

# First Record of the Superfamily Eurysquilloidea (Crustacea: Stomatopoda) from Japan

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Here we report the discovery of a single specimen of the euryssquillid mantis shrimp, *Manningia andamanensis* Ghosh, 1975, from Okinawa Island, southwestern Japan. This specimen is the first member of the superfamily Eurysquilloidea to be recorded from Japanese waters, and is the second record ever for this species. This new record significantly extends the range of *M. andamanensis* from the North Andaman Islands northeastward to Japan. Live coloration for this species is revealed in detail for the first time.

**Key Words:** stomatopods, new record, coral reef, Ryukyu Islands, marine biodiversity.

## Introduction

Stomatopods are a group of carnivorous marine crustaceans and include about 500 species in the world (Schram et al. 2013). Recent surveys in the Ryukyu Islands, southwestern Japan, have revealed a large diversity of stomatopod taxa (Ahyong 2012; Nakajima et al. 2022), but members of the superfamily Eurysquilloidea have yet to be recorded anywhere from Japan, including the Ryukyu Islands [see the species list in Ahyong (2012)]. This superfamily can be distinguished from others by the combination of 1) ovate propodi of the maxillipeds 3–5, 2) usually distinct median carina of the telson [absent in *Ankersquilla pardus* Ahyong, Porter, and Caldwell, 2020 (Ahyong et al. 2020); weakly developed in *Sinosquilla hispida* Liu and Wang, 1978 (Liu and Wang 1978)], 3) movable submedian teeth of the telson, and 4) ventrally recessed intermediate and lateral denticles of the telson (Ahyong 2001). Eurysquilloidea consists of a single family Eurysquillidae, and includes the following eight genera (Ahyong and Lin 2020): *Ankersquilla* Ahyong, Porter, and Caldwell, 2020; *Coronidopsis* Hansen, 1926; *Eurysquilla* Manning, 1963; *Eurysquilloides* Manning, 1963; *Liusquilla* Ahyong and Lin, 2020; *Manningia* Serène, 1962; *Raysquilla* Ahyong, 2000; and *Sinosquilla* Liu and Wang, 1978. *Eurysquilla* occurs in the Indo-West Pacific and East Pacific, and both sides of the Atlantic (Schram et al. 2013). *Manningia* occurs mainly in the Indo-West Pacific, but single species is known from the East Atlantic (Ahyong 1997, 2001). The remaining euryssquillid genera distributes only in the Indo-Pacific (Schram et al. 2013; Ahyong and Lin 2020; Ahyong et al. 2020). In this study, we found a single specimen of *Manningia* from Okinawa Island, southwestern

Japan. Among the euryssquillid genera, *Manningia* can be distinguished by the following combination of characters: 1) asymmetrically bilobed cornea, 2) ocular scales and dorsal process of antennular somite covered by rostral plate in dorsal view, 3) not elongated antennular somite, 4) rostral plate unarmed or having a single spine, 5) two dorsal teeth of raptorial claw carpus, and 6) four teeth of raptorial claw dactylus (Ahyong and Lin 2020).

## Materials and methods

We had a SCUBA dive at Mizugama, west coast of Okinawa Island on 31 August 2022. The authors found the species under a rock on the seabed at 10 m depth. After photographs were taken at laboratory, the specimen was fixed and preserved in 75% ethanol. The specimen is deposited at Ryukyu University Museum, Fujukan (RUMF), University of the Ryukyus. Measurements are given in millimeters (mm). Cornea width was measured along the widest part. Morphological terminology and abbreviations follow Ahyong (2001): A1, antennule; A2, antenna; AS, abdominal somite(s); CL, carapace length; IM, intermediate; LT, lateral; MG, marginal; SM, submedian; TL, total length; and TS, thoracic somite(s).

## Taxonomy

Superfamily **Eurysquilloidea** Manning, 1977

[New Japanese name: Ohiro-shako-jōka]

Family **Eurysquillidae** Manning, 1977

[Japanese name: Ohiro-shako-ka]

Genus **Manningia** Serène, 1962

[New Japanese name: Maningu-shako-zoku]

**Manningia andamanensis** Ghosh, 1975

[New Japanese name: Hekomi-maningu-shako]

(Figs 1, 2)

*Manningia andamanensis* Ghosh, 1975: 33–36, fig. 1 [type locality: Aerial Bay Rock Reef, Diglipur, North Andaman];

Ghosh and Manning 1988: 655; Ah Yong 2001: 22 (key).

**Material examined.** RUMF-ZC-7444, 1 female (TL 32.2 mm, CL 6.2 mm), Mizugama, west coast of Okinawa Island, Ryukyu Islands, southwestern Japan, 26°21'33"N, 127°44'17"E, about 10 m in depth, under rock, coll. T. Sato, H. Nakajima, and N. Jimi, 31 August 2022.

**Diagnosis.** Rostral plate distinctly wider than long, anterior margin emarginate, without spine. IM carina on AS5 unarmed posteriorly. AS6 without additional carina between SM and IM. Telson dorsal surface with three longitudinal carinae between accessory median carina and MG carina; with distinct posteriorly directed spine anterior to base of LT denticle.

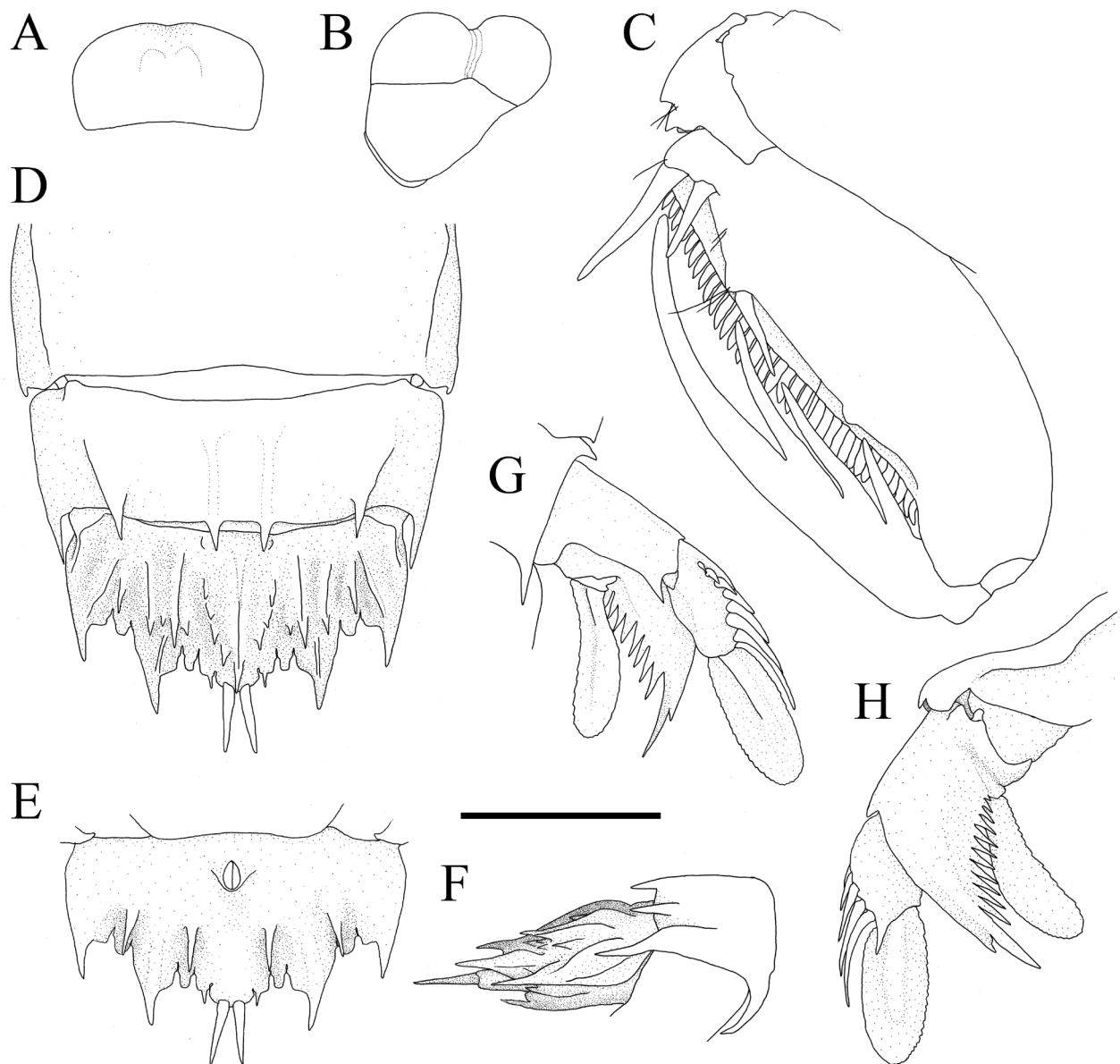


Fig. 1. *Manningia andamanensis* Ghosh, 1975, RUMF-ZC-7444, female (TL 32.2 mm, CL 6.2 mm). A, Rostral plate, dorsal view; B, right eye, lateral view; C, right raptorial claw, inner view; D, AS5–6 and telson, dorsal view; E, telson, ventral view; F, AS6 and telson, right lateral view; G, right uropod, dorsal view; H, right uropod, ventral view. Scale bar: A–C, 2 mm; D–H, 3 mm. Line drawing credit: Hiroki Nakajima.

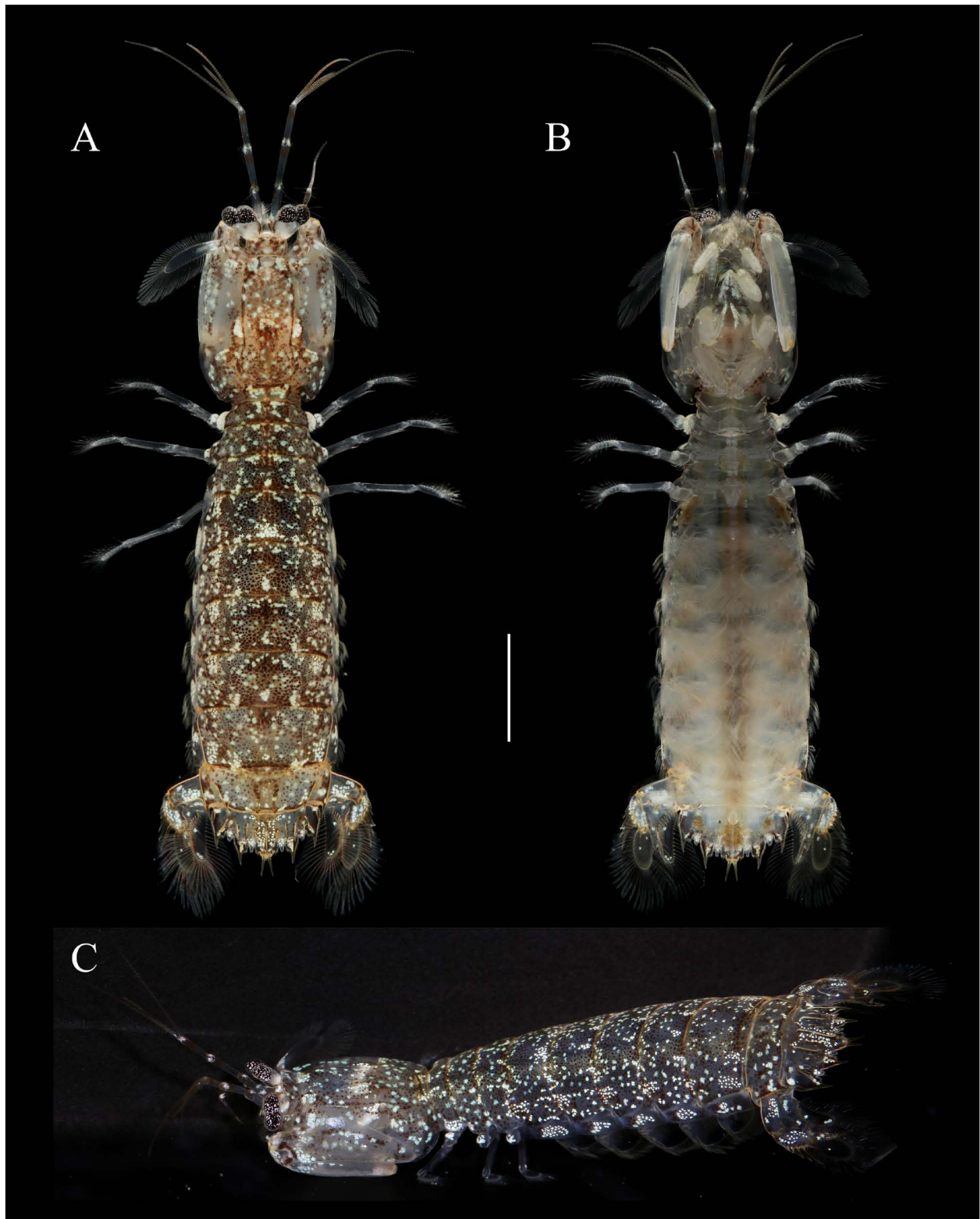


Fig. 2. *Manningia andamanensis* Ghosh, 1975, RUMF-ZC-7444, female (TL 32.2 mm, CL 6.2 mm). A, Dorsal view, after anesthetized with clove; B, ventral view, after anesthetized with clove; C, lateral view, live specimen. Scale bar: A, B, 5 mm. Photograph credit: Hiroki Nakajima.

**Description.** Cornea large, bilobed asymmetrically, outer lobe larger than inner lobe (Fig. 1B). Cornea index ( $CL/cornea\ width \times 100$ ) = 346. Eye stalk short. A1 length 0.98CL. A2 scale slender, length 0.51CL. Rostral plate (Fig. 1A) anterior margin emarginate, anterior spine absent; broader than long, length 0.55 times width, 0.30CL. An-

terolateral corner rounded. Ocular scales rounded, weakly divided medially. Carapace smooth, anterolateral corner rounded, posterolateral corner with low carina.

Raptorial claw (Fig. 1C) stout; merus lacking inferodistal spine; carpus with two dorsal spines; propodus occlusal margin with three movable spines; propodal index (CL/pro-

podus length of raptorial claw  $\times 100$ ) = 112; dactylus with 4 teeth, proximo-outer margin with single low lobe. Mandibular palp 3-segmented. Both sides of epipods of maxilliped damaged, left side 1–4 present, right side 1–2 present.

TS5–8 dorsal surfaces smooth, carina absent. TS5 lateral process indistinct, covered by posterolateral corner of carapace; TS6–7 lateral processes rounded. Pereiopods 1–3 slender.

AS1–4 dorsal surfaces almost smooth, lacking distinct carina and posterior directed spine. AS5 with posteriorly unarmed IM carina; small MG spine present. AS6 with indistinct SM carina and distinct IM carina, both posteriorly spined; slender, acute LT spine present (Fig. 1D). Ventral surface of AS6 with transverse groove (Fig. 1H), posteriorly directed small spine and wider lobe present anterior to articulation of uropodal protopod.

Uropodal protopod (Fig. 1G, H) dorsally with acute spine near articulation to exopod; inner primary spine large, outer primary spine small, lobe between primary spines low, indistinct, almost absent; inner margin of basal prolongation with 11 small spines. Uropodal endopod slender. Proximal article of uropodal exopod with 7 movable spines on outer margin, distalmost extending posteriorly beyond midlength of exopod distal article; with single fixed spine on postero-ventral surface. Distal article of uropodal exopod ovate, with longitudinal carina proximally.

Telson (Fig. 1D–F) SM movable teeth slender, adjacent medially. IM and LT teeth slender, each with dorsal carina. SM denticles absent. Two IM denticles present; inner IM denticle posteriorly spined, outer IM denticle posteriorly truncate. Single LT denticle present. Telson median carina distinct, posteriorly armed. Accessory median carina consisting of row of 3 or 4 small spines. Two posteriorly spined carinae anterior to IM tooth; 1 or 2 small spines near posterior base of these carinae. One distinct posteriorly directed spine anterior to base of LT denticle. Oblique lateral carina extending onto base of lateral tooth. MG carina anteriorly distinct. Telson ventral surface smooth, distinct ventrally recessed spines anterior to base of outer IM and LT denticles; each spine with small, rounded robe anterodorsally (Fig. 1F).

**Live coloration.** Whole body whitish, semi-translucent (Fig. 2). Dorsal surface scattered with numerous white, sky-blue and brown chromatophores. Eye cornea black with numerous small white particles. A2 scale semi-translucent, basal part with white spots. TS6 lateral part covered with white chromatophores, TS7–8 lateral parts covered with brown chromatophores. Both sides of median carina of telson with numerous white chromatophores.

**Remarks.** The specimen collected from Okinawa Island is clearly identifiable as a member of *Manningia* by its asymmetrically bilobed cornea (Fig. 1B), non-bispinous rostral plate (Fig. 1A), four teeth of the raptorial claw dactylus and two dorsal spines on the raptorial claw carpus (Fig. 1C).

*Manningia* consists of the following 11 species (Ahyong 2001): *M. amabilis* Holthuis, 1967; *M. andamanensis*; *M. arabica* Manning, 1990; *M. australiensis* Manning, 1970; *M. misool* Ahyong, 1997; *M. notialis* Manning, 1966; *M. pi-*

*laensis* (de Man, 1888); *M. posteli* Manning, 1977; *M. raymondi* Bruce, 1986; *M. wilsoni* Ahyong, 2001; and *M. zehntneri* Manning, 1974. Of these 11 species, *M. andamanensis* can be identified by the following morphological characters: anterior margin of rostral plate unarmed and emarginate; IM carina of AS5 unarmed; AS6 without additional carina between SM and IM; dorsal surface of the telson with three longitudinal carinae between accessory median carina and MG carina; and distinct spine bear base of LT denticle.

The size of our female specimen (TL 32.2 mm) was very similar to the female holotype of *M. andamanensis* (TL 32 mm; Ghosh 1975) and our specimen had the above-mentioned diagnostic characters, so it was easily identified as *M. andamanensis*. However, there were the following differences between our specimen and the original description: 1) lobe between primary teeth of the basal prolongation of the uropodal protopod minute in our specimen (vs. completely absent in the holotype; Ghosh 1975: fig. 1f); and 2) inner margin of basal prolongation of the uropodal protopod with 11 spines (vs. 9 or 10 spines in the holotype). We consider these two morphological differences as intra-specific variation. The difference in the length of the A2 scale (0.51CL in our specimen vs. as long as CL in the holotype description) could be due to errors in measurement methods and other factors, so the holotype would need to be re-examined. We concluded our specimen to be *M. andamanensis* for the above reasons.

The female specimen (RUMF-ZC-7444) is designated as the standard specimen for the new Japanese name (Hekomimaningu-shako) of the species. New Japanese name for the genus (Maningu-shako-zoku) is also proposed here. Japanese name for the family (Ohiro-shako-ka) had been proposed by Hamano (1987) and we applied it to the superfamily name (Ohiro-shako-jōka).

**Ecological note.** The present specimen was found under a rock on a sandy bottom at 10 m depth near a coral reef environment. It appears that the species burrows under the rock on sandy sediment in shallow waters. The habitat is similar to that of recently described euryquillids, namely *Ankersquilla pardus* and *Liusquilla taiwanica* Ahyong and Lin, 2020 (Ahyong and Lin 2020; Ahyong et al. 2020).

**Distribution.** The species was previously known only from the type locality, North Andaman Island (Ghosh 1975). This is the second record of the species in the world and significantly extends its range of distribution to the northeast.

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## Authors Contributions

Hiroki Nakajima: Conceptualization; Investigation; Formal analysis; Visualization; Writing – original draft; Writing – review & editing. Taigi Sato: Resources; Investigation; Writing – review & editing. Naoto Jimi: Investigation; Writing – review & editing; Funding acquisition.

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## Declarations

**Competing interests.** The authors declare no conflicts of interest.

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