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Author(s)	UCHIDA, Tohru; OKUDA, Shiro
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The hydroid *Lar* and the medusa *Proboscidactyla*[1)]

By

Tohru Uchida & Shiro Okuda

Zoological Institute, Faculty of Science, Hokkaido
Imperial University, Sapporo

(*With 11 textfigures*)

While studying the early development of the sedentary polychaete *Potamilla myriops* at the Akkeshi Marine Biological Station during August-September, 1940, the junior author happened to find a colony of curious hydroids growing at the extremity of the tube of the polychaete. Having received that report from the junior author, the senior author went to Akkeshi and was fortunate to be able to examine many living colonies. From the unique oddity of its configuration, the hydroid was easily identified as belonging to the genus *Lar*. Some of the colonies were bearing many medusa-buds which developed within several days into medusae and were liberated from the colonies. The medusae seem to be referable to *Proboscidactyla flavicirrata* which is very common in Akkeshi Bay.

In 1857 Gosse described the remarkable hydroid, *Lar sabellarum*, which was growing along the margin of a *Sabella*-tube from the coast of England. Afterwards Hincks (1872) examined a colony of the same hydroid attached to a *Sabella*-tube obtained off the Capstone at Ilfracombe. The colony contained gastrozooids and blastostyles, and the latter gave rise to hydromedusae with six radial canals and six marginal tentacles. Afterwards Browne (1896) pointed out that the hydromedusa *Willsia stellata* must be the adult form of the medusa liberated from the hydroid *Lar sabellarum* and further (1897) published a note on the branching of radial canals and on some abnormal individuals with five or seven main radial canals.

The hydroids of *Lar* found in Akkeshi Bay form a colony around the terminal portion of the tube of the sedentary polychaete,

1) Contributions from the Akkeshi Marine Biological Station, No. 36.

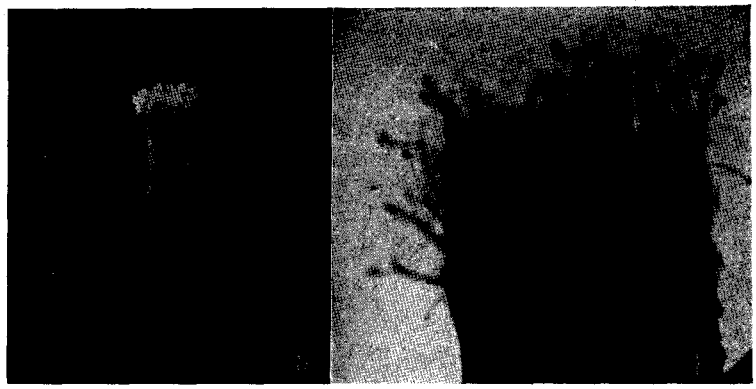

Fig. 1. Photographs of colony of *Lar* (= *Proboscidactyla*) *flavicirrata* growing on the tube of *Potamilla myriops*; a, Preserved specimen. ×2; b, Distal part of colony in living state. ×ca 10.

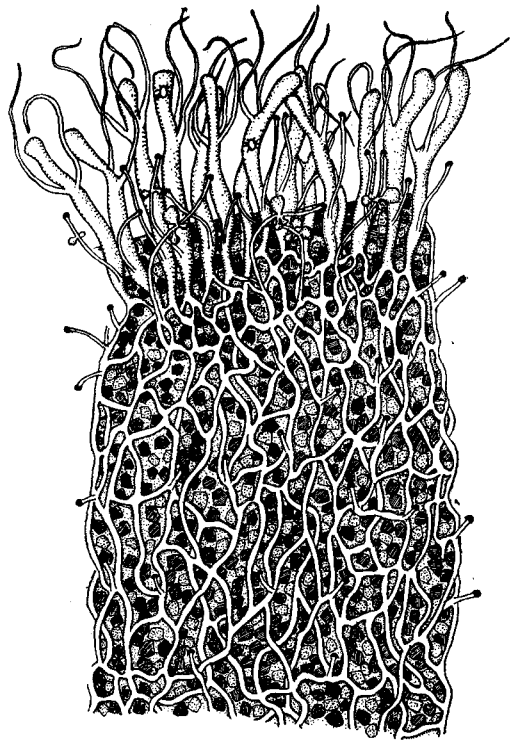

Fig. 2. A part of colony of *Lar* (= *Proboscidactyla*) *flavicirrata* growing on the polychaete tube. Enlarged.

Potamilla myriops only, but have never been found attached to the tube of other sedentary polychaetes, e.g. *Chone* and *Schistocomus*.

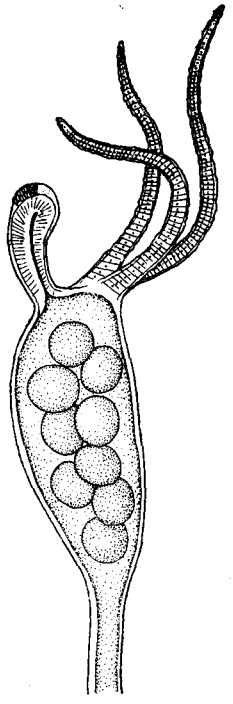

Fig. 3. Gastrozooid with three tentacles, the stomach containing eggs of *Potamilla myriops*. ×30.

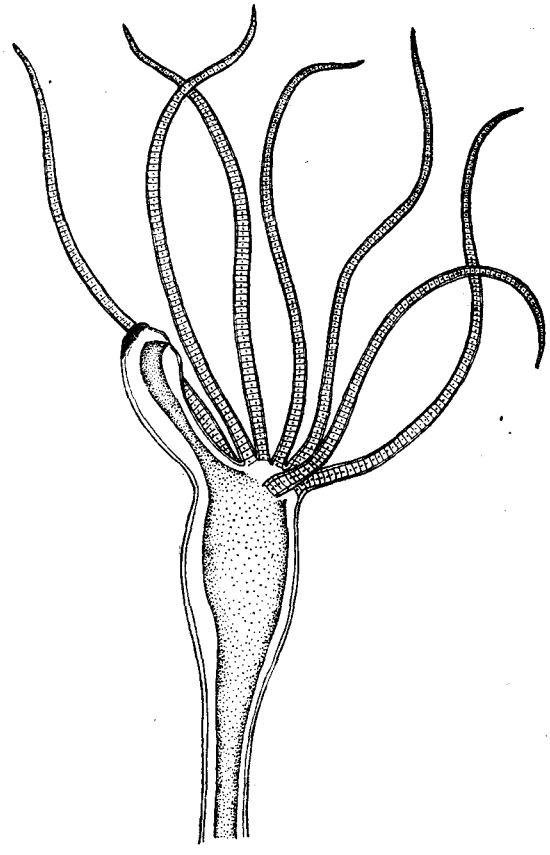

Fig. 4. Gastrozooid with seven tentacles. ×30.

In *P. myriops*, the tubes of relatively young worms are especially preferred. On closer examination the colony is seen to grow not only on the terminal portion of the polychaete tube but also to cover almost the whole surface of the tube. The polyps standing around the terminal end of the tube are large, containing gastrozooids having two tentacles and a lobe, and just inside of them tentacle-less blastostyles bearing medusa-buds. These polyps are connected with each other by a reticulated stolon which creeps adhering to the surface of the tube, forming a loose net-work. The stolon runs to the

proximal part of the tube and there gives rise here and there to minute blastostyles alone but no gastrozooids. These minute blastostyles do not bear medusa-buds. The hydroid is entirely destitute of perisarc.

Gastrozooids, present solely on the distal margin of the polychaete tube, arise singly from the stolon but are very close together. They are about 1 mm long and marked by the presence of two tentacles and a curious head-like lobe. The lobe is bilaterally symmetrical; the mouth does not open at the summit of the median axis but at the ventral portion slightly proximal to the summit. On the dorsal side just opposite to the mouth there is present like a boss a nematocyst cluster which is conspicuous in living specimens. The

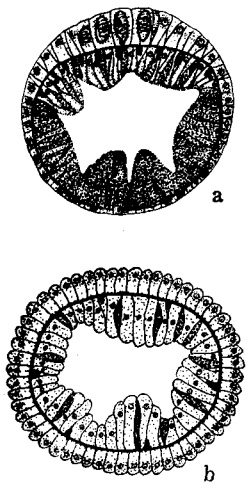

Fig. 5. a, Section through the nematocyst cluster of the lobe just above the level of mouth; b, Section of the hydrocaulus.

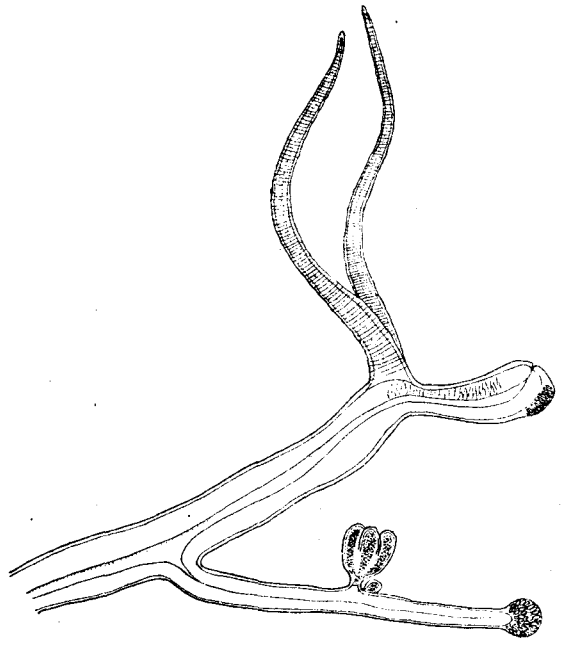

Fig. 6. Gastrozooid branching off a blastostyle. ×30.

lobe is rounded above and gradually narrowed proximally, concave on the ventral and convex on the dorsal side. In cross section the lobe is bilaterally symmetrical and slightly flattened dorso-ventrally. The ectoderm cells are vesiculated and the endoderm cells contain many granulated gland cells, especially near the mouth (Fig. 5, a).

Just below the narrowed neck of the lobe arise two large tentacles. These tentacles, standing on the ventral side in a pair, are solid with a row of endoderm cells, deficient in nematocysts, and longer than the lobe but shorter than the hydrocaulus. They are usually two in number but sometimes three and in an abnormal specimen seven as shown in Fig. 4. The stomach, situated below the tentacles, becomes vast, especially when food is contained. The ectoderm cells of the hydrocaulus are mostly mucous and the endoderm cells are glandular, containing granulated cells. The mesogloea is thin and sends out minute ectodemal muscles in the hydrocaulus but not in the lobe (Fig. 6, b). The colour of the gastrozooid is slightly brownish.

The blastostyles are filamentous, hollow, destitute of tentacles and terminated in a nematocyst knob. Those arising solitarily from the stolon near the terminal margin of the polychaete tube are large and bear medusa-buds, while those distributed over in other parts are minute and lack medusa-buds. The blastostyles are sometimes branched off from the gastrozooids (Fig. 6). The two-seven medusa-buds are borne in a group in the distal half of the blastostyles; they seem to be arranged more or less after Chun's law. It is a very important fact that the radial canals of medusae attached to one and the same blastosytle are variable in number; in other words, a single blastostyle bears medusae which are different in number in the radial canals and tentacles. Besides, the colony containing gastrozooids with tentacles more than two in number gives rise to blastostyles which reproduce medusa-buds which are seemingly normal in numbers of radial canals and tentacles (not especially numerous). The colour of blastostyles and medusa-buds is slightly brownish. The young medusa just liberated from the colony, is about 0.5 mm high and globular or hemispherical in shape.

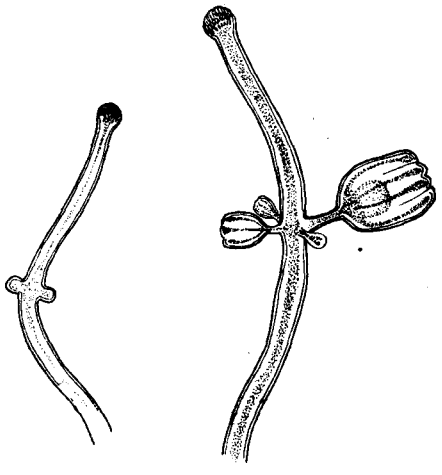

Fig. 7. Blastostyles bearing medusa-buds. ×30.

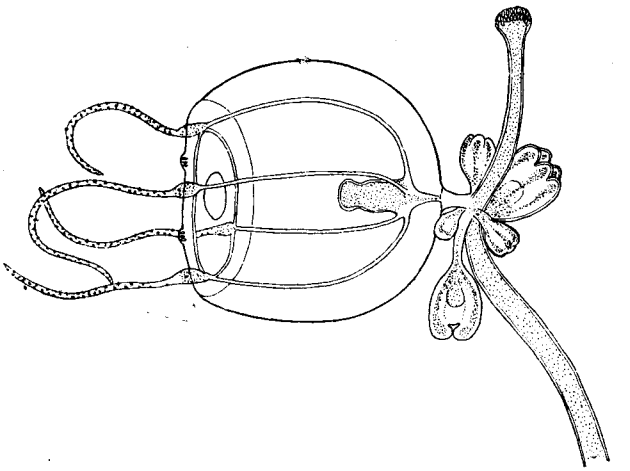

Fig. 8. Blastostyle bearing a medusa with four radial canals. ×30.

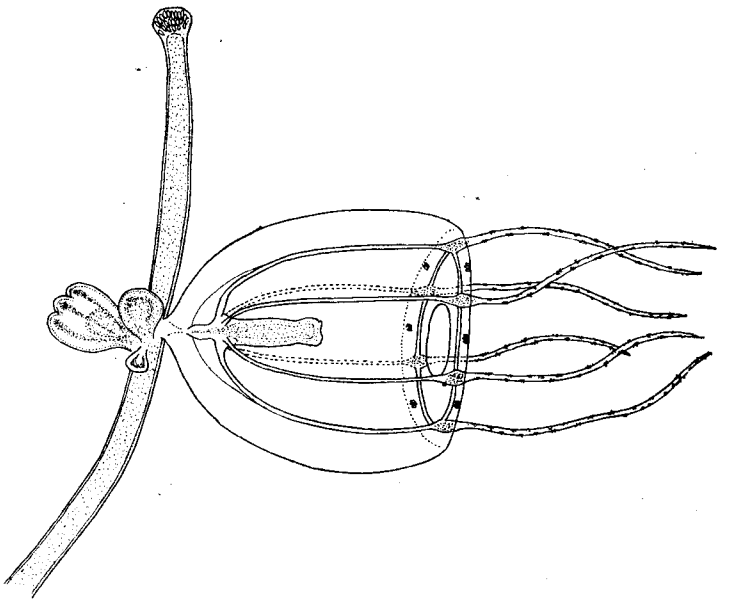

Fig. 9. Blastostyle bearing a medusa with six radial canals. ×30.

The medusa was at first connected with the blastostyle by the apical canal leading upward from the stomach. The remnant of the apical canal is often observed as an apical blind canal in liberated medusae, which gradually becomes diminished on account of the increase of

jelly especially in the apical portion. The manubrium is short and has a round mouth. The radial canals are straight and narrow.

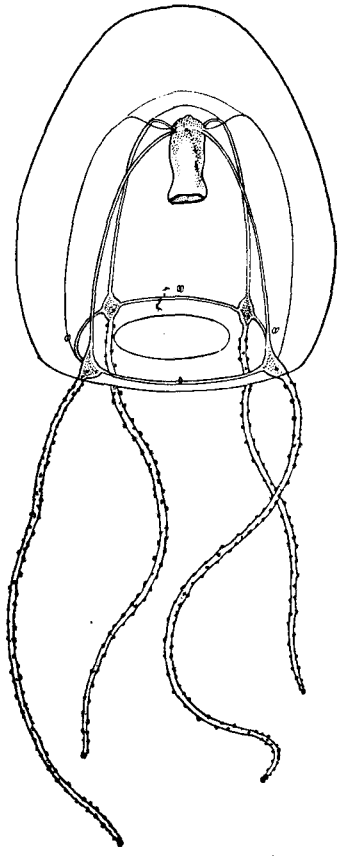

Fig 10. Young medusa with four radial canals. ×30.

So far as examined by the writers, the number of radial canal in young medusae ranges 4, 5 or 6, irrespective of the number of tentacles of gastrozooids. The ring canal, though narrow, is clearly observable in young medusae. The canal seems often to be somewhat degenerated in the adult medusae having many branches of radial canals. The tentacles arise from the enlarged junction points of the radial canals with the ring canal. The tantacles, when well extended, become longer than the bell-height. On the abaxial side of the tentacle bases is observed a minute eye fleck which seems to become obscure in the adult on account of the increase of endodermal pigment. Midway between the two neighbouring tentacle bases there occurs a nematocyst cluster containing one-three nematocysts. These nematocyst cells are connected with endoderm cells and are characteristic of the medusan family. Coloration: manubrium slightly brownish, tentacle bases more or less black. The hydroid from Akkeshi Bay generally agrees with *Lar sabellarum* from England but only differs in the occurrence of gastrozooids with tentacles of abnormal numbers and the presence of blastostyles branched out from gastrozooids. These facts, however, remain to be observed later, when many European specimens are available for examination.

The young medusa is undoubtedly identified with *Proboscidactyla flavicirrata* which is very common in Akkeshi Bay and has similar

features to the former. The metamorphosis from the young to the adult lies in the branching of radial canals, increase of marginal tentacles and endodermal nematocyst strings, degeneration of the ring canal, foldings of lips and development of gonads. The largest medusae so far examined by the writers are 5 mm in diameter and 4 mm high or 4 mm in diameter and 5 mm high. These medusae are furnished with 4×16 or 4×16 tentacles. The large specimen described by Maas (1909) under the name of *W. pacifica* has 6×18 radial canals and the mouth complexedly crisped. The medusae have mostly 4 or 6 main radial canals, but those with 5 or 8 main radial canals are not unfrequently examined. Sometimes medusae with 7 or 9 main radial canals were observed.

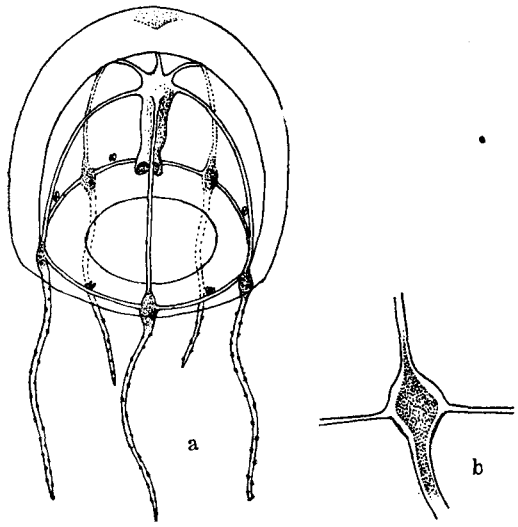

Fig. 11. a, Young medusa with six radial canals. ×30. b, Tentacle base showing ring canal.

Ecological notes on the hydroid. So far as the writers' observations go, the hydroid is only found on comparatively young tubes of *Potamilla myriops* abundantly found below the tidal line. In Akkeshi Bay the polychaete spawns eggs from the end of August to the middle of September. The eggs discharged by the polychaete are often swallowed by the mouth of the hydroid, therefore, the stomach of the hydroid is frequently filled with polychaete eggs. Inferring from the location of the gastrozooids of the hydroid, excrements or debris of food obtained by the polychaete are possibly to be carried away along the faecal groove of the worm to the gastrozooids which receive them into their stomach for digestion. With the supply of rich food the blastostyles adjacent to the gastrozooids make rapid growth and give rise to young medusae. While the hydroid bears medusa-buds, two kinds of Halacarid mites creep

among the polyps and devour those medusa-buds. But after the budding is ceased, the mites quit the hydroid colony.

Remarks. The distinction between the two genera, *Proboscidactyla* and *Willsia,* lies only in number of radial canals, stomachal lobes, lips and tentacles; the former is tetramerous but the latter is hexamerous. Among the species belonging to these genera hitherto described, well established species are the following: *Proboscidactyla flavicirrata, P. ornata* (including two varieties), *Willsia stellata, W. mutabilis.* Among them, *Probosidactyla ornata* is normally a tetramerous form and *Willsia stellata* is normally a hexamerous medusa, but the two other medusae are widely variable in numbers of lips, stomachal lobes, main radial canals and main marginal tentacles. In 1939 Browne and Kramp studying variations of main radial canals, main tentacles and stomachal lobes, for *Willsia mutabilis,* came to the conclusion that (p. 310), "The genus *Proboscidactyla* is characterized by the number of main radial canals and lobes to the stomach being four and six or more as in *Willia.* As demonstrated above, however, when eight main canals are found in *W. mutabilis* they are not of equal origin, and the fundamental number is really four, as in *Proboscidactyla.* If in a *Proboscidactyla* the four stomachal lobes, with the gonads, were to proceed with their outward growth beyond the first division of the main radial canals, the medusa would attain an appearance very like that of the intermediate stages of *Willia mutabilis* with eight main canals. Such prolongation of the stomachal lobes has actually been observed in specimens of *Proboscidactyla ornata* var. *stolonifera* from the west coast of Mexico (Bigelow, 1909, p. 220, pl. 41, figs. 1–7) and in *P. varians* Browne from India. *Accordingly, the limit between the two genera Willia and Proboscidactyla is not so sharp as formerly supposed."* The Pacific species *P. flavicirrata* displaying a wide variation actually covers the diagnosis of two genera, and the presence of this species strengthens the former conclusion that the difference of *Willsia* from *Proboscidactyla* is not distinct. Moreover, the hydroid of *P. flavicirrata* is on the whole similar to and is not generically different from the hydroid of *Willsia stellata.* As to the variation of radial canals, tentacles and stomachal lobes, similar cases are seen in other hydromedusan genera such as *Cladonema* and *Olindias.* Especially in *Olindias,* teteramerous and hexamerous forms are found and formerly the hexamerous form was disting-

uished from the tetramerous (*Olindias*) as a separate genus *Olidioides*. The latter genus was represented by a single species *O. formosa* which is normally tetra- or hexamerous but includes many other irregular forms. As in the case of *Olindias*, the two genera, *Proboscidactyla* and *Willsia* are to be united into a single genus, adopting the name *Proboscidactyla* because of priority. Thence the four certain species of *Proboscidactyla* are characterized as follows:

Proboscidactyla ornata: tetramerous in radial canals, tentacles and stomachal lobes.

Proboscidactyla flavicirrata: generally tetramerous or hexamerous, including pentamerous and other varieties.

Proboscidactyla mutabilis: generally hexamerous or octomerous, including decamerous and other varieties.

Proboscidactyla stella: hexamerous.

As the result of the union of the two genera, the genus *Misakia* instituted by Uchida (1926) must be abandoned. The type species, however, seems fit to be retained as a distinct species of *Proboscidactyla*.

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