2001-2002 Spiny Dogfish Specifications
Draft Environmental Assessment
Regulatory Impact Review
Initial Regulatory Flexibility Analysis
EFH Assessment

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Prepared by

The Mid-Atlantic Fishery Management Council

and

New England Fishery Management Council

in Conjunction with

the National Marine Fisheries Service

Executive Summary

The Mid-Atlantic and New England Fishery Management Councils (Mid-Atlantic Council and New England Council) initiated management of spiny dogfish (*Squalus acanthias*) pursuant to the Magnuson Stevens Fishery Conservation and Management Act (MSFMCA) of 1976 as amended by the Sustainable Fisheries Act (SFA) through the development of the Spiny Dogfish Fishery Management Plan (FMP). The lack of any regulations pertaining to the harvest of spiny dogfish in the US EEZ combined with the recent rapid expansion of the domestic fishery lead the Mid-Atlantic and New England Fishery Management Councils (Councils) to begin development of a management plan for the species in 1998.

The final rule implementing the FMP was approved on September 29, 1999 and contained the following measures: (1) A commercial quota; (2) seasonal (semi-annual) allocation of a commercial quota; (3) a prohibition on finning; (4) a framework adjustment process; (5) the establishment of a Spiny Dogfish Monitoring Committee; (6) annual FMP review; (7) permit and reporting requirements for commercial vessels, operators, and dealers; and (8) other measures regarding sea samplers, foreign fishing, and exempted fishing activities. An annual spiny dogfish commercial quota will be allocated to the fishery to control fishing mortality (F). The quota will be set at a level to assure that the F specified for the appropriate year in the FMP will not be exceeded. The annual commercial quota will be established by the Regional Administrator, Northeast Region, NMFS (Regional Administrator), based upon recommendations made by the Councils. The quota recommendation will be based upon projected stock size estimates for each year, as derived from the latest stock assessment information, coupled with the target fishing mortality rate specified for each year. The quota is specified for a fishing year that begins on May 1, and is subdivided into two semi-annual periods. The period from May 1-October 31 (quota period 1) is allocated 57.9 percent of the annual quota and the period from November 1-April 30 (quota period 2) is allocated 42.1 percent of the annual quota.

The Spiny Dogfish FMP specifies the target fishing mortality rate for year three (May 2001 - April 2002) and subsequent rebuilding years at F=0.03. Measures which can be considered annually include a commercial quota set in a range from zero to a maximum allowed to assure that F does not exceed 0.03. In addition to the commercial quota, the Councils may also recommend minimum or maximum fish sizes, seasons, mesh size restrictions, trip limits and other gear restrictions. The quota associated with an F=0.03 in year three (as specified in the FMP) is 4,00,000 pounds.

Both the Mid-Atlantic and New England Councils recommended a commercial quota specification and trip limits to achieve the FMP's objectives for fishing year 2001 at their respective meetings in December 2000 and January 2001. However, the Councils failed to reach agreement on a trip limit measure for this action. While both Councils recommended a quota of 4.5 million pounds the Mid-Atlantic Council recommended a trip limit of 600 pounds for quota period 1 and 300 pounds for quota period 2. In contrast, the New England Council recommended a trip limit of 5,000 pounds for both quota periods. Following the Councils' recommendations, a draft specifications document was submitted by the Mid-Atlantic Council to NMFS on February 1, 2001, for NMFS review. The FMP has a provision to deal with the situation where the Councils do not reach agreement on management measures for the upcoming fishing year. The FMP provides that the Regional Administrator may select from any option listed below that has not been rejected by both Councils.

Alternative 1- Mid-Atlantic Council Alternative: Specify quota for 2000-2001 at 4.5 million pounds with a commercial quota portion of 4.0 million pounds and a spiny dogfish research quota set-aside of 500,000 pounds and trip limits of 600 pounds for quota period 1 and 300 pounds for quota period 2

The MAFMC alternative includes a total quota of 4,500,000 pounds, divided into a commercial quota of 4,000,000 pounds and a spiny dogfish research set-aside quota of 500,000 pounds for fishing year 2001. Quota period 1 (May 1 through October 31) would be allocated 2,316,000 pounds (57.9%) of the 4,000,000 pounds commercial quota, and quota period 2 (November 1 through April 30) would be allocated 1,684,000 pounds (42.1%) of the 4,000,000 pounds commercial quota. In addition, to ensure that a directed fishery for spiny dogfish is largely eliminated, trip limits of 600 pounds per trip and 300 pounds per trip were recommended for quota periods 1 and 2, respectively (vessels are prohibited from landing more than the specified amount in one calendar day). This action is intended to achieve the F = 0.03 target and end the directed fishery for spiny dogfish in order to end overfishing and rebuild the spiny dogfish spawning stock biomass. The research quota set aside would provide for a means to investigate ways to direct fishing effort away from female spiny dogfish. This alternative represents the 2000-2001 status quo for spiny dogfish as implemented by Secretarial Interim Action.

Alternative 2 - New England Council Alternative: Specify quota for 2000-2001 at 4.5 million pounds with a commercial quota portion of 4.0 million pounds and a spiny dogfish research quota set-aside of 500,000 pounds and trip limit of 5000 pounds

The New England Council alternative includes a total quota of 4,500,000 pounds, divided into a commercial quota of 4,000,000 pounds and a spiny dogfish research set-aside quota of 500,000 pounds for fishing year 2001. Quota period 1 (May 1 through October 31) would be allocated 2,316,000 pounds (57.9%) of the 4,000,000 pounds commercial quota, and quota period 2 (November 1 through April 30) would be allocated 1,684,000 pounds (42.1%) of the 4,000,000 pounds commercial quota. In addition, the NEFMC recommended a trip limit of 5000 pounds per trip (vessels are prohibited from landing more than the specified amount in one calendar day) for quota periods 1 and 2 to allow for a small scale directed fishery for spiny dogfish to continue.

Alternative 3: No action

Under this alternative (no action), fishing mortality in the spiny dogfish fishery would not be regulated. With no restrictions, landings would be expected to increase to 22.0 million pounds in 2001-2002 (compared to landings of 6.7 million pounds in fishing year 2000-2001).

ENVIRONMENTAL ASSESSMENT FOR THE 2001-2002 CATCH SPECIFICATIONS FOR SPINY DOGFISH

1.0 Purpose and Need

The purpose of this document is to specify the management measures for the fishing year May 1, 2001 - April 30, 2002 (the third year of the management program). The Spiny Dogfish Fishery Management Plan (FMP) requires that the Councils annually review and recommend management measures which will insure that the target fishing mortality rate for spiny dogfish is not exceeded. Measures which can be considered annually include a commercial quota set in a range from zero to the maximum allowed to assure that F does not exceed 0.03. In addition to the commercial quota, the Councils may also recommend minimum or maximum fish sizes, seasons, mesh size restrictions, trip limits and other gear restrictions.

The Mid-Atlantic and New England Councils initiated management of spiny dogfish (*Squalus acanthias*) pursuant to the Magnuson Stevens Fishery Conservation and Management Act (MSFMCA) of 1976 as amended by the Sustainable Fisheries Act (SFA) through the development of the Spiny Dogfish Fishery Management Plan. For most of the first two decades of extended jurisdiction under the Magnuson Act, the spiny dogfish was considered to be an "under-utilized" species of relatively minor value to the domestic fisheries of the US East Coast. With the decline of more traditional fishery resources in recent years, an increase in directed fishing for dogfish resulted in a nearly ten-fold increase in landings from 1987-1996. Data and analyses in the most recent stock assessment (NEFSC 1998) indicate that the spiny dogfish stock in the Northwest Atlantic has declined as a result of the recent increase in exploitation. Particularly problematic is the fact that the fishery targets mature females due to their large size. The recent fishery expansion in combination with the removal of a large portion of the adult female stock has resulted in the species being designated as overfished (NEFSC 1998). As a result, the Mid-Atlantic and New England Fishery Management Councils jointly developed the Spiny Dogfish Fishery Management Plan (FMP) which was submitted to the Secretary of Commerce during the spring of 1999.

The Spiny Dogfish Fishery Management Plan (FMP) was partially approved by NMFS on September 29, 1999, and the final rule implementing the FMP was published on January 10, 2000. Included among the approved management measures in the FMP was the requirement that the Mid-Atlantic Council and New England Council jointly develop annual specifications, which include a commercial quota to be allocated on a semi-annual basis, and other restrictions to assure that fishing mortality targets will not be exceeded. The quota will be set at a level to assure that the F specified for the appropriate year in the FMP will not be exceeded. The quota is specified for a fishing year that begins on May 1, and is subdivided into two semi-annual periods. The period from May 1-October 31 is allocated 57.9 % of the annual quota and the period from November 1-April 30 is allocated 42.1 % of the annual quota.

The FMP implemented an annual procedure to develop management measures for the upcoming fishing year based on analyses of the Spiny Dogfish Monitoring Committee. The Spiny Dogfish Monitoring Committee is a joint committee made up of staff representatives of the Mid-Atlantic Council, the Northeast Regional Office, the Northeast Fisheries Center, and state representatives. The state representatives include any individual designated by an interested state from Maine to Florida. In addition, the Committee includes two non-voting, ex-officio industry representatives (one each from the Mid-Atlantic and New England Council regions).

The Spiny Dogfish Monitoring Committee annually reviews the best available data including, but not limited to, commercial and recreational catch/landing statistics, current estimates of fishing mortality, stock status, the most recent estimates of recruitment, VPA results or length-based stock projection models, target mortality levels, beneficial impacts of size/mesh regulations, as well as the level of noncompliance by fishermen or states and recommend to the Councils' Joint Spiny Dogfish Committee commercial and recreational measures designed to assure that the target mortality level for spiny dogfish is not exceeded.

The Monitoring Committee met on November 17, 2000 and developed recommendations based upon updated stock conditions estimated from 1999-2000 Spring NEFSC trawl survey data. The Monitoring Committee recommended a 4.0 million pound quota for spiny dogfish for the 2001-2002 fishing season to be divided into two semi-annual periods as follows: May-October, 2,316,000 pounds (57.9%) and November-April, 1,684,000 pounds (42.1%). The Spiny Dogfish Monitoring Committee also recommended a trip limit of 600 pounds for quota period 1 and a 300 pound trip limit for quota period 2. The Monitoring Committee also recommended that, in addition to the 4.0 million pounds commercial quota allocation, up to an additional 500,000 pounds be specified for experimental fishery projects. The Committee agreed by consensus that the experimental fishery allocation should be used for feasibility demonstration of a male only fishery, as well as for other fishery research projects which examine methods to reduce bycatch and methods to estimate discards and the mortality of unavoidable discards. The Joint Spiny Dogfish Committee met on December 7, 2001 to consider the recommendations of the Spiny Dogfish Monitoring Committee to determine appropriate annual adjustments to the quota and other management measures and make recommendations to the Councils. The Joint Spiny Dogfish Committee recommended that, assuming the Councils are obliged to set a quota consistent with F=0.03 for the 2001-2002 fishing season, that a 4.5 million pound commercial quota be specified. This quota will be allocated as follows: 4.0 million pounds will be divided into two semi-annual periods as follows: May-October - 2,316,000 pounds (57.9%) and November-April - 1,684,000 pounds (42.1%). The 2001-2002 fishing season quota will increase to 8.8 million pounds (4,000 mt), if through Amendment 1, the Councils adopt the constant harvest strategy of 8.8 million pounds that is equivalent to the existing Plan in terms of rebuilding female biomass. Experimental fisheries will be allocated up to 500,000 pounds initially, subject to an increase if the constant harvest approach is adopted through Amendment 1. In addition, the Joint Committee recommended a possession limit of 5,000 pounds for both quota periods 1 and 2 for the 2001-2002 fishing year (vessels to be prohibited from landing more than 5,000 pounds in one calendar day). The Councils received the report of the Joint Dogfish Committee and adopted the recommendations as outlined in section 3.0 below.

2.0 Methods of Analysis

The Mid-Atlantic and New England Fishery Management Councils adopted recommendations relative to third year management measures for spiny dogfish at their respective meetings in December 2000 and January 2001. The Councils failed to reach agreement on the preferred measures relative to trip limits for spiny dogfish in 2001-2002. As such, the respective measures recommended by each Council are presented below. The FMP specifies that the Regional Administrator shall review the recommendations and, if necessary, modify the annual quota and other management measures to assure that the target F will not be exceeded. As noted above, the Regional Administrator may modify the recommendations using any of the measures that were not rejected by both Councils.

The basic approach adopted in this analysis is an assessment of various management measures from the standpoint of determining the impacts upon the environment. In order to conduct a more complete analysis, impacts were examined in three alternatives. The first two alternatives examine the measures adopted by the MAFMC and the NEFMC. The third alternative examines the impacts of no action. The first and second alternatives examined represent the lowest quota (most restrictive scenario) and while the third alternative was the least restrictive scenario considered by the Councils. A full description of these scenarios is given in Section 3.0 below.

3.0 Alternatives

3.1 Mid-Atlantic Council Alternative (2000-2001 Status Quo) The MAFMC alternative includes a total quota of 4,500,000 pounds, divided into a commercial quota of 4,000,000 pounds and a spiny dogfish research set-aside quota of 500,000 pounds for fishing year 2001. Quota period 1 (May 1 through October 31) would be allocated 2,316,000 pounds (57.9%) of the 4,000,000 pounds commercial quota and quota period 2 (November 1 through April 30) would be allocated 1,684,000 pounds (42.1%) of the 4,000,000 pounds commercial quota. In addition, to ensure that a directed fishery for spiny dogfish is largely eliminated, trip limits of 600 pounds per trip and 300 pounds per trip (vessels are prohibited from landing more than the specified amount in one calendar day) were recommended for quota periods 1 and 2, respectively. This action is intended to achieve the F = 0.03 target and end the directed fishery for spiny dogfish in order to end overfishing and rebuild the spiny dogfish stock. The research quota set aside would provide for a means to investigate ways to direct fishing effort away from female spiny dogfish. **" \l 33.2 New England Council Alternative**

The New England Council alternative includes a total quota of 4,500,000 pounds, divided into a commercial quota of 4,000,000 pounds and a spiny dogfish research set-aside quota of 500,000 pounds for fishing year 2001. Quota period 1 (May 1 through October 31) would be allocated 2,316,000 pounds (57.9%) of the 4,000,000 pounds commercial quota and quota period 2 (November 1 through April 30) would be allocated 1,684,000 pounds (42.1%) of the 4,000,000 pounds commercial quota. In addition, the NEFMC recommended a trip limit of 5000 pounds per trip (vessels are prohibited from landing more than the specified amount in one calendar day) for quota periods 1 and 2 to allow for a small scale directed fishery for spiny dogfish to continue.

3.3.2 No Action Alternative

The Alternative action considered by the Councils was to allow unregulated landings to continue in the spiny dogfish fishery for 2001-2002. Under this alternative (no action), fishing mortality in the spiny dogfish fishery would not be regulated. With no restrictions, landings would be expected to increase to 22.0 million pounds in 2001-2002 (compared to landings of 6.7 million pounds in fishing year 2000-2001).

4.0 Affected Environment

4.1 General Description of the Species and Fishery

4.1.1 Biology and Distribution

Spiny dogfish and *Squalus acanthias* are the accepted common and scientific names for the species (American Fisheries Society 1980). Spiny dogfish are also known as dogfish, horn dog, piked dogfish, and grayfish (Bigelow and Schroeder 1953). Taxonomically, they are classified as members of the Class Chondrichthyes, Order Squaliformes and Family Squalidae.

The spiny dogfish body is a common small shark which inhabits the temperate and sub-arctic latitudes of the North Atlantic and North Pacific Oceans. They can be easily recognized by the presence of two dorsal fins, each preceded by a sharp spine and by their lack of an anal fin. The upper surface of the spiny dogfish is slate grey or brownish in coloration with numerous white spots which extend the length of the body, while the lower surface of the body varies from white to grey (Bigelow and Schroeder 1953; Castro 1983).

Spiny dogfish are distributed on both sides of the Atlantic Ocean. In the Northwest Atlantic, they range from Labrador to Florida, but are most abundant from Nova Scotia to Cape Hatteras. They migrate seasonally, moving north in spring and summer and south in fall and winter. The preferred temperature range is 45^{o} to 55^{o} F. Canadian research surveys indicate that spiny dogfish are distributed throughout the Canadian Maritimes during the summer months. The stock is concentrated in US waters during the fall through spring. Spiny dogfish are considered a unit stock in the Northwest Atlantic Ocean (US and Canadian waters) and, as such, represent an interjurisdictional stock.

4.1.2 Pupping and Early Life History

Like other members of the family Squalidae, the spiny dogfish is ovoviviparous (no placenta, live bearing). Female dogfish first reach sexual maturity at about 26 in (66 cm; approximate age of 8 years) while males are first sexually mature at 24 in (61 cm; approximate age of 6 years). Nammack *et al.* (1985) reported the length and age at 50% maturity of spiny dogfish in the Northwest Atlantic to be 23.4 in (59.5 cm) and 6 years for males and 30.6 in (77.9 cm) and 12 years for females.

Mating takes place during the winter months in the North Atlantic. Fertilized uterine eggs become encapsulated in a thin, horny transparent shell known as the "candle". Newly fertilized eggs remain encapsulated in the oviduct for 4-6 months and then develop as yolk sac embryos for the ensuing 17-19 months. Prior to fertilization, large ovarian eggs develop over the year concurrently with the second year of development of the previous litter (Nammack *et al.* 1985). The pups are delivered after the two year gestation period on the offshore wintering grounds. Pups measure 8-12 inches at birth (Castro 1983).

Litter size ranges from 2 to 15 pups (average of 6) with fecundity increasing with length (Soldat 1979). About 40 % of the variability in pup production may be attributable to size of the parent (Nammack *et al.* 1985). Soldat (1979) reported that the mean fecundity of females increased from 6.2 to 6.8 pups per female as average female size increased from 30.7 in (78 cm) to 38.5 in (98 cm). Nammack *et al.* (1985) found a maximum litter size of 15, with an average of 6.5 pups per female for northwest Atlantic spiny dogfish.

The relationship between stock and recruitment for spiny dogfish, like other elasmobranchs, is direct, owing to their reproductive strategy of low fecundity combined with few, well-developed offspring (Hoenig and Gruber 1990). Although Holden (1977) provides some evidence that fecundity of sharks can increase as stock size declines, size of the female body cavity and energy considerations combine to create an upper limit on pup production per adult female. As a result, recruitment to the stock in spiny dogfish is directly related to and dependent upon the number of adult females in the stock. The direct relationship between adult stock and recruitment is the most critical factor in the development of a rational strategy of exploitation of elasmobranch stocks (Hoenig and Gruber 1990), including spiny dogfish.

4.1.3 Age and growth

Dorsal spine circuli (concentric rings) have been used to estimate age of spiny dogfish in the Northwest Atlantic, as well as in other regions. The spiny dogfish is a long lived, slow growing species. Nammack *et al.* (1985) reported maximum ages of in the Northwest Atlantic for males and females to be 35 and 40 years, respectively. Holden (1977) reported a maximum age of 25 years for the European population of spiny dogfish. In contrast, McFarlane and Beamish (1987) reported a maximum age of 70 years in the North Pacific. Holden and Meadows (1962) observed ages up to 21 years in the spiny dogfish from the Northeast Atlantic Ocean. Ketchen (1975) reported an age of 64 years and calculated growth parameters of K=0.048 and L_{max} of 125.3 cm for female spiny dogfish in the Northeast Pacific. Nammack *et al.* (1985) reported calculated growth parameters of K=0.106 and L_{max}= 100.5 cm for the Northwest Atlantic population of spiny dogfish.

Sexually dimorphic growth in spiny dogfish is strongly apparent. Females attain a greater size than males, reaching maximum lengths up to 49 inches (125 cm) and weights up to 22 pounds (10 kg).

4.1.4 Length-weight relationship

NEFSC (1994) reported the following length weight relationships for spiny dogfish:

Females: $W = \exp(-15.0251) * L^{3.6069}$ and

Males: $W = \exp(-13.002) * L^{3.097787}$

where W equals weight in kg and L equal length in cm.

4.1.5 Mortality

The instantaneous natural mortality rate (M) is defined as annual losses experienced by adult spiny dogfish from all natural and anthropogenic factors except commercial and recreational fishing. As for most elasmobranchs, natural mortality rates for spiny dogfish are poorly known. NEFSC (1994) used several methods to estimate M for spiny dogfish. The first method was based on estimates of maximum longevity. Hoenig (1983) related published natural mortality rates (M) to the maximum age (t_{max}) of 83 fish stocks, from which he developed the following predictive equation:

$$\log_e (M) = 1.46 - 1.01 \log_e (t_{max}).$$

Based on a maximum age (t_{max}) of 50 years for spiny dogfish results in M value of 0.083 based on the Hoenig method.

An estimate of M was also derived using method of Holden (1974) who proposed, that the solution of the equation $Z' = xe^{-Ztm}$ would provide an estimate of M for an unfished stock, where x is the expected number of pups produced per female per lifetime and t_m is the average age at which maturity is reached. This method resulted in a value of M for spiny dogfish which was inconsistent with other aspects of their biology and was rejected (NEFSC 1994). NEFSC (1994) also derived estimates of M by considering the level of mortality necessary to reduce the recruited population to 1% of its initial value for different assumed estimates of longevity. Assuming a maximum longevity of 50 years for spiny dogfish in the Northwest Atlantic yields an estimate of M of 0.092, which was the value assumed for spiny dogfish greater than 12 in (30 cm) in the NEFSC 1994 and 1998 assessments and subsequent analyses conducted by the Spiny Dogfish Technical Committee. This value agrees well with Wood *et al.* (1979) and with the empirical value of 0.083 estimated from Hoenig's (1983) equation. The value of M assumed in the current analyses (0.092) is too high if spiny dogfish live longer than 50 years, which may be the case.

4.1.6 Food and feeding

Bowman *et al.* (1984) provided an extensive examination of the diet of spiny dogfish collected from shelf waters of the Northwest Atlantic Ocean during the period 1969-1983. The area studied included continental shelf waters extending from Cape Hatteras, North Carolina to Browns bank, Nova Scotia. The stomach contents of 10,167 spiny dogfish were examined during this period (about 50% of the stomachs were empty). Fish comprised the single most important prey item in the diet of spiny dogfish. Herrings (several species), Atlantic mackerel, American sand lance, and codfishes, including species such as Atlantic cod, haddock, silver hake, red hake, white hake and spotted hake were some of most important prey items identified. Other important contributors to the diet of spiny dogfish included *Loligo* and *Illex* squid, ctenophores, crustaceans (principally decapod shrimp and crabs) and bivalves (principally scallop viscera).

Bowman *et al.* (1984) observed a high degree of variability in the diet of spiny dogfish across seasons, areas and years. They considered this a reflection of their omnivorous nature and the high degree of temporal and spatial variability of both dogfish and their prey. Their diet appears broadly related to abundance trends in some of their major prey items. For example, when herring abundance was declining and mackerel abundance appeared to be at a peak during the period 1969-1972, Bowman *et al.* (1984) found mackerel to predominate in the diet of spiny dogfish. Conversely, during 1973-1976 when mackerel abundance was declining the incidence of mackerel in the diet of spiny dogfish was substantially reduced.

The incidence of *Loligo* and *Illex* squid in the diet of spiny dogfish was also shown to be related to their abundance. Another example of the opportunistic nature of spiny dogfish feeding was the appearance of scallop viscera in their diet after the increase in sea scalloping in the Northwest Atlantic Ocean beginning in 1978. Bowman *et al.* (1984) reported that trends in the incidence of scallop viscera in the diet of spiny dogfish closely followed trends in the level of sea scallop fishing effort in the study area.

4.1.7 Predators and competitors

As noted in the previous section, Atlantic herring, Atlantic mackerel, and *Loligo* and *Illex* squid are important components of the diet of spiny dogfish when they are abundant and available. As a result, spiny dogfish are potential competitors with virtually every marine predator within the Northwest Atlantic Ocean ecosystem. These include a wide variety of predatory fish, marine mammals and seabirds.

For example, bluefish, sea ravens, and the Atlantic angel shark are known to be major *Loligo* predators. The fourspot flounder, witch flounder, roughtail stingray, and white hake are also known to prey on *Loligo*. In many cases, squid remains in the stomach of fish are only identified as "squid" without reference to species. It is likely that some of these are *Loligo* and there are at least 42 other species of "squid"- eating fish in addition to those identified above (Langton and Bowman 1977). Cetacean and seabird predation upon squid is substantial. Kenney *et al.* (1985) estimated that between 154,000 mt and 224,000 mt of squid were consumed off the northeast US annually by whales and dolphins.

Illex are a major source of food for marine carnivores. Adults are heavily preyed on by porpoises, whales, and numerous pelagic fishes (e.g., tuna and swordfish). Other known predators of *Illex* are the fourspot flounder, goosefish, and bluefish. *Illex* is probably eaten by a substantially greater number of fish, however, partially digested animals are often difficult to identify and are simply recorded as squid remains, with no reference to the species. There are at least 47 other species of fish that are known to eat "squid" (Langton and Bowman 1977). As noted above, squid comprise an important component of the diet of marine birds and mammals (Kenney *et al.* 1985).

Atlantic mackerel have been identified in the stomachs of numerous fish species. They are preyed upon heavily by whales, dolphins, silver hake, white hake, weakfish, goosefish, Atlantic cod, bluefish, and striped bass. They also comprise part of the diet of swordfish, red hake, Atlantic bonito, bluefin tuna, blue shark, porbeagle, sea lamprey, and shortfin, mako and thresher sharks (Langton and Bowman 1977).

4.2 Fishery Description

4.2.1 Commercial Fishery

United States fishermen have been landing spiny dogfish along the Northeastern coast of the US since the 1880's (Bigelow and Schroeder 1953). The early domestic fishery utilized long lines and otter trawls but was of relatively minor importance to the US fishery due to low market demand. In fact, spiny dogfish were generally avoided by US fishermen and remained lightly exploited during the late 19th and most of the 20th century. However, spiny dogfish have been a popular foodfish in various European markets and have also been the target of the foreign fishing fleets throughout the world, including the east coast of North America (Soldat 1979).

The history of the US commercial fishery for spiny dogfish can be divided into three more or less distinct phases. In the first phase, prior to the passage of the Magnuson Act, reported US commercial landings of spiny dogfish were very small. Historical records dating back to 1931 indicate that US commercial landings of spiny dogfish were relatively minor, with less than 0.25 million pounds per year reported landed prior to 1960 (NEFSC 1998). There was a modest increase in dogfish landings from 1962-1966, when an average of 1.2 million pounds was landed by US fishermen. The annual US domestic spiny dogfish landings from Maine to North Carolina averaged roughly 0.7 million pounds from 1962-1978 (Table 1). Following the passage of the Magnuson Act, a second phase characterized by moderate US spiny dogfish landings began, as reported landings increased with the cessation of foreign fishing for dogfish in the US EEZ . During 1979-1989, US commercial spiny dogfish landings ranged from 9-15 million pounds. US commercial landings averaged 11.7 million pounds during this phase of moderate landings.

Beginning in 1990, the US commercial fishery for spiny dogfish began to expand dramatically. Landings increased six-fold from roughly 10 million pounds in 1989 to 60 million pounds in 1996. Spiny dogfish commercial landings declined to 45.2 million pounds in 1997. During this third phase of rapid fishery expansion (1990-1997), US commercial landings averaged about 40 million pounds. Cumulative removals during this eight year period was roughly 340 million pounds. In contrast, cumulative US landings for the period 1962-1989 (i.e., the previous 28 years) were only 118.6 million pounds. Foreign landings during the during the period 1965-1977 were about 345 million pounds. Thus, since 1990, the recently expanded US fishery has landed roughly the same weight of spiny dogfish in eight years that the foreign fishery removed in the 13 years prior to the passage of the Magnuson-Stevens Act. However, although the reported weight of landings were similar, the recent US fishery generated significant discards and the landings were comprised almost exclusively of mature females. In contrast, the foreign fishery was prosecuted on all sizes of spiny dogfish with minimal discarding (NEFSC 1998). Since the peak landings which occurred in 1996 (60.3 million pounds), spiny dogfish landings have declined both as a function of declining stock size from 1997-1999 and, more recently, due to regulation of the fishery under the Magnuson Act. Prior to regulation of the fishery, spiny dogfish landings declined to 45.3 million pounds in 1997, 43.0 million pounds in 1998 and then to 32.5 million pounds in 1999 (Table 1). In 2000, spiny dogfish landings declined to 12.5 million pounds due to implementation of a restrictive quota under the FMP which was implemented beginning in May 2000. Spiny dogfish are landed in every state from Maine to North Carolina (Table 2). However, prior to 1990, Massachusetts was responsible for the vast majority of commercial spiny dogfish landings. Beginning in 1989 (as the US fishery expansion began), the states of New Jersey, Maryland and Maine began to increase in importance. By 1996, the expansion of the spiny dogfish fishery had occurred in virtually every state, especially in North Carolina since 1992. Overall, Massachusetts and North Carolina recorded the highest landings of spiny dogfish during the period 1988-1997, followed by Maryland, Maine, New Jersey, Rhode Island, New Hampshire, and Virginia (Table 3).

Numerous gear types are reported as taking spiny dogfish based on NMFS weighout data. However, two principal gear types, trawls and gill nets, accounted for the majority of spiny dogfish commercial landings historically. From 1988-1990, roughly equal amounts of spiny dogfish were landed by trawls and gill nets. As the fishery expanded in the early 1990's, gill nets increased dramatically in importance. In 1991, gill nets accounted for greater than 60% of the dogfish landed and increased to 75% of the landings by 1993. In 1996, gill nets accounted for greater than 80% of the 60 million pounds of spiny dogfish landed in that year. Thus, the dramatic increase in spiny dogfish landings in recent years is due to largely to an increase in gill net activity within the fishery.

Spiny dogfish are landed in all months of the year (Table 3) and throughout a broad area along the Atlantic coast, principally from Maine to North Carolina. However, the distribution of those landings vary by area and season. During the fall and winter months, spiny dogfish are landed principally in Mid-Atlantic waters and southward from New Jersey to North Carolina. During the spring and summer months, spiny dogfish are landed mainly in northern waters from New York to Maine (Table 3).

Spiny dogfish landings by water area (state vs. EEZ) were available from the NMFS weighout data base prior to 1994. However, beginning in 1994, NMFS port agents no longer routinely collected distance from shore information (C. Yustin, pers. comm.). Based on historical weighout data prior to 1994, the vast majority of spiny dogfish landings were taken from the EEZ. For example, from 1989-1993, the EEZ proportion of total landings ranged from 88-95%. Beginning in 1994, only a fraction of the total landings can be assigned to a distance from shore category (i.e., only North Carolina landings) based on NMFS Weighout data. Since then, there appears to be a shift in the spiny dogfish fishery to inshore waters based on North Carolina landings. However, a preliminary analysis of vessel trip report (VTR) data indicates that there has been a shift in the fishery to inshore waters during recent years. Using the location fished information from the VTR data to prorate total landings from the weighout data, a preliminary analysis supplied to Council staff from the NMFS NERO indicated that the fishery has shifted inshore based on 1996 and 1998 VTR data (Yustin, pers. comm.). Based on this analysis, from 65-67% of the landings were estimated to originate from state waters in 1996 and 1998. However, since directed spiny dogfish fishermen were not required to submit logbook information in 1996 and 1998, the degree to which the VTR data are representative of the directed spiny dogfish fishery is unknown.

A total of 6.7 million pounds of spiny dogfish was landed during the 2000-2001 fishing year (May1, 2000-present) based on unpublished NMFS dealer reports (Table 4). The quota specification for 2000-2001, as implemented by Secretarial Interim Action, was 4.0 million pounds. Thus, the quota specification for the entire 2000-2001 fishing year was exceeded by 2.7 million pounds or 67 %. Due to the overage which occurred in 2000-2001 during the first quota period, the spiny dogfish fishery in the EEZ was closed in late August of 2000 and remained closed for the rest of the fishing year.

The second quota period for 2000-2001 was allocated 1,684,000 pounds or 42.1% of the annual quota under the Secretarial Interim Action. However, the closure of the fishery in August 2000 for the remainder of the fishing year resulted in virtually no landings for the second quota period from the EEZ. As a result, vessels which traditionally landed spiny dogfish in the second half of the fishing year were unable to do so in 2000-2001. This situation arose because regulations promulgated under the federal FMP only control actions of federal spiny dogfish permit holders. As a result, vessels which did not possess federal spiny dogfish permits were able to land spiny dogfish until the Atlantic States Marine Fisheries Commission (ASMFC) took an Emergency Action in August 2000 to close state waters to the take of spiny dogfish during periods of closure of the EEZ. The ASMFC took additional action in January 2001 to extend this Emergency Action for an additional year. As a result of this action, the overage that occurred in 2000 should not occur during the 2001-2002 fishing season. In addition, the Councils and ASMFC are considering additional management actions to insure that the annual quota specified for spiny dogfish is not exceeded. The Councils are currently developing Amendment 1 to the Spiny Dogfish FMP which includes an alternative which would subtract future overages from the quota period in which it occurred in subsequent fishing years. The ASMFC is currently drafting a spiny dogfish FMP for state waters which may provide a more permanent solution to this problem.

4.2.2 Recreational Fishery

Estimates of recreational catch and landings of dogfish were obtained from the NMFS Marine Recreational Fishery Statistics Survey (MRFSS). Recreational catch data have been collected in a consistent fashion since 1981. Methodological differences between the current survey and intermittent surveys before 1981 preclude the use of the earlier data. The MRFSS consists of two complementary surveys of anglers *via* on-site interviews and households *via* telephone. The angler-intercept survey provides catch data and biological samples while the telephone survey provides a measure of overall effort. Surveys are stratified by state, type of fishing (mode), and sequential two-month periods (waves). Annual catches pooled over all waves and modes and grouped by subregion (Maine to Connecticut, New York to Virginia and North Carolina to Florida) were examined.

Catches are partitioned into three categories: A, B1, and B2. Type A catches represent landed fish enumerated by the interviewer, while B1 are landed catches reported by the angler. Type B2 catches are those fish caught and returned to the water. In as much as dogfish are generally caught with live bait and are often mishandled by anglers, NEFSC (1998) assumed 100% discard mortality. The MRFSS provides estimates of landings in terms of numbers of fish. Biological information on dogfish is generally poor, resulting in wide annual fluctuations in mean lengths and weights. As a result, to compute total catch in
weight NEFSC (1998) assumed an average weight of 5.5 pounds (2.5 kg) per fish for all years. This assumption was used to the estimate recreational catch in weight.

Excluding the recreational estimate for 1981, total recreational catches increased from about 150,000 pounds in 1982-83 to greater than 900,000 pounds in 1989. Since then the estimates of spiny dogfish recreational catch in weight have declined. The 1993 estimate was about 265,000 pounds. Total catch in weight declined to less than 80,000 pounds in 1996, but increased to 146,000 pounds in 1997.

Total catches in number (Type A + B1 + B2) increased nearly five fold from 1982-1989. In the North Atlantic subregion (Maine-Connecticut), catches peaked in 1988 at nearly 400,000 fish and declined to fewer than 250,000 in 1993. Peak catches of nearly 500,000 fish occurred in the Mid-Atlantic states (New York-Virginia) in 1990. The number caught in 1993 declined to about 250,000. Catches of spiny dogfish from North Carolina to Florida increased dramatically after 1979, but are an order of magnitude lower than observed in the Mid-Atlantic and New England states. Historically, less than 4% of the spiny dogfish catch comes from North Carolina to Florida. Most dogfish are released after capture (Type B2) and the B2 proportion of the catch has increased to more than 90% in recent years. Most of the recreational spiny dogfish catch is taken from party/charter and private/ rental boats and in ocean waters greater than three miles from shore.

NEFSC (1998) considered the possibility that recreational catches may simply reflect increased reporting by anglers. If so, there should be no relation between catch and fishery-independent indices of abundance. The log of total catch was significantly correlated (r=0.62, P=0.015) with the log of average weight per tow from the NEFSC spring research vessel survey. Thus, increases in recreational catches roughly parallel increases in abundance and the hypothesis of an increased reporting rate was not supported (NEFSC 1998).

Even if all of the Type B2 catch is assumed to die after release, recreational catches have constituted only about 8% of the total landings. Therefore, any imprecision in the estimation of recreational landings is inconsequential relative to the commercial landings and discards, especially in recent years.

4.2.3 Foreign Fishing Activities

As noted above, spiny dogfish were generally avoided by US fishermen and remained lightly exploited during the late 19th and most of the 20th century. However, spiny dogfish have been a popular foodfish in various European markets and have also been the target of the foreign fishing fleets throughout the world, including the east coast of North America (Soldat 1979). Significant fishing effort directed at the spiny dogfish began in 1965 by vessels from the former Soviet Republic (USSR). By 1970, Poland, the former German Democratic Republic, Japan and Canada had also entered the fishery. Most of the foreign landings during the 1970's were attributable to vessels from the former USSR and originated from waters which later became regulated under the Magnuson Act (NAFO Areas 5 and 6). Reported foreign landings of spiny dogfish in NAFO Areas 2-6 increased from about 0.5 million pounds in 1962 to a peak of 54.4 million pounds in 1974 (Table 1). Foreign spiny dogfish landings averaged 29.6 million pounds for the period 1965-1977. Cumulative landings for the same period were 346.5 million pounds.

Foreign fishing for spiny dogfish began to be regulated with the advent of extended fishery jurisdiction in the US under the Magnuson Act in 1977. US regulations restricted foreign vessels fishing for squid and other species to certain areas and times (the so-called foreign fishing "windows"), primarily to reduce spatial conflicts with domestic fixed gear fishermen and minimize bycatch of non-target species. The result of these restrictions was an immediate reduction in the foreign landings of spiny dogfish from 37.4 million pounds in 1976 to 1.6 million pounds in 1978. Foreign landings from the US EEZ have remained sharply curtailed since the period of fishery expansion during the 1970's.

The Canadian landings of spiny dogfish are relatively minor compared to the recent US fishery. Since 1977, reported Canadian landings of dogfish have ranged from zero in several years to 4.0 million pounds in 1994. In most years the landings in this country were one million pounds or less, as was case in 1996, the most recent year for which Canadian spiny dogfish landings were available.

4.3 Status of the Stock

The status of the spiny dogfish stock in the Northwest Atlantic Ocean was most recently assessed at SAW-26 (NEFSC 1998). The results of that assessment suggest that the spiny dogfish stock in the Northwest Atlantic began to decline in the early 1990's as a result of the recent increase in exploitation. Swept-area estimates of fishable biomass (defined as dogfish $\geq$ 31.5 in) increased six-fold from 1969 to 1989 but have since declined to less than 170 million pounds. NMFS research survey data documented a steady rise in both abundance and biomass since the early 1970's but total biomass indices of large spiny dogfish have already declined from about 661 million pounds in 1990 to about 331 million pounds by 1997, approximately equal to levels observed in the early 1970's. However, because the fishery targets mature females, the estimated biomass of mature females has declined more dramatically (NEFSC 1998). In addition, length frequency data from both US commercial landings and research surveys indicate a pronounced decrease in the average size of females in recent years. For example, 75% of the females landed in the NEFSC spring trawl survey were below the length at 50% maturity (NEFSC 1998). In addition, the mean length of female dogfish landed in the commercial fishery declined from 38 inches (97 cm) in 1982 to 33 inches (84 cm) in 1996.

Recent levels of fishing mortality have exceeded the replacement level of the stock. The removal of a large portion of the female spawning stock since 1989 has reversed the trend of increasing mature biomass since the late 1970's. The NEFSC spring survey biomass index fluctuated from 29 to 147 pounds/tow during 1967 to 1979. Since 1979, the biomass index has ranged between 86 pounds/tow in 1983 and 330 pounds/tow in 1990. The biomass index for males has fluctuated between 133 pounds/tow in 1990 and 82 pounds/tow in 1997. The male biomass index was 130 pounds/tow in 1996. The male biomass index has since declined to 65 pounds/tow. The female biomass has shown a greater decline during the l990s, declining from 196 pounds/tow in 1990 to 99 pounds/tow in 1997. Since then, the three year moving average female biomass per tow for the period 1998-2000 has declined to about 57 pounds/tow (Rago 2000).

Minimum biomass estimates based on swept-area estimates from NEFSC spring surveys were segregated by sizes (representing immature and mature female dogfish) in the most recent assessment. The swept area estimate of female biomass between 14 and 31 in (36 and 79 cm) increased steadily from 37.0 million pounds in 1980 (the first year that dogfish captured by the research survey were recorded by sex) to 452 million pounds in 1997. Large, mature female biomass was over 882 million pounds in 1982, 1988, and 1990. Since 1990, the estimate of mature female biomass declined steadily. The three year moving average of swept area female biomass for the period 1998-2000 has declined to about 128 million pounds (Rago 2000).

The most recent update of the status of the spiny dogfish stock was presented at the November meeting of the Spiny Dogfish Monitoring Committee based on the most recent (through spring 2000) audited NEFSC spring trawl survey data. NEFSC spring survey mean number per tow and biomass per tow values for female spiny dogfish at length for three time periods (1985-88; 1995-1997 and 1998-2000) were compared. Notable was the reduction in the biomass of adult females (>85 cm) throughout the three time series. In addition, the large accumulation of female biomass between 60 and 90 cm evident in the 1995-1997 time period has been greatly reduced (based on the 1998-2000 data). It was also noted that the accumulation of female biomass at these medium size classes (which formed a major component of stock biomass in the 1995-1997 period) is what permitted stock rebuilding in a relatively short period of time for a long lived, slow growing elasmobranch such as spiny dogfish.

These data illustrate the effect of the recent increase in directed fishing on the adult female portion of the stock since 1989 by comparing female numbers and biomass at length for the pre-exploitation phase (1985-88) and the post-exploitation phase (1998-2000). Prior to the post-1989 expansion of the directed fishery, the stock was comprised of an accumulation of large adult females (>80 cm) and a substantial number of small dogfish (<40 cm) which were the offspring resulting from this accumulation of adult females. Since the advent of the recent directed fishery, the adult female portion of the stock has been dramatically reduced. As a result, pup production has also declined dramatically in recent years. The survey indices for pups have been the lowest in the time series for the past four consecutive years (1997-2000), indicating recruitment failure, as a result of the dramatic reduction in adult female biomass.

In addition, fishing mortality estimates from the B-H model have increased dramatically from less than 0.05 prior to 1990 to greater than 0.3 since about 1995 (Rago pers. comm.). Fishing mortality has exceeded the threshold level of 0.11 since 1991 regardless of the assumed level of natural mortality (0.06 to 0.09) and the size at entry into the fishery (70 to 90 cm).

Updated NEFSC survey indices (number and weight per tow), swept area biomass estimates, and length frequency distributions for spiny dogfish were also examined by the Spiny Dogfish Monitoring Committee. Survey data illustrated the dramatic reduction in the biomass of spiny dogfish pups based on the decline in biomass of dogfish < 35 cm. In addition, the most recent 3-yr average (1998-2000) estimate of adult female biomass is about 58,000 mt or 29% of the disapproved biomass rebuilding target (B_{msy}) of 200,000 mt.

4.4 Economic and Social Environment

4.4.1 Economic Characteristics of the Fishery

Spiny dogfish have become an increasingly important species to the commercial fishing sector from North Carolina to Maine over the past decade, while the recreational fishery for spiny dogfish is of little or no importance to the Atlantic coast recreational fisheries. For example, only 150,000 pounds of spiny dogfish was landed (catch type A + B1) by anglers in 1997 while the commercial landings in that same year was about 45 million pounds. Thus, it is evident that dogfish play a much greater role in the commercial fishery than the recreational fishery.

The individual firms engaged in the commercial harvesting and marketing of spiny dogfish make expenditures and generate employment in the course of business activities. When considering the relative benefits of spiny dogfish between commercial and recreational fishing sectors, it is difficult to juxtapose the value and impacts of each sector. Recreational values are not easily measured and too often, economic impacts of recreational fishing are erroneously contrasted with ex-vessel value in the commercial sector.

4.4.2 Commercial fishery

In general, the commercial fishery is divided into three parts: producers, processors, and marketing. The following section examines these three components of the commercial spiny dogfish fishery in order to better understand this fishery.

Ex-vessel value for 1988-1997 is illustrated in Tables 5 (total annual) and 6 (annual by state). The commercial landings increased steadily from slightly less than 6.0 million pounds in 1987 to 60.0 million pounds in 1996. In addition, the average ex-vessel price for spiny dogfish increased 300% between 1988 and 1996 (using 1995 adjusted mean).

Spiny dogfish are landed in the northeast primarily from May through October and in the mid-Atlantic from mid-November to April. Sink gill nets are the predominate gear used to catch spiny dogfish, comprising some 56% of the total catch in 1996. Other types of gill nets were used in 22 % of the 1996 spiny dogfish catch while 12% of the landings during this same year were from otter trawls.

Spiny dogfish are landed primarily from Maine to North Carolina. However, several states land the majority of spiny dogfish. Average landings for each state during 1988-1997 are broken down as follows: Massachusetts 55%, North Carolina 16%, Maryland and Maine with 7% each, and New Jersey with 5%. In total, these states landed 90% of the spiny dogfish from 1987-1996. Furthermore, there are several ports which landed a disproportionate amount of spiny dogfish in 1996. Notably, four ports comprise 44% of the 1996 spiny dogfish landings: Chatham, MA--14%; Plymouth, MA--12%; Ocean City, MD--12%; Gloucester, MA--6%.

Prior to FMP implementation, no permit was required for commercial fishing vessels landing spiny dogfish. As such, information on the total number of vessels landing spiny dogfish has been difficult to discern. NMFS weighout data can be used to approximate the number of vessels involved in the spiny dogfish fishery, but these data do not constitute a complete census. NMFS weighout data indicate that 595 vessels employing primarily the aforementioned gear types landed spiny dogfish in 1997 (sink gill nets, other types of gill nets, and otter trawls) while 596 vessels landed spiny dogfish in 1999. It was assumed in prior analyses that most of these vessels will apply for the permit required under the current FMP for two reasons: to maintain flexibility in the complex of species they fish and second, since the current management alternatives involve greatly reducing landings after the first year, there is little incentive not to fish in the first year of the FMP (after which the directed fishery was ostensibly closed). Beginning in 2000, regulations promulgated under the FMP required commercial vessels fishing for spiny dogfish in the EEZ to obtain a permit. Based on unpublished Northeast Permit data files, a total of 2759 vessels obtained commercial spiny dogfish permits in 2000.

Based on the number of trips landing dogfish in 1996 (13,632), the average ex-vessel value per trip was $807 (obtained by dividing the total 1996 ex-vessel value by the number of trips landing spiny dogfish in 1996). This would indicate that the fishery is a mixed fishery where the participants fish for a complex of species. This is reinforced by the number of other permits vessels landing spiny dogfish hold. Table 7 contains the number of different Northeast fishery permits held by the 595 vessels which landed spiny dogfish in 1997 based on NMFS permit file data.

4.4.3 Recreational fishery

In the recreational fishing sector, value and impacts are usually conceptualized as expenditures and revenues associated with fishing trips rather than the value of landings. Impacts and value for a particular species are best thought of in terms of expenditures and concomitant revenues derived from trips targeting that species of fish. The 1994 Marine Recreational Fisheries Statistics Survey (MRFSS) indicated that of the 33,279 intercept surveys conducted in New England and the Mid-Atlantic, 4 anglers were targeting spiny dogfish as their "primary" species. Although this number is not expanded to represent all anglers making trips during that year, it suggests that there is not a substantial directed recreational fishery for spiny dogfish.

Therefore, most of the catch of spiny dogfish in the recreational fishing sector appears to be incidental in the targeting of other species. Landings (catch type A + B1) of spiny dogfish by recreational anglers in 1996 was 14,408 pounds; the second lowest landing level since 1981 (1992 landings were 9,236). Of the total spiny dogfish caught in 1996, 7% was caught from beach, shore, or man-made structure; 40% was caught from a party or charter boat; and, 53% was caught from a private or rental boat. Given the migratory range of spiny dogfish, most were caught in North Atlantic and the Mid-Atlantic: 38% in the North Atlantic and 61% in the Mid-Atlantic (based on numbers of fish caught). Thus the value of spiny dogfish in the recreational fishing sector in terms of angler expenditures and revenues derived from those expenditures in the targeting of this species appears to be fairly low. Although a recreational demand curve for spiny dogfish is unavailable, based on the low level of interviewed anglers targeting spiny dogfish in recent years, there would likely be very little lessening of demand for marine recreational fishing trips as a result of any future recreational catch restrictions on spiny dogfish.

4.4.4 Foreign markets and international trade

The increase in landings as well as the noticeable increase in average ex-vessel price in reportedly due to the development of export markets for spiny dogfish. In Great Britain and France, the portion of the fish commonly called the "back" is used in fish and chips. The market price depends largely on the availability of a competing product from Scotland. Belly flaps are used in Germany and France for a cured product called *schillerlocken*. Backs and bellies are commonly sold in two sizes, medium and large. These sizes are further divided into fresh and frozen categories. Fresh fish is air-freighted to awaiting European markets while frozen product is more apt to be sent by ship. In general, the fresh bellies and backs garner higher prices than frozen product.

Tails and fins (excluding the dorsal fin which is not exported and currently has no market) are exported primarily to Pacific Rim nations. Spiny dogfish skins are used in the production of "shark skin" products and the head is used in two ways: (1) it is sold as bait for other fisheries or the cartilage is dried and pulverized to service a market for medicinal uses (primarily exported to Pacific Rim nations).

4.4.5 Description of Affected Human Environment

In order to identify the ports important to fisheries managed by the Mid-Atlantic Council and to identify the fisheries relatively important to those ports, the Council retained Dr. Bonnie J. McCay of Rutgers University to prepare a background document (McCay *et al.* 1993). This research covered ports from Chatham, Massachusetts, to Wanchese, North Carolina. McCay *et al.*1993 and was largely based on two data sources, 1992 NMFS landing statistics and information about the ports obtained from interviews with key informants. The quality of the port descriptions, therefore, partially depends on the information supplied by the informants. More recently, McCay and Cierei (2000) provided updated port descriptions for the states from New York to North Carolina based on 1998 landings and personal interviews. The port descriptions that follow for Massachusetts to Connecticut were taken from McCay *et al*. 1993. The port descriptions for the states from New York to North Carolina were condensed from McCay and Cierei (2000). Since the port descriptions provided here are brief summaries of the material contained in McCay *et al*. (1993) and McCay and Cierei (2000), readers requiring more detailed information are encouraged to obtain the original reports.

For purposes of orientation, Barnstable County, MA includes all of Cape Cod, including the fishing port of Chatham. New Bedford is located in Bristol County, MA. The port of Newport is located in Newport County, RI. Galilee is located in Washington County, RI. Stonington is located in New London County, CT. Greenport, Shinnecock/Hampton Bays, and Montauk are located in Suffolk County, NY. Freeport is located in Nassau County, NY. Brooklyn is located in Kings County, NY. Ocean City is located in Worcester County, MD. Virginia has a system whereby certain cities exist apart from counties. Within the scope of this analysis, Hampton, Norfolk, Newport News and Virginia Beach all fall into this category. Wanchese is located in Dare County, NC.

Chatham, Massachusetts

The total landed value of fish in Chatham in 1992 was around $11 million. Groundfish and shellfish -- bay scallops, quahogs, and mussels-- comprise the majority of the landed value for Chatham, accounting for over 80% of the landed value. *Loligo* accounted for 2.38% of landed value in 1992, harvested by pound-nets (65%) and fish pots (37%).

Atlantic mackerel accounted for 0.45%, caught by fish pots (77%), draggers (5%), and sink gill nets (4.6%). Pound nets and fish pots or traps accounted for only 4.6% of the total landed value of species in Chatham in 1992. However, *Loligo* accounted for 31% of the fish pot value and 86% of the pound net revenue. Atlantic mackerel accounted for 12% of the fish pot value and 3% of the pound net revenue. Butterfish accounted for 0.33% of the fish pot value and 0.20% of the pound net revenue.

New Bedford, Massachusetts

The squids, mackerel, and butterfish are not important to New Bedford. *Loligo* squid made up 0.05% of the total landed value for New Bedford in 1992. The other species covered by this FMP accounted for less than 0.01%.

Loligo is caught during the spring months of April and May by inshore boats in Nantucket Sound, and more boats are now fishing for *Loligo* offshore, reported a New Bedford port agent. Even into late fall, he said, boats are targeting squid offshore. New Bedford's *Loligo* fleet are those that summer flounder during the summer. They target squid during the spring and fall when they are not going for summer flounder. The port agent reported that some of the small boats offload at sea to freezer boats from Rhode Island.

Newport, Rhode Island

Within Newport, there are three commercial fishing packing and distributing businesses. One mainly deals with draggers, gillnetters, and some scallopers, and brings in a great deal of groundfish. Another is a lobster house, but they also handle the trappers. There is also a trap company located in Newport. Species caught in traps are discussed below. The dealer that handles mostly draggers packs and distributes the majority of species of important to this study. The trap company also deals with these species but not in as large of quantities.

Approximately 15 large draggers were tied up at the fish house that deals with draggers during a recent visit (1992) to Newport. The fish house owner, the local port agent, and fishermen spoken with on this day said that having 15 boats in port at the same time was unusual, and had to do with a storm moving through the area. Most of the boats that offload at the Newport fish house are not from Newport. They are from other ports such as New Bedford, various Long Island ports, Cape May, and Pt. Judith. These boats are going primarily for squid at the time of our visit, which was in December. This particular fish house owner does not own any of the boats that offload at his dock.

The fishermen who make up the crews in Newport are not necessarily from Newport, but some local people from the area do work on the boats. Some crew members come from Point Judith, New Jersey, New York, and New Bedford. Typically, the owners of the boats do not work the boats. Often the owners used to fish but do not anymore. As with almost all of the ports, crews are paid on the share system.

The total value of landings in Newport for 1992 was $14.5 million. Lobster ranked first, accounting for 44% of landed value. *Loligo* ranked sixth.

Other Washington County Communities, RI (including Quonset Point)

The value of the landings at Other Washington County communities including Quonset Point in 1992 was around $20 million.

Other Washington County including Quonset Point includes both traditional and innovative fisheries. Processing facilities for squid in the region have resulted in the dominance of both *Loligo* and *Illex* squid in terms of landed value, but lobster and bay quahogging and oystering remain important, as well as other inshore activities such as eel potting, trapping striped bass, and an unusual spear fishery for tautog (blackfish). There is some handlining for bluefin tuna and trolling for inshore species such as striped bass and summer flounder as well as yellowfin tuna.

Atlantic mackerel, butterfish, scup, summer flounder, and angler are among the top ten species landed by value, and they figure importantly in the catch of the otter trawl vessels. The gillnet fishery for cod and tautog includes a small amount of angler and Atlantic mackerel. The fish pots are predominantly for scup, but some black sea bass, summer flounder, bluefish, and *Loligo* squid are caught in them too.

Virtually all of the angler, butterfish, weakfish, Atlantic mackerel, and squid landed here are brought in by draggers.

A major fishing location in Washington County is located at Quonset Point, an abandoned Navy Base which houses several isolated industrial developments, including a major offloading facility for car imports. As for commercial fishing, Quonset Point is port to five factory trawlers, two of which are from Rhode Island and three from Portland, Maine. The five trawlers range in length from 117 ft. to 155 ft., and they can hold 4 to 5 hundred thousand pounds. of frozen product per trip. This contrasts with wet boats which have a 150,00 thousand pounds. capacity. The Rhode Island boats are owned by the president of a service and sales facility located at Quonset Point. The other three boats are owned by a man from Portland, Maine.

The service and sales facility located at Quonset Point started out with one boat about seven to eight years ago. The two boats owned by the president of the facility at Quonset Point were built specifically as freezer boats. These boats take one to two week trips. The three boats from Maine are converted supply boats and they may stay out as long as thirty days on some trips.

On occasion, the freezer trawlers engage in joint ventures with American boats. The smaller boats will fish and offload onto the freezer boats. The freezer boats have also in the past participated in joint ventures with Russian, Dutch and Polish boats.

The freezer boats target *Loligo* squid, *Illex* squid, butterfish, mackerel, whiting and sometimes scup. They may target herring but not normally.

The *Illex* squid season lasts from June to October, and the freezer boats average 12 day trips when they are working *Illex*. November to May is the *Loligo* season, and the trawlers average 30 days out while they are targeting *Loligo*. Mackerel is caught from December to April.

The freezer trawlers do not have any significant landings of butterfish. Butterfish is available year round, but they are only desirable from December to February because of their fat content.

The Quonset Point boats will fish from North Carolina up to the Canadian border although they rarely go that far north. They fish for *Illex* up to 600 ft (100 fathoms) off the coast of New Jersey. *Loligo* fishing is mostly done around Hudson Canyon and Block Canyon.

The fish is packaged on the boats in plastic bags and placed in aluminum trays. Fiberboard boxes are also used. The boxes hold approximately 27 to 28 pounds of fish and one boat can hold approximately 13,000 boxes, or 360,000 pounds of fish.

The freezer trawlers are at sea 280 days per year. October and May are the slow months. During this time, the crew works on boat maintenance and painting.

In 1992, the average cost of operating one of these boats for two years was $2,200,000, which covered fuel, maintenance, repairs and nets.

The Rhode Island boats have from 9 to 11 crew members plus a captain and all of these crew are from the local area. The service and sales facility at Quonset Point employs twenty-two persons apart from the crews. This number includes office personnel and `lumpers' who unload the boats.

Crew size increases during the *Loligo* squid season. During *Loligo* season the crew sorts the squid into six sizes and also sorts through the bycatch. *Illex* squid catches are much cleaner and do not require sorting through bycatch.

The crews are full-time workers and are paid on a share system. Individuals can make from $40,000 to $60,000 annually. Fuel costs comes off the top of the boat's catch. The boat takes about 52 or 58 percent and the crew takes about 42 or 48 percent. Food comes from the crew share.

Point Judith, RI

Point Judith is almost exclusively a fishing community, having a core group of fishermen who fish full-time. During the summers, the streets are filled with tourists coming or going on the Block Island ferry. Yet there is little for tourists to do in Point Judith. The town does not have the condominiums, shops, and hotels that other ports such as Chatham, Newport, and Montauk have. Only one hotel stands out in Point Judith, the Dutch Inn, which is circa 1960. The few restaurants, shops, and tourist venues, such as fudge shops, are enough to take care of the summer onslaught of ferry passengers and the year round working population centered around commercial fishing.

The total value of fish landed in Point Judith in 1992 was $36.5 million. The top ten species by percent landed value in 1992 were lobster, *Loligo* squid (15%), angler, summer flounder, scup, butterfish (4%), winter flounder, yellowtail, and cod. Mackerel accounted for 1%.

Point Judith has a large fleet of trawlers, gillnetters, and lobster boats. While estimates vary, approximately 200 commercial boats dock in Point Judith, including 80 trawlers, 30 gillnetters, and 100 or so lobster boats.

One informant described Point Judith boats as diverse in their annual round and approach to the fisheries, as opposed to New Bedford boats which only go after groundfish. Point Judith boats which are not diverse are the freezer boats which only target fish for frozen markets -- the squids, butterfish, and mackerel. The diverse approach to fisheries combined with full-time experienced fishermen means the fishermen are fishing year round even if they may switch fisheries and boats during the year.

Stonington, Connecticut

The Long Island sound and its estuaries and rivers are the major foci of Connecticut fisheries. There is a small traditional haul seine fishery for alewives and other fishes (unspecified, for "industrial" uses). Dip-nets are used for blue crabs (and a few alewives). Drift gillnets are used for menhaden, bluefish, weakfish, black sea bass, alewife, Atlantic mackerel, and other species. There is a specialized drift gillnet fishery for American shad. Quahogs (hard clams) are very important, and over 70% of Connecticut's landed value comes from oysters cultivated in Long Island Sound. Second to oysters are lobsters, most of which are caught inshore in the sound. Third in value is a mixed species otter trawl fishery, most of which is based in the port of Stonington.

Stonington is the primary port in Connecticut. The main fishing fleet is out of Stonington. Stonington is the only off-shore port with a fleet consisting of trawlers, lobster boats, and ocean scallopers. People are mostly going for groundfish such as cod, haddock, and flounder.

Atlantic mackerel is seldom targeted because there is no market for it in Stonington. Atlantic mackerel accounts for 0.01% of the landed value of species and these are caught primarily by drift gillnets. One vessel specializes in *Loligo* squid. Other vessels will target squid when they appear in large numbers. *Illex* squid is seldom targeted because the market is limited since the *Illex* squid spoils rapidly. There is a market for butterfish but no vessel is specialized in catching it.

The major species of fish caught in Stonington are flounder, summer flounder, squid, whiting, and some codfish during the winter months. Over the past five years (1988-1993), the fishermen have caught an increasing number of monkfish. The three large scallop boats have landed the majority of the monkfish.

In the past, summer flounder was the most important species caught by fishermen in Stonington. However, squid is increasing in importance as a result of the summer flounder quotas. During the summer of 1993, one boat attempted to specialize in dogfish but he discontinued this.

Freeport, NY

According to NMFS weighout data (Tables NY-FP1, 2), Freeport and neighboring Point Lookout (included in the Freeport port code) are almost entirely dependent on otter trawl landings (over 89% poundage, 87% value), and the major species are loligo squid and silver hake, with smaller amounts of scup, weakfish, bluefish, butterfish, summer flounder, other flounders, Atlantic mackerel. Gill-nets are used for bluefish, angler, and other species, and there are small handline, pot, pound-net and bay shellfisheries associated with these ports.

Table NY-FP1: Landings by Gear, Freeport, NY, 1998

GEAR TYPE, Freeport, NY	Pounds. %	Value %
Common seine, haul seine	0.3%	0.1%
Gill net, sink, other	7.0%	6.1%
Handline, other	2.5%	3.8%
Pot/trap, lobster, insh nk	0.6%	2.8%
Pot/trap, lobster, offsh nk	0.0%	0.0%
Pots + traps, blue crab	0.0%	0.0%
Pots + traps, conch	0.0%	0.0%
Pots + traps, fish	0.1%	0.1%
Pound net, fish	0.2%	0.2%
Rakes, other	0.2%	0.0%
Tongs & grabs, clam	0.0%	0.0%
Trawl, otter, bottom, fish	89.3%	86.8%

Total landings, rounded 1998: 1,865,800 pounds
Total value, rounded 1998: $1,504,800 dollars
Note: 0.0 = >0.0% but <0.06%

Table NY-FP2: Landings by Major Species, Freeport, NY, 1998

MAJOR SPECIES >2%	LBS %	VALUE %
Bluefish	4.6%	2.1%
Butterfish	2.8%	2.6%
Flounder, summer	2.8%	7.9%
Flounder, yellowtail	4.0%	2.3%
Hake, silver	27.4%	16.2%
Mackerel, atlantic	2.5%	0.8%
Scup	4.4%	8.8%
Squid (loligo)	37.3%	39.3%
Weakfish, squeteague	2.7%	2.8%
Lobster	0.6%	2.8%
Sea bass, black	0.8%	1.9%

Number of species: 62

Other species of MAFMC interest by percentage total value 1998: Tilefish (0.1), and Illex squid (0.0). Surf clams are also landed here but are reported as "Other New York."

Other Nassau County

Other Nassau County landings came to about 595,000 pounds, worth about 4 million dollars, in 1998. Over 93% of the landings were of hard clams (quahogs), soft clams, and oysters, taken in the rich "Oyster Bays" of this county. Gill nets, handlines, and lobster pots were also used for striped bass and other species.

Greenport and Mattituck, N.Y.

Although Greenport and Mattituck are very dissimilar ports, we combine landings information from them to protect confidentiality.

Otter trawl landings are by far the most important, over 95%, and the classic Mid-Atlantic complement of species is found, led by silver hake and loligo squid, but including butterfish, summer and winter flounder, scup, striped bass, angler, and other species. There is also pound-net fishing, haul-seining, gill-netting, handlining, pelagic longlining, lobster and conch pot fishing, and raking for clams and dredging for bay scallops. Tables NY-GP1, 2 provide weighout data for Greenport combined with nearby Mattituck.

Over 90% of the weighout landings attributed to Mattituck came from otter trawl fishing, and the full complement of Mid-Atlantic species were major landings (=>2% value in 1998: bluefish (25%), butterfish (12%), summer flounder (14.5%), scup (4.4%), dogfish 3.1%), lobster and striped bass were also significant, among the 37 species landed. Total landings in 1998 were less than 275,000 pounds. But recall that "Other New York" includes lobster and other landings which probably came from places like Mattituck.

Table NY-GP1: Landings by Gear Type, Mattituck and Greenport, NY, 1998

GEAR TYPE	Pounds %	VALUE %
Common seine, haul seine	0.0%	0.0%
Gill net, sink	1.5%	1.4%
Handline	1.1%	2.9%
Longline, pelagic	0.0%	0.1%
Pots + traps, conch	0.0%	0.0%
Pound net, fish	1.8%	3.0%
Trawl, otter, bottom, fish	95.6%	92.5%

Total landings, rounded 1998: 7,831,400 pounds
Total value, rounded 1998: $4,140,500 dollars
Note: Not including "Other New York" landings; here as elsewhere "0.0%" means more than 0 but less than 0.05%

Table NY-GP2: Landings by Major Species, Mattituck and Greenport, NY, 1998

MAJOR SPECIES >2%	Pounds %	VALUE %
Bluefish	4.2%	3.1%
Butterfish	1.6%	1.9%
Flounder, summer	1.1%	5.1%
Flounder, winter	2.9%	1.2%
Hake, Red	2.3%	1.5%
Hake, silver	63.3%	46.1%
Scup	0.8%	2.6%
Squid (loligo)	21.6%	27.2%
Bass, striped	0.6%	3.0%

Number of species: 62

Other species of MAFMC interest by percentage value 1998: Atlantic Mackerel (0.1), Black Sea Bass (0.9), dogfish, other (0.1), Dogfish, Smooth (0.0), Tilefish (0.3), and Illex Squid (0.0).

"Other Suffolk" and Amagansett, NY

The NMFS data are collected for the port of Amagansett and well as unspecified "Other Suffolk" fishing. "Other Suffolk" probably includes landings from the fishermen at Orient/Orient Point, Shelter and Fisher Islands, Southold, Cutchogue, and many other smaller places in Suffolk County on both the north and the south forks of eastern Long Island including Mount Sinai.

Bay clamming (for hard clams, or quahogs) is the major fishery, representing over 71% of the area's value in 1998. Lobstering is next, 14% of the value. Other important shellfisheries are for oysters, soft clams, horseshoe crabs, blue crabs, and green crabs. Harvesting bay scallops is an important fishery for all east end ports, but landings vary widely from one year to the next. There is tremendous diversity in gears used, bespeaking the mixed bay, sound, and ocean nature of these fisheries. They include handlines, longlines, harpoons, seines, otter trawls, gillnets, pound nets, pots for fish, eels, conch, crabs, and lobster, fyke-nets, cast nets, diving gear, crab and oyster dredges, shovels, rakes, tongs, patent tongs, and "by hand".

Montauk, NY

Montauk, the largest fishing port in New York, is situated near the eastern tip of the South Fork of Long Island. Otter-trawls and longlines are the principal gear-types, in terms of pounds landed and value (Table NY-M1). Loligo squid and silver hake are the two most important fin-fish caught in 1998, but tilefish also stand out, and swordfish and tuna landings are important as well. Montauk is the leading tilefish port in the U.S., but this fishery has declined greatly. For the past two years (1998-1999) some of the Montauk-based tilefish boats have been unloading their catches in Rhode Island. Nonetheless, tilefish accounted for 21% of the value of landings in this port in 1998 (Table NY-M2). The number of species landed at Montauk is staggering: 90. The methods used to harvest fish and shellfish are diverse, including pound nets or fish weirs, box traps, haul seines, and spears, along with the more usual pots, lines, and trawl nets.

Table NY-M1: Landings by Gear Type, Montauk, NY, 1998

GEAR TYPE	Pounds %	VALUE %
Box trap	0.0%	0.0%
Common seine, haul seine	0.0%	0.0%
Gill net, sink	1.2%	1.3%
Handline, other	3.0%	6.6%
Longline, bottom	11.4%	20.9%
Longline, pelagic	3.1%	8.7%
Pot/trap, lobster, insh nk	0.4%	1.3%
Pot/trap, lobster, offsh nk	0.1%	0.4%
Pots + traps, conch	0.0%	0.0%
Pots + traps, fish	0.1%	0.3%
Pound net, fish	0.6%	0.6%
Spears	0.0%	0.0%
Trawl, otter, bottom, fish	80.1%	59.9%

Total landings, rounded 1998: 12,035,700 pounds
Total value, rounded 12,108,800 dollars; 0.0% = <0.06 % rounded

Table NY-M2: Landings by Major Species, Montauk, NY, 1998

MAJOR SPECIES >2%	Pounds %	VALUE %
Bass, striped	[illegible]	5.2%
Bluefish	2.1%	0.8%
Butterfish	3.2%	2.0%
Dogfish, nk	2.4%	0.4%
Flounder, summer	2.8%	6.9%
Flounder, winter	3.8%	5.1%
Hake, red	3.2%	1.1%
Hake, silver	31.2%	15.7%
Scup	1.8%	3.6%
Squid (loligo)	24.2%	19.8%
Swordfish	1.0%	3.4%
Tilefish	11.5%	21.2%

Number of species: 90

Other species of MAFMC interest by percentage 1998 value: Atlantic Mackerel (0.3), Black Sea Bass (1.3), Dogfish, NK (0.0), Smooth Dogfish (0.0), and Illex squid (0.0).

Shinnecock/Hampton Bays, NY

Shinnecock/Hampton Bays is second only to Montauk as a commercial fishing center in New York. The offshore fishing industry in this part of Long Island is concentrated to the west of Shinnecock Inlet, on a barrier island that is just to the south of Hampton Bays. "Shinnecock," as it is known, is part of the town of Southampton. There is a large county-owned dock that is run by the town, where most commercial boats tie-up. The pack-out facilities and their associated docks are on private land, including two private unloading docks and one belonging to the Shinnecock Fishermen's Cooperative. The rest of the land to the east and west of the inlet is a county park. The NMFS codes for this fishery are for Shinnecock and Hampton Bays. We have combined them for this analysis because both refer to the same place (bluefin tuna and other large pelagic landings are collected using the Shinnecock port code, the rest using Hampton Bays).

This is primarily a dragger fishing port, otter trawl landings making up 84% of the poundage and 74% of the value in 1998 (Tables NY-HB1,2). Silver hake (whiting) and Loligo squid made up over 70% of these landings; 66 other species were landed by draggers, including bluefish, butterfish, red hake, and summer flounder. Gill-nets are second in importance, accounting for 12% of the value of landings in 1998. They too had diverse landings, totaling 39 species, led by bluefish (31% of pounds.), angler (28%), and skates (23%).

"Table NY-HB1: Landings by Gear, Hampton Bays and Shinnecock, N.Y., 1998

GEAR TYPE:	Pounds. %	VALUE %
Longline, Bottom	2.9	7.3
Handline	0.1	0.4
Longline, Pelagic	0.3	1.1
Otter Trawl, Bottom	84.3	74.2
Seines, Common and Haul	0.1	0.1
Gillnet, Sink	10.8	11.8
Pound Net, Fish	1.0	1.3
Pots/Traps, Fish	0.1	0.1
Pots/Traps, Eel	0.0	0.0
Pots/Traps, Conch	0.0	0.0
Pots/Traps, Lobster, Offshore	0.0	0.0
Pots/Traps, Lobster, Inshore	0.1	0.3
Shovels	0.0	0.1
By Hand	0.0	0.0
Rakes	0.0	0.0
Pots/Traps, Crab	0.0	0.0
Fyke-Net, Fish	0.0	0.0
Unknown	0.4	3.3

Total Landings by Weight, 1998: 13,143,401 pounds.
Total Landings by Value, 1998: $9,676,293

Table NY-HB2: Landings by Major Species, Shinnecock/Hampton Bays, NY, 1998

MAJOR SPECIES (>2%)	Pounds %	VALUE %
Angler	3.8	8.3
Bluefish	5.2	3.0
Winter Flounder	1.1	2.2
Summer Flounder	2.1	6.8
Yellowtail Flounder	0.9	2.0
Scup	1.5	3.4
Weakfish	2.5	2.1
Dogfish, NK	7.3	1.5
Skates	3.2	1.4
Tilefish	3.0	7.6
Silver Hake	37.5	23.1
Quahog	0.3	2.9
Loligo Squid	22.9	26.9

Total Number: 93

Other species of MAFMC interest, by percentage value, 1998: Butterfish (1.6), Atlantic Mackerel (0.3), Black Sea Bass (0.9), Smooth Dogfish (0.0), Spiny Dogfish (0.0), and Illex Squid (0.0).

BrooklynCommercial fish landings in New York City's boroughs have declined markedly over the years. Today landings in Brooklyn were reported in 1998 as less than 30,000 pounds, from otter-trawls (77%), sink gill nets (16%) and handlines. The principal species, out of 17 landed, were butterfish, bluefish, weakfish, and loligo squid. Sports fishing at Sheepshead Bay and other sites, have become more important than commercial fishing. **Columbia, Duchess, Queens, Greene, Rockland, Ulster, Westchester Counties**NMFS has "other" categories for counties where marine and estuarine fishes are landed. Those for Nassau and Suffolk are treated separately above. We lumped the others together; they largely represent estuarine and riverine fisheries. Most of these fisheries are the riverine ones for American shad (85% of pounds, 94% of value). Small amounts of menhaden, blue back herring, winter flounder, weakfish, scup and other species (totalling 10) were reported. The key gear types were drift and sink gill nets, both used for shad. Other gear types, with minor catches, were otter trawls, fyke nets, handlines, and fish pots/traps. The catches in 1998 were very small, totalling less than 200,000 pounds. or $230,000.**Belford, NJ**The fishing port of Belford is on a tidal creek leading out to Raritan Bay and the New York Bays. Its fishery is oriented both to the bay and to the Atlantic Ocean, which is reached by going out around Sandy Hook, a few miles from Belford. Belford and neighboring Port Monmouth were once a large industrial fishing and processing center for menhaden, but the menhaden factory closed in 1982. Menhaden are still caught with small purse-seine boats and pound-nets, primarily for the bait market, and in 1998 they accounted for over 2/3rd of the landings in Belford (Table NJ-B1) Today Belford's fisheries are small-scale and owner-operated; most of the finfish are handled through a fishermen's cooperative, which sells wholesale but also runs a small retail store and restaurant. Lobsters are sold in other ways, including through a local lobster pound. Otter trawl finfishing is the most important activity, accounting for 50% of the landed value in 1998 (Table NJ-B1). It is a multi-species fishery: 42 species were landed in 1998. Major species caught by otter trawlers landing in Belford, by landed value, were summer flounder, Loligo squid, silver hake, winter flounder, spiny dogfish and skates. Lobster pot fishing is third only to purse seining and dragging; it accounted for 17% of landed value in 1998. In recent years surf clam and ocean quahog vessels have been offloading at Belford, but in 1998 they accounted for less than 4% of the landed value (in contrast to 1992, when ocean quahogs accounted for over 30% of landed value). Crab dredging, in Raritan Bay, is of equal value. The last of New Jersey's pound-	Pounds %	Value %

Diving Gear	0.0	0.0
Dredge, SCOQ	2.7	3.8
Dredge, Crab	2.3	6.1
Hand Line	0.0	0.1
Pots/Traps, Lobster, Offshore	2.0	17.1
Pots/Traps, Blue Crab	0.0	0.0
Pots/Traps, Fish	0.0	0.2
Pound Nets	3.8	3.9
Purse Seine, Menhaden	65.1	18.6
Trawl, Otter, Bottom, Fish	23.9	50.1
Unknown	0.0	0.1

Note: “0.0" means more than 0 but less than 0.05. The figures for landings from which these percentages are derived are not given because they are confidential.	Pounds. %	Value %

Other Monmouth County Ports Highlands (at the mouth of two large tidal rivers coming out into Sandy Hook Bay with access to the Atlantic Ocean) and Neptune (in combination with neighboring municipalities which surround the tidal basin known as Shark River) are primarily small lobstering ports, sequestered within summer resort communities. Data for these ports are confidential. Highlands is also the site of bay clam depuration plants, which serve baymen who clam under state permits in Raritan and Sandy Hook Bays and the Navesink River. A small amount of handlining for finfish and potting for rock crab supplements lobstering. Atlantic Highlands is a center for recreational charter and party boat fishing.Crabbing constitutes most of the landings for the rest of Monmouth County. The winter dredge fishery for blue crabs in Raritan Bay and its tributaries is significant. Clamming is also important. It takes place in the Sandy Hook and Raritan Bays and tidal rivers and is largely dependent on a "depuration" process, located in Highlands, as well as some "relaying" of clams to cleaner waters in south Jersey. Crabbers and clammers, like those involved in other fisheries, live in and around Belford, Highlands, and various municipalities along the shore of Raritan Bay. **Point Pleasant, NJ** The commercial fisheries of Point Pleasant are third in New Jersey to those of the Cape

By Hand	0.0	0.0
	0.0	0.0
Dredge, Sea Scallop	1.2	10.4
Dredge, SCOQ	51.4	49.9
Gill Net, Drift	1.0	0.7
Gill Net, Sink	11.0	13.5
Hand Line	0.1	0.1
Longline, Pelagic	0.1	0.2
Pots/Traps, Lobster Offshore	0.6	3.5
Pots/Traps, Fish	0.0	0.0
Purse Seine, Menhaden	20.9	3.7
Trawl, Otter, Bottom, Fish	13.6	17.7
Troll Line	0.0	0.0
Troll Line, Tuna	0.0	0.0
Unknown	0.2	0.3

Total Landings, rounded, 1998: 31,916,900 poundsTotal Value, rounded, 1998: $16,715,400 dollars**Point Pleasant Beach, NJ**

The town of Point Pleasant (pop. 18,177, 1990) is located at the mouth of the Manasquan Inlet at the northern border of Ocean County. The town's economy is geared toward the summer tourist and recreational business. However, it is more than a "beach town", and has a large resident population. It is close to a larger township, called Brick or Bricktown (pop. 66,473, 1990), and across the Manasquan River from Manasquan (5,369, 1990) and Brielle (4,406). The fisheries are concentrated in an area known as Point Pleasant Beach, along a sandy strip which includes restaurants, a fisherman's supply store, small marinas, charter and party boat docks, and two commercial fishing docks.

One of the Cape May seafood businesses has two fishing properties in Point Pleasant, one of which is now used for offloading and trucking surf clams and ocean quahogs. (Each of these docks had been used for finfish until about 10 years ago). From 6 to 10 boats land clams here, according to company personnel interviewed in Cape May. There are 15 crew at the docks and about 50 on the boats. There is also a new (2000) seafood processing plant, initially shucking surf clams. One existed here two decades ago, part of the early surf clam industry.

A fishermen's cooperative owns two other properties, one for storing and working on gear and some dockage, the other including the coop's offices, gear storage, ice-making, packing house, and a retail store. The cooperative mostly depends on its fourteen or so members, who have older, wooden-hulled vessels, 45-65' in length. They are geared for bottom otter trawling in a mixed-species, diversified fishery. The vessels usually have a two or three man crew, including the captain, who are paid shares of the profits. They are all hired locally. Although there are families with several generations in the fisheries, in recent years crew members are not often related to the captain or owner. Some members of this cooperative and some crew members have been ethnic minorities (Spanish, Portuguese, Chinese, and others). A few women have crewed on these boats. The boats are all owner-operated. They tend to fish in areas of Hudson Canyon called "the Mudhole" or "the Gully." The Mudhole is closer and has a dredged channel, but poor landings, especially of silver hake ("whiting") have forced most to move north into the Gully, where silver hake seem to be more plentiful. The average trip to the Mudhole is one to three days, but for the Gully can last a week.

Most of the draggermen at the cooperative consider themselves loligo squid and whiting specialists, but different species are targeted at different times, depending on the conditions of the ocean, the market, and the preferences of the captain. Squid landings began to overtake silver hake landings in this fleet in 1992 and now account for over 50% of the landed value of Point Pleasant trawlers. At first it was a by-catch while silver hake fishing in the Gully. Now it is targeted by some of the captains. As one captain stated, "You can't help but target squid sometimes, there is so much out there." Squid is sold to local processors. The cooperative is at a disadvantage in marketing squid because members lack freezer boats or refrigerated sea water boats, and thus do not receive the same price that boats so equipped receive, particularly in Cape May.

Summer flounder has long been a mainstay of this fishery, especially in the Mudhole in September and October, as well as other times in New Jersey and New York waters. Because of sharp quota restrictions, it is now a derby-like fishery. It is marketed in the fresh fish markets of New York and Philadelphia, in local restaurants and fish stores, and in the coop's own retail store.

At one time a few trawlers targeted scup (also called porgies), partially because doing so took pressure off a supply-burdened whiting market. (There was also a significant offshore summer flounder fishery in the winter months, for a few boats). Today no vessels target scup but may encounter large schools in the winter. Marketing is similar. Spiny dogfish have emerged as a very important fishery for the draggers and even more so for a gill-net fleet, both local and visiting, which has grown in recent years. Gill-netters have used "runaround" nets for species such as bluefish, Spanish mackerel, little tuna, scup, and weakfish, although this gear did not appear in the 1998 NMFS data. They use drift and sink nets for dogfish, angler, bluefish, weakfish, and other species. Angler, or monkfish, are particularly important. In 1998 local fishermen using sink gill nets caught almost 17 million pounds of monkfish as well as over 8 million pounds of spiny dogfish.

Barnegat Light (Long Beach Island), NJ

The fishing port of Long Beach Island is mostly located in the small bayside municipality of Barnegat Light, on this long, densely-developed barrier island on the central New Jersey coast. The commercial fishery has been undergoing a transition from over 20 years of specializing in offshore, deep-water and distant-water longlining. That tradition remains in the importance of bottom and pelagic longline gear (18% of total landed value) and of species such as tilefish, swordfish, and tunas (including big eye, yellowtail, blackfin, and skipjack in 1998) (Table NJ-PoundsI). (Handlines are also used for big eye tuna as well as for bluefish and other species; troll lines for yellowfin tuna). However, the physical perils of the inlet has kept this a relatively small-boat longliner fleet, and natural and regulatory changes in the species sought have forced people to look for alternatives. An alternative developed over the past decade is sea scalloping and the attendant by-catch of angler. Another is for expansion of the species sought with bottom and pelagic longlines, including sharks and dogfish among others. In 1998 the pelagic longline gear of Long Beach Island caught fully 23 different species, and bottom gear caught 17 species.

Whether transitional adaptation or old stand-by, the gill-net fisheries of Long Beach Island are the most substantial, representing 76% of poundage and 45% of landed value in 1998 (Table NJ-PoundsI1). The number of species involved is equally impressive: 61 for the drift gill-nets, including mackerel, dogfish, flounders, tunas, weakfish, shad, sharks; 23 for the sink gill-nets. In contrast, otter trawl dragging is minor and only 10 species were landed. Spiny dogfish are a recent focus, representing over one-third of the total landings in 1998.

Table NJ-LB-1: Landings by Gear Type, Long Beach Island, NJ, 1998

GEAR TYPE: LONG BEACH ISLAND, NJ	Pounds (%)	VALUE (%)
Dredge, Sea Scallop	5.7	28.6
Gill Net, Drift	64.0	34.9
Gill Net, sink	11.8	9.8
Handline	0.1	0.1
Longline, Bottom	7.0	6.1
Longline, Pelagic	11.2	19.9
Rakes	0.0	0.2
Otter Trawl	0.2	0.3
Troll Line, Tuna	0.0	0.0
Unknown	0.0	0.0

Total Landings, rounded, 1998: 10,032,800 pounds.
Total Value, rounded, 1998: $10,194,400 dollars

Other Ocean County, NJ

Ocean County, New Jersey, covers a large region, ranging from Point Pleasant Beach in the north to Long Beach Island and beyond to the south. The "Other Ocean" category encompasses the bayman fisheries in this region, which is made up of barrier islands and a large complex known as Barnegat Bay. It also includes some offshore fisheries from places other than Long Beach Island and Point Pleasant. The bayman fisheries are, as always, for blue crabs and for hard clams (quahogs). Pots are the major way blue crabs are caught; clams are caught with rakes, tongs and "By hand". Fyke nets are minor, for flounders and eels (they are increasingly restricted by regulation). NMFS 1998 weighout data on substantial longline and drift gill-net fisheries and on angler, scallop, tilefish, and bluefin tuna refer to offshore fisheries comparable to and probably associated with those of Long Beach Island.

Atlantic City and Other Atlantic County, N.J.

Atlantic City is better known for casino gambling and its boardwalk than for its status as a fishing port. The fishing port is on the backbay side of the city and is almost entirely given over to surf clam and ocean quahog dredge fishing (Table NJ-AC1). Atlantic City has long been a favored port for this fishery because of ready access to dense beds of clams off the central coast of New Jersey. Ocean quahogging has moved to more northern ports, especially New Bedford, Massachusetts, in recent years; it represented only 11% of the value of Atlantic City's landings in 1998. Other fisheries in Atlantic City are minor. Gears include sink gill-nets, and handlines, and bluefish, black sea bass, weakfish, jonah crab, lobster, and conch predominate.

Table NJ-AC1: Landings by Gear Type, Atlantic City, NJ, 1998

GEAR TYPE: ATLANTIC CITY, NJ	Pounds (%)	VALUE (%)
Dredge, SCOQ	99.9	99.7
Gill Net, Sink	0.0	0.0
Handline	0.0	0.0
Pots & Traps, Conch	0.0	0.0
Pots & Traps, Fish	0.1	0.2

Total Landings, rounded, 1998: 37,338,500 pounds
Total Value, rounded, 1998: $17,867,000 dollars

Atlantic County, like the other coastal New Jersey counties, has numerous small-scale bay and estuary fisheries as well. By far the most important for this county is the hard clam (quahog) fishery (34% of the landings, 70% of the value for "other Atlantic" in 1998), using rakes, tongs, and "by hand" techniques such as treading. Some of this takes place through clam aquaculture. The other significant species is the blue crab, harvested with pots and dredges (50.5% landings, 25% value). Haul seines, fyke nets, gill nets, handlines, eel pots, and turtle traps are also used for white perch, menhaden, American shad, and many other bay and tidal river species.

Cape May, NJ

Cape May is New Jersey's largest commercial fishing port in terms of landings and value. When combined with neighboring Wildwood (the fishing port is often referred to as "Cape May/Wildwood"), its landings exceeded 93 million pounds., worth over $29 million in 1998.

Draggers, or vessels using bottom otter trawls, account for 69% of Cape May's landings and 70% of its value (Table NJ-CM1). Most are used for a wide variety of finfish species (56). Some are also used for scallops; Cape May has a long history of combined or alternating fin-fishing and scalloping. Squid is very important: In 1998 17% of Cape May's landed value came from Illex squid and another 22% from Loligo squid (Table NJ-CM2). Much of the squid is processed locally as is Atlantic mackerel, caught with draggers and midwater pair trawls. Summer flounder has been a major species but regulations have severely reduced catches (4% landed value in 1998). Scup is another dragger-caught species of historic importance in Cape May; in 1998 it represented 6% of landed value. Cape May is also the home of one of the very few vessels allowed to use purse seines for bluefin tuna in U.S. waters; this vessel lands its catch in Gloucester, MA. The only purse seine landings in Cape May in 1998 were for menhaden, using smaller vessels. Fishing for large pelagics is also done with longlines and troll lines.

Although sea scallop management measures have reduced opportunities for many Cape May fishermen, scalloping remains important. In addition to scalloping with otter trawls, scallop dredges are used, accounting for 15% of the total value of Cape May's landings in 1998. Angler (monkfish) are caught with scallop dredges as well as gill-nets, otter trawls, and scallop otter trawls (1.8% of landed value).

Table NJ-CM1: Landings by Gear Type, Cape May, NJ, 1998

GEAR TYPE: CAPE MAY, NJ	Pounds (%)	VALUE (%)
Handline	0.0	0.0
Longline, Pelagic	0.0	0.3
Otter Trawl, Fish	68.9	61.9
Otter Trawl, Scallop	0.5	7.7
Troll Line, Tuna	0.0	0.0
Gill Net, Sink	0.2	0.5
Gill Net, Drift	0.1	0.1
Purse Seine, Other	0.0	0.0
Purse Seine, Menhaden	23.9	6.7
Dredge, Scallop	0.9	15.4
Menhaden Trawl	3.4	0.6
Pots & Traps, fish	0.1	0.7
Pots & Traps, Conch	0.1	0.4
Pots & Traps, Lobster Offshore	0.2	2.6
Dredge, Crab	0.1	0.3
Dredge, SCOQ	1.4	2.9
Unknown	0.0	0.0

Total Landings, rounded, 1998: 87,244,700 pounds
Total Value, rounded, 1998: $25,757,200 dollars

Table NJ-CM2: Landings by Major Species, Cape May, NJ, 1998

MAJOR SPECIES: CAPE MAY, NJ	Pounds (%)	VALUE (%)
Atlantic Herring	2.9	1.0
Summer Flounder	0.9	3.9
Lobster	0.2	2.5
Atlantic Mackerel	20.9	8.2
Menhaden	24.1	6.8
Sea Scallop	1.1	21.9
Scup	1.7	6.1
Squid, Illex	34.1	16.9
Squid, Loligo	8.3	22.0
Surf Clam	1.4	2.9
Black Sea Bass	0.4	2.2

Number of Species: 69

Other species of MAFMC interest, by percentage of total value, 1998: Bluefish (0.2), Butterfish (0.5), Smooth dogfish (0.0), Spiny dogfish (0.1), Tilefish (0.0).

Wildwood, NJ

The fishing port of Wildwood is connected to a very popular tourist beach community. Resident and migratory draggers and clam boats are found in Wildwood. The largest landings come from surf clams and ocean quahogs, both harvested offshore with hydraulic dredges. A processing factory is in Wildwood. The otter trawl fleet accounts for 7% of Wildwood's landings, bringing in summer flounder, Loligo squid, butterfish, Atlantic croaker, black sea bass, weakfish, and other species (Table NJ-WW1). Wildwood also has a small pot fishery, including offshore lobster, conch, and fish pots (6% of value). The fish pots are used mainly for black sea bass. Gill-netting is done for weakfish, black sea bass, and other species. Wildwood also had some pelagic longline landings in 1998, notably swordfish and yellowfin tuna. Other species of Mid-Atlantic Fishery Management Council interest landed in 1998, in small quantities (less than 2% landed value) were bluefish, butterfish, Atlantic mackerel, scup, and dogfish.

Table NJ-WW1: Landings by Gear Type, Wildwood, NJ, 1998

GEAR TYPE: WILDWOOD, NJ	Pounds (%)	VALUE (%)
Crab Dredge	0.4	0.5
Surf Clam/Ocean Quahog Dred-ge	86.5	79.0
Gill Net, Drift	1.9	0.8
Gill Net, Sink	0.5	0.4
Handline	0.1	0.1
Longline, Pelagic	0.9	3.9
Pots & Traps, Offshore Lobster	0.8	1.7
Pots & Traps, Conch	0.5	2.0
Pots & Traps, Fish	1.1	2.8
Otter Trawl	7.2	8.6
Unknown	0.0	0.1

Total Landings, rounded, 1998: 6,193,40
Total Value, rounded, 1998: $3,492,900 dollars

Sea Isle City, NJ

Sea Isle City is north of Wildwood, one of the small fishing ports of the coast that is dependent on a dynamic and often problematic inlet for access to the sea. The fishery here is small. In 1998 fewer than 750,000 pounds, and $1.2 million dollars, were reported in the weighout data. There is a small offshore longliner fishery for tunas (mostly big eye, false albacore and yellowfin) and swordfish. Otter trawl fishing includes spiny dogfish, skates, angler, and fluke but only 4% of the landed value. More significant are pot fisheries for offshore lobster (6% of value), conch (12%), and fish (12%, mostly black sea bass). Gill-netting represents 12% of the value, particularly for angler (monkfish). We did not visit Sea Isle City for this report but can report that it is primarily a summer beach town.

Other Cape May County

In the creeks and bays along the Atlantic coast of Cape May and around the cape to the Delaware Bay side are numerous small fisheries, coded as "other Cape May." These are the classic baymen or watermen fisheries, based on crustaceans and shellfish: blue crabs and hard clams dominate (66% and

23.5% of landed value, respectively). Horseshoe crabs are also harvested (12% of the 1998 poundage although only 1.6% of the value). There is a small gill-net fishery for species such as weakfish, American shad, and numerous other estuarine and anadromous species. Very small amounts of bluefish, butterfish, and summer flounder were landed in 1998. This fishery is very similar to and intertwined with the "Other Cumberland County" fishery discussed below.

Table NJ-OCM1: Landings by Gear Type, Other Cape May, 1998

GEAR TYPE: OTHER CAPE MAY, NJ	Pounds (%)	VALUE (%)
By Hand	17.9	23.6
By Hand, Oyster	0.1	0.8
Dredge, Crab	1.1	0.7
Gill Net, Drift	2.6	0.6
Gill Net, sink	0.0	0.0
Handline	0.5	0.5
Longline, Pelagic	0.3	0.3
Pots & Traps, Crab	74.8	65.3
Pots & Traps, Eel	2.2	4.0
Pots & Traps, Fish	0.0	0.0
Rakes	0.4	1.5

Total Landings, rounded, 1998: 1,190,800 pounds.
Total Value, rounded, 1998: $3,492,900 dollars

"Other Cumberland,"NJ

The two big fisheries for this region, the center of New Jersey's Delaware Bay fisheries, are for oysters and blue crabs (Tables NJ-CC1, CC2). 1998 was one of the few years in the past decade when oysters were harvested, due to problems with oyster diseases (there is no harvest in 2000 due to the disease ‘dermo’). Oysters were taken with dredges, and represented 48% of the landed value. Blue crabs are caught with dredges and pots, and represented 46% of the value in 1998. Both horseshoe crabs and menhaden are also taken in large quantities (4.8% and 11.6% of poundage, respectively), and are the focus of controversy in this area due to their alleged roles for migratory birds and as bait for other fishes.

Table NJ-CC1: Landings by Gear Type, Cumberland County, NJ, 1998

Cumberland County Landings by Gear Type	Percent Pounds	Percent Value
Handline	0.9	0.6
Gill-net, Sink	2.6	0.9
Gill-net, Drift	5.3	1.4
Pots/Traps, Eels	0.8	1.3
By Hand	11.6	1.4
Dredge, Oyster	15.8	48.0
Dredge, Crab	2.4	1.5
Pots/Traps, Blue Crab	60.6	45.0

Total Landings, rounded, 1998: 4,444,900 pounds
Total Value, rounded, 1998: $5,573,300

Table NJ-OCM2: Landings by Major Species, Pounds and Value, Other Cumberland County, NJ, 1998

Cumberland County, Major Species, 1998	Percent Pounds	Percent Value
Menhaden	4.6	0.5
Weakfish	2.6	1.5
Blue Crab	62.9	46.4
Horseshoe Crab	11.6	1.4
Oysters	15.8	48

Total Species: 19, including MAFMC-managed Bluefish (0.0% value, 1998), Butterfish (0.0), and Summer Flounder (0.0).

Other New Jersey

Surprisingly, some commercial fishing is reported from the heavily urbanized, industrialized areas of northeastern New Jersey. There is a substantial amount of squid, both *Illex* and *Loligo*, as well as some summer flounder landed in (and trucked into) heavily urbanized Essex County, the site of a packing and processing company. Crab pot fishing is found with small landings in urbanized Bergen and Middlesex Counties. At the other side of the state, commercial fishing extends upbay and upriver from Cumberland County, into rural Salem and Hunterdon counties. Hunterdon is the site of one of the last of the river shad seine fisheries (and an annual shad festival). Salem is the home of small-scale waterman fisheries which involve gill-netting for shad, weakfish and other species, harvesting eels and snapper turtles.

Ocean City, MD (West Ocean City)

Ocean City, on the Atlantic Coast, is the only major port in Maryland engaged in the inshore and EEZ ocean fisheries. It accounts for 18.1% of the pounds landed and only 9.5% of the value landed in 1998 (Table MD1).

The major commercial fishing gears used for landings in Ocean City in 1998 (Table MD-OC1) were:
--gill-netting, heavily dependent on angler and spiny dogfish, but engaged in a very diversified fishery;
--surf clam and ocean quahogging, with small by-catches of angler and scallops;
--bottom dragging with otter trawls, a highly diversified fishery, with strong foci on summer flounder and loligo squid, but also landing 48 other species.

In terms of value, other gear types also emerge as important, namely fish traps and pelagic longlining. Traps are also used for lobster and conch.

Table MD-OC1: Landings by Gear Type, Ocean City, MD 1998

GEAR TYPE: OCEAN CITY, MD	Pounds. %	Value %
By hand	0.0	0.0
Dredge, SCOQ	56.3	55.8
Gill net, sink	28.1	13.7
Handline	0.0	0.0
Harpoon	0.0	0.0
Longline, pelagic	2.1	11.1
Pots, Lobster Offshore	0.1	0.7
Pots/Traps, Conch	0.9	1.4
Pots/Traps, Fish	2.9	7.4
Otter Trawl, Bottom, Fish	9.5	9.9
Unknown	0.0	0

Total Landings, rounded, 1998: 11,073,123 pounds (of state total)
Total Value, rounded, 1998: $6,356,802 (of state total)

The major species caught commercially in Ocean City (Table MD-OC2), ranked by 1998 landed value, are:

-surf clams and ocean quahogs
--black sea bass caught mostly with fish traps but also gillnets and draggers;
--angler, caught primarily with sink gillnets but also by the draggers and the clam boats;
--spiny dogfish, caught primarily by the gillnet fleet and also by draggers.
--summer flounder, mostly a dragger fishery
--swordfish, among the species caught with pelagic longlines from this port (tunas are also caught, and big eye and yellowfin tuna each represented over 2% of the total landed value in 1998).

Other species of significance (using the criterion of at least 2% of poundage or value) are:

-- Atlantic croaker and Atlantic mackerel, each caught by draggers and gill-netters
-- striped bass, also caught by draggers and gill-netters
-- lobster, an offshore pot fishery.

Table MD-OC2: Major Species, Landed, Ocean City, MD, 1998

Major Species: Ocean City, MD	Pounds(%)	Value (%)
Dogfish, Spiny	21.6	5.6
Angler	3.8	6.0
Clam, Surf	**	**
Quahog, Ocean	**	**
Sea Bass, Black	2.8	7.1
Flounder, Summer	1.6	5.0
Swordfish	0.7	4.5
Tuna, Big Eye	0.5	2.7
Tuna, Yellowfin	0.5	2.3

Total Species Landed: 69

Note: ** indicates confidential data because fewer than 3 federally permitted dealers involved.
Other species landed of MAFMC relevance (by % value): Bluefish (0.3%), Butterfish (**), Atlantic Mackerel (0.5%), Scup (**), Tilefish (**), Loligo Squid (0.8%), Illex Squid (**).

Chesapeake Bay

Virtually all of the other fishing activity in Maryland centers on the Chesapeake Bay and its tributaries. It is based in numerous small and dispersed landing areas, and focuses on the classic bay fisheries with blue crabs and oysters taking the lead (Table MD-OM1). This is the home of the Chesapeake Bay "watermen." For all ports in Maryland excluding Ocean City, blue crabs represented 71.5% of the value and oysters 12.6% of the value. The only other sizeable fishery in 1998 was for striped bass (5.9% of the value), thanks to the recovery of that species after a long moratorium. True to the tradition of watermen and baymen in the Mid-Atlantic, the diversity of species caught is extremely high: 57 species, ranging from terrapin and snapper turtles, crappies, carp, bullheads, and alewives, to name a few of the brackish water and anadromous species, to soft clams, horseshoe crabs, eels, lobsters, sturgeons, sunfishes, and sharks.

Table MD-OM1: Major Species, Other Maryland Ports, 1998

MAJOR SPECIES (>2%): MARYLAND OTHER THAN OCEAN CITY	Pounds (%)	Value (%)
Bass, Striped	5.6	5.9
Crabs, Blue	61.6	71.5
Croaker, Atlantic	2.4	0.7
Menhaden	8.9	0.7
Oysters	4.9	12.6
Gizzard Shad	3.5	0.9
White Perch	2.9	1.5
Soft Clam	0.4	2.1
Catfish	4.7	1.6

Total Species Landed: 57
Total Landings, 1998: 50,094,300 pounds.
Total Value, 1998: $60,832,500

Species Relevant to MAFMC according to value in 1998: Bluefish (0.1%), Butterfish (0.0%), Summer Flounder (0.2%), Atlantic Mackerel (0.0%), Scup (0.0%), Black Sea Bass (0.0%, Smooth Dogfish (0.0%), Spiny Dogfish (0.0%).

Virginia Beach, VA/ Lynnhaven

Most of the commercial fishing activity in Virginia Beach occurs in the Lynhaven section, along Long Creek, which empties into Lynnhaven Bay and eventually Chesapeake Bay.Two active federally permitted dealers in this port also operate as packing houses for two out-or-town dealers. In the past, there also was significant activity at Rudee Inlet on the Atlantic side of the city, but now there are only 3 or 4 commercial boats that work out of there.

The commercial fishery at Virginia Beach/Lynnhaven is inlet-dependent and pressured by competition for waterfront from tourist-related development and recreational boaters and fishers. The major gear type used as reported to the NMFS is the sink gill-net, used to catch a large number of species including bluefish, striped bass, Atlantic croaker, summer flounder, shad, dogfish, weakfish and spot (Table VA-VB1). Drift and stake gill nets are also used, the latter for spiny dogfish and bluefish among other species. This is also a center of pot fishing, for blue crabs, eels, conchs (whelks) and fish. The fish catches were mainly black sea bass and tautog. Handlines accounted for 9% of the landed value in 1998, mostly from black sea bass and summer flounder catches, but also striped bass, tautog, tilefish, tunas, and others. Pound nets accounted for 3.3% of the value in 1998; species included striped bass, bluefish, butterfish, Atlantic croaker, summer flounder, Spanish mackerel, spot, and weakfish.

Table VA-VB1: Landings by Gear Type, Virginia Beach/Lynnhaven, 1998

GEAR TYPE: VIRGINIA BEACH/LYNNHAVEN	POUNDS (%)	VALUE (%)
By Hand	0.0	0.0
Common Seine, Haul Seine	0.7	0.7
Dredge, conch	0.3	0.9
Dredge, Crab	0.8	1.0
Gill Net, Drift	1.3	1.0
Gill Net, Sink	70.1	43.3
Gill Net, Stake	0.2	0.1
Handline	2.0	9.2
Pots & Traps, Blue Crab	12.9	18.3
Pots & Traps, Conch	3.7	14.1
Pots & Traps, Eel	0.1	0.2
Pots & Traps, Fish	2.8	7.8
Pound Net	5.1	3.3
Tongs & Grabs, Clam, Patent	0.0	0.0

Total Landings, rounded, 1998: 7,812,000 pounds.
Total Value, rounded, 1998: $4,272,800 dollars

e: "0.0" means some activity but less than .06%

By species blue crab represented the highest value (19%). Next was black sea bass, which comprised 16% of 1998 landed value, mostly from handlining and fish pots (Table VA-VB2). Gillnetting for dogfish is another very important fishery. Atlantic croaker and striped bass are significant catches from the gill-net, handline, and pound-net fisheries, as is spot. Channeled whelk, caught in conch pots, made up 11% of value. The total number of species, though, is as always in this region very large: 65.

Table VA-VB22: Landings by Major Species, Virginia Beach/Lynnhaven, 1998

MAJOR SPECIES: VIRGINIA BEACH/LYNNHAVEN	POUNDS (%)	VALUE (%)
Striped Bass	4.4	11.0
Blue Crab	13.7	19.1
Atlantic Croaker	**	**
Spiny Dogfish	**	**
Black Sea Bass	4.2	15.6
Spot	14.1	8.8
Channeled Whelk	2.8	11.2
Conch	1.4	5.3
Other Fish, Industrial	2.2	0.3

Number of Species: 65

Note: ** indicates confidential data due to small number of businesses involved.

Other species of MAFMC interest by percentage value, 1998: Bluefish (0.7), Butterfish (0.7), Summer Flounder (0.3), Atlantic Mackerel (**), Scup (**), Dogfish, Other (0.3), Dogfish, Smooth (**), Tilefish

(**), Loligo Squid (**).

Newport News, VA

Sea scalloping is the principal fishery of Newport News, accounting for 72% of landed value in 1998. Scallopers use both dredges and bottom otter trawls (Table VA-NN1). Another fishery is finfish dragging (8.2% of value, 24.5% of landings) for a large variety of species. Summer flounder, angler, and black sea bass are landed in significant quantities (Table VA-NN2). Small scale inshore and bay fisheries are part of the waterman complex. They include clamming (hard clams or quahogs) and oystering using dredges, patent tongs, tongs and rakes; drift and sink gill-netting; pot-fishing and dredging for crabs (blue crabs were 28% of landings, 7% of value) and oysters; pot fishing for conch and eels and seining.

Table VA-NN1: Landings by Gear Type, Newport News, VA, 1998

GEAR TYPES, NEWPORT NEWS	Pounds (%)	VALUE (%)
Common Seine, Haul Seine	0.0	0.0
Dredge, Clam	0.0	0.0
Dredge, Crab	1.4	0.4
Dredge, Oyster	0.0	0.0
Dredge, Sea Scallop	32.9	59.7
Gill Net, Drift	0.0	0.0
Gill Net, Sink	1.0	0.3
Handline	0.0	0.0
Pots/Traps, Blue Crab	26.4	7.1
Pots/Traps, Conch	0.0	0.0
Pots/Traps, Eel	0.1	0.0
Tongs/Grabs, Oyster	0.5	0.6
Tongs/Grabs, Clam	2.4	6.0
Otter Trawl, Bottom, Fish	26.4	10.3
Otter Trawl, Bottom, Other	0.0	0.0
Otter Trawl, Bottom, Scallop	8.7	15.5

Total Landings, rounded, 1998: 5,742,500 pounds.
Total Value, rounded, 1998: $15,945,700 dollars

Table VA-NN2: Landings by Major Species, Newport News, VA, 1998

MAJOR SPECIES: NEWPORT NEWS, VA	POUNDS (%)	VALUE (%)
Crab, Blue	27.7	7.3
Flounder, Summer	19.8	8.6
Quahog	2.4	6.1
Scallop, Sea	34.4	72.1
Sea Bass, Black	2.4	0.9
Angler	7.0	3.0

Number of Species: 59

Other species of MAFMC interest, by percentage value 1998: Bluefish (0.2), Butterfish (0.0), Scup (0.0), Smooth Dogfish (0.0), Tilefish (0.0), Loligo Squid (0.4).

Norfolk, VA

The commercial fishery of Norfolk, VA today is actually typical of the more rural waterman communities. Only a few fish houses are left to buy from local fishers; other docks and wholesalers have closed down, and one wholesaler has changed to a retail store and restaurant. The fishery is a small inshore and bay fishery. Principal gears used are crab pots (55% of value), crab dredges (10%), clam patent tongs and rakes (4%), handlines (10%) and sink gill-nets (12%). Other gears are haul seines, conch dredges, and eel and fish pots. Striped bass (10% of value) are caught with gill-nets, handlines and seines, as are Atlantic croaker (4% of value) and other estuarine and anadromous species. The small black sea bass fishery here (2.2% of value) is carried out with handlines, as is the summer flounder fishery (2.1%). Blue crabs make up two-thirds of the value of Norfolk's catch (64%); hard clams or quahogs account for 4%, and conch 4% as well.

Hampton and Seaford, VA

For purposes of discussing fishery landings and preserving confidentiality, we have combined weighout data for Hampton (within the Metropolitan Statistical Area depicted above) and Seaford (within York County, census and employment data for which are offered below). Gear-type data (Table VA-H1) show that sea-scalloping with dredges is the single-most important fishery by value; otter-trawl dragging for finfish is highest for poundage. Some draggers are also used for scalloping. Gill-netting, crab potting and dredging, seining, and tonging for clams are other techniques used in these two ports (Seaford is almost entirely devoted to scalloping, but scalloping is also important in Hampton).

Like Newport News, Hampton and Seaford are important sea scalloping ports near the mouth of Chesapeake Bay. Scallops accounted for 69% of landed value in 1998. In Hampton, a significant portion of the scallops are caught with otter trawls rather than scallop dredges. The sea scallop fleet of Seaford relies entirely on dredges and accounts for virtually all of the landings and landed value there. Besides scallops these dredge-equipped vessels caught large amounts of angler as well as a small amount of summer flounder.

Finfish dragging is also important in Hampton. Species diversity is extremely high. The otter trawl fleet of Hampton takes Illex and Loligo squid, black sea bass (a substantial amount is also caught with handlines); Atlantic mackerel; Atlantic croaker (a large portion was caught by haul seines as well as pound nets and sink gill nets); and angler (although most was landed by scallop dredges and scallop otter trawls). A small amount of pelagic longlining is also done from Hampton, for black tip, mako shortfin and thresher sharks and tuna (big eye, yellowfin, albacore)

The inshore and bay fisheries of Hampton include the pound-net and seine fisheries for Atlantic croaker, gill-netting and handlining, blue crabs, (caught with dredges, pots, and scrapes) and hard clams or quahogs (harvested with patent tongs and crabs). We have combined the weighout data for Hampton and Seaford to preserve the confidentiality of data for fisheries with few businesses involved. Species diversity in the landings at Hampton and Seaford is extremely high, 79 in 1998 (Table VA-H2). Fourteen had either poundage or value at or above 2% in 1998, led by sea scallops, summer flounder, Illex squid, Atlantic croaker, blue crab, and angler.

Table VA-H1: Landings by Gear Type, Hampton and Seaford, VA, 1998

GEAR TYPE: HAMPTON & SEAFORD	POUNDS (%)	VALUE (%)
Common Seine, Haul Seine	4.6	0.7
Dredge, Crab	1.6	0.8
Dredge, Scallop, Sea	16.6	57.2
Gill Net, Drift	0.7	0.2
Gill Net, Sink	8.2	2.1
Handline	0.3	0.2
Longline, Pelagic	0.1	0.1
Pots & Traps, Blue Crab	9.2	3.9
Pots & Traps, conch	0.0	0.0
Pots & Traps, Eel	0.0	0.0
Pots & Traps, fish	0.0	0.0
Scrapes	0.0	0.0
Tongs & Grabs, Clam, Patent	0.7	3.4
Otter Trawl, Bottom, Fish	53.5	16.5
Otter Trawl, Bottom, Scallop	4.4	14.7
Otter Trawl, Bottom, Shrimp	0.0	0.0
Pound Nets	0.0	0.0

Total Landings, rounded, 1998: 9,089,500 pounds.
Total Value, rounded, 1998: $13,311,000 dollars

Table VA-H2: Major Species Landed, Hampton and Seaford, VA, 1998

MAJOR SPECIES: HAMPTON & SEAFORD	POUNDS (%)	VALUE (%)
Angler	3.6	3.1
Crab, Blue	10.8	4.7
Croaker, Atlantic	13.2	2.1
Flounder, Summer	11.1	9.4
Mackerel, Atlantic	**	**
Scallop, Sea	17.3	68.8
Sea Bass, Black	2.9	2.6
Squid, Illex	**	**
Squid, Loligo	3.2	0.9
Other Fish, Industrial	2.1	0.1
Striped Bass	4.8	1.1
Herring, NK	**	**
Herring, Atlantic	**	**
Quahog	1.3	4.2

Number of Species: 79

dicates confidential data due to small number of businesses involved.

Other species of MAFMC interest, by percentage value, 1998: Bluefish (0.4), Butterfish (0.1), Scup (0.1), Spiny Dogfish (0.0), Tilefish (0.0).

Northampton County, VA

Northampton County is at the southernmost tip of the Delmarva peninsula. Among its fishing ports are Oyster, inside the barrier islands of the Atlantic coast, and Cape Charles, at the entrance to the Chesapeake Bay, but most of the landings come from smaller sites coded as "Other Northampton" in NMFS weighout data. The fisheries are inshore and estuarine, dominated by blue crabs, Atlantic croaker, hard clams, and horseshoe crabs (Table VA-N2). Weakfish/squeteague and striped bass are among the 45 other species landed commercially in this area of Virginia.

Reflecting the importance of blue-crabs, the most important single gear-type is the blue crab pot (Table VA-N1). Pots are also used for conch, eel, and fish (the 1998 catches of the fish pots were Atlantic croaker and northern puffer, the latter a most unusual specialty). Dredges are used for hard clams, conch, horseshoe crabs, and blue crabs. Scrapes are used for crabs and eels; clams are harvested with patent tongs and "by hand."

Pound-nets are also important, both for crab and for fish. The fish pound nets catch Atlantic croakers, striped bass, summer flounder, weakfish and others, totaling 32 species. Otter trawl and "unknown" constitute the next largest gear types, totaling 8% of value; both were almost entirely horseshoe crab harvests in 1998. Gill-nets are used for a large variety of species; drift gill nets for 30 species, including striped bass, Atlantic croaker, and spot; sink gill nets for 25 species, including American shad and weakfish. The NMFS dealer weighout data used for landings do not completely reflect the active, inshore fishery of Virginia, which is recorded by the State of Virginia. On the other hand, they do indicate the variety of techniques and fisheries.

Table VA-N1: Landings by Gear Type, Northampton County, VA, 1998

GEAR TYPE: NORTHAMPTON CO., VA	POUNDS (%)	VALUE (%)
By Hand	0.3	2.3
By Hand, Oyster	0.0	0.0
Common, Haul Seine	0.0	0.0
Dredge, Clam	0.3	3.4
Dredge, Conch	0.1	0.3
Dredge, Crab	6.4	7.9
Dredge, Other	0.3	0.1
Gill Net, Drift	6.1	4.9
Gill Net, Sink	4.7	4.4
Gill Net, Stake	0.1	0.1
Handline	0.2	0.4
Pots & Traps, Blue Crab	28.7	33.6
Pots & Traps, Conch	0.4	1.6
Pots & Traps, Eel	0.0	0.0
Pots & Traps, Fish	0.1	0.2
Pound Net, Crabs	0.2	0.6
Pound Net, Fish	24.0	14.7
Scrapes	0.0	0.1
Tongs & Grabs, Clam, Patent	0.0	0.3
Otter Trawl, Bottom, Fish	16.7	13.9
“Unknown” (Horseshoe Crab)	11.4	11.1

Total Landings, rounded, 1998: 8,468,400 pounds.
Total Value, rounded, 1998: $5,001,400 dollars

Note: "0.0" indicates some activity but less than 0.06%

Table VA-N2: Landings by Major Species, Northampton County, VA, 1998

MAJOR SPECIES: NORTHAMPTON CO., VA	POUNDS (%)	VALUE (%)
Bass, Striped	1.3	3.1
Crab, Blue	34.9	41.2
Crab, Horseshoe	28.2	25.2
Croaker, Atlantic	21.4	13.1
Quahog	0.5	2.9
Spot	2.4	1.4
Conch	0.8	2.9
Clams, Blood	0.2	2.9
Weakfish	5.1	2.5

Number of Species: 49

Other species of MAFMC interest, by percentage value 1998: Bluefish (0.6), Butterfish (0.1).

Accomack County and Chincoteague, VA

The visiting otter trawl fishery accounts for almost half of Chincoteague's 1998 landed value; summer flounder predominates in this fishery and is the leading species for landed value (39%). Like other Mid-Atlantic otter trawl fleets, this one is highly diverse, landing 19 species in 1998, led by summer flounder, black sea bass, and Loligo squid. There is a small drift gill-net fishery for striped bass, Atlantic croaker and other species and a large sink gill-net fishery (27% of Chincoteague's value), mainly for angler, but also spiny dogfish, Atlantic mackerel, and other species. Angler was almost as valuable as fluke in 1998. Some handlining and longlining for tunas and sharks takes place, and in1998 16% of the value came from fish pots, mainly black sea bass. Less than 5% of Chincoteague's fishing activity, in terms of value, came from clamming, crabbing and other estuarine and bay fisheries, which otherwise predominate in the Virginia and Maryland region.

Table VA-AC1 shows 1998 landings and value, broken down by percentage for gear type and major species, combining Chincoteague's landings with those of the many small waterman fisheries of Accomack County, as well as the port of Wachapreague. Seventy-two species were landed in 1998, primarily blue crabs. Crabs are caught with dredges, pots, scrapes, and trot-lines. There is also oystering and hard-clamming. Angler and summer flounder, mainly from Chincoteague's gill-net and otter trawl fisheries, account for 2.2% and 3.8% of the county's total value. Striped bass, Atlantic croaker, and conch are other important species.

The major gear types are crab pots (52.2% of value) and conch and fish pots (4.9%); crab scrapes and dredges. Also important are gillnets (19.8% of value); otter trawls; and "by hand" referring to treading, hand rakes, and other techniques used to harvest hard clams, oysters and horseshoe crabs.

Table VA-CH1: Landings by Gear Type, Accomack County, VA, 1998

GEAR TYPE: CHINCOTEAGUE & OTHER ACCOMACK CO, VA	POUNDS %	VALUE %
By Hand	0.5	2.4
By Hand, Oyster	0.0	0.0
Dredge, clam	0.1	0.5
Gill Net, Drift	15.0	7.9
Gill Net, Sink	19.5	11.8
Gill Net, Stake	0.1	0.1
Handline	0.0	0.1
Longline Pelagic	0.0	0.0
Pots & Traps, Blue Crab	45.9	52.2
Pots & Traps, Conch	1.5	3.1
Pots & Traps, Fish	1.2	1.8
Rakes, Other	0.0	0.1
Trawl, Otter, Bottom, Fish	3.3	4.4
Cast Nets	0.1	0.1
Seines	0.7	0.3
Dredge, Conch	1.9	1.5
Dredge, Crab	4.4	4.3
Dredge, Oyster	0.1	0.3
Pots & Traps, Eel	0.0	0.0
Pound Net, Crab	0.1	0.3
Pound Net, Fish	3.2	0.8
Scrapes	2.1	7.3
Tongs & Grabs, Patent	0.1	0.7
Trot Line	0.1	0.1

Total Landings, rounded, 1998: 11,077,100 pounds
Total Value, rounded, 1998: $8,485,000 dollars

Table VA-AC2: Landings by Major Species, Accomack County, VA, 1998

MAJOR SPECIES: ACCOMACK CO, VA	POUNDS (%)	VALUE(%)
Crab, Blue	52.2	63.9
Flounder, Summer	2.4	3.8
Angler	**	**
Bass, Striped	1.5	2.7
Croaker, Atlantic	**	**
Dogfish, Spiny	**	**
Quahog	0.6	3.4
Horseshoe Crab	2.5	1.5
Conch	1.6	3.3
Menhaden	2.8	0.3
Spot	8.2	4.1

Number of Species: 72

Note: ** indicates confidential data due to the small number of businesses involved.

Other Species of MAFMC interest, by percentage value, 1998: Bluefish (0.5), Butterfish (0.1), Atlantic Mackerel (0.1), Scup (0.0), Black Sea Bass (1.7), Tilefish (**), Loligo Squid (**).

Carteret County, NC (includes fishing centers of Morehead City, Beaufort, Bettie, Harker's Island, Davis, Stacy, Sea Level, Atlantic, Cedar Island)

Carteret County has the largest fishery in terms of poundage and second largest in terms of value in North Carolina (Table NC1). Total 1998 landings were over 80 million pounds, but value was little more than 21 million pounds, largely due to the low value of species such as menhaden and thread herring caught by purse-seining. Other important fisheries were crab-potting, shrimp trawling, fluke trawling, hard-clamming, and the use of pound-nets, sink gill nets, longlines, and other gears for a large variety of finfishes (the total number of species landed was 69) (Tables NC-CC1, 2).

Table NC-CC1: Landings by Gear Type, Carteret County, North Carolina, 1998

GEAR TYPE	Pounds. %	VALUE %
Beach seine	0.0%	0.0%
By hand	0.1%	2.0%
Cast net	0.1%	0.0%
Channel net	0.1%	0.5%
Clam dredge (hydraulic)	0.0%	0.7%
Clam trawl, kicking	0.1%	2.2%
Common seine	0.0%	0.0%
Crab pot	6.0%	13.4%
Crab trawl	0.6%	1.4%
Fish pot	0.0%	0.2%
Flounder trawl	2.4%	9.1%
Flynet	0.6%	0.7%
Gigs	0.0%	0.1%
Gill net (drift)	0.1%	0.1%
Gill net (runaround)	0.5%	1.1%
Gill net set (float)	0.4%	1.1%
Gill net set (sink)	3.7%	5.4%
Haul seine	1.7%	2.9%
Longline bottom	0.0%	0.1%
Longline surface	0.1%	0.9%
Other (including conf.)	78.7%	22.8%
Oyster dredge	0.0%	0.1%
Peeler pot	0.0%	0.1%
Pound net	1.0%	5.5%
Purse seine	0.0%	0.0%
Rakes bull	0.0%	0.5%
Rakes hand	0.2%	3.8%
Rod-n-reel	0.8%	5.0%
Scallop dredge (bay)	0.1%	1.1%
Scallop dredge (sea)	0.0%	0.0%
Scallop scoop	0.0%	0.0%
Scallop trawl	0.0%	0.0%
Shrimp trawl	2.4%	16.7%
Skimmer trawl	0.1%	1.1%
Swipe net	0.0%	0.0%
Tongs, hand	0.0%	0.8%
Trolling	0.1%	0.4%

Total landings, rounded, 1998: 80,417,400 pounds.
Total value, rounded, 1998: 21,332,100 dollars

Table NC-CC2: Landings by Major Species, Carteret County, NC, 1998

MAJOR SPECIES >2%	Pounds %	VALUE %
Unclassified shrimp	1.9%	16.7%
Crabs, blue, hard	7.1%	15.4%
Croaker, Atlantic	2.7%	3.0%
Flounders, fluke	2.0%	14.0%
Other (including conf.)	78.7%	22.8%
Spot	1.5%	2.4%
Weakfish (seatrout, grey)	1.6%	2.8%
Clam, hard (meats)	0.4%	9.2%
Groupers	0.2%	1.9%

Number of species: 69

Pamlico County, NC

Pamlico County (pop. 11,372, 1990) had impressive total landings in 1998 of over 10 million pounds, worth over 9 million dollars. Important fishing centers include Bayboro, Vandemere, Hobucken and Oriental. Fishing takes place in the sounds and tidal rivers as well as coastal marine waters. Crab-potting, shrimp trawling, and flounder trawling are the major fisheries. Blue crabs accounted for 62% of the value in 1998, shrimp 13%, and fluke 19%. Fluke were caught mainly in trawls ("flounder trawls") but also in crab pots, crab trawls, drift or runaround gill-nets, set gill nets (float and sink), haul seines, pound nets, shrimp trawls, and swipe nets. Like other Mid-Atlantic areas, this is a very diversified fishing region, 46 species being landed by 19 different techniques or gears (Tables NC-PC1, 2).

Table NC-PC1: Landings by Gear Type, Pamlico County, NC, 1998

GEAR TYPE	Pounds %	VALUE %
By hand	0.0%	0.0%
Crab pot	72.0%	57.2%
Crab trawl	7.3%	5.5%
Eel pot	0.0%	0.0%
Flounder trawl	8.5%	16.6%
Flynet	0.0%	0.0%
Gill net (drift)	0.0%	0.0%
Gill net (runaround)	2.7%	1.7%
Gill net set (float)	2.5%	3.2%
Gill net set (sink)	0.5%	0.4%
Haul seine	0.0%	0.0%
Other (including conf.)	1.1%	1.4%
Oyster dredge	0.1%	0.3%
Peeler pot	0.0%	0.0%
Pound net	0.0%	0.0%
Rod-n-reel	0.0%	0.0%
Scallop trawl	0.0%	0.3%
Shrimp trawl	5.3%	13.5%
Swipe net	0.0%	0.0%

Total landings, 1998, rounded: 10,502,300 pounds.
Total value, 1998, rounded: 9,271,800dollars

Table NC-PC2: Landings by Major Species, Pamlico County, NC, 1998

MAJOR SPECIES >2%	Pounds %	VALUE %
Unclassified shrimp	4.9%	13.1%
Crabs, blue, hard	78.5%	60.1%
Flounders, fluke	9.4%	19.3%
Mullets	3.0%	1.6%
Crabs, blue, peeler	0.9%	2.1%

Number of species: 46

Beaufort County, NC

Beaufort County (pop. 42,283, 1990) is an important fishing county, accounting for over 10 million pounds. and 8 million dollars in 1998 (Tables NC-BC1,2). Bellhaven is the principal fishing port. Blue crabs, caught with pots, trawls, trotlines, and other methods, comprise almost all of the landings and value. Fluke made up over 3% of the value. Shrimp is also important although not shown below because of confidentiality.

Table NC-BC1: Landings by Gear-Type, Beaufort County, NC, 1998

GEAR TYPE	Pounds %	VALUE %
Crab pot	85.6%	82.9%
Crab trawl	10.0%	10.0%
Eel pot	0.1%	0.2%
Fish pot	0.0%	0.0%
Flounder trawl	0.0%	0.0%
Fyke net	0.0%	0.0%
Gigs	0.0%	0.0%
Gill net (runaround)	0.0%	0.0%
Gill net set (float)	1.4%	1.1%
Gill net set (sink)	1.2%	1.9%
Other (including conf.)	1.5%	3.7%
Oyster dredge	0.0%	0.0%
Peeler pot	0.0%	0.0%
Pound net	0.0%	0.0%
Rod-n-reel	0.0%	0.0%
Shrimp trawl	0.1%	0.1%
Trolling	0.0%	0.0%
Trotline	0.0%	0.0%

Total landings, rounded, 1998: 10,147,000 pounds
Total value, rounded,1998: 8,035,100 dollars

Table NC-BC2: Landings by Major Species, Beaufort County, NC, 1998

MAJOR SPECIES >2%	Pounds %	VALUE %
Crabs, blue, hard	94.4%	89.8%
Flounders, fluke	1.4%	3.1%
Other (including conf.)	1.5%	3.7%

Number of species: 38

Hyde County, NC

Hyde County (pop. 5,411 in 1990) although small in population (reportedly there is only one traffic light in the county) is the third largest fishing county of North Carolina, with total landings over 16 million pounds. and value over 10 million dollars in 1998 (Tables NC-HC1,2). Fishing centers include Swan

Quarter, Engelhard and Ocracoke. Blue crabs and fluke are the two most important species in terms of value; dogfish, and Atlantic croaker are also significant, and 56 other species are caught. Gears used are the full array of estuarine and inshore techniques, particularly crab pots and trawls, sink and float set gill nets, shrimp trawls, pound nets, and flounder trawls.

Table NC-HC1: Landings by Gear Type, Hyde County, NC, 1998

GEAR TYPE	Pounds %	VALUE %
By hand	0.0%	0.0%
Cast net	0.0%	0.0%
Crab pot	63.0%	58.4%
Crab trawl	4.4%	3.8%
Fish pot	0.0%	0.0%
Flounders trawl	1.9%	5.0%
Fly net	0.3%	0.6%
Gill net (runaround)	0.4%	0.3%
Gill net set (float)	2.2%	2.9%
Gill net set (sink)	17.8%	12.5%
Haul seine	0.0%	0.0%
Longline bottom	0.0%	0.0%
Longline shark	0.0%	0.0%
Other (including conf.)	5.7%	3.2%
Oyster dredge	0.1%	0.9%
Peeler pot	0.0%	0.0%
Pound net	1.5%	3.6%
Rakes bull	0.0%	0.0%
Rakes hand	0.0%	0.0%
Rod-n-reel	0.0%	0.0%
Shrimp trawl	2.5%	8.5%
Swipe net	0.0%	0.0%
Tongs, hand	0.0%	0.0%
Trolling	0.2%	0.4%

Total landings, rounded, 1998: 16,079,800 pounds
Total value, rounded,1998: 10,921,600 dollars

Table NC-HC2: Landings by Major Species, Hyde County, NC, 1998

MAJOR SPECIES >2%	Pound s%	VALUE %
Unclassified shrimp	2.3%	8.2%
Crabs, blue, hard	66.2%	58.5%
Croaker, Atlantic	8.3%	4.1%
Flounder, fluke	5.9%	16.0%
Other (including conf.)	5.7%	3.2%
Sharks, dogfish	3.8%	0.8%

Number of species: 62

Dare County, NC

Dare County (pop. 22,746, 1990) saw over 36.6 million pounds and 23.5 million dollars from fish and shellfish (and turtle) landings in 1998, the second highest county in the state in terms of pounds and first in terms of dollars (Tables NC-DC1,2). Fishing centers include Wanchese, Hatteras, and Mann's Harbor. Fluke (15%) was second to crabs (40%) in terms of value, but a much wider range of products were significant than in other North Carolina counties, because of the importance of ocean as well as estuarine fisheries. These included bluefish, dogfish, squid, weakfish, anglerfish, king mackerel, sharks, and tuna. The fisheries range from estuarine fisheries (crab-pots, pound-nets, turtle pots, fyke nets, etc.) to offshore longlining.

Table NC-DC1: Landings by Gear Type, Dare County, NC, 1998

GEAR TYPE	Pounds%	VALUE %
Beach seine	1.5%	1.3%
By hand	0.0%	0.0%
Cast net	0.1%	0.0%
Crab pot	30.6%	33.0%
Crab trawl	0.6%	0.5%
Eel pot	0.0%	0.1%
Fish pot	0.1%	0.2%
Flounder trawl	3.3%	7.5%
Flynet	13.2%	7.7%
Fyke net	0.0%	0.0%
Gigs	0.0%	0.0%
Gill net (runaround)	1.0%	1.0%
Gill net set (float)	0.7%	0.8%
Gill net set (sink)	36.4%	22.5%
Haul seine	0.7%	0.5%
Longline bottom	0.0%	0.0%
Longline shark	1.5%	0.8%
Longline surface	2.7%	5.8%
Other (including conf.)	0.6%	0.4%
Oyster dredge	0.0%	0.0%
Peeler pot	1.1%	5.6%
Pound net	2.1%	3.4%
Rakes bull	0.0%	0.0%
Rakes hand	0.0%	0.0%
Rod-n-reel	0.6%	1.4%
Shrimp trawl	0.4%	1.2%
Trolling	2.8%	6.1%
Turtle pot	0.0%	0.0%

Total landings, rounded, 1998: 36,625,800 pounds.

Total value, rounded, 1998: 23,511,500 dollars

Table NC-DC2: Landings by Major Species, Dare County, NC, 1998

MAJOR SPECIES >2%	Pounds %	VALUE %
Anglerfish (goosefish)	1.8%	1.9%
Bluefish	6.4%	2.6%
Crabs, blue, hard	30.1%	27.8%
Croaker, atlantic	18.9%	9.4%
Flounders, fluke	5.2%	15.0%
Mackerel, king	2.0%	4.7%
Sharks	2.7%	1.4%
Sharks, dogfish	10.9%	2.3%
Squid	2.4%	2.0%
Tuna	2.6%	5.2%
Weakfish (seatrout, grey)	4.7%	3.9%
Crabs, blue peeler	0.7%	2.2%
Crabs, blue, soft	1.6%	9.2%

Number of species: 69

Other North Carolina Counties:

Commercial fishing is important in many other North Carolina counties as well. Following are profiles of counties for which landings were reported in 1998, in rough geographical order, from southwest to northeast. Counties where landings were very small in 1998 are signified by full indentations and italics. Population figures for 1997 are from Diaby (1999:35), based on the July 1997 estimate from the Office of State Planning, Office of the Governor. Estimates of fishing income were derived from various sources described in Diaby (1999: 35).

Brunswick, Pender, and related Inland Counties

Brunswick County (pop. 65,200, 1997), at the southwestern end of the coast, has a diversified estuarine and inshore fishery, which yielded almost 3 million pounds and over 4.8 million dollars in 1998 (Tables NC-BC1,2). Shrimp trawls and rod-n-reel account for most of the landings by value; shellfish techniques ("by hand, bull rakes, hand rakes, hand tongs"), crab pots, trolling, and other techniques are also found. The major species by value was shrimp (48%); it was followed by a fairly even representation of porgies, snappers, groupers, hard clams, oysters, spot, triggerfish, and swordfish. In 1990 89 white men and 36 black men, plus 12 white women, claimed the occupation of fisher, and 23 white men were captains and other officers on the census. According to Diaby (1999: 35), there were 688 ETS issued in 1997, and the average fishing income that year was $11,572, compared with an average annual wage per worker of $23,860.

Pender County (pop. 37,208, 1997), up the Cape Fear River from Wilmington, is the site of estuarine and ocean fisheries, amounting to about $770,000 worth, for 535,000 pounds in 1998. 19 gear types were used that year, ranging from shrimp trawls and four different kinds of gill-nets to a variety of shell-fishing techniques and small scale nets (butterfly net, cast net, channel net). Shrimp, clams, crabs, and oysters were major. Fluke made up 2.1% of value and porgies 3.2% of value. Other ocean fishes are king mackerel, spot, snappers, and groupers. In 1990 66 white males declared fishing as their occupation. Diaby (1999: 35) reports 239 ETS issued in 1997, with average fishing income of $8,599 compared with an average annual wage of $19,329.

Bladen County, up the Cape Fear River, was the site of a gill-net fishery, plus a little oystering, haul-seining and crab potting in 1998. Species caught included crabs, spot, shad, croaker, and other bay and estuarine species. The 1990 census showed 8 black men as fishers. Robeson County, far inland up the same river, had a few landings in 1998 as well.

Columbus County, between Brunswick and Bladen Counties and on the Cape Fear River, had a small fishery, mainly oysters but also small amounts of spot, shad, fluke, bluefish, and crabs. It was valued at less than $70,000 in 1998. Techniques include crab pots, gill nets, gigs, and "by hand." The 1990 census showed no fishers as occupational types.

Three of the main landing ports for spiny dogfish (Wachapreague, VA; Plymouth, MA; and Scituate, MA) are discussed here. Information for these descriptions was gathered from port agents and/or harbor masters.

Scituate, MA: Located north of Cape Cod and south of the City of Boston, the fishing fleet in this port is comprised of primarily gill-net boats (approximately 85%). Reportedly most of the landings at Scituate and some of the landings in Plymouth (located to the south) can be attributed to these dogfish harvesters. Dogfish are unloaded and transported to processing facilities by 3-4 different carriers and ice is supplied primarily by one local business.

Plymouth, MA: Located to the south of Scituate and featuring a slightly smaller fishing fleet, Plymouth boats are comprised of about 40% gill-net boats. Reportedly, 1-2 different carriers transport dogfish from the port to processing facilities with the aid of one local business that acts as something of a broker. Ice is also provided locally.

Wachapreague, VA: Located in northern Virginia, Wachapreague features a small fleet of gill-net boats. These boats primarily make day trips and account for most of the dogfish landings in this port. One local seafood dealer packs the dogfish for transport and in most instances transportation is provided by the processing facility.

According to 1997 unpublished NMFS weighout data, several ports derive a large percent of landings value from spiny dogfish, as compared to the combined value of all other species landed in that port. For example, In Plymouth, MA, spiny dogfish accounted for 96% of the total pounds and 74% of the total value of all fish landed in this port. This phenomenon also manifests in several other ports. In Wachapreague, VA, spiny dogfish accounted for 90% of the total pounds and 76% of the total value of all fish landed in that port; in Scituate, MA, spiny dogfish accounted for 74% of the total pounds and 21% of the total value of all fish landed in this port; in Chatham, MA, spiny dogfish accounted for 47% of the total pounds and 14% of the total value of all fish landed in this port; in Ocean City, MD, spiny dogfish accounted for 32% of the total pounds and 11% of the total value of all fish landed in this port; and, in Dare County, NC, spiny dogfish accounted for 30% of the total pounds and 11% of the total value of all fish landed in this port.

Clearly these ports will be disproportionately affected by any proposed regulatory action. The extent to which local communities will be affected “materially” is unknown, but it is likely that some of the local businesses which support the commercial fishing industry in these areas will be adversely impacted by this proposed action in the short-term.

4.5 Protected Species Under the Endangered Species Act and Marine Mammal Protection Act

There are numerous species which inhabit the management unit of this FMP that are afforded protection under the Endangered Species Act (ESA) of 1973 (i.e., for those designated as threatened or endangered) and/or the Marine Mammal Protection Act of 1972 (MMPA). Eleven are classified as endangered or threatened under the ESA, while the remainder are protected by the provisions of the MMPA.

Entanglements of several species of marine mammals and other protected species have been documented in fishing gear types used in the spiny dogfish fishery. Marine mammals include the northern right whale, humpback whale, fin whale, minke whale, harbor porpoise, white-sided dolphin, bottlenose dolphin, common dolphin, harp seal, harbor seal and gray seal. The status of these and other marine mammal populations inhabiting the Northwest Atlantic has been discussed in detail in the U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments. Initial assessments were presented in Blaylock, *et al.* (1995) and are updated in Waring *et al.* (1999).

The protected species found in New England and Mid-Atlantic waters are listed below.

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),* Kemp's ridley *(Lepidochelys kempi),* Leatherback turtle *(Dermochelys coriacea),* Green sea turtle *(Chelonia mydas)* Shortnose sturgeon *(Acipenser brevirostrum).*

Threatened: Loggerhead turtle *(Caretta caretta)*

Species Proposed for ESA listing: Harbor porpoise: *(Phocoena phocoena).*

Other marine mammals: Other species of marine mammals likely to occur in the management unit include the minke whale *(Balaenoptera acutorostrata),* white-sided dolphin *(Lagenorhynchus acutus),* white-beaked dolphin *(Lagenorhynchus apoundsirostris),* bottlenose dolphin *(Tursiops truncatus),* [coastal stock listed as depleted under the MMPA], pilot whale *(Globicephala melaena),* Risso's dolphin *(Grampus griseus),* common dolphin *(Dephinis delphis),* spotted dolphin (Stenella spp.), striped dolphin *(Stenella coeruleoapoundsa),* killer whale *(Orcinus orca),* beluga whale *(Delphinapterus leucas),* Northern bottlenose whale *(Hyperood on ampullatus),* goosebeaked whale *(Ziphius cavirostris)* and beaked whale (Mesoplodon spp.). Pinnipeds species include harbor *(Phoca vitulina)* and gray seals *(Halichoerus grypus)* and less
commonly, hooded *(Cystophora cristata)* harp *(Pagophilus groenlandicus)* and ringed seals (*Phoca hispida*).

4.5.1 North Atlantic Right Whale

The northern right whale was listed as endangered throughout it’s range on June 2, 1970 under the ESA. The current population is considered to be at a low level and the species remains designated as endangered (Waring *et al.* 1999). A Recovery plan has been published and is in effect (NMFS 1991). This is a strategic stock because the average annual fishery-related mortality and serious injury from all fisheries exceeds the Potential Biological Removal (PBR).

North Atlantic right whales range from wintering and calving grounds in coastal waters of the southeastern US to summer feeding grounds, nursery and presumed mating grounds in New England and northward to the Bay of Fundy and Scotian shelf (Waring et al. 1999). Approximately half of the species’ geographic range is within the area in which the spiny dogfish fishery is prosecuted. In the management area as a whole, right whales are present throughout most months of the year, but are most abundant between February and June. The species uses mid-Atlantic waters as a migratory pathway from the winter calving grounds off the coast of Florida to spring and summer nursery/feeding areas in the Gulf of Maine.

NMFS designated right whale critical habitat on June 3, 1994 (59 FR 28793). Portions of the critical habitat within the action area include the waters of Cape Cod Bay and the Great South Channel off the coast of Massachusetts, where the species is concentrated at different times of the year.

The western North Atlantic population of right whales was estimated to be 295 individuals in 1992 (Waring *et al.* 1999). The current population growth rate of 2.5% as reported by Knowlton *et al.* (1994) suggests the stock may be showing signs of slow recovery. However, considerable uncertainty exists about the true size of the current stock (Waring *et al.* 1999).

4.5.2 Humpback Whale

The humpback whale was listed as endangered throughout it's range on June 2, 1970. This species is the fourth most numerically depleted large cetacean worldwide. In the western North Atlantic, humpback whales feed during the spring through fall over a range which includes the eastern coast of the US (including the Gulf of Maine) northward to include waters adjacent to Newfoundland/Labrador and western Greenland (Waring *et al.* 1999). During the winter, the principal range for the North Atlantic population is around the greater and Lesser Antilles in the Caribbean (Waring *et al.* 1999)

About half of the species' geographic range is within the management area of the spiny dogfish FMP. As noted above, humpback whales feed in the northwestern Atlantic during the summer months and migrate to calving and mating areas in the Caribbean. Five separate feeding areas are utilized in northern waters after their return; the Gulf of Maine (which is within the management unit of this FMP) is one of those feeding areas. As with right whales, humpback whales also use the Mid-Atlantic as a migratory pathway. Since 1989, observations of juvenile humpbacks in that area have been increasing during the winter months, peaking January through March (Swingle *et al.,* 1993). It is believed that non-reproductive animals may be establishing a winter feeding in the Mid-Atlantic since they are not participating in reproductive behavior in the Caribbean. It is assumed that humpbacks are more widely distributed in the management area than right whales. They feed on a number of species of small schooling fishes, including sand lance and Atlantic herring.

The most recent status and trends of the for the Western North Atlantic stock of humpback whales are given by Waring *et al.* (1999). The current rate of increase of the North Atlantic humpback whale population has been estimated at 9.0% (CV=0.25) by Katona and Beard (1990) and at 6.5% by Barlow and Clapham (1997). The minimum population estimate for the North Atlantic humpback whale population is 10,019 animals, and the best estimate of abundance is 10,600 animals (CV=0.07; Waring *et al.* 1999).

4.5.3 Fin Whale

The fin whale was listed as endangered throughout it's range on June 2, 1970 under the ESA. The fin whale is ubiquitous in the North Atlantic and occurs from the Gulf of Mexico and Mediterranean Sea northward to the edges of the arctic ice pack (Waring *et al.*1999). The overall pattern of fin whale movement is complex, consisting of a less obvious north-south pattern of migration than that of right and humpback whales. However, based on acoustic recordings from hydrophone arrays, Clark (1995) reported a general southward "flow pattern" of fin whales in the fall from the Labrador/Newfoundland region, south past Bermuda, and into the West Indies. The overall distribution may be based on prey availability, and fin whales are found throughout the proposed management area for this FMP in most months of the year. This species preys opportunistically on both invertebrates and fish (Watkins *et al.* 1984). As with humpback whales, they feed by filtering large volumes of water for the associated prey. Fin whales are larger and faster than humpback and right whales and are less concentrated in nearshore environments.

Hain *et al.* (1992) estimated that about 5,000 fin whales inhabit the northeastern United States continental shelf waters. Shipboard surveys of the northern Gulf of Maine and lower Bay of Fundy targeting harbor porpoise for abundance estimation provided an imprecise estimate of 2,700 (CV=0.59) fin whales (Waring *et al.* 1999).

4.5.4 Loggerhead Sea Turtle

The loggerhead turtle was listed as "threatened" under the ESA on July 28, 1978, but is considered endangered by the World Conservation Union (IUCN) and under the Convention on International Trade in Endangered Species of Flora and Fauna (CITES). Loggerhead sea turtles are found in a wide range of habitats throughout the temperate and tropical regions of the Atlantic. These include open ocean, continental shelves, bays, lagoons, and estuaries (NMFS& FWS 1995). In the management unit of this FMP they are most common on the open ocean in the northern Gulf of Maine, particularly where associated with warmer water fronts formed from the Gulf Stream. The species is also found in entrances to bays and sounds and within bays and estuaries, particularly in the Mid-Atlantic.

Since they are limited by water temperatures, sea turtles do not usually appear on the summer foraging grounds in the Gulf of Maine until June, but are found in Virginia as early as April. They remain in these areas until as late as November and December in some cases, but the large majority leave the Gulf of Maine by mid-September. Loggerheads are primarily benthic feeders, opportunistically foraging on crustaceans and mollusks (NMFS & FWS 1995). Under certain conditions they also feed on finfish, particularly if they are easy to catch *(e.g.,* caught in gillnets or inside pound nets where the fish are accessible to turtles).

A Turtle Expert Working Group (TEWG 1998) conducting an assessment of the status of the loggerhead sea turtle population in the Western North Atlantic (WNA), concluded that there are at least four loggerhead subpopulations separated at the nesting beach in the WNA (TEWG 1998). However, the group concluded that additional research is necessary to fully address the stock definition question. The four nesting subpopulations include the following 0areas: northern North Carolina to northeast Florida, south Florida, the Florida Panhandle, and the Yucatan Peninsula. Genetic evidence indicates that loggerheads from Chesapeake Bay southward to Georgia appear nearly equally divided in origin between South Florida and northern subpopulations. Additional research is needed to determine the origin of turtles found north of the Chesapeake Bay.

The TEWG analysis also indicated the northern subpopulation of loggerheads may be experiencing a significant decline (2.5% - 3.2% for various beaches). A recovery goal of 12,800 nests has been assumed for the Northern Subpopulation, but current nests number around 6,200 (TEWG 1998). Since the number of nests have declined in the 1980's, the TEWG concluded that it is unlikely that this subpopulation will reach this goal given this apparent decline and the lack of information on the subpopulation from which loggerheads in the WNA originate. Continued efforts to reduce the adverse effects of fishing and other human-induced mortality on this population are necessary.

The most recent 5-year ESA sea turtle status review (NMFS & USFWS 1995) highlights the difficulty of assessing sea turtle population sizes and trends. Most long-term data comes from nesting beaches, many of which occur extensively in areas outside U.S. waters. Because of this lack of information, the TEWG was unable to determine acceptable levels of mortality. This status review supports the conclusion of the TEWG that the northern subpopulation may be experiencing a decline and that inadequate information is available to assess whether its status has changed since the initial listing as threatened in 1978. NMFS & USFWS (1995) concluded that loggerhead turtles should remain designated threatened but noted that additional research will be necessary before the next status review can be conducted.

Sea sampling data from the sink gillnet fisheries, Northeast otter trawl fishery, and Southeast shrimp and summer flounder bottom trawl fisheries indicate incidental takes of loggerhead turtles. Loggerheads are also known to interact with the lobster pot fishery. Based on analogy with available data from other fisheries, gear types used to target spiny dogfish are capable of taking loggerhead turtles if time/area overlap exists. However, this is not believed to be the case and there is no reason to conclude at this time that the spiny dogfish fishery represents a major source of human-induced serious injury or mortality of loggerhead turtles.

4.5.5 Leatherback Sea Turtle

The leatherback is the largest living sea turtle and ranges farther than any other sea turtle species, exhibiting broad thermal tolerances (NMFS& USFWS 1995). Leatherback turtles feed primarily on cnidarians (medusae, siphonophores) and tunicates (salps, pyrosomas) and are often found in association with jellyfish. These turtles are found throughout the management unit of this FMP. While they are predominantly pelagic, they occur annually in Cape Cod Bay and Narragansett Bay primarily during the fall. Leatherback turtles appear to be the most susceptible to entanglement in lobster gear and longline gear compared to the other sea turtles commonly found in the management unit. This may be the result of attraction to gelatinous organisms and algae that collect on buoys and buoy lines at or near the surface.

Nest counts are the only reliable population information available for leatherback turtles. Recent declines have been seen in the number of leatherbacks nesting worldwide (NMFS & USFWS 1995). The status review notes that it is unclear whether this observation is due to natural fluctuations or whether the population is at serious risk. It is unknown whether leatherback populations are stable, increasing, or declining, but it is certain that some nesting populations (e.g, St. John and St. Thomas, U.S. Virgin Islands) have been extirpated (NMFS 1998).

Sea sampling data from the southeast shrimp fishery indicate recorded takes of leatherback turtles. As noted above, leatherbacks are also known to interact with the lobster pot fishery. Based on analogy with available data from other fisheries, gear types used to target spiny dogfish are capable of taking leatherback turtles if time/area overlap exists. However, there is no reason to conclude at this time that the spiny dogfish fishery represents a major source of human-induced serious injury or mortality of leatherback turtles.

4.5.6 Kemp’s Ridley Sea Turtle

The Kemp's ridley is probably the most endangered of the world's sea turtle species. The only major nesting site for ridleys is a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico (Carr 1963). Estimates of the adult population reached a low of 1,050 in 1985, but increased to 3,000 individuals in 1997. First-time nesting adults have increased from 6% to 28% from 1981 to 1989, and from 23% to 41% from 1990 to 1994, indicating that the ridley population may be in the early stages of growth (TEWG 1998).

Juvenile Kemp's ridleys inhabit northeastern US coastal waters where they forage and grow in shallow coastal during the summer months. Juvenile ridleys migrate southward with autumnal cooling and are found predominantly in shallow coastal embayments along the Gulf Coast during the late fall and winter months.

Ridleys found in mid-Atlantic waters are primarily post-pelagic juveniles averaging 40 cm in carapace length, and weighing less than 20 kg (NMFS 1998). After loggerheads, they are the second most abundant sea turtle in Virginia and Maryland waters, arriving in there during May and June and then emigrating to more southerly waters from September to November (NMFS 1998). In the Chesapeake Bay, ridleys frequently forage in shallow embayments, particularly in areas supporting submerged aquatic vegetation (Lutcavage and Musick 1985; NMFS 1998). The juvenile population in Chesapeake Bay is estimated to be 211 to 1,083 turtles (NMFS 1998).

The model presented by Crouse *et al.* (1987) illustrates the importance of subadults to the stability of loggerhead populations and may have important implications for Kemp's ridleys. The vast majority of ridleys identified along the Atlantic Coast have been juveniles and subadults. Sources of mortality in this area include incidental takes in fishing gear, pollution and marine habitat degradation, and other man-induced and natural causes. Loss of individuals in the Atlantic, therefore, may impede recovery of the Kemp's ridley sea turtle population.

Sea sampling data from the northeast otter trawl fishery and southeast shrimp and summer flounder bottom trawl fisheries has recorded takes of Kemp's ridley turtles. Based on analogy with available data from other fisheries, gear types used to target spiny dogfish are capable of taking Kemp's ridley turtles if time/area overlap exists However, there is no reason to conclude at this time that the spiny dogfish fishery would represent a major source of human-induced serious injury or mortality of Kemp's ridley turtles.

4.5.7 Green Sea Turtle

Green sea turtles are more tropical in distribution than loggerheads, and are generally found in waters between the northern and southern 20EC isotherms (NMFS 1998). In the wester Atlantic region, the summer developmental habitat encompasses estuarine and coastal waters as far north as Long Island Sound, Chesapeake Bay, and the North Carolina sounds, and south throughout the tropics (NMFS 1998). Most of the individuals reported in U.S. waters are immature (NMFS 1998). Green sea turtles found north of Florida during the summer must return to southern waters in autumn or risk the adverse effects of cold temperatures.

There is evidence that green turtle nesting has been on the increase during the past decade. For example, increased nesting has been observed along the Atlantic coast of Florida on beaches where only loggerhead nesting was observed in the past (NMFS 1998). Recent population estimates for the western Atlantic area are not available. Green turtles are threatened by incidental captures in fisheries, pollution and marine habitat degradation,
destruction/disturbance of nesting beaches, and other sources of man-induced and natural mortality.

Juvenile green sea turtles occupy pelagic habitats after leaving the nesting beach. At approximately 20 to 25 cm carapace length, juveniles leave pelagic habitats, and enter benthic foraging areas, shifting to a chiefly herbivorous diet (NMFS 1998). Post-pelagic green turtles feed primarily on sea grasses and benthic algae, but also consume jellyfish, salps, and sponges. Known feeding habitats along U.S. coasts of the western Atlantic include shallow lagoons and embayments in Florida, and similar shallow inshore areas elsewhere (NMFS 1998).

Sea sampling data from the scallop dredge fishery and southeast shrimp and summer flounder bottom trawl fisheries have recorded incidental takes of green turtles. Based on analogy from data from other fisheries, gear types used to target spiny dogfish are capable of taking green turtles if time/area overlap exists. However, there is no reason to conclude at this time that the spiny dogfish fishery would represent a major source of human-induced serious injury or mortality of this species.

4.5.8 Shortnose Sturgeon

Shortnose sturgeon occur in large rivers along the western Atlantic coast from the St. Johns River, Florida (possibly extirpated from this system), to the Saint John River in New Brunswick, Canada. The species is anadromous in the southern portion of its range *(i.e.,* south of Chesapeake Bay), while northern populations are amphidromous (NMFS 1998). Population sizes vary across the species' range with the smallest populations occurring in the Cape Fear and Merrimack Rivers and the largest populations in the Saint John and Hudson Rivers (Dadswell 1979; NMFS 1998).

Shortnose sturgeon are benthic and mainly inhabit the deep channel sections of large rivers. They feed on a variety of benthic and epibenthic invertebrates including molluscs, crustaceans (arnphipods, chironomids, isopods), and oligochaete worms (Vladykov and Greeley 1963; Dadswell 1979). Shortnose sturgeon are long-lived (30 years) and mature at relatively old ages. In northern areas, males reach maturity at 5-10 years, while females reach sexual maturity between 7 and 13 years.

In the northern part of their range, shortnose sturgeon exhibit three distinct movement patterns that are associated with spawning, feeding, and overwintering periods. In spring, as water temperatures rise above 8E C, pre-spawning shortnose sturgeon move from overwintering grounds to spawning areas. Spawning occurs from mid/late April to mid/late May. Post-spawned sturgeon migrate downstream to feed throughout the summer.

As water temperatures decline below 8E C again in the fall, shortnose sturgeon move to overwintering concentration areas and exhibit little movement until water temperatures rise again in spring (NMFS 1998). Young-of-the-year shortnose sturgeon are believed to move downstream after hatching (NMFS 1998) but remain within freshwater habitats. Older juveniles tend to move downstream in fall and winter as water temperatures decline and the salt wedge recedes. Juveniles move upstream in spring and feed mostly in freshwater reaches during summer.

Shortnose sturgeon spawn in freshwater sections of rivers, typically below the first impassable barrier on the river *(e.g.,* dam). Spawning occurs over channel habitats containing gravel, rubble, or rock-cobble substrates (NMFS 1998). Additional environmental conditions associated with spawning activity include decreasing river discharge following the peak spring freshet, water temperatures ranging from 9 -12 C, and bottom water velocities of 0.4 - 0.7 m/sec (NMFS 1998).

Based on analogy with available data from other fisheries, gear types used to target spiny dogfish are capable of taking shortnose sturgeon if time/area overlap exists. However, there is no reason to conclude at this time that the spiny dogfish fishery would represent a major source of human-induced serious injury or mortality of shortnose sturgeon.

4.5.9 Seabirds

Most of the following information about seabirds is taken from the Mid-Atlantic Regional Marine Research Program (1994) and Peterson (1963). Fulmars occur as far south as Virginia in late winter and early spring. Shearwaters, storm petrels (both Leach's and Wilson's), jaegers, skuas, and some terns pass through this region in their annual migrations. Gannets and phalaropes occur in the Mid-Atlantic during winter months. Nine species of gulls breed in eastern North America and occur in shelf waters off the northeastern US. These gulls include: glaucous, Iceland, great black-backed, herring, laughing, ring-billed, Bonaparte's and Sabine's gulls, and black-legged caduceus. Royal and sandwich terns are coastal inhabitants from Chesapeake Bay south to the Gulf of Mexico. The Roseate tern is listed as endangered under the ESA, while the Least tern is considered threatened (Safina pers. comm.). In addition, the bald eagle is listed as threatened under the ESA and is a bird of aquatic ecosystems.

Like marine mammals, seabirds are vulnerable to entanglement in commercial fishing gear. The interaction has not been quantified in the spiny dogfish fishery, but impacts are not considered significant. Human activities such as coastal development, habitat degradation and destruction, and the presence of organochlorine contaminants are considered the major threats to some seabird populations. Endangered, threatened or otherwise protected bird species, including the roseate tern and piping plover, are unlikely to be impacted by the gear types employed in the spiny dogfish fishery.

4.5.10 Harbor Porpoise

Harbor porpoise are found in both US and Canadian waters. During the summer they are concentrated in the northern Gulf of Maine and southern Bay of Fundy region, generally in waters less than 150 m deep. During fall and spring, harbor porpoises are widely dispersed from New Jersey to Maine. During the winter, harbor porpoise are found from New Jersey to North Carolina (Waring *et al.* 1999). Waring *et al.* (1999) recently estimated the population of harbor porpoises to be about 50,000 animals. They concluded that there are insufficient data to determine trends in population size for this species. However, they estimated the Potential Biological Removal (PBR) for the species to be 483 individuals.

Takes of harbor porpoise resulting in serious injury and incidental mortality are known to occur in the Gulf of Maine and Mid-Atlantic gill net fisheries. In addition, the incidental take of harbor porpoise in commercial fishing gear has been increasing over the last ten years (Waring *et al.* 1999). The estimated total annual average annual mortality and serious injury to this stock attributable to all fisheries in the New England and Mid-Atlantic region is approximately 2,100 animals. In the Mid-Atlantic region, the monkfish and dogfish fisheries account for most of the incidental take of harbor porpoise. NMFS sea sampling data indicated that there were 12 observed takes of harbor porpoise in the Mid-Atlantic coastal gill net for spiny dogfish in 1995 and 1996.

The gears used in the spiny dogfish fishery are listed under Categories I, II, and III of the final List of Fisheries for 1999 for the taking of marine mammals by commercial fishing operations under section 114 of the Marine Mammal Protection Act (MMPA) of 1972. Section 114 of the MMPA establishes an interim exemption for the taking of marine mammals incidental to commercial fishing operations and requires NMFS to publish and annually update the List of Fisheries, along with the marine mammals and the number of vessels or persons involved in each fishery, arranging them according to a two tiered classification system. The classification criteria consist of a two tiered, stock-specific approach that first addresses the total impact of all fisheries on each marine mammal stock (Tier 1) and then addresses the impact of the individual fisheries on each stock (Tier 2). If the total annual mortality and serious injury of all fisheries that interact with a stock is less than 10% of the PBR for the stock then the stock is designated as Tier 1 and all fisheries interacting with this stock would be placed in Category III. Otherwise, these fisheries are subject to categorization under Tier 2. Under Tier 2, individual fisheries are subject to the following categorization:

I. Annual mortality and serious injury of a stock in a given fishery is greater than or equal to 50% of the PBR level;

II. Annual mortality and serious injury of a stock in a given fishery is greater than one percent and less than 50% of the PBR level; or

III. Annual mortality and serious injury of a stock in a given fishery is less than one percent of the PBR level.

In Category I, there is documented information indicating a "frequent" incidental mortality and injury of marine mammals in the fishery. Some of the spiny dogfish gill net fisheries are in this category, including sink gill net fishing for spiny dogfish in areas where other Northeast multispecies sink gill netting occurs (L. Allen, pers. comm). With the mandatory reductions in spiny dogfish fishing mortality and subsequent reductions in fishing effort in this fishery, there should be a reduction in the incidental take of marine mammals and other protected species. The management measures proposed in this FMP, in concert with the HPTRP, should greatly reduce the chance of the incidental capture of harbor porpoise and other protected species. In fact, recent findings of the Harbor Porpoise Take Reduction Team indicate that the number of takes of this species has declined dramatically in recent years. This trend is expected to continue as fishing effort continues to be dramatically reduced in the directed spiny dogfish fisheries.

In Category II, there is documented information indicating an "occasional" incidental mortality and injury of marine mammals in the fishery. Some of the spiny dogfish gill net fisheries are in this category, principally the spiny dogfish gillnet fisheries prosecuted in the Mid-Atlantic region. With the mandatory reductions in spiny dogfish fishing mortality associated with the preferred alternative, there should be a reduced chance of entanglement and incidental take of protected species, most notably for the harbor porpoise.

In Category III, there is information indicating no more than a "remote likelihood" of an incidental taking of a marine mammal in the fishery or, in the absence of information indicating the frequency of incidental taking of marine mammals, other factors such as fishing techniques, gear used, methods used to deter marine mammals, target species, seasons and areas fished, and species and distribution of marine mammals in the area suggest there is no more than a remote likelihood of an incidental take in the fishery. "Remote likelihood" means that it is highly unlikely that any marine mammal will be incidentally taken by a randomly selected vessel in the fishery during a 20-day period. The spiny dogfish trawl and demersal longline fisheries are considered Category III fisheries.

The 1994 amendments to the Marine Mammal Protection Act (MMPA) require the preparation and implementation of Take Reduction Plans (TRP's) for strategic marine mammal stocks that interact with Category I or II fisheries. The 1998 Stock Assessment Report (SAR) (Waring *et al.*, 1999) states that harbor porpoise bycatch has been observed by the NMFS Sea Sampling program in the following fisheries: (1) the Northeast (NE) multispecies sink gillnet, (2) the mid-Atlantic coastal gillnet, (3) the Atlantic drift gillnet, (4) the North Atlantic bottom trawl fisheries, and (5) the Canadian Bay of Fundy sink gillnet fishery. The fisheries of greatest concern, and the subject of the HPTRP are the NE multispecies sink gillnet fishery (Category I), and the Mid-Atlantic coastal gillnet fishery (Category II). As noted above, the areas and gear types fished in the spiny dogfish commercial fisheries result in various portions of these fisheries being placed in Categories I, II, and III.

The NMFS recently published in 50 CFR 229, the Final Rule and Notice of Availability of Harbor Porpoise Take Reduction Plan (HPTRP) Regulations to reduce the bycatch of harbor porpoise (*Phocoena phocoena*) in gillnet fisheries throughout the stock's US range. As noted above, the incidental bycatch of harbor porpoise in the Gulf of Maine (GOM) and Mid-Atlantic gillnet fisheries exceeds the PBR level. The HPTRP uses a wide range of management measures to reduce the bycatch and mortality of harbor porpoise. In the GOM, the HPTRP implements time and area closures and time/area periods during which pinger use would be required in the Northeast, Mid-coast, Massachusetts Bay, Cape Cod South and Offshore Closure Areas. In the Mid-Atlantic area, the HPTRP implements time/area closures and modifications to gear characteristics, including floatline length, twine size, tie downs, and number of nets, in the large mesh and small mesh fisheries.

5.0 Environmental Consequences

5.1 Biological Impacts

5.1.1 Mid-Atlantic Council Alternative: Specify quota for 2001-2002 at 4.5 million pounds with a commercial quota portion of 4.0 million pounds and a spiny dogfish research quota set-aside of 500,000 pounds and trip limits of 600 pounds for quota period 1 and 300 pounds for quota period 2

The Spiny Dogfish Monitoring Committee recently found that current fishing mortality for spiny dogfish exceeds the threshold fishing mortality rate (F_{rep} , proxy for F_{msy}). In addition, total adult stock biomass of spiny dogfish is currently 29% of SSB_{max}, the proxy for B_{MSY}, based on a three year moving average of adult female biomass estimates from the 1998-2000 NEFSC spring survey. Thus, the spiny dogfish stock is considered overfished according to the new SFA overfishing guidelines and requires rebuilding. The FMP was designed to eliminate overfishing and rebuild the spiny dogfish stock through a two step reduction in fishing mortality rate. The first step allowed for a one year exit fishery of 22 million pounds to allow a phase out of the directed fishery. This approach was chosen to minimize the impact of the rebuilding program on both the harvest and processing sectors of the industry. For the first year of the rebuilding plan (1999-2000), F was to be reduced to 0.2. Following the first year exit fishery, the FMP specifies that the F will be reduced to F=0.03 in the remaining years of the rebuilding plan.

The MAFMC alternative includes a total quota of 4,500,000 pounds, divided into a commercial quota of 4,000,000 pounds and a spiny dogfish research set-aside quota of 500,000 pounds for fishing year 2001. Quota period 1 (May 1 through October 31) would be allocated 2,316,000 pounds (57.9%) of the 4,000,000 pounds commercial, and quota period 2 (November 1 through April 30) would be allocated 1,684,000 pounds (42.1%) of the 4,000,000 pounds commercial quota. In addition, to ensure that a directed fishery for spiny dogfish is largely eliminated, trip limits of 600 pounds per trip and 300 pounds per trip (vessels are prohibited from landing more than the specified amount in one calendar day) were recommended for quota periods 1 and 2, respectively. This action is intended to achieve the F = 0.03 target and end the directed fishery for spiny dogfish in order to end overfishing and rebuild the spiny dogfish stock. The research quota set aside would provide for a means to investigate ways to direct fishing effort away from female spiny dogfish. This alternative represents the 2000-2001 status quo which was implemented by Secretarial Interim Action.

The 500,000 pound research quota could be allocated to vessels participating in research projects designed to investigate ways to shift fishing away from female spiny dogfish, which in turn would help to rebuild the female portion of the stock and provide greater balance to the stock as a whole. The 500,000 pounds research quota is not expected to negatively impact the goals of the FMP. Research projects would be developed to investigate ways to avoid catch and discards of female spiny dogfish. The effect of the research projects on female dogfish will depend on the degree of targeting that occurs and the survival rate of discarded female dogfish. Both aspects will be important to consider and measure during the projects.

While the MAFMC recommended that 500,000 pounds of spiny dogfish be set aside for research, the FMP does not currently allow for such a provision. However, the Councils concluded that the benefits of the information developed from research projects would far outweigh the negative effects on the stock, if any. This conclusion was based upon the strong recommendation of the Spiny Dogfish Monitoring Committee relative to this issue.

One of the primary goals of the FMP is to eliminate the directed spiny dogfish fishery, which is known to target large female spiny dogfish. In order to achieve this goal, trip limits or other management measures should be restrictive enough to reduce the amount of landings of spiny dogfish and encourage vessel owners to direct on other species and avoid spiny dogfish. As indicated in Table 8, the trip limits of 300 pounds in quota period 2 and 600 pounds in quota period 1 would have approximately the same impact. Thus, the Mid-Atlantic Council proposes a 300 pound trip limit in quota period 2 and a 600 pound trip limit in quota period 1 for the purpose of ending the directed fishery without imposing a disproportionate impact on the number of trips during the two different quota periods.

The trip limits of 600 pounds and 300 pounds for quota periods 1 and 2, respectively, would effectively eliminate the directed fishery and would have similar impacts on spiny dogfish trips during their respective quota periods, based on an analysis of NMFS landings data. A trip limit of 300 pounds during quota period 2 and a trip limit of 600 pounds during quota period 1, would impact approximately 67% of spiny dogfish trips. These trip limits were developed with the intent of eliminating the directed spiny dogfish fishery. Thus, the proposed trip limits would help ensure that the F = 0.03 target is achieved because they will likely eliminate the directed spiny dogfish fishery. A fishing mortality rate target of F=0.03 is necessary to rebuild the stock under the SFA.

An analysis of the trip limits determined the regulatory savings and discards of spiny dogfish based on economic decisions of vessels when faced with a trip limit. This analysis indicates that trip limits in combination with a low commercial quota would produce a high level of regulatory discards because spiny dogfish are encountered, landed and discarded in nearly all major fisheries in the region. However, the goal of the Spiny Dogfish FMP and the 2001-2002 specifications is to eliminate the directed fishery in order to meet the $F_{0.03}$ target. The Spiny Dogfish FMP demonstrated that high discards are also associated with the directed fishery because the landed fish are primarily large females and all other fish are discarded. Increasing the trip limit and allowing for a directed fishery would increase the likelihood that the goals of the Spiny Dogfish FMP will not be achieved. In addition, since dogfish is a low value species that is difficult to handle onboard vessels, discards represented in the trip limit analyses may be overestimated since vessel owners are expected to make efforts to avoid spiny dogfish while targeting other species.

The intent of the Councils is to rebuild the spawning stock biomass of the spiny dogfish stock to levels which will support the fisheries at long term, sustainable levels. The short term effect of the Spiny Dogfish FMP on the fishery and associated fishing communities will be to reduce the allowable catch in a two step process. After the first year exit fishery, the FMP will have a dramatic effect on the directed spiny dogfish fishery. Landings during the rebuilding period will be limited to bycatch levels only, thus eliminating the directed fishery during the rebuilding phase. While the short term effects of the FMP are of negative consequence to the those involved in the fishery, the long term effects of the FMP are overwhelmingly positive. The recent unregulated fishery, left unchecked, would deplete the adult spawning portion of the stock by about 85% within ten years leading to stock collapse. Yields would be expected to plummet (even at current high levels of F) and the Councils would be faced with an extended rebuilding period which could be decades in duration. The FMP allows for the rebuilding of the adult spawning stock and then allows for a sustainable fishery at yield levels of approximately 14 million pounds per year.

5.1.2 Alternative 2 - New England Council Alternative: Specify quota for 2000-2001 at 4.5 million pounds with a commercial quota portion of 4 million pounds and a spiny dogfish research quota set-aside of 500,000 pounds and trip limit of 5000 pounds (NEFMC option) The New England Council alternative includes a total quota of 4,500,000 pounds, divided into a commercial quota of 4,000,000 pounds and a spiny dogfish research set-aside quota of 500,000 pounds for fishing year 2001. Quota period 1 (May 1 through October 31) would be allocated 2,316,000 pounds (57.9%) of the 4,000,000 pounds commercial, and quota period 2 (November 1 through April 30) would be allocated 1,684,000 pounds (42.1%) of the 4,000,000 pounds commercial quota. In addition, the NEFMC recommended a trip limit of 5000 pounds per trip (vessels are prohibited from landing more than the specified amount in one calendar day) for quota periods 1 and 2 to allow for a small scale directed fishery for spiny dogfish to continue. The trip limit recommended by the New England Council would allow a small scale directed fishery to operate for another year.

The biological impacts expected from this alternative are expected to be similar to the MAFMC alternative described above, except fore the trip limit. It is anticipated that a 5,000 pound trip will allow for a limited directed fishery. This could have negative biological consequences in terms of stock rebuilding since directed fishing is expected to concentrate on larger fish (i.e., adult females).

5.1.3 Alternative 3: No action " \l 4 The alternative action considered by the Councils was to allow unregulated landings to continue in the spiny dogfish fishery for 2001-2002. Under this alternative (no action), fishing mortality in the spiny dogfish fishery would remain unregulated. With no restrictions, landings would be expected to increase to 22.0 million pounds in 2001-2002 based on projections presented by the Spiny Dogfish Monitoring Committee. Therefore, unrestricted fishing would likely to result in a harvest of 22.0 million pounds and a fishing mortality that exceeds 0.3. Under these conditions, female SSB is likely to be reduced below current levels.

5.2 Economic and Social Impacts

The economic and social impacts resulting from each alternative is described in Section 3.3 of the Regulatory Impact Review. Overall, Massachusetts appears to be the most heavily impacted state, since they account for the highest percentage of landings and have the largest number of vessels actively engaged in the directed spiny dogfish fishery.

The intent of the Councils is to rebuild the spawning stock biomass of the spiny dogfish stock to levels which will support the fisheries at long term, sustainable levels. The short term effect of the Spiny Dogfish FMP on the fishery and associated fishing communities will be to drastically reduce the allowable catch. After the first year exit fishery, the FMP will have a dramatic effect on the directed spiny dogfish fishery. Landings during the rebuilding period will be limited to bycatch levels only, thus eliminating the directed fishery during the rebuilding phase. While the short term effects of the FMP are of negative consequence to the those involved in the fishery, the long term effects of the FMP are overwhelmingly positive. The recent unregulated fishery, left unchecked, would deplete the adult spawning portion of the stock by about 85% within ten years leading to stock collapse. Yields would be expected to plummet (even at current high levels of F) and the Councils would be faced with an extended rebuilding period which could be decades in duration. The FMP allows for the rebuilding of the adult spawning stock in a relatively short period of time and then allow for a sustainable fishery.

5.3 Impacts on Protected Species Under the Endangered Species Act and Marine Mammal Protection Act

The stock recovery schedule in the FMP specifies mandatory reductions in spiny dogfish fishing mortality which will result in reductions in fishing effort directed at spiny dogfish by about 30% in year one of the FMP and in excess of 90% of current levels during the years of the rebuilding period through elimination of the directed fishery. Under the proposed rebuilding plan for spiny dogfish, the directed fishery for this species will be closed until the stock is rebuilt following the first year exit fishery. During the rebuilding phase fishing effort directed towards spiny dogfish will be eliminated and thus the chance of incidental catches of protected species during this time period should be negligible during this period.

Once the spiny dogfish stock is rebuilt, the fishery will be prosecuted at a greatly reduced level compared to the unregulated fishery prior to implementation of this FMP. Overall, effort directed at spiny dogfish after the stock is rebuilt should be reduced by about 70-75% compared to the recent unregulated fishery. Therefore, the Councils concluded that the effect of this FMP, in concert with the HPTRP, should be to greatly reduce entanglements of protected species (most notably harbor porpoise) in the spiny dogfish fishery. The possibility does exist, however, that fishing effort previously directed at spiny dogfish could be shifted towards other species. These fisheries include Atlantic mackerel, weakfish, croaker, king whiting, bluefish and any other fishery for which no limited access program currently exists. The degree to which these effort shifts will occur can not be quantified based on current data.

The reductions in fishing mortality proposed under the either the MAFMC or NEFMC option for 2001-2002 will result in significant reductions in fishing effort that, in turn, will reduce interactions with protected species including marine mammals, sea turtles, shortnose sturgeon, and seabirds. The no action alternative would greatly increase that chance that interactions with protected species including marine mammals, sea turtles, shortnose sturgeon, and seabirds might occur, especially with harbor porpoise.

In May of 2000, the NMFS issued an emergency rule to close the waters along the coasts of North Carolina and Virginia to fishing with gill nets with a mesh size of 6 inches or larger to protect endangered and threatened sea turtles. This emergency action was in response to the unprecedented number of dead sea turtles which washed ashore on the North Carolina Outer Banks in April and May 2000. The vast majority of the turtles stranded during this event were loggerheads which is a threatened species. Four of the loggerheads that stranded in May were entangled in gill nets of 10 to 12 inches. NMFS analysis at the time of this closure indicated that the gill net fisheries for monkfish and dogfish were the fisheries most likely to be active during the time and area of the strandings. However, it is unlikely that gill nets of that size were used in the spiny dogfish fisheries which typically use mesh sizes much smaller than 10 inches. None the less, there still exists the chance that some of these interactions occurred as a result of the directed spiny dogfish fishery which remained unregulated until May of 2000. However, the proposed quota of 4.0 million pounds and low trips limits under the MAFMC alternative will effectively end the directed spiny dogfish fishery. As a result, the cessation of the directed dogfish fishery should virtually eliminate interactions between the dogfish fishery and sea turtles.

5.4 Essential Fish Habitat Assessment

Spiny dogfish have EFH designated in many of the same bottom habitats that have been designated as EFH for most of the groundfish within the Northeast Multispecies FMP, including: Atlantic cod, haddock, monkfish, ocean pout, American plaice, pollock, redfish, white hake, windowpane flounder, winter flounder, witch flounder, yellowtail flounder, Atlantic halibut and Atlantic sea scallops. Broadly, EFH is designated as the bottom habitats consisting of varying substrates (depending upon species) within the Gulf of Maine, Georges Bank, and the continental shelf off southern New England and the mid-Atlantic south to Cape Hatteras for the juveniles and adults of these groundfish. In general, these areas are the same as those designated for spiny dogfish.

Fishing activities for spiny dogfish occur in these EFH areas. The primary gears utilized to harvest these species are otter trawls and gill nets. Since the otter trawl is a bottom- tending mobile gear, it is most likely to be associated with adverse impacts to bottom habitat. The primary impact associated with this type of gear is reduction of habitat complexity (Auster and Langton, 1998).

The spiny dogfish FMP includes a stock rebuilding program which will result in fishing effort reductions in excess of 90% compared to an unregulated fishery. This should reduce gear impacts to bottom habitats by reducing the harvest of the managed species within this FMP. Any reductions in harvesting effort may indirectly benefit EFH by creating an overall reduction of disturbance by a gear type that impacts bottom habitats. Other management actions already in place should control redirection of effort into other bottom habitats.

The reductions in fishing mortality proposed under either the MAFMC or NEFMC option will result in significant reductions in fishing effort that, in turn, will indirectly benefit EFH by producing a reduction in the disturbance by a gear type that impacts bottom habitats. The no action alternative would be expected result in no benefit to EFH.

6.0 Finding of no significant impact

For the reasons discussed above, it is hereby determined that neither approval and implementation of the interim final rule for fishing year 2001 spiny dogfish specifications nor the alternatives would affect significantly the quality of the human environment, and that the preparation of an environmental impact statement for these specifications is not required by section 101(2)(c) of the National Environmental Policy Act nor its implementing regulations.

______________________ ________________________
Assistant Administrator for Fisheries, NOAA Date

REGULATORY IMPACT REVIEW AND ECONOMIC IMPACT ANALYSIS FOR THE 2001-2002 CATCH SPECIFICATIONS FOR SPINY DOGFISH

1.0 Introduction

The National Marine Fisheries Service (NMFS) requires the preparation of a Regulatory Impact Review (RIR) for all regulatory actions that either implement a new Fishery Management Plan (FMP) or significantly amend an existing plan. This RIR is part of the process of preparing and reviewing FMPs and provides a comprehensive review of the changes in net economic benefits to society associated with proposed regulatory actions. This analysis also provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problems. The purpose of this analysis is to ensure that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost-effective way. This RIR addresses many items in the regulatory philosophy and principles of Executive Order (E.O.) 12866.

2.0 Evaluation of E.O. 12866 Significance

The economic benefits of the spiny dogfish FMP were evaluated during plan development. The conclusions reached in the initial benefit-cost analyses of the FMP remain unchanged. The proposed action does not constitute a significant regulatory action under E.O. 12866 for the following reasons. First, it will not have an annual effect on the economy of more than $100 million. Based on unpublished NMFS preliminary data (Maine-North Carolina) the total commercial value for the spiny dogfish fishery was estimated at $1.0 million in fishing year 2000 (May 1, 2000 -present). The measures considered in this regulatory action will not affect total revenues generated by the commercial industry to the extent that a $100 million annual economic impact will occur. The proposed actions are necessary to rebuild the overfished spiny dogfish stock. The proposed action will not adversely affect, in the long-term, competition, jobs, the environment, public health or safety, or state, local, or tribal government communities. Secondly, the proposed actions will not create a serious inconsistency or otherwise interfere with an action taken or planned by another agency. No other agency has indicated that it plans an action that will affect the Spiny Dogfish fisheries in the EEZ. Thirdly, the proposed actions will not materially alter the budgetary impact of entitlement s, grants, user fees, or loan programs or the rights and obligations of their participants. Finally, the proposed actions do not raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this Executive Order.

Employment in the processing sector of the spiny dogfish industry may face the most severe effects of the implementation of the fishing year 2001 spiny dogfish specifications. The FMP indicated that due to the low commercial quotas mandated by the plan, and the labor-intensive nature of hand-processing spiny dogfish, employment reductions in the processing sector may result from the loss of dogfish supply. The extent of these employment reductions will most likely be determined by whether or not processors can find alternative species which require hand processing. If this does not occur, it is likely that seasonal or permanent reductions in employment may occur as a result of this action. With landings valued as high as $11 million, the value of the processing sector would have to expand the value of landings by a factor of 10 to have an impact on the economy greater than 100 million dollars, which is unlikely to occur. It is therefore likely that the impact of the management measures on the harvesting and processing sectors would result in an annual effect on the economy that is less than the 100 million dollar level. Other considerations under E.O. 12866 for significance are unchanged in consideration of impacts on the processing sector. Therefore, the fishing year 2001 specifications would not constitute a significant regulatory action.

3.0 Economic Impact Analysis

3.1 Introduction and Methods

The proposed measures for spiny dogfish for 2001-2002 could affect any vessel which landed spiny dogfish in the past or current holders of federal spiny dogfish commercial permits.   Unpublished data from the Northeast dealer report database indicate that 6.7 million pounds of spiny dogfish was landed from May1 to date during fishing year (FY) 2000-2001(herein referred to as FY 2000). However, the preliminary data available for FY 2000 do not include data specified to the vessel level. Therefore, to assess the economic impact of the proposed quota measures at the vessel level, 1999 unpublished dealer report data was used as a proxy for FY 2000. The NMFS Northeast dealer report database indicated that a total of 596 vessels landed spiny dogfish in 1999. All of these vessels readily fall within the definition of small businesses. Therefore, in the analysis that follows in section 3.3.4, an active participant in the spiny dogfish fishery was defined as any vessel that reported having landed one or more pounds of spiny dogfish in the Northeast dealer data during calendar year 1999. The dealer data covers activity by unique vessels that hold a Federal permit of any kind and provides summary data for vessels that fish exclusively in state waters. This means that an active vessel may be a vessel that holds any valid Federal fishing permit in the Northeast region. Beginning in 2000, commercial vessels fishing for spiny dogfish in the EEZ were required to obtain a federal spiny dogfish permit. In the present IRFA, the primary unit of observation for purposes of the analysis is a vessel that reported landing spiny dogfish during calendar year 1999 regardless of their permit status. However, any of the 2,759 vessels which obtained spiny dogfish permits could potentially be affected by the proposed measures.

The effects of proposed actions were analyzed by employing quantitative approaches to the extent possible. Where quantitative data were not available, qualitative analyses were conducted. The economic effects of the quota scenarios were estimated as follows. First, the Northeast dealer data were queried to identify all vessels that landed at least one or more pounds of spiny dogfish in calendar year 1999. As noted above, 1999 was chosen because it is the last full year from which vessel level data are available. Data from 2000 were not used in this analysis because the year is not complete and these data are not available at the vessel level . As such, 1999 landing data by vessel were used as a proxy for 2000. The second step was to sum the revenues from spiny dogfish landings and all species in total by vessel for 1999 to determine the proportion of total revenue attributable to spiny dogfish for each vessel. To estimate the reduction in revenues by vessel as a consequence of the proposed actions in FY 2001, it was assumed that the distribution by vessel of spiny dogfish landings in FY 2001 would be the same as was observed in 1999. In other words, it was assumed that the 596 vessels which landed spiny dogfish in 1999 would have landed the 6.7 million pounds landed in FY 2000 in the same relative proportions as was observed in 1999. The percent reduction in landings by vessel represented by the proposed actions in FY 2001 was applied to the spiny dogfish revenues by vessel (i.e, assuming that the FY 2001 quota would represent a 40% decline from actual FY 2000 landings). The percent reduction in total revenues as a result of the reduction in spiny dogfish landings due to the proposed quota was then calculated. A vessel was considered to be “affected” if total revenues for that vessel were expected to be reduced by more than 5% as a result of the proposed quota of 4.0 million pounds. These results were further summarized by vessel size class (length and GRT) and home state as defined by permit application data.

Not all landings and revenues reported through the Federal dealer data can be attributed to a specific vessel. Vessels with no Federal permits are not subject to any Federal reporting requirements with which to corroborate the dealer reports. Similarly, dealers that buy exclusively from state waters only vessels and have no Federal permits, are also not subject to Federal reporting requirements. Since vessels operating in the EEZ were not required to have a Federal permit to land spiny dogfish until 2000, it is possible that some vessel activity cannot be tracked with the landings and revenue data that are available. Thus, some of these vessels may not be included in the threshold analysis. This problem has two consequences for the analyses that follow. First, the stated number of entities subject to the regulation is a lower bound estimate, since all vessels may not be counted. Second, the portion of activity by these uncounted vessels may cause the estimated economic impacts to be over- or underestimated. The threshold analysis described above is intended to identify impacted vessels and to characterize the potential economic impact on directly affected entities. It is presumed that the impacts on vessels that cannot be identified will be similar to the participating vessels that are analyzed herein.

3.1.1 Trip Limit Analysis of Expected Reductions in Spiny Dogfish Exploitation

As they are typically conducted, a trip limit analysis involves relatively straightforward methods. Data on pounds per trip on occasions where the species of interest was landed are gathered and sorted in ascending order. All trips where actual landings were less than the proposed trip limit are assumed to be unaffected. Trips where landings exceed the proposed trip limit can be treated in any one of several different ways. One possibility is to simply truncate the landings distribution and assume that all trips above the trip limit do not occur. This approach has an obvious tendency to overstate the conservation benefit of a trip limit. At the other extreme, it could be assumed that the trip limit would have no effect on expected fishing patterns and fishermen would simply discard any catch in excess of the trip limit. The conservation benefit in this case would be limited to discard survival. An alternative approach is to make some assumption about how a trip limit would affect fishing choices.

The question of whether a trip limit will affect fishing patterns depends upon the interaction of several variables including the trip limit itself, revenues earned from bycatch or component catch, and fishing costs. Based on the assumption that, for a given trip, vessel owners seek to maximize revenues net of operating costs (i.e., seek to maximize profits), a simple economic model was developed to predict how trip limits would affect fishing behavior. On trips where landings are expected to exceed the trip limit, vessel owners are given the choice between continuing to fish while discarding any fish in excess of the trip limit, or simply not fishing at all. The model assumes that if a vessel owner can expect to earn enough revenue from the combination of regulated spiny dogfish (up to the trip limit) and the component catch to cover its operating costs then the trip would take place. If projected operating costs exceed potential revenues, it is assumed that no trip will take place. The model does not take into account any efforts made by vessel operators to avoid spiny dogfish given a certain trip limit or closure of the fishery, and may therefore overestimate regulatory discards.

The model was applied to landings data of spiny dogfish collected through the Northeast logbook program during 1994, 1995, 1996, 1997, and 1998 to project how a proposed trip limit would have affected landings and discards during those years. All trips were retained on which one or more pounds of spiny dogfish were landed. Average prices were obtained from Northeast dealer weighouts and average costs were adjusted for inflation and calculated by ton class from data obtained through NMFS sea sampling program and from the Capital Construction Fund (CCF) program. Sea sampling data was used to estimate daily operating costs for gillnet vessels and the CCF data provided an estimate of daily operating costs for otter trawl vessels. In combination, these two gear types comprised over 90% of the landings of spiny dogfish during those years. Gillnet costs were assigned to the remaining gear types by ton class. The model includes only daily operating costs (ice, water, food, fuel, oil, gear, supplies, lumping, auction, and packing fees). These are the costs vessel owners likely consider when deciding whether or not to make a fishing trip. Finally, all logbook landings and discard estimates were expanded according to dealer weighouts. The following provides a brief technical description of the economic model.

Trip Limit Model

The trip limit model is based upon the assumption that, for a given trip, individuals seek to maximize revenues net of operating costs. In the absence of a trip limit net revenues (NR) may be calculated as:

(1)
FUNC { NR sub ~ = ~ sum from i to I sum from j to J p SUB ij q SUB ij - ~VC }

where: p is price, q is quantity, VC is variable costs, i denotes spiny dogfish, that may be subject to a trip limit, and j denotes component species. For any given trip Equation 1 is unchanged if q_i (i.e., landings on the trip) are less than the trip limit. For trips where q_i exceeds the trip limit, q_i is replaced by the trip limit (TL_i) and net returns are calculated as:

(2_
FUNC { NR sub ~ = ~ p sub i (TL sub i) + sum from j to J p SUB j q SUB j - ~ VC }

The interaction of several variables including the trip limit itself, revenues earned from component catch, and fishing costs determine how a trip limit will affect fishing patterns. To explore these relationships further it was necessary to express equation 1 in terms of unit time:

(3_
FUNC { NR sub { t } ~ = ~ [sum from i to I p sub i (CPU sub i) + sum from j to J p SUB j (CPU sub j)] - VC sub t   }

where: days absent (DA) is used as the time unit (t), VC_t is variable costs per day absent and CPU_i is landings per day absent for spiny dogfish subject to the trip limit and CPU_j is landings per day absent for component species.

As before, if DA times CPU_i is less than the trip limit then the trip limit would not be exceeded. In cases where DA times CPU_i exceeds the trip limit the vessel owner is confronted with a choice between continuing to fish while discarding any spiny dogfish in excess of the trip limit, switching to another fishery or area where discard rates might possibly be lower, or simply not fishing at all. Since the trip limit analysis relies upon observed trips the second possibility of switching to another fishery or area was not incorporated in the model.

In cases where landings of spiny dogfish are expected to exceed the trip limit an individual would be assumed to choose the strategy (continue to fish and discard all spiny dogfish above the trip limit or stay tied-up at the dock and not go fishing) that yields the highest net return. In this model, it is assumed that if a vessel owner can expect to earn enough money from the combination of regulated spiny dogfish (up to the trip limit) and component species to cover its operating costs then the trip would take place.

3.1.2 Description of 2000-2001 Fishery and Effects of Quota Overages As noted in earlier sections, a total of 6.7 million pounds of spiny dogfish was landed during the 2000-2001 fishing year (May1, 2000-present) based on unpublished NMFS dealer reports. The quota specification for 2000-2001, as implemented by Secretarial Interim Action, was 4.0 million pounds. Thus, the annual quota specification for the entire 2000-2001 fishing year was exceeded by 2.7 million pounds or 67 %. Due to the overage which occurred in 2000-2001during the first quota period, the spiny dogfish fishery in the EEZ was closed in late August of 2000 and remained closed for the rest of the fishing year.The second quota period for 2000-2001 was allocated 1,684,000 pounds or 42.1% of the annual quota under the Secretarial Interim Action. However, the closure of the fishery in August 2000 for the remainder of the fishing year resulted in virtually no landings for the second quota period from the EEZ. As a result, vessels which traditionally landed spiny dogfish in the second half of the fishing year in the EEZ were unable to do so in 2000-2001. The distribution of vessels which landed spiny dogfish during quota period 2 of the 1999 fishing year are listed in Tables 9 and 10. Most, if not all of these vessel can be assumed to be impacted by the premature closure of the fishery due to the overage in quota period 1 during FY 2000. This situation arose because regulations promulgated under the federal FMP only control actions of federal spiny dogfish permit holders. As a result, vessels which did not possess federal spiny dogfish permits were able to land spiny dogfish until the Atlantic States Marine Fisheries Commission (ASMFC) took an Emergency Action in August 2000 to close state waters to the take of spiny dogfish during periods of closure of the EEZ. The ASMFC took additional action in January 2001 to extend this Emergency Action for an additional year. As a result of this action, the overage that occurred in 2000 should not occur during the 2001-2002 fishing season. In addition, the Councils and ASMFC are considering additional management actions to insure that the annual quota specified for spiny dogfish is not exceeded. The Councils are currently developing Amendment 1 to the Spiny Dogfish FMP which includes an alternative which would subtract future overages from the quota period in which it occurred in subsequent fishing years. The ASMFC is currently drafting an FMP spiny dogfish in state waters which will seek a more permanent solution to this problem. 3.2 Description of Proposed Alternatives

3.2.1 Mid-Atlantic Council Alternative (2000-2001 status quo)The MAFMC alternative includes a total quota of 4,500,000 pounds, divided into a commercial quota of 4,000,000 pounds and a spiny dogfish research set-aside quota of 500,000 pounds for fishing year 2001. Quota period 1 (May 1 through October 31) would be allocated 2,316,000 pounds (57.9%) of the 4,000,000 pounds commercial quota, and quota period 2 (November 1 through April 30) would be allocated 1,684,000 pounds (42.1%) of the 4,000,000 pounds commercial quota. In addition, to ensure that a directed fishery for spiny dogfish is largely eliminated, trip limits of 600 pounds per trip and 300 pounds per trip (vessels are prohibited from landing more than the specified amount in one calendar day) were recommended for quota periods 1 and 2, respectively. This action is intended to achieve the F = 0.03 target and end the directed fishery for spiny dogfish in order to end overfishing and rebuild the spiny dogfish stock. The research quota set aside would provide for a means to investigate ways to direct fishing effort away from female spiny dogfish.

3.2.2 New England Council Alternative The New England Council alternative includes a total quota of 4,500,000 pounds, divided into a commercial quota of 4,000,000 pounds and a spiny dogfish research set-aside quota of 500,000 pounds for fishing year 2001. Quota period 1 (May 1 through October 31) would be allocated 2,316,000 pounds (57.9%) of the 4,000,000 pounds commercial quota, and quota period 2 (November 1 through April 30) would be allocated 1,684,000 pounds (42.1%) of the 4,000,000 pounds commercial quota. In addition, the NEFMC recommended a trip limit of 5000 pounds per trip (vessels are prohibited from landing more than the specified amount in one calendar day) for quota periods 1 and 2 to allow for a small scale directed fishery for spiny dogfish to continue.**3.2.3. No Action Alternative**

The Alternative action considered by the Councils was to allow unregulated landings to continue in the spiny dogfish fishery for 2001-2002. Under this alternative (no action), fishing mortality in the spiny dogfish fishery would remain unregulated. With no restrictions, landings would be expected to be 22.0 million pounds in 2001-2002 based on status quo projections.

3.3 Analyses of Impacts of Alternatives

Because the spiny dogfish has been designated as overfished, the Councils were required under the Sustainable Fisheries Act to implement a stock rebuilding strategy which will allow the spiny dogfish stock to rebuild to levels which will support MSY. The rebuilding schedule and corresponding annual quotas, as described in the FMP, were developed assuming an implementation date of May 1, 1999. According to the rebuilding schedule adopted by the Councils for the period May 1, 1999, to April 30, 2000, F is reduced to 0.2, which resulted in a quota of 22,059,228 pounds for the first year. The semi-annual allocations for this period are 12,772,293 pounds for the period May 1, 1999-October 31, 1999; and 9,286,935 pounds for the period November 1, 1999-April 30, 2000.

For the remaining years of the rebuilding plan, which includes the fishing year 2001-2002, the FMP specifies that F will be reduced to 0.03. This has been projected to result in an annual quota of 4,000,000 pounds in 2001-2002 by the Spiny Dogfish Monitoring Committee.

3.3.1 Trip Limit Analysis Results

The results for a commercial quota of 4,000,000 pounds with trip limits of 600 pounds and 300 pounds in quota periods one and two respectively are provided in Tables 11 and 12, respectively. The results for a commercial quota of 4,000,000 pounds with a trip limit of 5000 pounds in quota periods one and two respectively are given in Tables 13 and 14.

Tables 11and 12 show projected landings, discards, and the likely closure date, based on landings alone, associated with trip limits of 600 pounds and 300 pounds for quota periods 1 and 2. A 75% discard mortality rate was assumed in the first set of projections and, for comparison, a 50% discard mortality rate in the second set of projections. Model results are presented for quota periods by fishing year (Column 1). A commercial quota of 2,316,000 pounds is considered for quota period 1 and 1,684,000 pounds is considered for quota period 2. Results based on a 50% discard mortality rate are not discussed here since it has not been scientifically justified.
Column 2 (Projected Quota Period 1 or 2 Closure Date) shows the date on which spiny dogfish landings would be projected to achieve the commercial quota. On average, given a trip limit of 600 pounds, the quota would be exceeded in approximately 128 days in quota period 1 (Table 11). On average, given a 300 pound trip limit, the commercial quota would not be exceeded because there would never be enough trips to trigger a closure (Table 12). On average, given a trip limit of 5,000 pounds, the quota would be exceeded in approximately 42 days in quota period 1 (Table 13) and in

approximately 40 days in quota period 2 (Table 14).

3.3.2 Commercial Quota of 4,000,000 pounds

Considering a commercial quota of 4,000,000 pounds (Tables 10 and 11), the analysis projected that, on average, under a 600 pounds trip limit for quota period 1, landings will exceed the semi-annual quota of 2,316,000 pounds on about September 5, 2000 (128 days). During quota period 2, however, landings were projected not to exceed the semi-annual quota of 1,684,000 pounds. The analysis projected landings of only 615,000 pounds during quota period 2. Thus, approximately 1,069,000 pounds of allowable spiny dogfish landings were projected not to be harvested. Although the commercial quota is 4,000,000 pounds, total projected landings would only reach 2,930,000 pounds. However, the analysis does not account for behavioral changes by vessel operators which could impact the amount of landings. Also, since vessels without federal permits are not captured in the analyses, additional landings could occur. The analysis also projected that, on average, under a trip limit of 5,000 pounds, the quota would be exceeded in approximately 42 days in quota period 1 (Table 13) and in approximately 40 days in quota period 2 (Table 14).

The projected landings and closure times rest on the assumption that the marginal revenue return of dogfish landings are sufficient to explain the future behavior of fishermen. The absence of a large processing sector may further reduce landings. Similarly, avoidance of dogfish by fishermen will likely further reduce landings and discard mortalities. The ability of fishermen to actively avoid large dogfish concentrations while targeting other species is unknown, but likely, given feedback from industry and previous practice.

3.3.3 Impact of 500,000 pounds Research Quota Set-aside

The 500,000 pounds research quota set aside would provide for additional revenue for participating vessels, although the level cannot be determined without an estimate of the number of vessels that would participate. In addition, it is likely that research organizations may provide additional funding as compensation for the use of the vessels in the research projects. While the both Councils recommended that 500,000 pounds of spiny dogfish be set aside for research, the FMP does not currently allow for such a provision. However, the FMP does specify that the Regional Administrator, in consultation with the Executive Directors, may exempt any person or vessel from the requirements of the FMP for the conduct of experimental fishing beneficial to the management of the spiny dogfish resource or fishery. The Regional Administrator may not grant such exemption unless it is determined that the purpose, design, and administration of the exemption is consistent with the objectives of the FMP, the provisions of the Magnuson-Stevens Act, and other applicable law, and that granting the exemption will not : 1) have a detrimental effect on the spiny dogfish resource and/or fishery or cause any quota to be exceeded; or 2) create significant enforcement problems. Each vessel participating in any exempted experimental fishing activity is subject to all provisions of the FMP except those necessarily relating to the purpose and nature of the exemption. The exemption must be specified in a letter issued by the Regional Administrator to each vessel participating in the exempted activity. This letter must be carried aboard the vessel seeking the benefit of such exemption. All experimental activities must be consistent with the harvest rates in the FMP. It was the intent of the Councils that experimental fisheries are short-term fisheries to answer specific management questions and are not to be used to resolve short-comings in existing fishery management plans.

3.3.4 Mid-Atlantic Council Alternative

The Mid-Atlantic Council recommendations for management measures for 2000-2001 would implement the FMP as approved by NMFS. The Mid-Atlantic Council's rational for these recommendations was as follows 1) the quota associated with an F=0.03 in year three (as specified in the FMP) is 4,000,000 pounds; 2) 600 and 300 pounds are the trip limit expected to produce, on average, the level of landings specified in the FMP during the rebuilding period to achieve an F=0.03; 3) the intent of the FMP was to close the directed fishery for adult female spiny dogfish after year one and allow for the landing of incidental bycatch of spiny dogfish only during the rebuilding period; and 4) to prevent a derby fishery and allow for a more equitable distribution of landings in time and space.

As noted in the introduction (section 3.0), preliminary landings data indicate that 6.7 million pounds of spiny dogfish was landed during FY 2000 (May 1, 2000 - present). The specification of a 4.0 million pound quota in FY 2001, therefore, represents a 40% reduction in landings from the 6.7 million pounds of spiny dogfish landed in FY 2000. However, the specification of a 4,000,000 pound quota would represent no reduction relative to 2000-2001 specifications which were implemented through a Secretarial Interim Action. However, due to quota overages which occurred in FY 2000, this quota specification for spiny dogfish, is expected to result in a reduction in revenue greater than 5% for vessels engaged in the directed spiny dogfish fishery relative to the FY 2000 landings, but not compared to the FY 2000 specifications.

The potential changes in revenues for the 2001-2002 spiny dogfish quota specification were evaluated in this analysis relative landings and revenues during FY 2000. As noted earlier, gross revenues are expected to decrease as a consequence of the proposed actions since the 2001-2002 quota specification is about 40% lower than what was landed in FY 2000. During FY 2000, spiny dogfish landings were 6.7 million pounds valued at $1,0720,000. The proposed quota for spiny dogfish as specified in the FMP for year three (2001-2002) is 4.0 million pounds or a reduction of 2.7 million pounds relative to the FY 2000 landings. Reductions in gross revenues to vessels is expected to be about $432,000 compared to FY 2000, assuming no increase in the price of spiny dogfish in 2001-2002.

This analysis assumes that the revenues of the 596 vessels which landed spiny dogfish in 1999 based on unpublished NMFS Dealer Reports would be reduced proportionately by the proposed action. Based on the distribution of landings by vessel during this year, gross revenues for vessels engaged in the directed spiny dogfish fishery are expected to decline by, on average, about $725 per vessel in 2001-2002 or about 40% of their revenue derived from spiny dogfish fishing (Table 15). Revenue losses would be less if the price of spiny dogfish were to increase as a result of decreased supply of the product on world markets. Of the 596 vessels which reported landing spiny dogfish in 1999, 36 vessels would be expected to experience a reduction in total gross revenues (all species combined) greater than 5% as a result of the 2.7 million spiny dogfish quota in 2001-2002. This represents 6% of the vessels which landed spiny dogfish in 1999. The percent reduction in gross total revenues for the 36 affected vessels ranged from 5.1% - 9.8 %. The remaining vessels (560 or 94%) are expected to experience a reduction in total gross revenues (all species combined) of less than 5% as a result of the 2.7 million pound reduction in the spiny dogfish quota in 2001-2002.

As noted above, 36 vessels are expected to experience a reduction of total gross revenues of greater than 5% due to the proposed spiny dogfish quota in 2001-2002. The size distribution of all vessels (in terms of length and gross registered tonnage) which landed spiny dogfish in 1999 is presented in Table 16. Of the 596 vessels that reported landing spiny dogfish in 1999, vessel attributes for vessel length and gross registered tonnage are available for 569 vessels from unpublished NMFS permit file data. In terms of length, about 95% of those vessels were less than 75 ft in length while the remaining vessels (5%) were greater than 75 ft. A comparison of the length distribution of vessels affected by the quota proposed (i.e., those vessels expected to experience a reduction in total gross revenues (all species combined) of greater than 5%) indicates that the impact of the proposed quota appears to be unequal across all length and tonnage classes. That is, a comparison of the frequency distributions of length and ton class for the total pool of vessels which landed spiny dogfish in 1999 and those affected by the proposed 4.0 million pound quota indicates that there are some disproportionate effects by vessel size class. For example, 69% of all vessels which landed spiny dogfish in 1999 were 25-49 ft in length while 91% of the affected vessels were in this length class. This comparison yields similar conclusions based on ton class. That is, 77% of all vessels which landed spiny dogfish in 1999 were ton class 2 vessels (5-50 grt) while 94% of the affected vessels were in this ton class.

Descriptive data for vessels which landed spiny dogfish in 1999 relative to home port state are given in Table 17. In addition, Table 17 provides a relative comparison of the same data for vessels expected to be affected by the proposed quota of 4.0 million pounds for spiny dogfish in 2001-2002 (MAFMC and NEFMC option). Overall, Massachusetts appears to be the most heavily impacted state, since they account for the highest percentage of landings and had the largest number of vessels actively engaged in the directed spiny dogfish fishery. Virginia appears to be the only state with disproportionate effects. For example, in terms of principal home port state, Virginia vessels accounted for 6% of all vessels landing spiny dogfish in 1999. However, Virginia vessels are expected to account for 30% of vessels affected by the proposed 4.0 million pound quota for spiny dogfish in 2001-2002.

In addition to the quota of 4.0 million pounds for year two, the MAFMC also recommended that a trip limits of 600 pounds in quota period 1 and 300 pounds during quota period 2 be implemented for the fishing year 2001-2002. The Mid-Atlantic Councils rational for these recommendations was as follows 1) the Quota associated with an F=0.03 in year three (as specified in the FMP) is 4.0 million pounds; 2) 600 and 300 pounds are the trip limits necessary to accommodate a bycatch fishery specified in the FMP during the rebuilding period to achieve an F=0.03; 3) the intent of the FMP was to close the directed fishery for adult female spiny dogfish after year one and allow for the landing of incidental bycatch of spiny dogfish only during the rebuilding period; and 4) to prevent a derby fishery and allow for an equitable distribution of landings in time and space.

The 600 and 300 pound trip limits proposed by the MAFMC would allow only for the landing of spiny dogfish taken incidentally by fishing effort directed at other species. As such, this low trip limit should discourage or eliminate fishing directed at mature female dogfish, which is the primary objective of the FMP (i.e., to rebuild the adult female portion of the spiny dogfish stock). The effects of the proposed 600 and 300 pound trip limits are discussed above in section 3.3.1. The economic analysis was based on results presented by the Dogfish Technical Committee using 1994-1997 NMFS unpublished Vessel Trip Report (VTR) data to determine the effect of trip limits on landings and estimated discards. The trip limit economic model assumed that all trips above the trip limit would continue as long as revenues from the truncated trips exceeded the cost of making the trip. It also assumed that if this criteria is met, fishing will continue when the trip limit is reached and the remaining dogfish would simply be discarded. Regulatory discard mortality (estimated assuming a discard mortality rate of 75%) and regulatory savings (estimated as the quantity of fish that would not be caught at all) were estimated for trip limits of 600 pounds in quota period 1 and 300 pounds in quota period 2. The model also indicated that regulatory discards due to trip limits are projected to be high and that trip limits alone may not allow stock rebuilding.

However, several factors may contribute to an overestimation of regulatory discard mortality from the economic model. First, the mortality rate for dogfish discards was assumed to be 75%, a higher overall rate than was assumed in the most recent stock assessment. Numerous members of industry have testified in the past at Council meetings and public hearings that the rate of discard mortality assumed in the last assessment was greatly overestimated. In fact, the true level of discard mortality for spiny dogfish is poorly known, but an overall rate of 75% for all gears is probably too high. Secondly, the economic trip limit model assumes that as long as revenues for a trip under the trip limit exceed the cost of making the trip, the trip will proceed exactly as it would have prior to imposition of the trip limit, except that all dogfish taken in excess of the trip limit will be discarded. That is, the model assumes that fishermen will not modify their fishing behavior once the trip limit is reached. Given the testimony by spiny dogfish fishermen and fishermen from other fisheries, it appears unlikely that this assumption would be met. Given the low economic value of dogfish relative to other species and the opportunity cost of handling dogfish taken incidentally in other fisheries, it is reasonable to assume that fishermen will tend to avoid spiny dogfish under restrictive trip limits. The MAFMC concluded that high trip limits would encourage directed fishing on mature females, and that once the low quota required for stock rebuilding was quickly taken that discards would represent additional mortality. The MAFMC noted that estimated regulatory discards were estimated to be high regardless of the trip limit specified, but that 600 and 300 pound trip limits would produce lower total mortality relative to other trip limits considered by the Councils (short of a total fishery closure) and tend to discourage directed fishing on mature female dogfish. These trip limit levels will allow for the landing of bycatch levels of spiny dogfish taken incidental to the prosecution of other fisheries and are not intended to allow for directed fishing.

3.3.5 New England Council Alternative

The New England Council alternative includes a total quota of 4,500,000 pounds, divided into a commercial quota of 4,000,000 pounds and a spiny dogfish research set-aside quota of 500,000 pounds for fishing year 2001. Quota period 1 (May 1 through October 31) would be allocated 2,316,000 pounds (57.9%) of the 4,000,000 pounds commercial, and quota period 2 (November 1 through April 30) would be allocated 1,684,000 pounds (42.1%) of the 4,000,000 pounds commercial quota. In addition, the NEFMC recommended a trip limit of 5000 pounds per trip for quota periods 1 and 2 to allow for a small scale directed fishery for spiny dogfish to continue.

The potential changes in revenues for the NEFMC 2001-2002 spiny dogfish commercial quota specification recommendations were evaluated in this analysis above under the MAFMC alternative relative to landings and revenues in 1999. In addition to the quota of 4.0 million pounds commercial quota for 2001-2002, the NEFMC also recommended that a trip limit of 5,000 pounds be implemented for the entire fishing year. The rationale for the action taken by the NEFMC was that it would allow for a small directed fishery to operate within the constraints of the 4.0 million pound quota.

The results for a commercial quota of 4,000,000 pounds with a trip limit of 5000 pounds in quota periods one and two respectively are given in Tables 13 and 14. On average, given a trip limit of 5,000 pounds, the quota would be exceeded in approximately 42 days in quota period 1 (Table 13) and in approximately 40 days in quota period 2 (Table 14).

As noted above, the NEFMC specifically recommended this trip limit alternative because it would increase the chances that a directed trip would occur. Under this alternative, a 5,000 pound trip would yield $800 in revenue per trip. Under this alternative, the fishery would be expected to remain open for just over one month for both quota periods 1 and 2. That is, a high trip limit is expected to promote a directed derby style fishery which would last for about 1.3 months. This could have a negative economic effect on vessels which traditionally landed spiny dogfish during the latter part of either quota period.

3.3.6 No Action Alternative

The Alternative action considered by the Councils was to allow unregulated landings to continue in the spiny dogfish fishery for 2001-2002. Under this alternative (no action), fishing mortality in the spiny dogfish fishery would again be unregulated. With no restrictions, landings would be expected to be about 22.0 million pounds in 2001-2002 based on status quo projections presented by the Spiny Dogfish Technical Committee.

This no action alternative represents an increase of 15.8 million pounds in landings compared to the amount landed in FY 2000. Therefore, the no action alternative for spiny dogfish will not result in a reduction in revenue greater than 5% for any vessels engaged in the spiny dogfish fishery. The potential changes in revenues under the status quo alternative were evaluated in this analysis relative to landings and revenues in FY 2000. As noted above, gross revenues are expected to increase under the no action alternative. During FY 2000, spiny dogfish landings were 6.7 million pounds valued at $1.1 million. The projected landings of spiny dogfish under the no action alternative are 22.0 million pounds or an increase of 15.3 million pounds relative to the FY 2000 landings. Increases in gross revenues to vessels under the no action alternative are expected to be about $2.5 million, assuming no increase in the price of spiny dogfish in 2000-2001. Under the no action alternative, gross revenues for vessels engaged in the spiny dogfish fishery are expected to increase, on average, by about $4,107 per vessel in 2001-2002 (Table 15) relative to FY 2000.

3.4 Explanation of Why The Action is Being Considered

Regulations implementing the Fishery Management Plan for Spiny Dogfish (FMP), prepared jointly by the Councils, appear at 50 CFR Part 648. These regulations stipulate that the Secretary publish a notice specifying an annual spiny dogfish commercial quota which will be allocated to the fishery to control fishing mortality (F). The quota is set at a level to assure that the F specified for the appropriate year in the FMP will not be exceeded. The annual commercial quota is established by the Regional Administrator, Northeast Region, NMFS (Regional Administrator), based upon recommendations made by the Councils with the advice of the Spiny Dogfish Monitoring Committee and the Joint Spiny Dogfish Committee. The quota recommendation is based upon projected stock size estimates for each year, as derived from the latest stock assessment information, coupled with the target F specified for each year. The quota is specified for a fishing year that begins on May 1, and is subdivided into two semi-annual periods. The period from May 1-October 31 is allocated 57.9 percent of the annual quota and the period from November 1-April 30 is allocated 42.1 percent of the annual quota.

3.5 Objectives and Legal Basis for the Rule

Refer to the section on Management Objectives of the FMP (section 1.2). The Magnuson-Stevens Fishery Conservation and Management Act (Public Law 94-265) as amended through October 11, 1996 provides the legal basis for the rule.

3.6 Demographic Analysis

Refer to the sections on description of fishing activities and economic characteristics of the fishery included in the EA.

3.7 Cost Analysis

Refer to the section on Regulatory Impact Analysis.

3.8 Competitive Effects Analysis

There are no large businesses involved in the industry, therefore, there are no disproportional small versus large business effects. There are no disproportional costs of compliance among the affected small entities.

3.9 Identification of Overlapping Regulations

The proposed action does not create regulations that conflict with any state regulations or other federal laws.

3.10 Conclusions

The preceding economic impact analysis indicates that the impacts of the proposed regulatory actions under any of the alternatives would result in severe adverse economic impacts on small entities. However, short term benefits to the industry from implementation of measures to end overfishing on spiny dogfish and rebuild the stock will provide long term benefits that outweigh any short term benefits to the industry from implementing less restrictive measures than the proposed alternatives.

4.0 Paper Work Reduction Act of 1995

The Paperwork Reduction Act concerns the collection of information. The intent of the Act is to minimize the Federal paperwork burden for individuals, small business, state and local governments, and other persons as well as to maximize the usefulness of information collected by the Federal government.

The Councils are not proposing measures under this regulatory action that will involve increased paper work and consideration under this Act.

5.0 Impacts of the Plan Relative to Federalism

The 2001-2002 spiny dogfish specifications do not contain policies with federalism implications sufficient to warrant preparation of a federalism assessment under Executive Order 12612.

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ATTACHMENT: TABLES

Table 1. Landings of spiny dogfish (pounds) in the Northwest Atlantic Ocean based on NMFS weighout data, NMFS South Atlantic General Canvas Data and SAW-26.

YEAR	CANADA	US COMM	US REC	US TOTAL	USSR	OTHER	TOTAL (Stock)
1962	0	518,081	0	518,081	0	0	518,081
1963	0	1,344,806	0	1,644,806	0	2,205	1,347,011
1964	0	1,609,358	0	1,609,358	0	35,274	1,644,632
1965	19,841	1,075,845	0	1,075,845	41,465	22,046	1,532,197
1966	85,979	1,274,259	0	1,274,259	20,698,989	0	22,059,228
1967	0	612,879	0	612,879	5,370,406	0	5,983,284
1968	0	38,327	0	348,327	9,709,058	0	10,057,385
1969	0	249,120	0	249,120	19,460,004	800,270	20,509,394
1970	41,887	233,688	0	233,688	10,855,450	1,578,494	12,709,519
1971	8,818	160,936	0	160,936	23,814,089	1,684,314	25,668,158
1972	6,614	152,117	0	152,117	51,371,589	1,518,969	53,049,290
1973	44,092	196,209	0	196,209	31,347,207	10,083,840	41,671,349
1974	79,366	279,984	0	279,984	45,070,842	8,970,517	54,400,710
1975	2,205	324,076	0	324,076	49,230,923	423,283	49,980,487
1976	6,614	1,212,530	0	1,212,530	36,774,933	235,892	38,229,969
1977	2,205	2,052,483	0	2,052,483	15,304,333	566,582	17,925,603
1978	185,186	1,825,409	0	1,825,409	1,272,054	99,207	3,381,856
1979	2,934,323	10,597,512	0	10,597,512	231,483	180,777	13,944,095
1980	1,477,082	9,027,837	0	9,027,837	773,815	546,741	11,825,474
1981	1,243,394	15,282,287	3,284,837	18,567,124	1,137,574	1,009,707	21,957,799
1982	2,100,984	11,929,091	154,946	12,084,037	59,524	742,950	14,987,495
1983	0	10,795,926	147,565	10,943,491	791,451	231,483	11,966,426
1984	8,818	9,810,470	200,888	10,011,358	641,539	220,460	1,082,175
1985	28,660	8,880,129	196,174	9,076,303	1,529,992	701,063	11,336,018
1986	46,297	6,058,241	403,073	6,461,314	471,784	339,508	7,318,903
1987	617,288	5,959,034	673,514	6,632,548	255,734	50,706	7,556,275
1988	0	6,845,283	792,385	7,637,668	1,265,440	160,936	9,064,044
1989	365,964	9,903,063	921,481	10,824,544	372,577	191,800	11,754,885
1990	2,901,254	32,475,963	392,750	32,868,713	844,362	22,046	36,636,374
1991	643,743	29,050,014	287,892	29,337,906	480,603	35,274	30,497,526

1992	1,827,613	37,165,147	534,798	37,699,945	57,320	90,389	39,675,266
1993	3,156,987	45,509,558	263,373	45,772,931	0	0	48,929,918
1994	4,010,167	41,446,480	340,692	41,787,172	0	0	45,797,339
1995	2,107,598	50,068,671	141,818	50,210,489	0	0	52,318,086
1996	950,183	60,055,509	79,244	60,134,753	0	0	61,084,935
1997	na	45,188,361	145,976	45,334,337	0	0	45,334,337
1998	na	43,004,348	122,350	43,126,694	0	0	43,126,694
1999	na	32,505,162	116,004	32,737,166	0	0	32,737,166
2000	na	12,325,694	n.a.	12,325,694	0	0	12,325,694

Table 2. Commercial landings of spiny dogfish by year and state.

	YEAR								
	1988 1000 Pounds	1989 1000 Pounds	1990 1000 Pounds	1991 1000 Pounds	1992 1000 Pounds	1993 1000 Pounds	1994 1000 Pounds	1995 1000 Pounds	1996 1000 Pounds
STATE									
ME	481	4,879	6,365	2,016	1,719	3,524	1,813	1,663	911
NH	.	.	185	.	402	1,641	2,375	2,106	1,079
MA	5,827	4,924	17,806	14,488	18,375	26,830	23,214	28,760	26,959
RI	.	4	1,300	3,160	2,027	1,924	530	573	1,128
CT	.	.	24	8	22	9	170	293	705
NY	86	48	18	77	155	95	237	934	1,327
NJ	10	22	4,543	2,715	2,534	770	1,129	2,388	4,635
DE	.	.	.	5	.	.	.	62	.
MD	23	3	2,181	4,939	3,063	1,795	1,428	3,117	7,151
VA	3	19	6	173	229	106	457	809	2,483
NC	301	.	41	1,463	8,634	8,806	9,877	7,174	13,210

Source: Unpublished NMFS Weighout Data.

Table 3. Commercial landings of spiny dogfish by state and month, 1988 - 1997 combined.

	MONTH											
	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
STATE	1000 Pounds	1000 Pounds	1000 Pounds	1000 Pounds	1000 Pounds	1000 Pounds	1000 Pounds	1000 Pounds	1000 Pounds	1000 Pounds	1000 Pounds	1000 Pounds
ME	.	2	1	34	83	542	731	568	307	99	10	.
NH	.	.	.	5	15	199	303	241	68	39	6	.
MA	99	24	27	338	1,268	2,667	4,443	3,738	2,733	2,100	916	359
RI	241	22	28	78	62	104	41	21	9	142	191	221
CT	9	5	8	15	7	15	9	3	8	22	23	5
NY	23	17	16	23	16	27	15	11	12	56	60	61
NJ	240	183	186	168	54	15	5	6	12	172	686	538
DE	.	.	.	.	.	.	.	.	.	.	.	.
MD	722	439	580	325	4	8	.	.	.	.	229	481
VA	224	105	139	53	11	1	.	.	.	1	59	240
NC	1,370	1,809	1,390	209	2	.	.	.	.	.	41	886
ALL	2,932	2,609	2,380	1,252	1,526	3,582	5,551	4,592	3,152	2,634	2,225	2,796

Source: Unpublished NMFS Weighout Data.

Table 4. Monthly spiny dogfish landings by state from January 1, 2000 through February 7, 2001 based on unpublished NMFS dealer reports.

STATE	MONTH	YEAR	SUM(POUNDS)
CONNECTICUT	feb 02	2000	105
	may 05	2000	22
	jun 06	2000	861
	jul 07	2000	1,397
	aug 08	2000	40
sum			2,425
DELAWARE	feb 02	2001	1
sum			1
MAINE	feb 02	2000	10
sum			10
MARYLAND	feb 02	2000	111,055
	mar 03	2000	14,750
	apr 04	2000	137,938
	may 05	2000	2,014
sum			265,757
MASSACHUSETTS	jan 01	2000	38,251
	mar 03	2000	12,950
	apr 04	2000	24,172
	may 05	2000	44,161
	jun 06	2000	629,581
	jul 07	2000	3,554,925
	aug 08	2000	2,087,169
sum			6,391,209

NEW HAMPSHIRE	jan 01	2000	20,450
	feb 02	2000	8,300
	mar 03	2000	17,100
	apr 04	2000	13,270
	may 05	2000	9,852
	jun 06	2000	23,846
	jul 07	2000	25,129
	aug 08	2000	27,450
	sep 09	2000	14,550
	oct 10	2000	23,325
	nov 11	2000	18,400
	dec 12	2000	4,300
	jan 01	2001	5,300
*************************			------------
sum			211,272
NEW JERSEY	feb 02	2000	1,423,764
	mar 03	2000	1,394,623
	apr 04	2000	1,240,952
	may 05	2000	12,138
	jun 06	2000	210
	jul 07	2000	3,033
	nov 11	2000	39
*************************			------------
sum			4,074,759
NEW YORK	feb 02	2000	6,522
	mar 03	2000	1,154
	apr 04	2000	1,022
	may 05	2000	8,144
	jun 06	2000	18,949
	jul 07	2000	9,130
	aug 08	2000	4,063
	sep 09	2000	6,968
	oct 10	2000	4,896
	nov 11	2000	684
	dec 12	2000	452
	jan 01	2001	1,070
*************************			------------
sum			63,054

NORTH CAROLINA	feb 02	2000	240,991
	mar 03	2000	261,665
	apr 04	2000	51,813
	dec 12	2000	300
************************			------------
sum			554,769
RHODE ISLAND	mar 03	2000	550
	apr 04	2000	2,462
	may 05	2000	2,453
	jun 06	2000	26,132
	jul 07	2000	19,749
	aug 08	2000	25,923
	sep 09	2000	1,815
	oct 10	2000	13,947
	nov 11	2000	5,975
	dec 12	2000	9,330
************************			------------
sum			108,336
VIRGINIA	feb 02	2000	258,789
	mar 03	2000	94,684
	apr 04	2000	306,859
	jun 06	2000	106
	aug 08	2000	35
************************			------------
sum			660,473

Table 5. Ex-vessel value and price per pound of spiny dogfish commercial landings value by year, Maine - North Carolina.

Year	Nominal Value ($1000)	Nominal Price (Mean)	1997 Adjusted (Mean)
1988	483	0.07	0.06
1989	860	0.09	0.07
1990	3,313	0.10	0.09
1991	2,692	0.09	0.09
1992	3,943	0.11	0.10
1993	5,567	0.12	0.12
1994	5,588	0.14	0.13
1995	9,138	0.19	0.19
1996	10,921	0.18	0.18
1997	6,807	0.15	0.15

Source: Unpublished NMFS Weighout Data.

Table 6. Value of commercial landings of spiny dogfish value by year and state.

	YEAR								
	1988	1989	1990	1991	1992	1993	1994	1995	1996
	VAL	VAL	VAL	VAL	VAL	VAL	VAL	VAL	VAL
	1000 $	1000 $	1000 $	1000 $	1000 $	1000 $	1000 $	1000 $	1000 $
STATE									
ME	59	430	745	188	203	509	264	338	169
NH	.	.	21	.	50	252	365	397	189
MA	359	405	1,597	1,145	2,186	3,541	3,394	5,413	4,934
RI	.	.	115	292	226	213	68	109	211
CT	.	.	2	.	1	1	10	19	133
NY	21	14	3	16	27	24	64	187	257
NJ	1	2	582	428	243	90	174	502	939
DE	.	.	.	4	.	.	.	12	.
MD	4	1	238	476	294	188	192	883	1,539
VA	1	6	2	17	19	9	40	125	400
NC	36	.	3	122	691	735	1,011	1,147	2,145

Source: Unpublished NMFS Weighout Data.

Table 7. Commercial Fishing Permits Held by Vessels Landing Spiny Dogfish in 1997.

Type of Permit	Number
Multispecies permit	562
Limited access multispecies permit	487
Summer flounder permit	295
Squid, mackerel, butterfish permits	527
Lobster permit	448
Scallop permits	40
Tuna permits	542

Table 8. Trips impacted under the spiny dogfish trip limit options.
Based on VTR data, November 1998 - October 1999.

	Quota Period 1 (Nov. 1 - April 30)		Quota Period 2 (May 1 - Oct. 31)	
Trip Limit Option	Number of Trips Impacted	Percent of Trips Impacted to Total (2782)	Number of Trips Impacted	Number of Trips Impacted to Total (3177)
0 lbs.*	2,782	100%	3,177	100%
300 lbs.	1,866	67%	2,396	75%
600 lbs.	1,597	57%	2,074	65%
5000 lbs.	747	27%	1093	34%

*Prohibition on possession of Spiny Dogfish

Table 9. Size distribution of all vessels which landed spiny dogfish in 1999 during January- April and November-December.

length (ft)	# vessels	% vessels
25 - 49	283	68.4
50 - 74	114	27.5
75 - 99	15	3.6
100 - 124	2	0.5
total	414	100

ton class[1]	# vessels	% vessels
1	7	1.0
2	318	76.8
3	79	19.1
4	10	2.4
total	414	100

[1] TC 1= <5 GRT; TC 2= 5 - 50 GRT; TC 3= 51 - 150- GRT; TC 4= >150 GRT
Source: unpublished NMFS permit file data.

Table 10. Distribution of vessels by home port state which landed spiny dogfish in January-April and November-December 1999.

Home Port State	# vessels	% vessels
MA	143	34.5
MD	17	4.1
NC	30	7.2
NH	28	6.8
NJ	62	15.0
NY	63	15.2
PA	8	1.9
RI	18	4.3
VA	30	7.2
other	15	3.6
Total	414	100.0

Source: unpublished NMFS permit file data.

Table 11. Projected landings (lbs), discards (lbs), and closure date associated with a 600 lb trip limit for spiny dogfish during quota period 1 (May 1-Oct 31) Quota = 2.316 million pounds.

Estimated Closure Date Calculation Excludes Discard Mortality

Assumes 75% Discard Mortality Rate

1	2	3	4	5	6	7	8	9
Fishing Year	**Projected Quota Period 1 Closure Date**	**Estimated Percent Reduction In Effort During Quota Period 1**	**Projected Landings at Period 1 Closure Date**	**Projected Mortality of Regulatory Discards at Period 1 Closure Date**	**Projected Mortality of Background Discards at Period 1 Closure Date**	**Projected Mortality of Background Discards After Closure Up to Quota Period 2**	**Projected Mortality of Regulatory Discards After Closure Up to Quota Period 2**	**Projected Total Mortality During Quota Period 1**
94	18-Oct-94	17.90	2,315,850	9,358,375	905,357	112,941	408,112	13,100,634
95	25-Jul-95	17.50	2,315,275	10,750,362	427,699	279,554	4,149,768	17,922,658
96	7-Sep-96	24.84	2,315,376	9,917,871	295,329	96,970	3,009,806	15,635,353
97	12-Sep-97	21.82	2,315,657	9,260,220	195,028	33,557	2,139,774	13,944,236
98	24-Aug-98	23.88	2,315,094	7,866,577	171,963	103,059	4,353,712	14,810,404
Avg	5-Sep	21.18	2,315,450	9,430,681	399,075	125,216	2,812,234	15,082,657

Assumes 50% Discard Mortality Rate

Fishing Year	**Projected Quota Period 1 Closure Date**	**Estimated Percent Reduction In Effort During Quota Period 1**	**Projected Landings at Period 1 Closure Date**	**Projected Mortality of Regulatory Discards at Period 1 Closure Date**	**Projected Mortality of Background Discards at Period 1 Closure Date**	**Projected Mortality of Background Discards After Closure Up to Quota Period 2**	**Projected Mortality of Regulatory Discards After Closure Up to Quota Period 2**	**Projected Total Mortality During Quota Period 1**
94	18-Oct-94	17.90	2,315,850	6,238,917	603,571	75,294	272,075	9,505,706
95	25-Jul-95	17.50	2,315,275	6,883,287	285,133	186,369	2,657,031	12,327,095
96	7-Sep-96	24.84	2,315,376	6,611,914	196,886	64,647	2,006,537	11,195,361
97	12-Sep-97	21.82	2,315,657	6,173,480	130,019	22,371	1,426,516	8,770,692
98	24-Aug-98	23.88	2,315,094	5,244,385	114,642	68,706	2,902,474	10,645,301
Avg	5-Sep	21.19	2,315,450	6,230,397	266,050	83,477	1,852,927	10,468,831

Table 11

Table 12. Projected landings (lbs), discards (lbs), and closure date associated with a 300 lb trip limit for spiny dogfish during quota period 2 (Nov 1-April 30) Quota = 1.684 million pounds.

Estimated Closure Date Calculation Excludes Discard Mortality

Assumes 75% Discard Mortality Rate

1	2	3	4	5	6	7	8	9
Fishing Year	Projected Quota Period 2 Closure Date	Estimated Percent Reduction in Effort During Quota Period 2	Projected Landings at Period 2 Closure Date	Projected Mortality of Regulatory Discards at Period 2 Closure Date	Projected Mortality of Background Discards at Period 2 Closure Date	Projected Mortality of Background Discards After Closure Up to Quota Period 1	Projected Mortality of Regulatory Discards After Closure Up to Quota Period 1	Projected Total Mortality During Quota Period 2
94/95	30-Apr-95	27.39	420,235	3,935,860	214,113	0	0	4,570,208
95/96	30-Apr-96	29.52	528,859	4,822,282	140,097	0	0	5,491,237
96/97	30-Apr-97	20.01	915,961	5,923,497	158,387	0	0	6,997,845
97/98	30-Apr-98	19.56	595,799	2,925,222	64,416	0	0	3,585,436
Avg	30-Apr	24.12	615,213	4,401,715	144,253	0	0	5,161,182

Assumes 50% Discard Mortality Rate

1	2	3	4	5	6	7	8	9
Fishing Year	Projected Quota Period 2 Closure Date	Estimated Percent Reduction in Effort During Quota Period 2	Projected Landings at Period 2 Closure Date	Projected Mortality of Regulatory Discards at Period 2 Closure Date	Projected Mortality of Background Discards at Period 2 Closure Date	Projected Mortality of Background Discards After Closure Up to Quota Period 1	Projected Mortality of Regulatory Discards After Closure Up to Quota Period 1	Projected Total Mortality During Quota Period 2
94/95	30-Apr-95	27.39	420,235	2,623,907	142,742	0	0	3,186,884
95/96	30-Apr-96	29.52	528,859	3,087,631	93,398	0	0	3,709,888
96/97	30-Apr-97	20.01	915,961	3,948,998	105,591	0	0	4,970,550
97/98	30-Apr-98	19.56	595,799	1,950,148	42,944	0	0	2,588,890
Avg	30-Apr	24.12	615,213	2,902,671	96,169	0	0	3,614,053

Table 12.

Table 13. - Projected Landings (lbs), Discards (lbs), and Closure Date Associated with a 5000 lb Trip Limit for Spiny Dogfish During Quota Period 1 (May 1 - Oct 31) Quota = 2.316 million lbs

Estimated Closure Date Calculation Excludes Discard Mortality

Assumes 75% Discard Mortality Rate

1	2	3	4	5	6	7	8	9
Fishing Year	**Projected Quota Period 1 Closure Date**	**Estimated Percent Reduction in Effort During Quota Period 1**	**Projected Landings at Period 1 Closure Date**	**Projected Mortality of Regulatory Discards at Period 1 Closure Date**	**Projected Mortality of Background Discards at Period 1 Closure Date**	**Projected Mortality of Background Discards After Closure Up to Quota Period 2**	**Projected Mortality of Regulatory Discards After Closure Up to Quota Period 2**	**Projected Total Mortality During Quota Period 1**
94	23-Jun-94	19.73	2,315,651	612,587	218,832	1,545,159	6,573,662	11,265,892
95	6-Jun-95	28.83	2,315,103	441,384	146,520	1,331,973	8,707,741	12,942,722
96	19-Jun-96	32.82	2,315,961	626,509	184,077	875,672	7,804,465	11,806,685
97	28-May-97	25.87	2,315,516	501,791	16,908	372,863	8,614,596	11,821,674
98	24-Aug-98	23.88	2,315,094	7,866,577	171,963	103,059	4,353,712	14,810,404
Avg	**11-Jun**	**26.23**	**2,315,465**	**2,009,770**	**147,660**	**845,745**	**7,210,835**	**12,529,475**

Assumes 50% Discard Mortality Rate

Fishing Year	Projected Quota Period 1 Closure Date	Estimated Percent Reduction in Effort During Quota Period 1	Projected Landings at Period 1 Closure Date	Projected Mortality of Regulatory Discards at Period 1 Closure Date	Projected Mortality of Background Discards at Period 1 Closure Date	Projected Mortality of Background Discards After Closure Up to Quota Period 2	Projected Mortality of Regulatory Discards After Closure Up to Quota Period 2	Projected Total Mortality During Quota Period 1
94	23-Jun-94	19.73	2,315,651	408,392	145,888	1,030,106	4,382,441	8,282,478
95	6-Jun-95	28.83	2,315,103	282,611	97,680	887,982	5,575,429	9,158,806
96	19-Jun-96	32.82	2,315,961	417,673	122,718	583,782	5,202,977	8,643,110
97	28-May-97	25.87	2,315,516	334,527	11,272	248,575	5,743,064	8,652,955
98	24-Aug-98	23.88	2,315,094	5,244,385	114,642	68,706	2,902,474	10,645,301
Avg	**11-Jun**	**26.23**	**2,315,465**	**1,337,517**	**98,440**	**563,830**	**4,761,277**	**9,076,530**

13.

Table 14. - Projected Landings (lbs), Discards (lbs), and Closure Date Associated with a 5000 lb Trip Limit for Spiny Dogfish During Quota Period 2 (Nov 1 - April 30) Quota = 1.684 million lbs

Estimated Closure Date Calculation Excludes Discard Mortality

Assumes 75% Discard Mortality Rate

1	2	3	4	5	6	7	8	9
Fishing Year	**Projected Quota Period 2 Closure Date**	**Estimated Percent Reduction in Effort During Quota Period 2**	**Projected Landings at Period 2 Closure Date**	**Projected Mortality of Regulatory Discards at Period 2 Closure Date**	**Projected Mortality of Background Discards at Period 2 Closure Date**	**Projected Mortality of Background Discards After Closure Up to Quota Period 1**	**Projected Mortality of Regulatory Discards After Closure Up to Quota Period 1**	**Projected Total Mortality During Quota Period 2**
94/95	7-Jan-95	21.54	1,683,457	880,337	262,713	132,813	2,187,446	5,146,766
95/96	12-Dec-95	26.40	1,679,419	426,853	91,185	129,067	2,974,820	5,301,343
96/97	17-Nov-96	20.68	1,679,134	621,746	53,508	191,468	4,502,604	7,048,460
97/98	4-Dec-97	18.17	1,677,820	376,090	21,079	58,228	2,109,893	4,243,110
Avg	**10-Dec**	**21.70**	**1,679,957**	**576,256**	**107,121**	**127,894**	**2,943,691**	**5,434,919**

Assumes 50% Discard Mortality Rate

1	2	3	4	5	6	7	8	9
Fishing Year	**Projected Quota Period 2 Closure Date**	**Estimated Percent Reduction in Effort During Quota Period 2**	**Projected Landings at Period 2 Closure Date**	**Projected Mortality of Regulatory Discards at Period 2 Closure Date**	**Projected Mortality of Background Discards at Period 2 Closure Date**	**Projected Mortality of Background Discards After Closure Up to Quota Period 1**	**Projected Mortality of Regulatory Discards After Closure Up to Quota Period 1**	**Projected Total Mortality During Quota Period 2**
94/95	7-Jan-95	21.54	1,683,457	586,891	175,142	88,542	1,458,297	3,992,329
95/96	12-Dec-95	26.40	1,679,419	273,307	60,790	86,044	1,904,730	4,004,290
96/97	17-Nov-96	20.68	1,679,134	414,497	35,672	127,646	3,001,736	5,258,685
97/98	4-Dec-97	18.17	1,677,820	250,726	14,052	38,819	1,406,595	3,388,013
Avg	**10-Dec**	**21.70**	**1,679,957**	**381,355**	**71,414**	**85,263**	**1,942,840**	**4,160,829**

Table 15. Summary of impacts of alternative quota specifications for spiny dogfish for 2001-2002 and no action.

Option	Total # of Vessels	Total Revenue Change ($millions)	Revenue Change per Vessel ($)	# of Vessels with Revenue Reduced by >5%
MAFMC	596	-1.07	-725	36
NEFMC	596	-1.07	-725	36
No Action	0	+2.5	+4,107	0

Table 16. Comparison of the size distribution of all vessels which landed spiny dogfish in 1999 and those expected to have total gross revenues reduced by >5% as a result of the 4.0 million pound commercial quota in 2001-2002.

	Vessels that landed spiny dogfish in 1999		Affected Vessels[1]	
length (ft)	# vessels	% vessels	# vessels	% vessels
25 - 49	394	69.2	30	90.9
50 - 74	148	26.0	3	9.1
75 - 99	25	4.4	0	0.0
100 - 124	2	1.4	0	0.0
total	569	100	33	100

ton class	# vessels	% vessels	# vessels	% vessels
1	16	2.8	1	3.0
2	436	76.6	31	94.0
3	104	18.3	1	3.0
4	13	2.3	0	0.0
total	569	100	33	100

[1] Vessels with revenues reduced by >5%
[2] TC 1= <5 GRT; TC 2= 5 - 50 GRT; TC 3= 51 - 150- GRT; TC 4= >150 GRT
Source: unpublished NMFS permit file data.

Table 17. Distribution of vessels by home port state which landed spiny dogfish in 1999 v. those affected by the proposed quota alternative of 4.0 million pounds for spiny dogfish in 2001-2002.

	All vessels		Affected vessels	
Home Port State	# vessels	% vessels	# vessels	% vessels
MA	219	38.5	11	33.3
MD	17	3.0	2	6.1
NC	30	5.3	2	6.1
NH	43	7.6	1	3.0
NJ	66	11.6	2	6.1
NY	106	18.6	1	3.0
PA	8	1.4	0	0.0
RI	27	4.7	0	0.0
VA	32	5.6	10	30.3
other	21	3.7	4	12.1
Total	569	100.0	33	100.0

Source: unpublished NMFS permit file data.