Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agency: National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Southeast Regional Office (SERO), Sustainable Fisheries Division (F/SER2)

Activity: The Continued Authorization of Snapper-Grouper Fishing in the U.S. South Atlantic Exclusive Economic Zone (EEZ) as Managed under the Snapper-Grouper Fishery Management Plan (SGFMP) of the South Atlantic Region, including Amendment 13C to the SGFMP

Consulting Agency: NOAA, NMFS, SERO, Protected Resources Division (F/SER3)

Approved by: Roy E. Crabtree, Ph.D., Regional Administrator.

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Contents:

Introduction

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 *et seq.*), requires each federal agency to ensure any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of any critical habitat of such species. When the action of a federal agency may affect an ESA-listed species or its critical habitat, that agency is required to consult with either NMFS or the U.S. Fish and Wildlife Service (USFWS), depending upon the protected species that may be affected.

Consultations on most listed marine species and their critical habitat are conducted between the action agency and NMFS. These consultations are concluded after NMFS has determined that an action is not likely to adversely affect listed species or designated critical habitat, or issues a biological opinion (opinion) identifying whether the proposed action is likely to jeopardize the continued existence of a listed species, or destroy or adversely modify any critical habitat. If jeopardy or destruction or adverse modification is found to be likely, NMFS must identify reasonable and prudent alternatives to the action, if any, that would avoid jeopardizing any listed species and avoid destruction or adverse modification of any designated critical habitat. The opinion establishes an incidental take statement (ITS) specifying the amount or extent of incidental take of the listed species that may occur, reasonable and prudent measures (RPMs) to reduce the effect of take, and may recommend conservation measures to further conserve the species. Notably, no incidental destruction or adverse modification of critical habitat can be authorized. Thus, there are no RPMs for critical habitat, only reasonable and prudent alternatives that must avoid destruction and adverse modification.

This document constitutes NMFS' opinion on the effects of the continued authorization of snapper-grouper fishing in the U.S. South Atlantic Exclusive Economic Zone (EEZ) on threatened and endangered species and designated critical habitat, in accordance with section 7 of the ESA. This consultation considers the operation of the snapper-grouper fishery as managed under SGFMP, including all amendments implemented to date, as well as the actions proposed in Amendment 13C to SGFMP (Amendment 13C, SAFMC 2006). NMFS has dual responsibilities as both the action agency under the Magnuson-Stevenson Fishery Conservation and Management Act (MSFMCA) (16 U.S.C. §1801 *et seq*.) and the consulting agency under the ESA. For the purposes of this consultation, F/SER2 is considered the action agency and the consulting agency is F/SER3.

This opinion is based on information provided in: Amendment 13C to the SGFMP (SAFMC 2006), including a Final Environmental Impact Statement, Final Biological Assessment, Initial Regulatory Flexibility Analysis, Regulatory Impact Review, and Social Impact Assessment/Fishery Impact Statement; Amendment 13A to the SGFMP, including an Environmental Assessment, Regulatory Impact Review, and Initial Regulatory Flexibility Analysis (SAFMC 2003); sea turtle recovery plans; past and current sea turtle research and population modeling efforts; logbook data on fishing effort and interactions between ESA-listed species and the snapper-grouper fishery in the South Atlantic; other relevant scientific data and reports; consultation with F/SER2 staff; and previous opinions on other fisheries.

1.0 Consultation History

An informal section 7 consultation was conducted on the South Atlantic Snapper-Grouper Fisheries Management Plan (SGFMP) after its implementation in 1983. NMFS concluded the management measures proposed in the SGFMP were not likely to adversely affect ESA-listed species. The consultation did not analyze the effects of the fishery itself.

The effects of the South Atlantic snapper-grouper fishery on threatened and endangered species were examined as part of a larger April 28, 1989, opinion analyzing the impacts of all commercial fishing activities in the Southeast Region. The opinion concluded that commercial fishing activities in the Southeast Region were not likely to jeopardize the continued existence of any threatened or endangered species. The incidental take of ten, documented green, hawksbill, Kemp's ridley, or leatherback sea turtles; 100 loggerhead sea turtles; and 100 shortnose sturgeon was allotted to each fishery identified in the ITS. The amount of incidental take was later reduced in a July 5, 1989, opinion to only ten documented green, hawksbill, Kemp's ridley, or leatherback sea turtles; 100 loggerhead sea turtles; and 100 shortnose sturgeon for all commercial fishing activities conducted in the South Atlantic and the Gulf of Mexico fisheries combined.

Amendments 1 through 12, 13A; an emergency interim rule; and eight regulatory amendments to the SGFMP were all either consulted on informally and found not likely to adversely affect threatened or endangered species, or were determined by F/SER2 to have no effect on ESA-listed species and did not warrant consultation. It was believed these changes would not alter the prosecution of the snapper-grouper fishery in ways not previously considered. Nor were they expected to significantly alter the potential impacts to threatened and endangered species, or their designated critical habitats, in ways not previously considered in the July 5, 1989, opinion. Amendments 14 and 15 are currently under development, and a section 7 consultation will be conducted at the appropriate time.

The formal consultation for this amendment was reinitiated on March 30, 2006. As provided in 50 CFR 402.16, reinitiation of formal consultation is required when discretionary involvement or control over the action has been retained (or is authorized by law) and: (1) the amount or extent of the incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not previously considered; or (4) if a new species is listed or critical habitat designated that may be affected by the identified action.

The proposed actions in Amendment 13C did not trigger the need to reinitiate. These proposed modifications are not expected to alter fishing in a manner that causes an effect to listed species or critical habitat not previously considered. Instead, consultation was reinitiated on the snapper-grouper fishery to address new data availability and the listing of a new species. These data provide new information on the impacts of South Atlantic snapper-grouper fishing on ESA-listed species that has emerged in the 22 years since the last formal consultation. This new information may impact the environmental baseline, which is considered when evaluating the overall impacts of the proposed action on each species. Additionally, the impacts of snapper-grouper fishing on the U.S. distinct population segment (DPS) of smalltooth sawfish (listed as endangered in April 2003) were not analyzed in previous consultations.

The presence of these reinitiating factors led F/SER2 to request reinitiation of consultation on the South Atlantic snapper-grouper fishery. Therefore, this opinion will analyze the effects of all snapper-grouper fishing activities prosecuted under the SGFMP, as amended to date, and under Amendment 13C.

2.0 Description of the Proposed Action

F/SER2 is proposing to implement Amendment 13C to the South Atlantic SGFMP. The South Atlantic Fisheries Management Council (SAFMC) and SERO prepared the amendment to modify the SGFMP and associated regulations at 50 CFR Part 622, under the authority of the MSFCMA. Specifically, five management actions are proposed: four would eliminate or phase out overfishing of snowy grouper, golden tilefish, vermilion snapper, and black sea bass; the other would increase red porgy harvest consistent with an updated stock assessment.

These proposed changes are guided by the MSFCMA, the principle federal statute governing the management of U.S. marine fisheries. The MSFCMA directs regional fishery management councils to adopt conservation and management measures that prevent overfishing, while continuously achieving optimum yield (OY) for managed fisheries (MSFCMA § 301(a)(1)). To assist the regional fishery management councils in achieving this mandate, FMPs are required to specify biological reference points and status determination criteria for managed species. These criteria are intended to provide managers with the means to measure the status and performance of a fishery and to allow them to assess whether management measures are achieving established goals.

The underlying goal of this amendment is to end overfishing, while achieving optimum yield from each fishery by implementing new regulations or by modifying existing ones. To end overfishing immediately, reductions in fishing mortality of 31% or more are required.[1] The proposed amendment seeks to achieve these reductions in the commercial sector by imposing new or adjusted: catch quotas, size limits, trip limits, seasonal closures, fishing year start dates, and gear restrictions. Measures instituting new or adjusted: catch allocations, bag limits, size limits, and seasonal closures for the recreational sector of the fishery are also proposed (Table 2.1)(SAFMC 2006).

Overfishing of red porgy has ceased in the wake of conservation efforts adopted under Amendment 12 to this FMP. As a result, the stock is rebuilding and a higher allowable

[1] Fishing mortality reductions needed to end overfishing are species dependent. Reductions of 31% are required to reduce overfishing in vermilion snapper, 62% for black sea bass, 34% for golden tilefish, and 66% for snowy grouper (SAFMC 2006).

biological catch is proposed for 2005-2007. The constant fishing mortality rebuilding strategy suggests an increase of 109% from the average catch during the 2000-2003 seasons would achieve this allowable biological catch. The management measures proposed to achieve this increase focus on the commercial sector of the fishery and involve new or adjusted catch quotas, size limits, trip limits, seasonal closures, fishing year start dates, and gear restrictions (SAFMC 2006).

When consulting on FMP actions, NMFS must consider not only the effects of the specific management measures proposed but also the effects of all fishing activity authorized under the FMP. A description of the South Atlantic snapper-grouper fishery is provided below in Section 2.2. The snowy grouper, golden tilefish, vermilion snapper, black sea bass, and red porgy fisheries represent only portions of the species managed in the South Atlantic snapper-grouper fishery. Therefore, the following sections are not specific to only the snowy grouper, golden tilefish, vermilion snapper, and black sea bass, or red porgy fisheries. Instead, they provide a summary of the overall characteristics of the South Atlantic snapper-grouper fishery authorized under the SGFMP, which are relevant to the analysis of its potential effects on threatened and endangered species.

2.1 Overview of Management and Regulations

The SAFMC has jurisdiction from the North Carolina/Virginia border to the Atlantic side of Key West, Florida. The snapper-grouper fishery of the South Atlantic has been regulated since the implementation of its Fishery Management Plan/Environmental Impact Statement (FMP/EIS) in 1983. The South Atlantic Fisheries Management Council currently manages snapper-grouper stocks via Fisheries Management Units (FMUs). Each regional fishery management council FMP defines an FMU, which identifies the specific fishery (or portion thereof) that is relevant to the FMP's management objectives. The SAFMC's snapper-grouper FMU is currently composed of 72 species.

The snapper-grouper complex was established because these species are subtropical/tropical in distribution and mostly limited to areas of the east coast, south of Cape Hatteras. The snapper-grouper complex is comprised of the overlapping ranges of a large multi-species fishery. By developing a single, comprehensive plan to manage all these species within the South Atlantic region, the costs of management are greatly reduced (SAFMC 1983).

Table 2.1. Proposed Changes to Commercial and Recreational Fishing Regulations (SAFMC 2006)

	Snowy Grouper	Golden Tilefish	Vermilion Snapper	Black Sea Bass	Red Porgy
Current Commercial Regulations					
Annual Quota	344,508 lbs. gutted weight (gw)	1,001,663 lbs. gw	None	None	May-Dec.: 50 lbs. gw bycatch/trip
Trip Limit	2,500 lbs. gw when season open; 300 lbs. gw when closed	5,000 lbs. gw, when season open; 300 lbs. gw when closed	None	None	Jan.-Apr.: 1/person/day
Size Limit	None	None	12" TL	10" TL	14" TL
Proposed Changes to Commercial Regulations					
Annual Quota (lbs. gw.)	151,000 yr 1; 118,000 yr 2; 84,000 yr 3+	295,000	1,100,000	477,000 yr1 423,000 yr 2 309,000 yr 3+	127,000
Trip Limit (unless noted otherwise)	275 lbs. gw yr 1; 175 lbs. gw yr 2; 100 lbs. gw yr 3+	4,000 lbs gw; 300 lbs. gw[2]	None	None	120 fish[1,4]
Size Limit	None	None	None	None	None
Current Recreational Regulations					
Bag Limit	Included in 5 grouper/person limit	Included in 5 grouper/person limit	10 (in addition to snapper bag limit)	20/person/trip	1/person/trip
Size Limit	None	None	11" TL	10" TL	14" TL
Seasonal Closure	None	None	None	None	None
Annual Quota	None	None	None	None	None
Proposed Recreational Regulations					
Bag Limit	1/person/day[5]	1/person/day[5]	None	15/person/trip	3/person/trip
Size Limit	None	None	12" TL	11" TL yr 1 12" TL yr 2+	None
Seasonal Closure	None	None	Jan. - Feb.	None[6]	None
Annual Recreational Allocation	None	None	None	633,000 yr 1 560,000 yr 2 409,000 yr 3+	None

[1]Until quota is met.
[2]Higher trip limit until 75% of quota is taken then reduce to 300 lbs. Do not adjust trip limit downwards unless 75% is captured on or before September 1.
[3]Also require use of 2" mesh for the entire panel of black sea bass pots and change fishing year to June 1 through May 31.
[4]Trip limit effective May through December.
[5]Within the 5 grouper/person/day aggregate recreational bag limit.
[6]Change fishing year to June 1 through May 31.

The original FMP was established in 1983 to address three primary problems within the fishery: (1) thirteen species in the snapper-grouper complex were in a documented state of growth overfishing; (2) the likelihood that many of the remaining species would experience growth overfishing in the near future was believed to be high; and (3) the data necessary to document growth and/or recruitment overfishing was very limited. To address these problems the FMP (1) imposed minimum size limits on six of the thirteen species, to combat growth overfishing; (2) requested NMFS' Regional Director to use his authorization to impose minimum size limits on additional species thought to be in danger of undergoing overfishing, according to an evaluation procedure it established; and (3) authorized the collection of necessary data to monitor stock status (SAFMC 1983).

Over the next two decades, subsequent amendments to that FMP were made to institute a variety of regulatory measures to further protect and manage the resource. Trawl gears, primarily targeting vermilion snappers, were prohibited starting in January 1989. Fish traps (not including black sea bass pots) and entanglement nets were prohibited as of January 1992. Bag limits were also implemented in January 1992 (10 vermilion snapper; 5 groupers). Quotas and trip limits for snowy grouper and golden tilefish were implemented in July 1994; tilefish were also added to the 5-grouper aggregate bag limit. A controlled access program for the commercial fishery was implemented fully beginning in 1999. In February 1999, red porgy regulations were 14 in. size limit and 5-fish bag limit and commercial closure during March and April; black sea bass size limit increased to 10 in. and a 20-fish bag limit was included; and the vermilion snapper recreational bag limit was increased to 11 in. All harvest of red porgy was prohibited from September 8, 1999, until August 28, 2000. Beginning on August 29, 2000, red porgy regulations included a January through April commercial closure, 1 fish bag limit, and 50-pound commercial bycatch allowance May through December. These red porgy regulations remain in place (SAFMC 2006).[2]

2.1.1 Management of South Atlantic Snapper-Grouper Exempted Fishing, Scientific Research, and Exempted Educational Activity

Regulations at 50 CFR 600.745 allow the Regional Administrator of NMFS' SERO to authorize the target or incidental harvest of species managed under an FMP or fishery regulations that would otherwise be prohibited, for scientific research activity, limited testing, public display, data collection, exploratory health and safety, environmental cleanup, hazardous waste removal purposes, or educational purposes. Every year, the SERO may issue a small number (e.g., two in 2005, five in 2004, none in 2003) of exempted fishing permits (EFPs), scientific research permits (SRPs), and/or exempted educational activity authorizations (EEAAs). These permits exempt the collection of a limited number of snapper-grouper species occurring in South Atlantic federal waters from regulations implementing the SGFMP. These EFPs, SRPs, and EEAAs involve fishing by commercial or research vessels, using fishing methods similar or identical to those of the snapper-grouper fishery. The types and rates of interactions with listed species from the EFP, SRP, and EEAA activities would be expected to be similar to those

[2] See Appendix A for a complete list of these amendments and their actions.

analyzed in this opinion. If the fishing type is similar and the associated fishing effort does not represent a significant increase beyond the levels expected in the fishery considered herein, then issuance of some EFPs, SRPs, and EEAAs would be expected to fall within the level of effort and impacts considered in this opinion. For example, issuance of an EFP to an active commercial vessel likely does not add additional effects than would otherwise accrue from the vessel's normal commercial activities. Similarly, issuance of an EFP, SRP, or EEAA to a vessel to conduct a minimal number of snapper-grouper trips with vertical line (commercial or recreational) or bottom longline gear likely would not appreciably change fishing effort within the fishery in a given year. Therefore, we consider the issuance of most EFPs, SRPs, and EEAAs by SERO to be within the scope of this opinion. The included EFPs, SRPs, and EEAAs would be those involving fishing consistent with the description of snapper-grouper fishing in Section 2 and not expected to increase fishing effort significantly.

2.1.2 South Atlantic Snapper-Grouper Fishery Monitoring and Reporting

Current regulations (50 CFR Part 622.5) require commercial and recreational for-hire participants in the South Atlantic snapper-grouper fishery, selected by the Southeast Science and Research Director (SRD), to maintain and submit a fishing record, on forms provided by the SRD (i.e., a logbook). Private and charter recreational participants in the South Atlantic snapper-grouper fishery are monitored mainly by the Marine Recreational Fishery Statistics Survey (MRFSS). Information describing monitoring and reporting by vessel type is presented below.

Commercial Vessels
Logbook reports have been required of all vessels with commercial South Atlantic snapper-grouper permits since 1992. Catch and effort data are collected per trip and reported via the Coastal Fisheries Logbook Program (CFLP). Information on the quantity caught for each species (reported in pounds), the area of catch, the type and quantity of gear, the dates of departure and return, the dealer and location where the catch was unloaded (county and state), the duration of the trip (time away from dock), an estimate of the fishing time, and the number of crew is required.

In August 2001, NMFS' Southeast Fisheries Science Center (SEFSC) initiated the Supplementary Discard Data Program (SDDP) to address bycatch reporting in Southeast fisheries (Poffenberger 2004). The SEFSC developed a supplemental form that is used with the CFLP to collect discard data as mandated by the Sustainable Fisheries Act. Commercial snapper-grouper fishers are now required, if selected, to report the number and average size of fish being discarded by species and the reasons for those discards (regulatory or market conditions). The bycatch data are collected using a supplemental form sent to a stratified, random sample of the commercial snapper-grouper permit holders (20% coverage). Sample selections are made in July of each year, and the selected fishers (vessels) are required to complete and submit discard forms, along with their logbook forms, for each trip they make during the following year's reporting period

(August through July, until 2005 when the reporting period shifted to the calendar year).[3] The sampling system is designed so that the 20% of fishermen selected to report for a given year are not selected for the next four years, so that over the course of a 5-year period, 100% of snapper-grouper permit holders will have been required to report. Failure to comply with reporting requirements can result in sanctions, precluding permit renewal.

For-hire Charter Vessels and Private Recreational Fishing Vessels
Harvest and bycatch in the recreational for-hire charter vessel sector and the private recreational sector have been consistently monitored since 1979. Monitoring is accomplished primarily through MRFSS. The survey uses a combination of random-digit-dialed telephone intercepts of coastal households for effort information and dock-side intercepts of individual trips for catch information to statistically estimate total trips, catch, and discards by species, for each subregion, state, mode, primary area, and wave.[4] Bycatch is enumerated by a disposition code for each fish caught but not kept.

Prior to 2000, sampling of the charter vessel sector resulted in highly variable estimates of catch. In 2000, a new charter vessel sampling methodology was implemented and now a 10% sample of charter vessel captains is called weekly to obtain trip level information. The standard dockside intercept data are now also collected from charter vessels, and charter vessel clients are sampled through the standard random digit dialing of coastal households. Precision of charter vessel effort estimates has improved by more than 50% due to these changes (Van Voorhees et al. 2000).

For-Hire Headboats
The SEFSC Beaufort Laboratory has monitored harvest from headboats since 1986, but no bycatch information is routinely collected. Prior to 1986, headboats were monitored through MRFSS. Daily catch records (trip reports) are filled out by headboat operators; or, in some cases, by NMFS-approved headboat samplers based on their communications with captains or crew. Headboat samplers sub-sample headboat trips for data on species' lengths and weights. Biological samples (scales, otoliths, spines, gonads, and stomachs) are taken as time permits. Occasionally, onboard headboat samplers will record lengths of discarded fish; however, these trips are rare, and the data do not become part of the headboat database.

2.2 Description of the South Atlantic Snapper-Grouper Fishery

2.2.1 Overview of the Commercial Fishery

The SAFMC has jurisdiction from the North Carolina/Virginia border to the Atlantic side of Key West, Florida. Within these waters, there are four legal methods of harvest in the

[3] The 2004/2005reporting period was extended to run from August 2004 to December 31, 2005, to allow the reporting period to shift, so it can reflect a calendar year. Those fishers participating in the discard program during that timeframe reported for a year and half, but all future participants will only be required report for a calendar year.
[4] Waves are two-month sampling periods.

South Atlantic commercial snapper-grouper fishery: vertical line (handline, hydraulic, or electric), longline, black sea bass pots, and powerheads or spears (except where prohibited in the EEZ). Fishing effort in the South Atlantic snapper-grouper fishery is relatively homogenously distributed throughout the region, except where otherwise prohibited (O'Malley pers. comm. 2006)

A limited access program in the South Atlantic snapper-grouper fishery was implemented in 1998/1999. During 1999-2003, 1,725 different vessels reported landings in the fishery. There appears to be a core group of vessels that frequently operate in the South Atlantic commercial snapper-grouper fishery. For example, 678 vessels fished during at least four of those past five years and 473 vessels fished every year. In 2004, within the snapper-grouper limited access program, there were 841vessels with unlimited transferable permits and 225 vessels with trip-limited permits. (SAFMC 2006).

An economic survey of commercial snapper-grouper vessels in the South Atlantic region, done in the mid-90s, found that on average, boats were 32.7 feet in length and most boats were less than 50 feet long. Bottom longline vessels tended to be the longest, had the most powerful engines, the greatest fuel capacities, and the largest holding boxes for fish and ice. Vertical line vessels, especially in the southern South Atlantic region, tended to be the shortest, least powerful, with the smallest fuel capacities, and the smallest holding boxes for fish and ice (Waters et al. 1997).

Most (77.5%) snapper-grouper species are caught by vessels using hook-and-line gear. The longline vessels target the deepwater grouper and tilefish species in the snapper-grouper fishery. In 2001, longline vessels caught no less than 66% of the total harvest of all deepwater groupers and 61% of all deepwater tilefishes. The pot subsector is very dependent on black sea bass (Table 2.1) (SAFMC 2003).

Table 2.1. The Relative Importance of Different Gear Types in the Snapper-Grouper Fishery (average for 2000 and 2001). **Source: Southeast Logbook, NMFS, SEFSC.**

	Hook-and-line	Longline	Pot	Powerhead
Percentage of snapper-grouper landings by gear type	77.47%	9.55%	7.41%	1.47%
Percent of snapper-grouper species in total catch by gear type	84%	40%	97%	84%

Vessels fishing vertical line gear harvest the majority of the total snowy grouper landings. However, these vessels take more trips and the harvest per trip is lower than the longline fleet. The number of longline vessels in this sector of the fishery has remained relatively constant until just recently, with the number of vessels targeting snowy grouper and golden tilefish split relatively evenly. While the number of vessels targeting these two species has been similar, the number of trips for golden tilefish has outnumbered those for snowy grouper every year from 1999 through 2003. Over the same time period, a total of 112 different vessels employed trap gear to catch black sea bass in the South Atlantic, with most vessels landing their catch in North Carolina. The number of pot trips for black sea bass and the number of vessels using trap gear declined in each year from 1999 through 2003 (SAFMC 2006). Below is more comprehensive description of the gear types and techniques used in the South Atlantic snapper-grouper fishery, as provided in SAFMC (2006).

2.2.2 Commercial Fishery Gear Types and Techniques

Vertical Lines

The vertical line sector of the commercial fishery operates throughout the SAFMC's area of jurisdiction. According to NMFS Logbook data, there were 15,302 trips reported in 200; hook-and-line gear was identified as the main gear type used during those trips. This fishery takes place in about 13 to 110 fathoms (78-660 feet) of water both during day and night.

Fishers targeting deepwater snapper-grouper species (primarily targeting snowy grouper, but also catching large red porgy, blue line tilefish, Warsaw grouper, and speckled hind) often fish between 50-100 fathoms (300-600 feet). They utilize multi-hook rigs (with anywhere from 2-10 circle hooks) and use squid, Boston mackerel, and other cut baits.

The majority of hook-and-line fishers use either electric or hydraulic reels known as "bandit" gear.[5] Boats generally employ 2-4 bandit reels, usually attached to the gunwale. This gear often consists of a fiberglass reel that holds about 1,000 feet of cable; an L-bar or spreader that keeps the leader from tangling with the main line; a pulley to feed the cable from the reel through the L-bar; a fiberglass arm; and an electronic or hydraulic reel motor (Figure 2.1).

Bandit reels are fished by throwing a baited line out over the gunwale of the boat as the drag on the spool of the bandit reel is released, sending the line down to the bottom or desired depth. If fishing a spot for the first time, a fisher may vary the depth at which he fishes.

Figure 2.1. Bandit Reel Used in the South Atlantic Snapper-Grouper Fishery (SAFMC 2006)

[5] So named because of its resemblance to one-armed bandit machines used in casinos.

Captains often “work the break” when fishing bandit gear, maneuvering the boat back and forth across an area of high relief in search of fish. Locations are selected by using fish-finding sonar and by relying on fishing spots previously marked on their plotter. A fish-finding sonar allows the captain to differentiate between different bottom types. An experienced captain can use it to distinguish different species of fish by evaluating where they occur in the water column, the size of the air bladder as displayed on the screen, and how the fish are congregated.

Those fishers participating in the mid-shelf fishery tend to either “sit and soak”[6] or “get up and down.”[7] Sitting and soaking consists of fishing live or dead baits, with circle or J hooks, at or near the bottom, for anywhere from 15 minutes to an hour. “Sit-and-soak” rigs are generally a 20-40 foot leader with 2 hooks. Fishers using this method typically fish in about 13-50 fathoms (78-300 feet) of water. Fishers “getting up and down,” actively fish 2-3 J hooks per reel with cut bait. This method requires the line to be tended constantly and is brought to the surface as soon as a bite is felt. Most vermilion snapper, triggerfish, and porgies are caught this way. Fishers also employ this method when fishing for grouper but use much larger hooks.

A fishery for yellowtail snapper also exists off South Florida. This is primarily a day boat fishery. Chum is utilized in this fishery to aggregate fish into schools, which makes them easier to catch. Fish are caught on handlines with J-hooks and chill-killed to preserve the quality of the fish. Some fishers also use a splatter or spider pole[8] to catch the fish when chumming.

Other than the yellowtail fishery off South Florida, there is no consistent day/night pattern in the vertical line fishery. The time of day fished varies from captain to captain and is a matter of personal preference. The majority of the bandit fleet fishes year-round. The only seasonal differences in catch are associated with the regulatory spawning season closures in March and April for gag. Most fluctuations in fishing effort are a result of the weather. Trips can be limited during hurricane season (June through November) and also during the winter months (December through March).

Longline

The use of bottom longlines is only permitted in depths greater than 50 fathoms and only north of St. Lucie Inlet, Florida (27°10’N). Both pelagic and bottom longline gears are authorized for use in the South Atlantic snapper-grouper fishery (except in prohibited areas, see above), but the behavior of the species targeted makes bottom longline the primary type of longline gear used in this fishery.

Longline vessels operating in the snapper-grouper fishery are generally larger than bandit boats. Their trips are often longer and costlier because they operate farther offshore. For example, a vessel leaving port from Charleston, South Carolina, may travel 90 miles

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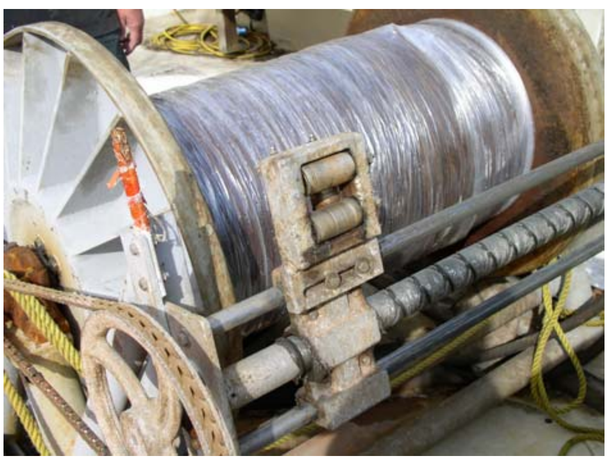
[6] The target species with this method is primarily groupers.
[7] The target species with this method is primarily vermilion snapper.
[8] This is a 10-12 foot bamboo pole with a single line and a barbless hook attached.

offshore to reach the fishing grounds and stay out for as many as 9 or 10 days. The cost of such a trip may be $2,500 or more.

The actual longline is located on a spool (Figure 2.2) about midway back on the stern deck of the boat. In the South Atlantic snapper-grouper fishery, a spool generally holds about 15 miles of cable or “mainline.” When fishing begins, the cable is paid out at the stern of the boat and a polyball and a high-flyer are attached to mark that end of the longline (end X). At the stern, members of the crew (usually two) stand near baskets of previously baited hooks and leaders. They snap these leaders onto the mainline, about every 2 feet, as the line pays out. As the gear deploys, the captain may steer in a zigzag fashion or make exaggerated turns to set the gear in the ideal location. Some fishers attach weights to the mainline as they make big turns to prevent it from rolling over and drifting on top of itself. When the desired amount of longline is paid out, the crew cuts the line from the spool and snaps on another polyball and high-flyer to indicate the end of the longline (end Y).[9]

The length of mainline paid out and the amount of time it is allowed to soak varies by boat and circumstance. Some vessels set out 5 miles of cable at a time, making as many as four or more sets a day, while others deploy 15 miles at a time and make only two sets a day. Soak times vary depending on the success of fishing, but gear is rarely in the water for more than two hours.

Figure 2.2 Example of a Longline Spool (SAFMC 2006)



Gear may be hauled back by either retrieving end X or end Y first. Retrieving end X first allows each hook about the same soak time. Fishers might retrieve end Y first instead, which means the hooks retrieved first have a shorter average soak time than those hooks deployed first.

The gear is retrieved from a haulback station equipped with a boom, which swings out over the side of the boat to help feed the cable through a block and pulley system. As the

[9] The terms “end X” and “end Y” are used here to improve the clarity of our discussion regarding gear retrieval techniques, and do not have any other meaning.

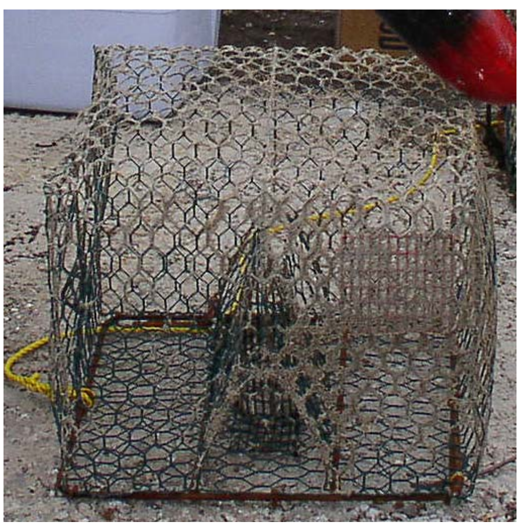
line is hauled back the catch is removed from the leaders and the main line is fed back onto the spool.

Longlines are only fished from daylight to dark because nocturnal sea lice eat the flesh of hooked fish while waiting for the line to be hauled in, subsequently reducing the quality of the fish. This fishery operates all year long with little or no seasonal fluctuation, barring a busy hurricane season.

Black Sea Bass Pots

The following mesh sizes are authorized for sea bass pots (Figure 2.3) used or possessed in the South Atlantic EEZ: 1) hexagonal mesh (chicken wire) at least 1.5 inches (3.8 cm) between the wrapped sides; 2) square mesh at least 1.5 inches (3.8 cm) between sides; and 3) rectangular mesh at least 1 inch (2.5 cm) between the longer sides and 2 inches (5.1 cm) between the shorter sides (50 CFR 622.40(c)(3)(A-C)). Mesh sizes most commonly used include: 1) 1.5 x 1.5 inch square mesh; 2) 1.5 inch hexagonal mesh (PVC coated chicken wire); and 3) 2 x 2 inch mesh. Coated chicken wire is the least common of the three as it is less durable. Current regulations also mandate the use of degradable material for hinges and fasteners and the use of two escape vents per pot (50 CFR 622.40(b)(3)(i)(A-B). All sea bass pots must have a valid identification tag attached (50 CFR 622.6(b)(1)(i)(b)).

Figure 2.3 Example of a Black Sea Bass Pot (SAFMC 2006)



Black sea bass pot mesh sizes that are less than 2 x 2 inches do not adequately allow the smaller fish to escape and bycatch of these fish often results. Some fishers, using a smaller mesh size, address this problem by using a 2 x 2 inch mesh for the back panel of the pot. This allows the smaller fish to escape the pot as it is being hauled, because they are pushed toward the back panel. Some fishers prefer to use a smaller mesh size because it makes the pot darker, which is believed to attract fish.

Fishing practices within the black sea bass pot fishery are diverse. A fisher’s technique varies depending on the fisher, season, and area. Many fishers set individual pots with one buoy line per pot. Other fishers, set “doubles,” which are two pots strung together and attached to one buoy line. A ground line may also connect three or more pots. This configuration is commonly referred to as a “trawl” and has a buoy line on each end. Anecdotal accounts suggest that only one person in North Carolina may be fishing with “trawls.” Both sinking and floating buoy lines are used in the fishery and most are about 200 feet (61 meters) in length. In the South Atlantic EEZ, the use of buoys is not required but, if used, each buoy must display the vessel’s assigned official number and color code.

The most common technique for targeting black sea bass is “precision setting.” Fishers use on-board electronics to identify suspected aggregations of fish and will set their pots accordingly. With this technique, pots are pulled and moved frequently, depending on the success of fishing. Depending on the availability of hard bottom and how successful the catch, pots may be clustered in some areas and spread out over others. Spacing between pots can range from 3 to 5 miles (4.8 to 8 kilometers) or just 10 to 15 feet (3 to 4.5 meters). Other fishers set out and leave many pots scattered over a wide area or in rows, regardless of bottom habitat, with the intention of attracting the fish to the pot. This technique targets more migratory individuals and the pots tend to stay in the water for a longer period of time.

Seasonal changes also influence fishing behavior. Typically, fishers fish fewer pots (on average 60 or less) during the winter than during the summer, with the majority of those fishers retrieving their pots nightly. In the summer, when fish are more scattered, each fisher may use a few hundred pots and leave them out for extended periods of time. During the winter, soak times are shorter with pots being hauled 2 to 3 times a day or more. Summer soak times are usually longer, with pots seldom being hauled more than twice a day. Pot set configuration also influences the soak time. Pots set as “doubles” or in “trawls” usually have longer soak times than individually set pots. In general, the number of pots set, gear configuration, season, and fisher preference influences pot soak time and retrieval frequency. Regional preferences may also exist.

Though individuals tend to fish fewer pots in the winter, it appears that more trips occur during these months than in the summer. Data from the SEFSC Logbook Program show that there were 1,054 trips in 2001 that reported sea bass pots were as the main gear type. Of these trips, 53% were conducted from November through March. Logbook data going back to 1998 shows 63% to 72% of reported trips occurred during the November through March time period with the number of trips falling off in March.

The majority of black sea bass pot fishing occurs off the Carolinas with little or no fishing occurring in the EEZ off Florida (J. McCawley pers. comm. 2006). Further assessing the actual fishing effort at any given time within the South Atlantic black sea bass pot fishery is difficult. Many snapper-grouper permit holders maintain pot endorsements though they are not actively involved in the pot fishery. Thus, the number of fishers permitted to fish with pots is higher than the actual number fishing. Fishing effort in the black sea bass pot fishery is often a function of fishers’ analyses of the income generated by black sea bass fishing, compared to the income generated by their other endeavors. It is common for participants to pot fish during the colder months and charter fish during the warmer months. Other black sea bass fishers may alternate between fisheries or among several fisheries. In South Carolina for example, logbook data suggests that as many as 50 to 60 fishers are permitted for pots as either their primary or secondary gear but that only a quarter of them are actively involved in pot fishing during the season.

Spearfishing and Powerheads

Commercial spearfishing and powerhead use is most commonly practiced off the coast of Florida. The use of powerheads to kill snapper-grouper species is illegal off the coast of South Carolina and in Special Management Zones.

Powerheads, or bangsticks, are underwater firearms that usually use 12-gauge or .357 Magnum rounds. Sharp contact from a thrust against a solid object activates a heavy, spring loaded, stainless steel firing pin that detonates the round from a short barrel. Much of the damage inflicted on a fish comes from the rapidly expanding gases forced into its body from the barrel end (Bannerot 2000).

There are three common methods for using powerheads to kill fish. The traditional method uses a spear tip to cause the initial injury to the fish and a powerhead is used to kill it. Another method, used in clear water, utilizes only a spear tip without a powerhead, as it is often more accurate at longer distances (40-50 feet) than a powerhead. The spear is often not physically connected to the fisher and once it’s shot the fisher must actively pursue and retrieve the dead or dying fish. The third method is a hybrid of the previous two. This method attaches a powerhead to the shaft, in place of a spear tip and is shot at a fish like a spear. Once the powerhead hits the fish, the round detonates in the fish, causing fatal injuries (R. Cardin, personal communication).

Scuba diving is the most common way to fish using powerheads. Powerhead and spearfishing effort is greatly impacted by depth, which directly influences the amount of time (bottom time) a diver can spend fishing. It is important to separate total dive time from actual working time on the dive. These differences are important to note when evaluating the overall fishing effort in these fisheries (SAFMC 2001).

2.2.3 Recreational Fishery

Charter and Private Recreational

According to MRFSS estimates (NMFS 2005a), approximately 4.7 million in-state recreational anglers participated in saltwater fishing in the southeastern United States in 2004. It is not possible to determine the number of those that target snapper-grouper species but testimony at public hearings, Council meetings, and overall public interest indicates that the recreational snapper-grouper fishery is growing in popularity. Recreational fishers for the most part use hook-and-line gear, although in some areas spearfishing is popular.

Methods that recreational fishers use to fish for snapper-grouper are very diverse. The distance people can go offshore in search of snapper-grouper depends in part on the size of their boat, engine power, fuel prices, and comfort level. Experience levels vary among recreational fishers, and consequently, fishing methods and efficiency differ. Bottom fishing for snapper and shallow-water grouper can be accessible to many recreational fishers, as they do not have to travel as far offshore. There is somewhat less skill involved when fishing for these species, compared to deeper fishing that targets mostly big grouper. As with the commercial fleet, many recreational anglers rely on technology such as fish finders and color machines to find fish. There is little or no technology gap between the professional (for-hire and commercial) fishers and those in the private sectors.

Recreational anglers use both electric and manual reels for bottom fishing. Twelve-volt electric reels, commonly called "elec-tra-mates", attach to fishing rods and reels to assist fishers in reeling in catches from deepwater. People who use electric reels tend to be more serious about fishing or fish deeper water.

Fishers choose lighter or heavier tackle based on which species they are targeting, the level of skill of the fishers, and a multitude of other factors including limiting gear loss. Generally, when fishing for grouper they will use heavier line (80 to 120-lb test) and larger hooks (6/0 and larger), which in turn call for larger weights. Fishing for snappers, porgies, and grunts generally means lighter tackle (1/0 to 4/0 hooks and 20 and 40-lb test line).

Like tackle, the use of bait also varies widely depending on the region, fishers' preference, and target species. Cut bait, live baits, and even artificial plugs are all used to fish for various snapper and grouper species. Popular cut baits include menhaden, herring, bluefish, sardines, and cigar minnows.

Headboat

Headboats (also called party boats) are popular in the Southeast. These vessels are larger than the commercial hook-and-line vessels and private and charter boats. Many are longer than 100 feet. They provide easy and economical access to successful fishing for the beginning angler and tourist. These boats take as many as 100 people offshore to fish for snapper-grouper species and a host of other fish.

Fishing trips on headboats can either be an all day (11 hours) or half day (4 hours) experience. Generally, when fishing off the Carolinas on half-day trips, headboats target sea bass, porgies, sharks, flounder, and other bottom species. All day headboat trips often fish 40 to 50 miles offshore to target snapper, grouper, large sea bass, and trigger fish. In general, headboats are fishing the same grounds as the commercial fleet and they can often be seen fishing side by side. Headboats will make special trips to fish during the night.

Headboat customers are generally provided with gear and bait. The fishing methods on headboats for snapper-grouper species are similar to those of the commercial fishery and the private charter fishery. Customers will be set up with a 4/0 or 6/0 reel rigged with 80-lb test monofilament, a rig with a 16-ounce weight, and the same variety of hook sizes as used by the commercial fleet. Most reels will be set up with two hook rigs. Cut squid is generally the preferred bait among headboat crews because it is easy to prepare and stays on the hook longer than other baits.

2.3 Action Area

The action area for a biological opinion is defined as the area affected directly or indirectly by the federal action and not merely the immediate area involved in the action. The South Atlantic snapper-grouper fishery is managed by the SGFMP, and overseen by the SAFMC. The SAFMC has jurisdiction throughout the South Atlantic states' EEZs, which extends from 3 nm seaward of Florida, Georgia, South Carolina, and North Carolina to 200 nm.[10] Throughout its range of operation, the South Atlantic snapper-grouper fishery may affect one or more of the listed species (detailed discussion in Section 3) known to occur with the South Atlantic; therefore, the action area for this consultation includes all of the U.S. South Atlantic EEZ.

[10] The EEZ off of southern Florida does not extend all the way out 200 nm due to the close proximity of the Bahamas.

3.0 Status of Listed Species and Critical Habitat

The following endangered and threatened species are known to occur in or near the South Atlantic EEZ:

Marine Mammals	**Status**
Blue whale (*Balaenoptera musculus)*	Endangered
Sei whale (*Balaenoptera borealis*)	Endangered
Sperm whale (*Physeter macrocephalus*)	Endangered
Fin whale (*Balaenoptera physalus*)	Endangered
Humpback whale (*Megaptera novaeangliae*)	Endangered
Northern right whale (*Eubalaena glacialis*)	Endangered
Sea turtles	
Green turtle (*Chelonia mydas*)	Endangered/Threatened*
Hawksbill sea turtle (*Eretmochelys imbricata*)	Endangered
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Endangered
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered
Loggerhead sea turtle (*Caretta caretta*)	Threatened
Fish	
Smalltooth sawfish (*Pristis pectinata*)	Endangered**

Critical Habitat
Critical habitat has been designated for the North Atlantic right whale in the U.S. Southeast Atlantic from the mouth of the Altamaha River, Georgia, to Jacksonville, Florida, out 15 nm and from Jacksonville, Florida, to Sebastian Inlet, Florida, out 5 nm. A portion of this area lies within the EEZ.

**Green sea turtles in U.S. waters are listed as threatened except for the Florida breeding population, which is listed as endangered. Due to the inability to distinguish between the populations away from the nesting beaches, green sea turtles are considered endangered wherever they occur in U.S. waters.*
***The U.S. distinct population segment (DPS).*

3.1 Analysis of Species Not Likely to be Adversely Affected

We have determined that the proposed action being considered in this opinion is not likely to adversely affect the following listed species or critical habitat under the ESA: blue whales, sei whales, sperm whales, fin whales, humpback whales, northern right whales, and northern right whale critical habitat**.** These species and critical habitat are therefore excluded from further analysis and consideration in this opinion. The following discussion summarizes our rationale for these determinations and conclusions.

3.1.1 Marine Mammals

Blue, Sei, and Sperm Whales
In the southeast U.S. Atlantic region, blue, sei, and sperm whales are predominantly found seaward of the continental shelf. Sightings of sperm whales are almost exclusively in the continental shelf edge and continental slope areas (Scott and Sadove 1997). Sei and blue whales also typically occur in deeper waters but neither is commonly observed in the east coast U.S. waters (CeTAP 1982; Wenzel et al. 1988; Waring et al. 1998; Waring et. al 2002). The depth at which these species are found greatly reduces the likelihood of their interactions with these fisheries. There is also no documented take of these species by the South Atlantic snapper-grouper fishery. For these reasons, NMFS believes the likelihood of these species being adversely affected by the proposed action is extremely low and therefore discountable.

Fin Whales
Fin whales are baleen whales generally found along the 100 m isobath with sightings also spread over deeper water including canyons along the shelf break (Waring et al. 1998). The fin whale's association with the 100 m isobath puts it within the range of the vertical line (commonly occurring between 23-201 m) and the longline (only allowed beyond 91m) portions of the fishery.[11] As a result, interactions are possible between fin whales and the vertical and longline gear portions of the fishery. The snapper-grouper vertical line and longline fisheries are listed as category three fisheries under the 2005 List of Fisheries (69 FR 70094; December 2, 2004), meaning there has been no documented take of marine mammals in these fisheries and the likelihood of such interactions are remote [MMPA § 118 (c)(1)(A)(iii)]. Though fin whale distributions may overlap with some portions of this fishery, these sectors have no documented takes of fin whales, and since the likelihood if interactions is so low, we believe any adverse affect from continued authorization of fishing will be discountable.

Northern Right and Humpback Whales
We believe that the only gear type that could pose a potential threat to northern right and humpback whales is the black sea bass pot sector of the fishery.[12] Given their seasonal distribution, right and humpback whales may overlap spatially and temporally with the black sea bass pot fishery. Sightings from aerial surveys throughout the southeast Atlantic region have reported right whales off the Carolinas from December through March including mother-calf pairs. December and January are also peak times for humpbacks to occur off North Carolina as they migrate southward through coastal waters to their wintering grounds, with a second peak occurrence in March and April as they migrate north again to their summer feeding grounds. The black sea bass pot fishery is fished most commonly off the coasts of the Carolinas during the winter months (SAFMC 2006).

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[11] NMFS does not believe fin whale interactions with the black sea bass pot sector of the fishery is likely, because that sector operates well landward of 100-m isobath (primarily between 22 m and 37 m [SAFMC 2006]).
[12] The other sectors of the fishery are listed as Category III fisheries in the 2005 List of Fisheries.

Though spatial and temporal overlap may occur, the best available information indicates there are no documented entanglements or other interactions between black sea bass pot gear and right whales (Poffenberger 2004; McCarthy SEFSC database; NMFS 2004a). In 2003, the Atlantic mixed species trap/pot fishery (of which the black sea bass pot fishery is a component) was elevated from a category III to a category II fishery in that year's List of Fisheries. This change in status was a precautionary action, based on the known impacts of similar gear types on marine mammals. The 2005 List of Fisheries (69 FR 70094, December 2, 2004) noted the only known interaction between the Atlantic mixed species trap/pot fishery and a humpback whale occurred in the Gulf of Maine, well north of the action area. Thus, there have been no documented interactions between black sea bass pots and any marine mammals in the South Atlantic. The lack of evidence suggesting interactions between this black sea bass pots and marine mammals, and the proposed provisions under the amendment to the Atlantic Large Whale Take Reduction Plan[13], lead us to conclude that any adverse affects resulting from the continued authorization of the South Atlantic snapper-grouper fishery are extremely unlikely to occur and are discountable.

3.1.2 Right Whale Critical Habitat

Northern right whale critical habitat (59 FR 28793) has been designated in the action area along coastal Florida and Georgia. To determine the potential impact of the proposed action on northern right whale critical habitat, we must evaluate how the proposed action will affect the environmental features (typically referred to as the primary constituent elements) of the critical habitat areas related to water temperature, bathymetry, and food availability. We feel the modes of operation for the fishery sectors under consultation are such that they are extremely unlikely to affect, in any measurable way, the primary constituent elements of the northern right whale critical habitat. Both the vertical line and longline sectors of the fishery primarily occur seaward the these designations (SAFMC 2006); the majority of the black sea bass pot fishing efforts occurs well north of critical habitat areas (SAFMC 2006); and while powerhead use may occur within these designated areas, fishers using powerheads do not target the prey of northern right whales and would not otherwise affect the primary constituent elements of the critical habitat. Additionally, these activities are extremely unlikely to impact the physical aspects (e.g., water temperature and water depth) of the critical habitat. We do not believe the proposed action will appreciably affect northern right whale critical habitat.

3.2 Analysis of Species Likely to be Adversely Affected

Green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles and the smalltooth sawfish are all likely to be adversely affected by the proposed action. Green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles area all highly migratory and travel widely throughout the South Atlantic EEZ. Smalltooth sawfish are known to occur in the South Atlantic EEZ, but mainly only off of peninsular Florida. All

[13] The Atlantic Large Whale Take Reduction Plan (ALWTRP) is a plan established to help provided protection for Atlantic Large whales as obligated through the ESA and MMPA. For more information on the ALWTRP please see (http://www.nero.noaa.gov/whaletrp/)

of these species have been documented as taken incidentally by, or vulnerable to, gears used in the South Atlantic snapper-grouper fishery. The remaining sections of this opinion, therefore, will focus solely on these species.

The following subsections are synopses of the best available information on the life history, distribution, population trends, and current status of the five species of sea turtles and the smalltooth sawfish. Additional background information on the status of sea turtle species can be found in a number of published documents, including: recovery plans for the Atlantic green sea turtle (NMFS and USFWS 1991a), hawksbill sea turtle (NMFS and USFWS 1993), Kemp's ridley sea turtle (USFWS and NMFS 1992), loggerhead sea turtle (NMFS and USFWS 1991b) and leatherback sea turtle (NMFS and USFWS 1992); Pacific Sea Turtle Recovery Plans (NMFS and USFWS, 1998a-e); sea turtle status reviews and biological reports (NMFS and USFWS 1995, Marine Turtle Expert Working Group (TEWG) 1998 and 2000, NMFS SEFSC 2001). Sources of background information on the smalltooth sawfish include the smalltooth sawfish status review (NMFS 2000), the proposed and final listing rules, and several publications (Simpfendorfer 2001, Seitz and Poulakis 2002, Simpfendorfer and Wiley 2004, Poulakis and Seitz 2004).

The sea turtle subsections focus primarily on the Atlantic Ocean populations of these species because these are the populations that may be directly or indirectly affected by the proposed action in the South Atlantic. However, these species are listed as global populations (with the exception of Kemp's ridleys and northwestern Atlantic Ocean and Florida greens, whose distribution is entirely in the Atlantic, including the Gulf of Mexico). The global status and trends of these species, therefore, are included as well, to provide a basis and frame of reference for our final determination of the effects of the proposed action on the species as listed under the ESA.

3.2.1 Green Sea Turtle

Federal listing of the green sea turtle occurred on July 28, 1978, with all populations listed as threatened except for the Florida and Pacific coast of Mexico breeding populations, which are endangered. The nesting range of the green sea turtles in the southeastern United States and includes sandy beaches of mainland shores, barrier islands, coral islands, and volcanic islands between Texas and North Carolina and the U. S. Virgin Islands (U.S.V.I.) and Puerto Rico (NMFS and USFWS 1991a). Principal U. S. nesting areas for green sea turtles are in eastern Florida, predominantly Brevard through Broward counties (Ehrhart and Witherington 1992). Green sea turtle nesting also occurs regularly on St. Croix, U.S.V.I, and on Vieques, Culebra, Mona, and the main island of Puerto Rico (Mackay and Rebholz 1996).

3.2.1.1 Pacific Ocean

Green turtles are thought to be declining throughout the Pacific Ocean, with the exception of Hawaii, from a combination of overexploitation and habitat loss (Eckert 1993, Seminoff 2002). In the western Pacific, the only major (>2,000 nesting females) populations of green turtles occur in Australia and Malaysia, with smaller colonies throughout the area. Indonesia has a widespread distribution of green turtles, but has experienced large declines over the past 50 years. Hawaii green turtles are genetically distinct and geographically isolated, and the population appears to be increasing in size despite the prevalence of fibropapilloma and spirochidiasis (Aguirre et al. 1998 in Balazs and Chaloupka 2003). In the Eastern Pacific, mitochondrial DNA analysis has indicated that there are three key nesting populations: Michoacán, Mexico; Galapagos Islands, Ecuador; and Islas Revillagigedos, Mexico (Dutton 2003). There is also sporadic green turtle nesting along the Pacific coast of Costa Rica.

3.2.1.2 Atlantic Ocean

Life History and Distribution
The estimated age at sexual maturity for green sea turtles is between 20-50 years (Balazs 1982, Frazer and Ehrhart 1985). Green sea turtle mating occurs in the waters off the nesting beaches. Each female deposits 1-7 clutches (usually 2-3) during the breeding season at 12-14 day intervals. Mean clutch size is highly variable among populations, but averages 110-115 eggs/nest. Females usually have 2-4 or more years between breeding seasons, whereas males may mate every year (Balazs 1983). After hatching, green sea turtles go through a post-hatchling pelagic stage where they are associated with drift lines of algae and other debris. At approximately 20 to 25 cm carapace length, juveniles leave pelagic habitats and enter benthic foraging areas (Bjorndal 1997).

Green sea turtles are primarily herbivorous, feeding on algae and sea grasses, but also occasionally consume jellyfish and sponges. The post-hatchling, pelagic-stage individuals are assumed to be omnivorous, but little data are available.

Green sea turtle foraging areas in the southeastern United States include any coastal shallow-waters having macroalgae or sea grasses. This includes areas near mainland coastlines, islands, reefs, or shelves, and any open-ocean surface waters, especially where advection from wind and currents concentrates pelagic organisms (Hirth 1997, NMFS and USFWS 1991a). Principal benthic foraging areas in the southeastern United States include Aransas Bay, Matagorda Bay, Laguna Madre, and the Gulf inlets of Texas (Doughty 1984, Hildebrand 1982, Shaver 1994), the Gulf of Mexico off Florida from Yankeetown to Tarpon Springs (Caldwell and Carr 1957, Carr 1984), Florida Bay and the Florida Keys (Schroeder and Foley 1995), the Indian River Lagoon System, Florida (Ehrhart 1983), and the Atlantic Ocean off Florida from Brevard through Broward counties (Wershoven and Wershoven 1992, Guseman and Ehrhart 1992). Adults of both sexes are presumed to migrate between nesting and foraging habitats along corridors adjacent to coastlines and reefs.

Population Dynamics and Status
The vast majority of green sea turtle nesting within the southeastern United States occurs in Florida (Meylan et al. 1995, Johnson and Ehrhart 1994). It is known that current nesting levels in Florida are reduced compared to historical levels, but the extent of the reduction is not known (Dodd 1981). However, green sea turtle nesting in Florida has

been increasing since 1989 (Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute Index Nesting Beach Survey Database). Total nest counts and trends at index beach sites during the past decade suggest the numbers of green sea turtles that nest within the southeastern United States are increasing.

Although nesting activity is obviously important in determining population distributions, the remaining portion of the green turtle's life is spent on the foraging and breeding grounds. Some of the principal feeding pastures in the western Atlantic Ocean include the upper west coast of Florida and the northwestern coast of the Yucatán Peninsula. Additional important foraging areas in the western Atlantic include the Mosquito and Indian River Lagoon systems and nearshore wormrock reefs between Sebastian and Ft. Pierce Inlets in Florida, Florida Bay, the Culebra archipelago and other Puerto Rico coastal waters, the south coast of Cuba, the Mosquito Coast of Nicaragua, the Caribbean Coast of Panama, and scattered areas along Colombia and Brazil (Hirth 1971). The summer developmental habitat for green turtles also encompasses estuarine and coastal waters from North Carolina to as far north as Long Island Sound (Musick and Limpus 1997).

There are no reliable estimates of the number of immature green sea turtles that inhabit coastal areas (where they come to forage) of the southeastern United States. However, information on incidental captures of immature green sea turtles at the St. Lucie Power Plant (they have averaged 215 green sea turtle captures per year since 1977) in St. Lucie County, Florida (on the Atlantic coast of Florida) show that the annual number of immature green sea turtles captured has increased significantly in the past 26 years (FPL 2002).

It is likely that immature green sea turtles foraging in the southeastern United States come from multiple genetic stocks; therefore, the status of immature green sea turtles in the southeastern United States might also be assessed from trends at all of the main regional nesting beaches, principally Florida, Yucatán, and Tortuguero. Trends at Florida beaches were previously discussed. Trends in nesting at Yucatán beaches cannot be assessed because of a lack of consistent beach surveys over time. Trends at Tortuguero (ca. 20,000-50,000 nests/year) showed a significant increase in nesting during the period 1971-1996 (Bjorndal et al. 1999), and more recent information continues to show increasing nest counts (Troëng and Rankin 2004). Therefore, it seems reasonable that there is an increase in immature green sea turtles inhabiting coastal areas of the southeastern United States; however, the magnitude of this increase is unknown.

Threats

The principal cause of past declines and extirpations of green sea turtle assemblages has been the over-exploitation of green sea turtles for food and other products. Although intentional take of green sea turtles and their eggs is not extensive within the southeastern United States, green sea turtles that nest and forage in the region may spend large portions of their life history outside the region and outside U. S. jurisdiction, where exploitation is still a threat. However, there are still significant and ongoing threats to green sea turtles from human-related causes in the United States. These threats include beach armoring, erosion control, artificial lighting, beach disturbance (e.g., driving on the beach), pollution, foraging habitat loss as a result of direct destruction by dredging, siltation, boat damage, and other human activities. A complete list of other indirect factors can be found in NMFS SEFSC (2001). Interactions with fishing gear are another issue affecting green turtles. Sea sampling coverage in the pelagic driftnet, pelagic longline, southeast shrimp trawl, and summer flounder bottom trawl fisheries has recorded takes of green turtles. There is also the increasing threat from green sea turtle fibropapillomatosis disease. Presently, this disease is cosmopolitan and has been found to affect large numbers of animals in some areas, including Hawaii and Florida (Herbst 1994, Jacobson 1990, Jacobson et al. 1991).

3.2.1.3 Summary of Status for Atlantic Green Sea Turtles

Green turtles range in the western Atlantic from Massachusetts to Argentina, including the Gulf of Mexico and Caribbean, but are considered rare in benthic areas north of Cape Hatteras (Wynne and Schwartz 1999). Green turtles face many of the same natural and anthropogenic threats as loggerhead sea turtles described below. In addition, green turtles are also susceptible to fibropapillomatosis, which can result in death. In the continental United States, green turtle nesting occurs on the Atlantic coast of Florida (Ehrhart 1979). Recent population estimates for the western Atlantic area are not available. The pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the ten years of regular monitoring since establishment of index beaches in 1989. However, given the species' late sexual maturity, caution is warranted about over-interpreting nesting trend data collected for less than 15 years.

3.2.2 Hawksbill Sea Turtle

The hawksbill turtle was listed as endangered under the precursor of the ESA on June 2, 1970, and is considered Critically Endangered by the International Union for the Conservation of Nature (IUCN). The hawksbill is a medium-sized sea turtle, with adults in the Caribbean ranging in size from approximately 62.5 to 94.0 cm straight carapace length. The species occurs in all ocean basins, although it is relatively rare in the Eastern Atlantic and Eastern Pacific, and absent from the Mediterranean Sea. Hawksbills are the most tropical of the marine turtles, ranging from approximately 30°N latitude to 30°S latitude. They are closely associated with coral reefs and other hard-bottom habitats, but they are also found in other habitats including inlets, bays and coastal lagoons (NMFS and USFWS 1993). There are five regional nesting populations with more than 1,000 females nesting annually. These populations are in the Seychelles, Mexico, Indonesia, and two in Australia (Meylan and Donnelly 1999). There has been a global population decline of over 80% during the last three generations (105 years) (Meylan and Donnelly 1999).

3.2.2.1 Pacific Ocean

Anecdotal reports throughout the Pacific indicate that the current Pacific hawksbill population is well below historical levels (NMFS 2004b). It is believed that this species is rapidly approaching extinction in the Pacific because of harvesting for its meat, shell, and eggs as well as destruction of nesting habitat (NMFS and USFWS 1998a). Hawksbill sea turtles nest in the Hawaiian Islands as well as the islands and mainland of southeast Asia, from China to Japan, and throughout the Philippines, Malaysia, Indonesia, Papua New Guinea, the Solomon Islands, and Australia (NMFS 2004b). However, along the eastern Pacific Rim where nesting was common in the 1930s, hawksbill's are now rare or absent (Cliffton et al. 1982, NMFS 2004b).

3.2.2.2 Atlantic Ocean

Life History and Distribution
The best estimate of age at sexual maturity for hawksbill sea turtles is about 20-40 years (Chaloupka and Limpus 1997, Crouse 1999a, NMFS 2004b). Reproductive females undertake periodic (usually non-annual) migrations to their natal beach to nest. Movements of reproductive males are less well known, but are presumed to involve migrations to their nesting beach or to courtship stations along the migratory corridor (Meylan 1999b). Females nest an average of 3-5 times per season (Meylan and Donnelly 1999, Richardson et al. 1999). Clutch size is larger on average (up to 250 eggs) than that of other turtles (Hirth 1980). Reproductive females may exhibit a high degree of fidelity to their nest sites.

The life history of hawksbills consists of a pelagic stage that 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), followed by residency in developmental habitats (foraging areas where juveniles reside and grow) in coastal waters. Adult foraging habitat, which may or may not overlap with developmental habitat, is typically coral reefs, although other hard-bottom communities and occasionally mangrove-fringed bays may be occupied. Hawksbills show fidelity to their foraging areas over several years (van Dam and Díez 1998).

The hawksbill's diet is highly specialized and consists primarily of sponges (Meylan 1988). Other food items, notably corallimorphs and zooanthids, have been documented to be important in some areas of the Caribbean (van Dam and Díez 1997, Mayor et al. 1998, Leon and Díez 2000).

In the western Atlantic, the largest hawksbill nesting population occurs in the Yucatán Peninsula of Mexico (Garduño-Andrade et al. 1999). With respect to the United States, nesting occurs in Puerto Rico, the U.S. Virgin Islands, and the southeast coast of Florida. Nesting also occurs outside of the United States and its territories in Antigua, Barbados, Costa Rica, Cuba, and Jamaica (Meylan 1999a). Outside of the nesting areas, hawksbills are relatively uncommon in the waters of the continental United States, preferring coral reefs, such as those found in the Caribbean and Central America. They have been documented off of the U.S. Gulf of Mexico states and along the eastern seaboard as far north as Massachusetts, although sightings north of Florida are rare (NMFS and USFWS 1993).

Population Dynamics and Status
Estimates of the annual number of nests at hawksbill sea turtle nesting sites are of the order of hundreds to a few thousand. Nesting within the southeastern United States and U.S. Caribbean is restricted to Puerto Rico (>650 nests/yr), the U.S. Virgin Islands (~400 nests/yr), and, rarely, Florida (0-4 nests/yr) (Eckert 1995, Meylan 1999a, Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute's Statewide Nesting Beach Survey data 2002). At the two principal nesting beaches in the U.S. Caribbean where long-term monitoring has been carried out, populations appear to be increasing (Mona Island, Puerto Rico) or stable (Buck Island Reef National Monument, St. Croix, USVI) (Meylan 1999a).

Increasing protections for live coral habitat in the Atlantic, Gulf of Mexico, and Caribbean over the last decade that have limited fishing activity in live coral habitat, may also increase hawksbill survival rates in the marine environment. Benefits may also be gained by hawksbills from the implementation of larger-sized TED requirements.

Threats
As with other sea turtle species, hawksbill sea turtles are affected by habitat loss, habitat degradation, marine pollution, marine debris, fishery interactions, and poaching in some parts of their range. A complete list of other indirect factors can be found in NMFS SEFSC (2001). There continues to be a black market for hawksbill shell products ("tortoiseshell"), which likely contributes to the harvest of this species.

3.2.2.3 Summary of Status for Hawksbill Sea Turtles

Worldwide, hawksbill sea turtle populations are declining. They face many of the same threats affecting other sea turtle species. In addition, there continues to be a commercial market for hawksbill shell products, despite protections afforded to the species under U.S. law and international conventions.

3.2.3 Kemp's Ridley Sea Turtle

The Kemp's ridley was listed as endangered on December 2, 1970. Internationally, the Kemp's ridley is considered the most endangered sea turtle (Zwinenberg 1977, Groombridge 1982, TEWG 2000). Kemp's ridleys nest primarily at Rancho Nuevo, a stretch of beach in Mexico, Tamaulipas State. This species occurs mainly in coastal areas of the Gulf of Mexico and the northwestern Atlantic Ocean. Occasional individuals reach European waters (Brongersma 1972). Adults of this species are usually confined to the Gulf of Mexico, although adult-sized individuals sometimes are found on the east coast of the United States.

Life History and Distribution
The TEWG (1998) estimates age at maturity from 7-15 years. Females return to their nesting beach about every 2 years (TEWG 1998). Nesting occurs from April into July and is essentially limited to the beaches of the western Gulf of Mexico, near Rancho

Nuevo in southern Tamaulipas, Mexico. The mean clutch size for Kemp's ridleys is 100 eggs/nest, with an average of 2.5 nests/female/season.

Little is known of the movements of the post-hatchling stage (pelagic stage) within the Gulf of Mexico. Studies have shown the post-hatchling pelagic stage varies from 1-4 or more years, and the benthic immature stage lasts 7-9 years (Schmid and Witzell 1997). Benthic immature Kemp's ridleys have been found along the Eastern Seaboard of the United States and in the Gulf of Mexico. Atlantic benthic immature sea turtles travel northward as the water warms to feed in the productive, coastal waters off Georgia through New England, returning southward with the onset of winter (Lutcavage and Musick 1985, Henwood and Ogren 1987, Ogren 1989). Studies suggest that benthic immature Kemp's ridleys stay in shallow, warm, nearshore waters in the northern Gulf of Mexico until cooling waters force them offshore or south along the Florida coast (Renaud 1995).

Stomach contents of Kemp's ridleys along the lower Texas coast consisted of nearshore crabs and mollusks, as well as fish, shrimp, and other foods considered to be shrimp fishery discards (Shaver 1991). Pelagic stage Kemp's ridleys presumably feed on the available *Sargassum* and associated infauna or other epipelagic species found in the Gulf of Mexico.

Population Dynamics and Status

Of the seven extant species of sea turtles in the world, the Kemp's ridley has declined to the lowest population level. Most of the population of adult females nest on the Rancho Nuevo beaches (Pritchard 1969). When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand 1963). By the mid-1980s nesting numbers were below 1,000 (with a low of 702 nests in 1985). However, observations of increased nesting (with 6,277 nests recorded in 2000) suggest that the decline in the ridley population has stopped and the population is now increasing (USFWS 2000). These trends are further supported by 2005 nesting data from Mexico, which shows a 41% increase in nests from 7,147 in 2004 to 10,099 in 2005 (Gladys Porter Zoo 2005).

A period of steady increase in benthic immature ridleys has been occurring since 1990 and appears to be due to increased hatchling production and an apparent increase in survival rates of immature sea turtles beginning in 1990. The increased survivorship of immature sea turtles is attributable, in part, to the introduction of turtle excluder devices (TEDs) in the United States and Mexican shrimping fleets. As demonstrated by nesting increases at the main nesting sites in Mexico, adult ridley numbers have increased over the last decade. The population model used by TEWG (2000) projected that Kemp's ridleys could reach the Recovery Plan's intermediate recovery goal of 10,000 nesters by the year 2015.

Next to loggerheads, Kemp's ridleys are the second most abundant sea turtle in Virginia and Maryland waters, arriving in these areas during May and June (Keinath et al. 1987, Musick and Limpus 1997). The juvenile population of Kemp's ridley sea turtles in

Chesapeake Bay is estimated to be 211 to 1,083 turtles (Musick and Limpus 1997). These juveniles frequently forage in submerged aquatic grass beds for crabs (Musick and Limpus 1997). Kemp's ridleys consume a variety of crab species, including *Callinectes spp*., *Ovalipes spp*., *Libinia sp*., and *Cancer spp*. Mollusks, shrimp, and fish are consumed less frequently (Bjorndal 1997). Upon leaving Chesapeake Bay in autumn, juvenile ridleys migrate down the coast, passing Cape Hatteras in December and January (Musick and Limpus 1997). These larger juveniles are joined there by juveniles of the same size from North Carolina sounds and smaller juveniles from New York and New England to form one of the densest concentrations of Kemp's ridleys outside of the Gulf of Mexico (Musick and Limpus 1997, Epperly et al. 1995a, Epperly et al. 1995b).

Threats
Kemp's ridleys face many of the same threats as other sea turtle species, including destruction of nesting habitat from storm events, natural predators at sea, and oceanic events such as cold-stunning. Although cold-stunning can occur throughout the range of the species, it may be a greater risk for sea turtles that utilize the more northern habitats of Cape Cod Bay and Long Island Sound. For example, in the winter of 1999-2000, there was a major cold-stunning event where 218 Kemp's ridleys, 54 loggerheads, and 5 green turtles were found on Cape Cod beaches (R. Prescott, pers. comm. 2001). Annual cold-stunning events do not always occur at this magnitude; the extent of episodic major cold stun events may be associated with numbers of turtles utilizing Northeast waters in a given year, oceanographic conditions and the occurrence of storm events in the late fall. Many cold-stunned turtles can survive if found early enough, but cold-stunning events can still represent a significant cause of natural mortality. A complete list of other indirect factors can be found in NMFS SEFSC (2001).

Although changes in the use of shrimp trawls and other trawl gear have helped to reduce mortality of Kemp's ridleys, this species is also affected by other sources of anthropogenic impacts similar to those discussed in previous sections. For example, in the spring of 2000, a total of five Kemp's ridley carcasses were recovered from the same North Carolina beaches where 275 loggerhead carcasses were found. Cause of death for most of the turtles recovered was unknown, but the mass mortality event was suspected to have been from a large-mesh gillnet fishery operating offshore in the preceding weeks. The five ridley carcasses that were found are likely to have been only a minimum count of the number of Kemp's ridleys that were killed or seriously injured as a result of the fishery interaction because it is unlikely that all of the carcasses washed ashore.

3.2.3.1 Summary of Kemp's Ridley Status

The only major nesting site for ridleys is a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico (Carr 1963). The number of nests observed at Rancho Nuevo and nearby beaches increased at a mean rate of 11.3% per year from 1985 to 1999. Current totals exceed 10,000 nests per year (Gladys Porter Zoo 2005). Kemp's ridleys mature at an earlier age (7-15 years) than other chelonids, thus 'lag effects' as a result of unknown impacts to the non-breeding life stages would likely have been seen in the increasing nest trend beginning in 1985 (USFWS and NMFS 1992).

The largest contributors to the decline of Kemp's ridleys in the past were commercial and local exploitation, especially poaching of nests at the Rancho Nuevo site, as well as the Gulf of Mexico trawl fisheries. The advent of TED regulations for trawlers and protections for the nesting beaches has allowed the species to begin to rebound. Many threats to the future of the species remain, including interactions with fishery gear, marine pollution, foraging habitat destruction, illegal poaching of nests and potential threats to the nesting beaches from such sources as global climate change, development, and tourism pressures.

3.2.4 Leatherback Sea Turtle

The leatherback sea turtle was listed as endangered throughout its global range on June 2, 1970. Leatherbacks are widely distributed throughout the oceans of the world, and are found in waters of the Atlantic, Pacific, and Indian Oceans (Ernst and Barbour 1972). Leatherback sea turtles are the largest living turtles and range farther than any other sea turtle species. The large size of adult leatherbacks and their tolerance to relatively low temperatures allows them to occur in northern waters such as off Labrador and in the Barents Sea (NMFS and USFWS 1995). Adult leatherbacks forage in temperate and sub-polar regions from 71°N to 47°S latitude in all oceans and undergo extensive migrations to and from their tropical nesting beaches. In 1980, the leatherback population was estimated at approximately 115,000 adult females globally (Pritchard 1982). That number, however, is probably an overestimation as it was based on a particularly good nesting year in 1980 (Pritchard 1996). By 1995, the global population of adult females had declined to 34,500 (Spotila et al. 1996). Pritchard (1996) also called into question the population estimates from Spotila et al. (1996), and felt it may be somewhat low, because it ended the modeling on data from a particularly bad nesting year (1994) while excluding nesting data from 1995, which was a good nesting year. However, Spotila et al. (1996) represents the best overall estimate of adult female leatherback population size.

3.2.4.1 Pacific Ocean

Based on published estimates of nesting female abundance, leatherback populations have collapsed or have been declining at all major Pacific basin nesting beaches for the last two decades (Spotila et al. 1996; NMFS and USFWS 1998b; Sarti et al. 2000; Spotila et al. 2000). For example, the nesting assemblage on Terengganu, Malaysia – which was one of the most significant nesting sites in the western Pacific Ocean – has declined severely from an estimated 3,103 females in 1968 to two nesting females in 1994 (Chan and Liew 1996). Nesting assemblages of leatherback turtles are in decline along the coasts of the Solomon Islands, a historically important nesting area (D. Broderick, pers. comm., in Dutton et al. 1999). In Fiji, Thailand, Australia, and Papua New Guinea (East Papua), leatherback turtles have only been known to nest in low densities and scattered colonies.

Only an Indonesian nesting assemblage has remained relatively abundant in the Pacific basin. The largest extant leatherback nesting assemblage in the Indo-Pacific lies on the north Vogelkop coast of Irian Jaya (West Papua), Indonesia, with over 3,000 nests recorded annually (Putrawidjaja 2000, Suarez et al. 2000). During the early-to-mid 1980s, the number of female leatherback turtles nesting on the two primary beaches of Irian Jaya appeared to be stable. More recently, this population has come under increasing threats that could cause this population to experience a collapse that is similar to what occurred at Terengganu, Malaysia. In 1999, for example, local Indonesian villagers started reporting dramatic declines in sea turtle populations near their villages (Suarez 1999). Unless hatchling and adult turtles on nesting beaches receive more protection, this population will continue to decline. Declines in nesting assemblages of leatherback turtles have been reported throughout the western Pacific region, with nesting assemblages well below abundance levels observed several decades ago (e.g., Suarez 1999).

In the western Pacific Ocean and South China Seas, leatherback turtles are captured, injured, or killed in numerous fisheries, including Japanese longline fisheries. The poaching of eggs, killing of nesting females, human encroachment on nesting beaches, beach erosion, and egg predation by animals also threaten leatherback turtles in the western Pacific.

In the eastern Pacific Ocean, nesting populations of leatherback turtles are declining along the Pacific coast of Mexico and Costa Rica. According to reports from the late 1970s and early 1980s, three beaches on the Pacific coast of Mexico supported as many as half of all leatherback turtle nests for the eastern Pacific. Since the early 1980s, the eastern Pacific Mexican population of adult female leatherback turtles has declined to slightly more than 200 individuals during 1998-99 and 1999-2000 (Sarti et al. 2000).

Spotila et al. (2000) reported the decline of the leatherback turtle population at Playa Grande, Costa Rica, which had been the fourth largest nesting colony in the world. Between 1988 and 1999, the nesting colony declined from 1,367 to 117 female leatherback turtles. Based on their models, Spotila et al. (2000) estimated that the colony could fall to less than 50 females by 2003-2004. Leatherback turtles in the eastern Pacific Ocean are captured, injured, or killed in commercial and artisanal swordfish fisheries off Chile, Columbia, Ecuador, and Peru; purse seine fisheries for tuna in the eastern tropical Pacific Ocean, and California/Oregon drift gillnet fisheries. Because of the limited data, we cannot provide high-certainty estimates of the number of leatherback turtles captured, injured, or killed through interactions with these fisheries. However, between 8-17 leatherback turtles were estimated to have died annually between 1990 and 2000 in interactions with the California/Oregon drift gillnet fishery; 500 leatherback turtles are estimated to die annually in Chilean and Peruvian fisheries; 200 leatherback turtles are estimated to die in direct harvests in Indonesia; and before 1992, the North Pacific driftnet fisheries for squid, tuna, and billfish captured an estimated 1,000 leatherback turtles each year, killing about 111 of them each year.

Although all causes of the declines in leatherback turtle colonies in the eastern Pacific have not been documented, Sarti et al. (1998) suggest that the declines result from egg poaching, adult and sub-adult mortalities incidental to high seas fisheries, and natural fluctuations due to changing environmental conditions. Some published reports support this suggestion. Sarti et al. (2000) reported that female leatherback turtles have been killed for meat on nesting beaches like Píedra de Tiacoyunque, Guerrero, Mexico. Eckert (1997) reported that swordfish gillnet fisheries in Peru and Chile contributed to the decline of leatherback turtles in the eastern Pacific. The decline in the nesting population at Mexiquillo, Mexico occurred at the same time that effort doubled in the Chilean driftnet fishery. In response to these effects, the eastern Pacific population has continued to decline, leading some researchers to conclude that the leatherback is on the verge of extinction in the Pacific Ocean (e.g., Spotila et al. 1996, Spotila et al. 2000). NMFS' assessment of three nesting aggregations in its February 23, 2004, opinion supports this conclusion: if no action is taken to reverse their decline, leatherback sea turtles nesting in the Pacific Ocean either have high risks of extinction in a single human generation (for example, nesting aggregations at Terrenganu and Costa Rica) or they have a high risk of declining to levels where more precipitous declines become almost certain (e.g., Irian Jaya) (NMFS 2004b).

3.2.4.2 Atlantic Ocean

In the Atlantic Ocean, leatherbacks have been recorded as far north as Newfoundland, Canada, and Norway, and as far south as Uruguay, Argentina, and South Africa (NMFS SEFSC 2001). Female leatherbacks nest from the southeastern United States to southern Brazil in the western Atlantic and from Mauritania to Angola in the eastern Atlantic. The most significant nesting beaches in the Atlantic, and perhaps in the world, are in French Guiana and Suriname (NMFS SEFSC 2001). Genetic analyses of leatherbacks to date indicate that within the Atlantic basin there are genetically different nesting populations; the St. Croix nesting population (U.S. Virgin Islands), the mainland nesting Caribbean population (Florida, Costa Rica, Suriname/French Guiana), and the Trinidad nesting population (Dutton et al. 1999). When the hatchlings leave the nesting beaches, they move offshore but eventually utilize both coastal and pelagic waters. Very little is known about the pelagic habits of the hatchlings and juveniles, and they have not been documented to be associated with the *Sargassum* areas as are other species. Leatherbacks are deep divers, with recorded dives to depths in excess of 1,000 m (Eckert et al. 1989, Hayes et al. 2004).

Life History and Distribution
Leatherbacks are a long-lived species, living for over 30 years. They reach sexual maturity somewhat faster than other sea turtles (except Kemp's ridley), with an estimated range from 3-6 years (Rhodin 1985) to 13-14 years (Zug and Parham 1996). They nest frequently (up to 10 nests per year) during a nesting season and nest about every 2-3 years. During each nesting, they produce 100 eggs or more in each clutch and, thus, can produce 700 eggs or more per nesting season (Schultz 1975). However, a significant portion (up to approximately 30%) of the eggs can be infertile. Thus, the actual proportion of eggs that can result in hatchlings is less than this seasonal estimate. The eggs incubate for 55-75 days before hatching. Based on a review of all sightings of leatherback sea turtles of <145 cm curved carapace length (ccl), Eckert (1999) found that leatherback juveniles remain in waters warmer than 26°C until they exceed 100 cm ccl.

Although leatherbacks are the most pelagic of the sea turtles, they enter coastal waters on a seasonal basis to feed in areas where jellyfish are concentrated. Leatherback sea turtles feed primarily on cnidarians (medusae, siphonophores) and tunicates.

Evidence from tag returns and strandings in the western Atlantic suggests that adult leatherback sea turtles engage in routine migrations between boreal, temperate, and tropical waters (NMFS and USFWS 1992). A 1979 aerial survey of the outer continental shelf from Cape Hatteras, North Carolina to Cape Sable, Nova Scotia showed leatherbacks to be present throughout the area with the most numerous sightings made from the Gulf of Maine south to Long Island. Leatherbacks were sighted in waters where depths ranged from 1-4151 m, but 84.4% of sightings were in areas where the water was less than 180 m deep (Shoop and Kenney 1992). Leatherbacks were sighted in waters of a similar sea surface temperature as loggerheads, from 7°-27.2°C (Shoop and Kenney 1992). However, this species appears to have a greater tolerance for colder waters because more leatherbacks were found at the lower temperatures (Shoop and Kenney 1992). This aerial survey estimated the in-water leatherback population from near Nova Scotia, Canada to Cape Hatteras, North Carolina at approximately 300-600 animals.

Population Dynamics and Status

The status of the Atlantic leatherback population is less clear than the Pacific population. The total Atlantic population size is undoubtedly larger than in the Pacific, but overall population trends are unclear. In 1996, the entire western Atlantic population was characterized as stable at best (Spotila et al. 1996), with numbers of nesting females reported to be on the order of 18,800. A subsequent analysis by Spotila (pers. comm.) indicated that by 2000, the western Atlantic nesting population had decreased to about 15,000 nesting females. According to NMFS SEFSC (2001) the nesting aggregation in French Guiana has been declining at about 15% per year since 1987. However, from 1979-1986, the number of nests was increasing at about 15% annually which could mean that the current 15% decline could be part of a nesting cycle which coincides with the erosion cycle of Guiana beaches described by Schultz (1975). In Suriname, leatherback nest numbers have shown large recent increases (with more than 10,000 nests per year since 1999 and a peak of 30,000 nests in 2001), and the long-term trend for the overall Suriname and French Guiana population may show an increase (Girondot 2002 in Hilterman and Goverse 2003). The number of nests in Florida and the U.S. Caribbean has been increasing at about 10.3% and 7.5%, respectively, per year since the early 1980s, but the magnitude of nesting is much smaller than that along the French Guiana coast (NMFS SEFSC 2001). Also, because leatherback females can lay 10 nests per season, the recent increases to 400 nests per year in Florida may only represent as few as 40 individual female nesters per year.

The conflicting information regarding the status of Atlantic leatherbacks makes it difficult to characterize the current status. Numbers at some nesting sites are increasing, while decreasing at others. Tag return data emphasize the wide-ranging nature of the leatherback and the link between South American nesters and animals found in U.S. waters. For example, a nesting female tagged May 29, 1990, in French Guiana was later recovered and released alive from the York River, Virginia. Another nester tagged in French Guiana on June 21, 1990, was later found dead in Palm Beach, Florida (STSSN database). Genetic studies performed within the Northeast Distant Fishery Experiment indicate that the leatherbacks captured in the Atlantic highly migratory species pelagic longline fishery were primarily from the French Guiana and Trinidad nesting stocks (over 95%), though individuals from West African stocks were surprisingly absent (Rhoden et al. in press).

There are a number of problems contributing to the uncertainty of the leatherback nest counts and population assessments. The nesting beaches of the Guianas (Guyana, French Guiana, and Suriname) and Trinidad are by far the most important in the western Atlantic. However, beaches in this region undergo cycles of erosion and reformation, so that the nesting beaches are not consistent over time. Additionally, leatherback sea turtles do not exhibit the same degree of nest-site fidelity demonstrated by loggerhead and other hardshell sea turtles, further confounding analysis of population trends using nesting data. Reported declines in one country and reported increases in another may be the result of migration and beach changes, not true population changes. Nesting surveys, as well as being hampered by the inconsistency of the nesting beaches, are themselves inconsistent throughout the region. Survey effort varies widely in the seasonal coverage, aerial coverage, and actual surveyed sites. Surveys have not been conducted consistently throughout time, or have even been dropped entirely as the result of wars, political turmoil, funding vagaries, etc. The methods vary in assessing total numbers of nests and total numbers of females. Many sea turtle scientists agree that the Guianas (and some would include Trinidad) should be viewed as one population and that a synoptic evaluation of nesting at all beaches in the region is necessary to develop a true picture of population status (Reichart et al. 2001). No such region-wide assessment has been conducted recently.

The most recent, complete estimates of regional leatherback populations are in Spotila et al. (1996). As discussed above, nesting in the Guianas may have been declining in the late 1990s but may have increased again in the early 2000s. Spotila et al. (1996) estimated that the leatherback population for the Atlantic basin, including all nesting beaches in the Americas, the Caribbean, and West Africa totaled approximately 27,600 nesting females, with an estimated range of 20,082-35,133 individuals. We believe that the current population probably still lies within this range, taking into account the reported nesting declines and increases and the uncertainty surrounding them. We therefore choose to rely on Spotila et al.'s (1996) published total Atlantic population estimates, rather than attempt to construct a new population estimate here, based on our interpretation of the various, confusing nesting reports from areas within the region.

Threats

Zug and Parham (1996) pointed out that the main threat to leatherback populations in the Atlantic is the combination of fishery-related mortality (especially entanglement in gear and drowning in trawls) and the intense egg harvesting on the main nesting beaches. Other important ongoing threats to the population include pollution, loss of nesting habitat, and boat strikes. A complete list of other indirect factors can be found in NMFS SEFSC (2001).

Of sea turtle species, leatherbacks seem to be the most vulnerable to entanglement in fishing gear. This susceptibility may be the result of their body type (large size, long pectoral flippers, and lack of a hard shell), their attraction to gelatinous organisms and algae that collect on buoys and buoy lines at or near the surface, possibly their method of locomotion, and perhaps their attraction to the lightsticks used to attract target species in longline fisheries. They are also susceptible to entanglement in gillnets and pot/trap lines (used in various fisheries) and capture in trawl gear (e.g., shrimp trawls).

Leatherbacks are exposed to pelagic longline fisheries in many areas of their range. Unlike loggerhead turtle interactions with longline gear, leatherback turtles do not usually ingest longline bait. Instead, leatherbacks are foul hooked by longline gear (e.g., on the flipper or shoulder area) rather than mouth hooked or swallowing the hook. According to observer records, an estimated 6,363 leatherback sea turtles were caught by the U.S. Atlantic tuna and swordfish longline fisheries between 1992-1999, of which 88 were released dead (NMFS SEFSC 2001). The U.S. fleet accounts for only 5%-8% of the hooks fished in the Atlantic Ocean, and adding up the under-represented observed takes of the other 23 countries that actively fish in the area would lead to annual take estimates of thousands of leatherbacks over different life stages. Basin-wide, Lewison et al. (2004) estimated that 30,000-60,000 leatherback sea turtle captures occurred in Atlantic pelagic longline fisheries in the year 2000 alone (note that multiple captures of the same individual are known to occur, so the actual number of individuals captured may not be as high).

Leatherbacks are also susceptible to entanglement in the lines associated with trap/pot gear used in several fisheries. From 1990-2000, 92 entangled leatherbacks were reported from New York through Maine (Dwyer et al. 2002). Additional leatherbacks stranded wrapped in line of unknown origin or with evidence of a past entanglement (Dwyer et al. 2002). Fixed gear fisheries in the Mid-Atlantic have also contributed to leatherback entanglements. In North Carolina, two leatherback sea turtles were reported entangled in a crab pot buoy inside Hatteras Inlet (D. Fletcher, pers. comm. to S. Epperly in NMFS SEFSC 2001). A third leatherback was reported entangled in a crab pot buoy in Pamlico Sound near Ocracoke. This turtle was disentangled and released alive; however, lacerations on the front flippers from the lines were evident (D. Fletcher, pers. comm. to S. Epperly in NMFS SEFSC 2001). In the Southeast, leatherbacks are vulnerable to entanglement in Florida's lobster pot and stone crab fisheries. In the U.S. Virgin Islands, where one of five leatherback strandings from 1982 to 1997 was due to entanglement (Boulon 2000), leatherbacks have been observed with their flippers wrapped in the line of West Indian fish traps (R. Boulon, pers. comm. to J. Braun-McNeill in NMFS SEFSC 2001). Because many entanglements of this typically pelagic species likely go unnoticed, entanglements in fishing gear may be much higher.

Leatherback interactions with the southeast Atlantic shrimp fishery, which operates predominately from North Carolina through southeast Florida (NMFS 2002a), have also been a common occurrence. Leatherbacks, which migrate north annually, are likely to encounter shrimp trawls working in the coastal waters off the Atlantic coast from Cape Canaveral, Florida, to the Virginia/North Carolina border. Leatherbacks also interact with the Gulf of Mexico shrimp fishery. For many years, TEDs required for use in these fisheries were less effective at excluding leatherbacks than the smaller, hard-shelled turtle species. To address this problem, on February 21, 2003, NMFS issued a final rule to amend the TED regulations. Modifications to the design of TEDs are now required in order to exclude leatherbacks and large and sexually mature loggerhead and green turtles.

Other trawl fisheries are also known to interact with leatherback sea turtles. In October 2001, a Northeast Fisheries Science Center observer documented the take of a leatherback in a bottom otter trawl fishing for *Loligo* squid off of Delaware; TEDs are not required in this fishery. The winter trawl flounder fishery, which did not come under the revised TED regulations, may also interact with leatherback sea turtles.

Gillnet fisheries operating in the nearshore waters of the Mid-Atlantic states are also suspected of capturing, injuring, and/or killing leatherbacks when these fisheries and leatherbacks co-occur. Data collected by the NEFSC Fisheries Observer Program from 1994 through 1998 (excluding 1997) indicate that a total of 37 leatherbacks were incidentally captured (16 lethally) in drift gillnets set in offshore waters from Maine to Florida during this period. Observer coverage for this period ranged from 54%-92%.

Poaching is not known to be a problem for nesting populations in the continental United States. However, NMFS SEFSC (2001) notes that poaching of juveniles and adults is still occurring in the U.S. Virgin Islands and the Guianas. In all, four of the five strandings in St. Croix were the result of poaching (Boulon 2000). A few cases of fishermen poaching leatherbacks have been reported from Puerto Rico, but most of the poaching is on eggs.

Leatherback sea turtles may be more susceptible to marine debris ingestion than other species due to their pelagic existence and the tendency of floating debris to concentrate in convergence zones that adults and juveniles use for feeding areas and migratory routes (Lutcavage et al. 1997, Shoop and Kenney 1992). Investigations of the stomach contents of leatherback sea turtles revealed that a substantial percentage (44% of the 16 cases examined) contained plastic (Mrosovsky 1981). Along the coast of Peru, intestinal contents of 19 of 140 (13%) leatherback carcasses were found to contain plastic bags and film (Fritts 1982). The presence of plastic debris in the digestive tract suggests that leatherbacks might not be able to distinguish between prey items and plastic debris (Mrosovsky 1981). Balazs (1985) speculated that the object might resemble a food item by its shape, color, size or even movement as it drifts about, and induce a feeding response in leatherbacks.

It is important to note that, like marine debris, fishing gear interactions and poaching are problems for leatherbacks throughout their range. Entanglements are common in Canadian waters where Goff and Lien (1988) reported that 14 of 20 leatherbacks encountered off the coast of Newfoundland/Labrador were entangled in fishing gear including salmon net, herring net, gillnet, trawl line and crab pot line. Leatherbacks are reported taken by many other nations that participate in Atlantic pelagic longline fisheries, including Taipei, Brazil, Trinidad, Morocco, Cyprus, Venezuela, Korea, Mexico, Cuba, U.K., Bermuda, People's Republic of China, Grenada, Canada, Belize, France, and Ireland (see NMFS SEFSC 2001, for a description of take records). Leatherbacks are known to drown in fishnets set in coastal waters of Sao Tome, West Africa (Castroviejo et al. 1994, Graff 1995). Gillnets are one of the suspected causes for the decline in the leatherback sea turtle population in French Guiana (Chevalier et al. 1999), and gillnets targeting green and hawksbill turtles in the waters of coastal Nicaragua also incidentally catch leatherback turtles (Lageux et al. 1998). Observers on shrimp trawlers operating in the northeastern region of Venezuela documented the capture of six leatherbacks from 13,600 trawls (Marcano and Alio-M 2000). An estimated 1,000 mature female leatherback sea turtles are caught annually in fishing nets off of Trinidad and Tobago with mortality estimated to be between 50%-95% (Eckert and Lien 1999). However, many of the turtles do not die as a result of drowning, but rather because the fishermen butcher them in order to get them out of their nets (NMFS SEFSC 2001).

3.2.4.3 Summary of Leatherback Status

In the Pacific Ocean, the abundance of leatherback turtle nesting individuals and colonies has declined dramatically over the past 10 to 20 years. Nesting colonies throughout the eastern and western Pacific Ocean have been reduced to a fraction of their former abundance by the combined effects of human activities that have reduced the number of nesting females. In addition, egg poaching has reduced the reproductive success of the remaining nesting females. At current rates of decline, leatherback turtles in the Pacific basin are a critically endangered species with a low probability of surviving and recovering in the wild.

In the Atlantic Ocean, our understanding of the status and trends of leatherback turtles is much more confounded, although the picture does not appear nearly as bleak as in the Pacific. The number of female leatherbacks reported at some nesting sites in the Atlantic Ocean has increased, while at others they have decreased. Some of the same factors that led to precipitous declines of leatherbacks in the Pacific also affect leatherbacks in the Atlantic: leatherbacks are captured and killed in many kinds of fishing gear and interact with fisheries in state, federal and international waters. Poaching is a problem and affects leatherbacks that occur in U.S. waters. Leatherbacks also appear to be more susceptible to death or injury from ingesting marine debris than other turtle species.

3.2.5 Loggerhead Sea Turtle

The loggerhead sea turtle was listed as a threatened species throughout its global range on July 28, 1978. It was listed because of direct take, incidental capture in various fisheries, and the alteration and destruction of its habitat. Loggerhead sea turtles inhabit the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans. In the Atlantic, developmental habitat for small juveniles is the pelagic waters of the North Atlantic and the Mediterranean Sea (NMFS and USFWS 1991b). Within the continental United States, loggerhead sea turtles nest from Texas to New Jersey. Major nesting areas include coastal islands of Georgia, South Carolina, and

North Carolina, and the Atlantic and Gulf of Mexico coasts of Florida, with the bulk of the nesting occurring on the Atlantic coast of Florida.

3.2.5.1 Pacific Ocean

In the Pacific Ocean, major loggerhead nesting grounds are generally located in temperate and subtropical regions with scattered nesting in the tropics. Within the Pacific Ocean, loggerhead sea turtles are represented by a northwestern Pacific nesting aggregation (located in Japan) and a smaller southwestern nesting aggregation that occurs in eastern Australia (Great Barrier Reef and Queensland) and New Caledonia (NMFS SEFSC 2001). There are no reported loggerhead nesting sites in the eastern or central Pacific Ocean basin. Data from 1995 estimated the Japanese nesting aggregation at 1,000 female loggerhead turtles (Bolten et al. 1996). Recent genetic analyses on female loggerheads nesting in Japan suggest that this "subpopulation" is comprised of genetically distinct nesting colonies (Hatase et al. 2002) with precise natal homing of individual females. As a result, Hatase et al. (2002) indicate that loss of one of these colonies would decrease the genetic diversity of Japanese loggerheads; recolonization of the site would not be expected on an ecological time scale. In Australia, long-term census data has been collected at some rookeries since the late 1960s and early 1970s, and nearly all the data show marked declines in nesting populations since the mid-1980s (Limpus and Limpus 2003). The nesting aggregation in Queensland, Australia, was as low as 300 females in 1997.

Pacific loggerhead turtles are captured, injured, or killed in numerous Pacific fisheries including Japanese longline fisheries in the western Pacific Ocean and South China Seas; direct harvest and commercial fisheries off Baja California, Mexico; commercial and artisanal swordfish fisheries off Chile, Columbia, Ecuador, and Peru; purse seine fisheries for tuna in the eastern tropical Pacific Ocean; and California/Oregon drift gillnet fisheries. In addition, the abundance of loggerhead turtles on nesting colonies throughout the Pacific basin has declined dramatically over the past 10 to 20 years. Loggerhead turtle colonies in the western Pacific Ocean have been reduced to a fraction of their former abundance by the combined effects of human activities that have reduced the number of nesting females and reduced the reproductive success of females that manage to nest (e.g., due to egg poaching).

3.2.5.2 Atlantic Ocean

In the western Atlantic, most loggerhead sea turtles nest from North Carolina to Florida and along the Gulf coast of Florida. There are at least five western Atlantic subpopulations, divided geographically as follows: (1) a northern nesting subpopulation, occurring from North Carolina to northeast Florida at about 29^{o}N; (2) a south Florida nesting subpopulation, occurring from 29^{o}N on the east coast to Sarasota on the west coast; (3) a Florida Panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida; (4) a Yucatán nesting subpopulation, occurring on the eastern Yucatán Peninsula, Mexico (Márquez 1990 and TEWG 2000); and (5) a Dry Tortugas nesting subpopulation, occurring in the islands of the Dry

Tortugas, near Key West, Florida (NMFS SEFSC 2001). The fidelity of nesting females to their nesting beach is the reason these subpopulations can be differentiated from one another. Fidelity for nesting beaches makes recolonization of nesting beaches with sea turtles from other subpopulations unlikely.

Life History and Distribution
Past literature gave an estimated age at maturity of 21-35 years (Frazer and Ehrhart 1985, Frazer et al. 1994) with the benthic immature stage lasting at least 10-25 years. However, based on new data from tag returns, strandings, and nesting surveys NMFS SEFSC (2001) estimated ages of maturity ranging from 20-38 years and benthic immature stage lasting from 14-32 years.

Mating takes place in late March-early June, and eggs are laid throughout the summer, with a mean clutch size of 100-126 eggs in the southeastern United States. Individual females nest multiple times during a nesting season, with a mean of 4.1 nests/individual (Murphy and Hopkins 1984). Nesting migrations for an individual female loggerhead are usually on an interval of 2-3 years, but can vary from 1-7 years (Dodd 1988). Generally, loggerhead sea turtles originating from the western Atlantic nesting aggregations are believed to lead a pelagic existence in the North Atlantic Gyre for 7-12 years or more. 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 and Gulf of Mexico, although some loggerheads may move back and forth between the pelagic and benthic environment (Witzell 2002). Benthic immature loggerheads (sea turtles that have come back to inshore and nearshore waters), the life stage following the pelagic immature stage, have been found from Cape Cod, Massachusetts, to southern Texas, and occasionally strand on beaches in Northeastern Mexico.

Tagging studies have shown loggerheads that have entered the benthic environment undertake routine migrations along the coast that are limited by seasonal water temperatures. Loggerhead sea turtles occur year round in offshore waters off of North Carolina where water temperature is influenced by the Gulf Stream. As coastal water temperatures warm in the spring, loggerheads begin to immigrate to North Carolina inshore waters (e.g., Pamlico and Core Sounds) and also move up the coast (Epperly et al. 1995a, Epperly et al. 1995b, Epperly et al. 1995c), occurring in Virginia foraging areas as early as April and on the most northern foraging grounds in the Gulf of Maine in June. The trend is reversed in the fall as water temperatures cool. The large majority leave the Gulf of Maine by mid-September but some may remain in Mid-Atlantic and Northeast areas until late fall. By December loggerheads have emigrated from inshore North Carolina waters and coastal waters to the north to waters offshore of North Carolina, particularly off of Cape Hatteras, and waters further south where the influence of the Gulf Stream provides temperatures favorable to sea turtles (≥11°C) (Epperly et al. 1995a-c). Loggerhead sea turtles are year-round residents of central and south Florida.

Pelagic and benthic juveniles are omnivorous and forage on crabs, mollusks, jellyfish, and vegetation at or near the surface (Dodd 1988). Sub-adult and adult loggerheads are primarily coastal dwelling and typically prey on benthic invertebrates such as mollusks and decapod crustaceans in hard bottom habitats.

Population Dynamics and Status

A number of stock assessments (TEWG 1998, TEWG 2000, NMFS SEFSC 2001, Heppell et al. 2003) have examined the stock status of loggerheads in the waters of the United States, but have been unable to develop any reliable estimates of absolute population size. Based on nesting data of the five western Atlantic subpopulations, the south Florida-nesting and the northern-nesting subpopulations are the most abundant (TEWG 2000 and NMFS SEFSC 2001). Between 1989 and 1998, the total number of nests laid along the U.S. Atlantic and Gulf coasts ranged from 53,014 to 92,182, annually with a mean of 73,751 (TEWG 2000). On average, 90.7% of these nests were of the south Florida subpopulation and 8.5% were from the northern subpopulation (TEWG 2000). The TEWG (2000) assessment of the status of these two better-studied populations concluded that the south Florida subpopulation is increasing, while no trend is evident (may be stable but possibly declining) for the northern subpopulation. However, a more recent analysis, including nesting data through 2003, indicates there is no discernable trend in the south Florida nesting subpopulation (Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute, Statewide and Index Nesting Beach Survey Programs).

Another consideration that may add to the importance and vulnerability of the northern subpopulation is the sex ratios of this subpopulation. NMFS scientists have estimated that the northern subpopulation produces 65% males (NMFS SEFSC 2001). However, new research conducted over a limited time frame has found different sex ratios (Wyneken et al. 2004) so further information is needed to clarify the issue. Since nesting female loggerhead sea turtles exhibit nest fidelity, the continued existence of the northern subpopulation is related to the number of female hatchlings that are produced. Producing fewer females will limit the number of subsequent offspring produced by the subpopulation.

The remaining three subpopulations (the Dry Tortugas, Florida Panhandle, and Yucatán) are much smaller subpopulations but no less relevant to the continued existence of the species. Nesting surveys for the Dry Tortugas subpopulation are conducted as part of Florida's statewide survey program. Survey effort has been relatively stable during the 9-year period from 1995-2003 (although the 2002 year was missed). Nest counts ranged from 168-270 but with no detectable trend during this period (Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute, Statewide Nesting Beach Survey Data). Nest counts for the Florida Panhandle subpopulation are focused on index beaches rather than all beaches where nesting occurs. Currently, there is not enough information to detect a trend for the subpopulation (Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute, Index Nesting Beach Survey Database). Similarly, nesting survey effort has been inconsistent among the Yucatán nesting beaches and no trend can be determined for this subpopulation. However, there is some optimistic news. Zurita et al. (2003) found a statistically significant increase in the number of nests on seven of the beaches on Quintana Roo, Mexico from 1987-2001 where survey effort was consistent during the period.

Actions have been taken to reduce anthropogenic impacts to loggerhead sea turtles from various sources, particularly since the early 1990's. These include lighting ordinances, predation control, and nest relocations to help increase hatchling survival, as well as measures to reduce the mortality of pelagic immatures, benthic immatures, and sexually mature age classes in various fisheries and other marine activities. Recent actions have taken significant steps towards reducing the environmental baseline and improving the status of all loggerhead subpopulations. For example, the new TED regulation (published on February 21, 2003 [68 FR 8456]) represents a significant improvement in the baseline affecting loggerhead sea turtles. Shrimp trawling is considered to be the largest source of anthropogenic mortality on loggerheads.

Threats

The diversity of sea turtles' life history leaves them susceptible to many natural and human impacts, including impacts while they are on land, in the benthic environment, and in the pelagic environment. Hurricanes are particularly destructive to sea turtle nests. Sand accretion and rainfall that result from these storms as well as wave action can appreciably reduce hatchling success. For example, in 1992, all of the eggs over a 90-mile length of coastal Florida were destroyed by storm surges on beaches that were closest to the eye of Hurricane Andrew (Milton et al. 1994). Also, many nests were destroyed during the 2004 hurricane season. Other sources of natural mortality include cold stunning and biotoxin exposure.

Anthropogenic factors that impact hatchlings and adult female turtles on land, or the success of nesting and hatching include: beach erosion, beach armoring and nourishment, artificial lighting, beach cleaning, increased human presence, recreational beach equipment, beach driving, coastal construction and fishing piers, exotic dune and beach vegetation, and poaching. An increase in human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants, feral hogs, dogs, and an increased presence of native species (e.g., raccoons, armadillos, and opossums) which raid nests and feed on turtle eggs. Although sea turtle nesting beaches are protected along large expanses of the northwest Atlantic coast (in areas like Merritt Island, Archie Carr, and Hobe Sound National Wildlife Refuges), other areas along these coasts have limited or no protection. Sea turtle nesting and hatching success on unprotected high density east Florida nesting beaches from Indian River to Broward County are affected by all of the above threats.

Loggerhead sea turtles are affected by many anthropogenic threats in the marine environment. These include oil and gas exploration, coastal development, and transportation, marine pollution, underwater explosions, hopper dredging, offshore artificial lighting, power plant entrainment and/or impingement, entanglement in debris, ingestion of marine debris, marina and dock construction and operation, boat collisions, and, poaching. A complete list of other indirect factors can be found in NMFS SEFSC (2001). Loggerheads in the pelagic environment are exposed to a series of longline fisheries, which include the Atlantic highly migratory species (HMS) pelagic longline fisheries, an Azorean longline fleet, a Spanish longline fleet, and various longline fleets in the Mediterranean Sea (Aguilar et al. 1995, Bolten et al. 1994, Crouse 1999b). Loggerheads in the benthic environment in waters off the coastal United States are exposed to a suite of fisheries in federal and state waters including trawl, purse seine, hook and line, gillnet, pound net, longline, and trap fisheries (see further discussion in Section 4, Environmental Baseline).

Loggerheads may also be facing a new threat that could be either natural or anthropogenic. A little understood disease may pose a new threat to loggerheads sea turtles. From October 5, 2000, to March 24, 2001, 49 debilitated loggerheads associated with the disease were found in southern Florida from Manatee County on the west coast through Brevard County on the east coast (Foley 2002). From the onset of the epizootic through its conclusion, affected sea turtles were found throughout south Florida. Most (N=34) were found in the Florida Keys (Monroe County). The number of dead or debilitated loggerheads found during the epizootic (N=189) was almost six times greater than the average number found in south Florida from October to March during the previous ten years. After determining that no other unusual mortality factors appeared to have been operating during the epizootic, 156 of the strandings were likely to be attributed to disease outbreak. These numbers may represent only 10% to 20% of the turtles that were affected by this disease because many dead or dying turtles likely never wash ashore. Overall mortality associated with the epizootic was estimated between 156 and 2,229 loggerheads (Foley 2002). Scientists were unable to attribute the illness and epidemic to any one specific pathogen or toxin. If the agent responsible for debilitating these turtles re-emerges in Florida, and if the agent is infectious, nesting females could spread the disease throughout the range of the adult loggerhead population.

3.2.5.3 Summary of Status for Loggerhead Sea Turtles

Loggerhead turtles are represented by two nesting aggregations in the Pacific Ocean. The first is in the northwestern Pacific (located in Japan); the second is a smaller southwestern aggregation that occurs in Australia (Great Barrier Reef and Queensland) and New Caledonia. The abundance of loggerhead turtles on nesting colonies throughout the Pacific basin has declined dramatically over the past 10 to 20 years. Data from 1995 estimated the Japanese nesting aggregation at 1,000 female loggerhead turtles (Bolten et al. 1996), but it has probably declined since 1995 and continues to decline (Tillman 2000). The nesting aggregation in Queensland, Australia, was as low as 300 females in 1997.

In the Atlantic Ocean, absolute population size is not known, but based on extrapolation of nesting information, loggerheads are likely much more numerous than in the Pacific Ocean. NMFS recognizes five subpopulations of loggerhead sea turtles in the western north Atlantic based on genetic studies. Cohorts from all of these are known to occur within the action area of this consultation. There are no detectable nesting trends for the two largest western Atlantic subpopulations: the South Florida subpopulation and the northern subpopulation. Because of its size, the South Florida subpopulation may be critical to the survival of the species in the Atlantic Ocean. In the past, this nesting aggregation was considered second in size only to the nesting aggregation on islands in the Arabian Sea off Oman (Ross 1979, Ehrhart 1989, NMFS and USFWS 1991b). However, the status of the Oman colony has not been evaluated recently and it is located in an area of the world where it is highly vulnerable to disruptive events such as political upheavals, wars, catastrophic oil spills, and lack of strong protections for sea turtles (Meylan et al. 1995). Given the lack of updated information on this population, the status of loggerheads in the Indian Ocean basin overall is essentially unknown.

All loggerhead subpopulations are faced with a multitude of natural and anthropogenic effects that negatively influence the status of the species. Many anthropogenic effects occur as a result of activities outside of U.S. jurisdiction (i.e., fisheries in international waters). The impact of international fisheries is a significant factor inhibiting sea turtle recovery. Additional information on the impacts of international fisheries is found in NMFS SEFSC (2001) and Lewison et al. (2004).

3.2.6 Smalltooth sawfish

The U.S. smalltooth sawfish distinct population segment (DPS) was listed as endangered under the ESA on April 1, 2003 (68 FR 15674). The smalltooth sawfish is the first marine fish to be listed in the United States. Critical habitat for the species has not been designated. Historically, smalltooth sawfish occurred commonly in the inshore waters of the Gulf of Mexico and the eastern U.S. seaboard up to North Carolina, and more rarely as far north as New York. Based on smalltooth sawfish encounter data, the current core range for the smalltooth sawfish is currently from the Caloosahatchee River, Florida, to Florida Bay (Simpfendorfer and Wiley 2004).

All extant sawfish belong to the Suborder *Pristoidea*, Family *Pristidae*, and Genus *Pristis*. Although they are rays, sawfish physically more resemble sharks, with only the trunk and especially the head ventrally flattened. Smalltooth sawfish are characterized by their “saw,” a long, narrow, flattened rostral blade with a series of transverse teeth along either edge.

Life History and Distribution
Life history information on smalltooth sawfish is limited. Small amounts of data exist in old taxonomic works and occurrence notes (e.g., Breder 1952, Bigelow and Schroeder 1953, Wallace 1967, Thorson et al. 1966). However, as Simpfendorfer and Wiley (2004) note, these relate primarily to occurrence and size. Recent research and sawfish public encounter information is now providing new data and hypotheses about smalltooth sawfish life history (e.g., Simpfendorfer 2001 and 2003, Seitz and Poulakis 2002, Poulakis and Seitz 2004, Simpfendorfer and Wiley 2004), but more data are needed to confirm many of these new hypotheses.

As in all elasmobranchs, fertilization is internal. Bigelow and Schroeder report the litter size as 15 to 20. Simpfendorfer and Wiley (2004), however, caution this may be an overestimate, with recent anecdotal information suggesting smaller litter sizes (~10). Smalltooth sawfish mating and pupping seasons, gestation, and reproductive periodicity are all unknown. Gestation and reproductive periodicity, however, may be inferred based on that of the largetooth sawfish, sharing the same genus and having similarities in size and habitat. Thorson (1976) reported the gestation period for largetooth sawfish was approximately 5 months and concluded that females probably produce litters every second year.

Bigelow and Schroeder (1953) describe smalltooth sawfish as generally about 2 feet long (61 cm) at birth and growing to a length of 18 feet (549 cm) or greater. Recent data from smalltooth sawfish caught off Florida, however, demonstrate young are born at 75-85 cm (Simpfendorfer and Wiley 2004), with males reaching maturity at approximately 270 cm and females at approximately 360 cm (Simpfendorfer 2002 and 2004). The maximum reported size of a smalltooth sawfish is 760 cm (Last and Stevens 1994), but the maximum size normally observed is 600 cm (Adams and Wilson 1995). No formal studies on the age and growth of the smalltooth sawfish have been conducted to date, but growth studies of largetooth sawfish suggest slow growth, late maturity (10 years) and long lifespan (25-30 years) (Thorson 1982; Simpfendorfer 2000). These characteristics suggest a very low intrinsic rate of increase (Simpfendorfer 2000).

Smalltooth sawfish feed primarily on fish, with mullet, jacks, and ladyfish believed to be their primary food resources (Simpfendorfer 2001). By moving its saw rapidly from side to side through the water, the relatively slow-moving sawfish is able to strike at individual fish (Breder 1952). The teeth on the saw stun, impale, injure, or kill the fish. Smalltooth sawfish then rub their saw against bottom substrate to remove the fish, which are then eaten. In addition to fish, smalltooth sawfish also prey on crustaceans (mostly shrimp and crabs), which are located by disturbing bottom sediment with their saw (Norman and Fraser 1937, Bigelow and Schroeder 1953).

Smalltooth sawfish are euryhaline, occurring in waters with a broad range of salinities from freshwater to full seawater (Simpfendorfer 2001). Their occurrence in freshwater is suspected to be only in estuarine areas temporarily freshwater from receiving high levels of freshwater input. Many encounters are reported at the mouths of rivers or other sources of freshwater inflows, suggesting estuarine areas may be an important factor in the species distribution (Simpfendorfer and Wiley 2004).

The literature indicates that smalltooth sawfish are most common in shallow coastal waters less than 25 m (Bigelow and Schroeder 1953, Adams and Wilson 1995). Indeed, the distribution of the smallest size classes of smalltooth sawfish indicate that nursery areas occur throughout Florida in areas of shallow water, close to shore and typically associated with mangroves (Simpfendorfer and Wiley 2004). However, encounter data indicate there is a tendency for smalltooth sawfish to move offshore and into deeper water as they grow. An examination of the relationship between the depth at which sawfish occur and their estimated size indicates that larger animals are more likely to be found in deeper waters. Since large animals are also observed in very shallow waters, it is believed that smaller (younger) animals are restricted to shallow waters, while large animals roam over a much larger depth range (Simpfendorfer 2001). Recent data from sawfish encounter reports and from satellite tagging indicate mature animals occur regularly in waters in excess of 50 meters (Poulakis and Seitz 2004, Simpfendorfer and Wiley 2004).

Mote Marine Laboratory (MML) data indicate smalltooth sawfish occur over a range of temperatures but appear to prefer water temperatures greater than 64.4°F (18°C) (Simpfendorfer 2001). The data also suggest that smalltooth sawfish may utilize warm-water outflows of power stations as thermal refuges during colder months to enhance their survival or become trapped by surrounding cold water from which they would normally migrate. Almost all occurrences of smalltooth sawfish in warm-water outflows were during the coldest part of the year, when water temperatures in these outfalls are typically well above ambient temperatures. Further study of the importance of thermal refuges to smalltooth sawfish is needed. Significant use of these areas by sawfish may disrupt their normal migratory patterns (Simpfendorfer and Wiley 2004).

Historic records of smalltooth sawfish indicate that some large mature individuals migrated north along the U.S. Atlantic coast as temperatures warmed in the summer and then south as temperatures cooled (Bigelow and Schroeder 1953). Recent Florida encounter data, however, do not suggest such migration. Only two smalltooth sawfish have been recorded north of Florida since 1963 (the first was captured off of North Carolina in 1999 (Schwartz 2003) and the other off Georgia 2002 [Burgess unpublished data]) but it is unknown whether these individuals resided in Georgia and North Carolina waters annually or if they had migrated north from Florida. Given the very limited number of encounter reports from the east coast of Florida, Simpfendorfer and Wiley (2004) hypothesize the population previously undertaking the summer migration has declined to a point where the migration is undetectable or does not occur. Further research focusing on states north of Florida or using satellite telemetry is needed to test this hypothesis.

Population Dynamics, Status and Trends

Despite being widely recognized as common throughout their historic range up until the middle of the 20^{th} century, the smalltooth sawfish population declined dramatically during the middle and later parts of the century. The decline in the population of smalltooth sawfish is attributed to fishing (both commercial and recreational), habitat modification, and sawfish life history. Large numbers of smalltooth sawfish were caught as bycatch in the early part of this century. Smalltooth sawfish were historically caught as bycatch in various fishing gears throughout their historic range, including gillnet, otter trawl, trammel net, seine, and to a lesser degree, handline. Frequent accounts in earlier literature document smalltooth sawfish being entangled in fishing nets from areas where smalltooth sawfish were once common but are now rare (Everman and Bean 1898). Loss and/or degradation of habitat contributed to the decline of many marine species and continue to impact the distribution and abundance of smalltooth sawfish.

Estimates of the magnitude of the decline in the smalltooth sawfish are difficult to make. Because of the species' limited importance in commercial and recreational fisheries and its large size and toothed rostrum, making it difficult to handle, it was not well studied before incidental bycatch severely reduced its numbers. However, based on the contraction of the species' range, and other anecdotal data, Simpfendorfer (2001) estimated that the U.S. population size is currently less than 5% of its size at the time of European settlement.

Seitz and Poulakis (2002) and Poulakis and Seitz (2004) document recent (1990 to 2002) occurrences of sawfish along the southwest coast of Florida, and in Florida Bay and the Florida Keys, respectively. The information was collected by soliciting information from anyone who would possibly encounter these fish via posters displaying an image of a sawfish and requesting anyone with information on these fish since 1990 to contact the authors. Posters were distributed beginning in January 1999 and continue to be maintained from Charlotte County to Monroe County in places where anglers and boaters would likely encounter them (e.g., bait and tackle shops, boat ramps, fishing tournaments). In addition to circulating posters, information was obtained by contacting other fishery biologists, fishing guides, guide associations, rod and gun clubs, recreational and commercial fishermen, scuba divers, mosquito control districts, and newspapers. The Poulakis and Seitz database available to us includes a total of 2,969 smalltooth sawfish encounters.

MML also maintains a smalltooth sawfish public encounter database, established in 2000 to compile information on the distribution and abundance of sawfish. Encounter records are collected using some of the same outreach tactics as above in Florida statewide. To ensure the requests for information are spread evenly throughout the state, awareness-raising activities were divided into six regions and focused in each region on a biannual basis between May 2002 and May 2004. Prior to 2002, awareness-raising activities were organized on an ad-hoc basis because of limited resources. The records in the database extend back to the 1950s, but are mostly from 1998 to the present. The data are validated using a variety of methods (photographs, video, directed questions). A total of 434 sawfish encounters have been validated since 1998, most from recreational fishers (Simpfendorfer and Wiley 2004).

The majority of smalltooth sawfish encounters today are from the southwest coast of Florida between the Caloosahatchee River and Florida Bay. Outside of this core area, the smalltooth sawfish appears more common on the west coast of Florida and in the Florida Keys than on the east coast, and occurrences decrease the greater the distance from the core area (Simpfendorfer and Wiley 2004). The capture of a smalltooth sawfish off Georgia in 2002 is the first record north of Florida since 1963. New reports during 2004 extend the current range of the species to Panama City, offshore Louisiana (south of Timbalier Island in 100 ft of water), southern Texas, and the northern coast of Cuba. The Texas sighting was not confirmed to be a smalltooth sawfish and may have been a largetooth sawfish.

There are no data available to estimate the present population size. Although smalltooth sawfish encounter databases may provide a useful future means of measuring changes in the population and its distribution over time, conclusions about the abundance of smalltooth sawfish now cannot be made because outreach efforts and observation efforts are not expanded evenly across each study period. Dr. Simpfendorfer reluctantly gives an estimate of 2,000 individuals based on his four years of field experience and data collected from the public, but cautions that actual numbers may be plus or minus at least 50%.

Recent encounters with neonates (young of the year), juveniles, and sexually mature sawfish indicate that the population is reproducing (Seitz and Poulakis 2002, Simpfendorfer 2003). The abundance of juveniles encountered, including very small individuals, suggests that the population remains reproductively active and viable (Simpfendorfer and Wiley 2004). Also, the declining numbers of individuals with increasing size is consistent with the historic size composition data (G. Burgess, pers. comm. in Simpfendorfer and Wiley 2004). This information and recent encounters in new areas beyond the core abundance area suggest that the population may be increasing. However, smalltooth sawfish encounters are still rare along much of their historical range and absent from areas of historical abundance such as the Indian River Lagoon and John's Pass (Simpfendorfer and Wiley 2004). With recovery of the species expected to be slow on the basis of the species' life history and other threats to the species remaining (see below), the population's future remains tenuous.

Threats

Smalltooth sawfish are threatened today by the loss of southeastern coastal habitat through such activities as agricultural and urban development, commercial activities, dredge and fill operations, boating, erosion, and diversions of freshwater run-off. Dredging, canal development, seawall construction, and mangrove clearing have degraded a significant proportion of the coastline. Smalltooth sawfish may be especially vulnerable to coastal habitat degradation due to their affinity for shallow, estuarine systems (NMFS 2000).

Fisheries still pose a threat to smalltooth sawfish. Although changes over the past decade to U.S. fishing regulations such as Florida's net ban have started to reduce threats to the species over parts of its range, smalltooth sawfish are still occasionally incidentally caught in commercial shrimp trawls, bottom longlines, and recreational rod and reel. The current and future abundance of the smalltooth sawfish is limited by its life history characteristics (NMFS 2000). Slow-growing, late-maturing, and long-lived, these combined characteristics result in a very low intrinsic rate of population increase and are associated with the life history strategy known as "k-selection." K-selected animals are usually successful at maintaining relatively small, persistent population sizes in relatively constant environments. Consequently, they are not able to respond effectively (rapidly) to additional and new sources of mortality resulting from changes in their environment (Musick 1999). Simpfendorfer (2000) demonstrated that the life history of this species makes it impossible to sustain any significant level of fishing and makes it slow to recover from any population decline. Thus, the species is susceptible to population decline, even with relatively small increases in mortality.

4.0 Environmental Baseline

This section identifies and discusses the effects of past and ongoing human and natural factors within the action area, leading to the current status of the species and their habitats. The anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process must also be evaluated (50 CFR 402.02).

The sea turtles species found within the action area may travel widely throughout the Atlantic, Gulf of Mexico, and Caribbean Sea. Individuals found in the action area can potentially be affected by the activities anywhere within this wide range. The most thorough account of permitted and non-permitted activities, including research activities that are not harmful to sea turtles, in the entire U.S. Atlantic, Gulf of Mexico, and Caribbean can be found in Appendix 2 of the NOAA Technical Memorandum NMFS-SEFSC-455, *Stock Assessments of Loggerhead and Leatherback Sea Turtles and an Assessment of the Impact of the Pelagic Longline Fishery on the Loggerhead and Leatherback Sea Turtles of the Western North Atlantic* (NMFS SEFSC 2001).

4.1 Factors Affecting Sea Turtles Within the Action Area

The most significant activities affecting sea turtles in the South Atlantic are fisheries and conservation activities directed at commercial fisheries. Other environmental impacts to turtles may result from vessel operations, discharges, dredging, military activities, oil and gas development activities, industrial cooling water intake, aquaculture, recreational fishing, coastal development, directed take, and marine debris. All of these activities and their impacts on sea turtles are reviewed in the following subsections.

4.1.1 Federal Actions

Federal Fisheries
In recent years, NMFS has undertaken several ESA section 7 consultations to address the effects of federally-permitted fisheries and other federal actions on threatened and endangered sea turtle species, and when appropriate, has authorized the incidental taking of these species. Each of those consultations sought to develop ways of reducing the probability of adverse effects of the action on sea turtles. Similarly, NMFS has undertaken recovery actions under the ESA are addressing the problem of take of sea turtles in the fishing and shipping industries and other activities such as Army Corps of Engineers (COE) dredging operations. The summary below of anticipated sources of incidental take of sea turtles includes only those federal actions in the South Atlantic which have already concluded or are currently undergoing formal section 7 consultation.

Adverse effects on threatened and endangered sea turtles from several types of fishing gear occur in the action area. These gears, including gillnet, hook-and-line (i.e., vertical line and longline), and trawl gear, have all been documented as interacting with sea turtles. For all fisheries for which there is a FMP or for which any federal action is taken to manage that fishery, the impacts have been evaluated via section 7 consultation. Formal section 7 consultations have been conducted on the following fisheries: the HMS pelagic longline fishery; the HMS shark fishery; dolphin/wahoo fishery; monkfish fishery; summer flounder, scup, and black sea bass fisheries; southern flounder gillnet fishery; and the Southeast shrimp trawl fishery. An ITS has been issued for the take of sea turtles in each of the fisheries. A summary of each consultation is provided below but more detailed information can be found in the respective opinions (NMFS 2004c, NMFS 2003a, NMFS 2003b, NMFS 2003c, NMFS 2001a, NMFS 2001b, and NMFS 2002a).

On June 1, 2004, NMFS completed an opinion on the continued operation of the Atlantic HMS pelagic longline fishery in the Atlantic, Gulf of Mexico, and Caribbean. The opinion found that the continued prosecution of the pelagic longline fishery was likely to jeopardize the continued existence of leatherback sea turtles. However, NMFS implemented an RPA to allow for the continuation of the pelagic longline fishery without jeopardizing that species. The provisions of the RPA included measures to: (1) Reduce post-release mortality of leatherbacks; (2) improve monitoring of the effects of the fishery; (3) confirm the effectiveness of the hook and bait combinations that are required as part of the proposed action; and (4) take management action to avoid long-term elevations in leatherback takes or mortality. All other sea turtles were found not likely to be jeopardized. The following amount of annual incidental take is anticipated in the future (2005 and beyond): 588 leatherbacks per year, 635 loggerheads, and a total of 35 individuals per year of either green, hawksbill, Kemp's ridley, and olive ridley turtles.

South Atlantic shark fisheries include commercial shark bottom longline and drift gillnet fisheries and recreational shark fisheries under the FMP for Atlantic Tunas, Swordfish, and Sharks (HMS FMP). The shark bottom longline and drift gillnet fisheries were both found likely to adversely affect sea turtles. An ESA section 7 consultation was completed on October 29, 2003, on the continued operation of those fisheries and the July 2003, Proposed Rule for Draft Amendment 1 to the HMS FMP (NMFS 2003a). The opinion concluded the proposed action was not likely to jeopardize the continued existence of any listed sea turtles. An ITS was provided authorizing non-lethal takes.

The FMP for the dolphin/wahoo fishery was approved in December 2003. NMFS conducted a formal section 7 consultation to consider the effects of implementation of the FMP on sea turtles. The biological opinion concluded that loggerhead, leatherback, hawksbill, green, and Kemp's ridley sea turtles may be adversely affected by operation of the fishery. However, the proposed action was not expected to jeopardize the continued existence of any of these species. An ITS has been provided.

The federal monkfish fishery occurs in all waters under federal jurisdiction from Maine to the North Carolina/South Carolina border. The monkfish fishery uses several gear types that may entangle sea turtles, including gillnet and trawl gear. NMFS reinitiated consultation on the Monkfish FMP on May 4, 2000, in part, to reevaluate the effects of the monkfish gillnet fishery on sea turtles. A new ITS was provided for the take of sea turtles in the fishery as a result of capture in monkfish gillnet and trawl gear.

Consultation was subsequently reinitiated in 2002 and 2003 to consider, first, the one year delay in reducing Days-at-Sea (DAS) to zero (which would have effectively eliminated directed monkfish fishing effort) and then elimination of the DAS reduction altogether. A new ITS was provided for sea turtles in each case. Reducing DAS to zero would have likely been of benefit to sea turtles by eliminating directed gillnet and trawl effort in the fishery. In March 2002, NMFS published new restrictions for the use of gillnets with larger than 8 inch (20.3 cm) stretched mesh, in federal waters (3-200 nautical miles) off of North Carolina and Virginia. These measures are in addition to Harbor Porpoise Take Reduction Plan measures in place that prohibit the use of large-mesh gillnets in southern Mid-Atlantic waters (territorial and federal waters from Delaware through North Carolina out to 72°30'W longitude) from February 15-March 15, annually. Operation of the gillnet sector of the monkfish fishery is further modified by management measures implemented under the Atlantic Large Whale Take Reduction Plan (ALWTRP).

The summer flounder, scup, and black sea bass fisheries are known to interact with sea turtles. Summer flounder, scup, and black sea bass are managed under one FMP since these species occupy similar habitat and are often caught at the same time. They are present in offshore waters throughout the winter and migrate and occupy inshore waters throughout the summer. The primary gear types used in the summer flounder, scup, and black sea bass fisheries are mobile trawl gear, pots and traps, gillnets, pound nets, and handlines. Significant measures have been developed to reduce the take of sea turtles in summer flounder trawls and trawls that meet the definition of a summer flounder trawl by requiring the use TEDs throughout the year for trawl nets fished from the North Carolina/South Carolina border to Oregon Inlet, North Carolina, and seasonally (March 16-January 14) for trawl vessels fishing between Oregon Inlet, North Carolina, and Cape Charles, Virginia (which would include fisheries for other species like scup and black sea bass). Developmental work is also ongoing for a TED that will work in the flynets used in the summer flounder fisheries. The gillnet, pot gear, and staked trap sectors could also entangle sea turtles. As a result of new information not considered in previous consultations, NMFS has reinitiated section 7 consultation on this FMP to consider the effects of the fisheries on sea turtles.

The North Carolina inshore fall southern flounder gillnet fishery was identified as a source of large numbers of sea turtle mortalities in 1999 and 2000, especially loggerhead sea turtles. In 2001, NMFS issued an ESA section 10 permit to North Carolina with mitigative measures for the southern flounder fishery. Subsequently, the sea turtle mortalities in these fisheries were drastically reduced. The reduction of sea turtle mortalities in these fisheries reduces the negative effects these fisheries have on the environmental baseline.

The Southeast shrimp trawl fishery affects more sea turtles than all other activities combined (NRC 1990). On December 2, 2002, NMFS completed the opinion for shrimp trawling in the southeastern United States under proposed revisions to the TED regulations (68 FR 8456, February 21, 2003). This opinion determined that the shrimp trawl fishery under the revised TED regulations would not jeopardize the continued existence of any sea turtle species. This determination was based, in part, on the opinion's analysis that shows the revised TED regulations are expected to reduce shrimp trawl related mortality by 94% for loggerheads and 97% for leatherbacks.

Formal section 7 consultations have also been conducted for the issuance of several exempted fishing permits (EFPs). These opinions have concluded the proposed activities may adversely affect but were not likely to jeopardize the continued existence of any sea turtles. ITSs for each EFP issued were provided.

Vessel and Military Operations
Potential sources of adverse effects from federal vessel operations in the action area and throughout the range of sea turtles include operations of the U.S. Department of Defense (DoD), Navy (USN), Air Force and Coast Guard (USCG), the Environmental Protection Agency, the National Oceanic and Atmospheric Administration (NOAA), and the COE. NMFS has conducted formal consultations with the USCG, the USN, and NOAA on their vessel operations. Through the section 7 process, where applicable, NMFS has and will continue to establish conservation measures for all these agency vessel operations to avoid or minimize adverse effects to listed species. At the present time, however, they present the potential for some level of interaction. Refer to the biological opinions for the USCG (NMFS 1995, 1996) and the USN (NMFS 1997a) for details on the scope of vessel operations for these agencies and conservation measures being implemented as standard operating procedures.

Since the USN consultation only covered operations out of Mayport, Florida, potential still remains for USN vessels to adversely affect sea turtles when they are operating in other areas within the range of these species. Similarly, operations of vessels by other federal agencies within the action area (NOAA, EPA, ACOE) may adversely affect sea turtles. However, the in-water activities of those agencies are limited in scope, as they operate a limited number of vessels or are engaged in research/operational activities that are unlikely to contribute a large amount of risk.

Additional Military Activities
Additional activities including vessel operations and ordnance detonation, also affect listed species of sea turtles. USN aerial bombing training in the ocean off the southeast U.S. coast, involving drops of live ordnance (500 and 1,000-lb bombs), is estimated to have the potential to injure or kill, annually, 84 loggerheads, 12 leatherbacks, and 12 greens or Kemp's ridley, in combination (NMFS 1997a). Operation of the USCG's boats and cutters in the U.S. Atlantic, meanwhile, is estimated to take no more than one individual turtle—of any species—per year (NMFS 1995). Formal consultation on overall USCG or USN activities in the Gulf of Mexico has not been conducted.

Dredging
The construction and maintenance of federal navigation channels and sand mining ("borrow") areas has also been identified as a source of sea turtle mortality. Hopper dredges move relatively rapidly (compared to sea turtle swimming speeds) and can entrain and kill sea turtles, presumably as the drag arm of the moving dredge overtakes

the slower moving sea turtle. Along the Atlantic coast of the southeastern United States, NMFS estimates that annual observed injury or mortality of sea turtles from hopper dredging may reach 35 loggerheads, 7 greens, 7 Kemp's ridleys, and 2 hawksbills (NMFS, 1997b). U.S. Navy northeast operations requiring dredging at the Dam Neck Naval Facility may take 10 loggerheads, 1 green and 1 Kemp's ridley.

Coal-Fueled and Nuclear Generating Plants
Another action with federal oversight (the Nuclear Regulatory Commission) impacting sea turtles is the operation of nuclear generating plants. Sea turtles entering coastal or inshore areas have been affected by entrainment in the cooling-water systems of coal-fueled and nuclear generating plants, though it is important to note that the majority of sea turtles caught are released alive. A biological opinion completed in January 2000 estimates that the operations at the Brunswick Steam Electric Plant in Brunswick, North Carolina, may take 50 sea turtles in any combination annually, that are released alive. NMFS also estimated the total lethal take of turtles at this plant may reach six loggerhead, two Kemp's ridley, or three green turtles annually.

ESA Permits
Regulations developed under the ESA allow for the issuance of permits allowing take of certain ESA-listed species for the purposes of scientific research under section 10(a)(1)(a) of the ESA. In addition, the ESA allows for NMFS to enter into cooperative agreements with states developed under section 6 of the ESA, to assist in recovery actions of listed species. Prior to issuance of these authorizations, the proposal must be reviewed for compliance with section 7 of the ESA.

Sea turtles are the focus of research activities authorized by a section 10 permit under the ESA. There are currently 11 active scientific research permits directed toward sea turtles that are applicable to the action area of this opinion. Authorized activities range from photographing, weighing, and tagging sea turtles incidentally taken in fisheries; blood sampling; tissue sampling (biopsy); and performing laparoscopy on intentionally captured turtles. The number of authorized takes varies widely depending on the research and species involved but may involve the taking of hundreds of turtles annually. Most of takes authorized under these permits are expected to be non-lethal. Before any research permit is issued, the proposal must be reviewed under the permit regulations (i.e., must show a benefit to the species). In addition, since issuance of the permit is a federal activity, issuance of the permit by NMFS must also be reviewed for compliance with section 7(a)(2) of the ESA to ensure that issuance of the permit does not result in jeopardy to the species. However, despite these safeguards, research activities may result in cumulative effects on sea turtle populations, though we anticipate any adverse affects from this research will be discountable.

4.1.2 State or Private Actions

Vessel Traffic
Commercial traffic and recreational pursuits can adversely affect sea turtles through propeller and boat strikes. The Sea Turtle Stranding and Salvage Network (STSSN)

reports many records of vessel interaction (propeller injury) with sea turtles off South Atlantic coastal states such as Florida, where there are high levels of vessel traffic. The extent of the problem is difficult to assess because of not knowing whether the majority of sea turtles are struck pre- or post-mortem. Private vessels in the South Atlantic participating in high-speed marine events (e.g., boat races) are a particular threat to sea turtles. NMFS and the USCG are in early consultation on South Atlantic marine events, but a thorough analysis has not been completed.

State Fisheries

Several coastal state fisheries are known to incidentally take listed species, but information on these fisheries is sparse (NMFS SEFSC 2001). Various fishing methods used in these commercial and recreational fisheries, including trawling, pot fisheries, gillnets, and vertical line are all known to incidentally take sea turtles, but information on these fisheries is sparse (NMFS SEFSC 2001). Although the past and current effects of state fisheries on listed species are currently not determinable, NMFS believes that ongoing fishing activities may be responsible for seasonally high levels of observed strandings of sea turtles on South Atlantic coastlines. Most state data are based on extremely low observer coverage or sea turtles were not part of data collection; thus, these data provide insight into gear interactions that could occur but are not indicative of the magnitude of the overall problem. The 2001 HMS Biological Opinion (HMS Bi-Op)(NMFS 2001c) has an excellent summary of turtles taken in state fisheries throughout the action area.

To address data gaps, several state agencies have initiated observer programs to collect information on interactions between listed species and certain gear types. Other states have closed nearshore waters to gear-types known to have high encounter rates with listed species. Depending on the fishery in question, many state permit holders also hold federal permits; therefore, existing section 7 consultations on federal fisheries may address some of the state fishery impacts. NMFS is also actively participating in a cooperative effort with ASMFC to standardize and/or implement programs to collect information on level of effort and bycatch in state fisheries.

Additional information on impact of take (i.e., associated mortality) is also needed for analysis of impacts to sea turtles from these fisheries. Certain gear types may have high levels of sea turtle takes, but very low rates of serious injury or mortality. For example, hook-and-line takes rarely are dead upon retrieval of gear, but trawls and gillnets frequently result in immediate mortality. Leatherbacks seem to be susceptible to a more restricted list of fisheries, while hardshell turtles, particularly loggerheads, seem to appear in data from almost all state fisheries. The HMS Bi-Op also summarizes sea turtle interactions with flynets and various trawl techniques that occur within the action area.

A detailed summary of the gillnet fisheries currently operating along the mid- and southeast U.S. Atlantic coastline, that are known to incidentally capture loggerheads, can be found in the TEWG reports (1998, 2000). Strict regulations are in place for nearshore gillnetting off South Carolina, Georgia, and Florida. Georgia and South Carolina prohibit gillnets for all but the shad fishery,[14] and Florida banned all but very small nets in state waters. Although many states have imposed strict regulations on gillnetting[15] the practice still occurs off some states' waters and in federal waters. The nearshore and inshore gillnet fisheries off North Carolina are of particular concern due to the incidental captures (both lethal and non-lethal) of loggerhead, leatherback, green and Kemp's ridley sea turtles have been reported (W. Teas, pers. comm., J. Braun-McNeill pers. comm.). Illegal gillnet incidental captures have also been reported in South Carolina and Florida (NMFS SEFSC 2001).

Gillnetting activities in North Carolina associated with the southern flounder fishery have also been implicated in large numbers of sea turtle mortalities. NMFS closed part of Pamlico Sound to the setting of gillnets targeting southern flounder in fall 1999 after the stranding of relatively large numbers of loggerhead and Kemp's ridley sea turtles on inshore beaches. NMFS also closed the waters north of Cape Hatteras to 38°N., including the mouth of the Chesapeake Bay, to large (> 6 inch stretched) mesh gillnets for 30 days in mid-May 2000 due to the large numbers of loggerhead strandings in North Carolina. Another such closure took effect on October 27, 2000, the North Carolina Division of Marine Fisheries (NCDMF) closed waters in the southeastern portion of the Pamlico Sound as a result of elevated takes by the commercial large-mesh flounder gillnet fishery. The NCDMF and NMFS had just agreed on details of a section 10 permit of the ESA for the flounder fishery just prior to the closure. The fishery was closed when anticipated incidental take levels were met for green sea turtles. The NCDMF estimated that there were 50 loggerheads captured at the time of closure and that 44 of those had been drowned (NMFS SEFSC 2001).

Pulses of elevated sea turtle strandings occur with regularity in the Mid-Atlantic area, particularly along North Carolina through southern Virginia in the late fall/early spring, coincident with sea turtle migrations. For example, in the end of April through early May 2000, approximately 300 turtles, mostly loggerheads, stranded north of Oregon Inlet, North Carolina. Gillnets were found with four of the carcasses. These strandings are likely caused by state fisheries as well as federal fisheries, although not any one fishery has been identified as the major cause. Fishing effort data indicate that fisheries targeting monkfish, dogfish, and bluefish were operating in the area of the strandings. Strandings in this area represent at best, 7%-13% of the actual nearshore mortality (Epperly et al. 1996).

The Sea Turtle Stranding and Salvage Network has documented record-setting levels of sea turtle strandings in North Carolina and Florida in recent years. For example, the total number of strandings in North Carolina for 1999 was 2.3 times the average annual strandings from 1980 to 1999. The total number of Kemp's ridley strandings in 1999 was 7 times the average annual for the same time period. The number of strandings in 2000 is greater than 1999 with a preliminary total of 766, including 78 Kemp's ridleys and 17

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[14] NMFS SEFSC observed this fishery off South Carolina for one season (McFee et al. 1996), and no takes of protected species were observed.
[15] Louisiana, Mississippi, and Alabama have also placed restrictions on gillnet fisheries within state waters such that very little commercial gillnetting takes place in Southeast waters.

leatherbacks. During the spring of 2000, there were two stranding events involving unprecedented numbers of turtles, along the Outer Banks in Dare and Hyde counties.

During the first stranding event, a total of 71 turtles (69 loggerheads and 2 Kemp's ridleys) washed ashore on the ocean-facing beaches between Rodanthe and Ocracoke from April 14-17, 2000. There were no externally obvious signs of death on the turtles. Necropsies on 12 loggerheads and 2 Kemp's ridleys revealed that the turtles had excellent fat stores and were probably in good health prior to their deaths. A few of the turtles had been feeding on nearshore, benthic species, but most had empty guts, suggesting that they were in a migratory, rather than foraging, mode. The uniform state of decomposition of the turtles indicated that they had likely all died suddenly within a short period of time, probably no more than a few days before stranding on the beach. Large amounts of Sargassum weed blew ashore, coincident with the turtle strandings, and considered indicative of the movement of warm Gulf Stream waters close to shore.

The second stranding event began on May 3, 2000. From May 3-8, approximately 209 additional sea turtles (3 Kemp's ridleys, the rest loggerheads) were found dead on ocean beaches between Oregon Inlet and Hatteras Inlet. Virtually all were severely decomposed, suggesting that they had been dead at sea for at least several days before stranding. Four of the carcasses were entangled in fishing gear: three loggerheads carried pieces of gillnet with a mesh size of 12 inches (30.48 cm) stretched, and one loggerhead was carrying gillnet with a mesh size of 10 inches (25.4 cm) stretched. The stranding events along the Atlantic coast represent only a fraction of the actual at-sea mortality. The causes are multiple, including state and federal fisheries, disease, and cold stunning.

Incidental captures of loggerheads in fish traps set off Florida have also been reported (W. Teas, pers. comm.). Although no incidental captures have been documented from fish traps set off North Carolina, they are another potential anthropogenic impact to loggerheads and other sea turtles. Long haul seines and channel nets in North Carolina are known to incidentally capture loggerhead and other sea turtles in the sounds and other inshore waters (J. Braun-McNeill, pers. comm.). No lethal takes have been reported (NMFS SEFSC 2001).

Observations of state recreational fisheries have shown that loggerhead, leatherback, and green sea turtles are known to bite baited hooks, and loggerheads frequently ingest the hooks. Hooked turtles have been reported by the public fishing from boats, piers, beaches, banks, and jetties, and from commercial fishermen fishing for snapper, grouper, and shark with both single rigs and bottom longlines (NMFS 2001). A detailed summary of the known impacts of hook-and-line incidental captures to loggerhead sea turtles can be found in the TEWG reports (1998, 2000).

Coastal Development

Beachfront development, lighting and beach erosion control all are ongoing activities along South Atlantic coastlines. These activities potentially reduce or degrade sea turtle nesting habitats or interfere with hatchling movement to sea. Nocturnal human activities along nesting beaches may also discourage sea turtles from nesting sites. The extent to which these activities reduce sea turtle nesting and hatchling production is unknown. However, more and more coastal counties are adopting stringent protective measures to protect hatchling sea turtles from the disorienting effects of beach lighting.

4.1.3 Conservation and Recovery Actions

NMFS has implemented a series of regulations aimed at reducing potential for incidental mortality of sea turtles from commercial fisheries in the South Atlantic. The regulations have primarily focused on the Southeast shrimp trawl fishery and the HMS pelagic longline fishery.

NMFS implemented a series of regulations aimed at reducing potential for incidental mortality of sea turtles in commercial fisheries. In particular, NMFS has required the use of TEDs in southeast U.S. shrimp trawls since 1989. It has been estimated that TEDs exclude 97% of the turtles caught in such trawls. These regulations have been refined over the years to ensure that TED effectiveness is maximized through proper placement and installation, configuration (e.g., width of bar spacing), flotation, and more widespread use. Analyses by Epperly and Teas (2002) indicated that the minimum requirements for the escape opening dimensions were too small, and that as much as 47% of the loggerheads stranding annually along the Atlantic seaboard and Gulf of Mexico were too large to fit through existing openings. On February 21, 2003, NMFS published a final rule to require larger escape openings.

In 1993 (with a final rule implemented in 1995), NMFS established a Leatherback Conservation Zone to restrict shrimp trawl activities from the coast of Cape Canaveral, Florida, to the North Carolina/Virginia border. This provided for short-term closures when high concentrations of normally pelagically distributed leatherbacks are recorded in near coastal waters where the shrimp fleet operates. This measure was necessary because, due to their size, adult leatherbacks were larger than the escape openings of most NMFS-approved TEDs. With the implementation of the new TED rule requiring larger opening sizes on all TEDs, the reactive emergency closures within the Leatherback Conservation Zone became unnecessary, and the Leatherback Conservation Zone was removed from the regulations.

In March 2002, NMFS published new restrictions for the use of gillnet with larger than 8-inch (20.3 cm) stretched mesh, in federal waters (3-200 nautical miles) off of North Carolina and Virginia. As a result, gillnets with larger than 8-inch stretched mesh are not allowed in federal waters (3-200 nautical miles) north of the North Carolina/South Carolina border at the coast to Oregon Inlet at all times; north of Oregon Inlet to Currituck Beach Light, North Carolina, from March 16 through January 14; north of Currituck Beach Light, North Carolina to Wachapreague Inlet, Virginia from April 1 through January 14; and, north of Wachapreague Inlet, Virginia, to Chincoteague, Virginia, from April 16 through January 14. Federal waters north of Chincoteague, Virginia, are not affected by these new restrictions although NMFS is looking at additional information to determine whether expansion of the restrictions are necessary to protect sea turtles as they move into northern Mid-Atlantic and New England waters.

These measures are in addition to Harbor Porpoise Take Reduction Plan measures that prohibit the use of large-mesh gillnets in southern Mid-Atlantic waters (territorial and federal waters from Delaware through North Carolina out to 72°30'W longitude) from February 15-March 15, annually.

On July 6, 2004, NMFS published a final rule to implement management measures to reduce bycatch and bycatch mortality of Atlantic sea turtles in the Atlantic pelagic longline fishery (69 FR 40734). The management measures include mandatory circle hook and bait requirements, and mandatory possession and use of sea turtle release equipment to reduce bycatch mortality. The rulemaking, based on the results of the 3-year Northeast Distant Closed Area research experiment and other available sea turtle bycatch reduction studies, is expected to have significant benefits to endangered and threatened Atlantic sea turtles.

NMFS has been active in public outreach efforts to educate fishermen regarding sea turtle handling and resuscitation techniques. As well as making this information widely available to all fishermen, NMFS conducted a number of workshops with Atlantic HMS pelagic longline fishermen to discuss bycatch issues including protected species, and to educate them regarding handling and release guidelines.

Sea Turtle Stranding and Salvage Network (STSSN) participants along the South Atlantic coast not only collect data on stranded dead sea turtles, but also rescue and rehabilitate live stranded turtles. Data collected by STSSN are used to monitor stranding levels and compare them with fishing activity in order to determine whether additional restrictions on fishing activities are needed. These data are also used to monitor incidence of disease, study toxicology and contaminants, and conduct genetic studies to determine population structure. STSSN participants also opportunistically tag live turtles (either via the stranding network through incidental takes or in-water studies). Tagging studies help provide basic life history information, including sea turtle movements, longevity, and reproductive patterns. In some cases, an STSSN-wide protocol is developed to address a particular problem. For example, currently all of the states that participate in STSSN are collecting tissue for and/or conducting genetic studies to better understand the population dynamics of the small subpopulation of northern nesting loggerheads.

The Recovery Plans for loggerhead and Kemp's ridley sea turtles are currently being revised. Recovery teams comprised of sea turtle experts have been convened and are currently working towards revising these plans based upon the latest and best available information. NMFS also recently convened the last of four meetings by the leatherback expert working group. The group was comprised of scientists, government officials, and non-governmental agencies from throughout the Atlantic basin. The final meeting sought to produce a status review of the leatherback population in the Atlantic basin. This review is projected to be ready by early 2007.

4.2 Factors Affecting Smalltooth Sawfish Within the Action Area

Smalltooth sawfish greater than 200 cm TL may be found in the southern portion (primarily off Florida) of the action area throughout the year intermittently, spending the rest of their time in shallower waters. Individuals found in the action area, therefore, can potentially be affected by activities both within the southeast portion of the action area and adjacent nearshore waters.

4.2.1 Federal Actions

Fisheries
Historically, smalltooth sawfish were frequently bycatch in various types of fishing gear. Fishers often viewed smalltooth sawfish as a nuisance species and killed bycaught animals because degree of gear entanglement was so severe it made extracting the animal dangerous (Henshall 1895). More recently, South Atlantic shark fisheries include commercial shark bottom longline and drift gillnet fisheries and recreational shark fisheries under the FMP for Atlantic Tunas, Swordfish, and Sharks (HMS FMP). An ESA section 7 consultation was completed on October 29, 2003, on the continued operation of those fisheries and the July 2003, Proposed Rule for Draft Amendment 1 to the HMS FMP (NMFS 2003a). The shark bottom longline and drift gillnet fisheries were both found likely to adversely affect smalltooth sawfish. Seven smalltooth sawfish have been observed caught in the bottom longline fishery to date. All of these caught animals, with the exception of one for which data are missing, were released alive. Only one smalltooth sawfish has been observed incidentally caught in the shark drift gillnet fishery. The incidental capture occurred in Atlantic, where the shark drift gillnet fishery predominantly operates. The consultation concluded the proposed action was not likely to jeopardize the continued existence of the smalltooth sawfish. An ITS was provided authorizing non-lethal takes.

Smalltooth sawfish may infrequently be taken in various other South Atlantic federal fisheries involving trawl, gillnet, bottom longline gear, and hook-and-line gear. However, NMFS has little data to substantiate such takings. NMFS is collecting data to analyze the impacts of these fisheries and will conduct section 7 consultations as appropriate.

ESA Permits
Regulations developed under the ESA allow for the taking of ESA-listed species for scientific research purposes. Prior to issuance of these authorizations for taking, the proposal must be reviewed for compliance with section 7 of the ESA. There is currently one active research permit issued for the smalltooth sawfish. The permit allows researchers to capture, handle, collect tissue samples, and tag up to 60 smalltooth sawfish per year. Although the research may result in disturbance and injury of smalltooth sawfish, the activities are not expected to affect the reproduction of the individuals that are caught, nor result in mortality.

4.2.2 State or Private Actions

A significant proportion of the Florida coast has been degraded by inland hydrological projects, urbanization, agricultural activities, and other anthropogenic activities such as dredging, canal development, sea wall construction, and mangrove clearing. These activities have led to the loss and degradation of smalltooth sawfish habitat and may adversely affect their recovery.

Florida state recreational fisheries are known to occasionally take smalltooth sawfish. Fishers who capture smalltooth sawfish most commonly are fishing for snook (*Centropomus undecimalis*), redfish (*Scianops ocellatus*), and sharks (Simpfendorfer and Wiley 2004). Available data indicate that these takes are non-lethal. NMFS is strongly encouraging the Florida Fish and Wildlife Commission to apply for an ESA section 10 incidental take permit for its fisheries.

4.2.3 Conservation and Recovery Actions

State regulations restricting the use of gear known to incidentally catch smalltooth sawfish may benefit the species by reducing their incidental capture and/or mortality in these gear types. In 1994, entangling nets (including gillnets, trammel nets, and purse seines) were banned in Florida state waters. Although intended to restore the populations of inshore gamefish, this action removed possibly the greatest source of fishing mortality on smalltooth sawfish (Simpfendorfer 2002). Regulations implemented under the Atlantic Large Whale Take Reduction Plan and the Atlantic HMS FMP limit the use of gillnets in federal waters. Florida's ban of the use of shrimp trawls within 1 mile of the Atlantic coast may also aid recovery of this species.

Under section 4(f)(1) of the ESA, NMFS is required to develop and implement a recovery plan for the conservation and survival of endangered and threatened species. NMFS convened a smalltooth sawfish recovery team in September 2003. The team has met several times and is currently drafting the plan. The team anticipates having a draft plan for public comment in mid 2006.

MML has been conducting a research project on the conservation biology of smalltooth sawfish since 1999. Funded in part by NMFS, the project's aim is to provide data on the current status of smalltooth sawfish and to provide scientific information on which to base effective conservation measures. The project has several components including: surveys conducted using a variety of gears, a public sightings database, acoustic tagging and tracking, and genetic analysis. Data collected are providing new information on the species' current distribution and abundance, habitat use patterns, and the impact of population decline. Computer models of smalltooth sawfish populations are also being developed to investigate the rate of change in the population and how the population will recover under different conservation strategies. In addition to these benefits, public outreach efforts to increase awareness of the database are helping to also educate the public regarding smalltooth sawfish status and handling techniques.

5.0 Effects of the Action

In this section of the opinion, we assess the probable direct and indirect effects of the continued operation of the South Atlantic snapper-grouper fishery on listed species. The analysis in this section forms the foundation for our jeopardy analysis in Section 7.0. A jeopardy determination is reached if we would reasonably expect a proposed action to cause reductions in numbers, reproduction, or distribution that would appreciably reduce a listed species' likelihood of surviving and recovering in the wild. The ESA defines an endangered species as "...in danger of extinction throughout all or a significant portion of its range..." and a threatened species as "...likely to become an endangered species within the foreseeable future..." The status of each listed sea turtle species and smalltooth sawfish likely to be adversely affected by the continued operation of the South Atlantic snapper-grouper fishery are reviewed in Section 3. Sea turtle species are listed because of their global status; a jeopardy determination must therefore find the proposed action will appreciably reduce the likelihood of survival and recovery of each species globally. Only the U.S. DPS of smalltooth sawfish is listed; a jeopardy determination must therefore find the proposed action will appreciably reduce the likelihood of survival and recovery of the U.S. DPS.

The quantitative and qualitative analyses in this section are based upon the best available commercial and scientific data on sea turtle biology and the effects of the proposed action. Frequently, the best available information may include a range of values for a particular aspect under consideration, or different analytical approaches may be applied to the same data set. In cases where uncertainty exists regarding a parameter that bears evaluating impacts of an action on listed species, the uncertainty should be resolved in favor of the species. The U.S. Congress provided guidance to this end [House of Representatives Conference Report No. 697, 96th Congress, Second Session, 12 (1979)] and NMFS will generally select the value yielding the most conservative outcome to provide the "benefit of the doubt" to threatened and endangered species (i.e., would lead to conclusions of higher, rather than lower, risk to endangered or threatened species).

When analyzing the effects of any action, it is important to consider both the indirect effects and the direct effects. Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Indirect effects include aspects such as habitat degradation, reduction of prey/foraging base, etc. For the proposed action analyzed in this opinion, there are no expected indirect effects to sea turtles or smalltooth sawfish. The operation of the South Atlantic snapper-grouper fishery (i.e., vessel operations, gear deployment and retrieval) is not expected to impact the water column or benthic habitat in any appreciable way. Unlike mobile trawls and dredges that physically disturb habitat as they are dragged along the bottom, the gears used in the South Atlantic snapper-grouper fishery are suspended in the water column or essentially stationary on the bottom and do not affect water column or benthic habitat characteristics. The fishery's target and bycatch species are not foraged on by sea turtles nor are they a primary prey species for smalltooth sawfish (Hopkins et al. 2003, Simpfendorfer 2001) so prey competition is also not a factor. Therefore, all analyses will be based on direct effects.

Direct effects of the South Atlantic snapper-grouper fishery on threatened and endangered species are from interactions with its fishing gear resulting in the capture, injury, or death of an individual. Our analysis therefore assumes sea turtles and smalltooth sawfish are not likely to be adversely affected by a gear type unless they interact with it. We also assume the potential effects of each gear type are proportional to the number of interactions between the gear and each species.

There are three basic types of gear used in the South Atlantic snapper-grouper fishery: powerheads, pot/traps (targeting black sea bass), and hook-and-line gear. Hook-and-line gear is further divided into vertical line (handline, bandit gear, rod and reel) and bottom longline. Section 2.0 describes these fishing gears and how commercial and recreational fishers use them to target snapper-grouper. The type of fishing gear and the area and manner in which it is used affects the likelihood and severity of sea turtle or smalltooth sawfish interactions. For the purpose of our analyses, the South Atlantic snapper-grouper fishery is sorted into four groups: spearfishing and powerhead gear, commercial black sea bass pots, commercial hook-and-line (i.e., bottom longline and vertical line gear) and recreational vertical line. Each of these groups is evaluated separately in the following subsections.

5.1 Commercial Non Hook-and-Line Gear Interactions with Sea Turtle and Smalltooth Sawfish

5.1.1. Commercial Spearfishing and Powerhead Gear

NMFS believes that spearfishing or powerhead use will not adversely affect sea turtles or smalltooth sawfish. The distribution of spearfishing effort does overlap geographically with that of sea turtles and smalltooth sawfish, but divers spearfishing or using powerheads only occasionally encounter sea turtles and only rarely encounter smalltooth sawfish. There are no reports of sea turtles or smalltooth sawfish being incidentally taken by spearfishing. Anecdotal information from encounters indicates some sea turtles and smalltooth sawfish change their route to avoid coming in close proximity to divers, whereas others appear unaware of the presence of divers. Any behavioral effects on sea turtles or smalltooth sawfish from the presence of divers spearfishing are expected to be insignificant.

5.1.2 Commercial Black Sea Bass Pot Gear

Sea Turtle Interactions
Based on the available information on sea turtle trap line entanglements in the South Atlantic region, we believe sea turtle interactions with black sea bass pot are very unlikely. The low likelihood of sea turtle entanglement causes us to believe the impacts of black sea bass fishing in the South Atlantic are discountable.

There are no specific reports of sea turtles interacting with fish pot/trap gear in the South Atlantic, but STSSN (STSSN is discussed below) has documented sea turtle strandings attributed to entanglement in trap lines in the region. In 2002 and 2003 there were three offshore[16] strandings reported as trap line entanglements in the South Atlantic. One stranding was off North Carolina (a leatherback) and the other two were off Florida (a leatherback and an unidentified turtle). None of these records specifically stated fish trap line was the source of entanglement. The two strandings off Florida specifically noted lobster trap gear as the source of entanglement, while the stranding off North Carolina did not specify any trap type (W. Teas pres. comm. 2006). Given that most black sea bass pot effort is primarily concentrated around the Carolinas, and very little effort, if any, is occurring off the Atlantic coast of Florida (J. McCawley pers. comm. 2006), it is not surprising that the entanglements off Florida were noted with lobster trap gear. Regardless of the type of trap identified with these reports, we should not place too much emphasis on these identifications, because we have no way of knowing if the observer/report filer could accurately tell the difference between the different gear types.

STSSN has also documented sea turtle entanglements in pot gear outside of the South Atlantic region where black sea bass pot gear was specifically noted as the source of entanglement. During 2002 and 2005, five sea turtle entanglements were documented. One entanglement was documented off Maryland and the other four were documented off of New Jersey. All five were leatherbacks, and all were released alive (W. Teas pers. comm. 2006).

Based on the strandings interactions noted above, there is evidence that black sea bass pot gear has entangled sea turtles outside of the action area, but it is unclear if such interactions occur within the action area. To better evaluate if such interactions occur within the action area, we examined other sources of data for evidence of sea turtle entanglements in black sea bass pots. We first looked at data available on observed black sea bass pot trips in the South Atlantic from the NEFSC observer program. Data collected through that program from 1995-2005 showed only two observed trips with 62 hauls, with no documented sea turtle interactions (N. Gilles pers. comm. 2006). We also evaluated data from the Supplementary Discard Data Program (SDDP)(see Section 5.3.1). Those data also showed no documented interactions between black sea bass pot fishers and sea turtles from July 2001 through August 2004. These data sources represent our best available data on black sea bass pot entanglements in the South Atlantic.

Smalltooth Sawfish Interactions
NMFS believes black sea bass pot fishing will not adversely affect smalltooth sawfish. This species may be present where black sea bass pots traps are located, but the majority of the fishing effort occurs well north of the species' core area. There are no historic or recent reports of smalltooth sawfish entangled in finfish pot/trap lines (Simpfendorfer pers. comm. 2004). A recent report of a smalltooth sawfish being entangled in a lobster pot line is the only documented interaction (Poulakis and Seitz 2004) between a smalltooth sawfish and a pot/trap line of any kind. A black sea bass pot/trap line consists of a single rope attached to a float at the surface. The rope is generally thicker than the space between individual teeth on a smalltooth sawfish's rostrum, so the rope is unlikely to become tangled in its teeth, as are other entanglement threats (e.g., gillnet). We also

[16] Offshore means on or seaward, of a South Atlantic beach.

have no information suggesting smalltooth sawfish attempt to feed on animals caught inside traps, which is how other animals such as sea turtles become entangled.

5.2 Commercial Hook-and-Line Gear/Sea Turtle Interactions

5.2.1 Types of Interactions

Hook-and-line gear is known to adversely affect sea turtles via hooking, entanglement, trailing line, and forced submergence. Captured sea turtles can be released alive or can be found dead upon retrieval of the gear as a result of forced submergence. Sea turtles released alive may later succumb to injuries sustained at the time of capture or from exacerbated trauma from fishing hooks or lines that were ingested, entangled, or otherwise still attached when they were released. Of the sea turtles hooked or entangled that do not die from their wounds, some may suffer impaired swimming or foraging abilities, altered migratory behavior, and altered breeding or reproductive patterns. The following discussion summarizes in greater detail the available information on how individual sea turtles are likely to respond to interactions with hook-and-line gear.

Entanglement
Sea turtles are particularly prone to entanglement as a result of their body configuration and behavior. Records of stranded or entangled sea turtles reveal that hook-and-line gear can wrap around the neck, flipper, or body of a sea turtle and severely restrict swimming or feeding. If the sea turtle is entangled when young, the fishing line becomes tighter and more constricting as the sea turtle grows, cutting off blood flow and causing deep gashes, some severe enough to remove an appendage.

Fishing gear can drift according to oceanographic conditions, including wind and waves, surface and subsurface currents, etc.; therefore, depending on sea turtle behavior, environmental conditions, and location of the set, turtles can become entangled in the gear. On longline gear, sea turtles have been found entangled in branchlines (gangions), mainlines, and float lines. Pelagic longline data indicates sea turtles entangled in longline are most often entangled around the neck and foreflippers, and, in the case of leatherback turtles, are often found snarled in mainlines, float lines, and gangions (e.g., Hoey 2000). If sea turtles become entangled in monofilament line the gear can inflict serious wounds, including cuts, constriction, or bleeding anywhere on a turtle's body. In addition, entangling gear can interfere with a turtle's ability to swim or impair its feeding, breeding, or migration and can force the turtle to remain submerged, causing it to drown.

Hooking
In addition to being entangled in hook-and-line gear, sea turtles are also injured and killed by being hooked. Hooking can occur as a result of a variety of scenarios, some of which will depend on foraging strategies and diving and swimming behavior of the various species of sea turtles. Sea turtles are either hooked externally (generally in the flippers, head, shoulders, armpits, or beak) or internally (inside the mouth or when the animal has swallowed the bait and the hook is ingested into the gastro-intestinal tract, often a major site of hooking) (E. Jacobson in Balazs et al. 1995). Pelagic longline

hooking data indicates entanglement and foul hooking are the primary forms of interaction between leatherback turtles and longline gear, whereas internal hooking is much more prevalent in hard-shelled turtles, especially loggerheads. Internal hooking of leatherback turtles is much more rare. Data on hooking location from the Atlantic longline observer program in 1999 and 2000 (NMFS SEFSC 2001) and from the Northeast Distant experiment (Watson et al. 2003) agreed closely. For leatherback turtles, the large majority of interactions (at least 75%) are external foul-hookings, usually in the front flipper, shoulder, or armpit. The remaining interactions are primarily entanglements without hooking, and only a few leatherbacks are hooked in the mouth. For loggerheads, almost all interactions result from taking the bait and hook; only a very small percentage of loggerheads are entangled or foul-hooked externally. Loggerheads caught on J-hooks most often swallow the hooks (67% of interactions in Watson et al. 2003). The J-hook was the standard hook style in the HMS pelagic longline fishery until July 2004. The use of circle hooks, however, has been shown to significantly reduce the rate of hook ingestion by loggerheads, reducing the post-hooking mortality associated with the interactions. This is because circle hooks, the predominant gear used in the South Atlantic snapper-grouper fishery, are designed so that they typically result in hooking of the lower jaw and are not swallowed (Watson et al. 2003).

Turtles that have swallowed hooks are of the greatest concern. The esophagus is lined with strong conical papillae directed caudally towards the stomach (White 1994). The presence of these papillae in combination with an S-shaped bend in the esophagus make it difficult to see hooks when looking through a turtle's mouth, especially if the hooks have been deeply ingested. Because of a turtle's digestive structure, deeply ingested hooks are also very difficult to remove without seriously injuring the turtle. A turtle's esophagus is attached firmly to underlying tissue; thus, if a turtle swallows a hook and tries to free itself or is hauled on board a vessel, the hook can pierce the turtle's esophagus or stomach and can pull organs from their connective tissue. These injuries can cause the turtle to bleed internally or can result in infections, both of which can kill the turtle.

If a hook does not lodge into, or pierce, a turtle's digestive organs, it can pass through to the turtle's colon or it can pass through the turtle entirely (E. Jacobson in Balazs et al. 1995; Aguilar et al. 1995) with little damage (Work 2000). Of 38 loggerheads deeply hooked by the Spanish Mediterranean longline fleet and subsequently held in captivity, six loggerheads expelled hooks after 53 to 285 days (average 118 days) (Aguilar et al. 1995). If a hook passes through a turtle's digestive tract without getting lodged, the hook probably has not harmed the turtle. Tissue necrosis that may have developed around the hook may also get passed along through the turtle as a foreign body (E. Jacobson in Balazs et al. 1995).

Trailing Line

Trailing line (i.e., line left on a turtle after it has been captured and released), particularly line trailing from an ingested hook, poses a serious risk to sea turtles. Line trailing from an ingested hook is likely to be swallowed, which may occlude the gastrointestinal tract. It may also prevent or hamper foraging eventually leading to death. Sea turtles that swallow monofilament still attached to an embedded hook may suffer from the "accordion effect" which is often fatal. In this condition the intestine, perhaps by its peristaltic action in attempting to pass the unmoving monofilament line through the alimentary canal, coils and wraps upon itself (Pont pers. comm. 2001). Trailing line may also become snagged on a floating or fixed object, further entangling a turtle and potentially slicing its appendages and affecting its ability to swim, feed, avoid predators, or reproduce. Sea turtles have been found trailing gear that has been snagged on the bottom, or has the potential to snag, thus anchoring them in place (Balazs 1985, Hickerson pers. comm. 2001). Long lengths of trailing gear are likely to entangle the turtle eventually, leading to impaired movement, constriction wounds, and potentially death.

Forcible Submergence

Sea turtles can be forcibly submerged by longline gear or snagged trailing line. Forcible submergence may occur through a hooking or entanglement event, where the turtle is unable to reach the surface to breathe. This can occur at any time during a longline set, including the setting and hauling of the gear. Forced submergence can occur when the sea turtle encounters a line deep below the surface and the line is too short and/or too heavy to be brought up to the surface by the swimming sea turtle, as would generally be the case with bottom longline gear.

Sea turtles forcibly submerged for extended periods show marked, even severe, metabolic acidosis as a result of high blood lactate levels. With such increased lactate levels, lactate recovery times may be as long as 20 hours. Kemp's ridley turtles stressed from capture in an experimental trawl (7.3 minute forcible submergence) experienced significant blood acidosis, which originated primarily from non-respiratory (metabolic) sources. Visual observations indicated that the average breathing frequency increased from approximately 1-2 breaths/minute pre-trawl to 11 breaths/minute post-trawl. Given the magnitude of the observed acid-base imbalance created by these trawl experiments, complete recovery of homeostasis may have required 7 to 9 hours (Stabenau et al. 1991). Similar results were reported for Kemp's ridleys captured in entanglement nets, where turtles showed significant physiological disturbance, and post-capture recovery depended greatly on holding protocol (Hoopes et al. 2000).

Observed long recovery times suggest that turtles would be more susceptible to lethal metabolic acidosis if they experience multiple captures in a short period of time (Lutcavage et al. 1997). Presumably, a sea turtle recovering from a forced submergence would most likely remain resting on the surface (given it had the energy stores to do so), which would reduce the likelihood of being recaptured by a submerged bottom longline or vertical line. Recapture would also depend on the condition of the turtle and the intensity of fishing pressure in the area. NMFS has no information on the likelihood of recapture of sea turtles by hook-and-line. However, turtles in the Atlantic Ocean have been captured more than once by pelagic longliners (on subsequent days), as observers reported clean hooks already in the jaws of captured turtles. Such multiple captures were thought to be most likely on three or four trips that had the highest number of interactions (Hoey 1998).

Stabenau and Vietti (2003) studied the physiological effects of multiple forced submergences in loggerhead turtles. The initial submergence produced severe and pronounced metabolic and respiratory acidosis in all turtles. Successive submergences produced significant changes in blood pH, PCO_2, and lactate, but as the number of submergences increased, the acid-base imbalances were substantially reduced relative to the imbalance caused by the first submergence. Increasing the time interval between successive submergences resulted in greater recovery of blood homeostasis. The authors conclude that as long as sea turtles have an adequate rest interval at the surface between submergences, their survival potential should not change with repetitive submergences.

Respiratory and metabolic stress from forcible submergence is also correlated with additional factors such as size and activity of the sea turtle (including dive limits), water temperature, and biological and behavioral differences between species. These factors affect the survivability of an individual turtle. For example, larger sea turtles are capable of longer voluntary dives than small turtles, so juveniles may be more vulnerable to the stress of forced submergence than adults. Gregory et al. (1996) found that corticosterone concentrations of captured small loggerheads were higher than those of large loggerheads captured during the same season. During the warmer months, routine metabolic rates are higher, so the impacts of the stress from entanglement or hooking may be magnified (e.g., Gregory et al. 1996). In addition, disease factors and hormonal status may play a role in anoxic survival during forced submergence. Any disease that causes a reduction in the blood oxygen transport capacity could severely reduce a sea turtle's endurance on a longline. Because thyroid hormones appear to have a role in setting metabolic rate, they may also play a role in increasing or reducing the survival rate of an entangled sea turtle (Lutcavage et al. 1997). Turtles necropsied following capture (and subsequent death) by pelagic longliners were found to have pathologic lesions. Two of the seven turtles (both leatherbacks) had lesions severe enough to cause probable organ dysfunction, although whether or not the lesions predisposed these turtles to being hooked could not be determined (Work 2000).

Sea turtles also exhibit dynamic endocrine responses to stress. In male vertebrates, androgen and glucocorticoid hormones (corticosterone (CORT) in reptiles) can mediate physiological and behavioral responses to various stimuli, influencing both the success and costs of reproduction. Typically, the glucocorticoid hormones increase in response to a stressor in the environment, including interaction with fishing gear. For example, Jessop et al. (2002) states, "during reproduction, elevated circulating CORT levels in response to a stressor can inhibit synthesis of testosterone or other hormones mediating reproduction, thus leading to a disruption in the physiology or behavior underlying male reproductive success." A study in Australia examined whether adult male green turtles decreased CORT or androgen responsiveness to a capture/restraint stressor to maintain reproduction. Researchers found that migrant breeders, which typically had overall poor body condition because they were relying on stored energy to maintain reproduction, had decreased adrenocortical activity in response to a capture/restraint stressor. Smaller males in poor condition exhibited a pronounced and classic endocrine stress response compared to the larger males with good body condition. The authors state: "We speculate that the stress-induced decrease in plasma androgen may function to reduce the temporary expression of reproductive behaviors until the stressor has abated. Decreased androgen levels, particularly during stress, are known to reduce the expression of reproductive behavior in other vertebrates, including reptiles." Small males with poor body condition that are exposed to stressors during reproduction and experience shifting hormonal levels may abandon their breeding behavior (Jessop et al. 2002). Female green turtles have also been studied to evaluate their stress response to capture/restraint. Studies showed that female green turtles during the breeding season exhibited a limited adrenocortical stress response when exposed to ecological stressors and when captured and restrained. Researchers speculate that the apparent adrenocortical modulation could function as a hormonal tactic to maximize maternal investment in reproductive behavior such as breeding and nesting (Jessop et al. 2002).

In the worst scenario, sea turtles will drown from being forcibly submerged. Such drowning may be either "wet" or "dry." With wet drowning, water enters the lungs, causing damage to the organs and/or causing asphyxiation, leading to death. In the case of dry drowning, a reflex spasm seals the lungs from both air and water. Before death due to drowning occurs, sea turtles may become comatose or unconscious. Studies have shown that sea turtles that are allowed time to stabilize after being forcibly submerged have a higher survival rate. This depends on the physiological condition of the turtle (e.g., overall health, age, size), time of last breath, time of submergence, environmental conditions (e.g., sea surface temperature, wave action, etc.), and the nature of any sustained injuries at the time of submergence (NRC 1990).

5.3 Estimating Commercial Hook and Line Sea Turtle Take Rates

5.3.1 Sources of Data for Estimating Sea Turtle Take Rates

Logbook Data (CFLP and SDDP Data)
As discussed in Section 2.1.2, all commercial South Atlantic snapper-grouper fishers are required to report their catch and effort data via the CFLP and approximately 20% of South Atlantic commercial snapper-grouper fishers are also required to submit discard data via the SDDP. Selections for the SDDP are made in July of each year, and the selected fishers (vessels) are required to complete and to submit discard forms, along with their CFLP logbook forms, for each trip they make during August through July of the following year. Over the past three reporting periods (i.e., August 2001 through July 2004) participants in the SDDP, representing between approximately 5% and 14% of all South Atlantic snapper-grouper CFLP fishing effort, reported catching eight sea turtles: three loggerheads and three unidentified sea turtles on vertical lines; and one leatherback and one loggerhead on bottom longlines. Reported sea turtle catch data for both bottom longlines and vertical lines are provided in Table 5.1.

5.3.2 Reported Sea Turtle Take

The SDDP reports (summarized in Table 5.1) demonstrate that both South Atlantic snapper-grouper commercial bottom longline gear and vertical line gear have caught sea turtles over the past three SDDP reporting years. NMFS believes that sea turtles have always been occasionally caught but too few trips were previously observed to detect such infrequent events. However, both the total number of sea turtles previously caught and the species composition of that catch are unknown.

As provided by the SDDP data collected over the past three years, we know for certain that at least eight sea turtles were taken during that time frame and where that take occurred (Table 5.1 and Figure 5.1). However, based on our knowledge of under-reporting in other self-reported logbook programs, fishers selected for the SDDP may have caught additional sea turtles but not reported them. Also, since only 20% of commercial fishers are selected for the SDDP, it is reasonable to assume the other 80% of fishers also caught sea turtles. Mote Marine Lab is currently conducting a cooperative longline observer program off western Florida and has documented two lethal takes in bottom longline gear from fishers not selected to report in the SDDP. While not specific to the action area, those data support our assumption that fishers not currently participating in the SDDP may be taking sea turtles. Thus, we believe the total number of sea turtle taken by South Atlantic snapper-grouper bottom longline and vertical line gear over the past three years is certainly more than eight and may be much greater.

NMFS did not validate any of the reported species' identifications recorded in the SDDP and cannot attest to the knowledge of fishermen regarding the identity of various sea turtle species. Thus, some of the sea turtles reported by species may be falsely identified. Leatherbacks are easy to identify and distinguish from hardshell species, but hardshell species can be difficult to tell apart from each other. As noted earlier, three of the eight documented sea turtle takes were marked as unidentified or unknown. Of the identified species, we are only confident in the accuracy of the one leatherback reported and that all other identified captures were not leatherbacks. We also assume all unidentified/unknown sea turtles reported were hardshell sea turtles, believing any leatherbacks would have been identified because of their uniqueness from other species.

Table 5.1 Sea Turtle Takes as Reported in the SDDP (McCarthy 2005)

Reporting Period	Month	Logbook Statistical Grid	Species Caught	Number Caught	Discard Condition
Vertical Hook and Line Sea Turtle Catch Data					
1	April	2482	Unidentified	1	Alive
1	November	3377	Loggerhead	1	Alive
2	February	2780	Loggerhead	1	Alive
2	November	3474	Loggerhead	1	Alive
2	November	3476	Unknown	1	Alive
2	December	3476	Unknown	1	Alive
Bottom Longline Sea Turtle Catch Data					
1	August	3674	Leatherback	1	Alive
3	January	3575	Loggerhead	1	Unknown

5.4 Three Year Commercial Sea Turtle Take Estimates

Due to limited data availability, we use extrapolation to estimate the total number of South Atlantic snapper-grouper commercial bottom longline and vertical line sea turtle takes over the past three SDDP reporting years (Table 5.1). In our analysis, we try to infer the number of sea turtles taken on each commercial gear type, based on available logbook data from the past three years. Those data include the number of sea turtle takes reported by fishermen participating in the SDDP, the amount of effort reported by SDDP participants, and the amount of effort reported by all South Atlantic snapper-grouper participants combined (Table 5.2).

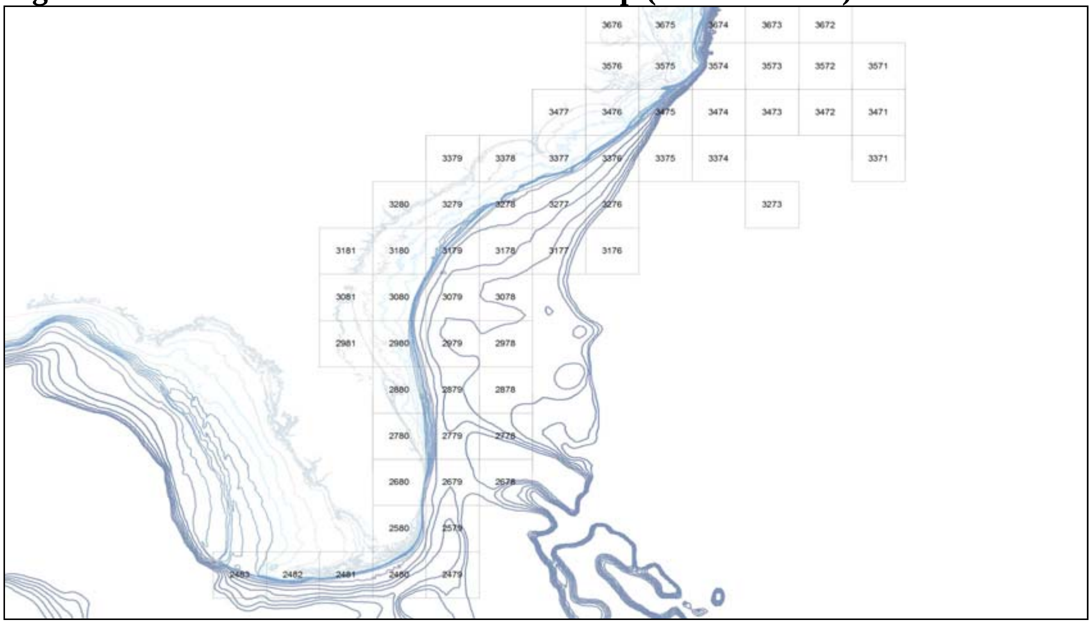
Effort data can be measured using a variety of variables reported in logbooks including hooks, days, hours, hook-hours, and lines fished. Vertical line data are available for each of these variables. For bottom longlines, data are available for hooks, days, and sets, but not for hook-hours. This is because the number of hours fished has been reported as two different values in the CFLP. The number of hours fished was initially required to be reported as hours per longline set but later changed to total hours fished. Unfortunately, not all fishers switched to reporting total hours fished; some continued to report hours per set. Therefore, in many cases it is impossible to determine which value (hours per set or total hours) is reported. To minimize errors resulting from our small bycatch sample size, and annual variability, data from the three reporting periods were combined prior to extrapolation.

Given the data available and our assumptions regarding species identification, we prepared three sea turtle take extrapolations: one for the number of hardshell sea turtles caught on vertical lines, one for the number of leatherbacks caught on longlines, and one for the number of hardshell sea turtles caught on bottom longline. Table 5.3 summarizes those extrapolation estimates, and a formulaic representation of these estimates is below.

Take estimate formulas are as follows:

- Total number of hardshell sea turtles reported caught on vertical lines ÷ SDDP participant reported effort × total CFLP reported effort
- Total number of leatherback sea turtles reported caught on bottom longlines ÷ SDDP participant reported effort × total CFLP reported effort
- Total number of hardshell sea turtles reported caught on bottom longlines ÷ SDDP participant reported effort × total CFLP reported effort

Figure 5.1 South Atlantic Statistical Grid Map (SAFMC 2006)



Which estimate most accurately reflects take for each gear type depends on which factors are driving the sea turtle interaction. For example, if the total number of hooks in the water at any time has the greater impact on the number of turtles taken, than does days at sea or hooks hours; then total number of hooks would most accurately reflect take estimates. In the absence of such information, we take the precautionary approach and assume the highest calculated take level. We estimated that over the past three SDDP reporting years (i.e., August 2001 through July 2004) there were 23 bottom longline hardshell sea turtles takes, 23 bottom longline leatherback sea turtle takes, 54 vertical line hardshell sea turtle takes, and no vertical line leatherback sea turtle takes.

Our extrapolation assumes that the probability of catching any hardshell sea turtle species is equal through time and space. We also assume that the probability of catching a leatherback sea turtle is equal through time and space. Factors potentially affecting sea turtle capture but for which sufficient data are not available to analyze include fishing depth, area, time of day, time of year, etc. The relationship between the number of turtles taken and effort is assumed to be linear (i.e., the more hooks fished, the more sea turtles caught).

Table 5.2 Recent South Atlantic Snapper-Grouper Commercial Fishing Effort (McCarthy 2005)

Reporting Period	Days Fished	Hooks Fished	Hook Hours Fished
SDDP Participant Reported Bottom Longline Effort			
8/1/2001-7/31/2002	132	316,927	N/A
8/1/2002-7/31/2003	19	12,275	N/A
8/1/2003-7/31/2004	44	34,350	N/A
8/1/2001-7/31/2004	195	363,552	N/A
All Reported Snapper-Grouper Bottom Longline Effort			
8/1/2001-7/31/2002	1,723	2,764,888	N/A
8/1/2002-7/31/2003	1,411	2,262,189	N/A
8/1/2003-7/31/2004	1,212	2,325,023	N/A
8/1/2001-7/31/2004	4,355	7,352,100	N/A
SDDP Participant Reported Vertical Line Effort			
8/1/2001-7/31/2002	2,169	34,439	341,295
8/1/2002-7/31/2003	3,302	16,111	126,410
8/1/2003-7/31/2004	2,214	8,848	69,235
8/1/2001-7/31/2004	7,685	59,398	536,940
All Reported Snapper-Grouper Vertical Line Effort			
8/1/2001-7/31/2002	24,109	149,712	1,398,997
8/1/2002-7/31/2003	23,251	157,924	1,206,795
8/1/2003-7/31/2004	20,614	124,188	1,163,349
8/1/2001-7/31/2004	67,974	431,824	3,769,141

Table 5.3. Three Year Sea Turtle Take Estimates by Gear Type and Effort Variable

Commercial Gear Type	Sea Turtle Type	Fishing Effort Variable		
		Hooks	Days	HookHrs
Vertical Line	Hardshell	44	54	43
	Leatherback	0	0	0
Bottom Longline	Hardshell	21	23	N/A
	Leatherback	21	23	N/A

5.4.1 Hardshell Sea Turtle Takes by Species

To conduct our jeopardy analysis and effectively assess the impacts of our take estimate, we must go beyond simply "hardshell species" and allocate take for individual species. The data provided by the SDDP on sea turtle take by species is limited and unverifiable. For the reasons described in Section 5.3.2 we were able to use the SDDP data to break down our take estimates by species only for leatherbacks. We must rely on what we know about sea turtle relative abundance in the action area, and behavioral characteristics to apportion our take estimates for each hardshell species.

Epperly et al. (2002) conducted a sea turtle relative abundance study for the Gulf of Mexico. This paper also evaluated the sea turtle relative abundance in the South Atlantic region, but could not stratify sea turtle composition beyond leatherback, loggerheads, and hardshell sea turtles due to data limitations. Since we are unable to apply the Epperly et al. (2002) analysis to the South Atlantic, we established our own sea turtle species composition estimate. The following paragraphs outline the data sources and process that was used to establish our species composition estimates.[17] Table 5.4 (pg. 75) summarizes those data and provides the sea turtle species composition estimates for each dataset.

HMS Atlantic Pelagic Longline Fishery
The Atlantic pelagic longline fishery operates off shore and targets swordfish and various tuna species (NMFS 2004c). Aggregated observer data from 1992 through 2002 (NMFS SEFSC 2001 (1992-1999 data); Yeung 2001 (2000 data); Garrison 2003 [2001-2002 data]) noted takes of 10,034 loggerheads; 9,302 leatherbacks; 221 greens; 53 hawksbills; and 49 Kemp's ridleys. Takes of loggerheads and leatherbacks were noted every year over that time span, while the remaining species were noted in some years while completely absent in others. The scattered records of greens, hawksbills, and Kemp's, combined with the ubiquity of loggerheads and leatherbacks, suggests that a majority of the green, hawksbill, and Kemp's records may have actually been misidentified loggerheads (NMFS SEFSC 2001).

HMS Atlantic Shark Fishery
The HMS Atlantic shark fishery operates closer to shore than the HMS pelagic longline fishery and consists of a bottom longline and drift gillnet sector. Both sectors operate somewhere between 33 ft to 180 ft of water, on average. Observed sea turtle bycatch was entirely leatherback and loggerheads. The bottom longline sector of the fishery took four leatherbacks and 31 loggerheads from 1994 through 2002, while the gillnet sector took 14 leatherbacks and six loggerheads from 1999 to 2002 (NMFS 2003a).

OBIS-SEAMAP NMFS SEFSC Survey Data
We also utilized SEFSC fisheries independent survey data available through the OBIS-SEAMAP database (Read et al. 2003). NMFS SEFSC collected data from 1992 through 1999 during both aerial and shipboard marine mammal surveys, occurring throughout the South Atlantic EEZ and over a range of water depths (NMFS SEFSC 1992, 1995; Hoggard et al. 1995a-c; Roden 1998, 1999). Those data yielded 671 records of identified sea turtles: 605 loggerheads, 52 leatherbacks, and 14 greens.

Sea Turtle Stranding and Salvage Network (STSSN) Database
STSSN database showed higher occurrences of greens, hawksbills, and Kemp's ridleys. From 1998 through 2005; 7,657 loggerheads; 2,244 greens; 338 leatherbacks; 135 hawksbills; and 1,075 Kemp's ridleys were observed (STSSN Database March 31, 2006).

[17] See Appendix B for further discussion on these sources of data.

Table 5.4 Sea Turtle Observations and Species Compositions

HMS Atlantic Shark Fishery (1994-2002)[1]		
Species	Number of Observed Take	% of Total
Loggerhead	37	67.2%
Leatherback	18	32.8%
Total	55	100%
HMS Atlantic Pelagic Longline Fishery (1992-2002)[2]		
Species	Number of Observed Take	% of Total
Loggerhead	10,034	51.7%
Leatherback	9,032	46.5%
Green	221	1.1%
Hawksbill	53	0.3%
Kemp's ridley	49	0.3%
Total	19,389	100%
OBIS-SEAMAP (1992-1999)[3]		
Species	Number of Observations	% of Total
Loggerhead	605	90.1%
Leatherback	52	7.7%
Green	14	2.2%
Total	671	100%
Sea Turtle Standing and Salvage Network (1998-2005)[4]		
Species	Number of Strandings	% of Total
Loggerhead	7,657	66.8%
Leatherback	338	2.9%
Green	2,244	19.6%
Hawksbill	135	1.2%
Kemp's ridley	1,075	9.3%
Total	11,449	100%

[1] NMFS 2003a
[2] NMFS SEFSC 2001 (1992-1999 data); Yeung 2001 (2000 data); Garrison 2003 (2001-2002 data)
[3] NMFS SEFSC 1992, 1995; Hoggard et al. 1995a-c; Roden 1998, 1999
[4] STSSN Database (March 31, 2006)

The above datasets cover a variety of depth ranges and fishing gears. They also represent a wide range of encounter events, with different species compositions. As Table 5.4 illustrates, species composition varies from one dataset to the next. The next step of our analysis was to evaluate each of those datasets and establish how best to apply the data from each source. The following paragraphs look at the operation of the three main sectors of the South Atlantic snapper-grouper fishery (commercial bottom longline, commercial vertical line, and recreational vertical line), and what we know about the fishery and sea turtle life histories to evaluate which datasets, and ultimately which species composition, are most appropriate to use.

Commercial Bottom Longline Gear

The South Atlantic snapper-grouper bottom longline fishery must operate at or beyond 50 fathoms, and primarily uses cut bait. Given the depth at which they operate, the gears used, and techniques employed, NMFS believes that the species composition of observed sea turtle takes in the HMS fisheries are the most representative of what we expect in the bottom longline sector of the South Atlantic snapper-grouper fishery. We expect loggerhead and leatherbacks will be encountered most frequently because they are the most pelagic of the five species considered in this analysis. What we know about green, hawksbill, and Kemp's ridley diets, foraging habits, and depth preferences (Section 3.0) suggests they are unlikely to interact with the bottom longline sector of the fishery. Additionally, we expect loggerheads to comprise most of the hardshell take because they are the most abundant sea turtle species found within the action area. The observed take data from the HMS fisheries seems to support our assumptions. Therefore, of the 23-hardshell sea turtle takes estimated over three years (Section 5.4), NMFS believes 22 will be loggerheads. NMFS also believes there will be no more than one take of a green, hawksbill, or Kemp's ridley taken by the bottom longline sector of the fishery. NMFS believes this take is unlikely, but documented takes of these species have been noted.

Commercial Vertical Line Gear
The vertical line sector of the fishery operates over a wider depth range (78-660 ft)(SAFMC 2006) than the bottom longline sector; consequently, the likelihood of encountering any listed sea turtle is increased. Like the commercial bottom longline fishery noted above, what we know about the diet, foraging habits, and depth preferences for green, hawksbill, and Kemp's ridleys (Section 3.0) suggests the likelihood of the vertical line sector incidentally taking these species will still be low. However, we believe the wider depth range over which this sector of the fishery operates increases the possibility of vertical line fishers interacting with green, hawksbill, and Kemp's ridley turtles. Due to this increased likelihood of interactions with these three species, we chose not to use the same species composition estimates that we used for the bottom longline sector. We also chose not to apply the species composition estimates suggested by STSSN data because we believe this sector of the fishery operates too far from shore for that dataset to be the most accurate. Instead, we looked at all the non-strandings data and selected the highest species composition percentage available to give us the most conservative estimate of take of greens, hawksbills, and Kemp's ridleys. The OBIS-SEAMAP data gave us the highest species composition percentage (2.2%) for greens, while the highest species composition percentage for the hawksbills and Kemp's ridleys (0.3% each) were from the HMS pelagic longline data set. Applying those percentages to our estimated 54 hardshells gives use an estimate of one green turtle and one hawksbill or Kemp's ridley over three years with loggerheads comprising the remaining 52 takes.

There were no documented takes of leatherbacks in the SDDP data for the vertical line sector. This may be a result of it occurring infrequently enough that these interactions are not captured by the existing reporting schemes, or there may have been no take. Since we know that interactions between this gear type and leatherbacks have occurred in the other fisheries' past, we believe it is likely to occur again in the future. For this reason, NMFS will act with precaution and anticipate the take of one leatherback every three years by the commercial vertical line sector.

Table 5.5 Three Year Sea Turtle Estimates by Species and Gear Type

Commercial Gear Type	Species				
	Loggerhead	Green	Hawksbill	Kemp's Ridley	Leatherback
Bottom Longline	22	1*	1*	1*	23
Vertical Line	52	1	1*	1*	1

* The take for these species is one of any of these species over three years, not one of each.

5.4.2 Sea Turtle Mortality Estimates

To estimate the total impact of the South Atlantic snapper-grouper fishery, it is necessary to estimate the mortality associated with the anticipated takes to better understand its impact on species. As discussed in 5.2.1, sea turtle mortality can occur prior to release (i.e., immediate mortality) or later in time (i.e., post-release mortality). Both types of mortality are reviewed and estimated in the following subsections.

5.4.2.1 Mortality at Time of Capture (Immediate Mortality)

Bottom Longline
Two sea turtles were reported in the SDDP as caught on bottom longlines; one was released alive while the condition at time of release for the other was unknown. Based on this information we are unable to determine the number of sea turtles, if any, that died as a result of interaction with South Atlantic snapper-grouper bottom longline fishery. Given what we know about the immediate mortality of sea turtles in similar hook-and-line fisheries, we believe the bottom longline gear employed in South Atlantic is just as likely to cause sea turtle mortalities and sea turtle deaths may not be accurately reflected in the SDDP data. For example, the immediate mortality of sea turtles taken in the Atlantic shark bottom longline and Gulf of Mexico reef fish fishery is estimated to be 23% and 27%, respectively (NMFS 2003a, NMFS 2005b). We believe the similarities in gear between the South Atlantic snapper-grouper bottom longline fishery, the Atlantic shark bottom longline fishery, and Gulf of Mexico reef fish bottom longline fishery make them appropriate surrogates for estimating immediate mortality rates in the South Atlantic. Because the mortality rates of these two fisheries are so close, and we have no way of determining which mortality estimate is more appropriate to apply to the South Atlantic snapper-grouper bottom longline sector, we chose to use the more conservative rate of 27%.

Applying this rate to our estimated sea turtles takes for bottom longline over a three-year period and rounding the products up to the nearest whole number yields seven (6.21) loggerheads and seven (6.21) leatherbacks. Since we assume that only one green, hawksbill, or Kemp's ridley will be taken during this period, applying this rate to these estimates suggests that take will be lethal. NMFS will assume that take is indeed lethal to allow for a more conservative estimate of impacts.

Vertical Line
All of the six sea turtles caught on vertical lines were reported as released alive. Since fishermen typically retrieve vertical lines within fifteen minutes of their deployment and because sea turtles can easily breath-hold for periods in excess of an hour, we believe it is highly unlikely that a sea turtle caught on a vertical line would be dead upon retrieval of the line. NMFS believes the reports that all turtles caught by vertical lines over the past three reporting periods were released alive is probably correct and assumes there is no immediate mortality related to vertical line fishing.

5.4.2.2. Post-release Mortality

Most, if not all sea turtles released alive from bottom longline gear will have experienced a physiological injury from forced submergence and/or traumatic injury from hooking and entanglement and many may still carry penetrating or entangling gear. Although sea turtles caught on vertical line gear are less likely to have physiological injury from forced submergence because of the short soak times, the other effects are still applicable. Thus, some level of post-release mortality might occur for sea turtles released alive on either gear type.

Bottom Longline
In January 2004, NMFS developed new draft criteria for estimating post-release mortality of sea turtles, based on the best available information on the subject, to set standard guidelines for assessing post-release mortality from pelagic longline interactions. The new draft criteria are presented in Table 5.7. The criteria are still subject to additional review, but constitute the best available science on this topic at this time. Under the new criteria, overall mortality ratios are dependent upon the type of interaction (i.e., hooking; entanglement, etc.) and the amount of gear left following the release (i.e., hook remaining, amount of line remaining, entangled or not). Therefore, the experience, ability, and willingness of the crew to remove the gear, and the availability of gear-removal equipment are very important factors in the post-release mortality ratios. The new criteria also take into account differences in post-release mortality between hardshell sea turtles and leatherback sea turtles, with slightly higher rates of post-release mortality assigned to leatherbacks.

The June 1, 2004, HMS pelagic longline opinion uses the January 2004 post-release mortality criteria and ratios, along with sea turtle bycatch and release data from the pelagic longline observer program to generate post-release mortality estimates for hardshell and leatherback sea turtles. Data describing the interaction type and release condition of South Atlantic snapper-grouper fishery sea turtle takes to date are not available for determining what interaction type and release condition category of the January 2004 post-release mortality ratios is applicable. Following the guidance provided in Epperly and Boggs (2004), takes were included in the most conservative likely category based on what we know about the fishery’s general operation. Given that commercial South Atlantic snapper-grouper bottom longline fishers use circle hooks (T.

Iarroci and J. McGovern pers. comm. 2006), and circle hooks are known to typically result in hooking of the lower jaw, we infer that most hardshell sea turtles caught will likely be hooked in the lower jaw. Anecdotal information indicates fishers typically just cut the line when sea turtles are caught. We therefore assume sea turtles are released still hooked and with trailing line. Based on these conditions and the January 2004 post-release criteria, post-release mortality is estimated to be 30% for hardshell sea turtles released alive and 40% for leatherbacks.

Applying the above rates to our estimated hardshell and leatherback sea turtles caught on bottom longline and released alive over the past three reporting periods (i.e., 15 loggerheads and 15 leatherbacks) and rounding to the nearest whole number, we estimate five (4.5) loggerheads and six (6.0) leatherbacks died as a result of post-release mortality. Our analysis also assumes that any take of green, hawksbill, or Kemp's ridleys will be lethal. Our sea turtle post-release mortality estimates, as well as our immediate mortality estimates are provided and summed for each species in Table 5.6.

Table 5.6 Three Year Sea Turtle Take Mortality Estimates for Bottom Longline

Species	Immediate Mortality	Post-release Mortality	Total
Green	1*	N/A	1
Hawksbill	1*	N/A	1
Kemp's ridley	1*	N/A	1
Leatherback	7	6	13
Loggerhead	7	5	12

* The take for these species is one of any of these species over three years, not one of each.

Similar post-release mortality criteria are not available for assessing post-release mortality from vertical line interactions. Sea turtles caught on vertical line gear and released alive would presumably be in better overall health than if released alive from bottom longline gear because of the shorter soak times and ability to reach the surface of the water to breathe. However, we see no reason why the same factors affecting post-release mortality of sea turtles hooked on bottom longlines (interaction type and amount of gear remaining) would not apply. In the absence of other quantitative data, we conservatively apply the same post-release mortality criteria (i.e., 30% for hardshells and 40% for leatherbacks) to our commercial vertical line take estimates (i.e., one green, one hawksbill or Kemp's ridley, and 52 loggerheads). The rounded results are presented in Table 5.8.

Table 5.7 Criteria for assessing marine turtle post-interaction mortality after release from pelagic longline gear. Percentage rates of mortality are shown for hardshell turtles, followed by percentages for leatherbacks (in parentheses).

Nature of Interaction	**Released with hook and with line greater than or equal to half the length of the carapace**	**Release with hook and with line less than half the length of the carapace**	**Released with all gear removed**
	Hardshell (Leatherback)	Hardshell (Leatherback)	Hardshell (Leatherback)
Hooked externally with or without entanglement	20 (30)	10 (15)	5 (10)
Hooked in cervical esophagus, glottis, jaw joint, soft palate, or adnexa (and the insertion point of the hook is visible when viewed through the mouth) with or without entanglement	30 (40)	20 (30)	10 (15)
Hooked in lower jaw (not adnexa[18]) with or without entanglement	45 (55)	35 (45)	25 (35)
Hooked in esophagus at or below level of the heart (includes all hooks where the insertion point of the hook is not visible when viewed through the mouth) with or without entanglement	60 (70)	50 (60)	n/a[19]
Entangled Only	Released Entangled 50 (60)		Fully Disentangled 1 (2)
Comatose/resuscitated	n/a[3]	70(80)	60(70)

[18] Subordinate part such as tongue, extraembryonic membranes
[19] Per veterinary recommendation hooks would not be removed if the insertion point of the hook is not visible when viewed through the open mouth.

Table 5.8 Three Year Hardshell Sea Turtle Take Mortality Estimates for Vertical Line

Hardshell Species	Immediate Mortality	Post-release Mortality	Total
Green	0	1	1
Hawksbills	0	1*	1
Kemp's ridley	0	1*	1
Loggerhead	0	16	16

* The take for these species is one of any of these species over three years, not one of each

5.5 Commercial Hook-and-Line Gear/Smalltooth Sawfish Interactions

5.5.1 Types of Interactions

It is worth reiterating here that sawfish encounters in the South Atlantic are far fewer than those in the Gulf of Mexico, and encounters north of Florida are extremely rare (i.e., two since 1963). However, incidental captures of smalltooth sawfish by commercial hook-and-line fisheries have been documented in the South Atlantic and the impacts of those encounters are discussed below.

Bottom longlines and vertical line gear can adversely affect smalltooth sawfish via hooking and entanglement. Based on hooking observation data from MML bottom longline research surveys and reported recreational rod and reel fishing encounters, the vast majority of smalltooth sawfish are hooked in the mouth (Simpfendorfer pers. comm. 2003; Burgess pers. comm. 2003; Seitz and Poulakis pers. comm. 2003). Once hooked, the gangion or leader most commonly becomes wrapped around the animal's saw (Burgess pers. comm. 2003; Seitz and Poulakis pers. comm. 2003). This may be from slashing during the fight, spinning on the line as it is retrieved, or any other action bringing the rostrum in contact with the line. Foul hooking (i.e., hooking in fin, near eye, etc.) reports are not nearly as frequent, but do occasionally occur. There are no reports, however, of smalltooth sawfish being deeply hooked.

Smalltooth sawfish captured on vertical line and bottom longline gear have all been observed or reported as alive upon capture and as released in good condition. Between 1994 and 2005, twelve smalltooth sawfish have been observed caught in the Atlantic and Gulf of Mexico HMS shark bottom longline fishery. All individuals observed were very active when reaching the surface and were released in apparent good health. Soak times do not seem to be a factor for smalltooth sawfish. Simpfendorfer speculates this is because the animal's natural habit consists of laying on the seafloor, using its spiracles to breathe (Simpfendorfer pers. comm. 2003). Thorson (1982) reports that largetooth sawfish caught by fishermen at night or when no one was present to tag them were left tethered in the water with a line tied around the rostrum for several hours with no apparent harmful effects. Additional information stems from Dr. Simpfendorfer of MML, who has been conducting smalltooth sawfish surveys since 2000 using bottom longline, nets, and rod and reel. As of February 2005, he has caught and handled over 50 individuals ranging in size from 87 cm to 450 cm, about half of which were caught on bottom longlines. All of these fish were alive upon capture and safely released with no apparent harm to the fish. There are no studies on the post-release mortality of smalltooth sawfish. Based on their lively condition at capture, physiology, and MML tagging recapture data, we believe post-release mortality is extremely rare.

Temporary sub-lethal effects on smalltooth sawfish may occur. A few rare reports from recreational fishers indicate smalltooth sawfish can damage their rostrum by hitting it against the vessel or other nearby objects (e.g., piling, bridge) while the fishers are preparing to release the fish. Reported damage ranges from broken rostral teeth to broken rostrums. Smalltooth sawfish have been caught missing their entire rostrum, otherwise appearing healthy, so they appear to be able to survive without it. Given the rostrum's role in smalltooth sawfish feeding activities, however, damage to their rostrum, depending on the extent, is likely to hinder their ability to feed and may ultimately impact the affected animal's growth and reproductive abilities.

5.6 Sources of Data for Smalltooth Sawfish Take Rates

The data available for estimating smalltooth sawfish interactions comes from observer data in the Atlantic and Gulf of Mexico HMS shark bottom longline fishery, as well as recent smalltooth sawfish encounter reports documented by Poulakis and Seitz and Mote Marine Lab (MML).

Shark Bottom Longline Observer Data
The HMS shark fishery operates in both the Atlantic and the Gulf of Mexico EEZ. As noted earlier, between 1994 and 2005, twelve smalltooth sawfish were observed caught in the HMS shark bottom longline fishery. Ten of the twelve captures were located in the Atlantic EEZ: nine off the Florida Keys, including four that were caught on one set in 1997, and one off of Georgia in 2002. The remaining two observed captures were in the Gulf of Mexico EEZ (NMFS 2003a).

Poulakis and Seitz Database
Biologists Gregg Poulakis (Florida Fish and Wildlife Commission, Fish and Wildlife Research Institute) and Jason Seitz (Florida Museum of Natural History) maintain a non-validated database of recent smalltooth sawfish encounters (1990 to present) from Gulf of Mexico and South Atlantic waters off southwest Florida. The Poulakis and Seitz data available to us shows a much higher percentage of smalltooth sawfish records occurring in the Gulf of Mexico than the South Atlantic. From 1990 through 2005, 11% (303 of 2967) of smalltooth sawfish observations were in the South Atlantic. Most sawfish encounters were reported as single fish being observed or caught on recreational hook-and-line, but there were also several sawfish observed together. Virtually all of the captured sawfish were the bycatch of fishers targeting sharks, tarpon, snook, or red drum. At least 52% (156 of 303) of sawfish reported as encountered were in water greater than 10 m. Longline vessels, shrimp trawlers, anglers, and scuba divers provided these reports.

To date, Poulakis and Seitz have not documented an interaction between the commercial South Atlantic snapper-grouper fishery and a smalltooth sawfish. They have documented three interactions[20] with HMS shark bottom longline gear since 1996. It should be noted that those interactions that occurred off the Florida Keys took place in waters where South Atlantic snapper-grouper bottom longline fishing is prohibited. There have been no reports of commercial vertical line smalltooth sawfish encounters.

MML Database
As discussed in Section 3.2.6, MML maintains a statewide database of validated sawfish encounters from 1998 through the present. From January 1998 through May 2004, MML has validated 434 observations of smalltooth sawfish in Florida (Simpfendorfer and Wiley 2004). The majority of these encounters (69.3%) occurred during fishing. This encounter data suggests that outside of the core range the smalltooth sawfish appears more common on the west coast of Florida and the Florida Keys. Although the overall latitudinal spread of encounters was similar off both coasts, encounters off the east coast were much less common. The majority of the east coast encounters occurred south of 27.2˚N, with no east coast areas having encounters rates greater than 0.03 per km (Simpfendorfer and Wiley 2004). Observations are based on sightings densities that have not been corrected for sightings effort, however, so may be somewhat biased by the amount of fishing effort (i.e., more fishing effort in the Gulf of Mexico state waters than off the Atlantic coast).

5.7 Three Year Commercial Smalltooth Sawfish Take Estimates

Although a bottom longline fishery exists for snapper-grouper in the South Atlantic, its characteristics vary greatly from the HMS shark bottom longline fishery that has taken smalltooth sawfish in the past. Operation of the South Atlantic snapper-grouper bottom longline fishery is prohibited south of St. Lucie Inlet, Florida (27º10'N). Fishing may occur north of St. Lucie Inlet, Florida, but only in waters deeper than 50 fathoms. These regulations restrict fishing to waters north of the primary areas where HMS shark bottom longline fishery incidental captures have been documented. Additionally, shark bottom longlines are set overnight, with average soak times of 11.5 hours per set. In contrast, snapper-grouper bottom longline fishing is most frequently conducted during the day, with an average soak time of two hours. Snapper-grouper sets also have shorter gangions and smaller hooks. With so many differences, we feel it is inappropriate to apply the observed smalltooth sawfish catch per unit of effort in the shark bottom longline fishery to the South Atlantic snapper-grouper fishery.

There have been no other documented interactions between South Atlantic snapper-grouper bottom longline gear and smalltooth sawfish. Evidence does suggest that bottom longline gear used in the Gulf of Mexico reef fish fishery has taken smalltooth sawfish in the past. In the absence of more applicable data, we will use the take estimates established in the Gulf of Mexico reef fish fishery biological opinion (NMFS 2005b) as a surrogate for the South Atlantic snapper-grouper bottom longline fishery. We believe this take estimate is applicable given the similarities in the techniques and gears used

[20] One encounter occurred off Georgia in 2002, and two occurred off the Florida Keys in 1996 and 1997.

between the two fisheries. We also believe using this take estimate provides an adequate degree of precaution. The prohibitions on bottom longline fishing south of 27º10'N and the requirements to fish beyond 50 fathoms where allowed, restricts fishing to areas deeper and further north of the smalltooth sawfishes' core range. Restriction of fishing to these areas is likely to greatly reduce the potential for interactions. This low likelihood of interactions leads us to believe that any incidental take in the South Atlantic snapper-grouper bottom longline fishery will not exceed that estimated for the Gulf of Mexico reef fish bottom longline fishery. Therefore, we believe up to two smalltooth sawfish were taken on snapper-grouper bottom longline gear. As noted in Section 5.5.1, we believe any effects on smalltooth sawfish were sub-lethal and short-term.

Like bottom longline gear, no smalltooth sawfish takes by commercial South Atlantic snapper-grouper vertical line gear have been documented. However, the Poulakis and Seitz database, and MML database, report takes of smalltooth sawfish in the South Atlantic EEZ on recreational vertical line gear (see Section 5.6). We believe the similarities between the ways recreational and commercial vertical line gears are prosecuted in this area, suggest commercial interactions may have also occurred. Without any documented interactions we will use a precautionary approach and apply the take estimates establish in the Gulf of Mexico opinion (NMFS 2005b). That opinion estimated the take of two smalltooth sawfish off the coast of southwest Florida, and an additional take in the northern and central Gulf. We do not believe the estimated take in the northern and central Gulf is applicable to our estimate because of spatial differences. Therefore, we conclude that up to two smalltooth sawfish were taken by snapper-grouper vertical line gear. We believe the same assumptions noted the preceding paragraph also apply here.

5.8 Recreational Vertical Line/Sea Turtles Interactions

Information on recreational hook-and-line/sea turtle interactions in U.S. EEZ waters is limited, especially on hooking, entanglement, or trailing line, but anecdotal information indicates recreational fishermen do occasionally take sea turtles. Observations of state recreational fisheries have shown that loggerhead, leatherback, Kemp's ridley, and green sea turtles are known to bite baited hooks, and loggerheads and Kemp's ridleys frequently ingest those hooks. Hooked sea turtles have been reported by the public fishing from boats, piers, beaches, banks, and jetties (TEWG 2000). Most sea turtles incidentally caught on hook-and-line are from fishing piers. Fishing piers are suspected of actually attracting sea turtles that learn to forage there for discarded bait and fish carcasses. The amount of persistent debris, including monofilament line, fishing tackle, and other man-made items, has also been found to increase around piers (NMFS 2004c), posing additional threat to sea turtles in the area.

Based on anecdotal information, we believe sea turtles will be affected by recreational hook-and-line gear. Offshore reefs in the U.S. EEZ where recreational fishing is typically concentrated may create an environment similar to a pier and make sea turtle takes likely. Shipwrecks are also targeted by fishermen due to the abundance of marine life attracted to them. Over time, lost anchor and monofilament lines may present an entanglement hazard to sea turtles. Dead sea turtles have been observed entangled in both discarded monofilament and anchor line on artificial reefs and shipwrecks off Florida and North Carolina (M. Barnette, NMFS, pers. obs.). We therefore believe recreational fishing will have adverse effects on sea turtles.

5.9 Three Year Recreational Sea Turtle Take Estimate

Absent sea turtle interaction data for recreational vertical line gear, the only way we can quantify past takes attributed to this gear is to use what we know from our commercial vertical line gear take analysis. To use this analysis, we assume recreational vertical line gear would have the same hardshell and leatherback sea turtle capture per unit effort as documented for commercial vertical lines. Differences exist between the type of commercial and recreational vertical line gear used and where it is fished; some suggest recreational sea turtle take levels may be higher while other differences indicate they could be lower. For example, commercial vertical line gear may have higher hardshell and leatherback catches per unit of effort per hook than recreational vertical line because sea turtles may be more attracted to the greater concentration of bait. Commercial vertical line fishers typically use bandit gear rigged with anywhere from five to as many as 20 hooks per line, whereas recreational fishermen mainly use rod and reel with only one or two hooks per line. However, on average, the number of vertical line hook hours fished annually by recreational snapper-grouper fishers in the South Atlantic is much greater than the number of hook hours fished by commercial snapper-grouper fishers.[21] Commercial vertical line fishers may also have a higher leatherback sea turtle catch per unit effort because they typically fish further offshore where leatherbacks are more abundant. The differences between the type of commercial and recreational vertical line gear used and where they are used may result in overall negligible differences in hardshell sea turtle catch per unit effort and slightly biased high leatherback estimates.

As noted above in Section 5.4, the commercial vertical line take estimates were based on reported catch per unit effort over the past three years. For consistency purposes, we therefore apply the commercial vertical line gear catch per unit effort to recreational effort data from approximately the same time frame.[22]

For private angler and charter boat (non-headboat) snapper-grouper effort, we used MRFSS data. Snapper-grouper trips were defined in our analysis as any trip where snapper-grouper species included in the South Atlantic snapper-grouper management units were either reported as one of the target species or caught. For each fishing mode and year, we multiplied the total estimated number of snapper-grouper trips in the South Atlantic EEZ by state, times the average number of reported hours fished per trip by state. This produced the total estimated number of snapper-grouper fishing hours in the South Atlantic EEZ by state. We then had to estimate the number of hooks fished per angler hour to derive total hook-hours by state. Anecdotal information indicates some private anglers fishing for snapper-grouper use one hook per line while others use two per

[21] From 2001-2004, recreational fishers fished an average of 5,526,329 hook-hours annually, while commercial fishers fished an average of 1,256,380 hook-hours annually.
[22] MRFSS and Headboat Survey 2001-2003 data.

line. Our analysis uses the average of those, 1.5 hooks fished, per private angler hour. On charter trips one hook per angler line is probably most common, but two hooks are still used by some anglers (R. Zales, pers. comm. 2004). For hooks fished per charter angler hour, therefore, we again estimated an average of 1.5 hooks per angler hour, to be precautionary. Each of these estimates was multiplied by our total estimated number of snapper-grouper fishing hours in the South Atlantic U.S.EEZ by state to estimate South Atlantic recreational vertical line snapper-grouper fishing effort in total hook-hours.

For headboat snapper-grouper effort, we used data from the SEFSC, Headboat Survey. Effort is recorded in the Headboat Survey database as angler days fished by statistical area. Headboats take both half-day and full-day trips, each of which includes a portion of time in transit to and from offshore fishing grounds. Overall, the average estimated number of hours fished per reported angler day is five hours (R. Dixon pers. comm. 2004). The reported number of angler days fished per statistical area was converted to hours fished by multiplying by five. The product was then multiplied by two, the number of hooks per line typically used by headboat anglers (R. Dixon pers. comm. 2004), to derive the total number of headboat hook-hours fished for the 2001-2003 period. Out of the total number of headboat trips reportedly taken in the South Atlantic EEZ, 93% caught at least one snapper or grouper (A. Strelcheck pers. comm. 2006). We therefore used 93% of our total headboat hook-hours reported effort to represent all snapper-grouper headboat effort.

Results
Over the past three years, recreational fishing resulted in an estimated 16.5 million (16,578,988) hook-hours of fishing effort. Using the commercial vertical line leatherback and hardshell capture per unit of effort, an estimated total of 185 hardshell sea turtles were caught over that time period.

As noted above, there were no documented takes of leatherbacks in the SDDP data for the commercial vertical line sector. Because we applied our take rates from the commercial sector to our information on the recreational sector, no leatherback take was anticipated. NMFS believes the same logic applied to the commercial vertical line sector, applies for the recreational sector. We know interactions between vertical line gear and leatherbacks occur, and we believe this is also possible with the recreational sector. NMFS therefore estimates one leatherback will be taken during a three-year period by the recreational sector of this fishery.

5.9.1 Hardshell Sea Turtle Take by Species

As stated in our commercial take analysis, to conduct our jeopardy analysis and assess take for each individual species, we need to estimate the number of sea turtles take for each species. We therefore must also break down our total recreational take estimate by species. The recreational fishery operates over a wide range of depths. Headboats may go farther offshore but the fishery primarily operates closer to shore (SAFMC 2006). Because of its relative close proximity to shore, NMFS believes it is most appropriate to apply the species composition estimate from the STSSN database (Table 5.4) to our recreational take estimates for hardshell species. What we know about the diet, foraging habits, and depth preferences for loggerhead, green, hawksbill, and Kemp's ridleys (Section 3.0) suggests these species may be occurring in waters fished by recreational vertical line fishers. As with the other sectors of this fishery, we believe loggerheads will make up the majority of the estimated takes. Applying STSSN species composition estimates to our estimated 185 hardshell takes yields a take rate of 37 green, 3 hawksbill, 17 Kemp's ridley, and the remaining (128) allocated to loggerheads. Leatherbacks may occur in these waters, but they are primarily a pelagic species that are not commonly associated with nearshore waters. Consequently, we do not expect leatherbacks to comprise much of our estimated take.

Table 5.9 Three Year Estimated Sea Turtle Take by Recreational Vertical Line

Recreational Gear Type	Species				
	Green	Hawksbill	Kemp's ridley	Leatherback	Loggerhead
Vertical Line	36	3	17	1	128

The same general assumptions and biases discussed in Section 5.4 for our commercial vertical line take estimates by species apply to our recreational vertical line 3-year take estimates.

5.9.2 Estimated Mortality

As noted in Section 5.4.2.1, there are no criteria for assessing sea turtle post-release mortality from vertical line interactions. Again, we assume sea turtles caught on vertical line gear and released alive would presumably be in better overall health than if released alive from bottom longline gear because of the shorter soak times and ability to reach the surface of the water to breathe. However, we see no reason why the same factors affecting post-release mortality of sea turtles hooked on bottom longlines (interaction type and amount of gear remaining) would not apply. Anecdotal information indicates that many anglers today now use circle hooks (T. Iarocci and J. McGovern pers. comm. 2006). Sea turtles occasionally found stranded (both live and dead) with hooks and line still attached indicates gear is sometimes left on individuals caught. Some post-release mortality may be experienced from stress of multiple captures, entanglement causing limited mobility, and ingestion of hooks and line potentially interfering with food intake and digestion. In the absence of other quantitative data, we conservatively apply the same post-release mortality criteria (i.e., 30% for hardshells and 40% for leatherbacks) as used for our commercial estimates. The results are presented in Table 5.10.

Table 5.10 Three Year Estimated Sea Turtle Take Mortality for Recreational Vertical Line

Species	Instantaneous Mortality	Post-release Mortality	Total Mortality
Loggerheads	0	39	39
Green	0	12	12
Hawksbill	0	1	1
Kemp's Ridley	0	6	6
Leatherbacks	0	1	1

5.10 Recreational Vertical Line/Smalltooth Sawfish Interactions

Smalltooth sawfish are occasionally hooked with rod-and-reel gear during recreational fishing. Fishers who captured smalltooth sawfish most commonly reported that they were fishing for snook, red drum, tarpon, or sharks (Poulakis and Seitz 2004, Simpfendorfer and Wiley 2004). The majority of reported captures are from state waters and mainly within their core distribution in Florida.

The majority of recreational fishing effort in the South Atlantic EEZ occurs off of Florida, where smalltooth sawfish may be present. Although mature smalltooth sawfish are known to occur, at least intermittently, in this area, encounter reports in the South Atlantic are relatively rare (see Section 5.6). Of the reported encounters since 2002, four had the possibility of being the result of snapper-grouper fishing. These takes were documented in the action area, over substrate known to be habitat for snappers and groupers, and occurred within a depth range also known to be inhabited by smalltooth sawfish. These encounter reports do not distinguish the target species of the angler. As a precautionary step, we will assume that all these takes were the result of recreational snapper-grouper fishing. Therefore, we believe up to four smalltooth sawfish were taken by recreational snapper-grouper vertical gear. As noted in Section 5.5.1, we believe any effects on smalltooth sawfish were sub-lethal and short-term.

5.11 Three Year Recreational Smalltooth Sawfish Take Estimate

Given the overall rarity of smalltooth sawfish in the action area, the chance of a smalltooth sawfish being encountered during recreational snapper-grouper fishing is minimal. There have been no documented takes in the action area by recreational snapper-grouper fishers over the past three years. However, two smalltooth sawfish takes by recreational vertical line fishers in the Gulf of Mexico U.S. EEZ waters have been documented over the past three years. The similarities between this fishery and the South Atlantic recreational vertical line fishery suggests smalltooth sawfish take in the action area may occur every so often. Based on the similar rationale to our commercial take estimates (Section 5.7), we will use the same take estimates as those estimated for the Gulf of Mexico reef fish fishery. We therefore conclude that up to four smalltooth sawfish may have been caught over the past three years. Based on previous interaction observations, it is likely all of these captures were released alive with only short-term sub-lethal effects.

5.12 Anticipated Future Take After Implementation of Amendment 13C

In the preceding sections, we extrapolated our best available data to estimate the number of sea turtle and smalltooth sawfish takes over the past three years resulting from operation of the South Atlantic snapper-grouper fishery. We now must consider what effect, if any, implementation of Amendment 13C would have on future levels of take; i.e., whether the estimated past take and mortality levels would increase or decrease and by how much, or whether the same levels would continue in the future. We do this by looking at what component of the South Atlantic snapper-grouper fishery will potentially be affected by Amendment 13C, how this component will be affected, and whether that effect will result in any changes to the overall operation of the South Atlantic fishery.

Amendment 13C includes management actions to reduce overfishing of snowy grouper, golden tilefish, vermilion snapper, and black sea bass by implementing catch quotas, trip limits, fishery season start dates, and gear modifications for the commercial sector; catch allocations and bag limits for the recreational sector; and new adjusted catch limits, size limits, and seasonal closures for both sectors. The Amendment also includes management actions that implement new catch quotas, size limits, trip limits, seasonal closures, and fishing year start dates to allow for an increase in allowable biological catch during 2005-2007.

These five species, as a group, comprised between 32% and 42% of the total catch for all snapper-grouper species, from 1999 through 2003.[23] Of these five species, vermilion snapper accounted for 16% of the total snapper-grouper landings during that period. By contrast, red porgy comprised the smallest proportion of total snapper-grouper landings, accounting for less than 1%. The commercial sector includes a vertical line (primarily bandit gear) and bottom longline segment, as well as a trap component for black sea bass. The recreational sector includes both private and for-hire boats (headboats and charter boats) using rod-and-reel to target and/or catch golden tilefish, vermilion snapper, black sea bass, and red porgy. From 1999 through 2003, headboats, on average, were responsible for about 45% of all recreational landings for these five species in the South Atlantic, while charter vessels harvested an average of 18% of all landings and private recreational fishers landed the remaining 37% (SAFMC 2006).

The management measures proposed in Amendment 13C would not immediately impact sea turtles or smalltooth sawfish because they do not specifically address these species, nor are they designed to specifically address fishing impacts on these species. Localized indirect impacts are possible from the proposed management measures because they do influence where and when fishing effort will occur. However, the proposed measures would not alter the techniques used in the South Atlantic snapper-grouper fishery, and the proposed gear modifications would impact only black sea bass pots. These modifications are not expected to appreciably reduce protected species interactions.

[23] In 2003 these five species accounted for approximately 2.1 MP out of approximately 6.4 MP (32%) and in 2001 they accounted for close to 3.1 MP of 7.5 MP (42%).

Although the proposed management measures are expected to reduce the amount of fishing for and harvest of snowy grouper, golden tilefish, vermilion snapper and black sea bass, reductions in overall snapper-grouper effort are not expected. Fishers are likely to continue fishing for other species when they meet the new limit for snowy grouper, golden tilefish, vermilion snapper, and black sea bass or during the proposed commercial closures. Thus, the reductions in fishing effort targeting snowy grouper, golden tilefish, vermilion snapper, and black sea bass would likely be made up by fishing for other snapper-grouper species. This effort might occur toward red porgy, given the proposed measures to increase trip limits.

Since the proposed measures will not appreciably alter the fishing techniques or gears used in the fishery in terms of protected species interactions, and because we do not expect the overall effort of the snapper-grouper fishery to change, we believe the sea turtle and smalltooth sawfish interaction patterns that existed in the recent past will continue into the future.

5.13 Summary

Based on our review in this section, South Atlantic snapper-grouper bottom longlines and commercial and recreational vertical lines have all adversely affected sea turtles and smalltooth sawfish in the past via hooking and entanglement. The other two gear types used in the South Atlantic snapper-grouper fishery – traps and spearfishing gear – have not likely adversely affected sea turtles or smalltooth sawfish. We anticipate the implementation of Amendment 13C will not change this conclusion or alter the take patterns documented in the past. Table 5.11 summarizes the anticipated take we expect on a three-year basis in the future.

Table 5.11 Summary of Anticipated 3-Year Take and Mortality Estimates

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
Loggerheads	Total Take	202
	Lethal Take	67
Smalltooth sawfish	Total Take	8
	Lethal Take	0

6.0 Cumulative Effects

Cumulative effects include the effects of future state, tribal, local, or private actions reasonably certain to occur within the action area considered in this opinion (i.e., South Atlantic federal EEZ). Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Cumulative effects from unrelated, non-federal actions occurring in the South Atlantic may affect sea turtles and smalltooth sawfish and their habitats. Stranding data indicate sea turtles in South Atlantic waters die of various natural causes, including cold stunning and hurricanes, as well as human activities, such as incidental capture in state fisheries, ingestion of and/or entanglement in debris, ship strikes, and degradation of nesting habitat. The cause of death of most sea turtles recovered by the stranding network is unknown.

Most of the fisheries described as occurring within the action area (see Sections 3.0 and 4.0, Status of the Species, and Environmental Baseline, respectively), are expected to continue as described into the foreseeable future, concurrent with the South Atlantic snapper-grouper fishery. Numerous fisheries in state waters along the South Atlantic coast have also been known to adversely affect threatened and endangered sea turtles. The past and present impacts of these fisheries have been discussed in the Environmental Baseline (Section 4) of this opinion. NMFS is not aware of any proposed or anticipated changes in these fisheries that would substantially change the impacts each fishery has on the sea turtles covered by this opinion.

In addition to fisheries, NMFS is not aware of any proposed or anticipated changes in other human-related actions (e.g., poaching, habitat degradation) or natural conditions (e.g., over-abundance of land or sea predators, changes in oceanic conditions, etc.) that would substantially change the impacts that each threat has on the sea turtles and smalltooth sawfish covered by this opinion. Therefore, NMFS expects that the levels of take of sea turtles described for each of the fisheries and non-fisheries will continue at similar levels into the foreseeable future.

7.0 Jeopardy Analyses: Effect of the Proposed Action on Likelihood of Survival and Recovery

The analyses conducted in the previous sections of this opinion serve to provide a basis to determine whether the proposed action would be likely to jeopardize the continued existence of any ESA-listed sea turtles or smalltooth sawfish known to interact with the South Atlantic snapper-grouper fishery. In Section 5, we have outlined how interactions with the South Atlantic snapper-grouper fishery can affect sea turtles and smalltooth sawfish. That section also evaluated the extent of those effects in terms of triennial estimates of the numbers of sea turtles and smalltooth sawfish captured and killed. Now we must assess each species' response to this impact, in terms of overall population effects from the estimated take. That assessment requires us to determine whether the effects of the proposed action, when added to the status of the species (Section 3), the environmental baseline (Section 4), and the cumulative effects (Section 6), will jeopardize the continued existence of any ESA-listed sea turtles or smalltooth sawfish known to interact with the South Atlantic snapper-grouper fishery.

"To jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly to reduce appreciably the likelihood of both the survival and the recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). Thus, in making this conclusion for each species, we first look at whether there will be a reduction in the reproduction, numbers, or distribution. Then, if there is a reduction in one or more of these elements, we explore whether it will cause an appreciable reduction in the likelihood of both the survival and the recovery of the species.

7.1 Green Sea Turtles

The proposed action is expected to result in the taking of no more than 39 green sea turtles every three years. Based on our knowledge of green sea turtles in the South Atlantic, we expect these takes would consist of both benthic immature and adult male and female individuals. Of these takes, 14 are expected to be lethal; the other green sea turtles are expected to survive the interaction with no adverse effects on reproduction, numbers, or distribution. We believe these takes will not appreciably reduce the green sea turtle's likelihood of surviving and recovering in the wild, and the proposed action is not likely to jeopardize the continued existence of this species.

The loss of 14 green sea turtles over any given 3-year period would result in a reduction in the number of green sea turtles for that time period. These lethal takes could also result in a potential reduction in future reproduction, assuming at least some of these individuals would be females and would have survived other threats and reproduced in the future. Sub-lethal effects on adult females may also reduce reproduction by hindering foraging success, as sufficient energy reserves are probably necessary for producing multiple clutches of eggs in a breeding year. Reductions in the distribution of green sea turtles would not occur as these randomly occurring takes would have no significant effect on the overall position, arrangement, or frequency of green sea turtles occurrences in the South Atlantic. The South Atlantic snapper-grouper fishery has been ongoing for decades, with no perceived changes in the distribution of green sea turtles to date.

Whether the reductions in numbers and reproduction of green sea turtles attributed to the South Atlantic snapper-grouper fishery would appreciably reduce the green sea turtle's likelihood of survival and recovery depends on the probable effect the changes in numbers and reproduction would have on the population's growth rate, and whether the growth rate would allow the species to recover from this relatively small number of deaths. Although caution is warranted about optimistically interpreting the future of green sea turtle populations based on this nesting trend data given the late sexual maturity of the species, as discussed in Section 3 (Status of the Species), available green sea turtle nesting trend data from major nesting beaches in Florida, Yucatán, and Tortuguero indicate green sea turtle populations are increasing. The proportional change in overall survival of benthic immature and adult green sea turtles from the loss of 14 individuals on a future triennial basis would therefore likely be undetectable. The death of 14 individuals and their future reproduction value is likely to be exceeded by the number of younger green sea turtles recruiting into the adult or subadult population (i.e., increased survivability of benthic adults from the 2003 enlarged-TED rule [68 FR 8456, February 21, 2003]) and their future potential reproductive value.

7.2 Hawksbill Sea Turtles

The proposed action is expected to result in the taking of up to four hawksbills every three years. Based on our knowledge of hawksbills in the South Atlantic, we expect these takes would be both benthic immature and adult individuals. Only three of these takes are expected to be lethal; the other is expected to survive the interaction and have no effect on reproduction, numbers, or distribution. We believe the proposed action will not appreciably reduce the hawksbill's likelihood of surviving and recovering in the wild and is not likely to jeopardize the continued existence of this species.

The loss of three hawksbills over any given 3-year period would result in a reduction in the number of hawksbills for that time period. These lethal takes could also result in a potential reduction in future reproduction assuming at least some of the individuals taken would be females and would have survived other threats and reproduced in the future. Reductions in the distribution of hawksbills would not occur as these randomly occurring takes would have no significant effect on the overall position, arrangement, or frequency of hawksbills occurrences in the South Atlantic. The South Atlantic snapper-grouper fishery has been ongoing for decades, with no perceived changes in the distribution of hawksbill sea turtles to date.

Whether the reductions in numbers and reproduction attributed to the South Atlantic snapper-grouper fishery would appreciably reduce the hawksbill's likelihood of survival and recovery depends on the probable effect the changes in numbers and reproduction would have on the population's growth rate and whether the growth rate would allow the species to recover from this relatively small number of deaths. As noted in Section 3 (Status of the Species), hawksbill populations appear to be increasing or stable at the two principal nesting beaches in the U.S. Caribbean where long-term monitoring has been carried out (Meylan 1999a). Although today's nesting population is only a fraction of what it was, nesting activity in recent years by hawksbills has increased on well-protected beaches in Mexico, Barbados, and Puerto Rico (Caribbean Conservation Corporation 2005). Increasing protections for live coral habitat in the Atlantic, Gulf of Mexico, and Caribbean over the last decade that have limited fishing activity in live coral habitat may also increase hawksbill survival rates in the marine environment. Benefits may also be gained by hawksbills from the larger-sized TED requirements implemented. The proportional change in overall survival rates of benthic immature and adult hawksbills from the loss of three individuals every three years would be insignificant. The death of these individual and their future reproductive value is likely to be exceeded by the number of younger hawksbills recruiting into the adult or subadult population and their future potential reproductive value.

7.3 Kemp's Ridley Sea Turtles

The proposed action is expected to result in the taking of no more than 19 Kemp's ridleys every three years. Based on our knowledge of Kemp's ridleys in the South Atlantic, we expect these takes would be both benthic immature and adult individuals. Only 8 of these takes are expected to be lethal; the other 11 are expected to survive the interaction, thus, these takes would have no effect on reproduction, numbers, or distribution. As a result, we believe the proposed action will not appreciably reduce the Kemp's ridleys' likelihood of surviving and recovering in the wild and is not likely to jeopardize the continued existence of this species.

The loss of eight Kemp's ridleys over any given 3-year period would result in a reduction in the number of Kemp's ridleys for that time period. Kemp's ridleys nest primarily at Rancho Nuevo, a stretch of beach in Mexico, Tamaulipas State, outside of the proposed action area, so the chance of these individuals being an inter-nesting adult female and causing an immediate reduction in reproduction is unlikely. However, these lethal takes could still result in a potential reduction in future reproduction if those individuals were female and would have survived other threats and reproduced in the future. Reductions in the distribution of Kemp's ridleys would not occur as these takes would have no bearing on the overall position, arrangement, or frequency of Kemp's ridleys occurrences in the South Atlantic.

The required use of TEDs in shrimp trawls in the United States under the sea turtle conservation regulations has had dramatic effects on the recovery of Kemp's ridleys. Their population, which had declined to critical levels in the 1980s, increased rapidly in the 1990s (TEWG 2000). Nesting beach survey data indicates the population is increasing (TEWG 2000). Over 1,000 nesting females were documented on one single day during 2002 (J. Peña pers. comm. 2005). In 2004, there were 7,747 nests documented in Mexico (B. Higgins, pers. comm. 2005). As of May 22, 2006, there have been 8,900 nests documented on Mexico beaches (J. Peña pers. comm. 2006) and over 60 documented on Texas beaches (D. Shaver pers. comm. 2006). The proportional change in overall survival of Kemp's ridleys from the loss of one individual would be insignificant. The number of younger turtles recruiting into the adult or subadult population and their future potential reproductive value would quickly exceed the death of eight individuals and their future reproductive value.

7.4 Leatherback Sea Turtles

The proposed action is expected to result in the taking of 25 leatherbacks every three years. Based our knowledge of leatherbacks in the South Atlantic, we expect these takes would be both immature and adult individuals. Fifteen of these takes are expected to be lethal; the other ten are expected to survive the interaction and have no effect on reproduction, numbers, or distribution. As a result, we believe the proposed action will not appreciably reduce the leatherback's likelihood of surviving and recovering in the wild and is not likely to jeopardize the continued existence of this species.

The lethal removal of up to 15 leatherback sea turtles over any given 3-year period would result in a reduction in the number of leatherbacks for that time period. These lethal takes could also result in a potential reduction in future reproduction, assuming at least a portion of the individuals killed would be females and would have survived other threats and reproduced in the future. Reductions in leatherback distribution would not occur because these randomly intermittent takes would have no significant effect on the overall position, arrangement, or frequency of leatherbacks occurrences in the South Atlantic. The South Atlantic snapper-grouper fishery has been ongoing for decades, with no perceived changes in the distribution of leatherback sea turtles to date.

The best available stock assessment for evaluating Atlantic leatherback populations is NMFS SEFSC (2001). That assessment is somewhat confounded by the near absence of data or high uncertainty for estimates of juvenile and adult survival and mortality, age and growth, and also, by the intermittence of nesting data from the major leatherback nesting beaches on the north coast of South America. Nevertheless, a very strong signal of declining nesting was detected for the nesting aggregation of Suriname and French Guiana, the largest remaining leatherback nesting aggregation in the world. Nesting there had been declining at about 15% per year since 1987 through the 1990s. For the period 1979-1986, however, the number of nests had been increasing at about 15% annually. As explained in Section 3, there is a great degree of uncertainty and inconsistency regarding the leatherback sea turtle population status and trends. The uncertain trends in nesting at U.S. beaches versus South American beaches complicate our evaluation. Additionally, because of a lack of sufficient data, the population modeling scenarios performed for loggerhead sea turtles are not possible at this point for leatherback sea turtles. Therefore, we use Spotila et al. (1996) as the latest, most complete estimation of leatherback populations throughout the Atlantic basin (from all nesting beaches in the Americas, the Caribbean, and West Africa) (approximately 27,600 nesting females with an estimated range of 20,082-35,133).

As stated earlier, the South Atlantic snapper-grouper fishery is expected to take 25 individuals and result in 15 mortalities every three years. The size ratio of leatherbacks captured in the South Atlantic snapper-grouper fishery is unknown. However, the HMS pelagic longline observer program data, which records leatherback size information based on the observer's best estimate of the turtle's carapace length, to the nearest foot, suggests that at least half of the leatherbacks caught in the South Atlantic snapper-grouper fishery may be mature breeders, and the rest are sub-adult animals. Information on the sex ratios of the leatherbacks caught in the South Atlantic snapper-grouper fishery is not available. Following the assumption used in the leatherback population model published in Spotila et al. (1996), we assume the population sex ratio is 50%. Using a 50% sex ratio and a 50% adult to juvenile ratio, therefore, an estimated three or four breeding-age (adult) females and another three or four subadult females are expected to be taken every three years.

The United States has taken action to reduce the number and severity of leatherback interactions from the two leading known causes of leatherback fishing mortality - the U.S. Atlantic longline fisheries, and the Southeast shrimp trawl fishery. The proportional change in overall survival of leatherbacks from the loss of a total of 15 leatherbacks every three years, with no more than three or four adult females and three or four subadult females would be insignificant. With an estimate 20-25,000 nesting females, we believe that the effects of these losses will not result in detectable change in leatherback populations. The death of 15 individuals every three years and their future reproductive value is likely to be exceeded by the number of younger turtles recruiting into the adult or subadult population and their future potential reproductive value.

7.5 Loggerhead Sea Turtles

The proposed action is expected to result in take of up to 202 loggerheads every three years, of which 67 are expected to be lethal. Based on our knowledge of loggerhead sea turtles in the South Atlantic, we expect these takes would be either benthic immature or adult individuals. As a result, we believe the proposed action will not appreciably reduce the loggerhead's likelihood of surviving and recovering in the wild and is not likely to jeopardize the continued existence of this species.

As discussed in the Status of the Species (Section 3), five northwestern Atlantic loggerhead subpopulations have been identified (NMFS SEFSC 2001), with the South Florida nesting and the northern nesting subpopulations being the most abundant. Based on Bowen et al. (2004), approximately 90.2% of loggerheads in the Gulf of Mexico are from the southwest Florida subpopulation, 5.8% are from the northern nesting subpopulation, 2.5 % are from the Yucatán, Mexico subpopulation, 0.8% are from the northwest Florida (Panhandle subpopulation) and 0.3% are from the Dry Tortugas subpopulation.

The lethal removal of 67 loggerheads over a given 3-year period would result in a reduction in the number of loggerheads for that time period. The lethal takes could also result in a potential reduction in future reproduction, assuming at least a portion of the individuals killed were females and would have survived other threats and reproduced in the future. Reductions in loggerhead distribution are not expected because these randomly occurring takes would have no significant effect on the overall position, arrangement, or frequency of loggerhead occurrences in the South Atlantic. The South Atlantic snapper-grouper fishery as been on going for decades, with no perceived changes in the distribution of loggerhead sea turtles to date.

Loggerhead sea turtles are the most abundant sea turtle in the South Atlantic. The TEWG (2000) was able to assess the status of the South Florida nesting and the northern nesting subpopulations and concluded that the South Florida subpopulation is increasing, while no trend is evident for the northern subpopulation, which is thought to be stable. However, more recent analysis, including nesting data through 2003, indicate that there is no discernable trend over the past 15 years in the South Florida nesting subpopulation (Witherington pers. comm. 2004). For the three smaller nesting aggregations (Yucatán, Florida Panhandle, and Dry Tortugas), there are not sufficient or consistent data to determine trends, as explained in Section 3 of this opinion.

Although nesting trends can provide an important indicator of subpopulation status, they cannot be viewed in isolation. Loggerheads mature at a late age (20-30 years); therefore, current nesting trends reflect natural and anthropogenic effects on female loggerheads that occurred over the last two decades. Using nesting trend data to make conclusions about the status of the entire subpopulation, therefore, requires making certain assumptions. These assumptions are that the current impacts to mature females are experienced to the same degree amongst all age classes regardless of sex, and/or that the impacts leading to the current abundance of nesting females are affecting the current immature females to the same extent.

Actions have been taken to reduce anthropogenic impacts to loggerhead sea turtles from various sources, particularly since the early 1990s. These include lighting ordinances, predation control, and nest relocations to help increase hatchling survival, as well as measures to reduce the mortality of pelagic immatures, benthic immatures, and sexually mature age classes in various fisheries and other marine activities. Recent actions have taken significant steps towards improving the environmental baseline and improving the status of all loggerhead subpopulations. The TED regulation (published on February 21, 2003 [68 FR 8456]) represents a significant improvement in the environmental baseline affecting loggerhead sea turtles, since shrimp trawling is considered to be the largest source of anthropogenic mortality on loggerheads.

Given the late maturity of loggerheads, the benefits of many of these actions in terms of positive effect on nesting trends will not be apparent for many years to come. Current modeling data suggests that all western loggerhead subpopulations should experience positive or at least stabilizing subpopulation growth as a result of new TED regulations (NMFS SEFSC 2001). Management action to increase pelagic immature survival in the U.S. Atlantic longline fisheries is expected to further drive the subpopulations to positive growth. Based on SEFSC (2001) models, the proportional change in overall survival of loggerheads from the loss of 67 individuals every three years and their future reproductive value would be insignificant. The losses are likely to be exceeded by the number of younger turtles recruiting into the adult or subadult population and their future potential reproductive value.

7.6 Smalltooth Sawfish

The proposed action is expected to result in the taking of eight adult smalltooth sawfish on a triennial future basis, but no mortality is anticipated. Our best available information indicates the short-term non-lethal effects anticipated on smalltooth sawfish are therefore not expected to affect their reproduction, numbers, or distribution. Thus, NMFS believes that the proposed action is not likely to jeopardize the continued existence of smalltooth sawfish.

The abundance of adults relative to juvenile smalltooth sawfish, including very small individuals, encountered in shallow waters outside of the proposed action area suggests the population remains reproductively active and viable. Based on this information, the

South Atlantic snapper-grouper fishery would not affect the reproduction, numbers, or distribution of smalltooth sawfish.

8.0 Conclusion

We have analyzed the best available data, the current status of the species, environmental baseline, effects of the proposed action, and cumulative effects to determine whether the proposed action is likely to jeopardize the continued existence of any sea turtle species or smalltooth sawfish.

Green, Hawksbill, Kemp's ridley, Leatherback, and Loggerhead Sea Turtles
Our sea turtle analyses focused on the impacts to and population response of sea turtles in the Atlantic basin. However, the impact of the effects of the proposed action on the Atlantic populations must be directly linked to the global populations of the species, and the final jeopardy analysis is for the global populations as listed in the ESA. Because the proposed action will not reduce the likelihood of survival and recovery of any Atlantic populations of sea turtles, it is our opinion that the continued operation of the South Atlantic snapper-grouper fishery is also not likely to jeopardize the continued existence of loggerhead, green, hawksbill, Kemp's ridley, or leatherback sea turtles.

Smalltooth Sawfish
The smalltooth sawfish analyses focused on the impacts and population response of the U.S DPS of smalltooth sawfish. Based on these analyses, it is our opinion that the continued operation of the South Atlantic snapper-grouper fishery is not likely to jeopardize the continued existence of smalltooth sawfish.

9.0 Incidental Take Statement (ITS)

Section 9 of the ESA and protective regulations issued pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the RPAs and terms and conditions of the ITS.

Section 7(b)(4)(c) of the ESA specifies that in order to provide an incidental take statement for an endangered or threatened species of marine mammal, the taking must be authorized under section 101(a)(5) of the MMPA. Since no incidental take of listed marine mammals is expected or has been authorized under section 101(a)(5) of the MMPA, no statement on incidental take of protected marine mammals is provided and no take is authorized. Nevertheless, F/SER2 must immediately notify (within 24 hours, if communication is possible) NMFS' Office of Protected Resources should a take of a listed marine mammal occur.

9.1 Anticipated Amount or Extent of Incidental Take

NMFS anticipates the following incidental takes may occur as a result of the continued operation of the South Atlantic snapper-grouper fishery. These numbers represent the total takes over 3-year periods, beginning with July 2006.

Table 9.1 Anticipated 3-Year Incidental Take in the South Atlantic Snapper-Grouper Fishery

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

9.2 Effect of the Take

NMFS has determined the level of anticipated take specified in Section 9.1 is not likely to jeopardize the continued existence of green, hawksbill, Kemp's ridley, leatherback, or loggerhead sea turtles, or smalltooth sawfish.

9.3 Reasonable and Prudent Measures (RPMs)

Section 7(b)(4) of the ESA requires NMFS to issue any agency action found to comply with section 7(a)(2) of the ESA and whose proposed action may incidentally take individuals of listed species a statement specifying the impact of any incidental taking. It also states that RPMs necessary to minimize impacts, and terms and conditions to implement those measures, must be provided and must be followed to minimize those impacts. Only incidental taking by the federal agency or applicant that complies with the specified terms and conditions is authorized.

The RPMs and terms and conditions are specified as required by 50 CFR 402.14 (i)(1)(ii) and (iv) to document the incidental take by the proposed action and to minimize the impact of that take on sea turtles and smalltooth sawfish. These measures and terms and conditions are non-discretionary, and must be implemented by NMFS in order for the protection of section 7(o)(2) to apply. NMFS has a continuing duty to regulate the activity covered by this incidental take statement. If NMFS fails to adhere to the terms and conditions of the incidental take statement through enforceable terms, and/or fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of the incidental take, F/SER2 must report the progress of the action and its impact on the species to NMFS as specified in the incidental take statement [50 CFR 402.14(i)(3)].

NMFS has determined that the following RPMs are necessary and appropriate to minimize impacts of the incidental take of sea turtles and sawfish during snapper-grouper fishing.

1. NMFS must ensure that any caught sea turtle or smalltooth sawfish is handled in such a way as to minimize stress to the animal and increase its survival rate.

2. NMFS must ensure that monitoring and reporting of any sea turtles or smalltooth sawfish encountered: (1) detects any adverse effects resulting from the South Atlantic snapper-grouper fishery; (2) assesses the actual level of incidental take in comparison with the anticipated incidental take documented in this opinion; (3) detects when the level of anticipated take is exceeded; and (4) collects improved data from individual encounters.

9.4 Terms and Conditions

To be exempt from liability for take prohibited by section 9 of the ESA, NMFS must comply with the following terms and conditions, which implement the RPMs described above. These terms and conditions are non-discretionary.

The following terms and conditions implement RPM No. 1.

1. NMFS, in cooperation with the SAFMC, must implement sea turtle bycatch release equipment requirements and sea turtle and smalltooth sawfish handling protocols and/or guidelines in the commercial and for-hire permitted South Atlantic snapper-grouper fishery. Use of the sea turtle release equipment requirements and sea turtle handling and release protocols listed in the proposed rule for Atlantic HMS bottom longline fishery (71 FR 15680, March 29, 2006) must be considered. At a minimum, regulations similar to those currently in the proposed rule for the Gulf of Mexico Reef Fish fishery must be implemented. Implementation of these requirements and guidelines must occur as soon as operationally feasible and no later than December 31, 2007.

2. NMFS, in cooperation with the SAFMC, must develop and implement an outreach program to train commercial and recreational fishermen in the use of any sea turtle release equipment and/or sea turtle and smalltooth sawfish handling protocols and guidelines implemented. In developing and implementing this outreach program, the HMS pelagic longline educational outreach program should be used as a model. The outreach program must be implemented in conjunction with term and condition No. 1.

The following terms and conditions implement RPM No. 2.

3. NMFS must maintain its current SDDP and improve the sea turtle data reported under the SDDP by distributing educational outreach materials regarding the specific information to be reported and sea turtle identification to commercial snapper-grouper fishermen selected to participate in this program prior to each reporting period (i.e., by January of each year).

4. NMFS must use observer data collected in conjunction with any fishery programs and grant-funded programs, such as the Marine Fisheries Initiative (MARFIN) and the Cooperative Research Program (e.g., the Gulf & South Atlantic Fisheries Foundation snapper-grouper observer project), to assist in monitoring take of sea turtle and smalltooth sawfish in the snapper-grouper hook-and-line fishery. As feasible, observers must record the information specified on the SEFSC sea turtle life history form for any sea turtle captured. For any smalltooth sawfish captured, observers must record the date, time, location (lat./long.), water depth, estimated total length, estimated length of saw, tag ID(s) if present, gear, target species, tackle (hook brand, type, size, etc.), where hooked and/or entangled, and bait type, as feasible. Photographs must also be taken to confirm species identity and release condition.

5. If requested by NMFS, observers must be prepared to tag any sea turtles or smalltooth sawfish caught. They must also be prepared to collect tissue samples from sea turtles for genetic analysis to determine the genetic identity of individual turtles caught. SEFSC shall be the clearinghouse for any genetic samples taken. This opinion serves as the permitting authority for tagging and taking such tissue samples (without the need for an additional section 10 permit).

6. F/SER2 must collaborate with the SEFSC to ensure the following information is reported to F/SER3 annually based on available information:
    a. detailed information on each sea turtle take reported
    b. total reported effort by gear type by fishermen selected for the SDDP
    c. total reported effort data by gear type from the CPL
    d. observer coverage level obtained in the commercial South Atlantic snapper-grouper fishery
    e. detailed information on any observed takes
    f. total observed effort
    g. observed CPUEs for species observed taken
    h. total take estimates for each species in the South Atlantic snapper-grouper fishery
    i. detailed information on sea turtle and smalltooth encounters with recreational fishers as provided through MRFSS protected species interaction questions

7. NMFS must add protected species encounter questions into existing recreational fishing surveys (e.g., Headboat Survey) by December 31, 2006.

10.0 Conservation Recommendations

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. NMFS should conduct or fund smalltooth sawfish research on the demographic, behavioral, spatial, and temporal patterns of smalltooth sawfish in the South Atlantic to improve understanding of the co-occurrence between the South Atlantic snapper-grouper fishery and smalltooth sawfish.

2. NMFS should conduct or fund surveys or other alternative methods for determining smalltooth sawfish abundance in federal South Atlantic snapper-grouper fishing areas off southeast Florida, adjacent to areas where smalltooth sawfish are known to occur in the greatest concentration (e.g., off the Florida Keys).

3. NMFS, in cooperation with federal and non-federal researchers, should conduct research to develop and evaluate fishing gear modifications and tactics to reduce the likelihood of interactions between sea turtles and fishing gear and reduce the immediate or delayed mortality rates of captured sea turtles in the South Atlantic snapper-grouper fishery.

4. NMFS should support in-water abundance estimates of sea turtles to achieve more accurate status assessments for these species and better assess the impacts of incidental take in fisheries.

5. NMFS should investigate methods to evaluate and estimate takes in recreational fisheries.

11.0 Reinitiation of Consultation

This concludes formal consultation on the South Atlantic snapper-grouper fishery. As provided in 50 CFR 402.16, reinitiation of formal consultation is required if discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of the taking specified in the incidental take statement is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat (when designated) in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the identified action. In instances where the amount or extent of incidental take is exceeded, F/SER2 must immediately request reinitiation of formal consultation.

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Appendix A: Chronological Amendments to 1983 Snapper Grouper FMP

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
FMP (1983)	08/31/83	PR: 48 FR 26843 FR: 48 FR 39463	-12" limit – red snapper, yellowtail snapper, red grouper, Nassau grouper, vermilion snapper -8" limit – black sea bass (bsb) -4" trawl mesh size -Gear limitations – poisons, explosives, fish traps, trawls -Designated modified habitats or artificial reefs as Special Management Zones (SMZs)
Regulatory Amendment #1 (1986)	03/27/87	PR: 51 FR 43937 FR: 52 FR 9864	-Prohibited fishing in SMZs except with hand-held hook-and-line and spearfishing gear. -Prohibited harvest of goliath grouper in SMZs.
Amendment #1 (1988)	01/12/89	PR: 53 FR 42985 FR: 54 FR 1720	-Prohibited trawl gear to harvest fish south of Cape Hatteras, NC and north of Cape Canaveral, FL. -Directed fishery defined as vessel with trawl gear and ≥200 lbs s-g on board. -Established rebuttable assumption that vessel with s-g on boar had harvested such fish in EEZ.
Regulatory Amendment #2 (1988)	03/30/89	PR: 53 FR 32412 FR: 54 FR 8342	-Established 2 artificial reefs off Ft. Pierce, FL as SMZs.
Notice of Control Date	09/24/90	55 FR 39039	-Anyone entering federal wreckfish fishery in the EEZ off S. Atlantic states after 09/24/90 was not assured of future access if limited entry program developed.
Regulatory Amendment #3 (1989)	11/02/90	PR: 55 FR 28066 FR: 55 FR 40394	-Established artificial reef at Key Biscayne, FL as SMZ. Fish trapping, bottom longlining, spear fishing, and harvesting of Goliath grouper prohibited in SMZ.
Amendment #2 (1990)	10/30/90	PR: 55 FR 31406 FR: 55 FR 46213	-Prohibited harvest/possession of goliath grouper in or from the EEZ -Defined overfishing for goliath grouper and other species
Amendment #3 (1990)	01/31/91	PR: 55 FR 39023 FR: 56 FR 2443	-Established management program for wreckfish: Added to FMU*; defined OY and overfishing; required permit to fish for, land or sell; collect data; established control date 03/28/90; fishing year beginning April 16*; process to set annual quota, with initial quota of 2 million lbs*; 10,000 lb. trip limit*; spawning season closure Jan 15-Apr 15. -Add wreckfish to the FMU; -Required permit to fish for wreckfish; -Required catch and effort reports from selected, permitted vessels; -Established a fishing year for wreckfish starting April 16; -Established 10,000 lb. trip limit; -Established a spawning season closure for wreckfish from January 15 to April 15; -Established a wreckfish quota and provisions for closure of wreckfish fishery; -Provided for annual adjustments of wreckfish

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
			management measures;
Notice of Control Date	07/30/91	56 FR 36052	-Anyone entering federal snapper grouper fishery (other than for wreckfish) in the EEZ off S. Atlantic states after 07/30/91 was not assured of future access if limited entry program developed.
Amendment #4 (1991)	01/01/92	PR: 56 FR 29922 FR: 56 FR 56016	-Prohibited gear: fish traps except bsb traps north of Cape Canaveral, FL; entanglement nets; longline gear inside 50 fathoms; bottom longlines to harvest wreckfish**; powerheads and bangsticks in designated SMZs off S. Carolina. -Permit, gear, and vessel id requirements specified for bsb traps. -No retention of S-G caught in other fisheries with gear prohibited in S-G fishery if captured S-G had no bag limit or harvest was prohibited. If had a bag limit, could retain only the bag limit. -8" limit – lane snapper and bsb -10" limit – vermilion snapper (recreational only) -12" limit – red porgy, vermilion snapper (commercial only), gray, yellowtail, mutton, schoolmaster, queen, blackfin, cubera, dog, mahogany, and silk snappers -20" limit – red snapper, gag, and red, black, scamp, yellowfin, and yellowmouth groupers. -28" FL limit – greater amberjack (recreational only) -36" FL or 28" core length – greater amberjack (commercial only) -bag limits – 10 vermilion snapper, 3 greater amberjack -aggregate snapper bag limit – 10/person/day, excluding vermilion snapper and allowing no more than 2 red snappers -aggregate grouper bag limit – 5/person/day, excluding Nassau and goliath grouper, for which no retention is allowed -spawning season closure – commercial harvest greater amberjack > 3 fish bag prohibited in April south of Cape Canaveral, FL -spawning season closure – commercial harvest mutton snapper >snapper aggregate prohibited during May and June -charter/headboats and excursion boat possession limits extended -commercial permit regulations established
Amendment #5 (1991)	04/06/92	PR: 56 FR 57302 FR: 57 FR 7886	-Wreckfish: established limited entry system with ITQs; required dealer to have permit; rescinded 10,000 lb. trip limit; required off-loading between 8 am and 5 pm; reduced occasions when 24-hour advance notice of offloading required for off-loading; established procedure for initial distribution of percentage shares of TAC
Regulatory Amendment #4 (1992)	07/06/93	FR: 58 FR 36155	-Black Sea Bass: modified definition of bsb pot***; allowed multi-gear trips for bsb***; allowed retention of incidentally-caught fish on bsb trips***
Regulatory	07/31/93	PR: 58	-Established 8 SMZs off S. Carolina, where only hand-

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Amendment #5 (1992)		FR 13732 FR: 58 FR 35895	held, hook-and-line gear and spearfishing (excluding powerheads) was allowed.
Amendment #6 (1993)	07/27/94	PR: 59 FR 9721 FR: 59 FR 27242	-commercial quotas for snowy grouper, golden tilefish -commercial trip limits for snowy grouper, golden tilefish, speckled hind, and Warsaw grouper -include golden tilefish in grouper recreational aggregate bag limits -prohibited sale of Warsaw grouper and speckled hind -100% logbook coverage upon renewal of permit -creation of the *Oculina* Experimental Closed Area -data collection needs specified for evaluation of possible future IFQ system
Amendment #7 (1994)	01/23/95	PR: 59 FR 47833 FR: 59 FR 66270	-12" FL – hogfish -16" limit – mutton snapper -required dealer, charter and headboat federal permits -allowed sale under specified conditions -specified allowable gear and made allowance for experimental gear -allowed multi-gear trips in N. Carolina -added localized overfishing to list of problems and objectives -adjusted bag limit and crew specs. for charter and head boats -modified management unit for scup to apply south of Cape Hatteras, NC -modified framework procedure
Regulatory Amendment #6 (1994)	05/22/95	PR: 60 FR 8620 FR: 60 FR 19683	Established actions which applied only to EEZ off Atlantic coast of FL: Bag limits – 5 hogfish/person/day (recreational only), 2 cubera snapper/person/day > 30" TL; 12" TL – gray triggerfish
Notice of Control Date	04/23/97	62 FR 22995	-Anyone entering federal bsb pot fishery off S. Atlantic states after 04/23/97 was not assured of future access if limited entry program developed.
Amendment #8 (1997)	12/14/98	PR: 63 FR 1813 FR: 63 FR 38298	-established program to limit initial eligibility for s-g fishery: Must demonstrate landings of any species in S-G FMU in 1993, 1994, 1995 or 1996; AND have held valid s-g permit between 02/11/96 and 02/11/97. -granted transferable permit with unlimited landings if vessel landed ≥ 1,000 lbs. of S-G spp. in any of the years -granted non-transferable permit with 225 lb. trip limit to all other vessels -modified problems, objectives, OY, and overfishing definitions -expanded Council's habitat responsibility -allowed retention of S-G in excess of bag limit on permitted vessel with a single bait net or cast nets on board -allowed permitted vessels to possess filleted fish harvested in the Bahamas under certain conditions.
Regulatory	01/29/99	PR: 63	-Established 10 SMZs at artificial reefs off South Carolina.

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Amendment #7 (1998)		FR 43656 FR: 63 FR 71793	
Amendment #9 (1998)	2/24/99	PR: 63 FR 63276 FR: 64 FR 3624	-red porgy: 14" length (recreational and commercial); 5 fish rec. bag limit; no harvest or possession > bag limit, and no purchase or sale, in March and April. -bsb: 10" length (recreational and commercial); 20 fish rec. bag limit; required escape vents and escape panels with degradable fasteners in bsb pots -greater amberjack: 1 fish rec. bag limit; no harvest or possession > bag limit, and no purchase or sale, during March and April; quota = 1,169,931 lbs; began fishing year May 1; prohibited coring. Vermilion snapper: 11" length (recreational) Gag: 24" length (recreational); no harvest or possession > bag limit, and no purchase or sale, during March and April Black grouper: 24" length (recreational and commercial); no harvest or possession > bag limit, and no purchase or sale, during March and April. Gag and Black grouper: within 5 fish aggregate grouper bag limit, no more than 2 fish may be gag or black grouper (individually or in combination) All S-G without a bag limit: aggregate recreational bag limit 20 fish/person/day, excluding tomtate and blue runners Vessels with longline gear aboard may only possess snowy, Warsaw, yellowedge, and misty grouper, and golden, blueline and sand tilefish.
Amendment #9 (1998) resubmitted	10/13/00	PR: 63 FR 63276 FR: 65 FR 55203	-Commercial trip limit for greater amberjack
Regulatory Amendment #8 (2000)	11/15/00	PR: 65 FR 41041 FR: 65 FR 61114	-Established 12 SMZs at artificial reefs off Georgia; revised boundaries of 7 existing SMZs off Georgia to meet CG permit specs; restricted fishing in new and revised SMZs
Emergency Interim Rule	09/08/99, expired 08/28/00	64 FR 48324 and 65 FR 10040	-Prohibited harvest or possession of red porgy.
Amendment #10 (1998)	07/14/00	PR: 64 FR 37082 and 64 FR 59152 FR: 65 FR 37292	-identified EFH and established HAPCs for species in the S-G FMU.

Document	All Actions Effective By:	Proposed Rule Final Rule	Major Actions. Note that not all details are provided here. Please refer to Proposed and Final Rules for all impacts of listed documents.
Amendment #11 (1998)	12/02/99	PR: 64 FR 27952 FR: 64 FR 59126	-MSY proxy: goliath and Nassau grouper = 40% static SPR all other species = 30% static SPR -OY: hermaphroditic groupers = 45% static SPR goliath and Nassau grouper = 50% static SPR all other species = 40% static SPR -Overfished/overfishing evaluations: BSB: overfished (MSST=3.72 mp, 1995 biomass=1.33 mp) undergoing overfishing (MFMT=0.72, F1991-1995=0.95) Vermilion snapper: overfished (static SPR = 21-27%). Red porgy: overfished (static SPR = 14-19%). Red snapper: overfished (static SPR = 24-32%) Gag: overfished (static SPR = 27%) Scamp: no longer overfished (static SPR = 35%) Speckled hind: overfished (static SPR = 8-13%) Warsaw grouper: overfished (static SPR = 6-14%) Snowy grouper: overfished (static SPR = 5=15%) White grunt: no longer overfished (static SPR = 29-39%) Golden tilefish: overfished (couldn't estimate static SPR) Nassau grouper: overfished (couldn't estimate static SPR) Goliath grouper: overfished (couldn't estimate static SPR) -rebuilding timeframe: red snapper and groupers ≤ 15 years (year 1 = 1991) other snappers, greater amberjack, bsb, red porgy ≤ 10 years (year 1 = 1991) -overfishing level: goliath and Nassau grouper = F>F40% static SPR all other species: = F>F30% static SPR Approved definitions for overfished and overfishing. MSST = (1-M) Bmsy of 0.5 whichever is greater. MFMT = Fmsy
Amendment #12 (2000)	09/22/00	PR: 65 FR 35877 FR: 65 FR 51248	-Red porgy: MSY=4.38 mp; OY=45% static SPR; MFMT=0.43; MSST=7.34 mp; rebuilding timeframe=18 years (1991=year 1); no sale during Jan-April; 1 fish bag limit; 50 lb. bycatch comm. trip limit May-December; modified management options and list of possible framework actions.
Amendment #13A (2003)	04/26/04	PR: 68 FR 66069 FR: 69 FR 15731	-Extended for an indefinite period the regulation prohibiting fishing for and possessing S-G spp. within the *Oculina* Experimental Closed Area.

Appendix B: Sources Of Data Used In Sea Turtle Species Abundance Calculations

HMS Pelagic Longline Fishery

The HMS pelagic longline fishery is monitored by the Pelagic Observer Program (POP). The program started at the Miami Laboratory began in May of 1992. The POP, with a corps of 10-12 observers, monitors a mobile U.S. pelagic longline fleet ranging from the Grand Banks to off Brazil and in the Gulf of Mexico. The POP targets an 8% coverage of the vessels based on the fishing effort of the fleet. During an average year, the observer corps will spend about 900 days at sea based on 70-75 vessel trips, and observe about 500 longline sets. The distance of a longline set can range from 10 to 40 miles fishing from 200 to 1000 baited hooks about 100 yards apart. Observers record fish species, length, weight, sex, location, and other environmental information (SEFSC Pelagic Observer Program webpage, accessed May 12, 2006 [http://www.sefsc.noaa.gov/pop.jsp]).

HMS Atlantic Shark Fishery

The HMS Atlantic shark fishery consists of a bottom longline and drift gillnet sector. Observations of the Atlantic shark directed bottom longline fishery have been conducted since 1994 (Burgess and Morgan 2003 and references therein). From 1994 through 2001, observer coverage was conducted on a voluntary basis. Beginning with the 2002 fishing season, observer coverage of the Atlantic shark directed bottom longline fishery became mandatory under authority of 50 CFR 635.7. Observer coverage from 1994 through the 1st trimester season of 2005 was coordinated by the Commercial Shark Fishery Observer Program (CSFOP), Florida Museum of Natural History, University of Florida, Gainesville, FL (Burgess and Morgan 2003) (Smith et al. 2006).

Observer coverage for this fishery is required under the current federal management plan for highly migratory species (NMFS 2003d). Starting with the 2nd trimester season of 2005, responsibility for the fishery observer program was transferred to National Marine Fisheries Service (NMFS), Southeast Fisheries Science Center (SEFSC), Panama City Laboratory (Smith et al. 2006).

Since 1993, an observer program has been underway to estimate catch and bycatch in the directed shark gillnet fisheries along the southeastern U.S. Atlantic coast. Because of the concerns by the NMFS Atlantic and Gulf of Mexico Stock Assessment Review Group and the re-initiation of the Biological Opinion issued under Section 7 of the Endangered Species Act, further observation of this fishery was required. Additionally, in 1999 a revised Fishery Management Plan for Highly Migratory Species (HMS-FMP) established a 100% observer coverage requirement for this fishery at all times to improve estimates of catch, effort, bycatch, and bycatch mortality (Carlson and Lee 2000).

OBIS-SEAMAP Database

The OBIS-SEAMAP project (Ocean Biogeographic Information System - Spatial Ecological Analysis of Megavertebrate Populations) is a web-based, spatially referenced database. The system organizes marine mammal, seabird and sea turtle data in a way that allows for the interactive display, query, and analysis of Digital Archive in conjunction with environmental data (Read et al. 2003). The datasets we used in our analysis, which were compiled under the OBIS-SEAMAP, are outlined below.

SEFSC Southeast Cetacean Aerial Survey, 1992
Abstract: Southeast Cetacean Aerial Survey, SECAS, was conducted in 1992 by NMFS' Southeast Fisheries Science Center (SEFSC) to estimate cetacean abundance. This data set contains sightings of cetaceans and sea turtles as well as other species, including fish and shark, observed during the aerial survey. Marine mammals and sea turtles observed includes as follows: Cetacean: Atlantic spotted dolphin, northern right whale, standard Bottlenose dolphin; Sea Turtle: green turtle, hardshell, Kemp's ridley, leatherback, and loggerhead. Survey's transects information is available in 'SECAS92Efforts.' Visual representation of this data set will be provided in the forms of ESRI's coverage and shapefile.

Purpose: The purpose of this data set was to collect cetacean distribution data and allow for estimating cetacean abundance in the Southeast. These abundance estimates were expected to serve as a basis for estimating Potential Biological Removals (PBR) for the species stocks in the region in support of Marine Mammal Protection Act (MMPA) requirements. More specifically, the survey was to obtain an index of abundance for *Tursiops truncatus* so as to detect population trends by comparison with historical abundance data (SETS).

SEFSC Mid-Atlantic Tursiops Survey, 1995 No.1 - 3
Abstract: Mid-Atlantic Tursiops Surveys (MATS) were conducted in 1995 by NOAA Southeast Fisheries Science Center to examine the distribution and estimate an index of relative abundance for Atlantic bottlenose dolphins (*Tursiops truncatus*) inhabiting the nearshore coastal waters in mid-and southern Atlantic bight. This data set contains sightings of not only the target dolphins but also other species including cetaceans, sea turtles, fish and shark observed during the aerial surveys. The same transects were traced three times on different dates during the survey period. This data set is the first one. The other two are provided, too, with the number following MATS95s indicating the first, second and last. Cetacean and sea turtles observed include as follows: Cetacean: standard Bottlenose dolphin; Sea Turtle: hardshell, leatherback, and loggerhead. Survey's transects information is available in MATS95s1Efforts.

Purpose: The purpose of this survey was to examine the distribution and estimate an index of relative abundance for Atlantic bottlenose dolphins inhabiting the nearshore coastal waters of the U.S. mid- and southern Atlantic bight.

SEFSC Southeast Cetacean Aerial Survey, 1995
Abstract: Southeast Cetacean Aerial Survey, SECAS, was conducted in 1995 by NOAA Southeast Fisheries Science Center (SEFSC) to estimate cetacean abundance. This data set contains sightings of cetaceans and sea turtles as well as other species, including fish and shark, observed during the aerial survey. Marine mammals and sea turtles observed includes as follows. The full taxonomic information will be found in Taxonomy section. Cetacean: Atlantic spotted dolphin, Cuvier's beaked whale, humpback whale, northern

right whale, Pantropical spotted dolphin, standard Bottlenose dolphin, and striped dolphin; Sea Turtle: green turtle, hardshell, Kemp's ridley, leatherback, and loggerhead. Survey's transects information is available in 'SECAS95Efforts.' Visual representation of this data set will be provided in the forms of ESRI's coverage and shapefile.

Purpose: The purpose of this data set was to collect cetacean distribution data and allow for estimating cetacean abundance in the Southeast. These abundance estimates were expected to serve as a basis for estimating Potential Biological Removals (PBR) for the species stocks in the region in support of Marine Mammal Protection Act (MMPA) requirements. More specifically, the survey was to obtain an index of abundance for *Tursiops truncatus* so as to detect population trends by comparison with historical abundance data (SETS).

SEFSC Atlantic surveys, 1998
Information unavailable on the specifics of the survey.

SEFSC Atlantic surveys, 1999
Abstract: An Atlantic Ocean ship survey was conducted by NMFS' Southeast Fisheries Science Center to evaluate abundance, distribution and stock structure of cetaceans in southeastern U.S. Atlantic waters. Data gathered on this survey will provide abundance estimates for calculating the Potential Biological Removal for U.S. Atlantic waters as required by the 1994 amendments to the Marine Mammal Protection Act. During the 32 survey days, at least 12 cetacean species were sighted, including Atlantic spotted dolphin, Bottlenose dolphin, Clymene dolphin, common dolphin, Fraser's dolphin, Melon-headed whale, Pantropical spotted dolphin, pilot whale, Risso's dolphin, Rough-toothed dolphin, sperm whale, and striped dolphin. The dataset is accompanied by transect data which is provided as a separate file.

Purpose: The purpose of this survey is to examine the distribution and estimate abundance of cetaceans in U.S. waters. Specific objectives of this survey are: 1. Obtain minimum abundance estimate for calculating Potential Biological Removal for each species. 2. Collect biopsy tissue samples to evaluate stock structure. 3.Establish and build time-series databases for monitoring trends in abundance. 4. Examine distribution in relation to physiographic and oceanographic features. 5. Obtain photographs and video images of selected species for photo-identification studies.

Sea Turtle Stranding and Salvage Network
The Sea Turtle Stranding and Salvage Network (STSSN) was formally established in 1980 to collect information on and document strandings and incidental captures of marine turtles along the U.S. Gulf of Mexico and Atlantic coasts. The network encompasses the coastal areas of eighteen states, including all the states in South Atlantic region. Network participants document marine turtle strandings and incidental captures, including any fishing gear or other marine debris associated with the turtle, in their respective states and enter that data into a central STSSN database.