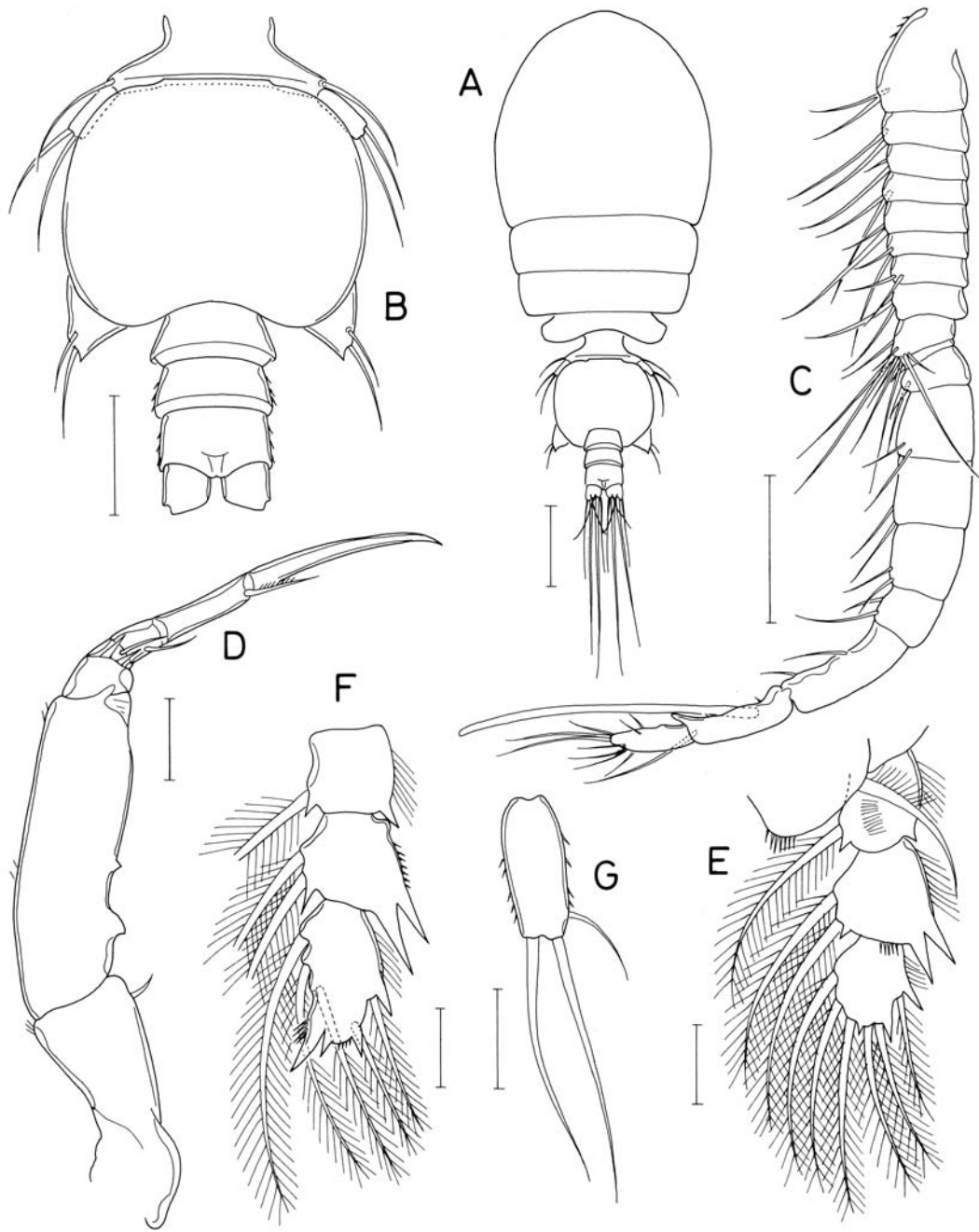


Fig. 32. *Asterocheres indivisus* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, maxilliped; E, endopod of leg 1; F, endopod of leg 2; G, free segment of leg 5. Scales: A, 0.1 mm; B, C, 0.05 mm; D-G, 0.02 mm.

of them very large. Leg 6 represented by 1 plumose seta and 1 small spinules in genital area (Fig. 31G).

Male. Body (Fig. 32A) narrower than that of female. Body length of dissected specimen 610 μm , and maximum width 270 μm . Urosome (Fig. 32B) 5-segmented. Fifth pedigerous somite 93 μm wide. Genital somite large, 92 \times 126 μm , with

rounded corners. Three abdominal somites 24 \times 52, 21 \times 50, and 29 \times 48 μm , respectively. Caudal ramus 20 \times 20 μm .

Rostrum as in female. Antennule (Fig. 32C) 315 μm long and 18-segmented; segments with 2 setae each, except 8 on ninth segment, 2+aesthetasc on seventeenth, and about 9 on last segment. Antenna as in female.

Oral cone, mandible, maxillule, and maxilla as in female. Maxilliped (Fig. 32D) with proximal process and another smaller process on inner margin.

Legs 1 and 2 with enlarged bifurcate outer distal process on second endopodal segment (Fig. 32E, F). Third endopodal segment of leg 2 with 4 setae and large, spinules-bearing process on inner distal area (Fig. 32F). Legs 3 and 4 as in female.

Free segment of leg 5 (Fig. 32G) $29 \times 12 \mu\text{m}$. Leg 6 represented by 2 naked setae on genital flap (Fig. 32B).

Etymology. The specific name *indivisus* (the Latin meaning “undivided”) alludes to the one-segmented palp of mandible.

Remarks. In most species of *Asterocheres* the two apical setae on the mandibular palp are distinctly unequal in size; one is larger and the other is markedly smaller. Several species are exceptional from this generality, but all of them appear to have a 2-segmented mandibular palp. Therefore, *A. indivisus* n. sp. is very unusual for *Asterocheres* in having both the 1-segmented mandibular palp and its subequally large apical setae.

Other diagnostic features of *A. indivisus* seem to be the presence of two large distal setae, in addition to a smaller subdistal one, on the free segment of female leg 5 and six or seven large spinules on the lateral margins of genital double-somite.

Asterocheres indivisus displays unique sexual dimorphisms in the maxilliped and legs 1 and 2: the male maxilliped has a small additional process on the inner margin distal to a larger proximal process; the bicuspid outer distal process of the second endopodal segment of male legs 1 and 2 is enlarged; and the third endopodal segment of leg 2 bears only five setae (rather than six as in the female) and a large inner subdistal process.

Although the examined specimens were all extracted from the same species of alcyonacean coral, the two collections reveal size variations. The specimens collected from a harbor at Hellville, which are described and figured, have a range of body lengths 780–841 μm (mean 833 μm) in the female, but in the specimens from Banc des Frères, near Isles Mitsio, were measured 650–730 μm (with a mean of 692 μm) in the same sex. The males were likewise different in lengths between the two collections. However, they did not reveal any other morphological differences.

***Asterocheres nudicoxus* n. sp. (Figs. 33-35)**

Material examined. 22 ♀♀, 3 ♂♂ from the stoloniferan coral *Tubipora musica* L., at the depth of 1 m, Pointe Lokobe, Nosy Bé, Madagascar, 12 June 1967, collected by A. G. Humes. Holotype (♀), allotype (♂), and paratypes (19 ♀♀, 1 ♂) have been deposited in the National Museum of

Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 1 ♂) are retained in the collection of the author.

Female. Body (Fig. 33A) with large prosome and small urosome. Body length 780 μm (747–800 μm), based on 10 specimens. Maximum width 417 μm . Prosome flat, subcircular, 517 μm long, and consisting of cephalothorax and 3 pedigerous somites. Cephalothorax 333 μm long much longer than remaining part of prosome. Urosome (Fig. 33B) 4-segmented. Fifth pedigerous somite much narrower than next somite. Genital double-somite $112 \times 108 \mu\text{m}$ and consisting of broad anterior part and short, narrower posterior part (79 μm wide across this part); anterior part strongly tapering anteriorly, with 2 tufts of setules (anterior tuft of 8–9 larger setules and posterior tuft of 7–8 smaller, spinule-like setules) on lateral margin posterior to genital area; genital area located dorsally at a region slightly posterior to midlength of somite (60% region). Two free abdominal somites 31×60 and $38 \times 51 \mu\text{m}$, respectively. Genital double- and abdominal somites with serrate posteroventral margin (Fig. 33C). Caudal ramus $27 \times 25 \mu\text{m}$ (1.08 : 1), with serrate posteroventral margin and 6 setae. Egg sac (Fig. 33D) about $273 \times 167 \mu\text{m}$ and containing 5 or 6 eggs; each egg 104 μm in diameter and containing granule-like globules of various sizes.

Rostrum broad but without posterior margin (Fig. 33E). Antennule 373 μm long and 21-segmented; with 8 setae on 9th segment, 2 setae+aesthetasc on 18th, 4 setae on 20th, 7 setae on terminal, and 2 setae on others; one of the setae on each 1st, 2nd, 4th, and 6th segments with bifurcate tip. Antenna (Fig. 33G) with unarmed coxa and basis. Exopod small, $11 \times 5 \mu\text{m}$, and armed with 2 unequal distal setae and 1 small lateral seta. Endopod 3-segmented; first segment $72 \times 18 \mu\text{m}$, with spinules on the outer margin; second segment with 1 seta; distal segment with 3 setae; terminal spine 63 μm long.

Oral cone (Fig. 33H) $140 \times 105 \mu\text{m}$, extending slightly beyond maxillipedal insertions, flat, proximally broad, and distally strongly tapering. Mandible (Fig. 34A) consisting of stylet and palp. Stylet 138 μm long, with minute teeth distally. Palp 1-segmented, but with vestige of articulation, and 56 μm long; 2 distal setae 129 and 53 μm , respectively. Maxillule (Fig. 34B) bilobed. Inner lobe $59 \times 18 \mu\text{m}$, with 1 small and 4 larger setae (the latter 86, 77, 68, and 50 μm long from inner to outer). Outer lobe small, $21 \times 7 \mu\text{m}$, with 4 distinct setae (97, 72, 56, and 31 μm long, respectively). Maxilla (Fig. 34C) 2-segmented; proximal segment with aesthetasc-like element proximally and fleshy process distally; distal claw slender, longer than proximal segment. Maxilliped (Fig. 34D) 6-segmented, with armature formula 1, 1, 2, 1, 1, and 1+claw; second segment $94 \times 31 \mu\text{m}$, with few spinules on outer margin; terminal claw very slender and 62

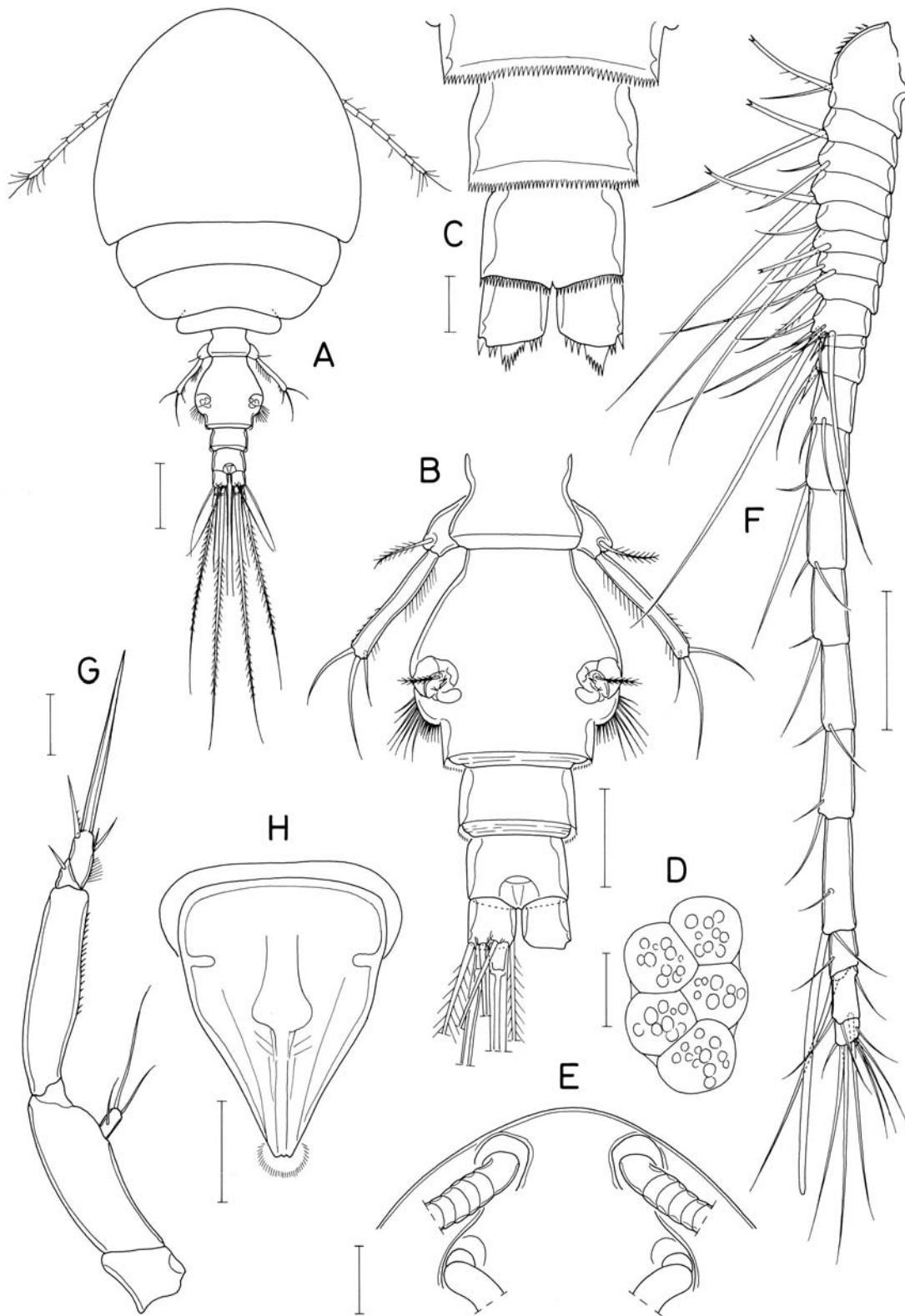


Fig. 33. *Asterocheres nudicoxus* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, abdomen, ventral; D, egg sac; E, rostral area, ventral; F, antennule; G, antenna; H, oral cone. Scales: A, D, 0.1 mm; B, E, F, H, 0.05 mm; C, G, 0.02 mm.

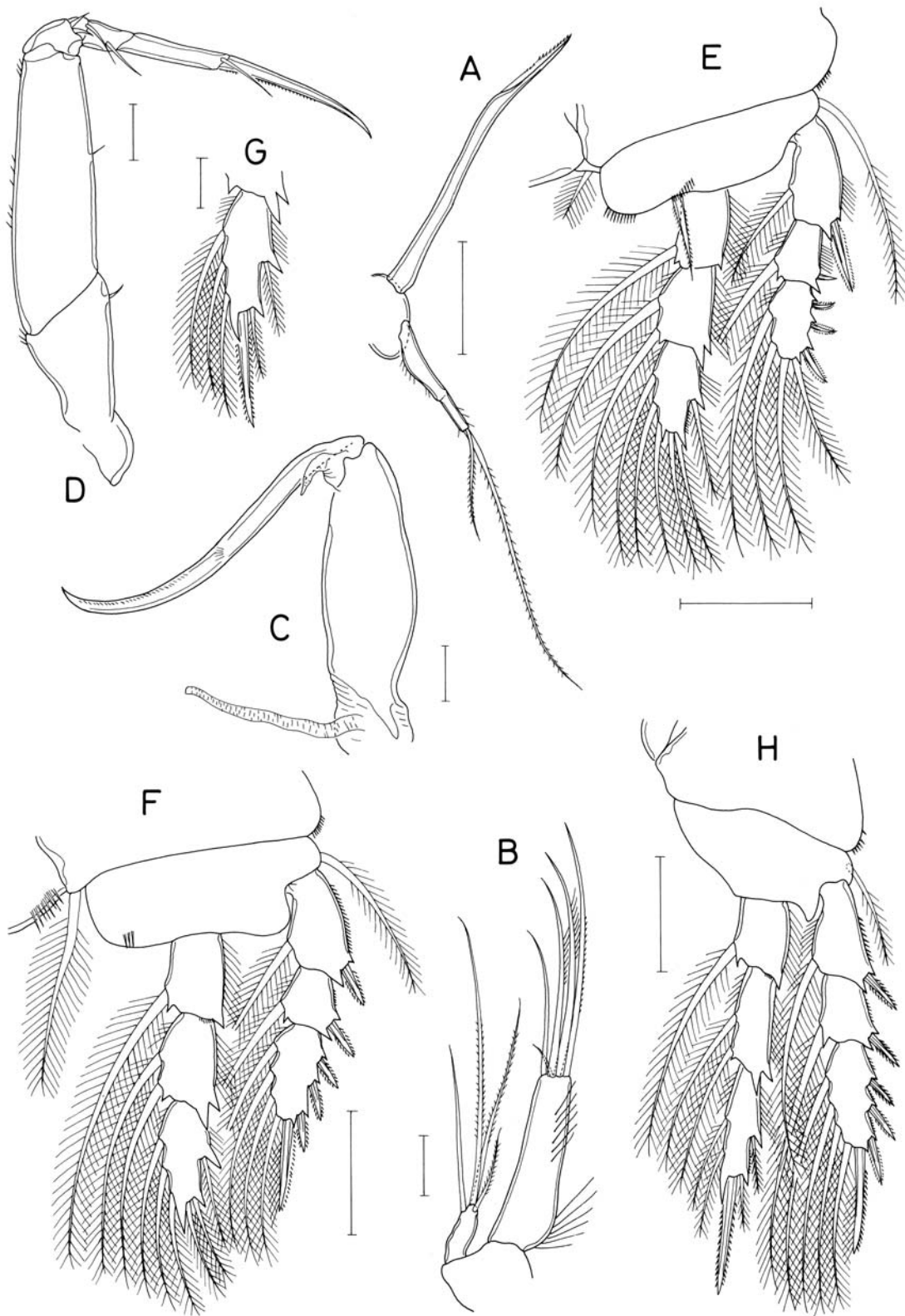


Fig. 34. *Asterocheres nudicoxus* n. sp., female. A, mandible; B, maxillule; C, maxilla; D, maxilliped; E, leg 1; F, leg 2; G, third endopodal segment of leg 3; H, leg 4. Scales: A, E, F, H, 0.05 mm; B-D, G, 0.02 mm.

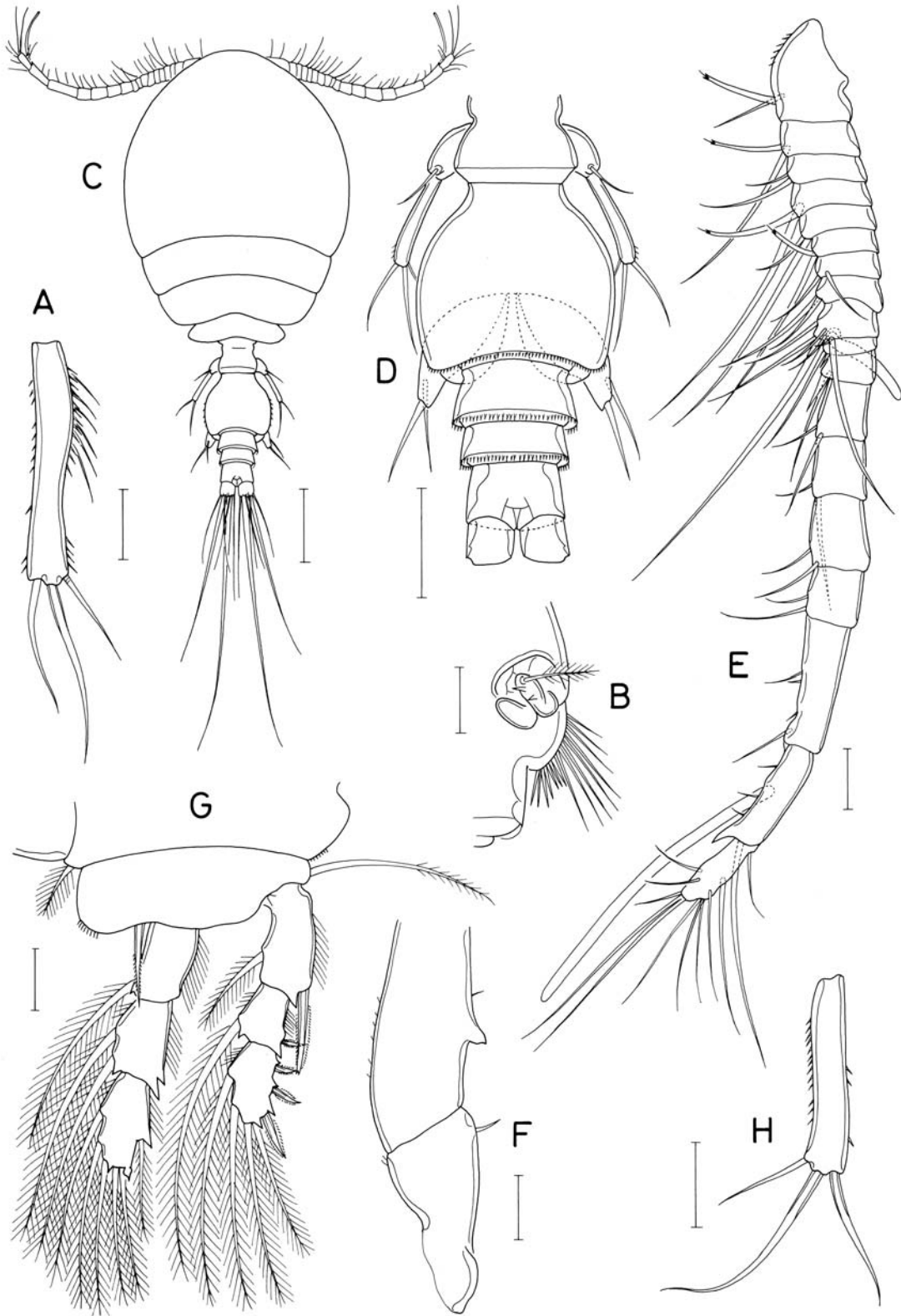


Fig. 35. *Asterocheres nudicoxus* n. sp. Female: A, free segment of leg 5; B, right genital area. Male: C, habitus, dorsal; D, urosome, dorsal; E, antennule; F, proximal part of maxilliped; G, leg 1; H, free segment of leg 5. Scales: A, B, E, 0.02 mm; C, 0.1 mm; D, F-H, 0.02 mm.

µm long.

Legs 1-4 with 3-segmented rami (Fig. 34E, F, H). Leg 1 with inner spinules at posterior margin of basis (Fig. 34E); inner seta on coxa relatively small and stiff; outer spine on first exopodal segment 28 µm long. Legs 1-4 with bicuspid outer distal process on second endopodal segment (Figs. 34E-H). Leg 4 without inner seta on coxa; spine on third endopodal segment 53 µm long. Armature formula of legs 1-4 as follows:

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

Leg 5 2-segmented; first segment with 1 plumose distero-dorsal seta; free segment (Fig. 35A) elongate, 70×11 µm (6.36:1), slightly narrowed in 2/3 region, with setules and spinules on lateral margins and 3 terminal setae (40, 52, and 29 µm from outer to inner). Leg 6 represented by 1 plumose seta and 2 spinules in genital area (Fig. 35B).

Male. Body (Fig. 35C) narrower than that of female. Body length of dissected specimen 617 µm (other 2 specimens 622 and 621 µm). Maximum width 312 µm. Prosome 412 µm long. Urosome (Fig. 35D) 5-segmented. Genital somite 91×91 µm. Three abdominal somites 28×57 , 19×49 , and 31×46 µm, respectively. Caudal ramus 22×22 µm.

Rostrum as in female. Antennule (Fig. 35E) 315 µm long and 18-segmented; 9th segment with 7 setae and 1 rod-shaped aesthetasc; 16th segment with 4 setae; 17th segment with 4 setae, 1 aesthetasc, and claw-like anterodistal process; terminal segment with 11 setae; other segments with 2 setae each. Antenna as in female.

Maxilliped with proximal process on inner margin of second segment (Fig. 35F). Other mouth organs as in female.

Leg 1 (Fig. 35G) with bead-like inner terminal process on third endopodal segment. Legs 2-4 as in female. Free segment of leg 5 48×10 µm; longest median terminal seta 52 µm long. Leg 6 represented by 2 naked setae on well-developed genital flap (Fig. 35D).

Etymology. The specific name *nudicoxus* is derived from the Latin *nudus* (naked) and *coxa*. It alludes to the absence of an inner seta on the coxa of leg 4.

Remarks. The closest relative of the new species is *A. tubiporae* Kim, 2004. They have in common the broad prosome, the broad rostrum, the elongated free segment of leg 5, the flat oral cone, and an aesthetasc on the ninth segment of male antennule. Moreover, they are associated with the same cnidarian host, *Tubipora musica* (Linnaeus), in Mada-

gascar.

It should be stated here that Kim (2004b) erroneously described and figured the female antennule of *A. tubiporae*: its fifteenth segment was duplicated. Therefore, the correct number of antennular segments of female *A. tubiporae* is 21, as in *A. nudicoxus*.

A careful comparison between *A. nudicoxus* and *A. tubiporae* resulted in the conclusion that they do not belong to the same species and can be distinguished from each other by the following differences: (1) the female genital double-somite is widest at midway in *A. tubiporae*, but widest at level of 60% region in *A. nudicoxus*; (2) the lateral margins of the genital double-somite are ornamented with one patch of setules in *A. tubiporae*, but two patches of setules in *A. nudicoxus*; (3) none of setae on the antennule is bifurcated in *A. tubiporae*, but some setae are bifurcated at tip in *A. nudicoxus*; (4) the lateral margin of the oral cone bears an angle in *A. tubiporae*, but none in *A. nudicoxus*; (5) two of the apical setae on the inner lobe of the maxillule are heavily ornamented with spinules in *A. tubiporae*, but all setae on the same lobe are simple in *A. nudicoxus*; (6) the free segment of female leg 5 is 4.37 times as long as wide (83×19 µm) in *A. tubiporae*, but 6.36 times (70×11 µm) in *A. nudicoxus*.

***Asterocheres tenuipes* n. sp. (Figs. 36-38)**

Material examined. 14 ♀♀, 1 ♂ from a sponge of the genus *Agelas*, at a depth of 23 m, south of Tany Kely, near Nosy Bé, Madagascar, 30 July 1967, collected by A. G. Humes. Holotype (♀) and paratypes (11 ♀♀) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratype (2 ♀♀, 1 ♂) are retaining in the collection of the author.

Female. Body (Fig. 36A) with large prosome and small urosome. Body length of dissected specimen 820 µm. Prosome 596 µm long, strongly tapering posteriorly. Cephalothorax much wider than long, 346×583 µm, distinctly wider than second pedigerous somite. Second and third pedigerous somites with concave posterior margin and oblique lateral margins. Third pedigerous somite distinctly longer than second, with slightly angular posterolateral corners. Fourth pedigerous somite much narrower than preceding somite, 229 µm wide. Urosome (Fig. 36B) 4-segmented. Fifth pedigerous somite 119 µm wide, with parallel lateral margins in anterior part and laterally projecting posterior part. Genital double-somite 118×132 µm, laterally expanding, with short, weakly tapering posterior part, about 10 lateral setules on lateral margin posterior to genital area, and transparent scales on dorsal surface (not drawn in Fig. 36B). Genital double- and first free abdominal somites with serrate posterodorsal

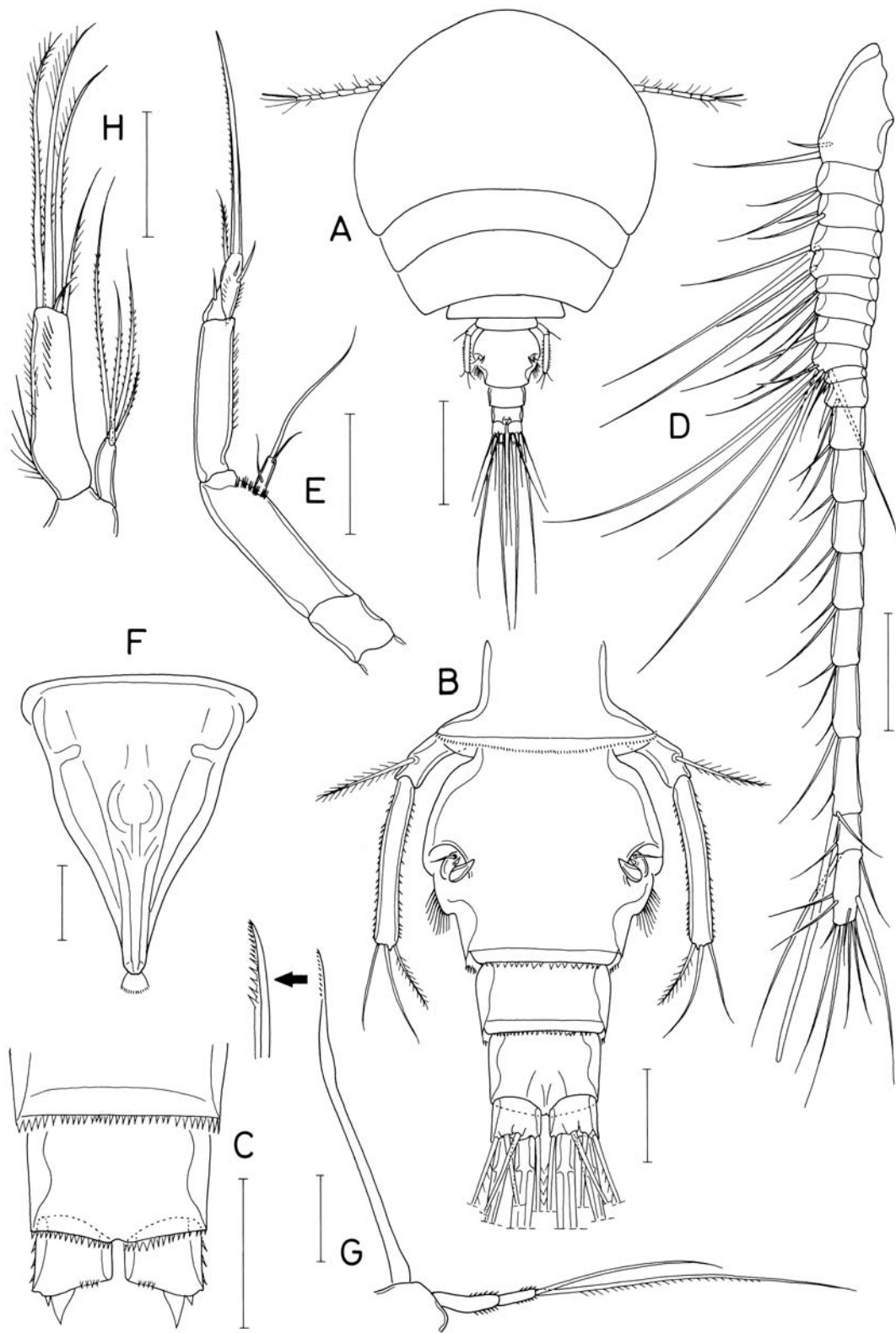


Fig. 36. *Asterocheres tenuipes* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, distal part of abdomen, ventral; D, antennule; E, antenna; F, oral cone; G, mandible; H, maxillule. Scales: A, 0.2 mm; B-H, 0.05 mm.

and posteroventral margins (Fig. 36B, C). Two free abdominal somites 36×74 and 47×62 μm , respectively. Anal somite with serrate posteroventral margin. Caudal ramus with 1 large and 1 small transparent scales and several spinules on posteroventral margin (Fig. 36C).

Rostrum as broad ridge, without posterior margin. Antennule (Fig. 36D) 375 μm long and 20-segmented; segments with 2 setae each, except for 8 setae on ninth segment, 2 setae+aesthetasc on eighteenth, and 11 setae on last; all setae naked; one of setae on first segment small. Antenna (Fig. 36E) with naked coxa; basis 70×23 μm , with about 5 pectinate spinules near base of exopod. Exopod 1-segmented, 17×4.5 μm (3.78 : 1), with 2 distal and 1 lateral setae. Endopod with armature formula 0, 1, and 3+claw; first segment 64×16 μm ; one of 3 setae on terminal segment minute; terminal claw thin, 94 μm long, and not articulated from terminal segment, with fine spinules on concave margin.

Oral cone (Fig. 36F) 195×142 μm , flat, broad, weakly tapering in proximal 2/5, strongly tapering in remaining 3/5, and reaching between insertions of maxilliped and leg 1. Mandible (Fig. 36G) with slender, 200 μm -long stylet distally bearing denticles. Mandibular palp 2-segmented; proximal and distal segments 38 and 23 μm , respectively; 2 distal setae 190 and 107 μm , respectively. Maxillule (Fig. 36H) bilobed. inner lobe 77×21 μm , its 5 distal setae 119, 118, 103, 62, and 16 μm , respectively. Outer lobe 26×8 μm , with 4 distal setae of 105, 78, 68, and 37 μm . Maxilla (Fig. 37A) slender and 2-segmented; distal claw thin, with tuft of setule near middle and fine spinules along distal half. Maxilliped (Fig. 37B) slender and 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; second segment 120×31 μm ; terminal claw 88 μm long, about twice as long as terminal segment.

Legs 1-4 with 3-segmented rami (Fig. 37C-F) and bicuspid outer distal process on second endopodal segment. Legs 1-3 with spinules on posterior margin of intercoxal plate. Leg 1 with outer spine on first exopodal segment of 36 μm long; inner distal corner of basis with fine spinules. Legs 3 and 4 with outer terminal setae on endopod much smaller than inner spine. Leg 4 without inner seta on coxa; its terminal spine on endopod 64 μm long. Armature formula of legs 1-4 as follows:

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

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

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

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

Leg 5 2-segmented; first segment well-defined from so-

mite, with plumose dorsal seta; free segment (Fig. 37G) elongate, 97×13 μm (7.46 : 1) with spinules on lateral margins and distally 1 small pointed process and 3 setae (51, 58, and 41 μm from outer to inner), inner one of which plumose. Leg 6 probably represented by 1 small seta, 1 minute spinule and 1 larger spiniform element (Fig. 36B).

Male. Body (Fig. 38A) similar to that of female. Body length of dissected specimen 738 μm . Prosoma 519 μm long. Cephalothorax 302×469 μm . Urosome (Fig. 38B) 5-segmented. Fifth pedigerous somite 94 μm wide. Genital somite 100×138 μm , with rounded corners. Three abdominal somites 28×68 , 24×61 , and 40×55 μm , respectively. Caudal ramus 24×24 μm .

Rostrum as in female. Antennule (Fig. 38C) 336 μm long and 18-segmented; number of setae on segments being 2, except for 8 setae on ninth, 4 on sixteenth, 2+aesthetasc on seventeenth, and 11 on last segments. Antenna as in female.

Oral cone, mandible, maxillule, and maxilla as in female. Maxilliped with beak-like proximal process on inner margin of second segment.

Third endopodal segment of legs 1 and 2 (Fig. 38E, F) stouter than those of female, without inner distal process but with fine spinules between outer and outer distal processes. Legs 3 and 4 as in female.

Free segment of leg 5 not different in form from that of female, 76×10 μm , largest one of its distal setae 49 μm . Leg 6 represented by 2 plumose setae on genital flap.

Etymology. The specific name *tenuipes* is derived from the Latin words *tenuis* (slender) and *pes* (on foot). It alludes to the slender free segment of leg 5.

Remarks. In seven known species of *Asterocheres* the free segment of female leg 5 is elongated, more than four times as long as wide, as in *A. tenuipes* n. sp. They are *A. crinoidicola* Humes, 2000, *A. enwetakensis* Humes, 1997, *A. reginae* Boxshall and Huys, 1994, *A. serrulatus* (Humes, 1996), *A. tubiporae* Kim, 2004, *A. bahamensis* n. sp., and *A. nudicoxus* n. sp. Of these, the following five species have an oral cone which is broad, dorsoventrally flat, and nearly pentagonal or triangular in ventral view, as *A. tenuipes* n. sp.: *A. reginae*; *A. serrulatus*; *A. tubiporae*; *A. bahamensis* n. sp.; and *A. nudicoxus* n. sp. These five species can be distinguished from the new species by the following features.

In *A. reginae* the cephalothorax is much more expanded than metasomites and overhang metasomites, the female antennule is 21-segmented, the exopod of antenna is not more than twice as long as wide (see Fig. 4A of Boxshall and Huys, 1994), the maxilla bears an aesthetasc-like element on the proximal segment, and leg 4 bears an inner seta on the coxa.

In *A. serrulatus* the female antennule is 19-segmented, the exopod of antenna is 1.63 times as long as wide, the distal

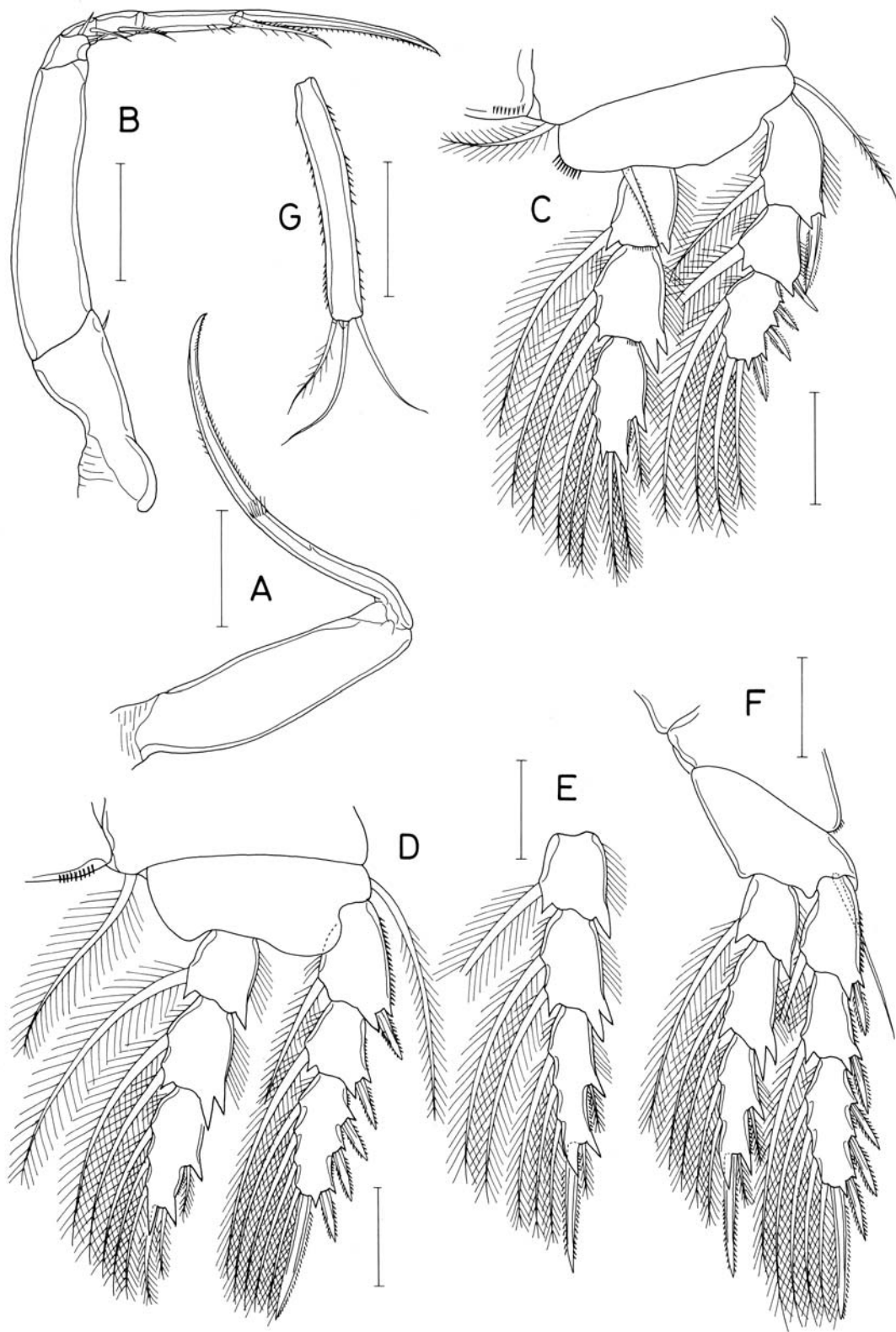


Fig. 37. *Asterocheres tenuipes* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5. Scales: 0.05 mm for all.

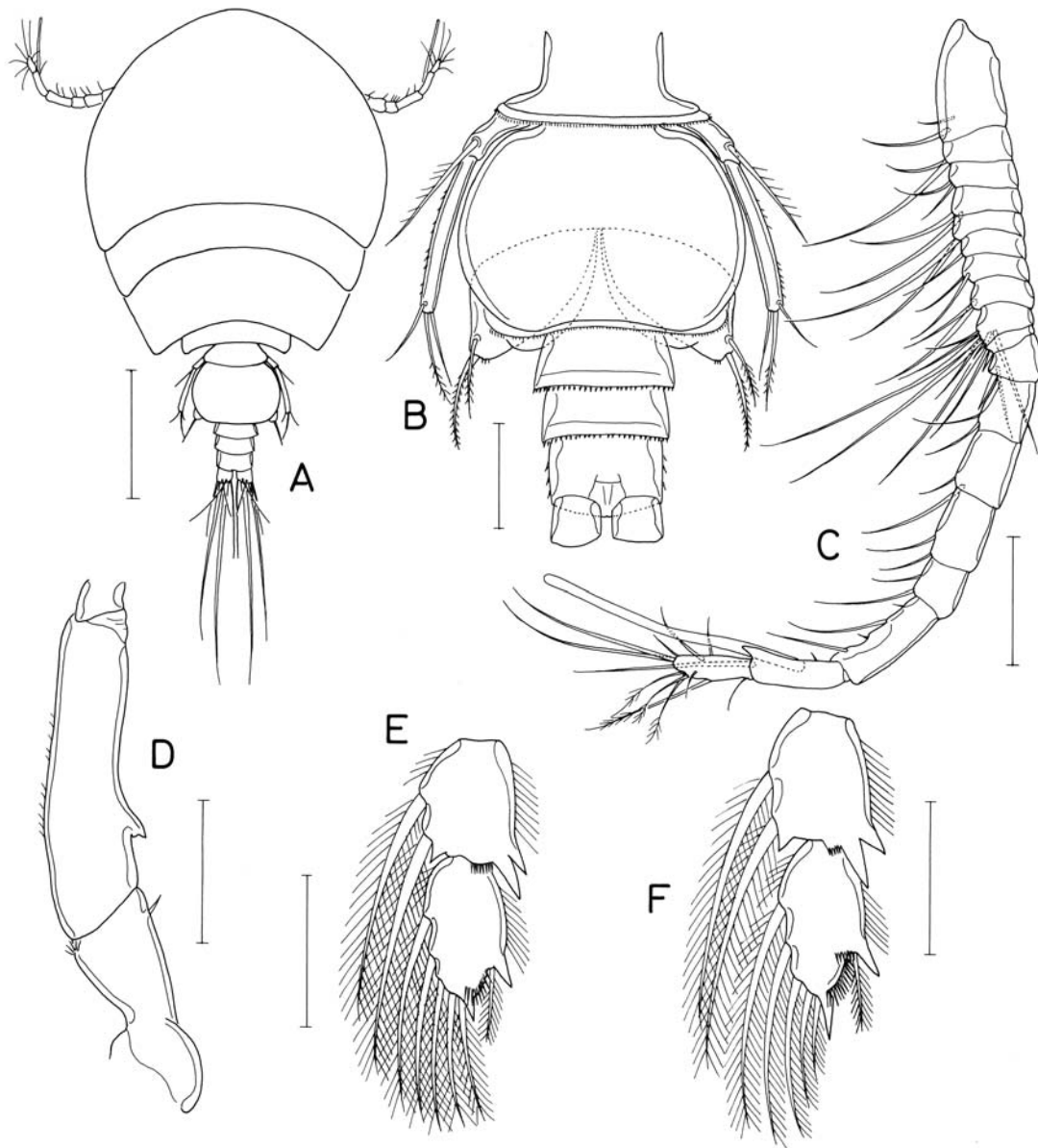


Fig. 38. *Asterocheres tenuipes* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, proximal segments of maxilliped; E, second and third endopodal segments of leg 1; F, second and third endopodal segments of leg 2. Scales: A, 0.2 mm; B-F, 0.05 mm.

claw of the antenna is shorter than the first endopodal segment, and the second endopodal segment of leg 1 bears an unicuspid outer distal process.

In *A. tubiporae* the female antennule is 21-segmented, the maxilla bears an aesthetasc-like element on the proximal segment, two of the distal setae on the inner lobe of maxillule are heavily ornamented with spinules, and the antennule and legs reveal sexual dimorphisms which are different from those of *A. tenuipes*.

In *A. bahamensis* the female antennule is 19-segmented, the distal claw of antenna is shorter than the first endopodal segment, the maxilla bears an aesthetasc-like element on the proximal segment, leg 4 bears an inner seta on coxa, and the third endopodal segment of male leg 3 is armed with 4 setae and 1 spine (formula 1,I,3).

In *A. nudicoxus* the anterior part of genital double-somite is distinctly tapering anteriorly, the female antennule is 21-segmented, some of setae on proximal segments of antennule

are bifurcated at tip, the maxilla bears an aesthetasc-like element on the proximal segment, and the male antennule bears an aesthetasc on the ninth segment.

***Asterocheres genodon* Stock, 1966 (Figs. 39-41)**

Material examined. 13 ♀ ♀, 2 ♂ ♂ from a tubular lavender sponge, at a depth of 1.8 m, Pointe Lokobe, Nosy Bé, Madagascar, 31 July 1963, collected by A. G. Humes; 30 ♀ ♀ from a tubular lavender sponge, Pointe Lokobe, Nosy Bé, Madagascar, 16 August 1960, collected by A. G. Humes; 20 ♀ ♀ from a tubular lavender sponge, at a depth of 12 m, Ambatoloaka, Nosy Bé, Madagascar, 17 August 1960, collected by A. G. Humes.

Redescription. Female. Body (Fig. 39A) with broad prosome. Mean body length 0.99 mm (0.89-1.05 mm), based on 9 specimens. Body length of figured specimen 1.00 mm, and maximum width 585 μ m. Prosome 680 μ m long and consisting of large cephalothorax and second to fourth pedigerous somites. Second and third pedigerous somites fringed with thin membrane on lateral margins. Urosome (Fig. 39B) 4-segmented. Fifth pedigerous somite 187 μ m wide, wider than next somite. Genital double-somite broad, 152 \times 167 μ m, posteriorly tapering in distal half, with angle on lateral margin posterior to genital area and about 14 thin lateral setules on margin anterior to angle (Fig. 40H); genital area located slightly posterior to midlength (at 58% region). Two free abdominal somites 46 \times 96 and 52 \times 85 μ m, respectively. Caudal ramus 42 \times 37 μ m (1.14 : 1), with longer outer margin and shorter inner margin, oblique distal margin, transparent membranous extensions of different sizes and shapes on posteroventral margin, and 7 caudal setae, including a small, naked ventral seta (Fig. 39C).

Rostrum weakly developed, longer than wide and tapering (Fig. 39D). Antennule (Fig. 39E) 482 μ m long and 21-segmented; articulation incomplete between 2 terminal segments; first segment with minute spinules on anterior margin; number of setae on segments being 2, except for 7 on 9th segment, 2+aesthetasc on 18th, 4 on 19th, and 7 on last; 1st, 3rd, 4th, 6th, and 8th segments each bearing 1 blunt seta; one of setae on 14th segment plumose. Antenna (Fig. 39F) with unarmed coxa; basis 85 \times 27 μ m, with longitudinal row of spinules near base of exopod. Exopod 10 \times 6 μ m, with 3 small setae. Endopod 3-segmented; first segment 74 \times 20 μ m, with spinules on lateral margins; second segment with 1 setae; terminal segment with long inner and small outer distal setae and setules on outer margin; terminal claw elongate, thin, 110 μ m long, and not articulated from terminal segment.

Oral siphon (Fig. 39G) elongated, 347 μ m long, 83 μ m wide across broadest proximal area, reaching slightly beyond intercoxal plate of legs 2. Mandible (Fig. 39H) consisting of

stylet and palp. Stylet slender, abruptly thinning along distal 2/3, 354 μ m long, with 4 teeth apically. Mandibular palp 2-segmented, proximal and distal segments 50 and 17 μ m long respectively; 2 apical setae very unequal, 192 and 64 μ m, respectively. Maxillule (Fig. 39I) bilobed; inner lobe 84 \times 28 μ m and tapering, terminally with 1 small and 4 large setae (lengths 272, 241, 195, and 76 μ m); outer lobe small, 30 \times 10 μ m, with 4 distal naked setae (lengths 110, 87, 78, and 28 μ m). Maxilla (Fig. 40A) with long tubular element on proximal segment; distal claw elongated, much longer than proximal segment, distally strongly curved, and bearing setules and spinules on concave margin. Maxilliped (Fig. 40B) 6-segmented; first segment with inner distal seta and tuft of small setules at outer distal corner; second segment 135 \times 45 μ m and unarmed; third segment with 2 small setae; fourth to sixth segments with 1 seta each; terminal claw thin, elongate, 118 μ m long, more than twice as long as terminal segment (51 μ m long).

Legs 1-4 with 3-segmented rami (Fig. 40C-F). Leg 1 with fine spinules on inner side of posterior margin of basis; outer spine on first exopodal segment 32 μ m long and curved. Legs 1-4 with bicuspid outer distal process on second endopodal segment. Leg 4 (Fig. 40F) with vestigial inner seta on coxa; terminal spine on third endopodal segment 72 μ m long. Armature formula of legs 1-4 as follows:

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

Free segment of leg 5 slightly tapering, 98 \times 26 μ m (3.77 : 1), with spinules on lateral margins and 3 terminal setae (lengths 150, 90, and 70 μ m from outer to inner). Leg 6 represented by 1 plumose and 1 small setae in genital area (Fig. 40H).

Male. Body (Fig. 41A) narrower than that of female. Body length of figured specimen 615 μ m, and maximum width 331 μ m. Prosome 435 μ m long. Second pedigerous somite distinctly narrower than cephalothorax. Urosome 5-segmented. Genital somite 106 \times 113 μ m, with prominent, pointed posterolateral processes (Fig. 41B) and spinules (or scales) on lateral margins. Three abdominal somites 22 \times 56, 16 \times 53, and 30 \times 52 μ m, respectively. Caudal ramus 24 \times 24 μ m.

Rostrum as in female. Antennule (Fig. 41C) not geniculated, 320 μ m long, and 17-segmented; each segment with 2 setae, except for 7 on tenth, 4 on twelfth, 4+aesthetasc on sixteenth, and 11 on last. Antenna as in female.

Oral siphon, mandible, maxillule, and maxilla as in female.

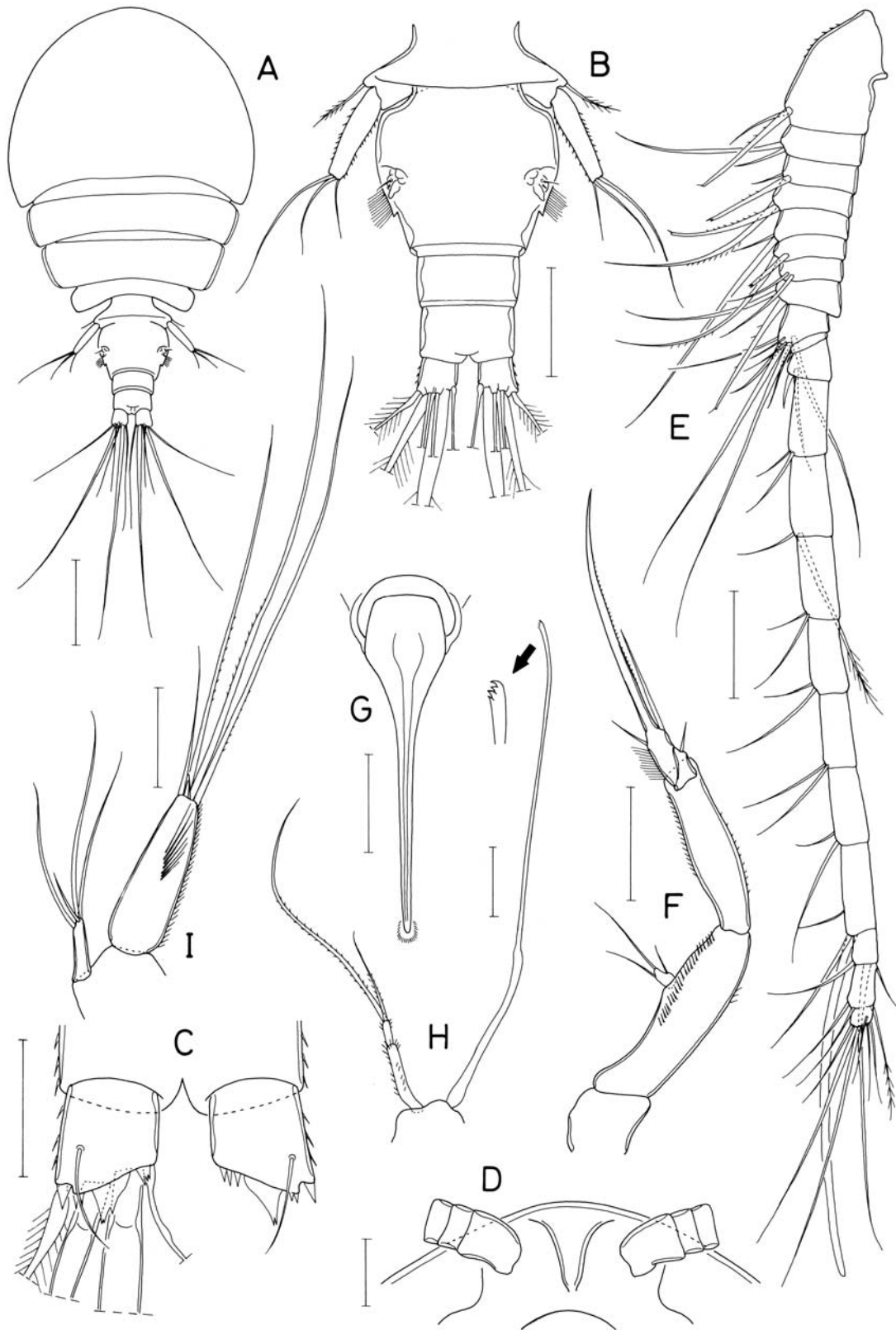


Fig. 39. *Asterocheres genodon* Stock, female. A, habitus, dorsal; B, urosome, dorsal; C, caudal rami, ventral; D, rostral area, ventral; E, antennule; F, antenna; G, oral siphon; H, mandible; I, maxillule. Scales: A, 0.2 mm; B, G, 0.1 mm; C-F, H, I, 0.05 mm.

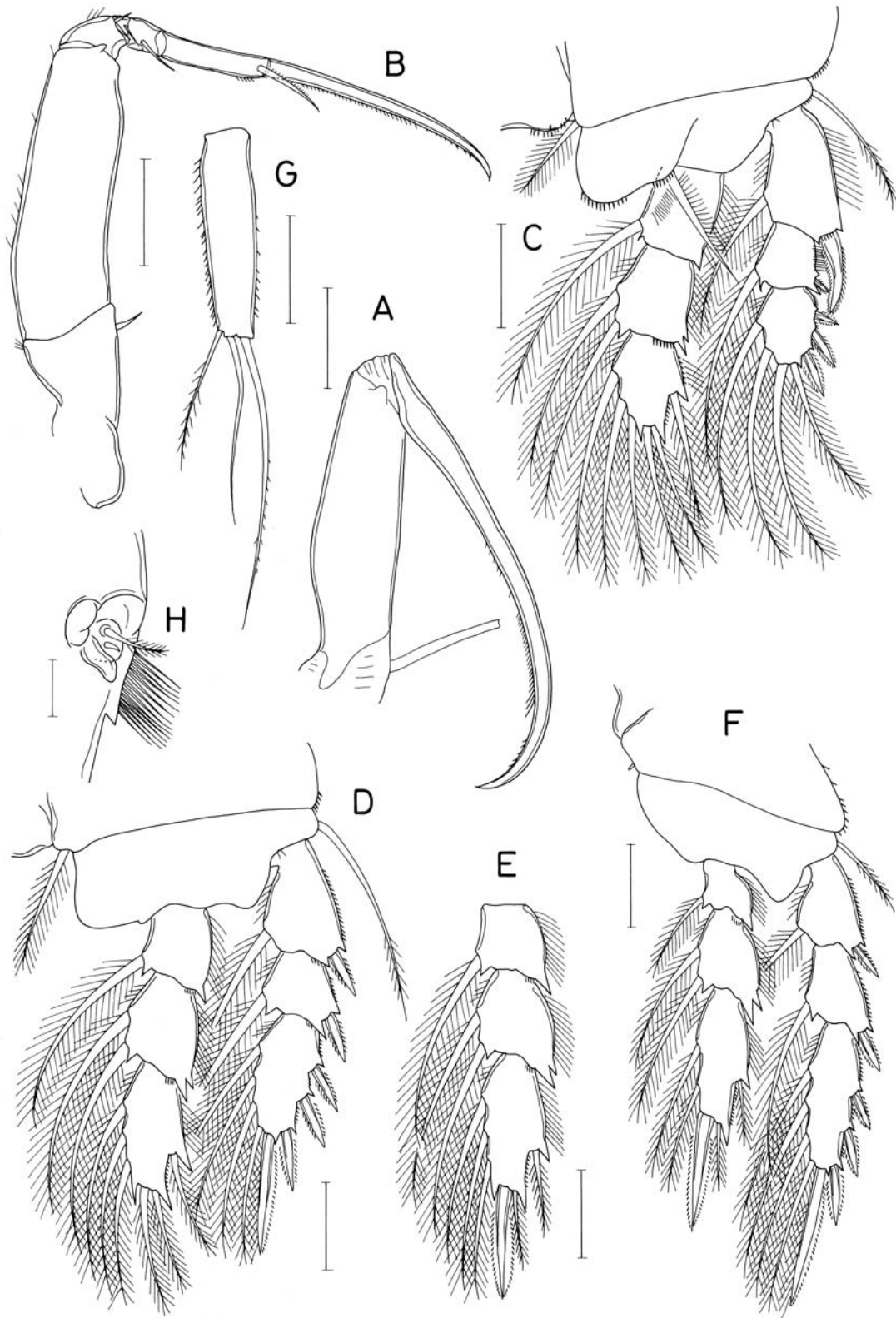


Fig. 40. *Asterocheres genodon* Stock, female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, right genital area. Scales: A-G, 0.05 mm; H, 0.02 mm.

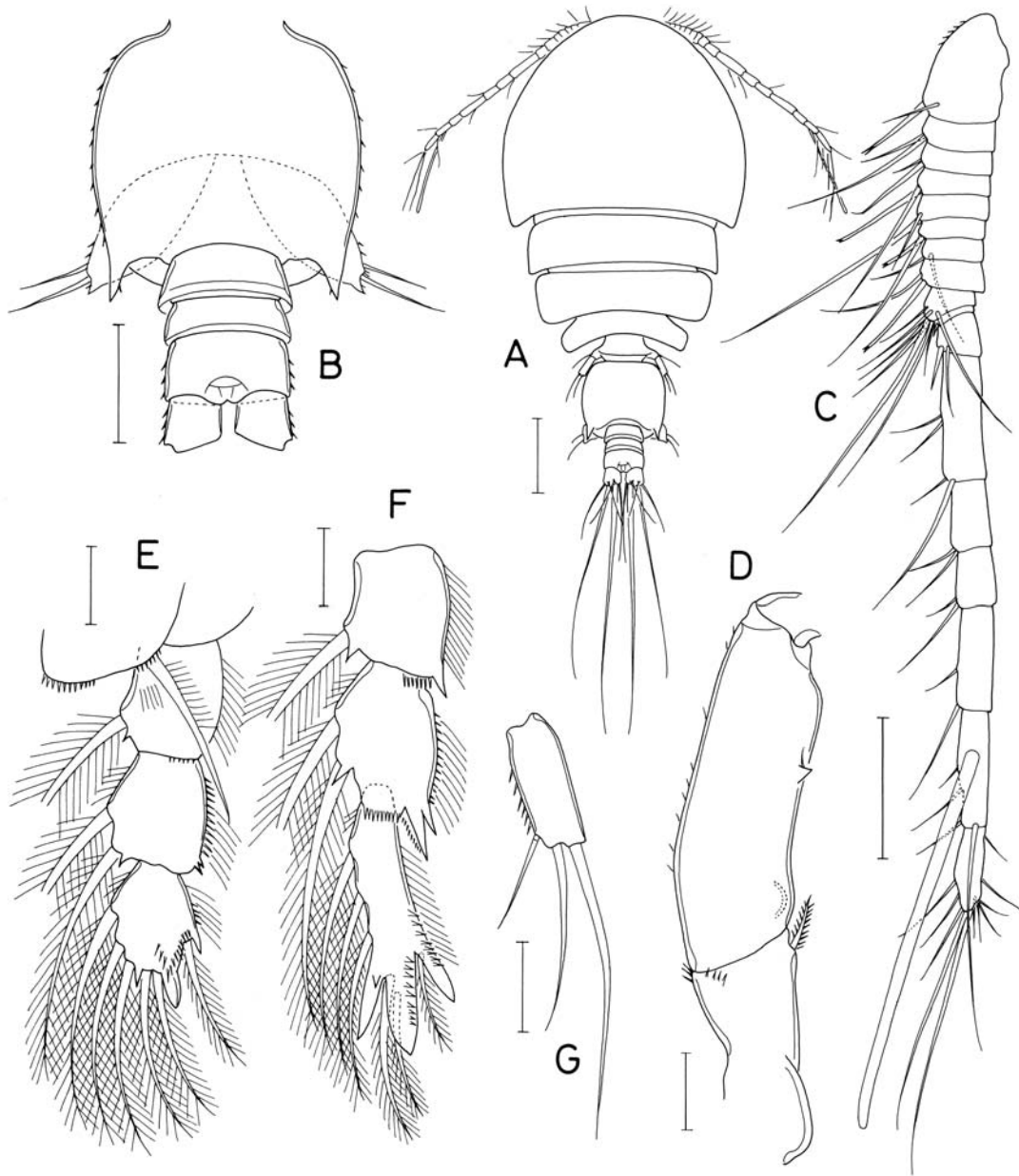


Fig. 41. *Asterocheres genodon* Stock, male. A, habitus, dorsal; B, genital somite and abdomen, dorsal; C, antennule; D, proximal segments of maxilliped; E, endopod of leg 1; F, endopod of leg 2; G, free segment of leg 5. Scales: A, 0.1 mm; B, C, 0.05 mm; D-G, 0.02 mm.

Maxilliped with plumose inner distal seta on first segment; second segment with small tubercle proximally and small cusp bearing minute setule on distal side (Fig. 41D).

Endopod of leg 1 (Fig. 41E) with thickened inner terminal process and additional spinules on terminal segment. Endopod of leg 2 (Fig. 41F) with 3 enlarged distal processes on terminal segment. Legs 3 and 4 as in female.

Free segment of leg 4 $31 \times 12 \mu\text{m}$, with spinules on inner margin and 3 unequal setae, largest outermost one $67 \mu\text{m}$

long. Leg 6 represented by 2 setae on genital flap (Fig. 41B).

Remarks. This species was described originally by Stock (1966a) based on eight females from Mauritius. It is easily identifiable by its characteristic features: the female genital double-somite bears an angle on the lateral margin; the terminal claw of antenna is thin and long; the mandibular stylet is very thin in distal 2/3 and the mandibular palp is 2-segmented, which consists of the longer proximal segment and the shorter distal segment; the inner lobe of maxillule bears

long distal setae; the maxilla and maxilliped bear elongated distal claw. These features are shared by the type specimens and the present specimens from Madagascar. Stock (1966a) probably overlooked the aesthetasc-like element on the proximal segment of maxilla and the ventral seta on the caudal ramus. The latter feature is reported also in *A. dysideae* Humes, 1996 (Humes, 1996b).

The male of *A. genodon* is known for the first time in this paper, which shows strongly sexually dimorphic features in the maxilliped and legs 1 and 2. The produced posterolateral corner of genital somite in the male is also a characteristic feature of this species.

Asterocheres galeatus n. sp. (Figs. 42-44)

Material examined. 2 ♀♀, 1 ♂ from the scleractinian coral *Platygyra daedala* (Ellis and Solander), at a depth of 1 m, Ambariobe, Nosy Bé, Madagascar, 28 January 1964, collected by A. G. Humes. Holotype (♀) and allotype (left antennule broken; antennule, maxilliped, leg 5 of right side dissected) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratype (1 ♀) is retained in the collection of the author.

Female. Body (Fig. 42A) with large, helmet-shaped cephalothorax. Body length of dissected specimen 842 µm. Prosome 616 µm long. Cephalothorax expanded, 379 × 592 µm, its posterolateral parts tapering and extending to level of middle of third pedigerous somite. Second and third pedigerous somites much narrower than cephalothorax. Third pedigerous somite nearly as long as second, with pointed or bicuspid posterolateral corners. Fourth pedigerous somite much smaller than preceding somites. Urosome 4-segmented. Genital double-somite 100 × 125 µm, roundly expanded in anterior 3/4 and narrowed and tapering in posterior 1/4, with 15 setules on lateral margin posterior to genital area. Two free abdominal somites 39 × 68 and 35 × 56 µm, respectively. Genital double- and 2 free abdominal somites with serrate posteroventral margin (Fig. 42C). Caudal ramus 26 × 24 µm, characteristically with 1 large, pointed scale on posteroventral margin (Fig. 42C).

Rostrum broad, broadened posteriorly, and continued to oral cone, with suture line between them (Fig. 42D). Antennule (Fig. 42E) 20-segmented and 259 µm long; proximal segments distinctly broader than distal segments; segments with 2 setae each, except for 7 setae on ninth segment, 2+aesthetasc on eighteenth, and 11 on last; all setae naked. Antenna (Fig. 42F) with naked coxa; basis 67 × 23 µm and unornamented. Exopod 11 × 5 µm, with 2 distal and 1 lateral setae. Endopod 3-segmented, with armature formula 0, 1, and 2+claw; first segment 52 × 16 µm; terminal claw 67 µm,

straight and spiniform.

Oral cone broad, flat, 175 × 157 µm, strongly tapering, and extending to place between maxilliped and leg 1 (Fig. 42D). Mandible (Fig. 42G) consisting of stylet and palp. Stylet bent at 2/3 region, acutely pointed distally, and 170 µm long. Mandibular palp 2-segmented; proximal and distal segments 46 and 17 µm, respectively; 2 distal setae large, 190 and 122 µm, respectively. Maxillule (Fig. 42H) bilobed. Inner lobe 65 × 20 µm, with 5 distal setae, 4 larger ones of which 96, 97, 90, and 48 µm, respectively. Outer lobe 35 × 8 µm, with 4 naked distal setae of 86, 84, 61, and 33 µm long, respectively. Maxilla (Fig. 43A) 2-segmented; proximal segment with small proximal tubercle on inner margin; distal claw very slender, with setules near middle and fine spinules along distal 1/3 part. Maxilliped (Fig. 43B) 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; second segment 117 × 31 µm; terminal segment 42 µm long; distal claw 72 µm long.

Legs 1-4 with 3-segmented rami (Fig. 43C-F), large outer seta on basis, and bifurcate outer distal process on second endopodal segment. Outer spine on first exopodal segment 32 µm. Leg 4 without inner seta on coxa; distal spine on endopod 46 µm long, and nearby seta much smaller than spine. Armature formula of legs 1-4 as follows.

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

Leg 5 2-segmented; first segment well defined from somite; free segment (Fig. 43G) 75 × 19 µm (3.95 : 1), with spinules on lateral margins and 3 distal setae (50, 60, and 47 µm from outer to inner), Leg 6 represented by 1 seta and 1 spinule in genital area.

Male. Body (Fig. 44A) similar in form to that of female, but cephalothorax less expanded. Body length of dissected specimen 896 µm. Prosome 629 µm long. Cephalothorax 385 × 575 µm, fringed with membrane on posterodorsal margin. Third pedigerous somite with small pointed process at posterolateral corners. Urosome (Fig. 44B) 5-segmented. Genital somite 91 × 147 µm, gradually narrowed distally, with linear posterior margin. Three abdominal somites 33 × 83, 42 × 72, and 42 × 62 µm, respectively. Caudal ramus 27 × 28 µm.

Rostrum as in female. Antennule 18-segmented; each segment with 2 setae, except for 7 setae on ninth segment, 4 on sixteenth, 2+aesthetasc on seventeenth, and 11 on last. Antenna as in female.

Oral cone, mandible, maxillule, and maxilla as in female.

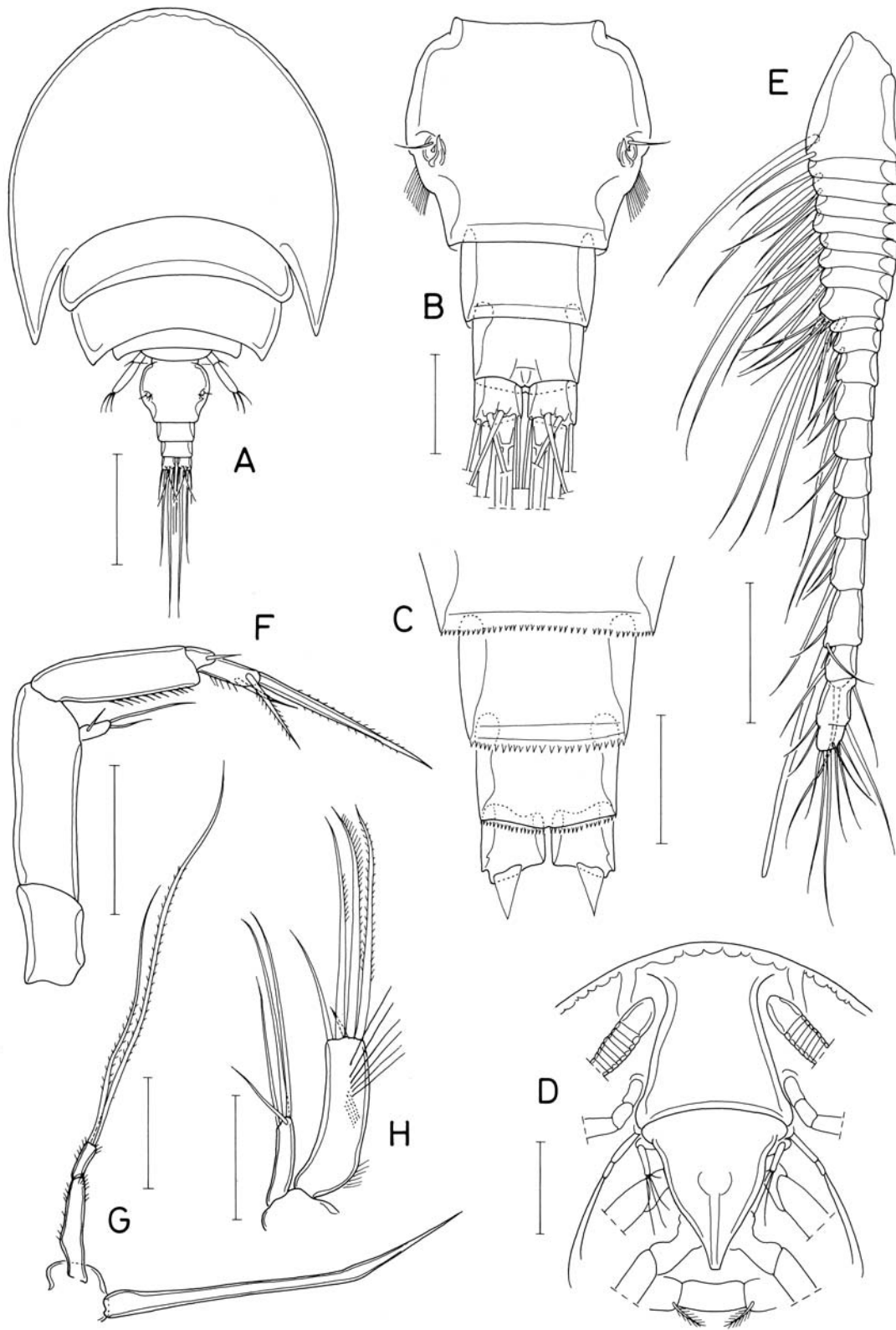


Fig. 42. *Asterocheres galeatus* n. sp., female. A, habitus, dorsal; B, genital double-somite and abdomen, dorsal; C, abdomen, ventral; D, cephalic area, ventral; E, antennule; F, antenna; G, mandible; H, maxillule. Scales: A, 0.2 mm; B, C, E-H, 0.05 mm; D, 0.1 mm.

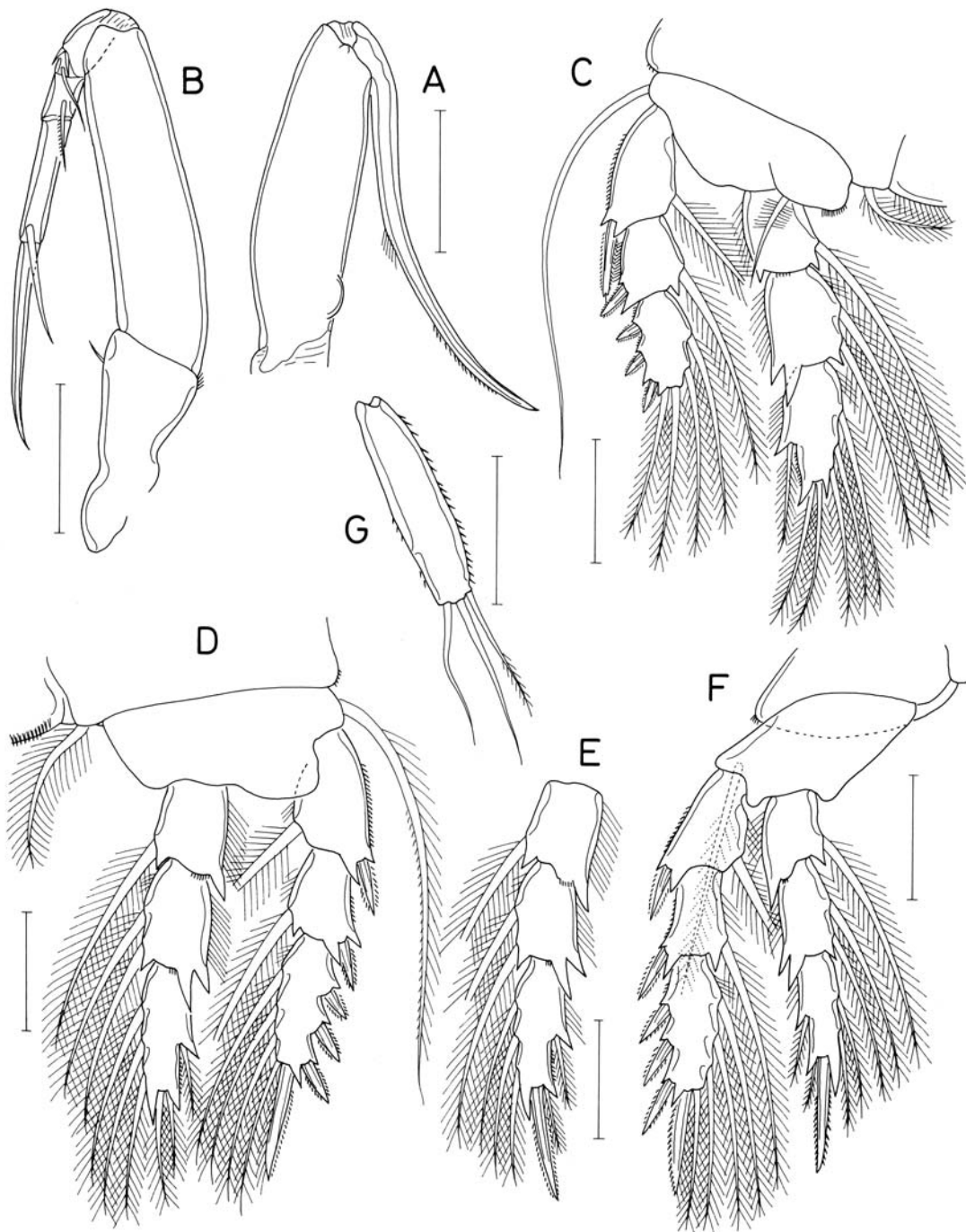


Fig. 43. *Asterocheres galeatus* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5. Scales: 0.05 mm for all.

Maxilliped with weak proximal process on second segment (Fig. 44D).

Legs 1-4 as in female. Leg 5 similar in shape to that of female; free segment $69 \times 15 \mu\text{m}$; 3 distal setae 52, 55 and $50 \mu\text{m}$ from outer to inner, last one plumose. Leg 6 repre-

sented by 2 similar naked setae on genital flap (Fig. 44B).

Etymology. The specific name is derived from the Latin *galea* (helmet) alluding to the helmet-shaped cephalothorax of the new species.

Remarks. *Asterocheres galeatus* n. sp. is very similar to *Phyl-*

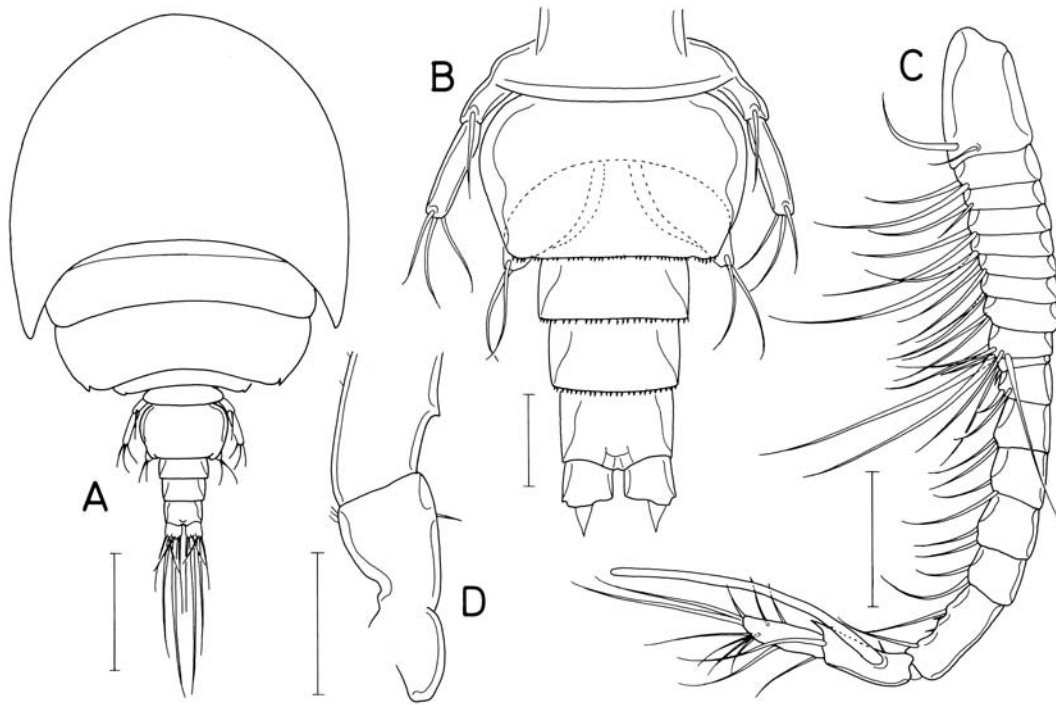


Fig. 44. *Asterocheres galeatus* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, proximal part of maxilliped. Scales: A, 0.2 mm; B-D, 0.05 mm.

locheres petalus Humes, 1996 in the body form in which the prosome is laterally expanded and the posterolateral corners of cephalothorax extended backwards. This similarity is, however, superficial, because they show significant differences in other characters, such as different armature formulae in legs 1 and 2. Within the genus *Asterocheres*, only *A. fastigatus* described below has the similar body form. However, *A. galeatus* is easily distinguishable from *A. fastigatus* by having the less expanded genital double-somite, the short and broad oral cone, the small exopod of antenna, the large triangular scale on the posteroventral margin of caudal ramus, the inner setae on coxa of leg 1, and the elongated free segment of leg 5.

The strongly expanded prosome and a broad, flat and strongly tapering oral cone in the new species are shared by its six congeners. These congeners can be differentiated from *A. galeatus* by their following features.

In *Asterocheres dysideae* Humes, 1996 the caudal ramus has an additional setule on the ventral surface, the female antennule is 19-segmented, and the outer seta on the basis of legs 1-3 are not enlarged.

In *Asterocheres serrulatus* (Humes, 1996) the outer lobe of maxillule is strongly reduced, the second endopodal segment of leg 1 has a simple outer distal process, the free segment of female leg 5 is 7.13 times as long as wide, and some

seta on the proximal segment of antennule are bifurcate at tip.

In *Asterocheres reginae* Boxshall and Huys, 1994 the posterolateral part of the third pedigerous somite is not angular or pointed, the maxilla has an aesthetasc-like element on the proximal segment, the maxilliped has a small inner seta on the second segment, and leg 4 has an inner seta on coxa.

In *Asterocheres tubiporae* Kim, 2004 some setae on the inner lobe of maxillule are broadened and heavily ornamented with spinules, the maxilla has an aesthetasc-like element on the proximal segment, the male antennule has an aesthetasc on the ninth segment.

In *Asterocheres nudicoxus* described in this paper the free segment of female leg 5 is 6.36 times as long as wide, some setae on proximal segments of the antennule are bifurcate at tip, the genital double somite is strongly different from that of *A. galeatus*, and the male antennule has an aesthetasc on the ninth segment.

In *Asterocheres tenuipes* described in this paper the free segment of female leg 5 is 7.46 times as long as wide and extends far beyond the genital area, and legs 1 and 2 display sexual dimorphism.

***Asterocheres fastigatus* n. sp. (Figs. 45-47)**

Material examined. 9 ♀♀, 6 ♂♂ from a blackish leathery

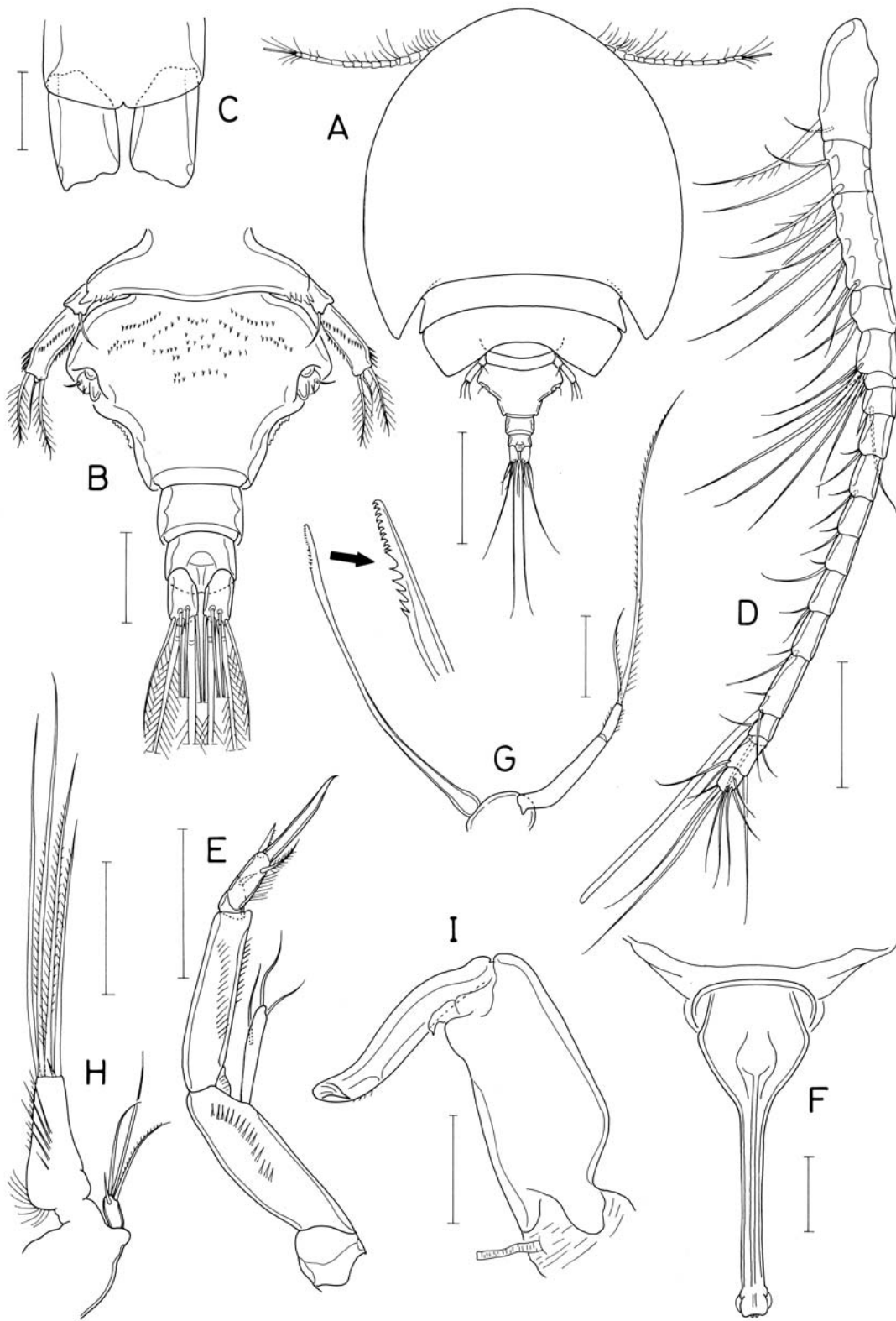


Fig. 45. *Asterocheres fastigatus* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, caudal rami, ventral; D, antennule; E, antenna; F, oral siphon; G, mandible; H, maxillule; I, maxilla. Scales: A, 0.2 mm; B, D-I, 0.05 mm; C, 0.02 mm.

smooth sponge, at a depth of about 7.5 m, on a wreck, Carlisle Bay, Barbados, 6 June 1959, collected by A. G. Humes and R. U. Gooding. Holotype (♀), allotype (♂), and paratypes (6 ♀♀, 4 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 1 ♂) are retained in the collection of the author.

Female. Body (Fig. 45A) with large prosome and small urosome. Mean body length 780 µm (758-812 µm), based on 9 specimens. Body length of dissected specimen 808 µm. Prosome 625 µm long. Cephalothorax 475 × 567 µm, greatly expanded, occupying more than half length of body, overhanging metasomites, with posterolateral sides extending over second pedigerous somite. Second and third pedigerous somite much narrower than cephalothorax. Second pedigerous somite shorter than third and distally broadened. Third pedigerous somite with concave posterior margin. Fourth pedigerous somite small, hardly visible from dorsal view of body. Urosome (Fig. 45B) 4-segmented. Fifth pedigerous somite short and wide, with several denticles on both sides of posterior margin. Genital double-somite 108 × 150 µm (0.72 : 1), rhomboidal, greatly expanded laterally, widest at 35% region, strongly tapering along posterior 65% region, with minute granule-like spinules on anterior part of dorsal surface and 5 or 6 setules near genital area (Fig. 46G); genital area located just posterior to widest region. Two free abdominal somites 27 × 48 and 33 × 40 µm, respectively. Caudal rami (Fig. 45C) slightly convergent, each ramus 31 × 17 µm (1.82 : 1), with 6 setae.

Rostrum lacking. Antennule (Fig. 45D) slender, 325 µm, and 17-segmented; second segment with 3 setae, third with 8 setae, fifth with 6 setae, fourteenth with 2 setae and 1 aesthetasc, sixteenth with 4 setae, last with 7 setae, and other segments with 2 setae each. Antenna (Fig. 45E) with small, unarmed coxa; basis 63 × 21 µm, with row of spinules. Exopod elongate, 33 × 5 µm, slightly longer than half length of first endopodal segment, with 2 distal and 1 lateral setae. Endopod 3-segmented; first segment with rows of minute setules; second and third segments with 1 and 2 setae each; terminal claw short, spiniform, and 36 µm long.

Oral cone (Fig. 45F) consisting of rhomboidal proximal part and distal siphon terminating in a small expansion, 225 µm long, 75 µm in maximum width at basal part, 15 µm wide across siphon, and extending beyond the insertions of maxillipeds. Mandible (Fig. 45G) with slender stylet bearing denticles distally. Mandibular palp slender, 2-segmented; proximal and distal segments 67 and 23 µm long each; 2 apical setae 207 and 63 µm, respectively. Maxillae (Fig. 45H) bilobed. Inner lobe strongly tapering, distally armed with 1 minute and 4 long setae (latters 138, 153, 123, and 98 µm from inner to outer). Outer lobe very small, 14 × 6 µm, its 4

apical setae 55, 37, 36, and 13 µm, respectively. Maxilla (Fig. 45I) 2-segmented and stout; proximal segment with small, aesthetasc-like element proximally and fleshy process distally; distal claw relatively short and strongly curved distally. Maxilliped (Fig. 46A) stocky and 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; second segment 100 × 46 µm; terminal claw 50 µm long, with 1 denticle-like process on concave margin.

Legs 1-4 with 3-segmented rami and bifurcate outer distal process on second endopodal segment (Fig. 46B-E). Leg 1 (Fig. 46B) without inner seta on coxa; outer spine on first exopodal segment 32 µm. Leg 2 (Fig. 46C) with very small outer setae on basis. Leg 4 (Fig. 46E) with small, naked inner seta on coxa; outer seta on basis large but naked. Armature formula of legs 1-4 as follows:

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

Leg 5 consisting of dorsolateral seta on fifth pedigerous somite and free segment. Free segment roughly spindle-shaped, 50 × 22 µm, with spinules on lateral margins and 3 distal setae (larger 2 plumose). Leg 6 represented by 1 seta and 1 small spinule in genital area.

Male. Body (Fig. 47A) similar to that of female. Mean body length 677 µm (670-704 µm) based on 6 specimens. Urosome (Fig. 47B) 5-segmented. Fifth pedigerous somite very small. Genital somite 108 × 155 µm, with rounded lateral margins. Three abdominal somites 33 × 53, 20 × 45, and 25 × 37 µm, respectively. Caudal ramus 27 × 15 µm (1.80 : 1).

Rostrum and antenna as in female. Antenna 355 µm and 14-segmented; segments with 2 setae, except for 8 setae on third segment, 7 on fifth, 4 on twelfth, 2+aesthetasc on thirteenth, and 11 on last.

Maxilliped with weak proximal process on second segment (Fig. 47D). Other mouth organs as in female.

Legs 1-4 as in female. Free segment of leg 5 (Fig. 47E) 54 × 16 µm.

Etymology. The specific name *fastigatus* is the Latin meaning "tapering" which alludes to the strongly tapering genital double-somite in the female.

Remarks. The most significant characters of the new species are (1) the possession of only a single inner seta on the second endopodal segment of leg 4; (2) there is no inner seta on coxa of leg 1; (3) the antenna has an elongated exopod.

The first character of the new species is shared only by *A. boeckii* (Brady, 1880), as illustrated by Sars (1915). Based

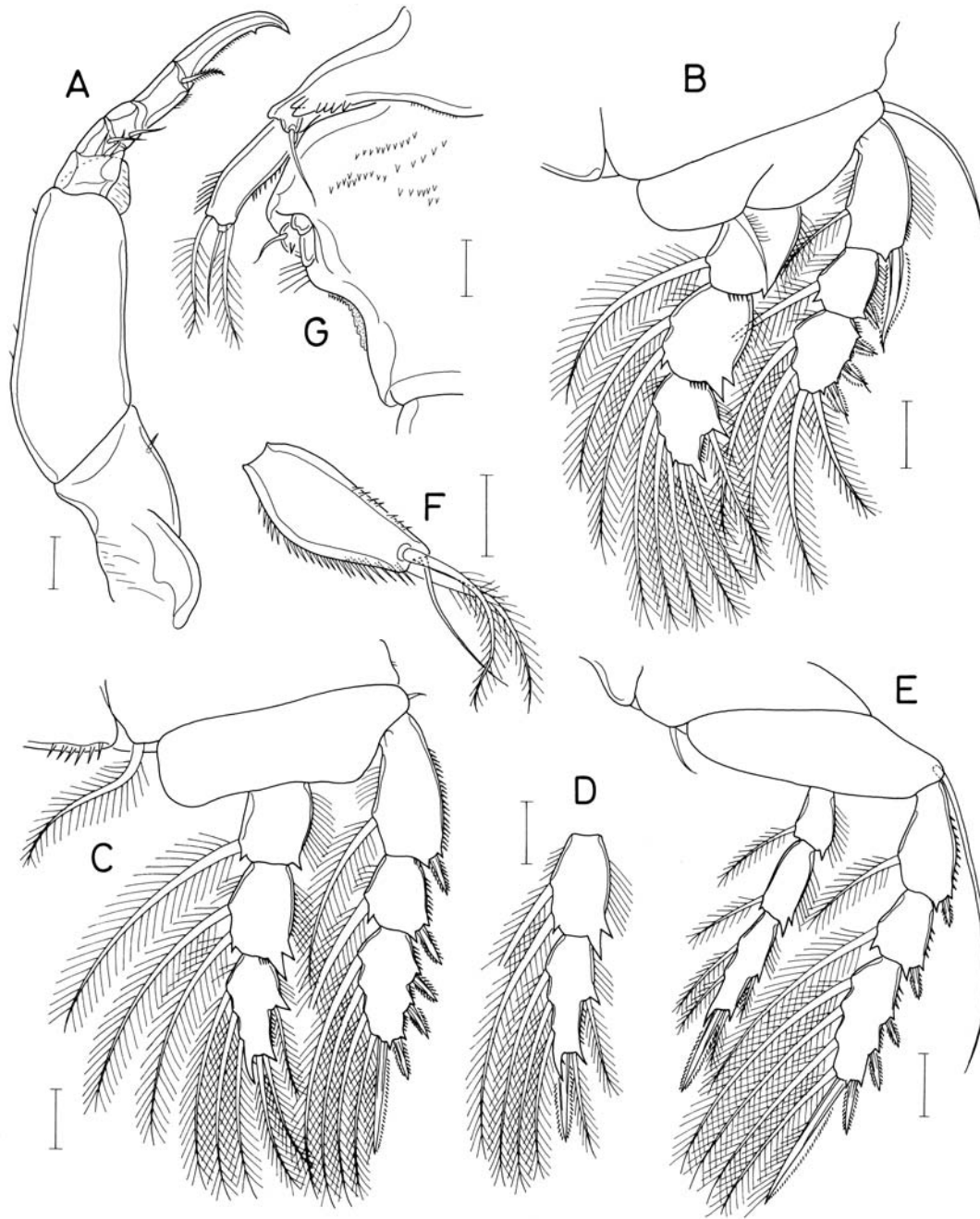


Fig. 46. *Asterocheres fastigatus* n. sp., female. A, maxilliped; B, leg 1; C, leg 2; D, second and third endopodal segments of leg 3; E, leg 4; F, free segment of leg 5; G, left side of first two urosomal somites, dorsal. Scales: 0.02 mm for all.

on this character, I tried once to place the new species and *A. boeckii* in an independent genus, but have withdrawn from this attempt due to significant differences in other characters between the two species. Within the genus *Asterocheres* the second character is shared only by *A. trisetatus* described above. The third character, the elongated exopod of the an-

tenna, which is longer than half length of the first endopodal segment, is not observable in other species of *Asterocheres*.

The cephalothorax of *A. fastigatus* is greatly expanded and extends beyond the metasome. Similar form of cephalothorax is exhibited by some species of *Asterocheres*, such as

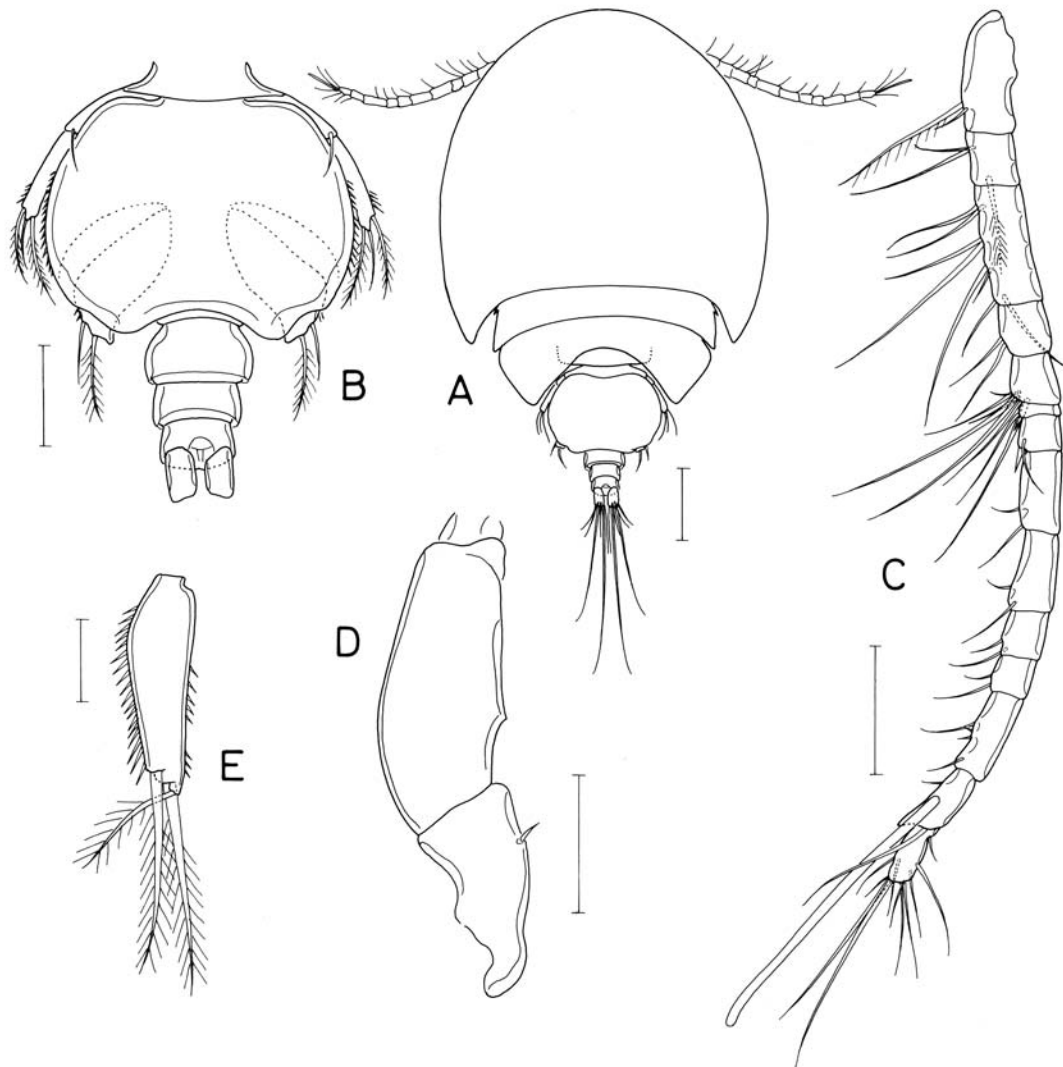


Fig. 47. *Asterocheres fastigatus* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, proximal segments of maxilliped; E, free segment of leg 5. Scales: A, 0.1 mm; B-D, 0.05 mm; E, 0.02 mm.

A. reginae Boxshall and Huys, 1994, *A. serrulatus* (Humes, 1996a), and *A. galeatus* described above. However, this similarity is merely superficial, because *A. fastigatus* shows many fundamental differences from those species in the morphology of appendages.

***Hetairosynella* n. gen.**

Diagnosis. Body cyclopiform. Prosome 4-segmented and moderately broad. Urosome 4-segmented in female and 5-segmented in male. Antennule 20- or 21-segmented in female and 18-segmented in male. Female antennule with aesthetasc on third or fourth segment from distad. Antenna with 1-segmented exopod bearing 3 setae; endopod 3-segmented, with

terminal claw. Oral cone tapering, moderately narrow, and extending near insertions of maxilliped. Mandible consisting of slender, apically pointed stylet and 2-segmented palp bearing 2 distal setae. Maxillule with 5 setae on inner lobe and 4 setae on outer lobe. Maxilla 2-segmented, with aesthetasc-like element on proximal segment. Maxilliped 6-segmented with distal claw. Legs 1-4 with 3-segmented rami and following armature formula:

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

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

Inner seta on coxal of leg 4 reduced. Leg 5 2-segmented; free segment with 3 setae.

Etymology. The generic name is derived from the name of its relative genus *Hetairosyna* Humes, 1991 and the Latin diminutive suffix *-ellus*. It alludes to the close similarity between the new genus and *Hetairosyna*. Gender is feminine.

Type species. *Hetairosynella bifurcata* n. sp

Remarks. The new genus deviates from the type genus of the Asterocheridae, *Asterocheres*, in having two distal spines (armature formula 1,II,2), instead of one seta and one spine (armature formula 1,1+I,2), on the third endopodal segment of leg 4. *Asterocheres bimbarrensis* Bispo, Johnsson and Neves, 2006 has the same armature formula of leg 4 but can not be placed in *Hetairosynella* n. gen., because it has an inner spine (rather than a seta) on the coxa of leg 1 (Bispo et al., 2006). Other genera closely related to *Hetairosynella* are *Hetairosyna* Humes, 1991 and *Hetairosynopsis* Humes, 1996 both known from the Indo-Pacific. In the latter two genera the mandibular palp is one-segmented, and the third endopodal segment of leg 3 has two terminal spines (armature formula 1,II,3) (Humes, 1991, 1996a), instead of one spine and one seta (armature formula 1,1+I,3) as in *Hetairosynella*.

Hetairosynella bifurcata n. sp. (Figs. 48-50)

Material examined. 47 ♀♀, 33 ♂♂ from a red tubular sponge, Maiden Cay, Jamaica, 4 September 1959, collected by A. G. Humes and R. U. Gooding. Holotype (♀), allotype (♂), and paratypes (44 ♀♀, 30 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 2 ♂♂) are retained in the collection of the author.

Other material examined. 45 ♀♀, 22 ♂♂ from a red tubular sponge, Turramoto Reef, Puerto Rico, 15 August 1959, collected by A. G. Humes and R. U. Gooding.

Female. Body (Fig. 48A) with rather broad prosome. Mean body length 731 µm (696-754 µm), based on 10 specimens. Body length of dissected specimens 753 µm; maximum width 449 µm. Prosome 516 µm long. Second to fourth pedigerous somites with lateral margins fringed with narrow membrane. Third pedigerous somite with angular postero-lateral corners. Urosome (Fig. 48B) 4-segmented. Fifth pedigerous somite 99 µm wide. Genital double-somite 95 × 115 µm, laterally expanded in anterior 2/3 and narrower, tapering in posterior 1/3, with 6-8 setules and 4 or 5 spinules on lateral margin just posterior to genital area (Fig. 49I); genital area located slightly anterior to midway of somite. Two free abdominal somites 41 × 66 and 38 × 64 µm, respectively. Anal somite with serrate posteroventral margin. Caudal ramus 31

× 33 µm (0.94 : 1), with serrate posteroventral margin and 6 setae, largest one of which 340 µm long. Egg sac (Fig. 48D) 220 × 190 µm, containing usually 5 eggs; each egg 129 µm in diameter.

Rostrum short and broad, without posterior margin. Antennule 388 µm long and 20-segmented; ninth, eighteenth, and last segments with 7 setae, 2 setae+aesthetasc, and 11 setae, respectively; other segments with 2 setae each; one of the setae on first to fourth, sixth, and eighth segments bifurcate and tipped with minute setule. Antenna (Fig. 48I) with short and unarmed coxa; basis 72 × 26 µm, with row of pectinate spinules. Exopod 10 × 6 µm, with 2 distal and 1 lateral setae. Endopod 3-segmented; first segment 60 × 18 µm; second and third segments with 1 and 2 bifurcate setae each; terminal claw 66 µm long, with fine spinules along concave margin.

Oral cone (Fig. 48H) 151 × 58 µm, evenly tapering, and reaching middle of maxillipedal insertions. Mandible (Fig. 48I) with 137 µm-long stylet. Mandibular palp 2-segmented; proximal and distal segments 44 and 23 µm long each; 2 distal setae 140 and 71 µm, respectively. Maxillule (Fig. 49A) bilobed. Inner lobe 54 × 20 µm, distally with 1 minute seta and 4 larger setae (latters 78, 75, 65, and 51 µm from inner to outer). Outer lobe 25 × 6 µm, with 4 distal setae of 82, 47, 47, and 20 µm, respectively. Maxilla (Fig. 49B) with aesthetasc-like proximal element on proximal segment; distal claw with tuft of setules near middle. Maxilliped (Fig. 49C) 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; second segment 99 × 34 µm; terminal claw 72 µm long.

Legs 1-4 with 3-segmented rami and bicuspid outer distal process on second endopodal segment (Fig. 49D-G). First exopodal segment of leg 1 with setules proximally and spinules distally on outer margin; its outer spine 29 µm long. Leg 4 (Fig. 49G) with small, naked inner seta on coxa; 2 terminal spines on endopod 61 (inner) and 32 µm (outer). Armature formula of legs 1-4 as follows:

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

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

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

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

Leg 5 2-segmented; first segment not articulated from somite, with 1 plumose seta; free segment (Fig. 49H) 52 × 18 µm, with scales on parallel lateral margins and 3 distal setae of 77, 81, and 48 µm long from outer to inner. Leg 6 represented by 1 plumose seta and 1 small spinule in genital area (Fig. 49I)

Male. Body (Fig. 50A) narrower than that of female. Body length of dissected specimen 551 µm. Prosome 364 µm long;

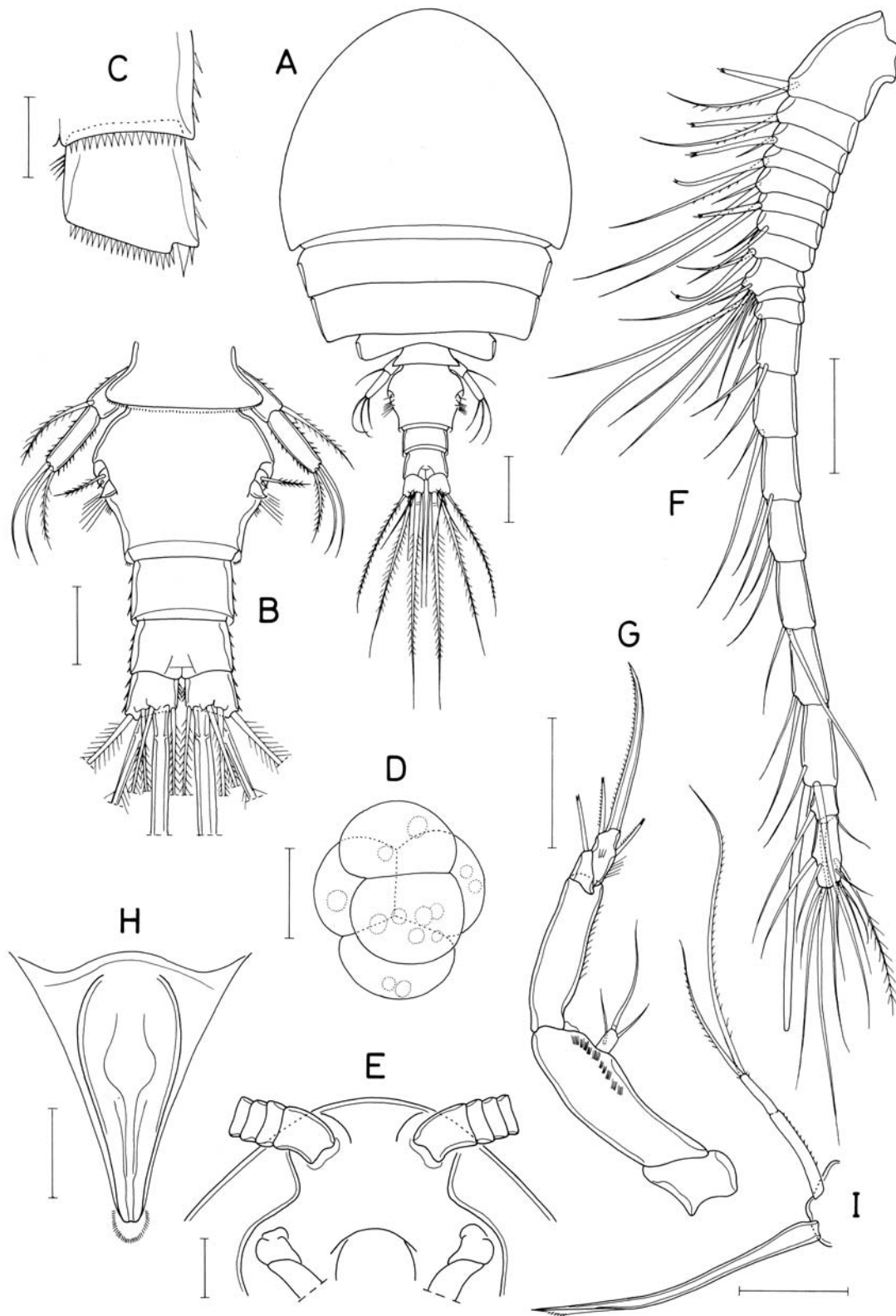


Fig. 48. *Hetairosynella bifurcata* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, left caudal ramus, ventral; D, egg sac; E, rostral area, ventral; F, antennule; G, antenna; H, oral cone; I, mandible. Scales: A, D, 0.1 mm; B, E-I, 0.05 mm; C, 0.02 mm.

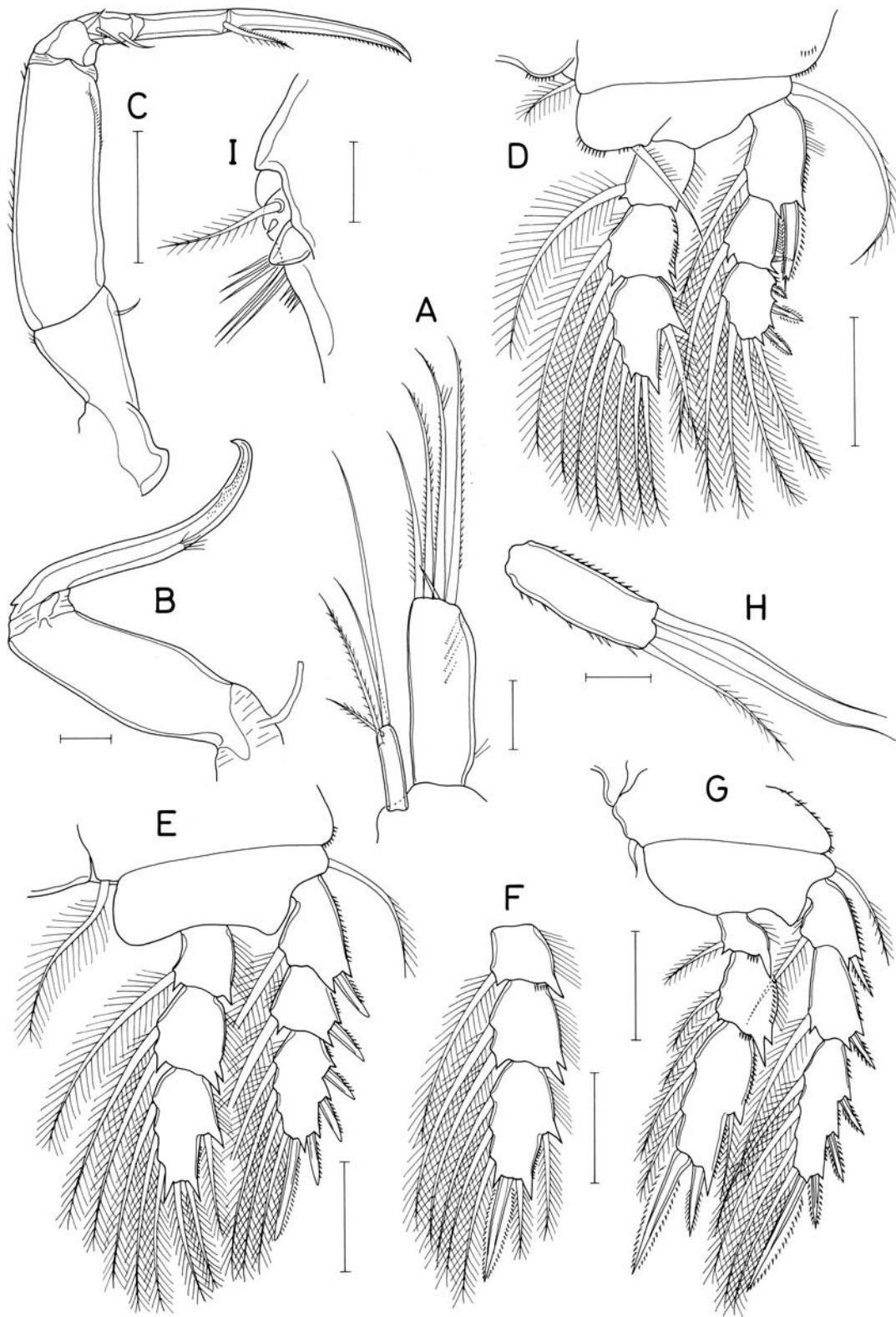


Fig. 49. *Hetairosynella bifurcata* n. sp., female. A, maxillule; B, maxilla; C, maxilliped; D, leg 1; E, leg 2; F, endopod of leg 3; G, leg 4; H, free segment of leg 5; I, left genital area, dorsal. A, B, H, I, 0.02 mm; C-G, 0.05 mm.

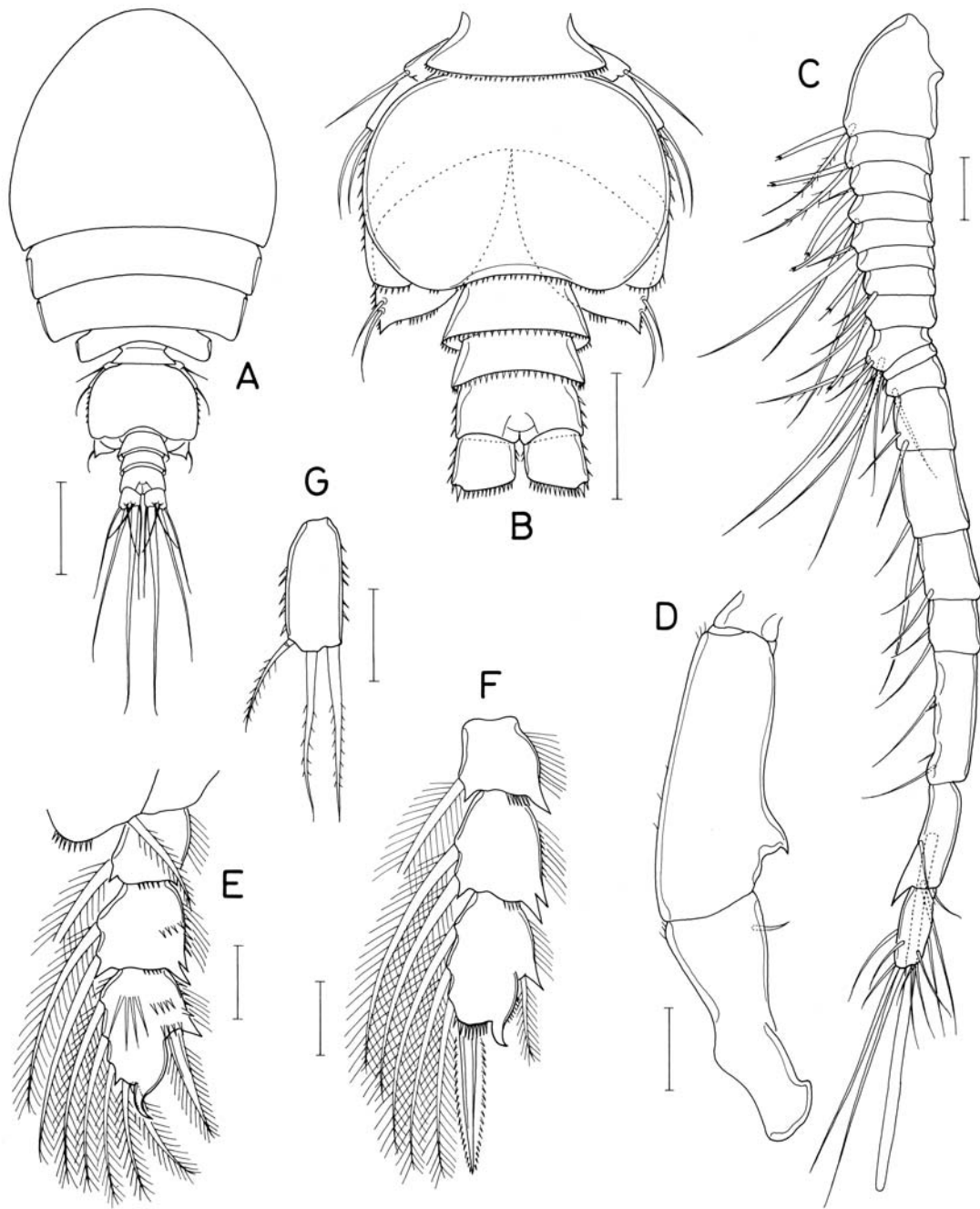


Fig. 50. *Hetairosynella bifurcata* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, proximal segments of maxilliped; E, endopod of leg 1; F, endopod of leg 3; G, free segment of leg 5. Scales: A, 0.1 mm; B, 0.05 mm; C-G, 0.02 mm.

maximum width 292 μ m. Urosome (Fig. 50B) 5-segmented. Fifth pedigerous somite 72 μ m wide. Genital somite 80 \times 123 μ m, with rounded lateral margins. Three abdominal somites 22 \times 58, 17 \times 53, and 28 \times 52 μ m, respectively. Caudal ramus 25 \times 25 μ m.

Rostrum and antenna as in female. Antennule (Fig. 50C)

334 μ m long and 18-segmented; ninth and 3 distal segments armed with 7 setae, 4 setae, 2 setae+aesthetasc, and 11 setae, respectively. Other segments with 2 setae each.

Maxilliped with prominent proximal process on inner margin of second segment (Fig. 50D). Other mouth organs as in female.

Third endopodal segment of leg 1 with additional spinules; its outer distal process curved, claw-like (Fig. 50E). Third endopodal segment of leg 3 without outer terminal seta (thus armature formula of this segment 1,I,3). Legs 2 and 4 as in female.

Free segment of leg 5 (Fig. 50G) $29 \times 12 \mu\text{m}$; its 3 distal setae 39, 38, and $23 \mu\text{m}$ from outer to inner. Leg 6 represented by 2 subequal setae on genital flap (Fig. 50B).

Etymology. The specific name *bifurcata* alludes to the bifurcate setae on the antennule and antenna.

Hetairosynella angulata n. sp. (Figs. 51-53)

Material examined. 33 ♀♀, 7 ♂♂ from a red tubular sponge (along with the preceding species), Maiden Cay, Jamaica, 4 September 1959, collected by A. G. Humes and R. U. Gooding. Holotype (♀), allotype (♂), and paratypes (30 ♀♀, 5 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 1 ♂) are retained in the collection of the author.

Female. Body (Fig. 51A) small. Mean body length $565 \mu\text{m}$ ($540\text{--}590 \mu\text{m}$), based on 10 specimens. Body length of dissected specimen $580 \mu\text{m}$, and maximum with $295 \mu\text{m}$. Prosome moderately broad and $357 \mu\text{m}$ long. Urosome (Fig. 51B) 4-segmented. Fifth pedigerous somite $72 \mu\text{m}$ wide. Genital double-somite $79 \times 87 \mu\text{m}$, consisting of laterally expanded anterior part and narrower posterior part, with angular posterolateral corners. Lateral margin ornamented with 3 or 4 larger and 2 or 3 smaller setules (or spinules) near genital area. Genital area located near midway of somite. Two free abdominal somites 31×52 and $35 \times 51 \mu\text{m}$, respectively. Anal somite with serrate posteroventral margin. Caudal ramus (Fig. 51C) $23 \times 24 \mu\text{m}$ (0.96 : 1), with 6 setae and serrate posteroventral margin.

Rostrum small and weak, without posterior margin (Fig. 51D). Antennule (Fig. 51E) $254 \mu\text{m}$ long and 21-segmented; ninth, eighteenth, and last 2 segments armed with 7 setae, 2 setae+aesthetasc, 4 setae, and 7 setae, respectively; other segments with 2 setae each; one of setae on first to fourth, sixth, eighth segments blunt and tipped with small setule. Antenna (Fig. 51F) with smooth coxa; basis $61 \times 19 \mu\text{m}$ and unornamented. Exopod $7 \times 4.4 \mu\text{m}$, with 2 distal and 1 lateral setae. Endopod with armature formula 0, 1, and 2+claw; first segment $46 \times 13 \mu\text{m}$; setae on 2 distal segments with bifurcate tip; terminal claw $54 \mu\text{m}$ long and strongly curved distally, with bifurcate tip.

Oral cone (Fig. 51G) rather slender, $130 \times 43 \mu\text{m}$, surrounded by a membranous fringe, and extending to posterior margin of maxillipedal insertions. Mandible (Fig. 51H) consisting of slender stylet and palp. Stylet $122 \mu\text{m}$ long and

sharply pointed apically. Mandibular palp 2-segmented; proximal and distal segments 35 and $14 \mu\text{m}$ long each; 2 distal setae 105 and $43 \mu\text{m}$, respectively. Maxillule (Fig. 51I) bilobed. Inner lobe $50 \times 13 \mu\text{m}$, distally armed with 1 small and 4 larger setae; latter 69, 69, 46, and $24 \mu\text{m}$ long from inner to outer. Outer lobe small, $17 \times 5 \mu\text{m}$, distally armed with 4 setae, each 56, 35, 27, and $13 \mu\text{m}$ long. Maxilla (Fig. 52A) with proximal, aesthetasc-like element on proximal segment; distal claw slender, with tuft of setules in middle and minute spinules along distal half. Maxilliped (Fig. 52B) 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; second segment $72 \times 23 \mu\text{m}$, with spinules on outer margin and distal half of inner margin; terminal claw elongate, $74 \mu\text{m}$, more than twice as long as terminal segment, with denticles along concave margin.

Legs 1-4 with 3-segmented rami and bicuspid outer distal process on second endopodal segment (Fig. 52C-F). Inner seta on coxa of leg 1 small but plumose. Two terminal spines of third endopodal segment of leg 4 being $39 \mu\text{m}$ for the inner and $19 \mu\text{m}$ for the outer spine; outer spine small and naked. Armature formula of legs 1-4 as in preceding species.

Leg 5 2-segmented; first segment fused with somite, with 1 plumose seta; free segment (Fig. 52G) $36 \times 15 \mu\text{m}$, with scales on lateral margins and 3 naked distal setae (54, 67, and $27 \mu\text{m}$ long from outer to inner). Leg 6 represented by 1 plumose seta and 1 spinule in the genital area.

Male. Body (Fig. 53A) similar to that of female. Body length of dissected specimen $408 \mu\text{m}$, and maximum width $217 \mu\text{m}$. Prosome $261 \mu\text{m}$ long. Urosome (Fig. 53B) 5-segmented. Fifth pedigerous somite $135 \mu\text{m}$ wide. Genital somite $54 \times 83 \mu\text{m}$, with nearly parallel lateral margins bearing scales. Three abdominal somites 18×48 , 14×41 , and $25 \times 40 \mu\text{m}$, respectively. First abdominal somite widened distally. Caudal ramus $18 \times 18 \mu\text{m}$.

Rostrum and antenna as in female. Antennule (Fig. 53C) 18-segmented; ninth, and 3 distal segments with 7 setae, 4 setae, 4 setae+aesthetasc, and 11 setae, respectively; one of two setae on third segment expanded.

Maxilliped with sharp proximal process on inner margin of second segment (Fig. 53D). Other mouth organs as in female.

Outer seta on third endopodal segment of leg 1 with thick setules (Fig. 53E). Third endopodal segment of leg 3 with 1 spine and 4 setae (armature formula 1,I,3) (Fig. 53F), and tuft of setules near base of terminal spine. Legs 2 and 4 as in female.

Free segment of leg 5 (Fig. 53G) $21 \times 12 \mu\text{m}$, its 3 distal setae 30, 33, and $16 \mu\text{m}$ from outer to inner. Leg 6 represented by 2 naked, unequal setae on genital flap.

Etymology. The specific name *angulata* refers to the angular posterolateral corners of the genital double-somite.

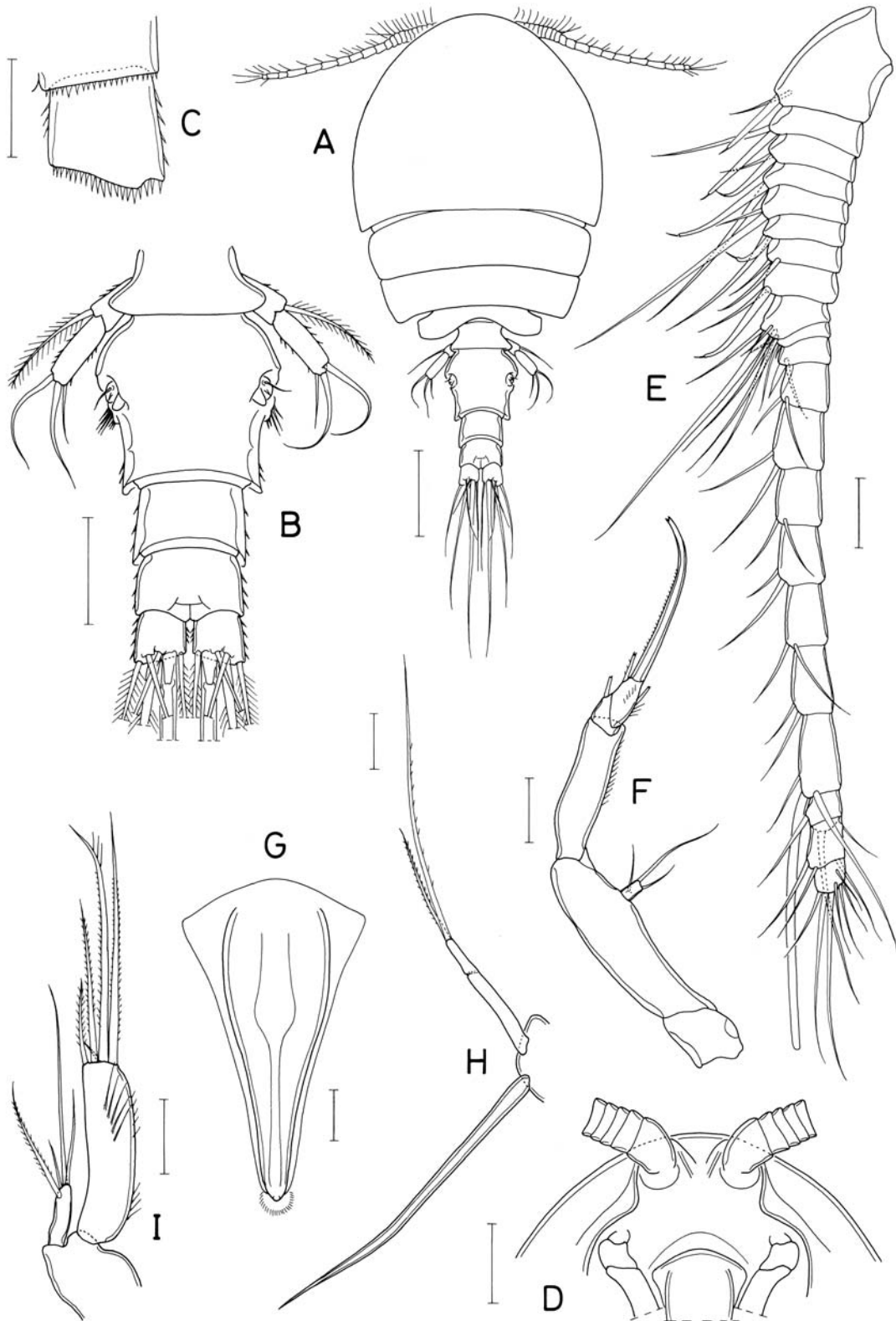


Fig. 51. *Hetairosynella angulata* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, left caudal ramus, ventral; D, rostral area, ventral; E, antennule; F, antenna; G, oral cone; H, mandible; I, maxillule. Scales: A, 0.1 mm; B, D, 0.05 mm; C, E-I, 0.02 mm.

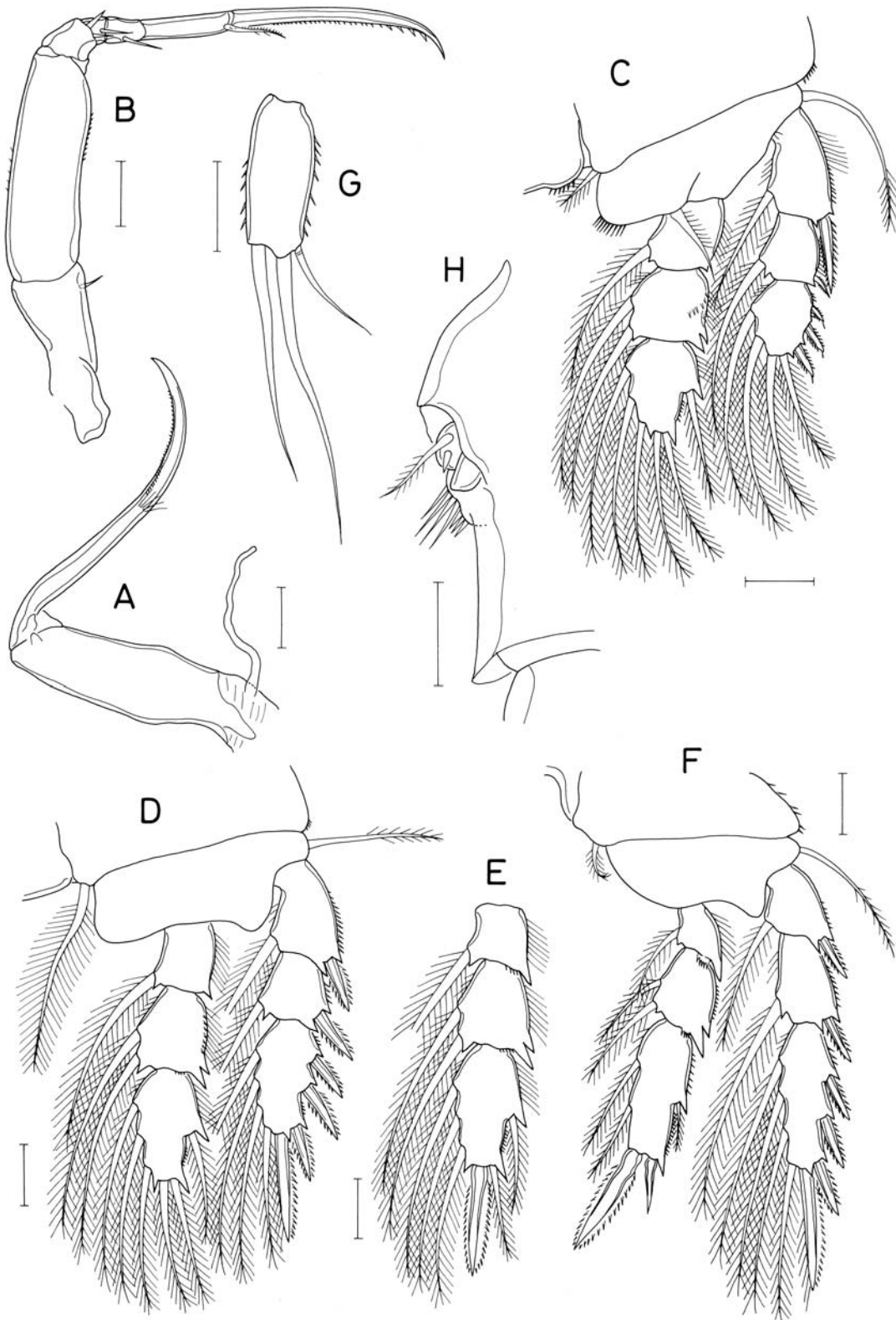


Fig. 52. *Hetairosynella angulata* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, left side of genital double-somite, dorsal. Scales: 0.02 mm for all.

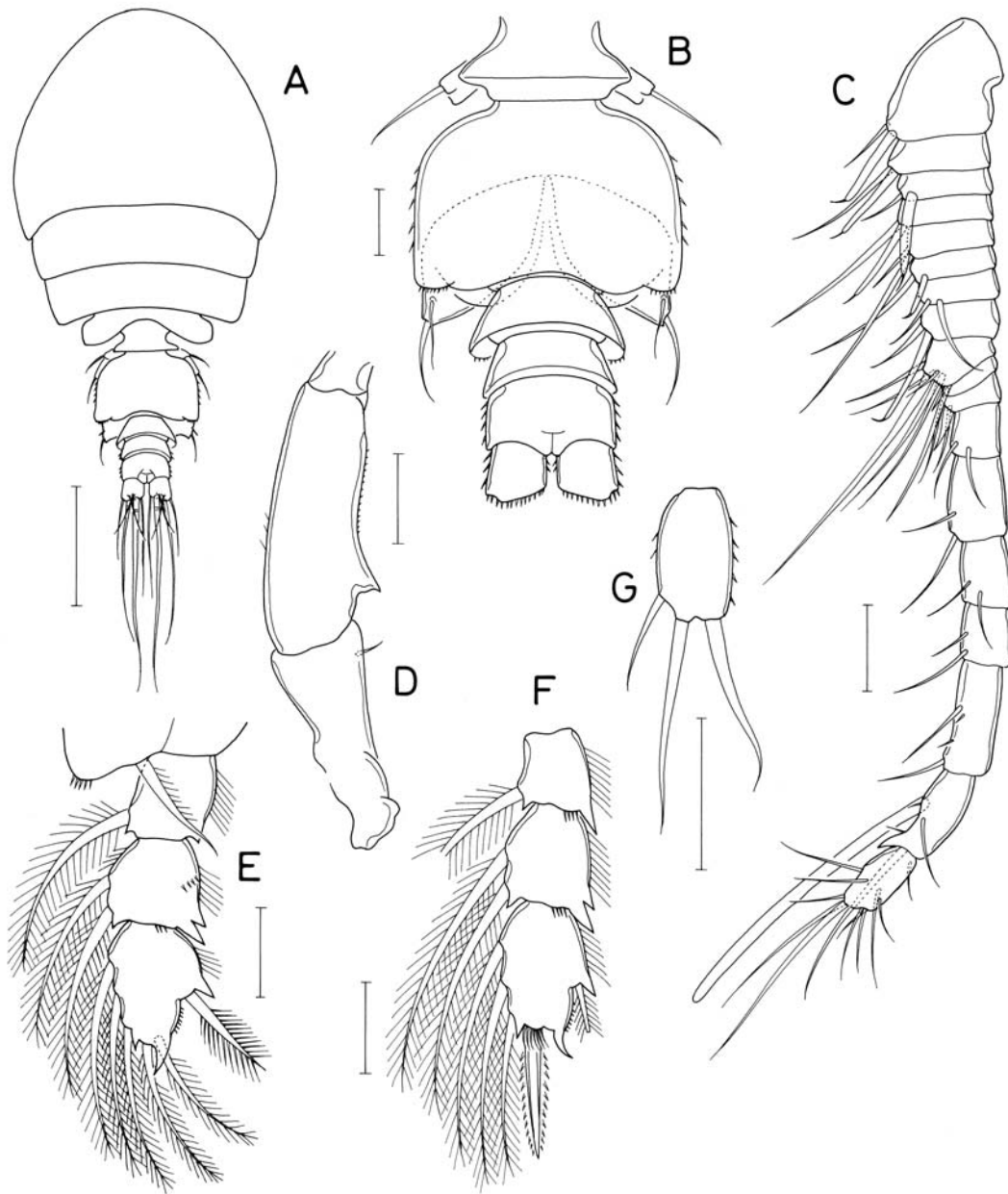


Fig. 53. *Hetairosynella angulata* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, proximal segments of maxilliped; E, endopod of leg 1; F, endopod of leg 3; G, free segment of leg 5. Scales: A, 0.1 mm; B-G, 0.02 mm.

Remarks. *Hetairosynella angulata* n. sp. is obtained along with the above *H. bifurcata* from the same sponge host. It differs from *H. bifurcata* in having the following differential features: (1) the smaller body, 540-590 μm in the female, compared to 696-754 μm in *H. bifurcata*; (2) the 20-segmented female antennules, compared to 21-segmented in *H. bifurcata*; (3) the narrower female genital double-somite; (4) the 3-4 setules plus 2 or 3 spinules on the lateral margins of the female genital double-somite, compared to 6-8 setules

plus 4 or 5 spinules in *H. bifurcata*; (5) and the smaller free segment of female leg 5, $36 \times 15 \mu\text{m}$ (2.40 : 1), compared to $52 \times 18 \mu\text{m}$ (2.89 : 1) in *H. bifurcata*.

***Hetairosynella aculeata* n. sp. (Figs. 54-56)**

Material examined. 39 ♀♀, 15 ♂♂ from a black brownish smooth encrusting sponge, off Lerner Marine Laboratory, Bimini, Bahamas, collected by A. G. Humes and R. U.

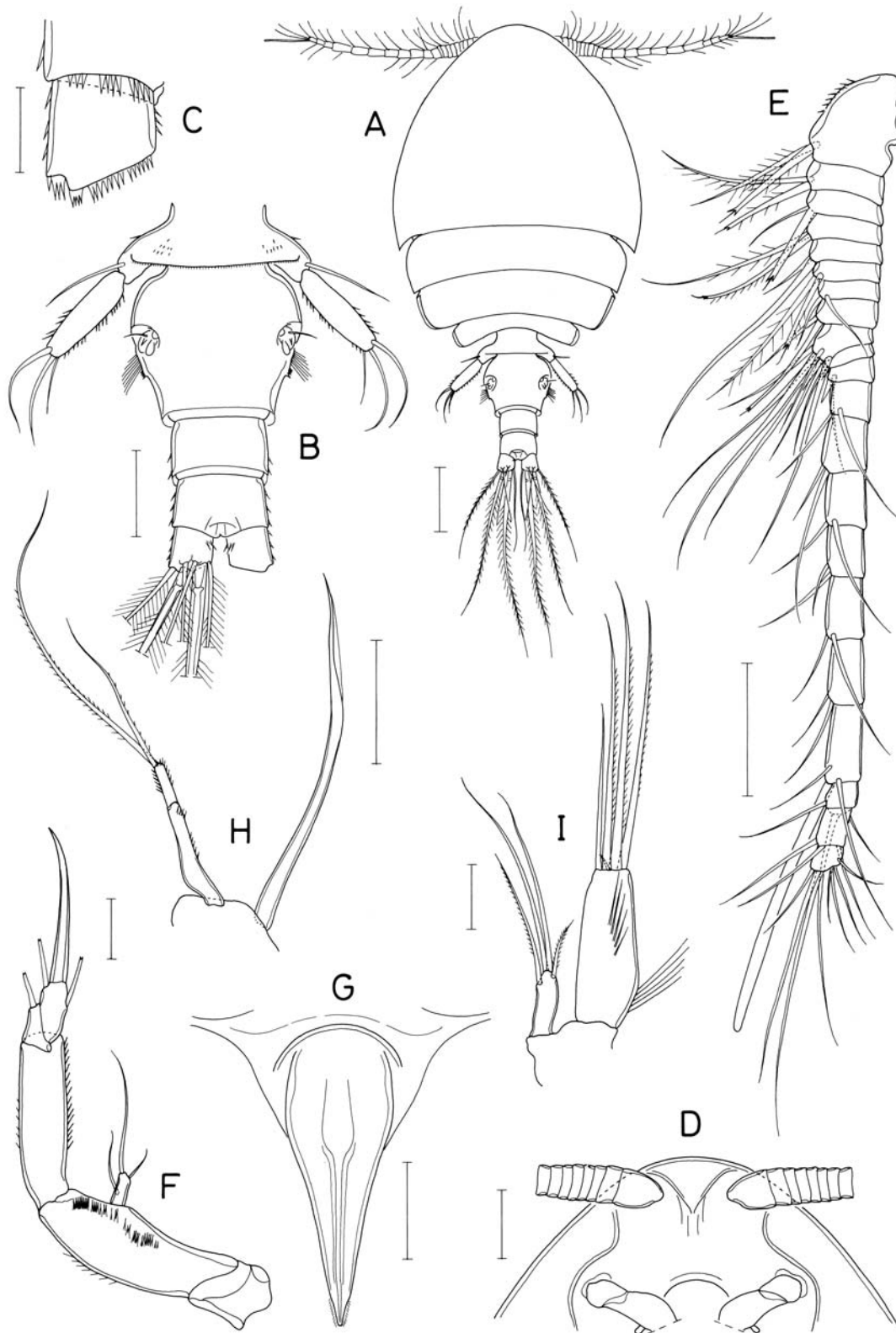


Fig. 54. *Hetairosynella aculeata* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, right caudal ramus, ventral; D, rostral area, ventral; E, antennule; F, antenna; G, oral cone, H, mandible; I, maxillule. Scales: A, 0.1 mm; B, D, E, G, H, 0.05 mm; C, F, I, 0.02 mm.

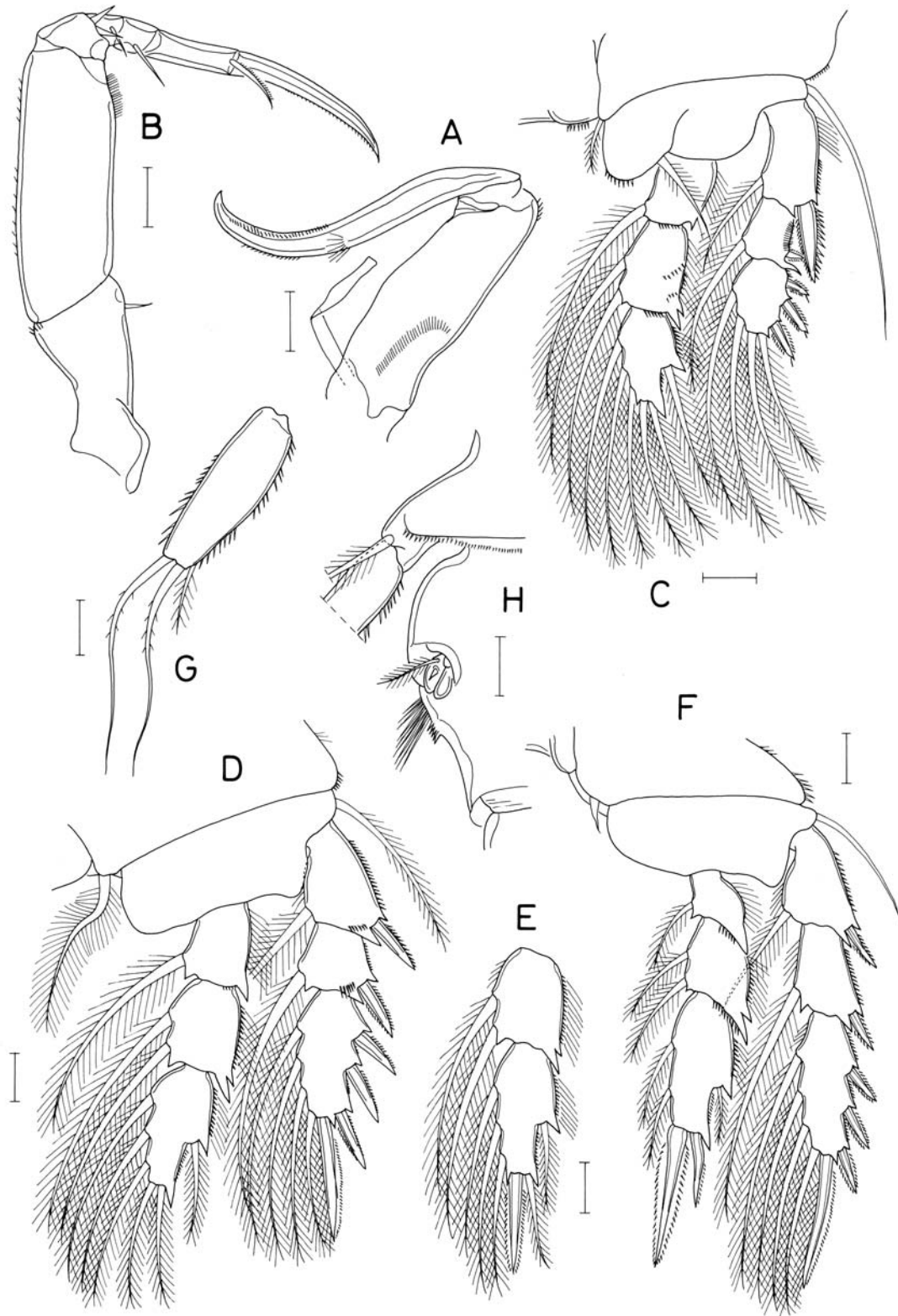


Fig. 55. *Hetairosynella aculeata* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, second and third endopodal segments of leg 3; F, leg 4; G, free segment of leg 5; H, left side of first two urosomal somites, dorsal. Scales: 0.02 mm for all.

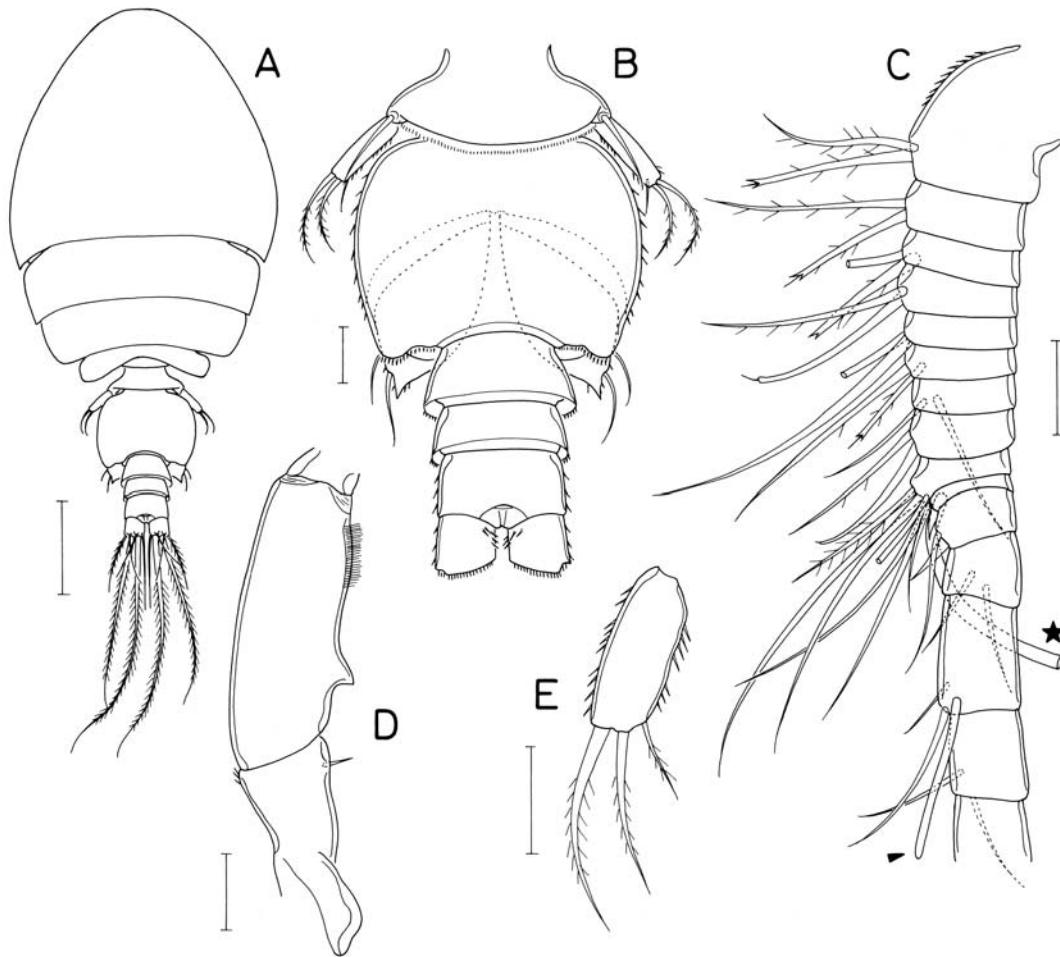


Fig. 56. *Hetairosynella aculeata* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, proximal part of antennule; D, proximal segments of maxilliped; E, free segment of leg 5. Scales: A, 0.1 mm; B-E, 0.02 mm.

Gooding on 1 June 1959. Holotype (♀), allotype (♂), and paratypes (36 ♀♀, 12 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 2 ♂♂) are retained in the collection of the author.

Female. Body (Fig. 54A) small and moderately broad. Mean body length 636 μm (585–688 μm), based on 10 specimens. Body length of dissected specimen 686 μm , and maximum width 385 μm . Prosome 469 μm long. Cephalothorax 312 μm long, with pointed posterolateral corners. Third and fourth pedigerous somites fringed with membrane on lateral margins. Urosome (Fig. 54B) 4-segmented. Genital double-somite 90 \times 102 μm , anteriorly wide and posteriorly narrowed, with about 10 setules and 6 minute spinules on lateral margin posterior to genital area (Fig. 55H). Two free abdominal somites 33 \times 58 and 37 \times 57 μm , respectively. Anal somite with serrate posteroventral margin. Caudal ramus

(Fig. 54C) 27 \times 25 μm , with 6 setae and serrate posteroventral margin.

Rostrum tapering and indistinct (Fig. 54D). Antennule (Fig. 54E) 305 μm long and 21-segmented; ninth, eighteenth, and 2 terminal segments with 7 setae, 2 setae+aesthetasc, 4 setae, and 7 setae, respectively; some setae on proximal segments plumose; one of two setae on first, second, third, sixth, and eighth segments distally bifurcated and tipped with small setule; first segment with spinules on anterior margin. Antenna (Fig. 54F) with smooth coxa; basis 63 \times 25 μm , with row of minute spinules. Exopod 12 \times 5 μm , with 2 distal and 1 lateral setae. Endopod with armature formula 0. 1, and 2+claw; first segment 53 \times 17 μm , with spinules on lateral margins; setae on second and third segments truncated; terminal claw 53 μm long.

Oral cone (Fig. 54G) narrow, 155 \times 56 μm , tapering along distal 2/3, and extending to posterior border of maxillipedal

insertions. Mandible (Fig. 54H) consisting of stylet and palp. Stylet 150 μm long, and sharply pointed distally. Mandibular palp 2-segmented; proximal and distal segments 44 and 17 μm long each; 2 distal setae 134 and 71 μm , respectively. Maxillule (Fig. 54I) bilobed. Inner lobe 48 \times 19 μm , distally with 1 minute and 4 large setae (the latter 83, 91, 79, and 52 μm from inner to outer). Outer lobe 19 \times 7 μm , with 4 distal setae (19, 58, 43, and 20 μm , respectively). Maxilla (Fig. 55A) with transparent proximal element and a row of fine spinules on proximal segment; distal claw with tuft of setules in middle and minute spinules in distal half. Maxilliped (Fig. 55B) 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; second segment 83 \times 33 μm , with row of stiff and minute setules on distal part of inner margin and small spinules on outer margin; terminal claw 59 μm long, twice as long as terminal segment.

Legs 1-4 with 3-segmented rami and bicuspid outer distal process on second endopodal segment (Fig. 55C-F). Leg 1 with small but plumose inner seta on coxa; outer seta on basis large and naked; outer spine on first exopodal segment broad and 30 μm ; outer distal process of second exopodal segment elongated and sharply pointed. Leg 4 with small, naked inner seta on coxa; 2 distal spines on third endopodal segment of 58 (inner) and 30 μm (outer). Armature formula of legs 1-4 as in type species.

Free segment of leg 5 (Fig. 55G) 65 \times 21 μm , with spinules on lateral margins; 2 distal setae equal in length, 80 μm long; smaller subdistal inner seta 26 μm long and distinctly plumose. Leg 6 represented by 1 plumose seta and 1 small spinule in genital area (Fig. 55H).

Male. Body (Fig. 56A) similar to that of female. Mean body length 558 μm (540-575 μm), based on 10 specimens. Body length of dissected specimen 565 μm . Urosome (Fig. 56B) 5-segmented. Genital somite 70 \times 105 μm , with convex lateral margins. Three abdominal somites 25 \times 55, 18 \times 50, and 24 \times 47 μm , respectively. Caudal ramus 21 \times 21 μm .

Rostrum and antenna as in female. Antennule 261 μm and 18-segmented; one of the setae on third, fifth, ninth, and tenth segments truncated, tubular, last one of which enlarged and directed posteriorly (indicated by asterisk in Fig. 56C); thirteenth segment armed with 2 setae and 1 aesthetasc (indicated by arrowhead in Fig. 56C); three distal segments with 4 setae, 3 setae+1 aesthetasc, and 10 setae, respectively.

Maxilliped with distinct proximal process on inner margin of second segment. Other mouth organs as in female.

Legs 1-4 as in female. Proximal segment of leg 5 completely fused with fifth pedigerous somite, leaving only dorsolateral seta; free segment (Fig. 56E) 32 \times 13 μm , with 3 setae (40, 31, and 15 μm from outer to inner). Leg 6 represented by 2 small setae on genital flap (Fig. 56B).

Etymology. The specific name *aculeata* has the Latin meaning “sharply pointed”, alluding to the sharply prolonged outer distal process of the second exopodal segment of leg 1. *Remarks.* *Hetairosynella aculeata* n. sp. is distinguished from the two preceding congeners by the following features. It has 10 setules and 6 spinules on the lateral margin of the female genital double-somite, a longer free segment of female leg 5 (3.10 times as long as wide, compared to 2.89 and 2.40 times respectively in *H. bifurcata* and *H. angulata*), and the absence of sexual dimorphisms in legs 1 and 3. The transformation of one of setae on the third, fifth, ninth and tenth segments of the male antennule into a truncate, tubular element and the possession of an aesthetasc on the thirteenth segment are also conspicuous traits of *H. aculeata*.

Genus *Asteropontius* Thompson and Scott, 1903

Remarks. Stock (1975) recognized five species as valid in the genus *Asteropontius*: *A. typicus* Thompson and Scott, 1903 (type species), *A. corallophilus* Stock, 1966, *A. longipalpus* Stock, 1975, *A. parvipalpus* Stock, 1975, and *A. ungelatus* Stock, 1975.

Thirteen more species have since been described, as follows: *A. laccadivensis* Nair and Pillai, 1984; *A. proximus* Stock, 1987; *A. iuxtus* Stock, 1989; *A. elizabethae* Johnsson, 1999; *A. bifurcatus* Kim, 2000; *A. acroporus* Kim, 2003; *A. brevioris* Kim, 2003; *A. caledonensis* Kim, 2003; *A. dissimilis* Kim, 2003; *A. minutus* Kim, 2003; *A. mycetophylliae* Varela, Ortiz and Lalana, 2005; *A. fungicola* Kim, 2007; and *A. goniopora* Kim, 2007. Therefore, there are 18 valid species in *Asteropontius*.

Humes (1992) reported two new species of *Asteropontius*, *A. bandicola* and *A. latus* both associated with antipatharian corals from the Southwest Pacific. Johnsson (1999b) proposed a new genus *Parasteropontius* to incorporate *A. bandicola* and *A. latus* and attributed this genus to the form of mandible in which the gnathobase is styliiform and the palp is one-segmented with a single distal seta. However, the definition seems not to be appropriate, because the form of mandibular stylet may appear to be distally wide or pointed depending on the angle of view and the mandibular palp is mostly tipped by 2 setae but one of them is usually minute and overlooked. In the same paper (Johnsson, 1999b), he described *Asteropontius elizabethae* as a new species that has only one seta on the mandibular palp. The genus *Parasteropontius* Johnsson, 1999 is accepted here on the basis of its other significant feature that the inner seta on the coxa of leg 1 is transformed into a spine, the feature shared by *Parasteropontius bandicola* (Humes, 1992) and *P. latus* (Humes, 1992).

***Asteropontius ungelatus* Stock, 1975 (Figs. 57-59)**

Material examined. 58 ♀♀, 36 ♂♂ from the actiniarian *Stoichactis anemone* (Ellis) (noted as *S. helianthus*), Lim's Cay, Jamaica, 30 August 1959, collected by A. G. Humes and R. U. Gooding; 65 ♀♀, 33 ♂♂ from the actiniarian *Stoichactis anemone*, at a depth of 1.2 m, La Cueva, Puerto Rico, 14 August 1959, collected by A. G. Humes and R. U. Gooding.

Female. Body (Fig. 57A) with broad prosome. Mean body length 1.28 mm (1.23-1.35 mm), based on 10 specimens. Prosome semicircular, 887 × 793 μm. Urosome (Fig. 57B) 4-segmented. Fifth pedigerous somite 208 μm wide. Genital double-somite 169 × 178 μm, with smoothly convex lateral margins, about 50 hairy setules on lateral margin posterior to genital area; genital area located midway of somite. Two free abdominal somites 70 × 110 and 70 × 103 μm, respectively. Caudal ramus (Fig. 57C) 49 × 44 μm (1.11 : 1), with 6 setae. Egg sac (Fig. 57D) about 510 × 285 μm.

Rostrum broad but obscure (Fig. 57E). Antennule 549 μm and 19-segmented; numbers of setae: 7 on ninth segment, 2+aesthetasc on eighteenth, 13 on last, and 2 each on remaining segments; first segment with fine spinules on anterior margin, one of its setae very small; all setae naked. Antenna (Fig. 57G) rather stout, with small coxa; basis 88 × 47 μm, less than twice as long as wide, with fine spinules near base of exopod. Exopod variable in length, 19-25 × 6 μm, with 2 distal and 1 lateral setae. Endopod 3-segmented, with armature formula 0, 1, and 2+claw; first segment 108 × 31 μm; terminal claw 73 μm, distinctly shorter than first segment.

Oral cone (Fig. 57H) stout, 193 × 105 μm, proximally narrowed and tapering distally, and extending slightly before insertions of maxillipeds. Mandible (Fig. 57I) with broad stylet bearing denticles on oblique distal margin. Mandibular palp small, 14.4 × 7.2 μm, distally with 1 minute setule and 1 small seta (35 μm). Maxillule (Fig. 57J) bilobed. Inner lobe distally with 5 thick, wrinkled large setae (156, 113, 112, 100, and 79 μm, respectively). Outer lobe 32 × 10 μm, distally with 4 slender, naked setae (99, 99, 58, and 26 μm, respectively). Maxilla (Fig. 58A) with smooth proximal segment; distal claw with tuft of setules in the middle. Maxilliped (Fig. 58B) 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1; seta on fourth and fifth segments very small, hardly visible; second segment 154 × 58 μm; terminal claw 74 μm.

Legs 1-4 with 3-segmented rami and unicuspid outer distal process on second endopodal segment (Fig. 58C-F). Outer spine on first exopodal segment of leg 1 (Fig. 58C) 44 μm. Leg 4 (Fig. 58F) with small but plumose inner seta on coxa; terminal spine on endopod 77 μm. Armature formula of legs 1-4 as follows:

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

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

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

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

Leg 5 consisting of dorsolateral seta on fifth pedigerous somite and free segment (Fig. 57B); free segment (Fig. 58G) 96 × 50 μm (1.92 : 1), with spinules on lateral margins and 2 distal (113 and 111 μm) and 1 subdistal (40 μm) naked setae. Leg 6 represented by 1 plumose seta and 1 minute spinule in genital area.

Male. Body (Fig. 59A) narrower than that of female. Mean body length 0.90 mm (0.88-0.93 mm), based on 10 specimens, Prosome 610 × 515 μm. Urosome (Fig. 59B) 5-segmented. Fifth pedigerous somite 142 μm wide. Genital somite about 131 × 171 μm, with rounded corners. Three abdominal somites 42 × 91, 45 × 85, and 46 × 77 μm, respectively. Caudal ramus 36 × 34 μm.

Rostrum and antenna as in female. Antennule (Fig. 59C) 413 μm and 17-segmented; ninth segment with 7 setae, twelfth and fifteenth with 4 setae each, sixteenth with 2 setae+aesthetasc, and last with 11 setae; one of 2 setae on second, third, and sixth segments short, curved, and claw-like; truncate setae: 1 on each sixth, eighth, tenth, and eleventh and 4 on ninth segments.

Maxilliped with inner process on second segment (Fig. 59D). Other mouth organs as in female.

Leg 1 with endopod bearing 5 setae on third segment (armature formula 1,1,3); inner terminal process on this segment larger than that of female and strongly recurved (Fig. 59E). Leg 4 with third endopodal segment bearing bluntly ended outer distal process (Fig. 59F).

Free segment of leg 5 35 × 22 μm, with 3 naked setae (66, 81, and 29 μm from outer to inner). Leg 6 represented by 2 very unequal setae on genital flap.

Remarks. The examined specimens of this study were collected from the type host *Stoichactis anemone* (Ellis). Stock (1975) stated that the spiniform processes on the endopodal segment of male legs 1-4 were longer than those of female. This feature is not confirmed in the present specimens. Instead, the strongly recurved inner distal process on the third endopodal segment of male leg 1 is noticed; interestingly, a similar process on the endopod of leg 1 was illustrated for *A. parvipalpus* by Stock (1975, see Fig. 177j).

Stock (1975) did not mention the truncate setae on some segments of the male antennule. Probably this feature was overlooked by him. Despite the discrepancy between male specimens of Stock and those observed in the present work,

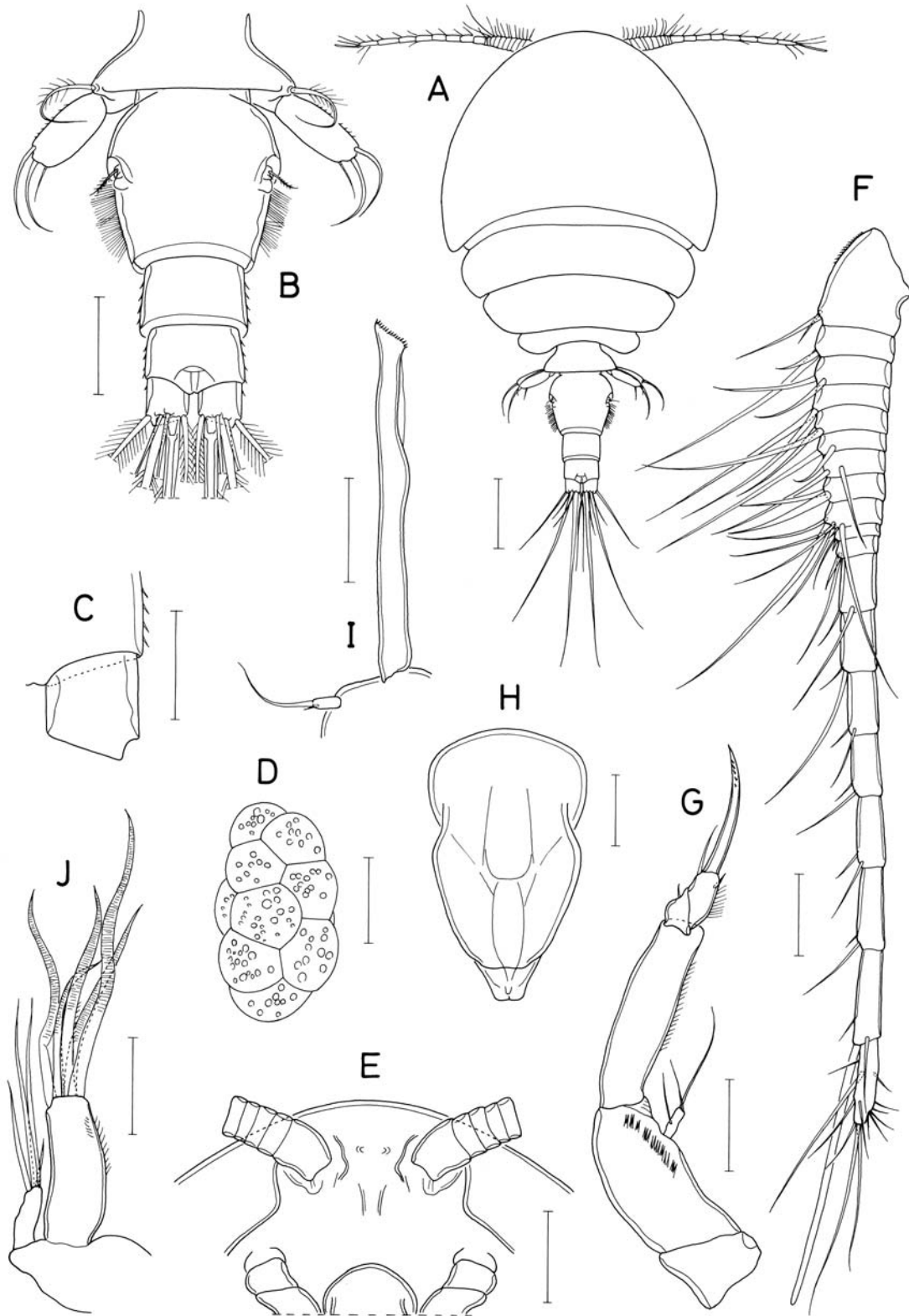


Fig. 57. *Asteropontius ungelatus* Stock, female. A, habitus, dorsal; B, urosome, ventral; C, right caudal ramus, dorsal; D, egg sac; E, rostral area, ventral; F, antennule; G, antenna; H, oral cone; I, mandible; J, maxillule. Scales: A, D, 0.2 mm; B, E, 0.1 mm; C, F-J, 0.05 mm.

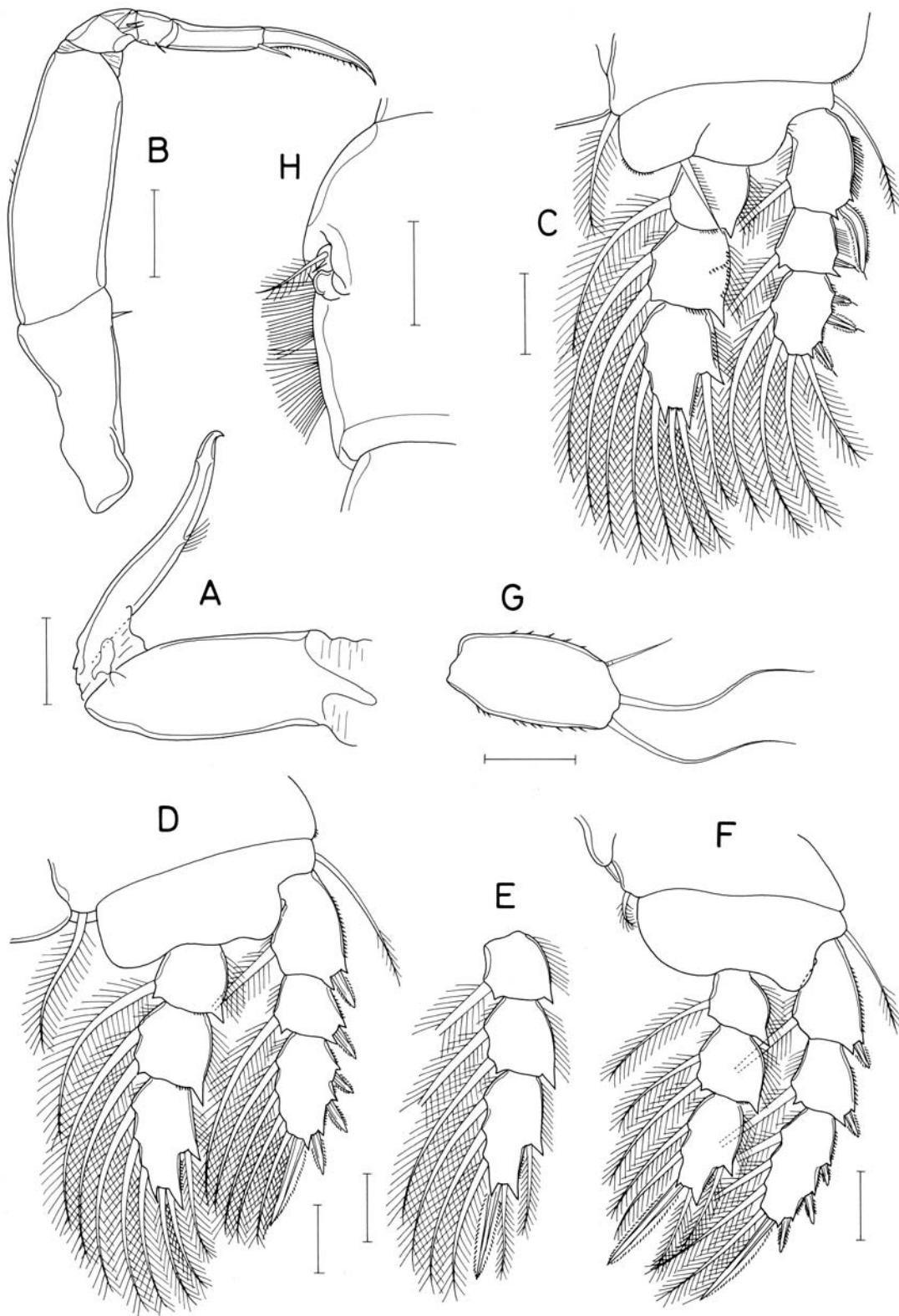


Fig. 58. *Asteropontius ungelatus* Stock, female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, left genital area, dorsal. Scales: 0.05 mm for all.

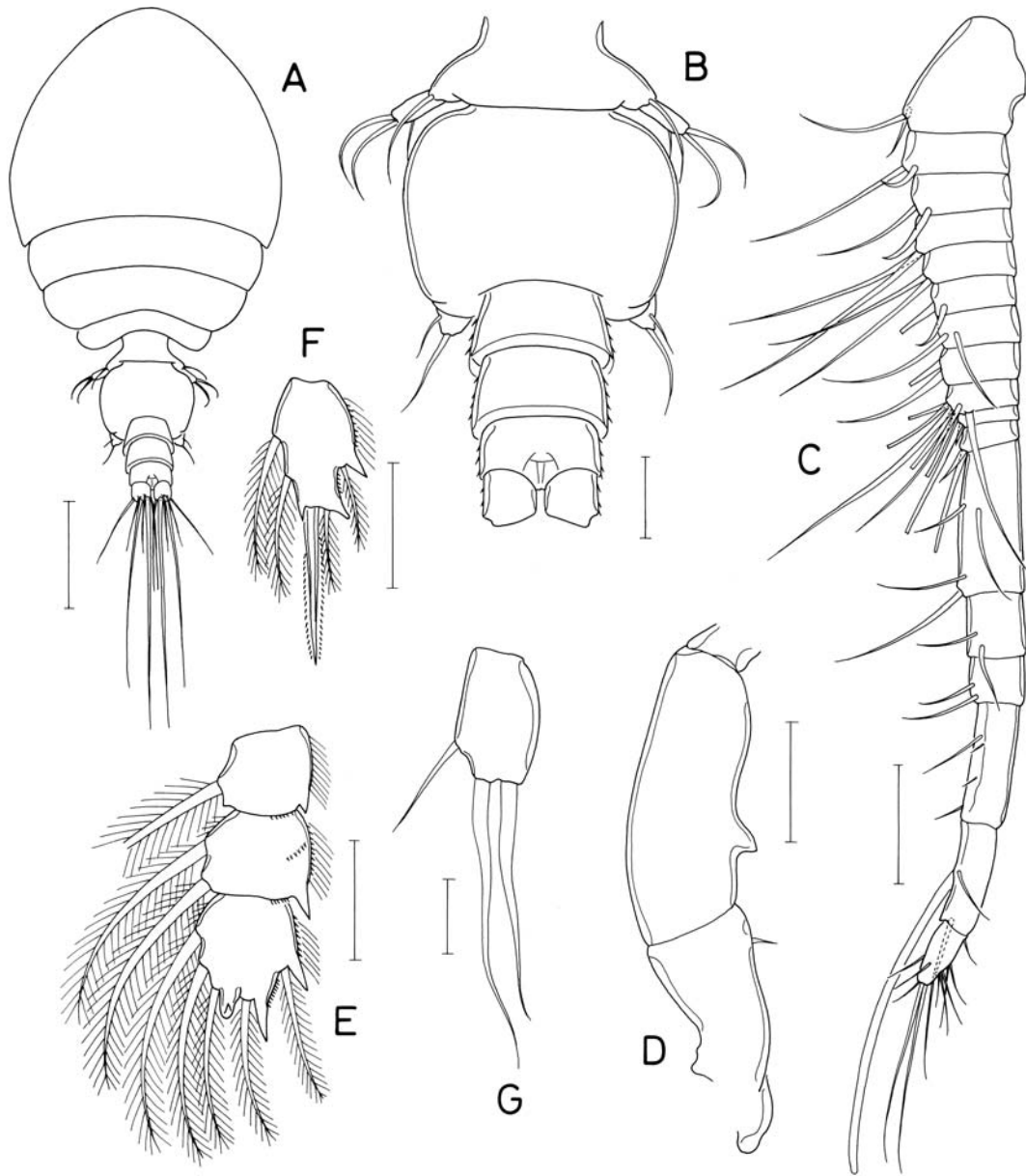


Fig. 59. *Asteropontius ungelatus* Stock, male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, proximal segments of maxilliped; E, endopod of leg 1; F, third endopodal segment of leg 4; G, free segment of leg 5. Scales: A, 0.2 mm; B-F, 0.05 mm; G, 0.02 mm.

I conclude the present specimens to belong to *A. ungelatus* in consideration of the following important similarities exhibited in the female: (1) all five setae on the inner lobe of maxillule are thick and large; (2) the mandibular palp is very small; (3) the oral cone and the exopod of antenna are very similar in form between the type specimens and the specimens of the present study.

***Asteropontius capillatus* n. sp. (Figs. 60-62)**

Material examined. 28 ♀♀, 2 ♂♂ from a large cylindrical coral (*Meandrina* sp.), at a depth of 3 m, off Coral Reef Club, Barbados, 14 January 1962, collected by A. G. Humes and R. U. Gooding. Holotype (♀), allotype (♂), and paratypes (25 ♀♀) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C.

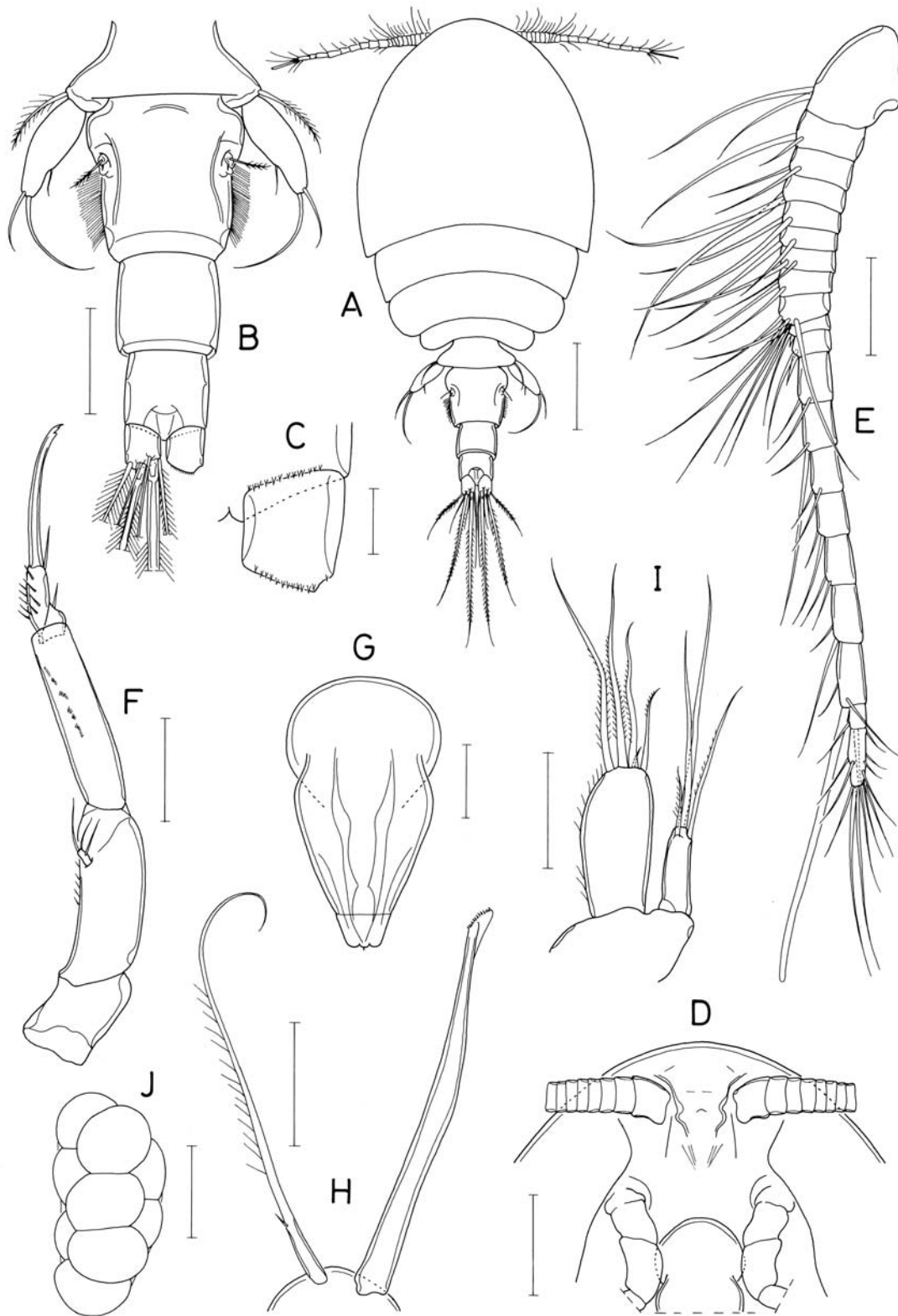


Fig. 60. *Asteropontius capillatus* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, left caudal ramus, ventral; D, rostral area, ventral; E, antennule; F, antenna; G, oral cone; H, mandible; I, maxillule; J, egg sac. Scales: A, J, 0.2 mm; B, D, 0.1 mm; C, 0.02 mm; E-I, 0.05 mm.

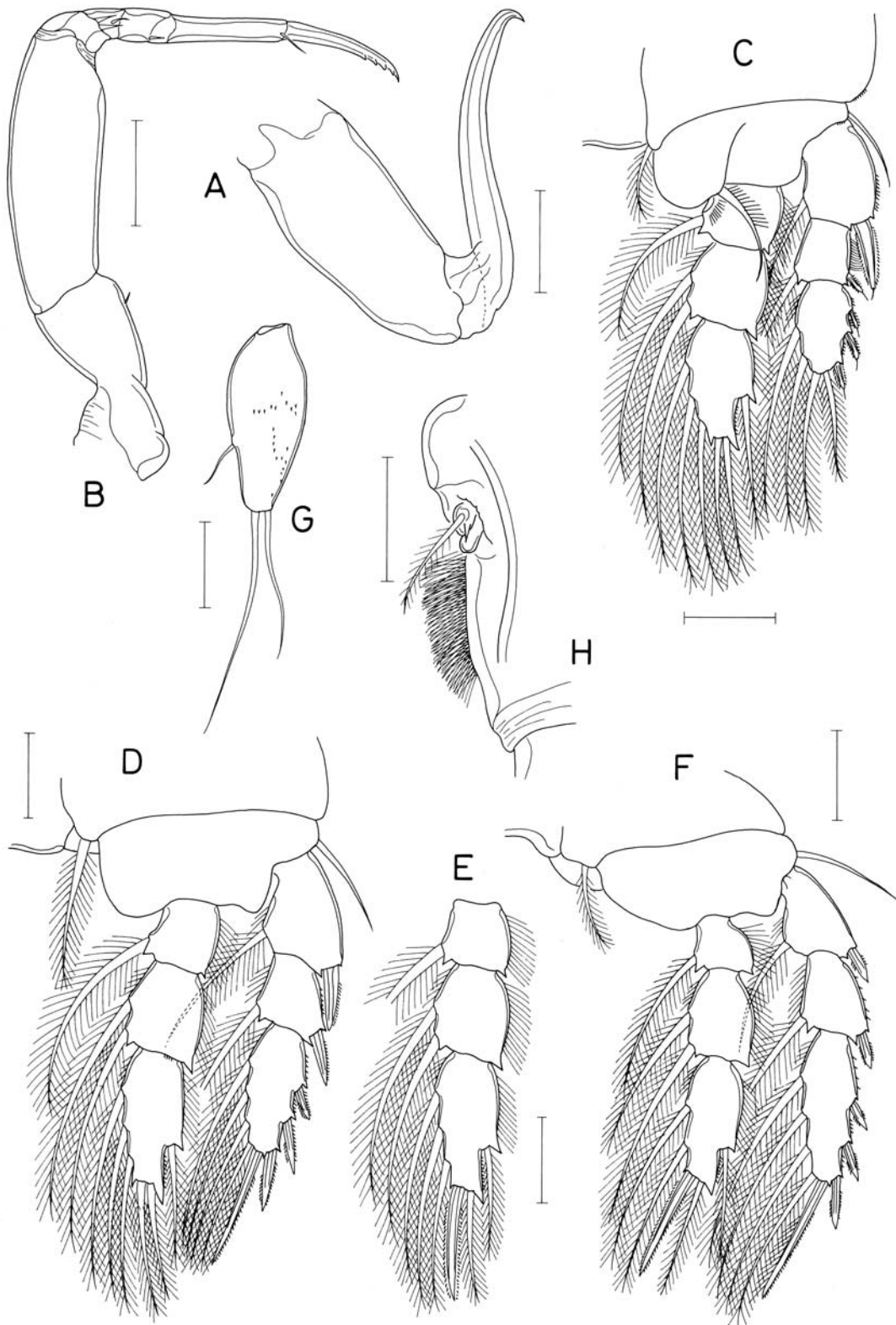


Fig. 61. *Asteropontius capillatus* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, left side of genital double-somite, dorsal. Scales: 0.05 mm for all.

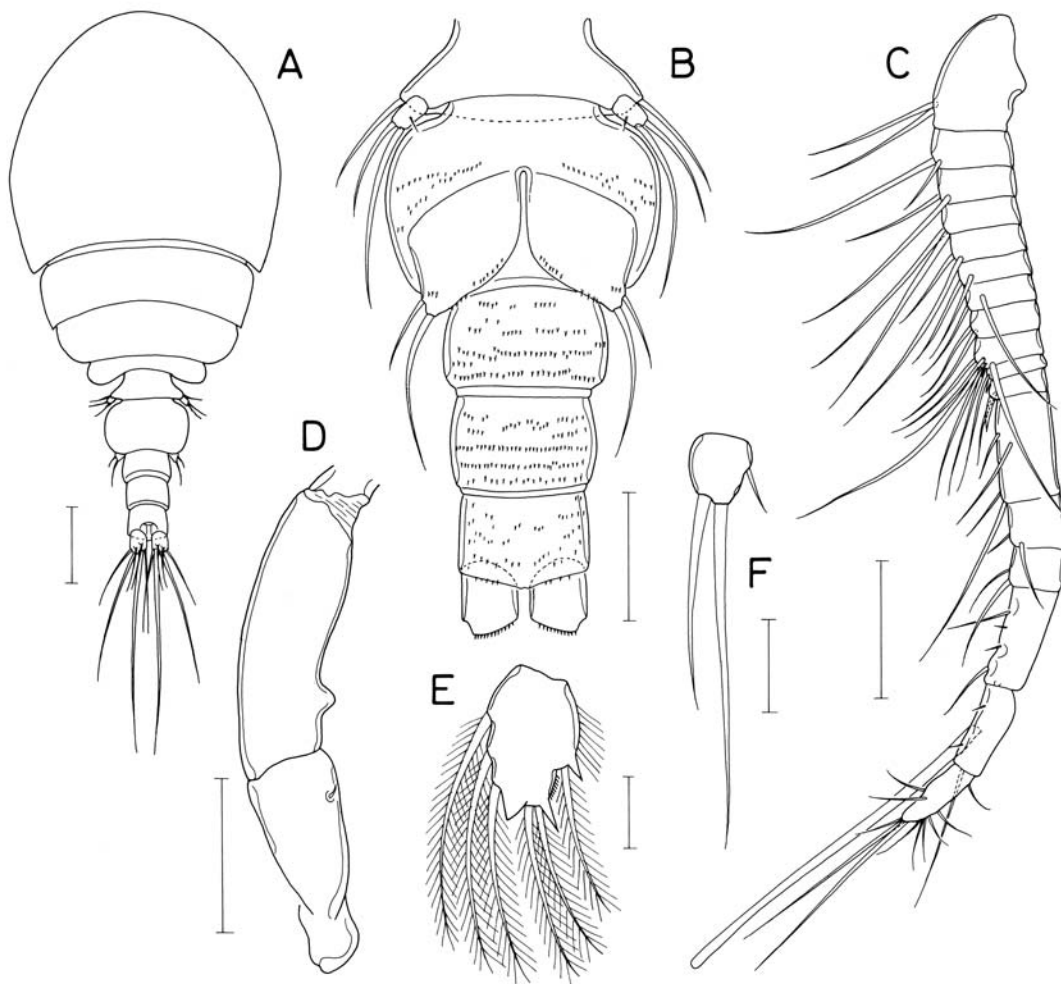


Fig. 62. *Asteropontius capillatus* n. sp., male. A, habitus, dorsal; B, urosome, ventral; C, antennule; D, proximal segments of maxilliped; E, third endopodal segment of leg 1; F, free segment of leg 5. Scales: A, 0.1 mm; B-D, 0.05 mm; E, F, 0.02 mm.

Dissected paratypes (2 ♀♀, 1 ♂) are retained in the collection of the author.

Female. Body (Fig. 60A) moderately narrow, with ovoid prosome. Mean body length 1.07 mm (1.02-1.12 mm), based on 10 specimens. Body length of dissected specimen 1.11 mm, and maximum width 555 μ m. Prosome 745 μ m long. Urosome (Fig. 60B) 4-segmented. Fifth pedigerous somite 183 μ m wide. Genital double-somite 150 \times 148 μ m, consisting of laterally slightly expanded anterior 1/3 and narrower posterior 2/3 bearing nearly parallel lateral margins; lateral sides sunken, thus remaining dorsomedian region forming broad ridge; lateral margin posterior to genital area with numerous setules (over 100); genital area located anterior to midway of somite (Fig. 61H). Two abdominal somites relatively long, 92 \times 98 and 85 \times 79 μ m, respectively. Anal somite with spinules along posteroventral margin. Caudal

ramus 37 \times 31 μ m (1.19 : 1), with spinules on posteroventral margin and 6 setae.

Rostrum faint, as tapering ridge, without posterior margin (Fig. 60D). Antennule (Fig. 60E) slender, 394 μ m long, and 20-segmented; ninth, eighteenth, and last segments with 8, 2+ aesthetasc, and 11 setae, respectively; other segments with 2 setae each; all setae naked; first segment with 2 large setae. Antenna (Fig. 60F) with smooth coxa; basis 83 \times 32 μ m, with few spinules on outer margin. Exopod small, 9 \times 4 μ m, with 2 distal and 1 lateral setae. Endopod 3-segmented; first segment unarmed and 93 \times 23 μ m; second segment with 1 seta; third segment with spinules on outer side and 1 inner distal seta; terminal claw 71 μ m long, slender, with small denticle subterminally. Egg sac (Fig. 60J) 485 \times 240 μ m; each egg 165 μ m in diameter.

Oral cone (Fig. 60G) nearly rhomboidal, 186 \times 96 μ m,

widest at proximal 1/5 region, and reaching middle of maxillipedal insertions. Mandible (Fig. 60H) consisting of stylet and palp. Stylet 164 μm long, distal half tapering, with broadened tip bearing denticles. Mandibular palp as long seta, 198 μm long, with small setule proximally. Maxillule (Fig. 60D) bilobed. Inner lobe 65 \times 30 μm , distally with 1 minute and 4 larger setae (latters 101, 90, 65, and 38 μm from inner to outer). Outer lobe 37 \times 14 μm , distally with 4 setae (111, 85, 65, and 29 μm , respectively). Maxilla (Fig. 61A) stout, with broad and unarmed proximal segment; distal claw unornamented, longer than proximal segment. Maxilliped (Fig. 61B) 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; setae on first and 3 distal segments obscure; terminal claw 61 μm long, as long as terminal segment, subterminally with 3-4 denticles.

Legs 1-4 with 3-segmented rami; outer distal corner of second endopodal segment unicuspid process (Fig. 61C-F). Outer seta on basis of legs 1-4 naked, and inner seta on coxa of these legs plumose. Armature formula of legs 1-4 as preceding species.

Leg 5 consisting of plumose dorsolateral setae on fifth pedigerous somite and free segment; free segment (Fig. 61G) spindle-shaped, 111 \times 47 μm , with 2 distal setae (89 and 136 μm , respectively) and 1 small seta (28 μm) on inner margin. Leg 6 represented by 1 plumose seta and 1 small spinule in genital area (Fig. 61H).

Male. Body (Fig. 62A) 704 μm long in dissected specimen. Prosome 469 μm long. Cephalothorax 296 \times 354 μm . Urosome (Fig. 62B) 5-segmented. Fifth pedigerous somite 95 μm wide. Genital double- and abdominal somites with minute spinules on ventral surface. Genital somite 76 \times 108 μm . Three abdominal somites 43 \times 65, 40 \times 58, and 35 \times 51 μm , respectively, with transverse rows of minute spinules on surface. Caudal ramus 29 \times 22 μm .

Rostrum and antenna as in female. Antennule (Fig. 62C) 310 μm long and 17-segmented; ninth, twelfth, and 3 distal segments armed with 8, 4, 4, 3+aesthetasc, and 11 setae, respectively.

Maxilliped with blunt proximal process on second segment (Fig. 62D). Other mouth organs as in female.

Leg 1 with broadened inner distal process on third endopodal segment. Legs 2-4 as in female. Free segment of leg 5 small, 15 \times 13 μm . Leg 6 represented by 2 naked unequal setae on genital flap (Fig. 62B).

Etymology. The specific name *capillatus* is a Latin meaning "hairy", which refers to the hairy lateral margins of the genital double-somite.

Remarks. The most significant feature of *Asteropontius capillatus* n. sp. seems to be the high number (over 100) of setules on the lateral margins of genital double-somite. Such a tuft of dense setules has not been reported yet in *Asteropontius*.

The free segment of female leg 5 of *A. capillatus* also serves to distinguish it from most of its congeners. It is distinctly tapering and characteristic in having an inner seta remotely isolated from the two distal setae. These features are shared by *A. proximus* Stock, 1987 and *A. iustus* Stock, 1989, both known also from the West Indies. *Asteropontius proximus* is readily distinguished from the new species by having only two setae on the outer lobe of maxillule. Comparison of the new species with *Asteropontius iustus* needs more carefulness, because both utilize the same genus (*Meandrina*) of scleractinians as host. Decisive differences present in the antennule: it is 19-segmented in *A. iustus* but 20-segmented in *A. capillatus*, and its first segment bears only one seta in *A. iustus* but two in *A. capillatus*. These two setae on the first antennular segment of *A. capillatus* are unusually large in both sexes and, therefore, hardly can be overlooked. As another important difference, the sexual dimorphisms occurring on legs 2-4 of *A. iustus* do not appear in *A. capillatus*.

***Asteropontius membranulatus* n. sp. (Figs. 63, 64)**

Material examined. 12 ♀♀ from the scleractinian coral *Seriatophora subseriata* Ehrenberg, at a depth of 0.9 m, Pointe Mahatsinjo, Nosy Bé, Madagascar, 5 September 1960, collected by A. G. Humes. Holotype (♀) and paratypes (10 ♀♀) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratype (1 ♀) is retained in the collection of the author.

Female. Body (Fig. 63A) with broad prosome. Mean body length 954 μm (900-1020 μm), based on 10 specimens. Body length of dissected specimen 1020 μm . Prosome 687 μm long. Cephalothorax 416 \times 570 μm , distinctly wider than next somite. Third and fourth pedigerous somites fringed with membrane on lateral margins. Urosome (Fig. 63B) 4-segmented. Fifth pedigerous somite 165 μm wide. Genital double-somite 146 \times 137 μm , with laterally expanded anterior half, tapering posterior half, and about 14 lateral setules near genital area (Fig. 63B, 64H); genital areas located mid-way of somite. Two free abdominal somites 54 \times 88 and 54 \times 83 μm , respectively. Caudal ramus 29 \times 35 μm , with weakly serrate posteroventral margin and 6 setae.

Rostrum tapering, with membranous fringe distally (Fig. 63C). Antennule 407 μm long and 20-segmented; first segment with spinules on anterior margin, one of 2 setae very small; ninth, eighteenth, and last segments with 7, 2+aesthetasc, and 11 setae, respectively; all setae naked. Antenna (Fig. 63E) with naked coxa; basis with setules on inner margin. Exopod small, 8 \times 7 μm , not articulated from basis, with 2 distal and 1 lateral setae. Endopod 3-segmented; first segment 80 \times 18 μm , longer than basis; second with 1 distal seta; third segment with 2 setae, outer one of which minute;

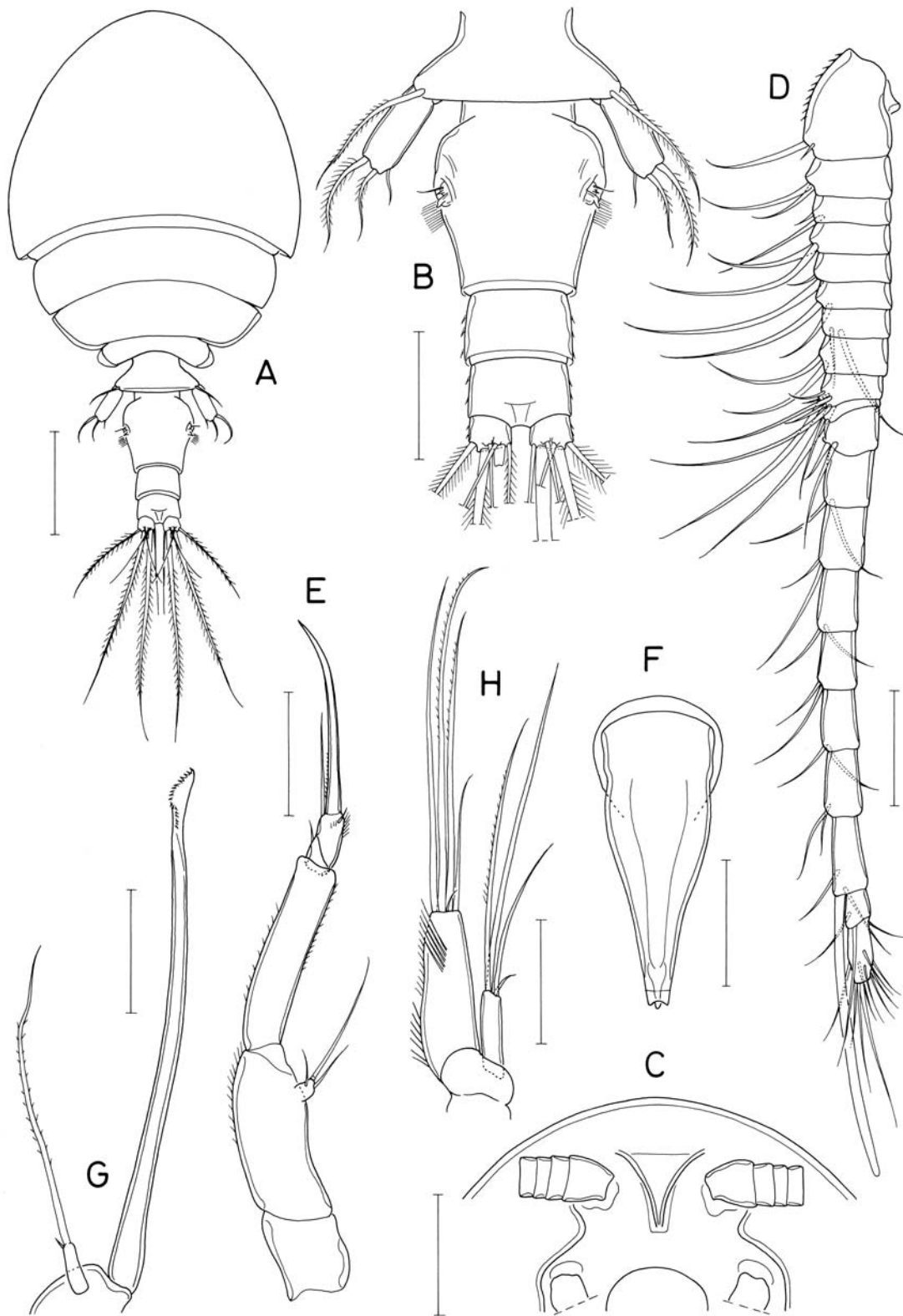


Fig. 63. *Asteropontius membranulatus* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, rostral area, ventral; D, antennule; E, antenna; F, oral cone; G, mandible; H, maxillule. Scales: A, 0.2 mm; B, C, F, 0.1 mm; D, E, G, H, 0.05 mm.

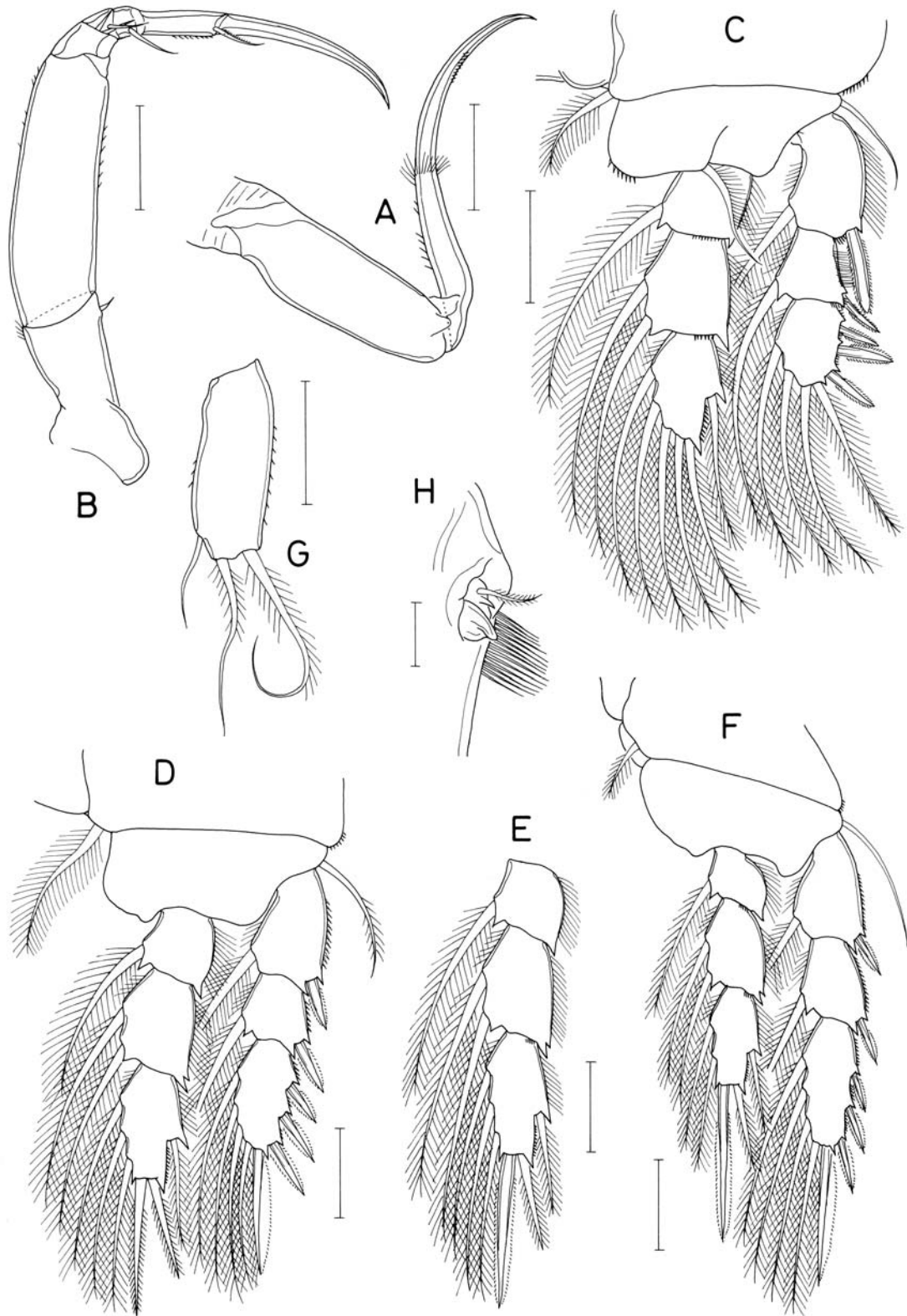


Fig. 64. *Asteropontius membranulatus* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, right genital area. Scales: A-G, 0.05 mm; H, 0.02 mm.

terminal claw slender, 82 μm long.

Oral cone (Fig. 63F) rather narrow, $233 \times 86 \mu\text{m}$, distal 2/3 portion tapering, and reaching slightly before insertions of leg 1. Mandible (Fig. 63G) consisting of stylet and palp; stylet 214 μm long, its apex obliquely widened, with minute denticles; palp $20 \times 7 \mu\text{m}$, distally with 1 minute setule and 1 large seta of 125 μm long. Maxillule (Fig. 63H) bilobed. Inner lobe $65 \times 23 \mu\text{m}$ slightly tapering, distally with 4 distinct setae (138, 145, 123, and 67 μm from inner to outer) and 1 small seta. Outer lobe $35 \times 9 \mu\text{m}$, with 4 distal setae (137, 115, 64, and 11 μm , respectively). Maxilla (Fig. 64A) with unarmed proximal segment; distal claw strongly arched, with tuft of setules in middle and minute spinules proximally and subdistally. Maxilliped (Fig. 64B) 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; second segment $127 \times 42 \mu\text{m}$, with spinules on lateral margins; terminal claw 94 μm long, more than twice as long as terminal segment,

Legs 1-4 with 3-segmented rami. Leg 1 (Fig. 64C) with elongate outer spines on second and third segment; outer spine on first segment 39 μm . Two terminal setae on endopod of leg 2 (Fig. 64D) spiniform. Terminal spine on endopod of leg 4 (Fig. 64F) 88 μm , distinctly longer than third segment. Outer distal corner of second endopodal segment of legs 2-3 bifurcated, but that of leg 1 simple. Armature formula of legs 1-4 as follows:

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

Leg 5 consisting of large dorsolateral seta on fifth pedigerous somite (proximal segment completely fused with somite) and free segment (Fig. 63B). Free segment (Fig. 64G) $80 \times 31 \mu\text{m}$ (2.58 : 1), with few spinules on lateral margins, 2 distal plumose setae (95 and 75 μm , respectively) and 1 naked subdistal seta (41 μm). Leg 6 represented by 1 plumose seta and 1 small spinule in genital area (Fig. 64H).

Male. Unknown.

Etymology. The specific name *membranulatus* alludes to the rostrum fringed with membrane.

Remarks. In the genus *Asteropontius* the outer distal process of the second endopodal segment of swimming legs is either unicuspid or bicuspid. There are three combinations of these armatures of the swimming legs: (1) the process is unicuspid in legs 1-4; (2) the process is bicuspid in legs 1-4; (3) the process is bicuspid in leg 1, but unicuspid in legs 2-4. The last example is observable in *Asteropontius minutus* Kim,

2003, and remaining other species belong to one of the two former cases. *Asteropontius membranulatus* n. sp. shows a new, unique combination of the armature: the outer distal process of the second endopodal segment is unicuspid in leg 1 but bicuspid in legs 2-4.

The presence of about 14 setules on the lateral margins of genital double-somite, the membranous fringe on the distal half of rostrum, the elongated outer spines on the two distal segments of leg 1, and the long setae on the lobes of maxillule are also the traits serve to identify this species.

Asteropontius plumatus n. sp. (Figs. 65, 66)

Material examined. 9 ♀♀ from the scleractinian coral *Seriasthophora subseriata* Ehrenberg, at a depth of 0.9 m, Pointe Mahatsinjo, Nosy Bé, Madagascar, 5 September 1960, collected by A. G. Humes. Holotype (♀) and paratypes (7 ♀♀) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratype (1 ♀) is retained in the collection of the author.

Female. Body (Fig. 65A) with rather broad prosome. Mean body length 900 μm (838-961 μm), based on 9 specimens. Body length of dissected specimen 917 μm , and maximum width 520 μm . Prosome 625 μm long. Fourth pedigerous somite fringed with membrane on lateral margin. Urosome (Fig. 65B) 4-segmented. Fifth pedigerous somite 143 μm wide. Genital double-somite $125 \times 113 \mu\text{m}$, weakly expanded laterally in anterior part and slightly tapering in posterior part, with 4 or 5 thin setules on lateral margin posterior to genital area; genital area located slightly anterior (43% region) to middle of somite. Two free abdominal somites 54×79 and $55 \times 75 \mu\text{m}$, respectively. Caudal ramus (Fig. 65C) $27 \times 33 \mu\text{m}$, with serrate posteroventral margin, and 6 setae.

Rostrum strongly tapering and posteriorly forming narrow ridge (Fig. 65D). Antennule (Fig. 65E) 462 μm long and 20-segmented; segments with 2 setae except for 7 setae on ninth segment, 2 setae+aesthetasc on eighteenth, and 11 setae on last; first segment with spinules on anterior margin, one of 2 setae on this segment very small; all setae naked. Antenna (Fig. 65F) with naked coxa; basis smooth. Exopod small, $6 \times 5 \mu\text{m}$, with 3 setae. Endopod 3-segmented; first segment $91 \times 17 \mu\text{m}$, with spinules on outer margin; second and third segments with 1 and 2 small setae each; terminal claw very slender, 95 μm long.

Oral cone (Fig. 65G) $180 \times 80 \mu\text{m}$, proximally constricted and distally tapering, and extending slightly over insertions of maxillipeds. Mandible (Fig. 65H) with 156 μm -long stylet bearing broadened, denticulated apex; palp $21 \times 8 \mu\text{m}$ with 1 minute setule and 1 seta of 115 μm , seta and segment fused. Maxillule (Fig. 69I) bilobed. Inner lobe broad, $55 \times 21 \mu\text{m}$, and distally armed with 3 large, heavily plumose setae (123,

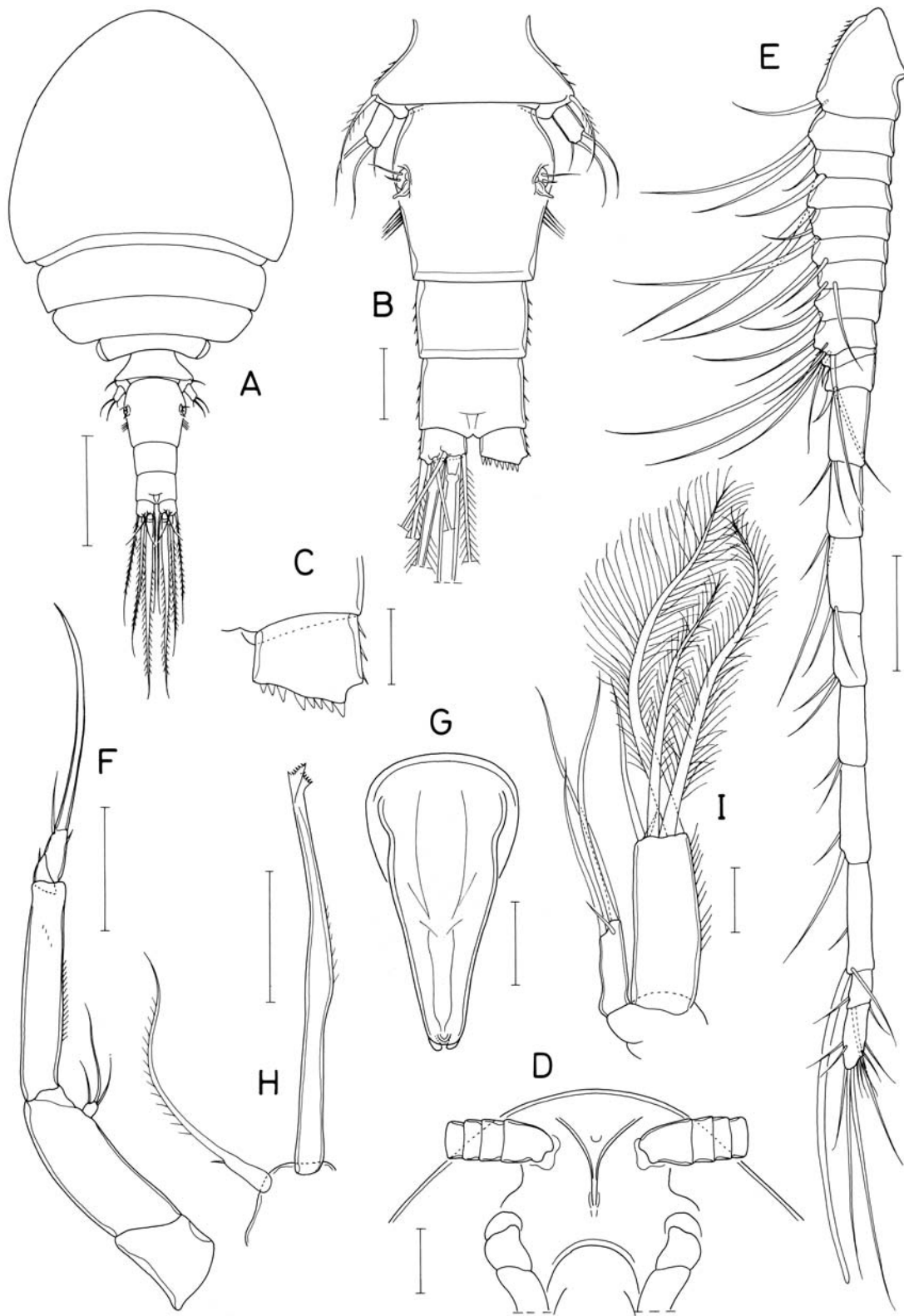


Fig. 65. *Asteropontius plumatus* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, left caudal ramus, ventral; D, rostral area, ventral; E, antennule; F, antenna; G, oral cone; H, mandible; I, maxillule. Scales: A, 0.2 mm; B, D-H, 0.05 mm; C, I, 0.02 mm.

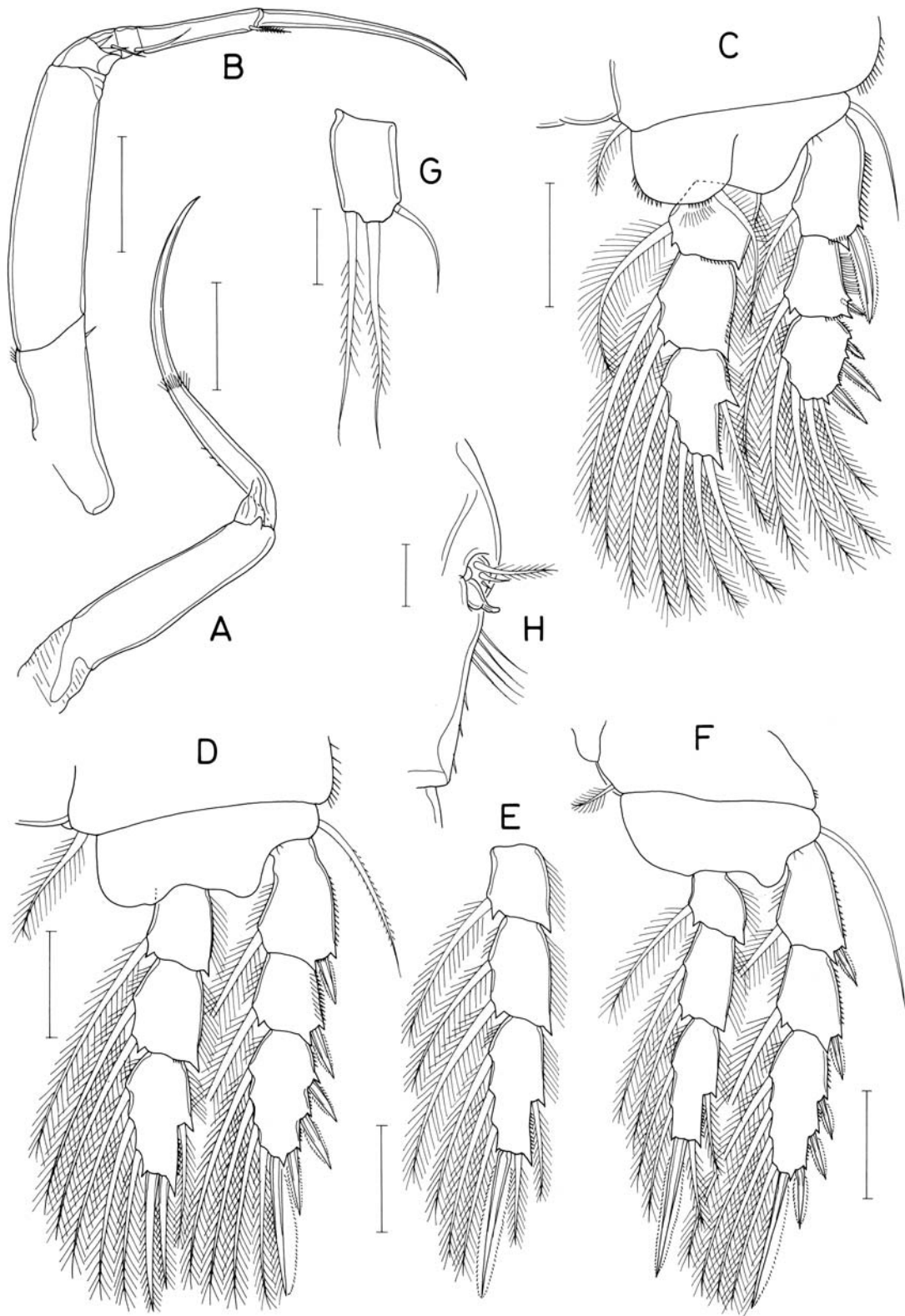


Fig. 66. *Asteropontius plumatus* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, right side of genital double-somite, dorsal. Scales: A-F, 0.05 mm; G, H, 0.02 mm.

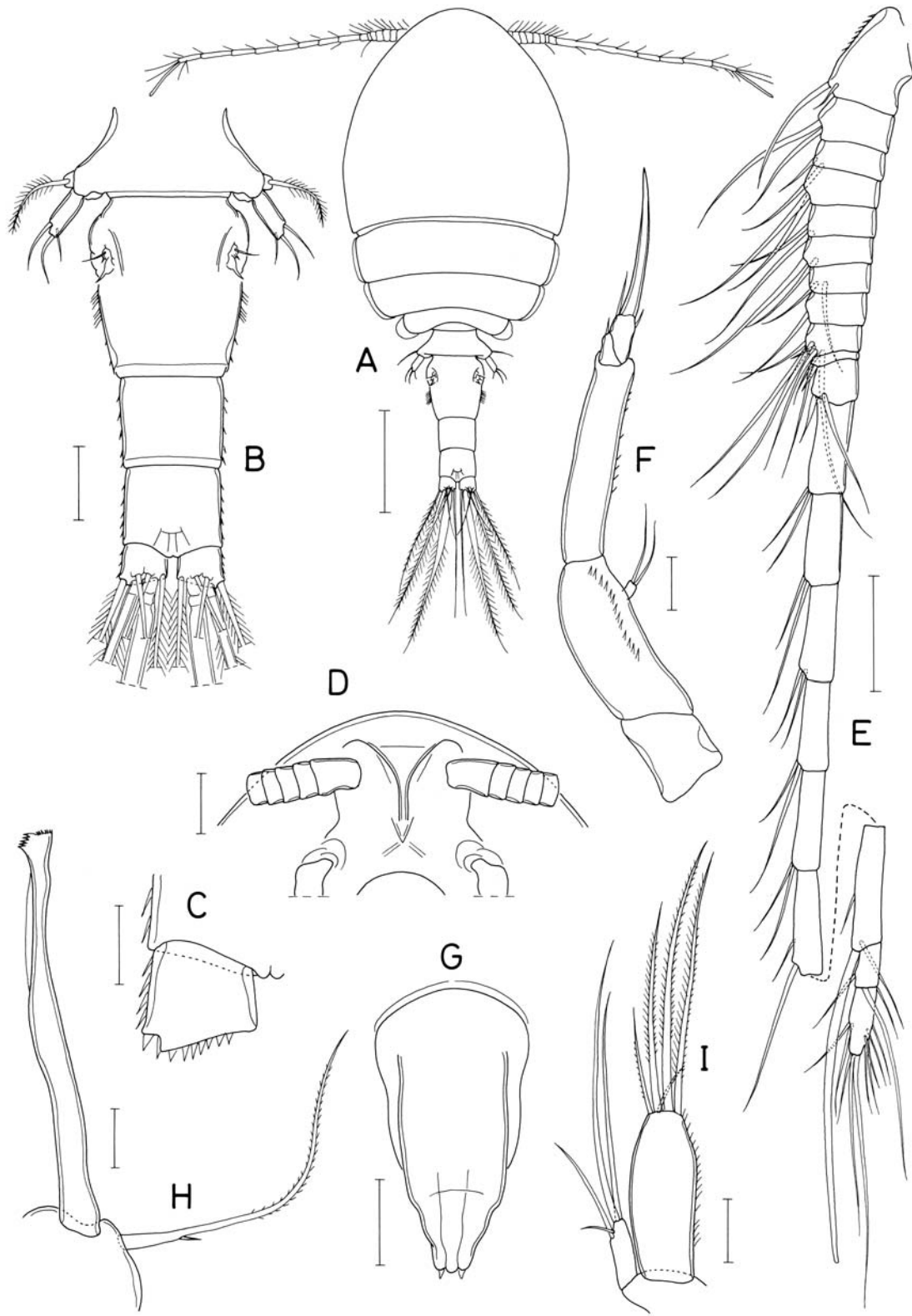


Fig. 67. *Asteropontius parvipes* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, caudal ramus, ventral; D, rostral area, ventral; E, antennule; F, antenna; G, oral cone; H, mandible; I, maxillule. Scales: A, 0.2 mm; B-E, G, 0.05 mm; F, H, I, 0.02 mm.

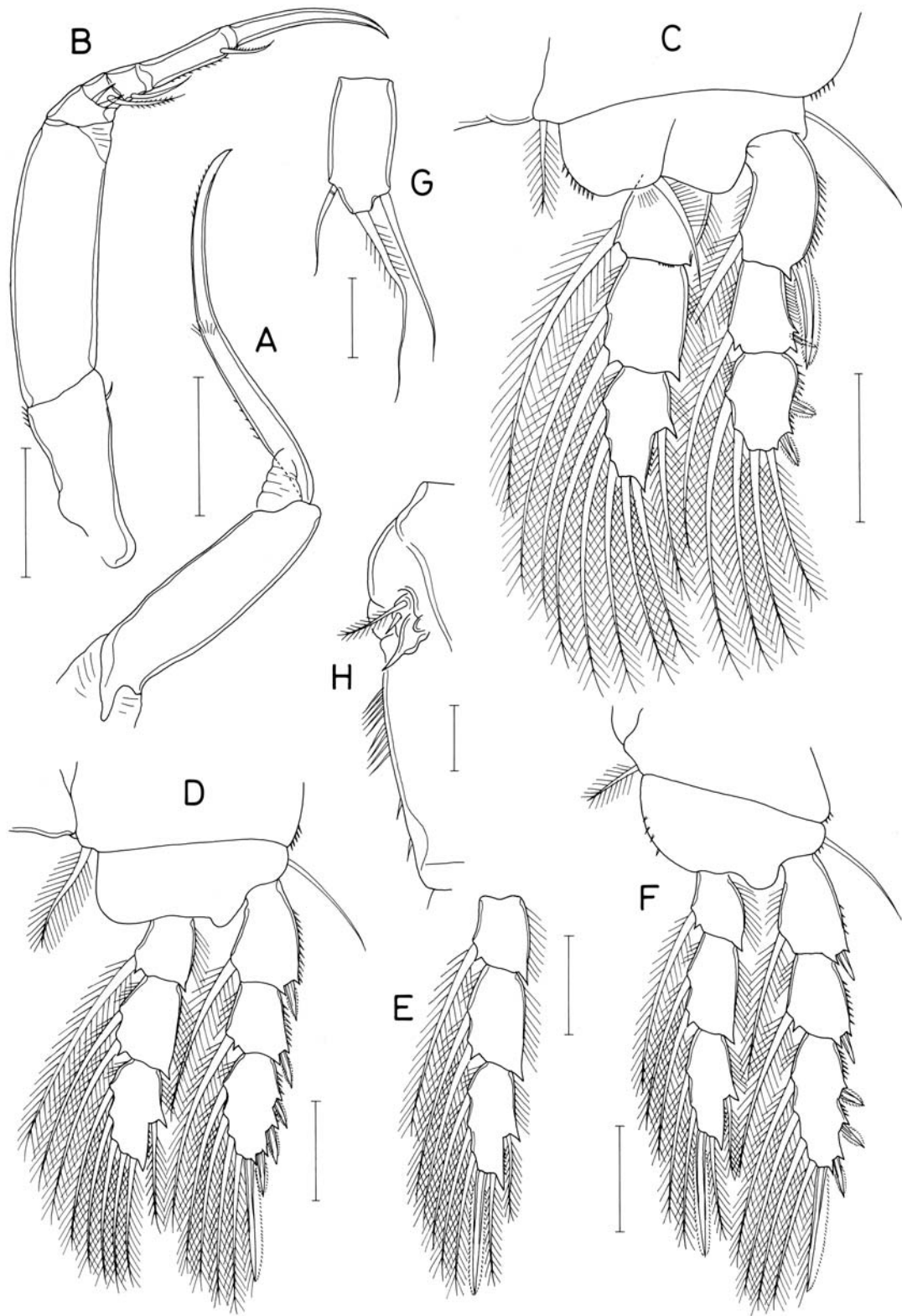


Fig. 68. *Asteropontius parvipes* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, left side of genital double-somite, dorsal. Scales: A-F, 0.05 mm; G, H, 0.02 mm.

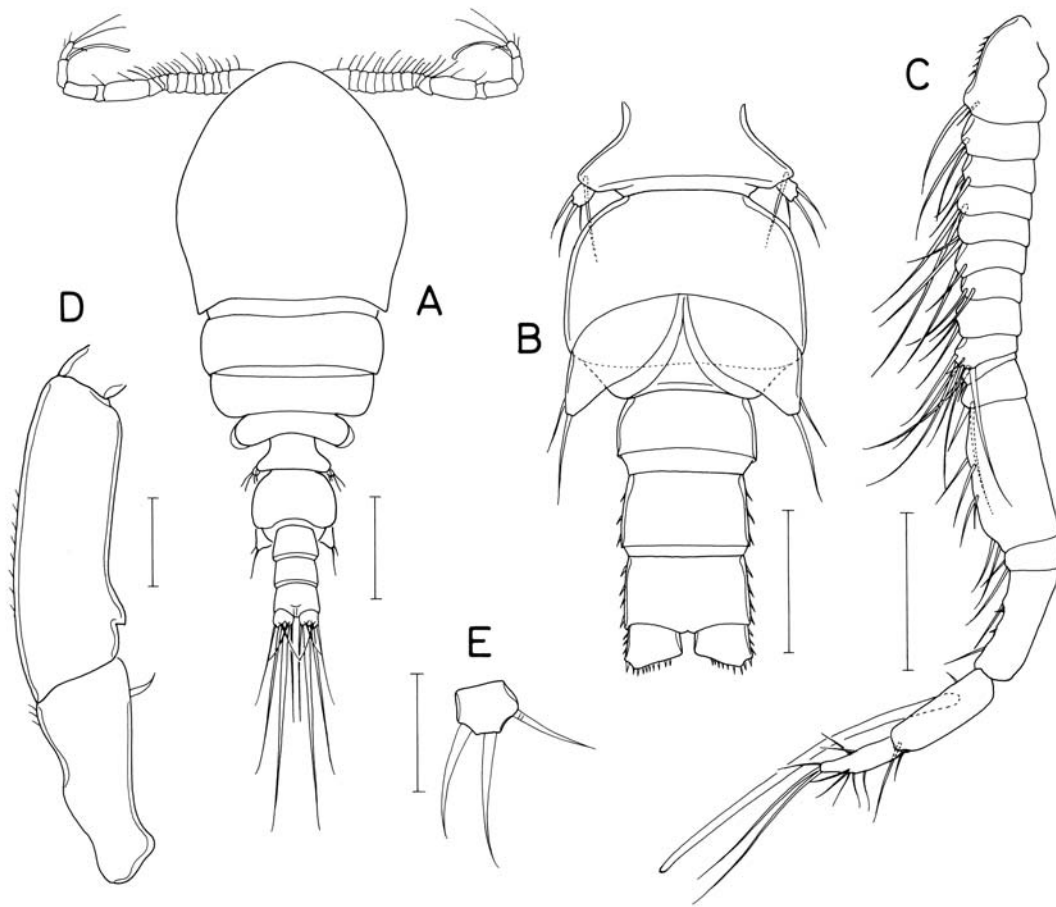


Fig. 69. *Asteropontius parvipes* n. sp., male. A, habitus, dorsal; B, urosome, ventral; C, antennule; D, proximal segments of maxilliped; E, free segment of leg 5. Scales: A, 0.1 mm; B, C, 0.05 mm; D, E, 0.02 mm.

pedigerous somite and free segment; free segment small, $34 \times 17 \mu\text{m}$ (2.0 : 1), with 3 setae (44, 51, and $25 \mu\text{m}$ from outer to inner), largest middle one weakly plumose, and other 2 smooth. Leg 6 represented by 1 plumose seta and 1 small setule in genital area (Fig. 68H).

Male. Body (Fig. 69A) narrower than that of female. Body length of dissected specimen $567 \mu\text{m}$, and maximum width $231 \mu\text{m}$. Prosome $389 \mu\text{m}$ long. Cephalothorax $256 \mu\text{m}$ long, longer than wide. Urosome (Fig. 69B) 5-segmented. Fifth pedigerous somite $76 \mu\text{m}$ wide. Genital somite $71 \times 86 \mu\text{m}$. Three abdominal somites 29×50 , 29×46 , and $28 \times 46 \mu\text{m}$, respectively. Caudal ramus $16 \times 21 \mu\text{m}$.

Rostrum and antenna as in female. Antennule (Fig. 69C) $270 \mu\text{m}$ and 16-segmented; ninth, twelfth, fourteenth, fifteenth, and last segments with 7 setae, 6 setae, 4 setae, 2 setae+1 aesthetasc, and 11 setae, respectively; other segments with 2 setae each.

Oral cone, mandible, maxillule, and maxilla as in female. Maxilliped with blunt proximal process on second segment

(Fig. 69D).

Legs 1-4 as in female. Free segment of leg 5 (Fig. 69E) small, knob-like, $8 \times 11 \mu\text{m}$, with 3 smooth setae of subequal lengths. Leg 6 represented by 2 naked unequal setae on genital flap (Fig. 69B).

Etymology. The specific name *parvipes* originated from the Latin words *parvus* (small) and *pes* (foot), which alludes to the possession of a small free segment of leg 5.

Remarks. *Asteropontius parvipes* n. sp. has, as a distinguishing feature, the unusual setation on the third exopodal segment of leg 1, which is armed with two spines and four setae (armature formula II,2,2), instead of three spines and four setae (III,2,2) or four spines and four setae (III,I,4) as in the other known species in the genus. This feature of the new species is shared only by the type species *A. typicus* Thompson and Scott, 1903 (see Fig. 8 in Pl. 19 of Thompson and Scott, 1903). A careful comparison made between the present specimens and the illustrations of Thompson and Scott resulted in the conclusion that they are different species.

The noticed differences are: the genital double-somite in the female of *A. typicus* bears a distinct lateral expansion, unlike that of *A. parvipes*; the inner seta on the basis of leg 1, which was illustrated by Thompson and Scott in other asterocherids reported in the same paper, does not appear in *A. typicus*; the third endopodal segment of leg 4 is armed with five setae, rather than one spine and four setae (armature formula 1,1+I,2) as in *A. parvipes* and other species in the genus; and the outer lobe of the maxillule of *A. typicus* is less atro-phied than that of *A. parvipes*.

***Asteropontius humesi* n. sp. (Figs. 70-72)**

Material examined. 26 ♀♀, 5 ♂♂ from a scleractinian coral of *Porites* sp. (subgenus *Synaraea*), at a depth of 1 m, Ambariobe, north of Nosy Komba, Madagascar, 17 September 1963, collected by A. G. Humes. Holotype (♀), allotype (♂), and paratypes (24 ♀♀, 3 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (1 ♀, 1 ♂) are retained in the collection of the author.

Other material examined. 92 ♀♀, 13 ♂♂ from a scleractinian coral of *Porites* sp. (the same species as above), at a depth of 1 m, Pointe Lokobe, Nosy Bé, Madagascar, 20 November, 1963, collected by A. G. Humes.

Female. Body (Fig. 70A) with broad prosome. Mean body length 0.97 mm (0.89-1.00 mm), based on 10 specimens. Body length of dissected specimen 1.00 mm, and maximum width 0.57 mm. Prosome 708 µm long. Cephalothorax expanded and 458 µm long. Second to fourth pedigerous somites fringed with narrow membrane on lateral margins. Urosome (Fig. 70B) 4-segmented. Fifth pedigerous somite 160 µm wide. Genital double-somite 125 × 138 µm, expanded laterally, with convex lateral margins, with 10 or 11 long setules near the genital area; genital area located at midway of somite. Two free abdominal somites 41 × 80 and 58 × 75 µm, respectively. Anal somite and caudal ramus with serrate posteroventral margin. Caudal ramus 28 × 33 µm (0.85 : 1), with 6 setae; inner median terminal seta thickened.

Rostrum strongly tapering proximally and posteriorly forming slender ridge (Fig. 70C). Antennule (Fig. 70D) 512 µm and 19-segmented, with aesthetasc on penultimate segment; each segment armed with 2 setae, except for ninth segment (7 setae), eighteenth segment (2 setae+aesthetasc), and last segment (11 setae); first segment with spinules on anterior margin, one of its 2 setae vestigial; all setae naked, and most of setae on proximal segments large. Antenna (Fig. 70E) with smooth coxa; basis 82 × 34 µm and unornamented. Exopod small, 10 × 5 µm, with 2 distal and 1 lateral setae. Endopod 3-segmented; first segment 82 × 23 µm; second segment with minute distal seta; third segment with 2 small

distal setae; terminal claw 92 µm, not articulated from segment.

Oral cone (Fig. 70F) 192 × 83 µm, constricted proximally and evenly tapering in most part, extending slightly over insertions of maxillipeds, with truncated apex. Mandible (Fig. 70G) with broad stylet (151 µm) bearing denticles on broad and oblique distal margin; mandibular palp fused with distal large seta, 140 µm in total, with small setule. Maxillule (Fig. 70H) bilobed. Inner lobe 60 × 20 µm, tapering, distally armed with 1 minute and 4 larger setae (latters 85, 108, 90, and 50 µm from inner to outer). Outer lobe 33 × 10 µm, distally with 1 minute and 3 larger setae (120, 108, and 54 µm, respectively). Maxilla (Fig. 71A) with unornamented proximal segment; distal claw with tuft of setules in middle and spinules subdistally. Maxilliped (Fig. 71B) 6-segmented; first segment unarmed; second segment 118 × 42 µm and unarmed; third segment with 2 small setae; fourth to sixth segments with 1 seta each; terminal claw 87 µm and sharply pointed.

Legs 1-4 with 3-segmented rami and spinules on inner side basis. Outer spine on first exopodal segment of leg 1 (Fig. 71C) 39 µm. Legs 2-4 with bicuspid outer distal process on second endopodal segment (Fig. 71D-F). Leg 4 with large, smooth outer seta on basis; terminal spine on endopod 80 µm long. Armature formula of legs 1-4 as follows:

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

Leg 5 consisting of large but naked dorsolateral seta on fifth pedigerous somite and free segment; free segment 38 × 29 µm with smooth margins and 2 large (150 and 146 µm, respectively) and 1 small (25 µm) naked setae. Leg 6 represented by 1 plumose seta and 1 small spinule in genital area (Fig. 71H).

Male. Body (Fig. 72A) narrower than that of female. Body length of largest dissected specimen 758 µm, and maximum width 392 µm. Prosome 538 µm long. Cephalothorax 346 µm long. Urosome (Fig. 72B) 5-segmented. Fifth pedigerous somite 97 µm wide. Genital somite nearly quadrangular, 92 × 116 µm. Three abdominal somites 33 × 60, 26 × 54, and 32 × 56 µm, respectively. Caudal ramus 19 × 24 µm.

Rostrum and antenna as in female. Antennule (Fig. 72C) 340 µm and 17-segmented; ninth and twelfth segments with 4 setae each, and three terminal segments with 4 setae, 2 setae+aesthetasc, and 11 setae, respectively; other segments with 2 setae each.

Maxilliped with knob-like inner distal seta on first segment;

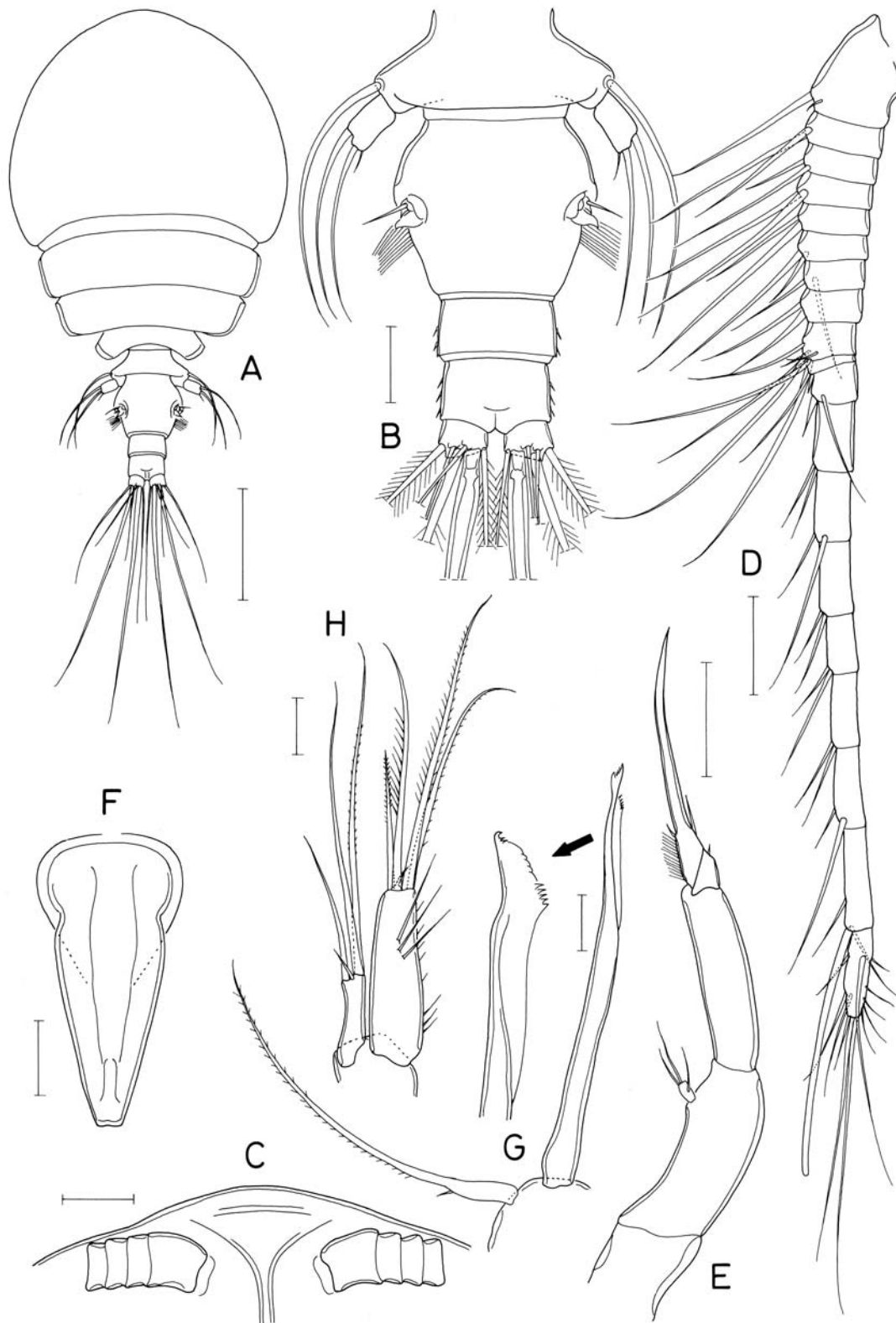


Fig. 70. *Asteropontius humesi* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, rostral area, ventral; D, antennule; E, antenna; F, oral cone; G, mandible; H, maxillule. Scales: A, 0.2 mm; B-F, 0.05 mm; G, H, 0.02 mm.

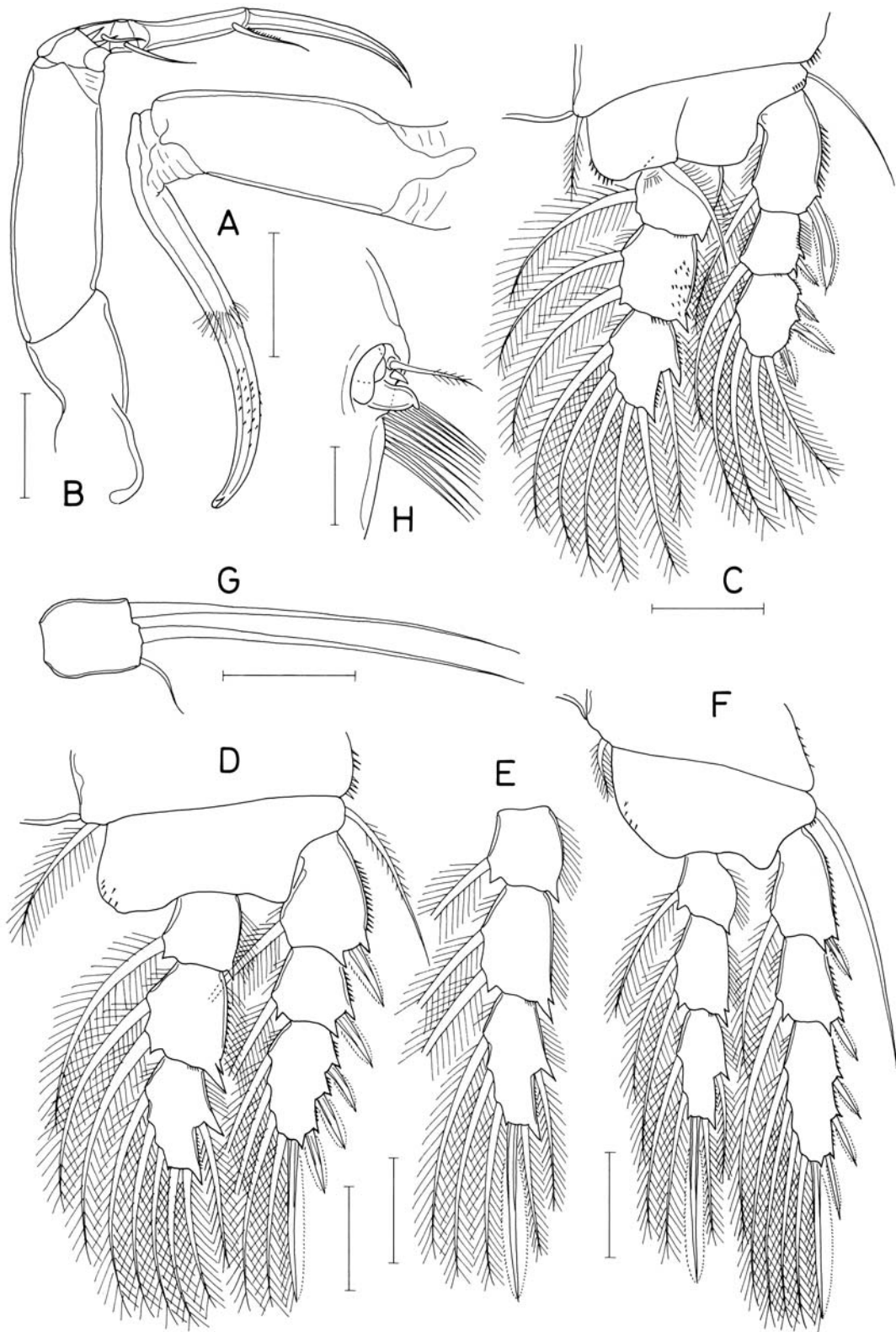


Fig. 71. *Asteropontius humesi* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, right genital area. Scales: A-G, 0.05 mm; H, 0.02 mm.

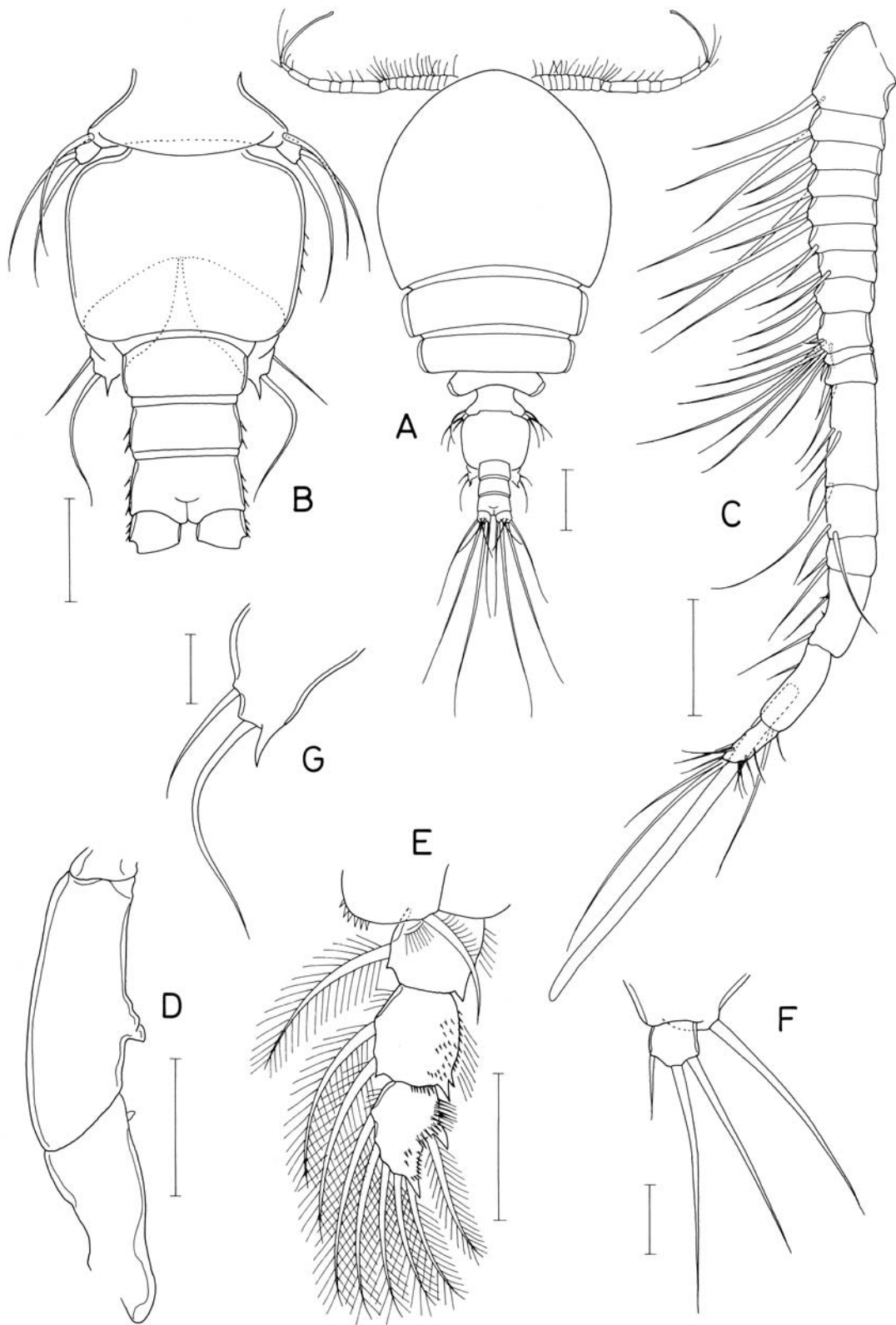


Fig. 72. *Asteropontius humesi* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, proximal segments of maxilliped; E, endopod of leg 1; F, leg 5; G, leg 6. Scales: A, 0.1 mm; B-E, 0.05 mm; F, G, 0.02 mm.

second segment with distinct inner process (Fig. 72D). Other mouth organs as in female.

Leg 1 with additional spinules on inner side of 2 distal segments of endopod (Fig. 72E). Legs 2-4 as in female. Leg 5 (Fig. 72F) with small free segment of $13 \times 14 \mu\text{m}$, its 3 distal setae 63, 74, and $18 \mu\text{m}$ from outer to inner. Leg 6 represented by 2 unequal naked setae and 1 spiniform process on genital flap (Fig. 72G).

Etymology. *Asteropontius humesi* n. sp. is named after the late Dr. Arthur G. Humes who collected the specimens of the new species.

Remarks. Like *Asteropontius membranulatus*, above, the new species *A. humesi* has the unicuspid outer distal process on the second endopodal segment of leg 1 and the bicuspid outer distal process in legs 2-4. Unlike *A. membranulatus*, the new species has a 19-segmented antennule in the female (20-segmented in *A. membranulatus*), the genital double-somite is wider than long (longer than wide in *A. membranulatus*), and the lateral margins of the genital double-somite have long setules.

The dorsolateral seta on the fifth pedigerous somite and two of three distal setae on the free segment of female leg 5 are naked and unusually large, extending beyond the posterior margin of genital double-somite. The female antennules is 19-segmented, due to the fusion of distal segments. These features also typify *A. humesi*.

The two collections of this species reveal a size difference. Unlike the type specimens which have a mean body length of 0.97 mm (ranged 0.89-1.00 mm) in the female, the specimens from Pointe Lokobe in Nosy Bé have a mean body length of 0.86 mm (ranging from 0.84-0.87 mm) in the same sex.

***Asteropontius angulatus* n. sp. (Figs. 73-75)**

Material examined. 17 ♀♀, 9 ♂♂ from a scleractinian coral (*Echinopora* sp.), at a depth of 2 m, Pointe de Tafondro, Nosy Bé, Madagascar, 30 May 1967, collected by A. G. Humes. Holotype (♀), allotype (♂), and paratypes (14 ♀♀, 7 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 1 ♂) are retained in the collection of the author.

Other material examined. 41 ♀♀ from the scleractinian coral *Lobophyllia hemprichii* (Ehrenberg), at a depth of 1 m, Nosy Sakatia, west of Nosy Bé, Madagascar, 12 May 1964, collected by A. G. Humes; 20 ♀♀, 5 ♂♂ from the scleractinian coral *Echinopora gemmacea* (Lamarck), at a depth of 1 m, Pointe de Tafondro, Nosy Bé, Madagascar, 21 September 1963, collected by A. G. Humes,

Female. Body (Fig. 73A) with very broad prosome. Mean

body length 1.10 mm (1.04-1.17 mm), based on 7 specimens. Body length of dissected specimen 1.13 mm, and maximum width $650 \mu\text{m}$. Prosome $800 \mu\text{m}$ long. First three prosomal somites very broad. Cephalothorax and second pedigerous somite with acutely pointed posterolateral corners; those of third pedigerous somite angular. Urosome (Fig. 73B) 4-segmented. Fifth pedigerous somite $208 \mu\text{m}$ wide. Genital double-somite $146 \times 158 \mu\text{m}$, weakly tapering, with about 14 long lateral setules near the genital area (Fig. 74H); genital area located slightly anterior to midway of somite. Two free abdominal somites 60×104 and $67 \times 98 \mu\text{m}$, respectively. Caudal ramus $40 \times 44 \mu\text{m}$ (0.91 : 1), with 6 setae; inner median terminal seta very expanded.

Rostrum strongly tapering, with truncate posterior apex (Fig. 73C). Antennule (Fig. 73D) $555 \mu\text{m}$ long and 20-segmented; ninth, eighteenth, and last segments with 7 setae, 2 setae+aesthetasc, and 10 setae, respectively; other segments with 2 setae each; first segment without spinules on anterior margin, one of its 2 setae rudimentary; all setae naked and thin. Antenna (Fig. 73E) with smooth coxa; basis $82 \times 33 \mu\text{m}$ and unornamented. Exopod small, $6 \times 5 \mu\text{m}$. with 3 setae. Endopod 3-segmented, with armature formula 0, 1, and 3+claw; first segment $82 \times 18 \mu\text{m}$, distinctly narrower than basis; setae on distal 2 segments minute; terminal claw $101 \mu\text{m}$ long, very thin, with small spinule subterminally.

Oral cone (Fig. 73F) $237 \times 123 \mu\text{m}$, strongly tapering, and extending slightly beyond insertions of maxillipeds. Mandible (Fig. 73G) with thick stylet and small palp. Stylet $186 \mu\text{m}$ long, with denticles on oblique distal margin. Palp small, fused with distal seta, $74 \mu\text{m}$ in total, with 1 small setule proximally. Maxillule (Fig. 73H) bilobed. Inner lobe $69 \times 28 \mu\text{m}$, distally with 1 minute seta and 4 larger plumose setae of 92, 100, 92, and $44 \mu\text{m}$ long. Outer lobe $33 \times 10 \mu\text{m}$, distally with 1 small and 3 larger naked setae (the latter 129, 101, and $71 \mu\text{m}$, respectively). Maxilla (Fig. 74A) with massive proximal segment; distal claw smooth and distally strongly recurved. Maxilliped (Fig. 74B) 6-segmented; first segment with papilla-like, rudimentary inner seta; second segment $116 \times 46 \mu\text{m}$ and smooth; third to sixth segments with 2, 1, 1, and 1 setae, respectively; terminal claw $92 \mu\text{m}$ long, more than twice as long as terminal segment, with 1 or 2 small spinules subterminally.

Legs 1-4 with 3-segmented rami and unicuspid outer distal process of second endopodal segment (Fig. 74C-F). Outer spine on first exopodal segment of leg 1 broad and $39 \mu\text{m}$ long. Armature formula of legs 1-4 as in preceding species.

Leg 5 consisting of dorsolateral plumose seta on fifth pedigerous somite and free segment (Fig. 73B); free segment (Fig. 74G) tapering, $55 \times 33 \mu\text{m}$ (1.67 : 1), with few scales on outer margin and 3 plumose distal setae (80, 123, and $31 \mu\text{m}$ from outer to inner). Leg 6 probably represented by 1

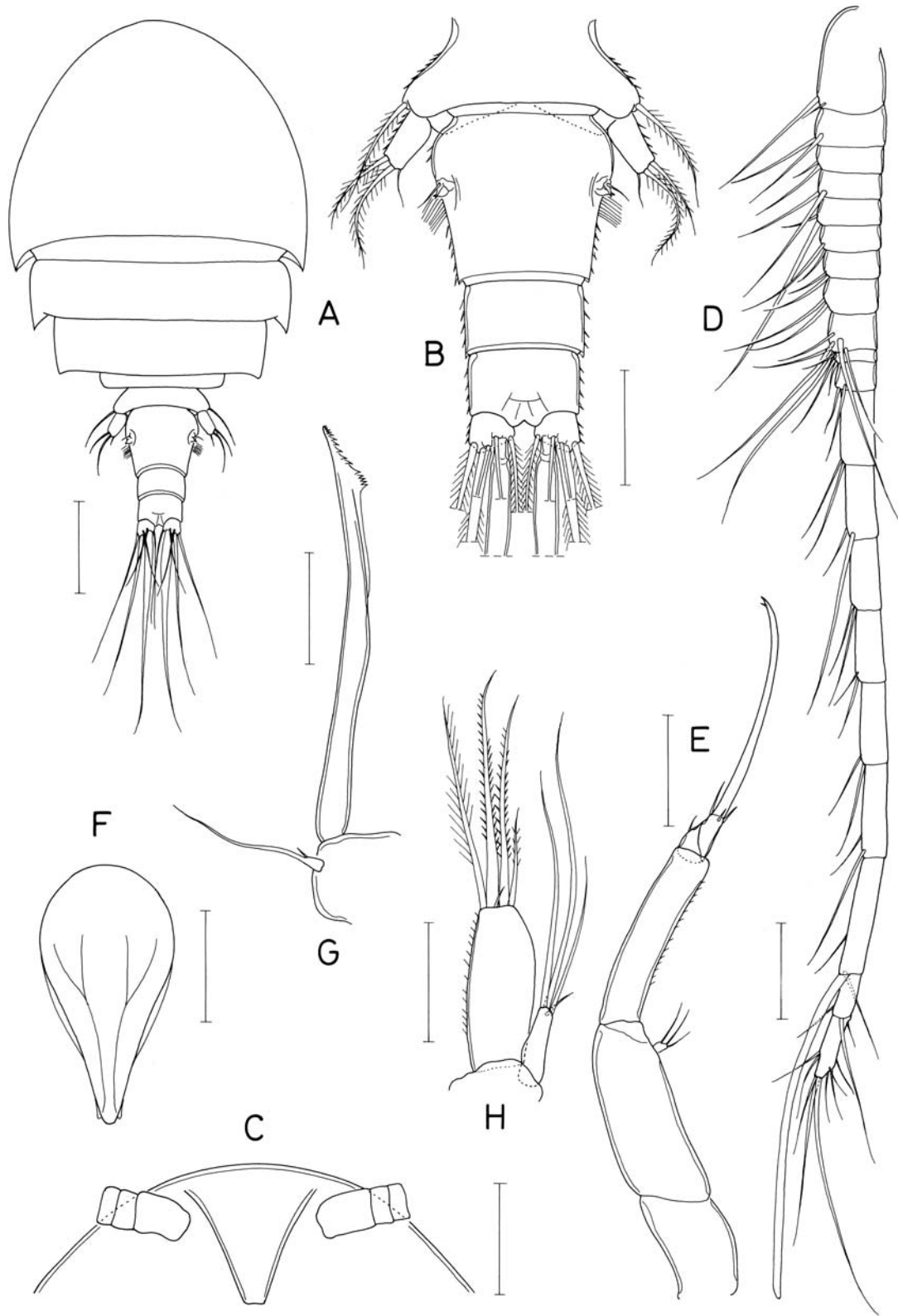


Fig. 73. *Asteropontius angulatus* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, rostral area, ventral; D, antennule; E, antenna; F, oral cone; G, mandible; H, maxillule. Scales: A, 0.2 mm; B, C, F, 0.1 mm; D, E, G, H, 0.05 mm.

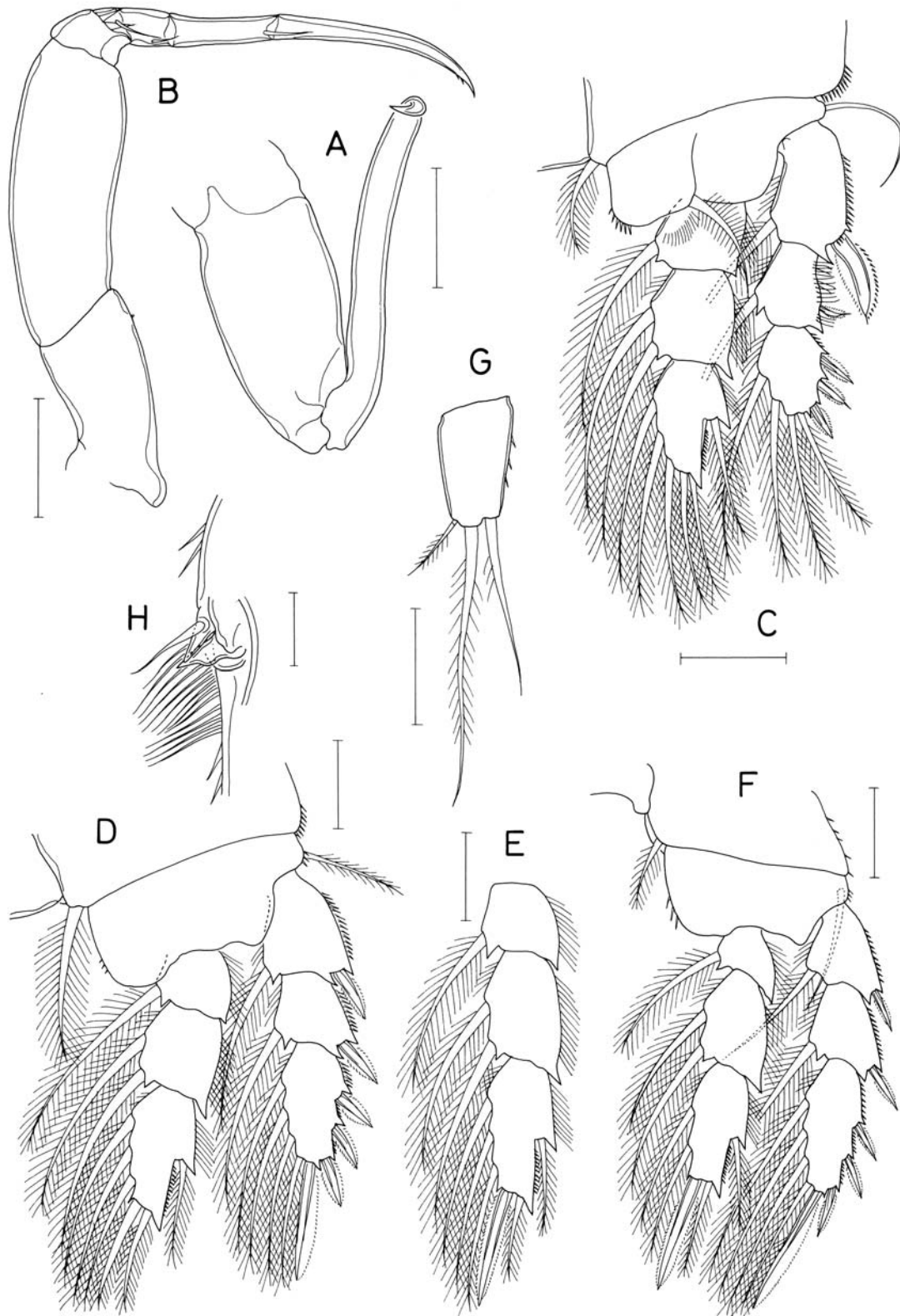


Fig. 74. *Asteropontius angulatus* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, left genital area. Scales: A-G, 0.05 mm; H, 0.02 mm.

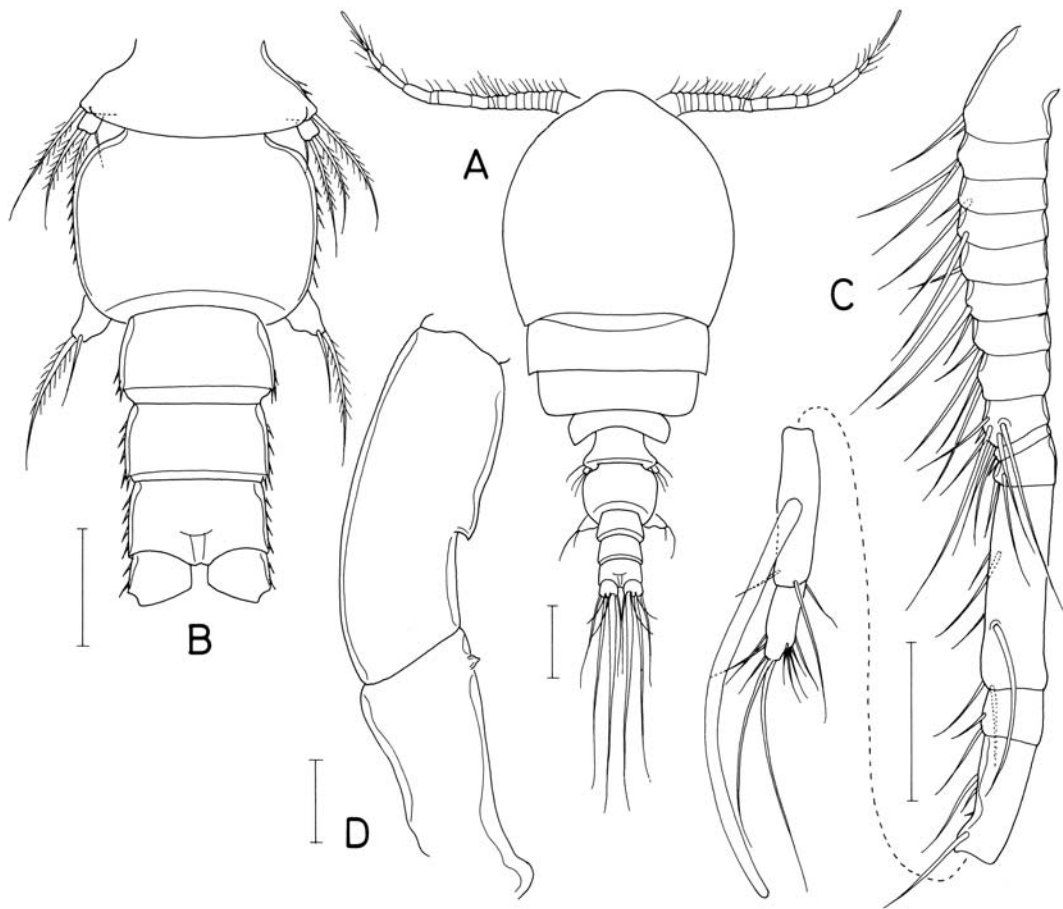


Fig. 75. *Asteropontius angulatus* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, proximal segments of maxilliped. Scales: A, 0.1 mm; B, C, 0.05 mm; D, 0.02 mm.

naked seta and 2 strong processes in genital area (Fig. 74H).

Male. Body (Fig. 75A) narrower than and different in form from that of female. Body length of dissected specimen 708 μm , and maximum width 327 μm . Prosome 480 μm long. First 2 prosomal somites with angular posterolateral corners; third pedigerous somite with rounded posterolateral corners. Urosome (Fig. 75B) 5-segmented. Fifth pedigerous somite 101 μm wide. Genital somite $76 \times 108 \mu\text{m}$, distinctly wider than long, with rounded corners and scales on lateral margins. Three abdominal somites 41×67 , 32×61 , and $36 \times 60 \mu\text{m}$, respectively. Caudal ramus $23 \times 27 \mu\text{m}$ (0.85 : 1).

Rostrum and antenna as in female. Antennule (Fig. 75C) 335 μm and 16-segmented; ninth, twelfth, and 3 terminal segments armed with 8 setae, 6 setae, 4 setae, 2 setae+aesthetasc, and 11 setae, respectively.

Maxilliped with small tubercle on inner distal area of first segment; second segment with blunt inner process (Fig. 75D). Other mouth organs as in female.

Legs 1-4 as in female. Free segment of leg 5 small and quadrate. Leg 6 represented by 1 large plumose and 1 small naked setae on genital flap (Fig. 75B).

Etymology. The specific name *angulatus* alludes to the angular or pointed posterolateral corners of anterior prosomal somites in the female.

Remarks. In two known species of *Asteropontius* the mandibular palp, including its distal seta, is markedly small, less than half length of the mandibular stylet, as in *A. angulatus* n. sp. They are *A. parvipalpus* Stock, 1975 and *A. ungelatus* Stock, 1975. These two species are easily distinguishable from *A. angulatus* by having a 19-segmented female antennule and the distal claw of antenna, which is shorter than the first endopodal segment.

The form of the prosome of *A. angulatus* is very characteristic: the posterolateral corners of the cephalothorax and second pedigerous somite are acutely pointed, and the third pedigerous somite is rectangular. With these features of the

prosoma, *A. angulatus* may be easily recognized without dissection. As additional diagnostic characteristics of the new species, the terminal claws of the antenna and maxilliped have a small cusp subapically, and the distal part of maxillary claw is strongly winded.

***Asteropontius latioriger* n. sp. (Figs. 76-78)**

Material examined. 23 ♀♀, 3 ♂♂ from the scleractinian coral *Fungia* cf. *scruposa* Klunzinger, at a depth of 3 m, Nosy N'Tangam, west of Nosy Bé, Madagascar, 24 June 1967, collected by A. G. Humes. Holotype (♀), allotype (♂), and paratypes (20 ♀♀, 1 ♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratype (2 ♀♀, 1 ♂) are retained in the collection of the author.

Other material examined. 50 ♀♀, 2 ♂♂ from a scleractinian coral (*Alveopora* sp.), at a depth of 3.5 m, Nosy N'Tangam, Madagascar, 23 October 1964, collected by A. G. Humes.

Female. Body (Fig. 76A) with ovoid prosoma. Mean body length 825 µm (801-833 µm), based on 10 specimens. Body length of dissected specimen 829 µm, and maximum width 429 µm. Prosoma 583 µm long. Cephalothorax 367 µm long, with angular posterolateral corners. Urosome (Fig. 76B) 4-segmented. Fifth pedigerous somite 148 µm wide. Genital double-somite 103 × 108 µm, gradually narrowed posteriorly, without setules on lateral margins; genital area located slightly anterior to midway of somite. Two free abdominal somites 37 × 67 and 50 × 60 µm, respectively. Anal somite and caudal rami with serrate posteroventral margin. Caudal ramus 23 × 29 µm (0.79 : 1).

Rostrum indistinct, tapering and posteriorly forming narrow ridge (Fig. 76C). Antennule (Fig. 76D) 19-segmented; first, ninth, and 2 terminal segments with 1 seta each, 7 setae, 2 setae+aesthetasc, and 13 setae; other segments with 2 setae each; first segment with smooth anterior margin. Antenna (Fig. 76E) with unornamented coxa; basis with fine spinules. Exopod very small and weak, about 6 × 2.5 µm, with 2 distal setae. Endopod 3-segmented; first segment 63 × 16 µm; second and third segments with 1 and 2 small setae each; terminal claw 50 µm, distinctly shorter than first segment.

Oral cone (Fig. 76F) very broad, its lateral margins parallel in proximal half and strongly tapering in distal half, with posterior apex forming 3 lobes. Mandibular stylet thick, 97 µm long, with denticles on broadened distal margin (Fig. 76G); palp fused with distal setae, 93 µm in total, with 1 small setule proximally. Maxillule (Fig. 76H) bilobed, inner lobe about 31 × 17 µm, tapering in distal third, with 1 small and 3 distinct setae (latters 50, 38, and 35 µm, respectively). Outer lobe 19 × 7 µm, with 1 small and 3 distinct setae (73, 50, and 32 µm, respectively). Maxilla (Fig. 77) slender, with

unornamented proximal segment and thin distal claw bearing tuft of setules in middle. Maxilliped (Fig. 77B) relatively stout and 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; second segment rather broad, 95 × 37 µm; terminal segment about 30 µm and claw 54 µm.

Legs 1-4 with 3-segmented rami and unicuspid outer distal process on second endopodal segment (Fig. 77C-F). Posterior margin of intercoxal plate of legs 1-4 naked, without spinules or setules. Outer spine on first exopodal segment of leg 1 (Fig. 77C) 33 µm long, reaching first outer spine on third segment. Terminal spine on third endopodal segment of leg 4 (Fig. 77F) 56 µm. Armature formula of legs 1-4 as follows:

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

Leg 5 consisting of dorsolateral seta on fifth pedigerous somite and free segment; free segment (Fig. 77G) stout, 40 × 23 µm (1.74 : 1), armed with 1 smooth seta (29 µm) on outer margin and 2 smooth distal setae (33 and 20 µm, respectively). Leg 6 represented by 2 unequal setae in genital area (Fig. 77H).

Male. Body (Fig. 78A) narrow. Body length of dissected specimen 574 µm, and maximum width 262 µm. Prosoma 394 µm long. Urosome (Fig. 78B) 5-segmented. Fifth pedigerous somite 100 µm wide. Genital somite 87 × 123 µm, wider than long, with rounded lateral margins bearing scales. Three abdominal somites 21 × 51, 17 × 48, and 28 × 44 µm, respectively. Caudal ramus 13 × 20 µm.

Rostrum and antenna as in female. Antennule 250 µm and 16-segmented; numbers of setae on first, ninth, twelfth, and three terminal segments: 1, 7, 4, 4, 3+aesthetasc, and 11; other segments with 2 setae each.

Maxilliped (Fig. 78D) with spear-like, spiniform inner setae on first segment; second segment with blunt proximal process on inner margin. Other mouth organs as in female.

Leg 1 (Fig. 78E) with heavily spinulated inner setae on all endopodal segments. Two inner setae on second endopodal segment of leg 2 (Fig. 78F) spiniform, stiff, with thick setules. Legs 3 and 4 as in female.

Free segment of leg 5 (Fig. 78G) small, 12 × 12 µm; its 3 setae naked and 21, 27, and 11 µm long from outer to inner. Leg 6 represented by 2 very unequal setae on genital flap (Fig. 78B).

Etymology. The specific name *latioriger* is a combination of the Latin words *latus* (broad)+*oris* (mouth)+*gero* (to carry). It alludes to the possession of a broad oral cone by the new

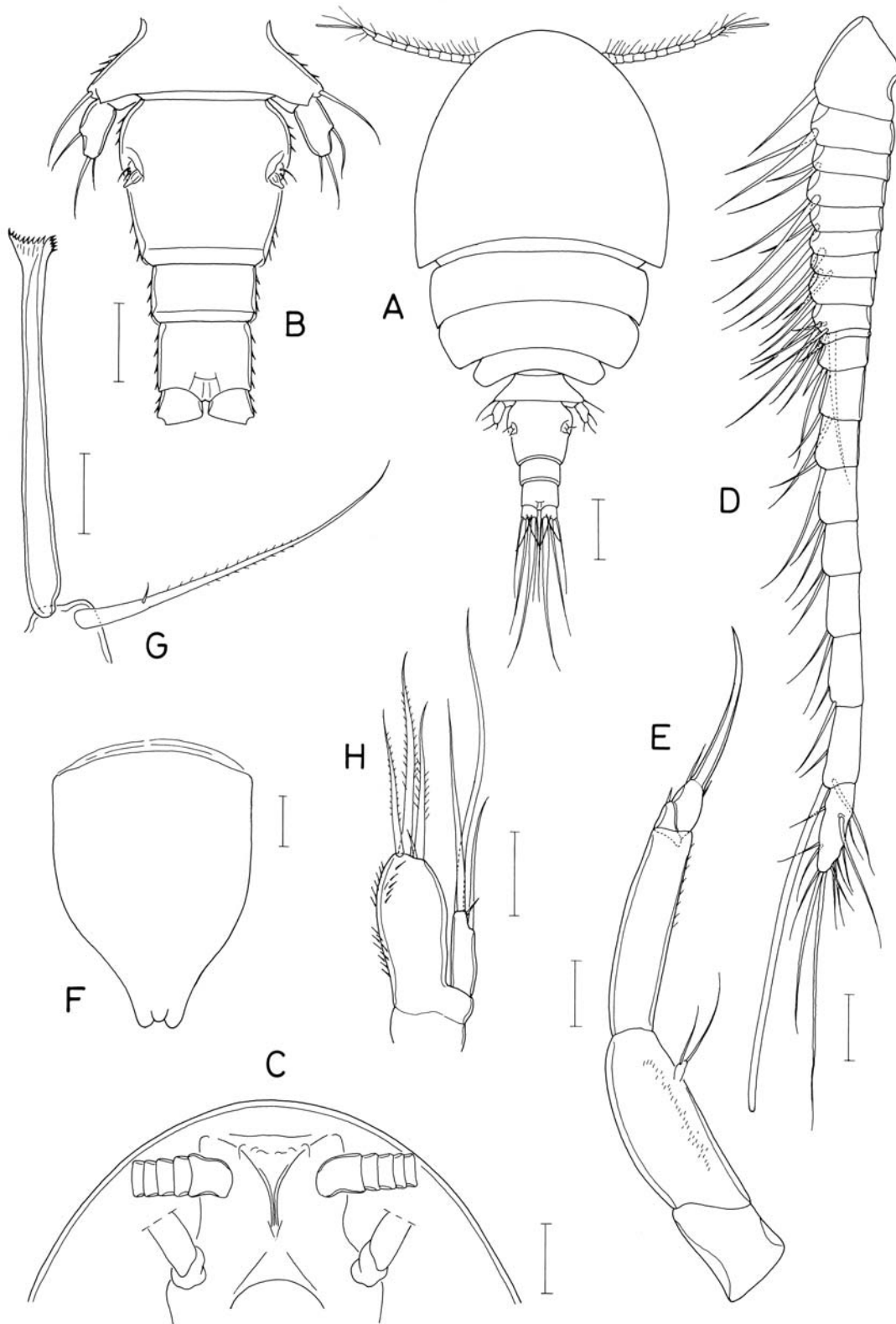


Fig. 76. *Asteropontius latioriger* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, rostral area, ventral; D, antennule; E, antenna; F, oral cone; G, mandible; H, maxillule. Scales: A, 0.1 mm; B, C, 0.05 mm; D-H, 0.02 mm.

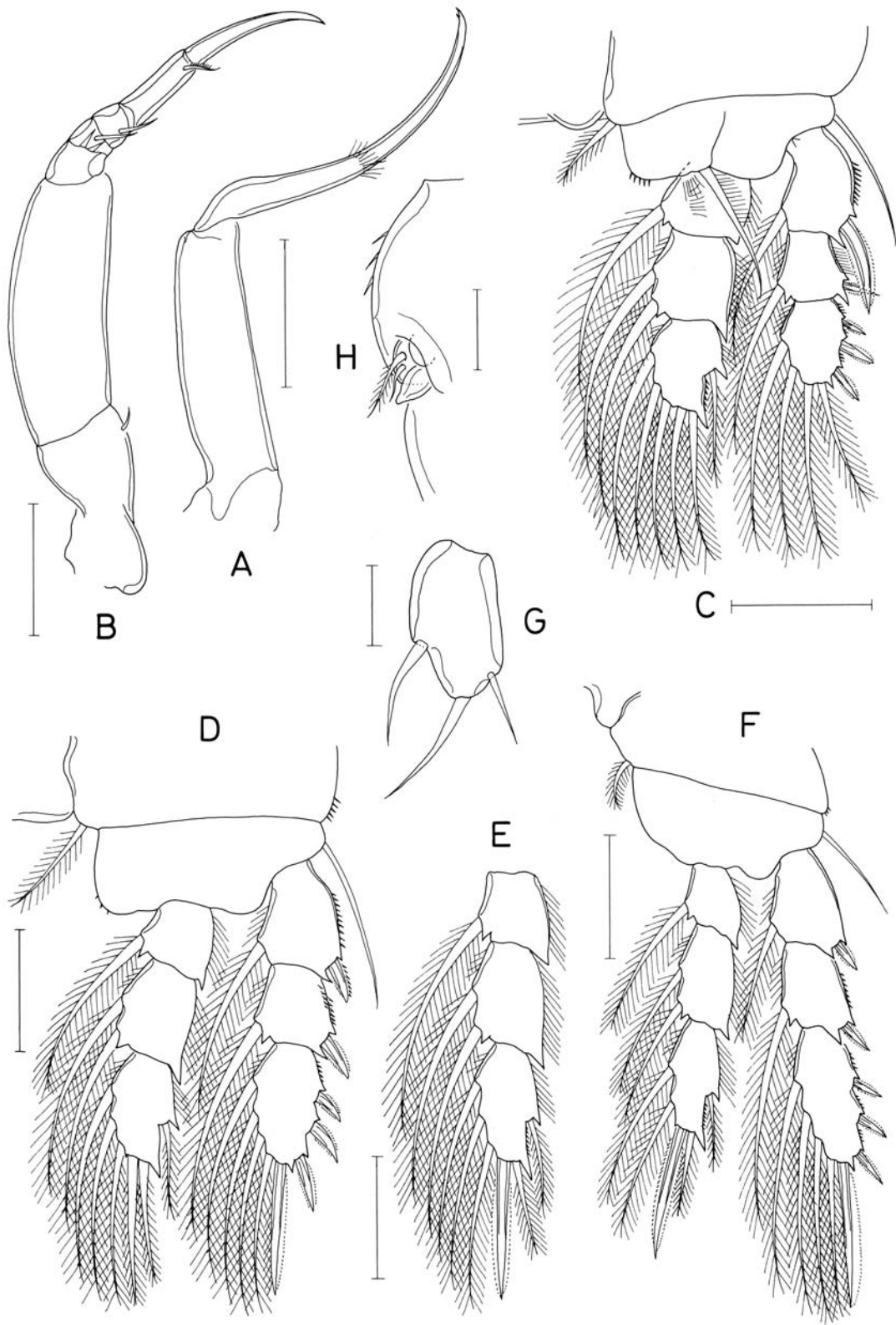


Fig. 77. *Asteropontius latioriger* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H left side of genital double-somite, dorsal. A-F, 0.05 mm; G, H, 0.02 mm.

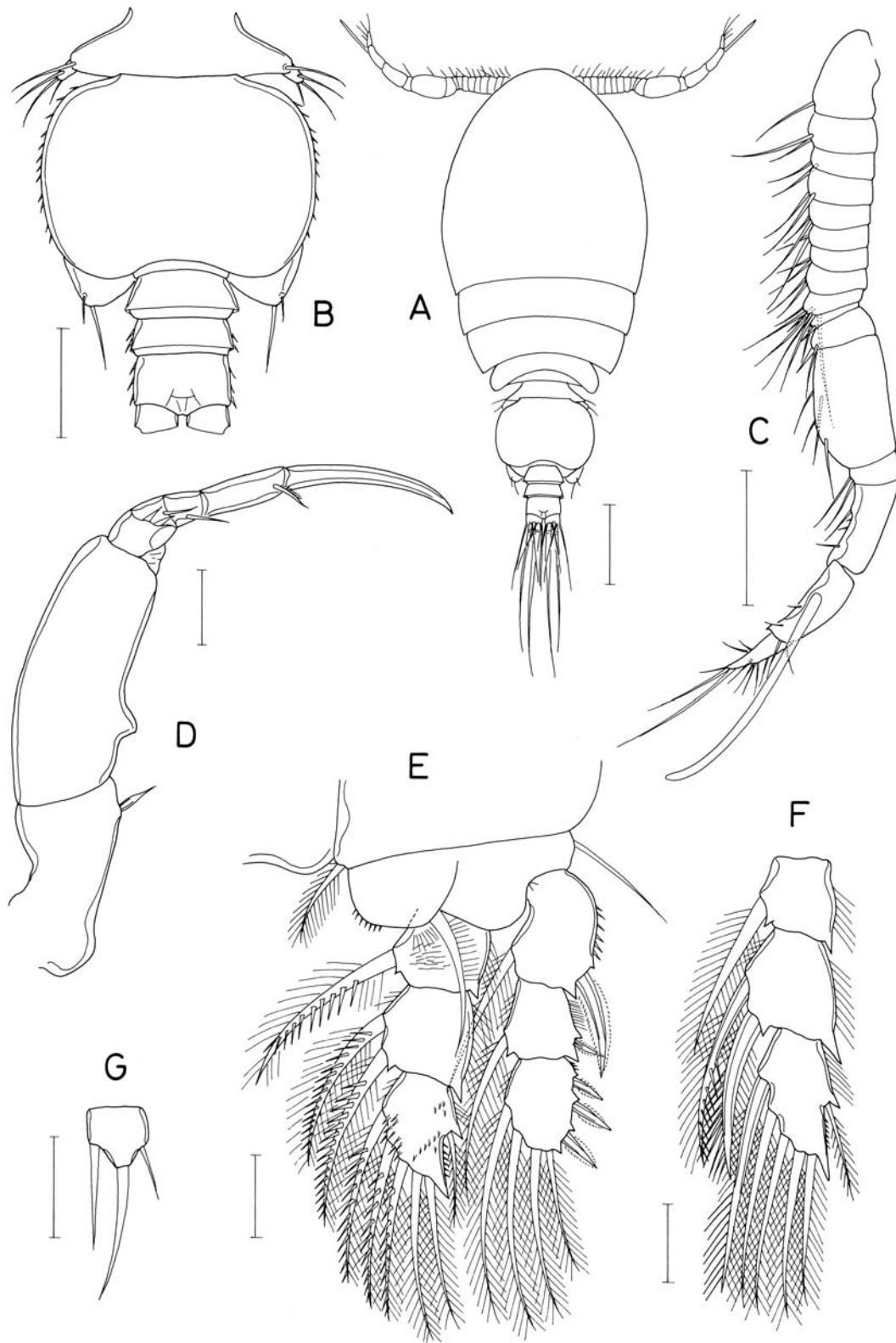


Fig. 78. *Asteropontius latioriger* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, maxilliped; E, leg 1; F, endopod of leg 2; G, free segment of leg 5. Scales: A, 0.1 mm; B, C, 0.05 mm; D-G, 0.02 mm.

species.

Remarks. *Asteropontius latioriger* n. sp. reveals the following conspicuous characters: (1) the female genital double-somite carries no setules or spinules on its lateral margins; (2) the first segment of antennule has only a single seta; (3) the exopod of antenna is very small, with only two distal setae; (4) the oral cone is very broad, with proximal half bearing parallel lateral margins and distal half strongly tapering; (5) the inner lobe of maxillule bears apically three distinct and one small setae; (6) the second endopodal segment of legs 1-4 has an unicuspid outer distal process; (7) one of three setae on the free segment of female leg 5 is located on the outer margin; (8) the first segment of male maxilliped bears spiniform inner seta; (9) the inner setae on the endopodal segments of male leg 1 are spiniform and heavily ornamented with spinules and setules; (10) the inner setae on the second endopodal segment of male leg 2 are spiniform. This combination of characters differentiates the new species from all congeners. Especially the characters (1), (4), and (7) may permit the new species to be identified without dissection.

***Asteropontius magnisetiger* n. sp. (Figs. 79-81)**

Material examined. 64 ♀♀, 8 ♂♂ from the scleractinian coral *Stylophora pistillata* (Esper), at a depth of 0.2 m, west of the sand isthmus between Ambariobe and Ambariotele, south of Nosy Be, Madagascar, 21 June 1963, collected by A. G. Humes. Holotype (♀), allotype (♂), and paratypes (61 ♀♀, 6 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 1 ♂) are retained in the collection of the author.

Other material examined. 25 ♀♀ from a scleractinian coral (*Stylophora* sp.), Pointe Antsamantsara, Nosy Bé, Madagascar, 9 June 1967, collected by A. G. Humes.

Female. Body (Fig. 79A) moderately broad. Mean body length 843 µm (820-866 µm), based on 10 specimens. Body length of dissected specimen 858 µm, and maximum width 438 µm. Prosome 563 µm long. Cephalothorax 367 µm long. Second to fourth pedigerous somites fringed with membrane on lateral margins. Urosome (Fig. 79B) 4-segmented. Fifth pedigerous somite 140 µm wide. Genital double-somite 117 × 113 µm, gradually narrowed posteriorly, with 4-6 setules on lateral margin posterior to genital area (Fig. 80H); genital area located slightly anterior to midway of somite. Two free abdominal somites 58 × 70 and 55 × 67 µm, respectively. Caudal ramus 28 × 31 µm (0.90:1), with about 5 scales on posteroventral margin and 6 setae.

Rostrum 129 × 88 µm, evenly tapering (Fig. 79C), with indistinct posterior apex. Antennule (Fig. 79D) 415 µm long and 20-segmented; all setae naked; numbers of setae on

ninth, eighteenth, and last segments 7, 2+aesthetasc, and about 10; other segments with 2 setae each; first segment with minute spinules on anterior margin, one of its 2 setae rudimentary and hardly visible. Antenna (Fig. 79E) with smooth coxa; basis 65 × 27 µm. Exopod knob-like, 5 × 5 µm, confluent with basis, with 3 setae. Endopod 3-segmented; first segment unarmed and 74 × 16 µm; second and third segments with 1 and 2 small distal setae each; terminal claw thin and 75 µm long.

Oral cone (Fig. 79F) strongly and evenly tapering, and terminated in 3 small lobes. Mandible (Fig. 79G) consisting of stylet and palp. Stylet 118 µm long, slightly expanded in middle, with denticles on broadened distal margin. Mandibular palp fused with larger distal seta, 124 µm long in total, with minute setule. Maxillule (Fig. 79H) bilobed. Inner lobe 50 × 18 µm and distally armed with 1 unilaterally plumose large seta (170 µm long), 3 medium-sized setae (83, 67, and 36 µm, respectively), and 1 minute seta. Outer lobe 21 × 7 µm, distally with 1 small setule and 3 naked setae (latters 77, 63, and 34 µm, respectively). Maxilla (Fig. 80A) slender, with unarmed proximal segment; distal claw elongated, distinctly longer than proximal segment, with tuft of setules near middle. Maxilliped (Fig. 87B) 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; second segment 108 × 34 µm; terminal claw 78 µm.

Legs 1-4 with 3-segmented rami and unicuspid outer distal process of second endopodal segment (Fig. 80C-F). Outer spine on first exopodal segment of leg 1 (Fig. 80C) 35 µm. Terminal spine on third endopodal segment of leg 4 (Fig. 80F) 61 µm. Armature formula of legs 1-4 as in preceding species.

Leg 5 consisting of dorsolateral plumose seta on fifth pedigerous somite and free segment; free segment small, 36 × 18 µm (2.0:1), distally with 2 large (68 and 63 µm, respectively) and 1 small (28 µm) setae. Leg 6 represented by 1 plumose seta and 1 minute spinule in genital area (Fig. 80H).

Male. Body (Fig. 81A) narrower than that of female. Body length of dissected specimen 544 µm, and maximum width 258 µm. Prosome 361 µm long. Urosome (Fig. 81C) 5-segmented. Fifth pedigerous somite 80 µm wide. Genital somite nearly quadrangular, 54 × 81 µm, with scales on lateral margins. Three abdominal somites 31 × 56, 29 × 51, and 29 × 49 µm, respectively. Caudal ramus 18 × 21 µm.

Rostrum and antenna as in female. Antennule (Fig. 81B) 257 µm long and 16-segmented; numbers of setae on first, ninth, twelfth, and 2 distal segments: 1, 7, 6, 2+aesthetasc, and 10; other segments with 2 setae each.

Maxilliped (Fig. 81D) with blunt inner process on second segment. Other mouth organs as in female.

Legs 1-4 as in female. Free segment of leg 5 very small, 13 × 10 µm. Leg 6 represented by 2 very unequal setae on genital flap (Fig. 81C).

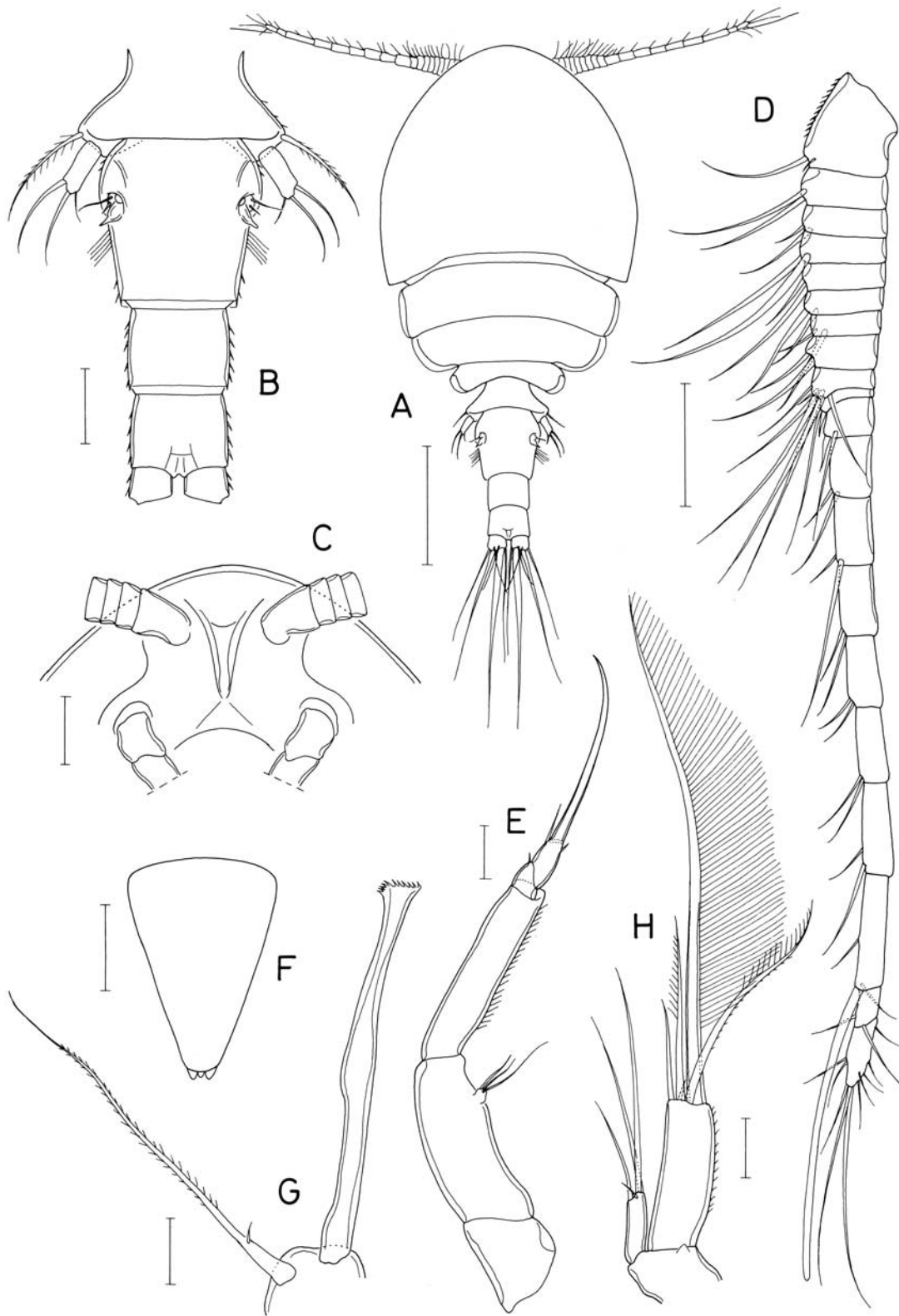


Fig. 79. *Asteropontius magnisetiger* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, rostral area, ventral; D, antennule; E, antenna; F, oral cone; G, mandible; H, maxillule. Scales: A, 0.2 mm; B-D, F, 0.05 mm; E, G, H, 0.02 mm.

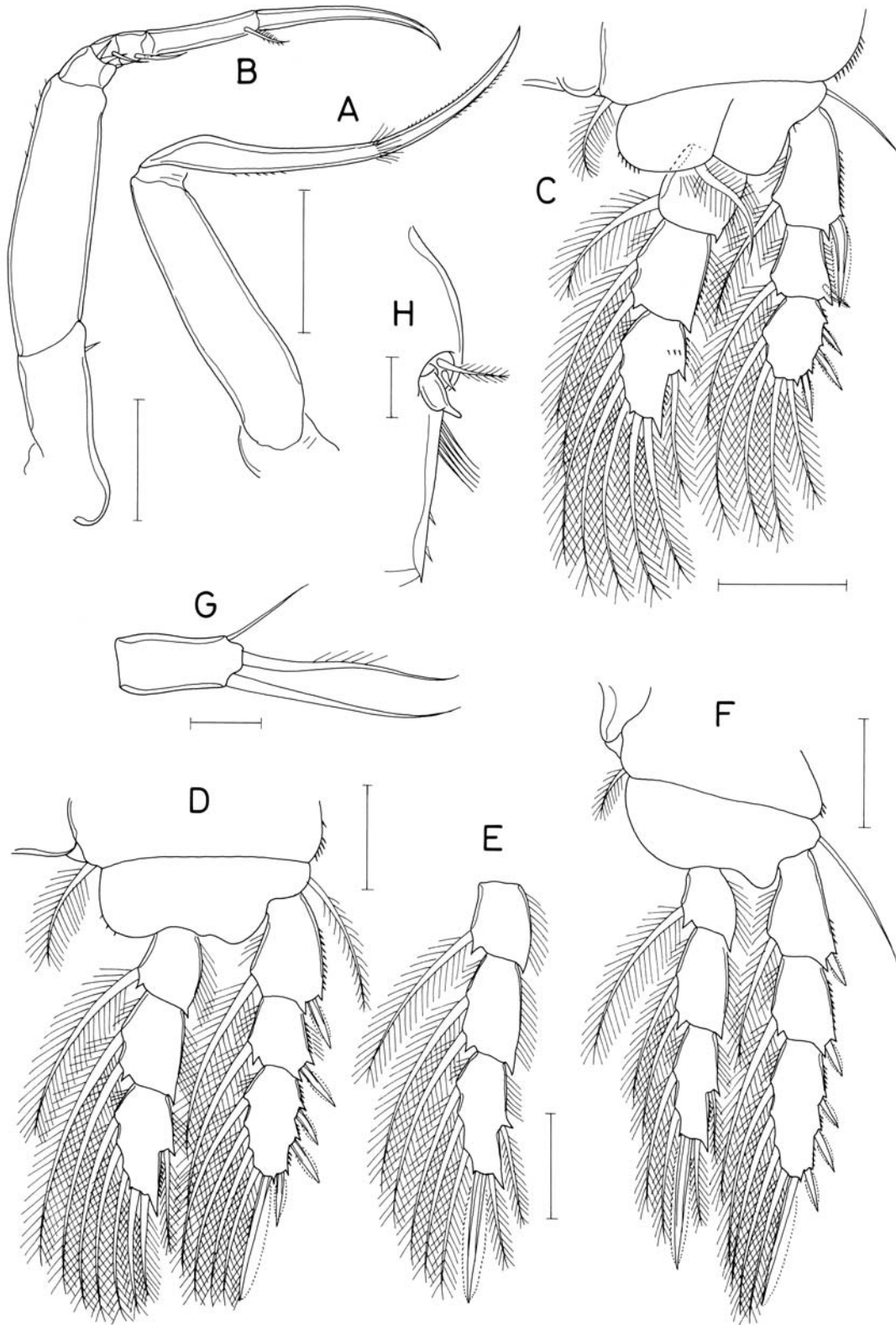


Fig. 80. *Asteropontius magnisetiger* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, right side of genital double-somite, dorsal. Scales: A-F, 0.05 mm; G, H, 0.02 mm.

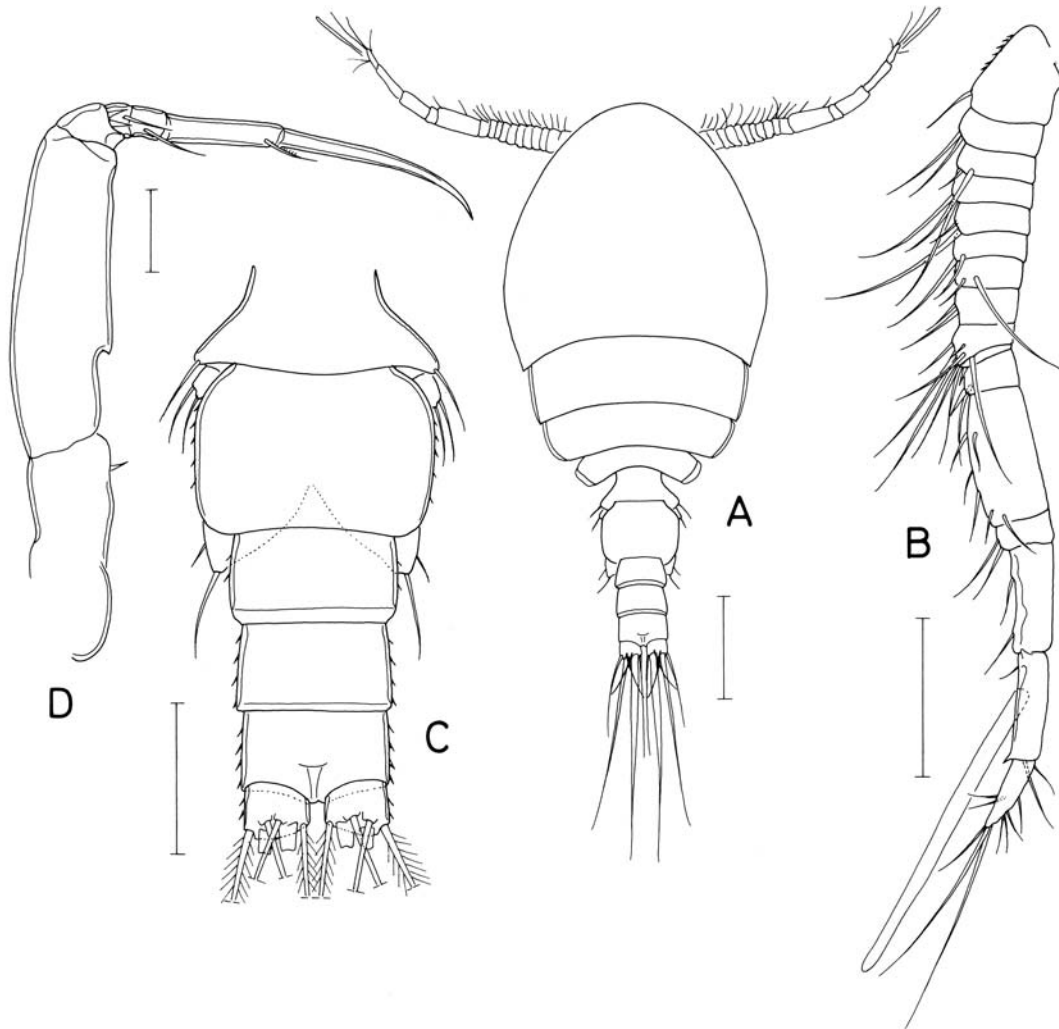


Fig. 81. *Asteropontius magnisetiger* n. sp., male. A, habitus, dorsal; B, antennule; C, urosome, dorsal; D, maxilliped. Scales: A, 0.1 mm; B, C, 0.05 mm; D, 0.02 mm.

Etymology. The specific name *magnisetiger* is the combination of the Latin words *magnis* (large)+*saeta* (seta)+*gero* (to carry). It alludes to the possession of a large seta on the inner lobe of maxillule.

Remarks. This species can be differentiated from all congeners by a single outstanding character, i.e., one of setae on the inner lobe of maxillule is greatly enlarged and unilaterally plumose with long setules. This form of maxillule has not been reported yet in *Asteropontius*. As other important characters, the female genital double-somite has 4-6 setules at its lateral margins, the exopod of antenna is rudimentary, and the mandibular palp (plus its distal seta) is slightly longer than the stylet.

Asteropontius pinnatus n. sp. (Figs. 82-84)

Material examined. 33 ♀♀, 18 ♂♂ from a scleractinian coral of the genus *Acropora* (probably *A. falifera*), at a depth of 2 m, Nosy Komba, Madagascar, 4 June, 1967, collected by A. G. Humes. Holotype (♀), allotype (♂), and paratypes (30 ♀♀, 15 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 2 ♂♂) are retained in the collection of the author.

Other material examined. 14 ♀♀, 3 ♂♂ from the scleractinian coral *Acropora hemprichi* (Ehrenberg), at a depth of 2.4 m, Pointe Lokobe, Nosy Bé, Madagascar, 2 September 1960, collected by A. G. Humes.

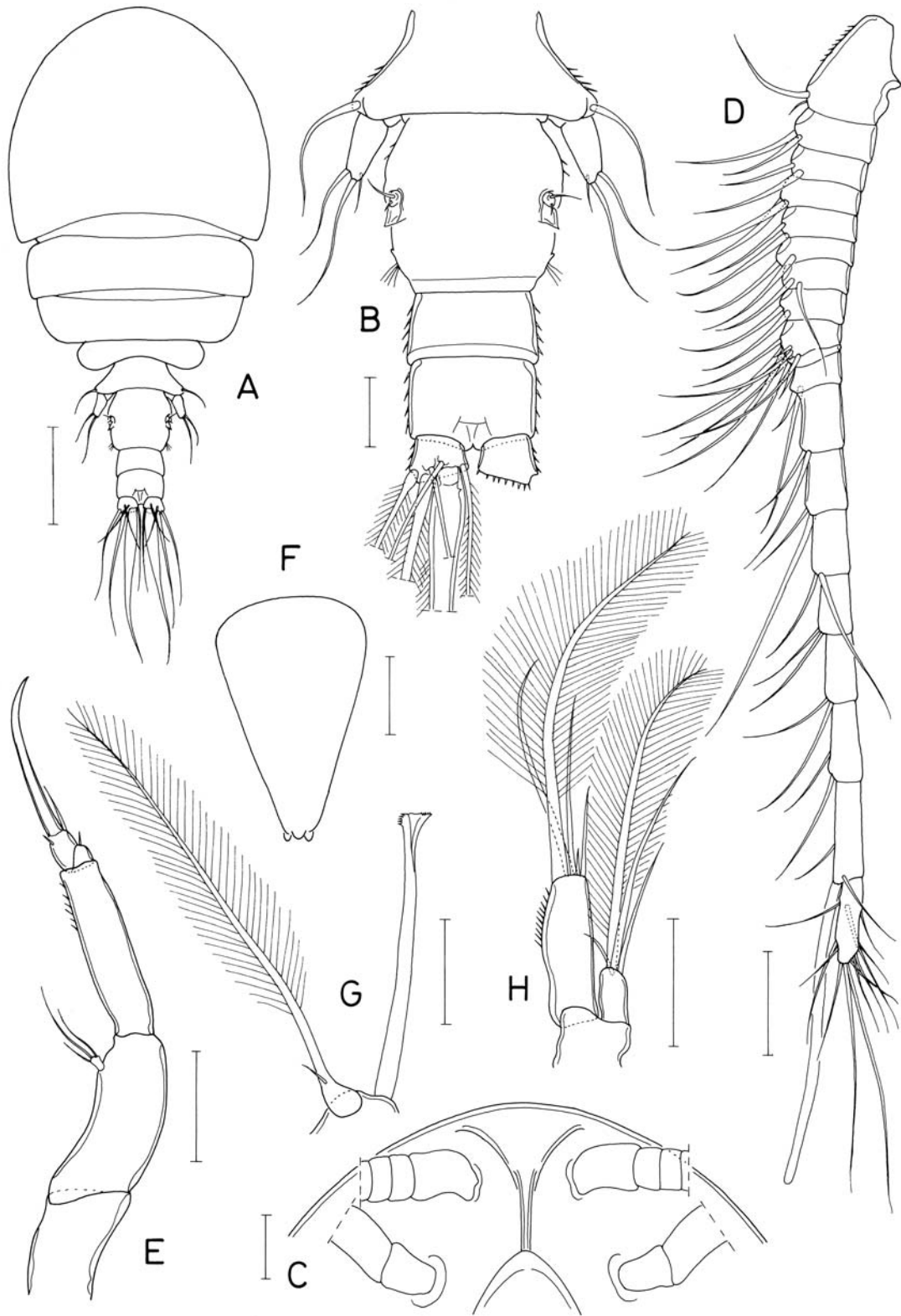


Fig. 82. *Asteropontius pinnatus* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, rostral area, ventral; D, antennule; E, antenna; F, oral cone; G, mandible; H, maxillule. A, 0.2 mm; B-H, 0.05 mm.

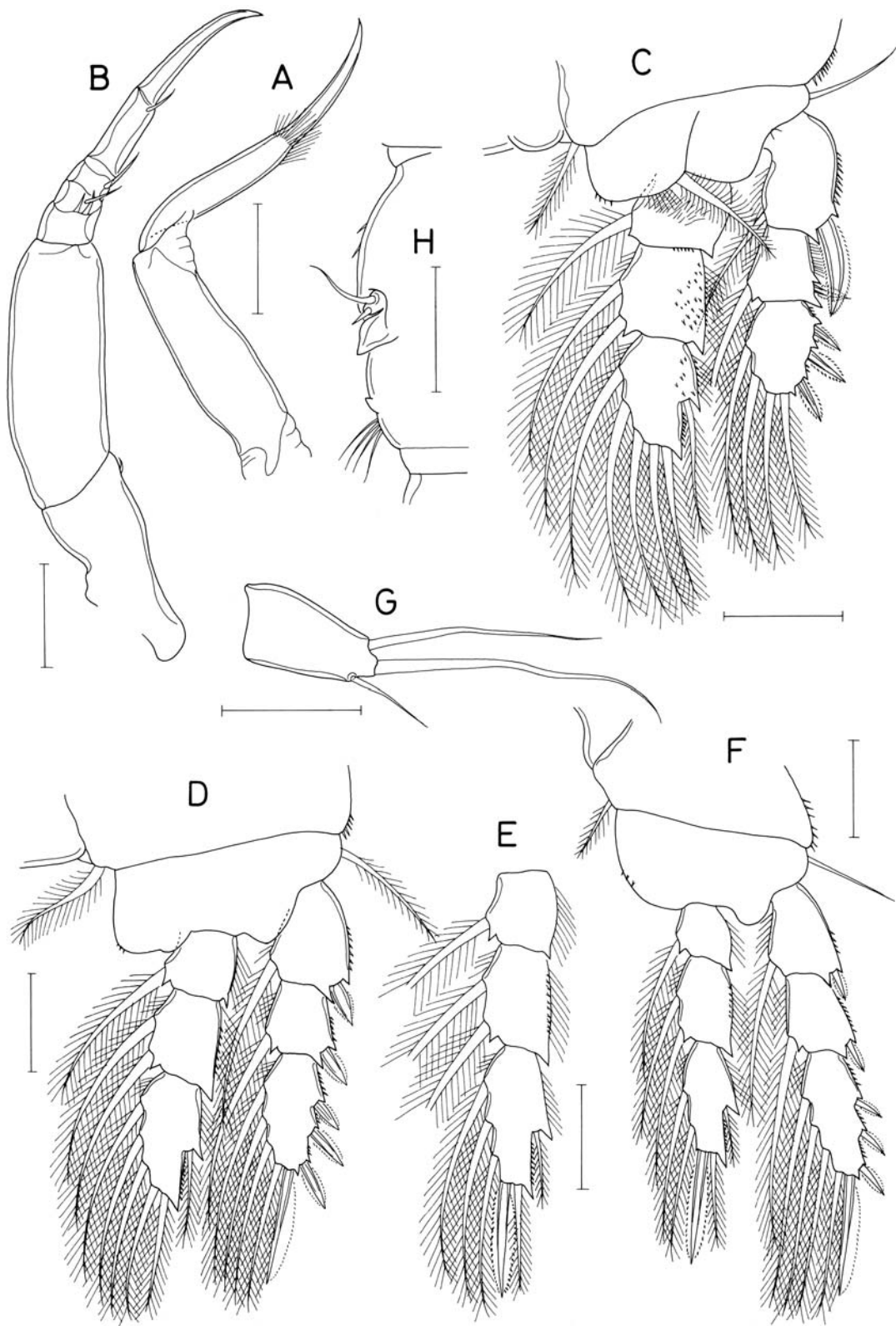


Fig. 83. *Asteropontius pinnatus* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, left side of genital double-somite, dorsal. Scales: 0.05 mm for all.

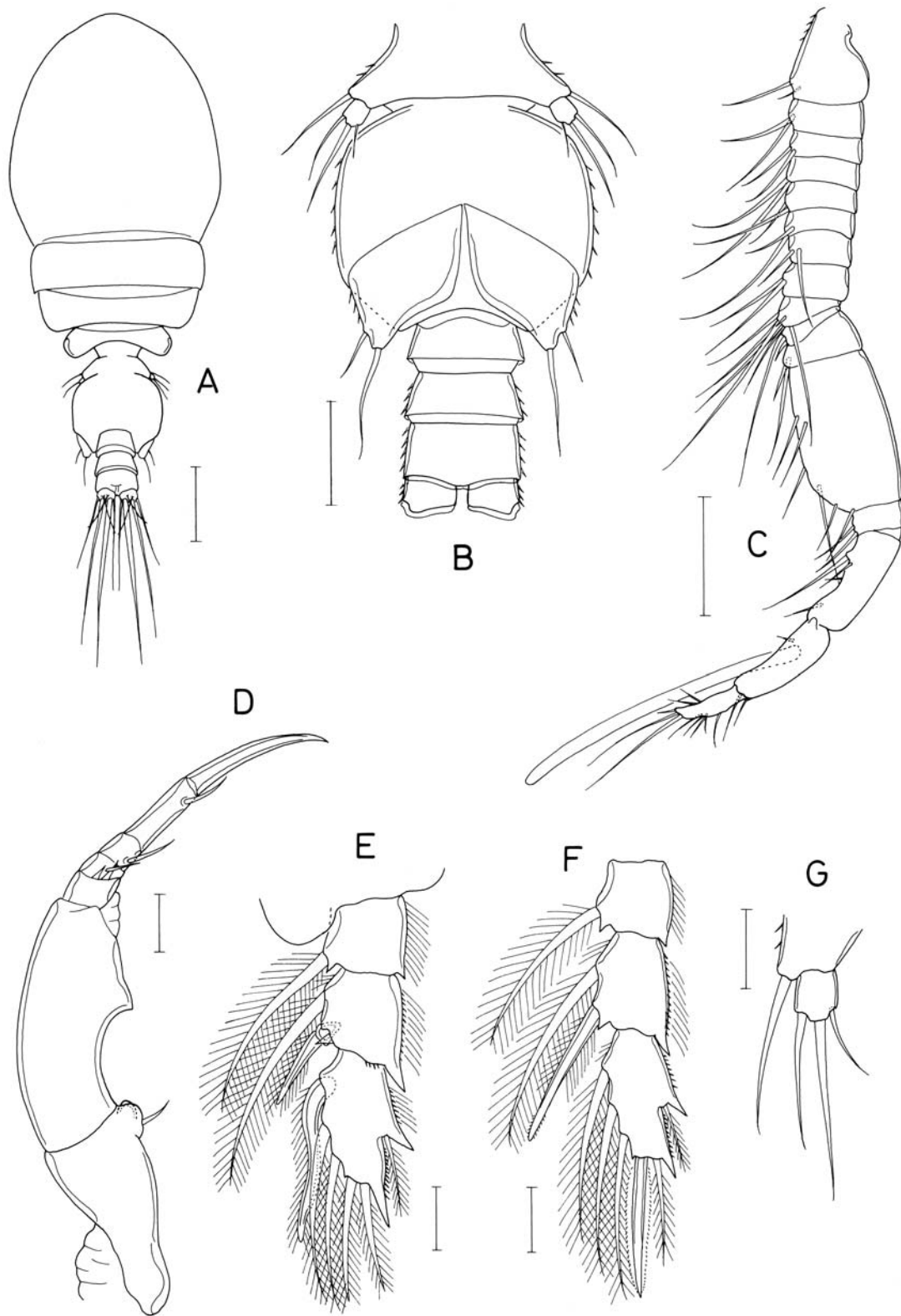


Fig. 84. *Asteropontius pinnatus* n. sp., male. A, habitus, dorsal; B, urosome, ventral; C, antennule; D, maxilliped; E, endopod of leg 2; F, endopod of leg 3; G, leg 5. Scales: A, 0.1 mm; B, C, 0.05 mm; D-G, 0.02 mm.

Female. Body (Fig. 82A) stout, with broad prosome. Body length of dissected specimen 1.05 mm, and maximum width 538 μm . Prosome 729 μm long. Cephalothorax 458 μm long. Urosome (Fig. 82B) 4-segmented. Fifth pedigerous somite 178 μm wide. Genital double-somite as long as wide, 128 \times 128 μm , nearly octagonal, with small, anterolaterally directed process and 4 or 5 setules on posterior part of lateral margin (Fig. 83H). Two free abdominal somites 46 \times 95 and 66 \times 93 μm , respectively. Caudal ramus 39 \times 44 μm (0.89 : 1) with 6 setae and scales (or spinules) on oblique posteroventral margin; inner median terminal seta greatly expanded. Egg sac about 354 \times 221 μm , each egg 140 μm in diameter.

Rostrum tapering in anterior half and forming narrow ridge in posterior half (Fig. 82C). Antennule (Fig. 82D) 457 μm long and 19-segmented; segments with 2 setae each, except for 7 setae on ninth, 2 setae+aesthetasc on penultimate, and 12 setae on last segments; first segment with fine spinules on anterior margin, one of its 2 setae very small; all setae naked. Antenna (Fig. 82E) with smooth coxa; basis relatively short and broad, 73 \times 32 μm . Exopod small, 7 \times 4 μm , with 3 obscure setae. Endopod much narrower than coxa and basis, 81 \times 21 μm ; 2 distal segments with 1 and 2 small setae each; terminal claw 74 μm long and thin.

Oral cone evenly and strongly tapering, 158 \times 96 μm , and extending slightly before insertions of maxillipeds. Mandible (Fig. 82G) consisting of stylet and palp. Stylet 139 μm long and distally broadened. Palp fused with large, heavily plumose distal seta, 231 μm long in total, much longer than stylet, with 1 small setule. Maxillule (Fig. 82H) bilobed. Inner lobe 59 \times 20 μm , distally with 1 large, heavily plumose seta (157 μm) and 4 naked smaller setae (latters 91, 71, 36, and 11 μm , respectively). Outer lobe 21 \times 11 μm , distally with 1 large, heavily plumose seta (127 μm) and 3 smaller naked setae (91, 55, and 22 μm , respectively). Maxilla (Fig. 83A) with unornamented proximal segment; distal claw narrowed in distal half, with tuft of setules near middle. Maxilliped (Fig. 83B) 6-segmented; first segment with minute, curved inner distal seta; second segment broad, 119 \times 47 μm ; third to sixth segments relatively stout, armed with 2, 1, 1, and 1 setae, respectively; terminal claw 70 μm long, relatively short.

Legs 1-4 with 3-segmented rami and unicuspid outer distal process of second endopodal segment (Fig. 83C-F). Outer spine on first exopodal segment of leg 1 (Fig. 83C) 41 μm . Terminal spine on third endopodal segment of leg 4 (Fig. 83F) 59 μm . Outer distal corner of coxa of legs 1-4 with several minute spinules. Armature formula of legs 1-4 as follows:

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

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

enp. 0-1; 0-2; 1,2,3

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

enp. 0-1; 0-2; 1,1+I,3

Leg 4: coxa 0-1; basis 1-0; exp. I-1; I-1; III,I,4;

enp. 0-1; 0-2; 1,I+1,2

Leg 5 consisting of large but naked dorsolateral seta on fifth pedigerous somite and free segment (Fig. 82B). Free segment (Fig. 83G) 53 \times 28 μm , tapering, with 3 naked setae (85, 108, and 34 μm from outer to inner). Leg 6 represented by 1 naked seta and 1 spinules in genital area (Fig. 83H).

Male. Body (Fig. 84A) narrower than that of female. Body length of dissected specimen 676 μm , and maximum width 291 μm . Prosome 474 μm long. Cephalothorax 312 μm long, slightly longer than wide. Urosome (Fig. 84B) 5-segmented. Fifth pedigerous somite 108 μm wide. Genital somite 103 \times 124 μm , with scales (or spinules) on lateral margins. Three abdominal somites 28 \times 56, 23 \times 57, and 30 \times 57 μm , respectively. Caudal ramus 18 \times 26 μm , fringed with membrane along posteroventral margin.

Rostrum and antenna as in female. Antennule 335 μm long and 16-segmented; numbers of setae on ninth, twelfth, and 3 distal segments armed with 8, 6, 4, 2+aesthetasc, and 10, respectively; other segments with 2 setae each.

Maxilliped (Fig. 84D) with 1 small and 1 larger tubercle (larger tubercle tipped by 1 seta) on inner distal corner of first segment; second segment with broad process on inner margin. Other mouth organs as in female.

Leg 1 as in female. Leg 2 with sexually dimorphic endopod (Fig. 84E): distal inner seta on second segment spiniform and shortened; proximal seta on third segment also spiniform and distinctly twisted. Distal inner seta on second endopodal segment of leg 3 spiniform and blunt (Fig. 84F).

Leg 5 (Fig. 84G) with small free segment (13 \times 11 μm), its largest distal seta 45 μm long. Leg 6 represented by 2 naked unequal setae on genital flap (Fig. 84B).

Etymology. The specific name *pinnatus* has the Latin meaning "feathered". It alludes to feather-like setae on the maxillule and mandibular palp of the new species.

Remarks. This species has three outstanding characters, each of which alone may differentiate it from all congeners: (1) one of the setae on the inner and outer lobes of the maxillule is enlarged and heavily plumose; (2) the distal seta of the mandibular palp is enlarged and heavily plumose; (3) the female genital double-somite bears a cusp-like process on the posterior area of lateral margin. The peculiarities of the sexual dimorphisms on legs 2 and 3 and of the maxilliped may confirm the identity of this species.

Asteropontius trifilis n. sp. (Figs. 85-87)

Material examined. 23 ♀♀, 5 ♂♂ from the scleractinian

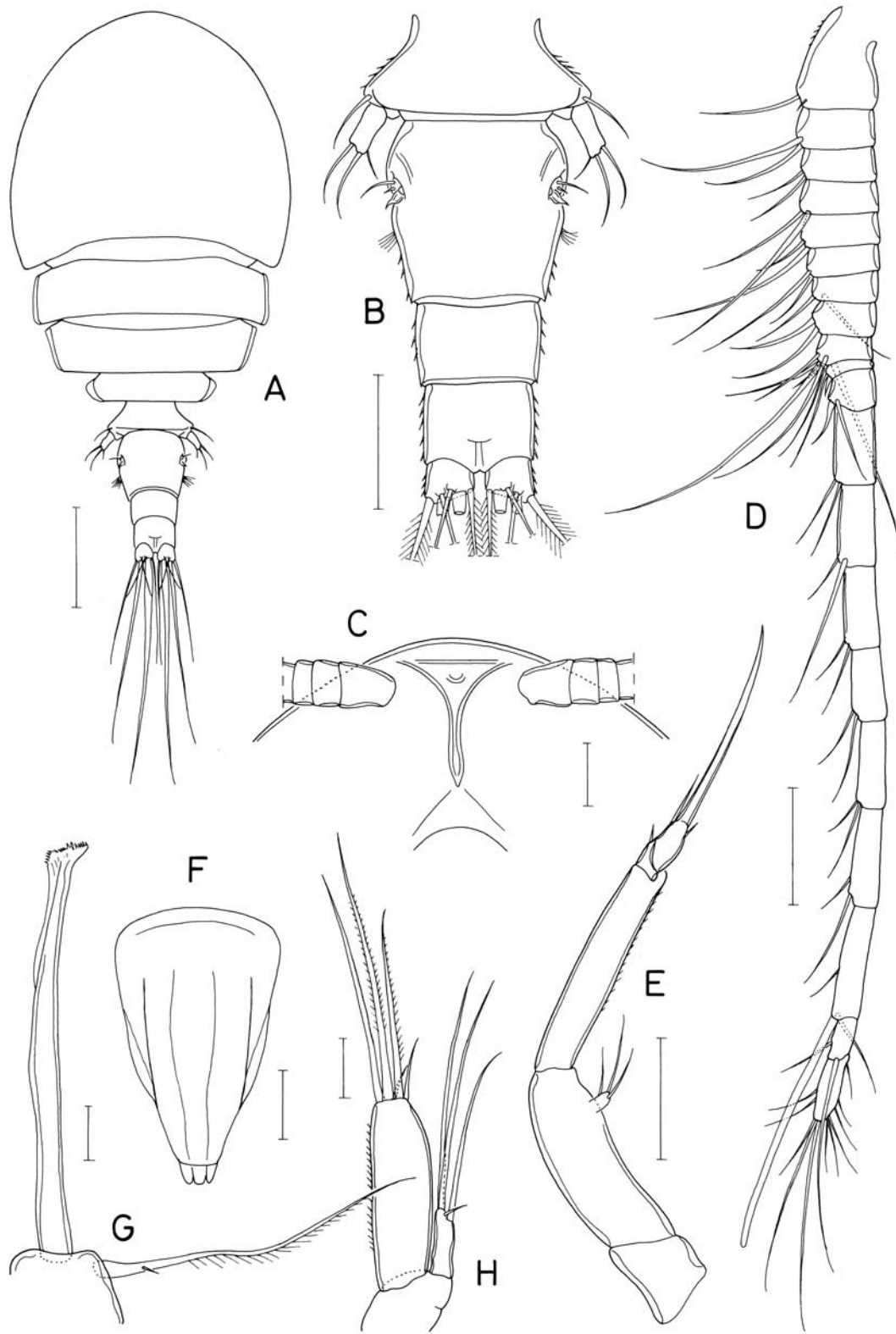


Fig. 85. *Asteropontius trifilis* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, rostral area, ventral; D, antennule; E, antenna; F, oral cone; G, mandible; H, maxillule. Scales: A, 0.2 mm; B, 0.1 mm; C-F, 0.05 mm; G, H, 0.02 mm.

coral *Merulina ampliata* (Ellis & Sollander), at a depth of 2 m, Pointe de Tafondro, Nosy Bé, Madagascar, 17 October 1963, collected by A. G. Humes. Holotype (♀), allotype (♂), and paratypes (20♀ ♀, 3♂ ♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2♀ ♀, 1♂) are retained in the collection of the author.

Female. Body (Fig. 85A) moderately broad. Mean body length 1.07 mm (1.03-1.12 mm), based on 10 specimens. Body length of dissected specimen 1.10 mm, and maximum width 560 µm. Prosome 780 µm long. Second to fourth pedigerous somites fringed with membrane along lateral margins. Urosome (Fig. 85B) 4-segmented. Fifth pedigerous somite 167 µm wide. Genital double-somite 135 × 133 µm, gradually narrowing posteriorly, with tuft of about 7 setules on lateral margin posterior to genital area (Fig. 86H); genital area located anterior to midway of somite. Two free abdominal somites 60 × 94 and 63 × 83 µm, respectively. Caudal ramus 34 × 36 µm (0.94 : 1), with 6 setae.

Rostrum tapering in anterior part and forming narrow ridge posteriorly (Fig. 85C). Antennule (Fig. 85D) 20-segmented; ninth, eighteenth, and last segments armed with 7 setae, 2 setae+aesthetasc, and 11 setae, respectively; first segment with minute spinules on anterior margin, one of 2 setae on this segment rudimentary and hardly visible; all setae naked. Antenna (Fig. 85E) slender, with smooth coxa; basis 80 × 29 µm and unornamented. Exopod 9 × 5 µm, not demarcated from basis, with 2 distal and 1 lateral setae. Endopod 3-segmented, with armature formula 0, 1, and 2+claw; first segment 94 × 18 µm; terminal claw thin and 88 µm long.

Oral (Fig. 85F) cone 202 × 117 µm, tapering, reaching posterior part of maxillipedal insertions, terminating in 3 lobes at apex. Mandible (Fig. 85G) consisting of stylet and palp. Stylet 158 µm long, with denticles on expanded distal margin. Palp fused with long distal seta, 125 µm long in total, with minute proximal setule. Maxillule (Fig. 85H) bilobed. Inner lobe 62 × 20 µm, distally armed with 3 larger setae (78, 91, and 63 µm from inner to outer) and 2 small setae (21 and 31 µm, respectively). Outer lobe 22 × 8 µm, distally with 3 large setae (81, 79, and 60 µm, respectively) and 1 minute seta. Maxilla (Fig. 86A) with smooth proximal segment; distal claw elongate and thin, with tuft of setules near middle. Maxilliped (Fig. 86B) 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; second segment 125 × 36 µm; terminal claw thin, 84 µm, about 1.7 times as long as terminal segment.

Legs 1-4 with 3-segmented rami and unicuspid outer distal process on second endopodal segment (Fig. 86C-F). Outer seta on basis of legs 1-4 large but naked. Outer spine on first exopodal segment of leg 1 (Fig. 86C) 44 µm long. Armature formula of legs 1-4 as in preceding species.

Leg 5 consisting of naked dorsolateral seta on fifth pedigerous somite and free segment; free segment small, unornamented, 39 × 20 µm (1.95 : 1), and armed with 2 weakly plumose distal setae (62 and 71 µm long, respectively) and 1 smaller subdistal seta (24 µm long). Leg 6 represented by 1 plumose seta and 1 small spinule in genital area (Fig. 86H).

Male. Body (Fig. 87A) narrower than that of female. Mean body length 623 µm (610-640 µm) based on 5 specimens. Body length of dissected specimen 640 µm, and maximum width 280 µm. Prosome 437 µm long. Urosome (Fig. 87B) 5-segmented. Fifth pedigerous somite 86 µm wide. Genital somite 86 × 67 µm, with parallel lateral margins bearing scales. Three abdominal somites 31 × 56, 27 × 53, and 34 × 52 µm, respectively. Caudal ramus 20 × 22 µm (0.91 : 1).

Rostrum and antenna as in female. Antennule (Fig. 87C) 308 µm and 16-segmented; numbers of setae on first, ninth, twelfth, and 3 distal segments: 1, 7, 6, 4, 2+aesthetasc, and 11.

Maxilliped with small process on inner margin of second segment (Fig. 87D). Other mouth organs as in female.

Leg 5 with small free segment (Fig. 87E) of 11 × 11 µm; its 3 distal setae smooth, 31, 37, and 18 µm from outer to inner. Leg 6 represented by 1 plumose and 1 smaller naked setae on genital flap.

Etymology. The specific name *trifilis*, with the Latin meaning "having three hairs", alludes to the presence of three larger setae (in addition to two smaller ones) on the inner lobe of the maxillule.

Remarks. *Asteropontius trifilis* n. sp. shows the following combination of characters: (1) the third exopodal segment of leg 1 is armed with three spines and four setae (armature formula III,2,2); (2) the third endopodal segment of leg 2 is armed with six setae (formula 1,2,3); (3) the second endopodal segment of legs 1-4 bears an unicuspid outer distal process; (4) none of setae on the inner and outer lobes of maxillule is enlarged or heavily plumose. Eight species of *Asteropontius* share the above combination of characters: *A. capillatus* described in this paper; *A. elizabethae* Johnsson, 1999; *A. laccadivensis* Nair and Pillai, 1984; *A. latioriger* described in this paper; *A. longipalpus* Stock, 1975; *A. mycetophylliae* Varela, Ortiz and Lalana, 2005; *A. proximus* Stock, 1987; and *A. ungelatus* Stock, 1975.

Of these, *A. laccadivensis* has six setae (formula 1,2,3; rather than 1, 1+I,3) on the third endopodal segment of leg 3 (Nair and Pillai, 1984), and *A. capillatus* and *A. ungelatus* have the mandibular palp (including its larger distal seta) which is longer than the stylet (in the former species) or shorter than half length of the stylet (in the latter), therefore, they differ from the new species. The remaining five species can be differentiated from the new species by their following features.

In *A. elizabethae* the female genital double-somite bears

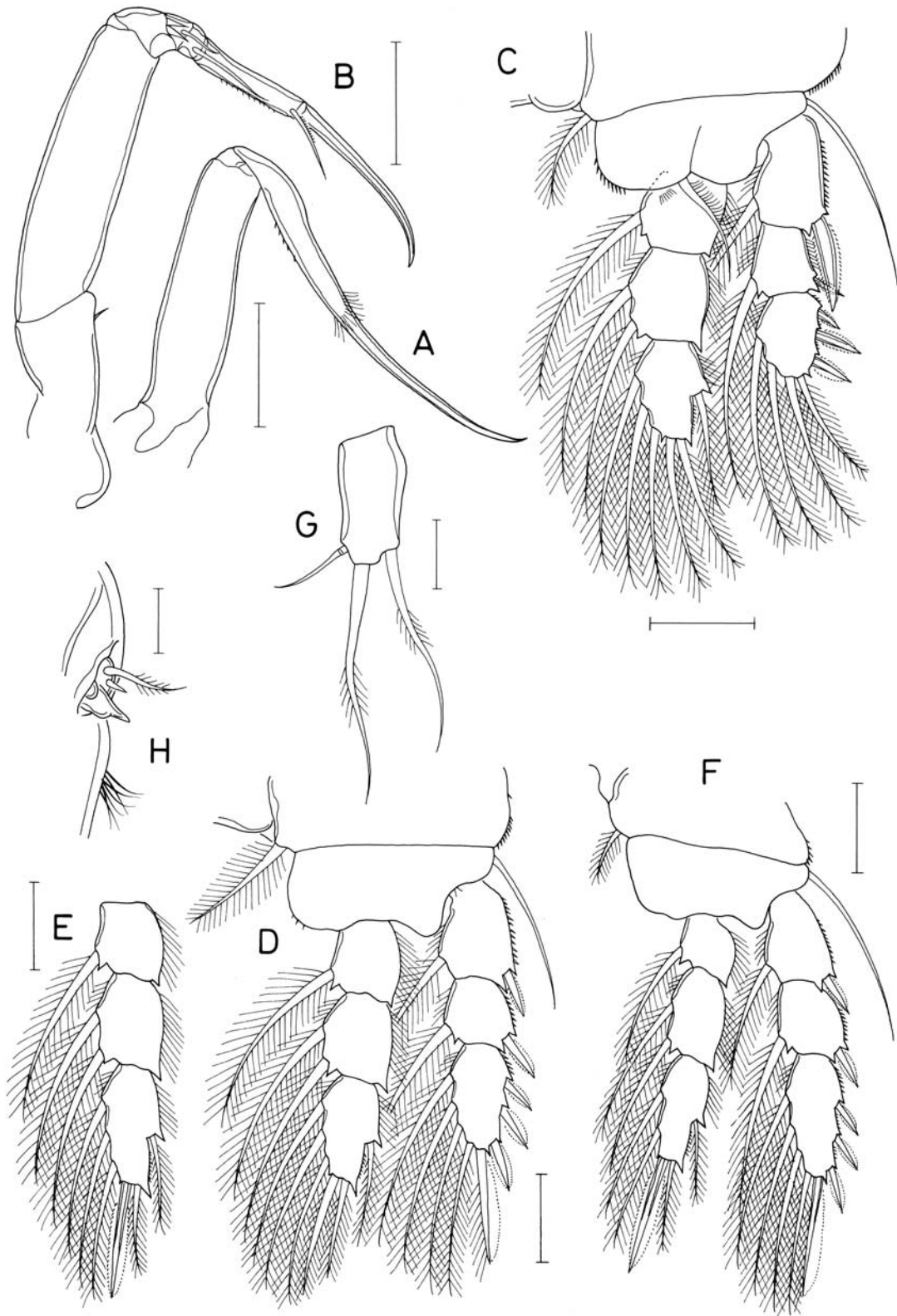


Fig. 86. *Asteropontius trifilis* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, right genital area. Scales: A-F, 0.05 mm; G, H, 0.02 mm.

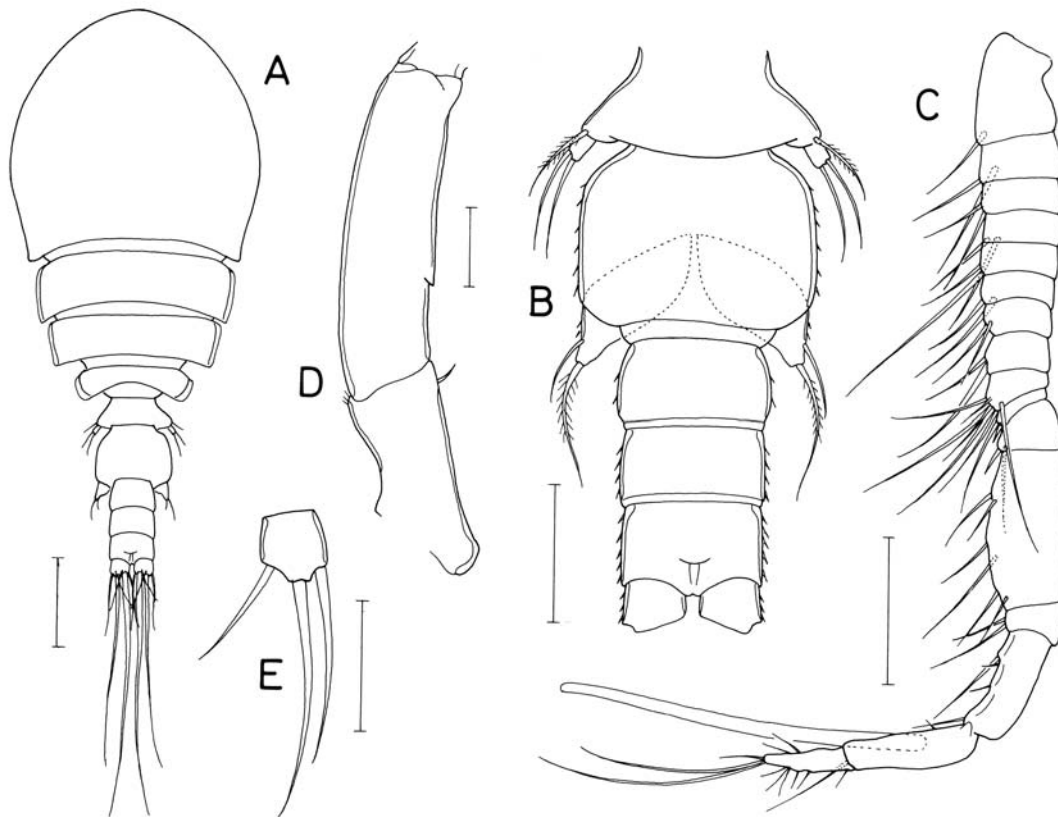


Fig. 87. *Asteropontius trifilis* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, proximal segments of maxilliped; E, free segment of leg 5. Scales: A, 0.1 mm; B, C, 0.05 mm; D, E, 0.02 mm.

more than 10 setules on the lateral margin, as illustrated by Johnsson (1999b); the antennule carries two similar setae on the first segment; the exopod of antenna is relatively large, longer than width of the basis, as illustrated.

In *A. latioriger*, the female genital double-somite is unornamented (without setules or spinules) on the lateral margins; the female antennule is 19-segmented; the inner lobe of maxillule is armed with four distal setae; and legs 1 and 2 display distinct sexual dimorphisms.

In *A. longipalpus* the female genital double-somite has numerous setules on the lateral margins, as Stock (1975) illustrated; and the free segment of female leg 5 is elliptical and $87 \times 38 \mu\text{m}$.

In *A. mycetophylliae* the female genital double-somite is longer than wide, with more than 10 setules on the lateral margin (see illustrations of Varela, Ortiz and Lalana, 2005); and the antennule has two distinct setae on the first segment.

In *A. proximus* the female genital double-somite has more than 10 setules on the lateral margin, as illustrated by Stock (1987); the outer lobe of maxillule has only two distal setae; and the female antennule is 19-segmented.

Asteropontius goniopora Kim, 2007

Material examined. 39 ♀♀, 24 ♂♂ from a scleractinian coral (*Goniopora* sp.), at a depth of 2 m, Ampombilava, Nosy Bé, Madagascar. 5 June 1967, collected by A. G. Humes.

Remarks. *Asteropontius goniopora* was described based on specimens associated with *Goniopora tenuidens* (Quelch) from the Moluccas (Kim, 2007). The specimens from Madagascar are $996 \mu\text{m}$ ($997\text{--}1070 \mu\text{m}$) long in the female and $690 \mu\text{m}$ long in a measured male. These sizes are not so different from those of the type specimens.

Although the Moluccas and Madagascar are remotely isolated across the Indian Ocean, the specimens of *A. goniopora* from both regions appear to be surprisingly similar in most morphological features, including the nature of sexual dimorphisms appearing in the maxilliped and leg 2. Kim (2007) illustrated 11 or 12 setules on each lateral margin of the genital double-somite of the specimens from the Moluccas, which coincides with the number 12 in the specimens from Madagascar. This fact demonstrates that the ornamentation on the lateral margins of the genital double-somite is taxonomically valuable.

***Asteropontius orcafer* n. sp. (Figs. 88, 89)**

Material examined. 23 ♀ ♀ from the scleractinian coral *Hydnophora tenella* Quelch, at a depth of 3 m, Pointe Mahatsinjo, Nosy Bé, Madagascar, 18 October 1963, collected by A. G. Humes. Holotype (♀) and paratypes (20 ♀ ♀) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀ ♀) are retained in the collection of the author.

Female. Body (Fig. 88A) rather broad. Mean body length 940 µm (910–980 µm) based on 10 specimens. Body length of dissected specimen 942 µm, and maximum width 492 µm. Prosoma 654 µm long. Cephalothorax 417 µm long, with angular posterolateral corners. Second to fourth pedigerous somites with membranous fringe on lateral margins. Urosome (Fig. 88B) 4-segmented. Fifth pedigerous somite 140 µm wide. Genital double-somite 113 × 108 µm, slightly longer than wide; proximal region weakly expanded laterally, widest at proximal 1/3 region; distal half narrower, with slightly convex lateral margins bearing 14 setules (Fig. 89H); genital area located slightly anterior to midway of somite. Two free abdominal somites 57 × 70 and 53 × 63 µm, respectively. Anal somite with serrate posteroventral margin. Caudal ramus 25 × 28 µm (0.89 : 1), with 6 setae and serrate posteroventral margin (not illustrated in Fig. 88B).

Rostrum weak, posteriorly forming narrow ridge (Fig. 88C). Antennule 373 µm long and 19-segmented; numbers of setae on ninth, and 2 distal segments 7, 2+aesthetasc and 13; other segments with 2 setae each; all setae naked; first segment with spinules on anterior margin. Antenna (Fig. 88E) with smooth coxa; basis 65 × 25 µm, with minute spinules on inner margin and outer side. Exopod small about 5 × 3.5 µm, not demarcated from basis, with 2 distal and 1 lateral setae. Endopod slender and 3-segmented; first segment 82 × 14 µm and slender; second segment with 1 minute seta; third segment with 2 small setae; terminal claw 50 µm long and not demarcated from terminal segment.

Oral cone (Fig. 88F) barrel-shaped, widest across distal 1/3 region, 140 × 67 µm, and reaching maxillipedal insertions, terminating in 3 lobes at apex. Mandible (Fig. 88G) with 122 µm-long stylet, its distal margin broadened, with denticles. Mandibular palp fused with distal larger seta, 100 µm long in total, with 1 small setule. Maxillule (Fig. 88H) bilobed. Inner lobe 45 × 17 µm, distally with 1 small and 4 larger, weakly plumose setae (latters 67, 75, 65, and 26 µm from inner to outer), Outer lobe 22 × 7 µm, distally with 4 naked setae, 3 larger on of which 64, 63, and 46 µm, respectively. Maxilla (Fig. 89A) with smooth proximal segment; distal claw slender and elongated, with tuft of setules near middle and spinules proximally and distally. Maxilliped (Fig. 89B), 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1;

second segment 103 × 33 µm and naked; terminal claw 63 µm long and about 1.6 times as long as terminal segment.

Legs 1-4 with 3-segmented rami. Legs 1 and 2 with unicuspid outer distal process on second endopodal segment; those on legs 3 and 4 bicuspid (Fig. 89C-F). Outer seta on basis of legs 1-4 naked. Armature formula of legs 1-4 as follows:

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

Leg 5 consisting of dorsolateral seta on fifth pedigerous somite and free segment (Fig. 88B); free segment (Fig. 89G) nearly quadrangular, 43 × 18 µm, with 2 plumose distal setae (51 and 55 µm) and 1 subdistal naked seta (30 µm). Leg 6 represented by 1 plumose seta and 1 small spinule in genital area (Fig. 89H).

Male. Unknown.

Etymology. The specific name *orcafer* is derived from the Latin *orca* (barrel) and *fero* (to bear). It alludes to the barrel-shaped oral cone of the new species.

Remarks. *Asteropontius orcafer* n. sp. has the following combination of characters: (1) the female antennule is 19-segmented; (2) the third exopodal segment of leg 1 is armed with three spines and four setae (armature formula III,2,2); and (3) the third endopodal segment of leg 2 is armed with six setae (armature formula 1,2,3). This combination of characters is shared by the following nine congeners: *A. laccadivensis* Nair and Pillai, 1984; *A. longipalpus* Stock, 1975; *A. mycetophylliae* Varela, Ortiz and Lalana, 2005; *A. parvipalpus* Stock, 1975; *A. proximus* Stock, 1987; *A. ungelatus* Stock, 1985; and the preceding *A. humesi*, *A. latioriger*, and *A. pinnatus*.

Of these nine species, *A. laccadivensis*, *A. parvipalpus*, and *A. ungelatus*, are easily distinguished from the new species, because the three species have six setae (armature formula 1,2,3) on the third endopodal segment of leg 3 and the mandibular palp which is not longer than a half length of the stylet.

Of the remaining six species, only *A. proximus* and *A. humesi* are comparable to *A. orcafer*, because they have a similar number of setules on the lateral margins of female genital double-somite. The number of the setules is numerous in *A. longipalpus* and *A. mycetophylliae* deduced from the illustrations in the respective original records of Stock (1975) and Varela et al. (2005), four or five in *A. pinnatus* (this paper), and none in *A. latioriger*.

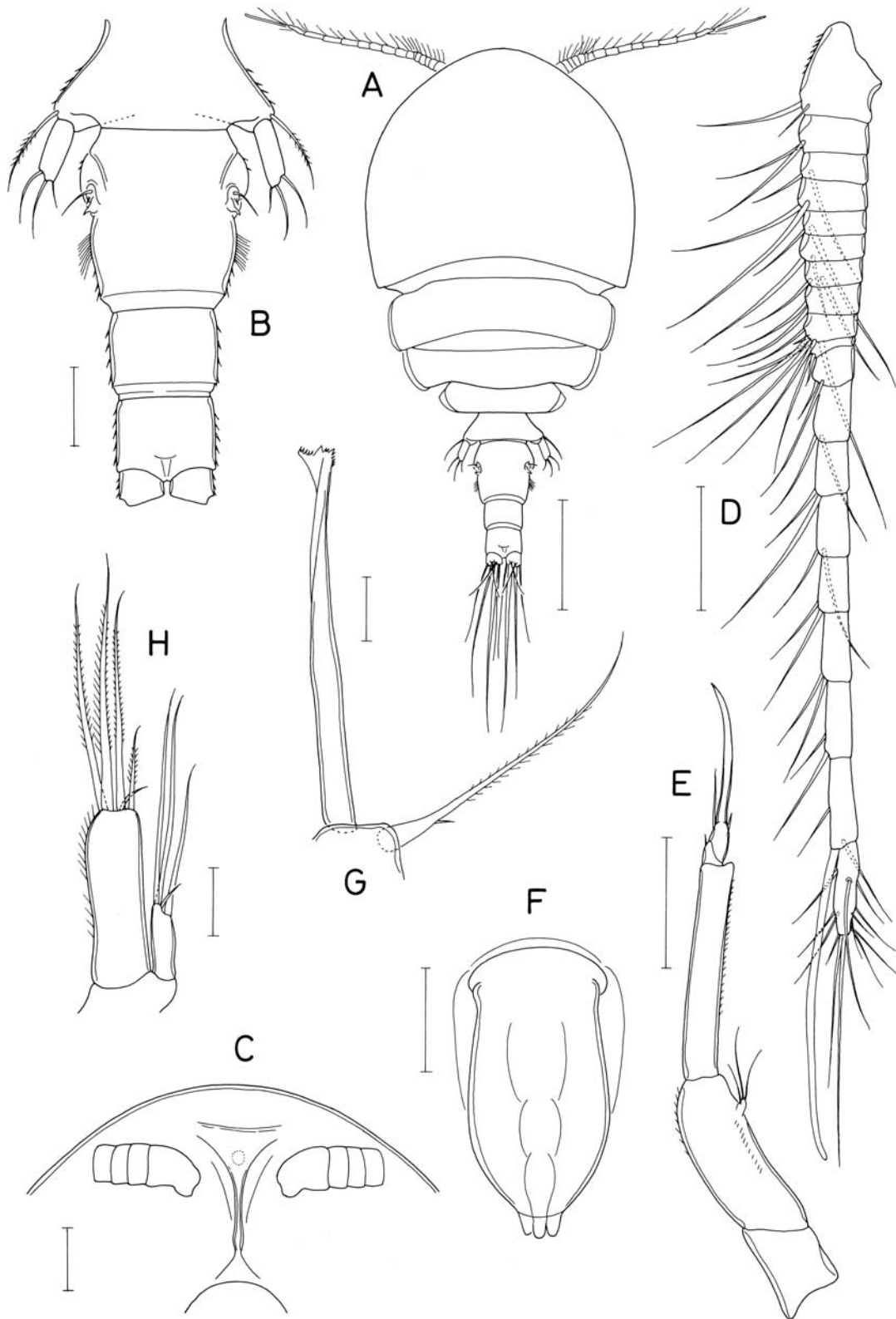


Fig. 88. *Asteropontius orcafer* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, rostral area, ventral; D, antennule; E, antenna; F, oral cone; G, mandible; H, maxillule. Scales: A, 0.2 mm; B-F, 0.05 mm; G, H, 0.02 mm.

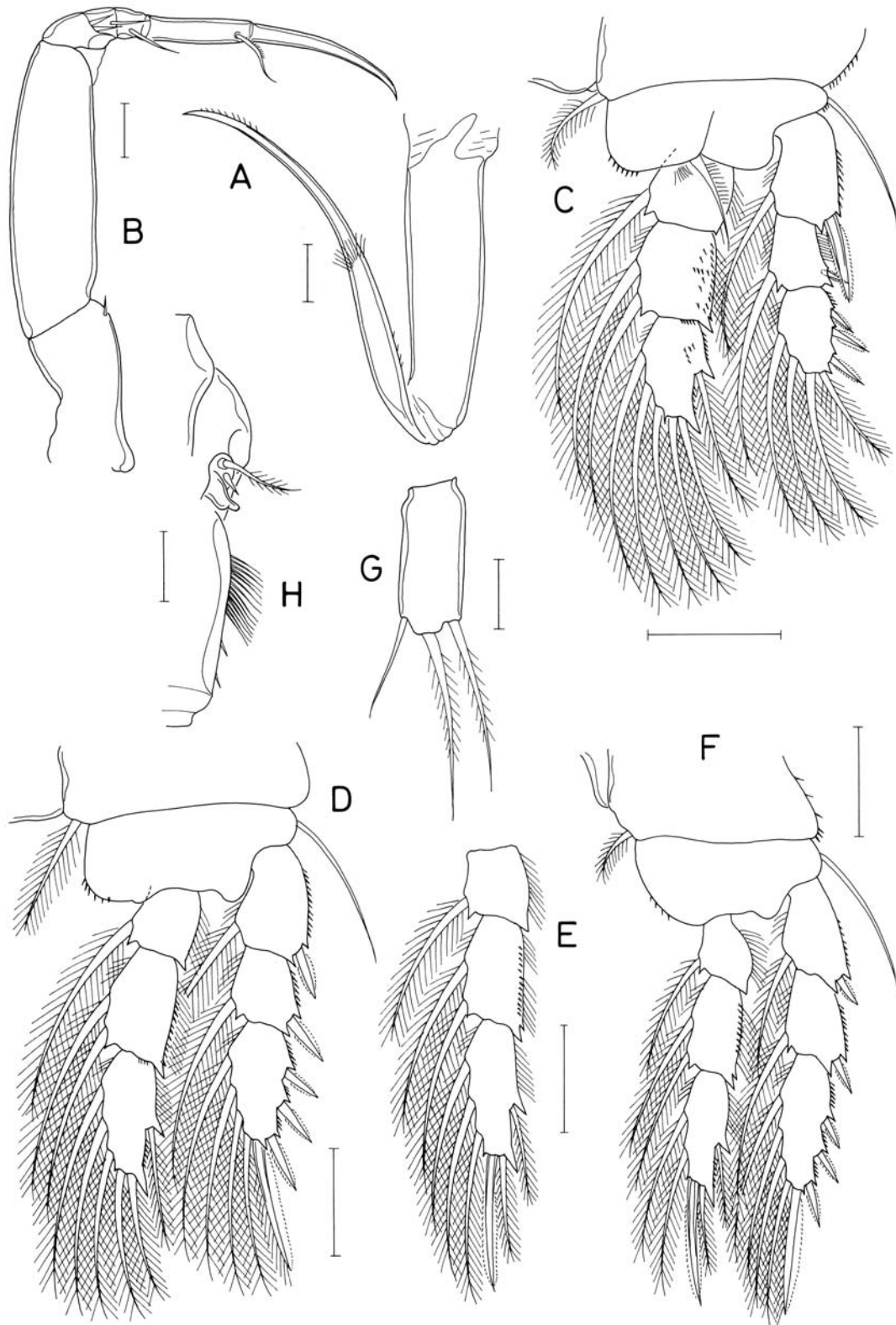


Fig. 89. *Asteropontius orcafer* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, right side of genital double-somite, dorsal. Scales: A, B, G, H, 0.02 mm; C-F, 0.05 mm.

Asteropontius proximus and *A. humesi* can be distinguished from *A. orcafer* by their following features. In *A. proximus* the inner lobe of maxillule bears only 2 distal setae (or 3 if the small seta was unnoticed in the original description); the free segment of female leg 5 is larger ($69 \times 32 \mu\text{m}$, according to Stock, 1987); and the oral cone is more slender and tapering. In *A. humesi* the distal claw of antenna is longer than its first endopodal segment; the free segment of female leg 5 is $38 \times 29 \mu\text{m}$ and its two distal setae are large, about four times as long as the segment; and the oral cone is more slender and tapering.

Due to a similar body form, the presence of the membranous fringes along the lateral margins of metasomites, and other general similarities of appendages, *A. orcafer* was originally thought to be conspecific with *A. trifilis*. After a careful comparison of both species, I concluded that they are different species, revealing differences in the shape of the oral cone, the number of setules on the lateral margins of female genital double-somite, and the number of segments of female antennule.

Asteropontius bilinguis n. sp. (Figs. 90-92)

Material examined. 63 ♀♀, 5 ♂♂ from the scleracitian coral *Acropora cytherea* Dana, at a depth of 0.9 m, Pointe Lokobe, Nosy Bé, Madagascar, 25 October 1960, collected by A. G. Humes. Holotype (♀), allotype (♂), and paratypes (60 ♀♀, 3 ♂♂) have been deposited from the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 1 ♂) are retained in the collection of the author.

Other material examined. 55 ♀♀, 11 ♂♂ from the scleracitian coral *Acropora corymbosa* (Lamarck), at a depth of 1.2 m, Pointe Lokobe, Nosy Bé, Madagascar, 1 November 1960, collected by A. G. Humes; 42 ♀♀, 6 ♂♂ from the scleracitian coral *Acropora cytherea* Dana, at a depth of 1.2 m, Pointe de Tafondro, Nosy Bé, Madagascar, 19 October 1960, collected by A. G. Humes; 62 ♀♀, 10 ♂♂ from *Acropora cytherea* Dana, at a depth of 1.8 m, Pointe Mahatsinjo, Nosy Bé, Madagascar, 18 October 1960, collected by A. G. Humes; 23 ♀♀, 10 ♂♂ from the *Acropora* cf. *corymbosa* (Lamarck), at a depth of 1.8 m, Pointe Mahatsinjo, Nosy Bé, Madagascar, 18 October 1960, collected by A. G. Humes.

Female. Body (Fig. 90A) relatively large, with broad prosome. Mean body length 1.17 mm (1.10-1.20 mm), based on 10 specimens. Body length of dissected specimen 1.20 mm, and maximum width 655 μm . Prosome 817 μm long. Second pedigerous somite $139 \times 561 \mu\text{m}$, with pointed posterolateral corners. Third pedigerous somite $122 \times 511 \mu\text{m}$, with angular posterolateral corners. Urosome (Fig. 90B) 4-segmented. Fifth pedigerous somite 220 μm wide. Genital double-somite

$141 \times 161 \mu\text{m}$, wider than long; its anterior 1/3 slightly expanded; distal 2/3 slightly narrowed posteriorly, without setules on lateral margins (Fig. 91H). Two free abdominal somites 80×114 and $72 \times 102 \mu\text{m}$, respectively. Caudal ramus $40 \times 44 \mu\text{m}$ (0.91 : 1) with 6 setae and smooth posteroventral margin.

Rostrum strongly tapering and forming short ridge posteriorly (Fig. 90C). Antennule (Fig. 90D) 432 μm long and 19-segmented; ninth, and 2 distal segments armed with 7 setae, 2 setae+aesthetasc, and 13 setae, respectively; all setae naked; first segment without setules or spinules on anterior margin, one of 2 setae on this segment rudimentary. Antenna (Fig. 90E) rather stocky, with naked coxa; basis $83 \times 41 \mu\text{m}$, with row of several spinules. Exopod $8 \times 5 \mu\text{m}$, with 3 setae. Endopod with armature formula 0, 1, 2+claw; first segment $91 \times 25 \mu\text{m}$; terminal claw slender, 93 μm long.

Oral cone (Fig. 90F) 192 μm long, evenly tapering, extending to middle of maxillipedal insertions, and characteristically tipped by pair of tongue-like large stripes. Mandible (Fig. 90G) consisting of stylet and palp. Stylet thick proximally, 182 μm long, with denticles on distal margin. Palp fused with distal naked seta, bearing small proximal setule, 97 μm long in total, much shorter than stylet. Maxillule (Fig. 90H) bilobed, both lobes thick. Inner lobe $59 \times 29 \mu\text{m}$, distally armed with 1 small and 4 larger setae (139, 114, 80, and 47 μm , respectively), largest one of which heavily plumose. Outer lobe $32 \times 18 \mu\text{m}$, distally armed with 1 small and 3 large, heavily plumose setae (latters 185, 155, and 151 μm , respectively). Maxilla (Fig. 91A) relatively slender; proximal segment naked; distal claw with tuft of setules near middle and spinules proximally and distally. Maxilliped (Fig. 91B) 6-segmented; first segment with small, papilla-like inner distal element; second segment thick, $133 \times 59 \mu\text{m}$, and unarmed; terminal claw 98 μm long, more than twice as long as terminal segment.

Legs 1-4 with 3-segmented rami and unicuspid outer distal process on second endopodal segment (Fig. 91C-F). Leg 1 with 46 μm -long outer spine on first exopodal segment; outer terminal seta on third exopodal segment small and naked. Armature formula of legs 1-4 as in preceding species.

Leg 5 consisting of dorsolateral plumose seta on fifth pedigerous somite and free segment; free segment (Fig. 91G) $71 \times 42 \mu\text{m}$, distally with 2 large plumose setae (131 and 151 μm , respectively) and 1 small, naked inner seta (42 μm). Leg 6 represented by 1 plumose seta and 1 small spinule (Fig. 91H).

Male. Body (Fig. 92A) narrow. Mean body length 730 μm (701-746 μm), based on 5 specimens. Body length of dissected specimen 746 μm , and maximum width 354 μm . Prosome 500 μm long. Cephalothorax 329 μm long. Urosome

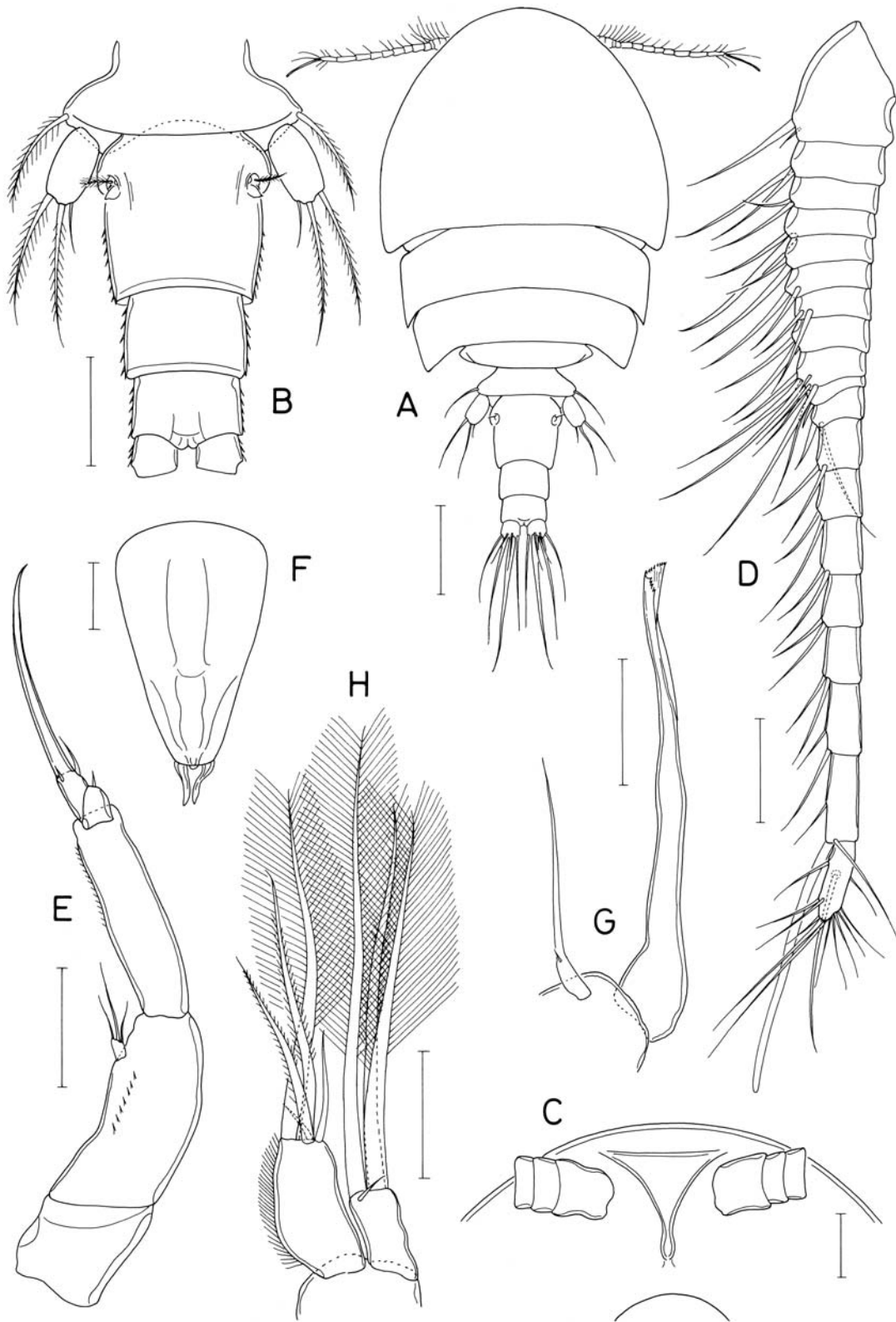


Fig. 90. *Asteropontius bilinguis* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, rostral area, ventral; D, antennule; E, antenna; F, oral cone; G, mandible; H, maxillule. Scales: A, 0.2 mm; B, 0.1 mm; C-H, 0.05 mm.

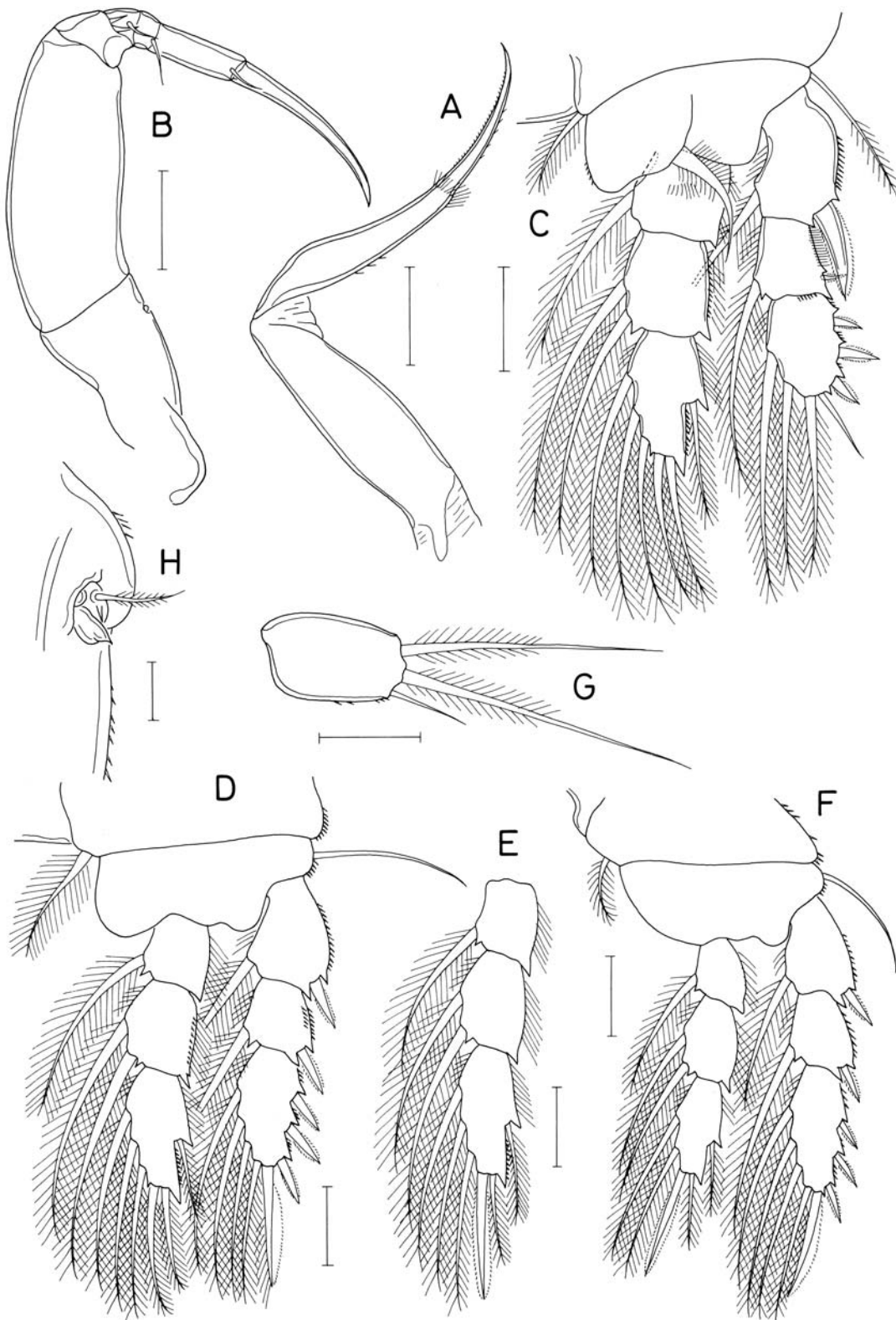


Fig. 91. *Asteropontius bilinguis* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, right genital area. Scales: A-G, 0.05 mm; H, 0.02 mm.

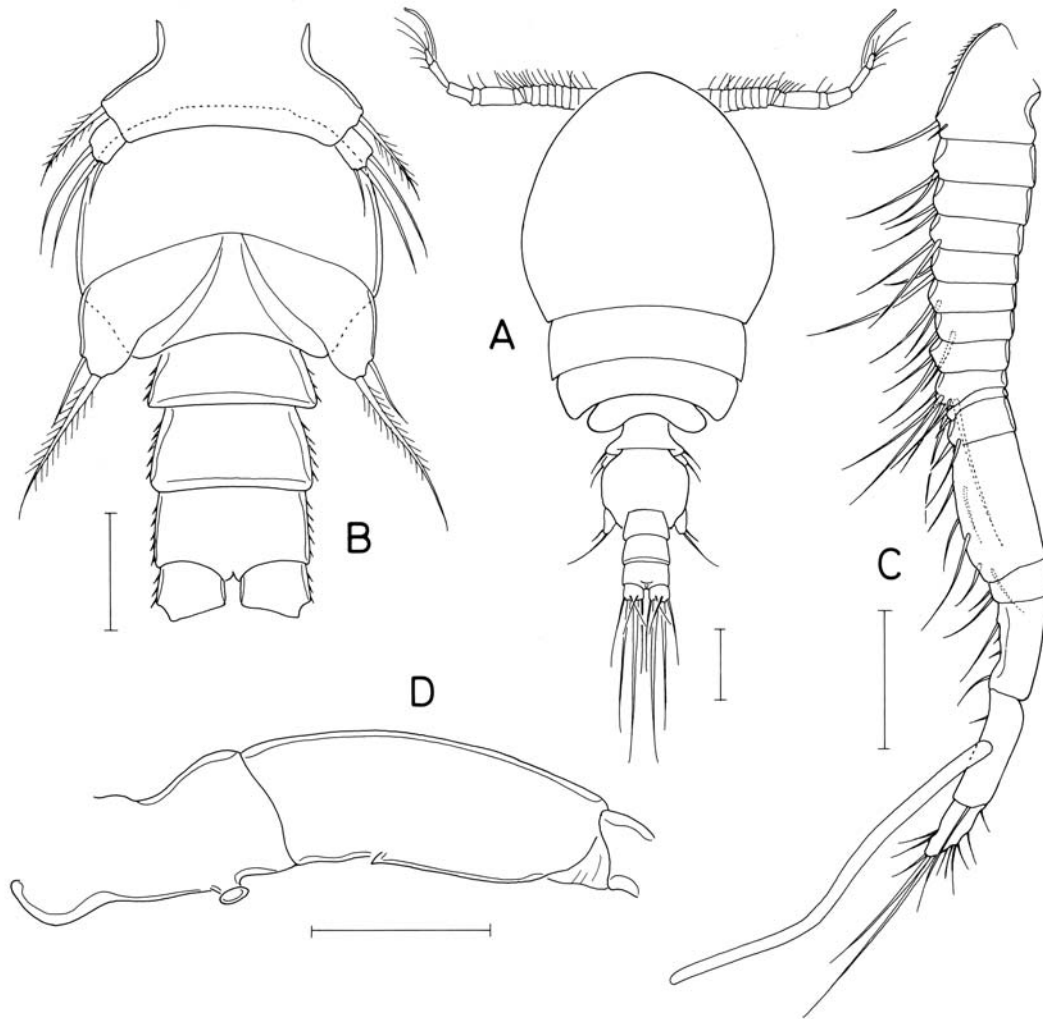


Fig. 92. *Asteropontius bilinguis* n. sp., female. A, habitus, dorsal; B, urosome, ventral; C, antennule; D, proximal segments of maxilliped. Scales: A, 0.1 mm; B-D, 0.05 mm.

(Fig. 92B) 5-segmented. Fifth pedigerous somite 112 μ m wide. Genital somite 96 \times 129 μ m. Three abdominal somites 29 \times 72, 35 \times 68, and 39 \times 66 μ m, respectively. Caudal ramus 25 \times 29 μ m.

Rostrum and antenna as in female. Antennule (Fig. 92C) 16-segmented; ninth, twelfth, and 3 distal segments with 7 setae, 6 setae, 4 setae, 2 setae+aesthetasc, and 11 setae, respectively; other segments with 2 setae each.

Maxilliped with small, disc-like process on inner margin of first segment (Fig. 92D); second segment with small, cusp-like process on inner margin. Other mouth organs as in female.

Legs 1-4 as in female. Leg 5 with free segment of 20 \times 16 μ m. Leg 6 represented by 1 large plumose seta and 1 small naked seta on genital flap. (Fig. 92B).

Etymology. The specific name *bilinguis*, the Latin meaning “having two tongues”, refers to the possession of the two tongue-like processes on the apex of oral cone.

Remarks. This species is distinguishable from all congeners by a single diagnostic character revealed on the maxillule, i.e., one of setae on the inner lobe and three of setae on the outer lobe are enlarged and heavily plumose.

The small mandibular palp which is markedly smaller than the stylet is represented by *A. parvipalpus* Stock, 1975, *A. ungelatus* Stock, 1975, and *A. angulatus*. But *A. bilinguis* n. sp. differs from these species by the lacking of setules on the lateral margins of genital double-somite. The possession of a pair of linguiform processes on the apex of oral cone is also an important differential feature of the new species.

***Asteropontius dentatus* n. sp. (Figs. 93-95)**

Material examined. 15 ♀♀, 7 ♂♂ from the scleractinian coral *Lobophyllia hemprichii* (Ehrenberg), at a depth of 1 m, Nosy Sakatia, west of Nosy Bé, Madagascar, 12 May 1964, collected by A. G. Humes. Holotype (♀), allotype (♂), and paratypes (12 ♀♀, 4 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 2 ♂♂) are retained in the collection of the author.

Female. Body (Fig. 93A) rather narrow. Mean body length 760 µm (747-792 µm), based on 10 specimens. Body of dissected specimen 776 µm long, its maximum width 373 µm. Prosome 519 µm long. Cephalothorax 331 µm long. Third and fourth pedigerous somites with membranous fringe on lateral margins. Urosome (Fig. 93B) 4-segmented. Fifth pedigerous somite 124 µm wide. Genital double-somite 100 × 102 µm, with expanded anterior 1/3 and narrower, tapering posterior 2/3 bearing about 14 setules on each lateral margin posterior to genital area (Fig. 94H); genital area located anterior to midway of somite. Two free abdominal somites 45 × 66 and 47 × 64 µm, respectively. Caudal ramus (Fig. 93C) 27 × 27 µm (1 : 1), with 6 setae. Anal somite and caudal ramus with minute spinules on posteroventral margin (Fig. 93C).

Rostrum weak, strongly tapering in anterior part and forming narrow ridge in posterior part (Fig. 93D). Antennule (Fig. 93E) 337 µm long and 20-segmented; ninth, eighteenth, and last segments with 7 setae, 2 setae+aesthetasc, and 9 setae, respectively; other segments with 2 setae each; first segment with minute spinules on anterior margin; all setae naked and thin. Antenna (Fig. 93F) with naked coxa; basis 58 × 24 µm, with row of fine spinules near base of exopod. Exopod 6 × 3.3 µm, with 2 distal and 1 lateral setae. Endopod 3-segmented, with armature formula 0, 1, and 3+claw; first segment 67 × 15 µm; 2 of 3 setae on terminal segment minute; terminal claw 50 µm long, distinctly shorter than first segment, and not articulated from segment, with 2 minute denticles subdistally on concave margin.

Oral cone (Fig. 93G) nearly elliptical and extending to insertions of maxillipeds, with 3 lobes at apex. Mandible (Fig. 93H) consisting of stylet and palp. Stylet 111 µm long and straight, with denticles on widened distal margin. Palp fused with distal seta, 92 µm long in total, with small setule. Maxillule (Fig. 93I) bilobed. Inner lobe 37 × 14 µm, distally armed with 4 larger setae (60, 62, 50, and 21 µm from inner to outer) and 1 small seta. Outer lobe 17 × 7 µm, distally armed with 3 larger setae (79, 62, and 33 µm, respectively) and 1 small seta. Maxilla (Fig. 94A) slender; distal claw with tuft of setules near middle. Maxilliped (Fig. 94B) 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; first

segment with minute, papilliform inner distal seta; second segment 81 × 28 µm; terminal claw 54 µm long, about 1.5 times as long as terminal segment, with 3-4 small denticles subdistally on concave margin.

Legs 1-4 with 3-segmented rami and bicuspid outer distal process on second endopodal segment (Fig. 94C-F). Leg 1 with thick inner distal spinules on posterior margin of basis; outer spine on first exopodal segment 24 µm long. Armature formula of legs 1-4 as follows:

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

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

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

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

Leg 5 consisting of dorsolateral naked seta on fifth pedigerous somite and free segment; free segment (Fig. 94G) broad, 30 × 21 µm (1.43 : 1), with smooth margins and 3 naked setae (54, 62, and 26 µm from outer to inner). Leg 6 represented by 1 naked seta and 1 small spinule in genital area (Fig. 94H).

Male. Body (Fig. 95A) narrower than that of female. Body length of dissected specimen 610 µm, and maximum width 277 µm. Prosome 407 µm long. Urosome (Fig. 95B) 5-segmented. Fifth pedigerous somite 88 µm wide. Genital somite 71 × 93 µm, nearly quadrangular. Three abdominal somites 35 × 55, 30 × 52, and 34 × 53 µm, respectively. Caudal ramus 21 × 23 µm.

Rostrum and antenna as in female. Antennule (Fig. 95C) 16-segmented; ninth, twelfth, and 3 distal segments with 7 setae, 6 setae, 4 setae, 2 setae+aesthetasc, and 11 setae, respectively; other segments with 2 setae each. Mandible (Fig. 95D) different from that of female; its palp represented by a small, smooth seta, without proximal setules. Maxilliped with larger papilliform inner seta on first segment (Fig. 95E); second segment with prominent process on inner margin. Remaining mouth organs like those of female.

Legs 1-4 with unicuspid outer distal process on second endopodal segment (Fig. 95F-H); outer and 2 distal processes on third endopodal segment more developed. Two distal setae on third endopodal segment of leg 2 spiniform (Fig. 95G).

Leg 5 with small free segment (Fig. 95I) of 10 × 10 µm; 2 larger ones of 3 distal setae equal in length, 43 µm long. Leg 6 represented by 1 larger plumose seta and 1 smaller naked seta on genital flap (Fig. 95B).

Etymology. The specific name *dentatus* comes from Latin meaning "toothed". It alludes to the minute subterminal denticles on the distal claw of the antenna and maxilliped of

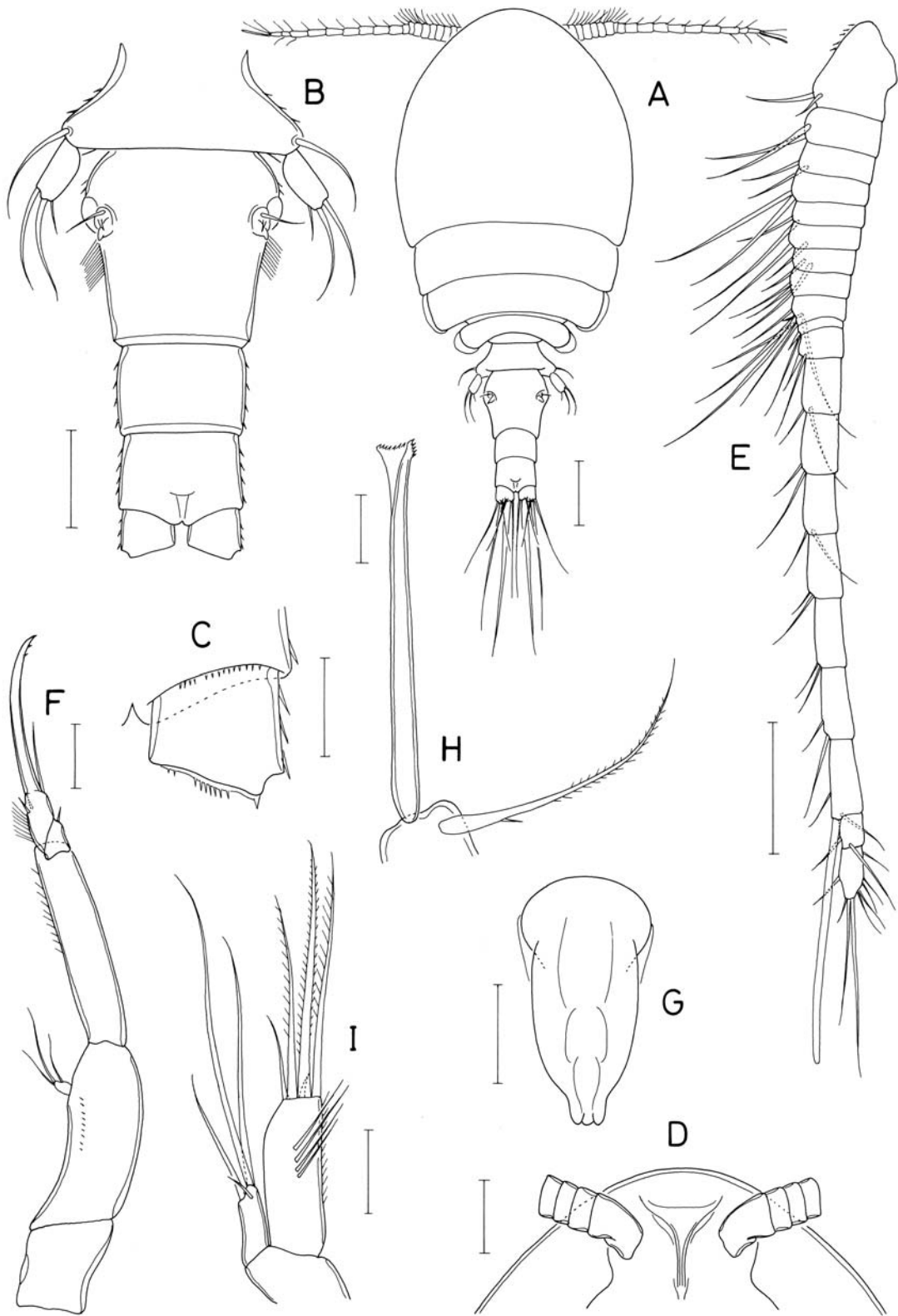


Fig. 93. *Asteropontius dentatus* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, caudal ramus, ventral; D, rostral area, ventral; E, antennule; F, antenna; G, oral cone; H, mandible; I, maxillule. Scales: A, 0.1 mm; B, D, E, G, 0.05 mm; C, F, H, I, 0.02 mm.

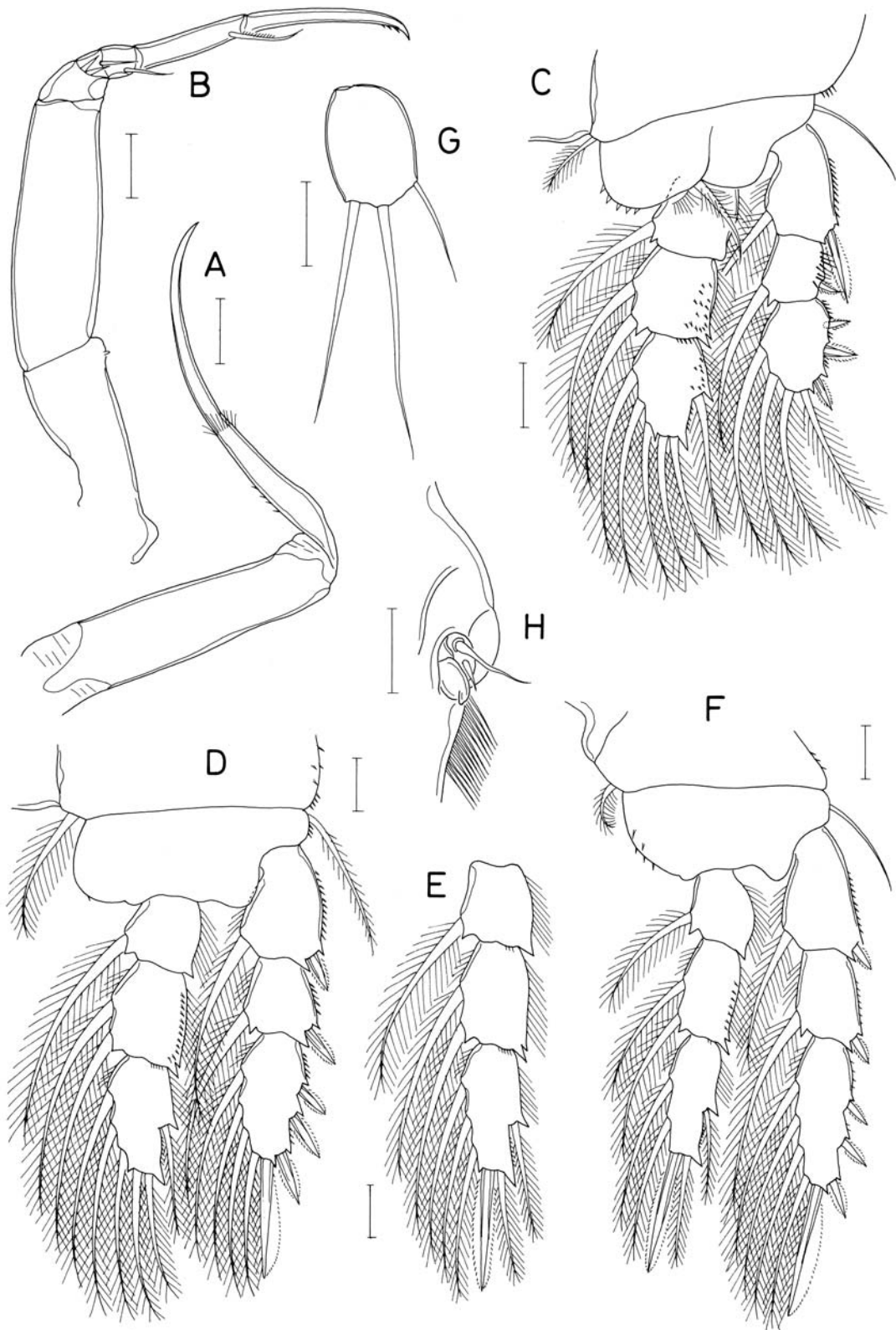


Fig. 94. *Asteropontius dentatus* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, right genital area. Scales: 0.02 mm for all.

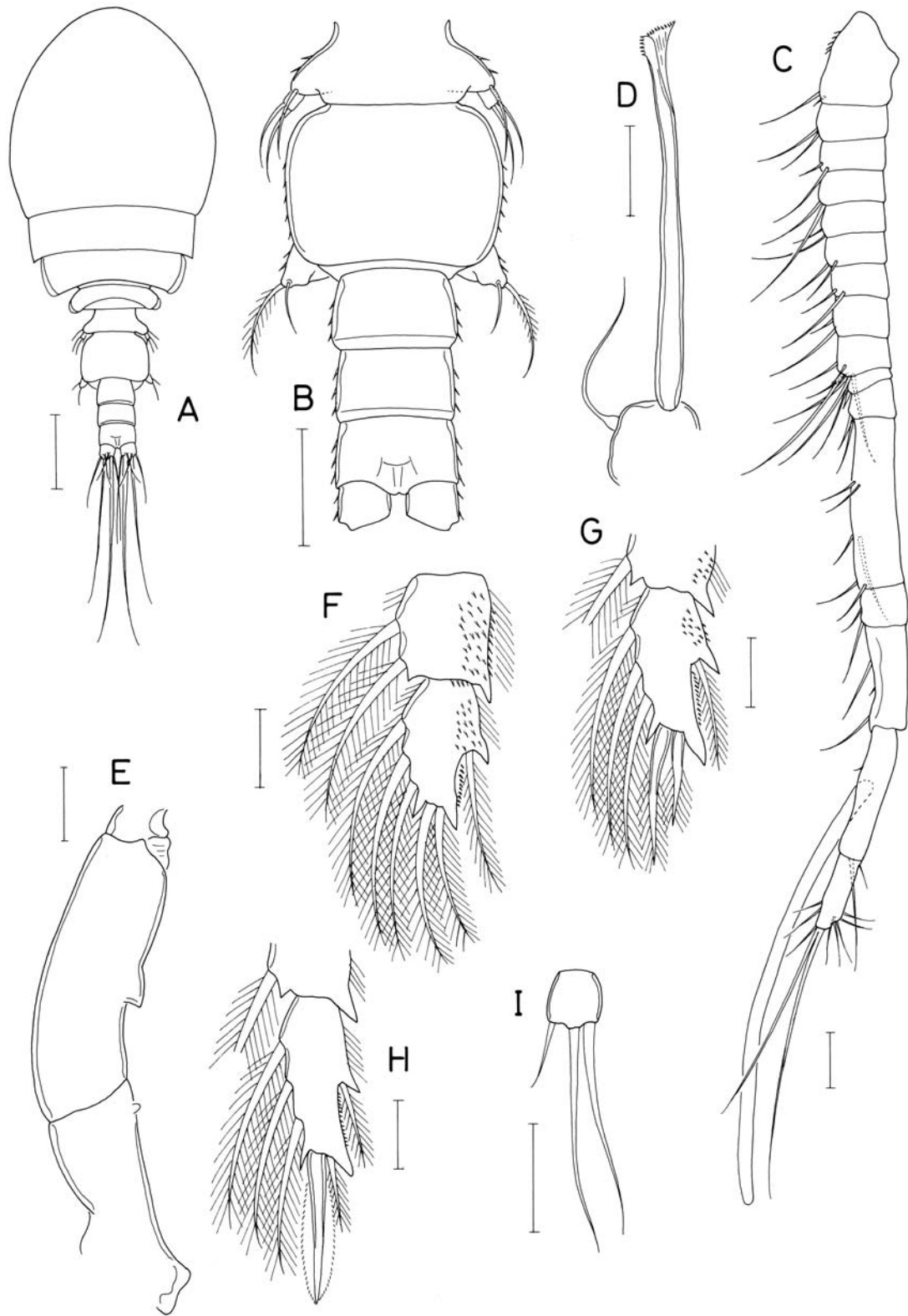


Fig. 95. *Asteropontius dentatus* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, mandible; E, proximal segments of maxilliped; F, second and third endopodal segments of leg 1; G, third endopodal segment of leg 2; H, third endopodal segment of leg 3; I, free segment of leg 5. Scales: A, 0.1 mm; B, 0.05 mm; C-I, 0.02 mm.

the new species.

Remarks. In the genus *Asteropontius* about half of known species have, as the new species, 20-segmented antennules in the female, and ten species have a bicuspid outer distal process on the second endopodal segment at least in one of legs 1-4. Seven species are known to have both features: *A. bifurcatus* Kim, 2000; *A. acroporus* Kim, 2003; *A. brevioris* Kim, 2003; *A. caledonensis* Kim, 2003; *A. fungicola* Kim, 2007; *A. goniopora* Kim, 2007; and *A. membranulatus* described in this paper. Of these, *A. bifurcatus*, *A. acroporus*, *A. brevioris*, and *A. caledonensis* are excluded from a further comparison, because *A. bifurcatus* has one spine and five setae (rather than six setae) on the third endopodal segment of leg 2, and the latter three species have four spines (rather than three spines) and four setae on the third exopodal segment of leg 1. The remaining three species can be distinguished from *A. dentatus* by the following features.

In *A. fungicola* the genital double-somite is longer than wide, the first segment of antennule has a single seta, and sexual dimorphisms in the maxilliped and legs are different from those of *A. dentatus*.

In *A. goniopora* the first segment of antennule has a single seta and the outer spine on the first exopodal segment of leg 1 is large and extends to the base of the proximal outer spine on the third exopodal segment.

In *A. membranulatus* the body is larger, at least 900 μm long in female adults, the oral cone extends over the insertions of the maxillipeds, and the free segment of female leg 5 is 2.58 times as long as wide

It is notable that the mandibular palp of *A. dentatus* reveals sexual dimorphism.

Asteropontius minutisetiger n. sp. (Figs. 96-98)

Material examined. 21 ♀♀, 12 ♂♂ from an antipatharian coral (*Antipathes* sp.), at a depth of 20 m, Banc de Dzamandzar, Nosy Bé, Madagascar, 16 September 1964, collected by A. G. Humes. Holotype (♀), allotype (♂), and paratypes (18 ♀♀, 10 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 1 ♂) are retained in the collection of the author.

Female. Body (Fig. 96A) with moderately broad prosome. Mean body length 855 μm (825-885 μm), based on 10 specimens. Body length of dissected specimen 879 μm , and maximum width 493 μm . Prosome 625 μm long. Cephalothorax 438 μm long and nearly globular. Urosome (Fig. 96B) 4-segmented. Fifth pedigerous somite 150 μm wide. Genital double-somite 113 \times 135 μm , broader than long, widest at anterior 1/3 region and evenly tapering along remaining posterior region, with about 16 thin setules on lateral margin

near genital area (Fig. 97H); genital area located midway of somite. Two free abdominal somites 42 \times 77 and 45 \times 70 μm , respectively. Anal somite with weakly serrate posteroventral margin (Fig. 99C). Caudal ramus (Fig. 96C) 26 \times 29 μm (0.90 : 1) with serrate posteroventral margin and 6 setae.

Rostrum broad, short, without posterior margin (Fig. 96D). Antennule (Fig. 96E) 479 μm long and 20-segmented; each segment armed with 2 setae, except for 7 setae on ninth, 2 setae+aesthetasc on eighteenth, and 11 setae on last segments; all setae naked; proximal 9 segments distinctly wider than distal segments. Antenna (Fig. 96F) stout, with naked coxa; basis 75 \times 39 μm . Exopod small, 12 \times 5 μm , with 2 distal and 1 lateral setae. Endopod 3-segmented; first segment 68 \times 28 μm ; second and third segments with 1 and 2 setae each; terminal claw elongate, 107 μm , distinctly longer than first endopodal segment.

Oral cone (Fig. 96G) 152 \times 97 μm , evenly tapering, and reaching middle of maxillipedal insertions. Mandible (Fig. 96H) consisting of stylet and palp. Stylet 142 μm , with oblique distal margin bearing denticles. Palp 1-segmented 46 \times 8 μm , distally with 1 small setule and 1 long seta; combined segment and seta 233 μm , distinctly longer than stylet. Maxillule (Fig. 96I) bilobed. Inner lobe 54 \times 22 μm , tapering, distally armed with 1 small, proximally expanded seta and 4 large plumose setae (the latter 81, 78, 73, and 65 μm long, respectively). Outer lobe 25 \times 11 μm , distally with 1 small naked seta (19 μm) and 3 large plumose setae (102, 95, and 67 μm , respectively). Maxilla (Fig. 97A) stout, with unornamented proximal segment; distal claw with tuft of setules near midlength. Maxilliped (Fig. 97B) 6-segmented; first segment with rudimentary inner distal seta; second segment unarmed and 110 \times 44 μm , with few spinules on outer margin; third to sixth segments with 2, 1, 1, and 1 setae, respectively; terminal claw 106 μm , more than twice as long as terminal segment.

Legs 1-4 with 3-segmented rami and bicuspid outer distal process on second endopodal segment (Fig. 97C-F). Leg 1 (Fig. 97C) with small outer seta on basis; first exopodal segment with rudimentary inner seta and large outer spine (41 μm). Leg 2 (Fig. 97D) with large outer seta on basis. Inner side of basis with scattered spinules in legs 2-4 but these spinules lacking in leg 1. Armature formula of legs 1-4 as follows:

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

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

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

Leg 5 consisting of dorsolateral seta on fifth pedigerous somite and free segment; free segment (Fig. 97G) 85 \times 33

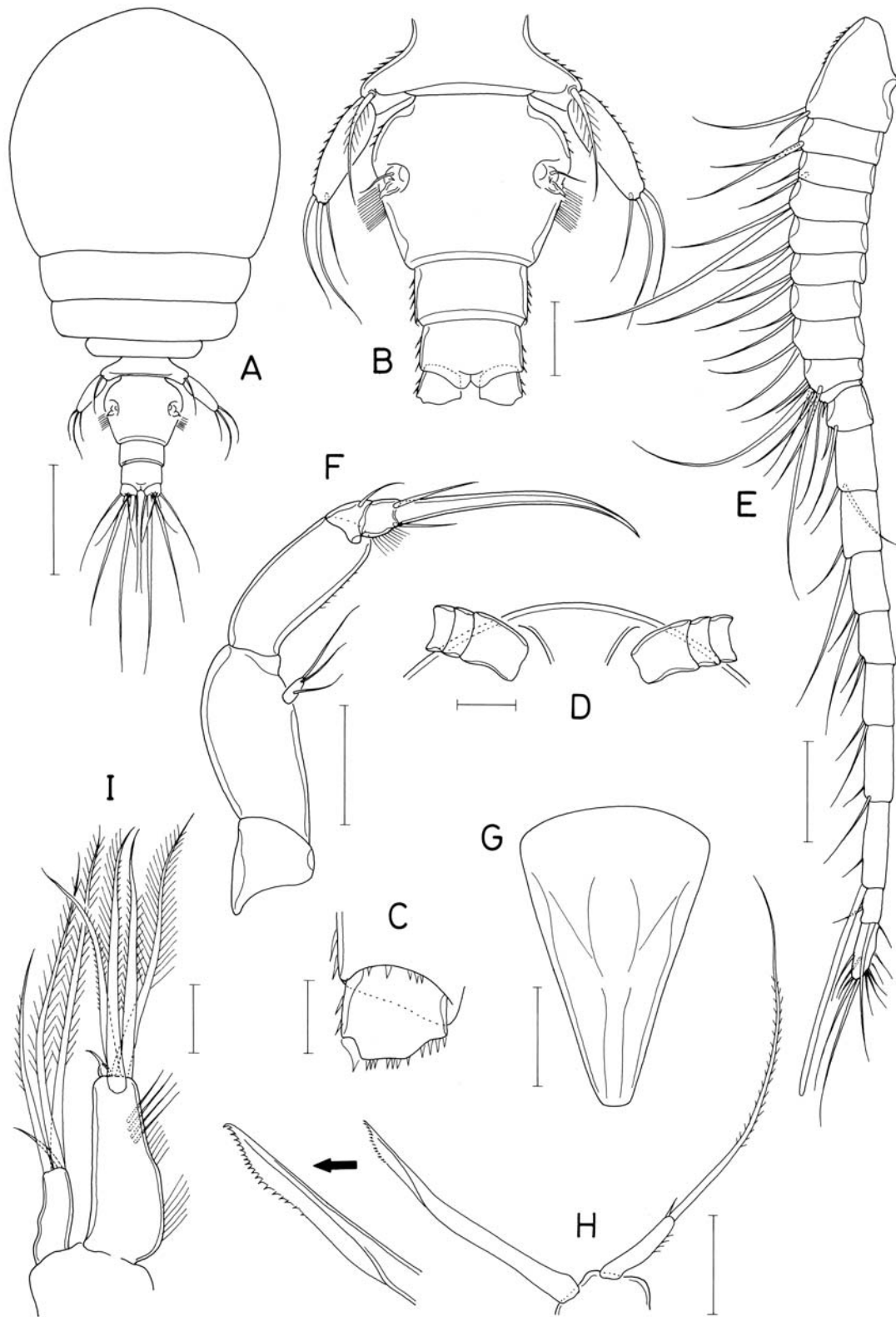


Fig. 96. *Asteropontius minutisetiger* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, caudal ramus, ventral; D, rostral area, ventral; E, antennule; F, antenna; G, oral cone; H, mandible; I, maxillule. Scales: A, 0.2 mm; B, D-H, 0.05 mm; C, I, 0.02 mm.

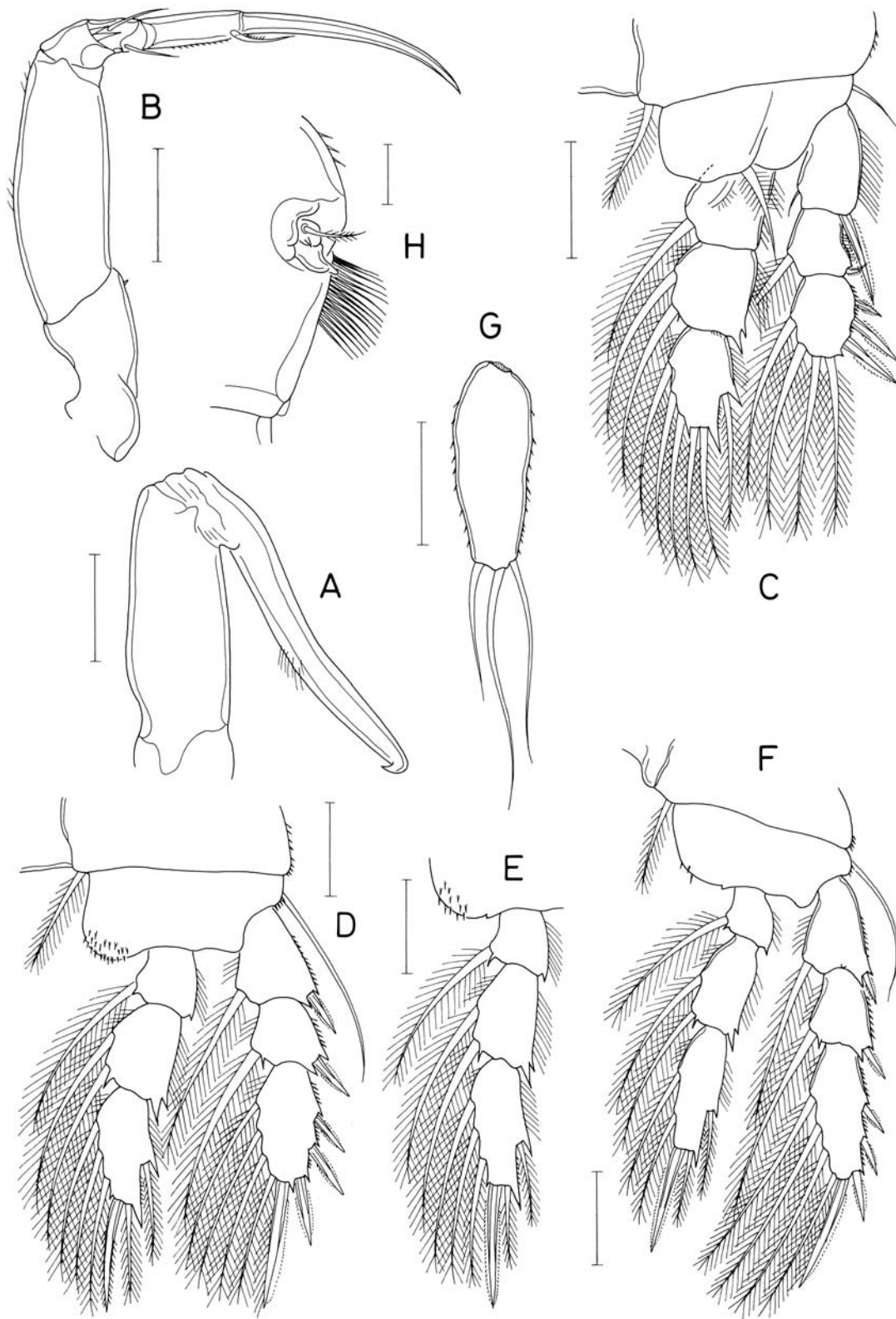


Fig. 97. *Asteropontius minutisetiger* n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, free segment of leg 5; H, right side of genital double-somite, dorsal. Scales: A-G, 0.05 mm; H, 0.02 mm.

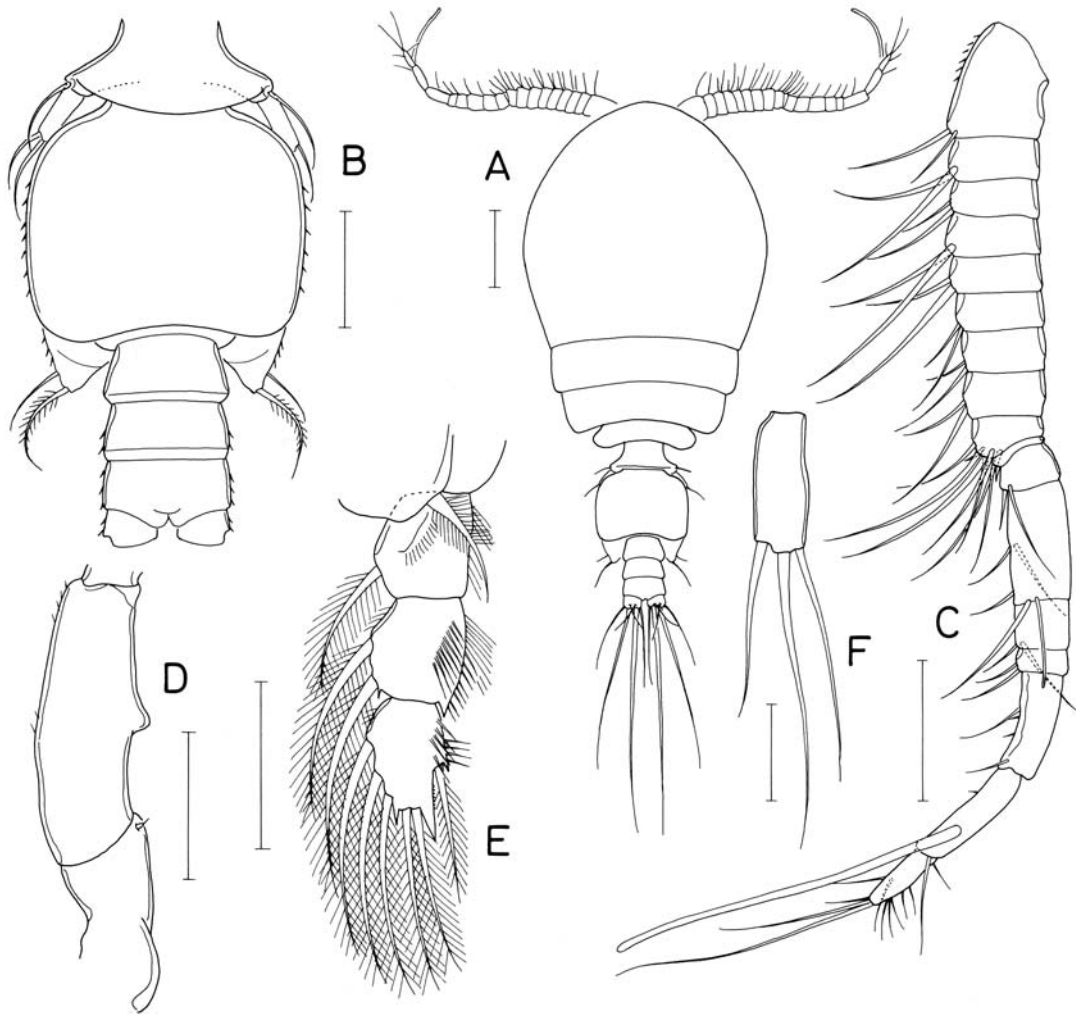


Fig. 98. *Asteropontius minutisetiger* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, proximal segments of maxilliped; E, endopod of leg 1; F, free segment of leg 5. Scales: A, 0.1 mm; B-E, 0.05 mm; F, 0.02 mm.

μm (2.58 : 1), slightly tapering, with spinules on lateral margins and 3 naked distal setae (lengths 85, 103, and 57 μm from outer to inner). Leg 6 represented by 1 small plumose seta and 1 minute spinule in genital area (Fig. 97H).

Male. Body (Fig. 98A) narrower than that of female. Mean body length 650 μm (630-673 μm), based on 10 specimens. Prosome 442 \times 315 μm . Cephalothorax 304 μm long. Urosome (Fig. 98B) 5-segmented. Fifth pedigerous somite 88 μm wide. Genital somite 106 \times 119 μm . Three abdominal somites 28 \times 54, 25 \times 54, and 28 \times 55 μm , respectively. Caudal ramus 19 \times 23 μm .

Rostrum and antenna as in female. Antennule (Fig. 98C) 340 μm long, 17-segmented, and characteristic in having small aesthetasc on twelfth segment; each segment armed with 2 setae, except for 7 setae on ninth segment, 4 setae+

aesthetasc on twelfth, 4 setae on fifteenth, 2 setae+aesthetasc on sixteenth, and 11 setae on last.

Maxilliped with first segment bearing minute, knob-like inner distal seta tipped by setule; second segment with blunt process near middle of inner margin (Fig. 98D). Other mouth organs as in female.

Leg 1 with additional spinules on outer side of second and third endopodal segments (Fig. 98E). Legs 2-4 as in female. Free segment of leg 5 (Fig. 98F) 29 \times 12 μm ; three distal setae smooth and 50, 65, and 38 μm from outer to inner. Leg 6 represented by 1 small naked and 1 larger plumose setae on genital flap (Fig. 98B).

Etymology. The specific name *minutisetiger* is a combination of the Latin words *minutus* (small)+*saeta* (seta)+*gero* (to carry). It alludes to the possession of a minute inner seta on

the first exopodal segment of leg 1.

Remarks. *Asteropontius minutisetiger* n. sp. is comparable to *A. bifurcatus* Kim, 2000, *A. corallophilus* Stock, 1966, *A. laccadivensis* Nair and Pillai, 1984, and *A. dissimilis* Kim, 2003, all of which possess one spine and five setae (armature formula 1,1+I,3, rather than 1,2,3) on the third endopodal segment of leg 2. The new species is particularly similar to *A. bifurcatus*, both associated with anthipatharian corals, in having similar body form, mandible and leg 5. But *Asteropontius bifurcatus* has, unlike *A. minutisetiger*, only four apical setae on the inner lobe of maxillule, without a small, transformed seta and the plumose middle seta on the free segment of leg 5 (Kim, 2000). Furthermore, the inner seta on the first exopodal segment of leg 1 is more distinct in *A. bifurcatus*. Other remaining three species also differ from *A. minutisetiger*, because their mandibular palp (plus its distal seta) is shorter than the stylet and their second endopodal segment of legs 1-4 bears an unicuspid outer distal process.

Other significant features of *A. minutisetiger* are: the smallest setae on the inner lobe of maxillule is proximally expanded; the free segment of female leg 5 extends beyond the genital area; the distal claw of antenna is longer than the remaining part of endopod; the inner seta on the first exopodal segment of leg 1 is rudimentary. The last trait is remarkable, because the seta is almost unnoticeable and the absence of this seta is a major feature of the genus *Asteropontopsis* Stock, 1987.

***Asteropontius bispinifer* n. sp. (Figs. 99-101)**

Material examined. 25 ♀♀, 7 ♂♂ from a scleracinian coral (*Favites* sp.), at a depth of 4 m, south of Tany Kely, near Nosy Bé, Madagascar, 10 June 1967, collected by A. G. Humes. Holotype (♀), allotype (♂), and paratypes (22 ♀♀, 5 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 1 ♂) are retained in the collection of the author.

Female. Body (Fig. 99A) with rather broad prosome. Mean body length 820 µm (785-846 µm), based on 8 specimens. Body length of dissected specimen 835 µm, and maximum width 430 µm. Prosome 569 µm long. Lateral corners of prosomal somites rounded. Cephalothorax 362 µm long. Second to fourth pedigerous somite with narrow membranous fringes on lateral margins. Urosome (Fig. 99B) 4-segmented. Fifth pedigerous somite 132 µm wide. Genital double-somite 108 × 102 µm, consisting of laterally expanded anterior 1/3 and narrower posterior 2/3; narrower posterior part with 2 transverse rows of several spinules and posteriorly 2 scales on slightly convex lateral margins (Fig. 100F); genital area located at anterior 1/3 region of somite. Two

free abdominal somites relatively long, 55 × 60 and 50 × 60 µm, respectively. Caudal ramus 27 × 30 µm (0.90 : 1), with 6 setae. Egg sac (Fig. 99C) 233 × 176 µm; each egg about 130 µm in diameter.

Rostrum strongly tapering in anterior part and forming a short ridge in the posterior part (Fig. 99D). Antennule (Fig. 99E) 372 µm long and 19-segmented; all setae naked; ninth and 2 distal segments with 7 setae, 2 setae+aesthetasc, and 11 setae, respectively; other segments with 2 setae each; first segment with minute spinules on anterior margin. Antenna (Fig. 99F) with unarmed coxa; basis stout, 59 × 26 µm, and unornamented. Exopod very small, with 2 distal setae. Endopod with armature formula 0, 1, and 2+claw; first segment 71 × 17 µm; terminal claw 45 µm long, much shorter than first endopodal segment.

Oral cone 127 µm long, evenly tapering, and extending to insertions of maxillipeds. Mandible (Fig. 99G) consisting of stylet and palp. Stylet strong, 95 µm long, with denticles on expanded distal margin. Mandibular palp fused with distal seta, 105 µm long in total, with small proximal setule. Maxillule (Fig. 99H) bilobed. Inner lobe 49 × 20 µm, distally armed with 4 larger setae (50, 71, 48, and 29 µm from inner to outer) and 1 small seta. Outer lobe 19 × 6 µm, distally with 3 larger setae (72, 50, and 32 µm, respectively) and 1 small seta. Maxilla (Fig. 99I) slender; distal claw thin, with several spinules. Maxilliped (Fig. 100A) 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; second segment 91 × 33 µm, with several small spinules in distal part of outer margin; terminal claw 50 µm long, about 1.7 times as long as terminal segment.

Legs 1-4 with 3-segmented rami and bicuspid outer distal process on second endopodal segment (Fig. 100B-E). Leg 1 with thick spinules on inner side of posterior margin of basis; outer spine on first exopodal segment 35 µm long. Outer setae on basis of legs 1-4 naked, that of leg 1 small. Armature formula of legs 1-4 as follows:

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

Leg 5 provided with a dorsolateral plumose seta on fifth pedigerous somite and free segment (Fig. 100F); free segment (Fig. 100G) 42 × 15 µm (2.80 : 1), with 2 distal setae (outer 49 µm, and inner 67 µm) and smaller inner seta (25 µm). Leg 6 represented by 1 naked seta and 1 small spinule in the genital area.

Male. Body (Fig. 101A) narrower than that of female. Body

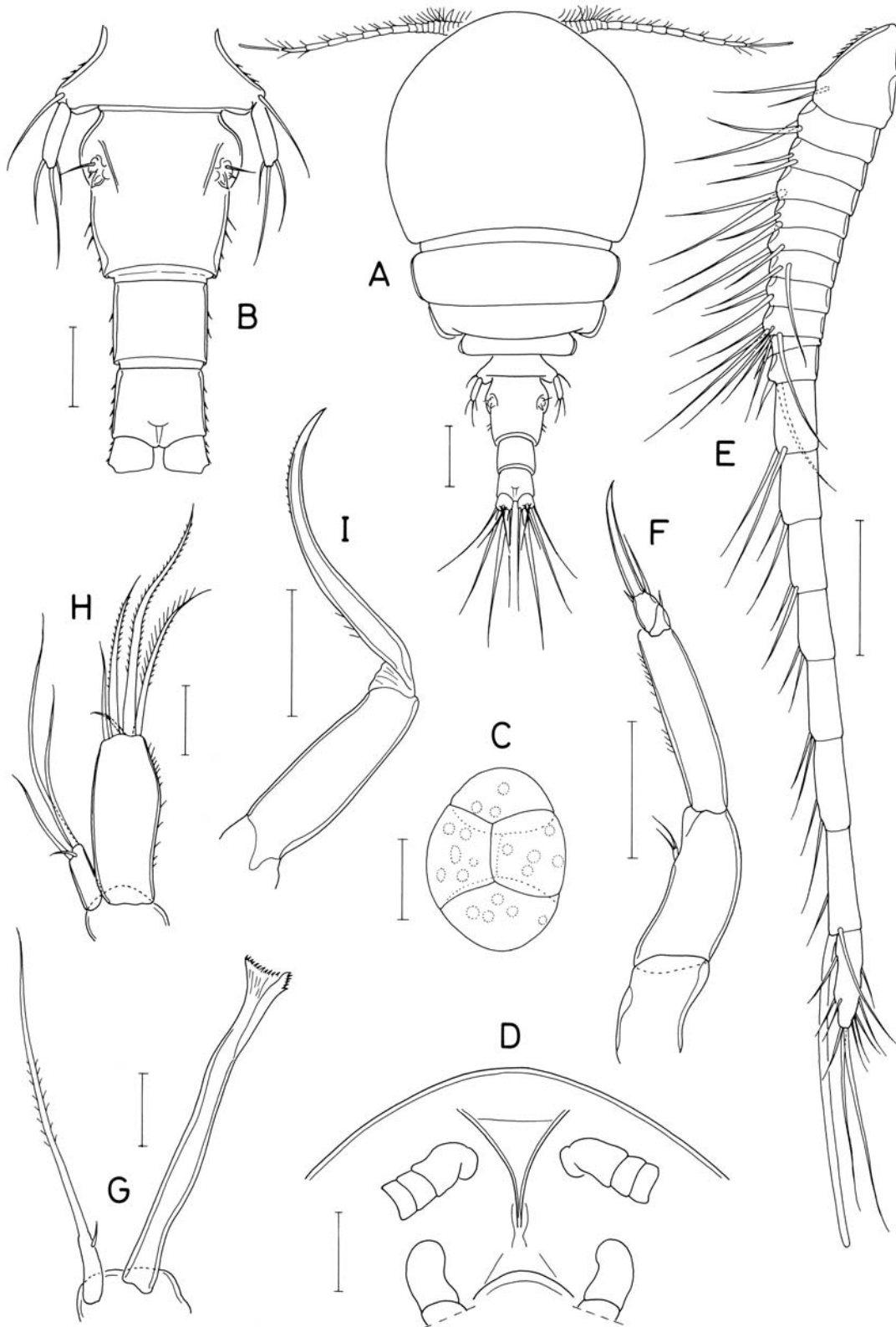


Fig. 99. *Asteropontius bispinifer* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, egg sac; D, rostral area, ventral; E, antennule; F, antenna; G, mandible; H, maxillule; I, maxilla. Scales: A, C, 0.1 mm; B, D-F, I, 0.05 mm; G, H, 0.02 mm.

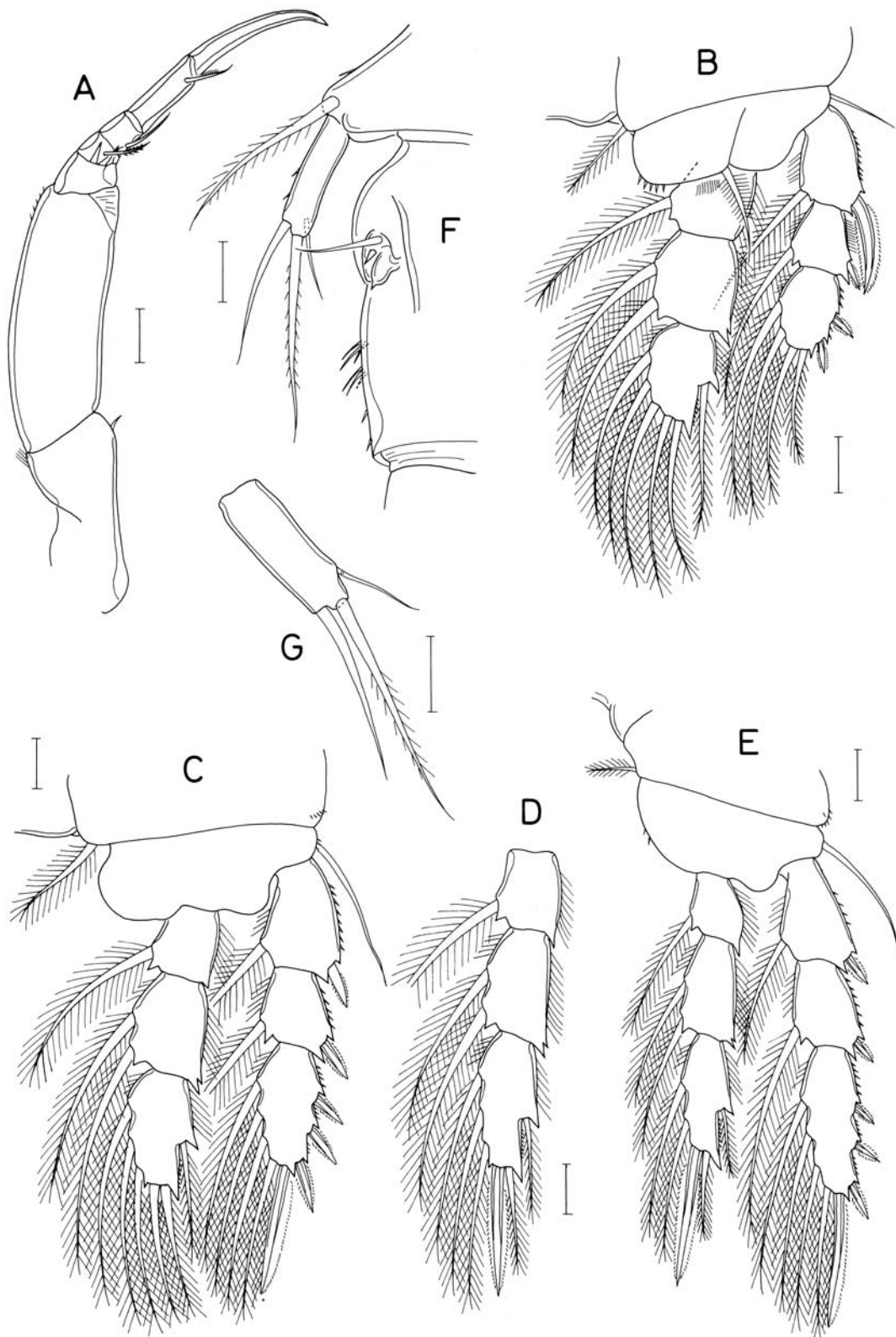


Fig. 100. *Asteropontius bispinifer* n. sp., female. A, maxilliped; B, leg 1; C, leg 2; D, endopod of leg 3; E, leg 4; F, left side of first two urosomal somites; G, free segment of leg 5. Scales: 0.02 mm for all.

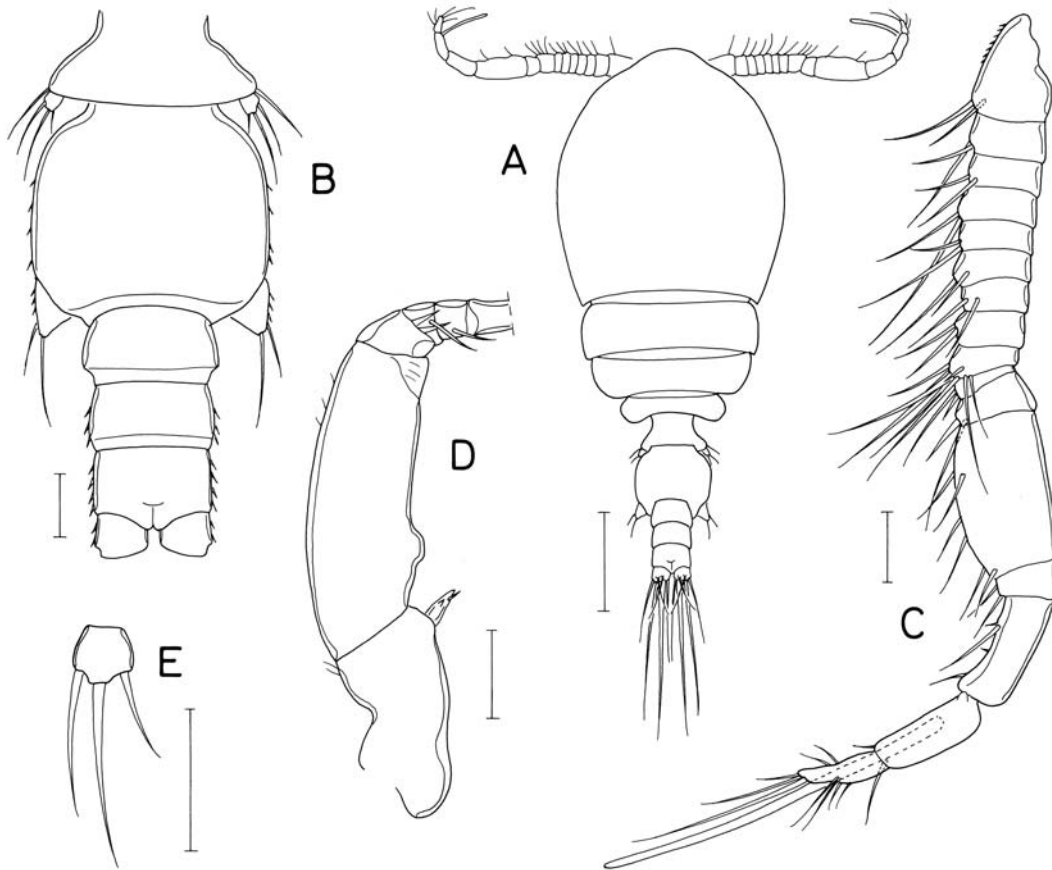


Fig. 101. *Asteropontius bispinifer* n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, proximal segments of maxilliped; E, free segment of leg 5. Scales: A, 0.1 mm; B-E, 0.02 mm.

length of dissected specimen 520 μm , and maximum width 223 μm . Prosome 353 μm long. Cephalothorax 250 μm long. Urosome (Fig. 101B) 5-segmented. Fifth pedigerous somite 67 μm wide. Genital somite 65 \times 78 μm , with nearly parallel lateral margins. Three abdominal somites 24 \times 44, 21 \times 41, and 26 \times 38 μm , respectively. Caudal ramus 15 \times 17 μm .

Rostrum and antenna as in female. Antennule (Fig. 101C) 252 μm long and 16-segmented; ninth, twelfth, and 3 distal segments with 8 setae, 6 setae, 4 setae, 2 setae+aesthetasc, and about 9 setae, respectively; other segments with 2 setae each.

Maxilliped with first segment bearing strong inner distal spine bearing subdistally 1 spinule and 1 setule (Fig. 101D); second segment with truncated proximal process on inner margin. Other mouth organs as in female.

Legs 1-4 as in female. Free segment of leg 5 (Fig. 101E) very small, 8 \times 8 μm , and armed with 3 naked setae. Leg 6 represented by 2 naked unequal setae on genital flap (Fig. 101B).

Etymology. The specific name *bispinifer* is a combination of the Latin words *bini* (two), *spina* (spine), and *fero* (to bear). It alludes to the presence of only two outer spines on the first exopodal segment of leg 1, as in some asterocheid copepods. *Remarks.* Only two species in the genus *Asteropontius* have been known to have, as *Asteropontius bispinifer* n. sp. does, only two outer spines on the third exopodal segment of leg 1 (armature formula II,2,2). These species are *A. typicus* Thomson and Scott, 1903, the type species, and *A. parvipes* recorded in the present paper. The new species differs from the two congeners in having the bicuspid outer distal process on the second endopodal segment of legs 1-4. It can be further differentiated from *A. typicus*, because the latter species has a free segment of female leg 5 which does not exceed twice as long as wide, and from *A. parvipes* in which the genital double-somite has 7-9 setules on the lateral margins.

Other important features of the new species are the shortness of the distal claw of the antenna and the lack of setules on the lateral margins of the genital double-somite.

Key to species of *Asteropontius*

1. Third exopodal segment of leg 1 with 2 spines and 4 setae (armature formula II,2,2) 2
 - Third exopodal segment of leg 1 with 3 or 4 spines and 4 setae (armature formula III,2,2 or IV,2,2) 4
2. Second endopodal segment of legs 1-4 with bicuspid outer distal corner *bispinifer* n. sp.
 - Second endopodal segment of legs 1-4 with unicuspid outer distal corner 3
3. First free abdominal somite distinctly longer than wide *typicus* Thompson & Scott
 - First free abdominal somite wider than long *parvipes* n. sp.
4. Third endopodal segment of leg 3 with 6 setae (formula 1,2,3) *laccadivensis* Nair & Pillai
 - Third endopodal segment of leg 3 with 1 spine and 5 setae (formula 1,1+I,3) 5
5. Third endopodal segment of leg 2 with 1 spine and 5 setae (formula 1,1+I,3) 6
 - Third endopodal segment of leg 2 with 6 setae (formula 1,2,3) 10
6. Second endopodal segment of legs 1-4 with bicuspid outer distal corner 7
 - Second endopodal segment of legs 1-4 with unicuspid outer distal corner 8
7. Inner lobe of maxillule with 4 distal setae *bifurcatus* Kim
 - Inner lobe of maxillule with 5 setae *minutisetiger* n. sp.
8. Caudal ramus longer than wide; mandibular palp as long as stylet *iuxtus* Stock
 - Caudal ramus wider than long; mandibular palp shorter than stylet 9
9. Free segment of female leg 5 tapering *corallophilus* Stock
 - Free segment of female leg 5 nearly rectangular *dissimilis* Kim
10. Second endopodal segment in all or some of legs 1-4 with bicuspid outer distal corner 11
 - Second endopodal segment of all legs 1-4 with unicuspid outer distal corner 20
11. Third exopodal segment of leg 1 with 4 outer spines 12
 - Third exopodal segment of leg 1 with 3 outer spines 15
12. Female antennule 19-segmented *minutus* Kim
 - Female antennule 20-segmented 13
13. Mandibular palp as long as stylet *brevioris* Kim
 - Mandibular palp shorter than stylet 14
14. Distal claw of antenna distinctly longer than first endopodal segment; free segment of female leg 5 less than twice as long as wide *acroporus* Kim
 - Distal claw of antenna nearly as long as first endopodal segment; free segment of female leg 5 more than twice as long as wide *caledonensis* Kim
15. Female antennule 19-segmented 16
 - Female antennule 20-segmented 17
16. Distal claw of antenna longer than first endopodal segment *humesi* n. sp.
 - Distal claw of antenna shorter than first endopodal segment *orcafer* n. sp.
17. Female genital double-somite wider than long; mandibular palp longer than stylet *goniopora* Kim
 - Female genital double-somite longer than or as long as wide; mandibular palp shorter than stylet 18
18. Second endopodal segment of leg 1 with unicuspid outer distal corner; free segment of female leg 5 more than twice as long as wide *membranulatus* n. sp.
 - Second endopodal segment of leg 1 with bicuspid outer distal corner; free segment of female leg 5 less than twice as long as wide 19
19. First segment of antennule with 1 seta; distal claw of antenna as long as first endopodal segment *fungicola* Kim
 - First segment of antennule with 2 setae; distal claw of antenna shorter than first endopodal segment *dentatus* n. sp.
20. At least some of setae on lobes of maxillule specialized (enlarged or heavily plumose) 21
 - Setae on lobes of maxillule not specialized 25
21. Lateral margins of genital double-somite without setules *bilinguis* n. sp.
 - Lateral margins of genital double-somite with setules 22
22. About 50 setules on lateral margin of genital double-somite *ungellatus* Stock
 - Setules less than 10 on lateral margin of genital double-somite 23
23. Female antennule 19-segmented; one of setae on outer lobe of maxillule large and plumose *pinnatus* n. sp.
 - Female antennule 20-segmented; outer lobe of maxillule without specialized seta 24
24. Mandibular palp shorter than stylet; 3 of 5 setae on inner lobe of maxillule large and plumose *plumatus* n. sp.
 - Mandibular palp longer than stylet; 1 of 5 setae on inner lobe of maxillule large and plumose *magnisetiger* n. sp.
25. Female antennule 20-segmented 26
 - Female antennule 18- or 19-segmented 28
26. Lateral margin of genital double-somite with about 100 setules; mandibular palp longer than stylet

- *capillatus* n. sp.
- Lateral margin of genital double-somite with less than 15 setules; mandibular palp shorter than stylet 27
- 27. Lateral margin of genital double-somite with about 14 setules; distal claw of antenna longer than first endopodal segment *angulatus* n. sp.
- Lateral margin of genital double-somite with about 7 setules; distal claw of antenna shorter than first endopodal segment *trifilis* n. sp.
- 28. Mandibular palp nearly as long as stylet 29
- Mandibular palp shorter than stylet 30
- 29. Lateral margin of genital double-somite without setules; distal claw of antenna shorter than first endopodal segment *latioriger* n. sp.
- Lateral margin of genital double-somite with setules; distal claw of antenna longer than first endopodal segment *mycetophylliae* Varela, Ortiz & Lalana
- 30. Exopod of antenna about 4 times as long as wide *elizabethae* Johnsson
- Exopod of antenna about twice as long as wide 31
- 31. Inner lobe of maxillule with 2 distal setae *proximus* Stock
- Inner lobe of maxillule with 4 distal setae *longipalpus* Stock

Genus *Collocherides* Stock, 1971

***Collocherides minutus* n. sp. (Figs. 102, 103)**

Material examined. 10 ♀♀, 8 ♂♂ from one unidentified ophiuroid with rather soft disk dorsally mottled with areas of brown covered with minute white dots, at a depth of 1.5 m, Pointe Mahatsinjo, Nosy Bé, Madagascar, 18 October 1960, collected by A. G. Humes. Holotype (♀), allotype (♂), and paratypes (8 ♀♀, 6 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (1 ♀, 1 ♂) are retained in the collection of the author.

Female. Body (Fig. 102A) small and narrow. Mean body length 498 µm (492-504 µm), based on 10 specimens. Body length of dissected specimen 498 µm, and maximum width 200 µm. Prosome nearly elliptical and 341 µm long. Cephalothorax 198 µm long, distinctly longer than remaining part of prosome. Third pedigerous somite with posteriorly extended posterolateral corners. Fourth pedigerous somite with pair of rugged, fleshy outgrowths in indented posteromedian region (Fig. 102A). Urosome (Fig. 102B) 5-segmented. Fifth pedigerous somite 70 µm wide. Genital double-somite 73 × 80 µm, with narrow anterior neck region, expanded remaining part gradually narrowed posteriorly; genital area located near midway of somite. Genital double- and first free abdominal somites each with 2 pairs of setules, one pair of which

on posteroventral margin and the other pair near posterolateral corners (Fig. 102C). Three free abdominal somites 18 × 47, 15 × 41, and 20 × 36 µm, respectively. Caudal ramus 21 × 15 µm (1.40 : 1), with 6 setae. Egg sac 148 × 89 µm, containing only 1 egg.

Rostrum lacking. Antennule (Fig. 102D) 190 µm long, 17-segmented, gradually narrowed distally; first segment with 1 seta; second segment with 3 rudimentary transverse suture lines, with 8 setae; sixth segment with 6 setae; fifteenth segment with 2 setae and 1 aesthetasc; last segment with 11 setae; other segments with 2 setae each; all setae naked. Antenna (Fig. 102E) with small coxa; basis 42 µm long and smooth. Exopod represented by 3 setae in the middle of the outer margin of basis. Endopod 2-segmented; first segment 20 µm long, unornamented, and gradually broadened distally; second segment about 11 µm long, with 1 proximal and 3 distal spiniform setae; terminal claw 26 µm long and truncated.

Oral cone short and directed ventrally. Mandible (Fig. 102F) consisting of stylet and palp. Stylet 67 µm long, with 8 or 9 teeth arranged in 2 rows at tip. Mandibular palp 1-segmented, 17 µm long and tipped with 1 large naked seta being 72 µm long. Maxillule (Fig. 102G) bilobed. Inner lobe 17 × 10 µm, with 3 distal setae (57, 53, and 51 µm, respectively). Outer lobe 19 × 6 µm with 2 distal setae (61 and 23 µm, respectively), smaller seta plumose. Maxilla (Fig. 102H) 2-segmented, not including terminal claw; proximal segment 46 µm long; slender distal segment 49 µm long; terminal claw 36 µm long, clearly defined from distal segment, and strongly curved, with broadened tip. Maxilliped (Fig. 102I) 6-segmented, with armature formula 1, 1, 2, 1, 1, and 1+claw; inner seta on second segment rudimentary, hardly visible, and located in the middle of inner margin; terminal claw 30 µm long, 1.5 times as long as terminal segment, with broadened tip.

Legs 1-4 (Figs. 103A-D) with 3-segmented rami, without inner seta on coxa. Legs 2-4 with bicuspid outer distal process on second endopodal segment. Armature formula of legs 1-4 as follows:

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

Leg 5 (Fig. 103E) 2-segmented; proximal segment nearly triangular, 23 × 24 µm, with 1 naked outer seta; distal segment (Fig. 103F) ovoid, 40 × 24 µm, with 3 unequal setae and on inner margin spinules. Leg 6 represented by 1 small

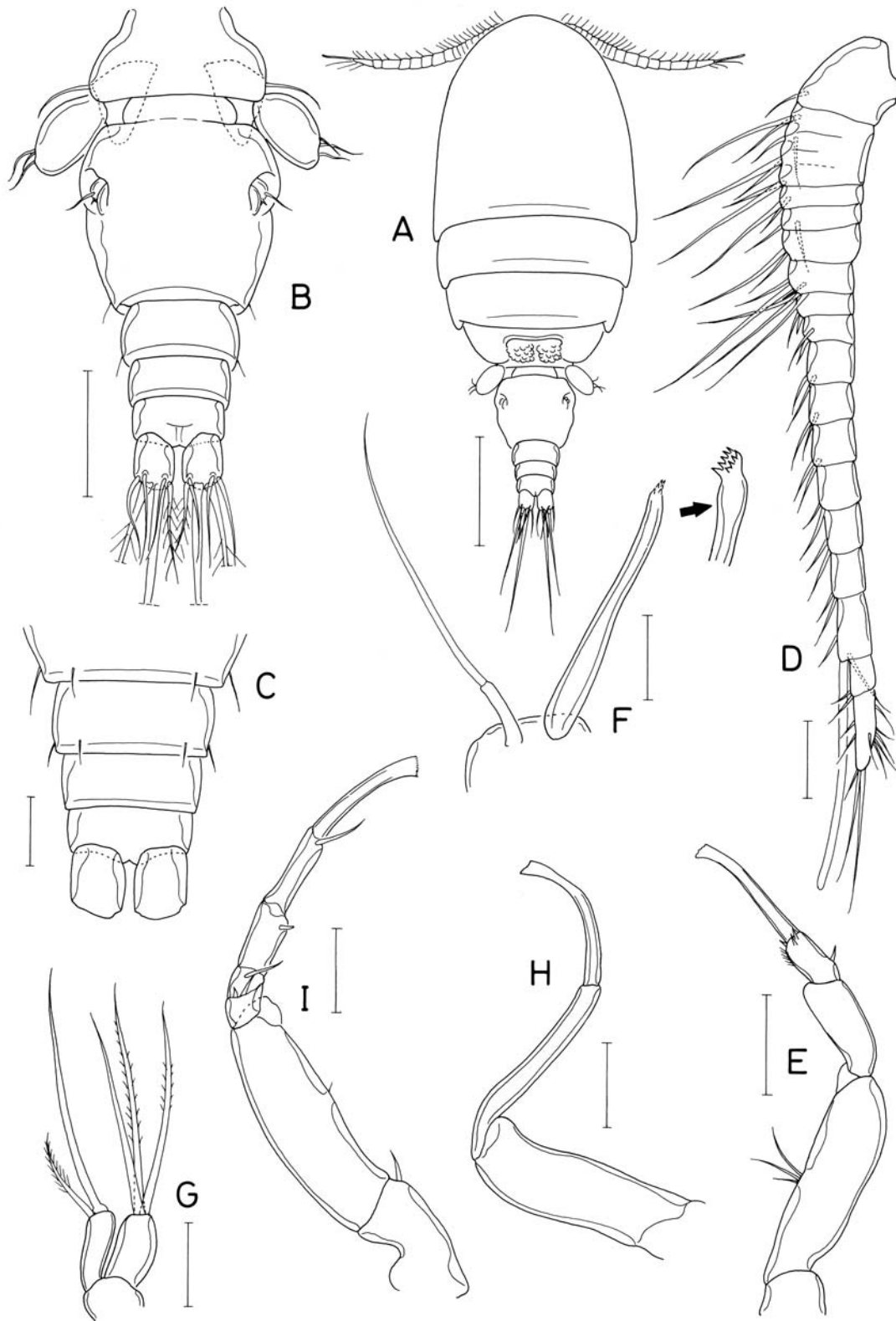


Fig. 102. *Collocherides minutus* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, abdomen, ventral; D, antennule; E, antenna; F, mandible; G, maxillule; H, maxilla; I, maxilliped. Scales: A, 0.1 mm; B, 0.05 mm; C-I, 0.02 mm.

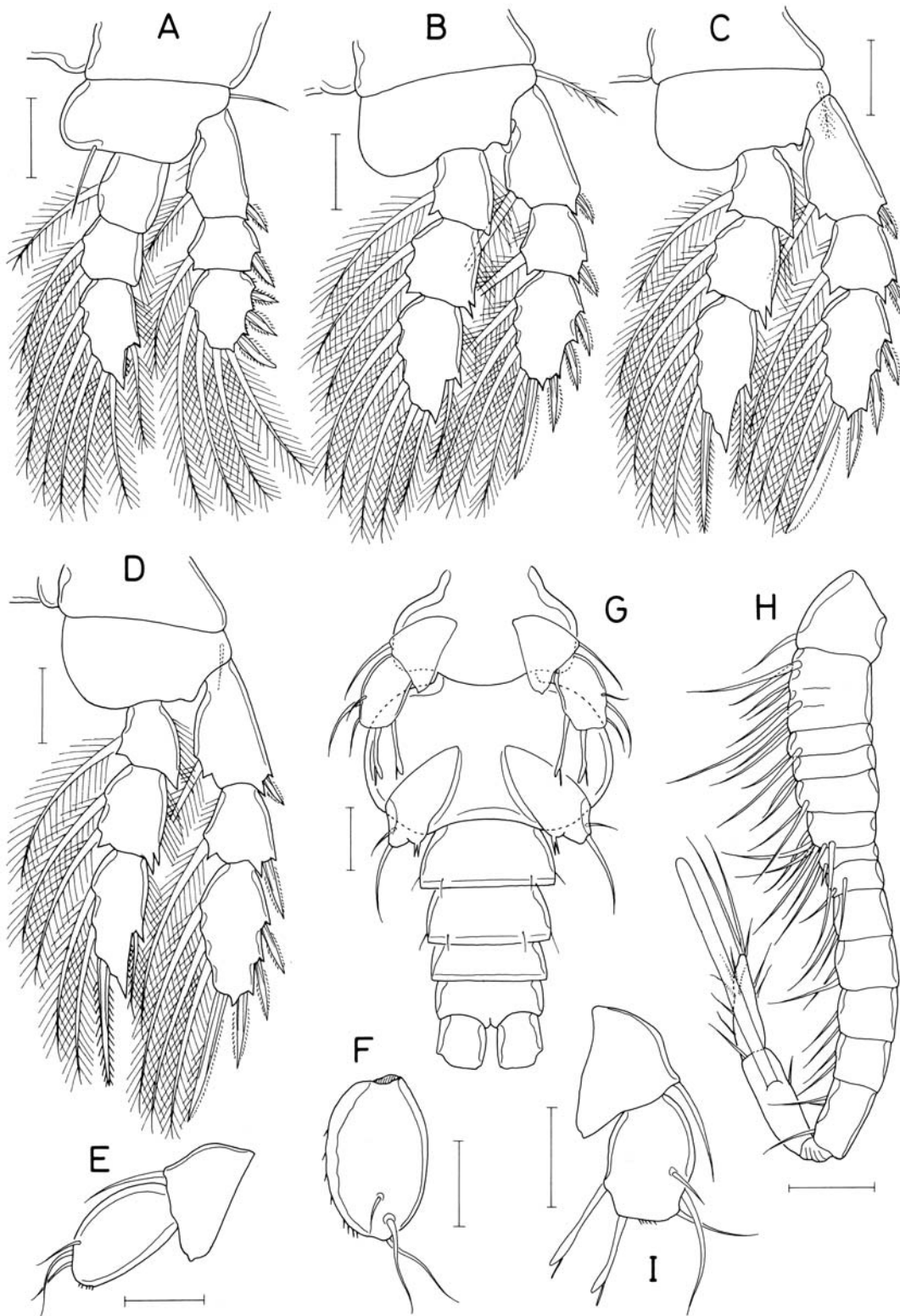


Fig. 103. *Collocherides minutus* n. sp. Female: A, leg 1; B, leg 2; C, leg 3; D, leg 4; E, leg 5; F, free segment of leg 5. Male: G, urosome, ventral; H, antennule; I, leg 5. Scales: 0.02 mm for all.

seta and 1 minute spinule in genital area.

Male. Body similar to that of female. Mean body length 431 μm (412–446 μm), based on 7 specimens. Prosome 295 \times 165 μm , Urosome (Fig. 103G) 6-segmented. Fifth pedigerous somite 59 μm wide. Genital somite 51 \times 80 μm , with strongly convex lateral margins. Four abdominal somites 22 \times 44, 18 \times 39, 12 \times 37, and 15 \times 35 μm , respectively. Caudal ramus 18 \times 15 μm (1.20 : 1).

Rostrum lacking. Antennule (Fig. 103H) 185 μm and 15-segmented, strongly geniculate between thirteenth and fourteenth segments; numbers of setae on first, second, sixth, and distal 3 segments 1, 8, 7, 3, 2+aesthetasc, and 11. Antenna as in female.

Mouthparts and leg 1–4 not different from those of female.

Leg 5 (Fig. 103I) with proximal segment of 22 \times 23 μm ; distal segment 25 \times 17 μm , with 3 outer simple setae and 2 inner digitiform setae (19 and 17 μm , respectively) bearing subdistal flagellum. Leg 6 represented by 2 unequal setae and 1 small bifurcate process on genital flap (Fig. 103G).

Etymology. The specific name *minutus*, with the Latin meaning “small”, indicates the small body size of the new species.

Remarks. The genus *Collocherides* Stock, 1971 currently comprises four known species. They are *C. astroboae* Stock, 1971, *C. bleptus* Humes, 1993, *C. brychius* Humes, 1999, and *C. singularis* Humes, 1986 (Humes, 1999). *Collocherides minutus* n. sp. shows the following differences from the four congeners: (1) the short caudal rami, with the ratio of length to width 1.40 : 1 (the lowest ratio is known as 2.75 : 1 for both *C. bleptus* and *C. brychius*); (2) the antennule is 17-segmented in the female and 15-segmented in the male (in all of four known species it is 20-segmented in the female and 18- or 19-segmented in the male); (3) the exopod of antenna is provided with three setae (in other known species it is provided with one or two setae); (4) the maxillule has three setae on the inner lobe and two setae on the outer lobe (in three known species except for *C. brychius* they are four and one, respectively); (5) the distal segment of male leg 5 is armed with three setae and two spines (five setae in *C. bleptus* and *C. singularis*).

Cyclocheres n. gen.

Diagnosis. Body very broad, with large, circular prosome and small urosome. Prosome consisting of cephalothorax and 3 pedigerous somites. Urosome 4-segmented in female and 5-segmented in male. Caudal ramus armed with 5 setae and 1 aesthetasc. Antennule 20-segmented in female and 18-segmented in male. Antenna with 1-segmented exopod and 3-segmented endopod. Oral cone blunt and short. Mandible consisting of stylet and 2-segmented palp. Maxillule bilobed with 5 setae on inner lobe and 4 setae on outer lobe.

Maxilliped 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw. Legs 1–3 with 3-segmented rami. Leg 4 with 3-segmented exopod and endopod lacking. Inner seta on coxa lacking in legs 1–4; setation on these legs reduced.

Type species. *Cyclocheres sensilis* n. sp.

Etymology. The generic name *Cyclocheres* is a combination of the Greek *kyklos* (a circle) and *-cheres*, the ending of many asterocherid genera. It alludes to the circular cephalothorax of the type species. Gender is masculine.

Remarks. Within the family Asterocheridae only two known genera *Cletofontius* Thompson and Scott, 1903 and *Temanus* Humes, 1997 are comparable with *Cyclocheres* n. gen. in having a 3-segmented exopod without an endopod in leg 4.

Cyclocheres n. gen. is readily distinguished from *Temanus*, because the latter genus has a 3-segmented maxilliped and the antenna is lacking an exopod.

The genus *Cletofontius* comprises two nominal species, *Cletofontius serratus* Thompson and Scott, 1903 and *Cletofontius titanus* Johnsson, 1999. Thompson and Scott (1903) recorded *Cletofontius serratus* as it has a 2-segmented exopod of antenna and a 1-segmented mandibular palp, both characteristics are significantly different from those of *Cyclocheres*. Other important differential features of *Cletofontius serratus* are the possession of a plumose inner coxal seta on leg 1, two inner setae on the second endopodal segment of the same leg, and armature formulae of legs 3 and 4, which are markedly different from those of *Cyclocheres*.

Johnsson (1999a) recorded *Cletofontius titanus* as an associate of a sponge from Brazil. This species has a 1-segmented exopod of antenna, no inner seta on the basis of leg 1, and armature formulae of legs 3 and 4 that are different from those of the type species of *Cletofontius*. I consider that *C. titanus* can not be placed in a same genus with *Cletofontius serratus*. Instead, the Brazilian species exhibits some similarities with *Cyclocheres* n. gen. They share a small body size, similar body forms, long lateral setules on the female genital double-somite, a broadened apex of mandibular stylet, and a 1-segmented exopod of antenna. However, *Cletofontius titanus* cannot be incorporated in the genus *Cyclocheres*, because in *C. titanus*, according to Johnsson (1999a), the mandibular palp is 1-segmented, legs 1 and 2 bear an inner seta on coxa, and legs 1, 3, and 4 display armature formulae strongly different from those of *Cyclocheres*. *Cletofontius titanus* needs to be re-examined.

Cyclocheres sensilis n. sp. (Figs. 104–106)

Material examined. 13 ♀♀, 2 ♂♂ from a grey sponge, at a depth of 3 m, Six Men’s Bay, Barbados, 8 July 1959, collected by A. G. Humes and R. U. Gooding. Holotype (♀), allotype (♂), and paratypes (10 ♀♀) have been deposited in the

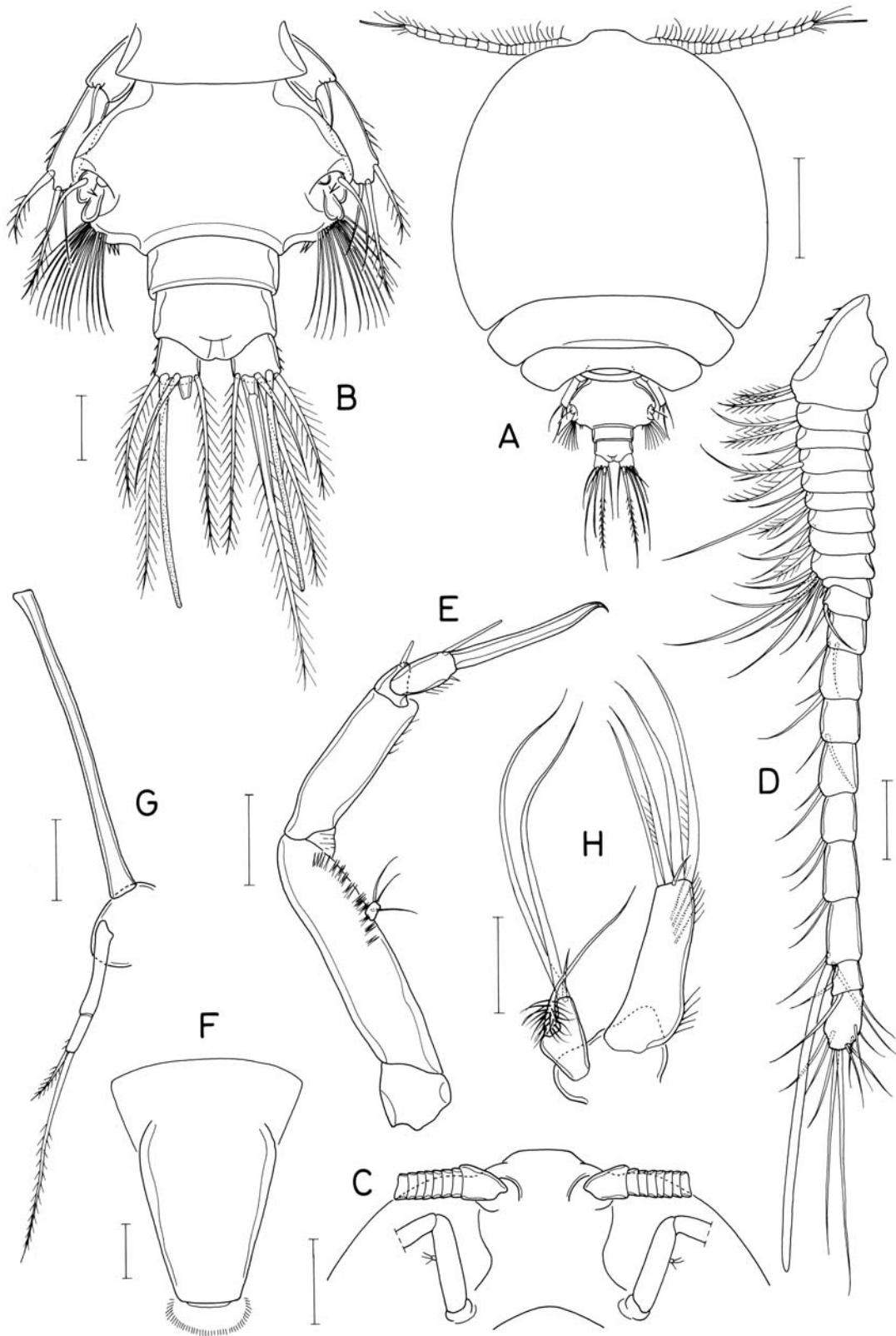


Fig. 104. *Cyclocheres sensilis* n. gen. n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, rostral area, ventral; D, antennule; E, antenna; F, oral cone; G, mandible; H, maxillule. Scales: A, 0.1 mm; B, D-H, 0.02 mm; C, 0.05 mm.

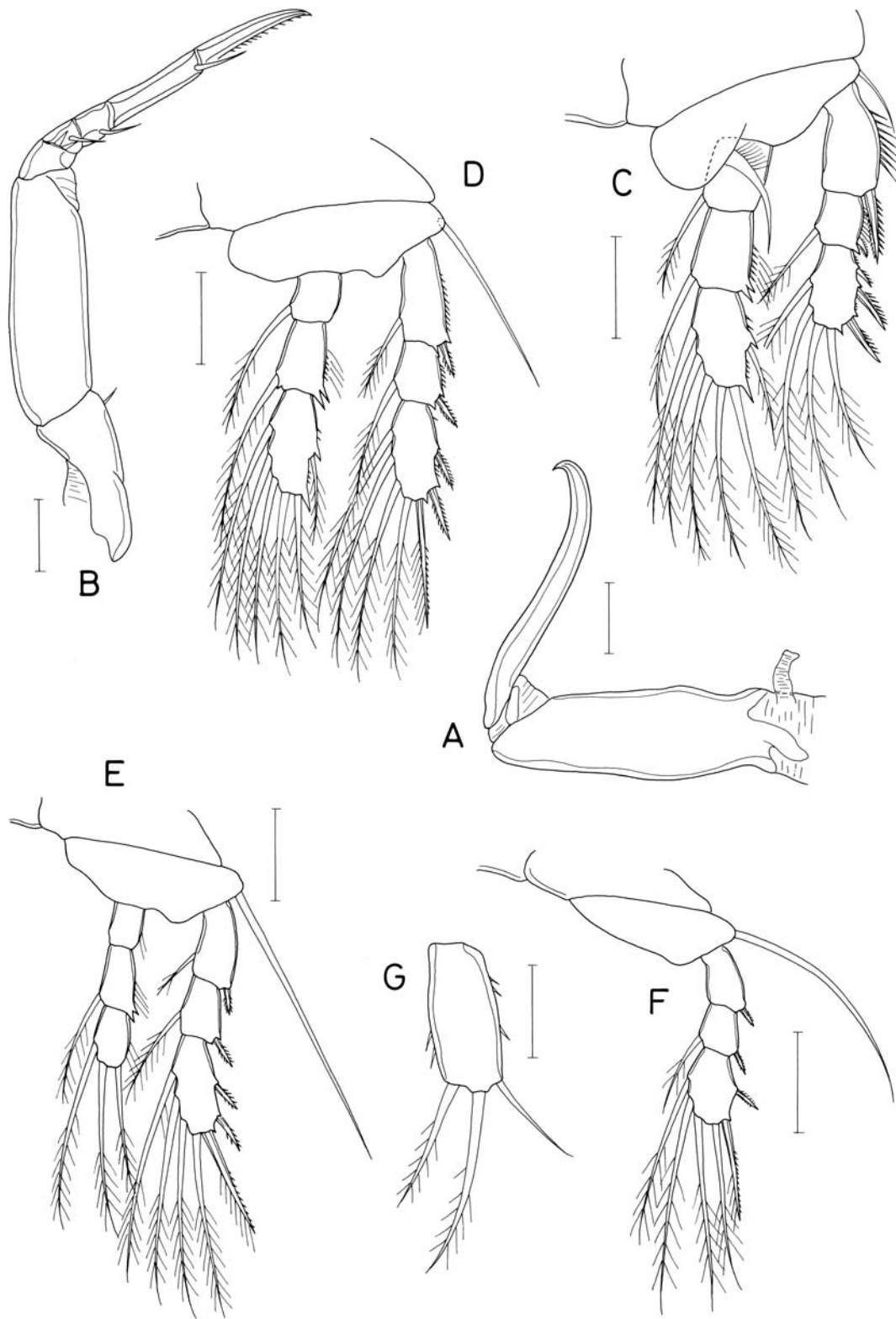


Fig. 105. *Cyclocheres sensilis* n. gen. n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, leg 3; F, leg 4; G, free segment of leg 5. Scales: 0.02 mm for all.

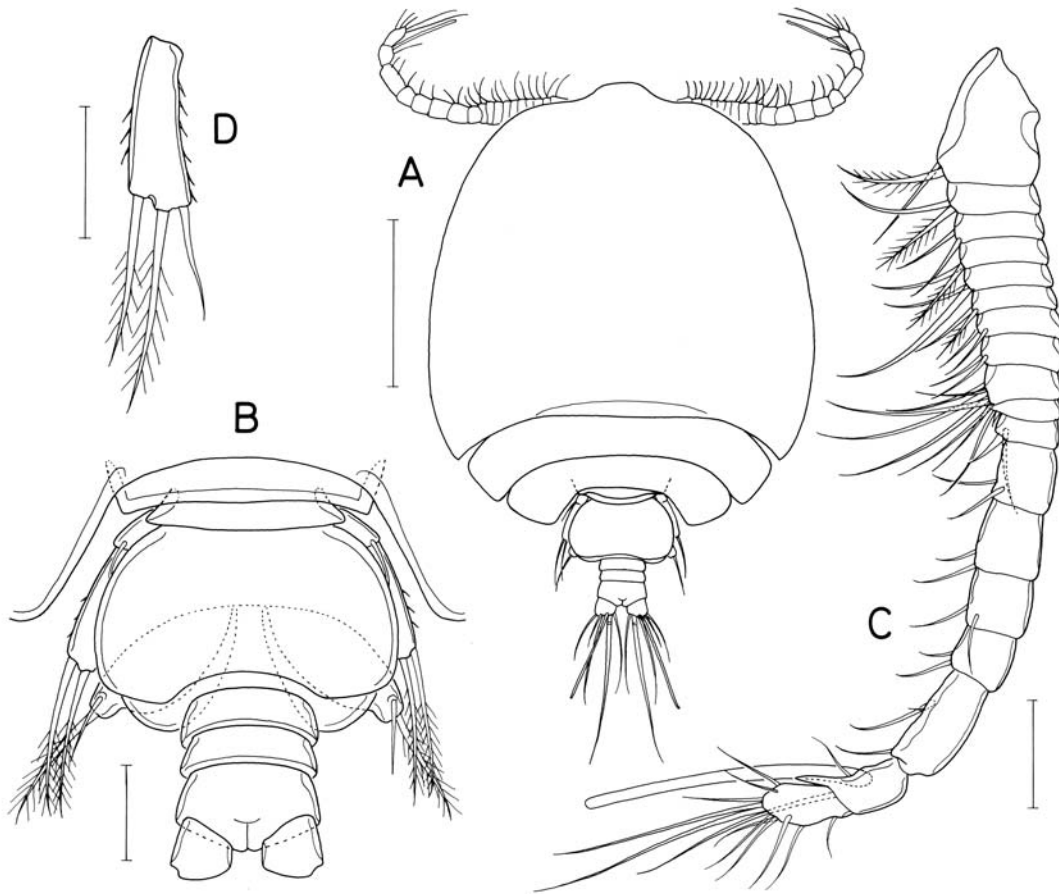


Fig. 106. *Cyclocheres sensilis* n. gen. n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, free segment of leg 5. Scales: A, 0.1 mm; B-D, 0.02 mm.

National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 1 ♂) are retained in the collection of the author.

Female. Body (Fig. 104A) small and nearly circular. Mean body length 426 μm (406–443 μm), based on 10 specimens. Body length of dissected specimen 443 μm , and maximum width 319 μm . Prosome 349 μm long. Cephalothorax 269 μm long, longer than half length of body, and wider than long; with slightly pronounced and truncated anterior apex. Fourth pedigerous somite very small and hardly visible in dorsal view of the body. Urosome (Fig. 104B) 4-segmented. Fifth pedigerous somite 60 μm wide, with angular posterolateral corners. Genital double-somite 48 \times 88 μm , greatly expanded laterally, with 13 or 14 large setules and 2 or 3 small spinules on lateral margin posterior to genital area; genital area located posterior to midway of somite. Two free abdominal somites 15 \times 42 and 24 \times 38 μm , respectively. Caudal ramus 14 \times 14 μm , armed with 5 setae and 1 aesthetasc.

Rostrum broad but short, without posterior margin (Fig. 104C). Antennule (Fig. 104D) 190 μm long and 20-segmented; ninth, eighteenth, and last segments with 7 setae, 2 setae + aesthetasc, and 11 setae, respectively; other segments with 2 setae each; several setae on proximal segments plumose. Antenna (Fig. 104E) slender; coxa small and naked; basis 56 \times 15 μm , with row of pectinate spinules. Exopod small, 4 \times 2.5 μm , with 2 distal and 1 lateral setae. Endopod 3-segmented; first segment 40 \times 12 μm and unarmed; second segment with 1 blunt seta; third segment with 1 blunt and 1 minute setae; terminal claw 37 μm long.

Oral cone (Fig. 104F) 89 \times 49 μm , stout, with truncated apex fringed with serrate membrane, and extending to middle of maxillipedal insertions. Mandible (Fig. 104G) consisting of rod-shaped stylet and palp. Stylet 80 μm long, with truncated, smooth tip. Mandibular palp 2-segmented; proximal and distal segments 24 and 10 μm long each; 2 distal setae 54 and 15 μm , both weakly plumose. Maxillule (Fig. 104H) bilobed. Inner lobe 38 \times 13 μm , armed distally with 4

setae (51, 46, 40, and 36 μm from inner to outer) and 1 small seta. Outer lobe $17 \times 9 \mu\text{m}$, expanded in the middle, distally with 3 naked setae (71, 66, and 10 μm , respectively) and 1 subdistal seta (36 μm) proximally thickened and densely plumose. Maxilla (Fig. 105A) with short, aesthetasc-like proximal element on proximal segment; distal claw naked and as long as proximal segment. Maxilliped (Fig. 105B) 6-segmented, with armature formula 1, 0, 2, 1, 1, and 1+claw; second segment $67 \times 22 \mu\text{m}$ and smooth; terminal claw 35 μm , slightly longer than terminal segment, with spinules along the inner margin.

Legs 1-3 (Fig. 105C-E) with 3-segmented rami. Leg 4 (Fig. 105F) with 3-segmented exopod but without endopod. All these legs without inner seta on coxa. Outer seta on basis of legs 3 and 4 very large and longer than exopod. First exopodal segment of leg 3 with or without inner seta. Armature formula of legs 1-4 as follows:

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

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

Leg 3: coxa 0-0; basis 1-0; exp. I-1 (I-0); I-1; II,I,4;
enp. 0-0; 0-1; 0,2,1

Leg 4: coxa 0-0; basis 1-0; exp. I-0; I-1; II,I,4;
enp. (lacking).

Leg 5 2-segmented; proximal segment fused with fifth pedigerous somite and armed with 1 small dorsolateral seta; free segment (Fig. 105G) $33 \times 15 \mu\text{m}$, with few scales on lateral margins and 3 distal setae (29, 41 and 23 μm from outer to inner). Leg 6 represented by 1 naked seta and 1 small spinule in genital area (Fig. 104B).

Male. Body (Fig. 106A) similar in form to that of female. Body length of dissected specimen 318 μm . Prosoma 247 \times 230 μm . Cephalothorax 200 μm long. Urosome 5-segmented (Fig. 106B). Fifth pedigerous somite 41 μm wide. Genital somite $33 \times 63 \mu\text{m}$, about twice as wide as long. Three abdominal somites 8×29 , 7×29 , and $18 \times 30 \mu\text{m}$, respectively. Caudal ramus $12 \times 12 \mu\text{m}$.

Rostrum and antenna as in female. Antennule (Fig. 106C) 164 μm long and 18-segmented; ninth, and 3 distal segments with 7 setae, 3 setae, 2 setae+aesthetasc, and 11 setae, respectively.

All mouth organs, including maxilliped, as in female. Legs 1-4 also as in female. Free segment (Fig. 106D) of leg 5 $26 \times 9 \mu\text{m}$, gradually widened distally; 3 distal setae 26, 31, and 18 μm from outer to inner. Leg 6 represented by 1 plumose and 1 smaller, naked setae on produced genital flap (Fig. 106B).

Etymology. The specific name *sensilis* is a Latin meaning "sensitive". It refers to the possession of an aesthetasc, a sensory filament, on the caudal ramus, which is transformed

from a dorsal seta.

Stenomyzon n. gen.

Diagnosis. Body narrow and tapering. Cephalothorax distinctly broader than other somites. Urosome 4-segmented in female and 5-segmented in male. Antennule 19-segmented in female and 17-segmented in male. Antenna with 1-segmented exopod and 3-segmented endopod. Oral cone short and blunt. Mandible consisting of 1-segmented palp bearing 2 distal setae, without gnathobase. Maxillule bilobed, with 4 setae on inner lobe and 3 setae on outer lobe. Maxilla 2-segmented. Maxilliped 5-segmented. Legs 1-3 with 3-segmented rami. Leg 4 with 3-segmented exopod and 2-segmented endopod. Legs 1-4 without inner seta on coxa. Setation of these legs reduced.

Type species. *Stenomyzon edentatum* n. sp.

Etymology. The generic name *Stenomyzon* is derived from the Greek *stenos*, meaning "narrow", and *-myzon*, the ending of many genera of Asterocheridae. It alludes to the narrow body of the new genus. Gender is neuter.

Remarks. The absence of a mandibular gnathobase seems to be the most significant feature justifying the proposal of this new genus, because this feature has not been reported in the Asterocheridae.

In the genera *Australomyzon* Nicholls, 1944, *Doropontius* Thompson and Scott, 1903, *Paracontiphorus* Eiselt, 1961, and *Discopontius* Nicholls, 1944, the morphology of mandible has not been clearly defined. Therefore, they should be compared with the new genus in different ways. One of the diagnostic features of *Stenomyzon* n. gen. is the 2-segmented endopod of leg 4. This feature is shared by four genera in the Asterocheridae: *Discopontius*, *Siphonopontius* Malt, 1991, *Tondua* Humes, 1997, and *Peltomyzon* Stock, 1975. *Tondua* and *Peltomyzon* lack an exopod on the antenna and, therefore, differs from *Stenomyzon*. *Discopontius* also differs from *Stenomyzon* in having a circular, disc-shaped body and 13-segmented female antennules. *Siphonopontius* has no inner seta on the second endopodal segment of leg 1, an armature formula 1,2,2 on the third endopodal segment of leg 2 (compared to 1,2,3 in *Stenomyzon*), and one spine and two setae on the third endopodal segment of leg 3 (only two setae in *Stenomyzon*).

It is noticed that *Stenomyzon* exhibits a body form very similar to that of *Gomumucheres* Humes, 1996 known from a sponge in the Moluccas. These two genera share, in particular, the characteristic form of the female genital double-somite, in which the anterior part expands over the narrower posterior part. But the similarity is superficial, because the latter genus carries a mandibular gnathobase and well-developed setation on legs 1-4.

***Stenomyzon edentatum* n. sp. (Figs. 107-119)**

Material examined. 57 ♀♀, 24 ♂♂ from a brownish-black sponge, Phosphorescent Bay, Puerto Rico, 10 August 1959, collected by A. G. Humes and R. U. Gooding. Holotype (♀), allotype (♂), and paratypes (54 ♀♀, 21 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (5 ♀♀, 2 ♂♂) are retained in the collection of the author.

Female. Body (Fig. 107A) narrow. Mean body length 585 µm (565-615 µm), based on 10 specimens. Body length of dissected specimen 589 µm. Prosome 386 µm long. Cephalothorax 216 × 302 µm, much wider than long, with rounded posterolateral corners. Rostral area slightly produced anteriorly. Second and following pedigerous somites much narrower than cephalothorax. Suture lines faint between cephalothorax and second pedigerous somite and between second and third pedigerous somites. Urosome (Fig. 107B) dorsoventrally flat and 4-segmented. Fifth pedigerous somite 96 µm wide. Genital double-somite 85 × 148 µm, greatly expanded laterally, with wing-like expansion in anterior half and strongly tapering posterior half; genital area located dorsally at midway of somite. Two free abdominal somites measure 46 × 60 and 40 × 44 µm, respectively, showing a thick exoskeleton. Anal somite armed with minute spinules on posteroventral margin (Fig. 107C). Caudal ramus 19 × 15 µm (1.27 : 1), with 6 setae; outer one of 2 median terminal setae large, 201 µm long, more than 3 times as long as the next longest inner median terminal seta.

Rostrum small and directed ventrally (Fig. 107D). Antennule 177 µm long, 19-segmented, and gradually narrowing distally; ninth and 2 terminal segments armed with 6 setae, 3+aesthetasc, and 11 setae, respectively; first segment with long, hair-like setule on anterior margin; all setae naked. Antenna (Fig. 107F) probably consisting of precoxa, coxobasis, 1-segmented exopod, and 3-segmented endopod. Coxobasis with vestigial suture line proximally on one side and being 61 µm long. Exopod 5 × 3 µm, with 2 distal and 1 lateral setae. Endopod with armature formula 0, 1, and 2+claw; second segment 37 µm long; terminal claw 25 µm long, distinctly shorter than first segment.

Oral cone (Fig. 107G) about 72 × 45 µm, blunt, and extending over insertions of maxilla but in front of maxillipedal insertions. Mandible (Fig. 107H) consisting of palp bearing 2 distal setae (122 and 69 µm, respectively), larger one of which distinctly plumose and extending to posterior margin of the cephalothorax. Mandibular gnathobase lacking. Maxillule (Fig. 107I) bilobed. Inner lobe 35 × 12 µm, with 4 setae (39, 33, 31, and 19 µm from inner to outer). Outer lobe slender, 26 × 5 µm, with 3 naked setae (45, 43, and 29 µm, res-

pectively). Maxilla (Fig. 107J) with smooth proximal segment; distal claw with minute spinules on concave margin. Maxilliped (Fig. 108A) 5-segmented, with armature formula 1, 1, 2, 2, and 1+claw; second segment 47 × 25 µm; terminal claw short, 24 µm long, slightly longer than terminal segment.

Legs 1-3 (Fig. 108B-D) with 3-segmented rami and bicuspoid outer distal process on second endopodal segment. Leg 4 (Fig. 108E) with 3-segmented exopod and 2-segmented endopod. Legs 1-4 without inner seta on coxa. Leg 1 with elongate outer spine (27 µm long) on first exopodal segment and prolonged inner distal process on third endopodal segment. Legs 2-4 with small pointed process on posterior margin of basis between base of exopod and endopod. Armature formula of legs 1-4 as follows:

Leg 1: coxa 0-0; basis 1-1; exp. I-1; I-1; II,2,2;
enp. 0-1; 0-1; 1,5

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

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

Leg 4: coxa 0-0; basis 1-0; exp. I-1; I-1; II,I,4;
enp. 0-0; 2.

Leg 5 consisting of dorsolateral seta on fifth pedigerous somite and free segment; free segment (Fig. 108F) 23 × 10 µm, with 3 distal setae, all of which naked and longer than segment. Leg 6 represented by 2 small setules in genital area (Fig. 107B).

Male. Body (Fig. 109A) similar to that of female. Mean body length 495 µm (465-510 µm), based on 10 specimens. Body length of dissected specimen 500 µm. Urosome (Fig. 109B) 5-segmented. Fifth pedigerous somite 81 µm wide. Genital somite 65 × 109 µm, with 2 pointed posterodorsal processes on both sides. Three abdominal somites 35 × 64, 37 × 46, and 30 × 36 µm, respectively. First 2 abdominal somites with pointed posterolateral corners. Caudal ramus 17 × 14 µm.

Rostrum and antenna as in female. Antennule (Fig. 109C) 177 µm long and 17-segmented; ninth, twelfth, and 2 distal segments armed with 6 setae, 4 setae, 3 setae+aesthetasc, and 11 setae, respectively; other segments with 2 setae each.

Maxilliped with distinct process on inner margin of second segment (Fig. 109D). Other mouth organs as in female.

Legs 2 and 3 with spinules (instead of setules) on outer margin of second endopodal segment (Fig. 109E, F). Third endopodal segment of leg 3 with or without pointed outer distal process. Legs 1 and 4 as in female.

Leg 5 with small free segment (Fig. 109G) of 16 × 10 µm. Leg 6 represented by 2 small setae on genital flap (Fig. 109B).

Etymology. The specific name *edentatum* is derived from the Latin *e* (out of) and *dentatus* (provided with teeth). It alludes to the absence of a mandibular gnathobase in the new

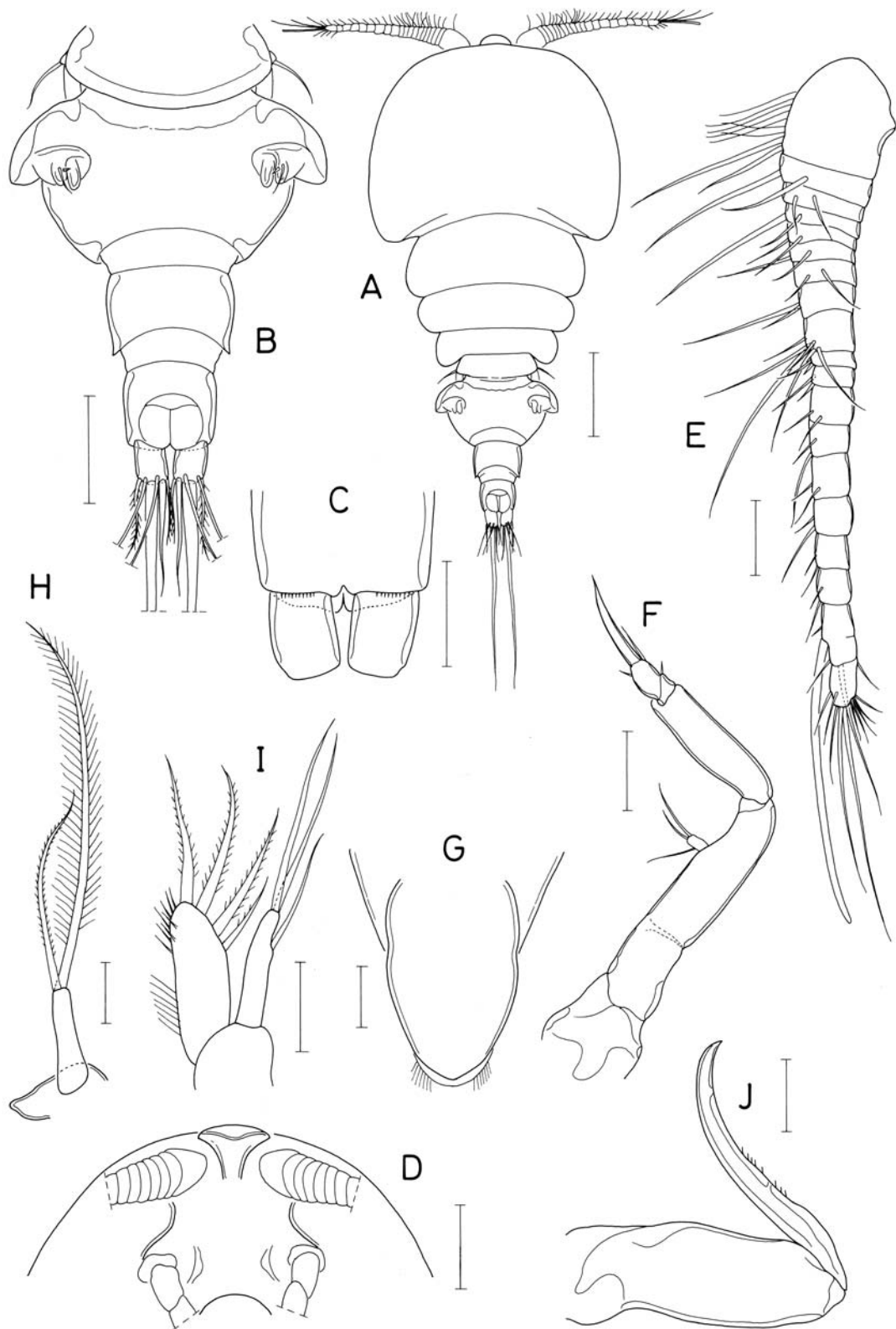


Fig. 107. *Stenomyzon edentatum* n. gen. n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, caudal rami, ventral; D, rostral area, ventral; E, antennule; F, antenna; G, oral cone; H, mandible; I, maxillule; J, maxilla. Scales: A, 0.1 mm; B, D, 0.05 mm; C, E-J, 0.02 mm.

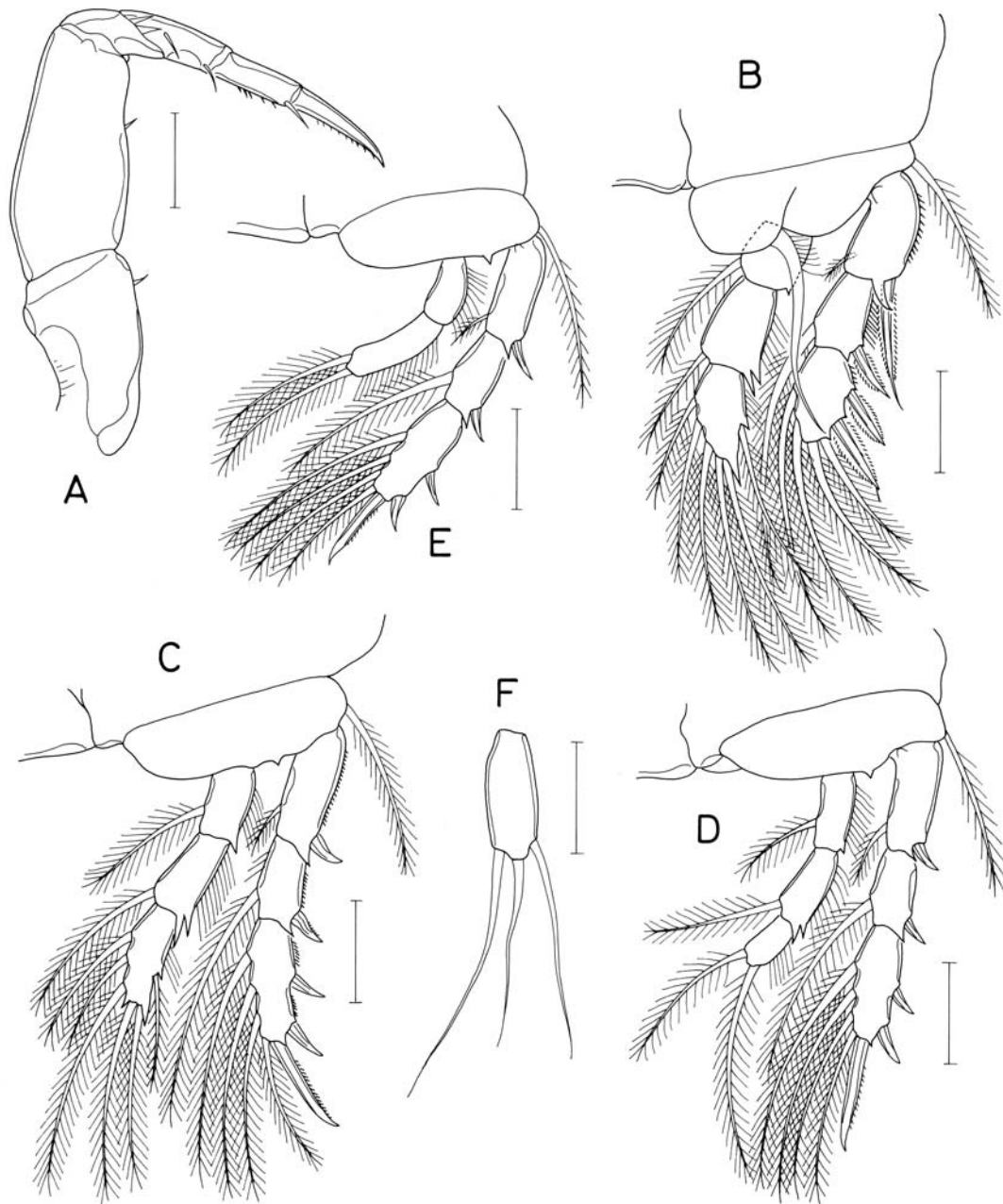


Fig. 108. *Stenomyzon edentatum* n. gen. n. sp., female. A, maxilliped; B, leg 1; C, leg 2; D, leg 3; E, leg 4; F, free segment leg 5. Scales: 0.02 mm for all.

species.

***Cephalocheres* n. gen.**

Diagnosis. Body with greatly expanded prosome and small urosome. Prosome consisting of cephalothorax and 3 pedigerous somites. Urosome 4-segmented in female and 5-segmented in male. Rostrum lacking. Antennule 18-segmented

in female and 15-segmented in male, with aesthetasc on terminal segment. Antenna without exopod; endopod 2-segmented, with 3 large setae on distal segment, without claw. Mandible consisting of stylet and 1-segmented palp bearing 1 large seta and 1 small setule. Maxillule with 5 setae on inner lobe and 4 setae on outer lobe. Maxilla 2-segmented. Maxilliped 5-segmented. Legs 1-4 with 3-segmented rami, without inner seta on coxa and inner seta on first exopodal

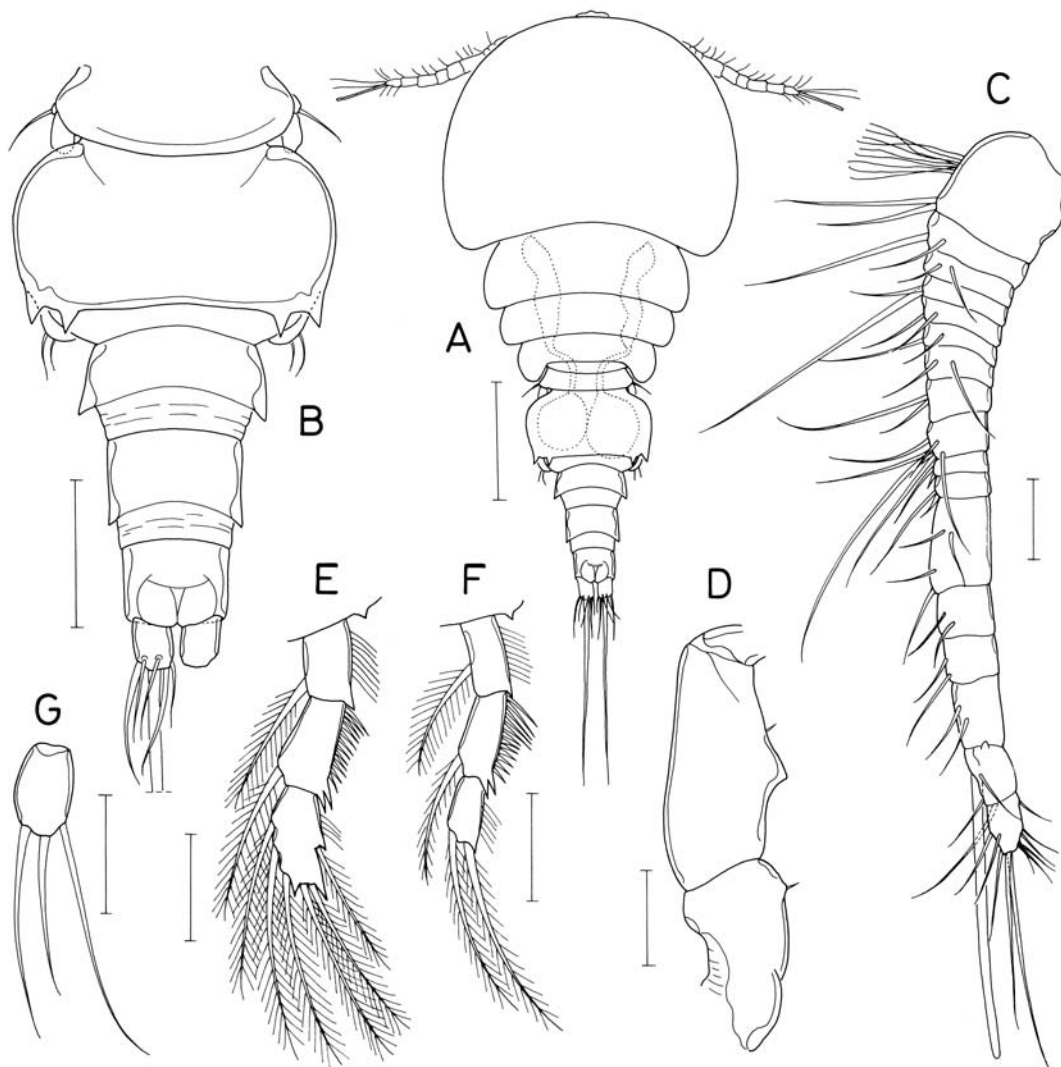


Fig. 109. *Stenomyzon edentatum* n. gen. n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, proximal segments of maxilliped; E, endopod of leg 2; F, endopod of leg 3; G, free segment of leg 5. Scales: A, 0.1 mm; B, 0.05 mm; C-G, 0.02 mm.

segment. Setations on legs 1-4 reduced. Leg 5 with 3 setae on free segment.

Type species. *Cephalocheres flagellatus* n. sp.

Etymology. The generic name *Cephalocheres* is a combination of the Greek *kephali* (a head) and *-cheres*, the ending of many generic name of asterocherids. It alludes to the large cephalothorax in relation to the urosome in the new genus.

Remarks. The presence of an aesthetasc on the terminal segment of the female antennule, as in *Cephalocheres* n. gen., is very rarely found in the family Asterocheridae. This feature is known only in the genera *Onychocheres* Stock and Gooding, 1986, *Asterocheroides* Malt, 1991, and *Siphonopontius* Malt, 1991, all of which bear a relatively narrow prosome (see Stock and Gooding, 1986; Malt, 1991), unlike

the new genus.

More significant features of the new genus occur in the antenna in which an exopod is absent and its 2-segmented endopod bears distally only setae without a terminal claw. The lack of an exopod on the antenna is observable in the genera *Bythocheres* Stock, 1988, *Cholomyzon* Stock and Humes, 1969, *Coralliomyzon* Humes and Stock, 1991, *Meandromyzon* Stock, 1989, *Peltomyzon* Stock, 1975, *Temanus* Humes, 1997, and *Tondua* Humes, 1997. The lacking of a terminal claw on the antenna is observable in the genera *Bythocheres*, *Acontiophorus* Brady, 1880, *Cecidomyzon* Stock, 1981, *Cystomyzon* Stock, 1981, *Mesocheres* Norman and Scott, 1905, *Hammatimyzon* Stock, 1981, and *Oedimyzon* Stock, 1981. Therefore, only *Bythocheres* reveals both fea-

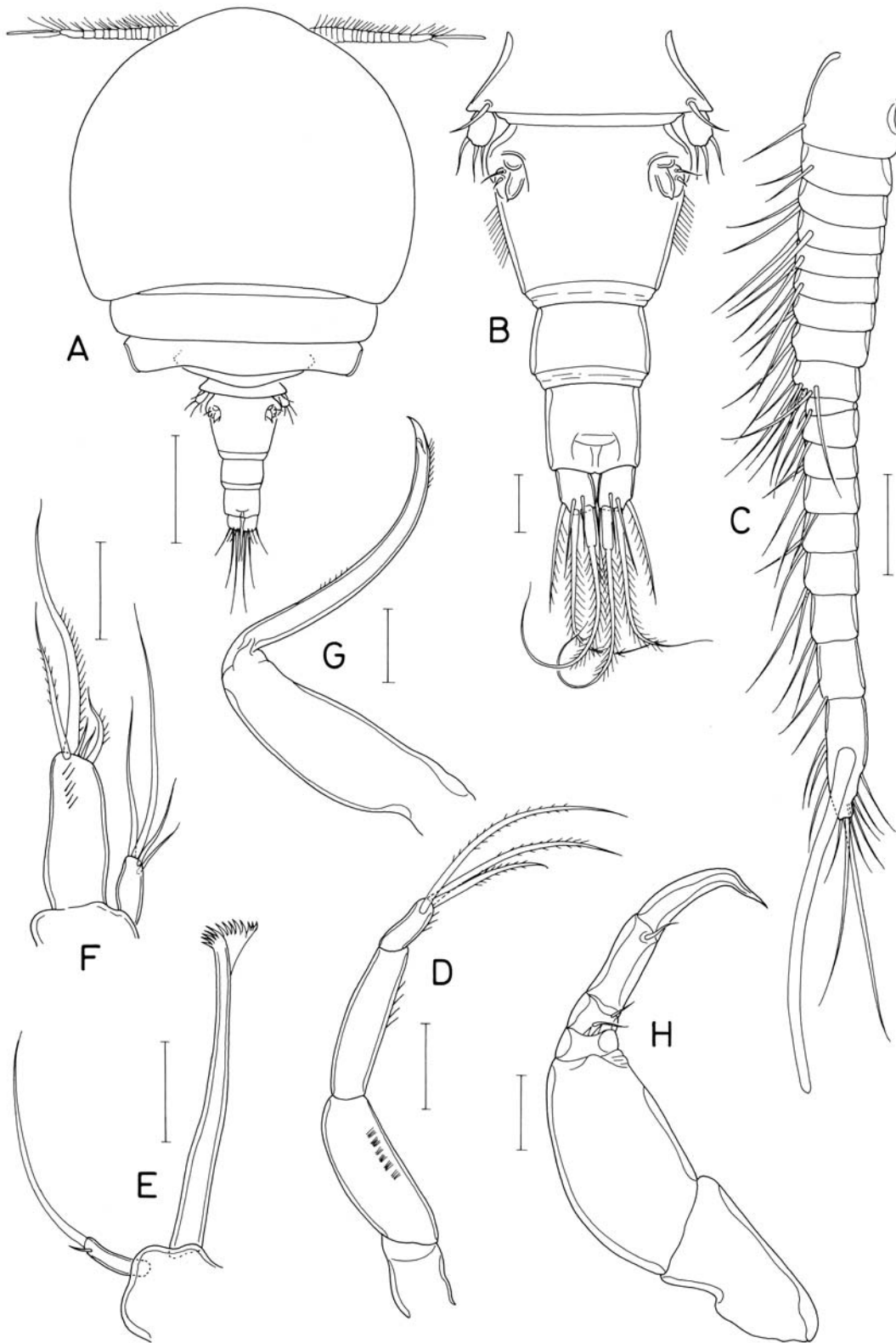


Fig. 110. *Cephalocheres flagellatus* n. gen. n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, antenna; E, mandible; F, maxillule; G, maxilla; H, maxilliped. Scales: A, 0.1 mm; B-H, 0.02 mm.

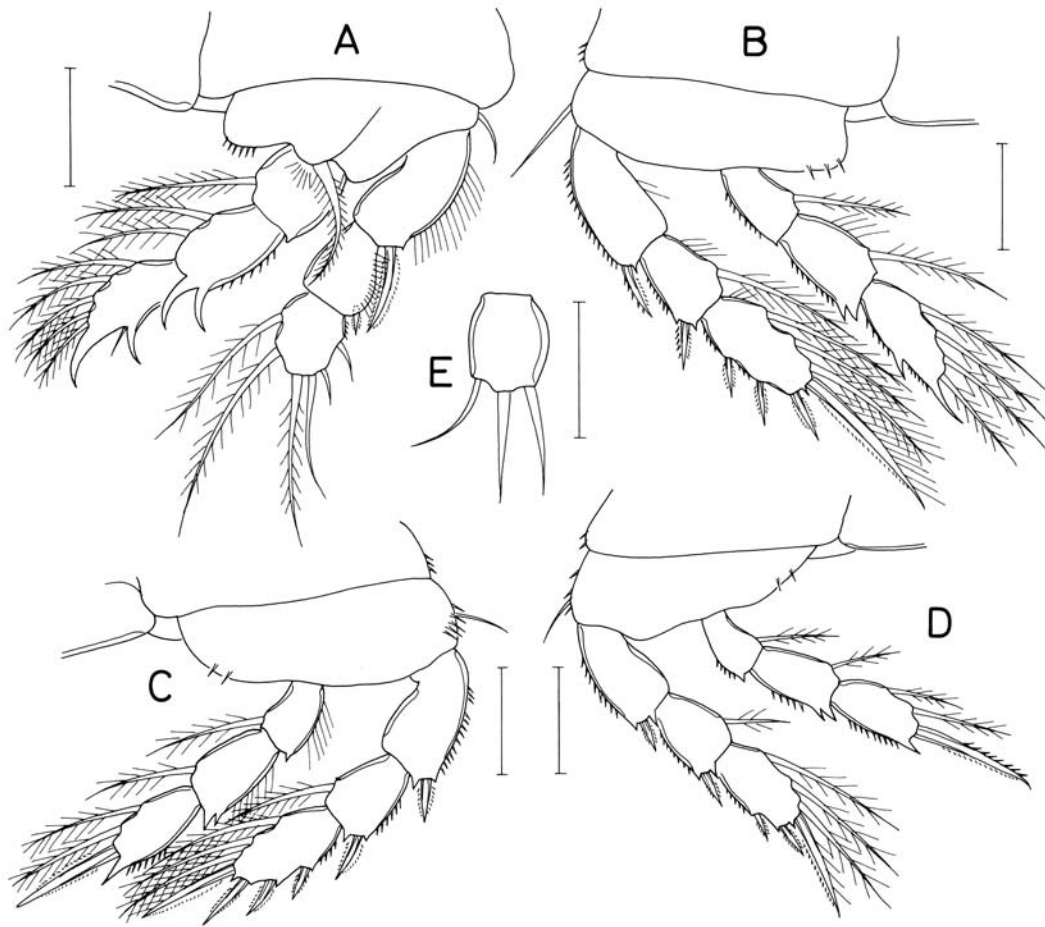


Fig. 111. *Cephalocheres flagellatus* n. gen. n. sp., female. A, leg 1; B, leg 2; C, leg 3; D, leg 4; E, free segment of leg 5. Scales: 0.02 mm for all.

female and 5-segmented in male. Antennule 19-segmented in female and 16-segmented in male, with aesthetasc on penultimate segment. Antenna with exopod represented by 1 seta; endopod 3-segmented, with armature formula 0, 1, and 2+claw. Oral cone short. Mandibular gnathobase distally expanded; palp with 1 large distal seta and 1 small setule. Maxillule armed with 2 setae on inner lobe and 3 setae on outer lobe. Maxilla with aesthetasc-like element proximally. Maxilliped 3-segmented, with armature formula 0, 0, and 1+claw. Legs 1-3 with 3-segmented rami. Leg 4 with 3-segmented exopod, without endopod. Legs 1-4 without inner seta on coxa or inner seta on first exopodal segment. Setations of legs 1-4 reduced. Leg 5 with 3 setae on free segment.

Type species. *Humesimyzon pusillum* n. sp.

Etymology. This genus is named for the late Dr. A. G. Humes who collected the type species of the new genus. The ending of the name “-myzon” occurs in many generic names of the

Asterocheridae. Gender is neuter.

Remarks. This genus belongs to the former family Coralliomyzontidae which has been synonymized with Asterocheridae by Boxshall and Halsey (2004). Four genera, *Cholomyzon* Stock and Humes, 1969, *Coralliomyzon* Humes and Stock, 1991, *Temanus* Humes, 1997, and *Tondua* Humes, 1997, all associated with scleractinian corals, had been placed in the Coralliomyzontidae. These genera and *Humesimyzon* n. gen. share several important traits: the maxilliped is clearly 3-segmented, excluding the terminal claw; the exopod of antenna is absent (in four genera) or reduced to a seta (in the new genus); the second endopodal segment of legs 1-3 carries a single inner seta or none; and the endopod of leg 4 is absent or 2-segmented. Of the four genera, *Tondua* possesses two-segmented rami in leg 4 and, thus, differs from the new genus. In *Cholomyzon* and *Coralliomyzon* leg 4 is absent or reduced to a lobe bearing 1 or 2 setae and the antennule is

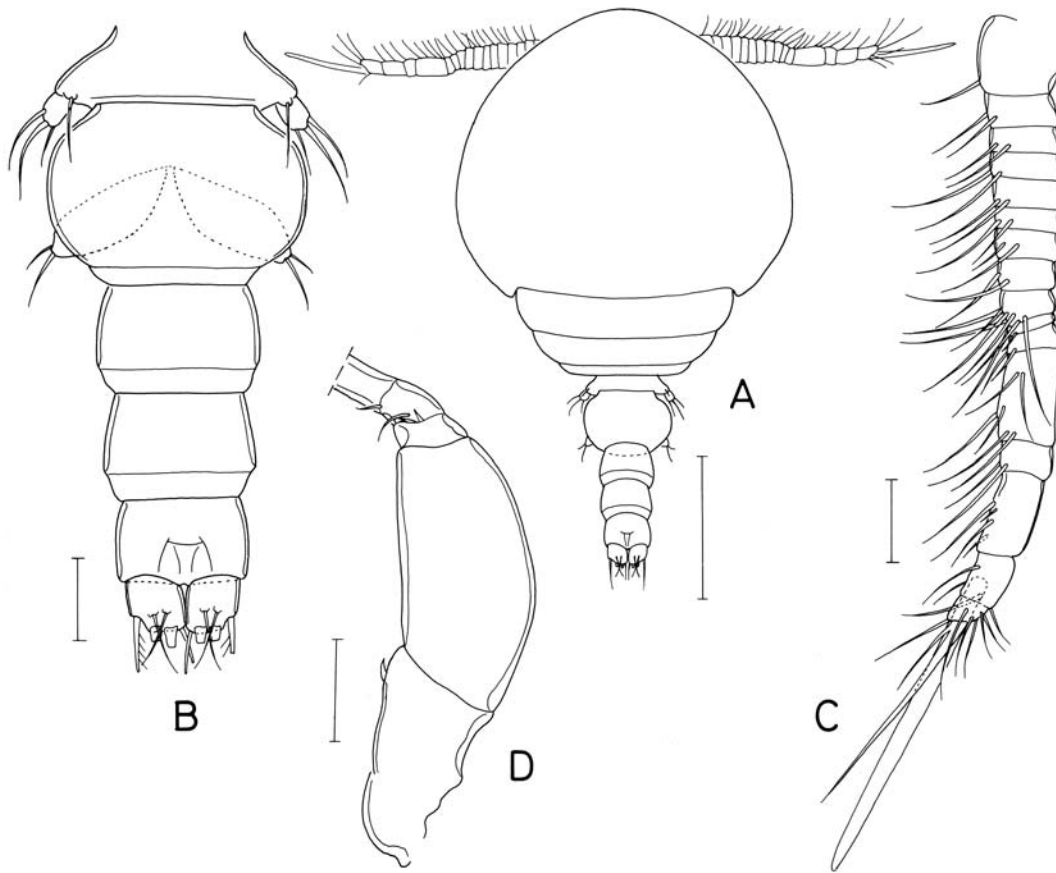


Fig. 112. *Cephalocheres flagellatus* n. gen. n. sp., male. A, habitus, dorsal; B, urosome, dorsal; C, antennule; D, proximal part of maxilliped. Scales: A, 0.1 mm; B-D, 0.02 mm.

11-segmented. The remaining genus *Temanus* carries no exopod on the antenna (represented by 1 seta in the new genus) and no inner seta on the basis of leg 1 (present in the new genus). The setation of the third endopodal segment of legs 1-3 of *Temanus* are 5 setae, 4 setae, and 2 spines plus 1 seta, respectively (Humes, 1997a), compared to 2 setae, 1 seta, and 1 spine in the new genus.

***Humesimyzon pusillum* n. sp. (Figs. 113, 114)**

Material examined. 73 ♀♀, 15 ♂♂ from the scleractinian coral *Psammocora contigua* (Esper), at a depth of 1 m, Ambariobe, Nosy Bé, Madagascar, 17 September 1963, collected by A. G. Humes. Holotype (♀), allotype (♂), and paratypes (70 ♀♀, 13 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 1 ♂) are retained in the collection of the author.

Other material examined. 350 ♀♀, 50 ♂♂ from *Psammocora contigua* (Esper), at a depth of 2 m, Ambariobe, Nosy

Bé, Madagascar, 8 September 1963, collected by A. G. Humes; 180 ♀♀, 45 ♂♂ from the same species of coral and locality, 6 September 1963, collected by A. G. Humes. *Female.* Body (Fig. 113A) small, ovoid, arched ventrally, and nearly uniform in size. Body length of dissected specimen 375 μm . Prosome 315 μm long. Cephalothorax 229 \times 229 μm , larger than remaining portion of body, with slightly truncated frontal apex. Second and third pedigerous somites with angular posterolateral corners. Urosome (Fig. 113B) short and laterally expanded. Fifth pedigerous somite much wider than long. Genital double-somite 36 \times 85 μm , more than twice as wide as long, with about 20 setules on posterior part of lateral margin. Two free abdominal somites much wider than long, 11 \times 37 and 19 \times 31 μm , respectively. Caudal ramus 10 \times 13 μm (0.77 : 1), with 6 naked setae.

Rostrum as broad and short ridge (Fig. 113C). Antennule (Fig. 113D) slender, 215 μm long, and 19-segmented; ninth segment with 7 setae, terminal segment with about 9 setae, penultimate segment with 2 setae and 1 large aesthetasc, other segments with 2 setae each; all setae naked; first seg-

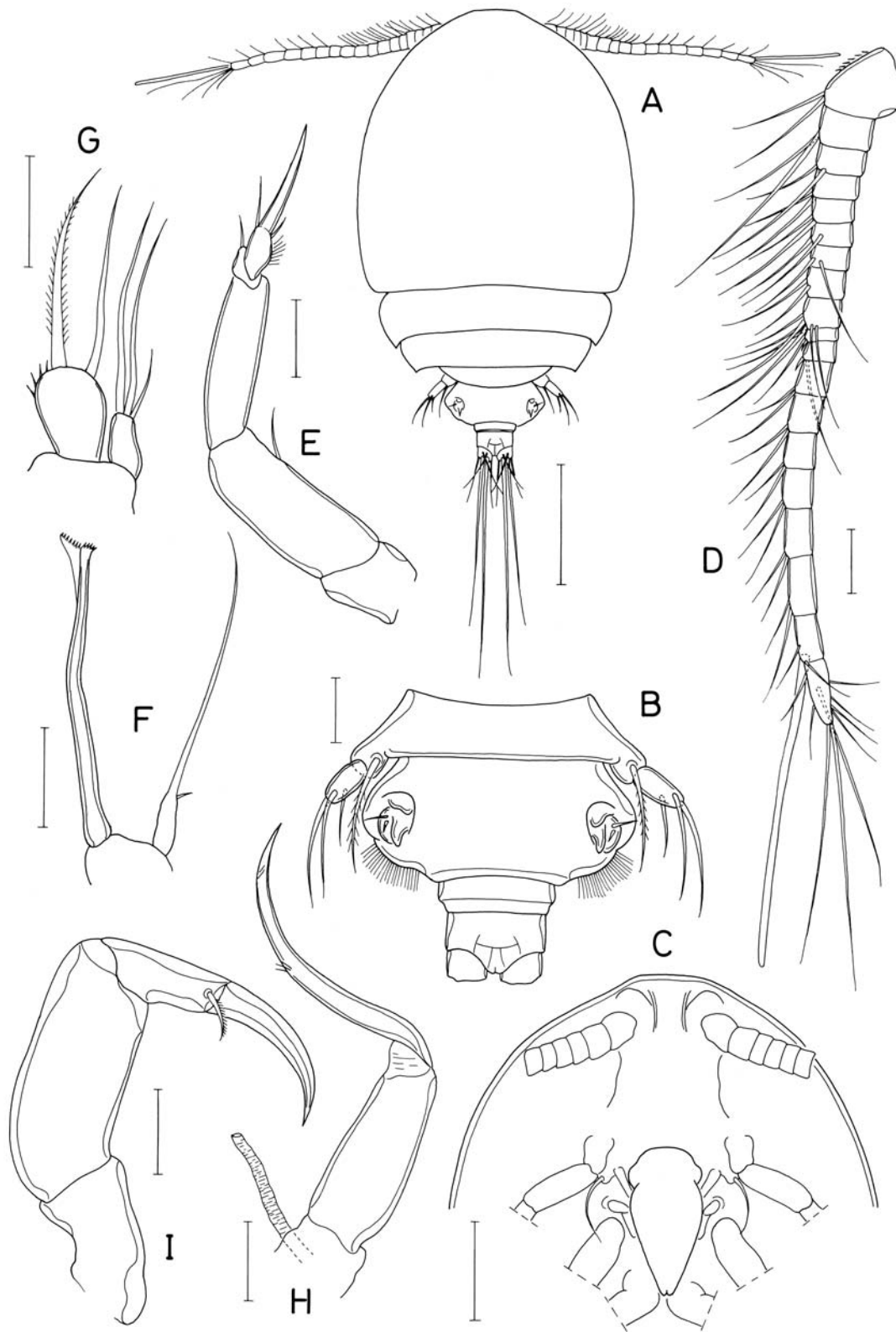


Fig. 113. *Humesimyzon pusillum* n. gen. n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, cephalic area, ventral; D, antennule; E, antenna; F, mandible; G, maxillule; H, maxilla; I, maxilliped. Scales: A, 0.1 mm; B, D-I, 0.02 mm; C, 0.05 mm.

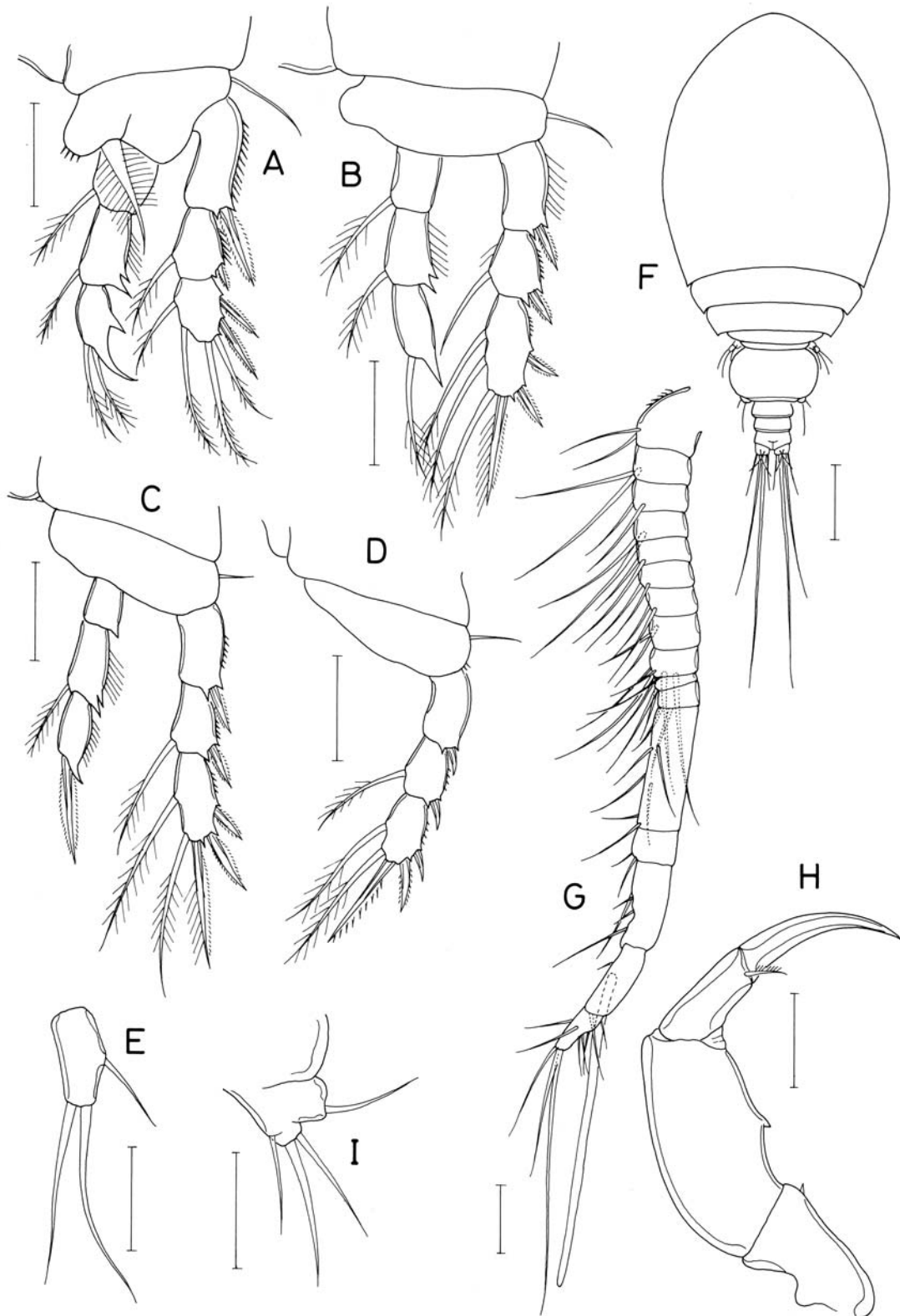


Fig. 114. *Humesimyzon pusillum* n. gen. n. sp. Female: A, leg 1; B, leg 2; C, leg 3; D, leg 4; E, free segment of leg 5. Male: F, habitus, dorsal; G, antennule; H, maxilliped; I, leg 5. Scales: A-E, G-I, 0.02 mm; F, 0.05 mm.

ment with minute spinules on anterior margin. Antenna (Fig. 113E) with small, unarmed coxa; basis $46 \times 19 \mu\text{m}$. Exopod represented by 1 naked seta. Endopod 3-segmented, with armature formula 0, 1, and 2+claw; first segment $43 \times 13 \mu\text{m}$; terminal claw spiniform, $30 \mu\text{m}$ long, and not articulated from segment.

Oral cone strongly tapering and extending towards insertions of maxillipeds (Fig. 113C). Mandible (Fig. 113F) consisting of stylet and palp. Stylet $63 \mu\text{m}$ long, slightly bent near middle, broadened distally, with fine denticles on distal margin. Palp forming distally a naked seta, $67 \mu\text{m}$ in total, with small setule proximally. Maxillule (Fig. 113G) bilobed. Inner lobe $17 \times 12 \mu\text{m}$, distally broadened, with several spinules and 2 distal setae (38 and $35 \mu\text{m}$, respectively), inner one of latter weakly plumose. Outer lobe $11 \times 6 \mu\text{m}$, with 3 naked distal setae (40 , 37 , and $14 \mu\text{m}$, respectively). Maxilla (Fig. 113H) with large, flexible, aesthetasc-like element on proximal part of proximal segment; distal claw slender, with few setules near middle. Maxilliped (Fig. 113I) stout and 3-segmented; first segment unarmed; second segment $50 \times 25 \mu\text{m}$, unarmed, and distinctly broader than first segment; third segment with spinules-bearing distal seta; terminal claw strong, $40 \mu\text{m}$ long.

Legs 1-3 (Fig. 114A-C) with 3-segmented rami and bicuspoid outer distal process on second endopodal segment. Third endopodal segment of legs 1-3 with acutely pointed spiniform distal process. Leg 4 (Fig. 114D) with 3-segmented exopod; endopod lacking. Legs 1-4 without inner seta on coxa. Inner seta on basis of leg 1 broad, with long setules perpendicular to margins. Armature formula of legs 1-4 as follows:

- Leg 1: coxa 0-0; basis 1-1; exp. I-0; I-1; II,2,2;
enp. 0-1; 0-1; 2
- Leg 2: coxa 0-0; basis 1-0; exp. I-0; I-1; II,1,3;
enp. 0-1; 0-1; 1
- Leg 3: coxa 0-0; basis 1-0; exp. I-0; I-1; II,1,2;
enp. 0-0; 0-1; 1
- Leg 4: coxa 0-0; basis 1-0; exp. I-0; I-1; II,1,2;
enp. (lacking).

Leg 5 2-segmented, but proximal segment fused with fifth pedigerous somite, with plumose dorsal seta; distal free segment (Fig. 114E) $19 \times 9 \mu\text{m}$, armed with 1 inner ($17 \mu\text{m}$) and 2 distal (42 and $36 \mu\text{m}$, respectively) naked setae. Leg 6 represented by 1 small seta and 1 small spinule on genital field (Fig. 113B).

Male. Body (Fig. 114F) narrower than that of female. Body length of dissected specimen $300 \mu\text{m}$. Prosome $223 \mu\text{m}$ long. Cephalothorax $170 \times 153 \mu\text{m}$, longer than remaining part of body. Urosome 5-segmented. Genital somite $37 \times 63 \mu\text{m}$. Three abdominal somites 12×30 , 10×27 , and $14 \times 25 \mu\text{m}$, respectively. Caudal ramus $8 \times 11 \mu\text{m}$.

Rostrum and antenna as in female. Antennule (Fig. 114G) 16-segmented; ninth, twelfth, and 3 distal segments armed with 7 setae, 6 setae, 4 setae, 2 setae+aesthetasc, and about 9 setae, respectively; other segments armed with 2 setae each.

Maxilliped (Fig. 114H) with spinule-like inner distal seta on first segment; second segment with pointed process on inner margin. Other mouth organs as in female.

Legs 1-4 as in female. Leg 5 (Fig. 114I) represented by 1-segmented, broad lobe bearing 4 naked setae. Leg 6 represented by 2 small, unequal setae on genital flap (Fig. 114F).

Etymology. The specific name *pusillum* is derived from the Latin *pusillus* (little) which alludes to the small body size of the new species.

***Thermocheres* n. gen.**

Diagnosis. Body cycloform, with thick exoskeleton. Prosome consisting of cephalothorax and 3 pedigerous somites. Urosome 5-segmented in female. First free abdominal somite with posteriorly extended epimera. Rostrum beak-like. Antennule 20-segmented in female, with aesthetasc on fourth segment from distad. Antenna with 1-segmented exopod; endopod 2-segmented, without terminal claw. Oral siphon moderately long. Mandible consisting of stylet and rudimentary palp. Maxillule with 3 large and 1 small setae on elongated inner lobe and 4 setae on outer lobe. Maxilla 2-segmented with tubular element on proximal segment. Maxilliped 6-segmented, with terminal claw. Legs 1-4 with 3-segmented rami, with well-developed setation. Third exopodal segment of legs 2-4 with 4 spines and 5 setae (armature formula III,I,5). Leg 5 2-segmented and located on ventral surface of fifth pedigerous somite, with proximal segment well-demarcated from somite.

Type species. *Thermocheres validus* n. sp.

Etymology. The generic name *Thermocheres* is a combination of *Thermos*, the Greek meaning "warm", and *-cheres*, the ending of many generic names of asterocherids. It alludes to the discovery of the new genus from tropical waters. Gender is masculine.

Remarks. Boxshall and Halsey (2004) mentioned that the Artotrogidae and Asterocheridae are closely related and indicated *Myzopontius* as a representative showing an intermediate state between the two families. *Thermocheres* n. gen. seems to be another genus related to both families. It similar to the genus *Myzopontius* in the following aspects: (1) the mandible consists of a long, filamentous stylet and an obsolete palp; (2) the third exopodal segment of legs 1-4 bears five setae; (3) the antenna has a 2-segmented endopod, without a distal claw; and (4) the female urosome is 5-segmented. Nevertheless, *Thermocheres* is placed in the Asterocheridae because of the following traits: (1) the female

antennule is 20-segmented, with a large aesthetasc on the seventeenth segment (none on the terminal segment); (2) the maxillule carries more than one, namely, three large distal setae on the inner lobe and the outer lobe is much smaller than the inner lobe; and (3) leg 5 is somewhat developed.

Only two genera, *Australomyzon* and *Bythochoeres*, in the Asterocheridae have four spines and five setae (armature formula III,I,5) on the third exopodal segment of both legs 3 and 4, as the new genus. *Thermochoeres* differs from *Australomyzon* because the latter genus has the antenna bearing a distal claw on the endopod and a 2-segmented exopod. *Thermochoeres* and *Bythochoeres* share an identical armature formula of legs 1-4, the rudimentary mandibular palp or its absence, and the lack of a distal claw on the antennal endopod. Nevertheless, *Thermochoeres* can be separated from *Bythochoeres*, because in the latter genus the antenna lacks an exopod, the female antennule is 15-segmented, and the proximal segment of female leg 5 is completely fused with the fifth pedigerous somite. *Bythochoeres* is a deep sea genus known from the Gulf of Mexico (Humes, 1988).

Thermochoeres validus n. sp. (Figs. 115, 116)

Material examined. 1 ♀ (holotype) from a tubular lavender sponge, at a depth of 1.8 m, Pointe Lokobe, Nosy Bé, Madagascar, 31 July 1963, collected by A. G. Humes. Holotype (dissected and mounted on a slide) has been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C.

Female. Body (Fig. 115A) with thick exoskeleton. Body length 1.63 mm. Prosoma 1.04 × 0.80 mm, consisting of cephalothorax and 3 pedigerous somites. All prosomal somites with pointed posterolateral corners. Cephalothorax 606 μm long. Second and third pedigerous somites 185 and 154 μm long each. Urosome (Fig. 115B) 5-segmented. Fifth pedigerous somite with tapering, posterolaterally produced epimera. Genital double-somite 190 (measured along axis) × 280 μm, with weak anterolateral expansion and strongly projected, pointed posterolateral corners; genital areas located dorsally at anterior third region. First free abdominal somite 63 × 198 μm, with posteriorly strongly projected posterolateral corners extending to the posterior margin of the anal somite. Second free abdominal somite 40 × 138 μm. Anal somite 87 × 147 μm and unornamented. Caudal rami slightly divergent, each ramus 137 × 70 μm (1.96 : 1), with setules on inner margin and 6 plumose setae. Egg sac (Fig. 115C) 738 × 300 μm and containing 4 series of eggs; each egg 162 μm in diameter.

Rostrum small but distinct and beak-like (Fig. 115D). Antennule (Fig. 115E) 512 μm long and 20-segmented, with armature formula 2, 2, 2, 2, 2 (5th segment), 2, 4, 7, 2, 2

(10th), 1, 1, 1, 1, 1 (15th), 1, 2+aesthetasc, 1, 4, and 7; all setae naked. Antenna (Fig. 115F) with unarmed coxa; basis 70 × 25 μm, with row of spinules near base of exopod. Exopod bent near proximal 2/5, 22 × 8 μm, with 2 unequal distal setae and 1 lateral seta. Endopod 2-segmented; proximal segment 46 × 25 μm, unarmed but with setules on outer margin; distal segment 36 × 18 μm, with setules on outer margin, 1 proximal seta and 3 distal setae, median one of the latter very large, 164 μm long.

Oral siphon 523 μm long and extending to insertions of leg 2, 93 μm wide across broader proximal part and 17 μm wide across thin distal part (Fig. 115D). Mandible (Fig. 115G) with rudimentary, setule-like palp and thin stylet bearing 10 distal denticles. Maxillule (Fig. 115H) bilobed. Inner lobe 146 × 23 μm, elongated and tapering, distally with 1 small seta and 3 extremely long, distally plumose, setae (346, 333, 331 μm, respectively). Outer lobe 56 × 13 μm, much smaller than inner lobe, with 1 plumose lateral seta (about 80 μm long) and 3 small distal setae (83, 63, and 56 μm, respectively). Maxilla (Fig. 115I) slender, with tubular element on proximal part of proximal segment; distal claw thin, with 1 small seta near middle, articulation at distal 30% region, tuft of setules at articulation followed by spinules in distal part. Maxilliped (Fig. 116A) slender and 6-segmented, with armature formula 1, 1, 2, 1, 1, and 1+claw; second segment 242 × 52 μm, its inner seta minute, setule-like and located in the middle of inner margin; terminal segment and claw 88 and 138 μm, respectively.

Legs 1-4 with 3-segmented rami and bicuspid outer distal process on second endopodal segment (Fig. 116B-E). Leg 1 (Fig. 116B) with expanded first exopodal segment bearing outer spine 44 μm long. Armature formula of legs 1-4 as follows:

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

Leg 5 (Fig. 116F) 2-segmented and located on ventral surface of fifth pedigerous somite; first segment plate-like, broad, with plumose outer distal seta and spinules on inner margin; second segment quadrate, 25 × 22 μm, with 1 plumose inner seta and 2 unequal naked distal setae. Leg 6 represented by 1 small naked seta and 1 minute spinule in genital area (Fig. 115B).

Male. Unknown.

Etymology. The specific name *validus* ("strong" in Latin) refers to the thick exoskeleton of the species.

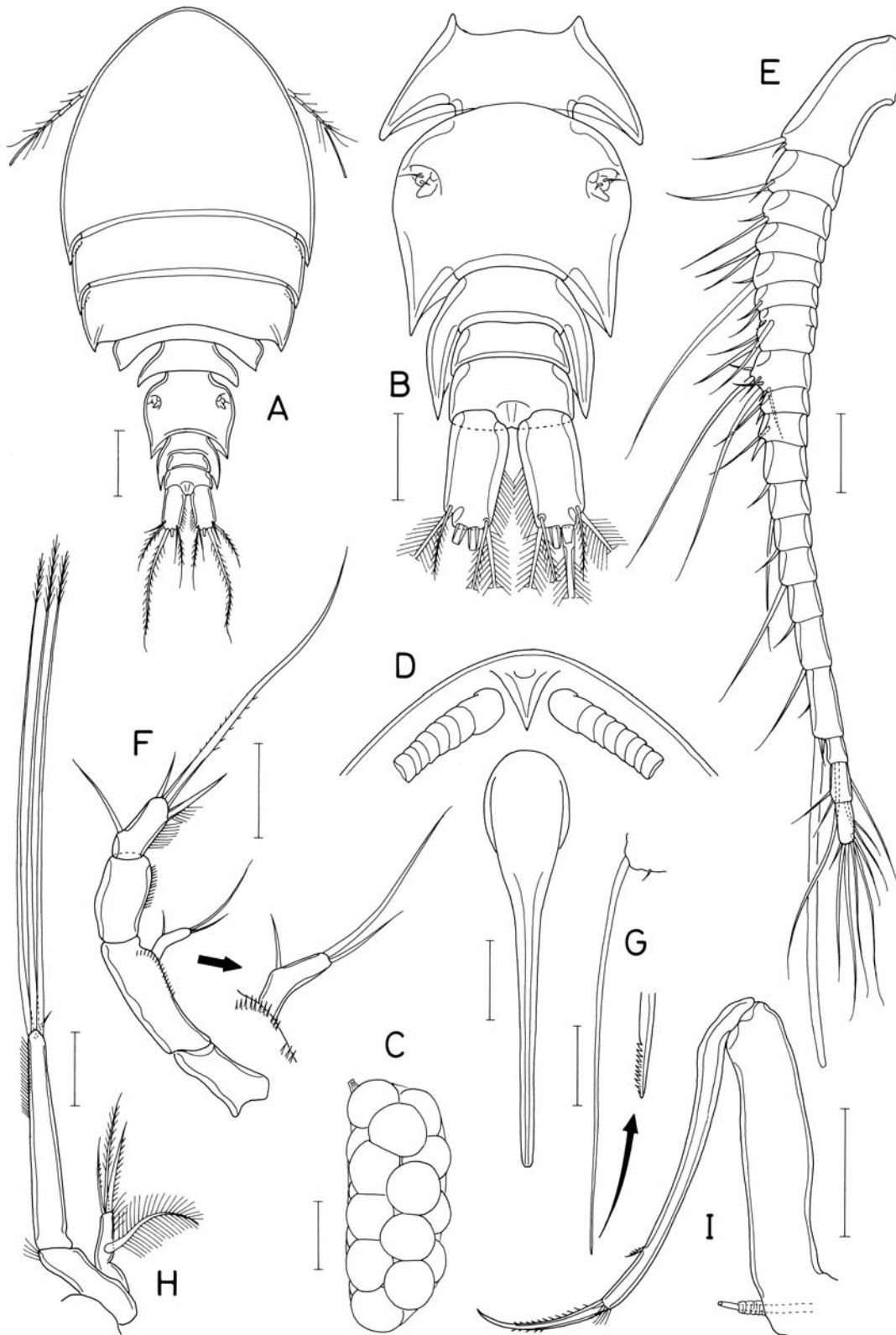


Fig. 115. *Thermochoeres validus* n. gen. n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, egg sac; D, rostral area and oral siphon; E, antenna; F, antenna; G, mandible; H, maxillule; I, maxilla. Scales: A, C, 0.2 mm; B, D, G, I, 0.1 mm; E, F, H, 0.05 mm.

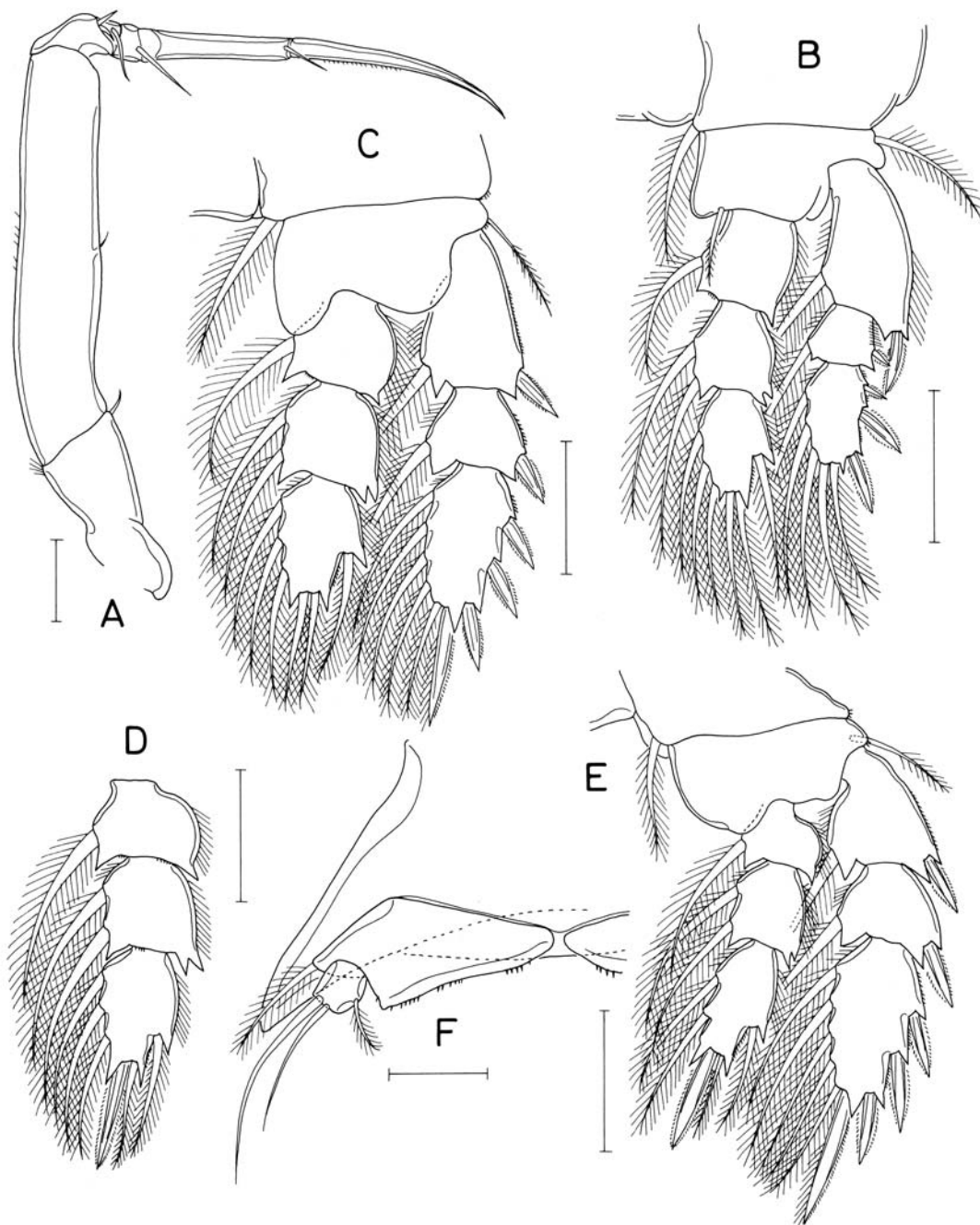


Fig. 116. *Thermochoeres validus* n. gen. n. sp., female. A, maxilliped; B, leg 1; C, leg 2; D, endopod of leg 3; E, leg 4; F, leg 5. Scales: A, F, 0.05 mm; B-E, 0.1 mm.

***Gascardama* n gen.**

Diagnosis. Body cyclopiform, with 4-segmented prosome and 4-segmented urosome in female. Rostrum lacking. Female antennule 20-segmented, with large aesthetasc on antepenultimate segment. Antenna with 1-segmented exopod

and 2-segmented endopod distally bearing a spiniform claw. Oral siphon very long and slender. Mandible consisting of thread-like stylet and 1-segmented palp bearing 2 distal setae. Maxillule with 4 setae on each inner and outer lobes. Maxilla consisting of proximal segment and distal claw. Maxilliped 6-segmented with distal claw. Legs 1-4 with 3-segmented

rami. Leg 1 with inner seta on basis. Armature formula of third exopodal segments: III,2,3 for leg 1, and III,I,4 for legs 2-4. Armature formula of third endopodal segments: 1,2,3 for legs 1 and 2, 1,1+I,3 for leg 3, and 1,1+I,2 for leg 4. Leg 5 bimerous; proximal segment fused with fifth pedigerous somite, with 2 distal setae (anterodistal and posterodistal); distal free segment with 3 setae.

Type species. *Gascardama longisiphonata* n. sp.

Etymology. The generic name *Gascardama* is an anagram of "Madagascar". Gender is feminine.

Remarks. In eleven genera of the Asterocheridae all or some of their species have three spines and five setae (armature formula III,2,3) on the third exopodal segment of leg 1, as *Gascardama* n. gen. Majority of these genera have a 5-segmented female urosome and only four genera have a 4-segmented female urosome like the new genus. These four genera are *Acontiophorus* Brady, 1880, *Cystomyzon* Stock, 1981, *Orecturus* Humes, 1992, and *Paracontiophorus* Eiselt, 1961. *Gascardama* is distinguishable from these genera by the following differences.

In *Cystomyzon* Stock, 1981 the female antennule is 7-segmented, the endopod of the antenna is 3-segmented, and the endopod of legs 1-4 is at most 2-segmented or lacking. In the remaining three genera *Acontiophorus*, *Orecturus*, and *Paracontiophorus*, the female antennule is at most 17-segmented, the third endopodal segment of leg 3 is armed with one spine and four setae (formula 1,I,3; versus 1,1,+I,3 in *Gascardama*), and the third endopodal segment of leg 4 is armed with one spine and three setae (formula 1,I,2; versus 1,1+I,2 in *Gascardama*).

The well developed leg 5, where the proximal segment bears a pair of distal setae, is also observable in the genera *Acontiophorus*, *Dermatomyzon* Claus, 1889, and *Scottocheres* Giesbrecht, 1897. *Acontiophorus* is not similar to *Gascardama* as mentioned above. *Dermatomyzon* has legs 3 and 4 bearing the same setation as those of *Acontiophorus*, *Orecturus*, and *Paracontiophorus*, as mentioned above, therefore differs from *Gascardama*. *Scottocheres* is not related to *Gascardama* because it carries no palp on the mandible and a different setation on legs 1-4.

***Gascardama longisiphonata* n. sp. (Figs. 117, 118)**

Material examined. 1 ♀ (holotype) from the scleractinian coral *Stylophora mordax* (Dana), at a depth of 2 m, Pointe Ambarionaomby, Nosy Komba, Madagascar, 1 October 1963, collected by A. G. Humes. Holotype (dissected and mounted on a slide) has been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. *Female.* Body (Fig. 117A) cycloform and moderately narrow. Body length 1.06 mm. Prosome 708 µm long and con-

sisting of cephalothorax and 3 pedigerous somites. Cephalothorax 458 × 483 µm. Second to fourth pedigerous somites fringed with membrane on lateral margins. Urosome (Fig. 117B) 4-segmented. Fifth pedigerous somite with pointed posterolateral corners. Genital double-somite 112 × 138 µm, gradually narrowed posteriorly, with weak, lateral expansion in anterior part, and transverse row of minute setules posterior to genital area (Fig. 118H); anterior expansion forming angular lateral apex on each side. Two free abdominal somites 53 × 96 and 77 × 92 µm, respectively. Genital double- and abdominal somites each with paired transverse rows of setules on ventral surface (Fig. 117C); these rows of setules consisting of 5 setules on genital double-somite, 3 or 4 setules on first abdominal somite, and 2 setules on anal somite. Caudal ramus 67 × 41 µm (1.63 : 1), with 1 large posteroventral process (Fig. 117C), setules on inner margin, and 6 plumose setae (Fig. 117B).

Rostrum lacking. Antennule (Fig. 117E) 377 µm long and 20-segmented; with armature formula 2, 2, 2, 2, 2 (5th segment), 2, 2, 2, 8, 2 (10th), 2, 2, 2, 2, 2 (15th), 1, 1, 2+aesthetasc, 2, and 11; first segment with minute spinules on anterior margin; one of 2 setae on third segment expanded; one of 2 setae on eleventh segment ending bluntly. Antenna (Fig. 117F) with naked coxa; basis 106 × 33 µm, with longitudinal row of spinules on outer side and setules on inner margin. Exopod elongated, 44 × 8 µm (5.5 : 1), and inserted to area slightly distal to midway of inner margin of basis, with 2 distal and 1 lateral setae. Endopod 2-segmented; proximal segment 83 × 21 µm and unarmed, with parallel lateral margins; distal segment less than half as long as proximal segment, with 3 setae; terminal claw spiniform, straight, and 100 µm long.

Oral siphon (Fig. 117G) elongated and very thin, 958 µm long, and reaching the base of caudal ramus. Mandible (Fig. 117H) with thread-like stylet. Mandibular palp 1-segmented, 42 µm long, distally with 2 unequal plumose setae. Maxillule (Fig. 117I) bilobed. Inner lobe stout, 37 × 20 µm, with 3 large smooth setae (approximately 177, 177, and 120 µm, respectively; larger 2 ones fused at base) and 1 minute seta. Outer lobe 39 × 13 µm, with 4 large plumose setae consisting of 2 distal, 1 subdistal, and 1 lateral. Maxilla (Fig. 118A) slender, with unarmed proximal segment; distal claw distinctly longer than proximal segment, with minute spinules and setules. Maxilliped (Fig. 118B) 6-segmented, with armature formula 1, 0, 2, 1, 0, and 1+claw; first segment with small, tapering, tubular process near base of seta; second segment 137 × 35 µm, with spinules on inner margin and setules on outer margin; terminal claw 101 µm long, more than twice as long as terminal segment, and smooth.

Legs 1-4 with 3-segmented rami. Leg 1 (Fig. 118C) with outer spine on first exopodal segment 35 µm long and dis-

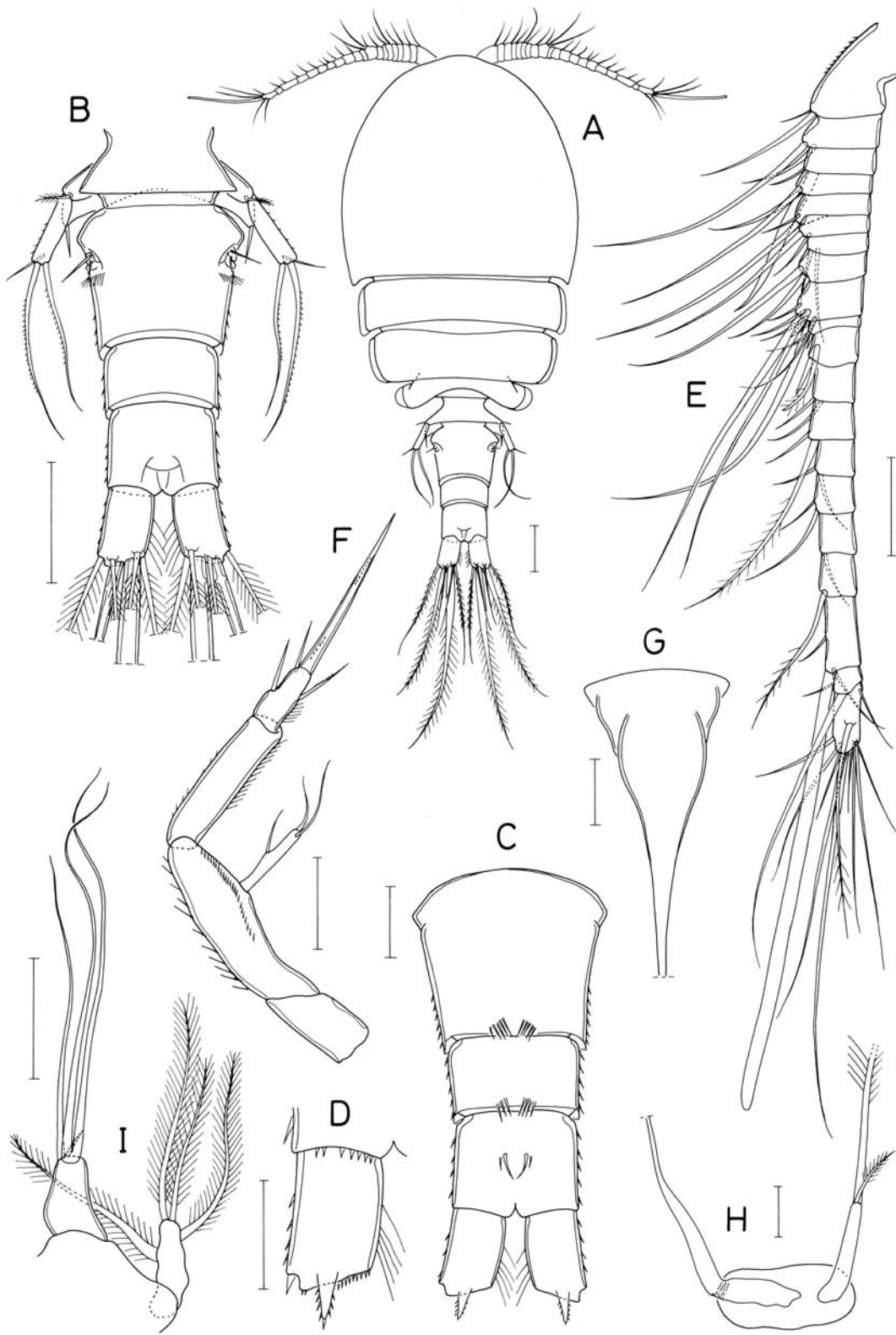


Fig. 117. *Gascardama longisiphonata* n. gen. n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, genital double-somite and abdomen, ventral; D, caudal ramus, ventral; E, antennule; F, antenna; G, oral siphon; H, mandible; I, maxillule. Scales: A, B, 0.1 mm; C-G, I, 0.05 mm; H, 0.02 mm.

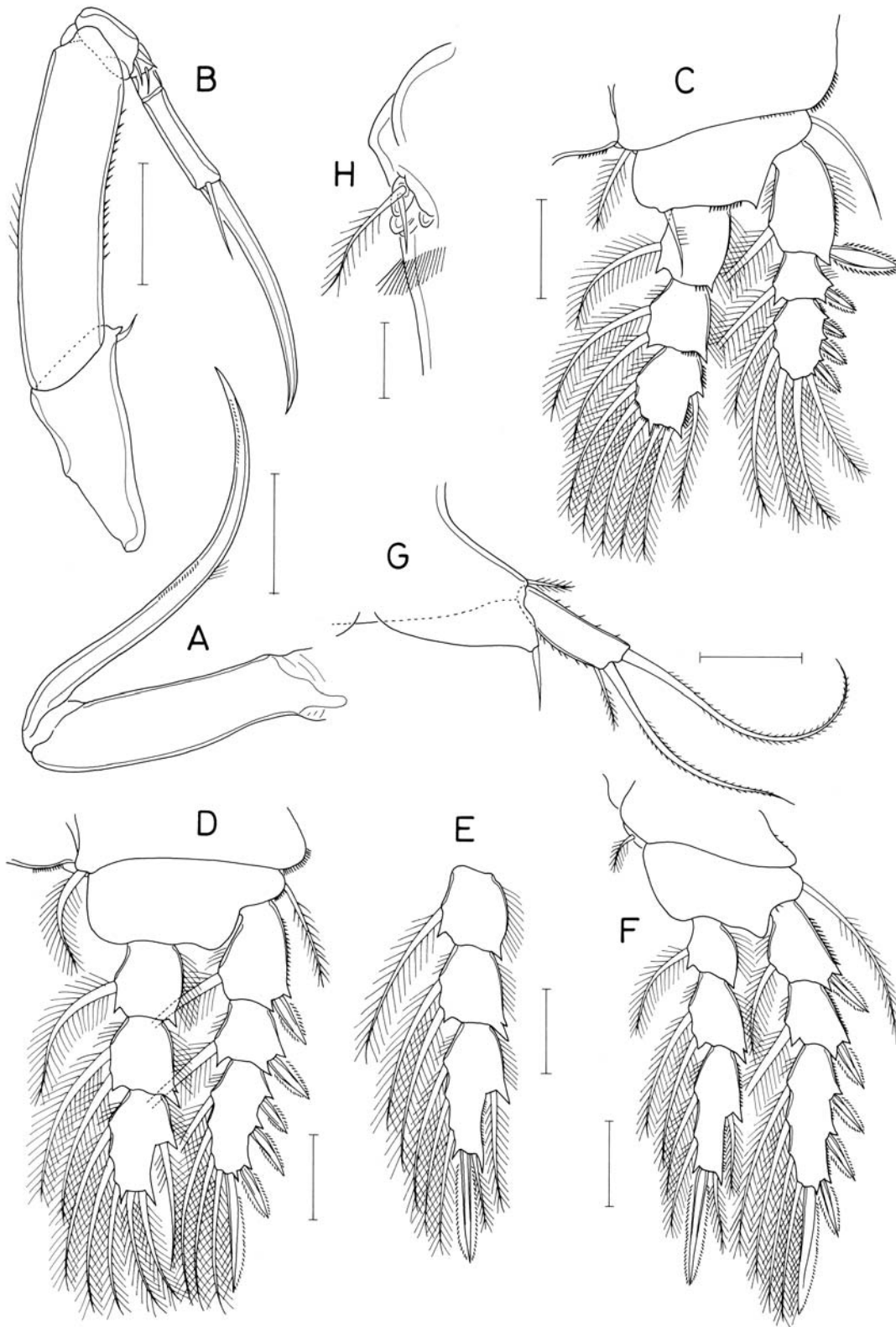


Fig. 118. *Gascardama longisiphonata* n. gen. n. sp., female. A, maxilla; B, maxilliped; C, leg 1; D, leg 2; E, endopod of leg 3; F, leg 4; G, leg 5; H, left genital area. Scales: A-G, 0.05 mm; H, 0.02 mm.

tinctly larger than other spines on the same legs. Legs 2-4 with bicuspid outer distal process on second endopodal segment (Fig. 118D-F). Armature formula of legs 1-4 as follows:

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

Leg 5 (Fig. 118G) 2-segmented; proximal segment distinct but fused with fifth pedigerous somite, with 1 plumose dorso-distal and 1 naked ventrodistal setae; free distal segment $65 \times 24 \mu\text{m}$ (2.71 : 1), with 2 large, distal setae (138 and 116 μm , respectively) and 1 small, subdistal inner seta (33 μm). Leg 6 represented by 1 plumose and 1 small, spiniform setae in genital area (Fig. 118H).

Male. Unknown.

Etymology. The specific name *longisiphonata* alludes to the thread-like, long oral siphon of the new species.

Family Dinopontiidae Murnane, 1967

Genus *Stenopontius* Murnane, 1967

***Stenopontius spinulatus* n. sp. (Figs. 119, 120)**

Material examined. 47 ♀♀, 4 ♂♂ from a sponge (*Prianos* sp.), at a depth of 30 m, west of Tany Kely, near Nosy Bé, Madagascar, 12 July 1967, collected by A. G. Humes. Holotype (♀), allotype (♂), and paratypes (44 ♀♀, 2 ♂♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀♀, 1 ♂) are retained in the collection of the author.

Female. Body (Fig. 119A) small and narrow. Body length of dissected specimen 423 μm . Prosome 246 μm long, and maximum width 158 μm . Cephalothorax 130 μm long. Cephalothorax and following 2 prosomal somites with angular posterolateral corners. Urosome (Fig. 119B) 5-segmented. Fifth pedigerous somite 60 μm wide. Genital double-somite $67 \times 69 \mu\text{m}$, with slightly convex lateral margins and slightly projected, angular posterolateral corners; genital areas located dorsally near midlength of somite. Three free abdominal somites 26×48 , 27×40 , and $23 \times 34 \mu\text{m}$, respectively. Genital double- and first 2 free abdominal somites with transverse rows of spinules on ventral surface (Fig. 119C). Anal somite with convex lateral margins. Caudal ramus $17 \times 12 \mu\text{m}$ (1.42 : 1), with 6 setae, largest one being 43 μm long.

Rostrum lacking. Antennule (Fig. 119D) 8-segmented, with armature formula 0, 0, 4, 5, 2, 2, 1, and 8+2 aesthetascs; all setae small and naked. Antenna (Fig. 119E) with naked precoxa and coxa; basis with spinules on outer side. Exopod

represented by 2 naked setae in middle of outer margin of basis. Endopod 3-segmented; first segment unarmed and slightly shorter than basis; second and third segments with 1 and 2 setae each; terminal claw strongly curved.

Oral cone $83 \times 30 \mu\text{m}$, tapering, truncated at apex (Fig. 119F), and extending to level between maxilliped and leg 1. Mandible consisting of simple stylet (63 μm long), without palp (Fig. 119F). Maxillule (Fig. 119G) bilobed. Inner lobe $24 \times 8 \mu\text{m}$, with thick lateral setules and 3 weakly plumose distal setae (41, 41, and 35 μm , respectively). Outer lobe very small, $6 \times 3 \mu\text{m}$, with 2 naked distal setae (33 and 22 μm , respectively). Maxilla (Fig. 119H) with unarmed proximal segment; distal claw strongly curved, with setules in distal part. Maxilliped (Fig. 119I) 5-segmented, with armature formula 0, 0, 0, 2, and 1+claw; articulation faint between first and second segments; third segment very small; terminal claw 16 μm long, as long as terminal segment, with minute spinules on distal half of inner margin.

Legs 1-4 (Figs. 119J, 120A-C) with 3-segmented rami and lacking inner seta on coxa. Inner spine on basis of leg 1 small and not exceeding posterior margin of first endopodal segment. Terminal spine on rami of legs 3 and 4 expanded, leaf-like. Armature formula of legs 1-4 as follows:

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

Leg 5 2-segmented (Fig. 119B); proximal segment fused with fifth pedigerous somite, with 1 dorsal seta; distal free segment (Fig. 120D) ovoid, $34 \times 19 \mu\text{m}$, with spinules on inner margin, setules on outer margin, and 3 naked distal setae (13, 10, and 9 μm from inner to outer). Leg 6 represented by 1 plumose and 1 naked setae in genital area (Fig. 119B).

Male. Body (Fig. 120E) very similar to that of female. Body length of dissected specimen 327 μm . Prosome $183 \times 121 \mu\text{m}$. Cephalothorax 102 μm long. Urosome (Fig. 120F) 6-segmented. Fifth pedigerous somite 40 μm wide. Genital somite expanded laterally, $44 \times 68 \mu\text{m}$, with rounded corners. Four abdominal somites 17×41 , 17×33 , 17×29 , and $18 \times 27 \mu\text{m}$, respectively. First abdominal somite strongly expanded posterolaterally. Caudal ramus $15 \times 11 \mu\text{m}$.

Rostrum lacking. Antennule (Fig. 120G) 11-segmented, with armature formula 1 aesthetasc, 1+2 aesthetascs, 1+aesthetasc, 2, 5+aesthetasc, 2+aesthetasc, 2+aesthetasc, 2, 1, 1+aesthetasc, and 7+aesthetasc. Antenna as in female.

Mouthparts and legs 1-4, as in female. Maxilliped also as in female.

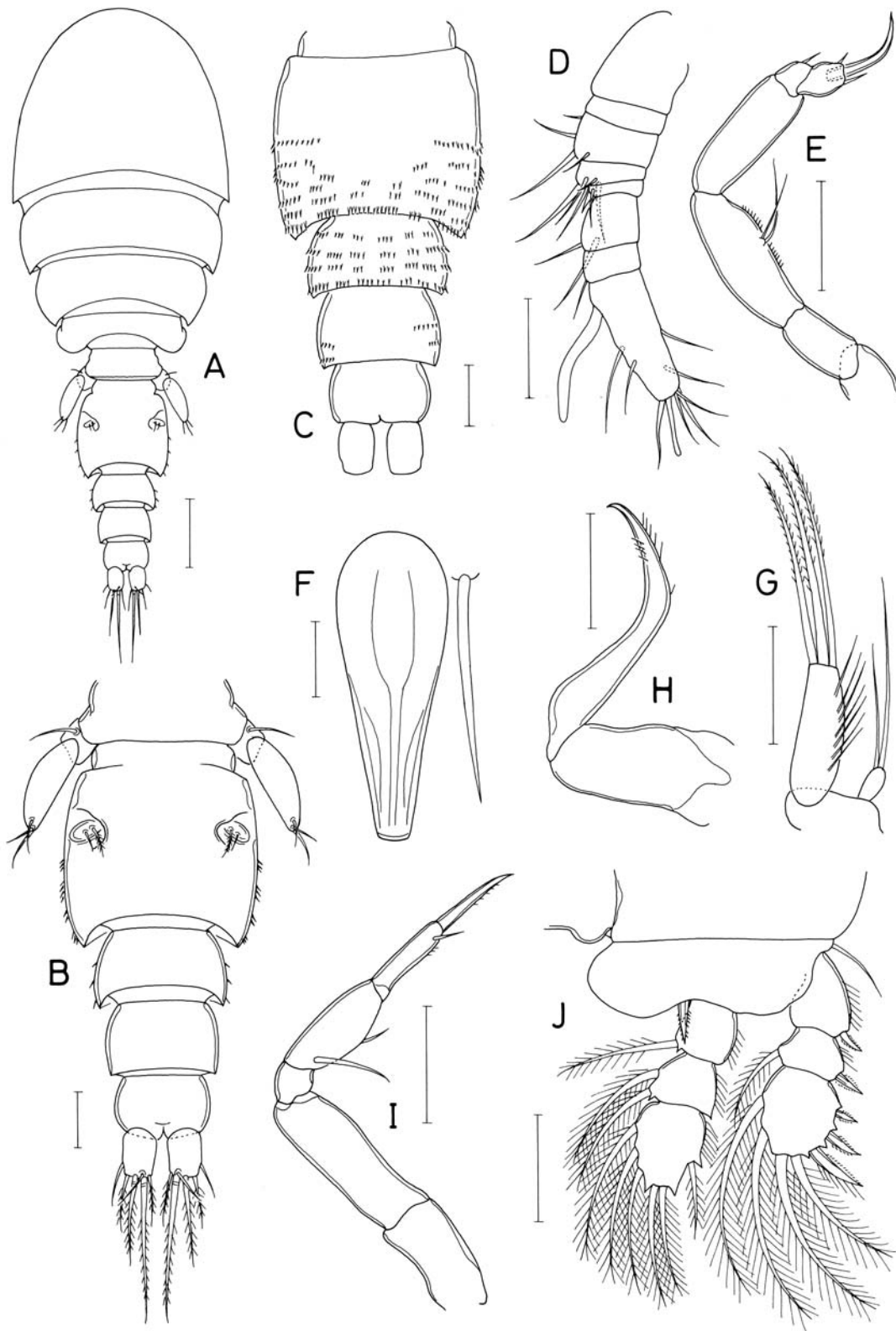


Fig. 119. *Stenopontius spinulatus* n. sp., female. A, habitus, dorsal; B, urosome, dorsal; C, urosome, ventral; D, antennule; E, antenna; F, oral cone and mandible; G, maxillule; H, maxilla; I, maxilliped; J, leg 1. Scales: A, 0.05 mm; B-J, 0.02 mm.

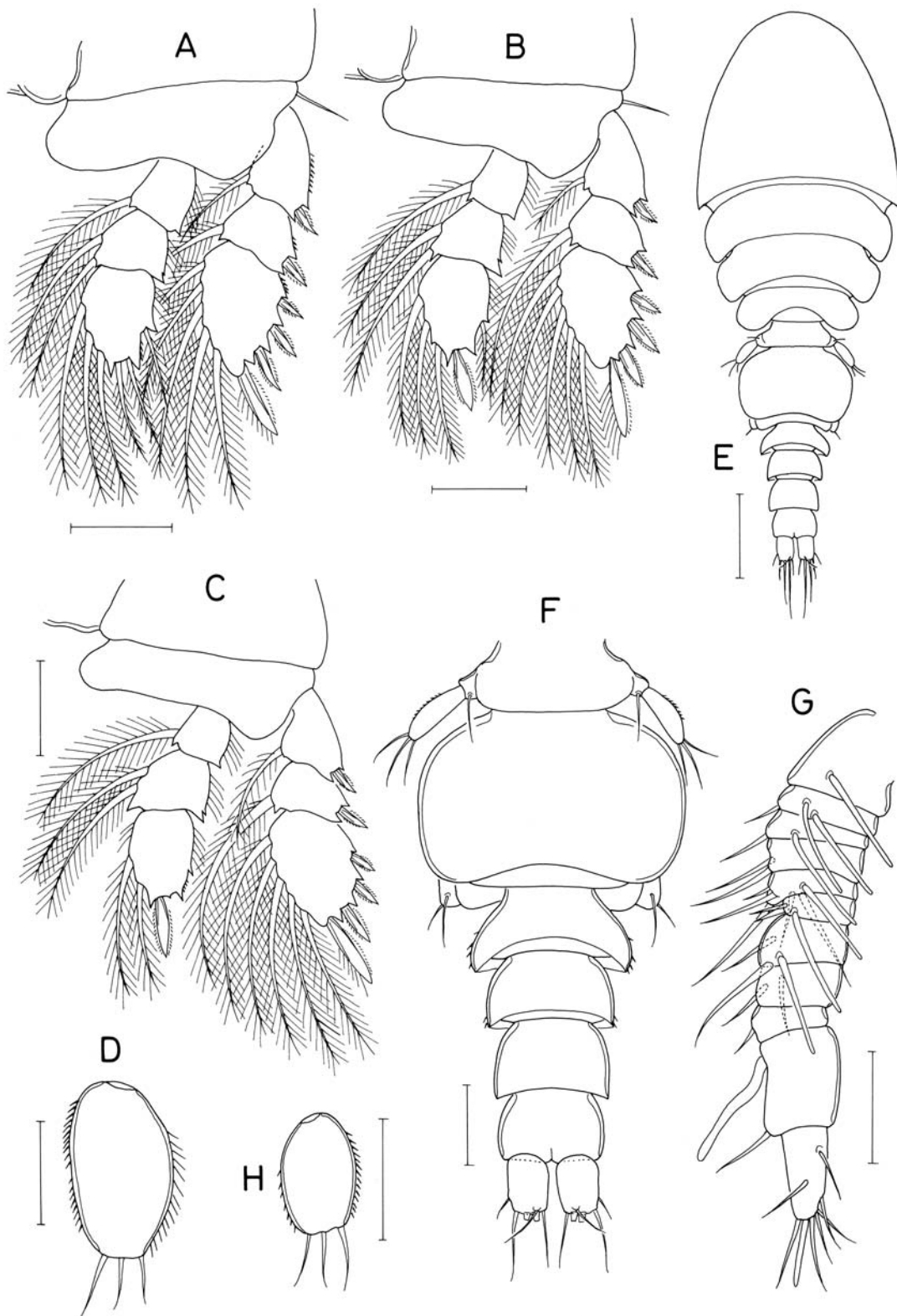


Fig. 120. *Stenopontius spinulatus* n. gen. n. sp. Female: A, leg 2; B, leg 3; C, leg 4; D, free segment of leg 5. Male: E, habitus, dorsal; F, urosome, dorsal; G, antennule; H, free segment of leg 5. Scales: A-D, F-H, 0.02 mm; E, 0.05 mm.

Free segment of leg 5 (Fig. 120H) $20 \times 13 \mu\text{m}$, with spinules on lateral margins and 3 distal setae. Leg 6 represented by 2 naked setae on genital flap (Fig. 120F).

Etymology. The specific name *spinulatus* refers to the presence of many spinules on the ventral surface of the genital double- and anterior abdominal somites.

Remarks. The genus *Stenopontius* Murnane, 1967 currently consists of three known species, *Stenopontius humesi* Murnane, 1967, *Stenopontius parvus* Boxshall, 1990, and *Stenopontius boxshalli* Malt, 1991, all associated with sponges. The morphological differences of antenna and leg 1 seem to be useful to differentiate species of *Stenopontius* easily. In *S. spinulatus* n. sp. the exopod of female antenna is represented by a couple of setae in contrasted to the lacking of the exopod in *S. boxshalli* and *S. parvus* or representing by a single seta in *S. humesi*. In *S. spinulatus* the third exopodal segment of leg 1 is armed with three spines and four setae (formula III,2,2) in contrast to two spines and four setae (II,2,2) in *S. boxshalli* and *S. humesi* or three spines and five setae (III,2,3) in *S. parvus*.

The male of *S. spinulatus* possesses nine aesthetascs on the antennule. This number of aesthetascs is remarkable, because only a single aesthetasc on the male antennule has been reported in *S. boxshalli* and *S. humesi* (the male of *S. parvus* is unknown).

Family Nanaspidae Humes and Cressey, 1959

Genus *Stephopontius* Thompson and A. Scott, 1903

***Stephopontius ahni* n. sp. (Figs. 121-123)**

Material examined. 7 ♀ ♀, 7 ♂ ♂ from the holothurian *Mertensiothuria fuscocinerea* (Jaeger), at a depth of 1.5 m, Nosy N'Tangam, west of Nosy Bé, Madagascar, 5 October 1960, collected by A. G. Humes. Holotype (♀), allotype (♂), and paratypes (4 ♀ ♀, 5 ♂ ♂) have been deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. Dissected paratypes (2 ♀ ♀, 1 ♂) are retained in the collection of the author.

Female. Body (Fig. 121A, B) nearly quadrate, unsegmented, and consisting of large prosomal and small urosomal regions. Body length of dissected specimen $698 \mu\text{m}$ and maximum width $483 \mu\text{m}$. Prosomal region divided at middle into cephalothoracic and metasomal areas by lateral constriction and dorsal transverse sclerotization (Fig. 121A). The cephalothoracic area with slight lateral constriction and short dorsal transverse sclerotization; anterior apex slightly concave. Metasomal area with prominent, digitiform posterolateral process ($121 \times 42 \mu\text{m}$) on both sides, pair of divergent, tapering posteroventral processes near base of urosomal region (Fig. 121B, D) and weak dorsal sclerotization. Urosomal region nearly quadrate, with large, posteriorly directed,

lateral processes on both sides; this process inserted into a socket of male antennule (Fig. 123E) during copulation, with 1 small ventral seta and 2 blunt inner lobes. Abdomen directed ventrally, and distally bilobed, with dorsal process on each lobe. Caudal ramus slightly longer than wide, mounted on large ventral lobe, with 6 small setae (Fig. 121D). Egg sac $625 \times 150 \mu\text{m}$ in dissected specimen, containing 8 or 9 large eggs arranged in 1 row (Fig. 121A).

Rostrum located ventrally and wider than long (Fig. 121B). Antennule (Fig. 122A) indistinctly 5-segmented, with armature formula 0, 0, 7, 6, and 7+2 aesthetascs; third segment subdivided distally. Antenna (Fig. 122B) 5-segmented; first and second segments (coxa and basis) incompletely articulated, with suture line on one side, and unarmed; third segment as long as wide, with spinules on inner side; fourth segment about 2.2 times as long as wide, with many pectinated spinules (or scales); short fifth segment with 1 inner seta; distal claw with 2 distal cusps on convex outer side and several minute spinules on concave inner side.

Oral cone short and directed ventrally (Fig. 121B). Mandible (Fig. 122C) represented by small lash inserted into oral cone. Maxillae (Fig. 122D) biramous; inner ramus (lobe) with 1 thick distal seta; outer ramus about twice as long as inner ramus, with 3 distal setae. One plumose seta located on ventral surface of body lateral to maxillule (Figs. 121B, 122D). Maxilla (Fig. 122E) 2-segmented; proximal segment stout and unarmed; distal claw strongly curved distally. Maxilliped (Fig. 122F) 4-segmented, with 1 inner seta on each segment; first segment with several spinules on inner margin; second segment with 3 or 4 spinules on outer margin; third segment shortest; fourth segment with spinules along whole inner margin; distal claw nearly as long as fourth segment with 1 subapical cusp on convex side.

Leg 1 (Fig. 122G) small, with unsegmented rami; exopod (anterior ramus) with 5 setae, apical one of them distinctly larger than others; endopod (posterior ramus) tapering and larger than exopod, with 1 large apical seta. Leg 2 (Fig. 122H) with 2-segmented exopod and 1-segmented endopod. First exopodal segment with 1 outer seta; second exopodal segment with 6 weakly plumose setae, 2 distal ones of them large. Endopod small, about twice as long as wide, with 2 distal setae. Leg 3 (Fig. 122I) with 2-segmented exopod, without endopod; exopod incompletely segmented, with 1 outer seta on first segment and 7 unequal setae on second segment. Leg 4 (Fig. 123A) with 1-segmented exopod, without endopod; exopod bearing 5 setae, 2 inner ones of them distinctly larger than the other 3. Leg 5 and 6 not recognized.

Male. Body (Fig. 123B) similar to that of female, but metasomal area distinctly narrower than cephalothoracic area and digitiform posterolateral processes absent on metasomal area.

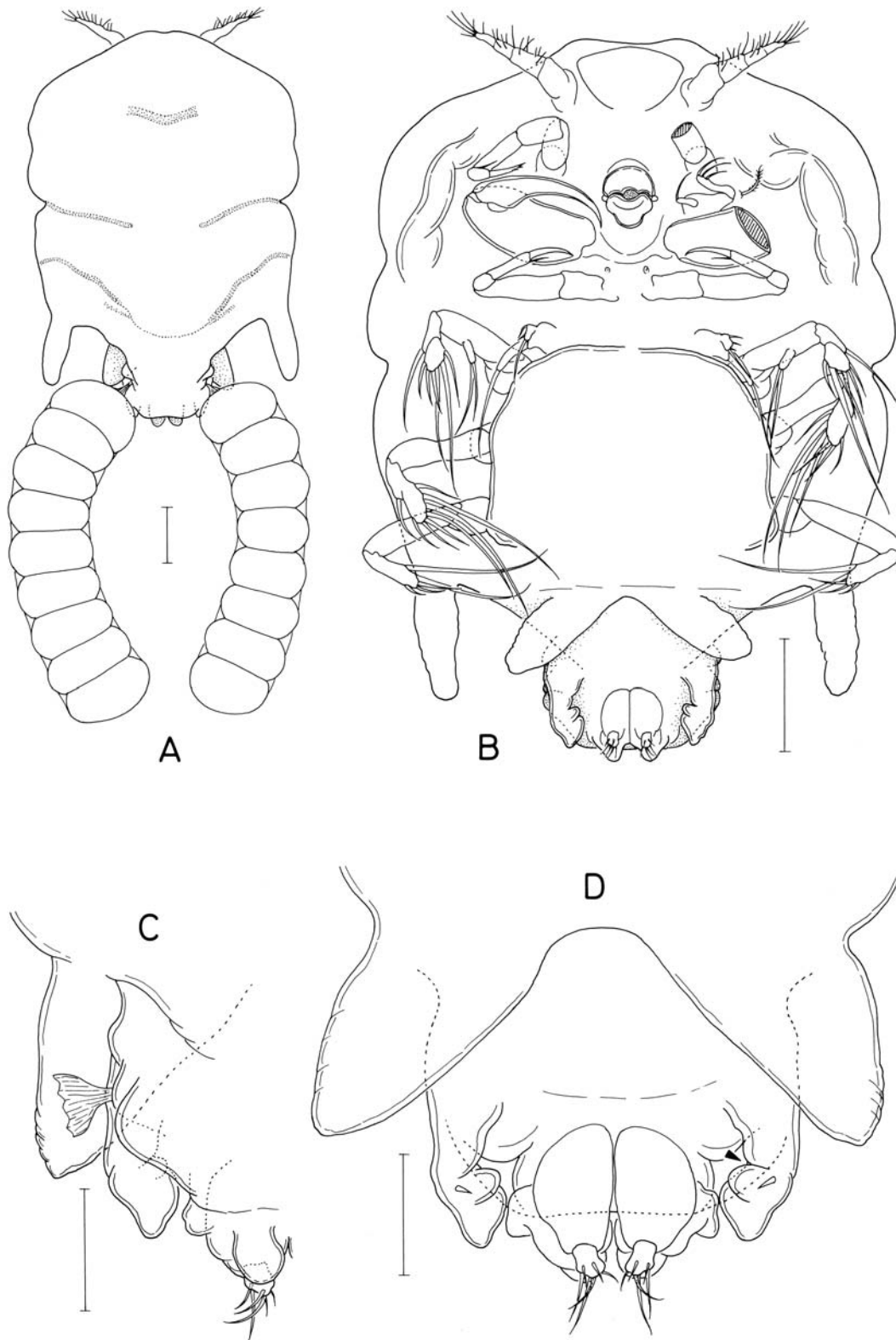


Fig. 121. *Stephopontius ahni* n. sp., female. A, habitus, dorsal; B, habitus, ventral; C, left side of urosome, dorsal; D, urosome, ventral. Scales: A, B, 0.1 mm; C, D, 0.05 mm.

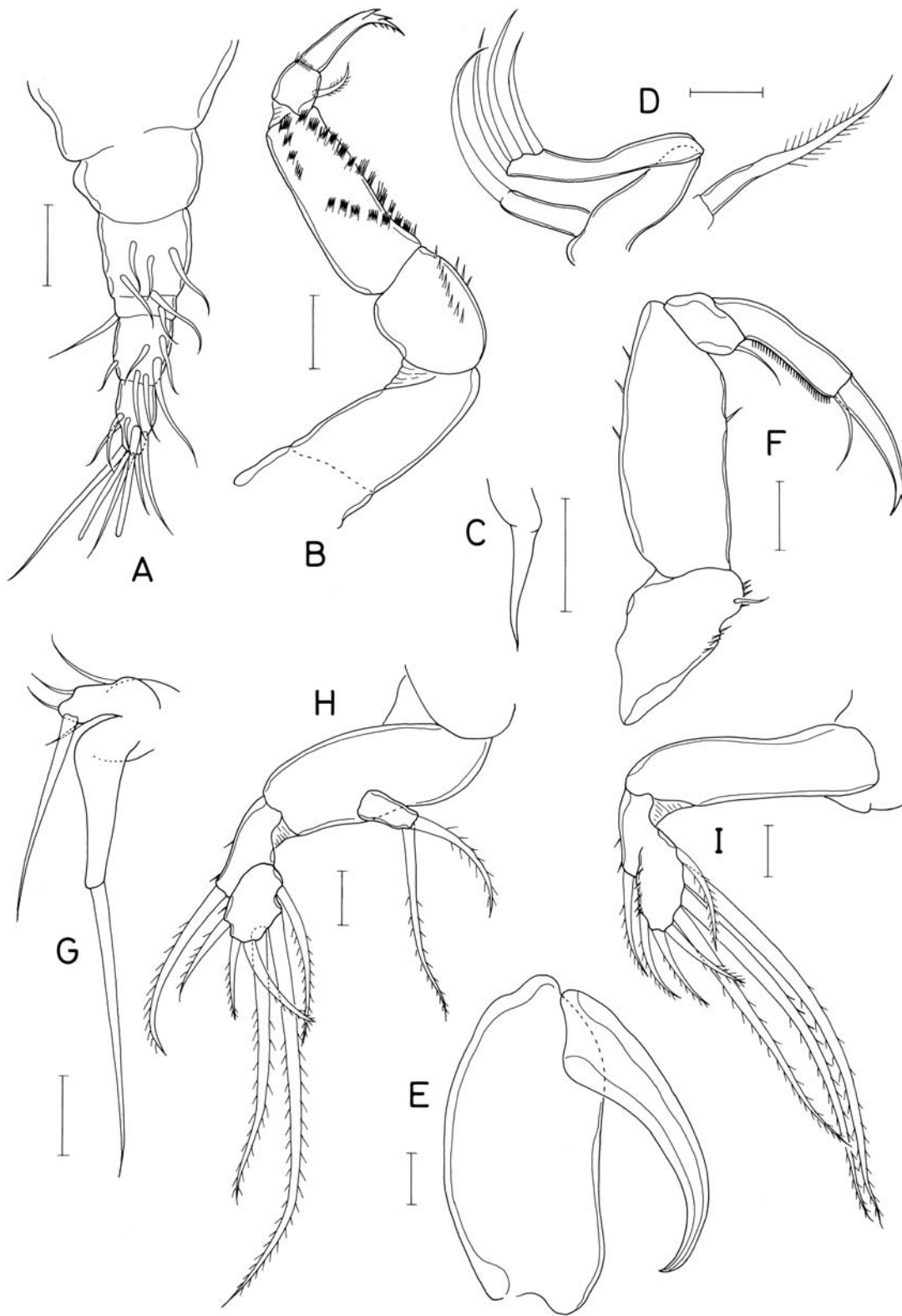


Fig. 122. *Stephopontius ahni* n. sp., female. A, antennule; B, antenna; C, mandible; D, maxillule; E, maxilla; F, maxilliped; G, leg 1; H, leg 2; I, leg 3. Scales: 0.02 mm for all.

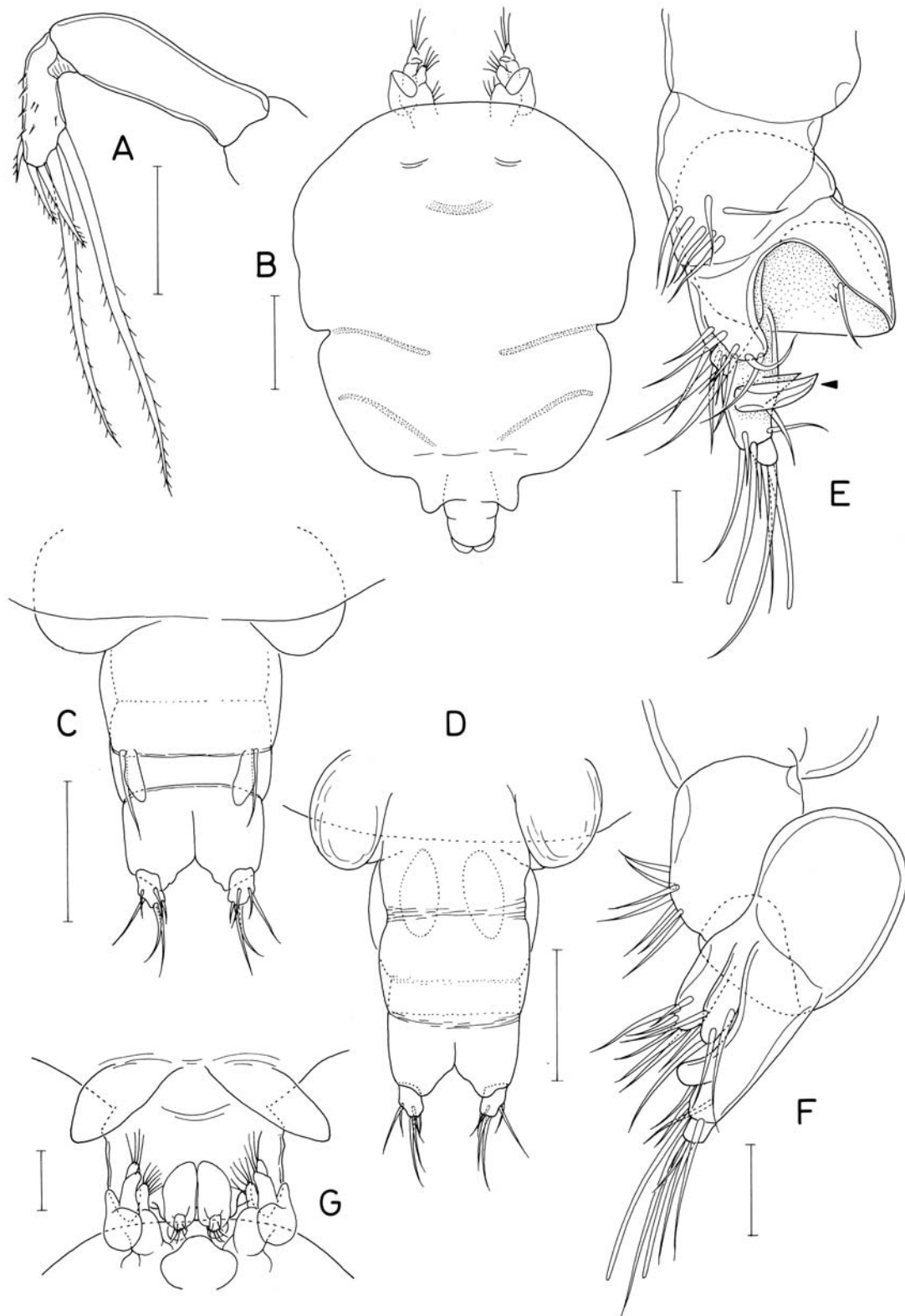


Fig. 123. *Stephopontius ahni* n. sp. Female: A, leg 4. Male: B, habitus, dorsal; C, urosome, ventral; D, urosome, dorsal; E, antennule, dorsal; F, antennule, ventral; G, female urosome and male rostral area during amplexus, ventral. Scales: A, C, D, G, 0.05 mm; B, 0.1 mm; E, F, 0.02 mm.

Body length 490 μm and maximum width 373 μm in dissected specimen. Metasomal area produced posteromedially (Fig. 123B). Urosome (Fig. 123C, D) obscurely 4-segmented and directed ventrally. First urosomite indistinctly divided from the following somite and represented by a large tubercle on both sides. Genital somite (second urosomite) recognized by containing 1 pair of spermatophores (Fig. 123D), longer ventrally than dorsally, with 1 seta and 1 digitiform process on both sides of posteroventral margin (Fig. 123C). Two abdominal somites smooth. Caudal ramus small, slightly longer than wide, with 6 naked setae.

Rostrum as in female. Antennule (Fig. 123E, F) probably 5-segmented; first segment unarmed; second segment with 7 setae; third segment with 11 setae and 1 large socket receiving lateral process of female urosome during copulation (Fig. 123G) and bearing 1 spinule and 1 additional seta in socket (Fig. 123E); fifth segment armed with 2 proximal claw-like spines, 4 setae and 1 aesthetasc; sixth segment small, with 3 setae and 1 aesthetasc. Large claw-like spine (indicated by arrowhead in Fig. 123E) inserting into inner furrow (indicated by arrowhead in Fig. 121D) of lateral process of female urosome during copulation. Antenna as in female.

Mouth organs, including maxilliped, as in female. Legs 1-4 also as in female. Leg 5 absent. Leg 6 represented by 1 seta and 1 digitiform process on posteroventral margin of genital somite (second urosomite) (Fig. 123C).

Etymology. This species is named after Dr. Kee-Cheong Ahn, Department of Biology, Chungnam National University.

Remarks. *Stephopontius* had been remained as a monotypic genus for more than a century, represented by *S. typicus* Thompson and Scott, 1903. Thompson and Scott measured mistakenly their specimens as 6.7 mm in the female and 8 mm in the male. The male is distinctly smaller than female, deduced from their illustrations of the female and male which were drawn at the same magnification (Pl. 20, Figs. 19 and 20 in Thompson and Scott, 1903). On the basis of their illustrations and recorded magnification, *S. typicus* may be revised as 0.67 mm long in the female and about 0.5 mm long in the male, which are not so different from the lengths of *S. ahni* n. sp. measuring 698 μm in the female and 490 μm in the male.

Stephopontius ahni n. sp. is similar to *S. typicus* in the body form, the structure of the antenna, the possession of the 2-segmented exopod of leg 2, and the reduced segmentation of the exopod of leg 3. Two aspects prevent them from being treated as conspecific: *S. typicus* was recorded to have a 2-segmented endopod of legs 2 and 3 and a 2-segmented exopod of leg 4 (Thompson and Scott, 1903). These leg structures are contrasted to those of *S. ahni* where the endopod of leg 2 is 1-segmented, the endopod of leg 3 is lacking, and the exopod of leg 4 is 1-segmented. The prosomal articula-

tions shown in *S. typicus* are not observable in *S. ahni*, either.

Thompson and Scott collected *S. typicus* from washings of dredged invertebrates. The finding of *S. ahni* from a holothurian suggests that *Stephopontius* is a genus associated with holothurians as other genera of the Nanaspidae, as Boxshall and Ohtsuka (2001) presumed. It is interesting to find that the male antennule of *Stephopontius* resembles that of some harpacticoid copepods.

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