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A new stygiobiont species of *Macrobrachium* (Crustacea: Decapoda: Caridea: Palaemonidae) from an anchialine cave on Miyako Island, Ryukyu Islands

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Abstract

A new stygiobiont species of the caridean genus *Macrobrachium* Bate, 1864 is described on the basis of two male specimens from an anchialine cave on Miyako Island, southern Ryukyu Islands. The new species, *M. miyakoense*, is compared with other five stygiobiont species of the genus characterized by a reduced eye, i.e. *M. cavernicola* (Kemp, 1924), *M. villalobosi* Hobbs, 1973, *M. acherontium* Holthuis, 1977, *M. microps* Holthuis, 1978, and *M. poeti* Holthuis, 1984. It is the first representative of stygiobiont species of *Macrobrachium* from East Asian waters.

Key words: Crustacea, Decapoda, Caridea, Palaemonidae, *Macrobrachium*, new species, anchialine cave, Miyako Island, Ryukyu Islands

Introduction

There are few stygiobiont species of the palaemonid genus *Macrobrachium* Bate, 1864 in the world, although the genus is one of the most speciose caridean genera, abundant in tropical fresh waters (Chace & Bruce, 1993). Holthuis (1986) listed six stygiobiont species of *Macrobrachium*, together with additional 12 stygiophile or stygoxene species. The six stygiobiont species are: *M. cavernicola* (Kemp, 1924) from Siju Cave in Assam, India (Kemp, 1924); *M. villalobosi* Hobbs, 1973 from caves in Oaxaca, Mexico (Hobbs, 1973; Hobbs et al., 1977); *M. lucifugum* Holthuis, 1974 from caves or sinkholes in Cuba, Jamaica, and Curaçao (Holthuis, 1974), and the Dominican Republic (Chace, 1975, as *M. crybelum* Chace, 1975); *M. acherontium* Holthuis, 1977 from caves in Tabasco, Mexico (Holthuis, 1977); *M. microps* Holthuis, 1978 from Danmin Cave, New Ireland (Holthuis,

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1978); and *M. poeti* Holthuis, 1984 from caves in the Gunung Sewu area, central Java, Indonesia (Holthuis, 1984). Since Holthuis (1986), *M. microps* has been recorded from an anchialine lava tube on Upolu, Samoa (Bruce & Iliffe, 1993), a cave on Lifou Island, New Caledonia (Short & Marquet, 1998), and Daniel Roux Cave on Christmas Island (Short & Meek, 2000). All but *M. lucifugum* are characterized by a reduced cornea of the eye and the lack of pigmentations on the body and appendages, and thus are considered to be highly adapted to cave or subterranean life.

Although the cave fauna of the Ryukyu Islands has been fairly well investigated in general (e.g. Shimojyana, 1978, 1979, 1980; Shokita, 1979, Nishida et al., 2003; Yoshigo et al., 2003), little attention has been paid for the decapod crustacean fauna. Species of decapod crustaceans reported from caves on the Ryukyu Islands include: one alpheid *Metabetaeus minutus* (Whitelegge, 1897), five atyids *Antecaridina lauensis* (Edmondson, 1935), *Halocaridinides trigonophthalma* (Fujino & Shokita 1975), *Caridina rapaensis* Edmondson, 1935, *C. rubella* Fujino & Shokita, 1975, *C. typus* H. Milne Edwards, 1837; three palaemonids, *Macrobrachium formosense* (Bate, 1868), *M. japonicum* (De Haan, 1849), *M. lar* (Fabricius, 1798); and one gecarcinid *Discoplax hirtipes* (Dana, 1851). The three *Macrobrachium* species and *D. hirtipes* are primarily epigean or terrestrial respectively, not obligatorily associated with cave or subterranean environments.

A field survey on the cave associated crustacean fauna of Miyako Island, southern Ryukyu Islands, conducted by the second author, has resulted in a significant finding of an undescribed species of *Macrobrachium* from an anchialine cave located at southern coast of the island. In the present work, the species is described as *M. miyakoense* n. sp. on the basis of two male specimens. *Macrobrachium miyakoense* n. sp. is a typical stygiobiont species characterized by reduced eyes and pale coloration in life, and is the first representative of *Macrobrachium* obligatorily associated with cave or subterranean environments in East Asian waters.

Material and Methods

The type specimens were collected by using baited traps. They are deposited in the Natural History Museum & Institute, Chiba (CBM). Size of specimens is indicated by postorbital carapace length (CL) measured from the orbital margin to the posterodorsal margin.

Taxonomic Account

Macrobrachium miyakoense, n. sp. (Figs. 1–6)

Type material. HOLOTYPE: CBM-ZC 8351, male CL 14.7 mm, anchialine cave located at southern coast of Miyako Island, Ryukyu Islands, 23 November 2004, baited trap, coll. Y. Fujita.

PARATYPE: CBM-ZC 8352, 1 male CL 12.6 mm, same locality as holotype, 21 February 2005, baited trap, coll. Y. Fujita, T. Kawahara, and H. Ikeda.

Diagnosis. Rostrum not reaching distal margin of antennal scale, dorsal margin slightly sinuous, armed with 11–13 teeth, including 4 on carapace posterior level of orbital margin, dorsal teeth subequally spaced; ventral margin armed with 3–8 teeth in distal half. Carapace with branchiostegal suture not extending posteriorly beyond hepatic spine; inferior orbital angle produced in roundly triangular lobe overhung and exceeded by antennal spine. Fourth abdominal pleura posteroventrally acute; inter-uropodal sclerite with conspicuous median tooth. Telson with posterior apex not overreaching posterolateral spines. Eye reduced, cornea darkly pigmented, its width about 0.8 of stalk width. Antennal scale with lateral margin straight. First pereopod with chela about half of carpus length. Epistome not bilobed, with sharp median carina on anterior surface. Second pereopods subequal in length and similar, relatively slender for genus, surface of segments not spinose, spinulose or densely setose; palms subcylindrical; fingers not densely pubescent, cutting edge only weakly dentate in proximal potions, not gaping, 1.40–1.60 times longer than palm; chela about 1.80 times longer than carpus, palm shorter than carpus; carpus subequal in length to merus, not longitudinally grooved. Third to fifth pereopods slender; third pereopod overreaching antennal scale by length of dactylus and half of propodus, propodus not profusely spinose or scaly; fifth pereopod overreaching antennal scale by length of dactylus and 0.60 of propodus.

Description of holotype. Body (Fig. 1) moderately robust for genus, glabrous, generally subcylindrical.

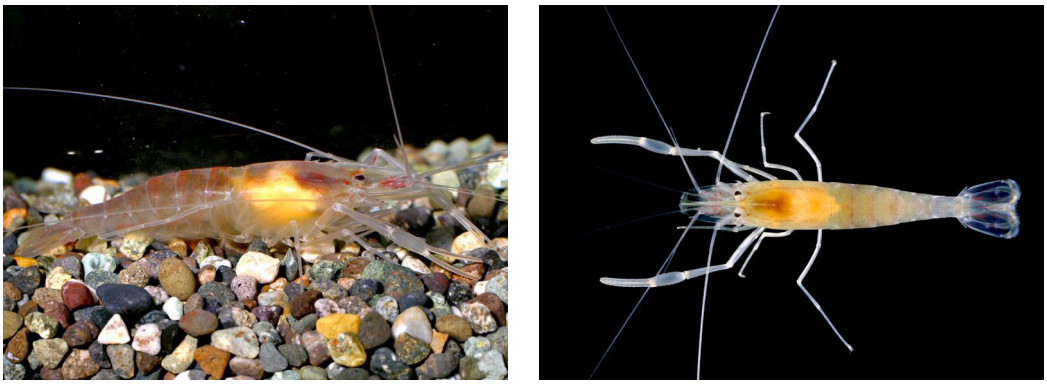

FIGURE 1. *Macrobrachium miyakoense* sp. n. Holotype male (cl 14.7 mm) from Miyako Island (CBM-ZC 8351). Left, living animal in aquarium; Right, entire animal, dorsal view.

Rostrum (Fig. 2A–C) directed forward, slightly exceeding beyond distal margin of third segment of antennular peduncle, but not reaching distal margin of antennal scale, 0.58 of carapace length; dorsal margin slightly sinuous, armed with 13 teeth, including 4 on carapace posterior to orbital margin, none having distinct basal suture; anterior 5 teeth unequally spaced, while posterior 8 teeth subequally spaced, posteriormost tooth arising 0.32 of carapace length; ventral margin convex, 8 unequal teeth on anterior half (anterior 3

and posteriormost 1 distinctly smaller than others); lateral surface with sharp carina extending from orbital margin to anterior 0.20. Carapace (Fig. 2A–C) with postrostral median ridge not reaching midlength; antennal spine submarginal, distinctly buttressed, overhanging and distinctly overreaching triangular inferior orbital lobe; branchiostegal suture delineated; shallow groove extending to base of hepatic spine present; hepatic spine moderately large, arising inferior to level of antennal spine, basally articulated, tip not reaching anterolateral margin of carapace; pterygostomial angle broadly rounded; surfaces of carapace smooth.

Thoracic sternum narrow; fourth sternite with low transverse ridge along posterior border; fifth sternite with prominent paired plates posterior to coxae of second pereopods; sixth and seventh sternites each with pair of rounded protuberances concealed by coxae of third and fourth pereopods; eighth sternite with pair of obliquely transverse ridges along posterior border of coxae of fifth pereopods.

Abdomen (Figs 1, 2D) rounded dorsally. Pleura of fourth and fifth somites each with acute posteroventral tooth. Sixth somite 1.60 of fifth somite length, 1.20 times longer than deep, with sharp posterolateral process; posteroventral angle subacute; posterior margin of sternite with pair of blunt teeth (Fig. 2E). Inter-uropodal sclerite (Fig. 2E) with conspicuous triangular tooth medially. Telson (Fig. 2D, F, G) 1.50 of sixth somite length, tapering posteriorly and terminating in acute tooth (= posteromedian tooth) reaching about midlength of mesial spines of posterior pairs; dorsal surface with 2 pairs of spines, anterior pair arising about midlength of telson; 2 pairs of spines present on posterior margin either side of posteromedian tooth, lateral pair much smaller than mesial pair; 12 submarginal plumose setae arising from ventral surface of posteromedian tooth.

Eye (Fig. 2B, C) strongly reduced; cornea small, oblique, darkly pigmented, corneal width about 0.80 of eye-stalk width. Eye-stalk weakly swollen. Ocellus absent.

Antennular peduncle (Fig. 2B, C) reaching about distal 0.25 of antennal scale. First segment moderately broad, lateral margin sublinear, anterolateral angle strongly produced, terminating in sharp spine overreaching distal margin of second segment of antennular peduncle; dorsal surface concave, with 2 longitudinal rows of short setae and tuft of long setae; anteromedial margin weakly concave; ventromesial margin unarmed; stylocerite short, acute, reaching about midlength of first segment. Second segment about half length of first segment, about 1.10 times as long as wide, with oblique articulation with third segment. Third segment about 1.40 of second segment length, about twice longer than wide. Lateral flagellum biramous, 5 or 6 proximal segments fused, longer ramus subequal in length to mesial flagellum, shorter ramus about 0.25 length of longer ramus.

Antenna (Fig. 2C, H) with stout basicerite armed with 1 moderately strong lateral tooth. Fifth segment of antennal peduncle (carpocerite) cylindrical, reaching 0.35 of antennal scale. Antennal scale 0.82 of carapace length, 2.58 times longer than broad, lateral margin nearly straight; distolateral tooth moderately large, slightly falling short of angular, bluntly rounded distal lamella. Flagellum longer than body.

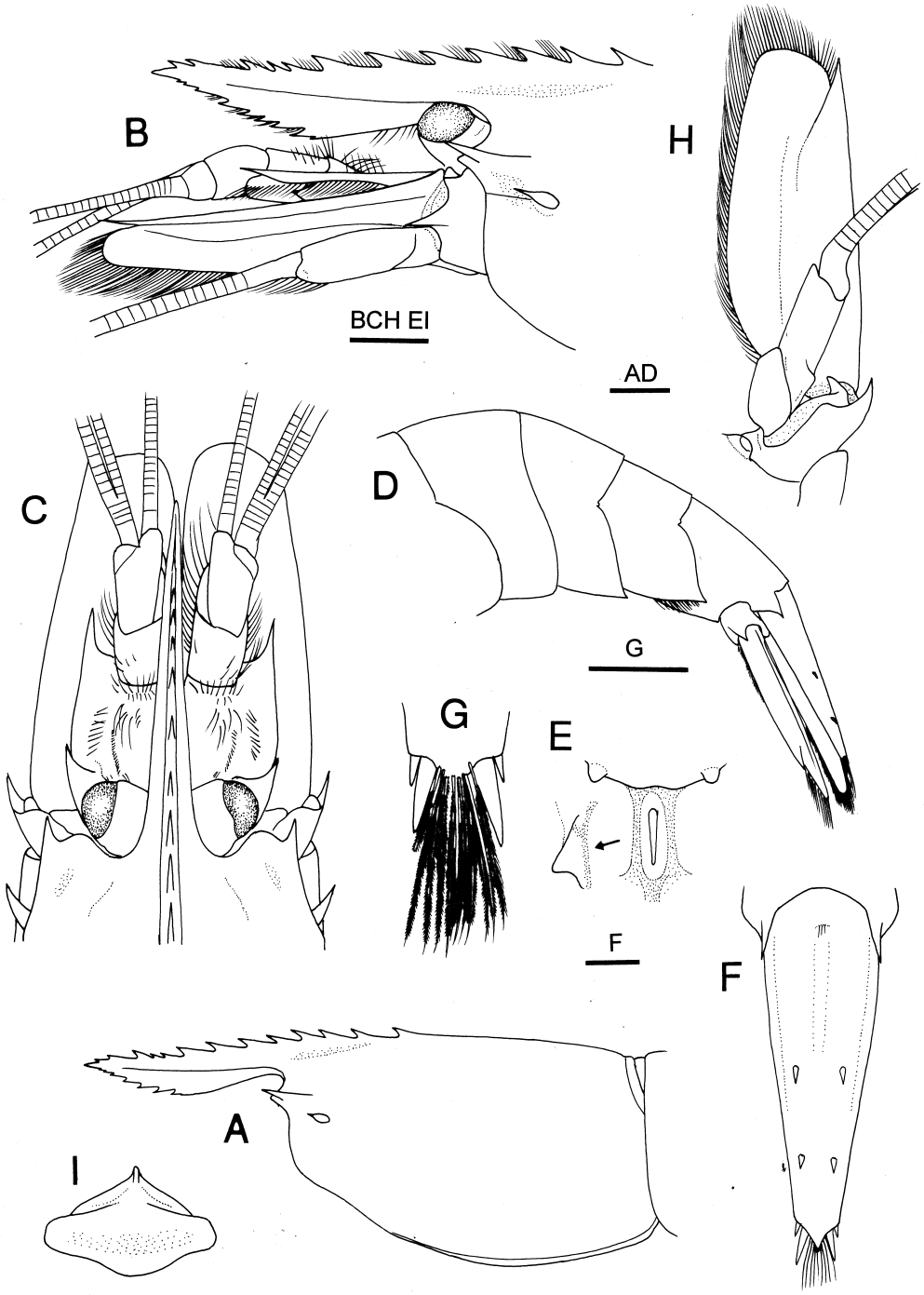

FIGURE 2. *Macrobrachium miyakoense* sp. n. Holotype male (cl 14.7 mm) from Miyako Island (CBM-ZC 8351). A, rostrum and carapace, lateral view (setae omitted); B, rostrum, anterior part of carapace and cephalic appendages, lateral view; C, same, dorsal view; D, third abdominal somite to telson, and left uropod, lateral view; E, posterior margin of sixth abdominal sternite and inter-uropodal sclerite, ventral view; inset, tooth on inter-uropodal sclerite, ventrolateral view; F, telson, dorsal view; G, posterior part of telson, ventral view; H, antenna, ventral view (flagellum omitted); I, epistome, ventral view. Scale bars: A–C, D, H, 2 mm; E, I, 1 mm; F, G, 1 mm, G, 1 mm.

Epistome (Fig. 2I) not bilobed; anterior surface sharply carinate medially.

Mouthparts typical for genus. Mandible (left) (Fig. 3A, B) with slender palp consisting of 3 articles, each article bearing stiff setae; molar process robust, truncate distally, with 4 principal peripheral teeth; incisor process large, armed with 3 subequal teeth distally. Maxillule (Fig. 3C) with palp deeply bilobed, outer lobe somewhat elongate, slender, bearing some setae; inner lobe short, rounded, somewhat curved inward; coxal endite large, extending as far as basial endite, tapering to truncate tip distally, bearing stiff setae distally; basial endite subrectangular, with double row of spines and stiff setae on truncate distal margin. Maxilla (Fig. 3D) with coxal endite obsolete; basial endite consisting of 2 elongate lobes, anterior lobe slightly broader than posterior lobe, both lobes with numerous short setae distally; palp moderately broad, curved mesially, tapering distally, with very short apical seta; scaphognathite moderately broad, anterior lobe with deeply emarginate mesial margin, posterior lobe rounded. First maxilliped (Fig. 3E) with somewhat thickened coxal endite; basial endite suboval, separated from coxal endite by narrow notch; palp moderately slender, not reaching distal margin of basial endite; exopod well developed, with long flagellum, caridean lobe moderately broad; epipod bilobed. Second maxilliped (Fig. 3F) with dactylus and propodus partially fused; mesial margin of dactylar part with short setae, that of propodal part with row of spiniform bristles; carpus with prominent projections at ventromesial distal angles; ischium and basis fused; coxa somewhat expanded mesially, with long setae; exopod long; epipod moderately large, rounded, with well-developed podobranch. Third maxilliped (Fig. 3G) with endopod slender, reaching distal margin of antennular peduncle; coxa stout, with small oval lateral plate; ischiomeral (antepenultimate) segment incompletely fused to basis, somewhat bowed in dorsal view, combined length about 7.20 times longer than greatest height; lateral surface of ischiomeral segment with row of low protuberances extending proximally onto ventral margin, each protuberance bearing tufts of long setae; carpus (penultimate segment) 0.80 length of ischiomeral segment, 8.00 times longer than distal height, with row of rounded, low protuberances and tufts of setae on ventral margin; ultimate segment 0.68 length of carpus, 6.30 times longer than greatest height, tapering to acute corneous spine (Fig. 3H), with numerous stiff setae, dorsal margin with row of low protuberances; exopod well developed, reaching 0.75 length of ischiomeral segment.

First pereopod (Fig. 4A) slender, overreaching antennal scale by length of chela. Chela (Fig. 5A) 5.00 times longer than broad; dactylus about 1.20 of palm length, terminating in small, curved claw, with entire cutting edge; fixed finger also terminating in small, curved claw crossing claw of dactylus, with entire cutting edge; both fingers with tufts of short setae; palm subcylindrical; carpus 1.90 length of chela, 11.7 times longer than distal width; merus shorter than carpus, with short row of setae proximally; ischium broader than merus, ventral margin slightly convex with row of numerous setae; basis also with ventral row of setae.

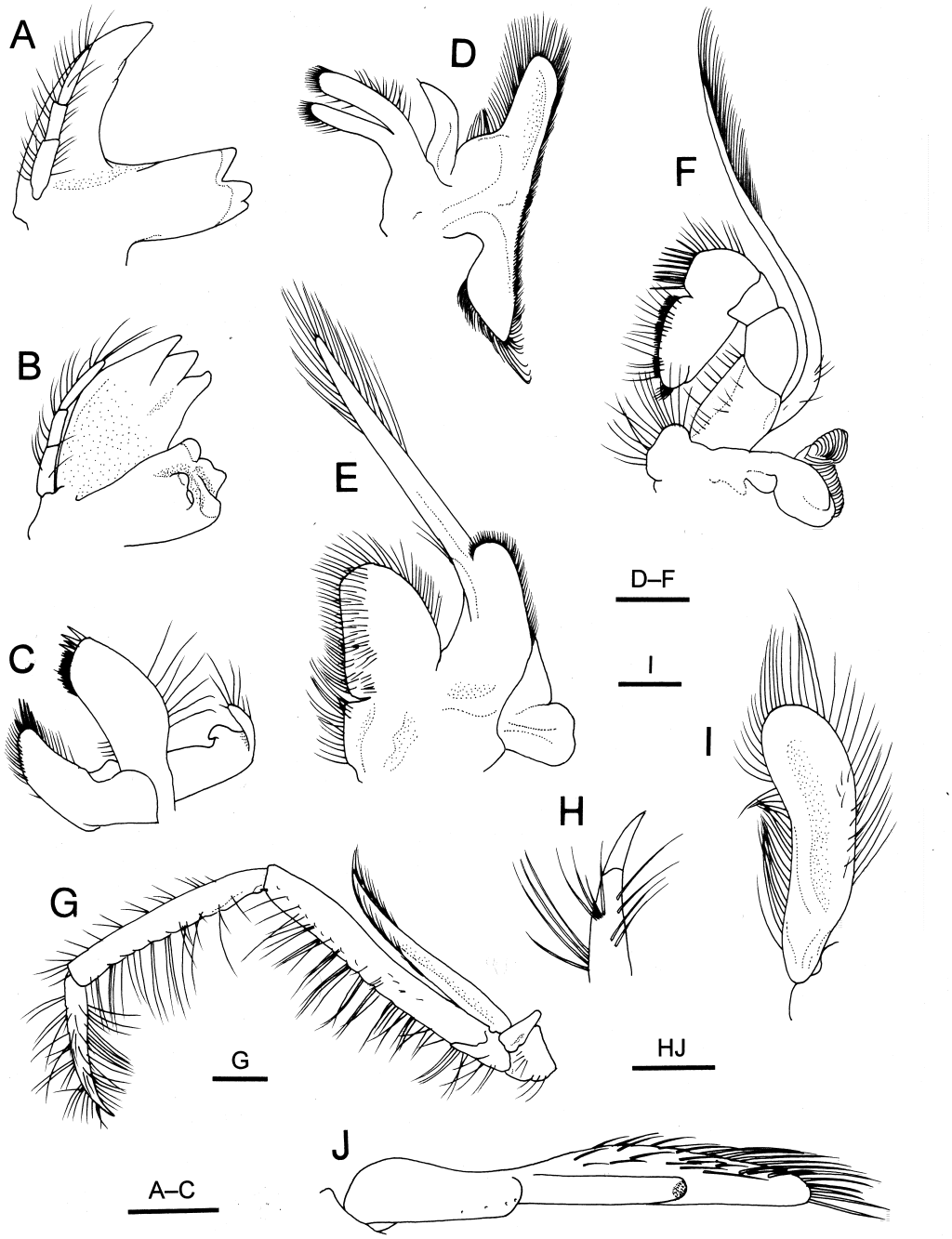

FIGURE 3. *Macrobrachium miyakoense* sp. n. Holotype male (cl 14.7 mm) from Miyako Island (CBM-ZC 8351). Left appendages. A, mandible, dorsal view; B, same, obliquely mesial view; C, maxillule, ventral view; D, maxilla, ventral view; E, first maxilliped, ventral view; F, second maxilliped, ventral view; G, third maxilliped, lateral view; H, tip of ultimate segment of third maxilliped, mesial view; I, endopod of first pleopod, ventral view; J, appendix interna and appendix masculina of second pleopod, mesial view. Scale bars: A–C, G, 1mm; D–F, 2 mm; H–J, 0.5 mm.

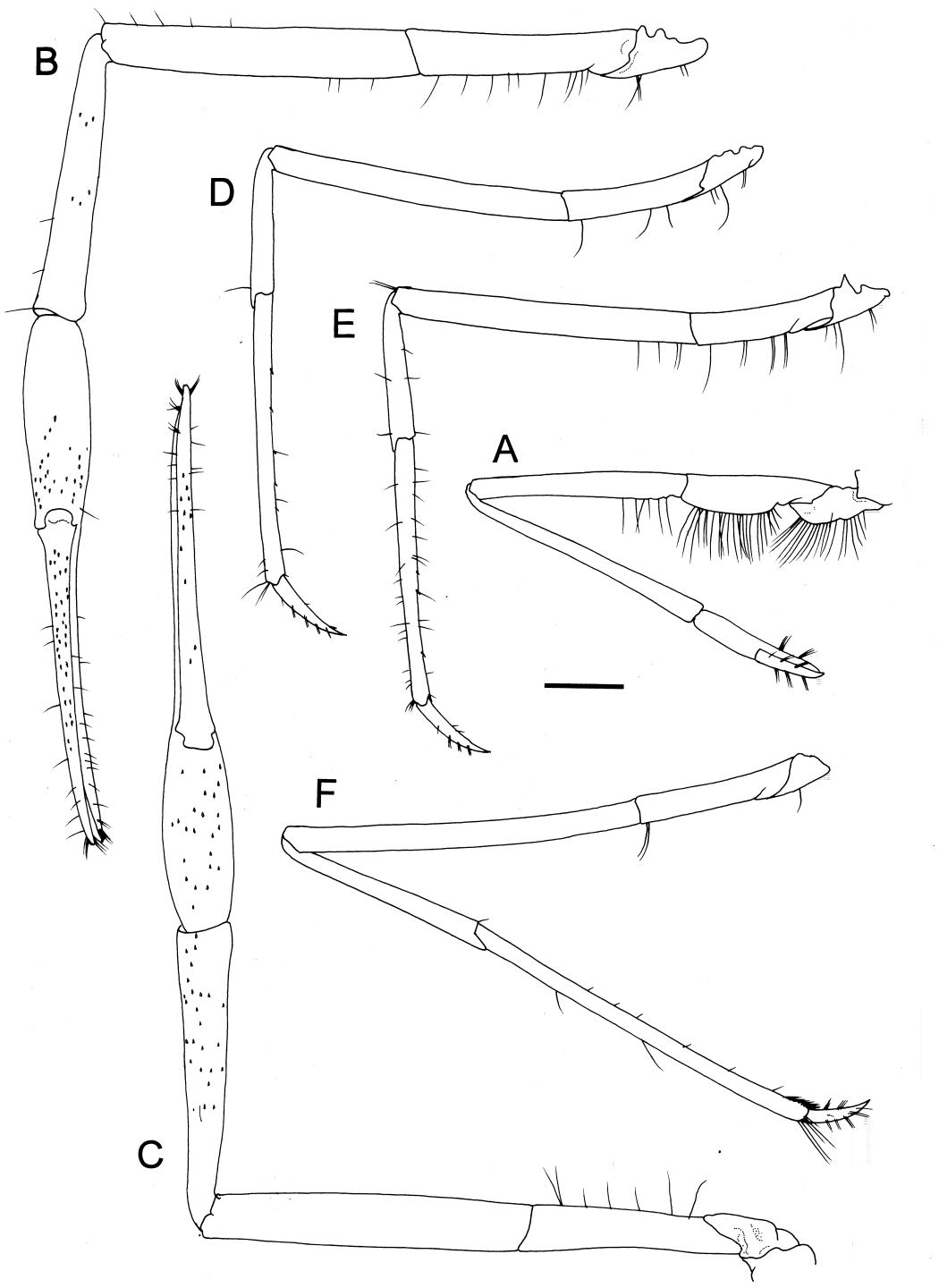

FIGURE 4. *Macrobrachium miyakoense* sp. n. Holotype male (cl 14.7 mm) from Miyako Island (CBM-ZC 8351). Pereopods, lateral views. A, first pereopod; B, left second pereopod; C, right second pereopod; D, third pereopod; E, fourth pereopod; F, fifth pereopod. Scale bar: 2 mm.

Second pereopods (Fig. 4B, C) subequal, similar, slender, overreaching antennal scale by length of chela and carpus, with scattered, very small scale-like structures on lateral surface of dactylus and palm; scale-like structure slender, tapering to acute point. Chela (Fig. 5B–D) 6.90 times as long as broad in dorsal view. Dactylus slender, 1.60 length of palm, terminating in curved, acute claw; cutting edge thin, with short row of very small, blunt teeth in proximal 0.15, remainder smooth. Fixed finger also slender, slightly deflexed, terminating in curved, acute claw crossing claw of dactylus; cutting edge also thin, with short row of very small teeth in proximal 0.15, remainder smooth. Palm subcylindrical, very slightly swollen. Carpus slightly widened distally, 0.54–0.55 of chela length, longer than palm, subequal in length to merus, 5.30 times longer than distal width; surfaces nearly smooth, but with few scale-like structures laterally. Merus shorter than carpus, 6.20 times longer than greatest depth; surfaces smooth. Ischium shorter than merus, also smooth.

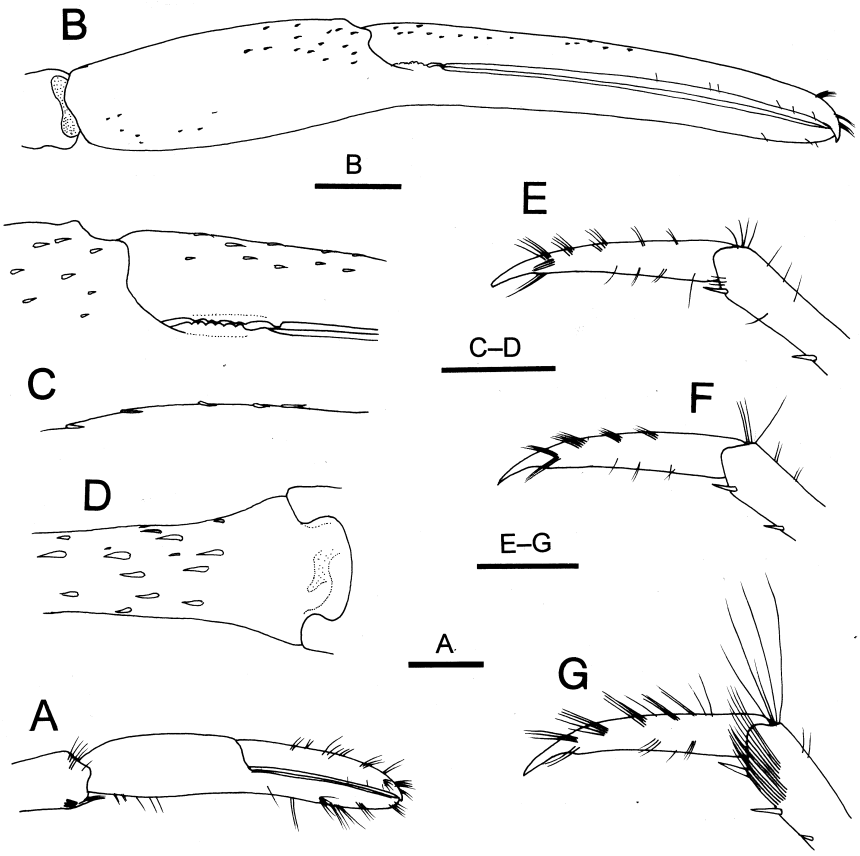

FIGURE 5. *Macrobrachium miyakoense* sp. n. Holotype male (cl 14.7 mm) from Miyako Island (CBM-ZC 8351). A, chela of left first pereopod, dorsal view; B, chela of left second pereopod, dorsal view; C, same, basal part of fingers, dorsal view; D, same, basal part of dactylus, lateral view; E–G, dactyli of left third to fifth pereopods, lateral view. Scale bars: A, C–D, 1 mm; B, 2 mm; E–G, 0.5 mm.

Ambulatory legs (third to fifth pereopods) slender. Third pereopod (Fig. 4D) overreaching antennal scale by length of dactylus and half of propodus; dactylus (Fig. 5E) compressed laterally, 0.32 of propodus length, 5.40 times longer than proximal depth, feebly curved, terminating in acute tip, unguis not clearly demarcated; lateral surface of dactylus with 5 tufts of short setae along dorsal margin (distal most tuft paired) and 3 tufts of shorter setae along ventral margin; ventral margin of dactylus very shallowly notched at about distal 0.20; propodus 14.2 times longer than distal depth, with 2 rows of widely spaced spinules and short setae on ventral margin; carpus 0.54 of propodus length; merus 8.80 times longer than greatest depth; surfaces of carpus, merus and ischium smooth. Fourth pereopod (Figs 4E, 5F) overreaching antennal scale by length of dactylus and 0.10 of propodus, similar to third pereopod in structure. Fifth pereopod (Fig. 4F) longer than third or fourth pereopods, overreaching antennal scale by length of dactylus and 0.60 of propodus; dactylus (Fig. 5G) 0.20 of propodus length, 5.70 times longer than proximal depth, with 6 tufts of short setae along dorsal margin; propodus 20.6 times longer than distal depth, with subdistal tufts of grooming setae (Fig. 5G) and 2 ventral rows of widely spaced spinules; carpus 0.55 of propodus length; merus 13.4 times longer than greatest depth; coxa with large gonopore.

First pleopod with moderately stout protopod; endopod (Fig. 3I) about half of exopod length, weakly broadened distally, weakly curved mesially, mesial margin distinctly sinuous; margins fringed with plumose setae; ventral surface concave, with some short setae adjacent to lateral margin. Second pleopod with appendix masculina (Fig. 3J) elongate, reaching 0.70 of endopod length, weakly expanded at midlength, armed with numerous spiniform bristles on dorsal margin extending onto terminal margin and dorsal part of mesial face; appendix interna exceeding midlength of appendix masculina.

Uropod (Fig. 2D) with protopod bearing strong acute posterolateral tooth. Exopod slightly overreaching tip of telson, lateral margin straight, terminating in small acute tooth at about 0.75 of length, with small movable spine just mesial to posterolateral tooth. Endopod subequal in length to exopod.

Note on paratype. Rostrum (Fig. 6A) armed with 11 teeth on dorsal margin, including 4 on carapace posterior to level of orbital margin; ventral margin with 3 teeth. Second pereopods (Fig. 6B, C) subequal, similar; dactylus 1.54 times longer than palm (left) or 1.44 times (right); chela 1.79 times longer than carpus (left) or 1.80 times (right); no scale-like structure present on surfaces of palm and carpus.

Coloration. (Fig. 1A, B) Body and appendages generally transparent; dorsal surface of carapace and abdomen with scattered red chromatophores, more abundant on abdomen adjacent to posterodorsal margins of first to third abdominal somites; carapace with red spot posterior to orbital margin; antennular peduncle with tint of red; yellow hepatopancrea visible through integument.

Distribution. So far known only from the type locality.

Habitat. The cave where the present specimens were collected consists of a more or less horizontal hall of 50 m length and 30 m width, 6.0 m height, which reaches an anchia-

line pool. This pool lies in total darkness. Its greatest depth is about 2 m. The water is clear, with the salinity 2–8‰ and the temperature 21.3–24.0°C. The pool seems to have an underground connection with the sea as their water level falls and rises with the tides (personal observation).

The other decapod crustaceans collected from this cave include: one alpheid, *Metabetaeus minutus* (Whitelegge, 1897); two atyids, *Halocaridinides trigonophthalma* (Fujino & Shokita 1975) and *Caridina rubella* Fujino & Shokita, 1975; two palaemonids, *Macrobrachium grandimanus* (Randall, 1840) and *M. lar* (Fabricius, 1798); and one gecarcinid, *Discoplax hirtipes* (Dana, 1851). Unidentified copepods and gnathiid praniza larvae were also collected.

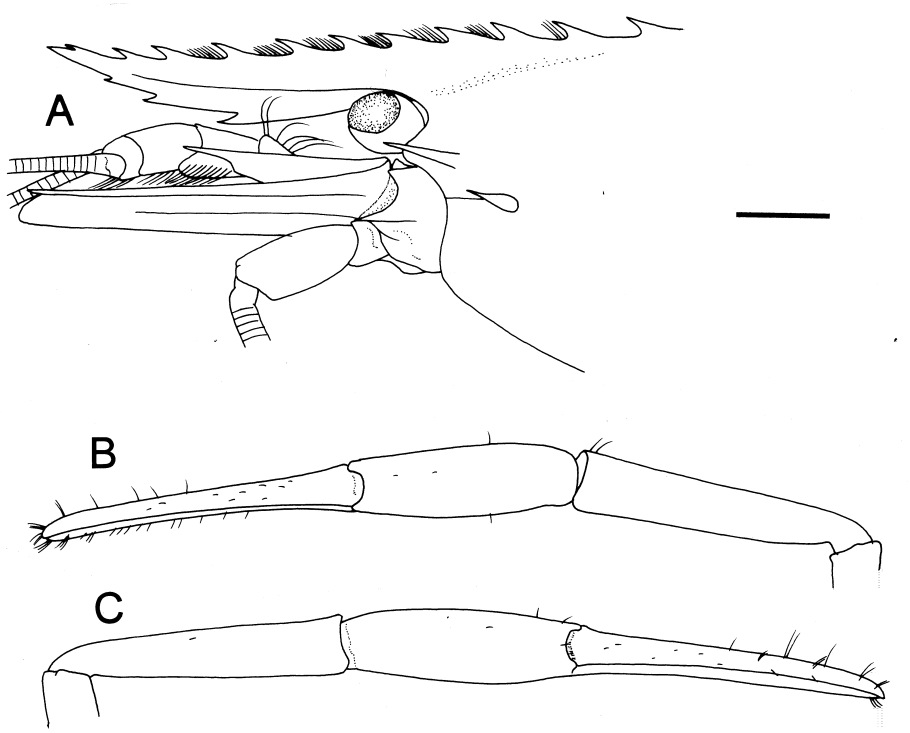

FIGURE 6. *Macrobrachium miyakoense* sp. n. Paratype male (cl 12.6 mm) from Miyako Island (CBM-ZC 8352). A, rostrum, anterior part of carapace and cephalic appendages, lateral view; B, chela and carpus of left second pereopod; C, chela and carpus of right second pereopod, lateral view. Scale bar: 2 mm.

Remarks. In general, species of *Macrobrachium* exhibit marked growth change in the morphology of the second pereopods, reflecting sexual dimorphism. Holthuis (1950) proposed general criteria for recognition of young males, including the shortness and symmetry of the second pereopods. However, we consider that the two specimens under consideration are adults in spite of the relatively short and slender second pereopods compared with many other congeneric species, because the gonopores on the fifth pereopods

and the appendices masculinae are fully developed. Furthermore, the specimen designated as the holotype of the new species proposed is larger than the type specimens of the four other stygiobiont species characterized by the reduced eyes, i.e., *M. villalobosi*, *M. acherontium*, *M. microps*, and *M. poeti* (Table 1). One of the two paratypic males of *M. cavernicola* is smaller than the holotype of the new species (CL 13.1 mm versus 14.3 mm) (Kemp, 1924). Therefore, although still limited, comparisons with the known stygiobiont species are possible.

TABLE 1. Size of known specimens of the six stygiobiont species of *Macrobrachium*.

	References	Carapace length including rostrum	Postorbital carapace length
M. cavernicola	Kemp (1924)	No data	8.0–18.5 mm
M. villalobosi	Hobbs (1973)	No data	9.2 mm
M. acherontium	Holthuis (1977)	3.5–16.0 mm	No data
M. microps	Holthuis (1978)	22 mm	No data
	Short & Marquet (1998)	No data	21.6, 23.1 mm
	Short & Meek (2000)	No data	11.9, 23.8 mm
M. poeti	Holthuis (1984)	11–21 mm	No data
M. miyakoense n. sp.	This study	20.6, 23.1 mm	12.6, 14.7 mm

Macrobrachium cavernicola can be distinguished from *M. miyakoense* by characters of rostrum, telson, second pereopods and ambulatory pereopods (Kemp, 1924). The rostrum is armed with five to nine dorsal teeth in *M. cavernicola* in contrast to 11–13 in *M. miyakoense*. The telson has the anterior pair of dorsolateral spines arising from the posterior to the midlength in *M. cavernicola*, rather than at the midlength in *M. miyakoense*. The dactyli of the second pereopods of *M. cavernicola* are thinly coated by dark brown fur, which is absent in *M. miyakoense*; and they are proportionally shorter in *M. cavernicola* than in *M. miyakoense* (1.18–1.19 of the palm length versus 1.44–1.60). The carpi of the second pereopods are proportionally shorter and stouter in *M. cavernicola* than in *M. miyakoense* (0.27–0.34 of chela length versus 0.54–0.55; 2.00–2.40 times longer than distal width versus 5.00–5.30 times). The third to fifth pereopods are shorter in *M. cavernicola* than in *M. miyakoense*. For example, the third pereopod overreaches the antennal scale by the length of the dactylus in *M. cavernicola*, rather than by the length of the dactylus and the half of propodus in *M. miyakoense*.

Macrobrachium villalobosi differs from all other stygiobiont species of the genus, including the new species, in the completely absence of faceted cornea of the eye (Hobbs, 1973). In other five species, the cornea is faceted and darkly pigmented. Furthermore, *M.*

villalobosi is distinguished from *M. miyakoense* by the less developed inferior orbital lobe, fixed hepatic spine and the second pereopod chela distinctly shorter than the carpus.

Macrobrachium acherontium is separated from *M. miyakoense* by characters of the rostrum, eye, and second pereopods (Holthuis, 1977). The dorsal teeth on the rostrum are fewer in *M. acherontium* than in *M. miyakoense* (seven to 11 versus 11–13). The dorsal margin of the rostrum is convex in *M. acherontium*, rather than slightly sinuous in *M. miyakoense*. The cornea of the eye is smaller in *M. acherontium* than in *M. miyakoense*. Although the slenderness of the second pereopod is similar between the two species, the dactylus is proportionally shorter in *M. acherontium* than in *M. miyakoense* (subequal to the palm length versus about 1.44–1.60 of the palm length); the carpus is also proportionally shorter in *M. acherontium* than in *M. miyakoense* (0.80–0.90 of the chela length versus 0.54–0.55).

Macrobrachium microps differs from *M. miyakoense* in characters of the eye, the second pereopods and the preanal carina on the inter-uropodal sclerite (Holthuis, 1978; Short & Marquet, 1998; Short & Meek, 2000). The width of cornea is slightly more than half of the greatest width of the eye-stalk in *M. microps*, rather than about 0.80 in *M. miyakoense*. The shape and armature of the second pereopods are quite different between the two species. In *M. microps*, the second pereopods are unequal and relatively stout, and the surfaces of the segments are covered with numerous spinules. In *M. miyakoense*, however, they are subequal and slender; the dactylus and palm are devoid of dense covering of spinules. The dactylus of the major chela is distinctly shorter and that of the minor chela is about 1.20 of the palm length in *M. microps*, whereas the dactyli of both chelae is 1.44–1.60 of the palm length in *M. miyakoense*. The pre-anal carina of *M. microps* is distinctly delineated, but not dentiform as in *M. miyakoense*.

Macrobrachium poeti differs from *M. miyakoense* in characters of the rostrum and the second pereopods (Holthuis, 1984). The ventral margin of the rostrum is armed with one or two teeth in *M. poeti*, whereas three to eight in *M. miyakoense*. The dactylus and palm of the second pereopods are provided with scattered tufts of very short setae, instead of sharp scale-like structure, on the lateral surface. The carpus is shorter and robust in *M. poeti* than in *M. miyakoense*; it is about 0.30 of the chela length in *M. poeti*, whereas 0.54–0.55 in *M. miyakoense*; the length of the carpus is about 2.60 of the distal width in *M. poeti*, but 5.30 in *M. miyakoense*.

Bruce and Iliffe (1993) referred a male specimen (CL 13.1 mm) from an anchialine lava tube on Upolu, Samoa, to *M. microps*, although they suggested that their specimen might represent a separate species because of the presence of a number of differences observed between their specimen and the holotype of *M. microps*. In fact, Bruce and Iliffe's specimen is rather more similar to the present new species than to *M. microps* in the shape of the second pereopods. Nevertheless, Bruce and Iliffe's specimen differs from the specimens of the present new species in characters of the carapace, eye and second pereopods. The posterior four teeth of the dorsal rostral series are basally articulated in the

Samoan specimen, but they are all fixed in the specimens of the present new species. Further, the posteriormost tooth of the dorsal series arises more posteriorly in the Samoan specimen than in the specimens of the present new species (0.45 of the carapace length versus 0.32). The cornea of the eye is smaller in the Samoan specimen than in the type specimens of the new species. The chela is less elongate in the Samoan specimen than in the type specimens of the new species. These differences strongly suggest that our Japanese specimens are specifically distinct from the Samoan specimen. The Samoan specimen might represent an undescribed species, instead of *M. microps*.

Besides the reduced eye, the present new species appears similar to an epigean species, *M. mieni* Dang, 1975, known from Vietnam and northern Thailand, in the general shape and armature of the rostrum and the general structure of the male second pereopods (Cai et al., 2004). The new species differs from *M. mieni* in the more numerous ventral teeth on the rostrum (3 to 8 versus 1 to 3) and the distinctly longer fingers of the second pereopods (1.60 times longer than the palm versus subequal in length) (Cai et al., 2004).

Etymology. This new species is named for its type locality, Miyako Island.

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