Updated July 27, 2015

Louisiana Shrimp

Fishery Management Plan

Louisiana Department of Wildlife and Fisheries

Office of Fisheries

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Executive Summary

SHRIMP HARVEST.

SHRIMP BOAT LOWERING ITS SKIMMER NETS.

Shrimp, namely white, brown, and seabob, have been harvested commercially in Louisiana since the 1800s and continue to be the foundation one of the state's most important seafood industries. Louisiana's shrimp resource supports the most valuable and the second largest commercial fishery in the state. Louisiana is the top harvester of shrimp in the U.S. Gulf of Mexico and has led the United States in shrimp landings every year since 2000. The recreational fishery for shrimp is popular as well; recreational fishermen harvest shrimp for food and bait. Shrimp are also a critical component of estuarine and offshore food webs, as both predator and prey.

Shrimp's biological characteristics make them inherently resilient to fishing pressure. Shrimp are essentially an "annual crop"—they are short-lived (most seldom live longer than one year) and fecund (spawning up to 1 million eggs per spawning event). As long as environmental conditions such as weather and water temperatures are favorable, shrimp are highly productive and can rebound from low abundance one year to high abundance the next.

This fishery management plan creates a centralized document that summarizes current information about the biology and status of Louisiana shrimp; Louisiana's commercial and recreational fisheries for shrimp; ecosystem considerations and environmental factors; management approaches within the state and regional framework; issues and options to address these issues; and future research needs.

Introduction

Definition of Management Unit

The management unit includes white (*Litopenaeus setiferus*), brown (*Farfantepenaeus aztecus*), and seabob (*Xiphopenaeus kroyeri*) shrimp and their fisheries in coastal waters of Louisiana.

Management Authority and Process

The Louisiana Department of Wildlife and Fisheries (LDWF), the Louisiana Wildlife and Fisheries Commission (Commission), and the Louisiana State Legislature (Legislature) are responsible for managing shrimp fisheries in Louisiana's state waters, which extend seaward from the shoreline to nine nautical miles.

Title 56 of Louisiana's Revised Statutes provides for the preparation and implementation of fishery management plans that will prevent overfishing and will achieve and maintain plentiful fish populations to ensure, on a continuing basis, the optimum yield from each fishery. Louisiana's fishery management plans are developed according to applicable principles and standards of the Food and Agriculture Organization of the United Nations' (FAO) Code of Conduct for Responsible Fisheries.

Responsible fisheries management requires an ongoing process of continual improvement, with active monitoring of fisheries resources and fisheries and timely response to any observed changes. Fishery management plans are flexible and can be improved with enhanced collection and analyses of relevant data. Plan work groups will continuously review new research and monitoring information, document progress toward fishery management goals and objectives, and fully review and revise management plans as managers and stakeholders prioritize issues and identify and refine options.

Management Goals and Objectives

The goal of the Louisiana Shrimp Fishery Management Plan is to ensure long-term conservation and sustainable use of shrimp resources for the maximum environmental, social, and economic benefit to the State and her citizens and visitors.

We will use the following objectives to achieve this goal:

1. Enhance economic value of the shrimp resource by promoting more effective and efficient harvesting strategies and practices.
2. Achieve a level of fishing capacity that provides for a sustainable harvest and allows for a profitable fishery.
3. Minimize incidental harvest of finfish, crustaceans, and protected species.
4. Promote the protection, restoration, and enhancement of habitat and environmental quality necessary for sustaining the shrimp resource.
5. Reduce conflicts among and within user groups, including non-shrimping user groups and activities.
6. Minimize adverse effects of underwater obstructions to shrimp trawling.
7. Reduce to the maximum extent possible waste of the resource by discouraging operations that result in culling to increase size of retained harvest.
8. Promote research, surveys, and outreach efforts that contribute to achieving management goals and objectives.

Description of the Stock

SHRIMP RESILIENCE

Shrimp are essentially an "annual crop"—they are short-lived (most seldom live longer than one year) and fecund (spawning up to 1 million eggs per spawning event). These biological factors make them inherently resilient to fishing pressure.

Shrimp abundance is driven primarily by environmental conditions such as weather and water temperatures. As long as these conditions are favorable, shrimp are highly productive and can rebound from low abundance one year to high abundance the next.

Biological Profile

Louisiana's shrimp fishery is primarily based on two shrimp species—white shrimp and brown shrimp. The fishery also harvests seabob shrimp, but to a much lesser degree. All three species are members of the family Penaeidae, a group of warm-water shrimp.

Physical Description

Brown shrimp

Brown shrimp are a species of "grooved" shrimp—they have grooves down both sides of their head and the last segment of their tail, which distinguish them from white shrimp (Tavares 2002). They have medium length antennae, about 1.4 times the body length. They have five pairs of walking legs and five pairs of swimming legs located on the front of their abdomen. Their carapace (shell) is smooth, with a spine called the rostrum, which extends in front of the eyes. There are usually eight or nine teeth on the back side of the rostrum and two on the front. The tip of the rostrum is moderately short, 1/4 or less the length of the rostrum.

Their color varies depending upon water clarity and bottom type, but they are generally brownish, sometimes with an orange or yellowish tinge, occasionally reddish or greenish (Williams 1984, Tavares 2002). Their tails are darker, often with a purple edge.

White shrimp

Similar to brown shrimp, white shrimp have a smooth shell with a rostrum, which extends in front of the eyes (Tavares 2002). There are usually seven to nine teeth on the back side of the rostrum and two on the front. The tip of the rostrum is long and slender (almost half the length of the rostrum). Unlike brown shrimp, white shrimp do not have grooves on their head or tail. White shrimp have five pairs of walking legs and five pairs of swimming legs located on the front of their abdomen. They have much longer antennae than other shrimp species (2.5 to 3 times longer

than their body length).

White shrimp are a translucent bluish white in color, sometimes greyish or greenish (Tavares 2002). Their rostrum and sides are pinkish. Their swimming legs are marked with dark red, while edges of their tail are dark brownish purple with a narrow stripe of yellowish green (Williams 1984).

Seabob shrimp

Seabob shrimp's entire body is smooth. The rostrum is very long, has five teeth on the back side (none on the front), and an upward-curving tip. Seabob shrimp have very long antennae, and their last pair of walking legs is long and slender.

Their color is whitish, or greyish, with a yellowish front; they are occasionally yellow all over. The tip of the rostrum and the antennae are reddish, their legs are pinkish or yellowish orange, and their swimming legs and tail are yellowish at the base and pink at the tips.

Distribution

Brown shrimp

Brown shrimp are found farther north than white and seabob shrimp—in the western Atlantic Ocean from Martha's Vineyard, Massachusetts to the Florida Keys, and around the Florida Peninsula to the northwest Sanibel grounds off western Florida (Larson et al. 1989, Patillo et al. 1997). The range is broken from this point to Apalachicola Bay, Florida where brown shrimp appear again and continue throughout the northern Gulf of Mexico to the northwestern Yucatan in Mexico. In the Gulf of Mexico, the brown shrimp's center of abundance is along the Texas coast and in the Gulf of Campeche near Ciudad del Carmen, Mexico (Williams 1984).

White shrimp

White shrimp are found off the Atlantic Coast as far north as Fire Island, New York, to St. Lucie Inlet on the Atlantic Coast of Florida (Muncy 1984). From here, they are absent on the Florida Coast until the Ochlocknee River on the Gulf Coast of Florida to Campeche, Mexico. In the Gulf of Mexico, there are two centers of abundance: one along the Louisiana-upper Texas coast and one in the Campeche area of Mexico (Klima et al. 1982).

Seabob shrimp

Seabob shrimp are found from North Carolina through the Gulf of Mexico and the Caribbean Sea and along the Atlantic coast of South America down to Santa Catarina, Brazil (Tavares 2002).

Habitat

In general, brown and white shrimp use a variety of habitats as they grow from planktonic larvae to spawning adults (GMFMC 1981). Both species inhabit similar offshore habitats; their habitat differs when they migrate inshore (Zein-Eldin and Renaud 1986, Howe et al. 1999, Fry et al. 2003). While they both depend on estuaries, environmental factors and feeding methods dictate where in the estuaries each species can thrive (Zimmerman and Minello 1984, McTigue and Zimmerman 1998, Jones et al. 2002, O'Connell et al. 2005). Seabob shrimp spend their entire lives in offshore waters.

Brown shrimp

Brown shrimp eggs are found offshore near the seafloor. Larvae are found offshore in the water column. Postlarvae migrate to inshore estuaries with incoming tides, mainly from February through April, with an additional minor peak in the fall. Postlarvae and juveniles are found in estuaries; they prefer shallow vegetated habitats where the majority of their prey resides (Larson et al. 1898, Fry et al. 2003). They use the cover provided by the vegetation to avoid predators (Zimmerman and Minello 1984, McTigue and Zimmerman 1998). They also live on silty sand and non-vegetated mud bottoms; Fry et al. (2003) found that shallow unvegetated interior marsh waters are particularly important habitat for juveniles.

In late spring/early summer, brown shrimp move offshore to deeper, saltier water where they live on silt, muddy sand, or sandy bottoms. They are most commonly found in waters 90 to 180 feet (27.5 to 55 meters) deep but have been reported at depths as great as 540 feet (164.5 meters). Adult brown shrimp are most abundant along the continental shelf of the Gulf of Mexico, but seasonal movements correlating with water temperature also influence distribution. Other factors that affect their distribution include salinity, food availability, and currents (Larson 1989).

White shrimp

White shrimp eggs are found in nearshore marine waters near the seafloor. Larvae inhabit the water column in the same waters. Postlarvae migrate through passes to inshore estuaries mainly from May through November, with peaks in June and September. White shrimp migrate farther into the estuaries than brown shrimp (Perez-Farfante 1969, O'Connell et al. 2005). Postlarvae and juveniles inhabit estuaries where they prefer mud and peat bottoms with large amounts of decaying organic matter or vegetative cover. Like brown shrimp, postlarval and juvenile white shrimp prefer vegetated habitats for the availability of prey and protection from predators. However, white shrimp

are also found in areas with non-vegetated substrate more often than brown shrimp (Zimmerman and Minello 1984, Muncy 1984, Howe et al. 1999). They can select more diverse habitat because they are better at catching free-swimming prey than brown shrimp and are thus less reliant on vegetated habitat rich with stationary prey (McTigue and Zimmerman 1998).

White shrimp migrate from estuaries in late August and September as they grow larger and in response to cooling temperatures. Offshore, adult white shrimp inhabit the same general nearshore waters along the continental shelf as brown shrimp for the same general reasons of food supply and currents (Muncy 1984). In offshore waters, adult white shrimp are most commonly found at depths less than 98 feet (30 meters) but may occur in waters as deep as 270 feet (82.25 meters; Tavares 2002). They prefer soft mud or clay bottoms.

Seabob shrimp

Seabob shrimp do not depend on the estuary like the other shrimp species. They spend their life cycle in a relatively narrow zone along the coastline (Kutkuhn 1966). They are most abundant in waters between 65 and 98 feet (19.75 to 30 meters) deep (Renfro and Cook 1963, Tavares 2002). Seabob shrimp concentrate along beaches and around the mouths of rivers and passes after the passage of cold fronts, likely due to high nutrient concentrations, extreme low temperatures, or heavy rainfall. In Louisiana, large numbers of seabob shrimp have been found near beaches in July and again in October and November (Juneau 1977). Seabob shrimp prefer bottoms of mud, silt, or silt mixed with sand (Christmas and Etzold 1977).

Reproduction, Age, and Growth

Shrimp in the Gulf of Mexico are considered an annual stock—they are short-lived (up to 18 to 24 months), grow fast, and mature quickly, typically within one year. Changes in temperature primarily affect growth and reproduction in shrimp.

Brown shrimp

Females are sexually mature at 5.5 inches (140 millimeters) total length (Henley and Rauschuber 1981). Mature brown shrimp spawn in offshore waters of the Gulf of Mexico primarily during the fall and spring months. They typically spawn at night in waters 59 feet (18 meters) or deeper in temperatures between 62.6 and 84.2°F. Brown shrimp may spawn more than once, but decreasing water temperatures in the fall stop spawning activity (Perez-Farfante 1969). Males place a spermatophore inside a receptacle on the female; the female releases her eggs and they are fertilized externally (Cook and Lindner 1970, Renfro and Brusher 1982, Lassuy 1983). Gazey et al. (1982) found brown shrimp averaging 7.6 inches (193 millimeters) total length released an average of 246,000 viable eggs per spawning event.

The fertilized eggs, which are denser than sea water and are approximately 0.01 inches (0.25 millimeters) in diameter, fall to the seafloor and usually hatch within 24 hours after fertilization (Kutkuhn 1966, Christmas and Etzold 1977). After hatching, brown shrimp go through numerous stages before becoming postlarvae, over a period of 1 to 25 days (Cook and Murphy 1969, Cook and Murphy 1971). Postlarval brown shrimp move inshore with the assistance of tides and currents, typically in late winter. They are about 0.39 to 0.59 inches (10 to 15 millimeters) total length at this time (Copeland and Truitt 1966, King 1971, Minello et al. 1989). For about three months, they feed in the shallow bays and marshes of coastal estuaries, which provide abundant food and some protection from predators for young shrimp as they grow into juveniles (at about 0.98 inches (25 millimeters) total length). In late spring/early summer, juveniles (about 3.15 to 3.94 inches, or 80 to 100 millimeters, total length) move out of the nursery area and into deeper, open waters of the estuary (Copeland 1965, Cook and Lindner 1970, Parker 1970). Sub-adults then migrate into coastal waters, typically coinciding with full moons and ebb tides (Copeland 1965, Minello et al. 1989). Once they mature, brown shrimp begin migrating back to the Gulf of Mexico in late summer and early fall to mate and spawn, completing their life cycle.

Brown shrimp seem to have an annual life cycle; however, captive individuals have survived for over two years (Perez-Farfante 1969, Zein-Eldin pers. comm.). Female brown shrimp grow larger than males, up to 9.3 inches (236 millimeters) in length; males grow up to 7.7 inches (195 millimeters) long (Tavares 2002).

White shrimp

Females are sexually mature at about 5.5 inches (140 millimeters) total length; males mature at about 4.7 inches (119 millimeters) total length. White shrimp spawn mainly from March to November, with peaks in June and July. As with brown shrimp, increasing water temperatures in the spring trigger spawning; decreasing temperatures in the fall stop spawning. White shrimp spawn offshore in waters between 29.5 and 111.5 feet (9 and 34 meters) deep; however, a small portion of the population may spawn in estuaries and bays. Male white shrimp place a spermatophore on the female's abdomen; when the female releases the eggs, the spermatophore releases sperm and fertilizes the eggs externally (Perez-Farfante 1969). Some female white shrimp spawn up to four times in a season.

Large mature females release an estimated 0.5 to 1 million eggs per spawning event (Anderson et al. 1949, Lindner and Cook 1970, Williams 1984).

White shrimp go through similar larval stages as brown shrimp over the course of 10 to 12 days. White shrimp reach the postlarval stage at about 0.28 inches (7 millimeters) total length. With the help of tides and currents, postlarval white shrimp move to estuarine habitat as brown shrimp are moving out, from May to November, with peaks in June and September (Baxter and Renfro 1967, Klima et al. 1982). Juvenile white shrimp feed in these nursery areas; growth rates at this time are rapid, ranging from 0.03 to 0.05 inches (0.7 to 1.2 millimeters) per day. Post-larvae develop into juveniles at about 0.98 inches (25 millimeters) total length (Christmas et al. 1976). Juveniles grow into sub-adults in four to six weeks. When they are large enough or when water temperatures begin to cool, sub-adult white shrimp (3.9 to 4.7 inches, or 99 to 119 millimeters, total length) leave marshes and move into deeper, saltier areas of the estuary and on to their offshore spawning grounds to complete their life cycle. This is usually around late August and September; however, some may stay in the estuary through the winter and migrate offshore to complete their life cycle in the spring.

White shrimp have a life expectancy of about 18 months (Klima et al. 1982). Female white shrimp grow larger than males, up to 10.1 inches (257 millimeters) in length; males grow up to 6.9 inches (175 millimeters) long (Tavares 2002).

Seabob shrimp

While relatively little is known about life history of seabob shrimp in the northern Gulf of Mexico, there have been several studies outlining early life stages. Juneau (1977) reported collecting fertile female seabob shrimp in peak numbers along Louisiana beaches in July and August, while smaller non-fertile females were taken in large numbers between December and March. He concluded that females mature at approximately 2.5 inches (63 millimeters) and that seabob shrimp most likely spawn in the Gulf of Mexico between July and December.

Very little information is available regarding the age and growth of seabob shrimp. Female seabob shrimp grow larger than males, up to 5.5 inches (140 millimeters); males grow up to 4.5 inches (115 millimeters) long (Williams 1984, Tavares 2002). Grabowski et al. (2014) estimated that female seabob shrimp in southern Brazil lived for 22 months while males in the same region lived for 18 months.

Predator-Prey Relationships

Shrimp are an important part of estuarine and offshore food webs. Larval shrimp are planktivores; juveniles and adults are omnivorous scavengers, eating anything from detritus and algae to small invertebrates and fish tissue, depending on their size. A number of predators, including foraging and carnivorous fishes and crustaceans feed on shrimp.

Brown shrimp

Brown shrimp larvae feed on phytoplankton and zooplankton (Zein-Eldin and Renaud 1986, Minello and Zimmerman 1991). Postlarvae feed mostly on phytoplankton, epiphytes, and detritus (Gleason and Zimmerman 1984). Juveniles and adults feed primarily at night and are more carnivorous than younger shrimp. Juveniles and adults prey on polychaetes (marine worms), amphipods (a type of crustacean), and insect larvae, as well as detritus and algae (GMFMC 1981, Zein-Eldin and Renaud 1986). Brown shrimp tend to rely more heavily on animal material in their diet than white shrimp.

Predation of brown shrimp is most likely the greatest cause of mortality in estuaries (Minello et al. 1989). Many finfish species and large crustaceans prey on brown shrimp. Brown shrimp are a primary food source for many estuarine and nearshore predators which include, but are not limited to: southern flounder, spotted seatrout, sand seatrout, Atlantic croaker, and red drum.

White shrimp

As larvae, white shrimp feed on feed on phytoplankton and zooplankton, as well as detritus suspended in the water column. Juvenile white shrimp feed on detritus and scavenge on the bottom sediment. As they mature, they also become predators. Juveniles and adults eat detritus, plants, microorganisms, invertebrates, and small fish (Darnell 1958, Perez-Farfante 1969, Christmas and Etzold 1977). White shrimp depend more heavily on plant matter than animal matter (McTigue and Zimmerman 1998). Cannibalism is also common among adult white shrimp.

Juvenile fish and some invertebrates eat post-larval and juvenile white shrimp, and a wide variety of finfish prey heavily on adult white shrimp.

Seabob shrimp

No information has been recorded on the food habits of seabob shrimp in the U.S. Gulf of Mexico. Cortés and Criales (1990) determined that seabob shrimp ate, in order of descending importance, detritus and fragments of bivalve shells, polychaete worms, foraminiferans, and crustaceans off the coast of Colombia. Kerkhove (2014) found that seabob shrimp rely on a combination of animal

prey (mostly crustaceans) and organic matter on the continental shelf of Suriname, South America.

Stock Status and Assessment Methodology

Stock Unit Definition

For the purposes of this fishery management plan, the management unit includes brown, white, and seabob shrimp in coastal waters of Louisiana. However, brown and white shrimp are found in both state and federal waters of the U.S. Gulf of Mexico. Their range seems to be continuous across adjacent U.S. Gulf states, and they are managed interjurisdictionally. For these reasons, these stocks are assessed on a Gulf-wide basis (not by individual states). It is common practice to assess a stock throughout its range, and it is appropriate to evaluate the condition of these stocks as a whole.

There is no stock assessment available for seabob shrimp in the U.S. Gulf of Mexico. Seabob shrimp is not part of the Gulf of Mexico Fishery Management Council's (Gulf Council) Shrimp Fishery Management Plan, so no stock assessments are required for this species. Harvest of seabob shrimp is fairly limited—they are only landed in Louisiana and Texas, with Louisiana landings averaging 2.8 million pounds annually from 2000 to 2013. Furthermore, biological information about seabob shrimp in the Gulf of Mexico is somewhat lacking.

Reference Points

National Standard 1 guidelines in the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) require that each fishery management plan specify objective and measurable status determination criteria for identifying when a fishery is overfished and undergoing overfishing. A stock is undergoing overfishing if fishing mortality rate exceeds the established maximum fishing mortality threshold (MFMT). A stock is overfished if biomass drops below the established minimum stock size threshold (MSST).

Both of these thresholds (MFMT and MSST) are typically related directly to point estimates of maximum sustainable yield (MSY). MSY is the largest long-term average catch that can be taken from a stock under prevailing conditions. However, given the annual nature of penaeid shrimp resources in the Gulf of Mexico, the Gulf Council determined that point estimates of MSY cannot be calculated for these species in any given year until the environmental dynamics that effect juvenile survival and adult catchabilities are identified and evaluated (GMFMC 2005). Nonetheless, the established overfishing and overfished thresholds are in accordance with the alternatives for establishing MSY specified in the National Standard Guidelines that allow a constant level of parent stock escapement as a proxy for the stock biomass that produces MSY (B_{MSY}). Parent stock escapement is the number of shrimp that migrate from inshore nursery areas to become adults and reproduce offshore. For U.S. Gulf of Mexico brown and white shrimp stocks, these escapement levels are defined as the minimum parent stock sizes (the number of shrimp that migrate from inshore nursery areas to become adults and reproduce offshore) known to have produced MSY the following year.

The overfishing levels (MFMT) currently established by the Gulf Council for U.S. Gulf of Mexico brown and white shrimp stocks are defined as follows:

- Brown shrimp: 125 million individuals, age 7+ months during the November through February period
- White shrimp: 330 million individuals, age 7+ months during the May through August period.

The overfished condition (MSST) is defined as one half of these stock levels.

The Gulf Council established these reference points before NOAA's National Marine Fisheries Service (NOAA Fisheries) transitioned the U.S. Gulf of Mexico shrimp stock assessments to a new stock assessment model. Earlier U.S. Gulf of Mexico shrimp stock assessments (Nance 2007, 2008, 2009) used a virtual population analysis (VPA), which determined the status of the stocks using the number of parent shrimp. In 2009, NOAA Fisheries scientists investigated new stock assessment models for assessing U.S. Gulf of Mexico shrimp stocks (Hart and Nance 2010) after the 2007 pink shrimp (*Farfantepenaeus duorarum*) stock assessment incorrectly determined pink shrimp were undergoing overfishing because the VPA model could not accommodate low fishing effort levels (Nance 2008). The VPA model had not been recalibrated since its inception in the early 1980s when effort and landings were substantially higher than current levels. Scientists concluded that the Stock Synthesis model (Methot 2009) was the best choice for modeling population dynamics of Gulf of Mexico shrimp. This commonly used, peer-reviewed assessment model integrates fishery and survey data and allows fishery independent data sources incompatible with the previous VPA model to be included in the stock assessment process. The Stock Synthesis model determines the status of the stocks in terms of estimates of spawning biomass and fishing mortality (Methot and Wetzel 2013).

The Gulf Council has accepted this new model. However,

the new model's outputs are not comparable to the current overfished and overfishing thresholds discussed above, resulting in unknown status determinations for U.S. Gulf shrimp stocks. The Gulf Council is currently in the process of revising MFMT and MSST to be comparable to the model outputs and to determine the current status of U.S. Gulf shrimp stocks (GMFMC 2014).

Current Stock Status

NOAA Fisheries has monitored the condition of brown and white shrimp stocks annually since 1970. NOAA Fisheries Southeast Fisheries Science Center (SEFSC) Galveston Laboratory currently conducts assessments for both stocks. Parent stock levels for brown and white shrimp have remained above overfished thresholds and below overfishing thresholds, indicating the stocks are not overfished or undergoing overfishing.

According to the most recently published assessment (Hart 2012a), there has been an increasing trend in brown shrimp spawning biomass and recruitment in recent years and a decreasing trend in fishing mortality during the later portion of the time series. This assessment provides evidence that U.S. Gulf of Mexico brown shrimp stocks are not overfished or undergoing overfishing. Although the 2014 assessment is not yet published, the brown shrimp spawning biomass estimate for 2013 was 47,223 metric tons (Hart pers. comm.). Annual fishing mortality (i.e., monthly fishing mortality values weighted by monthly numbers at age) estimates have slightly increased from 2012 levels with an apical fishing mortality (i.e., fishing mortality rate for the size where shrimp are fully-selected to the fishery) estimate of 1.41 for the offshore fishery and 2.19 for the inshore fishery in the 2013 fishing season (Hart pers. comm.).

There has also been an increasing trend in white shrimp spawning biomass and recruitment in recent years, and a decreasing trend in fishing mortality during the later portion of the time series (Hart 2012b). The 2012 assessment provides evidence that U.S. Gulf of Mexico white shrimp stocks are not overfished or undergoing overfishing. Although the 2014 assessment is not yet published, the spawning biomass estimate for the 2013 fishing season was 387,756 metric tons (Hart pers. comm.). The estimate of annual apical fishing mortality was 0.27, a slight increase from 2012 levels (Hart pers. comm.).

Control Rules

The Gulf Council established that if overfishing persists for two consecutive years, the appropriate committees and/or panels (e.g. stock assessment panels, Advisory Panels, or Scientific and Statistical Committee) be convened to review changes in parent stock size, fishing effort, habitat, environmental conditions, fishing mortality, and other factors that may have contributed to the decline. If excessive fishing is determined to be the source of, or a contributor to reduced parent stock sizes, reduction in fishing pressure should be recommended. The Gulf Council proposed a similar response with proposed modified stock status determination criteria in draft Amendment 15. The Gulf Council has also proposed a response to an overfished determination (not previously established).

These shrimp species are not restricted to Louisiana's waters; therefore, the Louisiana management authorities do not compute Louisiana-specific overfishing and overfished thresholds or require specific response if these thresholds are exceeded, as these considerations are regional in nature. In addition, environmental factors drive recruitment of these species and no relation between spawning stock and recruitment has been observed; the primary goal of management is to manage harvest to allow access to the resource and protect the smallest shrimp to allow increased yield per recruit (increased landings as well as value).

Assessment Methodology

NOAA Fisheries' latest assessment model uses data from 1984 through 2013 including commercial inshore and offshore shrimp catch statistics and three indices of shrimp abundance (summer and fall Southeast Area Monitoring and Assessment Program (SEAMAP) trawl surveys and monthly LDWF inshore trawl survey). The addition of these survey data greatly improves the precision of these assessments. Additionally, the Stock Synthesis model is scalable even for short-lived species such as shrimp. It can incorporate multiple data sources including biological and environmental conditions to account for parameters such as recruitment that can change over time in response to these factors (although environmental conditions are not currently incorporated into the model).

Catch statistics

The assessment model uses the following commercial catch data: directed fishing effort by year and month; total catch by shrimp size; and total catch in pounds of shrimp tails by month. The model is structured into two fleets for brown shrimp (commercial offshore and inshore) and a single fleet for white shrimp (commercial offshore and inshore combined). Catch data is derived from state trip ticket systems and NOAA Fisheries port agent records.

Scientists have subdivided the U.S. Gulf of Mexico into 21 statistical sub-areas (Patella 1975) used by port agents and state trip ticket systems to assign the location of the

shrimp fleet's catches and fishing effort on a trip-by-trip basis. Brown and white shrimp fishing grounds are located primarily within sub-areas 7 through 21. Port agents randomly visit fishing ports throughout the U.S. Gulf of Mexico to interview fishing captains and/or crews and record data pertaining to trawling activity (effort). These data include: the location and depth fished by statistical sub-area and the species-specific pounds and sizes of shrimp landed for each individual trip that a vessel has completed (Nance et al. 1989). Information from the electronic logbook program (mandatory for federal shrimp permit holders) has also been used to supplement the effort and location data collected by NOAA Fisheries agents and state trip tickets since 2006.

SEAMAP survey

The SEAMAP survey collects fishery-independent data on size, abundance, and distribution of shrimp west of the Mississippi River. Scientists collect shrimp samples using standard 40 and 20-foot trawls. Sampling protocol changed in 2009; now all trawls are towed for 30 minutes at randomly-selected sampling stations. Scientists identify and weigh all species captured, measuring up to 200 shrimp of each species from every trawl in the summer and 20 of each in the fall (except for Louisiana and Texas where they measure at least 50 of each). They estimate abundance using these data. They also collect environmental data such as water and air temperature, barometric pressure, wind speed and direction, and wave height.

LDWF survey

Each month, LDWF biologists conduct surveys to monitor the growth, distribution and abundance of shrimp. They tow 6-foot trawls to sample shallow marsh habitats, 16-foot trawls to sample the open waters of coastal lakes and bays, and 20-foot trawls in open Gulf of Mexico waters. Sample locations and procedures are standardized with 10-minute tow times. They identify and count all species captured and measure up to 50 randomly selected individuals of each species. They sample hundreds of locations, then compile all of the data and plug it into mathematical models to generate an abundance index. Scientists also collect data on hydrological conditions (conductivity, salinity and water temperature) at each sample site.

Stock Resilience

It is important to note that shrimp abundance is driven primarily by environmental conditions (GMFMC 2014). Shrimp are essentially an "annual crop"—they are short-lived (most seldom live longer than one year) and fecund (spawning up to 1 million eggs per spawning event). These biological factors make them inherently resilient to fishing pressure. The Gulf Council has named five main biological factors that contribute to this resiliency (GMFMC 1981):

1. The migration of the life stages through several environments
2. The food habits of juveniles and sub-adults in the estuary provide access to rich, widely-based food supply
3. The rapid growth rate of shrimp under favorable conditions results in a harvestable size shrimp within a short time
4. High fecundity and extended spawning seasons help to prevent recruitment overfishing even when intense fishing pressure occurs
5. A large portion of the Gulf of Mexico is inaccessible to harvesting, e.g. rock bottom, loggerheads, etc.

As long as environmental conditions such as weather and water temperatures are favorable, shrimp are highly productive and can rebound from low abundance one year to high abundance the next.

In addition, productivity is a function of fecundity, growth rates, natural mortality, age of maturity, and longevity and can be a reasonable proxy for resilience, i.e. 'the ability to rebound after perturbation' (Holling 1973). The FAO developed a classification scheme to determine the productivity for exploited aquatic species (FAO 2001; Table 1). Each life history characteristic is assigned a rank and then averaged to compute an overall productivity score. The overall productivity score for Gulf of Mexico shrimp stocks is 3, indicating high productivity and resilience.

Table 1: FAO proposed guideline for indices of productivity for exploited aquatic species. Parameter values from Hart 2012a and 2012b.

Parameter	**Productivity**			**Species**	**Score**
	Low = 1	**Medium = 2**	**High = 3**	**Brown / white shrimp**	
Natural mortality rate (M)	<0.2	0.2 - 0.5	>0.5	3.1 / 3.3	3
von Bertalanffy growth rate (K)	<0.15	0.15 - 0.33	>0.33	2.1 / 3.1	3
Age at maturity (t_{mat})	>8	3.3 - 8	<3.3	0.5	3
Maximum age (t_{max})	>25	14 - 25	<14	2	3
Examples	orange roughy, many sharks	cod, hake	sardine, anchovy	**Brown / white shrimp productivity score = 3 (high)**	

Description of the Fishery

FISHERY MONITORING

LDWF monitors commercial landings and fishing effort through a trip ticket program. Through this program, LDWF collects information about commercial fishermen's catch—for example, what it is, where it was caught, how it was caught, and how much was caught—from seafood dealers and commercial fishermen holding fresh products licenses. LDWF also conducts economic research pertaining to Louisiana and U.S. Gulf of Mexico region fisheries resources using information from the trip ticket program and surveys.

Numerous authors have reported on Louisiana's commercial and recreational shrimp fisheries, including descriptions of the history of exploitation, harvesters, fishing effort, processing and markets, management practices, fishing methods and gear, season structure, economics, landings, and imports (Tulian 1920, Viosca 1928, Burkenroad 1934, Anderson et al. 1949, Viosca 1957, Gunter and Snell 1958, Klima and Ford 1970, Ford and St. Amant 1971, Gaidry and White 1973, Christmas and Etzold 1977, Etzold and Christmas 1977, Sass and Roberts 1979, Brown et al. 1980, Roberts and Sass 1980, Keithly and Baron-Mounce 1990, LDWF 1992, Adkins 1993, Hein and Meier 1995, LaFleur et al. 2005, Southwick Associates 2008, Horst and Horst 2009, Miller and Isaacs 2011, Miller and Isaacs 2014).

Data Collection and Analyses

In Louisiana, fishermen have been harvesting shrimp commercially since the 1800s, with the earliest landings documented in 1880 by the U.S. Fish Commission and the Bureau of Commercial Fisheries (Lellis-Dibble et al. 2008). Reported commercial shrimp landings in Louisiana averaged less than 10 million pounds annually from 1880 through the early 1900s and have exceeded 20 million pounds each year since 1917. Annual Louisiana shrimp landings dating to 1903 have also been documented in Biennial Reports published by the Commission and were reported in barrels (1 barrel equals 210 pounds/head-on

weight).

Prior to 1999, NOAA Fisheries, via port agents, collected landings statistics on commercially harvested species in Louisiana; however, LDWF now monitors commercial landings and fishing effort through a trip ticket program implemented in 1999. Through this program, LDWF collects commercial shrimp landings data on a trip basis from licensed wholesale/retail seafood dealers and commercial fishermen holding fresh products licenses. LDWF requires that dealers purchasing shrimp from commercial fishermen submit trip tickets to capture information about their catch—for example, what it is, where it was caught, how it was caught, and how much was caught. Commercial fishermen who sell their catch directly to consumers (fresh products license holders) are also required to submit trip tickets. As of 2000, dealers could submit trip tickets through a computerized electronic trip ticket program; to date, about 279 dealers use electronic trip tickets to submit their data.

LDWF's Socioeconomic Research and Development Section conducts economic research pertaining to Louisiana and U.S. Gulf of Mexico region fisheries resources using information from Louisiana's trip ticket program and surveys. This section publishes results in LDWF reports and peer-reviewed scientific journals, presents research findings at professional and scientific meetings, and provides information to LDWF and other agencies to support scientific research and resource management.

Unless otherwise noted, the data presented throughout this section is sourced from LDWF's trip ticket program. Data is presented from 2000 (when the electronic trip ticket system was implemented) through 2013 (the most recent data year available). Value is presented in constant 2009 dollars; volume is presented in pounds.

Commercial Fishery

Shrimp supports the most valuable and the second largest commercial fishery (after Gulf menhaden) in Louisiana. 2013 landings totaled 98.5 million pounds (all species combined/head-on weight) and $167 million in dockside value (Table 2). Louisiana continues to account for the majority of shrimp landings in the U.S. Gulf of Mexico, averaging 43 percent of Gulf-wide shrimp landings since 1963 (Figure 1). Similarly, Louisiana has led the United States in shrimp landings in every year since 2000 (Table 3).

Volume and Value of Landings

Louisiana commercial shrimp landings (all species combined/head-on weight) between 2000 and 2013 have averaged 111.3 million pounds annually (Table 2). Landings reached a record high of 145.4 million pounds in 2000 and exceeded 100 million pounds for eight consecutive years. Landings dropped to 89.3 million pounds in 2008, the year of Hurricanes Gustav and Ike, due to disruptions in fishing activity and damage to infrastructure. Landings were lowest (74.6 million pounds) in 2010 following the *Deepwater Horizon* oil spill. Shrimp landings significantly increased in 2006 and 2009, years that immediately followed major hurricanes. Similar trends in blue crab landings were also observed following these hurricanes.

Annual real dockside value of commercial shrimp landings between 2000 and 2013 averaged $160.6 million (Table 2). Annual value reached a record high of $309 million in 2000 and dropped to $105.9 million in 2010. Although shrimp landings in 2013 were the fourth lowest during this period, dockside value was the third highest on record and totaled $167 million.

Table 2. Annual Louisiana shrimp landings and value, all species combined, 2000-2013.

Year	Volume	Real Dockside Value	Year	Volume	Real Dockside Value
2000	145,384,388	$308,999,881	**2008**	89,268,011	$131,615,054
2001	124,812,754	$224,430,545	**2009**	113,223,630	$120,218,323
2002	107,794,921	$166,057,353	**2010**	74,600,164	$105,874,384
2003	125,730,160	$155,822,602	**2011**	92,455,446	$129,270,662
2004	133,369,431	$155,370,483	**2012**	101,704,954	$139,060,737
2005	102,575,839	$144,739,722	**2013**	98,522,646	$167,022,152
2006	137,838,637	$155,727,974	**Average**	111,295,752	$160,562,663
2007	110,859,553	$143,667,414			

Figure 1. Average percentage contribution by state to total U.S. Gulf of Mexico shrimp landings, all species combined, 1963-2013. Source: NOAA Fisheries Annual Commercial Landings statistics.

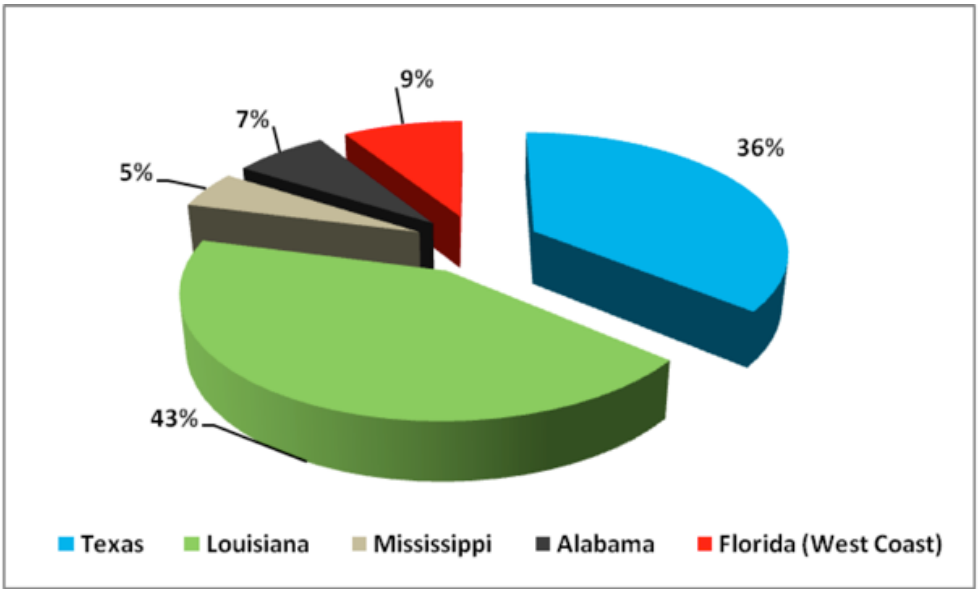


Table 3. Annual shrimp landings (all species combined; millions of pounds) and value (millions of dollars) from major shrimp producing U.S. states: 2000-2013. Source: NOAA Fisheries Annual Commercial Landings statistics.

	2000	2001	2002	2003	2004	2005	2006	2007
Alabama	20.1 / $56.7	16.6 / $38.6	14.9 / $29.6	15.8 / $30.3	16.1 / $29.2	16.3 / $32.0	24.2 / $39.0	21.2 / $40.7
Alaska	2.5 / $4.7	1.7 / $2.7	2.1 / $2.7	2.0 / $3.1	2.0 / $2.9	1.6 / $3.0	1.1 / $3.2	0.7 / $1.8
California	5.8 / $7.4	5.6 / $5.9	5.9 / $5.9	3.5 / $3.5	3.5 / $3.8	2.9 / $4.3	1.2 / $4.2	2.0 / $4.1
Florida East	11.2 / $23.5	10.3 / $20.1	6.2 / $13.2	6.5 / $12.7	11.7 / $17.4	5.2 / $11.1	8.8 / $16.4	6.2 / $13.8
Florida West	14.9 / $40.7	17.5 / $44.0	19.1 / $37.3	18.1 / $34.9	18.3 / $34.7	19.3 / $38.6	14.2 / $32.2	8.6 / $21.0
Georgia	5.5 / $17.8	4.5 / $11.0	5.1 / $11.0	5.6 / $10.3	5.1 / $10.6	4.5 / $8.9	3.9 / $7.6	2.8 / $6.4
Louisiana	145.4 / $253	124.8 / $188	107.8 / $141.2	125.7 / $135.2	133.4 / 1$38.5	102.6 / $133.1	137.8 / $147.4	110.9 / $139.8
Maine	4.6 / $3.6	2.0 / $1.8	0.8 / $0.9	2.1 / $1.9	2.4 / $1.0	3.5 / $2.0	4.2 / $1.5	7.5 / $2.9
Mississippi	14.8 / $38.3	15.9 / $31.6	16.8 / $29.9	17.6 / $25.6	18.0 / $0.2	7.8 / $13.7	8.4 / $11.7	10.4 / $16.4
North Carolina	10.3 / $25.4	5.3 / $11.9	10.0 / $18.4	6.2 / $10.9	4.9 / $9.5	2.4 / $4.4	5.7 / $9.1	9.5 / $17.9
Oregon	25.6 / $10.9	28.6 / $8.2	41.7 / $12.1	20.6 / $5.3	12.3 / $4.9	15.8 / $7.0	12.2 / $4.6	20.3 / $9.5
South Carolina	6.1 / $15.6	4.5 / $8.9	5.2 / $9.1	6.1 / $8.7	4.8 / $7.4	4.0 / $6.6	3.6 / $6.5	2.7 / $5.6
Texas	93.4 / $267.1	82.3 / $195	75.2 / $147.7	79.2 / $139.4	70.1 / $137.7	70.3 / $143.0	104.4 / $167.1	74.0 / $149.1
Washington	5.5 / $3.6	7.8 / $3.7	11.1 / $4.5	8.9 / $3.7	6.6 / $3.6	7.3 / $4.3	6.9 / $3.6	4.5 / $3.7

Table 3 continued. Annual shrimp landings (all species combined; millions of pounds) and value (millions of dollars) from major shrimp producing U.S. states: 2000-2013. Source: NOAA Fisheries Annual Commercial Landings statistics.

	2008	2009	2010	2011	2012	2013	Average
Alabama	17.2 / $38.4	23.2 / $34.9	9.6 / $22.5	19.2 / $44.4	18.1 / $39.0	16.1 / $49.0	17.8 / $37.5
Alaska	0.7 / $1.7	0.8 / $2.1	0.7 / $2.0	1.1 / $2.4	0.9 / $2.2	0.7 / $2.7	1.3 / $2.7
California	3 / $5.7	3.6 / $5.5	4.5 / $5.0	8.2 / $8.6	7.3 / $8.5	9.7 / $9.5	4.8 / $5.9
Florida East	7.6 / $17.2	8.7 / $12.5	8.7 / $17.1	10.5 / $24.4	8.9 / $21.9	5 / $14.1	8.3 / $16.8
Florida West	9.9 / $23.3	11.5 / $24.4	12.9 / $27.6	12 / $28.5	7.6 / $21.3	9.4 / $28.5	13.8 / $31.2
Georgia	3.1 / $7.9	3.3 / $6.6	4.6 / $10.1	4.4 / $11.4	3.9 / $11.0	1.9 / $5.8	4.2 / $9.7
Louisiana	89.3 / $130.9	113.3 / $120.6	75.5 / $107.4	92.5 / $133.7	101.7 / $146.4	98.4 / $178.4	111.4 / $149.5
Maine	8.5 / $4.2	4.8 / $1.9	12.3 / $6.7	10.2 / $7.7	4.9 / $4.7	0.6 / $1.0	4.9 / $3.0
Mississippi	8.6 / $17.1	10.1 / $12.6	4.1 / $8.3	10.1 / $18.5	13.0 / $23.8	8.9 / $22.1	11.8 / $19.3
North Carolina	9.4 / $19.3	5.4 / $8.5	6.0 / $10.8	5.1 / $10.9	6.1 / $13.3	9.7 / $25.9	6.9 / $14.0
Oregon	25.4 / $14.1	22.1 / $7.0	31.5 / $11.3	48.3 / $24.9	49.1 / $24.8	47.5 / $24.4	28.6 / $12.1
South Carolina	3.2 / $6.7	2.7 / $5.5	4.0 / $8.2	2.9 / $7.0	3.4 / $8.7	2.0 / $5.8	3.9 / $7.9
Texas	63.9 / $157.2	92.6 / $135.1	76.7 / $173.5	87.8 / $216.4	77.6 / $178.8	71.9 / $228.8	80.0 / $174.0
Washington	7.4 / $5.4	7.8 / $4.1	10.2 / $5.7	10.2 / $7.1	10.0 / $7.0	14.3 / $8.7	8.5 / $4.9

Landings by Species and Season

Together, brown, white, and seabob shrimp comprise more than 99 percent of annual commercial shrimp landings in Louisiana (Table 4). White shrimp dominate the landings, averaging 58 and 68 percent of Louisiana shrimp landings, by volume and value respectively Other shrimp species commercially harvested in Louisiana include pink, royal red (*Pleoticus robustus*), roughneck (*Trachypenaeus* sp.), and rock shrimp (*Sicyonia burkenroadi*).

The shrimp fishery in Louisiana operates in inshore waters (bayous, canals, bays, lakes, and sounds), state outside territorial waters, and adjacent offshore federal waters. A statutorily defined line (inside/outside shrimp line) delineates inside and outside state waters and generally follows the coastline, with some exceptions (Figure 3).

Louisiana has two regular inshore shrimp seasons each year:

- A spring inshore season that generally begins in early to mid-May, sometimes extending into July
- A fall inshore shrimp season usually beginning in early to mid-August and extending into December or early January.

Inshore shrimp seasons are flexible; the Commission sets opening dates based upon biological and technical data relative to shrimp populations within the state's major coastal basins. The Commission generally provides the Secretary of LDWF with authority to close, reopen, or extend regular shrimp seasons and to open or close special shrimp seasons or seasons in state outside waters.

State outside waters remain open year-round; however, portions of these waters extending seaward three nautical miles from the shore may be closed during winter to provide protection to small, overwintering white shrimp.

Brown shrimp landings are highest in May and June in conjunction with the opening of the spring inshore shrimp season (Table 4). Landings remain fairly high through August then begin to decline in September before reaching their lowest levels in March. Landings from tidal passes and adjacent outside waters begin to increase in April as the first crop of brown shrimp begin to trickle out of the estuaries in advance of major migrations that occur later in spring.

White shrimp landings begin to increase in August with the opening of the fall shrimp season in inside waters and peak in October and November with advancing cold fronts that drop tides and stimulate white shrimp movements from the estuaries (Table 4). Landings begin to decline in December with the closure of the inshore shrimp season and reach lowest levels in March averaging less than 1 million pounds. In early spring, white shrimp overwintering in nearshore Gulf if Mexico waters begin recruiting back into coastal lakes and bays with the return of southerly winds and increasing water temperatures. Landings in May and June reach secondary peaks with the opening of the spring inshore shrimp

season. Although May and June landings are dominated by brown shrimp, white shrimp price per pound during these months has averaged more than any other time of year due to the amount of very large white shrimp harvested.

An offshore shrimp species, seabobs are harvested almost exclusively in state outside waters with peak landings from November to January and a much smaller summer peak in July through September (Table 4). Seabobs are generally harvested at very small sizes and often processed as dried shrimp.

Table 4. Average monthly Louisiana shrimp landings and value, 2000-2013. Source: NOAA Fisheries Monthly Commercial Landings statistics.

	Brown shrimp			White shrimp		
Month	**Landings**	**Real dockside value**	**Real price per pound**	**Landings**	**Real dockside value**	**Real price per pound**
Jan	177,514	$341,131	$2.12	2,927,499	$3,708,164	$1.33
Feb	111,491	$248,976	$2.38	1,121,309	$1,485,848	$1.38
Mar	60,783	$178,136	$2.73	740,621	$1,385,984	$1.90
Apr	634,303	$840,790	$1.39	1,167,754	$2,489,050	$2.15
May	16,887,103	$15,920,037	$0.88	4,878,412	$9,956,359	$2.23
Jun	15,855,771	$17,822,189	$1.11	4,125,437	$9,789,159	$2.65
Jul	4,901,363	$6,903,285	$1.37	2,665,795	$5,509,968	$2.43
Aug	2,646,621	$4,827,833	$1.75	9,447,070	$16,687,122	$1.80
Sep	842,656	$1,726,796	$1.98	8,957,104	$15,260,756	$1.70
Oct	663,191	$1,233,226	$1.93	12,965,425	$19,846,765	$1.53
Nov	399,604	$678,057	$1.83	10,847,263	$14,827,445	$1.38
Dec	258,901	$445,655	$1.84	5,227,545	$6,755,435	$1.33
Annual	43,439,301	$51,166,111	$1.18	65,071,234	107,702,055	$1.66
	Seabob shrimp			**Total**		
Month	**Landings**	**Real dockside value**	**Real price per pound**	**Landings**	**Real dockside value**	**Real price per pound**
Jan	561,392	$256,808	$0.46	3,666,405	$4,306,103	$1.17
Feb	132,344	$68,767	$0.50	1,365,145	$1,803,591	$1.32
Mar	16,896	$8,174	$0.52	818,299	$1,572,294	$1.92
Apr	6,565	$4,170	$0.61	1,808,623	$3,334,010	$1.84
May	2,425	$1,333	$0.71	21,767,940	$25,877,729	$1.19
Jun	11,459	$5,463	$0.85	19,992,667	$27,616,812	$1.38
Jul	56,751	$29,456	$0.41	7,623,909	$12,442,709	$1.63
Aug	100,459	$43,228	$0.44	12,194,150	$21,558,183	$1.77
Sep	132,931	$65,816	$0.44	9,932,692	$17,053,367	$1.72
Oct	319,734	$162,226	$0.40	13,948,350	$21,242,217	$1.52
Nov	591,515	$282,693	$0.40	11,838,382	$15,788,195	$1.33
Dec	859,369	$422,081	$0.44	6,345,815	$7,623,170	$1.20
Annual	2,791,840	$1,350,215	$0.48	111,302,377	$160,218,380	$1.44

Landings by Gear Type and Vessel Length

Commercial fishermen primarily use otter trawls, butterfly nets, and skimmer nets to harvest shrimp. They occasionally use cast nets, but documented landings with this gear are very small. Introduced to the fishery in the early 1900s, otter trawls are cone-shaped nets with doors made of heavy wood and steel plate that keep the net open and on the bottom. Boats tow one or two trawls (double-rigs), but no more than four trawls (quad-rigs), behind them over the water bottom. Fishermen use otter trawls in both inshore and offshore waters but use them exclusively in deeper offshore waters.

Developed in the 1950s, butterfly nets are mounted to and held open by a pair of rigid rectangular metal frames and are

pushed along each side the boat. They can be emptied without removing the entire net from the water. Butterfly nets are used exclusively in inshore waters and in tidal passes, particularly on strong outgoing tides. They are also often attached to wharves, docks, barges, and pontoons and fished in deep bayous, channels, and cuts in the presence of strong outgoing tides.

Introduced in the 1980s, skimmer nets are very similar to butterfly nets. They consist of two rigid, L-shaped, metal frames mounted on each side of a boat with a cone-shaped net attached along two sides of each frame. Skimmers were specifically developed to harvest shrimp in shallower water. Fishermen lower the frames and nets into the water, with the outer part of the frames resting on the seafloor. The frame is rigid enough to keep the net on the bottom but skis on the bottom of the frame allow it to glide over obstacles along the bottom. A line and a weight spread the net horizontally and vertically. The boat pushes the nets through the water column, rather than towing them behind like an otter trawl. Fishermen can retrieve the cod end of the net (where the catch is retained) and empty the catch while the boat continues to move forward and the mouth of the net continues to fish. Fishermen use paired skimmer nets primarily in inshore waters and tidal passes; they also use them extensively in shallow nearshore Gulf of Mexico waters.

Otter trawls accounted for approximately 56 percent of annual Louisiana shrimp landings from 2000 to 2013, followed by skimmer nets (41 percent), and butterfly nets (3 percent; Figure 2).

The number and length of vessels used in Louisiana's commercial shrimp fishery varies widely. Due to the large number of relatively small vessels participating in the fishery, the inshore shrimp fleet has been referred to as the "mosquito fleet". Vessels ranging from 30 to 49 feet in length accounted for the highest proportion of shrimp landings among vessel size classes, averaging 40.6 million pounds annually from 2000 to 2013 (Figure 2; Table 5). Within this vessel size class, skimmer nets contributed approximately 31.3 million pounds to the total, followed by otter trawls with 7.8 million pounds. Landings from butterfly nets (1.5 million pounds) were the highest within this vessel size in comparison with other size classes using butterfly nets.

Vessels larger than 65 feet accounted for the second highest proportion of shrimp landings and averaged 36.3 million pounds annually from 2000 to 2013 (Table 5). Due to their draft, these vessels mainly fish offshore with otter trawls.

Small vessels ranging from 0 to 19 feet, in combination with slightly larger vessels ranging from 20 to 24 feet contributed approximately 5.1 million pounds to annual shrimp landings from 2000 to 2013 (Table 5). These vessels are generally outboard powered and primarily fish in shallower waters within the upper estuary. Skimmer nets accounted for a large majority of landings within these size classes, with butterfly nets and otter trawls accounting for nearly equal proportions.

Vessels ranging from 25 to 29 feet in length contributed approximately 6.6 million pounds to annual shrimp landings from 2000 to 2013 (Table 5). Skimmer nets accounted for an overwhelming majority of annual shrimp landings among vessels within this size class. Together, otter trawls and butterfly nets contributed less than 600,000 pounds annually to the total amount of shrimp harvested by vessels within this size class.

Figure 2. Average Louisiana shrimp landings by gear type and vessel length, 2000-2013.

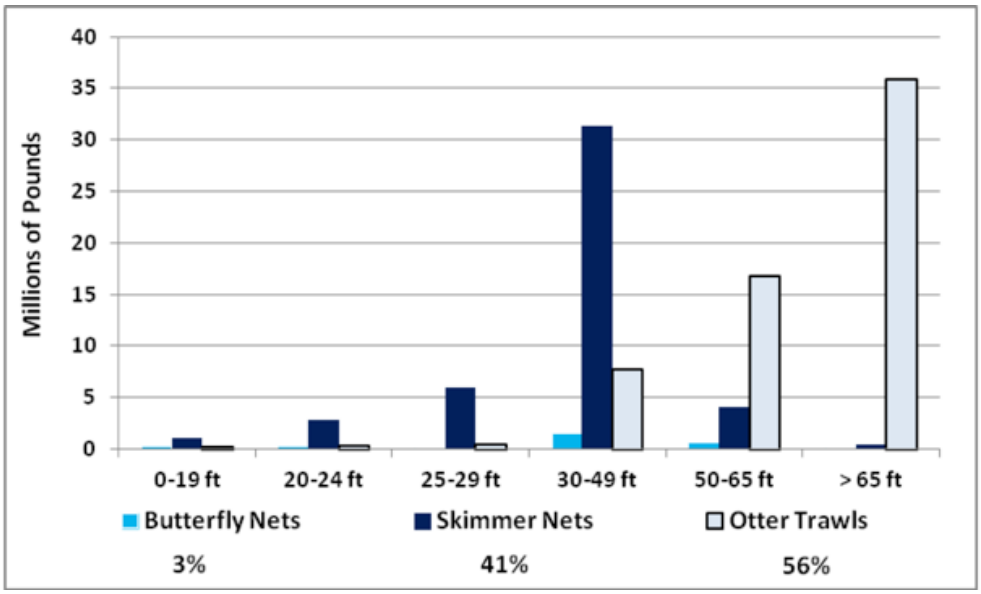


Table 5. Annual Louisiana shrimp landings by gear type and vessel length, 2000-2013.

	Vessel length 0-19				Vessel length 20-24			
Year	**Butterfly net**	**Skimmer net**	**Otter trawl**	**Total**	**Butterfly net**	**Skimmer net**	**Otter trawl**	**Total**
2000	576,717	2,056,392	575,441	3,208,550	425,660	4,739,279	788,817	5,953,756
2001	349,916	2,088,896	703,497	3,142,309	281,772	3,825,017	633,490	4,740,279
2002	244,033	1,178,020	283,027	1,705,080	222,672	2,506,564	294,175	3,023,411
2003	413,347	1,307,288	352,596	2,073,231	327,335	2,769,795	538,775	3,635,905
2004	309,354	1,228,687	241,314	1,779,355	536,028	2,964,745	437,873	3,938,646
2005	366,599	966,886	258,214	1,591,699	311,773	2,040,173	259,641	2,611,587
2006	370,246	1,243,082	186,824	1,800,152	316,301	2,664,800	160,834	3,141,935
2007	308,877	626,697	203,019	1,138,593	380,419	2,754,168	234,887	3,369,474
2008	199,493	643,758	112,108	955,359	322,972	2,255,391	151,045	2,729,408
2009	237,212	804,717	106,914	1,148,843	294,620	2,386,380	235,858	2,916,858
2010	249,892	883,468	97,291	1,230,651	169,015	2,816,932	324,224	3,310,171
2011	218,470	847,115	138,291	1,203,876	214,149	2,468,557	434,291	3,116,997
2012	123,368	739,930	131,387	994,685	187,915	2,492,896	135,330	2,816,141
2013	205,882	839,005	143,793	1,188,680	311,369	2,447,269	295,015	3,053,653
Average	298,100	1,103,853	252,408	1,654,362	307,286	2,795,141	351,733	1,151,387
	Vessel length 25-29				**Vessel length 30-49**			
Year	**Butterfly net**	**Skimmer net**	**Otter trawl**	**Total**	**Butterfly net**	**Skimmer net**	**Otter trawl**	**Total**
2000	184,136	10,221,568	899,725	11,305,429	1,952,359	31,391,089	11,621,555	44,965,003
2001	184,517	9,131,642	704,900	10,021,059	1,550,795	30,269,814	10,805,434	42,626,043
2002	145,675	5,664,777	377,895	6,188,347	1,959,682	23,606,179	7,983,891	33,549,752
2003	117,496	7,098,380	516,702	7,732,578	1,997,845	28,682,391	9,528,564	40,208,800
2004	148,162	7,473,255	501,234	8,122,651	2,417,257	32,672,607	10,716,576	45,806,440
2005	40,482	5,229,534	330,586	5,600,602	1,131,387	25,421,306	7,643,183	34,195,876
2006	161,988	6,410,206	471,774	7,043,968	1,916,603	38,894,320	8,869,762	49,680,685
2007	121,423	5,494,121	384,959	6,000,503	1,347,752	34,259,865	7,143,138	42,750,755
2008	138,376	4,383,568	362,285	4,884,229	980,900	31,330,436	5,779,421	38,090,757
2009	183,937	4,992,565	228,590	5,405,092	1,331,392	33,423,046	6,014,865	40,769,303
2010	178,450	5,388,962	231,540	5,798,952	1,214,040	27,957,218	4,612,550	33,783,808
2011	159,459	4,458,263	323,888	4,941,610	1,076,116	30,368,713	5,195,451	36,640,280
2012	263,874	3,995,939	378,168	4,637,981	1,348,744	35,342,764	5,882,764	42,574,272
2013	147,037	3,993,803	508,732	4,649,572	847,009	34,523,514	7,238,116	42,608,639
Average	155,358	5,995,470	444,356	6,595,184	1,505,134	31,295,947	7,788,234	40,589,315

Table 5 continued. Annual Louisiana shrimp landings by gear type and vessel length, 2000-2013.

	Vessel length 50-65				Vessel length 66 and up			
Year	**Butterfly net**	**Skimmer net**	**Otter trawl**	**Total**	**Butterfly net**	**Skimmer net**	**Otter trawl**	**Total**
2000	1,190,657	3,235,934	26,026,666	30,453,257	175,298	110,172	37,430,023	37,715,493
2001	580,334	2,901,055	22,656,578	56,591,224	66,756	112,906	34,758,173	34,937,835
2002	558,581	2,067,750	19,376,414	48,140,712	47,741	184,386	39,091,167	39,323,294
2003	651,948	2,590,999	21,220,468	46,466,160	34,757	223,168	46,638,991	46,896,916
2004	220,618	3,250,980	23,004,977	50,939,990	36,554	234,511	45,692,659	45,963,724
2005	313,249	2,415,163	18,089,744	47,294,731	84,010	450,011	35,574,916	36,108,937
2006	435,188	4,260,161	20,653,234	46,166,739	122,864	689,002	47,891,902	48,703,768
2007	791,259	4,134,377	14,364,244	44,638,463	117,164	655,275	38,622,119	39,394,558
2008	605,554	4,248,037	11,536,881	35,680,352	23,163	376,155	31,701,132	32,100,450
2009	990,841	5,298,984	14,744,225	37,424,522	72,799	494,870	44,260,895	44,828,564
2010	1,064,723	5,253,662	5,281,892	32,634,327	83,971	195,882	17,426,202	17,706,055
2011	856,425	5,500,653	11,101,212	29,058,567	23,487	1,208,672	26,495,761	27,727,920
2012	760,087	6,191,656	12,914,776	37,324,809	37,477	662,456	28,040,921	28,740,854
2013	735,077	5,953,980	13,048,764	39,604,340	102,092	656,372	27,784,387	28,542,851
Average	696,753	4,093,099	16,715,720	41,243,393	73,438	446,703	35,814,946	36,335,087

Landings by Area

State vs. federal waters

Landings of brown, white, and seabob shrimp are far greater in state versus federal waters (Table 6; Figure 3). Combined shrimp landings in state waters have averaged 67 percent of landings from 2000 to 2013. Fishermen and vessels harvesting shrimp in Louisiana waters must possess appropriate LDWF licenses; however, LDWF licenses are not required for shrimp fishermen and vessels harvesting shrimp in federal waters unless they land these shrimp in Louisiana. Additionally, vessels fishing in federal waters of the U.S. Gulf of Mexico are required to possess a shrimp vessel moratorium permit issued by NOAA Fisheries. In 2011, the Louisiana state legislature enacted legislation declaring that state territorial waters extend three marine leagues (nine nautical miles) seaward from the coastline. As a matter of policy, LDWF's Law Enforcement Division does not enforce shrimp licensing requirements in state waters extending from the three to nine nautical mile range. Regardless of the state's declaration of a nine nautical mile territorial sea, NOAA Fisheries requires a shrimp vessel moratorium permit for any shrimp vessel fishing in waters three nautical miles seaward of the Louisiana coastline.

Although brown shrimp landings have generally declined since 2001, brown shrimp landings in state waters have averaged 31.0 million pounds annually in comparison with average landings of 12.8 million pounds in federal waters (Table 6). With the exception of 2008, brown shrimp landings in federal waters exceeded 10 million pounds annually through 2009. Since then, landings from these waters have rapidly declined.

White shrimp landings from state waters have averaged 42 million pounds annually in comparison with an average of 23.6 million pounds landed from federal waters (Table 6). Landings of white shrimp in state waters peaked at 55 million pounds in 2006, the year following Hurricanes Katrina and Rita. With the exception of 2002, white shrimp landings from state waters have remained fairly consistent since 2000; however, landings from federal waters have declined since 2009.

Seabob shrimp landings from state waters have averaged 2.2 million pounds annually in comparison with an average of 0.56 million pounds from federal waters (Table 6). Landings of seabob shrimp in state waters ranged from a high of 6.5 million pounds in 2001 to a low of 0.26 million pounds in 2011. They have increased since then, up to 1.7 million pounds in 2013. In federal waters, landings of seabob shrimp have generally declined since peaking at 1.87 million pounds in 2000 down to a low of 0.03 million pounds in 2009. 2013 landings of seabob shrimp from federal waters totaled 0.26 million pounds. Seabob landings are likely driven by market conditions.

Table 6. Louisiana brown, white, and seabob shrimp landings from state vs. federal waters, 2000-2013.

	Brown shrimp		White shrimp		Seabob shrimp		Total	
Year	**State**	**Federal**	**State**	**Federal**	**State**	**Federal**	**State**	**Federal**
2000	42,744,992	18,952,654	46,973,686	31,258,200	5,402,893	1,869,236	95,121,571	52,080,090
2001	46,353,142	17,634,928	32,522,604	23,401,867	6,494,787	1,593,253	85,370,533	42,630,048
2002	32,680,965	20,728,038	23,682,353	23,273,371	5,226,024	1,547,990	61,589,342	45,549,399
2003	36,983,500	22,387,505	38,301,043	25,508,176	2,509,510	556,008	77,794,053	48,451,689
2004	35,944,689	19,931,689	46,432,085	28,370,542	2,565,509	920,458	84,942,283	49,222,689
2005	26,099,447	12,805,357	37,352,679	24,176,117	1,731,653	390,419	65,183,779	37,371,893
2006	34,293,868	13,724,338	54,994,631	34,467,355	748,326	201,191	90,036,825	48,392,884
2007	34,865,722	11,762,274	43,038,548	22,895,749	1,197,088	60,446	79,101,358	34,718,469
2008	22,585,412	6,224,872	43,179,060	23,306,585	1,115,605	182,515	66,880,077	29,713,972
2009	23,238,193	10,150,428	50,893,024	27,917,566	458,142	27,772	74,589,359	38,095,766
2010	13,274,690	3,538,923	44,744,273	11,830,063	863,245	129,672	58,882,208	15,498,658
2011	32,011,294	6,177,611	37,134,112	15,002,605	260,614	44,203	69,406,020	21,224,419
2012	22,367,352	6,539,460	48,289,971	22,290,748	1,129,073	95,887	71,786,396	28,926,095
2013	31,136,986	8,493,016	39,850,709	17,310,157	1,718,231	258,849	72,705,926	26,062,022
Average	31,041,447	12,789,364	41,956,341	23,643,507	2,244,336	562,707	75,242,124	36,995,578

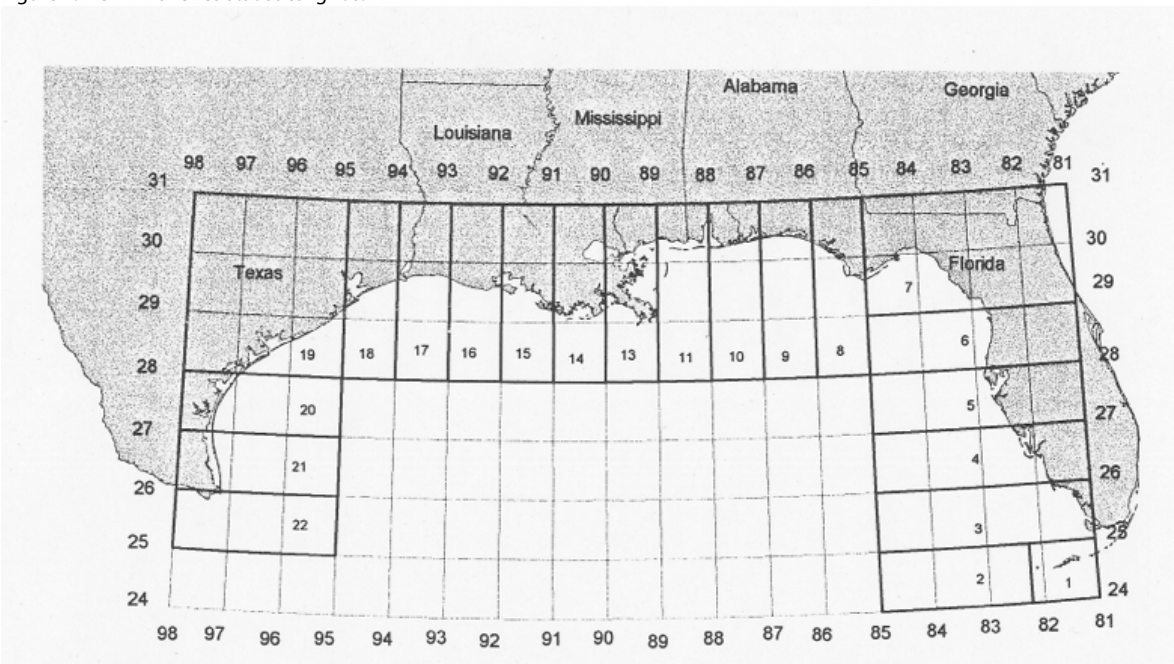
Figure 3. Louisiana's trip ticket basins, inside/outside line (in yellow), and NOAA Fisheries-recognized state/federal boundary (in red; three nautical miles seaward of the Louisiana coastline).

By basin and NOAA Fisheries grid

When commercial fishermen land shrimp in Louisiana, they are required to identify on their trip tickets the area, by major estuarine basin (Figure 3) or NOAA Fisheries grid (Figure 4), in which they caught the majority of their shrimp during each trip. For landings records and statistical purposes, NOAA Fisheries has divided federal waters of the U.S. Gulf of Mexico into 22 grids ranging from Key West, Florida westward to Brownsville, Texas. Grids 13 through 17 are

located in federal waters seaward from the Louisiana coastline.

Figure 4. NOAA Fisheries statistical grids.



Average landings from the Terrebonne and Barataria basins comprised over 73 percent of combined brown, white, and seabob shrimp landings among all basins between 2000 and 2013 (Table 7). Landings from the Lake Pontchartrain basin ranked third, followed by the Mississippi River, Calcasieu River, Atchafalaya-Vermilion-Teche River, Mermentau River and Sabine River basins. Comparisons of Louisiana shrimp landings from federal waters of the U.S. Gulf of Mexico indicate that landings from NOAA Fisheries grid 15 ranked first among grids, followed by grids 14, 13, 16 and 17.

The Barataria basin accounted for highest average annual brown shrimp landings among all basins (44 percent) followed by Terrebonne (33 percent), Lake Pontchartrain (13 percent), Mississippi River (5 percent), and Calcasieu River (4 percent) basins (Table 7). Brown shrimp landings from the Atchafalaya-Vermilion-Teche River, Mermentau River and Sabine River basins together comprised less than 1 percent of average brown shrimp landings from 2000 to 2013. Average annual brown shrimp landings from NOAA Fisheries grid 14 ranked first, followed by grids 13, 15, 16 and 17.

The Terrebonne basin accounted for highest average annual white shrimp landings among basins (40 percent) followed by Barataria (31 percent), Mississippi River (11 percent), Lake Pontchartrain (8 percent), Atchafalaya-Vermilion-Teche River (6 percent), and Calcasieu River (3 percent) basins (Table 7). The Mermentau and Sabine River basins together comprised less than 1 percent of average annual white shrimp landings. Comparisons of brown and white shrimp landings indicate that a large majority of shrimp harvested in federal waters of the U.S. Gulf of Mexico are white shrimp. Average annual white shrimp landings ranged from a high of 9.5 million pounds in NOAA Fisheries grid 15 to less than 1 million pounds in grid 17.

Compared to brown and white shrimp landings, seabob shrimp are harvested at much lower levels; consequently, much of these landings data are considered confidential at the annual basin and grid level (Table 7). Among all basins and grids, the Mermentau River basin led all areas in average annual seabob landings, followed by the Terrebonne basin.

It is important to note that brown, white, and seabob shrimp landings in certain years within certain basins and grids are considered confidential and are not included or used in averaging or summarizing landings totals.

Table 7. Average annual shrimp landings by basin and NOAA Fisheries statistical grid, 2000-2013.

Basin/Grid	Brown shrimp	White shrimp	Seabob shrimp	Total
Lake Pontchartrain	3,959,953	3,271,760	*23,479	*7,231,713
Mississippi River	1,653,042	4,437,317	*263,913	*6,090,359
Barataria	13,713,003	13,002,833	288,062	27,003,898
Terrebonne	10,145,204	16,948,405	709,630	27,803,239
Atchafalaya-Vermilion-Teche River	318,661	2,666,556	*420,098	*2,985,217
Mermentau River	*50,850	198,858	848,068	*1,046,926
Calcasieu River	1,182,180	1,368,048	510,823	3,061,051
Sabine River	*20,397	51,201*	**	*71,598
NOAA Fisheries Grid 13	3,898,012	4,679,155	*114,717	*8,577,167
NOAA Fisheries Grid 14	4,513,112	5,390,044	*89,017	*9,903,156
NOAA Fisheries Grid 15	2,869,748	9,535,277	*215,121	*12,405,025
NOAA Fisheries Grid 16	752,723	3,130,747	*228,013	*3,883,470
NOAA Fisheries Grid 17	*407,974	*773,335	*421,720	*1,603,029

*Average does not include years for which data is confidential.
**Confidential data.

Landings by Market Size

Among Louisiana's commercially harvested shrimp species, white shrimp are harvested at the largest and most valuable sizes (Table 8). Landings of white shrimp at sizes of 16-20 count per pound (one pound equals 16 to 20 shrimp) averaged 8.6 million pounds annually and comprised the largest component of white shrimp of any size landed from 2000 to 2013. Landings of slightly larger 11-15 count per pound white shrimp (6.7 million pounds) accounted for the third highest proportion among white shrimp sizes and closely followed the 7.2 million pound average of 41-50 count per pound white shrimp. Landings of smaller size white shrimp ranging from 61-70 to more than 100 count per pound comprised approximately 25 percent of average white shrimp landings.

Large brown shrimp sizes, ranging from 0-10 to 21-25 count per pound, comprised approximately 6 percent of average brown shrimp landings (Table 8). Landings of mid-size brown shrimp ranging from 26-30 to 51-60 count per pound comprised a larger component (17 percent) of average brown shrimp landings. However, landings of the smallest sizes of brown shrimp (61-70 to more than 100 count per pound) accounted for more than one-half of average brown shrimp landings from 2000 to 2013.

Seabob shrimp were harvested at mostly small sizes, with 99 percent of landings from 2000 to 2013 ranging from 80-100 to more than 100 count per pound (Table 8).

Table 8. Average Louisiana shrimp landings by species and market size (count per pound), 2000-2013.

Count per Pound	Brown	White	Seabob	Pink	Royal red	Rock	Roughneck
0-10	247,648	1,636,779	-	427	-	5	-
11-15	775,047	6,708,048	3	736	-	84	-
16-20	911,255	8,585,060	134	971	-	96	-
21-25	615,767	3,901,785	72	908	-	84	-
26-30	1,323,744	4,483,793	83	2,630	-	831	-
31-35	1,693,374	4,604,407	5	4,153	314	1,267	-
36-40	2,373,976	5,343,726	86	4,517	13	1,095	-
41-50	4,795,722	7,241,067	350	6,295	7	597	-
51-60	6,509,536	6,079,517	814	2,490	35	450	86
61-70	7,628,295	5,200,170	1,963	2,268	567	-	1,342
71-80	7,642,538	4,440,565	6,851	1,613	-	1	4,832
80-100	8,062,125	5,391,033	102,059	4,528	139	21	6,241
>100	899,244	1,267,593	925,025	693	1,261	-	1,210

Number of Commercial Shrimpers

Annual sales of commercial trawl, skimmer net, and butterfly net gear licenses have ranged from nearly 23,000 in 2001 to approximately 9,111 in 2005 and averaged more than 15,000 from 2000 to 2013 (Table 9). Gear license sales exceeded 20,000 annually through 2003 but abruptly declined in 2005, the year of Hurricanes Katrina and Rita. Gear license sales increased in 2006 and have remained somewhat consistent. Trawl licenses were the most popular shrimp gear license issued through 2005 but have since been replaced by skimmer net gear licenses. Butterfly net licenses have been the least popular among shrimp gear licenses; sales numbered fewer than 700 in 2013.

Table 9. Annual commercial shrimp gear license sales, 2000-2013.

Year	Trawl	Skimmer net	Butterfly net	Total
2000	12,006	7,636	2,576	22,218
2001	11,960	8,561	2,344	22,865
2002	11,078	8,544	2,005	21,627
2003	9,846	9,034	1,706	20,586
2004	8,339	7,535	1,473	17,347
2005	4,715	3,508	888	9,111
2006	5,994	6,490	1,162	13,646
2007	5,368	6,072	1,150	12,590
2008	4,773	5,590	1,113	11,476
2009	4,823	6,040	1,219	12,082
2010	4,841	6,705	1,260	12,806
2011	4,946	7,112	1,176	13,234
2012	4,845	6,806	1,077	12,728
2013	2,940	6,516	667	10,123
Average	6,891	6,868	1,415	15,174

It is difficult to quantify the exact number of fishermen who participate in the commercial shrimp fishery based on gear license sales because gear licenses are transferable. However, the number of shrimp fishermen participating in the fishery from year to year can be estimated through shrimp gear fees. Any fisherman who purchases a trawl, skimmer net, or butterfly net license must pay these fees once a year. According to gear fee sales, the number of licensed resident and non-resident shrimp fishermen in the Louisiana shrimp fishery from 2000 to 2013 has steadily declined from highs of 9,900 and 10,006 in 2000 and 2001 to a low of 5,101 in 2008 and averaging fewer than 5,600 thereafter (Figure 5).

Similarly, the number of licensed fishermen who reported sales of shrimp through trip tickets has followed this declining trend, ranging from a high of nearly 7,000 in 2001 to a low of 2,912 in 2008 (Figure 5). Both the number of licensed fishermen and those reporting trip ticket sales of shrimp slightly rebounded in from 2009 through 2011 but since declined to levels observed in the late 2000s.

The large disparity between the number of commercially licensed shrimp fishermen (those who paid a shrimp gear fee) and those reporting sales of shrimp can likely be attributed to the widespread use and importance of commercial shrimp gear in the recreational fishery. Recreational trawl gear is restricted to trawls 25 feet and under, and their use is subject to daily harvest limits so recreational shrimp fishermen may choose to purchase commercial shrimp gear (and appropriate licenses) to enhance their catch. Skimmer nets, butterfly nets, and trawls greater than 25 feet must be licensed commercially, and these gears are not restricted by daily harvest limits. Anecdotal evidence suggests that some Louisiana recreational fishermen obtain commercial shrimp gear licenses to use trawls larger than 25 feet when fishing for shrimp for personal consumption or other recreational purposes. The extent of this practice is unknown. Any sale of shrimp, whether from a fisherman to a dock or retailed by a fisherman to a consumer, requires the sale to be reported on LDWF trip tickets.

Figure 5. Number of Louisiana licensed commercial shrimp fishermen (those who paid a shrimp gear fee) vs. number reporting sales of shrimp, 2000-2013.

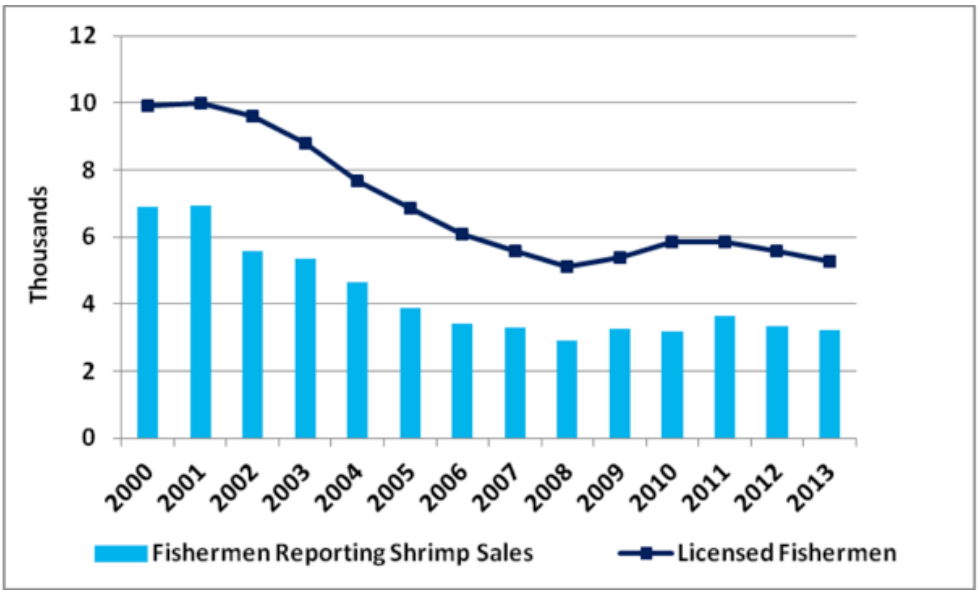
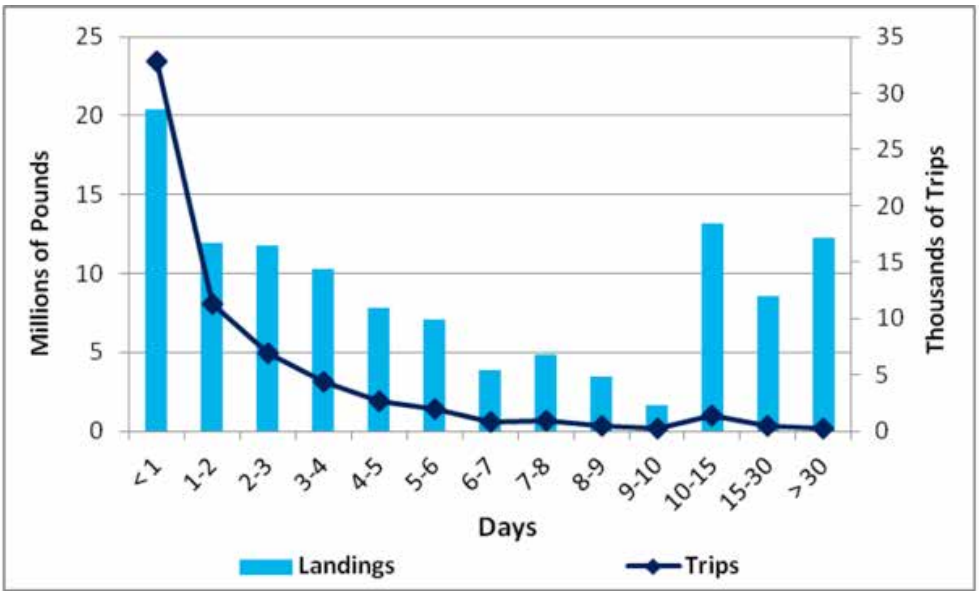


Figure 6. Average number of Louisiana shrimping trips and average landings by trip length, 2000-2013.



Fishing Effort

The majority of commercial shrimp fishing trips taken in Louisiana span less than two days (Figure 6). Trips spanning less than one day averaged nearly 33,000 annually and comprised approximately one-half of the total trips taken from 2000 to 2013. Annual landings for trips spanning less than one day averaged 20.4 million pounds, ranging from a high of nearly 43 million pounds in 2000 to a low of 13.8 million pounds in 2010 (Table 10). When combined with trips spanning one to two days, the number of trips spanning less than two days represented more than 68 percent of total trips taken and accounted for 28 percent of average annual landings. Combined landings from the number of trips spanning two to six days comprised 25 percent and 31 percent of total trips and landings, respectively. Both the average number of trips and landings from trips lasting more than six days and less than ten days were sharply lower; however, there were significant increases in both trip numbers and landings associated with trips spanning 10 to 15 days. Trips spanning more

than 15 days comprised only 3 percent of total trips taken from 2000 to 2013, but harvests from these trips accounted for nearly 30 percent of average annual landings.

The largest decline in trip length occurred in trips lasting less than one day; the number of these trips declined from nearly 76,500 in 2000 to 24,249 in 2013 (Table 10). Landings from these trips declined by more than 60 percent from 2000 to 2013; however, landings in 2013 were only 19 percent below the 2000-2013 average (Table 10). Although the number of trips spanning from two to seven days declined from earlier levels, the total number of these trips taken in 2013 exceeded the 2000-2013 average. Landings from these trips in 2013 also exceeded the 2000-2013 average. Trips spanning 15 to 30 days in 2013 numbered fewer than the 2000-2013 average, but landings from these trips were higher in 2013 than in seven of the previous 13 years. Similarly, 2013 trips spanning more than 30 days numbered fewer than the 2000-2013 average, but average landings per trip exceeded the 2000-2013 average by 22 percent.

Table 10. Annual Louisiana shrimp landings (all species combined/head-on weight) by trip length (days), 2000-2013.

	<1 day		1 to 2 days		2 to 3 days		3 to 4 days		4 to 5 days	
Year	**Number of trips**	**Total landings**	**Number of trips**	**Total landings**	**Number of trips**	**Total landings**	**Number of trips**	**Total landings**	**Number of trips**	**Total landings**
2000	76,474	42,751,296	15,635	14,962,865	10,005	13,923,818	6,084	11,994,089	3,718	8,683,548
2001	60,320	32,076,513	17,257	15,516,852	9,961	14,495,045	6,037	10,530,273	3,634	8,070,697
2002	41,584	20,572,531	11,322	9,519,330	7,344	9,206,592	5,338	9,234,547	3,373	7,336,868
2003	40,472	24,173,798	12,546	13,026,189	7,657	10,778,392	5,010	10,282,260	3,170	7,661,839
2004	36,277	22,860,004	13,151	14,490,386	7,770	13,464,126	5,785	14,286,677	2,718	8,216,341
2005	23,643	16,689,174	8,876	10,864,678	5,673	10,235,271	3,776	10,146,796	2,099	7,814,568
2006	24,589	19,631,052	11,825	15,200,386	6,725	15,188,297	4,147	13,556,291	2,109	8,315,622
2007	25,110	18,257,718	10,559	11,438,079	5,892	11,175,541	4,469	11,454,291	2,464	7,797,851
2008	19,063	14,180,116	8,720	10,947,551	5,086	10,115,438	3,273	8,508,601	1,939	6,631,339
2009	22,327	15,200,532	11,371	11,845,841	6,155	11,515,937	3,605	8,959,359	2,581	8,463,769
2010	19,621	13,801,525	8,667	10,849,514	4,943	10,973,134	2,165	7,101,106	1,591	6,455,856
2011	23,296	14,505,762	10,102	11,095,756	6,330	10,672,386	3,726	8,994,358	2,544	7,349,267
2012	21,946	14,896,345	8,236	9,366,782	6,549	11,935,929	3,907	9,181,625	3,082	9,031,208
2013	24,249	16,532,927	9,199	7,978,352	7,085	11,209,514	4,569	10,211,099	2,756	7,930,900
Average	32,784	20,437,807	11,248	11,935,897	6,941	11,777,816	4,421	10,317,241	2,698	7,839,977
	5 to 6 days		**6 to 7 days**		**7 to 8 days**		**8 to 9 days**		**9 to 10 days**	
Year	**Number of trips**	**Total landings**	**Number of trips**	**Total landings**	**Number of trips**	**Total landings**	**Number of trips**	**Total landings**	**Number of trips**	**Total landings**
2000	3,282	8,625,436	1,330	4,505,568	1,631	6,321,605	843	4,002,173	396	2,375,558
2001	2,848	7,203,893	1,065	3,489,494	1,443	5,286,720	804	3,685,225	340	1,655,994
2002	2,379	5,880,017	965	3,282,974	1,366	5,803,919	860	4,080,375	352	1,992,007
2003	2,380	6,855,775	927	3,461,226	1,098	5,543,237	807	5,150,311	339	3,000,473
2004	1,990	7,564,393	1,082	4,974,060	1,039	6,622,994	656	4,968,846	274	2,749,117
2005	1,403	5,740,634	587	3,220,873	609	4,214,690	531	4,214,172	197	2,016,592
2006	1,756	8,713,426	861	5,763,757	640	4,957,949	496	4,623,303	213	2,617,407
2007	1,801	7,512,435	796	4,117,398	712	5,147,998	379	3,332,469	177	1,721,112
2008	1,598	6,940,405	626	3,448,915	631	4,067,420	275	2,090,740	121	1,136,826
2009	1,594	6,059,486	713	3,284,976	829	5,007,537	484	3,595,576	124	1,062,490
2010	800	4,670,808	268	1,836,914	267	2,335,468	169	1,631,411	45	473,849
2011	1,714	6,377,518	779	3,534,094	598	3,515,795	267	1,908,981	118	863,453
2012	2,219	8,228,735	1,023	4,796,510	789	4,577,603	304	2,340,849	95	840,660
2013	2,645	8,990,329	1,027	4,335,553	760	4,448,190	354	2,436,366	101	725,312
Average	2,029	7,097,378	861	3,860,879	887	4,846,509	516	3,432,914	207	1,659,346

Table 10 continued. Annual Louisiana shrimp landings (all species combined/head-on weight) by trip length (days), 2000-2013.

	10 to 15 days		15 to 30 days		>30 days	
Year	**Number of trips**	**Total landings**	**Number of trips**	**Total landings**	**Number of trips**	**Total landings**
2000	2,615	18,402,436	641	6,756,972	199	4,105,733
2001	2,329	14,157,206	703	7,408,361	250	4,633,828
2002	2,321	15,025,111	767	8,901,178	292	6,445,621
2003	1,967	16,499,565	641	10,156,388	361	9,786,433
2004	1,680	15,584,898	520	9,214,315	294	9,198,773
2005	1,134	11,962,363	377	7,300,010	231	8,163,877
2006	1,193	15,603,344	409	12,015,049	266	12,260,415
2007	1,250	14,027,943	382	8,344,691	265	9,511,367
2008	1,009	11,807,300	337	7,377,071	247	9,344,316
2009	1,197	15,195,418	407	11,349,001	245	11,160,246
2010	395	5,494,297	281	6,408,924	74	2,355,442
2011	715	8,451,300	382	9,003,204	136	4,382,109
2012	936	11,625,464	338	7,705,924	178	6,195,506
2013	913	10,008,107	387	8,437,436	138	5,497,079
Average	1,404	13,131,768	469	8,598,466	227	7,360,053

Many of the commercially licensed shrimp fishermen in Louisiana land relatively low volumes of shrimp. The total number of fishermen landing brown and white shrimp from 2000 to 2013 averaged 3,440 and 3,480 annually (Figure 7; Table 11). Fishermen with annual landings ranging from 0 to 999 pounds of brown and white shrimp comprised the largest number of fishermen within any of the landings intervals examined. The number of fishermen with annual landings of brown shrimp ranging from 0 to 999 pounds averaged 790 annually from 2000 to 2013, declining from a high of 1,579 in 2001 to a low of 398 in 2008. The number of fishermen with annual landings of white shrimp ranging from 0 to 999 pounds averaged 826 annually from 2000 to 2013, declining from 1,621 in 2000 to a low of 479 in 2008. Combining the average number of fishermen landing 0 to 999 and 1,000 to 5,000 pounds of brown and white shrimp, fishermen landing less than 5,000 pounds of brown and white shrimp annually comprised approximately 48 and 46 percent, respectively, of the average number of commercial fishermen who reported shrimp landings from 2000 to 2013.

The number of fishermen with landings of brown and white shrimp ranging from 5,000 to 20,000 pounds averaged 31 and 26 percent, respectively, of the total number of shrimp fishermen who reported shrimp landings from 2000 to 2013 (Figure 7, Table 11). Since 2001, the number of fishermen reporting brown and white shrimp landings ranging from 5,000 to 20,000 pounds annually has declined; however, their percentage of the catch in 2013 (32 and 26 percent, respectively) remain consistent with the 2000 to 2013 average.

The number of fishermen reporting brown and white shrimp landings ranging from 20,000 to 50,000 pounds annually has similarly declined since 2001 (Figure 7; Table 11). From 2000 to 2013, the number of fishermen with brown and white shrimp landings ranging from 20,000 to 50,000 pounds averaged 16 and 17 percent, respectively, of the total number of fishermen reporting shrimp landings. In 2013, the number of these fishermen comprised 19 and 20 percent of the total number of fishermen reporting shrimp landings.

Fishermen reporting landings of both brown and white shrimp ranging from 50,000 to 100,000 pounds annually averaged 4 and 7 percent, respectively, of the total number of fishermen who reported shrimp landings from 2000 to 2013 (Figure 7; Table 11). Although the number of fishermen landing brown and white shrimp at these levels has declined since 2000, this decline has not been as pronounced as the decline among fishermen in other landings intervals. In 2000, shrimp fishermen with landings ranging from 50,000 to 100,000 pounds of brown and white shrimp peaked at 176 and 283, respectively. In comparison, these fishermen numbered 134 and 218 in 2013. In 2013, fishermen who landed 50,000 to 100,000 pounds of brown and white shrimp made up 5 and 8 percent, respectively, of the total number of fishermen who reported shrimp landings.

Fishermen reporting landing more than 100,000 pounds of brown and white shrimp annually averaged less than 1 and 3 percent, respectively, of the total number of fishermen who reported shrimp landings from 2000 to 2013 (Figure 7; Table 11). Fishermen landing more than 100,000 pounds of brown and white shrimp from 2000 to 2013 ranged from highs of 64 and 241, respectively, in 2007 to lows of 5 and 27, respectively, in 2001. Fishermen landing more than 100,000 pounds of brown and white shrimp in 2013 numbered 39 and 78, respectively.

Figure 7. Average number of Louisiana fishermen landing brown and white shrimp by landings interval (head-on weight), 2000-2013.

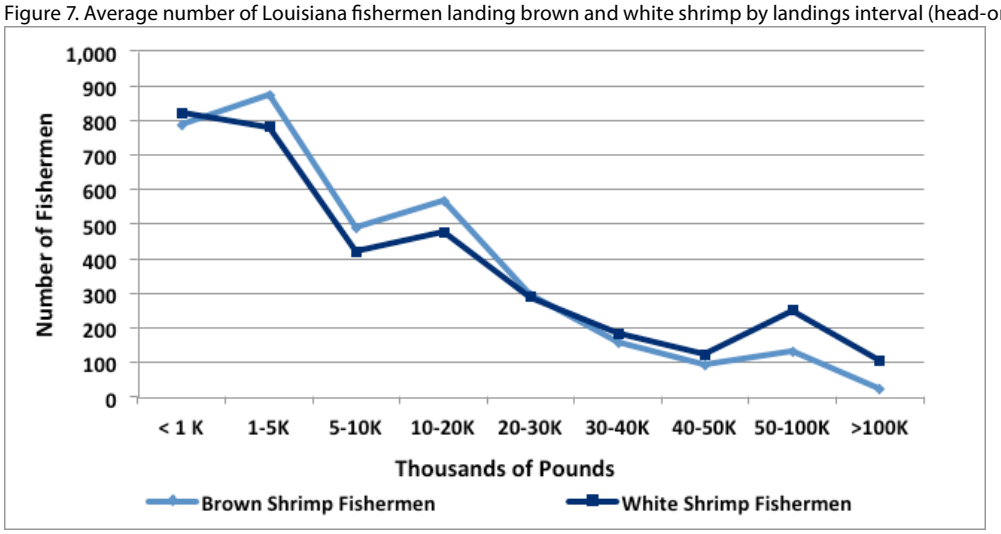


Table 11. Number of fishermen landing brown and white shrimp by landings interval (head-on weight), 2000-2013.

Year	2000		2001		2002		2003		2004	
Landings interval	Brown shrimp	White shrimp	Brown shrimp	White shrimp	Brown shrimp	White shrimp	Brown shrimp	White shrimp	Brown shrimp	White shrimp
0-999	1,513	1,621	1,579	1,508	1,293	1,188	1,099	1,055	878	841
1K-5K	1,331	1,215	1,593	1,153	1,317	1,057	1,163	960	927	905
5K-10K	788	667	784	640	715	556	673	569	490	432
10K-20K	857	793	936	780	809	588	749	570	578	507
20K-30K	464	488	507	385	361	314	373	329	340	318
30K-40K	243	320	276	203	186	142	195	224	177	222
40K-50K	139	193	164	96	105	102	110	114	107	182
50K-100K	176	283	164	183	171	166	219	266	223	324
>100K	18	58	5	27	12	24	30	64	49	109
Total	5,529	5,638	6,008	4,975	4,969	4,137	4,611	4,151	3,769	3,840
Year	2005		2006		2007		2008		2009	
Landings interval	Brown shrimp	White shrimp	Brown shrimp	White shrimp	Brown shrimp	White shrimp	Brown shrimp	White shrimp	Brown shrimp	White shrimp
0-999	681	761	502	522	456	558	398	479	551	559
1K-5K	785	789	632	574	556	598	565	541	637	583
5K-10K	496	407	346	351	358	307	330	275	397	310
10K-20K	611	385	478	345	495	375	362	334	421	364
20K-30K	289	232	255	237	298	271	228	217	216	246
30K-40K	168	138	159	161	183	171	131	177	104	178
40K-50K	81	94	124	128	129	121	67	127	66	123
50K-100K	103	263	159	327	172	262	75	257	101	311
>100K	7	115	64	241	34	137	10	147	24	187
Total	3,221	3,184	2,719	2,886	2,681	2,800	2,166	2,554	2,517	2,861

Table 11 continued. Number of fishermen landing brown and white shrimp by landings interval (head-on weight), 2000-2013.

Year	2010		2011		2012		2013		Average	
Landings interval	Brown shrimp	White shrimp	Brown shrimp	White shrimp	Brown shrimp	White shrimp	Brown shrimp	White shrimp	Brown shrimp	White shrimp
0-999	485	561	597	708	574	623	460	581	790	826
1K-5K	630	624	816	736	743	582	579	659	877	784
5K-10K	306	364	422	429	434	311	343	334	492	425
10K-20K	293	422	494	455	462	393	440	413	570	480
20K-30K	112	231	291	270	192	275	243	271	298	292
30K-40K	42	167	125	166	96	166	135	192	159	188
40K-50K	23	133	71	99	47	119	94	124	95	125
50K-100K	32	229	89	166	58	298	134	218	134	254
>100K	8	92	33	74	22	137	39	78	25	106
Total	1,931	2,823	2,938	3,103	2,628	2,904	2,467	2,870	3,440	3,480

Dealers

The number of wholesale/retail seafood dealers reporting purchasing shrimp directly from fishermen averaged 208 from 2000 to 2013, ranging from 267 in 2003 to a low of 172 in 2008 (Table 12). Dealers reporting annual purchases of less than 100,000 pounds of shrimp numbered more than any other group and, on average, comprised nearly 65 percent of all dealers who purchased shrimp. The number of dealers purchasing from 100,001 to 500,000 pounds of shrimp annually has generally declined since 2002. Dealers with annual purchases ranging from 500,001 to 1 million pounds of shrimp have remained at a fairly consistent level. The number of dealers reporting purchases between 1 and 5 million pounds of shrimp annually has generally declined since 2002. The number of dealers reporting purchases of more than 5 million pounds of shrimp has numbered seven or fewer since 2000; however, the number of dealers reporting shrimp purchases at this level has been confidential in many of these years. To ensure the confidentiality of dealer and fisherman information, LDWF does not release any individual data as well as any summarized data when less than three have reported landings or purchases.

Table 12. Number of Louisiana wholesale/retail seafood dealers by volume of shrimp purchased from commercial fishermen (all species combined/ head-on weight), 2000-2013.

Year	1-100,000 pounds	100,001-500,000 pounds	500,001-1 million pounds	1-5 million pounds	> 5 million pounds	Total
2000	139	31	17	50	*	237
2001	125	43	19	44	0	231
2002	129	39	20	33	0	221
2003	182	32	19	34	*	267
2004	164	22	18	36	4	244
2005	143	21	15	35	*	214
2006	111	9	15	33	6	174
2007	123	14	20	28	*	185
2008	106	21	17	28	*	172
2009	127	16	15	33	*	191
2010	117	19	14	27	*	177
2011	143	17	17	27	*	204
2012	140	14	19	27	4	204
2013	132	18	16	26	*	192
Average	134	23	17	33	*	208

*Confidential data.

Fresh Products License Holders

Regulations require commercial fishermen to sell their catch to a licensed wholesale/retail seafood dealer such as a dock or seafood market. However, fishermen who hold a fresh products license may retail their catch directly to a consumer. The spouse of a licensed commercial fisherman may also purchase a fresh products license, allowing the spouse to retail the catch while providing the commercial fisherman the opportunity to continue fishing. Fresh products license holders are also required to complete and submit trip tickets detailing sales made to consumers.

The number of fresh products license holders and their shrimp sales remained fairly low from 2000 to 2002 but slowly increased before peaking from 2009 to 2011 (Figure 8). In 2010, 339 fresh products license holders retailed approximately 302,000 pounds of shrimp. Both the number of license holders and volume of shrimp sales have since declined. In 2013, fresh products license holders numbered 168 with reported shrimp sales of approximately 57,000 pounds.

Fresh products license holders' shrimp sales totaled 1.89 million pounds from 2000 to 2013, with white shrimp comprising nearly 80 percent of the total (Figure 9). Sales of larger size shrimp ranging from 0-10 to 21-25 count per pound made up nearly 50 percent of total sales. Sales of smaller sizes were low, likely due to consumer preference for larger shrimp. Reported sales of shrimp by fresh products license holders in 2013 were a small component (less than one percent) of total shrimp landings; many have suggested that a large number of retail sales made by commercial shrimp fishermen and those holding fresh products licenses are not reported.

Figure 8. Number of Louisiana fresh products license holders and their reported sales of brown and white shrimp, 2000-2013.

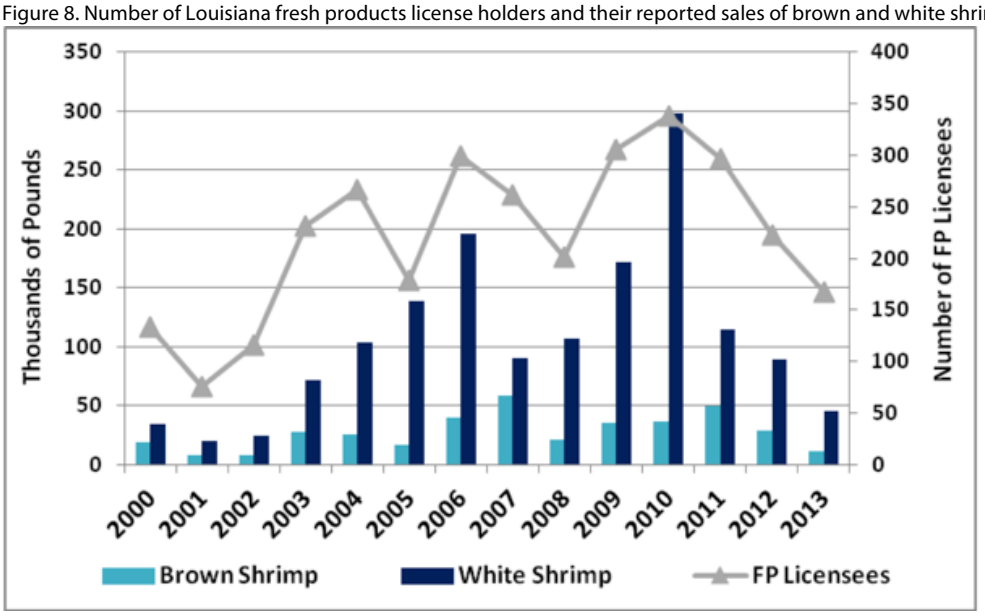
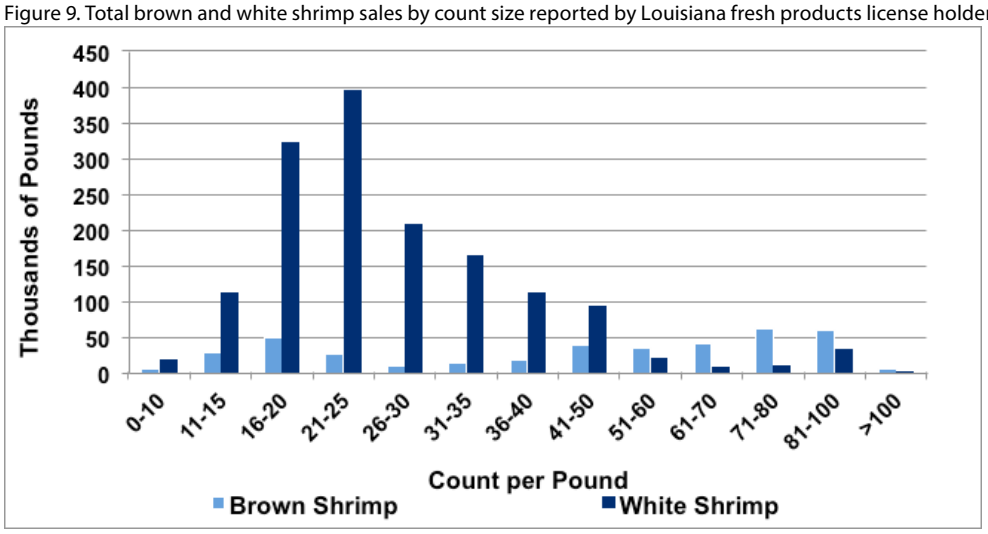


Figure 9. Total brown and white shrimp sales by count size reported by Louisiana fresh products license holders, 2000-2013.



Processors

NOAA Fisheries annually surveys seafood processors to measure seafood processing activity in Louisiana. Participation in the survey is optional, and all individual data are strictly confidential. The number of survey respondents reporting processing shrimp in Louisiana decreased from 25 in 2000 to 17 in 2012 (Table 13). The volume of shrimp products averaged 49.3 million pounds from 2000 to 2012, ranging from a low of 35.7 million pounds in 2008 to a high of 65.2 million pounds in 2009. The real value of shrimp products averaged $160.4 million from 2000 to 2012, from a high of $249 million in 2000 to $105.5 million in 2007.

During the time period measured, the volume of shrimp products per processor fluctuated between 1.98 million pounds in 2008 to 3.84 million pounds in 2009 (Table 13). The real value of shrimp products per processor ranged from $9.96 million in 2000 to $6.2 million in 2007.

Table 13. Volume and real value of shrimp products reported as processed in Louisiana, 2000—2012. Source: NOAA Fisheries Seafood Processors Survey data.

Year	Respondents producing shrimp products	Volume of shrimp products	Real value of shrimp products	Volume per processor respondent	Real value per processor respondent
2000	25	56,243,423	248,999,401	2,249,737	9,959,976
2001	22	47,731,135	214,177,188	2,169,597	9,735,327
2002	24	52,278,179	193,159,499	2,178,257	8,048,312
2003	23	52,763,544	171,305,865	2,294,067	7,448,081
2004	19	51,833,629	161,873,324	2,728,086	8,519,649
2005	21	43,720,029	145,056,266	2,081,906	6,907,441
2006	18	53,709,639	171,429,596	2,983,869	9,523,866
2007	17	41,195,236	105,502,543	2,423,249	6,206,032
2008	18	35,671,840	120,573,131	1,981,769	6,698,507
2009	17	65,237,048	138,303,634	3,837,473	8,135,508
2010	18	43,660,330	112,378,329	2,425,574	6,243,241
2011	18	48,203,698	136752642.4	2,677,983	7,597,369
2012	17	48,292,812	165864652.6	2,840,754	9,756,744
Average	20	49,272,349	160,413,544	2,528,640	8,060,004

In a survey of seafood processors in the U.S. Gulf of Mexico published by the Gulf States Marine Fisheries Commission (GSMFC), 43.7 percent of shrimp product sales among all processor-respondents who sold shrimp were peeled and deveined shrimp, 23.7 percent were headless shrimp, 5.1 percent were head-on shrimp, and 27.5 percent were in other forms (Miller et al. 2014a). Thirty-nine percent of shrimp sales were sold to states within the U.S. Gulf of Mexico region, 60 percent to purchasers in states outside the U.S. Gulf of Mexico, and one percent were exported. Forty-six percent of the shrimp processors sold only shrimp. In addition to selling shrimp, 40 percent sold crabs, 38 percent oysters, 38 percent fish, and 18 percent crawfish.

Imports

Shrimp are the most popular seafood consumed in the United States; in 2013, Americans consumed 3.6 pounds of shrimp per person (NFI 2015). Shrimp products make up the largest single import item among fish products (Joseph et al. 2013). The United States currently imports numerous shrimp products including frozen breaded shrimp, shrimp in prepared dinners, shrimp in other preparations, shrimp in cans and airtight containers, peeled shrimp, and shell-on shrimp. According to NOAA Fisheries U.S. Foreign Trade database, total U.S. imports of shrimp averaged 1.13 billion pounds and $4.26 billion per year between 2000 and 2013. Imports of shell-on and peeled shrimp comprise the majority of imports, averaging 43.5 percent and 32.7 percent of total imports by volume and 44 percent and 33.6 percent of total imports by value, respectively. The United States mainly imports shrimp from Southeast Asian countries, such as Thailand, Indonesia, China, India, and Vietnam, as well as Ecuador and Mexico. Historically, the source of supply was wild harvests from the tropical waters around the world; recent surges in imports have been caused by increases in the

production of foreign, farm-raised shrimp.

Shrimp imports to the United States have risen steadily since the 1970s (Gulf and South Atlantic Fisheries Foundation 2013). They began growing rapidly beginning the late 1990s, expanding from 582.89 million pounds in 1996 to a peak of 1.31 billion pounds in 2006. In 2001, the U.S. began importing record volumes of shrimp, much of it farm-raised, and the market share for domestic wild caught shrimp eroded to 12.4 percent (from 44.6 percent in 1980). U.S. imports rose due to a variety of factors including increased worldwide supply from rapid development of shrimp farms, stagnating demand in other major shrimp markets, and lack of duties on shrimp imports to the United States (Keithly and Poudel 2008, Haby et al. 2010). In conjunction with increasing imports, dockside prices for domestic shrimp have declined. For example, dockside prices fell by approximately 40 percent between 2000 and 2003; however, they have remained relatively stable since then (Keithly and Poudel 2008).

Shrimp imports have also negatively impacted the processing sector (Gulf and South Atlantic Fisheries Foundation 2013). Initially, processors benefitted from the extra product provided by imported shrimp because most imported shrimp arrived with little processing. In the 1980s, the processing of shrimp increased as imports increased and more shrimp was processed than was harvested locally. Imports helped stabilize processors. Today, increased imports are no longer a boon to processors because imported shrimp are increasingly being processed overseas, leaving little value to add once they arrive in the United States. Additionally, the stable supply of shrimp year round has disrupted processors' traditional strategy of storing shrimp until prices rise. Negative impacts to the processing sector are evidenced by declining numbers of processing firms in the southeast region.

In 2003, concern over the dramatic rise of cheaply priced imports and free-falling domestic shrimp prices prompted the Louisiana Shrimp Association (LSA), an organization of commercial shrimpers in Louisiana, to vote to initiate a petition with the U.S. Department of Commerce (USDOC) and U.S. International Trade Commission (USITC) to determine if countries were violating U.S. trade laws by selling shrimp into the U.S. market at below fair value (known as dumping). Nearly simultaneously, another group of southeastern U.S. shrimp producers and processors, the Southern Shrimp Alliance (SSA), filed an anti-dumping/countervailing petition with USDOC and USITC. Many Louisiana shrimp industry members and fishermen questioned the need and expense associated with two trade actions that were certain to eventually become consolidated. In response, the Governor created the Louisiana Wild Caught Shrimp Trade Action Advisory Council (LWCSTAAC) through an Executive Order (MJF 03-25). The LWCSTAAC was charged with supporting and assisting a trade action brought by a consolidated wild caught shrimp industry; exploring and developing funding sources to assist and support such trade action; and recommending proposed legislation to fund the trade action. The LWCSTAAC was subsequently reauthorized through Executive Orders KBB 04-05 and BJ 08-48.

In 2004, Louisiana's Governor authorized using $350,000 in shrimp industry disaster assistance funds (NOAA/USDOC Award No. NA02NMF4520310) to fund Louisiana's share of SSA's legal costs associated with the anti-dumping trade action. These federal grant funds were approved through a Cooperative Endeavor Agreement between LDWF and SSA and were redirected from the portion of allocated for shrimp marketing and promotional efforts. The LWCSTAAC recognized that additional funding would be need to support the trade action; subsequent funding was provided by the collection of additional fees assessed on commercial shrimp gear licenses and on wholesale/retail seafood dealers required to pay excise tax on shrimp and/or bought, sold, acquired, handled or purchased in excess of 250,000 pounds of shrimp during the previous license year (Act 904 of the 2004 Regular Legislative Session).

The USDOC and USITC established antidumping duties for shrimp imported from these countries to offset the domestic industry's economic losses due to dumping. The SSA continues to participate in the USDOC's annual administrative review of these duties. The USDOC adjusts the antidumping rates based upon their yearly investigations—more dumping results in higher antidumping rates, and less dumping results in a refund of collected duties (NCDMF 2015).

In 2010, the SSA successfully petitioned for shrimp harvested in the U.S. Gulf of Mexico and South Atlantic to be considered an eligible commodity for the Trade Adjustment Assistance for Farmers (TAAF) program. The TAAF program provides technical assistance and cash benefits to producers of farm commodities and fishermen who experience adverse economic effects from increased imports. The U.S. Department of Agriculture (USDA) Farm Service Agency administers this program.

In 2012, the Coalition of Gulf Shrimp Industries (COGSI) petitioned the USDOC and USITC to impose countervailing duties on seven shrimp-producing countries (China, Ecuador, India, Indonesia, Malaysia, Thailand, and

Vietnam) to neutralize the market impacts of imported shrimp subsidized by foreign governments (COGSI 2013). The USDOC preliminarily determined that these shrimp producers were benefiting from subsidy programs. However, in 2013, the USITC voted to deny this petition.

According to the SSA, the benefits of trade relief have not been apparent to the entire shrimp industry. Collected anti-dumping duties are typically distributed to domestic shrimp purchasers and not fishermen. Although there is increased stability in the market and declining shrimp prices have slowed, the amount shrimpers receive for their catch generally continues to decline (NCDMF 2015).

According to the shrimp industry, additional concerns regarding imports include transshipments of shrimp from third party nations, evasion of shrimp antidumping duties, inhumane treatment and abuse of immigrant workers in foreign shrimp supply chains, use of banned antibiotics in shrimp farming operations, and the repackaging of foreign imports and country of origin mislabeling (SSA 2015).

Economic Conditions

Miller and Isaacs (2014) conducted a survey of inshore shrimp fishermen who held licenses to commercially harvest shrimp in state waters of the U.S. Gulf of Mexico for the calendar year 2012; this survey was an update to a similar survey conducted in 2008 and described in a 2011 report (Miller and Isaacs 2011). The most recent survey examined the activities and financial performance of shrimpers who do not hold permits issued by NOAA Fisheries to harvest shrimp in federal waters of the U.S. Gulf of Mexico; therefore, it complements the annual analysis conducted by SEFSC concerning the economics of the federal U.S. Gulf of Mexico shrimp fishery. The majority (59.3 percent) of active inshore shrimpers were residents of Louisiana. The following are highlights of responses from all surveyed (not only Louisiana shrimpers):

- About 92 percent owned and operated their own vessels.
- The average vessel was about 24 years old and had a current market value of about $60,000.
- As a result of only 7.7 percent of respondents having loan balances in 2012, average debt was relatively low ($2,354), and average equity was relatively high at approximately $58,000.
- The average inshore shrimper took about 53 trips, almost entirely within state waters, and spent an average of 97 days at sea in 2012.
- Most inshore shrimpers (approximately 72 percent) harvested only shrimp and no other types of seafood. Most of their shrimp was sold to dealers or processors. About 85 percent sold no shrimp to retailers and 60 percent sold no shrimp directly to the public.
- Average cash inflows were about $85,000. Average cash outflows were approximately $59,000, about two-thirds of which was related to fuel, repairs and maintenance, and overhead. Average net cash flows were about $26,000, but median cash inflows were only $6,000. Estimated net cash flows were zero or negative for about 40 percent.
- When non-cash expenses like depreciation and owner's vessel time (opportunity cost) are included, and revenues unrelated to commercial fishing operations are excluded, average net income from operations falls to about -$5,000.
- Net income before taxes, which considers all sources of revenue, averaged $16,000. (Other sources of income related to shrimping include sale of other seafood, grant money, disaster relief payments, shrimp tariff disbursements, and oil spill compensation.) Estimated net income before taxes was negative for the majority of respondents.

There is a considerable amount of variability in the economic performance among inshore shrimpers in the U.S. Gulf of Mexico. Though average net cash flow and net income before taxes were positive, estimates for both were negative for many respondents. Economic conditions remain challenging for many commercial fishermen involved in the U.S. Gulf of Mexico inshore shrimp fishery.

Recreational Fishery

Recreational shrimpers target shrimp for food and both dead and live bait. In general, fishing effort is concentrated in shallow inshore waters, although some fishermen may fish along beaches and shallow nearshore waters when weather

conditions are favorable. Recreational fishermen generally use smaller outboard powered vessels rigged with a single trawl ranging from 6 feet to 25 feet headrope length. Trawls account for the majority of recreational catches; cast nets also contribute significantly to recreational shrimp harvests.

Although transferable, sales of recreational shrimp trawl licenses help indicate the number of fishermen participating in the recreational shrimp trawl fishery from year to year, but little data are available concerning recreational shrimping effort and harvest. NOAA Fisheries Marine Recreational Information Program (MRIP) does not collect data related to recreational shrimping. Also, use of trawls measuring 16 feet or less and other recreational gear is allowed under a Louisiana Sportsman's Paradise license. Sales of the Louisiana Sportsman's Paradise license when first available in 2001 numbered 672 but have increased to 5,519 in 2013; however, the number of these license holders who use trawls is unknown. Additionally, lifetime 16 and 25-foot trawl licenses are available for purchase, but combined sales have averaged less than six annually since first offered in 2005. Additionally, recreational shrimpers using cast nets are only required to have a basic fishing license. Recreational shrimpers also use dip nets and bait seines, neither of which require licenses, but use of these gears is very limited.

The number of recreational 16-foot trawl licenses sold annually has ranged from more than 6,000 in 2000 to 2,111 in 2013, about a two-thirds decrease since 2000 (Figure 10). Sharpest declines in 16-foot trawl license sales occurred from 2002 to 2003 and from 2004 to 2005; sales have since declined more gradually. Twenty-five foot recreational trawl licenses first became available in 2003; sales have been fairly consistent since 2005. Sales between 2006 and 2013 have averaged 444 annually, ranging from a high of 515 in 2009 to 396 in 2010.

The largest number of licensed recreational shrimp trawl fishermen both historically and currently reside in Jefferson Parish, followed by Lafourche, Terrebonne, St. John the Baptist, and St. Tammany Parishes (Table 14). Largest license sales are generally associated with coastal parishes; however, East Baton Rouge Parish ranked seventh overall in terms of 2013 recreational trawl license sales, likely due to a large population base of saltwater sport fishermen using trawls to catch bait.

Figure 10. Annual recreational 16 and 25-foot trawl license sales, 2000-2013. Includes both resident and nonresident license sales. Sales are by Fiscal Year (July 1-June 30). Source: LDWF License Files.

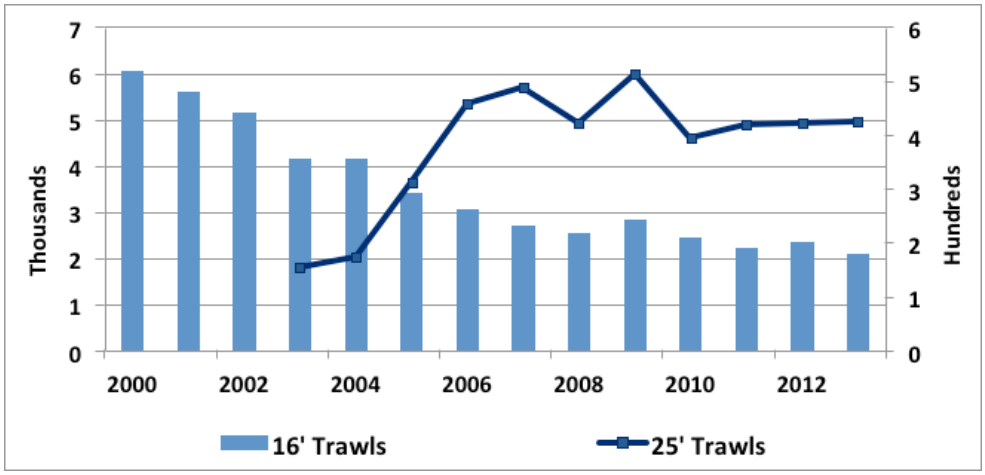


Table 14. Combined 16 and 25-foot recreational trawl license sales by parish of residence, 2000-2013. Data is not available by parish for 2001. Certain parishes not included due to low recreational trawl license sales.

Parish	2000	2002	2003	2004*	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average
Acadia	30	28	17	17	13	12	13	9	10	14	13	14	21	16
Ascension	59	55	56	42	44	43	33	26	28	36	50	56	45	43
Calcasieu	232	200	170	151	108	127	92	72	95	110	94	89	87	114
Cameron	20	14	12	13	12	10	5	11	9	11	15	11	9	11
East Baton Rouge	175	218	208	154	128	130	117	110	101	98	68	85	81	122
Iberia	42	38	55	46	62	70	72	46	45	41	45	53	60	54
Jefferson	1232	1,242	1,134	955	748	725	734	685	732	608	466	501	424	719
Jefferson Davis	39	14	32	26	20	27	36	23	23	40	30	48	38	30
Lafayette	68	59	53	48	50	42	47	37	38	38	57	68	68	51
Lafourche	751	808	780	634	582	516	413	377	434	274	383	361	299	476
Livingston	58	40	28	32	16	20	20	20	23	15	39	44	36	28
Orleans	243	287	163	136	128	84	30	32	34	30	94	93	83	98
Plaquemines	155	142	147	101	75	48	13	31	40	28	99	108	101	80
Saint Bernard	338	324	285	242	232	117	5	43	64	64	63	73	65	126
Saint Charles	202	140	162	118	91	95	80	57	70	37	71	83	71	88
Saint James	39	12	14	6	4	9	2	0	1	0	13	12	15	8
Saint Landry	20	101	85	80	65	79	67	48	60	54	12	15	9	53
Saint Mary	56	8	6	8	8	9	9	8	5	10	27	33	26	14
Saint Tammany	496	71	67	50	41	52	48	34	35	20	344	360	333	133
St John the Baptist	0	530	454	367	282	300	328	325	387	385	49	29	48	271
Tangipahoa	111	139	125	101	69	73	79	66	72	66	73	90	82	86
Terrebonne	572	774	733	627	555	482	414	390	380	275	343	341	308	457
Vermilion	61	56	63	67	67	80	73	45	54	65	54	68	58	62

*First year of 25-foot trawl license sales.

Miller et al. (2014b) conducted a Gulf-wide survey of recreational shrimpers who held licenses in 2013. The survey captured information on shrimping gear, effort and harvest, trip and gear related expenditures, reasons for shrimping, and respondent's age. Survey results for Louisiana recreational shrimpers are as follows:

- Approximately 76 percent of Louisiana respondents resided in a coastal parish.
- A nearly equal percentage of Louisiana recreational shrimpers were considered active and had taken at least one recreational shrimping trip within the 12 months preceding the survey.
- Nearly 90 percent of active Louisiana recreational shrimpers reported that they held a recreational shrimp license in two of the previous five years, and approximately 44 percent of shrimpers reported that they held a shrimping license in each of the previous five years.
- The majority (66 percent) of recreational shrimpers in Louisiana reported their primary reason for shrimping was personal consumption.
- Although shrimping for food ranked first among reasons for shrimping, approximately 40 percent of active shrimpers also claimed to shrimp recreationally for bait.
- Only 7 percent of Louisiana shrimpers indicated that they shrimped simply for recreation and relaxation.
- The most common gears used by active Louisiana recreational shrimpers were trawls, followed by cast nets.

Approximately 69 percent of active shrimpers only used trawls to harvest shrimp, whereas 3.5 percent of fishermen reported using only cast nets. Fishermen who reported using both trawls and cast nets comprised 24 percent of active shrimpers. It should be noted though that cast nets do not require a shrimping license, so this value may not represent the overall number of people using cast nets, only the usage among persons who also hold recreational trawling licenses. Very few Louisiana shrimpers reported using dip nets to harvest shrimp.

- In the 12 months preceeding the survey, Louisiana recreational shrimpers took an average of 8.6 trips, with harvests averaging 34.7 pounds per trip. The report authors estimated that a Louisiana recreational shrimp fisherman harvested an average of 319 pounds of shrimp in the 12-month period preceeding the survey and acknowledged that cumulative recreational shrimp harvests account for less than a fraction of a percent of commercial harvests.

Interactions with Other Fisheries or Users

Guillory et al. (2001) identified interactions between commercial crab trap fishermen and commercial shrimp fishermen as one of the most volatile user group conflicts. Conflicts arise in areas that are highly productive for both crabbing and shrimping. Crab trap fishermen have seen increased numbers of traps lost, damaged, or misplaced due to shrimping activities. Conversely, crab traps caught in shrimping gear can cause damage and loss of catch. A shrimper who catches an unserviceable crab trap must keep it on the vessel and properly dispose of it on shore. A shrimper that catches an otherwise serviceable trap without a float must return it to the water with a common float (an all-white plastic, one-gallon or larger bleach bottle). Louisiana's Blue Crab and Shrimp Task Forces continue to work to resolve issues of common interest, especially on potential changes to laws regulating possession of crab traps on shrimp vessel.

In addition, other issues may arise over oyster lease practices, geoseismic surveys, oil and gas exploration and production activity, commercial maritime navigation, and artificial reef development. Oyster lease holders are required to mark their leases; many choose to use 3.5 to 4-inch diameter PVC pipe to do so. When placed closely together or in high concentrations, these pipes may interfere with shrimpers' ability to fish these waters without risk of gear and vessel damage. The placement of buoys, cables and recorders associated with geoseismic surveys may present similar risk for gear and vessel damage. Abandoned or lost oil field equipment, other manmade underwater obstructions, and displaced hurricane debris continues to impact normal navigation and damage shrimp fishing gear. To mitigate financial losses caused by underwater obstructions in state waters, the Fisherman's Gear Compensation Program, administered by the Louisiana Department of Natural Resources (LDNR), was created. Qualified fishermen may receive compensation for losses to equipment and vessels resulting from hitting or snagging underwater obstructions following review and investigations of claims by LDNR Office of Coastal Management staff. To address the growing problem of natural and manmade underwater obstructions in navigable state waters, the Louisiana Underwater Obstruction Removal Program was created and is administered by LDNR Office of Conservation. Funding for the program is derived from an annual transfer of $250,000 from unused funds in the Fisherman's Gear Compensation Fund. Other conflicts may arise over navigational interactions with the marine transportation industry, particularly in narrow channels. The deployment of artificial reefs both inshore and offshore has led shrimpers to complain over the loss of fishing bottom.

Finally, to provide recreational anglers with a continuous supply of live bait, businesses holding a Special Bait Dealer permit may harvest and sell live bait during closed shrimp season. Some shrimpers have complained that heavy fishing effort within certain areas, particularly before the opening of the fall and spring inshore shrimp seasons, may be damaging the resource and have suggested that bait fishing should be restricted during these times.

Ecosystem Considerations and Environmental Factors

ADDRESSING POTENTIAL IMPACTS

State and federal authorities actively monitor the impact of the shrimp fishery on the ecosystem, for example, conducting research on bycatch through observer programs and other studies. State and federal authorities have implemented a number of measures to mitigate the fishery's potential impacts on other species, including requiring specific gear configurations and supporting species recovery efforts.

Ecosystem Considerations

Habitat

In the Gulf of Mexico, shrimp are harvested almost entirely over soft bottoms, such as mud or silt, which are more resilient to impacts from fishing gear than other bottom types (GMFMC 2014, Sheridan and Doerr 2007). Studies in other areas have indicated that shrimp trawling has few, if any, long-term impacts on organisms that dwell on soft bottoms (Cahoon et al. 2001, Simpson and Watling 2006). In North Carolina, based on underwater observations, skimmer nets are less damaging than otter trawls (Coale et al. 1994).

Bycatch and Discards

Fishing gear used to harvest shrimp can incidentally capture non-target species such as finfish and other crustaceans. Scott-Denton et al. (2012) reported on a mandatory federal observer program that was intended to characterize bycatch in the offshore penaeid shrimp fishery in the U.S. Gulf of Mexico. From 2007 to 2010, federal observers were placed on randomly-selected, federally-permitted shrimp otter trawl vessels. It should be noted that these vessels are required to carry bycatch reduction devices (BRDs). (A BRD is an opening in the shrimp trawl net to allow finfish or other incidentally captured

aquatic animals to escape while the target species of shrimp is directed towards the tail bag or cod end of the net.) Observers gathered data from 9,264 tows during 348 trips, the majority of which were off the coasts of Texas and Louisiana. Using weight extrapolations, they determined that the total bycatch to penaeid shrimp ratio was 2.5 kilograms (5.5 pounds) to 1 kilogram (2.2 pounds). The finfish to penaeid shrimp ratio in the U.S. Gulf of Mexico was 2.0 kilograms (4.4 pounds) to 1 kilogram (2.2 pounds). Bycatch to shrimp ratios were lower than reported in previous studies for the U.S. Gulf of Mexico penaeid shrimp fishery; these decreased ratios may be attributed to several factors, notably bycatch composition, use of BRDs, decreased shrimp effort, and higher shrimp catch per unit of effort (CPUE) in recent years. In terms of total CPUE, finfish comprised 57 percent of the catch and penaeid shrimp comprised 29 percent. Crustaceans (7 percent), invertebrates (5 percent), and debris (1 percent) accounted for the remainder. Observers identified 185 species; grouped finfish accounted for 27 percent of the total catch, followed by Atlantic croaker, *Micropogonias undulatus*, at 16 percent, brown shrimp at 14 percent, white shrimp at 11 percent, crustaceans at 7 percent, seatrout at 6 percent, invertebrates at 5 percent, longspine porgy, *Stenotomus caprinus*, at 4 percent, and pink shrimp at 4 percent. All other species accounted for 6 percent of the total weight.

Early estimates by Alverson et al. (1994) calculated a discard to landing ratio of 10.30 for the U.S. Gulf of Mexico shrimp otter trawl fishery. More recent assessments (Harrington et al. 2005, Kelleher 2005) revealed lower ratios. Scott-Denton (2007) estimated discards to landings ratios of 5.18 for the U.S. Gulf of Mexico from 1992 through 2005. These were slightly higher than estimates of 4.56 reported by Harrington et al. (2005) for 1992 through 1996 for the same area.

Bycatch rates are substantially lower in skimmer trawls compared with historical and current estimates of bycatch associated with capture from otter trawls. Scott-Denton et al. (2007) described the results of a voluntary coastal Louisiana skimmer trawl observer program from 2004 to 2005. Skimmer trawls are the dominant gear in Louisiana state waters. In this study, fishery observers collected data from 307 tows during 96 trips to estimate catch rates of target and non-target species. About 16,965.7 kilograms of total catch were recorded during 517 hours of fishing operations. White shrimp comprised 49 percent of the total catch; followed by other penaeid shrimp at 17 percent; Gulf menhaden, *Brevoortia patronus*, at 8 percent; blue crab, *Callinectes sapidus*, at 7 percent; discarded penaeid shrimp at 6 percent; debris at 3 percent; Atlantic croaker and threadfin shad, *Dorosoma petenense*, each at 2 percent; and blue catfish, *Ictalurus furcatus*, at 1 percent. All other species (54) comprised 5 percent of the total weight. The discards to landings ratio was 0.63 for the skimmer trawl fishery. This was notably less than the ratio of 4.56 reported by Harrington et al. (2005) for the shrimp otter trawl fishery in the U.S. Gulf of Mexico.

In 2012, the federal observer program expanded coverage to include the shrimp skimmer trawl fishery in the northern Gulf of Mexico. Data from observer coverage of skimmer trawl vessels fishing for shrimp off Louisiana, Mississippi, and Alabama from 2012 to 2014 is presented below:

- 2012: 58 trips, 796 tows; 43 percent had BRDs; bycatch to shrimp ratio: 1.24; finfish dominated the catch at 47 percent, followed closely by penaeid shrimp at 45 percent, crustaceans at 7 percent, debris at 2 percent, invertebrates at 1 percent, and discarded penaeid shrimp at less than 0.1 percent; total of 21 species (or species groupings) were identified—two species comprised more than 74 percent of total catch: brown shrimp at 38 percent and grouped finfish species at 36 percent (Pulver et al. 2012).
- 2013: 35 trips, 1,075 tows; 51 percent had BRDs; bycatch to shrimp ratio: 0.92; penaeid shrimp dominated the catch at 52 percent, followed closely by finfish at 43 percent, crustaceans at 3 percent, debris at 1 percent, invertebrates at 1 percent, and discarded penaeid shrimp at 0.1 percent; a total of 23 species (or species groupings) were identified; three species comprised more than 69 percent of

total catch: brown shrimp at 30 percent, grouped finfish species at 26 percent, and white shrimp at 14 percent (Pulver et al. 2014).

- 2014: 18 trips, 634 tows; 46 percent had BRDs; bycatch to shrimp ratio: 1.94; finfish dominated the catch at 64 percent, followed by penaeid shrimp at 34 percent, crustaceans at 2 percent, debris at 1 percent, invertebrates at less than 1 percent, and discarded penaeid shrimp at less than 0.1 percent; a total of 16 species groupings were identified; three species comprised approximately 87 percent of the total catch: grouped finfish species at 41 percent, brown shrimp at 26 percent, and Atlantic croaker at 20 percent (Scott-Denton et al. 2014).

Fishing characteristics (trip length, number of tows per trips, tow times), observer coverage levels, and catch rates varied over the aforementioned three years of coverage (Scott-Denton et al. 2014). Fewer vessels (18 trips) participated in 2014 compared with previous years; as such, this data may not be as representative of the fishery as a whole in terms of fishing practices, vessel characteristics, and geographic distribution/coverage. The bycatch to shrimp ratio (1.94) increased in 2014 compared to the ratio (0.92) in 2013, indicating that bycatch comprised a larger percentage of the catch.

Federal law requires shrimp vessels operating in federal waters to use BRDs to reduce non-target species being hauled in with the shrimp catch. As of August 1, 2015, LDWF law enforcement agents are authorized to enforce federal BRD regulations (see Appendix 1 for details of this legislation). In Louisiana state waters, BRDs are not mandatory but many fishermen voluntarily use them in both otter and skimmer trawls. However, some are concerned over potential shrimp loss if required to use BRDs in state waters. Fishermen may retain and sell most bycatch as long as they are in compliance with appropriate regulations and may retain fish for personal consumption as long as it is within minimum size and recreational daily possession limits. LDWF monitors landings and sales of these species through its trip ticket reporting system.

Sea Turtles

Five species of sea turtles often share the same aquatic habitat as shrimp in the Gulf of Mexico and Louisiana waters and may be affected by shrimping activities. All of these species are currently listed as threatened or endangered under the Endangered Species Act (ESA; Table 15).

Of these five species, Kemp's ridley sea turtles are of most concern in the Gulf of Mexico due to their limited range.

Table 15. Protected sea turtles in the Gulf of Mexico.

Species Common Name	Scientific Name	Endangered Species Act Status
Loggerhead sea turtle	*Caretta caretta*	Threatened
Green sea turtle	*Chelonia mydas mydas*	Threatened
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered

The other four species are found worldwide; Kemp's ridleys are predominantly found in the Gulf of Mexico, although they are also seen on the Atlantic Coast. See Appendix II for maps of sea turtle distribution. Kemp's ridleys primarily nest in the Western Gulf, on the beaches of Tamaulipas, Mexico (Figure 11). Sea turtles do not commonly use Louisiana's beaches as nesting habitat, although loggerhead sea turtles have been observed nesting in the Chandeleur Island area (Fuller and Lohoefener 1990). Kemp's ridleys primarily use Louisiana waters as foraging areas, possibly due to the large population of crabs, a major dietary component for Kemp's ridleys (Marquez-M. 1994).

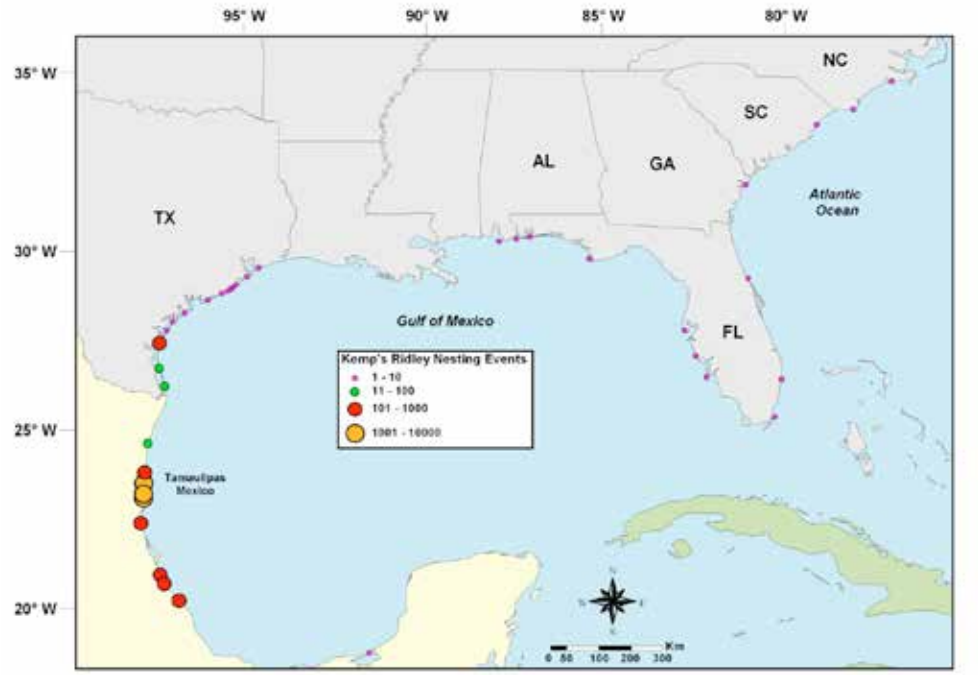
A decrease in the Kemp's ridley sea turtle population was observed during the early 1970s. This decrease was partially attributed to a number of factors, including egg collection, destruction and alteration of nesting and feeding habitats, and incidental capture in fishing gear. In fact, Magnuson et al. (1990) concluded that sea turtle mortality resulting from trawling operations in the southeastern shrimp fishery was the major source of man-induced mortality Kemp's ridley sea turtles. However, substantial progress has been made since the 1980s to reduce sea turtle interactions and recover sea turtle populations through a number of efforts, as discussed below (Scott-Denton et al. 2014).

Regulatory recovery efforts

NOAA Fisheries shares jurisdiction with the U.S. Fish and Wildlife Service (USFWS) for recovery and conservation of sea turtles listed under the ESA and leads the conservation and recovery of sea turtles in the marine environment. USFWS is the lead agency on land (nesting beaches).

The ESA prohibits directed harvest of sea turtles but permits incidental take of these species under some circumstances. ("Take" is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct", related to species listed under the ESA. "Incidental take" is the

Figure 11. Kemp's ridley nesting beaches in Tamaulipas, Mexico and proportion of nesting elsewhere, 2009 (NMFS et al. 2011).



unintentional, but not unexpected, take of those listed species.) Exceptions to this prohibition include incidental take during fishing activities in compliance with sea turtle conservation regulations and the restrictions, terms, and conditions of incidental take statements and biological opinions.

NOAA Fisheries has implemented several regulations under the ESA to prevent and reduce the impacts of incidental capture of sea turtles in the shrimp fishery. Although NOAA Fisheries does not have management authority over fisheries in state waters, the ESA gives them authority to mandate that state-authorized fisheries comply with sea turtle conservation regulations. As long as fishermen are in compliance with the following regulations, the taking of a sea turtle is legal, within certain limitations. Limitations include violating an incidental take statement, biological opinion, or incidental take permit or if the number of takes is likely to jeopardize the continued existence of sea turtles.

- Most vessels using otter trawls must install approved turtle excluder devices (TEDs) in their nets. A TED is a grid in the neck of a net, which has an opening in the bottom or top mesh to allow a turtle caught in the net to escape. When turtles and other large animals are caught at the mouth of a trawl, they bump into the grid bars and slide through the opening in the mesh. Shrimp and other small animals pass through the bars of the grid into the tailbag or cod end of the trawl net. TED use was initially voluntary among shrimpers; TEDs were mandated in 1987. Regulations include approved designs, design and construction standards, configuration, and proper installation for TEDs; specifics of these items have changed over the years in response to new research and changing circumstances.
- Some vessels are exempt from TED requirements and must follow tow-time restrictions instead. Exemptions include vessels with no power or mechanized trawl retrieval system; some bait shrimpers; pusher-head trawls and skimmer and butterfly nets; test/try nets (under certain circumstances); and specified areas during special environmental conditions or when TEDs are ineffective. A tow time is measured from the time that the trawl door enters the water until it is removed from the water. For a trawl that is not attached to a door, the tow time is measured from the time the cod end enters the water until it is removed from the water. Tow times may not exceed: 55 minutes from April 1 through October 31 and 75 minutes from November 1 through March 31.
- If shrimp fishermen incidentally capture a sea turtle, they must follow required guidelines for appropriate handling and resuscitation; depending on a captured sea turtle's condition, they release it alive,

rehabilitate it on board and release it, or release it dead.

See Appendix III for complete details of these regulations.

Section 7 of the ESA requires NOAA Fisheries to consult on sea turtle conservation regulations and continued authorization of shrimp fisheries in waters of the southeastern United States to ensure they are not likely to jeopardize the continued existence of sea turtles or result in the destruction or adverse modification of their critical habitat. At the end of the consultation process, NOAA Fisheries issues a biological opinion that identifies alternatives to the action as proposed, if any, that can avoid adverse impacts to sea turtles or their critical habitat, states the amount or extent of incidental take of the sea turtles that may occur, specifies measures that are required to minimize the impacts of incidental take and monitoring to validate the expected effects of the action, and recommends measures to further conserve the species. Consultations are reinitiated if the incidental take statement is exceeded, if there is new information or the action is modified in a way that has not been previously considered, or if there is a new species or critical habitat that the action could affect. NOAA Fisheries has conducted numerous consultations and subsequently issued numerous biological opinions regarding sea turtles and shrimp fisheries in the southeastern United States. Each one has authorized the continued operation of these shrimp fisheries, as long as they operate in compliance with sea turtle conservation regulations and NOAA Fisheries implements other measures as required in the biological opinions. See Appendix IV for a complete history of consultations and biological opinions.

Enforcement of and compliance with sea turtle conservation regulations play a major role in how successful they are at conserving sea turtles. NOAA Fisheries Office of Law Enforcement (OLE) and the U.S. Coast Guard (USCG) ensure shrimpers comply with sea turtle conservation regulations in all waters, including Louisiana state waters, through outreach to shrimpers before the shrimp season begins and enforcement patrols during the season. As of August 1, 2015, LDWF law enforcement agents are also authorized to conduct TED inspections aboard shrimp vessels and enforce federal sea turtle conservation regulations in state and federal waters (see Appendix I for details of this legislation). According to recent enforcement records for Louisiana waters, OLE inspected 187 shrimp vessels from October 2011 to December 2012 and found 41 TED-related violations, only ten of which were serious. Violations range from minor, such as a mismeasurement, which present a very low risk to sea turtles to more severe such as improper use or not using a TED at all; the degree of punishment directly relates to the type of violation. Ten of the 41 violations warranted action beyond a verbal or written warning (i.e. a fishing violation), meaning that of the vessels inspected, 78 percent were fully compliant with TED regulations and only around five percent had serious compliance issues. In 2013, the USCG boarded 58 vessels in Louisiana waters and found no TED violations, meaning 100 percent of the USCG-inspected vessels were compliant with TED regulations. See Appendix V for enforcement records from OLE and the USCG. More recent enforcement records are not available.

The SEFSC's Gear Monitoring Team (GMT) also assists with enforcement activities, providing TED technical training programs for enforcement officers who participate in enforcement boardings. The GMT also conducts extensive training and outreach to shrimp fishermen and TED net shops and conducts courtesy boardings; this helps inform stakeholders of the regulations and proactively identify and correct technical difficulties in the field to improve compliance with sea turtle conservation regulations. Texas Sea Grant and the Gulf and South Atlantic Fisheries Foundation provide similar training and outreach.

Throughout the U.S. Gulf of Mexico, TED compliance and sea turtle capture rates have fluctuated greatly since TEDs were first required. During 2010 and 2011, NOAA Fisheries documented elevated sea turtle strandings in the northern Gulf of Mexico, particularly throughout the Mississippi Sound area. NOAA Fisheries investigated possible causes for these strandings, including compliance with the TED laws, specifically proper TED installation and adherence to tow-time requirements. Initial reports indicated low compliance, with several instances of TEDs installed incorrectly or TEDs installed at incorrect angles. However, the majority of shrimp vessels with low compliance had new TEDs aboard which had not been used in trawling operations; further investigation traced many of the non-compliant TEDs back to specific net shops. GMT and enforcement personnel conducted site visits to the net shops in question to provide corrections. Thus, although very low TED compliance was documented, the discovery of the non-compliance prior to the fleet starting shrimp fishing en masse potentially averted more sea turtle deaths.

Since the extent and severity of TED violations play a major role in the success of sea turtle conservation regulations, NOAA Fisheries' 2012 Biological Opinion established a system to estimate and monitor actual performance of shrimp trawls in releasing sea turtles, effective June 2012. They set a "sea turtle capture rate

standard" for TEDs that limits the shrimp trawl fishery at or below an overall 12 percent sea turtle capture rate, a level estimated to not have an adverse effect on the sea turtle population.

Basically, according to NOAA Fisheries, the higher the compliance with TED laws, the lower the number of sea turtles estimated to be caught by shrimp trawls. When TEDs are not installed or maintained properly, their effectiveness can be reduced and, in severe cases (e.g. TED sewn shut), completely ineffective. To calculate a capture rate, NOAA Fisheries estimates the sea turtle mortalities caused by non-compliant TEDs and TED usage by assigning a rate of capture probability for TED violations. A TED installed incorrectly with an angle of 65 degrees would have a 90 percent chance of capturing a young (small) turtle and would then be scored as a 90 percent capture rate for juveniles; the same net would have a 60 percent chance of capturing an adult turtle and therefore would be assigned a 60 percent capture rate for adult sea turtles. A net with 100 percent compliance is still estimated to have a 3 percent capture rate. Using the percentages of compliant and non-compliant vessels, NOAA Fisheries estimates a final capture rate for all vessels.

NOAA Fisheries bases these capture rate estimations on TED testing observations using juvenile loggerheads and model leatherbacks and expert opinions of gear technicians (NMFS 2012). NOAA Fisheries derived capture probabilities from the following: TED testing observations during which juvenile loggerheads were exposed to various configurations of noncompliant TEDs, TED testing (diver-assisted) assessments of a leatherback model passing through non-compliant TED configurations, and expert opinion of SEFSC gear technicians.

NOAA Fisheries is required to review detailed TED inspection boarding data on the type and severity of the TED violation every six months to estimate the extent of overall fleet-wide compliance and associated sea turtle capture rates. If the six-month review indicates the shrimp trawl fleet exceeds the 12 percent standard, then NOAA Fisheries initiates a number of actions. If rates are not reduced after an additional six months, NOAA Fisheries then considers closing problem areas for up to one year. NOAA Fisheries' 2014 Biological Opinion reassessed this approach and requirements; they found that they are still realistic and that they should continue to monitor and ensure compliance with TED regulations at the 12 percent level, with some changes including monthly compliance reviews if the six-month period average exceeds 12 percent.

Since the 2012 Biological Opinion, NOAA Fisheries has been monitoring otter trawl TED compliance and periodically conducting sea turtle capture rate analyses per the terms and conditions of the opinion. From June 2012 through October 2013, the U.S. Gulf of Mexico overall average sea turtle capture rate for the entire data period was right at the established standard. The most recently published capture rate information is available in Table 16.

Table 16. Sea turtle capture rates, April 2014-January 2015 (NMFS 2015).

Month	Vessels Inspected for TED compliance	Vessels inspected found non-compliant	Overall sea turtle capture rate	Overall TED effective-ness
Apr 2014	50	22%	12%	88%
May 2014	23	13%	3%	97%
Jun 2014	7	29%	14%	86%
Jul 2014	83	19%	9%	91%
Aug 2014	48	13%	6%	94%
Oct 2014	4	0%	3%	97%
Nov 2014	15	0%	3%	97%
Dec 2014	6	17%	8%	93%
Jan 2015	4	0%	3%	97%

NOAA Fisheries also monitors incidental catch of sea turtles and compliance with TED regulations in the shrimp fishery through its observer program; however, this data is not considered in determining sea turtle capture rates. U.S. Gulf of Mexico shrimp trawl fisheries have been observed since 1992. Participation was voluntary until this program was made mandatory in July 2007; in June 2008, it expanded to include the South Atlantic. From July 2007 through December 2010, observers collected data from 10,206 tows over 5,197 days at sea during 608 trips; the majority of tows (around 70 percent) were off the coasts of Texas and Louisiana (Scott-Denton et al. 2012). Observed shrimp trawls captured 55 sea turtles (25 loggerhead, 21 Kemp's ridley, 4 green, 4 unidentified, and 1 hawksbill), mostly (47 percent) from May to August. Observers found 49 percent in try nets and 44 percent in TED-equipped nets (before the TED or in cod end). Four percent slid out of TED-equipped nets when they were retrieved, and 4 percent slid out of try nets when they were retrieved. Observers released most (80 percent) of the sea turtles alive and conscious.

In 2012, the observer program expanded coverage to include the shrimp skimmer trawl fishery in the northern Gulf of Mexico. Beginning in May 2012, observers were placed on randomly selected, state-licensed vessels to monitor sea turtle interactions. This expanded coverage was intended to provide data needed to develop management recommendations regarding incidental catch of sea turtles in the inshore skimmer fleet. In 2012, observers covered 119 days at sea and 796 tows. Of the skimmer trawls observed, five percent had TEDs. Observers documented the capture of 24 sea turtles, including 23 Kemp's ridley sea turtles; all were released alive. The majority (58 percent) of sea turtles captured during the 2012 observer coverage were small enough to pass through TED bar spacing (i.e. TEDs were ineffective for the small turtles in inshore waters). Tow times were exceeded on 65 percent of the tows observed in 2012 (Pulver et al. 2012).

Mandatory observer coverage of the skimmer fleet continued into 2013 and 2014. In 2013, observers covered 145 days at sea and 1,075 tows (Denton et al. 2013). Of the skimmer trawls observed, three percent had TEDs. Eight sea turtles were captured on observer trips in 2013; seven of these were Kemp's ridleys. Seven were released alive; one was released dead. Based on observer data, 38.07 percent of all tows and 38.66 percent of all tows from nets without TEDs did not exceed the seasonal 55-minute limit. The average tow-time for all tows was 62.7 minutes, and the average tow-time for nets without TEDs was 60.9 minutes. In 2014, observers covered 82 days at sea and 634 tows (Scott-Denton et al. 2014). Of the skimmer trawls observed, five percent had TEDs. Ten sea turtles were captured on these observed trips; six were released alive, three were released dead, and one was previously dead when captured. Observer data indicated that 27.8 percent of all tows and 28.6 percent of all tows from nets without TEDs did not exceed the seasonal tow-time limit. The average tow-time for all tows was 64.2 minutes, and the average tow-time for nets without TEDs was 63.8 minutes.

Other recovery efforts

The ESA requires USFWS and NOAA Fisheries to develop and implement species recovery plans for endangered or threatened species. These plans include a description of the site-specific management actions necessary to recover the species, objective criteria to measure the recovery of the species and removal from the list, and estimates of the time and costs required to achieve the plan's goals. Various stakeholders implement these plans.

The latest recovery plan for Kemp's ridley sea turtles is a bi-national plan, approved by both the U.S. and Mexican governments (NMFS et al. 2011). The recovery plan's strategy is to maintain and strengthen the conservation efforts already proven successful for Kemp's ridleys—protecting habitat, nesting females and nests, and maintaining or increasing hatchling production on the nesting beaches and, in the water, maintaining and expanding TED use and reducing mortality in gillnet fisheries. The plan also identifies adequate enforcement both on land and in the marine environment as essential for species recovery. The plan advocates development of social and economic programs in Mexico to reduce incidental capture of Kemp's ridleys in fisheries, additional research and monitoring to identify important habitats, migrations, and interactions between Kemp's ridleys and commercial and recreational fisheries. Finally, the plan identifies sources of increased funding and partnerships among stakeholders as needs to ensure long-term protection and sustained recovery of Kemp's ridleys.

The recovery plan established the following criteria that must be met prior to downlisting Kemp's ridley to threatened status or delisting Kemp's ridley from the Endangered Species List:

Downlisting demographic criteria

1. A population of at least 10,000 nesting females in a season (as measured by clutch frequency per female per season) distributed at the primary nesting beaches (Rancho Nuevo, Tepehuajes, and Playa Dos) in Mexico is attained. Methodology and capacity to implement and ensure accurate nesting female counts have been developed.
2. Recruitment of at least 300,000 hatchlings to the marine environment per season at the three primary nesting beaches (Rancho Nuevo, Tepehuajes, and Playa Dos) in Mexico is attained to ensure a minimum level of known production through in situ incubation, incubation in corrals, or a combination of both.

Delisting demographic criteria

1. An average population of at least 40,000 nesting females per season (as measured by clutch frequency per female per season) over a 6-year period distributed among nesting beaches in Mexico and the U.S. is attained. Methodology and capacity to ensure accurate nesting female counts have been developed and implemented.
2. Ensure average annual recruitment of hatchlings over a 6-year period from in situ nests and beach corrals is sufficient to maintain a population of at least 40,000 nesting females per nesting season distributed among nesting beaches in Mexico and the U.S into the future. This criterion may rely on massive synchronous nesting

events (i.e., arribadas) that will swamp predators as well as rely on supplemental protection in corrals and facilities.

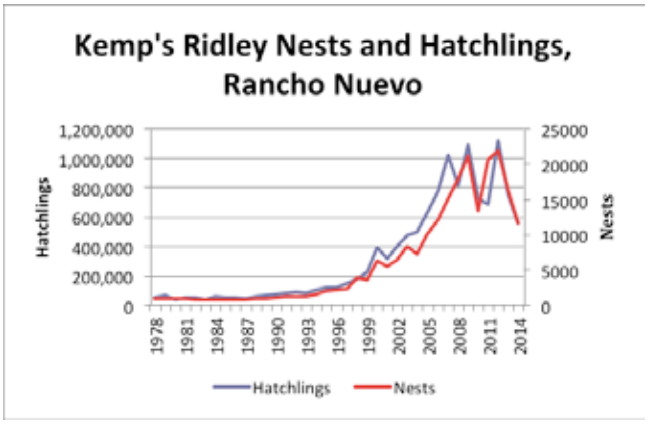
NOAA Fisheries is required to conduct five-year reviews to gather the most recent information on listed species and determine whether recovery criteria have been met. They began the latest five-year review for Kemp's ridleys in 2012.

Since the 1970s, a number of organizations including the Gladys Porter Zoo, USFWS, NOAA Fisheries, the Texas Parks and Wildlife Department, the National Park Service, Mexican government agencies, and private groups have cooperated to protect sea turtle nests and hatchlings on Rancho Nuevo and the surrounding Mexican beaches where the majority of Kemp's ridley sea turtles nest. USFWS previously funded these efforts; the GSMFC provided funding to support continued conservation efforts during the 2014 nesting season. Current efforts include observing nesting, protecting nests, counting hatchlings, and recording stranded sea turtles. It is important to collect information on number of Kemp's ridley nests around the Gulf of Mexico to monitor their recovery, especially as the delisting criteria for the species is set at 40,000 nesting females, based on the number of estimated nests that were seen in Tamaulipas in 1947. Since the program's inception, nest and hatchling numbers have increased tremendously (Table 17; Figure 12).

Table 17. Kemp's ridley nests and hatchlings recorded at Rancho Nuevo (Pena 2014). 2014 data is preliminary.

Year	Nests	Hatchlings	Year	Nests	Hatchlings
1978	924	48,009	**1997**	2,387	149,567
1979	954	63,996	**1998**	3,845	183,920
1980	868	37,378	**1999**	3,648	228,148
1981	897	53,282	**2000**	6,277	395,150
1982	750	48,007	**2001**	5,442	317,127
1983	746	32,921	**2002**	6,436	402,969
1984	798	58,124	**2003**	8,323	476,138
1985	702	51,033	**2004**	7,147	500,767
1986	744	48,818	**2005**	10,099	630,737
1987	737	44,634	**2006**	12,143	782,319
1988	842	62,218	**2007**	15,032	1,023,675
1989	828	66,802	**2008**	17,882	817,103
1990	992	74,339	**2009**	21,144	1,089,452
1991	1,178	79,749	**2010**	13,302	723,065
1992	1,275	92,116	**2011**	20,576	685,387
1993	1,241	84,605	**2012**	21,797	1,115,527
1994	1,562	107,687	**2013**	16,385	755,428
1995	1,930	120,038	**2014**	11,681	559,688
1996	2,080	119,196			

Figure 12. Kemp's ridley nests and hatchlings.



Current status

Sea turtle populations are monitored through several programs such as the Sea Turtle Stranding and Salvage Network (STSSN); self-reporting guidelines; population assessments; and aforementioned ESA consultations and resulting biological opinions.

The STSSN documents and responds to strandings of marine turtles on the U.S. Gulf of Mexico coast. LDWF is the primary sea turtle stranding response entity for the state of Louisiana. Biologists respond to all stranding reports and collect information including species, location, date, length, weight, and condition of the stranded sea turtle. They also rescue any live stranded sea turtles and take them to the Audubon Nature Institute for rehabilitation. There has been an increase in reported strandings in recent years in the northern Gulf of Mexico, particularly in the Mississippi Sound area. A large percentage of these strandings has been Kemp's ridleys. It should be noted that search effort has also increased due to increased presence on beaches from *Deepwater Horizon* oil spill response as well as National Fish and Wildlife Foundation-funded beach stranding surveys. NOAA Fisheries has not identified a definitive cause for these strandings; necropsy results indicate a significant number of stranded turtles from these events likely perished due to forced submergence, which is commonly associated with fishery interactions yet available information indicates fishery effort was extremely limited during the stranding events. The fact that the majority of stranded sea turtles were Kemp's ridleys is notable; however, this could simply be a function of the species' preference for shallow, inshore waters coupled with increased population abundance as reflected in recent Kemp's ridley nesting increases (described below; NMFS 2014). See Appendix VI for current strandings data.

In 2012, the GSMFC funded a stock assessment for Kemp's ridley sea turtles to provide refined analysis of the Kemp's ridley population in the Gulf of Mexico and to document and quantify both fishing and non-fishing related impacts on the population to better inform conservation and management efforts. Specifically, the stock assessment examined Kemp's ridley population status, trends, and temporal and spatial distribution in the Gulf of Mexico, estimated fishing mortality from shrimp trawls, and estimated total mortality (from all causes; Gallaway et al. 2013). The report concluded that the total population of Kemp's ridley sea turtles in recent years is likely in excess of one million, including about a quarter million subadults and adults. (About 75 percent of the population is very young and has not yet reached sexual maturity, which generally indicates a growing or rebounding population).

The recovery plan states average nests per female is 2.5, and the recovery goal of 10,000 nesting females is associated with 25,000 nests. About 30,000 nests are indicative of 10,000 nesting females in a season (NMFS and USFWS 2007). According to the 2014 Biological Opinion, Kemp's ridley nesting from Rancho Nuevo and adjacent Mexican beaches steadily increased through the 1990s, and then accelerated during the first decade of the 21st century, indicating the species is recovering. Kemp's ridley nests reached a record high of 21,797 in 2012, up from a significant, unexplained 1-year decline in 2010 (Pena 2014). A small nesting population is also emerging in the United States, primarily in Texas, rising from 6 nests in 1996 to 42 in 2004, to a record high of 209 nests in 2012. Nesting has also increased in Veracruz, Mexico, from 92 in 2000 to 819 in 2013. Kemp's ridley populations were increasing through 2012 and could have met criteria for delisting from the Endangered Species Act (NMFS 2012). The recent increases in Kemp's ridley sea turtle nesting seen in the last two decades are likely due to a combination of management measures including elimination of direct harvest, nest protection, the use of TEDs, reduced trawling effort in Mexico and the United States, and possibly other changes in vital rates (TEWG 1998, TEWG 2000). However, in 2013, there was a second significant decline, with only 16,385 nests recorded. Preliminary data from 2014 also indicate a large decline in number of nests and hatchlings. Gallaway et al. (2013) suggested the recent decline is related to reduced prey resources which may affect nesting frequency; other possible causes include losses of adults and sub-adults in the population due to the *Deepwater Horizon* oil spill or some other factor. Studies regarding the effects to Louisiana's natural resources, including sea turtles, from the *Deepwater Horizon* oil spill are ongoing through the Natural Resource Damage Assessment process.

Additional considerations

Several additional factors should be considered when examining sea turtle populations and the U.S. Gulf of Mexico shrimp fishery.

Declining effort

Shrimp fishing effort has declined in recent years due to economic, environmental, and regulatory factors, such as high fuel costs, imported shrimp prices, natural disasters, and limited entry in federal waters. Federal effort data indicates decreases of up to 50 percent between 1985 and 2012 in federal shrimping zones 7 through 21 (Hart and Nance 2013). Data collected through the Louisiana trip-ticket program indicates a similar decline in effort from inshore waters, ranging from 112,000 trips in 2000 to 48,000 in 2013. This decrease in effort indicates a decrease in the number of hours that trawls are fished in the U.S. Gulf of Mexico. This decrease could relate to decrease in interactions between sea turtles and shrimp trawls. According to Gallaway et al. (2013), sea turtle mortality from shrimp trawl interactions has decreased significantly since around 1989. In 1989, 76 percent of sea turtle mortality (or 2,051 sea turtles) was caused by shrimping, and in 2012, that number was reduced to 20 percent (or 3,300 sea turtles). (Due to the rise in population numbers, the reduced percentage does not equate to reduced numbers of sea turtles.)

Population assessment methodology

Data needed for accurate assessments of most sea turtle populations are not available, and this prohibits diagnostic evaluation that can benefit management. In light of this problem, NOAA Fisheries asked the National Research Council (NRC) for advice on methods for improving sea turtle population assessments. The NRC evaluated recent assessments, including data, research, and methodology, and made a series of recommendations for how to improve sea turtle population assessments in the short- and long-term. According to their report (NRC 2010), the NRC's overarching conclusion was that although abundance estimates are critical for assessing sea turtle populations, demographic and vital-rate parameters are critical for understanding and predicting trends in sea turtle populations. These parameters have not been adequately determined in the United States. In addition, available information is inadequate because data have not been collected, or if they have, they have not been analyzed or made available; both are due to unnecessary obstacles such as inadequate training of scientists and an inadequate process for issuing research permits. Furthermore, assessments have not been isolated from

broader evaluations of status and threats and rarely include scientists in other quantitative modeling fields such as fishery scientists.

The NRC's overarching recommendation was for NOAA Fisheries and USFWS to develop a coherent national strategy for sea turtle assessments to improve data collection methods, data quality, and data availability and to develop a rigorous plan for external review of data and models used to assess population status and trends. Expert groups including government officials, academics, and nongovernmental organizations should review this strategy. Research should emphasize estimating vital rates (averages, annual variance, and ecological or environmental mechanisms that drive vital rates) and improving in abundance estimates. The most serious demographic data gaps that need to be addressed include in-water abundance, hatchling-cohort production, survival of immature turtles and nesting females, age at sexual maturity, breeding rates, and clutch frequency. More precise estimates of anthropogenic mortality are needed to evaluate impacts. All sources of data should be evaluated for quality, consistency, spatial, and temporal heterogeneity and trends, and data gaps. See Appendix VII for a detailed list of conclusions and recommendations.

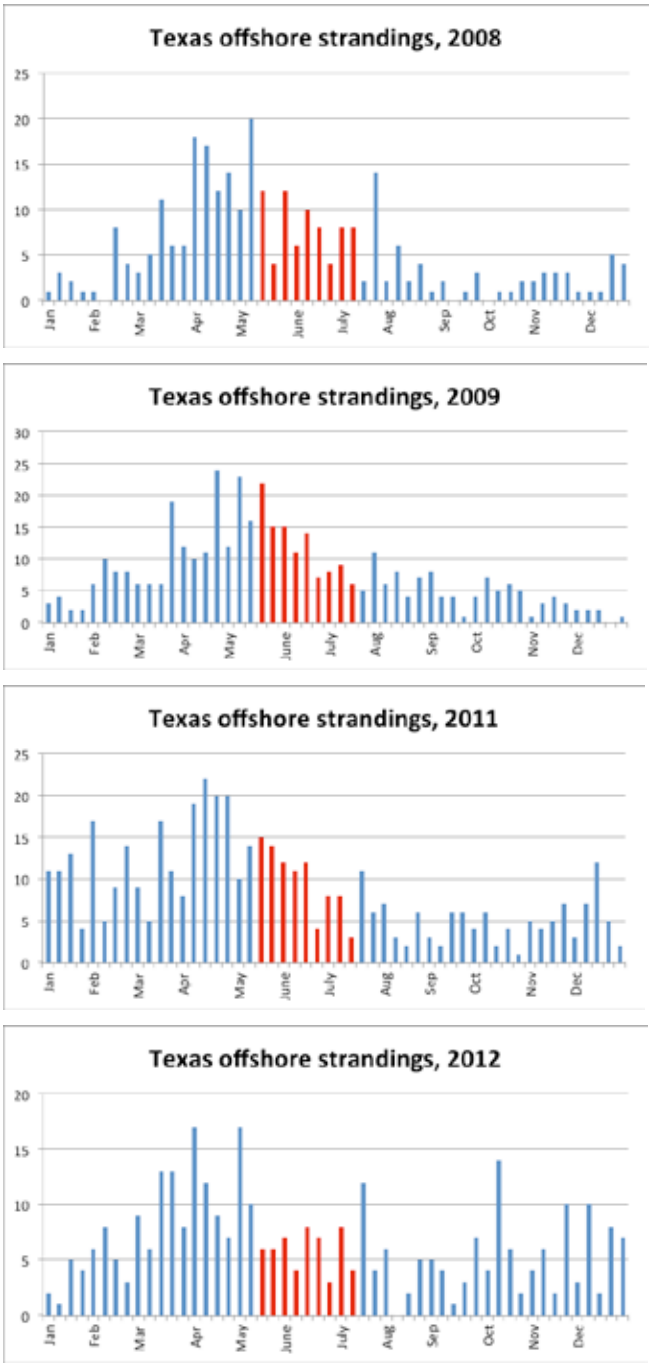
Strandings data

Sea turtle strandings information has been used to supplement data in publications regarding the shrimp fishery and its sea turtle interactions. Despite seasonal closures, the installation and enforcement of TEDs, shrimp gear restrictions, and the protection of nesting beaches, strandings continue to occur along the coast. For example, the state of Texas implements an annual shrimp fishing closure in state waters from mid-May to mid-July; federal managers implement a complementary closure in federal waters. During this closure period, areas from the Texas shore to 200 nautical miles from the coast experience no shrimping effort. Reports of sea turtle strandings occur during this closure period; this may indicate a percentage of mortality that can be attributed to natural mortality, predation, or other causes of death (Figures 13-16).

Deepwater Horizon *oil spill*

The long-term impacts of the *Deepwater Horizon* spill on the Gulf of Mexico ecosystem are unknown. During the response to the *Deepwater Horizon* oil spill, higher than normal numbers of sea turtle strandings were documented. Studies regarding the impacts to natural resources, including sea turtles, from the *Deepwater Horizon* oil spill are ongoing through the Natural Resource Damage Assessment process.

Figures 13-16. Reported sea turtle strandings on the Texas Coast during closed shrimp seasons, including 2008, 2009, 2011, and 2012. 2010 is not included as it does not represent a typical year, considering the 2010 *Deepwater Horizon* oil spill and its potential impacts. Source: STSSN.



Marine Mammals

Under section 118 of the Marine Mammal Protection Act (MMPA), NOAA Fisheries is required to classify all U.S. commercial fisheries into one of three categories

based on the level of incidental serious injury and mortality of marine mammals. The U.S. Gulf of Mexico shrimp trawl fishery is listed as a Category II fishery, meaning there is occasional incidental mortality or serious injury of marine mammals. Owners of vessels or gear engaging in a Category II fishery are required to register with the Marine Mammal Authorization Program and obtain a marine mammal authorization. Vessel or gear owners must display an authorization decal and possess an authorization certificate while fishing. Fishermen in a Category II fishery must accommodate an observer onboard their vessel upon request. They must report to NOAA Fisheries all incidental mortalities and injuries of marine mammals that occur during commercial fishing operations, regardless of the category in which the fishery is placed (I, II, or III) within 48 hours of the end of the fishing trip. ("Injury" is defined as a wound or other physical harm.) In addition, any animal that ingests fishing gear or any animal that is released with fishing gear entangling, trailing, or perforating any part of the body is considered injured, regardless of the presence of any wound or other evidence of injury, and must be reported.

Fishermen in a Category II fishery must also comply with any applicable take reduction plans. Take reduction plans help recover and prevent the depletion of strategic marine mammal stocks that interact with Category I and II fisheries. A strategic stock is one which is: listed as endangered or threatened under the ESA; declining, and likely to be listed as threatened under the ESA; listed as depleted under the MMPA; or experiencing direct human-caused mortality that exceeds the stock's "Potential Biological Removal (PBR) level". No take reduction plans are currently in place for the U.S. Gulf of Mexico shrimp trawl fishery.

Environmental Factors

Salinity, Water Temperature, and Dissolved Oxygen

Salinity, water temperature, and dissolved oxygen can influence function, distribution, growth, survival, and movement of shrimp. In fact, the hydrological conditions in shrimp's nursery areas, particularly in early spring, play a large role in dictating the next shrimping season's potential harvest.

Brown shrimp generally prefer salinities between 15 and 35 parts per thousand (ppt); however, groups of brown shrimp have been observed in salinities as low as 1 ppt (Zein-Eldin and Renaud 1986). Larvae and post-larvae require higher salinities than adults (Patillo et al. 1997). Brown shrimp tolerate temperatures between 41 and 100.4°F (5 and 38°C), with reduced survival rates at lower temperatures; their optimal range is 68 to 86°F (20 to 30°C). Brown shrimp growth increases with increases in temperature up to 89.6°F (32°C; Zein-Eldin and Renaud 1986). Brown shrimp generally inhabit zones with dissolved oxygen levels over 3.5 milligrams per liter (mg/L; Larson et al 1989). The success of annual Louisiana brown shrimp harvests can be directly correlated with mid-April estuarine water temperatures and the amount of marsh area with salinities greater than 10 ppt (Barrett and Gillespie 1973 and 1975, Barrett and Ralph 1976). Scientists anticipate good brown shrimp production if springs are dry and warm and poor production after wet and cold springs.

White shrimp generally tolerate the same salinity levels as brown shrimp (15 to 35 ppt), though white shrimp commonly tolerate lower salinity levels and their growth rate slows at higher salinities (Zein-Eldin and Renaud 1986). White shrimp also tolerate similar temperature and dissolved oxygen levels as brown shrimp. Their optimal temperature range is 68 to 86°F (20 to 30°C), and they also prefer dissolved oxygen levels above 3.5 mg/L (Muncy 1984, Zein-Eldin and Renaud 1986). Annual white shrimp production is directly related to river discharge and subsequent estuarine salinities. Lower than normal river discharge is necessary for optimum white shrimp production.

Though limited in scope, research on seabob shrimp has found they prefer salinities between 20 and 30 ppt, with an extreme lower limit of 2 ppt (Juneau 1977). Their optimal temperature range is 68 to 77°F (20 to 25°C), with tolerances as low as 41°F (5°C) and as high as 95°F (35°F; Juneau 1977). Castro et al. (2004) found highest concentration of seabob shrimp in dissolved oxygen of levels ranging from 4.6 to 5.5 mg/L.

Tidal movement also plays a key role in the recruitment and movement of shrimp. Strong southerly winds contribute to higher tides during spring and enhance transport of post-larval shrimp into nursery areas. In contrast, late spring cold fronts interrupt recruitment mechanisms by dropping tidal elevations, drying up shallow nursery habitats, and exposing developing juveniles to higher predation rates.

LDWF continues to monitor these hydrological conditions, along with shrimp growth, distribution, and abundance, and use these data to develop appropriate management recommendations.

Hypoxia

Large areas of hypoxic or oxygen-depleted waters are found off of Louisiana's continental shelf seasonally, from

late spring through early fall, and are largely attributed to heavy nutrient loads discharged by the Mississippi River. The timing and growth of these hypoxic waters correspond with peak shrimp fishing opportunities; hypoxia may impact shrimp harvest and economic dynamics. Hypoxic areas are often referred to as "dead zones" where dissolved oxygen levels in lower water layers and the water bottom may be too low to sustain marine life. Dissolved oxygen levels above 4 mg/L are adequate to sustain most aquatic organisms; however, levels below 2 mg/L, particularly during prolonged periods, may cause stress and mortalities (Renaud 1986). Wannamaker and Rice (2000) reported that brown shrimp strongly avoided oxygen concentrations of 2 mg/L. Their research has shown that populations of bottom-dwelling organisms that comprise important components in the diets of many fishes are less abundant in hypoxic waters in comparison to waters with normal oxygen levels.

Zimmerman and Nance (2001) analyzed shrimp landings and trip interview data over a 13-year period (1985 to 1997) and found a significant negative relationship between hypoxia and combined Louisiana and Texas brown shrimp landings. Additional analyses using data from 1985 to 2004 confirmed their findings; O'Conner and Whitall (2007) also determined a significant correlation between hypoxic area size and combined Texas and Louisiana brown shrimp landings. These authors also found no correlation of hypoxic area with Louisiana brown and white shrimp landings. Zimmerman and Nance (2001) theorized that brown shrimp migrating from inshore to offshore waters are more likely to be affected by hypoxia and noted that migrations to offshore habitats may be blocked by hypoxia, limiting the availability of suitable offshore shrimp habitats. They reported that the absence of a significant relationship between hypoxic area size and brown shrimp landings in Louisiana may be due to most harvest occurring inshore of hypoxic areas. The authors also noted that white shrimp are less sensitive to hypoxia and their preferred habitat is primarily inshore of hypoxic waters.

Evidence suggests that hypoxia influences harvest dynamics and decreases profits in the Louisiana shrimp fishery through the reduction of suitable brown shrimp habitats associated with hypoxic waters. The Mississippi/Gulf of Mexico Watershed Nutrient Task Force has been established to reduce and control hypoxia in the Gulf of Mexico. This Task Force has adopted an Action Plan and Annual Operating Plan as a national strategy and roadmap to reduce hypoxia in the Gulf of Mexico and Mississippi-Atchafalaya River Basin.

Invasive Species

Asian tiger prawns (*Penaeus monodon*) have increased in number in the last few years and are becoming established in the Gulf of Mexico (USGS 2014). In its home range, the Asian tiger prawn has been reported to prey on smaller shrimp (Pascual 1989). The possibility or extent of direct predation on Louisiana's shrimp populations is not known at this time. Another potential impact is direct competition for prey as tiger prawns grow faster than native shrimp and may be able to outcompete native shrimp for similar prey. Tiger prawns could also increase catch handling time due to the need to separate tiger prawns from the catch as buyers may not want them. Some fishermen may opt to sell tiger prawns separately from native shrimp due to their large size; this could be a supplemental market for the shrimp fleet.

Jellyfish such as the Australian spotted jellyfish (*Phyllorhiza punctata*) have been observed in the Gulf of Mexico and could potentially impact the shrimp fishery by clogging shrimp nets and restricting fishing. Jellyfish prey on shrimp—large population explosions of jellyfish may reduce shrimp biomass and also impact the fishery.

Bryozoans (*Zoobotryon verticillatum*) also occur in large numbers and could potentially clog shrimp nets. Bryozoans are currently considered a cryptogenic species in the Gulf of Mexico—scientists are not certain if this species has been introduced or if it is native.

Diseases and Parasites

There are many diseases and parasites that are known to affect penaeid shrimp in the Gulf of Mexico. These diseases and parasites can cause marked effects to shrimp biology. Shrimp can show signs of disease including but not limited to damaged shells, melanization and inflammation at the site of infection, growth problems, and muscle necrosis. Viruses such as Infectious Hypodermal and Hematopoietic Necrosis Virus (IHHNV), Taura Syndrome Virus (TSV), White Spot Syndrome Virus (WSSV), and Yellowhead Virus (YHV) have caused mass mortalities, and subsequent economic loss, in the shrimp farming industry; however, no shrimp farms are currently permitted to operate in Louisiana or U.S. Gulf of Mexico waters. Other diseases that can affect shrimp include bacterial infections (*Vibrio* spp.) and rickettsia. Parasites that can affect shrimp include protozoans, such as microsporidians, haplosporidians, and gregarines, as well as worms such as trematodes, cestodes, and nematodes.

Researchers have conducted several studies to determine the prevalence of diseases and parasites in wild shrimp populations in the Gulf of Mexico. Chavez-Sanchez et al.

(2002) sampled penaeid shrimp from ten stations in the southern Gulf of Mexico and determined that no serious infectious diseases occurred in the wild shrimp population there from 1999 to 2000. Dorf et al. (2005) sampled penaeid shrimp over a three-year period along the Texas Gulf coast, paying special attention to TSV and WSSV, but did not detect either virus during their study. del Rio-Rodriguez et al. (2013) studied wild white shrimp in the southern Gulf of Mexico and found no gross signs of WSSV, TSV, or IHHNV, and the PCR (polymerase chain reaction) analysis results for IHHNV and WSSV were also negative. del Rio-Rodriguez et al. (2013) also looked at the prevalence of some parasites. They found that juveniles had a much higher propensity for infection than adults. They showed that the occurrence of microsporideans was high or common. Haplosporideans have not been heavily studied in the wild, but in this study they were highly prevalent in juvenile white shrimp. Gregarines showed a moderate prevalence. Some trematodes commonly use white shrimp as an intermediate host. Cestodes and nematodes showed low prevalence in a study by Chavez-Sanchez et al. (2002).

Habitat Loss and Restoration

Marsh loss may also affect the abundance of estuarine dependent species such as shrimp. Turner (1977) observed that the yield of shrimp in Louisiana's estuaries is directly related to the acreage of marsh. He found no relationship between yields and estuarine water surface, average water depth, or volume. His findings concur with the observations of Barrett and Gillespie (1973) that annual brown shrimp production in Louisiana is correlated with the acreage of marsh with water above 10 ppt salinity, but not with acres of estuarine water above 10 ppt salinity. These findings suggest that shrimp yields in the U.S. Gulf of Mexico depend on the survival of the estuarine marshes and grassbeds in their natural state. These areas not only provide postlarval, juvenile, and subadult shrimp with food and protection from predation, but they help to maintain an essential gradient between fresh and salt water.

Eighty percent of the coastal marsh loss in the United States occurs annually in Louisiana. Louisiana's Coastal Protection and Restoration Authority (CPRA) monitors and measures coastal habitat loss and has proposed and/or implemented a number of coastal protection and restoration projects to help combat and slow some of these impacts through Louisiana's Coastal Master Plan. These projects may have a range of impacts on shrimp abundance and may also impact the shrimp fishery. LDWF provides input into the Coastal Master Plan, but its authority is limited, particularly with operation of freshwater diversions.

Both shrimp fishermen and shrimp industry representatives recognize the importance and benefits of flood protection and coastal restorations projects. However, many have expressed concern over how flood protection levees and floodgates may impact shrimp recruitment and emigration patterns, growing conditions, and even access to the fishery. Shrimpers, as well as others in the fishing community, have repeatedly criticized operation of the Davis Pond freshwater diversion structure located in the northern Barataria basin. Recent operation of the structure at high flow rates during March 2015 has reduced salinities to levels perceived by many fishermen as detrimental to brown shrimp development. The fishing community has also expressed concern over added nutrient loads associated with freshwater input and marsh loss due to eutrophication.

Louisiana has a great need to restore the coast, and the process of coastal restoration is very complex. Both habitat loss and efforts to minimize the impacts of this loss could affect the ability of marshes to provide habitats for shrimp and other estuarine dependent species. In fact, the changing coast of Louisiana would impact the fishery and shrimp even if nothing were done to counteract the natural and manmade causes of coastal land loss.

Deepwater Horizon Oil Spill

Studies regarding the effects to Louisiana's natural resources, including shrimp, from the *Deepwater Horizon* oil spill are ongoing through the Natural Resource Damage Assessment process. Oil spills and corresponding response activities may impact shrimp habitat.

Fishery Management Program

COLLABORATIVE FISHERY MANAGEMENT

Louisiana's fishery management authorities collaborate with the other Gulf states, federal fisheries management authorities, other aquatic and coastal resource management authorities, industry, and other stakeholders in the management of the state's shrimp resource and fisheries.

Management Framework

Louisiana's Constitution provides the foundation for the sustainable management of the state's fisheries resources, including shrimp, recognizing their importance to Louisiana's environment, citizens, and economy. According to the Constitution, "The freedom to hunt, fish, and trap wildlife, including all aquatic life, traditionally taken by hunters, trappers and anglers, is a valued natural heritage that shall be forever preserved for the people. Hunting, fishing and trapping shall be managed by law and regulation consistent with Article IX, Section I of the Constitution of Louisiana to protect, conserve and replenish the natural resources of the state."

Louisiana's legislative statutes and administrative code provide the legal and administrative framework for the state's fisheries management system. The Louisiana Revised Statutes 56:638.1-5 define the legislative intent, findings, purposes, policy, and standards for the conservation and management of all species of fish in Louisiana, similar to those found in the Magnuson-Stevens Act, the law that guides U.S. federal fisheries management. According to these statutes, fishery conservation and management should sustain:

- Louisiana's fisheries resources (fish and shellfish)
- The ecosystems in which they live (habitat and other aquatic species)

- The people that depend upon these resources (commercial and recreational fishing industries and coastal communities)

See Appendix VIII for specific details of these statutes.

Authorities

Louisiana

Legislature

The primary authority for managing shrimp fisheries in Louisiana's state waters rests with the Louisiana State Legislature. The Legislature is the lawmaking body of the state and enacts revised statutes defining the rules of fisheries. Louisiana's Constitution empowers the Legislature to enact laws to protect, conserve, and replenish the natural resources of the state, with consideration for the health, safety, and welfare of the people. The Legislature has delegated some of its authority to the Commission and the Secretary of LDWF. In general, management actions such as gear changes, licensing, and entry limitations are under the authority of the Legislature.

The Legislature adopts laws according to Louisiana's legislative process. LDWF often develops a legislative package and finds sponsors for individual bills. Legislators also develop bills of their own. See Appendix IX for a diagram outlining Louisiana's legislative process.

Wildlife and Fisheries Commission

The Commission is charged with the control and supervision of the wildlife of the state, including all aquatic life. Part of the executive branch, the Commission consists of seven members appointed by the governor, subject to confirmation by the Senate. The Commission operates as a policy-making and budgetary control board, with no administrative function.

The Commission receives and reviews biological, socioeconomic, and other technical data and management recommendations from LDWF, gathers public input, and ultimately votes on which actions will best achieve long-term management goals. In general, the Commission is charged with setting seasons, times, places, size limits, quotas, daily take, and possession limits based upon biological data, setting fees for nonresident recreational fishing licenses, among other authorities. With respect to shrimp, specific authorities include increasing minimum mesh sizes for trawl, skimmer, or butterfly nets during a special or extended shrimp season; opening and closing outside waters by zone, setting special shrimp seasons, and setting shrimp seasons for inside waters, all based on technical and biological data that indicate sufficient quantities of marketable shrimp are available for harvest; promulgating rules and regulations regarding the use, possession, and configuration of excluder devices for fish and other aquatic life in fishing gear within state and federal waters; and providing for a special bait dealer permit and allowing taking of live bait shrimp during the closed shrimp season. The Commission may also delegate to the Secretary of LDWF the authority to open and close regular and special shrimp seasons. See Appendix X for complete details on the Commission's authorities as outlined in Louisiana Revised Statutes Title 56.

The Commission adopts rules according to the process defined in Louisiana's Administrative Procedure Act (APA). The APA requires that the Commission give appropriate notice of their intended action, make the proposed rule available for public review and comment, and include a Fiscal and Economic Impact Statement (FEIS) summarizing what social and economic impacts the proposed rule might have. In addition to the FEIS, a proposed rule must also include Family Impact, Poverty Impact, and Provider Impact Statements. Once the notice of intent has gone through the process and is approved, it is published as a final rule in the Louisiana Register and is compiled with other Commission rules in the Louisiana Administrative Code Title 76.

Department of Wildlife and Fisheries

LDWF serves as the administrative and operational arm of the Commission. The Secretary of LDWF is appointed by the governor, subject to confirmation by the Senate. The Secretary is the executive head and chief administrative officer of LDWF. In general, LDWF conducts scientific research; collects and analyzes fishery dependent and independent data; provides this data and management recommendations to the Commission and Legislature; and administers and enforces laws, rules, and regulations as adopted by the Commission and Legislature. The Commission may also delegate to the Secretary the authority to open and close regular and special shrimp seasons.

The Legislature and Commission may grant the Secretary of LDWF additional authorities to create administrative rules. For example, the Secretary, when authorized, can make a "declaration of emergency" in times when public health, safety, and welfare are in jeopardy and quick and immediate action is required.

See Appendix XI for complete details of the Secretary's authorities related to shrimp as described in Louisiana Revised Statutes Title 56.

Governor

The Governor of Louisiana has authority to issue executive

orders, which are not statutes like those passed by the legislature but do have the force of law.

Shrimp Task Force

Louisiana's Legislature established the Louisiana Shrimp Task Force to study and monitor the shrimp industry and to make recommendations to the Commission, LDWF, and other state agencies to help enhance the domestic shrimp industry. The task force is composed of the following voting members:

- Six certified commercial fishermen (three members and three alternates) appointed by the governor (two of whom are nominated by LDWF, and four of whom are nominated by the Louisiana Shrimp Association)
- One shrimp dock owner, appointed by the governor
- Six active shrimp processors (three members and three alternates) appointed by the governor (one of whom is selected from a list of three nominees by the American Shrimp Processors Association).

Nonvoting members include the following:

- The governor or his designee
- Three members appointed by the Secretary of LDWF, including a marine biologist, an enforcement agent, and an economist
- The commissioner of the Louisiana Department of Agriculture and Forestry (LDAF) or his designee
- The secretary of the Louisiana Department of Health and Hospitals (LDHH) or his designee.

The task force has no direct management authority for the shrimp fishery. According to Louisiana Revised Statutes, the task force is responsible for:

- Coordinating efforts to increase shrimp production and marketability
- Providing for the study of the decline in shrimp marketability and price and impacts of imported shrimp on the domestic market
- Assisting in the development of a state shrimp inspection program and a Louisiana shrimp certification and branding program
- Making recommendations to the Commission, LDWF, LDNR, LDAF, and LDHH for implementation of policies to help enhance the domestic shrimp industry
- Making recommendations with respect to issues pertaining to the shrimp industry and shrimp production to the various state agencies charged with responsibility for different elements of the shrimp industry in Louisiana
- Developing markets and marketing strategies for the development an expansion of markets for shrimp harvested from Louisiana waters
- Administering the funds in the Shrimp Marketing and Promotion Fund and the Shrimp Trade Petition Account to create new markets for shrimp and promote the sale of shrimp harvested from Louisiana waters
- Representing the interests of the Louisiana shrimp industry before federal and state administrative and legislative bodies on issues of importance to the Louisiana shrimp industry
- Contracting for legal services to represent the interests of the Louisiana shrimp industry in judicial, administrative, and legislative proceedings

The Shrimp Task Force's activities are funded through the Shrimp Marketing and Promotion Fund and the Shrimp Trade Petition Account. They may also seek and receive assistance from universities within the state in the development of methods to increase production and marketability of shrimp.

The Shrimp Task Force works with the Crab Task Force to resolve issues of common interest, especially on potential changes to laws regulating possession of crab traps on shrimp vessels.

Other aquatic resource management authorities

Although not involved in marine fisheries management, several state or local agencies are involved in managing other aquatic or coastal resources, such as protecting habitat or monitoring water quality. LDNR is charged with regulating development activities and managing resources in Louisiana's coastal zone. Several coastal parishes have also developed their own coastal zone management programs. The Louisiana Department of Environmental Quality (LDEQ) is responsible for setting pollution standards and monitoring all waters of the state, including the Gulf of Mexico. CPRA is responsible for developing, implementing, and enforcing a comprehensive coastal protection and restoration Master Plan, including monitoring and measuring coastal habitat loss and coordinating habitat restoration projects. LDWF collaborates with all of these agencies, reviewing permits, commenting on coastal zone management and habitat restoration activities, and participating in the Coastal Master Plan development process.

All seafood produced and processed in Louisiana must meet quality and safety standards set forth in the

Louisiana Sanitary Code. LDHH routinely inspects the state's approximately 350 seafood processing plants using federal Hazard Analysis Critical Control Point (HACCP) requirements to ensure safe handling practices and that only safe product reaches the market. More details on these programs are available from LDHH.

LDHH works with LDEQ to issue fish consumption advisories based on fish tissue sampling in areas of suspected contamination and assessments of risk to human health. LDHH and LDEQ consult LDWF and the Louisiana Department of Agriculture and Forestry throughout the advisory development and dissemination process. LDEQ also monitors all waters of the state, including the Gulf of Mexico, to ensure they meet water quality standards.

Public participation and engagement

Louisiana's fisheries management authorities encourage public participation throughout the management process to not only ensure stakeholders' interests are considered but also to ensure they understand the regulatory process and resulting management actions. All meetings of the Natural Resources Committees of the Legislature, Commission, and the Shrimp Task Force are open to the public, according to Louisiana's Open Meetings Law (Louisiana Revised Statutes 42:12–42:28). This law ensures that government decisions are made in an open forum, ensuring state integrity and the public's trust and awareness of its governing officials. Meetings must be announced at least 24 hours before the meeting, provide opportunities for public comment, allow for audience recording of the meeting, and have recorded minutes of the proceedings.

Regional

The other U.S. states bordering the Gulf of Mexico are responsible for the conservation and management of shrimp fisheries within their respective waters. The State of Louisiana cooperates with these states in the scientific research and management of fisheries that cross jurisdictional boundaries, including shrimp, through the GSMFC. The Louisiana Revised Statutes establish Louisiana's authority to enter into the Gulf States Marine Fisheries Compact with other states. The GSMFC has no direct authority over the shrimp fishery but is authorized to make recommendations to the governors and legislatures of the five U.S. Gulf of Mexico states over programs beneficial to management of shared fisheries. The GSMFC also consults with and advises member states over fishery conservation problems, advises the U.S. Congress, and testifies on legislation and marine policies affecting the U.S. Gulf of Mexico states.

The Magnuson-Stevens Act, originally enacted in 1976 as the Fishery Conservation and Management Act, provides for exclusive U.S. management authority over the fishery resources within the Exclusive Economic Zone, waters extending seaward from state boundaries to 200 nautical miles offshore. Responsibility for federal fishery management decision-making is divided between the Secretary of Commerce and eight regional fishery management councils that represent the expertise and interests of constituent states. Regional councils are responsible for preparing, monitoring, and revising management plans for fisheries needing management within their jurisdiction. The Gulf Council is responsible for fishery resources in federal waters of the U.S. Gulf of Mexico. The Gulf Council consists of 17 voting members: 11 public members appointed by the Secretary; one each from the fishery agencies of Texas, Louisiana, Mississippi, Alabama, and Florida; and one from NOAA Fisheries. Non-voting members include representatives of USFWS, U.S. Coast Guard (USCG), and the GSMFC. The Gulf Council's Science and Statistical Committee reviews data and science used in assessments and fishery management plans and amendments. The Secretary of Commerce is responsible for promulgating regulations to implement proposed plans and amendments after ensuring that management measures are consistent with the Magnuson-Stevens Act and other applicable laws. In most cases, the Secretary delegates this authority to NOAA Fisheries.

LDWF works closely with NOAA Fisheries to develop management measures to prevent overfishing of shrimp stocks in the U.S. Gulf of Mexico to ensure optimum yield and that overfishing thresholds of parent stocks are not exceeded. LDWF contributes to these efforts and provides its fishery independent trawl survey data for use in developing annual assessment of the stock. Shrimp are a short-lived species, rarely living longer than 18 months, and are influenced by various environmental factors along with catch and fishing effort rates. Federal management of the shrimp resource in the U.S. Gulf of Mexico is designed to:

- Optimize the yield from shrimp recruited to the fishery
- Encourage habitat protection measures to prevent undue loss of shrimp habitat
- Coordinate the development of shrimp management measures by the Gulf Council with the shrimp management programs of the several states, where feasible
- Promote consistency with the ESA and the MMPA
- Minimize the incidental capture of finfish by

shrimpers, when appropriate

- Minimize conflict between shrimp and stone crab fishermen
- Minimize adverse effects of obstructions to shrimp trawling
- Provide for a statistical reporting system

Additionally, through their administration of laws, regulations, and policies, other federal agencies may influence the shrimp resource and fishery and management thereof. For example, under the MMPA and ESA, NOAA Fisheries is responsible for protecting marine mammals and endangered marine life from human impacts such as bycatch. NOAA Fisheries works with the fishing industry to monitor fishing and develop or modify fishing gear and practices to minimize bycatch and its potential impacts. See Appendix XII for a list of related federal management institutions and their authorities and jurisdictions and Appendix XIII for a list of related federal laws, regulations, and policies.

Existing Management Measures

Plans

LDWF completed the Fisheries Management Plan for Louisiana's Penaeid Shrimp Fishery in 1992; the Commission accepted the plan as a basis for future management of Louisiana's shrimp fishery in January 1993. The management unit included brown, white, pink, royal red, and seabob shrimp found within the jurisdiction of the state. The plan provided an in-depth description of the fishery, including an economic assessment; a description of the major penaeid shrimp species and their stock status; and the current management framework and practices. The plan also identified and discussed major problems in the fishery and management options to address these problems. LDWF implemented a number of these options, including:

- Nominally increasing commercial license fees (however, increases were not associated with addressing overcapitalization/excessive fishing effort)
- Through license and gear fees, assisting the shrimp industry with funding efforts to investigate possible violations of trade practices by some countries as well as the activities of the Shrimp Task Force and efforts to create new markets for shrimp and promote the sale of Louisiana shrimp
- Creating a shrimp excise tax for all shrimp that enter the state
- Adopting packaging standards for shrimp
- Establishing the Louisiana Wild Seafood Certification Program to guarantee the origin of Louisiana wild-caught seafood bearing the program's logo
- Increasing outreach to fishermen regarding federal tow time requirements for skimmer and butterfly nets
- Encouraging pertinent state and federal agencies to address estuarine habitat loss and supporting habitat restoration projects
- Refining areal management to expand the zone concept and develop staggered seasonal openings in specific areas based upon recruitment and emigration patterns, average size, and variable growth rates of shrimp between estuaries
- Analyzing LDWF's independent shrimp/groundfish monitoring database to explore long-term trends in populations
- Implementing trip ticket program to collect more timely and accurate catch and effort data.

The Gulf Council's Shrimp Fishery Management Plan was originally implemented in 1981. The management unit included brown, white, pink, royal red, seabob, and brown rock shrimp occurring in the Gulf Council's jurisdiction. Seabobs and rock shrimp were later removed from the plan in 1989. The plan's objective was to enhance yield in volume and value by deferring harvest of small shrimp to provide for growth. The plan's main actions included establishing a cooperative Tortugas Shrimp Sanctuary with the state of Florida to close a shrimp trawling area where small pink shrimp comprise the majority of the population most of the time; a cooperative 45-day seasonal closure with the state of Texas to protect small brown shrimp emigrating from bay nursery areas; a seasonal closure of an area east of the Dry Tortugas to avoid gear conflicts with stone crab fisherman; and reporting requirements for vessels, fishermen, dealers and processors. The plan has been amended numerous times since it was implemented. Amendments include adjustments to area closures, definitions of overfishing and action plans to arrest overfishing should it occur, bycatch reduction measures, and vessel permitting requirements. See Appendix XIV for a history of the Shrimp Fishery Management Plan and Amendments. See www.gulfcouncil.org for full details of the Shrimp Fishery Management Plan.

Statutes and Rules

Louisiana shrimp fisheries are governed by both State of Louisiana legislative statutes (Title 56) and rules promulgated by the Commission (Title 76). Specific regulations are listed below. This summary of regulations

does not retain their exact language and should be not be relied on for legal purposes. See Appendix XV for the full text of these regulations. See Appendix XVI for a chronological history of major changes to Louisiana's shrimp regulations.

Shrimping areas

Shrimping waters within the state are divided into two areas for management purposes:

- Inside waters (inland from the coastline, further divided by major estuarine basin; sometimes referred to as inshore waters)
- Outside waters (waters seaward of the inside/outside shrimp line)
  - Coastal (coastline, seaward out to 3 nautical miles)
  - Nearshore (3 to 9 nautical miles from the coastline)

The inside/outside shrimp line that separates inside waters from outside waters generally follows the coastline and begins at the Louisiana/Texas state line and ends at the Louisiana/Mississippi state line. Due to changes resulting from coastal erosion and subsidence, the Commission has authority to amend the shrimp line.

Inside waters are further divided by Louisiana's major estuarine basins. To increase flexibility in managing the shrimp resource and to enhance economic benefits, state managers regulate the shrimp fishery by area in response to different patterns in shrimp recruitment, growth, and emigration among basins. Shrimp found in nearshore waters are often a different size and age than shrimp found in inside waters at the same time of year; also, shrimp do not migrate on the same schedule or grow at the same rates uniformly across the coast. This management approach allows managers to account for these differences and stagger seasons according to data about shrimp populations.

Commercial

Licensing

Both resident and non-resident fishermen must have the appropriate commercial fishing and gear licenses to harvest shrimp commercially in Louisiana waters. Vessel owners must also have the appropriate vessel licenses. Gear licenses may be temporarily transferred between licensed commercial fishermen with the same residency status. Non-residents may not purchase licenses for commercial fishing gear prohibited in the state in which they reside. Five dollars from the sale of each commercial fisherman's license, each gear license, and each vessel license is deposited in the Seafood Promotion and Marketing Fund.

In addition, commercial fishermen who purchase a trawl, skimmer, or butterfly gear license must also pay an annual gear fee, which is deposited into the Shrimp Promotion and Marketing Fund.

Act 336 of the 2011 Louisiana Regular Legislative Session recognized Louisiana's historical Gulf-ward boundary as three marine leagues (nine nautical miles). In June 2012, the Commission took action to extend the state's jurisdiction for the purposes of fisheries management seaward to nine nautical miles. From a licensing policy perspective, non-resident vessels, gear, and captains fishing in state offshore territorial waters from three to nine nautical miles seaward of the shore need not be licensed in Louisiana unless these vessels land their catch at Louisiana ports.

To commercially harvest shrimp (and croaker) for live bait during the closed shrimp season, businesses must meet the requirements of and obtain a Special Bait Dealer Permit. Permit applicants, along with any fisherman that may be fishing under the permit, must undergo a background check for any Class 3 or greater wildlife or fishing-related conviction in the three previous years before the permit is issued. Additional permit requirements include vessel and facility inspections, tank size capacities, signage, gear and operational restrictions, bycatch limitations, reporting, notifications, and use of a Vessel Monitoring System (VMS) if fishing at night.

Licensed commercial fishermen may transport and sell their own catch to any licensed Louisiana wholesale/retail seafood dealer located within the state of Louisiana. They must have a Fresh Products License to sell their catch directly to a consumer; they may purchase a secondary fresh products license for their spouse for a reduced fee. Commercial fishermen that sell their catch to anyone other than a consumer or licensed dealer and anyone else that buys, acquires, handles, transports, or exports shrimp for sale or resale must have the appropriate licenses. A portion of each license fee is deposited in the Seafood Promotion and Marketing Fund.

Fishing licenses may be suspended, denied or revoked for failure to pay child support, nonpayment of unemployment compensation overtime and nonpayment of individual income taxes.

Fishery access

The shrimp fishery in Louisiana state waters is an open-access fishery.

To harvest shrimp in federal waters off Louisiana and other U.S. Gulf of Mexico states, commercial fishermen must have a shrimp vessel moratorium permit; there is currently

a moratorium on issuing new permits to reduce the number of vessels participating in the fishery.

Legal gear

In Louisiana's state inshore waters, most commercial fishermen use skimmer nets to harvest shrimp. They also use butterfly and cast nets. Otter trawls are also used extensively in state waters and are almost exclusively used in offshore federal waters. These are the only legal gear types that may be used to harvest saltwater shrimp (except bait shrimp) during open seasons in Louisiana state waters. Commercial fishermen may use cast nets, dip nets, bait traps, and bait seines to harvest bait shrimp.

Gear requirements

Statutes specify the size and configuration of legal trawls and butterfly and skimmer nets. In general, there are restrictions on net mesh size to regulate the size of shrimp harvested and to prevent overfishing and on net and frame size to control harvest levels and reduce conflicts between shrimp fishermen and other user groups, such as crab fishermen.

Act 336 of the 2011 Louisiana Regular Legislative Session recognized Louisiana's historical Gulf-ward boundary as three marine leagues (nine nautical miles). In June 2012, the Commission took action to extend the state's jurisdiction for the purposes of fisheries management seaward to nine nautical miles. Provisions in statute restrict the maximum amount of cork line and lead line used onboard shrimping vessels in offshore state territorial waters; however, shrimping vessels fishing in federal waters in the U.S. Gulf of Mexico are not restricted by trawl size. In consideration of the costs associated with fishermen having to purchase smaller trawls for use in state offshore waters extending beyond three nautical miles, LDWF adopted a resolution in April 2013 that clarified the boundary where trawl size would be enforced. This resolution limited enforcement of trawl size to state offshore territorial waters extending three nautical miles from shore; fishermen may use any number or any trawl size seaward of this boundary.

Seasons

Commercial fishermen may only harvest shrimp during open shrimp seasons (unless permitted to harvest live bait under a Special Bait Dealers Permit). Shrimp seasons are flexible—the Commission sets shrimp seasons for Louisiana's state waters by area, according to scientific information about environmental and water conditions and the growth rates, distribution, and abundance of shrimp. This helps ensure that shrimp are harvested at a marketable size. The Commission must base seasons on scientific data and hold a public hearing prior to opening the season. They consider input from the industry and other stakeholders. In general, shrimp seasons by area are:

- Inside: open when enough market-sized shrimp are available in these waters for harvest. The spring/brown shrimp season generally runs May to July. The fall/white shrimp season is generally open mid-August to mid- December; some waters stay open into January.
- Outside: year-round, except from mid or late December to April or May in certain areas to protect small white shrimp and allow them to grow to market size.
- Federal waters: year-round; the federal government controls these waters. A federal shrimp vessel moratorium permit is required for all vessels fishing for shrimp in federal waters of the U.S. Gulf of Mexico.

The Commission has authority to close waters when deemed necessary.

Size and possession limits

There is no size limit for any shrimp harvested during the spring open season nor for brown or seabob shrimp harvested during any open season.

White shrimp is legal size when a pound of white shrimp equals 100 whole shrimp or less. Fishermen may not harvest sub-legal white shrimp, except from October 15 through the 3rd Monday in December. Also, when more than half of a fisherman's catch is seabobs or brown shrimp, no more than 10 percent (by weight) of the catch may be sub-legal size white shrimp.

Area restrictions

Some areas including wildlife refuges, wildlife management areas, and habitat conservation areas may be closed to certain gear types and methods or shrimping altogether and may have different possession limits. These restrictions and closures help protect developing shrimp populations and reduce conflicts among user groups.

Commercial fishing is prohibited in coastal National Wildlife Refuges. Commercial fishermen must have a permit to fish commercially in Jean Lafitte National Historical Park and Preserve.

Operational restrictions

Fishermen may not fish with certain gears at night in some areas to limit fishing effort, reducing pressure on the resource, and to reduce conflicts among user groups.

Fishermen may not operate butterfly and skimmer nets in a

way that restricts or impedes normal navigation.

Fishing gear interactions

Fishermen may not trawl or use skimmer nets over any privately leased bedding grounds or oyster propagating place in the year immediately following the seeding of such area.

A shrimper who catches an unserviceable crab trap must keep it on board their vessel and properly dispose of it onshore. A shrimper who catches a serviceable crab trap must return it to the water with a common float (a white, plastic, one-gallon or larger bleach bottle). The owner of the crab trap must return the common float to any shrimper for reuse.

Bycatch

Fishing gear used to harvest shrimp can incidentally capture non-target species such as finfish and other crustaceans. Fishermen may retain and sell most bycatch as long as they comply with appropriate regulations and may retain fish for personal consumption as long as it is within minimum size and recreational daily possession limits. In particular, any commercial shrimping vessel may retain and any commercial fisherman may sell all southern flounder caught as bycatch on any shrimping trip. LDWF monitors landings and sales of these species through the state's trip ticket reporting system. The use of approved BRDs is required in shrimp nets used in federal waters. SEFSC monitors shrimp fishing effort as a proxy for associated shrimp trawl bycatch mortality on red snapper to ensure it is less than the established target reduction level. If effort exceeds the target, NOAA Fisheries Southeast Regional Administrator can implement a seasonal closure for the shrimp trawl fishery in federal waters to reduce red snapper bycatch. To date, effort has remained below the target and no closures have been implemented. Although BRDs are not required in Louisiana state waters, increasing numbers of fishermen voluntarily use BRDs in state waters to reduce non-target species being hauled in with the shrimp catch.

Federal law requires any shrimp trawler that is in the Atlantic Area or Gulf Area to have an approved TED installed in each net that is rigged for fishing. A net is rigged for fishing if it is in the water, or if it is shackled, tied, or otherwise connected to any trawl door or board, or to any tow rope, cable, pole or extension, either on board or attached in any manner to the shrimp trawler. TEDs allow incidentally captured turtles to escape the nets. Exceptions to this requirement include a shrimp trawler that:

- Has on board no power or mechanical-advantage trawl retrieval system (i.e., any device used to haul any part of the net aboard) and complies with the alternative tow-time restrictions. The tow time is measured from the time that the trawl door enters the water until it is removed from the water. Tow times may not exceed: 55 minutes from April 1 through October 31; and 75 minutes from November 1 through March 31
- Is a bait shrimper that retains all live shrimp on board with a circulating seawater system, if it does not possess more than 32 pounds (14.5 kilograms) of dead shrimp on board, if it has a valid original state bait-shrimp license, and if the state license allows the licensed vessel to participate in the bait shrimp fishery exclusively
- Has only a pusher-head trawl, skimmer trawl, or wing (butterfly) net rigged for fishing and complies with alternative tow-time restrictions (as noted above)
- Is in an area during a period for which tow-time restrictions apply
- Is using a single test net (try net) with a headrope length of 12 feet (3.6 meters) or less and with a footrope length of 15 feet (4.6 meters) or less, if it is pulled immediately in front of another net or is not connected to another net in any way, if no more than one test net is used at a time, and if it is not towed as a primary net.

The following fishing gear or activities are also exempted from the TED requirements:

- A beam or roller trawl, if the frame is outfitted with rigid vertical bars, and if none of the spaces between the bars, or between the bars and the frame, exceeds 4 inches (10.2 centimeters)
- A shrimp trawler fishing for, or possessing, royal red shrimp, if royal red shrimp constitutes at least 90 percent (by weight) of all shrimp either found on board, or offloaded from that shrimp trawler.

Packaging

The Secretary of LDWF has the authority to adopt rules and regulations to establish standards for the packaging of seafood in Louisiana for wholesale or retail sale. These standards may govern the quality, contents, and weight of all seafood packaged in this state. The Louisiana Seafood Promotion and Marketing Board may make recommendations to the Secretary for standards for the packaging of seafood. Standards for packing shrimp in or sold in Louisiana for wholesale and retail sale state that packages of shrimp bearing the words "Gulf of Mexico" or "Gulf USA Shrimp" must be harvested or landed in the Gulf of Mexico or adjoining U.S. Gulf states, packages

of shrimp bearing the word "Louisiana" or "Louisiana Shrimp" must be harvested or landed in Louisiana, packages bearing the word "United States," or "USA," or "Product of USA" must be harvested or landed in the United States.

Shipments containing fish shall be plainly marked, the tags or certificates to show the date and names of the consignor and the consignee, with an itemized statement of the number of pounds of shrimp and the names of each kind contained therein.

Bills of lading issued by a common carrier for such shipments shall state the number of packages which contain shrimp, and the date and names of the consignor and consignee, with an itemized statement of the number of pounds of shrimp and the names of each kind contained therein.

Recreational

Licensing

Recreational fishermen must have basic fishing license to harvest shrimp with small trawls or cast nets, and, if using trawls, a recreational trawl license. Recreational fishermen do not need a license if using bait seines or dip nets.

Legal gear

Legal recreational shrimping gear includes trawls, cast nets, bait seines, dip nets, and minnow traps.

Gear requirements

Statutes specify the size and configuration of legal trawls, cast nets, bait seines, and dip nets. In general, there are restrictions on net mesh size and net and/or frame size.

Seasons

Same as those listed under Commercial.

Size and possession limits

Size limits are same as those listed under Commercial.

There is a limit on how much shrimp recreational fishermen may harvest—this limit varies depending on when and where they are fishing, what type of gear they are using, and if they are fishing for bait or personal consumption. Specifically, recreational fishermen may harvest no more than 100 pounds of shrimp per day per boat if using trawls 16 feet or shorter, no more than 250 pound per day per bout if using trawls between 17 and 25 feet, no more than 50 pounds per day per boat or vehicle if using cast nets, bait seines, dip nets, or minnow traps during closed seasons, and no more than 100 pounds per day per boat or vehicle if using cast nets, bait seines, dip nets, or minnow traps during open seasons.

Area restrictions

Same as those listed under Commercial.

Operational restrictions

Same as those listed under Commercial.

Fishing gear interactions

Same as those listed under Commercial.

Other

Louisiana Seafood Promotion and Marketing Board (LSPMB)

The LSPMB works to enhance the public image of commercial fishery products, promote the consumption of these products, and assist the seafood industry, including commercial fishermen and wholesale and retail dealers, in market development to better use existing markets and help establish new marketing channels. Of the LSPMB's 14 members, one is nominated by the American Shrimp Processors Association, and one is nominated by the Louisiana Shrimp Association.

Louisiana Wild Seafood Certification Program (LWSCP)

LDWF established the LWSCP to build a brand that guarantees the origin of Louisiana wild-caught seafood. The program establishes rules and guidelines throughout the seafood supply chain that ensure all seafood products bearing the program's logo have been caught in Louisiana waters or the U.S. Gulf of Mexico by licensed Louisiana fishermen, then landed, processed, and packaged in Louisiana. The program's goal is not only to increase consumer confidence in the source of their seafood but also to establish Louisiana seafood as a premium product and ensure the state's industry remains competitive in the constantly changing global marketplace.

The program requires participating seafood dealers and processors to be trained on the program guidelines, state and federal regulations, and best practices for quality and safety. It also requires that participating seafood retailers demonstrate that their seafood products registered and labeled with the LWSCP logo can be traced back to participating dealers and processors. The requirements for this origin-based brand help ensure the integrity and reputation of Louisiana seafood—when buyers see the program's logo, they know they're purchasing authentic Louisiana wild seafood, a product known for fresh flavor, consistent quality, and sustainability.

Seafood Technology Equipment Program

To support the LWSCP, the LDWF has developed the Seafood Technology Equipment Program (STEP), a cost-share assistance program for the commercial seafood community. STEP provides LWSCP participants with funding opportunities to improve their equipment and practices to increase the quality and value of their

seafood, critical components for establishing a strong brand for Louisiana seafood. For example, through the Shrimp Refrigeration Program, harvesters, docks, and processors may apply for funds that will help relieve the financial burden of upgrading refrigeration equipment. The Louisiana Legislature allocated funding for STEP in 2009 by setting aside 10 percent of the Artificial Reef Trust Fund revenues.

Professionalism Program

LDWF, in collaboration with Louisiana Sea Grant and the Louisiana State University AgCenter, has also developed a multi-year, multi-phase professionalism program for all sectors of the Louisiana's commercial fishing industry, including fishermen, dock owners, processors, and distributors. This program will provide education and training essential for the continued success of the industry and will focus on a number of important topics, including seafood quality and safety best practices. Launching in 2014, the first year/first phase initiatives include producing videos such as How to be a Commercial Fishermen and How to be a Dock/Processor, with corresponding fact sheets, and holding the annual Louisiana Seafood Summit, which offers informative presentations and materials, as well as hands-on workshops. These workshops include field activities and dockside demonstrations on a fishing vessel where experts demonstrate vessel refrigeration/cooler systems, seafood freezing equipment, fuel efficiency equipment, fishing/harvesting equipment, and seafood handling and processing techniques.

Fisheries Extension

Through outreach efforts, LDWF promotes public awareness and advises beneficiaries on stewardship and best practices in preserving the unique nature of the state's natural resources. Via a strong presence at recreational events, industry-related expos, workshops, seminars, and other state sponsored events, LDWF strives to foster a community sense of resource and habitat stewardship. An assortment of printed materials is distributed at these events which focus on fishing regulations, commercial and sport fishing topics, as well as species profile brochures which highlight the life cycle and habitat requirements of shrimp and other native Louisiana species. Through participation in outreach events and distribution of educational materials and activities, the Aquatic Outreach Program message reaches over 200,000 Louisiana citizens each year.

Compliance

Reporting Requirements

Since 1999, LDWF has monitored harvest of shrimp at the point of initial sale through the Louisiana Trip Ticket program. Under the program, wholesale/retail seafood dealers purchasing or acquiring shrimp from commercial fishermen must complete a commercial trip ticket at the time of purchase or transfer of the catch from the fisherman to the dealer. The trip ticket must have the following information: wholesale/retail seafood dealer's name and license number; commercial fisherman's name and license number; vessel license number; vessel registration or U.S. Coast Guard documentation number; transaction date, species identification; quantity and units of each species; size and condition of each species; unit price of each species; and permit number for species requiring a permit to harvest. Both the commercial fisherman and the dealer must sign the trip ticket, attesting that the information on the trip ticket is correct. The fisherman and the dealer each keep a copy of the trip ticket. The dealer must transmit trip tickets from all of its transactions to LDWF once a month.

A commercial fisherman selling fish under a fresh product license must also complete trip tickets, except they record their fresh product license number in place of the wholesaler/retailer seafood dealer's license number. They must sign these trip tickets, confirming their accuracy, and submit them to LDWF once a month.

Trip ticket records must be maintained for three years and are open to inspection by LDWF. Trip ticket information is protected by both state and federal law to limit access to business-specific information. However, LDWF and approved contractors may analyze and compile individual trip information into reports to provide reliable information for monitoring harvest from locations across the state, while still protecting sensitive information. LDWF enforces the Louisiana Trip Ticket program; violation of statutes related to the program can result in citations written by LDWF or other law enforcement officials.

Recordkeeping Requirements

Wholesale/retail seafood dealers, retail seafood dealers, restaurants, and retail grocers must keep records of the following:

- The quantity and species of fish acquired, the date the fish was acquired, and the name and license number of the wholesale/retail seafood dealer or the out-of-state seller from whom the fish was acquired. When creel limits apply to commercial species, records shall also indicate the number by head count of such species of fish.
- The quantity and species of fish sold, the date the fish was sold, and the name and license number of

the person to whom the fish was sold. When sold to the consumer, the records shall indicate the quantity, species, and date and shall state that the fish was sold to the consumer.

Enforcement

Through events, outreach materials, and other resources, LDWF informs commercial and recreational fishermen about programs, projects, and most importantly, relevant rules and regulations to prevent illegal activities. LDWF's Law Enforcement Division is responsible for ensuring compliance with all commercial and recreational licensing and harvesting regulations through regular patrols and investigations. LDWF's Law Enforcement Division is also responsible for enforcing laws as provided for in the Constitution of the State of Louisiana, Louisiana Revised Statutes, and numerous federal laws including the Magnuson-Stevens Act, the ESA, the MMPA, and the Lacey Act.

LDWF's Law Enforcement Division partners with NOAA Fisheries and USCG enforcement agents and officers to increase their enforcement capabilities and carry out their important mission in Louisiana's waters and beyond.

Penalties

Classes of violations vary by legislative statute or Commission rule. Penalties for violations vary with the severity of the violation and include fines, jail time, loss of fishing license, and forfeiture of property. Penalties for each class of violation are below:

- Class One: First offense—fine of $50, imprisonment for no more than 15 days, or both; second offense—fine of $75-250, imprisonment of 30-60 days, or both; third and subsequent offenses—fine of $250-550 and imprisonment of 30-90 days
- Class Two: First offense—fine of $100-350, imprisonment of no more than 60 days, or both; second offense—fine of $300-550 and imprisonment of 30-60 days; third and subsequent offenses—fine of $500-750, imprisonment of 60-90 days, and forfeiture of anything seized in connection with the violation
- Class Three: First offense—fine of $250-500, imprisonment of no more than 90 days, or both; second offense—fine of $500-800, imprisonment of 60-90 days, and forfeiture of anything seized in connection with the violation; third and subsequent offense—fine of $750-1,000, imprisonment of 90-120 days, and forfeiture of anything seized in connection with the violation. In addition to any other penalty, for a second or subsequent violation of the same provision of law the penalty imposed may include revocation of the permit or license under which the violation occurred for the period for which it was issued and bar the issuance of another permit or license for that same period.
- Class Four: First offense—fine of $400-950, imprisonment of no more than 120 days, or both; second offense—fine of $750-999 and imprisonment of 90-180 days; third and subsequent offenses—fine of $1,000-5,000 and imprisonment of 180 days to two years. All Class Four penalties include forfeiture of anything seized in connection with the violation.
- Class Five-A: First offense—fine of $500-750 and imprisonment of 15-30 days; second offense—fine of $750-1,000 and imprisonment of 60-90 days; third and subsequent offenses—fine of $750-1,000 and imprisonment of 90-120 days. All Class Five penalties include forfeiture of anything seized in connection with the violation. In addition, the license under which the violation occurred shall be revoked and not reinstated at any time during the period for which it was issued and for one year thereafter.
- Class Five-B: First offense—fine of $350-500 and imprisonment of 30 days; second offense—fine of $500-1,000 and imprisonment of 60 days; third and subsequent offenses—fine of $1,000-2,000 and imprisonment of 90 days. All Class Five penalties include forfeiture of anything seized in connection with the violation. In addition, the license under which the violation occurred shall be revoked and not reinstated at any time during the period for which it was issued and for one year thereafter.
- Class Six: For each offense, a fine of $900-950, imprisonment of no more than 120 days, or both, as well as forfeiture of anything seized in connection with the violation.
- Class Seven-A: For each offense, a fine of $5,000-7,500, imprisonment for one year, or both, as well as forfeiture of anything seized in connection with the violation.
- Class Seven-B: For each offense, a fine of $5,000-7,500 and imprisonment for one year, as well as forfeiture of anything seized in connection with the violation.
- Class Eight: For each offense, a fine of $5,000-7,000 and imprisonment for 60 days to six months.

In addition, violators must forfeit any shrimp in connection with the violation, may have their license revoked, and

have illegal or improperly tagged fishing gear confiscated. A person who kills, catches, takes, possesses, or injures any fish or other aquatic life in violation of an applicable state statute or regulation or a federal statute or regulation is also liable to the state for the value of each fish or other aquatic life, unlawfully killed, caught, taken, possessed, or injured. Civil restitution for shrimp is currently assessed at $2.57 per pound.

For convictions of shrimping during the closed season, violator's may have their gear licenses suspended for a certain period of time, depending on prior convictions. During such revocation or suspension, the violator may only be present on a vessel harvesting or possessing shrimp or shrimping gear if the vessel is equipped with an operating vessel monitoring system accessible to LDWF. The violator also must serve community service or jail time, depending on prior convictions. These penalties are in place to maximize voluntary compliance with shrimping regulations and reduce purposeful and repeated shrimping violations.

Other States' Shrimp Regulations

See Appendices XVII and XVIII for other states' commercial and recreational shrimp trawl regulations.

Current Issues and Management Options

ACHIEVING MANAGEMENT GOALS

Addressing current issues facing Louisiana's shrimp fishery through options identified in this section or through stakeholder participation will advance this fishery toward meeting long-term management goals.

This section identifies current issues facing Louisiana's shrimp fishery, provides a description of each issue, and recommends options for future action to address these issues. LDWF will work with stakeholders to prioritize these issues and identify preferred recommendations. Before implementing any recommendation, LDWF will evaluate the feasibility and potential impacts of the action on the resource and fishery.

General Bycatch

Fishing gear used to harvest shrimp can incidentally capture non-target species such as finfish and other crustaceans. According to recent studies, the bycatch to shrimp ratio in otter trawls is 2.5 kilograms (5.5 pounds) to 1 kilogram (2.2 pounds); catch is comprised of finfish (57 percent), shrimp (29 percent), crustaceans (7 percent), invertebrates (5 percent), and debris (1 percent). Bycatch rates are substantially lower in skimmer trawls, as compared with historical and current estimates of bycatch associated with capture from otter trawls; from 2012 to 2014, bycatch to shrimp ratios ranged from 0.92 to 1.94.

Federal law requires shrimp vessels operating in federal waters to use approved BRDs to reduce non-target species being hauled in with the shrimp catch. As of August 1, 2015, LDWF law enforcement agents are authorized to enforce federal BRD regulations. In Louisiana state waters, BRDs are not mandatory but many fishermen voluntarily use

them in both otter and skimmer trawls. However, some are concerned over potential shrimp loss if required to use BRDs in state waters. Fishermen may retain and sell most bycatch as long as they are in compliance with appropriate regulations and may retain fish for personal consumption as long as it is within minimum size and recreational daily possession limits. LDWF monitors landings and sales of these species through its trip ticket reporting system.

Options:

- Research BRD use in skimmer and butterfly nets.
- Encourage voluntary use of certified and properly installed BRDs in trawl, skimmer, and butterfly nets used in state waters.
- Require BRDs in all trawl, skimmer, and butterfly nets used in state waters.
- Collaborate with commercial shrimpers to develop new and innovative gear options.
- Evaluate the use of area closures to reduce bycatch.
- Improve data collection on bycatch species.
- Expand and enhance observer program coverage.
- Assess the status of primary bycatch species.

Incidental Capture of Protected Sea Turtles

Five species of sea turtles often share the same aquatic habitat as shrimp in the Gulf of Mexico and Louisiana waters and may be affected by shrimping activities. All of these species are currently listed as threatened or endangered under the ESA. Of these five species, Kemp's ridley sea turtles are of most concern in the Gulf of Mexico due to their limited range. Sea turtle mortality resulting from trawling operations in the southeastern shrimp fishery has been identified as the major source of man-induced mortality of Kemp's ridley sea turtles. Substantial progress has been made to reduce sea turtle interactions and recover sea turtle populations through a number of efforts including gear modifications and other fishing regulations, population monitoring, and habitat and nest protection.

Louisiana shrimpers have complained that sea turtles are not found in many of the state's shrimp fishing grounds. At times, shrimp trawlers have expressed concern over unacceptable levels of shrimp loss when using TEDs in waters containing large amounts of woody debris carried by the Mississippi and Atchafalaya Rivers. This debris, together with manmade debris and high numbers of derelict crab traps, may impact TED performance and sea turtle interactions.

Continued enforcement of and compliance with sea turtle conservation regulations play a major role in the continued success of these efforts. In addition, enhanced sea turtle population monitoring efforts could provide necessary information to inform future recovery efforts including changes to fishing regulations, such as area or seasonal closures, permits for new gear, and gear modifications, as well as additional protection of nesting and foraging areas and possible mitigation.

Options:

- Promote regular TED inspections for compliance with correct grid angle, proper opening and escape flap panel sizes and length, correct bar spacing, and proper flotation.
- Increase outreach efforts directed to skimmer and butterfly net fishermen to enhance compliance with tow-time restrictions.
- Ensure that fishermen are familiar with and trained in proper sea turtle handling and resuscitation requirements.
- Collaborate with commercial shrimpers to develop new and innovative gear options.
- Propose and secure funding for monitoring and research projects to further advance sea turtle population monitoring and conservation, including but not limited to the following. (LDWF has already submitted grant proposals to secure additional funding for several of these proposed efforts; see Appendix XIX for details.)
  - Create a Sea Turtle Information Hub—a digital data source for all information regarding sea turtles in the Gulf of Mexico—to allow management agencies to identify and prioritize research needs.
  - Implement beach patrol surveys to monitor for nesting activity on Louisiana's barrier islands to support monitoring of and protection for sea turtle nesting activity in these areas.
  - Implement beach patrol surveys to monitor for strandings on the coast of Louisiana to provide additional information to NOAA Fisheries to help predict interactions, captures, and mortality of sea turtles.
  - Implement observer survey in state waters to help improve estimates of incidental takes and related mortalities and provide guidance for management options.
  - Conduct aerial surveys for nesting and stranded

sea turtles to help study sea turtle distribution and abundance, determine the relative use of nesting beaches, and inform management decisions.

- Work with LDWF enforcement agents to research TED compliance to better inform NOAA Fisheries estimates of sea turtle mortalities and future sea turtle management decisions and provide guidance for future outreach.
- Implement sea turtle reporting and response program to promote and incentivize self-reporting of incidental takes of both live and dead sea turtles, potentially leading to more accurate estimates of sea turtle catch per unit effort and calculation of incidental takes, better informing management decisions, and implementing additional conservation measures. LDWF would provide handling assistance for reported incidental sea turtle captures, collect biological data on all turtles and tag healthy live turtles prior to their release, and provide financial support to nesting beaches to mitigate sea turtle mortalities.
- Conduct satellite tagging study for neonates and juvenile/adult sea turtles to provide information for management, such as habitat use, seasonal movements, and inter-nesting migration patterns of sea turtles.
- Research the feasibility of using trawl sampling gear to monitor sea turtle populations in Louisiana and Gulf of Mexico waters to obtain information on sea turtles at all life stages, help determine the causes of population trends, and better inform management options.

- Request that state agencies are part of the peer-review process for all federal sea turtle-related reports.

Effort Management

The Louisiana shrimp fishery is an open access fishery. Since 2000, participation in the fishery has declined, as evidenced by steep reductions in license sales and fishing effort due to low shrimp prices, rising fuel costs, competition with imported products, and impacts of hurricanes. Despite current reduced levels of participation in the fishery, there is potential for rapid expansion of the fishery at some point in the future. Unrestricted participation may lead to increased competition within the fishery, reduced profitability of individual fishermen, as well as increased user conflicts. Consideration should be given to limiting access and effort in the fishery, including alternatives such as a professionalism program for new participants in the fishery.

Options:

- Develop and implement a professional development program designed to increase and elevate professionalism in the fishery. New license applicants could be required to enroll in and complete educational training in proper fishing techniques necessary for sustainability of the shrimp resource, proper techniques for the best capture and presentation of shrimp for marketability, reducing conflicts with other user groups, and bycatch reduction.
- Evaluate fishing capacity for the shrimp fishery compared to current participation and effort.
- Evaluate other methods for limiting effort in the fishery, including by not limited to:
  - Raising license fees
  - Requiring drug testing for entry into the fishery
  - Eliminating latent licenses
  - Qualifying participation based on license history, historical landings levels, or historical values of landings
  - Establishing a license buyback program
  - Requiring license endorsements that scale/tier trip limits
  - Removing gear license transferability

Habitat Loss

In general, the management community recognizes the landscape of Louisiana's coast is rapidly changing due to a history of manmade and natural events. As a result of these changes, the State of Louisiana has developed and is implementing plans to attempt to minimize loss of marsh habitat. Both factors have the potential to impact the ability of these marshes to provide suitable habitat for marine and estuarine organisms, including shrimp as well as their predators and prey. This could result in long-term changes in the abundance of shrimp stocks. However, at this time, it is not possible to predict with any confidence the direction, timing, or magnitude of these changes.

Options:

- Support programs that identify, preserve, and/or restore essential shrimp habitat and assess and encourage flood protection projects to maximize access by shrimp to essential habitats.
- Enhance shrimp industry participation in the development and implementation of coastal

restoration projects.

Foreign Imports

Shrimp imports to the United States have risen steadily since the 1970s. Shrimp imports currently make up the largest single import item among fish products in the United States and dominate the U.S. shrimp market. In conjunction with increasing imports, dockside prices for domestic shrimp have declined. Several industry groups have petitioned the federal government to require antidumping and countervailing duties on imported shrimp, with varying success, to offset the impact of imports on the domestic industry. They have also successfully petitioned for technical and financial assistance for the domestic shrimp industry.

Unfortunately, the benefits of trade relief have not been apparent to the entire industry. Collected anti-dumping duties are typically distributed to domestic shrimp purchasers and not fishermen.

In addition, according to the shrimp industry, other current concerns regarding imports include transshipments of shrimp from third party nations, evasion of shrimp antidumping duties, inhumane treatment and abuse of immigrant workers in foreign shrimp supply chains, use of banned antibiotics in shrimp farming operations, and the repackaging of foreign imports and country of origin mislabeling.

Options:

- Urge USDOC, the U.S. Food and Drug Administration, and the U.S. Department of Homeland Security to increase testing of all foreign shrimp imports for antibiotics as well as food safety issues.
- Encourage U.S. shrimp importers and seafood distributors to end their tolerance of the use of banned antibiotics in shrimp aquaculture.
- Encourage U.S. shrimp importers and seafood distributors to monitor their supply chains to ensure humane treatment of workers.
- Urge federal agencies to aggressively pursue fraudulent activities, violations of anti-dumping duty orders, country of origin mislabeling, and packaging and weight standards.
- Raise awareness of the quality, availability, and sustainability of Louisiana shrimp.

Harvesting for Market Demand

Yield per recruit could be enhanced if the fishery were managed for larger sized shrimp. However, it is important to consider that large areas may be closed to shrimping and that certain markets rely on smaller shrimp sizes harvested in Louisiana. It is also important to consider that opportunities to harvest larger size shrimp may be achieved through special shrimp seasons and shrimp season extensions limited to certain areas. However, the use of special seasons and season extensions may rely on boundaries designated by coordinates (e.g. latitudes and longitudes), particularly in open waters. When coordinates specifying certain waters open or closed to shrimping have been used in the past, the successful prosecution of violations has been challenging according to LDWF law enforcement agents. For this reason, LDWF has been unable to effectively optimize these opportunities.

Options:

- Review and evaluate current management target for opening of inshore brown shrimp season, currently based on projections of available shrimp at 50 percent of sampled crop at 100 count (whole shrimp) per pound.
- Review and evaluate current management target for opening of inshore white shrimp season, and methods to manage harvest effort within that season (e.g. in-season closures, area closures, gear regulation, etc.).
- Consider modifying criteria used to develop projections and recommendations for inshore shrimp season opening and closing dates.
- Restrict shrimping within certain waters during certain times.
- Close certain areas to shrimping.
- Increase minimum mesh size requirements.
- Establish minimum possession size limits for brown shrimp.
- Increase the minimum possession size limits for white shrimp and allow enforcement of the minimum size beyond possession onboard a vessel.
- Eliminate the minimum white shrimp possession size limit exemption (October 15 through the third Monday in December).
- Optimize opportunities for special shrimp seasons and shrimp season extensions using geographic coordinates.
- Encourage local district attorneys and courts to effectively prosecute violations.

User Group Conflicts

There is long history of conflict between the shrimp fishery and the crab fishery in Louisiana with regard to space, loss or damage to gear in both fisheries, and related issues. Review of this issue found that options to ameliorate the conflicts between commercial shrimp and crab fishermen include separating the two groups spatially or seasonally and restricting gear usage. Specific measures range from eliminating shrimping in certain waters, designating commercial crabbing seasons, separating shrimping and crabbing areas during periods of intensive fishing pressure, limiting entry and/or trap limits, increasing distance between traps, and placing traps in a single straight line. While some of these options have been used (e.g. separating shrimping and crabbing areas during periods of intensive fishing pressure), most options are either impractical, unenforceable, or not in the best interests of either fishery. However, conflict resolution meetings between user groups in impacted areas may prove beneficial and reduce the need for restrictive legislative statutes or Commission regulations that may negatively impact one or both fisheries.

Other issues may arise over oyster lease practices, geoseismic surveys, oil and gas exploration and production activity, commercial maritime navigation, and artificial reef development. In addition, shrimpers have complained that heavy fishing effort within certain areas by specially permitted bait dealers, particularly before the opening of the fall and spring inshore shrimp seasons, may be damaging the resource and have suggested that bait fishing be restricted during these times.

Options:

- Create an inter-task force working group to resolve conflicts.
- Implement crab trap and shrimping area and/or time restrictions to reduce user conflicts.
- Further define provisions in statute regarding placement of crab traps in navigable channels and streams.
- Designate areas prohibited to the use of crab traps (e.g. by depth, season, etc.).
- Designate areas prohibited to the use of shrimping gear (e.g. by depth, season, etc.).
- Require crab fishermen to tend their traps within a specified amount of time and to remove traps that are not being actively fished (e.g. placeholders).
- Restrict geoseismic survey operations to closed shrimp seasons or limit survey operations in areas with heavy shrimping activity.
- Limit the number of poles and PVC pipes used to mark oyster leases.
- Aggressively expand the Underwater Obstruction Removal Program and increase its annual funding.
- Restrict fishermen operating under a Special Bait Dealer permit to certain areas or exclude certain areas during certain periods, or limit bait dealer harvest to a certain trip limit per vessel in the days leading up to a season opening for a given area.
- Restrict the development of artificial reef sites to areas that are unproductive shrimp fishing grounds.
- Clearly mark artificial reefs developed within historic shrimp fishing grounds.
- Establish artificial reef zones where shrimping is prohibited.

Disease and Parasite Risks

Shrimp diseases and parasites pose no threat to human health, but there is concern over the discharge of water from aquaculture operations and effluent from the processing of imported shrimp and subsequent infection of domestic shrimp stocks..

Options:

- Encourage government agencies to remain cautious of permitting non-indigenous species of shrimp introduced into the state and permitting of mariculture operations.
- Mandate the proper disposal of effluent from the processing of imported shrimp.

Hypoxia

Large areas of hypoxic or oxygen-depleted waters are found off of Louisiana's continental shelf seasonally, from late spring through early fall, and are largely attributed to heavy nutrient loads discharged by the Mississippi River. Hypoxic areas are often referred to as "dead zones" where dissolved oxygen levels in lower water layers and the water bottom may be too low to sustain marine life. The timing and growth of these hypoxic waters correspond with peak shrimp fishing opportunities. Evidence suggests that hypoxia influences harvest dynamics and decreases profits in the Louisiana shrimp fishery through the reduction of suitable shrimp habitats associated with hypoxic waters.

Options:

- Work with the Mississippi/Gulf of Mexico Watershed Nutrient Task Force to control nutrient load and reduce the "dead zone" in the Gulf of

Mexico.

- Encourage the development of grant opportunities and awards to states, agencies, watershed groups, and wastewater treatment facilities to address nutrient-driven water quality problems.
- Encourage development of comprehensive nitrogen and phosphorus pollution reduction strategies.
- Encourage, support, and expand the use of technical guidance in development of water quality criteria for nutrients.
- Expand oversight of industry permitted nutrient discharges.

Coastal Restoration, Flood Control, and Freshwater Diversion Projects

CPRA monitors and measures coastal habitat loss and has proposed and implemented a number of coastal protection, restoration, and flood control projects through Louisiana's Coastal Master Plan. Both shrimp fishermen and shrimp industry representatives recognize the importance and benefits of flood protection and coastal restoration projects. However, many have expressed concern about potential impacts to shrimp recruitment and emigration patterns, growing conditions, access to the fishery, and increased eutrophication of marshes. Shrimp fishermen as well as other fishermen have witnessed how flow rates of existing freshwater diversion projects have influenced these conditions and resulting harvests.

Options:

- Request CPRA to adopt flexibility in the operation of freshwater diversions and not rely exclusively on long-term salinity averages.
- Reduce diversion flow rates during peak times of brown shrimp post-larval and juvenile recruitment.
- Request CPRA to relocate the Davis Pond management regime's 15 ppt salinity line farther north in the estuary.
- Most of the Davis Pond water quality monitoring stations are located in the center of the Barataria basin, and much of the freshwater inflow impacts the western side of the basin. Encourage CPRA to establish additional stations in the western portion of the basin.
- Request CPRA to enhance monitoring of nutrient loads associated with freshwater inflows and examine impacts of eutrophication on marsh deterioration and loss.

Expired Federal Permits

In 2001, the Gulf Council established a federal commercial permit for all vessels harvesting shrimp from federal waters of the U.S. Gulf of Mexico. In 2006, the Gulf Council placed a 10-year moratorium on issuing new federal shrimp permits, capping the number of permits at current participation (2,666 permitted vessels). Vessel owners had one year to obtain a permit under the moratorium, and NOAA Fisheries issued 1,933 moratorium permits at that time. When a vessel owner fails to renew their expired permit, the permit is permanently removed and is no longer available to the fishery. As of the end of 2014, 1,470 moratorium permits were valid or renewable (within one year of expiration). Therefore, the number of available permits has decreased significantly through passive reduction since the moratorium began.

Many Louisiana shrimpers operate vessels large enough to fish offshore, but the current permit system leaves them little means to obtain a permit to do so. (A shrimper who does not have a federal permit may only obtain one if a current permit holder transfers their permit to them.) These shrimpers are limited to fishing state inland and coastal waters and have been denied access to fishing even in nearshore federal waters for a number of years.

The permit moratorium will expire October 26, 2016. The Gulf Council is currently considering whether to: 1) allow the moratorium to expire and revert all federal shrimp permits to open access; 2) extend the moratorium for another period of time; or 3) establish a permanent limited access system for U.S. Gulf of Mexico shrimp permits. The Gulf Council is also considering creating reserve permits instead of allowing permits to expire and establishing qualification requirements to eliminate latent permits.

Options:

- Continue to encourage the Gulf Council and NOAA Fisheries to create a reserve permit procedure and system that makes expired permits available to fishermen.

Future Research and Data Needs

SCIENCE TO SUPPORT MANAGEMENT

Throughout the development of this fishery management plan, LDWF has identified several research projects that would provide data to address some of the issues and data gaps in the fishery or species biology.

Specific research projects are listed below.

1. Evaluate methods to estimate shrimping effort that provide statistically acceptable results.
2. Evaluate methods to collect detailed biological samples and area specific harvest information.
3. Develop a fishery-dependent survey on recreational shrimping designed to provide information on socioeconomic impacts.
4. Characterize bycatch across all strata (seasons, area, gear, vessel size), develop baseline estimates of bycatch, and develop release mortality estimates of discarded bycatch, including the source of the mortality (e.g. handling, predation while in possession, predation upon release, barotrauma).
5. Explore technologies for electronic landings reporting. Timely access to volume and size of catch at the basin and sub-basin level would be beneficial to season extensions and closures.
6. Evaluate potential for and effectiveness of creating sanctuaries.
7. Determine the impacts of changes to estuarine habitat from coastal land loss and

habitat restoration projects on shrimp populations.

8. Explore technologies for timely electronic notifications to the fishing industry of regulatory changes including season openings and closures.

Research Priorities, Funding, and Publication

LDWF prioritizes future research according to several factors, including the following:

- Whether it fits the agency's mission
- Whether it can be adequately funded
- Whether it can be reasonably expected to produce answers to specific management questions
- Whether it can be reasonably undertaken without compromising other capabilities and efforts
- Whether it has or will have the support of stakeholders
- Whether it has or can engender cooperation with other researchers, managers, user groups, and/or the general public.

Research is funded through state license fees and federal grants and programs; funding is allocated based on priority as described above.

LDWF analyzes all research and reports results in multiple formats, as appropriate. Ultimately, all information is publicly available (other than information linked to private enterprises, i.e. confidential landings data).

Acknowledgements

Other individuals who made contributions to this document include: Jason Adriance, Harry Blanchet, Rob Bourgeois, Jason Froeba, Cole Garrett, Michael Harden, Captain Chad Hebert, Jack Isaacs, Christopher Kubacki, Marc Maniscalco, Damon Morris, Josh Parks, Randy Pausina, Mark Schexnayder, Joey Shepard, Nicole Smith, Glenn Thomas, Joe West, and Drue Winters.

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Appendices

Appendix I. Louisiana Legislature 2015 Regular Session, House Bill No. 668/Act No. 416

To enact R.S. 56:492.1 and to repeal R.S. 56:57.2 as enacted by Act 283 of the 1987 Regular Session of the Louisiana Legislature, R.S. 56:57.2 as enacted by Act 891 of the 1987 Regular Session of the Louisiana Legislature, as amended, and R.S. 56:57.4, relative to enforcement of the federal requirement for the use of excluder devices in shrimp trawls; to repeal the prohibition on such enforcement; to require the Louisiana Shrimp Task Force to report to the legislature recommendations for legislation applicable to enforcement of the federal requirements for the use of turtle excluder devices in shrimp trawls used in state waters; to require wildlife agents to wear body cameras; to authorize the Wildlife and Fisheries Commission to promulgate rules relative to the use of excluder devices; and to provide for related matters. Be it enacted by the Legislature of Louisiana: Section 1. R.S. 56:492.1 is hereby enacted to read as follows:

§492.1. Excluder devices

The commission may promulgate rules and regulations in accordance with the Administrative Procedure Act relative to the use, possession, and configuration of devices designed to exclude the take of certain fish and other aquatic life from fishing gear within the territorial waters of the state and in the federal exclusive economic zone.

Section 2. R.S. 56:57.2 as enacted by Act 283 of the 1987 Regular Session of the Louisiana Legislature and R.S. 56:57.2 as enacted by Act 891 of the 1987 Regular Session of the Louisiana Legislature, as amended, are hereby repealed in their entirety.

Section 3. R.S. 56:57.4 is hereby repealed in its entirety.

Section 4. During the time period from June 1, 2016 through December 31, 2018, at all times while enforcing turtle excluder device requirements, a wildlife agent shall wear an electronic device capable of recording video and audio data or capable of transmitting video and audio data to be recorded remotely. In the event that the electronic device is broken, malfunctioning, powered off, absent, or otherwise unavailable, this Section shall not act as a defense to a violation of law nor shall it prohibit a wildlife agent from making a case, a district attorney or federal prosecutor from prosecuting a violation, or a court from considering all applicable evidence when adjudicating such an offense.

Section 5. No later than February 1, 2018, the Louisiana Shrimp Task Force shall submit a written report to the House Committee on Natural Resources and Environment and the Senate Committee on Natural Resources with recommendations for whether or not the use of turtle excluder devices should be enforced in state waters and proposed rules and regulations under which such devices should be enforced in state waters.

Appendix II. Sea Turtle Distribution Maps

Figure 17. Loggerhead sea turtle range map.

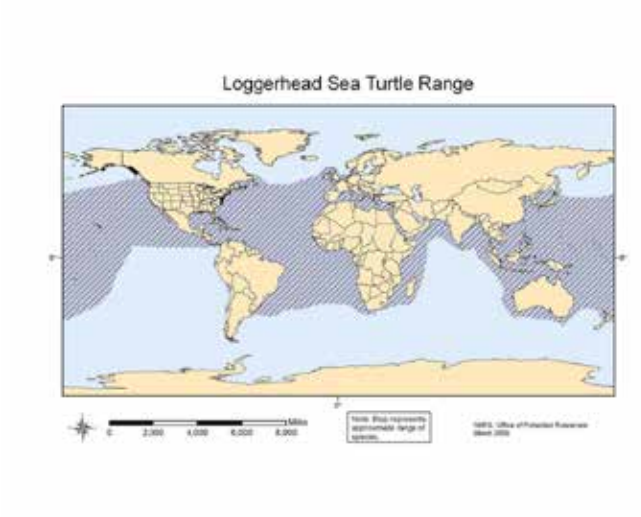


Figure 18. Green sea turtle range map.

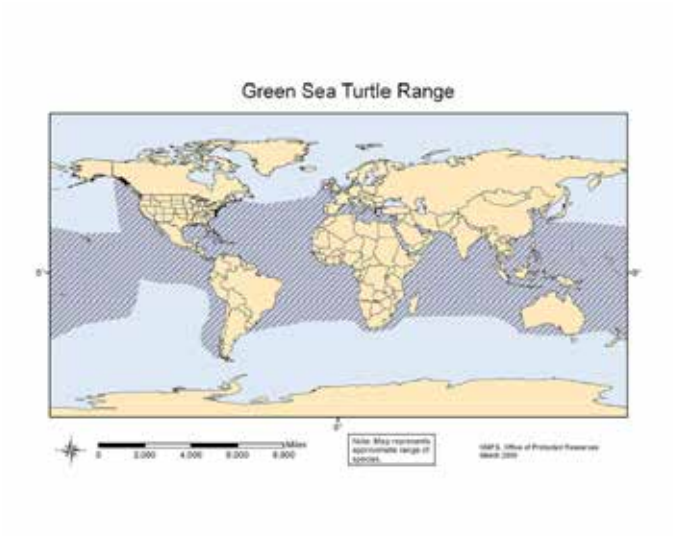


Figure 19. Hawksbill sea turtle range map.

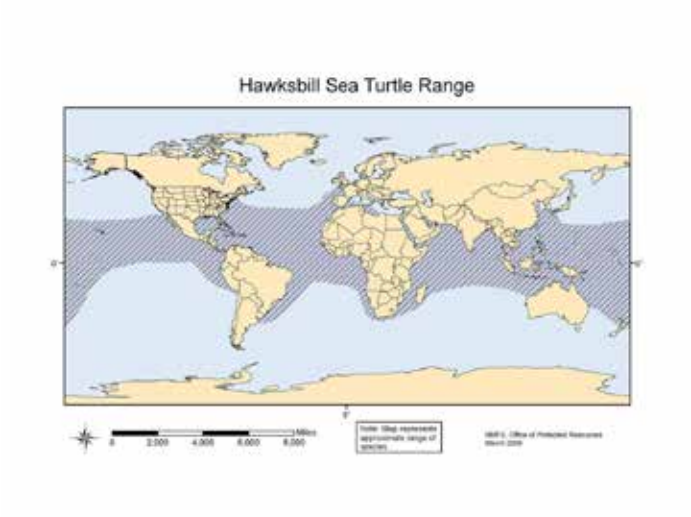


Figure 20. Kemp's ridley sea turtle range map.

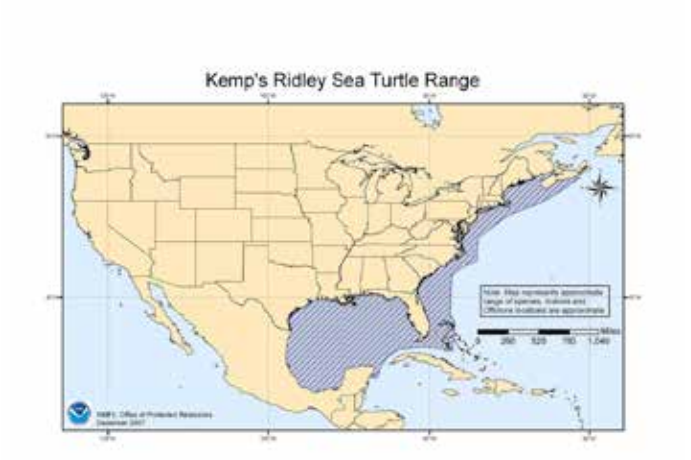
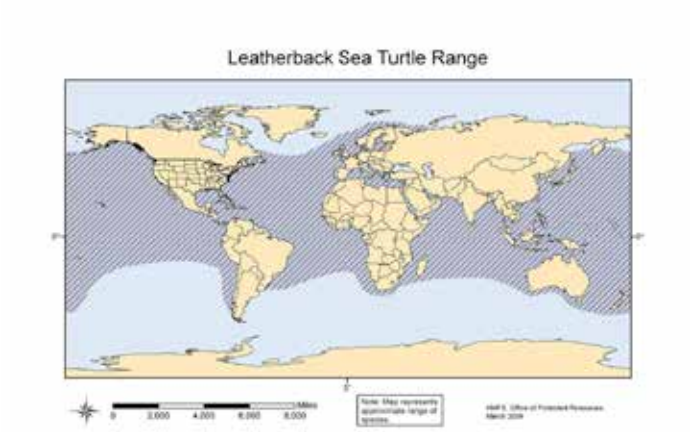


Figure 21. Leatherback sea turtle range map.



Appendix III. Federal Sea Turtle Conservation Regulations

§ 223.205 Sea turtles.

(a) The prohibitions of section 9 of the Act (16 U.S.C. 1538) relating to endangered species apply to threatened species of sea turtle, except as provided in §223.206.

(b) Except as provided in §223.206, it is unlawful for any person subject to the jurisdiction of the United States to do any of the following:

(1) Own, operate, or be on board a vessel, except if that vessel is in compliance with all applicable provisions of §223.206(d);

(2) Fish for, catch, take, harvest, or possess, fish or wildlife while on board a vessel, except if that vessel is in compliance with all applicable provisions of §223.206(d);

(3) Fish for, catch, take, harvest, or possess, fish or wildlife contrary to any notice of tow-time or other restriction specified in, or issued under, §223.206(d)(3) or (d)(4);

(4) Possess fish or wildlife taken in violation of paragraph (b) of this section;

(5) Fail to follow any of the sea turtle handling and resuscitation requirements specified in §223.206(d)(1);

(6) Possess a sea turtle in any manner contrary to the handling and resuscitation requirements of §223.206(d)(1);

(7) Fail to comply immediately, in the manner specified at §600.730 (b) through (d) of this Title, with instructions and signals specified therein issued by an authorized officer, including instructions and signals to haul back a net for inspection;

(8) Refuse to allow an authorized officer to board a vessel, or to enter an area where fish or wildlife may be found, for the purpose of conducting a boarding, search, inspection, seizure, investigation, or arrest in connection with enforcement of this section;

(9) Destroy, stave, damage, or dispose of in any manner, fish or wildlife, gear, cargo, or any other matter after a communication or signal from an authorized officer, or upon the approach of such an officer or of an enforcement vessel or aircraft, before the officer has an opportunity to inspect same, or in contravention of directions from the officer;

(10) Assault, resist, oppose, impede, intimidate, threaten, obstruct, delay, prevent, or interfere with an authorized officer in the conduct of any boarding, search, inspection, seizure, investigation, or arrest in connection with enforcement of this section;

(11) Interfere with, delay, or prevent by any means, the apprehension of another person, knowing that such person committed an act prohibited by this section;

(12) Resist a lawful arrest for an act prohibited by this section;

(13) Make a false statement, oral or written, to an authorized officer or to the agency concerning the fishing for, catching, taking, harvesting, landing, purchasing, selling, or transferring fish or wildlife, or concerning any other matter subject to investigation under this section by such officer, or required to be submitted under this part 223;

(14) Sell, barter, trade or offer to sell, barter, or trade, a TED that is not an approved TED;

…

(22) Attempt to do, solicit another to do, or cause to be done, any of the foregoing.

(c) In connection with any action alleging a violation of this section, any person claiming the benefit of any exemption, exception, or permit under this subpart B has the burden of proving that the exemption, exception, or permit is applicable, was granted, and was valid and in force at the time of the alleged violation. Further, any person claiming that a modification made to a TED that is the subject of such an action complies with the requirements of §223.207 (c) or (d) has the burden of proving such claim.

[64 FR 14069, Mar. 23, 1999, as amended at 67 FR 41203, June 17, 2002; 69 FR 25012, May 5, 2004; 71 FR 50372, Aug. 25, 2006; 73 FR 68354, Nov. 18, 2008]

§ 223.206 Exceptions to prohibitions relating to sea turtles.

(a) Permits —

(1) Scientific research, education, zoological exhibition, or species enhancement permits. The Assistant Administrator may issue permits authorizing activities which would otherwise be prohibited under §223.205(a) for scientific or educational purposes, for zoological exhibition, or to enhance the propagation or survival of threatened species of sea turtles, in accordance with and subject to the conditions of part 222, subpart C—General Permit Procedures.

(2) Incidental-take permits. The Assistant Administrator may issue permits authorizing activities that would otherwise be prohibited under §223.205(a) in accordance with section 10(a)(1)(B) of the Act (16 U.S.C. 1539(a)(1)(B)), and in accordance with, and subject to, the implementing regulations in part 222 of this chapter. Such permits may be issued for the incidental taking of threatened and endangered species of sea turtles.

…

(d) Exception for incidental taking. The prohibitions against taking in §223.205(a) do not apply to the incidental take of any member of a threatened species of sea turtle (i.e., a take not directed towards such member) during fishing or scientific research activities, to the extent that those involved are in compliance with all applicable requirements of paragraphs (d)(1) through (d)(11) of this section, or in compliance with the terms and conditions of an incidental take permit issued pursuant to paragraph (a)(2) of this section.

(1) Handling and resuscitation requirements.

(i) Any specimen taken incidentally during the course of fishing or scientific research activities must be handled with due care to prevent injury to live specimens, observed for activity, and returned to the water according to the following procedures:

(A) Sea turtles that are actively moving or determined to be dead as described in paragraph (d)(1)(i)(C) of this section must be released over the stern of the boat.

In addition, they must be released only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels.

(B) Resuscitation must be attempted on sea turtles that are comatose, or inactive, as determined in paragraph (d)(1) of this section, by:

(1) Placing the turtle on its bottom shell (plastron) so that the turtle is right side up and elevating its hindquarters at least 6 inches (15.2 cm) for a period of 4 up to 24 hours. The amount of the elevation depends on the size of the turtle; greater elevations are needed for larger turtles. Periodically, rock the turtle gently left to right and right to left by holding the outer edge of the shell (carapace) and lifting one side about 3 inches (7.6 cm) then alternate to the other side. Gently touch the eye and pinch the tail (reflex test) periodically to see if there is a response.

(2) Sea turtles being resuscitated must be shaded and kept damp or moist but under no circumstance be placed into a container holding water. A water-soaked towel placed over the head, carapace, and flippers is the most effective method in keeping a turtle moist.

(3) Sea turtles that revive and become active must be released over the stern of the boat only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels. Sea turtles that fail to respond to the reflex test or fail to move within 4 hours (up to 24, if possible) must be returned to the water in the same manner as that for actively moving turtles.

(C) A turtle is determined to be dead if the muscles are stiff (rigor mortis) and/or the flesh has begun to rot; otherwise the turtle is determined to be comatose or inactive and resuscitation attempts are necessary.

(ii) In addition to the provisions of paragraph (d)(1)(i) of this section, a person aboard a vessel in the Atlantic, including the Caribbean Sea and the Gulf of Mexico, that has pelagic or bottom longline gear on board and that has been issued, or is required to have, a limited access permit for highly migratory species under §635.4 of this title, must comply with the handling and release requirements specified in §635.21 of this title.

(iii) Any specimen taken incidentally during the course of fishing or scientific research activities must not be consumed,

sold, landed, offloaded, transshipped, or kept below deck.

(2) Gear requirements for trawlers —

(i) TED requirement for shrimp trawlers. Any shrimp trawler that is in the Atlantic Area or Gulf Area must have an approved TED installed in each net that is rigged for fishing. A net is rigged for fishing if it is in the water, or if it is shackled, tied, or otherwise connected to any trawl door or board, or to any tow rope, cable, pole or extension, either on board or attached in any manner to the shrimp trawler. Exceptions to the TED requirement for shrimp trawlers are provided in paragraph (d)(2)(ii) of this section.

(ii) Exemptions from the TED requirement—

(A) Alternative tow-time restrictions. A shrimp trawler is exempt from the TED requirements of paragraph (d)(2)(i) of this section if it complies with the alternative tow-time restrictions in paragraph (d)(3)(i) of this section and if it:

(1) Has on board no power or mechanical-advantage trawl retrieval system (i.e., any device used to haul any part of the net aboard);

(2) Is a bait shrimper that retains all live shrimp on board with a circulating seawater system, if it does not possess more than 32 lb. (14.5 kg) of dead shrimp on board, if it has a valid original state bait-shrimp license, and if the state license allows the licensed vessel to participate in the bait shrimp fishery exclusively;

(3) Has only a pusher-head trawl, skimmer trawl, or wing net rigged for fishing;

(4) Is in an area during a period for which tow-time restrictions apply under paragraphs (d)(3)(ii) or (iii) of this section, if it complies with all applicable provisions imposed under those paragraphs; or

(5) Is using a single test net (try net) with a headrope length of 12 ft (3.6 m) or less and with a footrope length of 15 ft (4.6 m) or less, if it is pulled immediately in front of another net or is not connected to another net in any way, if no more than one test net is used at a time, and if it is not towed as a primary net, in which case the exemption under this paragraph (d)(2)(ii)(A) applies to the test net.

(B) Exempted gear or activities. The following fishing gear or activities are exempted from the TED requirements of paragraph (d)(2)(i) of this section:

(1) A beam or roller trawl, if the frame is outfitted with rigid vertical bars, and if none of the spaces between the bars, or between the bars and the frame, exceeds 4 inches (10.2 cm); and

(2) A shrimp trawler fishing for, or possessing, royal red shrimp, if royal red shrimp constitutes at least 90% (by weight) of all shrimp either found on board, or offloaded from that shrimp trawler.

…

(3) Tow-time restrictions —

(i) Duration of tows. If tow-time restrictions are utilized pursuant to paragraph (d)(2)(ii), (d)(3)(ii), or (d)(3)(iii) of this section, a shrimp trawler must limit tow times. The tow time is measured from the time that the trawl door enters the water until it is removed from the water. For a trawl that is not attached to a door, the tow time is measured from the time the cod end enters the water until it is removed from the water. Tow times may not exceed:

(A) 55 minutes from April 1 through October 31; and

(B) 75 minutes from November 1 through March 31.

(ii) Alternative—special environmental conditions. The Assistant Administrator may allow compliance with tow-time restrictions, as an alternative to the TED requirement of paragraph (d)(2)(i) of this section, if the Assistant Administrator determines that the presence of algae, seaweed, debris or other special environmental conditions in a particular area makes trawling with TED-equipped nets impracticable.

(iii) Substitute—ineffectiveness of TEDs. The Assistant Administrator may require compliance with tow-time restrictions, as a substitute for the TED requirement of paragraph (d)(2)(i) of this section, if the Assistant Administrator determines that

TEDs are ineffective in protecting sea turtles.

(iv) Notice; applicability; conditions. The Assistant Administrator will publish notification concerning any tow-time

restriction imposed under paragraph (d)(3)(ii) or (iii) of this section in the Federal Register and will announce it in summary form on channel 16 of the marine VHF radio. A notification of tow-time restrictions will include findings in support of these restrictions as an alternative to, or as substitute for, the TED requirements. The notification will specify the effective dates, the geographic area where tow-time restrictions apply, and any applicable conditions or restrictions that the Assistant Administrator determines are necessary or appropriate to protect sea turtles and ensure compliance, including, but not limited to, a requirement to carry observers, to register vessels in accordance with procedures at paragraph (d)(5) of this section, or for all shrimp trawlers in the area to synchronize their tow times so that all trawl gear remains out of the water during certain times. A notification withdrawing tow-time restrictions will include findings in support of that action.

(v) Procedures. The Assistant Administrator will consult with the appropriate fishery officials (state or Federal) where the affected shrimp fishery is located in issuing a notification concerning tow-time restrictions. An emergency notification can be effective for a period of up to 30 days and may be renewed for additional periods of up to 30 days each if the Assistant Administrator finds that the conditions necessitating the imposition of tow-time restrictions continue to exist. The Assistant Administrator may invite comments on such an action, and may withdraw or modify the action by following procedures similar to those for implementation. The Assistant Administrator will implement any permanent tow-time restriction through rulemaking.

(4) Limitations on incidental takings during fishing activities—

(i) Limitations. The exemption for incidental takings of sea turtles in paragraph (d) of this section does not authorize incidental takings during fishing activities if the takings:

(A) Would violate the restrictions, terms, or conditions of an incidental take statement or biological opinion;

(B) Would violate the restrictions, terms, or conditions of an incidental take permit; or

(C) May be likely to jeopardize the continued existence of a species listed under the Act.

(ii) Determination; restrictions on fishing activities. The Assistant Administrator may issue a determination that incidental takings during fishing activities are unauthorized. Pursuant thereto, the Assistant Administrator may restrict fishing activities in order to conserve a species listed under the Act, including, but not limited to, restrictions on the fishing activities of vessels subject to paragraph (d)(2) of this section. The Assistant Administrator will take such action if the Assistant Administrator determines that restrictions are necessary to avoid unauthorized takings that may be likely to jeopardize the continued existence of a listed species.

The Assistant Administrator may withdraw or modify a determination concerning unauthorized takings or any restriction on fishing activities if the Assistant Administrator determines that such action is warranted.

(iii) Notice; applicability; conditions. The Assistant Administrator will publish a notification of a determination concerning unauthorized takings or a notification concerning the restriction of fishing activities in the Federal Register. The Assistant Administrator will provide as much advance notice as possible, consistent with the requirements of the Act, and will announce the notification in summary form on channel 16 of the marine VHF radio. Notification of a determination concerning unauthorized takings will include findings in support of that determination; specify the fishery, including the target species and gear used by the fishery, the area, and the times, for which incidental takings are not authorized; and include such other conditions and restrictions as the Assistant Administrator determines are necessary or appropriate to protect sea turtles and ensure compliance. Notification of restriction of fishing activities will include findings in support of the restriction, will specify the time and area where the restriction is applicable, and will specify any applicable conditions or restrictions that the Assistant Administrator determines are necessary or appropriate to protect sea turtles and ensure compliance. Such conditions and restrictions may include, but are not limited to, limitations on the types of fishing gear that may be used, tow-time restrictions, alteration or extension of the periods of time during which particular tow-time requirements apply, requirements to use TEDs, registration of vessels in accordance with procedures at paragraph (d)(5) of this section, and requirements to provide observers. Notification of withdrawal or modification will include findings in support of that action.

(iv) Procedures. The Assistant Administrator will consult with the appropriate fisheries officials (state or Federal) where the fishing activities are located in issuing notification of a determination concerning unauthorized takings or notification concerning the restriction of fishing activities. An emergency notification will be effective for a period of up to 30

days and may be renewed for additional periods of up to 30 days each, except that emergency placement of observers will be effective for a period of up to 180 days and may be renewed for an additional period of 60 days. The Assistant Administrator may invite comments on such action, and may withdraw or modify the action by following procedures similar to those for implementation. The Assistant Administrator will implement any permanent determination or restriction through rulemaking.

(5)–(6) [Reserved]

…

[64 FR 14070, Mar. 23, 1999]

Editorial Note: For Federal Register citations to §223.206, see the List of CFR Sections Affected, which appears in the Finding Aids section of the printed volume and at www.fdsys.gov.

Effective Date Notes:

1. At 64 FR 14070, Mar. 23, 1999, newly redesignated §223.206 was revised. Paragraph (d)(5) contains information collection and recordkeeping requirements and will not become effective until approval has been given by the Office of Management and Budget.

2. At 67 FR 41203, June 17, 2002, §223.206 was amended by adding paragraph (d)(2)(v). Paragraph (d)(2)(v)(C) contains information collection and recordkeeping requirements and will not become effective until approval has been given by the Office of Management and Budget.

§ 223.207 Approved TEDs.

Any netting, webbing, or mesh that may be measured to determine compliance with this section is subject to measurement, regardless of whether it is wet or dry. Any such measurement will be of the stretched mesh size.

(a) Hard TEDs. Hard TEDs are TEDs with rigid deflector grids and are categorized as "hooped hard TEDs" and "single-grid hard TEDs" such as the Matagorda and Georgia TED (Figures 3 & 4 to this part). Hard TEDs complying with the following generic design criteria are approved TEDs:

(1) Construction materials—

(i) Single-grid and inshore hooped hard TED. A single-grid hard TED or an inshore hooped hard TED must be constructed of one or a combination of the following materials, with minimum dimensions as follows:

(A) Solid steel rod with a minimum outside diameter of 1/4 inch (0.64 cm);

(B) Fiberglass or aluminum rod with a minimum outside diameter of 1/2 inch (1.27 cm); or

(C) Steel or aluminum tubing with a minimum outside diameter of 1/2 inch (1.27 cm) and a minimum wall thickness of 1/8 inch (0.32 cm) (also known as schedule 40 tubing).

(ii) Offshore hooped hard TED. An offshore hooped hard TED must be constructed of aluminum, with minimum dimensions as follows:

(A) Solid rod with a minimum outside diameter of 5/8 inch (1.59 cm); or

(B) Tubing with a minimum outside diameter of 1 inch (2.54 cm) and a minimum wall thickness of 1/8 inch (0.32 cm).

(2) Method of attachment. A hard TED must be sewn into the trawl around the entire circumference of the TED with heavy twine.

(3) Angle of deflector bars.

(i) The angle of the deflector bars must be between 30° and 55° from the normal, horizontal flow through the interior of the trawl, except as provided in paragraph

(a)(3)(ii) of this section.

(ii) For any shrimp trawler fishing in the Gulf SFSTCA or the Atlantic SFSTCA, a hard TED with the position of the escape opening at the bottom of the net when the net is in its deployed position, the angle of the deflector bars from the normal, horizontal flow through the interior of the trawl, at any point, must not exceed 55°, and the angle of the bottom-

most 4 inches (10.2 cm) of each deflector bar, measured along the bars, must not exceed 45° (Figures 14a and 14b to this part).

(4) Space between bars. The space between deflector bars and the deflector bars and the TED frame must not exceed 4 inches (10.2 cm).

(5) Direction of bars. The deflector bars must run from top to bottom of the TED, as the TED is positioned in the net, except that up to four of the bottom bars and two of the top bars, including the frame, may run from side to side of the TED. The deflector bars must be permanently attached to the TED frame or to the horizontal bars, if used, at both ends.

(6) Position of the escape opening. The escape opening must be made by removing a rectangular section of webbing from the trawl, except for a TED with an escape opening size described at paragraph (a)(7)(ii)(A) for which the escape opening may alternatively be made by making a horizontal cut along the same plane as the TED.

The escape opening must be centered on and immediately forward of the frame at either the top or bottom of the net when the net is in the deployed position. The escape opening must be at the top of the net when the slope of the deflector bars from forward to aft is upward, and must be at the bottom when such slope is downward. The passage from the mouth of the trawl through the escape opening must be completely clear of any obstruction or modification, other than those specified in paragraph (d) of this section.

(7) Size of escape opening—

(i) Hooped hard TEDs—

(A) Escape opening for inshore hooped hard TED. The inshore hooped hard TED escape opening must have a horizontal measurement of no less than 35 inches (89 cm) wide and a forward measurement of no less than 27 inches (69 cm). A hinged door frame may be used to partially cover the escape opening as provided in paragraph (d)(7) of this section. Alternatively, a webbing flap may be used as provided in paragraph (d)(3)(i) of this section. The resultant opening with a webbing flap must be a minimum width of 35 inches (89 cm) and a minimum height of 20 inches (51 cm), with each measurement taken simultaneously. This opening may only be used in inshore waters, except it may not be used in the inshore waters of Georgia and South Carolina.

B) Escape opening for offshore hooped hard TED. The offshore hooped hard TED escape opening must have a horizontal measurement of no less than 40 inches (102 cm) wide and a forward measurement of no less than 35 inches (89 cm). A hinged door frame may be used to partially cover the escape opening as provided in paragraph (d)(7) of this section. Alternatively, a webbing flap may be used as provided in paragraph (d)(3)(ii) of this section. The resultant escape opening with a webbing flap must have a stretched mesh circumference of no less than 142 inches (361 cm).

(ii) Single-grid hard TEDs. On a single-grid hard TED, the horizontal cut(s) for the escape opening may not be narrower than the outside width of the TED frame minus 4 inches (10.2 cm) on both sides of the grid, when measured as a straight line width. Fore-and-aft cuts to remove a rectangular piece of webbing must be made from the ends of the horizontal cuts along a single row of meshes along each side. The overall size of the escape opening must match one of the following specifications:

(A) 44–inch inshore opening. The escape opening must have a minimum width of 44 inches (112 cm) and a minimum height of 20 inches (51 cm) with each measurement taken separately. A webbing flap, as described in paragraph (d)(3)(i) of this section, may be used with this escape hole, so long as this minimum opening size is achieved. This opening may only be used in inshore waters, except it may not be used in the inshore waters of Georgia and South Carolina.

(B) The 71–inch offshore opening. The two forward cuts of the escape opening must not be less than 26 inches (66 cm) long from the points of the cut immediately forward of the TED frame. The resultant length of the leading edge of the escape opening cut must be no less than 71 inches (181 cm) with a resultant circumference of the opening being 142 inches (361 cm) (Figure 12 to this part). A webbing flap, as described in paragraph (d)(3)(ii) of this section, may be used with this escape hole, so long as this minimum opening size is achieved. Either this opening or the one described in paragraph (a)(7)(ii)(C) of this section must be used in all offshore waters and in all inshore waters in Georgia and South Carolina, but may also be used in other inshore waters.

(C) Double cover offshore opening. The two forward cuts of the escape opening must not be less than 20 inches (51 cm) long from the points of the cut immediately forward of the TED frame. The resultant length of the leading edge of the escape opening cut must be no less than 56 inches (142 cm) (Figure 16 to this part illustrates the dimensions of these

cuts). A webbing flap, as described in paragraph (d)(3)(iii) of this section, may be used with this escape hole. Either this opening or the one described in paragraph (a)(7)(ii)(B) of this section must be used in all offshore waters but also in all inshore waters in Georgia and South Carolina, and may be used in other inshore waters.

(8) Size of hoop or grid—

(i) Hooped hard TED—

(A) Inshore hooped hard TED. The front hoop on an inshore hooped hard TED must have an inside horizontal measurement of at least 35 inches (89 cm) and an inside vertical measurement of at least 30 inches (76 cm). The minimum clearance between the deflector bars and the forward edge of the escape opening must be at least 20 inches (51 cm).

(B) Offshore hooped hard TED. The front hoop on an offshore hooped hard TED must have an inside horizontal measurement of at least 40 inches (102 cm) and an inside vertical measurement of at least 30 inches (76 cm). The minimum clearance between the deflector bars and the forward edge of the escape opening must

be at least 23 1/4 inches (59 cm).

(ii) Single-grid hard TED. A single-grid hard TED must have a minimum outside horizontal and vertical measurement of 32 inches (81 cm). The required outside measurements must be at the mid-point of the deflector grid.

(9) Flotation. Floats must be attached to the top one-half of all hard TEDs with bottom escape openings. The floats may be attached either outside or inside the net, but not to a flap. Floats attached inside the net must be behind the rear surface of the TED. Floats must be attached with heavy twine or rope. Floats must be constructed of aluminum, hard plastic, expanded polyvinyl chloride, or expanded ethylene vinyl acetate unless otherwise specified. The requirements of this paragraph may be satisfied by compliance with either the dimension requirements of paragraph (a)(9)(i) of this section, or the buoyancy requirements of paragraph (a)(9)(ii) of this section, or the buoyancy-dimension requirements of paragraph (a)(9)(iii) of this section. If roller gear is used pursuant to paragraph (d)(5) of this section, the roller gear must be included in the circumference measurement of the TED or the total weight of the TED.

(i) Float dimension requirements.

(A) For hard TEDs with a circumference of 120 inches (304.8 cm) or more, a minimum of either one round, aluminum or hard plastic float, no smaller than 9.8 inches (25.0 cm) in diameter, or two expanded polyvinyl chloride or expanded ethylene vinyl acetate floats, each no smaller than 6.75 inches (17.2 cm) in diameter by 8.75 inches (22.2 cm) in length, must be attached.

(B) For hard TEDs with a circumference of less than 120 inches (304.8 cm), a minimum of either one round, aluminum or hard plastic float, no smaller than 9.8 inches (25.0 cm) in diameter, or one expanded polyvinyl chloride or expanded ethylene vinyl acetate float, no smaller than 6.75 inches (17.2 cm) in diameter by 8.75 inches (22.2 cm) in length, must be attached.

(ii) Float buoyancy requirements. Floats of any size and in any combination must be attached such that the combined buoyancy of the floats, as marked on the floats, equals or exceeds the weight of the hard TED, as marked on the TED. The buoyancy of the floats and the weight of the TED must be clearly marked on the floats and the TED as follows:

(A) Float buoyancy markings. Markings on floats must be made in clearly legible raised or recessed lettering by the original manufacturer. The marking must identify the buoyancy of the float in water, expressed in grams or kilograms, and must include the metric unit of measure. The marking may additionally include the buoyancy in English units. The marking must identify the nominal buoyancy for the manufactured float.

(B) TED weight markings. The marking must be made by the original TED manufacturer and must be permanent and clearly legible. The marking must identify the in-air, dry weight of the TED, expressed in grams or kilograms, and must include the metric unit of measure. The marking may additionally include the weight in English units. The marked weight must represent the actual weight of the individual TED as manufactured. Previously manufactured TEDs may be marked upon return to the original manufacturer. Where a TED is comprised of multiple detachable components, the weight of each component must be separately marked.

(iii) Buoyancy-dimension requirements. Floats of any size and in any combination, provided that they are marked pursuant to paragraph (a)(9)(ii)(A) of this section, must be attached such that the combined buoyancy of the floats equals or exceeds the following values:

(A) For floats constructed of aluminum or hard plastic, regardless of the size of the TED grid, the combined buoyancy must equal or exceed 14 lb (6.4 kg);

(B) For floats constructed of expanded polyvinylchloride or expanded ethylene vinyl acetate, where the circumference of the TED is 120 inches (304.8 cm) or more, the combined buoyancy must equal or exceed 20 lb (9.1 kg); or

(C) For floats constructed of expanded polyvinyl chloride or expanded ethylene vinyl acetate, where the circumference of the TED is less than 120 inches (304.8 cm), the combined buoyancy must equal or exceed 10 lb (4.5 kg).

(b) Special Hard TEDs. Special hard TEDs are hard TEDs which do not meet all of the design and construction criteria of the generic standards specified in paragraph (a) of this section. The following special hard TEDs are approved TEDs:

…

(2) Weedless TED. The weedless TED must meet all the requirements of paragraph (a) of this section for single-grid hard TEDs, with the exception of paragraphs (a)(1) and (a)(5) of this section. The weedless TED must be constructed of at least 1–1/4 inch (3.2 cm) outside diameter aluminum with a wall thickness of at least 1/8 inch (0.3 cm). The deflector bars must run from top to bottom of the TED, as the TED is positioned in the net. The ends of the deflectors bars on the side of the frame opposite to the escape opening must be permanently attached to the frame. The ends of the deflector bars nearest the escape opening are not attached to the frame and must lie entirely forward of the leading edge of the outer frame. The ends of the unattached deflector bars must be no more than 4 inches (10.2 cm) from the frame and may not extend past the frame. A horizontal brace bar to reinforce the deflector bars, constructed of the same size or larger pipe as the deflector bars, must be permanently attached to the frame and the rear face of each of the deflector bars at a position anywhere between the vertical mid-point of the frame and the unattached ends of the deflector bars. The horizontal brace bar may be offset behind the deflector bars, using spacer bars, not to exceed 5 inches (12.7 cm) in length and constructed of the same size or larger pipe as the deflector bars. See Figure 15.

(c) Soft TEDs. Soft TEDs are TEDs with deflector panels made from polypropylene or

polyethylene netting. The following soft TEDs are approved TEDs:

(1) Parker TED. The Parker TED is a soft TED, consisting of a single triangular panel, composed of webbing of two different mesh sizes, that forms a complete barrier inside a trawl and that angles toward an escape opening in the top of the trawl.

(i) Excluder Panel. (Figure 5 to this part) The excluder panel of the Parker TED must be constructed of a single triangular piece of 8-inch (20.3 cm) stretched mesh webbing and two trapezoidal pieces of 4-inch (10.2-cm) stretched mesh webbing.

The webbing must consist of number 48 (3-mm thick) or larger polypropylene or polyethylene webbing that is heat-set knotted or braided. The leading edge of the 8-inch (20.3-cm) mesh panel must be 36 meshes wide. The 8-inch (20.3-cm) mesh panel must be tapered on each side with all-bar cuts to converge on an apex, such that the length of each side is 36 bars. The leading edges of the 4-inch (10.2-cm) mesh panels must be 8 meshes wide. The edges of the 4-inch (10.2-cm) mesh panels must be cut with all-bar cuts running parallel to each other, such that the length of the inner edge is 72 bars and the length of the outer edge is 89 bars and the resulting fore-and-aft edge is 8 meshes deep. The two 4-inch (10.2-cm) mesh panels must be sewn to the 8-inch (20.3-cm) mesh panel to create a single triangular excluder panel. The 72-bar edge of each 4-inch (10.2-cm) mesh panel must be securely joined with twine to one of the 36-bar edges of the 8-inch (20.3-cm) mesh panel, tied with knots at each knot of the 4-inch (10.2-cm) webbing and at least two wraps of twine around each bar of 4-inch (10.2-cm) mesh and the adjoining bar of the 8-inch (20.3-cm) mesh. The adjoining fore-and-aft edges of the two 4-inch (10.2-cm) mesh panels must be sewn together evenly.

(ii) Limitations on which trawls may have a Parker TED installed. The Parker TED must not be installed or used in a two-seam trawl with a tongue, nor in a triple-wing trawl (a trawl with a tongue along the headrope and a second tongue along the footrope). The Parker TED may be installed and used in any other trawl if the taper of the body panels of the trawl does not exceed 4b1p and if it can be properly installed in compliance with paragraph (c)(1)(iii) of this section.

(iii) Panel installation—

(A) Leading edge attachment. The leading edge of the excluder panel must be attached to the inside of the bottom of the trawl across a straight row of meshes. For a two-seam trawl or a four-seam, tapered-wing trawl, the row of meshes

for attachment to the trawl must run the entire width of the bottom body panel, from seam to seam. For a four-seam, straight-wing trawl, the row of meshes for attachment to the trawl must run the entire width of the bottom body panel and half the height of each wing panel of the trawl. Every mesh of the leading edge of the excluder panel must be evenly sewn to this row of meshes; meshes may not be laced to the trawl. The row of meshes for attachment to the trawl must contain the following number of meshes, depending on the stretched mesh size used in the trawl:

(1) For a mesh size of 21/4inches (5.7 cm), 152–168 meshes;

(2) For a mesh size of 21/8inches (5.4 cm), 161–178 meshes;

(3) For a mesh size of 2 inches (5.1 cm), 171–189 meshes;

(4) For a mesh size of 17/8inches (4.8 cm), 182–202 meshes;

(5) For a mesh size of 13/4inches (4.4 cm), 196–216 meshes;

(6) For a mesh size of 15/8inches (4.1 cm), 211–233 meshes;

(7) For a mesh size of 11/2inches (3.8 cm), 228–252 meshes;

(8) For a mesh size of 13/8inches (3.5 cm), 249–275 meshes; and

(9) For a mesh size of 11/4inches (3.2 cm), 274–302 meshes.

(B) Apex attachment. The apex of the triangular excluder panel must be attached to the inside of the top body panel of the trawl at the centerline of the trawl. The distance, measured aft along the centerline of the top body panel from the same row of meshes for attachment of the excluder panel to the bottom body panel of the trawl, to the apex attachment point must contain the following number of meshes, depending on the stretched mesh size used in the trawl:

(1) For a mesh size of 21/4inches (5.7 cm), 78–83 meshes;

(2) For a mesh size of 21/8 inches (5.4 cm), 83–88 meshes;

(3) For a mesh size of 2 inches (5.1 cm), 87–93 meshes;

(4) For a mesh size of 17/8inches (4.8 cm), 93–99 meshes;

(5) For a mesh size of 13/4inches (4.4 cm), 100–106 meshes;

(6) For a mesh size of 15/8inches (4.1 cm), 107–114 meshes;

(7) For a mesh size of 11/2inches (3.8 cm), 114–124 meshes;

(8) For a mesh size of 13/8inches (3.5 cm), 127–135 meshes; and

(9) For a mesh size of 11/4inches (3.2 cm), 137–146 meshes.

(C) Side attachment. The sides of the excluder panel must be attached evenly to the inside of the trawl from the outside attachment points of the excluder panel's leading edge to the apex of the excluder panel. Each side must be sewn with the same sewing sequence, and, if the sides of the excluder panel cross rows of bars in the trawl, the crossings must be distributed evenly over the length of the side attachment.

(iv) Escape opening. The escape opening for the Parker soft TED must match one of the following specifications:

(A) Inshore opening. This opening is the minimum size opening that may be used in inshore waters, except it may not be used in the inshore waters of Georgia and South Carolina, in which a larger minimum opening is required. A slit at least 56 inches (1.4 m) in taut length must be cut along the centerline of the top body panel of the trawl net immediately forward of the apex of the panel webbing. The slit must not be covered or closed in any manner. The edges and end points of the slit must not be reinforced in any way; for example, by attaching additional rope or webbing or by changing the orientation of the webbing.

(B) Offshore opening. A horizontal cut extending from the attachment of one side of the deflector panel to the trawl to the attachment of the other side of the deflector panel to the trawl must be made in a single row of meshes across the top of the trawl and measure at least 96 inches (244 cm) in taut width. All trawl webbing above the deflector panel between the 96-inch (244-cm) cut and edges of the deflector panel must be removed. A rectangular flap of nylon webbing not larger than 2-inch (5.1-cm) stretched mesh may be sewn to the forward edge of the escape opening. The width of the flap must not be larger than the width of the forward edge of the escape opening. The flap must not extend more than

12 inches (30.4 cm) beyond the rear point of the escape opening. The sides of the flap may be attached to the top of the trawl but must not be attached farther aft than the row of meshes through the rear point of the escape opening. One row of steel chain not larger than3/16inch (4.76 mm) may be sewn evenly to the back edge of the flap. The stretched length of the chain must not exceed 96 inches (244 cm). A Parker TED using the escape opening described in this paragraph meets the requirements of §223.206(d)(2)(iv)(B). This opening or one that is larger must be used in all offshore waters and in the inshore waters of Georgia and South Carolina. It also may be used in other inshore waters.

(2) [Reserved]

(d) Allowable modifications to hard TEDs and special hard TEDs. Unless otherwise prohibited in paragraph (b) of this section, only the following modifications may be made to an approved hard TED or an approved special hard TED:

(1) Floats. In addition to floats required pursuant to paragraph (a)(9) of this section, floats may be attached to the top one-half of the TED, either outside or inside the net, but not to a flap. Floats attached inside the net must be behind the rear surface at the top of the TED.

(2) Accelerator funnel. An accelerator funnel may be installed in the trawl, if it is made of net webbing material with a stretched mesh size of not greater than 1 5/8 inches (4 cm), if it is inserted in the net immediately forward of the TED, and if its rear edge does not extend past the bars of the TED. The trailing edge of the accelerator funnel may be attached to the TED on the side opposite the escape opening if not more than one-third of the circumference of the funnel is attached, and if the inside horizontal opening as described above in maintained. In a bottom opening TED only the top one-third of the circumference of the funnel may be attached to the TED. In a top opening TED only the bottom one-third of the circumference of the funnel may be attached to the TED.

(i) In inshore waters, other than the inshore waters of Georgia and South Carolina in which a larger opening is required, the inside horizontal opening of the accelerator funnel must be at least 44 inches (112 cm).

(ii) In offshore waters and the inshore waters of Georgia and South Carolina, the inside horizontal opening of the accelerator funnel must be at least 71 inches (180 cm).

(3) Webbing flap. A webbing flap may be used to cover the escape opening under the following conditions: No device holds it closed or otherwise restricts the opening; it is constructed of webbing with a stretched mesh size no larger than 1-5/8 inches (4 cm); it lies on the outside of the trawl; it is attached along its entire forward edge forward of the escape opening; it is not attached on the sides beyond the row of meshes that lies 6 inches (15 cm) behind the posterior edge of the grid; the sides of the flap are sewn on the same row of meshes fore and aft; and the flap does not overlap the escape hole cut by more than 5 inches (13 cm) on either side.

(i) 44–inch inshore TED flap. This flap may not extend more than 24 inches (61 cm) beyond the posterior edge of the grid.

(ii) 71–inch offshore TED Flap. The flap must be a 133-inch (338-cm) by 52-inch (132-cm) piece of webbing. The 133-inch (338-cm) edge of the flap is attached to the forward edge of the opening (71-inch [180-cm] edge). The flap may extend no more than 24 inches (61 cm) behind the posterior edge of the grid (Figure 12 to this part illustrates this flap).

(iii) Double cover flap offshore TED flap. This flap must be composed of two equal size rectangular panels of webbing. Each panel must be no less than 58 inches (147 cm) wide and may overlap each other no more than 15 inches (38 cm). The panels may only be sewn together along the leading edge of the cut. The trailing edge of each panel must not extend more than 24 inches (61 cm) past the posterior edge of the grid (Figure 16 to this part). Each panel may be sewn down the entire length of the outside edge of each panel. Chafing webbing described in paragraph (d)(4) of this section may not be used with this type of flap.

(A) Edge lines. Optional edge lines can be used in conjunction with this flap. The line must be made of polyethylene with a maximum diameter of 3/8 inches (.95 cm). A single length of line must be used for each flap panel. The line must be sewn evenly to the unattached, inside edges and trailing edges, of each flap panel. When edge lines are installed, the outside edge of each flap panel must be attached along the entire length of the flap panel.

(B) [Reserved]

(4) Chafing webbing. A single piece of nylon webbing, with a twine size no smaller than size 36 (2.46 mm in diameter), may be attached outside of the escape opening webbing flap to prevent chafing on bottom opening TEDs. This webbing

may be attached along its leading edge only. This webbing may not extend beyond the trailing edge or sides of the existing escape opening webbing flap, and it must not interfere or otherwise restrict the turtle escape opening.

(5) Roller gear. Roller gear may be attached to the bottom of a TED to prevent chafing on the bottom of the TED and the trawl net. When a webbing flap is used in conjunction with roller gear, the webbing flap must be of a length such that no part of the webbing flap can touch or come in contact with any part of the roller gear assembly or the means of attachment of the roller gear assembly to the TED, when the trawl net is in its normal, horizontal position. Roller gear must be constructed according to one of the following design criteria:

(i) A single roller consisting of hard plastic shall be mounted on an axle rod, so that the roller can roll freely about the axle. The maximum diameter of the roller shall be 6 inches (15.24 cm), and the maximum width of the axle rod shall be 12 inches (30.4 cm). The axle rod must be attached to the TED by two support rods. The maximum clearance between the roller and the TED shall not exceed 1 inch (2.5 cm) at the center of the roller. The support rods and axle rod must be made from solid steel or solid aluminum rod no larger than1/2inch (1.28 cm) in diameter. The attachment of the support rods to the TED shall be such that there are no protrusions (lips, sharp edges, burrs, etc.) on the front face of the grid. The axle rod and support rods must lie entirely behind the plane of the face of the TED grid.

(ii) A single roller consisting of hard plastic tubing shall be tightly tied to the back face of the TED grid with rope or heavy twine passed through the center of the roller tubing. The roller shall lie flush against the TED. The maximum outside diameter of the roller shall be 31/2inches (8.0 cm), the minimum outside diameter of the roller shall be 2 inches (5.1 cm), and the maximum length of the roller shall be 12 inches (30.4 cm). The roller must lie entirely behind the plane of the face of the grid.

(6) Water deflector fin for hooped hard TEDs. On a hooped hard TED, a water deflector fin may be welded to the forward edge of the escape opening. The fin must be constructed of a flat aluminum bar, up to 3/8 inch (0.95 cm) thick and up to 4 inches (10.2 cm) deep. The fin may be as wide as the width of the escape opening, minus 1 inch (2.5 cm). The fin must project aft into the TED with an angle between 5° and 45° from the normal, horizontal plane of the trawl. On an inshore hooped hard TED, the clearance between the deflector bars and the posterior edge of the deflector fin must be at least 20 inches (51 cm). On an offshore hooped hard TED, the clearance between the deflector bars and the posterior edge of the deflector fin must be at least 23–1/4 inches (59 cm).

(7) Hinged door frame for hooped hard TEDs. A hinged door frame may be attached to the forward edge of the escape opening on a hooped hard TED. The door frame must be constructed of materials specified at paragraphs (a)(1)(i) or (a)(1)(ii) of this section for inshore and offshore hooped hard TEDs, respectively. The door frame may be covered with a single panel of mesh webbing that is taut and securely attached with twine to the perimeter of the door frame, with a mesh size not greater than that used for the TED extension webbing. The door frame must be at least as wide as the TED escape opening. The door frame may be a maximum of 24 inches (61 cm) long. The door frame must be connected to the forward edge of the escape opening by a hinge device that allows the door to open outwards freely. The posterior edge of the door frame, in the closed position, must lie at least 12 inches (30 cm) forward of the posterior edge of the escape opening. A water deflector fin may be welded to the posterior edge of the hinged door frame. The fin must be constructed of a flat aluminum bar, up to 3/8 inch (0.95 cm) thick and up to four inches (10.2 cm) deep. The fin may be as wide as the width of the escape opening, minus one inch (2.5 cm). The fin must project aft into the TED with an angle between 5° and 45° from the normal, horizontal plane of the trawl, when the door is in the closed position. The clearance between the posterior edge of the escape opening and the posterior edge of the door frame or the posterior edge of the water deflector fin, if installed, must be no less than 12 inches (30 cm), when the door is in the closed position. Two stopper ropes or a hinge limiter may be used to limit the maximum opening height of the hinged door frame, as long as they do not obstruct the escape opening in any way or restrict the free movement of the door to its fully open position. When the door is in its fully open position, the minimum clearance between any part of the deflector bars and any part of the door, including a water deflector fin if installed, must be at least 20 inches (51 cm) for an inshore hooped hard TED and at least 23 1/4 inches (59 cm) for an offshore hooped hard TED. The hinged door frame may not be used in combination with a webbing flap specified at paragraph (d)(3) of this section or with a water deflection fin specified at paragraph (d)(6) of this section.

(e) Revision of generic design criteria, and approval of TEDs, of allowable modifications of hard TEDs, and of special hard TEDs.

(1) The Assistant Administrator may revise the generic design criteria for hard TEDs set forth in paragraph (a) of this

section, may approve special hard TEDs in addition to those listed in paragraph (b) of this section, may approve allowable modifications to hard TEDs in addition to those authorized in paragraph (d) of this section, or may approve other TEDs, by regulatory amendment, if, according to a NMFS-approved scientific protocol, the TED demonstrates a sea turtle exclusion rate of 97% or greater (or an equivalent exclusion rate). Two such protocols have been published by NMFS (52 FR 24262, June 29, 1987; and 55 FR 41092, October 9, 1990) and will be used only for testing relating to hard TED designs. Testing under any protocol must be conducted under the supervision of the Assistant Administrator, and shall be subject to all such conditions and restrictions as the Assistant Administrator deems appropriate. Any person wishing to participate in such testing should contact the Director, Southeast Fisheries Science Center, NMFS, 75 Virginia Beach Dr., Miami, FL 33149–1003.

(2) Upon application, the Assistant Administrator may issue permits, subject to such conditions and restrictions as the Assistant Administrator deems appropriate, authorizing public or private experimentation aimed at improving shrimp retention efficiency of existing approved TEDs and at developing additional TEDs, or conducting fishery research, that would otherwise be subject to §223.206(d)(2). Applications should be made to the Southeast Regional Administrator (see §222.102 definition of "Southeast Regional Administrator").

[64 FR 14073, Mar. 23, 1999, as amended at 64 FR 55438, Oct. 13, 1999; 66 FR 1603, Jan. 9, 2001; 66 FR 24288, May 14, 2001; 68 FR 8467, Feb. 21, 2003; 68 FR 51514, Aug. 27, 2003; 68 FR 54934, Sept. 19, 2003; 69 FR 31037, June 2, 2004]

Effective Date Note: At 64 FR 14073, Mar. 23, 1999, §223.207 was added. Paragraphs (a)(9)(ii) (A) and (B) contain information collection and recordkeeping requirements and will not become effective until approval has been given by the Office of Management and Budget.

§ 224.104 Special requirements for fishing activities to protect endangered sea turtles.

(a) Shrimp fishermen in the southeastern United States and the Gulf of Mexico who comply with rules for threatened sea turtles specified in §223.206 of this chapter will not be subject to civil penalties under the Act for incidental captures of endangered sea turtles by shrimp trawl gear.

…

(c) Special prohibitions relating to sea turtles are provided at §223.206(d).

[64 FR 14066, Mar. 23, 1999, as amended at 66 FR 44552, Aug. 24, 2001; 66 FR 67496, Dec. 31, 2001; 68 FR 8471, Feb. 21, 2003; 69 FR 18453, Apr. 7, 2004; 72 FR 31757, June 8, 2007

Appendix IV. Sea Turtle Conservation Timeline

Partially adapted from NMFS 2014.

1961: Dr. Henry Hildebrand presents a film taken in 1947 of a mass nesting event showing thousands of Kemp's ridley sea turtles emerging from the waters of the Gulf. This was the first documented Kemp's ridley nesting event; it occurred in Tamaulipas, Mexico, where the majority (up to 95 percent) of this species' nesting still occurs.

1963: Using the 1947 film, Drs. Hildebrand and Archie Carr estimate that 40,000 turtles nested in one day at the beaches in Tamaulipas

1966: Mexican government protects nesting beaches from egg collectors

1970: Kemp's ridley nesting sea turtles dramatically decline (Table 18) likely due to direct harvest of eggs from nests, harvest of live turtles for meat and oil, heavy predation of nests from coyotes and ghost crabs, predation of hatchlings by birds and fish, and fishing-related sea turtle mortalities, specifically from trawl and gill net gear

Kemp's ridley sea turtles are listed by the U.S. Fish and Wildlife Service (USFWS) as endangered species under the Endangered Species Conservation Act of 1969, a precursor to the Endangered Species Act (ESA).

Table 18. Dr. Archie Carr's estimates of Kemp's ridley nesting sea turtles and total mature population.

Year	Estimated Nesting Arrival	Total Mature Population
1947	40,000	162,400
1970	2,500	10,150
1974	1,200	4,872

1970s: NOAA Fisheries begins testing different turtle excluder device (TED) designs for trawl nets

1973: ESA is enacted

1977: Beach at Rancho Nuevo, Mexico (in the state of Tamaulipas) is declared a National Reserve for the Management and Conservation of Sea Turtles

1978: Mexico and the United States (through USFWS) create a collaborative program for the recovery of this species. Efforts to protect and restore the Kemp's ridley population include daily surveys during nesting season, egg relocation to protected "corrals" (screened enclosures) for incubation, protection of hatchlings upon release, and collection of nesting and hatchling data.

Testing of TEDs results in preventing 75 percent of encountered turtles from entering the trawls, but shrimp losses (15 to 30 percent) are unacceptable. Research is directed towards releasing turtles once they enter the trawl versus preventing them from entering the trawl

1978-1981: NOAA Fisheries begins developing and testing a rigid TED that can be inserted farther back in the net. Turtle exclusion and shrimp retention results for the TED are positive. By 1981, the TED–a large, cage-like device with a metal-framed trap door–has been developed and found to release 97 percent of the turtles caught in shrimp trawls with no loss of shrimp.

1981-1983: NOAA Fisheries encourages voluntary use of TEDs in the shrimp fishery

1983-1986: NOAA Fisheries operates a formal program which builds and delivers TEDs to shrimp fishermen who agree to use them voluntarily in commercial shrimping operations. The program proves ineffective—as of late 1986, less than 3 percent of the shrimp fleet had used TEDs.

October-December 1986: NOAA Fisheries sponsors mediated sessions involving environmental and shrimp industry groups to attempt to develop a mutually acceptable implementation of TED requirements and avert threatened litigation

from environmental groups. One party to the mediation sessions, the Concerned Shrimpers of Louisiana, refuses to sign the developed agreement and negotiations break down.

1987: A report (Henwood and Stuntz 1987) analyzing observer data from the southeast U.S. shrimp fishery from 1973-1984 estimates that the shrimp fishery in offshore waters kills 9,874 loggerhead, 767 Kemp's ridley, and 229 green turtles annually.

March 1987: NOAA Fisheries develops and publishes proposed regulations to require TEDs in most offshore shrimp trawlers

June 1987: NOAA Fisheries implements TED requirements, phased in over a 20-month period, requiring TEDs seasonally aboard all shrimp trawlers over 25 feet in length in offshore waters of the Gulf and South Atlantic, except for southwest Florida and the Canaveral area, where they are required year-round. Shrimp trawlers less than 25 feet in length and all trawlers in inshore waters are required to limit their tow-times to a maximum of 90 minutes seasonally, except in southwest Florida and the Canaveral area, where tow-times are required year-round. Other exemptions to the TED requirement include trawlers fishing for royal red shrimp and rock shrimp and try nets up to 20 feet in headrope length. Regulations allow four specific designs of hard TEDs–the NMFS TED, the Cameron TED, the Matagorda TED, and the Georgia TED–and specify the minimum size of the TED escape openings as 32 inches in the Gulf and 35 inches in the Atlantic (how this opening is measured is not specified). The regulations make provisions for testing and approving additional TED designs that may be developed by NOAA Fisheries or the shrimping industry. An appendix published with the regulations specifies a scientific protocol for evaluating new TEDs in the Cape Canaveral shipping channel. Candidate TEDs must demonstrate a reduction in the catch of wild turtles, compared to a net with no TED, of greater than 96 percent.

September 1987: Biological Opinion concludes that implementation of 1987 TED regulations would substantially reduce sea turtle mortalities. At that time, NOAA Fisheries' policy on ESA section 7 consultations was to address the potential impacts to listed species of management actions and not to address potential adverse effects of the fishery itself. The policy changed on October 18, 1990, when the Assistant Administrator for Fisheries advises all NOAA Fisheries Regional Directors that future ESA consultations on fishery management actions would address both the fishery and the proposed management action.

October 1987: NOAA Fisheries authorizes an additional type of TED, the Morrison TED, which is the first soft TED. It uses an upward-sloping panel of flexible webbing instead of the rigid grid used in hard TEDs.

October 1987-May 1990: Lawsuits, injunctions, suspensions of law enforcement, legislative actions by several states, legislation by Congress, and temporary rules issued by NOAA Fisheries and the Department of Commerce follows the initial effective date of the 1987 regulations, resulting in a patchwork of times and areas where TEDs are and are not required/enforced. In Louisiana, the Legislature passes a statute requesting further information on the shrimp fishery's interactions with and impact on sea turtles in Louisiana waters, the effectiveness and efficiency of TED use in Louisiana waters, and alternative methods to foster sea turtle populations prior to allowing LDWF enforcement agents to enforce the federal TED laws in Louisiana state waters.

September 1988: NOAA Fisheries authorizes an additional soft TED, the Parrish TED. It uses a downward-sloping webbing panel leading to a rigid frame.

October 1988: President Reagan signs a bill that requires a study by the National Academy of Sciences to review the question of sea turtle conservation status and the significance of mortality from commercial trawling.

November 1989: President G. Bush signs a law which requires the Department of State, in consultation with the Department of Commerce, to negotiate with foreign countries to develop agreements for sea turtle conservation, with emphasis on countries that have commercial fishing fleets that adversely affect sea turtles. It further requires the United States to ban imports of commercially harvested shrimp unless the Department of States has certified the exporting country as having a regulatory program for sea turtle incidental capture in shrimp trawls comparable to U.S. requirements. The certification is due on May 1, 1991, and annually thereafter.

May 1990: The National Research Council releases the "Decline of the Sea Turtles: Causes and Prevention". This report concludes that (1) combined annual counts of nests and nesting females indicate that nesting sea turtles continue to experience population declines in most of the United States; (2) natural mortality factors, such as predation, parasitism, diseases and environmental changes, are largely unquantified, so their respective impacts on sea turtle populations remain unclear; (3) sea turtles can be killed by several human activities; (4) shrimp trawling kills more sea turtles than all other human activities combined, and previous annual mortality estimates may be low by as much as a factor of four; (5) shrimp trawling can be compatible with the conservation of sea turtles if adequate controls are placed on trawling activities, especially the mandatory use of TEDs in most places at most times of the year; and (6) the increased use of conservation measures on a worldwide basis would help to conserve sea turtles.

October 1990: NOAA Fisheries authorizes an additional soft TED, the Andrews TED.

NOAA Fisheries publishes an alternative scientific protocol for approving new TED designs. The new small turtle test protocol overcomes some of the other concerns over the Canaveral test. In particular, it uses turtles that are similar in size to wild Kemp's ridleys, the species of greatest conservation concern at the time, and allows divers to videotape every turtle's encounter with the candidate TED, greatly increasing the understanding of the factors in a TED's design that affect sea turtle exclusion. The small turtle test's limitation, however, is that, since captive animals are used under experimental conditions, the metric used for decisions is a candidate TED's performance relative to a control TED, rather than its straight reduction in sea turtle captures.

April 1992: NOAA Fisheries proposes to amend the sea turtle conservation regulations to strengthen their effectiveness and enforceability. The proposal would require essentially all shrimp trawlers in the southeastern United States to use TEDs year-round, even in inshore waters, with only limited exemptions.

August 1992: Consultation implemented in response to Amendment 6 to the Gulf of Mexico Shrimp Fishery Management Plan. The opinion concludes that incidental taking of sea turtles by shrimp trawlers in Atlantic Ocean off the coast of the southeastern United States and in the Gulf of Mexico is exempted from the ESA's take prohibition as long as trawlers comply with specified sea turtle conservation regulations (using TEDs in inshore and offshore waters, or, in some circumstances, limiting the duration of tow-times instead of using TEDs). Also concludes that shrimp trawling, in compliance with sea turtle conservation regulations, is not likely to jeopardize continued existence of listed sea turtles under NOAA Fisheries jurisdiction; however, it also states that mortalities of leatherback sea turtles remain a problem that must be addressed to avoid jeopardizing the recovery of this species.

September 1992: NOAA Fisheries implements some of the provisions of the April 1992 proposed rule

December 1992: NOAA Fisheries fully implements the April 1992 proposed rule requiring all shrimp trawlers in inshore and offshore waters from North Carolina to Texas to have TEDs installed in all nets that are rigged for fishing. The rule includes a phase-in period for inshore vessels with small nets until December 1, 1994. These TED requirements also have several exemptions (royal red shrimp trawlers, certain beam and roller trawls, certain single try nets, those allowed to use tow-time limits in lieu of TEDs, etc.). This rule also modifies resuscitation measures that fishermen must follow for incidentally caught turtles that come aboard in a comatose condition and allows fishermen to hold turtles on board under certain conditions while they are being resuscitated. This rule rewrites technical specifications for hard TEDs to create more explicit and more flexible descriptions of the required construction characteristics of hard TEDs, rather than require shrimpers to use one of the four named styles of hard TEDs from the 1987 regulation, clarifies the specifications for single-grid hard TED opening dimensions, and adds optional descriptions of accelerator funnels and webbing flaps as optional modifications to increase shrimp retention. This rule establishes a framework and procedures whereby NOAA Fisheries Assistant Administrator may impose additional restrictions on shrimping, or any other fishing activity, if the incidental taking of sea turtles in the fishery would violate an incidental take statement, biological opinion, or incidental take permit or may be likely to jeopardize the continued existence of a listed species.

May 1993: NOAA Fisheries authorizes an additional soft TED, the Taylor TED; approves a modification of the Morrison TED to use a larger escape opening covered with a flap. These TEDs have escape openings large enough to release leatherback turtles.

October 1993: NOAA Fisheries creates a new category of hard TEDs–special hard TEDs–and authorizes a new special hard TED for the shrimp fishery, the Jones TED.

Early 1994: Large number of sea turtles strand in Texas and Louisiana.

May 1994: NOAA Fisheries specifies a modification that can be made to the escape opening of single grid hard TEDs that will allow the TEDs to exclude leatherback turtles.

June 1994: NOAA Fisheries requires bottom-opening hard TEDs to be modified by attaching floats to the TEDs to keep them from riding hard on the sea floor. The absence of floats on bottom-opening TEDs was determined to be one contributing factor to the large number of turtle strandings earlier in the year.

November 1994: Consultation is initiated in response to extraordinarily high strandings of sea turtles, particularly Kemp's ridleys, in Texas and Louisiana in 1994 corresponding to periods of heavy nearshore shrimping effort. The opinion concludes that several alternatives need to be implemented to improve TED regulation compliance to allow the shrimp fishery to continue and avoid the likelihood of jeopardizing Kemp's ridleys. NOAA Fisheries is also required to re-examine the effectiveness of bottom-shooting hard TEDs and soft TEDs and mitigate impacts of intensive nearshore shrimping by identifying areas requiring special turtle management. NOAA Fisheries ultimately implements these measures, except for a shrimper permitting/registration system. Specifically, NOAA Fisheries expands TED requirements for otter trawls to all areas, including inshore waters, at all times. Skimmer trawls, butterfly nets, chopsticks, try nets, and scientific collections are exempt from these requirements and must instead follow tow time restrictions.

March 1995: NOAA Fisheries issues the details of an emergency response plan (as required in 1994 Biological Opinion) identifying monitoring, reporting, and enforcement actions, as well as associated management measures that NOAA Fisheries would consider implementing if strandings elevate. The plan identifies two interim sea turtle management areas within which enforcement would be elevated from April through November. NOAA Fisheries would implement gear restrictions on shrimp trawling in response to two weeks of elevated strandings at levels approaching (within 75 percent of) the indicated take levels or higher in these areas when no other likely causes of mortality were evident. Outside of the areas, NOAA Fisheries would consider implementing similar restrictions after four weeks of elevated strandings.

NOAA Fisheries finalizes the float requirement and implements a variety of other minor changes to TED technical specifications.

May-August 1995: NOAA Fisheries implements gear restrictions based on the emergency response plan.

April 1996: NOAA Fisheries proposes prohibiting the use of all previously approved soft TEDs; requiring the use of approved hard TEDs in try nets with a headrope length greater than 12 feet or a footrope length greater than 15 feet; establishing Shrimp Fishery Sea Turtle Conservation Areas in the northwestern Gulf of Mexico and in the Atlantic along the coasts of Georgia and South Carolina; and, within these areas, prohibiting soft TEDs, imposing the new try net restrictions, and prohibiting the use of bottom-opening hard TEDs.

June 1996: Consultation is initiated to evaluate the effects of the April 1996 proposed rule to revise TED regulations, a plan to implement a shrimp vessel registration system, and strandings exceeding strandings-based incidental take levels. The opinion concludes that continued operation of the shrimp fishery as proposed is not likely to jeopardize listed sea turtles with implementation of the proposed rule and shrimp vessel registration system, which the opinion requires to be formally proposed by the end of 1996. The opinion also eliminates the strandings-based incidental take levels that had been in place since 1995 and requires a more flexible requirement for NOAA Fisheries to consult with state stranding coordinators to identify significant local stranding events and to implement 30-day restrictions on shrimp trawling in response, as appropriate.

November 1996: Consultation is initiated to evaluate effects of the final rule implementing the April 1996 proposed rule to revise TED regulations and elevated loggerhead strandings that occurred in 1996. The opinion concludes that continued operation of the shrimp fishery is not likely to jeopardize listed sea turtles because the final rule implemented alternatives from the 1994 opinion that required NOAA Fisheries to address mortalities from incorrect installation of TEDs and certification of TEDs that do no effectively exclude sea turtles. The opinion also extends the deadline for

finalizing the shrimp vessel registration requirement through February 1997.

December 1996: NOAA Fisheries requires that TEDs be installed in try nets with a headrope length greater than 12 feet and a footrope length greater than 15 feet; removes the approval of the Morrison, Parrish, Andrews, and Taylor soft TEDs; establishes Shrimp Fishery Sea Turtle Conservation Areas, and within these areas, imposes the new TED requirement for try nets, removes the approval of soft TEDs, and modifies the requirements for bottom-opening hard TEDs.

March 1998: Consultation is initiated to evaluate the effects of approving the use of a new soft TED, to discuss the decision to not implement a mandatory shrimp vessel registration system (part of the 1994 opinion), and to evaluate recent data on sea turtle populations and strandings. The opinion concludes that continued operation of the shrimp fishery is not likely to jeopardize listed sea turtles, with continued improved enforcement of the sea turtle conservation regulations and expanded education and outreach programs.

April 1998: NOAA Fisheries authorizes the use of a new soft TED–the Parker TED–in certain trawl net styles for an 18-month trial period, during which its performance will be evaluated to ensure that it remains effective at excluding sea turtles during extended commercial use.

October 1998: NOAA Fisheries temporarily allows use of limited tow times by shrimp trawlers in Alabama inshore waters as an alternative to TEDs to address TED performance issues due to large amounts of debris in Alabama's bays in the aftermath of a hurricane.

October 1999: NOAA Fisheries extends authorized use of the Parker TED for an additional 12 months, as the results of the Parker TED's evaluation are inconclusive.

NOAA Fisheries temporarily allows the use of limited tow times by shrimp trawlers as an alternative to TEDs in the Matagorda Bay area of Texas due to extraordinarily high concentrations of a bryozoan lodging in TEDs, rendering them ineffective in expelling sea turtles as well as negatively impacting fishermen's catches.

April 2000: NOAA Fisheries announces that it is considering technical changes to TED requirements, including modifying the size of the TED escape opening, modifying or decertifying hooped hard TEDs and weedless TEDs, and changing the requirements for the types of flotation devices allowed.

NOAA Fisheries issues a 30-day rule mandating that shrimp trawlers required to have a TED installed in each net rigged for fishing, operating in Gulf of Mexico offshore waters out to 10 nautical miles between Port Mansfield Channel and Aransas Pass, Texas, to use the leatherback modification for hard TEDs or the leatherback modification for the Parker soft TED. This restriction is in response to leatherback sea turtle strandings in the area.

August 2000: NOAA Fisheries temporarily allows the use of limited tow times by shrimp trawlers as an alternative to TEDs in inshore waters of Galveston Bay, Texas. Dense concentrations of marine organisms documented in this area were clogging TEDs, rendering them ineffective in expelling sea turtles from shrimp nests as well as negatively impacting fishermen's catches.

January 2001: NOAA Fisheries permanently approves the use of the Parker soft TED. Although industry use of the Parker TED is extremely low, NOAA Fisheries' evaluation of its effectiveness does not find significant problems with compliance with the TED's specifications or with sea turtle captures.

May 2001: NOAA Fisheries approves the use of an additional style of single-grid hard TED–the double cover flap TED.

October 2001: NOAA Fisheries proposes to amend sea turtle conservation regulations to enhance their effectiveness in reducing sea turtle mortality resulting from shrimp trawling in the Atlantic and Gulf Areas of the southeastern United States. NOAA Fisheries determines that modifications to the design of TEDs need to be made to exclude leatherbacks and large loggerhead and green turtles; several approved TED designs are structurally weak and do not function properly under normal fishing conditions; and modifications to the try net and bait shrimp exemptions to the TED requirements are necessary to decrease lethal takes of sea turtles.

December 2001: NOAA Fisheries amends the sea turtle handling and resuscitation regulation.

November 2002: NOAA Fisheries temporarily allows use of limited tow times by shrimp trawlers in some Louisiana state waters and inshore Alabama waters due to large amounts of debris in the wake of Tropical Storm Isidore and Hurricane Lili.

December 2002: Consultation is initiated to evaluate proposed implementation of a final rule to further enhance the effectiveness of sea turtle conservation regulations by requiring increases in the sizes of TED escape openings to allow large loggerhead and leatherback sea turtles to escape from trawls, correcting the structural weakness of certain TED designs, and modifying current TED exemptions for bait shrimping and try nets to better protect sea turtles. Consultation also initiated to update estimates of sea turtle-shrimp interactions and analyses of associated effects with the availability of new evidence and additional analyses. The opinion concludes that continued operation of the shrimp fishery under the proposed revisions to the sea turtle conservation regulations is not likely to jeopardize listed sea turtles, based in part on analysis showing that the revised TED regulations are expected to reduce shrimp trawl related mortality by 94 percent for loggerheads and 97 percent for leatherbacks.

February 2003: NOAA Fisheries amends sea turtle conservation measures to reduce sea turtle mortality in the shrimp trawl fisheries, specifically requiring the use of larger TEDs to allow escapement of leatherback and large loggerhead and green sea turtles.

September 2005: NOAA Fisheries temporarily allows the use of limited tow times by shrimp trawlers in state and federal off Alabama and Louisiana affected by environmental conditions resulting from Hurricane Katrina that prevent some fishermen from using TEDs effectively.

October 2005: NOAA Fisheries temporarily allows the use of limited tow times by shrimp trawlers in state and federal waters off Louisiana and Texas affected by environmental conditions resulting from Hurricane Rita that prevent some fishermen from using TEDs effectively.

October 2008: NOAA Fisheries temporarily allows the use of limited tow times by shrimp trawlers in state and federal waters offshore of Louisiana due to environmental conditions resulting from Hurricanes Gustav and Ike that prevent some fishermen from using TEDs effectively.

NOAA Fisheries temporarily allows the use of limited tow times by shrimp trawlers in state and federal waters offshore of Texas due to environmental conditions resulting from Hurricane Ike that prevent some fishermen from using TEDs effectively.

2010: Reports of stranded sea turtles along the Gulf Coast increase significantly.

September 2010: NOAA Fisheries proposes to revise TED requirements to allow the use of new materials and modifications to existing approved TED designs, including the use of flat bar, rectangular pipe, and oval pipe as construction materials in currently-approved TED grids; an increase in maximum mesh size on escape flaps from 1-5/8 to 2 inches; the inclusion of the Boone Big Boy TED for use in the shrimp fishery; the use of three large TED and Boone Wedge Cut escape openings; and the use of the Chauvin shrimp deflector to improve shrimp retention. Additionally, there are proposed corrections to the TED regulations to rectify an oversight regarding the maximum size chain that can be used on the Parker TED escape opening flap, and the proposed addition of a brace bar as an allowable modification to hard TEDs.

May 2012: Consultation initiated due to several requests and addressed, among other things, elevated strandings suspected to be attributable to shrimp trawling, compliance concerns with TEDs and tow-time regulations, and elevated nearshore sea turtle abundance trawl catch per unit effort; new information on compliance with TED regulations and how noncompliance impacted the number of sea turtles captured and killed in shrimp otter trawls; an attempt to update sea turtle estimates for Southeast shrimp fisheries based on increases in Kemp's ridley and green sea turtle populations and shrimp industry compliance with TED regulations; and a proposal to require skimmer, pusher-head, and butterfly trawls to use TEDs. The opinion concludes that the proposed action is not likely to jeopardize listed sea turtles.

NOAA Fisheries proposes to withdraw the tow-time exemption for skimmer, pusher-head, and butterfly trawls and require these vessels to use TEDs. NOAA Fisheries later withdraws the rule after determining that current TED designs may not prevent small sea turtles from being caught in nets and may need to be modified to work effectively for the inshore trawl fisheries.

April 2014: Consultation is initiated because NOAA Fisheries determined that a final rule requiring TEDs in skimmer, pusher-head, and butterfly trawls is not warranted, creating a change to action proposed in the 2012 opinion. Consultation evaluates the effects of skimmer, pusher-head, and butterfly trawls on sea turtles, based upon the withdrawal of the TED requirement for these gear types and new observer data that led to that change, and revisited analysis of otter trawl's effects, incorporating more recent effort and TED compliance data. The opinion concludes that continued operation of the shrimp fishery is not likely to jeopardize listed sea turtles and required several measures to minimize impacts to listed sea turtles, including monitoring effort in shrimp fisheries and their effects on sea turtles and compliance with TED regulations, training fishermen and net shop personnel in the proper installation and use of TEDs, working with the industry on TED development, and researching the nature of sea turtle interactions, particularly very small juveniles, with shrimp trawls in inshore and nearshore waters.

July 2015: Louisiana Legislature repeals prohibition on state enforcement of federal TED regulations in Louisiana waters.

Appendix V. NOAA Fisheries Office of Law Enforcement and U.S. Coast Guard Enforcement Records

Table 19. NOAA TED inspections by state, October 1, 2011-January 1, 2013. This table contains information on all shrimp trawl vessels inspected by NOAA Office of Law Enforcement, by the state where the inspections occurred, during the time period indicated.

INSPECTIONS, BY STATE: 516

	NC	SC	GA	FL	AL	MS	LA	TX	Total
Oct-11						6	93		99
Nov-11								32	32
Dec-11	5		3	4					12
Jan-12				4				3	7
Feb-12				3		4	3	3	13
Mar-12				1				12	13
Apr-12				1	3		49	14	64
May-12	1		7	4				4	16
Jun-12	4			2		13	15	34	71
Jul-12	5						27	77	109
Aug-12	18	1		2		11		16	48
Sep-12		9	4	11					24
Oct-12		2							2
Nov-12				2					2
Dec-12								4	4
Total	33	12	14	34	3	34	187	199	516

Table 20. NOAA TED inspections with violations by state, October 1, 2011-January 1, 2013. Out of all the inspections recorded above, this table contains information on the number of vessels with noncompliant TEDs observed by NOAA Office of Law Enforcement, by the state where the inspections occurred, during the time period indicated.

INSPECTIONS WITH VIOLATIONS, BY STATE: 131

	NC	SC	GA	FL	AL	MS	LA	TX	Total
Oct-11						4	38		42
Nov-11									15
Dec-11	1		3	1					5
Jan-12				2				2	4
Feb-12				1				3	4
Mar-12								4	4
Apr-12				1			1	3	5
May-12			6	3				1	10
Jun-12	1			1				11	13
Jul-12							2	8	10
Aug-12	6			1		1		1	10
Sep-12		1		4					5
Oct-12		1							1
Nov-12									0
Dec-12								3	3
Total	8	3	9	14	0	5	41	51	131

Table 21. NOAA TED inspection results by state, October 1, 2011-January 1, 2013. This table contains information on the current outcome resulting from the violations observed by NOAA Office of Law Enforcement, by the state where the inspections occurred. It is important to note that not all violations are serious violations, and some may not be likely to appreciably increase the degree of the effect on animals interacting with the gear. While it is not uniform and difficult to precisely characterize, there is a correlation between the seriousness of the violation and the result indicated in the table. Thus, moving down the list of results in the table reflects a general increase in the seriousness of the observed violation, and a concomitant increase in the potential impact on animals interacting with the gear.

	NC	SC	GA	FL	AL	MS	LA	TX	Total
Fix It	5	1	2			1			9
Verbal Warning	1		1	6		2	22	37	69
Written Warning	1	1	4	2		1	9	4	22
Summary Settlement								3	3
Fishing Violation			1	2		1	10	4	18
Notice of Violation and Assessment								2	2
State Prosecution	1		1					1	3
State Warning				5					5
Grand Total	8	2	9	15	0	5	41	51	131

Table 22. USCG Louisiana shrimp vessel boardings, FY2009-FY2014. Data provided by USCG Sector New Orleans AOR FY09-FY14.

FY	Total boardings	No violations	Warnings	TED/BRD violations
FY09	48	18	0	6
FY10	38	19	1	3
FY11	38	19	0	4
FY12	113	71	2	0
FY13	58	43	1	1
FY14	15	14	0	1

All data presented in this appendix are preliminary and subject to further review and revision.

Appendix VI. Strandings Data

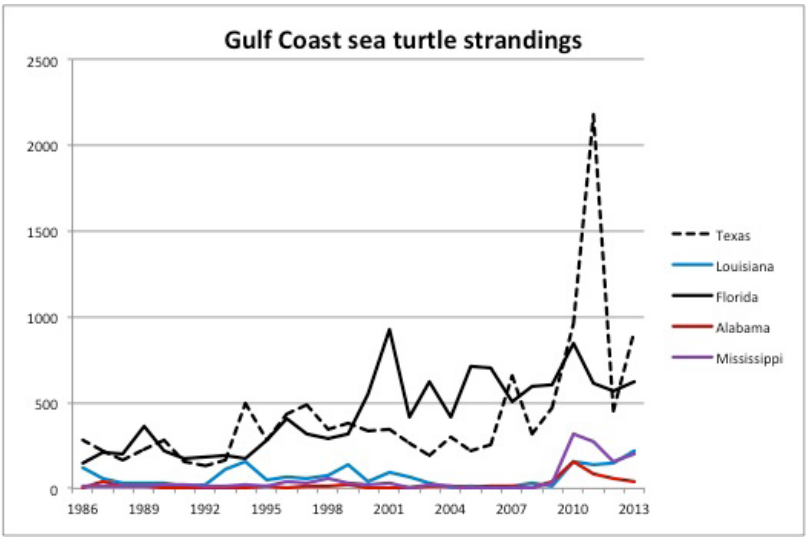
Table 23. Sea turtle strandings by species and Gulf state, 1986-2013.

	Texas				Louisiana				Mississippi			
Year	**Kemp's**	**Logger-head**	**Green**	**Total**	**Kemp's**	**Logger-head**	**Green**	**Total**	**Kemp's**	**Logger-head**	**Green**	**Total**
1986	145	130	7	282	92	29	1	122	6	8	2	16
1987	53	147	15	215	22	36	2	60	3	7	3	13
1988	42	118	8	168	11	15	2	28	6	7		13
1989	48	110	67	225	12	17		29	6	5		11
1990	119	133	26	278	17	12	2	31	5	16		21
1991	69	73	12	154	11	2	1	14	8	14		22
1992	58	63	11	132	14	6	1	21	7	4	3	14
1993	88	65	15	168	105	6		111	9	7		16
1994	252	192	48	492	136	11	7	154	17	8		25
1995	132	124	30	286	42	6		48	16	1		17
1996	117	197	118	432	46	16	4	66	16	21		37
1997	177	167	141	485	51	9		60	20	8		28
1998	121	167	58	346	62	15		77	38	22		60
1999	88	210	82	380	107	33	1	141	14	16		30
2000	83	163	91	337	29	8		37	17	5		22
2001	110	163	73	346	89	9		98	21	13		34
2002	74	130	63	267	54	12		66		0		0
2003	61	85	46	192	20	7	1	28	18	8		26
2004	51	118	129	298	3	2	1	6	7	2		9
2005	45	116	60	221	6	4		10	1	0		1
2006	58	110	84	252	5	2		7		0		0
2007	93	134	432	659	7	2		9		0		0
2008	110	67	143	320	29	1	0	30	4	0	0	4
2009	91	153	229	473	11	0	0	11	28	3	0	31
2010	128	115	715	958	132	8	13	153	297	12	5	314
2011	102	145	1928	2175	116	15	7	138	267	3	7	277
2012	109	62	283	454	133	5	11	149	152	3	2	157
2013	123	82	714	919	197	9	15	221	192	11	2	205

Table 23 continued. Sea turtle strandings by species and Gulf state, 1986-2013.

	Alabama				Florida			
Year	**Kemp's**	**Logger-head**	**Green**	**Total**	**Kemp's**	**Logger-head**	**Green**	**Total**
1986				0	4	117	22	143
1987	5	36	1	42	16	151	42	209
1988	5	11		16	12	158	35	205
1989	3	7		10	29	268	62	359
1990		3		3	13	141	66	220
1991		5		5	17	107	48	172
1992	2	2		4	26	116	39	181
1993		1		1	21	118	55	194
1994		4		4	27	96	50	173
1995	6	9		15	92	118	73	283
1996		1		1	75	184	150	409
1997	5	8		13	54	193	66	313
1998	7	7		14	55	159	78	292
1999	11	9		20	78	166	71	315
2000		6		6	96	343	110	549
2001		2		2	96	279	547	922
2002	2	3	1	6	80	236	100	416
2003	3	10		13	95	379	151	625
2004	6	8		14	52	274	92	418
2005	1	6		7	149	445	114	708
2006	7	9		16	81	536	89	706
2007	8	9	0	17	46	359	97	502
2008	3	4	1	8	59	295	237	591
2009	22	14	2	38	85	328	194	607
2010	138	13	9	160	106	292	450	848
2011	69	10	6	85	143	192	281	616
2012	53	4	3	60	140	184	247	571
2013	34	7	3	44	174	198	250	622

Figure 22. Gulf Coast sea turtle strandings, 1986-2013.



Appendix VII. Conclusions and Recommendations from 2010 National Research Council Report

Conclusion: Sea-turtle population assessments in the United States are based too heavily on estimates of abundance of adult females on nesting beaches. Although estimates of abundance of adult females are critical, without knowledge of accompanying changes in demographic rates at all life stages, the proximate and ultimate causes of population trends cannot be determined. Selection and evaluation of the best management options depend on an understanding of the basis of changes in population abundance.

Recommendation: NMFS and USFWS should ensure that estimates of abundance at life stages in addition to adult females are generated and that demographic rates are integrated with estimates of abundance in population assessments.

Conclusion: Inadequate information is available for population assessments because the data have not been collected or, if they have been collected, have not been analyzed or made accessible in a manner that allows them to be useful.

Recommendations:

- NMFS and USFWS should develop plans for the collection and analysis of data to address data gaps. The development should include outside experts who collect, analyze, and use the data.
- NMFS and USFWS should present a comprehensive assessment plan and a data plan to sea-turtle biologists to facilitate effective data collection for the integrated approach and to obtain input from them on improvement of the plans.
- NMFS and USFWS, with other government agencies and funding sources, should support the collection and analysis of those data.
- To avoid the overlooking of data sources, NMFS should create an on-line metadatabase that identifies as many of the sea-turtle datasets in the United States and its territories as possible and is similar to the document created for in-water projects in Florida (see Chapter 7). The database should be updated regularly.
- NMFS and USFWS should support a program to safeguard and make accessible as many sea-turtle databases as possible, past and present. There is some urgency to this task while data collectors are still available to provide essential metadata.
- NMFS and USFWS should partner with other government agencies, universities, and nongovernmental organizations to improve coordination among data holders. Incentives should be developed to encourage data sharing.
- NMFS and USFWS should arrange for a review of data now being collected under their auspices or with their support and evaluate the costs and benefits. For example, the sea-turtle stranding and salvage networks should be evaluated, perhaps with the assistance of the U.S. Geological Survey's National Wildlife Health Center.

Conclusion: Reviews of federal population assessments and research plans are not sufficiently rigorous and transparent.

Recommendations:

- NMFS and USFWS should develop a general framework for seaturtle assessment procedures, including data evaluation, model review, and management-strategy evaluation.
- NMFS and USFWS should ensure that all research plans generated in federal agencies are reviewed by panels that include federal and nonfederal scientists. Using reviewers with quantitative skills, such as skills in population assessment and statistical analysis, is particularly important.

Conclusion: There are unnecessary obstacles to collection and analysis of critical data, including inadequate quantitative training of scientists and an inadequate process for issuing research permits.

Recommendations:

- NMFS and USFWS should partner with other government agencies and universities to improve the quantitative skills of people who are involved in designing, reviewing, and implementing the projects and assessments that are generated under a comprehensive assessment plan. These efforts will be short term (e.g., recruiting quantitatively

skilled experts, improving the quantitative skills of current personnel) and long term (e.g., improving quantitative training of students).

- NMFS and USFWS should convene a working group to evaluate the permitting process for research projects and develop methods to expedite the process while meeting legislative requirements and intent. Participants should include representatives of the permitting agencies and research scientists. The review should weigh unintended consequences of permitting delays and lost research opportunities, should review the potential risks and benefits to the listed species of changing permitting requirements and procedures, and should assess the extent to which scrutiny of research permits has resulted in substantial take reductions.

Chapter 2, Units of Assessment

Conclusions:

- Genetic surveys, in conjunction with tagging studies (see Chapter 4),provide the best approach for resolving the complex population structure of sea turtles.
- mtDNA surveys of nesting populations are useful for defining management units in terms of isolated reproductive populations.
- nDNA surveys are useful for resolving the male-mediated connections between nesting populations and for defining RMUs connected by nuclear gene flow. In the case of isolated regional populations, mtDNA and nDNA may indicate that management units defined with mtDNA are equivalent to RMUs defined with nDNA. RMUs may qualify as DPSs under the Endangered Species Act.
- Mixed-stock analyses can reveal the demographic links between regional nesting populations and feeding populations and can indicate which nesting populations are at risk because of habitat disturbances and fishery bycatch in feeding areas. Confidence intervals on mixed-stock estimates are usually broad, indicating problems with comprehensive sampling of turtle populations.

Recommendations:

- Researchers should examine the finest scale of female homing in each species (already underway with green, leatherback, hawksbill, ridley, and loggerhead turtles) with mtDNA surveys of nesting beaches, preferably in conjunction with tagging studies. That is necessary to resolve management units defined by female homing behavior. It requires sampling coverage of continental coastline or adjacent islands where nesting is intermittent. Adequate sample size depends on the extent of genetic diversity but may begin at about 30 per nesting population. Note that to avoid resampling the same maternal lineage specimens must come from nesting females or a single progeny per female.
- Researchers should develop a suite of at least 10–15 variable microsatellite loci for each species. That is necessary to accomplish the next three goals in population resolution and to develop individual-specific DNA fingerprints. It has been largely accomplished for sea turtles in U.S. waters with the possible exception of Kemp's ridley.
- Researchers should survey nesting populations with microsatellites to determine the extent of connectivity between local nesting populations. That is necessary to resolve the male-mediated connections between nesting populations and to resolve RMUs. Adequate sample size depends on the extent of genetic diversity (heterozygosity) but may begin at about 50–80 per location.
- Researchers should survey regional feeding populations (juveniles and adults) with mtDNA sequences to determine the source of these individuals with mixed-stock models, assignment tests, and related methods. That is necessary to determine which populations are present (and possibly at risk) in coastal and oceanic habitats. Microsatellite studies may also be useful. Priorities may be established for the most affected feeding populations.
- Researchers should survey males in breeding populations off nesting beaches with mtDNA and microsatellites to determine whether they are homing. That is necessary to resolve which populations are present (and possibly at risk) in coastal and oceanic habitats.
- Researchers should conduct a sea-turtle genome project for the explicit purpose of developing additional nuclear markers, possibly the next generation of genetic markers for sea turtles (see Appendix A). That will also provide

benefits in understanding the natural history and genetic resilience of sea turtles. It may be accomplished in the context of the Genome 10K Project already under development (Genome 10K Community of Scientists, 2009).

- Researchers should develop sex-specific metapopulation models to evaluate genetic differences in dispersal. Males and females use habitat differently for feeding and reproduction, and this argues for sex-specific models for evaluating connectivity and survival. The models will increase understanding of management units and demography as outlined above.

Chapter 4, Abundance and Trends: Measuring Population Trends on Nesting Beaches

Conclusions:

- Choice of techniques to estimate adult-female abundance on nesting beaches has been influenced by logistics, personnel availability, opportunity, existing networks, and historical data. Few studies have sought to optimize the information gathered, given resource expenditure.
- Most U.S. nesting beaches have programs in place to count nests as a measure of sea-turtle abundance. The programs have extensive geographic coverage but do not provide direct turtle counts, measure recruitment, or estimate adult-female survival and reproductive rates. Few programs measure representative egg-to-hatchling survival.
- Multiannual near-saturation tagging of nesting females on the nesting beach provides a straightforward way to count turtles, measure recruitment, and estimate survival and reproductive rates, but the required effort is extensive and would be difficult and expensive to maintain throughout a population's range and nesting season for a statistically powerful time series.
- Seasonal nest counts require less effort per spatiotemporal unit. However, these counts estimate adult females indirectly (with associated error) and do not produce other information on vital rates.
- Interpretation of tracking data to measure reproductive rates has been used as a substitute for direct identification of large numbers of nesting females through tagging studies.

Recommendations:

- NMFS and the U.S. Fish and Wildlife Service (USFWS) should work with the states, and with other countries, to coordinate existing nesting beach data collection so that effort is balanced between geographic scope and depth of information gathered.
- Agencies should facilitate a tiered method of nesting-female abundance counts on beaches spanning a spectrum of data scope (breadth and depth proportions). An example of such a tiered method is (1) standardized population-wide track or nest counts with spatiotemporal sampling that could detect biologically significant spatial trends; (2) nest counts in representative index locations and seasons with spatiotemporal sampling over a time series long enough to detect biologically significant spatial and annual trends (e.g., a change of 1% per year); and (3) near-saturation identification tagging in representative index locations and seasons with mark-and-recapture rates of sufficient statistical power to detect biologically significant changes in annual number of nesting females, breeding rates, recruitment, and survivorship.
- The proposed methodological tiers ideally would be divided among existing research and conservation efforts and groups. For example, beach surveyor networks coordinated by government, nonprofit, and university-organized entities, are effective in maintaining broad-scale track and nest counts for long time series. Those groups may also coordinate indexed nest counts and conduct near-saturation tagging efforts. However, extensive tagging programs may be attractive to individual researchers in consulting firms and universities because of the potential that such projects have for ancillary basic and applied research.
- Because existing datasets and data-collection networks are important in planning efforts to measure nesting-female abundance on beaches, attention should be given to coordination and training that would focus existing data collection on statistically valid and powerful sampling and methods, measurement of observational error, and the recording effort.
- NMFS, USFWS, and the states should facilitate representative sampling of nesting females tracked with satellite tags, GSM telephone tags, or other technologies to describe clutch frequency and test hypotheses on nesting-

site fidelity. Those methods have a lower potential to generate survival rates than extensive marking with PIT and flipper identification tags. However, those tracking methods are useful for estimating clutch frequency in populations that nest over a broad geographic range where the mark–recaptures rate per unit effort is low. Remote tracking efforts that take place in conjunction with extensive marking of nesting turtles are recommended as a powerful combination of comparative methods.

Measuring Population Trends in the Water

Conclusions:

- Given an extensive distribution of current studies of sea turtles in the water, there is the potential for an integrated network of sampling projects to assess abundance and trends on local and regional scales.
- This integrated network would comprise intensive, low-variance measures of relative or absolute abundance in multiple, turtle-dense areas (i.e., index sites) and less-intensive, broad-scale measures of relative abundance throughout the same regions. Index sites may need to be geographically broad where turtle densities are determined by transient oceanographic features.
- Establishment and coordination of an integrated network, participant training, data sharing, and effective data management will require NMFS to provide resources, such as specialized program funding, expertise, and adequate staff.
- Assessments of relative abundance are sufficient for determination of trends; however, localized measures of absolute abundance are helpful in evaluating incidental catch and mortality and other takes.
- CMR efforts in various international locations have contributed to local and regional analyses using open robust design models to estimate relative or absolute abundance.
- Less-intensive, broad-scale measures of regional relative abundance (e.g., aerial surveys) are not a substitute for abundance measures in index sites. However, broad-scale surveys can fit into an integrated network of sampling projects by calibrating counts between well-sampled index sites and poorly sampled sites, by identifying spatial overlap with fisheries and other human activities, and by providing the only possible measure of relative abundance in inaccessible areas.
- Broad-scale measures, such as aerial surveys, may not be appropriate for estimates of regional abundance because of costs associated with long-term sampling and maintenance of extended synoptic surveys. They are most useful when coupled with measures of detectability and availability that allow estimation of turtle density.
- Measures of relative abundance based on aerial surveys will become more useful when detectability is improved by application of new technologies (e.g., LIDAR, multibeam sonar) and collection of more detailed information that would allow abundance to be assigned to specific size or ageclasses of a population's conceptual model. For example, new instrumentation, such as image mosaic and rectification, will allow accurate size assessment and help to define relationships and demographic overlap of surveyed areas and index sites where turtle life stages and genetic stocks are known.
- Fishery observer data can contribute to relative-abundance estimation when effort and vulnerability to capture (or detection) is understood (how it varies with catch rate) and when information that would allow abundance to be assigned to ageclasses of a population's conceptual model is collected.

Recommendations:

- NMFS should play a leadership role in assessments of sea-turtle abundance and trends by funding and coordinating an integrated network of sampling projects.
- Index sites should have internal (within-project) consistency in methods. Methods should be standardized between sites with similar sampling conditions but need not be standardized among all index sites.
- Random or periodic sampling in index sites is recommended to reduce sampling bias; however, consistency in bias should allow determination of representative trends in relative abundance.
- Index sites should be representative of geographic areas, genetic stocks, and life stages.

- Effective coordination should include training participants in network protocols and data reporting, application of incentives, and stipulation of requirements to achieve data sharing.
- Effective data management should include open access to data, metadata, and data products and facilitation of analyses by third parties.
- To improve its program for assessing abundance and trends, NMFS should develop a networked array of sites, having long-term CMR efforts that would support local and regional analyses with open robust-design models to estimate relative or absolute abundance specific to ageclasses in the conceptual models of populations. Assigning abundance to a conceptual model implies that turtles are identified by their genetic stock and that abundance measures apply to specific life stages. Secondarily recommended for multiple index sites are measures of relative abundance with quantified effort and estimated values for detectability, having relative- abundance measures that can be assigned to specific ageclasses of a population's conceptual model. This includes most in-water capture studies with quantified effort.

Chapter 5, Demographic Rates

Recommendations:

- Researchers should give high priority to generating estimates for the following parameters: survival of immature turtles and nesting females, age at sexual maturity, breeding rates, and clutch frequency.
- Because demographic rates can vary over time and space, researchers should collect data over both dimensions so that population trends can be detected and evaluated adequately.
- Researchers should be aware that evaluation of point estimates of demographic parameters is not sufficient for population assessment; characterizing uncertainty and variance is also necessary.
- Researchers should strive to understand the mechanisms regulating variation in demographic rates; this is essential for diagnosing changes in population abundance and mitigating population declines.

Chapter 6, Integrating Demographic Information with Abundance Estimates

Conclusions:

Population assessment for management requires an integration of abundance data and demography to account for species' life history and to determine the likely causes of observed trends. There are a number of modeling approaches of varied complexity and precision that can address management questions, but they all need accurate data at the population level. Vital-rate estimation is essential for these slow-growing species, as trends in nesting-beach abundance provide information about only a tiny fraction of a sea-turtle population. Some data that can be used to determine changes in vital rates already exist, including time series of juvenile abundance (or indexes of abundance) and size distributions.

Assessments of managed fish populations include gathering and reviewing biological information and catch data, a variety of modeling workshops to determine the most appropriate tools for assessment and reference points for status determination, and extensive external peer

review. Marine-mammal assessments also follow a prescribed path for evaluation. Sea-turtle assessments have included many of the elements required for those species but are not done in a set procedural framework that ensures consistency, transparency, and thorough evaluation.

There has been no thorough attempt to assess sea-turtle status with population models that are fitted by using available data on bycatch, size distributions, and productivity. That is because of the following three primary factors that can be addressed by the agency:

- Critical vital rates have not been monitored so there is high uncertainty in estimates of parameter values and in interpretation of trends.
- Data are scattered and require a thorough evaluation to determine their quality and their applicability to population assessment.
- Sea-turtle assessment efforts have not been isolated from broader evaluations of status and threats and have rarely included scientists in other quantitative modeling fields, such as fishery scientists.

Recommendations:

- NMFS and USFWS should develop a general framework for a seaturtle assessment procedure, including data evaluation, model review, and MSE.
- NMFS and USFWS should conduct data-evaluation workshops, starting with Atlantic loggerheads, focused specifically on the evaluation of time series information that can contribute to setting values of parameters for demographic models. Data for evaluation include, but are not limited to, nesting abundance, in-water abundance, hatchling-cohort production, length distributions, and reproductive frequency. All sources of data should be evaluated for quality, consistency and spatial or temporal heterogeneity, and gaps.
- Researchers should work with modelers in different fields to develop a toolbox for sea-turtle assessment that can provide standardized methods for evaluation and review of data-poor and data-rich species. They would include methods that use available data on trends and size distributions of turtles to reduce the possible ranges of unknown values of parameters and estimates of abundance through model fitting.
- The agencies should sponsor a cost-benefit analysis workshop to set priorities among research needs according to which parameters will provide the most useful information for diagnosis of population change.

Appendix VIII. Louisiana Revised Statutes 56:638.1-5 Saltwater Fishery Conservation and Management: Legislative Intent, Findings, Purpose, Policy, and Saltwater Fishery Standards

The legislative intent, findings, purposes, policy and standards for the conservation and management of all species of saltwater fish in Louisiana are defined in Louisiana Revised Statutes (R.S.) 56:638.1; 56:638.2: 56:638.3; 56:638.4 and 56:638.5 which function similarly to those found in the federal Magnuson-Stevens Fishery and Conservation Act.

LA R.S.56:638.1. Saltwater fishery conservation and management; legislative intent

Recognizing that there are ever increasing numbers of both sport and commercial fishermen utilizing the waters of the state for recreational and commercial pursuits resulting in conflicts over limited space and competition for the same saltwater fish, and acknowledging that both the sport and commercial fishing industries are vital to the economy of the coastal region and the entire state, the saltwater fishery standards for conservation and management of all species of saltwater finfish are hereby declared to be fair and in the best interest of the state.

LA R.S.56:638.2. Findings

The state of Louisiana recognizes that:

(1) Its saltwater finfish resources are of great value and are renewable. These saltwater finfish resources make many contributions to the state including, but not limited to, the food supply, economy, and health of the state and recreational opportunities. With proper regulations of the harvest by fishermen, coupled with protection and enhancement of their saltwater and estuarine habitat, Louisiana's saltwater finfish resources should be available to provide these benefits to the state indefinitely.

(2) As a consequence of increased fishing pressure and/or other factors and because of the inadequacy of fishery conservation and management practices, certain stocks of fish may have been or will become overfished.

(3) The future productivity of saltwater finfish resources may be seriously jeopardized as a consequence of the continued loss of Louisiana coastal wetlands, or because of human actions affecting the functionality and value of the coastal wetlands as saltwater finfish estuary and habitat.

(4) Both commercial and recreational fishing constitute a major source of employment and contribute significantly to the economy of the state. Many coastal areas are dependent upon such fishing and related activities and their economies have been damaged by pollution, habitat degradation, and/or overfishing.

(5) Saltwater finfish resources are finite but renewable. If timely placed under sound management, the fisheries can be conserved and maintained so as to provide optimum yields on a continuing basis.

(6) A state program for the wise conservation and management of the saltwater finfish resources of Louisiana is necessary to maintain plentiful fish populations to prevent overfishing, to rebuild reduced stocks, to insure conservation, and to realize their full potential.

(7) The safe development or improvement of fisheries that are not fully or properly utilized by the Louisiana commercial and recreational fishermen and fishing industries, should help to assure that Louisiana benefits from the employment, food supply, recreation, and social and economic benefit that could be maintained or generated thereby, if pursued in such a fashion that is socially, scientifically, economically, anthropologically, and biologically sound for the state, the species, and any related species.

(8) A strong state program is necessary to advocate the importance of the functionality and value of Louisiana's coastal wetlands as estuary and habitat for saltwater fisheries resources, the social and economic value of these resources to the state and the nation, and the need to actively seek to avoid any net loss of this functionality and value.

Acts 1991, No. 708, §1.

LA R.S.56:638.3. Purposes

In order to implement the objectives and purposes of this Subpart, the commission shall:

(1) Take timely action to conserve and manage saltwater finfish species.

(2) Promote the use of sound conservation and management principles in the regulation of commercial and recreational fishing.

(3) Actively advocate, on behalf of the saltwater finfish constituency, improvement of or no net loss of the functionality and value of the saltwater fisheries' habitat and estuary.

(4) Provide for the preparation and implementation of fishery management plans, in accordance with this policy that will prevent overfishing and will achieve and maintain plentiful fish populations to ensure, on a continuing basis, the optimum yield from each fishery.

(5) Recognize that saltwater finfish populations are subject to both natural and man-induced increases and decreases, and that changes in harvest levels may need to be recommended. If changes are required, these increases and decreases should be distributed among all fishermen in a fair and equitable manner that considers among other factors historical usage, ensuring that no historical user groups will be arbitrarily excluded.

Acts 1991, No. 708, §1.

LA R.S. 56:638.4. Policy

The policy of the state of Louisiana is hereby declared to be the following:

Stewardship of the state's saltwater finfish resources shall have as its utmost concern the continued health and abundance of the resource and its environs, shall provide for optimum sustained benefits to the state, shall be responsive to the needs of interested and affected citizens, shall ensure the proper and fair utilization of these resources for the citizens of the state in present and future generations, shall preserve the state's exclusive right to manage the fisheries within or beyond its jurisdiction, and shall be based on the best scientific information available. In addition, such stewardship of the state's saltwater finfish resources shall draw upon federal, state, and academic capabilities and promote efficiency in carrying out research, administration, management, and enforcement.

Acts 1991, No. 708, §1.

LA R.S. 56:638.5. Saltwater fishery standards

The commission shall adopt such rules and regulations, consistent with the authority granted by this Chapter, and in accordance with the Administrative Procedure Act, for the harvesting, conservation, and management of all species of saltwater finfish, in accordance with the following standards:

(1) Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield while maintaining healthy, plentiful stocks. In fact, every effort will be made at all times to prevent a harvest from exceeding the safe upper limit of harvests which can be taken consistently year after year without diminishing the stocks so that the stock is truly inexhaustible and perpetually renewable.

(2) Conservation and management measures shall be based upon the best scientific, economic, biological, anthropological, and sociological information available.

(3) To the extent practicable, an individual stock or unit of fish shall be managed as a unit throughout its range within the state's jurisdictional authority and interrelated stocks of fish and other saltwater resources shall be managed in close coordination.

(4) If it becomes necessary to allocate or assign fishing privileges among various fishermen, such allocations to the extent practicable shall be:

(a) Fair and equitable to all such fishermen.

(b) Reasonably calculated to promote conservation.

(c) Carried out in such a manner that no particular individual, corporation, or other legal entity acquires an excessive share of such privileges.

(d) In the best interest of the citizens of Louisiana.

(5) Conservation and management measures shall, where practicable, promote efficiency in the conservation and

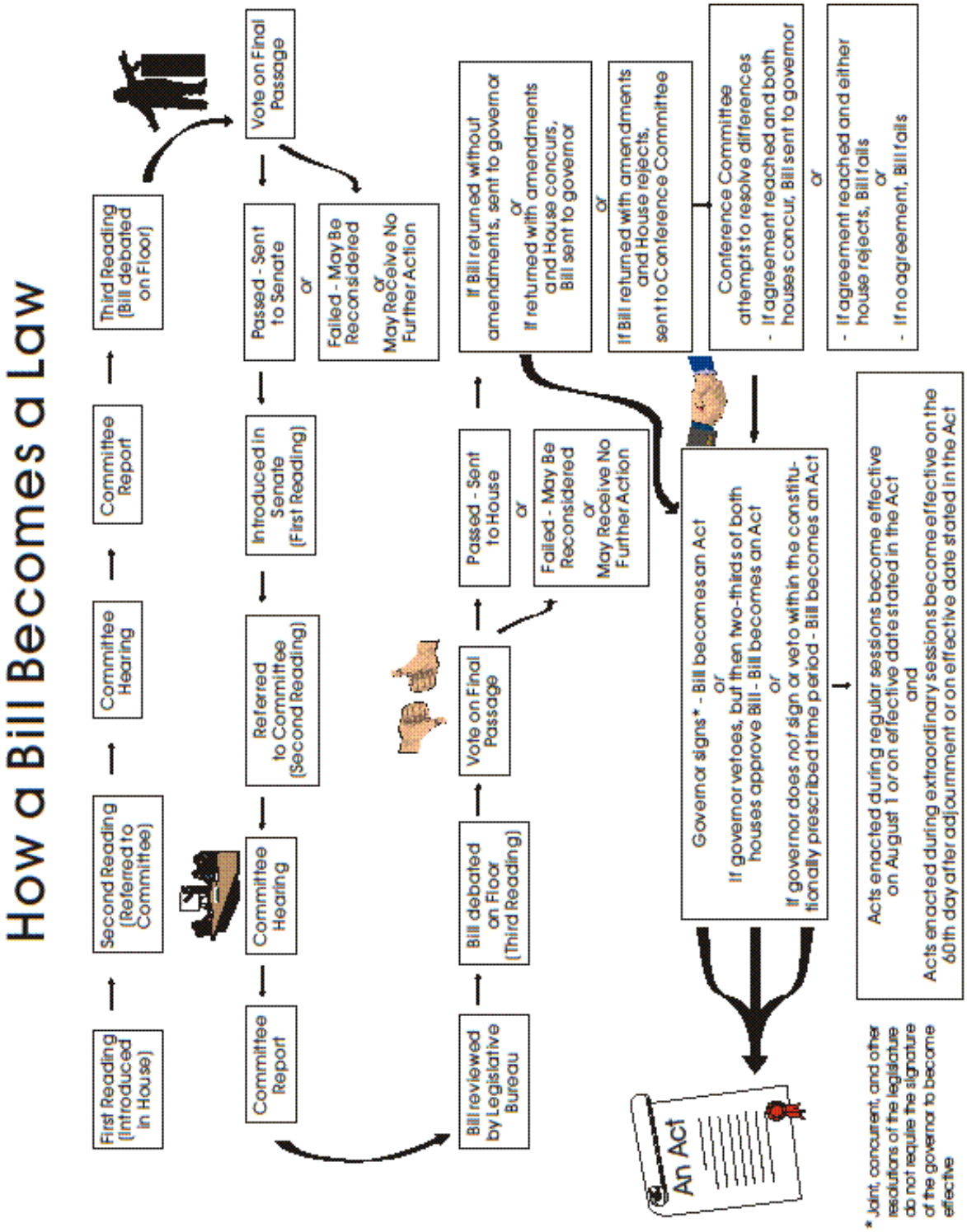
management of fishery resources; except that no such measure shall have economic allocation as its sole purpose.

(6) Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

(7) Conservation and management measures may take into account and allow for variations among, and contingencies in, fisheries resources and catches.

Acts 1991, No. 708, §1.

Appendix IX. Louisiana Legislative Process



Appendix X. Authorities of the Louisiana Wildlife and Fisheries Commission

According to Louisiana Revised Statutes Title 56, the Commission's authorities related to shrimp include:

LA R.S. 56:2 Supervision and direction of the Commission

The Commission has sole authority to establish and define management programs and policies and shall conduct such studies and investigations as necessary.

LA R.S. 56:3 Ownership of shellfish

The Commission has ownership and title to all wild birds, and wild quadrupeds, fish, other aquatic life and water bottoms within the territory and jurisdiction of the state, including all oysters and other shellfish.

LA R.S. 56:6(14)

Shall rigidly enforce all law relative to the bedding, fishing, selling, shipping, and canning of oysters; all law relative to the protection, propagation, and selling of birds and game; all law relative to the protection, propagation, and sale of all species of fish in the state, whether salt water or fresh water fish, shell fish, or fish of any description; and all law relative to diamond-back terrapin and shrimp.

LA R.S. 56:6(25a) Special powers and duties

The Commission may promulgate rules and regulations to set seasons, times, places, size limits, quotas, daily take, and possession limits based upon biological and technical data and may set fees for nonresident recreational hunting and fishing licenses.

LA R.S. 56:22 Rules and regulations

The Commission may entirely prohibit the taking of any species of fish in any part of the state, particularly in any lake or stream either wholly or partially within the state, for not more than a three-year period.

LA R.S. 56:313 Control of fisheries

The Commission has exclusive control of fish having a game or commercial value.

LA R.S. 56:315 Sanctuaries and propagating places

The Commission may operate and maintain hatcheries, sanctuaries and propagating places for the protection and propagation of fish and may restrict fishing in any manner it deems advisable.

LA R.S. 56:326.1 Size limits

The Commission may set size limits for all freshwater and saltwater fish for which no limits have been set by law.

LA R.S. 56:326.4 Staggered and split seasons

The Commission may split, stagger or otherwise arrange seasons and quotas for fishing in such a manner as to maximize the availability of popular fish for serving in Louisiana restaurants throughout the year.

LA R.S. 56:492.1 Excluder devices

The Commission may promulgate rules and regulations in accordance with the Administrative Procedure Act relative to the use, possession, and configuration of devices designed to exclude the take of certain fish and other aquatic life from fishing gear within the territorial waters of the state and in the federal exclusive economic zone.

LA R.S. 56:497(A)2 Saltwater Shrimp Seasons

The open seasons for all or part of the state waters shall be fixed by the Commission. The Commission, through the secretary, shall close the season based on biological and technical data. In addition, notwithstanding the provisions of

R.S. 56:499, when opening a special shrimp season or extending a regular shrimp season, the Commission shall have the authority for the duration of that season or extension to increase the minimum mesh size provided in R.S. 56:499 for any trawl, skimmer net, or butterfly net.

LA R.S. 56:497(A)3 Saltwater Shrimp Seasons

The Commission shall have the authority to open or close outside waters by zone each year as it deems appropriate upon inspection of and based upon technical and biological data which indicates that marketable shrimp, in sufficient quantities, are available for harvest.

LA R.S. 56:497(A)4 Saltwater Shrimp Seasons

The Commission shall conduct a public hearing prior to determining whether or not to open or close a regular or special season. The Commission shall give at least three days notice prior to the hearing on the decision to open or close a regular shrimp season and at least three days notice prior to the hearing on the decision to open or close a special season. Notice shall consist of a news release to the news media. The notice shall set forth the agenda and the date, time, and place for each hearing. At the public hearing, the Commission shall adopt written reasons for its decision and such reasons shall specify the biological and technical data on which the decision is based and the market standard by which the data is evaluated. Such decision shall not be effective until at least seventy-two hours after the decision is made.

LA R.S. 56:497(A)6 Saltwater Shrimp Seasons

The Commission shall also have the right to set special shrimp seasons for all or part of the state waters. Opening of the seasons shall be based upon the best biological and technical data presented to the Commission which indicates that marketable shrimp, in sufficient quantities, are available for harvest.

LA R.S. 56:497(A)7 Saltwater Shrimp Seasons

The Commission shall fix no less than two open seasons each calendar year for all inside waters by zone, based upon biological and technical data which indicates that marketable shrimp, in sufficient quantities, are available for harvest.

LA R.S. 56:497(A)9 Saltwater Shrimp Seasons

The Commission may delegate to the secretary the powers, duties, and authority to open and close regular and special shrimp seasons.

LA R.S. 56:497(C)1 Saltwater Shrimp Seasons

The Louisiana Wildlife and Fisheries Commission is authorized to adopt rules and regulations under the Administrative Procedure Act to provide for an annual special bait dealer permit and to allow the taking of live bait shrimp and live croaker by qualified permit holders during the closed shrimp season. The fee for such permit shall be one hundred ten dollars per year. All revenues received through the sale of such permits shall be used for the administration of the bait dealer program.

Appendix XI. Authorities of the Secretary, Louisiana Department of Wildlife and Fisheries

According to Louisiana Revised Statutes Title 56, the Secretary's authorities related to shrimp include:

LA R.S. 56:6.1(A) Emergency closures

The Secretary may declare a closed season on any or all species of fish found within the state or may restrict fishing in the closed season in any manner deemed advisable.

LA R.S. 56:6.2(A) Advisory committees

The Secretary may adopt rules to govern the procedures of advisory committees created in or for the department.

LA R.S. 56:17 Permits

The Secretary may take fish of any kind in any manner or place for the purpose of science and cultivation and distribution and may grant permits to other persons for the same purpose.

LA R.S. 56:318(C) Permits

The Secretary may issue permits to any persons to take fish for scientific or educational purposes or for propagation or distribution.

LA R.S. 56:327(E)

The Secretary shall have authority to set seasons, regulate type of gear used, and set possession limits for estuarine fish where it is clearly demonstrated that intense fishing competition exists or if pollution levels exceed adopted standards or if biological studies indicate the need.

LA R.S. 56:493

The exclusive control of the shrimp fishery and the shrimp industry in Louisiana is vested in the department, which shall enforce the laws regulating same. All shrimp or parts thereof taken, possessed, or transported contrary to the provisions of this Subpart shall, when found, be confiscated and disposed of by the department at its discretion.

LA R.S. 56:497(A)9 Saltwater Shrimp Seasons

The commission may delegate to the secretary the powers, duties, and authority to open and close regular and special shrimp seasons.

LA R.S. 56:571(B) Experimental Gear

The Secretary may issue permits to persons who are interested in the development of new gear and equipment to harvest fish.

LA R.S. 56: 579.1(B) Mariculture permits

The Secretary may issue permits for mariculture projects within the coastal zone and exempt permittees from statutory limitations to the kind, number or size of fish which may harvested or as to the method of harvesting or taking fish, seasons or other limitations

LA R.S. 56:640.3(D) Right to fish

The department shall recommend the elimination or restriction of any fishing gear currently in use or which may be used in recreational or commercial fisheries in implementing its management responsibilities or in response to any emergency situation. While elimination or restriction may have uneven impacts on different groups of fishermen, the proposed measures should be applicable to all people of the state. In addition to acquiring the best available biological data, the

department shall use all practicable means to collect all relevant social and economic data in support of such allocation decision making efforts.

Appendix XII. Federal Management Institutions

The following list of federal management institutions was adapted from a similar list in the GSMFC's Oyster Regional Management Plan (GSMFC 2012).

Regional Fishery Management Councils

With the passage of the Magnuson Fishery Conservation and Management Act (MFCMA), the federal government assumed responsibility for fishery management within the Exclusive Economic Zone (EEZ), a zone contiguous to the territorial sea and whose inner boundary is the outer boundary of each coastal state. The outer boundary of the EEZ is a line 200 nautical miles from the (inner) baseline of the territorial sea. Management of fisheries in the EEZ is based on fishery management plans (FMPs) developed by regional fishery management councils such as the Gulf of Mexico Fishery Management Council (GMFMC). Each council prepares plans for each fishery requiring management within its geographical area of authority and amends such plans as necessary. Plans are implemented as federal regulation through the U.S. Department of Commerce (DOC). The councils must operate under a set of standards and guidelines, and to the extent practicable, an individual stock of fish shall be managed as a unit throughout its range. Management shall, where practicable, promote efficiency, minimize costs, and avoid unnecessary duplication (MFCMA Section 301a).

National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), DOC

The Secretary of DOC, acting through NMFS, has the ultimate authority to approve or disapprove all FMPs prepared by regional fishery management councils. Where a council fails to develop a plan, or to correct an unacceptable plan, the Secretary may do so. NMFS also collects data and statistics on fisheries and fishermen. It performs research and conducts management authorized by international treaties. NMFS has the authority to enforce the MFCMA and Lacey Act and is the federal trustee for living and nonliving natural resources in coastal and marine areas. It conducts research and data collection programs and comments on all projects that affect marine fishery habitat.

National Ocean Service (NOS), NOAA, DOC

NOS, in conjunction with coastal states, administers the National Estuarine Research Reserve and National Marine Sanctuaries Programs as authorized under Section 315 of the Coastal Management Act of 1972. Those protected areas serve to provide suitable habitat for a multitude of estuarine and marine species and serve as sites for research and education activities relating to coastal management issues. Management plans for these areas may include restrictions on harvest and use of various marine and estuarine species. Harvest of shrimp could be directly affected by such plans. NOS may also influence fishery management for shrimp indirectly through administration of the Coastal Zone Management Program and by setting standards and approving funding for state coastal zone management programs. These programs often affect estuarine habitat on which shrimp depend.

United States Fish and Wildlife Service (USFWS), Department of the Interior (DOI)

USFWS may affect the management of shrimp through the Fish and Wildlife Coordination Act, under which USFWS and NMFS review and comment on proposals to alter habitat. Dredging, filling, and marine construction are examples of projects that could affect shrimp and their habitat. In certain refuge areas, USFWS may directly regulate fishery harvest. This harvest is usually restricted to recreational limits developed by the respective state. Special use permits may be required if commercial harvest is to be allowed in refuges.

United States Environmental Protection Agency (EPA)

EPA, through its administration of the Clean Water Act and the National Pollutant Discharge Elimination System (NPDES), provides protection for shrimp and their habitat. Applications for permits to discharge pollutants into estuarine waters may be disapproved or conditioned to protect these marine resources. EPA, individual states and the United States Coast Guard (USCG) work together, through the Clean Water Act Section 312, to provide each state with the opportunity to protect its citizens and its aquatic habitats through No Discharge Zone (NDZ) designations and national standards for marine sanitation devices on boat toilets or heads. Section 312 of the Clean Water Act helps protect

human health and the aquatic environment from disease-causing microorganisms that may be present in sewage from vessels and boats. There are three distinct kinds of NDZ designations that may be available to an interested state: (1) to protect aquatic habitats where pumpout facilities are available, (2) to protect special habitats or species, and (3) to protect human drinking water intake zones. In all three cases, the interested state petitions the Administrator of EPA to make the designation official. Upon such a finding, it is left to the state and USCG, if applicable, to enforce the limits of the NDZ. This means that the discharge of untreated and treated sewage is strictly forbidden and subject to fine if violated. Also, USCG can use its authority to board vessels to verify that adequate facilities are present in such areas. The National Estuary Program is administered jointly by EPA and a local sponsor. This program evaluates estuarine resources, local protection and development of policies, and seeks to develop future management plans. Input is provided to these plans by a multitude of user groups including industry, environmentalists, recreational and commercial interests, and policy makers. National Estuary Programs in the Gulf include Sarasota, Tampa, Mobile, Barataria/Terrebonne, Galveston, and Corpus Christi bays.

United States Army Corps of Engineers (USACOE)

Shrimp populations may be influenced by USACOE's responsibilities pursuant to the Clean Water Act and Section 10 of the Rivers and Harbors Act. Under these laws, USACOE issues or denies permits to individuals and other organizations for proposals to dredge, fill, and construct in wetland areas and navigable waters. USACOE is also responsible for planning, construction, and maintenance of navigation channels and other projects in aquatic areas, and these projects could affect shrimp and their habitat.

USCG

USCG is responsible for enforcing fishery management regulations adopted by DOC pursuant to management plans developed by GMFMC. USCG also enforces laws regarding marine pollution and marine safety, and they assist commercial and recreational fishing vessels in times of need.

United States Food and Drug Administration (FDA)

FDA directly regulates the harvest and processing of seafood and shrimp through its administration of the Food, Drug, and Cosmetic Act and other regulations that prohibit the sale and transfer of contaminated, putrid, or otherwise potentially dangerous foods. FDA does reserve the right and authority to enforce the Food, Drug, and Cosmetic Act and other regulations if the states fail to do so.

United States Customs and Border Protection

Imported seafood and shrimp are not legally entered into the United States until the shipment has arrived at a port of entry with the appropriate shipping documents and has been released by the United States Customs and Border Protection.

Appendix XIII. Federal Laws, Regulations, and Policies

The following federal laws, regulations, and policies may directly and indirectly influence the quality, abundance, and ultimately the management of shrimp. This list was adapted from a similar list in the GSMFC's Oyster Regional Management Plan (GSMFC 2012).

Magnuson-Stevens Fishery Conservation and Management Act of 1976 (MFCMA); Sustainable Fisheries Act of 1996; Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006

The MFCMA mandates the preparation of FMPs for important fishery resources within the EEZ. It sets national standards to be met by such plans. Each plan attempts to define, establish, and maintain the optimum yield for a given fishery. The 1996 reauthorization of the MFCMA set three new additional national standards to the original seven for fishery conservation and management, included a rewording of standard number five, and added a requirement for the description of essential fish habitat and definitions of overfishing. The 2006 reauthorization builds on the country's progress to implement the 2004 Ocean Action Plan which established a date to end overfishing in the United States by 2011, use market-based incentives to replenish U.S. fish stocks, strengthen enforcement of U.S. fishing laws, and improve information and decisions about the state of ocean ecosystems.

Interjurisdictional Fisheries (IJF) Act of 1986 (P.L. 99-659, Title III)

The IJF established a program to promote and encourage state activities in the support of management plans and to promote and encourage management of IJF resources throughout their range. The enactment of this legislation repealed the Commercial Fisheries Research and Development Act (P.L. 88-309).

Federal Aid in Sport Fish Restoration Act (SFRA); the Wallop-Breaux Amendment of 1984 (P.L. 98-369)

The SFRA provides funds to states, USFWS, and GSMFC to conduct research, planning, and other programs geared at enhancing and restoring marine sportfish populations.

Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA), Titles I and III and the Shore Protection Act of 1988 (SPA)

The MPRSA provides protection of fish habitat through the establishment and maintenance of marine sanctuaries. The MPRSA and the SPA regulate ocean transportation and dumping of dredged materials, sewage sludge, and other materials. Criteria for issuing such permits include consideration of effects of dumping on the marine environment, ecological systems, and fisheries resources.

Federal Food, Drug, and Cosmetic Act of 1938 (FDCA)

The FDCA prohibits the sale, transfer, or importation of "adulterated" or "misbranded" products. Adulterated products may be defective, unsafe, filthy, or produced under unsanitary conditions. Misbranded products may have false, misleading, or inadequate information on their labels. In many instances, the FDCA also requires FDA approval for distribution of certain products.

Clean Water Act of 1981 (CWA)

The CWA requires that an EPA approved NPDES permit be obtained before any pollutant is discharged from a point source into waters of the United States including waters of the contiguous zone and the adjoining ocean. Discharges of toxic materials into rivers and estuaries that empty into the Gulf of Mexico can cause mortality to marine fishery resources and may alter habitats. Under Section 404 of the CWA, USACOE is responsible for administration of a permit and enforcement program regulating alterations of wetlands as defined by the act. Dredging, filling, bulk-heading, and other construction projects are examples of activities that require a permit and have potential to affect marine populations. NMFS is the federal trustee for living and nonliving natural resources in coastal and marine areas under United States

jurisdiction pursuant to the CWA.

Clean Vessel Act of 1992 (CVA), as Amended

The CVA of 1992 (Public Law 102-587) amended the Sport Fish Restoration Act (SFR), commonly referred to as the Dingell-Johnson (DJ) Act. The original SFR Act was passed on August 9, 1950. The 1992 amendment to the SFR Act established a five year federal grant program and provided $40 million out of the Aquatic Resources Trust Fund for the CVA Program. The CVA Grant Program provides grant funds to the states, the District of Columbia and insular areas for the construction, renovation, operation, and maintenance of pumpout stations and waste reception facilities for recreational boaters and also for educational programs that inform boaters of the importance of proper disposal of their sewage. The governmental agency designated by each respective governor is eligible to participate in the CVA Program. The governmental agency may partner with local governments, private marinas, and others to fund eligible projects.

Federal Water Pollution Act of 1972 (FWPCA) and Marpol Annexes I and II

Discharge of oil and oily mixtures is governed by the FWPCA and 40 Code of Federal Regulations (CFR), Part 110, in the navigable waters of the United States. Discharge of oil and oily substances by foreign ships or domestic ships operating or capable of operating beyond the United States territorial sea is governed by MARPOL Annex I. MARPOL Annex II governs the discharge at sea of noxious liquid substances primarily derived from tank cleaning and deballasting. Most categorized substances are prohibited from being discharged within 22 km of land and at depths of less than 25 m.

Coastal Zone Management Act 1972 (CZMA), as Amended

Under the CZMA, states receive federal assistance grants to maintain federally-approved planning programs for enhancing, protecting, and utilizing coastal resources. These are state programs, but the act requires that federal activities must be consistent with the respective states' coastal zone management programs. Depending upon the individual state's program, the CZMA provides the opportunity for considerable protection and enhancement of fishery resources by regulation of activities and by planning for future development in the least environmentally damaging manner.

Endangered Species Act (ESA) of 1973, as Amended (P.L. 93-205)

The ESA provides for the listing of plant and animal species that are threatened or endangered. Once listed as threatened or endangered, a species may not be taken, possessed, harassed or otherwise molested. It also provides for a review process to ensure that projects authorized, funded or carried out by federal agencies do not jeopardize the existence of these species or result in destruction or modification of habitats that are determined by the Secretary of DOI to be critical.

National Environmental Policy Act of 1970 (NEPA)

The NEPA requires that all federal agencies recognize and give appropriate consideration to environmental amenities and values in the course of their decision-making. In an effort to create and maintain conditions under which man and nature can exist in productive harmony, the NEPA requires that federal agencies prepare an environmental impact statement (EIS) prior to undertaking major federal actions that significantly affect the quality of the human environment. Within these statements, alternatives to the proposed action that may better safeguard environmental values are to be carefully assessed.

Fish and Wildlife Coordination Act of 1958

Under the Fish and Wildlife Coordination Act, USFWS and NMFS review and comment on fish and wildlife aspects of proposals for work and activities sanctioned, permitted, assisted, or conducted by federal agencies that take place in or affect navigable waters, wetlands, or other critical fish and wildlife habitat. The review focuses on potential damage to fish, wildlife, and their habitat; therefore, it serves to provide some protection to fishery resources from activities that may alter critical habitat in nearshore waters. This act is important because federal agencies must give due consideration to the recommendations of USFWS and NMFS.

Fish Restoration and Management Projects Act of 1950 (P.L. 81-681)

Under this act, DOI is authorized to provide funds to state fish and game agencies for fish restoration and management

projects. Funds for protection of threatened fish communities that are located within state waters could be made available under the act.

Lacey Act of 1981, as Amended

The Lacey Act prohibits import, export, and interstate transport of illegally taken fish and wildlife. As such, the act provides for federal prosecution for violations of state fish and wildlife laws. The potential for federal convictions under this act with its more stringent penalties has probably reduced interstate transport of illegally possessed fish and fish products.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or "Superfund")

The CERCLA names NMFS as the federal trustee for living and nonliving natural resources in coastal and marine areas under United States jurisdiction. It could provide funds for "clean-up" of fishery habitat in the event of an oil spill or other polluting event.

MARPOL Annex V and United States Marine Plastic Research and Control Act of 1987 (MPRCA)

MARPOL Annex V is a product of the International Convention for the Prevention of Pollution from Ships, 1973/1978. Regulations under this act prohibit ocean discharge of plastics from ships; restrict discharge of other types of floating ship's garbage (packaging and dunnage) for up to 46 km from any land; restrict discharge of victual and other recomposable waste up to 22 km from land; and require ports and terminals to provide garbage reception facilities. The MPRCA of 1987 and 33 CFR, Part 151, Subpart A, implement MARPOL V in the United States.

Fish and Wildlife Act of 1956

This act provides assistance to states in the form of law enforcement training and cooperative law enforcement agreements. It also allows for disposal of abandoned or forfeited property with some equipment being returned to states. The act prohibits airborne hunting and fishing activities.

National Aquaculture Act (NAA) of 1980, Reauthorization 1985

The NAA in 1980 established national policy to encourage the development of aquaculture in the United States. The National Aquaculture Improvement Act (NAIA) of 1985 designated the U.S. Department of Agriculture (USDA) as the lead federal agency for coordination of federal activities and for dissemination of aquaculture information. Under this act, advisory, educational, and technical assistance is provided to encourage the implementation of aquaculture technology in rehabilitation and enhancement of publicly-owned fish and shellfish stocks, and in the development of private commercial aquaculture enterprises. The Joint Subcommittee on Aquaculture (JSA), established by the NAA, issued the National Aquaculture Development Plan of 1983, recognizing the status of aquaculture (including oyster culture), current technologies, impediments to development, existing programs, recommended programs and actions, and anticipated impacts.

Appendix XIV. History of Federal Shrimp Fishery Management Plan and Amendments

The Shrimp Fishery Management Plan was implemented as federal regulation May 20, 1981. The principal thrust of the plan was to enhance yield in volume and value by deferring harvest of small shrimp to provide for growth.

Principle actions included:

- Establishing a cooperative Tortugas Shrimp Sanctuary with the state of Florida to close a shrimp trawling area where small pink shrimp comprise the majority of the population most of the time.
- A cooperative 45-day seasonal closure with the state of Texas to protect small brown shrimp emigrating from bay nursery areas; and
- Seasonal zoning of an area of Florida Bay for either shrimp or stone crab fishing to avoid gear conflict.

The FMP also established reporting systems for vessels, dealers, and processors.

Shrimp Amendment 1

Amendment 1, approved in 1981, provided the Regional Administrator (RA) of NOAA Fisheries with the authority to adjust by regulatory amendment the size of the Tortugas Sanctuary or the extent of the Texas closure, or to eliminate either closure for one year. It updated and revised the text of the FMP.

Shrimp Amendment 2

Amendment 2 (1981) updated catch and economic date in the FMP.

Shrimp Amendment 3

Amendment 3 (1984) resolved another shrimp-stone crab gear conflict on the west central Florida coast.

Shrimp Amendment 4

Amendment 4, partially approved in 1988 and finalized in 1989, identified problems that developed in the fishery and revised the objectives of the FMP accordingly. The annual review process for the Tortugas Sanctuary was simplified, and GMFMC's and RA's review for the Texas closure was extended to February 1st. Disapproved was a provision that white shrimp taken in the EEZ be landed in accordance with a state's size/possession regulations to provide consistency and facilitate enforcement with the state of Louisiana. This latter action was to have been implemented at such time when Louisiana provided for an incidental catch of undersized white shrimp in the fishery for seabobs.

Shrimp Amendment 5

In July 1989, NOAA Fisheries published revised guidelines for FMPs that interpretatively addressed the Magnuson Act National Standards. These guidelines require each FMP to include a scientifically measurable definition of overfishing and an action plan to arrest overfishing should it occur. In 1990, Texas revised the period of its seasonal closure in Gulf waters from June 1 to July 15, to May 15 to July 15. The FMP did not have enough flexibility to adjust the cooperative closure of federal waters to accommodate this change, thus an amendment was required.

Amendment 5 also defined overfishing for Gulf brown, pink, and royal red shrimp and provided for measures to restore overfished stocks if overfishing should occur. Action on the definition of overfishing for white shrimp was deferred, and seabobs and rock shrimp were deleted from the management unit. This duration of the seasonal closure to shrimping off Texas was adjusted to conform with the changes in state regulations.

Shrimp Amendment 6

Amendment 6 (1993) eliminated the annual reports and reviews of the Tortugas Shrimp Sanctuary in favor of monitoring and an annual stock assessment. Three seasonally opened areas within the sanctuary continued to open seasonally, without need for annual action. A proposed definition of overfishing of white shrimp was rejected by NOAA Fisheries as

not being based on the best available data.

Shrimp Amendment 7

Amendment 7, finalized in 1994, defined overfishing for white shrimp and provided for future updating of overfishing indices for brown, white, and pink shrimp as new data become available. A total allowable level of foreign fishing (TALFF) for royal red shrimp was eliminated; however, a redefinition of overfishing for this species was disapproved.

Shrimp Amendment 8

Amendment 8, submitted in 1995 and implemented in early 1996, addressed management of royal red shrimp. It established a procedure that allows total allowable catch (TAC) for royal red shrimp to be set up to 30 percent above Maximum Sustainable Yield (MSY) for no more than two consecutive years so that a better estimate of MSY can be determined.

Shrimp Amendment 9

Amendment 9 addressed the issue of reducing the bycatch of juvenile red snapper in the shrimp trawl fishery.

Shrimp Amendment 10

Amendment 10 required the installation of NOAA Fisheries-certified BRDs that reduce the bycatch of finfish by at least 30% by weight in each net used aboard vessels trawling for shrimp in the Gulf of Mexico EEZ east of Cape San Blas, Florida (85° 30" W. Longitude). Excepted included vessels trawling for groundfish or butterfish. A single try net with a headrope length of 16 feet or less per vessel and no more than two rigid-frame roller trawls limited to 16 feed or less, such as those used in the Big Bend area of Florida were also exempted.

Shrimp Amendment 11

Amendment 11, implemented December 5, 2002, required all vessels harvesting shrimp from the EEZ to obtain a commercial shrimp vessel permit from NOAA Fisheries; prohibited the use of traps to harvest of royal red shrimp from the EEZ; and prohibited the transfer or royal red shrimp at sea. Permits required 12/5/02.

Shrimp Amendment 12 (Generic Amendment)

Amendment 12, implemented August 19, 2002, established two marine reserves in the EEZ in the vicinity of the Dry Tortugas, Florida known as Tortugas North and Tortugas south, in which fishing for coastal migratory pelagic species is prohibited. This action complemented previous actions taken under the National Marine Sanctuaries Act.

Shrimp Amendment 13

Amendment 13 established an endorsement to the existing federal shrimp vessel permit for vessels harvesting royal red shrimp; (2) defined MSY, optimum yield (OY), the overfishing threshold, and the overfished condition for royal red and penaeid shrimp stocks in the Gulf for stocks that lacked such definitions; (3) established bycatch reporting methodologies and improved collection of shrimping effort data in the EEZ; (4) required completion of a Gulf Shrimp Vessel and Gear Characterization Form; (5) established a moratorium on the issuance of commercial shrimp vessel permits; and (6) required reporting and certification of landings during a moratorium.

August 2006 Regulatory Amendment

The purpose of this regulatory amendment was to change the bycatch reduction certification criterion for red snapper from penaeid shrimp trawling in the EEZ. Revising the bycatch reduction device (BRD) certification criterion to address shrimp trawl bycatch more comprehensively and realistically was expected to increase flexibility, promote innovation, and allow for the certification of a wider variety of BRDs. Having a wider variety of BRDs available to the fishery would allow fishermen to choose the most effective BRD for the specific local fishing conditions, and enhance overall finfish reduction.

Shrimp Amendment 14

Amendment 14, part of Joint Reef Fish Amendment 27/Shrimp Amendment 14 was submitted to the NOAA Fisheries in June, 2007, and established a target reduction goal for juvenile red snapper mortality of 74% less than the benchmark years of 2001-2003, reducing that target goal to 67% beginning in 2011, eventually reducing the target to 60% by 2032. If necessary, a seasonal closure in the shrimp fishery would occur in conjunction with the annual Texas closure. The need for a closure would be determined by an annual evaluation by the NOAA Fisheries RA.

The joint amendment also addressed overfishing and bycatch issues in both the red snapper directed fishery and the shrimp fishery. The amendment set the TAC at 5.0 mp between 2008 and 2010. The commercial sector received a quota of 2.55 mp, with the remaining quota of 2.45 mp going to the recreational sector. The amendment also reduced the commercial size limit to 13", reduced the recreational bag limit to two fish, eliminated a bag limit for captain and crew aboard a for-hire vessel,and set the recreational fishing season from June 1 – September 30 (which could be extended by approximately 30 days if the Council's presumed assumption of a 10% post-hurricane reduction in recreational fishing effort was realized). In addition, all commercial and recreational reef fish fisheries are required to use non-stainless steel circle hooks when using natural baits, as well as venting tools and dehooking devices.

Framework Action to Establish Funding for the Electronic Logbook Program (ELB) in the Shrimp Fishery of the Gulf of Mexico

The purpose of this action was to maintain the NOAA Fisheries' ability to monitor and document offshore effort for the Gulf shrimp fleet through an ELB program. The need was to base conservation and management measures on the best scientific information available and to minimize bycatch to the extent practicable, as required by the Magnuson-Stevens Fishery Conservation and Management Act.

Appendix XV. Commercial and Recreational Shrimp Regulations—Full Text

Commercial Shrimping Regulations

License Fees

	Resident	*Non-Resident*
Commercial Fisherman	$55	$460
Senior Commercial Fisherman[1]	$20	N/A
Certified Commercial Fisherman	No added fee	No added fee
Fresh Products License	$20	$120
Fresh Products License (Spouse)	$5	N/A
Special Bait Dealers Permit[2]	$110	$110

Commercial fisherman and Fresh Product licenses may be purchased November 15 for the immediately following license year. Five dollars from the sale of each license dedicated to the Seafood Promotion and Marketing Fund.

[1]Includes shrimp gear licenses but not shrimp gear fee

[2]Requires $1,000 cash bond

Shrimp Trawl (per net)[1]	$25	$100
Skimmer Net (per net)	$25	$100
Butterfly Net (per net)	$25	$100
Dip Net	$25	$100
Cast Net	$25	$100
Shrimp Gear Fee[2]	$10	$40

Gear Licenses may be purchased October 1 for the immediately following license year. Licenses may be temporarily transferred between licensed commercial fishermen having the same residency status.

Non-resident gear licenses are not available for sale if domiciliary state prohibits the use of similar commercial fishing gear. Five dollars from the sale of each license dedicated to the Seafood Promotion and Marketing Fund.

[1]No license for test trawls provided they are used with another trawl for which the gear fee has been paid

[2]One-time fee paid once during any single license year with the purchase of any shrimp trawl, skimmer net or butterfly net license. Funds dedicated to the Shrimp Promotion and Marketing Fund

Vessel License[1 + 2]	$15	$60
Wholesale/Retail Seafood Dealer[2 + 3] (Business or Vehicle)	$250	$1,105
Retail Seafood Dealer[2 + 3] (Business or Vehicle)	$105	$405
Seafood Transport[3]	$30	$30
Commercial Fisherman Transport[3]	$30	$30

Five dollars from the sale of each license dedicated to the Seafood Promotion and Marketing Fund.

[1]Must be issued in the name of the vessel owner

[2]May be purchased beginning October 1 for the immediately following license year

[3]May be purchased for a 4-year period at four times the annual license fee

Commercial Fisherman's License

A commercial fisherman taking shrimp for sale must purchase a commercial fisherman's license R.S. 56:303(A)1

Cost is $55 for residents and $460 for non residents R.S. 56:303(B)

Valid for one year beginning January 1 and ending December 31 R.S. 56:303.1(A)

Available for purchase at any time of the year for the current license year and from November 15 for the immediately following license year R.S. 56:303.1(B)

A commercial fisherman holding a commercial fisherman's license may transport and sell his own catch to any licensed Louisiana wholesale/retail seafood dealer located within the state of Louisiana R.S. 56:303.7(A)

Holder of a commercial fisherman's license who sells or transfers his catch to a wholesale/retail seafood dealer must present his license to the dealer for verification and provide the dealer with the necessary information needed to complete trip tickets R.S. 56:303.7(B)

Unlawful for the owner of a commercial fishing vessel to allow any person who does not hold a commercial fisherman's license to operate the vessel while commercial fishing or in possession of fish for sale while on the water R.S. 56:304.2(A)

Senior Commercial Fisherman's license available to residents 70 years of age or older at a cost of $20 and also serves in lieu of any required commercial gear licenses and available for purchase at any time of the year for the current license year and from November 15 for the immediately following license year R.S. 56:303(F)

Certified Commercial Fisherman's license available upon presentation to LDWF of a notarized statement from the tax preparer certifying that based upon his most recent tax return the individual earns at least 50% of his income from commercial fishing activities. R.S. 56:303(E)1

Five dollars from the sale of each commercial fisherman's license is deposited in the Seafood Promotion and Marketing Fund R.S. 56:10(B)1

Fresh Products License

A commercial fisherman selling his catch directly to a consumer must possess a fresh product's license R.S. 56:303(A)2 and R.S. 56:303.1.1(A)

A commercial fisherman may purchase a secondary fresh products license for a spouse at a cost of $5.00 R.S. 56:303.1.1(E)

The cost of a fresh products license shall be $20 for residents and $120 for nonresidents. The fresh products license shall be valid for one year, beginning on January 1 of each calendar year and expiring on December 31 of the same calendar year R.S. 56:303.1.1(B)

Commercial Gear Licenses

A commercial fisherman must possess a commercial gear license indicating that the applicable gear fee has been paid whenever using or possessing any shrimp gear on the fishing grounds R.S. 56:303.2(A) and R.S. 56:305(A)

A commercial gear license can only be purchased by a person possessing a valid commercial fisherman's license R.S. 56:305.2(A)

A gear fee must be paid for each piece of gear or each type of gear, whichever is applicable, being used to take fish or, if the gear is not in use but is in possession on the fishing grounds, the gear fee must be paid for each piece of gear or type of gear, whichever is applicable, intended for use or used to take fish R.S. 56:305(A) and R.S. 56:305(E)

Cost of a trawl, skimmer net, butterfly net, cast net, and dip net license is $25 for residents and $100 for non residents R.S. 56:305(B)

No fee required for use of a test trawl when used with another trawl for which the gear fee has been paid R.S. 56:305(B)11

Licenses may be temporarily transferred between licensed commercial fishermen having the same residency status R.S. 56:305.3(A)

Not available for sale to non-residents if domiciliary state prohibits the use of similar commercial fishing gear R.S. 56:30(C)2

Valid for one year beginning January 1 and ending December 31 R.S. 56:305.1(A)

Available for purchase at any time of the year for the current license year and from November 15 for the immediately following license year R.S. 56:305.1(B)

A valid commercial gear license may be transferred for temporary use only to a person holding a valid commercial fisherman's license and having the same residency status as indicated on the license being transferred R.S. 56:305.3(A)

Five dollars from the sale of each gear license is deposited in the Seafood Promotion and Marketing Fund R.S. 56:10(B)1

Shrimp Gear Fee

Paid only once in any single license year. Any commercial fisherman who purchases a trawl, skimmer, or butterfly gear license shall be required to pay an annual fee of $10 for residents and $40 for nonresidents for deposit into the Shrimp Promotion and Marketing Account R.S. 56:305(G)

Vessel License

A vessel must be licensed whenever engaged in commercial fishing in or whenever possessing fish for sale in saltwater areas of the state R.S. 56:304(A)

Cost of the vessel license is $15 for residents and $60 for nonresidents R.S. 56:304(B)

Issued only to the owner of the vessel R.S. 56:304(D)

Five dollars of each vessel license fee is deposited in the Seafood Promotion and Marketing Fund R.S. 56:10(B)1

Valid for one year beginning January 1 and ending December 31 R.S. 56:304.1(A)

Available for purchase at any time of the year for the current license year and from October 15 for the immediately following license year R.S. 56:304.1(B)

Are not transferable and the name of a vessel for which a vessel license has been issued cannot be changed without prior notification to the department R.S. 56:304.5(A) and R.S. 56:304.5(B)

Wholesale/Retail Seafood Dealer's License

Any person buying, acquiring, or handling, from any person, by any means whatsoever, any species of fish, whether fresh, frozen, processed, or unprocessed, in Louisiana from within or outside the state, for sale or resale, including bait species, whether on a commission basis or otherwise, must possess a wholesale/retail seafood dealer's license R.S. 56:306(A)1

The owner or operator of any fish factory, platform, soft shell crab shedding facility, or other processing plant or a person shipping fish out of or into the state must possess a wholesale/retail seafood dealer's license R.S. 56:306(A)2(a)

Any person shipping fish into or out of the state shall possess wholesale/retail seafood dealer's license R.S. 56:306(A)2(b)

If the place of business is a vehicle, the license shall state "vehicle" and shall list the legal mailing address and physical location of the licensee R.S. 56:306(B)1

A wholesale/retail seafood dealer's license is required for each place of business R.S. 56:306(B)3

Must operate from the physical location of the business except for a wholesale/retail seafood dealer's license issued to a vehicle R.S. 56:306(B)1

A commercial fisherman selling his catch to anyone or any business other than a consumer or licensed wholesale/retail seafood dealer must possess a wholesale/retail seafood dealer's license R.S. 56:303(A)2

The cost of the wholesale/retail seafood dealer's license is $250 for residents and $1,105 for nonresidents R.S. 56:306.2(A)1

The license shall be valid for one year, beginning on January 1 of each calendar year and expiring on December 31 of the same calendar year R.S. 56:306.3(A)

The license may be purchased at any time of the year for the current license year and from October 1 for the immediately following license year R.S. 56:306.3(B)

Five dollars from the sale of each wholesale/retail seafood dealer license is deposited in the Seafood Promotion and Marketing Fund R.S. 56:10(B)1

Retail Seafood Dealer License

Any person buying, acquiring, or handling by any means whatsoever, from a Louisiana wholesale/retail seafood dealer, any species of fish whether fresh, frozen, processed, or unprocessed, that sells to the consumer for personal or household use and any person who ships fish out of or within the state of Louisiana to the consumer for personal or household use shall purchase a retail seafood dealer's license R.S. 56:306.1(A)

A retail seafood dealer's license is required for each place of business R.S. 56:306.1(B)3

Must operate from the physical location of the business except for a retail seafood dealer's license issued to a vehicle R.S. 56:306.1(B)1

Retail seafood dealers, restaurants and retail grocers shall buy directly only from wholesale/retail seafood dealers licensed in Louisiana R.S. 56:306.4(C)1

If the place of business is a vehicle, the license shall state "vehicle" and shall list the legal mailing address and physical location of the licensee R.S. 56:306.1(B)1

Restaurants and retail grocers who only purchase fish, whether fresh, frozen, processed, or unprocessed, from a licensed wholesale/retail seafood dealer and only sell such fish fully prepared by cooking for immediate consumption by the consumer need not be licensed R.S. 56:306.1(B)6

The cost of the retail seafood dealer's license is $105 for residents and $405 for nonresidents R.S. 56:306.2(A)2

A retail seafood dealer's license is valid for one year, beginning on January 1 of each calendar year and expiring on December 31 of the same calendar year R.S. 56:306.3(A)

A retail seafood dealer's license may be purchased at any time of the year for the current license year and from October 1 for the immediately following license year R.S. 56:306.3(B)

Seafood Transport License

Operators and drivers of any form of commercial transport, except common carriers, who are in the act of loading, unloading, or transporting fish shall have in their possession at least a commercial fisherman's license or wholesale/retail dealer's license or transport license R.S: 56:307(A)

In lieu of a wholesale/retail seafood dealer or retail seafood dealer license, a seafood transport license is required for each vehicle when delivering for or on behalf of a wholesale/retail seafood dealer or retail seafood dealer R.S. 56:306(B)4 and R.S. 56:306.1(B)4

No license required to transport processed fish or fish products R.S. 56:307(C)

Issued in the name of the wholesale/retail seafood dealer or retail seafood dealer licensee R.S. 56:307.1(B)

Remain transferable between vehicles R.S. 56:307.5

Employees of a wholesale/retail seafood dealer or retail seafood dealer operating under authority of a transport license for the dealer, the wholesale/retail seafood dealer or retail seafood dealer remains responsible for all activities taking place under authority of that license R.S. 56:306(B)4

The cost of a transport license is $30 per vehicle and can only be purchased by a person holding a valid Louisiana commercial fisherman's license or valid Louisiana wholesale/retail dealer's license R.S. 56:307.1(A)

If a restaurant or retail grocer buys fish from an out-of-state seller and brings fish into the state, the restaurant or retail grocer must possess a transport license when bringing such fish into the state R.S. 56:306.4(C)1

Five dollars from the sale of each transport license is deposited in the Seafood Promotion and Marketing Fund R.S. 56:10(B)1

Commercial Fisherman Seafood Transport License

A licensed commercial fisherman who possesses a transport license in his name may allow other individuals to transport his catch, provided these individuals are in possession of the fisherman's transport license R.S. 56:307.5

The transport license must be issued in the name of the commercial fisherman whose catch is being transported R.S. 56:307.1(B)

Five dollars from the sale of each transport license is deposited in the Seafood Promotion and Marketing Fund R.S. 56:10(B)1

Licensing/Residency Eligibility

"Bona fide resident" means any person who is a United States citizen or resident alien and has resided in this state continuously during the twelve months immediately prior to the date on which he applies for any license and who has manifested his intent to remain in this state by establishing Louisiana as his legal domicile, as demonstrated by compliance with all of the following, as applicable: R.S. 56:8(16)

- If registered to vote, he is registered to vote in Louisiana.
- If licensed to drive a motor vehicle, he is in possession of a Louisiana driver's license, or, if over the age of fifteen years and not licensed to drive, he is in possession of a special identification card issued by the Department of Public Safety and Corrections under the provisions of R.S. 40:1321.
- If owning a motor vehicle located within Louisiana, he is in possession of a Louisiana registration for that vehicle.
- If earning an income, he has filed a Louisiana state income tax return and has complied with state income tax laws and regulations.

As to a corporation or other legal entity, a resident shall be any which is incorporated or otherwise organized under and subject to the laws of Louisiana, and which is domiciled in Louisiana and has a permanent physical location of business in Louisiana where records are held. R.S. 56:8(16)B

Any person, corporation, or other legal entity which possesses a resident license from any other state or country shall not qualify for a resident license in Louisiana. R.S. 56:8(16)C

Helpers, deckhands or any person assisting in commercial fishing while on board a fishing vessel need not have a commercial fisherman's license provided the person in charge of the operation of a commercial fishing vessel, whether or not that person is the owner of the commercial fishing vessel, has a commercial fisherman's license and is on board the commercial fishing vessel. R.S. 56:303.3

Fishing licenses may be suspended, denied or revoked for failure to pay child support, nonpayment of unemployment compensation overtime and nonpayment of individual income taxes. R.S. 56:647

Inside and Outside Waters

Shrimping waters within the state are divided into two classes, inside and outside waters. The line of demarcation between these two classes generally follows the coastline and begins at the Louisiana/Texas state line and ends at the Louisiana/Mississippi state line as described in R.S. 56:499(A). Due to changes resulting from coastal erosion and subsidence, the Wildlife and Fisheries Commission has been given authority to amend the demarcation line (R.S. 56:495(E)

Seasons and Authority of the Wildlife and Fisheries Commission

The open seasons for all or part of the state waters shall be fixed by the commission. The commission, through the secretary, shall close the season based on biological and technical data. R.S. 56:497(A)1

When opening a special shrimp season or extending a regular shrimp season, the commission shall have the authority for the duration of that season or extension to increase the minimum mesh size for any trawl, skimmer net, or butterfly net. R.S. 56:497(A)2

The commission shall have the authority to open or close outside waters by zone each year as it deems appropriate upon inspection of and based upon technical and biological data which indicates that marketable shrimp, in sufficient quantities, are available for harvest. R.S. 56:497(A)3

The commission shall conduct a public hearing prior to determining whether or not to open or close a regular or special season. The commission shall give at least three days notice prior to the hearing on the decision to open or close a regular shrimp season and at least three days notice prior to the hearing on the decision to open or close a special season. Notice shall consist of a news release to the news media. The notice shall set forth the agenda and the date, time, and place for each hearing. At the public hearing, the commission shall adopt written reasons for its decision and such reasons shall specify the biological and technical data on which the decision is based and the market standard by which the data is

evaluated. Such decision shall not be effective until at least seventy-two hours after the decision is made. R.S. 56:497(A)4

The commission shall also have the right to set special shrimp seasons for all or part of the state waters. Opening of the seasons shall be based upon the best biological and technical data presented to the commission which indicates that marketable shrimp, in sufficient quantities, are available for harvest. R.S. 56:497(A)6

The commission shall fix no less than two open seasons each calendar year for all inside waters by zone, based upon biological and technical data which indicates that marketable shrimp, in sufficient quantities, are available for harvest. R.S. 56:497(A)7

No open season date shall begin on a Sunday. R.S. 56:497(A)8

The commission may delegate to the secretary the powers, duties, and authority to open and close regular and special shrimp seasons. R.S. 56:497(A)9

The Louisiana Wildlife and Fisheries Commission is authorized to adopt rules and regulations under the Administrative Procedure Act to provide for an annual special bait dealers permit and to allow the taking of live bait shrimp and live croaker by qualified permit holders during the closed shrimp season. The fee for such permit shall be one hundred ten dollars per year. All revenues received through the sale of such permits shall be used for the administration of the bait dealer program. R.S. 56:497(C)1

Methods of Taking

Saltwater shrimp includes all species of shrimp of commercial or economic value found in the coastal waters of the state and in the Gulf of Mexico contiguous to the Louisiana coast, including the white shrimp or "common saltwater shrimp"(*Litopenaeus setiferus*), also called the "lake shrimp"; the brown shrimp (*Farfantepenaeus aztecus*); the pink shrimp (*Farfantepenaeus duorarum*); the "sea bob" (*Xiphopeneus kroyeri*), also called "six barbes"; and any other shrimp or shrimplike species which may be taken from coastal waters or sold through commercial channels. R.S. 56:491(1)a

During open seasons, saltwater shrimp may be taken commercially with trawls, butterfly nets, skimmer nets or cast nets. R.S. 56:499(B)

Saltwater shrimp may be taken by means of trawls, butterfly nets, skimmer nets and cast nets and by no other means R.S. 56:499(A) except bait shrimp may be taken during closed season R.S. 56:497(B)2

Bait shrimp may be taken at any time, even during the closed season, with cast nets less than eight and one-half feet in radius, hand operated dip nets with a diameter not to exceed three feet, bait traps, and bait seines less than 30 feet with a maximum mesh size of 1/4 inch bar mesh which are manually operated on foot only R.S.56:497(B)

No trawl, skimmer net or butterfly net may be used in closed waters R.S. 56:499(B)1

No trawling shall be permitted in inside waters during closed season R.S. 56:495.1(A)1

Fishing with a butterfly net or skimmer prohibited in inside waters during closed season R.S. 56:495.1(A)

No shrimp may be taken in state waters during closed seasons with the use of a butterfly net, paupiere, skimmer net, trawl, night trawl, or beam trawl R.S. 56:497(B)2

No person shall take, have in possession, sell, or offer for sale any saltwater shrimp taken from state waters except in open seasons R.S. 56:497(A)1

Saltwater shrimp legally taken and processed within the state may be bought and sold at any time. Saltwater shrimp in their fresh state legally taken during the open seasons in state waters may be possessed for five days following the last day of each open season R.S. 56:497(B)1

No person shall sell or barter any fish taken recreationally or under authority of any type of recreational fishing license or with any recreational gear R.S. 56:302.10(A)

Gear Restrictions

Trawls

"Trawl" means any net, generally funnel-shaped, pulled through the water or along the bottom with otter boards to spread the mouth open while being fished. The term trawl also means and includes plumb staff beam trawls that do not exceed sixteen feet, that do not use otter boards but are held open laterally by a horizontal beam and vertically by two

vertical beams (plumb staffs), and that are used while the vessel is under way. R.S. 56:8(138)

Minimum mesh size is 5/8 inch bar mesh or 1¼ inch stretched mesh R.S. 56:499(B)1

Minimum mesh size is 3/4 inch bar mesh or 1½ inch stretched mesh during the fall inshore shrimp season in inside waters extending from the Atchafalaya River westward to the western shore of Vermilion Bay and Southwest Pass at Marsh Island R.S. 56:499(B)2

Mesh size is the full measure of the mesh as found in use or in possession on the fishing grounds, measuring the full "bar" stretched from the near side of one knot to the far side of the other R.S. 56:491(8)

The length of trawls is the full measure of the extended net as in use or in possession on the fishing grounds, when measured along the cork line between the points where the webbing is attached to the rope at either end, and does not include the additional rope used for pulling the net or attaching it to the arm-poles or trawl boards R.S. 56:491(7)

State Inside Waters

A single trawl not to exceed 50 ft measured along the cork line and 66 ft along the lead line in addition to a test trawl not to exceed 16 ft measured along the cork line and 20 ft along the lead line. Maximum door size is 43 inches tall and 8 ft in length. R.S. 56:495.1(A)1(a) and 1(b)

Two trawls, each not to exceed 25 ft measured along the cork line and 33 ft along the lead line in addition to a test trawl not to exceed 16 ft measured along the cork line and 20 ft along the lead line. R.S. 56:495.1(A)1(c) and R.S. 56:495.1(A)3

Breton and Chandeleur Sounds

A single trawl not to exceed 65 ft measured along the cork line and 82 ft along the lead line in addition to a test trawl not to exceed 16 ft measured along the cork line and 20 ft along the lead line. Maximum door size is 43 inches tall and 8 ft in length. R.S. 56:495.1(A)1 and (A)2

Two trawls, each not to exceed 65 ft measured along the cork line and 82 ft along the lead line in addition to a test trawl not to exceed 16 ft measured along the cork line and 20 ft along the lead line. Maximum door size is 43 inches tall and 8 ft in length for outer doors with no more than two inner sled doors. R.S. 56:495.1(A)1 and (A)2

State Outside Waters

A maximum of 4 trawls not to exceed a total maximum of 130 ft of cork line and 165 ft of lead line in addition to a test trawl not to exceed 16 ft measured along the cork line and 20 ft along the lead line. No door size restrictions. R.S. 56:495.1(C) and (F)

Butterfly Nets

"Butterfly net" means a fixed, frame-mounted net, used to fish the near-surface waters, which is suspended from the side or sides of a boat, pilings, floats, rafts, or shore installation. R.S. 56:8(17)

Minimum mesh size is 5/8 inch bar mesh or 1¼ inch stretched mesh R.S. 56:499(B)1

Minimum mesh size is 3/4 inch bar mesh or 1½ inch stretched mesh during the fall inshore shrimp season in inside waters extending from the Atchafalaya River westward to the western shore of Vermilion Bay and Southwest Pass at Marsh Island R.S. 56:499(B)2

Single butterfly nets are limited to a maximum frame size of 22 ft measured vertically or horizontally R.S. 56:499(B)1

Stationary double butterfly nets (those not mounted on vessels) are each limited to a maximum frame size of 12 ft measured vertically or horizontally R.S. 56:499(B)1

Double butterfly nets mounted onboard a vessel are each limited to a maximum frame size of 16 ft measured horizontally and 12 feet measured vertically R.S. 56:499(B)1

Frames must be mounted no more than 24 inches from the side of the vessel R.S. 56:499(B)1

Use of a trawl in conjunction with butterfly nets is prohibited R.S. 56:499(B)1

Attachment of leads, sweeper devices, extensions or wings is prohibited R.S. 56:499(C)

Stationary shrimp net is any net for taking shrimp including butterfly or skimmer net that is attached to the water bottom, bank, or fixed structure R.S. 56:499(D)2

Skimmer Nets

"Skimmer nets" means a net attached on two sides to a triangular frame and suspended from or attached to the sides of a boat, with one corner attached to the side of the boat and one corner resting on the waterbottom. A skid and one end of the lead line are attached to the corner of the frame that rests on the waterbottom and the other end of the lead line attached to a weight which is suspended from the bow of the boat. R.S. 56:8(122)

Minimum mesh size is 5/8 inch bar mesh or 1¼ inch stretched mesh R.S. 56:499(B)1

Minimum mesh size is 3/4 inch bar mesh or 1½ inch stretched mesh during the fall inshore shrimp season in inside waters extending from the Atchafalaya River westward to the western shore of Vermilion Bay and Southwest Pass at Marsh Island R.S. 56:499(B)2

Double skimmer nets limited to a maximum opening measuring no more than 72 ft in circumference and with a lead line length measuring no more than 33 ft for each net R.S. 56:499(B)3

Double skimmer nets limited to horizontal net frames that extend no more than 20 ft from the gunwale of the vessel R.S. 56:499(B)3

Tying individual skimmer nets together to exceed the maximum dimensions is prohibited R.S. 56:499(B)3

Use of a trawl in conjunction with skimmer nets prohibited R.S. 56:499(B)3

Attachment of leads, sweeper devices, extensions or wings is prohibited R.S. 56:499(C)

Stationary shrimp net is any net for taking shrimp including butterfly or skimmer net that is attached to the water bottom, bank, or fixed structure R.S. 56:499(D)2

Cast Nets

"Cast net" means a light circular net of vegetable or synthetic materials and weighted around its perimeter that is thrown by hand over the water. R.S. 56:8(9) No mesh size restrictions.

"Dip net" means a net, usually a deep mesh bag of vegetable or synthetic materials, on a fixed frame attached to a handle and held and worked exclusively by hand and by no more than one individual. R.S. 56:8(42) No mesh size restrictions.

Gear Marking Requirements

Butterfly nets located in the Cameron Parish sections of East and West Passes of the Calcasieu River, Grand Bayou and Oyster Bayou shall be tagged listing the fisherman's name, address and butterfly net license number. R.S. 56:499.1(B)2

Tags shall be readable, easily visible and with letters at least 3 inches high and appropriate width.

Tags shall be attached to the net or frame as to remain above the water at all times.

No nets or beam trawls used for taking fish or shrimp from the saltwater areas of the state shall be left unattended as defined in R.S. 56:8, except such legal nets or trawls which are attached to a wharf at a camp and which are tagged with a department tag issued in conjunction with the gear being used.

Size and Possession Limits

No size or possession limit on any saltwater shrimp during the spring inshore shrimp season. R.S. 56:498(A)

No size or possession limit on sea bobs (Xiphopenaeus kroyeri) or brown shrimp (Farfantepenaeus aztecus). R.S. 56:498(C)

Minimum size limit of 100 count per pound on saltwater white shrimp (Litopenaeus setiferus) possessed onboard a vessel except during that period beginning on October 15 of each year and extending through the third Monday in December. R.S. 56:498(B)1

Possession count determined by counting the number of shrimp contained in two random separate three-pound samples taken from each cargo lot of shrimp. The first sample shall be taken and counted by a LDWF agent and the second sample shall be taken and counted by the fisherman. The average number of specimens from the combination of these two samples shall be used to determine the count per pound. A "cargo lot" means a container, basket, box, chest, bin, hole, or storage compartment in which shrimp are kept for transport. R.S. 56:498(B)1

When more than 50% by weight of saltwater shrimp taken or possessed is seabobs or brown shrimp, then the maximum

allowable amount of white shrimp taken or possessed shall not exceed 10% by weight of total shrimp taken or possessed. R.S. 56:498(B)2

No size limit on recreational bait shrimp but may only be taken with cast nets, dip nets < 3' in diameter, bait traps and in compliance with other regulations. R.S. 56:323 and R.S. 56:500(B)

Area Restrictions

Trawling, skimming and butterflying is prohibited in Lake Maurepas and that portion of Lake Pontchartrain from the shoreline to 1 ¼ miles out from the Jefferson/Orleans Parish line east to South Point, from South Point to North Shore along the railroad bridge west from North Shore to Goose Point. R.S. 56:801(15) and R.S. 56:803(A)

The taking of fish, shrimp, and other seafood from the waters of the Lake Catherine and Lake Pontchartrain Sanctuary by use of trawls, skimmer nets, butterfly nets, seines, or traps or other netting, with the exception of cast nets, drop nets, or scoop nets, is hereby prohibited. R.S. 56:804(B)

- Trawling, skimming and butterflying is prohibited between the railroad bridge and Interstate 10 in Lake Pontchartrain. R.S. 56:803(C)
- The use of legal trawls, skimmer nets, and butterfly nets is authorized in open seasons in the area of the sanctuary located south and east of the Interstate 10 bridge. R.S. 56:804(C)

Trawls and butterfly nets are prohibited in the waters of Bayou Judge Perez (Bayou Hermitage) from its entrance into Lake Judge Perez (Lake Hermitage) to Devils Bayou, a distance of approximately one mile, located in Plaquemines Parish. LAC 76:VII.303

The use of seines, nets, webbing or traps of any and all types, including slat traps, for the taking of fish in the Tchefuncte River or its tributaries from its origin in Washington Parish to where it empties into Lake Pontchartrain in the parish of St. Tammany, Louisiana is prohibited. R.S. 56:405(A)

Trawling, skimming or butterflying north of the LA Highway 631 bridge at Des Allemands and in Lake Des Allemands, its streams and tributaries, is prohibited. R.S. 56:405(B)

Trawling is prohibited in the cove immediately adjacent to Cypremort Point State Park landward of a line from Blue Point to Cypremort Point to the shoreline. LAC 76:VII.306(A)

The areas within a 1/4-mile radius on the lake side only of the Lambert, Grand Bayou, Mangrove, and Peconi water control structures (otherwise identified as Structures No. 5, 1, 8 and 4 respectively), and the area within a 1/8-mile radius on the lake side only of the water control structure on No Name Bayou, all within the Calcasieu Lake system; the area within a 1/4-mile radius on the lake side only of the mouths of West Cove Bayou, West Cove Canal and the Sabine Refuge Headquarters Canal where they empty into Calcasieu Lake; and the area within a 1/4-mile radius on the lake side only of the mouths of Three Bayous and Willow Bayou where they empty into Sabine Lake, are fish sanctuaries and closed zones, and that all netting of fish by any means or method, including but not limited to trawls, butterfly nets, gill nets, seines, or trammel nets, is hereby prohibited, with the exception of hand cast nets, crab traps and crab drop nets. LAC 76: VII.333

Commercial fishing including commercial shrimping is prohibited in the following areas:

- Elmer's Island Wildlife Refuge LAC 76:III.337
- Salvador / Timken Wildlife Management Area LAC 76:XIX.111(A)
- Pointe aux Chenes Wildlife Management Area except in Cut Off Canal and Wonder Lake LAC 76:XIX.111(A)
- Marsh Island Wildlife Refuge LAC 76:III.310(4)
- State Wildlife and Paul J. Rainey Refuge LAC 76:III.323(A)4
- White Lake Wetlands Conservation Area LAC 76:III.335
- Rockefeller Wildlife Refuge LAC 76:III.309(5)
- Isle Dernieres Barrier Island Refuge LAC 76:III.331

Operational Restrictions

No person shall waste any fish of this state. As used in this Section, "waste" means the harvesting of any fish for commercial purposes which results in the excessive killing of such fish. R.S. 56:409.1(A)

Excessive killing shall be defined as "the killing resulting from taking or attempting to take any fish in excess of what the possessor thereof can process, utilize, or transport from the fishing grounds. Shrimp and shrimping operations are excluded." LAC 76:VII.313

No person shall interfere with or disturb any fishermen engaged in the lawful taking of wild animals on lands and waters managed by the state, or upon private lands or waters where a fishermen has been give permission by the owner to take wild animals. R.S. 56:648.1

Night shrimping, between the hours of one-half hour after sunset to one-half hour before sunrise, is prohibited in Vermilion Bay, East and West Cote Blanche Bays and Atchafalaya Bay to the western shore of the Atchafalaya River and the Atchafalaya River Ship Channel out to Eugene Island as described by the inside-outside line except in the following area:

- In the waters of Southwest Pass at Marsh Island south of a line drawn from the following points: the most southeastward point of Southwest Pass at 29 degrees 36 minutes 47 seconds north latitude, 92 degrees 00 minutes 32 seconds west longitude east southeast to the Green Light Channel Marker Number 21 at 29 degrees 36 minutes 44 seconds north latitude, 92 degrees 00 minutes 21 seconds west longitude; thence northeast to a point located at 29 degrees 37 minutes 34 seconds north latitude, 91 degrees 59 minutes 36 seconds west longitude; thence southeast to the western shore of Big Charles Bayou at 29 degrees 36 minutes 43 seconds north latitude, 91 degrees 59 minutes 17 seconds west longitude R.S. 56:499.4

Operation of butterfly nets and skimmer nets shall not restrict or impede normal navigation. R.S. 56:499(B)1

No person may operate a stationary shrimp net within 1,000 feet upstream from another stationary shrimp net that is attached to or moored to a wharf or platform permitted by the U.S. Army Corps of Engineers. However, if two permitted wharves or platforms are located within 1,000 feet of each other, the owner of the upstream wharf or platform may attach a stationary shrimp net if any one of the following applies: R.S. 56:499(D)1

- This permit from the U.S. Army Corps of Engineers was issued prior to August 15, 2004.
- This permit from the U.S. Army Corps of Engineers was issued prior to the permit for the downstream wharf or platform.
- The owner of the downstream wharf or platform does not operate a stationary shrimp net.

Use of trawls at night in the Cameron Parish sections of Calcasieu Lake, the Black Bayou System, Grand Bayou and Little Burton's Ditch is prohibited. R.S. 56:499.1(A)1

Use of skimmer nets in Calcasieu Lake from one-half hour after sunset to one-half hour before sunrise except in all areas of Cameron Parish west of the western shore of Calcasieu Lake. R.S. 56:499.1(A)2

Butterfly nets may be used in the Cameron Parish areas of Calcasieu Lake, Calcasieu River, Grand Bayou and Calcasieu Ship Channel both during days and nights during open season. R.S. 56:499.1(B)1

Butterfly nets located in the Cameron Parish sections of East and West Passes of the Calcasieu River, Oyster Bayou and Grand Bayou and are not being fished, the following shall apply: R.S. 56:499.1(B)3

- Butterfly nets attached to any unmanned boat or vessel, floating platform, pontoon, or barge, shall be moved from the waterway and relocated adjacent to the shoreline so as not to present an obstruction or hazard to navigation.
- Any anchor or weight used to secure any unmanned boat or vessel, floating platform, pontoon, or barge, shall be removed from the waterbottom.
- Any rope, line, chain, or other device used to connect any unmanned boat or vessel, floating platform, pontoon, or barge to the shoreline, is prohibited unless it does not present an obstruction or hazard to navigation.

No butterfly net or bottom net may be suspended from a piling, float, barge, raft, bridge or shore installation in the Rigolets or Chef Menteur Pass or in those portions of Lake Pontchartrain or Lake Borgne which are within two miles of the Rigolets or the Chef Menteur Pass. However, butterfly nets and bottom nets may be used in these areas if suspended

from a fishing boat or vessel which is motor-propelled and underway. R.S. 56:499.2(A)

In Chef Menteur Pass a properly licensed single butterfly net measuring not more than 22 feet by 22 feet may be suspended from a wharf which has been approved by the U.S. Corps of Engineers and which is attached to privately owned or leased immovable property, or to a structure that is not attached to privately owned or leased property if the owner has possessed a permit for such structure from the U.S. Corps of Engineers prior to 1988, provided that the owner or leaseholder is present on the immovable property or permitted structure at all times that the net is in the water. R.S. 56:499.2(B)

Butterfly nets and bottom nets may be used in Oyster Bayou (adjacent to Point au Fer Island) as well as in those waters adjacent to Oyster Bayou extending 1,000 feet into Four League Bay and extending 1,000 ft seaward into the Gulf of Mexico only when suspended from a fishing boat or vessel which is motor-propelled and underway. R.S. 56:499.3(A). Any anchor or weight used to secure any unmanned boat or vessel, floating platform, pontoon, or barge is prohibited within these waters. R.S. 56:499.3(B). Any rope, line, chain, or other device used to connect any unmanned boat or vessel, floating platform, pontoon, or barge to the shoreline is prohibited within these waters. R.S. 56:499.3(C)

Trawling, skimming and butterflying at night is prohibited in Grand Lake in Vermilion and Cameron parishes and White Lake in Vermilion parish. R.S. 56:410(A)

All commercial fishing with butterfly nets and trawls longer than 16 feet is prohibited in Lake Charles, Moss Lake and Prien Lake. LAC 76:VII.301(B)

Taking shrimp with saltwater trawls from May 1-September 15 each year is prohibited in state waters on the south side of Grand Isle from Caminada Pass to Barataria Pass in Jefferson Parish, from the southeast side of the Caminada bridge to the northwest side of Barataria Pass at Fort Livingston, extending from the beach side of Grand Isle to a distance of 500 feet beyond the shoreline into the Gulf of Mexico. LAC 76:VII.305

Paratrawling is prohibited in any canal comprising state waters. R.S. 56:410.1

The commission may prohibit crab traps in state-owned lake and river beds and other water bottoms of the state as follows: During a period not to exceed sixteen-consecutive-days between February first and March thirty-first, the commission may prohibit crab traps in one or more geographical areas of the state. During a period not to exceed fourteen-consecutive-days which includes the opening day of the spring inshore shrimp season the commission may prohibit crab traps in one or more geographical areas of the state. R.S. 56:332(N)1

Fishing Gear Interactions

No person shall trawl, seine or use a skimmer net over any privately leased bedding grounds or oyster propagating place in the year immediately following the seeding of such area which is staked off, marked or posted as required by law or regulation. R.S. 56:430(B)2. Lessees shall clearly mark and delineate these leases with prominent, durable signs stating "NO TRAWLING OR SEINING-OYSTER LEASE".

A shrimper who catches an unserviceable crab trap shall keep it on board his vessel and properly dispose of it at a designated disposal site if one is available. A shrimper who catches an otherwise serviceable trap without a float shall return it to the water with a common float. Any fisherman with a crab fishing license may raise and check any trap with a common float to determine ownership. The owner of the trap shall return the common float to any shrimper for reuse. R.S. 56:332(G)

A common float is defined as an all-white plastic, one gallon or larger bleach bottle. LAC 76:VII.345(B)

Federal Area Restrictions

Commercial fishing including commercial shrimping is prohibited in the following coastal National Wildlife Refuges:

- Big Branch Marsh National Wildlife Refuge
- Bayou Sauvage National Wildlife Refuge
- Breton National Wildlife Refuge
- Delta National Wildlife Refuge
- Mandalay National Wildlife Refuge

- Shell Keys National Wildlife Refuge
- Lacassine National Wildlife Refuge
- Cameron Prairie National Wildlife Refuge
- Sabine National Wildlife Refuge

National Parks: Jean Lafitte National Historical Park and Preserve. Commercial fishing allowed by permit only.

Reporting

Wholesale/retail seafood dealers purchasing or acquiring fish from commercial fisherman shall complete a commercial receipt form. The commercial receipt form shall be a three-part form signed by both the commercial fisherman and the wholesale/retail seafood dealer or his designee, attesting to that the information required to be provided by each is correct. One part of the receipt form shall be retained by the wholesale/retail seafood dealer, one part shall be given to the commercial fisherman at the time of the transaction, and one part shall be transmitted to the LDWF. R.S. 56:306.5(B)1

Wholesale/retail seafood dealers are responsible for recording on the commercial receipt form that information provided by the commercial fisherman and is responsible for the following information at the time of purchase or transfer of possession of the catch from a commercial fisherman to a wholesale/retail seafood dealer: wholesale/retail seafood dealer's name and license number, commercial fisherman's name, license number and signature, transaction date, species identification, quantity and units of each species, size and condition of each species, unit price of each species, and permit number for species requiring a permit to harvest. R.S. 56:306.5(B)2

Records required must be maintained for three years and shall be open to inspection by the department. R.S. 56:306.5(C)

Wholesale/retail seafood dealers shall, on or before the tenth of each month, make a return to the department of all commercial receipt forms representing actual transactions from every commercial fisherman during the preceding month. All commercial receipt forms submitted by a dealer shall be accompanied by a monthly submission sheet signed by the wholesale/retail seafood dealer certifying that the transactions submitted represent all of the transactions by that dealer from commercial fishermen for that particular month. R.S. 56:306.6(A)

A commercial fisherman selling fish under a fresh product license shall record all information required on trip tickets, except that the fresh product license number shall be recorded in place of the wholesaler/retailer seafood dealer's license number. The fresh product licensee shall complete monthly returns to the department as specified for wholesale/retail seafood dealers. The commercial fisherman shall sign each commercial receipt form attesting that the information provided therein is correct. R.S. 56:303.7(C)

Record Keeping

Wholesale/retail seafood dealers, retail seafood dealers, restaurants, and retail grocers shall keep, in the English language the following: R.S. 56:306.5(A)

Records of the quantity and species of fish acquired, the date the fish was acquired, and the name and license number of the wholesale/retail seafood dealer or the out-of-state seller from whom the fish was acquired. When creel limits apply to commercial species, records shall also indicate the number by head count of such species of fish. R.S. 56:306.5(A)1

Records of the quantity and species of fish sold, the date the fish was sold, and the name and license number of the person to whom the fish was sold. When sold to the consumer, the records shall indicate the quantity, species, and date and shall state that the fish was sold to the consumer. R.S. 56:306.5(A)2

Shipping Records

Shipments containing fish shall be plainly marked, the tags or certificates to show the date and names of the consignor and the consignee, with an itemized statement of the number of pounds of fish and the names of each kind contained therein. R.S. 56:307.7(A)

Bills of lading issued by a common carrier for such shipments shall state the number of packages which contain fish, and the date and names of the consignor and consignee, with an itemized statement of the number of pounds of fish and the names of each kind contained therein. R.S. 56:307.7(A)

Excise Tax

There is levied an excise tax on all saltwater shrimp taken from the waters of this state and on all shrimp imported into this state of fifteen cents per barrel of two hundred ten pounds or two hundred ten pounds equivalence. Saltwater shrimp taken from the waters of the state and whose heads are removed prior to delivery at a Louisiana landing will be computed at one hundred twenty-five pounds per barrel.

Shrimp imported into this state whose heads are removed will be computed at one hundred twenty-five pounds per barrel. Shrimp imported into this state that are peeled will be computed at seventy-five pounds per barrel R.S. 56:506

Dealers are required to file monthly tax reports on forms provided by the department regardless if a dealer reports no purchases of imported shrimp or purchases of shrimp harvested in Louisiana. Wholesale/retail seafood dealers, restaurants and retail grocers when selling or otherwise transferring shrimp shall specify on each invoice of sale or transfer required. All purchase records of retail dealers, restaurants and retail grocers which are required to be maintained by law, shall specify the country of origin of shrimp acquired or purchased. Shrimp from different countries shall be recorded separately on all records. All records for shrimp, which are harvested from Louisiana waters or which are landed in Louisiana from a harvesting vessel, shall indicate such shrimp are a "Product of Louisiana" or "Louisiana Shrimp" or "Louisiana (and shrimp species)." No wholesale/retail seafood dealer, retail seafood dealers, restaurants or retail grocers shall knowingly possess, package, process, sell, barter, exchange or attempt to sell, barter, trade or exchange shrimp which is represented to be a product of the United States or a product of Louisiana unless such shrimp is actually a product of the United States or a product of Louisiana. No wholesale/retail seafood dealer, retail seafood dealers or restaurants shall possess, package, process, sell, barter, exchange or attempt to sell, barter, trade or exchange shrimp from a foreign country which is commingled with shrimp caught in the United States or which is represented to be a product of the United States. LAC 76:VII.365

Confidentiality

All fishery dependent data (that is, only data collected from individuals or firms) collected or otherwise obtained by personnel or instrumentalities of the LDWF or members of the LWFC in the course of their duties are confidential and are not to be divulged, except in aggregate form, to any person except employees or instrumentalities of the LDWF or members of the LWFC or the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA/NMFS), or Legislative Committees and their staffs, whose duties require this information, except as authorized by law or court order. Aggregate form, with respect to data, shall mean data or information submitted by three or more persons that have been summed or assembled in such a manner so as not to reveal, directly or indirectly, the identity or business of any such person. LAC 76:I.321

Packaging

The secretary of the Department of Wildlife and Fisheries is authorized to adopt rules and regulations in accordance with the Administrative Procedure Act establishing standards for the packaging of seafood in Louisiana for wholesale or retail sale. Those standards may govern the quality, contents, and weight of all seafood packaged in this state. The Louisiana Seafood Promotion and Marketing Board may make recommendations to the secretary for standards for the packaging of seafood. For purposes of this Section, retail sale shall not include food service establishments which only serve food prepared for on premises or off premises consumption. R.S. 56:578.10

No person shall knowingly possess, package, distribute, label, broker, sell, purchase, or cause to be packaged, distributed, labeled, brokered, or sold any shrimp packaged in Louisiana packaging which were not taken, harvested, or landed in Louisiana. No person shall knowingly possess, package, distribute, label, broker, sell, purchase, or cause to be packaged, distributed, labeled, brokered, or sold any shrimp packaged in Gulf of Mexico packaging which were not taken, harvested or landed in the Gulf of Mexico or adjoining states of Texas, Louisiana, Mississippi, Alabama, or Florida. No person shall knowingly possess, package, distribute, label, broker, sell, purchase, or cause to be packaged, distributed, labeled, brokered, or sold any shrimp packaged in United States packaging which were not taken, harvested, or landed in the United States. Shrimp landed in the United States shall not mean shrimp imported into the United States from any country other than the United States. LAC 76:VII.373

Penalties

A person who kills, catches, takes, possesses, or injures any fish, wild birds, wild quadrupeds, and other wildlife and

aquatic life in violation of this Title, or a regulation adopted pursuant to this Title, or a federal statute or regulation governing fish and wildlife, or who, through the violation of any other state or federal law or regulation, kills or injures any fish, wild birds, wild quadrupeds, and other wildlife and aquatic life, is liable to the state for the value of each fish, wild bird, wild quadruped, and other wildlife and aquatic life, unlawfully killed, caught, taken, possessed, or injured. R.S. 56:40.1

Civil restitution for shrimp is assessed at $2.57 per pound. LAC 76:315(B)7

When converting heads-off weight to heads-on weight, the following multipliers are used LAC 76:316(B)

- Shrimp, Brown 1.61
- Shrimp, Pink 1.60
- Shrimp, River 1.67
- Shrimp, Rock 1.67
- Shrimp, Royal Red 1.80
- Shrimp, Seabob 1.53
- Trachypenaeus 1.61
- Shrimp, White 1.54

Any person required to be on board a vessel with an approved vessel monitoring system shall comply with all rules and regulations adopted by the department to ensure compliance with vessel monitoring system requirements. The cost of a vessel monitoring system shall be the responsibility of the person required to be on such vessel. The department shall determine approved vessel monitoring systems. R.S. 56:495.1(G)

To maximize voluntary compliance with shrimping regulations and to reduce purposeful shrimping violations by providing adequate deterrence and reduce recidivism, any person having two or more convictions during the preceding five year period for harvesting shrimp during closed season shall not be present on board any vessel harvesting or possessing shrimp, or which has any trawl, skimmer, or butterfly net on board, unless that vessel is equipped with and is using and employing an approved, fully functional and operating vessel monitoring system. LAC 76:VII.369(A)

In addition to any and all other penalties, for convictions of shrimping during the closed season, the court may revoke or suspend the violator's trawl, skimmer, and butterfly gear licenses for one year from the date of the conviction. During such revocation or suspension, the violator may be present on a vessel harvesting or possessing shrimp or possessing a trawl, skimmer, or butterfly net, only if the vessel is equipped with and employs an operating vessel monitoring system which is accessible to the Department of Wildlife and Fisheries. The court shall sentence the violator to perform forty hours of community service. If a litter abatement community service is available, the hours shall be served in a community service litter abatement program. For the second conviction of shrimping during the closed season, the court shall revoke or suspend the violator's trawl, skimmer, or butterfly gear licenses for three years from the date of the second conviction. During such revocation or suspension, the violator may be present on a vessel harvesting or possessing shrimp or possessing a trawl, skimmer, or butterfly net, only if the vessel is equipped with and employs an operating vessel monitoring system which is accessible to the Department of Wildlife and Fisheries. In lieu of the mandatory jail requirement found in R.S. 56:34, the court may sentence the offender to perform the corresponding amount of jail days in community service. If a litter abatement community service is available, the hours shall be served in a community service litter abatement program. For the third and subsequent convictions of shrimping during the closed season, the court shall revoke or suspend the violator's trawl, skimmer, or butterfly gear licenses for ten years from the date of the last conviction. During such revocation or suspension, the violator may be present on a vessel harvesting or possessing shrimp or possessing a trawl, skimmer, or butterfly net, only if the vessel is equipped with and employs an operating vessel monitoring system which is accessible to the Department of Wildlife and Fisheries. In lieu of the mandatory jail requirement found in R.S. 56:34, except for thirty days of the requirement, the court may sentence the offender to perform the corresponding amount of jail days in community service. If a litter abatement community service is available, the hours shall be served in a community service litter abatement program. LAC 76:VII.369(B)

Louisiana Seafood Promotion and Marketing Board (LSPMB)

Established to enhance the public image of commercial fishery products, thereby promoting the consumption of these

products and, further, to assist the seafood industry, including commercial fishermen and wholesale and retail dealers, in market development so as to better utilize existing markets and to aid in the establishment of new marketing channels. R.S. 56:578.1

One shall be appointed from a list of three names submitted by members from Louisiana of the American Shrimp Processors Association. One member shall be appointed from a list of three names submitted by the Louisiana Shrimp Association. R.S. 56:578.2

Louisiana Shrimp Task Force

Advises the LDWF and the LWFC and other state agencies for the maximization of benefit from that industry for the state of Louisiana and its citizens. R.S. 56:494(A)

Coordinate efforts to increase shrimp production and marketability.

Provide for the study of the decline in shrimp marketability and market price, provide for the study of the impacts of imported shrimp on the domestic market, assist in the development of a state shrimp inspection program, assist in the development of a Louisiana shrimp certification and branding program, and make recommendations to the Wildlife and Fisheries Commission and the Department of Wildlife and Fisheries, the Department of Natural Resources, the Department of Agriculture and Forestry, and the Department of Health and Hospitals for implementation of policies to help enhance the domestic shrimp industry.

Make recommendations with respect to issues pertaining to the shrimp industry and shrimp production to the various state agencies charged with responsibility for differing elements of the shrimp industry in this state, including the Department of Wildlife and Fisheries, the Department of Natural Resources, and the Office of Coastal Protection and Restoration, the Department of Health and Hospitals, the Department of Agriculture and Forestry, and the legislature.

Louisiana Wild Seafood Certification Program (LWSCP)

A voluntary certification program for Louisiana wild fish, as defined in R.S. 56:8, and for Louisiana wild seafood products, including wild-caught shrimp, which are taken, harvested, or landed in Louisiana. LAC 76:I.701

Must possess one of the following resident or non-resident Louisiana licenses: commercial fisherman's license; senior commercial license; fresh products dealer license; seafood wholesale/retail dealer; seafood retail dealer. LAC 76:I.701(B)1(a)

Wholesale/retail dealers must have their facility located within Louisiana. Retailers are not required to have their facility located within Louisiana. LAC 76:I.701(B)1(b)

Eligible participants not requiring a LDWF license include in-state restaurants or grocers who only sell seafood that is fully prepared by cooking for immediate consumption by the consumer, and all out-of state retailers. LAC 76:I.701(B)1(c)

Must possess and be in compliance with all other state and federal permits, licenses, and laws regarding the buying, acquiring, or handling, from any person, by any means whatsoever, any species of fish or seafood products. LAC 76:I.701(B)1(d)

Product considered eligible to possess the LWSCP logo must meet the following criteria. LAC 76:I.701(B)2

- Eligible wild seafood includes crab, oysters, freshwater finfish, saltwater finfish, crawfish, and shrimp. Seafood must be wild-caught, taken from Louisiana waters or from the Gulf of Mexico and any other adjacent state waters, and landed in Louisiana. Farmed and/or aquaculture products are excluded from program participation.
- Seafood must be taken by a Louisiana licensed commercial fisherman. Seafood must be landed in Louisiana and either be sold under an LWSCP participating fish products dealer license, or be purchased and/or physically acquired by a wholesale/retail seafood dealer participating in the LWSCP. Transfer of product throughout the supply chain must be between LWSCP participants until the product has been placed in a sealed and LWSCP label retail packing.

Seafood commingled with any other seafood that does not meet the above requirements, domestic or foreign, shall be prohibited from possessing the LWSCP label.

Recreational Shrimping Regulations

License Fees

	Resident	*Non-Resident*
Basic Fishing License[1]	$9.50	$60
Basic Fishing License (Daily)[1]	N/A	$5
Non-Resident Student Basic Fishing License[1]	N/A	$9.50
Senior Hunting and Fishing License[1 + 2]	$5	N/A
Senior Hunting and Fishing License (Lifetime)[2 + 3]	$50	N/A
Sportsman's Paradise License[1 + 4]	$100	N/A
Lifetime Fishing License (5-13 years old)	$200	N/A
Lifetime Fishing License (14 years or older)	$300	N/A
Lifetime Hunting & Fishing License (0-4 years old)	$200	N/A
Lifetime Hunting & Fishing License (5-13 years old)	$300	N/A
Lifetime Hunting & Fishing License (14 years or older)	$500	$3,000
Lifetime Fishing Gear License	N/A	10 X Annual fee per gear type
Wild Louisiana Stamp[5]	$9.50	$9.50
Wild Louisiana Stamp[5] (1-day)	$2	$2

[1]May be purchased June 1 for the immediately following license year. Required in order to purchase any recreational gear license.

[2]Does not include recreational gear licenses

[3]Available for residents 60 years of age or older.

[4]Includes use of all recreational gear except recreational trawls greater than 16 ft in length

[5]Required in lieu of a basic recreational fishing license if taking shrimp with dip nets or seines on LDWF Wildlife Management Areas (WMAs) or Wildlife Refuges.

Trawl (16 ft. or less in length)	$25	$100
Trawl (16 – 25 ft. in length)	$80	$320

Residents and nonresidents under 16 years of age are not required to obtain a basic or saltwater recreational fishing license. R.S. 56:302.2(A)

Recreational fishing and recreational gear licenses may be purchased at any time of year and are valid from the date of purchase through the following June 30th. R.S. 56:302.4(A)

Recreational fishermen must possess a basic fishing license in order to purchase a recreational gear license. R.S. 56:302.3(A)

Basic Fishing License Exceptions

Residents who are totally and permanently disabled and receiving social security benefit payments or disability retirement income from a retirement system whose members are exempt from federal social security may purchase a basic recreational fishing license for $2.50 and a saltwater fishing license for $2.50. R.S. 56:302.1(C)2(d)i

The following shall be issued a basic and saltwater recreational fishing license without payment of fees R.S. 56:302.2(B):

- Residents who are a veteran of the armed forces, the Louisiana Army or Air National Guard, having a permanent service connected disability classification of 50% or more. R.S. 56:302.2 (B)1
- Residents who are blind, paraplegic, or who is a single or multiple amputee, or is required to use one or more artificial limbs or permanent braces for mobility as a result of a permanent and total disability. R.S. 56:302.2(B)2

- The Secretary may exempt for good cause persons or groups of people from the basic and saltwater fishing license. R.S. 56:302.2(C)

The Department may allow recognized nonprofit rehabilitation programs, licensed hospitals, residences, community homes, schools or other facilities to purchases recreational fishing permits rather than individual fishing licenses for clients. R.S. 56:302.1(E))and (F)

Non-residents who are full time students enrolled in an accredited college or university that has a physical campus in Louisiana may purchase a non-resident basic fishing license at the cost of a resident fishing license, provided the domiciliary state of that non-resident offers the same option to Louisiana resident students to purchase a license at a resident fee. R.S. 56:302.1(G) and (H)

Revenues generated from the sale of recreational fishing licenses shall be dedicated exclusively to the operation of the Enforcement Division. R.S. 56:302.1(B)2

Recreational gear licenses may be transferred for temporary use to any person holding a basic fishing license and having the same residency status. R.S. 56:302.3(E)

Persons currently on active military duty with any one of the armed forces of the United States, including the National Guard, or the spouse or dependent of such person, may be issued a license for hunting or recreational fishing in Louisiana after payment of the same fee as that required of Louisiana residents for that same license. R.S. 56:643(B)1

Louisiana residents who are an active member of the Louisiana National Guard or any reserve component of the United States armed forces, though not currently on active duty may be issued a resident Louisiana National Guard license for a fee of $50. This license shall be in lieu of basic and saltwater fishing, basic hunting, big game, bow, primitive firearms, and waterfowl licenses, turkey hunting stamps, and WMA hunting permits. R.S. 56:643(B)2

Licensing/Residency Eligibility

Same as those listed under Commercial.

Methods of Taking

Shrimp may be taken with trawls not to exceed 25 ft in length R.S. 56:302.3(B). Basic fishing license required in addition to gear license.

Cast nets not to exceed eight feet six inches in radius R.S. 56:500(B). Basic fishing license required.

Bait seines with a maximum mesh size not to exceed one-quarter inch mesh bar, one-half inch mesh stretched, and thirty feet in length operated only on foot and solely by hand, without any mechanical device, pulley, or mechanical assistance whatsoever R.S. 56:323(B). No basic fishing license required.

Dip nets not to exceed 3 ft in diameter operated solely by hand, by no more than one person and without any mechanical assistance whatsoever R.S. 56:323(C). No basic fishing license required.

Minnow traps for bait purposes only R.S. 56:323(B)

See “Commercial Regulations” for definitions of a trawl, cast net and dip net.

“Seine” means any net used to ensnare or entrap fish wither in a bag or where its ends are pulled together on a vessel or a shore and constructed with a mesh of such size and design as not to be used primarily to ensnare or entangle commercial size fish by the gill or other boney projections R.S. 56:8(118)

Size and Possession Limits

Size limits are same as those listed under Commercial.

100 lbs/day per boat with use of recreationally licensed trawls not to exceed 16 ft R.S. 56:500(A)1

250 lbs/day per boat with use of recreationally licensed trawls not to exceed 25 ft R.S. 56:500(A)2

Cast nets, bait seines, dip nets and minnow traps R.S. 56:500(B)

- 50 lbs/day per boat or land vehicle during closed shrimp season
- 100 lbs/day per boat or land vehicle during open shrimp season

LDWF Wildlife Refuge and Management Area Limits and Restrictions

Isles Dernieres Barrier Island Refuge LAC 76:III.331

No boat traffic in man-made or natural waters within the refuge other than in California Canal

Fishing from boats or wade fishing in the surf areas of the island is allowed

Elmer's Island Refuge LAC 76:III.337

Same as those listed under Recreational Size and Possession limits

Access allowed only between one-half hour before sunrise to one-half hour after sunset

Requirements for a Wild Louisiana Stamp waived

Marsh Island Wildlife Refuge LAC 76:III.310

Access allowed only between sunrise and sunset

No trawling permitted, shrimp may be harvested with cast nets only

25 lbs/day during open shrimp season and 10 lbs/day during closed shrimp season

State Wildlife and Paul J. Rainey Wildlife Refuge LAC 76:III.323

Access allowed only between sunrise and sunset

No trawling permitted, shrimp may be harvested with cast nets only

Containers are required to receive cast net catches to prevent littering and for safety purposes

25 lbs/day during open shrimp season and 10 lbs/day during closed shrimp season

White Lake Wetlands Conservation Area LAC 76:III.335

Sport fishing with rod and reel only and under a lottery permit system.

Rockefeller Wildlife Refuge LAC 76:III.309

Access allowed only between sunrise and sunset

No trawling permitted, shrimp may be harvested with cast nets only

Containers are required to receive cast net catches to prevent littering and for safety purposes

25 lbs/day during open shrimp season and 10 lbs/day during closed shrimp season

Salvador/Timken Wildlife Management Area LAC 76:XIX

All nighttime activities prohibited

No trawling permitted, shrimp may be harvested with cast nets only

25 lbs/day during open shrimp season and 10 lbs/day during closed shrimp season

All cast net contents shall be contained and bycatch returned to the water immediately

Pointe aux Chenes Wildlife Management Area LAC 76:XIX

All nighttime activities prohibited

No trawling permitted, shrimp may be harvested with cast nets only

25 lbs/day during open shrimp season and 10 lbs/day during closed shrimp season

All cast net contents shall be contained and bycatch returned to the water immediately

Area Restrictions

Same as those listed under Commercial.

Federal Area Restrictions

Big Branch Marsh National Wildlife Refuge

Recreational shrimping restricted to 30 minutes before sunrise to 30 minutes after sunset

Cast nets measuring 8 ft or less allowed

Same as those listed under Recreational Size and Possession limits

Bayou Sauvage National Wildlife Refuge

Recreational shrimping with cast nets less than 8 ft in radius permitted year-round from 30 minutes before sunrise to 30 minutes after sunset inside the Hurricane Protection Levee and only after 12:00 p.m. outside of the Hurricane Protection Levee from November 1 through January 31 and during the state teal season

Cast nets measuring 8 ft or less allowed

Same as those listed under Recreational Size and Possession limits

Breton National Wildlife Refuge

Recreational fishing permitted on the refuge year round and must be in accordance with all state and federal regulations. All fishing equipment must be attended at all times. Anglers may not use trotlines, slat traps, or nets.

Delta National Wildlife Refuge

Recreational shrimping allowed in designated areas. Use of trawls prohibited.

Mandalay National Wildlife Refuge

Recreational shrimping allowed. Use of trawls prohibited.

Shell Keys National Wildlife Refuge

Recreational shrimping allowed.

Lacassine National Wildlife Refuge

Cast netting for shrimp is permitted from boats only. Cast netting is permitted during the Louisiana inshore shrimp seasons from legal sunrise to legal sunset in all refuge canals, unless posted as Closed. This activity must follow all state and refuge regulations. The daily shrimp limit is five gallons of heads-on shrimp per day, per vehicle or boat. All by-catch must be immediately returned to the water before cast netting can continue. Cast netters must maintain actual custody of shrimp while on the refuge. This means the transfer of shrimp to another individual, boat, or vehicle or the placement of shrimp at a location outside of the cast netters immediate custody is prohibited. Cast netting is prohibited at all recreation areas including Northline, Hog Island Gully, Blue Goose Trail, Blue Crab, West Cove, and the Wetland Walkway. Cast netting for bait is permitted from boats only, March 15 through October 15, from legal sunrise to legal sunset. The shrimp limit when cast netting for bait outside the Louisiana inshore shrimp season is one gallon.

Cameron Prairie National Wildlife Refuge

Each person is required to have valid basic and saltwater licenses to cast net for shrimp. Cast nets must be less than 8.5 feet in radius. Recreational cast netting for shrimp is only permitted Recreational cast netting for shrimp is permitted during the Louisiana inshore waters shrimp season only. The daily shrimp limit is five gallons of heads-on shrimp per day, per vehicle or boat. Cast netting for bait is permitted year round. The shrimp limit, when cast netting for bait outside the Louisiana inshore waters shrimp season, is one gallon per day per vehicle or boat. Cast nets must be emptied directly into a container. Cast netters must maintain actual custody of shrimp while on the refuge. Bank fishing and cast netting for bait are permitted year round, sunrise to sunset, along Bank Fishing Road. Boat admittance into the refuge is permitted from March 15 - October 15, from one hour before legal sunrise until one hour after legal sunset; however, fishing and cast netting activities are prohibited until legal sunrise and after legal sunset. Cast netting for bait is permitted along Bank Fishing Road, located opposite the Pintail Wildlife Drive on the west side of Highway 27 and a two mile stretch of Outfall Canal. Motorized boats with no horsepower restriction are permitted in the Outfall canal. Only non-motorized boats may be used in the Bank Fishing Road waterways. All State boating regulations must be followed.

Sabine National Wildlife Refuge

Each person is required to have valid basic and saltwater licenses to cast net for shrimp. Cast nets must be less than 8.5 feet in radius. Recreational cast netting for shrimp is permitted during the Louisiana inshore waters shrimp season only. The daily shrimp limit is five gallons of heads-on shrimp per day, per vehicle or boat. Cast netting for bait is permitted year round. The shrimp limit, when cast netting for bait outside the Louisiana inshore waters shrimp season, is one gallon per day per vehicle or boat. Cast netters must maintain actual custody of shrimp while on the refuge. No cast netting is permitted from the Blue Goose Trail or the Wetland Walkway, including associated entrance bridges, drives, parking

areas, walking trails, and surrounding areas. Areas closed to boats for cast netting include under the bridges to the water control structures at Hog Island Gully and West Cove Recreation Areas, the canal on both sides of the entrance bridge to the Wetland Walkway, and the canal adjacent to the Blue Goose Trail parking lot and walking path. Additional areas designated by No Fishing, or cast netting or Area Closed signs are also closed to cast netting for safety and/or management purposes. Cast netting for bait from a boat is permitted March 15 through October 15 throughout the refuge. Boat admittance into the refuge is permitted from one hour before legal sunrise until one hour after legal sunset; however, cast netting for bait is prohibited until legal sunrise and after legal sunset. Bank fishing is open year round from legal sunrise until legal sunset at North line, Hog Island Gully, Blue Crab, and West Cove Recreation Areas.

Jean Lafitte Historical Park and Preserve

Freshwater habitat and fishing from boardwalks, trail and bridges prohibited. Certain waterways closed to motorized vessels.

Operational Restrictions

Same as those listed under Commercial.

Fishing Gear Interactions

Same as those listed under Commercial.

Appendix XVI. Chronology of Major Changes to Louisiana Shrimp Regulations

1886 – Act 106: Allowed the people of Louisiana to use state owned water-bottoms for the purpose of catching oysters and other shellfish.

1904 – Act 85: Established the basket (considered 70 pounds) as the standard measure for weighing shrimp.

1908 – Act 144: Established the Commission for the Conservation of Natural Resources.

1910 – Act 172: Created an eight member Conservation Commission.

Act 245: The first comprehensive statute concerning shrimp. Established a license on shrimp seines that was dependent on length. Established a closed season from June 1 – July 14. Gave the Board of Commissioners for the Protection of Birds, Game, and Fish authority to issue shrimping regulations. Made it illegal to seine from a boat under some sort of propulsion.

1912 – Act 127: Established the Conservation Commission and empowered it to issue regulations for the comprehensive control of shellfish, superseding the Board of Commissioners for the Protection of Birds, Game, and Fish. Created a Conservation Fund in the State Treasury.

Act 168: Amended Act 245 of 1910. Set two closed shrimp seasons, December 1 – February 1 and June 1 – July 1. Added ¾-inch square minimum mesh size for shrimp seines.

1914 – Act 86: First mention of inside and outside waters but not defined. First trawl regulations formed. Prohibited trawl use in inside waters if determined to be detrimental to the interests of the state. Allowed the take of shrimp for canning or drying purposes in closed seasons by trawls from any outside waters of the state with a permit. The shrimp could not measure less than 4 inches.

1918 – Act 105: Reaffirmed the Department of Conservation and its control over shellfish. Also empowers the commissioner to appoint Conservation Agents.

1920 – Act 68: First delineation of the inside/outside line. Allowed bait shrimp to be taken anytime. Made it illegal to take and sell shrimp that measure less than 4 inches in length for canning or drying. First trawl licenses introduced. First severance tax on shrimp set forth. Established licenses for shrimp canning or packing plants and drying platforms.

1924 – Act 140: Further delineation of the inside/outside line. Specified two closed seasons, December 1 – March 1 and June 15 – August 15. Required a license to use a shrimp seine in excess of 10 fathoms, a trawl, or other device.

1926 – Act 103: Further delineation of the inside/outside line. Set closed season for all waters from June 15 – August 15, and inside closed seasons from December 1 – March 15 and June 15 – August 15. Seines 10 fathoms in length may be used for catching shrimp without a license. Any gear used to catch shrimp can have a license fee established.

1932 – Act 50: New delineation of the inside/outside shrimp line. Two closed seasons established, March 1 – April 15 and June 10 – August 10. Made it illegal to use a seine longer than 5 fathoms or a trawl without a license.

Act 134: Allows for the Department of Conservation to collect severance taxes on shrimp fished from Louisiana waters and sent out of state.

Act 206: Exempts contracts or agreements for seafood, including shrimp, from antitrust violations.

1934 – Act 193: First requirement of a license for shrimp wholesalers and retailers. Prohibited the use of seines in excess of 3,000 feet in length and trawls with a spread of more than 100 feet for the taking of shrimp. Vessels not allowed to operate more than one trawl at a time.

1940 – Act 10: New delineation of the inside/outside shrimp line. Made it illegal to use or possess any trawl in excess of 60 feet in length for the purpose of catching shrimp. Established two closed seasons, March 1 – April 15 and June 10 – August 10. Provided for shrimp licensing reciprocity agreements with other states.

Act 408: Requested the Department of Conservation to establish a freshwater/saltwater line.

1942 – Act 80: Made it illegal to take or possess any saltwater shrimp less than 4 inches in length.

Act 143: New delineation of the inside/outside shrimp line. Set two closed seasons for inside waters, March 16 – May 15 and June 26 – August 15. First shrimp count law enacted, 68 shrimp to the pound. Made it illegal to harvest saltwater shrimp in trawls or seines in inside waters between the hours of sunset and sunrise.

1944 – Act 328: Proposed constitutional amendment creating a Department of Wildlife and Fisheries (LDWF) and a Department of Conservation out of the former Department of Conservation.

1946 – Act 78: Placed exclusive control of the shrimp fishery and shrimp industry in Louisiana in LDWF. Established a yearly closed season in inside waters from December 15 – March 15 and a closed season for inside and outside waters from Jun. 10 – the second Monday in August of each year. First shrimp vessel license was established and based on vessel length. Set a gear fee for each trawl in operation. Established the first license requirement for shrimp wholesalers' agents and for shrimp retailers.

1948 – Act 51: New delineation of the inside/outside shrimp line. Established a 68 count size limit for shrimp but does not apply to bait shrimp or to "grooved shrimp" when taken between April 15 and June 21. Established two closed seasons for inside waters February 15 – April 15 and June 21 – the second Monday in Aug. each year.

1950 – Act 544: Defined minimum mesh size for shrimp seines, trawls, or other devices as ¾ inch "bar" or 1-½ inch stretched. Repealed count laws of 1948 Act 51.

1952 – Act 57: Established the Louisiana Wildlife and Fisheries Commission and transferred the functions from LDWF.

Act 627: Established gear and vessel licenses. Set license fees for shrimp seines and trawls based on length and for shrimp vessels based on length.

1954 – Act 251: Set size limits for shrimp trawls used in Vermilion Bay and East and West Cote Blanche Bays.

Act 348: Set two shrimp seasons for inside waters. No shrimp can be caught in trawls or seines in inside waters between sunset and sunrise.

1956 – Act 92: Extensive delineation of the inside/outside water "line" for shrimping.

1958 – Act 53: Defined the inside/outside shrimp line. Made it illegal for a boat to use two or more trawls at the same time in inside waters. Prohibited the use of trawls greater than 50 feet in inside waters. Established two seasons in inside waters, December 21 – April 30 and July 1 to the third Monday in August. Established a count size of 68 shrimp per to the pound with some exceptions during open season or on seabobs and bait shrimp.

1960 – Act 160: Reestablished LDWF, the office of Commissioner of Wildlife and Fisheries, and the Louisiana Wildlife and Fisheries Commission.

1962 – Act 452: Extensively delineated inside/outside line. Established a spring open season in inside waters for a 60-day period starting no earlier than May 1 and no later than May 15. Established a fall open season in inside waters from the 3rd Monday in August to December 21. No closed season in outside waters. Enacted a count-size limit of 68 shrimp to the pound except during the spring open season, or from November 15 – December 20 for brown shrimp, and no count for seabobs and bait shrimp.

1964 – Act 490: Specified legal gear for bait shrimping. Made it illegal to trawl for shrimp with more than two trawls and no trawl over 50 feet long in inside waters.

1966 – Act 54: Changed the dates for the spring open season in inside waters to no earlier than May 1 and no later than May 25 and extend for a period of not less than 50 days and no more than 60.

Act 190: Made it illegal to trawl for shrimp at night in Calcasieu Lake.

Act 421: First regulations on beam trawls and butterfly nets for shrimping. Minimum mesh size for both gear types set at 5/8-inch "bar" and 1-¼ inch stretched.

1969 – Act 60: Allowed the Commission to open and close shrimp seasons based on technical data. The stipulations were that there must be no less than two open seasons for all inside waters. One season must commence no later than May 25 and remain open a minimum of 50 days and closed using technical data to protect the incoming white shrimp. The other season shall begin on the third Monday in August and remain open until December 21.

1971 – Act 179: Allowed double riggers and "Biloxi type" vessels, either single or double rigged, to shrimp within Breton Sound and Chandeleur Sound during open seasons.

Act 504: Specified gear used for bait shrimping. Provided statute concerning the use of butterfly nets, paupiers, trawls, night trawls, and beam trawls.

1972 – Act 203: First delineation of the inside-outside line using coordinates.

1974 – Article IX §6 of the Louisiana Constitution: Established the Louisiana Wildlife and Fisheries Commission as a constitutional agency.

1975 – Act 245: Bait seines longer than 30 feet but not exceeding 100 feet can only be used for taking shrimp south of the saltwater/freshwater line.

1976 – Act 238: Adopted regulations for allowing the take of live bait shrimp by permitholders during closed seasons.

1977 – Act 127: Delineated inside/outside shrimp line.

Act 549: Allowed double riggers and "Biloxi type" vessels, either single or double rigged, to shrimp within Breton Sound and Chandeleur Sound during open seasons.

1979 – Act 284: Allowed commercial vessels to use a test trawl not to exceed 16 feet without an additional license. Allowed recreational fishermen to use trawls not to exceed 16 feet in open waters during open seasons. The limit for recreational shrimping was 100 pounds in aggregate per day.

Act 286: Required shrimp trawls to have a mesh size of at least ¾-inch bar or 1-½ inch stretched. Required beam trawls and butterfly nets to have a mesh size of at least 5/8-inch bar or 1-¼ inch stretched. Use of these gears in closed waters made illegal.

Act 291: Made it illegal to pull more than one trawl, which cannot exceed 50 feet, in inside waters, with the exception of the test trawl.

Act 673: Established the Fishermen's Gear Compensation Fund.

1980 – Act 817: Made it illegal to use a trawl with a mesh size of less than 5/8-inch bar or 1-¼ inch stretched during the May shrimp season.

Act 834: Established the Commercial Fisherman's Fuel Compensation Fund.

1981 – Act 890: Established the Louisiana Seafood Promotion and Marketing Board.

1982 – Act 777: Decreased the minimum mesh size for shrimp trawls to 5/8-inch bar or 1-¼ inch stretched.

1984 – Act 230: Commercial license fees raised $5 in order to fund Seafood Promotion and Marketing Fund.

Act 255: Double beam trawls or butterfly nets having individual nets may not measure greater than 16 feet horizontally or 12 feet vertically, each. Neither of these gears may use sweeper devices.

Act 300: Closed outside waters to shrimping from January 15 to March 15 but allowed for 15-day leeway period for opening and closing.

Act 586: Removed the shrimp count limitation from all shrimp during the spring open shrimp season. Removed the count restriction from brown shrimp from November 15 – December 15. Placed a possession count on white shrimp that must average larger than 100 per pound.

Act 692: Made it illegal to pull more than one shrimp trawl, not to exceed 50 feet in length, excluding test trawls. Allowed the Commission to close the outside waters for a period not to exceed 60 days during January 15 – March 15 west of the Mississippi River and during February 15 – April 15 on the east bank of the Mississippi River.

Act 693: Prohibited the use of "chopstick beam trawls" for commercial shrimping.

1985 – Act 908: Redefined shrimp "trawl". Allowed the only legal method of taking shrimp to be trawls, butterfly nets, cast nets, or licensed experimental gear.

1986 – Act 494: Allowed LDWF and the Commission to use the Declaration of Emergency to set shrimp seasons.

Act 554: Defined the inside/outside shrimp line.

Act 570: Provided that the Commission can close outside waters to shrimping from January 15 to April 15.

1987 – Act 283: LDWF is prohibited from enforcing any federal law or regulations requiring commercial or recreational shrimp fishermen in Louisiana to use TEDS until specified conditions have been satisfied.

Act 576: First use of shrimping zones I, II, and III to determine the opening of the seasons.

Act 876: Defined the inside/outside line.

1988 – Act 893: Deleted statutory shrimp season dates.

Act 894: Defined the inside/outside line.

Act 983: Empowered the Commission to open and close inside and outside waters based upon inspection of the biological data.

1989 – Act 85: Superseded by Act 489 same year.

Act 489: Allowed for when more than 50 percent by weight of saltwater shrimp taken or possessed is seabobs, then maximum allowable amount of undersized white shrimp taken or possessed cannot exceed 10 percent by weight of the total.

Act 510: Amended Act 893 of 1988 to include that before the Commission sets the season dates, a public hearing must be held to determine when to open or close the season.

Act 607: Defined the inside/outside shrimp line.

1990 – Act 549: Defined the inside/outside shrimp line.

1991 – Act 259: Prohibited fishing with butterfly nets in inside waters during closed seasons. Made it illegal for vessels to pull more than four trawls and a test trawl in outside waters. Added a penalty for the second and any subsequent shrimping violations that include loss of license for a period of one year.

Act 931: Made "skimmer nets" a legal gear for catching shrimp. Skimmer net minimum mesh set at 5/8-inch bar or 1-¼ inch stretched. Set measurement of frames for skimmer nets at no more than 16 feet horizontally and 12 feet vertically, with a lead line not to exceed 28 feet.

Act 946: Defined the inside/outside shrimp line. Amended the white shrimp count to provide that for when more than 50 percent by weight of the saltwater shrimp taken or possessed is seabobs or brown shrimp, then the maximum allowable amount of undersized white shrimp taken or possessed cannot exceed 10 percent by weight of the total saltwater shrimp taken or possessed.

1992 – Act 619: Removed the possession count on white shrimp during the period of October 15 through the third Monday in December.

1993 – Act 69: Amended a provision so that skimmer and butterfly nets may be mounted no more than 24 inches from the side of a vessel.

Act 263: Changed the minimum mesh size for trawls, skimmer nets, or butterfly nets to ¾-inch square or bar or 1-½ inch stretched in inside waters during the fall inshore shrimp season.

1995 – Act 509: Prohibited night time taking of shrimp in certain coastal waters except in the waters of Southwest Pass at Marsh Island past a line delineated in the law.

1997 – Act 277: Added "skimmer nets" to the list prohibited gears to be used during closed seasons.

Act 919: Reduced the minimum mesh size to 5/8-inch square or 1-¼ inch stretched except in Zone 2 west of the Atchafalaya River.

2001 – Act 83: Removed the provision to open the spring season no later than the third Monday in May and instead to use LDWF's projection of when 50 percent of the brown shrimp crop reaches 100 count per pound or greater.

Act 87: Double skimmer net shall not exceed 20 feet measured diagonally. Also allowed that reinforcement framing shall not be considered when determining the size of the net frame.

2002 – Act 75: Repealed the severance tax on shrimp and enacted an excise tax on saltwater shrimp taken in Louisiana and on any shrimp imported to Louisiana.

2003 – Act 269: Added a provision that prohibited the use of attachments in conjunction with or attached to skimmer nets, not just butterfly nets.

2004 – Act 161: Enacted a possession limit of 50 pounds for saltwater shrimp taken for bait with a 30 foot seine with ¼-inch mesh or dip nets with a maximum three foot diameter.

Act 904: Shrimp Trade Petition Account was created. Purpose of the expenditures was to promote and protect domestic wild caught shrimp. Also imposed an additional gear license fee of $10 for residents and $40 for nonresidents during the 2005 and 2006 license years. Imposed a new fee on wholesale/retail seafood dealers who pay a shrimp excise tax.

2005 – Act 102: Created a license withdrawal process for repeated convictions and a ban on commercial and recreational shrimping by repeat offenders.

2007 – Act 296: Added "skimmer nets" to the list of prohibited gears for taking shrimp at night in certain areas of Cameron Parish.

2008 – Act 16: Removed channel markers as lines of delineation and replaced with latitude/longitude measurements.

2010 – Act 606: Created the Louisiana Shrimp Task Force within LDWF and provided for its powers, duties, functions, responsibilities, and funding.

2012 – Act 83: Removed provision to require the opening of Zone 2 no later than the third Monday in May. Authorized the Commission to increase the minimum mesh size when opening a special season or extending a season. Authorized bait shrimp to be taken during closed seasons with a special bait dealer's permit available for purchase any time.

2014 – Act 14: Provision limited the size of a double skimmer to no larger than a 72 foot opening and a lead line no more than 33 feet. Repealed the law that prohibited the mounting of a skimmer net or butterfly net more than 24 inches from the side of the vessel. Prohibited the use of a double skimmer net where the horizontal net frame extends more than 20 feet from the gunwale of the vessel. Repealed the law that prohibited the use of sweeper devices, leads, extensions, wings, or other attachments in conjunction with or attached to butterfly nets or skimmer nets. Created a new provision that retained all of the above listed prohibitions for butterfly nets but repealed them for skimmer nets.

2015 – Act 416: Repealed prohibition on state enforcement of federal sea turtle and fish excluder devices regulations for in shrimp trawls. Also authorized the Commission to promulgate rules and regulations relative to the use, possession, and configuration of excluder devices.

Appendix XVII. Commercial Shrimp Trawl Regulations in Other Southeastern States

	Bycatch	Gear Restrictions	Times/Seasons	Size/Possession Limits	Fishery Access	Area Restrictions
NC	BRDs required on otter and skimmer trawls; TEDs required on otter trawls	Trawl minimum mesh size of 1-1/2 in; maximum 90 ft combined headrope, except in certain areas	No weekends; season opened by area by NCDMF based on biological sampling (shrimp size and count)	N/A	Open	Trawls are prohibited in certain areas, including Outer Banks sea grass beds, crab spawning sanctuaries Mar 1-Aug 31, primary or secondary nursery area (with exceptions)
SC	BRDs and TEDs required for otter trawls	Skimmers not allowed; minimum mesh size of 2-1/2 in; maximum 220 ft footrope length	Times and seasons set by SCDNR	N/A	Open	Trawling only permitted in General Trawling Zone
GA	BRDs and TEDs required for otter trawls	Skimmers not allowed; maximum 220 ft combined footrope length	DNR Commissioner may open state waters May 15-Feb 28 based on biological data (shrimp count 45 or fewer per pound, head-on May 15-Dec 31; 50 or fewer Jan and Feb); no night shrimping	N/A	Open	Sounds closed to trawling
FL	BRDs and TEDs required in skimmer and otter trawls	Mesh area no larger than 500 sq ft; mesh size and net length vary by area	Times and seasons vary by area; no night trawling on East Coast, except in Jun, Jul, and Aug;	All shrimp in possession must average no more than 47 shrimp per pound head-on or 70 per pound head-off (except in some areas)	Open	Certain areas including inland and inshore waters and designated shrimp beds closed to trawling year-round or seasonally
AL	TEDs required for otter trawls	No mesh size restrictions; trawls cannot exceed 50 ft along main top line in inside waters (bays, sounds, etc.)	AMRD sets seasons based on biological sampling (shrimp count 68 head-on shrimp per pound)	Average size of shrimp must be larger than 68 head-on shrimp per pound	Open	Inside rivers and within oyster beds and sea grass beds closed to trawling
MS	TEDs required for otter trawls	Single net no larger than 50 ft along headrope and 60 ft along footrope or two nets, each no longer than 25 ft headrope and 32 ft footrope within the Mississippi Sound north of the barrier islands; skimmers or wing nets no longer than 25 ft headrope and 32 ft footrope	MDMR sets seasons based on biological sampling (shrimp count 68 head-on shrimp per pound)	Shrimp must be larger than 68 head-on shrimp per pound	Open	Certain areas closed to trawling year-round or seasonally
TX	BRDs and TEDs required for otter trawls	Skimmers not allowed; maximum trawl net size depends on door length, configuration, area; number of trawls depends on area minimum mesh size varies from 6-1/2 to 8-3/4 in over 5 stretched mesh depending on area, season, target species	Inside waters open May 15-Jul 15, Aug 15-Nov 30, Feb 1-Apr 15; outside waters: Jul 16-Nov 30, inside 3 and 3 to 5 nm from north coast Feb 16-May 15; 5 to 9 nm from coast Dec 1-May 15; time restrictions by area; seabob in outside waters: Dec 1-May 15, Jul 16-Nov 30, no night	Inside waters: 600 pound bag limit May 15-Jul 15; 50 head-on shrimp per pound size limit Aug 15-Oct 31	Moratorium on sale of shrimp boat licenses; license buyback provision	Certain areas (e.g. nursery areas) closed to trawling year-round; all waters closed May 15-Jul 15

Appendix XVIII. Recreational Shrimp Trawl Regulations in Other Southeastern States

	Licenses	Gear Restrictions	Times/Seasons	Size/Possession Limits	Bycatch	Area Restrictions
NC	Recreational commercial gear license (RCGL) required for trawls and skimmers	Max headrope 26 ft; min mesh 1-1/2 in stretched	No trawls on weekends in inside waters	No size limit; 48 qts (head on), 30 qts (head off)/ person or vessel/day, max 2 limits/vessel	Same as commercial	Some areas closed to trawling
SC	Commercial saltwater fishing license, vessel decal, and gear license required for trawls	Same as commercial	Same as commercial	48 qts whole or 29 qts headed/person or boat	Same as commercial	Same as commercial
GA	Commercial license required to use trawls to harvest shrimp for food	Same as commercial	Same as commercial	Same as commercial	Same as commercial	Same as commercial
FL	No trawls allowed for recreational harvest	No trawls allowed for recreational harvest	No trawls allowed for recreational harvest	No trawls allowed for recreational harvest	No trawls allowed for recreational harvest	No trawls allowed for recreational harvest
AL	Boat license	Max 16 ft along main top line, no min mesh size	Same as commercial	No size limit; 5 gallons (head on)/person/day	TEDs not required unless using machinery to pull in their nets	Same as commercial
MS	Recreational shrimp license required for trawls	Single net, max 16 ft headrope	Same as commercial	Same as commercial	Same as commercial	Trawling prohibited in several areas
TX	Fishing license with saltwater stamp endorsement and individual bait-shrimp trawl tag required for trawls	1 trawl per boat, max 20 ft width between doors, min mesh size 8-3/4 in over 5 stretched meshes, boards no larger than 450 sq in each	**Purposes other than bait (major bays only):** Spring: May 15-Jul 15, until 2 pm; Fall 1: Aug 15-Oct 31, no night; Fall 2: Nov 1-Nov 30, no night; **Outside-Southern Zone:** beyond 5 nm: Dec 1-May 15, July 16-Nov 30, day and night; inside 5 nm: Jul 16-Nov 30, no nights; inside 9 nm: closed May 15-Jul 15, day and night; **Outside-Northern Zone:** beyond 5 nm: Dec 1-May 15, Jul 16-Nov 30, day and night; inside 5 nm: Feb 16-May 15, Jul 16- Nov 30, no nights; inside 9 nm: closed May 15-Jul 15, day and night	Spring: 15 lbs (head on)/ person/day; Fall 1: 15 lbs (head on)/person/day, no more than 50 shrimp per lb; Fall 2: 15 lbs (head on)/ person/day; Outside waters: 100 pounds (head on)/ boat/day	Same as commercial	No shrimping in designated nursery areas, natural or manmade passes leading from inside to outside waters, areas in Nueces County

Appendix XIX. Details of Proposed Sea Turtle Monitoring and Research Projects

1. Create a Sea Turtle Information Hub—a digital data source for all information regarding sea turtles in the Gulf of Mexico. Several government agencies and academic institutions currently collect information on sea turtles in the Gulf of Mexico and offshore waters of Louisiana. Researching historical and current data may provide valuable information on sea turtle populations. Identifying and compiling data from the numerous resources could allow management agencies to identify and prioritize research needs. Reference material would be organized by location. Potential sources include fishery observer data, reports from TED testing, U.S. Army Corps of Engineers hydraulic dredge monitoring, aerial surveys, sea turtle relocation data, seismic observer data, nesting data, satellite tagging data, and field reports of incidental encounters.
2. Implement beach patrol surveys to monitor for nesting activity and strandings:

   a. Nesting: Very little is known regarding the distribution, abundance, and seasonality of nesting sea turtles on the coast of Louisiana. Developing a standardized nesting survey protocol to be administered throughout identified beaches of coastal Louisiana and documenting the occurrence, abundance, and seasonality of sea turtle nesting in coastal Louisiana could support monitoring of and protection for sea turtle nesting activity on Louisiana's barrier islands.

   b. Strandings: LDWF is the primary responder to stranded sea turtles in Louisiana. NOAA Fisheries currently uses the information collected by the stranding network to predict interactions, captures, and mortality of sea turtles. Beach surveys should use standard sampling protocol, collecting effort data to analyze temporal and seasonal strandings along beaches.
3. Implement observer survey in state waters: Place fishery observers on vessels licensed to shrimp in Louisiana state waters to collect data on vessel size, gear type and size, length (time) and location of set, environmental parameters, as well as all sea turtle interactions. Data collection on observed interactions could improve the estimates of incidental takes and related mortalities and provide guidance for management options.
4. Conduct aerial surveys for nesting and stranded sea turtles: Create a standardized aerial survey protocol to be administered throughout identified beaches of coastal Louisiana and collect relevant data regarding sea turtles on Louisiana beaches and within state waters. Studying sea turtle distribution and abundance and determining the relative use of nesting beaches could increase knowledge of this resource and affect how it is managed.
5. Research TED compliance: LDWF enforcement agents have more direct contact with active commercial fishing vessels than any other division or agency. NOAA Fisheries Section 7 consultations and biological opinions directly associate estimated compliance rates with sea turtle mortalities. To capture accurate estimates of compliance rates, LDWF enforcement agents could conduct fishing gear compliance surveys to inspect for the use of TEDs in Louisiana's nearshore and offshore waters. LDWF would create and use a survey form similar to NOAA Fisheries TED Enforcement Boarding Form to develop a testing protocol. Accurate estimates of compliance rates could better inform future sea turtle management decisions and provide guidance for future outreach.
6. Implement Sea Turtle Reporting and Response Program: LDWF could develop and implement a statewide education and outreach plan and observer program for the shrimp trawl industry that promotes and incentivizes self-reporting of incidental takes of both live and dead sea turtles. LDWF response units located across the coast would respond to all reports of incidental sea turtle captures. LDWF would assess live sea turtles and follow protocols specified by NOAA Fisheries before their release or rehabilitation. Incidental takes resulting in dead sea turtles would be mitigated through financial support to Rancho Nuevo or Vera Cruz nesting beaches. LDWF would collect biological data on all turtles and tag healthy live turtles prior to their release. Information collected through this program could lead to the implementation of additional conservation management actions; more accurate estimates of sea turtle CPUE in the northern Gulf of Mexico could improve the calculation of incidental takes and better inform management decisions. In addition, mortality of sea turtles caught in commercial fishing gear could decrease through the care of trained biologist and other experts.
7. Conduct satellite tagging study: Satellite tagging provides useful information for management, such as habitat use, seasonal movements and inter-nesting migration patterns of sea turtles.

   a. Neonates: Efforts would include monitoring areas of pelagic sargassum and "rip" lines offshore of Louisiana for

neonate sea turtles; capturing, weighing, measuring, tagging, and releasing sea turtles; and monitoring satellite tracking signals. Protocols for tagging would be based on tested standards for neonate sea turtle tagging. Data should help determine the migration and location of post-hatchling sized sea turtles located offshore of Louisiana. Migration patterns may include waters of the Gulf of Mexico and off the Atlantic Coast.

b. Juvenile/adult sea turtles: Current tagging efforts focus primarily on female sea turtles, tagged after a nesting event. Increased tagging on males and females could improve knowledge of sea turtle concentrations and temporal patterns. Efforts would include monitoring areas of sargassum and "rip" lines for juvenile and adult sea turtles; capturing, weighing, measuring, tagging and releasing sea turtles; and monitoring satellite tracking signals. Data could help determine the abundance, migration patterns, and locations of juvenile and adult, male and female sea turtles in waters of Louisiana and the Gulf of Mexico.

8. Research the feasibility of using trawl sampling gear to monitor sea turtle populations in Louisiana and Gulf of Mexico waters: Currently, researchers predominantly monitor sea turtle populations by counting nests. The NRC suggested improvements to current sea turtle monitoring programs (NRC 2010), concluding that although estimates of abundance of adult females on nesting beaches are critical, researchers cannot determine the causes of population trends without knowledge of accompanying changes in demographic rates at all life stages. Best management options depend on an understanding of the basis of changes in population abundance. Data collected from trawl samples are frequently used for fisheries monitoring throughout the Gulf of Mexico; this project proposes to establish the feasibility of using trawl gear to monitor sea turtle populations in the Gulf of Mexico, providing density and abundance data to agencies to be used in management of sea turtles and calculate CPUE by species.