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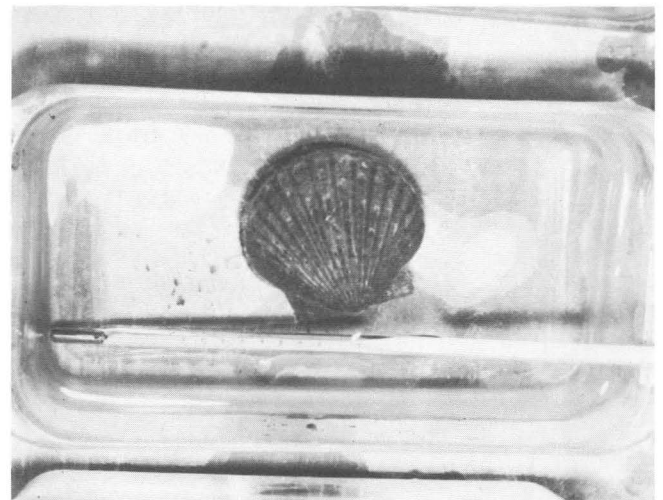
SPAWNING AND REARING THE BAY SCALLOP

VIMS LABORATORY METHOD

The bay scallop, *Aequipecten irradians*, contributed almost \$12 million to the United States fishery between 1960-67, ranking in value among bivalve mollusks behind oysters, clams and sea scallops. Yet, in spite of its commercial value, little attention was given to rearing the bay scallop from egg to market size until 1968 when the Wachapreague Laboratory of the Virginia Institute of Marine Science began investigating the possibility of rearing this species.

A number of reasons existed for considering the bay scallop for mariculture:

- 1) Most important, this species has a high market value necessary to support a mariculture operation.
- 2) Markets and consumer acceptability are already established.
- 3) Natural scallop populations fluctuate due to yearclass failures. Culture techniques could stabilize the supply and make it possible to develop new markets.
- 4) Hatchery techniques of conditioning, spawning, and rearing bay scallop larvae have been successfully demonstrated.
- 5) Rapid growth to market size is characteristic of this species (12-17 months in Massachusetts waters; 10 months in more favorable



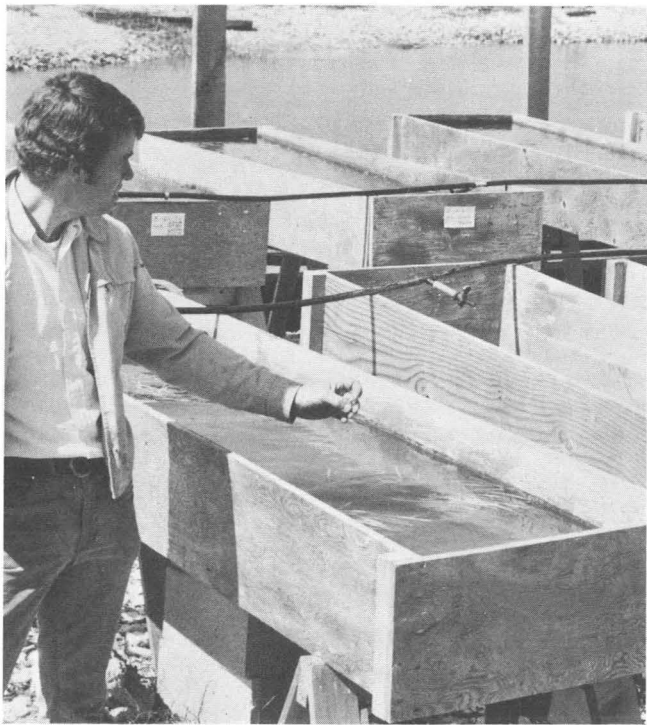
Scallops are held in small dishes and induced to discharge sperm and eggs. Fertilized eggs are placed in 20 gallon plastic containers where they complete larval development.

North Carolina waters) and growth rate could probably be increased by selection of brood stock.

- 6) Automatic shucking devices used for the calico scallop, *Argopecten gibbus*, could, with little or no modifications, be adapted for the bay scallop, alleviating labor and other problems related to hand shucking operations.



The larvae grow in standing sea water which must be changed every three days. When larvae have settled on the sides and bottom of plastic cans, they are washed off and transferred to plastic trays.



After about one week in plastic trays, young scallops are moved from the laboratory outside to wooden tanks of running sea water. Scallops remain in the tanks for 2 to 3 weeks and then are transferred to the anchored floats.

CONDITIONING AND SPAWNING

Adult scallops suitable for spawning can be obtained wherever natural populations exist. In 1968, the VIMS Wachapreague Laboratory collected adult scallops from local waters during the winter. Since then, scallops raised artificially have been used for spawners. Conditioning was accomplished by holding 6 to 10 scallops in fiberglass boxes with approximately 20 quarts of raw, standing seawater at 61 to 66° F during December and January. Water was changed three times per week and scallops were fed a mixture of unicellular algal solution daily. After about a week, temperatures were raised to 68° F for 4 to 8 weeks.

The bay scallop is a functional hermaphrodite, having both male and female reproductive organs. Natural gonadal development begins in the late spring and is recognized by a color change in the gonads. The testis comprises the front border of the gonad running from near the ventral tip to the dorsal base where it becomes slightly enlarged; the ovary occupies the back and considerably larger portion of the gonad. When ripe, the ovarian portion becomes reddish-orange and the testis becomes cream-colored, although a black-pigmented layer sometimes obscures the color change of the former.

When gonads appeared ripe, spawners were placed in finger bowls or pyrex dishes and stimulated to spawn by raising the water temperature from ambient to between 70 and 81° F. Occasionally a sperm suspension was needed to stimulate spawning.

When an individual scallop released both sperm and eggs, fertilization occurred simultaneously with spawning. However, the scallops more often released only one sex product per spawning. As soon as spawning occurred, adults were removed from the spawning dishes and the ova in each dish were fertilized with approximately 2 ml of sperm suspension. Care was taken to introduce only a small amount of sperm suspension, since high densities of spermatozoans were suspected of causing a high percent of deformed larvae.

REARING THE BAY SCALLOP

After the eggs were passed through a nylon screen to remove clumps of trash, they were counted and placed in 20 gallon plastic cans at a density of 1 to 2 million per 60 quarts of water (17 to 34 per ml). Temperatures of larval cultures ranged from 68 to 82° F during the larval period.

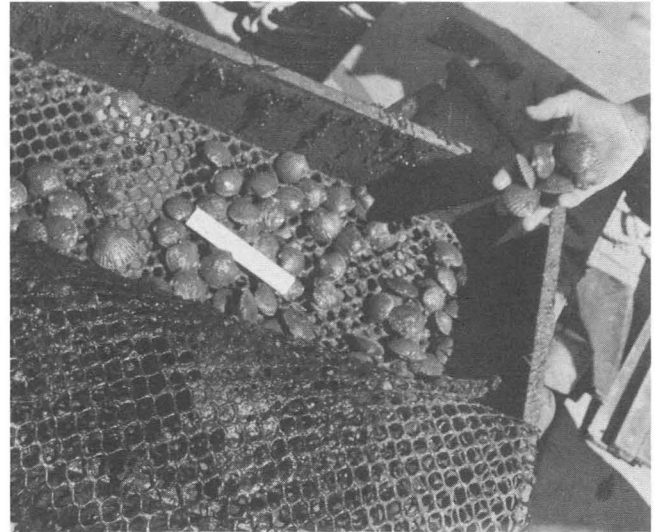
The water in each can was changed three times a week by siphoning water and larvae through a nylon screen. As larvae increased in size, the number per can was decreased until there were approximately 200,000 per can (4 per ml). At this density, the larvae measured .006 to .008 inch and were starting to set on the sides and bottom of the plastic cans. Once set, they were washed off with jets of water and transferred to plastic trays approximately 22 in. x 26 in. x 4 in. at a density of about 200,000 per tray.

Throughout the 10- to 19-day larval period and for the week in plastic trays, the developing scallops were fed the unicellular algal cultures daily. The young scallops were left in the plastic trays for about a week before being moved to wooden tanks with unfiltered flowing seawater. Approximately 500,000 scallops were placed in each tank (8 ft. x 2 ft. x 1 ft.) constructed of three-quarter inch plywood and painted with an epoxy coating.

When scallops reached about 1/16 inch in width (after about 2 to 3 weeks during the warmer months), they were moved to anchored floats. The wooden, rectangular floats (7 ft. x 2 ft. x 6 in.) were constructed of three-quarter inch pine boards and tops and bottoms were covered with fiberglass window screen (16 mesh per inch) or plastic netting. In approximately 12 to 13 weeks, the scallops measured about 1 inch and had been moved from floats with window screens to those with large (1/2 in. mesh) plastic netting to allow better flow, easier cleaning and to help cut down on fouling. Scallops were kept there until they reached market size (2.0-2.5 inch).

One preliminary study was made on the feasibility of holding scallops in pens. One-half inch hardware cloth was tacked to poles pumped into the bottom to give an area 10 ft. x 10 ft. x 6 ft. The scallops measured approximately 0.5 inch on July 9, 1970, the start of the experiment, and reached an average size of about 2.25 inches by November 24, 1970. This meant 6-7 months from egg to market size.

Using 66 adult scallops collected in 1967, three filial generations have been produced. The three generations have been used as brood stock and for



Rapid growth is a characteristic of the bay scallops. Spawned in the laboratory and grown in anchored floats, the scallops reach market size in 12 to 18 months.

other studies related to the mariculture of the bay scallop. The initial group of 66 adults was successfully conditioned and stimulated to spawn as early as February; however, despite bi-weekly efforts, spawning during February, March and early April was infrequent. By mid-April, when the gonads appeared more fully developed, spawning occurred quite easily and as frequently as twice a week. The natural spawning period in local waters is around May-June, but conditioning brood stock out of season was relatively easy.

During the early post-setting period up to the time the scallops were 1/16 inch, mortalities were high. The causes of death were not investigated in this study, but the scientists involved with the research suspect that during metamorphosis the nutritional needs of the scallops may change, requiring a different food than the type available. This could indirectly make the early juveniles more susceptible to disease. Smothering may also contribute to the mortalities.

Mortality of scallops held in floats was moderate and believed caused by such factors as disease, parasites, overcrowding, smothering and senescence. Due to the increased mortality noted in all groups at approximately 12 months, senescence is thought to be an important cause.

Although work is still being done to determine optimum densities and optimum depth for holding scallops in floats and to determine other methods for holding scallops from approximately 3/8 inch to market size, the biological feasibility of rearing the bay scallop from egg to market size has been established.



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