

Alabama's Shrimp From Plankton to Plate

Leslie D. Hartman

Marine Biologist II

Alabama Marine Resources Division

Originally printed in *Outdoor Alabama*

Shrimp are the most important fishery crop from the Gulf of Mexico and, historically, have ranked second in value in the US domestic fishery market. While only a few residents of our coastal area shrimp for a living, the local economy relies heavily on shrimp processing and wholesale/retail marketing of shrimp. Three species of shrimp dominate the Gulf commercial shrimp harvest; brown, white and pink shrimp. In Alabama, brown shrimp account for approximately 80% of all shrimp caught while white shrimp comprise 18% of the catch with the remaining 2% pink shrimp.

Life History

Brown shrimp live for approximately one year although they have been kept alive in the laboratory for over two years. They grow, migrate and reproduce in a short time span. At seven months of age brown shrimp begin to spawn offshore in 150 – 300 feet of water. The eggs are fertilized externally with the transfer of a spermatophore packet from a male to the female. The spermatophore packet is attached to the female right after she molts while her shell is soft. As she ovulates the eggs are fertilized and sink to the bottom of the ocean. Hatching usually occurs within 24 hours. After hatching, the shrimp becomes a planktonic larva called a nauplii. As they grow, shrimp transform through five naupliar stages, each slightly bigger than the last. Following the last naupliar stage, occurring when the shrimp is 0.02 inches long, and its next transformation yields a shrimp plankton called a protozoa. Three protozoal stages result in brown shrimp larvae becoming a whopping 0.09 (3/32) inches long. The last of the exclusively offshore stages are called mysis and three stages will produce a shrimp 0.15 inches long. Postlarvae will develop 10 to 24 days after fertilization at 0.16 (5/32) inches. This stage enters the estuary beginning in March, and develops utilizing marsh edges and sea grass to hide from predators while feeding on available phytoplankton or decaying material.

In the food rich estuary, surviving postlarvae grow rapidly, approximately 0.02 inch/day. At about 1 inch, the juvenile shrimp alter their eating habits. Juvenile and adult brown shrimp prefer meat. As they age, brown shrimp become predators feeding mainly on small worms, tiny crustaceans and even other shrimp. With this diet, supplemented with vegetation, juvenile shrimp can grow up to 1/8 inch/day.

When estuarine shrimp range from 3 - 4 inches long (131 to 58 count) they begin their journey offshore. Adult brown shrimp prefer saltier water and will migrate about 20 miles offshore where they will spawn and complete their life cycle.

White shrimp have a similar life history but differences occur beginning with fertilization and extending through their 1 ½ year life span. White shrimp females have

an external opening that allows mating to occur between individuals with hard shells or exoskeletons, the female does not have to be a 'soft shell'. These shrimp also progress through the larval stages more rapidly, 10 – 12 days, and may stay in the estuary longer. Large numbers of post larval white shrimp begin to appear in local estuaries in June. Some adult white shrimp even remain in the estuary and spawn. White shrimp also feed differently from brown shrimp as they are scavengers and eat a more balanced diet including worms, snails, algae and plant stems and roots.

The pink shrimp life cycle resembles that of the other two species. It lives about 1 ½ years and scavenges for its food. The development of their larvae is longer averaging 14 – 21 days and individuals become sexually mature at smaller sizes, approximately 2 ¾ – 3 ½ inches rather than 5 ½ - 6 ¼ inches as is found with the other species. Because pink shrimp are less abundant in Alabama, post larvae are also less common but begin to enter the estuary in April.

Environmental Factors

While predation is a major cause of death in shrimp, environmental factors such as temperature and salinity play a large role in the success of the annual shrimp crop. The white shrimp spawning period is from April through August while brown and pink shrimp spawn year-round. Despite this almost constant source of shrimp, these are considered to be 'seasonal' fisheries. Brown shrimp have two seasonal peaks of spawning activity, August through November and April through June while pink shrimp have a peak in summer. These peaks and periods are related to each species preferred environmental conditions.

Brown shrimp postlarvae appear in marsh areas once temperatures reach 68°F, usually March. Scientists believe that offshore postlarvae shrimp are able to 'sense' the temperature change and utilize their ability to move up and down in the water column allowing ocean currents to carry them into the estuary. Once in the estuary, the postlarvae can survive spring temperatures ranges although they may burrow in the bottom during a late cold snap. These preferences permit brown shrimp to take advantage of late spring and early summer water temperatures to optimize growth and survival. White shrimp prefer warmer temperatures than brown shrimp and will spawn later to maximize their growth during the summer. Pink shrimp also prefer warmer waters than brown shrimp. Their limited ability to handle cold temperatures and their preference for hard, sandy bottoms is important to understanding why large numbers are caught off Florida but far fewer are caught in Alabama.

Salinity preferences vary between shrimp species. As offshore larvae, brown and pink shrimp prefer salty water. Shrimp settling into marshes are not so choosy and may encounter a range of salinities as fresh water and salt water mix, depending on river discharge, rain or drought conditions in the estuary. As the shrimp age, their preference for saltier water increases and triggers them to move to the Gulf where they spawn. White shrimp can tolerate broader salinity ranges throughout their life than brown shrimp

but, in general, prefer less salty water than any other commercial shrimp. Occurrences of shrimp far up Mobile Delta are virtually always white shrimp.

Management

Shrimp management in Alabama is based on the 68-count law. This law requires that the Marine Resources Division prohibit shrimping in waters where shrimp are smaller than 68 whole shrimp to one pound. The count law was developed after years of monitoring the shrimp in Alabama's coastal waters. Generally, both the shrimper and consumer wanted to protect the crop until the shrimp had grown to their largest possible size before migrating back into the Gulf of Mexico. Shrimp will generally stay in our bays and estuaries until they are at least 68 per pound on the average. That's it; the law is simple, reality is hard.

Based on knowledge of brown shrimp preferences, biologists begin sampling for postlarvae in late February or early March. The quantity of postlarvae seen gives a general indication of the occurrence of spawning and the timing; early, late or on time. Since the effect of weather and predation varies annually, large amounts of postlarvae do not always yield a good crop. In early April, biologists begin to trawl at over two dozen sites from the Mississippi line to Florida. Over the years, samples at these sites have predictably captured shrimp indicative of the future crop. Sampling continues weekly. The information gathered from sampling; species, amount, weight and count, is carefully recorded. As local waters become fill with small shrimp, the average size decreases and the count per pound increases and shrimping must be prohibited. This usually occurs in early May.

To open waters to shrimping, biologists continue to sample throughout May and early June. These data are used to create a growth curve. Like most animals, younger shrimp grow more quickly than older ones resulting in a growth pattern that begins rapidly then decreases; a curve. The regularity of their growth is predictable and the use of actual sample data will factor in any weather induced changes, competition or food supply. Using the growth curve, the number of days until shrimp become 68 count is predicted. Initially, the day predicted for legal sized shrimp is fairly rough but with each additional sample, the predicted for opening day is fine tuned. This method allows the Marine Resources Division to announce the initial brown shrimp opening between one and two weeks in advance. Advanced notice permits all interested fishermen to prepare their gear.

Because of salinity and temperature variations and juvenile shrimp distribution, not all areas will open to shrimping simultaneously. Typically, upper Mobile Bay, north of Middle Bay Lighthouse, will remain closed for a longer period. This difference is a result of sustained spawning offshore causing additional postlarvae to enter the system as earlier juveniles leave it and also the fact that postlarvae prefer the lower salinities found closer to Mobile Delta. These factors combine to create local gradations in size. Local perturbations may cause two neighboring samples be of different counts. Typically, deepwater channels hold larger shrimp as those shrimp take advantage of the higher

salinities found in deeper water. Given the variety of counts that can be collected at different sites, effective management requires an average legal count be obtained on a regional basis. This approach may confuse the public since shrimp may be legal in a small area but the area remains closed. This is because there are enough small juvenile shrimp in the overall region to keep the count illegal.

As spring progresses to summer the majority of brown shrimp mature and move offshore just as postlarval white shrimp appear. During an average season, white shrimp are about 1 ½ to 2 inches long by late July. Their preference for fresher water causes the majority to move into the upper Bay and Mobile Delta. Occasionally an area already opened for brown shrimp season will be inundated with juvenile white shrimp. If sampling reveals that the average count is not legal, the region will be re-closed until the count recovers.

Unlike farming, humans are unable to enhance a shrimp crop. There is no magical fertilizer or irrigation scheme that will improve Mother Nature's bounty. Experienced shrimp fishermen prepare for all types of seasons. It is the responsibility of biologists to accurately follow the shrimp season to permit the most effective harvesting of the resource.