THE GROWTH OF *PSAMMECHINUS MILIARIS* (GMELIN) UNDER AQUARIUM CONDITIONS.

BY

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After 65 days in the sea at Whitstable, a cage made of $\frac{5}{8}$" mesh wire netting was found by Orton (1923) to contain a specimen of this sea-urchin whose test had a diameter of 2.7 cm. (excluding spines). He reasoned that "urchins up to 1.6 cm. could enter" this cage, and that therefore, this urchin showed a minimum growth of 1 cm. in diameter in that time. He also records in the same note that on August 1st, 1911 there were taken from the bottom of a floating coal hulk, which after cleaning, had been moored at Brixham since April 1910, specimens of *P. miliaris* of a diameter up to 3 cm. Elmhirst (1922) says it may reach a size of "2.5 cm. overall diameter" and be mature at one year old.

To this scanty information the following observations, though slight, form a useful and definite extension.

A large piece of clinker brought up on a fisherman's line, one mile S.E. of St. Mary's Lt., Northumberland, on October 5th, 1932 had on it over a dozen newly metamorphosed young specimens of *Psammechinus miliaris*, of an average diameter of a little over 1 mm. Eight of these were taken and reared, first, in a small jar covered with fine silk through which a good flow of sea water was maintained, and later, at large in one of the shallow concrete tanks close to the south window of the Laboratory. During the earlier period they were fed on fine suspensions of crab liver which they took readily. Natural growths on the sides of the jar provided additional food. When they were about 1 cm. in diameter in the following June, three of the eight (the remainder having disappeared) were transferred to the larger tank. During the summer and autumn months this tank is well covered with a rich growth of Algae, Bugula, Leucosolenia, Sycon, Botryllus, etc., and a number of fish were also kept in it. It may be safely asserted that they had an ample and well varied natural diet during these months at least.

Measurements were made frequently during the first year, and thereafter at approximately four times a year. The full record is given in the appendix at the end of the paper, and graphically in fig. 1. below. Growth was very rapid during the first year, relatively rapid during July to September in each successive year and almost stationary during the winter months. These fluctuations follow closely the fluctuating abundance of the growths on the sides of the tank. The size attained at the end of each year is summarised in Table 1.

TABLE 1.—Mean dimensions at the end of each successive year of growth of three specimens of *Psammechinus miliaris* reared under aquarium conditions.

Age, in years.	Diam. of test and spines. mm.	Diam. of test (*ex* spines). mm.	Height of test (*ex* spines). mm.
0	1.2*	—	—
1	32.3	20.0	11.3
2	43.0	26.2	15.3
3	47.0	29.2	16.5
4	49.0	30.3	17.7
5	59.7	37.0	21.3
6	61.7	38.7	22.0

*Mean of eight specimens.

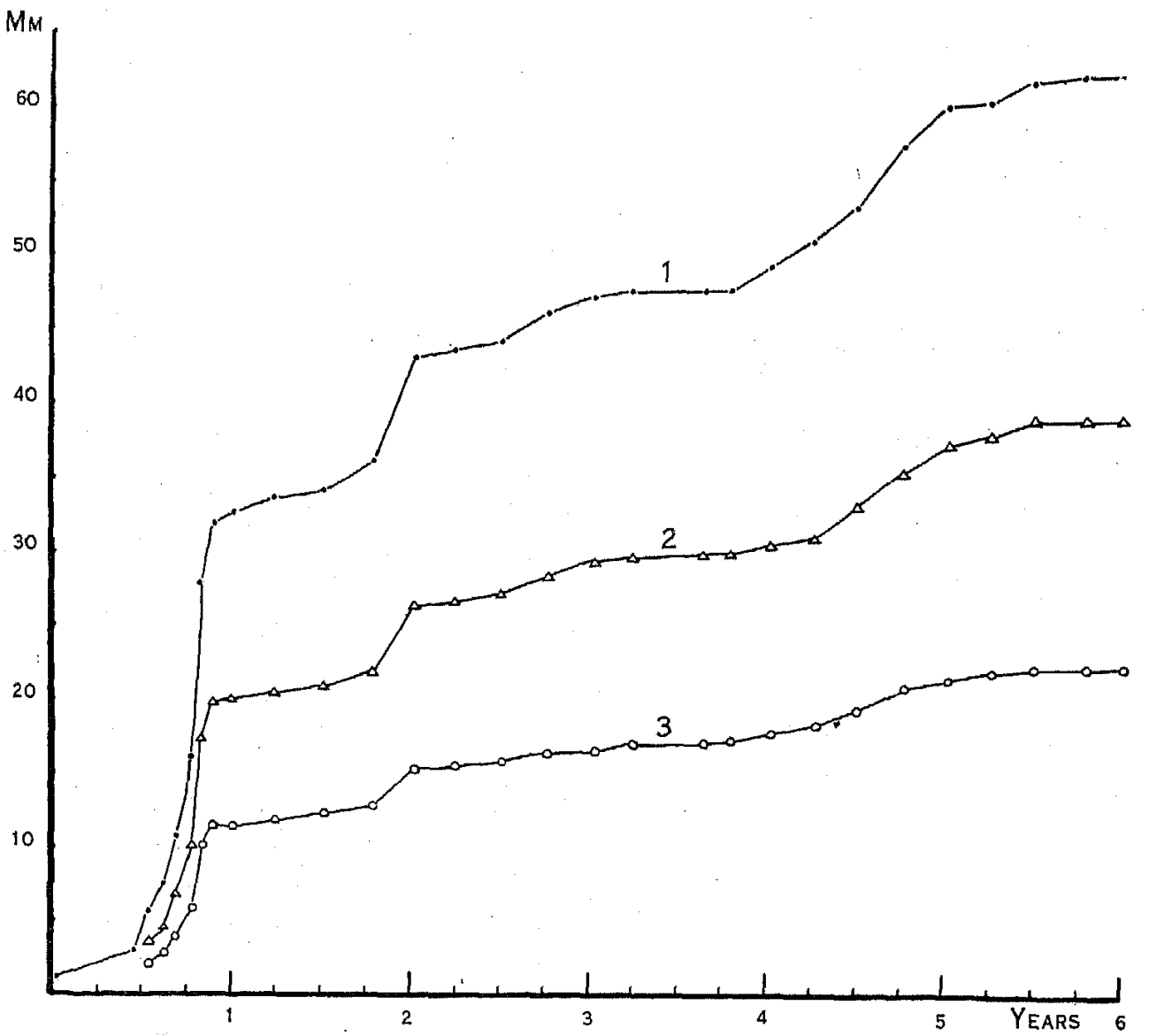

FIG. 1.—Mean growth of three specimens of *Psammechinus miliaris* in the Cullercoats Laboratory tanks from metamorphosis to six years.
1.—Dimensions of test and spines. 2.—Diameter of Test. 3.—Height of Test (*ex* spines). The record starts at October 1st, 1932.

It is to be noted that the ratio of the diameter of the test to the height of the test varied from time to time in the history of the individuals and from one to the other. In the most convex specimen (No. 1) it varied from 1.46 to 1.65, in the flattest specimen (No. 3) from 1.87 to 2.00. The former ratio is more characteristic of the deeper water forms, the latter of littoral specimens. Variations in the height of the test do not therefore appear to depend solely on environmental factors.

In colour and appearance the three specimens throughout have resembled the typical shore form of the species, *i.e.*, dark green with violet-tipped spines. Specimens collected from 1 mile S.E. of St. Mary's Lt. are typically of the deeper water variety of colouring in which fawn or brown shades tend to replace the green. It appears probable therefore that the colour variation is one of environment.

Summary.

The growth of the sea-urchin *Psammechinus miliaris* (Gmelin) under aquarium conditions is described from metamorphosis to six years of age.

Literature.

Elmhirst, R. (1922). Rep. Scott. Mar. Biol. Ass., Glasgow, 1922 : p. 27.

Orton, J. H. (1923). Nature, Feb. 3rd ; p. 147.