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New record of a callianassid ghost shrimp *Paratrypaea maldivensis* (Borradaile, 1904) (Crustacea: Decapoda: Axiidea) from subtidal flats in Okinawa-jima Island, Ryukyu Islands, Japan

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**Abstract.** A small ghost shrimp, *Paratrypaea maldivensis* (Borradaile, 1904), is recorded from Japanese waters for the first time, on the basis of specimens collected from Okinawa-jima Island, Ryukyu Islands. The specimens were found to burrow on muddy sand substrata at subtidal depths down to 20 m. A brief diagnosis and illustrations of selected parts based on the present specimens are provided as evidence of the identification. The status of the genus *Paratrypaea* Komai & Tachikawa, 2008 is also briefly discussed.

**Introduction**

*Paratrypaea maldivensis* (Borradaile, 1904) (Decapoda: Axiidea: Callianassidae) was first described from the Male Atoll, Maldives, by Borradaile (1904) on the basis of a single male specimen [as *Callianassa (Trypaea)*]. Soon after the original description, Pearson (1905) recorded the species from Sri Lanka. De Man (1928) noted that it was closely related to *Callianassa bouvieri* Nobili, 1904 and discussed differentiating characters between the two species. However, Sakai (1999) synonymized Borradaile’s (1904) taxon under *C. bouvieri*, together with *C. rectangularis* Ngoc-Ho, 1991, originally described from New Caledonia (Ngoc-Ho 1991). The synonymy has been followed by his subsequent publications (Sakai 2005, 2011). On the other hand, Komai & Tachikawa (2008) argued that *C. rectangularis* was a valid species, and transferred it to their new genus *Paratrypaea*, together with *C. bouvieri*. Finally, Dworschak (2012) clarified that *Callianassa maldivensis* is a senior synonym of *Paratrypaea rectangularis*, not a junior synonym of *Paratrypaea bouvieri* as Sakai (1999) proposed, and added the Red Sea and Taiwan to the geographical range of *P. maldivensis*.

During investigations of subtidal infaunal decapods in Okinawa-jima Island, Ryukyu Islands, a small collection of callianassid ghost shrimps was made, and amongst them specimens referable to *Paratrypaea maldivensis* were found. This short article serves to report on the occurrence of the species from Japanese waters for the first time. The status of the genus *Paratrypaea* is also briefly discussed.

Specimens were collected from sandy mud bottom at subtidal depths down to 20 m by using a suction pump (yabby pump) or sieve during SCUBA diving. Material examined in this study is deposited in Muséum National d’Histoire Naturelle, Paris (MNHN); the Natural History Museum and Institute, Chiba (CBM); the Ryukyu University Museum, Fujukan (RUMF); and Zoological Collection of the University Museum, the University of Tokyo (UMUTZ). The measurements given in the text are carapace length (cl) measured from the tip of the rostrum to the mid-point of the posterior border of the carapace.

For comparative purpose, the following material was examined.

*Gilvossius setimanus* (DeKay, 1844): 1 male (cli 12.2 mm), New Haven, Connecticut, USA, donated by the Museum of Yale College, UMTZ.


**Taxonomic Account**

**Genus Paratrypaea** Komai & Tachikawa, 2008

*Paratrypaea maldivensis* (Borradaile, 1904) (Figs 1–3)

New Japanese Name: Chigo-Suna-Moguri

**Restricted synonymy**

*Callianassa* (Trypaea) *maldivensis* Borradaile, 1904: 753, pl. 58, fig. 3b; De Man 1928: 22.

*Callianassa rectangularis* Ngoc-Ho, 1991: 292, fig. 5.

*Callianassa bouvieri*. – Sakai 1999: 40 (part), fig. 6a, b; 2005: 78 (part).


For full synonymy, see Dworschak (2012).

**Material examined.** One male (cl 3.3 mm), 1 ovigerous female (3.4 mm), Oura Bay, Nago, Okinawa-jima Island, subtidal, stn D2, about 8 m, 19 June 2009, SCUBA diving with yabby pump, coll. Y. Fujita, RUMF-ZC-2609; 1 male (cl3.7mm), 1 ovigerous female (cl 4.4 mm), same locality, 5 m, stn D5, 20 June 2009, SCUBA diving with yabby pump, coll. Y. Fujita, RUMF-ZC-2609.

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*Fig. 1. Paratrypaea maldensis* (Borradaile, 1904), male (cl 3.6 mm), CBM-ZC 11808. A, carapace and cephalic appendages, lateral view; B, rostrum and eyes, dorsal view; C, sixth abdominal somite, dorsal view; D, telson, dorsal view; E, left third maxilliped, lateral view (setae omitted); F, same, mesial view; G, propodus and dactylus of left third pereopod, lateral view (setae omitted); H, appendix interna of left third pleopod, ventral view; I, right uropod, dorsal (perpendicular) view (setae omitted). Scale bars: 1 mm for A; 0.5 mm for B–I.

図 1 Paratrypaea maldensis (Borradaile, 1904) (新称: タゴスナモグリ), 雄 (頭胸甲長 3.6 mm), CBM-ZC 11808. A, 頭胸甲および頭部付属肢, 側面; B, 額角および眼, 背面; C, 第6腹部, 背面; D, 尾節, 背面; E, 左第3腕脚, 側面 (剛毛を省略); F, 同, 内面; G, 左第3胸脚前節および指節, 側面 (剛毛を省略); H, 左第3腹肢内肢突起, 腹側面; I, 右尾肢, 背面 (剛毛を省略). スケールバー: A, 1 mm; B–I, 0.5 mm.
Fig. 2. *Paratrypaea maldivensis* (Borradaile, 1904). A, B, male (cl 3.6 mm), CBM-ZC 11808; C, D, ovigerous female (cl 3.2 mm), same lot. A, major (left cheliped), lateral view; B, minor (right) cheliped, lateral view; C, right cheliped, lateral view; D, left cheliped, lateral view. Scale bars: 1 mm.

Additional material. Holotype of *Callianassa rectangularis*, male (cl 4.5 mm), Surprise Atoll, New Caledonia, 18°19'S, 163°04'E, 36 m, coll. B. Richer de Forges, MNHN-Th 1069.
Diagnosis. Rostrum (Fig. 1A, B) spiniform, overreaching mid-length of eyestalks. Carapace (Figs. 1A, 3) with distinctly defined dorsal oval. Second abdominal somite subequal in length to sixth pleomere. Sixth pleomere (Fig. 1C) about 1.1 times longer than wide, with faint lateral notches posterior to midlength. Telson (Fig. 1D) subrectangular, 1.1–1.2 times longer than wide; lateral margin unarmed, with faint notch proximally; posterior margin faintly concave medially, with small median spine and 2 pairs of minute movable spinules at each lateral angle.
Antennular peduncle (Fig. 1A) slightly longer than antennal peduncle; ultimate segment not particularly elongate. Third maxillipeds (Fig. 1E, F) with ischium-merus operculiform, becoming wider distally; crista dentata consisting of about 10 small spines. Chelipeds distinctly unequal and dissimilar in males (Fig. 2A, B), subequal and similar in females (Fig. 2C, D). Male major cheliped (Fig. 2A) with ischium having row of spines on ventral margin; merus unarmored on dorsal margin, armed with row of 3–5 spines on proximal 0.5–0.6 of ventral margin; carpus wider than long; palm with dense long setae along distolateral margin, extending to fixed finger along cutting edge; dactylus with several to numerous long setae on extending to fixed finger along cutting edge; dense long setae along distolateral margin, carpus. Female chelipeds (Fig. 2C, D) subequal and similar to male minor cheliped. Propodus of third pereopod subovate, ventral margin smoothly convex, with movable spine subterminally, proximal heel not defined. First and second pleopods absent in males. Appendices internae on the third to fifth pleopods (Fig. 1H) stout, slightly longer than broad, not tapering distally, distinctly projecting from mesial margin of endopod. Uropod (Fig. 1I) with endopod subovate, moderately broad, with distinct dorsal plate bearing distal row of minute movable spines, lateral margin unarmored; exopod moderately broad, with slightly convex lateral margin, dorsal plate with distal row of minute spines, lateral margin unarmored.

**Coloration in life.** See Fig. 3. Body generally translucent; patches of pale pink dots on abdomen. Cornea black. Chelipeds pale pink. Female gonad and eggs light yellowish brown. Dworschak (2012) published color photographs of this species.

**Distribution.** Herefore known from the Red Sea (Dworschak 2012), Maldives (Borradaile 1904), Sri Lanka (Pearson 1905), Taiwan (Sakai 1999, as Callianassa bouvieri; Dworschak 2012), and New Caledonia (Ngoc-Ho 1991, as Callianassa rectangularis); shallow subtidal to 36 m. The present specimens represent the first record of this species from Japanese waters.

**Remarks.** The present specimens from Okinawa agree well with the redescription of Paratrypaea maldivensis by Dworschak (2012). As discussed by Dworschak (2012), P. maldivensis can be distinguished from P. bouvieri by the relatively strong posteromedian spine of the telson, the subequal and similar female chelipeds, and the possession of a row of spines on the ventral margin of the male major cheliped merus. In P. bouvieri, the chelipeds are distinctly unequal and dissimilar even in females; the ventral margin of the male major cheliped merus is expanded into a marginally denticulate lobe, though the size and shape of this lobe is rather variable. Dworschak (2012) showed that habitats are also different between the two species. Paratrypaea maldivensis inhabits the subtidal zone, extending near coral reefs, whereas P. bouvieri occurs in intertidal flats, including areas near mangroves. Our field observations in Okinawa well supports the observations by Dworschak (2012).

The status of Paratrypaea has been subject to disagreement. Komai and Tachikawa (2008) established the genus for Callianassa bouvieri (type species) and C. rectangularis. The authors considered various characters to diagnose Paratrypaea, following the scheme of Manning & Felder (1991), Poore (1994), Tudge et al. (2000), and Ngoc-Ho (2003), and discussed that Paratrypaea appeared closest to Pestarella Ngoc-Ho, 2003. Felder & Robles (2009) performed phylogenetic analysis of Callianassidae using 16S and 12S rDNA mitochondrial genes, and their result found support for continued recognition of many separate genera, particularly in Callianassinae. Dworschak (2012) continued to recognize Paratrypaea as a valid genus. On the other hand, Sakai (2011) and Sakai & Türky (2012) regarded Paratrypaea as a junior synonym of Gilvossius Manning & Felder, 1992, originally established to accommodate Gonodactylus setimanus DeKay, 1844 from the eastern coast of the United States. Sakai (2011) considered only limited characters to diagnose genera in Callianassidae (i.e., shape of third maxilliped and development of first and second pleopods in males), not fully reflecting morphological diversity within the subfamily. Unfortunately, the criticism by Sakai & Türky (2012: 736) against the molecular phylogenetic analyses of callianassids made by Felder & Robles (2009) does not make sense, and thus we cannot accept it at all.

Actually, Gilvossius setimanus, the type species of the genus, differs from the two species of Paratrypaea in several key characters, such as the absence of an acute rostral spine, the antennular peduncle distinctly longer than the antennal peduncle, the appendices internae on the third to fifth pleopods embedded in mesial edges of endopods, the lack of a
dorsal plate on the uropodal endopod, and the broadly rounded posterior margin of the telson (Manning & Felder 1992; this study). Furthermore, in G. setimanus, the merus of the male major cheliped has a prominent hook-like process on the ventral margin, whereas in two species of Paratrypaea, such a prominent hook-like process is not differentiated. In P. bouvieri, the merus of the male major cheliped bears a marginally denticulated lobe on the ventral margin; in P. maldivensis, there is a row of spines on the ventral margin of the merus of the male major cheliped (Fig. 2A). Consequently we follow Komai & Tachikawa (2008) and Dworschak (2012) to maintain Paratrypaea as a valid genus.

Acknowledgements

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要旨. 沖縄島沿岸の潮下帯砂泥域から採集された *Paratrypaea maldensis* (Borradaille, 1904) について、形態的特徴と近縁種である *P. bouvieri* (Nobili, 1904) (ブビエスナモグリ) との識別点について記述した。本種は、これまでに紅海、モルジブ、スリランカ、ニューカレドニア、台湾から記録されていたが、今回、日本沿岸における分布が初めて確認された。さらに、本種の所属する *Paratrypaea* (ブビエスナモグリ属) の有効性について論議した。なお、現在までに本種に対する和名は与えられていなかったため、本研究で検討した雄標本 (RUMF–ZC–2609) を基準標本とし、新標準和名としてチゴスナモグリを提唱する。

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