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A deep-water comatulid, *Chondrometra rugosa* A. H. Clark, 1918 (Echinodermata, Crinoidea, Comatulida, Charitometridae), first record from Japan

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Abstract: Ten excellent specimens of *Chondrometra rugosa* A. H. Clark 1918 (Echinodermata, Crinoidea, Comatulida, Charitometridae) were collected from the depth of 763-796 m off the Shima Peninsula, Kumano-nada Sea, central Japan on May 1st, 2004. This species has been known from tropical West Pacific. This is the first record for waters around Japan. We propose the Japanese name of this species as "Oni-katsura-umishida".

Key words: Crinoidea, Comatulida, Charitometridae, *Chondrometra rugosa*, Kumano-nada, Japan.

Introduction

The Kumano-nada Sea is located off the southeastern coast of the Kii Peninsula, from Daiosaki in Shima Peninsula, Mie Prefecture to Sionomisaki at the tip of the Kii Peninsula, Wakayama Prefecture; the total extension is approximately 140 km, and its large part borders on Mie Prefecture. The coastline from Toba City to Owase and Kumano City is deeply indented, which shows typical rias coastline. By contrast the coastline from Kumano City to Kiho Town in Minamimuro County is composed of a long gravel beach. The sea bottom slope of the Kumano-nada Sea is generally steep, reaching a depth of about 200 m at the distance of 2-10 km off the shore. In addition to these topographic features, the offshore Kuroshio current forms warm sea conditions (Saba *et al*., 1982); as a result, the Kumano-nada Sea has a diverse fish fauna reflecting the diverse natural environment (Kubo *et al*., 2012). However, the studies of comatulids in this area are few. Although Saba *et al*. (1982) and Kogo (1991) reported nine and 16 species, respectively, the species diversity of this area is still unknown.

In the present paper, one deep-water comatulid, *Chondrometra rugosa* A.H. Clark, 1918 collected from Kumano-nada Sea is reported with brief description based on excellent preserved specimens. This is the first record of this species in the waters around Japan, which was previously known only from the tropical western Pacific.

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Materials and Methods

The specimens were collected from the deep sea in Kumano-nada, Japan using the ORI (Ocean Research Institute, University of Tokyo) Beam Trawl with the R/V *Tansei-Maru* at a depth of 763 m to 796 m. The specimens were fixed with 70% ethanol and deposited at the Osaka Museum of Natural History (OMNH). The terminology for morphological descriptions generally follows Messing (1997) and Clark (1916). Abbreviations follow Kogo and Fujita (2014).

Family Charitometridae A. H. Clark, 1911
[Japanese name: Oni-katsura-umishida-ka]
Genus *Chondrometra* A. H. Clark, 1916
[New Japanese name: Oni-katsura-umishida-zoku]
***Chondrometra rugosa* A. H. Clark, 1918**
[New standard Japanese name: Oni-katsura-umishida]
(Fig. 1A-J)

Chondrometra rugosa A. H. Clark, 1916: 608; 1918: 187, 188, fig. 8; 1950: 206-208.

Material examined. 10 specimens: OMNH-8452, 1 specimen, 34°00.4970'N, 136°54.4270'E, 767.1-774.0 m, H. Kohtsuka coll., May 1, 2004; OMNH-8453, 7 specimens, 34°00.8610'N, 136°54.3210'E, 766.8-771.0 m, H. Kohtsuka coll., May 1, 2004; OMNH-8454, 2 specimens, 33°59.5620' N, 136°55.1230' E, 763.0-796.1 m, H. Kohtsuka coll., May 1, 2004;.

Diagnostic features. The centrodorsal is large, conical, cirrus sockets arranged in 10 regular columns, 2-4 to each column. Cirri are short, one-five to one-sixth of arm length.

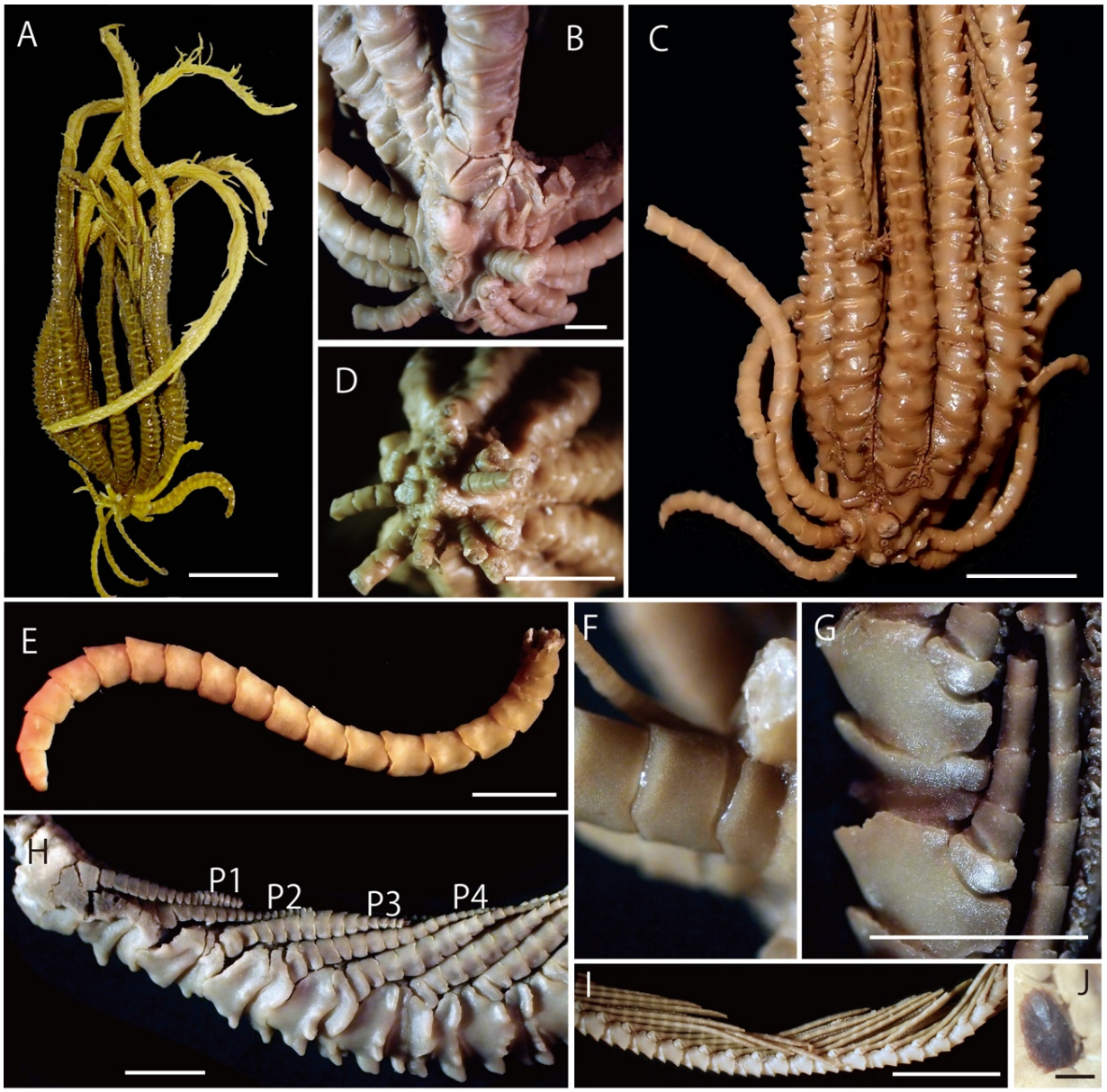

Fig. 1. *Chondrometra rugosa* from Kumano-nada Sea. A: a total body showing the color in life (side view), OMNH Iv-8452; B: centrodorsal (side view), OMNH Iv-8453; C: centrodorsal and proximal arms (side view), OMNH Iv-8452; D: proximal portion of body (aboral view), OMNH Iv-8453; E: a cirrus (side view), OMNH Iv-8453; F: proximal part of a cirrus, OMNH Iv-8452; G: brachials of middle arm including a syzygy (side view), OMNH Iv-8453; H: brachials and pinnules of proximal arm (P1-P4 indicate oral pinnules in side view), OMNH Iv-8453; I: brachials and pinnules of distal arm (side view), OMNH Iv-8453; J: a myzostomid parasite on brachials of middle arm, OMNH Iv-8453. Scale bars: A, 20 mm; B-I, 5 mm; F, J, 1 mm.

The IBr_1 is almost concealed, except for their distal portion, which is visible as a narrow band just below the axillaries from the external view. Basal brachials are V-shaped in cross section.

Description. Centrodorsal large, conical. 5.5-8.5 mm across at base, 6.2-8.0 mm high. 2.5-3.5 mm polar area.

Cirrus sockets arranged in 10 regular columns, 2 to each column (Fig. 1B, D). Both columns completely contacting with each other, and widely separated from adjacent columns by irregular and depressed area.

Cirri stout and short, about one-sixth of arm length (Fig. 1A), XXII-XXX, 17-21, 30-40 mm long. First cirral very short (Fig. 1F); second-fifth broader than long; seventh-tenth, longest cirrals, slightly longer than broad; succeeding cirrals gradually shortened and distally overlapped; two most distal cirrals reduced in size, slightly longer than broad. Opposing spine with? a blunt tubercle or unrecognizable. Terminal claw small, curved, often short protuberant (Fig. 1E).

Radials entirely concealed by centrodorsal. Some small tubercles on the both left and right sides of basal part of arms.

IBr_1 oblong, visible as a narrow band; IBr_2 axillary, rhombic, much shorter than wide. Ossicles of division series

and proximal brachials with prominent median crest, and fringed with irregular folds at corners (Fig. 1B, C, G).

Arms 10 in number, 175-200 mm long. Proximal and middle brachials with a high median crest and tubercles on distal edge border (Fig. 1C, H); distal brachials compressed laterally with overlapping sharp borders (Fig. 1I). The syzygial pairs having different positions in different arms. For example, four arms in a specimen have syzygies in the articulations between following brachials: 3+4, 11+12, 15+16, 19+20, 25+26, 31+32, 39+40, 46+47 and 3+4, 11+12, 15+16, 19+20, 26+27, 32+33+34, 42+43, 49+50, 56+57, 65+66, 75+76, 91+92 and 3+4, 13+14, 19+20, 25+26, 36+37, 44+45, 53+54, 60+61, 69+70, 82+83, 90+91 and 3+4, 14+15, 19+20, 26+27, 32+33, 45+46, 77+78. Some of the positions of the first through sixth syzygy are somewhat regular.

In particular, the positions of the syzygy after the middle of the arm show no regularity, with intervals of 10 brachials muscular articulations or more, …54+55, 59+60, 63+64, 67+68, 71+72.... in some cases, intervals of 2 to 3 brachials muscular articulation can be seen.

P_1 composed of 26-34 pinnule segments, 8.2-10.5 mm long; P_2 of 20-25, 8.0-11.0 mm; P_3 of 17-19, 8.8-9.9 mm; P_4 of 17-20, 10-10.5 mm; middle and distal pinnule segments of 15-19, up to 8.0 mm. P_1 and P_2 composed of small pinnule segments. P_3 to about P_7, are genital pinnules, with much broadened proximal pinnular and rapidly tapering delicate tip (Fig. 1H); gonads unrecognizable. Middle and distal pinnular very slender, composed of long pinnular (Fig. 1A, 1I).

Distribution. From Celebes (Gulf of Bone) to the East Timor Sea, at depths of 520 to 871 m (A. H. Clark, 1950).

Etymology. The specific name "*rugosa*" is named for the morphology. The new standard Japanese name is derived from Japanese words "Oni" (an ogre suggesting the keel of arm side), "Katsura" (Charitometridae, originally means Judas tree) and "umishida" (feather star).

Color in life. Mostly greenish brown overall. In some specimens, centrodorsal, proximal and middle arms greenish brown, distal arms and cirri yellow (Fig. 1A).

Symbiotic. A myzostomid parasite was recognized on the brachials of middle arm (Fig. J).

Remarks. Currently, the genus Chondrometra comprises four species (Clark, 1916, 1950; Marshall & Rowe, 1981; Messing, 2022).

Chondrometra aculeata (Carpenter, 1888) has a small body with arms of about 75 mm in length; the number of XV cirri with 18 segments, and about 27 mm in length; distributed in the Meangis Islands, Indonesia, 914 m in depth (Clark, 1950). Chondrometra crosnieri Marshall & Rowe, 1981 can be distinguished from other species by having smaller conical centrodorsal, slightly shorter arms, and the lack of distinct small spines on the dorsal brachials, indistinct dorsal brachial spines; Distributed in Madagascar, western Indian Ocean (Marshall & Rowe, 1981). Chondrometra robusta (Clark, 1911) is larger in body size, with arm 170-211 mm in length and XX-XXV cirri wach with 26-28 segments, 55-60 mm in length; Distributed in southern Philippines to the East Timor Sea, 520-1334 m in depth (Clark, 1950). Chondrometra rugosa is known from East Timor Sea, south of the Celebes Sea, 520-871 m in depth (Clark, 1950).

The present discovery indicates the first record of *Chondrometra rugosa* from Japanese waters, as well as the extension of the northern limit of this species' geographic range.

The morphological features of the examined 10 specimens mostly correspond to the previous description of Clark (1950). Although the centrodorsal was described as "truncated conical or more or less columnar" in the diagnosis (Clark, 1950: 206), each centrodorsal of all the present specimens is not truncated, nor columnar, but conical (Fig. 1A-D).

The position of syzygy in this species was found to be regular around 3+4 and 15+16; however, the position of syzygy after that varies from arm to arm.

In *Chondrometra aculeata* (Carpenter, 1888), syzygy was reported to be present at intervals of 6-9 oblique muscular articulations the distal of the arm between the vicinity of 3+4 and 15+16 (Clark, 1950). The position of the syzygy in this species is less regular than in *C. aculeta*.

Cysts of parasitic myzostomids were observed on the outer side of the brachials of the middle arm; the species could not be determined (Fig. 1J).

This time, the specimens were collected from the Kumano-nada Sea at a depth of about 760-790 m. Although this species has not been recorded from the waters around Japan, it is presumed that there are at least a few individuals in the limited depth range of the Kumano-nada Sea. Since there is little ecological information on this species, the accumulation of collection records based on specimens of this species will contribute not only to the understanding of its distribution area but also to the elucidation of knowledge on its growth.

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