

Development of *Carybdea brevipedalia* (Kishinouye, 1891) (Cnidaria: Cubozoa: Carybdeida: Carybdeidae) collected from northern Japan

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Summary

Both sexes of the box jellyfish *Carybdea brevipedalia* was collected from northern Japan, in November 2013, in order to observe its early life history, including polyp formation. Fertilization occurred externally. Demersal fertilized eggs were obtained during the incubation of mature females and males. Fertilized eggs developed into blastulae within 6h. Blastulae developed into planulae bearing about 30 larval ocelli within 12h, and then settled two to three days and metamorphosed into primary polyps bearing one to four tentacles. Primary polyps developed into adult polyps within 80 days, and both polyp stages could actively detach to change location by creeping on the central part of their body. Budding occurred in three to four-tentacled polyps, and buds were released two days after the commencement of budding. The developmental features of *C. brevipedalia* resemble most closely those of Tripedaliidae including *Tripedalia cystophora* and *Copula sivickisi* among the cubozoans. The morphological affinities of polyp of in *C. brevipedalia*, *T. cystophora* and *C. sivickisi* support recent molecular result.

Introduction

Carybdea brevipedalia is one of the common species in the class Cubozoa, with the maximum bell height of 44 mm and a maximum bell diameter of 33 mm (Uchida 1929). This species appears in calm bays and coves from summer to fall in Japanese waters (Kishinouye 1910, Uchida 1929). The poisonous sting of *C. brevipedalia* causes painful wound for divers, fishermen and sea-bathers. Only the embryological development of the life cycle of *C. brevipedalia* is known (Okada 1927). The present study describes its development and polyp formation.

Material and Methods

Carybdea brevipedalia medusae were collected using an underwater fish-luring lamp at Onahama Port, Fukushima Prefecture, northern Japan, on November 3, 2013. Male and female medusae were kept in a bucket with filtered seawater at about 20°C. Fertilized eggs were collected by

filtration of the aquarium water, using a plankton net. A total of several thousand eggs were incubated in petri dishes with filtered seawater at about 20°C. The development of eggs was observed with a binocular microscope every day. Chopped *Artemia* nauplii were fed directly to primary and secondary polyps using a fine needle, twice or thrice a week. Rearing water was completely replaced with filtered seawater about three hours after feeding.

Results and Discussions

Approximately 12 hours after medusae were collected, fertilized eggs were observed. Blastulae developed into planulae bearing about 30 larval ocelli, and then settled and metamorphosed into primary polyps. Primary polyps were either settled or actively detached to start a creeping phase. The shape of the settled polyps resembled a pouch with a very short stalk, with one to four tentacles protruding from the ovoid calyx around the mouth cone. The polyps in creeping phase had a long, worm-shaped body, and two to three outstretched tentacles.

The primary polyps developed into adult polyps within 80 days. The settled adult polyps were polyps able to actively detach, and creep in order to change locations. The shape of the adult polyps was almost identical to the primary polyp stage, but they were larger. Both settled and creeping polyps had four tentacles and each tentacle bore four to six nematocysts.

Asexual reproduction was observed when the 3-tentacled stage was reached. Bud formation occurred on the middle part of the calyx. Two days after the start of bud formation, a secondary polyp was released from the parent polyp. The shape of newly released buds resembled the parent polyps. The buds had three or four tentacles.

The developmental features of *C. brevipedalia* resemble most closely those of Tripedaliidae including *Tripedalia cystophora* and *Copula sivickisi* among the cubozoans. The similarities in all early life stages of both species support recent molecular results.

References

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- Okada, Y.K. 1927. Note sur l'ontogénie de *Carybdea rastonii* Haacke. The Biological Bulletin 3: 241–249.
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