



HOKKAIDO UNIVERSITY

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**Temperature as a Factor Influencing upon the Fission
of the Orange-Striped Sea-Anemone,
*Diadumene Luciae*¹⁾**

By

Mitsuharu Miyawaki

(Akkeshi Marine Biological Station, Akkeshi, Hokkaido)

(With 2 Text-figures)

There has been known by Stephenson (1935) and Uchida (1936) that the fissiparous reproduction of the sea-anemone seems to be caused on account of some unfavourable conditions. The writer (1951) was of opinion that the frequency of the fission of the actinian may be influenced by temperature. In the present paper, the writer described the results of the experiment concerning the asexual reproduction.

Before proceeding further the writer wishes to thank to Professor Tohru Uchida for his advices and for review of the manuscript.

Methods

For the purpose of regulating temperature were used thermostats, 1.5×2×1 feet, in which about 25 animals were reared. Each animal was separately kept in a glass vessel containing sea-water of about 30 cc. The sea-water here used was preserved in hermetic condition for a month and it was refreshed at intervals from two to four days.

Results and Discussion

Experimental Set No. 1

Temperature, regulated by running water, 6.5°C–8.0°C. Duration, from May 8th to May 25th. All 25 individuals did not show fission.

Experimental Set No. 2

Temperature, 22.0°C. Duration, from May 5th to May 25th. Five individuals out of 25 divided.

1) Contributions to the Akkeshi Marine Biological Station, No. 59.
Jour. Fac. Sci. Hokkaido Univ., Ser. VI, Zool., 11, 1952.

Experimental Set No. 3

Temperature, $25.0^{\circ}\text{C}\pm 1.0^{\circ}\text{C}$. Duration, from May 25th to June 20th. Six individuals out of 25 fissured, one of them gave rise to three daughter animals.

Experimental Set No. 4

Twenty-three individuals were reared from May 25th to July 27th in the temperature range from 12.0°C to 15.0°C . None of them fissured. At the end of the duration they were transferred into a thermostat which was regulated at 28.0°C . Up to August 5th, thirteen individuals divided, four individuals divided into three, and six remained undivided.

Experimental Set No. 5

Temperature, 31.0°C . Four individuals out of 25 divided during August 9th and 21st. Twenty-one individuals undivided were reared at 28.0°C for successive 23 days, and three individuals were observed to divide.

According to Stephenson (1935), Evans found that feeding stimulated the animal to divide. In the present experiment, however, the animals were not fed at all. From the results of these five sets of experiment it becomes apparent that the frequency of the fission is influenced by temperature. As shown in the two sets (Nos. 1 and 4) the fission was not observed in comparatively low temperature, while it was always induced in comparatively high temperature as in Nos. 2, 3, 4 and 5. In these experiments the writer could not decide exactly the critical point of effective temperature, which presumably lies near the lower side of the range between 15°C and 20°C . Temperature of sea-water rises over 20°C in this district in a very restricted period, from the end of July to the middle of August, the fission occurs in considerably long duration before and after the period in nature. On the other hand, it is possible from the results that the change of temperature of the environment acted as stimulation for the animals to divide. When the animals were brought into the environment of higher temperature, they might be affected by only the change of temperature.

Another three sets of experiment were performed at the fall of the year to get rid of a suspicion whether the results afore mentioned were affected by some seasonal conditions of the animal itself or not.

Experimental Set No. 6

Twenty-five individuals were reared at 10.0°C from November 19th to December 15th. In this duration none of the animal fissioned. Then temperature was risen to 20.0°C . By January 5th, 14 individuals divided.

Experimental Set No. 7

Twenty-five individuals were reared at 10.0°C from November 19th to November 26th and for a successive week at 20.0°C . There was observed no fission during the duration. Then, temperature was risen to 30.0°C and then 12 individuals divided before December 15th.

Experimental Set No. 8

Temperature, 35.0°C. Duration, from January 5th to January 18th. Only one animal out of 25 divided.

These results are coincided with the previous ones, so it is possible that the occurrence of the fission does not depend upon the seasonal condition of the animal itself but rather upon the temperature of the habitats. Stephenson and Uchida stated that the frequency of the fission is proportional to some unfavourable conditions of the habitats, but the temperature range from 20°C to 30°C seems to be not so unfavourable to the animal, and at the temperature higher than 30°C the animals were not found to be affected seriously, though the frequency of the fission decreased slightly (Nos. 5 and 8).

Uchida reported that the actinians scarcely reproduce by fission in Misaki and Shimoda, where temperature of sea-water is much higher than in Akkeshi Bay. The fact seems to be remarkable comparing with the present experiment, however, the writer is of opinion that this is due to the race-specificity of the actinians in these two localities.

It is interesting to note that an individual gives rise to three daughter ones by fission (5 cases in Nos. 3 and 4), which is illustrated in Figure 1.

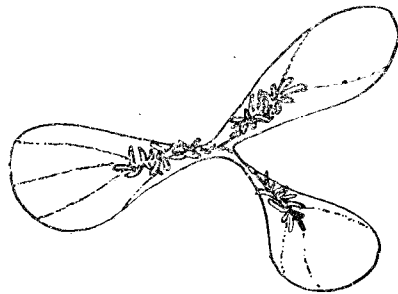


Fig. 1. A specimen giving rise to three daughter individuals.

Observations on the Behaviour of Stripes

Uchida described the arrangement of the stripes of the actinians in detail. The writer could also observe that the arrangement of the stripes changed in some individuals during the present experiment, i. e. fine stripes thickly arranged became gradually separated, and each stripe became more distinct (Figure 2). There was found no relationship between the arrangement of the stripes and the occurrence of the fission of the animals. That is, the animal with stripes in symmetrical arrangement does not always divide soon and, on the contrary, the animal with stripes in an asymmetrical arrangement has rather the tendency to divide in the same environmental condition.

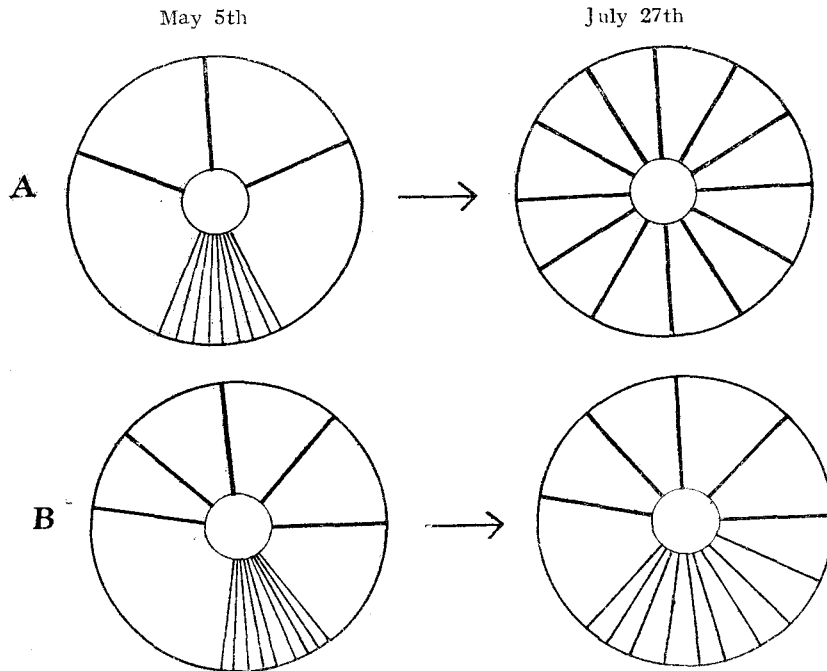


Fig. 2. Changes of arrangement of stripes in two actinians.

Summary

- (1) Temperature is an important factor influencing upon the frequency of the fission of *Diadumene Luciae* in Akkeshi Bay.
- (2) The stripes on the body surface are changed in their arrangement with the lapse of time.

Literature cited

- Miyawaki, M. 1951. Notes on the effect of low salinity on an actinian, *Diadumene Luciae*. Jour. Fac. Sci. Hokkaido Univ. Series VI, Vol. 10, pp. 123-126.
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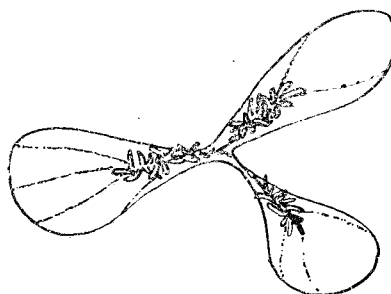


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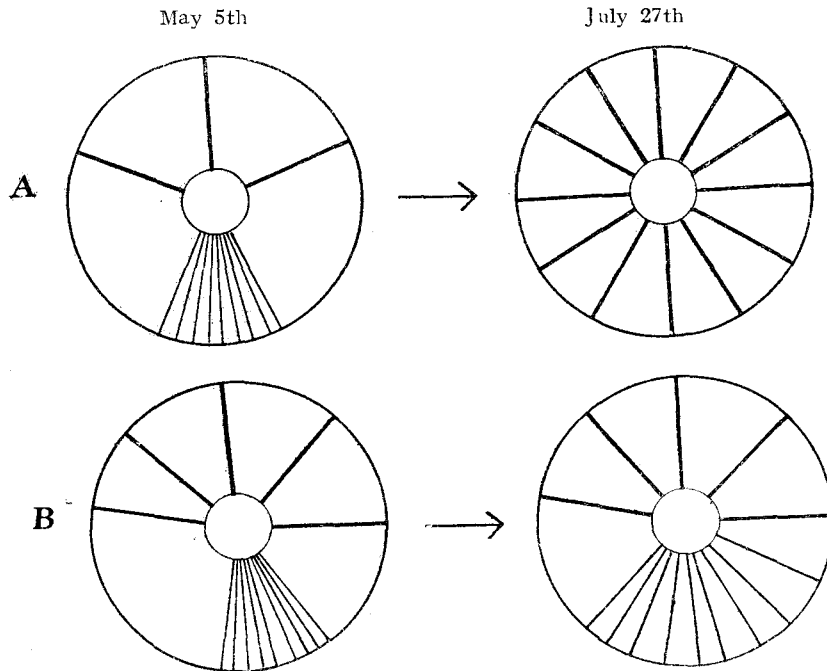


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