3 Affected Environment

3.1 *Habitat*

3.1.1 Inshore/Estuarine Habitat

Many deepwater snapper grouper species utilize both pelagic and benthic habitats during several stages of their life histories; larval stages of these species live in the water column and feed on plankton. Most juveniles and adults are demersal and associate with hard structures on the continental shelf that have moderate to high relief (e.g., coral reef systems and artificial reef structures, rocky hard-bottom substrates, ledges and caves, sloping soft-bottom areas, and limestone outcroppings). Juvenile stages of some snapper grouper species also utilize inshore seagrass beds, mangrove estuaries, lagoons, oyster reefs, and embayment systems. In many species, various combinations of these habitats may be utilized during diurnal feeding migrations or seasonal shifts in cross-shelf distributions. More detail on these habitat types is found in Sections 3.2.1 and 3.2.2 of the Council's Habitat Plan (SAFMC 1998a).

3.1.2 Offshore Habitat

Predominant snapper grouper offshore fishing areas are located in live bottom and shelf-edge habitats, where water temperatures range from 11° to 27° C (52^o to 81^o F) due to the proximity of the Gulf Stream, with lower shelf habitat temperatures varying from 11° to 14° C (52^o to 57^o F). Water depths range from 16 to 27 meters (54 to 90 feet) or greater for live-bottom habitats, 55 to 110 meters (180 to 360 feet) for the shelf-edge habitat, and from 110 to 183 meters (360 to 600 feet) for lower-shelf habitat areas.

The exact extent and distribution of productive snapper grouper habitat on the continental shelf north of Cape Canaveral is unknown. Current data suggest from 3 to 30 percent of the shelf is suitable habitat for these species. These live-bottom habitats may include low relief areas, supporting sparse to moderate growth of sessile invertebrates, moderate relief reefs from 0.5 to 2 meters (1.6 to 6.6 feet), or high relief ridges at or near the shelf break consisting of outcrops of rock that are heavily encrusted with sessile invertebrates such as sponges and sea fan species. Live-bottom habitat is scattered irregularly over most of the shelf north of Cape Canaveral, Florida, but is most abundant offshore from northeastern Florida. South of Cape Canaveral, the continental shelf narrows from 56 to 16 kilometers (35 to 10 miles) wide, thence reducing off the southeast coast of Florida and the Florida Keys. The lack of a large shelf area, presence of extensive, rugged living fossil coral reefs, and dominance of a tropical Caribbean fauna are distinctive benthic characteristics of this area.

Rock outcroppings occur throughout the continental shelf from Cape Hatteras, North Carolina to Key West, Florida (MacIntyre and Milliman 1970; Miller and Richards 1979; Parker *et al*. 1983), which are principally composed of boarded limestone and carbonate

sandstone (Newton *et al*. 1971), and exhibit vertical relief ranging from less than 0.5 to over 10 meters (33 feet). Ledge systems formed by rock outcrops and piles of irregularly sized boulders are also common. Parker *et al*. (1983) estimated that 24% (9,443 km^2) of the area between the 27 and 101 meters (89 and 331 feet) isobaths from Cape Hatteras to Cape Canaveral is reef habitat. Although the benthic communities found in water depths between 100 and 300 meters (328 and 984 feet) from Cape Hatteras to Key West is relatively small compared to the whole shelf, this area, based upon landing information of fishers, constitutes prime reef fish habitat and probably significantly contributes to the total amount of reef habitat in this region.

Man-made artificial reef structures are also utilized to attract fish and increase fish harvests; however, research on man-made reefs is limited and opinions differ as to whether or not these structures promote an increase of ecological biomass or merely concentrate fishes by attracting them from nearby, natural unvegetated areas of little or no relief.

The distribution of coral and live hard bottom habitat as presented in the SEAMAP Bottom Mapping Project is a proxy for the distribution of the species within the snapper grouper complex. The method used to determine hard bottom habitat relied on the identification of reef obligate species including members of the snapper grouper complex. The Florida Fish and Wildlife Research Institute (FWRI) showing the best available information on the distribution of hard bottom habitat in the south Atlantic region prepared ArcView maps for the four-state project. These maps, which consolidate known distribution of coral, hard/live bottom, and artificial reefs as hard bottom, are included in Appendix E of the Habitat Plan (SAFMC 1998a). These maps are also available on the Internet at the Council's following Internet Mapping System website: http://ocean.floridamarine.org/efh_coral/ims/viewer.htm.

The South Carolina Department of Natural Resources, NOAA/Biogeographic Characterization Branch, and the South Atlantic Fishery Management Council cooperatively generated additional information on managed species' use of offshore fish habitat. Plots of the spatial distribution of offshore species were generated from the Marine Resources Monitoring, Assessment, and Prediction Program (MARMAP) data (Figures 35-41) in the Habitat Plan (SAFMC 1998a). The plots should be considered as point confirmation of the presence of each species within the scope of the sampling program. These plots, in combination with the hard bottom habitat distributions presented in Appendix E of the Habitat Plan (SAFMC 1998a), can be employed as proxies for offshore snapper grouper complex distributions in the south Atlantic region. Maps of the distribution of snapper grouper species by gear type based on MARMAP data can be generated through the Council's Internet Mapping System at the following web address: http://ocean.floridamarine.org/efh_coral/ims/viewer.htm.

3.1.3 Essential Fish Habitat

Essential fish habitat (EFH) is defined in the Magnuson-Stevens Fishery Conservation and Management Act as "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S. C. 1802(10)). Specific categories of EFH identified in the South Atlantic Bight, which are utilized by federally managed fish and invertebrate species, include both estuarine/inshore and marine/offshore areas. Specifically, estuarine/inshore EFH includes: Estuarine emergent and mangrove wetlands, submerged aquatic vegetation, oyster reefs and shell banks, intertidal flats, palustrine emergent and forested systems, aquatic beds, and estuarine water column. Additionally, marine/offshore EFH includes: Live/hard bottom habitats, coral and coral reefs, artificial and manmade reefs, *Sargassum* species, and marine water column.

EFH utilized by snapper grouper species in this region includes coral reefs, live/hard bottom, submerged aquatic vegetation, artificial reefs and medium to high profile outcroppings on and around the shelf break zone from shore to at least 183 meters [600 feet (but to at least 2,000 feet for wreckfish)] where the annual water temperature range is sufficiently warm to maintain adult populations of members of this largely tropical fish complex. EFH includes the spawning area in the water column above the adult habitat and the additional pelagic environment, including *Sargassum*, required for survival of larvae and growth up to and including settlement. In addition, the Gulf Stream is also EFH because it provides a mechanism to disperse snapper grouper larvae.

For specific life stages of estuarine dependent and near shore snapper grouper species, EFH includes areas inshore of the 30 meters (100-foot) contour, such as attached macroalgae; submerged rooted vascular plants (seagrasses); estuarine emergent vegetated wetlands (saltmarshes, brackish marsh); tidal creeks; estuarine scrub/shrub (mangrove fringe); oyster reefs and shell banks; unconsolidated bottom (soft sediments); artificial reefs; and coral reefs and live/hard bottom habitats.

3.1.3.1 Habitat Areas of Particular Concern

Areas which meet the criteria for essential fish habitat-habitat areas of particular concern (EFH-HAPCs) for species in the snapper grouper management unit include medium to high profile offshore hard bottoms where spawning normally occurs; localities of known or likely periodic spawning aggregations; near shore hard bottom areas; The Point, The Ten Fathom Ledge, and Big Rock (North Carolina); The Charleston Bump (South Carolina); mangrove habitat; seagrass habitat; oyster/shell habitat; all coastal inlets; all state-designated nursery habitats of particular importance to snapper grouper (e.g., Primary and Secondary Nursery Areas designated in North Carolina); pelagic and benthic *Sargassum*; Hoyt Hills for wreckfish; the *Oculina* Bank Habitat Area of Particular Concern; all hermatypic coral habitats and reefs; manganese outcroppings on the Blake Plateau; and Council-designated Artificial Reef Special Management Zones (SMZs). Areas that meet the criteria for designating essential fish habitat-habitat areas of particular concern include habitats required during each life stage (including egg, larval, postlarval, juvenile, and adult stages).

In addition to protecting habitat from fishing related degradation though FMP regulations, the Council in cooperation with NOAA Fisheries, actively comments on non-fishing projects or policies that may impact essential fish habitat. The Council adopted a habitat policy and procedure document that established a four-state Habitat Advisory Panel and adopted a comment and policy development process. With guidance from the Advisory Panel, the Council has developed and approved habitat policies on: energy exploration, development, transportation and hydropower re-licensing; beach dredging and filling and large-scale coastal engineering; protection and enhancement of submerged aquatic vegetation; and alterations to riverine, estuarine and nearshore flows (Appendix C).

3.2 *Biological/Ecological Environment*

3.2.1 Species Most Impacted By This FMP Amendment

3.2.1.1 Gag, *Mycteroperca microlepis*

Gag occur in the Western Atlantic from North Carolina to the Yucatan Peninsula, and throughout the Gulf of Mexico. Juveniles are sometimes observed as far north as Massachusetts (Heemstra and Randall 1993). Gag commonly occur at depths of 39-152 m (131-498 ft) (Heemstra and Randall 1993) and prefer inshore-reef and shelf-break habitats (Hood and Schlieder 1992). Bullock and Smith (1991) indicated gag probably do not move seasonally between reefs in the Gulf of Mexico, but show a gradual shift toward deeper water with age. McGovern *et al.* (2005) reported extensive movement of gag along the Southeast United States. In a tagging study, 23% of the 435 recaptured gag moved distances greater that 185 km (100 nautical miles). Most of these individuals were tagged off South Carolina and were recaptured off Georgia, Florida, and in the Gulf of Mexico (McGovern *et al.* 2005).

Gag are probably estuarine dependent (Keener *et al.* 1988; Ross and Moser 1995; Koenig and Coleman 1998; Strelcheck *et al.* 2003). Juveniles (age 0) occur in shallow grass beds along Florida's east coast during the late spring and summer (Bullock and Smith 1991). Sea grass is also an important nursery habitat for juvenile gag in North Carolina (Ross and Moser 1995). Post-larval gag enter South Carolina estuaries when they are 13 mm (0.5 inches) TL and 40 days old during April and May each year (Keener *et al.* 1988), and utilize oyster shell rubble as nursery habitat. Juveniles remain in estuarine waters throughout the summer and move offshore as water temperatures cool during September and October. Adults are often seen in shallow water 5-15 m (16-49 ft) above the reef (Bullock and Smith 1991) and as far as 40-70 km (22-38 nautical miles) offshore.

Huntsman *et al.* (1999) indicated gag are vulnerable to overfishing since they are long-lived, late to mature, change sex, and aggregate to spawn. The estimated natural mortality rate is 0.14 (SEDAR 10 2007). Maximum reported size for gag is 145 cm (57.5 inches) TL and 36.5 kg (81 pounds) (Heemstra and Randall 1993), and maximum reported age is 26 years (Harris and Collins 2000). Gag is a sequential hermaphrodite,

changing sex from female to male with increased size and age (Coleman *et al.* 1996; McGovern *et al.* 1998; Coleman *et al.* 2000). All individuals less than 87.5 cm (34.7 inches) TL are females. At 105.0 cm (41.6 inches) TL, 50% of fishes are males. Almost all gag are males at sizes greater than 120.0 cm (47.5 inches) TL (McGovern *et al.* 1998).

Along the southeastern United States (1994-1995), size at first maturity is 50.8 cm (20.2 inches) TL, and 50% of gag females are sexually mature at 62.2 cm (24.7 inches) (McGovern *et al.* 1998). According to Harris and Collins (2000), age-at-first-maturity is 2 years, and 50% of gag are mature at 3 years. For data collected during 1978-1982 off the southeastern United States, McGovern *et al.* (1998) reported the smallest mature females were 58.0 cm (22.9 inches) TL and 3 years old. Hood and Schlieder (1992) indicated most females reach sexual maturity at ages 5-7 in the Gulf of Mexico. Off the southeastern United States, gag spawn from December through May, with a peak in March and April (McGovern *et al.* 1998). Duration of planktonic larvae is about 42 days (Keener *et al.* 1988; Koenig and Coleman 1998; Lindeman *et al.* 2000). McGovern *et al.* (1998) reported the percentage of male gag landed by commercial fishermen decreased from 20% during 1979-1981 to 6% during 1995-1996. This coincided with a decrease in the mean length of fish landed. A similar decrease in the percentage of males was reported in the Gulf of Mexico (Hood and Schleider 1992; Coleman *et al.* 1996).

Adults are sometimes solitary, and can occur in groups of 5 to 50 individuals. They feed primarily on fishes, crabs, shrimp, and cephalopods (Heemstra and Randall 1993), and often forage in small groups far from the reef ledge (Bullock and Smith 1991). Juveniles feed primarily on crustaceans, and begin to consume fishes when they reach about 25 mm (1 inch) in length (Bullock and Smith 1991; Mullaney 1994).

3.2.1.2 Red grouper, *Epinephelus morio*

Red grouper is primarily a continental species, mostly found in broad shelf areas (Jory and Iversen 1989). Red grouper occur in the Western Atlantic, from North Carolina to southeastern Brazil, including the eastern Gulf of Mexico and Bermuda, but can occasionally be found as far north as Massachusetts (Heemstra and Randall 1993). Red grouper is uncommon around coral reefs; it generally occurs over flat rock perforated with solution holes (Bullock and Smith 1991), and is commonly found in the caverns and crevices of limestone reef in the Gulf of Mexico (Moe 1969). It also occurs over rocky reef bottoms (Moe 1969).

Adult red grouper are sedentary fish that are usually found at depths of 5-300 m (16-984 ft). Fishermen off North Carolina commonly catch red grouper at depths of 27-76 m (88-249 ft) for an average of 34 m (111 ft). Fishermen off southeastern Florida also catch red grouper in depths ranging from 27-76 m (88-249 ft) with an average depth of 45 m (148 ft) (Burgos 2001; McGovern *et al.* 2002). Moe (1969) reported that juveniles live in shallow water nearshore reefs until they are 40.0 cm (16 inches) and 5 years of age, when they become sexually mature and move offshore. Spawning occurs during February-June, with a peak in April (Burgos 2001). In the eastern Gulf of Mexico, ripe females are found December through June, with a peak during April and May (Moe 1969). Based on the presence of ripe adults (Moe 1996) and larval red grouper (Johnson and Keener 1984)

spawning probably occurs offshore. Coleman *et al*. (1996) found groups of spawning red grouper at depths between 21-110 m (70-360 feet). Red grouper do not appear to form spawning aggregations or spawn at specific sites (Coleman *et al.* 1996). They are reported to spawn in depths of 30-90 m (98-295 ft) off the Southeast Atlantic coast (Burgos 2001; McGovern *et al.* 2002).

Red grouper are protogynous, changing sex from female to male with increased size and age. Off North Carolina, red grouper first become males at 50.9 cm (20.1 inches) TL and males dominate size classes greater than 70.0 cm (27.8 inches) TL. Most females transform to males between ages 7 and 14. Burgos (2001) reported that 50% of the females caught off North Carolina are undergoing sexual transition at age 8. Maximum age reported by Heemstra and Randall (1993) was 25 years. Burgos (2001) and McGovern *et al.* (2002) indicated red grouper live for at least 20 years in the Southeast Atlantic and a maximum age of 26 years has been reported for red grouper in the Gulf of Mexico (L. Lombardi, NMFS Panama City, personal communication). Natural mortality rate is estimated to be 0.20 (Potts and Brennan 2001). Maximum reported size is 125.0 cm (49.2 inches) TL (male) and 23.0 kg (51.1 pounds). For fish collected off North Carolina during the late 1990s, age at 50% maturity of females is 2.4 years and size at 50% maturity is 48.7 cm (19.3 inches) TL. Off southeastern Florida, age at 50% maturity was 2.1 years and size at 50% maturity was 52.9 cm (21.0 inches) TL (Burgos 2001; McGovern *et al.* 2002). These fish eat a wide variety of fishes, octopi, and crustaceans, including shrimp, lobsters, and stomatopods (Bullock and Smith 1991, Heemstra and Randall 1993).

3.2.1.3 Scamp, *Mycteroperca phenax*

Scamp occur in the Western Atlantic, from North Carolina to Key West, in the Gulf of Mexico, and in the southern portion of the Caribbean Sea. Juveniles are sometimes encountered as far north as Massachusetts (Heemstra and Randall 1993). Its reported depth range is 30-100 m (98-328 ft) (Heemstra and Randall 1993). Juveniles are found in estuarine and shallow coastal waters (Bullock and Smith 1991; Heemstra and Randall 1993).

Scamp are protogynous, with females dominating sizes less than 70.0 cm (27.8 in) (Harris *et al.* 2002). Scamp live for at least 30 years (Harris *et al.* 2002), and attain sizes as great as 107.0 cm (42.4 inches) TL and 14.2 kg (31.3 pounds) (Heemstra and Randall 1993). Natural mortality rate is estimated to be 0.15 (Potts and Brennan 2001). Harris *et al.* (2002) report the length and age at first spawning of females off North Carolina to southeast Florida was 30.0-35.0 cm (11.9-13.8 inches) TL and age 1. Length and age at 50% maturity was 35.3 cm (13.9 in) TL and 1.28 years, respectively (Harris *et al.* 2002). In a study conducted in the eastern Gulf of Mexico, all fish larger than 35.0 cm TL were sexually mature (M. Godcharles and L. Bullock, unpublished data).

Spawning occurs from February through July in the South Atlantic Bight and in the Gulf of Mexico, with a peak in March to mid-May (Harris *et al.* 2002). Hydration of eggs occurs primarily during the morning and late afternoon, which indicates scamp spawn during late afternoon and evening. Spawning individuals have been captured off South

Carolina and St. Augustine, Florida at depths of 33 to 93 m (108-305 ft). Scamp aggregate to spawn. Spawning locations and time of spawning overlaps with gag (Gilmore and Jones 1992). Fish are the primary prey of this species (Matheson *et al.* 1986).

3.2.1.4 Black grouper, *Mycteroperca bonaci*

The black grouper occurs in the Western Atlantic, from North Carolina to Florida, Bermuda, the Gulf of Mexico, West Indies, and from Central America to Southern Brazil (Crabtree and Bullock 1998). Adults are found over hard bottom such as coral reefs and rocky ledges. Black grouper occur at depths of 9 to 30 m (30 to 98 ft). Juveniles sometimes occur in estuarine seagrass and oyster rubble habitat in North Carolina and South Carolina (Keener *et al.* 1988; Ross and Moser 1995). In the Florida Keys, juveniles settle on patch reefs (Sluka *et al.* 1994). Commercial landings of black grouper exceed landings of any other grouper in the Florida Keys.

Natural mortality (M) is estimated to be 0.15 (Potts and Brennan 2001). Crabtree and Bullock (1998) found black grouper live for at least 33 years and attain sizes as great as 151.8 cm (60.1 inches) TL. Females range in length from 15.5 to 131.0 cm (6.1-51.9 inches) TL and males range in length from 94.7 to 151.8 cm (38.3-60.1 in) TL. Black grouper are protogynous. Approximately 50% of females are sexually mature by 82.6 cm (32.7 inches) TL and 5.2 years of age. At a length of 121.4 cm (48.1 inches) TL and an age of 15.5 years, approximately 50% of the females have become males. Black grouper probably spawn throughout the year, however, peak spawning of females occurs from January to March.

Off Belize, black grouper are believed to spawn in aggregations at the same sites used by Nassau grouper (Carter and Perrine 1994). Eklund *et al.* (2000) describe a black grouper spawning aggregation discovered during winter 1997-1998, less than 100 m outside a newly designated marine reserve. Adults feed primarily on fishes.

3.2.1.5 Rock hind, *Epinephelus adscensionis*

Rock hind are found in the western Atlantic from Massachusetts to southern Brazil, Bermuda, the Gulf of Mexico, and the Caribbean, (Smith 1997). They also occur in the eastern Atlantic from Ascension Island and St. Helena Island (Smith 1997). Rock hind is a demersal species, inhabiting rocky reef habitat to depths of 120 m (394 ft). It is usually solitary.

Maximum reported size is 61.0 cm (24.2 inches) TL (male) and 4.1 kg (9.1 pounds) (Heemstra and Randall 1993). Size at maturity and age at first maturity are estimated as 28.0 cm (11.1 inches) TL and 6.1 years, respectively. Maximum reported age is 12 years (Potts and Manooch 1995). The natural mortality rate is estimated as 0.25 (Ault *et al.* 1998).

Heemstra and Randall (1993) indicated that rock hind in the Gulf of Mexico are protogynous. This fish has been observed to spawn in aggregations near the shelf edge off the southwest coast of Puerto Rico in January at depths of 20-30 m (66 – 98 ft)

(Rielinger 1999). Off Cuba, rock hind spawn during January through March (García-Cagide *et al.* 1994). Off South Carolina, females in spawning condition (hydrated oocytes or postovulatory follicles) have been collected during May through August (Unpublished MARMAP data)**.** Crabs comprise the majority of their diet, but rock hind have also been observed to feed on fishes and young sea turtles (Heemstra and Randall 1993).

3.2.1.6 Red hind, *Epinephelus guttatus*

Red hind is found in the Western Atlantic from North Carolina to Venezuela and is the most common species of *Epinephelus* in Bermuda and the West Indies (Smith 1997). Red hind is found in shallow reefs and rocky bottoms, at depths of 2-100 m (7 – 328 ft; Froese and Pauly 2003). It is usually solitary and territorial.

Maximum reported size is 76.0 cm (30.0 inches) TL (male) and 25.0 kg (55.5 pounds) (Heemstra and Randall 1993). Natural mortality rate is estimated to be 0.18 (Ault *et al.* 1998). Potts and Manooch (1995) examined 146 otoliths of red hind collected from North Carolina to the Dry Tortugas during 1980-1992 and report a maximum age of 11 years and maximum sizes of 49.0 cm (19.4 inches) TL. Sadovy *et al.* (1992) conducted an age and growth study of red hind from Puerto Rico (n = 624) and St. Thomas, USVI (n = 162) and report a maximum age of 18 and a maximum size of 47.5 cm (18.8 inches) TL. Luckhurst *et al.* (1992) captured a red hind off Bermuda that was 72.0 cm (28.5 in) TL and 22 years old.

Sadovy *et al.* (1994) found that red hind collected off Puerto Rico are protogynous. Females (n = 390) become sexually mature at 21.5 cm (9.7 in) TL, the size at 50% maturity is 28.5 cm (11.3 inches) TL, and they range in size from 11.0 to 48.0 cm (4.4 to 19.0 inches) TL. Males (n = 120) range in size from 27.3 to 51.0 cm (10.8 to 20.2 inches) TL and transitional individuals (n = 7) were from 27.5 to 34.5 cm (10.9 to 13.7 in) TL. Annual spawning aggregations occur during the full moon in January and February off the southwest coast of Puerto Rico, and during the summer in Bermuda with no relation to lunar periodicity (Shapiro *et al.* 1993; Sadovy *et al.* 1994). Spawning off Jamaica, Puerto Rico, and USVI occurs from December to February (Thompson and Munro 1978; Colin *et al.* 1987; Sadovy *et al.* 1992; Sadovy *et al.* 1994). Burnett-Herkes (1975) report that red hind spawn from April to July off Bermuda. Red hind spawn during the summer off the southeastern United States (MARMAP unpublished data).

Red hind feeds mainly on crabs and other crustaceans, fishes, such as labrids and haemulids, and octopus (Heemstra and Randall 1993).

3.2.1.7 Graysby, *Cephalopholis cruentata*

Graysby occurs from North Carolina to south Florida and in the Gulf of Mexico, Caribbean and Bermuda. The graysby inhabits seagrass (*Thalassia*) beds and coral reefs, and is found as deep as 170 m (557 ft). It is sedentary, solitary, and secretive, usually hiding during the day, and feeding at night. This small grouper is rarely landed off the southeast United States, and is more commonly seen in the Caribbean (Potts and

Manooch 1999). Graysby are probably most often landed as unclassified grouper by commercial fishermen off the southeastern United States.

Maximum reported size is 42.6 cm (16.9 inches) TL (male) and 1.1 kg (2.4 pounds). In the northeastern Caribbean, individuals in spawning condition have been observed in March, and from May to July (Erdman 1976). Nagelkerken (1979) determined that graysby collected in the Caribbean spawn from July through October. Graysby spawn during summer off the Southeastern United States (MARMAP unpublished data). Size at maturity and age at first maturity are estimated as 14.0 cm (5.5 inches) TL and 3.5 years (Nagelkerken 1979). The graysby is protogynous (Nagelkerken 1979). Sexual transition occurs at sizes ranging from 14.0 to 26.0 cm (5.5-10.3 inches) TL with most transitional individuals occurring between the sizes of 20.0-23.0 cm (7.9-9.1 inches) TL and ages 4-5.

Potts and Manooch (1999) examined otoliths from 118 graysby collected during 1979 to 1997. Maximum reported age is 13 years and maximum size is 40.5 cm (16.0 inches) TL. Juveniles feed on shrimp, while adults eat primarily fishes. Natural mortality rate is estimated as 0.20 (Ault *et al.* 1998). Adult graysby eat bony fish, shrimp, stomatopods, crabs, and gastropods (Randall 1967).

3.2.1.8 Yellowfin grouper, *Mycteroperca venenosa*

Yellowfin grouper occur in the Western Atlantic, ranging from Bermuda to Brazil and the Guianas, including the Gulf of Mexico and Caribbean Sea at depths of 2-137 m (7-449 ft). Juveniles are commonly found in shallow sea grass beds, while adults occur over rocky areas and coral reefs.

Maximum reported size is 100.0 cm (39.6 inches) TL (male) and 18.5 kg (41.1 pounds) (Heemstra and Randall 1993). Thompson and Munro (1978) reported that yellowfin grouper off Jamaica are 4 years old between 46.0-57.0 cm (18.1-22.4 inches) TL, and by 80.0 cm (31.5 inches) TL, they are 10 years of age. Manooch (1987) reported a maximum age of 15 years for yellowfin grouper. Natural mortality rate (M) is estimated to be 0.18 (Ault *et al.* 1998). This fish is believed to be protogynous. Yellowfin grouper aggregate at some of the same sites utilized by tiger grouper, Nassau grouper, and black grouper (Sadovy *et al.* 1994). Spawning occurs during March in the Florida Keys (Taylor and McMichael 1983), and from March and May to August in the Gulf of Mexico (Bullock and Smith 1991). Most spawning occurs in Jamaican waters between February and April (Thompson and Munro 1978), and during July off Bermuda (Smith 1958). Yellowfin grouper feed mainly on fishes (especially coral reef species) and squids (Heemstra and Randall 1993).

3.2.1.9 Coney, *Cephalopholis fulva*

Coney is a small grouper that occurs in the Western Atlantic, ranging from South Carolina (USA) and Bermuda to southern Brazil, including Atol das Rocas. The coney is a sedentary species. It prefers coral reefs and clear water, and can be found to depths as great as 150 m (492 ft). Coney are most commonly taken in the Caribbean, where they are found associated with patch reefs. Most commercial landings of coney are off southeast Florida and are often labeled as unclassified grouper.

Maximum reported length is 41.0 cm (16.2 inches) TL (male). This species is protogynous (Heemstra and Randall 1993). Size at 50% maturity for females sampled off the west coast of Puerto Rico was 13.0 cm (5.1 inches) FL (Figuerola and Torrez Ruiz 2000). Heemstra and Randall (1993) report that females mature at 16.0 (6.3 inches) cm TL and transform to males at about 20.0 (7.9 inches) cm TL.

Potts and Manooch (1999) examined the otoliths from 55 coney collected during 1979-1997 from North Carolina to the Dry Tortugas, Florida. The maximum reported age is 11 years and maximum size is 39.7 cm (15.7 inches) TL. Natural mortality rate is estimated as 0.18 (Ault *et al.* 1998).

Spawning occurs in small groups composed of one male and multiple females. Although ripe ovaries are found from November to March off the west coast of Puerto Rico, spawning activity appears to be limited to several days around the last quarter and new moon phases during January and February (Figuerola *et al.* 1997). The diet is composed primarily of small fishes and crustaceans (Randall 1967).

3.2.1.10 Yellowmouth grouper, *Mycteroperca interstitialis*

Yellowmouth grouper occur along the eastern U.S. coast, Bermuda, Bahamas, Gulf of Mexico, and in the Caribbean south to Brazil (Smith 1971). Adults are found over rocky hard bottom and coral reefs near the shoreline as deep as 55 m (100 ft). Individuals have been found as deep as 150 m (275 ft). Juveniles commonly occur in mangrove line lagoons.

The maximum reported size of yellowmouth grouper is 84.0 cm (33.2 inches) TL (male) and 10.2 kg (22.6 pounds) (Froese and Pauly 2003). In the Gulf of Mexico, maximum reported age for yellowmouth grouper was 28 years (Bullock and Murphy 1994), while in Trinidad and Tobago the maximum reported age was 41 years (Maninckhand-Heilman and Phillip 2000). Males (2-28 years) are generally older than females (2-17 years). Females become sexually mature between 40.0-45.0 cm (15.8-17.7 inches) TL and ages 2-4 years. Fifty percent are males at 60.0-64.9 cm (23.6-25.6 inches) TL. Fish undergo sexual transition from female to male at lengths from 50.3 to 64.3 cm (19.8-25.3 inches) TL, between the ages of 5 and 14 years. Yellowmouth grouper may spawn all year, but peak spawning of females in the Gulf of Mexico occurs during March to May (Bullock and Murphy 1994). Finfish constitute a large part of the diet of yellowmouth grouper (Randall 1967).

3.2.1.11 Tiger grouper, *Mycteroperca tigris*

Tiger grouper occur in the Western Atlantic, ranging from Bermuda and south Florida (USA) to Venezuela and, possibly Brazil, including the Gulf of Mexico and the Caribbean Sea. It inhabits coral reefs and rocky areas at depths of 10 to 40 m (33-131 ft).

Maximum reported size is 101.0 cm (40.0 inches) TL (male) and 10 kg (22.2 pounds) (Heemstra and Randall 1993). Approximate life span is 26 years, and natural mortality (M) is estimated at 0.12 (Ault *et al.* 1998).

The size-sex ratios described in a study conducted off Bermuda indicate this fish is probably protogynous (Heemstra and Randall 1993). It forms aggregations at specific times and locations each year, but only during the spawning season (Coleman *et al*. 2000; White *et al.* 2002). White *et al.* (2002) reported that spawning aggregations of tiger grouper occurred one week after the full moon during January through April off Puerto Rico. Tiger grouper spawn from December through April off southwest Cuba (García-Cagide *et al*. 1999). The tiger grouper preys on a variety of fishes, and frequents cleaning stations (Heemstra and Randall 1993).

3.2.1.12 Vermilion Snapper, *Rhomboplites aurorubens*

Vermilion snapper occur in the Western Atlantic, from North Carolina to Rio de Janeiro. It is most abundant off the southeastern United States and in the Gulf of Campeche (Hood and Johnson 1999). The vermilion snapper is demersal, commonly found over rock, gravel, or sand bottoms near the edge of the continental and island shelves (Froese and Pauly 2003). It occurs at depths from 18 to 122 m (59 to 400 ft), but is most abundant at depths less than 76 m (250 ft). Individuals often form large schools. This fish is not believed to exhibit extensive long range or local movement (SEDAR2 2003).

The maximum size of a male vermilion snapper, reported by Allen (1985), in Froese and Pauly (2003), was 60.0 cm (23.8 in) TL and 3.2 kg (7.1 lbs). Maximum reported age in the South Atlantic Bight was 14 years (Zhao *et al.* 1997; Potts *et al.* 1998b). SEDAR 2-SAR2 (2003) recommends that natural mortality (M) be defined as 0.25/yr, with a range of 0.2-0.3/yr.

This species spawns in aggregations (Lindeman *et al.* 2000) from April through late September in the southeastern United States (Cuellar *et al.* 1996). Zhao *et al.* (1997) indicated that most spawning in the South Atlantic Bight occurs from June through August. Eggs and larvae are pelagic.

Vermilion snapper are gonochorists meaning that all vermilion snapper are mature at 2 years of age and 20.0 cm (7.9 in) (SEDAR 2 2003b). Cuellar *et al.* (1996) collected vermilion snapper off the southeastern United States and found that all were mature. The smallest female was 16.5 cm (6.5 in) FL and the smallest male was 17.9 cm (7.1 in) FL (Cuellar *et al.* 1996). Zhao and McGovern (1997) reported that 100% of males that were collected after 1982 along the southeastern United States were mature at 14.0 cm (5.6 in) TL and age 1. All females collected after 1988 were mature at 18.0 cm (7.1 in) TL and age 1.

This species preys on fishes, shrimp, crabs, polychaetes, and other benthic invertebrates, as well as cephalopods and planktonic organisms (Allen 1985). Sedberry and Cuellar (1993) reported that small crustaceans (especially copepods), sergestid decapods, barnacle larvae, stomatopods, and decapods dominated the diets of small (< 50 mm (2 in)

SL) vermilion snapper off the Southeastern United States. Larger decapods, fishes, and cephalopods are more important in the diet of larger vermilion snapper.

3.2.2 Science Underlying the Management of Snapper Grouper Species Most Impacted By This FMP Amendment

The status of gag and vermilion snapper has been recently assessed through the Southeast Data, Assessment, and Review (SEDAR) process. The SEDAR process consists of a series of workshops aimed at ensuring that each assessment is based on the best available scientific information.

First, representatives from NOAA Fisheries Service, state agencies, and the South Atlantic Council, as well as experts from non-governmental organizations and academia, participate in a data workshop. The purpose of a data workshop is to assemble and review available fishery-dependent and fishery-independent data and information on a stock, and to develop consensus about what constitutes the best available scientific information on the stock, how that information should be used in an assessment, and what type of stock assessment model should be employed.

Second, assessment biologists from these agencies and organizations participate in a stock assessment workshop, where data from the data workshop are input into one or more stock assessment models (e.g., production, age-structured, length structured, etc.) to generate estimates of stock status and fishery status. Generally, multiple runs of each model are conducted: base runs and a number of additional runs to examine sensitivity of results to various assumptions (e.g., different natural mortality rates, different data sets/catch periods, etc.).

Finally, a stock assessment review workshop is convened to provide representatives from the Center for Independent Experts the opportunity to peer review the results of the stock assessment workshop. Representatives from NOAA Fisheries Service, the South Atlantic Council, and constituent groups may attend and observe the review but the actual review is conducted by the Center for Independent Experts. The Council's Scientific and Statistical Committee (SSC) then reviews the report of the stock assessment review workshop.

The review portion of the SEDAR process has helped improve the acceptance of stock assessments. However, continued lack of basic fishery data has resulted in uncertainty in the assessment results. Each SEDAR Review Panel has identified significant shortcomings in data and research (see Section 4.3 for a detailed list of research and data needs). In addition, not all of the reviews have been completed with 100% consensus.

3.2.2.1 Gag assessment and stock status

SEDAR assessment

The stock of gag off the United States South Atlantic was assessed during a SEDAR assessment workshop, held at the Wyndham Grand Bay Hotel, Miami, Florida, on May 1–5, 2006. The workshop's objectives were to complete the SEDAR 10 benchmark assessment of gag and to conduct stock projections. Participants in the benchmark assessment included state, federal, and university scientists, as well as Council members and staff, and various observers. All decisions regarding stock assessment methods and acceptable data were made by consensus (SEDAR 10 2007).

Available data on the stock included abundance indices, recorded landings, and samples of annual size compositions and age compositions from fishery-dependent sources. Three fishery–dependent abundance indices were developed by the data workshop: one from the NOAA Fisheries Service headboat survey, one from the commercial logbook program, and one from the MRFSS survey. There were no usable fishery–independent abundance data for this stock of gag. Landings data were available from all recreational and commercial fisheries. The assessment included data through 2004.

A forward projecting statistical model of catch at age was used as the primary assessment model. In addition, an age-aggregated production model was used to investigate results under a different set of model assumptions. The assessment workshop developed two base runs: one assuming a time-varying catchability and one assuming constant catchability for the fishery dependent indices. Each base run of the catch-at-age model was used for estimation of benchmarks and stock status.

Stock projections were evaluated under five scenarios starting in 2008. Each scenario applied the current fishing mortality rate (F) in years 2005–2007. Starting in 2008, the five projection scenarios included: (1) current F, (2) F_{MSY}, (3) 85% of F_{MSY}, (4) 75% of F_{MSY}, and (5) 65% of F_{MSY}.

Status

The gag stock in the Atlantic is undergoing **overfishing** as of 2004 (last year of data in the stock assessment). This means fish are being removed more quickly than the stock can replace them such that the maximum sustainable yield (MSY) cannot be achieved. The Council compares the current fishing mortality rate (F) to the level of fishing mortality that would result in overfishing (maximum fishing mortality threshold or MFMT) and if the current F is greater than the MFMT, overfishing is occurring. For gag the most recent estimate of the fishing mortality rate (F) is from 2004 and was = 0.310. The Council is using the fishing mortality rate that would produce the maximum sustainable yield (F_{MSY} = 0.237) as the maximum fishing mortality threshold. Comparing these two numbers:

- F_{2004}/MFMT = 0.310/0.237 = 1.309

This comparison is referred to as the **overfishing ratio**. If the ratio is greater than 1, then overfishing is occurring.

The gag stock in the Atlantic was not **overfished** as of the start of 2005. This means that the spawning stock biomass (pounds of spawning fish in the water) has not been reduced below the level that could produce the maximum sustainable yield. The Council compares the current spawning stock biomass (SSB) to the level of spawning stock biomass that could be rebuilt to the level to produce the MSY in 10 years. This is referred to as the minimum spawning stock biomass or MSST. For gag, the estimated level of spawning stock biomass in 2005 was 7,470,000 pounds gutted weight (gw). The Minimum stock size threshold (MSST) = 6,816,000 pounds gw. Comparing these two numbers:

- SSB_{2005}/MSST = 7,470,000/6,816,000 = 1.096

This comparison is referred to as the **overfished ratio**. If the ratio is less than 1, then the stock is overfished.

The Secretary of Commerce has notified the Council that gag is approaching an overfished status (June 2007).

Gag Total Allowable Catch

The Council's Scientific and Statistical Committee (SSC) recommended the Council restrict harvest to the F_{OY} equal to the yield associated with 75% of F_{MSY}. This would correspond to a total allowable catch (TAC) of 694,000 pounds gutted weight for all sectors in 2008 (Table 2-3).

Table 3-1. Gag total allowable catch (TAC).

Alternatives	TAC (pounds gutted weight)
Alternative 1 (no action)	Do not specify a TAC
Alternative 2 (preferred)	Set the TAC* = 694,000 pounds gutted weight for 2009 onwards based on the yield at F_{OY}.
*Source: SEDAR 10 (2007)	

3.2.2.2 Vermilion Snapper assessment and stock status

SEDAR assessment

A SEDAR stock assessment workshop was convened at the NOAA Center for Coastal Fisheries and Habitat Research Beaufort, North Carolina, on Monday, April 4, 2007. The workshop's objectives were to conduct an update assessment of the vermilion snapper off the southeastern U.S. and to conduct stock projections based on possible management scenarios. Participants in the update assessment included state and federal scientists, Council AP and SSC members, and various observers. All decisions regarding stock assessment methods and acceptable data were made by consensus (SEDAR Assessment Update #3 2007).

Available data on the species included all those utilized for the benchmark assessment conducted in 2002; no additional data sources were identified during the scoping workshop. These data were abundance indices, recorded landings, and samples of annual size compositions from indices and landings. Four abundance indices were used in the benchmark assessment: one from the NMFS headboat survey and three from the SC

MARMAP fishery-independent monitoring program. Landings data were available from all recreational and commercial fisheries. While the MARMAP chevron trap index decreased in recent years, the remaining abundance indices showed neither marked increase nor decline during the assessment period (1976–2006).

The statistical model of catch at length as developed for the benchmark assessment was used as the only assessment model. The assessment workshop provided the base run of the model, identical to that used in the benchmark assessment. This base run was used for the estimation of benchmarks and stock status. The benchmark assessment concluded that the high degree of uncertainty in recruitment and spawning stock biomass estimates meant that reliable biomass based benchmarks could not be developed from the assessment, and this was found to be the case for the update assessment as well.

The ratio of fishing mortality in 2006 to F_{MAX} was 2.05, compared to 1.71 in the benchmark assessment, suggesting that overfishing continues. Projections were used to evaluate the potential of the stock to be rebuilt, but could only be conducted for constant F scenarios. Four projections were considered: $F=F_{MAX}$; $F=85\%F_{MAX}$; $F=75\%F_{MAX}$ and $F=65F_{MAX}$; the results of each were very similar.

Stock Status

The vermilion snapper stock in the Atlantic is undergoing **overfishing** as of 2006 (last year of data in the stock assessment update). This means fish are being removed more quickly than the stock can replace them such that the maximum sustainable yield (MSY) cannot be achieved. The Council compares the current fishing mortality rate (F) to the level of fishing mortality that would result in overfishing (maximum fishing mortality threshold or MFMT) and if the current F is greater than the MFMT, overfishing is occurring. For vermilion snapper the most recent estimate of the fishing mortality rate is from 2006 and was = 0.729. The Council is using the fishing mortality rate that produces the greatest yield per fish (F_{MAX} = 0.355) as the maximum fishing mortality threshold. F_{MAX} is being used as a proxy for F_{MSY} (F_{MSY} = Fishing mortality rate that would produce maximum sustainable yield) because the SSC did not have confidence in the calculated biomass reference points. The SSC does have confidence in the fishing mortality rate estimates from the SEDAR assessment. Comparing these two numbers:

- F_{2006}/MFMT = 0.729/0.355 = 2.05

This comparison is referred to as the **overfishing ratio**. If the ratio is greater than 1, then overfishing is occurring.

Whether the vermilion snapper stock in the Atlantic is currently **overfished** is unknown because the SSC does not have confidence in the biomass reference points from the SEDAR assessment. Recognizing the need for a new benchmark assessment, NMFS and the state of South Carolina began sampling available vermilion snapper otoliths to enable an age-based assessment. Further, the SEDAR steering committee replaced white grunt in the SEDAR schedule with vermilion snapper. Results from an age-based assessment for vermilion snapper will be reviewed by the Council's Scientific and Statistical Committee (SSC) during their November 30 – December 2, 2008 meeting.

The Council was notified in June 2007 that vermilion snapper was undergoing overfishing. Therefore, the Council is obligated to develop an amendment to end overfishing by June 2008. Since efforts to reassess vermilion snapper are proceeding, NMFS should have the opportunity to review the new assessment results prior to implementing any vermilion snapper regulations proposed by the Council to address the June 2007 overfishing notification.

Vermilion Snapper Total Allowable Catch

The Council's Scientific and Statistical Committee (SSC) recommended the Council restrict harvest to the F_{OY} equal to the yield associated with 75% of F_{MSY}. This would correspond to a total allowable catch (TAC) of 628,459 pounds whole weight (566,179 pounds gutted weight) for all sectors in 2008 (Table 3-2).

Table 3-2. Vermilion snapper total allowable catch (TAC).

Alternatives	TAC
Alternative 1 (no action)	Do not specify a TAC
Alternative 2 (preferred)	Set the TAC = 628,459 pounds whole weight* (566,179 pounds gutted weight) for 2009 onwards.
*Source: SSC.	

3.2.3 Other Affected Council-Managed Species

Gag and vermilion snapper are targeted by fishermen and are commonly taken on trips together. Red grouper, scamp, blueline tilefish, red snapper, gray triggerfish, greater amberjack, white grunt, and others are also targeted by commercial fishermen and are taken on trips with gag and vermilion snapper. Gag and vermilion snapper are commonly taken on trips by recreational fishermen with white grunt, black sea bass, gray triggerfish, and red porgy. Proposed actions that would end overfishing of gag and vermilion snapper would likely affect other target and non-target snapper grouper species through bycatch and effort shifting. A detailed description of the life history of these species is provided in the Snapper Grouper SAFE report (NMFS 2005).

3.2.4 Protected Species

There are 31 different species of marine mammals that may occur in the EEZ of the South Atlantic region. All 31 species are protected under the MMPA and six are also listed as endangered under the ESA (i.e., sperm, sei, fin, blue, humpback and North Atlantic right whales). There are no known interactions between the South Atlantic snapper-grouper fishery and marine mammals. Other species protected under the ESA occurring in the South Atlantic include five species of sea turtle (green, hawksbill, Kemp's ridley, leatherback, and loggerhead); the smalltooth sawfish, and two *Acropora* coral species (elkhorn [*Acropora palmata*] and staghorn [*A. cervicornis*]). A discussion

of these species is below. Designated critical habitat for the northern right whale also occurs within the South Atlantic region.

The impacts of the South Atlantic snapper grouper fishery on ESA-listed species were evaluated in a biological opinion on the continued authorization of snapper grouper fishing under the South Atlantic Snapper Grouper Fishery Management Plan and Amendment 13C (NMFS 2006). The opinion stated the fishery was not likely to adversely affect Northern right whale critical habitat, seabirds, or marine mammals (see NMFS 2006 for discussion on these species). However, the opinion did state that the snapper grouper fishery would adversely affect sea turtles and smalltooth sawfish. A discussion of these species is below.

NOAA Fisheries Service has also recently conducted an informal section 7 consultation evaluating the impacts of the South Atlantic snapper grouper fishery on ESA-listed *Acropora* species. The consultation concluded that the continued operation of the snapper grouper fishery was not likely to adversely affect newly listed *Acropora* species. A discussion of these species is below.

3.2.4.1 ESA-Listed Sea Turtles

Green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles are all highly migratory and travel widely throughout the South Atlantic. The following sections are a brief overview of the general life history characteristics of the sea turtles found in the South Atlantic region. Several volumes exist that cover more thoroughly the biology and ecology of these species (i.e., Lutz and Musick (eds.) 1997, Lutz et al. (eds.) 2002).

Green sea turtle hatchlings are thought to occupy pelagic areas of the open ocean and are often associated with *Sargassum* rafts (Carr 1987, Walker 1994). Pelagic stage green sea turtles are thought to be carnivorous. Stomach samples of these animals found ctenophores and pelagic snails (Frick 1976, Hughes 1974). At approximately 20 to 25 cm carapace length, juveniles migrate from pelagic habitats to benthic foraging areas (Bjorndal 1997). As juveniles move into benthic foraging areas a diet shift towards herbivory occurs. They consume primarily seagrasses and algae, but are also know to consume jellyfish, salps, and sponges (Bjorndal 1980, 1997; Paredes 1969; Mortimer 1981, 1982). The diving abilities of all sea turtles species vary by their life stages. The maximum diving range of green sea turtles is estimated at 110 m (360 ft) (Frick 1976), but they are most frequently making dives of less than 20 m (65 ft.) (Walker 1994). The time of these dives also varies by life stage. The maximum dive length is estimated at 66 minutes with most dives lasting from 9 to 23 minutes (Walker 1994).

The **hawksbill's** pelagic stage lasts from the time they leave the nesting beach as hatchlings until they are approximately 22-25 cm in straight carapace length (Meylan 1988, Meylan and Donnelly 1999). The pelagic stage is followed by residency in developmental habitats (foraging areas where juveniles reside and grow) in coastal waters. Little is known about the diet of pelagic stage hawksbills. Adult foraging

typically occurs over coral reefs, although other hard-bottom communities and mangrove-fringed areas are occupied occasionally. Hawksbills show fidelity to their foraging areas over several years (van Dam and Diéz 1998). The hawksbill's diet is highly specialized and consists primarily of sponges (Meylan 1988). Gravid females have been noted ingesting coralline substrate (Meylan 1984) and calcareous algae (Anderes Alvarez and Uchida 1994), which are believed to be possible sources of calcium to aid in eggshell production. The maximum diving depths of these animals are not known, but the maximum length of dives is estimated at 73.5 minutes. More routinely, dives last about 56 minutes (Hughes 1974).

Kemp's ridley hatchlings are also pelagic during the early stages of life and feed in surface waters (Carr 1987, Ogren 1989). Once the juveniles reach approximately 20 cm carapace length they move to relatively shallow (less than 50m) benthic foraging habitat over unconsolidated substrates (Márquez-M. 1994). They have also been observed transiting long distances between foraging habitats (Ogren 1989). Kemp's ridleys feeding in these nearshore areas primarily prey on crabs, though they are also known to ingest mollusks, fish, marine vegetation, and shrimp (Shaver 1991). The fish and shrimp Kemp's ridleys ingest are not thought to be a primary prey item but instead may be scavenged opportunistically from bycatch discards or from discarded bait (Shaver 1991). Given their predilection for shallower water, Kemp's ridleys most routinely make dives of 50 m or less (Soma 1985, Byles 1988). Their maximum diving range is unknown. Depending on the life stage a Kemp's ridleys may be able to stay submerged anywhere from 167 minutes to 300 minutes, though dives of 12.7 minutes to 16.7 minutes are much more common (Soma 1985, Mendonca and Pritchard 1986, Byles 1988). Kemp's ridleys may also spend as much as 96% of their time underwater (Soma 1985, Byles 1988).

Leatherbacks are the most pelagic of all ESA-listed sea turtles and spend most of their time in the open ocean. Although they will enter coastal waters and are seen over the continental shelf on a seasonal basis to feed in areas where jellyfish are concentrated. Leatherbacks feed primarily on cnidarians (medusae, siphonophores) and tunicates. Unlike other sea turtles, leatherbacks' diets do not shift during their life cycles. Because leatherbacks' ability to capture and eat jellyfish is not constrained by size or age, they continue to feed on these species regardless of life stage (Bjorndal 1997). Leatherbacks are the deepest diving of all sea turtles. It is estimated that these species can dive in excess of 1000 m (Eckert *et al.* 1989) but more frequently dive to depths of 50 m to 84 m (Eckert *et al.* 1986). Dive times range from a maximum of 37 minutes to more routines dives of 4 to 14.5 minutes (Standora *et al.* 1984, Eckert *et al.* 1986, Eckert *et al.* 1989, Keinath and Musick 1993). Leatherbacks may spend 74% to 91% of their time submerged (Standora *et al.* 1984).

Loggerhead hatchlings forage in the open ocean and are often associated with Sargassum rafts (Hughes 1974, Carr 1987, Walker 1994, Bolten and Balazs 1995). The pelagic stage of these sea turtles are known to eat a wide range of things including salps, jellyfish, amphipods, crabs, syngnathid fish, squid, and pelagic snails (Brongersma 1972). Stranding records indicate that when pelagic immature loggerheads reach 40-60 cm straight-line carapace length they begin to live in coastal inshore and nearshore waters of

the continental shelf throughout the U.S. Atlantic (Witzell 2002). Here they forage over hard- and soft-bottom habitats (Carr 1986). Benthic foraging loggerheads eat a variety of invertebrates with crabs and mollusks being an important prey source (Burke *et al.* 1993). Estimates of the maximum diving depths of loggerheads range from 211 m to 233 m (692-764ft.) (Thayer *et al.* 1984, Limpus and Nichols 1988). The lengths of loggerhead dives are frequently between 17 and 30 minutes (Thayer *et al.* 1984, Limpus and Nichols 1988, Limpus and Nichols 1994, Lanyan *et al.* 1989) and they may spend anywhere from 80 to 94% of their time submerged (Limpus and Nichols 1994, Lanyan *et al.* 1989).

3.2.4.2 ESA-Listed Marine Fish

The historical range of the **smalltooth sawfish** in the U.S. ranged from New York to the Mexico border. Their current range is poorly understood but believed to have contracted from these historical areas. In the South Atlantic region, they are most commonly found in Florida, primarily off the Florida Keys (Simpfendorfer and Wiley 2004). Only two smalltooth sawfish have been recorded north of Florida since 1963 (the first was captured off North Carolina in 1999 (Schwartz 2003) and the other off Georgia 2002 [Burgess unpublished data]). Historical accounts and recent encounter data suggest that immature individuals are most common in shallow coastal waters less than 25 m (Bigelow and Schroeder 1953, Adams and Wilson 1995), while mature animals occur in waters in excess of 100 meters (Simpfendorfer pers. comm. 2006). Smalltooth sawfish feed primarily on fish. Mullet, jacks, and ladyfish are believed to be their primary food resources (Simpfendorfer 2001). Smalltooth sawfish also prey on crustaceans (mostly shrimp and crabs) by disturbing bottom sediment with their saw (Norman and Fraser 1938, Bigelow and Schroeder 1953).

3.2.4.3 ESA-Listed Marine Invertebrates

Elkhorn (*Acropora palmata)* and staghorn (*A. cervicornis*) coral were listed as threatened under the ESA on May 9, 2006. The Atlantic *Acropora* Status Review (*Acropora* Biological Review Team 2005) presents a summary of published literature and other currently available scientific information regarding the biology and status of both these species.

Elkhorn and **staghorn** corals are two of the major reef-building corals in the wider Caribbean. In the South Atlantic region, they are found most commonly in the Florida Keys; staghorn coral occurs the furthest north with colonies documented off Palm Beach, Florida (26º3'N). The depth range for these species ranges from <1 m to 60 m. The optimal depth range for elkhorn is considered to be 1 to 5 m depth (Goreau and Wells 1967), while staghorn corals are found slightly deeper, 5 to 15 m (Goreau and Goreau 1973).

All Atlantic *Acropora* species (including elkhorn and staghorn coral) are considered to be environmentally sensitive, requiring relatively clear, well-circulated water (Jaap *et al.*

1989). Optimal water temperatures for elkhorn and staghorn coral range from 25° to 29°C (Ghiold and Smith 1990, Williams and Bunkley-Williams 1990). Both species are almost entirely dependent upon sunlight for nourishment, contrasting the massive, boulder-shaped species in the region (Porter 1976, Lewis 1977) that are more dependent on zooplankton. Thus, Atlantic *Acropora* species are much more susceptible to increases in water turbidity than some other coral species.

Fertilization and development of elkhorn and staghorn corals is exclusively external. Embryonic development culminates with the development of planktonic larvae called planulae (Bak *et al.* 1977, Sammarco 1980, Rylaarsdam 1983). Unlike most other coral larvae, elkhorn and staghorn planulae appear to prefer to settle on upper, exposed surfaces, rather than in dark or cryptic ones (Szmant and Miller 2006), at least in a laboratory setting. Studies of elkhorn and staghorn corals indicated that larger colonies of both species[1] had higher fertility rates than smaller colonies (Soong and Lang 1992).

3.2.4.4 South Atlantic Snapper Grouper Fishery Interactions with ESA-Listed Species

Sea turtles are vulnerable to capture by bottom longline and vertical hook-and-line gear. The magnitude of the interactions between sea turtles and the South Atlantic snapper grouper fishery was evaluated in NMFS (2006) using data from the Supplementary Discard Data Program (SDDP). Three loggerheads and three unidentified sea turtles were caught on vertical lines; one leatherback and one loggerhead were caught on bottom longlines, all were released alive (Table 3-3). The effort reported program represented between approximately 5% and 14% of all South Atlantic snapper grouper fishing effort. These data were extrapolated in NMFS (2006) to better estimate the number of interactions between the entire snapper grouper fishery and ESA-listed sea turtles. The extrapolated estimate was used to project future interactions (Table 3-2).

The SDDP does not provide data on recreational fishing interactions with ESA-listed sea turtle species. However, anecdotal information indicates that recreational fishermen occasionally take sea turtles with hook-and-line gear. The biological opinion also used the extrapolated data from the SDDP to estimate the magnitude of recreational fishing on sea turtles (Table 3-3).

Smalltooth sawfish are also considered vulnerable to capture by bottom longline and vertical hook-and-line gear based on their capture in other southeast fisheries using such gear (Poulakis and Seitz 2004; Simpfendorfer and Wiley 2004). SDDP data does not include any reports of smalltooth sawfish being caught in the South Atlantic commercial snapper grouper fishery. There are no other documented interactions between smalltooth sawfish and the South Atlantic commercial snapper grouper fishery. However, the potential for interaction, led NOAA Fisheries Service to estimate future interactions between smalltooth sawfish and the snapper grouper fishery in the biological opinion (Table 3-4).

[1] As measured by surface area of the live colony

Table 3-3. Sea turtle incidental take data from the supplementary discard data program (SDDP) for the Southeast U.S. Atlantic.

Reporting Period	Month	Logbook Statistical Grid	Species Caught	Number Caught	Discard Condition
Vertical Hook-and-Line Sea Turtle Catch Data					
8/1/01-7/31/02	April	2482	Unidentified	1	Alive
8/1/01-7/31/02	November	3377	Loggerhead	1	Alive
8/1/02-7/31/03	February	2780	Loggerhead	1	Alive
8/1/02-7/31/03	November	3474	Loggerhead	1	Alive
8/1/02-7/31/03	November	3476	Unknown	1	Alive
8/1/02-7/31/03	December	3476	Unknown	1	Alive
Bottom Longline Sea Turtle Catch Data					
8/1/01-7/31/02	August	3674	Leatherback	1	Alive
8/1/03-7/31/04	January	3575	Loggerhead	1	Unknown

Source: SEFSC Supplementary Discard Data Program

Table 3-4. Three year South Atlantic anticipated takes of ESA-Listed species for snapper grouper gears.

Species	Amount of Take	Total
Green	Total Take	39
	Lethal Take	14
Hawksbill	Total Take	4
	Lethal Take	3
Kemp's ridley	Total Take	19
	Lethal Take	8
Leatherback	Total Take	25
	Lethal Take	15
Loggerhead	Total Take	202
	Lethal Take	67
Smalltooth sawfish	Total Take	8
	Lethal Take	0

Source: NMFS 2006

3.3 *Administrative Environment*

3.3.1 The Fishery Management Process and Applicable Laws

3.3.1.1 Federal Fishery Management

Federal fishery management is conducted under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (16 U.S.C. 1801 et seq.), originally enacted in 1976 as the Fishery Conservation and Management Act. The Magnuson-Stevens Act claims sovereign rights and exclusive fishery management authority over most fishery resources within the U.S. Exclusive Economic Zone (EEZ), an area extending 200 nautical miles from the seaward boundary of each of the coastal states, and authority over U.S. anadromous species and continental shelf resources that occur beyond the U.S. EEZ.

Responsibility for Federal fishery management decision-making is divided between the U.S. 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 Secretary of Commerce (Secretary) is responsible for collecting and providing the data necessary for the councils to prepare fishery management plans and for promulgating regulations to implement proposed plans and amendments after ensuring that management measures are consistent with the M-Magnuson-Stevens Act and with other applicable laws summarized in Section 7.0. In most cases, the Secretary has delegated this authority to NOAA Fisheries Service.

The South Atlantic Fishery Management Council is responsible for conservation and management of fishery resources in Federal waters of the U.S. South Atlantic. These waters extend from 3 to 200 miles offshore from the seaward boundary of the States of North Carolina, South Carolina, Georgia, and east Florida to Key West. The Council has thirteen voting members: one from NOAA Fisheries Service; one each from the state fishery agencies of North Carolina, South Carolina, Georgia, and Florida; and eight public members appointed by the Secretary. On the South Atlantic Council, there are two public members from each of the four South Atlantic States. Non-voting members include representatives of the U.S. Fish and Wildlife Service, U.S. Coast Guard, State Department, and Atlantic States Marine Fisheries Commission (ASMFC). The South Atlantic Council has adopted procedures whereby the non-voting members serving on the Council Committees have full voting rights at the Committee level but not at the full Council level. Council members serve three-year terms and are recommended by State Governors and appointed by the Secretary of Commerce from lists of nominees submitted by State governors. Appointed members may serve a maximum of three consecutive terms.

Public interests also are involved in the fishery management process through participation on Advisory Panels and through council meetings, which, with few

exceptions for discussing personnel matters, are open to the public. The Council uses a Scientific and Statistical Committee to review the data and science being used in assessments and fishery management plans/amendments. In addition, the regulatory process is in accordance with the Administrative Procedures Act, in the form of "notice and comment" rulemaking.

3.3.1.2 State Fishery Management

The state governments of North Carolina, South Carolina, Georgia, and Florida have the authority to manage fisheries that occur in waters extending three nautical miles from their respective shorelines. North Carolina's marine fisheries are managed by the Marine Fisheries Division of the North Carolina Department of Environment and Natural Resources. The Marine Resources Division of the South Carolina Department of Natural Resources regulates South Carolina's marine fisheries. Georgia's marine fisheries are managed by the Coastal Resources Division of the Department of Natural Resources. The Marine Fisheries Division of the Florida Fish and Wildlife Conservation Commission is responsible for managing Florida's marine fisheries. Each state fishery management agency has a designated seat on the South Atlantic Council. The purpose of state representation at the council level is to ensure state participation in Federal fishery management decision-making and to promote the development of compatible regulations in state and Federal waters.

The South Atlantic states are also involved through the Atlantic States Marine Fisheries Commission (ASMFC) in management of marine fisheries. This commission was created to coordinate state regulations and develop management plans for interstate fisheries. It has significant authority, through the Atlantic Striped Bass Conservation Act and the Atlantic Coastal Fisheries Cooperative Management Act, to compel adoption of consistent state regulations to conserve coastal species. The ASFMC also is represented at the Council level, but does not have voting authority at the Council level.

NOAA Fisheries Service' State-Federal Fisheries Division is responsible for building cooperative partnerships to strengthen marine fisheries management and conservation at the state, inter-regional, and national levels. This division implements and oversees the distribution of grants for two national (Inter-jurisdictional Fisheries Act and Anadromous Fish Conservation Act) and two regional (Atlantic Coastal Fisheries Cooperative Management Act and Atlantic Striped Bass Conservation Act) programs. Additionally, it works with the ASMFC to develop and implement cooperative State-Federal fisheries regulations.

3.3.2 Enforcement

Both the National Oceanic and Atmospheric Administration (NOAA) Fisheries Office for Enforcement (NOAA/OLE) and the United States Coast Guard (USCG) have the authority and the responsibility to enforce South Atlantic Council regulations. NOAA/OLE agents, who specialize in living marine resource violations, provide fisheries expertise and investigative support for the overall fisheries mission. The USCG is a multi-mission agency, which provides at-sea patrol services for the fisheries mission.

Neither NOAA/OLE nor the USCG can provide a continuous law enforcement presence in all areas due to the limited resources of NOAA/OLE and the priority tasking of the USCG. To supplement at-sea and dockside inspections of fishing vessels, NOAA entered into Cooperative Enforcement Agreements with all but one of the states in the Southeast Region (North Carolina), which granted authority to state officers to enforce the laws for which NOAA/OLE has jurisdiction. In recent years, the level of involvement by the states has increased through Joint Enforcement Agreements, whereby states conduct patrols that focus on Federal priorities and, in some circumstances, prosecute resultant violators through the state when a state violation has occurred.

NOAA General Counsel issued a revised Southeast Region Magnuson-Stevens Act Penalty Schedule in June 2003, which addresses all Magnuson-Stevens Act violations in the Southeast Region. In general, this Penalty Schedule increases the amount of civil administrative penalties that a violator may be subject to up to the current statutory maximum of $120,000 per violation.

3.4 *Human Environment*

3.4.1 Description of the Fishery

A more detailed description of the snapper-grouper fishery is contained in previous amendments [Amendment 13C (SAFMC 2006), Amendment 15A (SAFMC 2007), and Amendment 15B (SAFMC 2008)] and is incorporated herein by reference. The following sections summarize key information relevant to this amendment.

3.4.1.1 Commercial Fishery

3.4.1.1.1 Gear and Fishing Behavior

The commercial snapper-grouper fishery utilizes vertical lines, longlines, black sea bass pots/traps, spears, and powerheads (i.e., spears with spring-loaded firearms). Vertical lines are used from the North Carolina/Virginia border to the Atlantic side of Key West, Florida. The majority of hook and line fishermen use either electric or hydraulic reels (bandit gear) and generally have 2-4 bandit reels per boat. The majority of the bandit fleet fishes year round for snapper-grouper with the only seasonal differences in catch associated with the regulatory spawning season closures in March and April for gag. Most fluctuations in fishing effort in this fishery are a result of the weather. Trips can be limited during hurricane season and also during the winter months from December through March. Some fishermen stop bandit fishing to target king mackerel when they are running.

The Council allows the use of bottom longlines north of St. Lucie Inlet, Florida, in depths greater than 50 fathoms. Bottom longline gear is used to target snowy grouper and golden tilefish. Longline boats are typically bigger than bandit boats, their trips are longer, and they cost more to operate because they operate farther offshore. A longline spool generally holds about 15 miles of cable. Longlines are fished from daylight to dark because sea lice eat the flesh of hooked fish at night. The fishery is operated year long with little or no seasonal fluctuation barring hurricane disruption.

Spears or powerheads are most commonly used off Florida and are illegal for killing snapper-grouper species in South Carolina and Special Management Zones.

Black sea bass pots are used exclusively to target black sea bass, though bycatch of other snapper-grouper species is allowed. The pots have mesh size, material, and construction restrictions to facilitate bycatch reduction. All sea bass pots must have a valid identification tag attached and more than 87% of tags in April, 2003 were for vessels with homeports in North Carolina. Fishing practices vary by buoy practices, setting/pulling strategies, number of pots set, and length of set, with seasonal variations. The South Carolina pot fishery is mainly a winter fishery with short soak times (in some cases about an hour) and relatively few pots per boat. Most trips are day trips with pots being retrieved before heading to port. The North Carolina pot fishery also is primarily a

winter fishery with some fishermen continuing to pot through the summer. North Carolina fishermen tend to use more pots than those in South Carolina. Although most North Carolina trips with sea bass pots last one day, more pots are left to soak for several days than in South Carolina. Many participants in the black sea bass fishery are active in other fisheries, including the recreational charter fishery during the summer months. Many snapper-grouper permit holders maintain pot endorsements but are not active in the pot fishery.

3.4.1.1.2 *Landings, Ex-vessel Value, Price, and Effort*

Landings of all species in the snapper-grouper management unit averaged 6.77 million pounds from 2001 through 2006, with an average annual dockside value of $12.99 million in current year dollars and $13.55 million in constant 2005 dollars (Table 3-5).[2] The shallow water groupers and mid-shelf snappers are the largest species groups by volume and value within the snapper-grouper fishery. Vermilion snapper in the mid-shelf snapper group is the largest volume species in the fishery, and accounts for 13% of total landings and 17% of dockside revenues on trips with at least one pound of snapper-grouper species. Gag is the largest volume shallow water grouper, and accounts for 6% of total landings and 10% of dockside revenues on trips that landed at least one pound of snapper-grouper species. Fishermen also landed an average of 1.84 million pounds of non-snapper-grouper species worth $1.95 million in current year dollars on trips that landed at least one pound of species in the snapper-grouper management unit. These trips included trips that targeted species in the snapper-grouper management unit and trips that landed snapper-grouper species while targeting non-snapper-grouper species.

Landings and dockside revenues declined between 2001 and 2006 for species in the snapper-grouper management unit (Table 3-5). Part of the declines appear to be attributable to variation in landings of vermilion snapper, which experienced a significant decline in 2003 due to unusually cold water temperatures in the summer and fall of 2003. Landings of vermilion snapper recovered in 2004 and 2005, but not to the levels experienced in 2001 and 2002, and declined again in 2006.

[2] Fishermen are required to report their landings by species by trip to NOAA Fisheries Service Southeast Fisheries Science Center logbook program. However, they do not report prices or revenues on their logbook sheets. Therefore, trip revenues were approximated as reported landings from individual logbook reports multiplied by average monthly prices for each species as calculated from the NOAA Fisheries Service Accumulated Landings System.

Table 3-5. Annual landings and dockside (ex-vessel) revenues for trips with at least one pound of species in the snapper-grouper fishery management unit in the south Atlantic.

Item	2001	2002	2003	2004	2005	2006	Average
	Trips with at least one pound of snapper-grouper species						
Snapper-grouper landings (million pounds, whole wgt)	7.60	7.36	6.50	6.70	6.39	6.07	6.77
Dockside revenue from snapper-grouper species (million dollars)	$13.95	$13.55	$12.12	$12.70	$12.98	$12.63	$12.99
Dockside revenue in constant 2005 dollars (millions)*	$15.38	$14.71	$12.87	$13.13	$12.98	$12.23	$13.55
Price/lb (whole wgt) for snapper-grouper species	$1.83	$1.84	$1.86	$1.90	$2.03	$2.08	$1.92
Price/lb in constant 2005 dollars*	$2.02	$2.00	$1.98	$1.96	$2.03	$2.01	$2.00
Producer price index for #2 diesel fuel, adjusted to constant 2005 price levels (index=100 for 2005)	44.1	41.2	53.1	67.8	100.0	114.7	70.2
Landings of other species on these trips (million lbs)	1.71	1.76	2.10	1.65	1.74	2.06	1.84
Dockside revenue from other species on these trips (million $)	$1.97	$1.96	$1.92	$1.78	$1.92	$2.17	$1.95
Dockside revenue from other species in constant 2005 dollars (millions)	$2.17	$2.13	$2.04	$1.84	$1.92	$2.10	$2.03
Vermilion snapper landings (million pounds)	1.65	1.31	0.77	1.07	1.16	0.86	1.14
Gag landings (million pounds)	0.52	0.53	0.60	0.53	0.54	0.50	0.54

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007. *The Consumer Price Index for all Urban Consumers was used to adjust dockside revenues and average annual prices for inflation.

In addition, participation in the snapper-grouper fishery has declined over time. The number of boats with snapper-grouper permits declined from 1,264 in 2001 to 1,007 in 2005 (Table 3-6). Two types of permits were created with the limited access program for the snapper-grouper fishery that was implemented in 1998. The number of transferable permits that allow an unlimited harvest per trip declined from 959 in 2001 to 801 in 2005, while the number of vessels with non-transferable permits with a 225-pound trip limit declined from 305 in 2001 to 206 in 2005. Preliminary information suggests additional declines in 2006. The number of transferable permits declined, in part, because new entrants into the fishery must buy two permits and retire one as the condition for entry into the fishery. Furthermore, it is likely that the number of vessels in the snapper-grouper fishery declined for economic reasons. Average annual prices, as indexed by the ratio of annual commercial revenues to landings, for species in the snapper-grouper management unit remained relatively constant when adjusted for inflation, whereas fuel prices more than doubled since 2001 (Table 3-5). The net result has been a decline since 2001 in the number of vessels, trips and days fished for species in the snapper-grouper management unit (Table 3-6). The decline in the number of vessels is evident in all harvest categories except for the highest producing category of 50,000 pounds or more per year. The number of fish dealers with permits to operate in the snapper-grouper fishery reached a maximum in 2003 and has declined since then (Table 3-6).

From 2001 through 2006, an average of 922 boats averaged 15,500 trips per year on which at least one pound of snapper-grouper species was landed (Table 3-6). On average, 528 boats landed at least 1000 pounds of snapper-grouper species annually; 260 boats landed at least 5000 pounds; 173 boats landed at least 10,000 pounds; and 27 boats landed at least 50,000 pounds of snapper-grouper species.

Table 3-6. Fishing effort and distribution of catch for trips with at least one pound of species in the snapper-grouper fishery management unit in the south Atlantic.

Item	2001	2002	2003	2004	2005	2006	Average
	Trips with at least one pound of snapper-grouper species						
Number of trips	17,278	17,199	16,563	15,045	13,757	13,159	15,500
Days away from port	29,932	29,580	27,620	24,828	22,810	23,005	26,296
Number of vessels landing snapper-grouper species	1,002	976	931	905	858	857	922
Number of vessels with more than 100 lbs of snapper-grouper spp.	867	829	791	749	720	697	776
Number of vessels with more than 1,000 lbs of snapper-grouper spp.	593	589	546	524	476	442	528
Number of vessels with more than 5,000 lbs of snapper-grouper spp.	287	280	277	261	238	217	260
Number of vessels with more than 10,000 lbs of snapper-grouper spp.	195	198	173	165	153	154	173
Number of vessels with more than 50,000 lbs of snapper-grouper spp.	26	27	20	32	29	26	27
Number of permitted vessels	1,264	1,174	1,123	1,066	1,007	974	1,101
Number of vessels with transferable permits	959	907	879	841	801	783	862
Number of vessels with non-transferable permits	305	267	244	225	206	191	240
Number of dealer permits	252	246	271	269	268	251	260

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007 and NOAA Fisheries Service, Southeast Regional Office permits database.

3.4.1.1.3 *The Snapper Grouper Fishery by State*

The following discussion provides annual averages from 2001 to 2006. To maintain the confidentiality of individual reporting units, summaries are provided for regions defined as North Carolina, South Carolina, Georgia and northeast Florida combined, and central and south Florida combined. The northeast Florida region consists of trips landed in Nassau, Duval and St. Johns Counties, and the central and south Florida region consists of trips landed from Flagler through Miami-Dade Counties and trips from Atlantic waters off the Florida Keys and landed in Monroe County.

The average annual quantities of snapper-grouper species harvested from 2001-2006 included 1.86 million pounds worth $3.46 million per year in North Carolina, 1.64 million pounds worth $3.44 million in South Carolina, 0.81 million pounds worth $1.65 million in Georgia and northeast Florida, and 2.46 million pounds worth $4.44 million in central and south Florida (Table 3-7). Snapper-grouper landings by state were not proportional to total days fished in each state. Boats in central and south Florida made 72% of the trips that landed species in the snapper-grouper management unit and accounted for 36% of the total snapper-grouper harvest. Conversely, boats in other states accounted for relatively larger portions of the total snapper-grouper harvest. Boats in North Carolina made 18% of the trips and landed 27% of the snapper-grouper harvest. Boats in South Carolina made 6% of the trips and landed 24% of the harvest. In addition, boats in Georgia and northeast Florida made 4% of the trips and landed 12% of the snapper-grouper harvest. Boats in South Carolina and Georgia and northeast Florida took fewer but longer trips than their counterparts in North Carolina or central and south Florida.

Gag and other shallow water groupers and vermilion snapper and other mid-shelf snappers tend to be landed in North Carolina, South Carolina, and Georgia and northeast Florida, while jacks and shallow water snappers tend to be landed in central and south Florida (Tables 3-8 and 3-9). The species groups that accounted for more than 10% of total landings and revenues in North Carolina include shallow water groupers with nearly 22% of total pounds landed and nearly 30% of total revenues on trips with at least one pound of snapper-grouper species; black sea bass with 20% of total landings and 19% of total revenues; and mid-shelf snappers with 18% of total landings and 25% of total revenues. In South Carolina, the shallow water groupers accounted for 27% of total pounds and 38% of total revenues, and the mid-shelf snappers accounted for 26% of total pounds and 30% of total revenues. In Georgia and northeast Florida, mid-shelf snappers accounted for 45% of total pounds and 52% of total revenues, shallow water groupers accounted for 18% of total pounds and nearly 25% of total revenues, and jacks accounted for 16% of total pounds and 6% of total revenues. In central and south Florida, the shallow water snappers accounted for 29% of total pounds and nearly 41% of total revenues, and jacks accounted for 17% of total pounds and 10% of total revenues on trips with at least one pound of snapper-grouper species. Fishermen in central and south Florida, especially in the Keys, tend to catch larger quantities of non-snapper-grouper species such as mackerels.

Table 3-7. Average annual landings and dockside revenues for trips with at least one pound of species in the snapper-grouper fishery, averages for 2001-2006 by state.

Item	North Carolina	South Carolina	Georgia and Northeast Florida	Central and South Florida	Total
	Trips with at least one pound of snapper-grouper species				
Snapper-grouper landings (million pounds, whole wgt)	1.86	1.64	0.81	2.46	6.77
Percent of total snapper-grouper pounds	27.4%	24.2%	12.0%	36.4%	100%
Dockside revenue from snapper-grouper species (million dollars)	$3.46	$3.44	$1.65	$4.44	$12.99
Percent of total snapper-grouper revenues	26.7%	26.5%	12.7%	34.2%	100%
Landings of other species on these trips (million lbs)	0.29	0.14	0.07	1.34	1.84
Dockside revenue from other species on these trips (million $)	$0.32	$0.18	$0.15	$1.30	$1.95
Number of boats*	170	66	50	650	922
Number of trips	2,801	956	560	11,183	15,500
Percent of trips	18.1%	6.2%	3.6%	72.1%	100%
Number of days	4,979	4,835	2,290	14,192	26,296
Trips per boat	16.5	14.5	11.2	17.2	16.8
Days per trip	1.8	5.1	4.1	1.3	1.7

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007. *****Some boats land in more than one state.

Table 3-8. Average annual landings (in thousands of pounds, whole weights) on trips that landed at least one pound of snapper-grouper species: averages for 2001-2006 by state and species group.

Item	North Carolina		South Carolina		Georgia and Northeast Florida		Central and South Florida		Total	
	lbs, 1000s	column percent	lbs, 1000s	column percent	lbs, 1000s	column percent	lbs, 1000s	column percent	lbs, 1000s	column percent
Shallow water groupers	464	21.6%	480	26.9%	163	18.5%	225	5.9%	1,332	15.5%
Deep water groupers	95	4.5%	98	5.5%	7	0.8%	113	3.0%	313	3.6%
Tilefishes	105	4.9%	150	8.4%	3	0.3%	252	6.6%	509	5.9%
Shallow water snappers	12	0.6%	18	1.0%	23	2.7%	1,104	29.1%	1,157	13.4%
Mid-shelf snappers	385	18.0%	467	26.2%	400	45.4%	68	1.8%	1,320	15.3%
Triggerfish /Spadefish	117	5.4%	69	3.8%	51	5.8%	6	0.2%	242	2.8%
Jacks	118	5.5%	159	8.9%	142	16.1%	647	17.0%	1,066	12.4%
Grunts & porgies	126	5.9%	80	4.5%	16	1.8%	42	1.1%	265	3.1%
Sea basses	436	20.3%	120	6.7%	6	0.7%	5	0.1%	567	6.6%
Snapper-grouper	1,858	86.6%	1,641	91.9%	811	92.1%	2,462	64.8%	6,771	78.7%
Coastal pelagics	205	9.5%	55	3.1%	40	4.6%	907	23.9%	1,207	14.0%
Sharks	11	0.5%	19	1.1%	7	0.8%	319	8.4%	357	4.1%
Tunas	25	1.1%	2	0.1%	1	0.1%	1	0.0%	29	0.3%
Other species	46	2.1%	68	3.8%	21	2.4%	109	2.9%	244	2.8%
All species	2,145	100.0%	1,785	100.0%	881	100.0%	3,798	100.0%	8,608	100.0%
Vermilion snapper	365	17.0%	424	23.8%	330	37.5%	18	0.5%	1,138	13.2%
Gag	146	6.8%	206	11.5%	99	11.3%	86	2.3%	537	6.2%

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

Table 3-9. Average annual dockside revenues in thousands of constant 2005 dollars on trips that landed at least one pound of snapper-grouper species: averages for 2001-2006 by state and species group.

Item	North Carolina		South Carolina		Georgia and Northeast Florida		Central and South Florida		Total	
	dollars, 1000s	column percent	dollars, 1000s	column percent	dollars, 1000s	column percent	dollars, 1000s	column percent	dollars, 1000s	column percent
Shallow water groupers	1,165	29.5%	1,433	38.0%	463	24.6%	600	10.0%	3,661	23.5%
Deep water groupers	212	5.4%	247	6.6%	17	0.9%	276	4.6%	752	4.8%
Tilefishes	128	3.2%	255	6.8%	6	0.3%	511	8.5%	899	5.8%
Shallow water snappers	24	0.6%	43	1.1%	51	2.7%	2,435	40.7%	2,553	16.4%
Mid-shelf snappers	1,001	25.4%	1,110	29.5%	984	52.2%	173	2.9%	3,268	21.0%
Triggerfish /Spadefish	123	3.1%	73	1.9%	54	2.9%	7	0.1%	256	1.6%
Jacks	100	2.5%	143	3.8%	123	6.5%	593	9.9%	959	6.2%
Grunts and porgies	117	3.0%	78	2.1%	17	0.9%	37	0.6%	249	1.6%
Sea basses	737	18.7%	199	5.3%	9	0.5%	8	0.1%	953	6.1%
Snapper-grouper	3,607	91.5%	3,581	95.1%	1,724	91.5%	4,638	77.4%	13,550	86.9%
Coastal pelagics	262	6.7%	93	2.5%	69	3.7%	950	15.9%	1,375	8.8%
Sharks	3	0.1%	13	0.3%	2	0.1%	121	2.0%	139	0.9%
Tunas	33	0.8%	4	0.1%	1	0.1%	2	0.0%	40	0.3%
Other species	39	1.0%	76	2.0%	88	4.7%	278	4.6%	481	3.1%
All species	3,943	100.0%	3,767	100.0%	1,885	100.0%	5,989	100.0%	15,584	100.0%
Vermilion snapper	943	23.9%	984	26.1%	776	41.2%	40	0.7%	2,743	17.6%
Gag	400	10.1%	639	17.0%	290	15.4%	255	4.2%	1,583	10.2%

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007, and NOAA Fisheries Service, Southeast Fisheries Science Center Accumulated Landings System as of October 5, 2007.

3.4.1.1.4 *The Snapper Grouper Fishery by Gear*

The following discussion provides annual averages from 2001 to 2006. To maintain the confidentiality of individual reporting units, summaries are provided for vertical lines, longlines, black sea bass pots, and all other gears combined. The all-other-gear category includes trolling lines, diving gear, nets and other gears.

Most of the snapper-grouper harvest, including vermilion snapper and gag, is taken by some type of vertical hook-and-line gear. The exceptions include black sea bass, which is harvested primarily with black sea bass pots, and golden tilefish and yellowedge grouper, which are harvested primarily with bottom longlines. Some species, such as snowy grouper, are harvested by both vertical lines and longlines. Longlines also are used in the shark fishery and may catch species in the snapper-grouper management unit as secondary species.

The average quantities of snapper-grouper species harvested from 2001-2006 included 5.36 million pounds worth $10.48 million per year with vertical lines, 0.54 million pounds worth $1.02 million with longlines, 0.53 million pounds worth $0.83 million with black sea bass pots, and 0.34 million pounds worth $0.65 million with other gears (Table 3-10). Trips with vertical lines accounted for 78% of all trips that landed species in the snapper-grouper management unit and 79% of the total snapper-grouper harvest. Trips with longlines tend to be longer than trips with other gears. Longline trips accounted for 2% of the trips and 8% of the snapper-grouper harvest. Trips with black sea bass pots represented 5% of the trips and accounted for 8% of the harvest, while trips with other gears represented 15% of the trips and 5% of the harvest.

Table 3-10. Average annual landings and dockside revenues for trips with at least one pound of species in the snapper-grouper fishery: averages for 2001-2006 by primary gear.

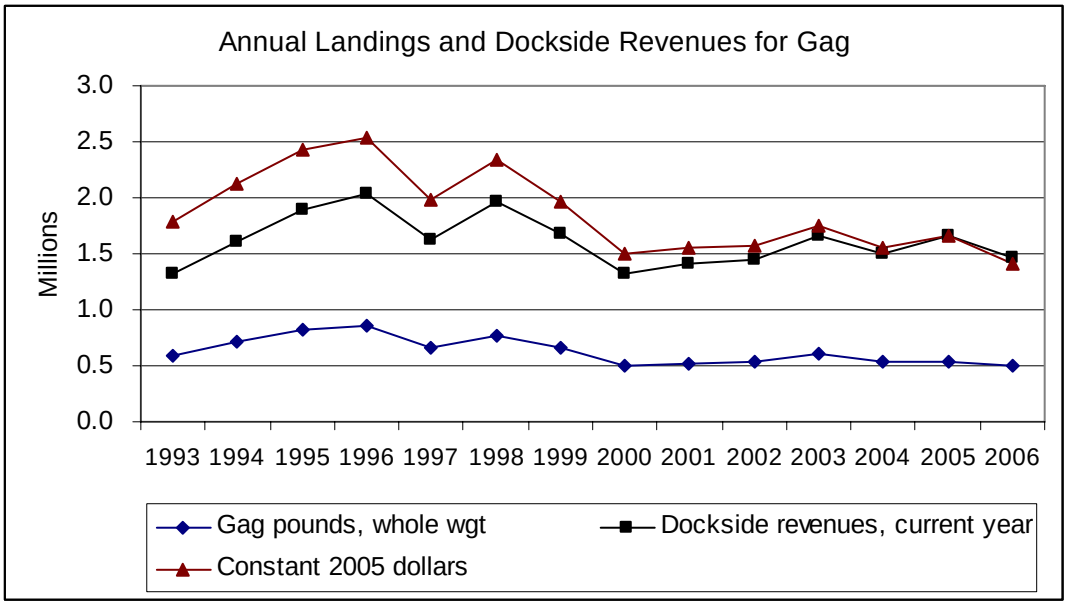
Item	Vertical Lines	Longlines	Traps / Pots	Other Gears	Total
	Trips with at least one pound of snapper-grouper species				
Vermilion snapper landings (million pounds, whole wgt)	1.13	0.00	0.00	0.01	1.14
Percent of total vermilion snapper pounds	99.3%	0.0%	0.1%	0.5%	100.0%
Gag landings (million pounds, whole wgt)	0.44	0.00	0.00	0.09	0.54
Percent of total gag pounds	81.7%	0.7%	0.2%	17.4%	100.0%
Snapper-grouper landings (million pounds, whole wgt)	5.36	0.54	0.53	0.34	6.77
Percent of total snapper-grouper pounds	79.2%	7.9%	7.8%	5.1%	100%
Dockside revenue from snapper-grouper species (million dollars)	$10.48	$1.02	$0.83	$0.65	$12.99
Percent of total snapper-grouper revenues	80.7%	7.9%	6.4%	5.0%	100%
Dockside revenue in constant 2005 dollars (millions)*	$10.93	$1.07	$0.87	$0.68	$13.55
Landings of other species on these trips (million lbs)	0.60	0.35	0.02	0.87	1.84
Dockside revenue from other species on these trips (million $)	$0.78	$0.19	$0.03	$0.96	$1.95
Dockside revenue from other species in constant 2005 dollars (millions)	$0.80	$0.20	$0.03	$1.01	$2.03
Number of boats*	749	33	53	304	922
Number of trips	12,065	286	793	2,357	15,500
Percent of trips	77.8%	1.8%	5.1%	15.2%	100%
Number of days	21,187	1,239	1,027	2,844	26,296
Trips per boat	16.1	8.7	15.0	7.8	16.8
Days per trip	1.8	4.3	1.3	1.2	1.7

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.
Some boats fish with more than one primary gear.

3.4.1.1.5 *The commercial fishery for gag*

Logbook data provide information about commercial landings for gag from 1993 through 2006. Between 1993 and 2006, commercial landings of gag ranged from a high of 0.85 million pounds (whole weight) worth approximately $2.03 million in 1996 to a low of 0.50 million pounds worth $1.32 million in 2000 (Figure 3-1). Preliminary data for 2006 indicate that landings of gag were approximately 0.50 million pounds worth $1.46 million. Dockside revenues and pounds landed fluctuate in the same direction, which suggests that ex-vessel demand is price elastic. The policy implication is that regulations that reduce industry landings in the short-term are expected to reduce dockside revenues in the short-term. Conversely, dockside revenues are expected to increase over time if regulation successfully increases biomass and landings.

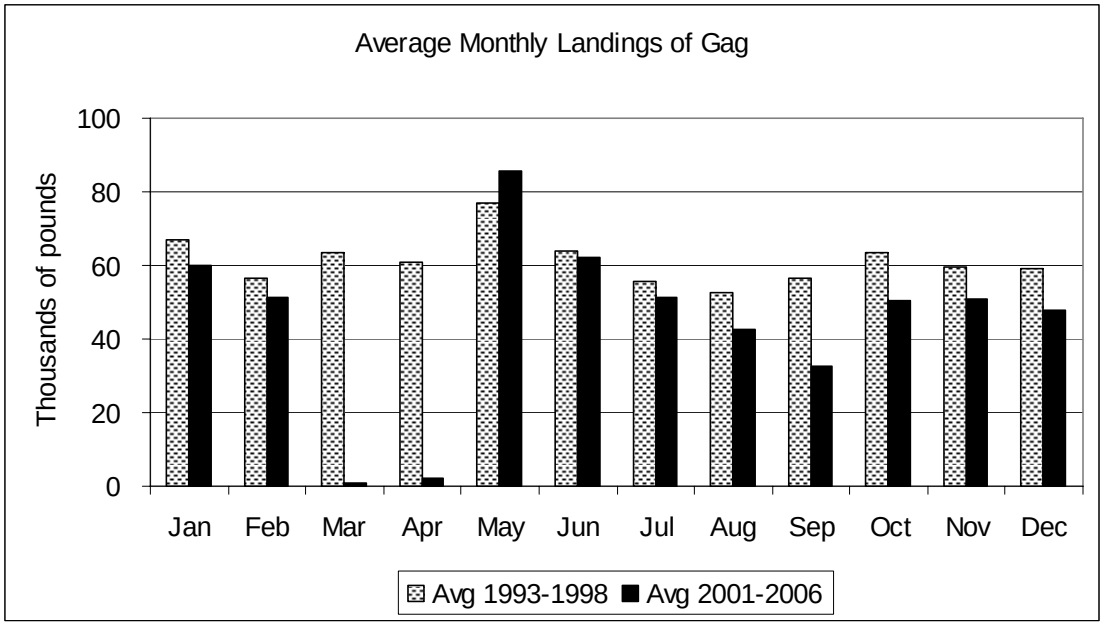
Figure 3-1. Annual landings and dockside revenues for gag, 1993-2006.



Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007, and NOAA Fisheries Service, Southeast Fisheries Science Center Accumulated Landings System as of October 5, 2007.

The time series for gag is defined by regulatory periods, with landings between 1993 and 1999 usually exceeding landings between 2000 and 2006. Between 1992 and 1998, the fishery for gag was regulated with a 20-inch minimum size limit. Beginning in 1999, the size limit was increased to 24 inches and the fishery was closed in March and April to protect the spawning stock. Prior to 1998, average monthly landings were highest in May and lowest in August (Figure 3-2). After the closure and larger size limit were implemented, average monthly landings increased in May, but otherwise declined in the remaining open months when compared to the 1993-1998 period, especially in September.

Figure 3-2. Average monthly landings of gag for the 1993-1998 and 2001-2006 periods.



Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

On average from 2001-2006, there were 2,417 trips that landed at least one pound of gag, and totaled an annual average of 0.54 million pounds of gag worth $1.52 million in current year dollars and $1.58 million in constant 2005 dollars (Table 3-11). In addition, these trips annually produced an average of 2.13 million pounds of other species worth $3.98 million in current year dollars. Gag was the primary revenue species on some trips and a lesser source of revenue on other trips.

Table 3-11. Annual landings, dockside revenues and fishing effort on trips for gag, 2001-2006.

Item	2001	2002	2003	2004	2005	2006	Average
	Trips with at least one pound of gag						
Gag landings (million pounds, whole wgt)	0.52	0.53	0.60	0.53	0.54	0.50	0.54
Dockside revenue from gag (million dollars)	$1.41	$1.44	$1.66	$1.50	$1.65	$1.46	$1.52
Dockside revenue in constant 2005 dollars (millions)*	$1.55	$1.57	$1.76	$1.55	$1.65	$1.41	$1.58
Landings of other species on trips with gag (million lbs)	2.67	2.20	1.98	1.98	2.05	1.87	2.13
Dockside revenue from other species on trips with gag (mill $)	$4.87	$4.00	$3.52	$3.71	$4.03	$3.78	$3.98
Dockside revenue from other species in constant 2005 dollars	$5.36	$4.34	$3.73	$3.83	$4.02	$3.65	$4.16
Number of boats that landed gag	337	305	302	292	302	257	299
Number of boats landing 1000 lbs or more per year of gag	117	99	114	100	99	95	104
Number of boats landing 5000 lbs or more per year of gag	27	35	39	33	35	34	34
Number of boats landing 10,000 lbs or more per year of gag	10	10	13	13	13	14	12
Number of trips with at least one pound of gag	2,787	2,767	2,484	2,183	2,203	2,079	2,417

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

Gag was the primary source of trip revenue on an average of 1,062 trips per year and a lesser source of revenue on 1,355 trips per year (Table 3-12). Therefore, gag was the primary source of trip revenue on less than 45% of the total number of trips on which they were landed. However, these trips accounted for approximately 67% of the total commercial harvest of gag. Trips on which gag was the primary source of revenue accounted for an annual average of 0.36 million pounds of gag worth $1.03 million in current dollars and 0.43 million pounds of other species, including other groupers, snappers, jacks, grunts, porgies and non-snapper-grouper species, worth $0.78 million. Trips on which gag was a lesser source of revenue accounted for an annual average of 0.17 million pounds of gag worth $0.49 million in current dollars and 1.70 million pounds of other species worth $3.20 million. Gag were caught as a

lesser source of revenue on trips for vermilion snapper, scamp, red grouper, jacks and other species.

Table 3-12. Annual landings, dockside revenues and fishing effort on trips with gag as the primary source of trip revenue, 2001-2006.

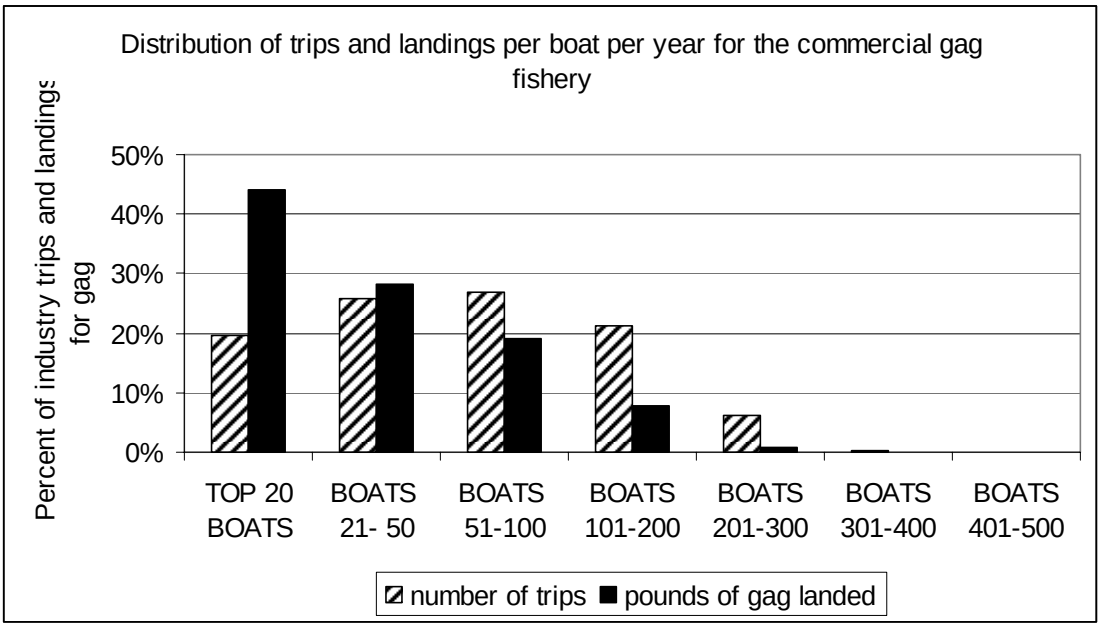
Item	2001	2002	2003	2004	2005	2006	Average
	Trips with gag as primary source of revenue						
Number of trips with at least one pound of gag	2,787	2,767	2,484	2,183	2,203	2,079	2,417
Number of trips with gag as primary source of trip revenue	1,084	1,194	1,192	993	1,026	885	1,062
Number of trips with gag as a lesser source of trip revenue	1,703	1,573	1,292	1,190	1,177	1,194	1,355
Landings of gag on trips with gag as primary source of revenue (million pounds)	0.32	0.36	0.42	0.38	0.37	0.34	0.36
Dockside revenue for gag on trips with gag as primary source of revenue (million $)	$0.86	$0.97	$1.16	$1.08	$1.13	$1.00	$1.03
Landings of other species on trips with gag as primary source of revenue	0.39	0.38	0.51	0.47	0.43	0.39	0.43
Dockside revenues for other species on trips with gag as the primary source of revenue	$0.67	$0.66	$0.91	$0.86	$0.83	$0.75	$0.78

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

The number of boats that reported landing at least one pound of gag declined from 337 in 2001 to 257 in 2006, and averaged 299 boats per year (Table 3-11). The fleet was not uniformly productive in the fishery for gag, which is consistent with the observation that gag was the primary source of trip revenue on some trips and a lesser source of revenues on other trips. On average for 2001-2006, the top 20 boats for gag production made 20% of the trips that landed gag and recorded 44% of the total commercial harvest of gag (Figure 3-3). The top 50 producing boats made 46% of the trips and recorded 72% of the total harvest, while the top 100 producing boats made 72% of the trips and landed 91% of the total harvest. On average, 104 boats landed at least 1,000 pounds of gag per year, 34 boats landed at least 5,000 pounds per year, and 12 boats landed at least 10,000 pounds of gag per year (Table 3-11).

Approximately 80% of gag is landed with vertical lines, and most of the remainder is landed with dive gear (Table 3-10).

Figure 3-3. Distribution of trips and landings per boat per year, based on trips that reported at least one pound of gag.

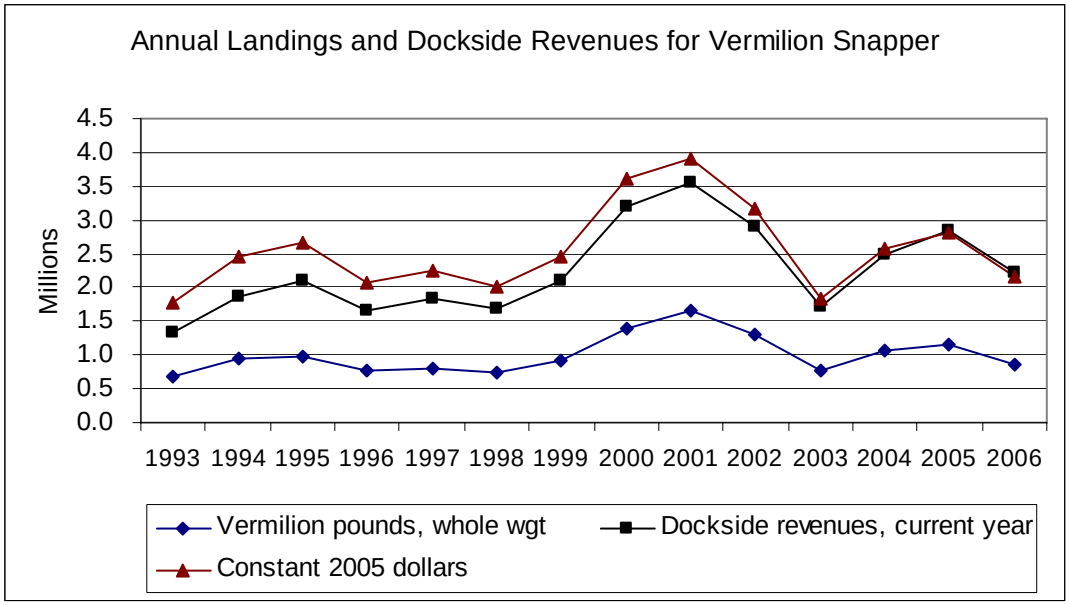


Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

3.4.1.1.6 *The commercial fishery for vermilion snapper*

Based on logbook data from 1993 through 2006, commercial landings of vermilion snapper ranged from a low of 0.68 million pounds (whole weight) worth $1.33 million in 1993 to a high of 1.65 million pounds worth approximately $3.54 million in 2001 (Figure 3-4). Landings of vermilion snapper began to increase in 1999 coincident with the implementation of more restrictive regulations for gag, peaked in 2001, and then declined through 2003 when unusually cold water temperatures reduced the availability of fish in the summer and fall of 2003. Landings of vermilion snapper recovered in 2004 and 2005, but not to the levels experienced in 2001 and 2002. Preliminary data for 2006 indicate that landings of vermilion snapper were approximately 0.86 million pounds worth $2.23 million. Dockside revenues generally displayed the same trend over time as commercial landings, which suggests that ex-vessel demand for vermilion snapper is price elastic. Hence, regulations that reduce industry landings in the short-term are expected to reduce dockside revenues in the short-term. Conversely, dockside revenues are expected to increase over time if regulation successfully increases biomass and landings.

Figure 3-4. Annual landings and dockside revenues for vermilion snapper, 1993-2006.

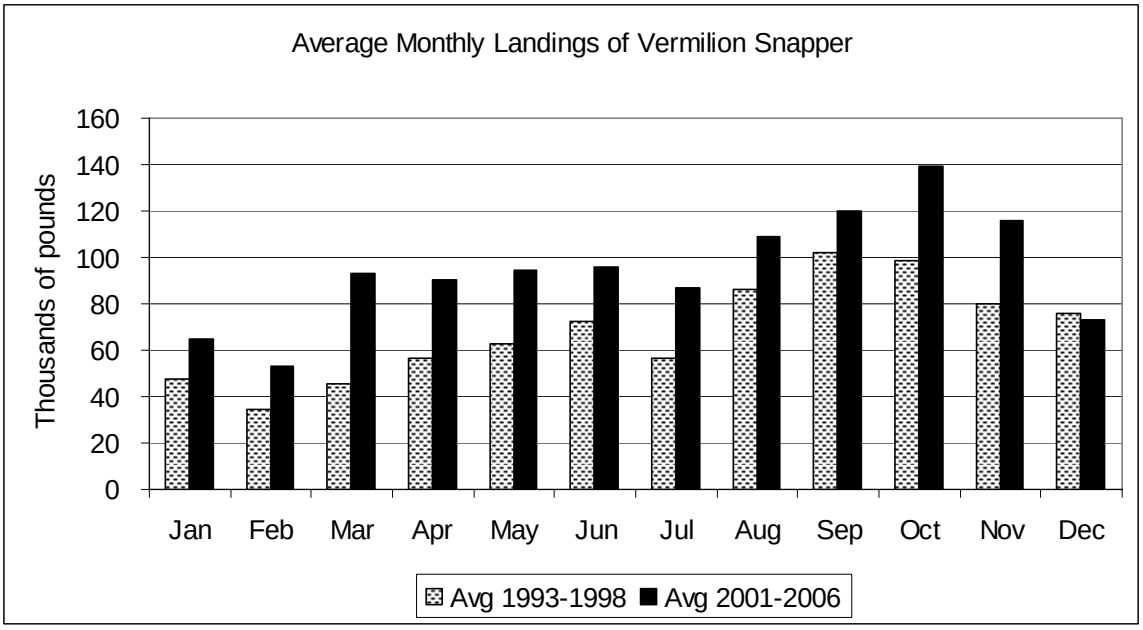


Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007, and NOAA Fisheries Service, Southeast Fisheries Science Center Accumulated Landings System as of October 5, 2007.

Vermilion snapper are landed throughout the year, with peak months from August through December (Figure 3-5). Average monthly landings were higher for all months except December during the 2001-2006 period compared to the 1993-1998 period. The greatest relative monthly increases in average landings between the two periods occurred during March and April, apparently as fishermen shifted their fishing effort from gag to vermilion in response to the closed season that was implemented in 1999.

On average from 2001-2006, there were 2,423 trips that landed at least one pound of vermilion snapper, and totaled an average of nearly 1.14 million pounds of vermilion snapper worth $2.62 million in current-year dollars and $2.74 million in constant 2005 dollars (Table 3-13). In addition, these trips annually produced an average of 2.14 million pounds of other species combined worth $4.07 million in current year dollars. Vermilion snapper was the primary revenue species on some trips and a lesser source of revenue on other trips.

Figure 3-5. Average monthly landings of vermilion snapper for the 1993-1998 and 2001-2006 periods.



Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

Vermilion snapper was the primary source of trip revenue on an average of 1,186 trips per year and a lesser source of revenue on 1,237 trips per year (Table 3-14). Therefore, vermilion snapper was the primary source of trip revenue on slightly less than 50% of the total number of trips on which they were landed. However, these trips accounted for approximately 86% of total vermilion snapper landings. Trips on which vermilion snapper was the primary source of revenue accounted for an annual average of 0.98 million pounds of vermilion snapper worth $2.27 million in current dollars and 0.92 million pounds of other species, including groupers, jacks, grunts, porgies and non-snapper-grouper species, worth $1.53 million. Trips on which vermilion snapper was a lesser source of revenue accounted for an annual average of 0.16 million pounds of vermilion snapper worth $0.35 million in current dollars and 1.22 million pounds of other species worth $2.54 million. Vermilion snapper were caught as a lesser source of revenue on trips for gag, scamp and red grouper in the shallow water grouper fishery, and snowy grouper in the deep water grouper fishery.

Table 3-13. Annual landings, dockside revenues and fishing effort on trips for vermilion snapper, 2001-2006.

Item	2001	2002	2003	2004	2005	2006	Average
	Trips with at least one pound of vermilion snapper						
Vermilion snapper landings (million pounds, whole wgt)	1.65	1.31	0.77	1.07	1.16	0.86	1.14
Dockside revenue from vermilion snapper (million dollars)	$3.54	$2.92	$1.73	$2.49	$2.83	$2.23	$2.62
Dockside revenue in constant 2005 dollars (millions)*	$3.90	$3.16	$1.83	$2.57	$2.83	$2.16	$2.74
Landings of other species on trips with vermilion snapper (million lbs)	2.36	2.20	2.03	2.06	2.07	2.15	2.14
Dockside revenue from other species on trips with vermilion snapper (million $)	$4.34	$3.99	$3.82	$3.90	$4.16	$4.19	$4.07
Dockside revenue from other species in constant 2005 dollars (millions)	$4.78	$4.33	$4.06	$4.03	$4.16	$4.05	$4.24
Number of boats that landed vermilion snapper	295	274	248	255	252	232	259
Number of boats landing 1000 lbs or more per year of vermilion snapper	118	106	91	84	91	80	95
Number of boats landing 5000 lbs or more per year of vermilion snapper	17	72	53	56	53	45	49
Number of boats landing 10,000 lbs or more per year of vermilion snapper	62	53	27	44	38	33	43
Number of trips with at least one pound of vermilion snapper	3,029	2,911	2,173	2,148	2,173	2,102	2,423

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

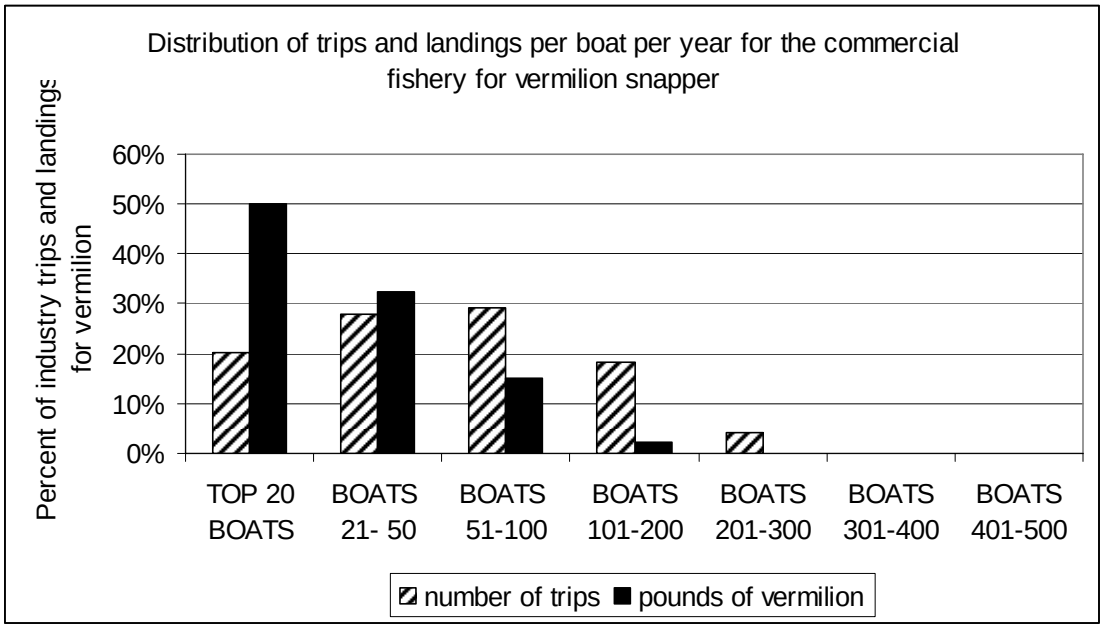
Table 3-14. Annual landings, dockside revenues and fishing effort on trips with vermilion snapper as the primary source of trip revenue, 2001-2006.

Item	2001	2002	2003	2004	2005	2006	Average
	Trips with vermilion snapper as primary source of revenue						
Number of trips with at least one pound of vermilion snapper	3,029	2,911	2,173	2,148	2,173	2,102	2,423
Number of trips with vermilion snapper as primary source of trip revenue	1,693	1,495	924	1,053	1,084	867	1,186
Number of trips with vermilion snapper as a lesser source of trip revenue	1,336	1,416	1,249	1,095	1,089	1,235	1,237
Landings of vermilion snapper on trips with vermilion as primary source of revenue (million lbs)	1.47	1.16	0.62	0.93	1.00	0.71	0.98
Dockside revenue for vermilion on trips with vermilion as primary source of revenue (million $)	$3.17	$2.58	$1.39	$2.16	$2.47	$1.86	$2.27
Landings of other species on trips with vermilion as primary source of revenue	1.16	1.04	0.69	0.86	0.99	0.80	0.92
Dockside revenues for other species on trips with vermilion as the primary source of revenue	$1.89	$1.66	$1.13	$1.42	$1.72	$1.36	$1.53

Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

The number of boats that reported landing at least one pound of vermilion snapper declined from 295 in 2001 to 232 in 2006, and averaged 259 boats per year (Table 3-13). The fleet was not uniformly productive in the fishery for vermilion snapper, which is consistent with the observation that vermilion snapper was the primary source of trip revenue on some trips and a lesser source of revenues on other trips. On average for 2001-2006, the top 20 boats for the production of vermilion snapper made 20% of the trips that landed vermilion and recorded 50% of the total commercial harvest of vermilion snapper (Figure 3-6). The top 50 producing boats made 48% of the trips and recorded 82% of the total harvest, while the top 100 producing boats made 77% of the trips and landed 98% of the total harvest. On average, 95 boats landed at least 1,000 pounds of vermilion snapper per year, 49 boats landed at least 5,000 pounds per year, and 43 boats landed at least 10,000 pounds of vermilion snapper per year (Table 3-13). Virtually all vermilion snapper are landed with vertical lines (Table 3-11).

Figure 3-6. Distribution of trips and landings per boat per year, based on trips that reported at least one pound of vermilion snapper.



Source: NOAA Fisheries Service, Southeast Fisheries Science Center logbook database as of October 10, 2007.

3.4.1.1.7 *Imports*

Imports have been a major source of seafood supply in the U.S., and the domestic snapper-grouper market is not an exception. For the period 2001-2006, imports of fresh and frozen snappers and groupers have stayed at relatively high levels, averaging at about 44.7 million pounds (Table 3-15). Compare this with the average overall landings of snapper-grouper in the South Atlantic for the same period of 6.77 million pounds (Table 3-5), and one can immediately see the dominance of imports in the snapper-grouper market. At an annual average of $79.2 million for the years 2001-2006, imports clearly dwarf the $12.99 million ex-vessel value of South Atlantic snapper-grouper landings. The dominance of imports in the snapper-grouper market may be expected to exert limits on the movement of domestic ex-vessel prices resulting from changes in domestic landings of snappers and groupers.

Table 3-15. U.S. imports of snappers and groupers, 2001-2006.

YEAR	Pounds of imports by product form Millions of pounds*			Value of imports by product form Millions of dollars		
	FRESH	FROZEN	TOTAL	FRESH	FROZEN	TOTAL
2001	31.1	8.4	39.4	$51.7	$10.6	$62.3
2002	33.4	9.2	42.6	$57.1	$12.3	$69.5
2003	34.3	10.2	44.5	$58.9	$14.4	$73.3
2004	33.3	9.8	43.1	$61.7	$13.9	$75.6
2005	35.9	13.8	49.7	$72.0	$21.0	$93.0
2006	35.2	13.4	48.6	$78.8	$22.9	$101.7
Average	33.9	10.8	44.7	$63.4	$15.9	$79.2

Source: NOAA Fisheries, Foreign Trade Database.
*Weights are not converted to equivalent whole weights.

3.4.1.2 Recreational Fishery

The South Atlantic recreational fishery is comprised of the private sector and for-hire sector. The private sector includes anglers fishing from shore (all land-based structures) and private/rental boats. The for-hire sector is composed of the charterboat and headboat (also called partyboat) sectors. Charterboats generally carry fewer passengers and charge a fee on an entire vessel basis, whereas headboats carry more passengers and payment is per person. The type of service, from a vessel- or passenger-size perspective, affects the flexibility to search different fishing locations during the course of a trip and target different species since larger concentrations of fish are required to satisfy larger groups of anglers.

3.4.1.2.1 *Harvest*

Recreational snapper grouper harvest has been variable during the period 2001-2006, averaging at a little over 10 million pounds (Table 3-16). The private/shore mode of fishing accounted for around 67 percent of all harvests, followed by the charter mode (17%), then by headboats (16%). Harvests in each state also fluctuated during the same time period (Table 3-17). On average, Florida accounted for around 66 percent of total harvests, followed by North Carolina (16%), South Carolina (12%), and Georgia (6%).

Gag and vermilion snapper are the main species addressed in this amendment, but there are also other species that may be affected especially by the closure alternatives in this amendment. These other species include black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney. For the period 2001-2006, gag averaged at 627,266 pounds, vermilion snapper at 581,567 pounds, and other species at 517,789 pounds (Table 3-18). The private/shore mode dominated the harvest of gag (71%) while the headboat sector dominated the harvest of vermilion snapper (60%). The private/shore mode also dominated the harvest of other species (56%). Summing across

species, total harvest is dominated by the private/mode sector, followed by the headboat sector, and lastly by the charterboat sector.

Table 3-16. Harvest of snapper grouper species by mode in the South Atlantic.

Year	Charterboat[1]	Headboat[2]	Shore and Private/Rental Boat[1]	Total
2001	1,347,441	1,655,941	7,984,461	10,987,843
2002	1,362,090	1,432,450	5,182,763	7,977,303
2003	2,301,303	1,375,688	7,265,886	10,942,877
2004	1,517,384	1,889,010	6,688,596	10,094,990
2005	2,313,468	1,649,210	6,123,049	10,085,727
2006	1,998,902	1,648,405	7,282,328	10,929,635
Average	**1,676,139**	**1,608,451**	**6,754,514**	**10,039,103**

Source: The Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab and MRFSS database, NOAA Fisheries, NMFS, SERO.
[1] Pounds of A and B1 fish estimated from the MRFSS Survey.
[2] The total annual estimate of headboat catch derived from data collected through the NMFS headboat survey.

Table 3-17. Harvest of snapper grouper species by state in the South Atlantic.

Year	Florida	Georgia	South Carolina	North Carolina
2001	7,480,907	740,040	1,517,191	1,249,704
2002	5,741,379	366,369	711,612	1,157,941
2003	7,848,011	770,993	1,042,157	1,281,714
2004	5,970,816	763,609	1,625,212	1,735,353
2005	6,696,212	622,302	852,105	1,915,107
2006	6,474,221	746,982	1,466,944	2,241,489
Average	6,701,924	668,383	1,202,537	1,596,885

Source: The Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab and MRFSS database, NOAA Fisheries, NMFS, SERO.

Florida accounted for the largest amount of harvests, followed by North Carolina, then by South Carolina, and lastly by Georgia (Table 3-19). Florida accounted for the largest share in the harvest of gag (67%) and other species (46%). South Carolina, on the other hand accounted for the largest share of vermilion snapper harvests (36%).

Table 3-18. Average harvest (lbs) of gag, vermilion snapper, and other species in this amendment by sector, 2001-2006.

Sector	Gag	Vermilion snapper	Other species*	Total
Charterboat	118,080	137,400	86,743	342,223
Headboat	62,117	351,767	140,820	554,704
Private/shore	447,069	92,400	290,226	829,695
Total	627,266	581,567	517,789	1,726,622

Source: The Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab and MRFSS database, NOAA Fisheries, NMFS, SERO.

*Other species includes black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.

Table 3-19. Average harvest (lbs) of gag, vermilion snapper, and other species in this amendment by state, 2001-2006.

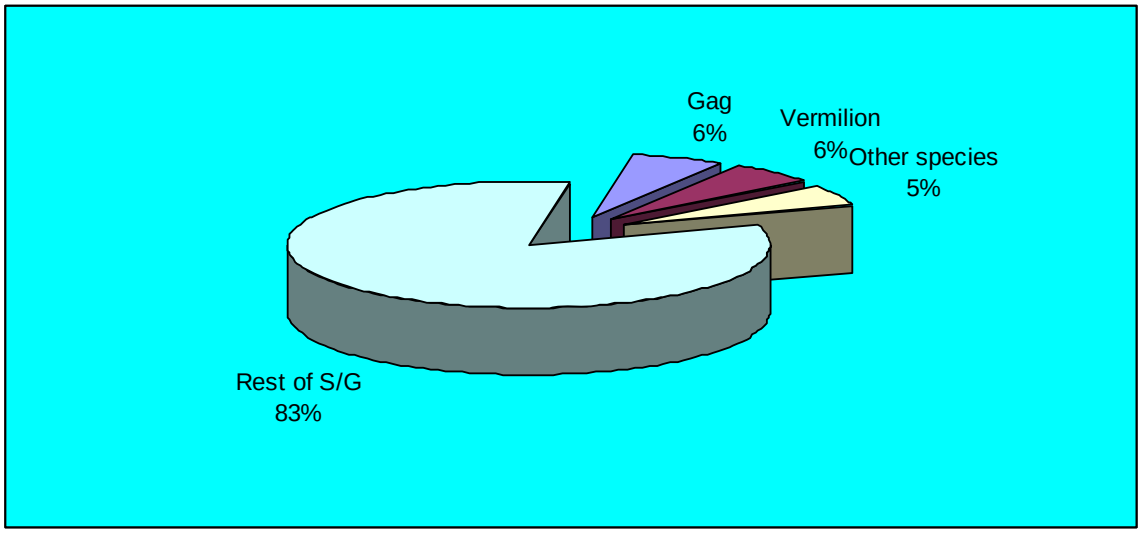
Sector	Gag	Vermilion snapper	Other species*	Total
Florida	422,571	147,223	227,140	796,934
Georgia	24,377	108,430	12,936	145,743
South Carolina	33,921	219,321	86,033	339,275
North Carolina	150,726	140,772	171,878	463,376
Total	631,595	615,746	497,987	1,745,328

Source: The Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab and MRFSS database, NOAA Fisheries, NMFS, SERO.

*Other species includes black grouper, red grouper, scamp, red hind, rock hind, yellowmouth grouper, tiger grouper, yellowfin grouper, graysby, and coney.

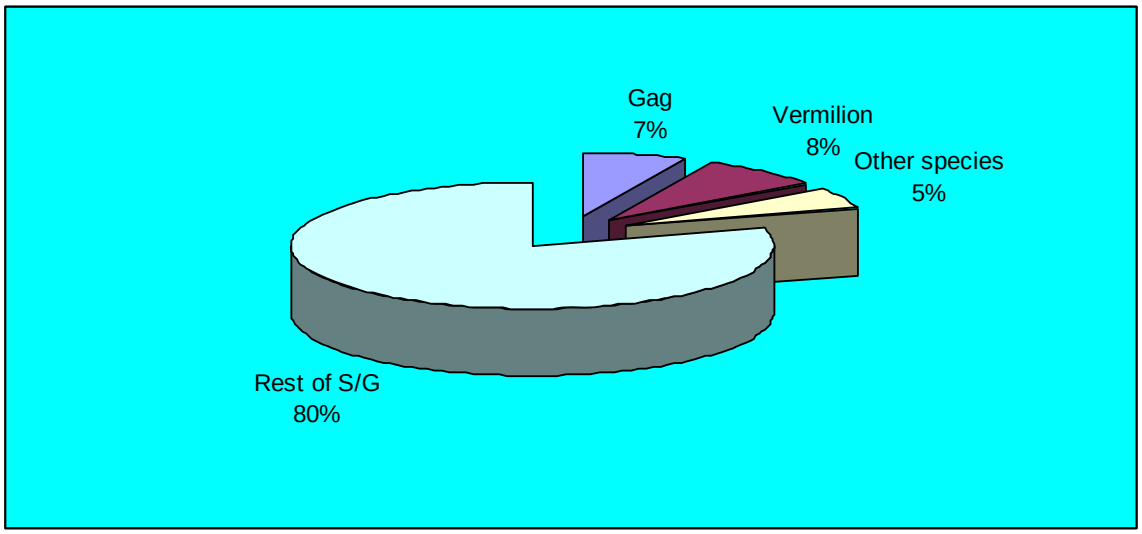
The species addressed by this amendment accounted for 17 percent of total recreational harvests of snappers and groupers for the period 2001-2006 (Figure 3-7). Gag and vermilion snapper accounted for 6 percent each of total harvests while other species accounted for 5 percent of total harvests. The subject species in this amendment vary in importance by sector. In the charterboat sector, the species in this amendment comprised 20 percent of this sector's total harvest (Figure 3-8). Of this sector's total harvest, vermilion comprised 8 percent, gag 7 percent, and other species 5 percent. For headboats, the species in this amendment accounted for 35 percent of total harvest (Figure 3-9). This can be broken down into 22 percent vermilion, 9 percent other species, and 4 percent gag. Among the various sectors, the private/shore mode has the lowest percentage of harvest affected by this amendment. The species in this amendment accounted for 12 percent of this sector's total harvest, with the following breakdown: 7 percent gag, 4 percent other species, and 1 percent gag (Figure 3-10).

Figure 3-7. Average composition of harvests (all modes) of species in this amendment, 2001-2006.



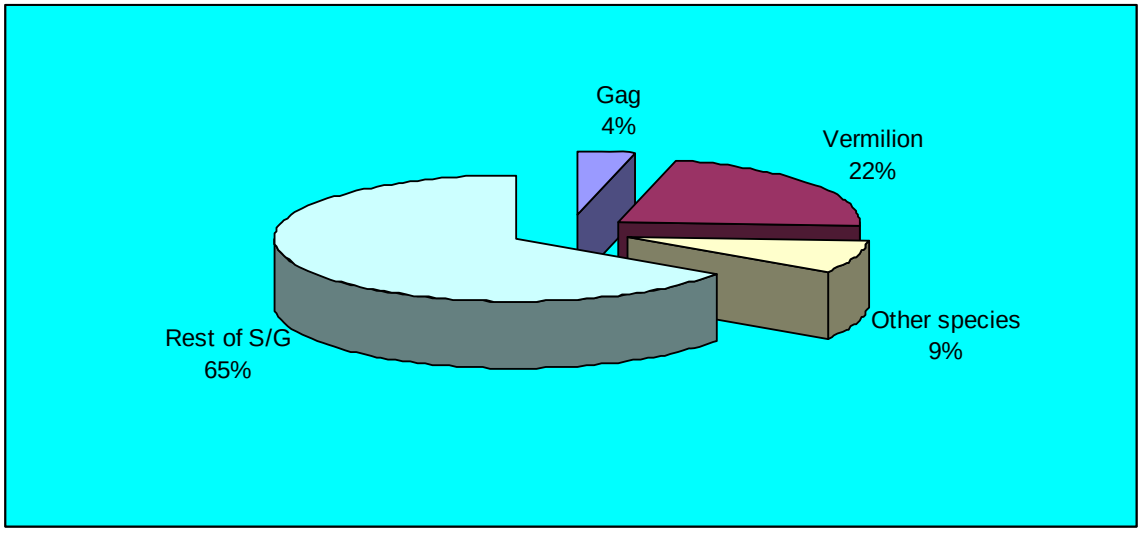
Sources: Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab and MRFSS database, NOAA Fisheries, NMFS, SERO.

Figure 3-8. Average composition of charterboat harvests of species in this amendment, 2001-2006.



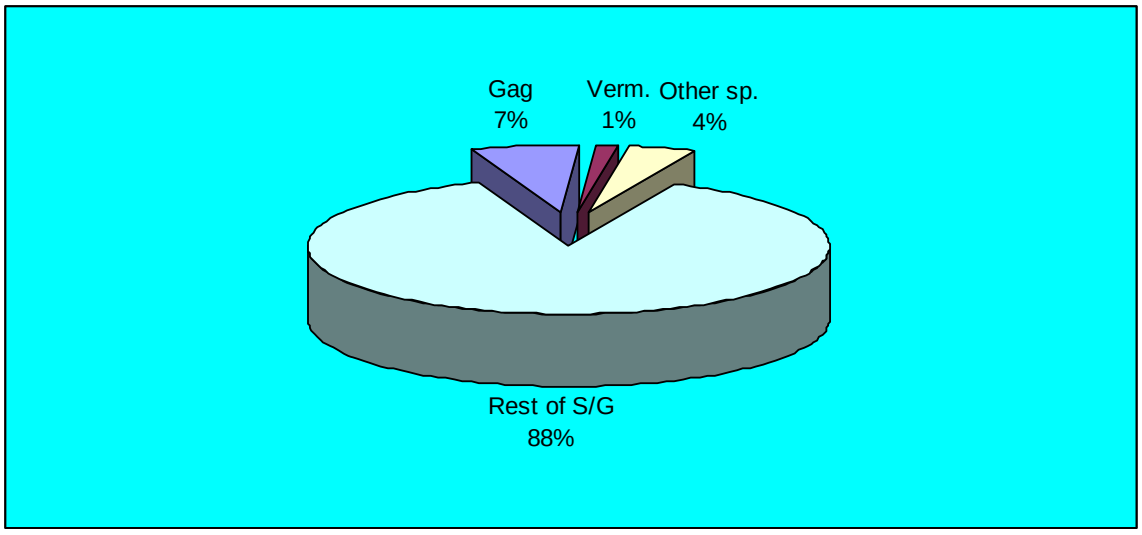
Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

Figure 3-9. Average composition of headboat harvests of species in this amendment, 2001-2006.



Source: Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab.

Figure 3-10. Average composition of private/shore mode harvests of species in this amendment, 2001-2006.



Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

3.4.1.2.2 *Effort*

Recreational effort derived from the MRFSS can be characterized in terms of the number of trips as follows:

1. Target effort - The number of individual angler trips, regardless of duration, where the intercepted angler indicated that the species or a species in the species group was targeted as either the first or second primary target for the trip. The species did not have to be caught.
2. Catch effort - The number of individual angler trips, regardless of duration and target intent, where the individual species or a species in the species group was caught. The fish did not have to be kept.
3. Total recreational trips - The total estimated number of recreational trips in the South Atlantic, regardless of target intent or catch success.

Estimates of average effort for the entire snapper grouper fishery are provided in Table 3-20 for trips by mode and Table 3-21 for trips by state. The total column refers to the total number of trips taken by anglers in the South Atlantic snapper-grouper fishery and not to the sum catch and target trips. On average, catch trips were highest on those taken through the private mode and lowest on those through the charter mode. The same is true with target trips: they were highest for private mode and lowest for charter mode. For the charter mode, both catch and target trips increased over time although there was some downward blip in the last year. Shore mode catch and target trips remained about flat around their means. Catch trips for the private fluctuate around their mean, but high levels were experienced in the last two years. On the other hand, private mode target trips declined over time, with a slight uptick in the last year.

Table 3-20. Recreational effort for the snapper-grouper fishery in the South Atlantic, in thousand trips, by mode, 2001-2006.

	Charter Mode Trips			Shore Mode Trips			Private Mode Trips		
	Catch	Target	Total	Catch	Target	Total	Catch	Target	Total
2001	102	21	497	1,200	355	11,534	1,803	607	9,565
2002	105	22	440	919	233	9,057	1,744	495	8,266
2003	118	23	412	1,103	263	10,872	2,105	648	9,963
2004	129	28	418	987	209	11,186	1,985	477	9,488
2005	373	69	971	1,095	195	11,240	2,096	473	9,886
2006	285	68	834	1,276	272	12,511	2,603	530	10,749
Avg.	185	39	595	1,097	255	11,067	2,056	538	9,653

Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

Table 3-21. Recreational effort for the snapper-grouper fishery in the South Atlantic, in thousand trips, by state, 2001-2006.

	Florida			Georgia			South Carolina			North Carolina		
	Catch	Target	Total	Catch	Target	Total	Catch	Target	Total	Catch	Target	Total
2001	2,620	772	12,464	78	53	807	123	96	1,676	283	61	6,650
2002	2,395	628	10,303	57	20	619	87	51	1,254	230	51	5,586
2003	2,860	723	11,444	92	46	971	143	86	2,098	231	80	6,733
2004	2,530	532	10,800	90	26	960	191	84	2,224	289	71	7,107
2005	2,835	579	12,200	96	28	859	178	60	2,188	454	70	6,849
2006	3,325	633	13,349	71	28	799	248	133	2,670	520	76	7,276
Avg.	2,761	645	11,760	81	34	836	162	85	2,018	335	68	6,700

Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

For the period 2001-2006, an annual average of 295,593 trips taken by anglers caught some of the species in this amendment (Table 3-22). This is about 9 percent of all catch trips taken by anglers in the South Atlantic snapper-grouper fishery. An average of 96,800 trips caught gag, 81,815 caught vermilion snapper, and 116,978 caught other species. The private mode accounted for the largest number of catch trips for all species groups in this amendment. The charter and shore modes registered substantially lower catch trips than the private mode. There were more trips catching other species than either gag or vermilion, and more vermilion catch trips than gag.

The number of trips that targeted species in this amendment (55,485)was substantially lower than catch trips. This is about 7 percent of all target trips in the South Atlantic snapper-grouper fishery. Again, the private mode dominated all other modes in terms of number of target trips. In fact, target trips by the charter and shore modes registered at very low levels (Table 3-22). There were substantially more target trips for gag (47,330) than for vermilion snapper (1,381) or other species (6,774).

Table 3-22. Average recreational effort for species in this amendment, by mode, 2001-2006.

	Gag	Vermilion	Other Species	Total
	Catch Trips			
Charter	11,405	36,148	25,461	73,014
Shore	7,423	310	3,098	10,831
Private	77,972	45,357	88,419	211,748
Total	96,800	81,815	116,978	295,593
	Target Trips			
Charter	3,155	250	177	3,582
Shore	2,151	0	379	2,530
Private	42,024	1,131	6,218	49,373
Total	47,330	1,381	6,774	55,485

Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

The regional distribution of catch and target trips for the species in this amendment is presented in Table 3-23. Florida, with 233,188 total catch trips, dominated all other states, but catch trips in South Carolina (36,382) and North Carolina (17,753) were also relatively high. Florida also had the largest catch trips for each of the three species groups in this amendment, followed by North Carolina, South Carolina, and Georgia.

In terms of target trips, only Florida registered large numbers while all other states showed relatively minimal target trips. In fact, Florida, with a total of 54,550 target trips, accounted for about 98 percent of all target trips for species in this amendment. It may be pointed out, though, that most of the Florida target trips (85%) were for gag, and there were more target trips for other species than for vermilion snapper.

Table 3-23. Average recreational effort for species in this amendment, by state, 2001-2006.

	Gag	Vermilion	Other Species	Total
	Catch Trips			
Florida	81,200	52,713	99,275	233,188
Georgia	1,607	5,784	879	8,270
South Carolina	3,358	10,831	3,564	17,753
North Carolina	10,636	12,486	13,260	36,382
Total	96,801	81,814	116,978	295,593
	Target Trips			
Florida	46,635	1,145	6,770	54,550
Georgia	252	0	0	252
South Carolina	14	22	0	36
North Carolina	429	214	3	646
Total	47,330	1,381	6,773	55,484

Source: MRFSS database, NOAA Fisheries, NMFS, SERO.

The fact that target trips were substantially lower than catch trips has implications on the determination of the economic effects of regulations considered in this amendment. It may be contended that target trips contain more meaningful economic valuation of the fishing experience than catch trips from the standpoint of predicting the economic outcome of regulations. One reason for this is that a target trip carries with it an indication of an angler's assignment of some positive values to the species targeted. On the other hand, some catch trips may simply be accidental and as such may not provide any indication of an angler's assignment of value on certain species. It is possible, of course, that past catch trips may shape future target trips, but this would necessitate further research to determine the nature and extent of the effects of past catch trips on future target trips. At any rate, the substantial difference between catch and target trips may imply that if regulations in this amendment were effective in reducing harvest by reducing catch trips more than target trips, then the resulting economic effects would likely be less than harvest reductions.

Similar analysis is not possible for the headboat sector since data are not collected at the angler level. Estimates of effort in the headboat sector are provided in terms of angler days, or the number of standardized 12-hour fishing days that account for the different half-, three-

quarter-, and full-day fishing trips by headboats. Despite the inability to associate headboat effort with specific species, the stationary bottom nature of headboat fishing, as opposed to trolling, suggests that all headboat trips and, hence, angler days, are snapper grouper trips by intent, though not necessarily success.

Headboat angler days are presented in Table 3-24. Due to very low headboat angler days for Georgia, entries for Georgia were combined with those of Florida. For the period 2001-2006, total headboat angler days fluctuated around the mean of 238,012 days. On average, Florida accounted for the largest number of angler days (163,375), or about 69 percent of all headboat angler days. Nevertheless, the numbers for South Carolina (44,810 days) and North Carolina (27,824 days) are far from being negligible.

Table 3-24. Estimate of headboat angler days for the U.S. South Atlantic.

	Florida	South Carolina	North Carolina	Total
2001	163,389	49,265	31,779	246,434
2002	151,546	42,467	27,601	223,616
2003	145,011	36,556	22,998	206,568
2004	173,701	50,461	27,255	253,421
2005	171,078	34,036	31,573	238,692
2006	175,522	56,074	25,736	259,338
Average	163,375	44,810	27,824	238,012

Source: The Headboat Survey, NOAA Fisheries, SEFSC, Beaufort Lab.

3.4.1.2.3 *Permits*

For-hire vessels in the South Atlantic are required to have a snapper grouper for-hire permit to fish for or possess snapper grouper species in the EEZ. The number of permitted vessels for the period 2001-2006 is provided in Table 3-25. This sector operates as an open access fishery and not all permitted vessels are necessarily active in the fishery. Some vessel owners have been known to purchase open access permits as insurance for uncertainties in the fisheries in which they currently operate.

The number of for-hire permits issued in the South Atlantic snapper-grouper fishery increased over the period 2001-2006, with 1,095 permits in 2001 to 1,681 permits in 2006. Most of the increases would likely be for strictly for-hire business, since permits issued for vessels operating as for-hire and commercial entities remained about flat during the same period. The majority of snapper grouper for-hire permitted vessels were home-ported in Florida; a good number of vessels were also home-ported in North Carolina and South Carolina. Interestingly, there were several vessels with home ports in states other than those within the South Atlantic Council's area of jurisdiction. Most of the vessels with both for-hire and commercial permits were home-ported in the South Atlantic Council's area of jurisdiction.

Table 3-25. Snapper grouper for-hire permit holders by home port state.

	Number of vessels issued for-hire vessel permits						Number of vessels with both a for-hire permit and a commercial snapper grouper permit					
Home Port State	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Florida	675	776	957	1,084	1,119	1,108	144	145	148	151	148	151
North Carolina	180	195	206	232	254	284	39	35	45	42	43	46
South Carolina	137	129	122	108	121	119	39	34	34	33	33	34
Georgia	25	27	36	27	33	33	4	5	4	2	2	2
Virginia	10	11	5	13	10	10	6	6		4	3	2
Other States	33	38	69	48	51	62	3	2	8	3	5	3
Gulf States	35	44	82	82	79	65						
Total	**1,095**	**1,220**	**1,477**	**1,594**	**1,667**	**1,681**	**235**	**227**	**239**	**235**	**234**	**238**

Source: Southeast Permits Database, NOAA Fisheries, SERO.

The for-hire permit does not distinguish between whether the vessel operates as a charterboat or headboat. Based on a 1997 survey, Holland *et al.* (1999) estimated that a total of 1,080 charter vessels and 96 headboats supplied for-hire services in all South Atlantic fisheries during 1997.

3.4.1.2.4 *Economic Value and Expenditures*

Participation, effort, and harvest are indicators of the value of saltwater recreational fishing. However, a more specific indicator of value is the satisfaction that anglers experience over and above their costs of fishing. The monetary value of this satisfaction is referred to as consumer surplus. The value or benefit derived from the recreational experience is dependent on several quality determinants, which include fish size, catch success rate, and the number of fish kept. These variables help determine the value of a fishing trip and influence total demand for recreational fishing trips.

Estimates of the economic value of a day of saltwater recreational fishing in the South Atlantic indicate that the mean value of access per marine recreational fishing trip is $109.31 for the South Atlantic (Haab *et al.* 2001). While this estimate is not specific to snapper-grouper fishing trips, it may shed light on the magnitude of an angler's willingness to pay for this type of recreational experience.

Willingness to pay for an incremental increase in catch and keep rates per trip was also estimated to be $3.01 for bottom fish species by Haab *et al.* (2001). Whitehead *et al.* (2001) estimated the marginal willingness to pay to avoid a one fish red snapper bag limit decrease to be $1.06 to $2.20. Finally, Haab *et al.* (2001) provided a compensating variation (the amount of money a person would have to receive to be no worse off after a reduction of the bag limit)

estimate of $2.49 per fish when calculated across all private boat anglers that targeted snapper grouper species in the South Atlantic.

These valuation estimates should not be confused with angler expenditures or economic activity. While expenditures for a specific good or service may represent a proxy or lower bound of value (a person would not logically pay more for something than it was worth to them), they do not represent the net value (benefits minus cost), nor the change in value associated with a change in the fishing experience. However, angler expenditures benefit a number of sectors that provide goods and services for salt-water sport fishing. Gentner *et al.* (2001) provides estimates of saltwater recreational fishing trip expenditures (Table 3-26). These estimates do not include expenditures in Monroe County, Florida, or expenditures in the headboat sector.

Table 3-26. Summary of expenditures on saltwater trips.

	North Carolina		South Carolina		Georgia		Florida	
Item	**Resident**	**Non Resident**	**Resident**	**Non Resident**	**Resident**	**Non Resident**	**Resident**	**Non Resident**
Shore mode trip expenses	$63.61	$75.53	$54.12	$104.27	$31.78	$115.13	$36.90	$141.30
Private/rental boat trip expenses	$71.28	$92.15	$35.91	$67.07	$161.34	$77.51	$66.59	$94.15
Charter mode trip expenses	$201.66	$110.71	$139.72	$220.97	$152.45	$155.90	$96.11	$196.16
Charter fee-average-per day	$133.76	$70.59	$114.26	$109.97	$73.68	$80.99	$71.37	$100.79

Source: 1999 MRFSS add-on survey (Gentner *et al.* 2001).

3.4.1.2.5 *Financial Operations of the Charter and Headboat Sectors*

Holland *et al.* (1999) estimated that the charterboat fee in the South Atlantic ranged from $292 to $2,000. The actual cost depended on state, trip length, and the variety of services offered by the charter operation. Depending on the state, the average fee for a half-day trip ranged from $296 to $360, for a full day trip the range was $575 to $710, and for an overnight trip the range was $1,000 to $2,000. Most (>90 percent) Florida charter operators offered half-day and full-day trips and about 15 percent of the fleet offered overnight trips. In comparison, only about 3 percent of operations in the other South Atlantic states offered overnight trips.

For headboats, the average fee in Florida was $29 for a half-day trip and $45 for a full day trip. For North and South Carolina, the average base fee was $34 per person for a half-day trip and $61 per person for a full day trip. Most of these headboat trips operated in Federal waters in the South Atlantic (Holland *et al.* 1999).

Capital investment in charter vessels averaged $109,301 in Florida, $79,868 for North Carolina, $38,150 for South Carolina and $51,554 for Georgia (Holland *et al.* 1999). Charterboat owners incur expenses for inputs such as fuel, ice, and tackle in order to offer the services required by their passengers. Most expenses incurred in 1997 by charter vessel owners were on crew wages and salaries and fuel. The average annual charterboat business expenditures incurred was $68,816 for Florida vessels, $46,888 for North Carolina vessels, $23,235 for South Carolina vessels, and $41,688 for vessels in Georgia in 1997. The average capital investment for headboats in the South Atlantic was approximately $220,000 in 1997. Total annual business expenditures averaged $135,737 for headboats in Florida and $105,045 for headboats in other states in the South Atlantic.

The 1999 study on the for-hire sector in the Southeastern U.S. presented two sets of average gross revenue estimates for the charter and headboat sectors in the South Atlantic (Holland *et al.*, 1999). The first set of estimates were those reported by survey respondents and were as follows: $51,000 for charterboats on the Atlantic coast of Florida; $60,135 for charterboats in North Carolina; $26,304 for charterboats in South Carolina; $56,551 for charterboats in Georgia; $140,714 for headboats in Florida; and $123,000 for headboats in the other South Atlantic states (Holland *et al*., 1999). The authors generated a second set of estimates using the reported average trip fee, average number of trips per year, and average number of passengers per trip (for the headboat sector) for each vessel category for Florida vessels. Using this method, the resultant average gross revenue figures were $69,268 for charterboats and $299,551 for headboats. Since the calculated estimates were considerably higher than the reported estimates (22 percent higher for charterboats and 113 percent higher for headboats), the authors surmised that this was due to sensitivity associated with reporting gross receipts, and subsequent under reporting. Alternatively, the respondents could have overestimated individual components of the calculated estimates. Although the authors only applied this methodology to Florida vessels, assuming the same degree of under reporting in the other states results in the following estimates in average gross revenues: $73,365 for charterboats in North Carolina, $32,091 for charterboats in South Carolina; $68,992 for charterboats in Georgia; and $261,990 for headboats in the other South Atlantic states.

It should be noted that the study's authors were concerned that while the reported gross revenue figures may be underestimates of true vessel income, the calculated values could overestimate gross income per vessel from for-hire activity (Holland *et al.*, 1999). Some of these vessels are also used in commercial fishing activities and that income is not reflected in these estimates.

3.4.2 Social and Cultural Environment

A more detailed description of the social and cultural environment of the snapper grouper fishery is contained in Amendment 13C (SAFMC 2006) and is incorporated herein by reference. The following sections summarize key information relevant to this action. Key communities were identified primarily based on permit and employment activity. These data were obtained from the U.S. Bureau of the Census and from state and federal permitting agencies.

Permit trends are hard to determine, since several factors may affect how many vessels are homeported in certain communities, including vessel mobility, shifting stock locations, and resettlement of fishermen due to coastal development. Nevertheless, although vessel location shifts occur, static geographical representations help determine where impacts may be felt.

Data from the US Census Bureau must be used with some caution. Census data may not reflect shifting community demographics. Businesses routinely start up and fail or move and the census data collection cycle may fail to capture key changes. Further, census estimates do not include seasonal visitors and tourists, or those that live less than half the year in a surveyed area. Many of the latter group may work as seasonal employees and not be counted. Census data also misses some types of labor, such as day laborers, undocumented crew members, or family members that help with bookkeeping responsibilities.

Permit requirements for the commercial snapper grouper fishery were established in 1998 by Amendment 8 (SAFMC 1997). This amendment created a limited entry system for the fishery and established two types of permits based on the historic landings associated with a particular permit. Those who could demonstrate a certain amount of landings over a certain time period received permits that did not limit the number of pounds of snapper grouper that could be landed from federal waters (hereafter referred to as “unlimited commercial permits”). These permits were transferable. Vessels with verified landings, but did not meet the threshold were issued permits that allowed them to land 225 pounds of snapper grouper species from federal waters each trip (hereafter referred to as “limited commercial permits”). These permits were not transferable. New entry into the fishery required the purchase of two unlimited permits from existing permit holders for exchange for a new permit. This “two for one” system was intended to gradually decrease the number of permits in the fishery. These restrictions only applied to the commercial snapper grouper permit.

Impacts on fishing communities from coastal development, rising property taxes, decreasing access to waterfront due to increasing privatization of public resources, rising cost of dockage and fuel, lack of maintenance of waterways and ocean passages, competition with imported fish, and other less tangible (often political) factors have combined to put all these communities and their associated fishing sectors under great stress.

While studies on the general identification of fishing communities have been undertaken in the past few years, little social or cultural investigation into the nature of the snapper grouper fishery itself has occurred. A socioeconomic study by Waters *et al.* (1997) covered the

general characteristics of the fishery in the South Atlantic, but those data are now almost 10 years old and do not capture important changes in the fishery. Cheuvront and Neal (2004) conducted survey work of the North Carolina commercial snapper grouper fishery south of Cape Hatteras, but did not include ethnographic examination of communities dependent upon fishing.

To help fill information gaps, members of the South Atlantic Council's Snapper Grouper Advisory Panel, Council members, Advisory Panel members, and representatives from the angling public identified communities they believed would be most impacted by the management measures proposed in Amendment 13C on the species addressed by this amendment. Details of their designation of particular communities, and the factors considered in this designation, can be found in Amendment 13C (SAFMC 2006).

Because so many communities in the South Atlantic benefit from snapper grouper fishing, the following discussion focuses on "indicator communities," defined as communities thought to be most heavily impacted by snapper grouper regulations.

3.4.2.1 North Carolina

Figure 3-11. North Carolina communities with substantial fishing activity, as identified by South Atlantic Advisory Panels.

3.4.2.1.1 *Statewide*

Overview

Of the four states in the South Atlantic region, North Carolina (Figure 3-11) is often recognized as possessing the most "intact" commercial fishing industry; that is, it is more robust in terms of viable fishing communities and fishing industry activity than the other three states. The state offers a wide variety of fishing opportunities, including sound fishing, trolling for tuna, bottom fishing, and shrimping. Perhaps because of the wide variety of fishing opportunities, fishermen have been better able to weather regulations and coastal development pressures, adjusting their annual fishing patterns as times have changed.

Commercial Fishing

There has been a steady decline in the number of federal commercial snapper grouper permits North Carolina since 1999, with 194 unlimited commercial permits in 1999, but only 139 in 2004. Limited permits similarly declined from 36 to16.

State license sale and use statistics for all types of licenses also indicate an overall decrease since 1994. While the overall number of state licenses to sell any species of fish or shellfish increased from 6,781 in 1994 to 9,712 in 2001/2002, the number of license holders actually reporting sales decreased from 6,710 in 1994/1995 to 5,509 in 2001/2002 (SAFMC 2006).

North Carolina fishermen demographics are detailed in Cheuvront and Neal (2004). Ninety eight percent of surveyed fishermen were white and 58 percent had completed some college or had graduated from college. Of those who chose to answer the question, 27 percent of respondents reported a household income of less than $30,000 per year, and 21 percent made at least $75,000 per year. On average, respondents had been fishing for 18 years, and had lived in their communities for 27 years.

Cheuvront and Neal (2004) also provided an overview of how North Carolina commercial snapper grouper fishermen carry out their fishery. Approximately 65 percent of surveyed fishermen indicated year-round fishing. Gag is the fish most frequently targeted by these fishermen, with 61 percent of fishermen targeting gag at some point in the year, despite the prohibition of commercial sales and limit to the recreational bag limit in March and April. Vermilion snapper (36.3 percent) and black sea bass (46 percent) are the next most frequently targeted species. A significant number of fishermen land king mackerel during each month, with over 20 percent of fishermen targeting king mackerel between October and May. During the gag closed season, king mackerel are targeted by about 35 percent of the fishermen. Other snapper/grouper complex species landed by at least 5 percent of the fishermen in any given month were red grouper (39.5 percent), scamp (27.4 percent), snowy grouper (9.7 percent), grunts (14.5 percent), triggerfish (13.7 percent), and golden tilefish (5.6 percent). Non-snapper/grouper complex species landed by at least 5 percent of the fishermen in any given month included Atlantic croaker, yellowfin tuna, bluefin tuna, dolphin, and shrimp.

Recreational Fishing

Recreational fishing is well developed in North Carolina and, due to natural geography, is not limited to areas along the coast. Data show that North Carolina is almost on par with east Florida for total recreational fishing participation effort (data not shown; see SAFMC (2006)). A brief discussion of public boat ramps and local recreational fishing clubs, as well as sources of information used by these anglers, can be found in SAFMC (2006).

The North Carolina state legislature approved the creation of a state recreational saltwater fishing license in 2004. The license created controversy for both the recreational and commercial sectors, each believing that it will hurt or help their access to marine resources. Possession of the license, subject to exemptions, will be required beginning on January 1, 2007 (http://www.ncdmf.net/recreational/NCCRFLfaq.htm).

3.4.2.1.2 *Hatteras Village*

A detailed history of this community, from its discovery by Italian explorers in the 16th century to establishment of a National Seashore in 1953, can be found in SAFMC (2006).

Overview

Census data indicate there was not a significant increase in population size in Hatteras Village from 1990 to 2000 (SAFMC 2006). The demographics of the island have shifted, as is evidenced in the decreasing percentage of the population that is actively in the workforce, perhaps reflecting a larger number of retirees in the community, and the increasing proportion of residents with higher education, also reflecting a retired, professional segment of the population. Hatteras Village has also experienced a significant increase in the percent of the population in the farming, fishing, and forestry occupations, from 5.6 percent to 10.8 percent. This may be reflective of the increasing number of persons employed in businesses related to recreational fishing, such as charter boat captains and crew, boat repair and sales, marinas, etc. See SAFMC (2006) for the raw data describing community demographics. Figure 3-12 includes two maps detailing the area.

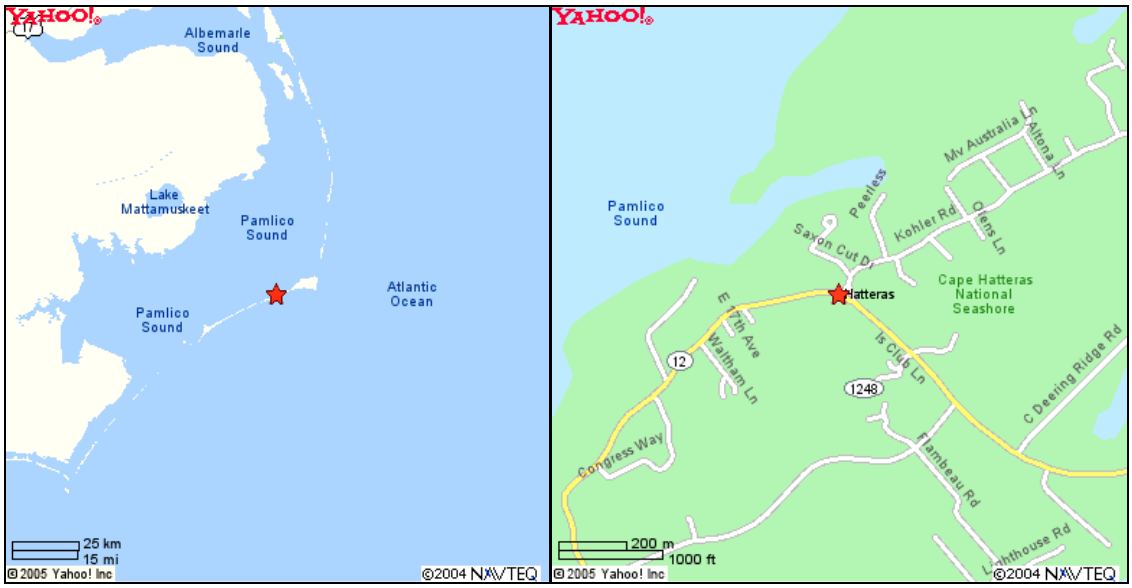


Figure 3-12. Hatteras Island and Village, Outer Banks, North Carolina.
Source: Yahoo Maps, http://www.yahoo.com.

Commercial Fishing

Anecdotal information from Hatteras residents indicates the number of fish houses has decreased as tourism has increased (SAFMC 2006). Residents, however, still promote the fisherman's way of life through festivals and special community designations (SAFMC 2006).

Mirroring the statewide trend, the number of unlimited commercial permits held by residents of Hatteras decreased from 1999 (9 permits) to 2004 (5 permits). The number of limited

commercial permits has remained at 3 (SAFMC 2006). Twenty people stated they were employed in fishing related industry in the 1998 census, with 18 of these employed by marinas. A listing of the six marinas and eight bait and tackle stores in Hatteras Village can be found in SAFMC (2006).

Recreational Fishing

Hatteras is host to several prestigious fishing tournaments and is homeport for the island's famous charter fishing fleet. The number of charter/headboat permits held by Hatteras residents has dramatically increased, from one permit in 1999 to 28 in 2004.

3.4.2.1.3 *Wanchese*

A history of this community, and neighboring Manteo, describing its persistence as a small, close-knit community focused on making its living from the sea, can be found in SAFMC (2006).

Figure 3-13. Map of Roanoke Island, North Carolina, showing Wanchese and Manteo.
Source: Kitner 2005.

Overview

Figure 3-13 provides a map of Roanoke Island, including Wanchese and Manteo. While Wanchese has maintained its identity as a commercial fishing community, it faces continuing pressure from developers in nearby Manteo and other Outer Banks communities. However, the town has recently approved a zoning document that would prevent unplanned growth and

would help preserve working waterfronts and residential areas (Kozak 2005). A partial community profile detailing local traffic patterns, businesses, and prominent families can be found in SAFMC (2006).

The largest industrial area in Wanchese is centered on the Wanchese Seafood Industrial Park, built to enhance business opportunities in the seafood and marine trades. Tenants of the park are able to ship products overnight to major domestic and international markets through the airport in Norfolk, Virginia. The park is utilized by fishermen and seafood dealers, as well as boatbuilding and boat maintenance businesses. The park is full of activity and it is common to find large numbers of people, especially Hispanics, working in the marine trade industries.

Census statistics from 2000 show the population of Wanchese is aging and very homogenous, with little ethnic diversity. There has been a slight increase in the Hispanic population since 1990, mirroring most other communities in North Carolina. Education levels have also increased, and the poverty rate has decreased. A higher percentage of people are employed in fishing-related professions in Wanchese than in almost any other community – 10 percent – although even that number has decreased nearly 50 percent since 1990.

Commercial Fishing

Commercial landings and value for Wanchese/Stumpy Point declined from 31.9 million pounds valued at $26.1 million in 2001 to 28.7 million pounds valued at $23.2 million in 2002. In 2001, Wanchese/Stumpy Point was listed as the 28th most prominent United States port based on the value of the product landed, declining to 30th in 2002. While landings increased in 2003, to 33 million pounds, value further declined to $21 million (31st place), with further declines in both poundage (31 million pounds) and value ($20.5 million) in 2004.

Amendment 8, which limited entry into the commercial snapper grouper fishery, does not appear to have caused a decrease in the number of commercial permits held by residents of Wanchese (SAFMC 2006). In 1999, seven unlimited commercial permits were held, with eight in 2004. Three limited commercial licenses were held in both 1999 and in 2004.

One hundred twenty residents of Wanchese stated they were employed in fishing related industries in the 1998 census (SAFMC 2006). Sixteen of these were listed as employed in fishing, 56 in fish and seafood, and 40 in boatbuilding.

There were 228 commercial vessels registered and 201 state standard commercial fishing licenses issued in the community in 2002 (SAFMC 2006). Wanchese residents also held 12 dealer licenses. The town is an important unloading port for many vessels transiting to and from the Mid-Atlantic and South Atlantic.

Recreational Fishing

As of 2005, nine boatbuilding businesses were located in Wanchese, building either pleasure yachts, recreational fishing vessels or, less often, commercial fishing vessels. There were two bait and tackle businesses and two marinas in town. All these businesses rely on the fishing industry. Manteo also maintains an active private and for-hire recreational fishing

community. From 1999 to 2004, there was an increase in the number of charter/headboat licenses held, from two permits to nine permits. As most of the recreational sector for the region operates out of Manteo and Nags Head, these communities would be more affected by recreational fishing restrictions than would Wanchese.

Figure 3-14. Area of Carteret County, North Carolina, showing Morehead City, Atlantic Beach (at the red star), and Beaufort.
Source: Yahoo Maps, http://www.yahoo.com.

3.4.2.1.4 *Morehead City*

In Carteret County, Morehead City, Beaufort, and Atlantic Beach form a triad of different but complementary communities in close geographic proximity (Figure 3-14). A detailed history of Morehead City, from its founding in the 1840s-1850s to its development as a center for sport and tournament fishing in recent years, can be found in SAFMC (2006).

Overview

Morehead City's economy is currently based on tourism, fishing (commercial and recreational), light industry, government, and other service and professional industries. The town has regained its commercial viability as a modern port terminal, and benefits from its location on the "sound-side" of the Atlantic Beach resort trade. Diving has become an important tourist activity; Rodale's Scuba Diving magazine recently named North Carolina as the best wreck diving destination in North America, and Morehead City as the best overall

dive destination. Recreational fishing effort is growing quickly, as new marinas, boat storage areas, boat builders, and marine supply stores open in the city.

Detailed statistics detailing community demographics of Morehead City in 1990 and 2000 can be found in SAFMC (2006). The population of Morehead City increased from 1990 to 2000, with sizable increases in the number of people declaring non-white ethnicities. Median income increased from approximately $20,000 to nearly $29,000 from 1990 to 2000. Median home value nearly doubled, and median rent increased 35 percent. The percentage of those completing high school increased by 10 percent, and there was a seven percent increase in those receiving a bachelor's degree or higher. The poverty level decreased. However, the unemployment rate increased. The occupations of farming, fishing, and forestry employ more than one percent of the population of Morehead City.

Commercial Fishing

In 1998, 100 people were employed in fishing related businesses according to census figures, with 40 employed in marinas and 36 employed in fish and seafood businesses (SAFMC 2006). Over 200 state commercial vessel licenses, 150 state standard commercial fishing licenses, and 14 dealer licenses were issued by the state to residents of Morehead City in 2002. The number of unlimited commercial permits held by Morehead City residents was 15 in 1999 and 14 in 2004, while the three limited commercial permits held in 1999 were no longer held by 2004 (SAFMC 2006). As of 2002, the state had issued 211 commercial vessel registrations, 150 standard commercial licenses, and 14 dealer licenses to Morehead City residents. Residents of Morehead City were primarily employed by marinas (40 percent) and fish and seafood (36 percent), with 16 percent employed in boatbuilding businesses.

A narrative detailing the fishing methods, habits, and observations of a bandit-rig fisherman in Morehead City can be found in SAFMC (2006).

Recreational Fishing

The number of charter/headboat permits held by Morehead City residents nearly doubled, from seven in 1999 to 13 in 2004.

3.4.2.1.5 *Beaufort*

Beaufort is located on the coast near Cape Lookout, and borders the southern portion of the Outer Banks. Its deep harbor is home to vessels of all sizes, and its marinas are a favorite stop-over for transient boaters. A detailed history of Beaufort, from its establishment to its importance as a trade center during the 18th and 19th centuries, to its later involvement in the menhaden fishing industry, can be found in SAFMC (2006).

Overview

Tourism, service industries, retail businesses, and construction are important mainstays of the Beaufort area, with many shops and restaurants catering to people from outside the area. Census data show a slight decrease in population size from 1990 to 2000, from 3,808 inhabitants to 3,771, perhaps due to the aging population. Educational attainment rose over the last decade, and the percentage of individuals below the poverty line fell slightly. The percentage of those in the labor force decreased, another possible indication of an aging population. However, the percentage unemployed also decreased. The number of people working in farming, fishing, and forestry remained about the same from 1990 to 2000. According to census business pattern data from 1998, most of the fishing-related employment in Beaufort (total 300 persons) occurs in the boat building industry, which employs 184 residents (SAFMC 2006). Forty-eight people reported working in marinas, while others are employed in fish processing, fish harvesting, and seafood marketing.

Commercial Fishing

There has been a slight decrease in the number of unlimited commercial permits held by residents of Beaufort, from 5 permits in1999 to 4 permits in 2004. In the last two years, the one limited commercial permit held by a Beaufort resident was no longer reported. As of 2002, the state had issued 430 commercial vessel registrations, 294 standard commercial licenses, and 32 dealer licenses to Beaufort residents.

Recreational Fishing

There has been virtually no change in the number of charter/headboat permits, 1 permit in 2003 and 2004, held by residents.

3.4.2.1.6 *Atlantic Beach*

Atlantic Beach has been a popular resort town since the 1870s. The first bathing pavilion was built on Bogue Banks in 1887. Tourists flocked to the resorts, and ferry service to Atlantic Beach increased. Other resorts and tourism related development occurred over the next century, and the area remains a popular vacation destination (www.atlanticbeach-nc.com/history_part-1.html).

Overview

Atlantic Beach demographic data from 1990 and 2000 show a slight population decline since 1990, as well as decreases in the percent of the population involved in farming, fishing, and forestry (SAFMC 2006). The median age of the population has increased, perhaps a reflection of the growing number of retirees moving to this area of the coast.

Commercial Fishing

As observed in other areas of North Carolina, since limited access was put into place, the number of commercial permits has decreased from eight unlimited commercial permits in 1999 to four in 2004, and four limited commercial permits to zero (SAFMC 2006). In 1998, 60 residents of Atlantic Beach were employed in fishing related industry, with 93 percent of those employed by the marine sector. In 2002, 56 vessels were registered with the state as commercial fishing vessels, 42 standard commercial fishing licenses were held by Atlantic Beach residents, and there were ten valid dealer licenses issued to community members (SAFMC 2006).

Recreational Fishery

Since 1999, the number of federal charter/headboat permits held by Atlantic City residents has increased from six to 19, though only one permit was recorded in 2002. Of the 60 individuals reporting working in a fishing related industry in 1998, 46 worked in marinas. Two state permits were issued to recreational fishing tournaments to sell licenses in 2002 (SAFMC 2006).

Figure 3-15. General area of Sneads Ferry, North Carolina.
Source: Yahoo Maps, http://www.yahoo.com.

3.4.2.1.7 *Sneads Ferry*

Sneads Ferry is a historical fishing village located on the New River near the northern tip of Topsail Island (Figure 3-15). The river joins the Intracoastal Waterway at Sneads Ferry, with

easy access to the Atlantic Ocean. A very active commercial fishing community, Sneads Ferry takes in more fish than any other Onslow County port (http://www.cbcoastline.com/areainfo.htm). It also includes Camp Lejeune, a U.S. Marine base. The Sneads Ferry Shrimp Festival has been held annually since 1971. Now grown to a two-day event, the annual shrimp festival is the town's major fund-raiser. From its proceeds, the town established a 14-acre community park and built a 7200-sq. ft. Shrimp Festival Community Building (www.sneadsferry.com/areahistory/his_sf.htm).

Overview

Census data indicate the population of Sneads Ferry increased by about 10 percent from 1990 to 2000, from 2,031 inhabitants to 2,248. Most new residents were white, and the number of black or African American residents decreased from 159 to 115. Median income increased from about $20,000 to nearly $35,000. Median home value increased from $65,000 to $110,000, but median rent remained about the same. The percentage of those completing high school increased by 10 percent and the percent of residents with at least a Bachelor's degree doubled, from six percent to 12.8 percent. The poverty level decreased from 20.9 percent to 13.5 percent, and the percentage of the population unemployed decreased from 8.3 percent to 2.2 percent. The percentage of residents employed in farming, fishing, and forestry decreased by half from 18.2 percent to 9 percent, while employment in sales and office occupations increased by over 17 percent. It is unclear who may be buying home sites on newly developed land in the town, but the town's current demographics may point to an increase in retirees in Sneads Ferry, as they are better educated, have higher incomes, and are older. The dramatic decline by approximately 50 percent of persons employed in extractive natural resource occupations may be due to increasing job opportunities outside of the community, the changing impacts of regulations, or status of the resources

Commercial Fishing

Sneads Ferry is a small town with little of the large-scale development seen elsewhere on the North Carolina coast. Many houses in the community have fishing vessels docked in front of the house or on the lawn. The white rubber boots worn by commercial fishermen in this community and many other parts of North Carolina are commonly referred to as "Sneads Ferry Sneakers", suggesting the importance of commercial fishing to the area. Most of the fishermen in town are shrimpers and net fishermen who go out daily. There is also a strong contingent of black sea bass pot fishermen resident in the town. The species with the highest consistent landings in the town are black sea bass, button clams, blue crab, flounders, mullet, shrimp, spot, and whiting.

The number of federal charter/headboat permits held by residents increased from six in 1999 to 13 in 2004, while the number of unlimited commercial permits decreased from 22 to 17, and the number of limited commercial permits remained at one (SAFMC 2006). Over 347 commercial fishing vessels were registered with the state in 2002, and 228 residents held state-issued standard commercial fishing licenses. There were also 18 dealer licenses in the community and 169 shellfish licenses. In 1998, 16 persons were employed in fishing related industry, with 75 percent working in fish and seafood.

Recreational Fishing

Recreational fishing in Sneads Ferry is not as prominent an activity as in Morehead City. However, there are a large number of vessels with charter permits for snapper grouper homeported there. Little is currently known about recreational fishing out of Sneads Ferry, aside for its advertisement as an important tourist attraction in many websites that discuss the community. At least five marinas cater to recreational fishermen. There are two other marinas at Camp LeJeune Marine Base, just across the Neuse River. Some smaller river and sound fishing charters operating out of the area and one headboat runs from Sneads Ferry. Other than black sea bass, it does not appear that many snapper grouper species are frequently caught recreationally from Sneads Ferry.

3.4.2.2 South Carolina

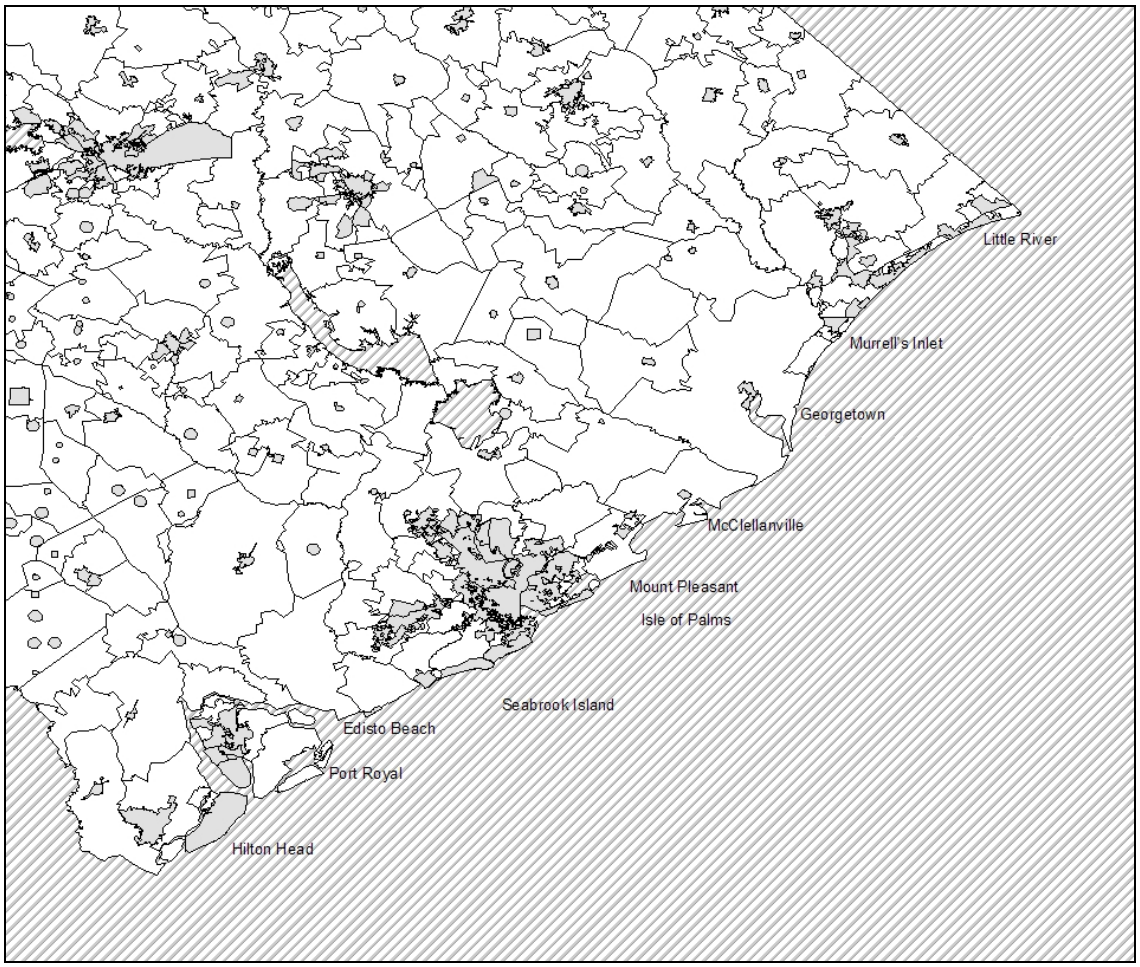


Figure 3-16. South Carolina communities with substantial fishing activity, as identified by South Atlantic Advisory Panels.

3.4.2.2.1 *Statewide*

Overview

South Carolina communities with substantial fishing activity are less developed than those in North Carolina and, over the past 20 to 30 years, the state has seen much more tourist-oriented development along its coasts than Georgia or North Carolina. In Horry County, the urban area of Myrtle Beach has expanded greatly in the past few decades, and much of the coastal area has been developed as vacation homes, condominiums, and golf courses. The communities most impacted by this development are Little River, Murrells Inlet, Pawleys Island, and Georgetown, although the latter three are located in Georgetown County (Figure 3-16). The same is true of rapid developing Charleston County, and the cities and communities of McClellanville, Mt. Pleasant, Sullivans Island, Wadmalaw and Edisto Islands feel the impact of urban sprawl from the city of Charleston. Further south along the coast, the Hilton Head Island resort development has been the impetus for changing coastal landscapes in the small towns of Port Royal, Beaufort, St. Helena Island, and Bluffton.

For the purpose of this document, only Little River will be singled out as a community with a high concentration of both commercial and recreational fishing, along with other types of coastal oriented leisure pursuits. Other analyses will consider South Carolina as a whole.

Commercial Fishing

While pockets of commercial fishing activities remain in the state, most are being displaced by the development forces and associated changes in demographics. The number of unlimited commercial permits, however, increased from 74 in 1999 to 87 in 2004, while the number of limited commercial permits decreased by 75 percent from 12 to 4 (SAFMC 2006).

Recreational Fishing

Many areas that used to be dedicated to commercial fishing endeavors are now geared towards the private recreational angler and for hire sector. The number of federal charter/headboat permits held by South Carolina residents increased from 41 in 1999 to 111 in 2004. The majority of saltwater anglers fish for coastal pelagic species such as king mackerel, Spanish mackerel, tunas, dolphins, and billfish. A lesser number focus primarily on bottom fish such as snapper and groupers and often these species are the specialty of the headboats that run out of Little River, Murrells Inlet, and Charleston. There are 35 coastal marinas in the state and 34 sportfishing tournaments (SAFMC 2006).

3.4.2.2.2 *Little River*

A history of Little River detailing its settlement in the late 1600s, its popularity as a vacation destination in the 1920s, and the concurrent rise in charter fishing, can be found in SAFMC (2006).

Figure 3-17. Little River, South Carolina, and surrounding area.
Source: Yahoo Maps, http://www.yahoo.com.

Overview

Figure 3-17 shows Little River and the surrounding area. A detailed description of changes in land-use patterns in and near Little River can be found in SAFMC (2006). Nearby Murrells Inlet is gradually transforming into a residential community for Myrtle Beach, and SAFMC (2006) argues this is also true for Little River.

Census data indicate the Little River population more than doubled from 1990 (3,470 persons) to 2000 (7,027 persons) and became more ethnically diverse with more people of American Indian or Alaskan Native, and Hispanic or Latino ethnicities. Median income increased by over 40 percent, from nearly $29,000 to over $40,000. Median home value also increased by over 40 percent, and median rent increased by nearly 35 percent. The percentage of those completing high school and those with a Bachelor's degree remained about the same. The poverty level decreased by nearly two-thirds to 4.7 percent, and the percentage of the population unemployed decreased from 6.6 percent to 3.4 percent. The percentage of residents employed in farming, fishing, and forestry decreased from 3.6 percent to 0.9 percent.

Commercial Fishing

In 1998, 38 residents of Little River were employed in fishing related industry according to the U.S. Census, with 81 percent of those employed by the marina sector. The number of snapper grouper unlimited harvest commercial permits held by community residents remained about the same between 1999 and 2004, from 15 permits to 16 permits, and one resident still held a limited harvest commercial license. Twenty-four Little River residents held state

permits, with the most being saltwater licenses (8 permits) or trawler licenses (5 permits) (SAFMC 2006).

Recreational Fishing

As observed in other coastal communities described herein, the number of charter/headboat permits held by community residents increased from nine in 1999 to 16 in 2004. Three headboats operated out of Little River, and this part of the for-hire industry has a long and storied past in the community. Recreational fishing, primarily as headboat effort, came about as a way for commercial fishermen to continue fishing in the summer months. A detailed account of how recreational fishing developed in Little River can be found in Burrell (2000). Most of the private recreational fishing effort in this area occurs out of marinas in North Myrtle Beach, Myrtle Beach, and Murrells Inlet.

3.4.2.3 Georgia

3.4.2.3.1 *Statewide*

Overview

Only one community in Georgia (Townsend) lands a substantial amount of the snapper grouper species addressed in this amendment. Other parts of the state involved in the commercial harvest of seafood are focused on penaeid shrimp, blue crabs, and other finfish such as flounder, shad, croaker, and mullet.

Brunswick, the other community that has a commercial fishing presence, was once a more thriving commercial fishing community but now tourism and other related activities are competing for waterfront in the town. The most commonly harvested species in Brunswick are blue crab and different species of penaeid shrimp. According to the ACCSP website, there have been no snapper grouper species landed in Brunswick in since 2001. Other parts of the state involved in the commercial harvest of seafood are focused on penaeid shrimp, blue crabs, and other finfish such as flounder, shad, croaker, and some mullet.

Commercial Fishing

Unlike the pattern observed in many other areas, the number of unlimited commercial permits and limited commercial permits held by Georgia residents did not decrease from 1999 to 2004, with eight permits and one permit, respectively. In 2002, 947 vessels were registered with the state as commercial fishing vessels, 612 full-time state commercial fishing licenses were held by Georgia residents, and 147 residents held part-time state commercial fishing licenses. Within the commercial fishing fleet, four hundred and eighty two vessels had shrimp gear on board in that year (SAFMC 2006).

Recreational Fishing

As observed in other areas, the number of charter/headboat permits held by Georgia residents increased markedly from five permits in 1999 to 27 permits in 2004 (SAFMC 2006). Recreational vessels are located at Tybee Island close to Savannah, on the barrier islands off Brunswick, and between Savannah and Brunswick.

3.4.2.3.2 *Townsend*

A history of the area, describing its economy before the Civil War, the rise and fall of lumbering, and the building of the railroad, can be found in SAFMC (2006). Townsend is a small, rural community. In 2005, the fish house in this community was relocating inland. It is not known if this relocation was successful and whether that fish house will be handling domestically harvested fish in the future.

Overview

The population of Townsend increased by over 1,000 residents from 2,413 in 1990 to 3,538 in 2000. Although there was a large relative increase in the number of Hispanic or Latino residents, from 2 to 27, most of the new inhabitants were white (1,465 in 1990 and 2,437 in 2000). Median income increased from approximately $23,000 to $35,000. Median home value nearly tripled, from $33,000 in 1990 to $98,100 in 2000, and monthly rent nearly doubled, from $213 to $431. In 1990, 26.9 percent of residents had less than a 9th grade education, but by 2000, that number declined to 11.0 percent. The percentage of those completing high school increased by nearly 15 percent, while the percent receiving a bachelor's degree or higher remained about the same (8.4 percent to 8.9 percent). The percent of the population with an income below the poverty line deceased by four percent, but remained high at 14.6 percent. The percentage of the population unemployed increased from 3.4 percent to 6.5 percent. There has been a sizeable decline in the percentage of the population employed in manufacturing, from 29.0 percent to 16.2 percent, and the proportion of the population employed in farming, fishing, and industry remained unchanged at approximately three percent.

Commercial Fishing

A comprehensive description of the historic and current fish houses of coastal Georgia and how they operate, focusing on Phillips Seafood of Townsend, can be found in SAFMC (2006). For nearly a decade, only one fish house has consistently handled snapper grouper species. A fish house in Brunswick may have landed these species in the past, but has not reported landings since 2001.

Recreational Fishing

Offshore recreational anglers do not often target or harvest snapper grouper species in Georgia (http://www.st.nmfs.noaa.gov/st1/recreational/overview/overview.html).

Of the snapper grouper species harvested, black sea bass, sheepshead, and vermilion snapper are the most commonly harvested fish at five, seven, and two percent, respectively. As of 2004, residents of the Savannah area held 11 charter/headboat permits for snapper grouper, and many of these vessels are docked on Tybee Island. Residents of the area around the city of Brunswick, including Jekyll Island and Sea Island, held four snapper grouper charter/headboat permits. Interestingly, unlike the cities profiled in the Carolinas, the number of federally permitted for-hire vessels has declined dramatically. From 2003 to 2004, the number of snapper grouper permitted for hire vessels declined from 43 to 27 (NMFS 2004). The cause of this decline is unknown.

3.4.2.4 Florida

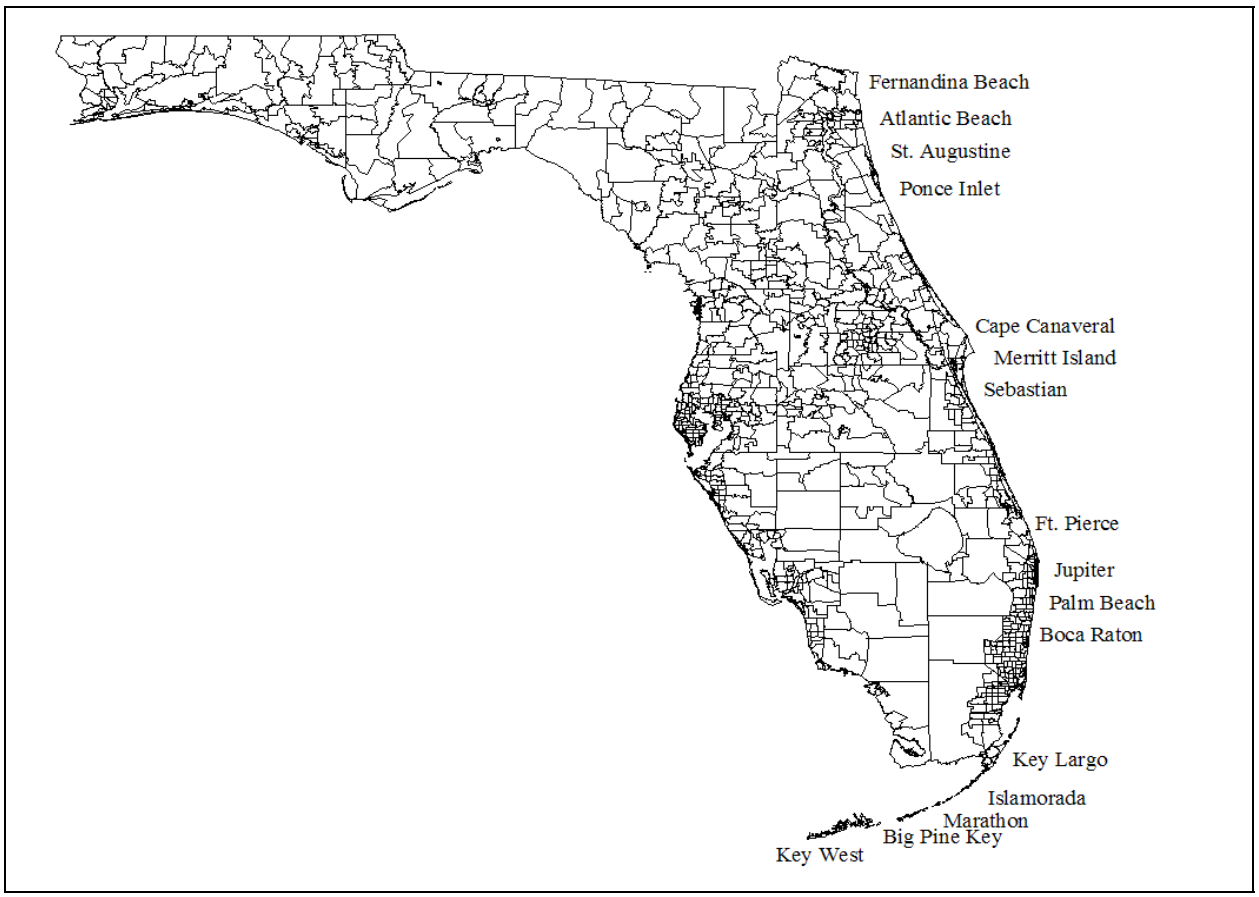


Figure 3-18. Florida communities with substantial fishing activity. Identified by South Atlantic Advisory Panels.
Source: Jepson *et al.* (2005).

3.4.2.4.1 *Statewide*

Overview

Florida stands apart from other states in the South Atlantic region in fishing behaviors, history, and demographics. Florida has one of the fastest growing populations in the United States, estimated to increase each day by 750 to 1,000 new immigrants. Twenty-five percent of all vacation homes in the United States are located in Florida's coastal counties (Coastal Ocean Resource Economics 2005).

Along with being heavily populated on land, coastal waters off Florida are also heavily used by recreational users of all kinds. This growth of a leisured class occupying coastal areas has led, in part, to conflicts over natural resource access and use-rights. One example of this type of struggle was the conflict over the use of gillnets in state waters. The conflict culminated in a state-wide ban on the use of gillnets, which dealt a resounding blow to many Florida fishermen, ending in the loss of many commercial fishing properties and the displacement of many fishermen. There have also been conflicts between the "environmental community" and commercial fishermen over the closing of the *Oculina* Bank off of Florida's central coast, and the creation of both the Florida Keys National Marine Sanctuary and the Tortugas Sanctuary, both in the Keys.

The natural geography of Florida also sets it apart from other South Atlantic states, particularly in the area from central Florida through the Keys. The weather is amenable to fishing almost year round, though hurricanes in 2004 were particularly devastating and took a toll on all fisheries in the state, both east and west coast. There was also a cold water event that started near West Palm Beach in 2003, which moved up the east coast causing a substantial decline in snapper grouper fishing that year. The continental shelf is much narrower in Florida than elsewhere in the region, allowing fishermen to access deep waters quickly and return the same day. Finally, the species of snapper grouper available to fishermen in southern Florida are different than further north, with yellowtail snapper, gag and black grouper, and other alternative species such as stone crab, spiny lobster, dolphin, kingfish, and billfish allow a greater variety of both commercial and recreational fishing opportunities. These fisheries are important to many Florida communities identified by the Snapper Grouper Advisory Panel as shown in Figure 3-18.

Commercial Sector

Considering the high population growth rates and emphasis on a tourism economy in Florida, the commercial fishing sector in Florida is still robust in some areas. Although total landings and dollar values of all species landed on the Florida East coast have decreased from 1998 to 2003 (from nearly 30 million pounds worth approximately $44 million to approximately 23 million pounds worth $33 million dollars; SAFMC 2006), there is still a considerable commercial fishing presence in east Florida.

Recreational Sector

While the commercial fishing industry, though still strong, may be in decline, the recreational sector appears to be stable. Excluding the headboat sector, although the number of participants declined in 2004 to approximately 1.9 million from 2.2 million in 2003 and from a high of 2.6 million in 2001, the number of trips taken in 2003 and 2004 remained at approximately 21 million. As may be recalled from Table 3-17, the headboat sector has exhibited a steady decline. In 2004, many homeports hosted at least one vessel holding both federal charter/headboat permits and federal unlimited commercial permits. Key West and Miami stand out, with 35 and 15 such vessels, respectively.

3.4.2.4.2 *Cape Canaveral*

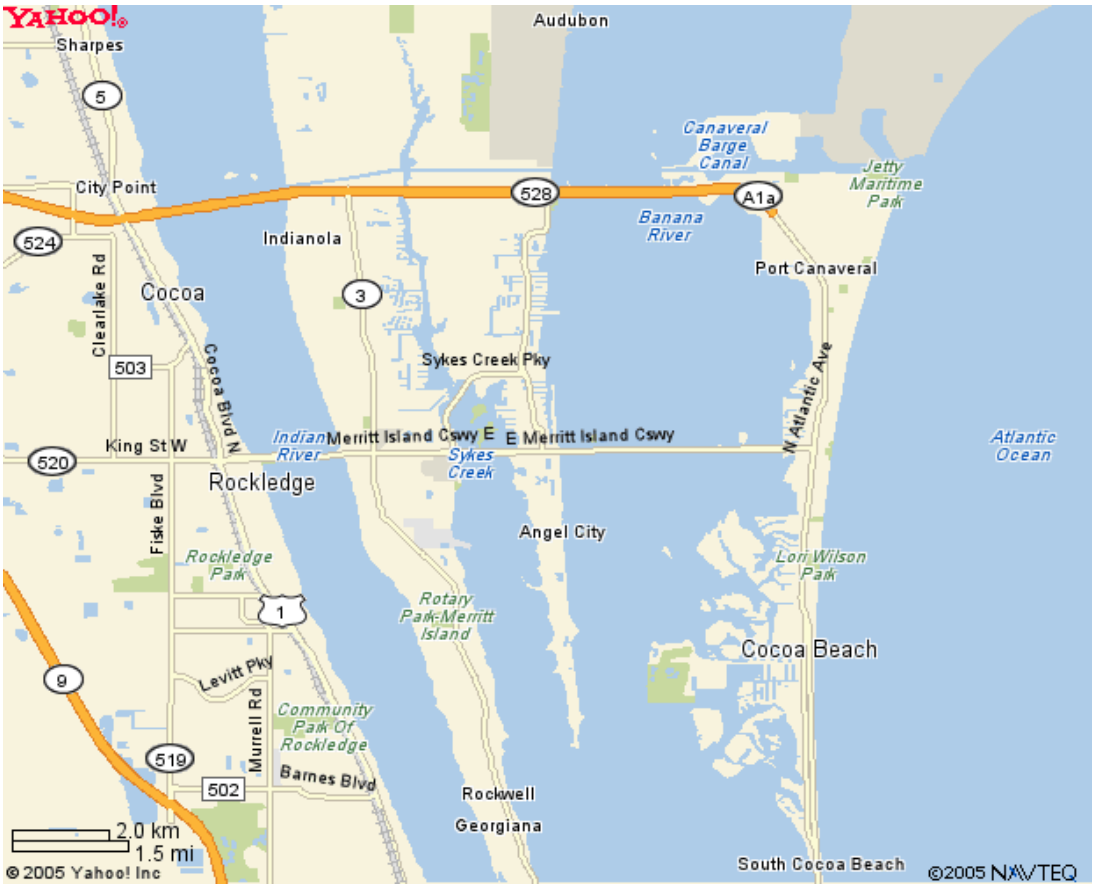


Figure 3-19. Area map of Cape Canaveral, Florida.

A detailed history of Cape Canaveral, Florida, from its first habitation 10,000 years ago, its settlement by the United States in the early 1800s, the establishment of the Banana River Naval Air Station in World War II, to NASA's arrival in 1952, can be found in SAFMC (2006). A map of the area is shown in Figure 3-19.

Overview

Cape Canaveral has a fairly homogenous, aging population, with those 65 years and older growing from 16.1 percent of the population to 23.1 percent since 1990. Overall, educational attainment has increased. The number of persons who speak a language other than English at home has increased 2.5 percent, and fewer people have incomes below the poverty line. Unemployment has decreased, but fewer people are in the labor force today than in 1990, perhaps due to an aging population. The percentage of persons in a service occupation has grown from 14.1 percent to 20.4 percent, while there has been a sizeable decline in the percent of residents employed in forestry, mining, and fishing, from 2.7 percent in 1990 to 0.4 percent in 2000.

Fisheries in central Florida generally operate in two different environments, inshore river or inlet fishing with associated lagoons, which primarily attracts recreational fishing, and offshore areas, where commercial fishing primarily occurs. Popular inshore areas include the Indian, St. Johns, and Banana Rivers and associated lagoons. Commercial exploitation of the rivers and lagoons declined after implementation of the Florida Net Ban of 1994.

Many commercial fish houses have gone out of business or have shifted to selling imported products to supplement their local supplies. At the same time, the number of businesses possessing federal dealer permits has increased from about 180 in 1999 to a little over 200 in 2001. There is some industry speculation that the increasing number of dealer permits reflects increased decentralization in the domestic fishing markets and the need to increase profits by self-marketing.

Commercial Fishing

Cape Canaveral draws fishermen from Cocoa/Cocoa Beach, Merritt Island, Melbourne, and Titusville. These fishermen target many snapper grouper species, as well as coastal migratory pelagics such as mackerel, highly migratory species such as sharks and swordfish, and shellfish such as oysters, quahogs, and shrimp. Snowy grouper and tilefish (particularly golden or sand tilefish) landings exceed 10,000 pounds per year. Total commercial landings decreased, however, from 8.9 million pounds to 6.0 million pounds from 1998 to 2004 (SAFMC 2006).

The number of unlimited commercial permits in this area increased from nine in 1999 to 16 in 2004. The number of limited commercial permits fluctuated over this period, but ultimately declined from four permits in 1999 to one in 2004 (SAFMC 2006).

The number of Florida Saltwater Products Licenses issued to residents of Brevard County (where Cape Canaveral is located) decreased from 872 in 1998/99 to 492 in 2004/05 (SAFMC 2006). This license is needed to sell marine species in the state. There have also been declines in license sales for various crustacean fisheries.

Recreational Fishing

In 2004, Brevard county supported 36 bait and tackle stores, with five in Cape Canaveral, and 70 marinas with over 3,000 wet slips, indicating the importance of recreational fishing to the area. Fourteen fishing tournaments consistently occur in the area. Additional details about these businesses and tournaments can be found in SAFMC (2006).

As in other coastal areas of Florida, there is a fairly heavy presence in Brevard County of charter boat businesses, private marinas, and other associated businesses catering to the recreational fishing sector. The number of federally permitted charter/headboat vessels in Cape Canaveral increased from zero to seven from 1999 to 2004. According to Holland *et al.* (1999), there were approximately 32 charter boats and 2 headboats in the Canaveral/Melbourne area. Current estimates from permit files show at least 38 for-hire vessels with Snapper grouper permits homeported in Cape Canaveral or Port Canaveral, which includes approximate four headboats. That is likely a low estimate for total the total number of for-hire vessels in the area since it does not include vessels in the nearby Merritt Island and in the Cocoa/Cocoa Beach areas.

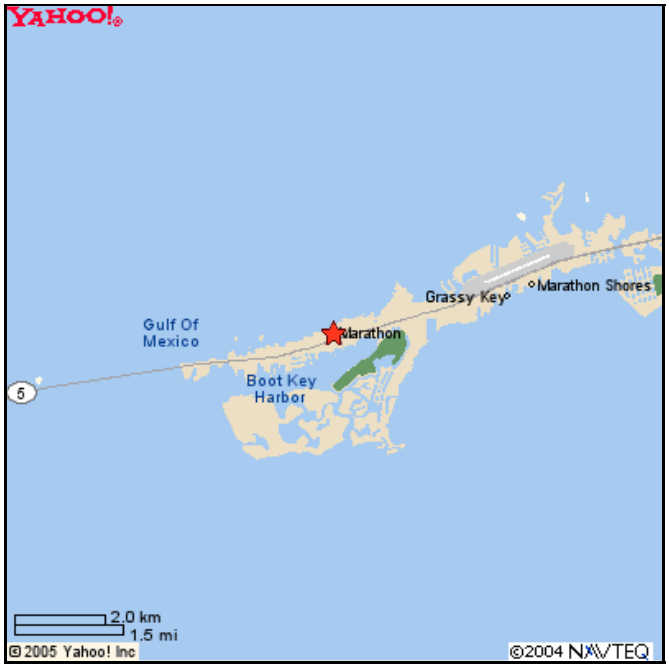


Figure 3-20. Marathon, Florida.
Source: Yahoo Maps, http://www.yahoo.com.

3.4.2.4.3 *Marathon*

A history of Marathon, detailing its settlement in the 1800s, the rise of industry, the effects of the Great Hurricane of 1935, the rise of tourism, and the importance of commercial fishing, can be found in SAFMC (2005). Figure 3-20 shows a map of Marathon, which lies in Monroe County.

Overview

Census data from 1990 and 2000 show there was an increase in overall population in Marathon from 8,857 in 1990 to 10,255 in 2000. During this period, the Hispanic population more than doubled, increasing from 1,040 to 2,095. This increase accounts for more than two thirds of the total population increase for the area. During this period of time, the median household income increased from approximately $25,000 to over $36,000.

Marathon has maintained a relatively high percentage of the total population, 4.1 percent in 2000, involved in farming, fishing, and forestry, though the percentage has declined from 8.7 percent in 1990. Since there is little commercial farming and forestry occurring in the area, the majority of percentage can be assumed to relate to fishing activities. The percentage of people that live below the poverty line decreased slightly from 15.1 percent in 1990 to 14.2 percent in 2000.

Commercial Fishing

In 1998, 184 Marathon residents were employed in fishing related industry according to the Census data, with 39 of those in the "fishing" category, 92 employed in "fish and seafood," and 47 employed by marinas (SAFMC 2006). The number of unlimited commercial permits held by community residents decreased from 65 permits to 44 permits between 1999 and 2004. Similarly, the number of limited commercial permits decreased from 43 permits to 31 permits.

Recreational Fishing

While most of the waters around Marathon are open to fishing, some areas have been set aside for eco-tourism and fish-viewing by divers and snorkelers. Sombrero Reef, said to be one of the most beautiful sections of North America's only living coral barrier reef, lies several miles offshore and is protected by the Florida Keys National Marine Sanctuary (http://www.fla-keys.com/marathon).

The importance of recreational boating and fishing to the economy of Marathon is shown by the businesses reliant upon it. As of 2004, there were at least 25 charter boat businesses, two party boat businesses, eight bait and tackle shops, and 27 marinas in the area. The number of vessels holding the federal charter/headboat permit increased from 16 in 1999 to 30 in 2004. In addition, there were seven fishing tournaments in Marathon. Most tournaments are centered on tarpon fishing. However, there are inshore and offshore fishing tournaments as well. These tournaments begin in February and run through June. Hotels and restaurants fill with participants and charters, guides and bait shops reap the economic benefits of these people coming to the area. These tournaments are positive economic pulses in the local economy, one that thrives on the existence of tourism and recreational fishing.