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A New Fresh-water Hydroid, *Astrohydra japonica*

With 3 Text-figures

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ABSTRACT A new fresh-water hydroid, *Astrohydra japonica* new genus and new species, was discovered in Shizuoka Prefecture, Japan. The polyp of *Astrohydra* resembles *Microhydra*, hydroid of the fresh-water medusa *Craspedacusta*, but is readily distinguished by very minute body size, usually not more than 0.3 mm long, in having very fine tentacles, smaller and different shape of the nematocysts and more delicate body cells. The quite active and stirring frustule is also characteristic of this hydroid. *Astrohydra* is always found as a solitary polyp, but very rarely forms a bipolar colony as in *Microhydra*. The sexual reproduction of this animal is unknown.

The author discovered a minute solitary polyp with apparent tentacles which were filiform and extended straight, as suggestive of the aster, in the fresh-water pond, Nomorinoike, Shizuoka Prefecture, Japan, in 1974. The polyp was abundantly found through all seasons and the material was cultured for examination of various characteristics, particularly in view of the relationship with the formerly known *Microhydra*, which is also common in the same habitat.

Judging from the author's morphological and biological studies, this animal is affirmed to be a new type of the fresh-water hydroid. The present paper deals with the descriptions on the polyp and frustule stage, and some interesting facts.

Astrohydra japonica gen. et sp. n.

Polyp stage. Body size varies from 0.1 to 0.3 mm long in natural condition. Body color of the living polyp is whitish and rather transparent. The polyp is quite variable in shape, mostly barrel form or often bottle shape (Fig. 1). The hypostome is covered with markedly large and vacuolated cells containing nematocysts, having a terminal mouth and bearing encircling tentacles, which are rather irregularly strewn over the hydranth. Each tentacle is fine, long and almost straight. Sometimes the tentacles are branched off particularly at the distal portion. The number of tentacles varies from about 10 to 30. The nematocysts are only single

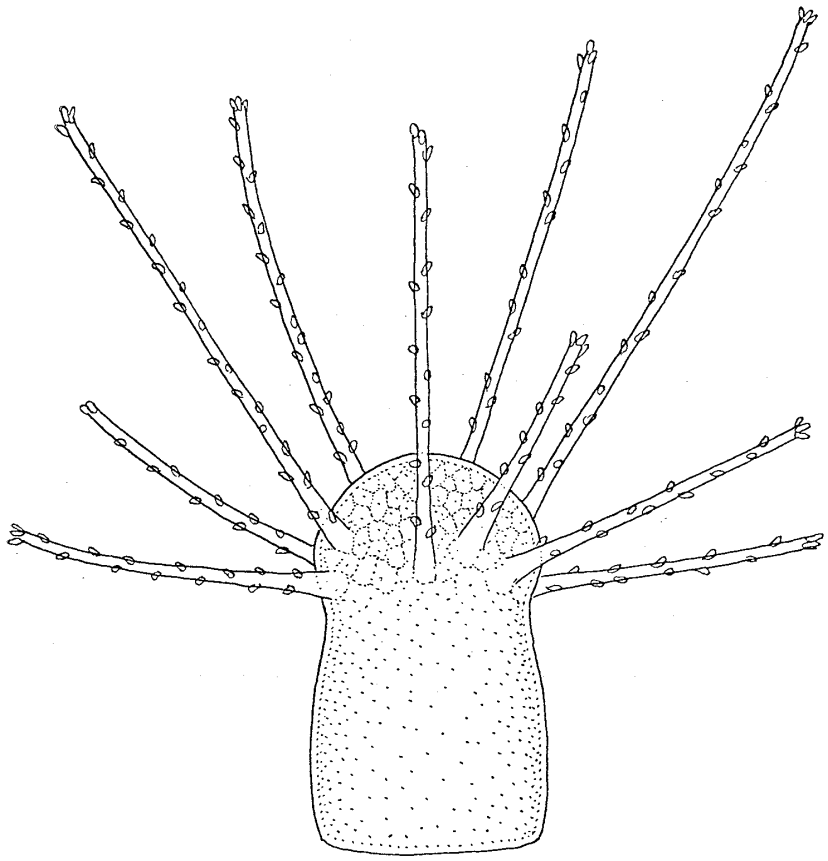
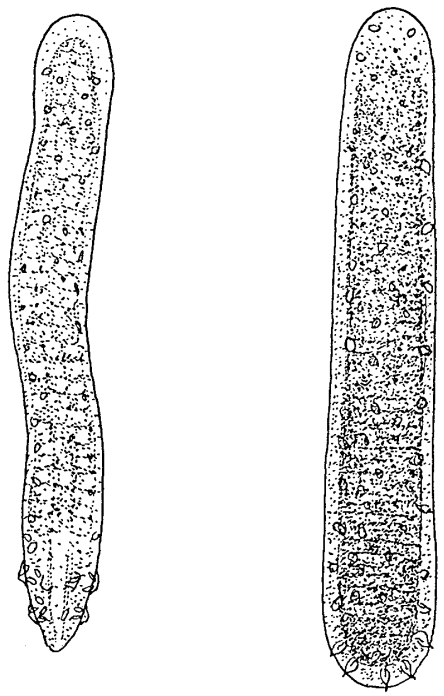


Fig. 1. *Astrohydra japonica*; polyp stage.

sort, penetrant, more or less arched in shape and not grouped to form any knob or ring but are freely scattered over the tentacle. Size of the stinging capsule is 4.5×2.0 μm. Thus the nematocyst of *Astrohydra* is distinctly smaller than that of *Microhydra*. The stalk is short, without peridium. Unlike *Microhydra* polyp, this polyp is always solitary and rises almost perpendicularly. The bipolar colony, which may be caused by abnormity, is seldom found. Body cells, both in epidermis and in gastrodermis, are apparently smaller than those of *Microhydra*.

Frustule stage. The frustule of *Astrohydra* is vermiform in shape and usually less than 0.5 mm long. The newborne frustule is short and its antero-posterior differentiation is inconspicuous at least from the morphological viewpoint, but the body is gradually lengthened and its posterior end becomes rather tapered in contrast with *Microhydra* frustule, in which the posterior margin is rounded (Fig. 2A, B). The matured frustule bears the germinals of the tentacle slightly before the rear end.

Biological notes. *Astrohydra* is found in the fresh-water pond but is rather uncommon in comparison with *Microhydra* which is widely distributed in Japan. The hydroids are usually attached to stones, piles, and various substrates in the



A B

Fig. 2. Frustule stage of *Astrohydra* (A) and *Microhydra* (B).

relatively shallow water and sometimes associated with *Microhydra*. The live polyp is expanded with filled coelomic fluid and often becomes deflated by means of the discharge of contents (Fig. 3A, B). The tentacles of *Astrohydra* are occasionally constricted to small projections. Sometimes, the polyp loses most of the tentacles especially under unfavourable conditions. The hibernation of this animal in Shizuoka Prefecture, is carried out in the polyp stage and such overwintering polyp bears only small rudiments of reduced tentacles. Such tentacleless polyp of *Astrohydra* resembles *Microhydra*, but the latter is distinguished by the feature of the capitulum covered with dense nematocysts. As is known, *Microhydra* normally forms a colony with 2 to 7 polyps (PAYNE, 1924), whereas *Astrohydra* is as a rule solitary polyp. The difference should be concerned with the presence of tentacles. The tentacles of *Astrohydra* are always erect straight and almost immovable. When the prey touches, the tentacle shrinks slowly and the victim is carried to the mouth part. *Astrohydra* mainly feeds on the minute benthic rotifers and asexually reproduces the frustule. The frustule occurs quite at random from every part of the stalk, except for mouth part. The frustule of *Astrohydra* is very active as compared with that of *Microhydra*. The velocity of the migrating frustule of *Astrohydra* is about 4 mm per hour at 25°C. This fact is worthy of noting for the *Microhydra* frustule goes fowards only 1 mm per hour under the same temperature condition. The period of the frustule stage of *Astrohydra* is apparently shorter

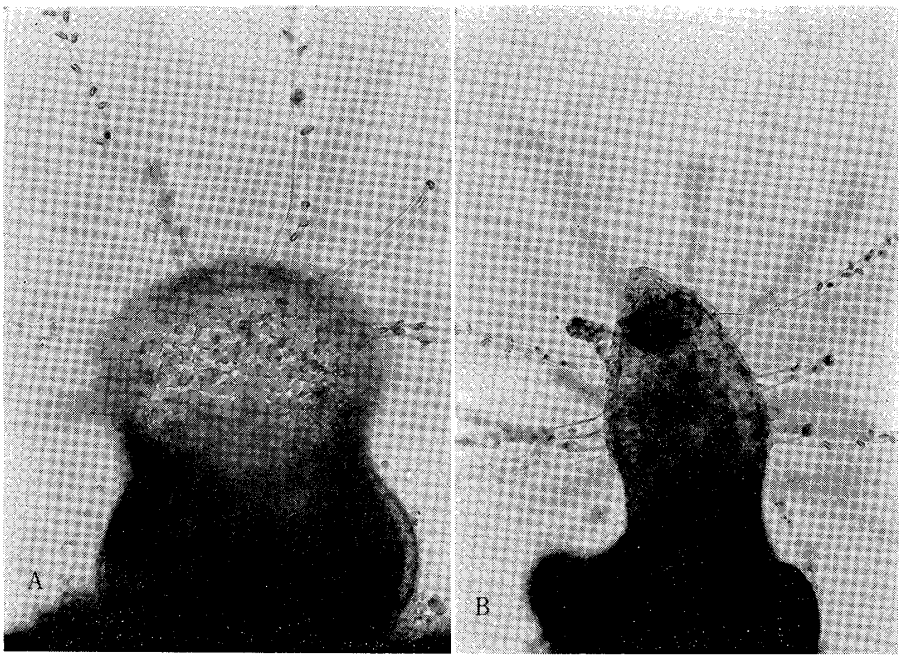


Fig. 3. *Astrohydra japonica* showing the hypostome in an expanded condition filled with coelomic fluid (A) and in contracted condition after discharge of the fluid (B).

than that of *Microhydra*, i.e., in *Astrohydra*, the frustule transforms into the polyp only one to two days after liberation, while in *Microhydra*, it wanders for about three to ten days until attachment. The saccula stage which is known in *Microhydra* (REISINGER, 1957) is also commonly found in *Astrohydra*. In spite of repeated examinations, the author has not seen the medusa bud of *Astrohydra*. Whether this hydroid has medusa stage or not is the most interesting problem in view of the evolution of the fresh-water Cnidaria.

DISCUSSION

Astrohydra having the frustule stage may belong to the family Microhydridae (NAUMOV, 1960). The known member of this family are the freshwater dwellers, *Microhydra* which is distributed in Europe, Asia, North America and Australia, and *Limnocnida* found only in Africa. *Microhydra* is always tentacleless and normally colonial. The polyp of *Limnocnida* is also lacking in the tentacles and forms a colony with 2–7 polyps as in *Microhydra* (BOUILLON, 1956–'57). *Astrohydra* bearing fine tentacles and usually forming solitary polyp is to be separated from those known hydroids at least at the genus level. It is of interest that unlike the generalized hydrozoan polyp, the tentacle of *Astrohydra* does not contain endodermal cell but consists of only one or two ectodermal cells, which are highly vacuolated and each of which bears 10 to 20 nematocysts. According to BOUILLON, the hypostome of *Limnocnida* polyp bears two to three encircling rows of papillae,

each being only an epidermic cell containing 2–3 nematocysts (BOUILLON, 1956–'57, p. 397). The tentacle of *Astrohydra* is considered to be homologous with such papilla-like projection in the polyp of *Limnocnida*. From this fact, it can be surmised that *Astrohydra* is closer to *Limnocnida* than to *Microhydra*.

NAUMOV and PASTERNAK (1968) described the fact that besides ordinary tentacleless polyp, a different type of polyp bearing fine tentacles has been found in the life cycle of *Microhydra*. According to them, both tentacleless and tentacled polyps occur from the fertilized eggs of the medusa *Craspedacusta* and the two types are able to convert each other through the frustule stage. The tentacled *Microhydra*, however, appeared only twice, first in Hungary in 1960 and second in the aquarium of Leningrad University in 1964. This is quite inexplicable, because such former investigators as PAYNE (1924), PERSCH (1933), DEJDAR (1934), REISINGER (1957), LYTLE (1961) and so on, have not referred to such tentacled polyp of *Microhydra*. The author's stocks of several clones of *Microhydra* from Japan never form such tentacled polyp. The polyps taken from the fertilized eggs of medusae were repeatedly cultured but the tentacled polyp never appeared. On the other hand, the author's clone of *Astrohydra* isolated from *Microhydra* and cultured for several years did not transform into *Microhydra*. The tentacled *Microhydra* reported by NAUMOV and PASTERNAK may be the same as the authors' *Astrohydra*.

KEY TO THE GENERA OF THE HYDROID OF MICROHYDRIDAE

1. Polyp as a rule solitary, with fine tentacles.....*Astrohydra*.
— Polyp as a rule colonial, without tentacles.....2.
2. Polyp with 2–3 encircling rows of papillae on the hypostome.....*Limnocnida*.
— Polyp without papilla-like projection but armored with uniform nematocysts all over the hypostome.....*Microhydra*.

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