



Florida Fish and Wildlife Conservation Commission

Fish and Wildlife Research Institute

**A** bountiful food source for native Americans centuries before the first Europeans arrived on the continent, clams are now an important segment of Florida's seafood industry. Despite the fact that variations in environmental and biological parameters can cause the number and size of clam populations to fluctuate dramatically, Florida consistently ranks among the top five states in hard clam production.

### Description

"Clam" is a catch-all term for a variety of bivalve, or two-shelled, mollusks. In general, clams have two muscles (adductors) used to close the shell, two siphons used to draw in or expel sea water, and a hatchet-shaped foot used to burrow into sand or mud. The two shells (also called "valves") are hinged, held together by a ligament attached to each shell; interlocking grooves help the shells fit together snugly.

### *Fast* FACT

*The Narragansett Indian word for clams is "poquahock." Early American settlers abbreviated it to "quahog," a term still used today. Likewise, "clam" is a short version of "clamps," another colonial name for these abundant mollusks.*

Two species of clams produce the bulk of the commercial market in Florida: the southern quahog (*Mercenaria campechiensis*) and the northern quahog (*Mercenaria mercenaria*). The name *Mercenaria*—in Latin, "wages" or "reward"—refers to the fact that the clam was used historically as a form of currency by native Indians. *Campechiensis* refers to the Campeche region of Mexico, where this specimen was first found and described in the late 1800s.

## CLAMS

### Florida's Buried Treasure

The southern quahog, or hard shell clam, has a heavy, dirty-gray to whitish oval shell. Both halves of the shell are equal in shape and size, and the exterior is lined with a series of growth ridges (like the rings on a tree). The interior of the shell is white and has two

muscle scars (points of attachment of the muscle to the shell) connected by an irregular line. Near the hinge are three well-developed grooves, called "teeth."

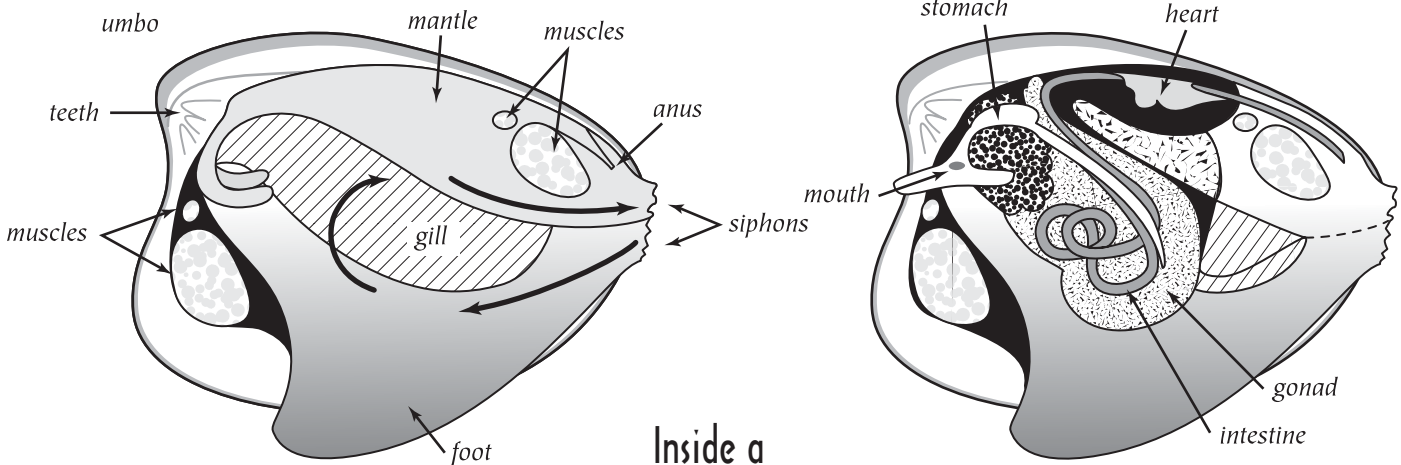
The northern quahog has a similar exterior color but has a thinner, smoother shell. Additionally, its interior may have light purple shading along the outer margin.

The shell of all clams is merely a "suitcase" constructed by the soft-bodied animal inside. A soft membrane called the mantle lines the shell and encases the animal. The mantle has three folds, and the outermost secretes the calcium carbonate and protein that form the hard shell. Clams have no eyes, but they respond to touch, vibrations, and chemical cues in their environment.

Clams have a single, hatchet-shaped foot that is composed of muscle tissue and is used to burrow into the sediments. This foot is completely developed only in adult clams; juveniles have thin, stringlike filaments that temporarily anchor them in place.

The siphons, or necks, of the clam are tubes that can be extended or retracted in response to threats from predators or to fluctuations in water quality. One siphon pumps water laden with oxygen and food particles over the gills and mantle, while the other expels filtered water and waste products. Because clams are filter-feeders that readily absorb and concentrate whatever pollutants may be in the surrounding water, they are good indicators of the overall health of a body of water.

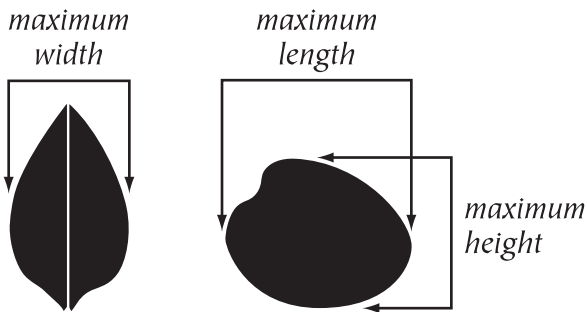
The terms littlenecks, cherrystones, and chowders refer to the size of the clam. Littlenecks measure one inch to about one-and-a-half inches; they have especially tender meat that is often served on the half-



Inside a hard clam

Art after R. D. Barnes, *Invertebrate Zoology*, 4th edition, 1980, p. 425.

shell. Chowders are the largest, at three inches or more. Cherrystones are in between. In the seafood industry, size is measured as maximum width across the closed shells.



Clams may live 20 years or more, in contrast to the scallop, another bivalve, which has a life span of only 12–18 months. Clams as old as 50 years have been reported in North Carolina.

## Range and Habitat

Northern quahogs are found along the Atlantic coast from the Gulf of St. Lawrence and Nova Scotia to the Gulf of Mexico. They are abundant off Massachusetts, Rhode Island, New York, and New Jersey, especially in Narragansett Bay and the Great South Bay of Long Island Sound. They are rare off west Florida, occurring in isolated patches. However, a thriving northern quahog fishery has developed in recent years along the east coast in Brevard County's Indian River Lagoon.

Northern hard shell clams were accidentally introduced into the waters of Great Britain about 1960 and have been successfully cultivated and marketed in both England and France. They have also been introduced in California waters.

Southern quahogs occur from New Jersey to the Gulf of Mexico and are abundant on Florida's west coast, particularly in bays and estuaries. On the Atlantic side, they are found mostly in deep water offshore. In the early part of the 20th century, the Ten Thousand Islands area of southwest Florida supported an extensive fishery of the southern hard shell clam. At one time, these clam beds were thought to be the largest in the world, but by 1947 the fishery collapsed, possibly due to diversion of freshwater flows and a massive outbreak of red tide in the area. A second fishery developed in Charlotte Harbor during the 1960s but was short-lived.

Clams may be found in sediments located at the average high-tide line or under 50 feet of water; they are most common on sand or sand-mud bottoms. Heavier clams sink in bottoms that are too soft and muddy, and excessive silt in the water can smother them. They prefer moderately salty water but are tolerant of a variety of salinities. In bays and estuaries, clams are closely associated with seagrass beds and algal mats, but in the Gulf of Mexico they are also found in bare sand flats. They generally inhabit areas near the mouths of bays and estuaries, where tidal flows and strong currents regularly deliver food and oxygen-enriched water to them and flush away waste products.



Besides northern and southern quahogs, other types of clams found in Florida include the marsh clam, coquina, calico clam, and sunray venus clam. These species support minor, extremely localized fisheries. The clam that is used most often to make the popular fried clam strips and clam chowder is the surf clam, which is not found in Florida.

## Life History

Quahogs are protandrous hermaphrodites, meaning they begin life as males but often change to females. About half of the population will undergo this sex change, usually by the end of their first year.

Spawning in Florida occurs in the spring and fall, when water temperatures reach about 73°F. The release of sperm into the water by male clams stimulates females to expel eggs. The union of sperm and egg is by chance. A female may spawn several times each year, producing millions of eggs. Because older females are so productive, the survival of large female clams is critical to the continued success of local stocks.

Within 12 to 14 hours, the fertilized egg hatches into a microscopic creature called a trochophore, which is cylindrical and fringed with hairlike cilia. In less than a day, this larval form transforms into a veliger, a free-swimming animal that resembles a butterfly; it has tiny lobes or wings that propel it through the water. The foot, shell, and body organs begin to form during the veliger stage, which lasts about 6 to 10 days.

### *f a s t* FACT

*Very few clams survive beyond the veliger stage. Veligers may be eaten by predators, killed by unfavorable water temperatures or salinities, or carried by currents to areas with insufficient food.*

As the tiny shell develops, the veliger drops to the sea floor and sheds its winglike lobes. When it touches bottom, it sends out thin filaments to hold it in place. As the clam matures, a muscular foot will replace these filaments, allowing the clam to bury itself in the sediments with only its siphons protruding.

Both southern and northern quahogs grow about three times faster in Florida waters than in more northern areas. Growth is most rapid in spring and fall. Southern quahogs grow fastest, from a little more than

a half-inch to nearly three inches in diameter in two years. Northern quahogs reach three inches in diameter in about three years. As the clams grow, they form concentric growth ridges on the outside of their shell—roughly one a year. Examining a cross section of the shells with a high-powered microscope helps scientists determine the age of the clam.

Southern quahogs may reach a maximum size of seven inches in diameter and a hefty six pounds; northern hard shells may be just as large but not quite as heavy.

Most of the clam's adult life is spent buried in the sea floor. It feeds on very small plants and animals that, suspended in sea water, are pumped into the shell through the clam's incurrent siphon. These particles are collected on mucus sheets lying over the gills; suitable food items are sifted out and delivered to the mouth, and all other particles are discharged through the excurrent siphon. Clams living in areas regularly exposed to the air during low tides may be stunted because they are not able to feed as often.

Humans are only one of many predators who enjoy consuming clams. Whelks, moon snails, and oyster drills easily penetrate the clam's armor to reach the tasty animal inside. Blue and stone crabs, pufferfish, drums, sea trout, skates, and rays also devour clams. Although clams can burrow deeper in the bottom when danger threatens, their best defense is size. The larger the clam shell, the more protected it is—although even the biggest clams are vulnerable to the powerful crushing claws of the stone crab.

## Economic Importance

The clam-harvesting industry in Florida has ebbed and flowed much like the tides that invade and retreat along the shoreline. The first commercial harvesting of the hard clam in Florida took place in the 1880s, and harvested quantities climbed steadily after the discovery of the 150-square-mile "clam factory" in the Ten Thousand Islands. In 1931, more than a million quahogs were harvested from Florida waters, and production remained high until the southwest Florida fishery collapsed in 1947. By 1950, only 4,000 pounds of clams per year were taken from this once seemingly boundless supply.

Exploitation of new clam beds elsewhere in the state generated harvests averaging 428,000 pounds a



year from 1971 through 1988. Harvests increased dramatically in the mid-1980s, when a large concentration of quahogs was discovered in the Indian River Lagoon area of east-central Florida. Those expansive clam beds, particularly in Brevard County, attracted professional clammers from as far away as New York and Rhode Island. The value of clams harvested in Florida in the mid-1990s was estimated to be roughly \$7 million; 90% of the harvest was from Brevard County alone.

Harvests of clams and some other shellfish in Florida are closely regulated by the state in order to protect public health, and areas that do not meet water-quality standards are closed to harvesting all or part of the time. However, new techniques have enabled clammers to collect and sell clams even from unapproved areas. Operating according to specified procedures, clammers either “relay” them (transfer the clams to cleaner waters until they purge potential contaminants from their system) or “depurate” them (place them in special tanks equipped with ultraviolet lights that kill any associated pathogens).

## *FAST FACT*

***Unlike most fishery species commercially harvested in Florida, smaller is better when it comes to clams, with littlenecks commanding top prices for their sweet, tender meat.***

Commercial clam fishermen work from boats and tread by foot in shallow water or use a variety of long-handled rakes or tongs to sift the bottom for their quarry. No equipment can be used to collect clams in seagrass beds.

Recreational clammers also harvest clams, often by using ordinary garden rakes to probe the sand flats or by wading in shallow areas and feeling with their toes for the hard shells hidden in the bottom. Rules governing minimum sizes, harvesting gear, harvesting areas, and other factors may change, so it is always advisable to check with the Florida Fish and Wildlife Conservation

Commission’s (FWC) Division of Law Enforcement for the latest guidelines before engaging in any fishing activity.

## Research Efforts

Hard clams are a popular subject for scientific studies because they are both economically valuable and ecologically important. From an economic perspective, scientists at the FWC’s Fish and Wildlife Research Institute (FWRI) conduct studies to evaluate alternative methods to enhance the abundance of wild clam populations in areas that are accessible to fishermen. Those alternatives include concentrating adult clams to increase local density and the production of fertilized eggs, planting seed scallops at high density also to increase the production of fertilized eggs, or directly releasing fertilized eggs into the environment to circumvent the vagaries of the natural spawning process. FWRI scientists also have developed Geographic Information System (GIS)-based maps describing areas that are suitable for clam aquaculture but that will not interfere with harvest from naturally occurring clam beds. Those scientists have also conducted genetic studies to evaluate the impact of hard clam aquaculture on the genetic structure of natural clam populations.

From an ecological perspective, scientists at FWRI have described the distribution and growth patterns of both the northern and southern hard clam, and their natural hybrids, in an effort to determine how the two species and their hybrids manage to co-occur in similar habitats. They have also described the gonadal cancer that tends to be more prevalent in the hybrid clams than in either of the two pure-species groups. Recently, those scientists have developed a novel technique to track the larvae deriving from a hard clam population to better understand how clams repopulate an area and what physical and biological factors affect that redistribution. Those results have led to a better understanding of how marine animals disperse to occupy new habitats.



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