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Morphological Notes on the Polyp and Medusa of *Climacocodon ikarii* Uchida (Hydrozoa, Margelopsidae) in Hokkaido

By

Shin Kubota

Zoological Institute, Hokkaido University

(*With 8 Text-figures*)

The present paper deals with the aberrant pelagic hydroid, *Climacocodon ikarii*, which was originally described by Uchida in 1924 based on the specimens of both polyp and medusa from Oshoro, Hokkaido, northern Japan. For reasons of its peculiar morphology and life-cycle, special attention has been paid to this species (Uchida, 1924, '27; Kramp, 1949; Rees, 1941, '57). Up to the present the collection records of this species have been very few and the localities are very restricted, that is the polyp was recorded only once from Oshoro (Uchida, 1924), and the medusa was around Hokkaido, such localities as Oshoro, Takashima, Biro, Akkeshi, and Muroran (Uchida, 1924, '27, and '40; Kubota, 1976). It is noticeable that the medusa was also recorded by Dawydoff (1936) in Ha-Long Bay, Viet Nam, far apart from Japan, but the description is very short.

In winter and early spring during the years from 1975 to 1979, a number of polyp and medusa of the present species were found among the plankton samples at Oshoro, facing the Japan Sea, and at Muroran, facing the Pacific. As a result of close examination of the external morphology of many specimens of the polyp and medusa including the specimens reared in laboratory, a wide morphological variation, which has been unknown, was found in both the polyp and medusa.

In the present paper, the morphology of both the polyp and medusa, the development of the laboratory-reared polyp from newly liberated one to well-grown one with many medusa-buds, and the morphological comparison between the specimens from Oshoro and those from Muroran, are described and illustrated in detail.

Before proceeding further, the author expresses his sincere thanks to Professor Mayumi Yamada, Hokkaido University, for his kind directions and critical reading of the manuscript and to Professor Emeritus Tohru Uchida, Hokkaido University, for his valuable suggestions and encouragement. Thanks are also due to Mr. Ken-Ichi Tajika, Hokkaido University, for his kindness to give me many medsuae from

Muroran, and also to the staff of the Institute of Algological Research, Muroran, and of the Oshoro Marine Biological Station, for the use of the facilities and helping the author for collecting materials.

Materials and Method

Among the specimens collected at the sea, the following specimens of the polyp and medusa, which were not damaged by tows and were preserved in formalin soon after collection, were used in the present study; 31 polyps (30: 25–IV–'78, 1: 28–IV–'79) and 87 medusae (2: 28–IV–'75, 12: 22–V–'75, 52: 25–IV–'78, 18: 28–IV–'79, 3: 29–IV–'79) from off Charatsunai-shore at Muroran, and 2 polyps (2: 16–XII–'77) and 51 medusae (47: 9–XII–'77, 3: 27–I–'78, 1: 23–IV–'79) from Oshoro Bay near Otaru. Besides these specimens, other two medusae were collected from Oshoro on April 15 and December 8, 1978, a specimen on each day. The water temperatures on these days varied from 3.0 to 11.2°C at Muroran and from 3.6 to 8.6°C at Oshoro.

In order to observe the continuous development of polyp directly, several youngest polyps, which were liberated from their parent medusae collected on December 9, 1977, were reared in laboratory for about a month, keeping them in covered glass-vessel containing the filtered sea water supplied from Oshoro Bay at the room temperature (5.4–11.5°C, mean 8.9°C) and feeding them with the newly hatched *Artemia* larvae. And several medusae were also reared to examine the successive development and to get their eggs.

All the drawings were made with the aid of a drawing apparatus, and the measurements are shown in the order: minimum-mean-maximum value, standard deviation, and the number of specimens examined.

Description of Polyp

1) Morphology of Polyp from Oshoro

(a) Newly Liberated Polyp

The youngest polyp (Fig. 1, A-C) has neither stem nor medusa-bud and assumes an actinula form. It is very small, 0.28–0.37–0.48 mm, 0.06, 20 in body length and 0.22–0.27–0.32 mm, 0.03, 20 in body width when well-extended; and milky white in color. Around the short tubular hypostome slightly below the mouth, several filiform oral tentacles are arranged in a circulet, 4–5.5–7, 0.8, 20 in number, and they are short and lean and a tentacle is rudimetary in three specimens. Two or three whorls of filiform aboral tentacles, 10–13.8–15, 1.4, 20 in number, on the other side, are present around the round stomach. The aboral tentacles, 0.10–0.16–0.32 mm, 0.07, 17 in length when well-extended, are longer than the oral tentacles and on nearly 1/3 of the distal parts of which nematocysts are abundantly scattered.

(b) Development and Well-grown Polyp

The formation and development of medusa-buds and of oral and aboral tentacles were observed in four youngest polyps, which were picked up among the above-described ones, by rearing them in laboratory. A week after liberation some medusa-buds began to be budded in two specimens, though they were rudiments and the number was very few, 2 or 5. These buds were oval in shape and were born on the basal part of the hypostome, arranging in a circulet on nearly the same horizontal level of body (cf. Fig. 1, D, E). On the 9th day all the polyps put forth several (2, 3, 5, and 6) medusa-buds when the polyp was about 0.7 mm in body length and 0.5 mm in body width. On the next day more rudiments of medusa-buds were newly produced on other parts of the basal portion of the hypostome, so the number increased to 3, 5, 5, and 7 in each specimen (Fig. 1, F). It was noticed that the arrangement of medusa-buds fairly coincides with that of the oral tentacles when viewed from oral side.

On the 11 to 13th day, 6–17 medusa-buds were present and they were in 5–7 clusters owing to the production of new medusa-buds on the base of several former

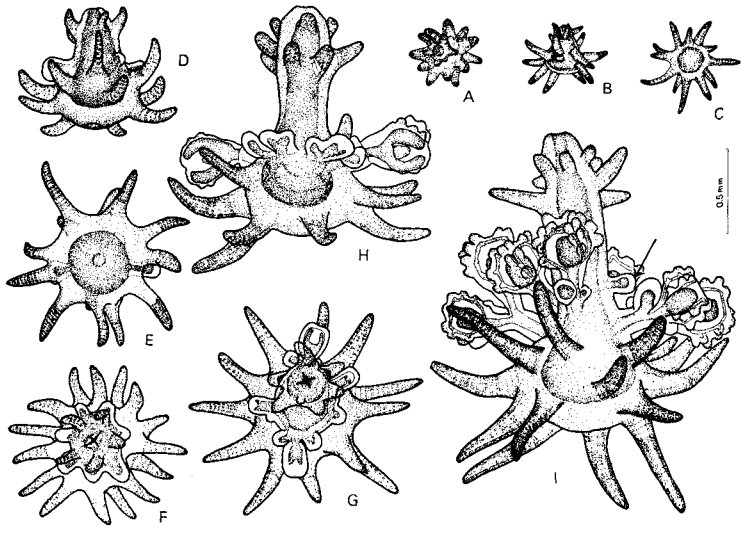

Fig. 1. Development of polyp from Oshoro, in living state (A-E, G, H: in the same specimen; F, I: in other two specimens; A, F, G: oral view; B, D, H, I: side view; C, E: aboral view). A-C: A newly liberated polyp in contracted (A) and extended (B, C) state. D, E: A young polyp 10 days old with three very young medusa-buds, 12 aboral tentacles, and 6 oral tentacles. F: A young polyp 10 days old with 7 young medusa-buds, 15 aboral tentacles, and 5 oral tentacles. G: A young polyp 12 days old with 13 medusa-buds of 6 clusters, 12 aboral tentacles, and 8 oral tentacles. H, I: Two well-grown polyps with many medusa-buds and two whorls of oral tentacles, H: a specimen 20 days old, I: another specimen 32 days old, arrow indicates a bud of the second set. D-I: extended state.

medusa-buds (Fig. 1, G), though all of them were still rudiments and small. At the same time the oral tentacles also increased in number (up to 8) due to the formation of some (1–2) rudimentary ones which were produced on the portions of hypostome between the former tentacles (Fig. 1, G). In this stage the body is about 0.8 or 0.9 mm in length and about 0.6 or 0.7 mm in width.

On the 15th day the polyp was larger, about three times as large as that of the newly liberated polyp, namely 1.0–1.3 mm in body length and 0.7–0.8 mm in body width, moreover the oral tentacles and medusa-buds increased successively, so all the specimens had 9 oral tentacles (3 or 4 ones were newly produced) and 13–18 medusa-buds of 5–7 clusters. In a cluster 1–5 medusa-buds were born.

On the 25th day the polyp was grown well (cf. Fig. 1, H, I), 1.6–2.3 mm in body length and 0.81–0.94 mm in body width, and had many medusa-buds and oral tentacles. The hypostome is long and tubular in shape and it is 1.00–1.44 mm in length and 0.25–0.31 mm in width when well-extended. It expands and contracts considerably. The oral tentacles were in two whorls, and the oral tentacles of the second whorl were produced on the hypostome just above the oral tentacles of the first whorl and they were still short and lean. The number of the oral tentacles, accordingly, increased twice as many as that of the newly liberated polyp (4 or 5 ones were newly produced), namely the number is 9, 10, 10, and 11 in each specimen. The body of polyp excluding hypostome is swollen and round in shape, without any trace of hydrocaulus, and around which two or three whorls of aboral tentacles are scattered. The number of the aboral tentacles, however, did not change in three specimens (12, 14, and 15 ones were present respectively), but in a specimen only a tentacle was newly produced and had 16 tentacles. It was observed that the first whorl of oral tentacles were 0.38–0.63 mm in length when well-extended, while the aboral tentacles were 0.94–1.25 mm; and both tentacles were not capitate but filiform. A number of medusa-buds (15–33) were produced in 5–7 clusters, and each cluster has a stalk and consists of several (2–9) medusa-buds of different growths and among which only one or two buds developed well than the others. Some (2 or 4) protuberances, probably the rudiments of medusa-buds of the second set, were newly produced above the former buds in two specimens (see Fig. 1, I), accordingly the number of medusa-buds attained 35.

Then within a few days the formation of the protuberances of medusa-buds of the second set was found in three specimens, though they were still very small and very few in number, 2, 3, and 4 in each specimen. On the 36th day that number was scarcely changed in a specimen (4 in number) and all of them were still rudiments. Since this day the polyp became weak and about on the 45th day they degenerated.

It was observed that (1) the aboral tentacles were connected with stomach by series of endodermal cells, which were more clearly found in the preserved state, (2) the rudiment of tentacles of the medusa-bud began to produce after the 18th day when the medusa-bud was 0.36–0.40 mm in umbrellar height and 0.30–0.36 mm in width (in 6 buds), (3) the well-grown medusa-buds near to detach sometimes

pulsated and could eat the body-pieces of *Artemia* nauplii torn by needles.

(c) Concluding Remarks

Only two polyps were collected in Oshoro Bay, and they were about 0.8 mm in body length and 0.6 mm in body width when quite contracted, and had 13 or 15 aboral tentacles of three whorls, 6 or 7 oral tentacles of single whorl, and 9 or 8 small medusa-buds of 5 or 6 clusters respectively. It was observed that in these two specimens one or three oral tentacles were rudiments, and the arrangement of oral tentacles was fairly in accord with that of the medusa-buds as was observed in the development of polyp reared in laboratory. The morphology of these two specimens well coincides with the original description of the polyp made by Uchida (1924).

Compared the specimens reared in laboratory with those collected from the sea including the specimens described by Uchida in 1924, both are well in accord with each other, while the former is more complicated in morphology and larger in size than the latter. Two noticeable characteristics found in the laboratory-reared polyp are (1) the arrangement of oral tentacles in two whorls, (2) the formation of medusa-bud of the second set.

2) Morphological Comparison of the Polyp from Muroran with That from Oshoro

A number of polyps consisting of various developmental stages were found among the plankton samples at Muroran. The successive morphological change of these polyps in the development, as shown in Fig. 2, generally conincides with that of the laboratory-reared polyp from Oshoro, though slight differences are found, particularly in the number of oral tentacles. In spite of the preserved condition, the specimens from Muroran are somewhat larger, namely the body length and width attained 2.44 mm and 1.31 mm respectively (Fig. 3). In most of the specimens from Muroran, the number of the oral tentacles is more than 11, which is the maximum value of the number of the oral tentacles in the laboratory-reared polyp from Oshoro, and it attained 17, arranging in two or three whorls (Fig. 2, B; Fig. 3). The number of the aboral tentacles and the clusters of medusa-buds is, on the other side, nearly the same in the specimens from the both localities, while in the specimens from Muroran the number of aboral tentacles attained 17, and the number of clusters of medusa-buds attained 9 (Fig. 2, B), moreover the number of medusa-buds attained 49 and up to 10 ones were present in a cluster (Fig. 2, A). The umbrellar width of the largest medusa-bud was 0.44 mm and 5 or 6 tentacles were present in each perradius. In spite of the formation of many medusa-buds, no buds of the second set were found in all the specimens from Muroran. It was observed that (1) in a specimen from Muroran a medusa-bud was born beside an aboral tentacle of the uppermost whorl, (2) in a living specimen, which is 1.13 mm in body length, the aboral tentacles were 1.44 mm and the oral tentacles were 1.00 mm in length when expanded.

3) Concluding Remarks on Morphology of Polyp in Hokkaido

As is described above, with the increase of body size the medusa-bud and the oral tentacles are successively produced, though the number of aboral tentacles and the cluster of medusa-buds scarcely increases from the young stage till well-grown one (Fig. 2); hence it follows that the former two characteristics are not stable and further variation will be observed in future. It should be mentioned here that the aboral end of polyp is a little flattened and it showed a small round shape in aboral view. This structure is probably due to the attachment

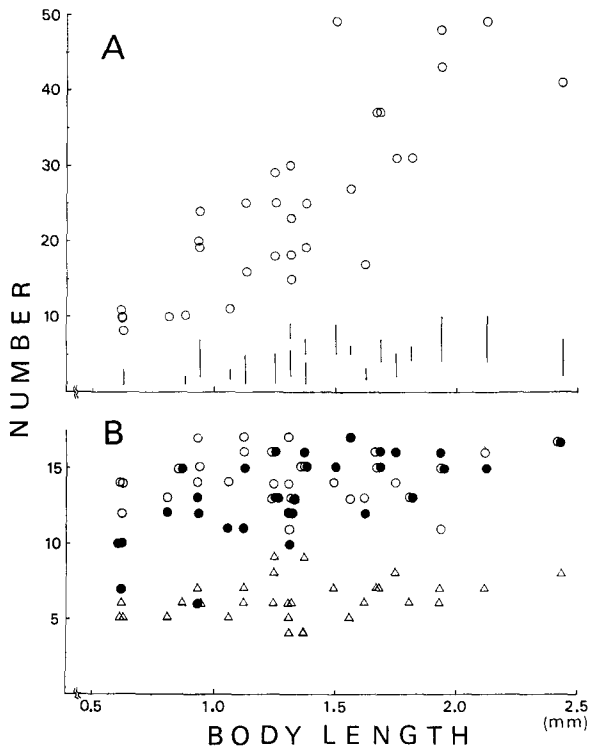

Fig. 2. Successive development of tentacles and medusa-buds of the polyp from Muroran, preserved state. A: Number of medusa-buds in a polyp (circle) and the variation range of the number of medusa-buds in a cluster (bar). B: Number of aboral tentacles (open circle), oral tentacles (solid circle), and of clusters of medusa-buds (triangle).

to the manubrium of medusa in the embryonic stage. And the noticeable characteristic of the present polyp is the absence of hydrocaulus; accordingly the external morphology of the present polyp closely resembles the hydranth of *Tubularia* or *Hybococon* polyp. Formerly there was an inference that the polyp

is not truly pelagic but it attaches to certain substratum and is washed away by violent storm or water current as was originally mentioned by Uchida (1924), but judging from the development of many polyps both reared in laboratory and collected at the sea the present polyp is apparently not of sessile type. This peculiar form without stem or stolon seems to be well adapted to the planktonic life, while in still water it is possible that the polyp sink to the bottom.

On the other hand, in the course of the development of the polyp reared in laboratory, the phenomenon of tachygenesis, which was already pointed out by Uchida (1924) in the present species, was observed and ascertained as was described above.

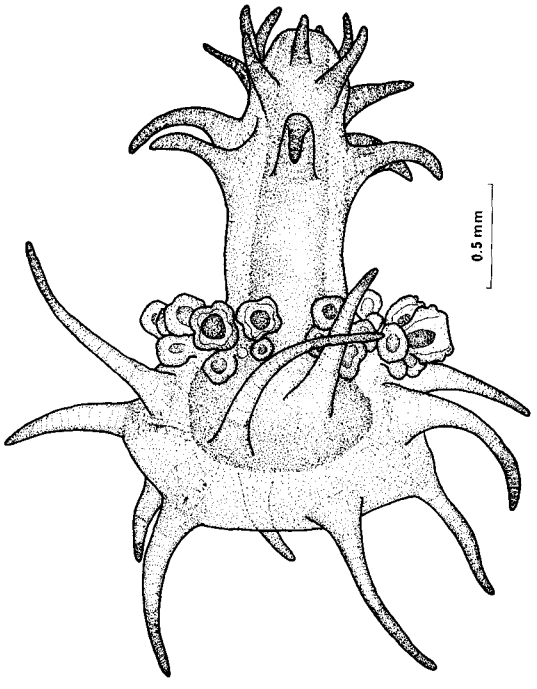

Fig. 3. The largest polyp from Muroran, preserved state.

Description of Medusa

1) Morphology of Medusa from Oshoro (Fig. 4)

The umbrella is squarish in shape and is usually deeper than wide, but a slight elevation is sometimes present at the apex of the umbrella. In the small immature specimens, however, the umbrellar height and width are nearly equal in size, and the trace of an umbilical canal is often found. The manubrium is flask-

shaped in well-grown or mature specimens, while tubular in immature ones; and it is quite large as long as the height of subumbrellar cavity when extended well, but not protruded from the umbrellar aperture. The gonad encircles the middle part of the manubrium. In female medusa many eggs of different embryonic stages are found, some are still included in the tissue of the manubrium, while some are entirely protruded from the ectoderm of the manubrium, connecting with a filamentous adjunct, and cleavage is taken place (Fig. 4, A, B). The radial canal is thick and straight, four in number, and widened at the junction points with the ring canal. The velum is developed well and the central portion of which protruded into the subumbrellar cavity, and when the medusa swims it pulsates back and forth rhythmically.

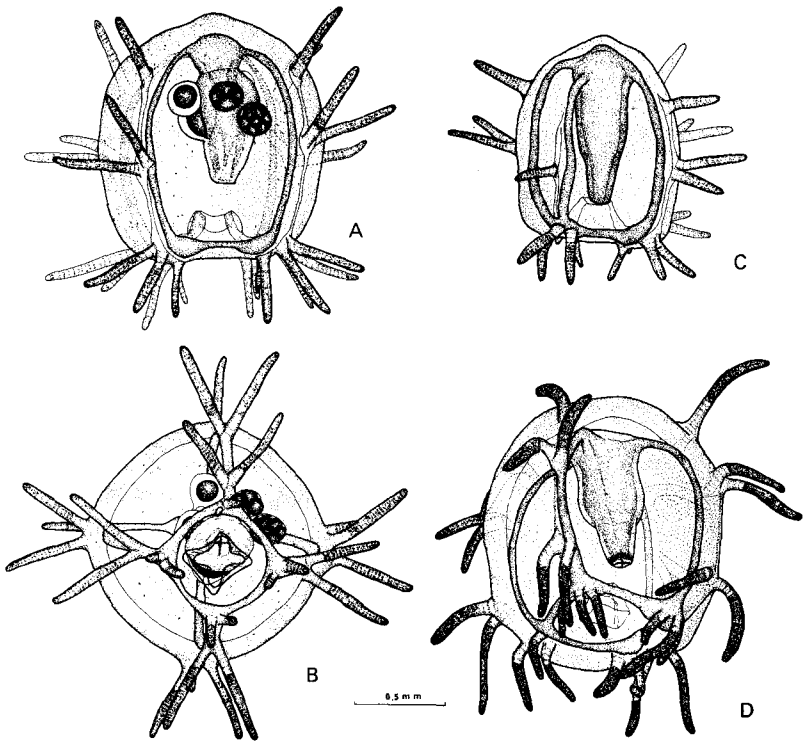

Fig. 4. Three medusae from Oshoro. A, B: a female medusa in side view (A) and oral view (B), preserved state; C: an immature medusa with irregular arrangement of tentacles, side view, preserved state; D: a well-grown medusa, side view, living state.

The marginal tentacles are filiform and solid, and they project from the exumbrella directly at nearly right angle, without any trace of basal bulbs or ocelli. They are regularly arranged along the radial canal in definite four sets, and linked

with it by series of endodermal cells, and each set is jointed together by a canal-like structure which is born on exumbrella along the radial canal. The tentacles of the first set, which are the uppermost ones, are four in number, one in each perradius. But some (1–2) were absent in 3 specimens out of 51 ones. The tentacles of the second or the thrid set are arising from the middle or lower portion of the umbrella respectively, and in a perradius two tentacles are present side by side in the respective set, hence each set consists of eight tentacles. But in a perradius of each of 4 specimens out of 51 ones, a tentacle of the second set was absent, and in a perradius of each of 3 specimens, one or two tentacles of the thrid set were absent. After all eight specimens out of 51 ones showed above-described partial or whole deficiency of tentacles in each set (cf. Fig. 4, C). All these tentacles of three sets are equal in length and similar in structure. The tentacles of the last (fourth) set are born at the umbrellar margin very near the tentacles of the third set, and they are variable in number and in length; the number is 1–4, mostly 2 or 3 in each perradius, and short and rudimentary and not arranging side by side but somewhat dislocated each other (cf. Fig. 4, B). However the total number of tentacles in a medusa is not so variable despite of the umbrellar size and maturity of the medusa; it varies between 23 and 36 in 51 specimens (Fig. 5). Among them a female medusa (the largest specimen), 2.2 mm in umbrellar height and 32 tentacles when collected (in the living state), grew larger by raising for 10 days and it had 46 tentacles when 2.8 mm in height (see Fig. 5). During the short-term growth of this medusa, 45 eggs were protruded from the ectoderm of manubrium; and 32 ones among which were detached, several eggs (up to 12) in a day, and these discharged eggs (probably unfertilized) are 160–183–200 μ, 9.8 in diameter.

Compared with the original description made by Uchida (1924), the external morphology of the present specimens from Oshoro is well in accord with it, but further variation in the number of tentacles and the umbrellar size is found as described above, for the specimens in the original description were very small, up to 1.1 mm in umbrellar height, and 28 tentacles of four sets, each set consists of 1–2–2–2 tentacles from top to bottom respectively.

2) Morphological Comparison of Medusa from Muroran with That from Oshoro

The morphology of the medusa from the both localities is different from each other in the number of tentacles and umbrellar size as is shown in Fig. 5. In spite of the equal size (0.6–2.8 mm in umbrellar height) the specimens from Muroran had apparently more tentacles, and many other specimens from Muroran were quite larger, attaining 4.6 mm in umbrellar height, and the tentacles are arranged in five sets in many of them (Fig. 6). The smallest specimen which had the tentacles of five sets was 2.0 mm in umbrellar height. And the intermediate arrangement of tentacles between four and five sets, namely some perradii had five sets but others still four sets, was observed in many specimens. In almost all of the specimens from Muroran, the tentacles of each of the upper three sets are in the same arrangements as those of the specimens from Oshoro, that is 1–2–2 in number from

top to bottom set respectively. When there were tentacles of the fifth set, the number of tentacles of the fourth set is two. The tentacles of the last set, which is either fourth or fifth, are clustered, up to 6 clusters in a perradius, and consists of many tentacles, 5–17 ones in a perradius (cf. Fig. 6, B), but in a perradius of each of three small specimens, only two or four tentacles, which is the same number as the specimens from Oshoro, were present. Consequently a large number of tentacles are born in the specimens from Muroran, and up to 87 tentacles were observed. It was observed that the number of tentacles in each of four perradii of a medusa is nearly equal. The irregular arrangement of tentacles is, however, found in 11 specimens out of 87 ones, among which a tentacle of the first set was absent in

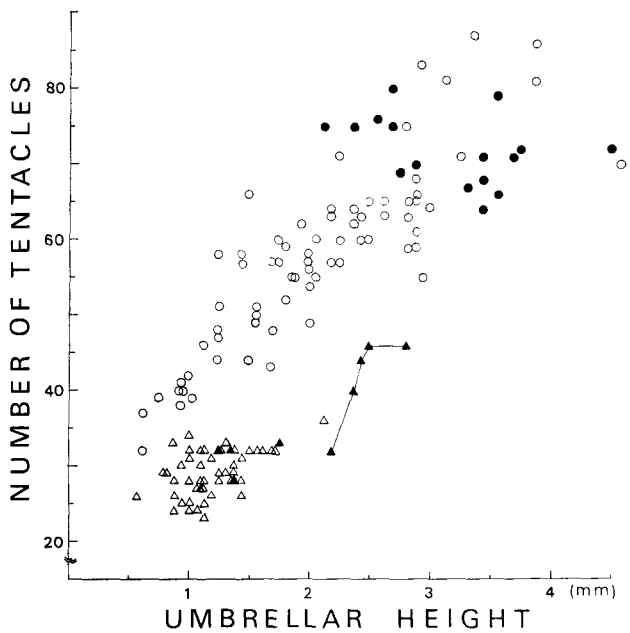

Fig. 5. Successive development of tentacles of medusa from Oshoro (triangle) and Muroran (circle), preserved state in almost all of the specimens. Solid symbol indicates female medusa, and the development of the largest specimen from Oshoro reared in laboratory is shown by drawing lines.

4 specimens, one or two tentacles of the second set were absent in 6 specimens, and not two but three tentacles of the fourth set were present in a perradius of a specimen. And the smallest specimen from Muroran, which was 0.63 mm in umbrellar height, had only tentacles of three sets; 1–2–(2+3) from top to bottom set respectively. This medusa might be accidentally detached from the polyp while collecting.

On the other hand, it is noteworthy that in the course of development of the medusa, the medusa from Oshoro matures earlier than that from Muroran; the female medusa and the immature one from Oshoro are 1.3–2.2 mm and 0.6–1.5 mm in umbrellar height respectively, while 2.1–4.5 mm and 0.6–2.9 mm in umbrellar height in the medusa from Muroran (Fig. 5). It was experienced that sorting out of the apparently male medusa was difficult.

The discharged eggs from three medusae from Muroran are 148–175–200 μ, 10.1, 39 eggs in diameter, and the size is not different from that of the medusa from Oshoro.

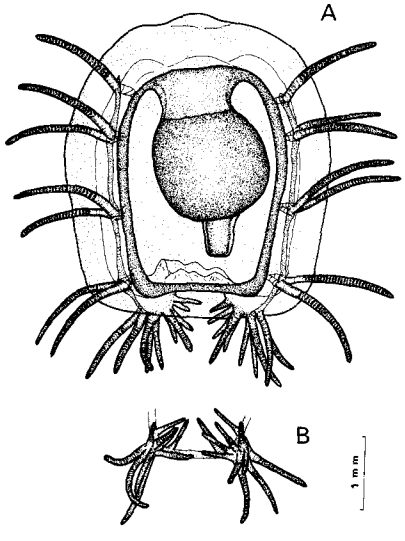

Fig. 6. The largest medusa from Muroran, preserved state. A: a profile, B: tentacles of the fifth set in two perradii, oral view.

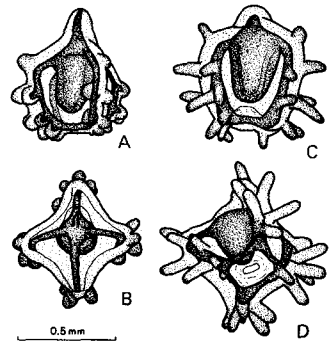

Fig. 7. Two newly liberated medusae detached from the polyp shown in Fig. 1, A-E, G, H. A specimen in side view (A) and aboral view (B), and another in side view (C) and oral view (D).

3) Newly Liberated Medusa from Oshoro and Muroran (Fig. 7)

The youngest medusae liberated from four laboratory-reared polyps from Oshoro are very small. The umbrella is roughly crusiform in section and the jelly is very thin, 0.04–0.06 mm in thickness, but the conical elevation of jelly, 0.12–0.17–0.28 mm, 0.06, in length, is markedly present on the apex of the umbrella, and the umbilical canal is herein contained (Fig. 7, A, C). The measurements of various body portions of 10 specimens are as follows: 0.34–0.44–0.56 mm, 0.09, in width; 0.48–0.66–0.88 mm, 0.14, in height; 0.20–0.33–0.44 mm, 0.10, in manubrium length; 0.12–0.20–0.28 mm, 0.05, in stomach width; 20–23.6–29, 3.1, in

tentacle number. Despite of the considerably small body, the arrangement and the number of tentacles of these youngest medusae are the same as those of the immature or mature medusae from Oshoro, namely the tentacles are arranged in four sets and the number in a perradius is 1–2–2–0 to 3 from top to bottom set respectively. But such several kinds of irregular arrangements of the tentacles in a perradius as 0–1–1–0, 1–1–2–1, 1–2–1–0, 1–2–3–2, and 1–3–2–0 to 1 were found. The tentacles are, however, short and rudimentary; 0.04–0.10–0.28 mm in length. In rearing a specimen in laboratory, the medusa grows rapidly and it assumes well-grown form within a month.

On the other hand, the morphology and size of three youngest medusae from Muroran, which are soon liberated from a well-grown polyp collected from the sea, is the same as those of medusa from Oshoro. The measurements of these medusae are as follows from small to large one: 0.48, 0.52, 0.64 mm in height; 0.44, 0.48, 0.50 mm in width; 30, 29, 30 in tentacle number. In most of the perradii the arrangement of tentacles is 1–2–2–2 to 3 from top to bottom set respectively, while 1–1–2–2 or 3 in two perradii.

It should be mentioned here that these medusae were detached from the polyp artificially to some extent, that is they were detached while the polyp was transferred into a container by a pipet or the bud was stimulated by needles.

4) Concluding Remarks on Morphology of Medusa in Hokkaido

With the growth of umbrella, the tentacles increased, and the growth of medusa seems to continue without cease untill the medusa degenerates (see Fig. 5). It is possible that the medusa which had the tentacles of six sets is found in future. But in what growth stage the medusa matures is not definitely determined, accordingly the appearance and maturation of gonad occur in different growth stage as were found between the specimens from Oshoro and Muroran.

It was already described by Uchida (1940) that a large specimen collected in Akkeshi Bay had also the tentacles of five sets (52 tentacles in total number) as the medusa from Muroran. Thus the medusa found in the Pacific coasts of Hokkaido is larger and has more tentacles than the medusa found in the Japan Sea coasts of Hokkaido.

The peculiarity of the arrangement of medusan tentacles grouped together in each perradius in the family Margelopsidae was already pointed out by Uchida (1924, '27), and this is one of the specialized features in the family as was mentioned by Rees (1957). The peculiarity is most appreciable in *Climacocodon*, and no similar arrangement of medusan tentacles in separate sets on exumbrella has been found among the hydroids belonging to Athecata-Anthomedusae.

It was observed that when the medusa swam swiftly all the tentacles tended downwards and the medusa hold them close to the exumbrella. The color of stomach and canals is red or reddish brown.

Description of Nematocysts

For the present species, the nematocyst equipment has been examined solely in the stage of mature medusa in the specimens from Muroran (Kubota, 1976), so in this study it is examined in other developmental stages. The constitution and size (length × maximum width of undischarged capsules, standard deviation, and the number of nematocysts examined, in μ) of nematocysts on various body portions of some developmental stages are as follows: in well-grown medusa (examined in a specimen from Oshoro), large type of stenoteles (Fig. 8, A): 9.6–9.7–10.0, 0.2×8.0–8.3–8.8, 0.2, 20 (on tentacles of the first set), 9.0–9.7–10.4, 0.4×8.0–8.4–8.8, 0.4, 7 (on tentacles of the second set), 9.6–9.8–10.4, 0.4×7.8–8.1–8.2, 0.2, 5 (on tentacles of the third set), 8.8–9.4–10.0, 0.5×7.2–7.9–8.4, 0.4, 5 (on tentacles of the fourth set), 10.4×8.7, –, 1 (on mouth); small type of stenoteles (Fig. 8, B, C): 7.0–7.6–8.2, 0.5×4.3–5.0–5.8, 0.4, 20 (on tentacles of the first set), 6.4–7.5–8.6, 0.6×4.2–5.0–5.8, 0.5, 20 (on tentacles of the second set), 6.6–7.6–8.2, 0.5×4.6–5.2–5.6, 0.3, 15 (on tentacles of the third set), 7.0–7.7–8.2, 0.4×4.6–5.1–5.6, 0.4, 15 (on tentacles of the fourth set), 6.6–7.6–8.2, 0.5×4.6–5.3–5.6, 0.4, 20 (on mouth); microbasic euryteles (Fig. 8, D-d, E): 7.4–8.1–9.4, 0.6×3.0–3.2–3.6, 0.1, 14 (on tentacles of the first set), 7.2–8.3–9.2, 0.6×2.6–3.3–3.8, 0.3, 20 (on tentacles of the second set), 7.8–8.4–9.0, 0.4×3.0–3.3–3.7, 0.2, 15 (on tentacles of the third set), 7.8–8.3–8.8, 0.4×2.8–3.2–3.6, 0.3, 7 (on tentacles of the fourth set), 7.8–8.1–8.2, 0.1×3.2–3.4–3.8, 0.2, 15 (on mouth), 8.0–8.6–9.0, 0.3×3.2–3.4–3.6, 0.1, 20 (on exumbrella); in newly liberated medusa (examined in the whole body of a specimen from Oshoro), large type of stenoteles (Fig. 8, F): 7.2–7.6–8.0, 0.3×6.0–6.4–6.6, 0.2, 10, small type of stenoteles (Fig. 8, G): 5.6–6.1–6.6, 0.4×4.0–4.1–4.2, 0.1, 14, microbasic euryteles

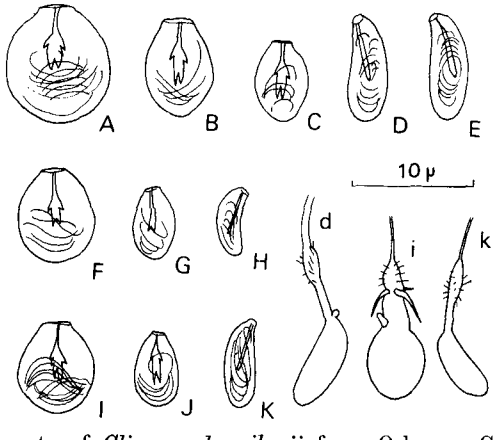

Fig. 8. Nematocysts of *Climacocodon ikarii* from Oshoro. Capital letters signify the undischarged state and small ones the discharged state of nematocysts. A-E: in well-grown medusa, F-H: in newly liberated medusa, I-K: in newly liberated polyp; A-C, F, G, I-i, J: stenoteles, D-d, E, H, K-k: microbasic euryteles.

(Fig. 8, H): 5.6–5.7–5.8, 0.1×2.4–2.5–2.6, 0.1, 3; in newly liberated polyp (examined in two specimens from Oshoro), large type of stenoteles (Fig. 8, I-i): 7.4–7.8–8.0, 0.3×5.8–6.4–7.2, 0.2, 30 (on aboral tentacles), 6.6–7.6–8.2, 0.4×5.8–6.2–6.6, 0.3, 17 (on manubrium with oral tentacles), small type of stenoteles (Fig. 8, J): 6.0–6.4–6.6, 0.1×3.0–4.0–4.2, 0.2, 30 (on aboral tentacles), 5.2–6.2–6.6, 0.4×3.4–4.0–4.4, 0.2, 25 (on manubrium with oral tentacles), microbasic euryteles (Fig. 8, K-k): 6.4–7.0–7.4, 0.3×2.4–2.6–3.2, 0.2, 30 (on aboral tentacles), 6.2–7.0–7.6, 0.4×2.4–2.6–3.2, 0.2, 20 (on manubrium with oral tentacles).

In the well-grown medusa, the same constitution and size of nematocysts are found among the tentacles of four sets and in mouth, and the small type of stenoteles are very abundant. In the newly liberated medusa, all kinds of the nematocysts are smaller than those found in the well-grown medusa, and microbasic euryteles are very few in number and they seem to be undeveloped.

On the other hand, in the newly liberated polyp, the same nematocyst equipment as that of medusa is found, and the constitution and size of nematocysts on aboral tentacles are the same as those on manubrium. Consequently, two kinds of nematocysts, stenoteles and microbasic euryteles, are present in the present species; and this combination of nematocyst kinds has not been found in other hydrozoan species as was previously pointed out by the author (1976).

Summary

The development and successive morphological changes of polyp and medusa of *Climacocodon ikarii* Uchida, 1924 including the morphology of newly liberated polyp and medusa as well as the nematocyst equipment are described and illustrated, using the specimens from Oshoro and Muroran, Hokkaido, northern Japan. The medusan specimens from Muroran are larger in size and have more tentacles (up to 4.6 mm in umbrellar height and 87 tentacles of five sets) than those from Oshoro (up to 2.8 mm in height and 46 tentacles of four sets), though the polypoid specimens from the both localities are mostly equal in their morphology. The polypoid specimens from Muroran are, however, to some extent larger and have more tentacles and medusa-buds; up to 2.4 mm in body length, 1.3 mm in body width, 17 aboral or oral tentacles of three whorls, and 49 medusa-buds of 9 clusters. The medusa from Oshoro, furthermore, matures earlier than that from Muroran in the development, though the eggs of medusae from the both localities are nearly equal in diameter (about 180 μ). The peculiar morphology and life-cycle of the present species is remarked.

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