

***Asterocheres enewetakensis*, new species (Copepoda:  
Siphonostomatoida), from a sponge at Enewetak Atoll, Marshall Islands**

ARTHUR G. HUMES

*Boston University Marine Program,  
Marine Biological Laboratory,  
Woods Hole, Massachusetts, 02543, U. S. A.*

**Abstract**—The asterocherid siphonostomatoid copepod *Asterocheres enewetakensis*, new species, is described from an unidentified sponge at Muti Island, Enewetak Atoll, Marshall Islands. It differs from all congeners in the elongated slender leg 5 (ratio in the female 6:1) and in the shape of the genital double-somite in the female.

Shallow-water marine invertebrates throughout the world are hosts to many poecilostomatoid and siphonostomatoid copepods (Gotto 1979). Siphonostomatoids associated with invertebrates are small copepods, mostly less than 2 mm in length. The family Asterocheridae, including *Asterocheres*, contains species often associated with sponges in Europe, the Mediterranean, the West Indies and Caribbean, and the Indo-Pacific. These copepods may be recognized by their siphon or oral cone and by the presence of an exopod on the antenna.

The genus *Asterocheres* contains 36 species of which the descriptions are sufficiently complete for reliable comparisons to be made (Humes 1996). Of these species, several are found in the Indo-Pacific, all associated with sponges. These include *Asterocheres aesthetes* Ho, 1984, from the Sea of Japan (Ho 1984) and Hong Kong (Boxshall 1991), *A. bulbosus* Malt, 1991, from Hong Kong, *A. dysideae* Humes, 1996, from the Moluccas, *A. genodon* Stock, 1966, from Mauritius, *A. halochondriae* Stock, 1966, from Mauritius, *A. hongkongensis* Malt, 1991, from Hong Kong, *A. mucronipes* Stock, 1960, from Mauritius (Stock 1966), *A. proboscideus* Stock, 1966, from Mauritius, *A. rotundus* Malt, 1991, from Hong Kong, and *A. scutatus* Stock, 1966, from the Gulf of Aqaba. Other species, less fully described, of *Asterocheres* from sponges in the Indo-Pacific are: *A. dentatus* Giesbrecht, 1897, from the Gulf of Mannar (Thompson & Scott 1903, Ummerkutty 1966), *A. major* (Thompson & Scott, 1903), from the Gulf of Manaar (Thompson & Scott 1903, Ummerkutty 1966), *A. manaarensis* Thompson & Scott, 1903, from the Gulf of Manaar (Thompson & Scott 1903, Ummerkutty 1966), *A. minor* (Thompson & Scott, 1903), from the Gulf of Manaar (Thompson & Scott 1903, Ummerkutty 1966), *A. minutus* (Claus, 1889) from Ceylon at the Gulf of Manaar (Thompson & Scott 1903), *A. orientalis* Sewell, 1949, from the

Maldive Archipelago (Sewell 1949, Ummerkutty 1966), and *A. stimulans* Giesbrecht, 1899, from the Gulf of Manaar (Thompson & Scott 1903).

### Materials and Methods

After collection in the field the sponge was isolated in a plastic bag with sea water, to which a small amount of 95% ethanol was added to make approximately a 5% solution. After soaking for 1–2 hours and rinsing, the wash water was passed through a fine net (approximately 120 holes per 2.5 cm). The copepods were then recovered from the sediment retained in the net.

The copepods were measured and dissected in lactic acid, using the wooden slide method described by Humes & Gooding (1964). All drawings were made with the aid of a camera lucida.

Siphonostomatoida Thorell, 1859

Asterocheridae Giesbrecht, 1899

*Asterocheres* Boeck, 1859

*Asterocheres enewetakensis* new species

Figures 1a–g, 2a–j, 3a–i

### TYPE MATERIAL

116 ♀♀, 70 ♂♂ from an unidentified sponge (dull yellow and black, exuding black dye when placed in 5% ethanol in sea water), in 2 m, northern end of Muti Island, Enewetik Atoll, Marshall Islands, approximately 11°21'N, 162°21'E, 29 June 1969. (Holotype ♀ (USNM 285466), allotype ♂ (USNM 285467), and 181 paratypes (112 ♀♀, 69 ♂♂ (USNM 285468) deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. Remaining paratypes (dissected) in the collection of the author.

### FEMALE

Body (Figure 1a) with moderately wide flattened prosome. Length 0.71 mm (0.67–0.73 mm) and greatest width 0.39 mm (0.37–0.41 mm), based on 10 specimens in lactic acid. Greatest dorsoventral thickness 0.25 mm. Somite bearing leg 1 fused with cephalosome. Epimera of metasomal somites as illustrated. Ratio of length of prosome to that of urosome 1.25:1. Ratio of length of prosome to that of urosome 1.87:1.

Somite bearing leg 5 (Figure 1b, c)  $44 \times 96 \mu\text{m}$ . Genital double-somite elongate,  $117 \times 101 \mu\text{m}$ , ratio of length to width 1.16:1. Lateral contour of somite as in Figure 1d. Row of long setules on both sides in posterior half of somite. Genital areas located dorsolaterally, bearing 1 seta (Figure 1d). Two postgenital somites from anterior to posterior  $44 \times 57$  and  $44 \times 55 \mu\text{m}$ , both somites with lateral surficial scalelike spinules.

Caudal ramus (Figure 1e) longer than wide,  $31 \times 23 \mu\text{m}$ , ratio 1.35:1. Outer lateral seta, displaced dorsally,  $177 \mu\text{m}$ , outermost terminal seta  $138 \mu\text{m}$ , and 2

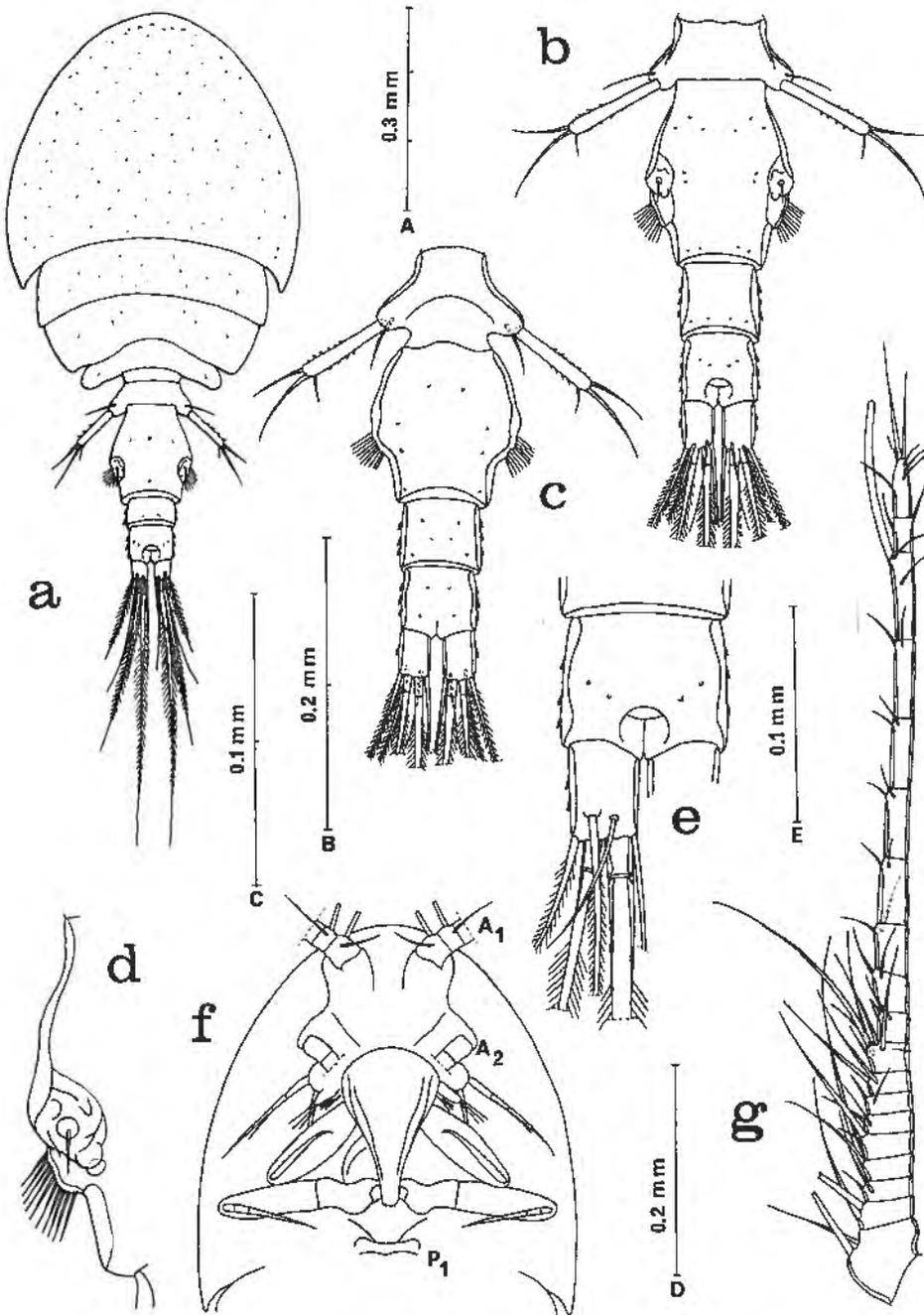


Figure 1. *Astrocheres enewetakensis*, new species. Female. a, dorsal (scale A); b, urosome, dorsal (B); c, urosome, ventral (B); d, edge of genital double-somite, dorsal (C); e, anal somite and caudal ramus, dorsal (C); f, cephalosome, ventral (D); g, antennule, outer (E).

long median terminal setae 297  $\mu\text{m}$  (outer) and 400 (inner), all with delicate lateral setules. Dorsal seta 65  $\mu\text{m}$  and innermost terminal seta 135  $\mu\text{m}$ , both smooth. Outer margin of ramus with 1 or 2 scalelike spinules.

Body surface with sensilla as in Figure 1a, b, c.

Egg sac not seen.

Rostral area (Figure 1f) weak. Antennule (Figure 1g) 19-segmented, 385  $\mu\text{m}$  long, with aesthetasc on antepenultimate segment. Lengths of segments (measured along their posterior nonsetiferous margins): 14 (36  $\mu\text{m}$  along anterior margin), 11, 10, 10, 11, 10, 10, 10, 12, 14, 18, 22, 29, 30, 32, 33, 36, 16, and 26  $\mu\text{m}$ , respectively. Formula for armature: 2, 2, 2, 2, 2, 2, 2, 2, 6, 2, 2, 2, 2, 2, 2, 2 + 1 aesthetasc, 2, and 7. Segments 1 and 2 with truncated seta. All setae smooth. Antenna (Figure 2a) with small exopod  $8 \times 4.5 \mu\text{m}$ . Endopod 3-segmented, formula for armature: 0, 1, and 3, middle terminal seta clawlike and 39  $\mu\text{m}$  long.

Oral cone (Figure 2b) 143  $\mu\text{m}$  long, reaching to level of maxillipeds (Figure 1f). Mandible (Figure 2c) with long slender gnathobase 150  $\mu\text{m}$  long having slight subterminal hyaline lamella. Palp 2-segmented, first segment 32  $\mu\text{m}$ , second segment 18  $\mu\text{m}$  bearing 2 terminal setae 44 and 100  $\mu\text{m}$ . Maxillule (Figure 2d) with small outer lobe bearing 3 setae and larger elongate inner lobe having row of several inner proximal setules, 3 long distal surficial setules, and 4 terminal setae. Maxilla (Figure 2e) 2-segmented, second segment slender with recurved tip. Maxilliped (Figure 2f) 5-segmented, with first segment bearing 1 small distal inner seta, third and fourth segments with 1 seta, and fifth segment with 2 terminal setae, one spiniform.

Legs 1-4 (Figure 2g-i) biramous with 3-segmented rami. Formula for armature as follows:

$P_1$	coxa 0-1	basis 1-1	exp I-1;	I-1;	II,I,4
			enp 0-1;	0-2;	1,2,3
$P_2$	coxa 0-1	basis 1-0	exp I-1;	I-1;	III,I,4
			enp 0-1;	0-2;	1,2,3
$P_3$	coxa 0-1	basis 1-0	exp I-1;	I-1;	III,I,4
			enp 0-1;	0-2;	1,1,I,3
$P_4$	coxa 0-1	basis 1-0	exp I-1;	I-1;	III,I,4
			enp 0-1;	0-2;	1,1,I,2

Leg 1 with inner spine on basis 17  $\mu\text{m}$  with slightly recurved tip. First segment of basis with distal outer spine 28  $\mu\text{m}$ , contrasting with corresponding spine on second segment 6  $\mu\text{m}$  (Figure 2g). Leg 4 with third segment of endopod having conspicuous terminal spiniform process (5.5  $\mu\text{m}$ ) between seta (26  $\mu\text{m}$ ) and barbed spine (55  $\mu\text{m}$ ) (Figure 2j).

Leg 5 (Figure 3a,b) with elongated free segment  $155 \times 26 \mu\text{m}$ , ratio 6:1, slightly wider distally than proximally. Two terminal setae 65 and 109  $\mu\text{m}$ , subterminal seta 38  $\mu\text{m}$ . Few minute spinules on both sides of free segment. Adjacent seta on body somite 90  $\mu\text{m}$ . All setae smooth.

Leg 6 represented by seta on genital area (Figure 1d).

Color of living specimens in transmitted light pale lavender to opaque brown, eye red.

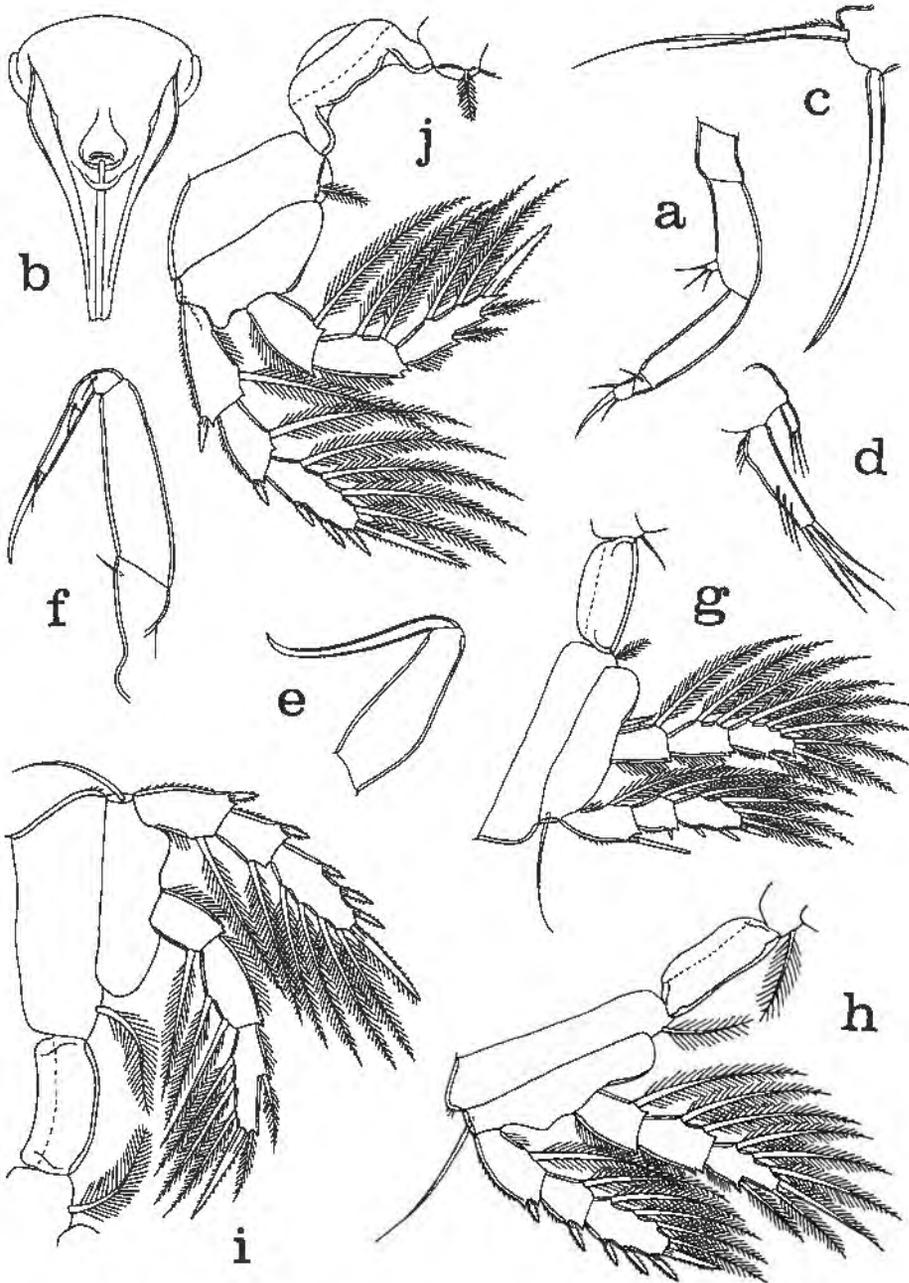


Figure 2. *Asterocheres enewetakensis*, new species. Female. a, antenna, outer (scale E); b, oral cone, ventral (E); c, mandible, anterior (E); d, maxillule, anterior (E); e, maxilla, anterior (E); f, maxilliped, anterior (E); g, leg 1 and intercoxal plate, anterior (E); h, leg 2 and intercoxal plate, anterior (E); i, leg 3 and intercoxal plate, anterior (E); j, leg 4 and intercoxal plate, anterior (E).

## MALE

Body (Figure 3c) slightly more slender than in female. Length 0.58 mm (0.56–0.61 mm) and greatest width 0.26 mm (0.25–0.27 mm), based on 10 specimens in lactic acid. Greatest dorsoventral thickness 0.14 mm. Ratio of length to width of prosome 1.48:1. Ratio of length of prosome to that of urosome 1.73:1.

Somite bearing leg 5 (Figure 3d)  $39 \times 73 \mu\text{m}$ . Genital somite  $86 \mu\text{m}$  long ( $95 \mu\text{m}$  including leg 6) and  $83 \mu\text{m}$  wide, ratio approximately 1:1. Three postgenital somites from anterior to posterior  $26 \times 53$ ,  $20 \times 47$ , and  $30 \times 44 \mu\text{m}$ . Urosome with small scalelike surficial spinules like those of female.

Caudal ramus resembling that of female but smaller,  $23 \times 21 \mu\text{m}$ .

Body surface with sensilla as in Figure 3c,d.

Rostral area as in female. Antennule (Figure 3e)  $230 \mu\text{m}$ , 17-segmented, with aesthetasc on penultimate segment. Lengths of segments (measured along their posterior nonsetiferous margins): 15 ( $25 \mu\text{m}$  along anterior margin), 11, 9, 9, 9, 9, 9, 12, 13, 18, 22, 22, 17, 44, 34, and  $23 \mu\text{m}$ , respectively. Armature: 2, 2, 2, 2, 2, 2, 2, 6, 2, 2, 2, 2, 2, 2 + 1 aesthetasc, and 7. Slight evidence of sclerotization accompanying geniculation on segment 15. Antenna like that of female.

Oral cone, mandible, maxillule, and maxilla as in female. Maxilliped similar to that of female, but second segment having inner proximally directed thorn-shaped process (Figure 3f).

Legs 1–4 as in female.

Leg 5 (Figure 3g) resembling that of female, but smaller,  $39 \times 26 \mu\text{m}$ , ratio 1.5:1.

Leg 6 (Figure 3h) posteroventral flap on genital somite bearing 2 unequal setae, longer seta  $34 \mu\text{m}$ .

Spermatophore (extruded from body of male) elongate, approximately  $50 \times 21 \mu\text{m}$  (Figure 3i).

Color as in female.

## ETYMOLOGY

The specific name *enewetakensis* is composed of Enewetak, the name of the atoll where the specimens were collected, and the Latin ending *-ensis*, meaning living in. (For the spelling of the name of the atoll, see the National Geographic Atlas of the World, 1990.)

## Remarks

A few features of the new species observable without dissection are useful in separating it from its many congeners (see Humes 1996). *Asterocheres enewetakensis* may be distinguished by the dimensions of the free segment of leg 5 in the female (ratio 6:1). In all congeners the dimensions the ratio is 4.6:1 or less. Although Sewell (1949), in his description of *Asterocheres indicus*, illustrated leg 5, in his text-fig. 10b of the urosome, as long and slender, approximately 6:1, in his drawing of the entire female leg 5 is shown as much shorter, leading to uncertainty of its true dimensions. However, in *A. indicus* the shape of the genital dou-

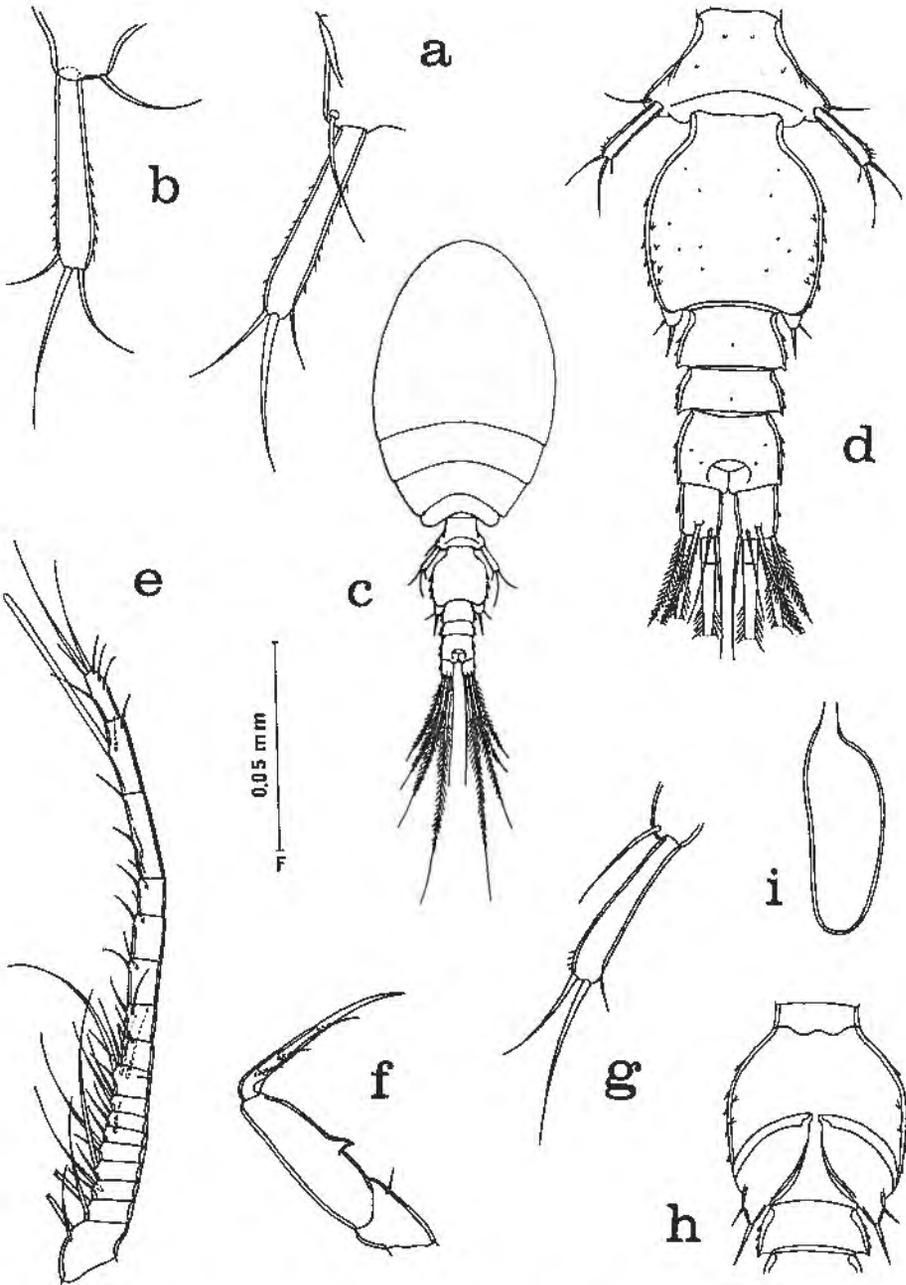


Figure 3. *Astrocheres enewetakensis*, new species. Female. a, leg 5, dorsal (scale C); b, leg 5, anterior, as seen in dissection (C). Male. c, dorsal (A); d, urosome, dorsal (E); e, antennule, inner (E); f, maxilliped, posterior (E); g, leg 5, dorsal (F); h, genital somite, showing leg 6, ventral (E); i, spermatophore, extruded from body of male (F).

ble-somite in the female "dilated in the anterior region and . . . without any spines on the lateral margins" (Sewell 1949; 55) sets this species apart from *A. enewetakensis*. The shape of the female genital-double somite of the new species, in dorsal view longer than wide, ratio 1.16:1, and broadest near its middle, is also distinctive.

#### Acknowledgements

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