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On the Medusa-Budding Found in a Limnomedusa, *Scolionema suvaense*

By

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(*With 4 Text-figures*)

The medusa is commonly found on the coasts of Japan and is known to proliferate asexually by medusa-budding. *Scolionema suvaense* is only one member in the Olindiadae, which produces medusa-buds. Because of scanty of literature of the medusan budding the writers will report the results of observations as follows:

Materials used here were all collected from Misaki, Kanagawa Prefecture by towing plankton-net in nights all the year round from 1973 to 1974. Preserved specimens in 5% formalin were used for observation.

Medusa-budding

The medusa buds can be classified into the following four stages according to the degree of development.

Stage I: Medusa nucleus, hemispherical in shape, about 0.1 mm in diameter.

Stage II: Medusan structures begin to be formed, especially the manubrium can be distinctly seen, 0.2–0.4 mm in diameter.

Stage III: Medusa-buds 0.4–0.6 mm, the mean value being 0.45 mm in diameter, fairly flattened and apparently chrysanthemum-like, tentacles being rolled inside like the petals of the flower. In this stage the medusa-bud is still covered with membrane.

Stage IV: Juvenile medusa before liberation, stripped off the covering membrane, 0.8–1.3 mm wide.

The new medusa-buds are already recognized as medusa nuclei even in the juvenile medusae which remain attached to the mother medusa. They are situated on the rudiments of medusa-bud which are located at the uppermost parts of the raidal canals of the mother medusa. The medusa nucleus is usually projected from near the terminal portion of the rudiment as a hemispherical body which is transparent and seems to be structureless. These medusa-buds represented as medusa nuclei belong to the Stage I as mentioned above. The

rudiments are corn- or rod-like in shape from 0.12 mm long × 0.08 mm wide to 0.25 mm long × 0.18 mm wide in size, and the medusa-nuclei are 0.06–0.13 mm in diameter (Fig. 1).

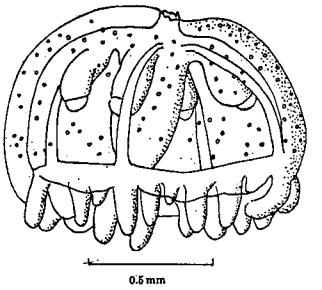

Fig. 1 Side view of a juvenile medusa before liberation, artificially separated from mother medusa, 0.7 mm high and 1.2 mm wide.

The rudiments of medusa-bud shift from the uppermost parts to the lower middle along the radial canals and meanwhile the medusa-buds increase in cluster. The specimens examined by us mainly belong to this type. They are 2–3 mm in umbrellar diameter and have 7–8 tentacles and 2 statocysts in each quadrant. The medusa-buds in mother medusae of similar size and equally developmental stage are widely divergent in number. The radial canal of a single medusa bears nearly the definite numbers of medusa-buds. The medusa-buds found in each individual range from 4 to 17 in number but rarely lack at all. The medusa-buds reach gradually Stage III accompanied with those of Stages II and I. The latter medusa-buds arise separately from near the basal parts of the former.

The medusa-buds in clusters shift further downwards along with the growth of the mother medusa and get to near the bell margin.

The medusa-buds, which have been fully grown, show Stage IV and are associated with the amount of medusa-buds of successive stages, Stage III, II and I (Fig. 3). The medusae now described are 4–5 mm in umbrellar diameter and with 8–12 tentacles and 2–4 statocysts per quadrant (Fig. 2). One of the medusae examined denotes as an example as follows: This medusa is 5.5 mm in umbrellar diameter, with 10–12 tentacles and 4 statocysts per quadrant. The constituents of medusa-buds in each quadrant are composed of (3 ones of Stage III, 2 ones of Stage II, 4 ones of Stage I), (1 one of Stage IV, 2 ones of Stage III, 2 ones of Stage II, 3 ones of Stage I), (1 one of Stage IV, 2 ones of Stage III, 3 ones of Stage II, 2 ones of Stage I) and (1 one of Stage IV, 2 ones of Stage III, 2 ones of Stage II, 3 ones of Stage I). They count 33 totally. In general, several medusa-buds arise irregularly from the discoidal basement or are arranged somewhat zigzag from the trunk-like projection, with the most developed one at the tip. In very young medusa, the medusa-buds shift rapidly downwards but with the growth of mother

medusae, they gradually shift slowly. The medusa-buds always displace from the proximal part to nearly the terminal portion of the radial canals and finally reach near the bell margin. The phenomenon is characteristic of this medusa.

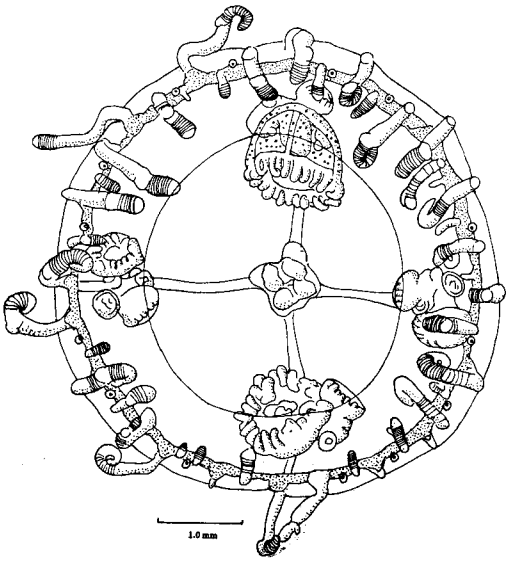

Fig. 2 Oral view of a well developed medusa, 3.3 mm high and 5.5 mm wide.

Juvenile medusa just before liberation

Juvenile medusae just before liberation are from 0.5 mm high × 0.8 mm wide to 0.8 mm high × 1.3 mm wide; the exumbrella is scattered with nematocysts, the radial canals are fairly wide and the manubrium is well developed. Tentacles 6–7, statocysts 2 in number both in each quadrant (Fig. 1). In this medusa, Kinoshita (1916) has already described about the arrangement and increase of both tentacles and statocysts due to the growth and the paper was cited by the senior author (1929).

Gonad formation

There could be found one medusa alone which seems to be in the process of gonad formation. The medusa is 7.2 mm wide in living state but 4.5 mm in fixed. It is a very well developed medusa with 9–12 tentacles and 4 statocysts per quadrant. The specimen was obtained on October 18, almost the last time of the season. The water temperature at that time was 22°C. The gonad has been formed in the place, where the medusa-buds successively arose, showing a winding thick ribbon (Fig. 4). In this individual, the gonad is present only in one

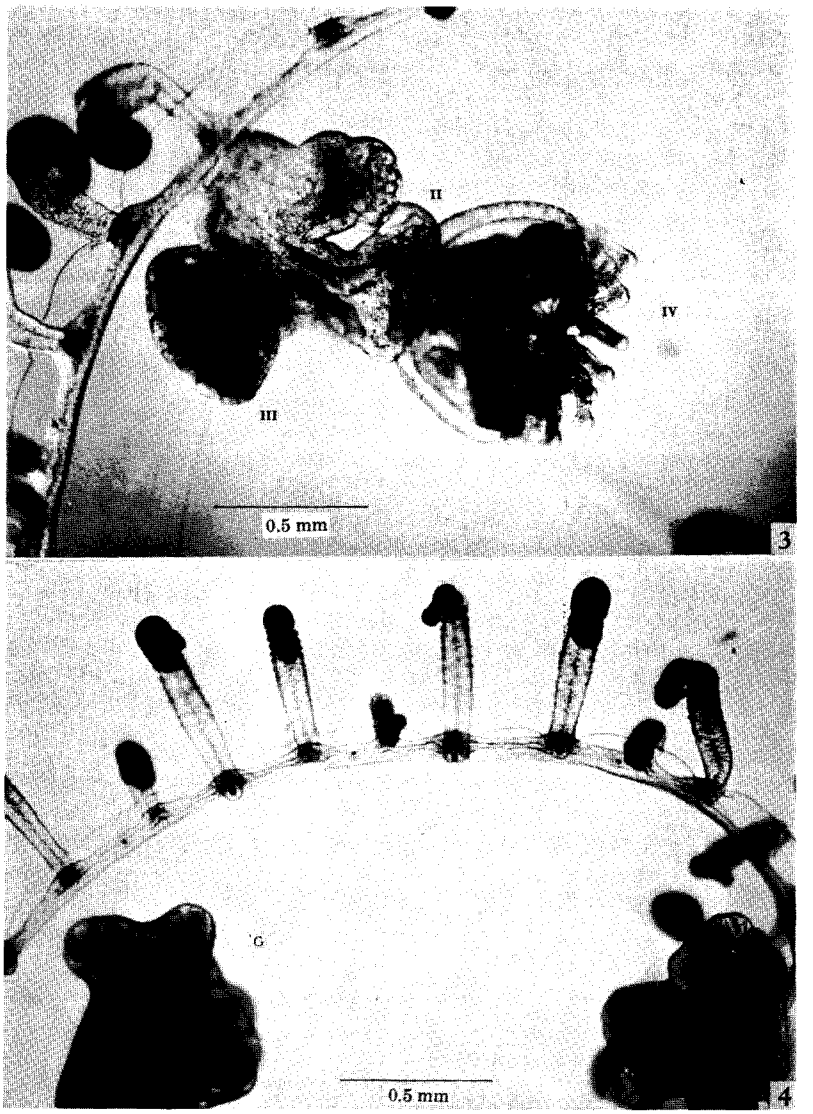

Fig. 3 Oral view of a medusa-bud-cluster arising from the centrifugal portion of a radial canal in the well developed medusa: II, Stage II; III, Stage III; IV, Stage IV.

Fig. 4 A part of bell-margin, showing the development of a gonad: G, gonad.

quadrant, while in other three quadrants are still remained clusters of well-developed medusa-buds.

Seasonal occurrence and daily appearance

The medusae are found attached to the seaweed such as sargassum by the adhesive pads of tentacles in the daytime, so the material used in this report has been mainly collected by plankton-net as surface plankton after sunset. The collection has been rhythmically carried out almost once a week, two times a day, at noon and after sunset from April, 1973 to March, 1974. They were obtained from May 7 to November 8, 1973, especially the majority of medusae from June 3 to July 9, in the water of 20–23°C in temperature, but they extremely decreased in number after August. There were 21 days of a year that the medusae could be obtained. During the daytime, only one individual was exceptionally captured, while all the other medusae have been collected only in the night, after 8 p.m.. From the facts above mentioned, medusa seems to have the habit of the nocturnal activity.

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