

Life History of *Obelia bicuspidata* Clarke, 1875 (Hydrozoa, Campanulariidae) in Korea

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ABSTRACT

The life history of *Obelia bicuspidata* Clarke, 1875 (Hydrozoa, Campanulariidae) was studied in its habitats, Jak-yak Island, Korea and in the laboratory. It grows mainly attaching to the under sides of small rocks immersed in muddy shores, or the shade surfaces of oyster shells. The hydroids liberate medusae. The medusa buds develop twice per year, during from March to June and from September to October. The optimum water temperature for the hydroids is between 4°C and 8°C, and at the temperature above 9°C, the hydroids begin to degenerate. In August the surface water temperature is around 25°C, and the hydrothecae are all disappeared. The hydroids grow best during from February to May. The medusae are small, 0.3 mm high, 0.45 mm wide, and require about 9 days at room temperature (about 20°C) for mature after releasing. *Obelia bicuspidata* turned out to be boreal species in this work.

Key words: Life history, *Obelia bicuspidata*, Hydrozoa, Campanulariidae, Korea

INTRODUCTION

The hydroid, *Obelia bicuspidata* belonging to the family Campanulariidae is abundant in the

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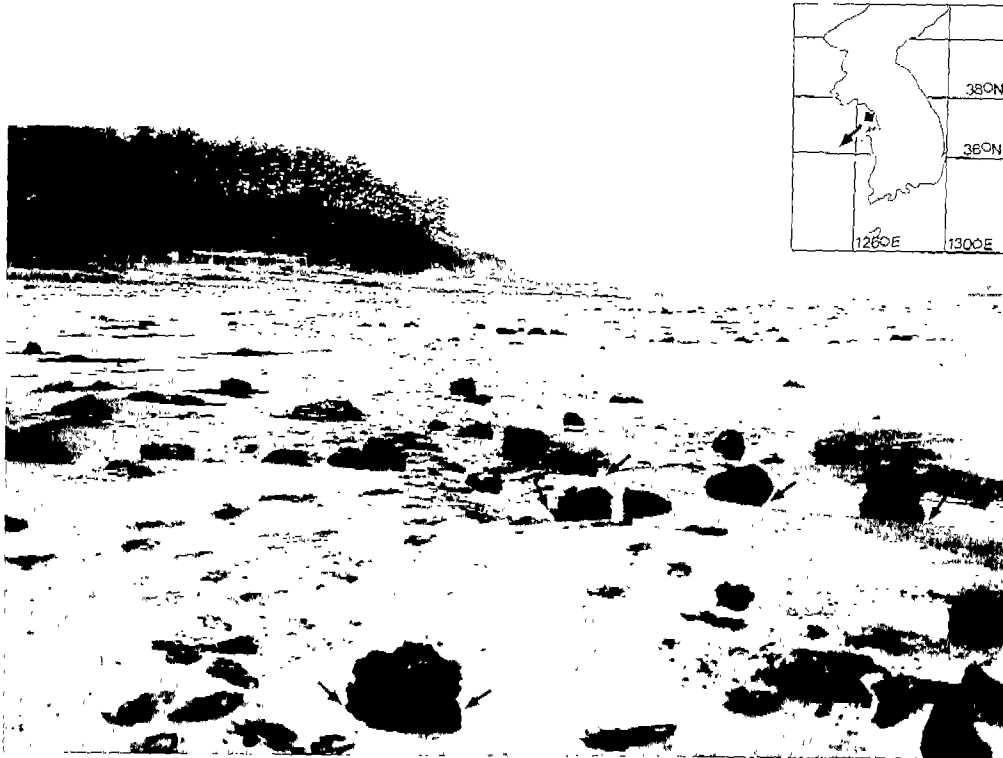


Fig. 1. Habitat of *Obelia bicuspidata* in Jak-yak Island at low tide. Arrows indicate the sites where the hydroids are attached.

muddy shores of Jak-yak Island (Inchon), Korea (Fig. 1). It was reported by Rho and Park (1983) and Park (1990, 1993, 1995) with redescrptions and microphotographs in Korea. Vervoort (1946), Vannucci (1954), Hamond (1957) and Mammen (1965) noted that *O. bicuspidata* releases a medusa. However the medusa was never apparently described and the life history has not been studied.

For the life history of *O. bicuspidata* we surveyed the hydroids in its habitats at low tide usually at monthly intervals and collected them during from August 1995 to July 1996. They were carried back to the laboratory with keeping them cool in an icebox. Some specimens were preserved in neutral formalin after narcotization for the monthly differences of characters. The 30 colonies with normal hydrothecae were randomly selected and their body portions were measured with a micrometer. And other some fertile specimens were reared in the culture vessel for medusae. The water temperature was kept like their habitat one. The hydroids were sufficiently fed with newly hatched *Artemia* nauplii daily. The sea water was exchanged to fresh sea water twice a day after feeding. The released medusae were transferred to another culture vessel and examined until their gonads are developed.

RESULTS

Description of the hydroid

Hydroids (Fig. 2) attach to the under sides of small rocks immersed in muddy shores or shade surfaces of oyster shells and other substratums. Colonies large, reached to about 17–118 mm in

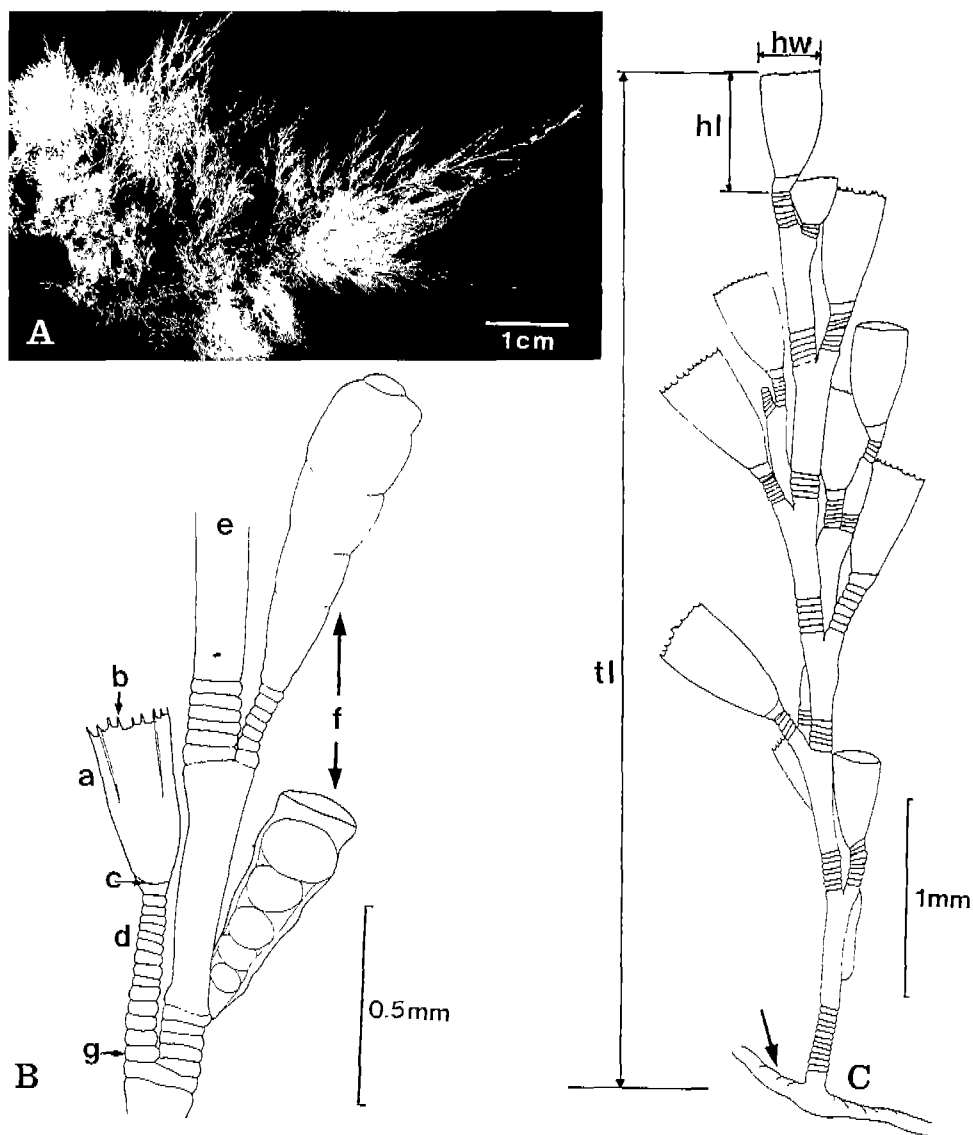


Fig. 2. *Obelia bicuspidata*. A, colony; B, a part of stem with gonangia and a hydrthea showing the body portions (a, hydrotheca; b, hydrothecal teeth; c, intrathecal diaphragm; d, hydrothecal pedicel; e, hydrocaulus; f, internode; g, annulation; h, gonotheca); C, colony showing the body portions (hl, length of hydrotheca; hw, width of hydrotheca; tl, total length of colony; arrow indicates hydrorhiza).

height. Hydrorhiza stolon creeping irregularly and forming tangle mass. Stem usually polysiphonic, except for distal portion which monosiphonic, branched off irregularly, divided into regular internodes, internode long, with lateral process distally, to which hydrothecal pedicel attached. Annuli between the successive internodes 6-7 in number. Branch arising from above of internode, similar to stem in shape, delicate comparing to stem and slightly flexuose. Hydrothecal pedicel annulated throughout or with central smooth portion with hydrotheca distally. Hydrotheca very deep tubular, 1-3 times as diameter, slightly asymmetry, with longitudinal folds in hydrothecal wall between cusps, diaphragm oblique, margin with 10-20 bimucronate cusps. Gonotheca oblong, truncated with broad aperture but no neck, with annulated short pedicel.

Monthly size differences in its some characters

The 30 colonies with normal hydrothecae were randomly selected and their body portions were measured with a micrometer, Their measurements are shown in Table 1.

HPAN, annulation number of hydrothecal pedicel; HW, maximum width of hydrotheca; HL, length of hydrotheca; I, length of internode; TL, total length of colony.

The colony size decreased from April to August and from October to December when the hydroids are degenerated. But it increased from January to March when gonophores begin to develop. At the water temperature between 4°C to 8°C the hydroid growth is best and from the water temperature over 9°C, the hydroids begin to degenerate. The growth condition of hydroids is in the best from February to May. After the gonophores develop the length of hydroids begin to degenerate. The reproductive periods turned out to be from March to July and from September to October. As the medusa development proceed, the colony length decrease gradually. During the fertile period the total length of hydrotheca slightly increase in April and decreased from May to June, and again increase in July. The annulation number of hydrothecal pedicel shows decrease after March but the internode length of stem show increase from March to May, and shows decrease from June.

Table 1. Comparison of body portions of hydroids which were collected from Jak-yak Island during the period from Aug. 1995 to Jul. 1996.

Date	HPAN	HW (μm)	HL (μm)	I (μm)	TL (mm)
Jan. 1996	4-12	220-350	500-700	200-450	6.00-77.00
Feb. 1996	2-8	220-300	500-600	180-540	9.00-95.00
Mar. 1996	4-11	190-370	440-720	180-720	4.80-118.00
Apr. 1996	3-7	220-370	500-700	250-1,000	2.40-73.00
May 1996	3-9	200-360	500-680	400-1,270	4.90-68.00
Jun. 1996	3-18	180-350	450-680	150-750	0.39-11.10
Jul. 1996	3-14	170-350	450-620	200-720	4.10-14.02
Sept. 1995	3-8	200-360	410-640	320-1,550	3.25-32.00
Oct. 1995	4-14	170-290	370-510	100-600	1.72-6.85

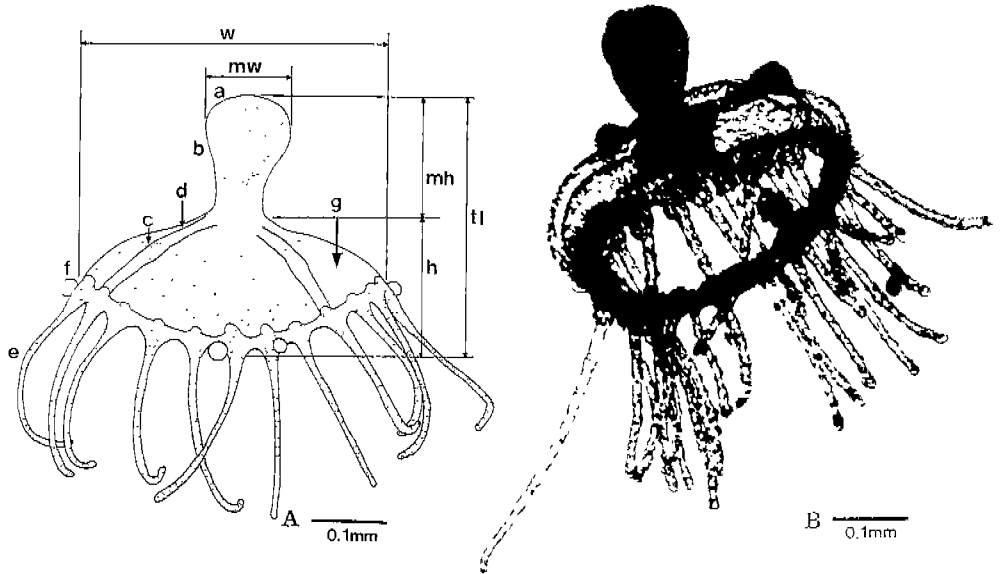


Fig. 3. *Obelia bicuspidata*. A, young medusa showing the body portions (a, oral lobe; b, manubrium; c, gonad; d, radial canal; e, tentacle; f, statocyst; g, nematocyst; h, height of umbrella; mh, length of manubrium; mw, width of manubrium; tl, total length); B, mature medusa.

Description of the medusa

Young medusa (Fig. 3A) very small, 0.1 mm high, 0.4 mm wide, flatter than hemispherical, usually everted backward, as result manubrium projecting out. Manubrium light red color, 0.2 mm high, 0.1 mm wide, light bulb shape. Oral lobe dome shaped, not separate, without any appendages. Four radial canals arising from manubrium, perpendicular each other. Gonads vestigial. Bell margin with 24 tentacles and eight statocysts which placed randomly between tentacles. Tentacle straight, filiform, armed with battery cells. Nematocysts distributed on surfaces of exumbrella and tentacles. Velum very narrow, barely perceptible web between the bases of tentacles. As development proceed, bell (Fig. 3B) deeper than one of young medusa, reached 0.3 mm high and 0.45 mm wide. Tentacles increase in length, and four gonads developed on middle portion of radial canals, dark red color. Other characters similar to young medusa.

DISCUSSION

The surface water temperatures are monthly variable in the habitats of *Obelia bicuspidata* in Korea (Table 2). These water temperature fluctuation affects to the hydroid activity (Calder, 1990) In February and March when the temperature was low, at 4–8°C the colonies grow best, but with the temperature increases the growth begin to decrease. At March the gonophore development begins to occur, and continues to July. In August above the temperature 25°C the gonophore production is stopped and the hydrothecae are all disappeared. The size and shape of hydrotheca

Table 2. Surface water temperature and pH of the habitats of *O. bicuspidata* in Jak-yak Island.

Date	Time	Temperature (°C)	pH	Date	Time	Temperature (°C)	pH
1 Mar. 1995	11 : 10	3	.	26 Nov. 1995	13 : 27	12.6	7.94
18 Mar. 1995	12 : 08	7	7.98	23 Dec. 1995	11 : 48	-4	8.01
3 Apr. 1995	13 : 11	8.8	7.91	9 Jan. 1996	13 : 06	3.8	8.00
15 Apr. 1995	11 : 05	12	8.06	22 Jan. 1996	12 : 23	4.4	7.94
29 Apr. 1995	11 : 07	14	.	21 Feb. 1996	12 : 50	3.7	8.13
20 May 1995	15 : 20	15	.	8 Mar. 1996	13 : 05	5.8	8.10
11 Jun. 1995	09 : 30	18	.	20 Mar. 1996	11 : 51	9.6	8.38
30 Jun. 1995	12 : 47	22.9	7.94	5 Apr. 1996	12 : 10	7.7	.
14 Jul. 1995	12 : 36	23	.	18 Apr. 1996	11 : 31	11	8.05
31 Aug. 1995	14 : 13	28.2	7.54	4 May 1996	11 : 51	14.5	8.08
27 Sept. 1995	12 : 39	23	8.03	17 May 1996	11 : 12	18	8.05
10 Oct. 1995	12 : 01	22	8.03	5 Jun. 1996	13 : 47	20.2	8.05
29 Oct. 1995	14 : 20	19.5	7.99	5 Jul. 1996	14 : 18	23.5	7.84
12 Nov. 1995	13 : 37	14.7	8.00				

vary with food quantity and temperature (West and Renshaw, 1970). In lower temperature the length of hydrotheca is longer than one in higher temperature. The number of annulations on the pedicel is usually considered a diagnostic character. Berrill (1949) reported the effect of growth rates on the number of annulations in *Obelia* sp. Similar results observed in *Obelia bicuspidata*. During from March to May when the growth rate is high, the number of annulations of hydrothecal pedicel is most. So that the annulation number and the size of some portions in *Obelia bicuspidata* indicate little importance in species recognition. In August most hydrothecae are all degenerated. *Obelia bicuspidata* turned out to be boreal species in this work.

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한국산 쌍뿔족혹히드라 (히드라충강, 종히드라과)의 생활사

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요 약

작약도에 서식하고 있는 쌍뿔족혹히드라 (*Obelia bicuspidata* Clarke, 1875)의 생활사를 서식지와 실험실에서 조사하였다. 쌍뿔족혹히드라는 종히드라과 (Campanulariidae)에 속하고 주로 뾰 해안에 있는 작은 바위 또는 굴의 패각에 부착한다. 해파리를 방출하며 해파리 눈 (medusa buds)은 일년에 2번, 즉 3월과 6월 사이, 9월과 10월 사이에 발달한다. 폴립 성장의 최적 온도는 4–8°C로 나타났다. 수온이 9°C 이상으로 올라가면 퇴화하기 시작하여 수표면 온도가 약 25°C되는 8월에는 히드라엽이 모두 퇴화하는 것으로 나타났다. 해파리는 작고 폴립에서 방출된 후 약 9일 후 생식선이 발달하였다. 본 연구에서 쌍뿔족혹히드라는 냉수성 종으로 판명되었다.