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# A new hexapodid crab (Decapoda: Brachyura) from the Middle Pleistocene Atsumi Group, Japan, with notes on *Hexapus anfractus* (Rathbun, 1909) from the Holocene Nanyo Formation, Japan

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#### Abstract

*Mariaplax ohiranorikoae*, a new species of the crab family Hexapodidae Miers is described from the Middle Pleistocene Atsumi Group of Aichi Prefecture, central Japan. This is the second record for *Mariaplax* Rahayu and Ng from the Pleistocene deposits of Japan. *Hexapus anfractus* (Rathbun) recorded from the Holocene Nanyo Formation is re-evaluated and identified with the extant species, *Mariaplax chenae* Rahayu and Ng.

Key words: Eubrachyura, Hexapodidae, Mariaplax, Quaternary, Japan

## Introduction

Karasawa et al. (2014) reported a single carapace of Hexapus sp. cfr. H. anfractus (Rathbun, 1909) (Eubrachyura: Hexapodidae) from the Middle Pleistocene Atsumi Group of central Japan. In the same year, Rahayu and Ng (2014) erected the new genus Mariaplax Rahayu and Ng, 2014, with the type species, Lambdophallus anfractus Rathbun, 1909. They gave the separate status for the Japanese species previously assigned to Hexapus anfractus (=Lambdophallus anfractus) and described it as the new species, Mariaplax chenae Rahayu and Ng, 2014. The identify of Hexapus sp. cfr. H. anfractus, reported by Karasawa et al. (2014), therefore, needs to be re-evaluated. Examination of previously known and additional specimens allows to describe this species as a new species of Mariaplax. Additionally, Hexapus anfractus known from the Holocene Nanyo Formation (Tokai Fossil Society, 1977; Umemoto et al., 1994; Umemoto and Karasawa, 1998) is re-examined and identified with *Mariaplax chenae*.

The specimens described herein are deposited in the Mizunami Fossil Museum (MFM).

#### **Systematics**

Family Hexapodidae Miers, 1886

Genus *Mariaplax* Rahayu and Ng, 2014 *Type species: Lambdophallus anfractus* Rathbun, 1909, by original designation.

## Mariaplax ohiranorikoae, new species (Figs. 1.1a–1.3b)

[New Japanese name: Ōhira-himemutuasi-gani] *Diagnosis*: Carapace subquadrate, about 1.4 times as wide as long; fronto-orbital margin about half of maximum carapace width; front narrow, medially sulcate with straight frontal margin; upper orbital margin entire, finely tuberculate, rimmed; anterolateral margins arcuate; posterolateral margins not clearly differentiated from anterolateral margins, strongly sinuous, with a protuberance; posterior margin wide, about 75% maximum carapace width. Dorsal surface densely tuberculate, with regions defined by grooves.

*Etymology*: The specific name is derived from Noriko Ōhira (Aichi), who is one of the researchers of our project on a diversity for crabs from the Atsumi Group.

*Material examined*: MFM142043 (holotype), carapace,  $4.9 \times 3.5$  mm; MFM142044 (paratype), carapace,  $4.2 \times 3.0$  mm; MFM142045 (paratype), carapace,  $3.6 \times 2.6$  mm. Measurements are of the carapace width and length, respectively.

*Type locality*: Sandy-silt of the Toyohashi Formation of the Atsumi Group; Takamatsu, Tahara City, Aichi Prefecture, central Japan (Karasawa and Tanaka, 1994; Karasawa et al., 2014); Middle Pleistocene, Marine Isotope Stage 9 (Nakashima et al., 2008).

Description: Carapace subquadrate, about 1.4 times as wide as long, widest at about mid-length, weakly convex axially and nearly flattened transversely. Fronto-orbital margin about half of maximum carapace width. Front narrow, about 25% maximum carapace width, projected forward, downturned, with shallow median sulcus; frontal margin nearly straight, weakly rimmed. Orbits small; upper orbital margin entire, gently concave, finely tuberculate, rimmed, continuing to divergent lateral margin of front, with bluntly angular outer-orbital angle. Anterolateral margins arcuate, tuberculate, rimmed. Posterolateral margins not clearly differentiated from anterolateral margins, strongly sinuous, converging posteriorly, with a protuberance directed posterolaterally. Posterior margin wide, about 75% maximum carapace width, very weakly convex. Dorsal surface densely tuberculate, with regions defined by grooves. Protogastric regions separated from mesogastric and hepatic regions by shallow grooves, and from epibranchial regions by deep grooves. Metagastric region divided from branchial regions by deep grooves. Urogastric region transversely depressed. Cervical groove shallow. Branchiocardiac groove deep. Metabranchial regions separated from mesobranchial regions shallow grooves. Intestinal region narrow.

Ventral aspects and appendages not known.

*Remarks: Mariaplax* includes 18 species in the present Indo-Pacific (Ng and Wong, 2019) and an unnamed species from the Middle Pleistocene Hamamatsu Formation, central Honshu (Kato and Kitamura, 2020). Among known extant species the present new species resembles *Mariaplax exigua* Ng and Wong, 2019, from Hong Kong, *M. galaxae* Rahayu and Ng, 2014, from Singapore, *M. granulifera* (Campbell and Stephenson, 1970) from Australia, *M. ourabay* Rahayu and Ng, 2014, from Okinawa, Japan, and



Fig. 1. *Mariaplax ohiranorikoae*, new species. Carapace from the Middle Pleistocene Atsumi Group. *1a*, *b*, holotype (MFM142043), *2a*, *b*, paratype (MFM142044). *3a*, *b*, paratype (MFM142045). a. frontal view; b, dorsal view. Scale bar = 5 mm.



**Fig. 2.** *Mariaplax chenae* **Rahayu and Ng, 2014.** All from the Holocene Nanyo Formation. *1a–e*, MFM142759-1, male. *2a–e*, MFM142759-2, female. *3*, MFM142759-3, male. *4a*, *b*, MFM142759-4, female. *5*, MFM142759-5, male. *6*, MFM142759-6, male. 1a, 2a, frontal view; 1b, 2b, 5, 6, dorsal view; 1c, 2c, 3, ventral view; 1d, 2d, close-up images of maxillipeds 3 and chelipeds; 1e, 2e, 3, 4a, close-up images of thoracic sternum, abdomen, and maxillipeds 3; 4b, close-up image of maxillipeds 3. Scale bars = 5 mm.

M. pitrai Rahayu and Widyastuti, 2018, from Indonesia in that a relatively narrow carapace is about 1.4 times as wide as long and ornamented with closely spaced tubercles on dorsal regions. Mariaplax ohiranorikoae, new species, however, differs from these species in having the well-marked dorsal regions of the carapace. Besides M. ourabay, two extant species, M. chenae Rahayu and Ng, 2014, and M. narusei Rahayu and Ng, 2014, have been recorded from Japan (Rahayu and Ng, 2014; Naruse et al., 2017); M. ohiranorikoae, new species, however, is readily distinguished from both species in having the tuberculate dorsal carapace with well-marked dorsal regions. Naruse et al. (2017) showed that the ratio of the carapace width and length is recognized as a distinctive character within the Japanese species, based upon Rahayu and Ng (2014). The ratio of the carapace width and length is about 1.4 in M. ourabay, 1.5 in M. chenae, and 1.7 in M. narusei (Naruse et al., 2017), whilst that is about 1.4 in M. ohiranorikoae, new species.

The present new species differs from *Mariaplax* sp., as a sole fossil from the Hamamatsu Formation in having the tuberculate dorsal carapace with a protuberance on the posterolateral margin.

Notes on Hexapus anfractus (Rathbun, 1909) from the Holocene Nanyo Formation: Tokai Fossil Society (1977), Umemoto et al. (1994), and Umemoto and Karasawa (1998) reported Hexapus anfractus (Rathbun, 1909) from the Holocene Nanyo Formation (9,000– 5,000 y. B.P.) of the Nagoya Harbor, Ise Bay, Aichi Prefecture, Japan. After the major revision of Hexapodidae by Rahayu and Ng (2014), Mariaplax anfracta (Rathbun, 1909) (=Hexapus anfractus) has been only recorded from Thailand, Malaysia, and Hong Kong (Ng and Wong, 2019) and the Japanese species assigned to H. anfractus has been identified with Mariaplax chenae Rahayu and Ng, 2014. The identify of H. anfractus from the Holocene Nanyo Formation, therefore, must be reconsidered.

The well-preserved specimens (MFM142759-1–6) previously reported as *H. anfractus* (Figs. 2.1a–6) are examined. Among these, a subquadrate carapace is about 1.5 times as broad as long; the male pleon has the somite 6 with a broadly triangular lateral projection and a subtriangular telson with a rounded distal margin; the ischium of the maxilliped 3 is longer than the merus; and

the merus of the pereiopod 4 is long with a longitudinal groove on the lateral margin. These are diagnostic characters of *Mariaplax chenae* (Rahayu and Ng, 2014); this species, therefore, is identical with *Mariaplax chenae*.

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## Appendix

*Mariaplax ohiranorikoae* Karasawa and Kobayashi, new species LSID: urn:lsid:zoobank.org:act:5C7C7E5F-F94C-4944-918E-92DF18904E52 新称:オオヒラヒメムツアシガニ