

**Two new species of the genus *Heteronucia* (Crustacea: Decapoda: Brachyura: Leucosiidae) from Japan**

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*Abstract.*—Two new species of leucosiid crabs, *Heteronucia toyoshioae* and *H. granulata*, are described from the offshore banks of the Ryukyu Islands in southern Japan and the Izu Islands in central Japan. *Heteronucia toyoshioae* may be distinguished from all the known species of *Heteronucia* Alcock, 1896 by having seven tubercles on the carapace, a median triangular tooth on the sixth segment of the male abdomen, and the shape of the male first pleopod. *Heteronucia granulata* is similar to *H. globata* Sakai, 1963 and *H. perlata* (Sakai, 1963) from East Asia but can be distinguished by the presence of a small tubercle on the pterygostomian margin, a ridged row of granules on the branchial region, and a triangular tubercle on the posterolateral margin of the carapace.

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A joint project entitled “Investigation of Deep-Sea Fauna and Marine Pollution in the Ryukyu Islands” has been carried out since 2000 by the National Science Museum, Hiroshima University, and Ehime University. The first author joined some cruises of the TRV *Toyoshio Maru* of Hiroshima University in 2000–2003, investigating the planktonic, benthic, and nektonic fauna of the Ryukyu Islands, Japan, through the courtesy of Dr. Susumu Ohtsuka. During these cruises, a good series of leucosiid crabs was obtained by dredging, beam trawls, and sledge nets. Among the materials collected from the Oshima-shinsone Bank off the Amami Group in the northern Ryukyu Islands, there were some specimens identified as two new species of the genus *Heteronucia* Alcock, 1896. In addition to this material, the first author collected specimens of the same two species from the Kurose Bank off the Izu Islands

in central Japan, on board the TRV *Shinyo Maru* of Tokyo University of Marine Science and Technology (former Tokyo University of Fisheries), through the courtesy of Dr. Kotaro Tsuchiya. In this paper, we describe and illustrate these two species as new to science.

Measurements, given in millimeters (mm), are of the greatest carapace length (including the posterior lobe) and breadth, respectively. Pereopods are measured along the outer margin from ischium to dactylus. The specimens examined are deposited in the Department of Zoology, National Science Museum, Tokyo (NSMT).

*Heteronucia toyoshioae*, new species  
Figs. 1, 2, 5A, B

*Material examined.*—Holotype: male (7.0×7.3), NSMT-Cr 16071, 28°52.54'N, 129°33.11'E, Oshima-shinsone Bank, Amami Group, Ryukyu Is., southern Japan, TRV *Toyoshio Maru*, TY-01-06 cruise, stn

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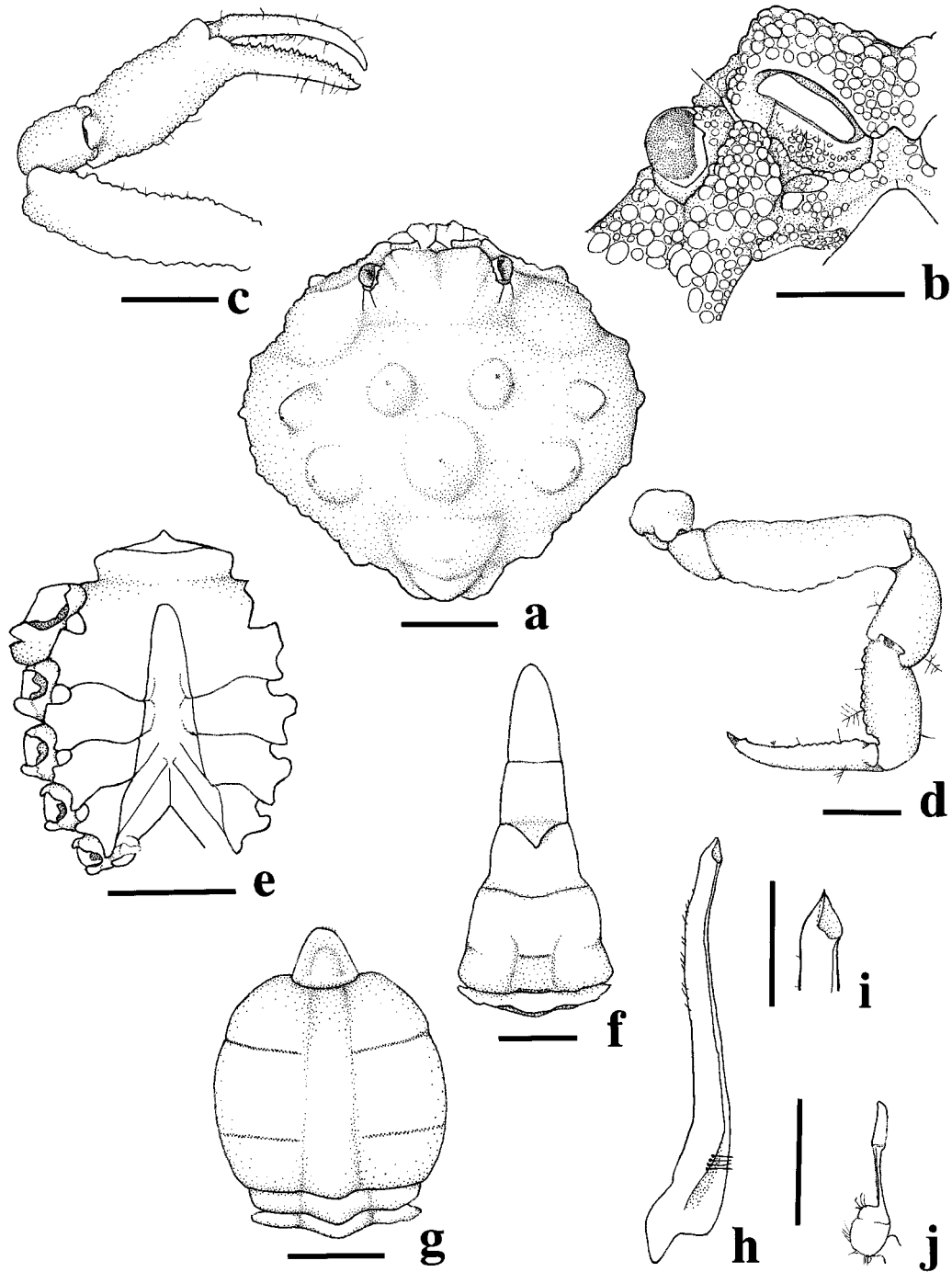


Fig. 1. *Heteronucia toyoshioae*. a-f, h-j, holotype, male (7.0 × 7.3 mm; NSMT-Cr 16071); g, paratype, ovig. Female (8.3 × 9.0 mm; NSMT-Cr 16072) from Oshima-shinsone Bank, Amami Group, Ryukyu Is., southern Japan. a, carapace, dorsal view; b, frontal region, frontal view; c, left cheliped, dorsal view; d, right fourth ambulatory leg, dorsal view; e, male thoracic sternites, ventral view; f, male abdomen, ventral view; g, female abdomen, ventral view; h, right male first pleopod, external view; i, tip of same, external view; j, right male second pleopod. Scales for a, c, e, g = 2 mm; scales for b, d, f, h, j = 1 mm; scale for i = 0.5 mm.

9, dredge, 145 m, bed of Porifera, coll. H. Komatsu, 28 May 2001.

Paratypes: 1 ovig. female ( $8.3 \times 9.0$ ), 1 empty carapace ( $6.7 \times 7.4$ ; probably male), NSMT-Cr 16072,  $28^{\circ}52.14'N$ ,  $129^{\circ}32.99'E$ , Oshima-shinsono Bank, Amami Group, Ryukyu Is., southern Japan, TRV *Toyoshio Maru*, TY-03-03 cruise, stn 15, dredge, 163–167 m, bed of Porifera and Octocorallia, coll. H. Komatsu, 27 May 2003; 1 young male ( $4.0 \times 4.5$ ), NSMT-Cr 16073,  $33^{\circ}26.8'N$ ,  $139^{\circ}42.7'E$ , Kurose Bank, Izu Is., central Japan, TRV *Shinyo Maru*, SY-03-10 cruise, stn 19, dredge, 170–176 m, coll. H. Komatsu, 21 Oct 2003; 1 ovig. Female ( $8.8 \times 10.0$ ), NSMT-Cr 16074,  $28^{\circ}29.62'N$ ,  $129^{\circ}30.03'E$ , off Naze, Amami Group, Ryukyu Is., southern Japan, FV *Daiyu Maru*, DY-02 cruise, stn 1, dredge, 290 m, coll. M. Osawa, 26 Jun 2002.

*Description.*—Carapace (Fig. 1a) subcircular in general outline, slightly broader than long (holotype 1.04 times broad as long); upper surface convex dorsally, covered with closely set, flattened granules of various sizes, armed with 1 pair of gastric, 1 cardiac and 2 pairs of branchial, conical tubercles, tubercles weak in female; regions ill-defined. Frontal region moderately produced, shallowly concave medially; margin divided into 2 lobes by median small notch. Gastric and cardiac regions raised, not divided from each other; gastric tubercles directed dorsally; cardiac tubercle directed dorsally, largest among dorsal tubercles of carapace. Intestinal region protuberant. Hepatic region scarcely defined; margin not protruded from general outline of carapace. Pterygostomian margin weakly convex outwards, with rounded tubercle on midlength. Branchial region convex; margin roundly convex in anterior half, obliquely convergent in posterior half, with 3 small, rounded tubercles at equidistant intervals on anterior half, with larger triangular tubercle on posterior end; anterior branchial tubercle directed somewhat laterally, slightly smaller than gastric one; posterior branchial tubercle directed somewhat posterolaterally,

slightly larger than gastric one. Posterior margin with 2 rounded lobes, lobes inconspicuous in female.

Ocular peduncle (Fig. 1b) short, covered with small granules, without dorsal extension onto cornea. Orbit with 2 straight fissures on dorsal roof, with V-shaped notch on infraorbital margin; orbital hiatus closed with infraorbital lobe. Antennule obliquely folded into fossa; basal segment occupying ventral 0.6 of fossa, covered with small granules, sparsely setose. Antenna: basal segment transversely ovate; second segment subsquamate, laterally concealed beneath infraorbital lobe. Afferent channel with remnant tooth on distal end of mesial margin; anterior margin with small notch on lateral corner.

Mandible (Fig. 2a, b) well calcified; cutting edge triangular in outline, pointed medially; endopod palp 3-segmented, first segment very short, densely fringed with stout setae on terminal segment. Maxillule (Fig. 2c): coxal endite somewhat compressed, directed mesially, fringed with several setae, terminal setae stout; basial endite triangular, fringed with weakly plumose, stout and thin setae on mesial margin, with some plumose setae on lateral margin; endopod elongate triangular, with some plumose setae on proximal part of lateral margin. Maxilla (Fig. 2d): coxal endite roundly bilobed; basial endite elongate tongue-shaped, with some terminal setae; endopod broad, triangular, with acute tip, with some setae on lateral margin; exopod (scaphognathite) longitudinally expanded into oval structure, entirely fringed with short, plumose setae. First maxilliped (Fig. 2e): coxal endite semiglobular, with dense, weakly plumose setae; basial endite subtriangular, densely fringed with moderately long, plumose setae along entire margin; endopod longitudinally expanded, rounded at apex, fitting in efferent channel, fringed with very short setae along mesial margin; exopod longitudinally filiform, with some plumose setae on proximal part of lateral margin and around tip, bearing flagellum with some

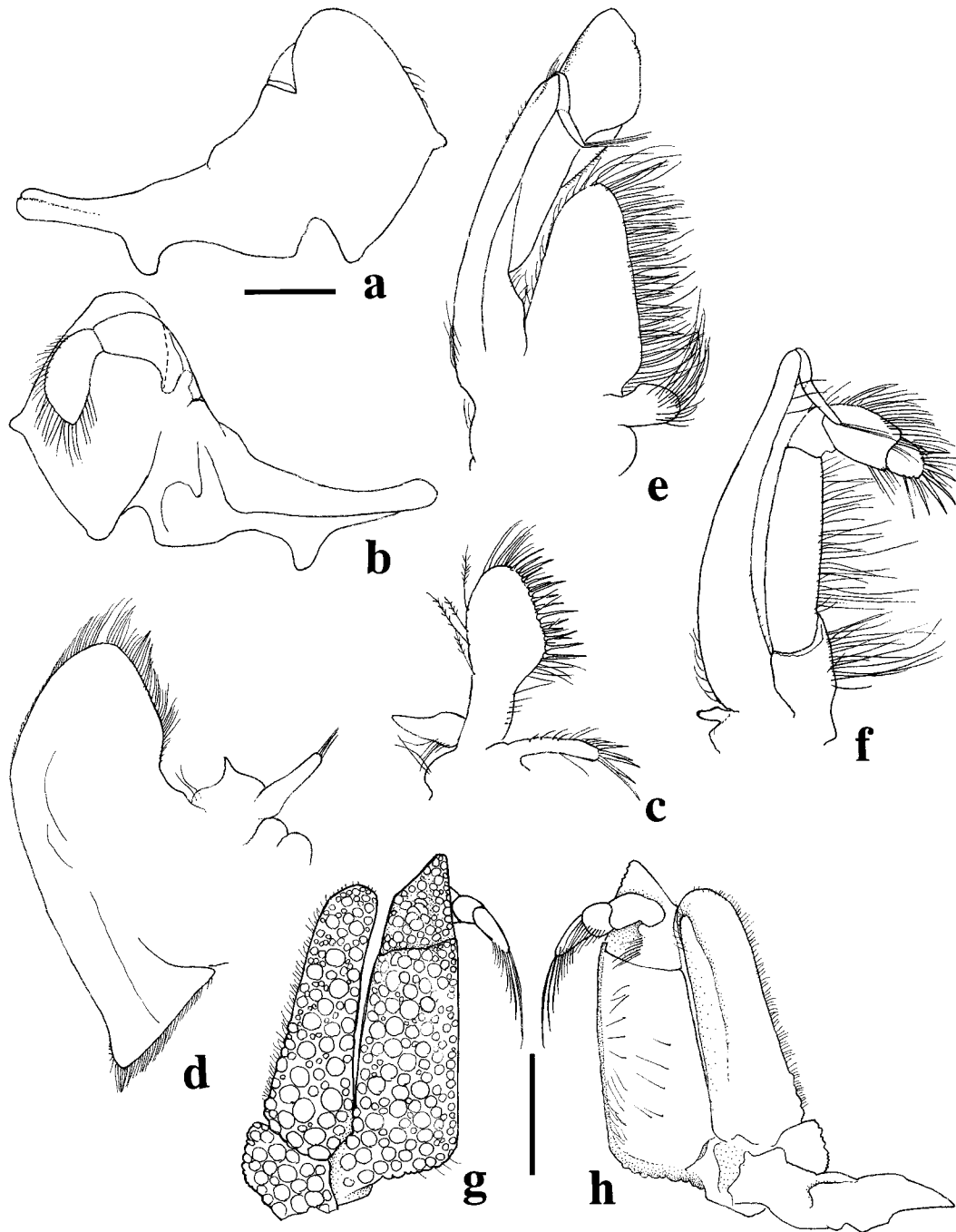


Fig. 2. Right mouth parts of *Heteronucia toyoshioae*. Holotype, male (7.0 × 7.3 mm; NSMT-Cr 16071) from Oshima-shinsone Bank, Amami Group, Ryukyu Is., southern Japan. a, mandible, external view; b, same, internal view; c, maxillule, external view; d, maxilla, external view; e, first maxilliped, external view; f, second maxilliped, external view; g, third maxilliped (proximal part of coxa broken), external view; h, same, internal view. Scale for a-f = 0.5 mm; scale for g-h = 1 mm.

weakly plumose, terminal setae. Second maxilliped (Fig. 2f): ischium and merus fringed with long plumose setae along mesial margin; propodus densely fringed with weakly plumose setae along outer and distal margins; dactylus armed with weakly plumose, stout setae around tip; exopod filiform, tapering distally, with some plumose setae on distal part of mesial margin and proximal part of lateral margin, bearing flagellum with some terminal setae; exodite tongue-shaped; podobranch absent.

Third maxilliped (Fig. 2g, h) covered with flattened, round granules of various sizes; basis fused with ischium, but with remnant of suture on internal surface; ischium subsquamate; merus strongly bent dorsally in situ, about 0.6 times as long as ischium along mesial margin; propodus with dense simple setae on internal surface; dactylus with distally denticulate setae along inner margin; exopod subsquamate, scarcely tapering distally, rounded at tip, fringed with short plumose setae on lateral margin; internal exopodal ridge prominent, with some distal setae; epipod reduced, not well calcified; podobranch absent.

Cheliped (Fig. 1c) stout, 1.6 times as long as carapace in holotype, male, 1.4 times in paratype, female, covered with flattened, round granules of various sizes; coxal condyle subcircular in both sexes; merus subcylindrical, flat on dorsal surface, with several acute granules on inner surface; carpus convex; palm convex dorsally, slightly constricted distally, arcuate on inner surface; fingers without gap between cutting edges when closed; movable finger about 1.1 times as long as palm; immovable finger about 1.5 times broader than movable one; cutting edges entirely armed with triangular teeth in almost regular order of 1 big and 2 or 3 small teeth, teeth on immovable finger larger than those on movable one.

Ambulatory legs (Fig. 1d) of moderate length, similar in shape, gradually decreasing in length from first to fourth, covered with flat granules, sparsely furnished with

short plumose setae; coxal condyles rounded in both sexes; meri and carpi subcylindrical; propodi moderately compressed; dactyli subconical, with smooth dactylo-propodal locks on proximal ends of dorsal surfaces.

Male thoracic sternites (Fig. 1e) covered with large flat granules of various shapes; first sternite completely fused with second one; second sternite separated from third one by transverse suture; third sternite separated from fourth one by shallow concavity; episternites not divided; abdominal cavity reaching nearby anterior margin of fourth sternite; median fissure reaching border between seventh and eighth sternites.

Female thoracic sternites covered with vesicular granules of various sizes; first to fourth sternites fused; second sternite smooth; third sternite separated from fourth one by shallow groove; abdominal cavity reaching to middle of third sternite.

Male abdomen (Fig. 1f) covered with vesicular granules of various sizes; first segment very short, transversely subrectangular; second segment short, transversely subrectangular; main fused section composed of third to fifth segments, elongate trapezoidal, with medial transverse groove on border between third and fourth segments, with entire transverse shallow groove on border between fourth and sixth segments; sixth segment free, with large acute triangular tooth on proximal margin, tooth directed postero-ventrally; telson elongate triangular.

Female abdomen (Fig. 1g) covered with vesicular granules of various sizes; first segment completely concealed beneath carapace; second and third segments short, transversely subrectangular; main fused section composed of fourth to sixth segments, ovate, moderately convex ventrally, segments divided by medially interrupted vestigial sutures, slightly constricted at remnant border between fifth and sixth segments; telson triangular with rounded tip, fringed with very short setae.

Male first pleopod (Fig. 1h) slender,

weakly compressed, fringed with short simple setae along distal 0.4 of lateral margin, with distal aperture (Fig. 1i). Male second pleopod (Fig. 1j) short, about 0.4 times as long as first one, filiform, 2-jointed; basal part fringed with several plumose setae; distal joint spatulate.

*Color.*—Dorsal surfaces of carapace, chelipeds and ambulatory legs symmetrically speckled with bright red punctae; ventral surfaces white.

*Etymology.*—This species is named after the TRV *Toyoshio Maru* of Hiroshima University.

*Remarks.*—*Heteronucia toyoshioae* is similar to *H. vesiculosa* Alcock, 1896 in the arrangement of tubercles on the dorsal surface of carapace, but can be distinguished in that the dorsal surface of the carapace has seven tubercles, whereas it has eight or nine acute tubercles in *H. vesiculosa*; the lateral margin of the carapace has one rounded, three small, and one large tubercles, whereas it has eight coarse spines in *H. vesiculosa*.

*Heteronucia toyoshioae* is readily distinguished from all the other members of *Heteronucia* by having seven tubercles on the carapace, a median triangular tooth on the proximal margin of the sixth segment of the male abdomen, and a distal aperture of the male first pleopod.

*Heteronucia toyoshioae* is also similar to *Ebalia tuberculosa* (A. Milne-Edwards, 1873) in the arrangement of tubercles on the carapace, the contour of the carapace, the bilobed posterior margin, and the free sixth segment of the male abdomen, but can be distinguished from *E. tuberculosa* by some features: the branchial region has two pairs of tubercles in *H. toyoshioae*, but one pair of tubercles in *E. tuberculosa*; the branchial margin has three small and one large tubercles in *H. toyoshioae*, but no tubercle in *E. tuberculosa*; the orbital hiatus is closed with the infraorbital lobe in *H. toyoshioae*, but loosely filled with the second segment of antenna in *E. tuberculosa*; the male abdomen has a tooth on the prox-

imal margin of the sixth segment in *H. toyoshioae*, but a tooth on the proximal margin of the telson in *E. tuberculosa*.

*Distribution.*—Japan-Ryukyu Is. (type locality) and Izu Is., occurring at depths of 145–176 m.

***Heteronucia granulata*, new species**

Figs. 3, 4, 5C, D

*Material examined.*—Holotype: male (4.3 × 4.2), NSMT-Cr 16075, 28°52.14'N, 129°32.99'E, Oshima-shinsone Bank, Amami Group Ryukyu Is., southern Japan, TRV *Toyoshio Maru*, TY-03-03 cruise, stn 15, dredge, 163–167 m, bed of Porifera and Octocorallia, coll. H. Komatsu, 27 May 2003.

Paratypes: 1 ovig. female (5.2 × 5.7), NSMT-Cr 16076, same data as holotype; 1 ovig. female (6.2 × 6.7), NSMT-Cr 16077, 33°26.8'N, 139°42.7'E, Kurose Bank, Izu Is., central Japan, TRV *Shinyo Maru*, SY-03-10 cruise, stn 19, dredge, 170–176 m, coll. H. Komatsu, 21 Oct 2003; 1 ovig. female (6.0 × 6.4), NSMT-Cr 16078, 33°27.3'N, 139°42.6'E, Kurose Bank, Izu Is., central Japan, TRV *Shinyo Maru*, SY-03-10 cruise, stn 20, dredge, 200–211 m, coll. H. Komatsu, 21 Oct 2003.

*Description.*—Carapace (Fig. 3a) subcircular in general outline, slightly longer than broad in male (holotype 1.03 times), 1.1 times broader than long in female; upper surface convex dorsally, moderately covered with pearly granules, sparsely furnished with short setae on frontal region, gastric tubercle, hepatic region, branchial ridged row of granules, and posterior branchial tubercle. Frontal region moderately produced, medially concave deeply; margin broadly V-shaped. Gastric and cardiac regions raised, not divided from each other; gastric region with pair of small tubercles. Intestinal region strongly convex, divided from branchial region by a deep longitudinal groove on each side. Hepatic region divided by a shallow arcuate groove, with horizontal suture; margin inconspicuous.

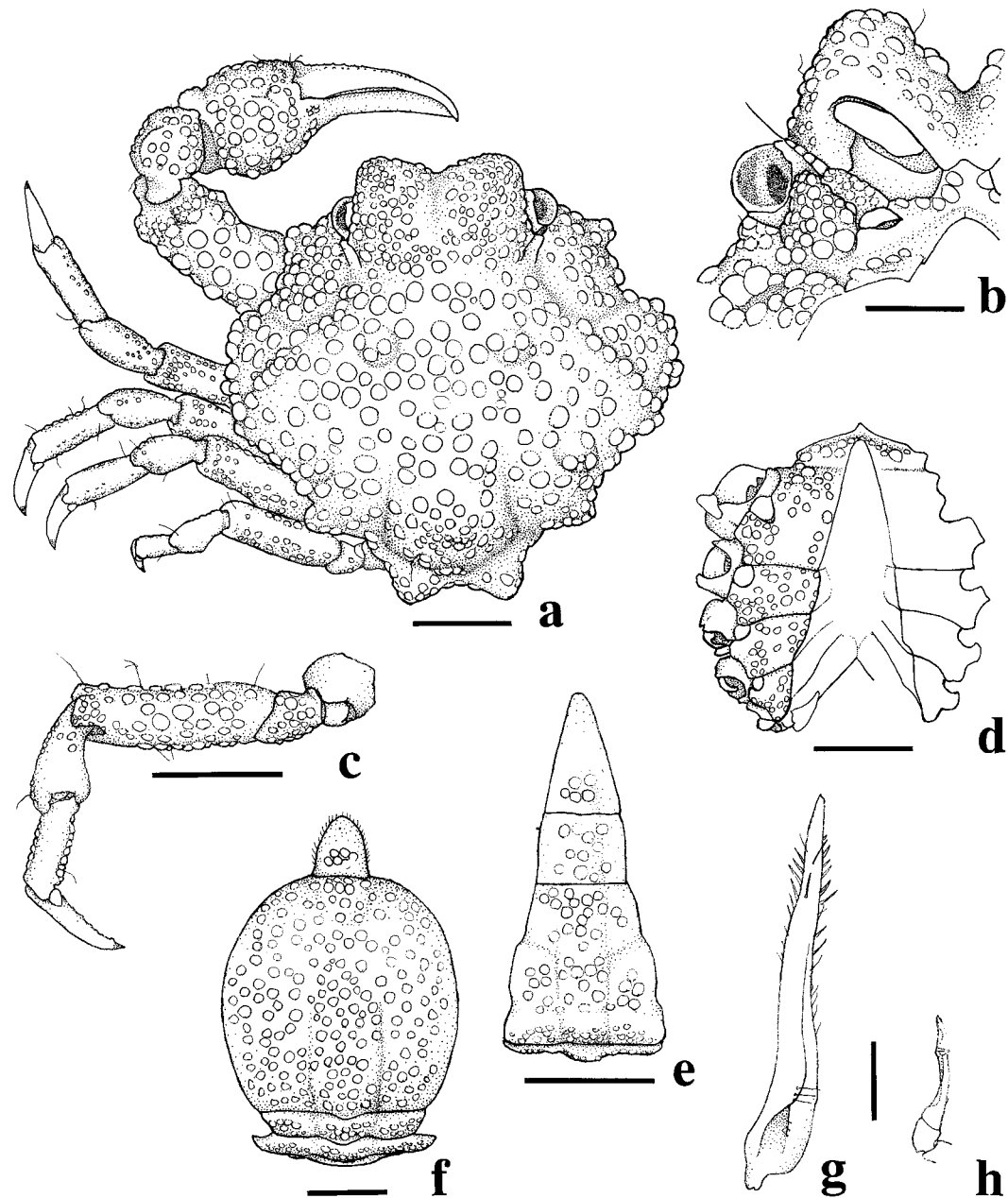


Fig. 3. *Heteronucia granulata*. a-e, g-h, holotype, male (4.3 × 4.2 mm; NSMT-Cr 16075); f, paratype, ovig. female (5.2 × 5.7 mm; NSMT-Cr 16076) from Oshima-shinsone Bank, Amami Group, Ryukyu Is., southern Japan. a, whole body, dorsal view; b, frontal region, frontal view; c, left fourth ambulatory leg, dorsal view; d, male thoracic sternites, ventral view; e, male abdomen, ventral view; f, female abdomen, ventral view; g, right male first pleopod, external view; h, right male second pleopod, external view. Scales for a, d-f = 1 mm; scales for b, c, g, h = 0.5 mm.

Pterygostomial margin weakly convex outwards, with median triangular tubercle. Branchial region convex, with short oblique ridged row of granules on anterior part, with small tubercle on posterolateral part; margin roundly convex, weakly expanded into thin edge in anterior half, weakly angled at junction with anterior ridge, with large triangular tubercle on posterior end. Posterior margin with 2 triangular lobes; lobes separated from each other.

Ocular peduncle (Fig. 3b) short, without dorsal extension onto cornea. Orbit with 2 straight fissures on dorsal roof, with V-shaped notch on infraorbital margin, notch with short suture on apex; orbital hiatus filled with second segment of antenna. Antennule obliquely folded into fossa; basal segment occupying ventral 0.5 of fossa, smooth. Antenna: basal segment transversely ovate; second segment subcylindrical, covered with flat granules of various sizes. Afferent channel with remnant tooth on distal end of mesial margin; anterior margin with small notch on lateral 0.3, notch with short suture on apex.

The mouth parts of this new species (Fig. 4) are very similar to those of *Heteronucia toyoshioae* (Fig. 2) in most diagnostic characters, with only the differences described below. Maxilla (Fig. 4d): endopod not broad, without seta; exopod (scaphognathite) longitudinally expanded into oval structure, entirely fringed with short, plumose setae. First maxilliped (Fig. 4e): endopod fringed with very short setae along mesial and distal margins. Second maxilliped (Fig. 4f): ischium and merus fringed with sparse, weakly plumose setae along mesial margin; exodite rounded; one podobranch present.

Third maxilliped (Fig. 4g, h) covered with sparse pearly granules of various sizes; basis fused with ischium, but with sutures on internal and external surfaces; ischium subsquamate, weakly convex in lateral 0.6, with row of large pearly granules along convexity; merus strongly bent dorsally in situ, about 0.7 times as long as ischium along mesial margin; propodus and dactylus

with dense, distally denticulate setae along inner margin; exopod subsquamate, rounded at tip, sparsely fringed with short plumose setae on lateral margin; internal exopodal ridge prominent, with some setae along ridge; epipod reduced, short; podobranch absent.

Cheliped (Fig. 3a) stout, 1.2–1.3 times as long as carapace (N = 4; holotype 1.2 times), covered with pearly granules of various sizes; coxal condyle rounded in both sexes; merus subcylindrical, with small triangular process on distal end of inner margin; carpus produced on lateral corner; palm strongly convex dorsally, arcuate on inner margin; fingers blade-shaped, without gap between cutting edges when closed; movable finger about 1.5–1.6 times as long as palm; immovable finger as broad as movable one; cutting edges entirely armed with triangular teeth as in *H. toyoshioae*.

Ambulatory legs (Fig. 3c) of moderate length, similar in shape, gradually decreasing in length from first to fourth, covered with flat granules of various sizes, sparsely furnished with short plumose setae; coxal condyles rounded in both sexes; meri and carpi subcylindrical; propodi moderately compressed; dactyli subconical, with smooth dactylo-propodal locks on proximal ends of dorsal surfaces.

Male thoracic sternites (Fig. 3d) covered with vesicular granules; first sternite completely fused with second one; second sternite fused with third one, without granule; third sternite separated from fourth one by deep, transverse groove; episternites not divided; abdominal cavity reaching border between second and third sternites; median fissure absent.

Female thoracic sternites covered with vesicular granules of various sizes; first to fourth sternites fused; second sternite smooth; third sternite separated from fourth one by deep, oblique groove; abdominal cavity reaching border between second and third sternites.

Male abdomen (Fig. 3e) covered with vesicular granules of various sizes; first seg-



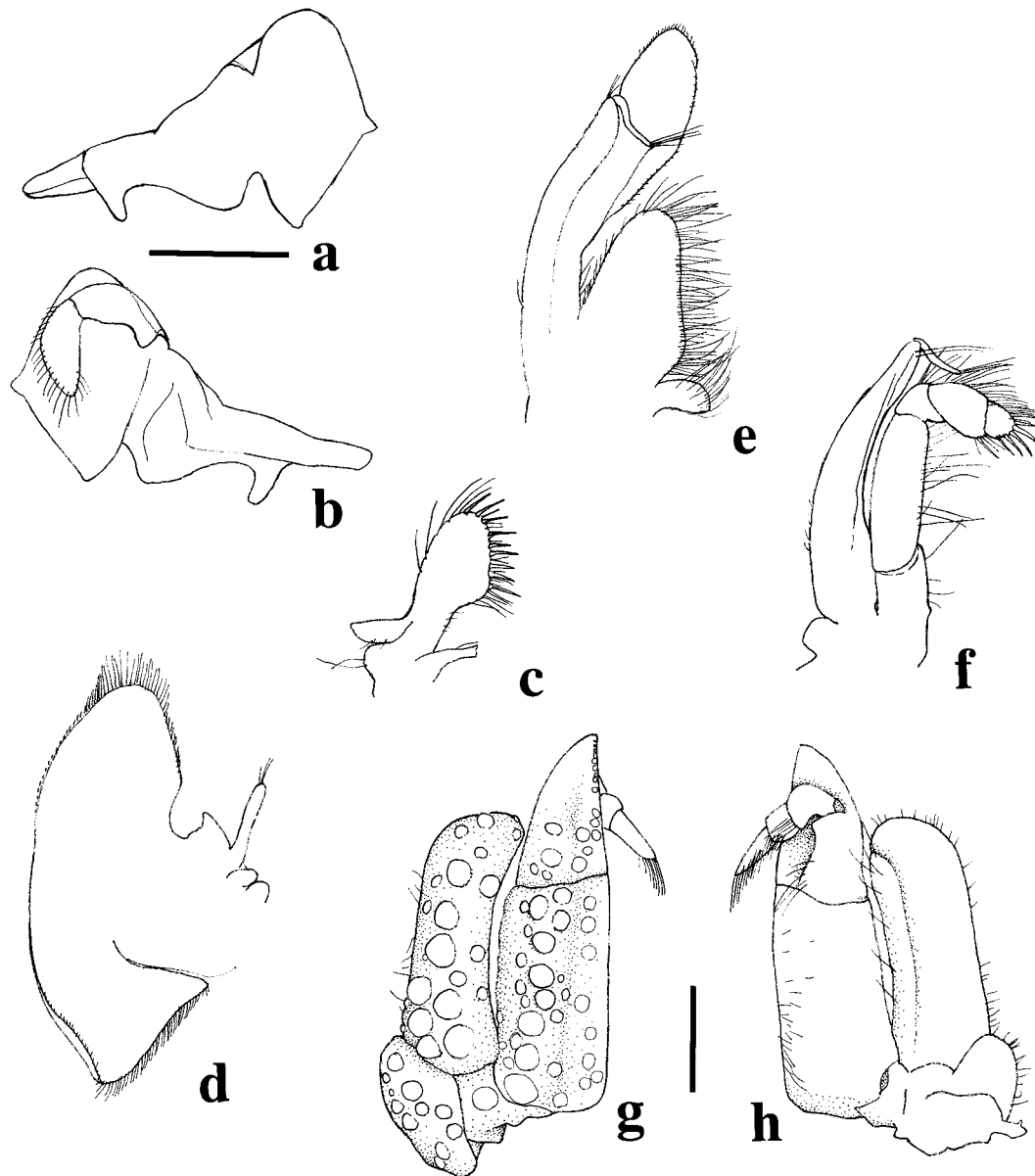


Fig. 4. Right mouth parts of *Heteronucia granulata*. Holotype, male (4.3 × 4.2 mm; NSMT-Cr 16075) from Oshima-shinsone Bank, Amami Group, Ryukyu Is., southern Japan. Right mouth parts. a, mandible, external view; b, same, internal view; c, maxillule (tip of coxal endite lost), external view; d, maxilla, external view; e, first maxilliped, external view; f, second maxilliped, external view; g, third maxilliped, external view; h, same, internal view. Scales for a–f, g, h = 0.5 mm.

ment (not seen in figure) very short, transversely subrectangular; second segment short, transversely subrectangular; main fused section composed of third to fifth seg-

ments, subtrapezoidal; sixth segment free, subsquare; telson elongate triangular.

Female abdomen (Fig. 3f) moderately covered with vesicular granules; first seg-

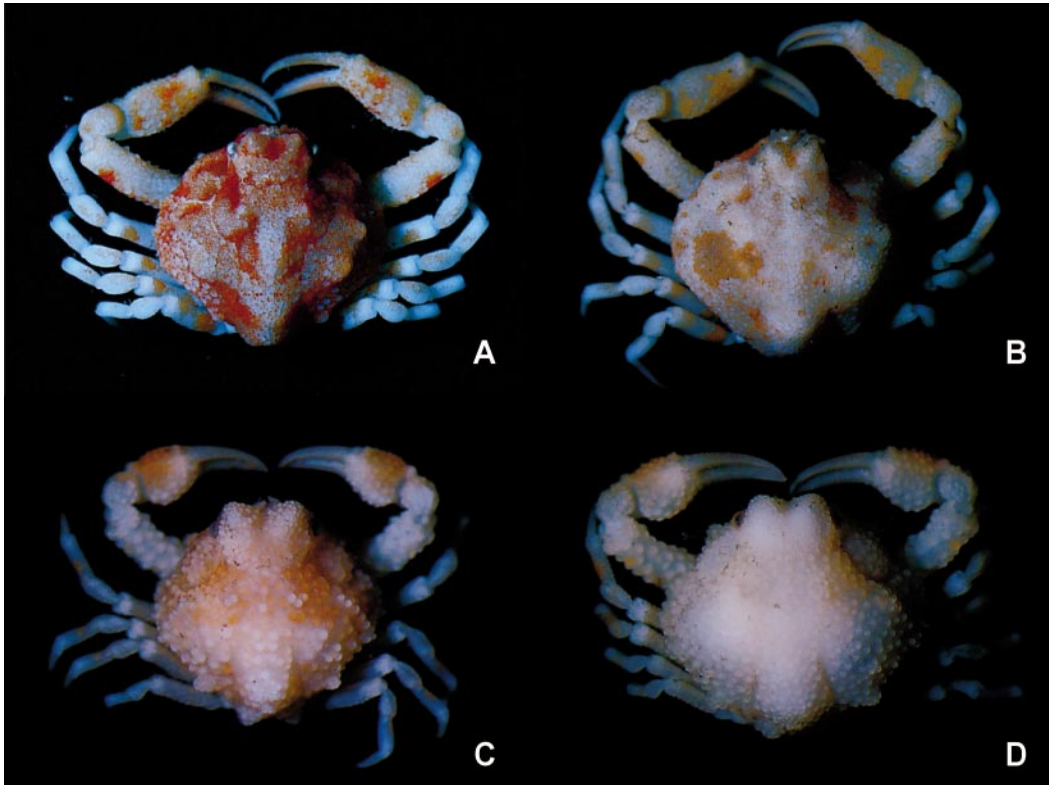


Fig. 5. A, B, *Heteronucia toyoshioae*. A, holotype, male (7.0 × 7.3 mm; NSMT-Cr 16071); B, paratype, ovig. female (8.3 × 9.0 mm; NSMT-Cr 16072). C, D, *Heteronucia granulata*. C, holotype, male (4.3 × 4.2 mm; NSMT-Cr 16075); D, paratype, ovig. female (5.2 × 5.7 mm; NSMT-Cr 16076). All from Oshima-shinsono Bank, Amami Group, Ryukyu Is., southern Japan.

ment very short; second and third segments short, transversely subrectangular; main fused section composed of fourth to sixth segments, ovate, weakly convex ventrally, with 2 longitudinal shallow grooves; telson tongue-shaped, fringed with very short setae.

Male first pleopod (Fig. 3g) almost straight, tapering distally, compressed, fringed with short simple setae along distal 0.7 of mesial and 0.5 of lateral margins, setae getting thicker distally. Male second pleopod (Fig. 3h) short, about 0.3 times as long as first one, filiform, 2-jointed; basal part not broadened; distal joint acute triangular.

*Color*.—Whole body light brown, with brick red spots on both sides of gastric re-

gion and upper surfaces of chelipedal palm and propodi of ambulatory legs.

*Etymology*.—The name is derived from the Latin “granulata” for granule, alluding to the characteristic pearly granules covering the carapace.

*Remarks*.—*Heteronucia granulata* is similar to *H. globata* Sakai, 1963 in the general outline of carapace, the presence of a pair of gastric tubercles, and the triangularly bilobed posterior margin, but can be distinguished from it by the divided hepatic region, a triangular tubercle on the pterygostomial margin, a ridged row of granules on the branchial region, a large triangular tubercle on the postero-lateral margin, and the elongate chelipedal finger.

*Heteronucia granulata* is also similar to

*H. perlata* (Sakai, 1963) in the divided intestinal and hepatic regions, the upper surface of carapace covered with pearly granules, and the blade-shaped chela, but can be distinguished by a ridged row of granules on the branchial region, a small tubercle on the pterygostomial margin, a triangular tubercle on the posterolateral margin, and the triangularly bilobed posterior margin.

*Distribution.*—Japan endemic-Ryukyu Is. (type locality) and Izu Is., occurring at depths of 163–211 m.

#### Acknowledgments

We wish to express our profound gratitude to the staff of the TRV *Toyoshio Maru* of Hiroshima University, the TRV *Shinyo Maru* of Tokyo University of Marine Science and Technology and the FV *Daiyu*

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