

Two New Species of the Genus *Heteromysis* (Crustacea: Mysida: Mysidae) Occurred in the Aquarium of the Kushimoto Marine Park Center, Japan

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Abstract Two new species of the genus *Heteromysis* are described on specimens which occurred in exhibition tanks in the Aquarium of the Kushimoto Marine Park Center, Wakayama, Japan. A species, *Heteromysis kushimotensis* sp. nov., closely resembles *H. meenakshiae* Bamber, 2000, but is distinguished from this species by the size of the cornea, the armature on the carpopropodus of the third thoracopodal endopod, the shape of the second female pleopod, and the spine number of the lateral margin of the telson. The other species, *H. nomurai* sp. nov., is identical with the atypical form of *H. japonica* Murano and Hanamura, 2002. This species is distinctly different from *H. japonica* in the shape of the rostrum, the armature of the merus, ischium and carpopropodus of the third thoracopodal endopod, and the spination of the uropodal endopod and telson.

Key words: Mysidae, *Heteromysis*, taxonomy, new species, Japan

Introduction

To date, the genus *Heteromysis* S. I. Smith, 1873, is known to be composed of about 70 species (Murano & Hanamura, 2002), while only two species, *Heteromysis xanthops* Ii, 1964, and *H. japonica* Murano & Hanamura, 2002, have been reported from Japanese waters. Two new species described in this paper were obtained from exhibition tanks in the Aquarium of Kushimoto Marine Park Center, Wakayama, Japan. All specimens examined are lodged in the National Science Museum, Tokyo (NSMT).

Systematics

Heteromysis kushimotensis sp. nov.

(Figs. 1–3)

Type series. Holotype (NSMT-Cr 15541), adult male (5.3 mm); allotype (NSMT-Cr 15542), gravid female (5.1 mm); paratypes (NSMT-Cr 15543), 8 adult males (4.8–5.3 mm, one specimen of 5.3 mm dissected for drawings), 12

gravid females (4.5–5.2 mm) and 7 adult females (4.6–5.0 mm); exhibition tank of spiny lobster (*Panulirus japonicus*) in the Aquarium of the Kushimoto Marine Park Center, 23 October 1996, coll. K. Nomura.

Other specimens. Abundant immature and juvenile males (up to 4.1 mm) and females (up to 4.5 mm) (NSMT-Cr 15544); collection data same as type series. Eleven gravid females (4.5–5.2 mm), 6 males (4.4–5.2 mm), 8 immature females (3.3–4.7 mm) and 6 juveniles (NSMT-Cr 15545); exhibition tank in the Aquarium of Kushimoto Marine Park Center, 4 October 2002, coll. K. Nomura.

Description. Body moderately robust, slightly depressed dorsoventrally.

Carapace (Fig. 1A, D) produced frontally in triangular rostrum with narrowly rounded apex and concave lateral margins, extending to middle of first segment of antennular peduncle. Antero-lateral corner of carapace rounded; posterior margin emarginate, leaving last thoracic somite exposed.

Eye (Fig. 1A, D) as long as broad; cornea rather small, occupying less than half of eye, slightly narrower than eyestalk, well pigmented; eyestalk with distinct denticle at distal end of mesial margin.

Antennular peduncle (Fig. 1A, D) slightly more robust in male than in female; first segment

with anterolateral corner strongly produced anteriorly and tipped with several setae; second segment short and narrow, triangular in shape in dorsal view, furnished with 2 setae on anteromesial corner, one seta (Fig. 1C) rounded distally with subterminal minute flagellum, another seta slender and plumed; third segment longest, mesial

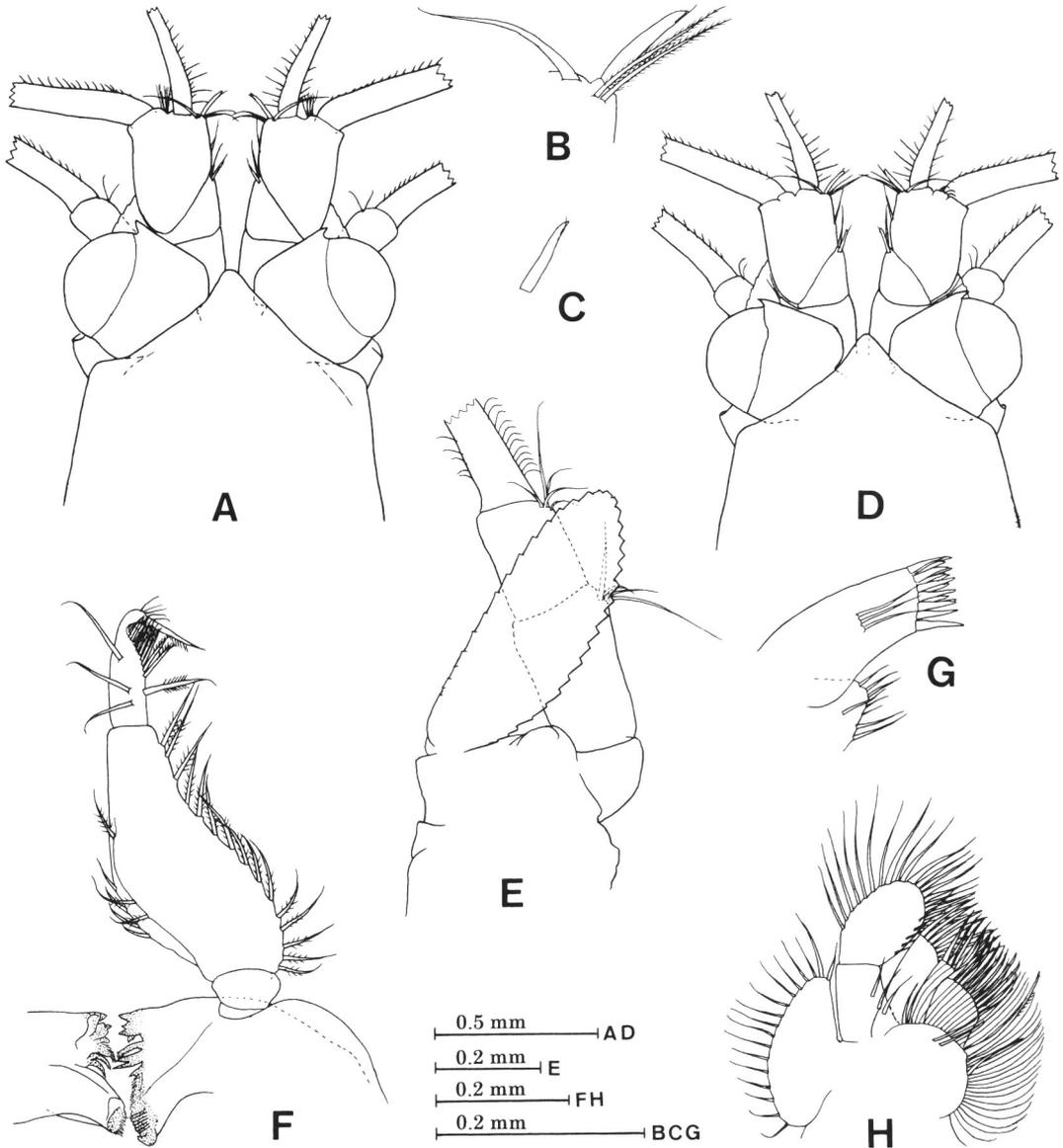


Fig. 1. *Heteromysis kushimotoensis* sp. nov.; A, holotype, D, allotype, B, C, E–H, one of male paratypes. A, anterior part of adult male; B, spine and setae at anteromesial corner of third segment of antennular peduncle; C, spine at anteromesial corner of second segment of antennular peduncle; D, anterior part of adult female; E, antenna; F, mandible; G, maxillule; H, maxilla.

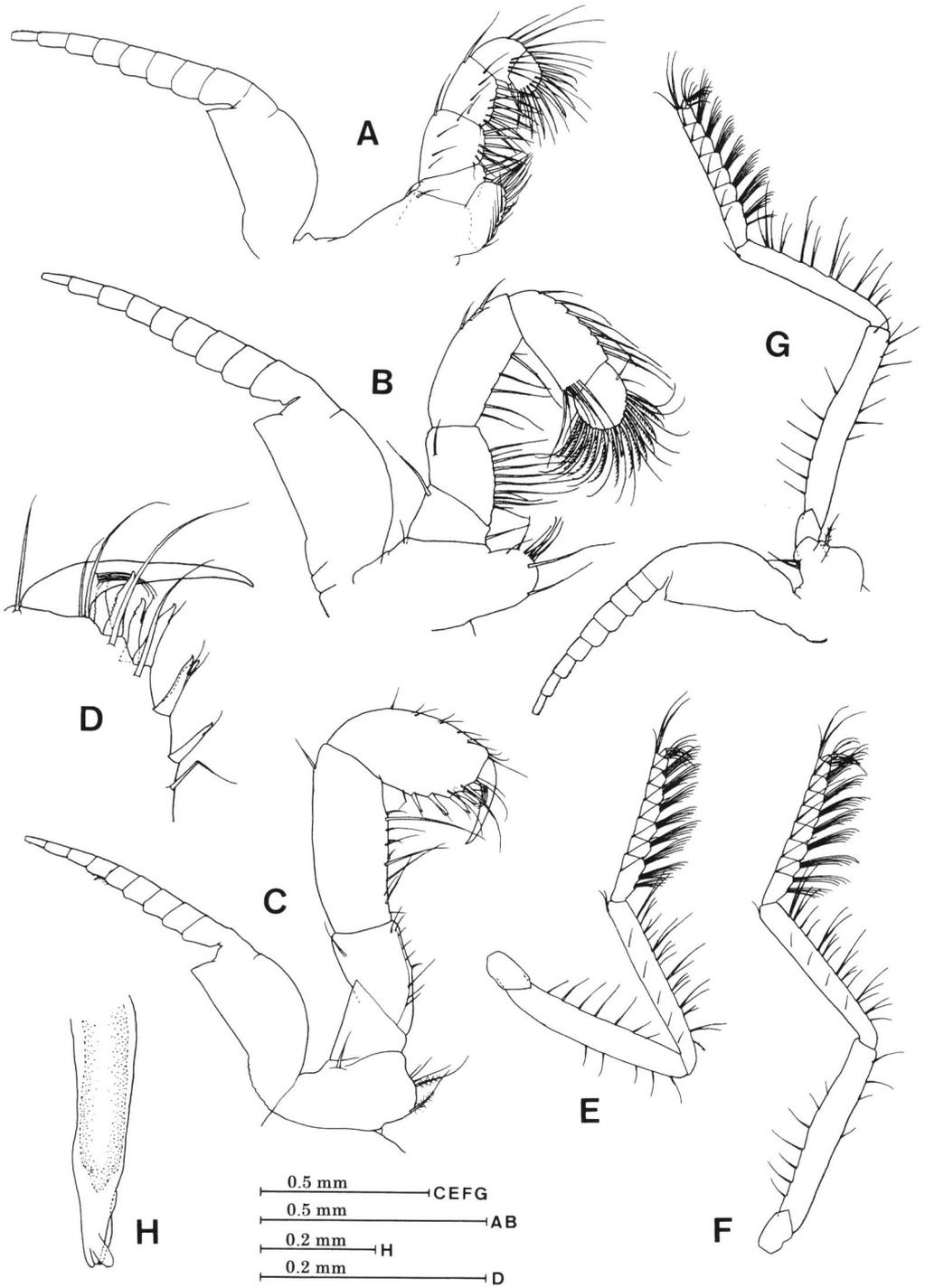


Fig. 2. *Heteromysis kushimotensis* sp. nov., one of male paratypes. A, first thoracic limb; B, second thoracic limb; C, third thoracic limb; D, terminal claw and mesial margin of carpopropodus of third thoracic limb; E, endopod of fourth thoracic limb; F, endopod of sixth thoracic limb; G, eighth thoracic limb; H, penis.

margin with 1 seta at about middle part, anteromesial corner with 1 flagellated seta and 3 setae (Fig. 1B), one naked, directed laterally, two others plumed, directed mesially.

Antennal scale (Fig. 1E) extending to middle of third segment of antennular peduncle, foliate in shape, nearly 3 times as long as maximum breadth at middle, setose all around; distal suture invisible. Antennal peduncle (Fig. 1E) equal to antennal scale in length, 3-segmented with middle segment longest, armed with several setae at anteromesial corner of second and third segments. Antennal sympod (Fig. 1E) without denticle at anterolateral corner.

Thoracic somites without ventral processes.

Mandible, maxillule, maxilla and first and second thoracic limbs as shown in Fig. 1F, G, H and Fig. 2A, B, respectively.

Endopod of third thoracic limb (Fig. 2C, D) robust; merus longest, less than 2.5 times as long as broad, with variable setae on mesial margin; carpopropodus elliptical in shape, armed on distal 2/3 of mesial margin with 3 paired and 1 single flagellated spines; terminal claw strong, more than half as long as carpopropodus.

Endopods of fourth to eighth thoracic limbs (Fig. 2E–G) similar in structure to each other; ischium longest; merus slightly decreasing in length posteriorly; carpopropodus divided into 7 or 8 subsegments; dactylus small; terminal claw slender, with inner margin serrated.

Exopods of thoracic limbs (Fig. 2A–C, G) with flagellipart 8-segmented in first limb, 9-segmented in second to eighth limbs, anterolateral corner of basal plate angulate, but not pointed.

Penis (Fig. 2H) becoming narrower distally, apex divided into 4 small lobes, unarmed.

Anterior 5 abdominal somites subequal in length, sixth somite 1.4 times longer than preceding one.

Pleopods of male reduced to single, unsegmented lobe. First pleopod (Fig. 3A) short, not modified. Second pleopod (Fig. 3B) longest, modified, tapered distally, terminating in naked, outwardly curved seta, with small flagellated spine on mesial margin and slender short seta

near distal end on lateral margin. Third pleopod (Fig. 3C) slender, knife-shaped, longer than fourth and fifth pleopods, rounded distally, distomesial margin with row of 11–21 flagellated spinules, lateral margin concave, naked, terminating in short seta, mesial margin with 11 long setae. Fourth pleopod (Fig. 3D) allied to third in structure, somewhat more robust, serration on distomesial margin consisting of 21–28 flagellated spinules. Fifth pleopod (Fig. 3E) modified, becoming narrower distally, armed with about 11 short setae on apical to distomesial margin and with 11 long setae on mesial margin, lateral margin naked.

Pleopods of female (Fig. 3F–J) reduced to single, unsegmented lobe; first pleopod similar to that of male; second pleopod modified, similar to that of male; third to fifth pleopods not modified, fifth pleopod longer than third and fourth ones.

Uropod (Fig. 3K, L) relatively short, setose all around; endopod overreaching apex of distal spine of telson by 1/8 length, with 1 spine on mesial margin of statocyst region; exopod longer than endopod by 1/8 length.

Telson (Fig. 3L) triangular with posterior cleft, 1.3 times longer than last abdominal somite, 1.3 times as long as broad; lateral margin slightly concave, armed on less than posterior half with 5–9 spines (aver. 6.3) arranged in regular intervals; each apex of posterior lobes narrowly truncate, with 2 spines, outer spine more than 3 times longer than inner; posterior cleft V-shaped, 2/7 of telson length, with 22–31 spinules (aver. 26.2) along margin.

Remarks. *Heteromysis kushimotoensis* sp. nov. most closely resembles *Heteromysis (Oliwaemysis) meenakshiae* Bamber, 2000, collected from waters around Cape d'Aguilar, Hong Kong, in many morphological characters. However, the new species is different from the latter species as follows. (1) Cornea in *H. meenakshiae* is large, occupying half eye, while that of *H. kushimotoensis* rather small, occupying less than half eye. (2) Carpopropodus of the third thoracopodal endopod bears numerous marginal and submarginal spines on the mesial margin in *H. meenakshiae*,

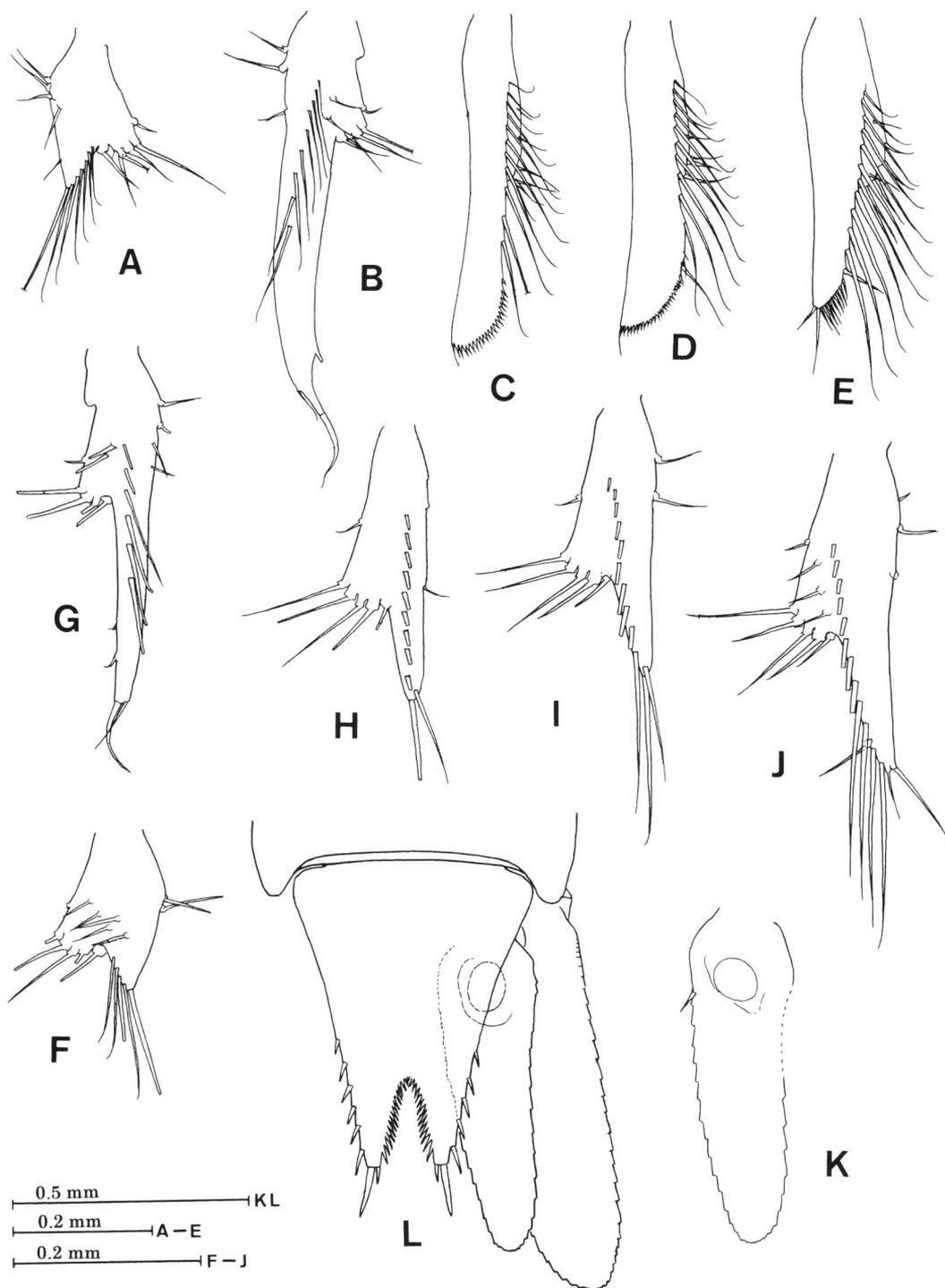


Fig. 3. *Heteromysis kushimotoensis* sp. nov., A–E, K, one of male paratypes; F–J, one of female paratypes; L, holotype. A, first pleopod; B, second pleopod; C, third pleopod; D, fourth pleopod; E, fifth pleopod; F, first pleopod; G, second pleopod; H, third pleopod; I, fourth pleopod; J, fifth pleopod; K, endopod of uropod; L, uropod and telson.

while only 7 spines on the mesial margin in *H. kushimotoensis*. (3) A stout spine is present at about middle of the outer margin of carpopropodus of the third thoracopod in *H. meenakshiae*, while such a spine is absent in *H. kushimotoensis*. (4) Flagellum of the thoracopodal exopods is divided into 9 or 10 segments in *H. meenakshiae*

compared to 8 or 9 segments in *H. kushimotoensis*. (5) Female pleopods are simple, typical and setose in *H. meenakshiae*, whereas the second female pleopod in *H. kushimotoensis* is modified as in that of male. (6) Second male pleopod is smooth in *H. meenakshiae*, while it is armed with a small flagellated spine near the apex of the

Table 1. Intraspecific variation in the number of spines on the uropodal endopod, the telson and the third and fourth pleopods of male (adult male).

| Body length (mm) | Uropodal endopod | | Lateral margin of telson | | Telson cleft | Left pleopods | |
|---------------------|------------------|------|-----------------------------|------|--------------|---------------|------|
| | Right | Left | Right | Left | | 3rd | 4th |
| 5.3 | 1 | 1 | 7 | 7 | 26 | — | — |
| 5.3 | 1 | 1 | 7 | 9 | 28 | 21 | 26 |
| 5.3 | 1 | 1 | 5 | 6 | 29 | 15 | 23 |
| 5.2 | 1 | 1 | 6 | 5 | 31 | — | — |
| 5.2 | 1 | 0 | 7 | 7 | 25 | 14 | 28 |
| 5.2 | 1 | 1 | 5 | 7 | 27 | 14 | 26 |
| 5.1 | 1 | 1 | 7 | 7 | 26 | 11 | 21 |
| 5.1 | 1 | 1 | 6 | 5 | 29 | 14 | 24 |
| 4.8 | 1 | 1 | 6 | 6 | 29 | 11 | 21 |
| Mean | | | | | | | |
| 5.17 | 1 | 0.9 | 6.2 | 6.6 | 27.8 | 13.9 | 24.1 |

Table 2. Intraspecific variation in the number of spines on the uropodal endopod and the telson (adult female).

| Body length (mm) | Uropodal endopod | | Lateral margin of telson | | Telson cleft |
|---------------------|------------------|------|-----------------------------|------|--------------|
| | Right | Left | Right | Left | |
| 5.2* | 1 | 1 | 6 | 6 | 29 |
| 5.2* | 1 | 1 | 7 | 6 | 25 |
| 5.2* | 1 | 1 | 8 | 6 | 31 |
| 5.2* | 1 | 1 | 7 | 7 | 27 |
| 5.2 | 1 | 1 | 6 | 6 | 24 |
| 5.1* | 1 | 1 | 5 | 6 | 24 |
| 5.1* | 1 | 1 | 6 | 6 | 27 |
| 5.0 | 1 | 1 | 7 | 7 | 26 |
| 4.9* | 1 | 1 | 7 | 8 | 30 |
| 4.9* | 1 | 1 | 6 | 7 | 27 |
| 4.8* | 1 | 0 | 5 | 6 | 26 |
| 4.8 | 1 | 1 | 6 | 6 | 26 |
| 4.7* | 1 | 1 | 6 | 6 | 26 |
| 4.7 | 1 | 1 | 6 | 6 | 25 |
| 4.7 | 1 | 1 | 6 | 6 | 28 |
| 4.6* | 1 | 1 | 6 | 6 | 25 |
| 4.6* | 1 | 1 | 7 | 6 | 31 |
| 4.6 | 1 | 1 | 5 | 6 | 25 |
| 4.6 | 1 | 1 | 6 | 7 | 25 |
| 4.5* | 1 | 1 | 6 | 6 | 22 |
| Mean | | | | | |
| 4.88 | 1.0 | 1.0 | 6.2 | 6.3 | 25.5 |

* Gravid female.

mesial margin. (7) Number of lateral spines of telson is 10 in *H. meenakshiae* compared to 5–9 in males (aver. 6.4, n=18) and 5–8 in females (aver. 6.3, n=40) in *H. kushimotoensis*.

Intraspecific variations in the spine number on the lateral and cleft margins of telson, mesial margin of endopodal uropod, and distal margin of the third and fourth male pleopods were examined for adult specimens (Tables 1, 2). Variations in the lateral telson margin and the mesial margin of the endopodal uropod in both sexes are rather small, but the spines on the telson cleft margin are variable in number and there is no correlation between the body length. The uropodal endopod is armed usually with one spine in the statocyst region, but none of spine was observed in one among 18 endopods (nine specimens) in the male and in one of 40 endopods (20 specimens) in the female. The number of spinules on the distal margin of the third and fourth male pleopods varies with individuals to 11–21 (aver. 13.9, n=7) and 21–28 (aver. 24.1, n=7), respectively.

Heteromysis (*O.*) *meenakshiae* was collected as an epifauna of sponges and serpulid polychaetes (*Salmacina dysteri*) (Bamber, 2000), while *H. kushimotoensis* was observed to swim actively in exhibition tanks, and any indication of commensalism was not observed (Nomura, personal communication).

Heteromysis nomurai sp. nov.

(Figs. 4–6)

Heteromysis japonica Murano & Hanamura (atypical form), 2002: 75–80, fig. 3J, K, L.

Type series. Holotype (NSMT-Cr 15546), adult male (6.5 mm); allotype (NSMT-Cr 15547), gravid female (6.5 mm); paratypes (NSMT-Cr 15548), 1 adult male (6.9 mm, dissected for drawings), 7 immature males (4.3–5.5 mm) and 1 immature female (5.9 mm); exhibition tank of spiny lobster (*Panulirus japonicus*) in the Aquarium of the Kushimoto Marine Park Center, 23 October 1996, coll. K. Nomura.

Description. Body moderately robust, somewhat depressed dorsoventrally.

Rostrum (Fig. 4A–D) narrow, prolonged with pointed apex, strongly bent downwards apically, so that apical part of rostrum frequently invisible from dorsal side. Lateral margin of rostrum (Fig. 4A–D) concave with supra-ocular swelling. Anterolateral corner of carapace rounded; posterior margin emarginate, leaving last thoracic somite exposed.

Cornea of eye (Fig. 4A, B) well pigmented, distinctly narrower than eyestalk; eyestalk without denticle at distal end of mesial margin.

Antennular peduncle of both sexes almost same in form (Fig. 4A, B): first segment with anterolateral corner strongly produced anteriorly and tipped with several setae; second segment short and narrow, triangular in shape in dorsal view, furnished on anteromesial corner with 2 setae, one naked and the other plumose; third segment longest, mesial margin with 1 plumose seta at about middle in male and at about distal third in female, anteromesial corner in male with 2 naked stout setae, one directed laterally, another mesially, in female with 2 short plumose setae besides 2 naked stout setae.

Antennal scale (Fig. 4E) extending to middle of third antennular peduncle segment, foliate in shape, nearly 3.3 times as long as maximum breadth at distal 2/5, setose all around; distal suture invisible. Antennal peduncle (Fig. 4E) slightly longer than antennal scale, 3-segmented with middle segment longest, armed with several setae at anteromesial corner of second and third segments. Antennal sympod (Fig. 4E) without denticle at anterolateral corner.

Thoracic somites without processes ventrally.

Mandibular palp, maxillule, maxilla, labrum and endopods of first and second thoracic limbs as shown in Figure 4F, G, H, I and Figure 5A, B, respectively.

Endopod of third thoracic limb (Fig. 5C) robust, developed; ischium with about 6 small flagellated spines on distal half of mesial margin; merus 3 times as long as broad, with several small, simple spines and about 6 small flagellated spines on mesial margin; carpopropodus fused with dactylus incompletely, longest, broadened

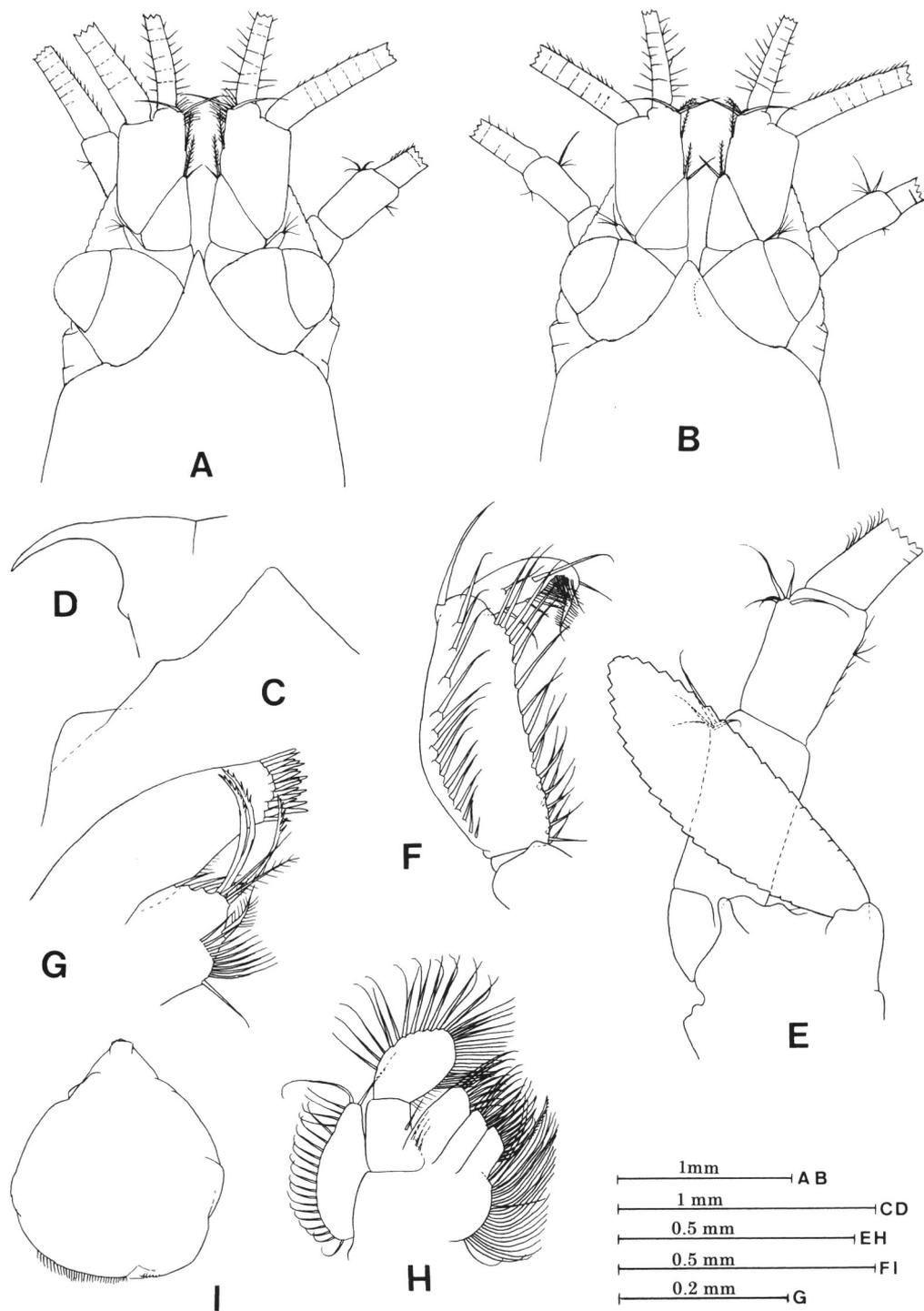


Fig. 4. *Heteromysis nomurai* sp. nov. A, holotype; B, allotype; C–I, one of male paratypes. A, anterior part of adult male; B, anterior part of adult female; C, anterior margin of carapace (dorsal view); D, anterior part of carapace (lateral view); E, antenna; F, mandibular palp; G, maxillule; H, maxilla; I, labrum.

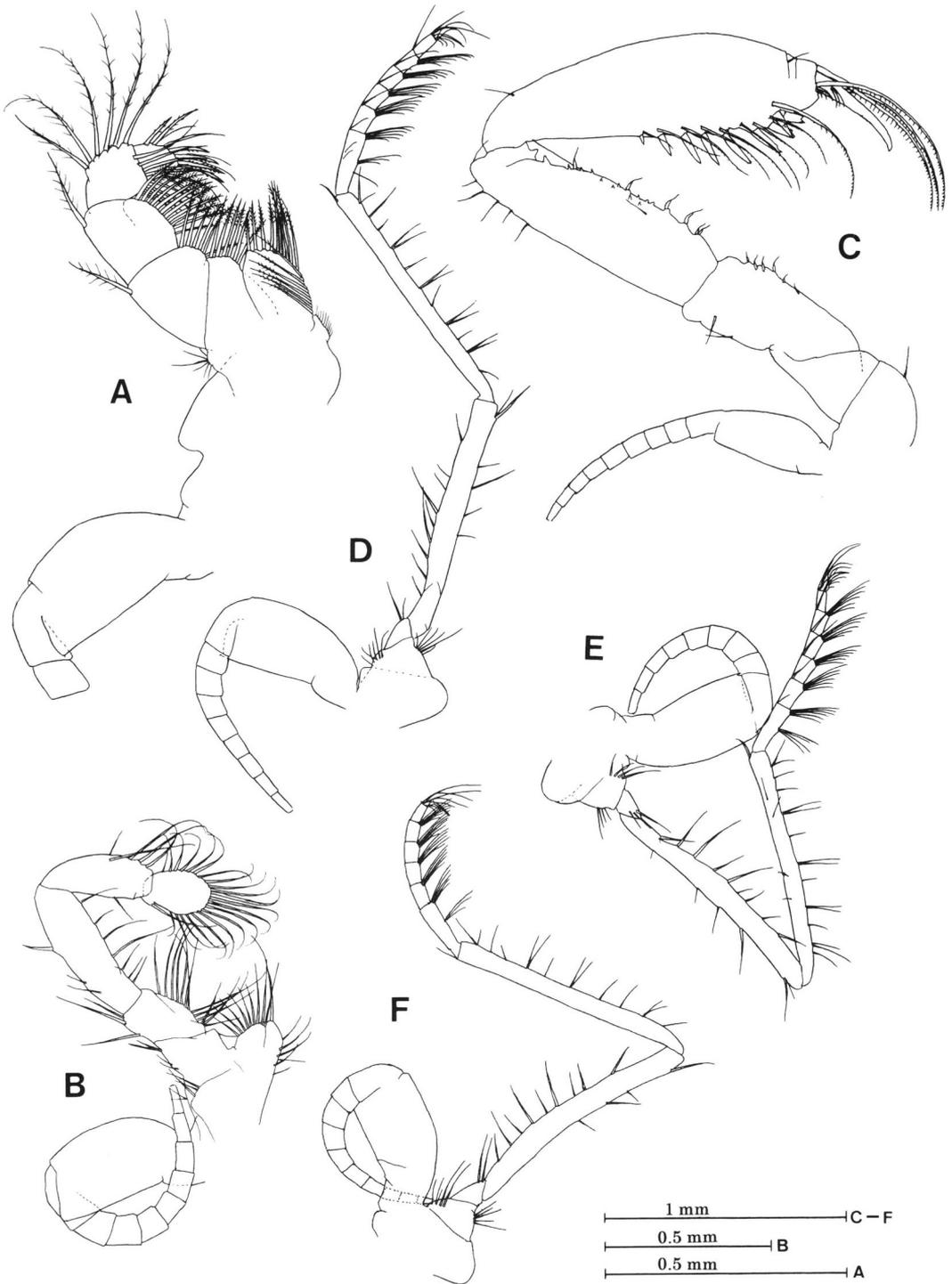


Fig. 5. *Heteromysis nomurai* sp. nov., one of male paratypes. A, endopod of first thoracic limb; B, second thoracic limb; C, third thoracic limb; D, fourth thoracic limb; E, fifth thoracic limb; F, sixth thoracic limb.

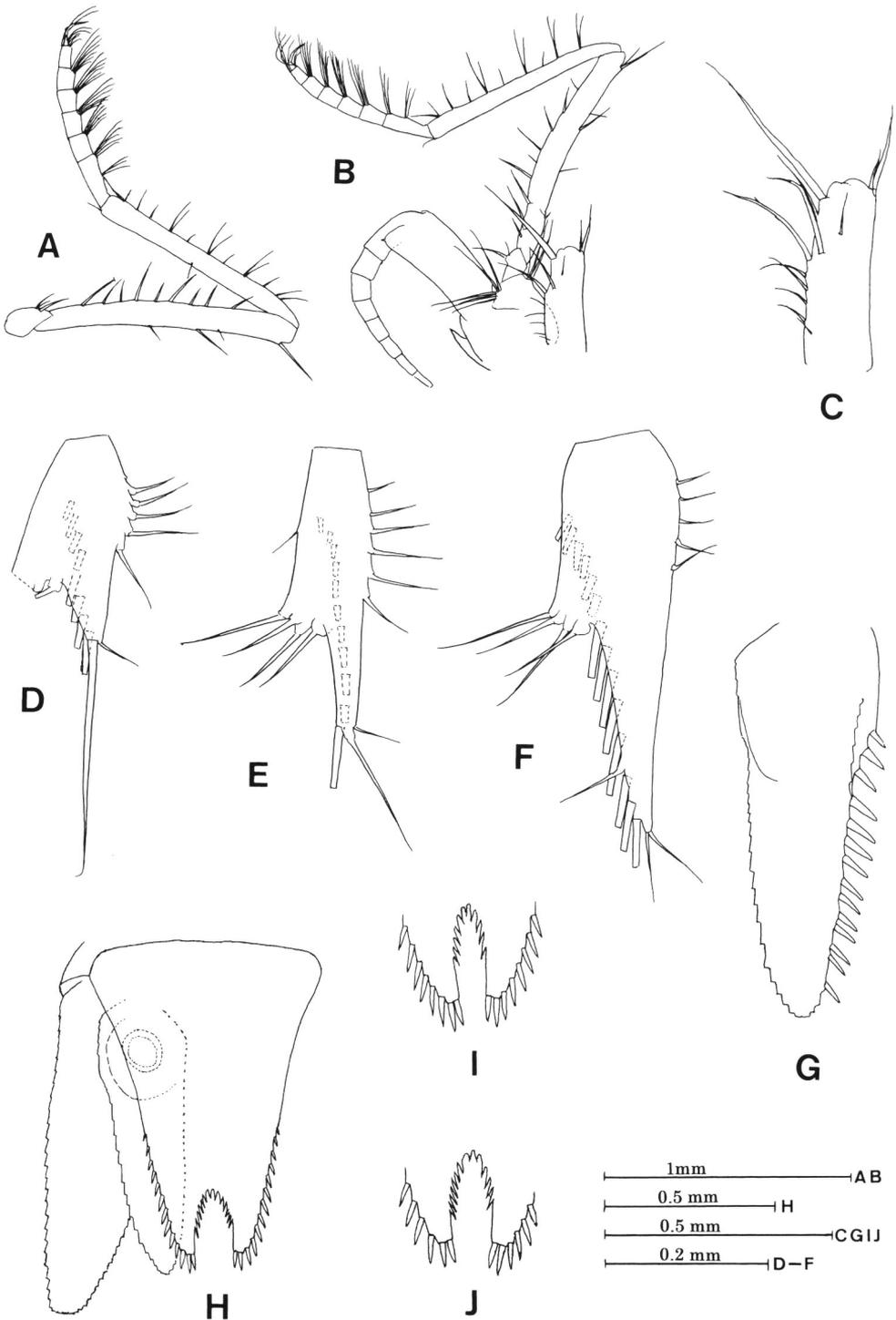


Fig. 6. *Heteromysis nomurai* sp. nov., A–G, J, one of male paratypes; H, holotype; I, allotype. A. endopod of seventh thoracic limb; B, eighth thoracic limb with penis; C, penis; D, second pleopod; E, fourth pleopod; F, fifth pleopod; G, endopod of uropod; H, uropod and telson; I, posterior part of telson; J, posterior part of telson.

towards distal third, armed on distal 3/5 of mesial margin with 9 spines; terminal claw strong, 1/3 as long as carpopropodus.

Endopods of fourth to eighth thoracic limbs (Fig. 5D–F, Fig. 6A, B) slender, similar in structure to each other, decreasing in length towards posterior pairs; ischium about as long as merus in fourth to sixth limbs, clearly longer than merus in seventh and eighth limbs; carpopropodus divided into 6 subsegments; dactylus small; terminal claw slender. Exopods of thoracic limbs (Fig. 5A–F, Fig. 6B) with flagellipart 8-segmented in first and eighth limbs, 9–10-segmented in second to seventh limbs, anterolateral corner of basal plate pointed in first, fourth, fifth, sixth and eighth limbs.

Penis (Fig. 6B, C) rounded apically, with 2 setae at anteroapical corner and about 9 variable setae on posterior margin, one at posteroapical corner long and robust.

Anterior 5 abdominal somites subequal, sixth somite longest, 1.2 times longer than preceding one.

Pleopods of male (Fig. 6D–F) reduced to single, unsegmented lobe, not modified sexually.

Uropod (Fig. 6G, H) relatively short, setose all around; endopod reaching tip of apical spines of telson, with 12–14 robust spines on mesial margin from statocyst region to near apex; exopod broad, overreaching endopod by 1/7 of its length.

Telson (Fig. 6H–J) triangular with posterior cleft, 1.5 times longer than last abdominal

somite, 1.4 times as long as broad; lateral margin slightly concave in anterior half and slightly convex in posterior half, armed on less than posterior half with 11 rather slender spines increasing in length posteriorly; each apex of posterior lobes narrowly truncate, with 2 spines, outer spine equal in length to posteriormost lateral spine, slightly longer than inner spine; posterior cleft 1/5 of telson length, with 10–13 spinules on slightly more than anterior half of cleft margin.

Remarks. *Heteromysis nomurai* sp. nov. is judged to be identical with the atypical form of *Heteromysis japonica* Murano and Hanamura, 2002, by similarity in the uropodal endopod with robust spines along the inner margin, the U-shaped telson cleft armed with spinules on the anterior half, the lateral telson margin armed with about ten spines on less than the distal half, and each apex of distal lobes of the telson with two subequal spines. However, the both are somewhat different in the lateral margin of the rostrum: the margin in *H. nomurai* has a superecular swelling at about middle while that in the atypical form is evenly concave without any swelling.

The new species is allied to *H. japonica*, but is distinctly different from the latter species as shown in Table 3.

A note on ecology

The present two new mysid species occurred

Table 3. Morphological differences between *Heteromysis japonica* and *H. nomurai*.

| | <i>H. japonica</i> Murano & Hanamura, 2000 | <i>H. nomurai</i> sp. nov. |
|---------------------------------|----------------------------------------------|--------------------------------------------|
| Cornea | Slightly narrower than eyestalk | Distinctly narrower than eyestalk |
| Lateral margin of rostrum | Evenly concave | Supre-ocular swelling present |
| Antennal scale | 2.7 times as long as broad | 3.3 times as long as broad |
| Endopod of third thoracic limb: | | |
| Ischium | With ordinary setae | With small spines tipped with seta |
| Merus | With a conspicuous spine | Without such a spine |
| Carpopropodus | With 5 paired spines | With 9 spines |
| Uropodal endopod | With slender spines | With robust spines |
| Telson: | | |
| Cleft | With 12–19 spines on whole margin | With 10–13 spines on anterior half |
| Lateral margin | With 9–15 spines on more than posterior half | With 11 spines on less than posterior half |
| Two spines on apex | Outer spine twice longer than inner | Outer spine slightly longer than inner |

in many indoor exhibition tanks of the Aquarium of the Kushimoto Marine Park Center. In the exhibition tanks, the animals swam actively and waywardly just above the bottom and among spaces of stone constructions set on the bottom. They never formed any swarms or schools, and commensalism with other animals which has been known in other heteromysid species, was not observed. They ate residue of food given for exhibited fishes, crustaceans and so on. The difference between the two species in behavior was hardly perceived. Living animals were slightly reddish (Nomura, personal communication).

Acknowledgements

We wish to thank Mr. Keiichi Nomura, the Kushimoto Marine Park Center, for giving us the opportunity to examine the present specimens

and the ecological information.

References

- Bamber, R. N., 2000. Mysids (Crustacea, Mysidacea) from Hong Kong, with a description of a new species of *Heteromysis* (Mysinae: Heteromysini). In B. Morton (ed.), *The Marine Flora and Fauna of Hong Kong and Southern China V. Proc. 10th Intern. Mar. Biol. Workshop: The Marine Flora and Fauna of Hong Kong and Southern China*, pp. 57–64, Hong Kong University Press, Hong Kong.
- Ii, N., 1964. Fauna Japonica, Mysidae (Crustacea). 610 pp. Biogeogr. Soc. Japan, Tokyo.
- Murano, M. & Y. Hanamura, 2002. A new species of *Heteromysis* (Crustacea: Mysida: Mysidae) from Japan. *Plankton Biol. Ecol.*, **49**: 75–80.
- Smith, S. I., 1873. Report upon the invertebrate animals of Vineyard Sound and the adjacent waters, with an account of the physical characters of the region. Rep. Comm. Fish Fish., 1871 and 1872: 295–747.