A New Bivalve-Inhabiting Hydroid from Central Japan, with Reference to the Evolution of the Bivalve-Inhabiting Hydroids[1)]

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(With 4 Text-figures and 2 Tables)

Introduction

The bivalve-inhabiting hydroids in the world have been divided into three groups from the life-historical point of view (Kubota 1981) and recent systematic investigations on such hydroids indicate that they all belong to the family Eutimidae (Santhakumari 1970, Narchi and Hebling 1975, Kubota 1978, '79a, b, '83a, b, etc.). However, the taxonomic studies on this unique hydroid group have been poorly made, and it is expected that a new commensal hydroid of a new group will be discovered. This comes true on the occasion of a recent faunal survey on the Japanese bivalve-inhabiting hydroids. A new commensal hydroid of the fourth group associated with a mussel was found at Zagashima Island, central Japan, together with *Eugymnanthea inquilina japonica* Kubota in 1982. This occurrence of *E. i. japonica* in this place is also noticeable, and the systematic studies on this hydroid will be reported on another paper in the near future.

The present new hydroid of which polyp is of the ordinary type (Groups I, III, Kubota 1983a, p. 390) produces a rather precocious medusa, by which it is clearly different from the other bivalve-inhabiting hydroids so far been known. The occurrence of the present hydroid, which is the third species in Japan, will help us to reveal the phylogeny of the bivalve-inhabiting hydroids and their relatives on the one hand, but it will make the taxonomy more complicated. In the present paper the full description of the present new hydroid with detailed taxonomic discussion and some reference to the evolution of the commensal hydroids associated with bivalves are given.

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1) This paper was read at the 54th annual meeting of the Zoological Society of Japan held at Matsuyama, Ehime Pref., October 1983.

Materials

With at least three specimens of *Mytilus edulis* out of 35 ones examined, collected from Zagashima Is. in Ago Bay, Mie Pref., on Nov. 22-24, 1982, the present hydroid was associated. All these mussels were attached to ropes (with dead Pectinid bivalve shells on which sessile organisms were raised) hanging down from buoys in the surface layer of the sea, within several meters in depth, or attached to a set of raft for pearl culture. The size of these mussels ranges from 3.1 to 8.4 cm in antero-posterior axis, and that of the specimens harbored the present hydroid was 4.2, 5.6, 5.6 cm, respectively. It is noteworthy that one of these hosts, 5.6 cm in shell size, harbored *Eugymnanthea inquilina japonica* simultaneously with the new species. In this place, *E. i. japonica* was more common, and it was associated with some other bivalves than *M. edulis*.

After carrying back all these mussels to Sapporo, they were dissected and the commensal polyps found were picked up. The polyps attached to all the soft body portions of each host, and in many of them small medusa-buds were produced then. They were reared in laboratory to obtain their medusae. The newly liberated medusae as well as the polyps were reared by the same method as described before (Kubota 1983a). The water temperature of rearing was set at 18-20°C except for rearing of some specimens at 12°C.

In the following description both the drawings and the measurements were made in the living specimens, and Fig. 1, C, D were made with the aid of a drawing apparatus. The measurements in text are shown in the order, minimum-mean-maximum values and the number of specimens examined is in parentheses.

***Eucheilota intermedia* n. sp.**

(Figs. 1-3)

Youngest Medusa 1 Day Old

About 50 or more medusae were liberated from the polyps associated with the three specimens of *Mytilus edulis*. In 44 specimens examined, two marginal tentacles are usually present, but one specimen had one tentacle and two had no tentacle. The following measurements of various body portions are taken from the specimens (possibly females) originated from the two hosts, both 5.6 cm in shell size. The umbrella is 0.63-0.91-1.3 mm (27) in width and 0.63-0.80-1.0 mm (12) in height. On nearly the whole exumbrellar surface nematocysts are scattered and at the apex of the umbrella a small concavity was sometimes present. The manubrium is 0.25-0.31 mm (12) in length and the stomach is 0.09-0.13 mm (5) in breadth. There are eight marginal swellings and on each of which up to four cirri, summing up the abaxial and the lateral cirri, are found. Eight statocysts are present in the adradii, and one statocyst contains one to three statoliths. In

one specimen 16-22.8-28 (12) cirri and 8-11.6-20 (12) statoliths were found. Among the specimens examined the specimens above 0.75 mm in width had the rudiments of gonads on each of four radial canals near the stomach. In only such larger specimens the ring canal is green in color and a black band is present on the abaxial side of each of the tentacular bulbs. The tentacular bulbs and the manubrium are usually creamy in color.

Development of Medusa and Morphology of Mature and Spent Medusae

One of the characteristics of the present hydroid is that the maturation of gonads of the medusa proceeds more rapidly than growth of its umbrella. For example, a specimen became a male mature medusa on the fourth day, when it was still very small, being 1.6 mm in width and had only two tentacles (Fig. 1, A; the specimen ■ in Fig. 2). Another specimen became a female mature medusa on the eighth day, when it was 2.1 mm in width and had four tentacles of which two were still short. Another female specimen was nearly mature on the eighth day, when it was 1.3 mm in width and had two tentacles, and it was fully mature on the 13th day, when 1.5 mm in width and had still two tentacles. This medusa had no tentacles when liberated from the polyp, and one tentacle and gonads began to be produced on the fifth day. All the specimens reared in laboratory, 20 in number, were fully mature within 13 days after liberation despite of their small size (Fig. 2).

The mature medusae are 1.5 to 3.4 mm in width (Table 1), and they have 2 or 4 tentacles and 0-8 marginal warts of the second set. In a quadrant, 0-2 very small marginal warts of the second set were produced on the umbrellar margin between the interradial marginal warts of the first set and the statocysts (Fig. 1, D; Fig. 3). Only one marginal wart of the third set was formed on the umbrellar margin between the perradial swelling and the statocyst in one male mature medusa even it was 7-day-old (Fig. 1, A). In this specimen 7 marginal warts of the third set were produced on the 19th day (Fig. 1, B, D). No cirri are found on the marginal warts of the second and the third sets, while on the perradial or the interradial marginal swellings up to 6 lateral cirri were present in one swelling. There were 22-41 lateral cirri in one specimen, therefore the total number of cirri is more than that of the youngest medusa despite of the disappearance of the abaxial cirri on the interradial marginal warts of the mature medusa.

In order to reveal the further morphological changes of the mature medusa as well as its life-span, one male specimen (Fig. 1) and six female ones were reared for more than a month until they began to degenerate (Fig. 2). All these specimens had four tentacles on and after the 16th day. It was observed that the male specimen (Fig. 1, A) began to produce the third tentacle on the 13th day when it was 2.6 mm in width. This specimen was the largest mature specimen with two tentacles the day before (12th day). The mature gonads are oval at first and are found on the radial canal near the manubrium (Fig. 1, A). One gonad discharged sperm on the 6th day, but it developed again and all the gonads lengthened as this

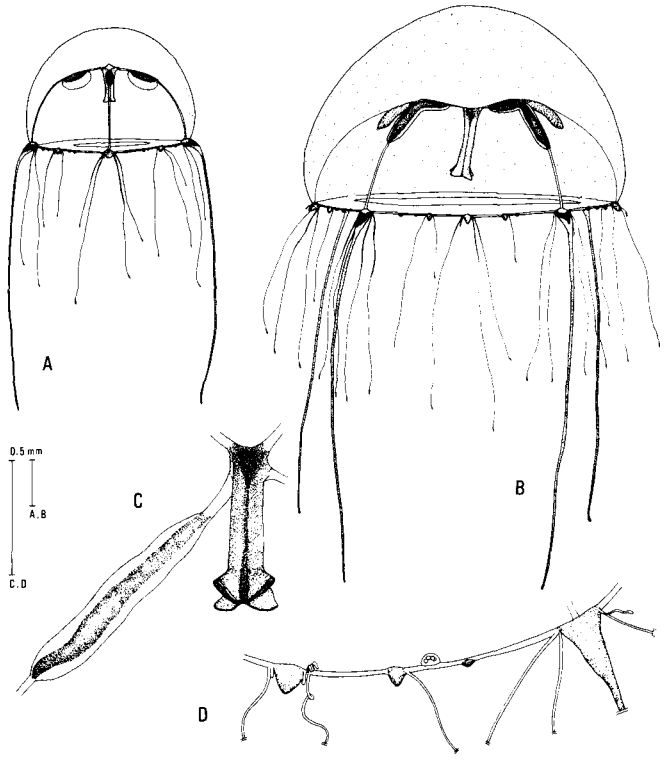

Fig. 1. A: a male mature medusa, 7 days old, with 2 tentacles, 17 marginal swellings (4 marginal warts of the first set, 8 ones of the second set, and one of the third set), 22 statoliths, and 36 cirri. Note the frontal gonad already degenerated after maturation. B: the same male mature medusa as the above, 19 days old, with 4 tentacles, 23 marginal swellings (4 marginal warts of the first set, 8 ones of the second set, and 7 ones of the third set), 37 statoliths, and 41 cirri. C: manubrium with crusiform oral lips (obliquely viewed) and a linear gonad on radial canal of the same specimen as B, oral view. D: a portion of umbrellar margin, showing one tentacular bulb with 4 lateral cirri, one marginal wart of the first set with 5 cirri, one marginal wart of the second set with one cirrus, one marginal wart of the third set without cirri, and a statocyst containing 4 statoliths, oral view of the same specimen as B (distal part of the tentacles and well-developed lateral cirri omitted).

male medusa grew. Consequently they became linear in shape and occupied nearly the first half of the radial canal (Fig. 1, B, C). This elongation of gonads was also observed in female medusae reared and the maximum length of the gonads was 1.0 mm when measured from the aboral side (Table 1).

On and after 21st day every specimen could not take the food for itself. Therefore after tearing the *Artemia* nauplii into pieces by needles, they were taken to the mouth of each specimen, and by this feeding the medusa could survive thereafter in a healthy condition. However, nearly all the gonads degenerated

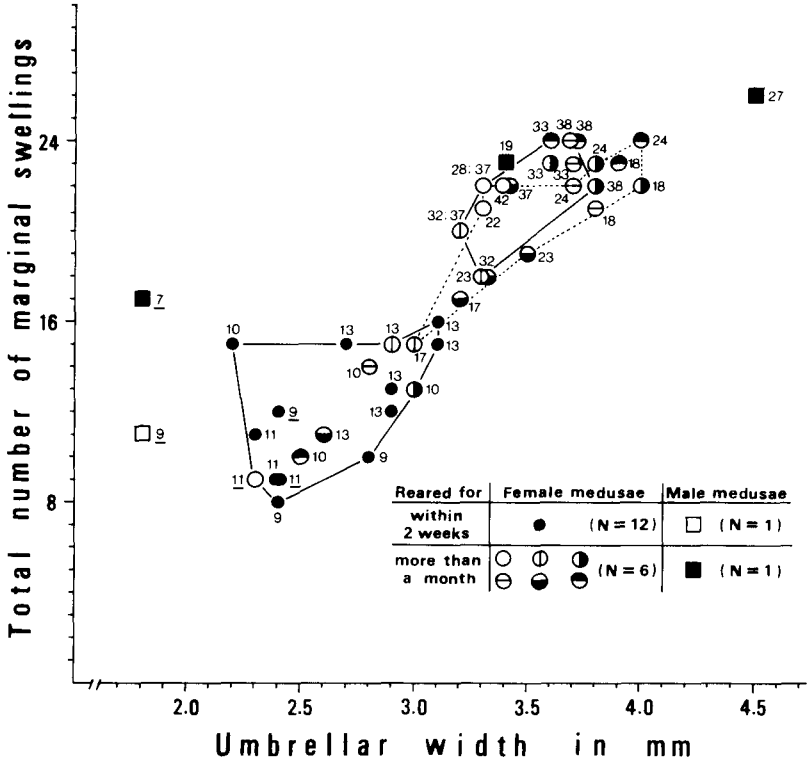

Fig. 2. Relationship between the umbrellar width and the total number of marginal swellings of the mature and spent medusae. In each of seven specimens (6♀♀ +1♂) successive development for more than a month is shown. In female specimens, mature ones within two weeks old, mature and spent ones 17–28 days old, and spent ones more than one month old are demarcated. Number beside each symbol represents age of medusa (days), and the underlined ones indicate the specimens with two tentacles (others four). For details see in text.

between the 23rd and 28th day, moreover the medusa did not grow more from that time on. The life-span was at the longest 53 days. The morphology of the spent medusa is also shown in Table 1. Throughout the life-span of the medusa the followings are noticed: 1) The oral lips are crusiform in shape (Fig. 1, C) and not assuming crenulated or frilled ones; 2) No peduncle is formed; 3) The perradial and interradial marginal swellings are dark black in color; 4) The exumbrellar nematocysts do not disappear; 5) The tip of the tentacles is often swollen; 6) One lateral cirrus is formed on one marginal wart of the second set on the 16th day in a male medusa shown in Fig. 1; 7) One statocyst of one male medusa 40 days old

Table 1. Measurements of various body portions of mature and spent medusae from Zagashima Island, in mm.

Sex[1]	Female medusa		Male medusa	
Stage	Mature	Spent	Mature	Mature
Spec. no., Age[2]	18, 9-13	8, 37-42	2, 7-9	1, 19
Umbrellar width	2.2 -3.1 (2.7)	3.2 -3.8 (3.5)	1.8	3.4
Umbrellar height	1.6 -2.2 (2.0)	2.6 -3.3 (3.0)	1.3 -1.4	2.2
Length of manubrium	0.44-0.63(0.55)	0.40-0.50(0.44)	0.38-0.44	0.69
Thickness of jelly at the umbrellar apex	0.63-1.0 (0.80)	1.4 -1.7 (1.6)	0.44	1.1
Breadth of stomach	0.16-0.19	0.14-0.20	0.19	0.19
Length from center of stomach to proximal portion of gonad	0.31-0.56	0.35-0.50	0.16-0.25	0.38
Length of gonad	0.38-0.56(0.44)	0.70-1.0	0.31-0.38	0.94
Maximum width of gonad	0.14-0.20	0.09-0.16	0.20-0.22	0.19
Breadth of velum	0.31-0.50	0.25-0.31[3]	0.31-0.38	0.44
No. of statocysts	8	8[3]	8	8
No. of statoliths	20-26(23.2)	44-52(48.7)[3]	22-24	37
No. of statoliths per statocyst	1- 4(2.9)	4- 8(6.1)	2- 3	3-5
Total no. of cirri	22-36(30.9)	4-10(8.2)[3]	36-37	41
No. of tentacles	2 or 4	4	2	4
Total no. of marginal swellings	8-16(12.1)	20-24(22.3)[3]	11-17	23

1) Female specimens originated from one host of which antero-posterior axis is 5.6 cm and male ones from one host whose antero-posterior axis is 4.2 cm.
2) Number of specimens examined, and age in days.
3) In two specimens measurements were impossible due to partial degeneration.

(the specimen shown in Fig. 1)[1] contained 10 statoliths which is the maximum number of the statoliths per statocyst; 8) In spent medusae 37-42 days old the cirri decrease in number, and only 4-10 cirri are present; 9) The unfertilized eggs discharged from five specimens are 26-86 μm (142) in diameter, and 64.0 % of them are 64-82 μm in diameter and 26.8 % are 50-62 μm; 10) Several medusae were reared at about 12°C, but they did not grow well and on the 19th day they were 1.7-1.8 mm in width and had only two tentacles, moreover any sign of gonads did not appear; 11) From two sexual pairs, each reared in a separate vessel to get their offspring, only one embryo was obtained.

1) In this specimen half of the umbrellar margin was quite reduced on the 36th day, when it was 4.0 mm in diameter and had at least 16 marginal swellings.

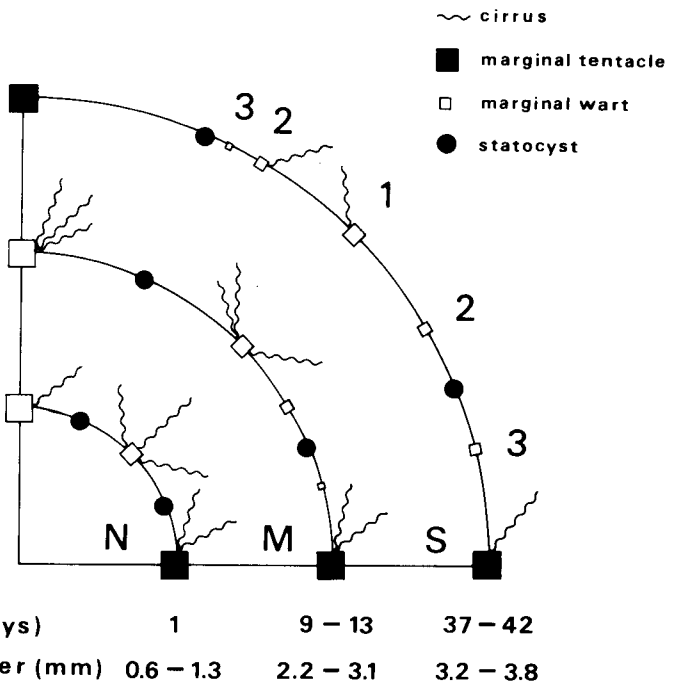

Fig. 3. Diagram showing the subsequent formation of tentacles, marginal warts, and cirri in a quadrant of medusa, from oral side. N: newly liberated medusa, M: mature medusa, S: spent medusa.

Table 2. Nematocysts of mature and spent medusae from Zagashima Island. Size: length × maximum width, range (mean), number of nematocysts examined, in μm.

Body portions	Atrichous isorhizes	Basitrichous isorhizes	Merotrichous isorhizes
Tentacles	L: 7.8-9.2×3.8-4.4 (8.6) 12 (4.0)	S: 6.0- 8.8×2.0-2.6 (7.4) 22 (2.4)	—
	M: 5.0-7.6×2.0-3.2 (6.2) 16 (2.7)	—	—
Cirri	S: 4.2-5.4×1.6-2.2 (4.8) 17 (1.8)	—	9.6-11.8×3.2-3.6 (10.9) 18 (3.4)
Oral lips	—	S: 7.2- 8.8×2.1-2.6 (7.8) 20 (2.3)	—
Exumbrella	—	L: 8.8-10.0×4.8-5.8 (9.5) 16 (5.4)	—

— : Absent, L: large type, M: medium type, S: small type.

Nematocysts

Two polyps (possibly female specimens) originated from the two hosts (shell length, 5.6 cm) were examined. As a result, one kind of nematocysts, basitrichous isorhizes, is found. Measurements (length × maximum width of undischarged capsules) of this nematocyst are as follows: 7.2-8.3-9.6 μm × 1.9-2.2-2.4 μm (42). It is cofirmed that other nine specimens from the two hosts have a similar nematocyst equipment.

On the other hand, in the medusa, one mature medusa 13 days old and one spent medusa 37 days old were examined. No distinct difference of the nematocyst equipment was detected between these two female specimens, therefore their measurements (ditto) are combined together and shown in Table 2. It was observed that 15-18 merotrichous isorhizes were contained in the distal knob of one cirrus (in three cirri of the two specimens).

Type Material

The holotype is a mature male medusa described in text and illustrated in Figs. 1, 2, and paratypes are male and female medusae described in text. The type material are deposited in the Zoological Institute, Faculty of Science, Hokkaido University.

Etymology

The specific name *intermedia* literally refers to the present mature and spent medusa which is intermediate between the medusa of *Eugymnanthea* and that of *Eutima* as discussed below.

Discussion

1) *Morphological Comparison of the Present Hydroid with the Other Bivalve-Inhabiting Hydroids*

Among the commensal hydroids associated with bivalves so far been known except for two subspecies of *Eugymnanthea inquilina*, the present hydroid produces the smallest mature or spent medusa with only two or four tentacles, and in this life stage it is clearly distinguishable from the others. The most distinct characteristic of the present medusa is the absence of the peduncle through its life-span. It is noteworthy that in *Eutima sapinhoa* from Brazil, which has a small mature medusa about 3 mm or more in diameter with only four tentacles, the peduncle was produced rapidly (3-5 days after liberation) in laboratory when the medusa is 3 mm in diameter (Narchi and Hebling 1975) and that in *E. commensalis* from India, which also has a small mature medusa (under about 6 mm in diameter) with eight tentacles, the peduncle was formed when about 3 mm in diameter in preserved state (Santhakumari 1970).

In Japanese waters, two bivalve-inhabiting hydroids, *Eutima japonica* Uchida, 1925 and *Eugymnanthea inquilina japonica* Kubota, 1979 are known (Kubota 1979, '83a). Compared the present hydroid with them, the present polyp is similar to their polyps, though the mature medusae of these three hydroids differ with each other. Indeed the present hydroid closely resembles *Eutima japonica* in having a similar polyp and a young medusa as well as nearly the same nematocyst equipment and an equal diameter of eggs, but the present mature and spent medusae are distinguishable from those of *E. japonica* in the following points: 1) No peduncle is formed throughout the life-span; 2) The umbrellar size is smaller, under 4.5 mm in width; 3) The number of tentacles is 2-4, less than one-half; 4) The total number of marginal swellings is fewer, 26 and below; 5) The gonads are not produced on the distal half of the radial canals, but on the first half; 6) The oral lips are simple, crusiform in shape; 7) Many exumbrellar nematocysts are remained; 8) Basitrichous isorhizes on tentacles are the same size as those on oral lips (thus both of small types), though in *E. japonica* the latter is larger than the former (the latter tends to be smaller than the nematocysts of *E. japonica* while the former be larger, cf. Kubota 1983a, Table 29); 9) The life-span is shorter, about one month, at the longest about two months. It is noteworthy that in *E. japonica* the peduncle is formed when the umbrella is above 3.8 mm in width (Kubota 1983a, p. 334), overlapping with the size of the present mature medusa without peduncle, and the present polyp had no nematocysts of basitrichous isorhizes of stumpy type.

2) *Morphological Comparison of the Present Hydroid with Other Related Hydroids*

Judging from the above-described characteristics of the mature and spent medusae of the present hydroid, it belongs to the genus *Eucheilota* of the family Lovenellidae according to the well-established taxonomic system of the medusae by Kramp (1959, '61, '68). In this medusan genus 14 species have hitherto been described in the world (Kramp *op. cit.*, Tundisi 1962, Goy 1979). Of these four species, *E. bakeri* (Torrey, 1909), *E. massi* Neppi and Stiasny, 1911, *E. diademata* Kramp, 1959, and *E.* sp. Kramp, 1959, are described only based on the young medusae, therefore their generic status is doubtful unless their mature stages are clarified. Moreover, *E. flevensis* van Kampen, 1922 had disappeared from the type locality and its neighborhood of Danish waters prior to the full description was made (see Kramp 1959). On the other hand, the polypoid generation of the genus is known in only one species, *E. maculata* Hartlaub, 1894, by laboratory-rearing (Werner 1968), and unfortunately the polyp of the type species, *E. ventricularis* McCrady, 1857, is still unknown.

In Japanese waters two species of *Eucheilota* have been known. *E. tropica* Kramp, 1959 was recorded at Misaki (one male mature medusa, 26-IV-'14) by Kramp (1965). The other is *E. paradoxica* Mayer, 1900, and many specimens of this species were collected as follows: two specimens (4-XII-'28) from Amakusa

(Uchida 1938a); one specimen (VIII-'21) in Mutsu Bay (Uchida 1938b); very few specimens in Tanabe Bay in summer (Yamazi 1958); many immature and mature specimens from Misaki in March to October in 1970-'75 (Uchida 1938b, Uchida and Sugiura 1975); one immature specimen (23-VIII-'79) in Otsuchi Bay (Sugiura *et al.* 1980); two immature specimens (7-IX-'78) from Harumi, Tokyo Harbour (Sugiura 1980); and 13 immature specimens (31-VIII-'79, 13-IX-'79) in Oshoro Bay (Kubota unpublished). This widely distributed medusa in Japan as well as in other parts of the world has an ability to produce many daughter medusae by budding, which is one of the unique characteristics among the Leptomedusae.

The present mature and spent medusae are clearly discriminated from all the above-enumerated species of *Eucheilota* including the two species recorded in Japan. Moreover, the present polyp is not a free-living one like the polyp of *E. maculata*, but it is a commensal polyp associated with *Mytilus edulis* like most of the polyps of the bivalve-inhabiting hydroids so far been known (Groups I, III, cf. Fig. 4).

3) *Taxonomic Discussion and the Evolutionary Status of the Present Hydroid among the Bivalve-Inhabiting Hydroids in the World*

The discovery of the present Eucheilotid bivalve-inhabiting hydroid sets a question as to the systematics of the bivalve-inhabiting hydroids: the commensal hydroids associated with bivalves may not be a monophyletic group but a diphyletic or a polyphyletic one. It is conceivable that all the known bivalve-inhabiting hydroids have been the members of the family Eutimidae (Kubota 1983a, etc.), but the present hydroid belongs to the Lovenellidae as mentioned above. It is noticeable that *Eugymnanthea inquilina* and *Eugy. cirrhifera* (certainly recognized as *Eutima japonica* at this moment) were thought to belong to the Lovenellidae by Uchida (1964). Judging from the available knowledge concerning the morphology in both the polyp and medusa as well as their nematocyst equipment (see Werner 1968, Russell 1970, Kubota 1983a and unpublished data), both families are considered to be closely related each other phylogenetically. Generally speaking, the mature medusa of *Eutima* has the morphology that adds the peduncle to the mature medusa of *Eucheilota*, or the mature medusa of *Eucheilota* is the morphology that adds the gonads to the young medusa of *Eutima* without peduncle. It should be confessed that the present new hydroid was thought to be *Eutima japonica* (the southern Japan form) when the polyp and the young medusa were observed.

The taxonomic revision[1)], if necessary, should be made after the life-histories

1) It is one of the taxonomic solutions that all the bivalve-inhabiting hydroids are assigned to the genus *Eutima*, and the genera such as *Eutima* containing at least two or three types for the present (cf. Fig. 4), *Eugymnanthea*, and *Eucheilota* are reduced to a lower level (subgenera). The author conceived this idea when his first paper on the Japanese bivalve-inhabiting hydroids was written (Kubota 1978, p. 144).

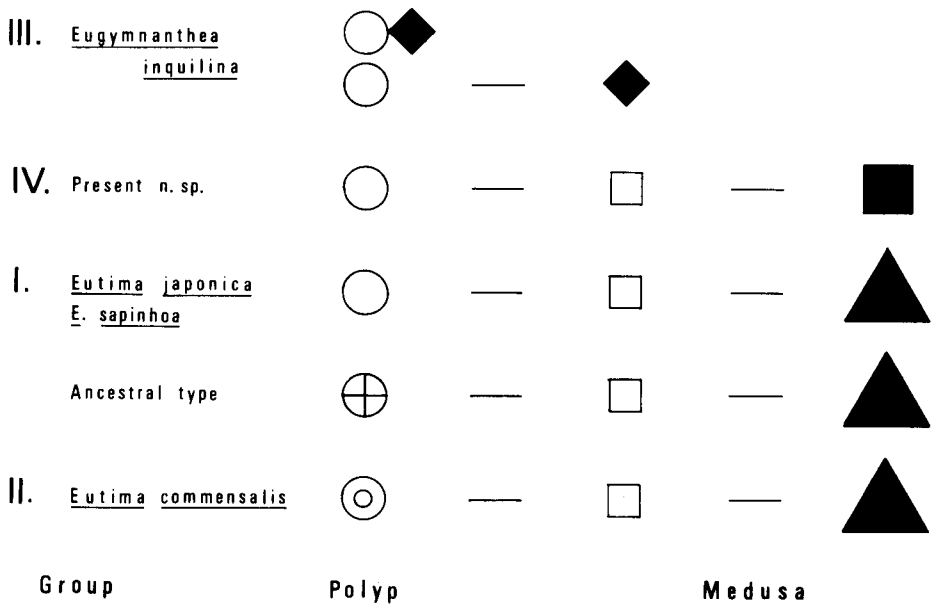

Fig. 4. Schematic illustration of the ontogeny of the bivalve-inhabiting hydroids of four groups (I-IV) and that of their ancestral type. Different symbols indicate the different morphology, among which solid symbols represent mature stages.

of the members of the Eutimidae and Lovenellidae are clarified, when it is possible that the taxonomic situation for these hydroids becomes more complicated than the present state (see Kubota 1983a, p. 395). If this possible situation kept in mind, it is better to designate the present hydroid as *Eugymnanthea inquilina inquilina* Palombi, 1935 - *Eucheilota intermedia* n. sp. Further systematic studies on the Japanese bivalve-inhabiting hydroids and their related ones, which have been carrying out in various localities in Japan, particularly the studies on such hydroids from Hachinohe (type locality of *Eugymnanthea cirrhifera* Kakinuma, 1964) and those from Enoshima Is. and its vicinities (near the type locality of *Eutima japonica* Uchida, 1925) confirm that the present hydroid is undoubtedly a new species. The binomen *Eucheilota intermedia*, which in a strict sense is assigned to the present mature and spent medusae, can be truly applied to the present hydroid, but the above quadrinomen might be better to represent an exact nature of this animal, holding the above complicated taxonomic problem including a possible discovery of a new hydroid of a new group derived from '*Eugymnanthea*' (a commensal polyp of the ordinary type with fixed sporosacs of very reduced type) or that derived from *Eutima commensalis* (a polyp of the extraordinary type with fixed sporosacs or with Eucheilotid medusa).

From the life-historical point of view, four groups are discriminated in the

bivalve-inhabiting hydroids in the world, for the time being, and three of which are found in Japanese waters. The life-history patterns of the commensal hydroids of the four groups and the free-living hydroids of their ancestral type are schematically shown in Fig. 4. Each group is arranged, from the top, in the order that the degree of the morphological modification is larger except for the Group II (bottom) which is only modified in its polypoid generation as the Group I. The present new hydroid (Group IV) exactly fills up a morphological gap between the hydroids of the Group III and those of the Group I. Having an opinion that the bivalve-inhabiting hydroid is a monophyletic group, the most probable evolution of such hydroid is as follows. The evolution proceeds directionary from '*Eutima*' to '*Eugymnanthea*' passing through '*Eucheilota*'. Although it cannot be denied the following three possible courses: 1) the evolution from '*Eucheilota*' to '*Eugymnanthea*' and '*Eutima*'; 2) that from '*Eucheilota*' to '*Eugymnanthea*' passing through '*Eutima*'; 3) that from '*Eugymnanthea*' to '*Eucheilota*' and/or '*Eutima*', the latter two evolution may be more difficult to occur. '*Eucheilota*' and '*Eugymnanthea*' would have modified their polypoid and medusan generations of the ancestor. This is one of the reasons why '*Eugymnanthea*', of which morphological modification is the largest, have been an enigmatic hydroid (Kramp *op. cit.*, Rees 1967, etc.). The above-deduced paedomorphic evolution by the accerelation of sexual maturity (progenesis) is often encountered in parasitic organisms, for which the evolution of the bivalve-inhabiting hydroids may fit, though the relationship between the hydroids and their hosts (bivalves) is conceivable as commensalism.

It is interesting here to note that the above evolutionary change is confirmed from the biogeographic point of view. In Japanese waters *Eutima japonica* is widely distributed from Shikoku to Hokkaido, while the distribution of *Eugymnanthea inquilina japonica* and the present new hydroid is very restricted to the central part of Japan. Thus *E. japonica* is the most primitive bivalve-inhabiting hydroid in Japan and the other two are considered to be the daughter species, though it is highly possible that *E. i. japonica* is an introduced species from Europe (Kubota 1981; '83a, p. 389) and furthermore their dispersal capability is different.

Summary

A new commensal hydroid associated with *Mytilus edulis* was described based on the male and female specimens collected from Zagashima Island, Mie Pref., central Japan. The newly liberated medusa with usually two tentacles was reared in laboratory for about two months and the morphological changes in the life-span were clarified. The present hydroid is different from the related ones so far been known in its medusan generation from mature to spent stages. The small medusa, up to 4.5 mm in diameter, has many (up to 41) cirri, up to 4 tentacles and 26 marginal swellings including the tentacular bulbs, oval to linear gonads on the

first half of the radial canals, and up to 52 statoliths (up to 10 ones per statocyst), but no peduncle. A binomen *Eucheilota intermedia* is assigned to the medusan generation, and the author insists on designating the present hydroid as *Eugymnanthea inquilina inquilina* Palombi, 1935 - *Eucheilota intermedia* Kubota, 1984, prior to settle the complete scientific name (binomen). The present bivalve-inhabiting hydroid belongs to the fourth group and it is an intermediate hydroid between the members of the Group I (the most primitive hydroids) and the Group III (the most derived ones). A paedomorphic evolution from '*Eutima*' to '*Eugymnathea*' passing through '*Eucheilota*' (progenesis) was deduced, assuming that the bivalve-inhabiting hydroids are a monophyletic group. This evolutionary change was confirmed in Japanese hydroids from the biogeographic point of view.

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