Fishery Management Report No. 46

of the

Atlantic States Marine Fisheries Commission

Working towards healthy, self-sustaining populations for all Atlantic coast fish species or successful restoration well in progress by the year 2015.

Interstate Fishery Management Plan
for Atlantic Coastal Sharks

August 2008

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Prepared by

Atlantic States Marine Fisheries Commission
Coastal Sharks Plan Development Team

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This Management Plan was prepared under the guidance of the Atlantic States Marine Fisheries Commission's Spiny Dogfish & Coastal Sharks Management Board, Chaired by Eric Smith of Connecticut. The Coastal Sharks Technical Committee, Advisory Panel, and Law Enforcement Committee provided technical and advisory assistance.

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EXECUTIVE SUMMARY

1.0 Introduction

In 2000, ASMFC formed the Spiny Dogfish and Coastal Sharks Management Board (Board). The Commission tasked this Board with developing fishery management plans (FMPs) for spiny dogfish and coastal sharks. Due to concern over the status of the spiny dogfish stocks, the Board first completed the Interstate FMP for Spiny Dogfish in 2002. The Management Board is now actively addressing the development of an Interstate Coastal Sharks FMP.

In May 2005, ASMFC received a letter from NOAA Fisheries requesting ASMFC to initiate the development of an interstate FMP for Atlantic coastal sharks. With the successful coordination of an interstate and federal management program for spiny dogfish (*Squalus acanthias*), NOAA Fisheries requested the Commission dedicate similar efforts towards the establishment of an interstate management program for coastal shark species.

Later in May 2005, ASMFC received an additional letter from NOAA Fisheries seeking assistance in addressing issues specifically related to finetooth shark (*Carcharhinus isodon*) management in the south Atlantic region. At that time, NOAA Fisheries had determined that overfishing of this species was occurring. NOAA Fisheries has now determined overfishing is not occurring on this species but is occurring on blacknose sharks (May 7, 2008, 73 FR 25665). However, there is very little existing information regarding recreational and commercial landings of either shark species in state and federal waters. Because these sharks primarily inhabit inshore, shallow waters, getting more information on landings in state waters is essential to determining the best course of action to take in order to reduce fishing mortality.

NOAA Fisheries believes that coordinated state management is a vital step towards establishing healthy self-sustaining populations of Atlantic coastal sharks and that eliminating inconsistencies in shark management will address enforcement concerns and strengthen shark rebuilding efforts at the federal and state levels.

The Interstate Fishery Management Program (ISFMP) Policy Board met during the May 2005 Commission meeting in part to discuss the management requests from NOAA Fisheries. During this meeting it was recognized that ASMFC had previously indicated it would develop an interstate coastal shark FMP after the successful completion and adoption of the interstate FMP for spiny dogfish. During this meeting, the Policy Board discussed a variety of issues relating to the development of a new Interstate FMP including Commission resources, workload and priorities, full and careful consideration of all issues, potential partnership with and support from NOAA Fisheries, and fairness amongst states. After consideration of the above issues, the Spiny Dogfish and Coastal Sharks Management Board approved in August 2005 to initiate development of an Interstate FMP for Atlantic Coastal Sharks.

2.0 Goals and Objectives, Management Unit, overfishing definition

The goal of the Interstate Fishery Management Plan for Coastal Sharks is to promote stock rebuilding and management of the coastal shark fishery in a manner that is biologically, economically, socially, and ecologically sound.

In support of this goal, the following objectives proposed for the Interstate Shark FMP:

- Reduce fishing mortality to rebuild stock biomass, prevent stock collapse, and support a sustainable fishery.

- Protect essential habitat areas such as nurseries and pupping grounds to protect sharks during particularly vulnerable stages in their life cycle.
- Coordinate management activities between state and federal waters to promote complementary regulations throughout the species' range.
- Obtain biological and improved fishery related data to increase understanding of state water shark fisheries.
- Minimize endangered species bycatch in shark fisheries.

Specification of the Management Unit *(2.4)*
The management unit for the Interstate Fishery Management Plan for Coastal Sharks is defined as the range of the coastal sharks resource within the US waters of the Northwest Atlantic Ocean. It is recognized that the Atlantic shark resource, as defined here, is interstate and state-federal in nature, and that effective assessment and management can be enhanced through cooperative efforts with all Atlantic state and federal scientists and fisheries managers.

Overfishing Definition *(2.5)*
This plan does not define overfishing. The management options were developed to compliment the federal management program that defines overfishing based on the probability of achieving maximum sustainable yield as defined in the Magnusson Stevens Fisheries Conservation and Management Act. Reference points can be developed in the future through the addendum process as part of *Section 4.5 Adaptive Management.*

Implementation Schedule *(2.6)*
The Interstate Fishery Management Plan for Atlantic Coastal Sharks was approved and adopted by the Commission on August 21, 2008. States are required to implement the provisions by January 1, 2009.

3.0 Monitoring program specification

This plan does not establish mandatory monitoring requirements for states because current shark survey funding is contingent on outside funding sources.

4.0 Management Program Implementation

Recreational Fisheries Management Measures *(4.2)*
Recreational Seasonal Closure *(4.2.1)*
Recreational anglers are prohibited from possessing silky, tiger, blacktip, spinner, bull, lemon, nurse, scalloped hammerhead, great hammerhead, and smooth hammerhead in the state waters of Virginia, Maryland, Delaware and New Jersey from May 15 through July 15—regardless of where the shark was caught. Fishermen who catch any of these species in federal waters may not transport them through the state waters of VA, MD, DE, and NJ during the seasonal closure.

Recreationally Permitted Species *(4.2.2)*
Recreational anglers may catch any species that is not illegal to land by recreational anglers in federal waters. Conversely, recreational anglers are prohibited from possessing any shark species that is illegal to catch or land by recreational anglers in federal waters. As federal recreationally prohibited shark species change, recreationally prohibited shark species in state waters change automatically without Board action.

Landings Requirements *(4.2.3)*
All sharks caught by recreational fishermen must have heads, tails, and fins attached naturally to the carcass. Anglers may still gut and bleed the carcass by making an incision at the base of the caudal peduncle as long as the tail is not removed. Filleting sharks at sea is prohibited.

Recreational Minimum Size Limits *(4.2.4)*
Sharks caught in the recreational fishery must have a fork length of at least 4.5 feet (54 inches) *with the exception of Atlantic sharpnose, blacknose, finetooth, bonnethead, and smooth dogfish*.

Authorized Recreational Gear *(4.2.5)*
Recreational anglers may catch sharks only using a handline or rod & reel. Handlines are defined as a mainline to which no more than two gangions or hooks are attached. A handline must be retrieved by hand, not by mechanical means.

Recreational Fishing License *(4.2.6)*
States are encouraged, but not required, to adopt a marine fishing license to collect, among other things, recreational data on sharks.

Recreational Possession Limits *(4.2.7)*
This FMP establishes different possession limits for shore-anglers and vessel-fishermen. When aboard a vessel, anglers are bound by the more restrictive vessel-fishing possession limits, regardless of the location where the sharks were caught.

Recreational Shore-Angler Possession Limits *(4.2.7.1)*
Shore fishing is defined as any fishing that does not take place on board a vessel. The terms 'shore-fishermen' and 'shore-angler' are synonymous, describing any person engaged in shore fishing.

Each recreational shore-angler is allowed a maximum harvest of one shark from the federal recreationally permitted species (*Section 4.2.2*), including smooth dogfish, per calendar day. In addition, each recreational shore angler may harvest one additional bonnethead, and one additional Atlantic sharpnose, and one additional smooth dogfish per calendar day.

Sharks that are transported by a vessel are considered 'boat assisted' and are regulated under the more restrictive vessel-fishing possession limits regardless of where they were caught.

Recreational Vessel-Fishing Possession Limits *(4.2.7.2)*
Vessel fishing is defined as any fishing conducted from a vessel. The word "vessel" includes every description of watercraft used or capable of being used as a means of transportation on water except for non-displacement craft and seaplanes.

Recreational fishing vessels are allowed a maximum harvest of one shark from the federal recreationally permitted species (*Section 4.2.2)*, including smooth dogfish, per trip, regardless of the number of people on board the vessel. In addition, each recreational angler fishing from a vessel may harvest one bonnethead, and one Atlantic sharpnose, and one smooth dogfish per trip.

Sharks that are transported by a vessel are considered 'boat assisted', and are regulated under the more restrictive vessel-fishing possession limits regardless of where they were caught

<u>Commercial Fisheries Management Measures</u> *(4.3)*

Commercial Fishing Year *(4.3.1)*
The commercial shark fishery shall operate on a January 1 – December 31 fishing year. All annual fishery specifications begin on January 1 of each fishing year.

Commercial Seasonal Closure *(4.3.2)*
All commercial fishermen are prohibited from possessing silky, tiger, blacktip, spinner, bull, lemon, nurse, scalloped hammerhead, great hammerhead, and smooth hammerhead in the state waters of Virginia, Maryland, Delaware and New Jersey from May 15 through July 15.

Commercial Species Groupings *(4.3.3)*
This FMP establishes six commercial 'species groups' for management: Prohibited, Research, Smooth Dogfish, Small Coastal (SCS), Non-Sandbar Large Coastal (LCS), and Pelagic. These groupings apply to all commercial shark fisheries in state waters.

Prohibited and Research Species Groups (4.3.3.1)
The Prohibited Species Group consists of the following species: sand tiger, bigeye sand tiger, whale, basking, white, dusky, bignose, Galapagos, night, reef, narrowtooth, Caribbean sharpnose, smalltail, Atlantic angel, longfin mako, bigeye thresher, sharpnose sevengill, bluntnose sixgill, and bigeye sixgill sharks.

The Research Species Group consists of sandbar sharks.

Fishermen are prohibited from catching or landing any species in either the Prohibited or Research Species Groups without a state display or research permit as specified in *Section 4.3.8.2, Display and Research Permits.*

Smooth Dogfish, Small Coastal, Non-Sandbar Large Coastal, and Pelagic Species Groups *(4.3.3.2)*
Commercial fishermen may harvest any sharks in the Smooth Dogfish, Small Coastal, Non-Sandbar Large Coastal, and Pelagic Species Groups as long as they are in compliance with all rules and regulations contained in this plan.

The Smooth Dogfish Species Group consists of smooth dogfish sharks.

The Small Coastal Sharks Species Group consists of Atlantic sharpnose, finetooth, blacknose, and bonnethead sharks.

The Non-Sandbar Large Coastal Sharks Species Group consists of silky, tiger, blacktip, spinner, bull, lemon, nurse, scalloped hammerhead, great hammerhead, and smooth hammerhead sharks.

The Pelagic Species Group consists of shortfin mako, porbeagle, common thresher, oceanic whitetip, and blue sharks.

Quota Specification *(4.3.4)*
The Spiny Dogfish & Coastal Sharks Board will not actively set quotas for any species contained in the SCS, Non-Sandbar LCS, or Pelagic species groups but will close the fishery for any species in these groups when NOAA Fisheries closes the fishery in federal waters. When NOAA Fisheries closes the fishery for any species, the commercial landing, harvest, and possession of that species will be prohibited in state waters until NOAA Fisheries reopens the fishery. Upon receiving notification of a federal quota, the FMP Coordinator for Coastal Sharks will notify ASMFC states about which species can no longer be harvested. The state waters fishery will reopen only when NOAA Fisheries reopens the fishery for that species or species group in federal waters.

The Board has the authority but is not required to set an annual quota for smooth dogfish as it finds appropriate (*Section 4.3.7)*. In the event that an annual smooth dogfish quota is set, and when an annual quota is harvested or projected to be harvested, the commercial landing, harvest, and possession of smooth dogfish will be prohibited in state waters.

Seasons *(4.3.5)*
The Board is not required, but has the option, to split the annual quota among seasonal periods for all groups.

Possession Limits *(4.3.6)*
Possession limits for commercial shark fisheries will be set annually through the specification setting process described in *Section 4.3.7*. The Board may use number of fish or weight to set the possession limit. Vessels are prohibited from landing more than the specified amount in one twenty-four hour period.

Display and Research Permit holders may be exempt from possession limits restrictions (*Section 4.3.8.2)* depending on their permit agreement.

Annual Process for Setting Fishery Specifications *(4.3.7)*
The Spiny Dogfish & Coastal Sharks Management Board may set a quota for the Smooth Dogfish species group; and possession limits for the Smooth Dogfish, Small Coastal, Non-Sandbar Large Coastal, and Pelagic species groups as follows.

The Coastal Sharks Technical Committee (TC) will annually review the best available data, and based on this review, will make quota and possession limit recommendations to the Board. Specifically, the TC must recommend a quota for the Smooth Dogfish Species Group and possession limits for the Smooth Dogfish, SCS, Non-Sandbar LCS, and Pelagic Species Groups. The TC may recommend not setting a quota for Smooth Dogfish or trip limits for any species group as they find appropriate. The Coastal Sharks TC's recommendations will be forwarded to the Board for final approval.

The Board will consider the TC's recommendations and determine the quota and possession limits for the following year. The Board has the option, but is not required, to set a quota and trip limits as it finds appropriate.

In addition, the Board has the option, but is not required to set the specifications for up to 5 years. Multi-year specifications may be useful for fishing industries to set long term business strategies. Specifications do not have to be constant from year to year, but instead are based upon expectations of future stock conditions as indicated by the best available scientific information during the year in which specifications are set. Under this management program, if a multi-year commercial quota and/or possession limit is implemented, annual review of updated information on the fishery and stock conditions by the Technical Committee and Management Board is required. As part of the annual review process, the specified management measures will be evaluated based upon updated scientific information of stock conditions. If scientific review finds that no adjustment to the subsequent year's specifications is needed, then the existing management measures will be considered adequate and implemented the following year. If, however, updates to stock conditions determine that specified measures should be modified, then the Spiny Dogfish & Coastal Sharks Board will be presented with this information and a new specification setting process will be initiated.

All specifications shall remain in place until changed by the Spiny Dogfish & Coastal Sharks Management Board. All states must implement measures contained in the final decision made by the Board.

In summary, the steps for setting fishery specifications are:

1. The Technical Committee reviews the most recent stock status data and makes fishery specification recommendations to the Management Board.
2. The Board considers the recommendations of the Technical Committee and establishes fishery specifications.

Permit Requirements *(4.3.8)*
Fishermen are required to hold the following permits in order to harvest more and/or different species than the recreational regulations contained in this FMP allow.

Commercial Permit *(4.3.8.1)*
Commercial shark fishermen must hold a state commercial license or permit in order to commercially catch and sell sharks in state waters. This requirement does not require that states establish a new "shark" permit or license.

Display and Research Permits (4.3.8.2)
States may grant exemptions from the seasonal closure, quota, possession limit, size limit, gear restrictions, and prohibited species restrictions contained in this plan through a state display or research permit system. Exemptions may only be granted for display and/or research purposes. States must report weight, species, location caught, and gear used for each shark collected for research or display as part of their annual compliance report. States are required to include annual information for all sharks taken for display throughout the life of the shark. These reporting requirements are necessary to ensure that sharks taken under the auspice of 'display' are not sold in illegal markets.

Dealer Permit (4.3.8.3)
A federal Commercial Shark Dealer Permit is required to buy and sell any shark caught in state waters.

Authorized Commercial Gear *(4.3.9)*
Commercial fishermen can only use one of the following gear types (and are prohibited from using any gear type not listed below) to catch sharks in state waters. Fishermen with a federal shark permit who are fishing outside of state waters are not restricted to these gear types and may land sharks using any gear that is in accordance with the rules and regulations established by NOAA Fisheries.

The following gear types are *the only* gear authorized for use by commercial fishermen to catch sharks in state waters:
- **Rod & reel**
- **Handlines**. Handlines are defined as a mainline to which no more than two gangions or hooks are attached. A handline is retrieved by hand, not by mechanical means, and must be attached to, or in contact with, a vessel.
- **Small Mesh Gillnets**. Defined as having a stretch mesh size smaller than 5 inches
- **Large Mesh Gillnets.** Defined as having a stretch mesh size equal to or greater than 5 inches.
- **Trawl nets.**
- **Shortlines.** Shortlines are defined as fishing lines containing 50 or fewer hooks and measuring less than 500 yards in length. A maximum of 2 shortlines are allowed per vessel.
- **Pound nets/fish traps.**
- **Weirs.**

Bycatch Reduction Measures *(4.3.10)*
Vessels using shortlines and large-mesh gillnets to catch sharks must abide by the following regulations. Any vessels that employ these gear types and do not follow the bycatch reduction measures may not land or sell any sharks.

Any vessel using a shortline must use corrodible circle hooks[1]. All shortline vessels must practice the protocols and possess the recently updated federally required release equipment for pelagic and bottom longlines for the safe handling, release, and disentanglement of sea turtles and other non-target species; all captains and vessel owners must be certified in using handling and release equipment. Captains and vessel owners can become certified by attending a Protected Species Safe Handling, Release, and Identification Workshop offered by NOAA Fisheries. Information on these workshops can be found at http://www.nmfs.noaa.gov/sfa/hms/workshops/index.htm or by calling the Management Division at (727)-824-5399.

Large-mesh gillnets (defined as having a stretch mesh size greater than or equal to 5 inches) must be shorter than 2.5 kilometers and nets must be checked once every two hours.

Finning and Identification *(4.3.11)*
All sharks harvested by commercial fishermen within state boundaries must have the tails and fins attached naturally to the carcass through landing. Fins may be cut as long as they remain attached to the carcass (by natural means) with at least a small portion of uncut skin. Sharks may be eviscerated and have the heads removed. Sharks may not be filleted or cut into pieces at sea.

ADAPTIVE MANAGEMENT *(4.5)*
The Spiny Dogfish and Coastal Sharks Management Board may vary the requirements specified in this management plan as part of adaptive management to conserve the coastal shark resource. Such changes will be instituted to be effective on the first fishing day of the following year, but may be put in place at an alternative time when deemed necessary by the Management Board. These changes should be discussed with the appropriate federal representatives and Councils prior to implementation in order to be complementary to the regulations for the EEZ.

Measures Subject to Change *(4.5.2)*
The following measures are subject to change under adaptive management upon approval by the Spiny Dogfish and Coastal Sharks Management Board:

1. Overfishing definition;
2. Rebuilding targets and schedules;
3. Management areas;
4. Fishing year and/or seasons/trimesters;
5. Fishing year specification process;
6. Annual specifications for total allowable landings;
7. Possession limits;
8. Seasonal allocation;
9. Seasonal allocation proportions;
10. Biomedical research set asides;
11. Biological research set asides;
12. Measures to monitor, control, or reduce bycatch;
13. Compliance efficiency;
14. Observer requirements;

15. Reporting requirements;
16. Research or monitoring requirements;
17. Size limits;
18. Area closures;
19. Catch controls;
20. Gear limitations including limitations of commercial gears;
21. Effort controls;
22. State-by-state allocation of the coastwide quota;
23. Regional allocation of the quota;
24. Allocation of or proportions designated to the components of the regional quota scheme;
25. Transferability of quota;
26. Regulatory measures for the recreational fishery;
27. Recommendations to the Secretaries for complementary actions in federal jurisdictions;
28. Species groupings;
29. Prohibited species;
30. Closures;
31. Dealer reporting schedule or requirements;
32. Logbook reporting schedule of requirements;
33. *De minimis* specifications;
34. Scientific & research permit harvest quotas;
35. Compliance report due dates;
36. Habitat description and designation;
37. Any other management measures currently included in the Coastal Sharks Management Plan.

5.0 Compliance

MANDATORY COMPLIANCE ELEMENTS FOR STATES *(5.1)*

A state will be determined to be out of compliance with the provisions of this fishery management plan, according to the terms of Section Seven of the ISFMP Charter if:

$ Its regulatory and management programs to implement *Section 4* have not been approved by the Spiny Dogfish and Coastal Sharks Management Board; or
$ It fails to meet any schedule required by *Section 5.1.2*, or any addendum prepared under adaptive management (*Section 4.5*); or
$ It has failed to implement a change to its program when determined necessary by the Spiny Dogfish and Coastal Sharks Management Board; or
$ It makes a change to its regulations required under *Section 4* or any addendum prepared under adaptive management (*Section 4.5*), without prior approval of the Spiny Dogfish and Coastal Sharks Management Board.

Mandatory Elements of State Programs *(5.1.1)*

To be considered in compliance with this fishery management plan, all state programs must include harvest controls on Atlantic coastal sharks fisheries consistent with the requirements of *Sections 4.0, 4.1, 4.2 and 4.3****;*** except that a state may propose an alternative management program under *Section 4.4*, which, if approved by the Management Board, may be implemented as an alternative regulatory requirement for compliance.

Regulatory Requirements (5.1.1.1)

States shall begin to implement the Interstate Fishery Management Plan for Atlantic Coastal Sharks after final approval by the Commission. Each state must submit its required coastal sharks regulatory program to the Commission through the ASMFC staff for approval by the Spiny Dogfish and Coastal Sharks Management Board. During the period from submission and until the Management Board makes a decision on a state's program, a state may not adopt a less protective management program than contained in this management plan or contained in current state law.

The following lists the specific compliance criteria that a state/jurisdiction must implement in order to be in compliance with the Interstate Fishery Management Plan for Atlantic Coastal Sharks:

1. Recreational seasonal closure as specified in *Section 4.2.1*.
2. Recreational prohibition of species that are illegal to land by recreational anglers in federal waters.
3. All sharks caught by recreational fishermen must have head, tail, and fins attached to carcass.
4. Sharks caught in the recreational fishery must have a fork length of at least 4.5 feet with the exception of Atlantic sharpnose, blacknose, finetooth, bonnethead, and smooth dogfish.
5. Recreational anglers may only use handlines and rod & reel.
6. Recreational possession limits as specified in *Section 4.2.7.1* and *4.2.7.2*
7. Commercial seasonal closure as specified in *Section 4.3.2*.
8. Quota specifications as specified in *Section 4.3.4*.
9. Ability to allocate quotas seasonally as specified in *Section 4.3.5*.
10. Possession limits as specified in *Section 4.3.6*.
11. Commercial permit requirement.
12. Display and research permit requirements.
13. Federal Commercial Shark Dealer Permit requirement.
14. Prohibition of use of any gear type not listed in *Section 4.3.9*.
15. Shortline and gillnet bycatch reduction measures as specified in section *4.3.10*.
16. All sharks caught by commercial fishermen must have tails and fins attached naturally to the carcass through landing.

Once approved by the Spiny Dogfish and Coastal Sharks Management Board, states are required to obtain prior approval from the Board of any changes to their management program for which a compliance requirement is in effect. Other measures must be reported to the Board but may be implemented without prior Board approval. A state can request permission to implement an alternative to any mandatory compliance measure only if that state can show to the Board's satisfaction that its alternative proposal will have the same conservation value as the measure contained in this management plan or any addenda prepared under Adaptive Management (*Section 4.5*). States submitting alternative proposals must demonstrate that the proposed action will not contribute to overfishing of the resource. All changes in state plans must be submitted in writing to the Board and to the Commission either as part of the annual FMP Review process or the Annual Compliance Reports.

Compliance Schedule *(5.1.2)*
States must implement the Atlantic Coastal Sharks Management Plan according to the following schedule:

October 1st, 2008: States must submit programs to implement the Atlantic Coastal Sharks Management Plan for approval by the Spiny Dogfish & Coastal Sharks Management Board.

January 1st 2009: All states must implement the Atlantic Coastal Sharks Management Plan with their approved management programs. States may begin implementing management programs prior to this deadline if approved by the Management Board.

Reports on compliance must be submitted to ASMFC by each jurisdiction annually, no later than **August 1, beginning in 2009**

Compliance Report Content *(5.1.3)*
Each state must submit an annual report concerning its coastal sharks fisheries and management program for the previous fishing year. Reports should follow the standard report for compliance reports, as was adopted by the ISFMP Policy Board. The report shall cover:

- The previous fishing year's fishery and management program including activity and results of regulations that were in effect and harvest, including estimates of non-harvest losses;
- The planned management program for the current fishing year summarizing regulations that will be in effect and highlighting any changes from the previous year; and
- The number of coastal sharks taken for display and research (*Section 4.3.8.2)* in the previous fishing year. States must report weight, species, location caught, and gear type used for each shark collected for research and display purposes. This report should also indicate the number of exempted fishing permits issued for the previous fishing year.
- The status of any shark taken for display purposes each year through the life of the shark.

6.0 Management and Research Needs

The Coastal Sharks Fishery Management Plan contains a list of management and research needs that should be addressed in the future in order to improve the current state of knowledge of coastal sharks biology, stock assessment, population dynamics, habitat issues, social and economic issues. By no means are these lists of management and research needs all-inclusive. The management and research needs will be reviewed, updated, and reprioritized annually through the ASMFC's FMP Review process.

7.0 Protected Species

The Coastal Sharks Fishery Management Plan provides an overview of the protected species known to occur throughout the range of spiny dogfish and that have potential interactions with spiny dogfish fisheries.

ACKNOWLEDGEMENTS

The Interstate Fishery Management Plan for Atlantic Coastal Sharks was developed under the supervision of the Atlantic States Marine Fisheries Commission's Spiny Dogfish and Coastal Shark Management Board, chaired by Eric Smith of Connecticuit. Members of the Plan Development Team (PDT) included Christopher M. Vonderweidt (Atlantic States Marine Fisheries Commission, PDT Chair), Karyl Brewster-Geisz (NOAA Fisheries Office of Sustainable Fisheries), Greg Skomal (Massachusetts Division of Marine Fisheries), Dr. Donna Fisher (Georgia Southern University), and Fritz Rohde (North Carolina Division of Marine Fisheries).

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The Plan Development Team would also like to thank LeAnn Southward Hogan (NOAA Fisheries Office of Sustainable Fisheries), Toni Kerns (ASMFC), Nichola Meserve (ASMFC), Braddock Spear (ASMFC), Steve Meyers (NOAA Fisheries Office of Sustainable Fisheries), and Claire McBane (NH DMF) for their assistance in editing this FMP.

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1.1 BACKGROUND INFORMATION

1.1.1 Statement of the Problem

In 2000, ASMFC formed the Spiny Dogfish and Coastal Sharks Management Board (Board). The Commission tasked this Board with developing fishery management plans (FMPs) for spiny dogfish and coastal sharks. Due to concern over the status of the spiny dogfish stocks, the Board first completed the Interstate FMP for Spiny Dogfish in 2002. The Management Board is now actively addressing the development of an Interstate Coastal Sharks FMP.

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1.1.2 Benefits of Implementation

1.1.2.1 Social and Economic Benefits

Many species of coastal sharks have been in a depleted state and continue to be vulnerable to collapse if fishing pressure continues as it has in recent years. Any regulatory action that effectively reduces fishing mortality to levels consistent with a high probability of recovery will result in short-term adverse effects on both the harvesting and processing sectors of the coastal shark fishery. Concomitantly, reduction of fishing mortality to levels consistent with short-term recovery and, later, long-term sustainability will provide long-term economic opportunity in both the harvesting and processing sectors. Sustaining a viable coastal shark fishery benefits fishing communities by helping maintain diversity in the industry and providing opportunities to harvest, process, and further develop support industries.

1.1.2.2 Ecological Benefits

Coordinated state management is a vital step towards establishing healthy self-sustaining populations of Atlantic coastal sharks. Prior to this plan, some states mirrored federal regulations for Atlantic sharks, while other states had no shark management (other than spiny dogfish) or had regulations inconsistent with the federal FMP. This plan, coupled with the federal regulations, provides comprehensive management coverage for Atlantic coastal sharks throughout their range in US waters.

A key part to enhance recovery of depleted shark populations is to reduce the mortality of juvenile sharks. Because many species depend on coastal estuaries and bays as pupping and nursery grounds, protection of sharks in state waters is vital to a successful management plan.

This plan proposes to speed rebuilding of the most vulnerable and depleted species by prohibiting their harvest completely.

1.2 DESCRIPTION OF THE RESOURCE

1.2.1 Species Life History

Sharks belong to the class Chondrichthyes (cartilaginous fishes) that also includes rays, skates, and deepwater chimaeras (ratfishes). From an evolutionary perspective, sharks are an old group of fishes characterized by skeletons lacking true bones. The earliest known sharks have been identified from fossils from the Devonian period, over 400 million years ago. These primitive sharks were small creatures, about 60 to 100 cm long, that were preyed upon by larger armored fishes that dominated the seas. The life span of all shark species in the wild is not known, but it is believed that many species may live 30 to 40 years or longer.

Relative to other marine fish, sharks have a very low reproductive potential. Several important commercial species, including large coastal carcharhinids, such as sandbar (*Carcharhinus plumbeus*) (Casey and Hoey, 1985; Sminkey and Musick, 1995; Heist et al., 1995), lemon (*Negaprion brevirostris*) (Brown and Gruber, 1988), and bull sharks (Branstetter and Stiles, 1987), do not reach maturity until 12 to 18 years of age. Various factors determine this low reproductive rate: slow growth, late sexual maturity, one to two-year reproductive cycles, a small number of young per brood, and specific requirements for nursery areas. These biological factors leave many species of sharks vulnerable to overfishing.

There is extreme diversity among the approximately 350 species of sharks, ranging from tiny pygmy sharks of only 20 cm (7.8 in) in length to the giant whale sharks, over 12 meters (39 feet) in length. There are fast-moving, streamlined species such as mako (*Isurus* spp.) and thresher sharks (*Alopias* spp.), and sharks with flattened, ray-like bodies, such as angel sharks (Squatina dumerili). The most commonly known sharks are large apex predators including the white (Carcharadon carcharias), mako, tiger (*Galeocerdo cuvier*), bull (*Carcharhinus leucas*), and great hammerhead (*Sphyrna mokarran*). Some shark species reproduce by laying eggs, others nourish their embryos through a placenta. Despite their diversity in size, feeding habits, behavior and reproduction, many of these adaptations have contributed greatly to the evolutionary success of sharks.

The most significant reproductive adaptations of sharks are internal fertilization and the production of fully developed young or "pups." These pups are large at birth, effectively reducing the number of potential predators and enhancing their chances of survival. During mating, the male shark inseminates the female with copulatory organs, known as claspers that develop on the pelvic fins. In most species, the embryos spend their entire developmental period protected within their mother's body, although some species lay eggs. The number of young produced by most shark species in each litter is small, usually ranging from two to 25, although large females of some species can produce litters of 100 or more pups. The production of fully developed pups requires great amounts of nutrients to nourish the developing embryo. Traditionally, these adaptations have been grouped into three modes of reproduction: oviparity (eggs hatch outside body), ovoviviparity (eggs hatch inside body), and viviparity (live birth).

Adults usually congregate in specific areas to mate and females travel to specific nursery areas to pup. These nurseries are discrete geographic areas, usually in waters shallower than those inhabited by the adults. Frequently, the nursery areas are in highly productive coastal or estuarine waters where abundant small fishes and crustaceans provide food for the growing pups. These areas also may have fewer large predators, thus enhancing the chances of survival of the young sharks. In temperate zones, the young leave the nursery with the onset of winter; in tropical areas, young sharks may stay in the nursery area for a few years.

Shark habitat can be described in four broad categories: (1) coastal, (2) pelagic, (3) coastal-pelagic, and (4) deep-dwelling. Coastal species inhabit estuaries, the nearshore and waters of the continental shelves, e.g., blacktip (*Carcharhinus limbatus*), finetooth, bull, lemon, and sharpnose sharks *(Rhizoprionondon terraenovae*). Pelagic species, on the other hand, range widely in the upper zones of the oceans, often traveling over entire ocean basins. Examples include shortfin mako (Isurus oxyrinchus), blue (Prionace glauca), and oceanic whitetip (*Carcharhinus longimanus*) sharks. Coastal-pelagic species are intermediate in that they occur both inshore and beyond the continental shelves, but have not demonstrated mid-ocean or transoceanic movements. Sandbar sharks are examples of a coastal-pelagic species. Deep dwelling species (e.g., most cat sharks (*Apristurus* spp.) and gulper sharks (*Centrophorus* spp.)) inhabit the dark, cold waters of the continental slopes and deeper waters of the ocean basins.

ASMFC manages Spiny dogfish (*Squalus acanthias*), a shark species common along the Atlantic coast, separately under the 2002 Interstate Fishery Management Plan for Spiny Dogfish.

1.2.2 Stock Assessment Summary

All following sections provide brief summaries of the stock assessment reports listed below. Please refer to the documents themselves for more detail.

The most recent stock assessment documents for Atlantic coastal sharks are the 2005 Stock Assessment for Porbeagle Sharks (DFO 2005), 2006 Stock Assessment of Dusky Shark in the U.S. Atlantic and Gulf of Mexico (Cortez et al. 2006), 2006 Southeast Data, Assessment and Review (SEDAR) Large Coastal Shark (LCS) Assessment (NOAA 2006), and 2007 SEDAR Small Coastal Shark (SCS) Assessment (NOAA 2007). Appropriate interstate management of coastal sharks requires the use of all of these documents.

1.2.2.1 2005 Stock Assessment for Porbeagle Sharks

The following paragraph is an excerpt from Draft Amendment 2 to the Consolidate Atlantic Highly Migratory Species Fisheries Management Plan

> *A stock assessment was conducted for North Atlantic porbeagle sharks in 2005 by the Canadian Department of Fisheries and Oceans. This assessment was reviewed by NOAA Fisheries and determined to be the best available science and appropriate for use in U.S. domestic management. Results indicate that porbeagle sharks are overfished, however, overfishing is not occurring. The assessment recommended that there is a 70-percent probability of rebuilding in 100 years if F levels are maintained at or below 0.04 (current F level).*

1.2.2.2 2006 Stock Assessment of Dusky Shark in the U.S. Atlantic and Gulf of Mexico

The 2006 assessment used a variety of methodologies, all of which indicated that dusky populations have been heavily exploited. Four of the five time series examined showed statistically significant decreasing trends in average weight. The vast majority of biomass dynamic models all predicted depletions >80% of virgin biomass. The catch-free model runs all had outcomes consistent that the stock is overfished with overfishing occurring.

The report notes that the results are ‘hardly surprising’ given the biology of the species, which is characterized by very late age at first reproduction (~20 years), high longevity (> 40 years), and very limited reproductive potential, which result in low population growth rates and long generation times (30 years).

The Interstate Fishery Management Plan for Atlantic Coastal Sharks and current federal regulations prohibit fishermen from directing on or landing dusky sharks in any capacity.

1.2.2.3 SEDAR 11 Stock Assessment Report, Large Coastal Shark Complex, Blacktip and Sandbar Shark

Following protocol, the 11th SEDAR LCS stock assessment was organized into a data workshop, and assessment workshop, and an independently peer reviewed workshop. The SEDAR process emphasizes constituent and stakeholder participation in the assessment development, transparency in the assessment process, and a rigorous and independent scientific review of the completed stock assessment.

Unlike past assessments, the 2005/2006 LCS stock assessment determined that it is inappropriate to assess the LCS complex as a whole due to the variation in life history parameters, different intrinsic rates of increase, and different catch and abundance data for all species included in the LCS complex. Based on these results, NOAA Fisheries has changed the status of the LCS complex from overfished to unknown. According to this assessment sandbar sharks are overfished and overfishing is occurring. Blacktip sharks were assessed for the first time as two separate populations: Gulf of Mexico and Atlantic. The results indicate that the Gulf of Mexico stock is not overfished and overfishing is not taking place. This assessment also indicated that the current status of blacktip sharks in the Atlantic region is unknown.

1.2.2.4 SEDAR 13 Stock Assessment Report, Small Coastal Sharks

On November 13, 2007 (72 FR 63888), NOAA Fisheries published a Notice of Availability announcing the availability of the final SCS stock assessment report. NOAA Fisheries has not published formal determinations for the SCS species, however a summary of the outputs from the data and assessment workshops for each species is provided below.

The team of independent peer reviewers for SEDAR 13 considered the data to be the 'best available at the time' and determined the status of the complex to be 'adequate.' The Review Panel based their recommendations on species-specific results rather than aggregated small coastal complex results. The following is an excerpt of the Executive Summary from the Consensus Summary Report.

> *For* **finetooth sharks**, *the population model and resulting population estimates are considered the best possible given the data available. Stock status was determined from the results of a range of general production model fits reflecting the Panel's uncertainty about life history parameters, catches and indices of abundance. Results indicated that the stock is not overfished and overfishing is not occurring. While it is reasonable to conclude that the stock is not presently overfished, the impact of index choice when so few are applicable (2002 assessment results versus current assessment results) suggest that management should be cautious.*
>
> *For* **blacknose sharks**, *appropriate standard assessment methods based on general production models and on age-structured modeling were used to derive management benchmarks. The current assessment indicates that spawning stock fecundity (SSF) in 2005 and during 2001-2005 is smaller than SSFmsy, i.e. that blacknose shark are overfished. The estimate of fishing mortality rate in 2005 and the average for 2001-2005 is greater than Fmsy, and the ratio is substantially greater than 1 in both cases. Thus, overfishing was occurring and is likely still occurring. However, because of uncertainties in indices, catches and life history parameters, the status of blacknose shark could change substantially in the next assessment in an unpredictable direction.*
>
> *For* **Atlantic sharpnose sharks**, *the Panel concluded that the data used for the analyses were treated appropriately. The assessment does not show the SSF index*

falling below the threshold over the period considered, but the ratio index shows an almost continuous decline towards it. While it is reasonable to conclude that the stock is not presently overfished, the fact that F is close to, but presently below, F_{MSY} (i.e. overfishing is not occurring) means that if F is maintained, the stock will continue to decline toward the SSF threshold and will fall below it as F fluctuates around F_{MSY}. It would therefore be desirable to distinguish between targets and thresholds.

In terms of **bonnethead sharks***, the Panel accepts the conclusion of the current assessment that it is likely that SSF is greater than SSF_{MSY}, i.e. that bonnethead are not overfished. The estimate of fishing mortality rate in 2005 is less than F_{MSY}, thus overfishing was not occurring in that year. However, fishing mortality rates in the recent past have fluctuated above and below F_{MSY}. Thus, there is some probability that fishing mortality rates in 2006 and 2007 have been or will be in excess of F_{MSY}*

1.3 DESCRIPTION OF THE FISHERY

Unless otherwise specified the main sources of the following information are Amendment 1 to the 1999 FMP for Atlantic Tunas, Swordfish and Sharks, the 2006 Consolidated HMS FMP, and Amendment 2 to the Consolidated HMS FMP.

1.3.1 Commercial Fishery

1.3.1.1 History

In the early years of the 20th century, a Pacific shark fishery supplied limited demand for fresh shark fillets and fishmeal as well as a more substantial market for dried fins of soupfin sharks. In 1937, the price of soupfin shark liver skyrocketed when it was discovered to be the richest source of vitamin A available in commercial quantities. A shark fishery in the Caribbean Sea, off the coast of Florida, and in the Gulf of Mexico developed in response to this demand (Wagner, 1966). At this time, shark fishing gear included gillnets, hook and line, anchored bottom longlines, floating longlines, and benthic lines for deepwater fishing. These gear types are slightly different than the gears used today and are fully described in Wagner (1966). By 1950, the availability of synthetic vitamin A caused most shark fisheries to be abandoned (Wagner, 1966).

A small fishery for porbeagle existed in the early 1960s off the U.S. Atlantic coast involving Norwegian fishermen. Between the World Wars, Norwegians and Danes had pioneered fishing for porbeagles in the North Sea and in the region of the Shetland, Orkney, and Faroe islands. In the late 1940s, these fishermen caught from 1,360 to 2,720 metric tons (mt) yearly, with lesser amounts in the early 1950s (Rae, 1962). The subsequent scarcity of porbeagles in their fishing area forced the Norwegians to explore other grounds, and around 1960, they began fishing the Newfoundland Banks and the waters east of New York. Between 1961 and 1964, their catch increased from 1,800 to 9,300 mt, then declined to 200 mt (Casey et al., 1978).

Shark fisheries developed rapidly in the late 1970s due to increased demand for their meat, fins, and cartilage. At the time, sharks were perceived to be underutilized as a fishery resource. The high commercial value of shark fins led to the controversial practice of finning, or removing the fins from sharks and discarding the carcass. Growing demand for shark products encouraged expansion of the commercial fishery throughout the late 1970s and the 1980s. Tuna and swordfish vessels began to retain a greater proportion of their shark incidental catch, and some directed fishery effort expanded as well. As catches accelerated through the 1980s, shark stocks suffered a precipitous decline. Peak commercial landings of large coastal and pelagic sharks were reported in 1989. While organized, intensive shark fisheries have fluctuated, more localized shark fisheries have existed for many years.

1.3.1.2 Vessel Permits

Fishermen who wish to sell sharks caught in Federal waters must possess a Federal shark permit (directed or incidental). As part of the HMS FMP, NOAA Fisheries implemented a limited access system for the commercial fishery so permits can only be obtained through transfer or sale, subject to upgrading restrictions. The purpose of limited access was to reduce latent effort in the shark fishery and prevent further overcapitalization. Based on current and historical participation, implementation of limited access reduced the number of shark permit holders from over 2,200 permit holders before limited access, to 527 as of October 1, 2007. The limited access system is fully described in Chapter 4 of the 2006 Consolidated HMS FMP. As of October 1, 2007 there were 231 directed shark permits holders and 296 incidental shark permit holders.

1.3.1.2 Bottom Longline Fishery History

Commercial shark fishing effort is generally concentrated in the southeastern United States and Gulf of Mexico (Cortes and Neer, 2002). During 1997 – 2003, 92 – 98 percent of LCS, 38 – 49 percent of pelagic sharks, and nearly all SCS (80 – 100 percent) came from the southeast region (Cortes, pers. comm.). McHugh and Murray (1997) found in a survey of shark fishery participants that the largest concentration of BLL fishing vessels is found along the central Gulf coast of Florida, with the John’s Pass - Madeira Beach area considered the center of directed shark fishing activities. Consistent with other HMS fisheries, some shark fishery participants move from their homeports to other fishing areas as the seasons change and fish stocks move.

The Atlantic BLL fishery targets both LCS and SCS. Bottom longline is the primary commercial gear employed in the LCS and SCS fisheries in all regions. Gear characteristics vary by region, but in general, an approximately ten-mile long BLL, containing about 600 hooks is fished overnight. Skates, sharks, or various finfishes are used as bait. The gear typically consists of a heavy monofilament mainline with lighter weight monofilament gangions. Some fishermen may occasionaly use a flexible 1/16 inch wire rope as gangion material or as a short leader above the hook.

1.3.1.3 Recent Catches and Landings Data - Bottom Longline Gear

The following section provides information on shark landings as reported in the shark BLL observer program. In January 2002, the observer coverage requirements in the shark BLL fishery changed from voluntary to mandatory participation if selected. NMFS selects approximately 40 - 50 vessels for observer coverage during each season. Vessels are randomly selected if they have a federal directed shark limited access permit (LAP), have reported landings from sharks during the previous year, and have not been selected for observer coverage during each of the three previous seasons. Most trips occur in federal waters although some occur in state waters.

The U.S. Atlantic commercial shark BLL fishery was monitored by the University of Florida and Florida Museum of Natural History, Commercial Shark Fishery Observer Program (CSFOP) from 1994 through the first season of 2005. In June 2005, responsibility for the observer program was transferred to the SEFSC's Panama City Laboratory. The observer program trains and places the observers aboard vessels in the directed shark BLL fishery in the Atlantic and Gulf of Mexico to collect data on the commercial shark fishery and thus improve overall management strategies for the fishery. Observers provide baseline characterization information, by region, on catch rates, species composition, catch disposition, relative abundance, and size composition within species for the LCS and SCS BLL fisheries.

During 2003, six observers logged 263 sea days on shark fishing trips aboard 20 vessels in the Atlantic from North Carolina to Florida and in the eastern Gulf of Mexico off Florida. The number of trips taken on each vessel ranged from one to five and the number of sea days each observer logged ranged from nine to 35. Observers documented the catches and fishing effort on approximately 150 longline sets that fished 103,351 hooks. During 2003, LCS comprised 68.4 percent of the total catch, and sandbar sharks were 30.6 percent of total LCS catch.

During 2004, five observers logged 196 sea days on 56 shark fishing trips aboard 11 vessels. Observers documented the catches and fishing effort during 120 longline sets that fished 90,980 hooks. In 2004 LCS comprised 66.7 percent of the total catch, and sandbar sharks were 26.6 percent of catch in 2004. Regional differences in sandbar shark abundance were evident. For example, in the Carolina region, sandbar sharks comprised 67.4 percent of the total catch and 77.2 percent of the LCS catch. In the Florida Gulf region, sandbar sharks comprised 62.0 percent of the total catch and 66.5 percent of the large coastal catch, whereas in the Florida East Coast region, sandbar sharks comprised only 17.2 percent of the total observed catch, and 37.1 percent of the LCS catch (Burgess and Morgan, 2003). Blacktip sharks comprised 13.9 percent of total observed catch and 20.3 percent of the large coastal catch (Burgess and Morgan, 2002). Tiger sharks comprised 7.5 percent of the total observed catch and 11.0 percent of the LCS catch. A majority of tiger sharks (71.7 percent) and nurse sharks (98.8 percent) were tagged and released.

From July 2005 through December 2006, five observers logged 89 trips on 37 vessels with a total of 211 hauls for the second and third seasons in the Atlantic from North Carolina to Florida and in the eastern Gulf of Mexico off Florida (Hale and Carlson, 2007). Observers documented the catches and fishing effort on 34 hauls on four trips targeting grouper/snapper or grouper/shark in the Gulf of Mexico, 82 hauls on 31 trips targeting shark in the Gulf of Mexico, 77 hauls on 50 trips targeting ships in the South Atlantic, and 18 hauls on four trips observed targeting tilefish in the South Atlantic.

From January to November 2007, the shark BLL observer program covered a total of 42 trips on 25 vessels with a total of 264 hauls. Gear characteristics of trips varied by area (Gulf of Mexico or the U.S. Atlantic Ocean) and target species (grouper/snapper or grouper/tilefish, shark or tilefish) (for more details, see Hale *et al*., 2007). There were no grouper/snapper-targeted trips observed in the U.S. Atlantic Ocean. No trips were observed in the northern U.S. Atlantic Ocean. Observers documented the catches and fishing effort on 179 hauls and 10 trips targeting snapper/grouper or grouper/tilefish in the Gulf of Mexico. There were 24 hauls on 7 trips observed targeting sharks in the Gulf of Mexico. In the U.S. Atlantic Ocean, 39 hauls on 21 trips were observed targeting shark, and 22 hauls on three trips were observed targeting tilefish.

In 2007 on the trips targeting shark in the Gulf of Mexico, 1,302 individual animals were caught. This consisted of 94.9 percent sharks, 4.1 percent teleosts, 0.5 percent invertebrates, and 0.2 percent batoids. LCS comprised the greatest amount of shark catch, at 69.5 percent, and SCS comprised 30.3 percent. The prohibited dusky shark was also caught (0.1 percent). Red grouper was the most caught teleost, while blacktip sharks was the most commonly caught shark (Hale *et al.*, 2007).

In 2007 on the trips targeting grouper/snapper or grouper/tilefish in the Gulf of Mexico, 8,980 individual animals were caught. This consisted of 87.3 percent teleosts, 11.6 percent sharks, 0.2 percent batoids, and 0.8 percent invertebrates. Large coastal shark species comprised 16.5 percent of the shark catch, while SCS comprised the majority of the shark catch at 73.7 percent. Red grouper was the most caught teleost, and Atlantic sharpnose were the most caught sharks (Hale *et al.*, 2007).

On the trips targeting shark in the South Atlantic in 2007, 2,735 individual animals were caught. This consisted of 95.7 percent sharks, 2.5 percent teleosts, 1.2 percent batoids, and 0.4 percent invertebrates. Large coastal shark species comprised 78.7 percent of the shark catch while SCS species comprised 19.2 percent of the shark catch. Sandbar sharks and tiger sharks were the most commonly caught LCS. Other shark species caught were dusky sharks, sand tiger sharks, night sharks, and sixgill sharks. Great amberjack, almaco jack, and great barracuda were the most commonly caughts teleosts (Hale *et al.*, 2007).

On the trips targeting tilefish in the South Atlantic in 2007, 1,293 individual animals were caught. This consisted of 97.2 percent teleosts, 2.5 percent sharks, and 0.2 percent invertebrates. Large coastal sharks comprised 9.4 percent of the shark catch, while no SCS species caught. Other shark species caught included the sevengill shark, shortfin mako shark, smooth dogfish and spiny dogfish (87.5 percent). Spiny dogfish was the most commonly caught shark species (75 percent) while tilefish was the most caught teleost at 97.5 percent (Hale *et al.*, 2007).

BLL for sharks has relatively low observed bycatch rates. For vessels targeting sharks in the Gulf of Mexico in 2007, four loggerhead turtles were observed caught in BLL gear. Of these, two were released alive, and two were released dead. For vessels targeting shark in the Atlantic, no loggerhead turtles were observed caught in BLL gear. However, three smalltooth sawfish were observed caught, with two being released alive and one released dead.

Loggerhead sea turtles - In the BLL fishery, a total of 79 sea turtles were observed caught from 1994 through 2007. Seasonal variation indicates that most of the sea turtles were caught early in the year. Of the 79 observed sea turtles, 64 were loggerhead sea turtles, of which 33 were released alive. Another 14 loggerheads were released in an unknown condition and 17 were released dead. Based on extrapolation of observer data 784.3 loggerhead interactions with BLL gear occurred between 2004 and 2006, the time period for the latest ITS under the October 29, 2003 BiOp for the shark fisheries. An additional 17.4 unidentified sea turtles were estimated to have been taken (NMFS, 2007b; Richards, 2007).

Leatherback sea turtles - Of the 79 observed sea turtle interactions in the BLL fishery from 1994 – 2007, six were leatherback sea turtles of which one was dead and five were released with its condition unknown. Based on extrapolated takes from observer data, it was estimated that 83.2 leatherback sea turtles were taken in the shark BLL fishery from 2004 through 2006 (NMFS, 2007b; Richards, 2007). Given the large number of turtles released in an unknown condition, these estimated take numbers do not discriminate between live and dead releases. However, leatherback mortality is usually low because it is known that leatherbacks rarely ingest or bite hooks, but are usually foul hooked on their flippers or carapaces, reducing the likelihood of post-hooking release mortality. However, leatherback-specific data for this fishery is not available.

Smalltooth sawfish - As of April 1, 2003, NMFS listed smalltooth sawfish as an endangered species (68 FR 15674) under the ESA. After reviewing the best scientific and commercial information, the status review team determined that the continued existence of the U.S. Distinct Population Segment of smalltooth sawfish was in danger of extinction throughout all or a significant portion of its range from a combination of the following four listing factors: the present or threatened destruction, modification, or curtailment of habitat or range; over-utilization for commercial, recreational, scientific, or educational purposes; inadequacy of existing regulatory mechanisms; and other natural or manmade factors affecting its continued existence. NMFS is in the process of designating critical habitat for smalltooth sawfish.

From 1994 through 2006, 12 smalltooth sawfish interactions have been observed (11 released alive, and one released in unknown condition) in shark BLL fisheries (Morgan pers. comm.; Burgess and Morgan, 2004; Hale and Carlson, 2007; Hale *et al*., 2007). In 2007, there were three observed smalltooth sawfish interactions with shark BLL gear (Hale *et al*., 2007). Two were released alive, and one released dead. All three interactions occurred in the South Atlantic region. Based on extrapolated takes for 2004 through 2006, 60 smalltooth sawfish have taken in the BLL fisheries (NMFS, 2007b; Richards, 2007). No mortalities were extrapolated based on the overall extrapolated takes; however, one known mortality occurred in 2007. NMFS has not calculated the extrapolated takes since the mortality occurred.

Marine Mammals - Four delphinids have been observed caught and released alive between 1994 and 2007, and one bottlenose dolphin was observed dead in 2003 (G. Burgess, pers. comm.; Hale and Carlson, 2007; Hale *et al*., 2007). Based on this one dead encounter in 2003 (no interactions with marine mammals and BLL were observed in 2004 through 2007), NMFS extrapolated that a total of 100 bottlenose dolphin interactions with BLL gear (Richards, 2007).

Seabirds - Bycatch of seabirds in the shark BLL fishery has been virtually non-existent. A single pelican has been observed killed from 1994 through 2007. The pelican was caught in January 1995 off the Florida Gulf Coast (between 25° 18.68 N, 81° 35.47 W and 25° 19.11 N, 81° 23.83 W) (G. Burgess, University of Florida, pers. com.). No expanded estimates of seabird bycatch or catch rates are available for the BLL fishery.

1.3.1.4 Gillnet Fishery History

The southeast shark gillnet fishery is comprised of several vessels based primarily out of ports in northern Florida (South Atlantic Region) that use nets typically 456 to 2,280 meters long and 6.1 to 15.2 meters deep, with stretched mesh from 12.7 to 22.9 cm. This fishery is currently prohibited in the state waters off South Carolina, Georgia, and Florida, thereby forcing some of these vessels to operate in deeper waters under Federal jurisdiction, where gillnets are less effective. The entire process (set to haulback) takes approximately 9 hours (Carlson and Baremore, 2002a).

In the southeast shark gillnet fishery, NOAA Fisheries modified the requirement to have 100 percent observer coverage at all times on March 30, 2001 (66 FR 17370), by reducing the level required to a statistically significant level outside of right whale calving season (100 percent observer coverage is still required during the right whale calving season from November 15 through March 31). This modification of observer coverage reduced administrative costs while maintaining statistically significant and adequate levels of coverage to provide reasonable estimates of sea turtle and marine mammal takes outside the right whale calving season. The level of observer coverage necessary to maintain statistical significance will be reevaluated annually and adjusted accordingly. Additionally, in 2001 NOAA Fisheries established a requirement to conduct net checks every two hours to look for and remove any protected species.

1.3.1.5 Recent Catches and Landings Data - Gillnet Gear

The following section provides information on shark landings as reported in the shark gillnet observer program. As with the bottom longline observer program, this program observes only vessels that have a federal shark limited access permit. The 2006 Directed Shark Gillnet Fishery Observer Program report described the gear and soak time deployed by drift gillnet, strike gillnet, and sink gillnet fishermen. Set duration was generally 0.3 hours in depths averaging 20.9 m, and haulback averaged 3.3 hours. The average time from setting the net through completion of haulback was 10.2 hours. Stretched mesh sizes measured from 12.7-25.4 cm. Strikenetters use the largest mesh size (22.9-30.4 cm) and the set times were 3.2 hours. Sink gillnets used to target sharks generally use 7.3-20.3 cm mesh size and the process lasted for approximately 6.1 hours. This gear was also observed being deployed to target non-HMS (teleosts); using a stretched mesh size of 6.4-12.7 cm, and the entire process took approximately 2.3 hours (Carlson and Bethea, 2007).

Strikenets - NMFS published a final rule (72 FR 34632, June 25, 2007) to reduce bycatch of right whales. It prohibits gillnet fishing or gillnet possession during periods associated with the right whale calving season. Limited exemptions to the fishing prohibitions are provided for gillnet fishing for sharks and for Spanish mackerel south of 29°00' N. lat. In this area, only gillnets used in a strikenet fashion can operate during day time when right whales are present. Operation in this area at that time requires VMS and observer coverage, if selected. Vessels fishing in a strikenet fashion used nets 364.8 meters long, 30.4 meters deep, and with mesh size 22.9 cm.

The total observed strike gillnet catch consisted of eight species of sharks from 2005-2006. Finetooth and blacktip sharks made up the greatest percentage of catch in terms of total number caught in strike gillnets from 2005-2006. There were no strike gillnet trips observed in 2007.

In the strikenet fishery from 2005-2006, 99.7 percent of the observed catch were sharks with only 0.15 percent teleosts, and 0.07 percent non-shark elasmobranchs. Blacktip, finetooth, and spinner shark comprised over 94 percent of the observed shark strike net catch by number and weight. Tarpon and little tunny were the teleosts encountered most frequently (Carlson and Bethea, 2007).

Drift Gillnets - In 2005 and 2006, observed drift gillnet catches by number were 88.7 percent shark, 10.8 percent teleosts, 0.5 percent non-shark elasmobranchs, and 0.03 percent protected resources. Three species of sharks made up 91.3 percent of the observed drift gillnet catch: Atlantic sharpnose, blacktip, and bonnethead sharks. Two species of teleosts made up the majority of the catch, including: little tunny and king mackerel (Carlson and Bethea, 2007).

In 2007, a total of five driftnet gillnet vessels were observed making 84 sets on 11 trips. Of those trips, there were 3 vessels observed that targeted sharks for a total of 4 trips and 4 hauls. The total observed catch composition for sets targeting sharks was 86.7 percent shark, 13.3 percent teleosts, zero non-shark elasmobranches, and zero percent protected resources. Two species of sharks made up 98.1 percent of the observed shark catch: Atlantic sharpnose shark and blacknose shark. By weight, the shark catch was composed of Atlantic sharpnose, followed by scalloped hammerhead shark, blacknose shark, and blacktip shark. Three species of teleosts made up approximately 97 percent by number of the overall non-shark species. These species were little tunny, king mackerel, and barracudas (Baremore *et al.*, 2007).

Total observed catch composition for sets targeting Spanish mackerel was 84.5 percent, 15.3 percent sharks, 0.1 percent non-shark elasmobranches, and 0.05 protected resources. Three species of teleosts made up 96.6 percent of the total teleost catch: Spanish mackerel, bluefish, and menhaden. Shark catch was dominated by Atlantic sharpnose shark followed by bonnethead shark (Baremore *et al.*, 2007).

Sink Gillnets - Sinknet landings and bycatch vary by target species. Four main groups were targeted on observed sink gillnet trips in 2005 and 2006, including: shark, Spanish mackerel, kingfish, and various teleosts. Vessels targeting sharks with this gear caught 79.3 percent sharks, 17.6 percent teleosts, and 3.1 percent non-shark elasmobranchs. Vessels targeting Spanish mackerel caught 89.5 percent teleosts, 10.4 percent sharks, and 0.02 non-shark elasmobranchs. Vessels targeting kingfish caught 90.5 percent teleosts, 3.9 percent sharks, and 6.1 percent non-shark elasmobranchs. When targeting various teleosts with sink gillnet gear, vessels caught 98 percent teleosts and 2 percent shark (Carlson and Bethea, 2007).

There were 41 species of teleosts, four species of rays, and no marine mammal species observed caught during the sink gillnet season from 2005-2006 (Carlson and Bethea, 2007). The species of teleosts making up the largest percentage by number of the overall non-shark species in observed strikenet catches were southern kingfish, gulf flounder, whitebone porgy, and crevalle jack.

A total of 29 trips making 112 sink net sets on six vessels were observed in 2007. Of those, 17 trips making 60 sets targeted sharks, 3 trips making 27 sets targeted Spanish mackerel, and 4 trips making 9 sets targeted Atlantic croaker, and 6 trips making 16 sets targeted other teleosts. Sink gillnets that targeted sharks caught 97.8 percent shark, 1.4 percent teleosts, 0.7 percent non-shark elasmobranches, and 0.1 percent protected resources. By number, the shark catch was primarily bonnethead shark, finetooth shark, Atlantic sharpnose shark, and blacknose shark. By weight the shark catch was made up of mostly finetooth shark, followed by bonnethead shark, blacknose shark, and spinner shark. Cobia made up 25.8 percent of the teleost catch, followed by Gulf kingfish and banded drum. Cownose ray and Atlantic guitarfish and other stingrays made up 100 percent of the non-shark elasmobranch catch (Baremore *et al*., 2007).

Catch of vessels targeting Spanish mackerel was 99.4 teleosts and 0.6 percent shark. Shark catches were mostly Atlantic sharpnose by number, and blacktip and bonnethead sharks. By weight, spiny dogfish were the predominant catch, followed by smooth dogfish, blacktip shark, and bonnethead shark. Spanish mackerel, butterfish, and bluefish made up the majority of the catch (Baremore *et al*., 2007).

Sink gillnet vessels targeting croaker caught 3.2 percent sharks, 96.7 percent teleosts, an 0.01 percent non-shark elasmobranches. Sink gillnet vessels that targeted other species other than sharks, Spanish mackerel, and Atlantic croaker caught mostly bluefish and Atlantic croaker (Baremore *et al*., 2007).

Loggerhead sea turtles - Loggerhead sea turtles are rarely caught in the shark gillnet fishery. No loggerheads were observed caught with strikenets during the 2000 – 2002 right whale calving seasons (Carlson, 2000; Carlson and Baremore, 2001; Carlson and Baremore, 2002a). However, three loggerhead sea turtles were observed caught with drift gillnets during right whale calving season, one each year from 2000 to 2002 (Carlson, 2000; Carlson and Baremore, 2001; Carlson and Baremore, 2002a; Garrison, 2003a).

No loggerhead sea turtles were caught outside of the right whale calving season in 2002 (Carlson and Baremore, 2002b), and no loggerhead turtles were observed caught during or after the right whale calving season in 2003 or 2004 in the directed shark gillnet fishery (Carlson and Baremore, 2003; Carlson, pers. comm). In 2005, five loggerheads were observed caught, and in 2006 three loggerheads were observed caught. In 2007, 4 loggerhead sea turtles were observed, three were released alive, and one was released in an unknown condition (Baremore *et al*., 2007).

Leatherback sea turtles - In the shark gillnet fishery, leatherback sea turtles are sporadically caught. No leatherback sea turtles were observed caught with strikenets during the 2000 – 2002 right whale calving seasons (Carlson, 2000; Carlson and Baremore, 2001; Carlson and Baremore, 2002a). Leatherback sea turtles have been observed caught in shark drift gillnets, including 14 in 2001 and 2 in 2002 (Carlson, 2000; Carlson and Baremore, 2001; Carlson and Baremore, 2002a; Garrison, 2003a). NMFS temporarily closed the shark gillnet fishery (strikenetting was allowed) from March 9 to April 9, 2001, due to the increased number of leatherback interactions that year (66 FR 15045, March 15, 2001).

From 2003 – 2004, no leatherback sea turtles were observed caught in gillnets fished in strikenet or driftnet methods (Carlson and Baremore, 2003; Carlson, pers. comm.). In 2005, one leatherback turtle was caught and released alive. In 2006 and 2007, no leatherbacks were observed caught in gillnets (Carlson and Bethea, 2007; Baremore *et al*., 2007)

Smalltooth sawfish - To date there has been only one observed catch of a smalltooth sawfish in shark gillnet fisheries. The sawfish was taken on June 25, 2003, in a gillnet off the west coast of Florida and was released alive (Carlson and Baremore, 2003). The sawfish was cut from the net and released alive with no visible injuries. This indicates that smalltooth sawfish can be removed safely if entangled gear is sacrificed. The set was characteristic of a typical drift gillnet set, with gear extending 30 to 40 feet deep in 50 to 60 feet of water. Prior to this event it was speculated that the depth at which drift gillnets are set above the sea floor may preclude smalltooth sawfish from being caught. From 2004-2007, there were no observed catches of smalltooth sawfish in shark gillnet fisheries.

Although sometimes described as a lethargic demersal species, smalltooth sawfish feed mostly on schooling fish, thus they would occur higher in the water column during feeding activity. In fact, smalltooth sawfish and Atlantic sharks may be attracted to the same schools of fish, potentially making smalltooth sawfish quite vulnerable if present in the area fished. The previous absence of smalltooth sawfish incidental capture records is more likely attributed to the relatively low effort in this fishery and the rarity of smalltooth sawfish, especially in Federal waters. These factors may result in little overlap of the species with the gear.

Given the high rate of observer coverage in the shark gillnet fishery, NMFS believes that smalltooth sawfish takes in this fishery are very rare. The fact that there were no smalltooth sawfish caught during 2001 when 100 percent of the fishing effort was observed indicates that smalltooth sawfish takes (observed or total) most likely do not occur on an annual basis. Based on this information, the 2003 BiOp permitted one incidental take of smalltooth sawfish (released alive) from 2004 through 2008 as a result of the use of gillnets in this fishery (NMFS, 2003b). Additional management measures may result based on the 2008 BiOp expected this spring.

Marine mammals - Observed takes of marine mammals in the Southeast Atlantic shark gillnet fishery during 1999 – 2007, totaled 12 bottlenose dolphins and four spotted dolphins. Extrapolated observations from 2004-2006 suggest 1.4 interactions with bottlenose dolphin and zero Atlantic spotted dolphin outside the right whale season. During the right whale season, there was one interaction with bottlenose dolphins and zero interactions with Atlantic spotted dolphins in the shark gillnet fishery from 2004 through 2006 (Garrison, 2007).

On January 22, 2006, a dead right whale was spotted offshore of Jacksonville Beach, Florida. The survey team identified the whale as a right whale calf, and photos indicated the calf as having one large wound along the midline and smaller lesions around the base of its tail. The right whale calf was located at 30°14.4’ N. Lat., 81° 4.2’′ W. Long., which was approximately 1 nautical mile outside of the designated right whale critical habitat, but within the Southeast U.S. Restricted Area. NMFS determined that both the entanglement and death of the whale occurred within the Southeast U.S. Restricted Area, and all available evidence suggested the entanglement and injury of the whale by gillnet gear ultimately led to the death of the animal.

On February 16, 2006, NMFS published a temporary rule (71 FR 8223) to prohibit, through March 31, 2006, any vessel from fishing with any gillnet gear in the Atlantic Ocean waters between 32°00' N. Lat. (near Savannah, GA) and 27°51' N. Lat. (near Sebastian Inlet, FL) and extending from the shore eastward out to 80°00' W. long under the authority of the ALWTRP (50 CFR 229.32 (g)) and ESA. NMFS took this action based on its determination that a right whale mortality was the result of an entanglement by gillnet gear within the Southeast U.S. Restricted Area.

NMFS implemented the final rule on June 25, 2007 (72 FR 34632), that prohibits gillnet fishing, including shark gillnet fishing, from November 15 to April 15, between the NC/SC border and 29° 00' N. The action was taken to prevent the significant risk to the wellbeing of endangered right whales from entanglement in gillnet gear in the core right whale calving area during calving season. Limited exemptions to the fishing prohibitions are provided for gillnet fishing for sharks and for Spanish mackerel south of 29°00' N. lat. Shark gillnet vessels fishing between 29° 00' N and 26° 46.5' N have certain requirements as outlined 50 CFR § 229.32 from December 1 through March 31 of each year. These include vessel operators contacting the SEFSC Panama City Laboratory at least 48 hours prior to departure of a fishing trip in order to arrange for an observer.

In addition, a recent rule (October 5, 2007, 72 FR 57104) amends restriction in the Southeast U.S. Monitoring Area from December 1 through March 31. In that area no person may fish with or possess gillnet gear for sharks with webbing of 5" or greater stretched mesh unless the operator of the vessel is in compliance with the VMS requirements found in 50 CFR 635.69. The Southeast U.S. Monitoring Area is from 27°51' N. (near Sebastian Inlet, FL) south to 26°46.5' N. (near West Palm Beach, FL), extending from the shoreline or exemption line eastward to 80°00' W. In addition, NMFS may select any shark gillnet vessel regulated under the ALWTRP to carry an observer. When selected, the vessels are required to take observers on a mandatory basis in compliance with the requirements for at-sea observer coverage found in 50 CFR 229.7. Any vessel that fails to carry an observer once selected is prohibited from fishing pursuant to 50 CFR § 635. There are additional gear marking requirements that can be found at 50 CFR § 229.32.

1.3.1.6 Pelagic Longline Fishery

The U.S. PLL fishery for Atlantic HMS primarily targets swordfish, yellowfin tuna, and bigeye tuna in various areas and seasons. Secondary target species include dolphin, albacore tuna, pelagic sharks (including mako, thresher, and porbeagle sharks), as well as several species of large coastal sharks. Although this gear can be modified (*e.g.*, depth of set, hook type, etc.) to target swordfish, tunas, or sharks, it is generally a multi-species fishery. These vessel operators are opportunistic, switching gear style and making subtle changes to target the best available economic opportunity of each individual trip. Pelagic longline gear sometimes attracts and hooks non-target finfish with little or no commercial value as well as species that cannot be retained by commercial fishermen due to regulations, such as billfish. Pelagic longlines may also interact with protected species such as marine mammals, sea turtles, and seabirds. Thus, this gear has been classified as a Category I fishery with respect to MMPA. Any species (or undersized catch of permitted species) that cannot be landed due to fishery regulations is required to be released, whether dead or alive. Pelagic longline gear is composed of several parts (see 3.4[2]) (NMFS, 1999).

The primary fishing line, or mainline of the longline system, can vary from five to 40 miles in length, with approximately 20 to 30 hooks per mile. The depth of the mainline is determined by ocean currents and the length of the floatline, which connects the mainline to several buoys, and periodic markers which can have radar reflectors or radio beacons attached. Each individual hook is connected by a leader, or gangion, to the mainline. Lightsticks, which contain chemicals that emit a glowing light, are often used, particularly when targeting swordfish. When attached to the hook and suspended at a certain depth, light sticks attract baitfish, which may, in turn, attract pelagic predators (NMFS, 1999).

1.3.1.7 Recent Catches and Landings Data - Pelagic Longline Gear

From May 1992 through December 2000, the Pelagic Observer Program (POP) recorded a total of 4,612 elasmobranchs (15 percent of the total catch) caught off the southeastern U.S. coast in fisheries targeting tunas and swordfish (Beerkircher *et al.*, 2004). Of the 22 elasmobranch species observed, silky sharks were numerically dominant (31.4 percent of the elasmobranch catch), with silky, dusky, night, blue, tiger, scalloped hammerhead, and unidentified sharks making up the majority (84.6 percent) (Beerkircher *et al.*, 2004). For data on reported catch of species caught by U.S. Atlantic PLLs, in number of fish, for 2000-2006 please refer to Chapter 3 Table 3-17 of the Amendment 2 to the Consolidated HMS FMP.

1.3.1.8 Federal Commercial Landings

The tables on the following pages provide a summary of the recent landings of sharks on a species by species basis. Landings for sharks were compiled from the most recent stock assessment documents.

[2] As of April 1, 2001, (66 FR 17370) a vessel is considered to have pelagic longline gear on board when a power-operated longline hauler, a mainline, floats capable of supporting the mainline, and leaders (gangions) with hooks are on board.

Table 1.1 Commercial landings of large **coastal sharks in lb dw: 2001-2006.** Source: Amendment 2 to the Consolidated HMS FMP pp. 3-84

Large Coastal Sharks	2001	2002	2003	2004	2005	2006
Basking**	0	0	0	0	0	0
Bignose*	1,442	0	318	0	98	61
Bigeye sand tiger**	0	0	0	0	0	0
Blacktip	1,135,199	1,099,194	1,474,362	1,092,600	993,380	1,272,016
Bull	27,037	40,463	93,816	49,556	133,265	173,125
Caribbean Reef*	1	0	0	0	0	0
Dusky*	1,973	8,779	23,288	1,025	874	4,183
Galapagos*	0	0	0	0	0	0
Hammerhead, Great	0	0	0	0	0	0
Hammerhead, Scalloped	0	0	0	0	0	0
Hammerhead, Smooth	0	0	0	92	54	108
Hammerhead, Unclassified	69,356	108,160	150,368	116,546	197,067	153,592
Large Coastal, Unclassified	172,494	147,359	51,433	0	0	0
Lemon	24,453	56,921	80,688	67,810	71,805	62,738
Narrowtooth*	0	0	0	0	0	0
Night*	0	0	20	0	0	0
Nurse	387	69	70	317	97	2,258
Sandbar	1,407,550	1,863,420	1,425,628	1,223,241	1,282,477	1,516,497
Sand Tiger**	1,248	409	624	1,832	5,167	3,166
Silky	14,197	30,731	51,588	11,808	17,646	16,173
Spinner	6,970	8,447	12,133	14,806	44,150	96,259
Tiger	26,973	16,115	18,536	30,976	33,477	53,706
Whale**	0	0	0	0	0	0

Large Coastal Sharks	2001	2002	2003	2004	2005	2006
White**	26	0	1,454	58	0	88
Unclassified, assigned to large coastal	525,661	771,450	908,077	603,229	527,026	397,851
Unclassified, fins	23,988	142,565	181,431	137,375	110,613	145,928
Total (excluding fins)	**3,414,967 (1,549 mt dw)**	**4,151,594 (1,883 mt dw)**	**4,292,403 (1,947 mt dw)**	**3,213,896 (1,458 mt dw)**	**3,306,583 (1,500 mt dw)**	**3,751,821 (1,698 mt dw)**

* indicates species that were prohibited in the commercial fishery as of June 21, 2000.
** indicates species that were prohibited as of April 1997.

Table 1.2 Commercial landings of small coastal sharks in lb dw: 2001-2006. Source: Amendment 2 to the Consolidated HMS FMP pp. 3-85

Small coastal sharks	2001	2002	2003	2004	2005	2006
Atlantic Angel*	0	495	1,397	818	3,587	249
Blacknose	160,990	144,615	131,511	68,108	120,320	187,907
Bonnethead	63,461	36,553	38,614	29,402	33,295	33,911
Finetooth	303,184	185,120	163,407	121,036	107,327	80,536
Sharpnose, Atlantic	196,441	213,301	190,960	230,880	375,881	519,019
Sharpnose, Atlantic, fins	209	0	0	0	0	0
Sharpnose, Caribbean*	205	0	0	0	0	0
Unclassified Small Coastal	51	35,831	8,634	1,407	9,792	471
Total (excluding fins)	**724,332 (329 mt dw)**	**615,915 (279 mt dw)**	**534,523 (242 mt dw)**	**451,651 (205 mt dw)**	**650,202 (295 mt dw)**	**822,093 (373 mt dw)**

* indicates species that were prohibited in the commercial fishery as of June 21, 2000.

Table 1.3 Commercial landings of pelagic sharks in lb dw: 2001-2006. Source: Amendment 2 to the Consolidated HMS FMP pp. 3-85

Pelagic Sharks	2001	2002	2003	2004	2005	2006
Bigeye thresher*	330	0	0	719	267	0
Bigeye sixgill*	0	0	0	0	0	0
Blue shark	65	137	6,324	423	0	588
Mako, longfin*	9,453	3,008	1,831	1,827	403	2,125
Mako, shortfin	171,888	159,840	151,428	217,171	188,608	107,267
Mako, Unclassified	73,556	58,392	33,203	50,978	35,241	27,231
Oceanic whitetip	922	1,590	2,559	1,082	713	338
Porbeagle	1,152	2,690	1,738	5,832	2,452	3,456
Sevengill*	0	0	0	0	0	0
Sixgill*	0	0	0	0	0	0
Thresher	56,893	53,077	46,502	44,915	24,280	32,549
Unclassified, pelagic	0	5,965	79,439	0	0	411
Unclassified, assigned to pelagic	31,636	182,983	314,300	356,522	18,057	12,936
Unclassified, pelagic, fins	12,239	0	0	41	0	0
Total (excluding fins)	**345,895 (157 mt dw)**	**467,682 (212 mt dw)**	**637,324 (289 mt dw)**	**679,469 (308 mt dw)**	**270,021 (122 mt dw)**	**186,901 (85 mt dw)**

* indicates species that were prohibited in the commercial fishery as of June 21, 2000

1.3.2 Recreational Fishery

1.3.2.1 History

Recreational fishing for Atlantic sharks occurs in federal and state waters from New England to the Gulf of Mexico and Caribbean Sea. In the past, sharks were often called “the poor man’s marlin.” Recreational shark fishing with rod and reel is now a popular sport at all social and economic levels, largely because of accessibility to the resource. Sharks can be caught virtually anywhere in salt water, with even large specimens available in the nearshore area to surf angler or small boaters. Most recreational shark fishing takes place from small to medium-size vessels. Makos, white sharks, and large pelagic sharks are generally accessible only to those aboard ocean-going vessels. Recreational shark fisheries are exploited primarily by private vessels and charter/headboats although there are some shore-based fishermen active in the Florida Keys.

Charter vessel fishing for sharks is becoming increasingly popular. In most U.S. waters, this type of fishing occurs from May to September. In some regions, certain species are heavily targeted, e.g., sharpnose and blacktip in the Carolinas, and makos and large white sharks at Montauk, NY. Many charter vessels also fish for sharks out of ports in Ocean City, MD and Wachapreague, VA. Headboats may land the smaller shark species, but they usually do not target sharks specifically, except for a headboat fishery for sharpnose sharks based in Port Aransas, TX. Effective March 1, 2003, an HMS Angling category permit has been required to fish recreationally for any HMS-managed species (Atlantic tunas, sharks, swordfish, and billfish) (67 FR 77434, December 18, 2002). Prior to March 1, 2003, the regulations only required vessels fishing recreationally for Atlantic tunas to possess an Atlantic Tunas Angling category permit. The recreational shark fishery is managed using bag limits, minimum size requirements, and landing requirements (sharks must be landed with head and fins attached). Additionally, the possession of 19 species of sharks is prohibited.

1.3.2.2 Recreational Landings

The recreational landings database for HMS consists of information obtained through surveys including the Marine Recreational Fishery Statistics Survey (MRFSS), Large Pelagic Survey (LPS), Southeast Headboat Survey (HBS), Texas Headboat Survey, and Recreational Billfish Survey Tournament Data (RBS). Recreational landings of sharks are an important component of HMS fisheries. Recreational shark fishing with rod and reel is a popular sport at all social and economic levels, largely because the resource is accessible. Sharks can be caught virtually anywhere in salt water, depending upon the species. Recreational shark fisheries are oftentimes exploited in nearshore waters by private vessels and charter/headboats. However, there is also some shore-based fishing and some offshore fishing. The following table provides a summary of landings for each of the three species groups. Amendment 1 to the 1999 FMP for Atlantic Tunas, Swordfish, and Shark limited the recreational fishery to rod and reel and handline gear only.

Table 1.4 Estimates of Total Recreational Harvest of Atlantic Sharks: 1999-2006 (numbers of fish in thousands). Source: Amendment 2 to the Consolidated HMS FMP pp. 3-79

Species Group	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
LCS	92.3	140.0	137.2	82.8	88.8	66.6	86.2	59.5
Pelagic	11.1	13.3	3.8	4.7	4.3	5.0	5.4	18.1
SCS	125.7	199.9	212.5	153.8	133.7	126.0	119.1	121.7
Unclassified	6.9	10.9	24.5	5.4	18.1	27.9	47.4	7.3
Species Group	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
LCS	169.6	92.3	131.5	127.9	76.3	86.1	66.3	86.2
Pelagic	11.8	11.1	13.3	3.8	4.7	4.3	5.1	5.4
SCS	175.1	125.7	197.8	211.6	154.6	134.7	128.5	119.1
Unclassified	8.0	6.9	11.0	22.2	5.3	18.1	27.3	47.4

1.4 HABITAT CONSIDERATIONS

1.4.1 Habitat Important to the Stocks

The following section contains excerpts from the Final Consolidated Atlantic Highly Migratory Species Fishery Management Plan (NMFS 2006a) and Final Fishery Management Plan for Atlantic Tunas, Swordfish and Sharks (NMFS 1999). Portions were modified to reflect changes and updates since these two documents were published, or to improve flow within this section.

1.4.2 Description of Habitat

Sharks are found in a wide variety of coastal and ocean habitats including estuaries, nearshore areas, the continental shelf, continental slope, and open ocean. Many species are migratory and, like other marine species, are affected by the condition of the habitat. Atlantic sharks are broadly distributed as adults but have been found to utilize specific estuaries as pupping and nursery areas during pupping season and throughout their neonate (newborn) life stages which may vary from a few to many months. Since coastal and coastal pelagic species frequently appear near shore and have pupping and nursery areas near shore, much more is known about their habitat requirements, particularly for early life history stages. Much less is known about the habitat requirements, pupping areas, and other details of pelagic and deep dwelling species.

1.4.3 Identification and Distribution of Essential Fish Habitat

The following is an excerpt from Appendix B of Volume III of the 2006 Final Consolidated Atlantic Highly Migratory Species Fishery Management Plan with some minor changes.

1.4.3.1 Large Coastal Sharks

Basking shark (*Cetorhinus maximus*)

The basking shark is the second largest fish in the world, its size exceeded only by the whale shark. Like the whale shark, it is a filter-feeding plankton eater. It is a migratory species of the subpolar and cold temperate seas throughout the world, spending the summer in high latitudes and moving into warmer water in winter (Castro, 1983). Despite its size and local abundance in summer, its habits are very poorly known. Sims and Quayle (1998) have shown that basking sharks forage along thermal fronts and seek the highest densities of zooplankton. During the European autumn, basking sharks disappear and are not seen until the following summer, when they return after giving birth.

Distribution data for the basking shark is incomplete largely because the species is not commonly taken by fisheries. According to one OMB reviewer, EFH for the basking shark may need to include waters east of the Great South Channel and the Gulf of Maine to the Bay of Fundy. Pertinent information on life history and distribution of the basking shark in the North Atlantic may be found in Templeman (1963), Owen (1984), Kenney et al. (1985), Sims and Merrett (1997), Sims and Quayle (1998), Sims (1999), Sims et al. (2000), Skomal et al. (2004), and Wilson (2004).

Reproductive potential: Little is known about basking shark reproductive processes. Males are believed to reach maturity between 460 and 610 cm (Bigelow and Schroeder, 1948), at an estimated age of four to five years (Parker and Stott, 1965). However, these age estimates have not been validated. Females mature at 810 to 980 cm (Compagno, 1984). It is believed that female basking sharks give birth to young measuring about 180 cm total length (TL), probably in high latitudes. There are no modern reports on the size of litters or data on reproductive cycles.

Impact of fisheries: Fishing for the basking shark is prohibited in U.S. waters, although basking sharks are common off the east coast in winter.

Essential fish habitat for basking shark:

Neonate (≥182 cm TL): At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Juveniles (183 to 809 cm TL): Offshore of the mid-Atlantic United States south of Nantucket Shoals at 70°W to the north edge of Cape Hatteras, NC at 35.5°N in waters 50 to 200 m deep; associated with boundary conditions created by the western edge of the Gulf Stream (Figure 1.4.3.1.1a).

Adults (≥810 cm TL): Offshore southern New England, west of Nantucket Shoals at 70°W to Montauk, Long Island, NY at 72°W, out to the continental shelf in waters 50 to 200 m deep, where water column physical conditions create high abundances of zooplankton (Figure 1.4.3.1.1b).

<u>Great hammerhead (*Sphyrna mokarran*)</u>
This shark species is found both in open oceans and shallow coastal waters. One of the largest sharks, the great hammerhead is circum-tropical in warm waters (Castro, 1983). It is usually a solitary fish, unlike the more common scalloped hammerhead that often forms very large schools.

Reproductive potential: In Australian waters males mature at about 210 to 258 cm TL and females mature usually at 210 to 220 cm TL (Stevens and Lyle, 1989). Pups measure about 67 cm TL at birth (Stevens and Lyle, 1989) and litters consist of 20 to 40 pups (Castro, 1983). The gestation period lasts about 11 months (Stevens and Lyle, 1989). The reproductive cycle is biennial (Stevens and Lyle, 1989). There are few reports and little data on its nurseries. Hueter (CSR data) found small juveniles from Yankeetown, FL to Charlotte Harbor, FL from May to October at temperature of 23.9 to 28.9°C and salinities of 21.9 to 34.2 ppt.

Impact of fisheries: Great hammerheads are caught in coastal longline shark fisheries as well as in pelagic tuna and swordfish longline fisheries. Its fins bring the highest prices in the shark fin market. Although finning is prohibited in the Atlantic, in many fishing operations elsewhere the fins are removed while the carcasses are discarded at sea. The great hammerhead is vulnerable to overfishing because of its biennial reproductive cycle and because it is caught both in directed fisheries and as bycatch in tuna and swordfish fisheries.

Essential fish habitat for great hammerhead:

Neonate (≤74 cm TL): At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Juveniles (71 to 209 cm TL): Off the Florida coast, all shallow coastal waters out to the 100 m isobath from 30°N south around peninsular Florida to 82.5°W, including Florida Bay and adjacent waters east of 81.5°W (north of 25°N), and east of 82.5°W (south of 25°N) (Figure 1.4.3.1.2a).

Adults (≥210 cm TL): Off the entire east coast of Florida, all shallow coastal waters out to the 100 m isobath, south of 30°N, including the west coast of Florida to 85.5°W (Figure 1.4.3.1.2b).

<u>Scalloped hammerhead (*Sphyrna lewini*)</u>
This is a very common, large, schooling hammerhead shark that lives in warm waters. It is the most common hammerhead in the tropics, and is abundant in inshore artisanal and small commercial fisheries, as well as offshore operations (Compagno, 1984). It migrates seasonally north-south along the eastern United States. Additional life history information can be found in Lessa et al. (1998), Hazin et al. (2001), and Bush and Holland (2002).

Reproductive potential: Males in the Atlantic mature at about 180 to 185 cm TL (Bigelow and Schroeder, 1948), while those in the Indian Ocean mature at 140 to 165 cm TL (Bass et al., 1973). Females mature at about 200 cm TL (Stevens and Lyle, 1989). The young are born at 38 to 45 cm TL, litters consisting of 15 to 31 pups (Compagno, 1984). The reproductive cycle is annual (Castro, 1993b), and the gestation period is nine to ten months (Stevens and Lyle, 1989).

Castro (1993b) found nurseries in the shallow coastal waters of South Carolina. Hueter (CSR data) found small juveniles from Yankeetown to Charlotte Harbor on the west coast of Florida, in temperatures of 23.2° to 30.2 °C, salinities of 27.6 to 36.3 ppt, and dissolved oxygen of 5.1 to 5.5 mg/L.

Impact of fisheries: Because the scalloped hammerhead forms very large schools in coastal areas, it is targeted by many fisheries for its high priced fins. The scalloped hammerhead is considered vulnerable to overfishing because its schooling habit makes it extremely vulnerable to gillnet fisheries and because scalloped hammerheads are actively pursued in many fisheries throughout the world.

Essential fish habitat for scalloped hammerhead:

Neonate (≤62 cm TL): Shallow coastal waters of the South Atlantic Bight, off the coast of South Carolina, Georgia, and Florida, west of 79.5°W and north of 30°N, from the shoreline out to 25 miles offshore. Additionally, shallow coastal bays and estuaries less than 5 m deep, from Apalachee Bay to St. Andrews Bay, FL (Figure 1.4.3.1.3a).

Juveniles (63 to 227 cm TL): All shallow coastal waters of the U.S. Atlantic seaboard from the shoreline to the 200 m isobath from 39° N, south to the vicinity of the Dry Tortugas and the Florida Keys at 82° W. Also in the Gulf of Mexico, in the area of Mobile Bay, AL and Gulf Islands National Seashore in all shallow coastal waters from the shoreline out to the 50 m isobath (Figure 1.4.3.1.3b).

Adults (≥228cm TL): In the South Atlantic Bight from the 25 to 200 m isobath from 36.5°N to 33°N, then continuing south from the 50 m isobath offshore to the 200 m isobath to 30°N, then from the 25 m isobath to the 200 m isobath from 30°N south to 28°N. Also in the Florida Straights between the 25 and 200 m isobaths, from 81.5°W west to 82.25°W in the vicinity of Key West and the Dry Tortugas (Figure 1.4.3.1.3c).

<u>Smooth hammerhead (*Sphyrna zygaena*)</u>

This is an uncommon hammerhead of temperate waters. Fisheries data for hammerheads includes this species and the scalloped and great hammerheads; however, there is little data specific to the species.

Essential fish habitat for smooth hammerhead:

Neonate (≤66 cm TL): At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Juveniles (67 t0 283 cm TL): At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Adults (≥284 cm TL): At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

White shark (*Carcharodon carcharias*)
The white shark is the largest of the lamnid, or mackerel sharks. It is a poorly known apex predator found throughout temperate, subtropical, and tropical waters. Its presence is usually sporadic throughout its range, although there are a few localities (e.g., off California, Australia, and South Africa) where it is seasonally common. Large adults prey on seals and sea lions and are sometimes found around their rookeries. The white shark is also a scavenger of large dead whales. It has been described as the most voracious of the fish-like vertebrates and has been known to attack bathers, divers, and even boats. According to one OMB reviewer, EFH for the white shark may need to be modified. The review by Casey and Pratt (1985) is a comprehensive size-specific examination of white shark distribution, life history, and nursery habitat in the western North Atlantic. Preliminary estimates of age and growth of this species were recently conducted by Natanson (2002). Estrada et al. (*In press*) present new information on the trophic ecology of this species in the western North Atlantic based on stable isotopes.

Reproductive potential: Very little is known of its reproductive processes because only two gravid females have been examined by biologists in modern times. Both specimens contained seven embryos. Recent observations show that white sharks carry seven to ten embryos that are born at 120 to 150 cm TL (Francis, 1996; Uchida et al., 1996). The lengths of the reproductive and gestation cycles are unknown. White sharks are believed to mature at between 370 and 430 cm at an estimated age of nine to ten years (Cailliet et al., 1985). Cailliet et al., (1985) estimated growth rates of 25.0 to 30.0 cm/year for juveniles and 21.8 cm/year for older specimens, and gave the following von Bertalanffy parameters: n = 21, L_∞ = 763.7 cm, K = 0.058, t_o = -3.53. They estimated that a 610 cm TL specimen would be 13 to 14 years old. The types of habitats and locations of nursery areas are unknown. It is likely that the nurseries will be found in the warmer parts of the range in deep water.

Impact of fisheries: The white shark is a prized game fish because of its size. It is occasionally caught in commercial longlines or in near-shore drift gillnets, but it must be released in a manner that maximizes its survival. Its jaws and teeth are often seen in specialized markets where they bring high prices. Preliminary observations (Strong et al., 1992) show that populations may be small, highly localized, and very vulnerable to overexploitation. The white shark has been adopted as a symbol of a threatened species by some conservation organizations, and has received protected status in South Africa, Australia, and the State of California. In 1997, the Unites States implemented a catch-and-release only recreational fishery for the white shark, while prohibiting possession of the species. There are no published population assessments, or even anecdotal reports, indicating any population decreases of the white shark. Nevertheless, it is a scarce apex predator and a long-lived species of a limited reproductive potential that is vulnerable to longlines.

Essential fish habitat for white shark:

Neonate (≤166 cm TL): At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Juveniles (167 to 479 cm TL): Offshore northern New Jersey and Long Island, NY in pelagic waters from the 25 to 100 m isobath in the New York Bight area, bounded to the east at 71.5°W and to the south at 39.5°N. Also offshore of Cape Canaveral, FL between the 25 and 100 m isobaths from 29.5° N to 28°N (Figure 1.4.3.1.4).

Adults (≥480 cm TL): At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Nurse shark (*Ginglymostoma cirratum*)

The nurse shark inhabits littoral waters in both sides of the tropical and subtropical Atlantic, ranging from tropical West Africa and the Cape Verde Islands in the east, and from Cape Hatteras, NC to Brazil in the west. It is also found in the east Pacific, ranging from the Gulf of California to Panama and Ecuador (Bigelow and Schroeder, 1948). It is a shallow water species, often found lying motionless on the bottom under coral reefs or rocks. It often congregates in large numbers in shallow water (Castro, 1983; Pratt and Carrier, 2002).

Reproductive potential: The nurse shark matures at about 225 cm TL (Springer, 1938). Litters consist of 20 to 30 pups, the young measuring about 30 cm TL at birth. The gestation period is about five to six months and reproduction is biennial (Castro, 2000). The age at maturity is unknown, but the nurse shark is a long-lived species. Clark (1963) reported an aquarium specimen living up to 24 years in captivity.

Its nurseries are in shallow turtle grass (*Thalassia* sp.) beds and shallow coral reefs (Castro, 2000; Pratt and Carrier, 2002). However, juveniles are also found around mangrove islands in south Florida. Hueter and Tyminski (2002) found numerous juveniles along the west coast of Florida, in temperatures of 17.5° to 32.9°C, salinities of 28.0 to 38.5 ppt, and dissolved oxygen of 3.1 to 9.7 mg/L. Large numbers of nurse sharks often congregate in shallow waters off the Florida Keys and the Bahamas at mating time in June and July (Fowler, 1906; Gudger, 1912; Pratt and Carrier, 2002). A small area has been set up for protection of mating sharks at Fort Jefferson in the Dry Tortugas. It is not certain, however, whether this area is a primary mating ground or a refuge for mated females.

Impact of fisheries: In North America and the Caribbean the nurse shark has often been pursued for its hide, which is said to be more valuable than that of any other shark (Springer, 1950a). The fins have no value, and the meat is of questionable value (Springer, 1979). The U.S. commercial bottom longline fleet catches few nurse sharks.

Essential fish habitat for nurse shark:

Neonate (≤36 cm TL): Shallow coastal areas from West Palm Beach, FL, south to the Dry Tortugas in waters less than 25 m deep, including Charlotte Harbor, FL at 82°W and 26.8°N in waters less than 25 m deep (Figure 1.4.3.1.5a).

Juvenile (37 to 221 cm TL): Shallow coastal waters from the shoreline to the 25 m isobath off the east coast of Florida from south of Cumberland Island, GA (at 30.5°N) to the Dry Tortugas. Also shallow coastal waters from Charlotte Harbor, FL (at 26°N) to the north end of Tampa Bay, FL (at 28°N). Additionally, off southern Puerto Rico, shallow coastal waters out to the 25 m isobath from 66.5°W to the southwest tip of the island, and areas in the northeast Gulf of Mexico (Apalachee Bay, Apalachicola Bay, and Crooked Island Sound, FL) (Figure 1.4.3.1.5b).

Adults (≥221 cm TL): Shallow coastal waters from the shoreline to the 25 m isobath off the east coast of Florida from south of Cumberland Island, GA (at 30.5°N) to the Dry Tortugas. Also, shallow coastal waters from Charlotte Harbor, FL (at 26°N) to the north end of Tampa Bay, FL (at 28°N), and off southern Puerto Rico, shallow coastal waters out to the 25 m isobath from 66.5°W to the southwest tip of the island (Figure 1.4.3.1.5c).

Bignose shark (*Carcharhinus altimus*)
The bignose shark is a poorly known, bottom dwelling shark of the deeper waters of the continental shelves. It is found in tropical and subtropical waters throughout the world (Castro, 1983).

Reproductive potential: The smallest mature specimens recorded by Springer (1960) were a 213 cm TL male and a 221 cm TL female. Springer (1950c) reported litters of seven to eight pups, while Stevens and McLoughlin (1991) noted from three to 15 pups. Birth size is probably around 70 cm TL based on the largest embryos (65 to 70 cm TL) reported by Fourmanoir (1961), and free swimming specimens with fresh umbilical scars seen by Bass et al. (1973). The lengths of the gestation period and of the breeding cycle have not been reported. The location of the nurseries is unknown.

Impact of fisheries: Springer (1950c) stated that the bignose shark appeared to be the most common large shark of the edges of the continental shelves in the West Indian region, and that the species made up a substantial portion of the catch in the Florida shark fishery of the 1940s. In some areas bignose sharks are mistaken for sandbar sharks.

Essential fish habitat for bignose shark:

Neonate (≤67 cm TL): From offshore of the Delmarva Peninsula at 38°N, to offshore of Bull=s Bay, SC at 32°N, between the 100 and 200 m isobaths (Figure 1.4.3.1.6a).

Juveniles (68 to 225 cm TL): From offshore of the Delmarva Peninsula at 38°N, to offshore of Bull=s Bay, SC at 32°N, between the 100 and 500 m isobaths. Also from St. Augustine, FL at 30°N, south to offshore West Palm Beach, FL at 27°N, between the 100 and 500 m isobaths (Figure 1.4.3.1.6b).

Adults (≥226 cm TL): At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Blacktip shark (*Carcharhinus limbatus*)
The blacktip shark is circumtropical in shallow coastal waters and offshore surface waters of the continental shelves. In the southeastern United States it ranges from Virginia to Florida and the Gulf of Mexico. Upon examination of a large number of museum specimens, Garrick (1982) believed the blacktip shark to be a single worldwide species. Dudley and Cliff (1993), working off South Africa, and Castro (1996), working off the southeastern United States, showed that there were significant differences among the various populations of blacktip sharks. For

example, the median size for blacktip sharks in the Atlantic is 126.6 cm fork length, whereas the median size in the Gulf region is 117.3 cm fork length.

The blacktip shark is a fast moving shark that is often seen at the surface, frequently leaping and spinning out of the water. It often forms large schools that migrate seasonally north-south along the coast. This species is much sought after in the eastern United States because of the quality of its flesh. Blacktip and sandbar sharks are the two primary species in the U.S. commercial fisheries. In the markets of the United States, Ablacktip@ has become synonymous with good quality shark; therefore, many other species are also sold under that name.

Additional information on blacktip shark nursery habitat can be found in Heupel and Hueter (2002), Heupel and Simpfendorfer (2002), Keeney et al. (2003), Heupel et al. (2004), Keeney et al. (2005), and Heupel and Simpfendorfer (2005a; 2005b).

Reproductive potential: Off the southeastern United States, male blacktip sharks mature at between 142 and 145 cm TL and females at about 156 cm TL (Castro, 1996). According to Branstetter and McEachran (1986), in the western north Atlantic males mature at 139 to 145 cm TL at four to five years, and females mature at 153 cm TL in six to seven years. A similar pattern is evident in the Atlantic and Gulf of Mexico, with larger size at maturity in the Atlantic than in the Gulf region. However, these ages are unvalidated and based on a small sample. Branstetter and McEachran (1986) estimated the maximum age at ten years, and gave the von Bertalanffy parameters for combined sexes as: L_∞ = 171, K= 0.284, t_o= -1.5.

Young blacktip sharks are born at 55 to 60 cm TL in late May and early June in shallow coastal nurseries from Georgia to the Carolinas (Castro, 1996), and in Bay systems in the Gulf of Mexico (Carlson, 2002; Parsons, 2002) and the Texas coast (Jones and Grace, 2002). Litters range from one to eight pups (Bigelow and Schroeder, 1948), with a mean of four pups. The gestation cycle lasts approximately one year; the reproductive cycle is biennial (Castro, 1996).

According to Castro (1993b), blacktip shark nurseries are on the seaward side of the coastal islands of the Carolinas, at depths of two to four meters. Carlson (2002) found neonates in depths of 2.1 to 6.0 m under a variety of habitat conditions. Castro (1993b) found neonates over muddy bottoms off Georgia and the Carolinas, while Hueter found them over seagrass beds off west Florida (unpublished Mote Laboratory CSR data). Neonates and juveniles were found off west Florida (from the Florida Keys to Tampa Bay) at temperatures of 18.5^o to 33.6^{o}C, salinities of 15.8 to 37.0 ppt, and dissolved oxygen concentrations of 3.5 to 9.0 mg/L. The neonates were found from April to September, while juveniles were found there nearly year-round.

Impact of fisheries: The blacktip shark is caught in many diverse fisheries throughout the world. Off the southeastern United States, it is caught in commercial longlines set in shallow coastal waters, but it is also pursued as a gamefish. There are localized gillnet fisheries in Federal waters off Florida that target blacktip sharks during their migrations, when the schools are close to shore in clear waters. Aircraft are often used to direct net boats to the migrating schools, often resulting in the trapping of large schools. The species is pursued commercially throughout its range and is targeted because it is often found in shallow coastal waters. The blacktip shark's habit of migrating in large schools along shorelines makes it extremely vulnerable to organized drift gillnet fisheries.

Essential fish habitat for blacktip shark:

Neonate (≤69 cm TL): Shallow coastal waters to the 25 m isobath, from Bull=s Bay, SC at 33.5°N, south to Cape Canaveral, FL at 28.5°N. Also on the west coast of Florida from Thousand Islands at 26°N to Cedar Key, FL at 29°N, especially in Tampa Bay and Charlotte Harbor, FL. Additionally, shallow coastal waters with muddy bottoms less than five meters deep on the seaward side of coastal islands from Apalachee Bay to St. Andrews Bay, FL. Also includes shallow coastal waters south of the Thousand Islands, FL at 26°N south to Key West, FL at 24.5°N, and the northeastern Gulf of Mexico (Apalachee Bay, Apalachicola Bay, St. Joseph Bay, Crooked Island Sound and St Andrew Bay) at 85°W to the mouth of St. Louis Bay and the Terrebonne Timbalier Bay System, LA at 91.2°W. Also all major bay systems along the Gulf coast of Texas from Sabine Lake to Lower Laguna Madre (Figure 1.4.3.1.7a).

Juvenile (69 to 155 cm TL): Shallow coastal waters from the shoreline to the 25 m isobath: from Cape Hatteras, NC at 35.25°N to 29°N at Ponce de Leon Inlet to the west coast of Florida, including the Florida Keys and Florida Bay, north to Cedar Key at 29°N; from Cape San Blas, FL north of 29.5°N to the east coast of the Mississippi River delta north of 29°N; from the coast of Texas in Galveston west of 94.5°N, to the U.S./Mexico border; and from the northeastern Gulf of Mexico (Apalachee Bay, Apalachicola Bay, St. Joseph Bay, Crooked Island Sound and St Andrew Bay) to the mouth of St. Louis Bay and the Terrebonne Timbalier Bay System, LA. Also all major bay systems along the Gulf coast of Texas from Sabine Lake to Lower Laguna Madre (Figure 1.4.3.1.7b).

Adult (≥155 cm TL): Shallow coastal waters of the Outer Banks, NC from the shoreline to the 200 m isobath between 36°N and 34.5°N. Also shallow coastal waters offshore to the 50 m isobath from St. Augustine, FL (30°N) to offshore Cape Canaveral, FL (28.5°N), and shallow waters on the west coast of Florida to the 50 m isobath from 81°W in Florida Bay, to 85°W, east of Cape San Blas, FL. Additionally, areas north of St. Augustine, FL at 30°N to Cumberland Island, GA at 30.9°N, but excludes areas south from Apalachicola Bay to Tarpon Springs at 28.2°N (Figure 1.4.3.1.7c).

Bull shark (*Carcharhinus leucas*)

The bull shark is a large, shallow water shark that is cosmopolitan in warm seas and estuaries (Castro, 1983). It often enters fresh water, and may penetrate hundreds of kilometers upstream.

Reproductive potential: Males mature at 210 to 220 cm TL or 14 to 15 years of age, while females mature at >225 cm TL or 18+ years of age (Branstetter and Stiles, 1987). Growth parameters have been estimated by Branstetter and Stiles (1987) as L_∞ = 285 cm TL, K= 0.076, t_o = -3.0 yr. Thorson and Lacy (1982) estimated that females reached, Atheir larger size at approximately 16 years and that males of maximum size were 12 years old." Additionally, bull shark pups measure about 75 cm TL at birth (Clark and von Schmidt, 1965). Jensen (1976) stated that litters ranged from one to ten pups and that the average size was 5.5 pups. The gestation period is estimated at ten to eleven months (Clark and von Schmidt, 1965). The length of the reproductive cycle has not been published, but it is probably biennial.

In the United States, the nursery areas are in low-salinity estuaries of the Gulf of Mexico Coast (Castro, 1983) and the coastal lagoons of the east coast of Florida (Snelson et al., 1984). Hueter (CSR data), working off the Florida west coast, found neonates in Yankeetown, Tampa Bay, and Charlotte Harbor from May to August. The neonates were in temperatures of 28.2° to 32.2°C, with salinities of 18.5-28.5 ppt. Hueter (CSR data) found juveniles off the west coast of Florida in temperatures of 21.0° to 34.0°C, salinities of 3.0 to 28.3 ppt, and dissolved oxygen concentrations of 3.7 to 8.4 ml/L.

Additional information on bull shark life history and nursery habitat can be found in Tremain et al. (2004), Neer et al. (2005), and Simpfendorfer et al. (2005).

Impact of fisheries: The bull shark is a common coastal species that is fished in both artisanal and industrial/modern fisheries. Clark and von Schmidt (1965) found it to be the most common shark caught in their survey of the sharks of the central Gulf coast of Florida, accounting for 18% of the shark catch. Dodrill (1977) reported bull sharks to be the seventh most commonly taken shark at Melbourne Beach, Florida, composing 8.6% of all longline landings. Thorson (1976) recorded a marked decline of the Lake Nicaragua-Rio, San Juan, population from 1963 to 1974, resulting from a small-scale, but sustained commercial fishing operation. This fishery intensified in 1968, and by 1972 bull sharks in the area had become so scarce that Thorson (1976) predicted that any other developments would eliminate the bull shark from Lake Nicaragua.

Russell (1993) indicated that the bull shark constituted three percent of the shark catch in the directed shark fishery in the U.S. Gulf of Mexico. Castillo (1992) referred to the species in Mexico as Aintensely exploited in both coasts." The bull shark is vulnerable to overfishing because of its slow growth, limited reproductive potential, and because it is pursued in numerous fisheries.

Essential fish habitat for bull shark:

Neonate (≤83 cm TL): In shallow coastal waters, inlets, and estuaries, in waters less than 25 m deep: from just north of Cape Canaveral, FL at 29°N to just south of Cape Canaveral, FL at 28°N; from just south of Charlotte Harbor, FL at 26.5°N north to Cedar Key, FL at 29°N; in the mouth of Mobile Bay, AL from 87.75°W to 88.25°W; in the mouth of Galveston Bay, TX from 94.5°W to 95°W; and from South Padre Island, TX south of 28.5°N to Laguna Madre, TX at 27°N (Figure 1.4.3.1.8a).

Juveniles (84 to 225 cm TL): In shallow coastal waters, inlets, and estuaries, in waters less than 25 m deep: from Savannah Beach, GA at 32°N southward to the Dry Tortugas, FL; from Ten Thousand Islands, FL at 26°N north to northern Cedar Key, FL at 29°N; from Apalachiacola, FL at 85°W to the Mobile Bay, AL area at 88.5°W; and from just east of Galveston Bay, TX at 94.5°W to the U.S./Mexico border (Figure 1.4.3.1.8b).

Adults (≥226 cm TL): In shallow coastal waters, inlets, and estuaries, in waters less than 25 m deep, from just south of Charlotte Harbor, FL at 26.5°N to Anclote Key, FL at 28°N (Figure 1.4.3.1.8c).

Caribbean reef shark (*Carcharhinus perezi*)

The Caribbean reef shark inhabits the southeast coast of Florida, the Caribbean, and the west Atlantic south to Brazil. This is a poorly known, bottom-dwelling species that inhabits shallow coastal waters, usually around coral reefs (Castro, 1983).

Reproductive potential: Males mature at about 170 cm TL and females mature at about 200 cm TL. Pups are born at about 70 cm TL; litters consist of four to six pups. The reproductive cycle is biennial (Castro, unpublished data). The nurseries have not been described.

Essential fish habitat for Caribbean reef shark:

Neonate (≤66 cm TL): At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Juveniles (67 to 199 cm TL): Shallow coastal waters of the Florida Keys less than 25 m deep from Key Largo to the Dry Tortugas (Figure 1.4.3.1.9).

Adults (≥200 cm TL): At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Dusky shark (*Carcharhinus obscurus*)

The dusky shark is common in warm and temperate continental waters throughout the world. It is a migratory species that moves north-south with the seasons. This is one of the larger species found from inshore waters to the outer reaches of the continental shelf. It used to be important as a commercial species and a game fish, but fishing is currently prohibited.

Reproductive potential: Male dusky sharks mature at 290 cm TL and reach at least 340 cm TL. The females mature at about 300 cm TL and reach up to 365 cm TL. The dusky shark matures at about 17 years, and is considered a slow growing species (Natanson, 1990). Litters consist of six to 14 pups, which measure 85 to 90 cm TL at birth (Castro, 1983). The gestation period is believed to be about 16 months (Clark and von Schmidt, 1965), but this has not been confirmed. Natanson (1990) gave the following parameters for males: L_{max}= 351 cm FL (420 cm TL), K= .047, t_o = −5.83; and females: L_{max}= 316 cm TL (378 cm TL), K= .061, t_o=-4.83. The growth rate is believed to be about 10 cm/yr for the young and five cm/yr for the adults. Age and growth information can also be found in Natanson et al. (1995).

Dusky shark nursery areas are in coastal waters. Castro (1993c) reported that dusky sharks gave birth in Bulls Bay, SC in April and May. Musick and Colvocoresses (1986) stated that the species gives birth in the Chesapeake Bay, MD in June and July; however, Grubbs and Musick (2002) note that dusky sharks use nearshore waters in VA as nursery areas, but rarely enter estuaries.

Impact of fisheries: The dusky shark has played an important role in the coastal shark fisheries for flesh and fins, and is taken as bycatch in the swordfish and tuna fisheries. The dusky shark is one of the slowest growing requiem sharks, and is often caught on both bottom and pelagic longlines, making it highly vulnerable to overfishing. Fishing for dusky sharks is currently prohibited, as they are a candidate for listing under the Endangered Species Act.

Essential fish habitat for dusky shark:

Neonate (≤110 cm TL): Shallow coastal waters, inlets, and estuaries to the 25 m isobath, from the eastern end of Long Island, NY at 72°W south to Cape Lookout, NC at 34.5°N. Also from Cape Lookout south to West Palm Beach, FL (27.5°N), in shallow coastal waters, inlets, estuaries, and offshore areas to the 90 m isobath. Additionally, areas out to the 200 m isobath off the states of Maryland to North Carolina, and out to the 70 m isobath off New Jersey to Long Island, NY (Figure 1.4.3.1.10a).

Juvenile (110 to 299 cm TL): Coastal and pelagic waters between the 25 and 200 m isobaths off the coast of southern New England from 70°W west and south. Also shallow coastal waters, inlets, and estuaries to the 200 m isobath, from Assateague Island at the Virginia/Maryland border (38°N) to Jacksonville, FL at 30°N. Additionally, shallow coastal waters, inlets, and estuaries to the 500 m isobath, continuing south to the Dry Tortugas, FL at 83° W (Figure 1.4.3.1.10b).

Adult (≥299 cm TL): Pelagic waters offshore the Virginia/North Carolina border at 36.5°N south to Ft. Lauderdale, FL at 28°N between the 25 and 200 m isobaths, including coastal waters offshore from the Virginia/North Carolina border at 36.5°N south to Cape Romain, NC out to the 25 m isobath. Also coastal waters offshore from the Georgia/Florida border at 30.8°N to Cape Canaveral at 28.5°N (Figure 1.4.3.1.10c).

Galapagos shark (*Carcharhinus galapagensis*)

The Galapagos shark is circumtropical in the open ocean and around oceanic islands (Castro, 1983). It is very similar to the dusky shark and is often mistaken for it, although the dusky prefers continental shores (Castro, 1983). The Galapagos shark is very seldom seen in the continental United States. A few Galapagos sharks are undoubtedly caught off the east coast every year, but they can be easily misidentified as dusky sharks.

Reproductive potential: Male Galapagos sharks reach maturity between 205 and 239 cm TL, and females are mature between 215 and 245 cm TL (Wetherbee et al., 1996). Pups are born at slightly over 80 cm TL, and litters range from four to 16 pups, the average being 8.7. The gestation cycle is estimated to last approximately one year (Wetherbee et al., 1996), but the length of the reproductive cycle is not known.

Essential fish habitat for Galapagos shark:

Neonate: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Juveniles: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Adults (≥215 cm TL): At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Lemon shark (*Negaprion brevirostris*)

The lemon shark is common in the American tropics, inhabiting shallow coastal areas, especially around coral reefs. It is reported to utilize coastal mangroves for some of its nursery habitats, although this is not well documented in the literature. The primary population in continental U.S. waters is found off of south Florida, although adults stray north to the Carolinas and Virginia during the summer. Additional life history information can be found in Sundstrom et al. (2001) and Barker et al. (2005).

Reproductive potential: Lemon sharks mature at about 228 cm TL (Springer, 1950b). Brown and Gruber (1988) estimated an age at maturity of 11.6 years for males and 12.7 years for females, showing that the species tends to be slow growing and long lived. Brown and Gruber reported the von Bertalanffy parameters as: L_∞ =317.65, K= .057, and t_o= -2.302. Litters consist of five to 17 pups, which measure about 64 cm TL at birth (Springer, 1950b; Clark and von Schmidt, 1965). The lemon shark's reproductive cycle is biennial (Castro, 1993c), and gestation lasts 10 (Springer, 1950b) to 12 months (Clark and von Schmidt, 1965). Its nurseries are in shallow waters around mangrove islands (Springer 1950b) off tropical Florida and the Bahamas. Hueter (CSR data) found lemon shark neonates in Tampa Bay, FL during the month of May, at temperatures of 22.0° to 25.4°C, salinities of 26.8 to 32.6 ppt, and dissolved oxygen concentrations of 5.9 to 9.6 mg/L. He also found juveniles over a wider area off western Florida and in a wider range of temperatures and salinities.

Impact of fisheries: The lemon shark is captured throughout its range, although it is not a primary commercial species along the Atlantic coast. Anecdotal evidence indicates that lemon sharks are vulnerable to local depletions.

Essential fish habitat for lemon shark:

Neonate (≤68cm TL): Shallow coastal waters, inlets, and estuaries out to the 25 m isobath, from Savannah, GA at 32°N south to Indian River Inlet, FL at 29°N. Also shallow coastal waters, inlets, and estuaries from Miami around peninsular Florida to Cape Sable at 25.25°N, including the Florida Keys in waters less than 25 m deep. Additionally, waters of Tampa Bay, FL, including waters immediately offshore the mouth of the bay, and shallow coastal waters, inlets, and estuaries from South Padre Island, TX at 95.5°N south to the U.S./Mexico border in waters less than 25 m deep (Figure 1.4.3.1.11a).

Juveniles (69 to 235 cm TL): Shallow coastal waters, inlets, and estuaries offshore to the 25 m isobath, west of 79.75°W from Bull=s Bay, SC to south of Cape Canaveral (West Palm Beach), FL at 28°N. Shallow coastal waters, inlets, and estuaries offshore to the 25 m isobath, from Miami at 25.5°N, around peninsular Florida to Tampa Bay, FL (including the Keys) to 28°N. Also shallow coastal waters, inlets, and estuaries offshore to the 25 m isobath, off the south coast of Puerto Rico from 66°W to 67°W (Figure 1.4.3.1.11b).

Adults (≥236 cm TL): Shallow coastal waters, inlets, and estuaries offshore to the 25 m isobath, from Cumberland Island, GA at 31°N to St. Augustine, FL at 31°N. Also from West Palm Beach, FL at 27°N around peninsular Florida to 28.5° N near Anclote Key in shallow coastal waters, inlets, and estuaries, and offshore to the 25 m isobath (Figure 1.4.3.1.11c).

Narrowtooth shark (*Carcharhinus brachyurus*)
This is a coastal-pelagic species of widespread distribution in warm temperate waters throughout the world. In general, it is a temperate shark, absent or rare in tropical waters (Bass et al., 1973). Although the species has been reported from the California coast by Kato et al. (1967) as *C. remotus*, and for the southwest Atlantic, limited data exists for the western north Atlantic.

Reproductive potential: Male narrowtooth sharks mature between 200 and 220 cm TL, and females mature below 247 cm TL. The young are born at about 60 to 70 cm TL. In one study, six pregnant females averaged 16 embryos, with a range of 13 to 20 pups per litter (Bass et al., 1973). Walter and Ebert (1991) calculated age at sexual maturity at 13 to 19 years for males and 19 to 20 years for females. Gestation is believed to last one year (Cliff and Dudley, 1992). The length of the reproductive cycle is not known, but it is probably biennial, as it is for most large carcharhinid sharks.

Impact of fisheries: Because it appears to be a very slow growing carcharhinid (based on the unvalidated ages by Walter and Ebert (1991)), the narrowtooth shark is likely vulnerable to overfishing.

Essential fish habitat for narrowtooth shark:

Neonate: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Juveniles: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Adults: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Night shark (*Carcharhinus signatus*)
This carcharhinid shark inhabits the waters of the western north Atlantic from Delaware to Brazil and the west coast of Africa. It is a tropical species that seldom strays northward. It is usually found at depths greater than 275 to 366 m during the day and about 183 m at night (Castro, 1983).

Reproductive potential: There is little information on night shark reproductive processes. Litters usually consist of 12 to 18 pups that measure 68 to 72 cm TL at birth (Castro, 1983). Length at maturity has been reported for females as 150 cm FL (178 cm TL) (Compagno, 1984). The nurseries remain undescribed. Hazin et al. (2000) and Santana and Lessa (2004) provide additional information on reproduction and age and growth, respectively.

Impact of fisheries: The night shark was abundant along the southeast coast of the United States and the northwest coast of Cuba before the development of the swordfish fishery of the 1970s. Martinez (1947) stated that the Cuban shark fishery relied heavily on the night shark, which constituted 60 to 75% of the total shark catch; the average annual catch from 1937 to 1941 was 12,000 sharks. Manday (1975) documented a precipitous decline in night shark catches off the Cuban northwest coast during the years 1971 to 1973. Berkeley and Campos (1988) stated that this species represented 26.1% of all sharks caught in the swordfish fisheries studied along the east coast of Florida from 1981 to 1983.

Anecdotal evidence from commercial swordfish fishermen also indicates that in the late 1970s it was not unusual to have 50 to 80 dead night sharks, usually large gravid females, in every set from Florida to the Carolinas. During the 1970s, sport fishermen in south Florida often resorted to catching night sharks when other more desirable species, such as marlin, were not biting. The photographic record of sport fishing trophies shows that large night sharks were caught daily and landed at the Miami docks in the 1970s. Today, the species is rare along the southeast coast of the United States. The decline of the night shark may be an example of how a species can decline due to bycatch mortality.

Essential fish habitat for night shark:

Neonate (≤70 cm TL): At this time, the information available is insufficient to identify EFH for this life stage (Map not available).

Juveniles (71 to 177 cm TL): From offshore Assateague Island, MD at 38°N south to offshore Cape Fear at 33.5°N, from the 100 to 2,000 m isobath (Figure 1.4.3.1.12a).

Adults (≥178 cm TL): In the South Atlantic Bight, from the 100 m isobath to either the 2,000 m isobath at 100 miles from shore, or the EEZ boundary, whichever is nearest, from 36°N offshore Oregon Inlet, NC to 25.5°N, off the coast of Miami, FL (Figure 1.4.3.1.12b).

Sandbar shark (*Carcharhinus plumbeus*)

The sandbar shark is cosmopolitan in subtropical and warm temperate waters. It is a common species found in many coastal habitats. It is a bottom-dwelling species most common in 20 to 55 m of water, but occasionally found at depths of about 200 m.

Reproductive potential: The sandbar shark is a slow growing species. Both sexes reach maturity at about 147 cm TL or approximately 5 feet (Merson, 1998). Estimates of age at maturity range from 15 or 16 years (Sminkey and Musick, 1995) to 29 or 30 years (Casey and Natanson, 1992); however, 15 to 16 years is the commonly accepted age of maturity. The von Bertalanffy growth parameters proposed for combined sexes are: L_∞= 186 cm FL (224 cm TL; 168 cm PCL), K= 0.046, t_o= -6.45 by Casey and Natanson (1992); and re-evaluated by Sminkey and Musick (1995) as: L_∞= 164 cm PCL (219 cm TL; 182 cm Fl), K= 0.089, and t_o= -3.8. Young are born from March to July at about 60 cm TL (smaller in the northern parts of the North American range). Litters consist of one to 14 pups, with nine being the average (Springer, 1960). The gestation period lasts about a year and reproduction is biennial (Musick et al., 1993). Hoff (1990) used an age at maturity of 15 years, a life span of 35 years, and a two-year reproductive cycle to calculate that each female may reproduce only ten times. New maturity estimates and the increased mortality in the fishery may reduce that reproductive potential much further.

In the United States, the sandbar shark has its nurseries in shallow coastal waters from Cape Canaveral, FL (Springer, 1960), to Great Bay, NJ (Merson and Pratt, 2002). Delaware Bay, DE (McCandless et al., 2002), Chesapeake Bay, MD (Grubbs and Musick, 2002), and the waters off Cape Hatteras, NC (Jensen et al., 2002), are important primary and secondary nurseries. Juveniles return to Delaware Bay after a winter absence around May 15, and are found as far north as Martha=s Vineyard, MA in the summer. Neonates have been captured in Delaware Bay in late June. Young of the year were present in Delaware Bay until early October when the temperature fell below 21°C. Another nursery may exist along the west coast of Florida and along the northeast Gulf of Mexico. Hueter and Tyminski (2002) found neonates off Yankeetown, FL from April to July, in temperatures of 25.0° to 29.0°C and salinities of 20.4 to 25.9 ppt. Neonate sandbar sharks were found in an area between Indian Pass and St. Andrew Sound, FL in June when the temperature had reached 25°C (Carlson 2002).

Impact of fisheries: The sandbar shark is one of the most important commercial species in the shark fishery of the southeastern United States, along with blacktip sharks. It is a preferred species because of the high quality of its flesh and large fins. Commercial longline fishermen pursue sandbar stocks in their north-south migrations along the coast; their catches can be as much as 80 to 90% sandbar sharks in some areas. Musick et al. (1993) have documented a severe decline in CPUE of the sandbar shark in the Chesapeake Bay area. It is considered highly vulnerable to overfishing because of its slow maturation and heavy fishing pressure, as evidenced in the catch per unit effort (CPUE) declines in U.S. fisheries.

Essential fish habitat for sandbar shark:

Neonate (≤71 cm TL): Shallow coastal areas to the 25 m isobath from Montauk, NY at 72°W, south to Cape Canaveral, FL at 80.5°W (all year). Nursery areas are in shallow coastal waters from Great Bay, NJ to Cape Canaveral, FL, especially Delaware and Chesapeake Bays (seasonal-summer), and in shallow coastal waters up to a depth of 50 m on the west coast of Florida and the Florida Keys from Key Largo at 80.5°W to south of Cape San Blas, FL at 85.25°W. Also on the west coast of Florida from the 50 m isobath to the 30 m isobath, and approximately 20 miles offshore from the Virginia/Maryland border at 37.8°N south to Pamlico Sound, NC at 35.4°N (Figure 1.4.3.1.13a). *Typical parameters*: salinity greater than 22 ppt, and temperatures greater than 21°C.

Juvenile (71 to 147 cm TL): Areas offshore of southern New England and Long Island, NY, including all coastal and pelagic waters north of 40°N and west of 70°W, and Cape Poge Bay, MA around Chappaquiddick Island, MA, and off the south shore of Cape Cod, MA. Also in shallow coastal areas to the 25 m isobath, south of 40°N at Barnegat Inlet, NJ, to Cape Canaveral, FL (27.5° N). Additionally, in the winter, from 39°N to 36°N, in the Mid-Atlantic Bight at the shelf break in benthic areas between the 90 and 200 m isobaths. Also on the west coast of Florida, from shallow coastal waters to the 50 m isobath, from Florida Bay and the Keys at Key Largo to Cape San Blas, FL at 85.5°W (Figure 1.4.3.1.13b).

Adult (≥147 cm TL): Shallow coastal areas on the east coast of the U.S., from the coast to the 50 m isobath from Nantucket, MA, south to Miami, FL. Also shallow coastal areas from the coast to the 90 m isobath around peninsular Florida to the Florida panhandle at 85.5°W, near Cape San Blas, FL, including the Keys and saline portions of Florida Bay (Figure 1.4.3.1.13c).

Habitat Areas of Particular Concern (HAPC) for sandbar shark:
Important nursery and pupping grounds have been identified in shallow areas and at the mouth of Great Bay, NJ, in lower and middle Delaware Bay, DE, lower Chesapeake Bay, MD, near the Outer Banks and in Pamlico Sound, NC, and in areas adjacent to Hatteras and Ocracoke Islands, NC, and offshore of those islands (Figure 1.4.3.1.13d).

Silky shark (*Carcharhinus falciformis*)
The silky shark inhabits warm, tropical, and subtropical waters throughout the world. Primarily, the silky shark is an offshore, epipelagic shark, but juveniles venture inshore during the summer. The silky shark is one of the most abundant large sharks in the world.

Reproductive potential: Data on silky shark reproduction are variable, and there is a strong possibility that different populations may vary in their reproductive potential. Litters range from six to 14 pups, which measure 75 to 80 cm TL at birth (Castro, 1983). According to Bonfil et al. (1993), the silky shark in the Campeche Bank, Mexico, has a 12-month gestation period, and gives birth to ten to 14 pups (average 76 cm TL) during late spring and early summer, possibly every two years. Males mature at 225 cm TL (in about 10 years), and females mature at 232-245 cm TL (older than 12 years). The von Bertanffy parameters estimated by Bonfil et al. (1993) are: L_∞ = 311 cm TL, K= 0.101, and t_o= -2.718 yr. Maximum ages were 20+ years for males and 22+ years for females (Bonfil et al., 1993). Springer (1967) describes reefs on the outer continental shelf as nursery areas. Bonfil et al, (1993) mentions the Campeche Bank as a prime nursery area in the Atlantic.

Impact of Fisheries: The silky shark is caught frequently in swordfish and tuna fisheries. Berkeley and Campos (1988) found that it constituted 27.2% of all sharks caught in swordfish vessels off the east coast of Florida from 1981 to 1983. Bonfil et al. (1993) considered that the life-history characteristics of slow growth, late maturation, and limited offspring may make the species vulnerable to overfishing. In all probability, local stocks of this species cannot support sustained heavy fishing pressure.

Essential fish habitat for silky shark:

Neonate (≤85 cm TL): Waters off Cape Hatteras, NC between the 100 and 2,000 m isobaths, and shallow coastal waters just north and immediately west of Cape Hatteras. Waters off St. Augustine, FL south to off Miami in depths 25 to 1,000 m (likely along the western edge of the Gulf Stream), and off of northwest FL in the De Soto Canyon area between the 200 and 2,000 m isobaths (Figure 1.4.3.1.14a).

Juveniles (86 to 231 cm TL): Waters off the mouth of the Chesapeake Bay, MD to offshore waters west of the North Carolina/South Carolina border from the 50 to 2,000 m isobath. Also from the North Carolina/South Carolina border south to Key West paralleling the 200 m isobath, and the area northwest of Key West to west of the Ten Thousand Islands between the 50 and 2,000 m isobaths (Figure 1.4.3.1.14b).

Adults (≥232 cm TL): At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Spinner shark (*Carcharhinus brevipinna*)

The spinner shark is a common, coastal-pelagic, warm-temperate, and tropical shark of the continental and insular shelves (Compagno, 1984). It is often seen in schools, leaping out of the water while spinning. It is a migratory species, but its patterns are poorly known. Off eastern North America it ranges from Virginia to Florida and in the Gulf of Mexico.

Reproductive potential: Male spinner sharks mature at 130 cm TL in four to five years, and females mature at 150 to 155 cm TL in seven to eight years (Branstetter, 1987). According to Branstetter (1987), males reach maximum size in 10 to 15 years, and females reach maximum size in 15 to 20 years. However, it was noted that as sharks near their maximum size, their growth is slower, therefore, their maximum ages may be much greater (Branstetter, 1987). Branstetter (1987) gave von Bertalanffy parameters for both sexes as: L_∞ = 214 cm, K= 0.212, t_o = -1.94 yr (no age validation).

According to Garrick (1982), spinner sharks may reach up to 278 cm TL. The young are born at 60 to 75 cm TL in late May and early June. The litters usually consist of six to 12 pups (Castro, 1983). Spinner sharks have a biennial reproductive cycle (Castro, 1993c). In the Carolinas the nursery areas are in shallow coastal waters (Castro, 1993c); however, the extent of the nursery areas is unknown. Hueter (CSR data) found juveniles along the west coast of Florida in temperatures of 21.9° to 30.1° C, salinities of 21.0 to 36.2 ppt, and dissolved oxygen concentrations 3.5 to 5.0 mg/L. Additional life history information on the spinner shark can be found in Allen and Wintner (2002), Capape et al. (2003), Bethea et al. (2004), Carlson and Baremore (2005), and Joung et al. (2005).

Impact of fisheries: The impact of fisheries on this species is unknown. The spinner shark is similar in reproductive potential and habits to the blacktip shark, and its vulnerability to fisheries is probably very similar to that of the blacktip. In fact, the blacktip-spinner complex is a commonly used category that combines the landings of these two species, due to difficulties in distinguishing their similar characteristics.

Essential fish habitat for spinner shark:

Neonate (≤71 cm TL): Shallow coastal waters out to the 25 m isobath, along the coast of the southeastern United States and the west coast of Florida from Cape Hatteras, NC at 35.25°N around Florida, including Florida Bay and the Florida Keys to 29.25°N. Additionally, shallow coastal waters with muddy bottoms less than five meters deep, on the seaward side of coastal islands, and in shallow bays along seagrass beds from Apalachee Bay to St. Andrews Bay, FL (Figure 1.4.3.1.15a).

Juveniles (72 to 184 cm TL): In shallow coastal waters to the 200 m isobath, off the east coast from the Florida/Georgia border at 30.7°N to 28.5°N (Figure 1.4.3.1.15b).

Adults (≥185 cm TL): From shallow coastal waters out to the 100 m isobath, off the east coast of Florida from 30°N to 28.5°N offshore of Cape Kennedy (Figure 1.4.3.1.15c).

Tiger shark (*Galeocerdo cuvieri*)

The tiger shark inhabits warm waters in both deep oceanic and shallow coastal regions (Castro, 1983). It is one of the larger species of sharks, reaching over 550 cm TL and over 900 kg. Its characteristic tiger-like markings and unique teeth make it one of the easiest sharks to identify. It is one of the most dangerous sharks, and is believed to be responsible for many attacks on humans (Castro, 1983).

Reproductive potential: Tiger sharks mature at about 290 cm TL (Castro, 1983; Simpfendorfer, 1992). The pups measure 68 to 85 cm TL at birth. Litters are large, usually consisting of 35 to 55 pups (Castro, 1983). According to Branstetter et al. (1987), males mature in seven years and females in 10 years, and the oldest males and females were 15 and 16 years of age (ages not validated). Branstetter et al. (1987) gave the growth parameters for an Atlantic sample as: L_∞ = 440 cm TL, K= 0.107, and t_o= -1.13 years; and for a Gulf of Mexico sample as: L_∞ = 388 cm TL, K= 0.184, and t_o= -0.184.

There is little data on the length of the reproductive cycle. Simpfendorfer (1992) stated that the females do not produce a litter each year, and the length of the gestation period is uncertain. Clark and von Schmidt (1965) stated that the gestation period may be slightly over one year. While this estimate has not been confirmed, it is probably correct, given that many large carcharhinid sharks have biennial reproduction and year-long gestation periods. The nurseries for the tiger shark appear to be in offshore areas, but they have not been described. More recent age and growth information on the tiger shark can also be found in Natanson et al. (1999) and Wintner and Dudley (2000).

Impact of Fisheries: This species is frequently caught in coastal shark fisheries, but is usually discarded due to low fin and meat value.

Essential fish habitat for tiger shark:

Neonate (≤90cm TL): From shallow coastal areas to the 200 m isobath, from Cape Canaveral, FL to offshore of Montauk, Long Island, NY (south of Rhode Island). Also from offshore southwest of Cedar Key, FL to the Florida/Alabama border, from shallow coastal areas to the 50 m isobath (Figure 1.4.3.1.16a).

Juveniles (91 to 296 cm TL): Shallow coastal areas in the 100 m isobath, from the Mississippi Sound (just west of the Mississippi/Alabama border) to the Florida Keys, and around the 100 m isobath of peninsular Florida to the Florida/Georgia border. Also in the 25 to 100 m isobath, from the Florida/Georgia border to Cape Lookout, NC, and inshore to the 100 m isobath, from Cape Lookout north to just south of the Chesapeake Bay, MD. Then north of the mouth of Chesapeake Bay to offshore Montauk, Long Island, NY, to south of Rhode Island between the 25 and 100 m isobaths. Additionally, the south and southwest coasts of Puerto Rico from inshore to the 2,000 m isobath (Figure 1.4.3.1.16b).

Adults (≥297 cm TL): Offshore from Chesapeake Bay, MD south to Ft. Lauderdale, FL to the western edge of the Gulf Stream, and from Cape San Blas, FL to Mississippi Sound between the 25 and 200 m isobaths. Also off the south and southwest coasts of Puerto Rico from inshore to the 2,000 m isobath (Figure 1.4.3.1.16c).

Bigeye sand tiger (*Odontaspis noronhai*)

This is one of the rarest large sharks. Its large eyes and uniform dark coloration indicate that it is a deep-water species. The few catch records that exist indicate that it frequents the upper layers of the water column at night. A few bigeye sand tiger specimens were caught at depths of 600-1,000 m off Brazil (Compagno, 1984). Additionally, a 321 cm TL immature female was caught in the Gulf of Mexico, about 70 miles east of Port Isabel, TX in 1984. Another specimen was caught in the tropical Atlantic (5°N; 35°W) at a depth of about 100 m where the water was about 3,600 m deep. These appear to be all the records for the species. Nothing is known of its habits. Possession of this species is prohibited in Atlantic waters of the United States.

Essential fish habitat for bigeye sand tiger shark:

Neonate: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Juveniles: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Adults: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Sand tiger shark (*Carcharias taurus*)

The sand tiger is a large, coastal species found in tropical and warm temperate waters throughout the world. It is often found in very shallow water (4 m) (Castro, 1983). It is the most popular large shark in aquaria, because, unlike most sharks, it survives easily in captivity. It has been fished for its flesh and fins in coastal longline fisheries, although possession of this species in Atlantic waters of the United States is now prohibited.

Reproductive potential: According to Gilmore (1983), male sand tiger sharks mature at about 191.5 cm TL. According to Branstetter and Musick (1994), males reach maturity at 190 to 195 cm TL in four to five years, and females reach maturity at more than 220 cm TL in six years. The largest immature female seen by J. Castro (personal communication) was 225 cm TL and the smallest gravid female was 229 cm TL, suggesting that maturity is reached at 225 to 229 cm TL. The oldest fish in Branstetter and Musick=s (1994) sample of 55 sharks was 10.5 years old, an age that has been exceeded in captivity (Govender et al., 1991). The von Bertalanffy parameters, according to Branstetter and Musick (1994) are for males: L_{max}= 301 cm, K= 0.17, and t_o= -2.25; and for females: L_{max}= 323 cm, K= 0.14, and t_o= -2.56 yrs. Gilmore (1983) gave growth rates of 19 to 24 cm/yr for the first years of life of two juveniles born in captivity.

The sand tiger has an extremely limited reproductive potential, producing only two young per litter (Springer, 1948). In North America the sand tiger gives birth in March and April to two young that measure about 100 cm TL. Parturition (birth of the young) is believed to occur in winter in the southern portions of its range, and the neonates migrate northward to summer nurseries. The nursery areas are the following Mid-Atlantic Bight estuaries: Chesapeake, Delaware, Sandy Hook, and Narragansett Bays, as well as coastal sounds. Branstetter and Musick (1994) suggested that the reproductive cycle is biennial, but other evidence suggests annual parturition. Additional information on the sand tiger shark may be found in Gelsleichter et al. (1999) and Lucifora et al. (2002).

Impact of fisheries: The sand tiger shark is extremely vulnerable to overfishing because it congregates in coastal areas in large numbers during the mating season. These aggregations are attractive to fishermen, although the effects of fishing these aggregations probably contribute to local declines in the population abundance. Its limited fecundity (two pups per litter) probably contributes to its vulnerability. In the United States there was a very severe population decline in the early 1990s, with sand tiger sharks nearly disappearing from North Carolina and Florida waters. Musick et al. (1993) documented a decrease in the Chesapeake Bight region of the U.S. Mid-Atlantic coast. In 1997, NOAA Fisheries prohibited possession of this species in U.S. Atlantic waters.

Essential fish habitat for sand tiger shark:

Neonate (≤117cm TL): Shallow coastal waters from Barnegat Inlet, NJ to Cape Canaveral, FL, from the coast to the 25 m isobath (Figure 1.4.3.1.17a).

Juveniles (118 to 236 cm TL): At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Adults (≥237 cm TL): Shallow coastal waters out to the 25 m isobath from Barnegat Inlet, NJ to Cape Lookout, and from St. Augustine to Cape Canaveral, FL (Figure 1.4.3.1.17b).

Whale shark (*Rhincodon typus*)

The whale shark is a sluggish, pelagic filter feeder, often seen swimming on the surface. It is the largest fish in the oceans, reaching lengths of 1210 cm TL and perhaps longer. It is found throughout all tropical seas, usually far offshore (Castro, 1983). Possession of this species in Atlantic waters of the United States is now prohibited.

Reproductive potential: For many years the whale shark was believed to be oviparous, based on a presumably aborted egg case trawled from the Gulf of Mexico many years ago. Recent discoveries (Joung et al., 1996) proved the whale shark to be viviparous and the most prolific of all sharks. The only gravid female examined carried 300 young in several stages of development. The embryos measured 580 to 640 mm TL, the largest appearing ready for birth. The length of the reproductive cycle is unknown, but is probably biennial such as in the closely related nurse shark (*Ginglymostoma cirratum*), and most other large sharks (Castro, 1996).

Based on unpublished information on the growth rate of one surviving embryo from a female reported by Joung et al. (1996), the whale shark may be the fastest growing shark. Only a handful of small juveniles have ever been caught, probably because of the extremely fast growth rate or high mortality rate of juveniles. The locations of whale shark nurseries are unknown and remain one of the interesting mysteries of shark biology. Additional life history information can be found in Chang et al. (1997), Colman (1997), and Wintner (2000).

Impact of fisheries: There are very few reports of aggregations of whale sharks. The range of the whale shark may be extremely vast, perhaps encompassing entire ocean basins. It may therefore be necessary to consider whale shark fisheries on an ocean-wide perspective. There have been a few small fisheries for whale sharks in India, the Philippines, and Taiwan, but it is of little commercial importance elsewhere. The whale shark used to be fished for its flesh, but presently the fins and oil are also taken. Generally, the size of the whale shark safeguards it from most fisheries. Records of the Taiwanese fishery demonstrate that whale sharks, like most elasmobranchs, are susceptible to overfishing. In 1997, NOAA Fisheries prohibited possession of this species in U.S. Atlantic waters.

Essential fish habitat for whale shark:

Neonate: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Juveniles: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Adults: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Atlantic angel shark (*Squatina dumerili*)

The angel shark is a flattened shark that resembles a ray. It inhabits coastal waters of the United States from Massachusetts to the Florida Keys, the Gulf of Mexico, and the Caribbean. It is common from southern New England to the Maryland coast (Castro, 1983).

Reproductive potential: Maturity is probably reached at a length of 90 to 105 cm TL. The pups measure 28 to 30 cm TL at birth, and up to 16 pups in one litter have been observed (Castro, 1983). Very little is known about the biology of this species.

Essential fish habitat for Atlantic angel shark:

Neonate (≤31 cm TL): In shallow coastal waters out to the 25 m isobath, off the coast of southern New Jersey, Delaware, and Maryland from 39°N to 38°N, including the mouth of Delaware Bay (Figure 1.4.3.1.18).

Juveniles (32 to 113 cm TL): In shallow coastal waters out to the 25 m isobath, off the coast of southern New Jersey, Delaware, and Maryland from 39°N to 38°N, including the mouth of Delaware Bay (Figure 1.4.3.1.18).

Adults (≥113 cm TL): In shallow coastal waters out to the 25 m isobath, off the coast of southern New Jersey, Delaware, and Maryland from 39°N to 38°N, including the mouth of Delaware Bay (Figure 1.4.3.1.18).

<u>Bonnethead (*Sphyrna tiburo*)</u>

The bonnethead is a small hammerhead that inhabits shallow coastal waters where it frequents sandy or muddy bottoms. It is confined to the warm waters of the western hemisphere (Castro, 1983).

Reproductive potential: Male bonnetheads mature at about 70 cm TL, and females mature at about 85 cm TL (Parsons, 1993). Litters consist of eight to12 pups, with the young measuring 27 to 35 cm TL at birth (Castro, 1983; Parsons, 1993). Parsons (1993) estimated the gestation period of two Florida populations at 4.5 to 5 months, one of the shortest gestation periods known for sharks. The reproductive cycle is annual (Castro, personal observation). Hueter (CSR data) found young of the year and juveniles in the west coast of Florida at temperatures of 16.1° to 31.5°C, salinities of 16.5 to 36.1 ppt, and dissolved oxygen concentrations of 2.9 to 9.4 mg/L. Additional life history information can be found in Cortes et al. (1996), Cortes and Parsons (1996), Cortes et al. (1996), Carlson and Parsons (1997), Lessa and Almeida (1998), Marquez-Farias et al. (1998), Carlson et al. (1999), and Lombardi-Carlson et al. (2003).

Impact of fisheries: The bonnethead is at a lesser risk of overfishing because it is a fast growing species that reproduces annually, and, due to its small size, is generally not targeted by commercial fisheries. Although bonnetheads are caught as bycatch in gillnet fisheries operating in shallow waters of the southeastern United States, many of these fisheries have been prohibited by various states, and are therefore forced into deeper Federal waters where gillnets are less effective. Bonnethead bycatch in the U.S. Gulf of Mexico shrimp fishery seems to have remained stable over the last twenty years, from 1974 to 1994 (Pellegrin, 1996).

Essential fish habitat for bonnethead shark:

Neonate (≤38 cm TL): Shallow coastal waters, inlets, and estuaries less than 25 m deep, from Jekyll Island, GA to just north of Cape Canaveral, FL, and in shallow waters less than 25 m deep on the Gulf-side of the Florida Keys as far north as Cape Sable. Additionally, shallow coastal bays and estuaries less than five meters deep, from Apalachee Bay to St. Andrews Bay, FL (Figure 1.4.3.1.19a).

Juveniles (39 to 82 cm TL): Shallow coastal waters, inlets, and estuaries from Cape Fear, NC southward to West Palm Beach, FL, in waters less than 25 m deep. Also shallow coastal waters, inlets, and estuaries from Miami around peninsular Florida as far north as Cedar Key, in waters less than 25 m deep. Additionally, shallow coastal waters, inlets, and estuaries from the Mississippi River westward to the Rio Grande River (Texas/Mexico border) (Figure 1.4.3.1.19b).

Adults (≥83 cm TL): Shallow coastal waters, inlets, and estuaries from Cape Fear, NC to Cape Canaveral, FL. Also shallow waters around the Florida Keys, and shallow coastal waters from Mobile Bay, AL west to South Padre Island, TX, from inshore to the 25 m isobath (Figure 1.4.3.1.19c).

<u>Atlantic sharpnose shark (*Rhizoprionodon terraenovae*)</u>

The Atlantic sharpnose shark is a small coastal carcharhinid, inhabiting the waters of the northeast coast of North America. It is a common year-round resident along the coasts of South

Carolina, Florida, and in the Gulf of Mexico, and an abundant summer migrant off Virginia. Frequently, these sharks are found in schools of uniform size and sex (Castro, 1983).

Reproductive potential: The male Atlantic sharpnose sharks mature at around 65 to 80 cm TL, and grow to 103 cm TL. The females mature at 85 to 90 cm TL, and reach a length of 110 cm TL. Litters range from four to seven pups, which measure 29 to 32 cm TL (Castro, 1983). Mating is in late June; the gestation period is approximately 11 to 12 months (Castro and Wourms, 1993). The von Bertalanffy growth parameter estimates for the species are: L_∞ = 108, K= 0.359, and t_o= -0.985 yr (Branstetter, 1987). Cortés (1995) calculated that the population=s intrinsic rate of increase was, at best, r= .044, or a finite increase of e_r = 1.045.

Off South Carolina, the young are born in late May and early June in shallow coastal waters (Castro and Wourms, 1993). Hueter (CSR data) found neonates off the west coast of Florida at Yankeetown and Anclote Key during the months of May to July. These neonates were found in temperatures of 24.0° to 30.7°C, salinities of 22.8 to 337 ppt, and dissolved oxygen concentrations of 5.7 mg/L. Larger juveniles were also found in the area in temperatures of 17.2° to 33.3°C, salinities of 22.8 to 35.5 ppt, and dissolved oxygen concentrations of 4.5 to 8.6 mg/L. Additional life history information can be found in Cortes (1995), Marquez-Farias and Castillo-Geniz (1998), Gelsleichter et al. (1999), Carlson and Baremore (2003), Hoffmayer and Parsons (2003), Loefer and Sedberry (2003), and Bethea et al. (2004).

Impact of fisheries: Large numbers of Atlantic sharpnose sharks are taken as bycatch in the U.S. shrimp trawling industry. The Texas Recreational Survey, NOAA Fisheries Headboat Survey, and the U.S. Marine Recreational Fishing Statistics Survey have estimated a slow increase in the sharpnose fishery. The Atlantic sharpnose shark is a fast-growing species that reproduces yearly. In spite of being targeted by recreational fisheries and the large bycatch in the shrimp industry, the populations appear to be stable.

Essential fish habitat for Atlantic sharpnose sharks:

Neonate (≤40 cm TL): Shallow coastal areas including bays and estuaries out to the 25 m isobath, from Galveston Island south to the Rio Grande (Texas/Mexico border), and from Daytona Beach to Cape Hatteras, NC. Additionally, shallow coastal bays and estuaries less than five meters deep, from Apalachee Bay to St. Andrews Bay, FL (Figure 1.4.3.1.20a).

Juveniles (41 to 78 cm TL): Shallow coastal areas including bays and estuaries out to the 25 m isobath, from Galveston Island south to the Rio Grande (Texas/Mexico border). Also off Louisiana from the Atchafalya River to Mississippi River Delta out to the 40 m isobath, and from Daytona Beach, FL to Cumberland Island, GA. Additionally, Hilton Head Island, SC to Cape Hatteras, NC, out to the 25 m isobath (slightly deeper- to the 50 m isobath off North Carolina) (Figure 1.4.3.1.20b).

Adults (≥79 cm TL): From Cape May, NJ to the North Carolina/South Carolina border, and shallow coastal areas north of Cape Hatteras, NC to the 25 m isobath. Also south of Cape Hatteras between the 25 and 100 m isobaths, and offshore of St. Augustine, FL to Cape Canaveral, FL from inshore to the 100 m isobath. Additionally, Mississippi Sound from Perdido Key to the Mississippi River Delta to the 50 m isobath, and coastal waters from Galveston to Laguna Madre, TX to the 50 m isobath (Figure 1.4.3.1.20c).

Blacknose shark (*Carcharhinus acronotus*)

The blacknose shark is a common coastal species that inhabits the western north Atlantic from North Carolina to southeast Brazil (Bigelow and Schroeder, 1948). It is very abundant in coastal waters from the Carolinas to Florida and the Gulf of Mexico during summer and fall (Castro, 1983). Schwartz (1984) hypothesized that there are two separate populations in the West Atlantic.

Reproductive potential: Blacknose sharks reach maturity at about 100 cm TL. Litters consist of three to six pups, which measure 50 cm TL at birth (Castro, 1983). Dodrill (1977) estimated the gestation period to be 10 to 11 months, and suggested that the breeding cycle was biennial. Schwartz (1984) estimated that the largest adult male captured was 164 cm TL and was 9.6 years old, while an adult female of 154 cm TL was also 9.6 years old.

Castro (1983) stated that in South Carolina, nursery areas were in shallow waters. The species is common throughout the year off Florida, suggesting that part of the population may be non-migratory and that nursery areas may exist in Florida as well. Hueter (CSR data) found 13 neonates in the Ten Thousand Islands and off Sarasota in June and July at temperatures 29° to 30.1°C, salinities of 32.2 to 37.0 ppt, and dissolved oxygen concentrations of 6.5 mg/L. He also found young of the year and juveniles at temperatures of 17.3° to 34°C, salinities of 25.0 to 37.0 ppt, and dissolved oxygen concentrations of 4.8 to 8.5 mg/L. Additional life history information can be found in Carlson et al. (1999), Hazin et al. (2002), and Driggers et al. (2004a; 2004b).

Impact of fisheries: Large numbers of blacknose sharks are caught in shallow coastal waters of the southeastern United States. The species is vulnerable to overfishing because it has typical carcharhinid characteristics such as biennial reproductive cycle, and it is targeted in the shark fisheries in the southeastern United States.

Essential fish habitat for blacknose shark:

Neonate (≤52 cm TL): Shallow coastal waters to the 25 m isobath from the North Carolina/South Carolina border to Cape Canaveral, FL, and shallow waters to the 25 m isobath from Ten Thousand Islands north to just south of Tampa Bay, FL (Figure 1.4.3.1.21a).

Juveniles (53 to 106 cm TL): Shallow coastal waters to the 25 m isobath from the Georgia/Florida border to West Palm Beach, FL, and shallow waters to the 25 m isobath from the Florida Keys to the mouth of Tampa Bay, FL. Additionally, shallow coastal bays and estuaries less than five meters deep with expanses of seagrasses, from Apalachee Bay to St. Andrews Bay, FL (Figure 1.4.3.1.21b).

Adults (≥107 cm TL): Shallow coastal waters to the 25 m isobath from St. Augustine south to Cape Canaveral, FL, and shallow waters to the 25 m isobath from the Florida Keys north to Cedar Key, FL. Also Mississippi Sound from Mobile Bay, AL to the waters off Terrebonne Parish, LA in waters 25 to 100 m deep (Figure 1.4.3.1.21c).

<u>Caribbean sharpnose shark (*Rhizoprionodon porosus*)</u>
The Atlantic sharpnose shark and the Caribbean sharpnose shark are cognate species, separable only by having different numbers of precaudal vertebrae (Springer, 1964). However, their ranges do not overlap - the Caribbean sharpnose shark inhabits the Atlantic from 24°N to 35°S, while the Atlantic sharpnose is found at latitudes higher than 24°N. Their biology is very similar.

Essential fish habitat for Caribbean sharpnose shark:

Neonate: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Juveniles: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Adults: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

<u>Finetooth shark (*Carcharhinus isodon*)</u>
The finetooth shark is a common inshore species of the western Atlantic ranging from North Carolina to Brazil. It is abundant along the southeastern United States and the Gulf of Mexico (Castro, 1983). Finetooth sharks captured in the northeastern Gulf of Mexico ranged in size from 48 to 150 cm TL, and were generally found in water temperatures averaging 27.3°C and depths of 4.2 m (Carlson, 2002). Important nursery habitat is also located in South Carolina (Ulrich and Riley, 2002), Louisiana (Neer et al., 2002), and the coast of Texas (Jones and Grace, 2002).

Reproductive potential: Males mature at about 130 cm TL and females mature at about 135 cm TL. The young measure 48 to 58 cm TL at birth. Litters range from two to six embryos, with an average of four. The gestation period lasts about a year, and the reproductive cycle is biennial. Some of the nurseries are in shallow coastal waters of South Carolina (Castro, 1993b). Additional life history information can be found in Carlson et al. (2003), Hoffmayer and Parsons (2003), and Bethea et al. (2004).

Impact of fisheries: According to the SCS stock assessment, finetooth sharks are caught commercially almost exclusively in the South Atlantic region, and mostly with gillnets (approximately 80% of finetooth shark landings) and longlines (approximately 20%). The SCS stock assessment estimates that 16,658 finetooth sharks were landed commercially in 2000, and of these, only 8% were from HMS fisheries. The majority of the catch thus appears to come from fishermen in non-HMS fisheries. The species is vulnerable to overfishing because of its biennial reproductive cycle and small brood size.

Essential fish habitat for finetooth shark:

Neonate (≤65 cm TL): Shallow coastal waters of South Carolina, Georgia, and Florida out to the 25 m isobath, from 33°N to 30°N. Additionally, shallow coastal waters less than five meters deep with muddy bottoms, and on the seaward side of coastal islands from Apalachee Bay to St. Andrews Bay, FL, especially around the mouth of the Apalachicola River. This includes coastal waters out to the 25 m isobath from Mobile Bay, AL to Bay St. Louis, MS, from 88°W to 89.5°W, and from near Sabine Pass, TX to Laguna Madre, TX (Figure 1.4.3.1.22a).

Juvenile (65 to 135 cm TL): Shallow coastal waters of South Carolina, Georgia, and Florida out to the 25 m isobath, from 33°N to 30°N. Additionally, shallow coastal waters less than five meters deep with muddy bottoms, and on the seaward side of coastal islands from Apalachee Bay to St. Andrews Bay, FL, especially around the mouth of the Apalachicola River. This includes coastal waters out to the 25 m isobath, from Mobile Bay, AL to Atchafalaya Bay, LA from 88°W to 91.4°W, and from near Sabine Pass, TX at 94.2°W to Laguna Madre, TX at 26°N. Also coastal waters out to the 25 m isobath from South Carolina to Cape Hatteras, NC at 35.5°N (Figure 1.4.3.1.22b).

Adult (≥135 cm TL): Shallow coastal waters of South Carolina, Georgia, and Florida out to the 25 m isobath, from 33°N to 30°N. Additionally, shallow coastal waters less than five meters deep with muddy bottoms, and on the seaward side of coastal islands from Apalachee Bay to St. Andrews Bay, FL, especially around the mouth of the Apalachicola River. This includes coastal waters out to the 25 m isobath, from Mobile Bay, AL to Atchafalaya Bay, LA from 88°W to 91.4°W, and from near Sabine Pass, TX at 94.2°W to Laguna Madre, TX at 26°N. Also coastal waters out to the 25 m isobath from South Carolina to Cape Hatteras, NC at 35.5°N (Figure 1.4.3.1.22b).

Smalltail shark (*Carcharhinus porosus*)

This is a small, tropical, and subtropical shark that inhabits shallow coastal waters and estuaries in the western Atlantic, from the Gulf of Mexico to southern Brazil, and the eastern Pacific from the Gulf of California to Peru (Castro, 1983). A few specimens have been caught in the Gulf of Mexico off Louisiana and Texas.

Reproductive potential: There is almost no published data on smalltail shark reproductive processes. Females observed in Trinidad were in different stages of gestation, suggesting a wide breeding season. Embryos up to 35 cm TL were observed. The reproductive cycle appears to be annual (Springer 1950a). Additional life history information can be found in Lessa and Santana (1998) and Lessa et al. (1999b).

Impact of fisheries: The species is marketed in many areas of Central America; Springer (1950a) stated that large numbers were sold in the Trinidad market.

Essential fish habitat for smalltail shark:

Neonate: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Juveniles: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Adults: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

1.4.3.2 Pelagic Sharks

Bigeye sixgill shark (*Hexanchus vitulus*)

This is a poorly known deep-water shark that was not described until 1969. Most specimens have been accidental captures at depths of 400 m in tropical waters (Castro, 1983). In North America most catches have come from the Bahamas and the Gulf of Mexico.

Essential fish habitat for bigeye sixgill shark:

Neonate: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Juveniles: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Adults: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Sevengill shark (*Heptranchias perlo*)

This is a deep-water species of the continental slopes, where it appears to be most common at depths of 180 to 450 m. It has a world-wide distribution in deep tropical and warm temperate waters. In the United States, the sevengill shark ranges from South Carolina to the Gulf of Mexico.

Reproductive potential: Maturity is reached at about 85-90 cm TL. Litters consist of nine to 20 pups, which measure about 25 cm TL at birth (Castro, 1983). According to Tanaka and Mizue (1977), off Kyushu, Japan, the species reproduces year-round. The lengths of the reproductive and gestation cycles are unknown. The locations of the nurseries are also unknown.

Impact of fisheries: The sevengill shark is sometimes caught in large numbers as bycatch in fisheries using bottom trawls or longlines (Compagno, 1984). In North America it is occasionally seen in small numbers as bycatch of tilefish longlines (Castro, unpublished data).

Essential fish habitat for sevengill shark:

Neonate: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Juveniles: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Adults: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Sixgill shark (*Hexanchus griseus*)

One of the largest sharks, the sixgill shark is a common, bottom-dwelling species usually reported from depths of 180 to 1,100 m, in deep, tropical, and temperate waters throughout the world (Castro, 1983). It often comes close to the surface at night, where it may take longlines set for other species. Juveniles stray into very shallow cool waters.

Reproductive potential: Very few mature sixgill sharks have been examined by biologists; thus the reproductive processes are poorly known. Ebert (1986) reported a 421 cm TL female to be gravid with term embryos. Harvey-Clark (1995) stated that males mature at 325 cm TL, without providing any evidence for this. The species has not been aged. It is probably long-lived, similar to the Greenland shark, another deep-water giant shark. The pups measure 60 to 70 cm TL at birth. Litters are large; up to 108 pups have been reported in a single parturition event (Castro, 1983). Juveniles are often caught in coastal waters, suggesting that the nurseries are in waters much shallower than those inhabited by the adults. Nothing else is known about the nurseries of this species. Additional life history information can be found in Ebert (2002) and McFarlane et al. (2002).

Impact of fisheries: Although juveniles are common in deep continental shelf waters and often enter coastal waters, the adults are seldom taken (Springer and Waller, 1969; Ebert, 1986). Apparently, adults are in waters deeper than those regularly fished, or perhaps these very large animals break the gear and escape. Thus, the very deep habitat of the adults or perhaps their large size seems to convey some measure of protection from most fisheries.

According to Harvey-Clark (1995), in 1991 the sixgill shark became the target of a directed, subsidized, longline fishery off British Columbia, Canada. At about the same time, the species also became of interest as an ecotourism resource, with several companies taking diving tourists out to watch sixgill sharks in their environment.

The fishery was unregulated and lasted until 1993, when the commercial harvest of sixgill sharks was discontinued due to conservation and management concerns (Harvey-Clark 1995). Also according to Harvey-Clark (1995), diver observations of sixgill sharks decreased in 1993, and it was unclear at the time whether the fishery or the ecotourism could be sustained. It is difficult to evaluate the vulnerability of the sixgill shark because of the lack of fisheries or landings data. The only fishing operations on record collapsed in a few years, suggesting that the species may be very vulnerable to overfishing.

Essential fish habitat for sixgill shark:

Neonate: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Juveniles: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Adults: At this time, available information is insufficient for the identification of EFH for this life stage (Map not available).

Longfin mako shark (*Isurus paucus*)
This is a deep dwelling lamnid shark found in warm waters. The species was not described until 1966, and it is very poorly known.

Reproductive potential: There is very little data on the reproductive processes of the longfin mako shark. Litters consist of two to eight pups, which may reach 120 cm TL at birth (Castro, unpublished).

Impact of fisheries: The longfin mako shark is a seasonal bycatch of the pelagic tuna and swordfish fisheries. Possession of this species in Atlantic waters of the United States is now prohibited.

Essential fish habitat for longfin mako shark:
Note: At this time, insufficient data is available to differentiate essential fish habitat by size classes, therefore, it is the same for all life stages.

Neonate (≤149 cm TL): Off the northeast U.S. coast from the 100 m isobath out to the EEZ boundary, from south Georges Bank to 35°N. Also from 35°N to 28.25°N off Cape Canaveral, FL, from the 100 m isobath to the 500 m isobath. Additionally, from 28.25°N south around peninsular Florida and west to 92.5°W in the Gulf of Mexico, from the 200 m isobath to the EEZ boundary (Figure 1.4.3.1.23).

Juveniles (150 to 244 cm TL): Off the northeast U.S. coast from the 100 m isobath out to the EEZ boundary, from south Georges Bank to 35°N. Also from 35°N to 28.25°N off Cape Canaveral, FL, from the 100 m isobath to the 500 m isobath. Additionally, from 28.25°N south around peninsular Florida and west to 92.5°W in the Gulf of Mexico, from the 200 m isobath to the EEZ boundary (Figure 1.4.3.1.23).

Adults (≥245 cm TL): Off the northeast U.S. coast from the 100 m isobath out to the EEZ boundary, from south Georges Bank to 35°N. Also from 35°N to 28.25°N off Cape Canaveral, FL, from the 100 m isobath to the 500 m isobath. Additionally, from 28.25°N south around peninsular Florida and west to 92.5°W in the Gulf of Mexico, from the 200 m isobath to the EEZ boundary (Figure 1.4.3.1.23).

Porbeagle (*Lamna nasus*)
The porbeagle is a lamnid shark common in deep, cold temperate waters of the north Atlantic, south Atlantic, and south Pacific Oceans. It is highly esteemed for its flesh. There have been fisheries for this species in the north Atlantic for many years.

Reproductive potential: Very little is known about the reproductive processes of the porbeagle. Aasen (1963) estimated that maturity was reached at 150 to 200 cm TL for males and 200 to 250 cm TL for females. Castro (unpublished data) estimated that porbeagles reach 20 to 30 years of age. Shann (1911) reported an embryo 61 cm TL, and estimated that porbeagles were probably born at about 76 cm TL. Bigelow and Schroeder (1948) recorded a free-swimming specimen at 76 cm TL. Gauld (1989) gave 3.7 as the mean number of embryos in a sample of 12 females. The frequency of reproduction is not known.

According to Aasen (1963), the porbeagle probably reproduces annually, but there is no evidence to support this claim. Furthermore, the nurseries are probably in continental shelf waters. More recent life history information can be found in Francis and Stevens (2000), Jensen et al. (2002), Joyce et al. (2002), Natanson et al. (2002), Campana and Joyce (2004), and Francis and Duffy (2005).

Impact of fisheries: The porbeagle is presently targeted in northern Europe and along the northeast coast of North America. Whether the porbeagles in the north Atlantic constitute one or more separate stocks is not known. A small porbeagle fishery resumed in the early 1990s in the northeastern United States, after being practically non-existent for decades. Intensive fisheries have depleted the stocks of porbeagles in a few years wherever they have existed, demonstrating that the species cannot withstand heavy fishing pressure.

Essential fish habitat for porbeagle shark:

Neonate (≤79 cm TL): From the 100 m isobath to the EEZ boundary, from offshore Cape May, NJ, or approximately 39°N to approximately 42°N (west of Georges Bank) (Figure 1.4.3.1.24a).

Juveniles (80 to 209 cm TL): From the 200 m isobath to the EEZ boundary, from offshore Great Bay at approximately 38°N to approximately 42°N (west of Georges Bank) (Figure 1.4.3.1.24b).

Adults (≥210 cm TL): From offshore Portland, ME to Cape Cod, MA, along the 100 m isobath out to the EEZ boundary, and from Cape Cod to the 2,000 m isobath out to the EEZ boundary (Figure 1.4.3.1.24c).

Shortfin mako shark (*Isurus oxyrinchus*)

The shortfin mako shark is found in warm and warm-temperate waters throughout all oceans. It is an oceanic species at the top of the food chain, feeding on fast-moving fishes, such as swordfish, tuna, and other sharks (Castro, 1983). It is considered one of the great game fish of the world, and its flesh is considered among the best to eat.

Reproductive potential: According to Pratt and Casey (1983), females mature at about 7 years of age. Cailliet et al. (1983) estimated the von Bertalanffy parameters (n= 44) for the shortfin mako shark as: L_∞ = 3210 mm, K= .072, and t_o= -3.75. Cailliet and Mollet (1997) estimated that a female shortfin mako shark lives for approximately 25 years, matures at four to six years, has a two-year reproductive cycle, and has a gestation period of approximately 12 months. The litters range from 12 to 20 pups, although only a handful have been examined (Castro, unpublished data). There is circumstantial evidence that the nursery areas are in deep tropical waters. The life span of the species has been estimated at 11.5 years (Pratt and Casey, 1983). Additional life history information can be found in Stillwell and Kohler (1982), Pratt and Casey (1983), Heist et al. (1996), Mollet et al. (2000), Campana et al. (2002), Estrada et al. (2003), Francis and Duffy (2005), Loefer et al. (2005), and MacNeil et al. (2005).

Impact of fisheries: The shortfin mako shark is a common bycatch in tuna and swordfish fisheries. Due to their high market value, shortfin mako sharks are usually the only sharks retained in some pelagic fleets with high shark bycatch rates. Off the northeast coast of North America, most of the catch consists of immature fish (Casey and Kohler, 1992). The index of abundance for shortfin mako sharks in the commercial longline fishery off the Atlantic coast of the United States shows a steady decline (Cramer, 1996a). The few indices available (ICES, 1995; Cramer, 1996a; Holts et al., 1996) indicate substantial population decreases. Because the species is commonly caught in widespread swordfish and tuna operations, it is reasonable to assume that similar decreases are occurring in areas for which there are limited data.

Essential fish habitat for shortfin mako shark:

Neonate (≤85 cm TL): Between the 50 and 2,000 m isobaths, from Cape Lookout, NC at approximately 35°N, to just southeast of Georges Bank (approximately 42°N and 66°W) to the EEZ boundary. Also between the 25 and 50 m isobaths from offshore of the Chesapeake Bay (James River at the North Carolina/Virginia border) to a line running west of Long Island, NY to just southwest of Georges Bank at approximately 67°W and 41°N (Figure 1.4.3.1.25a).

Juveniles (108 to 262 cm TL): Between the 25 and 2,000 m isobaths from offshore Onslow Bay, NC to Cape Cod, MA, and extending west between 38°N and 41.5°N to the EEZ boundary (Figure 1.4.3.1.25b).

Adults (≥263 cm TL): Between the 25 and 2,000 m isobaths from offshore of Cape Lookout, NC to Long Island, NY, and extending west between 38.5°N and 41°N to the EEZ boundary (Figure 1.4.3.1.25c).

Blue shark (*Prionace glauca*)

One of the most common and widest ranging of sharks, the blue shark is cosmopolitan in tropical, subtropical, and temperate waters. It is a pelagic species that inhabits clear, deep, blue waters, usually in temperatures of 10° to 20°C, at depths greater than 180 m (Castro, 1983). Its migratory patterns are complex and encompass great distances, but are poorly understood. The biology, migrations, and the impact of fisheries on the blue shark must be considered on the basis of entire ocean basins. Males and females are known to segregate in many areas (Strasburg, 1958; Gubanov and Grigoryev, 1975). Strasburg (1958) showed that blue sharks are most abundant in the Pacific between latitudes of 40°N and 50°N.

Reproductive potential: Although some authors have examined very large numbers of blue sharks, the data on its size at maturity are imprecise. This may be due to poor criteria for maturity, incomplete samples, samples that did not include animals of all sizes, or some peculiarities of the blue shark. Pratt (1979) used different criteria for determining maturity of males and gave a range of 153 to 183 cm FL for male maturity, but when he used the standard criterion of clasper calcification, he observed that the males reached maturity at 183 cm FL (218 cm TL). Bigelow and Schroeder (1948) suggested that females mature at 213 to 243 cm TL. Strasburg (1958) stated that the smallest gravid female seen by him measured 214 cm TL. Nakano (1994) used data from 105,600 blue sharks, and stated that females matured at 140 to

160 cm (166 and 191 cm TL, using the regression of Pratt), and males matured at 130 to 160 cm PCL, based on clasper development.

The blue shark is probably the most prolific of the larger sharks. Litters of 28 to 54 pups have often been reported (Bigelow and Schroeder, 1948; Pratt, 1979), but one account documented up to 135 pups in a litter (Gubanov and Grigoryev, 1975). Nakano (1994) observed 669 pregnant females in the North Pacific and stated that the number of embryos ranged from one to 62, with an average of 25.6 embryos. Strasburg (1958) gave the birth size as 34 to 48 cm TL. Suda (1953) examined 115 gravid females from the Pacific Ocean, and concluded that gestation lasts nine months and that birth occurs between December and April.

Pratt (1979) examined 19 gravid blue shark females from the Atlantic, and used data from 23 other Atlantic specimens, to arrive at a gestation period of 12 months. Nakano (1994) stated that gestation lasts approximately one year, based on length-frequency histograms, but did not state how many gravid animals had been observed nor showed any data. The length of the reproductive cycle is believed to be annual.

Nakano (1994) gave the age at maturity as four or five years for males and five or six years for females, based on growth equations. According to Cailliet et al. (1983), blue sharks become reproductively mature at six or seven years of age and may live for 20 years.

The nursery areas appear to be in open oceanic waters in the higher latitudes of the range. Strasburg (1958) attributed the higher CPUE in the 30°N to 40°N zone of the Pacific Ocean, in summer, to the presence of newborn blue sharks, and commented on the absence of small blue sharks in the warmer parts of the range. Nakano (1994) also stated that parturition occurred in early summer between latitudes of 30°N to 40°N of the Pacific Ocean. Additional life history and ecological information can be found in Kenney et al. (1985), Estrada et al. (2003), and Skomal and Natanson (2003).

Impact of fisheries: Although finning is now prohibited in U.S. Atlantic waters, blue sharks have historically been finned and discarded because of the low value of their flesh. Large numbers of blue sharks are caught and discarded yearly in pelagic tuna and swordfish fisheries. The blue shark is one of the most abundant large vertebrates in the world, yet it may be vulnerable to overfishing because it is caught in tremendous numbers as bycatch in numerous longline fisheries. Preliminary catch rate information for some areas suggests that this species may be declining.

Essential fish habitat for blue shark:

Neonate (≤60 cm TL): North of 40°N from Manasquan Inlet, NJ to Buzzards Bay, MA, in waters from 25 m to the EEZ boundary (Figure 1.4.3.1.26a).

Juveniles (61 to 183 cm TL): From 45°N (offshore Cape Hatteras, NC), in waters from the 25 m isobath to the EEZ boundary (Figure 1.4.3.1.26b).

Adults (≥184 cm TL): From 45°N (offshore Cape Hatteras, NC), in waters from the 25 m isobath to the EEZ boundary, and extending around Cape Cod, MA to include the southern part of the Gulf of Maine (Figure 1.4.3.1.26c).

Oceanic whitetip shark (*Carcharhinus longimanus*)

The oceanic whitetip shark is one of the most common large sharks in warm oceanic waters (Castro, 1983). It is circumtropical and nearly ubiquitous in water deeper than 180 m and warmer than 21°C.

Reproductive potential: Both male and female oceanic whitetip sharks appear to mature at about 190 cm TL (Bass et al., 1973). The young are born at between 65 and 75 cm TL (Castro, 1983). The number of pups per litter ranges from two to 10, with a mean of six (Backus et al., 1956; Guitart Manday, 1975). The length of the gestation period has not been reported, but it is probably 10 to 12 months, similar to most large carcharhinids. Additionally, the reproductive cycle is believed to be biennial (Backus et al., 1956). Although the location of nurseries has not been reported, preliminary work by Castro (unpublished data) indicates that very young oceanic whitetip sharks are found well offshore along the southeastern United States in early summer, suggesting offshore nurseries over the continental shelves. Additional life history information can be found in Lessa et al. (1999a), Lessa et al. (1999c), and Whitney et al. (2004).

Impact of fisheries: Large numbers of oceanic whitetip sharks are caught as bycatch each year in pelagic tuna and swordfish fisheries. Strasburg (1958) reported that the oceanic whitetip shark constituted 28% of the total shark catch in exploratory tuna longline fishing south of 10° N in the central Pacific Ocean. According to Berkeley and Campos (1988), oceanic whitetip sharks constituted 2.1% of the shark bycatch in the swordfish fishery along the east coast of Florida in 1981 to 1983. Furthermore, Manday (1975) demonstrated a marked decline in the oceanic whitetip shark landings in Cuba from 1971 to 1973. The oceanic whitetip shark is probably vulnerable to overfishing due to its limited reproductive potential, and because it is caught in large numbers in various pelagic fisheries and in directed fisheries. There are no data on populations or stocks of this species in any ocean.

Essential fish habitat for oceanic whitetip shark:

Neonate (≤83 cm TL): In the vicinity of the Charleston Bump, from the 200 m isobath to the 2,000 m isobath, between 32.5°N and 31°N (Figure 1.4.3.1.27a).

Juveniles (84 to 136 cm TL): Offshore of the southeast U.S coast from 32° N to 26° N, from the 200 m isobath to the EEZ boundary or 75°W, whichever is nearer (Figure 1.4.3.1.27b).

Adults (≥137 cm TL): Offshore of the southeast U.S. coast from the 200 m isobath to the EEZ boundary, or from 36°N to 30°N. Also, in the Caribbean, south of the U.S. Virgin Islands, from east of 65°W to the EEZ boundary or the 2,000 m isobath, whichever is nearer (Figure 1.4.3.1.27c).

<u>Bigeye thresher shark (*Alopias superciliosus*)</u>
The bigeye thresher shark is cosmopolitan in warm and warm-temperate waters. It is a deep-water species that ascends to depths of 35 to 150 m at night. It feeds on squid and small schooling fishes (Castro, 1983), which it stuns with blows from its tail. This is one of the larger sharks, reaching up to 460 cm TL (Nakamura, 1935).

Reproductive potential: Male bigeye thresher sharks mature at about 270 cm TL and females mature at about 340 cm TL (Moreno and Moron, 1992). Litters consist of two pups, one in each uterus. Gestation probably lasts approximately one year, but there is no evidence to support this hypothesis. The length of the reproductive cycle and the location of nursery areas are unknown. Additional life history information can be found in Chen et al. (1997), Liu et al. (1998), and Weng and Block (2004).

Impact of fisheries: The bigeye thresher shark is often caught as bycatch of swordfish fisheries. An individual will often dislodge several baits before impaling or hooking itself. The flesh and fins of the bigeye thresher shark are of poor quality, thus it is usually discarded dead in swordfish and tuna fisheries. Possession of this species in Atlantic waters of the United States is now prohibited.

Essential fish habitat for bigeye thresher shark:

Neonate (≤116 cm TL): At this time, available information is insufficient to identify EFH for this life stage (Map not available).

Juveniles (117 to 340 cm TL): Offshore of North Carolina, from 36.5°N to 34°N, between the 200 and 2,000 m isobaths (Figure 1.4.3.1.28a).

Adults (≥341 cm TL): Offshore North Carolina, from 35.5°N to 35°N, between the 200 and 2,000 m isobaths (Figure 1.4.3.1.28b).

<u>Thresher shark (*Alopias vulpinus*)</u>
The common thresher shark is cosmopolitan in warm and temperate waters. It is found in both coastal and oceanic waters, but according to Strasburg (1958), it is more abundant near land. It is a large shark that uses its tremendously large tail to hit and stun the small schooling fishes upon which it feeds.

Reproductive potential: According to Strasburg (1958), female thresher sharks in the Pacific Ocean mature at about 315 cm TL. According to Cailliet and Bedford (1983), males mature at about 333 cm TL. Cailliet and Bedford (1983) stated that the age at maturity ranges from three to seven years. Litters consist of four to six pups, which measure 137 to 155 cm TL at birth (Castro, 1983). According to Bedford (1985), gestation lasts nine months and female thresher sharks give birth annually every spring (March to June). New age and growth information can be found in Gervelis (2005).

Impact of fisheries: Thresher sharks are caught in many fisheries. The most detailed data available are for the California drift gillnet fishery that started in 1977 for thresher sharks, shortfin mako sharks, and swordfish, extending from the Mexican border to San Francisco, CA

(Hanan, 1984). After 1982, the fishery expanded northward yearly, ultimately reaching the states of Oregon and Washington (Cailliet et al., 1991).

Thresher shark landings peaked in 1982, and the thresher shark resource quickly began to decline after that year (Bedford, 1987). Catches have continued to decline and the average size has remained small despite numerous regulations restricting fishing (Hanan et al., 1993). Cailliet et al. (1991) summarized the condition of the resource by stating, “The coastwide fishery for this once abundant shark is now a thing of the past.” Legislation passed in 1986 limited the directed thresher shark fishery in the Pacific Ocean. Off of the U.S. Atlantic coast, the CPUE has shown a considerable decline (Cramer, 1996).

Essential fish habitat for thresher shark:

Neonate (≤175 cm TL): Offshore of Long Island, NY and southern New England in the northeastern United States, in pelagic waters deeper than 50 m, between 70°W and 73.5°W, south to 40°N (Figure 1.4.3.1.29).

Juveniles (176 to 388 cm TL): Offshore of Long Island, NY and southern New England in the northeastern United States, in pelagic waters deeper than 50 m, between 70°W and 73.5°W, south to 40°N (Figure 1.4.3.1.29).

Adults (≥389 cm TL): Offshore of Long Island, NY and southern New England in the northeastern United States, in pelagic waters deeper than 50 m, between 70°W and 73.5°W, south to 40°N (Figure 1.4.3.1.29).

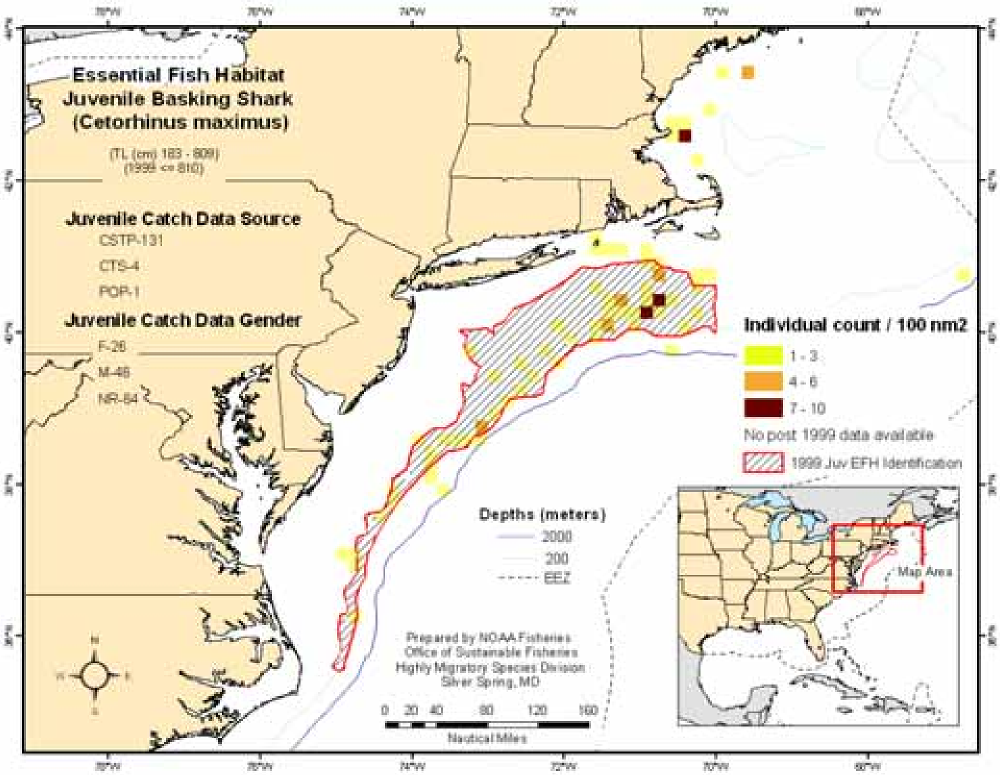

Figure 1.4.3.1.1a. Essential fish habitat for juvenile basking shark

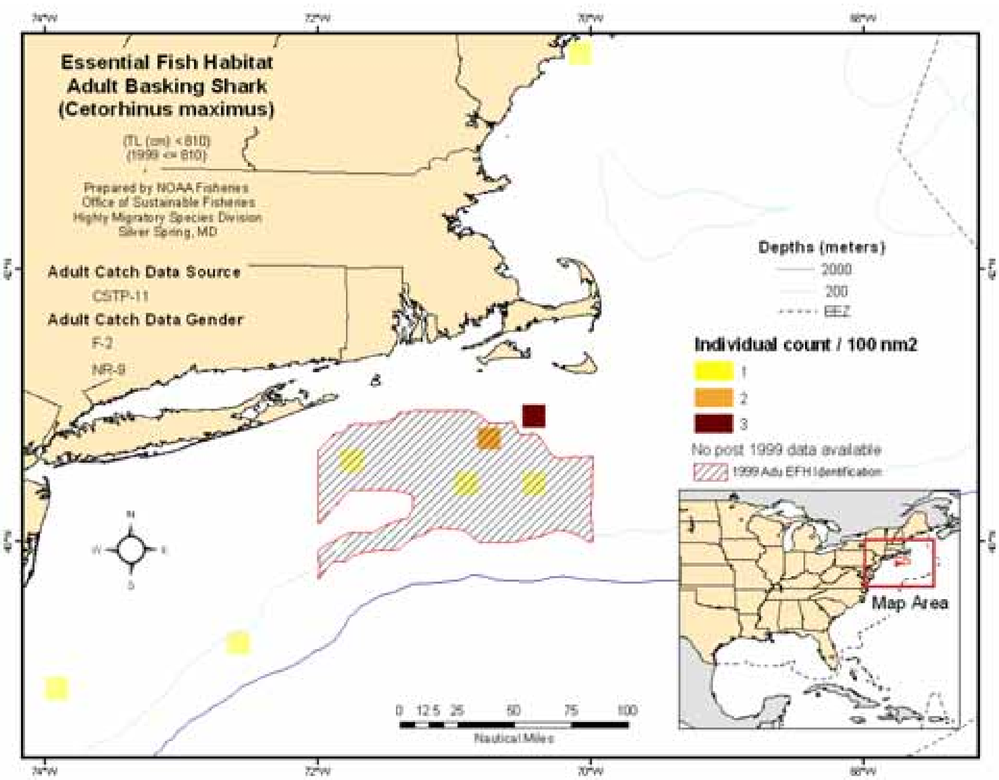

Figure 1.4.3.1.1b. Essential fish habitat for adult basking shark

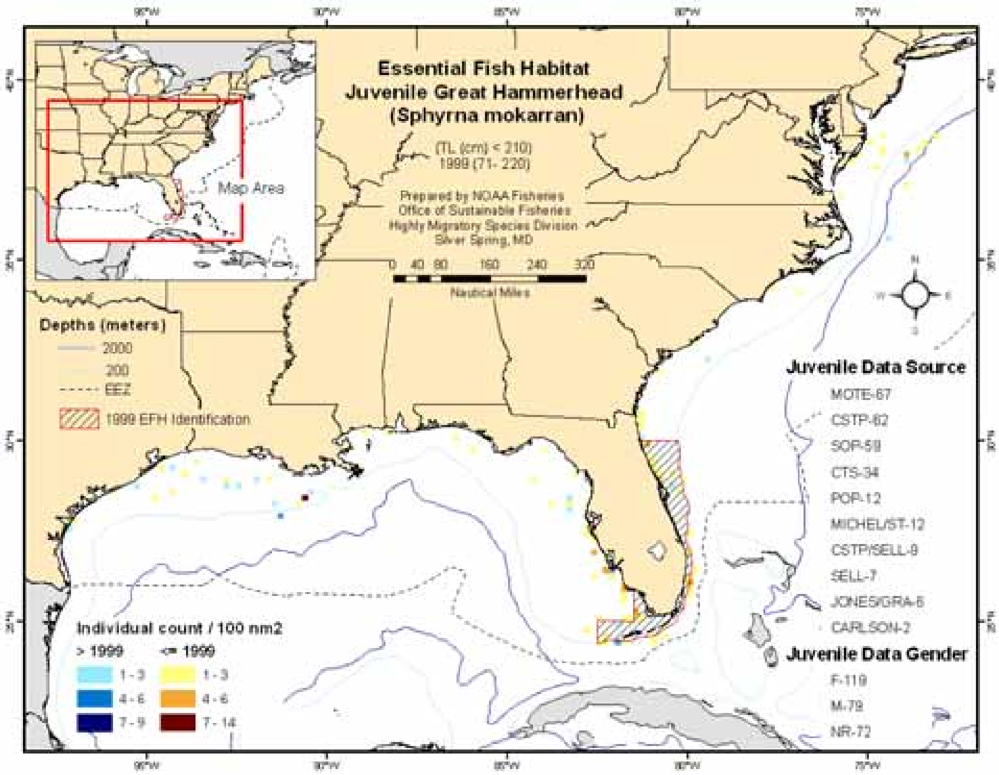

Figure 1.4.3.1.2a. Essential fish habitat for juvenile great hammerhead

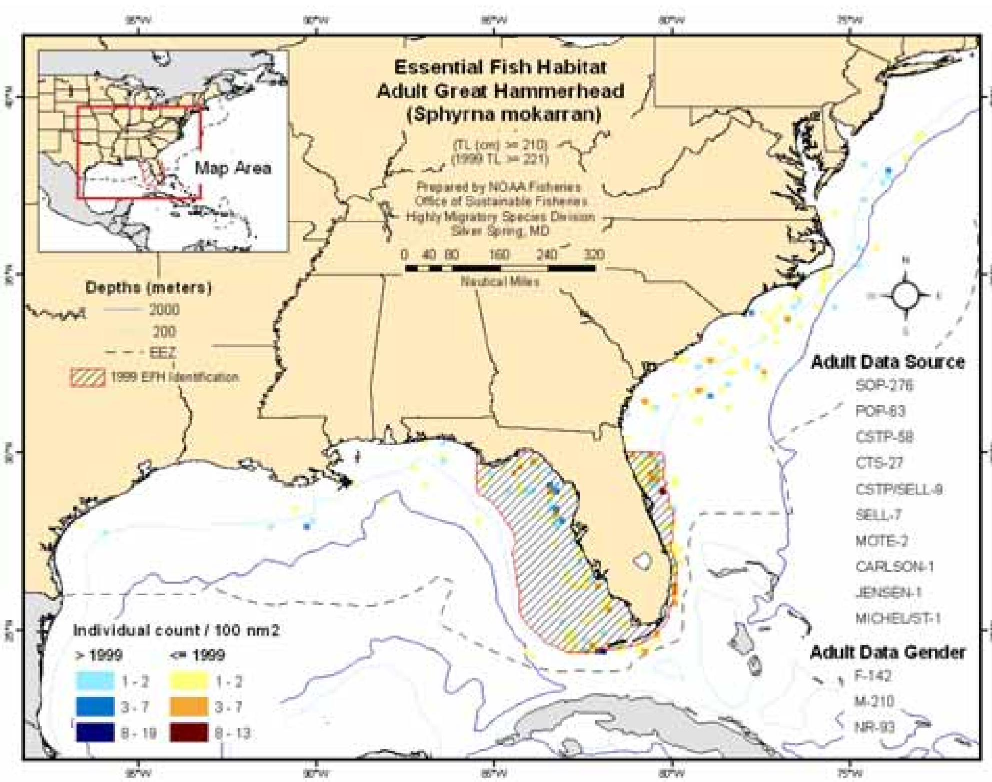

Figure 1.4.3.1.2b. Essential fish habitat for adult great hammerhead

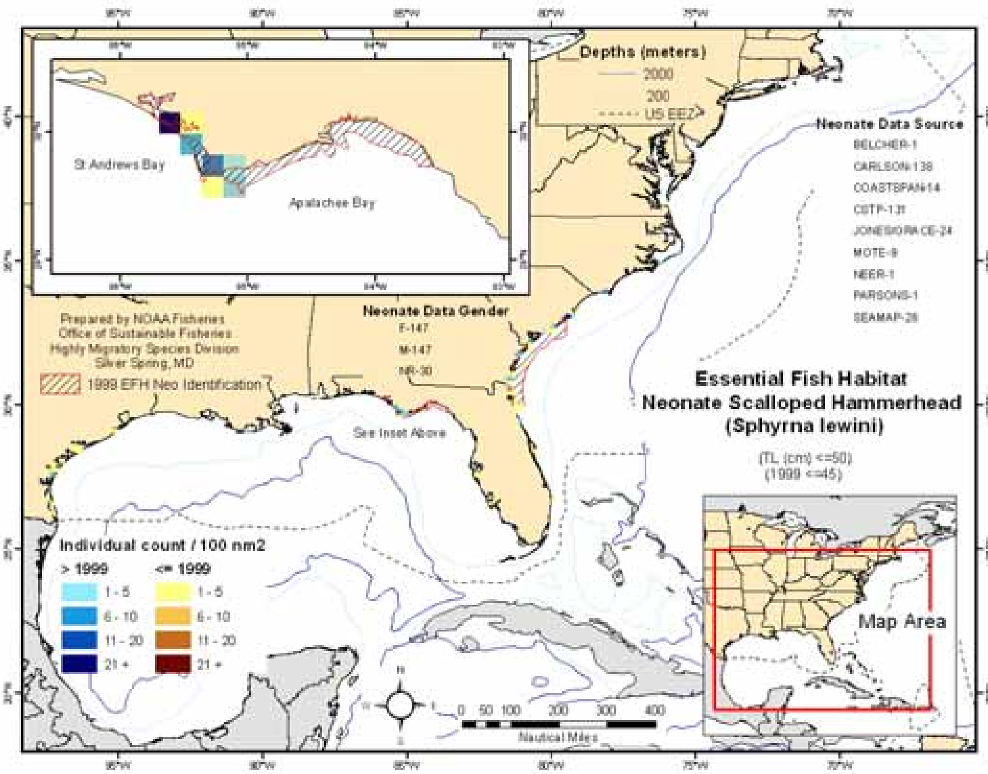

Figure 1.4.3.1.3a. Essential fish habitat for neonate scalloped hammerhead

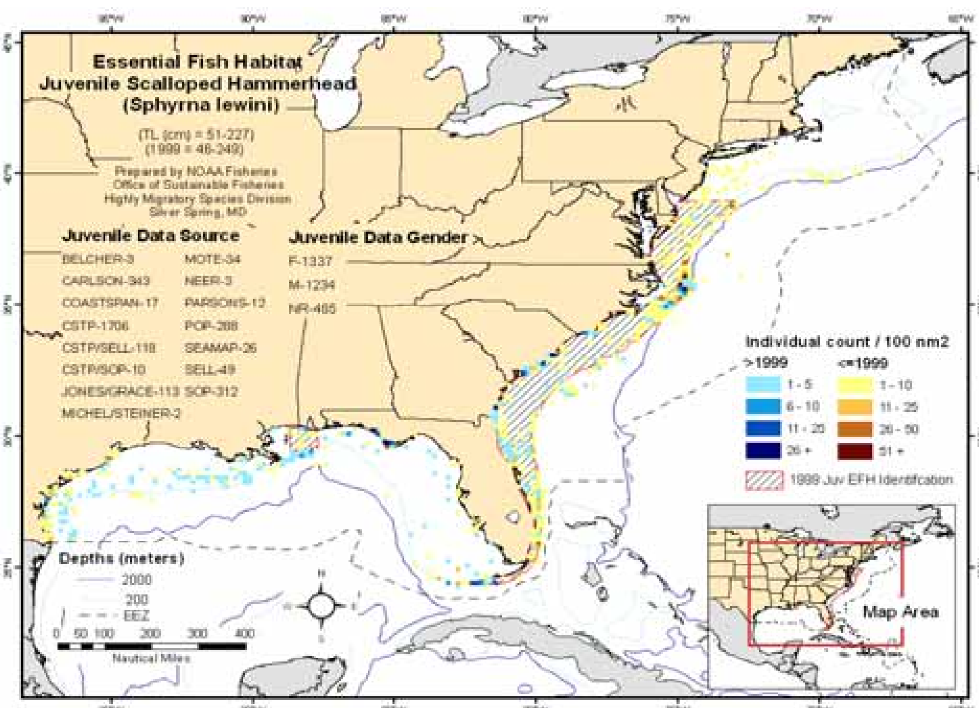

Figure 1.4.3.1.3b. Essential fish habitat for juvenile scalloped hammerhead

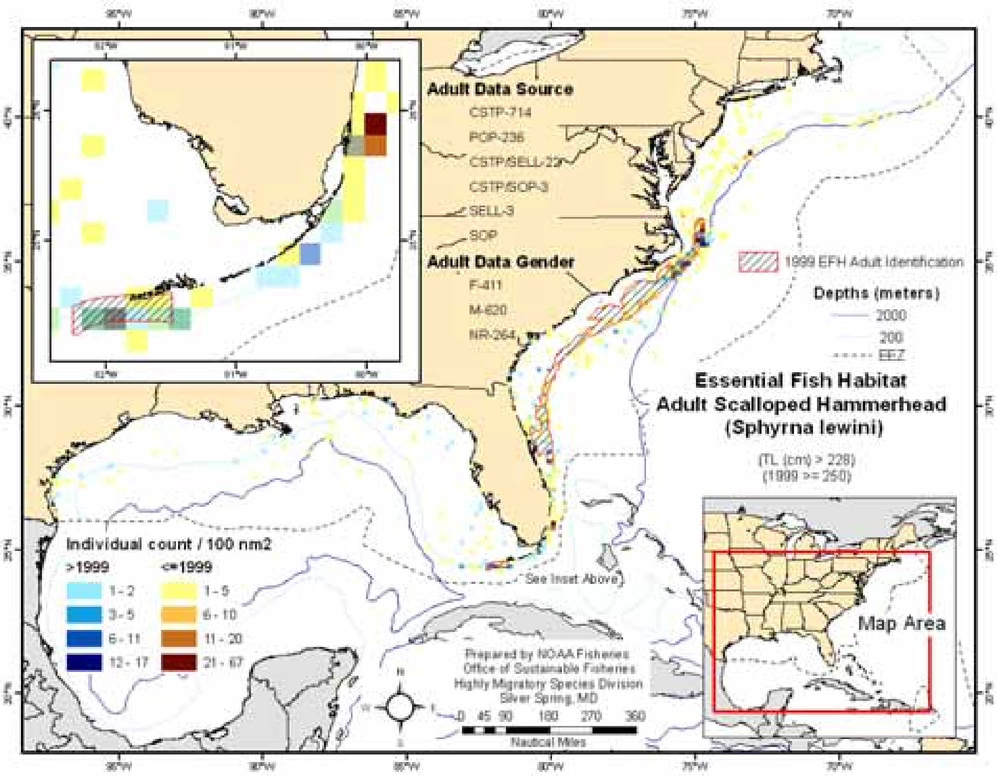

Figure 1.4.3.1.3c. Essential fish habitat for adult scalloped hammerhead

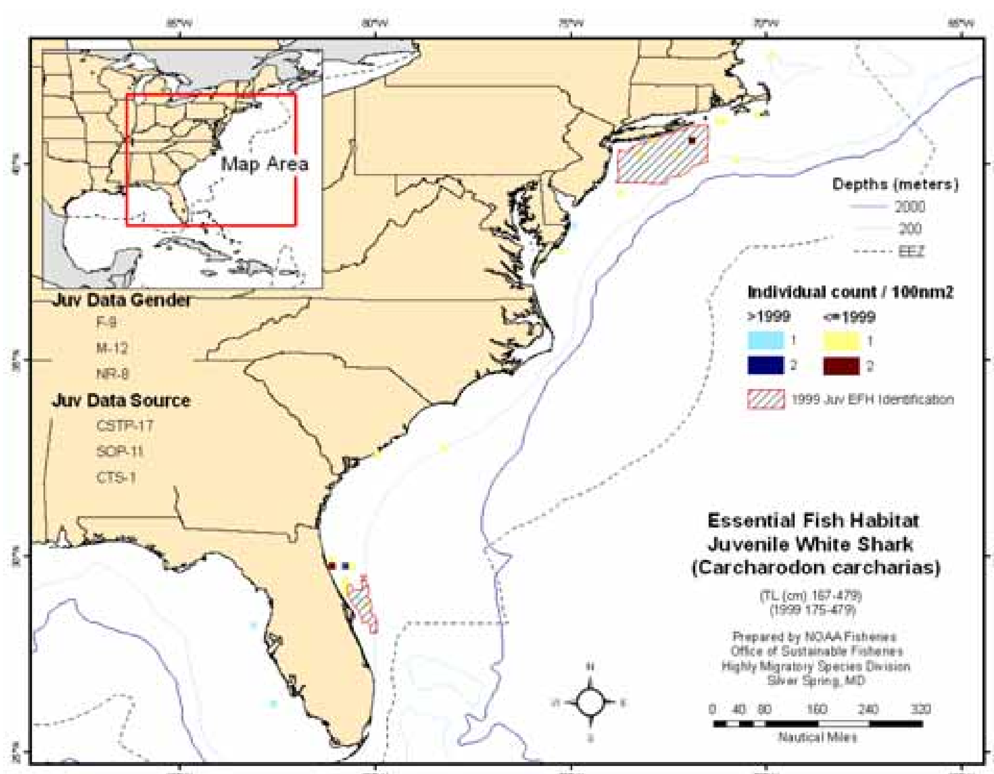

Figure 1.4.3.1.4. Essential fish habitat for juvenile white shark

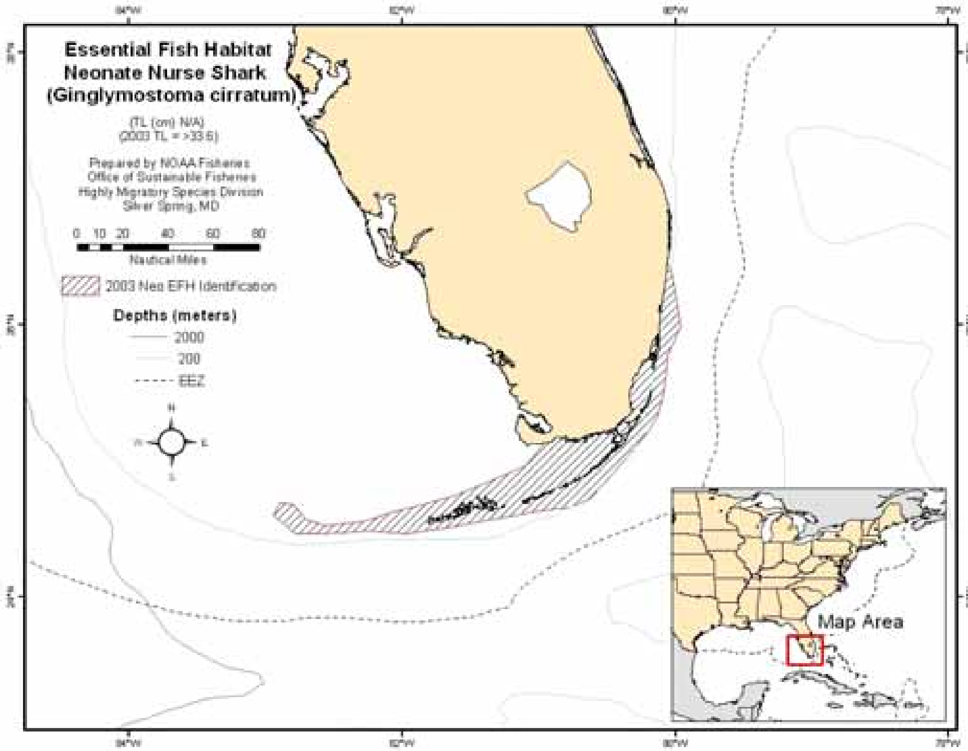

Figure 1.4.3.1.5a. Essential fish habitat for neonate nurse shark

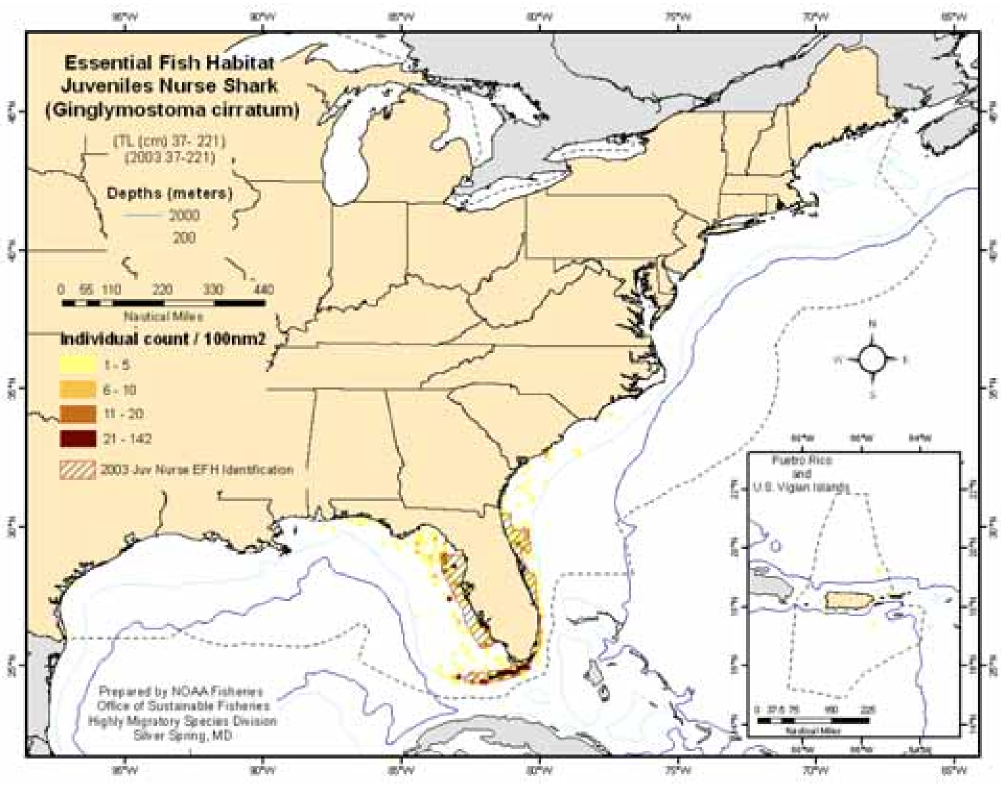

Figure 1.4.3.1.5b. Essential fish habitat for juvenile nurse shark

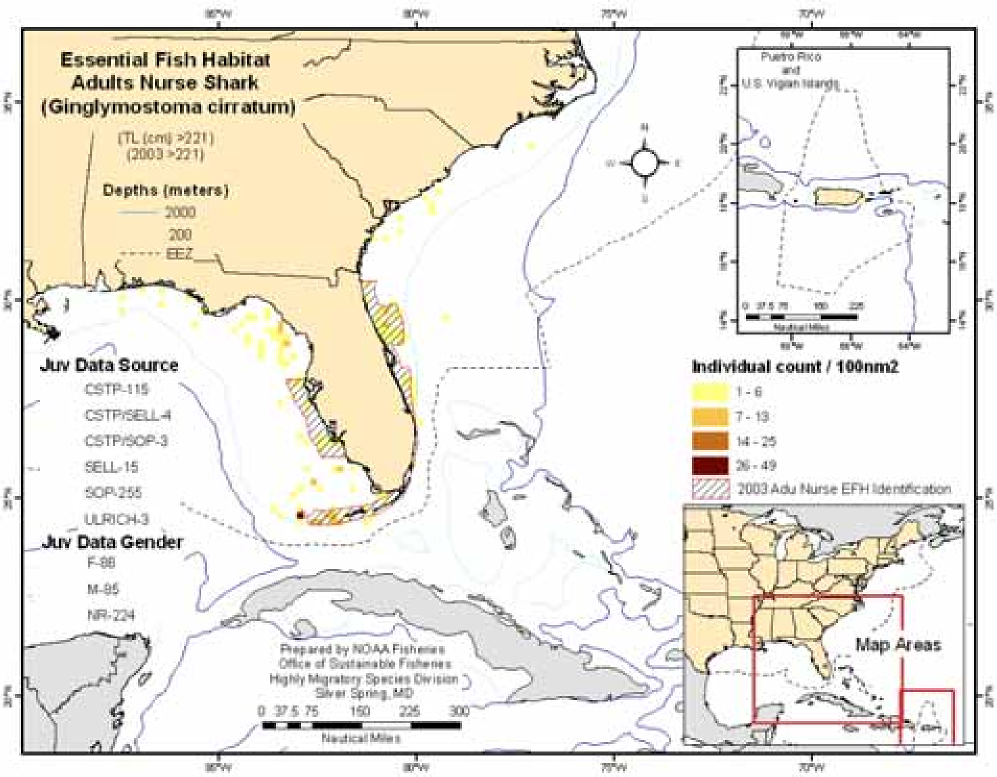

Figure 1.4.3.1.5c. Essential fish habitat for adult nurse shark

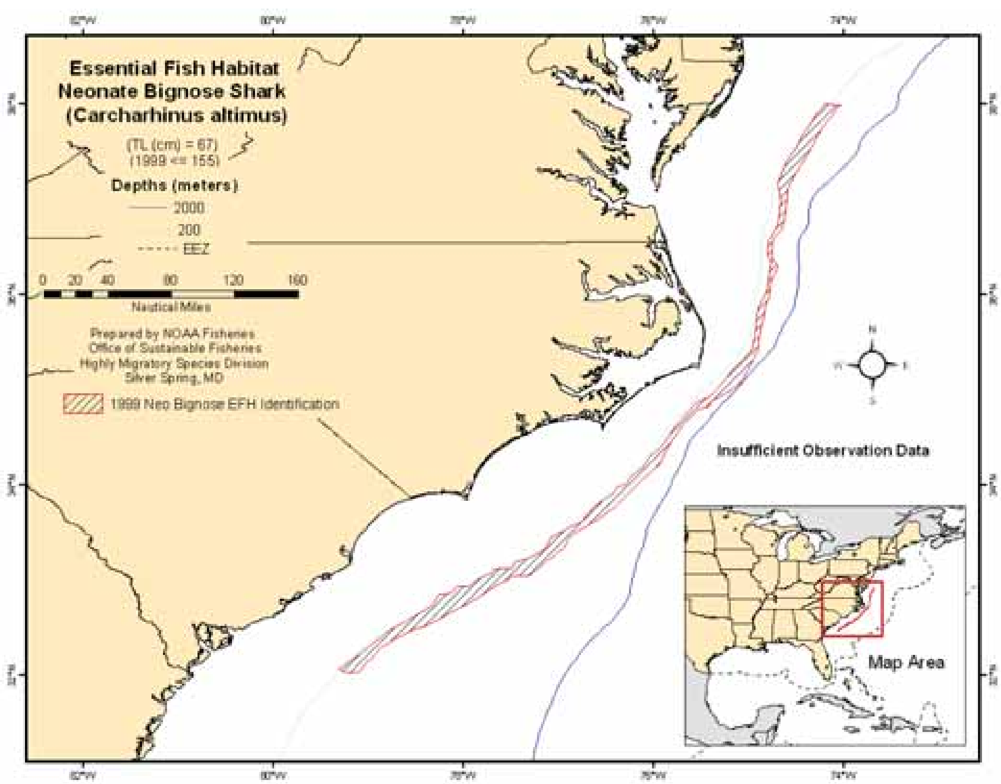

Figure 1.4.3.1.6a. Essential fish habitat for neonate bignose shark

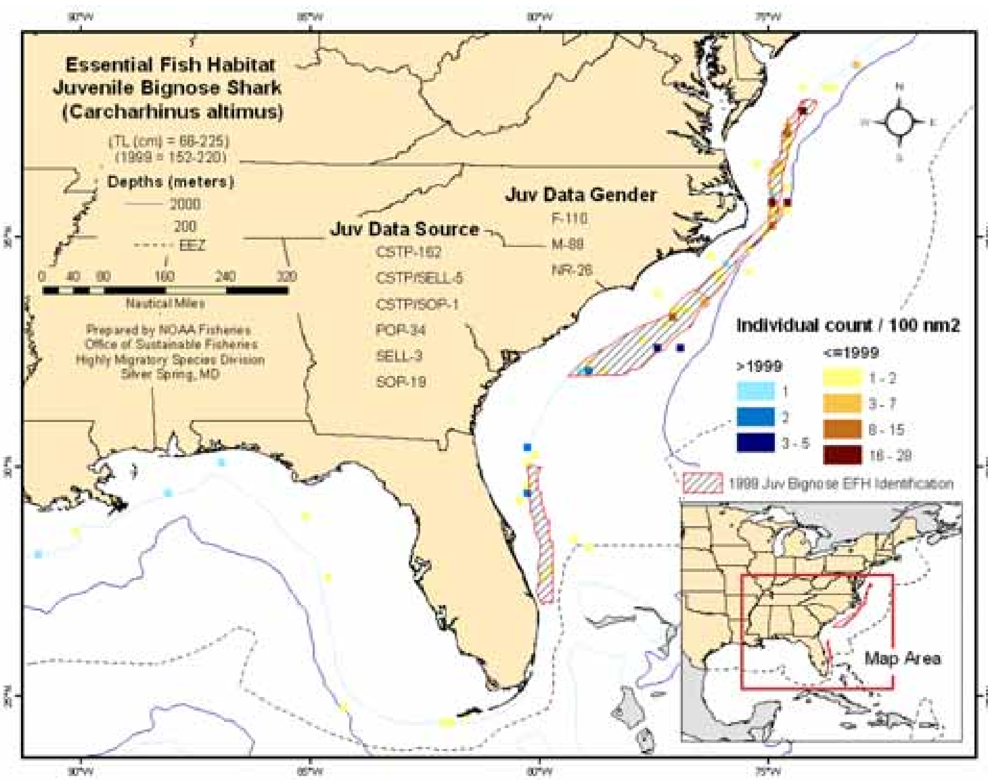

Figure 1.4.3.1.6b. Essential fish habitat for juvenile bignose shark

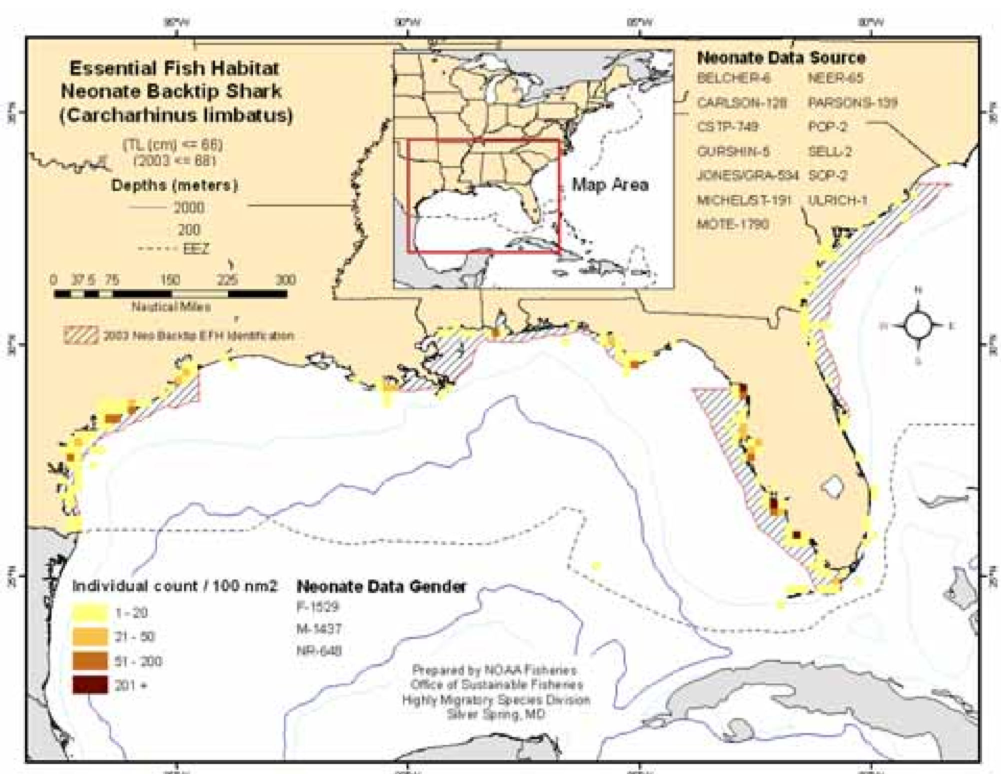

Figure 1.4.3.1.7a. Essential fish habitat for neonate blacktip shark

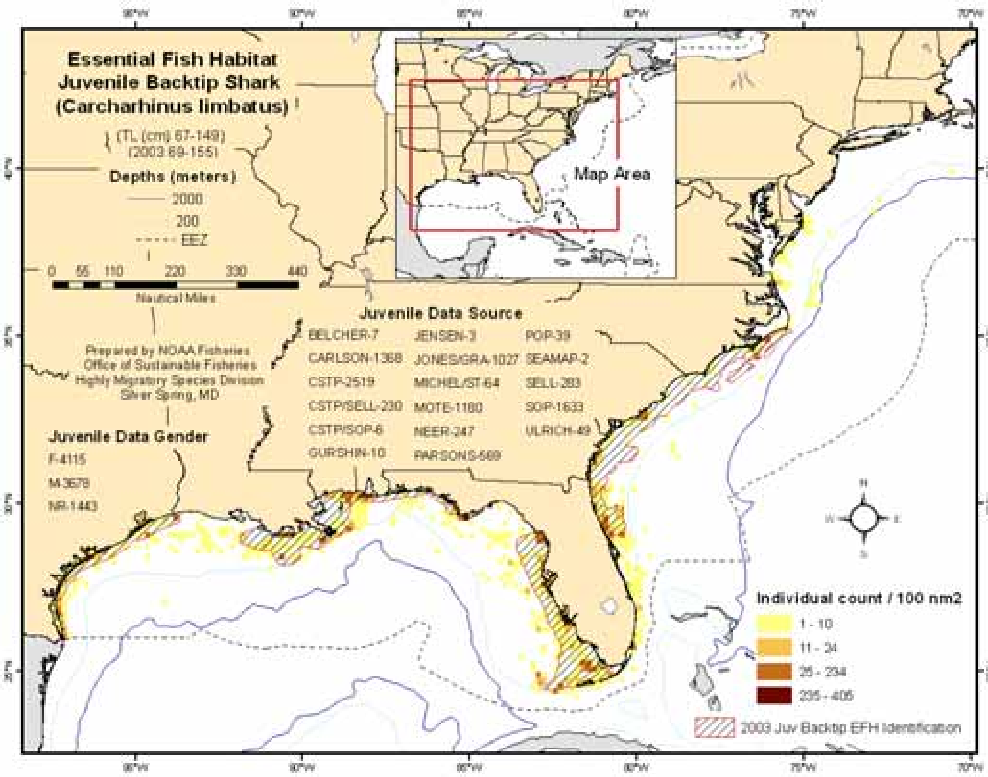

Figure 1.4.3.1.7b. Essential fish habitat for juvenile blacktip shark

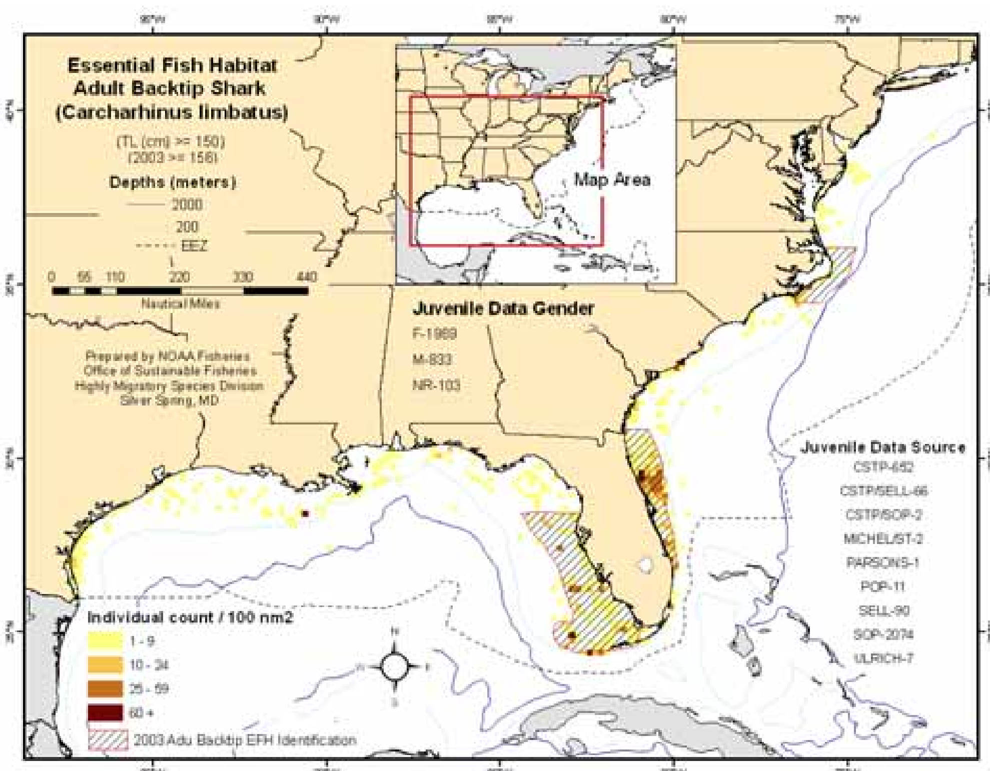

Figure 1.4.3.1.7c. Essential fish habitat for adult blacktip shark

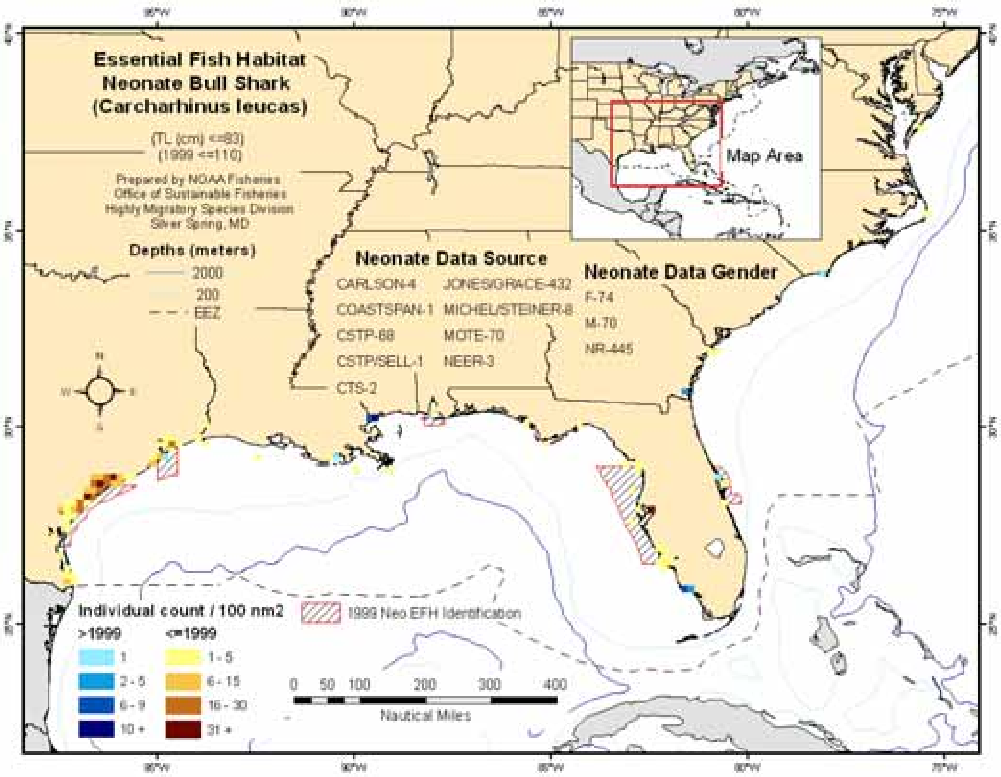

Figure 1.4.3.1.8a. Essential fish habitat for neonate bull shark

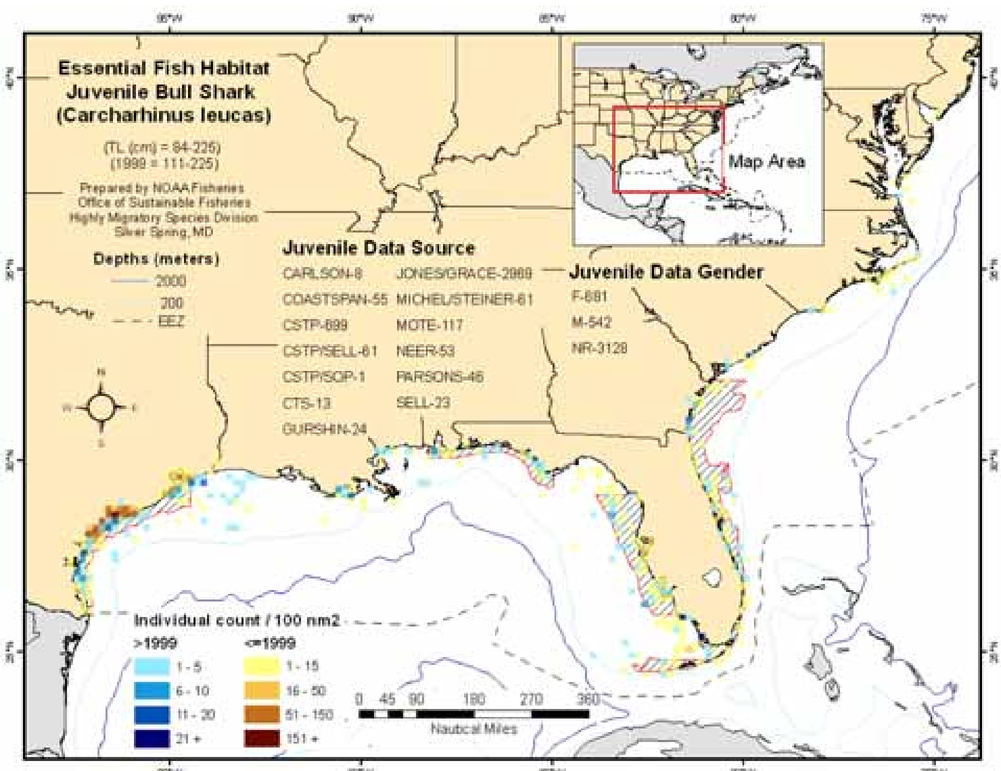

Figure 1.4.3.1.8b. Essential fish habitat for juvenile bull shark

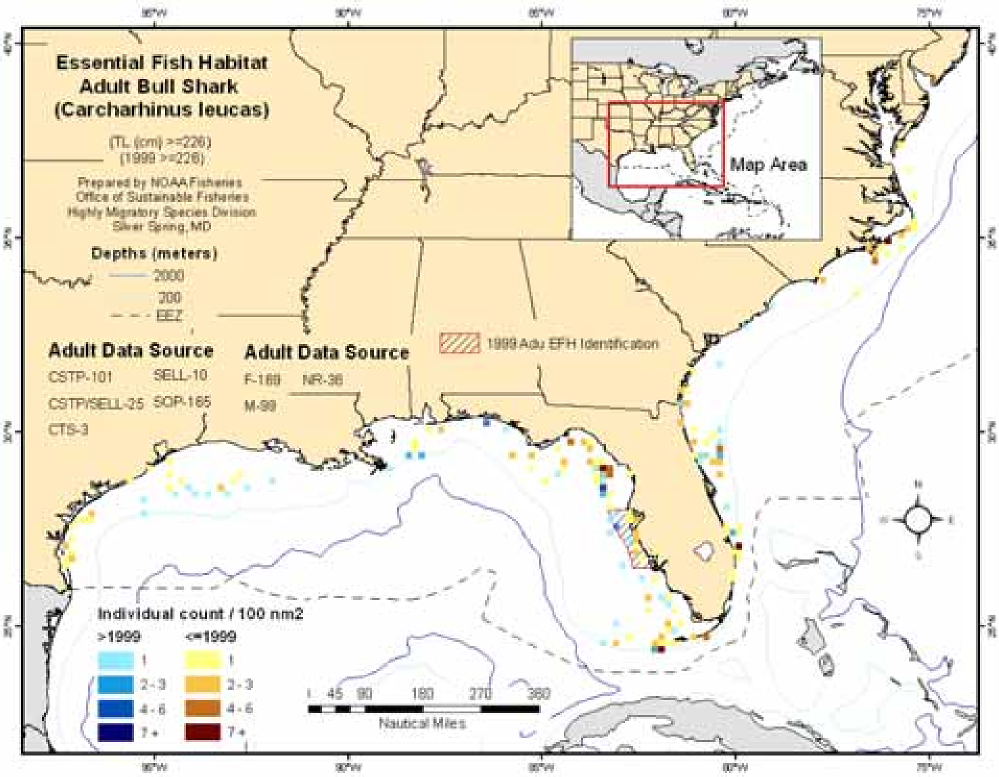

Figure 1.4.3.1.8c. Essential fish habitat for adult bull shark

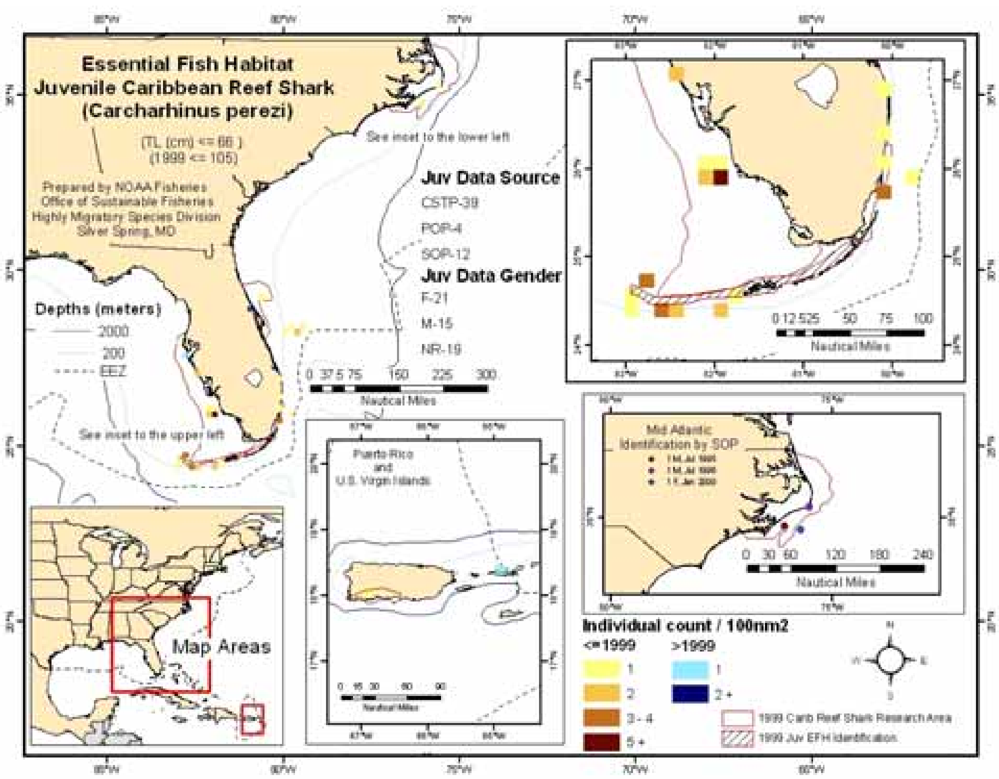

Figure 1.4.3.1.9. Essential fish habitat for juvenile Caribbean reef shark

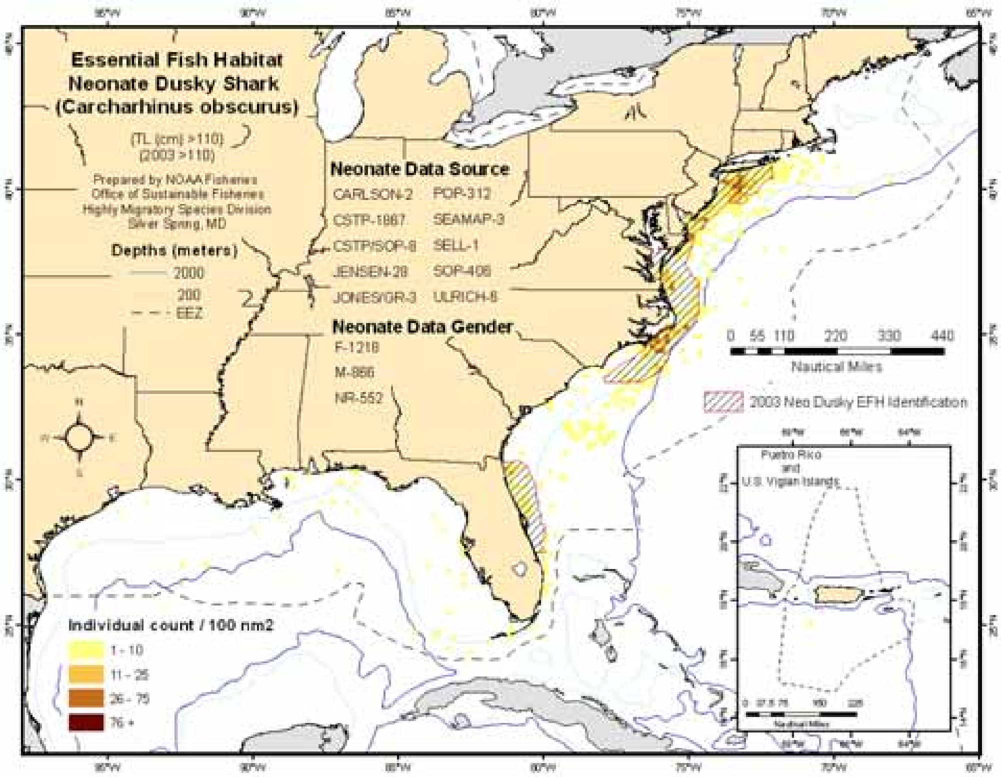

Figure 1.4.3.1.10a. Essential fish habitat for neonate dusky shark

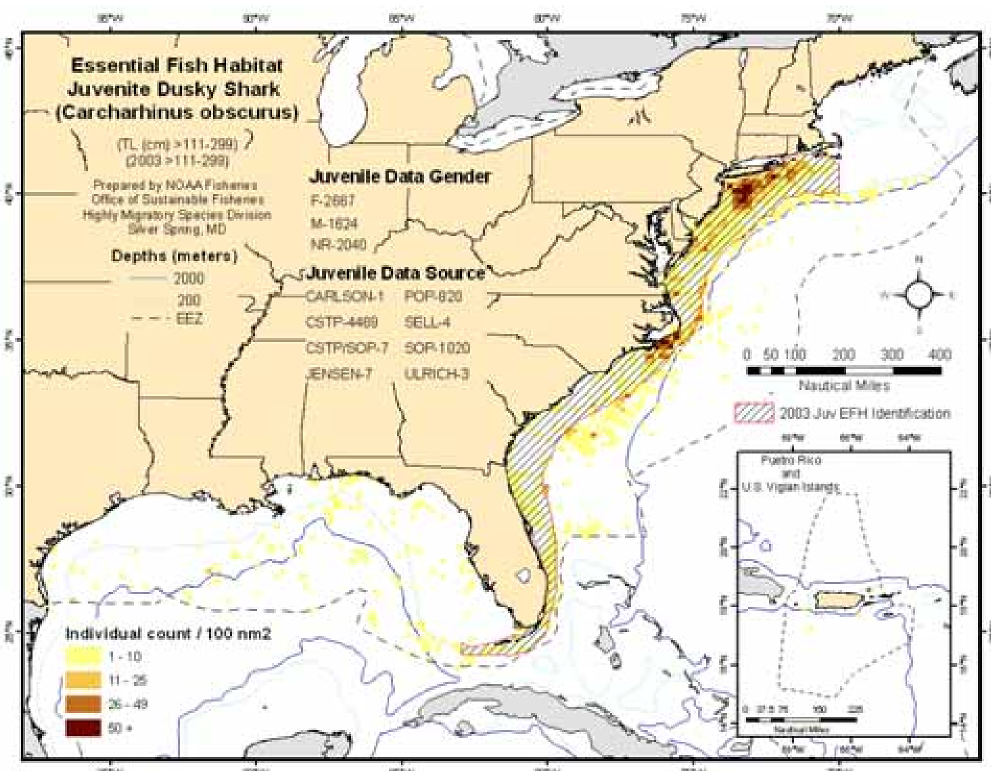

Figure 1.4.3.1.10b. Essential fish habitat for juvenile dusky shark

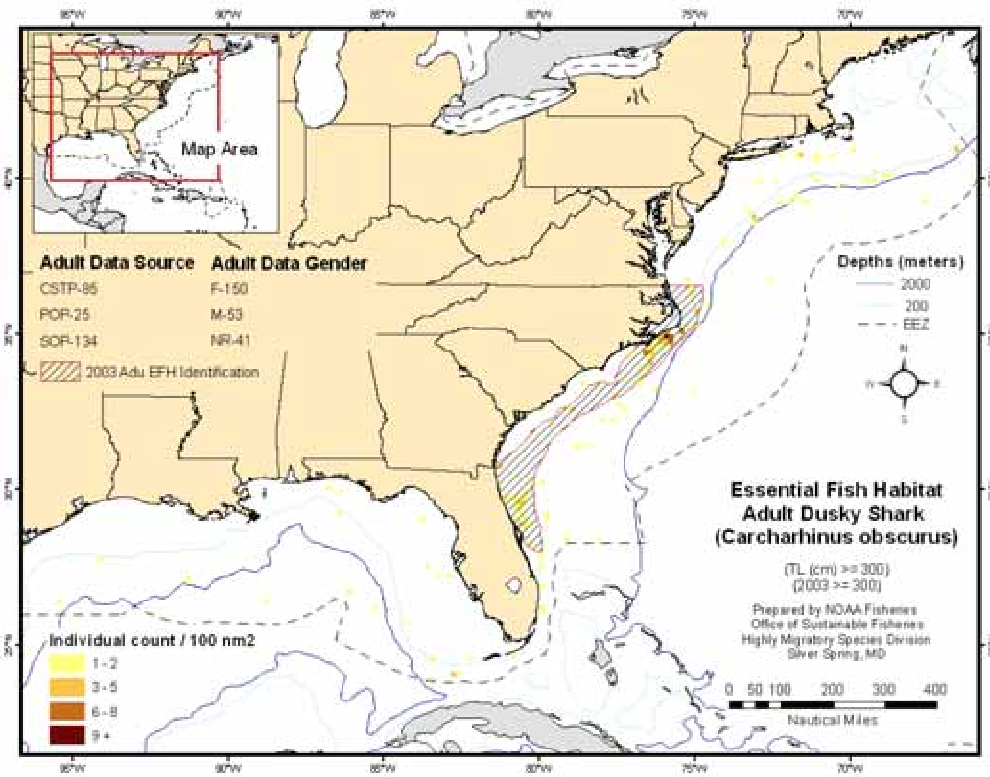

Figure 1.4.3.1.10c. Essential fish habitat for adult dusky shark

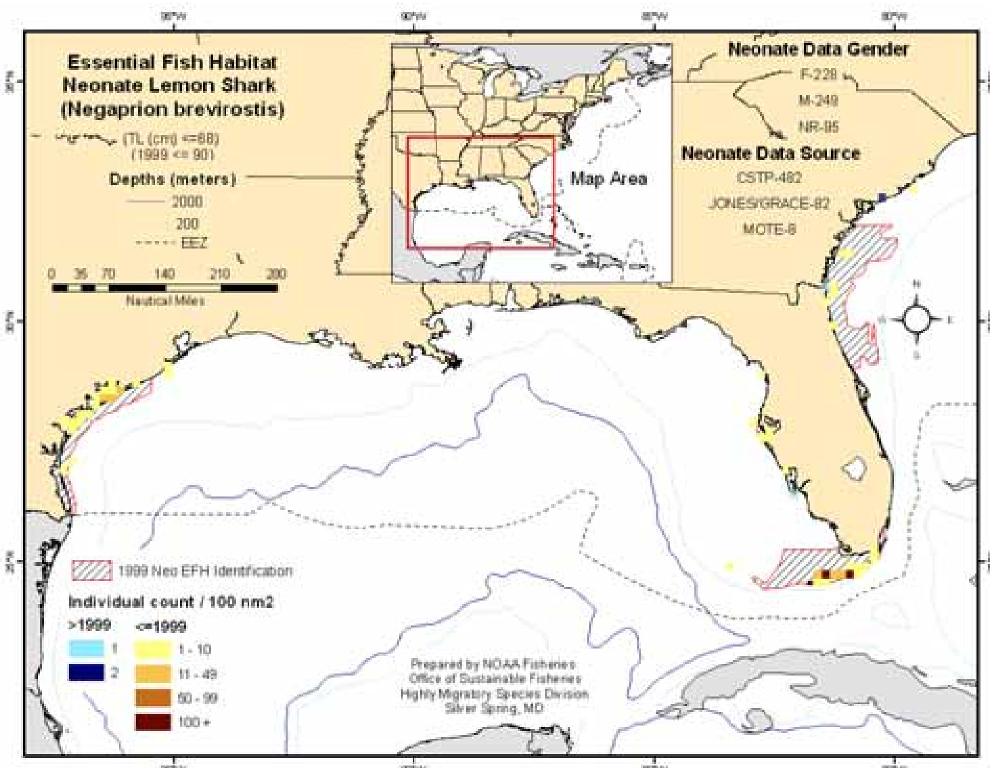

Figure 1.4.3.1.11a. Essential fish habitat for neonate lemon shark

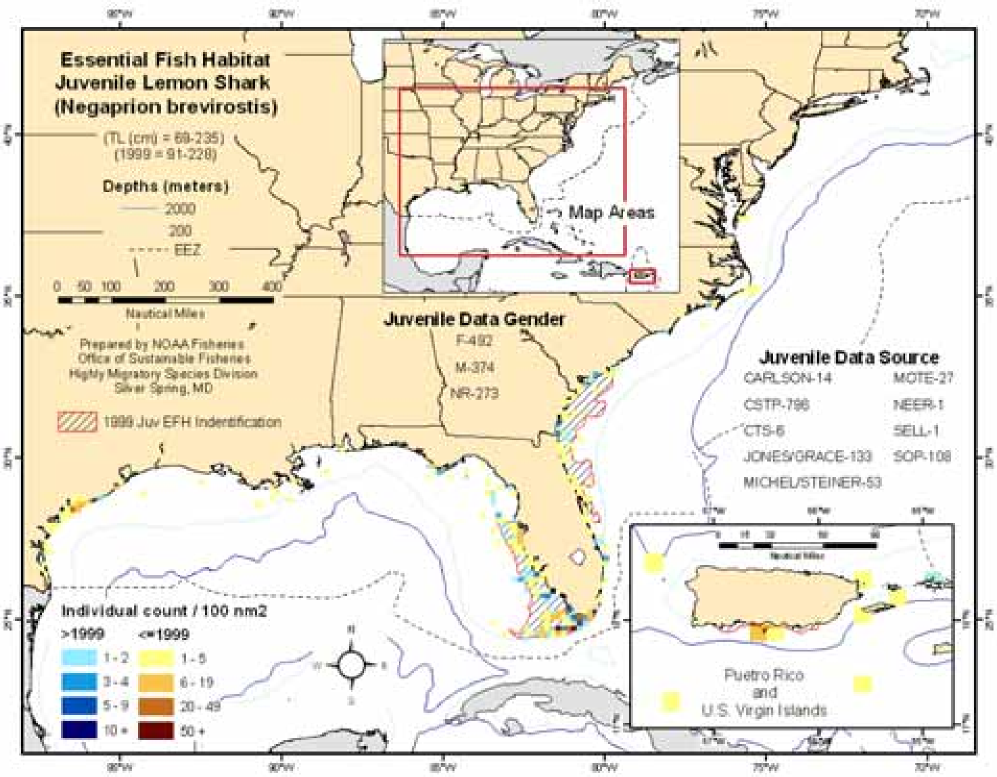

Figure 1.4.3.1.11b. Essential fish habitat for juvenile lemon shark

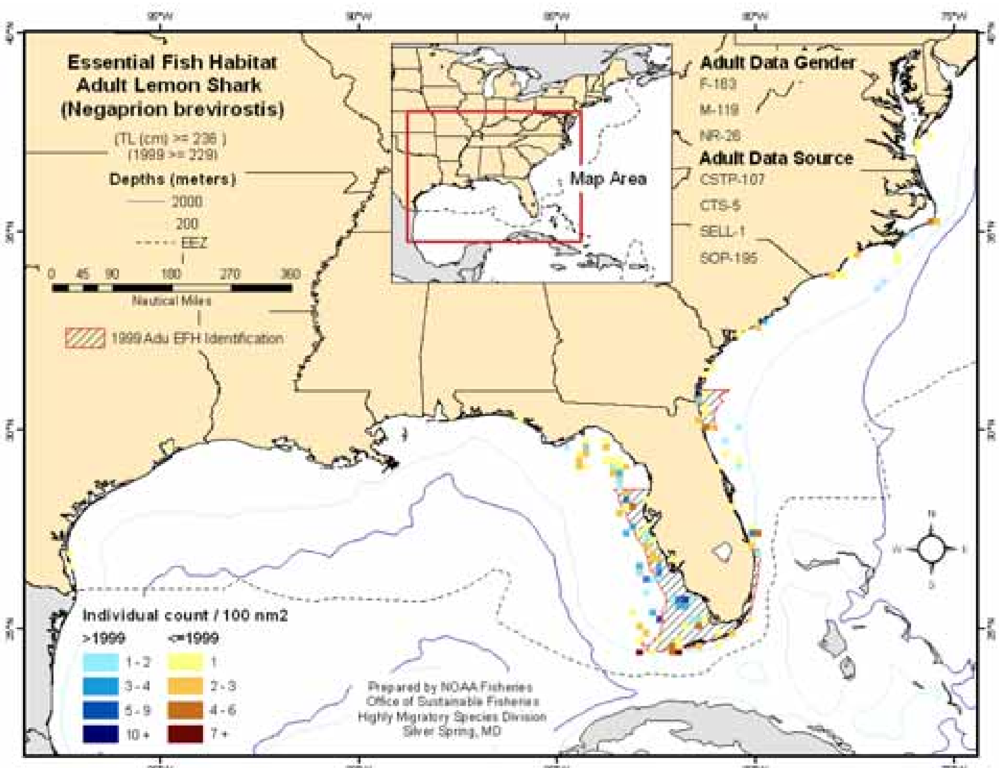

Figure 1.4.3.1.11c. Essential fish habitat for adult lemon shark

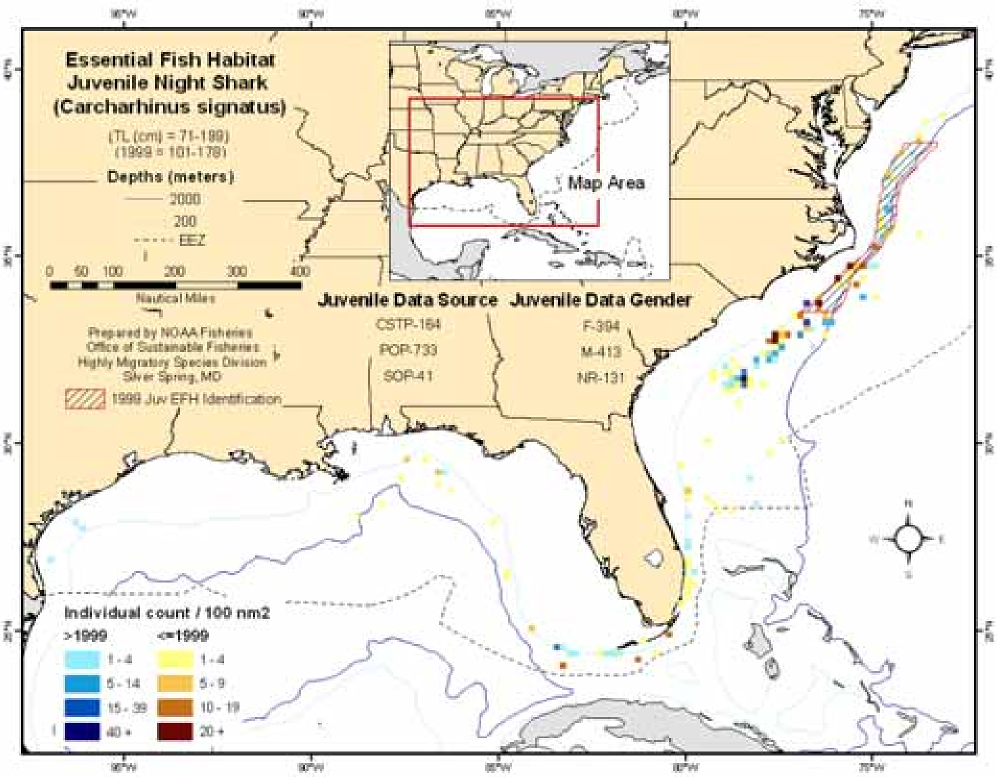

Figure 1.4.3.1.12a. Essential fish habitat for juvenile night shark

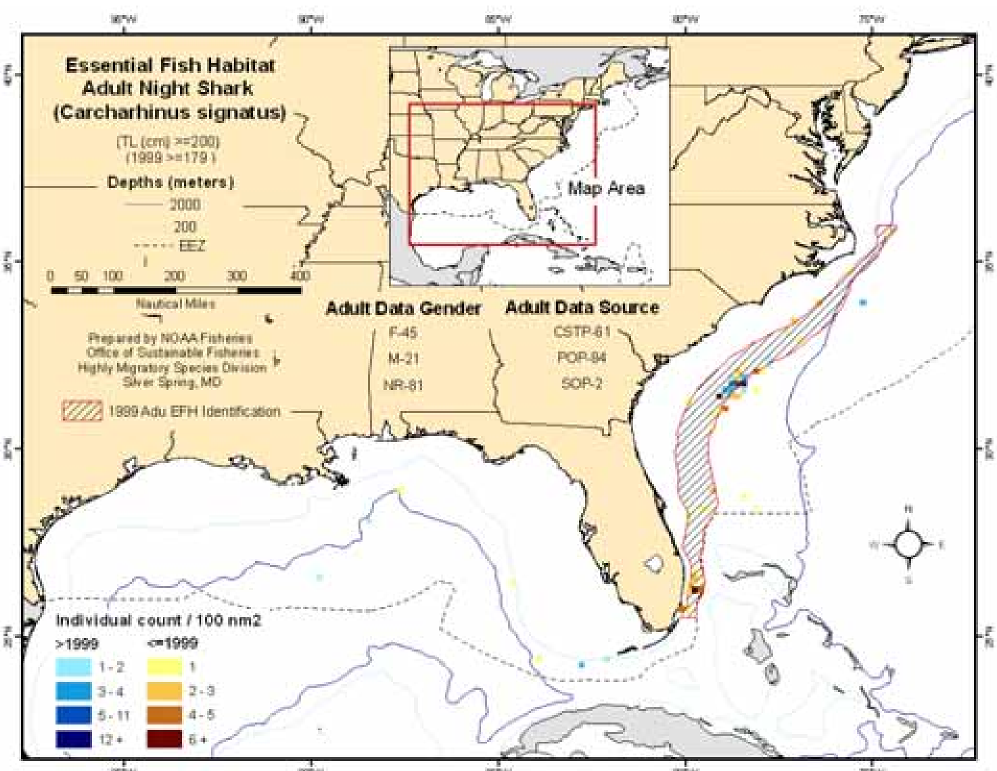

Figure 1.4.3.1.12b. Essential fish habitat for adult night shark

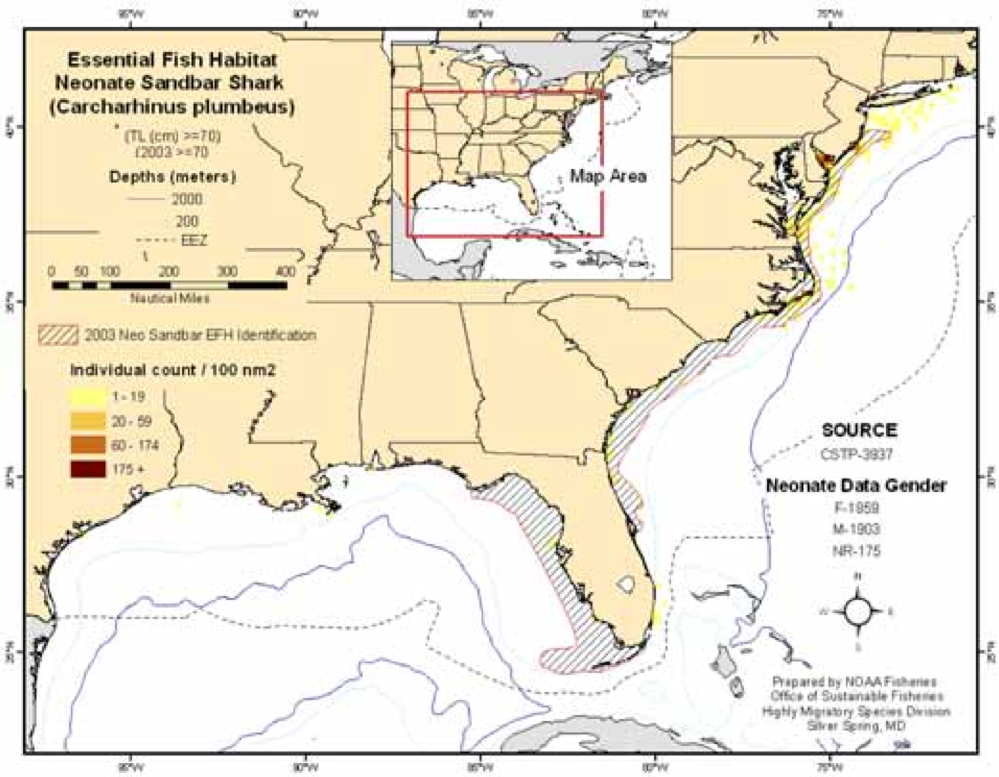

Figure 1.4.3.1.13a. Essential fish habitat for neonate sandbar shark

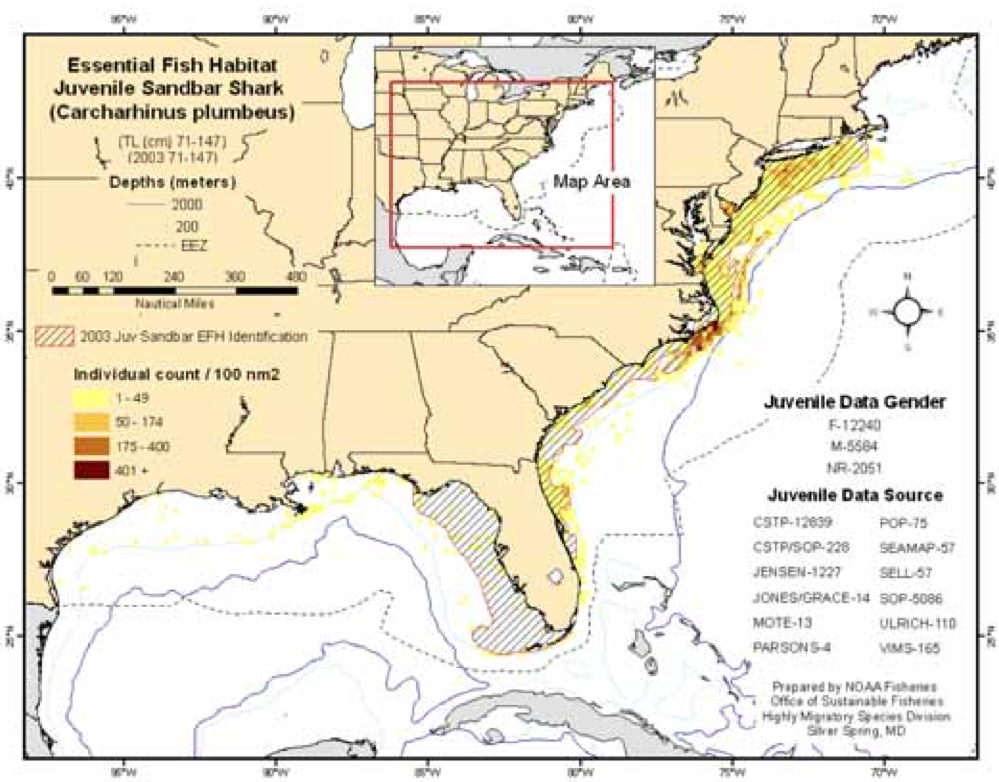

Figure 1.4.3.1.13b. Essential fish habitat for juvenile sandbar shark

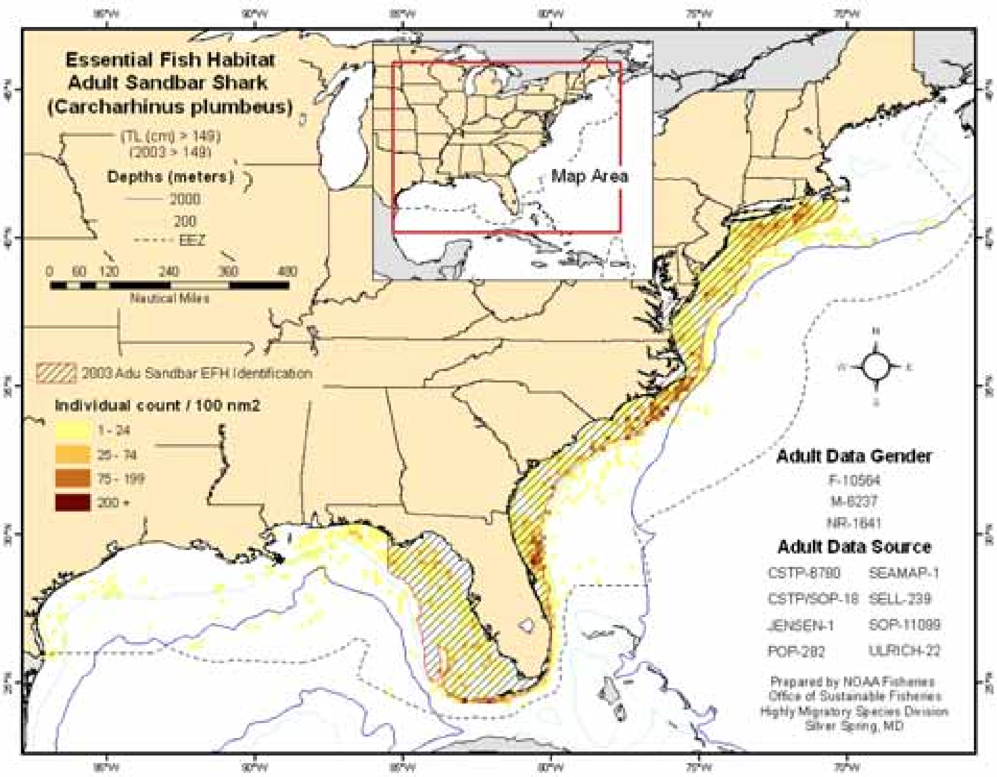

Figure 1.4.3.1.13c. Essential fish habitat for adult sandbar shark

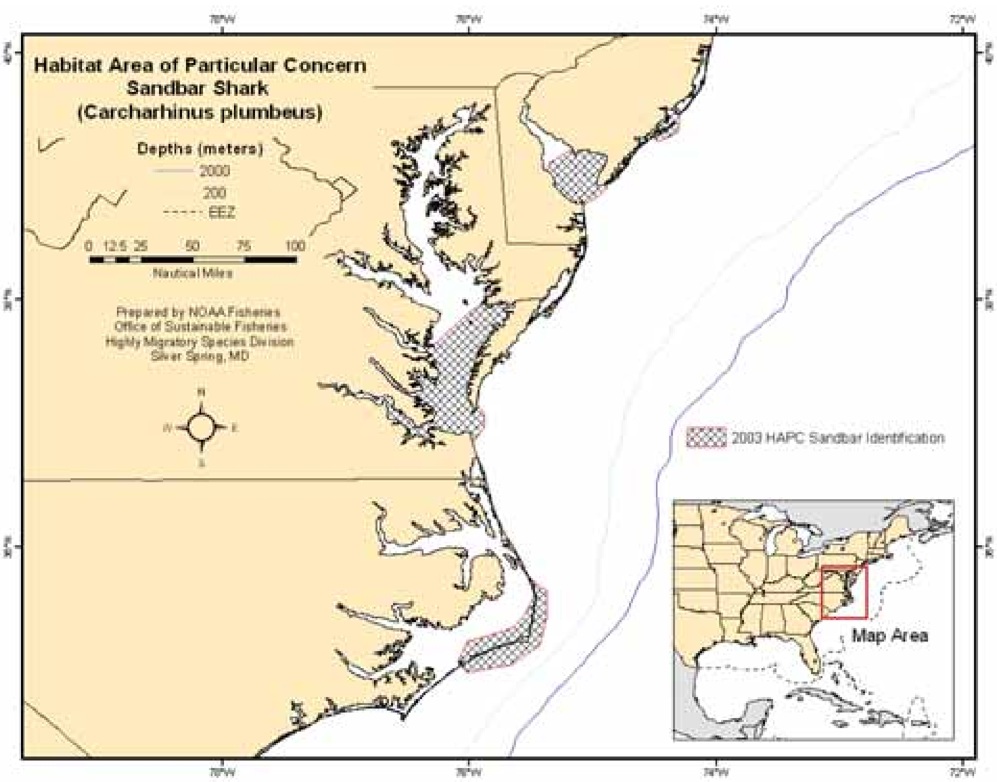

Figure 1.4.3.1.13d. Habitat Areas of Particular Concern for sandbar shark

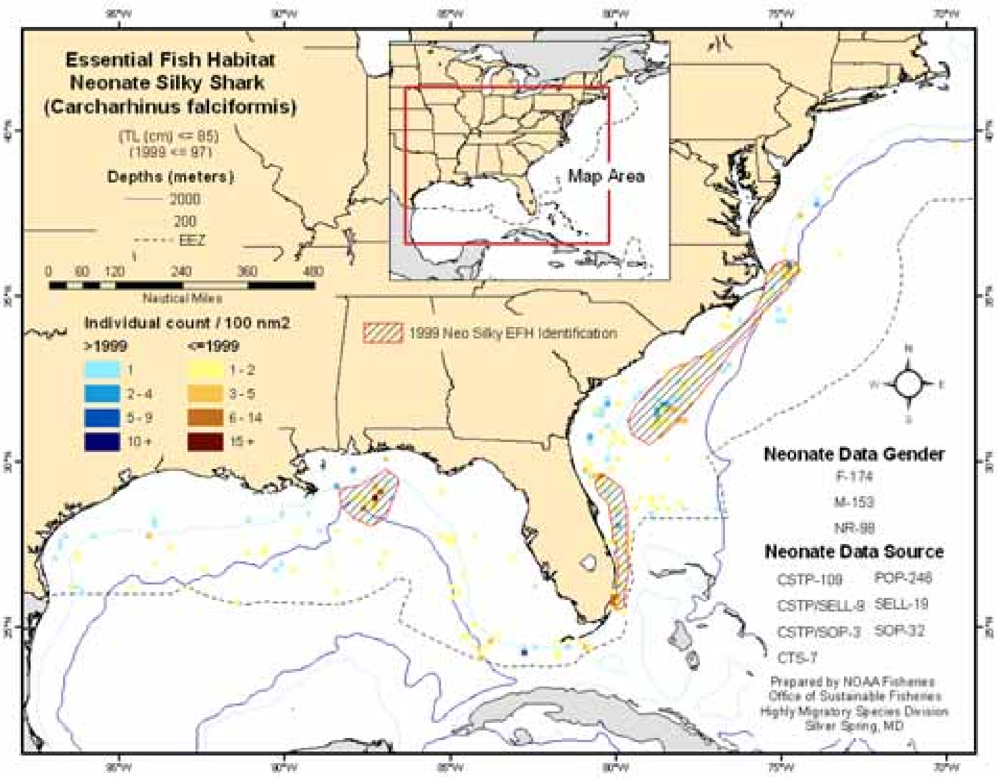

Figure 1.4.3.1.14a. Essential fish habitat for neonate silky shark

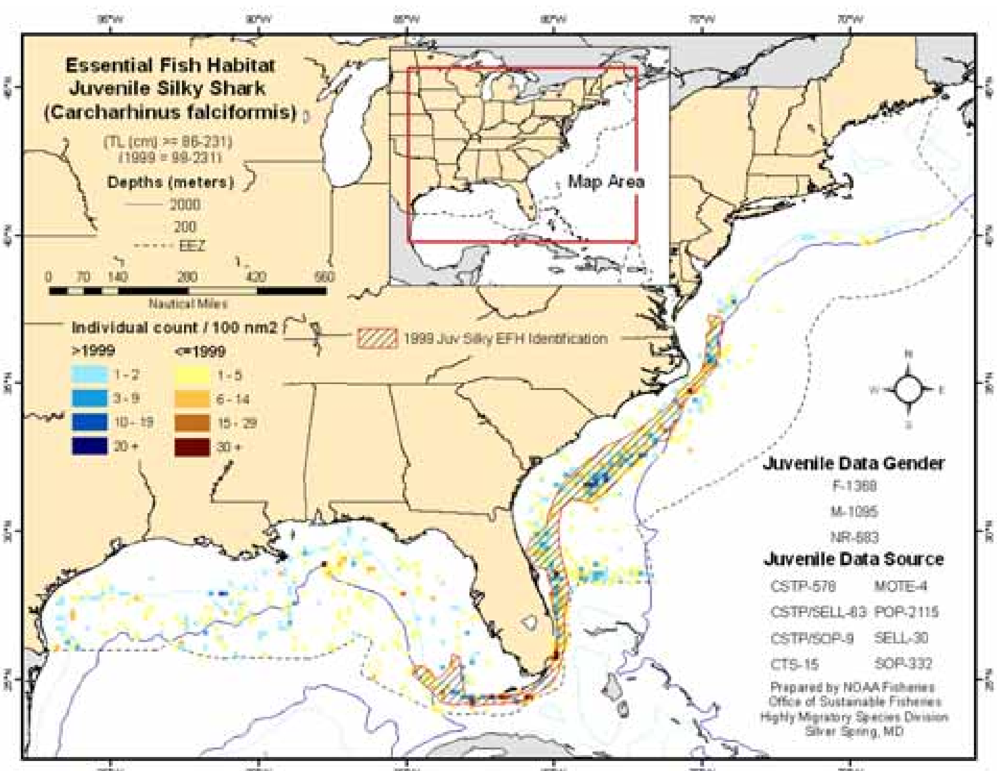

Figure 1.4.3.1.14b. Essential fish habitat for juvenile silky shark

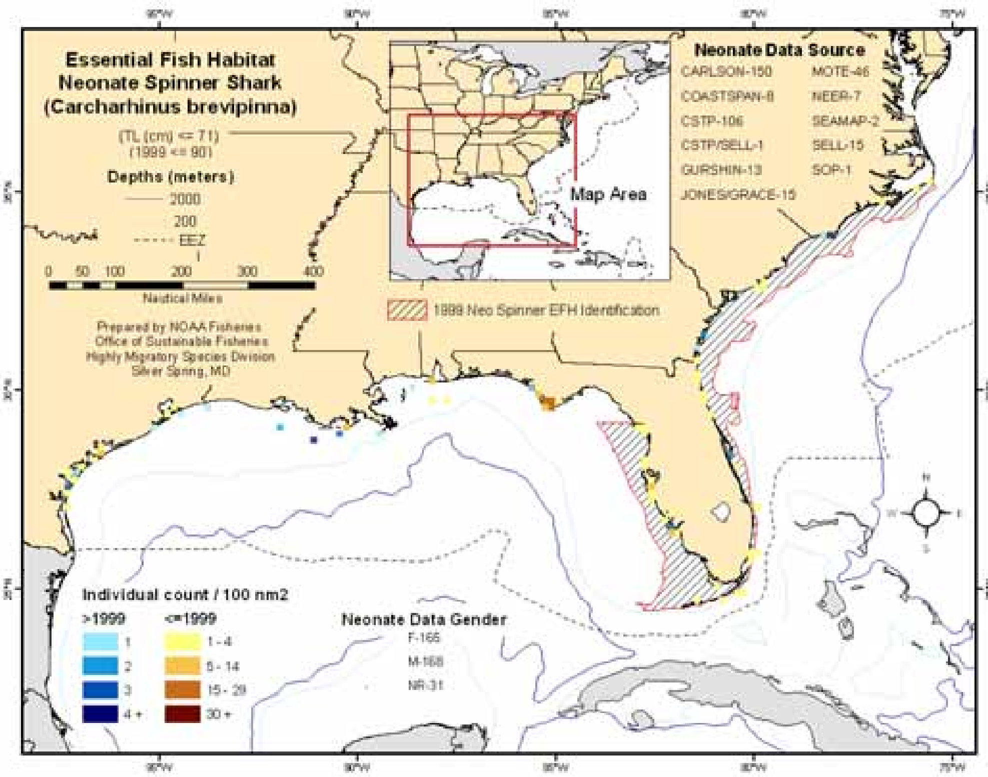

Figure 1.4.3.1.15a. Essential fish habitat for neonate spinner shark

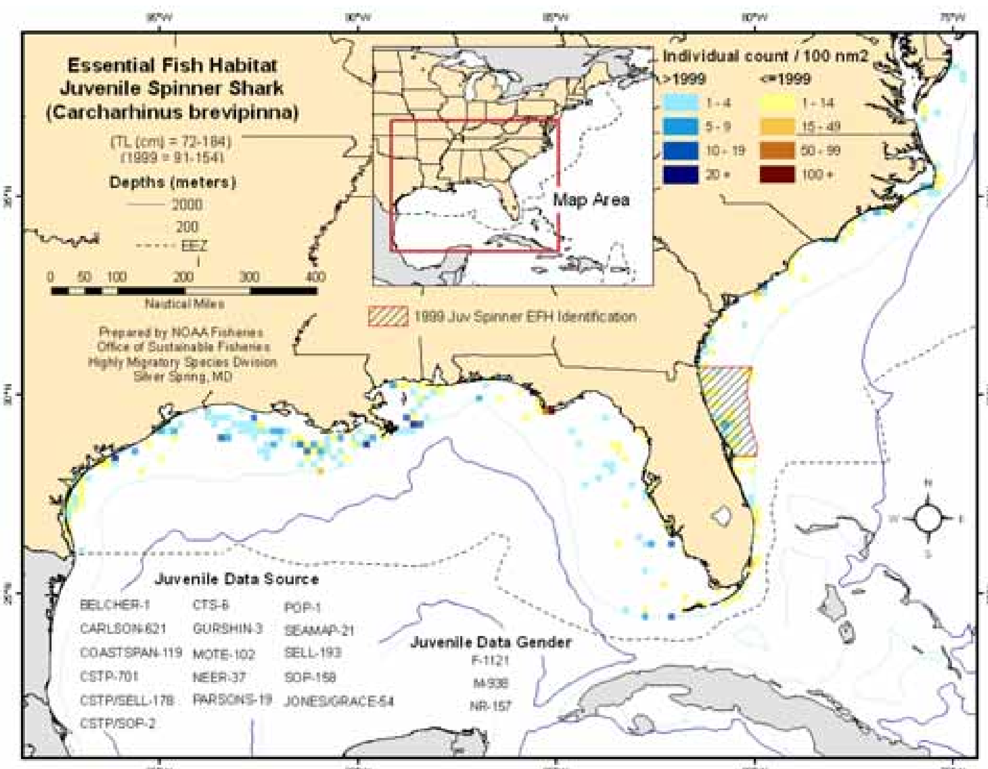

Figure 1.4.3.1.15b. Essential fish habitat for juvenile spinner shark

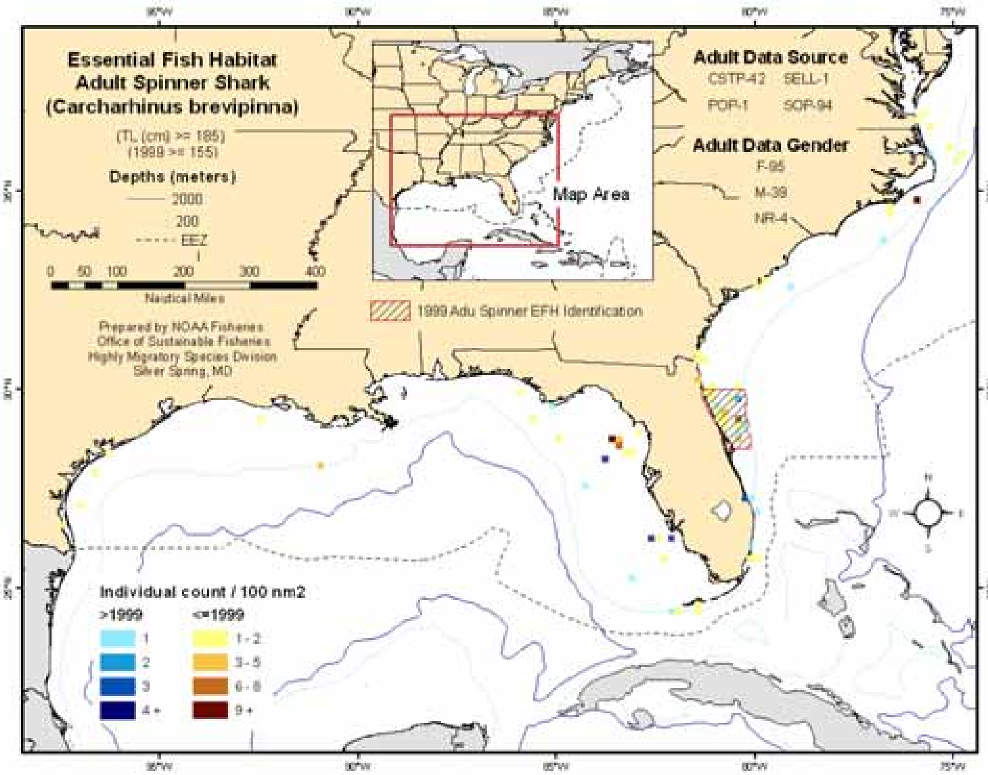

Figure 1.4.3.1.15c. Essential fish habitat for adult spinner shark

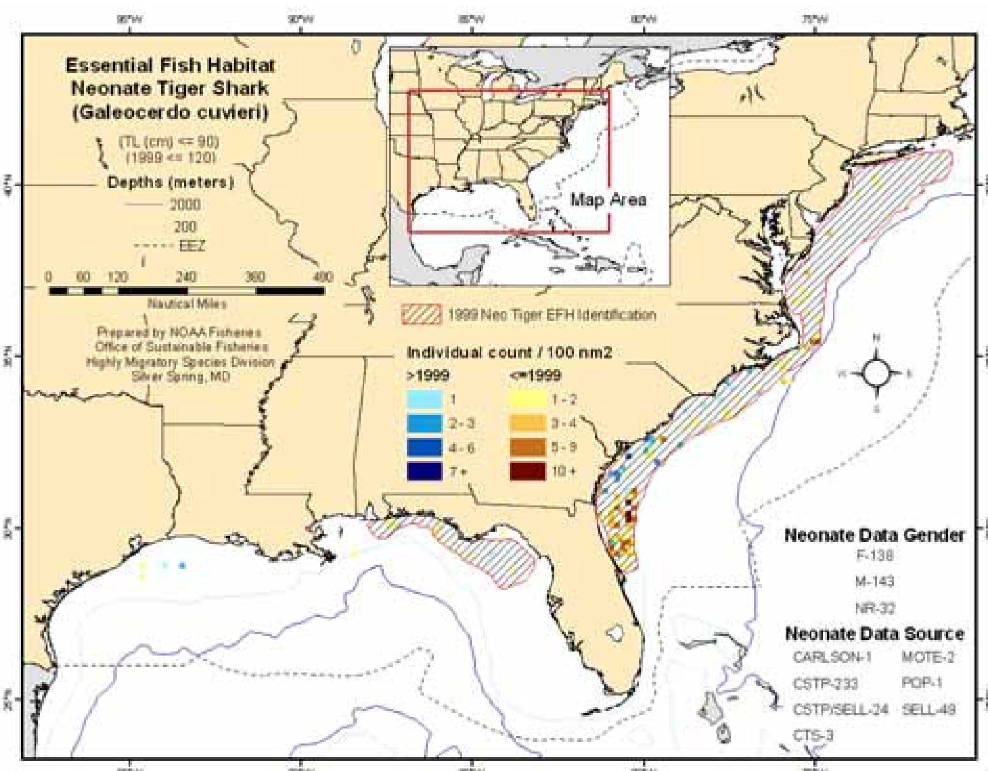

Figure 1.4.3.1.16a. Essential fish habitat for neonate tiger shark

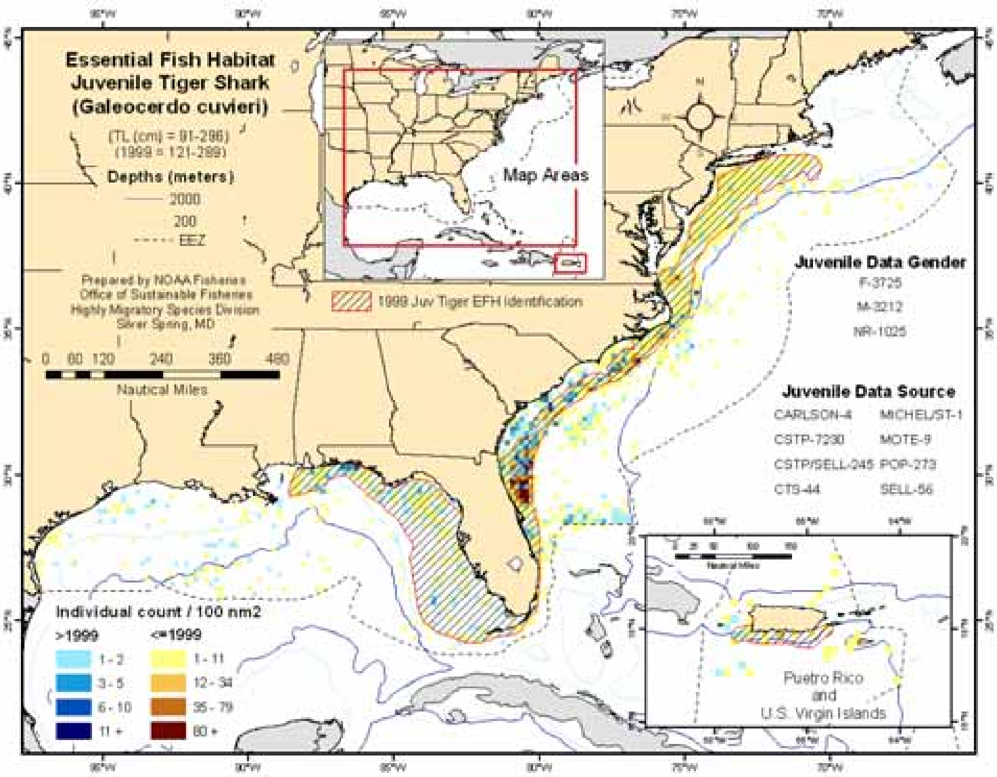

Figure 1.4.3.1.16b. Essential fish habitat for juvenile tiger shark

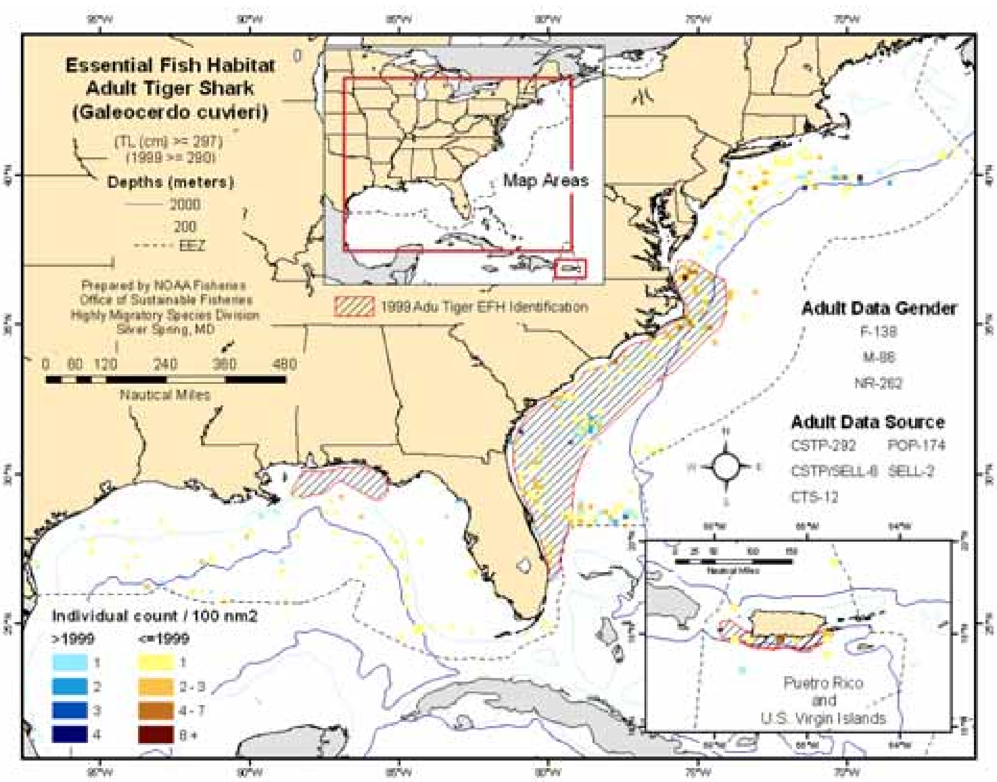

Figure 1.4.3.1.16c. Essential fish habitat for adult tiger shark

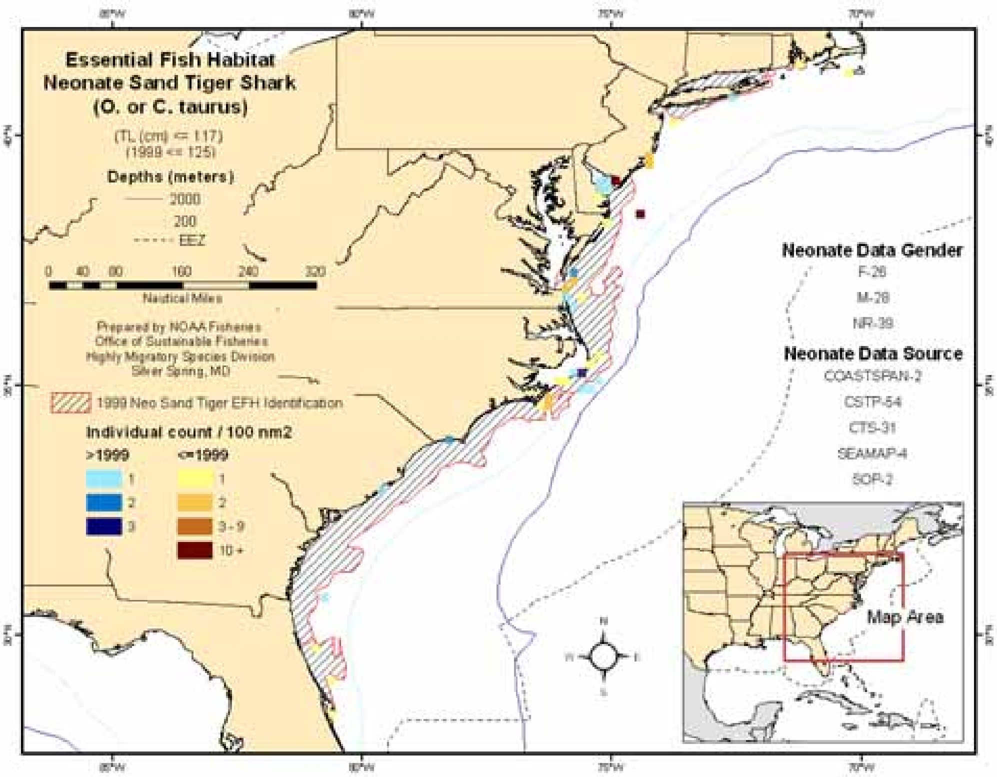

Figure 1.4.3.1.17a. Essential fish habitat for neonate sand tiger shark

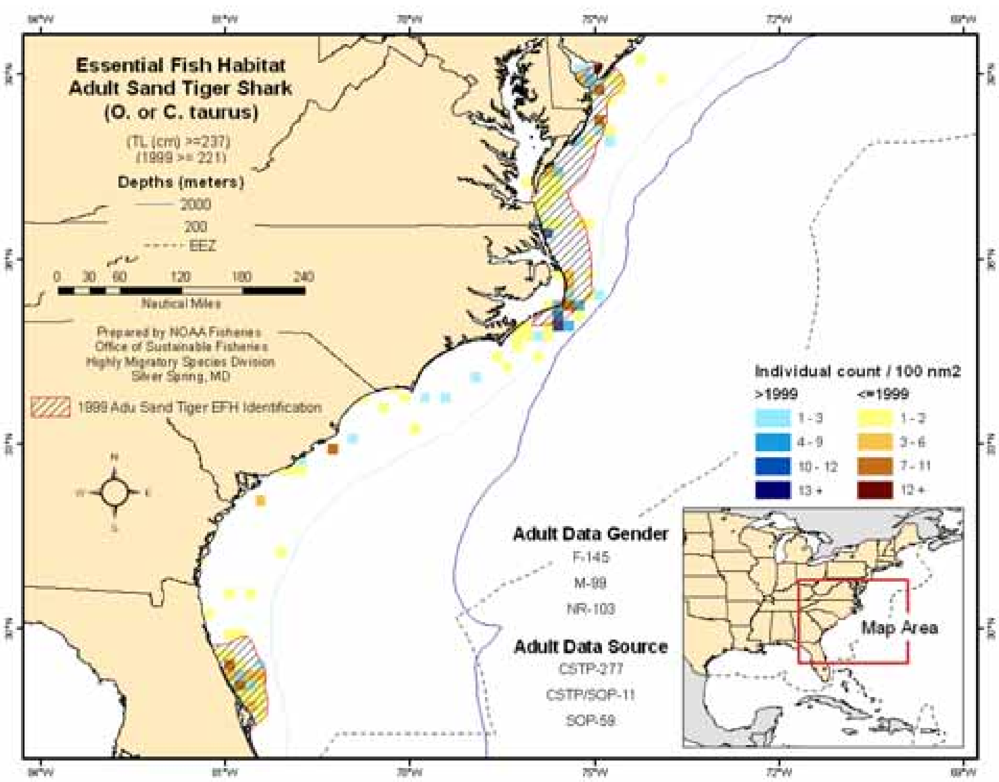

Figure 1.4.3.1.17b. Essential fish habitat for adult sand tiger shark

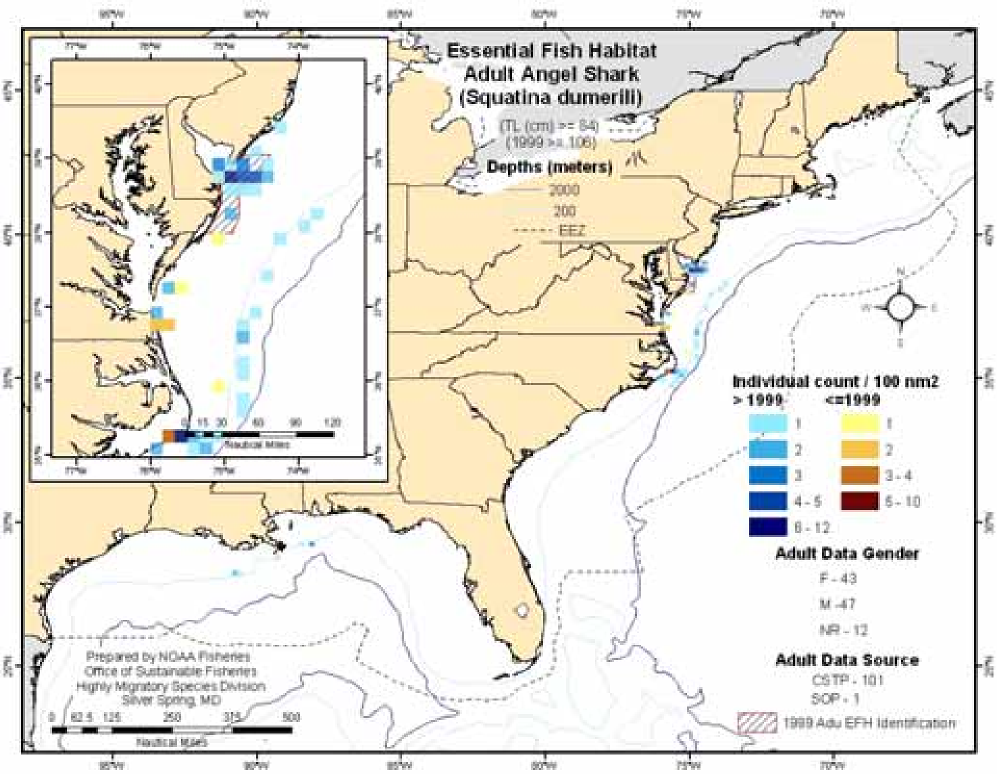

Figure 1.4.3.1.18. Essential fish habitat for neonate, juvenile, and adult angel shark

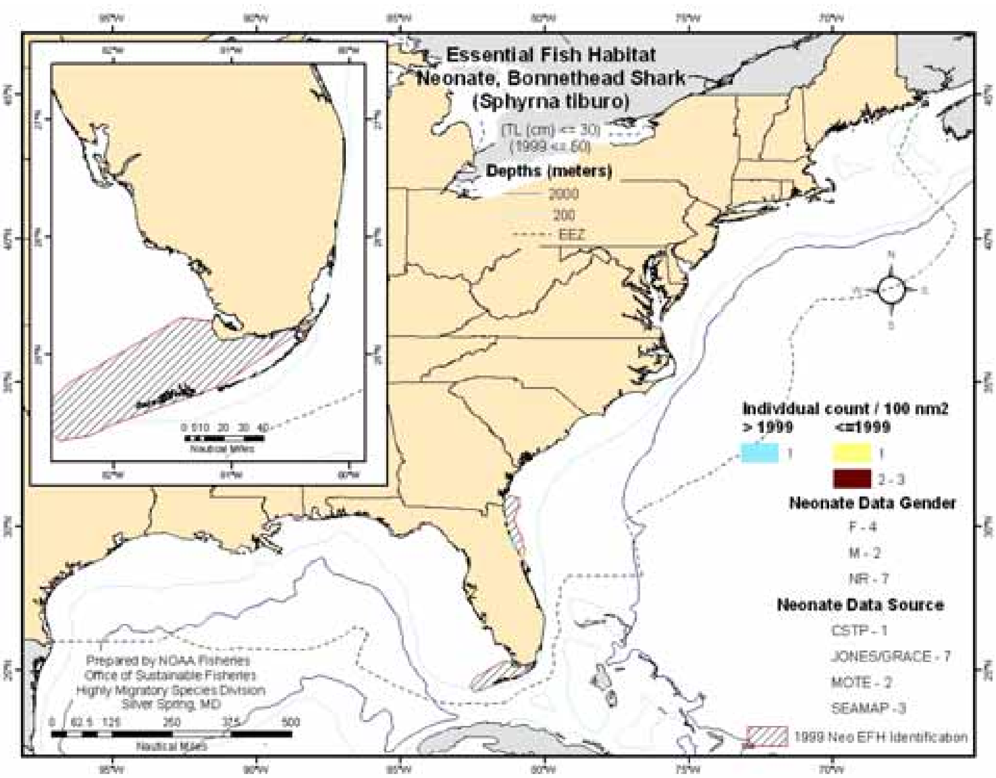

Figure 1.4.3.1.19a. Essential fish habitat for neonate bonnethead shark

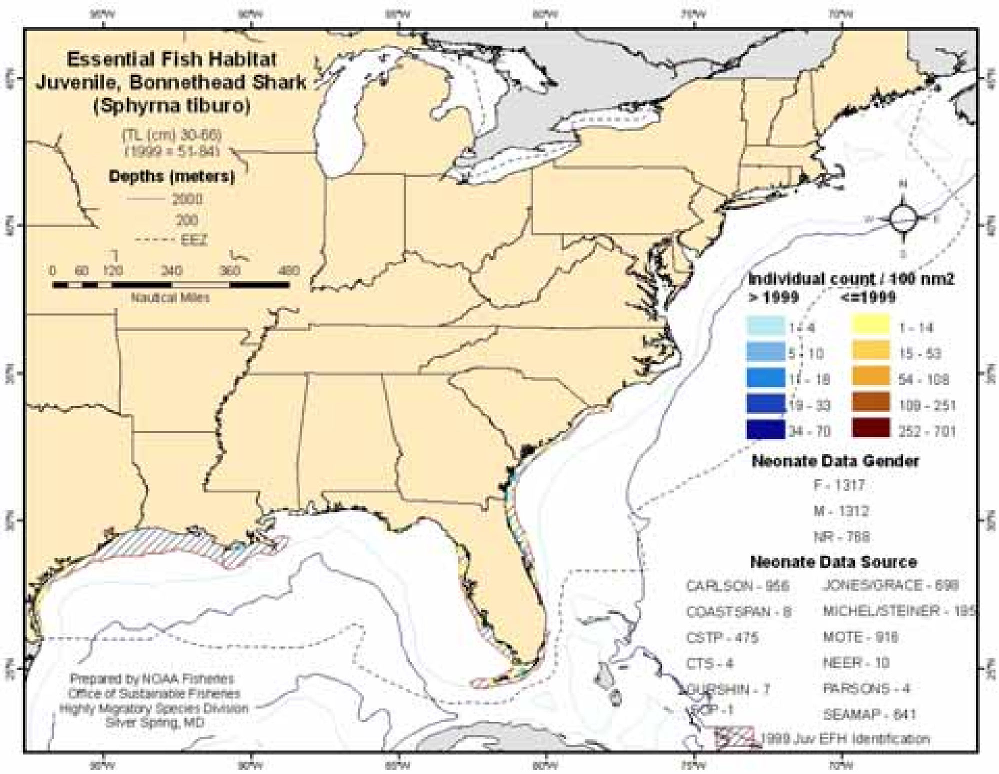

Figure 1.4.3.1.19b. Essential fish habitat for juvenile bonnethead shark

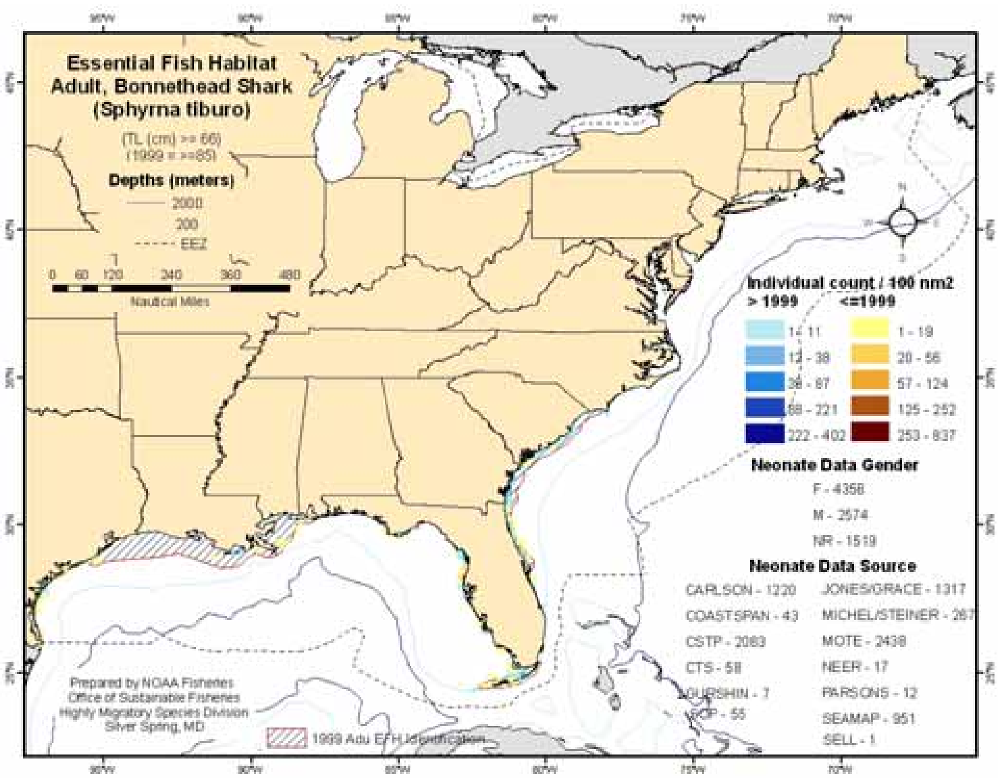

Figure 1.4.3.1.19c. Essential fish habitat for adult bonnethead shark

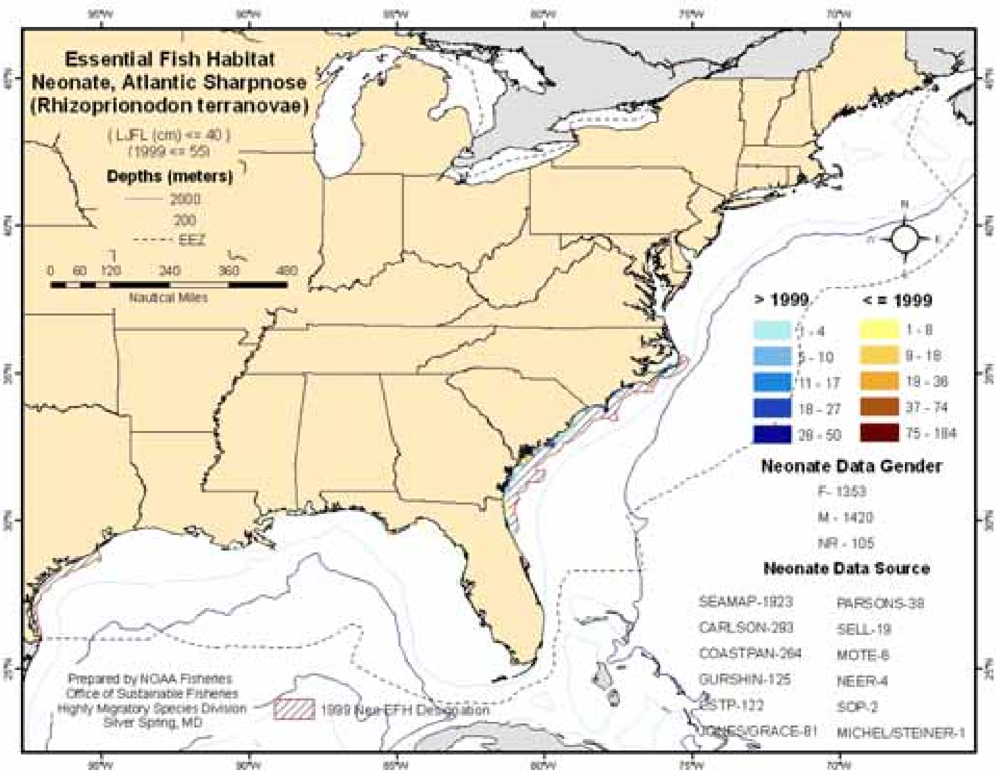

Figure 1.4.3.1.20a. Essential fish habitat for neonate Atlantic sharpnose shark

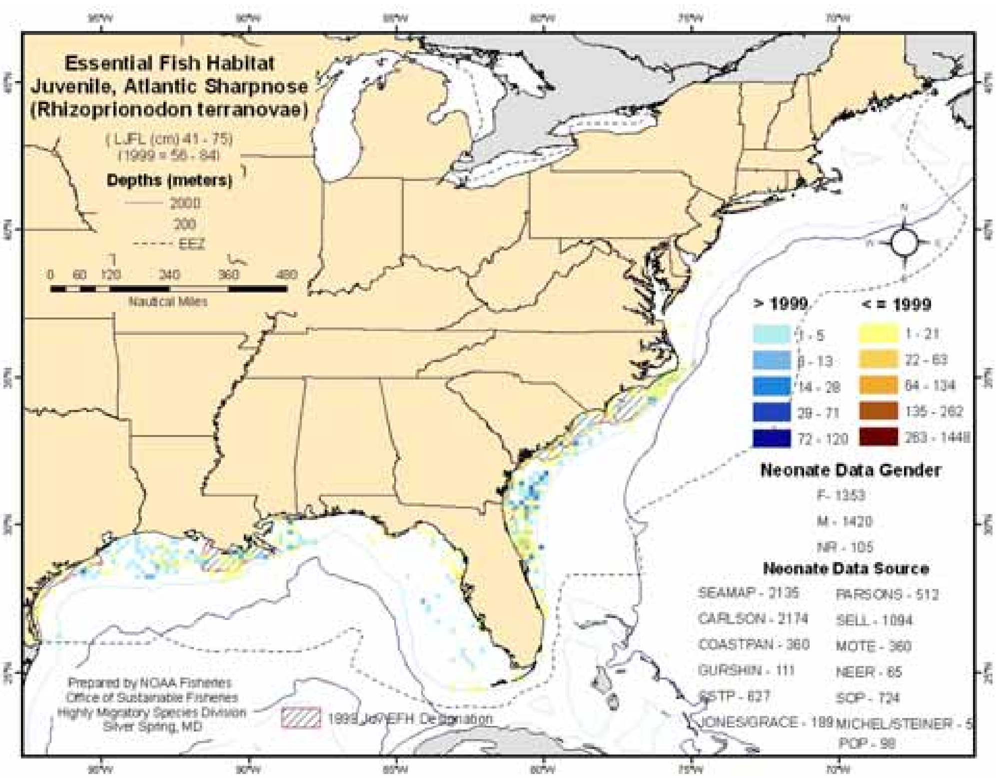

Figure 1.4.3.1.20b. Essential fish habitat for juvenile Atlantic sharpnose shark

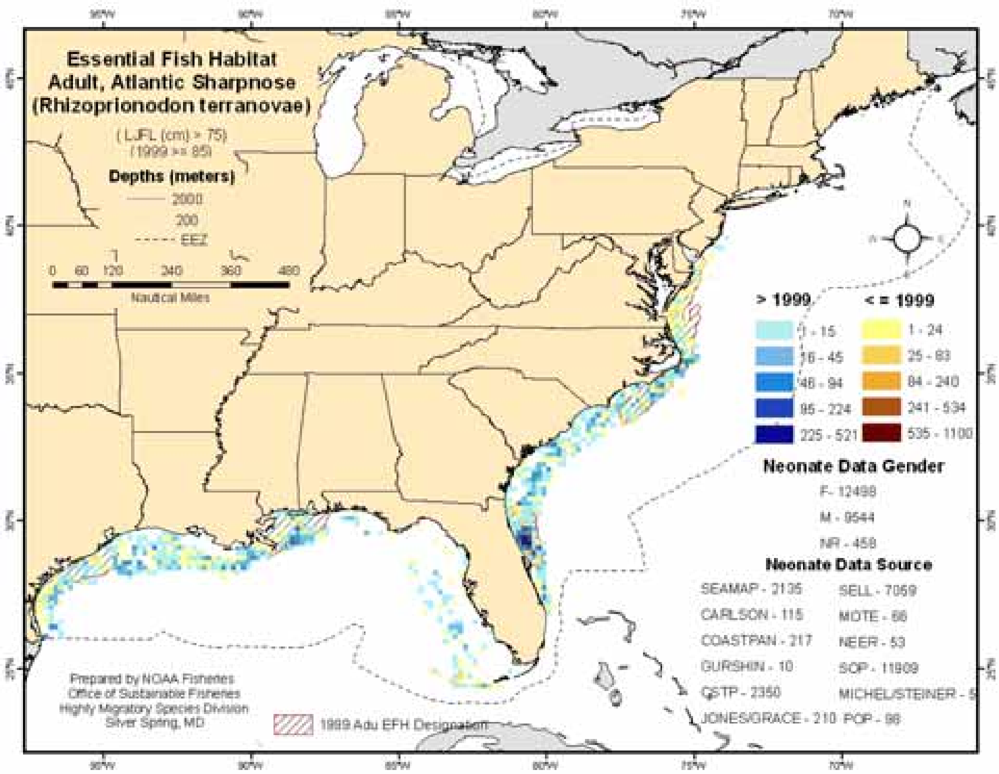

Figure 1.4.3.1.20c. Essential fish habitat for adult Atlantic sharpnose shark

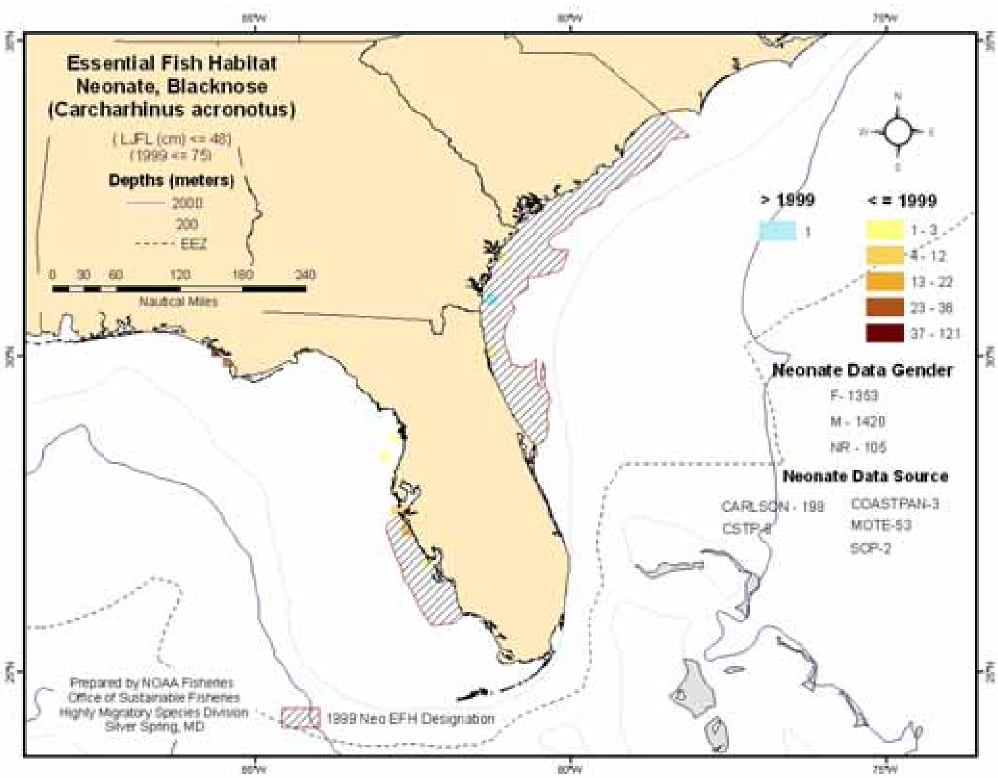

Figure 1.4.3.1.21a. Essential fish habitat for neonate blacknose shark

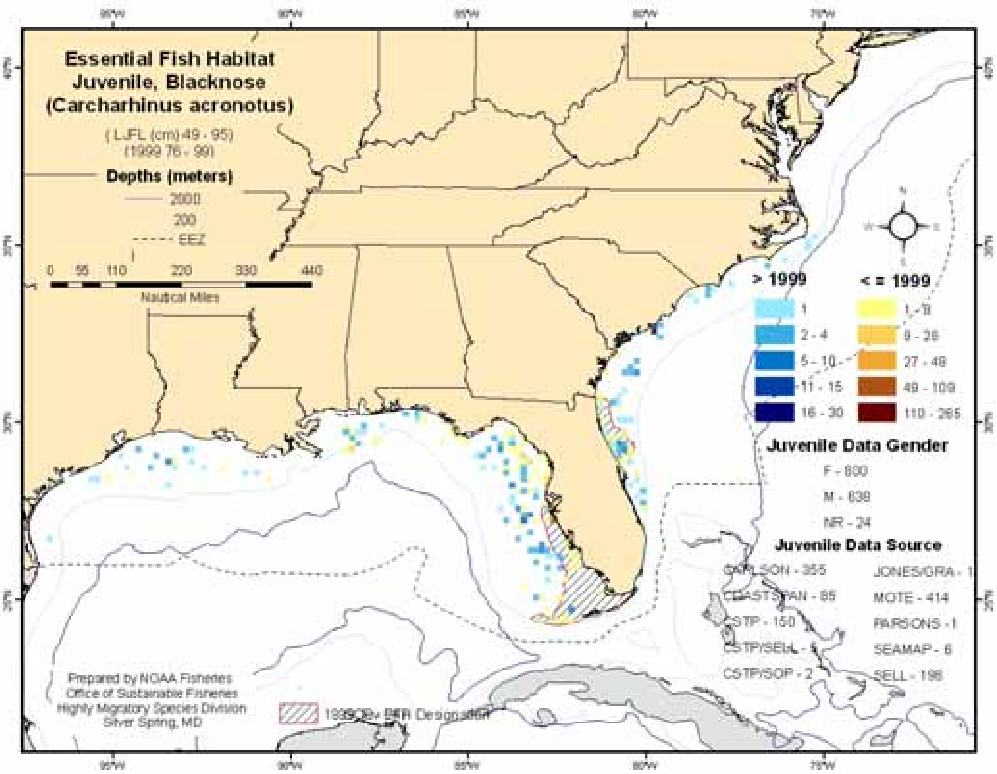

Figure 1.4.3.1.21b. Essential fish habitat for juvenile blacknose shark

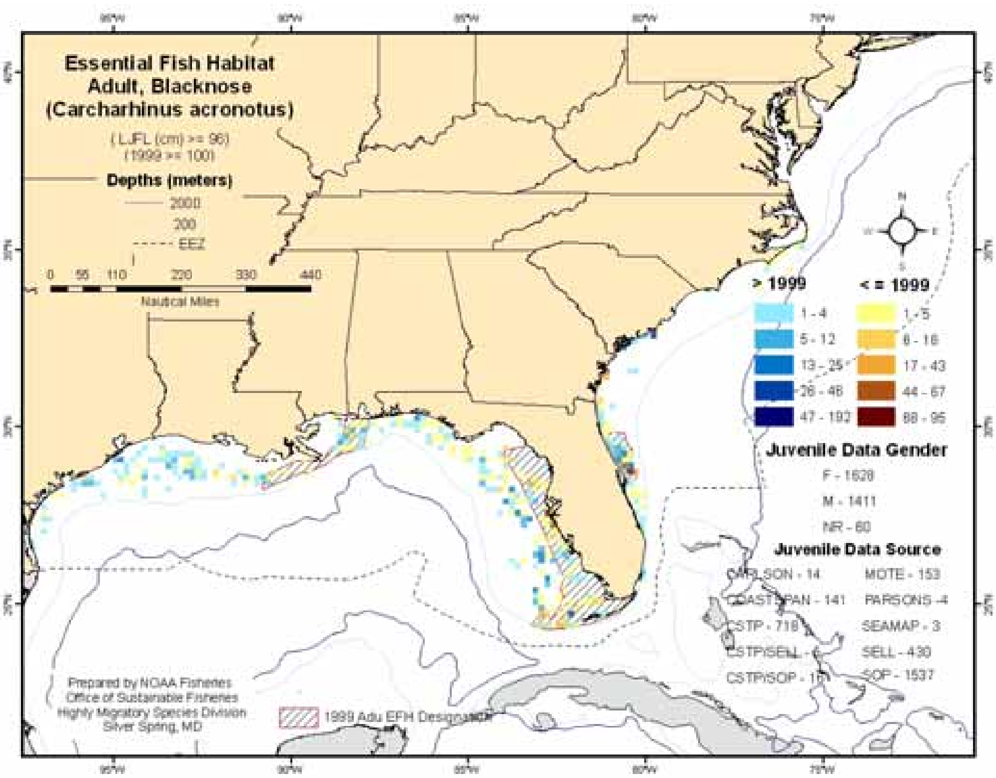

Figure 1.4.3.1.21c. Essential fish habitat for adult blacknose shark

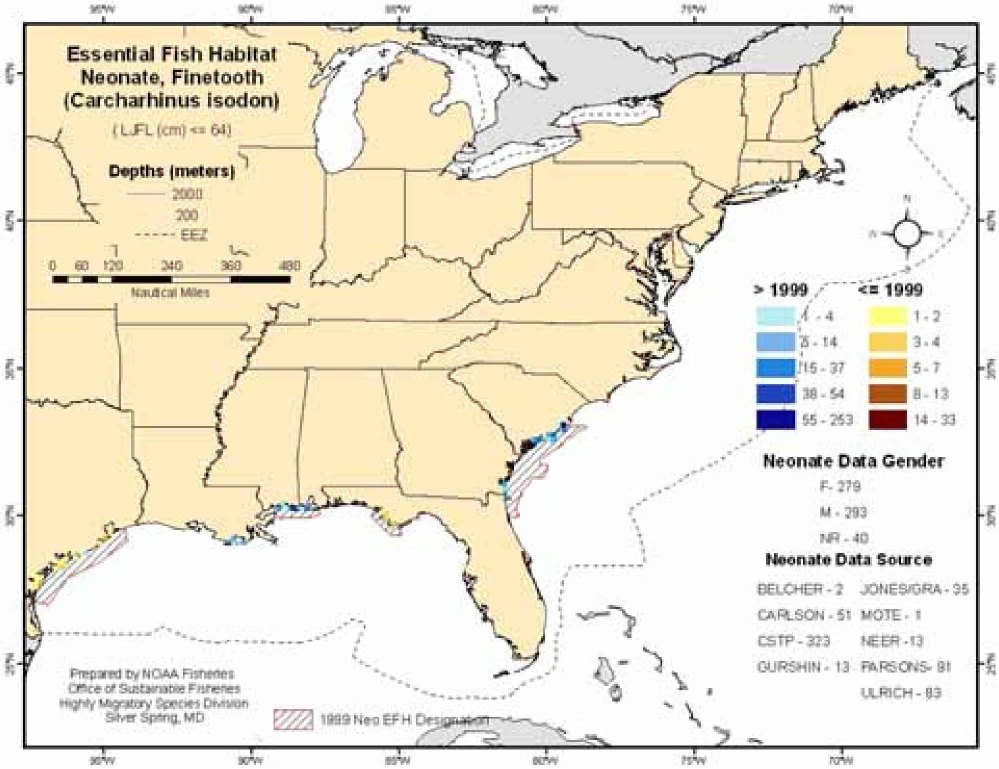

Figure 1.4.3.1.22a. Essential fish habitat for neonate finetooth shark

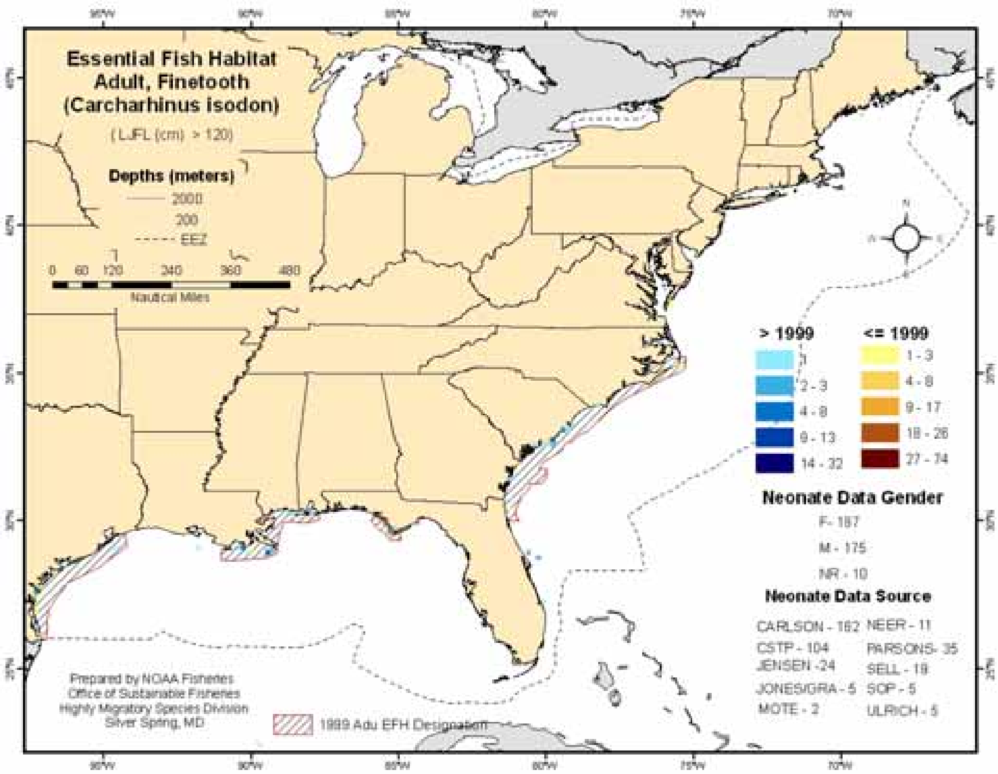

Figure 1.4.3.1.22b. Essential fish habitat for juvenile and adult finetooth shark

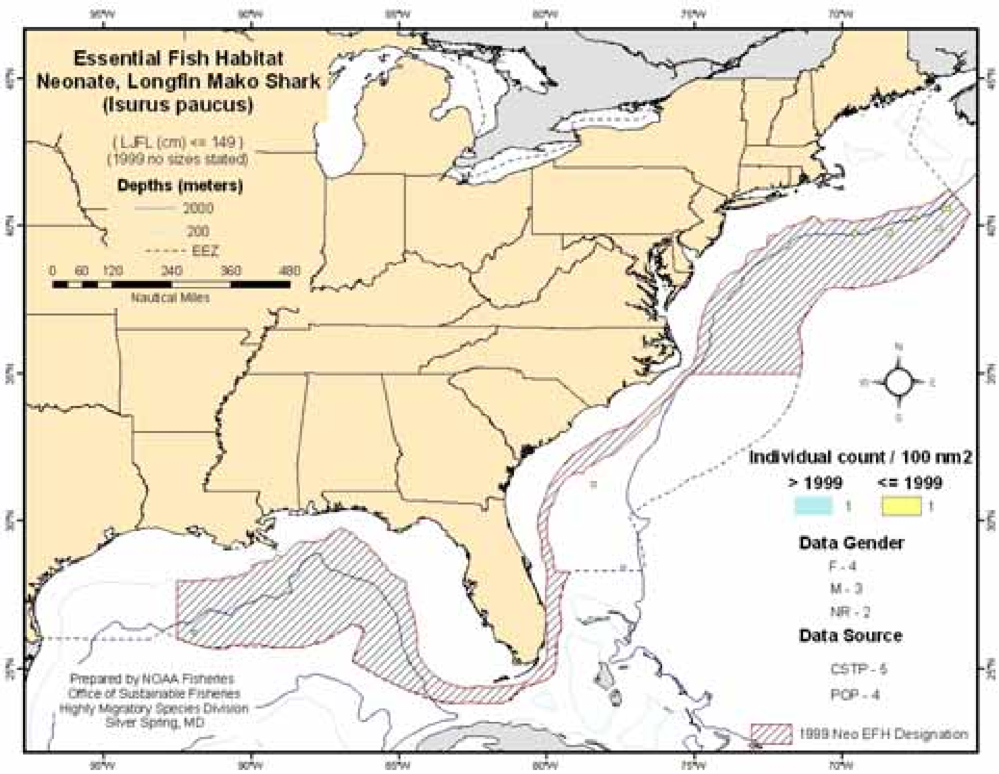

Figure 1.4.3.1.23. Essential fish habitat for neonate, juvenile, and adult longfin mako shark

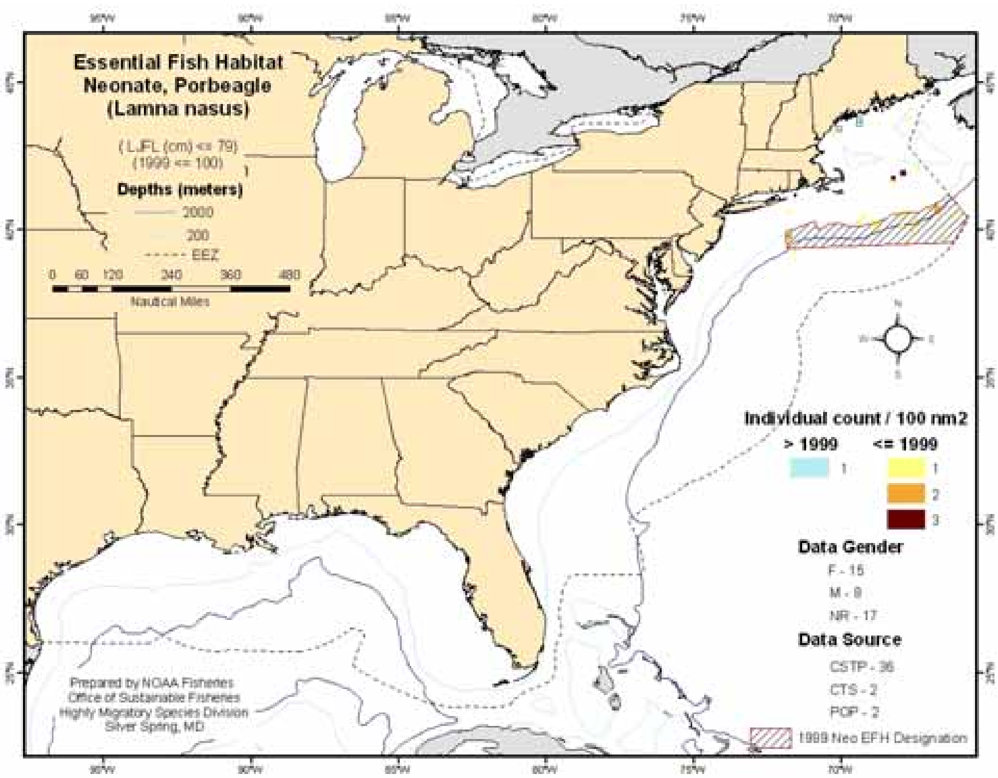

Figure 1.4.3.1.24a. Essential fish habitat for neonate porbeagle

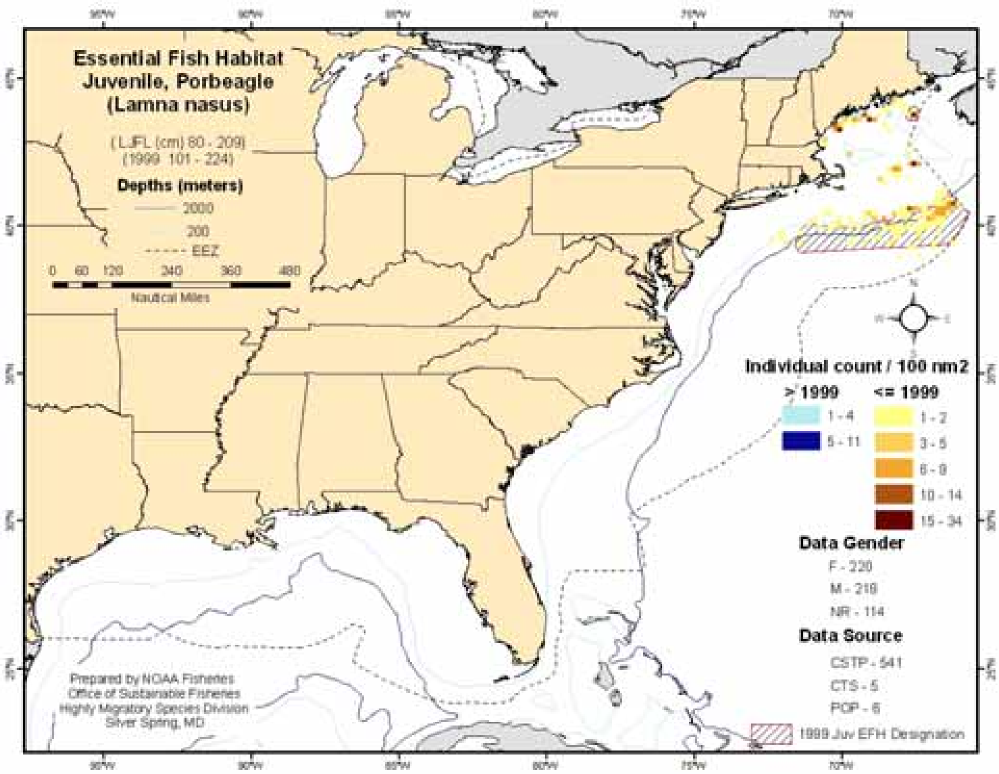

Figure 1.4.3.1.24b. Essential fish habitat for juvenile porbeagle

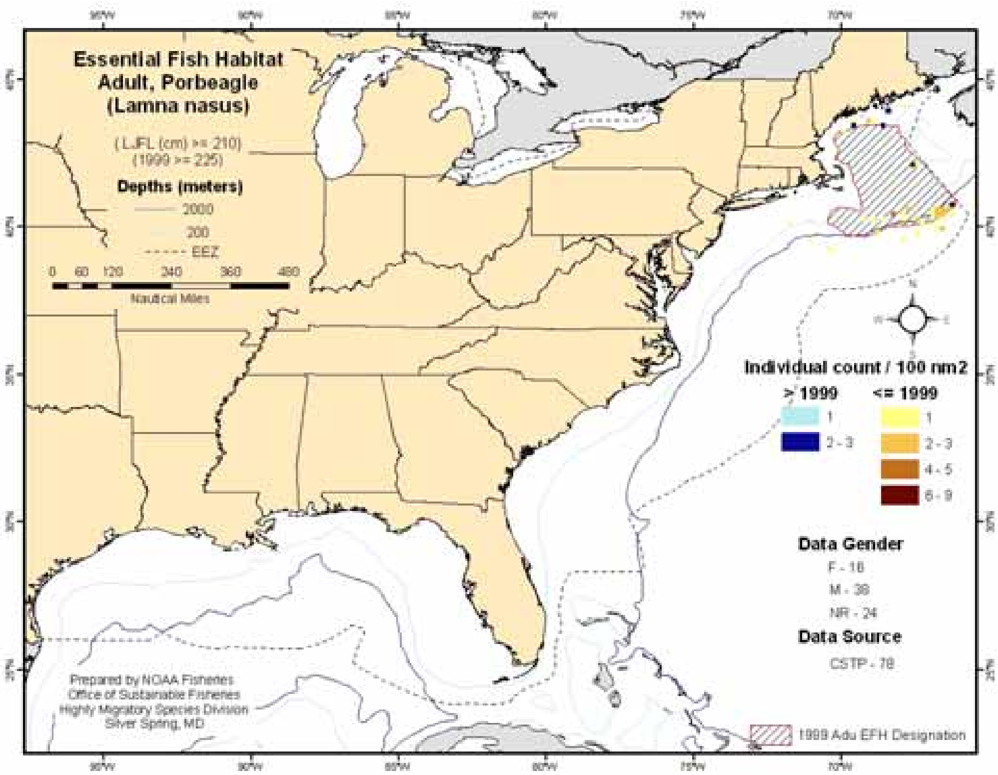

Figure 1.4.3.1.24c. Essential fish habitat for adult porbeagle

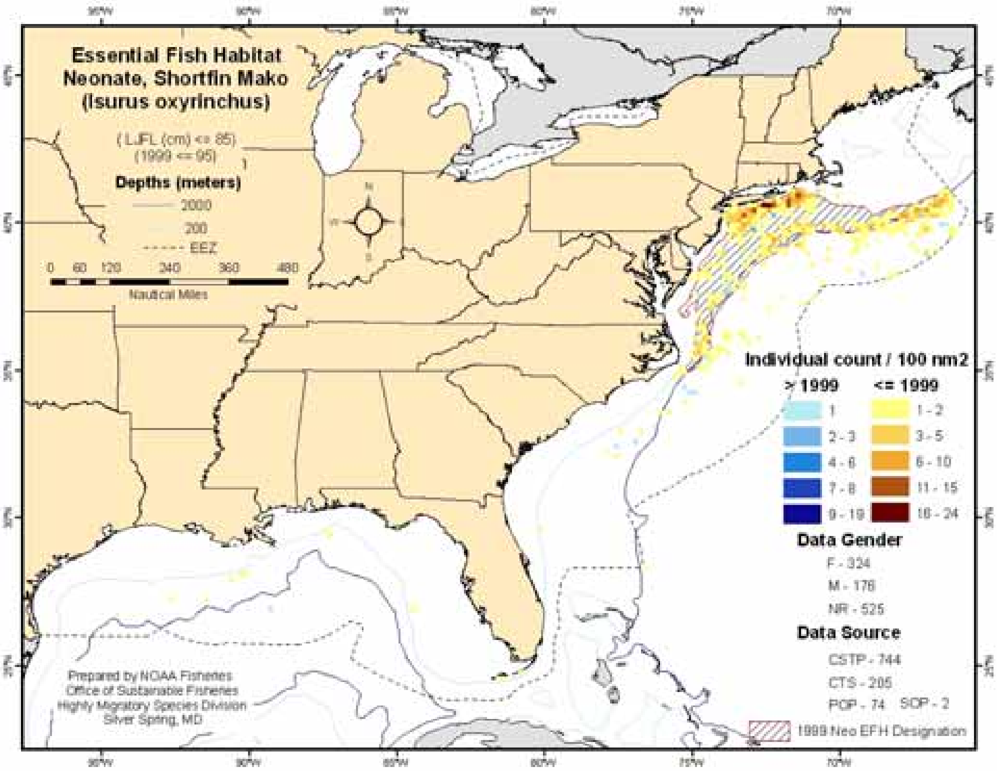

Figure 1.4.3.1.25a. Essential fish habitat for neonate shortfin mako shark

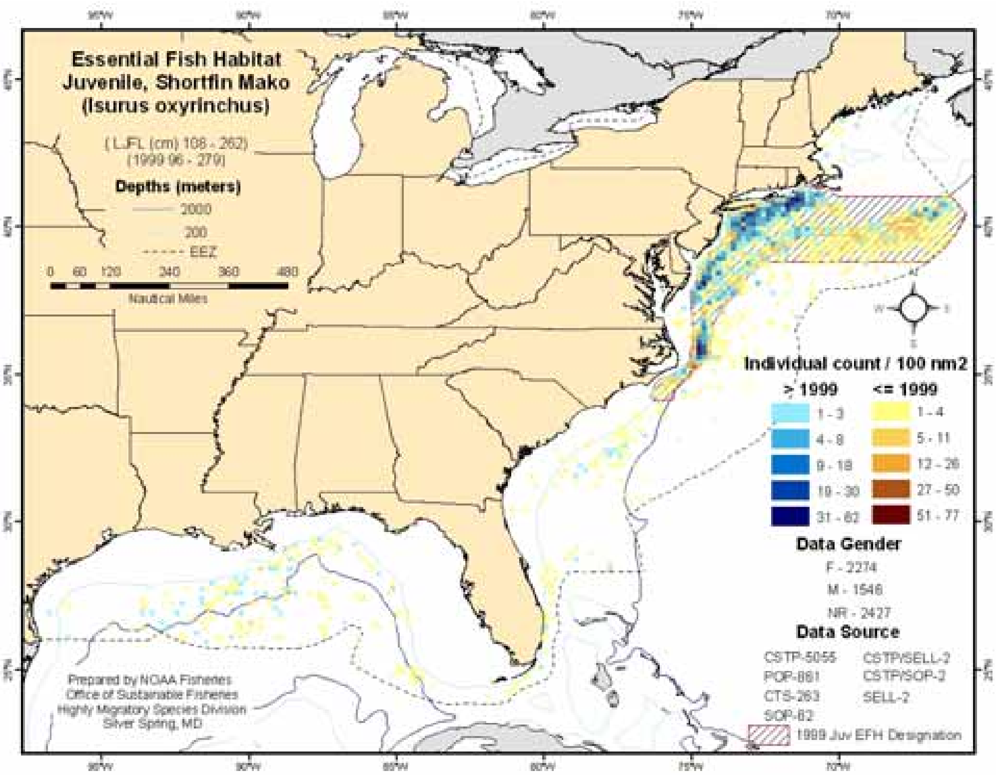

Figure 1.4.3.1.25b. Essential fish habitat for juvenile shortfin mako shark

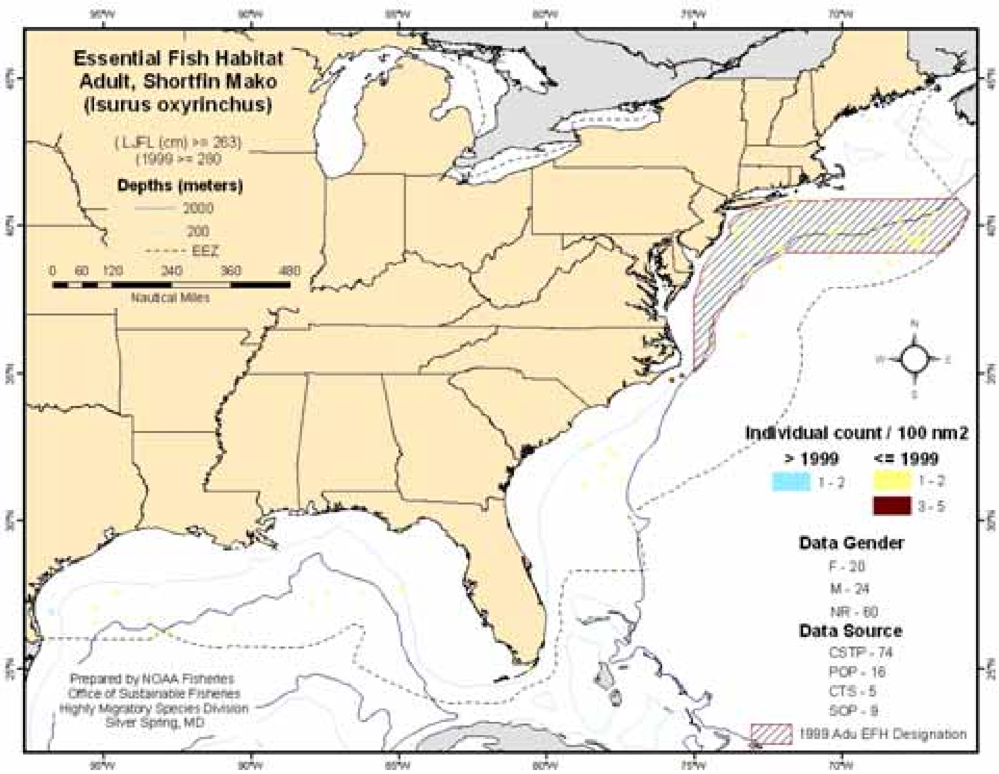

Figure 1.4.3.1.25c. Essential fish habitat for adult shortfin mako shark

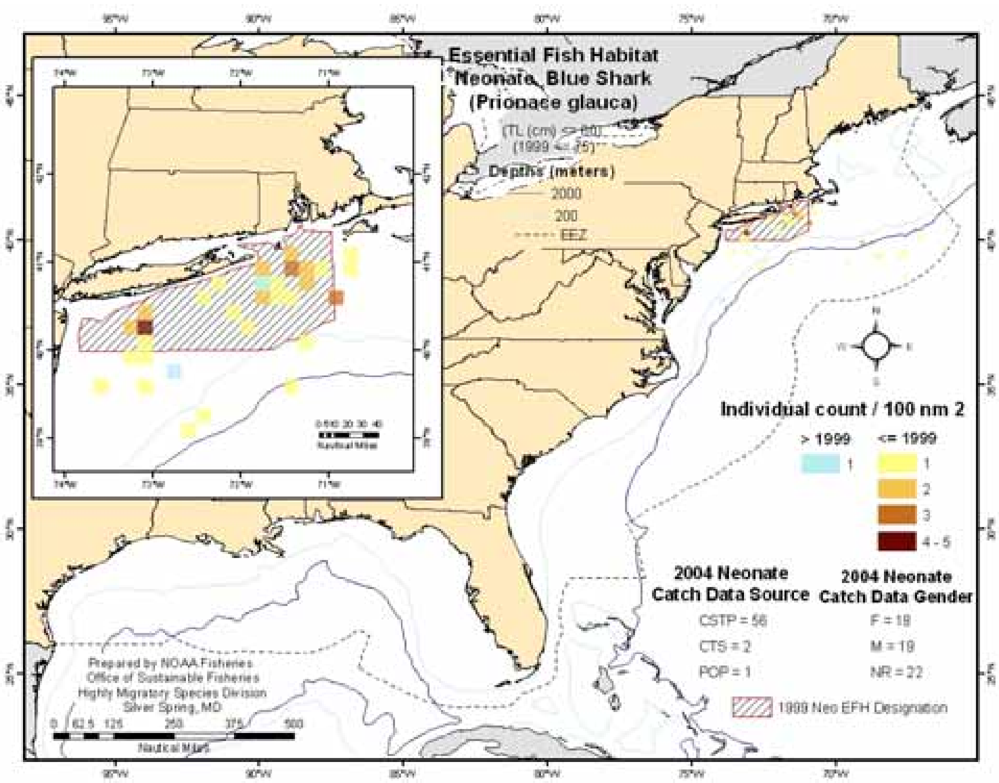

Figure 1.4.3.1.26a. Essential fish habitat for neonate blue shark

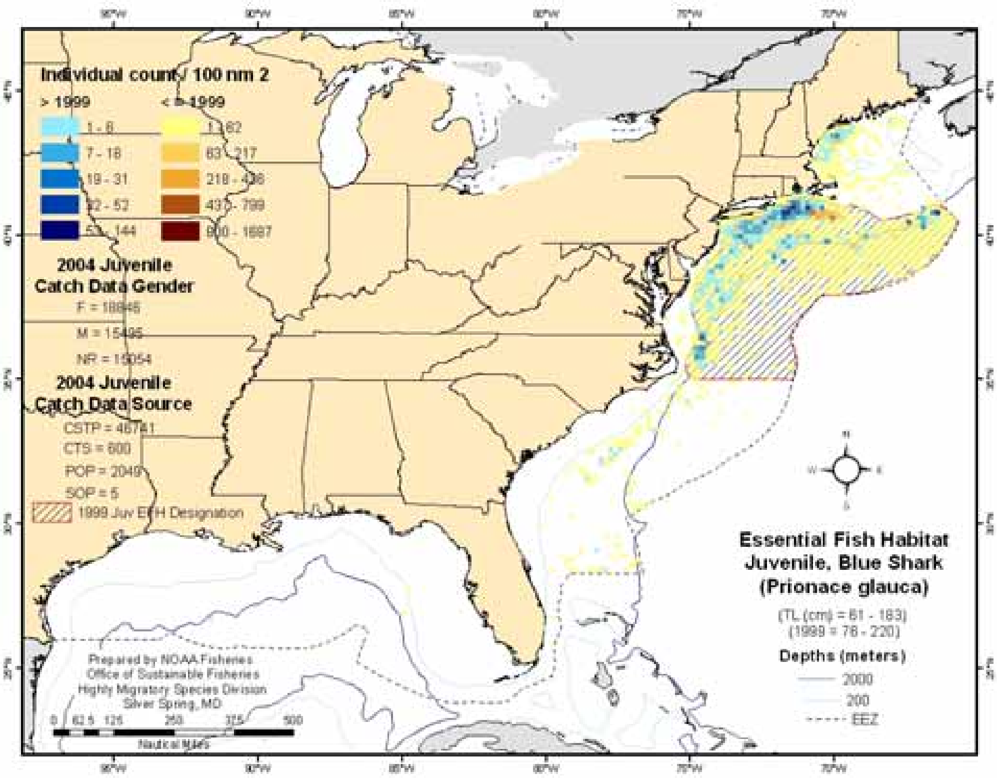

Figure 1.4.3.1.26b. Essential fish habitat for juvenile blue shark

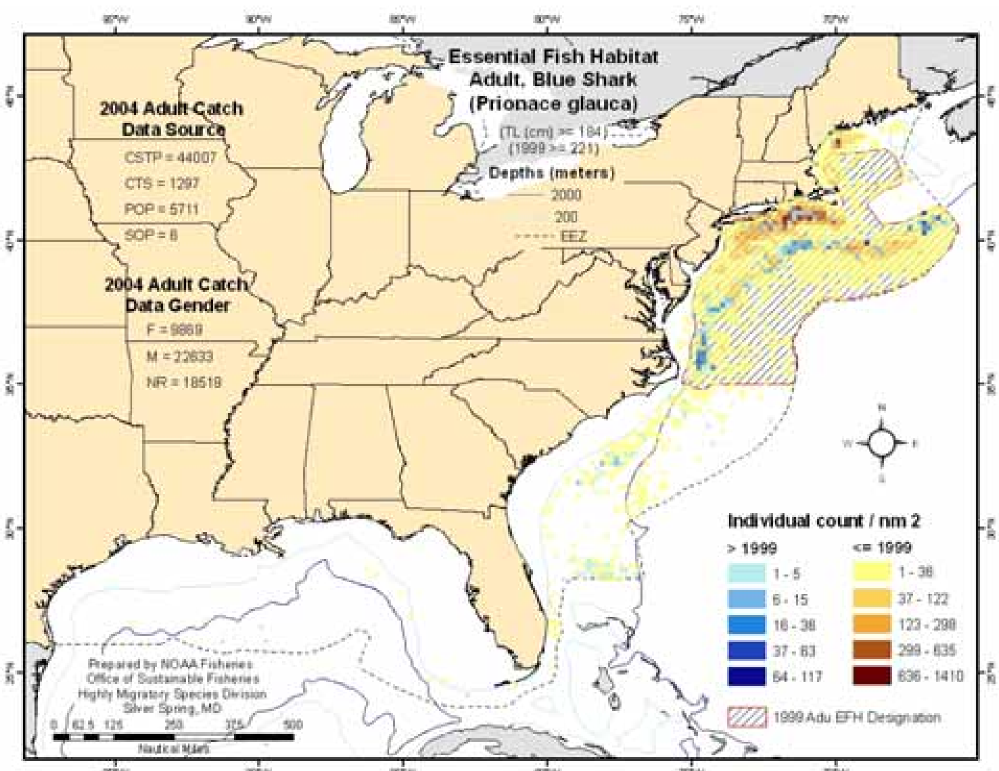

Figure 1.4.3.1.26c. Essential fish habitat for adult blue shark

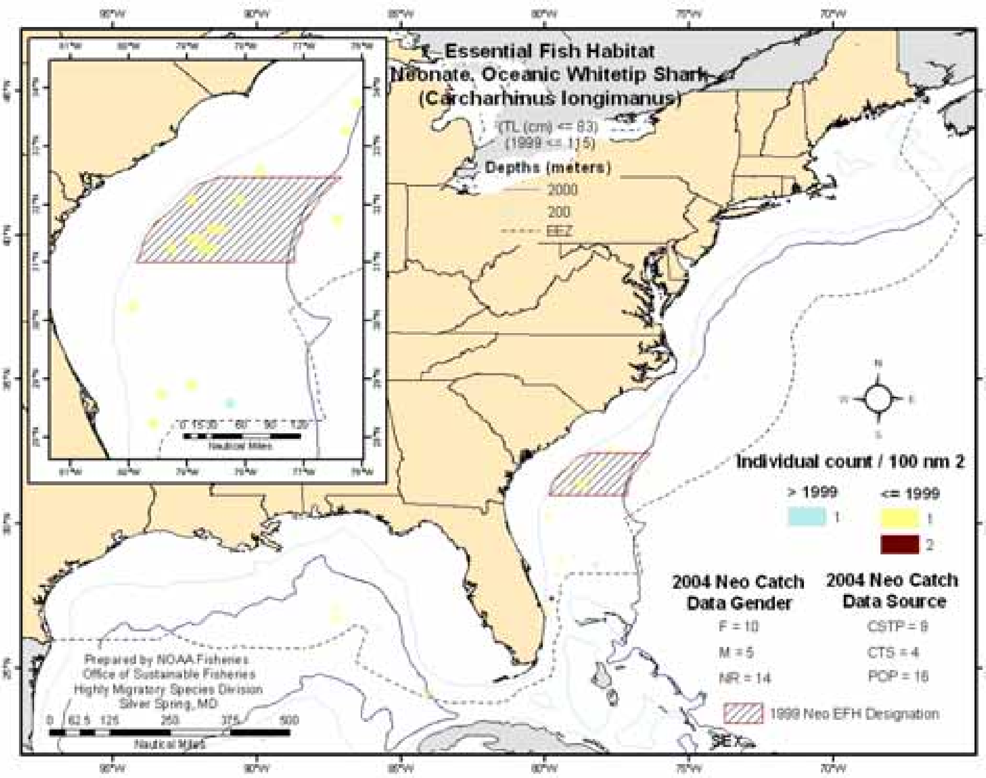

Figure 1.4.3.1.27a. Essential fish habitat for neonate oceanic whitetip shark

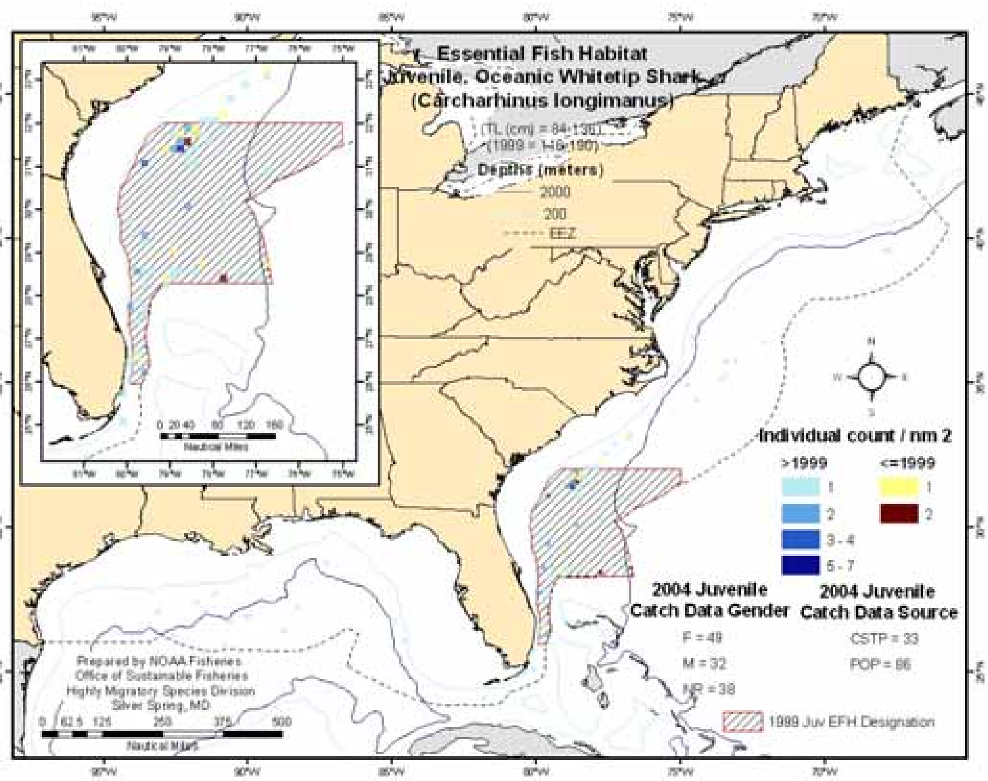

Figure 1.4.3.1.27b. Essential fish habitat for juvenile oceanic whitetip shark

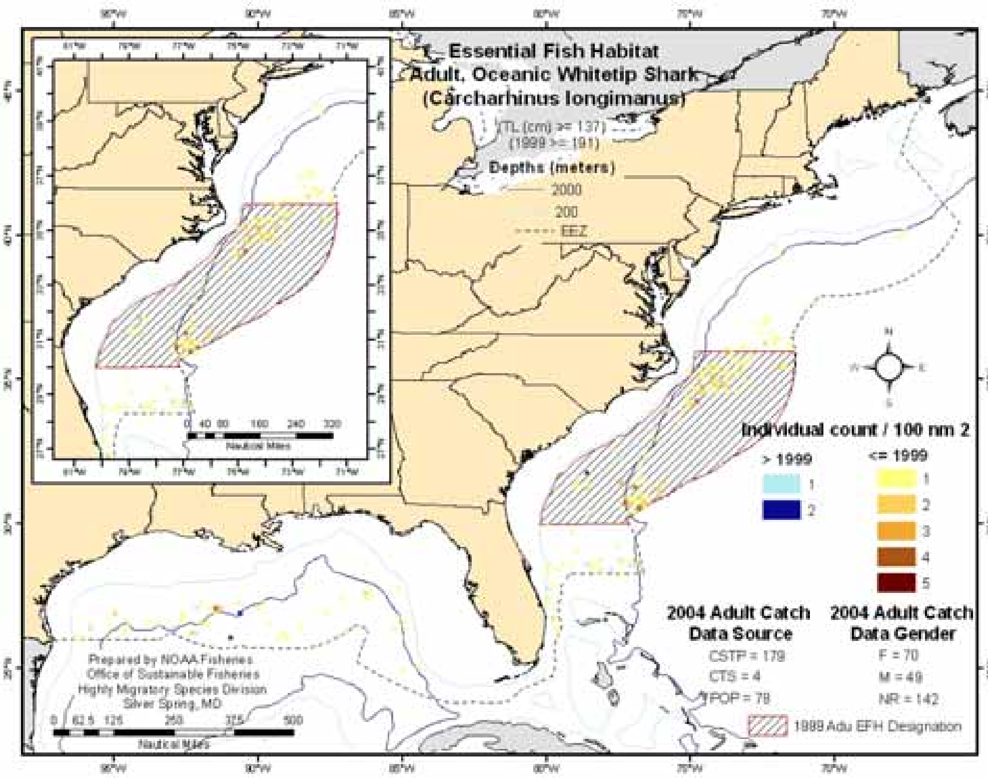

Figure 1.4.3.1.27c. Essential fish habitat for adult oceanic whitetip shark

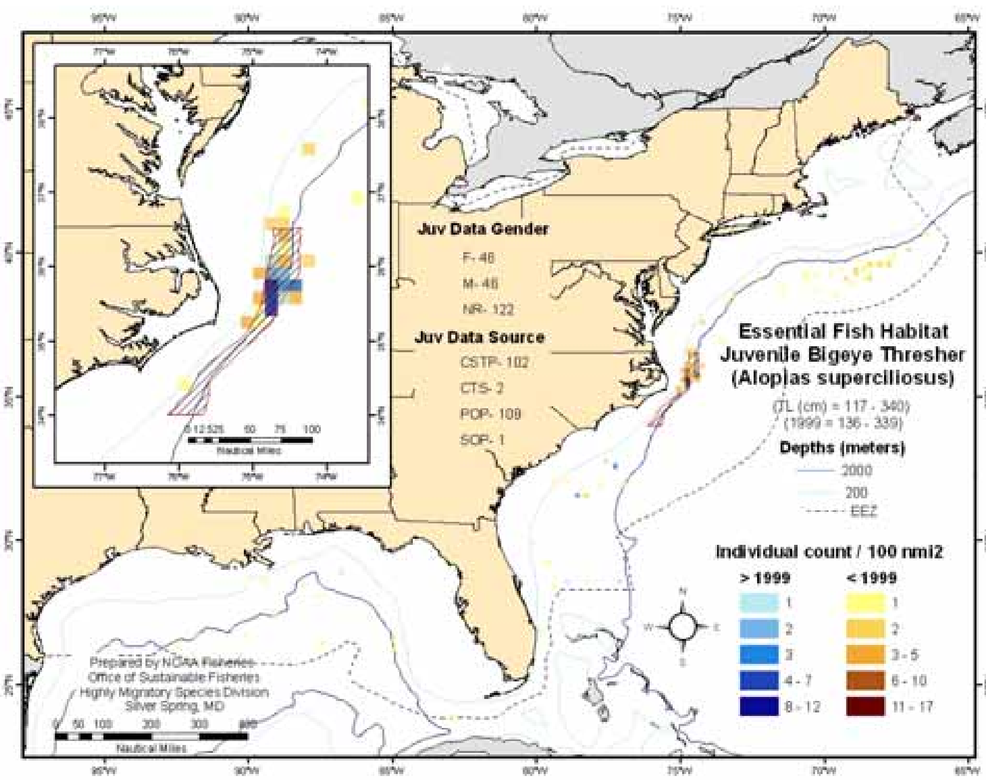

Figure 1.4.3.1.28a. Essential fish habitat for juvenile bigeye thresher shark

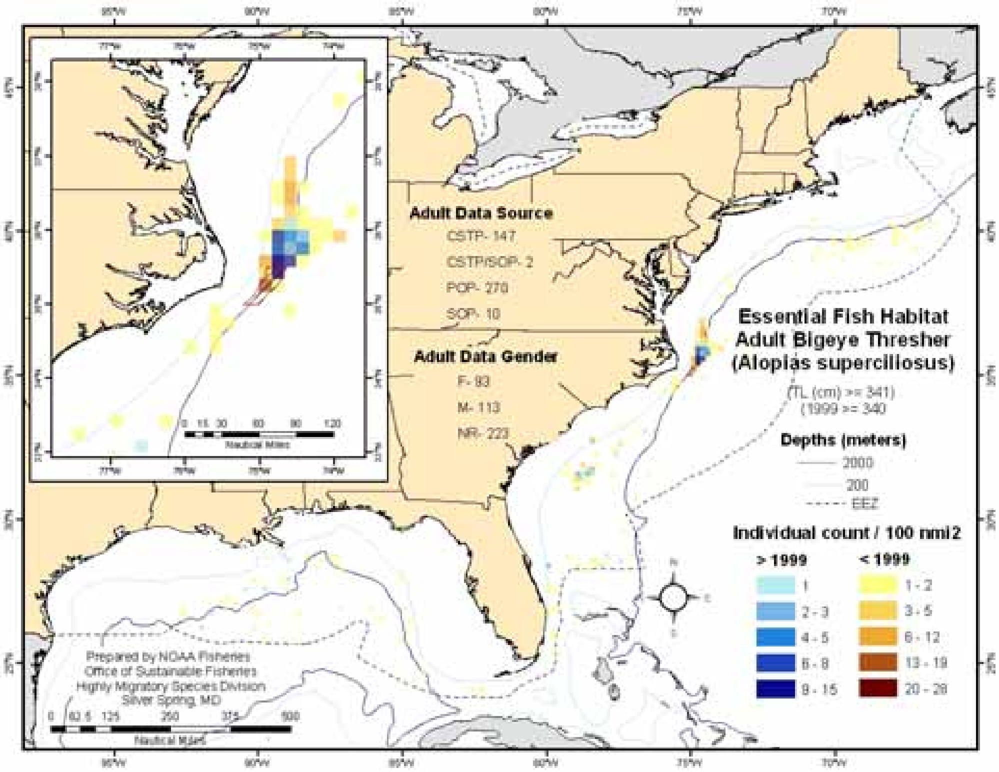

Figure 1.4.3.1.28b. Essential fish habitat for adult bigeye thresher shark

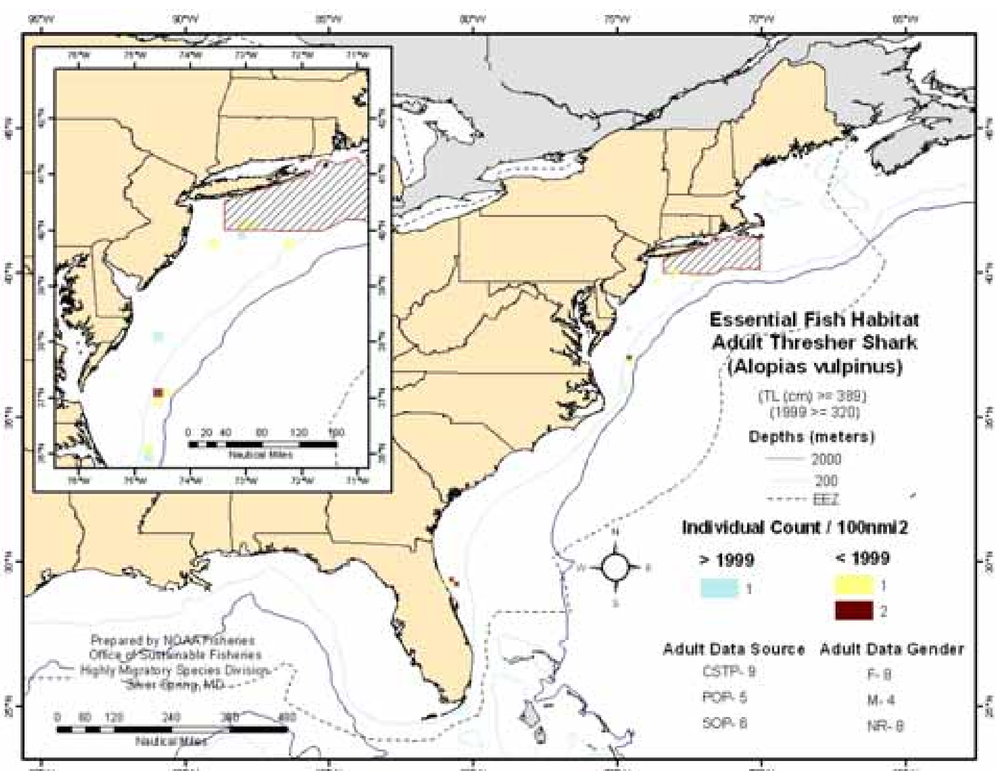

Figure 1.4.3.1.29. Essential fish habitat for neonate, juvenile, and adult thresher shark

1.5 IMPACT OF THE FISHERY MANAGEMENT PROGRAM
1.5 Economic Impacts

1.5.1 Recreational Fishery

The various alternatives proposed under the permitted species management measures present varying degrees of restriction related to the prohibited species list. Alternatives that require anglers to have knowledge of the "most commonly caught species" or the species that is "easily identifiable" open the management authorities to enforcement difficulties given the imprecise definition of allowable species.

Minimum size limits should have little or no negative economic impact on the fisheries.

Authorized gear restrictions may have a slight negative impact on anglers due to a minor additional expense of bait, and the onetime expense of rod and reel for individuals not currently using these specific gear types.

The possession limits are consistent with federal shark regulations and therefore should not have any significant economic impact on the fishery.

1.5.2 Commercial Fishery

The alternatives associated with the definition of regions are primarily an administrative issue. The alternative which adopts the federally defined regions will have little or no economic impact on the fishery.

The definition of seasons and seasonal closures should have a positive economic impact on the fishery overall. Commercial anglers who have fished during times that adversely affect the fishery may be negatively impacted by imposing this restriction.

The imposition of additional quotas could have a negative effect on the fishery. If ASMFC chooses to define its own quotas, this will require additional administrative costs.

The alternatives for permit requirements should have little or no economic impact on the fisheries. Commercial shark vessels have the flexibility to have either a federal shark permit, or to have an individual on the boat with a state commercial fishing license.

Setting possession limit and size limits by species management will require additional resources and may have a slight negative economic impact as participants need to keep informed of the annual limit requirements for each species group. The tradeoff here is between cost and flexibility. This option allows ASMFC considerable flexibility in managing the species, but there are costs associated with keeping the anglers informed about the changing regulations.

The alternatives for authorized commercial gear offer a wide range of options. Economic impact could range from insignificant to significant depending on which gears are authorized. There are no shark longliners who operate in state waters so prohibiting longlines would have little adverse economic effect.

Bycatch reduction measures will have some negative economic impact on the fishery. They will require that captains and vessel owners be certified in the use of release equipment. This requires an additional investment of time and money on the part of the commercial fishermen.

The set of alternatives for dealers should have minimal economic impact on the fishery. The permits and reporting schedule are already in place in most states. The reporting requirements include details by individual species. This may require additional record keeping by some dealers.

2.0 GOALS AND OBJECTIVES

2.1 HISTORY AND PURPOSE OF THE PLAN

2.1.1 History of Prior Management Actions

In May 2005, the Atlantic States Marine Fisheries Commission received a letter from the National Marine Fisheries Service requesting ASMFC to initiate the development of an interstate fishery management plan for Atlantic coastal sharks. After reviewing the letter, the ASMFC Spiny Dogfish and Coastal Shark Management Board agreed that coordinated state management is vital to establish healthy self-sustaining populations of Atlantic coastal sharks.

On August 18, 2005, the Atlantic States Marine Fisheries Commission Spiny Dogfish and Coastal Shark Management Board approved the development of an Interstate Fishery Management Plan for Coastal Sharks. The Secretary of Commerce manages coastal sharks in federal waters. Below is a brief history of federal management actions and issues.

Section 3.1 of the draft Amendment 2 to the Consolidated Atlantic HMS FMP provides a history of Atlantic shark management history. This section provides a summary of that history.

In 1993, the National Marine Fisheries Service (NMFS) implemented the FMP for Sharks of the Atlantic Ocean, which established three management units: large coastal sharks (LCS), small coastal sharks (SCS), and pelagic sharks. Under that FMP, species groups were not managed on a regional basis. NOAA Fisheries identified LCS as overfished, and therefore, implemented commercial quotas for LCS and also established recreational harvest limits for all sharks.

In April 1999, NOAA Fisheries published the FMP for Atlantic Tunas, Swordfish and Sharks, which included numerous measures to rebuild or prevent overfishing of Atlantic sharks in commercial and recreational fisheries. The 1999 FMP for Atlantic Tunas, Swordfish and Sharks replaced the 1993 FMP and the implementing regulations were published on May 28, 1999 (64 FR 29090). The 1999 FMP for Atlantic Tunas, Swordfish and Sharks addressed numerous shark management measures, including: reducing commercial LCS and SCS quotas, establishing a commercial quota for blue sharks and a species-specific quota for porbeagle sharks, expanding the list of prohibited shark species, implementing a limited access permitting system in commercial fisheries, and establishing season-specific over- and under-harvest adjustment procedures. The 1999 FMP for Atlantic Tunas, Swordfish and Sharks also partitioned the LCS complex into ridgeback and non-ridgeback categories but did not include regional quota measures.

In 2003, NOAA Fisheries re-examined and amended the measures enacted in the 1999 FMP for Atlantic Tunas, Swordfish and Sharks based on the 2002 stock assessments, litigation, and public comments. Implementing regulations for Amendment 1 to the 1999 FMP for Atlantic Tunas, Swordfish and Sharks were published on December 24, 2003 (68 FR 74746). Management measures enacted in the amendment included: re-aggregating the large coastal shark complex, using maximum sustainable yield (MSY) as a basis for setting commercial quotas, eliminating the commercial minimum size restrictions, establishing three regional commercial quotas (Gulf of Mexico, South Atlantic, and North Atlantic) for LCS and SCS management units, implementing trimester commercial fishing seasons effective January 1, 2005, imposing gear restrictions to reduce bycatch, and a time/area closure off the coast of North Carolina effective January 1, 2005. As a result of using MSY as a basis for setting quotas, and implementing a new rebuilding plan, the base quota for LCS was established at 1,017 metric tons (mt) dressed weight (dw) and 454 mt dw for SCS.

Regional quotas for large and small coastal sharks were intended to improve overall management of the stocks by tailoring quotas to specific regions based on landings information. These quotas were based upon average historical landings (1999-2001) from the General Canvass and Quota Monitoring System (QMS) databases and were not expected to result in early closures or have economic impacts. The General Canvass database provides a near-census of the landings at major dealers in the southeast United States (including state landings) and the QMS database collects information from dealers in the South Atlantic and Gulf of Mexico regions (not including state landings). The Northeast Commercial Fisheries Database compiles dealer reports for sharks in the northeast United States. Logbook data were obtained from the Coastal Fisheries Logbook, which includes actual landings of sharks reported by federally permitted fishermen.

The data used to establish quotas in 2003 Amendment 1 (1999-2001) indicated that the Gulf of Mexico, South Atlantic, and North Atlantic regions accounted for 4, 83, and 13 percent of the total SCS landings and 42, 54, and 4 percent of the total LCS landings, respectively. However, on November 30, 2004, (69 FR 69537), NOAA Fisheries implemented regulations that revised regional quota levels for Atlantic LCS and SCS based on additional landings data (2002-2003) and created a framework mechanism for making annual adjustments to quotas based on new landings data**.** This rule also included measures for distribution of quotas within regional trimester seasons, accounting for over- and underharvests during the transition from semi-annual to trimester seasons, and a framework for future review and adjustment of regional and trimester quotas as necessary.

The 2004 rule established that 52, 41, and 7 percent of the base LCS quota (1,017 mt dw) be allocated to the Gulf of Mexico, South Atlantic, and North Atlantic regions, respectively. Within individual regions, trimester quotas in the Gulf of Mexico and South Atlantic regions are distributed evenly (33.3 percent/trimester), whereas trimester quotas in the North Atlantic region were based on historical landings (4 percent, 88 percent, and 8 percent for the first, second and third trimester, respectively). For SCS, the 2004 rule established that 10, 87, and 3 percent of the base SCS quota (484 mt dw) be allocated to the Gulf of Mexico, South Atlantic, and North Atlantic regions, respectively. Within individual regions, trimester quotas in the Gulf of Mexico and South Atlantic regions are distributed evenly (33.3 percent/trimester), whereas trimester quotas in the North Atlantic region were based on historical landings.

On October 2, 2006 (71 FR 58058), NOAA Fisheries published the Final Consolidated HMS FMP that implemented a variety of management measures. Those specific to shark fishermen or dealers include: mandatory workshops for fishermen and dealers; two small time/area closures to maintain consistency with closures enacted by the Gulf of Mexico Fishery Management Council; identification of criteria for modifying time/area closures; outlining activities and measures to address overfishing of finetooth sharks; requiring the second dorsal fin and anal fin remain on all sharks through landing, and further refining ways to differentiate between pelagic longline (PLL) and bottom longline (BLL) gear.

NOAA Fisheries recently expanded the equipment required for the safe handling and release, and disentanglement of sea turtles caught in the Atlantic shark BLL fishery (72 FR 5633; February 7, 2007). As a result, equipment required for BLL is now consistent with the requirements for the PLL fishery. Furthermore, this action implemented several year-round BLL closures to protect EFH to maintain consistency with Caribbean Fishery Management Council.

On April 26, 2007 (72 FR 20765), NOAA Fisheries published a final rule that adjusted the SCS regional quota allocations in the South Atlantic and Gulf of Mexico regions due to recent overharvests of SCS in the Gulf of Mexico region and continued underharvests of the available quota in the South Atlantic region. This change reflects current landings and should avoid future overharvest of SCS in the Gulf of Mexico region and should not cause overharvest in the South Atlantic region.

On July 27, 2007 (72 FR 41392), NMFS published a proposed rule and draft Environmental Impact Statement to amend the Consolidated HMS FMP (Amendment 2). Based on the 2005 Canadian porbeagle stock assessment, the 2006 dusky shark stock assessment and the 2005/2006 LCS stock assessment NOAA Fisheries has determined that a number of shark species are overfished and overfishing is occurring and an amendment to the HMS FMP is needed to implement management measures to rebuild overfished stocks and prevent overfishing. The management measures proposed would reduce fishing effort and mortality to rebuild overfished Atlantic shark species while ensuring that a small incidental shark fishery can be maintained.

On November 29, 2007 (72 FR 67580), NOAA Fisheries announced quotas and season opening and closing dates for the 2008 first trimester season quotas for large coastal sharks (LCS), small coastal sharks (SCS), and pelagic sharks based on over- or underharvests from the 2007 first trimester fishing season. NOAA Fisheries will close the LCS fishery in all regions for the 2008 first and second trimester seasons. The SCS and pelagic shark fisheries opened on January 1, 2008, and will remain open during the first trimester season, as long as quota is available. The measures in this action will remain effective until they are replaced by those implemented under Amendment 2 to the Consolidated HMS FMP. If Amendment 2 to the Consolidated HMS FMP is finalized and effective after the start of the 2008 second trimester season, May 1, 2008, the SCS and pelagic shark fisheries will open on May 1, 2008 with the baseline quotas.

2.1.2 Purpose and Need for Action

Sharks are particularly vulnerable to overfishing because they have low reproductive capability, are slow to reach sexual maturity, and have long reproductive cycles. Appropriate regulations for Atlantic sharks in state waters are essential to ensure healthy self-sustaining populations.

Prior to this plan, shark management in state waters consisted of disjointed state specific regulations. Federal shark management began with the Fisheries Management Plan for Sharks of the Atlantic Ocean in 1993. Since then, federal shark management has evolved as the shark fishery has changed, while state regulations have continued to lack continuity throughout the range of the sharks. The lack of state regulations create difficulty for enforcement officers who cannot prove if a shark was caught in state or federal waters.

Since the Interstate Fishery Management Plan for Coastal Sharks is mostly complementary to federal regulations, it closes loopholes and allows for joint specification setting throughout the entire Atlantic shark range.

This Fishery Management plan also protects shark nurseries and pupping grounds that are found primarily in state waters. Interstate regulations provide protection to sharks during a particularly vulnerable stage in their life cycle in a location that federal jurisdiction cannot protect.

2.2 GOAL

The goal of the Interstate Fishery Management Plan for Coastal Sharks is:

"To promote stock rebuilding and management of the coastal shark fishery in a manner that is biologically, economically, socially, and ecologically sound."

2.3 OBJECTIVES

In support of this goal, the following objectives proposed for the Interstate Shark FMP:

1. Reduce fishing mortality to rebuild stock biomass, prevent stock collapse, and support a sustainable fishery.
2. Protect essential habitat areas such as nurseries and pupping grounds to protect sharks during particularly vulnerable stages in their life cycle.
3. Coordinate management activities between state and federal waters to promote complementary regulations throughout the species' range.
4. Obtain biological and improved fishery related data to increase understanding of state water shark fisheries.
5. Minimize endangered species bycatch in shark fisheries.

2.4 SPECIFICATION OF THE MANAGEMENT UNIT

The management unit for the Interstate Fishery Management Plan for Coastal Sharks is defined as the range of the coastal sharks resource within the US waters of the Northwest Atlantic Ocean. It is recognized that the Atlantic shark resource, as defined here, is interstate and state-federal in nature, and that effective assessment and management can be enhanced through cooperative efforts with all Atlantic state and federal scientists and fisheries managers.

2.4.1 Management Area

The management area of this management plan shall be the entire coastwide distribution of the resource from the estuaries eastward to the inshore boundary of the EEZ.

2.5 DEFINITION OF OVERFISHING

This plan does not define overfishing. The management options were developed to compliment the federal management program that defines overfishing based on the probability of achieving maximum sustainable yield as defined in the Magnusson Stevens Fisheries Conservation and Management Act. Reference points can be developed in the future through the addendum process as part of *Section 4.5 Adaptive Management.*

2.6 IMPLEMENTATION SCHEDULE

The Interstate Fishery Management Plan for Atlantic Coastal Sharks was approved and adopted by the Commission on August 21, 2008. States are required to implement the provisions by January 1, 2009.

3.0 MONITORING PROGRAM

3.1 STOCK ASSESSMENTS

NOAA Fisheries organizes assessments for the LCS and SCS complexes every two to three years. The 2005/2006 LCS stock assessment was the first time the SEDAR process (explained in *Section 1.2.2*) was used to assess LCS species. A SEDAR assessment consists of three workshops: a data workshop, an assessment workshop, and a peer review workshop. ASMFC staff and Coastal Shark Technical Committee (TC) members take part in both the data and assessment workshops.

Conducting separate shark assessments would not be an efficient use of resources at this time for the following reasons:

1. SEDAR is an accepted ASMFC assessment method.
2. Significant overlap of the same scientists/modelers.
3. The data used in the assessments are the best available.
4. Individual species are assessed if data iare available, not just complexes.

Separate assessments can be carried out as determined by the Management Board based on resource availability and input from the TC.

3.2 MONITORING PROGRAM SPECIFICATIONS

Currently there are no state funded shark surveys or research on the Atlantic coast. All of the existing surveys receive the majority of funding from NOAA Fisheries and universities. South Carolina's Department of Natural Resources (SC DNR) and North Carolina's Department of Marine Fisheries (NC DMF) participate in the Cooperative Atlantic States Shark Pupping and Nursery (COASTSPAN) Survey. The vast majority of funding for the COASTSPAN Survey comes from NOAA Fisheries and universities.

This plan does not establish mandatory monitoring requirements for states because current shark survey funding is contingent on outside funding sources. Requiring NC DMF and SC DNR to continue a survey that may not have future funding may cause unnecessary burden if the funding is discontinued. States are encouraged to continue any surveys that collect shark data.

The Coastal Sharks Plan Review Team (PRT) will annually review implementation of the management plan and any subsequent adjustments (addenda), and report to the Management Board on any compliance issues that may arise. The PRT will also prepare the annual Atlantic Coastal Sharks FMP Review and coordinate the annual update and prioritization of research needs (see *Section 6.0*).

4.0 MANAGEMENT PROGRAM IMPLEMENTATION

All management measures in Section 4.0 refer to **state-water shark fisheries** unless explicitly stated otherwise. For example, the statement "fishermen cannot land prohibited species" should be interpreted as: "fishermen cannot land prohibited species [that are caught in state waters]."

States are allowed to enact more stringent regulations than those contained in this FMP.

The term 'catch' is defined as: *To take, kill, trap, gather, harvest, or in any manner reduce any fish to personal possession.*

The term 'landing' is defined as: *Unloading any fish at a dock or shore by commercial fishermen; or bringing any fish to a dock, pier, or shore by recreational fishermen for personal use.*

4.1 GENERAL MANAGEMENT PROVISIONS

Shark species that are managed under this plan are listed in Table 4.1. Please see *Section 4.2 Recreational Fisheries Management Measures* and *Section 4.3 Commercial Fisheries Management Measures* for specific management measures for each species in each fishery.

Spiny dogfish *Squalus acanthias* are managed under the Interstate Fishery Management Plan for Spiny Dogfis*h* and are **not** included in this plan.

Smooth dogfish *Mustelus canis* are not currently managed in federal waters, but are included in this plan.

Table 4.1. Species managed under the Interstate FMP for Atlantic Coastal Sharks.

Common Name	Scientific Name	Common Name	Scientific Name
Smooth dogfish	*Mustelus canis*	**Sandbar**	*Carcharhinus plumbeus*
Sand tiger	*Carcharias taurus*	**Silky**	*Carcharhinus falciformis*
Bigeye sand tiger	*Odontaspis noronhai*	**Tiger**	*Galeocerdo cuvier*
Whale	*Rhincodon typus*	**Blacktip**	*Carcharhinus limbatus*
Basking	*Cetorhinus maximus*	**Spinner**	*Carcharhinus brevipinna*
White	*Carcharodon carcharias*	**Bull**	*Carcharhinus leucas*
Dusky	*Carcharhinus obscurus*	**Lemon**	*Negaprion brevirostris*
Bignose	*Carcharhinus altimus*	**Nurse**	*Ginglymostoma cirratum*
Galapagos	*Carcharhinus galapagensis*	**Scalloped hammerhead**	*Sphyrna lewini*
Night	*Carcharhinus signatus*	**Great hammerhead**	*Sphyrna mokarran*
Reef	*Carcharhinus perezii*	**Smooth hammerhead**	*Sphyrna zygaena*
Narrowtooth	*Carcharhinus brachyurus*	**Atlantic sharpnose**	*Rhizoprionodon terraenovae*
Caribbean sharpnose	*Rhizoprionodon porosus*	**Finetooth**	*Carcharhinus isodon*
Smalltail	*Carcharhinus porosus*	**Blacknose**	*Carcharhinus acronotus*
Atlantic angel	*Squatina dumeril*	**Bonnethead**	*Sphyrna tiburo*
Longfin mako	*Isurus paucus*	**Shortfin mako**	*Isurus oxyrinchus*
Bigeye thresher	*Alopias superciliosus*	**Porbeagle**	*Lamna nasus*
Sharpnose sevengill	*Heptranchias perlo*	**Common thresher**	*Alopias vulpinus*
Bluntnose sixgill	*Hexanchus griseus*	**Oceanic whitetip**	*Carcharhinus longimanus*
Bigeye sixgill	*Hexanchus nakamurai*	**Blue**	*Prionace glauca*

4.2. RECREATIONAL FISHERIES MANAGEMENT MEASURES

Recreational anglers are prohibited from selling, bartering, or trading sharks or shark pieces. A recreational angler is defined as any fisherman who catches sharks for personal use. All recreational shark anglers must abide by the management measures in this section (*Section 4.2).*

4.2.1 Recreational Seasonal Closure

Recreational anglers are prohibited from possessing silky, tiger, blacktip, spinner, bull, lemon, nurse, scalloped hammerhead, great hammerhead, and smooth hammerhead in the state waters of Virginia, Maryland, Delaware and New Jersey from May 15 through July 15—regardless of where the shark was caught. Recreational fishermen who catch any of these species in federal waters may not transport them through the state waters of VA, MD, DE, and NJ during the seasonal closure.

Recreational fishermen may still catch and transport the following species of sharks during the seasonal closure: smooth dogfish, Atlantic sharpnose, blacknose, finetooth, bonnethead, shortfin mako, common thresher, oceanic whitetip, porbeagle, and blue.

4.2.2 Recreationally Permitted Species

Recreational anglers may catch any species that is not illegal to land by recreational anglers in federal waters. Conversely, recreational anglers are prohibited from possessing any shark species that is illegal to catch or land by recreational anglers in federal waters. As federal recreationally prohibited shark species change, recreationally prohibited shark species in state waters change automatically without Board action.

Amendment 2 to the Consolidated Atlantic Highly Migratory Species Fisheries Management Plan (Amendment 2), which was the most recent federal shark management document when this plan was enacted, restricts recreational anglers to possess *only* the following species[3]:

> *Recreational anglers are allowed to possess all non-ridgeback LCS, tiger sharks, SCS, and pelagic sharks (including porbeagle sharks). Authorized shark species include: non-ridgeback LCS (blacktip, bull, spinner, great hammerhead, smooth hammerhead, scalloped hammerhead, lemon, and nurse); tiger sharks; SCS (blacknose, finetooth, Atlantic sharpnose, and bonnethead sharks); and, pelagic sharks (blue, shortfin mako, common thresher, oceanic whitetip, and porbeagle). Sandbar sharks and silky sharks (and all prohibited species of sharks) are not authorized for harvest by recreational anglers.*

Amendment 2 permits recreational anglers to land species that are commonly caught and easily identifiable (Table 4.2). All the large coastal sharks that are authorized to be landed, except for tiger sharks, do not have an interdorsal ridge. Tiger sharks have distinctive markings. As such, they can be easily identified by recreational anglers. Species may be added to the federal prohibited species list if at least two of the following criteria are met: (1) there is sufficient biological information to indicate the stock warrants protection, such as indications of depletion or low reproductive potential or the species is on the ESA candidate list; (2) the species is rarely encountered or observed caught in HMS fisheries; (3) the species is not commonly encountered or observed caught as bycatch in fishing operations; and (4) the species is difficult to distinguish from other prohibited species (i.e., look-alike issue) (Table 4.3). Please see Amendment 2 for more information.

Smooth dogfish are not managed in federal waters and, consequently, are not on any prohibited list. While there is a distinction between ‘permitted’ and ‘unregulated’, smooth dogfish were included on the federally allowed species, table 4.2, for simplicity. There were no pending regulations proposing to prohibit recreational take of smooth dogfish in federal waters when this FMP was finalized.

[3] Please note that recreational prohibited species are different from commercial prohibited species (*Section 4.3.3.1)*.

Table 4.2. Federal regulations ALLOW recreational possession of the following species only.

Recreationally Permitted Species	
Smooth Dogfish[4]	*Mustelus canis*
Atlantic sharpnose	*Rhizoprionodon terraenovae*
Finetooth	*Carcharhinus isodon*
Blacknose	*Carcharhinus acronotus*
Bonnethead	*Sphyrna tiburo*
Tiger	*Galeocerdo cuvier*
Blacktip	*Carcharhinus limbatus*
Spinner	*Carcharhinus brevipinna*
Bull	*Carcharhinus leucas*
Lemon	*Negaprion brevirostris*
Nurse	*Ginglymostoma cirratum*
Scalloped hammerhead	*Sphyrna lewini*
Great hammerhead	*Sphyrna mokarran*
Smooth hammerhead	*Sphyrna zygaena*
Shortfin mako	*Isurus oxyrinchus*
Porbeagle	*Lamna nasus*
Common thresher	*Alopias vulpinus*
Oceanic whitetip	*Carcharhinus longimanus*
Blue	*Prionace glauca*

Table 4.3. Federal regulations PROHIBIT recreational possession of the following species.

Recreationally Prohibited Species	
Sandbar	*Carcharhinus plumbeus*
Silky	*Carcharhinus falciformis*
Sand tiger	*Carcharias taurus*
Bigeye sand tiger	*Odontaspis noronhai*
Whale	*Rhincodon typus*
Basking	*Cetorhinus maximus*
White	*Carcharodon carcharias*
Dusky	*Carcharhinus obscurus*
Bignose	*Carcharhinus altimus*
Galapagos	*Carcharhinus galapagensis*
Night	*Carcharhinus signatus*
Reef	*Carcharhinus perezii*
Narrowtooth	*Carcharhinus brachyurus*
Caribbean sharpnose	*Rhizoprionodon porosus*
Smalltail	*Carcharhinus porosus*
Atlantic angel	*Squatina dumeril*
Longfin mako	*Isurus paucus*
Bigeye thresher	*Alopias superciliosus*
Sharpnose sevengill	*Heptranchias perlo*
Bluntnose sixgill	*Hexanchus griseus*
Bigeye sixgill	*Hexanchus nakamurai*

[4] Smooth dogfish are not regulated in federal waters and are not prohibited as a result.

4.2.3 Landings Requirements
All sharks caught by recreational fishermen must have heads, tails, and fins attached naturally to the carcass. Anglers may still gut and bleed the carcass by making an incision at the base of the caudal peduncle as long as the tail is not removed. Filleting sharks at sea is prohibited.

4.2.4 Recreational Minimum Size Limits
Sharks caught in the recreational fishery must have a fork length (Figure 4.1) of at least 4.5 feet (54 inches) *with the exception of Atlantic sharpnose, blacknose, finetooth, bonnethead, and smooth dogfish*. (Table 4.4).

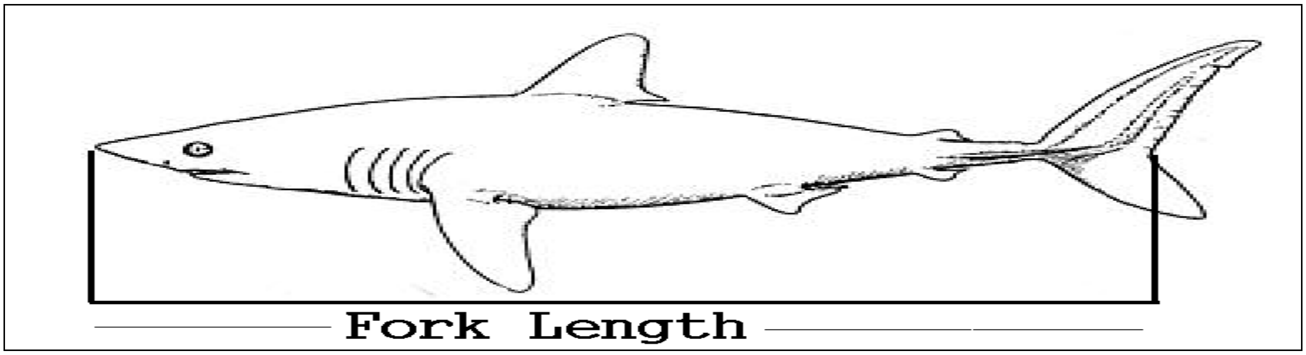

Figure 4.1 Definition of fork length.

Table 4.4. Recreational minimum size limits.

No Minimum Size	At Least 4.5 Feet Fork Length	
Smooth Dogfish	Tiger	Shortfin mako
Atlantic sharpnose	Blacktip	Porbeagle
Finetooth	Spinner	Thresher
Blacknose	Bull	Oceanic whitetip
Bonnethead	Lemon	Blue
	Nurse	Scalloped hammerhead
	Great hammerhead	Smooth hammerhead

4.2.5 Authorized Recreational Gear
Recreational anglers may catch sharks only using a handline or rod & reel. Handlines are defined as a mainline to which no more than two gangions or hooks are attached. A handline must be retrieved by hand, not by mechanical means.

4.2.6 Recreational Fishing License
States are encouraged, but not required, to adopt a marine fishing license to collect, among other things, recreational data on sharks.

4.2.7 Recreational Possession Limits
This FMP establishes different possession limits for shore-anglers and vessel-fishermen. When aboard a vessel, anglers are bound by the more restrictive vessel-fishing possession limits, regardless of the location where the sharks were caught.

4.2.7.1 Recreational Shore-Angler Possession Limits

Shore fishing is defined as any fishing that does not take place on board a vessel. The terms 'shore-fishermen' and 'shore-angler' are synonymous, describing any person engaged in shore fishing.

Each recreational shore-angler is allowed a maximum harvest of one shark from the federal recreationally permitted species (*Section 4.2.2,* Table 4.2), including smooth dogfish, per calendar day. In addition, each recreational shore angler may harvest one additional bonnethead, and one additional Atlantic sharpnose, and one additional smooth dogfish per calendar day.

Sharks that are transported by a vessel are considered 'boat assisted' and are regulated under the more restrictive vessel-fishing possession limits regardless of where they were caught.

4.2.7.2 Recreational Vessel-Fishing Possession Limits

Vessel fishing is defined as any fishing conducted from a vessel. The word "vessel" includes every description of watercraft used or capable of being used as a means of transportation on water except for non-displacement craft and seaplanes.

Recreational fishing vessels are allowed a maximum harvest of one shark from the federal recreationally permitted species (*Section 4.2.2,* Table 4.2*)*, including smooth dogfish, per trip, regardless of the number of people on board the vessel. In addition, each recreational angler fishing from a vessel may harvest one bonnethead, and one Atlantic sharpnose, and one smooth dogfish per trip.

Sharks that are transported by a vessel are considered 'boat assisted', and are regulated under the more restrictive vessel-fishing possession limits regardless of where they were caught.

4.3 COMMERCIAL FISHERIES MANAGEMENT MEASURES

A fisherman is considered to be commercial if one or both of the following is true:

1.) They have sold a shark caught in state waters during a given fishing year. For example, if a fisherman sells a shark on January 2, 2009 then they are considered to be a commercial shark fisherman through December 31, 2009.
2.) A fisherman has sharks caught in state waters on his/her boat, which he/she intends to sell.

All commercial shark fishermen must abide by the management measures in this section (*Section 4.3)*.

4.3.1 Commercial Fishing Year

The commercial shark fishery shall operate on a January 1 – December 31 fishing year. All annual fishery specifications begin on January 1 of each fishing year.

4.3.2 Commercial Seasonal Closure

All commercial fishermen are prohibited from possessing silky, tiger, blacktip, spinner, bull, lemon, nurse, scalloped hammerhead, great hammerhead, and smooth hammerhead in the state waters of Virginia, Maryland, Delaware and New Jersey from May 15 through July 15.

Fishermen who catch any of the above named species in federal waters, in a legal manner that is consistent with federal regulations, may transport the shark(s) through the state waters of VA, MD, DE, and NJ during the seasonal closure provided;

(a) that the vessel does not engage in fishing within the closed area while possessing the above species and,
(b) the sharks possessed were not caught in the closed area and,
(c) that all fishing gear is stowed and not available for immediate use as defined below.

(1)"On Reel" stowage for vessels transiting a closed area;

(A) The net is on a reel, its entire surface is covered with canvas or other similar opaque material, and the canvas or other material is securely bound;
(B) The towing wires are detached from the doors; and
(C) No containment rope, codend tripping device, or other mechanism to close off the codend is attached to the codend.

(2) Hook gear. All anchors and buoys are secured and all hook gear, including jigging machines, is covered.
(3) Sink gillnet gear. All nets are covered with canvas or other similar material and lashed or otherwise securely fastened to the deck or rail, and all buoys larger than 6 inches (15.24 cm) in diameter, high flyers, and anchors are disconnected.

Fishermen may still catch and transport the following species of shark during the seasonal closure: smooth dogfish, Atlantic sharpnose, blacknose, finetooth, bonnethead, shortfin mako, common thresher, oceanic whitetip, porbeagle, and blue.

4.3.3 Commercial Species Groupings

This FMP establishes six commercial 'species groups' for management (Table 4.5 & Table 4.6): Prohibited, Research, Smooth Dogfish, Small Coastal (SCS), Non-Sandbar Large Coastal (LCS), and Pelagic. These groupings apply to all commercial shark fisheries in state waters.

The six commercial species groups are based on fisheries, biology, and stock status of the various species. Six groups were necessary in order to set the most appropriate quotas (*Section 4.3.4)* and possession limits (*Section 4.3.6)* for species whose stock levels are high enough to allow sustainable fishing pressure, and to grant display and research permits (*Section 4.3.8.2)* for species whose stock levels can only allow for display or research catch. These species groups are designed to parallel the federal groupings established in Amendment 2 in the simplest manner possible. Note: smooth dogfish are not currently managed in federal waters.

Some species are included for enforcement reasons because they closely resemble species in the management unit. The Galapagos shark and the bigeye sand tiger shark, for example, are rare in U.S. waters, but are similar in appearance to the prohibited dusky and sand tiger sharks, respectively, and thus included in the prohibited shark management unit.

The Spiny Dogfish and Coastal Sharks Management Board can move a species from one group to another as part of *Section 4.5, Adaptive Management*.

4.3.3.1 Prohibited and Research Species Groups

The Prohibited Species Group consists of the following species: sand tiger, bigeye sand tiger, whale, basking, white, dusky, bignose, Galapagos, night, reef, narrowtooth, Caribbean sharpnose, smalltail, Atlantic angel, longfin mako, bigeye thresher, sharpnose sevengill, bluntnose sixgill, and bigeye sixgill sharks (Table 4.5).

The Research Species Group consists of sandbar sharks (Table 4.5).

Fishermen are prohibited from catching or landing any species in either the Prohibited or Research Species Groups without a state display or research permit as specified in *Section 4.3.8.2, Display and Research Permits.*

Table 4.5. Sharks in the Prohibited and Research Species Groups. Fishermen may not harvest any of these species without a display or research permit (*Section 4.3.8.2*).

Prohibited Species	
Sand tiger	*Carcharias taurus*
Bigeye sandtiger	*Odontaspis noronhai*
Whale	*Rhincodon typus*
Basking	*Cetorhinus maximus*
White	*Carcharodon carcharias*
Dusky	*Carcharhinus obscurus*
Bignose	*Carcharhinus altimus*
Galapagos	*Carcharhinus galapagensis*
Night	*Carcharhinus signatus*
Reef	*Carcharhinus perezii*
Narrowtooth	*Carcharhinus brachyurus*
Caribbean sharpnose	*Rhizoprionodon porosus*
Smalltail	*Carcharhinus porosus*
Atlantic angel	*Squatina dumeril*
Longfin mako	*Isurus paucus*
Bigeye thresher	*Alopias superciliosus*
Sharpnose sevengill	*Heptranchias perlo*
Bluntnose sixgill	*Hexanchus griseus*
Bigeye sixgill	*Hexanchus nakamurai*
Research	
Sandbar	*Carcharhinus plumbeus*

4.3.3.2 Smooth Dogfish, Small Coastal, Non-Sandbar Large Coastal, and Pelagic Species Groups

Commercial fishermen may harvest any sharks in the Smooth Dogfish, Small Coastal, Non-Sandbar Large Coastal, and Pelagic Species Groups as long as they are in compliance with all rules and regulations contained in this plan (Table 4.6).

The Smooth Dogfish Species Group consists of smooth dogfish sharks.

The Small Coastal Sharks Species Group consists of Atlantic sharpnose, finetooth, blacknose, and bonnethead sharks.

The Non-Sandbar Large Coastal Sharks Species Group consists of silky, tiger, blacktip, spinner, bull, lemon, nurse, scalloped hammerhead, great hammerhead, and smooth hammerhead sharks.

The Pelagic Species Group consists of shortfin mako, porbeagle, common thresher, oceanic whitetip, and blue sharks.

Table 4.6. Sharks in the Smooth Dogfish, Small Coastal, Non-Sandbar Large Coastal, and Pelagic species groups. Fishermen with state commercial fishing permits (section 4.3.8.1) may harvest these species according to the rules and regulations contained in this plan.

Smooth Dogfish	
Smooth Dogfish	*Mustelus canis*
Small Coastal	
Atlantic sharpnose	*Rhizoprionodon terraenovae*
Finetooth	*Carcharhinus isodon*
Blacknose	*Carcharhinus acronotus*
Bonnethead	*Sphyrna tiburo*
Non-Sandbar Large Coastal	
Silky	*Carcharhinus falciformis*
Tiger	*Galeocerdo cuvier*
Blacktip	*Carcharhinus limbatus*
Spinner	*Carcharhinus brevipinna*
Bull	*Carcharhinus leucas*
Lemon	*Negaprion brevirostris*
Nurse	*Ginglymostoma cirratum*
Scalloped hammerhead	*Sphyrna lewini*
Great hammerhead	*Sphyrna mokarran*
Smooth hammerhead	*Sphyrna zygaena*
Pelagic	
Shortfin mako	*Isurus oxyrinchus*
Porbeagle	*Lamna nasus*
Common thresher	*Alopias vulpinus*
Oceanic whitetip	*Carcharhinus longimanus*
Blue	*Prionace glauca*

4.3.4 Quota Specification

The Spiny Dogfish & Coastal Sharks Board will not actively set quotas for any species contained in the SCS, Non-Sandbar LCS, or Pelagic species groups but will close the fishery for any species in these groups when NOAA Fisheries closes the fishery in federal waters. When NOAA Fisheries closes the fishery for any species, the commercial landing, harvest, and possession of that species will be prohibited in state waters until NOAA Fisheries reopens the fishery. Upon receiving notification of a federal quota, the FMP Coordinator for Coastal Sharks will notify ASMFC states about which species can no longer be harvested. The state waters fishery will reopen only when NOAA Fisheries reopens the fishery for that species or species group in federal waters.

The Board has the authority but is not required to set an annual quota for smooth dogfish as it finds appropriate (*Section 4.3.7)*. In the event that an annual smooth dogfish quota is set, and when an annual quota is harvested or projected to be harvested, the commercial landing, harvest, and possession of smooth dogfish will be prohibited in state waters.

Currently there is no assessment of smooth dogfish stocks on the Atlantic coast. Traditionally, fishery quotas are set at a harvest level that is estimated to be sustainable by the stock assessment for that species. In the absence of a stock assessment, the Board is currently unable to set the appropriate level of harvest for smooth dogfish. Until an assessment is conducted, possession limits (*section 4.3.6)* are likely to be the only effort control for the harvest of smooth dogfish stocks.

Commercial Fishermen may not harvest species in the Prohibited and Research Species Groups.

Table 4.7 Quota Specification for each species group

Species Group	Quota
Prohibited	Display and Research Permit holders only
Research	Display and Research Permit holders only
Smooth Dogfish	Set by Board Action
Small Coastal (SCS)	Open and close with NMFS
Non-Sandbar Large Coastal (LCS)	Open and close with NMFS
Pelagic	Open and close with NMFS

4.3.5 Seasons

The Board is not required, but has the option, to split the annual quota among seasonal periods for all groups. Establishment of or changes to seasons will happen as necessary through Board action. For species groups that the ASMFC does not actively set quotas for (e.g. SCS, non-sandbar LCS, and pelagic), the Board may allocate the federal quota among seasons and control the harvest through landings restrictions. The fishery for a species will still close when NOAA fisheries closes the fishery for that species as specified in *Section 4.3.4*. To ensure that commercial quotas are not exceeded, all periods may be shortened and fishing within a season may be restricted. Due to temporal differences in fishing practices, fish availability, and pupping activity, under this measure, the annual quota does not have to be split equally among seasons. The Board has the flexibility to establish quotas for each season based on landings history, markets, pupping season, and other relevant factors. The Board may establish as many or few seasons as it finds appropriate.

4.3.6 Possession Limits

Possession limits for commercial shark fisheries will be set annually through the specification setting process described in *Section 4.3.7* and Table 4.8. The Board may use number of fish or weight to set the possession limit. Vessels are prohibited from landing more than the specified amount in one twenty-four hour period.

Display and Research Permit holders may be exempt from possession limits restrictions (*Section 4.3.8.2)* depending on their permit agreement.

Table 4.8. Possession Limit Specification Process

Species Group	Possession Limit
Prohibited	Display and Research Permit holders only
Research	Display and Research Permit holders only
Smooth Dogfish	Set by Board Action
Small Coastal (SCS)	Set by Board Action
Non-Sandbar Large Coastal (LCS)	Set by Board Action
Pelagic	Set by Board Action

4.3.7 Annual Process for Setting Fishery Specifications

The Spiny Dogfish & Coastal Sharks Management Board may set a quota for the Smooth Dogfish species group; and possession limits for the Smooth Dogfish, Small Coastal, Non-Sandbar Large Coastal, and Pelagic species groups as follows. The Board may set any specification for up to 5 years and has the flexibility to review any specification annually as new information becomes available.

The Coastal Sharks Technical Committee (TC) will annually review the best available data, and based on this review, will make quota and possession limit recommendations to the Board. Specifically, the TC must recommend a quota for the Smooth Dogfish Species Group and possession limits for the Smooth Dogfish, SCS, Non-Sandbar LCS, and Pelagic Species Groups. The TC may recommend not setting a quota for Smooth Dogfish or trip limits for any species group as they find appropriate. The Coastal Sharks TC's recommendations will be forwarded to the Board for final approval.

The Board will consider the TC's recommendations and determine the quota and possession limits for the following year. The Board has the option, but is not required, to set a quota and trip limits as it finds appropriate.

In addition, the Board has the option, but is not required to set the specifications for up to 5 years. Multi-year specifications may be useful for fishing industries to set long term business strategies. Specifications do not have to be constant from year to year, but instead are based upon expectations of future stock conditions as indicated by the best available scientific information during the year in which specifications are set. Under this management program, if a multi-year commercial quota and/or possession limit is implemented, annual review of updated information on the fishery and stock conditions by the Technical Committee and Management Board is required. As part of the annual review process, the specified management measures will be evaluated based upon updated scientific information of stock conditions. If scientific review finds that no adjustment to the subsequent year's specifications is needed, then the existing management measures will be considered adequate and implemented the following year. If, however, updates to stock conditions determine that specified measures should be modified, then the Spiny Dogfish & Coastal Sharks Board will be presented with this information and a new specification setting process will be initiated.

All specifications shall remain in place until changed by the Spiny Dogfish & Coastal Sharks Management Board. All states must implement measures contained in the final decision made by the Board.

In summary, the steps for setting fishery specifications are:

1. The Technical Committee reviews the most recent stock status data and makes fishery specification recommendations to the Management Board.

2. The Board considers the recommendations of the Technical Committee and establishes fishery specifications.

The Spiny Dogfish and Coastal Sharks Management Board voted on the following initial specifications to begin on January 1, 2009 (Table 4.9). Please note that specifications are subject to change in subsequent fishing years:

Table 4.9. Initial Specifications for the Coastal Sharks Fishery beginning January 1, 2009.

Species Group	Quota	Possession Limit
Prohibited	Display and Research Permit holders only	Display and Research Permit holders only
Research	Display and Research Permit holders only	Display and Research Permit holders only
Smooth Dogfish	No quota until assessment	1,000 lbs
Small Coastal (SCS)	Open and close with NMFS	None
Non-Sandbar Large Coastal (LCS)	Open and close with NMFS	33 Fish
Pelagic	Open and close with NMFS	None

4.3.8 Permit Requirements

Fishermen are required to hold the following permits in order to harvest more and/or different species than the recreational regulations contained in this FMP allow.

4.3.8.1 Commercial Permit

Commercial shark fishermen must hold a state commercial license or permit in order to commercially catch and sell sharks in state waters. This requirement does not require that states establish a new "shark" permit or license.

4.3.8.2 Display and Research Permits

States may grant exemptions from the seasonal closure, quota, possession limit, size limit, gear restrictions, and prohibited species restrictions contained in this plan through a state display or research permit system. Exemptions may only be granted for display and/or research purposes. States must report weight, species, location caught, and gear used for each shark collected for research or display as part of their annual compliance report. States are required to include annual information for all sharks taken for display throughout the life of the shark. These reporting requirements are necessary to ensure that sharks taken under the auspice of 'display' are not sold in illegal markets.

4.3.8.3 Dealer Permit

A federal Commercial Shark Dealer Permit is required to buy and sell any shark caught in state waters. Commercial Shark Dealer Permits are open access and can be obtained by contacting the NMFS Southeast Regional Office in St. Petersburg, FL at 727-824-5326. Applications are available on the web at http://sero.nmfs.noaa.gov/permits/permits.htm.

4.3.9 Authorized Commercial Gear

Commercial fishermen can only use one of the following gear types (and are prohibited from using any gear type not listed below) to catch sharks in state waters. Fishermen with a federal shark permit who are fishing outside of state waters are not restricted to these gear types and may land sharks using any gear that is in accordance with the rules and regulations established by NOAA Fisheries.

The following gear types are *the only* gear authorized for use by commercial fishermen to catch sharks in state waters:

- **Rod & reel**
- **Handlines.** Handlines are defined as a mainline to which no more than two gangions or hooks are attached. A handline is retrieved by hand, not by mechanical means, and must be attached to, or in contact with, a vessel.
- **Small Mesh Gillnets.** Defined as having a stretch mesh size smaller than 5 inches
- **Large Mesh Gillnets.** Defined as having a stretch mesh size equal to or greater than 5 inches.
- **Trawl nets.**
- **Shortlines.** Shortlines are defined as fishing lines containing 50 or fewer hooks and measuring less than 500 yards in length. *A maximum of 2 shortlines are allowed per vessel.*
- **Pound nets/fish traps.**
- **Weirs.**

4.3.10 Bycatch Reduction Measures

Vessels using shortlines and large-mesh gillnets to catch sharks must abide by the following regulations. Any vessels that employ these gear types and do not follow the bycatch reduction measures may not land or sell any sharks.

Any vessel using a shortline must use corrodible circle hooks[5]. All shortline vessels must practice the protocols and possess the recently updated federally required release equipment for pelagic and bottom longlines for the safe handling, release, and disentanglement of sea turtles

[5] Defined as a non-offset hook with the point turned perpendicularly back to the shank. Please refer to Special Report No. 77 of the Atlantic States Marine Fisheries Commission: Circle Hook Definition and Research Issues, for specifics on the definition.

and other non-target species; all captains and vessel owners must be certified in using handling and release equipment. Captains and vessel owners can become certified by attending a Protected Species Safe Handling, Release, and Identification Workshop offered by NOAA Fisheries. Information on these workshops can be found at http://www.nmfs.noaa.gov/sfa/hms/workshops/index.htm or by calling the Management Division at (727)-824-5399.

Large-mesh gillnets (defined as having a stretch mesh size greater than or equal to 5 inches) must be shorter than 2.5 kilometers and nets must be checked once every two hours.

4.3.11 Finning and Identification

All sharks harvested by commercial fishermen within state boundaries must have the tails and fins attached naturally to the carcass through landing. Fins may be cut as long as they remain attached to the carcass (by natural means) with at least a small portion of uncut skin. Sharks may be eviscerated and have the heads removed. Sharks may not be filleted or cut into pieces at sea.

4.4 ALTERNATIVE STATE MANAGEMENT REGIMES

Once approved by the Spiny Dogfish & Coastal Sharks Management Board, states are required to obtain prior approval from the Board for any changes to their management program for which a compliance requirement is in effect. Other non-compliance measures must be reported to the Board but may be implemented without prior Board approval. A state can request permission to implement an alternative to any mandatory compliance measure only if that state can show to the Board's satisfaction that its alternative proposal will have the same conservation value as the measure contained in this amendment or any addenda prepared under Adaptive Management (*Section 4.5*). States submitting alternative proposals must demonstrate that the proposed action will not contribute to overfishing of the resource. All changes in state plans must be submitted in writing to the Board and to the Commission either as part of the annual FMP Review process or the Annual Compliance Reports.

4.4.1 General Procedures

A state may submit a proposal for a change to its regulatory program or any mandatory compliance measure under this amendment to the Commission, including a proposal for *de minimis* status. Such changes shall be submitted to the Chair of the Plan Review Team, who shall distribute the proposal to the Management Board, the Plan Review Team, the Technical Committee, and the Advisory Panel.

The Plan Review Team is responsible for gathering the comments of the Technical Committee, and the Advisory Panel, and presenting these comments as soon as possible to the Management Board for decision.

The Spiny Dogfish & Coastal Sharks Management Board will decide whether to approve the state proposal for an alternative management program if it determines that it is consistent with the goals and objectives of this amendment.

4.4.2 Management Program Equivalency

The Coastal Sharks Technical Committee, under the direction of the Plan Review Team, will review any alternative state proposals under this section and provide to the Spiny Dogfish & Coastal Sharks Management Board its evaluation of the adequacy of such proposals.

4.4.3 *De minimis* Fishery Guidelines

This FMP does not establish specific *de minimis* guidelines that would exempt a state from regulatory requirements contained in this plan. *De minimis* shall be determined on a case-by-case basis. *De minimis* often exempts states from monitoring requirements in other fisheries but this plan does not contain any monitoring requirements.

De minimis guidelines are established in other fisheries when implementation and enforcement of a regulation is deemed unnecessary for attainment of the fishery management plan's objectives and conservation of the resource. Due to the unique characteristics of the coastal shark fishery, namely the large size of sharks compared to relatively small quotas, the taking of a single shark could contribute to overfishing of a shark species or group. Therefore, exempting a state from any of the regulatory requirements contained in this plan could threaten attainment of this plans goals and objectives.

States may apply for *de minimis* status by submitting a written request to the Spiny Dogfish & Coastal Sharks Management Board through the Chair of the Coastal Sharks Plan Review Team (PRT). Upon receiving a *de minimis* request, the PRT Chair will coordinate two meetings or conference calls to obtain recommendations from both the PRT and Technical Committee concerning the request. These recommendations will then be presented to the Management Board at the next ASMFC meeting.

If aspects of the coastal shark fishery change in a way that makes specific *de minimis* guidelines appropriate, then guidelines can be implemented through an addendum as specified in *Section 4.5 Adaptive Management.*

4.5 ADAPTIVE MANAGEMENT

The Spiny Dogfish and Coastal Sharks Management Board may vary the requirements specified in this management plan as part of adaptive management to conserve the coastal shark resource. Such changes will be instituted to be effective on the first fishing day of the following year, but may be put in place at an alternative time when deemed necessary by the Management Board. These changes should be discussed with the appropriate federal representatives and Councils prior to implementation in order to be complementary to the regulations for the EEZ.

4.5.1 General Procedures

The Plan Review Team (PRT) will monitor the status of the fishery and the resource and report on that status to the Spiny Dogfish and Coastal Sharks Management Board annually, or when directed to do so by the Management Board. The Plan Review Team will consult with the Technical Committee and the Advisory Panel in making such review and report. The report will contain recommendations concerning proposed adaptive management revisions to the management program.

The Spiny Dogfish and Coastal Sharks Management Board will review the report of the Plan Review Team and may consult further with Technical Committee or the Advisory Panel. The

Management Board may direct the PRT to prepare an addendum to make any changes it deems necessary. The addendum shall contain a schedule for the states to implement its provisions.

The Plan Review Team will prepare a draft addendum as directed by the Management Board, and shall distribute it to all states for review and comment. A public hearing will be held in any state that requests one. The Plan Review Team will also request comment from federal agencies and the public at large. After a 30-day review period, the Plan Review Team will summarize the comments and prepare a final version of the addendum for the Management Board.

The Management Board shall review the final version of the addendum prepared by the Plan Review Team, and shall also consider the public comments received and the recommendations of the Technical Committee and the Advisory Panel; it shall then decide whether to adopt or revise and then adopt the addendum.

Upon adoption of an addendum implementing adaptive management by the Management Board, states shall prepare plans to carry out the addendum and submit them to the Management Board for approval according to the schedule contained in the addendum.

4.5.2 Measures Subject to Change

The following measures are subject to change under adaptive management upon approval by the Spiny Dogfish and Coastal Sharks Management Board:

1. Overfishing definition;
2. Rebuilding targets and schedules;
3. Management areas;
4. Fishing year and/or seasons/trimesters;
5. Fishing year specification process;
6. Annual specifications for total allowable landings;
7. Possession limits;
8. Seasonal allocation;
9. Seasonal allocation proportions;
10. Biomedical research set asides;
11. Biological research set asides;
12. Measures to monitor, control, or reduce bycatch;
13. Compliance efficiency;
14. Observer requirements;
15. Reporting requirements;
16. Research or monitoring requirements;
17. Size limits;
18. Area closures;
19. Catch controls;
20. Gear limitations including limitations of commercial gears;
21. Effort controls;
22. State-by-state allocation of the coastwide quota;
23. Regional allocation of the quota;
24. Allocation of or proportions designated to the components of the regional quota scheme;

25. Transferability of quota;
26. Regulatory measures for the recreational fishery;
27. Recommendations to the Secretaries for complementary actions in federal jurisdictions;
28. Species groupings;
29. Prohibited species;
30. Closures;
31. Dealer reporting schedule or requirements;
32. Logbook reporting schedule of requirements;
33. *De minimis* specifications;
34. Scientific & research permit harvest quotas;
35. Compliance report due dates;
36. Habitat description and designation;
37. Any other management measures currently included in the Coastal Sharks Management Plan.

4.6 EMERGENCY PROCEDURES

Emergency procedures may be used by the Spiny Dogfish and Coastal Sharks Management Board to require any emergency action that is not covered by or is an exception or change to any provision in the Atlantic Coastal Sharks Management Plan. Procedures for implementation are addressed in the ASMFC Interstate Fisheries Management Program Charter, Section Six (c)(10) (ASMFC 2000).

4.7 MANAGEMENT INSTITUTIONS

The management institutions for Atlantic coastal sharks shall be subject to the provisions of the ISFMP Charter (ASMFC 2000). The following is not intended to replace any or all of the provisions of the ISFMP Charter. All committee roles and responsibilities are included in detail in the ISFMP Charter and are only summarized here.

4.7.1 ASMFC and the ISFMP Policy Board

The ASMFC (Commission) and the ISFMP Policy Board are generally responsible for the oversight and management of the Commission's fisheries management activities. The Commission must approve all fishery management plans, and amendments, including this Atlantic Coastal Sharks Management Plan; and must also make all final determinations concerning state compliance or noncompliance. The ISFMP Policy Board reviews any non-compliance recommendations of the various Management Boards and Sections and, if it concurs, forwards them on to the Commission for action.

4.7.2 Spiny Dogfish and Coastal Sharks Management Board

The Spiny Dogfish and Coastal Sharks Management Board was established under the provisions of ASMFC's ISFMP Charter (Section Four [b]) and is generally responsible for carrying out all activities under this management plan (ASMFC 2000).

The Spiny Dogfish and Coastal Sharks Management Board (Board) establishes and oversees the activities of the Plan Development or Plan Review Team, the Technical Committee, the Stock Assessment Subcommittee, and the Advisory Panel. Among other things, the Board makes changes to the management program under adaptive management and approves state programs implementing the amendment and alternative state programs under *Sections 4.4* and *4.5*. The

Board reviews the status of state compliance with the FMP or amendment at least annually, and if it determines that a state is out of compliance, reports that determination to the ISFMP Policy Board under the terms of the ISFMP Charter.

4.7.3 Coastal Sharks Plan Development / Plan Review Team

The Coastal Sharks Plan Development Team (PDT) and the Coastal Sharks Plan Review Team (PRT) are composed of a small group of scientists and/or managers whose responsibility is to provide all of the technical support necessary to carry out and document the decisions of the Spiny Dogfish and Coastal Sharks Management Board. Both are chaired by an ASMFC FMP Coastal Sharks FMP Coordinator. The Coastal Sharks PDT/PRT is directly responsible to the Board for providing information and documentation concerning the implementation, review, monitoring and enforcement of the Atlantic Coastal Sharks Management Plan. The Coastal Sharks PDT/PRT is comprised of personnel from state and federal agencies who have scientific and management ability and knowledge of coastal sharks. The PDT is responsible for preparing all documentation necessary for the development of the Atlantic Coastal Sharks Management Plan, using the best scientific information available and the most current stock assessment information. The PDT will assume inactive status upon completion of the Atlantic Coastal Sharks Fisheries Management Plan. The Board may elect to retain PDT members as members of the PRT or appoint new members. The PRT will provide annual advice concerning the implementation, review, monitoring, and enforcement of the Atlantic Coastal Sharks Management Plan once the Commission has adopted it.

4.7.4 Coastal Sharks Technical Committee

The Coastal Sharks Technical Committee consists of representatives from state or federal agencies, Regional Fishery Management Councils, Commission, university and other specialized personnel with scientific and technical expertise and knowledge of the coastal sharks fishery. The Board will appoint the members of the Technical Committee and may authorize additional seats as it sees fit. Its role is to act as a liaison to the individual state and federal agencies, provide information to the management process, and review and develop options concerning the management program. The Technical Committee will provide scientific and technical advice to the Management Board, PDT, and PRT in the development and monitoring of a fishery management plan or amendment.

4.7.5 Coastal Sharks Stock Assessment Subcommittee

The Coastal Sharks Stock Assessment Subcommittee shall be appointed by the Technical Committee at the request of the Management Board, and will consist of scientists with expertise in the assessment of coastal shark populations. Its role is to assess coastal shark population, assist NMFS with coastal shark assessments, review coastal shark assessments, provide scientific advice concerning the implications of proposed or potential management alternatives, and to respond to other scientific questions from the Board, Technical Committee, PDT or PRT. The Stock Assessment Subcommittee will report to the Technical Committee.

4.7.6 Coastal Sharks Advisory Panel

The Coastal Sharks Advisory Panel was established according to ASMFC's Advisory Committee Charter. Members of the Advisory Panel are citizens who represent a cross-section of commercial and recreational fishing interests and others who are concerned about coastal shark conservation and management. The Advisory Panel provides the Board with advice directly concerning the ASMFC's coastal shark management program.

4.7.7 Federal Agencies

4.7.7.1 Management in the Exclusive Economic Zone (EEZ)

Management of Atlantic coastal sharks (except for smooth dogfish) in the EEZ is under the jurisdiction of the NOAA Fisheries Office of Sustainable Fisheries Highly Migratory Species Management Division in accordance with the Magnuson-Stevens Fishery Conservation and Management Act. Currently smooth dogfish are not managed in the EEZ.

4.7.7.2 Federal Agency Participation in the Management Process

The Atlantic States Marine Fisheries Commission has accorded the United States Fish and Wildlife Service (USFWS) and the NMFS voting status on the ISFMP Policy Board and the Spiny Dogfish and Coastal Sharks Board in accordance with ASMFC's ISFMP Charter. NMFS and USFWS are involved with several of the coastal sharks related committees and teams.

4.8 RECOMMENDATIONS TO THE SECRETARIES FOR COMPLEMENTARY ACTIONS IN FEDERAL JURISDICTIONS

The Atlantic States Marine Fisheries Commission believes that many species of Atlantic coastal sharks covered by this fishery management plan continue to be overfished and are in need of conservation. This plan coordinates the management of coastal sharks across state boundaries. In order to achieve the goals and objectives of this management plan, the management of coastal sharks in federal waters should complement the Interstate Fishery Management Plan for Atlantic Coastal Sharks. Currently there is no management plan for smooth dogfish in federal waters. The ASMFC would recommend that NOAA Fisheries implement smooth dogfish fisheries specifications that are identical to those required by this plan.

5.0 COMPLIANCE

Full implementation of the provisions of this management plan is necessary for the management program to be equitable, efficient and effective. States are expected to implement these measures faithfully under state laws. Although the Atlantic States Marine Fisheries Commission does not have authority to directly compel state implementation of these measures, it will continually monitor the effectiveness of state implementation and determine whether states are in compliance with the provisions of this fishery management plan. This section sets forth the specific elements states must implement in order to be in compliance with this fishery management plan, and the procedures that will govern the evaluation of compliance. Additional details of the procedures are found in the ASMFC Interstate Fisheries Management Program Charter (ASMFC 2000).

5.1 MANDATORY COMPLIANCE ELEMENTS FOR STATES

A state will be determined to be out of compliance with the provisions of this fishery management plan, according to the terms of Section Seven of the ISFMP Charter if:

- Its regulatory and management programs to implement *Section 4* have not been approved by the Spiny Dogfish and Coastal Sharks Management Board; or
- It fails to meet any schedule required by *Section 5.1.2*, or any addendum prepared under

adaptive management (*Section 4.5*); or

- $ It has failed to implement a change to its program when determined necessary by the Spiny Dogfish and Coastal Sharks Management Board; or
- $ It makes a change to its regulations required under *Section 4* or any addendum prepared under adaptive management (*Section 4.5*), without prior approval of the Spiny Dogfish and Coastal Sharks Management Board.

5.1.1 Mandatory Elements of State Programs

To be considered in compliance with this fishery management plan, all state programs must include harvest controls on Atlantic coastal sharks fisheries consistent with the requirements of *Sections 4.0, 4.1, 4.2 and 4.3;* except that a state may propose an alternative management program under *Section 4.4*, which, if approved by the Management Board, may be implemented as an alternative regulatory requirement for compliance.

5.1.1.1 Regulatory Requirements

States shall begin to implement the Interstate Fishery Management Plan for Atlantic Coastal Sharks after final approval by the Commission. Each state must submit its required coastal sharks regulatory program to the Commission through the ASMFC staff for approval by the Spiny Dogfish and Coastal Sharks Management Board. During the period from submission and until the Management Board makes a decision on a state's program, a state may not adopt a less protective management program than contained in this management plan or contained in current state law.

The following lists the specific compliance criteria that a state/jurisdiction must implement in order to be in compliance with the Interstate Fishery Management Plan for Atlantic Coastal Sharks:

1. Recreational seasonal closure as specified in *Section 4.2.1*.
2. Recreational prohibition of species that are illegal to land by recreational anglers in federal waters.
3. All sharks caught by recreational fishermen must have head, tail, and fins attached to carcass.
4. Sharks caught in the recreational fishery must have a fork length of at least 4.5 feet with the exception of Atlantic sharpnose, blacknose, finetooth, bonnethead, and smooth dogfish.
5. Recreational anglers may only use handlines and rod & reel.
6. Recreational possession limits as specified in *Section 4.2.7.1* and *4.2.7.2*
7. Commercial seasonal closure as specified in *Section 4.3.2*.
8. Quota specifications as specified in *Section 4.3.4*.
9. Ability to allocate quotas seasonally as specified in *Section 4.3.5*.
10. Possession limits as specified in *Section 4.3.6*.
11. Commercial permit requirement.
12. Display and research permit requirements.
13. Federal Commercial Shark Dealer Permit requirement.
14. Prohibition of use of any gear type not listed in *Section 4.3.9*.
15. Shortline and gillnet bycatch reduction measures as specified in section *4.3.10*.

16. All sharks caught by commercial fishermen must have tails and fins attached naturally to the carcass through landing.

Once approved by the Spiny Dogfish and Coastal Sharks Management Board, states are required to obtain prior approval from the Board of any changes to their management program for which a compliance requirement is in effect. Other measures must be reported to the Board but may be implemented without prior Board approval. A state can request permission to implement an alternative to any mandatory compliance measure only if that state can show to the Board's satisfaction that its alternative proposal will have the same conservation value as the measure contained in this management plan or any addenda prepared under Adaptive Management (*Section 4.5*). States submitting alternative proposals must demonstrate that the proposed action will not contribute to overfishing of the resource. All changes in state plans must be submitted in writing to the Board and to the Commission either as part of the annual FMP Review process or the Annual Compliance Reports.

5.1.1.2 Monitoring Requirements

This plan does not propose any monitoring requirements. For more information see *Section 3.2 Monitoring Program Specifications*.

5.1.1.3 Research Requirements

This plan does not propose any research requirements. For more information see *Section 3.2 Monitoring Program Specifications*.

5.1.1.4 Law Enforcement Reporting Requirements

All state programs must include law enforcement capabilities adequate for successfully implementing a state's coastal sharks regulations. The adequacy of a state's enforcement activity will be monitored annually by reports of the ASMFC Law Enforcement Committee to the Coastal Sharks Plan Review Team. The first reporting period will cover the period from January 1, 2009 through December 31, 2009.

5.1.2 Compliance Schedule

States must implement the Atlantic Coastal Sharks Management Plan according to the following schedule:

October 1st, 2008: States must submit programs to implement the Atlantic Coastal Sharks Management Plan for approval by the Spiny Dogfish & Coastal Sharks Management Board.

January 1st 2009: All states must implement the Atlantic Coastal Sharks Management Plan with their approved management programs. States may begin implementing management programs prior to this deadline if approved by the Management Board.

Reports on compliance must be submitted to ASMFC by each jurisdiction annually, no later than **August 1, beginning in 2009**

5.1.3 Compliance Report Content

Each state must submit an annual report concerning its coastal sharks fisheries and management program for the previous fishing year. Reports should follow the standard report for compliance reports, as was adopted by the ISFMP Policy Board. The report shall cover:

- The previous fishing year's fishery and management program including activity and results of regulations that were in effect and harvest, including estimates of non-harvest losses;
- The planned management program for the current fishing year summarizing regulations that will be in effect and highlighting any changes from the previous year; and
- The number of coastal sharks taken for display and research (*Section 4.3.8.2)* in the previous fishing year. States must report weight, species, location caught, and gear type used for each shark collected for research and display purposes. This report should also indicate the number of exempted fishing permits issued for the previous fishing year.
- The status of any shark taken for display purposes each year through the life of the shark.

5.2 PROCEDURES FOR DETERMINING COMPLIANCE

Detailed procedures regarding compliance determinations are contained in the ISFMP Charter, Section Seven (ASMFC 2000). The following summary is not meant in any way to replace the language found in the ISFMP Charter.

In brief, all states are responsible for the full and effective implementation and enforcement of fishery management plans in areas subject to their jurisdiction. Written compliance reports as specified in the Plan or Amendment must be submitted annually by each state with a declared interest. Compliance with the Atlantic Coastal Sharks Management Plan will be reviewed at least annually. The Spiny Dogfish and Coastal Sharks Management Board, ISFMP Policy Board or the Commission, may request the Coastal Sharks Plan Review Team to conduct a review of plan implementation and compliance at any time.

The Spiny Dogfish and Coastal Sharks Management Board will review the written findings of the PRT within 60 days of receipt of a State's compliance report. Should the Management Board recommend to the Policy Board that a state be determined out of compliance, a rationale for the recommended non-compliance finding will be included, addressing specifically the required measures of the Atlantic Coastal Sharks Management Plan that the state has not implemented or enforced, a statement of how failure to implement or enforce the required measures jeopardizes coastal sharks conservation, and the actions a state must take in order to comply with the Atlantic Coastal Sharks Management Plan requirements.

The ISFMP Policy Board shall, within thirty days of receiving a recommendation of non-compliance from the Spiny Dogfish and Coastal Sharks Management Board, review that recommendation of non-compliance. If it concurs in the recommendation, it shall recommend at that time to the Commission that a state be found out of compliance.

The Commission shall consider any Coastal Sharks Management Plan non-compliance recommendation from the Policy Board within 30 days. Any state which is the subject of a recommendation for a non-compliance finding is given an opportunity to present written and/or oral testimony concerning whether it should be found out of compliance. If the Commission agrees with the recommendation of the Policy Board, it may determine that a state is not in compliance with the Coastal Sharks Management Plan, and specify the actions the state must take to come into compliance.

Any state that has been determined to be out of compliance may request that the Commission rescind its non-compliance findings, provided the state has revised its coastal sharks conservation measures or shown to the Board and/or Commission's satisfaction that actions taken by the state provide for conservation equivalency.

5.3 RECOMMENDATION TO JURISDICTIONS OUTSIDE THE MANAGEMENT UNIT

The Spiny Dogfish and Coastal Sharks Board, through the Atlantic Coastal Sharks Fishery Management Plan, requests that those jurisdictions inside the Gulf of Mexico implement complementary regulations to protect overfished shark populations. Several studies have provided evidence that shark stocks migrate between the Gulf of Mexico and South Atlantic during the year. Because of this migration, the ASMFC Coastal Sharks Technical Committee has identified coordinated management in the Gulf of Mexico state waters as the final segment of a range-wide comprehensive plan to rebuild Atlantic shark stocks. It is our hope that the ASMFC, NOAA Fisheries, and The Gulf States Marine Fisheries Commission (GSMFC) can work together to manage sharks using complementary regulations and quotas.

5.4 ANALYSIS OF ENFORCEABILITY OF PROPOSED MEASURES

The ASMFC Law Enforcement Committee has reviewed the proposed FMP for Coastal Sharks. It appears that there was an excellent effort to utilize the Law Enforcement Committee's "Guidelines For Resource Managers" in the development of the various harvest restrictions in this FMP. The plan includes daily possession limits, and hard quotas; both of which are reasonably enforceable from a law enforcement standpoint. The plan also requires all fins and tails to remain attached to the shark carcasses, which helps with species identification and closes potential finning loopholes. Additionally the plan removes the possibility for landing bycatch during closures in the fishery that can be reasonably monitored by law enforcement personnel.

6.0 MANAGEMENT AND RESEARCH NEEDS

The following list of research needs have been identified in order to enhance the state of knowledge of the coastal shark resource, population dynamics, ecology, and the various fisheries for spiny dogfish. This list will be reviewed annually by the Technical Committee, Advisory Panel, and the Management Board and an updated, prioritized list will be included in the Annual Atlantic Coastal Sharks FMP Review.

This initial list was developed based on research recommendations from SEDAR 11, SEDAR 13, Stock Assessment of Dusky Shark in the U.S. Atlantic and Gulf of Mexico, and Stock Assessment Report on NAFO Subareas 3 – 6 Porbeagle Shark, and from recommendations of the Coastal Sharks Technical Committee.

6.1 STOCK ASSESSMENT AND POPULATION DYNAMICS

- Develop a fishery-independent porbeagle shark survey to provide additional size composition and catch rate data to calculate index of abundance.
- Conduct species-specific assessments for all shark species.

6.2 RESEARCH AND DATA NEEDS

6.2.1 Biological

- Biological data should be collected on the illegal Mexican Shark catch confiscated in U.S. waters, including species, sex, and length.
- Gear-related information, including effort and gear used for each species should be collected on the interdicted Mexican vessels.
- One central electronic database for biological and gear data should be created to keep information regarding the confiscated sharks and vessels.
- Scientists should help the Coast Guard create the database and teach the agents how to identify the species and gear information.
- The Atlantic menhaden fishery data should be examined to determine shark bycatch estimates, if available.
- Better landings information on number of species, by weight, from dealers should be sought.
- Dockside sampling information would be helpful to verify landings information such as species composition.
- Additional life history research into sandbar sharks to supplement or replace the available data from the mid 1990's
- Additional life history studies for all species of the shark complex should be carried out to allow for additional species-specific assessments.
- Additional length sampling and age composition collection to improve information for developing selectivities.
- Initiation or expansion of dockside sampling for sharks.
- Determine bonnethead life history in Atlantic Ocean, spanning the range of the stock. Re-evaluate finetooth life history in the Atlantic Ocean in order to validate fecundity and reproductive periodicity.
- Determine reproduction biology for finetooth in the Gulf of Mexico.
- Re-evaluate blacknose life history in Atlantic Ocean, spanning the range of the stock. Expand research efforts directed towards tagging of individuals in south Florida and Texas/Mexico border to get better data discerning potential stock mixing.
- Develop empirically based estimates of natural mortality.
- Coordinate a biological study for Atlantic sharpnose so that samples are made at least monthly, and within each month samples would be made consistently at distinct geographic locations. For example, sampling locations would be defined in the northern Gulf, west coast of Florida, the Florida Keys (where temperature is expected to be fairly constant over all seasons), and also several locations in the South Atlantic, including the east coast of Florida, South Carolina, and North Carolina. This same sampling design could be applied to all small coastal sharks.
- Population level genetic studies are needed that could lend support to arguments for stock discriminations using new loci and/or methodology that has increased levels of sensitivity.

6.2.2 Economic

- Collect species-specific recreational data.

6.2.3 Habitat

- Identify nursery areas for sandbars in the northern Gulf of Mexico.

7.0 PROTECTED SPECIES

In the fall of 1995, Commission member states, the National Marine Fisheries Service (NMFS) and the US Fish and Wildlife Service (USFWS) began discussing ways to improve implementation of the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA) in state waters. Historically, these policies have been only minimally implemented and enforced in state waters (0-3 miles). In November 1995, the Commission, through its Interstate Fisheries Management Program (ISFMP) Policy Board, approved an amendment of its ISFMP Charter (Section Six (b) (2)) so that protected species and their interactions with ASMFC managed fisheries are addressed in the Commission's fisheries management planning process. Specifically, the Commission's fishery management plans will describe impacts of state fisheries on certain marine mammals and endangered species (collectively termed protected species), and recommend ways to minimize these impacts. The following section outlines: (1) the federal legislation which guides protection of marine mammals and sea turtles, (2) the protected species with potential fishery interactions; (3) the specific type(s) of fishery interaction; (4) population status of the affected protected species; (5) existing and proposed federal regulations pertaining to relevant protected species; (6) potential impacts to Atlantic coastal state and interstate fisheries and (7) identification of current data gaps and research needs.

7.1 MARINE MAMMAL PROTECTION ACT (MMPA) REQUIREMENTS

Since its passage in 1972, one of the underlying goals of the MMPA has been to reduce the incidental serious injury and mortality of marine mammals permitted in the course of commercial fishing operations to insignificant levels approaching a zero mortality and serious injury rate. Under 1994 Amendments, the Act requires NOAA Fisheries to develop and implement a take reduction plan to assist in the recovery or prevent the depletion of each strategic stock that interacts with a Category I or II fishery. Specifically, a strategic stock is defined as a stock: (1) for which the level of direct human-caused mortality exceeds the potential biological removal (PBR)[6] level; (2) which is declining and is likely to be listed under the ESA in the foreseeable future; or (3) which is listed as a threatened or endangered species under the ESA or as a depleted species under the MMPA. Category I and II fisheries are those that have frequent or occasional incidental mortality and serious injury of marine mammals, respectively, whereas Category III fisheries have a remote likelihood of incidental mortality and serious injury of marine mammals.

Under 1994 mandates, the MMPA also requires fishermen in Category I and II to register under the Marine Mammal Authorization Program (MMAP), the purpose of which is to provide an exception for commercial fishermen from the general taking prohibitions of the MMPA for non-endangered or threatened marine mammals. All fishermen, regardless of the category of fishery they participate in, must report all incidental injuries and mortalities caused by commercial fishing operations. More information about the MMAP can be found via the Internet at http://www.nmfs.noaa.gov/pr/interactions/mmap

[6] PBR is the number of human-caused deaths per year each stock can withstand and still reach an optimum population level. This is calculated by multiplying “the minimum population estimate” by “½ stock’s maximum productivity rate” by “a recovery factor ranging from 0.1 for endangered species to 1.0 for healthy stocks.”

Section 101(a)(5)(E) of the MMPA may authorize the Secretary to issue permits for the incidental taking of individuals from marine mammal stocks listed as threatened or endangered under the ESA in the course of commercial fishing operations if it is determined that (1) incidental mortality and serious injury will have a negligible impact on the affected species or stock; (2) a recovery plan has been developed or is being developed for such species or stock under the ESA; and (3) where required under Section 118 of the MMPA, a monitoring program has been established, vessels engaged in such fisheries are registered in accordance with Section 118 of the MMPA, and a take reduction plan has been developed or is being developed for such species or stock. Currently, there are no permits that authorize takes of threatened or endangered marine mammal species by any commercial fishery in the Atlantic. Permits are not required for Category III fisheries; however, any serious injury or mortality of a marine mammal must be reported.

7.2 ENDANGERED SPECIES ACT (ESA) REQUIREMENTS

The taking of endangered marine mammals, sea turtles, and birds is prohibited under Section 9 of the ESA. In addition, NOAA Fisheries may issue Section 4(d) protective regulations necessary and advisable to provide for the conservation of threatened species. There are several mechanisms established in the ESA to avoid the takings prohibition in Section 9. First, under section a 4(d) of the ESA, whenever any species is listed as a threatened species, regulations may include less stringent requirements intended to reduce incidental take and thus allow for the exemption from the taking prohibition. Section 10(a)(1)(B) of the ESA authorizes NMFS to permit, under prescribed terms and conditions, any taking otherwise prohibited by Section 9 of the ESA, if the taking is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Finally, Section 7(a) requires NOAA Fisheries to consult with each federal agency to ensure that any action that is authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species. Section 7(b) authorizes incidental take of listed species after full consultation and identification of reasonable and prudent alternatives or measures to monitor and minimize such take.

7.3 PROTECTED SPECIES WITH POTENTIAL FISHERY INTERACTIONS

There are numerous species that inhabit the management unit of this FMP that are afforded protection under the MMPA and ESA. Fifteen are classified as endangered or threatened under the ESA, while the remainder are protected by the provisions of the MMPA.

In addition, over 50 species of marine birds occur within the areas fished for coastal sharks. These include fulmars, shearwaters, storm petrels, jaegers, skuas, and various species of terns and gulls. Approximately 20 species of marine birds breed along the northern and central Atlantic coast. Another seven species breed in other parts of the Atlantic Ocean and spend their non-breeding season in northern and Mid-Atlantic waters from May through September. An additional 15 species winter in the Mid-Atlantic region where and when the coastal shark fishery may occur. All of these birds are protected under the Migratory Bird Treaty Act.

Listed below are protected species found in coastal Northwest Atlantic waters.

Endangered

Right whale	(*Eubalaena glacialis*)
Humpback whale	(*Megaptera novaeangliae*)
Fin whale	(*Balaenoptera physalus*)
Sperm whale	*(Physeter macrocephalus)*
Blue whale	*(Balaenoptera musculus)*
Sei whale	*(Balaenoptera borealis)*
Green turtle[7]	*(Chelonia mydas*)
Leatherback turtle	(*Dermochelys coriacea*)
Kemp's ridley turtle	(*Lepidochelys kempii*)
Hawksbill turtle	*(Eretmochelys imbricata)*
Shortnose sturgeon	(*Acipenser brevirostrum*)
Roseate tern	(*Sterna dougallii)*
Bermuda petrel	*(Pterodroma cahow)*

Threatened

Green sea turtle	(*Chelonia mydas*)
Loggerhead turtle	(*Caretta caretta*)

Candidate

Atlantic sturgeon	(*Acipenser oxyrinchus oxyrinchus*)

MMPA

Includes all marine mammals above in addition to:

Minke whale	(*Balaenoptera acutorostrata*)
Bottlenose dolphin	(*Tursiops truncatus*)
Harbor porpoise	(*Phocoena phocoena*)
Harbor seal	(*Phoca vitulina*)
Gray seal	(*Halichoerus grypus*)
Harp seal	(*Pagophilus groenlandicus*)
Long-finned pilot whale	(*Globicephala melas*)
Pygmy sperm whale	(*Kogia breviceps*)
Risso's dolphin	(*Grampus griseus*)
Short-finned pilot whale	(*Globicephala macrorhynchus*)
Atlantic white-sided dolphin	(*Lagenorhyncus acutus)*
Common dolphin	(*Delphinus delphis*)
Hooded seal	(*Cystophora cristata*)
Atlantic spotted dolphin	(*Stenella frontalis*)
Cuvier's beaked whale	(*Ziphius cavirostris*)
Mesoplodon beaked whale	(*Mesoplodon spp.*)
Northern bottlenose whale	(*Hyperoodon ampullatus*)
Pantropical spotted dolphin	(*Stennella attenuate*)

[7] The breeding populations of green turtles in Florida and on the Pacific coast of Mexico are listed as endangered; the remainder of the population is listed as threatened.

Melon headed whale	(*Peponocephala electra*)
Striped dolphin	(*Stenella coeruleoalba*)
Fraser's dolphin	(*Lagenodelphis hosei*)
Clymene dolphin	(*Stenella clymene*)
Spinner dolphin	(*Stenella longirostris*)
Pygmy killer whale	(*Feresa attenuate*)
Dwarf sperm whale	(*Kogia sima*)

Species of Concern

Red-throated loon	(*Gavia stellata)*
Black-capped petrel	(*Pterodroma hasitata)*
Common loon	(*Gavia immer)*
Razorbill	(*Alca torda)*

7.4 PROTECTED SPECIES INTERACTIONS WITH EXISTING FISHERIES

Commercial shark fishing effort is generally concentrated in the southeastern United States and Gulf of Mexico (Cortes and Neer, 2002). The principal gear types that account for coastal shark landings are longline (bottom, and to a lesser extent pelagic) and gillnet (drift or strikenet). The Atlantic bottom longline fishery targets large coastal sharks (66.2% of catch). Small coastal sharks comprise 32.4% of the total observed bottom longline catch. Gillnets are the dominant gear that catch small coastal sharks. In the pelagic longline fishery, coastal sharks comprise only about 3.4% of total catch.

7.4.1 Marine Mammals

Interactions have been documented between marine mammals and the primary fisheries that target coastal sharks, including gillnet and longline. Based on the stock status and documented interactions, the species of greatest concern are the bottlenose dolphin, North Atlantic right whale, harbor porpoise, humpback whale, and long-finned and short-finned pilot whales.

The 2007 MMPA List of Fisheries classifies the fisheries by the marine mammal species that have been reported incidentally injured or killed by the gear. Category I fisheries are those with frequent serious injury or mortality to marine mammals and Category II fisheries are those with occasional serious injury or mortality. Table 7.1 lists the predominant gears used to target coastal sharks and the marine mammal interactions associated with those gears.

Subsequent sections discuss the number of documented interactions with the primary species of concern, e.g., bottlenose dolphin, right whale, harbor porpoise, humpback whale, and pilot whales. These bycatch reports do not represent a complete list, but rather available records. It should be noted that without an observer program for many of these fisheries, actual numbers of interactions are difficult to obtain.

Table 7.1. List of Fisheries: Commercial Fisheries in the Atlantic Ocean (NMFS 2007).

Fishery Description	Marine Mammal Species Incidentally Killed/Injured
CATEGORY I	
Mid-Atlantic gillnet	Bottlenose dolphin, Common dolphin, Gray seal, Harbor porpoise, Harbor seal, Harp seal, Humpback whale, Long-finned pilot whale, Minke whale, Short-finned pilot whale, White-sided dolphin
Northeast sink gillnet	Bottlenose dolphin, Common dolphin, Fin whale, Gray seal, Harbor porpoise, Harbor seal, Harp seal, Hooded seal, Humpback whale, Minke whale, North Atlantic right whale, Risso's dolphin, White-sided dolphin
Atlantic Ocean, Caribbean, Gulf of Mexico large pelagics longline	Atlantic spotted dolphin, Bottlenose dolphin, Common dolphin, Cuvier's beaked whale, Long-finned pilot whale, Mesoplodon beaked whale, Northern bottlenose whale, Pantropical spotted dolphin, Pygmy sperm whale, Risso's dolphin, Short-finned pilot whale
CATEGORY II	
North Carolina inshore gillnet	Bottlenose dolphin
Northeast anchored float gillnet	Harbor seal, Humpback whale, White-sided dolphin
Southeast Atlantic gillnet	Bottlenose dolphin
Southeastern U.S. Atlantic shark gillnet	Atlantic spotted dolphin, Bottlenose dolphin, North Atlantic right whale

7.4.1.1 Gillnet

<u>Bottlenose Dolphin</u>

From 1996 to 2000, a total of 12 coastal bottlenose dolphin takes were observed in the Mid-Atlantic gillnet fishery. NOAA Fisheries has determined that the total estimated average annual fishery-related mortality or serious injury resulting from the 12 observed takes in this fishery is 233 bottlenose dolphins. From 2001-2002, two additional bottlenose dolphin mortalities were observed in this fishery. The Mid-Atlantic gillnet fishery is a combination of small vessel fisheries that target a variety of fish species, including bluefish, croaker, spiny and smooth dogfish, kingfish, Spanish mackerel, spot, striped bass and weakfish (Steve et al. 2001). It operates in different seasons targeting different species in different states throughout the range of coastal bottlenose dolphins.

The Mid-Atlantic gillnet fishery has the highest documented level of mortality of bottlenose dolphins, and the North Carolina sink gillnet fishery is its largest component in terms of fishing effort and observed takes. From April 1998 through February 2002, there were four observed takes documented in the North Carolina winter gillnet fishery. The gear characteristics of these takes included a mesh size range of 5.8” to 6”, twine sizes of .90 mm to 1.05 mm, and string lengths of 1200 to 2100 feet. All takes occurred in water depths of 6 to 9 feet (Palka 2001).

Additionally, an estimated 6 mortalities occurred annually in the shark drift gillnet fishery off the coast of Florida during 1999-2002.

North Atlantic Right Whale

Assessing the level of interactions between right whales and fisheries has been difficult to measure and is derived from two primary sources -- observed takes and non-observed fishery entanglement records. There has been only one documented case of an observed take of a right whale and this occurred in a pelagic drift gillnet in 1993 (Waring et al. 2007). Subsequent re-examination of this take record, combined with information on additional entanglement reports on this whale, concluded that the suspected mortality of this whale was due to entanglement in lobster pot gear.

All other indications of fishery-related interactions have been derived from entanglement records. These records, maintained by NOAA Fisheries Northeast Regional Office (NMFS, unpublished data) from 1970 through 2000, included at least 72 right whale entanglements or possible entanglements, including right whales in weirs, entangled in gillnets, and trailing line and buoys (Waring et al. 2007). From 1996 through 2000, five to nine records of mortality or serious injury (including records from both the US and Canadian waters) involved entanglement or fishery interactions. Unfortunately, most of these records do not contain the detail necessary to assign the entanglements to a particular fishery or location.

From 2001-2005, of 51 reports involving right whales, 24 were confirmed entanglements and 14 were confirmed ship strikes. There were 22 verified right whale mortalities, three due to entanglements, and eight due to ship strikes. Serious injury was documented for four entanglement events and one ship strike involving right whales. (Nelson et al. 2007)

Incidents of entanglements in groundfish gillnet gear, cod traps, and herring weirs in waters of Atlantic Canada and the US East Coast were summarized by Read (1994). In six records of right whales becoming entangled in groundfish gillnet gear in the Bay of Fundy and the Gulf of Maine between 1975 and 1990, the right whales were either released or escaped on their own, although several whales have been observed carrying net or line fragments (Waring et al. 2007). A right whale mother and calf were released alive from a herring weir in the Bay of Fundy in 1976. For all areas, specific details of right whale entanglement in fishing gear are often lacking. When direct or indirect mortality occurs, some carcasses come ashore and are subsequently examined, or are reported as “floaters” at sea; however, the number of unreported and unexamined carcasses is unknown, but may be significant in the case of floaters. More information is needed about fisheries interactions and where they occur.

On June 14, 2001, in accordance with Section 7 of the ESA, NOAA Fisheries issued a Biological Opinion pertaining to the authorization of fisheries under the federal Spiny Dogfish Fishery Management Plan, which included sink gillnet, bottom longline, and drift gillnet. The opinion concluded that the proposed fisheries are likely to adversely affect the right whale, Eubalaena glacialis. NOAA Fisheries based the conclusion on previous patterns of marine mammals and sea turtles that have been captured, injured, or killed through interactions with gear used in the fisheries.

Harbor Porpoise

Before 1998 most of the harbor porpoise takes from US fisheries were from the Northeast sink gillnet fishery. In the mid-1980s, using rough estimates of fishing effort, NOAA Fisheries estimated that a maximum of 600 harbor porpoises were killed annually in this fishery. Between 1990 and 2004, NOAA Fisheries Sea Sampling Program observed 501 harbor porpoise mortalities related to this fishery, with estimates of annual bycatch ranging from 2,900 animals in 1990 to 270 animals in 1999, and 654 animals in 2004 (Waring et al. 2007). Average estimated harbor porpoise mortality and serious injury in the Northeast sink gillnet fishery during 1994-1998, before the Take Reduction Plan, was 1,163. The average annual harbor porpoise mortality and serious injury in the Northeast sink gillnet fishery from 2000 to 2004 was 450.

In July 1993, NOAA Fisheries initiated an observer program in the Mid-Atlantic coastal gillnet fishery. This fishery, which extends from North Carolina to New York, is a combination of small vessel fisheries that target a variety of fish species, some of the vessels operate right off the beach, some use drift nets and others use sink nets. From 1995 to 2000, 114 harbor porpoise were observed taken (Waring et al. 2002). During that time, fishing effort was scattered between New York and North Carolina from the beach to 50 miles from shore. After 1995, documented bycatch was observed from December to May. Annual average estimated harbor porpoise mortality and serious injury from the Mid-Atlantic coastal gillnet fishery before implementation of the Harbor Porpoise Take Reduction Plan (1995-1998) was 358 animals. The average annual harbor porpoise mortality and serious injury in this fishery was 65 animals (2000-2004).

Following implementation of the Harbor Porpoise Take Reduction Plan and other fishery management plans for groundfish, fishing practices changed during 1999 (Waring et al. 2002). The most recent stock assessment estimates total annual average human-caused mortality to be 575 porpoises per year (515 from U.S. fisheries), which is lower than the PBR of 747 (Waring et al. 2007).

Humpback Whale

Assessing the level of interactions between humpback whales and fisheries has been difficult and is derived from two primary sources -- observed takes and non-observed fishery entanglement records, including strandings records. Between 1996 and 2000 (U.S. and Canada), there were 14 documented humpback whale interactions with fishing gear (two mortalities and 12 serious injuries). Two of the 12 seriously injured humpbacks were observed entangled in gillnet gear in the Bay of Fundy, Canada. For the period 2000 through 2004, there were 7 mortalities attributable to fishery interactions and 11 cases of serious injuries coast-wide (Waring et al. 2007). Unfortunately, most of the records do not contain the detail necessary to assign entanglements to a particular fishery or location because often times a whale is carrying a piece of line that cannot easily be attributed to a specific fishery. More information is needed on fisheries interactions with humpback whales, specifically the location of the interaction and types of gear involved.

Pilot Whale

Few interactions between both short-finned and long-finned pilot whales and the Mid-Atlantic coastal gillnet fishery have been documented. These two species are difficult to distinguish at sea as separate species and, therefore, abundance estimates, PBR, and bycatch estimates are combined into one listing for pilot whales. No pilot whale interactions were observed in this fishery from 1993 to 1997, one pilot whale interaction was observed in 1998, and none were observed in 1999 and 2000. The estimated annual mortality in this fishery in 1998 was seven pilot whales. Average annual estimated fishery-related mortality attributable to this gillnet fishery during 1996-2000 was one pilot whale per year.

7.4.1.2 Longlines

Entanglement in bottom longline gear is not well documented for any fishery, nor is there any dedicated observer coverage of bottom longline effort.

The nature of interactions between the pelagic longline fishery and long- and short-finned pilot whales is not well understood, however most observed interactions of marine mammals and pelagic longlines are with pilot whales in the Mid-Atlantic Bight. Pilot whales, like other marine mammals, have been observed to prey on longline bait and/or catch. Pilot whales may perceive catch on longline gear as an easy foraging opportunity, thus increasing the risk of serious injury and mortality to these animals. Depredation may also result in loss of catch and bait, damage or loss of gear, and loss of time fishing, leading to increased vessel costs for the fishermen. Observed types of injuries on pilot whales include hooks inside or imbedded in the mouth as well as entanglements in gear or trailing gear. These are considered by NOAA Fisheries to be serious injury because they are likely to lead to mortality.

The 2006 U.S. Atlantic and Gulf of Mexico Stock Assessment Report (Waring *et al.* 2007) now lists long- and short-finned pilot whales as non-strategic[8] and indicates that serious injuries and mortalities in the pelagic longline fishery are primarily limited to the Mid-Atlantic Bight, the distributions of the two pilot whales species are thought to overlap. For pilot whales, estimated serious injury and mortality levels in the pelagic longline fishery exceed the insignificance threshold but do not exceed the PBR level for the stock.

7.4.2 Sea Turtles

Interactions with sea turtles may occur when fishing effort overlaps with sea turtle distribution. The distribution of coastal sharks is similar to the migration of turtles, as both are believed to move north in the spring and summer and south in the fall and winter months. This further compounds the potential for interactions. Interactions could occur in the summer and fall, as turtles are commonly found in northeastern waters from June to November. Juvenile and immature Kemp's ridleys and loggerheads utilize nearshore and inshore waters north of Cape Hatteras during the warmer months and can be found as far north as the waters in and around Cape Cod Bay. Sea turtles are likely to be present off the Virginia, Maryland, and New Jersey coasts by April or May, but do not arrive in great concentrations in New York and northwards until mid-June. Although uncommon north of Cape Hatteras, immature green sea turtles also use northern inshore waters during the summer and may be found as far north as Nantucket Sound. Leatherback and hawksbill turtles may also occur in the waters where coastal shark fisheries operate. With the decline of water temperatures in late fall, sea turtles migrate south to warmer waters. When water temperatures are greater than approximately 11°C, sea turtles may be present in areas where the coastal shark fisheries occur.

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[8] A strategic stock is one in which direct human-caused mortality exceeds the potential biological removal level for that stock; which is listed as a threatened or endangered species under the Endangered Species Act of 1973; or, which is declining and likely to be listed as a threatened or endangered species within the foreseeable future.

As mentioned previously, the primary coastal shark fishery gear types are gillnets and bottom longline. Currently, sea turtles are taken in the Gulf of Mexico and Northwest Atlantic coastal areas and most are released alive. Loggerhead and leatherback turtles dominate the catch of sea turtles. In general, sea turtle captures are rare, but takes appear to be clustered (Hoey and Moore, 1999).

7.4.2.1 Gillnets

The capture of sea turtles could occur in all gear sectors of the gill-net fishery, including sink gillnets. Sink gillnets would be most likely to interact with loggerhead, Kemp's ridley, and green sea turtles as these species are commonly found near the bottom. These species, as well as leatherback turtles, may also interact with the driftnet sector. Loggerheads and leatherbacks have been captured in the Mid-Atlantic gillnet fishery and the northeast sink gillnet fishery. Large mesh gillnet fisheries may also affect Kemp’s Ridley turtles, as was hypothesized to be the cause of a mass stranding event in North Carolina in the spring of 2000 (NMFS 2001). Sea turtles may become entangled in either the buoy lines of the gillnets at the surface or at depth or the nets themselves at depth. Turtles are unlikely to be able to break off fragments of the gear and depending on where in the water column they are entangled, they may not be able to reach the surface to breath. While turtles are vulnerable to drowning under conditions of forced submergence, some turtles have been recovered alive from sink gillnet gear.

7.4.2.2 Longline

Entanglement in bottom longline gear is not well documented for any fishery. Of the turtle species, loggerheads would be most likely to interact with this gear sector due to their attraction to baited hooks. Animals may become entangled in the longline or may ingest hooks. The vast majority of interactions with pelagic longlines occur with loggerhead and leatherback turtles.

A Biological Opinion (BiOp) completed on June 14, 2001, found that the actions of the pelagic longline fishery jeopardized the continued existence of loggerhead and leatherback sea turtles. This document reported that the pelagic longline fishery interacted with an estimated 991 loggerhead and 1,012 leatherback sea turtles in 1999. The estimated take levels for 2000 were 1,256 loggerhead and 769 leatherback sea turtles (Yeung 2001). A new BiOp for the Atlantic pelagic longline fishery was completed on June 1, 2004. The BiOp concluded that long-term continued operation of the Atlantic pelagic longline fishery, authorized under the 1999 FMP, was not likely to jeopardize the continued existence of loggerhead, green, hawksbill, Kemp’s ridley, or olive ridley sea turtles; and was likely to jeopardize the continued existence of leatherback sea turtles. In 2005, the pelagic longline fishery interacted with an estimated 351 leatherback sea turtles and 275 loggerhead sea turtles.

NOAA Fisheries issued a final rule on February 7, 2007 to update the necessary equipment and protocols that vessel operators in the BLL fishery must possess, maintain, and utilize for the safe handling, release, and disentanglement of sea turtles and other non-target species. These requirements increase the amount of handling, release, and disentanglement gear that are required on BLL vessels and are intended to reduce post hooking mortality of sea turtles and other non-targeted species consistent with the Highly Migratory Species (HMS) Fishery Management Plan (FMP). This requirement created consistency between the requirements for

PLL and BLL Federal commercial fisheries. For more detail on this ruling, please see: http://www.nmfs.noaa.gov/by_catch/bottomlongline.pdf

7.4.2.3 Hook and Line

Sea turtles have also been caught on recreational hook and line gear. For example, from May 24 to June 21, 2003, five live Kemp's ridleys were reported as being taken by recreational fishermen on the Little Island Fishing Pier near the mouth of the Chesapeake Bay. Many other similar anecdotal reports exist. These animals are typically alive, and while the hooks should be removed whenever possible and when it would not further injure the turtle, NOAA Fisheries suspects that the turtles are probably often released with hooks remaining.

7.4.3 Seabirds

Some seabirds are vulnerable to entanglement in commercial fishing gear. The magnitude of the interaction has not been well quantified for the coastal shark fisheries, especially since fishing methods have changed over the past decade. Since coastal shark fisheries occur throughout the year over a wide geographic area and employs a variety of gear types, it is very difficult to assess the amount of bird bycatch that will occur in coastal sharks directed fisheries.

7.4.3.1 Gillnets

In the Mid-Atlantic region during the winter and spring, the most likely species of birds to be drowned in gillnets are red-throated loons, common loons, red breasted mergansers, and northern gannets. The number of birds caught each year is not well quantified, but most of these birds are capable of diving to 50 to 100 foot depths and occur out to the edge of the continental shelf. In general, the less time the gillnet is in the water the less likely the loons will become entangled. The practice of drop netting would seem to be the least likely to catch loons in the Mid-Atlantic region in fall through spring and anchored nets in the early morning and late evening would catch the most diving birds.

In spring through fall in the Northeastern US, some loons, and possibly horned puffins and razorbills, are likely to be caught in gillnets, but far more abundant and likely to be caught are the greater, sooty, Cory's, and Manx shearwaters. The greater followed by the sooty have been documented to be caught in sink gillnets in the highest numbers, but their populations are greater than other shearwaters. Northern gannets are also caught in gillnets in the Northeast. A couple of anecdotal observations have documented that birds are sometimes caught in nets when the nets are being set or retrieved and the birds are attempting to feed on offal or bait in the nets. This type of bycatch might be mitigated by changes in fishing methods.

7.4.3.2 Longlines

In general, birds that forage by scavenging and surface seizing are most likely to be caught on longlines while trying to steal the bait during deployment or retrieval. Within the range of the East Coast coastal shark fisheries, the species most likely to be caught on longlines are the great black-backed, lesser black-backed, herring, and ring-billed gulls, plus some shearwaters, northern fulmars, northern gannets, and black-capped petrels. The vulnerability of birds to longline gear is dependent on a large variety of factors including the ships size (baited hooks hanging in the air longer from larger ships), gear characteristics (weighted hooks, thawed bait, weighted lines), deterrent devices, the hunger of the birds, and fishing practices such as how and when offal is dumped. A variety of studies throughout the Pacific Ocean in recent years have determined that by using deterrent devices, and modifying gear and methods of fishing can reduce bird bycatch on longlines to very low levels while not reducing the landings.

Observer data from 1992 through 2005 indicate that seabird bycatch is relatively low in the U.S. Atlantic pelagic longline fishery. Since 1992, a total of 129 seabird interactions have been observed, with 95 observed killed (73.6 percent). No expanded estimates of seabird bycatch or catch rates for the bottom longline fishery have been made due to the rarity of seabird takes. (NMFS 2006)

7.5 POPULATION STATUS OF RELEVANT PROTECTED SPECIES

7.5.1 Marine Mammals

Marine mammal species are known to co-occur with or become entangled in gear used by coastal shark fisheries, such as coastal bottlenose dolphin, North Atlantic right whale, humpback whale and harbor porpoise. These species are classified as strategic stocks under the MMPA. Additionally, the right, fin and humpback whales are listed as endangered. Above all, the species of greatest concern is the right whale, which is one of the most endangered species in the world, numbering only around 306 animals (Waring et al. 2007).

The status of these and other marine mammal populations inhabiting the Northwest Atlantic has been discussed in great detail in the US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments. Initial assessments were presented in Baylock et al. (1995) and were updated in Waring et al. (2007). The report presents information on stock definition, geographic range, population size, productivity rates, PBR, fishery specific mortality estimates, and compares the PBR to estimated human-caused mortality for each stock.

7.5.1.1 Bottlenose Dolphin, *Tursiops truncatus*

Under the MMPA, the Western North Atlantic coastal bottlenose dolphin population is listed as depleted and is classified as a strategic stock. The species range is on the Atlantic coast from New Jersey south to central Florida (Waring et al. 2002). While there is uncertainty regarding population size and stock structure of Atlantic coastal bottlenose dolphins, the stock is designated as depleted under the MMPA due to mortality caused during the 1987-88 die-off and high incidental commercial fishery-related mortality relative to PBR. There are data suggesting that the population was at an historically high level immediately prior to a 1987-88 mortality event (Keinath and Musick 1988); however, this mortality event was estimated to have decreased the population by as much as 53%.

Within the western North Atlantic, the stock structure of the coastal bottlenose dolphin is complex (Waring et al. 2007). The standing hypothesis was that there is a single coastal migratory stock, ranging seasonally from as far north as Long Island, New York to as far south as central Florida. More recent studies, however, suggest that this hypothesis is incorrect and that there is likely a complex mosaic of stocks. Evidence to support this hypothesis includes observed geographic distribution, recent genetic analyses, photo-identification studies, satellite telemetry and stable isotope studies. Most of the available data, however, pertain to stocks in the waters off of North Carolina. Fewer data are available for bottlenose dolphins south of North

Carolina and the theory of stock separation in this area is tentative. Stock affiliation for coastal animals in inland waters (estuaries, bays, sounds) also is poorly understood.

As a result of these findings and for the purposes of developing the Bottlenose Dolphin Take Reduction Plan, NOAA Fisheries subdivided the coastal population into seven different management units, partitioned by region and summer (May 1 – October 30) and winter (November 1 – April 30) seasons. These management units are: (1) Northern migratory during the summer (NJ/NY border to NC/VA border), (2) Northern North Carolina during the summer (VA/NC border to Cape Lookout, NC), (3) Southern North Carolina during the summer (Cape Lookout, NC to Murrell's Inlet, SC), (4) South Carolina annually (Murrell's Inlet, SC to SC/GA border), (5) Georgia annually (coastwide, including estuarine waters), (6) Northern Florida annually (FL/GA border to Indian/Banana River Lagoon), and (7) Central Florida annually (Indian/Banana River Lagoon south). During the winter season, the animals in the Northern Migratory, Northern North Carolina, and Southern North Carolina mix and overlap along the coast of North Carolina and Virginia to form what is referred to as the Winter-Mixed Management Unit. The actual population structure is likely more complex than these management units, and research efforts to continue to identify and clarify the stock structure.

Abundance estimates for each management are outlined in the following table (Table 7.2) which incorporate counts conducted by aerial or shipboard surveys, and from photo-identification data combined with mark recapture technology (Garrison et al. 2003).

Table 7.2. Estimates of abundance for each management unit of the Western North Atlantic Coastal Bottlenose Dolphins (taken from Garrison et al. 2003).

Management Unit	Abundance Estimate
Northern Migratory summer (May - October)	17,466
Northern North Carolina summer (May - October)	7,079
Southern North Carolina summer (May - October)	3,786
*North Carolina mixed winter (November - April)	16,913
South Carolina annual	2,325
Georgia annual	2195
Northern Florida annual	448
Central Florida	10,652

* North Carolina mixed winter represents the winter abundance estimate for the Northern migratory, Northern North Carolina and Southern North Carolina populations combined.

7.5.1.2 North Atlantic Right Whale, *Eubalaena glacialis*

Northern right whales are listed as endangered under the ESA. They are also protected under the MMPA. Hunting is the major reason the western North Atlantic right whale population has declined to less than 300 individuals. Presently, the North Atlantic right whale is considered one of the most critically endangered populations of large whales in the world (Clapham et al. 1999). The species was continually hunted off the US East Coast for three centuries possibly reducing its numbers to less than 100 individuals by the time international protection from the League of Nations came into effect in 1935 (see Waring et al. 2000 and reference therein). Right whales have been protected from commercial whaling under legislation of the International Whaling Commission since 1949 (NMFS 1991).

Western North Atlantic right whales occur in the waters off New England and northward to the Bay of Fundy and the Scotian Shelf during the summer (Waring et al. 2000). During the winter, a segment of the population, consisting mainly of pregnant females, migrates southward to calving grounds off the coastal waters of the southeastern US. Right whales use Mid-Atlantic waters as a migratory pathway between their summer feeding grounds and winter calving grounds. During the winters of 1999/2000 and 2000/2001, considerable numbers of right whales were recorded in the Charleston, South Carolina area (Waring et al. 2007). Currently, it remains unclear whether this is typical or reflects a northern expansion of the normal winter range.

Based on photo-identification techniques, the western North Atlantic population size was estimated to be 291 individuals in 1998 (Kraus et al. 2000). This estimate may be low if animals were not photographed and identified or if animals were incorrectly presumed dead due to not being seen for an extended period of time. The population growth rate estimated for the western North Atlantic population during the late 1980's through early 1990's suggested that the stock was slowly recovering (Knowlton et al. 1994). However, a review of work conducted in 1999 indicated that the survival rate of the northern right whale had declined during the 1990's (Waring et al. 2007). One factor currently under review for this decline is the apparent increase in the calving interval. The mean calving interval pre-1992 was estimated at 3.67 years. An updated analysis using data through the 1997/98 season indicated that the mean calving interval had increased to more than 5 years (Kraus et al. 2000 as cited in Waring et al. 2000). Reasons under consideration for this shift include contaminants, biotoxins, nutrition/food limitation, disease and inbreeding problems.

The primary sources of human-caused mortality and injury of right whales include ship strikes and entanglement in fishing gear. A recent study estimated that 61.6% of right whales show injuries consistent with entanglement in gear while 6.4% exhibited signs of injury from vessel strikes (Hamilton et al. 1998). With the small population size and low annual reproductive rate, human-caused mortalities have a greater impact on this species relative to other species. As such, due to the overall decline in the western North Atlantic right whale population, the PBR is set at zero (Waring et al. 2000).

7.5.1.3 Harbor Porpoise, *Phocoena phocoena*

The Gulf of Maine/Bay of Fundy harbor porpoises were proposed to be listed as threatened under the ESA on January 7, 1993, but in 1999 NOAA Fisheries determined this listing was not warranted (NMFS 1999). NOAA Fisheries removed this stock from the ESA candidate species list in 2001. The harbor porpoise is considered a strategic stock under the MMPA. The PBR for the harbor porpoise is 747 animals (Waring et al. 2007). The total fishery-related mortality and serious injury for this stock not less than 10% of the calculated PBR, which means the human induced mortality is not approaching zero mortality and serious injury rate. For many years before 1999, the total fishery-related mortality and serious injury exceeded the PBR, and thus it was listed as a strategic stock.

The harbor porpoise can range from Labrador to North Carolina. The southern-most stock of harbor porpoise is referred to as the Gulf of Maine/Bay of Fundy stock and generally spends its winters in the Mid-Atlantic region, but also occurs in New England waters. Harbor porpoise are generally found in coastal and inshore waters, but will also travel to deeper, offshore waters. The status of the harbor porpoise stock in US waters is unknown. There is insufficient data to determine the population trends for this species because they are widely dispersed in small groups, spend little time at the surface, and their distribution varies unpredictably from year to year depending on environmental conditions (NMFS 2002). The best estimate of abundance for the Gulf of Maine/Bay of Fundy harbor porpoise is 89,700. The minimum population estimate is 74,695 individuals (Waring et al. 2007).

7.5.1.4 ***Humpback Whale,*** *Megaptera novaeangliae*

Humpback whales are listed as endangered under the ESA and are also protected by the MMPA. Recent abundance estimates indicate continued population growth of the Gulf of Maine stock. However, there are insufficient data to determine population trends of North Atlantic humpbacks and this particular stock may still be below its optimum sustainable population. Continued human-caused mortality, especially in the Mid-Atlantic region, may be limiting recovery.

In the western North Atlantic, humpback whales feed during spring, summer and fall over a geographic range encompassing the eastern coast of the United States (including the Gulf of Maine), the Gulf of St. Lawrence, Newfoundland/Labrador, and western Greenland (Katona and Beard 1990). In the winter, most humpbacks migrate to the West Indies to mate and breed, while others have been observed at higher latitudes in the waters off the Mid-Atlantic and southeast U.S. The estimate of 11,570 individuals (CV=0.068) is regarded as the best available estimate for the North Atlantic (Waring et al. 2007).

Similar to right whales, the major known sources of mortality and injury of humpback whales include entanglement in commercial fishing gear, such as sink gillnet gear, and ship strikes. Based on photographs of the caudal peduncle of Gulf of Maine humpback whales, Robbins and Mattila (1999) estimated that between 48% and 78% of animals exhibit scarring caused by entanglement. Several whales have apparently been entangled on more than one occasion. These estimates are based on sightings of free-swimming animals that initially survive the encounter. Because some whales may drown immediately, the actual number of interactions may be higher. In addition, the actual number of species-gear interactions is contingent on the intensity of observations from aerial and ship surveys. Humpback whales may also be adversely affected by habitat degradation, habitat exclusion, acoustic trauma, harassment, or reduction in prey resources resulting from a variety of activities including the operation of commercial fisheries. Because entanglements and vessel collisions have been documented in both U.S. and Canadian waters, estimated human-caused mortality and serious injury is divided between the U.S. (2.4) and Canada (0.6) for a total of 3.0 per year. The Atlantic Large Whale Take Reduction Plan (ALWTRP) established measures that attempt to reduce humpback whale bycatch in U.S. waters.

7.5.1.5 Pilot Whales*, Globicephala melas, Globicephala macrorynchus*

The two species of pilot whales in the Atlantic, long-finned and short-finned pilot whales, are difficult to distinguish to the species level at sea, because of similarities in size, form, and coloration. The species tend to overlap from New Jersey to Cape Hatteras, North Carolina. Sightings north of this overlapping area are likely to be long-finned pilot whales, while sightings south of this area are more likely to be short-finned pilot whales. The ability to distinguish between the two pilot whale species is particularly relevant for the pelagic longline fishery, as the distributions of the two pilot whales species are thought to overlap along the mid-Atlantic coast of the U.S. between 35° and 39°N., which is the same area where the majority of interactions with the pelagic longline fishery are observed.

Both long-finned and short-finned pilot whale abundance may have been affected by reduction in foreign fishing, curtailment of the Newfoundland drive fishery for pilot whales in 1971, and increased abundance of herring, mackerel, and squid stocks. The total number of long-finned and short-finned pilot whales off the eastern U.S. is unknown. Because long-finned and short-finned pilot whales are difficult to identify at sea, seasonal abundance estimates were reported for *Globicephala* species as a whole. The best available abundance estimate for pilot whales (*Globicephala sp.*) is 31,139 and the minimum population estimate is 24,866 (Waring et al. 2007).

Long-finned pilot whale

The status of long-finned pilot whales, *Globicephala melas*, relative to their optimum sustainable population is unknown, and there are insufficient data to determine a population trend for this species.

Long-finned pilot whales range from North Carolina north to Iceland and Greenland and east to North Africa. Off the northeast U.S. coast, pilot whales are distributed principally along the continental shelf edge in the winter and early spring. In late spring, pilot whales move onto Georges Bank and into the Gulf of Maine and more northern waters until late autumn. Pilot whales generally prefer areas of high relief or submerged banks, and also areas associated with the Gulf Stream north wall and thermal fronts along the continental shelf edge. Stock structure of the long-finned pilot whale is uncertain, although it has been proposed that two populations exist (a warm-water population and a cold-water population) related to sea surface temperature (Fullard *et al.* 2000).

Short-finned pilot whales

The status of short-finned pilot whales, *Globicephala macrorynchus*, relative to their optimum sustainable population, is unknown, and there are insufficient data to determine a population trend for this species.

Short-finned pilot whales range worldwide in tropical to warm temperate waters with North Carolina considered the northern extent of their range in U.S. waters. Sightings within U.S. waters are primarily within the Gulf Stream and along the continental shelf and continental slope in the northern Gulf of Mexico. No information is available on stock structure for this species.

7.5.2 Sea Turtles

All sea turtles that occur in US waters are listed as either endangered or threatened under the ESA. The Kemp's ridley (Lepidochelys kempii), leatherback (Dermochelys coriacea), and hawksbill (Eretmochelys imbricata) are listed as endangered. The loggerhead (Caretta caretta) and green turtle (Chelonia mydas) are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific coast of Mexico, which are listed as endangered. All five of these species inhabit the waters of the US Atlantic and Gulf of Mexico.

Atlantic coastal waters provide important developmental, migration, and feeding habitat for sea turtles. The distribution and abundance of sea turtles along the Atlantic coast is related to geographic location, reproductive cycles, food availability, and seasonal variations in water temperatures. Water temperatures dictate how early northward migration begins each year and are a useful factor for assessing when turtles will be found in certain areas. Sea turtles can occur in offshore as well as inshore waters, including sounds and embayments.

7.5.3 Seabirds

Two endangered species of birds the roseate tern and the Bermuda petrel (believed to have a population of less than 200 individuals) may occur in the areas fished for coastal sharks, however, they are very unlikely to be caught in the fishery. The populations and status of red-throated loons and the black-capped petrels are largely unknown and the common loon is listed by the Fish and Wildlife Service as a species of concern. Common loons breed on lakes where they face a number of hazards including mercury and lead poisoning, poaching, disturbance, loss of habitat, and capture in freshwater gillnet fisheries. The Northern Gannet's populations are stable. In their migration, molting, and wintering habitat along coastal Atlantic waters the loons and gannets the major threat is from gillnets and oil spills.

Two species of alcids, the horned puffin and razorbill breed on islands in Maine and could be caught in gillnets while diving for fish. The razorbill is on the US Fish and Wildlife Service's Species of Concern List. Other birds, including the black-capped petrel and the common loon, that occur in the areas fished are also on the Species of Concern List. While the black-capped petrel is unlikely to overlap with dogfish fishing efforts the common loons have been caught in sunken gillnets throughout the region.

7.6 EXISTING AND PROPOSED FEDERAL REGULATIONS/ACTIONS PERTAINING TO RELEVANT PROTECTED SPECIES

7.6.1 Marine Mammals

7.6.1.1 Bottlenose Dolphin

Because Western North Atlantic coastal bottlenose dolphin stock is a strategic stock that interacts with Category I and II fisheries, a Take Reduction Plan is required under the MMPA to reduce dolphin serious injury and mortality below potential biological removal level (PBR). PBR is defined as the number of human-caused deaths per year each stock can withstand and still reach an optimum population level. NOAA Fisheries convened the Bottlenose Dolphin Take Reduction Team in 2001 to provide consensus recommendations in developing the Bottlenose Dolphin Take Reduction Plan.

NOAA Fisheries issued a final rule to implement the BDTRP on April 26, 2006 to implement regulatory and non-regulatory management measures to reduce the incidental mortality and serious injury (bycatch) of the western North Atlantic coastal bottlenose dolphin stock (dolphin) (Tursiops truncatus) in the mid-Atlantic gillnet fishery and eight other coastal fisheries operating within the dolphin's distributional range. The measures contained in this final rule will implement gillnet effort reduction, gear proximity requirements, gear or gear deployment modifications, and outreach and education measures to reduce dolphin bycatch below the marine mammal stock's PBR. The regulations in this final rule became effective on May 26, 2006.

The BDTRP affects the following coastal shark fisheries via regulatory or non-regulatory components: the mid-Atlantic gillnet fishery, North Carolina inshore gillnet fishery, Southeastern U.S. Atlantic shark gillnet fishery, and Southeast Atlantic gillnet fishery.

For additional information, please contact the National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division F/SER3, 263 13th Avenue South, St. Petersburg, FL 33701 or online at: http://www.nmfs.noaa.gov/pr/interactions/trt/bdtrp.htm

7.6.1.2 Atlantic Right Whale and Humpback Whale

The Atlantic Large Whale Take Reduction Plan (64 FR 7529; February 16, 1999) addresses the incidental bycatch of large baleen whales, primarily North Atlantic right whales, fin whales and humpback whales, in several fisheries including the Northeast sink gillnet and Mid-Atlantic gill-net. The PBR has been set at zero for right whales and is 1.3 for humpback whales and 4.7 for fin whales (Waring et al. 2007). Amongst other measures, the plan closes right whale critical habitat areas to specific types of fishing gear during certain seasons and modifies fishing practices. Areas identified as right whale critical habitats include two areas off of the New England coast (Cape Cod/Massachusetts Bay and Great South Channel) and one off the Southeast coast (Altamaha River, Georgia to approximately Jacksonville Beach, Florida).

The ALWTRP relies on a suite of measures to meet its goals under the MMPA, including modifications to gear and fishing practices, seasonal area management (SAM), and dynamic area management (DAM). The ALWTRP specifies both universal gear modifications and area- and season-specific gear modifications. Universal requirements include the following: 1. No floating buoy line at the surface, 2. No wet storage of gear, and 3. Maintain knot-free buoy lines as much as possible. Area- and season-specific gear modification information for gillnet fisheries is available from NOAA Fisheries Northeast Regional Office, contact information below.

Copies of the various rules governing large whale protection are available from the Protected Resources Division, National Marine Fisheries Service, Northeast Region, 1 Blackburn Drive, Gloucester, MA 01930. You can also access additional information regarding the rule and changes under consideration via the Internet at http://www.nero.nmfs.gov/whaletrp/

The Atlantic Large Whale Take Reduction Team continues to identify ways to reduce possible interactions between large whales and commercial gear. NOAA Fisheries is considering modifications to the ALWTRP that will address additional gear marking and modification provisions to further reduce the risk of entanglement. In response to the continued serious injury and mortality of large whales from entanglement in commercial fishing gear since the 2002 ALWTRP rules became effective, NOAA Fisheries Service determined that additional modifications to the ALWTRP were warranted. NOAA Fisheries published a Draft Environmental Impact Statement in February 2005, which analyzed the impacts of alternatives for amending the ALWTRP (68 FR 38676). NOAA Fisheries Service is currently working on a Final Environmental Impact Statement and Final Rule. For an overview of the alternatives being

considered, please see:
http://www.nero.noaa.gov/nero/hotnews/whales/OutreachFinalVersion3Revised.pdf

7.6.1.3 Harbor Porpoise

On December 2, 1998, NOAA Fisheries published a final rule to implement the Harbor Porpoise Take Reduction Plan (HPTRP) for the Gulf of Maine and the Mid-Atlantic waters (63 FR 66464, December 2, 1998). The Northeast sink gillnet and Mid-Atlantic gill-net fisheries are the two primary fisheries regulated by the HPTRP. Among other measures, the HPTRP uses seasonal time/area closures in combination with the deployment of acoustic deterrant devices (e.g., pingers) in Northeast waters (Maine through Rhode Island), as well as seasonal time/area closures along with gear modifications for both small mesh (greater than 5 inches (12.7 cm) to less than 7 inches (17.78 cm)) and large mesh (greater than or equal to 7 inches (17.78 cm) to 18 inches (45.72 cm)) gillnets in Mid-Atlantic waters (New York through North Carolina). Although the HPTRP predominately impacts multispecies (groundfish), spiny dogfish, and monkfish fisheries due to high rates of porpoise bycatch, other gillnet fisheries are also managed under the HPTRP depending on where these fisheries operate.

Copies of the final rule and additional outreach material are available from the Protected Resources Division, National Marine Fisheries Service, Northeast Region, 1 Blackburn Drive, Gloucester, MA 01930. Additional information regarding HPTRP regulations, outreach guides, and related information can be accessed at: http://www.nero.nmfs.gov/prot_res/porptrp/

7.6.1.4 Pilot Whales

On June 8, 2006, the Pelagic Longline Take Reduction Team reached consensus on a draft Take Reduction Plan including recommendations for management strategies and additional research needs, thus meeting the statutory requirements of the MMPA. The overall goal of the Atlantic Pelagic Longline Take Reduction Plan (TRP or Plan) is to reduce, within five years of its implementation, serious injuries and mortalities of pilot whales (Globicephala spp.) and Risso’s dolphins in the Atlantic pelagic longline fishery to insignificant levels approaching a zero mortality and serious injury rate (i.e., <10% of PBR). Among other measures, the PLTRP regulates the establishment of a Cape Hatteras Special Research Area (an area defined to capture hot spots of bycatch and a concentration of fishing effort), as well as setting a 20 nautical-mile upper limit on mainline length for all pelagic longline sets within the Mid-Atlantic Bight. The Team agreed to evaluate the success of the TRP at periodic intervals over the next five years and retained the option of revising the Plan based on the results of ongoing monitoring, research, and evaluation.

The U.S. Atlantic pelagic longline fishery has experienced significant change over the past decade. In 2005, there were approximately 94 active vessels in the U.S. fishery, reflecting a decrease from a high of 501 active vessels in 1994. Most recently, a suite of measures designed to reduce bycatch or bycatch mortality have been implemented, including time/area closures, gear and safe handling and release requirements for sea turtle interactions, and the switch from traditional “J” hooks to circle hooks, also to reduce interactions with sea turtles. The domestic pelagic longline fleet is also fishing within the context of a broader international pelagic longline fishery. While the U.S. fleet comprises less than 10% of the longline fishing effort in the Atlantic Ocean and adjacent waters, foreign vessels use similar gear and fishing practices and most certainly interact with pilot whales, Risso's dolphins, and potentially other marine mammals. The Team recognizes that, ultimately, the best way to manage trans-boundary stocks is within an international framework and that successful U.S. management measures should be "exported" to foreign fleets.

For more information on these regulations, please visit the Atlantic Pelagic Longline Take Reduction Team website: http://www.nmfs.noaa.gov/pr/interactions/trt/pl-trt.htm

7.6.2 Sea Turtles

Under the ESA, and its regulations, taking sea turtles – even incidentally – is prohibited, with exceptions identified in 50 CFR 223.206. The incidental take of endangered species may only legally be authorized by an incidental take statement or an incidental take permit issued pursuant to section 7 or 10 of the ESA. No incidental take of sea turtles is currently authorized for any of the gear (i.e., gillnet, longlines) used to target coastal sharks.

Existing NOAA Fisheries regulations specify procedures that NOAA Fisheries may use to determine that unauthorized takings of sea turtles occur during fishing activities, and to impose additional restrictions to conserve sea turtles and to prevent unauthorized takings (50 CFR 223.206(d)(4)). Restrictions may be effective for a period of up to 30 days and may be renewed for additional periods of up to 30 days each.

All sea turtles found in U.S. waters are listed as either endangered or threatened under the ESA. The Kemp's ridley, leatherback, and hawksbill are listed as endangered. Loggerhead, green, and olive ridley turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific Coast of Mexico and olive ridleys on the Pacific Coast of Mexico, which are listed as endangered. Sea turtle-related regulations have been implemented since 2001, which impact the use of large mesh gillnets (>8 inches) throughout Virginia and North Carolina. These regulations include one permanent area closure and three seasonal area closures. To protect migrating sea turtles, NOAA Fisheries published a final rule on December 3, 2002 (67 FR 71895), establishing seasonally-adjusted gear restrictions by closing portions of the mid-Atlantic exclusive economic zone (EEZ) to fishing with gillnets with a mesh size larger than 8–inch (20.3–cm) stretched mesh. In this final rule, NOAA Fisheries is revising the large mesh size restriction from the current greater than 8–inch (20.3–cm) stretched mesh, as defined in the 2002 final rule, to 7–inch (17.8–cm) stretched mesh or greater. On July 6, 2004, NOAA Fisheries implemented additional regulations for the Atlantic pelagic longline fishery to further reduce the mortality of incidentally caught sea turtles (69 FR 40734). These measures include requirements on hook type, hook size, bait type, dipnets, lineclippers, and safe handling guidelines for the release of incidentally caught sea turtles.

Copies of the regulations are available from the Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910-3226.

7.6.3 Seabirds

Under the Migratory Bird Treaty Act it is unlawful "by any means or in any manner, to pursue, hunt, take, capture, [or] kill" any migratory birds except as permitted by regulation (16 USC. 703). The regulations at 50 CFR 21.11 prohibit the take of migratory birds except under a valid permit or as permitted in the regulations. The US Fish and Wildlife Service's Policy on Waterbird Bycatch states "It is the policy of the US Fish and Wildlife Service that the Migratory Bird Treaty Act of 1918, as amended, legally mandates the protection and conservation of migratory birds. Avian conservation is of significant concern to many in the United States. Substantial numbers of waterbirds (especially seabirds, but also waterfowl, shorebirds, and other related wading species) are killed annually in fisheries, making waterbird bycatch a serious conservation issue and a violation of the underlying tenets of the MBTA. The goal of the US Fish and Wildlife Service is the elimination of waterbird bycatch in fisheries. The Service will actively expand partnerships with regional, national, and international organizations, States, tribes, industry, and environmental groups to meet this goal. The Service, in cooperation with interested parties, will aggressively promote public awareness of waterbird bycatch issues, and gather the scientific information to develop and provide guidelines for management, regulation, and compliance."

7.7 POTENTIAL IMPACTS TO ATLANTIC COASTAL STATE AND INTERSTATE FISHERIES

Regulations under all four take reduction plans for Atlantic large whales, humpback whales, harbor porpoises, bottlenose dolphins, and pilot whales have the potential to impact gillnet and longline fisheries that harvest coastal sharks. The plan with the greatest impact is the Bottlenose Dolphin Take Reduction Plan because of the high level of observed take and estimated bycatch that has occurred in that fishery in the past.

7.8 IDENTIFICATION OF CURRENT DATA GAPS AND RESEARCH NEEDS

7.8.1 Bottlenose Dolphin Research Needs

Stock Identification and Status

- Continued research on stock structure to confirm existing stock delineations and incorporate dolphins in estuarine waters for improved stock identification.
- Precise abundance estimates over entire range of the coastal morphotype from southern Florida to the New York/New Jersey border, winter and summer, including estuaries.

Improving Assessment of Serious Injury and Mortality Estimates

- Increase observer coverage to provide more accurate estimates of commercial fishing related mortality, including the development and use of alternative platforms. Observer coverage should be expanded into state waters.
- Explore and expand stranding networks for collection of data pertinent to bottlenose dolphin/fishery interactions. Include training, equipment, support, and better communication among participants (stranding network members, managers, local authorities, scientists, and fishers).

Gear Modification Research

- Research on the effectiveness of reflective nets for catching fish, as well as for reducing takes of *Tursiops truncatus.*
- Research on comparing the behavior of captive and wild dolphins around gillnets with and without acoustically reflective webbing.
- Investigate the effects of twine stiffness and acoustically reflective webbing on dolphin bycatch.

- Investigate bridle alterations to prevent collapsing of the net and elimination of bridles on anchored gillnet gear with respect to their potential effects on the likelihood of bottlenose dolphin interactions.
- Investigate the behavior of anchored gillnet gear with regard to likelihood of entanglement a) when net panels are laced together and b) when they are not laced together, leaving gaps between nets.
- Investigate the effects of different string designs (i.e., shallower net depth, hung in different parts of the water column) to determine if the amount of webbing can be reduced without affecting catch for different fisheries (especially small mesh in coastal waters).
- Determine if dolphins that appear to be attracted to boats or nets in North Carolina waters are interacting with gillnet gear, attempt to identify such dolphins, and investigate their behavior and mortality rate.
- Investigate the importance of time of day and time from set with respect to when dolphins are caught in gear, based on carcass temperature and soak times.

7.8.2 Sea Turtle Research Needs

- Research into gear development/deployment for gillnets and trawls of this fishery should be conducted to ensure minimal impact on sea turtles.
- Fishermen should be instructed on handling and resuscitation procedures for turtles encountered in the course of fishing.
- In order to better understand sea turtle populations and the impacts of incidental take in coastal sharks fisheries, ASMFC and the affected states should support (i.e. fund, advocate, promote) in-water abundance estimates of sea turtles to achieve more accurate status assessments for these species and improve our ability to monitor them.
- ASMFC and the affected states should consider a monitoring program to document incidental take of sea turtles in the coastal sharks fishery. An annual summary of all incidental captures of sea turtles should then be submitted to NOAA Fisheries.

7.8.3 North Atlantic Right Whale Research Needs

The priorities listed below were identified for the 2006 Request for Proposals (Round 6) for the Right Whale Research Program. Note that these priorities may be updated in the future. Funding priorities for gear investigation and testing to reduce entanglements are:

- Research related to reducing risk associated with vertical lines. Important data gaps include development of the following:
- Lipid soluble rope that would quickly deteriorate if it came in contact with a whale;
- Device to reduce the separation between buoys in the surface system of buoy line;
- Mechanical time release which holds the buoy and buoy line on the bottom for a predetermined length of time and then releases the buoy, allowing it to float to the surface with the buoy line;
- Device to store and release buoy lines on the ocean bottom such as through an acoustic release, galvanic time release or mechanical time release;
- Thwartable bottom link, located at the bottom of a buoy line that will act as a weak link until the gear is ready to be hauled. At that time the device is switched from a weak link mode to a strong link mode, allowing the gear to be hauled;

- Continue with field testing of time tension line cutter bottom release units and improve handling and safety concerns. Time tension line cutters, located at the bottom of a buoy line, will release the buoy line from the bottom gear after a predetermined load and time period have been exceeded.
- Research related to lowering the profile of groundlines. Important data gaps include studies to improve the abrasion resistance and overall durability of sinking/neutrally buoyant rope.
- Research the profile of gillnet and trap/pot gear in the water column in various habitats and oceanographic conditions.
- Develop technology for producing knotless splices.
- Right whale biological needs priorities to support the Atlantic Large Whale Take Reduction Plan are:
- Research on the horizontal and vertical distribution of right whales in the water column throughout their range in U.S. waters. Important data gaps include behavior over rocky, coral or wreck habitats (e.g. inshore areas and depths over 100 fathoms), as well as on the migratory corridor and breeding grounds.
- Information on the temporal and spatial distribution of right whales (e.g. utilizing aerial surveys, vessel surveys, and passive acoustics). Important data gaps include 1) the occupancy of right whales in coastal waters of Maine; 2) the mid-Atlantic, from the coast to the EEZ; and 3) discovery of the principle wintering area for non-calving right whales.
- Research on the vertical distributions of both the processes and the prey organisms related to right whale foraging for habitat characterization and predictive modeling.
- Develop technical advances/improvements for disentanglement including sedatives and tools. Also, investigate behavioral issues that may affect and should be considered during disentanglement.
- Research on the development of long-term tracking tags suitable for deployment on right whales with minimal health risks.

7.8.4 Harbor Porpoise Research Needs

The following research needs have been identified by the Harbor Porpoise Take Reduction Team, NOAA Fisheries, and through suggestions received during NOAA Fisheries recent HPTRP outreach meetings.

- Research on testing the effectiveness of alternative methods of reducing incidental take of harbor porpoises such as pingers of higher frequencies than are currently required, as well as reflective gillnets, and compare the effectiveness of these methods to currently required bycatch reduction methods.
- Acquire and test a device that can determine the functionality of pingers deployed on actively fished gillnet gear.

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