

Description of Male *Ebalia stellaris* Naruse and Ng, 2006 (Crustacea, Decapoda, Leucosiidae), with a Revision of the Species Diagnosis

Hironori Komatsu¹, Akio Go², Kazumitsu Nakaguchi² and Susumu Ohtsuka³

¹ Department of Zoology, National Museum of Nature and Science,
4–1–1, Amakubo, Tsukuba-shi, Ibaraki, 305–0005 Japan
E-mail: h-komatu@kahaku.go.jp

² TRV *Toyoshio Maru*, Faculty of Applied Biological Science, Hiroshima University,
7–4, Takara-machi, Kure-shi, Hiroshima, 737–0029 Japan

³ Takehara Marine Science Station, Setouchi Field Science Center,
Graduate School of Biosphere Science, Hiroshima University,
5–8–1, Minato-machi, Takehara-shi, Hiroshima, 725–0024 Japan

(Received 19 July 2011; accepted 28 September 2011)

Abstract *Ebalia stellaris* Naruse and Ng, 2006 was first described from an ovigerous female, but during recent cruise to the Ryukyu Islands a male and a young female specimens were collected. These specimens are described, illustrated and the diagnosis of the species is partly revised on the basis of the present finding.

Key words: Crustacea, Decapoda, Leucosiidae, *Ebalia stellaris*.

Introduction

Since 1988, research cruises of TRV *Toyoshio Maru* of the Hiroshima University investigating marine fauna and flora around the Ryukyu Islands, southwestern Japan, have been intensively carried out by the authors. Among the recent material collected, were a male and a young female identified as *Ebalia stellaris* Naruse and Ng, 2006. *Ebalia stellaris* was originally described from these islands on the basis of a single ovigerous female specimen, and was differentiated from a closely related congener *E. humilis* Takeda, 1977, from the Ogasawara Islands, mainly by the morphology of the carapace and cheliped. This paper deals with the first description of a male *E. stellaris* and the re-examination of a series of *E. humilis* specimens, including types. As a consequence the diagnostic characters of *E. stellaris* are partly revised. Additional comments are made with regard to the morphology of *E. humilis*, *E. longispinosa* Ihle, 1918 and *Nursia dimorpha* Balss, 1915.

The specimens examined are deposited in the

Naturhistorisches Museum, Wien (NHMW), the National Museum of Nature and Science, Tokyo (NSMT), and the Zoologische Staatssammlung, München (ZSM). Measurements, given in millimeters (mm), are of the greatest carapace breadth (cb) and length (cl), respectively. Pereiopods are measured along the outer margin from ischium to dactylus. Abbreviations used are as follows: G1, first male gonopod; G2, second male gonopod; P2–P5, pereiopods 2–5 (first to fourth ambulatory legs); stn, station.

Taxonomy

Family Leucosiidae Samouelle, 1819

Ebalia stellaris Naruse and Ng, 2006

[New Japanese name: Hoshizuna-ebalia]

(Figs. 1–3)

Material examined. 1 male (cb 3.1×cl 2.5 mm), NSMT-Cr 21751, south off Nagannu-jima I., Kerama Group, Ryukyu Is., 26°14.34'N 127°32.66'E–26°14.42'N 127°32.50'E, 41.4–46.0 m, dredge, TRV *Toyoshio Maru* 2007 cruise, stn



Fig. 1. *Ebalia stellaris* Naruse and Ng, 2006, male (cb 3.1×cl 2.5 mm), NSMT-Cr 21751. Scale=1 mm.

8, coll. H. Komatsu, 25 May 2008; 1 young female (3.0×2.3), NSMT-Cr 21752, Ankyaba, Kakeroma-jima I., Amami Group, Ryukyu Is., 12 m, sandy bottom, SCUBA, TRV *Toyoshio Maru* 2003 cruise, coll. T. Akiyama, 26 May 2003.

Comparative material examined. *Ebalia humilis* Takeda, 1977 (Fig. 3): 1 male (3.4×2.9), NSMT-Cr 11298, Miyanohama, Chichi-jima I., Ogasawara Is., 25 m, SCUBA, coll. H. Tachikawa, 5 January 1993; 2 males (2.8×2.3, 3.0×2.5), NSMT-Cr 18300, Kominato, Chichi-jima I., Ogasawara Is., 4 m, SCUBA, coll. H. Tachikawa, 4 May 1995; 1 male (2.9×2.5), 1 female (3.4×3.0), NSMT-Cr 18302, Susaki, Chichi-jima I., Ogasawara Is., 10 m, SCUBA, coll. H. Tachikawa, 18 April 1993; 1 male (3.1×2.6), NSMT-Cr 18303, Mizutama Bay, Ani-jima I., Ogasawara Is., 10 m, SCUBA, coll. H. Tachikawa, 5 May 1994; 1 ovig. female (3.6×2.9), NSMT-Cr 18305, Takinoura, Ani-jima I., Ogasawara Is., 8 m, SCUBA, coll. H. Tachikawa, 3 April 1994.

Ebalia longispinosa Ihle, 1918: 1 female (6.1×5.1), NSMT-Cr 5294, northeast of Tanegashima I., Osumi Is., western Japan, 30°41.4'E 131°07.5'E, 56 m, 17 June 1975; 1 ovig. female (6.8×5.5), NSMT-Cr 5295, northeast of Tanegashima I., Osumi Is., western Japan, 30°45.9'E 131°11.2'E, 72 m, 17 June 1975.

Nursia dimorpha Balss, 1915: syntype, male (4.0×3.5), NHMW Inv. 7496, Dahlak Bank, Red Sea, 16°02'E 41°13'E, 800 m, dredge, Pola-expedition stn 145, 29 October 1897; syntype, male (3.5×3.3), ZSM 448/1, Dahlak Bank, Red Sea, 17°07'E 39°55'E, 212 m, dredge, Pola-expedition stn 143, 28 October 1897.

Description of male. Carapace (Figs. 1, 2) sub-pentagonal in general outline, 1.2 times broader than long, convex dorsally; upper surface entirely covered with microscopic, flat granules. Front strongly produced, weakly concave medially; margin divided into two lobes by median triangular notch. Orbit with two longitudinal sutures dorsally; infraorbital lobe with broad V-shaped notch with short suture. Gastro-cardiac region raised, with pair of gastric tubercles and low cardiac tubercle; gastric tubercles prominent, sub-conical, slightly lower than frontal region. Intestinal region prominently convex, with subdistal peak, subtriangular in outline, protruding beyond posterior margin. Hepatic region scarcely swollen; border indistinct, inside from general outline. Pterygostomian margin obliquely straight, with triangular median tooth, continuous with branchial margin. Branchial region convex laterally, sloping antero-laterally; antero-lateral margin divergent, with evenly arranged 3 trian-



Fig. 2. *Ebalia stellaris* Naruse and Ng, 2006, male (cb 3.1×cl 2.5 mm), NSMT-Cr 21751. Scale=1 mm.

gular teeth, middle tooth faint, posterior tooth largest, upturned, making angle with postero-lateral margin; postero-lateral margin convergent, with faint anterior tooth and large rounded, posterior tooth, posterior tooth as large as intestinal projection. Posterior margin separately bilobed, triangular with rounded tip.

Ocular peduncle short. Antennule obliquely folded in fossa; basal segment occupying ventral half, smooth. Basal segment of antenna subcylin-

drical, fitting into orbital hiatus.

Mandible (Fig. 3A, B) calcified; cutting edge triangular in outline, pointed medially; palp three-segmented, terminal segment fringed with short setae. Maxillule (Fig. 3C): coxal endite missing; basal endite tongue-shaped, with stout, thin setae on mesial margin; endopod reduced. Maxilla (Fig. 3D): coxal endite, basal endite and endopod missing; exopod (scaphognathite) longitudinally expanded into ovate structure, entirely

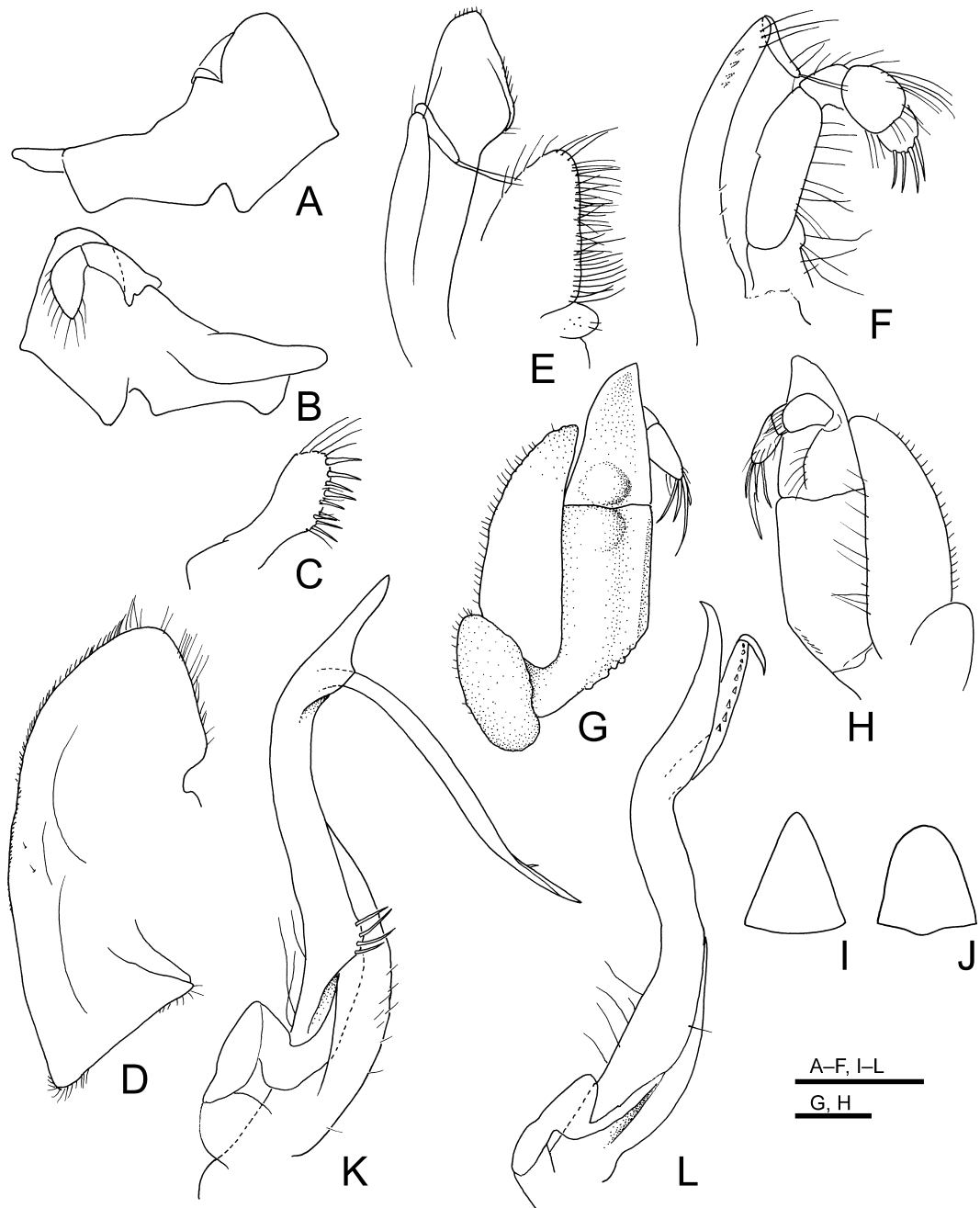


Fig. 3. A–I, K, *Ebalia stellaris* Naruse and Ng, 2006, male (cb 3.1×cl 2.5 mm), NSMT-Cr 21751; J, L, *Ebalia humilis* Takeda, 1977, male (cb 3.1×cl 2.6 mm), NSMT-Cr 18303. — A, Mandible, external view; B, same, internal view; C, maxillule (coxal endite missing), external view; D, maxilla (coxal and basal endites and endopod missing), external view; E, first maxilliped (endites detached), external view; F, second maxilliped (endopod detached), external view; G, third maxilliped (granules omitted), external view; H, same, internal view; I, J, telson, ventral view; K, L, G1 and G2, abdominal view. Scales for A–H, K, L=0.25 mm; scale for I, J=0.5 mm.

fringed with short, plumose setae. First maxilliped (Fig. 3E): coxal endite semiglobular; basial endite lobular, largely expanded into triangular structure, fringed with long setae; endopod lobular, longitudinally expanded, fitting in efferent channel, having short setae along anterior margin, plicate on external surface; exopod longitudinally filiform, with long setae on distal part of mesial margin, bearing flagellum with some long terminal setae. Second maxilliped (Fig. 3F): endopod with long setae along inner margins of ischium and merus and outer margins of carpus and propodus, dactylus fringed with stout setae around tip; exopod tapering distally, with long setae on distal portion of mesial margin, bearing flagellum with tuft of long terminal setae.

Third maxilliped (Fig. 3G, H) entirely covered with flat, rounded granules; basis fused with ischium, but with remnant suture on internal surface; ischium as long as merus along mesial margin, with subdistal tubercle; merus elongate triangular, with subproximal tubercle; palp 3-segmented, with dense setae; exopod arcuated and fringed with very short setae on lateral margin, internal ridge vestigial.

Cheliped (Figs. 1, 2) stout, 2.0 times as long as carapace, entirely covered with vesicular granules; coxal condyle reduced; merus subcylindrical, posterior border weakly arcuate, with triangular proximal process, with 3 teeth excluding proximal process; carpus subglobular; palm convex dorsally; movable finger slender, strongly arcuate and leaving gape in proximal half, straight and meeting with immovable finger in distal half, with some small triangular teeth; immovable finger straight, tapering distally, with several small triangular teeth on cutting edge.

Ambulatory legs (P2–P5; Figs. 1, 2) slender, gradually decreasing in length from P2 to P5, similar in shape, covered with microscopic, flat granules except on dactyli; coxal condyles very small; meri, carpi and propodi subcylindrical; dactyli slender, curved at tip, with rounded dactylo-propodal lock on proximal border of dorsal surface, with 6 small teeth on inner border in P2 and with 4 teeth in P3–P5.

Thoracic sternum covered with microscopic, flat granules as on carapace, episternites not divided entirely; sternites 1–4 completely fused; abdominal cavity reaching to buccal cavern; median suture absent; transverse sutures between sternites 4/5, 5/6, 6/7 and 7/8 medially interrupted.

Abdomen (Fig. 2) covered with microscopic, flat granules as on carapace; somite 1 very short, transversely linear; somite 2 short, transversely subrectangular; main fused section composed of somites 3 to 6, elongate trapezoidal, swollen at both sides of proximal 0.3, with small triangular, subdistal tooth, lateral margin with small V-shaped notch between somites 5/6 discernible; telson (Fig. 3I) elongate triangular.

G1 (Fig. 3K) compressed, S-shaped, tapering distally, with aperture at mesial border of distal 0.2. G2 (Fig. 3K) filiform, much longer than G1, inserted into proximal aperture of G1; distal part protruding from distal aperture of G1, directed mesially in situ, with some spinules.

Notes on young female. Carapace 1.3 times broader than long; gastric and cardiac tubercles very low; antero-lateral margin without tooth except small triangular, lateral tooth; postero-lateral margin with very low, rounded tooth. Cheliped 1.5 times longer than carapace; merus with 4 teeth on posterior border; movable finger almost straight.

Color in life. Carapace white with broad, median, pale brown band posteriorly extending from behind frontal region to intestinal region; frontal region pinkish; gastric tubercles laterally rimed with dark brown line; metabranchial region dark brown; pereopods white.

Remarks. Naruse and Ng (2006) differentiated *Ebalia stellaris* from *E. humilis* by clearer convexities on the dorsal surface of the carapace and being covered with microscopically granules (vs. lower convexities without microscopically granules in *E. humilis*), larger subhepatic and posterolateral humps (vs. humps much smaller), wider carapace (1.50 times CL vs. 1.21–1.22 times CL), and four rounded teeth of the posterior margin of the cheliped merus (vs. 3 acute

teeth). However, the present study revealed that 1) convexities on the dorsal surface of the carapace is variable and covered with microscopic granules in *E. humilis*; 2) size and shape of the pterygostomian (subhepatic) hump is variable in *E. humilis*; 3) the carapace breadth is about 1.2 times carapace length in male of *E. stellaris*; 4) the chelipedal merus has 2–4 teeth in *E. humilis*. Therefore these characters cannot differentiate the two species.

A comparison of the adult male specimens of both species shows that *E. stellaris* can be distinguished from *E. humilis* (Fig. 4) by the carapace being 1.5 times broader than long in female (vs. 1.2 times in *E. humilis*); the lateral angle of the carapace is smaller than metabranchial tooth (vs. larger); the male telson is elongate-triangular (vs. tongue-shaped, Fig. 3J); the distal part of G2 is straight and directed mesially (vs. curled abdominally, Fig. 3L).

Naruse and Ng (2006) also mentioned that *E. stellaris* has an intermediate appearance that straddles the current members of Ihle's (1918) groups A and D of *Nursia* Leach, 1817 (see Naruse and Ng, 2006). However, *E. stellaris* is distinct from group A of *Nursia* and *N. phylloides* Ihle, 1918, in group D by the degree of fusion in the abdominal somites of both sexes, ab-

breivation of mouthparts, and the shape of the gonopods and therefore shows no affinity with these groups. But *Nursia dimorpha* Balss, 1915, which is assigned to the group D of *Nursia*, is similar to *E. stellaris*, in the formula of abdomen of both sexes, the vestigial internal exopodal ridge of the third maxilliped, having a tooth on the proximal end of the posterior margin of the chelipedal merus, and the elongate G2, but is distinguished from *E. stellaris* in the very low gastric and cardiac tubercles (vs. high in *E. stellaris*), the rounded and lamellar branchial margin of the carapace (vs. laterally angled), the straight dactylus of the cheliped in adult male (vs. strongly curved), and the anteriorly directed G2 (vs. directed mesially).

The female of *E. stellaris* is similar to those of *E. longispinosa* Ihle, 1918, in the arrangement of spines or teeth on the carapace, the absence of the endopod of the maxillule and tubercles on the ischium and merus and the vestigial internal exopodal ridge of the third maxilliped. However *E. stellaris* can be distinguished from *E. longispinosa* by that the carapace and the chelipedal merus are not spinate (vs. spinate in *E. longispinosa*). Male of *E. longispinosa* is unknown to date.

As mentioned by Ihle (1918), Serène and Soh

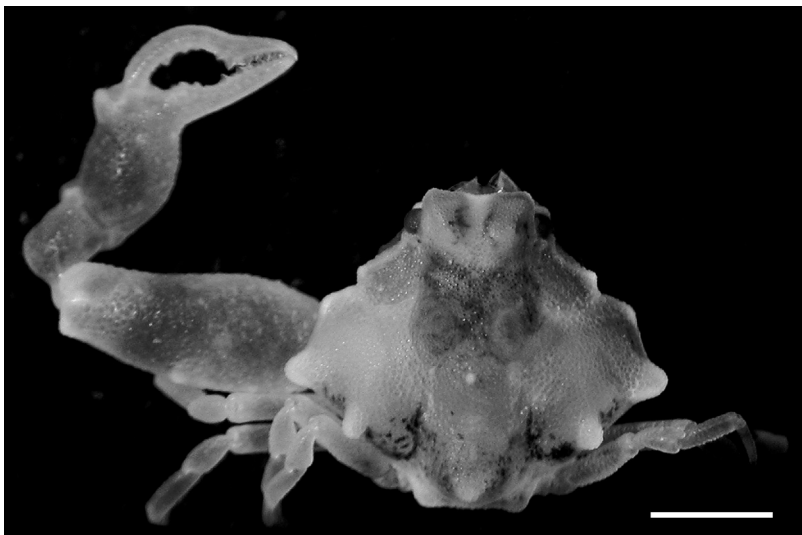


Fig. 4. *Ebalia humilis* Takeda, 1977, male (cb 3.1×cl 2.6 mm), NSMT-Cr 18303. Scale=1 mm.

(1976), Tan and Ng (1993), Komatsu and Takeda (1999), and Naruse and Ng (2006), *Ebalia* Leach, 1817, and *Nursia* are quite heterogeneous and need further revision.

Distribution. *Ebalia stellaris* is known only from the Ryukyu Islands, occurring at the depths of 12–46 m (Naruse and Ng, 2006; this study).

Acknowledgement

We wish to express our cordial thanks to Drs. Peter C. Dworschak (NHMW), Ludwig Tiefenbacher (ZSM), and Tadashi Akiyama (Okayama University) for providing us with the specimens. Our thanks also due to the crew of TRV *Toyoshio Maru* and all the members who joined the 2003 and 2007 cruises for their help in collecting specimens on board. This manuscript was greatly improved by Paul C. F. Clark of The Natural History Museum, London.

References

- Balss, H. 1915. Die Decapoden des Roten Meeres I. Die macruren. Denkschriften der Kaiserlichen Akademie der Wissenschaften. Mathematisch-Naturwissenschaftliche Classe, 91: 1–38.
- Ihle, J. E. W. 1918. Die Decapoda Brachyura der Siboga-Expedition. III. Oxystomata: Calappidae, Leucosiidae, Raninidae. Siboga Expéditie, 39 (B2): 159–322.
- Komatsu, H. and M. Takeda 1999. A new leucosiid crab of the genus *Nursia* from the Ryukyu Islands. Bulletin of the National Science Museum, Series A, 25: 59–64.
- Leach, W. E. 1817. Monograph on the genera and species of the Malacostracous family Leucosidea. In W. E. Leach (ed.): The Zoological Miscellany; being descriptions of new, or interesting animals, pp. 17–26. E. Nodder and Son, Covent Garden and London.
- Naruse, T. and P. K. L. Ng 2006. Two new species of leucosiid crabs (Decapoda: Brachyura) from the Ryukyu Islands, Japan. Crustacean Research, 35: 108–116.
- Samouelle, G. 1819. The entomologist's useful compendium; or an introduction to the knowledge of British insects, comprising the best means of obtaining and preserving them, and a description of the apparatus generally used; together with the genera of Linné, and the modern method of arranging the classes Crustacea, Myriapoda, Spiders, Mites and Insects, from their affinities and structure, according to the views of Dr. Leach. Also an explanation of the terms used in entomology; a calendar of the times of appearance and usual situations of near 3,000 species of British insects; with instructions for collecting and fitting up objects for the microscope. 496 pp. London.
- Serène, R. and C. L. Soh 1976. Brachyura collected during the Thai-Danish Expedition (1966). Research Bulletin, Phuket Marine Biological Center, (12): 1–37, 28 figs, 7 pls.
- Takeda, M. 1977. Crabs of the Ogasawara Islands, V. A collection made by dredging. Memoirs of the National Science Museum, Tokyo, (10): 113–140.
- Tan, C. G. S. and P. K. L. Ng 1993. *Praosia punctata*, a new genus and species of mangrove leucosiid crab (Decapoda, Brachyura) from Singapore. Crustaceana, 64(1): 40–47.