



Oysters and Clams

The South Carolina oyster fishery is based entirely on the eastern oyster, *Crassostrea virginica*. Although other oysters are grown on the west coast, no other commercially important oyster species occurs on the east coast. The oyster is one of the most popular local seafoods. It is readily available and can be served in a variety of appetizing ways. Oysters are not only palatable, but also contain a number of vitamins, minerals, carbohydrates and proteins.

The oyster feeds by filtering food particles from the surrounding water. Opening and closing of the valves are controlled by an adductor muscle attached to each shell. Food and other particulate matter, suspended in the water, are drawn into the oyster by the motion of small, fringe-like whips called cilia located on the gills. The quantity of water pumped by a large, healthy oyster may approach four gallons per hour. Food particles retained by the gills are conducted by ciliary action to the mouth and then to the stomach of the oyster. Matter brought into the shell, but not passed through the mouth, is collected by mucus on the gills and then discharged. Large amounts of silt are rejected in this manner. This ability to separate food from silt apparently allows oysters to survive in waters of high turbidity which occurs in many estuaries. The filtering action of oysters can play an important role in removing not only suspended sediments from the water column, but can cleanse the water of various pollutants.

Spawning and Attachment

Spawning begins in the spring when water temperature exceeds 70 degrees F. Individual oysters are capable of alternating sexes, although the sexes are, at any given time, separate. In South Carolina most spawning occurs from April to October and is intensive during the summer months. The sperm and eggs are released directly into the water column where fertilization and the early stages of development occur. Free-swimming larvae develop in approximately 24 hours. Limited locomotion is produced by controlled movements of the cilia, however tides and currents produce the greater movement. After three to four weeks these larvae settle on the bottom where they must locate a hard, clean surface for permanent attachment. If a place for attachment cannot be found, the larvae sink to the bottom and die. If a suitable surface for attachment is found, the larva secretes a fluid that cements the left shell permanently to the object. Unless removed by some external force, the oyster will never move again. Almost any hard, clean surface is acceptable for attachment. However, other oyster shells appear to be the most-favored surface. Oyster shells that are purposely

placed or planted to attract oyster larvae are known as culch.

After attachment occurs, these small oysters are called spat. In southern waters there is a nearly continuous setting of spat during warm weather. This frequently produces overcrowding and results in thin, elongated oysters. Most east coast oysters north of Cape Fear, North Carolina, are subtidal, growing on bottoms that are covered with water throughout the tidal cycle. South of Cape Fear to northeastern Florida, most oysters grow intertidally, in the area exposed between high and low tides, although there are some isolated subtidal oysters growing in South Carolina. Intertidal oysters are frequently subjected to rapidly changing temperatures, including freezing air during the winter months. However, they are rarely killed by either low or high temperatures.

Growth & Predation

Intertidal oysters occur in all of South Carolina's estuarine areas. Typically in South Carolina, a number of sounds, bays and river mouths are connected by an intricate system of creeks and rivers separated by extensive saltwater marsh. Oysters occur along most of these creeks and riverbanks and on exposed mud flats.

Oysters reach a harvestable size in South Carolina at an age of about three years. Shapes of intertidal oysters are varied. The ultimate shape of the shell depends upon growing conditions. The most common intertidal growth is that which produces oyster clusters. These are formed by successive sets, one upon another. Each oyster in a cluster is used by succeeding generations. The cluster continues to grow as each new set occurs. Sometimes clusters reach a foot or more in thickness. The added weight of additional individuals tends to push the lowermost oysters into the mud where they eventually suffocate. Only the outermost oysters remain alive. Harvesters are encouraged to cull-in-place, that is, to break apart clusters while harvesting, thereby leaving smaller oysters in place for future growth. Harvesting is done by hand at low tide.

Oyster predators suffer more from exposure to the elements than do oysters. Therefore, intertidal oysters are subjected to less predation than oysters which grow subtidally. The blue crab, as well as other crab species, oyster drills, starfish and boring sponges cause mortality, especially among small oysters.

Abundance of oysters in South Carolina has remained relatively stable in recent years, although populations are lower now than they were in 1900. Declines, in part, have been related to increased siltation resulting from alterations in stream flow, overharvesting, and physical disturbances to the shell bed. Diseases, particularly in areas with high salinities, have also periodically killed oysters.

Oyster Reefs

Intertidal oysters are also found in groups known as oyster reefs. Oyster reefs are formed by oysters growing on a firm foundation of dead shells. Successive sets occur, joining clusters together to form a continuous group. The intricate, three-dimensional nature of oyster reefs provides extensive habitat for numerous marine species. Mud crabs, shrimps, juvenile fishes and other organisms have been observed to seek shelter in reefs from predators as the tide rises. Loose oyster shell on creek bottoms serves as hard clam habitat as well as substrate for sponges, sea fans, and whip corals which, in turn, supply habitat for small crustaceans and fishes.

Stone crabs typically reside near or in oyster reefs and feed largely upon oysters. Many larger fish forage for prey hiding among the oysters. Oyster reefs are important in stabilizing exposed marsh edges, thus preventing bank erosion and loss of marsh grasses. The energy of natural and man-made waves is dissipated as the waves are refracted on the complex structure of the reef.

Storage & Cleaning

Harvested live oysters in the shell should not be stored in water but at 35 to 40 degrees F. in a refrigerator, where they will keep for several days. Discard any with broken shells or with gaping shells which do not close when lightly tapped.

Shucked oysters should be light grey in color with clear liquid. If stored in their own liquor, sealed, and packed on ice in a refrigerator, oysters will keep for about one week.

Although home freezing is possible, the resulting product is not as satisfactory as commercially quick frozen oysters. If necessary, shucked oysters can be frozen in their own liquor if sealed in a container with as little air space as possible. They should be used within two months. If oysters are to be used immediately, they can be placed in the freezer for a few hours to relax the muscle which holds the shell closed. This makes shucking much easier. Oysters, like other shellfish, should not be refrozen.

CLAMS

In South Carolina, the hard clam, *Mercenaria mercenaria*, may be one of our most overlooked shellfish delicacies. More than 85% of our commercial clam production is shipped out of state in the shell, some to return months later to grocery store shelves as Manhattan or New England clam chowder. The recipe may originate from our northern counterparts, but not necessarily the clam.

In suitable environments, clams inhabit coastal waters from Florida to the Gulf of St. Lawrence and along the Gulf of Mexico to the Yucatan Peninsula. Clams indigenous to South Carolina are predominantly the northern quahog.

Clams prefer a shell and sand substrate over muddy bottoms. Clams usually occur in groups, so when one clam is found, the chances of finding others in the same area are good.

Optimum salinity for clams ranges from 24 to 32 parts per thousand (sea water is roughly 35 parts per thousand). However, populations often occur in areas where the salinity is higher or lower than ideal. Growth occurs throughout the year in South Carolina.

Spawning & Feeding

Most spawning begins in the spring, continues through midsummer and may resume in September, continuing through October. Depending on water temperature, it normally requires two to four weeks from spawning until the juvenile clam burrows into bottom sediments. Unless protected by overlying shell, juvenile clams are easy prey for crabs.

Clams feed upon plankton through a double-tubed siphon which operates like a snorkel. The siphon

serves to obtain food and eliminate waste products. In-flowing water is pumped through the siphon, passed over the gills and strained to remove food particles. After oxygen is supplied and carbon dioxide received from the gills, water and waste products from the digestive tract are expelled through the outgoing siphon. Constant water circulation is maintained by the beating of a multitude of microscopic hairs (cilia) located inside the siphon and in the gill chamber.

Chowders, Cherrystones, & Littlenecks

Clams are generally sold under three market categories which correspond to their sizes. The largest and cheap-est of the clams are marketed as "chowders" which, as the name implies, are made into New England-style chowder (with milk-cream), Manhattan-style chowder (with tomatoes) or minced, diced or ground for other food uses.

Cherrystones are medium-sized, medium-priced and sometimes served on the half shell. Cherrystones are the popular New England clam bake size. Littlenecks are the smallest, tenderest and most expensive. They are usually served steamed with clam broth and garlic butter.

Storage & Cleaning

Despite their sturdy appearance, clam shells are actually fragile and should be handled with care to avoid damage. Any clams with broken or gaping shells should be discarded. Live clams may be stored in the shell or shucked in the same manner as oysters. They also may be frozen in the shell for up to six months. It is easier to shuck them before thawing.

Recreational Harvesting of Oysters and Clams

Recreational harvesting of oysters and clams by individuals for personal consumption is a popular and traditional activity in South Carolina. Care must be taken to harvest only from authorized areas. In South Carolina, growing areas generally fall into several categories, including private grounds, known as Shellfish Culture Permits, State Shellfish Grounds and Public Oyster Grounds. The South Carolina Department of Natural Resources maintains the last two areas for public harvesting.

Public Oyster Grounds are areas where South Carolina residents can gather oysters and clams for their personal use. Commercial harvesting is not permitted. The boundaries of these areas currently are marked with metal signs which read: "Public Oyster Grounds,

Commercial Harvesting

Prohibited." State Shellfish Grounds are also open to recreational shellfishermen. These grounds may be marked with metal signs which read: "State Shellfish Grounds, Public Harvesting Permitted".

In addition to harvesting only in an authorized area, there are several regulations with which the recreational harvester must comply. It is unlawful to harvest between May 15 and September 1 annually, although the Department of Natural Resources can vary the season if conditions warrant. A South Carolina Marine Recreational Fisheries Stamp, currently costing \$5.50, is required for recreational harvesting. There is a harvesting limit of two bushels of oysters or one-half bushel of clams,

or both, per person, per day from authorized harvesting areas. Shellfish culture permits cannot be harvested without being in possession of written permission from the permit holder.

Saltwater Fishing Conservation and Ethics

Although most people once considered ocean resources to be unlimited, recent rapid declines in the populations of many commercial and recreational species have demonstrated the opposite.

Numerous types of saltwater game fish now are being over-harvested and other species will face a similar fate unless all anglers practice wise conservation and adopt an ethical approach to fishing.

Size and catch limits, seasons and gear restrictions should be adhered to strictly. These regulations change from time to time as managers learn more about fish life histories and how to provide angling opportunities without depleting stocks.

The challenge of catching, not killing, fish provides anglers with the excitement and the reward of fishing. Undersized fish, or fish over the limit should be released to ensure the future of fish populations. The number of saltwater finfish tagged and released annually in South Carolina has increased significantly in recent years as more and more fishermen take up this practice that provides information on growth and movement of fish as well as conserving resources.

Saltwater fishermen can further contribute to conservation by purchasing a Marine Recreational Fisheries Stamp which is required to fish from a private boat or to gather shellfish in South Carolina's saltwaters. Funds generated by the sale of stamps must be spent on programs that directly benefit saltwater fish, shellfish and fishermen. Help ensure the outdoor enjoyment of future generations by strictly adhering to all rules, regulations, seasons, catch limits and size limits, and through the tag and release of saltwater game fish.

Special Note

This publication was made possible with funds from the sale of the South Carolina Marine Recreational Fisheries Stamp. Help ensure outdoor enjoyment for future generations by strictly adhering to all rules, regulations, seasons, catch limits and size limits. The South Carolina Department of Natural Resources publishes an annual Rules and Regulations booklet that lists all saltwater fishing regulations. Have an enjoyable fishing trip by reading these requirements before you depart.

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