

## A New Species of the Genus *Cytaeis* (Cnidaria, Hydrozoa) from Tateyama Bay, Japan

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**Abstract** *Cytaeis kakinumae* sp. nov. (Cytaeidae, Hydrozoa) is described based on specimens collected from Tateyama Bay, Japan. The hydroid colonies of this species grow on a substrate hitherto unknown, viz. the shells of the living gastropod, *Nebularia rosacea* (Reeve, 1845). This new species can be distinguished from its congeners in the medusa stage by the distinctive oval umbrella with a conical tip, and in its hydroid stage by the kind of substrate, the polyp morphology, and the cnidome.

**Key words:** Cytaeidae, *Cytaeis kakinumae*, Hydrozoa, new species.

### Introduction

In March, 2012 an open course of the education program on natural history studies on marine animals was conducted at the Marine and Coastal Research Center, Ochanomizu University. During this open course, a short faunal survey program on the benthos was performed using a small dredge (30 cm in wide) in Tateyama Bay, Chiba Prefecture, Japan. During this survey program an immature colony of an unknown athecate hydroid was discovered on the shell of a living gastropod, *Nebularia rosacea* (Reeve, 1845), collected from the sandy mud bottom at ca. 15 m depth. Subsequently, in July, 2012, an additional hydroid colony was collected from the shell of the same gastropod species in the same locality by the dredge.

These two hydroid colonies were brought to the National Museum of Nature and Science, Tsukuba, and kept alive in the laboratory for taxonomic studies. The colonies on the gastropod shells were fed with food (*Artemia* nauplii) in the

culture containers (8 cm in diameter and 4 cm in height) filled with artificial seawater (SEA LIFE: Marine Tech Co., Tokyo) at 15–23°C. During the rearing period, many medusae, the most important taxonomic character to distinguish species in these hydroids, were released from the colonies and, by feeding, matured after about 20 days from release. Studies of these hydroid colonies and the matured medusae confirmed that the hydroid is a new species of *Cytaeis*.

After we obtained enough mature medusae to definitively identify the species, all specimens of the hydroid colonies on the gastropod shells and the medusae (both stages, just after liberation and full maturation) were fixed in 10% formalin, diluted with sea water. These specimens are deposited in the National Museum of Nature and Science, Tsukuba (NSMT). Measurements of hydroid colonies and medusae of type material in living condition are shown in Table 1.

Table 1. Measurements (mean  $\pm$  S.D., range) of *Cytaeis kakinumae* sp. nov.

	P (n = 20)	MB (n = 30)	NM (n = 30)	MM (n = 30)
Height of body (mm)	1.39 $\pm$ 0.56 (0.5–3.1)	0.8 $\pm$ 0.04 (0.6–0.9)	0.56 $\pm$ 0.06 (0.45–0.75)	1.8 $\pm$ 0.1 (1.6–2.1)
Width of body (mm)	0.16 $\pm$ 0.04 (0.1–0.25)	0.3 $\pm$ 0.03 (0.25–0.32)	0.53 $\pm$ 0.06 (0.40–0.70)	1.3 $\pm$ 0.1 (1.2–1.5)
Length of manubrium (mm)				0.6 $\pm$ 0.1 (0.5–0.7)
No. of oral tentacles	7.8 $\pm$ 0.94 (4–10)		4	4
No. of marginal tentacles			4	4

P: polyps; MB: medusa buds; NM: medusae within 24 hrs after liberation; MM: medusae with matured gonads.

### Taxonomy

Family Cytaeidae L. Agassiz, 1862

Genus *Cytaeis* Eschscholtz, 1829

*Cytaeis kakinumae* sp. nov.

[Japanese name: Eboshi-tamakurage]

(Fig. 1–3)

*Type material.* Holotype: NSMT-Co 1393, female. Colony growing on the shell of *Nebularia rosacea* (Reeve, 1845), and medusae (both just after liberation and after full maturation) released in the laboratory. Sandy mud bottom at ca. 15 m depth off Koyatsu, Tateyama Bay, Chiba Prefecture, Japan. 9 July 2012. Paratype: NSMT-Co 1394, male. Ditto in the kind of specimens and the locality of the holotype. 12 March 2012.

*Description.* Hydroid colonies (Fig. 1A–C) of the type material were growing on the shell of the living gastropod *Nebularia rosacea* (Reeve, 1845). Hydrorhizae covered with perisarc run in the grooves of the host gastropod shells. Polyps and medusa buds were formed on the hydrorhizae. Polyps were cylindrical and whitish. The mouth opened at the tip of the conical hypostome, surrounded by 4–10 filiform tentacles. No perisarc cup was observed around the basal part of the polyps. Greenish medusa buds were pyriform with short stalks. The medusa buds developed to medusae on the hydrorhizae.

Medusae (Fig. 2A–D) were free living. Newly liberated medusae (within 24 hrs. after liberation from hydroid colonies) had a greenish spherical umbrella with four radial canals and a ring canal.

Manubrium cylindrical dangling from apex of umbrella. Mouth simple, without pleats on edge, opening at tip of manubrium, with four unbranched oral tentacles surrounding it. One marginal tentacle extending from each of the four tentacular bulbs arranged on margin of umbrella. Gonads were not developed around the manubrium. However, the interstitial cells fated to differentiate to germ cells, or the primordial germ cells, could be observed in the area of supposed gonad development through staining with 0.05% toluidine blue solution of pH 6.0 (Fig. 3).

After about 20 days after liberation, medusae had fully developed gonads around the manubrium and spawned gametes. The transparent umbrella of the matured medusa transformed into an oval shape with a conical tip. Tentacle number, however, did not change during growth. Eggs transparent, 100  $\mu$ m in diameter.

Three kinds of nematocysts (Desmonemes, Microbasic euryteles and Basitrichous isorhizas) occurred (Table 2). Desmonemes were found in the oral tentacles of polyps and the marginal tentacles of medusae. Microbasic euryteles were classified into four types by size and proportion. Types 1 and 2 of the microbasic euryteles were found in the polyps. Type 3 was scattered on the umbrella of the medusae and type 4 was distributed only in the oral tentacles of the medusae. Basitrichous isorhizas were exclusively found in the polyps existing around the aperture of the host gastropod shells.

*Etymology.* The specific name “kakinumae” is dedicated to the late Dr. Yoshiko Kakinuma

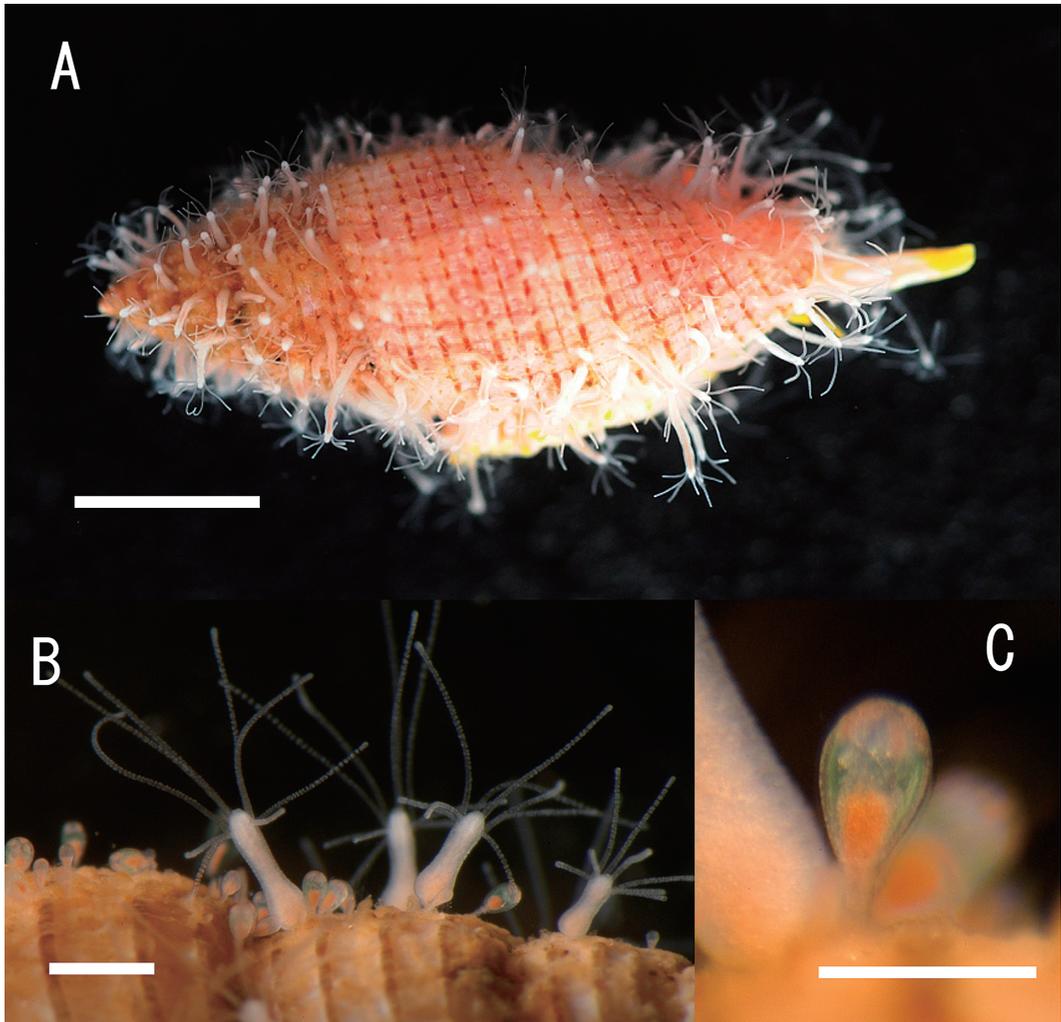


Fig. 1. Hydroid colony of *Cytaeis kakinumae* sp. nov. — A, a hydroid colony growing on the shell of the living gastropod *Nebularia rosacea* (Reeve, 1845); B, polyps and medusa buds formed on hydrorhizae; C, greenish medusa buds (A–C are from holotype. A–C were photographed in the living condition). Scale = 5 mm in A, 0.5 mm in B and C.

Table 2. Dimensions (mean  $\pm$  S.D., range) of each type of nematocysts for holotype of *Cytaeis kakinumae* sp. nov. ( $\mu\text{m}$ )

	<i>n</i>	Length	Width
Polyps			
Desmonemes	30	7.6 $\pm$ 0.5 (7.0–8.0)	4.6 $\pm$ 0.4 (4.0–5.0)
Microbasic euryteles			
type 1	30	11.5 $\pm$ 0.6 (10.2–12.0)	5.3 $\pm$ 0.7 (4.2–6.0)
type 2	30	7.9 $\pm$ 0.2 (7.6–8.0)	3.8 $\pm$ 0.2 (3.6–4.0)
Basitrichous isorhiza	30	23.3 $\pm$ 1.06 (22.0–25.0)	9.5 $\pm$ 0.9 (8.0–10.4)
Medusae			
Desmonemes	30	7.0 $\pm$ 0.5 (6.0–7.6)	4.1 $\pm$ 0.3 (3.6–4.4)
Microbasic euryteles			
type 3	30	8.8 $\pm$ 0.4 (8.0–9.0)	5.8 $\pm$ 0.3 (5.0–6.0)
type 4	30	9.2 $\pm$ 0.7 (8.0–10.0)	2.5 $\pm$ 0.4 (2.0–3.0)

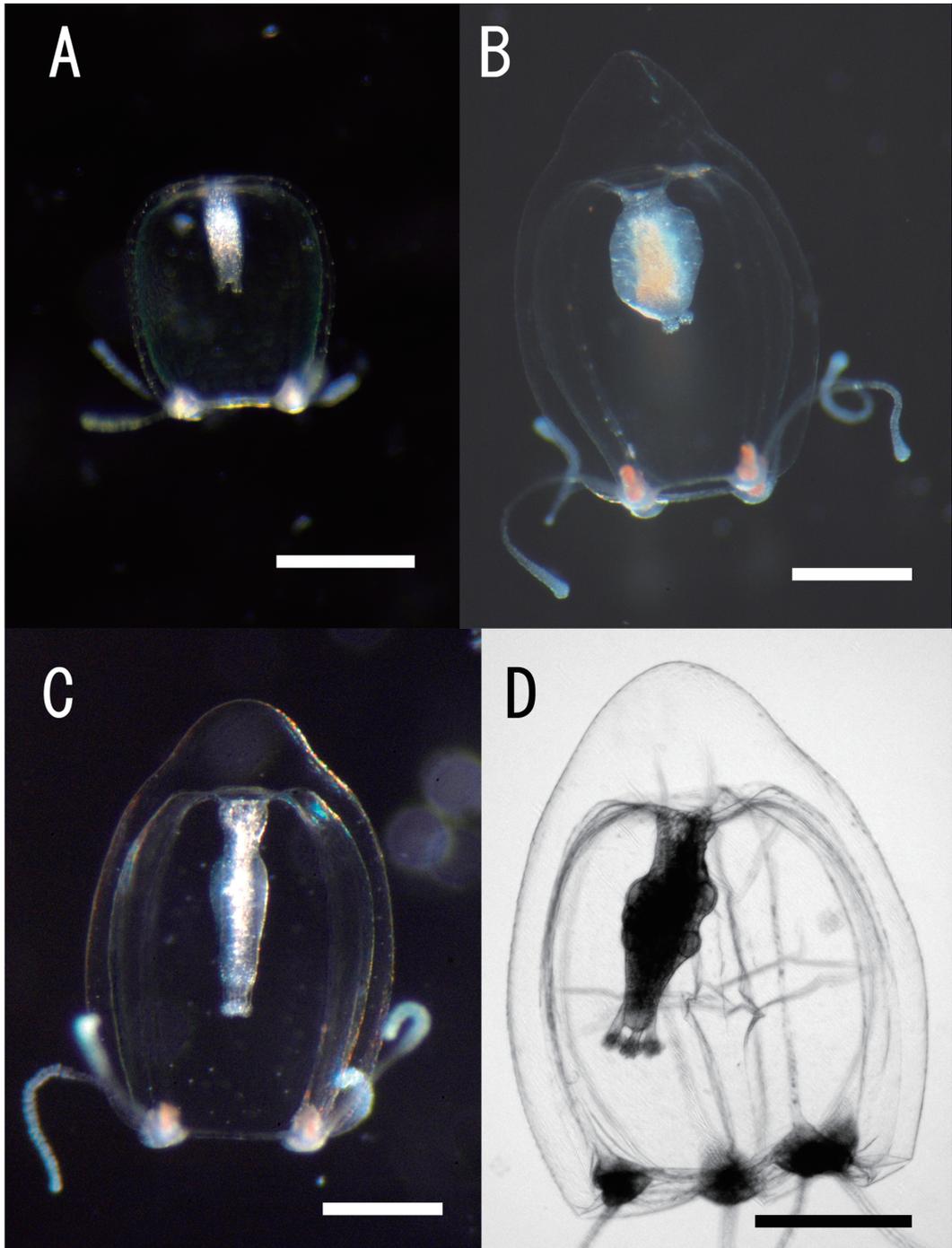


Fig. 2. Medusae of *Cytaxis kakinumae* sp. nov. — A, newly liberated medusa (within 24 hrs. after liberation from hydroid colony); B, female medusa with fully developed gonads; C, male medusa with fully developed gonads; D, oval umbrella with a conical tip of the mature female medusa (A, B, D are from holotype and C is from paratype. A–C were photographed in the living condition and D was in fixed condition). Scale = 0.2 mm in A, 0.5 mm in B–D.

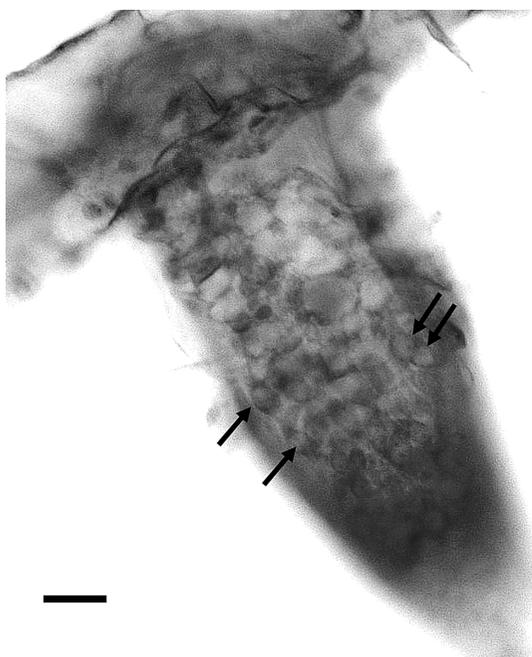


Fig. 3. Manubrium of newly liberated medusa stained by 0.05% toluidine blue solution (pH 6.0). — The arrows indicate the interstitial cells fated to differentiate to germ cells, or primordial germ cells. Scale = 10  $\mu$ m.

who contributed to the development of biological studies on hydrozoa in Japan.

*Remarks.* The present new species is assigned to the genus *Cytaeis* by having medusae with four tentacles extending from the margin of the umbrella and by having unbranched oral tentacles arranged around the tip of the manubrium (Bouillon *et al.*, 2006). This new species can be distinguished from the six congeners (*Cytaeis adherens*, *C. imperialis*, *C. pusilla*, *C. tetrastyla*, *C. uchidae* and *C. vulgaris*) in the mature medusae by its distinctive oval umbrella with a conical tip (Bouillon *et al.*, 1991; His Majesty the Showa Emperor, Hirohito, 1988; Mayer, 1910; Rees, 1962; Uchida, 1964). Although the mature medusae are unknown in the other four species (*C. capitata*, *C. nassa*, *C. niotha* and *C. nuda*), *Cytaeis kakinumae* is distinguishable from these four species by the combination of the difference of the substrata habitat of the hydroid colonies, the morphology of the polyps and the cnidome

(His Majesty the Showa Emperor, Hirohito, 1988; Millard, 1959; Puce *et al.*, 2004; Rees, 1962).

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