

A NEW SPECIES OF THE GENUS *CALAXIOPSIS* (DECAPODA:
THALASSINIDEA: CALOCARIDIDAE) FROM JAPAN

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A B S T R A C T

A new species of calocaridid thalassinidean shrimp of the genus *Calaxiopsis* is described based on a single male specimen from Boso Peninsula, central Japan. It is related to *C. serrata*, but is readily distinguished from the latter in the unarmed submedian carinae on the gastric region, ventrally unarmed abdominal pleura, much shorter antennal acicle and rudimentary podobranchs of the third maxilliped to third pereopods, which lack normally developed gill filaments. The discovery of the new species shows that the development of the podobranchs on the third maxilliped to third pereopods is variable within the genus. A check list of all known species of Axiidae and Calocarididae from the northwestern Pacific is included.

The calocaridid genus *Calaxiopsis* was originally established by Sakai and de Saint Laurent (1989) as a new genus of Axiidae. The type species of the genus is *C. serrata* Sakai and de Saint Laurent, 1989, known from Guinea, west coast of Africa. In addition to the type species, *Calastacus felix* Alcock and Anderson, 1899, known from the Arabian Sea off Cape Comorin, was also assigned to the genus by the authors based on superficial similarity to the type species, although detailed morphology of the latter still remains unknown. Poore (1994) cladistically analyzed the phylogenetic relationships of the thalassinidean genera and recognized that Calocarididae is a distinct family, including *Ambiaxius* Sakai and de Saint Laurent, 1989, *Calastacus* Faxon, 1893, *Calocaris* Bell, 1853, *Eucalastacus* Sakai, 1992, and *Lophaxius* Kensley, 1989, in addition to *Calaxiopsis*. The genus *Paracalocaris* Sakai, 1991, is also assignable to Calocarididae, although Poore (1994) did not mention that genus.

During a continuous marine faunal survey of Boso Peninsula, central Japan, an unusual specimen of thalassinidean shrimp living in a burrow made on fragile clay rock, was captured by commercial gill net from off Takeoka, Uchibo coast. Detailed examination revealed that the specimen represented an undescribed species, herein described as *Calaxiopsis manningi*. The discovery of the new species has disclosed that the development of the podobranchs on the third maxilliped to third pereopods, which has been considered

to provide a diagnostic feature of generic level, is variable within *Calaxiopsis*. In addition, a check list of all known species of Axiidae and Calocarididae from the northwestern Pacific is presented in order to summarize taxonomic information of the local species (see Appendix).

The holotype is deposited in the Natural History Museum and Institute, Chiba (CBM, with a code of ZC). The abbreviation cl indicates postorbital carapace length measured from the level of the posterior margin of orbit to the midpoint of the posterior margin of the carapace. The drawings were made with the aid of a drawing tube mounted on a Leica MZ8 stereomicroscope.

SYSTEMATICS

Calaxiopsis manningi, new species
Figs. 1–5

Material Examined.—Holotype, male (cl 6.3 mm); off Takeoka, Uchibo coast of Boso Peninsula, central Japan, 80–100 m; living in burrow on clay rock; commercial gill net; coll. J. Takayama; CBM-ZC 4934.

Description.—Rostrum (Fig. 2A, B) narrow, 0.28 times as long as carapace, slightly falling short of anterior margin of distal segment of antennular peduncle, gradually tapering to acute, upturned apex; dorsal surface concave, lacking median carina; lateral margin sharply ridged, with 3 pairs of prominent, subequal spines (posteriormost spine supraocular in position) and sparse row of long setae; ventral surface rounded. Carapace (Figs. 1, 2A, B)

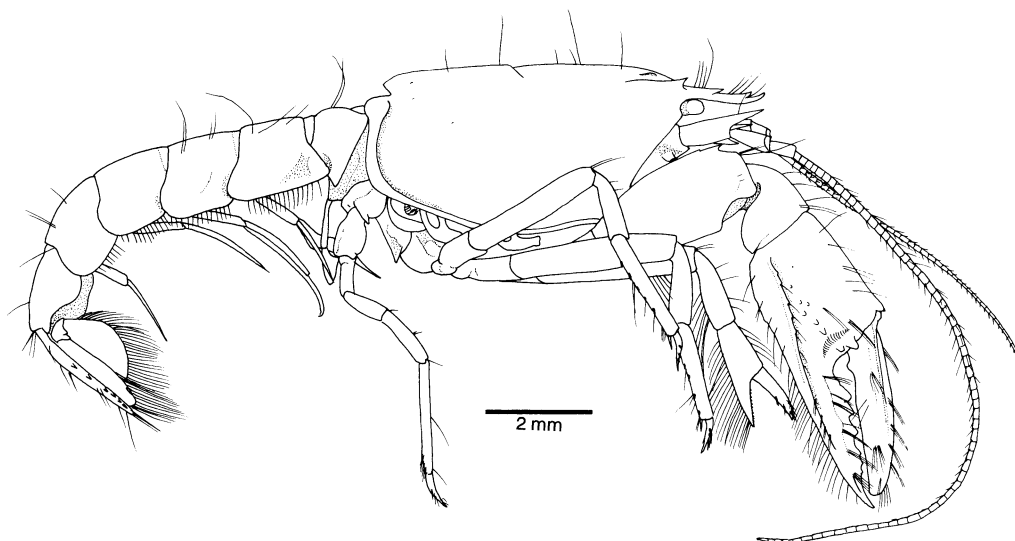


Fig. 1. *Calaxiopsis manningi*, new species. Holotype, male (cl 6.3 mm; CBM-ZC 4934). Entire animal in lateral view. Scale bar indicates 2 mm.

smooth, with scattered short to long setae on dorsal surface; gastric region weakly convex; median carina unarmed, extending from base of rostrum to about midlength of gastric region; submedian carinae very short, divergent posteriorly, unarmed; lateral rostral carinae unarmed, divergent posteriorly, not reaching level of posterior end of median carina; anterolateral margin unarmed but forming light angle at infraorbital position; pterygostomial angle produced anteriorly, broadly rounded; cervical groove restricted to dorsal region; branchiostegal region with faint, short longitudinal sulcus; postcervical region rounded dorsally; ventrolateral and posterolateral margin broadly carinate; posterodorsal margin produced posteriorly as rounded lobe; cardiac notch distinct.

Abdomen (Fig. 1) with paired long setae on dorsal surface of each somite. Pleuron of first somite triangular with subacute ventral apex; pleura of second to sixth somites unarmed; ventral margin of sixth somite sinuous, with prominent, rounded process at posteroventral corner. Telson (Fig. 2D) subrectangular, slightly narrowed posteriorly, 1.1 times longer than greatest breadth; dorsal surface with shallow median sulcus extending from anterior 0.3 length, with tuft of long setae at anterior end of median sulcus, and with submedian row of sparse setae; lateral margins with 8 and 6 fixed spines on left and right re-

spectively; posterior margin broadly rounded, unarmed.

Eyestalks (Fig. 2 A, B) less than 0.2 length of rostrum, contiguous to each other; corneal region rounded, scarcely differentiated, unpigmented; distomesial portion of eyestalk slightly extending anteriorly beyond corneal region.

Antennular peduncle (Fig. 2A, B) slightly falling short of distal margin of fourth segment of antennal peduncle. Basal segment longer than distal 2 segments combined, with small spine on lateral surface of statocyst lobe. Penultimate segment unarmed. Ultimate segment nearly as long as penultimate segment, unarmed. Dorsal flagellum missing. Ventral flagellum slightly longer than carapace, bearing short setae on distal margin of each article.

Antennal peduncle (Fig. 2A, B) moderately stout, with supernumerary segmentation. First segment with 2 small spines on ventrodorsal margin; green gland opening situated ventrolaterally. Second segment with dorsolateral distal angle produced in strong spine, overreaching midlength of second segment. Third segment with distinct spine at ventromesial distal angle. Fourth segment narrowed proximally, unarmed. Fifth segment less than half length of fourth segment, unarmed. Antennal acicle slender, terminating in acute tip, reaching midlength of third segment. Antennal fla-

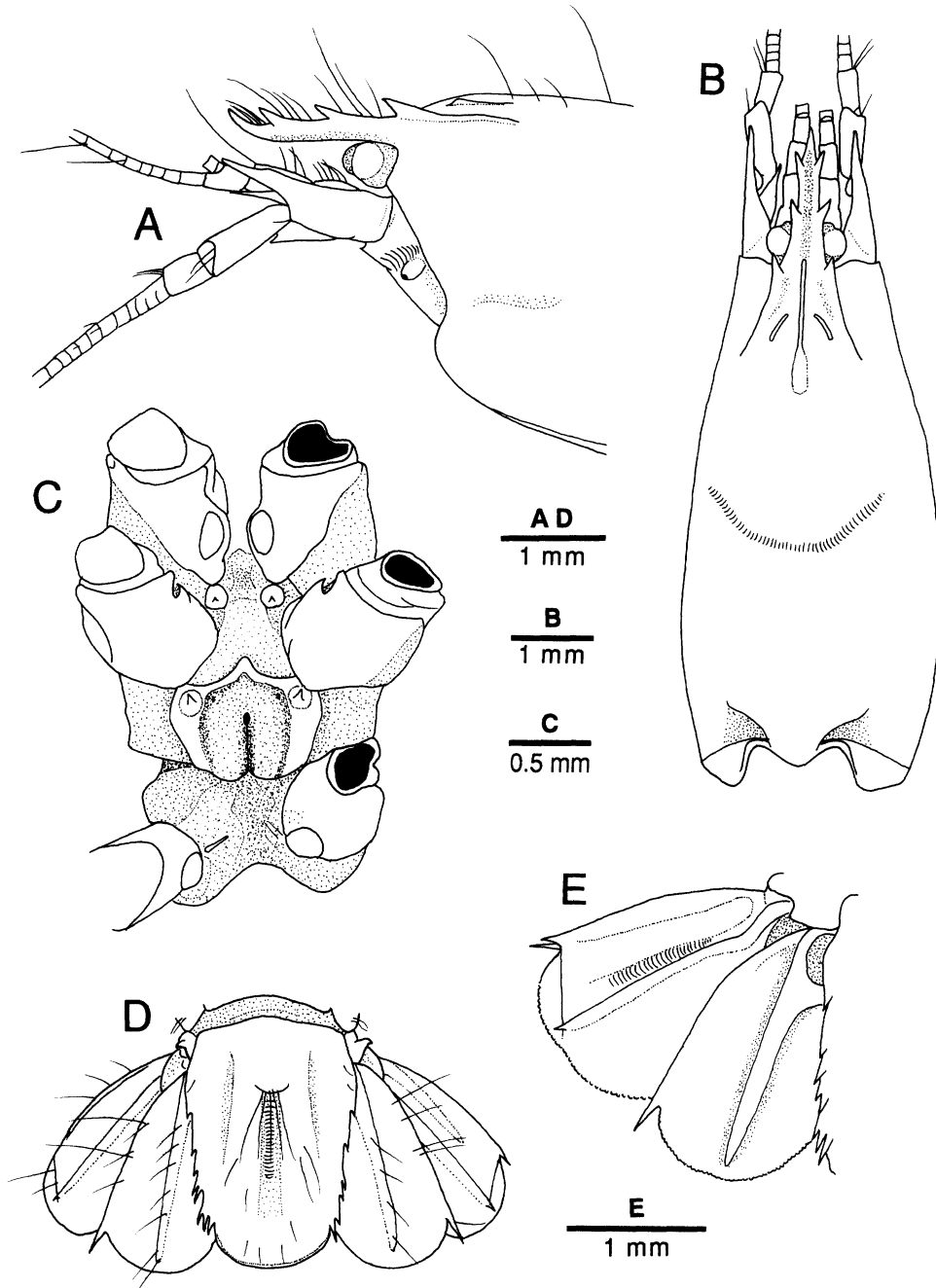


Fig. 2. *Calaxiopsis manningi*, new species. Holotype, male (cl 6.3 mm; CBM-ZC 4934). A, anterior part of carapace and cephalic appendages, lateral, dorsal flagellum of antennule missing; B, carapace and cephalic appendages, dorsal; C, thoracic sternum and coxae of second to fifth pereopods, ventral, setae omitted; D, telson and uropods, dorsal, setae partially omitted; E, uropods, dorsolateral, setae omitted. Scale bars indicate 1 mm or 0.5 mm.

gellum much longer than ventral antennular flagellum (but shorter than body), with several short to long setae on each article.

Mandible (Fig. 3A) with incisor process rounded anteriorly, with obtuse tooth on cut-

ting edge proximally; palp 3-articulated, distal article somewhat elongate, curved, with short setae. Maxillule (Fig. 3B) with proximal endite tapering mesiodistally, bearing spiniform setae on mesiodistal margin; prox-

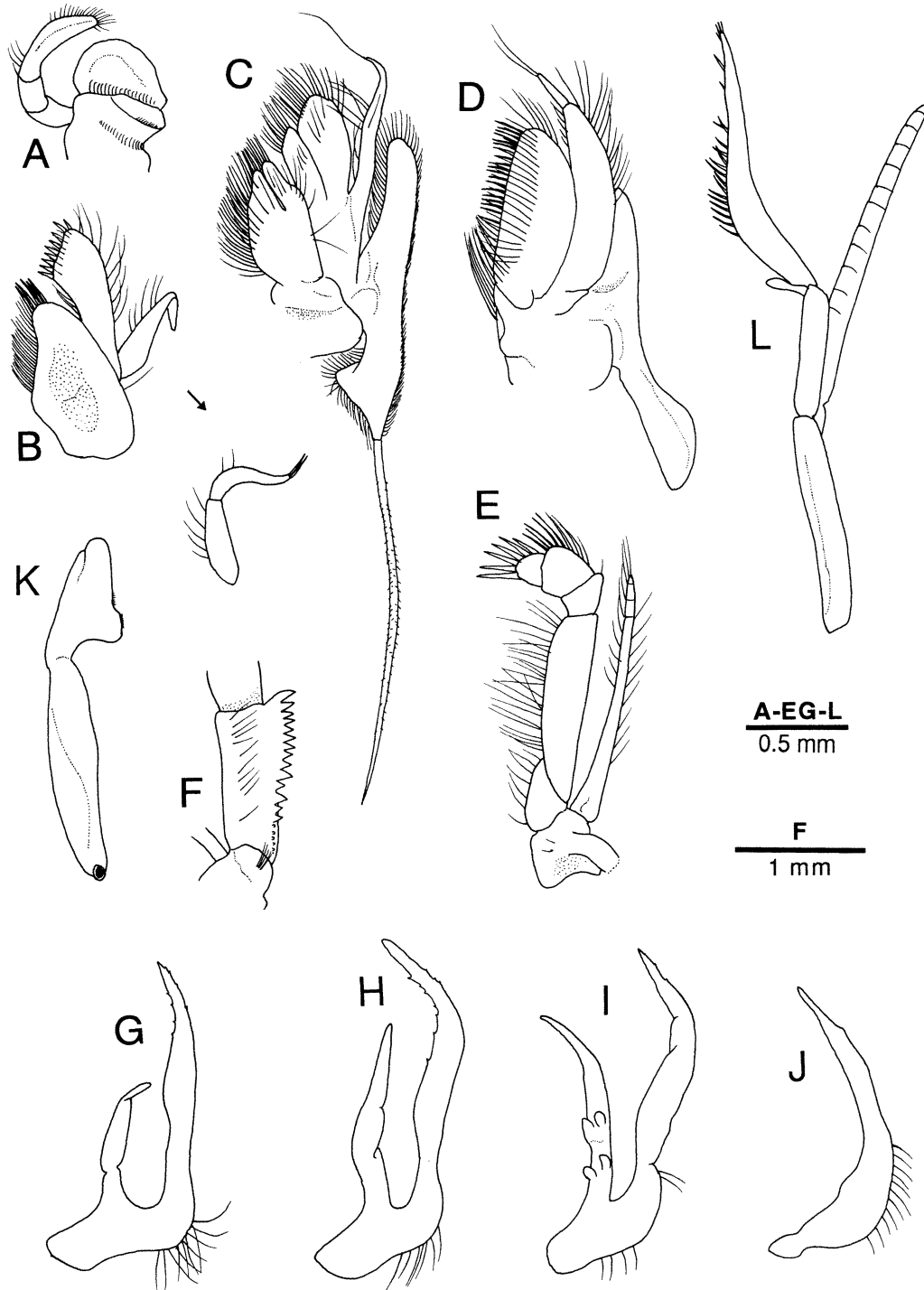


Fig. 3. *Calaxiopsis manningi*, new species. Holotype, male (cl 6.3 mm; CBM-ZC 4934). A, left mandible, internal; B, left maxillule, external; inset, endopod, lateral; C, left maxilla, external; D, left first maxilliped, external; E, left second maxilliped, external, epipod broken; F, ischium of left third maxilliped, dorsal; G-J, epipod and/or podobranch of first to fourth pereopods, lateral; K, left first pleopod, dorsal; L, left second maxilliped, mesial, setae omitted.

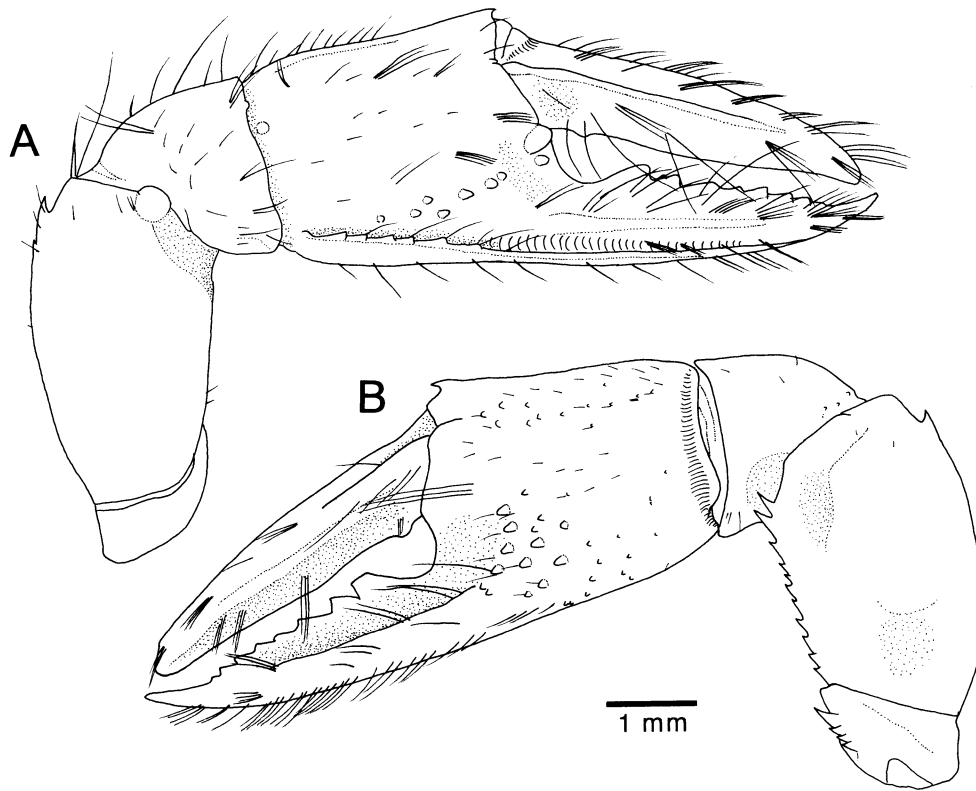


Fig. 4. *Calaxiopsis manningi*, new species. Holotype, male (cl 6.3 mm; CBM-ZC 4934). A, right first pereiopod, lateral; B, same, mesial. Scale bar indicates 1 mm.

imal endite with double row of spines on mesial margin; endopod 2-articulated, distal article strongly sinuous, with 2 apical bristles. Maxilla (Fig. 3C) with proximal endite unequally bilobed (distal lobe much more slender than proximal lobe); distal endite unequally bilobed (distal lobe somewhat broader than proximal lobe); palp elongate, distinctly overreaching distal margin of distal endite, slightly sinuous, tapering to slender distal part, bearing 1 long apical seta; scaphognathite reaching midlength of endopod; posterior lobe tapering posteriorly, with elongate seta with numerous setules. First maxilliped (Fig. 3D) with elongate suboval distal endite; proximal endite short, separated from distal endite by distinct suture; endopod (not visible from external view) 2-articulated, tapering distally, reaching distal 0.3 of exopod; exopod flattened, weakly curved mesially, overreaching distal margin of distal endite, distal article short, much narrower than proximal article, not articulated, with 2 apical setae;

epipod narrow, slightly bilobed. Second maxilliped (Fig. 3E) with slender, pediform endopod; merus elongate; carpus short; propodus broad, with stout setae on extensor margin; dactyls subsemicircular, with 6 spines on distal margin; exopod slender, reaching distal margin of carpus, multiarticulated distally, with sparse setae; epipod slender, lacking podobranch. Third maxilliped (Fig. 5A) overreaching distal margin of antennal peduncle; ischium (Fig. 2F) with 2 small spines on proximal half of ventral margin, crista dentata composed of acute teeth noticeably enlarged distally (proximal teeth very small, showing as tubercles); merus with 2 spines on distal half of ventral margin (distal spine much stronger than second one); carpus with small spine on ventrodistal margin; propodus nearly as long as carpus; dactyls shorter than propodus, tapering distally; exopod slender, distinctly overreaching distal margin of merus.

Right first pereiopod (Fig. 4A, B) with integument microscopically granular. Coxa

bearing small distomesial spine ventrally. Basis unarmed. Ischium short, with row of small spines becoming smaller proximally on ventral margin mesially. Merus somewhat compressed laterally, becoming slightly deeper distally; dorsal surface convex, bluntly ridged, with 1 prominent subdistal spine; lateral surface convex; mesial surface slightly concave; ventral margin with row of small spines increasing in size distally. Carpus short, about 0.4 times as long as merus, unarmed, inflated ventrolaterally. Chela 3.7 times longer than carpus, 2.6 times longer than greatest depth. Palm 1.2 times longer than deep, becoming deeper distally with peak at dorsodistal spine; dorsal margin sharply carinate, terminating distally in small spine, with row of short stiff setae just lateral to dorsal carina; lateral surface generally convex, with oblique row of rounded tubercles ventrally and scattered setae (occasionally forming tuft), laterodistal margin with 1 prominent tubercle; ventrolateral carina distinct, extending to distal 0.2 of fixed finger, tuberculate in proximal 0.3; mesial face convex, with scattered tubercles ventral to midline, becoming stronger distally, occasionally accompanied by tufts of short setae; ventral surface slightly convex, with few setae. Fixed finger slightly curved, tapering distally in subacute apex, with prominent hiatus basally and row of 8 strong subacute teeth becoming weaker distally; lateral face with blunt median carina flanked by rows of tufts of long stiff setae; mesial face with distinct median carina extending to distal 0.3, flanked by sparse rows of tufts of stiff setae, and row of stiff setae along ventral margin. Dactyl about 1.3 times longer than palm, gradually tapering distally (distal part damaged); dorsal margin distinctly carinate, accompanied by row of tufts of stiff setae mesially; lateral surface with median carina becoming obsolete in distal half, flanked by sparse row of tufts of long stiff setae; mesial face strongly convex, but without distinct median carina, bearing 2 sparse rows of tufts of stiff setae; cutting edge nearly smooth, except for 1 small rounded tooth near proximal end.

Left cheliped small, in process of regeneration.

Second pereopod (Fig. 5B) chelate, overreaching distal margin of antennal peduncle by half length of chela. Coxa with small distomesial spine ventrally. Basis unarmed. Is-

chium unarmed, with concave ventral margin. Merus strongly compressed laterally, unarmed, but with row of long setae on distal half of ventromesial margin. Carpus 0.46 times as long as merus, becoming deeper distally; dorsal surface with sparse row of long setae over entire length; ventral margin with row of longer setae in distal 0.6. Chela 1.4 times longer than carpus and 3 times longer than deep; palm becoming slightly deeper distally; dorsal surface rounded, with row of long setae; lateral and mesial faces with few tufts of short setae distally and ventrally; ventral surface rounded, with row of long setae extending to tip of fixed finger. Fixed finger terminating in slender corneous claw, with tufts of short setae laterally and ventrally; cutting edge with row of small corneous teeth. Dactyl 1.1 times longer than palm, terminating in slender corneous claw, with tufts of setae on dorsal, lateral and mesial faces; cutting edge with row of small corneous teeth in distal 0.6.

Third pereopod (Fig. 5C) overreaching distal margin of antennal peduncle by length of dactyl and half of propodus. Coxa unarmed, with large gonopore. Basis, ischium, and merus unarmed. Carpus 0.52 times as long as merus. Propodus 1.23 times longer than carpus, with row of 5 small corneous spines on lateral surface ventrally; ventrodorsal spine reaching proximal 0.3 of dactyl, slightly curved laterally. Dactyl (Fig. 5D) 0.37 times as long as propodus, somewhat twisted, terminating in slender corneous claw; dorsal margin with few tufts of setae; lateral surface with 2 small corneous spines dorsally, arising from proximal to midlength (second spine much smaller than first one), and 1 tuft of short setae at midlength; mesial face with tuft of short setae.

Fourth pereopod (Fig. 5E) slightly shorter than third pereopod in length of merus, overreaching distal margin of antennal peduncle by length of dactyl. Coxa with small subdistal spine on ventromesial margin. Basis, ischium and merus unarmed. Carpus 0.56 times as long as merus. Propodus 1.4 times longer than carpus, with row of 6 small corneous spines on lateral surface ventrally; ventral surface with dense cluster of stiff setae distally; ventrodorsal spine reaching proximal half of dactyl, slightly curved laterally, bearing numerous setules dorsally in distal half. Dactyl (Fig. 5F) 0.36 times as long as propo-

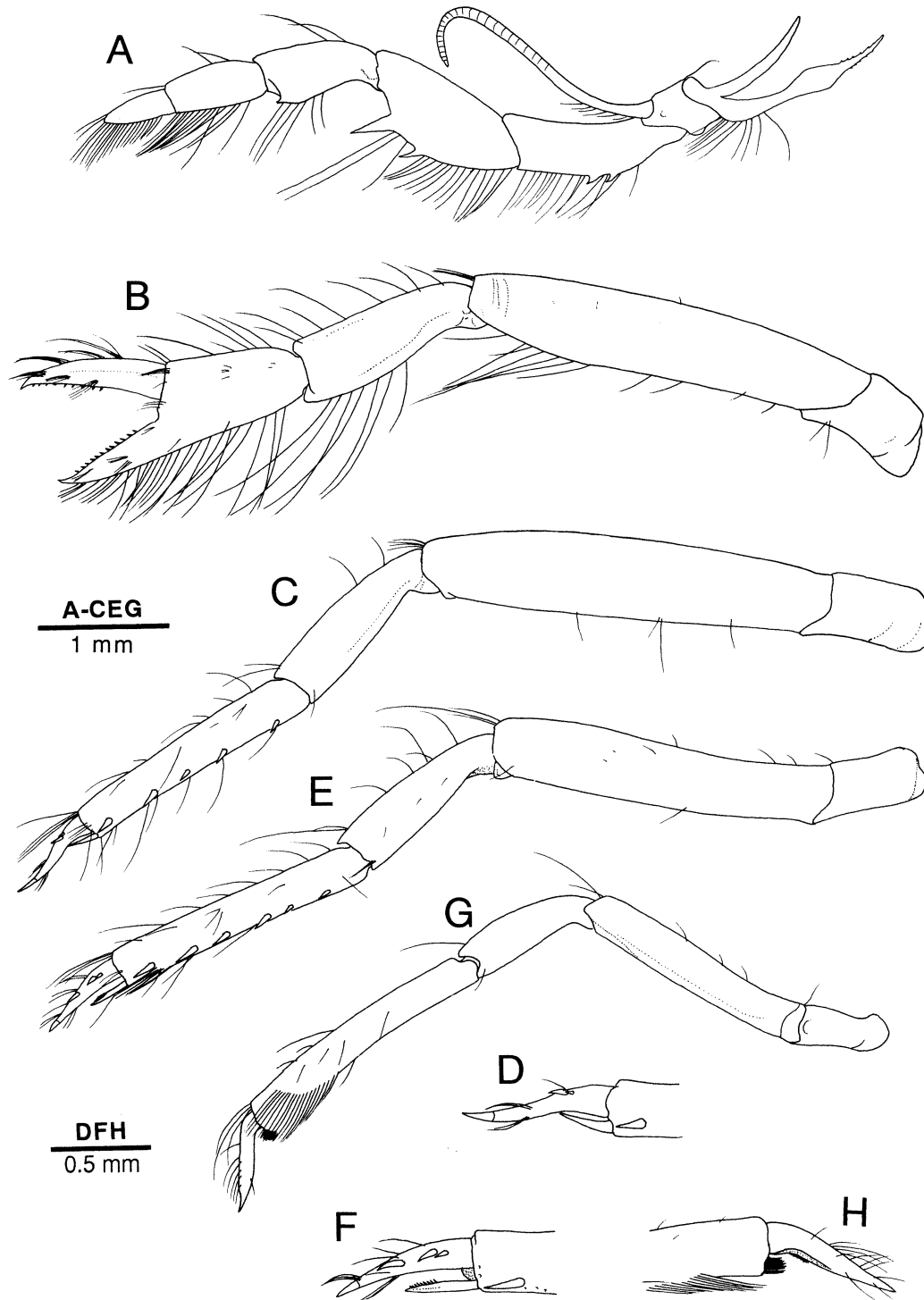


Fig. 5. *Calaxiopsis manningi*, new species. Holotype, male (cl 6.3 mm; CBM-ZC 4934). Left thoracic appendages. A, third maxilliped, lateral; B, second pereopod, lateral; C, third pereopod, lateral; D, same, dactyl and distal part of propodus, lateral; E, fourth pereopod, lateral; F, same, dactyl and distal part of propodus, lateral; G, fifth pereopod, lateral; H, same, dactyl and distal part of propodus, mesial.

Table 1. *Calaxiopsis manningi*, new species. Branchial formula. r = rudimentary.

| | Maxillipeds | | | Pereiopods | | | | |
|---------------|-------------|---|---|------------|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 | 4 | 5 |
| Pleurobranch | — | — | — | — | — | — | — | — |
| Arthrobranchs | — | — | 2 | 2 | 2 | 2 | 2 | — |
| Podobranchs | — | — | r | r | r | r | — | — |
| Epipods | + | + | + | + | + | + | + | — |
| Setobranchs | — | — | — | + | + | + | + | — |

dus, somewhat twisted, terminating in slender corneous claw; dorsal margin with few tufts of setae; lateral surface with 3 small corneous spines and few tufts of short setae; mesial face smooth.

Fifth pereiopod (Fig. 5G) shortest among pereiopods, overreaching anterolateral margin of carapace by length of dactyl. Coxa unarmed, bearing gonopore. Basis, ischium, and merus unarmed. Carpus 0.67 times as long as merus, unarmed. Propodus 1.7 times longer than carpus, unarmed, but with cluster of grooming setae distally, extending from ventral surface to lateral surface; ventrodorsal margin with row of short bristles. Dactyl (Fig. 5H) 0.42 times as long as propodus, somewhat twisted, terminating in slender corneous claw; dorsal surface with few setae; ventrolateral margin expanded, with row of minute corneous spinules.

Branchial formula summarized in Table 1. Two trichobranchiate arthrobranchs on each third maxilliped to fourth pereiopod. No pleurobranch. Podobranch present on each third maxilliped to third pereiopods, those on third maxilliped to second pereiopod (Figs. 4A, 3G, H) lacking gill filaments, that on third pereiopod (Fig. 3I) with few rudimentary, papilla-like gill filaments. Epipods on third maxilliped to fourth pereiopods (Fig. 3G–J) subequal in length, each longer than podobranch, showing as elongate lobe curved anteriorly, bearing marginal denticles in distal portion.

Sixth thoracic sternite (Fig. 2C) with paired spiniform processes arising from posterior to coxae of third pereiopods. Seventh thoracic sternite (Fig. 2C) divided into 2 sections by distinct transverse carina; carina produced anteriorly medially; anterior section narrowed anteriorly, apparently fused with sixth sternite; posterior section with strongly raised lateral margins, bearing strong spiniform process anterolaterally; ventral surface de-

pressed, with deep median pit followed by deep median groove extending to posterior surface. Eighth thoracic sternite (Fig. 2C) depressed medially on ventral surface, with paired short, obliquely transverse carinae mesial to coxae of fifth pereiopods; posterior margin deeply concave. Precoxa of fifth pereiopod with prominent triangular process at posterolateral angle; lateral face with deep obliquely transverse groove.

First pleopods (Fig. 3K) contiguous. Basal segment weakly twisted, narrowed distally. Distal segment distinctly shorter than basal segment, subtriangular, with rounded apex; distal portion bilobed; proximomesial lobe well produced, bearing minute adhesive hooks on mesial margin.

Second pleopod (Fig. 3L) with exopod not reaching distal margin of appendix masculina. Endopod lacking distal segment, basal segment about half length of appendix masculina. Appendix masculina elongate, articulated to distal end of basal segment, sinuously curved, tapering to narrowly rounded apex; dorsal margin with double row of spiniform setae or bristles in distal 0.75, becoming shorter and more sparse distally, distal margin with 4 short bristles. Appendix interna articulated at ventrodorsal portion of basal segment of exopod, very short, but with minute adhesive hooks.

Third to fifth pleopods each with well-developed, slender appendix interna.

Uropod (Fig. 2E) with unarmed protopodite. Endopod with lateral margin slightly convex, terminating in slender spine overreaching rounded posterior margin of endopod; submedian carina on dorsal surface unarmed, but with few tufts of setae. Exopod with lateral margin slightly convex, unarmed, terminating in small spine posteriorly; 1 articulated spine arising from just mesial to distolateral spine; distal margin rounded, overreaching distolateral spine; lateral carina on dorsal surface unarmed, submedian carina with 1 small subdistal spine; uropodal suture distinct, extending obliquely from base of distolateral articulated spine to posterior end of median carina.

Coloration in Life.—Entire animal dirty light yellowish brown. Eye not pigmented.

Distribution.—Known only from the type locality, off Takeoka, Boso Peninsula, central Japan; at depths of 80–100 m.

Habitat.—The unique holotype was found to live in a burrow made on fragile clay rock, which was collected at depths of 80–100 m. Unfortunately, the structure of the burrow was not observed, as the rock was destroyed before discovery of the specimen. From the same rock, paired specimens of alpheid shrimp *Alpheus* cf. *albatrossi* Banner were also collected.

Etymology.—This species is dedicated to Dr. Raymond B. Manning, in recognition of his immense contribution to the study of decapod and stomatopod Crustacea.

Remarks.—The taxonomy of Axiidae and Calocarididae is still in need of considerable study (see Poore, 1994; Sakai, 1994), though our knowledge of these groups in the northwestern Pacific has been enriched in the last 10 years (see Appendix). Although the present new species differs from *Calaxiopsis serrata*, the type species of the genus, in the development of the podobranchs on the third maxilliped to third pereopods (see below), the following features closely relate the former to the latter species: cervical groove restricted to dorsal region; eye partially fused with carapace, cornea unpigmented; both coxae of third and fifth pereopods with gonopores in male; pleurobranch absent; male first pleopod present, with broadened distal segment; male second pleopod with elongate appendix masculina articulated distally to basal segment of endopod; third to fifth pleopods each with appendix interna; and uropod with distinct suture. Thus, the present new species is assigned to *Calaxiopsis*. In addition to the development of the podobranchs, *Calaxiopsis manningi* is readily distinguished from *C. serrata* in the unarmed gastric submedian carinae, unarmed pleura of the second to fourth abdominal somites, and much shorter antennal acicle. In *C. serrata*, the gastric submedian carina is armed with two small spines anteriorly; the second abdominal pleuron bears an obtuse ventral tooth posteriorly, and the third to fourth abdominal pleura are each armed with two teeth (the anterior teeth are acute in male and obsolete in female); and the antennal acicle reaches as far as the dorsodistal lateral spine of the second peduncular segment of the antenna. Although Sakai and de Saint Laurent (1989) assigned *Calastacus felix* to *Calaxiopsis*, detailed morphology of this species remains unknown. Ac-

ording to Alcock and Anderson (1899), *C. felix* appears to be quite different from *C. manningi* in having one spine on the gastric submedian carina and the thickly setose palm of the first pereopod. In order to decide the systematic position of *C. felix*, reexamination of the type material is strongly recommended.

It has been reported that the podobranchs on the third maxilliped to third pereopods bear gill filaments in *C. serrata* (Sakai and de Saint Laurent, 1989). At my request, M. de Saint Laurent reexamined the type material of *C. serrata* deposited in the Muséum national d'Histoire naturelle (Guinea, Guinea trawling survey, 11 Aug 1966: stn 11, 240–250 m, holotype male, cl 10.0 mm, MNHN–Th 1172; same station, paratype female, cl 9.0 mm, MNHN–Th 1173; stn 7, 200 m, female paratype, cl 4.0 mm, MNHN–Th 1174; stn 8, 100 m, paratype male, cl 8.0 mm, MNHN–Th 1175), and confirmed the presence of well-developed gill filaments on the podobranchs on the third maxilliped to third pereopods. In the new species, however, all but one podobranch are simple (see Figs. 5A, 3G, H); that on the third pereopod bears a few rudimentary gill filaments (see Fig. 3I). So far, it seems to be reasonable to consider that the development of the podobranchs is variable within *Calaxiopsis*, since the present new species agrees well with the genus in the other diagnostic features (see above). Sakai and de Saint Laurent (1989: 60) compared *Calaxiopsis* with *Ambiaxius* Sakai and de Saint Laurent, 1989, and considered the development of the podobranchs as one of the diagnostic features separating the two genera. In *Ambiaxius*, the podobranchs on the third maxilliped to third pereopods are all simple (Sakai and de Saint Laurent, 1989; Sakai, 1994, 1995). The discovery of the new species, however, shows that the development of the podobranchs on the third maxilliped to second pereopods is not reliable in separating the two genera, though the development of the podobranch on the third pereopod is still different between *C. manningi* and the species of *Ambiaxius*.

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ACCEPTED: 1 November 1999.
- Acanthaxius amakusana* (Miyake and Sakai, 1967): Amakusa Islands, Kyushu, Japan (previously in the genus *Axiopsis* Borradaile, 1903).
- Acanthaxius pilocheirus* (Sakai, 1987): Kumanonada, Japan; 360 m (previously in the genus *Axiopsis* Borradaile, 1903).
- Genus *Allaxius* Sakai and de Saint Laurent, 1989
- Allaxius princeps* (Boas, 1880): northern Japan and Prymorie in the Russian Far East; 30–300 m (previously in the genus *Axiopsis* Borradaile, 1903).
- Genus *Ambiaxius* Sakai and de Saint Laurent, 1989
- Ambiaxius alcocki* (McArdle, 1900): South Africa, Sri Lanka, New Caledonia, Japan; 370–1,000 m (previously in the genus *Calocaris* Bell, 1853).
- Ambiaxius japonicus* Kensley, 1996: Off Osezaki, Suruga Bay, Japan; 472 m.

APPENDIX

Check list of species of Axiidae and Calocarididae known from the northwestern Pacific (Japan, Russian Far East, Korea, northern China, and Taiwan), with their known geographic range and bathymetric distribution, past generic assignment, and common synonyms. A total of 24 species, including two of uncertain taxonomic status, are so far known from the region. (Based primarily on: Sakai and de Saint Laurent, 1989; Sakai, 1991, 1992, 1995; Kensley and Komai, 1992; Kensley, 1996, 1997; Kensley and Chan, 1998.)

Family Axiidae

Genus *Acanthaxius* Sakai and de Saint Laurent, 1989

Acanthaxius formosa Kensley and Chan, 1998: southwestern Taiwan; about 350 m.

Acanthaxius grandis Kensley and Chan, 1998: Taiwan; about 350 m.

Acanthaxius miyazakiensis (Yokoya, 1933): Japan, Philippines, and New Caledonia; 137 m (previously in the genus *Axius* Leach, 1815, or *Axiopsis* Borradaile, 1903).

Acanthaxius polyacanthus (Miyake and Sakai, 1967): East China Sea; 118 m (previously in the genus *Axiopsis* Borradaile, 1903).

Genus *Axiopsis* Borradaile, 1903

Axiopsis serratifrons (A. Milne Edwards, 1873): Indo-Pacific, Red Sea, in the eastern Pacific from Colombia, western and South Atlantic; shallow subtidal to about 17 m.

Axiopsis tsushimaensis Sakai, 1992: Tsushima Strait, Japan; 70–102 m.

Genus *Calocarides* Wollebaek, 1908

?*Calocarides habereri* (Balss, 1913): Japan, Korea, Yellow Sea; 99–102 m (previously in the genus *Axius* Leach, 1815, or *Axiopsis* Borradaile, 1903).

Calocarides soyoi (Yokoya, 1933): Pacific coast of Japan; 138–200 m (previously in the genus *Axius* Leach, 1815, or *Axiopsis* Borradaile, 1903).

Genus *Eiconaxius* Bate, 1888

Eiconaxius farreae Ortmann, 1890: Japan; 77–732 m.

Eiconaxius mortensenii Sakai, 1992: Sagami Bay, Japan; 366–732 m.

Genus *Neaxiopsis* Sakai and de Saint Laurent, 1989

Neaxiopsis euryrhynchus (de Man, 1905): Celebes and Japan; 36 m (previously in the genus *Axius* Leach, 1815).

Genus *Neaxius* Borradaile, 1903

Neaxius acanthus (A. Milne Edwards, 1878): Ryukyu Islands, Mariana Islands, West Celebes, New Britain, New Caledonia, Murray Islands, Torres Strait, Port Louis, and Mauritius; intertidal to subtidal (= *Eiconaxius taliliensis* Borradaile, 1900; *Axius acanthus* var. *mauritanus* Bouvier, 1914).

Genus *Oxyrynchaxius* Parisi, 1917

Oxyrynchaxius japonicus Parisi, 1917: Japan, Hong Kong; 30–80 m.

Genus *Paraxiopsis* de Man, 1905

Paraxiopsis brocki (de Man, 1888): Ryukyu Islands, Indonesia, Borneo, Bikini Atoll, western to northern Australia; intertidal to 83 m (previously in the genus *Axiopsis* Borradaile, 1903, or *Eutrichocheles* Wood-Mason, 1876).

Family Calocarididae

Genus *Calastacus* Faxon, 1893

Calastacus crosnieri Kensley and Chan, 1998: northeastern Taiwan; about 350 m.

Genus *Calaxiopsis* Sakai and de Saint Laurent, 1989

Calaxiopsis manningi, new species: Boso Peninsula, Japan; 80–100 m.

Genus *Calaxius* Sakai and de Saint Laurent, 1989

Calaxius mimasensis (Sakai, 1967): Tosa Bay, Japan; 200 m (previously in the genus *Calastacus*).

Genus *Paracalocaris* Sakai, 1991

Paracalocaris sagamiensis Sakai, 1991: Sagami Bay, Japan; 250–280 m.

Species of Uncertain Taxonomic Status

Calastacus quinqueseriatus reported by Kobjakova (1937): Sea of Okhotsk; 1,150 m. Kobjakova's record of this species from the Sea of Okhotsk appears from the figure to be fairly similar to *Calocarides soyoi* (Yokoya, 1933) but does not have spinose margins on the first chelipeds. Additionally, the chelae appear to be proportionally broader than in *Calocarides quinqueseriatus* (Rathbun, 1902) or *C. soyoi* (cf. Kensley and Komai, 1992). When specimens from the Sea of Okhotsk become available for comparison, it may be eventually revealed that the Okhotsk population represents a distinct species.

Axius spinulicauda amurensis Kobjakova, 1937: Amur Bay, Sea of Japan; 31 m. The nominotypical form described by Rathbun (1902) from California was assigned to *Acanthaxius* Sakai and de Saint Laurent, 1989 (Sakai and de Saint Laurent, 1989). However, from the figure, Kobjakova's taxon appears to be considerably different from the known members of *Acanthaxius* in the morphology of the first chelipeds, development of the rostrum and ocular peduncles. The original description is too brief to determine its generic position. It is desirable to examine the holotype or topotypic material in order to establish its taxonomic status.