

Hard Clam Aquaculture in New Jersey

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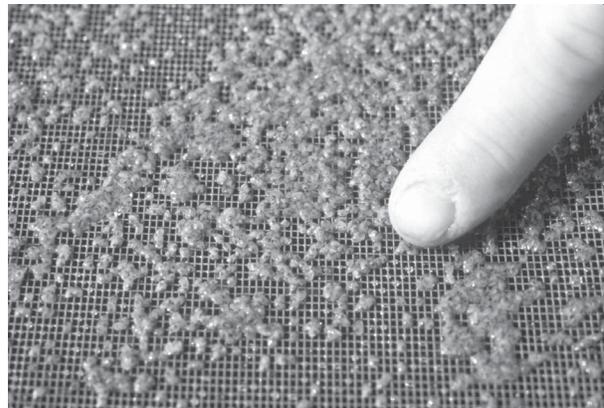
The hard clam, or northern quahog, *Mercenaria mercenaria*, has long been a main stay of New Jersey's coastal communities. Since the resources of the rich coastal bays were first harvested, the clam captured a strong hold in the fresh seafood market and the hearts of the summer residents. In recent years, the focus of the clam fishery has shifted from being a product harvested from the wilds to being another crop successfully cultivated in the Garden State.

This bivalve mollusk, sought by commercial and recreational clammers alike, grows well in many parts of our bays. Each year, landings of this species represent about \$5 to 10 million, ex-vessel price. Using a normal fisheries economic multiplier of 4, and factoring in the recreational harvest, the hard clam contributes about \$20 to 40 million to New Jersey's economy each year.

Unfortunately, New Jersey's natural clam beds have diminished steadily for the past thirty years. This decline cannot be attributed to any one specific reason, but is probably the result of habitat degradation, siltation, harvest pressure, lack of management, varied water quality, and wetlands destruction. As a result of this downturn, the growth of the commercial aquaculture industry now accounts for more than 25 percent of the total landings of hard clams each year.

The Aquaculture Industry

The industry currently has six hard clam hatcheries and three separate land based nursery systems, located mainly in southern Ocean, Atlantic, and northern Cape May counties. Most of the leased grow out areas are in the same general vicinity. These facilities grow clam seed either for their own use, or for sale to growers in New Jersey and other states. There are about 50 active clam growers producing millions of high quality clams each year. These clams are consumed in many homes and local restaurants, and are also shipped to other states.



In the early stages, hard clam seed looks like grains of sand.

The clam aquaculture industry is monitored by three divisions of the New Jersey Department of Environmental Protection (NJDEP) and, as with all shellfish, the New Jersey Department of Health.



The NJDEP Division of Water Monitoring and Classification approves all shellfish harvesting and growing areas by taking numerous water samples year round to certify the quality and purity of the water, the Division of Fish, Game and Wildlife, Bureau of Shellfisheries oversees the leasing of areas for growing clams. Approving or denying leases is the responsibility of the Shellfish Council, which is composed of licensed and practicing shellfishermen. Before any lease is granted, there is a biological survey done by the Bureau to confirm that the area in question is truly not productive. This assures that only areas with minimal recruitment (little or no clam abundance) are given to an individual to farm. This allows public access to the largest area of productive beds. The Bureau of Marine Enforcement patrols the leased areas on the lookout for poachers.



Brood stock are arranged on a wet table for spawning.

The Culturing Process

In nature, clams spawn in the spring. When coastal bays warm up, the shellfish release their eggs and sperm into the water. These eggs and sperm unite to form larvae, but in nature the fertilization process is haphazard at best. Those larvae that result feed on the naturally occurring phytoplankton, or algae in the water. This algae is the product of the photosynthetic process which combines the nutrients washed off the salt marshes by the spring rains,

the increase in sunlight, and the rising water temperature.

After a couple weeks in a free-floating state, the clam larvae settle to the bottom, nestle into the sand or mud, and begin to grow to market size. The average littleneck clam in nature is probably 4 to 5 years old.

Aquaculture mimics this process, but the culturist takes control, and increases the speed at which the clams are produced.

A large set of parents, or brood stock are placed on a spawning table which looks like very shallow bathtub. These 50 to 100 hundred ripe clams are bathed with alternating doses of cool and warm seawater to simulate the springtime tides. Once the clams start to release their eggs and sperm, the spawners are removed from the table, separating the males and females, and set in small bowls. The eggs and sperm (gametes) are collected separately, and eventually mixed together. This allows for greater genetic diversity. Fertilization then occurs when the culturist selectively mixes the gametes in a container. The resultant larvae are placed in a large tank containing filtered seawater. For the next 1 to 2 weeks, the larvae swim in the tank feeding and growing on a diet of specially prepared unicellular algae previously grown by the culturist.

Once the larvae reach 200 microns, they begin to metamorphose or “set.” During this process they lose their ability to swim and settle to the bottom of the tank. (A micron or micrometer is one millionth of a meter, or one thousandth of a millimeter. In English units, it is equivalent to 1/25,000 of an inch.) These “post set” are collected and placed in upwelling tanks where they are fed ambient bay water, filtered to remove larger particles and potential competitors, and its naturally occurring algae. An upweller, in most simple design looks like a 5-gallon bucket with screening on the bottom. The bucket has a hole on its side near the top. A group of upwellers are placed in a tank, which is fed bay water. The hole in the side of the upweller is connected through the side of the tank. Thus, the only way the water entering the tank can escape is to flow through the

mass of clam seed in the upweller, and exit through the side of the tank.



Upwellers are used in a land-based nursery to raise seed to field plantable size.

At about 1500 microns (1.5mm), the seed are taken from the upwellers and placed on raceways. Raceways are made of 2 by 4's and plywood, or fiberglass, and are used to provide a surface on which to feed the clams flowing bay water until they reach 8 to 10 millimeters or larger, when they are ready for field planting. This part of the nursery process can also be done in the field in specially designed plastic mesh bags and boxes.

The field grow out process occurs in the leases previously mentioned. The clam seed are planted in small plots, approximately 14 by 20 feet, and are covered by ¼ inch flexible plastic screening to protect them from numerous predators that typically feed on shellfish. Blue crabs, green crabs, mud



Killifish are used to reduce fouling in field nursery boxes.

crabs, drills, moon snails, knobbed and channeled whelks, rays as well as waterfowl, can all damage the clam crop. The clams remain in these plots until they reach market size, which usually about 2 to 4 years after the spawn. During this time the culturist manages the area as a farmer does his fields. Screens must be cleaned of fouling and checked for rips that might allow access by predators. Plots may be thinned and fast growers harvested for sale. They then find their way to seafood markets, raw bars and restaurants throughout the state and region.

Clam aficionados will sometimes notice reddish striations on the shells of some clams. These markings are found in the *notata* strain of *Mercenaria mercenaria*, and occur only about 2 to 3 percent of the time in nature. Aquaculturists breed these striations into their spawns because a high percentage of the marked clams indicate to a dealer that the clams are cultured. This serves as a deterrent to poachers who might try to pass the cultured clams off as something caught in the wild—one more method of predator control.



Large seed are culled for thinning and replanting under predator control screens.

The Benefits of Hard Clam Culture

The advent of hard clam aquaculture has allowed many people who worked solely on wild clam stocks in the past to remain employed on the water.

With the reduction of normal shellfish populations, the bay clammer, as independent as the New Jersey farmer, has a better opportunity to control his future by farming his own product. Clam aquaculture allows people the chance to continue as a working waterman, a profession that is dying out in many places. The culturist is able to supply safe, consistently high quality shellfish, in its most readily accepted market form, in large volumes, at a fair price, on a year round basis.

The hard clam aquaculture industry plays another significant role in preserving and enhancing the hard clam industry in New Jersey. Because the clams cannot be harvested until they reach a legal

size of 1-1/2 inch, they have been able to spawn at least once. These spawns release billions of gametes into the water, some of them fertilizing and settling in the areas, increasing the stocks of clams in the wild. Also, every day the culturist spends working on his clam farm is once less day he is exerting pressure on the wild populations. This gives other commercial and recreational clammers a chance to participate in the fishery.

By combining simple technology and hard work, hard clam aquaculture in New Jersey is spawning an environmentally sound industry that provides a safe quality product and much-needed jobs.

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