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Note

# First record of wild polyps of *Chrysaora pacifica* (Goette, 1886) (Scyphozoa, Cnidaria)

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**Abstract:** Polyps of *Chrysaora pacifica* were found on sediments sampled from the sea bottom in Sagami Bay near the mouth of the Sagami River on 26 June 2009; they were identified from released ephyrae in the laboratory. This is the first record of wild polyps of *C. pacifica*. Polyps and/or podocysts were found from five among the six stations. They were found on 25 shells (2.5–9.2 cm in width, 1.6–5.3 cm in height) and on 22 stones (1.5–8.0 cm in width, 1.3–5.0 cm in height). The shells with polyps were mostly from the dead clam *Meretrix lamarckii*. Polyps and podocysts were mostly found on the concave surface of bivalve shells, or in hollows of the stones. The number of polyps and podocysts per shell ranged between 0–52 (median=9) and 0–328 (median=28); and those per stone were 1–12 (median=2) and 0–26 (median=1.5). The number, especially of podocysts, was much greater on shells than on stones. On a convex substrate they can easily be removed by being hit with other substrates during dredging and washing, and such a process may also occur in natural conditions. They were induced to strobilate and release ephyrae by decreasing the temperature from 22–23°C to 5–10°C.

**Key words:** benthos, jellyfish, life cycle, sea nettle, Semaeostomeae

Recent increases of jellyfish populations have led to the need to integrate social demands to understand, predict and control jellyfish populations. For such a purpose, understanding the biology and ecology of the polyp stage is essential. Wild colonies of polyps of *Aurelia* spp. have been found on the undersurface of floats in protected areas and investigation of their ecology is progressing (Ishii & Katsukoshi 2010, Miyake et al. 2002, Purcell et al. 2009, Willcox et al. 2008). However, in most scyphozoan species the habitat of polyps is unknown.

Among Scyphozoa, polyps of Coronatae have been collected from shallow waters to sea bottom areas of several hundred meters depth, probably because they have a chitinous exoskeleton that is easily visible in bottom samples. In Japan, two species of the genus *Stephanoscyphus* are known (Komai 1936). Among the other two orders (Semaeostomeae and Rhizostomeae) polyps do not have such prominent outstructures, therefore previous records, excluding *Aurelia* spp., are fewer than for those of Coronatae. Cargo & Shultz (1966) reported the distribution of polyps of *Chrysaora quinquecirrha* (DeSor, 1848) and *Cyanea* sp. in Chesapeake Bay. Miyake et al. (2004) reported polyps of *Sanderia malayensis* Goette, 1886 attached to tubes of tubeworm *Lamellibrachia satsuma* Miura, Tsukahara & Hashimoto, 1997 at submarine fumaroles in Kagoshima Bay. With regards to the Rhizostomeae, Dawson et al. (2001) reported polyps of *Mastigias papua* (Lesson, 1830) from the bottom of brackish lakes in Palau.

I surveyed the sea bottom in Sagami Bay near the mouth of Sagami River to find polyps of *Rhopilema esculentum* Kishinouye, 1891 and accidentally found polyps of *Chrysaora pacifica* (Goette, 1886). This is the first record of wild polyps of *C. pacifica*, so I leave a brief note on the discovery for the sake of future studies. Although most recent literature on the common Japanese *Chrysaora* species use the specific name *melanaster*, I use the specific name *pacifica* throughout this report according to the revision of the genus by Morandini & Marques (2010).

On 26 June 2009 I surveyed near the outflow of the Sagami River, southern coast of Japan (Fig. 1). Stones and mollusk (mostly bivalves) shells were sampled by two to five minute tows of a small Kamiya's dredge (38 cm×9.5 cm opening, with a body of 13 mm stainless mesh and near the end of 3 mm stainless mesh, the end is covered by a canvas bag). Recovered sediments were gently washed in baskets using seawater to remove attached mud. Sampled sediments were stored in buckets with aerated seawater and transported to the laboratory. Coordinates of the sampling sites were recorded using a Garmin handy GPS. Depth was determined from the coordinates and a bathymetric chart (Maritime Safety Agency 1983). All the stations were near the contour line of 5 m or shallower than 5 m (Fig. 1). Temperature and salinity at each station were not

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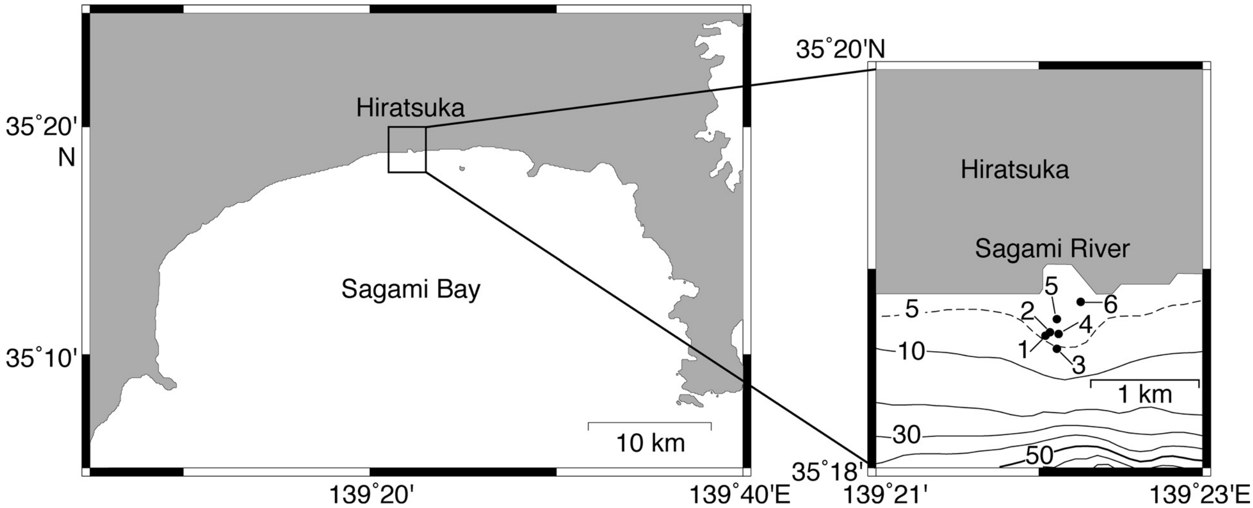


**Fig. 1.** Stations where sediments were sampled on June 2009 in Sagami Bay, Japan. Bathymetry (contours in meters) is based on the bathymetric chart of the bay (Marine Safety Agency 1983).

measured.

Back in the laboratory, sediments were checked under dissecting microscopes to search for polyps or podocysts of scyphozoans. When a polyp or a podocyst was found, the dimensions of the substrate were measured by a ruler to 1 mm and type (stone, bivalve shell, etc.) was recorded. The number of polyps and podocysts were also recorded. Each sediment sample was stored in a polystyrene container separately, and polyps were fed with *Artemia* nauplii two or three times a week and grown until large enough (ca. 2 mm in diameter) to strobilate. After that the container was kept in the dark in a refrigerator (5–10°C) to induce the polyps to strobilate. Released ephyrae were checked for species identification under a dissecting microscope. Ephyrae with a pointed tip on the marginal lappets and presence of nematocyst batteries on the exumbrella were identified as *C. pacifica* (Kakinuma 1967). Other scyphozoans common in Sagami Bay are *Aurelia aurita* (Linnaeus, 1758) sensu lato (s.l.), *M. papua* and *R. esculentum* (Kinoshita & Hiromi 2005, Sakiyama & Adachi 2001, Yamashita & Sakiyama 1999). However, marginal lappets end in a rounded tip in ephyrae of *A. aurita* s.l. and *M. papua* (Sugiura 1963), and they end in 4–6 branches in *R. esculentum* (Ding & Chen 1981). All the ephyrae released were identified as *C. pacifica* with no exception. There was no remarkable difference in the forms of polyps and strobila from the detailed description of morphology by Kakinuma (1967). Therefore, all the polyps and podocysts collected were considered to be *C. pacifica*.

Polyps and/or podocysts were found from all the stations but Sta. 3. They were found on 25 shells (2.5–9.2 cm in width, 1.6–5.3 cm in height) and on 22 stones (1.5–8.0 cm in width, 1.3–5.0 cm in height). The shells with polyps were mostly of dead clams *Meretrix lamarckii* Deshayes, 1853. Polyps and podocysts were mostly found on the inner concave surface of the bivalve shells, or in the hollows on the surface of stones. The numbers of polyps and podocysts per shell were 0–52 (median=9) and 0–328 (median=28). Those per stone were 1–12 (median=2) and 0–26 (median=1.5). The number, especially of podocysts was much greater on shells than on stones. On a convex substrate they can easily be torn off by being hit with other substrates during dredging and washing, while such a process may also occur in natural conditions. The sediments nearby the stations were composed of fine to medium sands with low mud content and were supposed to be often under turbulent conditions due to wave motion (Owada et al. 2007). Investigation of samples collected by more gentle methods (e.g. hand picking by divers) will reveal this point in the future.

It was surprising that polyps of *C. pacifica* were discovered in such an open area to the ocean, as previously I believed that they originate from estuaries or in semi-enclosed bays, because they often co-occur with *A. aurita* s.l. in semi-enclosed bays. In Tokyo Bay, which is adjacent and on the east side of Sagami Bay, *C. pacifica* is a common member of the jellyfish community during springtime (Nomura & Ishimaru 1998, Kinoshita et al. 2006). Polyps of *C. quinquecirrha* were abundant in the salinity range of 7–21 in Chesapeake Bay (Cargo & Shultz 1967). Although the stations of this study are located within 1 km of the mouth of the Sagami River, it is known that outflow of low salinity water is usually limited to the thin surface layer (<1 m) and the bottom salinity in front of the river-mouth is higher than 32 (Kanazawa et al. 2004). Therefore, it is unlikely that polyps of *C. pacifica* prefer low salinities.

Although *C. pacifica* is sometimes a nuisance to fisheries (Kinoshita & Hiromi 2005), their life cycle in the field, for example, when they strobilate to release ephyrae, when they sexually reproduce and when new polyps recruit, is only fragmentarily understood. For example, they are recorded to strobilate from October to November in the laboratory of the Asamushi Marine Biological Station in northern Japan (Kakinuma 1967), and they strobilated when the temperature was lowered from room temperature (22–23°C) to 5–10°C in this study. This is in contrast to polyps of *C. quinquecirrha* which strobilate when temperature increases and release ephyrae after May (Cargo & Shultz 1966, 1967). Probably polyps of *C. pacifica* in Sagami Bay strobilate and release ephyrae in the early winter, and in fact ephyrae of *C. pacifica* have been sampled in December, January, and April (Yamashita & Sakiyama 1999, Sakiyama & Adachi 2001). Studies will be needed in the future to reveal more about the ecology of *C. pacifica*, and the location and habitat conditions found in this study may help in finding polyps in the field and carrying out further studies.

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## References

Cargo DG, Schultz LP (1966) Notes on the biology of the sea nettle, *Chrysaora quinquecirrha*, in Chesapeake Bay. Chesapeake Sci 7: 95–100.

Cargo DG, Schultz LP (1967) Further observations on the biology of the sea nettle and jellyfishes in Chesapeake Bay. Chesapeake Sci 8: 209–220.

Dawson MN, Martin LE, Penland LK (2001) Jellyfish swarms, tourists, and the Christ-child. Hydrobiologia 451: 131–144.

Ding G, Chen J (1981) The life history of *Rhopilema esculenta* Kishinouye. J Fish China 5: 93–102, pl 1. (in Chinese with English abstract)

Ishii H, Katsukoshi K (2010) Seasonal and vertical distribution of *Aurelia aurita* polyps on a pylon in the innermost part of Tokyo Bay. J Oceanogr 66: 329–336.

Kakinuma Y (1967) Development of a scyphozoan, *Dactylometra pacifica* Goette. Bull Mar Biol Stn Asamushi 13: 29–33, pls 1–3.

Kanazawa N, Mizutani M, Watabe I, Iwasaki S (2004) Reports on the environment survey of fishery ground adjacent to discharge of river water and treated sewage effluent. (1) Hydrographic structure and current in the estuary. Bull Jpn Soc Fish Oceanogr 63: 196–200. (in Japanese)

Kinoshita J, Hiromi J (2005) Mass occurrence of jellyfishes and their influence on fisheries in Sagami Bay, Japan. Bull Plankton Soc Japan 52: 20–27. (in Japanese with English abstract)

Kinoshita J, Hiromi J, Yamada Y (2006) Abundance and biomass of scyphomedusae, *Aurelia aurita* and *Chrysaora melanaster*, and Ctenophora, *Bolinopsis mikado*, with estimates of their feeding impact on zooplankton in Tokyo Bay, Japan. J Oceanogr 62: 607–615.

Komai T (1936) On the peculiar scyphopolyps, *Stephanoscyphus*. Dobutsugaku zasshi 48: 535–544. (in Japanese with English abstract)

Maritime Safety Agency (1983) Basic map of the sea in coastal waters, Sagami Wan (Bathymetric Chart). Maritime Safety Agency, Tokyo.

Miyake H, Hashimoto J, Chikuchishin M, Miura T (2004) Scyphopolyps of *Sanderia malayensis* and *Aurelia aurita* attached to tubes of vestimentiferan tubeworm (*Lamellibrachia satsuma*) at submarine fumaroles in Kagoshima Bay. Mar Biotechnol 6: S174–S178.

Miyake H, Terazaki M, Kakinuma Y (2002) On the polyps of the common jellyfish *Aurelia aurita* in Kagoshima Bay. J Oceanogr 58: 451–459.

Morandini AC, Marques AC (2010) Revision of the genus *Chrysaora* Péron & Lesueur, 1810 (Cnidaria: Scyphozoa). Zootaxa 2464: 1–97.

Nomura H, Ishimaru T (1998) Monitoring the occurrence of medusae and ctenophores in Tokyo Bay, central Japan, in recent 15 years. Umi no Kenkyu 7: 99–104. (in Japanese with English abstract)

Owada M, Yoshida N, Sato T, Kanazawa K (2007) Morphological and adaptational evolution caused by interaction between marine invertebrates, and the effect of human activity on it—mollusks and bottom environment in the shallow water of Sagami Bay off Hiratsuka—. Sci J Kanagawa Univ 18: 77–80. (in Japanese with English abstract)

Purcell JE, Hoover RA, Schwarck NT (2009) Interannual variation of strobilation by the scyphozoan *Aurelia labiata* in relation to polyp density, temperature, salinity, and light conditions in situ. Mar Ecol Prog Ser 375: 139–149.

Sakiyama T, Adachi A (2001) Medusae collected in Enoshima- Shonan port and its adjacent waters—II. Nat Hist Rep Kanagawa 22: 69–72. (in Japanese with English abstract)

Sugiura Y (1963) On the life-history of rhizostome medusae I. *Mastigias papua* L. Agassiz. Annot Zoöl Jpn 36: 194–202.

Willcox S, Moltschaniwskyj NA, Crawford CM (2008) Population dynamics of natural colonies of *Aurelia* sp. scyphistomae in Tasmania, Australia. Mar Biol 154: 661–670.

Yamashita O, Sakiyama T (1999) Medusae collected in Enoshima- Shonan port and its adjacent waters. Nat Hist Rep Kanagawa 20: 97–100. (in Japanese with English abstract)