Improved Techniques For Collecting Seed Oysters in the Chesapeake Area

DAVID H. WALLACE
Oyster Institute of North America
Annapolis, Md.

THE FOUNDATION of successful commercial oyster culture is an adequate source of seed oysters. Seed is as important for oyster farming as it is for wheat growers in the Midwest or the rice farmers of Japan. Where harvesting of a wild crop is the normal procedure, either on land or on an oyster bed, the average yield is far lower than in areas where cultivation of the crop is the practice.

Seed areas are the most valuable oyster grounds of all and are proportionately scarce; bottoms for growing are far more extensive and a greater variety of conditions can be tolerated. Biologists and commercial oyster farmers alike have tried, from time to time, to describe precisely the environment necessary for successful spawning, fertilization of the eggs, growth and survival of the larvae, and final setting and survival of the spat. So far no one has been able to specify these conditions which would apply in all parts of the range of our eastern oyster. Possibly this is because we do not observe closely enough.

Lunz found that with proper arrangements he could encourage young oysters to set in great abundance in the warm, muddy waters of South Carolina rivers. The encouragement was provided in the form of shell bags suspended on a wire between two pilings in the zone between high and low tide. His oysters succeeded where others failed to set on shells on the bottom. He concluded that silt collected on the bottom and rendered the shells there unable to receive a set. When shells were suspended above the bottom in the tidal zone the silt seemed to be carried away, leaving a clean surface for attachment of the spat.

Lunz is not the only scientist who has encouraged setting by removing the shells from the bottom. For many years the Japanese have been punching holes in oyster shells, stringing them on wire, and suspending them in the water just before setting. The technique was adopted in the Pacific Northwest with some success, but the oystermen there found they could import cheaper, better seed from Japan than they could grow themselves.

In British Columbia where the waters are very deep and with little intertidal zone, Quayle developed floating rafts, with strings of shells suspended beneath them. His experiments were most successful in obtaining a set, and furthermore the young oysters grew far more rapidly when raised off the bottom.

Various other commercial practices have been developed in various parts of the world to collect seed. In Australia, hickory sticks are placed on racks just prior to setting. The spat are then shaved off the sticks for planting on the growing grounds. In Holland, the Dutch use smooth tiles as cultch and the spat are scraped off when they have become hard enough to withstand such treatment.

Along the Atlantic and Gulf Coasts collection of seed has been more haphazard. While a great variety of setting experiments have been carried out, the oystermen have generally ruled out new techniques without testing them, on the grounds they were impractical. The commercial practice is to throw shells on the bottom sometime in the spring or early summer and hope for the

best. In many areas oystermen make no attempt to grow seed. Their seed stock is obtained from public grounds, where it grows naturally. This is a condition fast disappearing, since the natural seed rocks become depleted and apparently unable to replenish themselves each year. The public seed grounds in Connecticut are excellent examples. Where 1,000 tongers worked twenty-five years ago taking seed, not a single license was issued last year for the Bridgeport, Conn., natural area which contains thousands of acres.

Along the Atlantic Coast the only natural seed produced in abundance without assistance from man is from the James River in Virginia. The natural beds there are undoubtedly the most extensive, finest natural seed grounds in the world. From 2.5 to 3.5 millions of seed are produced each year, with no indications at present of overfishing.

In New Jersey the natural seed beds in the upper Delaware Bay are badly depleted. The oyster planters there are seeking other seed sources. In Maryland, natural seed is unavailable to the private planters, and even in Virginia, where the oyster growers are blessed with a good supply, efforts are being made to plant shells for the purpose of obtaining a set, to hedge against set failures in the James River.

Planting of shells for cultch is widely practiced throughout the range of the eastern oysters but the techniques for doing this are almost as numerous as the persons engaged in it. Neither time nor interest permit a description of each. Except for plantings by the state of Maryland on the public grounds, shells are planted as near to the time of setting as is possible from a mechanical standpoint. Dependent upon the type of bottom and tidal conditions, the shells are either strewn over the bottom broadcast, placed in small humps or in windrows. Concentrations vary from 2,000 to 10,000 bushels per acre, dependent again upon the bottom and the method of planting. In Maryland, shells are planted in areas where experience or sampling indicate a reasonable expectancy of a good set. Planting is not done by an indiscriminate scattering of shells during all parts of the year, as done by some states.

Even under these controlled conditions, results have been variable from year to year in the Chesapeake area. Even in high setting years the yield of seed is usually less than two-thirds the amount of shell planted, and there is great variation in quality of the seed when it is transplanted.

Two years ago biologists of the Fish and Wildlife Service carried out experiments in an area called Smith's Creek in Maryland where much of the bottom is leased and is being used to grow seed. They suspended small shell bags at various depths in the water from the surface to the bottom. Shells were also planted on the bottom under the structures built to hold the bags. It is not my prerogative to detail their results, but the general findings were made available to the planters in the area. To those interested in seed culture, the conclusions were startling. Setting in the area was best from just above the bottom and to about two feet above it, where the overall depths of the water were about six feet. The surface set was poor in comparison.

The bags just above the bottom had a very high count of surviving oysters at the end of three months. For the practical oyster farmer the conclusions were disturbing indeed. How could a practical planting operation collect set zero to two feet above the bottom in waters ranging in depths from five to ten feet?

During the summer of 1958, a large scale planting was carried out in Smith's Creek which attempted to meet the setting characteristics of the area as indi-

cated by the experimental studies. Shell bags were constructed of one inch chicken wire. The bags were approximately twenty-four inches high by twenty inches wide, and when filled with shells were about ten inches thick. A slightly wider and thicker bag was also made and used for comparative purposes, holding three-fourths of a bushel of shells.

Rather than suspend the bags from a sagging cable, which seemed impractical on a large scale, or to drop them over individually so they would be lying on the bottom, three of the filled bags were tied together. When the group of three was dropped overboard, they sank to the bottom, coming to rest in an upright position, in a sort of tripod arrangement. This placed them in the heavy setting zone, with the maximum shell surface exposed for a set. Since set have been known to penetrate six inches into a pile of shells, there was reason to believe the inner shells might receive a set.

This planting was not on an experimental basis. Almost 30,000 bags of shells were placed over in this manner. In the same area, and even adjacent to the bags, other oystermen planted large quantities of shells in the orthodox manner.

Undoubtedly 1958 will be recorded as a poor setting year in Chesapeake Bay. Every report of the biologists working on the Bay indicates light or no sets, except in the James River. Smith's Creek was no exception. The set there was probably the lightest in the last five years. From preliminary examination, a large percentage of the shells planted on the bottom probably do not have a set sufficiently good to justify moving. Some samples examined counted less than 250 young oysters per bushel of shell. The results were quite different on the bags. The set in these ranged from 250 to more than 1,500 per bushel. Furthermore, the spat grew far more rapidly than those on the bottom. Survival after three months was high, and after three months the planting was moved since the young oysters had begun to grow through the meshes of the bag.

This method is far more costly than meets the eye. It usually ends in large quantities of the material being lost as a base for attachment of the larvae, and a poorer count of seed for planting. While the actual processes were far more expensive than the conventional planting, the results in a commercial set justified the procedure. In my opinion, had 1958 been a high setting year the values would have been just as striking in favor of the bag plantings.

This one planting is being detailed to illustrate the possibilities of utilizing local conditions to the advantage of the grower. It is not presented to be the panacea for seed culture in the United States. In fact it is almost certain that such a technique would be an utter failure in South Carolina or possibly in Georgia. However, it is my firm conviction that the production of seed has to move beyond the rudimentary stage of wholesale throwing over of cultch on the bottom in hopes a great quantity of oysters will attach themselves there.

The oyster industry must improve its methods and approach maximum efficiency if it expects to compete in the present food market. Oyster production in the United States is declining even as our population is growing by leaps and bounds. We are getting less and less of the consumer dollar spent for food, because of our inability to produce in sufficient quantities to justify selling our product.

The production of oysters lends itself better to a fusion of science and industry than any of the fishery products produced in the United States. We need new thinking, new ideas and good technical advice. In the states where private

growers are permitted to operate, the services of biologists should be available to them for guidance. Experiments should be planned and developed to supply some answers to their questions. In the states where public oystering is the policy, biologists and business men should team up to provide sound management divorced as far as possible from political pressures. I emphasize the combination of biologists and business men since my own experience indicates that biologists as managers are frequently quite impractical and need the assistance which good business men can give.

Oysters are cooperative subjects to work with. They spawn and the larvae set consistently if given half a chance. I am confident that every state along the Atlantic and Gulf Coasts could greatly increase its supply of oysters, if we could obtain the close liaison between science and industry. The Gulf and Caribbean Fisheries Institute can be a major factor in bringing this about.

Progress in Atlantic Coast Shad Investigations—Migration

JAMES E. SYKES AND GERALD B. TALBOT
U. S. Fish & Wildlife Service
Beaufort, North Carolina

IN 1950, AT THE REQUEST of the Atlantic States Marine Fisheries Commission, the U. S. Fish and Wildlife Service began a study of the Atlantic Coast shad (*Alosa sapidissima*). This project was undertaken to determine causes of fluctuations in abundance of this species and methods of controlling and predicting the size of shad runs. We were remarkably successful in achieving these objectives for rivers where records of the shad catch each year and the amount of gear used each year in making that catch were available (Fredin 1954; Talbot 1954).

Much of the research depended upon estimation of the total populations of shad in the rivers being studied. The estimates were determined through tagging programs in which ratios of tagged to untagged fish sampled in catches were applied to total numbers of fish tagged so that total numbers of fish in the populations were derived. Usually between 40 and 50 per cent of the tags applied were recovered within the river of tagging. Some of those tagged fish which were not caught in the rivers and which escaped other mortalities were recaptured elsewhere, and from these, as well as recaptures from other tagging experiments, the oceanic migration pattern of shad became known.

The shad is an anadromous fish, running up coastal rivers to spawn. Its river life is rather well known. Shad begin running into the St. Johns River in Florida (which is the southern range of this species) as early as November. The runs begin in more northern streams at progressively later dates. For instance, shad enter Chesapeake Bay streams in February and March, the Hudson River in April, and the St. Lawrence River (the northern limit of the species) in June. While in the river, the females deposit an average of about 250,000 eggs. These are deposited loosely in the water and are then fertilized by the males. After absorbing water, the fertilized eggs sink to the bottom and are carried along by the current. The eggs hatch in three to ten days, depending upon