
3. **ESSENTIAL FISH HABITAT**

Section 303(a)(7) of the Magnuson-Stevens Act, 16 U.S.C. §§ 1801 *et seq.*, as amended by the Sustainable Fisheries Act in 1996, requires that Fishery Management Plans (FMPs) describe and identify essential fish habitat (EFH) within the U.S. Exclusive Economic Zone (EEZ) for all life stages of each species in a fishery management unit. Available information should be evaluated through a hierarchical analysis based on: 1) presence/absence of the species in specific habitats; 2) habitat-related densities or relative abundances; 3) growth, reproduction, or survival rate comparisons between habitats; and 4) habitat-dependent production rates (quantified by habitat quantities, qualities and specific locations). This information should be interpreted with a risk-averse approach to ensure that adequate areas are protected as EFH for the managed species. The HMS FMP addresses EFH for species managed under that plan in Chapter 6.

3.1 **Atlantic Sharks**

Thirty-three shark species were added to the management unit in the HMS FMP in order to prohibit finning on all species of shark. Many of these species are small, deep-water species rarely targeted in HMS fisheries. However, some are taken incidentally in directed shark, tuna, or swordfish fisheries, while others, such as the smooth dogfish, are the targets of directed fisheries.

Determining EFH is a lengthy and data-dependent process. Sections 6.22 and 6.23 of the HMS FMP detail the process used to determine EFH for Atlantic Sharks as well as the general methodology and data sets used to designate EFH. In general, there are few data on the life history and fishery interactions of these thirty-three shark species. This paucity of data creates significant challenges in constructing accurate EFH descriptions. NMFS is currently using Geographic Information Systems (GIS) to analyze all available data for these species. Results and complete EFH descriptions are expected by early 2000 and will be issued in an Addendum to this document. Presented below are life history summaries for the shark species. The following descriptions are taken predominantly from Castro (1983), and supplemented with material from Compagno (1984).

BRAMBLE SHARKS (Echinorhinidea)

Bramble shark *Echinorhinus brucus*

The bramble shark is a large, sluggish, bottom dwelling shark. It is primarily a deepwater species, thought to be widely distributed in the deep temperate and tropical waters of continental and insular shelves and upper slopes. Although this shark appears most abundant in depths of 350-900 meters, it is occasionally found in shallow water. Bramble shark catches are often reported in the eastern Atlantic and western Indian Oceans, but only three specimens have been reported from the North American east coast in the past hundred years. Reports of specimens from the west coast are doubtful due to high incidences of species misidentification.

Biology: Very little is known about the habits of the bramble shark. Development is ovoviviparous and a litter of 24 pups has been reported. Pups are approximately 40 cm (16 in) at birth and reach a maximum size of 245 cm (96 in).

Fishing: The bramble shark is most often caught in depths greater than 200 meters.

DOGFISH SHARKS (Squalidae)

Lined lanternshark *Etmopterus bullisi*

The lined lanternshark is a small, slender shark that inhabits the western Atlantic Ocean. It is a deep-water species, usually found along the continental slope from North Carolina to the Caribbean Sea in water 350-650 meters deep.

Biology: The lined lanternshark feeds on small crustaceans and squid. It is capable of swallowing relatively large squid whole, possibly by distending its jaws. Although development is presumed to be ovoviviparous, nothing else is known of its reproduction. The specimens collected have been juveniles between 18-24 cm (7-9 in). The size range for an adult is not yet known.

Fishing: The lined lanternshark can be caught in deep-water trawls.

Broadband dogfish *Etmopterus gracilispinis*

Broadband dogfish catches have been reported from the western North Atlantic Ocean (off Virginia and Florida) and from both sides of the South Atlantic Ocean. This shark is assumed to be widely distributed in the Atlantic along the outer continental shelf and upper slope at depths ranging from 400-600 meters. Like several other small, deepwater species, it is believed to ascend in the water column at night. Nothing else is known of its habits.

Biology: Development is probably ovoviviparous. A newborn specimen measuring 13 cm (5 in) has been reported, and a 26 cm (10 in) male was determined to be immature. Specimens of broadband dogfish have been recorded at 33 cm (13 in).

Fishing: The broadband dogfish can be caught in deep-water trawls.

Caribbean lanternshark *Etmopterus hillianus*

The Caribbean lanternshark is a small shark found in the Caribbean and the Atlantic Ocean ranging from southern Florida to the Chesapeake Bay. It appears to be confined to deep water of the upper continental and insular slopes and has been reported from depths of 350-700 meters. Nothing else is known of its habits.

Biology: Development is ovoviviparous. Males and females reach maturity at about 25 cm (10

in) and 30 cm (12 in), respectively. Litters consist of up to five pups, around 9 cm (4 in) in length at birth. Average size is about 25 cm (10 in) and sharks have been reported at 32 cm (13 in).

Fishing: The Caribbean lanternshark can be caught in deep-water trawls.

Great lanternshark *Etmopterus princeps*

The great lanternshark is a small, slender shark found throughout the North Atlantic Ocean. It is common from southern Nova Scotia to southern New England. Confined to deep waters of the continental slopes, the great lanternshark has been reported from depths of 550 to over 2000 meters.

Biology: Little is known about the habits and diet of this species. Development is presumed to be ovoviviparous. A 55 cm (22 in) male was reported as mature and individuals have been reported at a length of about 75 cm (30 in).

Fishing: The great lanternshark has been caught only in deep-water trawls.

Smooth lanternshark *Etmopterus pusillus* and *Etmopterus bigelowi* (formerly one species; *Etmopterus pusillus*)

The smooth lanternshark is a small, deep water shark reported throughout the North and South Atlantic Ocean. It is thought to be well distributed in deep water along the continental slopes with most specimens caught at depths around 450 meters.

Biology: The smooth lanternshark is known to feed on squid, other small sharks, and small bony fishes. Reproductive processes have not been described, however, males up to 39 cm (15 in) and females up to 47 cm (19 in) have been reported as immature. Average size is about 45 cm (18 in) and the largest specimen on record measured 47 cm (19 in).

Fishing: The smooth lanternshark can be caught in deep-water trawls.

Fringefin lanternshark *Etmopterus schultzi*

The fringefin lanternshark is a small, deep water shark found in the northern Gulf of Mexico. It appears to be common along upper continental slopes at depths ranging from 400-750 meters.

Biology: The species is known to feed on squid. No data on its reproductive development are available. The average size of a fringefin lanternshark is about 27 cm (11 in), with some specimens reaching 30 cm (12 in) in length.

Fishing: The fringefin lanternshark can be caught in deep-water trawls.

Green dogfish *Etmopterus virens*

The green dogfish is only found in the northern Gulf of Mexico, where it is relatively common. It appears to live in dense schools confined to moderately deep waters, typically 350-450 meters.

Biology: The green dogfish feeds primarily on squid or octopus. The cephalopod beaks and eyes commonly found in stomach contents are large enough to indicate that the shark's jaws must have been greatly stretched at the time of swallowing. It has been suggested that dense schools of these sharks attack prey much larger than themselves, biting off chunks with their sharp lower teeth. Development is ovoviviparous and the gestation period is believed to last around one year. Litters consist of one to three pups which measure nearly 9 cm (4 in) at birth. Maturity is reached at about 19 cm (7 in) and the average size is 20-25 cm (8-10 in). The largest observed green dogfish have been recorded at 30 cm (12 in).

Fishing: The green dogfish can be caught in deep-water trawls.

Japanese gulper shark (or Needle dogfish) *Centrophorus acus*

The Japanese gulper shark is a little-known deep-water species. It is presumed to be located in the western North Atlantic Ocean at depths below 200 meters.

Biology: Males reach maturity at approximately 81 cm.

Gulper shark *Centrophorus granulosus*

The gulper shark is a deep-water species found along the outermost continental shelves and upper slopes. Specimens have been caught in trawls in the western Atlantic from the Carolinas to the Gulf of Mexico at depths around 350 meters. Although the gulper shark is widely distributed in the Atlantic, it is rarely encountered in the U.S. EEZ, and little is known of its habits.

Biology: Development is ovoviviparous, with litters consisting of four to six pups measuring approximately 35 cm (14 in) at birth. Average size and weight is about 150 cm (59 in) and 27 kg (60 lb) and individuals can reach 182 cm (72 in) in length.

Fishing: The gulper shark is most often caught in deep-water trawls.

Little Gulper Shark *Centrophorus uyato*

The little gulper is a small, slender shark that inhabits continental slopes in the Gulf of Mexico. The typical range is 200-900 meters, although individuals have been reported at depths as shallow as 50 meters and as deep as 1,400.

Biology: Its diet and habits are largely unknown. The largest recorded length for a little gulper is 98 cm (39 in).

Fishing: The little gulper shark is most often in deep-water trawls.

Roughskin spiny dogfish *Squalus asper*

The roughskin spiny dogfish is widely distributed in deep water of the upper continental slope. Most specimens have been isolated captures in the Gulf of Mexico or off of South Carolina in waters 200-650 meters deep.

Biology: The roughskin spiny dogfish is a poorly described species. Its diet includes squid and small fishes, but nothing else is known of its habits. Development is ovoviviparous, with litters of 21 and 22 pups reported. Although size at maturity has not been determined, specimens 85 cm (33 in) long have been reported as mature. Average size is around 90 cm (35 in) and individuals can reach at least 118 cm (46 in) in length.

Fishing: The roughskin spiny dogfish has been caught with both hook and line and trawling gear in deep waters.

Blainville's dogfish *Squalus blainvillei*

Blainville's dogfish are found throughout deep tropical and temperate waters along the continental shelves and upper slopes. Catches have been reported in the Gulf of Mexico, typically from bottom trawls, at depths ranging from 350-750 meters.

Biology: The habits of Blainville's dogfish are poorly known. Diet includes crustaceans, squid, and small fishes. Development is ovoviviparous with a two year gestation period. Litters typically consist of six pups that measure 22-26 cm (9-10 in) at birth and reach maturity at 60-70 cm (24-28 in). Average size is about 75 cm (30 in) and individuals can reach 100 cm (39 in) in length.

Fishing: Blainville's dogfish are most often caught in mid-water or bottom trawls.

Cuban dogfish *Squalus cubensis*

The Cuban dogfish inhabits the Gulf of Mexico, the Caribbean, and Atlantic waters from North Carolina to Florida. It is a bottom-dwelling species found along the continental shelf and uppermost slopes, forming dense schools at 100-350 meters.

Biology: The habits and diet of this shark have not yet been reported. Development is ovoviviparous, with observed litters of 10 embryos. Average size is 75 cm (30 in) and individuals can reach 110 cm (43 in) in length.

Fishing: The Cuban dogfish is caught in bottom trawls at depths greater than 50 meters. It is harvested for its liver, used in the production of oil and vitamins.

Flatnose gulper shark (or Arrowhead dogfish) *Deania profundorum*

The flatnose gulper shark is a poorly known deep water species, assumed to be widely distributed in bottom waters of the upper continental slope. It has been reported at depths of 300-1,800 meters.

Biology: This species is known to feed on crustaceans, squid, and lanternfishes. Embryos have not been described, although development is probably ovoviviparous. Males reach maturity at approximately 70 cm (28 in). Average size is about 50 cm (20 in) and individuals can reach a maximum size of 76 cm (30 in).

Fishing: The flatnose gulper shark is caught in deep-water trawls.

Portuguese shark *Centroscymnus coelolepis*

The Portuguese shark is found from the Grand Banks to Delaware Bay, although few catches have been reported in North American waters. This shark inhabits very deep waters along the continental slope ranging from depths of 350-2,700 meters. Most captures occur at depths greater than 900 meters at a temperature between 5-6°C (41-43°F).

Biology: Stomach contents of Portuguese sharks consist mainly of small fishes. Development is ovoviviparous, with average litters of 13-15 pups measuring 27-30 cm (11-12 in) at birth. Average size is 90-107 cm (35-42 in) and the maximum size is estimated at 120 cm (47 in).

Fishing: The majority of Portuguese shark specimens were caught on halibut lines at depths greater than 350 meters.

Greenland shark *Somniosus microcephalus*

The Greenland shark is a large, wide-bodied shark commonly found in North American waters from Baffin Bay to the Gulf of Saint Lawrence. Individuals have been reported in the Gulf of Maine and as far south as Cape Hatteras. This is the only shark species regularly encountered in the polar waters of the Atlantic Ocean, where average temperatures are 2-7°C (35-45°F). In the summer, the Greenland shark tends to reside at depths of 200-750 meters, although some have been caught as deep as 1,100 meters. During the winter months, the species moves up the water column, often approaching the surface at the edge of the ice.

Biology: The Greenland shark feeds on capelin, char, halibut, herring, lumpfish, salmon, numerous other fishes, and seals. This species often gathers in large numbers around sealing or whaling operations, feeding on offal or carrion. Very little is known about the reproductive processes of this shark, presumed to be oviparous until a few years ago. Development is now thought to be ovoviviparous. Pups measure about 38 cm (15 in) at birth and up to 10 pups have been reported in one litter. Tagging studies have shown the Greenland shark to be a very slow-growing fish; medium-size specimens appear to grow only 1 cm (0.4 in) or less per year. Average size is 340 cm (11.1 ft) and 285 kg (627 lb) and the largest specimen on record measured 640 cm (21.0 ft) and weighed 1,022 kg (2,250 lb).

Fishing: The Greenland shark has been fished for its liver oil along the coasts of Norway, Iceland, and Greenland. In Greenland it is targeted using longlines in 250-550 meter water. In the winter, fishermen often use light to lure sharks to the surface where they tend to be extremely sluggish and offer little resistance.

Kitefin shark *Dalatias licha*

The kitefin shark is a small, deep-water shark, usually found over the outer continental and insular shelf and slope at depths of 250-600 meters. This species is rarely found off North American coasts; only catches in Georges Bank and the Gulf of Mexico have been reported. Catch records in the Mediterranean suggest that the kitefin is primarily a solitary shark, and does not exhibit schooling behavior.

Biology: The kitefin shark is a versatile deep-sea predator and feeds on numerous bony fishes, rays, crabs, and squid. Adults tend to consume more crustaceans and sharks and fewer cephalopods than do juveniles and rely heavily on sharks as an alternative food source in the spring and winter. Development is ovoviviparous and litters consist of 10 to 16 pups 30 cm (12 in) in length. Males are estimated to reach maturity at 95 cm (37 in), with females maturing at 120 cm (47 in). Average size and weight is about 120 cm (47 in) and 8 kg (18 lb) and the largest specimen on record measured 182 cm (72 in).

Fishing: The kitefin shark is most often taken in deep-water trawls or on longlines.

Cookie-cutter shark *Isistius brasiliensis*

The cookie-cutter shark inhabits the deep waters of the tropical and subtropical belts of the Atlantic, Pacific, and Indian Oceans. The only reported catches near the United States come from the area north of the Bahamas. It is a very small shark species usually characterized as epipelagic to bathypelagic (epipelagic refers to the zone of the ocean where light can penetrate and photosynthesis occurs; bathypelagic refers to the ocean depths, typically 60-3,600 meters). Most catches occur after dark between the surface and 550 meters, indicating a possible nighttime vertical migration from deeper water. The species is also thought to exhibit schooling behavior.

Biology: The cookie-cutter shark has very powerful jaws and large teeth. It feeds extensively on large squid, but may also attack even larger prey. Evidence indicates that it feeds by taking bites from large pelagic fishes (tunas, wahoo, dolphin, marlins, etc.) as well as porpoises and whales. It has been suggested that the shark is able to grab a quick bite after being approached, and subsequently rejected, by larger animals in search of prey. The ventral surface of the head and body (except for the dark collar around the gill area), as well as the ventral fin surfaces, are luminescent, and emit a bright greenish glow. The number of light organs is highly variable; some specimens may have very few or emit no light at all. Cookie-cutter development is presumed to be ovoviviparous. Six or seven large eggs have been reported from females, but embryos have not been reported as of yet. Females mature at 40 cm (16 in) and males are thought to reach maturity around 37 cm (15 in). The cookie-cutter shark ranges in size from 14-50 cm (6-20 in);

the largest on record is 50 cm (20 in).

Fishing: The cookie-cutter shark can be caught on surface and in mid-water trawls after dark. It does not appear to be attracted to lights.

Bigtooth (or Largetooth) cookie-cutter shark *Isistius plutodus*

The bigtooth cookie-cutter is a small shark characterized as epipelagic and possibly bathypelagic. Catches have been reported in the Gulf of Mexico.

Biology: The habits of the bigtooth cookie-cutter are presumed to be similar to those of the cookie-cutter shark. However, its more powerful jaws, bigger mouth, and gigantic lower teeth (proportionately the largest of any living shark) enable it to take larger bites out of its prey. In addition, its short snout and anteriorly positioned eyes allow for binocular vision, and may be useful in locating prey. There are no data available on reproduction and the maximum size of this species has been estimated at 42 cm (17 in).

Fishing: A bigtooth cookie-cutter shark specimen was caught in a mid-water trawl.

Pygmy shark (or Spiny Pygmy shark) *Squaliolus laticaudus*

The pygmy shark is a minute, cigar-shaped shark. The species is wide ranging, inhabiting temperate and tropical waters at depths ranging from 200-500 meters. Pygmy sharks tend to undergo diurnal vertical migrations, migrating upward to depths of 200 meters at night to feed.

Biology: The pygmy shark is known to feed on squid, lanternfishes, and lightfishes. Although embryos have not been observed, development is presumed to be ovoviviparous. Males reach maturity at 15-22 cm (6-9 in), while females mature at 17-20 cm (7-8 in). The shark is the smallest on record with an average size of 15-22 cm (6-9 in) and a maximum size of about 27 cm (11 in).

Fishing: The pygmy shark can be caught in mid-water trawls at depths of 200-500 meters.

Smallmouth velvet dogfish *Scymnodon obscurus*

The smallmouth velvet dogfish is a little-known deepwater shark found on or near the bottom of the continental slopes at depths of 550 to 1,450 meters.

Biology: This species preys on bottom fishes and invertebrates and is assumed to be ovoviviparous. Maximum total lengths for adults are 51 cm and 59 cm for males and females, respectively.

Fisheries: Smallmouth velvet dogfish have been reported caught in bottom trawls, with line gear, and with fixed bottom nets in the eastern Atlantic.

SAWSHARKS (Pristiophoridae)

American sawshark *Pristiophorus schroederi*

The American sawshark is a poorly known deep-water species, inhabiting waters of the continental and insular slopes. The limits of its distribution are unknown. The only positively identified specimens have come from waters off southeast Florida and the Bahamas, although the species appears to be locally common in deep water around Cay Sal Bank. What reported catches there are have occurred in water 650-950 meters deep.

Biology: The American sawshark is easily recognized by its snout, which is prolonged into a long flat blade. The snout is equipped with “teeth”, or enlarged dermal denticles, on each side and two long barbels on the underside. The American sawshark is not to be confused with the sawfish, the latter being a shark-like ray of the batoid family Pristidae. However, the sawshark may use its saw to stun and disable prey just as sawfishes do. Development is assumed to be ovoviviparous and newborns measure in at 30 cm (12 in). The largest American sawshark specimen was recorded at 81 cm (32 in) in length.

Fishing: The American sawshark can be caught in deep-water trawls.

CATSHARKS (Scyliorhinidae)

Iceland catshark *Apristurus laurussonii*

The Iceland catshark has been reported off the New England coast, the Gulf of Mexico, and the Caribbean. The limits of its distribution are unknown, but it appears to be widespread in deep water and commonly found in deep water off the Gulf of Mexico. Reported catches in the Gulf of Mexico and Caribbean have come from depths of 900-1450 meters.

Biology: The habits and diet of the Iceland catshark are unknown. There are no data available on its reproduction.

Fishing: Icelandic catsharks have been caught only in deep-water trawls.

Smallfin catshark *Apristurus parvipinnis*

The smallfin catshark inhabits the upper continental and insular slopes of the Gulf of Mexico and the Caribbean Sea. It is commonly found in deep water in the Gulf of Mexico where specimens have been collected at depths ranging from 650-1100 meters.

Biology: Average size is 45-50 cm (18-20 in). No other information is available.

Fishing: The smallfin catshark can be caught in deep-water trawls.

Deepwater catshark *Apristurus profundorum*

The deepwater catshark inhabits waters of the continental slopes. It has been caught off Delaware Bay at a depth of 1,500 meters.

Biology: The average size of this small shark is on the order of 50 cm (20 in). There is no other information available on this species.

Fishing: The deepwater catshark can be caught in deep-water trawls.

Broadgill catshark *Apristurus riveri*

The broadgill catshark inhabits deep waters in the Gulf of Mexico and the Caribbean Sea. Specimens have been collected at depths ranging from 650-1,100 meters.

Biology: Little is known of the habits of broadgill catshark. Development is oviparous and egg cases are smooth-surfaced, translucent, greenish with indistinct bands of lighter color, and measure about 5.5 cm (2 in) long by 1.3 cm (0.5 in) wide. Females are believed to mature at 40 cm (16 in), and males are thought to mature at a slightly larger size. Average adult size is 42 cm (17 in), with the largest recorded specimen measuring 48 cm (19 in).

Fishing: The broadgill catshark can be caught in deep-water trawls.

Marbled catshark *Galeus arae*

The marbled catshark is a small, slender shark that inhabits bottom waters along the continental slopes from Georgia southward to the eastern Gulf of Mexico and Colombia. It is common throughout its range, although distribution is irregular, and inhabits waters 300-750 meters deep with a temperature range of 6-11°C (43-52°F). Adults have been found to reside in deeper water than juveniles.

Biology: The marbled catshark feeds on various species of deep-water shrimp. The type of development has not yet been determined, but is believed to be ovoviviparous due to the presence of eggs without cases found inside a female. Gravid females are very seldom seen, although large numbers of females have been caught. Maturity is reached at about 27cm (11 in) and the average size is around 35 cm (14 in). Maximum size is estimated at 40 cm (16 in).

Fishing: The marbled catshark is most often caught in deep-water shrimp trawls.

Blotched catshark *Scyliorhinus meadi*

The blotched catshark is a small shark inhabiting the western Atlantic Ocean from North Carolina

to Cuba. Its limits of distribution are not well known, however, specimens have been trawled from depths of 350-550 meters.

Biology: The few specimens collected have all been immature, ranging from 18-49 cm (7-19 in). One specimen was reported with cephalopod beaks in its stomach, indicating squid as an important prey item. Development is probably oviparous, but little is known about the reproduction and biology of this species.

Fishing: The blotched catshark is most often caught in deep-water shrimp trawls.

Chain dogfish (or Chain catshark) *Scyliorhinus retifer*

The chain dogfish is a small, slender catshark that inhabits the waters of the Gulf of Mexico and the western Atlantic Ocean from Georges Bank to Nicaragua. It is a bottom-dwelling species found in the deep waters of the continental shelf and slope, usually in temperatures near 10°C (50°F). The species appears to be most abundant in deep waters off Virginia and North Carolina. It is occasionally taken at depths of 40-200 meters in the northern parts of the range, but inhabits deeper waters (450 meters or more) further south.

Biology: Development is oviparous. Pregnant females have seldom been taken, but the egg cases are believed to be 5-6 cm (2 in) long by 2 cm (0.9 in) wide, brownish/amber in color, and possess a long tendril at each corner. The pups measure about 10 cm (3.9 in) at hatching. One trawl off Cape Hatteras produced a large number of newly hatched or small chain dogfish, suggesting that nursery areas may be highly localized. Average size is about 38 cm (15 in) and the largest recorded chain dogfish measured 47 cm (19 in).

Fishing: The chain dogfish is most often taken by trawling in depths greater than 75 meters and at temperatures around 10°C (50°F).

Dwarf catshark *Scyliorhinus torrei*

The dwarf catfish is a small, slender shark previously collected off the southeast coast of Florida and the Virgin Islands. It is a bottom dwelling species along the upper continental slope, and has been caught at depths of 200-550 meters. However, the extent of this shark's distribution remains unknown.

Biology: Analysis of stomach contents have indicated a diet of squid and possibly cuttlefish. Nothing else is known about its habits and reproduction, as neither eggs nor newly hatched pups have been observed. Average size is 26 cm (10 in) and the largest recorded dwarf catshark measured 29 cm (11 in).

Fishing: The dwarf catshark has been caught only in deep-water trawls.

SMOOTHFOUND SHARKS (Triakidae)

Smooth dogfish *Mustelus canis*

The smooth dogfish has a very slender body and a prominent spiracle behind the eye. In North American waters its range encompasses the Bay of Fundy to Florida as well as the Gulf of Mexico. This is a common shark in bays and inshore waters, usually found at depths of less than 20 meters. It is frequently encountered from Cape Cod to Charleston, where it is the second most abundant shark after the spiny dogfish, *Squalis acanthias*. There is some evidence that this species is divided into several discrete populations. The most well known population is found in the range from the Carolinas north along the coast to New England and southern Canada. The species is relatively uncommon between North Carolina and Florida, but can be found in abundance off the Florida coast. In addition, smooth dogfish catches occur frequently in many areas of the Gulf of Mexico and the Caribbean. Off the Atlantic coast, the species migrates in response to changes in water temperature, moving from north to south with the seasons. They primarily winter in the area between southern North Carolina and the Chesapeake Bay, moving up the coast to New England in the spring. The Caribbean populations inhabit deeper water (typically below 200 meters) and prefer rocky bottoms.

Biology: This species feeds on large crustaceans, including crabs, lobsters, and shrimp. However, the smooth dogfish is both an opportunistic feeder and a scavenger and will consume whatever prey is easily available, including bony fishes and squid. It is primarily nocturnal and tends to be a very active shark, constantly patrolling the bottom for food. Development is viviparous. Pups measure 34-39 cm (13-15 in) at birth, with litters usually consisting of 10 to 20 pups. The gestation period lasts about ten months and most births occur in early summer. The growth rate of this species is believed to be very fast, with maturation occurring after only one or two years at a size of 85 cm (33 in). Average size is about 122 cm (48 in), but individuals as large as 152 cm (60 in) have been reported.

Fishing: The smooth dogfish can be easily taken with hook and line using squid or shrimp bait. Because of its abundance, it interferes with shrimp trawling operations and affects crab and lobster stocks. It is often caught in large numbers by shrimp trawlers. The species is extensively used as a laboratory animal and often displayed in aquaria.

Florida dogfish *Mustelus norrisi*

The very slender Florida dogfish is usually found in shallow coastal waters with sand or mud bottoms. The species typically moves inshore to waters of 5-7 meters or less during the winter months, although specimens have been caught in water as deep as 90 meters. Florida dogfish are common along the west coast of Florida, and have also been reported in the southern Caribbean and the western Atlantic south to Brazil. The limits of distribution are not well known.

Biology: This dogfish feeds on crabs, shrimp, and small fishes. Development is viviparous, with litters in late winter or early spring usually consisting of seven to fourteen pups that measure 30 cm (12 in) at birth. Males reach maturity at about 58 cm (23 in), and females mature at 65 cm (26 in). Average size is 75 cm (30 in) for males and 90 cm (35 in) for females, although

individuals have been reported exceeding 100 cm (39 in) in length.

Fishing: The Florida dogfish is most often taken in fish nets, usually very close to shore.

3.2 Cooperative Atlantic States Shark Pupping and Nursery Survey

*The following material is excerpted from Pratt and McCandless, 1999.

Introduction

The HMS FMP calls for research and information about the EFH of shark species, focusing on shark nurseries. Specifically, it calls for further delineation of summer and winter nursery areas, determining if sharks return to their natal nurseries, determining habitat relationships such as temperature and salinity, determining significance of areas of aggregation, and determining the role of coastal/inshore habitats in supporting neonate and juvenile sharks. Shark nursery areas are frequently located in highly productive coastal or estuarine waters within state boundaries. Studies suggest that these inshore nursery grounds offer selective advantages of low predation rates and high forage abundance. Understanding both primary (where parturition and young-of-the-year sharks occur) and secondary (utilized by juveniles, age 1 + only) coastal shark nursery habitat is critical to effective management and necessary for defining EFH for these species. In 1998, the NMFS Apex Predators Program (APP) formed the Cooperative Atlantic States Shark Pupping and Nursery (COASTSPAN) Survey, an alliance of state cooperators to investigate shark nursery grounds along the east coast of the United States. The COASTSPAN Survey was designed to provide some answers to the questions raised in the HMS FMP and to use these answers to identify states that should be involved in a potential Atlantic States Marine Fisheries Commission (ASMFC) shark management plan. Cooperative researchers in selected coastal states conducted a comprehensive and standardized investigation of potential shark nursery areas. The North Carolina Division of Marine Fisheries, South Carolina Department of Natural Resources, Savanna State University with cooperation from Georgia Department of Natural Resources, and Florida Department of Environmental Protection participated in 1998. NMFS APP staff conducted the COASTSPAN study in Delaware Bay.

Results represented here are for the first year of a five-year sampling program. The first year of sampling was designed to select suitable locations that are characteristic of local state waters where supposed shark nursery grounds may occur. The second consideration was to test the COASTSPAN gillnet and longline in the selected coastal states to access compatibility with local conditions of tide, current, and boat traffic.

Subsequent years will direct the efforts of state cooperators toward repeating the selected stations, chosen in concert with NMFS staff, using agreed upon gear and methodology. The program will continue the delineation of shark nursery areas, develop relative indices of abundance of neonate and juvenile sharks in these nursery areas, and use the environmental data and bycatch collected to determine habitat relationships. It will also use tag and recapture data to determine if sharks return to their natal nurseries and identify overwintering nursery grounds.

Preliminary 1998 COASTSPAN Findings

The data clearly show that the Delaware Bay is an important pupping and nursery ground for sandbar sharks. COASTSPAN 1998 data suggest that pupping of sandbar sharks occurs in the Bay between mid-June and early September. Tag recapture evidence suggests that neonate sandbar sharks remain in the Delaware Bay nursery for at least three months. Tag recaptures show that some age 1+ juveniles return to the Bay the next year and probably up to six years. The presence of early juvenile sand tiger sharks suggests that Delaware Bay may also be a secondary nursery ground for this species.

Preliminary COASTSPAN results show that North Carolina's coastal waters probably support several shark nursery grounds. Presence of fresh umbilical scars suggest that spinner, dusky, and Atlantic sharpnose sharks utilize these waters as pupping and nursery grounds. COASTSPAN data give supporting evidence that sandbar sharks use North Carolina waters as important overwintering and secondary nursery grounds. Blacknose sharks, blacktip sharks, smooth hammerheads, and scalloped hammerheads utilize these areas as secondary nursery grounds. COASTSPAN data and other records suggest that this area may not be a pupping and nursery ground for the finetooth shark, spiny dogfish, and the Atlantic angel shark. Further sampling, with emphasis in the southeast part of North Carolina, is needed.

South Carolina's coastal waters may also support a variety of shark nursery grounds. Preliminary COASTSPAN findings show that spinner, sandbar, finetooth, and Atlantic sharpnose sharks utilize these waters to some degree as pupping and nursery grounds. The presence of neonates and juveniles from June to September indicates that Bulls Bay, North Edisto Bay and perhaps other parts of South Carolina are pupping and nursery grounds for sandbar sharks. COASTSPAN data support existing evidence that sharpnose sharks utilize Bulls Bay as a pupping and nursery ground and also point out the possibility of North Edisto Bay and Stone Inlet as pupping and nursery grounds. Preliminary data also indicate that blacktip, scalloped hammerhead, and bonnethead sharks utilize South Carolina waters as at least secondary nursery grounds. The apparent lack of neonate and juvenile lemon sharks in South Carolina waters during the 1998 COASTSPAN survey suggest that this area is probably not an important nursery ground area for these species.

COASTSPAN data support the hypothesis that Atlantic sharpnose and bonnethead sharks utilize Georgia's coastal waters as pupping and nursery grounds. These waters may also support secondary nursery ground habitat for scalloped hammerhead and finetooth sharks.

The data contributed to COASTSPAN by the Florida Department of Environmental Protection suggest that Indian River Lagoon is an important secondary nursery ground for bull sharks. More cooperative work is necessary to confirm all of these findings.