



Shrimp in South Carolina

Shrimp are America's most valuable and most popular seafood. South Carolina is home to three species of the penaeid shrimp: brown shrimp (*Farfantepenaeus aztecus*), white shrimp (*Litopenaeus setiferus*), and pink shrimp (*Litopenaeus duorarum*). Brown and white shrimp are more common than pink shrimp. All three taste the same.

In South Carolina waters, other small species of shrimp, such as grass shrimp, are easily confused with juveniles of penaeid shrimp but have no commercial or recreational value. Rock shrimp, named for their thick, hard shells, occur in South Carolina's offshore waters and are commercially fished off Florida's East Coast. The mantis shrimp (not a true shrimp) is a flattened, inshore crustacean sometimes incorrectly called "rock shrimp." Mantis shrimp can be eaten, but have little meat of poor quality.

Identification of Shrimp Species

All three of the edible shrimp species look very similar, but you can tell them apart if you look closely. White shrimp has a lighter color than brown or pink shrimp. Tail flippers (uropods) on white shrimp are black near the base with bright yellow and green along the edges. Brown shrimp tails are red, dark green, and occasionally light blue in color. Pink shrimp have a light purplish-blue tail, and usually a dark red spot on the side of the abdomen. Brown and pink shrimp have grooves along the upper midline of the head and the upper midline of the lower region of the abdomen. The grooves on

pink shrimp are slightly narrower than those of brown shrimp. White shrimp do not have grooves and typically have much longer antennae and a long rostrum (horn).

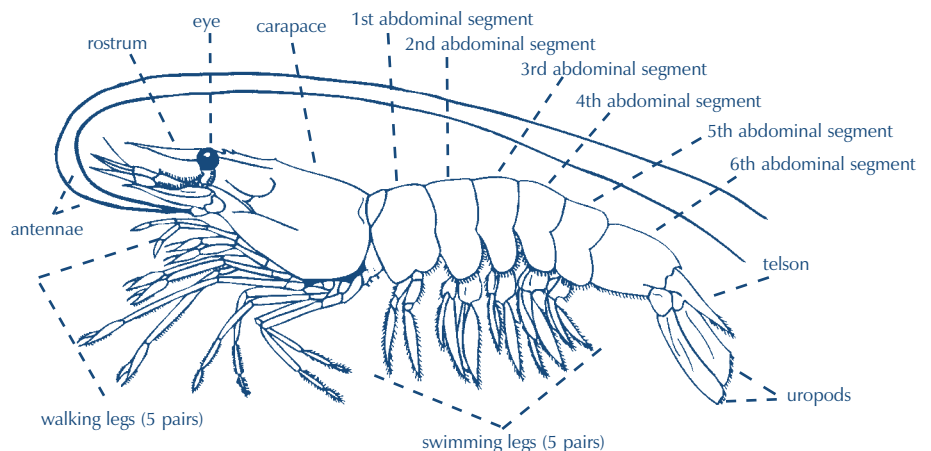
Life History

Brown, white, and pink shrimps have similar life cycles. Spawning usually occurs in the ocean, ranging from near the beaches to several miles offshore. A single female produces between 500,000 and 1,000,000 eggs and may spawn several times. Brown shrimp spawn during October and November, and occasionally later. White shrimp typically spawn in the spring and early summer. The exact timing of the spawning period depends on water temperature.

During mating, the male transfers a packet of sperm, called a spermatophore, to the female. Brown and pink shrimp mate when the female's exoskeleton is soft, immediately after molting. The spermatophore is covered by two "plates" that hold it in place. Females may spawn days later. White shrimp mate between molts when the exoskeleton is

hard. The spermatophore is glued to the underside of the female, and spawning occurs almost immediately. Eggs of both species are fertilized as they are ejected past the spermatophore, and sink to the ocean floor. After about 12 to 24 hours, they hatch into tiny larvae that rise into the water column.

The initial larval stage, during which the shrimp looks like a tiny mite, is followed by about 10 larval phases before reaching the post-larval stage after about two weeks. Postlarvae look like miniature adult shrimp. Brown shrimp postlarvae remain in the ocean bottom sediments during the winter. As the ocean warms in late February and March, these postlarvae become active and ride tidal currents into the estuaries. White shrimp postlarvae move into the estuaries about two weeks after spawning, usually in late May and June, moving further in with each high tide. Death rates are very high for larval and juvenile shrimp; less than one or two percent of the eggs spawned survive to adults.



Nursery Habitat

Postlarval shrimp settle out in the shallow waters in the upper ends of salt marsh tidal creeks. Shrimp stay in this “nursery habitat” for about two or three months, growing to about four inches long. During high tide, juveniles move into the marsh grass to feed and escape predators. At low tide, when the water level is below the salt marsh grass, shrimp gather in creek beds. The smallest shrimp stay close to the creek bank while larger juveniles prefer deeper water. In unusually clear water, shrimp seek the deepest areas available to avoid predatory birds, fish, and crabs.

Both brown and white shrimp prefer muddy bottom, but pink shrimp do best on a sand/shell bottom. In South Carolina’s mostly muddy estuaries juvenile and adult pink shrimp are scarce, although their post larvae are relatively common.

Growth

Young shrimp grow quickly, up to 2.5 inches per month, molting their exoskeleton as they grow. Small shrimp molt several times per week, but molting slows as they become larger. Shrimp can tolerate a wide range of salinities. The ideal nursery habitat has salinity about 25 to 40 percent seawater for white shrimp and 35 to 65 percent seawater for brown shrimp. Shrimp can do well, however, in salinities near 100 percent seawater (such as in Murrell’s Inlet) or in 10 percent seawater (such as the Cooper River near Charleston).

Offshore Migration

Shrimp move three different ways, using either their walking legs, swimming legs, or with a sudden tail snap. While shrimp

can walk short distances, when migrating long distances, they swim as much as two to five miles a day. To escape predators, a shrimp contracts its abdominal muscles, which causes the tail to snap, and propels the shrimp backwards. White shrimp commonly use this method to jump from the water.

As shrimp become larger, they leave the nursery area and move toward the ocean on the outgoing tide, particularly at night. Shrimp move from the shallow estuary creeks into coastal rivers when they are about four inches long. They continue to grow as they move into the lower reaches of sounds, bays and river mouths where they gather just before moving into the ocean.

When white shrimp are in the staging areas, they feed in nearby shallow areas at night. Brown shrimp, on the other hand, prefer to stay in deeper waters at night. In years when shrimp are abundant, they migrate into the ocean when they are between four and five inches long. When the population is smaller, however, shrimp may be six inches or more before they leave the estuaries. When shrimp are more concentrated in the tidal creeks, growth rates slow due to competition for limited food, or each shrimp spending more time protecting its space instead of feeding. Low salinities due to heavy rainfall cause juvenile shrimp to leave nursery areas early, reducing growth and survival.

In a wet year, the majority of white shrimp move into the ocean in August, about a month early. This can result in a poor shrimp baiting season and a poor harvest by commercial trawlers in October, which is normally one of the better months for shrimping. Areas most severely affected are Charleston Harbor and Winyah Bay, which receive relatively large amounts of upstate river discharge.

If there is not significant rainfall and/or river discharge during fall, white shrimp remain in the estuaries until water temperature falls to about 60-65 degrees. Migration into the ocean occurs

during the large tides associated with new and full moons.

Shrimp seldom live more than eight or nine months. The record white shrimp (just over ten inches) was caught by a commercial shrimper off Seabrook Island in July 1979. That shrimp was probably about 14 months old.

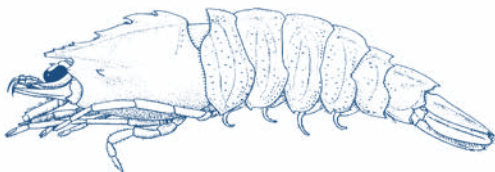
Food

Shrimp are bottom-feeding omnivores, eating most organic materials – animal or plant – they encounter at the bottom. Smaller shrimp pick food off the sediment while larger shrimp become predators, feeding on polychaete worms, amphipods, nematodes, crustacean larvae, isopods, copepods, small fishes, grass shrimp, fiddler crabs, and square-back crabs. Shrimp also eat other shrimp.

Disease

Several diseases affect shrimp. One of the most common, cotton disease, is caused by a single cell protozoan parasite called a microsporidian. These tiny animals invade various tissues of the shrimp, turning the affected areas grey or white. Cotton disease may affect only the head or the reproductive system but often spreads throughout the shrimp’s entire muscular system. Cotton disease is most common in large white shrimp, but can affect small white shrimp, as well as other species. At times, up to 15 percent of the population of white shrimp has cotton disease. Minor infection (white shrimp having small specks of diseased tissue) may reach levels of 70 or 80 percent, but these specks are usually isolated to the head. Large individuals with cotton disease often have a dark blue or black band across the abdomen. Shrimp with cotton disease are not harmful if eaten, but the disease affects the texture and flavor of the meat.

A second condition common along the Atlantic coast is called black gill or brown gill disease, first seen in 1999. This disease is caused by another single celled protozoan known as apostome.



Rock Shrimp

The swarming stage of this parasite, called a tomite, apparently attaches to and penetrates the shrimp's gills, turning them brown or black. The shrimp is affected until it molts and casts off its old shell, which includes the outer covering of the gill.

Black gill disease usually begins in mid August, peaks in September, and slowly disappears in October. The disease does not directly cause mortality, but impairs respiration, making the shrimp more vulnerable to predators and temperature extremes. The parasite is not a danger to humans.

In the 1980s massive die offs of shrimp in mariculture farm ponds around the world led to new understanding of the impacts of viruses on shrimp. These viruses are relatively common and can cause mortalities in intensive shrimp farming operations. Shrimp viruses pose no danger to humans and have not negatively affected wild shrimp in South Carolina. However, DNR requires that live shrimp imported for shrimp farming be certified as free of diseases.

The Commercial Fishery

The commercial fishery in South Carolina is dominated by shrimp trawlers, boats ranging in length from 17 to 85 feet. Trawling is allowed only in the ocean, except for short periods during fall when trawlers may work in the lower areas of Winyah and North Santee Bays. Most shrimpers trawl within three or four miles of the beach.

The commercial shrimp trawling fishery has three seasons. The first is the so-called roe shrimp season in May or June. This season is opened when the DNR determines that an adequate supply of eggs has been spawned to produce a good fall harvest. The roe shrimp season is usually less than a month long and landings (catches) are dependent upon the severity of the previous winter. Following mild winters, heads-off landings are often 400 to 600 thousand pounds. After severe winters, landings of roe shrimp are usually

less than 50 thousand pounds and often zero.

The second season is for brown shrimp. This fishery usually begins in June and ends in August, although significant quantities of brown shrimp have been landed in October during years when the population of brown shrimp was high. Good years for brown shrimp have landings of 1.3 to 2.0 million pounds (heads off).

The fall white shrimp season typically produces the largest catch. These shrimp are the offspring of the spring spawn. Landings of young white shrimp by the commercial fleet usually begin in August and peak in September and October. The season usually lasts through December and sometimes into January.

The channel net or set net fishery occurs in Winyah and North Santee bays. This limited fishery usually begins in September and continues until December 15 if shrimp size and abundance are adequate for commercial harvest. This fishery involves the use of anchored nets that are very similar to shrimp trawls. They are held open at the mouth by long wooden poles and capture shrimp as the tide carries them seaward. In some years, this can be a very effective fishery, with relatively high catch rates at low operating costs.

The Recreational Fishery

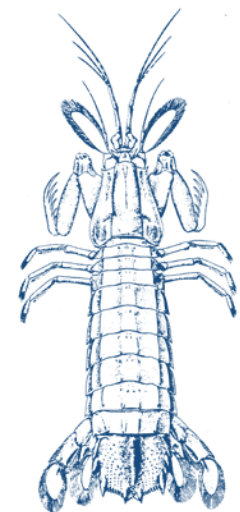
The recreational harvest of brown shrimp by cast nets and seines takes place in the state's tidal creeks, usually starting in early June. White shrimp are first caught in the creeks in late July or early August and have usually moved into the ocean by late October. The shrimp baiting fishery, which targets white shrimp, is set by law to last 60 days and opens at noon on the last Friday on or before September 15. Shrimp are also harvested recreationally by drop nets from docks and seawalls during the fall as larger white shrimp are moving seaward. Unlike seines and cast nets, drop nets require bait. See DNR regulations for the types of nets

that can be used for recreational shrimping.

Changes in the Shrimp Population Size

Shrimp populations experience relatively dramatic fluctuations. Annual commercial shrimp landings have ranged from 1.3 to 6.8 million pounds. White shrimp population, more weather dependent, fluctuates more than the brown shrimp population. During late fall, white shrimp not caught by recreational or commercial fishermen migrate south as far as Cape Canaveral, Florida, and do not return. Therefore, South Carolina depends upon the small white shrimp that overwinter in our estuaries to be our primary spring spawning stock. When winter water temperature falls to 46 degrees or below for seven or more days, most of the overwintering brood stock is wiped out. Following severe winters, the roe shrimp harvest is usually less than 50,000 pounds, and with so few spawners, fall commercial landings also suffer.

Another important factor for the white shrimp abundance is salinity in the nursery habitat during the late summer months. Dry summers, which result in higher salinities, produce smaller white shrimp populations. However, unusually wet summers can also impact white shrimp. Moderate rainfall and normal levels discharge of freshwater from rivers seems to create ideal conditions for white



Mantis Shrimp

shrimp.

The number of spawners does not seem to be a problem with brown shrimp since the inshore movement of post larvae every year remains relatively constant. The best years for brown shrimp are those with relatively mild springs that allow brown shrimp to begin growing soon after moving into the nursery habitat. Brown shrimp grow and survive best in salinities slightly higher than half strength seawater. Unusually wet spring and early summer weather has detrimental effects on brown shrimp.

Many other factors such as abundance of predators and food availability affect both species. Good habitat and clean water are also important for good shrimp production. Unfavorable winds could transport larvae away from

the coast, or heavy predation on larvae by a concentration of jellyfish, for example, could have serious effects.

Aquaculture

Scientists in South Carolina are among the world's leaders in developing techniques to culture marine shrimp. Some of the first studies in the United States were conducted in the 1950s at the old Bears Bluff laboratories on Wadmalaw Island. Today, researchers at the Waddell Mariculture Center near Bluffton provide technical assistance to several companies growing shrimp in ponds in the state. The preferred species for culture is the Pacific coast white shrimp, *Penaeus vannamei* which grows faster than local shrimp species.

Conservation

As more and more people

move to the coast, pressure on the shrimp resource will continue to increase. To ensure that both commercial and recreational fishermen will continue to have an ample supply of shrimp, everyone must take steps to conserve the resource. It is important that no shrimp be wasted. Shrimpers should utilize all shrimp that they catch, and if shrimp are too small, larger mesh nets should be used or shrimping activities should be postponed until shrimp grow to a useable size. Those individuals who catch more than their fair share of the resource not only violate the law but may force fishery managers to create tighter restrictions for all users. The legal daily limit for recreational shrimpers is 48 quarts (heads-on) or 29 quarts (heads-off) per boat or seining party.

Shrimp Life Cycle



1. Eggs

Shrimp eggs are thought to sink to the bottom at the time of spawning. Egg diameter is less than 1/64 in. Most spawning is believed to occur in high salinity oceanic waters



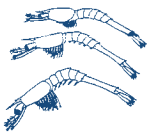
2. Nauplius

There are five naupliar stages. The first stage is about the size of the egg and succeeding stages are slightly larger. Nauplii have limited swimming ability and usually are a part of the oceanic plankton.



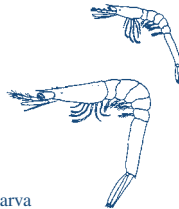
3. Protozoa

The three protozoal stages range in size from 1/25 to 1/12 in. These planktonic forms are found in oceanic waters. Protozoa have undergone development of their mouth parts and the abdomen has begun to develop.



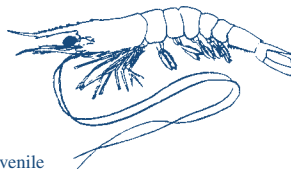
4. Mysid

There are three mysid stages ranging in size from 1/8 to 1/5 in. These are planktonic in the ocean. Mysids have early development of legs and antennae.



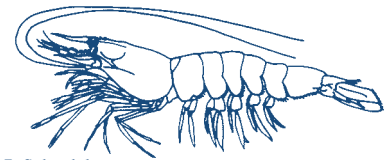
5. Postlarva

The two postlarval stages for white shrimp are about 1/6 to 1/4 in. Brown shrimp postlarvae are larger, up to 1/2 in. The walking and swimming legs have developed and the postlarvae appear as miniature shrimp. The second postlarval stage rides the flood tides into the estuaries, apparently becoming active during flood tide and settling to the bottom during ebb tides. The postlarvae ultimately settle in the upper parts of tidal creeks.



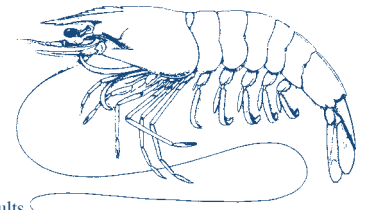
6. Juvenile

Postlarval shrimp develop directly into juvenile shrimp. Growth is rapid, up to 2 1/2 in. per month. Juveniles are similar to adults except they are characterized by a much longer rostrum (horn). Juveniles typically remain in the marsh creeks until reaching about 4 to 4 1/2 in. before moving into the deeper rivers.



7. Sub-adults

Sub-adults move into the deeper waters of the estuaries and may remain there for a month or more before moving seaward. These shrimp continue to grow but at a slower rate than juveniles. Sub-adults usually do not exhibit any signs of ovarian maturity



8. Adults

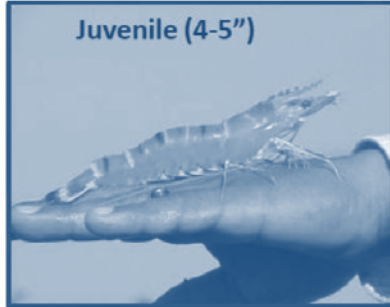
Adults may be 5 to 8 inches in length. Adults are usually found in the ocean, but in dry years may delay migration until cold weather occurs. Spawning females are characterized by brightly colored ovaries that can be seen under the shell on the upper side of the body. Adults may be found near the beaches out to 5 or 6 miles from shore. Some species are known to migrate hundreds of miles along the coast.

Have You Caught Any Tiger Shrimp?



DNR

Juvenile (4-5")



Adult (12")



DNR Needs Your Help

Researchers at the South Carolina Department of Natural Resources are asking recreational and commercial shrimpers who catch tiger shrimp to photograph and freeze specimens. The date and location of collection should also be documented.

Tiger shrimp, *Penaeus monodon*, native to the Western Pacific, is an invasive species in South Carolina and its impacts on our native fauna are uncertain. Scientists are eager to collect more information on tiger shrimp in order to address the source of these animals and methods of introduction.

Collections by commercial fishermen can be reported to their usual contacts at DNR, while incidental and recreational collections, along with additional information should be directed to: tigershrimp@dnr.sc.gov.

Penaeus monodon was first reported in South Carolina in 1988 following an accidental release of approximately 2,000 animals from an in-state aquaculture facility. Later that year, nearly 300 *P. monodon* were collected from the wild by commercial shrimp trawlers fishing along the South Carolina, Georgia and Florida Atlantic coasts. There were, however, no further reports of this species in South Carolina, or elsewhere in the southeastern U.S., until 2006, suggesting that the animals released in 1988 did not lead to the establishment of wild populations in U.S. waters.

Mature tiger shrimp are easy to distinguish from native shrimp by the distinctive dark and light bands across their backs and by their large size (up to 12" in length), which considerably exceeds that of native shrimp species. Rapid growth rates and broad tolerances to temperature and salinity contributed to the success of *P. monodon* as an aquaculture species, but these are also characteristics that increase its ability to invade new areas.

In its native range, *P. monodon* breeds in tropical marine habitats and has a diet that includes bottom-dwelling invertebrates, including other shrimp species. This raises concerns regarding its possible predation impacts on the native fauna. Tiger shrimp may also have a competitive advantage over native shrimp for food resources.

Saltwater Fishing Conservation and Ethics

Ocean resources, once thought to be unlimited, have declined rapidly in recent decades, due in part to the overharvest of many commercial and recreational species of fish and shellfish.

To reduce overfishing, all anglers should practice wise conservation practices 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 fish populations.

The challenge of catching, not killing, fish should provide 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.

More and more South Carolina fishermen now practice tag and release, which not only conserves resources but also provides information on growth and movement of fish.

Saltwater fishermen can further

contribute to conservation by purchasing a Saltwater Recreational Fishing License, which is required to fish from a private boat or gather shellfish in South Carolina's salt waters. Funds from the sale of licenses 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 catch and release of saltwater game fish.

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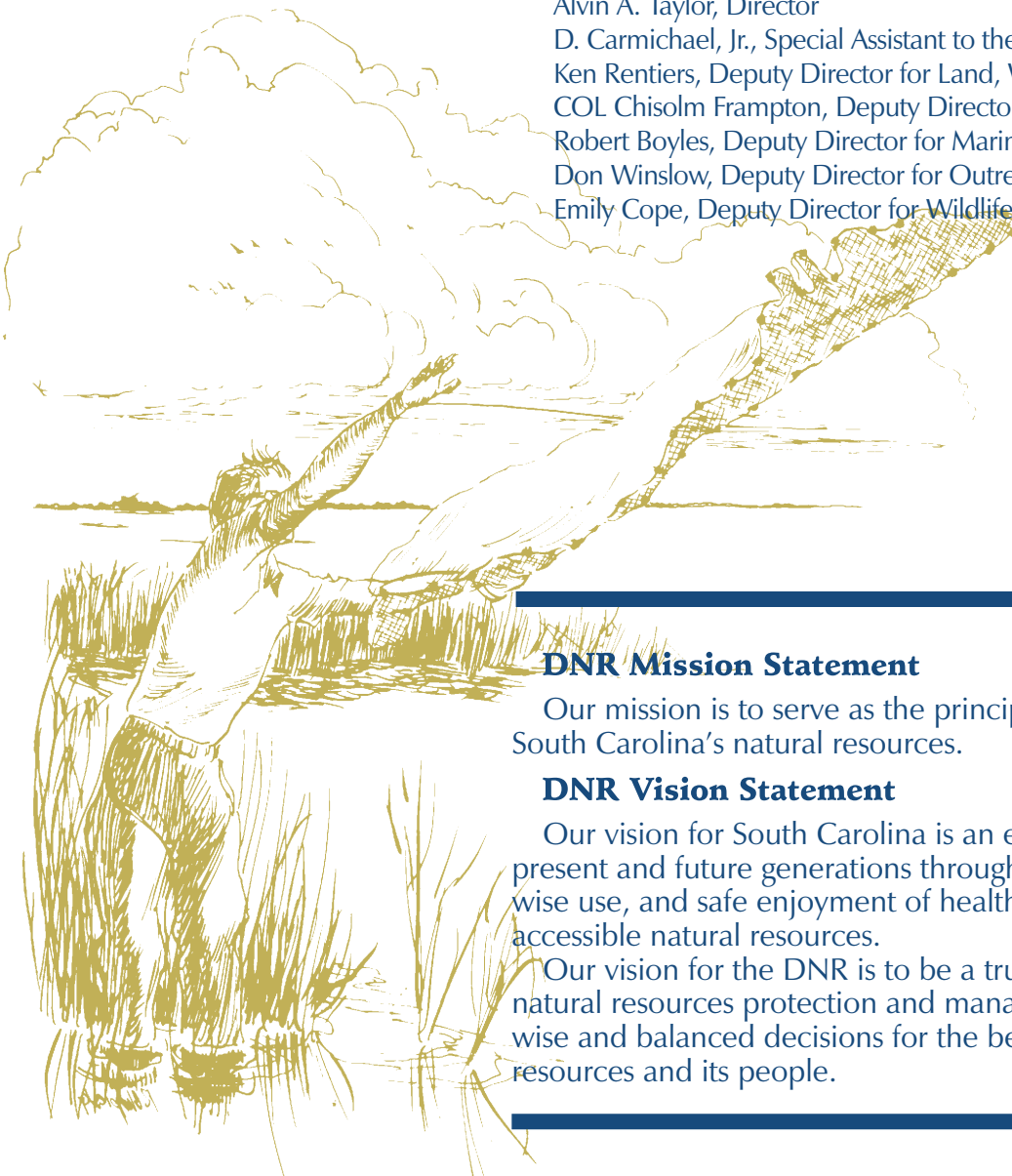
DNR Mission Statement

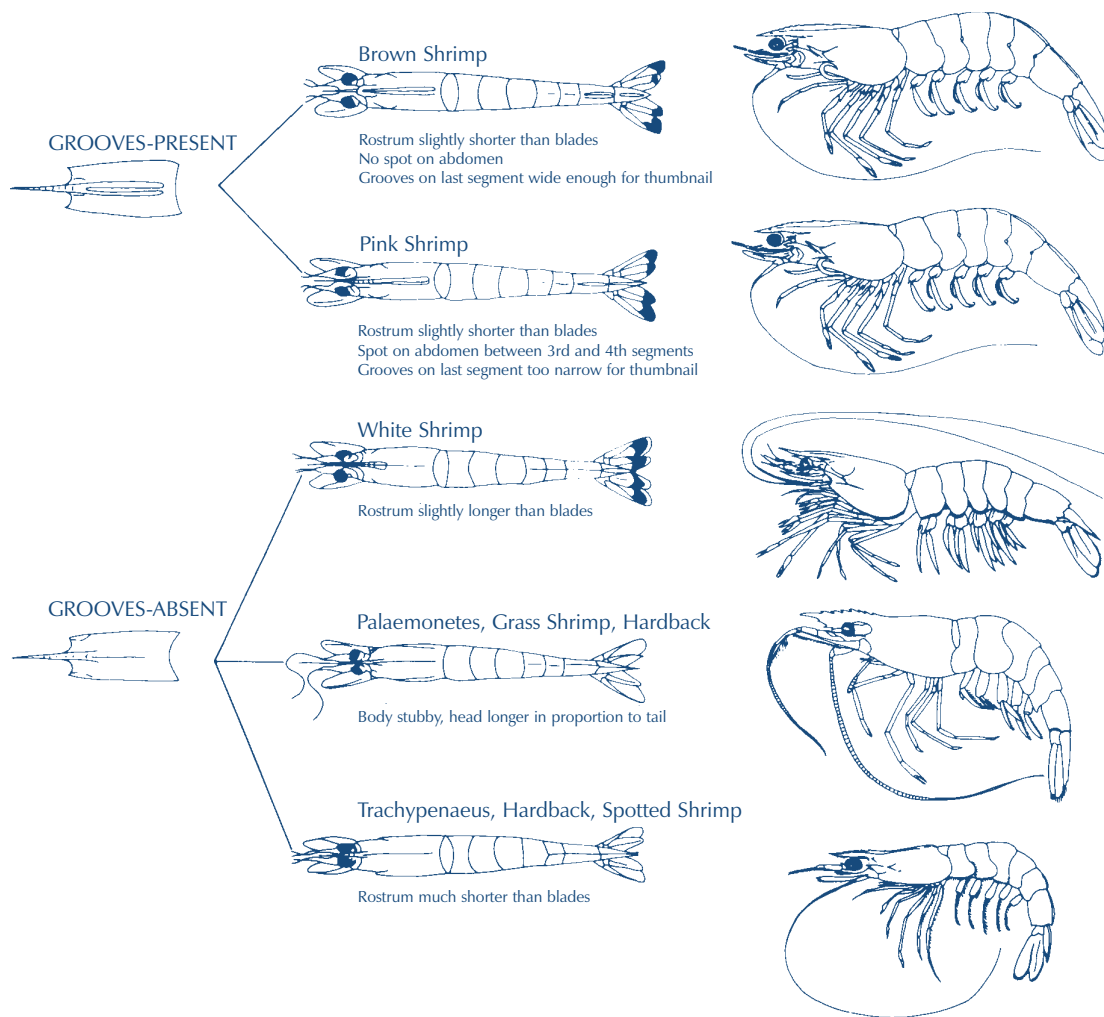
Our mission is to serve as the principal advocate for and steward of South Carolina's natural resources.

DNR Vision Statement

Our vision for South Carolina is an enhanced quality of life for present and future generations through improved understanding, wise use, and safe enjoyment of healthy, diverse, sustainable and accessible natural resources.

Our vision for the DNR is to be a trusted and respected leader in natural resources protection and management, by consistently making wise and balanced decisions for the benefit of the state's natural resources and its people.





South Carolina Shrimp

Three shallow-water species of shrimp are recreationally and commercially important in South Carolina. A description of these is provided (A, B, & C) together with two similar (D and E) but less important species that often confuse the layman.

A *Litopenaeus setiferus*

Common Name- White Shrimp

Remarks: Pale to whitish color with the tail edged in green. No groove present along the base of either side of the rostrum or along the head. Antennae twice as long as the body. Last tail segment keeled. Rostrum slightly longer than that of the brown or pink shrimp.

B *Farfantepenaeus aztecus*

Common Name- Brown Shrimp

Remarks: Brownish in color. Groove present along the base of both sides of rostrum and along the length of the head. Tail edged in red and blue. Antennae less than twice as long as the body and rostrum not as long as that of the white shrimp.

C *Farfantepenaeus duorarum*

Common Name- Pink Shrimp, Hopper and Brown-spotted Shrimp

Remarks: Brownish in color and often somewhat darker than the brown shrimp. Usually a prominent dark spot on each side of the tail. Grooves on the head along the rostrum and the last segment of the tail similar to the brown shrimp but less pronounced.

D *Palaemonetes vulgaris*

Common Name- Grass Shrimp, Hardback (Not a recreational or commercial species.)

Remarks: Occur throughout estuarine waters in great numbers. Frequently confused with white shrimp. Average between 1 and 2 inches in length with a relatively long rostrum with teeth on the lower edge. Stubby in appearance, head larger in proportion to the tail than in the other species.

E *Trachypenaeus constrictus*

Common Name- Spotted Shrimp, Hardback (Not a recreational or commercial species.)

Remarks: Occur in inshore waters and along beaches just offshore. Light brown to pinkish in color with grayish spots on its tail. Short rostrum not grooved on each side.

This publication was made possible in part with funds from the sale of the [South Carolina Saltwater Recreational Fishing License](#). 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 fish.

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Glossary

• **estuary**

The part of the wide, lower course of a river where the current is met by tides of the ocean. "Where rivers meet the sea."

• **emigration**

To migrate from an area: shrimp emigrate from the estuary as they become adults.

• **fishing mortality**

The death of aquatic animals resulting from fishing efforts by man.

• **fishing pressure**

The collective amount of fishing activity that affects aquatic animals.

• **immigration**

The migration of animals into an area: postlarval shrimp immigrate into an estuary from the ocean.

• **natural mortality**

The death of animal life through natural causes; e.g. predation, disease, natural environmental stress, etc.

• **periopods**

On shrimp, the five pair of walking legs used in locomotion.

• **plankton**

Usually small animals, including larvae and postlarvae, that are transported by tidal and wind-driven ocean currents.

• **pleopods**

On shrimp, the feather-like appendages located on the underside of the tail. Used primarily in swimming.

• **postlarvae**

In shrimp, the first stage in the life cycle which takes on the shrimp-like appearance and follows the larval stages. Postlarval shrimp are usually 4-12 mm in length. Shrimp immigrate into the estuaries as postlarvae.

• **spawning**

The release of eggs by shrimp or fish. Eggs are usually broadcast and either sink to the bottom or drift as plankton.

• **spermatophore**

In shrimp, the "packet" that contains the sperm. The spermatophore is attached to the female shrimp near the gonopore, either on the outside of the exoskeleton or under exoskeletal plates depending upon the species.

• **stock**

Animals of the same species, usually aquatic or marine, that reproduce with one another and live in the same general geographic area.

• **uropod**

In shrimp, one of the four appendages on the shrimp's tail that form the fan which is brightly colored in some species. The fan is used in helping shrimp move themselves backward quickly.