

***Cytaeis nuda* Rees, 1962 (Cnidaria: Hydrozoa) from Toyama Bay, Japan**

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Abstract: *Cytaeis nuda* Rees, 1962, previously known only from Sagami Bay, is newly recorded from Toyama Bay, Japan. Hydroid colonies of the species were found on sponge encrusted shells of two living gastropod species, *Fusinus perplexus* (A. Adams, 1864) and *F. ferrugineus* Kuroda and Habe, 1961. Fully grown medusae and nematocyst composition are described for the first time. The species can be distinguished from its congeners by the combination of small number of eggs and timing of gonad development, in addition to host preference.

Key words: Hydrozoa, Cytaeidae, *Cytaeis nuda*.

Introduction

Cytaeis nuda Rees, 1962 was described on the basis of two specimens growing on the sponge encrusted shells of a live gastropod *Fusinus perplexus* collected from Sagami Bay in July 1934 by the Showa Emperor (Rees, 1962). In the original description, *C. nuda* was distinguished from its congeners by the small number of eggs found in the deep bell-shaped female medusae just after liberation and the naked polyps lacking perisarcular cups. However, because the number of eggs may increase during medusa growth, a description of the fully grown medusa, commonly considered to bear the most important taxonomic characters of hydrozoa, was clearly necessary. Up to now, such has not been possible owing to the non-collection of additional specimens of the species, even from the type locality, since 1934.

In May 2013, during research on fauna of the Sea of Japan, many specimens of an athecate hydroid species living on the sponge encrusted shells of live gastropods, *Fusinus perplexus* and *F. ferrugineus*, were collected from Toyama Bay. The hydroid specimens were tentatively identified as *Cytaeis nuda* due to the deep bell-shaped female medusa having a small number of eggs just after liberation, and naked polyps without perisarcular cups, in addition to their host animals. In the present study the morphology of fully grown medusae was clarified so as to enable a positive distinction between *Cytaeis nuda* and its congeners. Additional information on morphological characteristics of the former species is also included here.

Materials and Methods

Thirty specimens of two live gastropod species (*Fusinus perplexus* and *F. ferrugineus*) with sponges on their shells were kindly provided by Mr. Ikeguchi, Notojima Marine Aquarium, having been initially collected by a fisherman from ca. 30 m depth in Toyama Bay, off Noto Peninsula, in May 2013. Some of the shells were completely covered by sponges, possibly an unde-

scribed species of Demosponge (Y. Ise, pers. comm.), and the others partly so (Fig. 1). Hydroid colonies were found on all of the shells.

The gastropods, complete with hydroid colonies, were conveyed to the National Museum of Nature and Science, Tsukuba, and kept alive in the laboratory (in closed aquariums with filtering apparatus, filled with 45 L of artificial seawater (SEA LIFE: Marine Tech Co., Tokyo) at 17–23°C) so as to obtain fully grown medusae. The hydroid colonies and gastropods were fed *Artemia* nauplii and clam meat, respectively. Many medusae of both sexes were released from these hydroid colonies, being subsequently held in culture containers (8 cm diameter and 4 cm height) filled with artificial seawater as above, and fed with *Artemia* nauplii. Live measurements of the hydroid colonies and medusae were also taken (Table 1).

Description

Family Cytaeidae L. Agassiz, 1862

Genus *Cytaeis* Eschscholtz, 1829

Cytaeis nuda Rees, 1962

Cytaeis nuda Rees, 1962, p. 387–390, text-figs. 4–7, plate 10, fig. 1; Uchida, 1964, p. 139–140; Hirohito, His Majesty the Showa Emperor, 1988, p. 110, fig. 39 d–f.

Hydroid colonies (Fig. 2A–C). Hydroid colonies were present only on the sponge encrusted areas of the shells of living specimens of *Fusinus perplexus* and *F. ferrugineus*. Polyps and medusa buds were formed on hydrorhizas present on the host gastropod shells and within the sponges. Polyps were cylindrical without perisarcular cups around their basal parts, their tips appearing above the sponge surface. The mouth opening at the top of the conical hypostome was surrounded by 7–10 filiform tentacles. Pyriform medusa buds, developed within the sponge body, appeared on the surface just before liberation. Under artificial rearing conditions, the hydroid colonies eventually disappeared from the shells following the degeneration of the sponges.

Medusae (Fig. 2D–F). Just after their liberation from the hydroid colonies, medusae were 0.3–0.4 mm in diameter, being characterized by a deep bell-shaped umbrella which subsequently became spherical of 0.45–0.70 mm in diameter within the next 24 hours. Medusae reached maximum size after about 10 days, most living for ca. 20 days following release, although some persisted for up to 50 days. Medusae had four radial canals and a ring canal on the umbrella. One

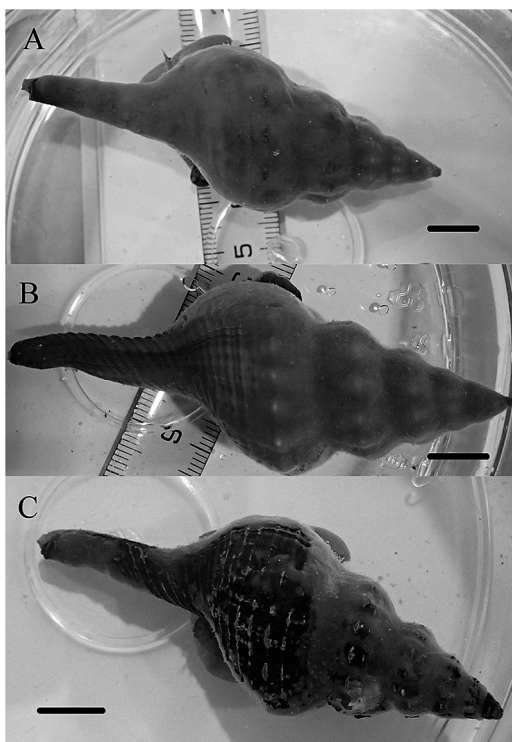


Fig. 1. Sponge encrusted shells of two live gastropods (*Fusinus* spp.) from ca. 30 m of Toyama Bay, off Noto Peninsula. A, a shell completely covered with thick layer of sponge; B, a shell mostly covered with thin layer of sponge; C, a shell partly covered with thin layer of sponge. Scale=1 cm.

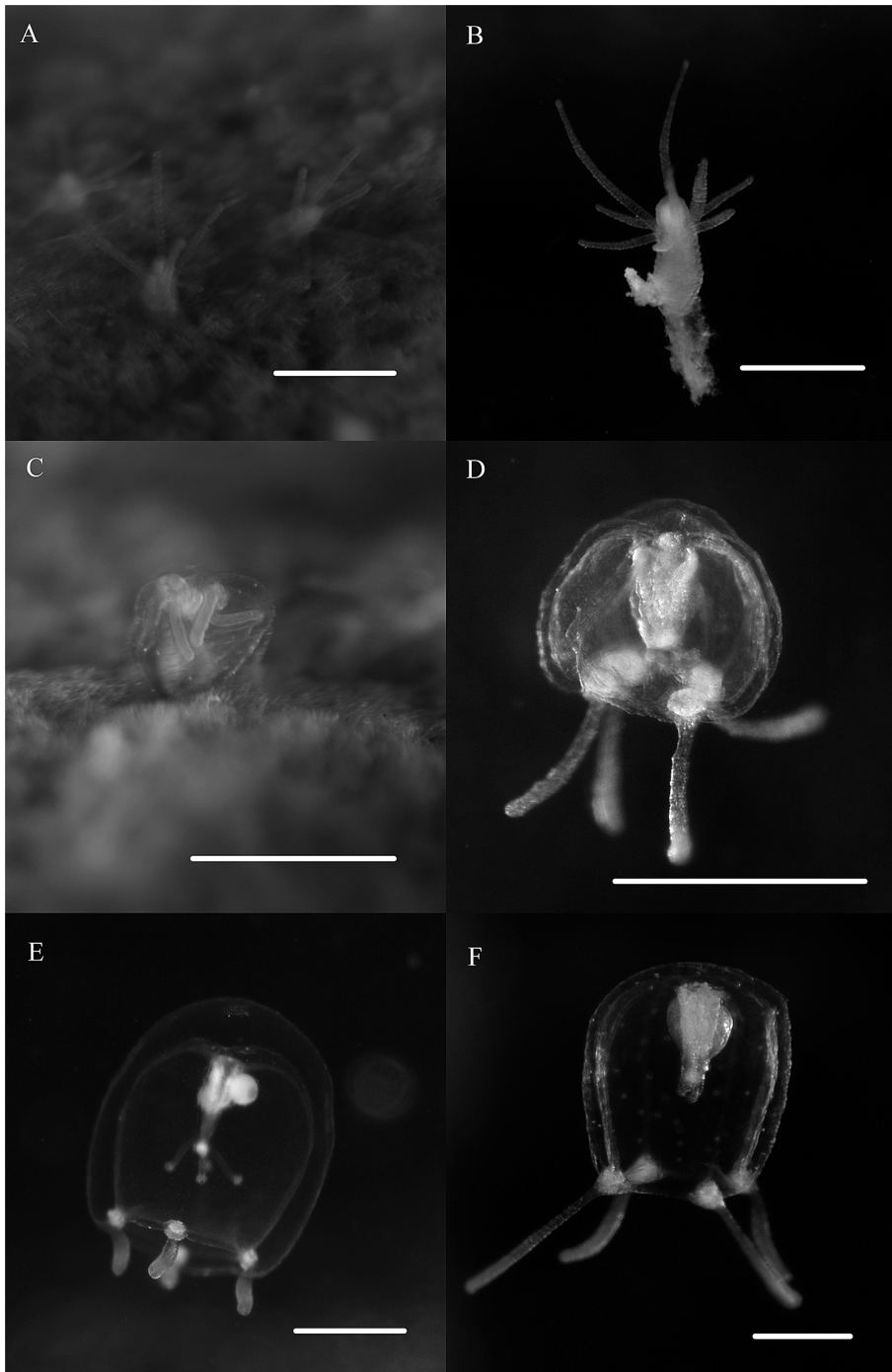


Fig. 2. *Cytaeis nuda*. A, polyps with tips apparent above the surface of the sponge; B, a polyp separated from the hydroid colony; C, a medusa bud on the sponge; D, a medusa within 24 hours following liberation from the hydroid colony; E, a fully grown female medusa (50 days from release) with two ova in the gonads; F, a fully grown male medusa (10 days from release) with full matured spermatozoa in the gonads. Scale=0.5 mm.

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

	Polyps (<i>n</i> = 30)	Medusae within 24 hours after liberation (<i>n</i> = 30)	Fully grown medusae (<i>n</i> = 30)
Body height (mm)	0.5 $\pm$ 0.06 (0.4–0.6)	0.50 $\pm$ 0.04 (0.4–0.6)	1.0 $\pm$ 0.1 (0.9–1.2)
Body width (mm)	0.20 $\pm$ 0.04 (0.15–0.27)	0.57 $\pm$ 0.05 (0.45–0.70)	1.0 $\pm$ 0.1 (0.9–1.2)
Length of manubrium (mm)		0.24 $\pm$ 0.03 (0.2–0.3)	0.4 $\pm$ 0.1 (0.3–0.5)
No. of oral tentacles	8.6 $\pm$ 0.95 (7–10)	4	4.6 $\pm$ 1.1 (4–7)
No. of marginal tentacles		4	4

Table 2. Dimensions (mean $\pm$ S.D., range) of each nematocyst type of *Cytaeis nuda*.

	<i>n</i>	Length (μ m)	Width (μ m)
Polyps			
Desmonemes	30	6.2 $\pm$ 0.2 (5.0–7.6)	2.2 $\pm$ 0.2 (1.6–2.4)
Microbasic euryteles	30	8.7 $\pm$ 0.5 (8.0–9.0)	2.4 $\pm$ 0.3 (2.0–3.0)
Medusae			
Desmonemes	30	6.2 $\pm$ 0.4 (6.0–7.0)	3.4 $\pm$ 0.5 (3.0–4.0)
Microbasic euryteles			
oral tentacles	30	8.2 $\pm$ 0.5 (7.6–9.0)	2.8 $\pm$ 0.4 (2.2–3.6)
umbrella	30	10.6 $\pm$ 1.0 (10.0–12.0)	7.3 $\pm$ 0.5 (7.0–8.0)

marginal tentacle extended from each of four tentacular bulbs arranged on the margin of the umbrella. A cylindrical manubrium dangled from the apex of the umbrella, the mouth opening at the tip. Unbranched oral tentacles around the mouth numbered four just after liberation, sometimes increasing to seven in fully grown medusae. Gonads already developed around the manubrium just after liberation comprised several oocytes with germinal vesicles in females. However, ova numbers did not increase with subsequent growth of the medusae. Spawned eggs were milky and 150 μ m in diameter.

Nematocysts. Two types of nematocysts (desmonemes and microbasic euryteles) were found (Table 2). Both two nematocyst types were present on the oral tentacles of the polyps. Desmonemes were also present on the marginal tentacles of the medusa and microbasic euryteles on the oral tentacles. Microbasic euryteles, of greater size than those on the oral tentacles, were distributed over the umbrella.

Remarks. Hydroid specimens growing on the sponge encrusted shells of two live gastropods (*Fusinus* spp.) collected from Toyama Bay were identified as *Cytaeis nuda* Rees, 1962 on the basis of the following characters provided in the original description of the species; deep bell-shaped medusa morphology just after liberation, naked polyps and small numbers of eggs. *Cytaeis nuda* can be discriminated from ten congeners (*Cytaeis adherens*, *C. capitata*, *C. imperialis*, *C. kakinumae*, *C. nassa*, *C. niotha*, *C. pusilla*, *C. tetrastyla*, *C. uchidae* and *C. vulgaris*) by the combination of morphological differences in the polyps and medusae, egg numbers, the timing of gonad development and nematocyst composition, in addition to host preference (Mayer, 1910; Millard, 1959; Rees, 1962; Uchida, 1964; Hirohito, His Majesty the Showa Emperor, 1988; Bouillon *et al.*, 1991; Puce *et al.*, 2004; Namikawa and Deguchi, 2013).

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References

- Bouillon, J., F. Boero and G. Seghers, 1991. Notes additionnelles sur les meduses de Papouasie Nouvelle-Guinee (Hydrozoa, Cnidaria) IV. *Cahiers de biologie marine*, **32**: 387–411.
- Hirohito, His Majesty the Showa Emperor, 1988. The hydroids of Sagami Bay. Biological Laboratory, Imperial Household, Tokyo. 179 pp. (English text) + 110 pp. (Japanese text).
- Mayer, A. G., 1910. Medusa of the world. Hydromedusae, I, II. 498 pp., 55 pls. Washington.
- Millard, N. A. H., 1959. Hydrozoa from the coast of Natal and Portuguese East Africa. II. Gymnoblaster. *Annals of the South African Museum*, **44**: 297–313.
- Namikawa, H. and R. Deguchi, 2013. A new species of the genus *Cytæis* (Cnidaria, Hydrozoa) from Tateyama Bay, Japan. *Bulletin of the National Museum of Nature and Science, Series A (Zoology)*, **39**: 63–67.
- Puce, S., A. Arillo, C. Cerrano, R. Romagnoli and G. Bavestrello, 2004. Description and ecology of *Cytæis capitata* n. sp. (Hydrozoa, Cytaeididae) from Bunaken Marine Park (North Sulawesi, Indonesia). *Hydrobiologia*, **530/531**: 503–511.
- Rees, W. J., 1962. Hydroids of the family Cytaeidae L. Agassiz. 1862. *Bulletin of the British Museum (Natural History) Zoology*, **8**: 381–400.
- Uchida, T., 1964. A new hydroid species of *Cytæis*, with some remarks on the interrelationships in the Filifera. *Publication of the Seto Marine Biological Laboratory*, **12**: 133–144.