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A new species of ghost shrimp (Decapoda: Thalassinidea) from the Miocene Kunimi Formation, Fukui Prefecture, Japan

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Abstract

Neocallichirus hattai sp. nov., a new species of the ghost shrimp (Thalassinidea: Callianassoidea) is described from the Miocene Kunimi Formation of Fukui Prefecture, Japan. This represents the second record for the genus from the Miocene of Japan.

Key wards: Decapoda, Thalassinidea, *Neocallichirus*, Miocene, Kunimi Formation, Japan

Introduction

The decapods from the Miocene Kunimi Formation comprises only three thalassinidean species: *Callianassa nishikawai* Karasawa (Callianassidae), *Laurentiella imaizumii* Karasawa (Laomediidae), and *Thalassina anomala* (Herbst) (Thalassinidae). The present paper is to describe a new species of a callianassid from the Kunimi Formation of Fukui Prefecture. This species is well documented from the major cheliped as well as pereiopods 2–5 and abdomen, unusual in the fossil records.

The specimens described here are deposited in the Fukui City Museum of Natural History (FCMNH-GF) and the Mizunami Fossil Museum (MFM).

Locality and Geology

Miocene volcanic rocks and sediments in the Niu Mountains divided into the Nishitani Rhyolite, the Ito-o Formation, the Kunimi Formation, the Aratani Formation, the Ichinose Rhyolite, and the Kunimidake Volcanic Rocks, in ascending order. The Lower to Middle Miocene Kunimi Formation mainly consists of non-marine to shallow marine sandstone, conglomerate, and mudstone, and is intercalated with pumice-lapilli tuff to tuff (Kano *et al*., 2007). This formation yields abundant mangrove and intertidal to shallow marine molluscs (Kaseno and Miura, 1956; Nakagawa, 1989, 1998, 2002), the Daijima type-plants including *Liquidambar miocenica* and *Comptonia naumanni* (Hujioka, 1955; Uemura and Yasuno, 2001), and decapods (Karasawa and Nakagawa, 1992; Karasawa, 1993). The geological age is assigned to 18–16 Ma in K–Ar and fission-track ages (Nakajima *et al*., 1990; Kano *et al*., 2007).

The fossil-locality is shown in Fig. 1. The outcrop is about 70 m-thick, the lower part mainly consists of mudstone and muddy fine-grained sandstone, and the upper part mainly consists of fine-grained sandstone and sandy mudstone (Fig. 2). The specimens were collected from sandy mudstone nodule of the upper part by Naoki Hatta.

Molluscan fossils are abundant in the muddy fine-grained sandstone and sandy mudstone in the lower half (Hatta, 2003) and contains intertidal to mangrove dwellers, *Anadara* (*Hataiarca*) *kakehataensis*, *Crassostrea gravitesta, Geloina stachi, Cyclina japonica, Cultellus izumoensis, Vicarya ykoyamai,* "*Vicaryella*" *notoensis* (not *Turritella* sp. in Hatta, 2003). On the other hand, the upper part of the outcrop mainly consists of wavy and cross laminated fine-grained sandstone with *Mactra* sp., "*Hadecardium*" *ogurai* and *Solidicorbula* sp. Therefore, *Neocallichirus hattai* sp. nov. seems to have lived in subtidal to shallow marine environments.

Systematics

Family Callianassidae Dana, 1852
Subfamily Callichirinae Manning and Felder, 1991

Genus *Neocallichirus* Sakai, 1988

Type species: *Neocallichirus horneri* Sakai, 1988, by original designation.

***Neocallichirus hattai* sp. nov.**

(Figs. 3, 4)

Diagnosis: Large species for *Neocallichirus*. Chelipeds large, unequal, dissimilar in shape. Dactylus of major cheliped with smooth dorsal margin; occlusal margin with broad tooth at mid-length. Palm longer than high; dorsal margin slightly convex, ventral margin slightly

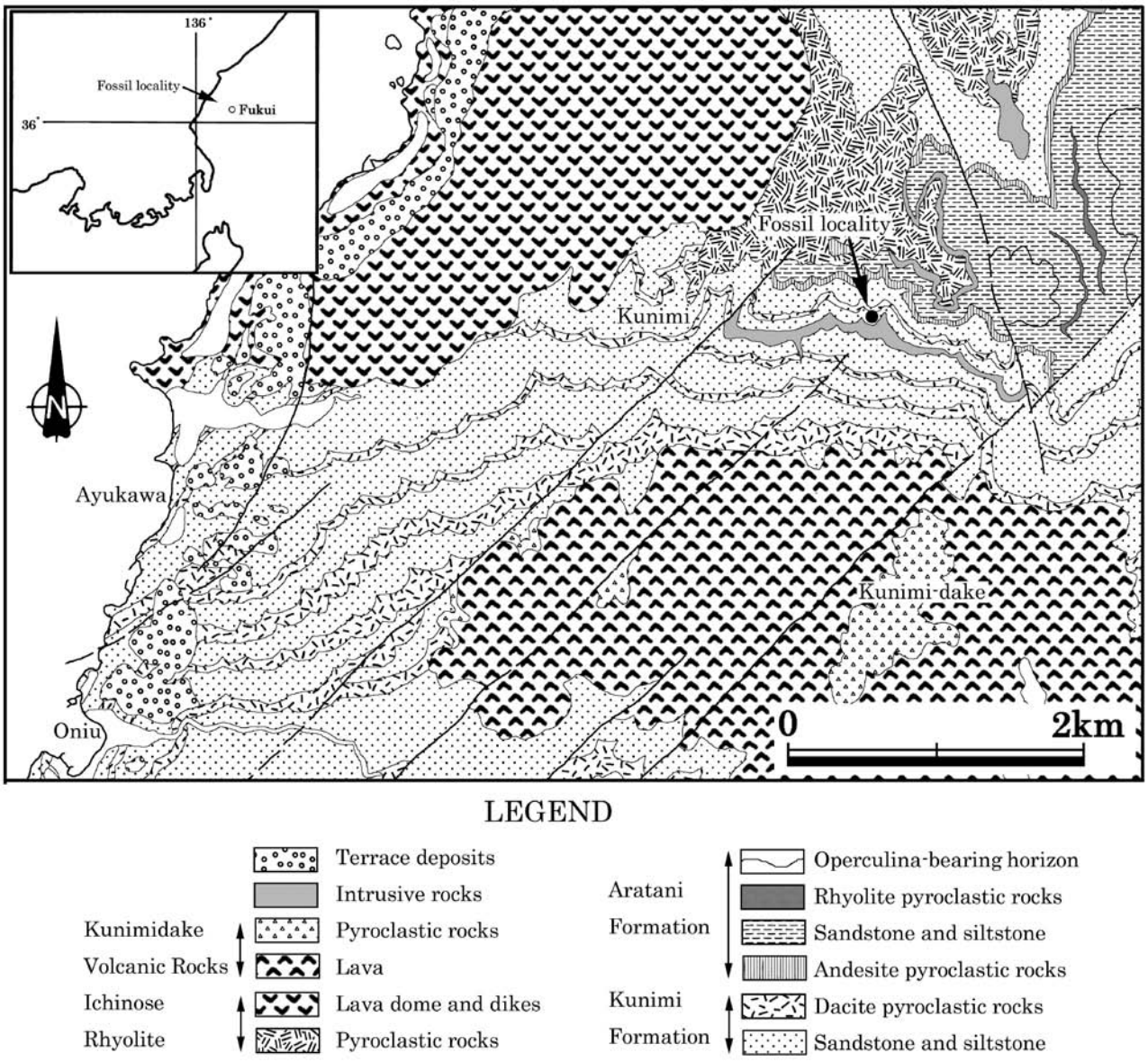

Fig. 1. Map showing the fossil-bearing locality. The geological map modified from Kano *et al*. (2007).

sinuous, both margins obtusely dentate. Carpus subrectangular, about 55–60 % length of palm, about 0.7–0.9 times higher than long. Merus slightly longer than carpus, about 0.6 times higher than long; dorsal margin gently convex; ventral margin strongly convex, finely dentate, without ventral hook; lateral surface with longitudinal ridge. Ischium elongate, about as long as merus. Uropodal endopod subrectangular, much longer than wide, broadened distally. Uropodal exopod broadly triangular, much longer than endopod; lateral margin gently convex; distal margin nearly straight.

Etymology: The specific name is named from N. Hatta who collected specimens.

Description: Large-sized *Neocallichirus*. Chelipeds large, unequal, dissimilar in shape. Dactylus of major cheliped curved ventrally with acutely pointed tip; dorsal margin smooth; occlusal margin bearing broad tooth at mid-length. Fixed finger about 75 % dactylus length with acutely pointed tip; occlusal margin gently concave; ventral margin smooth, gently convex. Palm subrectangular in lateral view, about 1.2–1.7 times longer than high, about 1.7 length of dactylus; dorsal margin slightly convex, ventral margin slightly sinuous, both margins obtusely dentate; lateral surface smooth, longitudinally inflated. Carpus subrectangular in lateral view, about 55–60 % length of palm, about 0.7 –0.9 times higher than long, tapering proximally; lateral surface smooth, longitudinally, convex. Merus slightly longer than carpus, about 0.6 times higher than long; dorsal margin gently convex; ventral margin strongly convex, finely dentate, without ventral hook; lateral surface with longitudinal ridge. Ischium elongate, about as long as merus. Minor cheliped poorly preserved; propodus about 70 % length of that of major cheliped.

Carapace unknown.

Pereiopods 2–5 preserved, depressed laterally, but propodi and dactyli unknown.

Abdomen preserved within some specimens. Somite 1 not preserved.

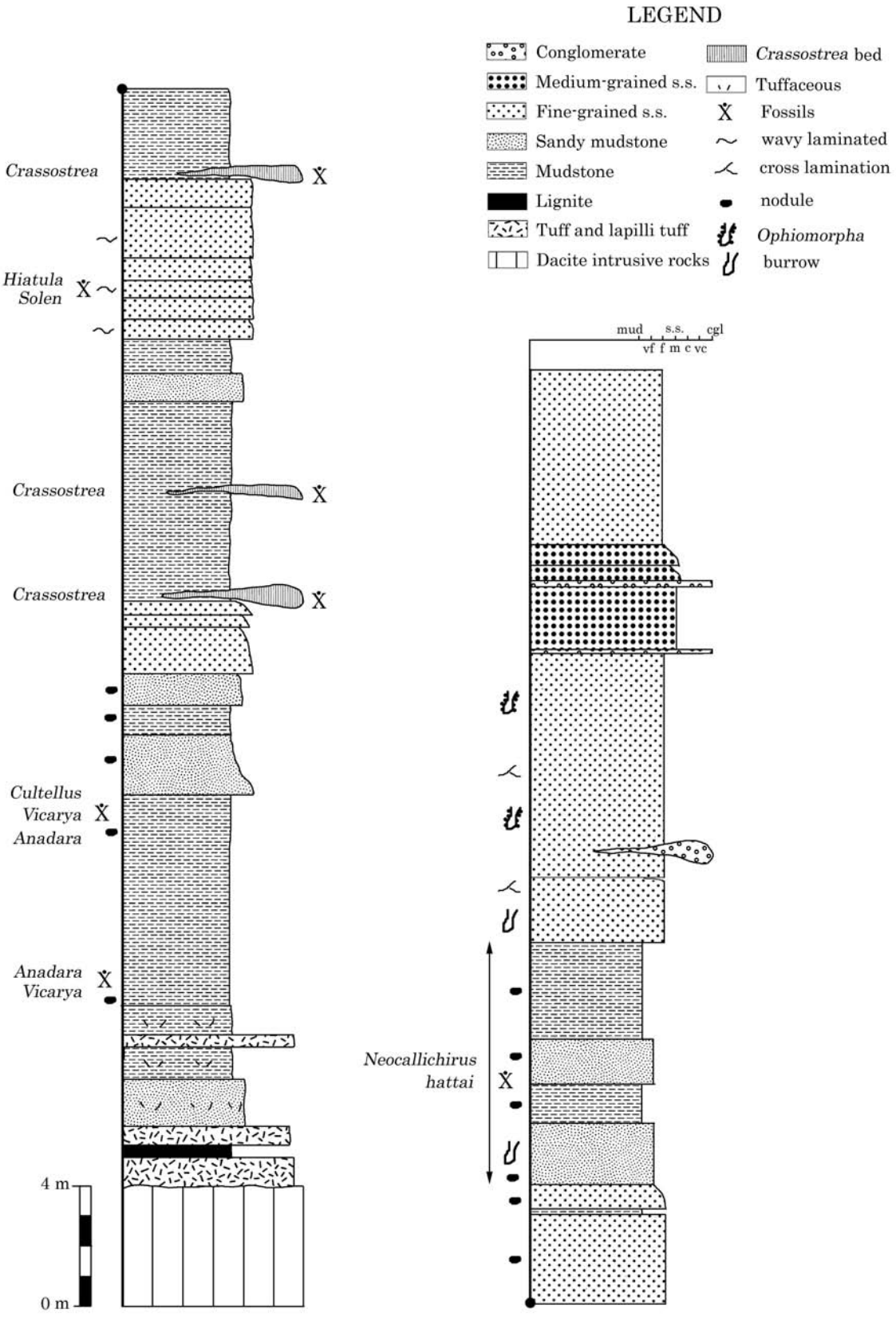

Fig. 2. Columnar section of the fossil-bearing locality.

Somite 2 longer than other somites; ventro-distal lobe rounded, overlapping somite 3. Somites 3–5 shorter than somite 2, similar in size and shape, with rounded ventro-distal lobe overlapping next somite. Somite 6 slightly longer than somite 5, without ventro-distal lobe; arcuate lateral groove present at distal third. Telson poorly preserved, lateral margin convergent distally. Uropodal endopod subrectangular, much longer than wide, broadened distally. Uropodal exopod broadly triangular, divergent distally, much longer than endopod, with dorsal plate; lateral margin gently convex; distal margin nearly straight.

Discussion: The Japanese fossil *Neocallichirus* is represented by three species, *Neocallichirus bona* (Imaizumi, 1959) from the Miocene Moniwa and Akeyo Formations (Karasawa, 1993, 1997), *Neocallichirus okamotoi* (Karasawa, 1993) from the upper Oligocene Hioki Group (Karasawa, 1993, 1997), and *Neocallichirus sakiae* Karasawa and Fudouji, 2000, from the Oligocene Kishima Group (Karasawa and Fudouji, 2000). Among these, *Neocallichirus hattai* most resembles *N. okamotoi*, but differs in that major cheliped has a shorter carpus and the palm with obtusely dentate dorsal and ventral margins. This species differs from *N. sakiae* by having obtusely dentate dorsal and ventral margins of palm and marginal denticles on the ventral margin of merus. A short carpus readily distinguishes this species from *N. bona*. *Callianassa nishikawai* Karasawa, 1993, is abundant in the early Middle Miocene deposits of southwest Honshu. Schweitzer *et al*. (2002) moved *C. nishikawai to Neocallichirus*, but the species has a meral hook, which the extinct *Neocallichirus* lacks. Therefore, the generic status of *Callianassa nishikawai* is retained.

Material examined: Holotype (FCMNH-GF7697), paratypes (FCMNH-GF7698, 7699; MFM83069–83072).

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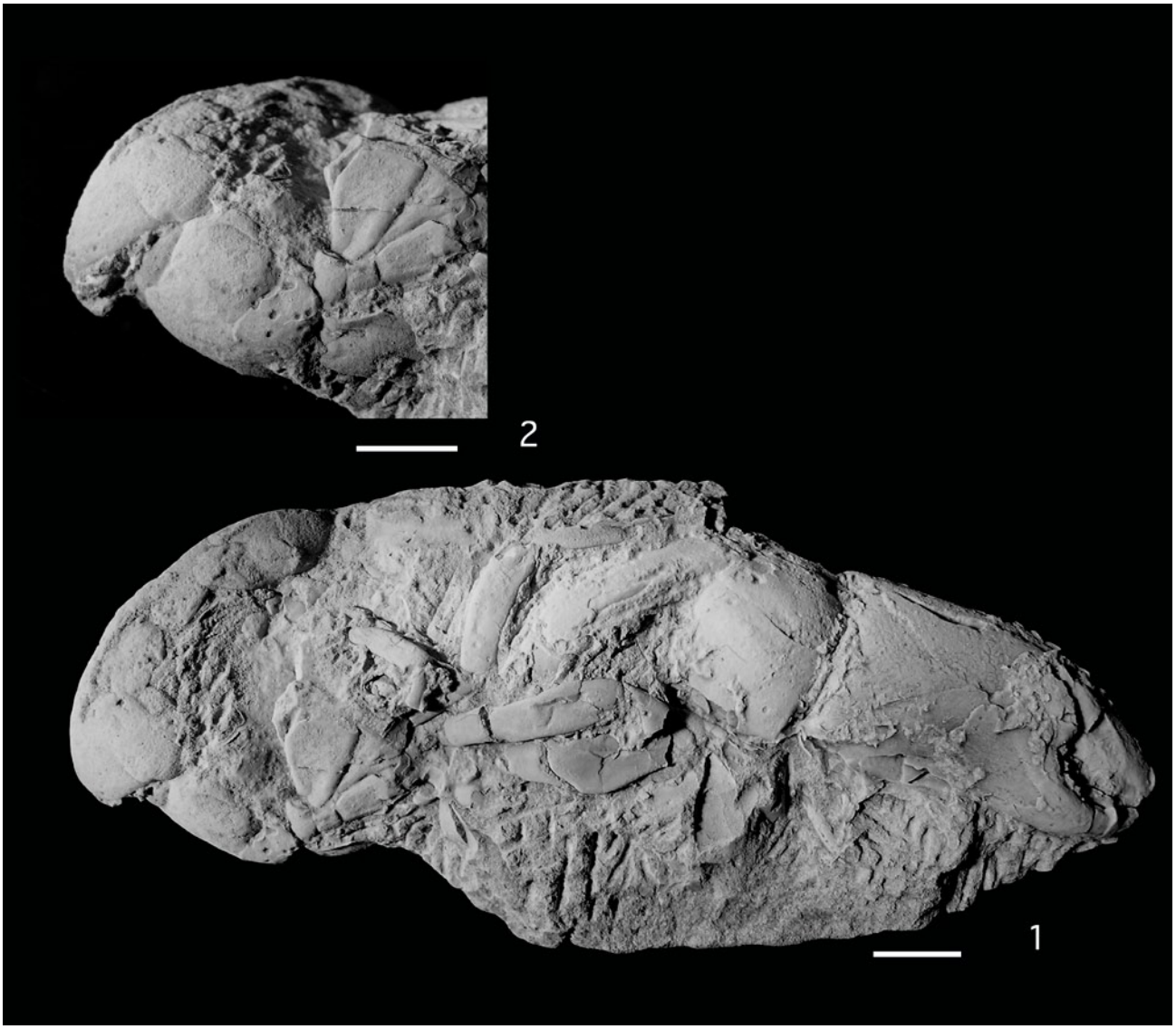

Fig. 3. *Neocallichirus hattai* sp. nov. holotype (FCMNH-GF7697). 1, major cheliped, pereiopods 2–5, abdomen, telson, and uropod. 2, abdomen, telson, and uropod. Scale bar = 1 cm.

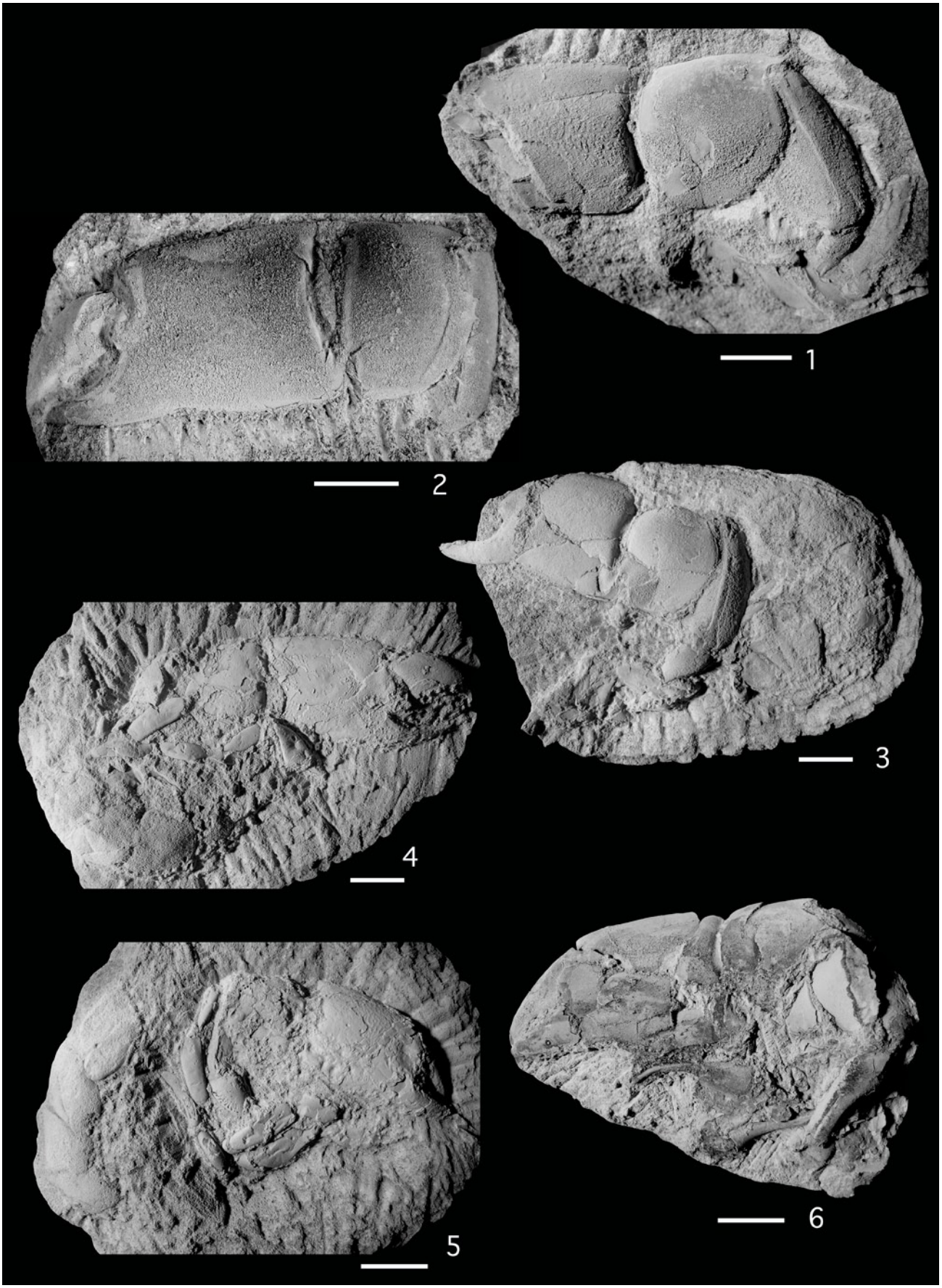

Fig. 4. *Neocallichirus hattai* sp. nov. 1, paratype (MFM83069), major cheliped and pereiopods. 2, paratype (FCMNH-GF7698), major cheliped. 3, paratype (MFM83070), major cheliped, pereiopods, abdomen, telson, and uropod. 4, paratype (MFM83071), major cheliped, pereiopods, and abdomen. 5, paratype (MFM83072), major cheliped, pereiopods, abdomen. 6, paratype (FCMNH-GF7699), chelipeds and pereiopods. Scale bar = 1 cm.

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