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GROWTH AND SURVIVAL OF THE BAY SCALLOP, *ARGOPECTEN IRRADIANS*, AT VARIOUS LOCATIONS IN THE WATER COLUMN AND AT VARIOUS DENSITIES

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ABSTRACT

Two experiments were carried out in 1971 using bay scallops spawned in August and September of 1970. Four groups of 150 scallops were held at the surface, one meter below the surface, two meters off the bottom, and one meter off the bottom, to find the effects of depth on growth and survival. Scallops were held in surface enclosures at four different densities (100, 75, 50 and 25/ft^2) to find out the effects of crowding.

In the depth experiment growth was approximately equal throughout the water column. Mortality decreased with increasing depth with the exception of those held at one meter off the bottom.

In the density experiment growth up to a height of 27.0 - 28.0 mm (1.1 in) was approximately equal at all densities. Above this size, growth decreased with increasing density. Mortality was low and about equal at all densities for the first two months but increased with increasing density during the last two months.

INTRODUCTION

The bay scallop is a likely species for mariculture. It grows rapidly, has a high market value, can be readily conditioned and induced to spawn and its larvae are amenable to mariculture (Wells, 1927; Loosanoff and Davis, 1963; Sastry, 1965; Castagna and Duggan, 1971).

The Virginia Institute of Marine Science Eastern Shore Laboratory began investigating the possibility of culturing the bay scallop in 1968. Work completed up to 1971 established the biological feasibility of culturing this species from egg to market size. The purpose of the present study is to show how growth and survival are affected by the location of the scallops in the water column and by the density at which the scallops are held.

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DESCRIPTION OF AREA

Experiments were carried out in Finney Creek in front of the Virginia Institute of Marine Science Eastern Shore Laboratory. Tidal amplitude is 1.2 - 1.5 m (3.6 - 4.9 ft). Water depth is 5-6 m at high tide. Temperatures ranged from 17.2 - 28.7°C and salinities from 20.8 - 31.6 ‰ during the experimental period. The bottom is soft mud. Tidal currents average approximately 30.0 cm/sec throughout the entire water column (Joseph and Van Engle, 1967).[1]

MATERIALS AND METHODS

Juvenile scallops used in these experiments were spawned in the laboratory from brood stock in late summer of 1970 and tray reared in Finney Creek until May and June 1971 when the

[1] Joseph E., and W. A. Van Engle. 1967. Nursery ground study. Bureau of Comm. Fish., Comm. Fish. Res. & Devel. Act. Funded under 88-309, Suppl. Rep. Vol. e. (Unpublished manuscript).

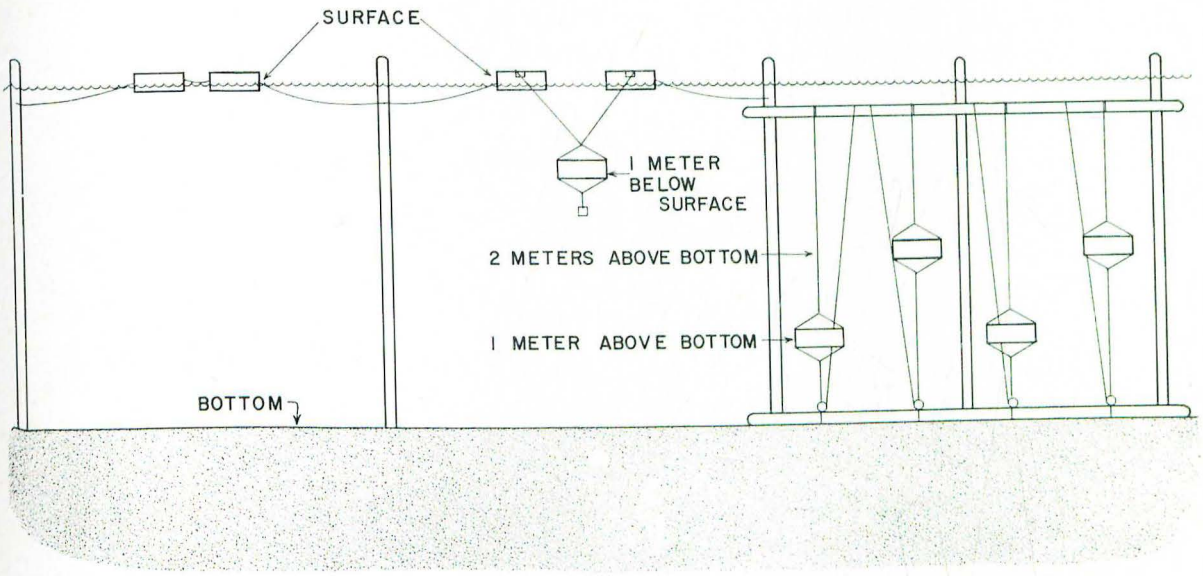

FIG. 1. *Enclosures held at the surface, one meter below the surface, and one and two meters off the bottom.*

experiments began.

Enclosures used in each experiment were constructed of ¾ in. pine covered top and bottom with plastic screen (mesh opening 7.0 mm). Those used in the depth experiment measured 64.0 x 55.5 x 15.0 cm while those in the density experiment measured 122.0 x 56.5 x 15.0 cm. The surface enclosures used in the density experiments had 14.5 x 1.9 cm boards added on each side for stabilizing wings. Enclosures held at the surface were tied to stakes and maintained at the surface by their own buoyancy. Enclosures held below the surface were either suspended from surface floats or secured to poles at the appropriate depth (Fig. 1).

Experiments were run in duplicate. Mean growth measurements and mortality counts were averaged from duplicate enclosures at two-week intervals and enclosures were cleaned of the mud and fouling organisms that had accumulated during that period.

All enclosures were held in a line parallel to the tidal flow. All measurements of scallops refer to the height or distance from the hinge to ventral edge.

RESULTS

Depth Experiment: Growth and Mortality

This experiment ran from 10 June, 1971 - 7 October, 1971. One hundred and fifty scallops with a mean size of 14.4 mm had been placed in each enclosure held at the surface, 1 m below the surface and 1 and 2 m above the bottom (Fig. 1).

At the end of this experiment scallops averaged 44.7 mm at the surface, 44.6 mm at 1 m below the surface, 47.0 mm at 2 m above the bottom and 42.7 mm at 1 m above the bottom, indicating approximately equal growth at all depths (Fig. 2).

With the exception of those scallops held at 1 m above the bottom, total percent mortality decreased with increasing depth: 16.5% at the

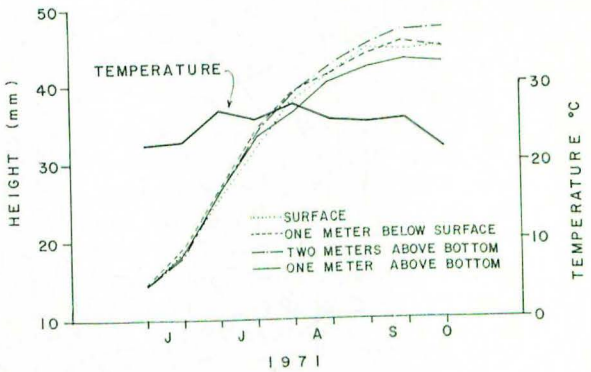

FIG. 2. *Growth data for scallops held at various locations in the water column (surface, one meter below the surface, one and two meters above the bottom.)*

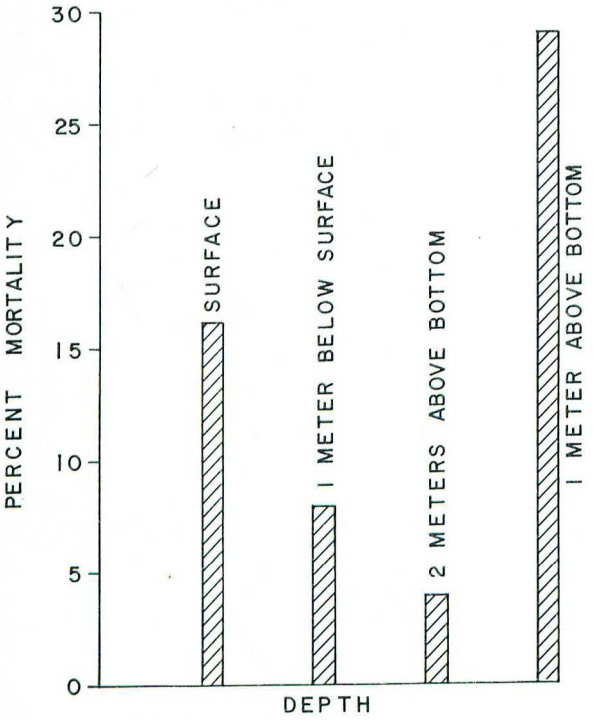

FIG. 3. *Total percent mortality of scallops held at the four experimental depths.*

surface, 8.0% at 1 m below the surface and 4.0% at 2 m above the bottom. Mortality at 1 m above the bottom was 29.0% (Fig. 3).

Density Experiment: Growth and Mortality

This experiment ran from 12 May, 1971 - 20 September, 1971. Initial densities of 100, 75, 50 and 25/ft^2 were tested.

Figure 4 indicates approximately equal growth at all densities until the scallops reached 27.0 - 28.0 mm. Above this size growth decreased with increased density.

Figure 5 indicates low mortality at all densities during the first two months and increased mortality during the last two months with higher densities having the greater mortalities. Mortalities began to increase when the scallops were about 37.0, 39.0, 43.5 and 46.2 mm at densities of 100, 75, 50 and 25/ft^2 respectively.

Total mortality at the end of the experiment averaged 35.0, 16.0, 6.2 and 3.2% at densities of 100, 75, 50 and 25/ft^2 respectively (Table I).

DISCUSSION

Although scallops grew and survived best at a

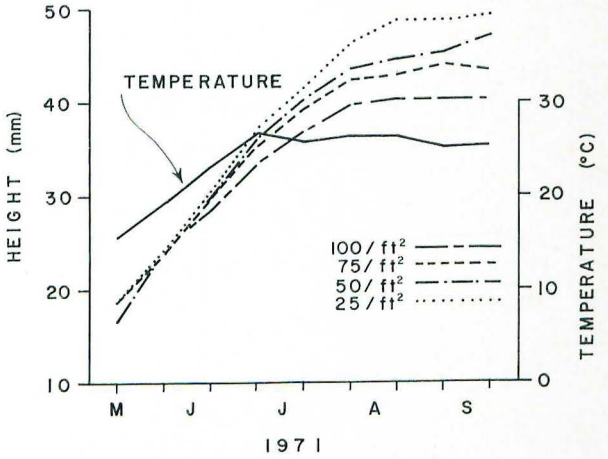

FIG. 4. *Growth data for scallops held at the four experimental densities (100, 75, 50 and 25/ft^2).*

density of 25/ft^2, the data suggests that densities as high as 60-65/ft^2 could be used (Table I). Control of factors mentioned below would probably allow scallops to grow and survive equally well throughout the water column.

Those factors which affected growth and survival in both experiments were: (1) heavy fouling of the screen meshes with hydroids, mud and/or algae resulting in poor water circulation; and (2) mechanical disturbance of enclosures due to boat wakes, wave action and/or tidal currents. The effect of these factors seemed to depend on the location of the enclosures in the water column, the density at which the scallops were held, the size of the scallops and stability of the enclosure.

In the density experiment fouling and mechani-

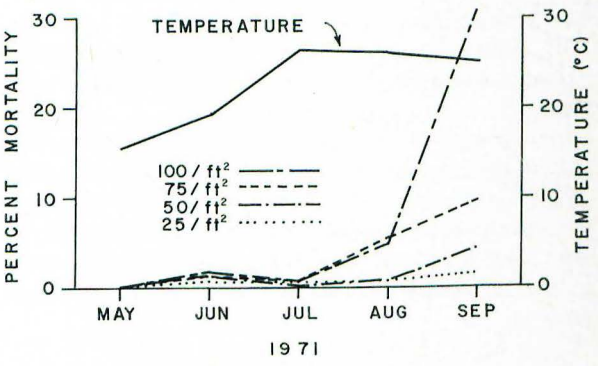

FIG. 5. *Average monthly mortality of scallops held at the four experimental densities (100, 75, 50 and 25/ft^2).*

TABLE I. *Initial densities, total percent mortality and final densities of scallops in density experiment.*

Initial Densities scallops/ft^2	Total Percent Mortality	Final Densities scallops/ft^2
100	35.0	65
75	16.0	63
50	6.2	47
25	3.2	24

cal disturbance were common to all enclosures. Decreased circulation due to fouling probably resulted in a greater competition for food which became more intense as the scallops increased in size. This was particularly true at the higher densities indicated by the decreased growth rate and increased mortality. Mechanical disturbance of the enclosures probably disturbed the scallops feeding behavior. Occasionally scallops were washed to one end of the enclosure causing some smothering of the scallops. Again this was more intense at the higher densities.

In the depth experiment the high mortality of scallops at one meter off the bottom is believed due to heavier accumulations of silt or mud in these enclosures than in the enclosures just above them. Scallops were frequently found buried. Fouling was common to all the enclosures in this experiment and undoubtedly had an adverse affect on growth and survival.

The decrease in mortality from the surface to two meters off the bottom (Fig. 3) is believed due to the decreased effects of wave action and other surface turbulences with increased depth. The relatively stationary position in which the enclosures at two meters off the bottom were held helped reduce disturbances at this depth and probably accounts for the slightly higher mean size and percent survival attained by the scallops held here. The effects of the mechanical disturbance of the enclosures in this experiment were similar to those described for the density experiment.

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