

Where Scallops Live, How They Grow

By DR. WILLIAM E. FAHY

(Editor's Note: The writer of this article is a member of the staff of the Institute of Fisheries Research, Morehead City).

From the historical standpoint the scallop is almost as well known as the oyster. The structural beauty of the scallop shell has long been recognized, and at least since medieval times, it has been copied for ornamental purposes.

Indeed, in our own day, the scallop shell is used as the trademark for one of the larger oil companies. The early American Indians also recognized the superior food qualities of the scallop as evidenced by their kitchen middens. (A midden is a refuse heap, found in places of primitive habitation).

Throughout the world there are many different kinds of scallops of varying sizes and shapes. From the coast of North Carolina alone there have been seven species reported, but of these only one, the so-called bay scallop, has ever been of commercial importance.

This scallop occurs along the Atlantic seaboard from Nova Scotia to Texas, but its commercial range extends from Cape Cod in the north, to Florida in the south. Throughout its range the bay scallop is found in shallow estuaries, the mouths of rivers, in bays and in sounds. In North Carolina, the entire scallop fishery is located in the sounds inside the "outer banks."

The bay scallop is a marine bivalve mollusk with rounded shells approximately 3 1/4 inches in diameter. A series of ridges radiating from a long straight hinge extend across the shells. At the hinge the shells are fastened together by means of a flexible ligament and a small cartilage; these structures tend to keep the shells open. Somewhat centrally located within the shells is a strong columnar muscle, the adductor muscle, sometimes as thick as the thumb of a man. It is this muscle which closes the shell and it is also this muscle with which most are familiar, because this is the scallop "meat," the part which is placed on the market.

Development, Behavior

The early development of the bay scallop is essentially like that of other well known bivalve mollusks such as the oyster and hard clam. However, in the scallop both sex products, eggs and sperm, are present in the same individual.

In the spawning process the scallop usually discharges only one kind of sex cell at a time, thus self-fertilization seldom occurs. In North Carolina most bay scallops spawn in the period August through October.

Fertilization of the egg occurs in the water surrounding the scallops. Within a few hours the microscopic scallop is capable of locomotion by means of fine hairs. At one or two days a swimming organ edged with fine hairs is formed and also at this stage the first shell is formed.

After four or five days marked changes have occurred and the young scallop appears as a miniature of the adult, yet the length (diameter from the straight hinge to the opposite side) is only about 1/25 of an inch.

At this stage the little animal possesses a "foot," a muscular organ which protrudes between the shells in the angle formed by the straight hinge and the shells. By means of this foot the scallop crawls about the bottom attaching itself to any object by means of fine threads secreted by a gland in the foot.

Thus a "set" of young scallops results when attachment is made to submerged vegetation, old shells, stones, logs or other similar material. The young scallop can make or break this attachment as the occasion demands.

Attachment to submerged ob-

jects is of great significance because it prevents the young from being swept to unfavorable environments by violent wave action or strong tides. The duration of the attachment habit in early life varies greatly with individuals.

Usually attached scallops are one-half inch in diameter or less (up to four months of age), but occasionally one can find an attached scallop the size of a half-dollar (up to 10 months of age). For the most part older scallops (five months and older) are found in shallow pits which they fashion in the bottom. Such a pit affords considerable protection against water movement.

Many Blue Eyes

Another unique character of the scallop is the presence of many eyes of a deep blue color. These eyes are located on short stalks and can be seen through the open shells all around the animal. These are very complex structures containing a cornea, lens, iris, retina and optic nerve, thus the eye of the scallop is comparable to the eyes of much higher animals such as mammals.

Another singular possession of the scallop is the power of swimming. The light shell, strong adductor muscle, well-developed cartilage in the hinge and other components are coordinated to permit more or less rapid movement through the water. In swimming the scallop appears to "bite" the water moving quite rapidly with the hinge behind. In this manner they come to the surface and move along it for short distances.

Although it is a widely-spread tale that scallops accomplish long migrations from the sea to the different sounds, or from sound to sound, there is no recorded scientific evidence or observation to support such. On any particular shoal there is considerable movement of scallops.

On numerous occasions a swarm of perhaps a hundred scallops have been seen to move 10 or 15 feet when a person walks through them.

Growth of Scallop

After larval development, growth of the scallop is rapid during the warm months of August, September and October. In late October the water temperature decreases and the growth rate slows, but growth does not cease. By February and March the scallop has attained a length of about one-half inch to one inch.

With the warm water temperatures of the spring the growth rate is greatly increased and by July, that is about 11 months after fertilization of the egg, a length of approximately 2 to 2 1/2 inches is reached.

At one year of age the scallop is sexually mature. If one opens a scallop at this time, an organ shaped like a large kidney bean can be seen in the central region. The red-orange end of this organ contains the eggs and the dark brown or black end contains the sperm cells. The red-orange coloration denotes ripeness in the eggs.

During the months of August through October, the thirteenth through the fifteenth month of life, the scallop does not increase very much in length, apparently most of the animal's energy is being devoted to reproduction. In the following period, November

through February, the shell length is increased to about 3 1/4 inches. The commercial fishery is so intense that few scallops survive their second winter.

Even if the scallops were not caught there is considerable evidence that few would survive naturally through the second spring. At this time the adductor muscle becomes weakened in many individuals, and such animals become easy prey for enemies such as crabs.

Of the few which do survive the second spring, shell length continues to increase, but very slowly. There is some evidence that these older scallops, about to spawn for the second year, do not wait until August, but rather discharge their sex products in May.

Such a phenomenon explains the existence of a considerable number of very small scallops (1/25 to 3/25 of an inch long) in May and June. Quite frequently very old scallops are found, that is scallops which have lived as long as 30 months. Whether they live longer than this in nature is not known.

Scallop Industry

In the past decades scallop production in North Carolina has compared favorably with that of other states of the Atlantic seaboard. The highest production recorded in the statistics for North Carolina was in 1928 when 174,250 gallons were harvested.

Such a figure was higher than any other scallop-producing state and represented more than 40 per cent of the national bay scallop harvest for that year. Following the disappearance of eelgrass from the coastal areas of the United States in the early 1930's, scallop production in North Carolina and other states declined.

Since 1931 North Carolina has had only one "good" scallop year and that occurred in 1951 when 46,000 gallons were harvested. The scallop fishery, once located in Bogue Sound, is now found chiefly in Core Sound.

In North Carolina scallops are harvested by hand with rakes or more frequently with long handled scoop nets. Dredging is prohibited by law. The quantity of scallops caught by a fisherman in a day depends on the density of the scallops, weather conditions and individual skill.

On a clear calm day a skilled man on good scallop ground can gather 45 bushels. The shucking out of the adductor muscle for market is a family affair. The fisherman takes his catch to his home where the entire family usually becomes engaged in the shucking process. Later the meats are taken to a fish dealer where the fisherman is paid by the gallon.

Most of North Carolina's scallops are shipped to the market in New York City.

Scallop meat yield has been studied for several years by investigators at the University of North Carolina Institute of Fisheries Research. Investigations show that the volume of meat in a scallop doubles between the months of September and December, that is, the adductor muscle increases in size twofold from the thirteenth to the sixteenth month of life. It is in December that the commercial fishing season opens.

Meat Yields Vary

Studies have also shown that there is great variation in the meat yields of scallops from different shoals. In general the nearer a shoal is to an ocean inlet, the greater the yield of meat per scallop. About 280 scallops are required to yield a gallon of meats when the scallops are harvested from the "best" grounds, such as at present are found on the Whitehurst Island shoals in Core Sound near the bight of Cape Lookout; almost 500 scallops are required

to yield a gallon of meats when the scallops are gathered from shoals halfway between Barden Inlet and Drum Inlet in Core Sound.

The significance of the differences between meat yields to the fisherman is apparent at once. A man fishing in one area has to do twice the work (both in catching and in shucking) to obtain the same amount of money.

The prices received by fishermen and dealers have varied in the past few years. The price is generally governed by the prevailing market in New York City. From 1949 to 1952 the price received by the fishermen was about \$4 per gallon and the average price in New York was \$6.

In 1953 the market was slow and the price to fishermen varied from \$2.00 to \$3.00 per gallon; in New York scallops brought \$3.25 to \$3.50. This figure represents the lowest price level in recent years.

In 1954 fishermen received about \$4 per gallon and in New York the market price varied from \$5.25 to \$6.50.

Hoax Played

A discussion of the scallop industry would not be complete without a description of a hoax that used to be played upon restaurant owners and sea food eaters, and perhaps it still is. The pectoral fins of certain skates and rays would be cut into the approximate shape and size of scallop meats, and the same would be sold as "scallops" to the restaurants.

Detection of such a deception is relatively easy. You merely stand the suspected meat upright on one of the round ends; if the muscle fibers run up and down, the meat is a scallop muscle, but if the muscle fibers run crosswise of your plate you are not eating scallops, but possibly the fin of a skate.

Fluctuations in Abundance

A study of statistics of scallop production of different states, including North Carolina, shows great fluctuations through the years. Because bay scallops form a desirable and intensely cropped resource, it can be assumed that annual harvests reflect the true number of scallops present in a fishery.

Unfortunately, high air temperatures did not occur in that period as forecast and the demonstration was not successful. The object of this experiment was to determine the practicability of large-scale removal of scallops from "danger" areas to "safe" areas when weather forecasts indicated such a need.

Attempts were made to induce scallops to set in "safe" areas, that is locations where they would be protected to a large extent against extremely high or low water temperatures. Clam shells were scattered over certain selected spots "to catch a set." These attempts failed because in the estuaries the collectors became sanded over, or were removed by humans, thus upsetting the experiment.

Surveys made in summer, 1955, show that more scallops were present in Bogue Sound than in recent years. Hurricane Connie swept through the immediate area with an attendant heavy rainfall. The following day Bogue Sound was brown in color because of the heavy runoff of rainwater.

It is entirely possible that several thousand dollars worth of scallops in Bogue Sound perished because of a prolonged period of fresh water over a scallop bed. Of course the wave action attending the storm may well have destroyed most of them.

If such is the case, not only might the coming winter's harvest be destroyed, but also some of the young just spawned.

The studies of the Institute of Fisheries Research show that environmental conditions can cause large fluctuations in the abundance of scallops. It is possible that such environmental factors as covering vegetation, extremes of water temperature, excessive runoff of rain water, or scouring action of wind storms can account for the fluctuations in abundance of scallops through the years.

In the light of present knowledge it is the opinion of the investigators at the Institute of Fisheries Research that nothing can be done to stabilize the bay scallop fishery in North Carolina because the environmental conditions influencing the number of scallops are extremely variable and not able to be modified or controlled, indeed in most instances their occurrence cannot even be predicted.

The reasons for these fluctuations have not been clear. In 1951 the Institute of Fisheries Research began an intensive study of the bay scallop in North Carolina. One of the reasons offered by biologists for the lower catches of scallops along the eastern coast of the United States since 1931 was the disappearance of eelgrass from the estuaries. With such disappearance marine biologists suspected that vital cover for certain animal forms, including the bay scallop, was taken away.

Since 1948 an increasing area of the Core Sound bottom has been covered with vegetation during summer and fall months, the critical months for the young of the bay scallop. It is at this time that young scallops require cover that protects them from predators and prevents their being swept away by strong tidal currents or wave action.

(Most of the vegetation that covers the scallop areas today is not eelgrass but two other plants.) The area of bottom covered by vegetation increased from 1948 through 1951 and the production of scallops rose from a very small amount to 46,000 gallons.

However, in the years 1952 through 1954, the area of bottom covered by vegetation did not decrease and scallop production decreased pronouncedly. Obviously, factors other than vegetation can control the number of scallops available to a fishery.

Many Young

In spring, 1952, just after the relatively high production of the 1951-52 winter season there were large numbers of young scallops on the Core Sound grounds. On the basis of plot counts throughout the grounds, the 1952 harvest promised to be greater than the previous season's.

In June, 1952, record air temperatures (up to 107 degrees F.) were recorded at Morehead City. The water temperatures over most of the scallop grounds ranged from 80 degrees to 95 degrees F. During these periods of high air temperatures, extremely low tides bare where normally one or two feet of water could be expected. These temperatures killed almost all of the scallops.

The only area in which scallops survived in large numbers was the Whitehurst Island shoal where cooling ocean water washed through Barden Inlet and the different sloughs of the area on flood tides. Throughout the scallop grounds "pockets" of scallops that had survived could be found.

Most of these occurred in deeper water (4 to 8 feet) along the edge of sloughs, but some were found on vegetation-covered shoals that had not fallen bare.

It is quite probable that the vegetation and the layer of water served as insulators against the extremely high water temperatures. (Such combinations of vegetation, air and water temperature, and water depth may be effective against extreme temperature in winter also.)

An elaborate experiment was set up in Core Sound during early summer of 1953 to attempt to demonstrate the effect of extreme high water temperatures on exposed

scallop populations as compared to those populations protected by vegetation and deeper water.

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Francis Taylor, Pensacola, president of NFI, and Charlie Jackson, general manager, will attend. Following a luncheon there will be a discussion of local fisheries problems and NFI affairs.

Other regional meetings and their dates follow: Region III, Friday, Oct. 7, New Orleans, La.; Region IV, Monday, Oct. 10, Santa Barbara, Calif.; Region V, Friday, Oct. 14, Seattle, Wash.; Region VI, Tuesday, Oct. 18, Chicago; Region I, Friday, Oct. 21, Boston, Mass.

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Gillikin Brothers Build Boats at Harkers Island

Gillikin Brothers Boat Yard at Harkers Island, run by Paul and James T. Gillikin, is celebrating its second anniversary this month.

In the two-year period of operation of the yard has built more than 18 boats, including three small skiffs and one commercial fishing vessel.

Following Hurricane Hazel last October, the yard made many repairs on damaged fishing boats.

One person, Walter J. Wilkins, Norfolk, has had two cabin cruisers made at the yard. The first, a 42-footer costing \$18,000, was launched in May 1954. A crowd of 300 persons, mostly from Harkers Island, but from other parts of the county as well, attended the gala launching, one of the largest crowds ever to witness such an event, because boat launching on Harkers Island is a rather common occurrence.

The second boat, a 47-footer costing \$40,000, was launched in August of this year. It took the yard nine months to complete this

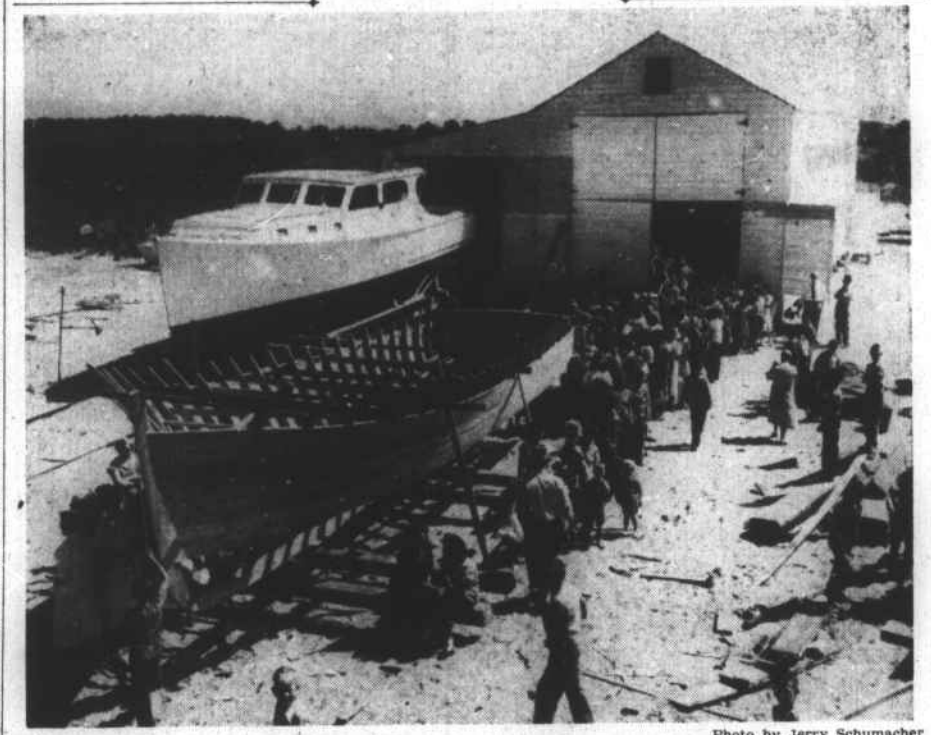
particular boat. Mr. Gillikin said it takes between three and more months to complete an "ordinary boat."

Largest boat made by Gillikin Brothers thus far is a 65-footer which is being used as a head boat for sports fishermen in South Carolina. Like Mr. Wilkins' second cabin cruiser, it was launched at the yard in August.

The one commercial fishing boat built at the yard was a 28-footer.

Employees, all residents of Harkers Island, are Clem Willis, Lonnie Fulcher, Alvie Fulcher, Curvis Hamilton, Mervin Rose, Chauncey Guthrie, Ashton Styron, Vance Gillikin, Sam Salter, Harold Guthrie, David Lewis, Terrell Scott, George Rose and James A. Rose, as well as the Gillikin brothers.

There are 200 living species of scallops and many fossil scallops. Of the seven species reported in North Carolina waters, the only variety of commercial value is the bay scallop (pecten irradians).



Crowd attends launching of cabin cruiser costing \$18,000.

Photo by Jerry Schumacher

Crab in Can Looks, Tastes Better Than Crab 'In Claw'

Two million pounds of crabs taken from the waters of the Pamlico River, the Pungo River, and other waters within a radius of 20 miles of Belhaven are brought yearly to the docks of the Blue Channel Corp. plant at Belhaven. The appetite-tantalizing canned crab meat then goes to the tables of homes all over the nation.

The Belhaven plant has been in operation since 1943. The main office of the firm, founded in 1935, is at Port Royal, S. C. There the company's other plant is located. It cans oysters and shrimp in addition to crabmeat, while the Belhaven plant produces only crabmeat, although it canned both oysters and herring roe for several seasons. The corporation has had plants at Crisfield, Md., New Orleans, La., and Beaufort, S. C.

About 150 Beaufort Countians are employed during the peak of the crab season under the supervision of Joseph T. Miller, plant manager.

The spacious plant, which covers about 20,000 square feet, consists of four buildings in addition to the office, occupying the former site of the Ruark Crab Co.

The building closest to the water opens to the dock, where the crabs

are unloaded, washed in a wire tumbler, and steamed. Inside the building, the crabs are cleaned, picked, and the meat graded. After the meat has been washed and placed in cans, the cans are sealed and processed under pressure.

The crabmeat is packaged in the five and one-half-ounce family size as well as the one-pound institutional size. A popular package contains a six-ounce can of deviled crab and four crab shells for serving the spicy concoction. An innovation in the company's packaging is the three-ounce can of deviled crab, designed to compete with deviled ham for hors d'oeuvres.

In the storage building, the cans are labeled as to content and stored. After they are packed, they move out to markets in New England and New York, as well as in North Carolina.

Taking a cue from the meat packing industry, which "uses every part of the pig except his squeal," Blue Channel has gone the meat packers one better but using every part of the crab, including his shell.

Shells measuring four to five inches across are cooked in lye to remove all clinging particles of meat. Then a chemical base is applied to neutralize the acid; and the shell is dried thoroughly and

brushed. The attractive shells are packaged with a can of deviled crab so that the housewife may serve her deviled crab in a fashion pictured in the best cookbooks and homemaking magazines.

Shells which do not meet size requirement for marketing are relegated to the dehydrator, along with all other waste material. The meal which is the product of the dehydrating process is used in animal feeds.

Mr. Miller, the personable manager of the Belhaven industry, has been with the North Carolina plant since 1949. A native of Massachusetts, Mr. Miller is a graduate of the state university at Amherst, where he received his bachelor's degree in food chemistry.

Mr. Miller has been associated with the corporation since 1941, having been employed at several other plants before assuming his managerial position in Belhaven. He served with the Navy as an ensign during World War II, and was stationed at Pearl Harbor from 1944 until 1946.

His firm, using a patented process for capping its product, is the only one on the Atlantic coast, he says, which cans crab meat.

North Carolina is proud to number it among its seafood processing plants.



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