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A New Species of the Genus *Cyphocaris* (Crustacea: Amphipoda: Cyphocarididae) from Japan

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Abstract *Cyphocaris ohtsukai*, a new amphipod species belonging to the family Cyphocarididae from Japan, is described and illustrated. The new species is similar to *C. anonyx*, *C. cornuta*, and *C. geyserensis* in having a serrate ventral margin of the spur on the posterior margin of the basis of the pereopod 5. However, the new species is distinguished from them by the combination of the following characters: the eyes are incomplete; the ventral margin of the spur on the posterior margin of the basis of the pereopod 5 is multi-dentate; the spur of the basis of the pereopod 5 is long; and the telson almost reaches the posterior end of the uropod 3. A key to species of the family Cyphocarididae is provided.

Key words: Amphipoda, Cyphocarididae, *Cyphocaris ohtsukai*, new species, Japan, key to species.

The amphipod family Cyphocarididae comprises two genera, *Cyphocaris* Boeck, 1871 and *Procyphocaris* Barnard, 1961. Members of the major genus, *Cyphocaris*, are pelagic or demersal micropredators with cosmopolitan distributions (Lowry and Stoddart, 2003). To date, 12 species of the genus are known from the world oceans (Lowry and Stoddart, 1994, 1997; Hendrycks and Conlan, 2003). In Japanese waters, two species, *C. challengeri* Stebbing, 1888 and *C. richardi* Chevreux, 1905, have been recorded from the Pacific Ocean (off southeast and southwest Hokkaido, and off northwest Honshu) (Nagata, 1963, 1981; Yamada and Ikeda, 2000, 2006).

During a research cruise of T/S *Toyoshio-Maru* of Hiroshima University to the Nansei Islands, southwestern Japan in 2006, collections of amphipod crustaceans were made by the author, amongst three specimens representing an undescribed species of *Cyphocaris* were found. In this paper, a new species, *Cyphocaris ohtsukai*, is described and illustrated.

Materials and Methods

Amphipods were captured using a sledge net (mouth opening 145 cm×15 cm, mesh opening 328 μm) at one station in the Nansei Islands, southwestern Japan. The gear was towed along the bottom at a speed of 2 knots for 20 minutes by the T/S *Toyoshio-Maru*. Samples were preserved immediately in 99% ethanol on-board ship. On land, specimens of *Cyphocaris* were sorted from samples of amphipods under a stereomicroscope. Dissected appendages were mounted on glass slides in gum-chloral medium. All drawings were made with the aid of a camera lucida attached to a differential interference microscope (Olympus BH-2). The body length from the tip of the rostrum to the base of the telson was measured to the nearest 0.1 mm. The type specimens are deposited at the National Museum of Nature and Science, Tokyo (NSMT).

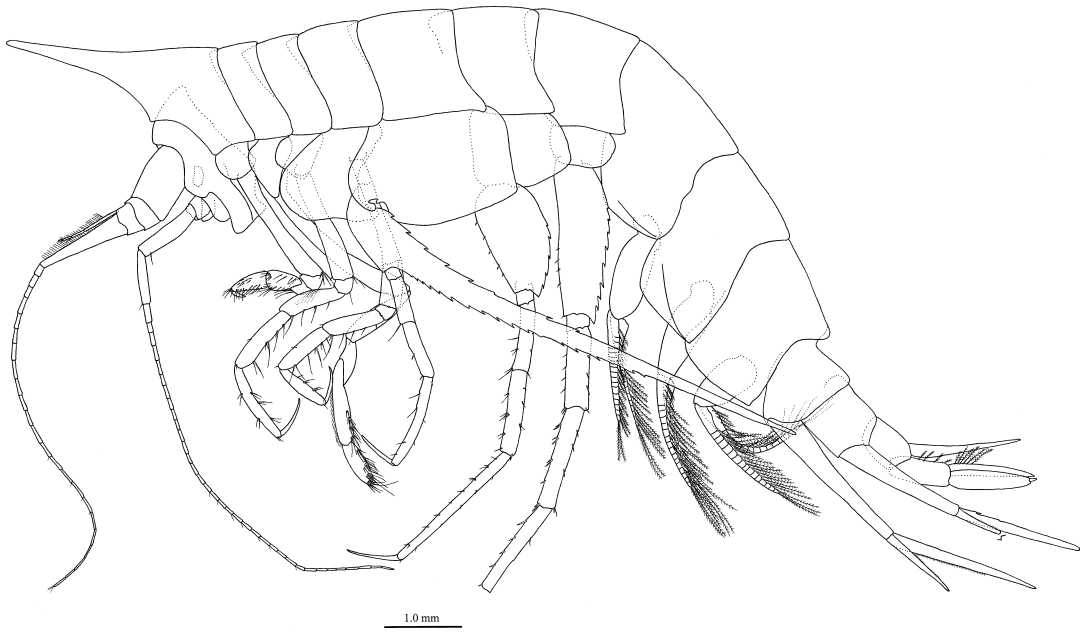

Fig. 1. *Cyphocaris ohtsukai* sp. nov., holotype, female (11.9 mm), NSMT-Cr 17873, off Kuroshima Island, Yaeyama Islands. Entire animal in lateral view.

Taxonomy

Cyphocaris ohtsukai sp. nov.

[New Japanese name: ohtsuka-nekoze-yokoebi]

(Figs. 1–5)

Material examined. Holotype: NSMT-Cr 17873, female (11.9 mm), off Kuroshima Island, Yaeyama Islands, Ryukyu Islands, 26°19.50′N, 127°25.18′E to 26°20.35′N, 127°26.21′E, 646–709 m, T/S *Toyoshio-maru*, stn TY-06-XII, 27 May 2006, local time 10:00–11:02, coll. K. Tomikawa.

Paratypes. NSMT-Cr 17874, 1 juvenile (6.2 mm), same data as holotype; NSMT-Cr 17875, 1 juvenile (4.4 mm), same data as holotype.

Description. Female holotype. Body (Fig. 1) smooth, without setae. Pereonite 1 (Fig. 1) conspicuously produced anterodorsally. Urosomite 1 (Fig. 1) with anterodorsal notch. Head (Fig. 1) positioned under produced pereonite 1, narrow, much deeper than long; eyes indistinct, lacking ommatidia; rostrum short; lateral cephalic lobe broad, margin shallowly concave. Antenna 1 (Fig. 2A) 60% as long as body length, peduncular article 1 about twice as long as peduncular articles 2–3 combined; accessory flagellum (Fig. 2B) short and slender, 70% as long as article 1 of primary flagellum, 4-articulate; primary flagellum 23-articulate, article 1 very long, densely covered with aesthetascs, articles 2–23 with short setae, each article without calceoli. Antenna 2 (Fig. 2C) as long as antenna 1, peduncular articles 4 and 5 slender, with fine setae, flagellum consisting of 35 articles, calceoli absent.

Ventral margin of upper lip (Fig. 2D) slightly produced, with fine setae. Lower lip (Fig. 2E) with broad outer lobe, furnished with fine setae, inner lobe indistinct, mandibular lobe rounded. Mandibles (Fig. 2F–H) with left and right incisors both 3-dentate (Fig. 2G, H); left lacinia mobilis (Fig. 2G) with 7-dentate, right lacinia absent (Fig. 2H); accessory setal row of left and right mandibles with 5 and 7 weakly pectinate setae, respectively; molar developed and triturative; palp 3-articulate, article 1 short without setae, article 2 with a weak protuberance ventrally, with 14 submarginal, ventral setae, article 3 70% as long as article 2, with about 40 setae

Fig. 2. *Cyphocaris ohtsukai* sp. nov., holotype, female (11.9 mm), NSMT-Cr 17873, off Kuroshima Island, Yaeyama Islands. A, antenna 1 (distal articles of flagellum omitted), medial view; B, accessory flagellum of antenna 1, medial view; C, antenna 2 (distal articles of flagellum omitted), medial view; D, upper lip, anterior view; E, lower lip (half of it broken off), anterior view; F, right mandible, medial view; G, incisor and lacinia mobilis of left mandible, medial view; H, incisor of right mandible, medial view; I, maxilla 1, dorsal view; J, distal teeth on outer plate of maxilla 1, dorsal view; K, maxilla 2, dorsal view; L, maxilliped, dorsal view; M, outer plate of maxilliped (some setae omitted), dorsal view; N, inner plate of maxilliped (some setae omitted), dorsal view.

along ventral margin and 6 subapical setae. Maxilla 1 (Fig. 2I, J) with inner and outer plates; inner plate tapering distally, distal half of medial margin with 10 stout setae, including some plumose and some simple; outer plate rectangular with 11 multi-cusped teeth in a 6/5 arrangement; palp longer than outer plate, 2-articulate, with 8 stout, apical setae and 1 long, apical seta and 7 long, subapical setae. Maxilla 2 (Fig. 2K) with broad and triangular inner plate, fully setose medially; outer plate narrow, slightly longer than inner, bearing apical setae. Maxilliped (Fig. 2L–N) with inner and outer plates; inner plate (Fig. 2N) rectangular with 3 nodular, robust apical setae, medial margin fully lined with long, plumose setae; outer plate (Fig. 2M) subovate, apicolateral margin with 5 long, plumose setae, medial margin with 11 close-packed robust setae; palp long, 4-articulate, articles 1–3 with setae on medial margin, article 3 shortest, dactylus large, blade-like, with 2 medial plumose setae and posterior seta, unguis absent.

Gnathopod 1 (Fig. 3A, B) weakly subchelate with small coxa, bearing 2 minute setae; basis long, slightly widened distally, anterior margin with 7 minute setae, posterodistal corner with long setae; ischium and merus short; carpus as long as propodus; propodus (Fig. 3B) short, subtriangular, posterodistal margin finely serrate; dactylus (Fig. 3B) with 1 robust and 4 slender setae, posterior margin finely dentate. Gnathopod 2 (Fig. 3C–E) subchelate, with small, subtriangular coxa; basis very long, gradually curved posteriorly, with 2 minute setae on posterior margin, posterodistal corner without setae; ischium long, four times as long as maximum width; merus short; carpus long, 1.9 times as long as propodus, anterior margin with short setae, posterior margin with clusters of long setae; palm of propodus (Fig. 3E) short, finely serrated, palmer corner defined by 1 medial and 1 lateral robust setae; dactylus (Fig. 3E) slightly shorter than palm, posterior margin smooth with subterminal seta.

Pereopod 3 (Fig. 3G) with small coxa, bearing minute seta; basis long, anterior and posterior margins with 4 and 1 minute setae, respectively; posterior margins of carpus and propodus with robust, long setae; dactylus long, slender, 50% as long as propodus, with minute subapical seta. Pereopod 4 (Fig. 3H) with large coxa, partly covering coxa 3, anterior margin broadly rounded, posterior margin strongly excavated; basis long, gradually curved anteriorly, anterior and posterior margins each with minute seta, other articles same as pereopod 3. Pereopod 5 (Fig. 4A, B) with very large coxa, width 1.3 times as long as coxa 4; basis expanded posteroventrally to form elongate spur, length 49% as long as body length, with serrate dorsal and ventral margins, other articles slender. Pereopod 6 (Fig. 4C, D) with coxa not lobate; anterior margin of basis with 4 small, robust setae, posterior margin serrate with 5 teeth, posterodistal lobe acute; propodus long. Pereopod 7 (Fig. 4E, F) with coxa not lobate; anterior margin of basis with 4 small, robust setae, posterior margin serrate with 8 teeth, posterodistal lobe acute.

Coxal gills on gnathopod 2 and pereopods 3–7. Brood plates (Fig. 3F) on gnathopod 2 and pereopods 3–5.

Posteroventral corner of epimeral plate 1 rounded (Fig. 5A), those of plates 2 and 3 both quadrate (Fig. 5B, C). Pleopods (Fig. 4G–I) each with paired retinacula and associated robust seta (Fig. 4H), surface of peduncle bare; medial margin of inner ramus with 4 bifid plumose setae (Fig. 4I).

Uropod 1 (Fig. 5D) with long peduncle bearing 1 robust and 1 fine setae on distolateral corner; inner ramus 92% as long as peduncle, with 2 medial robust and many lateral fine setae; outer ramus 56% as long as inner ramus, with many medial fine setae and 1 trace of lateral robust seta. Uropod 2 (Fig. 5E) 80% as long as uropod 1, with peduncle bearing 1 medial and 1 distomedial robust setae; inner ramus 94% as long as peduncle, with medial robust seta, trace of medial robust seta, and many lateral fine setae; outer ramus incomplete, with many medial fine setae. Uropod 3 (Fig. 5F, G) 48% as long as uropod 1, with peduncle bearing 1 medial robust, 4 medial plumose, and 3 submedial simple setae; inner

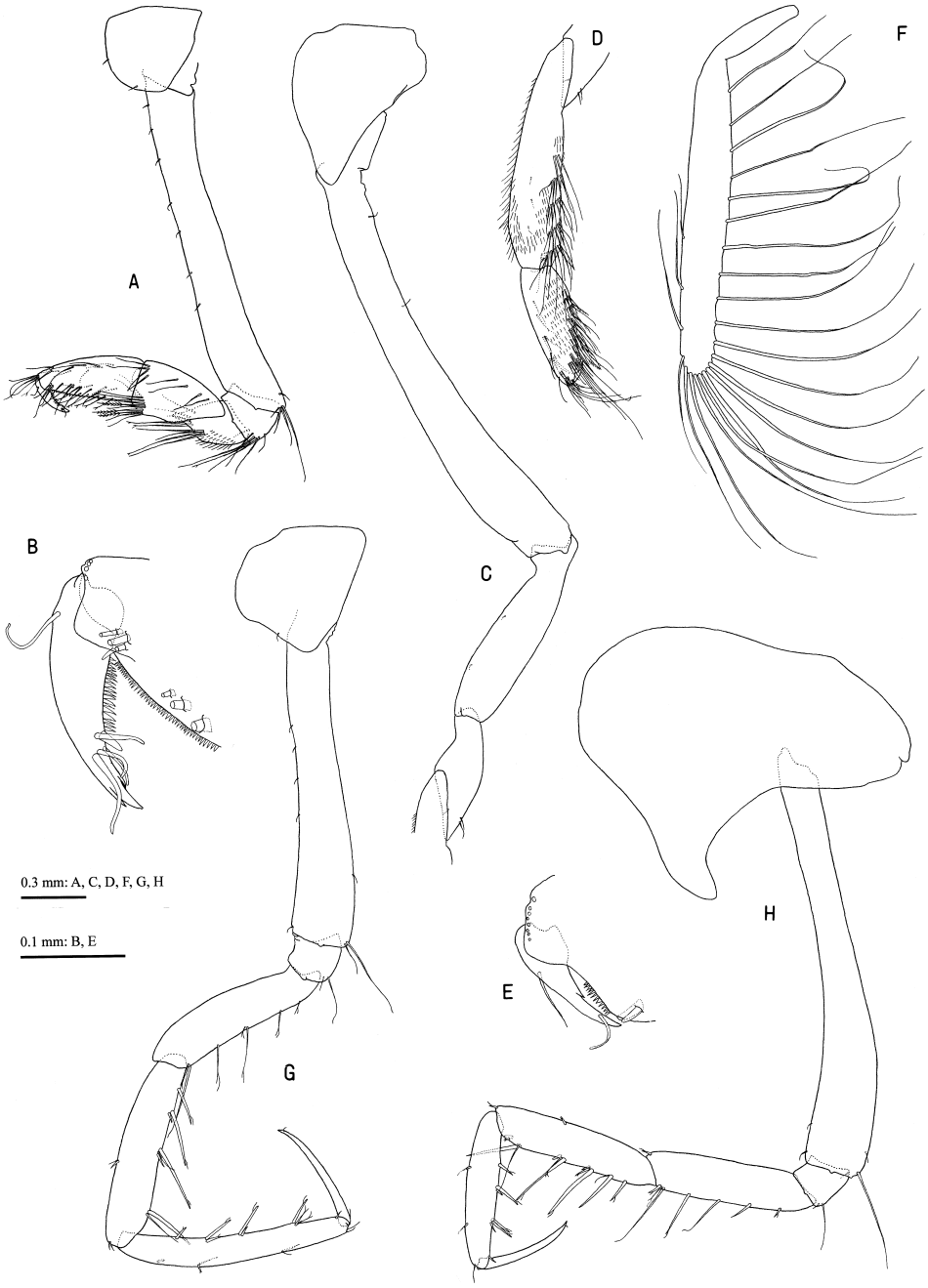

Fig. 3. *Cyphocaris ohtsukai* sp. nov., holotype, female (11.9 mm), NSMT-Cr 17873, off Kuroshima Island, Yaeyama Islands. A, gnathopod 1, lateral view; B, E, palms and dactyli of gnathopods 1 and 2, respectively (some setae omitted), lateral view; C, coxa to merus of gnathopod 2, lateral view; D, carpus to dactylus of gnathopod 2, lateral view; F, brood plate on gnathopod 2, lateral view; G, pereopod 3, lateral view; H, pereopod 4, lateral view.

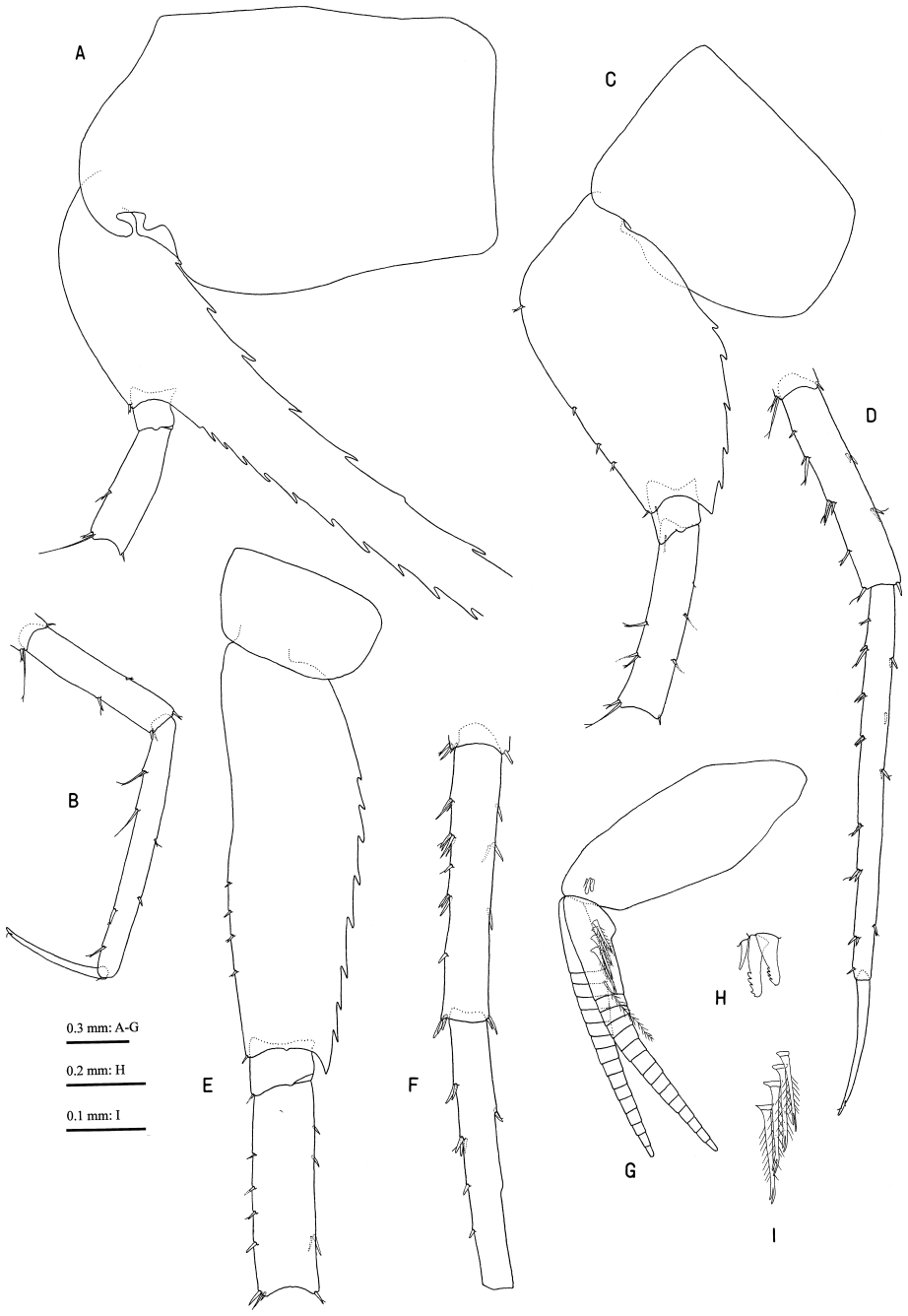

Fig. 4. *Cyphocaris ohtsukai* sp. nov., holotype, female (11.9 mm), NSMT-Cr 17873, off Kuroshima Island, Yaeyama Islands. A, C, E, coxae to meri of pereopods 5–7, respectively (distal part of spur of pereopod 5 omitted), lateral view; B, D, carpi to dactyli of pereopods 5 and 6, respectively, lateral view; F, carpus to propodus of pereopod 7 (dactylus broken off), lateral view; G, pleopod 1 (some setae on rami omitted), medial view; H, retinacula and associate seta on pleopod 1, medial view; I, bifid plumose seta on pleopod 1, medial view.

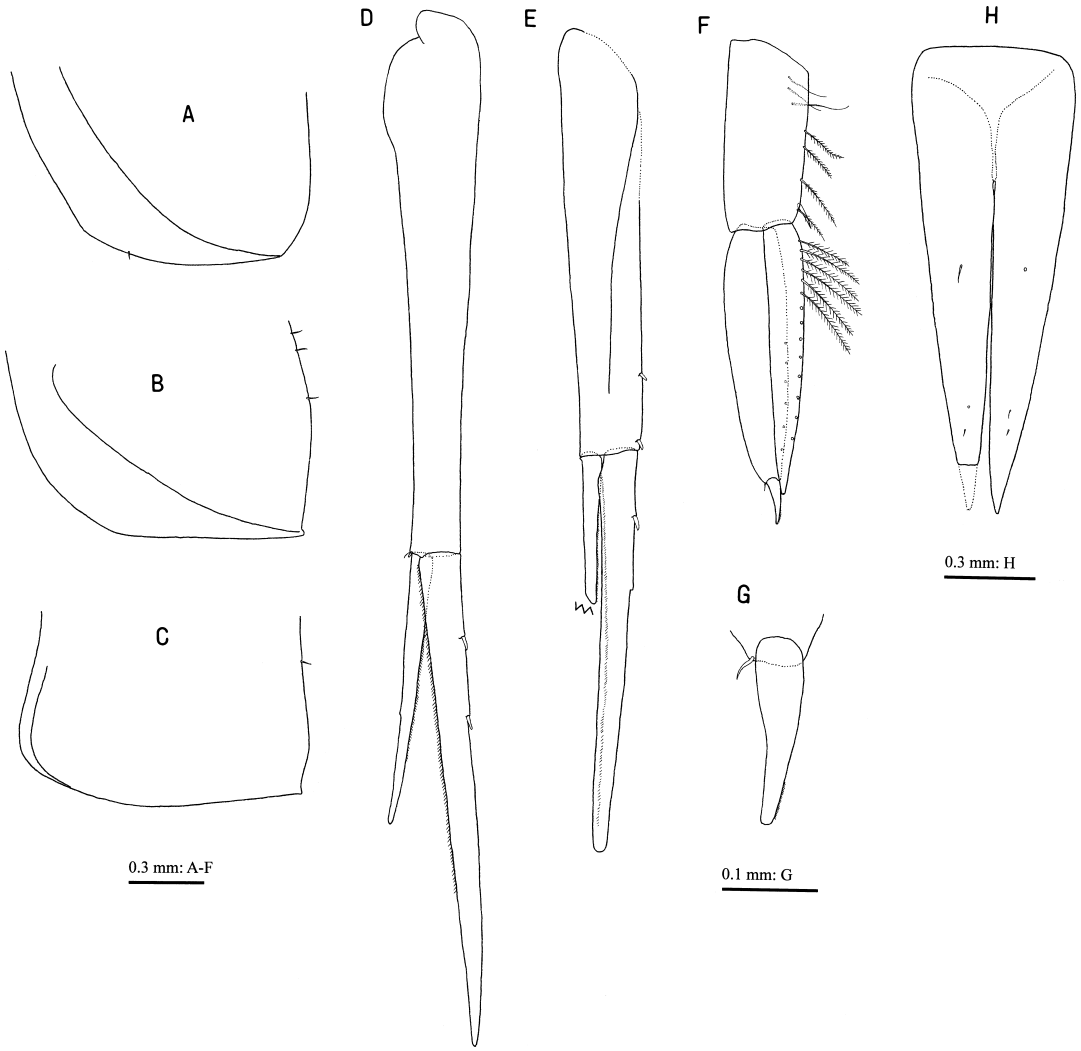

Fig. 5. *Cyphocaris ohtsukai* sp. nov., holotype, female (11.9 mm), NSMT-Cr 17873, off Kuroshima Island, Yaeyama Islands. A–C, epimeral plates 1–3, lateral views; D–F, uropods 1–3, dorsal views; G, terminal article of uropod 3, dorsal view; H, telson, dorsal view.

ramus 90% as long as outer ramus, with 6 medial plumose setae and 8 traces of medial setae; outer ramus 2-articulate, with 6 traces of medial setae and distolateral seta, terminal article 17% as long as proximal article, distal quarter of medial margin with many fine setae. Telson (Fig. 5H) elongate, almost reaching posterior end of uropod 3, 2.8 times as long as wide, cleft for 72%, lobes narrowing distally with 1 small dorsal and 2 small subapical setae, tips acute.

Juvenile paratype (NSMT-Cr 17874). Similar to holotype, except the following. Accessory flagellum of antenna 1 3-articulated, slightly longer than article 1 of primary flagellum. Bases of pereopods 5–7 with fewer posteromarginal teeth than in adult female. Brood plate absent. Inner ramus of uropod 3 shorter than in adult female, length half of the length of outer ramus; outer ramus narrower proximally, terminal article longer than in adult female, 60% as long as proximal article. Telson 2.2 times as long as wide, cleft for 67%.

Remarks. The present new species is assigned to the family Cyphocarididae by having the following features: the molar of the mandible is columnar and triturative, the outer plate of the maxilla 1 is broad with 11 multi-cusped teeth in a 6/5 arrangement, coxae 1–3 are extremely reduced, and the telson is deeply cleft (Lowry and Stoddart, 1997). The following features place the new species in *Cyphocaris*: the posterior margin of the basis of pereopod 7 is deeply indentured, and coxae 1–3 are all small and covered partly by coxa 4 (Lowry and Stoddart, 1997).

The serrate ventral margin of the spur on the posterior margin of the basis of the pereopod 5 links the new species to the three previously described species, *C. anonyx* Boeck, 1871 from Greenland, *C. cornuta* Ledoyer, 1978 from Madagascar, and *C. geyserensis* Ledoyer, 1986 also from Madagascar. Comparison with the description of *C. anonyx* by Stebbing (1888; as *C. micronyx*) reveals the following differences between *C. ohtsukai* and *C. anonyx*: the eyes are reduced but still evident in the new species, rather than completely absent in *C. anonyx*; the spur on the posterior margin of the basis of the pereopod 5 is distinctly longer in *C. ohtsukai* than in *C. anonyx*; and the telson almost reaches the posterior end of the uropod 3 in the new species, but not reaching in *C. anonyx*. *Cyphocaris ohtsukai* differs from *C. cornuta* as follows (Ledoyer, 1978): the coxa 2 is subtriangular in the new species, rather than subquadrate in *C. cornuta*; the posteroventral corner of the epimeral plate 2 is angular in *C. ohtsukai*, but rounded in *C. cornuta*; and the telson almost reaches the posterior end of the uropod 3 in *C. ohtsukai*, whereas not reaching the midlength of the inner ramus of the uropod 3 in *C. cornuta*. Finally, the new species differs from *C. geyserensis* by the following characters (Ledoyer, 1986): the eyes are incomplete but still evident in *C. ohtsukai*, rather than completely absent in *C. geyserensis*; the ventral margin of the spur on the posterior margin of the basis of the pereopod 5 is multi-serrate in *C. ohtsukai*, while uni-serrate in *C. geyserensis*; and the medial margin of the inner ramus of the uropod 3 bears plumose setae in the new species, which are absent in *C. geyserensis*.

Etymology. The new species is named in honor of Prof. Susumu Ohtsuka of Hiroshima University who provided the author with opportunity for this study.

Key to Species of Cyphocarididae

Lowry and Stoddart (1997) provided a key to species of the family Cyphocarididae recorded from the temperate and tropical western Atlantic Ocean. I here amend the key to include all the species of the world. Features of *Cyphocaris polaris* follow Hendrycks and Conlan (2003).

1. Posterior margin of basis of pereopod 7 smooth; only coxae 1–2 reduced and covered by coxa 3 . . . . . *Procyphocaris indurata* (K. H. Barnard, 1925)
— Posterior margin of basis of pereopod 7 serrate; coxae 1–3 all small and covered partly by coxa 4 . . . . . (*Cyphocaris*) 2
2. Basis of pereopod 5 produced into blunt lobe 3
— Basis of pereopod 5 produced into short spur 5
— Basis of pereopod 5 produced into long, narrow spur 6
3. Pereonite 1 not produced (unknown in female); accessory flagellum of antenna 1 reaching only half of article 1 of antenna 1 . . . . . *C. latimana* Hendrycks and Conlan, 2003
— Pereonite 1 produced into sharp projection; accessory flagellum of antenna 1 extending two-thirds of article 1 of antenna 1 4

4. Lateral cephalic lobe shallowly concave; posterodistal lobe of basis of pereopod 5 with serrate ventral margin. . . . . *C. richardi* Chevreux, 1905
— Lateral cephalic lobe subacutely concave; posterodistal lobe of basis of pereopod 5 with smooth ventral margin . . . . . *C. polaris* Gurjanova, 1951
5. Both margins on spur of basis of pereopod 5 serrate . . . . . *C. anonyx* Boeck, 1871
— One or both margins on spur of basis of pereopod 5 smooth . . . . . *C. bouvieri* Chevreux, 1916
6. Both margins on spur of basis of pereopod 5 smooth 7
— One or both margins on spur of basis of pereopod 5 serrate 8
7. Tip of telson not reaching posterior end of uropod 3; serration on posterior margins of bases of pereopods 6 and 7 deep . . . . . *C. challengeri* Stebbing, 1888
— Tip of telson almost reaching posterior end of uropod 3; serration on posterior margins of bases of pereopods 6 and 7 shallow . . . . . *C. faurei* Barnard, 1916
8. Ventral margin on spur of basis of pereopod 5 serrate 9
— Ventral margin on spur of basis of pereopod 5 smooth 11
9. Eyes absent; ventral margin on spur of basis of pereopod 5 uni-dentate . . . *C. geyserensis* Ledoyer, 1986
— Eyes present or reduced; ventral margin on spur of basis of pereopod 5 multi-dentate. 10
10. Coxa 2 sub-triangular; posteroventral corner of epimeral plate 2 quadrate; telson almost reaching posterior end of uropod 3 . . . . . *C. ohtsukai* sp. nov.
— Coxa 2 sub-quadrate; posteroventral corner of epimeral plate 2 rounded; telson not reaching midlength of inner ramus of uropod 3 . . . . . *C. cornuta* Ledoyer, 1978
11. Tip of telson reaching posterior end of uropod 3 . . . . . *C. bellona* Lowry and Stoddart, 1994
— Tip of telson exceeding posterior end of uropod 3 12
12. Pereonite 1 forming long, narrow, slightly up-turned process in male, not developed in female; telson 1.5 times as long as uropod 3 . . . . . *C. johnsoni* Shoemaker, 1934
— Pereonite 1 forming long, narrow, slightly down-turned process in both sexes; telson 1.8 times as long as uropod 3 . . . . . *C. tunicola* Lowry and Stoddart, 1997

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