

Whelks Guild

Knobbed Whelk *Busycon carica*

Channeled Whelk *Busycotypus canaliculatus*

Lightning Whelk *Busycon contrarium*

Pear Whelk *Busycotypus spiratus*

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DESCRIPTION

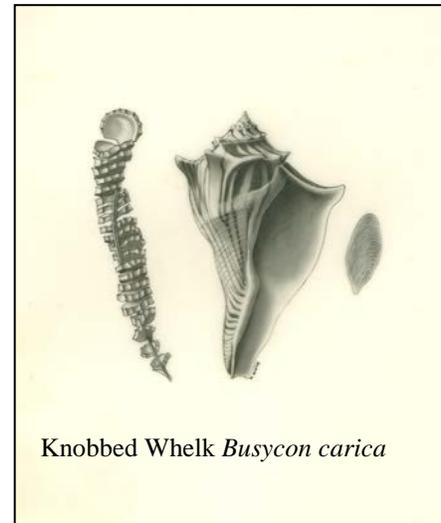
Taxonomy and Basic Description

The knobbed whelk, *Busycon carica*, is the most common whelk in South Carolina, but 3 other species are found in State waters in the following order of abundance: the channeled whelk (*Busycotypus canaliculatus*); the lightning whelk (*Busycon sinistrum*); and the pear whelk (*Busycotypus spiratus*). The only whelk in SC found in commercial quantities is the knobbed whelk and therefore it is the best studied.

First described by Gmelin in 1791, the knobbed whelk, *Busycon carica*, is a member of the family Melongenidae. Whelks have flourished off of the South Carolina coast in the Atlantic for over 30 million years. Adult knobbed whelks are usually 13 cm to 23 cm (5-9 in.) in length and are characterized by low knobs on the shoulder of the whorl with the aperture on the right side. Aperture coloration ranges from light orange-yellow to brick red. The knobbed whelk is the state shell of both New Jersey and Georgia.

The structure and coloration of knobbed whelk shells vary greatly, not only over their geographical range, but also within a locality. It is not unusual to find whelks on South Carolina beaches with different knob lengths, knob directions, and aperture colors. Whelks grow by extending the shell around a central axis, producing turns or whorls as they evolve. The final whorl—and usually the largest—is the body whorl that terminates, providing the aperture into which the snail can withdraw. Whelks also have a separate hard, horny plate, called an operculum, which acts like a trap door when the snail withdraws into the shell. Sometimes called a “shoe,” the operculum is attached to the top of the foot and is seldom found with empty whelk shells (Magalhaes 1948; Eversole and Anderson 1985).

Knobbed whelks in South Carolina lay egg strings twice a year, usually from September through October and April through May. Egg strings start to appear at times when the water temperature approximates 20°C (68°F). Of the 2 egg-laying periods, fall appears to be the most productive. It is not known if an individual female whelk contributes to both of these egg-laying peaks or if a female lays more than one string per season. Good estimates of the average number of eggs per capsule (34 to 35) and capsules per string (100 to 120) are available for this species. Spent egg strings often wash up on beaches and consist of a series of flattened capsules attached at one end

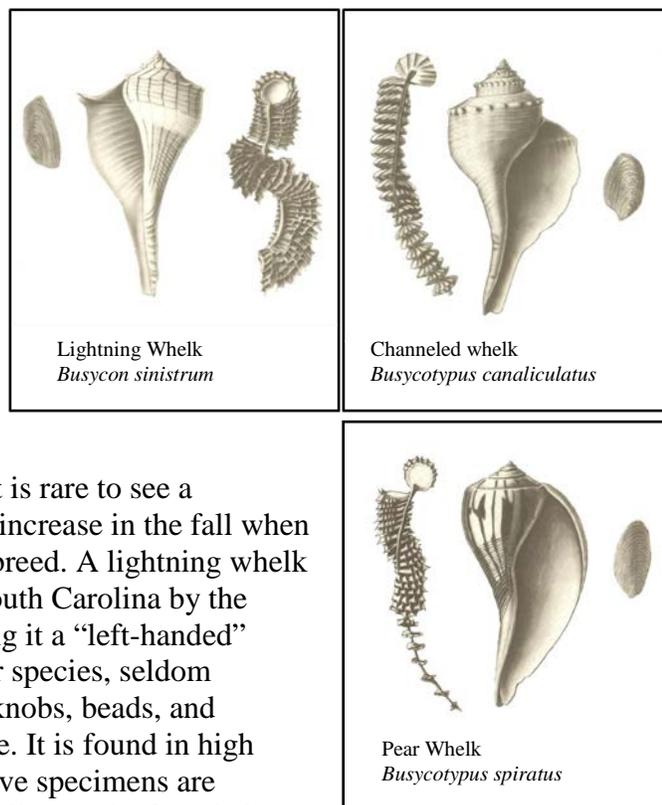


Knobbed Whelk *Busycon carica*

to a tough cord or string-like structure. Some egg cases reach a length of over 0.3 m (1ft.) and contain up to 160 capsules. In all 4 whelk species, eggs complete their development within the egg capsule and, after hatching, small juvenile snails emerge through a predesigned exit. The first capsules in the string usually do not contain eggs and are buried in the ocean floor as an anchor. Knobbed whelk egg capsules are coin-shaped, 20 mm to 30 mm (0.8-1.2 in.) in diameter, and are 3 mm to 6 mm (0.1-0.2 in.) thick with crenulations around the edges. Eggs develop slowly, hatching in about 3 to 13 months. Egg cases that wash up on beaches are usually empty, with open holes providing evidence of successful hatchings (Magalhaes 1948; Eversole and Anderson 1985).

If one finds a large knobbed whelk on the beach, chances are good it is a female. Male knobbed whelks rarely reach the large sizes of their opposite sex. Normally, female knobbed whelks have larger shells, weigh more, and possess a larger foot. Whelks are thought to be protandric hermaphrodites; this means that they start out as males when young, and then change into females as they grow older. This phenomenon may lead to a preponderance of females among the older and larger-sized individuals in the population (Eversole and Anderson 1985).

Channeled whelks have a much thinner shell than knobbed whelks and may be covered with a fine hairy periostracum. The spire is characterized by flat shoulders with knobs that are reduced to fine beads. Lightning whelks can reach a length of 40 cm (16 in.), making them the largest whelk in South Carolina. However it is rare to see a lightning whelk in inshore waters. Chances increase in the fall when mature individuals may migrate inshore to breed. A lightning whelk is distinguished from the other whelks in South Carolina by the counter-clockwise coiling of the shell, giving it a “left-handed” shell. Pear whelks are smaller than the other species, seldom exceeding 15 cm (6 in.). The species lacks knobs, beads, and periostracum and has a large flaring aperture. It is found in high salinity, subtidal areas and is nocturnal so live specimens are seldom seen in South Carolina, although shells may be found along the southern coastline.



Whelks are carnivorous gastropods, not to be confused with filter feeding conchs, such as the queen conch (*Strombus gigas*), found in the waters of southern Florida and the Caribbean. Whelks feed by tearing off strips of tissue with their file-like radula. Knobbed whelks and lightning whelks feed on bivalves such as hard clams (*Mercenaria* spp.), oysters (*Crassostrea virginica*), and incongruous arks (*Anadara brasiliiana*). These heavy whelks use the lip of their shell to chip and pry the valves of their prey apart, holding it with its foot so that the ventral edges of the prey valves are under the outer lip of the whelk shell. Slow chipping continues until

an opening is generated that allows the whelk to wedge its shell between the prey valves and then enter its proboscis to begin feeding. Since the feeding process results in damage to the shell, limited growth sometimes occurs in adults as energy is used to repair their shells (Carriker 1951; Magalhaes 1948).

The thinner-shelled pear and channeled whelks feed on incompletely closed bivalves (e.g. razor clams) or wait for prey to open its valves and use the lip of their own shell as a wedge. Pear whelks also feed on mobile gastropods which they outrun and trap in their large siphonal canal. Channeled whelks are also easily caught in traps baited with horseshoe crabs.

Status

The knobbed whelk is a common species of the shallow shelf ecosystem in South Carolina estuaries. The prevalence of knobbed whelks in this habitat makes it an excellent indicator of the health of this ecosystem.

Many people enjoy collecting whelk shells at the beach. Aside from its recreational and ecological value, the knobbed whelk is targeted in the offshore whelk trawl fishery in South Carolina. Although this species is harvested, there is limited information about population trends or how whelk populations recover from commercial harvests.

South Carolina manages the whelk trawling fishery through a Whelk Fishery Management Plan. Although state law provides for a minimum size of 10 cm (4 in.) shell length, the trawl fishery minimum size is currently 11 cm (4.5 in.). The Plan restricts trawling to early spring, with exact dates determined by water temperature, and fishermen are required to report catches daily so that the fishery can be closed when the harvest approaches 13,000 bushels, which is considered to be the maximum sustainable yield. The cyclical nature of the offshore fishery suggests that overfishing is followed by fishery collapse and slow recovery. Since 1998, annual harvests have been lower than 10,000 bushels, whereas the average annual harvest for 2004-2012 was only 228 bushels.

Recently, more whelks (predominately knobbed whelks but probably also channeled whelks) have been included in harvest statistics as by-catch in crab pots. It also appears that intertidal hand harvesting may be increasing. Inshore populations have not been studied in South Carolina, but data from Georgia (Shalack et al. 2011a,b) suggest that inshore populations may be easily overfished. The SC Whelk Management Plan does not regulate the inshore fishery. Minimum size is 10 cm (4 in.), but there are no seasonal closures or catch limitations. Although this by-catch has made up a sizable portion of the annual whelk harvest, it is a relatively modest total (<200 bushels per year). If a targeted whelk fishery were to emerge, landings might increase substantially and represent a risk to inshore populations. Also, if whelk pots are utilized, these are likely to target channeled whelks more than knobbed whelks. Our knowledge of channeled whelk populations is less than that for knobbed whelk.

POPULATION SIZE AND DISTRIBUTION

Knobbed whelks are found in US East Coast waters from the south shore of Cape Cod, Massachusetts to Cape Canaveral, Florida, with greater numbers occurring in more southern latitudes (Abbott 1974). There is no estimate of the whelk population size or distribution in South Carolina. All existing data are fishery-dependent.

Channeled whelks have a similar distribution but are more common in northern latitudes.

Lightning whelks range from New Jersey to Florida and into the Gulf of Mexico but are more common in the southern portion of the range. Pear whelks are found from North Carolina to Mississippi and are more common in Florida and Georgia than in South Carolina.

HABITAT AND NATURAL COMMUNITY REQUIREMENTS

The knobbed whelk lives in tidal estuarine waters and offshore in depths of up to 45.7 m (150 ft.), although they are more commonly found in shallow shelf waters. In estuaries, knobbed whelks sometimes congregate on oyster reefs and clam beds as they feed on these species, along with other marine bivalves, such that these are key habitats for these gastropods (Magalhaes 1948). Mating and spawning occurs in estuaries and offshore where egg cases are anchored to the bottom. Higher abundances of whelk in intertidal habitats in spring and fall have been assumed to reflect migrations to and from subtidal waters; however, Shalack et al. (2011b) suggest that intertidal populations probably remain localized year-round and are simply less visible in summer and winter when harsh intertidal conditions limit their ability to forage at low tide.

Results from mark-recapture studies indicate that whelks are very slow growing and exhibit little long-shore movement, migrating to and from estuaries only in the immediate area of their genesis (Anderson et al. 1985; Eversole et al. 2008). Similar results have been found in Georgia (Walker et al. 2008) where male whelks have been shown to reach sexual maturity at 4 years old and 90 mm (3.5 in.), while females did not reach maturity until 100 mm (3.9 in.) and 6 years of age (Power et al. 2009).

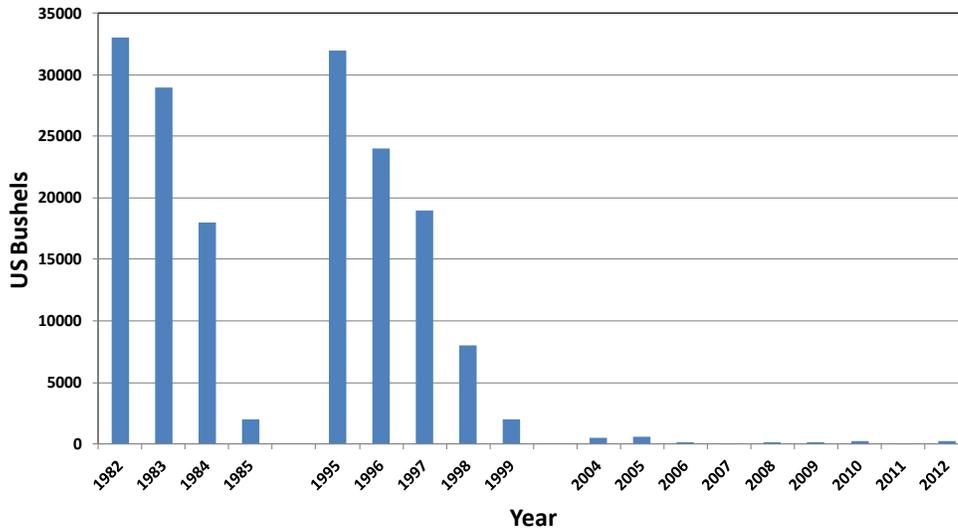
CHALLENGES

The whelk trawl fishery off the South Carolina coast evolved in 1977-1978 as an alternative industry to provide cash flow during the periodic closure of the shrimp season. During the early 1980s, knobbed whelks were shipped alive to processing facilities in Mt. Pleasant and near Beaufort, South Carolina and cooked under pressure for approximately 20 minutes to break down the viscera that attaches the animal to its shell. Meats were extracted from the shell and transported on ice to New England or blast frozen in Savannah, Georgia for markets in the Far East. Whelk meats that arrived in New England were usually processed as canned scungilli (Anderson et al. 1985).

Trawling occurs from 0.8 km to 4.8 km (0.5 to 3 mi.) offshore. Peak collections occur in the spring as the water temperature approaches 14°C (57°F); this is when whelks begin moving over the sediment surface after a dormant period of burial. Of the whelks collected in this trawl fishery, knobbed whelks average approximately 90% of the catch with the remainder being

channeled whelks. In recent years, no more than 10 commercial fishermen have participated in the fishery. Peak whelk harvests occurred in 1982 and 1995 with landings of over 30,000 US bushels. This was followed by 2 years of declining catches and 4 consecutive years (1985-1988) of production below 3,000 US bushels as the fishery collapsed. Currently, whelk harvest in State waters is limited to a total of 13,000 US bushels per year (SCDNR Office of Fisheries Management 2003), but harvests have not reached that level since 1997.

SC Commercial Harvest of Knobbed Whelk



The offshore whelk fishery will likely remain cyclical based on market demand, cost of processing the whelk, and the capacity of fishermen to locate aggregations of whelk populations in offshore coastal waters. South Carolina has a highly regulated, short exploitation window for whelk (usually mid-February to mid-April) that is further limited by fishing gear restrictions, weather conditions, minimum whelk harvest size, and marketing opportunities.

To provide whelks the opportunity to reach sexual maturity and spawn before entering the fishery, SCDNR requires a minimum size of 11 cm (4.5 in.) in shell length (apex to end of siphonal canal) for whelk harvest by trawl (hand harvest minimum size is 10 cm or 4 in.); however, as the siphonal canal frequently breaks during normal feeding, the minimum shell length may not always be indicative of sexual maturity. Furthermore, data from Georgia suggest that females have only recently reached sexual maturity at 10 cm (4 in.) (Walker et al. 2008). Data from both South Carolina and Georgia suggest that this size limit will result in the selective harvest of females (Walker et al. 200; Eversole et al. 2008).

Other anthropogenic activities that may negatively impact whelk populations include oil spills, beach renourishment, and dredging. Oil spills, depending upon their severity, could inhibit the feeding and movement out of the affected area by whelk. Whelks can be entrained in the dredge cutter during beach renourishment, where sand is pumped from offshore or directly from a nearby tidal creek onto the front beach, causing mortality. Pumping substrate for projects such as

maintenance dredging in South Carolina harbors or the Atlantic Intracoastal Waterway can also cause mortality in a manner similar to that described above (W. D. Anderson, pers. obs.).

Whelks are major predators on oysters and clams such that shellfish growers actively remove and destroy whelks preying on their culture grounds. While the presence of large numbers of whelks in these areas suggests an abundant population, the practice of destroying large quantities of these organisms could become problematic for the larger population.

CONSERVATION ACCOMPLISHMENTS

Since 1983, SCDNR has had regulatory authority over commercial whelk fisheries to set lawful fishing areas, minimum size requirements, net mesh size, and the opening / closing dates for the offshore whelk trawl fishery. Currently, whelk harvesting in state waters by trawl is limited to a total of 13,000 US bushels/year. The complete closure of inshore trawling areas in 1986 has conserved the resource by reducing incidental whelk by-catch during shrimp harvest. A management plan for South Carolina's offshore whelk trawl fishery was developed in 1999 to provide for a more balanced, less cyclical fishery. There has been virtually no fishery since the plan was enacted, although it is unclear whether this is due to a lack of fishing effort or reduced catch per unit of effort (CPUE). The management plan specifies closing the whelk season when water temperature reaches 20°C (68°F) to prevent trawling when sea turtles are present.

CONSERVATION RECOMMENDATIONS

- Develop reliable aging techniques for knobbed whelk.
- Determine sex specific growth rates for knobbed whelk.
- Further study the population dynamics of inshore whelk (both knobbed whelk and channeled whelk).
- Develop methods for and evaluate long-term population trends in both inshore and offshore populations of knobbed whelk.
- Evaluate the potential effects of an inshore fishery on whelk populations and determine the need for an inshore whelk fishery management plan.
- Utilize and continue to update the SCDNR Offshore Whelk Trawl Fishery Management Plan.
- Investigate the roles that knobbed whelk play in benthic communities, particularly as they pertain to oyster and clam populations.

MEASURES OF SUCCESS

There is currently a lack of biological information needed to effectively manage the whelk fishery for sustainability, particularly with regards to a growing inshore fishery. Development of this knowledge base would be a measure of success. Consistent, less cyclical, whelk harvests in the offshore fishery and sustainable harvests in an inshore fishery would also be indicators of success.

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