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**Title**

OBSERVATIONS AND EXPERIMENTS  
ON STARFISH  
WITH REFERENCE TO THE OYSTER

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REPORT for 1934

G. F. M. Smith

Observation and Experiments on Starfish, with reference to  
the Oyster

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The starfish (Asterias vulgaris) is the chief enemy of the oyster spat in Malpeque Bay, P.E.I. Dr. Needler has notified that starfish in this bay were smaller than those commonly seen at St. Andrews. The water is warmer (over 20°C during July and August) and fresher (27 ‰) at the Prince Edward Island Biological Station than at the open coast. This investigation was begun in an effort to determine some of the limiting factors in the local distribution of the starfish, and compare these limits with those of the oyster. Some work was also done on the rate of growth and occurrence of starfish, and an effort made to determine the spawning period.

Work was begun on June 20th. The absence of starfish larvae in the regular plankton tows at various points, and the condition of the gonads of adult starfish, taken from this date until the end of July, suggested that the starfish had spawned before this date. This would make the starfish spawning period be well in advance of the oyster spawning period, but this assumption will be checked next year.

**Size frequency of Starfish and Distribution.**

Regular samples of starfish, taken by the commercial method of mopping, showed only one distinct year class, and a suggestion of a second. The rate of growth during the summer, as indicated by samples taken at intervals from the same localities, was not the same on different oyster beds. On one bed where spat was planted in June, 1934, after the bed had been mopped to remove most of the starfish, large starfish were found on July 23, 1934, while on another bed that had not been mopped, or planted with spat, the starfish were much smaller. The difference in size is presumably due mainly to a food supply of small oysters, most of which were found to be destroyed on the former bed.

Starfish were not found near the heads of the inlets or "rivers" where the water is warmer and fresher than the water of the bay, nor were any starfish found on a pure shaly sand bottom bed, although oysters were present at both places. Elsewhere, at places examined in the bay, there were starfish where there were oysters.

**Effect of various temperatures and salinities on adult starfish.**

Adult starfish of different sizes were kept in thermostats at various temperatures from 12°C to 30°C, and salinities from 40 ‰ to 0 ‰, the period of an experiment being three days.

At above 25°C no starfish lived three days in any salinity. At 25°C starfish less than 5 cm. lived in salinities between 27 ‰ and 15 ‰. At 23°C the results were similar to those at 25°C except the starfish were larger, (less than 9 cm. diameter). At 20 C all starfish lived at 14 ‰, those less than 5.5 cm. diameter lived at 13 ‰ and all died at 12 ‰. At 15°C. all starfish died at 10 ‰ and lived at 15 ‰ and starfish over 10 cm. diameter died in 35 ‰ and 40‰. These results were checked by placing starfish in cages at various points in the "rivers" and recording salinities and temperatures (max. and min.). The agreement between results of the two methods was good.

It appears from these two sets of experiments that the local starfish cannot withstand prolonged temperature much above 25°C. or salinity much below 13 ‰, and the smaller starfish are somewhat more adaptable than the large ones. At low temperatures (12°C.) the starfish seem to be able to withstand a little more range in salinities than at higher temperatures. The maximum temperature figure mentioned is lower and the salinity figure higher than is essential for the oyster. This is borne out by the occurrence of oysters in parts of the inlets where both of these limits are exceeded at times and the complete absence of starfish in these localities as far as was observed.

G. F. M. Smith,  
November 6, 1934.