SPINY DOGFISH FISHERY MANAGEMENT PLAN

(Includes Final Environmental Impact Statement and Regulatory Impact Review)

February 1999

Mid-Atlantic Fishery Management Council

and the

New England Fishery Management Council

in cooperation with the

National Marine Fisheries Service

Draft adopted by Councils: 11 August (NEFMC) and 17 August (MAFMC) 1998
Final adopted by Councils: 27 January (NEFMC) and 3 February (MAFMC) 1999
Final approved by NOAA: 29 September 1999

A Publication of the Mid-Atlantic Fishery Management Council pursuant to National Oceanic and Atmospheric Administration Award No. NA57FC0002

17 March 1999

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
One Blackburn Drive
Gloucester, MA 01930-2298

SEP 29 1999

Dr. James Gilford
Mid-Atlantic Fishery Management Council
Room 2115 Federal Building
300 South New Street
Dover, DE 19904-6790

Dear Jim:

I have partially approved the Fishery Management Plan (FMP) for Spiny Dogfish. For the reasons discussed below, I have disapproved:

- the 180,000 mt female Spawning Stock Biomass (SSB) rebuilding target contained in the overfishing definition.

Although the proposed target fishing mortality rate, fishing mortality threshold and biomass threshold are consistent with SFA provisions, the selection of a biomass rebuilding target at 90% of SSB_{max} (180,000 mt) is inconsistent with the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) National Standard 1. The Spiny Dogfish Technical Committee recommended the use of SSB_{max} as a proxy for B_{msy}, and indicated that the SSB for spiny dogfish which produces maximum recruitment (SSB_{max}) is 200,000 mt. This conclusion was supported by the Overfishing Definition Review Panel and by the Councils' Joint Scientific & Statistical Committee. The biomass rebuilding target selected by the Councils does not provide for rebuilding to maximum sustainable yield, and therefore cannot be approved. The Councils need to resubmit a new biomass rebuilding target. When the revised target is submitted, the associated analysis must show how it complies with the Magnuson-Stevens Act and other applicable law.

The following management measures have been approved:

- an annual commercial quota based upon F=0.2 for the first year (remaining six months) of the rebuilding program, and F=0.03 for the remaining years of the rebuilding program;
- seasonal (semi-annual) allocation of the quota, based upon the percentage of commercial landings for each semi-annual period during the years 1990-1997;
- A prohibition on "finning", with a maximum 5% fin to carcass ratio, by weight;

- a framework adjustment process;

- establishment of a Spiny Dogfish Monitoring Committee consisting of Council staff, NMFS Regional staff, Northeast Fisheries Science Center staff, and individuals designated by interested states from Maine to Florida. The Committee also includes two non-voting, ex-officio industry representatives;

- an annual FMP review process for establishing the quota and other management measures for the upcoming year;

- permit and reporting requirements for commercial vessels, operators, and dealers; and,

- other measures regarding the placement of observers on vessels, foreign fishing, and experimental exemptions.

The following items contained in the FMP have also been approved, but with some comments:

- the description of fishing activities and participants, including the assessment of the effects of management measures on fishery participants and fishing communities; and,

- the description and identification of Essential Fish Habitat for Spiny Dogfish, including provisions which minimize, to the extent practicable, adverse effects on EFH caused by fishing, and provisions which identify actions to encourage conservation and enhancement of EFH.

<u>Description of Fishing Activities and Participants</u>

Subsequent amendments to the FMP should improve the level of detail in this section. The analysis of impacts of contemplated future alternatives on fishery participants and communities should also be improved. While major ports are discussed, further information should be added concerning the remaining ports where dogfish vessels, including party/charter vessels, operate. As information becomes available, the Councils should further provide demographics of the fishery, describe the socio-cultural matrix of the fishery, and describe community social institutions related to the fishery, such as fishing associations.

<u>Description and Identification of Essential Fish Habitat</u>

On an ongoing basis, the Councils and NMFS should work to monitor any shifts in effort from the dogfish fishery to other fisheries that could adversely impact spiny dogfish EFH, and work to minimize these impacts, to the extent practicable.

I appreciate the hard work you and your staff have put into developing this FMP. I look forward to working with you to ensure that the plan operates effectively to eliminate overfishing and rebuild the spiny dogfish resource.

Sincerely,

Patricia A. Kurkul
Regional Administrator

c.c. - Dr. Mike Sissenwine (NEFSC)
Dr. Gary Matlock (F/SF)

SPINY DOGFISH FISHERY MANAGEMENT PLAN

(Includes Final Environmental Impact Statement and Regulatory Impact Review)

February 1999

Mid-Atlantic Fishery Management Council

and the

New England Fishery Management Council

in cooperation with the

National Marine Fisheries Service

Draft adopted by Councils: 11 August (NEFMC) and 17 August (MAFMC) 1998
Final Adopted by Councils: 27 January (NEFMC) and 3 February (MAFMC) 1999
Final approved by NOAA: 29 September 1999

A Publication of the Mid-Atlantic Fishery Management Council pursuant to National Oceanic and Atmospheric Administration Award No. NA57FC0002

EXECUTIVE SUMMARY

The purpose of the proposed action is to initiate management of spiny dogfish (*Squalus acanthias*) pursuant to the Magnuson-Stevens Act of 1976 as amended by the Sustainable Fisheries Act (SFA). For most of the first two decades of extended jurisdiction under the Magnuson-Stevens 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 groundfish resources in recent years, an increase in directed fishing for dogfish has resulted in a nearly ten-fold increase in landings from 1987-1996. 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 develop a management plan for the species.

In addition, data and analyses in the most recent stock assessment indicate that the spiny dogfish stock in the Northwest Atlantic has declined as a result of the recent increase in exploitation (NEFSC 1998). Recent rapid expansion of the fishery has resulted in a dramatic increase in fishing mortality. Particularly troublesome 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). The SFA requires remedial action by the Councils for stocks designated as overfished. The SFA requires that a management program be developed immediately for this species and that targets and thresholds for stock size and fishing mortality be established.

The management unit for this FMP is defined as the entire spiny dogfish (*Squalus acanthias*) population along the Atlantic coast of the United States.

The overall goal of this FMP is to conserve spiny dogfish in order to achieve optimum yield from this resource.

To meet the overall goal, the following objectives are adopted:

1. Reduce fishing mortality to ensure that overfishing does not occur.
2. Promote compatible management regulations between state and Council jurisdictions and the US and Canada.
3. Promote uniform and effective enforcement of regulations.
4. Minimize regulations while achieving the management objectives stated above.
5. Manage the spiny dogfish fishery so as to minimize the impact of the regulations on the prosecution of other fisheries, to the extent practicable.
6. Contribute to the protection of biodiversity and ecosystem structure and function.

The fishing year for spiny dogfish is the twelve (12) month period beginning 1 May.

Management Program for Spiny Dogfish

The Councils adopted the following management program:

Management Strategy

The SFA, which reauthorized and amended the Magnuson-Stevens Fishery Conservation and Management Act, made a number of changes to the existing National Standards. With respect to National Standard 1, the SFA imposed new requirements concerning definitions of overfishing in fishery management plans. To comply with National Standard 1, the SFA requires that each Council FMP define overfishing as a rate or level of fishing mortality that jeopardizes a fishery's capacity to produce maximum sustainable yield (MSY) on a continuing basis.

Each FMP must specify objective and measurable status determination criteria for identifying when stocks or stock complexes covered by the FMP are overfished. To fulfill the requirements of the SFA, status determination criteria for spiny dogfish are comprised of two components: 1) a maximum fishing mortality threshold and 2) a minimum stock size threshold. The maximum F threshold should be specified as F_{MSY} (or a suitable proxy) and the minimum biomass threshold should be specified as ½ B_{MSY} (or a suitable proxy).

For spiny dogfish, MSY could not be reliably estimated from a surplus production model, like other stocks that have better catch and effort data. The Councils adopted F_{rep}, with a pup-per-recruit ratio of 1.0 or the fishing mortality rate which allows for the production of 1.0 female pup per female recruit to adult stock (i.e., the adult female portion of the stock is replacing itself), as a proxy for F_{MSY}. This fishing mortality rate is currently estimated to be $F=0.11$.

The SFA also requires that a risk averse fishing mortality target be specified, as well as a biomass target. For spiny dogfish, the Councils adopted a fishing mortality rate of F_{rep} with a pup-per-recruit ratio of 1.5, or the fishing mortality rate which allows for the production of 1.5 female pups per female recruit (estimated to be $F=0.08$ for current size at first entry to the fishery). The Councils have chosen a target stock biomass which is 90% of B_{MSY} (as represented by the proxy SSB_{max}).

An additional requirement of the SFA is that stocks which are identified as overfished must be rebuilt to the level that will produce maximum sustainable yield (B_{MSY}). The SFA guidelines advise that, in most cases, the stock rebuilding period may not exceed 10 years. The most recent stock assessment data presented by NEFSC (1998) and the Dogfish Technical Committee indicate that total adult female spiny dogfish stock biomass is currently about 280 million lbs (127,000 mt), well below the stock biomass target of 397 million lbs (180,000 mt) based on a three year moving average of the most recent NEFSC survey data. As a result, the Councils propose to rebuild the adult female spiny dogfish stock to 180,000 mt (90% of SSB_{max}) over a five year rebuilding period through the implementation of this FMP.

The preferred alternative will eliminate overfishing and rebuild the spiny dogfish stock through a two step reduction in fishing mortality rate. The first step allows for a one year exit fishery of 22 million lbs (10,006 mt) 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, F will be reduced to 0.2 and then will be reduced to F=0.03 in the remaining four years of the rebuilding plan. This schedule allows for stock rebuilding to the level at or near 90% of the SSB_{max} level in the year 2003.

Proposed and Alternative Management Measures

Preferred Management Measures

The Councils adopted a number of preferred management measures to meet the objectives of the FMP (a complete description of these management measures is given in section 3.1). These preferred alternatives are as follows:

1. Permit and reporting requirements for commercial vessels, operators and dealers.

2. The establishment of a Spiny Dogfish FMP Monitoring Committee.

3. The implementation of a framework adjustment process.

4. A five year stock rebuilding schedule.

5. A commercial quota.

6. Seasonal (semi-annual) allocation of the quota.

7. Prohibition on finning.

Alternatives to the Preferred Management Actions

A number of alternatives to the proposed management measures have been identified by the Councils for consideration by the public (a complete description of these management measures is given in section 3.1). These non-preferred alternatives include:

1. Take no action at this time.

2. Alternative rebuilding schedules.

3. A commercial quota with trip limits.

4. A commercial quota with alternative seasonal allocations.

5. A commercial quota with alternative size limits including a slot size limit.

6. Limited entry program for spiny dogfish commercial fishery.

7. A target commercial quota.

8. A limit of 80 nets (50 fathoms each) in the spiny dogfish gillnet fishery.

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

1.1 PURPOSE AND NEED FOR ACTION

1.1.1 History of Development of the Plan

The purpose of the proposed action is to initiate 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). 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 groundfish resources in recent years, an increase in directed fishing for dogfish has resulted in a nearly ten-fold increase in landings from 1987-1996. 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 develop a management plan for the species.

In addition, 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. Recent rapid expansion of the fishery has resulted in a dramatic increase in fishing mortality. Particularly troublesome 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). The SFA requires remedial action by the Councils for stocks designated as overfished. The SFA requires that a management program be developed immediately for this species and that targets and thresholds for stock size and fishing mortality be established.

FMPs and amendments must meet the requirements of a number of federal laws and regulations. In addition to MSFCMA, these include the National Environmental Policy Act, the Endangered Species Act, the Marine Mammal Protection Act, Executive Order 12866, and the Regulatory Flexibility Act. This document has been developed to meet these federal requirements and contains all elements of the FMP Act, Final Environmental Impact Statement, Regulatory Flexibility Analysis, Regulatory Impact Review, and Fishery Impact Statement.

1.1.2 Problems for Resolution

Based upon the NEFSC (1994) recommendations and concerns expressed by both industry and the general public, the Councils held scoping hearings in the New England and Mid-Atlantic regions during the fall of 1997 to begin the process of FMP development. The purpose of the scoping hearings was to determine the scope of issues to be addressed and to identify the significant issues and problems relating to the management of spiny dogfish. This action was also necessary to comply with federal environmental documentation requirements of the National Environmental Policy Act. The following problems and issues were identified during the scoping hearings.

1.1.2.1 Depletion of mature female portion of the spiny dogfish stock

The spiny dogfish stock was recently designated as overfished. Under the new SFA requirements, a formal definition of overfishing needs to be developed. In addition to the need for a definition of overfishing, a minimum spawning stock threshold must be specified and the stock must be rebuilt to a level which will produce maximum sustained yield in 10 years or less.

1.1.2.2 High discard rates in non-directed fisheries

Virtually all of the spiny dogfish taken as bycatch in the mixed- and multi-species gillnet and otter trawl fisheries in the Northwest Atlantic Ocean were discarded based on sea sample data from 1991-1993. The primary reason for discarding of dogfish taken in these fisheries is small size or lack of market. The result of this activity is to reduce the mean size/age of recruitment to the fishery. Since these animals are discarded, they represent economic and biological waste.

Any harvest policy developed for spiny dogfish must take into account the background mortality that results from discarding of dogfish from these fisheries. The issue of discards is a particularly important issue in the management of spiny dogfish, especially given the new National Standard 9, which mandates that regulations within FMPs developed under the SFA must minimize the level of discards and the mortality of discards which are unavoidable.

The intent of this FMP is to minimize the impacts of the spiny dogfish rebuilding program on the prosecution of other fisheries. However, if discards in non-directed fisheries severely impede the rebuilding efforts of this FMP, the Councils may find it necessary impose additional measures which could have negative consequences for other, non-directed fisheries. The degree to which restrictions on other fisheries become necessary will depend on the interpretation of the SFA by the Councils and NMFS. Resolution of the problems which arise when FMPs for different species promulgated under the Magnuson-Stevens act have competing objectives will involve a significant policy consideration for the Councils and NMFS. Resolution of this issue is beyond the scope of this FMP and will require a much broader policy analysis of the consequences for the stocks, fisheries and fishing communities involved.

1.1.2.3 Spiny dogfish life history makes stock vulnerable to overfishing

Spiny dogfish are long lived and slow growing (see Section 2.1.3.2). This life history strategy (long lived with low reproductive potential) makes the species particularly vulnerable to overfishing. Holden (1973) noted the limited ability of sharks and other elasmobranchs to maintain the levels of exploitation sustainable in fisheries for teleost or bony fishes. This is because stock and recruitment are directly related and reductions in adult stock size result in reduced recruitment. In addition, the limited reproductive potential of spiny dogfish offers little flexibility in compensating for increased exploitation.

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 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 and the Councils would be faced with an extended rebuilding period which could be decades in duration. The FMP will allow for the rebuilding of the adult spawning stock in a relatively short period of time and then allow for a sustainable fishery as defined under the SFA.

1.1.2.4 Identification of essential habitat for spiny dogfish

Pursuant to the new requirements of the SFA, the Councils are required to identify essential habitat for spiny dogfish in the western Atlantic Ocean. Therefore, the Councils solicited comments from the public on the identification of and threats to essential habitat for spiny dogfish during the scoping progress.

1.1.3 Management Objectives

The overall goal of this FMP is to conserve spiny dogfish in order to achieve optimum yield from this resource in the western Atlantic Ocean.

To meet the overall goal, the following objectives are adopted:

1. Reduce fishing mortality to ensure that overfishing does not occur.

2. Promote compatible management regulations between state and Council jurisdictions and the US and Canada.

3. Promote uniform and effective enforcement of regulations.

4. Minimize regulations while achieving the management objectives stated above.

5. Manage the spiny dogfish fishery so as to minimize the impact of the regulations on the prosecution of other fisheries, to the extent practicable.

6. Contribute to the protection of biodiversity and ecosystem structure and function.

1.1.4 Management Unit

The management unit for this FMP is defined as the entire spiny dogfish (*Squalus acanthias*) population along the Atlantic coast of the United States.

1.1.5 Management Strategy

The SFA, which reauthorized and amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) made a number of changes to the existing National Standards. With respect to National Standard 1, the SFA imposed new requirements concerning definitions of overfishing in fishery management plans. To comply with National Standard 1, the SFA requires that each Council FMP define overfishing as a rate or level of fishing mortality that jeopardizes a fishery's capacity to produce maximum sustainable yield (MSY) on a continuing basis. Each FMP must specify objective and measurable status determination criteria for identifying when stocks or stock complexes covered by the FMP are overfished. To fulfill the requirements of the SFA, status determination criteria for spiny dogfish are comprised of two components: 1) a maximum fishing mortality threshold and 2) a minimum stock size threshold. The maximum F threshold should be specified as F_{MSY} (or a suitable proxy) and the minimum biomass threshold should be specified as ½ B_{MSY} (or a suitable proxy).

For spiny dogfish, MSY could not be reliably estimated from a surplus production model, like other stocks that have better catch and effort data. Surplus production modeling so gives results that are conditioned on the exploitation pattern, which appears to be changing (the fishery has targeted smaller fish with time). In lieu of this approach, Applegate *et al.*(1998) and the Dogfish Technical Committee recommended using yield-per-recruit biological reference points that maximize yield and protect against declines in total recruitment. Yield-per-recruit analyses do not give any advice on the amount of recruitment or how it changes with stock size. To estimate a stock size that would maximize recruitment, a stock-recruitment model was fitted to spawning stock biomass and recruitment observations. The stock size that would maximize average recruitment is known as the SSB_{max} and was recommended as a proxy value for B_{MSY}. This value is estimated to be 440 million pounds (200,000 mt) and was measured as a swept-area biomass index of adult females from the NEFSC spring survey. As a proxy for F_{MSY}, Applegate *et al.* (1998) recommended using F_{rep} with a pup-per-recruit ratio of 1.0 or the fishing mortality rate which allows for the production of 1.0 female pup per female recruit to adult stock (i.e., the adult female portion of the stock is replacing itself). This fishing mortality rate is currently estimated to be F=0.11.

The SFA also requires that a risk averse fishing mortality target be specified as well as a biomass target, which is the stock level associated with MSY (B_{MSY}). For spiny dogfish, Applegate *et al.* (1998) recommended specifying the target fishing mortality rate as F_{rep} with a pup-per-recruit ratio of 1.5, or the fishing mortality rate which allows for the production of 1.5 female pups per female recruit (estimated to be F=0.08 for current size at first entry to the fishery). The Councils have chosen a target stock biomass which is 90% of B_{MSY} (as represented by the proxy SSB_{max}).

An additional requirement of the SFA is that stocks which are identified as overfished (i.e., stock biomass is less than minimum biomass threshold) must be rebuilt to the level that will produce maximum sustainable yield (B_{MSY}). The SFA guidelines advise that, in most cases, the stock rebuilding period may not exceed 10 years. The most recent stock assessment data presented by NEFSC (1998) and the Dogfish Technical Committee indicate that total adult female spiny dogfish stock biomass is currently about 280 million lbs (127,000 mt), well below the stock biomass target of 397 million lbs (180,000 mt) based on a three year moving average of the most recent NEFSC survey data. As a result, the Councils propose to rebuild the adult female spiny dogfish stock to 180,000 mt (90% of SSB_{max}) over a five year rebuilding period through the implementation of this FMP.

The preferred alternative will eliminate overfishing and rebuild the spiny dogfish stock through a two step reduction in fishing mortality rate. The first step allows for a one year exit fishery of 22 million lbs (10,000 mt) 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 will be reduced to 0.2 and then will be reduced to F=0.03 in the remaining four years of the rebuilding plan (2000-2003). This schedule allows for stock rebuilding to the level at or near 90 % of the SSB_{max} level in the year 2003 (Rago pers.comm.).

1.2 PROPOSED AND ALTERNATIVE MANAGEMENT MEASURES

1.2.1 Proposed Management Measures

The Councils are proposing a number of management measures to meet the objectives of the FMP (a complete description of these management measures is given in section 3.1). These preferred alternatives are as follows:

1. Permit and reporting requirements for commercial vessels, operators and dealers.

2. The establishment of a Spiny Dogfish FMP Monitoring Committee.

3. The implementation of a framework adjustment process.

4. A five year stock rebuilding schedule.

5. A commercial quota.

6. Seasonal (semi-annual) allocation of the quota.

7. Prohibition on finning.

1.2.2 Alternatives to the Preferred Management Actions

A number of alternatives to the proposed management measures have been identified by the Councils for consideration by the public (a complete description of these management measures is given in section 3.1). These non-preferred alternatives include:

1. Take no action at this time.

2. Alternative rebuilding schedules.

3. A commercial quota with trip limits.

4. A commercial quota with alternative seasonal allocations.

5. A commercial quota with alternative size limits including a slot size limit.

6. Limited entry program for spiny dogfish commercial fishery.

7. A target commercial quota.

8. A limit of 80 nets (50 fathoms each) in the spiny dogfish gillnet fishery.

2.0 DESCRIPTION OF AFFECTED ENVIRONMENT

2.1 DESCRIPTION OF THE STOCK

2.1.1 Species Description 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 (Figure 1). They migrate seasonally, moving north in spring and summer and south in fall and winter. The preferred temperature range is 45° to 55° 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.

2.1.2 Abundance and Present Condition

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 has begun to decline 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 331 million pounds (150,000 mt). 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 (300,000 mt) in 1990 to about 331 million pounds (150,000 mt) in 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 has declined from 38 inches (97 cm) in 1982 to 33 inches (84 cm) in 1996 (Table 1).

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 lb/tow during 1967 to 1979 (Table 2). Since 1979, the biomass index has ranged between 86 lb/tow in 1983 and 330 lb/tow in 1990. The biomass index for males has fluctuated between 133 lb/tow in 1990 and 82 lb/tow in 1997. The male biomass index was 130 lb/tow in 1996. The female biomass has shown a greater decline during the l990s, declining from 133 lb/tow in 1990 to 99 lb/tow in 1997.

Minimum biomass estimates based on swept-area estimates from NEFSC spring surveys, segregated by sizes (representing immature and mature female dogfish) are given in Table 3. The swept area estimate of female biomass between 14 and 31 in (36 and 79 cm) increased steadily from 37.0 million pounds (17,000 mt) in 1980 (the first year that dogfish captured by the research survey were recorded by sex) to 452 million pounds (205,000 mt) in 1997. Large, mature female biomass was over 882 million pounds (400,000 mt) in 1982, 1988, and 1990. Since 1990, the estimate of mature female biomass declined to 185 million pounds (84,000 mt), the second lowest value on record since 1980.

2.1.3 Ecological Relationships and Stock Characteristics

2.1.3.1 Spawning 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.

2.1.3.2 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 lbs (10 kg).

2.1.3.3 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.

2.1.3.4 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 $Z'=xe^{-Zt_m}$ 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.

2.1.3.5 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.

2.1.3.6. 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).

2.1.4. Maximum Sustainable Yield

Maximum sustainable yield (MSY) was estimated for the Northwest Atlantic stock of spiny dogfish at SAW-18 (NEFSC 1994). Applegate *et al.* (1998) concluded that MSY could not be reliably estimated directly from a surplus production model like other stocks that have better catch and effort data. This approach also gives results that are conditioned on the exploitation pattern, which appears to be changing (the fishery has targeted smaller fish with time). In lieu of this approach, Applegate *et al.* (1998) recommended using yield-per-recruit biological reference points that maximize yield and protect against declines in total recruitment. Yield-per-recruit analyses do not give any advice on the amount of recruitment or how it changes with stock size. To estimate a stock size that would maximize recruitment, a stock-recruitment model was fitted to adult female spawning stock biomass and recruitment observations. The stock size that would maximize average recruitment is knows as the SSB_{max} and is recommended as a proxy value for B_{MSY} or the biomass which would produce maximum sustainable yield. This value is estimated to be 200,000 mt and was measured as a swept-area biomass index of mature females based on the NMFS spring trawl survey.

As a maximum fishing mortality threshold that would serve as a proxy for F_{MSY}, Applegate *et al.* (1998) recommended adopting the fishing mortality value estimated to stabilize the female population at SSB_{max} while maximizing yield per recruit, also referred to as F_{rep}. This corresponds to a fishing mortality rate that would produce an average of 1.0 pup-per-recruit. Based on the yield-per-recruit analysis conducted by SAW-26, the fishing mortality replacement threshold would be $F=0.11$ with a size-at-entry in the fishery of 27.5 in (70 cm). Analyses conducted by the Spiny Dogfish Committee estimated recent fishing mortality at $F=0.297$. Long term potential yield for spiny dogfish at a fishing mortality rate of $F_{rep}=0.11$ was estimated to be about 14 million pounds (6,250 mt). Long term yield would be higher at a larger size-at entry.

2.1.5. Probable Future Condition

The Spiny Dogfish Technical Committee evaluated a number of stock rebuilding options during the development of this FMP for spiny dogfish using a length-based stock projection model (Rago pers. comm.). Included in these analyses were projections of stock size and yields assuming maintenance of the status quo (which would mean no action). Under the no action alternative, the Technical Committee assumed that fishing mortality would remain at recent levels ($F=0.3$) and the size at entry to the fishery would remain at 27.5 in (70 cm). Assuming maintenance of the status quo (assuming F remains at the recent level of 0.3), the spiny dogfish population is expected to decline rapidly and projected landings (yield) would be expected to decrease by 80% within 7 years (to less than 11 million pounds or 5,000 mt) and then decline at a slower rate. Thereafter, landings would gradually decline to near zero over the next 20-25 years.

The Technical Committee also examined a suite of management options which would involve reductions in fishing mortality over a period of ten years or less (see Section 3.1). These projections indicate that if fishing mortality is substantially reduced and maintained at low levels, then the spiny dogfish stock can be rebuilt to levels which will allow sustainable harvests within a ten year planning horizon or less. If fishing mortality is reduced, then the decline in the spiny dogfish stock will be arrested and stock rebuilding will occur relatively quickly, especially given the slow growth and low reproductive capacity of this stock. This rebuilding can occur relatively quickly due to the large biomass of spiny dogfish of intermediate size which currently exists. Husbandry of this intermediate size group currently in the population will allow the adult female portion of the stock to increase and allow for subsequent stock size increases overall through increased recruitment.

2.2 DESCRIPTION OF HABITAT

2.2.1 Inventory of Environmental and Fisheries Data

According to CFR section 600.815 (a)(2)(i)(A) from the Interim Final Rule on essential fish habitat, published in the *Federal Register* 19 December 1997, an initial inventory of available environmental and fisheries data sources relevant to the managed species should be used in describing and identifying essential fish habitat (EFH).

In section 600.815 (a)(2)(i)(B), in order to identify EFH, basic information is needed on current and historic stock size, the geographic range of the managed species, the habitat requirements by life history stage, and the distribution and characteristics of those habitats.

2.2.1.1 Range

The spiny dogfish, *Squalus acanthias,* is a coastal squaloid shark with a circumboreal distribution. In addition to being the most abundant shark in the western North Atlantic, it is also one of the most highly migratory species of the Atlantic coast (Bigelow and Schroeder 1953). Rago *et al.* (1994) report that their general distribution in the Northwest Atlantic is between Labrador and Florida but are most abundant from Nova Scotia to Cape Hatteras, North Carolina (Figure 1).

Spiny dogfish school by size until they mature and then they school by both size and sex. (Templeman 1944, Bigelow and Schroeder 1953, Saulson 1982, Nammack *et al.* 1985, Silva 1993, Rago *et al.* 1994). Schools are often composed of: (1) very large, mature females; (2) medium-sized individuals, either all mature males or all immature females; or (3) small immature individuals of both sexes in equal numbers (Bigelow and Schroeder 1953).

Seasonal migrations occur northward in the spring and summer and southward in the fall and winter (Jensen 1965). Fish that spend the summer north of Cape Cod move southward to Long Island in the fall, and as far south as North Carolina in the winter (Collette and MacPhee, In prep.). Winter catches in waters south of North Carolina were reported by Bearden (1965) and Hess (1966) and occurrences as far south as Cuba were reported by Bigelow and Schroeder (1953).

Seasonal inshore-offshore movements and coastal migrations are thermally induced (Bigelow and Schroeder 1953, Jensen 1965). Generally, spiny dogfish spend summers in inshore waters and overwinter in deeper offshore waters. They are usually epibenthic, but occur throughout the water column and are found in a depth range from nearshore shallows to offshore shelf waters approaching 3,000 ft (Collette and MacPhee, In prep.).

Climatic, physiographic, and hydrographic differences separate the Atlantic ocean from the Gulf of Maine to Florida into two distinct areas, the New England-Middle Atlantic Area and the South Atlantic Area, with the natural division occurring at Cape Hatteras. These differences result in major zoogeographic faunal changes at Cape Hatteras. The New England region from Nantucket Shoals to the Gulf of Maine includes Georges Bank, one of the worlds most productive fishing grounds. The Gulf of Maine is a deep cold water basin, partially sealed off from the open Atlantic by Georges and Browns Banks, which fall off sharply into the continental shelf.

The New England-Middle Atlantic area is fairly uniform physically and is influenced by many large coastal rivers and estuarine areas including Chesapeake Bay, the largest estuary in the United States, Narragansett Bay, Long Island Sound, the Hudson River, Delaware Bay, and the nearly continuous band of estuaries behind the barrier beaches from southern Long Island to Virginia. The southern edge of the region includes the estuarine complex of Currituck, Albemarle, and Pamlico Sounds, a 2500 square mile system of large interconnecting sounds behind the Outer Banks of North Carolina.

The South Atlantic region is characterized by three long crescent shaped embayments, demarcated by four prominent points of land, Cape Hatteras, Cape Lookout, and Cape Fear in North Carolina, and Cape Romain in South Carolina. Low barrier islands occur along the coast south of Cape Hatteras with concomitant sounds that are only a mile or two wide. These barriers become a series of large irregularly shaped islands along the coast of Georgia and South Carolina, separated from the mainland by one of the largest coastal salt-water marsh areas in the world. Similarly, a series of islands border the Atlantic coast of Florida. These barriers are separated in the north by broad estuaries, which are usually deep and continuous with large coastal rivers, and in the south by narrow, shallow lagoons.

The continental shelf (characterized by water less than 650 feet in depth) extends seaward approximately 120 miles off Cape Cod, narrows gradually to 70 miles off New Jersey, and is 20 miles wide at Cape Hatteras. South of Cape Hatteras, the shelf widens to 80 miles near the Georgia-Florida border, narrows to 35 miles off Cape Canaveral, Florida, and is 10 miles or less off the southeast coast of Florida and the Florida Keys. The shelf is at its narrowest, reaching seaward only 1.5 miles, off West Palm Beach, Florida.

Surface circulation is generally southwesterly on the continental shelf during all seasons of the year, although this may be interrupted by coastal indrafting and some reversal of flow at the northern and southern extremities of the area. There may be a shoreward component to this drift during the warm half of the year and an offshore component during the cold half. The direction of this drift, fundamentally the result of temperature-salinity distribution, is largely determined by the wind. A persistent bottom drift at speeds of tenths of nautical miles per day extends from beyond mid-shelf toward the coast and eventually into the estuaries.

Water temperatures range from less than 33 °F in the New York Bight in February to over 80 °F off Cape Hatteras in August. The vertical thermal gradient is minimized during winter. In late April to early May, a thermocline develops in shelf waters except over Nantucket Shoals where storm surges retard thermocline development. The thermocline persists through the summer until surface waters begin to cool in early autumn. By mid-November, surface to bottom temperature along the shelf is nearly homogeneous.

Coastwide, an annual salinity cycle occurs as the result of freshwater stream flow and the intrusion of slope water from offshore. Water salinities nearshore average 32 ppt, increase to 34-35 ppt along the shelf edge, and exceed 36.5 ppt along the main lines of the Gulf stream.

2.2.1.2 Status of the stock

The Spiny dogfish stock was recently assessed at the December 1997 SARC and is currently classified as overfished (NEFSC 1998). Figure 2 presents spiny dogfish combined commercial landings and stratified mean catch/tow from spring bottom trawl surveys conducted by NEFSC. The combined commercial landings (1963 - 1996) include the U.S., Canada, foreign, and U.S. recreational catches. The U.S. recreational catch data are unknown prior to 1980.

The increase in total commercial landings of spiny dogfish from 1968 through 1974 was due largely to the foreign fleet harvest, most notably the former USSR. This foreign pressure continued through 1977. With the advent of the Fishery Conservation Zone (the predecessor to the renamed Exclusive Economic Zone), the foreign harvest dwindled to a low in 1979, but landings by the U.S. and Canada have been steadily increasing since then. A sharp intensification of the U.S. commercial fishery began in 1990. Estimated landings for 1996, in excess of 61.5 million lbs (28,000 mt), represent the highest landings since 1962.

2.2.1.3 Habitat Requirements by life history stage

The following information on juveniles and adult dogfish habitat requirements was taken directly from the document "FMP EFH Source Document, Spiny Dogfish, *Squalus acanthias* Linnaeus, 1758: life history, food habits, status of the stock, habitat characterization, and distribution and relative abundance" (McMillan and Morse 1998). It does not contain information on eggs and larvae because dogfish are oviviparous (no placenta, live birth). The McMillan and Morse (1998) document is referred to hereafter as the dogfish EFH background document. Most of the tables and figures from McMillan and Morse (1998) are included in this FMP. The McMillan and Morse (1998) dogfish EFH background document is currently being modified for publication by NMFS and can be obtained in its entirety from NMFS, Sandy Hook Laboratory, 74 McGruder Road, Highlands, New Jersey 07732.

Habitat characteristics for juvenile and adult spiny dogfish are provided in Table 4. This table includes the particular study, investigator, geographic area, hydrographic preference, estuarine use, and prey/predator selection.

For this analysis, McMillan and Morse (1998) assumed 32.6 in (83 cm; females) and 23.6 in (60 cm; males) are the median lengths at which 50% of the individuals are mature. Individuals are classified as either adults or juveniles; i.e. males and females for the particular life stage were combined for distribution and abundance plots.

2.2.1.3.1 Juveniles

Habitat requirements

Catches of juvenile spiny dogfish and their relationship to bottom water temperatures and bottom depths observed on NEFSC's spring and autumn bottom trawl surveys are provided in Figure 3. During the spring surveys, observed bottom temperatures ranged from 34-72 °F (1-22°C). Juvenile spiny dogfish occurred in a bottom temperature range between 37-63 °F (3-17°C), while most were caught in waters with bottom temperatures between 46-55 °F (8-13°C). Trawl stations occupied during the spring had a bottom depth range from 16 to 440 ft (5 to 439 m). Juveniles occurred in waters with a bottom depth range between 23 and 1,280 ft (7 and 390 m), while most were caught in waters with bottom depths between 164 and 492 ft (50 and 150 m).

During the autumn surveys, observed bottom temperatures ranged from 41-82 °F (5-28°C). Juvenile spiny dogfish occurred in waters between 41-68 °F (5-20°C), with the majority caught in waters between 50-59 °F (10-15°C). Trawl stations occupied during this season had bottom depths ranging from 16 to 1578 ft (5 to 481m). Juvenile spiny dogfish occurred in waters with bottom temperatures ranging from 39 to 1201 ft (2 to 366m), while most were caught in waters with bottom depths between 82 and 246 ft (25 and 75 m).

Distribution and Abundance

The seasonal distribution and relative abundance of juvenile spiny dogfish from the NEFSC research trawl surveys are shown in Figures 4-7. The data analyzed to describe the distribution and abundance patterns were limited to those surveys where the sex of spiny dogfish was determined.

The winter distribution of juvenile spiny dogfish was widespread across the shelf from North Carolina to the eastern edge of Georges Bank (Figure 4). Juveniles were absent in the western portions of Georges Bank and nearly absent on Nantucket Shoals. The Gulf of Maine was not adequately sampled to describe juvenile distribution during the winter.

The distribution and relative abundance of juvenile spiny dogfish caught during the spring surveys are shown in Figure 5. Juveniles were concentrated in offshore waters from North Carolina to the eastern edge of Georges Bank. The highest numbers occurred along the outer shelf (200-660 ft; 60-200m). Juveniles were nearly absent in the northwest portion of the Gulf of Maine.

Due to inadequate sampling during the summer surveys (i.e. the number of surveys where sex was determined only encompassed the Gulf of Maine and were limited to 1993-1995) McMillan and Morse (1998) could not summarize distribution during this season for juveniles (Figure 6).

Autumn distribution and relative abundance for juvenile spiny dogfish is provided in Figure 7. The highest numbers were evident: 1) around Nantucket Shoals; 2) on Georges Bank and; 3) in waters between Lurcher Shoal and German Bank off the coast of Nova Scotia. It should be noted that juveniles were widespread throughout the Gulf of Maine.

2.2.1.3.2 Adults

Habitat requirements

Catches of adult spiny dogfish, and their relationship to bottom water temperatures and bottom depths observed on NEFSC spring and autumn bottom trawl surveys, are provided in Figure 3. During the spring surveys, bottom temperature ranged from 34-72 °F (1-22°C). Adult spiny dogfish occurred in waters with a bottom temperature range between 37-63°F (3-17°C), while most were caught in waters with bottom temperatures between 45-52 °F (7-11°C). Trawl stations occupied during the spring had a bottom depth range from 16 to 1440 ft (5 to 439 m). Adults occurred in waters with a bottom depth range between 23 to 1440 ft (7 and 439 m), while most were caught in waters with bottom depths between 164 and 489 ft (50 and 149m).

During the autumn surveys, bottom temperature ranged from 41-82 °F (5-28°C). Adult spiny dogfish occurred in waters with a bottom temperature range between 41-66 °F (5-19°C), with the majority being caught in waters with a bottom temperature range between 50 -59 °F (10-15°C). Trawl stations occupied during this season had bottom depths ranging from 16-1578 ft (5- 481 m). Adults occurred in waters with a bottom depth range between 39-1128 ft (12-344m), while most were caught in waters with bottom depths between 32-161 ft (10-49m).

Distribution and Abundance

Winter distribution of adult spiny dogfish was very similar to that of winter juveniles (Figures 4 and 8). Distribution was widespread across the shelf from Cape Hatteras, North Carolina to the eastern edge of Georges Bank. Adults were nearly absent in the New York Bight, Nantucket Shoals, and completely absent on the western portion of Georges Bank.

In the spring, the distribution and relative abundance of adults were somewhat similar to that of the juveniles (Figures 5 and 9). High numbers of dogfish were seen along the outer shelf from North Carolina to the northeast peak of Georges Bank, continuing onto Browns Bank. Lesser numbers occurred inshore from Cape Hatteras to Long Island, the western portion of Georges, and central Gulf of Maine.

Due to inadequate sampling during the summer surveys, i.e. the number of surveys where sex was determined only encompassed the Gulf of Maine and were limited to 1993-1995, McMillan and Morse (1998) could not accurately summarize distribution during this season for adults (Figure 10).

The distribution and relative abundance of adult spiny dogfish captured during the autumn surveys is provided in Figure 11. Adults were absent across the shelf from North Carolina to the area just south of the Hudson Canyon. Low numbers occurred along the nearshore area of Long Island. The highest abundance was seen off Nantucket Shoals, then north along the eastern edge of Cape Cod, and into Cape Cod and Massachusetts bays. Another area of high abundance occurred just southwest of Nova Scotia. To a lesser degree than juveniles, adults were scattered throughout the Gulf of Maine and along the northwest edge of Georges Bank.

2.2.1.4 Importance of dogfish in state waters

The primary data source for dogfish in state waters is National Oceanic and Atmospheric Administration's (NOAA) Estuarine Living Marine Resources Program (ELMR; Tables 5 and 6); while not as quantitative as the NEFSC trawl data it does describe the dogfish spatial (Table 5) and temporal (Table 6) relative abundance by life stage and month in the various coastal estuaries (Figures 12-14). While dogfish may be important in other state waters, currently, the only state data available to NMFS in a consistent electronic format is Massachusetts Inshore Trawl Survey, Connecticut Trawl Survey - Long Island Sound, and the NMFS Trawl Survey - Hudson-Raritan Estuary/Sandy-Hook Bay. These data will not be used to designate EFH within estuaries because the data are not currently available in a consistent electronic format for other states. Therefore, it will only be used to confirm ELMR data. These data generally agree with ELMR presence/absence data for these estuaries. Habitat along the coast is generally covered because the NEFSC trawl data are presented by 10 minute squares and, in general, cover the entire coastal area. Data collected from states' seine and trawl surveys, as it becomes available, will be incorporated in future iterations of this FMP.

2.2.2 Description and Identification of Essential Fish Habitat

2.2.2.1 Methodology for description and identification

According to section 600.815 (a)(1), FMPs must describe EFH in text and with tables that provide information on the biological requirements for each life history stage of the species. These tables should summarize all available information on environmental and habitat variables that control or limit distribution, abundance, reproduction, growth, survival, and productivity of the managed species. The dogfish EFH background document (McMillan and Morse 1998) is considered the best scientific information available in order to meet National Standard 2 of the MSFCMA and will form the basis of this section.

As defined in section 3 (10) of the MSFCMA, essential fish habitat is "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." NMFS interprets "waters" to include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle.

A matrix of habitat parameters (i.e. temperature, salinity, light, etc.) for dogfish was developed in the dogfish EFH background document and included in this FMP as Table 4. Also included from the EFH background document are the ELMR data by dogfish life stage in major Atlantic coast estuaries (Tables 5 and 6 and Figure 12 for juveniles and 13 for adults). Researchers at Sandy Hook Laboratory are currently in the process of assembling numerous state survey data that can be used to identify EFH more quantitatively than the somewhat subjective means of how the ELMR data were derived. Currently, the Massachusetts Inshore Trawl Survey, Connecticut Trawl Survey of Long Island Sound, and NMFS Trawl Survey of the Hudson-Raritan Estuary are the only state inshore survey data available in the consistent format being compiled by the personnel at Sandy Hook. Due to the strict time constraints of the October-Sustainable Fishery Act deadline, it is unlikely that all the state data will be incorporated in this Amendment. However, as these and other data and information become available on dogfish, EFH designations can be reconsidered; and in fact, every FMP must be reviewed at least every five years. It is important to understand that this EFH is a "work in progress", and that the process will evolve. The identification and description of EFH is a frameworked management provision (section 2.2.8 for process description).

Section 600.815 (a)(2)(i)(C) identifies the four levels of data and the approach that should be used. All the dogfish data are either Level 1 (presence/absence) or perhaps, at best, Level 2 (habitat related densities). No dogfish data are available at Level 3 (growth, reproduction, and survival rates within habitats) or Level 4 (production rates by habitat types). The Councils encourage NMFS and the scientific community to collect more habitat associated data and to strive towards assembling data that can be precisely used for the quantitative identification and description of EFH.

In section 600.815 (a)(2)(ii)(A), the Councils are directed to "interpret this information in a risk-averse fashion". In the next section (B), it states, "if a species is overfished, and habitat loss or degradation may be contributing to the species being identified as overfished, all habitats currently used by the species should be considered essential in addition to certain historic habitats that are necessary to support rebuilding the fishery and for which restoration is technologically and economically feasible."

The Councils have interpreted the above direction of interpreting the information in a "risk-averse" fashion as the same as the NMFS policy on risk aversion as expressed by Schaefer (1995). Schaefer (1995) stated that there is no formal agency (NMFS) definition of risk-averse decision making. A succinct agency statement regarding the rationale and objectives of this type of decision making was presented publicly in the *Strategic Plan of the National Marine Fisheries Service -- Goals and Objectives* dated 10 June 1991. This statement, according to Schaefer (1995), still represents the formal agency position on this issue. Under Goal 2 -- Maintain Currently Productive Fisheries, there is a discussion of risk-prone and risk-averse decision making. This clearly explains that the agency advocates risk-averse fishery management decisions because they reduce the risk of overfishing and give the benefit of the doubt to conservation, particularly in the face of uncertainty about the effects of management actions on the managed fishery resources. Also, in *Our Living Oceans,* December 1993, page 24, NMFS indicates that risk-averse decision making is a key element in the development of any improved management system, and that this policy means that managers should err on the side of caution with respect to long-term resource health when making fishery management decisions. Making such decisions based on short-term objectives often places the resource's long-term health at risk.

Currently, two data sets are available for determining dogfish EFH. These data sets are Level 1 or, at best, Level 2 data. The data sets are: 1) NEFSC trawl survey (Level 2) and 2) ELMR data (Level 1). The limited state data in the dogfish background document (McMillan and Morse 1998) were also evaluated and, in general, agree with the ELMR data. Again, the available state data will not be used to designate EFH because the same level of data is not available to NEFSC Sandy Hook for all of the states.

To identify and describe EFH offshore, the Mid-Atlantic Council is relying primarily on data and information derived from the NMFS bottom trawl surveys. These surveys provide the best available information on the distribution and relative abundance of Council-managed species in offshore waters. Precise information on the distribution and relative abundance in inshore areas, especially in estuaries and embayments, has been sparse and incomplete in most cases.

To identify and describe EFH in state water, NOAA's ELMR data will be used. The ELMR program has been conducted jointly by the Strategic Environmental Assessments (SEA) Division of NOAA's Office of Ocean Resources Conservation and Assessment (ORCA), NMFS, and other agencies and institutions. The goal of this program is to develop a comprehensive information base on the life history, relative abundance, and distribution of fishes and invertebrates in estuaries throughout the nation. The nationwide ELMR database was completed in 1994 and includes information for 135 species found in 122 estuaries and coastal embayments. The Jury *et al.* (1994) report summarizes information on the distribution and abundance of 58 fish and invertebrate species in 17 North Atlantic estuaries and is the only volume that includes dogfish. The Stone *et al.* (1994) report summarizes information on the distribution and abundance of 61 fish and invertebrate species in 14 Mid-Atlantic estuaries. The Nelson *et al.* (1991) report covers 40 fish and invertebrate species in 20 estuaries between North Carolina and Florida. Until all the remaining state data are completely available in a uniform format, the ELMR data for adults and amended ELMR data for juveniles will be used to designate EFH in estuarine areas.

Reid *et al.* (1998) produced an appendix for all the species' habitat background documents produced by Sandy Hook Laboratory that describes the methods used in NEFSC, state, and other surveys. Data were collected in these surveys on distribution and abundance of all life stages and environmental variables. The Appendix in Reid *et al.* (1998) covered the NEFSC trawl survey data, but does not describe the ELMR data.

The NEFSC bottom trawl surveys have been conducted in the fall since 1963 and in the spring since 1968, with season surveys also being conducted in summer and winter on an intermittent basis. Distribution of juvenile and adult fish have been identified through trawl stations that were selected in a stratified random design that provides unbiased estimates of fish availability to the trawl gear in relation to the distribution of the species. Strata were defined based on water depth, latitude, and historical fishing patterns. Station allotments were approximately one station per 200 square nautical miles. At each station, the total catch was sorted by species, and the catch of each species was weighed and measured; very large catches were subsampled. Geographic range extends throughout the US Atlantic EEZ north of Cape Hatteras. Full details of this survey are described in Reid *et al.* (1998). Nearly all areas to the continental shelf break have been sampled over the past 30 years by the NEFSC trawl survey. Figure 10 in Reid *et al.* (1998) indicates all stations that were sampled throughout the survey.

The objective of NOAA's ELMR program is the development of a consistent data base on the distribution, abundance, and life history characteristics of important fishes and invertebrates in the Nation's estuaries. The Nation-wide data base is divided into five study regions, of which dogfish are included in one (North Atlantic) of the three (Mid-Atlantic and Southeast) Atlantic study regions. The data base contains the monthly relative abundance of each species' life stage by estuary for three salinity zones (seawater, mixing, and tidal fresh). Data collection was extensive, peer reviewed, evaluated relative to its reliability, but is also somewhat subjective. This subjectivity has generated some anxiety on the part of research scientists and is the main reason that, when the compilation of all the state data is completed in a consistent format, the quantitative state survey data will likely replace the ELMR data. However, at this time, ELMR data do meet National Standard 2 and are very important in describing essential dogfish habitat in the estuaries.

Currently, there is almost no data on dogfish south of Cape Hatteras, although they range to Florida. The Southeast Area Monitoring and Assessment Program (SEAMAP) is a cooperative state/federal program which sponsors a survey conducted by the South Carolina Department of Natural Resources. Data were collected from trawl surveys of coastal habitats between Cape Hatteras and Cape Canaveral from 1986 through 1996. Collections were made at randomly selected sites in predefined strata. During the 1986 through 1989 pilot phase of the survey, 19 strata were sampled. In 1989, five additional strata were added to the southern end of the study area, and each of the 24 strata was divided into an inshore and offshore stratum. Much less effort is expended and less data collected in this survey in comparison to the much longer time series NEFSC trawl surveys. Reid *et al.* (1998) details the SEAMAP program. While this data set has not yet been analyzed for dogfish, dogfish have been caught by this survey in various years. This information will not be used to designate EFH at this time, only to confirm its presence south of Cape Hatteras.

2.2.2.1.1 Five alternative approaches for describing EFH considered by the Mid-Atlantic Technical Team

One of the tasks of the Mid-Atlantic EFH Technical Team was to develop alternatives to designate EFH for consideration by the Council. Alternatives that were developed were a result of a meeting with several ecologists at the Sandy Hook Laboratory in February 1998. The alternatives were initially developed for bluefish, because the Bluefish Fishery Management Plan was the first plan to be amended with the EFH requirements of the reauthorized Magnuson-Stevens Act. However, the same concepts apply to other Council-managed species. At this meeting, five alternatives for EFH identification recommendations were discussed for bluefish. These alternatives were to provide the basis for evaluation of the other Council managed species. These five bluefish alternatives were: 1) no action (NEPA requirement); 2) 100% of area where overfished resources occur; 3) the "bottleneck" concept as identified in the bluefish EFH background document where a critical area may restrict recruitment; 4) identification of EFH based on temperature or other key environmental requirement; and 5) a threshold or cutoff point using some percentage of the distribution, i.e. 50%, 75%, 90%, or 100% (Reid *et al.* 1998). The following is a discussion for dogfish of the various alternatives and how they were approached with the Level 2 data (NEFSC trawl survey).

1. The "no action" alternative is included in the FMP because it is required by NEPA, but it is not viewed by the Councils as defensible. This alternative, or no EFH designation, could not meet the Congressional mandate identified in the 1996 reauthorized Magnuson-Stevens Act. With this alternative, there would be no stock improvement associated with the conservation of essential fish habitat.

2. The second alternative (100% of the distribution) would conform with the 1997 proposed EFH rule's criteria of listing all habitat where an overfished resource occurs as EFH. This alternative is supportable under the Interim Final Rule (1998) with only Level I data (i.e. presence/absence); however, there is Level 2 data available for dogfish. This alternative is also defensible if an association between the overfished status of the resource and the loss of essential habitat can be identified. However, no such association has been identified for dogfish.

3. The third alternative, identify bottlenecks in a history stage or to recruitment, is not applicable because no such bottlenecks are identified in the dogfish EFH background document.

4. The alternative 4 approach of identifying EFH based on key environmental requirements is not possible because of the lack of good quantitative habitat and environmental data corresponding to relative abundance of dogfish.

5. Finally, the use of some threshold or cutoff point of some percentage of the survey distributions, e.g., identifying some distributional percentage of the catches by area, seemed the only logically defensible position. For EFH designations based on Level 2 data, it is assumed that high value areas are those that support the highest density or relative abundance. This approach is supported by the technical guidance manual when Level 2 data (e.g., NEFSC Atlantic trawl survey) are available (USDC 1998).

2.2.2.1.2 Viable alternatives from the five alternatives identified above

Alternatives 1, 3, and 4, above were eliminated by the Council from consideration. Alternative 1 simply because the no action alternative would not meet the Congressional mandate. Alternatives 3 and 4 may prove useful in the future but were presently eliminated because of the lack of data at the current time (McMillan and Morse 1998). While public comment was solicited on any of the above considered five alternatives, or any other means of identifying EFH, the Council considered only alternatives 2 and 5 viable. In actuality, alternative 2 (100% of the distribution) is one of the options under alternative 5.

The Councils seriously considered using Alternative 2 (100% of the distribution) because dogfish has been identified as overfished. When the initial EFH guidelines were proposed in 1997, EFH for overfished species was to be identified as wherever the resource occurred. The Council, commenting on those guidelines in 1997, suggested that the Secretary should establish rules on how much of the total habitat should really be declared EFH. The relevant, nation-wide question is how much habitat is necessary to maintain a healthy stock. The Council also considered using 100% because of the language in section 600.815 (a)(2)(ii)(B), where it states, "if a species is overfished, and habitat loss or degradation may be contributing to the species being identified as overfished, all habitats currently used by the species should be considered essential in addition to certain historic habitats that are necessary to support rebuilding the fishery and for which restoration is technologically and economically feasible."

The Councils did not really want to identify all areas where dogfish are found as EFH; thus they endorsed the concept of the Technical Team to use some threshold or cutoff point of less than 100% (Alternative 5) when supported by Level 2 data. The Technical Team, after meeting with the bluefish experts, suggested that, for all overfished species, 90% of the area where they occur be designated EFH, while, when the resource is fully utilized or under utilized, that 75% be designated as EFH. This approach was applied to all MAFMC managed species. Where only Level 1 (as in the South Atlantic) data are available, the Council has decided to identify 100% of the area in order to be risk averse. The Guidelines instruct that, when using Level 1 data, "EFH can be inferred on the basis of distributions among habitats where the species has been found and on information on its habitat requirements and behavior."

The Technical Team, Habitat Committee, Habitat Advisors, and Scientific and Statistical Committee all considered the five alternatives and concluded that the thresholds or cutoff points of some percentage of the survey distribution (Alternative 5) was the most reasonable means for identifying and describing EFH for bluefish, and this same logic was applied to dogfish. The Council deems this approach to be reasonable until delineation with Level 3 and Level 4 data can be available. As more information is amassed, the EFH areas delineated can be increased or reduced, as necessary, since the description and identification provision of EFH is one of the provisions of the FMP that is frameworked (section 2.2.8).

2.2.2.1.3 Options for calculation of EFH under the threshold alternative (Alternative 5)

Options under Alternative 5, the preferred alternative, are based on the relative densities and areas of higher concentrations of dogfish. Maps of EFH designation options are provided for each gender and life history stage (juveniles and adults; Figures 15a and 15b). The maps display the distribution and abundance data by ten minute squares. This is the most efficient and understandable spatial scale. The data can easily be compared to other data sets, information from the fishing industry, and existing management analyses. Although these thresholds are subjective for two reasons: 1) the cutoff points could have just as well been 40%, 60% 80%, and 100% rather than 50%, 75%, 90%, and 100%, and 2) the choice of one particular cutoff for designating EFH is based on the best professional judgements of the people involved (there is no *a priori* reason to choose 50% over 75% or 90% over 50%). However, these alternatives reflect a reasonable range of designation alternatives. The New England Fishery Management Council is approaching the identification and description of EFH in a similar manner with the assistance of the NEFSC. Four options were considered for Level 2 data (offshore areas north of Cape Hatteras) using a threshold (Figures 15a and 15b):

1. The top two quartiles (50% of the observations);

2. The top three quartiles (75% of the observations);

3. 90% of the observations; or

4. 100% of the observations, or the entire observed range of the resource from the surveys.

The "preferred" alternative for EFH designation using these data was chosen to be the highest 90% of the area where juvenile and adult dogfish were caught NEFSC trawl surveys. The CPUE and logged CPUE methods were not chosen because they tend to undervalue the area that is essential to dogfish.

To create the habitat related density maps, Level 2 data from NEFSC trawl survey were binned into ten-minute square maps. Data were assigned to a ten-minute square based on the location of the sample. Only those squares that had more than three samples and one positive catch were selected (Cross pers. comm.) The ten minute squares were ranked from high to low based on three methods: 1) mean catch per unit effort (CPUE); 2) ln CPUE; 3) ln CPUE by area. A total abundance index was calculated for the entire data set by summing the mean catch for all squares. The cumulative portion of the total abundance index was calculated for the ranked ten-minute squares beginning with the lowest rank (equals highest catch). Cutoff points at 50%, 75%, 90%, and 100% of the total abundance index, were identified, and the squares at each of these cutoff points for each life stage were mapped. These groupings (50%, 75%, 90%, and 100%) represent areas of decreasing average density and increasing area. The ten-minute squares contained in the top 50%, 75%, 90% and 100% of all the ranked squares based on the ln CPUE by area were mapped separately for juvenile and adult dogfish (Figure 15).

Although this approach has some limitations, it is a scientifically objective approach that is based on the best available information. State and inshore surveys, for the most part, either do not exist or are not in format comparable currently to NMFS data. Few of the surveys collect the habitat information that is most needed (habitat type, substrate, biological associations, etc.). Additional sources of information (fishermen, historical, etc.) are sparse, difficult to verify, and largely anecdotal. However, public involvement in identifying and describing EFH was also solicited during the public hearing process.

Even while faced with these limitations, we can be reasonably assured of where most of the dogfish tend to be and where they tend to occur in higher concentrations. This is the first step toward a complete designation of EFH. Thus, for the current FMP process, the Councils can designate EFH based on the limited information available and set the stage for gathering new and better information. This additional information will help us eliminate the limitations of the current process and either verify or discredit the assumptions used.

One important thing to remember is that this is not the last step in the process, but that the public, Habitat Advisors, Habitat Committee, and the Council will have the opportunity to review and if necessary, modify these EFH designations in the future through the framework process. During the public hearing process, the public was asked to comment on these designations and able to provide additional available information. Following public review, the Council had the opportunity to modify the EFH designations based on input gathered during this process. No changes were made by the Council prior to approval for submittal.

The Council chose the preferred alternative to be the highest 90% of the area (ranked by CPUE, for the offshore Level 2 data, NEFSC) because it is the most inclusive and thus the most risk averse without going to 100% of the dogfish distribution. Remember that dogfish are significantly overfished. The Council made the decision on the description of EFH (the highest 90% of the area where dogfish were collected) with the above factors in mind at the June Council meeting. The Council also decided to use the highest 90% of the area for both juveniles and adults for the designation of EFH since there was no readily apparent significant differences by life stage. There is not current information to support that any life stage appears specifically limiting in terms of an ecological bottleneck-type habitat association, and therefore to maintain consistency the Council concluded there was no justification for different percentages by life stage. The Council solicited comments from the public on the appropriate percentages used for describing EFH where Level 2 data are available. Maps of the juvenile and adult dogfish with the associated percentages of offshore EFH designation are in Figure 15a for juveniles, and 15b for adults.

The actual area (number of 10 minute squares) for each of the standardized percentage (50%, 75%, 90%, and 100%), as well as corresponding variable percentages with catch for both life stages (juveniles and adults), are presented in Tables 7a-b. For example, Table 7b shows that the highest 90% of the catch of adult dogfish were caught within 28% of the area (approximately 238 out of the 850 ten minute squares) where dogfish were caught, while the highest 90% of the area would encompass 765 out of the 850 ten minute squares where dogfish were caught. The logged catch analysis was not included in Tables 7a-b because its area is consistently between the area and catch analyses (Figure 16a-b for the two life stages). The guidelines [Section 600.815 (a)(2)(C)(2)] state that, "Density data should reflect habitat utilization, and the degree that a habitat is utilized is assumed to be indicative of that habitat value." The Technical Guidance manual (USDC 1997a) continues to explain that "EFH is the area of moderate to high abundance. However, under certain conditions, habitats of low to moderate abundance may contribute to enough of the overall species productivity (e.g., reduced population size, when current population size of the species or stock is below historic levels)." Again, the Council selected one of the more inclusive approaches in its designation of offshore EFH because the surveys are inherently biased low for dogfish, and it will require significant management measures to rebuild this resource in the mandated 10 year time frame.

The only data presently available for dogfish south of Cape Hatteras are the SEAMAP data, which have not been summarized or analyzed in McMillan and Morse (1998). As mentioned earlier, the state data are now being put into a consistent, usable electronic format by the NEFSC and should be available for the next iteration of EFH amendments. The guidelines instruct that when using Level 1 data, "EFH can be inferred on the basis of distributions among habitats where the species has been found and on information about its habitat requirements and behavior." Therefore, in an effort to be risk averse and to follow the guidelines for Level 1 data, all waters with the same habitat parameters that are important to dogfish north of Cape Hatteras (i.e., epibenthic waters with same depth, temperature, and salinity) from Cape Hatteras, North Carolina to Florida will be designated as EFH (Figure 17). The purpose of identifying a broad area south of Cape Hatteras as EFH is so that any project proponents should document the distribution and abundance of dogfish in the areas that may be impacted with their activities. The Council is eagerly soliciting public comments on EFH designation in the South Atlantic because the offshore SEAMAP data are much less complete than offshore trawl data for the area north of Cape Hatteras.

The best available data to identify EFH for juvenile and adult dogfish in estuarine areas are the ELMR data (Tables 5 and 6, and Figures 12 and 13; Jury *et al.* 1994). In order to continue its risk averse approach to EFH, the Council concluded that all estuaries where juvenile and adult dogfish are listed as "common" or "abundant" will be designated as EFH (Table 8). While dogfish are not estuarine dependent, the ELMR data do show that juveniles and adults are "common" and/or "abundant" in most New England estuaries, thus the "seawater" (defined by ELMR as >25 ppt) portion of the estuaries will be designated as EFH.

2.2.2.2 Specific description and identification of dogfish essential fish habitat

Juveniles: 1) North of Cape Hatteras, EFH is the waters of the Continental shelf from the Gulf of Maine through Cape Hatteras, North Carolina in areas that encompass the highest 90% of all ranked ten-minute squares for the area where juvenile dogfish were collected in the NEFSC trawl surveys (Figure 19). 2) South of Cape Hatteras, EFH is the waters over the Continental Shelf from Cape Hatteras, North Carolina through Cape Canaveral, Florida, to depths of 1280 ft (Figure 17). 3) Inshore, EFH is the "seawater" portions of the estuaries where dogfish are common or abundant on the Atlantic coast, from Passamaquoddy Bay, Maine to Cape Cod Bay, Massachusetts (Table 8, Figures 12 and 14). Generally, juvenile dogfish are found at depths of 33 to 1280 ft in water temperatures ranging between 37 °F and 82 °F.

Adults: 1) North of Cape Hatteras, EFH is the waters of the Continental shelf from the Gulf of Maine through Cape Hatteras, North Carolina in areas that encompass the highest 90% of all ranked ten-minute squares for the area where adult dogfish were collected in the NEFSC trawl surveys (Figure 18). 2) South of Cape Hatteras, EFH is the waters over the Continental Shelf from Cape Hatteras, North Carolina through Cape Canaveral, Florida, to depths of 1476 ft (Figure 17). 3) Inshore, EFH is the "seawater" portions of the estuaries where dogfish are common or abundant on the Atlantic coast, from Passamaquoddy Bay, Maine to Cape Cod Bay, Massachusetts (Table 8, Figures 13-14). Generally, adult dogfish are found at depths of 33 to 1476 ft in water temperatures ranging between 37 °F and 82 °F.

Finally, the MAFMC solicited input from the public and state personnel on where they perceive EFH should be designated for dogfish. Only one response in the form of a map was received from the State of Massachusetts and those comments were incorporated into the EFH. Additional comments on Figures 20 and 21 will be welcomed for future iterations of this FMP.

2.2.2.2.1 Identification of habitat areas of particular concern

According to section 600.815 (a)(9), FMPs should identify habitat areas of particular concern (HAPC) within EFH where one or more of the following criteria must be met: (i) ecological function, (ii) sensitive to human-induced environmental degradation, (iii) development activities stressing, or (iv) rarity of habitat.

The Councils are not recommending any portions of EFH as HAPC for dogfish at this time. This is because no strong associations between habitat type or location and recruitment for this species has been identified in the EFH background documents (section 2.2.1). The information in the EFH background documents appear inadequate at this time to put a high priority on specific habitat. However, the Councils are recommending the Secretary identify HAPCs for summer flounder in that FMP and the Council does expect to designate additional HAPCs for other species as more data become available. Designation of HAPCs is a frameworked measure so the Council will have the flexibility to establish or modify HAPC designations as further information becomes available. The Council intends to use the framework process identified in section 2.2.8 and work through the Habitat Monitoring Committee for future consideration of HAPCs.

2.2.3 Fishing Activities that May Adversely Affect EFH

According to section 600.815 (a)(3), adverse effects from fishing may include physical, chemical, or biological alterations of the substrate, and loss of, or injury to, benthic organisms, prey species and their habitat, and other components of the ecosystem. FMPs must include management measures that minimize adverse effects on EFH from fishing, to the extent practicable, and identify conservation and enhancement measures. Councils must act to prevent, mitigate, or minimize any adverse effects from fishing, to the extent practicable, if there is evidence that a fishing practice is having an identifiable adverse effect on EFH.

The following is a summary of general impacts of mobile fishing gear from the report "Indirect Effects of Fishing" (Auster and Langton 1998).

The discussion of the wide range of effects of fishing on EFH is based on the definition of EFH within the Act and the technical guidance produced by NMFS to implement the Act. The Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." For the purpose of interpreting the definition (and for defining the scope of this report), "waters" is interpreted by NMFS as "aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate" and "substrate" is defined to include sediment, hard bottom, structures, and associated biological communities. These definitions provide substantial flexibility in defining EFH based on our knowledge of the different species, but also allows EFH to be interpreted within a broader ecosystem perspective. Disturbance has been defined as "any discrete event in time that disrupts ecosystem, community, or population structure and changes resources, substrate availability, or the physical environment" (Pickett and White 1985). From an ecological perspective, fishing with fixed mobile gear is the most widespread form of direct disturbance in marine systems below depths which are affected by storms (Watling and Norse 1997). Disturbance can be caused by many natural processes such as currents, predation, iceberg scour (Hall 1994). Human caused disturbance can result from activities such as harbor dredging and fishing with mobile gear. Disturbance can be gauged by both intensity (as a measure of the force of disturbance) and severity (as a measure of impact on the biotic community). Table 9 summarizes the relative effects of the range of agents which produce disturbances in marine communities.

One of the most difficult aspects of estimating the extent of impacts on EFH is the lack of high resolution data on the distribution of fishing effort. Fishers are often resistant to reporting effort based on locations of individual tows or sets (for the obvious reason of divulging productive locations to competitors and regulators). Effort data in many fisheries are apportioned to particular statistical areas for monitoring purposes. Using this type of data it, has been possible to obtain averages of effort, and subsequent extrapolations of area impacted, for larger regions.

Trawling effort in the Middle Atlantic Bight off the northeast US was summarized by Churchill (1989). Trawled area estimates were extrapolated from fishing effort data in 30 minute latitude x 30 minute longitude grids. The range of effort was quite variable, but the percent area impacted in some blocks off southern New England was over 200% with one block reaching 413%. Estimating the spatial impact of fixed gears is even more problematic. For example, during 1996 there were 2,690,856 lobster traps fished in the state of Maine (Maine Department of Marine Resources unpublished data). These traps were hauled on average every 4.5 d, or 81.4 times year^{-1}. Assuming a 1 m^2 footprint for each trap, the area impacted was 219 km^2. If each trap was dragged across an area three times the footprint during set and recovery, the area impacted was 657 km^2. A lack of data on the extent of the area actually fished makes analysis of the impacts of fishing on EFH in those fisheries difficult.

Auster and Langton (1998) summarize and interpret the current scientific literature on fishing impacts as they relate to fish habitat. These studies are discussed within three broad subject areas: effects on structural components of habitat, effects on benthic community structure, and effects on ecosystem level processes. The interpretation is based on commonalities and differences between studies. Fishing gear types are discussed as general categories (e.g., trawls, dredges, fixed gear). The necessity for these generalizations is based on two over-riding issues: (1) many studies do not specify the exact type and configuration of fishing gear used, and (2) each study reports on a limited range of habitat types. However, their interpretation of the wide range of studies is based on the type and direction of impacts, not absolute levels of impacts. Auster and Langton (1998) do not address the issues of bycatch (Alverson *et al.* 1994), mortality of gear escapees (Chopin and Arimoto 1995), or ghost fishing gear (Jennings and Kaiser 1998, p. 11-12 and references therein), as these issues do not directly relate to fish habitat, and recent reviews have been published which address these subjects.

Impacts of fishing on fish habitat (Auster and Langton 1998) include the following:

1. Effects on structural components of habitat;
2. Effects on community structure; and
3. Effects of ecosystem processes.

2.2.3.1 Effects on structural components of habitat

Habitat has been defined as "the structural component of the environment that attracts organisms and serves as a center of biological activity" (Peters and Cross 1992). This definition includes a range of sediment types (i.e., mud through boulders), bed forms (e.g., sand waves and ripples, flat mud), as well as the co-occurring biological structures (e.g., shell, burrows, sponges, seagrass, macroalgae, coral). A review of 22 studies (Table 10) all show measurable impacts of mobile gear on the structural components of habitat (e.g., sand waves, emergent epifauna, sponges, coral), when defining habitat at this spatial scale. Results of each of the studies show similar classes of impacts despite the wide geographic range of the studies (i.e., tropical to boreal). In summary, mobile fishing gear reduced habitat complexity by: (1) directly removing epifauna or damaging epifauna leading to mortality, (2) smoothing sedimentary bedforms and reducing bottom roughness, and (3) removing taxa which produce structure (i.e., taxa which produce burrows and pits). Studies which have addressed both acute and chronic impacts have shown the same types of effects.

Some species with demersal life history stages have obligate habitat requirements or recruitment bottlenecks (without the specific structural components populations of fishes with these habitat requirements would not persist). Few published accounts of the impacts of fixed gears on habitat have been written. Eno *et al.* (1996) studied the effects of crustacean traps in British and Irish waters. One experiment assessed the effects of setting and hauling pots on emergent epifaunal species (i.e., sea pens) on soft bottom. Both impacts from dragging pots across the bottom, and pots resting for extended periods on sea pens, showed the group was able to mostly recover from such disturbances. Limited qualitative observations of fish traps, longlines, and gill nets dragged across the seafloor during set and recovery showed results similar to mobile gear such that some types of epibenthos was dislodged, especially emergent species such as erect sponge and coral (High 1992, SAFMC 1991). While the area impacted per unit of effort is smaller for fixed gear than with mobile fishing gear, the types of damage to emergent benthos appear to be similar (but not necessarily equivalent per unit effort). Quantitative studies of fixed gear effects, based on acute and chronic impacts, have not been conducted.

The issue of defining pelagic habitats and elucidating effects of fishing is difficult because these habitats are poorly described at the scales that allow for measurements of change based on gear use. While pelagic habitat can be defined based on temperature, light intensity, turbidity, oxygen concentration, currents, frontal boundaries, and a host of other oceanographic parameters and patterns, there are few published data that attempt to measure change in any of these types of parameters or conditions concurrently with fishing activity and associations of fishes. Kroger and Guthrie (1972) showed that menhaden (*Brevoortia patronus* and *B. tyrannus*) were subjected to greater predation pressure, at least from visual predators, in clear versus turbid water, suggesting that turbid habitats were a greater refuge from predation. This same type of pattern was found for menhaden in both naturally turbid waters and in the turbid plumes, generated by oyster shell dredging activities (Harper and Hopkins 1976). However, no work has been published that addresses the effects of variation in time and space of the plumes or the effects using turbid water refugia on feeding and growth. There are also examples of small scale aggregations of fishes with biologic structures in the water column and at the surface. Aggregations of fishes may have two effects on predation patterns by: (1) reducing the probability of predation on individuals within the aggregation, and (2) providing a focal point for the activities of predators (a cue that fishermen use to set gear). For example, small fishes aggregate under mats of *Sargassum* (e.g., Moser *et al.* 1998) where high density vessel traffic may dis-aggregate mats. Also, fishes have been observed to co-occur with aggregations of gelatinous zooplankton and pelagic crustaceans (Auster *et al.* 1992, Brodeur in press). Gelatinous zooplankton are greatly impacted as they pass through the mesh of either mobile or stationary gear (unpublished observations), which may reduce the size and number of aggregations and disperse associated fishes. These changes could reduce the value of aggregating, resulting in increased mortality or reduced feeding efficiency.

Lack of information on the small scale distribution and timing of fishing makes it difficult to ascribe the patterns of impacts observed in field studies to specific levels of fishing effort. Auster *et al.* (1996) estimated that between 1976 and 1991, Georges Bank was impacted by mobile gear (i.e., otter trawl, roller-rigged trawl, scallop dredge) on average between 200-400% of its area on an annual basis and the Gulf of Maine was impacted 100% annually. However, fishing effort was not homogeneous. Sea sampling data from NMFS observer coverage demonstrated that the distribution of tows was nonrandom. While these data represent less than 5% of overall fishing effort, they illustrated that the distribution of fishing gear impacts is quite variable.

Recovery of the habitat following trawling is difficult to predict as well. Timing, severity, and frequency of the impacts all interact to mediate processes which lead to recovery (Watling and Norse 1997). For example, sand waves may not be reformed until storm energy is sufficient to produce bedform transport of coarse sand grains (Valentine and Schmuck 1995), and storms may not be common until a particular time of year or may infrequently reach a particular depth, perhaps only on decadal time scales. Sponges are particularly sensitive to disturbance because they recruit aperiodically and are slow growing in deeper waters (Reiswig 1973, Witman and Sebens 1985, Witman *et al.* 1993). However, many species such as hydroids and ampelescid amphipods reproduce once or twice annually, and their stalks and tubes provide cover for the early benthic phases of many fish species and their prey (e.g., Auster *et al.* 1996, 1997b). Where fishing effort is constrained within particular fishing grounds, and where data on fishing effort is available, studies which compare similar sites along a gradient of effort have produced the types of information on effort-impact that will be required for effective habitat management (e.g., Collie *et al.* 1996, 1997; Thrush *et al.* in press).

The role these impacts on habitat have on harvested populations is unknown in most cases. However, a growing body of empirical observations and modeling demonstrate that effects can be seen in population responses at particular population levels. For example, Lindholm *et al.* (1998) have modeled the effects of habitat alteration on the survival of 0-year cohorts of Atlantic cod. The model results indicate that a reduction in habitat complexity has measurable effects on population dynamics when the adult stock is at low levels (i.e., when spawning and larval survivorship does not produce sufficient recruits to saturate available habitats). At high adult population levels, when larval abundance may be high and settling juveniles would greatly exceed habitat availability, predation effects would not be mediated by habitat, and no effect in the response of the adult population to habitat change was found.

Empirical studies that most directly link changes due to gear impacts changes on habitat structure to population responses are being carried out in Australia. Sainsbury (1987,1988, and 1991) and Sainsbury *et al.* (In press) have shown a very tight coupling between a loss of emergent epifauna and fish productivity along the north west continental shelf. In these studies, there was a documented decline in the bycatch of invertebrate epifauna, from 500 kg/hr to only a few kg/hr, and replacement of the most commercially desirable fish associated with the epifaunal communities by less valuable species associated with more open habitat. By restricting fishing, the decline in the fish population was reversed. This corresponded to an observed recovery in the epifaunal community, albeit the recovery for the larger epifaunal invertebrates showed a considerable lag time after trawling ceased. This work is based on a management framework which was developed to test hypotheses regarding the habitat dependence of harvested species. The hypotheses, described in Sainsbury (1988 and 1991), assessed whether population responses were the result of: (1) independent single-species (intraspecific) responses to fishing and natural variation, (2) interspecific interactions such that, as specific populations are reduced by fishing, non-harvested populations experienced a competitive release, (3) interspecific interactions such that, as non-harvested species increase from some external process, their population inhibits the population growth rate of the harvested species, and (4) habitat mediation of the carrying capacity for each species, such that gear induced habitat changes alter the carrying capacity of the area.

2.2.3.2 Effects on community structure

An immediate reduction in the density of non-target species is commonly reported following impact from mobile gear (Table 11). In assessing this effect, it is common to compare numbers and densities for each species before and after trawling and/or with an undisturbed reference site.

Time series data sets that allow for a direct long-term comparison of before and after fishing are essentially nonexistent, primarily because the extent to which the worlds oceans are currently fished was not foreseen, or because time series data collection focused on the fish themselves rather than the impact of fishing on the environment. Nevertheless, there are several benthic data sets that allow for an examination of observational or correlative comparisons before and after fishing (Table 12). Long-term effects of fishing included reduced densities of certain types of macrobenthos including sponges, coelenterates, bivalves, as well as seagrass meadows and increases in taxa such as polychaete. Other shifts occurred; for example, a decline in sea urchins to an increase in brittle stars, a decline in deposit feeders and an increase in suspension feeders and carnivores, as well as a decline in animal size.

Data sets on the order of months to a few years are more typical of the longer term studies on trawling impacts on benthic community structure. Otter trawl door marks were visible for 2 to 7 months with no sustained significant impact on the benthic community noted at high energy locations. In the lower energy muddy sand location, there was a loss in surficial sediments and lowered food quality of the sediments. The subsequent variable recovery of the benthic community over the following six months correlated with the sedimentary food quality which was measured as microbial populations, chlorophyll "a" and enzyme hydrolizable amino acids. While some taxa recolonized the impacted areas quickly, the abundances of some taxa (i.e., cumaceans, phoxocephalid and photid amphipods, nephytid polychaetes) did not recover until food quality also recovered.

The most consistent pattern in fishing impact studies at shallow depths is the resilience of the benthic community to fishing. Most studies demonstrate that most taxa recover from the effects of trawling within months to years. These taxa include worms, bivalves, sea grass, and crustacea. In the case of the most intense trawling, seagrass beds did not recover after two years. Sometimes the community may shift to less commercially desirable species. In experimentally closed areas, there has been a recovery of fish and an increase in the small benthos but, based on settlement and growth of larger epifaunal animals, it may take 15 years for a system to recover. Two studies in the intertidal, harvesting worms and clams using suction and mechanical harvesting gear demonstrated a substantial immediate effect on the macrofaunal community but from seven months to two years later, the study sites had recovered to pre-trawled conditions (Beukema 1995, Kaiser and Spencer 1996). In a South Carolina estuary, Van Dolah *et al.* (1991) found no long term effects of trawling on the benthic community. The study site was assessed prior to and after the commercial shrimp season and demonstrated variation over time, but no trawling effects *per se*. Other studies of pre and post impacts from mobile gear on sandy to hard bottoms have generally shown similar results (Currie and Parry 1996, Gibbs *et al.* 1980, MacKenzie 1982), with either no or minimal long term impact detectable.

Clearly, the long term effects of fishing on benthic community structure are not easily characterized. The pattern that does appear to be emerging from the available literature is that communities that are subject to variable environments, and are dominated by short-lived species, are fairly resilient. Depending on the intensity and frequency of fishing, the impact of such activity may well fall within the range of natural perturbations. In communities which are dominated by long-lived species in more stable environments, the impact of fishing can be substantial and longer term. In cases such as described in Auster and Langton (1998) for Strangford Loch and the Australian shelf, recovery from trawling will be on the order of decades. In many areas, these patterns correlate with shallow and deep environments. However, water depth is not the single variable that can be used to characterize trawling impacts.

There are few studies that describe fishing impacts on soft muddy bottom communities or deep areas at the edge of the continental shelf. Such sites would be expected to be relatively low energy zones, similar to Strangford Loch, and might not recover rapidly from fishing disturbance. Studies in these relatively stable environments are required to pattern fishing impacts over the entire environmental range but, in anticipation of such results, it is suggested here that one should expect a tighter coupling between fish production and benthic community structure in the more stable marine environments.

2.2.3.3 Effects on ecosystem processes

A number of studies indicate that fishing has measurable effects on ecosystem processes. Disturbance by fishing gear in relatively shallow depths (i.e., 98 - 131 ft [30-40 m] depth) can reduce primary production by benthic microalgae. Recent studies in several shallow continental shelf habitats have shown that primary production by a distinct benthic microflora can be a significant portion of overall primary production (i.e., water column plus benthic primary production; Cahoon and Cooke 1992, Cahoon *et al.* 1990 and 1993). Benthic microalgal production supports a variety of consumers, including demersal zooplankton (animals that spend part of each day on or in the sediment and migrate regularly into the water; Cahoon and Tronzo 1992). Demersal zooplankton include harpacticoid copepods, amphipods, mysids, and other animals that are eaten by planktivorous fishes and soft bottom foragers (Thomas and Cahoon 1993).

The disturbances caused by fishing to benthic primary production and organic matter dynamics are difficult to predict. Semi-closed systems such as bays, estuaries, and fjords are subject to such effects at relatively small spatial scales. Open coastal and outer continental shelf systems can also experience perturbations in these processes. However, the relative rates of other processes may minimize the effects of such disturbances depending upon the level of fishing effort.

Mayer *et al.* (1991) discussed the implications of organic matter burial patterns in sediments versus soils. Their results are similar to organic matter patterns found in terrestrial soils. Sediments are essentially part of a burial system while soils are erosional. While gear disturbance can enhance remineralization rates by shifting from surficial fungal dominated communities to subsurface communities with dominant bacterial decomposition processes, burial caused by gear disturbance might also enhance preservation if material is sequestered in anaerobic systems. Given the importance of the carbon cycling in estuaries and on continental shelves to the global carbon budget, understanding the magnitude of effects caused by human disturbances on primary production and organic matter decomposition will require long term studies as have been conducted on land.

2.2.3.3.1 Direct alteration of food web

In heavily fished areas of the world, it is undebatable that there are ecosystem level effects (Gislason 1994, Fogarty and Murawski 1998) and that shifts in benthic community structure have occurred. The data to confirm that such shifts have taken place is limited at best (Riesen and Reise 1982) but the fact that it has been documented at all is highly significant. If the benthic communities change, what are the ecological processes that might bring about such change?

One of these is an enhanced food supply, resulting from trawl damaged animals and discarding both nonharvested species and the offal from fish gutted at sea. The availability of this food source might affect animal behavior, and this energy source could influence survival and reproductive success. There are numerous reports of predatory fishes and invertebrate scavengers foraging in trawl tracks after a trawl passes through the area (Medcof and Caddy 1971, Caddy 1973, Kaiser and Spencer 1994, Ramsey *et al.* 1997a-b). The prey available to scavengers is a function of the ability of animals to survive the capture process, either being discarded as unwanted by-catch or having been passed through or over by the gear (Meyer *et al.* 1981, Fonds 1994, Rumhor *et al.* 1994, Santbrink and Bergman 1994, Kaiser and Spencer 1995). Stomach contents data demonstrate that fish not only feed on discarded or damaged animals, and often eat more than their conspecifics at control sites, they also consume animals that were not damaged but simply displaced by the trawling activity, or even those invertebrates that have themselves responded as scavengers (Kaiser and Spencer 1994, Santbrink and Bergman 1994).

It is of interest to note that Kaiser and Spencer (1994) make the comment, as others have before them, that it is common practice for fishermen to re-fish recently fished areas to take advantage of the aggregations of animals attracted to the disturbed benthic community. The long term effect of opportunistic feeding following fishing disturbances is an area of speculation.

Another process that can indirectly alter food webs is alteration of the predator community by removing keystone predators. In the northwest Atlantic, Witman and Sebens (1992) showed that onshore-offshore differences in cod and wolffish populations reduced predation pressure on cancrid crabs and other megafauna in deep coastal communities. They suggest that this regional difference in predation pressure is the result of intense harvesting of cod, a keystone predator, with cascading effects on populations of epibenthos (e.g., mussels, barnacles, urchins), which are prey of crabs. Other processes (e.g., annual variation in physical processes effecting survivorship of recruits, climate change, El Nino, recruitment variability of component species caused by predator induced mortality) can also result in food web changes; while it is important to understand the underlying causes of such shifts, precautionary approaches should be considered, given the strong inference of human caused effects in the many cases where studies were focused on identifying causes.

2.2.3.4 Summary

This review of the literature by Auster and Langton (1998) indicates that fishing, using a wide range of gear, produces measurable impacts. However, most studies were conducted at small spatial scales, and it is difficult to apply such information at a regional levels where predictive capabilities would allow us to manage at an ecosystem scale (Jennings and Kaiser in press). Our current understanding of ecological processes related to the chronic disturbances caused by fishing make results difficult to predict (Auster and Langton 1998).

The removal of fish for human consumption from the world's oceans has effects not only on the target species, but also on the associated benthic community. The size specific, and species specific, removal of fish can change the system structure, but, fortunately, the regions of the continental shelf which are normally fished appear to be fairly resilient. The difficulty for managers is defining the level of resilience, in the practical sense of time/area closures or mesh regulations or overall effort limits, that will allow for the harvest of selected species without causing human induced alterations of the ecosystem structure to the point that recovery is unduly retarded or community and ecosystem support services are shifted to an alternate state (Steele 1996). Natural variability forms a backdrop against which managers must make such decisions, and, unfortunately, natural variability can be both substantial and unpredictable (Auster and Langton 1998).

2.2.3.5 Ghost fishing

Stationery gear may also cause adverse impacts to fish habitat by becoming ghost fishing gear. This occurs when storms, mobile gear, or boats rip traps, gill nets, and pots from their lines. This lost gear cannot be retrieved and may continue to fish for years (Rhodes 1995). In addition, ghost gill nets, traps, and pots change the structural component of the habitat. This can be a problem with commercial and recreational gear. This problem is currently impossible to quantify and the ecosystem effects are difficult to predict.

2.2.3.6 Fishing gear used within the dogfish range

Commercial fishing gear used in 1995 for all fisheries prosecuted from Maine to Virginia is characterized in Table 13 (based on unpublished NMFS weighout data). While total pounds of all species landed is not necessarily an indication of effort, it gives some indication of the relative use of the various fishing gears in both state and federal waters. Fishing gear which caught 1% or more of the landings for the Mid-Atlantic Council-managed species from Maine to Virginia in 1995 is presented in Table 13. Bottom gear used from Maine to Virginia include bottom otter trawls, clam dredges, sea scallop dredges, and other dredges. Fishing gear managed by the South Atlantic Council is presented in Table 14.

2.2.3.7 Fishing impacts to dogfish EFH

Dogfish are a predominantly epibenthic species, with no known associations to any particular substrate, submerged aquatic vegetation (SAV), or any other structural habitat (McMillan and Morse 1998). However, because its life history does focus towards the ocean bottom, any mobile gear that comes in contact with the bottom may potentially adversely impact habitat that is important to dogfish. Effort of mobile gear in federal and state waters throughout the entire dogfish range is unquantified. Therefore, it is difficult to predict the exact impact that mobile gear in contact with the bottom will have on dogfish habitat. Although there is no way to gauge the intensity and severity of mobile gear in contact with the bottom (bottom otter trawl, clam dredge, scallop dredge, and dredge-other), these gears are characterized as having a "potential adverse impact" on dogfish EFH (Table 15).

2.2.4 Options for Managing Adverse Effects from Fishing

According to section 600.815 (a)(3) Councils must act to prevent, mitigate, or minimize adverse effects from fishing, to the extent practicable, if there is evidence that a fishing practice is having an identifiable adverse effect on EFH. Testimony to various gear impacts on bottom in the Mid-Atlantic Region has been presented to the Council over the past several years. It is because of this anecdotal information that the Council is considering that all mobile gear coming into contact with the seafloor within dogfish EFH is characterized as having a potential impact on their EFH. However, the effort of these bottom tending gears is largely unquantified from data that are presently collected by the NEFSC, as summarized by Auster and Langton (1998), and therefore, no management measures will be proposed at this time.

Section 600.815 (a)(4) states that, fishery management options may include, but are not limited to: (i) fishing equipment restrictions, (ii) time/area closures, and (iii) harvest limits.

The requirement concerning gear impact management is to the extent practicable given the evidence that the fishing practice is having an identifiable adverse effect. The Council feels strongly that very little evidence was provided in the synthesis document of Auster and Langton (1998) relative to identifiable adverse effects to EFH in FMPs managed by this Council at this time. Fishing gear impacts along with the description and identification of EFH are frameworked management measures which can easily and readily be changed as more information becomes available. The Council's Habitat Monitoring Committee (section 2.2.8) will be meeting annually and can provide recommendations concerning gear impacts that NMFS and the Council can act on in the future. The Council feels it would be premature, given the lack of identifiable adverse effects of gear impacts to these managed species EFH, to propose gear management measures at this time. It is simply not practicable to impose unwarranted management measures that are unjustifiable. The Council will consider implementing management measures to protect EFH if and when adverse gear impacts are identified.

Little evidence was provided in the synthesis document by Auster and Langton (1998) relative to the identifiable adverse effects to EFH of fishing gear. Therefore, the Council is not proposing any discussion of options for managing the effects of fishing on dogfish EFH. If and when adverse effects to dogfish EFH are documented the Council will use its frameworked capabilities and propose management measures. Fishing effort will so significantly be reduced in order to meet the overfishing objectives of many FMPs that gear impacts most certainly will be reduced along the entire East Coast.

2.2.5 Identification of Non-Fishing Activities and Associated Conservation and Enhancement Recommendations

NOTE: Sections 600.815(a)(5), 600.815(a)(6), and 600.815(a)(7) are all combined here, in order to better clarify the cause and effect association of actions.

According to section 600.815 (a)(5), FMPs must identify activities that have the potential to adversely affect EFH quantity or quality, or both. Broad categories of activities which can adversely affect EFH include, but are not limited to: dredging, fill, excavation, mining, impoundment, discharge, water diversions, thermal additions, actions that contribute to non-point source pollution and sedimentation, introduction of potentially hazardous materials, introduction of exotic species, and the conversion of aquatic habitat that may eliminate, diminish, or disrupt the functions of EFH.

Estuarine and coastal lands and waters are used for many purposes that often result in conflicts for space and resources (USDC 1985a). Some may result in the absolute loss or long-term degradation of the general aquatic environment or specific aquatic habitats, and pose theoretically significant, but as yet unquantified threats to biota and their associated habitats (USDC 1985a).

Multiple-use issues are constantly changing, as are the impacts of certain activities on living marine resources (USDC 1985a). Activities that occur on estuarine and coastal lands and waters and offshore waters may affect living marine resources directly and/or indirectly through habitat loss and/or modification. These effects, combined with cumulative effects from other activities in the ecosystem, may contribute to the decline of some species (USDC 1997a). The following discussion identifies and describes each multiple use issue and the potential threats associated with that issue. The adverse effects to marine organisms and their habitats resulting from any given threat are demonstrable, but usually not completely quantifiable. Environmental and socio-economic issues remain to be satisfactorily resolved with regard to impacts on marine organisms and their habitats.

The threats addressed in this section are germane to the entire Atlantic coast. All Council managed species exist outside the geographic boundaries of Mid-Atlantic Council. Knowledgeable NMFS/Council individuals were asked to identify and prioritize non-fishing "perceived" threats. Once this list was complete, the resulting paper was distributed for review via mail, workshops, and conferences. The list is prioritized in regards to (1) perceived threats of habitat managers and others in the environmental community and (2) potential impact to dogfish EFH (Table 16). Information from the ASMFC workshop (Stephan and Beidler 1997) for habitat managers, which included a broad spectrum of constituents, was also used to identify threats.

Measures for conservation and enhancement of EFH

According to section 600.815 (a)(7), FMPs must describe options to avoid, minimize, or compensate for the adverse effects identified in the non-fishing threats section including cumulative impacts (section 2.2.5.14). The Councils are deeply concerned about the effects of marine and estuarine habitat degradation on fishery resources.

The MSFCMA provides for the conservation and management of living marine resources (which by definition includes habitat), principally within the EEZ, although there is concern for management throughout the range of the resource. Additionally, the MSFCMA provides [305(b)(3)(A)] that "Each Council may comment on, and make recommendations to the Secretary and any federal agency concerning, any activity authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by any federal or state agency that, in the view of the Council, may affect the habitat, including essential fish habitat, of a fishery resource under its authority." [305(b)(4)(B)] "Within 30 days after receiving a comment under subparagraph (A), a federal agency shall provide a detailed response in writing to the Council commenting under paragraph (3)."

The Councils have a responsibility under the MSFCMA to consider the impact of habitat degradation on dogfish. The following recommendations are made in light of that responsibility.

The goal of the Councils is to preserve all available or potential natural habitat for dogfish by encouraging management of conflicting uses to assure access by dogfish and maintenance of high water quality to protect dogfish migration, spawning, nursery, overwintering, and feeding areas. Non-water dependent actions should not be authorized in dogfish EFH, if they adversely affect that habitat. Those non-water dependent actions in adjacent upland areas, such as agriculture, should be managed to minimize detrimental effects. Water dependent activities that may adversely affect dogfish EFH, should be designed using environmentally sound engineering and best management practices to avoid or minimize those impacts. Regardless, the least environmentally damaging alternatives available should be employed to reduce impacts, both individually and cumulatively to dogfish EFH. Finally, compensatory mitigation should be provided for all unavoidable impacts to dogfish EFH.

Also, in general, the USEPA (US Environmental Protection Agency) and states should review their water quality standards relative to dogfish EFH areas and make changes as needed in estuarine and coastal areas. The USEPA should establish water quality standards for the EEZ sufficient to maintain edible dogfish. Finally, water quality standards in dogfish EFH should be enforced rigidly by state or local water quality management agencies, whose actions should be carefully monitored by the USEPA. Where state or local management efforts (standards/enforcement) are deemed inadequate, USEPA should take steps to assure improvement; if these efforts continue to be inadequate, USEPA should assume authority, as necessary.

Specific recommendations for the conservation and enhancement of dogfish EFH are found following discussion of individual habitat threats. The permitting/licensing authority should ensure that the project proponents adhere to the following recommendations.

2.2.5.1 Habitat threats prioritized for dogfish EFH

Many anthropogenic (caused by man) actions threaten the integrity of dogfish EFH. These threats have been prioritized based on the following:

Dogfish are epibenthic predators found across the Continental Shelf and in estuaries (Figures 1 and 4-11). They are opportunistic feeders, however, some of their prey items, e.g., menhaden, are estuarine dependent. A total of 14 estuaries in the North Atlantic have been designated as dogfish EFH, and cumulative impacts from estuarine and land-based activities can have negative effects on dogfish EFH in nearshore and offshore waters.

Based on these considerations, threats that impact estuaries, inshore areas, and water quality are priority concerns in dogfish EFH (Table 16). The threats may be primary, direct (e.g., physically removing habitat by dredging or filling) or secondary, indirect (e.g., water quality degradation caused by urban or agricultural runoff). Many of the threats associated with dogfish EFH result in both primary and secondary impacts (e.g., coastal development, dredging and spoil disposal). Collectively, these impacts are "cumulative," which are often synergistic (i.e., the whole is greater than the sum of its parts). Some of the more challenging cumulative impacts are discussed in Section 2.2.5.14.

A more detailed discussion of the habitat threats affecting dogfish EFH and other Atlantic coast habitats follows. The described threats, and associated enhancement or mitigative recommendations, are related to both direct and indirect impacts. Again, their priority with respect to dogfish EFH is identified in Table 16.

2.2.5.2 Coastal development

Coastal development involves changes of land use; these activities include urban, suburban, commercial, and industrial, along with the construction of corresponding infrastructure. Coastal development also includes clearing of forestlands and filling of wetlands for agricultural use. Development first occurred in the coastal areas, and this historical trend continues. Approximately 80 percent of the Nation's population lives in coastal areas (USEPA 1993). The US Census Bureau estimates the 1997 world population to be 267.7 million in the United States and 5.84 billion in the world (Zero Population Growth Reporter pers. comm.). The US population rose 85 percent within 50 miles of the coastlines between 1940 and 1980, compared to 70 percent for the nation as a whole (Zero Population Growth Reporter 1994). The US Census Bureau projects that by the year 2000, the US population will reach 275 million, more than double its 1940 population.

Brouha (1994) points out our dilemma and states: "All our scientific work will be for naught if world human population growth and resource consumption are not stabilized soon. Unchecked growth, subsidies that support unsustainable resource use, and natural resource policies focused on short-term economic gains have created a conundrum for the long-term economic integrity and productivity of global ecosystems." However, Ehrlich (1990) may have stated the problem best: "No matter how distracted we may be by the number of problems now facing us, one issue remains fundamental: Overpopulation. The crowding of our cities, our nations, underlies all other problems."

During development, vegetated and open forested areas are converted to land uses that usually have increased areas of impervious surface resulting in increased runoff volumes and pollutant loadings (USEPA 1993). Eventually, changes to the physical, chemical, and biological characteristics of the watershed result. Vegetative cover is stripped from the land and cut-and-fill activities that enhance the development potential of the land occur. As population density increases, there is a corresponding increase in pollutant loadings generated from human activities (USEPA 1993).

Everyday household activities also generate numerous pollutants that affect water quality, including (USEPA 1993): improper disposal of used oil and antifreeze; frequent fertilization, pesticide application; improper disposal of yard trimmings; litter and debris; and pet droppings (USEPA 1993). Runoff from commercial land areas such as shopping centers, business districts, office parks, and large parking lots or garages may contain high hydrocarbon loadings and metal concentrations contributing more pollutants such as heavy metals, sediments, nutrients, and organics, including synthetic and petroleum hydrocarbons (USEPA 1993).

In addition to habitat impacts associated with the primary effects of coastal development, such as wetland filling, forest clearing, land grading, and construction, many secondary impacts resulting from changes in land use and population growth may occur. For example, urban/suburban development in low lying coastal areas and floodplains often causes a need for flood control that results in channel relocation, channelization, and impoundment of streams, rivers, and wetlands. Loss of natural wildlife habitats lead to wildlife management practices that promote wetland impoundment and filling shallows for bird breeding islands that deleteriously affect living marine resources. As population growth continues, the demand for nuisance insect control, such as ditching of tidal marshes and the spraying of insecticides for mosquito abatement, also continues.

Measures for conservation and enhancement

A). Filling of wetlands and shallow coastal water habitat should not be permitted in or near dogfish EFH. Mitigating or compensating measures should be employed where filling is totally unavoidable. Project proponents must demonstrate that project implementation will not negatively affect dogfish, their habitat, or their food sources.

B). Coastal development traditionally involved dredging and filling of shallows and wetlands, hardening of shorelines, clearing of riparian vegetation, and other activities that adversely affect the habitats of living marine resources. Mitigative measures are imperative for all development activities in and adjacent to dogfish EFH to prevent further degradation.

C). Adverse impacts resulting from construction should be avoided whenever practicable alternatives are identified. For those impacts that cannot be avoided, minimization through implementation of best management practices should be employed. For those impacts that can neither be avoided nor minimized, compensation through replacement of equivalent functions and values should be required.

D). Flood control projects in waterways draining into dogfish EFH should be designed to include mitigative measures and constructed using Best Management Practices (BMPs). For example, stream relocation and channelization should be avoided whenever practicable. However, should no practicable alternatives exist, relocated channels should be of comparable length and sinuosity as the natural channels they replace to maintain the quality of water entering receiving waters (i.e., dogfish EFH).

E). Wildlife management projects should not adversely affect dogfish EFH. No impoundment of tidal wetlands or creation of islands should be authorized in dogfish EFH.

F). Mosquito control in dogfish EFH should be implemented using BMPs. Ditching should be in accordance with the principles of Open Marsh Water Management (e.g., restricting ditching to only those areas that are actively breeding mosquitoes; using specialized equipment, such as the rotary ditcher that slurries marsh peat thereby eliminating spoil disposal problems). Insecticides that are used should be selected to minimize impacts to non-target species (e.g., Abate: a short-lived insecticide that inhibits mosquito larvae from pupating).

2.2.5.2.1 Water withdrawal and diversion

As residential, commercial, and industrial growth continues, the demand for potable, process, and cooling water, flow pattern disruption, waste water treatment and disposal, and electric power increases. As ground water resources become depleted or contaminated, greater demands are placed on surface water through activities such as dam and reservoir construction or some other method of freshwater diversion. The consumptive use or redistribution of significant volumes of surface freshwater causes reduced river flow that can affect salinity regimes as saline waters intrude further upstream.

Turek *et al.* (1987) identified numerous studies that have correlated freshwater inflows and fishery resource production. Salinity is a primary ecological factor regulating the distribution and survival of marine organisms. The amount of freshwater entering an estuary influences physicochemical variables (e.g. salinity, temperature, and turbidity) directly affecting physiological processes in organisms. Salinity is also a primary factor regulating estuarine primary production. In addition, salinity governs fish distribution by secondarily restricting predator distribution (Turek *et al.* 1987).

Diversion of freshwater to other streams, reservoirs, industrial plants, power plants, and municipalities can change the salinity gradient downstream and displace spawning and nursery grounds. Patterns of estuarine circulation necessary for larval and planktonic transport can be modified. Such changes can expand the range of estuarine diseases and predators associated with higher salinities that affect commercial shellfish.

Measures for conservation and enhancement

A). Water withdrawals should be regulated to provide flows adequate to maintain the biological, chemical, and physical integrity of waters flowing into dogfish EFH. For example, under low flow conditions, flows should be maintained to prevent shifts in salinity regimes or changes in fish distribution.

B). The transfer of water from one basin to another is discouraged. Interbasin transfers can cause hydrological imbalances in rivers flowing into estuaries that can adversely affect dogfish EFH.

C). Dams constructed for reservoir development should not be sited in sensitive habitats. Dams that block anadromous rivers and streams (into which fish migrate from the sea) adversely affect dogfish directly by impairing prey production (e.g., river herrings) or indirectly by reducing flows that downstream salinity changes.

2.2.5.2.2 Construction

Construction activities within watersheds and in coastal marine areas often impact fish habitat. Some of these projects are of sufficient scope to singly cause significant, long term or permanent impacts to aquatic biota and habitat; however, most are small scale, causing losses or disruptions to organisms and environment. The significance of small scale projects lies in the cumulative effects resulting from the large number of these activities (USDC 1985a).

Tremendous development pressures exist throughout the coastal area of the Northeast Region. More than 2,000 permit applications are processed annually by the NMFS Northeast Region for commercial, industrial, and private marine construction proposals.

The proposals range from generally innocuous, open pile structures, to objectionable fills that encroach into aquatic habitats, thereby eliminating their productive contribution to the marine ecosystem (USDC 1985a). The projects range from small scale recreational endeavors to large scale commercial ventures to revitalize urban waterfronts (USDC 1985a).

Runoff from construction sites is by far the largest source of sediment in urban areas under development (USEPA 1993). Eroded sediment from construction sites creates many problems in coastal areas, including adverse impacts on water quality, sensitive habitats, SAV beds, recreational activities, and navigation (USEPA 1993). Other potential pollutants associated with construction activities include: pesticides (insecticides, fungicides, herbicides, and rodenticides); fertilizers used for vegetative stabilization; petrochemicals (oils, gasoline, and asphalt degreasers); construction chemicals such as concrete products, sealers, and paints; wash water associated with these products; paper; wood; garbage; and sanitary wastes (USEPA 1993). The variety of pollutants present and the severity of their effects are dependent on a number of factors (USEPA 1993):

1. The nature of the construction activity;

2. The physical characteristics of the construction site; and

3. The proximity of surface waters to the nonpoint pollutant source.

Construction impacts can also include hydrological changes and water quality changes. Hydrologic and hydraulic changes occur in response to site clearing, grading, and the addition of impervious surfaces and maintained landscapes (USEPA 1993).

In addition, construction in and adjacent to waterways often involves dredging and/or fill activities which result in elevated suspended solids emanating from the project area. The distance the turbidity plume moves from the point of origin is dependent upon tides, currents, nature of the substrate, scope of work, and preventive measures employed by the contractor (USDC 1985a).

Measures for conservation and enhancement

The following measures were taken from Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (USEPA 1993).

A). Watershed protection/site development should be encouraged. Comprehensive planning for development on a watershed scale and for small-scale site development, including planning and designing to protect sensitive ecological areas, minimize land disturbances and retain natural drainage and vegetation whenever possible.

B). Pollution prevention activities, including techniques and activities to prevent nonpoint source pollutants from entering surface waters, should be implemented. Primary emphasis should be placed on public education to promote methods for proper disposal and/or recycling of hazardous chemicals, pet waste management strategies, management practices for lawns and gardens, onsite disposal systems (OSDSs), and commercial enterprises such as service stations and parking lots.

C). Construction erosion/sediment control measures should reduce erosion and transport of sediment from construction sites to surface water. A sediment and erosion control plan should be developed and approved prior to land disturbance for construction sites of less than 5 acres.

D). Runoff from new development should be managed so as to meet two conditions: (1) The average annual total suspended solid (TSS) loadings after construction is completed are reduced, a) by 80 percent or b) so that they are no greater than pre-development loadings; and (2) To the extent practicable, post-development peak runoff rate and average volume are maintained at levels that are similar to pre-development levels.

E). Construction site chemical control measures should address the transport of toxic chemicals to surface water by limiting the application, generation, and migration of chemical contaminants (i.e., petrochemicals, pesticides, nutrients) and providing proper storage and disposal.

F). Watershed management programs of existing developments should be developed that identify the sources, specify appropriate controls such as retrofitting or the establishment of buffer strips, and provide a schedule by which these controls are to be implemented.

G). New onsite disposal systems should be built to reduce nutrient/pathogen loadings to surface water. OSDS are to be designed, installed and operated properly, and to be situated away from open waterbodies and sensitive resources such as wetlands, and floodplains. Protective separation between the OSDS and the groundwater table should be established. The OSDS unit should be designed to reduce nitrogen loadings in areas where surface waters may be adversely affected.

H). Operating onsite disposal systems should prevent surface water discharge and reduce pollutant loadings to ground water. Inspection at regular intervals and repair or replacement of faulty systems should occur.

2.2.5.2.3 Construction of infrastructure

Construction activities of infrastructure, such as highways, bridges, and airports, can result in permanent loss or long-term disruption of habitat (USEPA 1993). For instance, highway construction often involves stream straightening or relocation. Dredging can degrade productive shallow water and destroy marsh habitat or resuspend pollutants, such as heavy metals, pesticides, herbicides and other toxins. Concomitant with dredging is spoil disposal, which traditionally occurred on marshes or in water where the effects were temporary (both short and long term) or permanent in terms of its degradation or destruction. Shoreline stabilization can cause gross impacts when intertidal and sub-tidal habitats are filled, or when benthic habitats are scoured by reflective wave energy. Stabilization can also cause subtle effects that result in gradual elimination of the ecosystem between the shore and the water (USEPA 1993).

Construction of bridges in coastal areas can cause significant erosion and sedimentation, resulting in the loss of wetlands and riparian areas (USEPA 1993). Additionally, since bridge pavements are extensions of the connecting highway, runoff waters from bridge decks also deliver loadings of heavy metals, hydrocarbons, toxic substances, and deicing chemicals to surface waters. Bridge maintenance can also contribute heavy loads of lead, rust particles, paint, abrasive, solvents, and cleaners into surface waters. Bridge structures should be located to avoid crossing over sensitive fisheries and shellfish-harvesting areas to prevent washing polluted runoff into the waters below. Also, bridge design should account for potential scour and erosion, which may affect shellfish beds and bottom sediments (USEPA 1993).

Wetland and riparian areas will need special consideration if affected by highway and bridge construction, particularly in areas where construction involves depositing fill, dredging, or installing pilings (USEPA 1993). Highway development is most disruptive in wetlands because it may cause increased sediment loss, alteration of surface drainage patterns, changes in the subsurface water table, and loss of wetland habitat (USEPA 1993).

Measures for conservation and enhancement

The following measures were taken from Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (USEPA 1993).

A). Roads, highways, bridges and airports should be situated away from areas that are sensitive ecosystems and susceptible to erosion and sediment loss. The siting of such structures should not adversely impact water quality, minimize land disturbances, and retain natural vegetation and drainage features.

B). Construction projects of roads, highways, bridges and airports should implement approved erosion and sediment control plans prior to construction, which would reduce erosion and improve retention of sediments onsite during and after construction.

C). Construction site chemical control measures for roads, highways, and bridges should limit toxic and nutrient loadings at construction sites by ensuring the proper use, storage, and disposal of toxic materials to prevent significant chemical and nutrient runoff to surface water.

D). Operation and maintenance should be developed for roads, highways, bridges, and airports to reduce pollutant loadings to receiving waters during operation and maintenance.

E). Runoff systems should be developed for roads, highways, bridges, and airports to reduce pollutant concentrations in runoff from existing roads, highways, and bridges. Runoff management systems should identify priority pollutant reduction opportunities and schedule implementation of retrofit projects to protect impacted areas and threatened surface waters.

F). The planning process for new and maintenance channel dredging projects should include an evaluation of the potential effects on the physical and chemical characteristics of surface waters and riparian habitat that may occur as a result of the proposed work and reduce undesirable impacts. The operation and maintenance programs for existing modified channels should identify and implement any available opportunities improve the physical and chemical characteristics of surface waters in those channels.

G). Bridges should be designed to include collection systems which convey surface water runoff to land-based sedimentation basins.

2.2.5.2.4 Shoreline stabilization

The erosion of shorelines and stream banks is a natural process that can have either beneficial or adverse impacts on the creation and maintenance of riparian habitat (USEPA 1993). Beaches are dynamic, ephemeral land forms that move back and forth onshore, offshore and along shore with changing wave conditions.

Stabilization of eroding shorelines can be beneficial to living marine resources by reducing turbidity and subsequent sedimentation. However, some stabilization techniques can have secondary adverse impacts. Although bulkheads and seawalls protect the upland area against further land loss, they often create a local problem. Bulkheads harden shorelines, thereby eliminating the interaction between organisms and intertidal habitats during high tides. Downward forces of water produced by waves striking a wall can produce a transfer of wave energy and rapidly move sand from the wall, causing scouring and undermining, and increased erosion downstream and rendering adjacent benthic habitats less productive (USEPA 1993). Additionally, bulkheads are often constructed with chemically treated timber which contain toxic compounds that leach into adjacent waters through time.

Groin fields generally do not incorporate additional sediments to the system, but depend on the trapping of suspended sediments carried by longshore currents. Groins characteristically accrete sediments on the updrift side and become sediment starved on the downdrift side. This problem can be prevented by constructing low-profile groins (i.e., the top of the structure being constructed at an elevation between mean high and mean low tide) that allow sediments to accumulate on both sides of the structure. Jetties are structures similar to groins, but are used to stabilize inlets, not curtail erosion. However, the accretion/starvation sediment patterns displayed by groins are also demonstrated by jetties.

Alternatives to vertical bulkheads are stone revetments (riprap) and vegetative stabilization. Unlike bulkheads, stone revetments are not vertical, and consequently, do not reflect wave energy. Also, the hard surfaces and interstitial spaces between the stones adds heterogeneity to local habitats. Vegetative stabilization provides the most natural means of erosion control, as well as, enhancing local habitats. Marsh creation and stream bank "bioengineering" are two methods of vegetative stabilization that have proven effective in many circumstances.

Beach nourishment is another type of shoreline stabilization, which involved the replacement of lost sediments with new sediments. Traditional beach nourishment is not structurally stabilized, but erosion abatement is accomplished through engineering design using appropriate grain-sized sand. Depending on the source of material for beach nourishment, ecological impacts are frequently greater at the borrow site than at the nourishment area.

Measures for conservation and enhancement

A). To stabilize eroding stream banks, vegetative methods such as marsh creation and vegetative bank stabilization ("bioengineering") are the preferred methods. Stream bank and shoreline features such as wetlands and riparian areas with the potential to reduce nonpoint source (NPS) pollution should be protected (USEPA 1993).

B). Vegetative shoreline stabilization should be implemented in dogfish EFH whenever feasible.

C). When wave energy is sufficient to preclude vegetative stabilization, stone revetments should be constructed in dogfish EFH. Revetments reduce reflected wave energy and provide habitat for benthic organisms.

D). Bulkheads, or shoreline hardening structures, should not be constructed in dogfish EFH when practicable alternatives exist.

E). Beach nourishment in dogfish EFH should only be considered when an acceptable source of borrow material is identified.

F). When groin fields are considered acceptable for construction in dogfish EFH, low-profile design should be employed.

G). When jetties intercept sediments in dogfish EFH, sand should be "by-passed". By-passing is the transfer of sediments from the accreted side of the jetties to the starved side thereby maintaining longshore sediment transport.

2.2.5.3 Nonpoint source (NPS) contamination

Nonpoint pollution generally results from land runoff, atmospheric deposition, drainage, groundwater seepage, or hydrologic modification (USEPA 1993). Technically, the term "nonpoint source" is defined to mean any source of water pollution that does not meet the legal definition of "point source" in section 502(14) (40 CFR 122.2) of the Clean Water Act. That definition states:

> The term "point source" means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture.

Nonpoint pollution is the pollution of our nation's waters caused by rainfall or snowmelt moving over and through the ground. Ground water is an important source of surface water and nutrients. The U.S. Geologic Survey (USGS) has determined that 50% of the water in streams comes from ground water. The amount of ground water varies according to the type of rock and sediment beneath the land surface (USGS 1997). Up to one-half of the nitrogen entering the Chesapeake Bay travels through the ground water (USGS 1997). It is possible that about 10% to 20% of the phosphorous entering the Chesapeake Bay also travels through ground water (USGS 1998). Atmospheric deposition transports about 9% of the nitrogen and 5% of the phosphorous loads to the Chesapeake Bay (Alliance for Chesapeake Bay 1993).

As the runoff moves, it picks up and transports natural and anthropogenic pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and ground waters. Major pollutants in runoff include pathogens, nutrients, sediments, heavy metals, oxygen demanding substances, road salts, hydrocarbons, and toxics. Acid precipitation from nonpoint sources are demonstrable problems in Atlantic coastal and estuarine waters (USEPA 1993, USDC 1985a). In addition, hydrologic modification is a form of nonpoint source pollution that often adversely affects the biological, physical and chemical integrity of surface waters (USEPA 1993). The alteration of natural hydrology due to urbanization, and the accompanying runoff diversion, channelization, and destruction of natural drainage systems, have resulted in riparian and tidal wetland degradation or destruction. Temperature changes result from increased flows, removal of vegetative cover, and increases in impervious surfaces. NPS can be divided into three components, each of which will be discussed separately. Conservation measures will be offered for each component.

2.2.5.3.1 Urban NPS

Urban construction is not limited to the shore but also includes inland development that can adversely impact aquatic areas. One of the major problems arising from urban development is the increase in nonpoint source contamination of estuarine and coastal waters. Highways, parking lots, and the reduction of terrestrial and wetland vegetation facilitate runoff loaded with soil particles, fertilizers, biocides, heavy metals, grease and oil products, polychlorinated biphenyls (PCBs), and other material deleterious to aquatic biota and their habitats. Atmospheric emissions resulting from certain industrial processes contain sulphurous and nitrogenous compounds that contribute to acid precipitation, a growing source of concern in some anadromous and fresh water sections of tidal streams.

Nonpoint pollution is incorporated in water, sediments, and living marine resources (USDC 1985a).

Cumulatively, the effects of this environmental insult may have far reaching implications for fisheries resources. Estuarine and riverine plumes entering coastal waters are influenced by global and other dynamic forces. These plumes may remain as discrete water masses flowing close to the coast for hundreds of miles.

The purpose of vegetated filter strips is to remove sediment and other pollutants from runoff and wastewater by filtration, deposition, infiltration, absorption, adsorption, decomposition, and volatilization, thereby reducing the amount of pollution entering adjacent waterbodies. The ability of a wetland to act as a sink for phosphorus and the ability to convert nitrate to nitrogen gas through de-nitrification are two examples of the important nonpoint source pollution abatement functions performed by constructed wetlands.

Measures for conservation and enhancement

A). Watershed protection/site development should be encouraged. Comprehensive planning for development on a watershed scale and for small-scale site development, including planning and designing to protect sensitive ecological areas, minimize land disturbances and retain natural drainage and vegetation whenever possible.

B). Pollution prevention activities, including techniques and activities to prevent nonpoint source pollutants from entering surface waters, should be implemented. Primary emphasis should be placed on public education to promote methods for proper disposal and/or recycling of hazardous chemicals, pet waste management strategies, management practices for lawns and gardens, onsite disposal systems (OSDSs), and commercial enterprises such as service stations and parking lots.

C). Watershed management programs of existing developments should be developed that identify the sources, specify appropriate controls, such as retrofitting or the establishment of buffer strips, and provide a schedule by which these controls are to be implemented.

D). Best Management Practices (BMPs) should be employed during urban construction to minimize impacts to dogfish EFH. Numerous specific conservation measures are provided at the end of Section 2.2.5.2.2 Construction.

E). The release of harmful chemical contaminants should be sequestered at their source thereby preventing their entering the atmosphere and subsequently being deposited in dogfish EFH.

F). BMPs should be implemented to manage stormwater to minimize the discharge of contaminants that degrade dogfish EFH or waters flowing into dogfish EFH. Stormwater should not be allowed to mix with sewage effluents (i.e., combined sewage/stormwater outfalls or CSOs). Where CSOs exist, the systems should be retrofitted to separate the two discharges.

2.2.5.3.2 Agricultural NPS

Agricultural development can affect fisheries habitat directly through physical alteration and indirectly through nutrient enrichment and chemical contamination. Fertilizers, herbicides, insecticides, and other chemicals are washed into the aquatic environment via uncontrolled nonpoint source runoff draining agricultural lands. These nutrients and chemicals can affect the growth of aquatic plants, which in turn affects fish, invertebrates, and the general ecological balance of the water body. Additionally, agricultural runoff transports animal wastes and sediments that can affect spawning areas, and degrade water quality and benthic substrate. One of the most serious consequences of erosional runoff is that the frequent dredging of navigational channels results in dredged material that requires disposal, often in areas important to living marine resources (USDC 1985a). Excessive uncontrolled or improper irrigation practices also contribute to nonpoint source pollution and often exacerbate the contaminant flushing, as well as deplete and contaminate ground water.

Agricultural development can significantly affect wetlands. Common flood control measures in low lying coastal areas include: dikes, ditches, and stream channelization. Wetland drainage is practiced to increase tillable land acreage. Wildlife management techniques that also destroy or modify wetland habitat include the construction of dredged ponds, low level impoundments, and muskrat ditches and dikes (USDC 1985a).

Animal waste (manure) includes fecal and urinary waste of livestock and poultry; process water (e.g., from a milking parlor); excess feed, bedding, litter, and soil (USEPA 1993). Pollutants associated with animal wastes include: oxygen-demanding substances; nitrogen, phosphorous, and other nutrients; organic solids; bacteria, viruses, and other microorganisms; salts; and sediments (USEPA 1993). Runoff transporting these wastes and pollutants may result in fish kills; dissolves oxygen depletion; unpleasant odors, taste and appearance; eutrophication; and shellfish contamination (USEPA 1993).

Another source of nonpoint source pollution from livestock is atmospheric deposition. Recent analyses by Dr. Joe Rudek clearly demonstrate that more than two-thirds (65-90%) of nitrogen excreted by the huge swine concentration in coastal North Carolina is evaporated as ammonia and redeposited within about 65 miles maximum – typically into nutrient sensitive waters, including the Neuse River and Tar-Pamlico Sounds (Rader pers. com).

Many agricultural fields are poorly drained. To facilitate crop planting and cultivation, elaborate systems of drainage ditches are excavated. These drainage systems are frequently excavated through wetlands and ultimately discharged into natural waterways. Drainage systems serve as conduits transporting fertilizers, pesticides, sediment, and other contaminants that degrade habitat and water quality.

Measures for conservation and enhancement

A). USEPA and appropriate agencies should establish and approve criteria for vegetated buffer strips in agricultural areas adjacent to dogfish EFH to minimize pesticide, fertilizer, and sediment loads to these areas critical for dogfish survival. The effective width of these vegetated buffer strips should vary with slope of terrain and soil permeability.

B). The Natural Resources Conservation Service and other concerned federal and state agencies should conduct programs and demonstration projects to educate farmers on improved agricultural practices that would minimize the wastage of pesticides, fertilizers, and top soil and reduce the adverse effects of these materials on dogfish EFH areas (MAFMC 1990a).

The following measures were taken mainly from Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (USEPA 1993).

C). Delivery of sediment from agricultural lands to receiving waters should be minimized. Land owners have a choice of one of two approaches: (1) apply the erosion component of the US Department of Agricultures Conservation Management System through such practices as conservation tillage, strip cropping, contour farming, and terracing, or (2) design and install a combination of practices to remove settleable solids and associated pollutants in runoff for all but the larger storms.

D). New confined animal facilities and existing confined animal facilities over a certain size should be designed to limit discharges to waters of the US by storing wastewater and runoff caused by all storms up to and including the 25-year frequency storms. For smaller existing facilities, the management systems that collect solids, reduce contaminant concentrations, and reduce runoff should be designed and implemented to minimize the discharge of contaminants in both facility wastewater and runoff caused by all storms up to and including 25-year frequency storms.

E). Stored runoff and solids should be managed through proper waste utilization and use of disposal methods which minimize impacts to surface/ground water. Confined animal facilities required to obtain a discharge permit under the National Pollutant Discharge Elimination System (NPDES) permit program should not be subject to these recommendations.

F). Development and implementation of comprehensive nutrient management plans should occur. The fundamentals of a comprehensive nutrient management plan include a nutrient budget for the crop, identification of the types and amounts of nutrients necessary to produce a crop based on realistic crop yield expectations, and an identification of the environmental hazards of the site. Other items include soil tests and other tests to determine crop nutrient needs and proper calibration of nutrient equipment.

G). Pesticide and herbicide management should minimize water quality problems by reducing pesticide use, improving the timing and efficiency of application (not within 24 hours of expected rain or irrigation), preventing backflow of pesticides into water supplies, and improving calibration of pesticide spray equipment. Strategies such as integrated pest management (IPM) should be used. IPM strategies include evaluating current pest problems in relation to the cropping history, previous pest control measures, and applying pesticides only when an economic benefit to the producer will be achieved, i.e., application based on economic thresholds. If pesticide applications are necessary, pesticides should be selected based on consideration of their environmental impacts such as persistence, toxicity, and leaching potential.

H). Livestock grazing should protect sensitive areas, including streambanks, wetlands, estuaries, ponds, lake shores, and riparian zones. Protection is to be achieved with improved grazing management that reduces the physical distance and direct loading of animal waste and sediment caused by livestock by restricting livestock access to sensitive areas through a range of options.

I). Upland erosion is to be reduced by either: (1) applying the range and pasture components of a Conservation Management System, or (2) maintaining the land in accordance with the activity plans established by either the Bureau of Land Management or the Forest Service. Such techniques include the restriction of livestock from sensitive areas through locating salt, shade, and alternative drinking sources away from sensitive areas, and providing livestock stream crossings.

J). Irrigation systems that deliver necessary quantities of water, yet reduce nonpoint pollution to surface waters and groundwater, should be developed and implemented. To achieve this, uniform application of water based upon an accurate measurement of cropwater needs and the volume of irrigation water applied should be calculated. When applying chemicals through irrigation (a process known as chemigation), special additional precautions apply. In state waters, conflicting laws may take precedence. In no case should irrigation be practiced to the point that runoff occurs from the field.

K). Best Management Practices should be implemented to minimize habitat impacts when agricultural ditches are excavated through wetlands that drain to dogfish EFH.

L). NPDES/ State Pollutant Discharge Elimination System (SPDES) permits in consultation with state fishery agency should be required for agricultural ditch systems that discharge into dogfish EFH.

M). Acceptable swine waste treatment technologies should be developed to replace current practices which rely upon evaporation or movement through groundwater to dispose of nitrogen (Rader pers. comm.).

N). Nitrogen reduction programs should account for airborne delivery (Rader pers. comm.).

2.2.5.3.3 Silvicultural NPS

Federal land management has allowed activities to occur which have degraded riparian and riverine habitat in the national forests, thereby contributing to the decline of marine and anadromous fishes (USDC 1997a). The impacts of forest activities conducted within the framework of these land use plans include effects on marine and anadromous species and significant habitat degradation from timber harvest, road construction, grazing, mining, outdoor recreation, small hydropower development, and water conveyance permitting. These actions have: reduced physical, biological and channel connectivity between streams and riparian areas, floodplains, and uplands; increased sediment yields (leading to pool filling and elimination of spawning and rearing habitat); reduced or eliminated large woody debris; reduced or eliminated the vegetative canopy (leading to increased temperature fluctuations); altered peak flow timing; increased water temperature; decreased dissolved oxygen; caused streams to become straighter, wider, and shallower; and degraded water quality by adding toxic chemicals through mining and pest control. These effects, combined with cumulative effects from activities on nonfederal lands, have contributed to the decline of marine and anadromous fish species (USDC 1997a).

Silvicultural contributions to water pollution has been recognized by all states with significant forestry activities (USEPA 1993). On a national level, silviculture contributes approximately 3% to 9% of nonpoint source pollution to the nation's waters (USEPA 1993). Local impacts of timber harvesting and road construction on water quality can be severe, especially in smaller headwater streams. Studies on forest land erosion have concluded that surface erosion rates on roads often equaled or exceeded rates reported for severely eroding agricultural lands (USEPA 1993). These effects are of greatest concern where silvicultural activity occurs in high-quality watershed areas that provide municipal water supplies or support cold-water fisheries. The USEPA (1993) reported that 24 states have identified silviculture as a problem source contributing to nonpoint source pollution. Some states report up to 19% of their river miles impacted by silviculture. On federal lands, such as national forests, many water quality problems can be attributed to the effects of timber harvesting and related activities (USEPA 1993).

Measures for conservation and enhancement

The following measures were taken from Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (USEPA 1993).

A). Preharvest planning should ensure that silvicultural activities take into account potential nonpoint source pollutant delivery to surface waters. Key aspects of forestry operations relevant to water quality protection that should be addressed include: the timing, location, and design of harvesting and road construction; the identification of sensitive areas or high-erosion-hazard areas; and the potential for additional cumulative contributions to existing water quality impairments.

B). Streamside management areas (SMA) should be established along dogfish EFH and should be managed to protect the water quality of the adjacent waterbody.

C). Delivery of sediment from road construction or reconstruction should be reduced. This is to be accomplished by following the preharvest plan layouts.

D). Existing roads should be managed to prevent sedimentation and pollution from runoff-transported materials. Measures taken can include the use of inspections and maintenance actions to prevent erosion of road surfaces and ensure the continued effectiveness of stream crossing structures. Appropriate actions for closing roads that are no longer in use should also be taken.

E). NPS pollution resulting from timber harvesting operations should be reduced by taking into account the location of landings, the operation of ground-skidding and cable yarding equipment, and preventing of pollution from petroleum products. Harvesting practices that protect water quality and soil productivity can also reduce total mileage of roads and skid trails, lower equipment maintenance costs, and provide better road protection and reduce road maintenance. Appropriate skid trail location and drainage, and proper harvesting in SMAs should be addressed.

F). Impacts of mechanical site preparation and regeneration operations should be reduced, and on-site potential nonpoint source pollution should be confined. Measures such as keeping slash materials out of drainages, operating machinery on the contour, and protecting the ground cover in ephemeral drainages and SMAs should be implemented.

G). Potential nonpoint source pollution and erosion resulting from prescribed fire for site preparation and from methods for suppression of wildfire should be reduced. Prescribed fires should be conducted under conditions to avoid the loss of litter and incorporated soil organic matter. Bladed firelines should be stabilized to prevent erosion, or practices such as handlines, firebreaks, or hose lays should be used where possible.

H). Erosion and sedimentation by the rapid revegetation of areas of soil disturbance from harvesting and road construction should be reduced. The disturbed areas to be revegetated are those localized areas within harvest units or road systems where mineral soil is exposed or agitated such as road cuts, fill slopes, landing surfaces, cable corridors, or skid trails.

I). Pesticide and herbicides should be managed to minimize water quality problems by reducing pesticide use, improving the timing and efficiency of application (not within 24 hours of expected rain or irrigation), preventing backflow into water supplies, and improving calibration of spray equipment.

The following recommendations are taken from Murphy (1995):

J). Riparian buffer zones of appropriate size and design should be required on any forested land adjacent to waterways that include EFH. The buffers should provide all processes that create and maintain fish habitat, particularly shade, stream bank integrity, and recruitment of large woody debris.

K). Enforcement of best forestry management practices for ensuring water quality standards at state and federal levels should be strongly encouraged.

L). Watershed analysis and subsequent watershed planning at the local and state levels should be strongly encouraged.

M). Upland habitat restoration should be encouraged. Restoration of upland habitat should include measures to control erosion, stabilize roads, upgrade culverts for fish passage, and manage watershed uses.

N). Restoration of riparian areas should be encouraged. Restoration goals should restore functions of riparian vegetation by reestablishing mature conifers or other appropriate vegetation.

O). Riparian areas should be revegetated with stable vegetation.

2.2.5.4 Dredging and disposal of dredged material

Dredging and disposal of dredged material can create significant impacts in aquatic ecosystems. The purpose of dredging in nearshore and offshore areas include: creation and maintenance for shipping and recreational boating, construction of infrastructure, and marine mining. During dredging operations, bottom sediments are removed, disturbed, and resuspended (Chytalo 1996). Historically, dredged material was disposed of by being discharged in designated open-water disposal areas near the dredging site. Because of concern about environmental damage, disposal of dredged material has begun to be tightly regulated (Chytalo 1996). Environmental impacts of dredging include:

1. Direct removal/burial of organisms as a result of dredging and placement of dredged material;

2. Turbidity/siltation effects, including increased light attenuation from turbidity, alteration of bottom type, and physical effects of suspended sediments on organisms;

3. Contaminant release, and uptake, including nutrients, metals, and organics from interstitial water and the resuspended sediments;

4. Release of oxygen-consuming substances, such as sulfides;

5. Noise/disturbance to terrestrial organisms;

6. Alterations to the hydrodynamic regime and physical habitat; and

7. Loss of wetland, SAV beds, and riparian habitat.

Excluding the potential of new work being authorized in sensitive habitats, the major problem associated with dredging is disposal of dredged material (spoil). Almost 60 per cent of the spoil generated nationally (approximately 310 thousand metric wet tons) is discharged into estuarine and marine habitats (OTA 1987). This volume can be anticipated to increase as the trend for deeper channels and port expansions escalate.

Although alternatives to in-water disposal have been proposed, such as transporting spoil to inland areas to reclaim strip mines and use as a raw material for manufacturing bricks, only upland disposal in adjacent coastal areas has proven to be practicable. However, as the demand for coastal development increases, the amount of available uplands is diminishing, while the cost of those lands is increasing. Additionally, mounting evidence indicates that long-term use of upland spoil sites cause adverse impacts, such as salinity intrusion in shallow aquifers.

Diked containment islands in estuaries have been effective, cost efficient methods to dispose of dredged material. However, these islands, such as Craney Island in Virginia and Hart-Miller Island in Maryland, require hundreds of acres each for construction. This is an irreversible commitment of estuarine habitat. Consequently, sensitive areas must be identified and avoided. Construction of spoil islands must be restricted to those areas that will have the least impact on estuarine and marine ecosystems. Compensatory mitigation to increase the carrying capacity within the affected estuaries to offset these impacts must also be a requirement of island construction.

More recently, there has been a trend toward the "beneficial use" of dredged material. Some uses of dredged material can be truly beneficial, while some are merely a trade-off of one habitat type for another, usually at the expense of living marine resources. Some examples of true beneficial uses are by-passing sediments removed from natural littoral processes to down-drift, starved beaches, restoration of structure to depleted oyster reefs, and restoration of eroded wetlands to abate erosion. However, other proposed beneficial uses, such as creating bird breeding islands in shallow water habitats, only deplete valuable fish habitats (Goodger pers. comm.).

Measures for conservation and enhancement

A). Filling of wetlands or coastal shallow water habitat should not be permitted in or near EFH areas. Mitigating or compensating measures should be employed where filling is totally unavoidable. Project proponents must demonstrate that project implementation will not negatively affect dogfish, their EFH, or their food sources.

B). No dredging or dredge spoil placement should take place in SAV beds.

C). Best engineering and management practices (e.g., seasonal restrictions, dredging methods, disposal options, etc.) should be employed for all dredging and in-water construction projects. Such projects should be permitted only for water dependent purposes when no feasible alternatives are available. Mitigating or compensating measures should be employed where significant adverse impacts are unavoidable. Project proponents should demonstrate that project implementation will not negatively affect dogfish, their EFH, or their food sources.

D). Construction of spoil containment islands should be avoided in dogfish EFH, except when no practicable alternatives are available. In those exceptional cases when island construction is necessary, sites should be selected that result in the least damaging impacts to dogfish EFH.

E). "Beneficial Use" proposals in dogfish EFH should be compatible with existing uses by dogfish. Conflicting uses, such as construction of bird breeding islands, should not be authorized.

The following measures were taken from Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (USEPA 1993).

F). When projects are considered and in review for open water disposal permits for dredged material, state and federal permitting agencies should identify the direct and indirect impacts such projects may have on EFH.

G). No unconfined disposal of contaminated dredge material, sewage sludge, or industrial waste should ever be allowed in EFH.

H). Disposal sites should be located in uplands when possible.

I). The creation of new habitat at the expense of another naturally functioning system (e.g. marsh creation with dredge material placed in shallow water habitat) should be fully justified and documented, given best available information, through a demonstrated net gain in EFH.

2.2.5.5 Port development, utilization, and shipping

Major ports along the Atlantic coast include those at Miami Florida, Jacksonville Florida, Savannah Georgia, Charleston South Carolina, Wilmington North Carolina, Norfolk Virginia, Baltimore Maryland, Wilmington Delaware, Philadelphia Pennsylvania, New York New York, Providence Rhode Island, Boston Massachusetts, Portsmouth New Hampshire, and Portland Maine. These ports handle primarily grains, coal, ores, and manufactured commodities. Some of these ports and many other ports along the Atlantic seaboard (e.g. Gloucester and New Bedford Massachusetts, Rockland Maine, Newport and Point Judith Rhode Island, Hampton-Norfolk Virginia, Ocean City Maryland) also support major commercial and recreational fisheries (USDC 1985a).

All ports require shoreline infrastructure, mooring facilities, and adequate channel depth. Ports compete fiercely for limited national and international markets and continually strive to upgrade their facilities. Dredging and dredged material disposal, filling of aquatic habitats to create fast land for port improvement or expansion, and degradation of water quality are the most serious perturbations arising from port development. All have well recognized adverse impacts to living marine resources and habitat.

The introduction of exotic species and contaminated materials through ballast water release and exchange is an impact of port utilization. Ballast water is used by most ships for stability and maneuverability (Moyle 1991). The water is typically pumped into separate tanks used just for ballast or in empty cargo tanks when departing from port, and discharged when the ship takes on a cargo at another port. Evidence shows that hundreds of species of invertebrates have become established in exotic locales after being transported in ballast water (Moyle 1991). An infamous Atlantic coast example of a ballast water introduction is the zebra mussel (*Orreissena polymorha*).

Another hazard of port utilization is the potential for shipping accidents. Transportation of fossil fuels and other materials may result in major spills of oils and other hazardous materials (Hill 1996). Tributyl-tin, used in commercial anti-fouling paints, was formerly a major concern and has been largely banned, with the notable exception of aluminum hauled vessels (Foerster pers. comm.).

Construction activities associated with port development result in a loss of habitat diversity along the water's edge. Bulkheading, filling, and construction of port features result in general water quality degradation that reduces biotic diversity of important productive areas (USDC 1985a). Habitat types that are destroyed by construction of port infrastructure include: shallow bay bottom; shoreline wetlands; seagrass meadows; and intertidal wetlands (Fearing 1983). The effect of loss of these habitats include loss of nursery area, reduction in water clarity, and shifts in primary productivity (Fearing 1983).

Measures for conservation and enhancement

The impacts of port development and utilization are caused by a need for infrastructure (i.e. filling of wetlands) and adequate channel depths (i.e. dredging and shoreline stabilization). Recommendations to minimize these impacts are located in sections 2.2.5.2.3, 2.2.5.2.4., and 2.2.5.3, respectively.

Impacts that are a result of shipping are addressed in the following recommendations:

A). To avoid introducing exotic species and toxic materials, ballast water should be exchanged beyond 200 miles or treated with chlorine or other toxicants. Procedures should be developed for monitoring ballast water. Factors controlling introduced species should be studied in species' native ecosystems (Moyle 1991).

B). All vessels transporting fuels and other hazardous materials should be required to carry equipment to contain and retrieve the spill.

C). Dispersants should not be used to clean up fuels and hazardous materials unless approved by the USEPA/Coast Guard after consultation with fisheries agencies.

2.2.5.6 Marinas and recreational boating

As residential and commercial use of coastal lands increase, so does the recreational use of coastal waters. Marinas, public access landings, private piers, and boat ramps all vie for space. Boating requires navigational space, a place to berth for some boat owners, and boat yards for repair and storage.

Based on an annual average of 40 hours of cruising, the 10 million outboard and inboard/outboard powered pleasure boats in the U.S. impact as much water, fish eggs, larval and juvenile fish, and shellfish, as 800 nuclear and fossil fueled generating stations would in a year. Unfortunately, boating activity is concentrated in a short boating season that also occurs during the period of maximum biological activity in many estuaries (Stolpe 1997).

Marinas and recreational boating are increasingly popular uses of coastal areas. The growth of recreational boating, along with the growth of coastal development in general, has led to a growing awareness of the need to protect waterways. In the Coastal Zone Management Act (CZMA) of 1972, as amended, Congress declared that state coastal management programs provide for public access to the coasts for recreational purposes. Clearly, boating and adjunct activities (e.g., marinas) are an important means of public access. When these facilities are poorly planned or poorly managed, however, they may pose a threat to the health of aquatic systems (and may pose other environmental hazards; USEPA 1993). Since marinas are located right at the water's edge, there is often no buffering of the release of pollutants to waterways. Adverse environmental impacts may result from the following sources of pollution and activities associated with marinas and recreational boating (USEPA 1993):

1. Poorly flushed waterways where dissolved oxygen deficiencies exist;
2. Pollutants discharged from boats;
3. Pollutants transported in storm water runoff from parking lots, roofs, and other impervious surfaces;
4. The physical alteration or destruction of wetlands and of shellfish and other bottom communities during the construction of marinas, ramps, and related facilities; and
5. Pollutants generated from boat maintenance activities on land and in the water.

Impacts on the ecosystem that are caused by marinas include lowered dissolved oxygen, increased temperature, bioaccumulation of pollutants by organisms, water contamination, sediment contamination, resuspension of sediments, loss of SAV and estuarine vegetation, change in photosynthesis activity, change in the nature and type of sediment, loss of benthic organisms, eutrophication, change in circulation patterns, shoaling and shoreline erosion. Pollutants that result from marinas include nutrients, metals, petroleum hydrocarbons, pathogens, and PCBs (USEPA 1993). Other contaminants introduced into surface waters originate from chemically treated timber used for piers and bulkheads. Commonly used chemicals are creosote and CCA (copper, chromium, and arsenic salts).

Other impacts of recreational boating are a result of improper sewage disposal, fish waste, fuel and oil spillage, cleaning fluids, and boat operation and maintenance (USEPA 1993).

According to the 1989 American Red Cross Boating Survey, there were approximately 19 million recreational boats in the United States (USEPA 1993). About 95 percent of these boats were less than 26 feet in length. A very large number of these boats used a portable toilet, rather than a larger holding tank. Given the large percentage of smaller boats, facilities for the dumping of portable toilet waste should be provided at marinas that service significant numbers of boats under 26 feet in length (USEPA 1993).

The propellers from boats can also impact fish and fish habitat by direct damage to multiple life stages of organisms, including eggs, larvae, juveniles, and adults, as well as submerged aquatic vegetation (e.g., prop scarring); de-stratification (temperature and density which is characteristic of some estuaries; e.g., Pamlico Sound, North Carolina); elevated heat; and resuspension of sediments increasing turbidity (Stolpe 1997, Goldsborough 1997). The resuspension of bottom sediment can result in the reintroduction of toxic substances into the water column. This may lead to an increased turbidity, which can affect photosynthetic activity of algae and submerged aquatic vegetation (USEPA 1993). The SAV provides habitat for fish, shellfish, and waterfowl and plays an important role in maintaining water quality through assimilating nutrients. It also reduces wave energy, protecting shorelines and bottom habitats from erosion (USEPA 1993).

Fish waste can result in water quality problems at marinas with large numbers of fish landings or at marinas that have limited fish landings but poor flushing (USEPA 1993). The amount of fish waste disposed of into a small area such as a marina can exceed that existing naturally in the water at any one time. As fish waste decomposes, it requires oxygen, thus sufficient quantities of disposed fish waste can be a cause of dissolved oxygen depression, as well as odor problems (USEPA 1993).

Fuel and oil are commonly released into surface waters during fueling operations through the fuel tank air vents, during bilge pumping, and from spills directly into surface waters and into boats during fueling. Oil and grease from the operation and maintenance of inboard engines are a source of petroleum in bilges (USEPA 1993).

Marina employees and boat owners use a variety of boat cleaners, such as teak cleaners, fiberglass polishers, and detergents (USEPA 1993). Boats are cleaned over the water or onshore adjacent to the water. This results in a high probability of some of the cleaning material entering the water. Copper-based antifouling paint is released into marina waters when boat bottoms are cleaned in the water (USEPA 1993).

A workshop on the environmental impacts of boating held at Woods Hole Oceanographic Institute, December 1994, summarizes the substantiated impacts of boating activity. These include: sediment and contaminant resuspension and resultant turbidity; laceration of aquatic vegetation with loss of faunal habitat and substrate stability; toxic effects of chemical emissions of boat engines; increased turbulence; shearing of plankton; shorebird disturbance; and the biological effects of chemically treated wood used in dock and bulkhead construction. Many of these issues and concerns remain inadequately described. Sufficient hard data was referred to or presented at the workshop, that recreational and commercial motor boat operation is far from a benign influence on aquatic and marine environments. This is particularly so in temperate climes due to the unfortunate synchrony, with only a few exceptions, of vertebrates and invertebrates in estuaries and coastal waters.

Measures for conservation and enhancement

The following measures were taken mainly from Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (USEPA 1993), unless otherwise specified.

A). Marina siting and design should allow for maximum flushing of the water supply for the site. Adequate flushing reduces the potential for the stagnation of water in a marina, helps to maintain the biological productivity, and reduces the potential for toxic accumulation in bottom sediment.

B). Water quality must be considered in the siting and design of both new and expanding marinas.

C). Marinas should be designed and located so as to protect against adverse impacts on shellfish resources, wetlands, submerged aquatic vegetation, and other important habitat areas as designated by local, state, or federal governments.

D). Where shoreline erosion is a nonpoint source pollution problem, shorelines should be stabilized. Vegetative methods are strongly preferred.

E). Runoff control strategies, which include the use of pollution prevention activities and the proper design of hull maintenance areas, should be implemented at marina sites. At least 80% of suspended solids must be removed from stormwater runoff coming from the hull maintenance areas. Marinas which obtain a NPDES permit for their hull maintenance areas are not required to conform to this hull maintenance area provision.

F). Fueling stations should be located and designed so that, in the case of an accident, spill contaminants can be contained in a limited area. Fueling stations should have fuel containment equipment, as well as a spill contingency plan.

G). To prevent the discharge of sewage directly to coastal waters, new and expanding marinas should install pumpout, pump station, and restroom facilities where needed.

H). Solid wastes produced by the operation, cleaning, maintenance, and repair of boats should be properly disposed of to limit their entry to surface waters.

I). Sound fish waste management should be promoted through a combination of fish cleaning restrictions, public education, and proper disposal.

J). Appropriate storage, transfer, containment, and disposal facilities for liquid materials commonly used in boat maintenance, along with the encouragement of recycling of these materials, should be required.

K). The amount of fuel and oil leakage from fuel tank air vents should be reduced.

L). Potentially harmful hull cleaners and bottom paints, and their release to marinas and coastal waters, should be minimized.

M). Public education/outreach/training programs should be instituted for boaters, as well as marina operators, to prevent improper disposal of polluting materials.

N). Pumpout facilities should be maintained in operational condition, and their use should be encouraged to reduce untreated sewage discharges to surface waters.

O). In shallow areas, intense boating activities may contribute to shoreline erosion. Increased turbidity and physical destruction of shallow-water habitat resulting from boating activities should be minimized.

P). Emissions from outboard motors should be monitored, and emissions standards should be enforced (Stolpe 1997).

Q). Dry stack storage marinas are recommended, as opposed to wet marinas, in dogfish EFH. Unlike wet marinas that require extensive dredging and other physical disruptions to physical habitats, dry stack storage facilities are located on uplands thereby minimizing the need for dredging and dependence on the use of timber treated with toxic chemicals. Additionally, land storage allows the use of polymer-based bottom paints, eliminating the need for toxic treatments containing copper or tributyl-tin.

2.2.5.7 Energy production and transport

Energy production facilities are widespread along Atlantic coastal areas. Electric power is generated by various methods, including land based nuclear power plants, hydroelectric plants, and fossil fuel stations. These facilities compete for space along the coastal zone and require water for cooling. The impacts on the marine and estuarine environment resulting from the various types of power plants include water consumption, heated water and reverse thermal shock, entrainment and impingement of organisms, discharge of heavy metals and biocides in blow down water, destruction and elimination of habitat, and disposal of dredged materials and fly ash (USDC 1985a).

2.2.5.7.1 Hydroelectric

Hydropower plants may alter the following characteristics of water bodies:

1. Dissolved oxygen concentrations and temperature;

2. Create artificial destratification;

3. Withdraw or divert water;

4. Change sediment load;

5. Change channel morphology;

6. Accelerate eutrophication;

7. Change nutrient cycling; and

8. Contaminate water and sediment (Hill 1996).

Water quality contaminants of major concern include mercury, PCBs and organochlorine pesticides. Dams and the need for altered flows may substantially affect anadromous fish runs and/or restoration programs (Hill 1996). In addition, impingement of juvenile and adult fish may occur on trash racks that protect turbines from mechanical damage and turbine entrainment causes mortality of eggs and juvenile fishes. Altered dissolved oxygen levels can cause gas bubble disease to fishes (Hill 1996).

Habitat alterations include dams, which create reservoirs and tailwaters. Tailwaters can scour substrate and benthic organisms, as well as fish and fish eggs, create bank erosion, displace sediment downstream, and limit the establishment of riparian vegetation. In addition, clearing for hydropower projects requires disruption of wetlands and riparian habitat and control of some aquatic vegetation (Hill 1996).

2.2.5.7.2 Nuclear

A major adverse impact of nuclear power plants is water withdrawal and thermal pollution, due to the use of cooling water (Hill 1996). Once-through cooling which requires withdrawal of large volumes of water causes significant impingement of juveniles and larger size classes, and entrainment of eggs and larvae. Reverse thermal shock can also occur when plant operation ceases, causing fish mortality to organisms that are adapted to the warmer outflow. As an alternative to once-through large-water volume usage, cooling towers can be constructed which reduce both impingement/entrainment and thermal pollution. Incidental use of biocides to reduce biofouling also introduces pollutants to the surface waters. Another problem is storage and disposal of nuclear wastes which will last centuries.

2.2.5.7.3 Fossil fuels

Coal- and oil-fired plants and shore based refineries are served by various sized vessels, which transport those fuels. Additional navigational channels may be required, which could result in habitat disruption initially and periodically, and the need to find appropriate sites for placement of dredged materials (USDC 1985a). Transportation of fossil fuels may risk the chance of major oil spills or release of other hazardous materials, increases in automotive emissions, and habitat loss from construction of pipelines (Hill 1996). Coal fired plants generate voluminous amounts of fly ash, sulfur dioxide, nitrogen oxides, carbon dioxide, and traces of mercury contributing to acid rain (USDC 1985a, Hill 1996). The excavation of fossil fuels may have adverse effects on biota, as well (Hill 1996). Mining can contribute to acid mine drainage, human health impacts, vegetation and associated wildlife losses, erosion and stream sediments (Hill 1996). In addition, water withdrawal and diversion may cause impingement and entrainment of fish, as well as thermal pollution (Hill 1996).

2.2.5.7.4 Offshore oil and gas operations

The Outer Continental Shelf (OCS) exploratory and production drilling and transport may affect biota and their habitats through the deposition of drilling muds and cuttings. Oil spills resulting from well blowouts, pipeline breaks, and tanker accidents are of major concern. Seismic testing operations can interfere with fishing operations and damage or destroy fishing gear. Contaminants from oil exploration include mostly petroleum hydrocarbons and heavy metals. Effects of hydrocarbon contamination in the water column and sediments may include: mortality of larval fish; mortality from predation due to slower avoidance behavior; bioaccumulation in fish; migration interference for salmon and other anadromous species; and slower maturation of larvae (Howarth 1991). Sublethal effects can cause a decrease in recruitment, as well as complex ecological interactions (Howarth 1991). Cumulative effects of oil on ecosystems include changes in benthic community structure and possible changes in planktonic community structure (Howarth 1991). Oil and gas exploration in the Mineral Management Service's (MMS) Mid-Atlantic, North Atlantic, and South Atlantic lease areas may result in loss or degradation of benthic habitat from the deposition of discharged drilling muds and cuttings. Should production of oil and gas occur in these areas, the transport of the products to onshore storage and processing facilities would pose additional threats to coastal zone and estuarine ecosystems (USDC 1985a).

Measures for conservation and enhancement

A). Appropriate measures should be taken to reduce acid precipitation and runoff into estuaries and nearshore waters.

B). Prior to pipeline construction, less damaging, alternative modes of oil and gas transportation should be explored (Penkal and Phillips 1984).

C). State natural resource agencies should be involved in the preliminary pipeline planning process to prevent violations of water quality and habitat protection laws and to minimize impact of pipeline construction and operation on aquatic resources (Penkal and Phillips 1984).

D). Potential effects of proposed and existing tidal power projects should be estimated; state and federal agencies, regardless of their regulatory jurisdiction, should become involved in this process (Rulifson *et al.* 1986).

E). All vessels transporting fuels and other hazardous materials should be required to carry equipment to contain and retrieve the spill. Dispersants shall not be used to clean up fuels and hazardous materials unless approved by the USEPA/Coast Guard and fishery agencies.

F). NPDES permit conditions, such as those relating to dissolved oxygen, temperature, impingement and entrainment, under the Clean Water Act, should be monitored and strictly enforced in dogfish EFH.

G). NPDES permits should be reviewed every five years for all energy production facilities.

H). Offshore oil and gas leasing, exploration, and production should be strictly limited and controlled, so as not to degrade dogfish EFH. Onshore facilities assisting offshore oil and gas exploration and development, and secondary development stimulated by OCS development, should not degrade dogfish EFH. Seismic work should not be carried out with explosives (air bursts only) in dogfish EFH.

The following measures were taken from Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (USEPA 1993) and apply to dams 25 feet or more in height and greater than 15 acre-feet in capacity, or to dams six feet or more in height and greater that 50 acre-feet in capacity. They also apply only to those projects and activities that fall outside of existing jurisdiction of the NPDES permit program.

I). Erosion should be reduced and sediment retained onsite, to the extent practicable, during and after construction of dams. An approved erosion and sediment control plan, or similar administrative document that contains erosion and sediment control provisions, should be prepared and implemented prior to land disturbance.

J). Proper storage and disposal of certain chemicals, substances, and other materials that are used in construction or maintenance activities at dams, should be implemented. These include construction chemicals such as concrete additives, petrochemicals, solid wastes, cement washout, pesticides and fertilizers. Application, generation, and migration of toxic substances should be limited and properly stored and disposed of. This measure also ensures that nutrients are applied at rates necessary to establish and maintain vegetation without causing significant nutrient runoff to surface waters.

K). Operation of dams should be assessed for impacts to surface water quality and instream and riparian habitat, and that the potential for improvement should be evaluated. Significant nonpoint source pollution problems that exist from excessive surface water withdrawals should also be assessed and evaluated.

2.2.5.8 Sewage treatment and disposal

The Atlantic Ocean off the northeastern United States has been used in the past for the disposal of solid wastes and sewage sludge. Some waste treatment methods, such as chlorination, pose additional problems to aquatic species. Habitats and associated organisms have been degraded by long-term ocean disposal, particularly of sewage wastes. Sewage pollution causes closure of shellfish beds, and occasionally, of public swimming areas because of high fecal coliform counts. Dumping of sewage sludge in the Atlantic coastal waters is regulated under Section 102 of the Marine Protection and Sanctuaries Act, while the discharge of treated sewage effluent is permitted under Section 402 of the Clean Water Act.

Organic loading of estuarine and coastal waters is an emerging problem. Ocean disposal of sewage sludge degrades water quality and associated habitats. Symptoms of elevated levels include excessive algae blooms, shifts in abundance of algal species, increased biological oxygen demand (BOD) in sediments of heavily affected sites, and anoxic events in coastal waters. Changes in biological components are frequently a consequence of long-term ocean disposal. Harmful human pathogens and parasites can be found in biota and sediments in the vicinity of ocean dump sites. In 1995, 4.9 million acres of shellfish-growing waters was harvest- limited due to water quality (USDC 1997c). The top five pollution sources reported as contributing were urban runoff (40%), upstream sources (39%), wildlife (38%), individual wastewater treatment systems (32%), wastewater treatment plants (24%), and unknown (6%; USDC 1997a).

The Chesapeake Bay and the Hudson-Raritan Estuary are two of the three estuaries with the largest number of point discharges in the US (USDC 1993a). Most of the point sources of nutrient loading into the Hudson-Raritan Estuary are sewage treatment plants. In 1988, it was estimated that 6.8 million gallons per day of raw sewage were discharged into this estuary, mainly from Manhattan, Staten Island, and Brooklyn, contributing to most of the 50,000 tons of total nitrogen and 32,000 tons of total phosphorus added to the region per year. Wastewater treatment plants contributed 43% of the total nitrogen and 90% of the total phosphorus to the New York Bight (USDC 1993a). Toxics metals were added at a rate of 35,700 tons per year. Contributing to this loading was urban runoff (31%), wastewater treatment plants (19%), direct industrial discharge (14%), and various other sources.

Sewage treatment effluent produces changes in biological components as a result of chlorination and increased contaminant loading. Sewage treatment plants constructed where the soils are highly saturated often allow suburban expansion in areas that would have otherwise remained undeveloped, thereby exacerbating already severe pollution problems in some areas. Sewage treatment pollutant components include solids, phosphorus, and pathogens (USEPA 1993). Eutrophication in surface waters has also been attributed to the low nitrogen reductions provided by conventional onsite-disposal system.

Poorly designed or operating onsite disposal systems can cause ponding of partially treated sewage on the ground that can reach surface water through runoff. In addition to oxygen-demanding organics and nutrients, these surface sources contain bacteria and viruses that present problems to human health. Viral organisms can persist in temperatures as low as -20 °F, suggesting that they may survive over winter in contaminated ice, later becoming available to ground water in the form of snowmelt (USEPA 1993). Although ground-water contamination from toxic substances is more often life-threatening, the majority of ground-water-related health complaints are associated with pathogens from septic tank systems (USEPA 1993).

While a variety of other wastes have been disposed of in coastal waters of the New York Bight for over 50 years, sewage sludge has only been dumped offshore of the New York Bight over the last 20 years (Chang 1993). Species abundances of silver and red hakes (*Merluccius bilinearis* and *Urophycis chuss*), summer flounder (*Paralichthys dentatus*), goosefish (*Lophius americanus*), and black sea bass (*Centropristis striata*) declined significantly over temporal and spatial scales during the disposal of contamination laden sewage sludge at the deepwater 106-Mile Dump Site (Chang 1993). There was also a decline in the array of all aggregated species (Chang 1993).

Congress requested the Office of Technology Assessment (OTA) to assess the status of waste disposal in marine environments (OTA 1987). In general, OTA determined that estuarine and coastal waters were severely degraded across the nation and that "many of the adverse impacts on marine waters and organisms are caused by the introduction of pollutants through the disposal of wastes." These wastes include municipal sewage sludge, industrial wastes, dredged materials, industrial and municipal effluents, and urban and agricultural runoff. Based on their assessment, OTA concluded:

1. "Estuaries and coastal waters around the country receive the vast majority of pollutants introduced into marine environments. As a result, many of these waters have exhibited a variety of adverse impacts, and their overall health is declining or threatened;"

2. "In the absence of additional measures, new or continued degradation will occur in many estuaries and some coastal waters around the country during the next few decades (even in some areas that exhibited improvements in the past);"

3. "In contrast, the health of the open ocean generally appears to be better than that of estuaries and coastal waters. Relatively few impacts from waste disposal have been observed, partly because the open ocean has been subject to relatively little waste disposal and because wastes are typically dispersed and diluted. Uncertainty exists, however, about the ability to discern impacts in the open ocean". (Note, however, that studies which would detect these impacts in the open ocean have not been conducted.)

OTA (1987) determined that municipal and industrial discharges, sewage sludge, and dredged material accounted for most of the pollutants found in estuary and coastal waters along the Atlantic coast. OTA (1987) identified Buzzard's Bay, Boston Harbor, Narragansett Bay, Long Island Sound, the New York Bight, and Chesapeake Bay as specific areas that were severely polluted or degraded. Contaminated sediments, containing excessive concentrations of organic chemicals, metals and pathogens have been identified in Boston Harbor, New Bedford Harbor, the New York Bight, Raritan Bay, Hudson River Estuary, the Patapsco River around Baltimore, and the James River Estuary. Contaminated water and sediments in the North Atlantic have had adverse impacts on marine organisms. Fish kills, increases in fish diseases and abnormalities, and restrictions on commercial and recreational harvest of both finfish and shellfish have occurred as the result of this pollution (OTA 1987).

The dumping of sewage sludge is no longer allowed in the Atlantic Ocean. Historically, municipal sewage sludge and industrial waste were dumped in two areas along the North Atlantic coast: the New York Bight and deep water sites 100 miles east of Delaware Bay (OTA 1987). In 1985, approximately 7 million wet metric tons (15.4 million pounds) of municipal sewage sludge, several billion gallons of raw sewage, and 8 million wet metric tons (17.6 million pounds) of dredge spoils were dumped in the New York Bight. Routine dumping of municipal sewage sludge and dredge spoils probably contributed to the depletion of oxygen in the New York Bight during the summer and early autumn of 1976. Near anoxic and, in places, anoxic water was located approximately 4 miles off New

Jersey and covered an area about 100 miles long and 40 miles wide during the most critical phases of oxygen depletion (Sharp 1976). The most commercially important species affected by the anoxia were surfclams, red hake, lobsters and crabs. Finfish were observed to be driven to inshore areas to escape the anoxia, or were trapped in water with concomitant high levels of hydrogen sulfide (Steimle 1976). Oxygen levels in 1985, in some areas of the Bight, approached the low values observed in 1976 (OTA 1987).

Measures for conservation and enhancement

A). All sewage should go through tertiary treatment (i.e., nutrient removal) when discharged in dogfish EFH.

B). Dechlorination facilities or lagoon effluent holding facilities should be used to destroy chlorine at sewage treatment plants and power plants.

C). All NPDES permits of public owned treatment works (POTWs) should be reviewed and strictly enforced in dogfish EFH.

2.2.5.9 Industrial wastewater and solid waste

Industrial wastewater effluent is regulated by USEPA through the NPDES/SPDES permitting program. This program provides for issuance of waste discharge permits as a means of identifying, defining, and controlling virtually all point source discharges. However, many problems remain due to inadequate monitoring and enforcement. It is not possible presently to estimate the singular, combined, and synergistic effects on the ecosystem impacted by industrial (and domestic) wastewater.

Point source discharges can potentially alter the following properties of communities and ecosystems: diversity, nutrient and energy transfer, productivity, biomass, density, stability, connectivity, species richness, and eveness (Cairns 1980). Additionally, point source discharges may alter the following characteristics of fish, shellfish, and related organisms: longevity; fecundity; growth; visual acuity; swimming speed; equilibrium; flavor; feeding rate; response time to stimuli; predation rate; photosynthetic rate; spawning season; migration route; and resistance to parasites. Contamination of water quality is generally due to organics and heavy metals, though other characteristics such as flow, pH, hardness, dissolved oxygen may also be altered (Cairns 1980).

Non-point discharges and solid wastes associated with industrial processes also contribute chemical contaminants to dogfish EFH. Chemicals can leak from storage facilities and leach from wastewater lagoons contaminating groundwater that ultimately discharge to rivers and estuaries. Solid wastes historically have been indiscriminately buried and, likewise, have contaminated groundwater with chemical leachates. Although regulatory programs have been enacted to preclude similar actions from occurring today, accidents still occur, and many areas are contaminated from past operations. Consequently, fish that inhabit waters adjacent to these sites, even seasonally, often bioaccumulate contaminants making them unfit for human consumption. Federal and state programs (e.g., Superfund) are designed to remediate hazardous waste sites, thereby reducing the bioavailability of contaminants to fish and other aquatic organisms. Unfortunately, remedial actions sometimes physically modify affected areas so completely that they are no longer suitable habitats for aquatic organisms.

Sediments and biota in specific areas along the Atlantic coast contain elevated levels of PCBs (OOMA 1987). Although PCBs are suspected carcinogens to humans, comprehensive research has not yet been done on the significance of elevated body burdens on the fish themselves, or on reproduction processes and subsequent recruitment of larval, juvenile, and pre-recruits to adult stocks. Whereas laboratory and field effects of a range of organic contaminants have been measured, there is little understanding of how contaminants such as PCBs affect the behavior, biochemistry, genetics, or physiology of these fish at either the lethal or sublethal level. It is significant that where elevated levels of PCBs have been reported in the marine environment they have generally been associated with elevated levels of toxic heavy metals, petroleum hydrocarbons, and other contaminants.

Measures for conservation and enhancement

A). No toxic substances in concentrations harmful (synergistically or otherwise) to humans, fish, wildlife, and aquatic life should be discharged. The USEPA's Water Quality Criteria Series should be used as guidelines for determining harmful concentration levels. Use of the best available technology to control industrial waste water discharges should be required in areas essential for the survival of dogfish. Any new potential discharge into dogfish EFH must be shown not to have a harmful effect on dogfish.

B). The siting of industries requiring water diversion and large volume water withdrawals should be avoided in dogfish EFH. Project proponents should demonstrate that project implementation will not negatively affect dogfish, its EFH, or its food supply. Where such facilities currently exist, best management practices must be employed to minimize adverse effects on the environment.

C). All NPDES permits should be reviewed and strictly enforced in dogfish EFH.

D). Hazardous waste sites should be cleaned up (i.e., remediated) to prevent contaminants from entering aquatic food chains.

E). Remedial actions affecting aquatic and wetland habitats should be designed to facilitate restoration of ecological functions and values.

2.2.5.10 Marine mining

Mining for sand, gravel, shell stock, and beach nourishment projects in coastal and estuarine waters can result in the loss of infaunal benthic organisms, modifications of substrate, changes in circulation patterns, and decreased dissolved oxygen concentrations at deeply excavated sites, where flushing is minimal (USDC 1997a). Marine mining elevates suspended materials at mining sites and turbidity plumes may move several miles from individual sites. Resuspended sediments may contain contaminants such as heavy metals, pesticides, herbicides, and other toxins. Mining also results in changes in sediment type or sediment quality, often over areas measurable in square miles. Deep borrow pits created by mining may become seasonally or permanently anaerobic. Finfish appear to seek out these warmer pockets in the late fall, possibly as a result of declining water temperatures in surrounding area (Ludwig and Gould 1988). It may be important for beach nourishment projects to avoid areas that are rich in clam shells or near other "reef" habitats (Steimle pers. comm.).

Consumption of sand from offshore shoals is occurring on al large scale along the US Atlantic coast. Although the offshore shoals are actively being modified by waves and currents, they are relict features which formed at times of lower sea level. As such, once lost, they are not expected to be replaced by natural processes. Cumulative environmental impacts to finfish are expected to since loss of offshore shoals will reduce habitat diversity on the US inner continental shelf.

Deep ocean extraction of mineral nodules is a possibility for some non-renewable minerals now facing depletion on land. Such operations are proposed for the deep ocean proper, where nodules are bedded on oceanic oozes. Resuspension of these oceanic oozes can affect water clarity over wide areas and, if roiled to the near-surface, could also affect photosynthetic activity. Nodule concentrations have been located along the slope/ocean deep zone in Georgia and the Carolinas (Ludwig and Gould 1988). Such mining activities could potentially affect benthic organisms and their habitats, as well as pelagic eggs and larvae (USDC 1985a).

Measures for conservation and enhancement

A). Sand mining and beach nourishment should not be allowed in dogfish EFH during seasons when dogfish are utilizing the area.

The following are applicable to freshwater situations and are recommendations taken from the NMFS National Gravel Extraction Policy (1996).

B). Gravel extraction operations should be managed to avoid or minimize impacts to bathymetric structure in estuarine and nearshore areas.

C). The cumulative impacts of gravel and sand extraction should be addressed by federal and state resource management and permitting agencies and considered in the permitting process.

D). An integrated environmental assessment, management, and monitoring program should be a part of any gravel or sand extraction operation, and encouraged at federal and state levels.

E). Plan and design mining activities to avoid significant resource areas (such as consolidated sand ledges, sand dollar beds, or algae beds).

F). Plan and design mining activities with minimum area and depth to minimize recolonization times (deep holes should be avoided).

G). Mitigation and restoration should be an integral part of the management of gravel and sand extraction policies.

H). Remove unlike material as part of the mining operation to help restore natural bottom characteristics.

I). Remove material from areas where accumulation is caused by human activities.

2.2.5.11 Aquaculture

Aquaculture is an expanding industry in the US. The annual commercial harvest is over 700 million lbs round weight with a value to producers of nearly $600 million (Robinette *et al.* 1991). The commercial culture of channel catfish, salmonids, and crayfish is very successful, and the potential commercial culture of other species is being explored. Most aquaculture facilities are located in farmland, tidal, intertidal, and coastal areas (Robinette *et al.* 1991). Major potential adverse impacts of aquaculture include disease, genetic pollution of wild stock, escape of exotic species, water contamination, and eutrophication (Robinette *et al.* 1991). Also, the use of low-head dams, weirs, and other obstructions may impede the natural movement of estuarine species (Robinette *et al.* 1991).

Escape of exotic species may result in a restructuring of the native ecosystem through such pathways as gene pool deterioration, trophic alteration, introduction of pathogens and disease, and displacement of native species through competition (these impacts of exotic species are discussed separately in section 2.2.5.13; Robinette *et al.* 1991). Cultured species may be genetically altered and/or have a less genetically diverse background than wild species. The release of the reared stock may have an adverse impact to the wild stock. For example, a reared stock may be less resistant to a disease than a wild stock. When the two stocks begin to mix it may lower the resistance of the native stock to the disease (Sindermann 1992).

Measures for conservation and enhancement

The following recommendations are taken from The American Fisheries Society (AFS) Position Statement of Commercial Aquaculture (Robinette *et al.* 1991).

A). Federal and state agencies should cooperatively promulgate and enforce regulations to ensure both the health of the aquatic organism and quality of the food products. Animals that are to be moved from one biogeographic area to another or to natural waters should be quarantined to prevent disease transmission.

B). To prevent disruption of natural aquatic communities, cultured organisms should not be allowed to escape, and the use of organisms native to each facility's region is strongly encouraged.

C). When commercially cultured fish are considered for stocking in natural waters, every consideration should be given to protecting the genetic integrity of native fishes.

D). Aquaculture facilities should meet prevailing environmental standards for wastewater treatment and sludge control.

2.2.5.12 Ocean disposal

Ocean disposal of industrial waste products, dredged material, and radioactive wastes degrades water quality and associated habitats. Concentrations of heavy metals, pesticides, insecticides, petroleum products, and other toxic contaminants contribute significantly to degradation of waters off the Atlantic coast. Changes in biological components are a consequence of long-term ocean disposal. Harmful human pathogens and parasites can be found in biota and sediments in the vicinity of ocean dump sites. In addition, shellfish harvesting grounds have been closed because of excessive concentrations of pathogenic and indicator species of bacteria.

Many of the above issues and concerns may also be germane to the dumping of fish and shellfish waste in the ocean. The closure of land based processing plants because of the inability to meet NPDES/SPDES effluent requirements encourages the attempts for at sea disposal. While fishery byproducts may be nutritive in value, problems of biological oxygen demand (BOD) increase excessive algal blooms, and concentrations of pathogenic bacteria, may all be associated with ocean disposal of fisheries products.

Measures for conservation and enhancement

Note: This threat was a major concern to NMFS habitat researchers and the Council members in the mid to the late 1980s. Through concerted efforts of numerous individuals and agencies, ocean disposal has presently ceased; however, discussions still persist relative to resuming dumping. Should ocean disposal ever become viable again, the Council policy (MAFMC 1990b) should be reviewed.

A). Under no circumstances should there be disposal of contaminated material in EFH (section 2.2.5.4.D). All of the other recommendations for dredging and disposal of dredged materials (section 2.2.5.4) apply here as well.

B). Ocean disposal of fresh fish waste (i.e., scallop shells and bodies, fish racks, etc.) shall be permitted in areas that are not environmentally at risk. Monitoring of the disposal area will be the responsibility of the discharger if there is credible scientific information that suggest the area is being negatively impacted by the discharge.

2.2.5.13 Introduced species

Over the past two decades there has been an increase in introductions of exotic species into aquatic habitats (Kohler and Courtenay 1988). Introductions can be intentional (e.g., for purpose of stocking or pest control) or unintentional (e.g., fouling organisms). Five types of negative impacts generally occur due to species introductions: (1) habitat alteration; (2) trophic alteration; (3) gene pool alteration; (4) spatial alteration; and (5) introduction of diseases. Habitat alteration includes the excessive vegetation of introduced aquatic plants (e.g., hydrilla, watermilfoil, and alligator weed (Kohler and Courtenay 1988). This overgrowth interferes with swimming and fishing activities, upsets predator-prey relationships, and causes water quality problems. The introduction of exotic species may alter community structure by predation on native species (e.g., brown trout on brook trout) or by population explosions of the introduced species (e.g., tilapias). Spatial alteration occurs when territorial introduced species compete with native species (e.g., displacement of brook trout by brown trout). Although hybridization is rare, gene pool deterioration may occur between native and introduced species (e.g. brown trout and brook trout). One of the most severe threats to a native fish community is the bacteria, viruses, and parasites that can be introduced with exotic species (Kohler and Courtenay 1988).

Escape of exotic species may result in a restructuring of the native ecosystem through such pathways as gene pool deterioration, trophic alteration, introduction of pathogens and disease, and displacement of native species through competition (Robinette *et al.* 1991). Cultured species may be genetically altered and/or have a less genetically diverse background than wild species. The release of the reared stock may have an adverse impact to the wild stock. For example, a reared stock may be less resistant to a disease than a wild stock. When the two stocks begin to mix it may lower the resistance of the native stock to the disease (Sindermann 1992).

Measures for conservation and enhancement

The following recommendations are taken from the AFS Position Statement on Introductions of Aquatic Species (Kohler and Courtenay 1986).

A). Fish importers, farmers, dealers, and hobbyists should prevent and discourage the accidental or purposeful introduction of aquatic species into their local ecosystems.

B). City, county, state or federal agencies should not introduce species into any waters within its jurisdiction which might contaminate any waters outside its jurisdiction.

C). Only ornamental aquarium fish dealers should be permitted to import such fishes for sale or distribution to hobbyists.

D). The importation of fishes for purposes of research not involving introduction into a natural ecosystem should be made with the responsible government agencies.

E). All species that are considered for release should be prohibited and considered undesirable for any purpose of introduction into any ecosystem unless found to be desirable by federal fisheries agencies, as well as neighboring state agencies.

2.2.5.14 Cumulative impact analysis

According to section 600.815 (a)(6), to the extent feasible and practicable, FMPs should analyze how fishing and non-fishing activities influence habitat function on an ecosystem or watershed scale.

"Cumulative impacts to the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of who undertakes such actions." Several examples of cumulative impacts from non-fishing and fishing threats include wetland losses, nutrient enrichment, eutrophication, toxic algal blooms, and global climate change. These cumulative impacts generally occur in estuarine and inshore areas; the multiple effects can result in adverse impacts to dogfish EFH.

Estuaries provide the nation with highly productive habitats and important living resources. Intensive use of these ecosystems for industrial, residential, and recreational activities has had cumulative adverse effects on many estuarine resources. Thirteen estuaries have been designated as dogfish EFH (Table 8).

The Mid-Atlantic region extends from New York through North Carolina. However, Mid-Atlantic Fishery Management Council manages species throughout their range, which for dogfish includes the entire U.S. Atlantic coast. The National Estuarine Inventory defines 15 estuaries in the Mid-Atlantic States including Gardiner's Bay, Long Island Sound, Great South Bay, Hudson-Raritan Bay, Barnegat Bay, New Jersey Inland Bays, Delaware Bay, Delaware Inland Bays, Chincoteague Bay, Chesapeake Bay, Albemarle Sound, Pamlico Sound, Bogue Sound, New River, and Cape Fear River (USDC 1990). Mid-Atlantic estuaries account for 44% of the total freshwater discharge to coastal waters along the Atlantic coast.

Human use of estuaries in the Mid-Atlantic is extensive and described earlier in section 2.2.5. These problems have begun to be addressed. However, conclusions about the cumulative effects of contaminants is lacking on the ecosystem and the 13 estuaries

(Table 8 and Figures 12 and 13) that were established as dogfish EFH, along with much of the inshore area of the Atlantic coast (Figures 17-19). Some of the dogfish prey species are estuarine dependent. Unquantified cumulative impacts to estuarine and inshore areas have potential impacts to the sustainability of the dogfish fishery.

2.2.5.14.1 Nutrient Loading

Land use intensification threatens efficient nutrient cycling in many watersheds. Excess nutrients from land based activities accumulate in the soil, pollute the atmosphere, pollute ground water, or move into streams. Healthy watersheds have a reasonable balance of nutrient imports and exports (Aschman *et al.* 1997). Physical characteristics and nutrient loadings of eight of the major mid-Atlantic estuaries are summarized in Table 17. Five of eight of these estuaries have medium to high nutrient loadings. Nutrient inputs include a combination of urban and industrial sources (Mid-Atlantic Regional Research Program 1994). Nutrient to these mid-Atlantic estuaries include sewage input (septic systems and wastewater treatment), industrial wastewater, urban input, agricultural sources, and atmospheric inputs.

Of course while nutrient overloading is a significant problem in many areas, nutrients are necessary for overall productivity. It is speculated by some that chemosynthesis from deep sea trenches is perhaps the largest input of nutrients into the marine system. (Fletcher pers.comm.). While worldwide, chemosynthesis may be very important in the oceans' productivity, it does not appear that significant nutrients are contributed from deep sea trenches to areas currently designated as dogfish EFH.

Measures for conservation and enhancement

Nutrient loading is a cumulative impact that results from the individual threats of coastal development, nonpoint source pollution, marinas and recreational boating, sewage treatment and disposal, industrial wastewater and solid wastes, ocean disposal and aquaculture. Please refer to the above sections for individual measures for conservation and enhancement.

2.2.5.14.2 Eutrophication

Nutrient inputs are known to have a direct effect on water quality. For example, in extreme conditions excess nutrients can stimulate excessive algal blooms that can lead to increased metabolism and turbidity, decreased dissolved oxygen, and changes in community structure, a condition called eutrophication (USDC 1997d-f). Office of Ocean Resources Conservation and Assessment (ORCA) initiated the Estuarine Eutrophication Survey in 1992 to comprehensively assess the scale and scope of nutrient enrichment and eutrophication in the National Estuarine Inventory estuaries. Table 18 illustrates the results of the eutrophication survey for the Atlantic coast, collected through a series of surveys, interviews, and regional workshops. The surveys describe existing conditions and trends of 17 parameters that characterize nutrient enrichment (USDC 1997d-f).

Measures for conservation and enhancement

Eutrophication is a cumulative impact that results from the individual threats of coastal development, nonpoint source pollution, marinas and recreational boating, sewage treatment and disposal, industrial wastewater and solid wastes, ocean disposal and aquaculture. Please refer to the above sections for individual measures for conservation and enhancement.

2.2.5.14.3 Harmful algal blooms

It is believed that nutrient enrichment of estuarine waters has lead to blooms of noxious dinoflagellates and algae (Mid-Atlantic Regional Marine Research Program 1994). Examples of such dinoflagellates or algae include *Gynodinium breve*, the dinoflagellate that causes neurotoxic shellfish poisoning, dinoflagellates of the genus *Alexandrium*, which cause paralytic shellfish poisoning, *Aureococcus anophagefferens*, the algae which causes "Brown tide", and diatoms of the genus *Pseudo-nitzschia*, which cause amnesic shellfish poisoning (Boesch *et al.* 1997).

Brown tide has been a recurrent problem in Peconic/Flanders and South Shore Bays of Long Island, since 1985 (Suffolk County DOHS 1997). It has also occurred in Narragansett Bay, Rhode Island and Barnegat Bay, New Jersey. Among finfish and shellfish that have been impacted by brown tide, the scallop population in the Peconic Estuary has virtually eradicated (Suffolk County DOHS 1997). The causes of the impact of brown tide are still unknown and may be attributed to toxic, mechanical, and/or nutritional aspects of the organism. However, when brown tide blooms exist at concentrations greater than 200,000 to 250,000 cells per 0.06 cu. in. (1 ml), it reduces light penetration, adversely impacting eelgrass beds which are of critical importance to finfish and shellfish (Suffolk County DOHS 1997). Although macro-nutrients do not cause blooms, they may provide optimum conditions for it.

Pfiesteria piscicida is a recently-described toxic dinoflagellate that was originally isolated from North Carolina waters (FDEP 1998). It has been documented in the water column in Delaware, Maryland, and North Carolina. Another *Pfiesteria*-like organism has been documented in St. John's River, Florida. *P. piscicida* has been associated with fish kills in North Carolina and Maryland (FDEP 1997, Hughes Commission 1997). Although *Pfiesteria* has been documented in Maryland waters, and fish with lesions were found in those same waters, etiologies of those lesions is still unknown, and is currently being studied by state, federal, and university pathologists (Driscoll pers. comm.). Additionally, the role of nutrient runoff and other possible causes are being investigated (Driscoll pers. comm).

The role of nutrients in algal blooms around the world is well documented (Hughes Commission 1997). *Pfiesteria* has a complicated life cycle (Figure 22), and the role that nutrients play in that life cycle is still unknown. Dr. Joanne Burkholder, who is credited with the discovery of *Pfiesteria*, has demonstrated in the laboratory that the growth of non-toxic stages of *Pfiesteria* can be stimulated by the addition of inorganic and organic nutrients. Field studies conducted by Burkholder have demonstrated a correlation between phosphorous-rich waste outfalls and high concentrations of non-toxic *Pfiesteria* (Hughes Commission Report 1997). It is important to note that not all outbreaks of *Pfiesteria* occurred in nutrient-enriched waters. Currently, it is not known what triggers *Pfiesteria* to a toxic stage. High nutrient concentrations are not required for *Pfiesteria* or *Pfiesteria*-like dinoflagellates to turn toxic. In fact, if suitable concentrations are present, toxic outbreaks can occur even if nutrient concentrations are relatively low. It appears that excessive nutrient loadings can help to create an environment rich in microbial prey and organic matter that *Pfiesteria* uses as a food supply (Hughes Commission 1997). Some scientists hypothesize that the primary stimuli for the transformation of the dinoflagellate into toxic stages are chemical cues secreted or excreted by the fish. In other words, fish must be present for a toxic outbreak to occur (Hughes Commission 1997).

Measures for conservation and enhancement

A). Federal and state agencies should address the issue of harmful algal blooms and *Pfiesteria*-like toxins which cause adverse effects in dogfish EFH.

2.2.5.14.4 Wetland loss

In the late 1970's and early 1980's the country was losing wetlands at an estimated rate of 300,000 acres per year. The Clean Water Act and state wetland protection programs have helped to decrease wetland losses to 117,000 acres per year, between 1985 and 1995 (Dahl *et al.* 1997). Estimates of wetlands loss differ according to agency. USDA estimates attributes 57% wetland loss to development, 20% to agriculture, 13% to deepwater habitat, and 10% to forest land, rangeland, and other uses (USDA 1995). Of the wetlands lost to uplands between 1985 and 1995, USFWS estimates that 79% wetlands were lost to upland agriculture. Urban development and "other" types of land use activities were responsible for 6% and 15%, respectively (Dahl *et al.* 1997). Strong wetland protection must continue to be a national priority; otherwise, fisheries that support more than a million jobs and contribute billions of dollars to the national economy are at risk (Stedman and Hanson 1997).

Despite the urbanized nature of the mid-Atlantic, it contains more than 3,500 square miles of wetlands (Stedman and Hanson 1997). The Chesapeake and Delaware Bays have the first and second highest areas of wetlands in the region, respectively. Forested wetlands are the most common type of wetland, accounting for nearly 58% of the region's wetlands, followed by salt marsh (28%; Stedman and Hanson 1997).

Measures for conservation and enhancement

Wetland loss is a cumulative impact that results from the individual threats of coastal development, dredging and dredge spoil placement, port development, marinas and recreational boating, sewage treatment and disposal, industrial wastewater and solid wastes, ocean disposal, marine mining, and aquaculture. Please refer to the above sections for individual measures for conservation and enhancement.

2.2.5.14.5 Global climate change

Global warming, an indirect impact of population growth, is an increased accumulation of carbon dioxide and other gases, such as methane, that trap solar infrared light in the atmosphere causing a warming trend. Although these gases also result from natural processes, excesses originate from industrial and residential sources. Although the issue of global warming is controversial, all models predict some warming, especially in the higher latitudes in the northern hemisphere (Thorne-Miller and Catena 1991).

While the rise of the ocean temperature may not be as dramatic or as fast as the atmosphere, only a degree or two can have a dramatic effect on biological communities (Thorne-Miller and Catena 1991). Another potential affect will be sea level rise caused by the melting of the Arctic tundra and ice cap. Among the possible effects on sea life are: (1) a significant loss of coral reefs, salt marshes, and mangrove swamps unable to keep up with a rapid rise in sea level; (2) loss of species whose temperature tolerance range is exceeded (perhaps an even greater threat to corals than sea-level rise); (3) effects from Tundra runoff including runoff of nutrients and suspended sediments; and (4) saltwater intrusion that wreaks havoc with freshwater ecosystems, including rivers, freshwater marshes, and coastal lowland farm acreage (Thorne-Miller and Catena 1991). Other effects that may result from the melting of the Arctic tundra, include: (1) warmer water species would invade formerly cooler habitats confining cooler habitat species farther north; and (2) physical changes in the Arctic Seas that may have repercussions through oceans worldwide by altering the patterns of circulation, food chains that include valuable fisheries, and climate in other part of the world (Thorne-Miller and Catena 1991).

The Department of Commerce reports that human-generated increases in greenhouse gas concentrations have combined with natural forces to cause unprecedented warming in the Arctic in the 20th century, a phenomenon that could lead to significant changes in the earth's natural environment (USDC 1997b). Between 1840 and the mid-20th century, the Arctic warmed to the highest levels of the past four centuries, causing dramatic retreats of glaciers, thawing of permafrost and sea ice, and changes in terrestrial and lake ecosystems (USDC 1997b). Significant warming in the Arctic, particularly after 1920, may also be related to increased solar irradiance, decreased volcanic activity, and factors internal to the climate system (USDC 1997b).

As a result of changing meteorological conditions and sea level rise, fish habitats, fishery yields, and the industry's shoreline infrastructure could change dramatically (Bigford 1991). The projected average range of global sea level rise over the next century has been adjusted down since the mid-1980's, but still ranges from about 20 to 78 in. (50 to 200 cm). At least three factors will determine the severity of impacts from sea-level rise on natural resources and their habitat: (1) physical obstruction to inland habitat shifts from natural or human barriers; (2) resilience of species to withstand new environmental conditions during periods of erosion-induced transition; and (3) the rate of environmental change (Bigford 1991). Also sea-level rise could affect species distributions and abundance, particularly for estuarine-dependent or wetland dependent species.

2.2.5.15 Legislation and regulations that currently address habitat issues

Many federal laws are designed to regulate activities that have the potential to adversely affect the environment. Frequently, state programs complement those of the federal government. However, it is not the intent of this discussion to provide a comprehensive description of all these programs, but rather focus attention on those that most directly affect fisheries resources and their associated habitats. Those programs in which NMFS participate are emphasized because NMFS is specifically charged with conserving, enhancing, and managing living marine resources and, in concert with the Councils, implementing provisions of the MSFCMA.

Consultative authority is conferred to NMFS by several laws [e.g., Fish and Wildlife Coordination Act (FWCA), the National Environmental Policy Act (NEPA), the Marine Mammal Protection Act (MMPA), and the Endangered Species Act (ESA)]. These laws require federal agencies to consult with NMFS when proposing to construct, operate, authorize, or fund any activity that may affect resources within the purview of NMFS (e.g., fisheries resources, some marine mammals and endangered species, and their respective habitats). These mandates are essential to NMFS when reviewing proposals requiring permits to modify estuarine and marine habitats, such as those regulated by the Rivers and Harbors Act Section 10/Clean Water Act Section 404 program.

Section 10 of the River and Harbor Act of 1899 authorizes the Army Corps of Engineers (COE) to regulate activities in navigable waters (to mean high water shoreline). Section 404 of the Clean Water Act (CWA), as amended, authorizes COE to regulate the discharge of dredged or fill materials in waters of the United States, including wetlands. USEPA exercises oversight of the corps through establishment of guidelines under Section 404(b)(1) and the ability to veto permit decisions under section 404(c). The COE must consult with NMFS, and consider any recommendation made by them, before making a permit decision. It is through these recommendations that NMFS has the opportunity to alleviate potential adverse impacts associated with project implementation.

NMFS may also use its consultative authorities when reviewing other activities that can affect aquatic habitats. For example, Section 402 of CWA authorizes USEPA, or delegated states with approved programs, to regulate the discharge of all industrial and municipal wastes (i.e., point source discharges). The USEPA and COE also share regulatory responsibilities under the Marine Protection, Research, and Sanctuaries Act (MPRSA) for the discharge of wastes into ocean waters. The COE specifically regulates the discharge of dredged materials, while USEPA regulates other discharges (e.g., municipal sewage sludge, industrial wastes). MPRSA also directs NOAA to conduct research and establish marine sanctuaries, which have habitat applications, as do elements of the Coastal Zone Management Act (CZMA).

Section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA) requires states with approved Coastal Zone Management Programs to address nonpoint pollution in coastal waters. States must submit Coastal Nonpoint Pollution Control Programs for approval to both the USEPA and the NOAA. USEPA published "Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters" to assist states to achieve compliance with CZARA. States failing to comply with Section 6217 may lose part of their federal funding under Section 306 of CZMA and Section 319 of CWA.

Other provisions of CWA enable NMFS to exercise its consultative authorities to conserve and enhance living marine resources and habitat. For example, Section 316 (a) and (b) require power plants to address and abate thermal pollution, and entrainment and impingement of organisms, respectively, and Section 303 requires states to address water quality holistically by watershed. Total Maximum Daily Loads (TMDLs) are being established for some key pollutants (e.g., some heavy metals, nutrients), however, in most cases have not been established under Section 303. Stream segments within each watershed are then monitored, and abatement plans are developed so that each watershed can be brought into compliance with TMDLs.

Section 320 of the CWA authorizes the National Estuary Program (NEP). Currently, 28 estuaries are included in the NEP nationally; 8 in the Mid-Atlantic. Habitat loss and modification and eutrophication have been identified as major problems affecting Mid-Atlantic estuaries. Comprehensive Conservation and Management Plans (CCMPs) have been developed that address the problems affecting these estuaries, describe measures needed to resolve these problems, and provide implementation strategies. Plans are also developed to monitor the success of plan implementation. NMFS participates on the Scientific and Technical Committees (STACs) and Living Resources Subcommittees (LRSCs) of many of these estuaries recommending research needed to understand estuarine processes and problems, assisting in the development of CCMPs, and facilitating their implementation.

Some laws, such as the Federal Power Act, as amended, provide NMFS with the authority to prescribe mitigative measures (e.g., construction of fish passage facilities) for projects licensed by the Federal Energy Regulatory Commission. In the northeast, prescriptive authority is primarily used to retrofit facilities that injured resources resulting from past actions, such as requiring construction of fishways on existing hydroelectric plants during relicensing evaluations. Other legislation mandating NMFS to mitigate resource injuries through restoration or replacement of equivalent services are found in the Comprehensive Environmental Response, Compensation, and Liability Act (Superfund) and Oil Pollution Act.

Additionally, NMFS is involved in programs (e.g., Saltonstall-Kennedy, Anadromous Fish Act) that provide grants for the implementation of studies that contribute to the conservation of fish and habitats, or improve fisheries management.

The MSFCMA interim final rule requires consultation between NMFS and other state and federal agencies regarding EFH. Federal agencies are required to respond to NMFS and Council comments on federal activities, including those that are federally authorized or funded. State and federal agencies are encouraged to coordinate with NMFS and the Council in the early stages of actions to identify potential impacts to EFH.

Other pertinent legislation affecting the protection, conservation, enhancement, and management of living marine resources and habitat can be found in *A Plan to Strengthen the National Marine Fisheries Service's National Habitat Program* (USDC 1996b).

2.2.6 Prey Species

According to section 600.815 (a)(8), actions that reduce the availability of a major prey species, either through direct harm or capture, or through adverse impacts to the prey species' habitat that are known to cause a reduction in the population of the prey species may be considered adverse effects on a managed species and its EFH. The bulk of this information can be found in section 2.1.3.5 Food and Feeding.

In summary, dogfish are non-selective predators, however some of their prey items are estuarine dependent. Conservation and enhancement recommendations (section 2.2.5) address degradation in estuarine areas for dogfish and their food sources.

2.2.7 Research and Information Needs

From section 600.815 (a)(10), it states that each FMP should contain recommendations for research efforts that the Councils and NMFS view as necessary for carrying out their EFH management mandate. There are two sets of recommendations included in this section.

In general, there is a necessity to review the unpublished "grey" literature from organizations such as Sea Grant, state and federal agencies, educational institutions, consulting firms, etc. where significant research has been performed on fisheries related contaminant data. However, the time frame imposed by Congress did not permit for a complete this data. Review of existing information should provide a logical first step for management and better define and prioritize research needs.

The two sets of recommendations in this section are simply a compilation of all existing data needs. The Council stands ready to work with NMFS to prioritize these needs on a coastwide basis. The Council is soliciting input from the public during the hearing process as to their view of prioritization.

The first set of recommendations comes from McMillan and Morse (1998) where it is stated that the following information is lacking on the biology of dogfish. For a more detailed register of research needs see NEFSC reference document 94-22 and the update, revised December 1997.

1. Update age and growth estimates;

2. Update length at maturity estimates;

3. Update/investigate food habits of young-of-year (<35cm) and recruits (>35cm);

4. Improve estimates of discards by non-directed fisheries;

5. Investigate potential databases from coastal states regarding estuarine use, particularly the ELMR mid-Atlantic region; and

6. Increase the frequency of sex determination for all surveys and seasons.

The second list comes from Auster and Langton (1998). A number of areas where primary data are lacking, which would allow better monitoring and improved experimentation, ultimately leading to improved predictive capabilities, are:

1. The spatial extent of fishing induced disturbance. While many observer programs collect data at the scale of single tows or sets, the fisheries reporting systems often lack this level of spatial resolution. The available data makes it difficult to make observations, along a gradient of fishing effort, in order to assess the effects of fishing effort on habitat, community, and ecosystem level processes.

2. The effects of specific gear types, along a gradient of effort, on specific habitat types. These data are the first order needs to allow an assessment of how much effort produces a measurable level of change in structural habitat components and the associated communities. Second order data should assess the effects of fishing disturbance in a gradient of type 1 and type 2 disturbance treatments.

3. The role of seafloor habitats on the population dynamics of harvested demersal species. While there is often good time series data on late-juvenile and adult populations, and larval abundance, there is a general lack of empirical information (except in coral reef, kelp bed, and for seagrass fishes) on linkages between EFH and survival, which would allow modeling and experimentation to predict outcomes of various levels of disturbance.

These data, and any resulting studies, should allow managers to regulate where, when, and how much fishing will be sustainable in regards to EFH. Conservation engineering should also play a large role in developing fishing gears which are both economical to operate and minimize impacts to environmental support functions.

2.2.8 Review and Revision of EFH Components of FMP

In section 600.815 (a)(11), it states that Councils and NMFS should periodically review the EFH components of FMPs, including an update of the fishing equipment assessment. Each EFH FMP amendment should include a provision requiring review and update of EFH information and preparation of a revised FMP amendment if new information becomes available.

The Council will amend its FMPs at least every five years as called for in this section, but is also including a habitat framework adjustment provision that can be included in each FMP. Due to the very rapid time constraints of meeting the October-MSFMCA deadline mandated by Congress (with very limited additional funds), it was impossible to include much of the state survey data that will be available in the future, as well as, much of the unpublished literature on contaminants etc. It is important to understand that this EFH is a "work in progress" and that the process will evolve. This framework provision is envisioned to work along the existing framework provisions established for the New England Multispecies FMP by the NEFMC. A similar process is proposed in this FMP for other non-EFH management measures.

The FMP contains definitions of essential fish habitat, estimates of gear impacts on essential fish habitat, and contains recommendations that describe options to avoid, minimize, or compensate for the adverse effects and promote the conservation and enhancement of EFH. In some cases those definitions, estimates, and recommendations are made in general terms because the necessary work on, for example, the specific content and concentrations of organic and inorganic (nutrient) compounds which have not as yet been compiled and/or specified by regulatory agencies, such as the Environmental Protection Agency, Fish and Wildlife Service, National Marine Fisheries Service, and/or appropriate state agencies. The purpose of this framework provision is to incorporate such specifics into the definitions, estimates, and recommendations as specifics are developed via existing data not available when the FMP was adopted. The framework provision is not to be used to add or delete the conservation and enhancement recommendations, but only to adjust definitions of EFH (boundaries) and revise gear management measures (such as degradable panels and lines).

The Council envisions creating a Habitat Monitoring Committee (HMC) made up of at least staff representatives from the NMFS Northeast Fisheries Science Center, the Northeast Regional Office Management and Habitat Sections, the Atlantic States Marine Fisheries Commission, and Chaired by the Council Executive Director or his/her designee. The HMC will meet at the call of the HMC Chair, to develop options for MAFMC consideration on any adjustment or elaboration of any FMP EFH definition or gear impacts of EFH recommendations necessary to achieve the habitat goals and objectives. Based on this review, the HMC will recommend specific measures to revise EFH definitions, identify HAPCs and/ or revise gear specifications.

The MAFMC, through its Habitat Committee, will review the recommendations of the HMC and all of the options developed by the HMC and other relevant information, consider public comment, and develop a recommendation to meet the FMP's habitat goals and objectives. If the MAFMC does not submit a recommendation that meets the FMP's habitat goals and objectives and is consistent with other applicable law, the Regional Administrator may adopt by regulatory change any option developed by the HMC, unless rejected by the MAFMC or tabled by the MAFMC for additional consideration, provided the option meets the FMP's habitat goals and objective and is consistent with other applicable law. The frameworked process for developing EFH and/or gear impacts will follow the same overall process as that for other non-EFH management measures.

2.3. DESCRIPTION OF FISHING ACTIVITIES

2.3.1 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 (100 mt) 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 (359 mt) from 1962-1978 (Table 19). 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 (4,000-6,800 mt). US commercial landings averaged 11.7 million pounds (5,300 mt) 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 (4,500 mt) in 1989 to 60 million pounds (27,000 mt) in 1996. Spiny dogfish commercial landings declined to 45.2 million pounds (20,500 mt) in 1997. During this third phase of rapid fishery expansion (1990-1997), US commercial landings averaged about 40 million pounds (18,000 mt). Cumulative removals during this eight year period was roughly 340 million pounds (154,000 mt). In contrast, cumulative US landings for the period 1962-1989 (i.e., the previous 28 years) were only 118.6 million pounds (54,000 mt). Foreign landings during the during the period 1965-1977 were about 345 million pounds (156,000 mt). 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).

Spiny dogfish are landed in every state from Maine to North Carolina (Table 20). 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 21).

Numerous gear types are reported as taking spiny dogfish based on NMFS weighout data (Table 22). However, two principal gear types, trawls and gill nets, accounted for the majority of spiny dogfish commercial landings historically (Tables 22 and 23). 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 (Table 23). 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. In addition, there has been a recent increase in dogfish landings by longline (Table 23). The landings of spiny dogfish by gear type by state, for the period 1988-1997, are given in Table 24.

Spiny dogfish are landed in all months of the year (Table 25) 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 25).

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.). Spiny dogfish landings by distance from shore by year based on unpublished NMFS weighout data are given in Table 26. 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 (Table 27; the only data which contain distance from shore information). The degree to which these data are representative of the inshore-offshore distribution of landings along the entire coast since 1994 can not be determined based on NMFS weighout data. 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.

2.3.2 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 (Table 19).

Excluding the recreational estimate for 1981, total recreational catches increased from about 150,000 pounds (70 mt) in 1982-83 to greater than 900,000 pounds (408 mt) in

1989 (Table 19). Since then the estimates of spiny dogfish recreational catch in weight have declined. The 1993 estimate was about 265,000 pounds (120 mt). Total catch in weight declined to less than 80,000 pounds (37 mt) in 1996, but increased to 146,000 pounds (66 mt) in 1997.

Total catches in number (Type A + B1 + B2) increased nearly five fold from 1982-1989 (Table 28). 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 (Table 29). 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 (Table 30) and in ocean waters greater than three miles from shore (Table 31).

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.

2.3.3. 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 (Figure 23) increased from about 0.5 million pounds (207 mt) in 1965 to a peak of 54.1 million pounds (24,549 mt) in 1974 (Table 19). Foreign spiny dogfish landings averaged 29.6

million pounds (12,059 mt) for the period 1965-1977. Cumulative landings for the same period were 346.5 million pounds (157,000 mt).

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 (16,971 mt) in 1976 to 1.6 million pounds (706 mt) 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.

2.3.4 Economic Characteristics of the Fishery

As described above, 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 (67 mt) 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 (20,000 mt). 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.

2.3.4.1 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 32 (total annual) and 33 (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%.

At present, no permit is required for commercial fishing vessels landing spiny dogfish. As such, information on the total number of vessels landing spiny dogfish is 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). It is likely 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 will ostensibly be closed).

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 34 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.

2.3.4.2 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.

2.3.4.3 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).

2.3.4.4 Port and community description

The Mid-Atlantic Fishery Management Council commissioned a report to describe the people and communities involved in the region's fisheries in the early 1990's. The report titled "Part 2, Phase I, Fishery Impact Statement Project, Mid-Atlantic Fishery Management Council" by McCay *et al.* (1993) was developed to assist in describing the potential effects of management actions on the people and communities involved in fisheries throughout the region in the early 1990's. The results of McCay *et al.* 1993 and more recent NMFS weighout data for 1997 provide recent historical and current description of the reliance of various ports along the Atlantic coast on spiny dogfish.

The principal approaches employed to compile the information presented in McCay *et al.* (1993) were open-ended phone interviews, port visits, data analysis, and interviews of people involved in different aspects of the fishing industry. The report prepared by McCay *et al.* (1993), identified ports that appeared in the top 10, in terms of landed value, for any of the species that the Mid-Atlantic Fishery Management Council has full or shared responsibility for the preparation of Fishery Management Plans (tilefish, scup, black sea bass, summer flounder, dogfish, Atlantic mackerel, *Loligo* squid, *Illex* squid, butterfish, weakfish, bluefish, and angler or monkfish). The ports identified as relevant in the report covered ports from Chatham, Massachusetts, to Wanchese, North Carolina. Landing statistics and values were from the National Marine Fisheries Service weighout data. Information about the ports is from interviews with key informants and from earlier studies conducted by McCay's research team (McCay *et al.* 1993). The results of McCay *et al.* 1993 can be contrasted with more recent 1997 NMFS weighout data

The descriptive information that follows is excerpted and paraphrased from a report prepared for the Council by McCay *et a*l. 1993 and is based on interviews conducted in the respective ports as described above:

Wanchese, North Carolina

"Wanchese has traditionally been a fishing community with commercial fishing operations since the late 1800s. Many of the current residents of Wanchese are descendants of people who settled here in the late 1600s and early 1700s." Many of the fishers are small, independent owner operators. "Informants have estimated that fifty percent of the men in Wanchese are in a marine related career." Wanchese has never developed the strong tourism sector seen in nearby areas. Because of the periodic shallowness of Oregon Inlet, many of its larger trawlers stay in Hampton, Virginia or New Bedford, Massachusetts during the winter. "Wanchese is also the site of the Wanchese Seafood Industrial Park (WSIP) which was developed in the 1970s to be a major site for seafood processing activities. However, because of the uncertain nature of Oregon Inlet and the general decline in fisheries since the 1970s, very few businesses actually operate in WSIP. The catch is either sold at retail markets locally or it is packed in ice and sent to other markets. At least one of the Wanchese commercial fishing and packing operations has expanded to other ports such as Hampton, Virginia and New Bedford, Massachusetts." In recent years, some New Bedford vessels have moved south to base in Wanchese in response to shortages of groundfish and scallops in New England.

Much of the ocean fishing occurs in the winter months (November-April). However, the boats in Wanchese fish all year round. Bluefish is predominantly caught with ocean gill nets which fish up to ten miles offshore and fish the area of Ocracoke to Currituck Light.

Other species include weakfish, dogfish and Atlantic croaker between the first of November and the end of April. There are a half dozen fish houses and other marine-related businesses that handle species other than crabs, and a couple that handle crabs exclusively. McCay *et al.* (1993) reported that summer flounder (21%) was the most important species in Dare County in terms of landed value in 1991. The value of all species landed in Dare County was over $11 million in 1991. Blue crabs (hard) are second in importance (11%), followed by weakfish (9%). Other species of volume in Dare County in 1991 were bluefish (4.02%), sea basses (3.41%), dogfish (1.00%), tilefish (0.53%), scup (0.41%), butterfish (0.31%), squid (0.29%), and Atlantic mackerel (0.12%).

Generally, the boats that are owned by local companies are operated by hired captains. However, these boats may be operated by a relative in some instances. Independent boats are usually owner-operated, with family members often serving as crew. "The crew on these vessels are mostly local; 75-80 percent are from within the area. All are paid with some variation of a share system." The crews are mostly 18 to 40 years of age; captains are usually older, with some over 65. Most crew members are white, though there are some black fishers including black captains. Sometimes, members of a family will own boats and fish houses. In the fish houses, most of the work force is black women, except for the crab houses where Latino workers are more common."

"Recreational fishers use the inshore, offshore, and sound waters around Wanchese and Dare Counties." Those fishing from boats do not predominantly target bluefish. Bluefish are targeted by pier and surf fishers, who are primarily local residents and residents of nearby counties. Other species targeted by pier and surf fishers are: flounder, Kingfish or sea mullet, triggers, puffers, skates, rays, spot, pigfish, and pinfish.

Hampton/Hampton Roads, Virginia

The area in Virginia containing Hampton, Newport News, Seaford, and Virginia Beach is know as Hampton Roads. It is difficult to describe fishing in Hampton apart from the rest of the area. These ports have historically been fishing communities. The Hampton Roads area included five of the six major offloading ports in Virginia. However, the fishing industry is but one of the many industries in the Hampton Roads area. While Hampton itself is not a big tourist spot, the town is trying to emphasize its waterfront area and its tourism potential. There is an Air and Space Museum, a marina for pleasure boats, a number of military installations, and a large coal port in addition to other shipping."

Much of the landed fish in Virginia by weight is accounted for by menhaden, but other species are also important. Dogfish accounted for less than 0.01% of the total landed value in Hampton Roads in 1992, 100% of which was landed by sink gill nets. Overall, the fishers in this area are very opportunistic, targeting whatever is available and marketable.

Family ties are important in choosing crew members on the smaller vessels. These boats tend to have very stable crews. Larger vessels, especially scallopers have a much higher turnover rate among crew. Crew are paid on a share system. Most of the captains and some of the crew have been fishing for most of their lives. Educational levels vary. "There is a mix of age groups in commercial fishing in Hampton Roads. One informant said that for a while, there was concern that there were no younger people getting into this industry. A few younger people have joined fishing recently with the recession and the scale down in the military." There is a small but growing contingent of Vietnamese-owned boats, which is generating some resentment from longtime resident fishers. There are also a small number of Mexican-American fishers, most of whom are members of a single extended family.

"Trawlers unload at packing houses and these fish houses often serve as the wholesale buyer and distributor. One of the fish houses has government contracts and supplies the navy with all of its seafood. Bluefish are shipped north to Philadelphia or New York City. Two of the companies in Hampton own their own trucks and one of these is also a secondary buyer."

"Hampton Roads also has a large recreational fishery. Virginia Beach has a sports fishing center like Ocean City, Maryland but not as big as Oregon Inlet, North Carolina." Summer flounder is an important recreational species with hook and line, with the highest recreational landings in the spring near Chincoteague (eastern shore). Headboats go out for black sea bass, and some recreational fishers target scup. Other recreational species include bluefish and weakfish, with dogfish being an incidental catch.

Ocean City, Maryland

"The principal ocean port in Maryland is Ocean City. Ocean City is a commercial fishing community with families that have been involved in fishing for at least sixty years. In the last [twenty] years, Ocean City has grown into its current status as a summer resort area. However, new development is not taking place at the same levels as it did in the past. In fact, fishers are also finding it hard to go into other industries such as crabbing or construction because these are depressed as well." Surfclams and ocean quahogs are the two most important species, but summer flounder, black sea bass, sea scallops, bigeye tuna, swordfish, spiny dogfish, and yellowfin tuna are also species of interest.

Draggers take a variety of species, but primarily summer flounder and spiny dogfish. They trawl year round for summer flounder, black sea bass, and scup. From April through September they target summer flounder almost exclusively. Black sea bass are important species for inshore handline fishers. There has also been a significant sea bass pot fishery, with black sea bass landed value being second only to summer flounder in many years though it has seen some decline recently. The black sea bass pot fishery runs from April to September. The top ten species by value (1992) landed in Ocean City are: surf clam (34.09%), ocean quahog (28.04), summer flounder (4.83%), black sea bass (4.69%), sea scallop (4.07%), bigeye tuna (3.94%) swordfish (3.78%), spiny dogfish

(3.66%), yellowfin tuna (3.62%), and lobster (1.51%). Bluefish ranked 29th in importance, accounting for 0.10% of the total landed value in this port.

"Most of the vessels in Ocean City are owner-operated but a few hire captains. Most owners pay their crew by the share system. A few African-Americans are in the crews and at least one boat had an African-American captain." Captains range from age 23 and up.

"Businesses that serviced the surfclam and ocean quahog fishery such as trucking, fuel and ice have declined tremendously. There are unloading areas in Ocean City as well as local buyers. Fluke [summer founder] and black sea bass are taken to New York or Norfolk to bigger fish houses. During the summer, more summer flounder is sold locally and in Baltimore. Big-eye tuna and the best yellowfins go to Japan and bring a lot of money per pound."

"Ocean City is a well known recreational fishing port with many offshore charter boats." Pelagic boats target white marlin, as also tuna, bluefins and big eyes. Atlantic mackerel are also popular targets.

<u>Belford/Pleasant Point/Barnegat Light/Long Beach, New Jersey</u>

Belford's fleet is mostly in the 40-60 foot range and most vessels are older. This is a family based fishing port, with draggers, pound netters and lobster potters predominating. Most of the fish are handled by a local cooperative, with other firms handling lobster and shellfish. There is little or no tourism. Point Pleasant is more diverse and larger. It is less dominated by family businesses. There are half a dozen fish houses, including a cooperative. There are also a lot of marine-related industries and a strong tourist sector. Barnegat Light is heavily tourism oriented in the summer but becomes more dependant on fishing in the winter.

Most boats in these ports are owner-operated, and there are no freezer boats. Whiting is an important species, as are surfclams and ocean quahogs. There is a bluefish poundnet fishery in Sandy Hook Bay. In Belford, bluefish accounted for less than 2% of the total landed value for all species in 1992. In Belford, there is a sink gill-net fishery, which accounted for 0.6% of the total landed value in 1992. It is dominated by weakfish (50%) and bluefish (39%), and also includes butterfish, summer flounder, bluefish, black sea bass, and scup. Run-around gill nets are sometimes used for bluefish. In Point Pleasant, bluefish accounted for less than 1% of the total landed value by all species in 1992. In Point Pleasant, weakfish, bluefish, mackerel, little tunny, and scup are major species landed by gill net boats. Some bluefish are also landed by hand line gear. In Barnegat Light/Long Beach Island, bluefish accounted for less than 2% of the total landed value by all species in 1992. Captains tend to be aged 40-60. "Belford is a place where fishers have little other skilled work experience and thus are particularly dependent on fishing."

There is a charter boat fleet in Barnegat Light which targets mostly bluefish, summer flounder and tuna.

Cape May/Wildwood, New Jersey

Cape May "is noted for its tremendous tourist and beach economy during the summer. While there are marinas in town there is little conflict for space with commercial fishers because the commercial docks are separated from the rest of the community." The general outline of the area fisheries indicate that dogfish are caught by gill netters and they are a bycatch for draggers. There are only a few gill netters in Cape May. For the Cape May/Wildwood area the sink gill net fishery accounted for 0.69% of the total landed value in 1992. However, the gill-netters are almost totally dependent on few species: dogfish (41% landed value), weakfish (27%), and bluefish (11%) in 1992. Other species caught included angler, summer flounder, scup, Atlantic mackerel, and butterfish. The draggers are generally 50-75 feet long, steel hulled, and specialize in scup and summer flounder. "In addition to local boats, a large number of transient boats from North Carolina, Virginia and some northern states land here." The number of boats has been fairly stable recently, however, perhaps due to the great diversity of species landed here.

Brooklyn/Freeport, New York

Vessels originating from these ports are primarily draggers fishing for whiting, summer flounder, winter flounder, *Loligo* squid, and scup. There are also lobster boats in these ports. Most are day boats who take an occasional 48 hour trip for squid. Most boats are owner-operated. "According to one informant, the gill netters target bluefish, weakfish, butterfish, and mackerel." Pay is by the share system. There is also a substantial amount of tourism, with numerous charter boats based in Freeport.

Stonington, Connecticut

Species of importance in the area include lobster, quahog, summer flounder, winter flounder, and squid. Menhaden, bluefish, black sea bass, alewife, and weakfish are important components of the drift gill net fishery. The number of boats in Stonington is stable. Most fishers are of Portuguese descent. The share system is typically used. There are several fish dealers who sell to markets in Baltimore, Philadelphia, Boston and New York, or directly to local fish markets.

Newport/Other Washington County, Rhode Island

"Three ports make up the bulk of the landings in Rhode Island: Point Judith, Quonset Point, and Newport. Point Judith is generally a "wetfish" port, where the fish is most often landed on ice and packaged at port. Newport is similar. Quonset Point is strictly a large factory freezer vessel port. Newport traditionally landed groundfish and lobster, but in the early 1990s began targeting squid, mackerel, butterfish, scup and dogfish."

"Groundfishing boats, a few scallopers, gill-netters, and draggers make up the range of boats in Newport. While Newport's fish potters rely almost entirely on scup, they also catch a little tautog, small amounts of black sea bass, bluefish, and summer flounder, among other species"

"Newport's small gill-net fishery relies heavily on anglers, as well as its traditional cod, tautog, and bluefish catches. Newport's gill-netters also land the majority of spiny dogfish. They also land large amounts of weakfish and small amounts of *Loligo* squid." Newport's floating trap fishery targets among others: scup, bluefish, summer flounder, Atlantic mackerel, black sea bass, and *Loligo* squid.

Point Judith harbors some minor fisheries. Pot fisheries, besides lobster, are heavily reliant on scup, and pots catch a small percentage of black sea bass, as well as tautog, conger eel, and small amounts of bluefish. Point Judith's small gill net fishery depends heavily on angler, as well as cod, dogfish, tautog, and other species. Bluefish, Atlantic mackerel, summer flounder, black sea bass, weakfish, and butterfish in small quantities are landed in the gill-net fishery. Angler are caught predominantly by draggers, accounting for the bulk of the total landed value for the dragger fishery in 1992. Bluefish, butterfish, summer flounder, scup, black sea bass, squids and weakfish, are also landed by draggers.

Newport has several commercial fish packing and distributing firms, but is also heavily oriented to yachting and tourism. Few non-fishing jobs are available, however. Point Judith is almost exclusively a fishing town, though there is some summer tourism, mostly related to Block Island. The Point Judith coop employed some local labor as well, but is now closed.

New Bedford, Massachusetts

"The dominant gear types in new Bedford are scallop dredges and otter trawls." Angler, summer flounder, spiny dogfish, *Loligo* squid, and scup are among the most important species landed in New Bedford.

Chatham, Massachusetts

"Chatham is a seasonal resort community. It is a wealthy community and property values are very high. Sportfishing and commercial fishing are important to the community. However they do not seem to be the mainstays of the community's economy. Chatham's fishing community is divided between two ports, Chatham Harbor on the east coast of town, and Stage Harbor on the south side of town. Scup, fluke, sea bass, mackerel, butterfish, weakfish and bluefish are caught as miscellaneous fish by Chatham Harbor boats. Chatham boats are all under 50 feet and are owner-operated. Most crew are paid by the share system and others are paid by the day or are wage workers."

Other North Carolina locations

In the work conducted by McCay *et al.* (1993), the only port described in North Carolina was Wanchese. This section further describes the general characteristics of fishing activities in North Carolina. The descriptive information that follows is excerpted and paraphrased from a report prepared by Griffith (1996), and is based on visits to fishing centers around the state, surveys, and in depth-interviews.

The information presented in this section is based on the following visited locations: Swan Quarter, Englehard, Rose Bay, Germantown, and Ocracoke in Hyde County; Belhaven, and Aurora in Beaufort County; Hatteras, Wanchese, and Alligator River in Dare County; Atlantic, Stacey, Beaufort and Salter Path in Carteret County; Vandamere and Paradise in Pamlico County; Sneads Ferry, and Hampstead in Oslow County; and Varnumtown in Brunswich County.

"First, most obviously, the busiest fishing season for almost all sites visited begins in the spring and lasts through summer, with December through February being relatively quiet in most locations. Exceptions to this are the fisheries of the Outer Banks, which tend to be net-based and to target winter species. Second, despite the fact that we find a number of extremely large vessels in the state, crews on most vessels tend to be small (<45'). Most crews consist of between one and three fishermen and many interviewed fishermen fish alone. The menhaden fishery, of course, is an exception to this (Garrite-Blake 1995). Third, relatively few sites we visited specialize in only one species, one type of gear, or one type of vessel. Crab pots and shrimp or otter trawls rank high among the principal gears used in the state, but others tend to be found in use alongside these either by the same fishermen or by others using the same docking and other facilities. Fourth, few full-time, owner-operator North Carolina fishermen rely on a single species or single gear for their livelihood, and many operate from more than one vessel; indeed, this diversity and flexibility constitutes one of the central defining characteristics of a full-time fishermen in North Carolina. Small crew sizes, especially those based on family and community relations, are adaptive under these conditions, where shifting among fishing gears and locations does not depend on mobilizing large numbers of crewmen. Fifth, this diversity and flexibility has some implications for managing the fisheries of the state. Although fishermen tend to be defined by the *primary* species they target and gear they use to capture those species, such as shrimpers using otter trawls or crabbers using crab pots, North Carolina fishermen become more alike one another, often, in the *secondary* species they target and, in particular, the gears they use for those species. Sixth, North Carolina fisheries are highly localized. Those sites with access to both inland and off-shore waters, such as fishermen based in Wanchese or the Outer Banks or Carteret County, have more options available to them to switch among fisheries and even between recreational and commercial sectors (such as operating as charter boat fishermen) than fishermen based along the Pamlico River or Albemarle Sound. Some fishermen, recognizing the advantages to these different locations, dock boats at more than one location or utilize more than one launching facility. However, several fishermen we interviewed had little or no idea about the character of fisheries fewer than fifty to sixty miles away. Seventh, regional differences occur among the fisheries as we move from North to South, yet are more pronounced as we move from East to West. For example, those fishermen who fish in the Albemarle Sound are more like fishermen of the Pamlico River than they are like those who operate out of Wanchese. Urban and rural distinctions also figure into these differences, fishing strategies of around the Nags Head/Manteo are more similar to Morehead City and Wilmington fishing strategies than they are toward those of Eastern Dare further down the Outer Banks. Finally, with the exception of crab processing plants, most shore sites are staffed by relatively few people on land; most of the work of off-loading, icing, and other handling of the catch is done by fishermen."

Regarding the present aspects of the fishery in the area, it was found that "North Carolina's principal fisheries have change considerably through time, yet certain historical continuities thread through the fishing lifestyles we find on the coast from prehistoric and colonial times to the present." Some families in the Tidewater area (Hyde County) still depend on combining commercial crabbing, eeling, gill net fishing, trapping, hunting, and hiring out as guides to hunters and sportfishermen. Individuals around the upper reaches of the Albemarle Sound still string together seasonal work in the herring fishery, hunting, logging, and from time to time, farming. "Two of the earliest fisheries in North Carolina provided an organizational template for fisheries that continue, in altered form, today. The early herring fisheries on the Chowan River and the Albemarle Sound were highly capitalized fisheries in which harvesting and processing were as tightly integrated as today's menhaden fishery."

Three of the main landing ports for spiny dogfish (Wachapreague, VA; Plymouth, MA; and Scituate, MA) were not included in the hearing draft and are briefly 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 the most recent weighout data (1997), several ports are extremely dependent on the spiny dogfish fishery and derived 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 (Table 35).

Clearly these ports are very dependent upon spiny dogfish landings and 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 FMP in the short-term.

3.0 ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES

3.1 MANAGEMENT ALTERNATIVES

3.1.1 Preferred Measures to Attain Management Objectives

3.1.1.1 Specification of OY, DAH, DAP, JVP, and TALFF

Section 600.310 (b) states that the determination of OY is a decisional mechanism for resolving the Magnuson-Stevens Act's multiple purposes and policies, implementing an FMP's objectives, and balancing the various interests that comprise the national welfare. OY is to be based on MSY, or on MSY as it may be reduced for social, economic, or ecological reasons. The most important limitation on the specification of OY is that the choice of OY and the conservation and management measures proposed to achieve it must prevent overfishing.

OY is all spiny dogfish harvested pursuant to this FMP as determined by the overfishing definition and rebuilding schedule detailed in this FMP. OY will change as the fishing mortality rate target varies and is dependent on the level of adult stock biomass.

The Council has concluded that U.S. vessels have the capacity to, and will, harvest the OY on an annual basis, so DAH equals OY. The Council has also concluded that US fish processors, on an annual basis, will process that portion of the OY that will be harvested by U.S. commercial fishing vessels, so DAP equals DAH and JVP equals zero. Since US fishing vessels have the capacity and intent to harvest the entire OY, there is no portion of the OY that can be made available for foreign fishing, so TALFF also equals zero.

3.1.1.2. Rebuilding schedule

The SFA requires the Councils to set the overfishing definition to meet a new standard (F_{MSY}) or a suitable proxy . In addition, the resource must be rebuilt to the biomass associated with MSY, B_{MSY} or a suitable proxy in as short a period as possible. The rebuilding period is not to exceed 10 years, except where biology, environmental conditions or international agreements dictate otherwise.

In the most recent assessment for spiny dogfish, NEFSC (1998) 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 71% of the target biomass (90 % of SSB_{max}, , the proxy for B_{MSY}) based on a three year moving average of adult female biomass estimates form the NEFSC spring survey. In addition, the estimate for 1997 was 185 million pounds (84,000 mt) which is below the minimum biomass threshold. Thus, the spiny dogfish stock is considered overfished according to the new SFA overfishing guidelines and requires rebuilding. This FMP addresses the overfishing problem and plans to rebuild the resource to meet SFA requirements over a five year planning horizon.

The preferred alternative will eliminate overfishing and rebuild the spiny dogfish stock through a two step reduction in fishing mortality rate. The first step allows for a one year exit fishery of 22 million pounds (10,006 mt) 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 will be reduced to 0.2 and then F will be reduced to F=0.03 in the remaining four years of the rebuilding plan (2000-2003). This schedule allows for stock rebuilding to the level which is 90% of the B_{MSY} in the year 2003.

3.1.1.3 Permit requirements for commercial vessels

Any owner of a vessel desiring to fish for spiny dogfish within the US EEZ for sale, or transport or deliver for sale, any spiny dogfish taken within the EEZ must obtain a federal commercial vessel permit from NMFS for that purpose.

The federal costs of implementing an annual permit system for the sale of spiny dogfish shall be charged to permit holders as authorized by section 303(b)(1) of the Magnuson-Stevens Act. In establishing the annual fee, the NMFS Regional Administrator will ensure that the fee does not exceed the administrative costs incurred in issuing the permit, as required by section 304(d) of the Magnuson-Stevens Act.

3.1.1.4 Dealer permits and fees

Any dealer of spiny dogfish must have a permit. A dealer of spiny dogfish is defined as a person or firm that receives spiny dogfish for a commercial purpose from a vessel possessing a commercial spiny dogfish permit pursuant to this FMP for other than transport.

An applicant must apply for a federal dealer permit in writing to the Regional Administrator. The application must be signed by the applicant and submitted to the Regional Administrator at least 30 days before the date upon which the applicant desires to have the permit made effective. Applications must contain the name, principal place of business, mailing address and telephone number of the applicant. The Regional Administrator will notify the applicant of any deficiency in the application. If the applicant fails to correct the deficiency within 15 days following the date of notification, the application will be considered abandoned. Except as provided in Subpart D of 15 CFR Part 904, the Regional Administrator will issue a permit within 30 days of the receipt of a completed application.

A permit expires on 31 December of each year or if the ownership or the dealer changes. Any permit issued under this section remains valid until it expires, is suspended, is revoked, or ownership changes. Any permit which is altered, erased, or mutilated is invalid. The Regional Administrator may issue replacement permits. Any application for a replacement permit shall be considered a new permit.

A permit is not transferable or assignable. It is valid only for the dealer to whom it is issued.

The permit must be displayed for inspection upon request by an authorized officer or any employee of NMFS designated by the Regional Administrator.

The Regional Administrator may suspend, revoke, or modify, any permit issued or sought under this section. Procedures governing permit sanctions or denials are found at Subpart D of 15 CFR Part 904. The Regional Administrator may, after publication of a notice in the *Federal Register*, charge a permit fee. Within 15 days after the change in the information contained in an application submitted under this section, the dealer issued the permit must report the change in writing to the Regional Administrator.

3.1.1.5 Operator permit and fees

Any individual who operates a vessel for the purpose of fishing commercially for spiny dogfish (i.e., possesses a valid commercial vessel permit spiny dogfish) must obtain an operators permit. Any vessel fishing commercially for spiny dogfish must have on board at least one operator who holds an operators permit. That operator may be held accountable for violations of the fishing regulations and may be subject to a permit sanction. During the permit sanction period, the individual operator may not work in any capacity aboard a federally permitted fishing vessel.

The federal permit program has the following requirements:

1. Any operator of a commercial vessel fishing for spiny dogfish must have an operator's permit issued by the NMFS Regional Administrator.

2. An operator is defined as the master or other individual on board a vessel who is in charge of that vessel (see 50 CFR 620.2).

3. The operator is required to submit an application, supplied by the Regional Administrator, for an Operator's Permit. The permit will be issued for a period of up to three years.

4. The applicant would provide his/her name, mailing address, telephone number, date of birth and physical characteristics (height, weight, hair and eye color, etc.) on the application. In addition to this information, the applicant must provide two passport-size color photos.

5. The permit is not transferable.

6. Permit holders would be required to carry their permit aboard the fishing vessel during fishing and off-loading operations and must have it available for inspection upon request by an authorized officer.

7. The Regional Administrator may, after publication in the *Federal Register*, charge a permit fee.

3.1.1.6 Spiny dogfish FMP Monitoring Committee

The Spiny Dogfish Monitoring Committee is a joint committee made up of staff representatives of the Mid-Atlantic and New England Fishery Management Councils, the Northeast Regional Office, the Northeast Fisheries Center, and state representatives. The state representatives will include any individual designated by an interested state from Maine to Florida. In addition, the Committee will include two non-voting, ex-officio industry representatives (one each from the Mid-Atlantic and New England Council regions). The Mid-Atlantic Council Executive Director or his designee will chair the Committee.

The Spiny Dogfish Monitoring Committee will annually review 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 Committee will also review the gear used to catch spiny dogfish to determine whether gears need to be regulated to help ensure attainment of the fishing mortality rate target and propose such regulations as appropriate.

The Councils will receive the report of the Joint Spiny Dogfish Committee as well as appropriate public input. The Councils will consider this information and jointly determine the quota and framework adjustments for the following year. Next, the Councils will make its recommendations to the Regional Administrator. The Regional Administrator will receive the report of the Councils and publish a report in the *Federal Register* for public comment by the date specified in the regulations, which provides the Councils sufficient time to implement quotas and other management measures. Following the review period, the Regional Administrator will set the final quota and other management measure adjustments for the year. If each option has been rejected by one or the other Council, then the Regional Administrator may select any option that has not been rejected by both Councils.

In summary, the steps from the Monitoring Committee to action by the Councils and Regional Administrator are:

1. The Monitoring Committee reviews the data and makes recommendations to the Joint Spiny Dogfish Committee.

2. The Joint Spiny Dogfish Committee considers the recommendations of the Monitoring Committee in determining the annual quota and framework adjustments and makes recommendations to the Councils.

3. The Councils consider the recommendations of the Joint Spiny Dogfish Committee and make their recommendations to the Regional Administrator.

4. The Regional Administrator considers the recommendations of the Councils decision and publishes proposed measures in the *Federal Register*. If each option is rejected by one or the other Council, then the Regional Administrator may select any option that has not been rejected by both Councils.

3.1.1.7 Framework adjustment process

In addition to the annual review and modifications to management measures detailed in section 3.1.1.6, the Councils could add or modify management measures through a framework adjustment procedure. This adjustment procedure allows the Councils to add or modify management measures through a streamlined public review process. As such, management measures that have been identified in the plan could be implemented or adjusted at any time during the year.

The following management measures could be implemented or modified through framework adjustment procedures:

1. Minimum fish size.
2. Maximum fish size.
3. Gear requirements, restrictions or prohibitions (including, but not limited to, mesh size restrictions and net limits).
4. Regional gear restrictions.
5. Permitting restrictions and reporting requirements.
6. Recreational fishery measures including possession and size limits and season and area restrictions.
7. Commercial season and area restrictions.
8. Commercial trip or possession limits.
9. Fin weight to spiny dogfish landing weight restrictions.
10. Onboard observer requirements.
11. Commercial quota system including commercial quota allocation procedure and possible quota set asides to mitigate bycatch, conduct scientific research or for other reasons.
12. Recreational harvest limit.
13. Annual quota specification process.
14. FMP Monitoring Committee composition and process.
15. Description and identification of essential fish habitat.
16. Description and identification of habitat areas of particular concern
17. Overfishing definition and related thresholds and targets.
18. Regional season restrictions (including option to split seasons).
19. Restrictions on vessel size (LOA and GRT) or shaft horsepower.
20. Target quotas.
21. Measures to mitigate marine mammal entanglements and interactions.
22. Regional management.
23. Any other management measures currently included in the FMP.
24. Measures to regulate aquaculture projects.

The adjustment procedure would involve the following steps. If the Councils determine that an adjustment to management measures is necessary to meet the goals and objectives of the Spiny Dogfish FMP, they will recommend, develop and analyze appropriate management actions over the span of at least two Council meetings. The Councils will provide the public with advance notice of the availability of the recommendation, the appropriate justifications and economic and biological analyses, and opportunity to comment on the proposed adjustments prior to and at the second Council meeting. After developing management actions and receiving public testimony, the Councils will then submit the recommendation to the Regional Administrator. The Councils recommendation to the Regional Administrator must include supporting rationale, an analysis of impacts, and a recommendation to the Regional Administrator on whether to publish the management measures as a final rule.

If the Councils recommend that the management measures should be published as a final rule, the Councils must consider at least the following factors and provide support and analysis for each factor considered:

1. Whether the availability of data on which the recommended management measures are based allows for adequate time to publish a proposed rule.

2. Whether regulations have to be in place for an entire harvest/fishing season.

3. Whether there has been adequate notice and opportunity for participation by the public and members of the affected industry in the development of the Councils recommended management measures.

4. Whether there is an immediate need to protect the resource.

5. Whether there will be a continuing evaluation of management measures adopted following their promulgation as a final rule.

If, after reviewing the Councils recommendation and supporting information:

1. The Regional Administrator concurs with the Councils recommended management measures and determines that the recommended management measures may be published as a final rule, then the action will be published in the Federal Register as a final rule; or

2. The Regional Administrator concurs with the Councils recommendation and determines that the recommended measures should be published first as a proposed rule, the action will be published as a proposed rule in the Federal Register. After additional public comment, if the Regional Administrator concurs with the Council recommendation, the action will be published as a final rule in the Federal Register; or

3. The Regional Administrator does not concur, the Councils will be notified, in writing, of the reason for non-concurrence.

4. Framework actions can be taken only in the case where both Councils approve the proposed measure.

3.1.1.8 Commercial management measures

3.1.1.8.1 Commercial quota

The process used to set the quota is specified in 3.1.1.6. A quota would be allocated to the commercial fishery to control fishing mortality. The quota would be based on projected stock size estimates for that year as derived from the latest stock assessment information. Estimates of stock size coupled with the target fishing mortality rate would allow for a calculation of total allowable landings (TAL). The quota will be specified for the fishing year which will be defined as May 1 - April 30.

During the first year of the FMP, the quota will be set at 22 million pounds (10,006 mt) to allow a phase out of the directed fishery. This one year "exit" 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 will be reduced to 0.2 and then F will be reduced to F=0.03 in the remaining four years of the rebuilding plan (2000-2003). This schedule allows for stock rebuilding to the level which will support harvests at or near the MSY level in the year 2003. Assuming that F does not exceed 0.2 in year 1, the TALs in the remaining 4 years of the rebuilding program would be those specified in Table 36.

A system to distribute and manage the annual commercial quota on a seasonal basis within the fishing year would be implemented by NMFS. Quotas would be distributed between seasons based on the percentage of commercial landings for the each semi-annual period during the years 1990-1997. These season specific quotas are specified in Table 37. The specification of the seasonal allocation may change under the framework procedure described in section 3.1.1.7.

After year one of the management program, the annual commercial quota will be set at a range of between 0 and the maximum allowed by the adopted fishing mortality rate reduction strategy. The commercial quota includes all landings for sale by *any* gear. If a person or vessel does not have a commercial spiny dogfish permit, the fish may not be sold and any recreational rules on size, possession, and season apply.

The annual commercial quota would be based on the recommendations of the Spiny Dogfish FMP Monitoring Committee to the Councils. The commercial quota may change annually, if appropriate, following the Spiny dogfish Monitoring Committee process set forth in 3.1.1.6. However, the quota may be specified for a period of up to three years.

The quota will apply throughout the management unit, that is, in both state and federal waters. All spiny dogfish landed for sale in a state would be applied against commercial quota regardless of where the spiny dogfish were harvested. Using data collected through this FMP (section 3.1.1.11), NMFS will monitor the fishery to determine when a quota will be reached. The Regional Administrator shall prohibit landings of spiny dogfish by vessels with federal spiny dogfish permits when the quota has been landed. In addition, each state is encouraged to close state waters to take of spiny dogfish when the quota is landed.

3.1.1.9 Prohibition of finning

Finning, the act of removing the fins of spiny dogfish and discarding the carcass, will be prohibited. Vessels which land spiny dogfish must land fins in proportion to carcasses, with a maximum of a 5% fin to carcass ratio, by weight. Fins may not be stored aboard a vessel after the first point of landing.

3.1.1.10 Other measures

Only persons with a dealer permit may buy spiny dogfish at the point of first sale landed by an individual that has a commercial spiny dogfish permit issued pursuant to this FMP. Only persons with a dealer permit may buy spiny dogfish landed by a vessel that has a commercial permit issued pursuant to this FMP.

Individuals and owner/operators with commercial permits may sell spiny dogfish at the point of first sale only to a dealer that has a dealer permit issued pursuant to this FMP.

The amount of spiny dogfish on board a vessel using mesh sizes smaller than those specified for trawl or gill net gear may not exceed the minimum threshold (if specified).

All spiny dogfish on vessels fishing with a mesh smaller than the legal minimum size (if one is specified) must have any spiny dogfish on board boxed in a manner that will facilitate enforcement personnel knowing whether the vessel has more than the level specified of spiny dogfish on board to meet the minimum mesh size criterion. Any unboxed spiny dogfish on board a vessel fishing with a net smaller that the legal minimum is considered a violation of this FMP. A box holds 100 lbs of spiny dogfish and is approximately 36" long, 15" wide, and 12" high (approximately 3.75 cubic feet).

The Regional Administrator may place sea samplers aboard vessels if he determines a voluntary sea sampling system is not giving a representative sample from the spiny dogfish fishery.

No foreign fishing vessel shall conduct a fishery for or retain any spiny dogfish. Foreign nations catching spiny dogfish shall be subject to the incidental catch regulations set forth in 50 CFR 611.13, 611.14, and 611.50.

The Regional Administrator, in consultation with the Executive Directors, may exempt any person or vessel from the requirements of this 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 this FMP except those necessarily relating to the purpose and nature of the exemption. The exemption will 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 is 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.

3.1.1.11 Specification and sources of pertinent fishery data

3.1.1.11.1 Domestic and foreign fisheries

Section 303(a)(5) of the MSFCMA requires that the Councils specify the pertinent data which shall be submitted to the Secretary with respect to commercial, recreational, and charter/party fishing in the fishery, including, but not limited to, information regarding the type and quantity of fishing gear used, catch by species in numbers of fish or weight thereof, areas in which fishing was engaged in, time of fishing, number of hauls and the estimated processing capacity of, and actual processing capacity utilized by, United States fish processors. In order to achieve the objectives of this FMP and to manage the fishery for the maximum benefit of the US, it is necessary that, at a minimum, the Secretary collect on a continuing basis and make available to the Councils: (1) spiny dogfish catch, effort, and ex-vessel value and the catch and ex-vessel value of those species caught in conjunction with spiny dogfish for the commercial fishery provided in a form that analysis can be performed at the trip, water area, gear, month, year, principal (normal) landing port, landing port for trip, and state levels of aggregation; (2) catch, effort and discards for the recreational fishery; (3) biological (e.g., length, weight, age, and sex) samples from both the commercial and recreational fisheries; and (4) annual and fully comparable NMFS bottom trawl surveys for analyses of both CPUE and age/size frequency. The Secretary may implement necessary data collection procedures through amendments to the regulations. It is mandatory that these data be collected for the entire management unit on a compatible and comparable basis.

Commercial logbooks must be submitted on a monthly basis by federal commercial permit holders in order to monitor the fishery.

It is intended that the reports required by this section are the same as the reports required by the Summer Flounder FMP, the Northeast Multispecies FMP, and the Atlantic Sea Scallop FMP. That is, fishermen need to submit one logbook report, not one report for each FMP.

Foreign fishermen are subject to the reporting and record keeping requirements in 50 CFR 611.

3.1.1.11.2 Dealers

In order to monitor the fishery and enable the Regional Administrator and the states to forecast when a closure will be needed, dealers with permits issued pursuant to this FMP must submit weekly reports showing at least the quantity of spiny dogfish purchased (in pounds), and the name and permit number of the individuals from whom the spiny dogfish was purchased. Dealers having state permits should report to the state or NMFS all spiny dogfish purchased. States should report state landings weekly to NMFS.

Buyers that do not purchase directly from vessels are not required to submit reports under this provision. Dealers should report only those purchases from vessels with commercial permits for spiny dogfish.

3.1.1.11.3 Processors

Section 303(a)(5) of the MSFCMA requires that at least estimated processing capacity of, and the actual processing capacity utilized by U.S. fish processors, must be submitted to the Secretary. The Secretary may implement necessary data collection procedures through amendments to the regulations.

3.1.2 Alternatives to the Preferred Management Measures

3.1.2.1 Take no action at this time

This would mean that the spiny dogfish fishery would remain unregulated and overfishing would continue.

3.1.2.2 Alternative rebuilding schedules

3.1.2.2.1 Reduce fishing mortality to F=0.04 in year one and maintain to allow stock rebuilding in four years to rebuild to biomass target (90% of B_{MSY})

This option would require a reduction in fishing mortality to F=0.04 in years 1-4 and would allow for stock rebuilding over a four year planning horizon by maintaining a constant F. Total allowable landings (TAL) or quota would have to be reduced to 5.1 million pounds (2,300 mt) during the first four years of the management program (1999-2003). TAL would then increase to level associated with the long term target F or about 14 million pounds (6250 mt) at the current size at entry.

3.1.2.2.2 Reduce fishing mortality in year one half way between $F_{current}$ and $F_{threshold}$, in year two reduce fishing mortality to $F_{threshold}$ and in year three reduce F to level required to rebuild stock in remaining eight years of the rebuilding program

This option would require a reduction in fishing mortality to F=0.204 in year one (half way between $F_{current}$ and $F_{threshold}$), in year two fishing mortality would be reduced to $F_{threshold}$ or F=0.11. Under this scenario, if F was reduced to F=0.026 in ensuing eight years, the stock would be rebuilt to the target SSB by the tenth year. In year 1 the TAL would be 22.5 million pounds (10,196 mt), in year 2 TAL would equal 11.3 million pounds (5,130 mt) and in the eight remaining years TAL would range from 2.8 - 3.4 million pounds (1,262 - 1,558 mt).

3.1.2.2.3 Reduce fishing mortality in year one to allow a harvest of 13.7 million pounds (6,238 mt) and in year two reduce F to allow for harvest of 9.0 million pounds (4,117 mt) then reduce F to the level required to rebuild stock in remaining three years of the rebuilding program

This option would require a reduction in fishing mortality in year one to allow a harvest of 13.7 million pounds (6,238 mt) and in year two to allow for a harvest of 9.0 million pounds (4,117 mt), F would then be reduced to F=0.028 to rebuild the stock in the remaining three years of the rebuilding program. In the last three years of the rebuilding program, TAL would be approximately 3.3 million pounds (1,500 mt).

3.1.2.2.4 Reduce fishing mortality to F=0.072 in year one and maintain to allow stock rebuilding in 15 years to rebuild to biomass target

This option would require a reduction in fishing mortality to F=0.072 in years 1-15 and would allow for stock rebuilding over a 15 year planning horizon by maintaining a constant F. This option would not meet the requirements of the SFA.

3.1.2.2.5 Reduce fishing mortality to F=0.078 in year one and maintain to allow stock rebuilding in 20 years to rebuild to biomass target

This option would require a reduction in fishing mortality to F=0.078 in years 1-20 and would allow for stock rebuilding over a 20 year planning horizon by maintaining a constant F. This option would not meet the requirements of the SFA.

3.1.2.2.6 Reduce fishing mortality to F=0.088 in year one and maintain to allow stock rebuilding in 30 years to rebuild to biomass target

This option would require a reduction in fishing mortality to F=0.088 in years 1-30 and would allow for stock rebuilding over a 30 year planning horizon by maintaining a constant F. This option would not meet the requirements of the SFA.

3.1.2.3. Establish a coastwide trip limit

This alternative would establish a system of uniform trip limits established on a coastwide basis in conjunction with the quota system. To estimate allowable trip limits under any of the scenarios requires an estimation of the number of trips likely to be taken during each year of the management program. For example, there are roughly 5,000 vessels which currently possess permits to fish in the EEZ from ME to NC. Assuming that each vessel makes 100 trips per year, and that half of those trips could land spiny dogfish, yields an estimate of 250,000 trips. If the annual TAL was 2.9 million pounds (1,316 mt) in the year 2000, the associated trip limit would be about 12 lbs. This analysis suggests that any trip limit specified on an annual basis would be very low. A trip limit could also be specified for a limited season which might allow for a higher trip limit.

3.1.2.4 Minimum size limits

3.1.2.4.1 Establish a minimum size which corresponds to the length at which 50% of female spiny dogfish are sexually mature

This alternative would establish a minimum size for spiny dogfish which corresponds to the length at which 50% of female spiny dogfish are sexually mature. This would require a minimum size of 32 in (80 cm).

3.1.2.4.2 Establish a minimum size which corresponds to the length at which 100% of female spiny dogfish are sexually mature

This alternative would establish a minimum size for spiny dogfish which corresponds to the length at which 100% of female spiny dogfish are sexually mature. This would require a minimum size of 36 in (91 cm).

3.1.2.4.3 Establish minimum a size of 27.5 in (70 cm)

This alternative would establish a minimum size of 27.5 in, which is the current effective minimum size at capture for spiny dogfish in the commercial fishery.

3.1.2.4.4 Establish a slot size limit of 27.5 in to 32 in (70-80 cm)

Each of the stock rebuilding strategies which meet the SFA requirements could be implemented with a slot size limit of 27.5 in to 32 in (70-80 cm). This alternative would require that the F applied in any given year be applied fully to a slot limit of 27.5 in to 32 in (70-80 cm) and that a partial recruitment vector of 0.5 of that F was applied to dogfish greater than 32 in (80 cm). Under these scenarios only fish from 27-32 in (70-80 cm) could be retained, and it was assumed that fish greater than 32 in (80 cm) would continue to be caught and discarded, with an effective mortality rate of 50% of those landed in the slot. The results indicated that this strategy would result in lower yields and would not alter the rebuilding time frame.

3.1.2.5 Alternative seasonal allocation of the commercial quota

3.1.2.5.1 Allocate commercial quota on a quarterly basis

The process used to set the quota is specified in 3.1.1.6. A quota would be allocated to the commercial fishery to control fishing mortality. The quota would be based on projected stock size estimates for that year as derived from the latest stock assessment information. Estimates of stock size coupled with the target fishing mortality rate would allow for a calculation of total allowable landings (TAL).

A system to distribute and manage the annual commercial quota on a seasonal basis would be implemented by NMFS. Quotas would be distributed between seasons based on the percentage of commercial landings for each quarterly period during the years 1990-1997. These season specific quotas are specified in Table 37.

3.1.2.5.2 Allocate commercial quota on a bi-monthly basis

The process used to set the quota is specified in 3.1.1.6. A quota would be allocated to the commercial fishery to control fishing mortality. The quota would be based on projected stock size estimates for that year as derived from the latest stock assessment information. Estimates of stock size coupled with the target fishing mortality rate would allow for a calculation of total allowable landings (TAL).

A system to distribute and manage the annual commercial quota on a seasonal basis would be implemented by the Councils. Quotas would be distributed between seasons based on the percentage of commercial landings for each bi-monthly period during the years 1990-1997. These season specific quotas are specified in Table 37.

3.1.2.6 Limit entry into the spiny dogfish fisheries

Under this alternative, vessels would have to qualify for a limited access commercial permit for spiny dogfish. The qualifying criteria would be based on historical performance in the fishery at a level specified by the Councils. The intent of this action would be to limit the number of participants in the commercial fishery for spiny dogfish.

3.1.2.7 Specify a target commercial quota

Under this alternative, the Councils would specify a target commercial quota in place of the "hard" or fixed quota specified in the preferred alternative. This approach to managing the commercial fishery would require additional management measures which would control fishing effort (i.e., input controls). Under this system an annual target quota would be specified and a suite of effort controls would be specified such that the landings under the effort control system would be expected to approximate the target quota. The fishery would not necessarily be closed if the target quota is reached or exceeded. This system depends on fishing effort limitations primarily through limitations on the number of days that vessels may fish during the quota period.

3.1.2.8 Gill net limitations

Under this alternative, commercial gill net vessels fishing for spiny dogfish would be prohibited from fishing more than a total of 80 nets (50 fathoms each).

3.1.3 The FMP Relative to the National Standards

Section 301(a) of the MSFCMA states: "Any fishery management plan prepared, and any regulation promulgated to implement such plan pursuant to this title shall be consistent with the following national standards for fishery conservation and management. The following is a discussion of the standards and how this amendment meets them:

3.1.3.1 Conservation and management measures shall prevent overfishing while achieving, on a continuous basis, the optimum yield from each fishery for the United States fishing industry.

The SFA, which reauthorized and amended the Magnuson-Stevens Act, made a number of changes to the existing National Standards. With respect to National Standard 1, the SFA imposed new requirements concerning definitions of overfishing in fishery management plans. To comply with National Standard 1, the SFA requires that each Council FMP define overfishing as a rate or level of fishing mortality that jeopardizes a fishery's capacity to produce maximum sustainable yield (MSY) on a continuing basis.

Each FMP must specify objective and measurable status determination criteria for identifying when stocks or stock complexes covered by the FMP are overfished. To fulfill the requirements of the SFA, status determination criteria for spiny dogfish are comprised of two components: 1) a maximum fishing mortality threshold and 2) a minimum stock size threshold. The maximum F threshold should be specified as F_{MSY} (or a suitable proxy) and the minimum biomass threshold should be specified as ½ B_{MSY} (or a suitable proxy).

For spiny dogfish, MSY could not be reliably estimated from a surplus production model, like other stocks that have better catch and effort data. This approach also gives results that are conditioned on the exploitation pattern, which appears to be changing (the fishery has targeted smaller fish with time). In lieu of this approach, Applegate *et al.* (1998) and the Dogfish Technical Committee recommended using yield-per-recruit biological reference points that maximize yield and protect against declines in total recruitment. Yield-per-recruit analyses do not give any advice on the amount of recruitment or how it changes with stock size. To estimate a stock size that would maximize recruitment, a stock-recruitment model was fitted to spawning stock biomass and recruitment observations. The stock size that would maximize average recruitment is known as the SSB_{max} and was recommended as a proxy value for B_{MSY}. This value is estimated to be 440 million pounds (200,000 mt) and was measured as a swept-area biomass index of adult females from the NEFSC spring survey. As a proxy for F_{MSY}, Applegate *et al.* (1998) recommended using F_{rep} with a pup-per-recruit ratio of 1.0 or the fishing mortality rate which allows for the production of 1.0 female pup per female recruit to adult stock (i.e., the adult female portion of the stock is replacing itself). This fishing mortality rate is currently estimated to be $F=0.11$.

The SFA also requires that a risk averse fishing mortality target be specified as well as a biomass target, which is the stock level associated with MSY (B_{MSY}). For spiny dogfish, Applegate *et al.* 1998 recommended specifying the target fishing mortality rate as F_{rep} with a pup-per-recruit ratio of 1.5, or the fishing mortality rate which allows for the production of 1.5 female pups per female recruit (estimated to be F=0.08 for current size at first entry to the fishery). The Councils have chosen a target stock biomass of 397 million pounds (180,000 mt) which is 90% of B_{MSY} (as represented by the proxy SSB_{max}).

Recommended biological reference points that would define overfishing and overfished conditions for spiny dogfish (from Applegate *et al.* 1998).

Reference point	Basis	Estimated value
Biomass target	90% of SSB_{max} (the female spawning stock biomass calculated to produce maximum recruitment on the Ricker S/R function).	397 million pounds (180,000 mt) female spawning stock biomass
Biomass threshold	½ SSB_{max} - defines a 10 year rebuilding program when female SSB > ½ SSB_{max} and a 5 year rebuilding program when female SSB < ½ SSB_{max}.	220 million pounds (100,000 mt) female spawning stock biomass.
Total swept-area adult female biomass - 1995-1997	Status quo value.	279 million pounds (127,000 mt) (64% of the biomass target).
Fishing mortality target	Defined by the fishing mortality rate that would allow stock production at 1.5 pups per recruit.	0.082 with a 27.5 in (70 cm) size-at-entry to the fishery and 0.118 at 32 in (80 cm).
Fishing mortality threshold	The fishing mortality rate that stabilizes the population at the SSB_{max} when recruitment @ 27.5 in (70 cm).	0.11 (51 percent of current fishing mortality).
Current fishing mortality - three-year smoothed average.	Status quo value.	0.297

The female spawning stock, SSB_{max} is the point on the Ricker stock-recruitment curve that would produce the highest average recruitment over time, if spawning stock biomass remains constant. Applegate *et al.* (1998) recommended using this total female biomass level as a proxy for B_{MSY}, because it maximizes average recruitment. The reader is cautioned that this does not represent the maximum level of female biomass observed for spiny dogfish. When a fishing mortality rate that maximizes yield-per-recruit is applied, this biomass approximates a level that would maximize total yield. Using a swept-area method for calculating total biomass from a survey index, the Ricker equation gives a SSB_{max} value of 440 million pounds (200,000 mt). The Councils adopted a value of 90% of SSB_{MAX} as the long term rebuilding stock biomass target which is currently estimated to be 397 million pounds (180,000 mt).

Whenever biomass is low, potentially jeopardizing recruitment success, the Councils should take immediate and significant steps to reduce mortality and rebuild spawning biomass as quickly as possible. Applegate *et al.* (1998) and the Spiny Dogfish Technical Committee panel used a length projection model to estimate rebuilding potential from equilibrium conditions. In general, slower growth rates and lower fecundity make elasmobranchs, like spiny dogfish, less resilient than teleost fish and rebuilding times are much longer for equivalent biomass levels. Therefore, a more aggressive rebuilding strategy was recommended for a control law, or fishing mortality management strategy.

Due to this low resiliency and the long rebuilding times needed for recovery, Applegate *et al.* (1998) recommended using ½ of the SSB_{max} as a minimum biomass threshold. If total female biomass is above the minimum biomass threshold, then the Councils should not permit mortality to exceed levels that would require rebuilding to 90% of SSB_{max} over periods greater than 10 years. When total female biomass is below ½ of the SSB_{max}, then fishing mortality should not exceed a rate that would allow rebuilding to the 90% SSB_{max} in five years. If female biomass is above the target level, then the fishing mortality rate that would allow the stock to fluctuate around 90% of SSB_{max} would define overfishing.

The SFA requires that stocks which are identified as overfished (i.e., stock biomass is less than minimum biomass threshold) must rebuilt to the level that will produce maximum sustainable yield (B_{MSY}). The SFA guidelines advise that, in most cases, the stock rebuilding period may not exceed 10 years. The most recent stock assessment data presented by NEFSC (1998) and the Dogfish Technical Committee indicate that total adult spiny dogfish stock biomass is currently about 280 million lbs (127,000 mt), well below the biomass target of 397 million lbs (180,000 mt) and below the minimum biomass threshold of 220 million pounds (100,000 mt). As a result, the Councils propose to rebuild the spiny dogfish stock to 90% of the B_{MSY} level (as represented by the proxy of SSB_{max}) over a five year rebuilding period through the implementation of this FMP.

The preferred alternative will eliminate overfishing and rebuild the spiny dogfish stock through a two step reduction in fishing mortality rate. The first step allows for a one year exit fishery of 22 million lbs (10,006 mt) 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 will be reduced to 0.2 and then will be reduced to F=0.03 in the remaining four years of the rebuilding plan (2000-2003). This schedule allows for stock rebuilding to the target biomass level in the year 2003.

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 four year 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 will allow for the rebuilding of the adult spawning stock in a relatively short period of time and then allow for a sustainable fishery at yield levels of approximately 14 million pounds (6250 mt) per year.

3.1.3.2 Conservation and management measures shall be based upon the best scientific information available.

This Amendment is based on the best and most recent scientific information available. Future dogfish research should be devoted toward both data collection and analysis in order to evaluate the effectiveness of this FMP. Future research to determine the level of post-release mortality of spiny dogfish discarded in non-directed fisheries by gear type is of particular importance. This species should be reviewed periodically by the NEFSC Stock Assessment Workshop process.

3.1.3.3 To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

The FMP's management unit is spiny dogfish throughout their range on the Atlantic coast from Maine through Florida, including the EEZ, territorial sea, and internal waters. This specification is consistent with National Standard 3.

3.1.3.4 Conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

The FMP does not discriminate among residents of different states. It does not differentiate among U.S. citizens, nationals, resident aliens, or corporations on the basis of their state of residence. It does not incorporate or rely on a state statute or regulation that discriminates against residents of another state. Since the quota is based on stock size and will be determined annually to assure that the target mortality rate is not exceeded, National Standard 4B is met.

In the commercial fishery, the commercial quota will be applied coastwide. In addition, any recreational measures would be applied coastwide. These provisions are, therefore, "fair and equitable to all fishermen." The management measures included in this FMP are all specified so they may be adjusted annually following procedures set forth in Section 3.1.1.7 to assure that the fishing mortality target is achieved. These provisions are, therefore, "reasonably calculated to promote conservation."

3.1.3.5 Conservation and management measures shall, where practicable, consider efficiency in the utilization of the fishery resources; except that no such measure shall have economic allocation as its sole purpose.

The management regime is intended to allow the fishery to operate at the lowest possible cost (e.g., fishing effort, administration, and enforcement) given the FMP's objectives. The objectives focus on the issue of administrative and enforcement costs. The FMP places no restrictions on processing or marketing.

3.1.3.6 Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

The management measures in this FMP are all specified so that they may be adjusted annually following procedures set forth in the FMP to assure that the fishing mortality reduction strategy is followed. The definition of overfishing is based upon a fishing mortality rate strategy. As such, the annual quota will fluctuate to reflect changes in spiny dogfish stock conditions.

3.1.3.7 Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

The FMP is consistent with and complements, but does not duplicate, management measures contained in other FMPs and PMPs.

3.1.3.8 Conservation and management measures shall, consistent with the conservation requirements of the Magnuson-Stevens Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

The SFA, which reauthorized and amended the Magnuson-Stevens Act made a number of changes to the existing National Standards, as well as to definitions and other provisions of the Magnuson-Stevens Act. In regard to National Standard 8, the SFA requires that the importance of the fishery resources to fishing communities must be taken into account when implementing conservation and management measures.

One area which may be significantly affected is employment. Several industry advisors have indicated that due to the low TALs mandated by the plan, and the labor-intensive nature of hand-processing spiny dogfish, employment reductions in the processing sector may be needed. The extent of these employment reductions will most likely be determined by whether or not processors can find an alternative species which requires 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. However, specific data needed to quantify the extent of these potential reductions are unavailable.

Another area of concern is the preferred alternatives effect on certain ports. According to the most recent NMFS weighout data (1997), several ports are extremely dependent on the spiny dogfish fishery and derived 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 (Table 35).

Clearly these ports are very dependent upon spiny dogfish landings and will be disproportionately affected by the proposed regulatory action. The extent to which local communities will be affected "materially" is unknown, but it is likely that local businesses which support the commercial fishing industry will be adversely impacted by this FMP. However, the rapid expansion of the fishery and subsequent increase in landings is a relatively recent event which began in 1990 and cannot be sustained, even in the near-term.

The proper management of the spiny dogfish stock through implementation of the management measures described above will be beneficial to the commercial and recreational fishing communities of the Atlantic coast in the long-term once the stock is rebuilt. By preventing continued overfishing and allowing stock rebuilding, benefits to the fishing communities will be realized through increased spiny dogfish abundance and subsequent harvests at sustainable levels. However, to meet the conservation objectives embodied in National Standard 1 of the SFA, short-term reductions in catch and revenue from the spiny dogfish fisheries are necessary and unavoidable. 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 and

the Councils would be faced with an extended rebuilding period which could be decades in duration. The FMP will allow for the rebuilding of the adult spawning stock in a relatively short period of time and then allow for a sustainable fishery at yield levels of approximately 14 million pounds per year.

3.1.3.9 Conservation and management measures shall, to the extend practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

The SFA, which reauthorized and amended the Magnuson-Stevens Act made a number of changes to the existing National Standards, as well as to definitions and other provisions an the Magnuson-Stevens Act. In regard to National Standard 9, the SFA requires that bycatch issues must be considered when implementing conservation and management measures.

This national standard requires Councils to consider the bycatch effects of existing and planned conservation and management measures. Bycatch can, in two ways, impede efforts to protect marine ecosystems and achieve sustainable fisheries and the full benefits they can provide to the Nation. First, bycatch can increase substantially the uncertainty concerning total fishing-related mortality, which makes it more difficult to assess the status of stocks, to set the appropriate optimal yield (OY) and define overfishing levels, and to ensure that OYs are attained and overfishing levels are not exceeded. Second, bycatch may also preclude other more productive uses of fishery resources.

The term "bycatch" means fish that are harvested in a fishery, but that are not sold or kept for personal use. Bycatch includes the discard of whole fish at sea or elsewhere, including economic discards and regulatory discards, and fishing mortality due to an encounter with fishing gear that does not result in capture of fish (i.e., unobserved fishing mortality). Bycatch does not include any fish that legally are retained in a fishery and kept for personal, tribal, or cultural use, or that enter commerce through sale, barter, or trade. Bycatch does not include fish released alive under a recreational catch-and-release fishery management program. A catch-and-release fishery management program is one in which the retention of a particular species is prohibited. In such a program, those fish released alive would not be considered bycatch.

Virtually all of the spiny dogfish taken in the non-directed mixed- and multi-species gillnet and otter trawl fisheries in the Northwest Atlantic Ocean were discarded based on sea sample data from 1991-1993 (NEFSC 1998). The primary reason for discarding of dogfish taken in these fisheries is small size or lack of market. The result of this activity is to reduce the mean size/age of selection. Since these animals are discarded, they represent economic and biological waste.

Any future harvest policy developed for spiny dogfish must take into account the background mortality that results from discarding of dogfish from these fisheries. The issue of discards is a particularly important issue in the management of spiny dogfish, especially given the new National Standard 9, which mandates that regulations within FMPs developed under the SFA must minimize the level of discards and the mortality of discards which are unavoidable.

Estimates of discards of spiny dogfish were updated by the Spiny Dogfish Technical Committee using the Domestic Sea Sampling Program database for 1989-1997. The data were pooled across years to increase the number of observations for each category. For each trip observed, the primary species caught (> 50% of the total pounds on board) and the number of pounds of spiny dogfish discarded were calculated. These were summed over all trips grouped by primary species caught. A discard rate was calculated by dividing the total pounds of dogfish subsampled by the total pounds of the primary species. To calculate total dogfish discarded by year, these rates were multiplied by the pounds of the primary species caught from the NEFSC weighout database where the primary species comprised more than 50% of the trip.

The results of the analysis are provided in Tables 38a-c. The major fisheries which discard dogfish are the cod, goosefish, flatfish, mackerel, scup, butterfish, silver hake, *Loligo*, skate, and spiny dogfish otter trawl directed fisheries and groundfish and spiny dogfish sink gill net fisheries. The total amount of dogfish discarded over the time period varied from a low of 15.4 million pounds (7,000 mt) in 1995 to a high of 25.6 million pounds (11,600 mt) in 1989. Discard mortality was assumed to be 50% for otter trawls and 75% for sink gill nets.

During the development of this FMP, the Joint Dogfish Committee requested that the Technical Committee re-evaluate the discard mortality estimates by gear provided by SARC 26. The Technical Committee contacted researchers conducting tagging studies on spiny dogfish in recent years. The committee was unable to obtain any data to address the issue of discard mortality. In addition, the committee contacted the NC Division of Marine Fisheries, whose biologists have been obtaining sea sample data from the spiny dogfish fishery off the state of North Carolina. No data were made available to the Technical Committee. The committee members were unaware of any additional data relative to discard mortality of spiny dogfish.

During the evaluation of the discard mortality assumption, the Technical Committee discussed the apparent mismatch between the predicted yield from the swept area estimates of biomass and the observed yields in the fishery. During discussions about post release mortality of spiny dogfish, it was noted that there appears to be some portion of total mortality of spiny dogfish not currently being accounted for in the analysis. Two possible sources of this uncertainty include unreported catch and discard mortality. Since the bulk of the spiny dogfish landings are handled by a small number of processors which are adequately covered in the weighout data system, the committee concluded that the most likely reason that total yield is underestimated is that losses due to discarding are underestimated in the current analysis. This would imply that the current estimates of discard mortality are realistic. If discard mortality was lower than assumed, then we would be over-estimating mortality in the current analysis, which does not appear to be the case. The committee concluded that there is no basis to change the SARC assumptions about discard mortality at the current time, especially lacking any new information.

The Technical Committee also considered the issue of what the level of losses due to discards are expected to be during the recovery period (after the year one exit fishery occurs). The question is, will expected losses due to discards exceed the levels assumed under the rebuilding plan? The answer to that question depends on how fishermen will adapt to a fishery closure. The Technical Committee concluded that given the current inability to predict the behavior of the fishing fleet of the Northwest Atlantic Ocean, they were unable to predict the absolute level of discard mortality of spiny dogfish in the future. The Committee decided on another approach, which was to consider a range of possible achievable reductions in fishing mortality. These scenarios were developed to allow the Councils to compare the various stock rebuilding options relative to one another. That is, the alternatives presented can be compared in a relative sense. Once the rebuilding program is implemented, the stock will have to be monitored to determine the sources and magnitude of fishing mortality for spiny dogfish. All of the stock rebuilding scenarios considered by the Technical Committee and presented in this FMP assume that current levels of background discard mortality losses will continue in the future.

The discard mortality issue with respect to the rebuilding plan for spiny dogfish is significant. The Technical Committee recommended that the fisheries which take dogfish as bycatch be monitored through collection of sea sample data after the plan goes into effect. Research into the post release survivorship by gear type should also be conducted. With respect to increased levels of bycatch of spiny dogfish, any of the proposed management measures will likely result in the discard of spiny dogfish which could otherwise be kept under current regulations. These measures include quotas, trip limits, size limits, season or area closures and recreational measures. The FMP includes framework provisions to deal with future discard problems. Specifically, if a discard problems become so severe as to compromise the conservation objectives of the FMP, then gear, season and area restrictions could be implemented to reduce discard mortality. All of these factors will result in the minimization of bycatch and discard mortality of spiny dogfish in the commercial fishery, to the extent practicable. Therefore, National Standard 9 is satisfied.

The intent of this FMP is to minimize the impacts of the spiny dogfish rebuilding program on the prosecution of other fisheries. However, if discards in non-directed fisheries severely impede the rebuilding efforts of this FMP, the Councils may find it necessary impose additional measures which could have negative consequences for other, non-directed fisheries. The degree to which restrictions on other fisheries become necessary will depend on the interpretation of the SFA by the Councils and NMFS. Resolution of the problems which arise when FMPs for different species promulgated under the Magnuson-Stevens Act have competing objectives will involve a significant policy consideration for the Councils and NMFS. Resolution of this issue is beyond the scope of this FMP and will require a much broader policy analysis of the consequences for the stocks, fisheries and fishing communities involved.

3.1.3.10 Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

The SFA, which reauthorized and amended the Magnuson-Stevens Act, made a number of changes to the existing National Standards, as well as to definitions and other provisions in the Magnuson-Stevens Act. In regard to National Standard 10, the SFA requires that the safety of human life at sea must be promoted when implementing conservation and management measures.

National Standard 10 recognizes that fishery regulations by definition place constraints on fishing that would not otherwise exist. It's purpose is to ensure that fishery regulations do not create pressures on fishermen to fish under conditions they would otherwise avoid. None of the management measures in this amendment will promote or result in increased levels of unsafe behavior at sea relative to the status quo.

The management measures in this FMP should not alter the behavior or fishing practices of fishermen to extent that they would engage in fishing practices that they would otherwise avoid. None of the measures should affect the vessel operating environment or gear loading requirements. In order to minimize the creation of derby style fisheries, the Councils are implementing the commercial quota on a seasonal basis. The Council developed this FMP in consultation with industry advisors to help ensure that this was the case. In summary, the Council has concluded that this FMP will not impact or affect the safety of human life at sea. Therefore, National Standard 10 is met.

3.1.4 Analysis of the Proposed and Alternative Management Measures

3.1.4.1 Analysis of the proposed management measures

This section presents an analysis of the impacts of the preferred management measurers considered by the Councils on the environment. These actions were described in section 3.1.1 above. In this section each management measure is analyzed in terms of biological, economic, and social impacts, and its effects to marine mammals, turtles, and sea birds.

3.1.4.1.1. Rebuilding schedule and commercial quota management strategy

The SFA requires the Councils to set the overfishing definition to meet a new standard (F_{MSY}) or a suitable proxy. In addition, the resource must be rebuilt to the biomass associated with MSY (i.e., $B_{MSY,}$ or a suitable proxy) in as short a period as possible. The rebuilding period is not to exceed 10 years, except where biology, environmental conditions, or international agreements dictate otherwise.

In the most recent assessment for spiny dogfish, NEFSC (1998) 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 71% of the target female biomass (SSB_{max}, proxy for B_{MSY}). Thus, the spiny dogfish stock is considered overfished according to the new SFA overfishing guidelines and requires rebuilding. This FMP addresses the overfishing problem and plans to rebuild the resource to meet SFA requirements over a five year planning horizon.

Biological Impacts

Spiny dogfish are long lived and slow growing (see Section 2.1.3.2). This life history strategy (long lived with low reproductive potential) makes the species particularly vulnerable to overfishing. Holden (1973) noted the limited ability of sharks and other elasmobranchs to maintain the levels of exploitation sustainable in fisheries for teleost or bony fish. This is because stock and recruitment are directly related and reductions in adult stock size result in reduced recruitment. In addition, the limited reproductive potential of spiny dogfish offers little flexibility in compensating for increased exploitation.

The relationship between stock and recruitment in 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) provided 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.

The preferred alternative will eliminate overfishing and rebuild the spiny dogfish stock through a two step reduction in fishing mortality rate. The first step allows for a one year exit fishery of 22 million pounds (10,006 mt) 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 will be reduced to 0.2, and then F will be reduced to F=0.03 in the remaining four years of the rebuilding plan (2000-2003). This schedule allows for stock rebuilding to the level which will support harvests at or near the MSY level in the year 2003.

The rebuilding plan proposed in this FMP recognizes the unique biological characteristics of spiny dogfish relative to other marine species subject to exploitation (i.e, the marine teleosts). The primary goal of the rebuilding plan is to allow the adult female biomass of spiny dogfish to rebuild to a level at or near that which will maximize average recruitment and in turn allow sustainable harvests. Thus, the biological impacts of the management program in general, and the rebuilding strategy in particular, will be positive.

A major concern raised during the development of this FMP has been the ecological ramifications of a fully rebuilt spiny dogfish stock (i.e., at levels approaching SSB_{MAX}). Of particular concern were the possible negative consequences on other species (principally groundfish, squid and the pelagic stocks) both through increased competition and/or predation as spiny dogfish abundance increases. To address this concern, among others, the Councils convened a joint meeting of Mid-Atlantic and New England Fishery Management Council Scientific and Statistical Committees on January 19, 1999 (see Appendix 4).

The Joint Committee concluded the following with respect to this issue: "The committees heard a presentation based on information from the NEFSC food habits data base which included data on 250,000 stomachs collected over a period of 25 years, mostly during spring and autumn. The data included information on spatial overlap between cod and spiny dogfish and showed moderate overlap (30-40%) in spatial co-occurrence of these species in the surveys, yet very low predation rates. While the S&S Committee applauds moves to consider ecosystem approaches to management, it found no compelling reason to consider predation by spiny dogfish on other commercially valuable groundfish in determining its B_{MSY}. The stock of spiny dogfish is a very small part of the ecological community and because of its' opportunistic predatory habits it may have minimal direct and indirect effects on the relationships between different species. It is recognized, however, that dogfish do have effects on other species through predation and competition. It is the Committee's opinion that changing the mature female biomass from 200,000 to 150,000 mt will have a minimal effect on other stocks of groundfish. Because of compensation, and the constantly changing stock sizes, it is not currently possible to predict the degree of or the direction of change in pelagic stocks, in particular, that could be attributed to changes in the spiny dogfish B_{msy}. The Committee would like to see more efforts to build conceptual models and undertake empirical tests to study ecological relationships relevant to fisheries management. Trying to determine pairwise relationships between one species and a series of others is, however, not currently feasible and development of this area of research would be enlightening as ecosystem-based management develops."

Economic impacts

The preferred alternative will eliminate overfishing and rebuild the spiny dogfish stock while allowing a one year "exit fishery." This step allows for a one year fishery of 22 million pounds (10,006 mt) to allow a phase out of the directed fishery. This approach was chosen to minimize the impacts of the rebuilding program on both the harvesting and processing sectors of the industry. Landings will be reduced to 2.9 million pounds (1,316 mt) in the year 2000 and maintained at under 4.0 million pounds (2,000 mt) until the rebuilding target is reached in 2003. It is assumed that pursuant to reaching the biomass rebuilding target (90% of SSB_{MAX}), spiny dogfish yields will increase to approximately 14 million pounds (6,250 mt).

This alternative is expected to rebuild the spiny dogfish stock in the shortest possible time, thus meeting the requirements of the SFA while minimizing economic and social impacts in year one. In 1999, landings would be reduced by 22,674,861 pounds ($3,401,229) relative to 1997 total landings.

Based upon projected status quo total landings (i.e., total predicted landings if no management measures were imposed), 1999 commercial landings would be reduced by 9,234,540 pounds ($1,385,181). Based upon projected status quo landings in relation to proposed TALs, ex-vessel gross revenue declines reach $3,383,903 in year two as landings are reduced to 2,901,780 lbs (1316 metric tons) (Tables 39 and 40). Pack-out facility gross revenue declines by $902,374 in year two (Table 41). Gross revenue losses decline from this point as projected landings increase.

The cumulative discounted impacts of this action are illustrated in Figure 25 (See Figure 24 for non-discounted impacts). Notably, the discounted projected impacts of the preferred management action and its alternatives do not reach status quo levels (the *x* axis) until after the 28th year (Figure 25). The discounted loss of gross ex-vessel revenues is fairly dramatic until the year 2004 when the benefits of harvest reductions begin to be realized as projected TALs increase dramatically. This characterization, however, has several shortcomings, the most important being that it does not account for elasticity of demand. Potentially, price could increase as supply declines causing these curves to rise (i.e., toward the *x* axis). This characterization also does not account for changes in costs and introductions of new, potentially more efficient harvest technologies.

An additional area of uncertainty is the effect of low TALs upon markets. Processors have indicated that the ability to process spiny dogfish in a cost-effective manner is dependent upon volume. The proposed low TAL may cause processors to cease processing spiny dogfish and thus cause established US based markets for this species to collapse. Since currently, most spiny dogfish are processed and exported, the implications of management upon both foreign and domestic markets are hard to predict. Two scenarios are: 1) the demand for spiny dogfish by foreign markets may decline as this species is replaced by a more readily available alternative; and conversely, 2) the lessening of supply in light of a static demand could cause price to rise and allow for a modified fishery to exist while landings remain at low levels. Preliminary indications from industry members are that the first scenario is the most likely to occur. The long-term effects of a potential market collapse are unknown and, furthermore, the ability of processors and harvesters to re-establish markets, if they go dormant, is also unknown.

These scenarios would also affect harvesters: if markets for spiny dogfish cease, there will not be an outlet to sell their catch. Conversely, if prices rise, harvesters will be able to receive greater ex-vessel prices for spiny dogfish (assuming a market exists). Even if prices increase, however, due to the extremely low TALs, this would probably do little to mitigate the economic impacts caused by the preferred alternative (this is true for both harvesters and processors). Given low TALs, the harvesting, processing, and support industries are not likely to see cumulative nominal benefits for at least 15 years (see Figure 24).

An additional area of concern is with the redirection of fishing effort from the spiny dogfish fishery into other fisheries. Given that the weighout data indicate that there were 595 participants is the spiny dogfish fishery in 1997, these participants will be faced with the choice of either exiting fishing altogether or redirecting their effort into other fisheries. Griffith *et al.* (1996) found that one of the primary responses to 'fisheries crises' was either moving to other regions to fish or simply moving into other fisheries. This practice may impede the stock rebuilding schedules for species deemed overfished and currently under management as well as stress species currently not under management. Another concern is to what degree participants in the spiny dogfish fishery will be able to find other commercially valuable species from which to supplement their income. Given that many species are under some form of limited entry, those that currently do not have permits may not be able to acquire them. This greatly limits harvesters' ability to make-up lost income and may cause some to exit the fishing industry completely.

The Councils recognize that the directed fishery for spiny dogfish will be closed during the four rebuilding period and that this may result in the redirection of fishing effort from the spiny dogfish fishery into other fisheries. Given that weighout data suggests that there were 595 participants is the spiny dogfish fishery in 1997, these participants will be faced with the choice of either exiting fishing altogether or redirecting their effort into other fisheries. However, the expansion of the spiny dogfish fishery is a very recent phenomenon which began in 1990. It is unlikely that the new entrants into this fishery since 1990 represent completely new effort or capitalization into the Northeast fisheries. Rather, the escalation of fishing effort into the spiny dogfish has occurred via the transfer of fishing effort from other fisheries into the spiny dogfish fishery, especially the gill net fishery. This rapid increase in effort in this fishery is not sustainable and clearly effort must be dramatically reduced to meet the conservation requirements of the SFA.

Other businesses that support the spiny dogfish industry will also be impacted by the preferred alternative. Although the magnitude and the scope of these impacts are unknown, businesses that provide packaging material for exporting dogfish, transportation to European markets, and fish brokers, will be impacted by this FMP.

The preferred alternative is not likely to affect demand for recreational fishing trips targeting spiny dogfish. The 1996 landings of spiny dogfish by the recreational fishing sector (catch type A + B1) was 14,408 lbs (6.5 mt) and discards (catch type B2) were estimated at 143,130 lbs (65 mt). The 1994 MRFSS survey 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. In light of this, there is expected to be no lessening of demand for recreational fishing trips due to this proposed action.

Social Impacts

The proposed rebuilding schedule will achieve the female biomass rebuilding target in five years while allowing for stability in projected yields during the recovery period. Furthermore, it provides the industry with an adjustment period during the first year of the rebuilding program which will minimize social impacts. Once the stock is rebuilt, long-term benefits should be realized though a sustainable spiny dogfish fishery which can continue to capitalize on existing markets or take advantage of new markets. One caveat to this is that if the US based export market does cease for the duration of the rebuilding plan, the level of demand for a product that has been unavailable for many years may be adversely affected.

The commercial quota is allocated between two six month seasons based on the seasonal distribution of landings during the period 1990-1997. This is intended to preserve the traditional distribution of landings, both geographically and seasonally. By allocating the quota on a seasonal basis, the Councils are attempting to ensure that the harvest is allocated in a fair and equitable manner. This should have positive benefits for the communities that have traditionally depended on spiny dogfish for employment and income.

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 four year 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 and the Councils would be faced with an extended rebuilding period which could be decades in duration. The FMP will allow for the rebuilding of the adult spawning stock in a relatively short period of time and then allow for a sustainable fishery at yield levels of approximately 14 million pounds (6,250 mt) per year.

Effects on Marine Mammals, Sea Turtles, and Seabirds

Activities conducted under this FMP have not yet been considered for their impacts on endangered species in order to do a Section 7 of the Endangered Species Act consultation. NMFS and the Fish and Wildlife Service will be performing a Section 7 consultation relative to marine mammals, sea turtles, and any seabirds that may be impacted by this FMP. The following background information is provided to facilitate evaluations of the alternatives relative to the order of magnitude that these spiny dogfish fisheries may have on these threatened or endangered species.

Numerous species of marine mammals and sea turtles occur in the northwest Atlantic Ocean. The most recent comprehensive survey in this region was done from 1979-1982 by the Cetacean and Turtle Assessment Program (CETAP) at the University of Rhode Island (University of Rhode Island 1982) under contract to the Minerals Management Service (MMS), Department of the Interior. The following is a summary of the information gathered in that study, which covered the area from Cape Sable, Nova Scotia, to Cape Hatteras, North Carolina, from the coastline to 5 nautical miles seaward of the 1000 fathom isobath.

Four hundred and seventy one large whale sightings, 1,547 small whale sightings and 1,172 sea turtles were encountered in the surveys. The "estimated minimum population number" for each mammal and turtle in the area, as well as those species currently included under the Endangered Species Act, were also tabulated.

CETAP concluded that both large and small cetaceans were widely distributed throughout the study area in all four seasons and grouped the 13 most commonly seen species into three categories based on geographical distribution. The first group contained only the harbor porpoise, which is distributed only over the shelf and throughout the Gulf of Maine, Cape Cod, and Georges Bank, but probably not southwest of Nantucket. The second group contained the most frequently encountered baleen whales (fin, humpback, minke, and right whales) and the white-sided dolphin. These were found in the same areas as the harbor porpoise and also occasionally over the shelf at least to Cape Hatteras or out to the shelf edge. The third group indicated a "strong tendency for association with the shelf edge" and included the grampus, striped, spotted, saddleback, and bottlenose dolphins, and the sperm and pilot whales.

Loggerhead turtles were found throughout the study area, but appeared to migrate north to about Massachusetts in summer and south in winter. Leatherbacks appeared to have had a more northerly distribution. CETAP hypothesized a northward migration of both species in the Gulf Stream with a southward return in continental shelf waters nearer to shore. Both species usually were found over the shoreward half of the slope and in depths less than 200 feet. The northwest Atlantic may be important for sea turtle feeding or migrations, but the nesting areas for these species generally are in the South Atlantic and Gulf of Mexico.

This problem may become acute when climatic conditions result in concentration of turtles and fish in the same area at the same time. These conditions apparently are met when temperatures are cool in October but then remain moderate into mid-December and result in a concentration of turtles between Oregon Inlet and Cape Hatteras, North Carolina. In most years sea turtles leave Chesapeake Bay and filter through the area a few weeks before the bluefish becomes concentrated. Efforts are currently under way (by VIMS and the U.S. Fish and Wildlife Service refuges at Back Bay, Virginia, and Pea Island, North Carolina) to more closely monitor these mortalities due to trawls. Fishermen are encouraged to carefully release turtles captured incidentally and to attempt resuscitation of unconscious turtles as recommended in the 1981 *Federal Register* (pages 43976 and 43977).

The only endangered species of fish occurring in the northwest Atlantic is the shortnose sturgeon (*Acipenser brevirostrum*). The Councils urge fishermen to report any incidental catches of this species to the Regional Administrator, NMFS, One Blackburn Drive, Gloucester, Massachusetts 01930, who will forward the information to persons responsible for the active sturgeon data base.

The range of spiny dogfish and the above mentioned marine mammals and endangered species overlap and there always exists a potential for an incidental kill. Under the proposed rebuilding plan for spiny dogfish, the directed fishery for this species will be closed for four years following the first year exit fishery. During the rebuilding phase (years two-five) fishing effort directed towards spiny dogfish will be eliminated and thus the chance of accidental catches during this time period should be near zero. Thus the fishery should have a positive impact on marine mammal or abundances of endangered species. Once the spiny dogfish stock is rebuilt, the fishery will be prosecuted at greatly reduced level compared to the unregulated fishery prior to plan implementation. 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 this FMP should have an overwhelmingly positive impact relative to interactions with marine mammal or abundances of endangered species.

Attempts were made to put these fisheries/sea turtle interaction into perspective relative to other sources of mortality for these endangered turtle species. The Congressionally mandated report *Decline of the Sea Turtles: Causes and Prevention* (NRC 1990) states that "Of all the known factors, by far the most important source of deaths was the incidental capture of turtles (especially loggerheads and Kemp's ridleys) in shrimp trawling. This factor acts on the life stages with the greatest reproductive value for the recovery of sea turtle populations."

Mortality associated with other fisheries and with lost or discarded fishing gear is much more difficult to estimate than that associated with shrimp trawling, and there is a need to improve these estimates (NRC 1990). This report identified possible turtle losses from the winter trawl fishery north of Cape Hatteras (about 50-200 turtles per year), the historical Atlantic sturgeon fishery, now closed, off the Carolinas (about 200 to 800 turtles per year), and the Chesapeake Bay passive-gear fisheries (about 25 turtles per year). Considering the large numbers of fisheries from Maine to Texas that have not been evaluated and the problems of estimating the numbers of turtles entangled in the 135,000 metric tons of plastic nets, lines, and buoys lost or discarded annually, it seems likely that more than 500 loggerheads and 50 Kemp's ridleys are killed annually by nonshrimp fisheries (NRC 1990). These other fishery operations, lost fishing gear, and marine debris are known to kill sea turtles, but the reported deaths are only about 10% of those caused by shrimp trawling. Dredging, entrainment in power-plants intake pipes, collisions with boats, and the effects of petroleum-platform removal all are potentially and locally serious causes of sea turtle deaths. However these collectively amount to less than 5% of the mortality caused by shrimp trawling (NRC 1990).

The NRC report (1990) concludes that all species of marine turtles need increased protection under the Endangered Species Act and other relevant legislation. While the report does not recommend specific conservation measures for these fisheries, the recommendations for the shrimp trawling are germane. The NRC report (1990) recommended TEDs, 60 minute winter tow-time limits, and limited time/area closure for turtle "hot spots". Currently, there are 5 sea turtle recovery plans in place; these include plans for the loggerhead (1991), the green sea turtle (1991), the leatherback (1992), the Kemp's ridley sea turtle (1992), and the hawksbill sea turtle (1993).

Shortnose sturgeon (*Acipenser brevirostrum*) is an additional endangered species that may be caught incidentally in trawl fisheries. Sturgeon will be included in the Incidental Take Statement of the pending Biological Opinion. As shortnose sturgeon are generally associated with the estuarine environment, rather than the truly marine environment, it is anticipated that the gear and fishing locations of these dogfish fisheries will rarely encounter shortnose sturgeon.

Marine mammals are managed under the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973. Marine mammals have been historically important in the U.S. both as targets for commercial harvests and in ecological interactions with commercial fisheries. An excellent description of the historical importance of marine mammals is described in USDC 1993b.

The results of this earlier work were addressed in 1979 when the U.S. Marine Mammal Commission sponsored a workshop to help define research needed for the study of marine mammals on the U.S. east and Gulf coasts and in 1989 at a NMFS-sponsored workshop on Gulf of Mexico marine mammal research needs (USDC 1993b). These workshops set a research agenda that was immediately addressed by agencies such as the Minerals Management Service and NMFS. During the 1980's, several institutions in the northeast developed active research programs which have resulted in a body of knowledge that is being drawn upon in developing management approaches for several critical marine mammal issues in the region. In the 1990's, increased attention has been focused on the characterization of marine mammal fauna of the U.S. Gulf of Mexico and the Mid-Atlantic Bight (USDC 1993b).

Thirty-five species of marine mammals inhabit the U.S. Atlantic and Gulf of Mexico waters (32 whales, dolphins and porpoises, two seal species, and one manatee). Their status, in general, is poorly known, but some, like the right whale, Mid-Atlantic coastal bottlenose dolphin, and harbor porpoise, are under stresses that may affect their survival (USDC 1993b).

The gears managed under this FMP are listed under Categories I, II, and III for 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 Potential Biological Removal (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 an overwhelming beneficial impact from the preferred alternative management measures on the marine mammal populations of the east coast, principally the harbor porpoise.

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 in the preferred alternative, there should be an overwhelming beneficial impact from the preferred alternative management measures on the marine mammal populations of the east coast, principally 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 1996 Stock Assessment Report (SAR) (Waring *et al.*, 1997) 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 this TRP, 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 U.S. range. The potential biological removal (PBR) level for Gulf of Maine harbor porpoise throughout their range is 483 animals (62 FR 3005, January 21, 1997). 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.

As noted above, the stock recovery schedule in this FMP specifies mandatory reductions in spiny dogfish fishing mortality which will result in reductions in fishing effort directed at spiny dogfish in excess of 90% of current levels in years 2-5 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 for four years following the first year exit fishery. During the rebuilding phase (years two-five) fishing effort directed towards spiny dogfish will be eliminated and thus the chance of accidental catches during this time period should be near zero. Thus the fishery should have a positive impact on marine mammal species, most notably the harbor porpoise. Once the spiny dogfish stock is rebuilt, the fishery will be prosecuted at a greatly reduced level compared to the unregulated fishery prior to plan implementation. 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 this FMP should have an overwhelmingly positive beneficial impact from the preferred alternative management measures on certain marine mammal populations of the east coast, principally harbor porpoise.

Pelagic seabirds are not likely to come into contact with spiny dogfish fisheries. Most of the following information 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. Eight gulls breed in eastern North America and occur in shelf waters off the northeastern U.S. 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.). Of course, our national symbol, the bald eagle is listed as endangered under the ESA and is a bird of aquatic ecosystems. Literally translated, its Latin name, *Haliaeetus leucocephalus*, means white-headed sea eagle (*Federal Register* 1994, 35584).

Spiny dogfish are not important prey for the Common and Roseate terns (Safina 1987, Safina *et al*. 1988, and Safina *et al.* 1990). Safina *et al.* (1988) note that few other seabird studies have measured ambient food levels among foraging birds, but many studies which have examined food provisioning to chicks and reproductive performance in seabirds have found results similar to theirs. Laying dates, clutch sizes, growth, and fledgling success of seabirds have been linked to food availability by a number of workers. Safina *et al*. (1988) recorded that prey fish were more abundant in 1984 than it was in 1985 and noted that reproductive productivity of terns was greater in 1984 for most parameters measured. Although they studied productivity for only two seasons, the results suggest that prey population fluctuations may limit reproductive success in the terns they studied.

Safina *et al.* (1990) noted that observing prey deliveries at nests cannot address the question of how foraging birds select prey or foraging habitat from the range of possibilities. However, the variability they found shows that either prey availability or birds' selection criteria changes, and that prey availability or selection varies differently between the two tern species, Common and Roseate, they studied. Some prey species may have their own consistent internal rhythms (or influencing factors) which make them differentially susceptible to tern predation on a daily time scale.

The stock recovery schedule proposed in this amendment will reduce fishing mortality over a five year period. As such, these reductions in fishing mortality will result in reduced fishing effort that in turn will reduce interactions with marine mammals, sea turtles, shortnose sturgeon, and seabirds. Preventing overfishing of spiny dogfish thus will be beneficial to some seabirds and certain species of marine mammals.

3.1.4.1.2 Impacts of permit and reporting requirements under the preferred alternative

Biological Impacts

Actions two through four implement permit requirements for commercial vessels, dealers, and operators. Given the current status of the stocks and the uncertainties regarding discard rates for spiny dogfish, mechanisms which account for all activities in the fishery are necessary to enforce provisions of the FMP and ensure overfishing is prevented. Permits issued to all sectors which harvest, process, or sell spiny dogfish provide the foundation for effective monitoring and enforcement of regulations.

There are no direct biological impacts associated with the implementation of these management actions. However, this alternative will help track the quota and therefore reduce the chance that the quota is exceeded, and as such, reduce the chance of overfishing. A commercial permit to sell is essential for a quota based management system. The dealer permitting and reporting requirements are also very important in tracking the quota and forecasting necessary closures.

Economic Impacts

It is estimated that 595 different vessels landed spiny dogfish in 1997 along the Atlantic coast. Under the all of the alternatives, any vessel desiring to fish commercially for spiny dogfish must obtain a federal spiny dogfish vessel permit. It is estimated that 87% of commercial vessels landing spiny dogfish in 1997 possess a NMFS permit for at least one or more fisheries (Table 34). Therefore, approximately 77 new applicants would be required to apply for a federal spiny dogfish permit using the initial application form. The remainder would use the renewal form and would not likely incur an additional burden. It is estimated that owner/operators of all 77 vessels would apply for a spiny dogfish permit. The total burden cost associated with public requirements is $578 ($7.50 per vessel) and the total burden cost associated with federal requirements is estimated at $2,739. In addition, the expected burden cost associated with public requirements for the commercial logbook submission is \$1,533 (\$20 per vessel per year) and the total government cost is \$1,924.

It is expected that there will be approximately 15 new applicants for dealer permits. The total coat burden associated with the public requirement for new applicants is \$1.25 per applicant. Thereafter the public annual estimate of submitting weekly reports will be \$26 per dealer per year. Thereafter, the annual estimate of processing weekly reports for the NMFS will be \$43 per dealer. Thus total cost for all new dealers (who do not currently have permits) for permitting requirements in the first year is \$409 and the combined public and private burden will be \$1,054.

Social Impacts

The issuance of permits and reporting requirements are essential ingredients in the management of fishery resources. Section 303(b)(1) of the MSFCMA specifically recognized the need for permit issuance. Almost every international, federal, state, and local fishery management authority recognizes the value of permits and uses permits as part of their management systems. The purpose and uses of permits are to: 1) register fishermen, fishing vessels, fish dealers and processors, 2) list the characteristics of fishing vessels and/or dealer/processor operations, 3) exercise influence over compliance (e.g., withhold issuance pending collection of unpaid penalties), 4) provide a mailing list for the dissemination of important information to the industry, and 5) provide a universe for data collection purposes and efficacy of the management program.

Commercial fishing permit information can be used by enforcement officials to check for regulatory infractions and by NOAA scientists and economists as a basis for analysis. The commercial fishing permit requirement ensures more complete reporting from the fishery. Commercial fishing permits will increase compliance with commercial quota management. With the implementation of a commercial fishing permit, the quota system should be tracked more accurately. Therefore, permit requirements will enhance enforcement.

Effects on Marine Mammals, Sea Turtles, and Seabirds

The various permitting and reporting requirements required by this FMP for the commercial fishery, dealers, and operators should a positive impact on marine mammals, sea turtles, shortnose sturgeon, and seabirds. There are currently no permits required to fish for spiny fish and commercial fishermen are not required to report their landings for dogfish if no other regulated species are taken. The vessel permit and reporting requirements should provide the most benefit since they will improve the information available to define and monitor fishing activity within the directed spiny dogfish fishery.

3.1.4.1.3 Prohibition of finning

Finning, the act of removing the fins of spiny dogfish and discarding the carcass, will be prohibited. Vessels which land spiny dogfish must land fins in proportion to carcasses, with a maximum of 5% fin to carcass ratio, by weight. Fins may not be stored aboard a vessel after the first point of landing.

Biological Impacts

This management measure is intended to eliminate the wasteful practice of finning. The Councils intend to ensure that, to the extent practical, the entire fish be utilized when harvested. This problem could be acute during the rebuilding phase of the FMP since most of the spiny dogfish taken will have to be discarded during that time period. This will have positive biological impacts for the spiny dogfish stock by reducing the wasteful discard of spiny dogfish carcasses and therefore eliminating a potential source of discard mortality.

Economic Impacts

During the course of development of this FMP, the issue of finning and discard of the carcass at sea of spiny dogfish has been discussed extensively. Industry advisors testified that this practice occurs only under extremely limited circumstances. Therefore, no negative economic impacts as a result of this management measure are expected. The prohibition of finning is primarily a preventative measure to stop the practice when the fishery is reduced in magnitude.

Social Impacts

As noted above, during the course of development of this FMP, the issue of finning and discard of the carcass at sea of spiny dogfish has been discussed. The response of the public and industry was overwhelmingly in favor of a prohibition on the practice of finning. Because of its universal acceptance by the public, this measure is not expected to have any negative social consequences.

Effects on Marine Mammals, Sea Turtles, and Seabirds

This measure will not have any significant impact on marine mammals, sea turtles, shortnose sturgeon, and seabirds.

3.1.5 Analysis of the Alternatives to the Preferred Management Measures

3.1.5.1 Take no action at this time

Biological Impacts

With the implementation of this alternative, the spiny dogfish fishery would remain unregulated. The no action alternative would not address the problems and objectives identified in sections 1.1.2 and 1.1.3, respectively. Overfishing would continue to occur and the stock would be expected to continue to decline. 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 and the Councils would be faced with an extended rebuilding period which could be decades in duration. It should be noted that the status quo projections presented in Table 36 assume that fishing mortality will remain constant at $F=0.3$ and that the size at recruitment to the fishery will also remain constant at about 28 in (70 cm). If either of these assumptions are violated, the outcome of the status quo projections would change. For example, if the age/size at first selection were to decrease or fishing mortality were to increase, then the yield streams would be altered and the SSB would be depleted at a faster rate.

Economic impacts

The implementation of this alternative would not reduce overfishing or rebuild the stock. As a result, economic benefits will not accrue in the long-term. As noted above, if fishing mortality remains at recent levels the consequences for the stock and fishery would be severe. The longer overfishing is allowed to continue, the more protracted the rebuilding period would be, during which time spiny dogfish landings would have to be dramatically curtailed. The absolute magnitude of the economic consequences would depend on the duration the rebuilding period, but would be expected to exceed the cumulative economic impact of the preferred alternative.

Social Impacts

With the implementation of this alternative, the Council will not address the requirements of the Magnuson-Stevens Act. A sustainable spiny dogfish fishery will not be developed, and negative social and economic impacts would result if the stock is not rebuilt. The social impacts could be especially severe if the Councils failed to arrest overfishing in this fishery.

Effects on Marine Mammals, Sea Turtles, and Seabirds

No action may jeopardize the continued existence of the threatened or endangered species mentioned above because there will be uncontrolled, unlimited fishing pressure on spiny dogfish. As noted earlier, the various gear types fished in the spiny dogfish commercial are designated as Categories I, II, and III under the MMPA. The reductions in fishing mortality necessary to rebuild the spiny dogfish stock will require significant reductions in fishing effort, and thus will be beneficial to certain species of marine mammals, especially harbor porpoise.

3.1.5.2 Alternative rebuilding schedules

3.1.5.2.1 Reduce fishing mortality to $F=0.04$ in year one and maintain to allow stock rebuilding in four years to rebuild to biomass target (90% of B_{MSY})

This option would require a reduction in fishing mortality to F=0.04 in years 1-4 and would allow for stock rebuilding over a four year planning horizon by maintaining a constant F. Total allowable landings (TAL) or quota would have to be reduced to 5.1 million pounds (2,300 mt) during the first four years of the management program (1999-2002). TAL would then increase to level associated with the long term target of about 14 million pounds (6,250 mt) at the current size at entry.

Biological Impacts

Spiny dogfish are long lived and slow growing (see Section 2.1.3.2). This life history strategy (long lived with low reproductive potential) makes the species particularly vulnerable to overfishing. Holden (1973) noted the limited ability of sharks and other elasmobranchs to maintain the levels of exploitation sustainable in fisheries for teleost or bony fish. This is because stock and recruitment are directly related and reductions in adult stock size result in reduced recruitment. In addition, the limited reproductive potential of spiny dogfish offers little flexibility in compensating for increased exploitation.

The relationship between stock and recruitment in 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.

This alternative would eliminate overfishing and rebuild the spiny dogfish stock through a one step reduction in fishing mortality rate. F would be reduced to F=0.04 for the four years of the rebuilding plan (1999-2002). This schedule allows for stock rebuilding to the level which will support harvests at or near the MSY level by the end of year 2002.

This rebuilding plan recognizes the unique biological characteristics of spiny dogfish relative to other marine species subject to exploitation (i.e, the marine teleosts). The primary goal of the rebuilding plan is to allow the adult female biomass of spiny dogfish to a level that will maximize average recruitment and, in turn, allow sustainable harvests. Thus, the biological impacts of this rebuilding strategy will be positive.

Economic Impacts

The first non-preferred alternative would reduce landings to 4.7 million pounds (2162 mt) in year one and maintain mortality at under 6.6 million pounds (3000 mt) to allow the stock to reach the target SSB_{max} in 2003. This alternative will reduce gross ex-vessel revenues by $3,979,584 (relative to status quo) in year one (1999) and this impact will decrease as expected TALs increase. Successive revenue losses are projected to continue until 2002, although at a decreasing rate (Table 39). Figure 24 shows that cumulative gross revenues (not discounted) exceed status quo levels in 2016. Pack-out facilities will see gross revenues decline in year one (1999) by $1,061,222 compared to the status quo (Table 41).

This alternative reduces landings to a consistent level of approximately 5.5 million pounds (2500 mt) until 2002 when, as stated previously, landings are assumed to reach a consistent level of 14 million pounds (6250). At approximately 5.5 million pounds (2500 mt), a directed fishery for spiny dogfish is unlikely and the affect that a bycatch fishery may have on markets is currently unknown. In addition, this option did not provide for a one year 'exit' fishery and was thus not desirable to fishery participants.

Social Impacts

This alternative reduces landings to a consistent level of approximately 5.5 million pounds (2,500 mt) over four years. Although this will reduce gross revenues for all sectors, the reduction of supply in light of demand may cause prices for spiny dogfish to increase. This point is complicated, however, by the low allowable landings. At approximately 5.5 million pounds (25,00 mt), a directed fishery for spiny dogfish is unlikely, and the effect that a bycatch fishery may have on markets is currently unknown. This alternative is likely to have greater negative social consequences than the preferred alternative since the directed dogfish fishery and associated processing sector would be eliminated immediately in year one of the management program. This would have negative social consequences, especially during the first year of the management program since there is no period for a phase down of harvesting and processing activities.

Effects on Marine Mammals, Sea Turtles, and Seabirds

As noted earlier, the various gear types fished in the spiny dogfish commercial are designated as Categories I, II, and III under the MMPA. The reductions in fishing mortality necessary to rebuild the spiny dogfish stock would require a virtual elimination of fishing effort directed at spiny dogfish. These reductions in gill net fishing effort would be very beneficial to certain species of marine mammals, especially the harbor porpoise.

3.1.5.2.2 Reduce fishing mortality in year one half way between $F_{current}$ and $F_{threshold}$, in year two reduce fishing mortality to $F_{threshold}$ and in year three reduce F to level required to rebuild stock in remaining eight years of the rebuilding program.

This option would require a reduction in fishing mortality to F=0.204 in year one (half way between $F_{current}$ and $F_{threshold}$), in year two fishing mortality would be reduced to $F_{threshold}$ or F=0.11. Under this scenario, if F was reduced to F=0.026 in the ensuing eight years, the stock would be rebuilt to the target SSB by the tenth year. In year one the TAL would be 22.5 million pounds (10,186 mt), in year 2 TAL would equal 11.3 million pounds (5,130 mt) and in the eight remaining years TAL would range from 2.8 -

3.4 million pounds (1,262 - 1,558 mt). This option would meet the requirements of the SFA by rebuilding the female biomass to the target level in ten years.

Biological Impacts

This option would require a reduction in fishing mortality to F=0.204 in year one (half way between $F_{current}$ and $F_{threshold}$), in year two fishing mortality would be reduced to $F_{threshold}$ or F=0.11. Under this scenario, if F was reduced to F=0.026 in ensuing seven years, the stock would be rebuilt to the target SSB by the ninth year. In year one the TAL would be 22.5 million pounds (10,186 mt), in year two TAL would equal 11.3 million pounds (5,130 mt) and in the seven remaining years TAL would range from 2.8 - 3.4 million pounds (1,262 - 1,558 mt). This option would meet the requirements of the SFA by rebuilding the female biomass to the target level in nine years.

Economic Impacts

This non-preferred management alternative would reduce landings to nearly one-half of 1997 levels in year one (1999), by 75% in year two (2000), and then limit landings to a level which would ensure the rebuilding of the stocks within a ten year time-frame. Relative to status quo, gross revenue declines reach a high of $2,778,962 in year three (2001) (Table 39). Figure 24 shows that cumulative gross revenues exceed status quo levels in 2220. Similarly (also relative to status quo), gross revenue declines for pack-out facilities reach a high of $741,056 in year three (2001) (Table 41). Impacts decline from this point as projected landings increase. Unlike the preferred alternative, this alternative does not provide for a rebuilt stock until 2009. Similarly Figures 24 and 25 illustrate that, although the second year of this option provides for a higher TAL than the preferred, the long term economic outlook for the preferred alternative is superior.

Given the higher TAL in year two of this option, there is the possibility that in the short-term, this option could provide some cost savings. By not forcing harvesters into other fisheries as quickly as the preferred alternative, this could possibly provide greater cost savings in the first two years of the proposed regulation. However, the cost data needed to clarify this point are currently unavailable. This analysis looks at gross revenues and, as Figures 24 and 25 suggest, the long-term benefits of the preferred alternative exceed this alternative.

Social Impacts

Non-preferred management alternatives two and three allow for landings at slightly more than one-third of current landings rates for year one followed by large reductions in landing necessary to rebuild stocks. Like the preferred alternative, the graduated reduction in landings should allow producers and processors to transition to other fisheries in light of the low allowable landings in years two through ten. However, the benefits of these alternatives do not exceed the preferred alternative which allows for the largest TAL exit fishery.

Effects on Marine Mammals, Sea Turtles, and Seabirds

As noted earlier, the various gear types fished in the spiny dogfish commercial are designated as Categories I, II, and III under the MMPA. The reductions in fishing mortality necessary to rebuild the spiny dogfish stock will require significant reductions in fishing effort. These reductions in gill net fishing effort would be very beneficial to certain species of marine mammals, especially the harbor porpoise. However, this option would allow higher levels of fishing effort in the first two years of the management program compared to the preferred alternative. This would lead to a higher probability of encounter with certain marine mammals compared to the preferred alternative, and thus would be expected to have a greater negative impact on these species.

3.1.5.2.3 Reduce fishing mortality in year one to allow a harvest of 13.2 million pounds (6,238 mt) and in year two reduce F to allow for harvest of 8.8 million pounds (4,117 mt) then reduce F to the level required to rebuild stock in remaining three years of the rebuilding program.

Biological Impacts

This option would require a reduction in fishing mortality in year one to allow a harvest of 13.2 million pounds (6,238 mt) and in year 2 to allow for a harvest of 8.8 million pounds (4,117 mt), F would then be reduced to F=0.028 to rebuild the stock in the remaining three years of the rebuilding program. In the last three years of the rebuilding program, TAL would be approximately 3.3 million pounds (1,509 mt). The biological impacts of this alternative are similar to the preferred alternative

Economic Impacts

This non-preferred alternative allows for a reduction to 13.2 million pounds (6,238 mt) and 8.8 million pounds (4,117 mt) in years one and two. Landings until 2003 are reduced to such a level as to allow the stock to be rebuilt in five years. Year one gross ex-vessel revenue declines are $2,631,447 compared to the status quo (Table 39). Pack-out facility gross revenue declines are $302,173 in year one compared to the status quo (Table 41). These impacts will decline throughout the time-span of the management plan as projected landings increase. This option consists of a graduated restriction of landings; 13.2 million pounds (6,238 mt) in year one and 8.8 million pounds (4,117 mt) in year two, followed by landing of less than 4.4 million pounds (2000 mt) until 2004 when landings are predicted to increase to14 million pounds (6,250 mt). This alternative does not provide as substantial an exit fishery as the preferred alternative and as such, was not favored by members of the fishing industry. In addition, this alternative's long-term economic benefits do not exceed that of the preferred alternative.

Social Impacts

This alternative allows for gradually reduced landings for years one and two followed by large reductions in landing necessary to rebuild stocks. Like the preferred alternative, the graduated reduction in landings should allow producers and processors to transition to other fisheries in light of the low allowable landings in years three through five. However, the benefits of these alternatives do not exceed the preferred alternative which allows for the largest TAL exit fishery and thus is expected to provide greater social benefits.

Effects on Marine Mammals, Sea Turtles, and Seabirds

As noted earlier, the various gear types fished in the spiny dogfish commercial are designated as Categories I, II, and III under the MMPA. The reductions in fishing mortality necessary to rebuild the spiny dogfish stock will require significant reductions in fishing effort. These reductions in gill net fishing effort would be very beneficial to certain species of marine mammals, especially the harbor porpoise. The benefits are expected to be similar to those described for the preferred alternative.

3.1.5.2.4 Reduce fishing mortality to F=0.072 in year one and maintain to allow stock rebuilding in 15 years to rebuild to biomass target

Biological Impacts

This option would require a reduction in fishing mortality to F=0.072 in years 1-15 and would allow for stock rebuilding over a 15 year planning horizon by maintaining a constant F. This option would not meet the requirements of the SFA. As a result, negative biological consequences are expected because the stock will not be rebuilt in 10 years.

Economic Impacts

These options may spread economic impacts over a greater time period, but do not meet the requirements of the SFA.

Social Impacts

These options may spread social impacts over a greater time period, but do not meet the requirements of the SFA.

Effects on Marine Mammals, Sea Turtles, and Seabirds

As noted earlier, the various gear types fished in the spiny dogfish commercial are designated as Categories I, II, and III under the MMPA. The reductions in fishing mortality necessary to rebuild the spiny dogfish stock will require significant reductions in fishing effort. These reductions in gill net fishing effort would be very beneficial to certain species of marine mammals and sea turtles relative to the status quo. However, the extended rebuilding period under this alternative would not provide benefits to these species to the degree that the preferred alternative does.

3.1.5.2.5 Reduce fishing mortality to F=0.078 in year one and maintain to allow stock rebuilding in 20 years to rebuild to biomass target

Biological Impacts

This option would require a reduction in fishing mortality to F=0.078 in years 1-20 and would allow for stock rebuilding over a 20 year planning horizon by maintaining a constant F. This option would not meet the requirements of the SFA. As a result, negative biological consequences are expected because the stock will not be rebuilt in 10 years.

Economic Impacts

These options may spread economic impacts over a greater time period, but do not meet the requirements of the SFA.

Social Impacts

These options may spread social impacts over a greater time period, but do not meet the requirements of the SFA.

Effects on Marine Mammals, Sea Turtles, and Seabirds

As noted earlier, the various gear types fished in the spiny dogfish commercial are designated as Categories I, II, and III under the MMPA. The reductions in fishing mortality necessary to rebuild the spiny dogfish stock will require significant reductions in fishing effort. These reductions in gill net fishing effort would be very beneficial to certain species of marine mammals and sea turtles relative to the status quo. However, the extended rebuilding period under this alternative would not provide benefits to these species to the degree that the preferred alternative does.

3.1.5.2.6 Reduce fishing mortality to F=0.088 in year one and maintain to allow stock rebuilding in 30 years to rebuild to biomass target

Biological Impacts

This option would require a reduction in fishing mortality to F=0.088 in years 1-30 and would allow for stock rebuilding over a 30 year planning horizon by maintaining a constant F. This option would not meet the requirements of the SFA. As a result, negative biological consequences are expected because the stock will not be rebuilt in 10 years.

Economic Impacts

These options may spread economic impacts over a greater time period, but do not meet the requirements of the SFA.

Social Impacts

These options may spread social impacts over a greater time period, but do not meet the requirements of the SFA.

Effects on Marine Mammals, Sea Turtles, and Seabirds

As noted earlier, the various gear types fished in the spiny dogfish commercial are designated as Categories I, II, and III under the MMPA. The reductions in fishing mortality necessary to rebuild the spiny dogfish stock will require significant reductions in fishing effort. These reductions in gill net fishing effort would be very beneficial to certain species of marine mammals and sea turtles relative to the status quo. However, the extended rebuilding period under this alternative would not provide benefits to these species to the degree that the preferred alternative does.

3.1.5.3. Establish a coastwide trip limit

Biological Impacts

This alternative would establish a system of uniform trip limits established on a coastwide basis in conjunction with the quota system. To estimate allowable trip limits under any of the scenarios requires an estimation of the number of trips likely to be taken during each year of the management program. For example, there are roughly 5,000 vessels which currently possess permits to fish in the EEZ from ME to NC. Assuming that each vessel makes 100 trips per year, and that half of those trips could land spiny dogfish, yields an estimate of 250,000 trips. If the annual TAL was 2.9 million pounds (1,316 mt) in the year 2000, the associated trip limit would be about 12 pounds (5.5 kg). This analysis suggests that any trip limit specified on an annual basis would be very low. A trip limit could be specified for a limited season which might allow for a higher trip limit. The biological impacts would be the same as those identified in the sections described above for the commercial quota.

Economic Impacts

Under this alternative, the Councils may establish trip limits and seasons to insure that the annual quota is not exceeded. Thus, the Councils would be required to implement a uniform trip limit which would apply coastwide. A coastwide uniform trip limit system will not likely ensure equitable distribution for all areas, gears, and seasons.

This alternative would establish a system of uniform trip limits in conjunction with the quota system. Section 3.1.3 of this document describes the low projected trip limits per vessel, potentially as low as 12 pounds (5.5 kg) per trip. This would seem to preclude any targeted fishery for spiny dogfish and would create mostly a by-catch fishery. Given that the average commercial fishing trip in 1996 landed 4,405 pounds (2 mt), this low trip limit would preclude a viable directed fishery. Conceivably, there would be fewer participants involved in the commercial spiny dogfish fishery which may allow larger trip limits. However, a uniform trip limit system may not ensure an equitable distribution for all areas, gears, and seasons (if implemented). Therefore, positive long-term benefits may be fettered by this management option. Table 42 illustrates the potential affects of trip limits under the preferred and non-preferred management alternatives.

Social Impacts

The advantage of this alternative is that a uniform trip limit would be relatively easy to enforce because all individuals would be subject to the same trip limit regardless of origin or location of fishing. The drawback to this alternative is that a uniform trip limit would not be appropriate for all areas, gears, and seasons. This could result in negative social consequences due to the disproportionate effects of the trip limit.

Effects on Marine Mammals, Sea Turtles, and Seabirds

The trip limit options considered in this Amendment could have an impact on marine mammals if the practice of highgrading spiny dogfish were to develop. As noted earlier, the various gear types fished in the spiny dogfish commercial are designated as Categories I, II, and III under the MMPA. It is possible that effective effort in the spiny dogfish fisheries could be greater under a trip limit scenario compared to the preferred alternative, which would have negative consequences for some species of marine mammals and sea turtles.

3.1.5.4 Minimum size limits

3.1.5.4.1 Establish a minimum size which corresponds to the length at which 50% of female spiny dogfish are sexually mature

This alternative would establish a minimum size for spiny dogfish which corresponds to the length at which 50% of female spiny dogfish are sexually mature. This would require a minimum size of 32 inches (80 cm).

3.1.5.4.2 Establish a minimum size which corresponds to the length at which 100% of female spiny dogfish are sexually mature

This alternative would establish a minimum size for spiny dogfish which corresponds to the length at which 100% of female spiny dogfish are sexually mature. This would require a minimum size of 36 inches (91 cm).

3.1.5.4.3 Establish minimum a size of 27.5 in (70 cm)

This alternative would establish a minimum size of 27.5 in (70 cm), which is the current effective minimum size at capture for spiny dogfish in the commercial fishery.

3.1.5.4.4 Establish a slot size limit of 27.5 in to 32 in (70-80 cm)

Each of the stock rebuilding strategies which meet the SFA requirements could be implemented with a slot size limit of 27.5 in to 32 in (70-80 cm). This alternative would require that the F applied in any given year be applied fully to a slot limit of 27.5 in to 32 in (70-80 cm), and that a partial recruitment vector of 0.5 of that F was applied to dogfish greater than 80 cm. Under these scenarios, only fish from 27-32 in (70-80 cm) could be retained, and it was assumed that fish greater than 32 in (80 cm) would continue to be caught and discarded, with an effective mortality rate of 50% of those landed in the slot.

The results indicate that this strategy would result in lower yields and would not alter the rebuilding time frame.

<u>Biological Impacts</u>

Assuming that undersized fish are not caught and discarded, minimum size regulations would have positive impacts on the stock. In general, because minimum sizes increase the size at full recruitment, yields are increased as fishermen catch larger, heavier fish. In addition, minimum size regulations can increase the resilience of the stock to overfishing, i.e., the biological reference points (F_{MSY} or proxy F_{rep}) can increase. Finally, minimum size regulations can increase spawning stock biomass by allowing more fish to spawn.

However, negative biological consequences of minimum and slot size restrictions in the spiny dogfish fishery would result from increased discarding. It is unlikely that spiny dogfish fishermen could avoid catching sub-legal fish, and, as a result, increased levels of discards are expected, especially given the current size composition of the stock.

<u>Economic Impacts</u>

The economic impact from the implementation of these alternatives would vary between regions and gears employed. In general terms, reduction in revenues in the short-term would be expected. The degree of long term economic consequences would depend on the level and extent of discarding as the stock rebuilds.

Overall, these alternatives are expected to have a significant adverse economic effect on the spiny dogfish fishery, at least in the short-term. However, benefits of a size restrictions in the fishery could result from increased catches of fish in future years. Gains will accrue to fishermen through protecting small fish until they reach legal size. This management measure will result in a short-term reduction in the marketable catch and long-term benefits as more fish mature and increase the size of the spawning stock. In addition, a reduction in the mortality of small fish will allow for an increase in yield or harvest as small fish that were previously killed grow larger and add weight to the stock.

Social Impacts

The proposed commercial fish size limitations would reduce the commercial catch and increase discards. If commercial fishermen can substitute the potential income loss by landing another species without additional effort then they may see no negative impact. However, if this is not possible, short-term impacts could occur. Nevertheless, given the analysis conducted under economic impacts above, it is possible that commercial fishermen could be faced with substantial income loss as the result of the minimum size limit, with uncertain biological results.

Effects on Marine Mammals, Sea Turtles and Seabirds

Size restrictions in the spiny dogfish fishery will not have any significant impact on marine mammals, sea turtles, shortnose sturgeon, and seabirds.

3.1.5.5 Alternative seasonal allocation of the commercial quota

3.1.5.5.1 Allocate commercial quota on a quarterly basis

The process used to set the quota is specified in 3.1.1.6. A quota would be allocated to the commercial fishery to control fishing mortality. The quota would be based on projected stock size estimates for that year as derived from the latest stock assessment information. Estimates of stock size coupled with the target fishing mortality rate would allow for a calculation of total allowable landings (TAL).

A system to distribute and manage the annual commercial quota on a seasonal basis would be implemented by the Councils. Quotas would be distributed between seasons based on the percentage of commercial landings for the each quarterly period during the years 1990-1997. These season specific quotas are specified in Table 36.

3.1.5.5.2 Allocate commercial quota on a bi-monthly basis

The process used to set the quota is specified in 3.1.1.6. A quota would be allocated to the commercial fishery to control fishing mortality. The quota would be based on projected stock size estimates for that year as derived from the latest stock assessment information. Estimates of stock size coupled with the target fishing mortality rate would allow for a calculation of total allowable landings (TAL).

A system to distribute and manage the annual commercial quota on a seasonal basis would be implemented by the Councils. Quotas would be distributed between seasons based on the percentage of commercial landings for the each bi-monthly period during the years 1990-1997. These season specific quotas are specified in Table 36.

Biological Impacts

The alternative seasonal allocations described above could be expected to have positive or negative biological impacts for the spiny dogfish stock, depending on fishermen behavior in reaction to the imposition of various seasons. In general, the shorter the season, the greater the assurance that the quota will be taken throughout the year. However, increased discarding could occur once the seasonal quota is reached, resulting in negative biological consequences for the stock.

Economic Impacts

These alternatives would establish an annual quota distributed seasonally, as implemented by the Councils. The effects of these alternatives would depend largely upon the distributional system set up by the Councils. Quotas should be allocated so as to ensure an equitable distribution of the TAL based on historical landings data. Since there is a northern and southern fishery, consideration should be given to reducing economic impacts associated with seasonal price variations for spiny dogfish. An equitable allocation of quotas should ensure the maximization of long-term benefits through a rebuilt spiny dogfish fishery.

Social Impacts

As noted above, seasonal quota allocations of quotas should ensure the maximization of long-term benefits through a rebuilt spiny dogfish fishery. Quotas should be allocated so as to ensure an equitable distribution of the TAL based on historical landings data. The effects of these alternatives would depend largely upon the distributional system set up by the Councils.

Effects on Marine Mammals, Sea Turtles, and Seabirds

Alternative seasonal allocations of the quota in the spiny dogfish fishery will not have any significant impact on marine mammals, sea turtles, shortnose sturgeon, and seabirds.

3.1.5.6 Limit entry into the spiny dogfish fisheries

Biological Impacts

Under this alternative, vessels would have to qualify for a limited access commercial permit for spiny dogfish. The qualifying criteria would be based on historical performance in the fishery at a level specified by the Councils. The intent of this action would be to limit the number of participants in the commercial fishery for spiny dogfish. As such, this measure would not be expected to have any biological impacts.

Economic Impacts

The level of economic impacts of this alternative would depend on the qualifying criteria that the Councils choose to obtain a limited access permit. The stricter the requirements, the fewer the number of vessels that would qualify for a limited access permit. The economic consequences of any limited access program would have to be evaluated based on the requirements of the program. However, in general the economic consequences would be positive for the historical participants who qualify since they will be assured some share of the economic benefits derived from the stock rebuilding program.

Social Impacts

The level of social impact of this alternative would depend on the qualifying criteria that the Councils choose to require for a limited access permit. The stricter the requirements, the fewer the number of vessels that would qualify for a limited access permit. The social consequences of any limited access program would have to be evaluated based on the requirements of the program. However, in general the social consequences would be positive for the historical participants who qualify since they will be assured of the benefits derived from the stock rebuilding program.

Effects on Marine Mammals, Sea Turtles, and Seabirds

Limiting entry into the spiny dogfish fishery will not have any significant impact on marine mammals, sea turtles, shortnose sturgeon, and seabirds.

3.1.5.7 Specify a target commercial quota

Biological Impacts

Under this alternative, the Councils would specify a target commercial quota in place of the "hard" or fixed quota specified in the preferred alternative. This approach to managing the commercial fishery would require additional management measures which would control fishing effort (i.e., input controls). Under this system an annual target quota would be specified and a suite of effort controls would be specified such that the landings under the effort control system would be expected to approximate the target quota. The fishery would not necessarily be closed if the target quota is reached or exceeded. This system depends on fishing effort limitations primarily through limitations on the number of days that vessels may fish during the quota period.

Spiny dogfish are long lived and slow growing (see Section 2.1.3.2). This life history strategy (long lived with low reproductive potential) makes the species particularly vulnerable to overfishing. Holden (1973) noted the limited ability of sharks and other elasmobranchs to maintain the levels of exploitation sustainable in fisheries for teleost or bony fish. This is because stock and recruitment are directly related and reductions in adult stock size result in reduced recruitment. In addition, the limited reproductive potential of spiny dogfish offers little flexibility in compensating for increased exploitation.

Given the vulnerability of this species to overfishing, this system of management could have negative biological consequences if it fails to dramatically reduce fishing mortality. The spiny dogfish stock is designated as overfished and under the SFA the stock must be rebuilt in ten years or less. If an effort control system fails to end overfishing and allow stock rebuilding, yield would be foregone and thus optimum yield would not be obtained.

Economic Impacts

If an effort control system fails to end overfishing and allow stock rebuilding, yield would be foregone and thus, optimum yield would not be obtained. As a result, economic inefficiency and lost revenue to the spiny dogfish fishery, in terms of both the harvesting and processing sector, would be expected.

Social Impacts

If effort controls fail to end overfishing, the resulting economic inefficiency and lost revenue to the spiny dogfish fishery, in terms of both the harvesting and processing sector, would be expected to have negative social impacts. These impacts would be especially acute in the ports and the associated communities which depend heavily on spiny dogfish.

Effects on Marine Mammals, Sea Turtles, and Seabirds

The impact of this measure on marine mammals, sea turtles and seabirds would depend on the degree to which the measures implemented would reduce fishing effort in the spiny dogfish gill net fisheries. Assuming that the effort control program was successful in reducing effort in these gill net fisheries, then they would be expected to have a positive impact on some species of marine mammals, especially the harbor porpoise.

3.1.5.8 Gill net limitations

Biological Impacts

Commercial gill net vessels fishing for spiny dogfish will be prohibited from fishing more than a total of 80 nets (50 fathoms each). The purpose of this measure is to attempt to cap overall fishing effort during the first year exit fishery. It is intended to prevent a derby style fishery during the first year when a directed fishery will be prosecuted. This measure should have positive biological impacts since it will place an overall limitation on gill nets in the directed spiny dogfish fishery, thereby reducing the chance that the quota will be exceeded.

Economic Impacts

Since no regulations specific to the spiny dogfish gill net fishery currently exist, little or no information exits on the amount of fishing effort in the directed fishery. However, anecdotal reports from industry indicate few if any spiny dogfish gill netters fish in excess of the proposed net limit. As a result, there are no economic impacts expected from this measure.

Social Impacts

Since no regulations specific to the spiny dogfish gill net fishery currently exist, little or no information exits on fishing effort in the directed fishery. However, anecdotal reports from industry indicate few if any spiny dogfish gill netters fish in excess of the proposed net limit. As a result, there are no social impacts expected from this measure.

Effects on Marine Mammals, Sea Turtles, and Seabirds

The effect of this measure is to place an overall cap on fishing effort in the spiny dogfish gill net fishery. Since these are classified as Category I, II, and III fisheries, this measure is may have a positive impact on marine mammals since it will limit the amount of fishing gear that can be used to take spiny dogfish.

4.0 REGULATORY IMPACT REVIEW AND INITIAL REGULATORY FLEXIBILITY ANALYSIS

4.1 INTRODUCTION

The National Marine Fisheries Service 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. The RIR is prepared by the Regional Fishery Management Councils with assistance from the National Marine Fisheries Service (NMFS), as necessary. The RIR is part of the process of preparing and reviewing FMPs and provides a comprehensive review of the economic impacts associated with proposed regulatory actions.

The National Marine Fisheries Service requires a RIR for all regulatory actions that are part of the "public interest." The RIR does three things: 1) it provides a comprehensive review of the level and incidence of economic impacts associated with proposed regulatory actions; 2) it 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 meet these objectives; and, 3) it ensures 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 manner.

The RIR addresses many items in the regulatory philosophy and principles of Executive Order (E.O.) 12866. The RIR also serves as the basis for determining whether any proposed regulation is a "significant regulatory action" under certain criteria provided in E.O. 12866. The RIR also determines whether the proposed regulations will have a significant economic impact on a substantial number of small entities in compliance with the Regulatory Flexibility Act (RFA) of 1980 as amended by Public Law 104-121. The purpose of the RFA is to relieve small businesses, small organizations, and small government agencies from burdensome regulations and record-keeping requirements, to the extent possible.

4.2 PROBLEMS AND OBJECTIVES

The description of the spiny dogfish fishery can be found in section 2.0 of this document. The problems for resolution and management objectives are outlined in sections 1.1.2 and 1.1.3 of this document, respectively.

4.3 METHODOLOGY AND FRAMEWORK FOR ANALYSIS

The basic approach adopted in the RIR is an assessment of management measures from the standpoint of determining the resulting changes in costs and benefits to society. The net effects should be stated in terms of producer and consumer surplus for harvesters, processors/dealers, and consumers. Ideally, the expected present value of net yield streams over time associated with different management alternatives should be compared in evaluating the benefits. The approach taken in analyzing the alternative management actions is to describe and/or quantify, to the extent possible, the changes in net benefits by looking at changes in gross revenues for different industry sectors.

4.4 IMPACTS OF THE PREFERRED ACTIONS AND ALTERNATIVES TO THE PREFERRED ACTIONS

Changes in gross revenues were estimated relative to the projected status quo levels for each alternative. Impacts were calculated using the projected status quo landings by taking the average 1997 ex-vessel price for spiny dogfish (per pound) and multiplying this value by the proposed change in landings. It is important to note that the ex-vessel price for spiny dogfish, given the proposed reductions in landings, would depend on the elasticity of demand for this species. Since no studies have determined a demand function for spiny dogfish, revenue changes which account for varying levels of demand could not be calculated. In addition, changes in costs and market trends are not reflected in the analysis due to a lack of data.

Pack-out facilities are usually compensated based on the number of pounds off-loaded and prepared for transport. Many different types of arrangements exist; for example, in some instances the pack-out facility only packs the fish in ice and prepares it for transport. In other situations the pack-out facility may act as a broker between the producers and processors. Since no formal database is maintained on this sector, primary information from pack-out businesses was used to determine the economic impacts of the proposed management alternatives. These individuals generally receive 3-5 cents per pound for fish handled, therefore, it was assumed that 100% of spiny dogfish landed were handled by a pack-out facility at 4 cents per pound for each management option. This assumption represents the upper bound for this sector since it could be argued that not all dogfish are handled by pack-out facilities. This assumption is based on the desire to include the dealer/transport sector as part of the spiny dogfish fisheries system.

No formal database on the gross revenues of processors is maintained; therefore the losses of gross revenues for this sector could not be calculated. Information on the percent of spiny dogfish revenues to total gross revenues was obtained to conduct a Regulatory Flexibility Act (RFA) Analysis (see Section 4.6.3). Although this document contains such an analysis, under NMFS' current interpretation of the law, processors and pack-out facilities are not considered directly impacted by fisheries regulations and thus are not part of the RFA.

4.4.1 SUMMARY OF IMPACTS OF PREFERRED ALTERNATIVE

4.4.1.2 Preferred Alternative

The preferred alternative will eliminate overfishing and rebuild the spiny dogfish stock while allowing a one year "exit fishery." This step allows for a one year fishery of 22 million pounds (10,006 mt) to allow a phase out of the directed fishery. This approach was chosen to minimize the impacts of the rebuilding program on both the harvesting and processing sectors of the industry. Landings will be reduced to 2.9 million pounds (1316 mt) in the year 2000 and maintained at under 4.4 million pounds (2000 mt) until the target biomass is reached in 2003. It is assumed that pursuant to reaching 90% of SSB_{max} spiny dogfish yields will increase to approximately 14 million pounds (6,250 mt).

4.4.1.3 Impacts of the Preferred Alternative on Commercial Fishing, Processors, and Pack-out Facilities

This alternative is expected to rebuild spiny dogfish stocks in the shortest possible time while still meeting the requirements of the Sustainable Fisheries Act and still allow an exit fishing in year one. During this time period, the processing sector should be able to continue operations. In 1999, landings would be reduced by 22,674,861 pounds (10,285 mt; $3,401,229) relative to 1997 total landings.

Based upon projected status quo total landings (i.e. total predicted landings if no management measures were imposed), 1999 commercial landings would be reduced by 9,234,540 pounds (4189 mt; $1,385,181). Based upon projected status quo landings in relation to proposed TALs, ex-vessel gross revenue declines reach a high of $3,383,903 in year two as landings are reduced to 2,901,780 lbs (1,316 metric tons) (Tables 39 and 40). Pack-out facility gross revenue declines are greatest ($902,374) in year two (Table 41). Gross revenue losses decline from this point as projected landings increase.

The cumulative discounted impacts of this action are illustrated in Figure 25 (See Figure 24 for non-discounted impacts). Notably, the discounted projected impacts of the preferred management action and its alternatives do not reach status quo levels (the *x* axis) until after the 28th year (Figure 25). The discounted loss of gross ex-vessel revenues is fairly dramatic until the year 2004 when the benefits of harvest reductions begin to be realized as projected TALs increase. This characterization, however, has several shortcomings, the greatest of which is that it does not account for elasticity of demand. Potentially, price could increase as supply declines causing these curves to rise (i.e., toward the *x* axis). This characterization also does not account for changes in costs and introductions of new, potentially more efficient harvest technologies.

An additional area of uncertainty is the effect of low TALs upon markets. Processors have indicated that the ability to process spiny dogfish in a cost-effective manner is dependent upon volume. The proposed low TAL may cause processors to cease processing spiny dogfish and thus cause established U.S. based markets for this species to collapse. Since currently, most spiny dogfish are processed and exported, the implications of management upon both foreign and domestic markets are hard to predict. Two scenarios are: 1) the demand for spiny dogfish by foreign markets may decline as this species is replaced by a more readily available alternative; and conversely, 2) the lessening of supply in light of a static demand could cause price to rise and allow for a modified fishery to exist while landings remain at low levels. Preliminary indications from industry members are that the first scenario is the most likely to occur. The long-term effects of a potential market collapse are unknown and, furthermore, the ability of processors and harvesters to re-establish markets, if they go dormant, is also unknown.

These scenarios would also affect harvesters: if markets for spiny dogfish cease, there will not be an outlet to sell their catch. Conversely, if prices rise, harvesters will be able to receive greater ex-vessel prices for spiny dogfish (assuming a market exists). Even if prices increase, however, due to the extremely low TALs, this would probably do little to mitigate the economic impacts caused by the preferred alternative (this is true for both harvesters and processors). Given low TALs, the harvesting, processing, and support industries are not likely to see cumulative nominal benefits for at least 15 years (see Figure 24).

An additional area of concern is with the redirection of fishing effort from the spiny dogfish fishery into other fisheries. Given that the weighout data indicate that there were 595 participants is the spiny dogfish fishery in 1997, these participants will be faced with the choice of either exiting fishing altogether or redirecting their effort into other fisheries. Griffith *et al.* (1996) found that one of the primary responses to 'fisheries crises' was either moving to other regions to fish or simply moving into other fisheries. This practice may impede the stock rebuilding schedules for species deemed overfished and currently under management as well as stress species currently not under management. Another concern is to what degree participants in the spiny dogfish fishery will be able to find other commercially valuable species from which to supplement their income. Given that many species are under some form of limited entry, those that currently do not have permits may not be able to acquire them. This greatly limits harvesters' ability to make-up lost income and may cause some to exit the fishing industry completely.

Other businesses that support the spiny dogfish industry will also be impacted by the preferred alternative. Although the magnitude and the scope of these impacts are unknown, businesses that provide packaging material for exporting dogfish, transportation to European markets, and fish brokers, will be impacted by this FMP.

4.4.1.4 Impacts of the Preferred Alternative on Recreational Fishing

Since no recreational measures are proposed in year one, demand for recreational fishing trips targeting spiny dogfish will not be affected. The 1996 landings of spiny dogfish by the recreational fishing sector was 14,408 lbs (catch type A + B1) and discards were estimated at 143,130 lbs (catch type B2). The 1994 MRFSS survey 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. In light of this, there is expected to be no lessening of demand for recreational fishing trips due to this proposed action.

4.4.1.5 Impacts of Permit and Reporting Requirements Under the Preferred Alternative

Actions two through four implement permit requirements for commercial vessels, dealers, and operators. Given the current status of the stocks and the uncertainties regarding discard rates for spiny dogfish, mechanisms which account for all activities in the fishery are necessary to enforce provisions of the FMP and ensure overfishing is prevented. Permits issued to all sectors which harvest, process, or sell spiny dogfish provide the foundation for effective monitoring and enforcement of regulations.

It is estimated that 595 different vessels landed spiny dogfish in 1997 along the Atlantic coast. Under the all of the alternatives, any vessel desiring to fish commercially for spiny dogfish must obtain a federal vessel/owner spiny dogfish permit. It is estimated that 87% of commercial vessels landing spiny dogfish in 1997 possess a NMFS permit for at least one or more fisheries. Therefore, approximately 77 new applicants would be required to apply for a federal spiny dogfish vessel permit using the initial application form. The remainder would use the renewal form and would not likely incur an additional burden. It is estimated that owner/operators of all 77 vessels would apply for a spiny dogfish permit. The total burden cost associated with public requirements is $578 ($7.50 per vessel) and the total burden cost associated with federal requirements is estimated at $2,739. The expected burden cost associated with public requirements for the commercial logbook submission is $1,533 ($20 per vessel per year) and the total government cost is $1,924.

In addition, it is expected that approximately 77 new applicants would be required to apply for a federal spiny dogfish operator permit using the initial application form. The remainder would use the renewal form and would not likely incur an additional burden. The total burden cost associated with public requirements is $1,155 ($15 per operator) and the total burden cost associated with federal requirements is estimated at $5,082.

It is expected that there will be approximately 15 new applicants for dealer permits. The total coat burden associated with the public requirement for new applicants is $1.25 per applicant. Thereafter the public annual estimate of submitting weekly reports will be $26 per dealer per year. Thereafter, the annual estimate of processing weekly reports for the NMFS will be $43 per dealer. Thus total cost for all new dealers (who do not currently have permits) for permitting requirements in the first year is $409 and the combined public and private burden will be $1,054.

4.4.1.6 Impacts of Framework Adjustment Measures Under the Preferred Alternative

The next regulatory action establishes the framework adjustment process which enables the modification of management measures through a framework adjustment procedure.

This adjustment procedure allows the Councils to add or modify management measures through a streamlined public review process.

The following management measures could be implemented or modified through framework adjustment procedures.

1. Minimum fish size.
2. Maximum fish size.
3. Gear requirements, restrictions or prohibitions (including, but not limited to, mesh size restrictions and net limits).
4. Regional gear restrictions.
5. Permitting restrictions and reporting requirements.
6. Recreational fishery measures including possession and size limits and season and area restrictions.
7. Commercial season and area restrictions.
8. Commercial trip or possession limits.
9. Fin weight to spiny dogfish landing weight restrictions.
10. Onboard observer requirements.
11. Commercial quota system including commercial quota allocation procedure and possible quota set asides to mitigate bycatch, conduct scientific research or for other reasons.
12. Recreational harvest limit.
13. Annual quota specification process.
14. FMP Monitoring Committee composition and process.
15. Description and identification of essential fish habitat.
16. Description and identification of habitat areas of particular concern

17. Overfishing definition and related thresholds and targets.
18. Regional season restrictions (including option to split seasons).
19. Restrictions on vessel size (LOA and GRT) or shaft horsepower.
20. Target quotas.
21. Measures to mitigate marine mammal entanglements and interactions.
22. Regional management
23. Any other management measures currently included in the FMP.
24. Measures to regulate aquaculture projects.

The framework adjustment procedures listed above may be used to modify the FMP to ensure the objective of rebuilding spiny dogfish stocks. The maximum and minimum size limit would likely do little to fetter the harvesting of spiny dogfish beyond the proposed restrictions. These provisions may add flexibility to the method of managing spiny dogfish as well as ensuring the timely rebuilding of fish stocks (refer to section 3.1.5.4 for a discussion of size limits). Section 3.1.4.4 discusses gear restrictions and minimum mesh sizes and permitting requirements are discussed in section 4.4.1. As previously stated, there is no known major recreational fishery targeting spiny dogfish and, as such, neither possession and size limits, nor seasons is likely to have a significant impact on the demand for recreational fishing trips. Section 3.1.5.1 discusses season and area restrictions. A prohibition on finning (removing the fin at sea and disposing of the carcass) is likely to have no economic impact as industry advisors have indicated that this practice is very rare. Similarly, fin weight to spiny dogfish landing weight restrictions are likely to have no economic impacts as this has historically not been an issue in the spiny dogfish fishery. Trip and/or possession limits are discussed in section 4.4.2. The likely impacts of onboard observer requirements and measures to mitigate marine mammal entanglements and interactions are hard to predict. The remaining measures may be necessary to ensure adherence to the FMP and other laws, respectively.

4.4.1.7 Impacts of Commercial Fishing Quotas Under the Preferred Alternative

The next regulatory action establishes a seasonally allocated commercial fishing quota. The quota would be based on projected stock size estimates for that year as derived by the latest stock assessment information. The annual commercial quota would be distributed between seasons based on the percentage of commercial landings for each semi-annual period during the years 1990-1997. This quota should succeed in reducing mortality rates to the point where spiny dogfish stocks can be rebuilt within the legally mandated 10 year time-frame.

A seasonally allocated commercial fishing quota would also likely ensure that spiny dogfish landings are equitably distributed between northern and southern areas. Figures 24 and 25 as well as Tables 38 and 39 illustrated the likely impacts on gross ex-vessel revenues of the preferred option as well as the alternative rebuilding strategies.

4.4.1.8 Impacts of Mesh Sizes Under the Preferred Alternative

This action would set a minimum mesh requirement for otter trawls and gill nets and would be implemented though the framework process specified in 3.1.1.6. This regulation would not likely add to the impacts outlined in Figures 24 and 25 and Tables 39 and 40. This regulation would however assist in implementing minimum size limits and potentially reduce discards, which in turn, would likely enhance the effectiveness of the FMP.

4.4.2 SUMMARY OF IMPACTS OF NON-PREFERRED ALTERNATIVES

4.4.2.1 Status Quo

Status quo (take no action) will not allow for the problems identified in section 1.1.2 of this document to be solved. The implementation of this alternative is projected to cause landings to decline precipitously: by the year 2001 landing would be less than half of what they were in 1997. This alternative would not meet the requirements of the Sustainable Fisheries Act nor capture long-term economic benefits of rebuilt spiny dogfish stocks.

4.4.2.2 Non-Preferred Alternative Rebuilding Schedule1

This alternative reduces landings to a consistent level of approximately 5.5 million pounds (2,500 mt) until 2003 when, landings are assumed to reach a consistent level of 14 million pounds (6250 mt). At approximately 5.5 million pounds (2,500 mt), a directed fishery for spiny dogfish is unlikely and the effect that a by-catch fishery may have on markets is currently unknown. In addition, this option did not provide for a one year 'exit' fishery and was thus not desirable to fishery participants.

4.4.2.3 Non-Preferred Alternative Rebuilding Schedule 2

This non-preferred management alternative would reduce landings to nearly one-half of 1997 levels in year one, by 75% in year two, and then limit landings to a level which would ensure the rebuilding of the stocks within a ten year time-frame. Relative to status quo, gross revenue declines reach a high of $2,778,962 in year three (2001) (Table 39). Figure 24 shows that cumulative gross revenues exceed status quo levels in 2220. Similarly (also relative to status quo), gross revenue declines for pack-out facilities reach a high of $741,056 in year three (2001) (Table 41). Impacts decline from this point as projected landings increase. Unlike the preferred alternative, this alternative does not provide for a rebuilt stock until 2009. Similarly, Figures 24 and 25 illustrate that, although the second year of this option provides for a higher TAL than the preferred, the long term economic outlook for the preferred alternative is superior.

Given the higher TAL in year two of this option, there is the possibility that in the short-term, this option could provide some cost savings. By not forcing harvesters into other fisheries as quickly as the preferred alternative, this could possibly provide greater cost savings in the first two years of the proposed regulation. However, the cost data needed to clarify this point are currently unavailable. This analysis looks at gross revenues and, as Figures 24 and 25 suggest, the long-term benefits of the preferred alternative exceed this alternative.

4.4.2.4 Non-Preferred Alternative Rebuilding Schedule 3

This non-preferred alternative allows for a reduction to 13.2 million pounds (6,238 mt) and 8.8 million pounds (4,117 mt) in years one and two. Landings until 2003 are reduced to such a level as to allow the stock to be rebuilt in five years. Year one gross ex-vessel revenue declines are $2,631,447 compared to the status quo (Table 39). Pack-out facility gross revenue declines are $302,173 in year one compared to the status quo (Table 41). These impacts will decline throughout the time-span of the management plan as projected landings increase. This option consists of a graduated restriction of landings; 13.2 million pounds (6,238 mt) in year one and 8.8 million pounds (4,117 mt) in year two, followed by landing of less than 4.4 million pounds (2000 mt) until 2004 when landings are predicted to increase to 14 million pounds (6,250 mt). This alternative does not provide as substantial an exit fishery as the preferred alternative and as such, was not favored by members of the fishing industry. In addition, this alternative's long-term economic benefits do not exceed that of the preferred alternative.

4.4.2.5 Non-Preferred Alternatives 4, 5, and 6

Alternatives four, five, and six all reduce mortality to levels that are necessary to rebuild spiny dogfish stocks within a 15, 20, and 30 year time frame, respectively. These options may spread economic impacts over a greater time period, but do not meet the requirements of the SFA.

4.4.2.6 Non-Preferred Alternative 7

Alternative seven would establish a system of uniform trip limits in conjunction with the quota system. Section 3.1.3 of this document describes the low projected trip limits per vessel, potentially as low as 12 lbs. per trip. This would seem to preclude any targeted fishery for spiny dogfish and would create mostly a by-catch fishery. Given that the average commercial fishing trip in 1997 landed 3,116 lbs, this low trip limit would preclude a viable directed fishery. Conceivably, there would be less participants involved in the commercial spiny dogfish fishery which may allow larger trip limits. However, a uniform trip limit system may not ensure an equitable distribution for all areas, gears, and seasons (if implemented). Therefore positive long-term benefits may be fettered by this management option. Table 42 illustrates the projected spiny dogfish gross ex-vessel revenues under trip limits scenarios for the various management alternatives.

4.4.2.7 Non-Preferred Alternatives 8 and 9

Alternative eight and nine would establish a minimum size limit for spiny dogfish which corresponds to the length at which 50% of female spiny dogfish are sexually mature (32 inches) and the length at which 100% of female spiny dogfish are sexually mature (36 inches), respectively. This is likely to have little economic impact on recreational fishing. There are likely to be negative short-term economic impacts on the commercial harvesting sector, which will correspondingly be incurred by processors and dealers.

4.4.2.8 Non-Preferred Alternative 10

Alternative ten would establish a slot size limit of 27.5 inches to 32 inches. The results of projected TAL under this scenario indicate that this strategy would result in lower overall yields and not quicken the pace of the rebuilding period. Thus the potential benefits under this scenario are less than the preferred alternative in the same time-frame.

4.4.2.9 Non-Preferred Alternatives 11 and 12

The eleventh and twelfth alternatives would establish an annual quota distributed quarterly and/or bi-monthly, as implemented by the Councils. The effects of these alternatives would depend largely upon the distributional system set up by the Councils. Quotas should be allocated so as to ensure an equitable distribution of the TAL based on historical landings data. Since there is a northern and southern fishery, consideration should be given to reducing economic impacts associated with seasonal price variations for spiny dogfish. An equitable allocation of quotas should ensure the maximization of long-term benefits through a rebuilt spiny dogfish fishery.

4.5 DETERMINATION OF SIGNIFICANT REGULATORY ACTION

Pursuant to E.O. 12866, a regulation is considered a "significant regulatory action" if it is likely to: (1) have an annual effect on the economy of $100 million dollars or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal governments or communities; (2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; (3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs of the rights and obligations of recipients thereof; or, (4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in E.O. 12866.

The current interpretation of this Executive Order indicated that these criteria are to be applied to entities directly impacted by the regulatory action, in this case the harvesting sector. Therefore, unless otherwise stated, the following analysis addresses direct impacts on fishermen (impacts on processors and ports follows the discussion of impacts on harvesters).

In 1996, the commercial harvesting sector landed spiny dogfish valued at just above 11 million dollars and in 1997, the total value was just over 6 million. Therefore it is unlikely that the proposed rule will result in an annual economic effect of 100 million dollars. The effects on employment for the harvesting sector are currently unknown. Table 43 contains information on total number of crew listed at each port. Two caveats to this table are the following: first, permit data for 'crew' represents the number of berths on the vessel and not the actual number of crew members. Therefore, a vessel could have 8 berths while only actually employing 4 crew members; second, home port is where the vessel is likely to be docked but in some instances, owners may list home towns etc., rather than where the vessel is primarily located.

It is unlikely that this regulatory action will create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; materially alter the budgetary impact of entitlements, grants, user fees, or loan programs of the rights and obligations of recipients thereof; or, raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in E.O. 12866.

In a broader interpretation of the law, there are other sectors which may be impacted by the proposed regulatory action. For the processing sector, employment may be significantly affected. Several industry advisors have indicated that due to the low TALs mandated by the plan, and the labor-intensive nature of hand-processing spiny dogfish, employment reductions in the processing sector may be needed. Currently the number of processors has dropped to approximately 3-4 main processors employing from 200-300 individuals. 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. However, specific data needed to quantify the extent of these potential reductions are unavailable.

Another area of concern is the preferred alternatives affect on certain ports. According to the most recent weighout data (1997), several ports are extremely dependent on the spiny dogfish fishery and derived 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 91% of the total pounds and 76% of the total value of all fish landed in that port in 1997; 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 (Table 35).

Clearly these ports are very dependent upon spiny dogfish landings and will be disproportionately affected by the proposed regulatory action. The extent to which local communities will be affected "materially" is unknown, but it is likely that local businesses which support the commercial fishing industry will be adversely impacted by this FMP (see section 2.3.4.4 for port and community descriptions).

Three of the main landing ports (Wachapreague, VA; Plymouth, MA; and Scituate, MA) listed above were not included in the hearing draft and are briefly 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.

The annual effect on the economy is unlikely to be near the 100 million dollar level. Under the current interpretation of the law, therefore, it is concluded that this regulation, if enacted, would not likely constitute a "significant regulatory action."

4.6 REVIEW OF IMPACTS RELATIVE TO THE ~~INITIAL~~ REGULATORY FLEXIBILITY ACT

4.6.1 Introduction

The purpose of the Regulatory Flexibility Act (RFA) is to minimize the adverse impacts from burdensome regulations and record keeping requirements on small businesses, small organizations, and small government entities. The category of small entities likely to be affected by the proposed plan is that of commercial entities harvesting spiny dogfish. The following discussion of impacts centers specifically on the effects of the proposed actions on the mentioned small business entities.

4.6.2 Determination of a Significant Economic Impact on a Substantial number of Small Entities

The Small Business Administration (SBA) considers any business a small business if it is independently owned and operated and not dominant in its field of operations and if it has annual receipts not in excess of $3,000,000. For related industries (processing) involved in canned and cured fish and seafood or prepared fish or frozen fish and seafoods, a small business is one that employs 500 employees or less. In the spiny dogfish fishery, the 595 boats and 3-4 major processors are small business entities (the number and size of pack-out facilities is unknown).

According to the NMFS guidelines on regulatory analysis of fishery management actions, a "substantial number" of small entities is more that 20 percent of those small entities engaged in the fishery. Since the proposed action will directly and indirectly affect most of the vessels and processors involved in the spiny dogfish fishery, the "substantial number" criterion will be met.

Economic impacts on small business entities are considered to be "significant" if the proposed action would result in any of the following: a) a reduction in annual gross revenues by more that 5 percent; b) an increase in total costs of production by more than 5 percent as a result of an increase in compliance costs; c) an increase in compliance costs as a percent of sales for large entities; d) capital internal cash flow and external financing capabilities; or e) 2 percent of small business entities being forced to cease business operations.

4.6.3 Analysis of Economic Impacts

<u>(a) Does this action result in a reduction in annual gross revenues by more than 5 percent for more than 20 percent of small entities:</u>

In year one of the preferred alternative, there will be a 30% reduction in landings compared to status quo. This reduction will cause a decrease in gross revenues of greater than 5% for 25% of the harvesting sector (using 1997 dealer and weighout data). In year two, with an 89% reduction in landings (relative to status quo) this will cause 39% of harvesters to see a reduction of gross revenues greater that 5% (based on 1997 landings and dealer data).

Additional entities that are likely to be affected are the processors. There are known to be less then five (most likely three) major processors of spiny dogfish (representing a "distinct segment"). The percent of gross revenues that these processors derive from spiny dogfish ranges from 10-70%. Given the proposed 48% reduction in the TAL in 1999 (relative to the most recent 1997 landings data) it is estimated that 75% of the processors will incur a lessening of gross revenues of greater than 5%. This is determined by considering the reductions in landings in relation to reductions in gross revenues derived from dogfish, as a percent of total revenues.

For example, if a processor derived 25% of their gross revenues from dogfish, a proposed 24% reduction in landings would most likely meet this threshold. The proposed 30%

reductions of landings in year 1 (relative to status quo) and further restrictions in following years combined with dependence of several processors on spiny dogfish, will have a significant economic impact.

Under the current NMFS guidelines, however, entities not directly regulated by the proposed rule are not to be included in the RFA analysis. Thus, since the processing sector is not directly regulated by the proposed regulatory action, these impacts, although severe, are not subject to the Regulatory Flexibility Analysis.

(b) Does this action result in an increase in compliance costs (annualized capital, operating, reporting, etc.) of greater than 5 percent for 20 percent or more of the participants:

Compliance costs for participants were described in section 4.4.1. The total burden cost associated with public requirements is $1,868 and the total burden cost associated with federal requirements is estimated at $8,217. It is expected that there will be approximately 15 new applicants for dealer permits. The total burden costs associated with the public requirement for new applicants is $1.25 per applicant. Thereafter the public annual estimate of submitting weekly reports will be $26 per dealer per year. Thereafter, the annual estimate of processing weekly reports for the NMFS will be $43 per dealer. Thus total cost for all new dealers (who do not currently have permits) for permitting requirements in the first year is $409 and the combined public and private burden will be $1,054. It is not expected that these burden costs will substantially increase compliance costs for the affected entities. Thus, it is likely that this threshold is not met.

(c) Does this action result in 2 percent of the entities ceasing operations:

Given that: 2.7% of harvesters derive over 90% of their total gross revenues from spiny dogfish; 3.8% of harvesters derive over 80% of their total gross revenues from spiny dogfish; 4.8% of harvesters derive over 70% of their total gross revenues from spiny dogfish; and, 7% of harvesters derive over 50% of their total gross revenues from spiny dogfish, it is possible that the proposed rule will result in at least 2% of these harvesters ceasing operations.

Based upon the preceding information it is concluded that this regulation, if enacted, would have a significant economic impact on a substantial number of small entities.

5.0 OTHER APPLICABLE LAWS

5.1 RELATION OF RECOMMENDED MEASURES TO EXISTING APPLICABLE LAWS AND POLICIES

5.1.1 FMPs

This FMP is related to other plans to the extent that all fisheries of the northwest Atlantic are part of the same general geophysical, biological, social, and economic setting. US fishermen usually are active in more than a single fishery. Thus regulations implemented to govern harvesting of one species or a group of related species may impact on other fisheries by causing transfers of fishing effort.

5.1.2 Treaties or International Agreements

No treaties or international agreements, other than GIFAs entered into pursuant to the MSFCMA, relate to this fishery.

5.1.3 Federal Law and Policies

5.1.3.1 Marine mammals and endangered species

Activities conducted under this FMP have not yet been considered for their impacts on endangered species in order to do a Section 7 of the Endangered Species Act consultation. NMFS will be performing a Section 7 consultation while the FMP is out for public review during the next few months. The Fish and Wildlife Service may also perform a Section 7 consultation on any seabirds that may be impacted by this FMP. The following background information is provided to facilitate evaluations of the alternatives relative to the order of magnitude these spiny dogfish fisheries may have on these threatened or endangered species.

Numerous species of marine mammals and sea turtles occur in the northwest Atlantic Ocean. The most recent comprehensive survey in this region was done from 1979-1982 by the Cetacean and Turtle Assessment Program (CETAP) at the University of Rhode Island (University of Rhode Island 1982) under contract to the Minerals Management Service (MMS), Department of the Interior. The following is a summary of the information gathered in that study, which covered the area from Cape Sable, Nova Scotia, to Cape Hatteras, North Carolina, from the coastline to 5 nautical miles seaward of the 1000 fathom isobath.

Four hundred and seventy one large whale sightings, 1,547 small whale sightings and 1,172 sea turtles were encountered in the surveys. The "estimated minimum population number" for each mammal and turtle in the area, as well as those species currently included under the Endangered Species Act, were also tabulated.

CETAP concluded that both large and small cetaceans were widely distributed throughout the study area in all four seasons and grouped the 13 most commonly seen species into three categories based on geographical distribution. The first group contained only the harbor porpoise, which is distributed only over the shelf and throughout the Gulf of Maine, Cape Cod, and Georges Bank, but probably not southwest of Nantucket. The second group contained the most frequently encountered baleen whales (fin, humpback, minke, and right whales) and the white-sided dolphin. These were found in the same areas as the harbor porpoise and also occasionally over the shelf at least to Cape Hatteras or out to the shelf edge. The third group indicated a "strong tendency for association with the shelf edge" and included the grampus, striped, spotted, saddleback, and bottlenose dolphins, and the sperm and pilot whales.

Loggerhead turtles were found throughout the study area, but appeared to migrate north to about Massachusetts in summer and south in winter. Leatherbacks appeared to have had a more northerly distribution. CETAP hypothesized a northward migration of both species in the Gulf Stream with a southward return in continental shelf waters nearer to shore. Both species usually were found over the shoreward half of the slope and in depths less than 200 feet. The northwest Atlantic may be important for sea turtle feeding or migrations, but the nesting areas for these species generally are in the South Atlantic and Gulf of Mexico.

This problem may become acute when climatic conditions result in concentration of turtles and fish in the same area at the same time. These conditions apparently are met when temperatures are cool in October but then remain moderate into mid-December and result in a concentration of turtles between Oregon Inlet and Cape Hatteras, North Carolina. In most years sea turtles leave Chesapeake Bay and filter through the area a many weeks before the spiny dogfish become concentrated. Efforts are currently under way (by VIMS and the US Fish and Wildlife Service refuges at Back Bay, Virginia, and Pea Island, North Carolina) to more closely monitor these mortalities due to trawls. Fishermen are encouraged to carefully release turtles captured incidentally and to attempt resuscitation of unconscious turtles as recommended in the 1981 *Federal Register* (pages 43976 and 43977).

The only endangered species of fish occurring in the northwest Atlantic is the shortnose sturgeon (*Acipenser brevirostrum*). The Councils urge fishermen to report any incidental catches of this species to the Regional Administrator, NMFS, One Blackburn Drive, Gloucester, Massachusetts 01930, who will forward the information to persons responsible for the active sturgeon data base.

The range of spiny dogfish and the above mentioned marine mammals and endangered species overlap and there always exists a potential for an incidental kill. Under the proposed rebuilding plan for spiny dogfish, the directed fishery for this species will be closed for four years following the first year exit fishery. During the rebuilding phase (years two-five) fishing effort directed towards spiny dogfish will be eliminated and thus the chance of accidental catches during this time period should be near zero. Thus the fishery should have a positive impact on marine mammal or abundances of endangered species. Once the spiny dogfish stock is rebuilt, the fishery will be prosecuted at greatly reduced level compared to the unregulated fishery prior to plan implementation. 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 this FMP should have an overwhelmingly positive impact relative to interactions with marine mammal or abundances of endangered species.

Attempts were made to put these fisheries/sea turtle interaction into perspective relative to other sources of mortality for these endangered turtle species. The Congressionally mandated report *Decline of the Sea Turtles: Causes and Prevention* (NRC 1990) states that "Of all the known factors, by far the most important source of deaths was the incidental capture of turtles (especially loggerheads and Kemp's ridleys) in shrimp trawling. This factor acts on the life stages with the greatest reproductive value for the recovery of sea turtle populations."

Mortality associated with other fisheries and with lost or discarded fishing gear is much more difficult to estimate than that associated with shrimp trawling, and there is a need to improve these estimates (NRC 1990). This report identified possible turtle losses from the winter trawl fishery north of Cape Hatteras (about 50-200 turtles per year), the historical Atlantic sturgeon fishery, now closed, off the Carolinas (about 200 to 800 turtles per year), and the Chesapeake Bay passive-gear fisheries (about 25 turtles per year). Considering the large numbers of fisheries from Maine to Texas that have not been evaluated and the problems of estimating the numbers of turtles entangled in the 135,000 metric tons of plastic nets, lines, and buoys lost or discarded annually, it seems likely that more than 500 loggerheads and 50 Kemp's ridleys are killed annually by nonshrimp fisheries (NRC 1990). These other fishery operations, lost fishing gear, and marine debris are known to kill sea turtles, but the reported deaths are only about 10% of those caused by shrimp trawling. Dredging, entrainment in power-plants intake pipes, collisions with boats, and the effects of petroleum-platform removal all are potentially and locally serious causes of sea turtle deaths. However these collectively amount to less than 5% of the mortality caused by shrimp trawling (NRC 1990).

The NRC report (1990) concludes that all species of marine turtles need increased protection under the Endangered Species Act and other relevant legislation. While the report does not recommend specific conservation measures for these fisheries, the recommendations for the shrimp trawling are germane. The NRC report (1990) recommended TEDs, 60 minute winter tow-time limits, and limited time/area closure for turtle "hot spots". Currently, there are 5 sea turtle recovery plans in place; these include plans for the loggerhead (1991), the green sea turtle (1991), the leatherback (1992), the Kemp's ridley sea turtle (1992), and the hawksbill sea turtle (1993).

Shortnose sturgeon (*Acipenser brevirostrum*) is an additional endangered species that may be caught incidentally in trawl fisheries. Sturgeon will be included in the Incidental Take Statement of the pending Biological Opinion. As shortnose sturgeon are generally associated with the estuarine environment, rather than the truly marine environment, it is anticipated that the gear and fishing locations of these dogfish fisheries will rarely encounter shortnose sturgeon.

Marine mammals are managed under the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973. Marine mammals have been historically important in the US both as targets for commercial harvests and in ecological interactions with commercial fisheries. An excellent description of the historical importance of marine mammals is described in USDC 1993b.

The results of this earlier work were addressed in 1979 when the U.S. Marine Mammal Commission sponsored a workshop to help define research needed for the study of marine mammals on the US east and Gulf coasts and in 1989 at a NMFS-sponsored workshop on Gulf of Mexico marine mammal research needs (USDC 1993b). These workshops set a research agenda that was immediately addressed by agencies such as the Minerals Management Service and NMFS. During the 1980's, several institutions in the northeast developed active research programs which have resulted in a body of knowledge that is being drawn upon in developing management approaches for several critical marine mammal issues in the region. In the 1990's, increased attention has been focused on the characterization of marine mammal fauna of the US Gulf of Mexico and the Mid-Atlantic Bight (USDC 1993b).

Thirty-five species of marine mammals inhabit the US Atlantic and Gulf of Mexico waters (32 whales, dolphins and porpoises, two seal species, and one manatee). Their status, in general, is poorly known, but some, like the right whale, Mid-Atlantic coastal bottlenose dolphin, and harbor porpoise, are under stresses that may affect their survival (USDC 1993b).

The gears managed under this FMP are listed under Categories I, II, and III for 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 Potential Biological Removal (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 an overwhelming beneficial impact from the preferred alternative management measures on the marine mammal populations of the east coast, principally the harbor porpoise.

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 in the preferred alternative, there should be an overwhelming beneficial impact from the preferred alternative management measures on the marine mammal populations of the east coast, principally 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 1996 Stock Assessment Report (SAR) (Waring *et al.*, 1997) 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 this TRP, 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. The PBR level for Gulf of Maine harbor porpoise throughout their range is 483 animals (62 FR 3005, January 21, 1997). 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.

The stock recovery schedule in this FMP specifies mandatory reductions in spiny dogfish fishing mortality which will result in reductions in fishing effort directed at spiny dogfish in excess of 90% of current levels in years 2-5 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 for four years following the first year exit fishery. During the rebuilding phase (years two-five) fishing effort directed towards spiny dogfish will be eliminated and thus the chance of accidental catches during this time period should be near zero. Thus the fishery should have a positive impact on marine mammal species, most notably the harbor porpoise. Once the spiny dogfish stock is rebuilt, the fishery will be prosecuted at a greatly reduced level compared to the unregulated fishery prior to plan implementation. 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 this FMP should have an overwhelmingly positive beneficial impact from the preferred alternative management measures on certain marine mammal populations of the east coast, principally harbor porpoise.

Pelagic seabirds are not likely to come into contact with spiny dogfish fisheries. Most of the following information 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. Eight 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.). Of course, our national symbol, the bald eagle is listed as endangered under the ESA and is a bird of aquatic ecosystems. Literally translated, its Latin name, *Haliaeetus leucocephalus*, means white-headed sea eagle (*Federal Register* 1994, 35584).

Spiny dogfish are not important prey for the Common and Roseate terns (Safina 1987, Safina *et al.* 1988, and Safina *et al.* 1990). Safina *et al.* (1988) note that few other seabird studies have measured ambient food levels among foraging birds, but many studies which have examined food provisioning to chicks and reproductive performance in seabirds have found results similar to theirs. Laying dates, clutch sizes, growth, and fledgling success of seabirds have been linked to food availability by a number of workers. Safina *et al.* (1988) recorded that prey fish were more abundant in 1984 than it was in 1985 and noted that reproductive productivity of terns was greater in 1984 for most parameters measured. Although they studied productivity for only two seasons, the results suggest that prey population fluctuations may limit reproductive success in the terns they studied.

Safina *et al.* (1990) noted that observing prey deliveries at nests cannot address the question of how foraging birds select prey or foraging habitat from the range of possibilities. However, the variability they found shows that either prey availability or birds' selection criteria changes, and that prey availability or selection varies differently between the two tern species, Common and Roseate, they studied. Some prey species may have their own consistent internal rhythms (or influencing factors) which make them differentially susceptible to tern predation on a daily time scale.

The stock recovery schedule proposed in this amendment will reduce fishing mortality over a five year period. As such, these reductions in fishing mortality will result in reduced fishing effort that in turn will reduce interactions with marine mammals, sea turtles, shortnose sturgeon, and seabirds. Preventing overfishing of spiny dogfish thus will be beneficial to some seabirds and certain species of marine mammals.

5.1.3.2 Marine sanctuaries

National marine sanctuaries are allowed to be established under the National Marine Sanctuaries Act of 1973. Currently there are 12 designated marine sanctuaries that creates a system that protects over 14,000 square miles (National Marine Sanctuary Program 1993).

There are four designated national marine sanctuaries in the area covered by the FMP: the *Monitor* National Marine Sanctuary off North Carolina, and the Stellwagen Bank National Marine Sanctuary off Massachusetts, Gray's Reef off Georgia and the Florida Keys National Marine Sanctuary . There is currently one additional proposed sanctuary on the east coast, the Norfolk Canyon.

The *Monitor* National Marine Sanctuary was designated on 30 January 1975, under Title III of the Marine Protection, Research and Sanctuaries Act of 1972 (MPRSA). Implementing regulations (15 CFR 924) prohibit deploying any equipment in the Sanctuary, fishing activities which involve "anchoring in any manner, stopping, remaining, or drifting without power at any time" (924.3 (a)), and "trawling" (924.3 (h)). The Sanctuary is clearly designated on all National Ocean Service (NOS) charts by the caption "protected area."

This minimizes the potential for damage to the Sanctuary by fishing operations. Correspondence for this sanctuary should be addressed to: *Monitor* NMS, NOAA, Building 1519, Fort Ousts, Virginia 23604.

Gray's Reef was designated a National Marine Sanctuary in January 1981. Located 17 miles off the coast of Georgia, Gray's Reef is one of the largest nearshore sandstone reefs in the southeastern United States. The sanctuary encompasses 17 nm^2 of live-bottom habitat. Implementing regulations (15 CFR 922.90) permit recreational fishing and commercial fishing is restricted. Specifically, wire fish traps and bottom tending fishing gears (dredges, trawls etc.) are prohibited. Correspondence for this sanctuary should be addressed to: Gray's Reef Sanctuary Manager, 10 Ocean Science Circle, Savannah, Georgia 31411.

NOAA/NOS issued a proposed rule on 8 February 1991 (56 FR 5282) proposing designation under MPRSA of the Stellwagen Bank National Marine Sanctuary, in federal waters between Cape Cod and Cape May, Massachusetts. On 4 November 1992, the Sanctuary was Congressionally designated. Implementing regulations (15 CFR 940) became effective March 1994. Commercial fishing is not specifically regulated by Stellwagen Bank regulations. The regulations do however call for consultation between federal agencies and the Secretary of Commerce on proposed agency actions in the vicinity of the Sanctuary that "may affect" sanctuary resources. The process for consultation is currently (late 1995) being worked out between the Regional office of NMFS, the Sanctuary, and NEFMC for Amendment 7 to groundfish. Correspondence for this sanctuary should be addressed to: Stellwagen Bank NMS, 14 Union Street, Plymouth, Massachusetts 02360.

The United States Congress passed the Florida Keys National Marine Sanctuary and Protection Act of 1990 designating the Florida Keys a National Marine Sanctuary. The act required NOAA to develop a comprehensive management plan with implementing regulations to govern the overall management of the Sanctuary and to protect and conserve it's resources. The Sanctuary consists of 2,800 nm^2 of coastal and oceanic waters, and the associated submerged lands surrounding the Florida Keys, extending westward to include the Dry Tortugas, but excluding the Dry Tortugas National Park. The sanctuary prohibits the taking of coral or live rock, except as permitted by the NMFS or the state of Florida. The sanctuary contains designated Sanctuary Preservation Areas and Replenishment Reserves where the taking or disturbance of sanctuary resources is prohibited. Fishing is prohibited in these non-consumptive areas. Correspondence for this sanctuary should be addressed to Superintendent, NOAA/Florida Keys National Marine Sanctuary, P.O. Box 500368, Marathon, Florida 33050.

Details on sanctuary regulations may be obtained from the Chief, Sanctuaries and Reserves Division (SSMC4) Office of Ocean and Coastal Resource Management, NOAA, 1305 East-West Highway, Silver Spring, Maryland 20910.

5.1.3.3 Indian treaty fishing rights

No Indian treaty fishing rights are known to exist in the fishery.

5.1.3.4 Oil, gas, mineral, and deep water port development

While Outer Continental Shelf (OCS) development plans may involve areas overlapping those contemplated for offshore fishery management, no major conflicts have been identified to date. The Councils, through involvement in the Intergovernmental Planning Program of the MMS, monitor OCS activities and have opportunity to comment and to advise MMS of the Councils' activities. Certainly, the potential for conflict exists if communication between interests is not maintained or appreciation of each other's efforts is lacking. Potential conflicts include, from a fishery management position: (1) exclusion areas, (2) adverse impacts to sensitive biologically important areas, (3) oil contamination, (4) substrate hazards to conventional fishing gear, and (5) competition for crews and harbor space. The Councils are unaware of pending deep water port plans which would directly impact offshore fishery management goals in the areas under consideration, and are unaware of potential effects of offshore FMPs upon future development of deep water port facilities.

5.1.3.5 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 businesses, state and local governments, and other persons as well as to maximize the usefulness of information collected by the Federal government.

The Council proposes, through this amendment, to establish the implementation of a party/charter, dealer, and operator permits. The total public reporting burdens for the time for reviewing instructions, searching existing data, collection of information and maintaining the data needed, reviewing the collection of information, and reporting requirements are estimated to be about 117 hours.

Since this FMP proposes new reporting requirements which solicit facts from "10 or more persons," the collection will have to be cleared through the Office of Management and Budget. The sponsor agency (NMFS) must submit an information collection budget, containing a listing of all new information collections planned for the upcoming fiscal year.

5.1.3.6 Impacts of the plan relative to federalism

The Amendment does not contain policies with federalism implications sufficient to warrant preparation of a federalism assessment under Executive Order 12612.

5.1.4 State, Local, and Other Applicable Law and Policies

5.1.4.1 State management activities

This plan will apply to all states from Florida to Maine. This includes Florida, Georgia, South Carolina, North Carolina, Virginia, Maryland, Delaware, New Jersey, New York, Connecticut, Rhode Island, Massachusetts, New Hampshire, and Maine. There are currently no state management activities specific to spiny dogfish.

5.1.4.2 Impact of federal regulations on state management activities

There are currently no state management activities specific to spiny dogfish.

5.1.4.3 Coastal zone management program consistency

The CZM Act of 1972, as amended, provides measures for ensuring stability of productive fishery habitat while striving to balance development pressures with social, economic, cultural, and other impacts on the coastal zone. It is recognized that responsible management of both coastal zones and fish stocks must involve mutually supportive goals.

The Council must determine whether the FMP will affect a state's coastal zone. If it will, the FMP must be evaluated relative to the state's approved CZM program to determine whether it is consistent to the maximum extent practicable. The states have 45 days in which to agree or disagree with the Councils' evaluation. If a state fails to respond within 45 days, the state's agreement may be presumed. If a state disagrees, the issue may be resolved through negotiation or, if that fails, by the Secretary.

The FMP was reviewed relative to CZM programs of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, and Florida. Letters will be sent to all of the states listed along with a hearing draft of the FMP. The letters to all of the states will state that the Council concluded that the FMP would not affect the state's coastal zone and was consistent to the maximum extent practicable with the state's CZM program as understood by the Council.

6.0 COUNCIL REVIEW AND MONITORING OF THE FMP

The Councils and Commission will monitor the fishery using the best available data, including that specified in section 3.1.1.11. The commercial, recreational, biological, and survey data specified in section 3.1.1.11 are critical to the evaluation of the management measures adjustment mechanism. It is necessary that NMFS incorporate all of the above data types from all spiny dogfish fisheries into the overall NEFSC data bases. Additionally, improved stock assessments are necessary for FMP monitoring. As a result of that monitoring, the Councils will determine whether it is necessary to amend the FMP.

The primary organization in the review and monitoring process will be the Spiny Dogfish FMP Monitoring Committee (section 3.1.1.6).

7.0 LIST OF PREPARERS

This Amendment was prepared by the following members of the MAFMC staff - Dr. Christopher M. Moore, Richard J. Seagraves, Dr. Thomas B. Hoff, Jose Montanez, and Valerie M. Whalon; and Timothy Goodger (NMFS) and Jonathan O'Neil (Rutgers University).

8.0 AGENCIES AND ORGANIZATIONS

In preparing the Amendment, the Councils consulted with the NMFS, the South Atlantic Fishery Management Council, the Fish and Wildlife Service, the Department of State, and the States of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina through their membership on the Council and the following committees - Mid-Atlantic EFH Technical Committee, Northeast Region Steering Committee, MAFMC Habitat Committee, MAFMC Habitat Advisory Panel and the Joint MAFMC and NEFMC Dogfish Committee. In addition to the states that are members of the Councils, South Carolina, Georgia and Florida were also consulted through the Coastal Zone Management Program consistency process.

9.0 REFERENCES

Alliance for the Chesapeake Bay. 1993. Nutrients and the Chesapeake: Refining the Bay cleanup effort. 10 pp.

Allen, L. 1999. Personal communication - February 1999. NMFS, Gloucester, MA.

Alverson,, D.L., M.H. Freeberg, J.G. Pope, and S.A. Murawski. 1994. A global assessment of fisheries bycatch and discards. FAO Fish. Tech. Pap. 339:1-233.

American Fisheries Society (AFS). 1970. Common and Scientific names of fishes from the United States and Canada. Am. Fish. Soc. Spec. Publ. 6, Bethesda, MD.

Applegate, A.J., S. Cadrin, J. Hoenig, C. Moore, S. Murawski, and E. Pikitch. 1998. Evaluation of existing overfishing definitions and recommendations for new overfishing definitions to comply with the Sustainable Fisheries Act. Overfishing Definition Review Panel. 179 p.

Arntz, W., E. Rachor, and S. Kuhne. 1994. Mid- and long-term effects of bottom trawling on the benthic fauna of the German Bight. p. 59-74. NIOZ Rapport 1994-11, Netherlands Institute of Fisheries Research, Texel.

Aschman, S.G., D. Anderson, and R.J. Croft. 1997. Challenges for Sustainable Nutrient Cycling in Watersheds. Presented at the 89th Annual Meeting, American Society of Agronomy, October 26-30, 1997, Anaheim, CA.

Atlantic States Marine Fisheries Commission (ASMFC). 1992. Reef Material Criteria Handbook. Artificial Reef Advisory Committee. Washington, D.C.

ASMFC. 1997. Atlantic Coastal Wetlands Losses and the Economic Value of Fisheries: A State by State Review.

ASMFC. 1993. Resolution II: In opposition to the use of combustion/incineration ash for artificial reef construction. *In*: Resolutions Adopted by the Atlantic States Marine Fisheries Commission: 52nd Annual Meeting. Washington, D.C. 1 p.

Auster, P.J. and R.W. Langton. 1998. The Indirect Effects of Fishing.

Auster, P.J., C.A. Griswold, M.J. Youngbluth, and T.G. Bailey. 1992. Aggregations of myctophid fishes with other pelagic fauna. Env. Biol. Fish. 35:133-139.

Auster, P.J., R.J. Malatesta, R.W. Langton, L. Watling, P.C. Valentine, C.L.S. Donaldson, E.W. Langton, A.N. Shepard and I.G. Babb. 1996. The impacts of mobile fishing gear on seafloor habitats in the Gulf of Maine (Northwest Atlantic): implications for conservation of fish populations. Reviews in Fisheries Science 4(2):185-202.

Bearden, C.M. 1965. Occurrence of spiny dogfish, *Squalus acanthias*, and other elasmobranchs in South Carolina coastal waters. COPEIA, No. 3. Ichthyological Notes. p. 378.

Bergman, M.J.N. and M. Hup. 1992. Direct effects of beamtrawling on macrofauna in a sandy sediment in the southern North Sea. ICES J. mar. Sci. 49:5-11.

Beukema, J.J. 1995. Long-term effects of mechanical harvesting of lugworms *Arenicola marina* on the zoobenthic community of a tidal flat in the Wadden Sea. Netherlands J. Sea Res. 33:219-227.

Bigelow, H.B. and W.C. Schroeder. 1953. Fishes of the Gulf of Maine. U. S. Fish and Wildlf. Serv., Fish. Bull. 53(74): 47-51.

Bigford, T.E. 1991. Sea-level rise, nearshore fisheries, and the fishing industry. *Coastal Management* 19:417-437

Boesch, D.F. D.A. Anderson, R.A. Horner, S.E. Shumway, P.A. Tester, T.E. Whitledge, 1997. Harmful Algal Blooms in Coastal Waters: Options for Prevention, Control, and Mitigation. NOAA Coastal Ocean Program, Decision Analysis Series No. 10. Special Joint Report with the National Fish and Wildlife Foundation, February 1997.

Bowman, R., R. Eppi and M. Grosslein. 1984. Diet and Consumption of Spiny Dogfish in the Northwest Atlantic. NOAA, NMFS, NEFC, Woods Hole, MA. 16 pp.

Bradstock, M. and D. Gordon. 1983. Coral-like bryozoan growths in Tasman Bay, and their protection to conserve commercial fish stocks. New Zealand Journal of Marine and Freshwater Research 17:159-163.

Bridger, J.P. 1970. Some effects if the passage of a trawl over the seabed. ICES C.M. 1970/B:10 Gear and Behavior Committee. 8p.

Bridger, J.P. 1972. Some observations on the penetration into the sea bed of tickler chains on a beam trawl. ICES C.M. 1972/B:7. 9 p.

Briggs, J.C. 1960. Fishes of world-wide (circumtropical) distribution. Copeia 3:171-180.

Brodeur, R.D. In press. In situ observations of the association between juvenile fishes and scyphomedusae in the Bering Sea. Mar. Ecol. Prog. Ser.

Brouha, P. 1994. Population growth: the real problem. *Fisheries* 19(9):4.

Brown, R.A. 1989. Bottom trawling on Strangford Lough:problems and policies. Proceedings reprints, Distress Signals, signals from the environment in policy and decision making, May 31-June 2, 1989 Rotterdam, Netherlands. 11p.

Brylinsky, M., J. Gibson, and D.C. Gordon Jre. 1994. Impacts of flounder trawls on the intertidal habitat and community of the Minas Basin, Bay of Fundy. Can. J. Fish. Aquat. Sci. 51:650-661.

Caddy, J.F. 1973. Underwater observations on tracks of dredges and trawls and some effects of dredging n a scallop ground. J. Fish. Bd. Can. 30:173-180.

Cahoon, L.B., and C.R. Tronzo. 1992. Quantitative estimates of demersal zooplankton abundance in Onslow Bay, North Carolina. Mar. Ecol. Prog. Ser. 87:197-200.

Cahoon, L.B., and J.E. Cooke. 1992. Benthic microalgal production in Onslow Bay, North Carolina. Mar. Ecol. Prog. Ser. 84:185-196.

Cahoon, L.B., R.L. Redman, and C.R. Tronzo. 1990. Benthic microalgal biomass in sediments of Onslow Bay, North Carolina. Est. Coast. and Shelf Sci. 31:805-816.

Cairns, J. Coping with point source discharges. Fisheries 5(6):3.

Castro, J.I. 1983. The sharks of North American waters. College Station: Texas A & M University Press. 180 p.

Chang, S. 1993. Analysis of fishery resources: potential risk from sewage sludge dumping at the deepwater dumpsite off New Jersey. Fishery Bulletin 91:594-610.

Chopin, F.S. and T. Arimoto. 1995. The condition of fish escaping from fishing gears - a review. Fish. Res. 21:315-327.

Churchill, J.H., 1989. The effect of commercial trawling on sediment resuspension and transport over the Middle Atlantic Bight continental shelf. Continental Shelf Research 9(9):841-864.

Chytalo, K. 1996. Summary of Long Island sound dredging windows strategy workshop. *In*: Management of Atlantic Coastal Marine Fish Habitat: Proceedings of a Workshop for Habitat Managers. ASMFC Habitat Management Series #2.

Collette, B.B. and G.K. MacPhee (Eds.). In Prep. Revision of Bigelow and Schroeder Fishes of the Gulf of Maine. Smithsonian Institution Press.

Collie, J.S., G.A. Escanero and L. Hunke and P.C. Valentine. 1996. Scallop dredging on Georges Bank: photographic evaluation of effects on benthic fauna. ICES C.M. 1996/Mini:9.
14 p.

Collie, J.S., G.A. Escanero and P.C. Valentine, 1997. Effects of bottom fishing on the benthic megafauna of Georges bank. Mar. Ecol. Prog. Ser. 155:159-172.

Cross, J. 1998. Personal communication. NMFS, NEFSC, Sandy Hook, NJ.

Currie, D.R. and G.D. Parry. 1994. The impact of scallop dredging on a soft sediment community using multivariate techniques. Mem. Queensl. Mus. 36:316-326.

Currie, D.R. and G.D. Parry. 1996. Effects of scallop dredging on a soft sediment community: a large-scale experimental study. Mar. Ecol. Prog, Ser. 134:131-150.

Dahl, T.E., R.D. Young, and M.C. Caldwell. 1997. Status and trends of wetlands in the conterminous United States. U.S. Department of Interior, Fish and Wildlife Service, Washington D.C. Draft.

DeAlteris, J.T. and D.M. Riefsteck. 1993. Escapement and survival of fish from the codend of a demersal trawl. ICES Mar. Sci. Symp. 196:128-131.

De Groot, S.J. 1984. The impact of bottom trawling on benthic fauna of the North Sea. Ocean Management 9:177-190.

Driscoll, C. 1998. Personal Communication - April 1998. NMFS, Oxford, MD.

Eleftheriou, A. and M.R. Robertson. 1992. The effects of experimental scallop dredging on the fauna and physical environment of a shallow sandy community. Netherlands J. Sea Res. 30:289-299.

Engel, J. and R. Kvitek. MS1997. Bottom trawling: impact interpretation a matter of perspective. Submitted to Conservation Biology.

Eno, N.C., D.S. MacDonald and S.C. Amos. 1996. A study on the effects of fish (crustacea/mollusc) traps on benthic habitats and species. Final Report to the European Commission.

Fehring, W.K. 1983. Ports, industry, and fisheries-can they coexist? *In*: Improving Multiple Use of Coastal and Marine Resources. *American Fisheries Society Symposium*. 8 p.

Florida Department of Environmental Protection (FDEP). 1998. Pfiesteria Summary. Prepared by Karen Steidinger and Jan Landsberg.

Foerster. 1998. Personal communication - April 1998. Department of Naval Research.

Fogarty, M.J. and S.A. Murawski. 1998. Large-scale disturbance and the structure of marine systems: Fishery impacts on Georges Bank. Ecol. Appl. 8(1) Supplement:S6-S22.

Fonds, M. 1994. Mortality of fish and invertebrates in beam trawl catches and the survival chances of discards. p. 131-146. NIOZ Rapport 1994-11, Netherlands Institute for Fisheries Research, Texel.

Fonseca, M.S., G.W. Tanyer, A.J. Chester and C. Foltz, 1984. Impact of scallop harvesting on eelgrass (Zostera marina) meadows: implications for management. North American Journal of Fisheries Management 4:286-293.

Freese, L., J. Hiefetz, B. Wing, and P. Auster. In prep. The impacts of trawling on seafloor habitat in the Gulf of Alaska: I. Changes in habitat structure and associated invertebrate taxa.

Gaspar, M.B., C.A. Richardson and C.C. Monteiro. 1994. The effects of dredging on shell formation in the razor clam *Ensis siliqua* from Barrinha, Southern Portugal. J. Mar. Biol. Ass. U.K. 74:927-938.

Gibbs, P.J., A.J. Collins and L.C. Collett. 1980. Effect of otter prawn trawling on the macrobenthos of a sandy substratum in a New South Wales estuary. Aust. J. Mar. Freshwater Res. 31:509-516.

Gislason, H. 1994. Ecosystem effects of fishing activities in the North Sea. Marine Pollution Bulletin 29(6-12):520-527.

Goldsborough, W.J. 1997. Human impacts on SAV - a Chesapeake Bay case study. *In*: Aquatic Coastal Submerged Aquatic Vegetation. ASMFC Management Series #1. Washington, DC.

Goodger, T. 1998. Personal Communication - April 1998. NMFS, Oxford, MD.

Griffith, D. 1996. Impacts of new regulations on North Carolina fisherman: a classificatory analysis. North Carolina Sea Grant College Program, Publication Number: UNC-SG-96-07

Griffith, D. and C. Dyer. 1996. An Appraisal of the Social and Cultural Aspects of the Multispecies Groundfish Fishery in New England and the Mid-Atlantic Regions. Report submitted by Aquirre International.

Guillén, J.E., A.A. Ramos, L.Martínez and J. Sánchez Lizaso. 1994. Antitrawling reefs and the protection of *Posidonia oceanica* (L.) Delile Meadows in the western Mediterranean Sea: Demand and aims. Bull. Mar. Sci. 55(2-3):645-650.

Hall, S.J. 1994. Physical disturbance and marine benthic communities: life in unconsolidated sediments. Oceanography and Marine Biology: An Annual review 32:179-239.

Hess, W.N. 1966. The hated dogfish. Sea Frontiers. International Oceanographic Foundation. Vol. 12, No. 2. 166-122.

High, W.L. MS1992. A scientist/diver's marine science and technology observations. Alaska Fisheries Science Center, NMFS, Seattle.

Hill, J. 1996. Environmental considerations in licensing hydropower projects: policies and practices at the federal energy regulatory commission. *American Fisheries Society Symposium* 16:190-199.

Hoenig, J.M. 1983. Empirical use of longevity data to estimate mortality rates. Fish. Bull. U.S. 81:898-903.

Hoenig, J.M. and S.H. Gruber. 1990. Life-history patterns in the elasmobranchs: implications for fisheries management. *In:* Elasmobranchs as Living Resources: Advances in the Biology, Ecology, Systematics, and the Status of the Fisheries (H.L. Pratt, Jr., S.H. Gruber, and T. Taniuchi, eds.). U.S. Dep. of Commer., NOAA Tech. Rep. NMFS. 90:1-16.

Holden, M.J. 1973. Are long-term sustainable fisheries for elasmobranchs possible? *In*: Fish, Stocks and Recruitment (F.R. Harden-Jones, ed.) Rapp. P.-v. Reun. Cons. int. Explor. Mer. 164:360-367.

Holden, M.J. 1974. Problems in the rational exploitation of elasmobranch populations and some suggested solutions. *In*: Sea Fisheries Research (F.R. Harden-Jones, ed.). pp. 117-137. Halsted Press, New York.

Holden, M.J. 1977. Elasmobranchs. *In*: Fish Population Dynamics (J.A. Gulland, ed.). John Wiley and Sons, New York. 187-215.

Holden, M.J. and P.S. Meadows. 1962. The structure of the spine of the spur dogfish (*Squalus acanthias* L.) and its use for age determination. J. Mar. Biol. Ass. UK. 42:179-197.

Holme, N.A. 1983. Fluctuations in the benthos of the western English Channel. Oceanol. Acta, Procedings 17th European Maine Biology Symposium, Brest, France, 27 Set.-1 Oct., 1982, pp.121-124.

Howarth, R.W. 1991. Assessing the ecological effects of oil pollution from outer continental shelf oil development. *In*: Fisheries and Oil Development on the Continental Shelf. *American Fisheries Society Symposium* 11:1-8.

Hughes Commission Report. 1997. Blue Ribbon Citizens *Pfiesteria* Action Commission. Final Report. Governor Harry R. Hughes Commission Chairman.

Industrial Science Division. 1990. The impact of commercial trawling on the benthos of Strangford Lough. Interim Report No. TI/3160/90. Industrial Science Division, 17 Antrim Rd., Lisburn, Co., Antrim B128 3AL.

Jamieson, G.S. and Campbell. 1985. Sea scallop fishing impact on American lobsters in the Gulf of St. Lawrence. Fish. Bull., U.S. 83:575-586.

Jennings, S. and M.J. Kaiser. 1998. The effects of fishing on marine ecosystems. Adv. Mar. Biol. 34:In press.

Jensen, A.C. 1965. Life history of the spiny dogfish. U. S. Fish and Wildlf. Serv., Fish. Bull. 65: 527-554.

Jury, S.H., J.D. Field, S.L. Stone, D.M. Nelson and M.E. Monaco. 1994. Distribution and abundance of fishes and invertebrates in North Atlantic estuaries. ELMR Rep. No. 13. NOAA/NOS Strategic Environmental Assessments Division, Silver Spring, MD. 221 p.

Kaiser, M. 1996. Starfish damage as an indicator of trawling intensity. Mar. Ecol. Prog. Ser. 134:303-307.

Kaiser, M.J. and B.E. Spencer. 1994. Fish scavenging behavior in recently trawled areas. Mar. Eol. Prog. Ser. 112:41-49.

Kaiser, M.J. and B.E. Spencer. 1995. Survival of by-catch from a beam trawl. Mar. Ecol. Prog. Ser. 126:31-38.

Kaiser, M.J. and B.E. Spencer. 1996a. The effects of beam-trawl disturbance on infaunal communities in different habitats. J. Animal Ecol. 65:348-358.

Kaiser, M.J., D.B. Edwards and B.E. Spencer. 1996. Infaunal community changes as a result of commercial clam cultivation and harvesting. Aquat. Living Resour. 9:57-63.

Kaiser, M.J., K. Cheney, F.E. Spencer, D.B. Edwards, K. Radford. 1997b. Implications of bottom trawling for biogenic structures and their importance in seabed assemblages. Fisheries Research (submitted).

Kenny, R.D., M.A.M. Hyman, and H.E. Winn. 1985 Calculation of standing stocks and energetic requirements of the cetaceans of the northeast United States outer continental shelf. NOAA Tech. Mem. NMFS-F/NEC-41. 99 p.

Ketchen, K.S. 1975. Age and growth of dogfish *Squalus acanthias* in British Columbia waters. J. Fish. Res. Board Can. 32:43-59.

Kohler, C.C. and W.R. Courtenay, Jr. 1986. Introduction of aquatic species. Fisheries 11(2):39-42.

Kroger, R.L. and J.F. Guthrie. 1972. Effect of predators on juvenile menhaden in clear and turbid estuaries. Mar. Fish. Rev. 34:78-80.

Langton, R.W., and R.E. Bowman. 1977. An abridged account of predator - prey interactions from some northwest Atlantic species of fish and squid. NMFS, NEFC, Woods Hole Lab. Ref. No. 77-17.

Lindholm, J., M. Ruth, L. Kaufman, and P. Auster. 1998. A modeling approach to the design of marine refugia for fishery management. In: Linking Protected Areas With Working Landscapes. Science and Management of Protected Areas Association, Wolfville, Nova Scotia. In press.

Ludwig, M. and E. Gould. 1988. Contaminant input, fate, and biological effects. In: Characterization of the Middle Atlantic Water Management Unit of the Northeast Regional Action Plan. U.S. Department of Commerce, NOAA, NMFS. NOAA Technical Memorandum NMFS-F/NEC-56.

MacKenzie, C.L., Jr., 1982. Compatibility of invertebrate populations and commercial fishing for ocean quahogs. North American Journal of Fisheries Management 2:270-275.

Magorrian, B.H. 1995. The impact of commercial trawling on the benthos of Strangford Lough. Ph.D. dissertation. The Queen's University of Belfast, Northern Ireland.

Mayer, L.M., D.F. Schick, R.H. Findlay and D.L. Rice, 1991. Effects of commercial dragging on sedimentary organic matter. Mar. Environ. Res 31:249-261.

McCay, B.J., B. Blinkoff, R. Blinkoff, and D. Bart. 1993. Report, part 2, phase I, fishery impact management project, to the MAFMC. Dept. of Human Ecology, Cook College, Rutgers Univ., New Brunswick, N.J. 179 p.

McFarlane, G.A. and R.J. Beamish. 1987. Validation of the dorsal spine method of age determination for spiny dogfish. *In*: The age and growth of fish (R.C. Summerfelt and G.E. Hall, eds.). pp. 287-300. Iowa State Univ. Press, Ames.

McMillan, D.G. and W.N. Morse. 1998. FMP EFH source document, spiny dogfish (spurdog), *Squalus acanthias* Linnaeus, 1758: life history, food habits, status of the stock, habitat characterization, and distribution and relative abundance.

Medcof, J.C. and J.F. Caddy. 1971. Underwater observations on the performance of clam dredges of three types. ICES C.M. 1971/B:10

Meyer T L., R.A. Cooper and K.J. Pecci, 1981. The performance and environmental effects of a hydraulic clam dredge. Mar. Fish. Rev. 43(9):14-22.

Mid-Atlantic Fishery Management Council (MAFMC). 1990b. Ocean Disposal Policy. Dover, DE.

Mid-Atlantic Fishery Management Council (MAFMC). 1995. Artificial reef policy. Dover, DE. 2 p.

Mid-Atlantic Regional Marine Research Program (MARMPP). 1994. Mid-Atlantic Research Plan. University of MD. College Park, MD. 163 p.

Moser, M.L., P.J. Auster and J.B. Bichy. 1998. Effects of mat morphology on large *Sargassum*-associated fishes: observations from a remotely operated vehicle (ROV) and free-floating video camcorders. Env. Biol. Fish. 51:391-398.

Moyle, P.B. 1991. AFS Position Statement - Ballast Water Introductions. Fisheries 16(1):4-6.

Murawski S.A. and F.M. Serchuk, 1989. Environmental effects of offshore dredge fisheries for bivalves. ICES 1989 Statutory Meeting The Hague Netherlands. 12p. 7 figs.

Nammack, M.F., J.A. Musick and J.A. Colvocoresses. 1985. Life history of spiny dogfish off the northeastern United States. Transactions of the Amer. Fish. Society 114: 367-376.

National Marine Fisheries Service (NMFS). 1997. Report to Congress; Status of fisheries of the United States. 39 p.

Nelson, D.M. and M.E. Monaco. 1994. Distribution and abundance of fishes and invertebrates in Southeast estuaries. ELMR Rep. No. 9. NOAA/NOS Strategic Environmental Assessments Division, Silver Spring, MD. 167 p.

Northeast Fisheries Science Center (NEFSC). 1994. Report of the 18th Northeast Regional Stock Assessment Workshop: Stock Assessment Review Committee Consensus Summary of Assessments. NEFSC Ref. Doc. 94-22.

Northeast Fisheries Science Center (NEFSC). 1998. Report of the 26th Northeast Regional Stock Assessment Workshop: Stock Assessment Review Committee Consensus Summary of Assessments. NEFSC Ref. Doc. 98-03.

OTA (Office of Technology Assessment). 1987. Wastes in Marine Environments. OTA Pub. OTA-O-335.

Pearson, T.E., A.B. Josef son and R. Rosenberg. 1985. Petersen's benthic stations revisited. 1. Is the Kattagatt becoming eutrophic? J. Exp. Mar. Biol. Ecol. 92:157-206.

Penkal, R.F. and G.R. Phillips. 1984. Construction and operation of oil and gas pipelines. Fisheries 9(3):6-8.

Peters, D.S. and F.A. Cross. 1992. What is coastal fish habitat? p. 17-22. In: R.H. Stroud (ed.), Stemming the Tide of Coastal Fish Habitat Loss. Marine Recreational Fisheries Vol. 14. National Coalition for Marine Conservation, Savannah, Georgia.

Peterson, C.H., H.C. Summerson and S.R. Fegley. 1983. Relative efficiency of two clam rakes and their contrasting impacts on seagrass biomass. Fish. Bull., U.S. 81: 429-434.

Peterson, C.H., H.C. Summerson and S.R. Fegley, 1987. Ecological consequences of mechanical harvesting of clams. Fish. Bull. 85(2):281-298.

Pickett, S. T .A. and P. S. White, editors. 1985. The Ecology of Natural Disturbance and Patch Dynamics. Academic Press, New York.

Prena, J., T.W. Rowell,, P. Schwinghamer, K. Gilkinson, and D.C. Gordon Jr. 1996. Grand banks otter trawling impact experiment: 1.Site selection process, with a description of macrofaunal communities. Can.Tech. Rep. Fish. Aqua. Sci. 2094:38pp.

Rader, D. 1998. Personal communication - April 1998. NRDC, Raleigh, NC.

Rago, P. 1998. Personal communication - May 1998. NMFS, Woods Hole, MA.

Rago, J.P., K. Sosebee, J. Brodziak, and E.D. Anderson. 1994. Distribution and dynamics of northwest Atlantic spiny dogfish (*Squalus acanthias*). Woods Hole, MA: NOAA/NMFS/NEFSC. Ref. Doc. 94-19.

Ramsay, K., M.J. Kaiser and R.N. Hughes. 1996. Changes in hermit crab feeding patterns in response to trawling disturbance. Mar. Ecol. Prog. Ser. 144: 63-72.

Ramsay, K., M.J. Kaiser and R.N. Hughes. 1997a. Responses of benthic scavengers to fishing disturbance by towed gear in different habitats. J. Exp. Mar. Biol. Ecol.

Ramsay, K. M.J. Kaiser, P.G. Moore and R.N. Hughes. 1997b. Consumption of fisheries discards by benthic scavengers: utilization of energy subsidies in different marine habitats. J. Animal Ecol. (in press)

Reid, R., F. Almeida, C. Zetlin. 1998. Appendix 1, Methods Used in Federal, State and Other Surveys. NMFS, NEFSC, Highlands, NJ.

Reise, K. 1982. Long-term changes in the macrobenthic invertebrate fauna of the Wadden Sea: are polychaetes about to take over? Netherlands Journal of Sea Research 16:29-36.

Reiswig, H.M. 1973. Population dynamics of three Jamaican Demspongiae. Bull. Mar. Sci. 23:191-226.

Riesen W. and K. Reise. 1982. Macrobenthos of the subtidal Wadden Sea: revisited after 55 years. Helgoländer Meersunters. 35:409-423.

Robinette, H.R., J. Hynes, N.C. Parker, R. Putz, R.E. Stevens, and R. Stickney. 1991. Commercial aquaculture. Fisheries 16(1):18-22.

Rulifson, R.A., M.J. Dadaswell, and G.K. Mahoney. 1986. Tidal power development and estuarine and marine environments. Fisheries 11(4):36-39

Rumhor, H. and P. Krost. 1991. Experimental evidence of damage to benthos by bottom trawling with special reference to Artica islandica. Meeresforsch 33:340-345.

Rumhor, H., H. Schomann, and T. Kujawski. 1994. Environmental impact of bottom gears on benthic fauna in the German Bight. p. 75-86. NIOZ Rapport 1994-11, Netherlands Institute for Fisheries Research, Texel.

Sainsbury, K.J. 1987. Assessment and management of the demersal fishery on the continental shelf of northwestern Australia. pp. 465-503. In: Tropical Snappers and Groupers: Biology and Fisheries Management (J.J. Polovina and S. Ralston, Eds.). Boulder, Colorado: Westview Press.

Sainsbury, K.J. 1988. The ecological basis of multispecies fisheries and management of a demersal fishery in tropical Australia. pp. 349-382. In: Fish Population Dynamics, 2nd edition. (J.A. Gulland, Ed.). London: John Wiley and Sons.

Sainsbury, K.J. 1991. Application of an experimental approach to management of a demersal fishery with highly uncertain dynamics. ICES Mar. Sci. Symp. 193:301-320.

Sainsbury, K.J., R.A. Campbell, R. Lindholm, and A.W. Whitelaw. In press. Experimental management of an Australian multispecies fishery: examining the possibility of trawl-induced habitat modification. Amer. Fish. Soc. Symp. 20: 107-112.

Santbrink, J.W. van and M.J.N. Bergman. 1994. Direct effects of beam trawling on macrofauna in a soft bottom area in the southern North Sea. p. 147-178. NIOZ Rapport 1994-11, Netherlands Institute for Fisheries Research, Texel.

Saulson, T.P. 1982. Growth, maturation, and fecundity of the spiny dogfish, *Squalus acanthias*, in the northwestern Atlantic. State University of New York at Stony Brook. Ph.D. thesis, 97 pp.

Schaefer, R.H. 1995. Memorandum on NMFS Policy of Risk Aversion in Face of Uncertainty.

Sharp, J.H. 1976. Anoxia on the middle Atlantic shelf during the summer of 1976. Report on a workshop held in Washington, D.C., 15-16 October 1976. NSF Contract No. OCE 7700465.

Silva, H.G.M.. 1993. Population dynamics of spiny dogfish, *Squalus acanthias*, in the NW Atlantic. University of Massachusetts, Amherst. Ph.D. thesis, 238 pp.

Sindermann, C.J. 1992. Disease risks associated with importation of nonindigenous marine animals. *Marine Fisheries Review* 54(3):1-9.

Smith, E.M., M.A. Alexander, M.M. Blake, L. Gunn, P.T. Howell, M.W. Johnson, R.E. MacLeod, R.F. Sampson, Jr., D.G. Simpson, W.H. Webb, L.L. Stewart, P.J. Auster, N.K. Bender, K. Buchholz, J. Crawford, and T.J. Visel. 1985. A study of lobster fisheries in the Connecticut waters of Long Island Sound with special reference to the effects of trawling on lobsters. Connecticut Department of Environmental Protection, Marine Fisheries Program, Hartford, Connecticut.

SAFMC. 1991. South Atlantic Fishery Management Council. Amendment 4 (Gear Restrictions and Size Limits), Regulatory Impact Review, Initial Regulatory Flexibility Analysis and Environmental Assessment for the Fishery Management Plan, for the Snapper Grouper Fishery of the South Atlantic Region.

Soldat, V.T. 1979. Biology, Distribution, and abundance of the spiny dogfish in the Northwest Atlantic. ICNAF Res. Doc. 79/VI/102. Serial No. 5467:9 pp.

South-Atlantic Fishery Management Council (SAFMC). 1998. Habitat Plan for the South Atlantic Region: Essential Fish Habitat Requirements for Fishery Management Plans of the South Atlantic Fishery Management Council (Public Hearing Draft). Charleston, SC.

Stedman, S. and J. Hanson. 1997. Wetlands fisheries and economics in the mid-Atlantic coastal states of Habitat Conservation. Habitat Connections 1(5):1-4.

Steele, J.H. 1996. Regime shifts n fisheries management. Fish. Res. 25:19-23.

Steimle, F. 1976. A summary of the fish kill-anoxia phenomenon off New Jersey and its impact on resource species. *In:* Sharp (Ed.). Anoxia on the middle Atlantic shelf during the summer of 1976. pp. 5-11. Report on a workshop held in Washington, D.C., 15-16 October 1976. NSF Contract OCE 7700465, University of Delaware.

Steimle, F. Personal communication. NMFS, Sandy Hook, N.J.

Stephan, C.D. and K. Beidler. 1997. Management of Atlantic Coastal Marine Habitat: Proceedings of a Workshop for Habitat Managers. ASMFC Management Series #2.

Stolpe, N. 1997. New Jersey Fishnet. November 2, 1997 Issue.

Stone, S.L., T.A. Lowery, J.D. Field, C.D. Williams, D.M. Nelson, S.H. Jury, M.E. Monaco, and L. Andreasen. 1994. Distribution and abundance of fishes and invertebrates in Mid-Atlantic estuaries. ELMR Rep. No. 12. NOAA/NOS Strategic Environmental Assessments Division, Silver Spring, MD. 280 p.

Suffolk County Department of Health Services. 1998. Brown Tide Fact Sheet. Office of Ecology.

Templeman, W. 1944. The Life history of the spiny dogfish, *Squalus acanthias* and the vitamin A values of dogfish liver oil. Newfoundland Dept. Nat. Resour. Res. Bull. No. 15 (Fisheries).

Thomas, C.J., and L.B. Cahoon. 1993. Stable isotope analyses differentiate between different trophic pathways supporting rocky-reef fishes. Mar. Ecol. Prog. Ser. 95:19-24

Thorne-Miller, B. and J. Catena. 1991. The Living Ocean. Island Press. Washington, D.C.

Thrush, S.F., J.E. Hewitt, V.J. Cummings, and P.K. Dayton. 1995. The impact of habitat disturbance by scallop dredging on marine benthic communities: what can be predicted from the results of experiments?. Mar. Ecol. Prog. Ser. 129:141-150.

Thrush, S.F., V.J. Cummings, J.E. Hewitt, P.K. Dayton, S.J. Turner, G. Funnell, R. Budd, C. Milburn, and M.R. Wilkinson. In press. Disturbance of the marine benthic habitat by commercial fishing: impacts at the scale of the fishery. Ecol. Appl.

Turek, J.G., T.E. Goodger, T.E. Bigford, and J.S. Nichols. 1987. Influence of freshwater inflows on estuarine productivity. NOAA. Tech. memo. NMFS-F/NEC-46. 26 p.

U.S. Department of Commerce (USDC). 1985a. Regional action plan: northeast regional office and northeast fisheries center. *In*: NOAA. NMFS. Tech. memo. F/NEC-37. 20 p.

USDC. 1985b. National Artificial Reef Plan. NOAA Technical Memorandum NMFS OF-6. Washington, D.C.

USDC. 1990. Estuaries of the Untied States. NOAA, NOS, Ocean Assessment Division, Strategic Assessment Branch. Washington, D.C.

USDC. 1993. Assessment of Chemical Contaminants in the Hudson-Raritan Estuary and Coastal New Jersey Area. National Status and Trends Program. Silver Spring, MD.

USDC. 1996a. NMFS Gravel Extraction Policy. Office of Habitat Conservation, Silver Spring, MD.

USDC. 1996b. NMFS Habitat Conservation Program. NMFS, Silver Spring, MD.

USDC. 1997a. Technical guidance manual for implementation of essential fish habitat.

USDC. 1997b. Four hundred years of Arctic data provide insight into climate change. 2 p.

USDC. 1997c. National shellfish register nothing to clam up about. NOAA, Silver Spring, MD. 2 p.

USDC. 1997d. NOAA's Estuarine Eutrophication Survey, Volume 1: South Atlantic Region. NOAA, NOS, Office of Ocean Resources Conservation and Assessment, Silver Spring, MD.

USDC. 1997e. NOAA's Estuarine Eutrophication Survey, Volume 2: Mid-Atlantic Region. NOAA, NOS, Office of Ocean Resources Conservation and Assessment, Silver Spring, MD.

USDC. 1997f. NOAA's Estuarine Eutrophication Survey, Volume 3: North Atlantic Region. NOAA, NOS, Office of Ocean Resources Conservation and Assessment, Silver Spring, MD.

USDC. 1998. Draft Technical Guidance Manual to NMFS Implementing the Essential Fish Habitat Requirements for the Magnuson-Stevens Act. NOAA, NMFS, Office of Habitat Conservation, Silver Spring, MD.

U.S. Environmental Protection Agency (USEPA). 1993. Guidance for specifying management measures for sources of nonpoint pollution in coastal waters. Office of Water. 840-B-92-002. 500+ p.

U.S. Geological Survey. 1997. News Release - What we know so far...Nutrients, Ground Water, and the Chesapeake Bay - A Link with Pfiesteria? Office of outreach, Reston, VA.

Valentine, P.C. and E.A. Schmuck. 1995. Geological mapping of biological habitats on Georges Bank and Stellwagen Bank, Gulf of Maine region. p. 31-40. In: Applications of side-scan sonar and laser-line systems in fisheries research. Alaska Department of Fish and Game, Special Publication No. 9.

Van Dolah, R. F., P.H. Wendt and M.V. Levisen. 1991. A study of the effects of shrimp trawling on benthic communities in two South Carolina sounds. Fish Res., 12:139-156.

Van Dolah, R. F., P.H. Wendt and N. Nicholson. 1987. Effects of a research trawl on a hard bottom assemblage of sponges and corals. Fish. Res. 5:39-54.

Watling L., R.H. Findlay, L.M. Mayer, and D.F. Schick. 1997. Impact of scallop dragging on a shallow subtidal marine benthic community.

Watling, L. and E.A. Norse. 1997. Physical disturbance of the sea bottom by mobile fishing gear: a comparison with forest clear-cutting. (Submitted to Conservation Biology).

Witbaard, R. and R. Klein. 1994. Long-term trends on the effects of the southern North Sea beamtrawl fishery on the bivalve mollusc Arctica islandica L. (Mollusca, bivalvia). ICES J. mar. Sci. 51: 99-105.

Witman, J.D. and K.P. Sebens. 1985. Distribution and ecology of sponges at a subtidal rock ledge in the central Gulf of Maine. p. 391-396 In: K. Rutzler (ed.) New Perspectives in Sponge Biology. Smithsonian Institution Press, Washington, D.C.

Wood, C.C., K.S. Ketchen and R.J. Beamish. 1979. Population dynamics of spiny dogfish (*Squalus acanthias*) in British Columbia waters. J. Fish. Res. Board Can. 36:747-656.

Yustin, C. 1999. Personal communication - February 1999. NMFS, Gloucester, MA.

Table 1. Biological characteristics of US commercial landings of spiny dogfish, 1982 - 1996.

	Commercial landings (million lbs.)					Mean Weight (kg)		Total Number Caught				Mean Length (cm)	
Year	Total	Females	Males	Female%	Male%	Females	Males	Females	Males	Female%	Male%	Females	Males
1982	11.9	11.7	0.2	98.30%	1.70%	4.44	2.17	1,199,204	42,325	96.59%	3.41%	97.0	84.8
1983	10.8	10.8	-	100.0%	-	4.09	-	1,197,182	-	100.00%	0.00%	94.7	-
1984	9.8	9.8	<0.1	99.76%	0.24%	4.42	1.76	1,004,315	6,030	99.40%	0.60%	96.7	79.4
1985	8.9	8.8	<0.1	99.48%	0.52%	4.10	1.68	976,479	12,375	98.75%	1.25%	94.8	78.1
1986	6.0	5.9	0.1	97.82%	2.18%	4.01	1.63	670,564	36,838	94.79%	5.21%	93.7	77.6
1987	6.0	5.9	<0.1	99.31%	0.69%	3.78	1.70	711,085	11,022	98.47%	1.53%	92.3	78.8
1988	6.8	6.8	<0.1	99.80%	0.20%	4.29	2.11	722,972	2,869	99.60%	0.40%	96.0	84.6
1989	9.9	9.8	0.1	98.79%	1.21%	4.02	1.93	1,103,734	28,095	97.52%	2.48%	94.2	82.0
1990	32.5	32.4	0.1	99.62%	0.38%	4.00	1.77	3,669,820	31,268	99.16%	0.84%	94.1	79.8
1991	29.0	28.9	0.2	99.36%	0.64%	3.90	1.08	3,354,707	77,348	97.75%	2.25%	93.4	77.9
1992	37.2	37.1	<0.1	99.82%	0.18%	3.82	1.86	4,402,269	16,576	99.62%	0.38%	92.9	81.1
1993	45.5	45.2	0.4	99.22%	0.78%	3.58	1.87	5,721,367	86,687	98.51%	1.49%	91.5	81.2
1994	41.4	40.9	0.5	98.71%	1.29%	3.17	1.84	5,846,452	131,350	97.80%	2.20%	88.1	80.9
1995	50.1	49.8	0.3	99.42%	0.58%	2.95	1.55	7,662,456	84,537	98.91%	1.09%	86.3	76.4
1996	60.1	50.0	10.1	83.22%	16.78%	2.65	1.56	8,567,153	2,933,039	74.50%	25.50%	84.1	76.4

Table 2. Weight per tow (lbs.) indices for spiny dogfish from NEFSC spring (1968-1997) and autumn (1967-1996) bottom trawl surveys (offshore strata 1-30, 33-40, 61-76; Footnotes A-C).

	Spring				Autumn			
Year	Unsexed	Male	Female	Total	Unsexed	Male	Female	Total
1967	-	-	-	-	76.8	-	-	76.8
1968	56.8	-	-	56.8	49.3	-	-	49.3
1969	35.4	-	-	35.4	121.7	-	-	121.7
1970	29.3	-	-	29.3	52.4	-	-	52.4
1971	52.8	-	-	52.8	34.1	-	-	34.1
1972	107.8	-	-	107.8	35.4	-	-	35.4
1973	125.6	-	-	125.6	47.7	-	-	47.7
1974	147.4	-	-	147.4	17.8	-	-	17.8
1975	100.3	-	-	100.3	46.0	-	-	46.0
1976	81.4	-	-	81.4	43.6	-	-	43.6
1977	53.0	-	-	53.0	35.4	-	-	35.4
1978	79.9	-	-	79.9	42.5	-	-	42.5
1979	29.5	-	-	29.5	58.5	-	-	58.5
1980	29.5	75.2	3.52	108.0	-	8.8	33.2	42.0
1981	1.3	44.9	106.0	152.2	-	27.9	76.8	104.7
1982	-	68.4	189.2	257.4	-	11.4	21.3	32.8
1983	-	46.4	38.9	85.6	-	30.1	48.6	78.8
1984	-	42.5	50.6	93.3	-	19.1	30.6	49.5
1985	-	220.9	146.7	367.6	-	32.1	55.0	87.3
1986	-	12.8	85.8	98.8	-	29.5	52.1	81.6
1987	-	89.3	135.7	225.1	-	23.3	24.6	48.0
1988	-	59.2	170.3	229.7	-	33.7	53.5	87.1
1989	-	76.6	94.8	171.2	-	13.4	12.1	25.3
1990	-	133.3	196.2	329.6	-	32.8	32.8	65.6
1991	-	80.3	116.6	196.9	-	54.1	58.7	112.9
1992	-	98.6	154.2	252.8	-	31.0	91.5	122.5
1993	-	78.5	114.8	193.4	-	11.2	4.6	15.8
1994	-	109.8	77.66	187.2	-	40.7	32.2	72.2
1995	-	76.6	88.0	164.6	-	36.7	25.1	61.6
1996	-	129.8	133.1	262.9	-	31.7	58.7	90.4
1997	-	82.5	98.78	181.3	-	-	-	-

A. During 1963-1984, BMV oval doors were used in the spring and autumn surveys; since 1985, Portuguese polyvalent doors have been used in both surveys. No adjustments have been made because no significant difference was found between the two types of doors for spiny dogfish (NEFSC 1991).

B. Spring surveys from 1973-1981 were accomplished with a '41 Yankee' trawl; in all other years, spring surveys were accomplished with a '36 Yankee' trawl. A factor of 0.69 was applied to all tows in these years (Sissenwine and Bowman, 1978).

C. During the fall of 1970, 1975, 1978, 1979, 1980, 1981, 1985, 1986, 1988, 1989, 1990, 1991, an 1993 and the springs of 1973, 1976, 1977, 1979, 1980, 1981, 1982, 1987, 1989, 1990, 1991, and 1994, the *Delaware II* was used entirely or in part to conduct the survey. All other years, the *Albatross IV* was the only vessel used for the survey. A factor of 0.81 was applied to all *Delaware II* tows (NEFSC 1991).

Table 3. Minimum biomass estimates (millions of lbs.) based on area swept by NEFSC trawl during spring surveys.

	Lengths ≥ 80 cm			Lengths 36-79 cm			Lengths ≤ 35 cm			
Year	Females	Males	Total	Females	Males	Total	Females	Males	Total	All Lengths
1968	-	-	91.3	-	-	243.4	-	-	3.4	338.0
1969	-	-	60.4	-	-	152.8	-	-	1.5	214.5
1970	-	-	80.9	-	-	72.8	-	-	7.0	160.7
1971	-	-	228.8	-	-	60.8	-	-	6.1	295.9
1972	-	-	279.1	-	-	321.7	-	-	3.4	604.3
1973	-	-	394.0	-	-	364.4	-	-	5.7	763.9
1974	-	-	489.2	-	-	395.9	-	-	5.9	890.9
1975	-	-	231.7	-	-	275.6	-	-	8.8	515.9
1976	-	-	212.3	-	-	266.3	-	-	2.6	481.3
1977	-	-	170.4	-	-	149.9	-	-	1.2	321.7
1978	-	-	192.7	-	-	289.2	-	-	2.7	484.6
1979	-	-	115.3	-	-	41.0	-	-	4.0	160.3
1980	230.8	33.7	370.6	37.0	159.2	272.3	0.7	0.9	1.9	644.6
1981	587.5	53.8	647.7	56.2	165.6	221.8	4.7	6.2	11.2	880.7
1982	1,000.9	76.3	1,077.2	135.8	315.9	451.7	1.1	1.5	2.6	1,531.3
1983	171.3	66.4	237.7	80.9	217.2	298.3	6.8	8.7	15.5	551.4
1984	254.9	60.6	315.5	73.6	194.0	267.6	0.3	0.5	0.8	584.0
1985	698.9	276.7	975.8	226.0	1,107.8	1,333.8	8.8	11.2	20.1	2,329.6
1986	421.7	7.7	429.5	114.4	65.3	179.7	1.9	2.4	4.3	613.3
1987	483.0	199.5	682.5	135.6	378.5	513.9	5.4	10.5	15.9	1,212.5
1988	954.8	57.8	1,012.8	205.7	338.6	544.5	2.0	2.4	4.4	1,561.7
1989	357.4	89.3	446.7	221.3	348.8	570.1	2.5	3.4	5.9	1,022.7
1990	882.5	155.9	1,038.4	360.5	668.2	1,028.7	1.5	2.3	3.8	2,070.8
1991	485.9	66.1	551.8	239.0	410.7	649.7	2.2	3.2	5.3	1,206.8
1992	618.4	92.4	710.8	396.6	511.2	907.9	1.6	2.2	3.8	1,622.4
1993	517.2	61.3	578.7	229.5	437.6	667.1	1.2	1.4	2.7	1,248.5
1994	232.1	81.8	313.9	238.8	560.4	799.2	9.4	12.2	21.6	1,134.9
1995	225.8	65.0	290.8	339.5	384.7	724.2	0.6	0.8	1.3	1,016.1
1996	433.2	73.6	506.8	444.7	738.1	1,182.6	2.2	2.5	4.7	1,694.2
1997	184.5	38.6	223.1	452.4	461.0	913.4	0.1	0.1	0.2	1,136.5

Notes: Total equals sum of males and females plus unsexed dogfish. Data for dogfish prior to 1980 are currently not available by sex.

Table 4. Distribution and habitat use for spiny dogfish.

Study	Area	Spatial & Temporal Distribution	Bottom Temp (°C)	Salinity (ppt)	Bottom Depth (m) Bottom Type	Estuarine Use	Prey/Predator
Biglow & Schroeder 1953	Gulf of Maine	Seasonally transient. Cape Cod to Cape Sable. Common on offshore banks as well as along the coast. As early as mid May in Penobscot Bay. Autumnal departure by October-November.	Appear coastally when temperature warms to 6°, and disappear when temp increases to 15°. Preferred range on offshore wintering grounds seems to be 6° to 11°.		Occur at depths anywhere from surface to bottom. Deep water preferred in winter, moving to schoaler water summer-fall.	See spatial column	Prey: Mostly fish, in particular, herrings and mackerel. Practically all species of Gulf of Maine fish smaller than themselves. Squid among regular article found in stomachs. Also known to eat worms, shrimps, and crabs. Upon May arrival in Woods Hole, often found full of Ctenophores.
Jensen, *et al.* 1961, 1965	Northwest Atlantic	Coastal waters from Cape Lookout, NC, northward around Nova Scotia, along both the northern and southern shores of the Gulf of Lawrence, past the Strait of Belle Isle to southeast Labrador. Appear early on Georges Bank (Mar-Apr), New Jersey (Mar). Spring and autumn transients in their southern range, from New York to North Carolina. General migration northward in spring, moving south in fall.	Prefer 7.2° - 12.8° range.		Deep water in winter, shallower water in summer. Average depth at which 100+ dogfish per haul obtained Jan-Jun 1948-1960 = 137 m. Avg. Depth for Jul-Dec same period = 87 m.		Prey: Primarily a fish eater but will also feed on invertebrates, both swimming and bottom-dwelling forms. Clupeoids are important part of diet, but undoubtedly feeds on whatever species are abundant and not too difficult to capture. Predator: Sharks (Mackerel, Great White, Tiger, Blue), Barndoor skate, Lancetfish, Bluefin tuna, Tilefish, Goosefish.
Cohen, 1982	Northwest Atlantic	Labrador to Florida, most abundant from Nova Scotia to Cape Hatteras, NC. As far south as Florida in winter, chiefly north of Cape Cod in summer. Begin southward migration in October, begin returning north in spring.	In Mid-Atlantic and New England areas inhabit waters with bottom temp ranging from 4° to 18°. Preferred temp range seems to be between 7.2° and 12.8°				Prey: Voracious, opportunistic feeders. Most species of fish smaller than themselves, primarily mackerel, herring, scup, flatfish, cod haddock, shrimp, crabs, squid, siphonophores, and sipunculid worms, ctenophores. Predator: Shark (other)
Nammack, *et al.* 1985	Northwest Altantic	Greeland to Southern Florida and Cuba; more typically from Newfoundland to Georgia. Offshore and south in the winter.					
Silva, 1993	Northwest Atlantic	Exhibit extensive seasonal migrations between winter pupping/mating grounds (Cape Hatteras to New Jersey) and summer feeding grounds (Gulf of Maine and Georges Bank to Newfoundland).	7° to 13°.		1968-1990. Juveniles prin. found along 100m contour, adult fem. shallower and inwards from 100m in south, deeper water in north. Adult males sim. to adult females.		
Rago, *et al.* 1994	Northwest Atlantic	Mid-Atlantic waters in winter and spring. Summer movement towards Canadian waters including bays and estuaries. Autumnal migration to the south.	7.2° to 12.8° (Jensen, 1965)			See spatial column	Prey: Herring, Atlantic mackerel, and squid.
Wilk, *et al.* 1997	Hudson-Raritan Estuary, NJ	Nov.-Dec. 1994-1997. Found on Romer Shoals, East Bank, and in Ambrose Channel.	Occurred at: range 7.1° - 11.3°.	Occurred at: range 30.7 - 32.2 ppt	Occurred at: range 12 - 18 m.	See Appendix #1	Prey: Crabs American eel, small fish

Source: McMillan and Morse 1998.

Table 4. (continued) Distribution and habitat use for spiny dogfish.

Study	Area	Spatial & Temporal Distribution	Bottom Temp (°C)	Salinity (ppt)	Bottom Depth (m) Bottom Type	Estuarine Use	Prey/Predator
NMFS, NEFC Juveniles (see Figures 5-8 for season and dates)	Northwest Atlantic	Winter: Across shelf from North Carolina to Georges Bank (GB). Spring: Across shelf from NC to GB, more abundant offshore. Summer: Inadequate sampling. Autumn: Nantucket Is., Georges Bank, between Lucher Shoal and German Bank.	OR=observed range OA=occurred at PR=preferred range Spring OR: 1 - 22 OA: 3 - 17 PR: 8 - 13 Autumn OR: 5 - 28 OA: 5 - 20 PR: 10 - 15		Spring OR: 5 - 439 AR: 7 - 390 PR. 50 - 150 Autumn OR: 5 - 481 AR: 12 - 366 PR: 25 - 75		Major predators on some commercially important species, mainly herring, Atl. Mackerel, and squid, and to a lesser extent, haddock and cod.
NMFS, NEFC Adults (see Figures 13-16 for season and dates)	Northwest Atlantic	Winter: Across shelf from NC to GB. Spring: Outer shelf from MC to northeast peak of GB, Browns Bank. Summer: Inadequate sampling. Autumn: Nantucket Shoals, eastern C. Cop, Cape Cod & Mass. Bays.	Spring: OR: 1 - 22 OA: 3 - 17 PR: 7 - 11 Autumn: OR: 5 - 28 OA: 5 - 19 PR: 10 - 15		Spring: OR: 5 - 439 AR: 7 - 439 PR: 50 - 149 Autumn: OR: 5 - 481 AR: 12 - 344 PR: 10 - 49		See Above
Mass. Inshore trawl survey 1980-1996 Juveniles	Inshore from Vineyard Sound to Cape Ann	Spring: SW Martha's V., Southern Nantucket I., NE Cape Cod, No. Cape Cod Bay. Autumn: NE Nantucket I., Cape Cod and C. Cod Bay, Cape Ann	Spring: OR: 1 - 15 OA: 2 - 14 PR: 7 - 10 Autumn: OR: 4 - 23 OA: 4 - 20 PR: 8 - 10* 13 - 16* *Bimodal preference		Spring: OR: 5 - 82 AR: 7 - 64 PR: 10 - 44 Autumn: OR: 4 - 82 AR: 8 - 82 PR: 15 - 34		
Mass. Inshore trawl survey 1980-1996 Adults	Inshore from Vineyard Sound to Cape Ann	Spring: So. Nantucket I., NE Cape Co, C. Cod Bay, Absent in GOM. Autumn: Eastern C. Cod, No. C. Cod, C. Cod Bay, Cape Ann, Ipswich Bay, Plum I.	Spring: OR: 1 - 15 AR: 1 - 14 PR: 6 - 12 Autumn: OR: 4 - 23 AR: 4 - 20 PR: 9 - 15		Spring: OR: 4 - 82 AR: 6 - 64 PR: < 45 Autumn: OR: 4 - 82 AR: 6 - 82 PR: 10 - 34		
Gottschall, *et al*. In review. Connecticut Bur. Maine Resources Apr-Jun 1984-1994 Jul-Aug 1984-1990	Long Island Sound	Enter the Sound in May and June and depart by early August. Return in September-November with highest numbers in November.			May-June: Prefer waters > 27m, and sand to transitional bottom type September-November: Prefer waters > 27m, and mud to transitional bottom.		

Source: McMillan and Morse 1998.

Table 4. (continued) Distribution and habitat use for spiny dogfish.

Study	Area	Spatial & Temporal Distribution	Bottom Temp (°C)	Salinity (ppt)	Bottom Depth (m) Bottom Type	Estuarine Use	Prey/Predator
Scott, 1982 (two publications)	Scotian Shelf & Bay of Fundy	Summer intruder to Bay of Fundy and Fundian channel. Occas large catches on the Scotian Shelf. Always associated with warm water.	Temp range= 3 - 11 Prefer Temp= 7 - 9	Sal range= 31 - 34 Prefer sal= 31 - 34	Depth range= 37 - 363 Prefer ranges= 20 - 29 70 - 79 90 - 99 pref. 1)For Scotian Shelf drift: glacial till 2)Sambro basin sand 3)Emerald basin salt 4)LaHave basin clay 5)Sable Is. sand & gravel		
Schwartz, 1964	Isle of Wight, Assawoman, Sinepauxent, & Chincoteague Bays, Ocean City, MD	April-June: S. Dogfish from 70 to 90 can occur in the harbor and inlet area of Ocean City, MD	Range during summer: Bays: 20 - 38 Inlet: 23 - 24	Sal range= 26 - 32	Inlet= 7 - 10 m Bays= 2 - 3 m Assawoman: western 3/4=mud eastern 1/4=sand	See "Area"	
Sameoto, *et al.*, 1994	Nova Scotia Shelf	Emerald and LaHave basins, more abundant in June than October.	Emerald basin June: 8.3, October: 8.6	Emer. Bas. June: 34.3	Emerald and LaHave > 200	n/a	Prey: Zooplankton, namely *Calanus finmarchicus & Meganyctiphanes norvegica.*
Azarovitz, *et al.*, 1980	Middle Atlantic Bight	Spring: Larger catches offshore, inshore south of Delaware Bay but have not reaches coastal NJ or NY. Autumn: Southern movement from the northern (summer) grounds has begun. Young of the Year (≤ 32 cm) rarely occur inshore. Pupping is an exclusive offshore event.	Inhabit waters 4 - 18 prefer waters 7.2 - 12.8				See Bigelow & Schroeder, 1953
Woodhead, *et al.*, 1976	Frenchman Bay and surrounding waters, ME	Early June: 89% ♀ caught Flanders Bay. Late June/Early July: 95% ♂ caught off Stave Island. Late July/Early Aug.: Males plentiful around Ironbound Island. Late August: Mostly males caught in Bar Harbor.			All sets made in 16 - 32 m on muddy or sandy bottoms.	See spatial	Bait used = aged salted herring
Soldat, 1979	Northwest Atlantic	Migratory, thermally induced. Dense aggreg during winter off Norfolk, VA, Nantucket I, and southern slopes Georges. Diurnal vertical migrations.	Overall range: 4 - 17 prefer: 6 - 14 Winter: 7 - 10 Summer: 8 - 12		Winter: 200 - 300, as well as 40 - 80. Summer: 60 - 150 on Georges		Feeds mainly on fish, with squid being an important prey item also.

Note:
1 mm = 0.04 in
1 cm = 0.39 in
1 m = 39.37 in
1 kg = 2.2046 lbs

Source: McMillan and Morse 1998.

Table 5. **Spatial distribution and relative abundance of dogfish in North Atlantic estuaries.**

	North Atlantic Estuaries																	
	Passamaquoddy Bay			Englishman Machias Bays			Narraguagus Bay			Blue Hill Bay			Penobscot Bay			Muscongus Bay		
Life Stage	T	M	S	T	M	S	T	M	S	T	M	S	T	M	S	T	M	S
A		●	■		●	■		●	■		●	■		●	■		●	●
M			na			na			na			na			na			na
J		●	■		●	■		●	■		●	■		●	●		●	●
P			na			na			na			na			na			na

	Damariscotta River			Sheepscot River			Kennebec/ Androscoggin Rivers			Casco Bay			Saco Bay			Wells Harbor		
Life Stage	T	M	S	T	M	S	T	M	S	T	M	S	T	M	S	✳	M	S
A		●	●		●	●		●	●		▼	●		▼	●			
M			na			na			na									
J		●	●		●	●		●	●		▼	●		▼	●			
P			na			na			na									

	Great Bay			Merrimack River			Massachusetts Bay			Boston Harbor			Cape Cod Bay		
Life Stage	T	M	S	T	M	✳	✳	✳	S	✳	M	S	✳	M	S
A									■		▼	▼		▼	■
M									na						na
J									■		▼	▼		▼	■
P									na						na

Relative Abundance

▲ - Highly Abundant
■ - Abundant
● - Common
▼ - Rare
Blank - Not present

Salinity Zone

T - Tidal Fresh
M - Mixing
S - Seawater
✳ - Salinity Zone not present

Life stage

A - Adults
M - Mating
J - Juveniles
P - Parturition

Source: Jury *et al.* 1994.

Table 6. Temporal distribution and relative abundance of dogfish in North Atlantic estuaries.

Estuary (North Atlantic estuaries)	Life Stage	J	F	M	A	M	J	J	A	S	O	N	D
Passamaquoddy Bay	A						*C*	*C*	*C*	*A*	*A*		
	M						na						
	J						*C*	*C*	*C*	*A*	*A*		
	P						na						
Englishman / Machias Bays	A						*C*	*C*	*A*	*A*	*A*	*R*	
	M						na						
	J						*C*	*C*	*A*	*A*	*A*	*R*	
	P						na						
Narraguagus Bay	A						*C*	*C*	*A*	*A*	*A*	*C*	
	M						na						
	J						*C*	*C*	*A*	*A*	*A*	*C*	
	P						na						
Blue Hill Bay	A						*C*	*C*	*A*	*A*	*A*	*C*	
	M						na						
	J						*C*	*C*	*A*	*A*	*A*	*C*	
	P						na						
Penobscot Bay	A						*C*	*A*	*A*	*C*	*C*	*R*	
	M						na						
	J						*C*	*C*	*C*	*C*	*C*	*R*	
	P						na						
Muscongus Bay	A					*R*	*C*	*C*	*C*	*C*	*R*	*R*	
	M						na						
	J					*R*	*C*	*C*	*C*	*C*	*R*	*R*	
	P						na						
Damariscotta River	A					*R*	*C*	*C*	*C*	*C*	*R*	*R*	
	M						na						
	J					*R*	*C*	*C*	*C*	*C*	*R*	*R*	
	P						na						
Sheepscot River	A					*R*	*C*	*C*	*C*	*C*	*R*	*R*	
	M						na						
	J					*R*	*C*	*C*	*C*	*C*	*R*	*R*	
	P						na						
Kennebec / Androscoggin Rivers	A					*R*	*C*	*C*	*C*	*C*	*R*	*R*	
	M						na						
	J					*R*	*C*	*C*	*C*	*C*	*R*	*R*	
	P						na						
Casco Bay	A					*R*	*C*	*C*	*C*	*C*	*C*	*R*	
	M												
	J					*R*	*C*	*C*	*C*	*C*	*C*	*R*	
	P												
Saco Bay	A					*R*	*C*	*C*	*C*	*C*	*C*	*R*	*R*
	M												
	J					*R*	*C*	*C*	*C*	*C*	*C*	*R*	*R*
	P												
Wells Harbor	A												
	M												
	J												
	P												
Great Bay	A												
	M												
	J												
	P												
Merrimack River	A												
	M												
	J												
	P												
Massachusetts Bay	A					*R*	*C*	*A*	*A*	*A*	*C*	*R*	
	M						na						
	J					*R*	*C*	*A*	*A*	*A*	*C*	*R*	
	P						na						
Boston Harbor	A					*R*	*R*	*R*	*R*	*R*	*R*	*R*	
	M												
	J					*R*	*R*	*R*	*R*	*R*	*R*	*R*	
	P												
Cape Cod Bay	A					*R*	*C*	*A*	*A*	*A*	*A*	*R*	
	M						na						
	J					*R*	*C*	*C*	*A*	*A*	*A*	*R*	
	P						na						

Relative Abundance

H - Highly Abundant
A - Abundant
C - Common
R - Rare
Blank - Not Present
na - No data available

Life Stage

A - Adults
M - Mating
J - Juveniles
P - Parturition

Source: Jury *et al.* 1994

Table 7a. Approximate area (percent and number of 10 minute squares) for the dogfish catch and area EFH alternatives, for male and female juvenile dogfish caught in the NEFSC bottom trawl survey. The logged catch alternative was not presented because the percent area and number of squares consistently fall between the catch and area alternatives. The preferred alternative is 90% of the area.

Female juvenile dogfish

% Area	% Catch	Number of 10" squares
0	0	0
4	50	40
12	75	117
30	90	293
50	92	488
75	95	731
90	98	878
100	100	850

Male juvenile dogfish

% Area	% Catch	Number of 10" squares
0	0	0
2	50	15
7	75	50
17	90	131
50	93	363
75	96	544
90	99	653
100	100	725

Table 7b. Approximate area (percent and number of 10 minute squares) for dogfish catch and area EFH alternatives, for male and female dogfish caught in the NEFSC trawl survey. The logged catch alternative was not presented because the percent area and number of squares consistently fall between the catch and area alternatives. The preferred alternative is 90% of the area.

Female adult dogfish

% Area	% Catch	Number of 10" squares
0	0	0
6	50	50
12	75	102
28	90	238
50	93	425
75	96	638
90	98	765
100	100	850

Male adult dogfish

% Area	% Catch	Number of 10" squares
0	0	0
6	50	50
15	75	125
28	90	238
50	92	425
75	95	638
90	98	765
100	100	850

Table 8. Estuaries designated as essential fish habitat for juvenile and adult dogfish (seawater portions only).

Estuaries	Adults	Juveniles
Passamaquoddy Bay	X	X
Englishman / Machias Bays	X	X
Narraguagus Bay	X	X
Blue Hill Bay	X	X
Penobscot Bay	X	X
Muscongus Bay	X	X
Damariscotta Bay	X	X
Sheepscot Bay	X	X
Kennebec / Androscoggin Rivers	X	X
Casco Bay	X	X
Saco Bay	X	X
Massachusetts Bay	X	X
Cape Cod Bay	X	X

Table 9. Comparisons of intensity and severity of various sources of physical disturbance to the seafloor (based on Hall 1994, Watling and Norse MS1997). Intensity is a measure of the force of physical disturbance and severity is the impact on the benthic community.

Source	Intensity	Severity
ABIOTIC		
Waves	Low during long temporal periods but high during storm events (to 70-80 m depth)	Low over long temporal periods since taxa adapted to these events but high locally depending on storm behavior
Currents	Low since bed shear normally lower than critical velocities for large volume and rapid sediment movement	Low since benthic stages rarely lost due to currents
Iceberg Scour	High locally since scouring results in significant sediment movement but low regionally	High locally due to high mortality of animals but low regionally
BIOTIC		
Bioturbation	Low since sediment movement rates are small	Low since infauna have time to repair tubes and burrows
Predation	Low on a regional scale but high locally due to patchy foraging	Low on a regional scale but high locally due to small spatial scales of high mortality
HUMAN		
Dredging	Low on a regional scale but high locally due to large volumes of sediment removal	Low on a regional scale but high locally due to high mortality of animals
Land Alteration (Causing silt laden runoff)	Low since sediment laden runoff per se does not exert a strong physical force	Low on a regional scale but high locally where siltation over coarser sediments causes shifts in associated communities
Fishing	High due to region wide fishing effort	High due to region wide disturbance of most types of habitat

Source: Auster and Langton 1998.

Table 10. Studies of the impacts of fishing gear on the structural components of fish habitat.

Habitat	Gear Type	Location	Results	Reference(s)
Eelgrass	Scallop dredge	North Carolina	Comparison of reference quadrats with treatments of 15 and 30 dredgings in hard sand and soft mud substrates within eelgrass meadows. Eelgrass biomass was significantly greater in hard sand than soft mud sites. Increased dredging resulted in significant reductions in eelgrass biomass and number of shoots.	Fonesca et al. (1984)
Eelgrass and shoalgrass	Clam rake and "clam kicking"	North Carolina	Comparison of effect of two fishing methods. Raking and "light" clam kicking treatments, biomass of seagrass was reduced approximately 25% below reference sites but recovered within one year. In "intense" clam kicking treatments, biomass of seagrass declined approximately 65% below reference sites. Recovery did not begin until more than 2 years after impact and biomass was still 35% below the level predicted from controls to show no effect.	Peterson et al. (1987)
Eelgrass and shoalgrass	Clam rakes (pea digger and bull rake)	North Carolina	Compared impacts of two clam rake types on removal of seagrass biomass. The bull rake removed 89% of shoots and 83% of roots and rhizomes in a completely raked 1 m2 area. The pea digger removed 55% of shoots and 37% of roots and rhizomes.	Peterson et al. (1983)
Seagrass	Trawl	western Mediter-ranean	Noted loss of *Posidonia* meadows due to trawling; 45% of study area. Monitored recovery of the meadows after installing artificial reefs to stop trawling. After 3 years plant density has increased by a factor of 6.	Guillen et al. (1994)
Sponge-coral hard-bottom	Roller-rigged trawl	off Georgia coast	Assessed effect of single tow. Damage to all species of sponge and coral observed; 31.7% of sponges, 30.4% of stony corals, and 3.9% of octocorals. Only density of barrel sponges (*Cliona* spp.) significantly reduced. Percent of stony coral damage high because of low abundance. Damage to other sponges, octocorals, and hard corals varied but changes in density not significantly different. No significant differences between trawled and reference sites after 12 months.	Van Dolah et al. (1987)
Sponge-coral hard-bottom	roller-frame shrimp trawl	Biscayne Bay, Florida	Damage to approximately 50% of sponges, 80% of stony corals, and 38% of soft corals.	Tilmant (1979) (cited in Van Dolah et al. 1987)

Source: Auster and Langton 1998.

Table 10 (continued). **Studies of the impacts of fishing gear on the structural components of fish habitat.**

Habitat	Gear Type	Location	Results	Reference(s)
Various tropical emergent benthos	Trawl	North West Shelf, Australia	Catch rates of all fish and large and small benthos show that in closed areas fish and small benthos abundance increased over 5 years while large benthos (>25 cm) stayed the same or increased slightly. In trawled areas all groups of animals declined. Found that settlement rate and growth to 25 cm was on the order of 15 years for the benthos.	Sainsbury et al. (In press)
Gravel pavement	Scallop dredge	Georges Bank	Assessed cumulative impact of fishing. Undredged sites had significantly higher percent cover of the tube-dwelling polychaete *Filograna implexa* and other emergent epifauna than dredged sites. Undredged sites had higher numbers of organisms, biomass, species richness, and species diversity than dredged sites. Undredged sites were characterized by bushy epifauna (bryozoans, hydroids, worm tubes) while dredged sites were dominated by hard-shelled molluscs, crabs, and echinoderms.	Collie et al. (1996, 1997)
Gravel-boulder	Assumed roller-rigged trawl	Gulf of Maine	Comparison of site surveyed in 1987 and revisited in 1993. Initially mud draped boulders and high density patches of diverse sponge fauna. In 1993, evidence of moved boulders, reduced densities of epifauna and extreme truncation of high density patches.	Auster et al. (1996)
Cobble-shell	Assumed trawl and scallop dredge	Gulf of Maine	Comparison of fished site and adjacent closed area. Statistically significant reduction in cover provided by emergent epifauna (e.g., hydroids, bryozoans, sponges, serpulid worms) and sea cucumbers.	Auster et al. (1996)
Gravel	Beam trawl	Irish Sea	An experimental area was towed 10 times. Density of epifauna (e.g., hydroids; soft corals, *Alcyonium digitatum*) was decreased approximately 50%.	Kaiser and Spencer (1996a)
Boulder-Gravel	Roller-rigged trawl	Gulf of Alaska	Comparisons of single tow trawled lane with adjacent reference lane. Significant reductions in density of structural components of habitat (two types of large sponges and anthozoans). No significant differences in densities of a small sponge and mobile invertebrate fauna. 20.1% boulders moved or dragged. 25% of ophiuroids (*Amphiophiura ponderosa*) in trawled lanes were crushed or damaged compared to 2% in reference lanes.	Freese et al. (In prep.)
Gravel over sand	Scallop dredge	Gulf of St. Lawrence	Assessed effects of single tows. Suspended fine sediments and buried gravel below the sediment-water interface. Overturns boulders.	Caddy (1973)

Source: Auster and Langton 1998.

Table 10 (continued). Studies of the impacts of fishing gear on the structural components of fish habitat.

Habitat	Gear Type	Location	Results	Reference(s)
Bryozoan beds (on sand and cobble)	Otter trawl and roller-rigged trawl	New Zealand	Qualitative comparison of closed and open areas. Two bryozoans produce "coral-like" forms and provide shelter for fishes and their prey. Comparisons of fished site with reference sites and prior observations from fishers show reduced density and size of colonies.	Bradstock and Gordon (1983)
Mussel bed	Otter trawl	Strangford Lough, Northern Ireland	Comparison of characteristics of trawled and untrawled *Modiolus modiolus* beds as pre and post impacts of a trawl. Trawled areas, confirmed with sidescan sonar, showed mussel beds disconnected with reductions in attached epibenthos. The most impacted sites were characterized by few or no intact clumps, mostly shell debris, and sparse epifauna. Trawling resulted in a gradient of complexity with flattened regions at the extreme. Immigration of *Nephrops* into areas previously dominated by *Modiolus* may result in burial of new recruits due to burrowing activities; precluding a return to a functional mussel bed habitat.	Magorrian (1995)
Sand-mud	Trawl and scallop dredge	Hauraki Gulf, New Zealand	Comparisons of 18 sites along a gradient of fishing effort (i.e., heavily fished sites through unfished reference sites). A gradient of increasing large epifaunal cover correlated with decreasing fishing effort.	Thrush et al. (In press)
Soft sediment	Scallop dredge	Port Phillip Bay, Australia	Compared reference and experimentally towed sites in BACI designed experiment. Bedforms consisted of cone shaped callianasid mounds and depressions prior to impact. Depressions often contained detached seagrasses and macroalgae. Only dredged plot changed after dredging. Eight days after dredging the area was flattened; mounds were removed and depressions filled. Most callianasids survived and density did not change in 3 mo following dredging. One month post impact, seafloor remained flat and dredge tracks distinguishable. Six months post impact mounds and depressions were present but only at 11 months did the impacted plot return to control plot conditions.	Currie and Parry (1996)
Sand	Beam trawl	North Sea	Observations of effects of gear. As pertains to habitat, trawl removed high numbers of the hydroid *Tubularia.*	DeGroot (1984)

Source: Auster and Langton 1998.

Table 10 (continued). Studies of the impacts of fishing gear on the structural components of fish habitat.

Habitat	Gear Type	Location	Results	Reference(s)
Gravel-sand-mud	Trawl	Monterey Bay	Comparison of heavily trawled (HT) and lightly trawled (LT) sites. The seafloor in the HT area had significantly higher densities of trawl tracks while the LT area had significantly greater densities of rocks >5 cm and mounds. The HT area had shell debris on the surface while the LT area had a cover of flocculent material. Emergent epifauna density was significantly higher for all taxa (anenomes, sea pens, sea whips) in the LT area.	Engel and Kvitek (MS1997)
Sand	Otter trawl	North Sea	Observations of direct effects of gear. Well buried boulders removed and displaced from sediment. Trawl doors smoothed sand waves. Penetrated seabed 0-40 mm (sand and mud).	Bridger (1970, 1972)
Sand-shell	Assumed trawl and scallop dredge	Gulf of Maine	Comparison of fished site and adjacent closed area. Statically significant reduction of habitat complexity based on reduced cover provided by biogenic depressions and sea cucumbers. Observations at another site showed multiple scallop dredge paths resulting in smoothed bedforms. Scallop dredge paths removed cover provided by hydrozoans which reduced local densities of associated shrimp species. Evidence of shell aggregates dispersed by scallop dredge.	Auster et al. (1996)
Sand-silt to mud	Otter trawl with chain sweep and roller gear	Long Island Sound	Diver observations showed doors produced continuous furrows. Chain gear in wing areas disrupted amphipod tube mats and bounced on bottom around mouth of net, leaving small scoured depressions. In areas with drifting macroalgae, the algae draped over grounder of net during tows and buffered effects on the seafloor. Roller gear also created scoured depressions. Spacers between discs lessened impacts.	Smith et al. 1985

Source: Auster and Langton 1998.

Table 11. Studies of short-term impacts of fishing on benthic communities.

Taxa	Gear and Sediment Type	Region	Results	Reference(s)
Infauna	beam trawl; megaripples and flat substrate	Irish Sea, U.K.	Assessed at the immediate effects of beam trawling and found a reduction in diversity and abundance of some taxa in the more stable sediments of the northeast sector of their experimental site but could not find similar effects in the more mobile sediments. Out of the top 20 species 19 had lower abundance levels at the fished site and nine showed a statistically significant decrease. Coefficient of variation for numbers and abundance was higher in the fished area of the NW sector supporting the hypothesis that heterogeneity increases with physical disturbance. Measured a 58% decrease in mean abundance and a 50% reduction in the mean number of species per sample in the sector resulting from removal of the most common species. Less dramatic change in the sector where sediments are more mobile.	Kaiser and Spencer (1996a)
Starfish	beam trawl; coarse sand, gravel and shell, muddy sand, mud	Irish Sea, U.K.	Evaluated damage to starfish at three sites in the Irish sea that experienced different degrees of trawling intensity. Used ICES data to select sites and used side scan to confirm trawling intensity. Found a significant correlation between starfish damage (arm regeneration) and trawling intensity.	Kaiser (1996)
Horse mussels	otter trawl; horse mussel beds,	Strangford Lough; N. Ireland	Used video/rov, side scan and benthic grabs to characterize the effect of otter trawling and scallop dredging on the benthic community. There was special concern over the impact on *Modiolus* beds in the Lough. Plotted the known fishing areas and graded impacts based on a subjective 6 point scale; found significant trawl impacts. Side scan supported video observations and showed areas of greatest impact. Found that in otter trawl areas that the otter boards did the most damage. Side scan suggested that sediment characteristics had changed in heavily trawled areas.	Industrial Science Division. (1990)
Benthic fauna	beam trawl; mobile megaripples structure and stable uniform sediment	Irish Sea, U.K.	Sampled trawled areas 24 hours after trawling and 6 months later. On stable sediment found significant difference immediately after trawling. Reduction in polychaetes but increase in hermit crabs. After six months there was no detectable impact. On megaripples substrate no significant differences were observed immediately after trawling or 6 months later.	Kaiser et al MS 1997

Source: Auster and Langton 1998.

Table 11 (continued). Studies of short-term impacts of fishing on benthic communities.

Taxa	Gear and Sediment Type	Region	Results	Reference(s)
Bivalves, sea scallop, surf clams, ocean quahog	scallop dredge, hydraulic clam dredge; various substrate types	Mid-Atlantic Bight, USA	Submersible study of bivalve harvest operations. Scallops harvested on soft sediment (sand or mud) had low dredge induced mortality for uncaught animals (<5%). Culling mortality (discarded bycatch) was low, approx. 10%. Over 90% of the quahogs that were discarded reburrowed and survived whereas 50% of the surf clams died. Predators crabs, starfish, fish and skates, moved in on the quahogs and clams in the predator density 10 items control area levels within 8 hours post dredging. Noted numerous "minute" predators feeding in trawl tracks. Non-harvested animals, sand dollars, crustaceans and worms significantly disrupted but sand dollars suffered little apparent mortality.	Murawski and Serchuck (1989)
Ocean quahog	hydraulic clam dredge;	Long Island, N.Y., USA	Evaluated clam dredge efficiency over a transect and changed up to 24 hours later. After dredge fills it creates a "windrow of clams". Dredge penetrates up to 30 cm and pushes sediment into track shoulders. After 24 hours track looks like a shallow depression. Clams can be cut or crushed by dredge with mortality ranging from 7 to 92 %, being dependent on size and location along dredge path. Smaller clams survive better and are capable of reburrowing in a few minutes. Predators, crabs, starfish and snails, move in rapidly and depart within 24 hours.	Meyer et al. (1981)
Macro-benthos	scallop dredge; coarse sand	Mercury Bay, New Zealand	Benthic community composed of small short-lived animals at two experimental and adjacent control sites. Sampling before and after dredging and three months later. Dredging caused an immediate decrease in density of common macrofauna. Three months later some populations had not recovered. Immediate post-trawling snails, hermit crabs and starfish were feeding on damaged and exposed animals	Thrush et al. (1995)
Scallops and associated fauna	scallop dredge; "soft sediment"	Port Phillip Bay, Australia	Sampled twice before dredging and three times afterwards, up to 88 days later. The mean difference in species number increased from 3 to 18 after trawling. The total number of individuals increased over the sampling time on both experimental and control primarily as a result of amphipod recruitment, but the number of individuals at the dredged sites were always lower than the control. Dissimilarity increased significantly, as a result of dredging, because of a decrease in species numbers and abundance.	Currie and Parry (1994)

Source: Auster and Langton 1998.

Table 11 (continued). **Studies of short-term impacts of fishing on benthic communities.**

Taxa	Gear and Sediment Type	Region	Results	Reference(s)
Sea Scallops and associated fauna	otter trawl and scallop dredge; gravel and sand	Gulf of St. Lawrence, Canada	Observed physical change to sea floor from otter doors and scallop dredge and lethal and nonlethal damage to the scallops. Noted an increase in the most active predators within the trawl tracks compared to outside; winter flounder, sculpins and rock crabs. No increase in starfish or other sedentary forms within in an hour of dredging.	Caddy (1973)
Macrofauna	beam trawl; hard-sandy substrate	North Sea, coast of Holland	Sampling before and after beam trawling (*hrs, 16 hrs and 2 weeks) showed species specific changes in macrofaunal abundance. Decreasing density ranged from 10 to 65% for species of echinoderms (starfish and sea urchins but not brittle stars), tube dwelling polychaetes and molluscs at the two week sampling period. Density of some animals did not change others increased but these were not significant after 2 weeks.	Bergman and Hup (1992)
Benthic fauna	beam trawl and shrimp trawl; hard sandy bottom, shell debris and sandy-mud	North Sea, German coast	Preliminary report using video and photographs comparing trawled and untrawled areas. Presence and density of brittle stars, hermit crabs, other "large" crustaceans and flatfish was higher in the controls than the beam trawl site. Difference in sand ripple formation in trawled areas was also noted, looking disturbed not round and well developed. Found a positive correlation with damage to benthic animals and individual animal size. Found less impact with the shrimp trawl, diver observations confirmed low level of impact although the net was "festooned" with worms. Noted large megafauna, mainly crabs, in trawl tracks.	Rumhor et al. (1994)
Soft bottom macrofauna	beam trawl; very fine sand	North Sea, Dutch Sector	Compared animal densities before and after trawling and looked at fish stomach contents. Found that total mortality due to trawling varied between species and size class of fish, ranging from 4 to 139% of pretrawling values. (values> 100% indicate animals moving into the trawled area). Mortality for echinoderms was low, 3 to 19%, undetectable for some molluscs, esp. solid shells or small animals, while larger molluscs had a 12 to 85% mortality. Burrowing crustaceans had low mortality but epifaunal crustaceans approximated 30 % but ranged as high as 74%. Annelids were generally unaffected except for Pectinaria, a tube building animal. Generally mortality increased with number of times the area was trawled (once or twice). Dab were found to be the major savager, immigrating into the area and eating damaged animals.	Santbrink and Bergman (1994)

Source: Auster and Langton 1998.

Table 11 (continued). Studies of short-term impacts of fishing on benthic communities.

Taxa	Gear and Sediment Type	Region	Results	Reference(s)
Hermit Crabs	beam trawl	Irish Sea, U.K.	Compared the catch and diet of two species of hermit crab on trawled and control sites. Found significant increases in abundance on the trawl lines two to four days after trawling for both species but also no change for one species on one of two dates. Found a general size shift towards larger animals after trawling. Stomach contents weight was higher post-trawling for one species. Diets of the crabs were similar but proportions differed.	Ramsey et al. (1996)
Sand macrofauna and infauna	scallop dredge	Irish Sea	Compared experimental treatments based frequency of tows (i.e., 2,4,12,25). Bottom topography changes did not change grain size distribution, organic carbon, or chlorophyll content. Bivalve molluscs and peracarid crustaceans did not show significant changes in abundance or biomass. Polychaetes and urchins showed significant declines. Large molluscs, crustaceans and sand eels were also damaged. In general, there was selective elimination of fragile and sedentary components of the infauna as well as large epifaunal taxa.	Eleftheriou and Robertson (1992)

Source: Auster and Langton 1998.

Table 12. Studies of long-term impacts of fishing on benthic communities.

Habitat Type and Taxa Present	Time Period	Location	Effect	Reference
Sand; macrobenthos and meiofauna	2-7 months	Bay of Fundy	Experimental trawling in high energy area. Otter trawl doors dug up to 5 cm deep and marks were visible for 2 to 7 months. Initial significant effects on benthic diatoms and nematodes but no significant impact on macrofauna. No significant longterm effects.	Brylinsky et al. (1994)
Quartz sand; benthic infauna	5months	South Carolina Estuary	Compared benthic community in two areas, one open to trawling one closed, before and after shrimp season. Found variation with time but no relationship between variations and trawling per se.	Van Dolah et al. (1991)
Sandy; ocean quahogs	----	Western Baltic	Observed otter board damage to bivalves, especially ocean quahogs, and found an inverse relation between shell thickness and damage and a positive correlation between shell length and damage.	Rumhor and Krost (1991)
Subtidal shallows and channel; macrobenthos	100 years	Wadden Sea	Reviewed changes in benthic community documented over 100 years. Considered 101species. No long term trends in changing abundance for 42 common species, with 11 showing considerable variation. Sponges, coelenterates and bivalves suffered greatest losses while polychaetes showed the largest gains. Decrease subtidally for common species from 53 to 44 and increase intertidally from 24 to 38.	Reise (1982)
Intertidal sand; lug worms	4 years	Wadden Sea	Studied impact of lugworm harvesting versus control site. Machine digs 40 cm gullies. Immediate impact is a reduction in several benthic species and slow recovery for some the larger long-lived species like soft shelled clams. With one exception, a polychaete, the shorter-lived macrobenthic animals showed no decline. It took several years for the area to recover to prefishing conditions.	Beukema (1995)
Various habitat types; all species	---	North Sea	Review of fishing effects on the North Sea based primarily on ICES North Sea Task Force reports. Starfish, sea urchins and several polychaetes showed a 40 to 60 % reduction in density after beam trawling but some less abundant animals showed no change and one polychaete increased. At the scale of the North Sea the effect of trawling on the benthos is unclear.	Gislason (1994)

Source: Auster and Langton 1998.

Table 12 (continued). **Studies of long-term impacts of fishing on benthic communities.**

Habitat Type and Taxa Present	Time Period	Location	Effect	Reference
Sand; macrofauna	73 years	Kattegatt	Compared benthic surveys form 1911-1912 with 1984. Community composition has changed with only approximately 30% similarity between years at most stations. Primary change was a decrease in sea urchins and increase in brittle stars. Animals were also smaller in 1984. Deposit feeders have decreased while suspension feeders and carnivores have increased.	Pearson et al. (1985)
Subtidal shallows and channels; Macrofauna	55 years	Wadden Sea, Germany	Documented increase in mussel beds and associated species such as polychaetes and barnacles when comparing benthic survey data. Noted loss of oyster banks, *Sabellaria* reefs and subtidal sea grass beds. Oysters were overexploited and replaced by mussels; *Zostera* lost to disease. Conclude that major habitat shifts are the result of human influence.	Riesen and Reise (1982)
146 stations; Ocean Quahogs	---	Southern North Sea, Europe	Arctica valves were collected from 146 stations in 1991 and the scars on the valve surface were dated, using internal growth bands, as an indicator of the frequency of beam trawl damage between 1959 and 1991. Numbers of scars varied regionally and temporally and correlated with fishing.	Witbaard and Klein (1994)
Various habitats; Macrofauna	85 years	Western English Channel, UK	Discusses change and causes of change observed in benthic community based on historic records and collections. Discusses effects of fishing gear on dislodging hydroid and bryozoan colonies, and speculates that effects reduce settlement sites for queen scallops.	Holme (1983)
Gravel/sand; Macrofauna	3 years	Central California, USA	Compared heavily trawled area with lightly trawled (closed) area using Smith MacIntyre grab samples and video transect data collected over three years. Trawl tracks and shell debris were more numerous in heavily trawled area, as were amphinomid polychaetes and oligochaetes in most years. Rocks, mounds and flocculent material were more numerous at the lightly trawled station. Commercial fish were more common in the lightly trawled area as were epifaunal invertebrates. No significant differences were found between stations in term of biomass of most other invertebrates.	Engel and Kvitek (MS 1997)
Fine sand; razor clam	----	Barrinha, Southern Portugal	Evaluated disturbance lines in shell matrix of the razor clam and found an increase in number of disturbance lines with length and age of the clams. Sand grains were often incorporated into the shell suggestive of a major disturbance , such as trawling damage, and subsequent recovery and repair of the shell.	Gaspar et al. (1994)

Source: Auster and Langton 1998.

Table 12 (continued). Studies of long-term impacts of fishing on benthic communities.

Habitat Type and Taxa Present	Time Period	Location	Effect	Reference
Fine to medium sand; ocean quahogs	----	Southern New Jersey, USA	Compared areas unfished, recently fished and currently fished for ocean quahogs using hydraulic dredges. Sampled invertebrates with a Smith MacIntyre grab. Few significant differences in numbers of individuals or species were noted, no pattern suggesting any relationship to dredging.	MacKenzie (1982)
Gravel, shell debris and fine mud; Horse mussel community	8 years	Strangford Lough, Northern Ireland	Review paper of effects of queen scallop fishery on the horse mussel community. Compared benthic survey from the 1975-80 period with work in 1988. Scallop fishery began in 1980. *Modiolus* community has remained unchanged essentially from 1857 to 1980. The scallop fishery has a large benthic faunal bycatch, including horse mussels. Changes in the horse mussel community are directly related to the initiation of the scallop fishery and there is concern about the extended period it will take for this community to recover.	Brown (1989)
Shallow muddy sand; scallops	6 months	Maine, USA	Sampled site before, immediately after and up to 6 months after trawling. Loss of surficial sediments and lowered food quality of sediments, measured as microbial populations, enzyme hydrolyzable amino acids and chlorophyll *a*, was observed. Variable recovery by benthic community. Correlation with returning fauna and food quality of sediment.	Watling et al. (MS 1997)
Sand and seagrass; hard shelled clams and bay scallops	4 years	North Carolina, USA	Evaluated effects of clam raking and mechanical harvesting on hard clams, bay scallops, macroinvertebrates and seagrass biomass. In sand, harvesting adults showed no clear pattern of effect. With light harvesting seagrass biomass dropped 25% immediately but recovered in a year. In heavy harvesting seagrass biomass fell 65% and recovery did not start for >2 years and did not recover up to 4 years later. Clam harvesting showed no effect on macroinvertebrates. Scallop densities correlated with seagrass biomass.	Peterson et al. (1987)
Gravel pavement; benthic magafauna	Not known	Northern Georges Bank, USA	Used side scan, video and naturalist dredge sampling to characterize disturbed and undisturbed sites based on fishing activity records. Documented a gradient of community structure from deep, undisturbed to shallow disturbed sites. Undisturbed sites had more individual organisms, greater biomass, greater species richness and diversity and were characterized by an abundant bushy epifauna. Disturbed sites were dominated by hard-shelled molluscs, crabs and echinoderms.	Collie et al. (1997)

Source: Auster and Langton 1998.

Table 12 (continued). Studies of long-term impacts of fishing on benthic communities.

Habitat Type and Taxa Present	Time Period	Location	Effect	Reference
Sand; epifauna	3 year	Grand Banks, Canada	Experimentally trawled site 12 times each year within 31 to 34 hours for three years. Total invertebrate bycatch biomass declined over the three year study in trawls. Epibenthic sled samples showed lower biomass, averaging 25%, in trawled areas than reference sites. Scavenging crabs were observed in trawl tracks after first 6 hours and trawl damage to brittle stars and sea urchins was noted. No significant effects of trawling were found for four dominant species of mollusc.	Prena et al. (MS 1997)
Sand, shrimp and macrobenthos	7 months	New South Wales, Australia	Sampled macrofauna, pretrawling, after trawling and after commercial shrimp season using Smith McIntyre grab at experimental and control sites. Under water observation of trawl gear were also made. No detectable changes in macrobenthos was found or observed.	Gibbs et al. (1980)
Soft sediment; scallops and associated fauna	17 months	Port Phillip Bay, Australia	Sampled 3 months before trawling and 14 months after trawling. Most species showed a 20 to 30% decrease in abundance immediately after trawling. Dredging effects generally were not detectable following the next recruitment within 6 months but some animals had not returned to the trawling site 14 months post trawling.	Currie and Parry (1996)
Bryozoans; fish and associated fauna	----	Tasman Bay, New Zealand	Review of ecology of the coral-like bryozoan community and changes in fishing gear and practices since the 1950s. Points out the interdependence of fish with this benthic community and that the area was closed to fishing in 1980 because gear had developed which could fish in and destroy the benthic community thereby destroying the fishery.	Bradstock and Gordon (1983)
Various habitat types; diverse tropical fauna	5+years, ongoing	North West Shelf, Australia	Describes a habitat dependent fishery and an adaptive management approach to sustaining the fishery. Catch rates of all fish and large and small benthos show that in closed areas fish and small benthos abundance increased over 5 years while large benthos (>25 cm) stayed the same or increased slightly. In trawled areas all groups of animals declined. Found that settlement rate and growth to 25 cm was on the order of 15 years for the benthos.	Sainsbury et al. (In press)

Source: Auster and Langton 1998.

Table 12 (continued). Studies of long-term impacts of fishing on benthic communities.

Habitat Type and Taxa Present	Time Period	Location	Effect	Reference
Mudflat; commercial clam cultivation and benthos	7 months	South-east England	Sampled benthic community on a commercial clam culture site and control area at the end of a two year growing period, immediately after sampling, and again 7 months later. Infaunal abundance was greatest under the clam culture protective netting but species composition was similar to controls. Harvesting with a suction dredge changed the sediment characteristics and reduced the numbers of individual animals and species. Seven months later the site had essentially returned to the unharvested condition.	Kaiser et al. (1996a)
Sand; razor clam and benthos	40 days	Loch Gairloch, Scotland	Compared control and experimentally harvested areas using a hydraulic dredge at 1 day and 40 days after dredging. On day one a non-selective reduction in the total numbers of all infaunal species was apparent but no differences were observed after forty days.	Hall et al. (1990)
Sand and muddy areas; Macro-zoobenthos	3years; ongoing	German Bite, Germany	Investigated macro-zoobenthos communities around a sunken ship that had been "closed" to fishing for three years. Compared this site with a heavily fished area. Preliminary results show an increase in polychaetes and the bivalve Tellina in the fished, sandy, area. The data does not yet allow for a firm conclusion regarding the unfished area but there is some (nonsignificant) increase in species numbers and some delicate, sensitive species occurred within the protected zone.	Arntz et al. (1994)

Source: Auster and Langton 1998.

Table 13. Total commercial landings in millions of pounds by gear type from Maine to Virginia, in 1995.

GEAR TYPE	X 10^6 POUNDS	% OF TOTAL
PURSE SEINE, MENHADEN	739	44.90%
TRAWL, OTTER, BOTTOM	249	15.12%
UNKNOWN	142	8.60%
DREDGE, CLAM	118	7.17%
PURSE SEINE, HERRING	76	4.63%
POT/TRAP, LOBSTER	71	4.32%
TRAWL, OTTER, MIDWATER	69	4.25%
GILL NET, SINK, OTHER	58	3.55%
DIVING GEAR	28	1.70%
DREDGE, SCALLOP, SEA	22	1.32%
POTS + TRAPS, OTHER	21	1.28%
DREDGE, OTHER	17	1.02%
OTHER	14	0.82%
LONGLINE, BOTTOM	10	0.62%
LONGLINE, PELAGIC	6	0.36%
GILL NET, OTHER	3	0.19%
POUND NET	2	0.13%
PURSE SEINE, OTHER	1	0.04%
GRAND TOTAL	1650	100.00%

Source: USDC weighout file 1995.

Table 14. Fishing gear managed by South Atlantic Fishery Management Council.

Gear Impacts and Council Action
Gear Used in Fisheries Under South Atlantic Council Fishery Management Plans

The following is a list of gear currently in use (or regulated) in fisheries managed under the South Atlantic Council fishery management plans. In general, if gear is not listed, it is prohibited or not commonly used in the fishery:

Snapper Grouper Fishery Management Plan
1. Vertical hook-and-line gear, including hand-held rod and manual or electric reel or "bandit gear" with manual, electric or hydraulic reel (recreational and commercial).

2. Spear fishing gear including powerheads (recreational and commercial).

3. Bottom longlines (commercial).
   - Prohibited south of a line running east of St. Lucie Inlet, Florida and in depths less than 50 fathoms north of that line.
   - May not be used to fish for wreckfish.

4. Sea bass pots (commercial).
   - May not be used or possessed in multiple configurations.
   - Pot size, wire mesh size and construction restrictions.
   - May not be used in the EEZ south of a line running due east of the NASA Vehicle Assembly Building, Cape Canaveral, Florida.

5. Special Management Zones (created under the Snapper Grouper FMP).
   - Sea bass pots are prohibited in all Special Management Zones.
   - Fishing may only be conducted with hand-held hook-and-line gear (including manual, electric, or hydraulic rod and reel) and spearfishing gear in specified Special Management Zones, however, and other specified Special Management Zones a hydraulic or electric real that is permanent affixed to a vessel ("bandit gear") and or spear fishing gear (or only powerheads) are prohibited.

Shrimp Fishery Management Plan
1. Shrimp trawls -- wide-ranging types including otter trawls, mongoose trawls, rock shrimp trawls, etc. (commercial).
   - Specified areas are closed to trawling for rock shrimp.

Red Drum Fishery Management Plan
1. No harvest or possession is allowed in or from the EEZ (no gear specified).

Golden Crab Fishery Management Plan
1. Crab traps (commercial).
   - May not be fished in water depths less than 900 feet in the northern zone and 700 feet in the middle and southern zones.
   - Trap size, wire mesh size, and construction restrictions.

Coral, Coral Reefs, and Live/Hard Bottom Habitat
1. Hand harvest only for allowable species (recreational and commercial).
2. Oculina Bank Habitat Area of particular concern.
   - Fishing with bottom longlines, bottom trawls, dredges, ports, or traps is prohibited.
   - Fishing vessels may not anchor, use and anchor and chain, or use a grapple and chain.

Coastal Migratory Pelagic Resource Fishery Management Plan
1. Hook-and-line gear, usually rod and reel or bandit gear, hand lines, flat lines, etc. (recreational and commercial).
2. Run-around gillnets or sink nets (commercial).
   - A gillnet must have a float line less than 1,000 yards in length to fish for coastal migratory pelagic species.
   - Gillnets must be at least 4-3/4 inch stretch mesh.
3. Purse seines for other coastal migratory species (commercial) with an incedental catch allowance for Spanish mackerel (10%) and king mackerel (1%).
4. Surface longlines primarily for dolphin.

Table 15. Proposed impact of fishing gear on dogfish EFH.

GEAR TYPE	KNOWN	POTENTIAL	NO EXPECTED
PURSE SEINE, MENHADEN			X
TRAWL, OTTER, BOTTOM		X	
UNKNOWN			X
DREDGE, CLAM		X	
PURSE SEINE, HERRING			X
POT/TRAP, LOBSTER		X	
TRAWL, OTTER, MIDWATER			X
GILL NET, SINK, OTHER		X	
DIVING GEAR			X
DREDGE, SCALLOP, SEA		X	
POTS + TRAPS, OTHER		X	
DREDGE, OTHER		X	
OTHER			X
LONGLINE, BOTTOM			X
LONGLINE, PELAGIC			X
GILL NET, OTHER		X	
POUND NET			X
PURSE SEINE, OTHER			X

Table 16. Matrix of prioritized threats in regards to their potential impact to dogfish EFH along the Atlantic coast.

	IMPACTS																								
Threat	A. Change in Topography	B. Fish Blockage	C. Wetland alteration	D. Loss of SAV	E. Loss of riparian habitat	F. Erosion	G. Change in nature of substratight	H. Suspended sediments, turbidity	I. Change in temperature regime	J. Change in salinity regime	K. Change in circulation pattern	L. Hypoxia / Anoxia	M. Nutrient loading, Eutrophication	N. Change in photosynthesis regime	O. Water contamination	P. Sediment contamination	Q. Litter	R. Atmospheric Deposition	S. Loss in benthic organisms	T. Physical damage to organism	U. Gene pool deterioration	V. Trophic alteration	W. Pathogens, disease	X. Displacement of Species	Y. Introduction of exotic species
1.0 Coastal Development	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*					*	
2.0 Nonpoint Source Pollution	*			*			*	*	*	*	*	*	*	*	*	*	*	*	*				*	*	
3.0 Dredging and Dredge Spoil Placement	*		*	*			*	*			*	*		*	*	*			*	*			*	*	
4.0 Port Development, Utilization, and Shipping	*		*				*	*				*		*	*	*		*	*	*				*	*
5.0 Marinas and Recreational Boating			*	*		*	*	*	*	*		*			*	*	*	*	*	*			*	*	*
6.0 Energy Production and Transport		*	*				*	*	*	*	*				*	*		*		*				*	
7.0 Sewage Treatment and Disposal			*				*	*	*			*	*	*	*	*			*				*	*	
8.0 Industrial Wastewater and Solid Wastes		*	*				*		*	*			*	*	*	*				*				*	
9.0 Marine Mining	*		*	*		*	*	*				*		*					*					*	
10.0 Aquaculture	*	*	*	*		*	*						*								*		*	*	*
11.0 Ocean Disposal							*	*				*	*	*	*	*							*	*	
12.0 Introduced Species	*			*				*													*	*	*	*	

Table 17. **Physical characteristics and nutrient loadings for eight major Mid-Atlantic estuaries.**

Location	Volume (cubic ft.)	Surface Area (sq. mi.)	Average Daily Inflow (cfs)	Total Drainage Area (sq. mi.)	Estimated Nitrogen Loadings (tons/yr.)	Estimated Phosphoru s Loadings (tons/yr.)
Delaware Bay	4.48×10^{11}	768	19,800	13,450	50,199 (High)	13,109 (High)
Delaware Inland Bays*	3.85×10^{9}	33.3	300	292	1,425 (Med-High)	82 (Med.)
Chincoteague Bay	2.25×10^{10}	137	400	300	292 (Low)	84 (Low)
Chesapeake Bay	2.59×10^{12}	3,830	85,800	69,280	119,929 (High)	16,813 (High)
Albemarle-Pamlico Sound	1.08×10^{12}	2,949	46,000	29,574	28,224 (High)	3,565 (High)
Bogue Sound	1.31×10^{10}	102	1,300	680	710 (Low)	56 (Low)
New River	5.18×10^{9}	32	800	470	616 (Low)	112 (Med.)
Cape Fear River	1.22×10^{10}	38	10,100	9,090	8,102 (Med.)	1,486 (High)

Source: Cooper and Lipton 1994

Table 18. Recent trends in selected parameters characterizing eutropication, by estuary.

Parameter		St. Croix R./Cobscook Bay M	St. Croix R./Cobscook Bay S	Englishman Bay M	Englishman Bay S	Narraguagus Bay M	Narraguagus Bay S	Blue Hill Bay M	Blue Hill Bay S	Penobscot Bay T	Penobscot Bay M	Penobscot Bay S	Muscongus Bay M	Muscongus Bay S	Damadscotta River M	Damadscotta River S	Sheepscot Bay T	Sheepscot Bay M	Sheepscot Bay S	Kennebec/Andro River T	Kennebec/Andro River M	Kennebec/Andro River S	Casco Bay M	Casco Bay S	Saco Bay M	Saco Bay S	Great Bay M	Great Bay S	Hampton Harbor M	Hampton Harbor S	Merdmack River T	Merdmack River M	Plum Island Sound M	Plum Island Sound S	Massachusetts Bay S	Boston Harbor M	Boston Harbor S	Cape Cod Bay S
CHLOROPHYLL *A* (pg/1)		●	●	?	?	?	?	?	●	?	?	?	?	●	?	●	?	●	●	?	?	?	●	●	●	●	●	●	?	?	?	?	●	●	●	?	●	●
TURBIDITY		V*	●	?	Λ	?	?	?	●	?	?	?	?	?	?	●	●	●	●	?	?	?	V	●	?	?	●	●	?	?	?	?	●	●	●	●	●	●
NUISANCE ALGAE	*event duration*	●	●	?	?	?	?	?	?	?	●	●	?	?	?	●	●	●	●	?	?	?	●	●	●	●	●	●	●	●	?	?	●	●	●	?	?	●
	frequency of occurrence	●	●	?	?	?	?	?	?	?	●	●	?	?	●	●	●	●	●	?	?	?	●	●	●	●	●	●	●	●	?	?	●	●	●	?	?	●
TOXIC ALGAE	*event duration*	●	●	?	●	?	●	?	●	?	●	●	?	?	?	●	●	●	●	?	?	?	●	●	●	●	●	●	●	●	?	?	●	●	●	?	?	●
	frequency of occurrence	●	●	?	●	?	?	?	●	?	●	●	?	?	●	●	●	●	●	?	?	?	●	●	●	●	●	●	●	●	?	?	●	●	●	?	?	●
MACROALGAL		Λ		?	Λ	?	?	?	●	?	?	?	●	●	?	●	●	●	●	?	?	?	●	Λ*	?	?	Λ*	Λ*	●	●	?	?	?	?	Λ	?	Λ*	Λ
EPIPHYTE ABUNDANCE		?	●	?	?	?	?	?	?	?	?	?	●	●	●	●	●	●	●	?	?	?	●	●	?	?	●*	●*	●	●	?	?	?	?	●	?	?	●
NITROGEN (mg/1)		●	●	?	●	?	?	●	●	?	V*	●	?	●	●	●	●	●	●	?	?	?	●	●	●	●	●	●	?	?	?	?	●	●	●	?	●	Λ*
PHOSPHORUS (mg/1)		●	●	?	?	?	?	●	●	●	●	●	?	●	●	●	●	●	●	?	?	?	●	●	●	●	V	●	?	?	?	?	●	●	●	?	●	●
BOTTOM DO (mg/1)		Λ	●	?		?	?	●	●	Λ	Λ	●	●	●	●	●	Λ*	?	●	?	?	?	Λ	Λ	Λ	●	●	●	?	?	?	?	●	●	●	?	●	V*
ANOXIA	*event duration*	?	●	?	?	?	?	●	●	V	V	●	●*	?	●	●	?	?	●	?	?	?	?	V	?	?	●	●	?	?	?	?	●	●	●	?	?	●
	frequency of occurrence	?	●	?	?	?	?	●	●	V	V	●	●*	?	●	●	?	?	?	?	?	?	?	V	?	?	●	●	?	?	?	?	●	●	●	?	●	●
	spatial coverage	?	●	?	?	?	?	●	●	V	V	●	●*	?	●	●	?	?	●	?	?	?	?	V	?	?	●	●	?	?	?	?	●	●	●	?	●	●
HYPOXIA	*event duration*	?	●	?	?	?	?	●	●	V	V	●	●*	?	●	●	?	?	●	?	?	?	V	V	?	?	●	●	?	?	?	?	●	●	●	?	?	●
	frequency of occurrence	?	●	?	?	?	?	●	●	V	V	●	●*	?	●	●	?	?	?	?	?	?	V	V	?	?	●	●	?	?	?	?	●	●	●	?	●	●
	spatial coverage	?	●	?	?	?	?	●	●	V	V	●	●*	?	●	●	?	?	●	?	?	?	V	V	?	?	●	●	?	?	?	?	●	●	●	?	●	●
BIOLOGICAL STRESS	*event duration*	?	●	?	?	?	?	●	●	V	V	●	●*	?	●	●	?	?	●	?	?	?	V	V	?	?	●	●	?	?	?	?	●	●	●	?	?	●
	frequency of occurrence	?	●	?	?	?	?	●	●	V	V	●	●*	?	●	●	?	?	?	?	?	?	?	V	?	?	●	●	?	?	?	?	●	●	●	?	●	●
	spatial coverage	?	●	?	?	?	?	●	●	V	V	?	●*	?	●	●	?	?	●	?	?	?	V	V	?	?	●	●	?	?	?	?	●	●	●	?	●	●
PRIMARY PRODUCTIVITY		●*	●*	?	?	?	?	●	●	?	?	?	?	?	●*	●*	?	●	●	●*	●*		?	?	?	?	●	●	?	?	?	?	●	●	●	?	●	●
PLANKTONIC COMMUNITY		?	●	?		?	?	?	●	?	?	?	?	?	●	●	?	●	●	●*	●*		?	●	?	?	?	●	?	?	?	?	●	●	●	?	●	●
BENTHIC COMMUNITY		?	●	?		?	?	?	●	?	●	●	?	?	●	●	●	●	●	●*	●*		●	●	?	?	●	●	?	?	?	?	●	●	①	●	②	●
SAV (spatial coverage)		●	Λ	?	?	?	?	●	●	?	?	?	?	?	●	●*	?	?	?	●*	●*		●	V	?	?	Λ	Λ	●	●	?	V	●	●	V	●	V	V

? - unknown V - decreasing trend * - speculative response ● - no trend or shift Λ - increasing trend ① - shift from annelids to diverse ② - shift from a mixture of annelids and and crustaceans to crustaceans to crustaceans

Source: USDC 1997d

Table 18 (continued). Recent trends in selected parameters characterizing eutropication, by estuary.

	Buzzards Bay		Narragansett Bay			Gardiners Bay		Long Island Sound			Connecticut River		Great South Bay		Hudson R./Raritan Bay			Barnegat Bay		N. J. Inland Bays	
	M	S	T	M	S	M	S	T	M	S	T	M	M	S	T	M	S	M	S	M	S
CHLOROPHYLL *A* (pg/1)	?	Λ•	●	●	●	●	●	●	●	●	?	?	●	●	?	●	●•	●	●	Λ•	Λ•
TURBIDITY (concentration)	?	?	●	●	●	●	●	●•	V	V	?	?	●	●	?	?	?	?	?	?	?
NUISANCE ALGAE *event duration*	?	?	Λ	Λ	Λ	●	?	?	Λ	Λ	?	?	?	?	?	●•	●•	●	●	●	Λ•
frequency of occurrence	?	?	Λ	Λ	Λ	●	?	?	Λ	Λ	?	?	?	?	?	●•	●•	●	●	●	Λ•
TOXIC ALGAE *event duration*	?	?	?	?	?	?	?	●	●	●	?	?	●	●	?	●•	●•	●	●	●	●
frequency of occurrence	?	?	?	?	?	?	?	●	●	●	?	?	●	●	?	?	?	●	●	●	●
MACROALGAL ABUNDANCE	?	?	Λ	Λ	?	Λ	V	?	Λ	●	?	?	●	●	?	?	?	?	?	?	?
EPIPHYTE ABUNDANCE	?	?	?	?	?	?	?	?	Λ	●	?	?	●	●	?	?	?	?	?	?	?
NITROGEN (mg/1)	?	Λ•	●	●	●	●	V	●	Λ•	●	●	?	●	●	V	●	●	?	?	?	?
PHOSPHORUS (mg/1)	?	?	●	●	●	●	V	●	Λ	●	●	?	●	●	●	V	V	?	?	?	?
BOTTOM DO (mg/1)	?	?	Λ	Λ	●	●	●	Λ	Λ	V	?	?	●	●	?	Λ	V	?	?	?	?
ANOXIA *event duration*	?	?	V	V	●	●	●	●	●	Λ	?	?	●	●	?	V	●	?	?	?	?
frequency of occurrence	?	?	V•	V•	?	?	?	?	?	Λ	?	?	?	?	?	V	?	?	?	?	?
spatial coverage	?	?	V	V	●	●	●	●	●	Λ	?	?	●	●	?	V	●	?	?	?	?
HYPOXIA *event duration*	?	?	V	V	●	●	●	●	●	Λ	V	?	●	●	?	V	Λ	?	?	?	?
frequency of occurrence	?	?	V•	V•	V•	?	?	?	?	Λ	?	?	?	?	?	V	?	?	?	?	?
spatial coverage	?	?	V	V	●	●	●	●	●	Λ	V	?	●	●	?	V	●	?	?	?	?
BIOLOGICAL STRESS *event duration*	?	?	V	V	●	●	●	●	●	Λ	?	?	●	●	?	V	●	?	?	?	?
frequency of occurrence	?	?	V•	V•	V•	?	?	?	?	Λ	?	?	?	?	?	?	?	?	?	?	?
spatial coverage	?	?	V	V	●	●	●	●	●	Λ	?	?	●	●	?	V	●	?	?	?	?
PRIMARY PRODUCTIVITY	?	③	?	?	?	●	●	?	●•	●	?	?	●	●	?	③	③	?	?	?	●•
PLANKTONIC COMMUNITY	?	?	④	●	④	●	●	?	●	●	?	?	●	●	?	●	●	●•	●•	?	●•
BENTHIC COMMUNITY	?	?	①	●	●	?	?	●	●	●	?	?	●	●	⑤	●	①	●•	●•	?	?
SAV (spatial coverage)	V	V	●	●	●	Λ	Λ	V	V	V	?	?	V	V	?	V	V	?	?	?	?

	Delaware Bay			DE Inland Bays		MD Inland Bays		Chincoteague Bay	Chesapeake Bay			Patuxent River		Potomac River	
	T	M	S	M	S	M	S	S	T	M	S	T	M	T	M
CHLOROPHYLL *A* (pg/1)	●	●	●	●	●	V•	●	?	●	●	●	Λ	●	●	V
TURBIDITY (concentration)	●	●	●	●	●	●	?	●	●	●	●	●	●	●	V
NUISANCE ALGAE *event duration*	●	●	●	●	●	●	●	?	●	●	●	●	?	V	●
frequency of occurrence	●	●	●	●	●	●	●	?	●	●	●	●	●	V	V
TOXIC ALGAE *event duration*	●	●	●	?	?	?	?	?	●	●	●	?	?	●	●
frequency of occurrence	●	●	●	?	?	?	?	?	●	●	●	?	?	●	●
MACROALGAL ABUNDANCE	●	●	●	?	?	?	?	?	●	●	●	●	●	V	●
EPIPHYTE ABUNDANCE	●	●	●	●	●	?	?	?	●	?	●	?	?	?	?
NITROGEN (mg/1)	V	V	V	●	●	V•	?	V•	●	Λ•	●	V	V	●	●
PHOSPHORUS (mg/1)	Λ	Λ	Λ	●	●	V	●	V•	●	V•	●	V	V	V	●
BOTTOM DO (mg/1)	Λ	Λ	●	●	●	●	●	●	●	●	●	Λ	●	Λ	●
ANOXIA *event duration*	V	V	●	?	?	●	?	?	●	●	●	●	●	●	●
frequency of occurrence	?	?	?	?	?	?	?	?	●	●	?	●	●	●	●
spatial coverage	●	V	●	?	?	●	●	?	●	Λ	●	●	●	?	●
HYPOXIA *event duration*	V	V	●	●	●	●	?	?	●	●	●	●	●	●	●
frequency of occurrence	?	?	?	?	?	?	?	?	●	●	?	●	●	●	●
spatial coverage	●	V	●	●	●	●	●	?	●	Λ	●	●	●	Λ	●
BIOLOGICAL STRESS *event duration*	V	V	●	●	●	●	●	?	●	●	●	V	●	●	●
frequency of occurrence	?	?	?	?	?	?	?	?	●	●	?	?	●	●	V
spatial coverage	V	V	●	●	●	●	●	?	●	Λ	●	V	●	V	●
PRIMARY PRODUCTIVITY	●	●	●	●	●	?	?	?	●	●	?	?	?	?	?
PLANKTONIC COMMUNITY	●	④	④	①	●	●	●	?	●	●	●	●	●	●	●
BENTHIC COMMUNITY	?	?	②	●	●	●	●	?	●	●	●	●	●	●	●
SAV (spatial coverage)	●	●	●	●	●	●	?	Λ	●	Λ	Λ	Λ	●	Λ	Λ

	Rappahannock River		York River		James River		Chester River		Choptank River		Tan.Poc. Sounds	
	T	M	T	M	T	M	T	M	T	M	T	M
CHLOROPHYLL *A* (pg/1)	Λ	Λ	Λ	Λ	Λ	Λ	●	●	●	●	Λ	Λ
TURBIDITY (concentration)	●	●	●	●	●	●	●	●	●	V	●	V
NUISANCE ALGAE *event duration*	●	●	●	●	●	●	?	?	●	●	?	●
frequency of occurrence	●	●	●	●	●	●	?	?	●	●	?	●
TOXIC ALGAE *event duration*	●	●	●	●	●	●	?	?	●	●	?	●
frequency of occurrence	●	●	●	●	●	●	?	?	●	●	?	●
MACROALGAL ABUNDANCE	●	●	●	●	●	●	?	?	●	●	?	Λ
EPIPHYTE ABUNDANCE	●	●	●	●	●	●	?	?	●	V	?	Λ
NITROGEN (mg/1)	●	●	●	●	●	●	●	●	●	●	?	V
PHOSPHORUS (mg/1)	Λ	●	Λ	●	●	●	●	●	●	V	?	V
BOTTOM DO (mg/1)	●	V	●	●	●	V	●	●	●	●	●	●
ANOXIA *event duration*	?	?	●	●	●	?	●	●	●	●	●	●
frequency of occurrence	?	?	?	?	?	?	●	●	●	Λ	●	●
spatial coverage	?	?	●	●	●	?	●	●	●	●	●	●
HYPOXIA *event duration*	?	?	●	●	●	?	●	●	●	●	●	●
frequency of occurrence	?	?	?	?	?	?	●	●	●	Λ	●	●
spatial coverage	?	?	●	●	●	?	●	●	●	●	●	●
BIOLOGICAL STRESS *event duration*	●	?	●	●	●	?	●	●	●	●	●	●
frequency of occurrence	?	?	?	?	?	?	●	●	●	Λ	●	●
spatial coverage	●	?	●	●	●	?	●	●	●	●	●	●
PRIMARY PRODUCTIVITY	?	?	?	?	?	?	?	?	?	?	?	?
PLANKTONIC COMMUNITY	●	●	●	●	●	●	?	●	●	●	?	?
BENTHIC COMMUNITY	●	●	●	●	●	●	●	●	●	●	?	?
SAV (spatial coverage)	●	Λ	●	●	●	Λ	●	Λ	●	Λ	?	Λ

? - unknown V - decreasing trend • - speculative response Λ - increasing trend ① - shift to diverse mixture ② - shift to annelids and crustaceans ③ - shift to pelagic ④ - shift to diatoms ⑤ - shift to mollusks

Source: USDC 1997e

Table 18 (continued). Recent trends in selected parameters characterizing eutropication, by estuary.

Parameter		Albemarle/Pamlico Sounds			Pamlico River	Neuse River		Bogue Sound		New River		Cape Fear River			Winyah Bay			N & S Santee River		Charleston Harbor			Stono/N. Edisto River	
		T	M	S	M	T	M	M	S	M	S	T	M	S	T	M	S	T	M	T	M	S	M	S
CHLOROPHYLL *A* (µg/l)		?	?	●*	Λ	●	Λ	?	●	?	?	?	?	●	?	?	●	?	?	?	?	?	?	?
TURBIDITY (concentrations)		V	?	?	?	●	?	?	●	?	?	Λ	?	?	Λ	Λ	●	V	V	?	Λ	Λ	Λ	Λ
NUISANCE ALGAE	*event duration*	?	●	?	?	V	Λ	●	●	?	?	?	?	?	●*	●*	●*	●*	●*	?	●	●*	?	?
	frequency of occurrence	?	●	?	?	V	Λ	●	●	?	?	?	?	?	●*	●*	●*	●*	●*	?	●	●*	?	?
TOXIC ALGAE	*event duration*	?	●	?	?	V	Λ	●	?	?	?	?	?	?	●*	●*	●*	●*	●*	?	●	●*	?	?
	frequency of occurrence	?	●	?	?	V	Λ	●	●	?	?	?	?	?	●*	●*	●*	●*	●*	?	●	●*	?	?
MACROALGAL ABUNDANCE		V	?	?	?	?	●	?	●	?	?	●	●	●	?	?	?	●*	●*	Λ	?	?	●	●
EPIPHYTE ABUNDANCE		?	?	?	?	?	●	?	?	?	?	●	●	●	?	?	?	●*	●*	?	?	?	●	●
NITROGEN (mg/l)		?	●	?	●	Λ	Λ	●	●	?	?	?	?	?	V	V	V	V	V	V	V	V	V	?
PHOSPHORUS (mg/l)		?	●	?	V	●	●	●	●	?	?	?	?	?	V	V	V	V	V	V	V	V	V	V
BOTTOM DO (mg/l)		?	?	?	V	V	V	●*	●	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
ANOXIA	*event duration*	?	?	?	●	?	Λ	●	●	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
	frequency of occurrence	?	?	?	●	?	Λ	●	●	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
	spatial coverage	?	?	?	●	Λ	Λ	●	●	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
HYPOXIA	*event duration*	?	?	?	●	Λ	Λ	●	●	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
	frequency of occurrence	?	?	?	●	Λ	Λ	●	●	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
	spatial coverage	?	?	?	●	Λ	Λ	●	●	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
BIOLOGICAL STRESS	*event duration*	?	?	?	●	Λ	Λ	●	●	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
	frequency of occurrence	?	?	?	●	Λ	Λ	●	●	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
	spatial coverage	?	?	?	●	Λ	Λ	●	●	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
PRIMARY PRODUCTIVITY		●	?	?	●	●*	●	?	?	?	?	?	?	?	?	?	●	?	?	?	?	?	?	?
PLANKTONIC COMMUNITY		●	?	?	●	①	●	●	●	?	?	?	?	?	?	?	●	?	?	●	?	?	?	?
BENTHIC COMMUNITY		?	?	?	?	?	?	?	●*	?	?	?	?	?	?	?	●	?	?	?	●	●	●	●
SAV (spatial coverage)		V	V	?	V	●	V	?	?	?	?	?	?	?	?	?	●	?	?	?	Λ	?	●	●
WETLANDS (spatial coverage)		●	●	?	●	●	●	●	●	?	?	?	?	?	?	●	●	●	●	?	●	●	●	●

Parameter		St. Helena Sound		Broad River		Savannah River			Ossabaw Sound			St. Catherine/Sapelo Sound		Altamaha River			St. Andrews/ St. Simon Sound			St. Marys/Cumberland Sound		St. Johns River			Indian River	Biscayne Bay	
		M	S	M	S	T	M	S	T	M	S	M	S	T	M	S	T	M	S	M	S	T	M	S	S	M	S
CHLOROPHYLL *A* (µg/l)		?	?	?	?	?	?	?	?	●*	?	?	?	?	?	?	?	?	?	?	?	●	●	●	Λ*	●	●
TURBIDITY (concentrations)		●	?	Λ	●	Λ	●	?	?	?	?	?	?	?	●	?	?	?	?	?	?	●	●	●	●	●	V
NUISANCE ALGAE	*event duration*	?	?	?	?	?	●	●	?	●	●	●	●	?	●	?	?	●	●	●	●	●	●	●	●	●*	●*
	frequency of occurrence	?	?	?	?	?	●	●	?	●	●	●	●	?	●	●	?	●	●	●	●	●	●	●	●	●*	●*
TOXIC ALGAE	*event duration*	?	?	?	?	?	●	●	?	●	●	●	●	?	●	●	?	●	●	●	●	●	●	●	●	●*	●*
	frequency of occurrence	?	?	?	?	?	●	●	?	●	●	●	●	?	●	●	?	●	●	●	●	●	●	●	●	●*	●*
MACROALGAL ABUNDANCE		?	?	?	?	?	●	●	?	?	?	●	●	?	●	●	●	●	●	●	●	●	●	●	●	●	●
EPIPHYTE ABUNDANCE		?	?	?	?	?	●	●	?	?	?	●	●	?	●	●	●	●	●	●	●	●	●	●	?	●	●
NITROGEN (mg/l)		V	?	●	?	●	●	●	●	●	?	Λ*	?	V	V	?	Λ*	Λ*	?	●	?	●	●	●	●*	V	Λ
PHOSPHORUS (mg/l)		●	?	●	●	●	●	●	●	●	?	Λ*	?	●	●	?	Λ*	Λ*	?	●	?	●	●	●	●*	●	V
BOTTOM DO (mg/l)		?	?	?	?	?	Λ	?	?	?	?	?	?	?	?	?	?	?	?	?	?	●	●	●	●	V	V
ANOXIA	*event duration*	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	●	●	●	●	●	●
	frequency of occurrence	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	●	●	●	●	●	●
	spatial coverage	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	●	●	●	●	●	●
HYPOXIA	*event duration*	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	●	●	●	●	●	●
	frequency of occurrence	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	●	●	●	●	●	●
	spatial coverage	?	?	?	?	?	Λ	?	?	?	?	?	?	?	?	?	?	?	?	?	?	●	●	●	●	●	●
BIOLOGICAL STRESS	*event duration*	?	?	?	?	?	?	?	?	?	?	●*	?	●*	●*	?	●*	●*	?	●*	?	●	●	●	●	●	●
	frequency of occurrence	?	?	?	?	?	?	?	?	?	?	●*	?	●	●	?	●*	●*	?	●*	?	●	●	●	●	●	●
	spatial coverage	?	?	?	?	?	Λ	?	?	?	?	●*	?	●*	●*	?	●*	●*	?	●*	?	●	●	●	●	●	●
PRIMARY PRODUCTIVITY		●	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	●*	?	●
PLANKTONIC COMMUNITY		?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	●	●	●	?	?	●
BENTHIC COMMUNITY		?	?	?	?	?	●	?	?	?	?	?	?	?	?	?	?	?	?	?	?	●	●	●	②	?	●
SAV (spatial coverage)		?	?	?	?	?	●	●	?	?	?	●	●	?	●	●	?	●	●	●	●	V	V	●	V*	●	Λ
WETLANDS (spatial coverage)		●	●	●	●	?	V*	V*	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	V*	V	V

? - unknown V - decreasing trend * - speculative response ● - no trend or shift Λ - increasing trend ① - shift from annelids to diverse mixture ② - shift from a mixture of annelids and crustaceans to crustaceans

Source: USDC 1997f

Table 19. 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

Table 20. **Commercial landings of spiny dogfish by year and state.**

	YEAR									
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
STATE	LBS	LBS	LBS	LBS	LBS	LBS	LBS	LBS	LBS	LBS
ME	481	4,879	6,365	2,016	1,719	3,524	1,813	1,663	911	448
NH	.	.	185	.	402	1,641	2,375	2,106	1,079	1,009
MA	5,827	4,924	17,806	14,488	18,375	26,830	23,214	28,760	26,959	21,820
RI	.	4	1,300	3,160	2,027	1,924	530	573	1,128	1,013
CT	.	.	24	8	22	9	170	293	705	347
NY	86	48	18	77	155	95	237	934	1,327	487
NJ	10	22	4,543	2,715	2,534	770	1,129	2,388	4,635	3,950
DE	.	.	.	5	.	.	.	62	.	.
MD	23	3	2,181	4,939	3,063	1,795	1,428	3,117	7,151	4,227
VA	3	19	6	173	229	106	457	809	2,483	4,274
NC	301	.	41	1,463	8,634	8,806	9,877	7,174	13,210	7,608

Source: Unpublished NMFS Weighout Data.

Table 21. Commercial spiny dogfish average annual landings by state, 1988 - 1997.

State	1000 lbs	Percent
ME	2,382	6
NH	879	2
MA	18,900	53
RI	1,166	3
CT	158	-
NY	346	-
NJ	2,270	6
DE	6	-
MD	2,793	7
VA	856	2
NC	5,711	16
ALL STATES	35,473	100

Source: Unpublished NMFS Weighout Data.

Table 22. Spiny dogfish commercial landings by gear, Maine to Florida, 1988 - 1997 combined.

Gear	1000 Pounds	Percent
Haul Seines, Beach	67	-
Haul Seines, Long	6	-
Danish Seine	-	-
Purse Seines, Menhaden	-	-
Otter Trawl Bottom, Crab	-	-
Otter Trawl Bottom, Fish	76,367	21
Otter Trawl Bottom, Scallop	8	-
Otter Trawl Bottom, Shrimp	7	-
Otter Trawl Bottom, Other	73	-
Trawl Midwater, Paired	444	-
Trawl Bottom, Paired	-	-
Scottish Seine	68	-
Pound Nets, Fish	65	-
Pound Nets, Other	4	-
Floating Traps (Shallow)	7	-
Fyke and Hoop Nets, Fish	-	-
Pots and Traps, Crab, Blue	-	-
Pots and Traps, Fish	1	-
Pots and Traps, Lobster Inshore	40	-
Pots and Traps, Lobster, Offshore	-	-
Gill Nets, Set, Salmon	-	-
Gill Nets, Sea Bass	9	-
Gill Nets, Other	55,585	15
Gill Nets, Sink, Other	202,945	57
Gill Net, Shad	-	-
Gill Nets, Drift, Other	6,528	1
Gill Nets, Drift, Runaround	47	-
Gill Nets, Stake	-	-
Trammel Nets	4	-
Lines Hand, Other	166	-
Lines Troll, Other	-	-
Lines Long Set with Hooks	10,690	3
Unk. Combined Gears	1,572	-
Dredge, Surf Clam	1	-
Dredges Scallop, Sea	4	-
Dredge, Urchin	1	-
ALL GEAR	354,731	100

Source: Unpublished NMFS Weighout Data.

Table 23. Spiny dogfish commercial landings by year and gear type, Maine to Florida.

Gear	1988 % of Total	1989 % of Total	1990 % of Total	1991 % of Total	1992 % of Total	1993 % of Total	1994 % of Total	1995 % of Total	1996 % of Total	1997 % of Total
Haul Seines, Beach	.	0.0	0.0	0.0	0.0	.	0.1	0.0	0.0	0.0
Haul Seines, Long	.	.	.	0.0	.	.	0.0	.	0.0	.
Danish Seine	.	.	.	.	.	.	.	0.0	.	.
Purse Seines, Menhaden	.	.	.	.	.	.	.	0.0	.	.
Otter Trawl Bottom, Crab	.	.	.	.	.	.	.	0.0	.	.
Otter Trawl Bottom, Fish	50.6	10.8	47.6	39.5	28.4	24.7	15.6	12.1	11.8	8.7
Otter Trawl Bottom, Scallop	.	.	.	.	.	0.0	0.0	0.0	.	.
Otter Trawl Bottom, Shrimp	0.0	0.0	.	0.0	0.0	.	0.0	0.0	0.0	.
Otter Trawl Bottom, Other	.	.	.	.	.	.	.	0.0	0.1	.
Trawl Midwater, Paired	.	.	.	.	1.2	.	.	.	.	.
Trawl Bottom, Paired	.	.	.	0.0	0.0	.	.	.	.	.
Scottish Seine	.	.	.	.	.	0.0	0.0	0.0	0.0	0.1
Pound Nets, Fish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pound Nets, Other	.	.	.	.	.	0.0	.	0.0	.	.
Floating Traps (Shallow)	.	.	0.0	.	0.0	0.0	0.0	0.0	0.0	0.0
Fyke and Hoop Nets, Fish	.	.	.	.	.	.	.	.	0.0	.
Pots and Traps, Crab, Blue	.	.	.	.	.	.	0.0	0.0	.	.
Pots and Traps, Fish	.	0.0	0.0	0.0	.	.	0.0	.	0.0	0.0
Pots and Traps, Lobster Inshore	.	.	.	0.1	.	0.0	.	0.0	.	.
Pots and Traps, Lobster, Offshore	.	.	.	.	.	.	0.0	0.0	0.0	.
Gill Nets, Set, Salmon	.	.	.	.	.	.	.	0.0	.	.
Gill Nets, Sea Bass	.	.	.	.	.	.	0.0	.	.	.
Gill Nets, Other	0.0	0.0	0.1	4.4	22.8	18.8	23.4	14.9	21.7	16.7
Gill Nets, Sink, Other	48.7	85.5	52.1	54.8	46.3	55.1	57.0	62.9	56.3	64.0
Gill Net, Shad	.	.	.	.	.	.	.	.	0.0	.
Gill Nets, Drift, Other	0.2	0.2	0.1	0.8	1.0	0.0	0.1	1.6	4.7	5.0
Gill Nets, Drift, Runaround	0.2	0.3	0.0	0.0	.	0.0	.	.	.	.
Gill Nets, Stake	.	.	.	.	.	.	.	.	0.0	0.0
Trammel Nets	.	.	.	.	.	0.0	.	.	.	.
Lines Hand, Other	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.1
Lines Troll, Other	.	.	.	.	.	.	0.0	0.0	0.0	0.0
Lines Long Set with Hooks	0.2	3.1	0.1	0.2	0.1	1.2	2.6	6.9	4.9	5.3
Unk. Combined Gears	.	.	.	.	0.1	0.0	1.3	1.5	0.3	0.1
Dredge, Surf Clam	.	.	.	.	.	.	.	.	0.0	0.0
Dredges Scallop, Sea	.	.	.	.	0.0	.	.	.	0.0	.
Dredge, Urchin	.	.	.	.	.	0.0	.	.	.	.
ALL GEAR	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Unpublished NMFS Weighout Data.

Table 24. Spiny dogfish commercial landings by state and gear type, 1988 - 1997 combined.

Gear	ME % of Total	NH % of Total	MA % of Total	RI % of Total	CT % of Total	NY % of Total	NJ % of Total	DE % of Total	MD % of Total	VA % of Total	NC % of Total
Haul Seines, Beach	.	.	.	.	.	0.0	.	.	.	0.1	.
Haul Seines, Long	.	.	.	.	.	.	.	.	.	.	0.1
Danish Seine	.	.	0.0	.	.	.	.	.	.	.	0.0
Purse Seines, Menhaden	.	.	.	.	.	.	0.0	.	.	.	.
Otter Trawl Bottom, Crab	.	.	.	.	.	.	.	.	.	.	.
Otter Trawl Bottom, Fish	1.5	5.9	22.6	18.3	61.9	84.2	56.3	.	38.0	24.6	0.0
Otter Trawl Bottom, Scallop	.	.	.	.	.	.	0.0	.	.	0.0	2.3
Otter Trawl Bottom, Shrimp	0.0	.	0.0	.	.	.	.	.	.	.	.
Otter Trawl Bottom, Other	.	.	.	.	.	.	.	.	0.3	.	0.0
Trawl Midwater, Paired	.	.	0.2	.	.	.	.	.	.	.	.
Trawl Bottom, Paired	.	.	.	0.0	.	0.0	.	.	.	.	.
Scottish Seine	.	.	0.0	.	.	.	.	.	.	.	.
Pound Nets, Fish	.	.	.	.	0.1	1.6	0.0	.	.	0.0	.
Pound Nets, Other	.	.	.	.	.	0.1	.	.	.	.	.0
Floating Traps (Shallow)	.	.	.	0.1	.	.	.	.	.	.	.
Fyke and Hoop Nets, Fish	.	.	.	.	.	0.0	.	.	.	.	.
Pots and Traps, Crab, Blue	.	.	.	.	.	.	.	.	.	.	.
Pots and Traps, Fish	.	.	0.0	.	.	0.0	0.0	.	0.0	.	0.0
Pots and Traps, Lobster Inshore	.	0.0	0.0	0.0	.	.	0.2	.	.	.	0.0
Pots and Traps, Lobster, Offshore	.	0.0	.	.	0.0	.	0.0	.	.	.	.
Gill Nets, Set, Salmon	.	.	.	.	.	0.0	.	.	.	.	.
Gill Nets, Sea Bass	.	.	0.0	.	.	.	.	.	.	.	.
Gill Nets, Other	.	.	.	.	0.1	.	.	22.6	.	.	.
Gill Nets, Sink, Other	96.6	93.5	71.7	81.2	5.1	9.7	17.7	.	59.5	67.1	97.3
Gill Net, Shad	.	.	.	.	.	.	.	.	0.0	.	.
Gill Nets, Drift, Other	.	.	0.0	.	.	0.3	24.6	77.4	1.9	4.0	.
Gill Nets, Drift, Runaround	.	.	0.0	.	.	.	0.1	.	.	.	.
Gill Nets, Stake	.	.	.	.	0.0	.	.	.	.	.	.
Trammel Nets	.	.	.	.	.	.	0.0	.	.	.	.
Lines Hand, Other	0.1	0.2	0.1	0.0	.	0.3	0.0	.	0.0	0.1	0.0
Lines Troll, Other	.	.	.	.	.	.	.	.	.	.	0.0
Lines Long Set with Hooks	1.9	0.4	5.2	0.0	2.9	3.7	0.6	.	0.2	.	0.1
Unk. Combined Gears	.	.	0.3	0.4	29.9	.	0.4	.	.	4.2	0.2
Dredge, Surf Clam	.	.	.	.	.	.	0.0	.	.	.	.
Dredges Scallop, Sea	.	.	0.0	0.0	.	.	0.0	.	.	.	.
Dredge, Urchin	.	.	0.0	.	.	.	.	.	.	.	.
ALL GEAR	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Unpublished NMFS Weighout Data.

Table 25. 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	ALL
STATE	1000 LBS	1000 LBS	1000 LBS	1000 LBS	1000 LBS	1000 LBS	1000 LBS	1000 LBS	1000 LBS	1000 LBS	1000 LBS	1000 LBS	1000 LBS
ME	.	2	1	34	83	542	731	568	307	99	10	.	2,382
NH	.	.	.	5	15	199	303	241	68	39	6	.	879
MA	99	24	27	338	1,268	2,667	4,443	3,738	2,733	2,100	916	359	18,718
RI	241	22	28	78	62	104	41	21	9	142	191	221	1,166
CT	9	5	8	15	7	15	9	3	8	22	23	5	134
NY	23	17	16	23	16	27	15	11	12	56	60	61	342
NJ	240	183	186	168	54	15	5	6	12	172	686	538	2,270
DE	.	.	.	.	.	.	.	.	.	.	.	.	.
MD	722	439	580	325	4	8	.	.	.	.	229	481	2,793
VA	224	105	139	53	11	1	.	.	.	1	59	240	836
NC	1,370	1,809	1,390	209	2	.	.	.	.	.	41	886	5,711
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	35,236

Source: Unpublished NMFS Weighout Data.

Table 26. Distribution of spiny dogfish landings, from Maine to North Carolina, by distance from shore (thousands of pounds), 1988-1997.

	State		EEZ	
Year	1000 LBS	Percent	1000 LBS	Percent
1988	872	13.0	5863	87.0
1989	490	5.0	9378	95.0
1990	3612	11.2	28753	88.8
1991	2698	9.4	25879	90.6
1992	4489	12.3	31968	87.7
1993	3605	8.0	41282	92.0
1994[1]	4020	40.7	5856	59.3
1995[1]	3417	47.6	3756	52.4
1996[1]	6522	49.4	6687	50.6
1997[1]	4395	57.8	3212	42.2

[1] ME through VA are not available due to a change in reporting requirements.

Source: Unpublished NMFS Weighout Data.

Table 27. Spiny dogfish landings, by state and distance from shore, 1988-1997.

	ME		NH		MA		RI		NY		NJ		MD		VA		NC	
Year	State	EEZ	State	EEZ	State	EEZ	State	EEZ	State	EEZ	State	EEZ	State	EEZ	State	EEZ	State	EEZ
1988	0.1	99.9	0	100	13.3	86.7	32.3	67.7	87.9	12.1	76.5	23.5	50.8	49.2	0	100	0	100
1989	5.1	94.9	*	*	4.4	95.6	6.7	93.3	5.7	94.3	16.6	83.4	78.9	21.1	0	100	*	*
1990	45.7	54.3	0	100	0.6	99.4	44.1	55.9	5.2	94.8	0.2	99.8	0.1	99.9	0	100	3.6	96.4
1991	46.3	53.7	*	*	0	100	26.3	73.7	21.4	78.6	0.3	99.7	4.9	95.1	70.7	29.3	36.8	63.2
1992	10.9	89.1	0	100	0.4	99.6	1.4	98.6	18.7	81.3	2.1	97.9	2.7	97.3	59.5	40.5	45.2	54.8
1993	5.5	94.5	1.1	98.9	5.9	94.1	2.0	98.0	41.7	58.3	1.1	98.9	5.3	94.7	0	100	19.0	81.0
1994[1]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	40.7	59.3
1995[1]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	47.6	52.4
1996[1]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	49.4	50.6
1997[1]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	57.8	42.2

[1] ME through VA are not available due to a change in reporting requirements.

Source: Unpublished NMFS Weighout Data.

Table 28. Spiny dogfish recreational catch, landings and discards in numbers, based on NMFS MRFSS data, 1981-1997.

Year	Catch (A + B1 + B2)	Landings (A + B1)	Discards (B2)
1981	715,683	597,243	118,440
1982	167,902	28,172	139,730
1983	242,803	26,830	215,973
1984	206,099	36,525	169,574
1985	421,412	35,668	385,745
1986	548,216	73,286	474,930
1987	544,844	122,457	422,387
1988	494,480	144,070	350,410
1989	707,273	167,542	539,731
1990	539,494	71,409	468,085
1991	592,227	52,344	539,883
1992	504,721	9,236	407,485
1993	491,963	47,886	444,077
1994	449,218	61,944	387,274
1995	276,922	25,785	251,137
1996	157,538	14,408	143,130
1997	363,459	26,541	336,918

Table 29. Spiny dogfish recreational catch (number) by sub-region, based on NMFS MRFSS data, 1981-1997.

	REGION		
Year	North Atlantic	Mid-Atlantic	South Atlantic
1981	77,564	638,119	-
1982	57,322	110,580	-
1983	58,732	184,071	-
1984	105,940	100,159	-
1985	239,651	169,657	12,104
1986	305,614	242,246	356
1987	304,740	238,866	1,238
1988	368,514	125,373	594
1989	261,193	299,969	146,110
1990	79,968	442,243	17,284
1991	121,137	448,591	22,499
1992	228,611	230,215	45,895
1993	246,488	244,493	982
1994	151,856	296,592	771
1995	143,611	131,659	1,652
1996	100,102	55,728	1,708
1997	137079	223,882	2,498

Table 30. Spiny dogfish recreational catch (number) by mode based on NMFS MRFSS data, 1981-1997.

Year	Man Made	Beach/Bank	Shore	Party/Charter	Private Rental
1981	11,955	14,506	-	115,318	573,907
1982	-	-	-	140,126	27,776
1983	1,825	6,667	-	171,929	62,382
1984	409	4,611	-	57,833	143,247
1985	13,408	3,451	-	387,255	17,298
1986	-	-	5,615	245,549	297,052
1987	-	-	3,454	367,400	173,990
1988	-	-	1,539	232,669	260,272
1989	709	138,533	9,465	162,761	395,805
1990	3,058	13,856	11,254	358,819	152,507
1991	1,139	15,070	62,715	139,937	373,366
1992	2,459	21,291	11,268	216,659	252,839
1993	511	264	21,826	210,052	259,273
1994	343	428	21,003	124,467	302,977
1995	-	1,539	5,658	144,036	125,576
1996	289	909	9,940	63,429	82,971
1997	-	-	5,317	174,672	183,471

Table 31. Spiny dogfish recreational catch (number) by area based on NMFS MRFSS data, 1981-1997.

Year	Area: Ocean ≤ 3 mi.	Ocean > 3 mi.	Inland
1981	24,264	673,742	17,677
1982	62,427	96,457	9,018
1983	28,195	179,610	34,997
1984	7,896	187,768	10,435
1985	16,607	398,392	6,413
1986	112,669	336,658	98,889
1987	206,544	276,364	61,936
1988	67,130	386,593	40,757
1989	183,651	418,097	105,525
1990	63,044	403,039	73,411
1991	240,587	256,437	95,203
1992	126,871	290,597	87,253
1993	187,960	232,035	71,968
1994	109,850	240,145	99,223
1995	62,988	163,050	50,884
1996	46,961	71,104	39,472
1997	111,991	195,740	55,728

Table 32. Exvessel 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 33. Value of commercial landings of spiny dogfish value by year and state.

	YEAR									
	1988 VAL 1000 $	1989 VAL 1000 $	1990 VAL 1000 $	1991 VAL 1000 $	1992 VAL 1000 $	1993 VAL 1000 $	1994 VAL 1000 $	1995 VAL 1000 $	1996 VAL 1000 $	1997 VAL 1000 $
STATE										
ME	59	430	745	188	203	509	264	338	169	67
NH	.	.	21	.	50	252	365	397	189	145
MA	359	405	1,597	1,145	2,186	3,541	3,394	5,413	4,934	3,119
RI	.	.	115	292	226	213	68	109	211	141
CT	.	.	2	.	1	1	10	19	133	47
NY	21	14	3	16	27	24	64	187	257	96
NJ	1	2	582	428	243	90	174	502	939	696
DE	.	.	.	4	.	.	.	12	.	.
MD	4	1	238	476	294	188	192	883	1,539	781
VA	1	6	2	17	19	9	40	125	400	725
NC	36	.	3	122	691	735	1,011	1,147	2,145	984

Source: Unpublished NMFS Weighout Data.

Table 34. Commercial fishing permits held by vessels landing spiny dogfish in 1997.

Type of Permit	Number
Multispecies permit	509
Limited access multispecies permit	450
Summer flounder permit	267
Commercial summer flounder permit	106
Squid, mackerel, butterfish permits	401
Commercial squid, mackerel, butterfish permits	391
Lobster permit	420
Commercial lobster permit	168
Scallop permits	433
Commercial scallop permit	408
Commercial Tuna permits	172

Source: NMFS unpublished weighout data.

Table 35. Spiny dogfish percent of total landings and value, by port (1997).

Port	% of total $ from dogfish	% of total lbs. from dogfish	1997 Total pounds of dogfish
WACHAPREAGUE, VA	76%	91%	236,000
PLYMOUTH, MA	74%	96	4,872,917
SCITUATE, MA	21%	74%	2,236,151
CHATHAM, MA	14%	47%	5,853,769
OCEAN CITY, MD	11%	32%	4,220,467
OTHER DARE, NC	11%	30%	2,096,504
MARBLEHEAD, MA	10%	48%	333,409
CHINCOTEAGUE, VA	6%	27%	313,315
NORFOLK, VA	5%	22%	310,191
LONG BEACH, NJ	3%	26%	2,137,567
CAMP ELLIS, ME	3%	16%	26,386
GLOUCESTER, MA	3%	8%	6,225,688
RYE, NH	3%	27%	101,915
NEWPORT NEWS, VA	3%	34%	2,390,814

Source: Unpublished NMFS Weighout Data.

Table 36. Estimated total allowable landings (millions of pounds) of spiny dogfish and percent of target SSB for various alternatives.

	Preferred 1		Status Quo		Non-preferred 2		Non-preferred 3		Non-preferred 4	
Year	TAL	%SSB	TAL	%SSB	TAL	%SSB	TAL	%SSB	TAL	%SSB
1999-2000	22.1	75	31.3	77	4.77	77	22.5	77	13.8	77
2000-2001	2.90	75	25.5	70	5.01	90	11.3	76	9.08	83
2001-2002	3.15	81	21.3	58	5.29	96	2.78	76	3.33	85
2002-2003	3.20	87	16.8	47	5.27	100	2.84	82	3.37	92
2003-2004	3.18	100	13.1	42	13.8	--	2.83	94	3.34	100
2004-2005	1.38	--	10.7	32	13.8	--	2.86	94	13.8	--
2005-2006	1.38	--	9.45	25	13.8	--	2.94	94	13.8	--
2006-2007	1.38	--	9.10	19	13.8	--	3.09	92	13.8	--
2007-2008	1.38	--	9.08	18	13.8	--	3.26	98	13.8	--
2008-2009	1.38	--	8.84	18	13.8	--	3.44	100	13.8	--

Note: %SSB = percentage of female SSB rebuilding target.

Source: P. Rago, pers. comm.

Table 37. Estimated total allowable landings of spiny dogfish in 1999 under preferred stock rebuilding alternative for semi-annual, quarterly, and bimonthly quota periods. Seasonal quota allocations based on seasonal distribution of spiny dogfish landings from NMFS weighout data, 1990-1997.

Period	1999 TAL (million lbs.)	1997 (million lbs.)	1990-1997 (million lbs.)
May-Oct.	12.8	22.8	194.3
Nov.-April	9.3	22.4	141.5

Period	1999 TAL (million lbs.)	1997 (million lbs.)	1990-1997 (million lbs.)
Quarter 1 (May - July)	6.5	13.7	98.6
Quarter 2 (Aug. - Oct.)	6.3	9.1	95.7
Quarter 3 (Nov. - Jan.)	5.2	11.5	79.4
Quarter 4 (Feb. - Apr.)	4.1	10.9	62.0

Period	1999 TAL (million lbs.)	1997 (million lbs.)	1990-1997 (million lbs.)
Jan. - Feb.	3.6	11.5	55.2
March - April	2.4	5.8	36.2
May - June	3.0	7.8	45.8
July - Aug.	6.3	10.2	95.5
Sept. - Oct.	3.5	4.8	52.9
Nov. - Dec.	3.3	5.1	50.1

Table 38a. Estimates of spiny dogfish discards and mortality (thousands of lbs.) based on 1989-1997 NMFS sea sampling data.

Year	OT	GN	Total	OTD	GND	Total Dead
1989	12,619.1	4,900.8	17,520.0	6,309.6	3,675.1	9,984.6
1990	21,016.5	4,623.0	25,641.7	10,509.3	3,467.8	13,977.2
1991	18,452.5	3,970.5	22,423.0	9,226.3	2,978.4	12,202.5
1992	16,307.4	4,069.7	20,374.9	8,152.6	3,051.2	11,2056.0
1993	16,166.3	4,131.4	20,297.8	8,084.3	3,097.5	11,181.7
1994	12,367.8	3,582.5	15,950.3	6,183.9	2,687.4	8,871.3
1995	11,014.2	4,261.5	15,275.7	5,507.1	3,196.7	8,703.8
1996	14,995.7	4,506.2	19,499.7	7,497.8	3,379.7	10,877.5
1997	12,894.7	4,649.5	17,544.2	6,446.3	3,487.7	9,933.9

OTD - Otter Trawl Dead
GND - Gill Net Dead

Table 38b. Estimates of spiny dogfish discards for otter trawl by primary species landed based on NMFS sea sampling data.

			Dogfish Discards (Thousands of lbs)								
Species	Number of Trips	Discard Rate	1989	1990	1991	1992	1993	1994	1995	1996	1997
Goosefish	31	0.0579	140.8	60.1	279.5	311.4	337.4	309.3	468.7	589.5	594.2
Butterfish	12	0.1580	153.3	145.7	231.8	224.9	822.0	569.0	220.1	402.3	357.2
Cod	101	0.1631	1,429.5	2,673.3	1,630.7	788.4	633.6	486.3	209.4	395.4	290.9
Atlantic Croaker	8	0.0000	<1,000 lbs	0	0	0	<1,000 lbs	<1,000 lbs	<1,000 lbs	<1,000 lbs	<1,000 lbs
Blueback Herring	1	0.0151	0	0.2	0	9.2	0	0.2	<1,000 lbs	0	1.4
Winter Flounder	26	0.3248	510.3	539.4	618.9	484.4	282.3	308.8	645.5	798.9	1,239.9
Summer Flounder	116	0.5445	704.0	273.3	383.1	632.2	637.6	888.4	1,002.4	1,010.1	1,463.8
Witch Flounder	1	4.5455	321.9	11.0	34.3	406.7	278.0	250.4	301.4	411.9	268.8
Yellowtail Flounder	46	0.1779	511.0	2,206.2	606.9	405.1	145.1	332.8	80.9	140.4	312.7
American Plaice	11	0.0376	3.5	1.1	5.3	11.4	4.8	5.5	5.5	8.2	7.7
Windowpane Flounder	2	0.0141	21.1	7.2	43.7	13.4	11.9	1.3	9.8	75.1	2.4
Other Flounders	1	2.7348	105.2	40.7	87.5	112.8	85.7	16.4	0.6	4.5	7.8
Haddock	1	0.0026	<1,000 lbs	0.2	0.4	1.1	0.1	<1,000 lbs	<1,000 lbs	<1,000 lbs	0.1
Red Hake	12	0.0095	4.2	3.9	3.7	5.4	4.4	7.5	2.2	7.1	5.5
White Hake	1	0.3570	29.0	187.1	231.0	345.1	114.0	8.6	32.1	39.7	4.6
Atlantic Herring	19	0.0235	25.2	33.9	81.5	211.3	110.5	141.0	121.5	109.5	67.2
Atlantic Mackerel	19	0.0628	914.8	1,062.0	1,925.2	1,045.2	273.8	862.3	912.3	1,248.6	825.6
Ocean Pout	3	0.1585	345.5	360.6	371.4	60.8	41.2	43.4	5.4	11.3	4.5
Pollock	7	0.0321	114.2	100.0	52.4	33.4	12.5	4.9	6.5	8.3	16.6
Scup	15	0.4152	402.5	239.1	902.9	806.9	741.4	569.2	362.1	574.0	636.4
Black Sea Bass	1	1.8766	36.8	90.8	24.6	1.2	115.3	152.4	5.8	236.2	69.4
Weakfish	17	0.0340	30.7	35.3	6.2	12.0	5.7	5.7	19.3	15.7	17.2
Spiny Dogfish	32	0.3979	308.9	5,903.8	4,191.4	3,459.9	3,952.0	2,286.8	2,037.0	2,409.0	1,263.3
Skates	26	0.1192	1,431.1	2,350.3	2,184.5	2,466.7	2,353.0	1,342.1	1,062.2	2,922.2	1,659.7
Little Skates	18	0.2682	0	0	0.3	0	0	0	77.8	0	0
Tautog	7	0.0011	<1,000 lbs	<1,000 lbs	<1,000 lbs	<1,000 lbs	0.1	<1,000 lbs	<1,000 lbs	<1,000 lbs	<1,000 lbs
Silver Hake	219	0.1001	2,857.3	3,350.4	2,418.6	2,237.5	2,631.2	1,656.7	1,739.5	2,643.0	2,286.6
Other Groundfish	1	0.0459	0	<1,000 lbs	0	0.2	0	0	0	0	0
664	1	1.4577	0	0	0	0	0	0	0	0	0
Unclassified Crab	2	0.0004	0	0	0	0	0	<1,000 lbs	<1,000 lbs	<1,000 lbs	<1,000 lbs
Horseshoe Crab	51	0.0010	0.7	0.5	0.6	0.8	1.5	0.7	0.7	1.1	0.8
Northern Shrimp	476	0.0006	4.3	5.3	4.0	3.9	2.8	4.4	8.3	11.5	7.8
Conchs	2	0.0080	1.5	1.4	0.7	0.1	1.2	2.5	0.5	0.4	0.6
Loligo	147	0.0692	2,193.7	1,243.7	1,999.1	1,795.4	2,445.7	2,047.2	1,602.0	885.5	1,438.9
Illex	30	0.0009	13.1	21.5	22.8	34.1	34.4	33.5	26.1	28.2	24.2
Unclassified Squid	7	0.0561	3.7	69.2	109.1	96.1	87.8	30.5	48.1	7.5	18.7

Table 38c. Estimates of spiny dogfish discards for sink gill net by primary species landed based on NMFS sea sampling data.

			Dogfish Discards (Thousands of lbs)								
Species	Number of Trips	Discard Rate	1989	1990	1991	1992	1993	1994	1995	1996	1997
Goosefish	611	0.0385	0.5	0.8	21.3	64.9	120.5	193.1	310.2	268.2	292.0
Bluefish	114	0.1157	103.2	143.8	100.5	159.4	156.4	184.7	110.9	118.4	257.8
Bonito	8	0.0047	0	0	0	0.1	<1,000 lbs	0.1	0.1	<1,000 lbs	<1,000 lbs
Cod	2200	0.3015	1,908.5	1,620.9	1,606.5	1,028.0	759.7	850.9	884.2	921.5	481.5
Atlantic Croaker	170	0.0022	0.2	<1,000 lbs	<1,000 lbs	0.5	3.8	4.5	4.2	5.8	2.5
Red Drum	1	0.3333	0	0	<1,000 lbs	0.2	1.0	<1,000 lbs	0.2	0.1	0
Winter Flounder	118	0.0151	1.0	0.8	0.5	0.9	0.9	0.5	1.4	0.6	0.7
Witch Flounder	10	1.5964	0.9	0.8	3.2	0.3	0	0.2	0.1	0.2	0.7
Yellowtail Flounder	148	0.0067	0.1	0.5	0.7	0.5	0.2	0.4	1.7	1.4	0.8
White Hake	269	0.5741	999.8	739.3	326.7	1,123.1	589.7	146.4	267.4	173.0	84.9
Hickory Shad	2	0.0888	0	0	0	<1,000 lbs	0.1	<1,000 lbs	<1,000 lbs	<1,000 lbs	2.6
King Mackerel	5	0.0025	0	0	0	<1,000 lbs	<1,000 lbs	<1,000 lbs	<1,000 lbs	<1,000 lbs	0.1
Atlantic Mackerel	37	0.0660	3.5	19.1	6.4	10.5	2.8	4.9	6.5	18.0	9.3
Menhaden	23	0.0054	0.7	1.9	3.7	0.6	6.1	6.0	2.0	2.1	0.9
Pollock	470	0.1773	1,113.3	596.0	252.9	212.9	256.6	104.6	95.5	63.7	96.5
Scup	1	0.3529	0	0	0	0.1	0.4	0.5	2.3	2.7	0.9
Sea Robins	1	0.0716	0	0	0	0	<1,000 lbs	0	5.6	<1,000 lbs	0.1
Weakfish	80	0.1262	15.8	20.0	24.2	10.9	47.1	53.6	33.4	48.7	42.6
American Shad	10	0.0068	5.7	4.6	3.2	4.2	4.0	3.2	1.7	3.9	0.6
Smooth Dogfish	85	0.0020	0	0	0.5	1.3	0.9	0.8	0.9	1.5	1.0
Spiny Dogfish	1399	0.0853	741.1	1,400.0	1,323.1	1,395.8	2,149.9	1,969.8	2,479.2	2,737.9	2,463.0
Skates	12	0.0123	<1,000 lbs	<1,000 lbs	0.5	1.7	9.8	14.5	6.4	12.1	27.2
Little Skates	8	0.0152	0	0	0	0	0	0	0.2	0	0
Winter Skates	25	0.0002	0	0	0	0	0	0	0	0	0
Striped Bass	7	0.0561	0	15.4	11.4	20.7	16.2	18.7	26.0	90.9	9.7
Atlantic Sturgeon	1	0.3763	0	0	0	0	0	<1,000 lbs	0.1	0.1	0
Tautog	36	0.0613	0.7	1.9	3.9	4.7	1.1	2.1	1.2	1.4	0.3
Little Tuna	6	0.0006	0	0	0	<1,000 lbs	<1,000 lbs	<1,000 lbs	<1,000 lbs	<1,000 lbs	<1,000 lbs
Porbeagle Shark	3	0.0940	0	0	0.1	0	<1,000 lbs	0	<1,000 lbs	0	0.1
Wolffish	1	125.0000	6.0	57.8	280.5	27.8	4.5	23.9	21.8	34.3	869.4
660	2	0.6308	0	0	0	0	0	0	0	0	0
Horseshoe Crab	2	0.0796	0	0	0	0	0	0.1	1.5	1.3	5.1
American Lobster	14	0.0012	<1,000 lbs	0	0	<1,000 lbs	<1,000 lbs	<1,000 lbs	<1,000 lbs	0.1	<1,000 lbs

Table 39. Projected spiny dogfish gross ex-vessel revenues ($1000) for status quo and management options (not discounted).

	Staus Quo		Non-preferred - 1		Non-preferred - 2		Preferred		Non-preferred - 3	
	Nominal	Cumulative	Nominal	Cumulative	Nominal	Cumulative	Nominal	Cumulative	Nominal	Cumulative
1999	4,695	4,695	715	715	3,369	3,369	3,309	3,309	2,063	2,063
2000	3,819	8,514	752	1,467	1,697	5,065	435	3,745	1,362	3,425
2001	3,196	11,710	793	2,260	417	5,483	472	4,217	499	3,924
2002	2,525	14,236	790	3,050	426	5,909	480	4,697	506	4,430
2003	1,964	16,199	2,067	5,118	425	6,334	477	5,174	501	4,931
2004	1,607	17,806	2,067	7,185	427	6,763	2,067	7,241	2,067	6,998
2005	1,418	19,224	2,067	9,252	441	7,204	2,067	9,308	2,067	9,065
2006	1,365	20,590	2,067	11,319	463	7,667	2,067	11,375	2,067	11,132
2007	1,362	21,952	2,067	13,386	489	8,156	2,067	13,442	2,067	13,200
2008	1,348	23,300	2,067	15,464	515	8,671	2,067	15,510	2,067	15,267
2009	1,308	24,608	2,067	17,521	2,067	10,738	2,067	17,577	2,067	17,334
2010	1,236	25,844	2,067	19,588	2,067	12,805	2,067	19,644	2,067	19,401
2011	1,138	26,983	2,067	21,655	2,067	14,873	2,067	21,711	2,067	21,468
2012	1,025	28,007	2,067	23,722	2,067	16,940	2,067	23,778	2,067	23,536
2013	903	28,910	2,067	25,790	2,067	19,007	2,067	25,845	2,067	25,603
2014	783	29,693	2,067	27,857	2,067	21,074	2,067	27,913	2,067	27,670

Source: Unpublished NMFS Weighout Data.

Table 40. Projected spiny dogfish gross ex-vessel revenues ($1000) for status quo and management options (disc. rate = 7%).

	Status Quo		Non-preferred - 1		Non-preferred - 2		Preferred		Non-preferred - 3	
	Discounted	Cumulative (discounted)	Discounted	Cumulative (discounted)	Discounted	Cumulative (discounted)	Discounted	Cumulative (discounted)	Discounted	Cumulative (discounted)
1999	4,388	4,388	668	668	3,149	3,149	3,093	3,093	1,928	1,928
2000	3,336	7,723	657	1,325	1,482	4,631	380	3,473	1,189	3,118
2001	2,609	10,333	647	1,973	341	4,971	386	3,859	407	3,525
2002	1,927	12,259	603	2,575	325	5,296	366	4,225	386	3,911
2003	1,400	13,659	1,474	4,049	303	5,599	340	4,565	357	4,268
2004	1,071	14,730	1,377	5,427	286	5,885	1,377	5,942	1,377	5,646
2005	883	15,613	1,287	6,714	275	6,160	1,287	7,229	1,287	6,933
2006	795	16,408	1,203	7,917	269	6,429	1,203	8,435	1,203	8,136
2007	741	17,147	1,124	9,042	266	6,695	1,124	9,557	1,124	9,260
2008	685	17,834	1,051	10,093	262	6,957	1,051	10,608	1,051	10,311
2009	621	18,456	982	11,075	982	7,939	982	11,590	982	11,293
2010	549	19,004	918	11,993	918	8,857	918	12,508	918	12,211
2011	472	19,477	858	12,850	858	9,715	858	13,366	858	13,069
2012	397	19,874	802	13,652	802	10,516	802	14,167	802	13,871
2013	327	20,201	749	14,401	749	11,266	749	14,917	749	14,620
2014	265	20,466	700	15,101	700	11,966	700	15,617	700	15,320

Source: Unpublished NMFS Weighout Data.

Table 41. Projected spiny dogfish pack-out facility revenues ($1000) for status quo and management options (not discounted).

	Status Quo	Non-preferred - 1	Non-preferred - 2	Preferred	Non-preferred - 3
1999	1,252	191	898	883	550
2000	1,018	201	452	116	363
2001	852	212	111	126	133
2002	673	211	114	128	135
2003	524	551	113	127	134
2004	428	551	114	551	551
2005	378	551	118	551	551
2006	364	551	123	551	551
2007	363	551	130	551	551
2008	360	551	137	551	551
2009	349	551	551	551	551
2010	330	551	551	551	551
2011	304	551	551	551	551
2012	273	551	551	551	551
2013	241	551	551	551	551
2014	209	551	551	551	551

Source: Unpublished NMFS Weighout Data.

Table 42. Projected spiny dogfish gross ex-vessel value under trip limit scenario.

	Status Quo				Non-preferred 1				Non-preferred 2			
Year	Yield (lbs.)	per trip (lbs)	DISC 7%	Nominal	Yield (lbs.)	per trip (lbs.)	DISC 7%	Nominal	Yield (lbs.)	per trip (lbs.)	DISC 7%	Nominal
1999	14194	2158	$303	$324	2162	356	$50	$53	10186	1549	$217	$232
2000	11547	1756	$230	$263	2274	374	$49	$56	5130	780	$102	$117
2001	9664	1469	$180	$220	2398	394	$48	$59	1262	192	$23	$29
2002	7636	1161	$133	$174	2389	393	$45	$59	1288	196	$22	$29
2003	5937	903	$97	$135	6250	1028	$110	$154	1284	195	$21	$29
2004	4858	739	$74	$111	6250	1028	$103	$154	1297	197	$20	$30
2005	4287	652	$61	$98	6250	1028	$96	$154	1334	203	$19	$30
2006	4128	628	$55	$94	6250	1028	$90	$154	1400	213	$19	$32
2007	4119	626	$51	$94	6250	1028	$84	$154	1477	225	$18	$34
2008	4077	620	$47	$93	6250	1028	$78	$154	1558	237	$18	$36
2009	3954	601	$43	$90	6250	1028	$73	$154	6250	950	$68	$143
2010	3737	568	$38	$85	6250	1028	$68	$154	6250	950	$63	$143
2011	3442	523	$33	$79	6250	1028	$64	$154	6250	950	$59	$143
2012	3098	471	$27	$71	6250	1028	$60	$154	6250	950	$55	$143
2013	2729	415	$23	$62	6250	1028	$56	$154	6250	950	$52	$143
2014	2367	360	$18	$54	6250	1028	$52	$154	6250	950	$48	$143

Source: Unpublished NMFS Weighout Data.

Table 43. Total crew by port involved in the spiny dogfish fishery.

Home City	No.
BOSTON, MA	259
NEW YORK, NY	226
GLOUCESTER, MA	175
NORFOLK, VA	80
MONTAUK, NY	62
CHATHAM, MA	58
POINT JUDITH, RI	48
PORTSMOUTH, NH	35
NEW BEDFORD, MA	34
PHILADELPHIA, PA	31
BARNEGAT LIGHT, NJ	30
POINT PLEASANT, NJ	30
CAPE MAY, NJ	28
WANCHESE, NC	28
BELFORD, NJ	27
OCEAN CITY, MD	27
SCITUATE, MA	27
FALLING WATERS, WV	24
PROVINCETOWN, MA	23
HAMPTON, NH	21

Source: Unpublished NMFS Weighout Data.

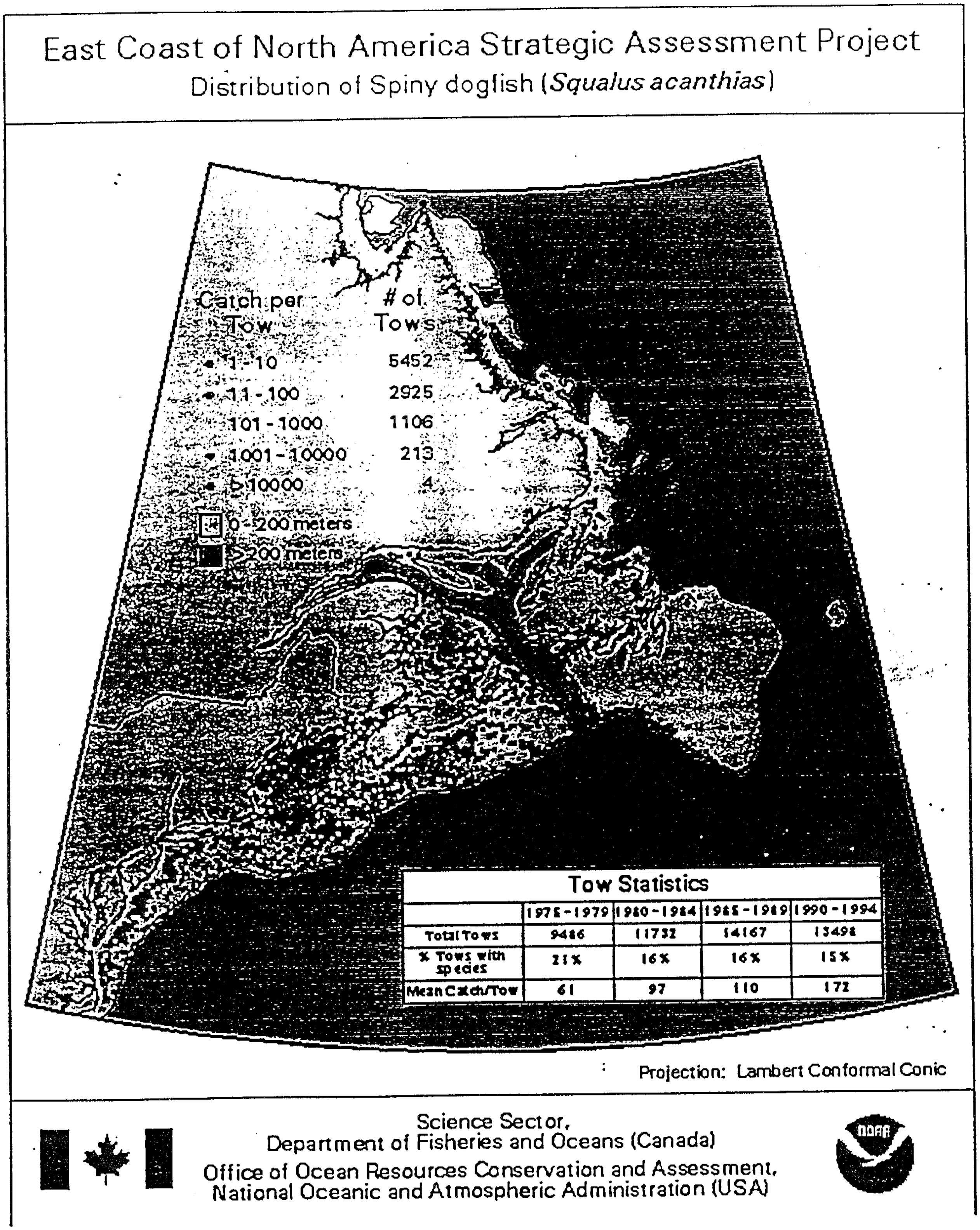


Figure 1. Distribution and relative abundance of spiny dogfish in the northwest Atlantic Ocean, 1975 - 1994, from the Department of Fisheries and Oceans (DFO Canada) and the National Oceanic & Atmospheric Administration (NOAA USA).
Source: McMillan and Morse 1998.

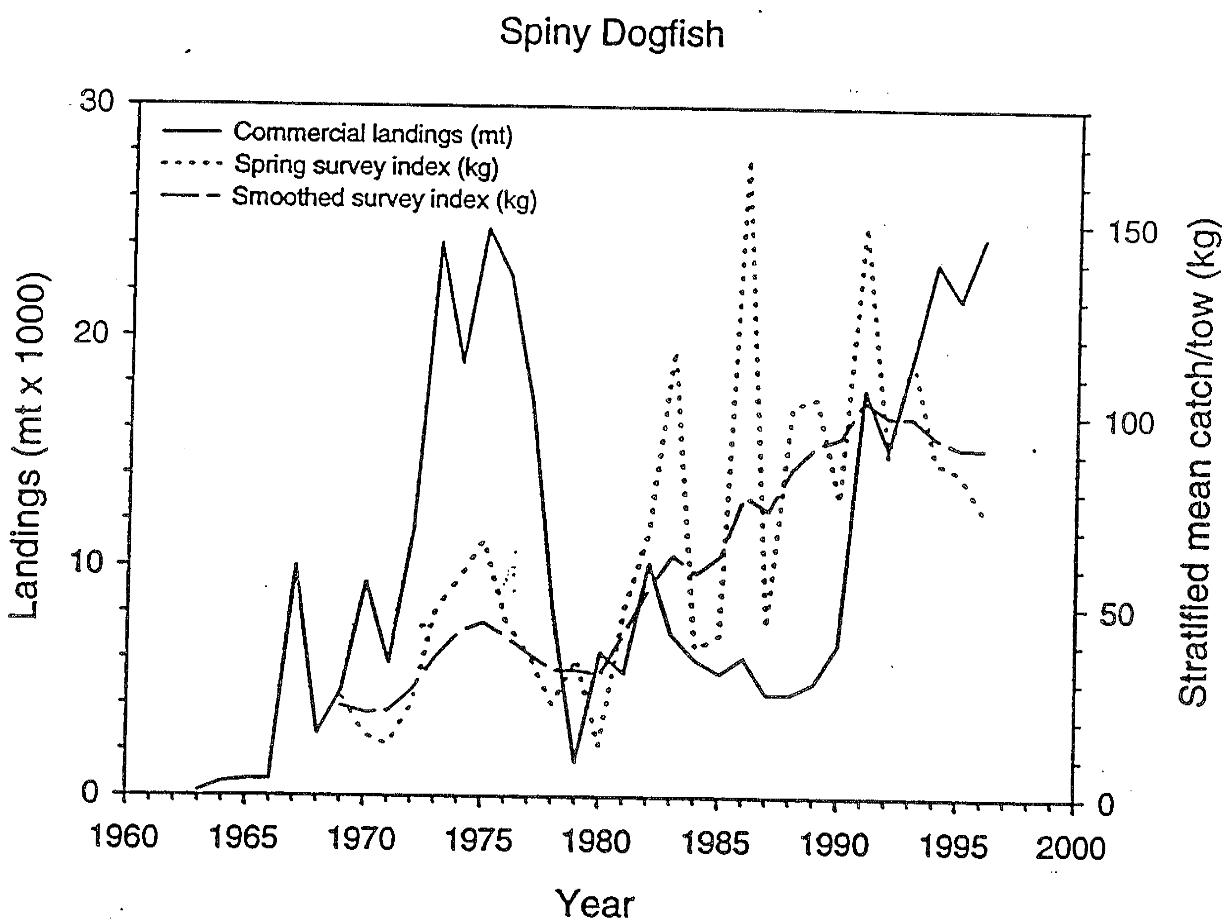


Figure 2. Commercial landings (US, Foreign, US Recreational) and NMFS bottom trawl data (stratified mean catch/tow) of spiny dogfish, 1963 - 1996.
Note: 1,000 metric tons = 2.205 million lbs.
Source: McMillan and Morse 1998.

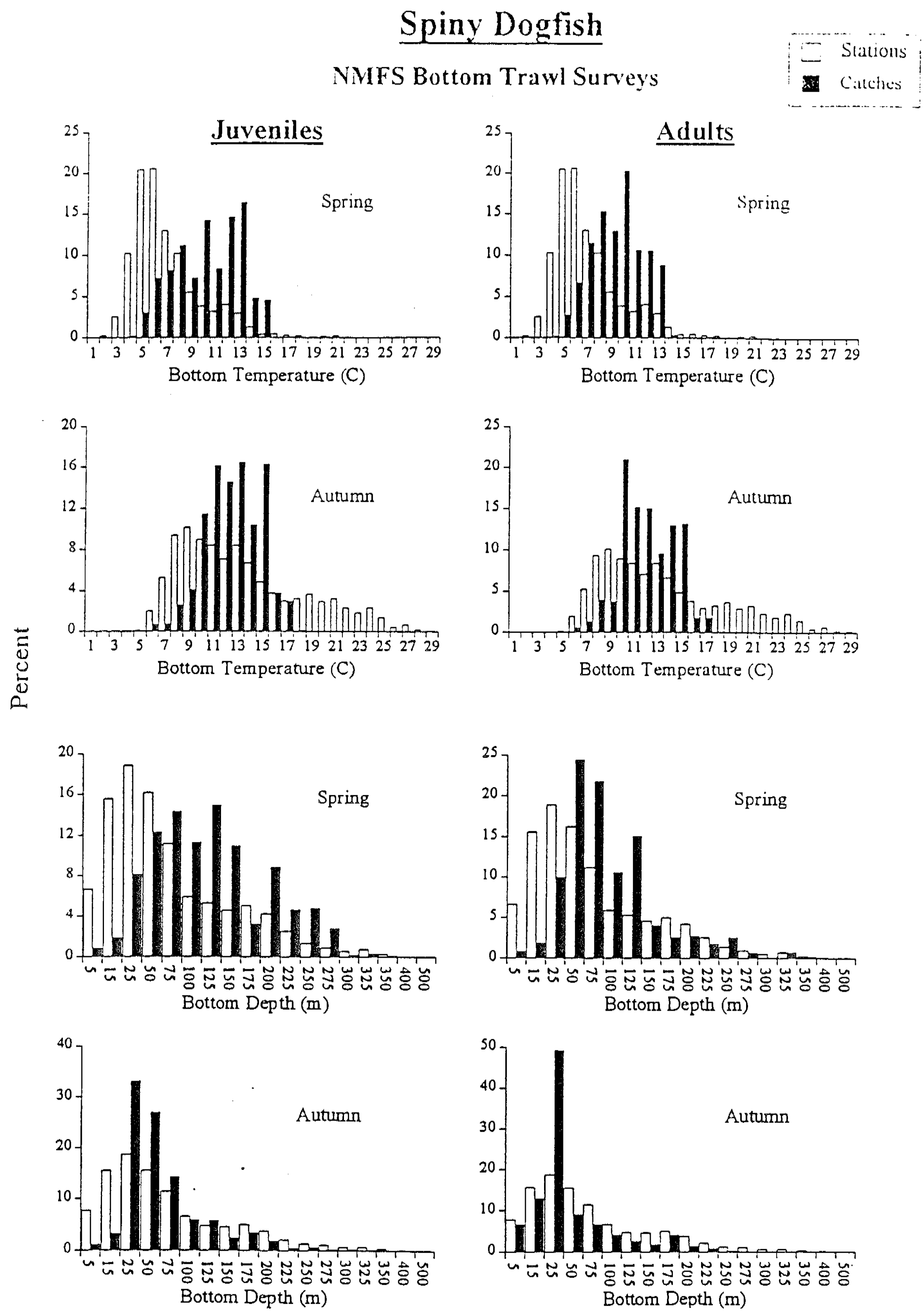


Figure 3. Percent frequencies for spring and autumn bottom temperature and bottom depth intervals for all stations sampled and for stations weighted by the number of spiny dogfish captured from NMFS, NEFSC bottom trawl surveys.
Source: McMillan and Morse 1998.

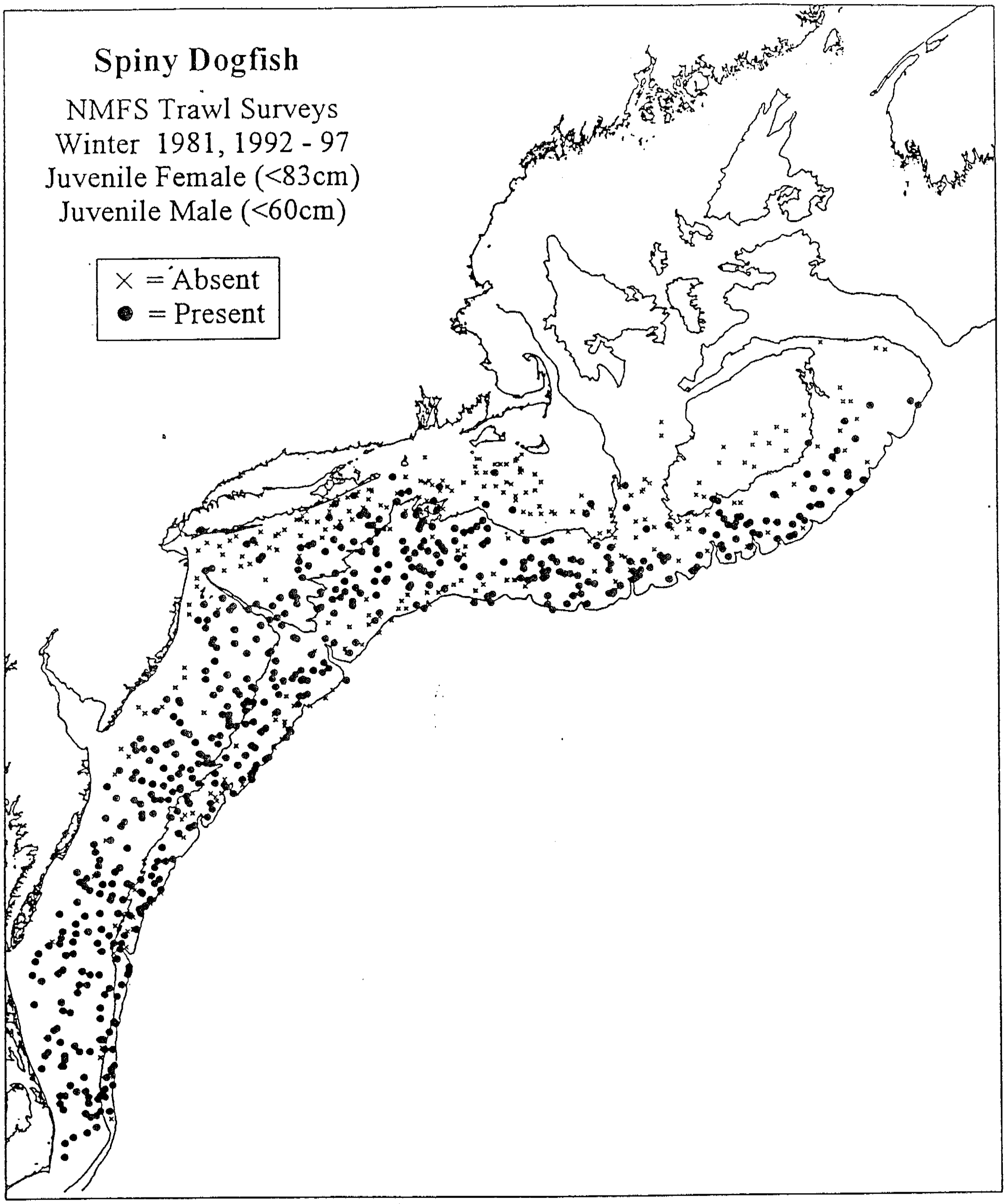


Figure 4. Distribution of stations sampled and stations where spiny dogfish were captured from NMFS, NEFSC bottom trawl surveys.
Source: McMillan and Morse 1998.

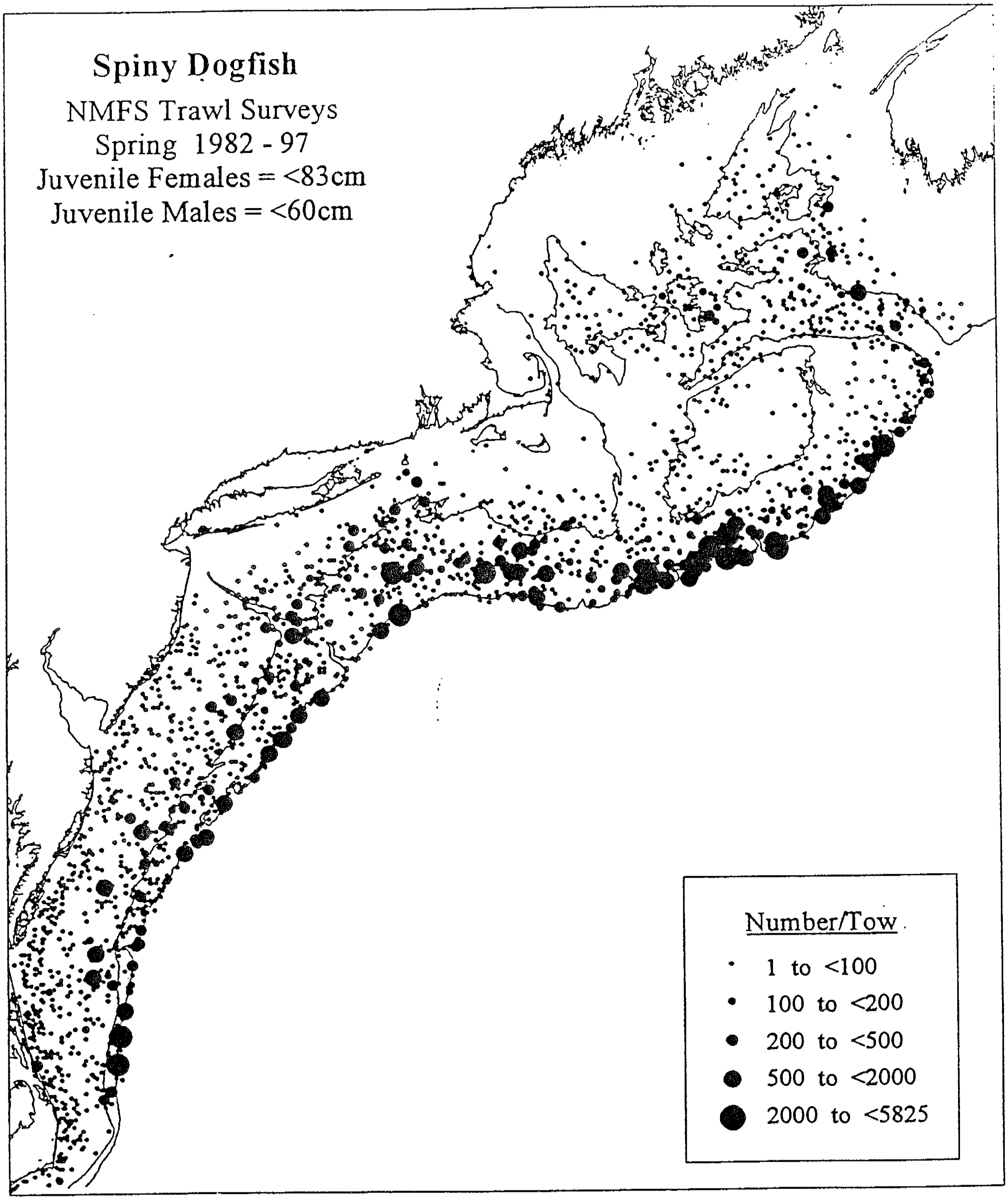


Figure 5. Distribution and relative abundance of spiny dogfish from NMFS, NEFSC bottom trawl surveys.
Source: McMillan and Morse 1998.

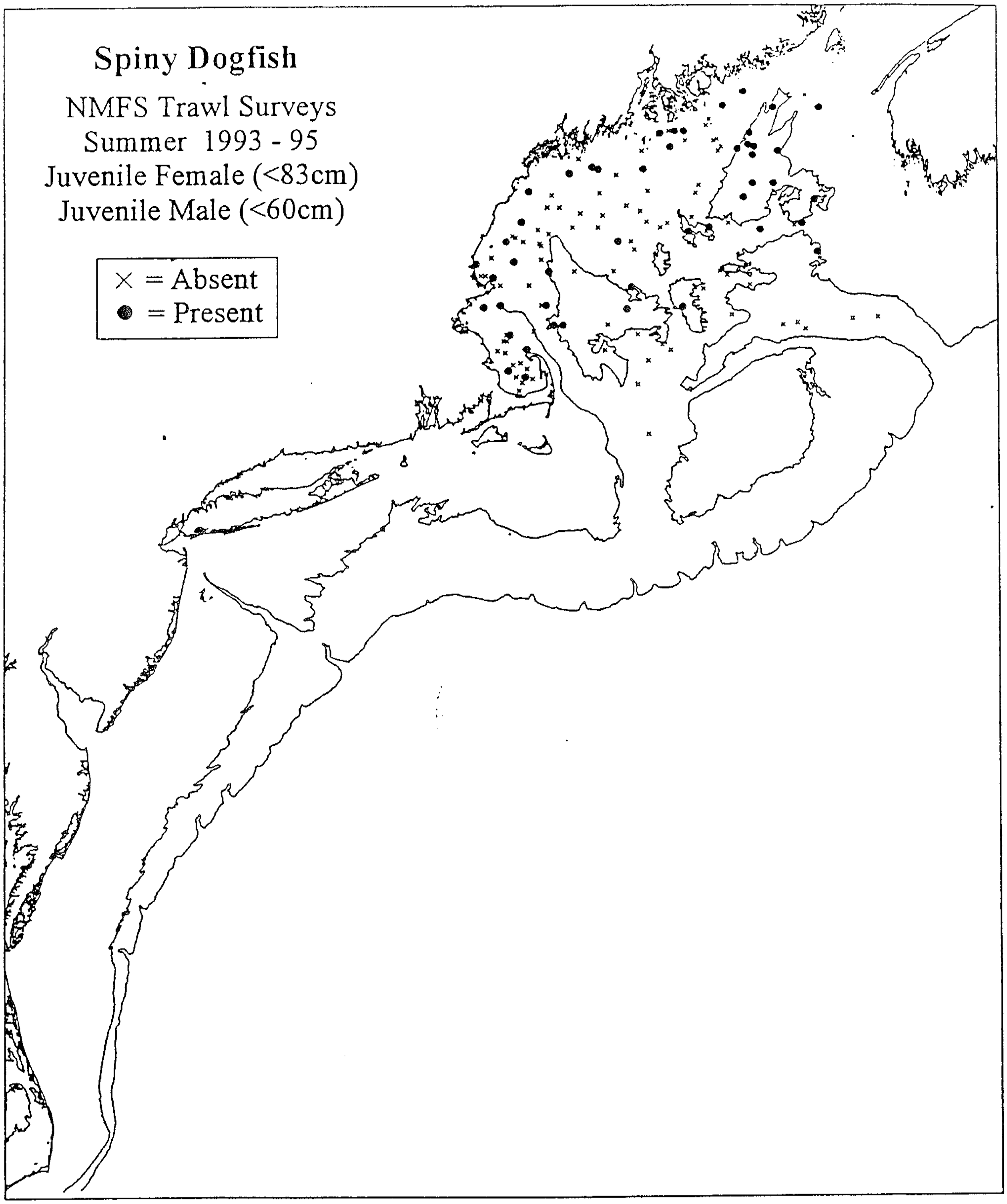


Figure 6. Distribution of stations sampled and stations where spiny dogfish were captured from NMFS, NEFSC bottom trawl surveys.
Source: McMillan and Morse 1998.

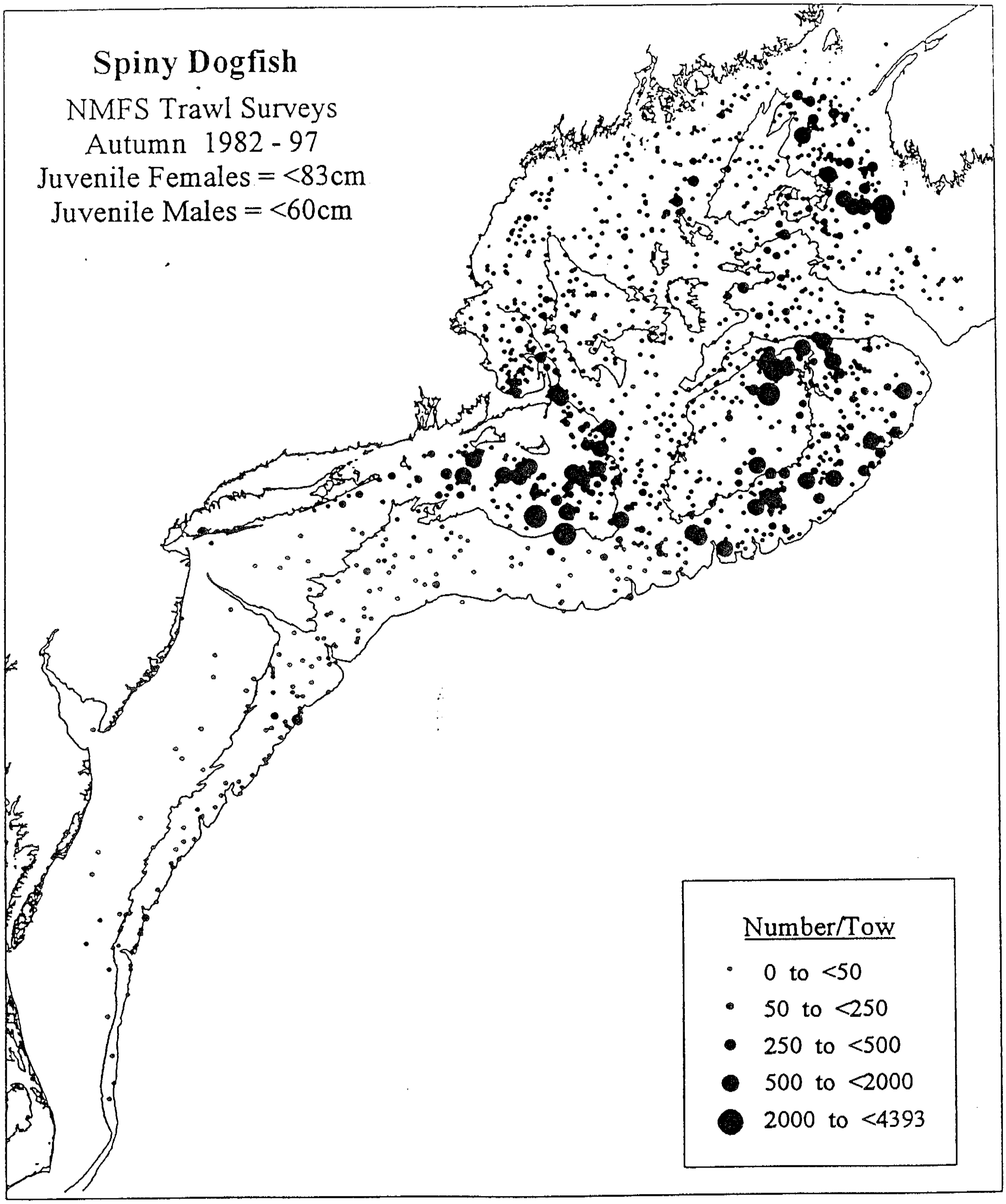


Figure 7. Distribution and relative abundance of spiny dogfish from NMFS, NEFSC bottom trawl surveys.
Source: McMillan and Morse 1998.

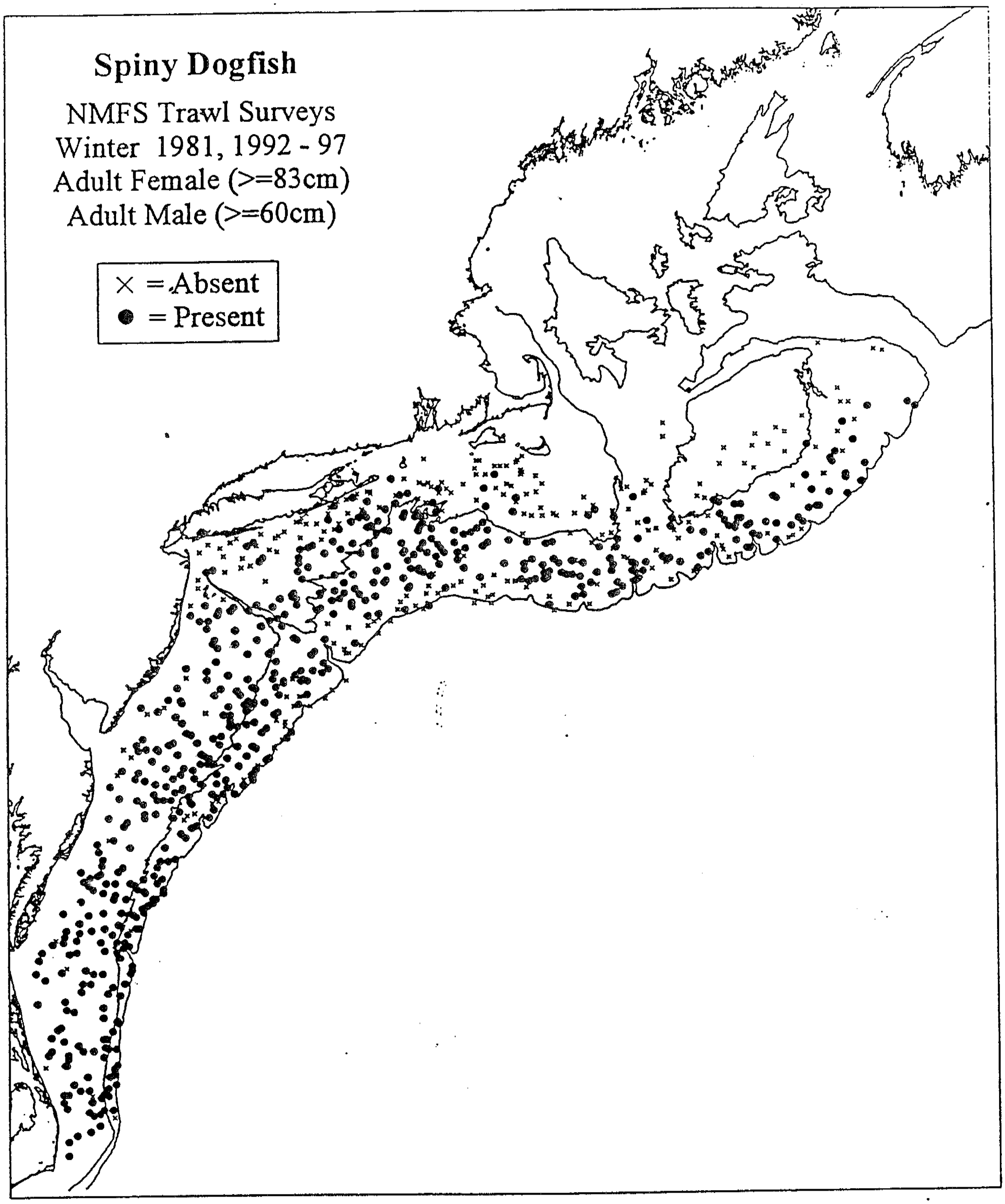


Figure 8. Distribution of stations sampled and stations where spiny dogfish were captured from NMFS, NEFSC bottom trawl surveys.
Source: McMillan and Morse 1998.

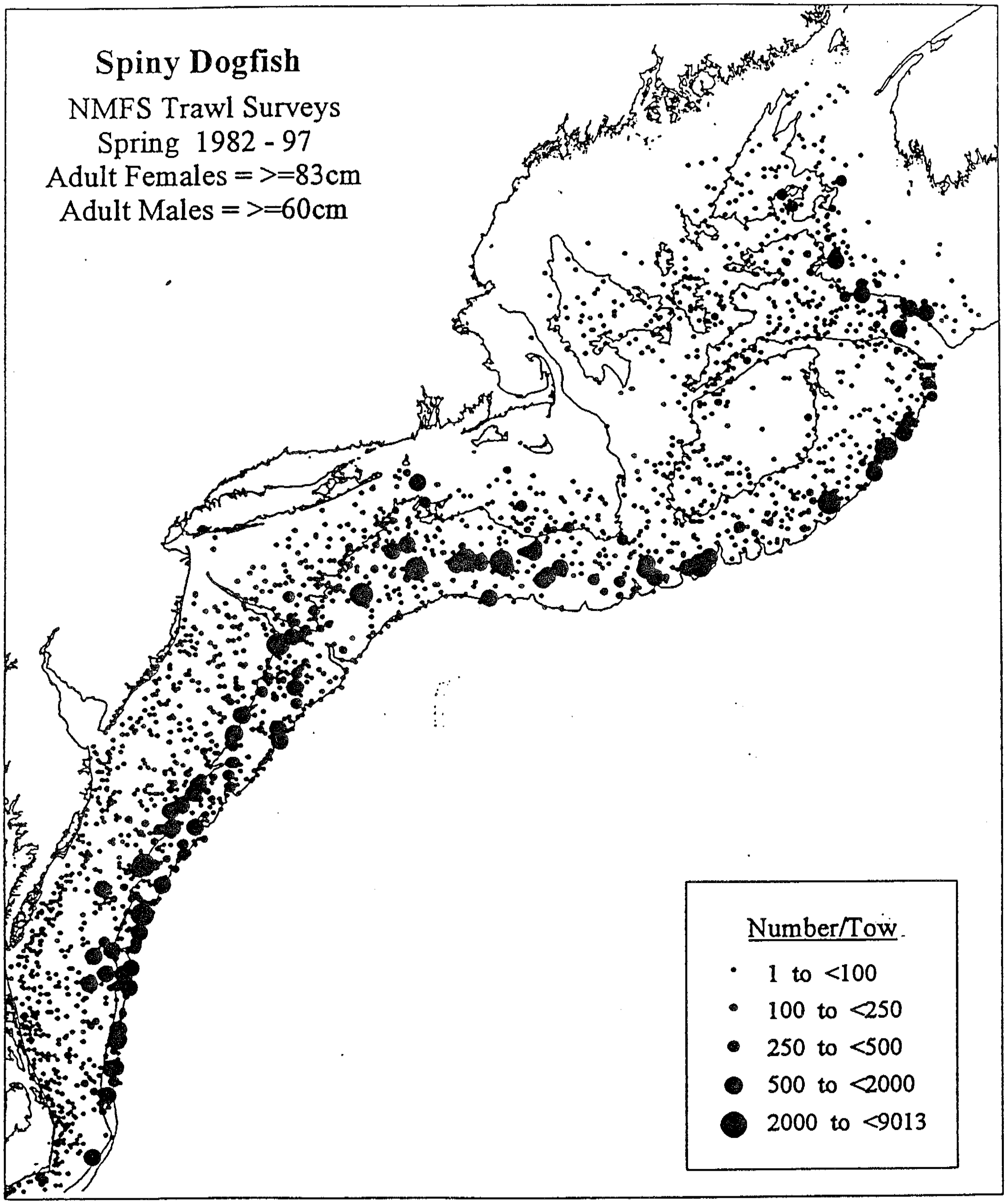


Figure 9. Distribution and relative abundance of spiny dogfish from NMFS, NEFSC bottom trawl surveys.
Source: McMillan and Morse 1998.

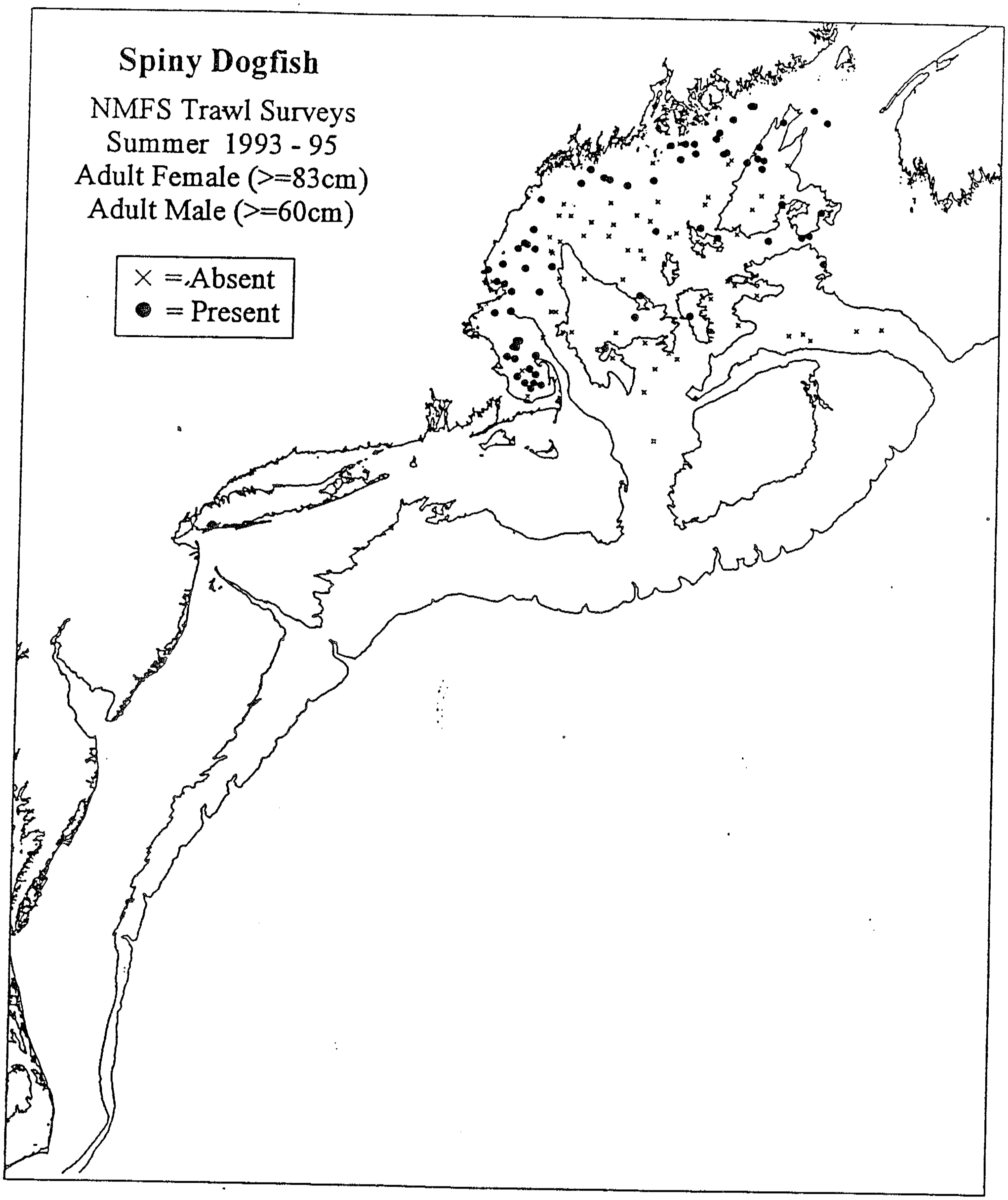


Figure 10. Distribution of stations sampled and stations where spiny dogfish were captured from NMFS, NEFSC bottom trawl surveys.
Source: McMillan and Morse 1998.

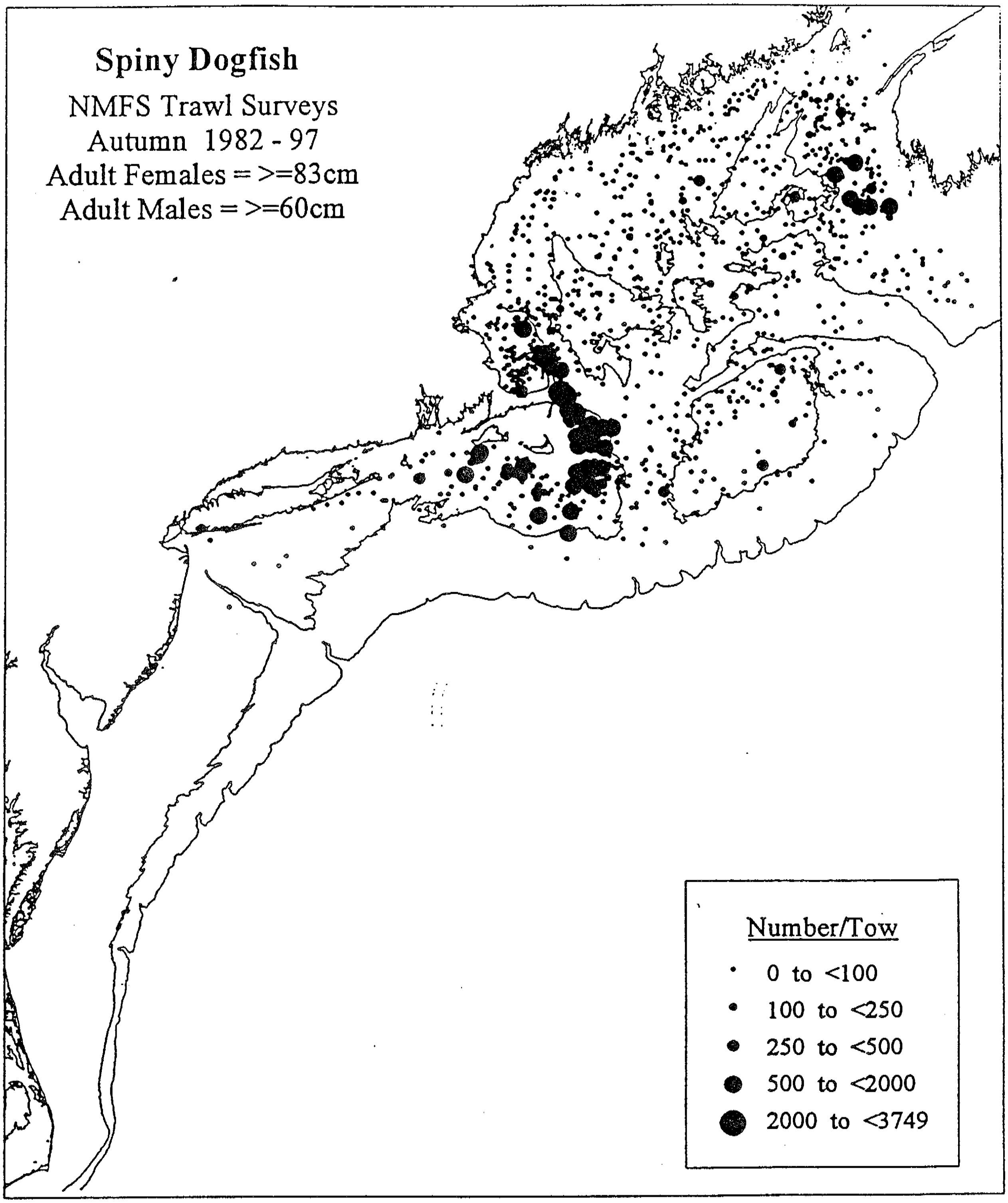


Figure 11. Distribution and relative abundance of spiny dogfish from NMFS, NEFSC bottom trawl surveys.
Source: McMillan and Morse 1998.

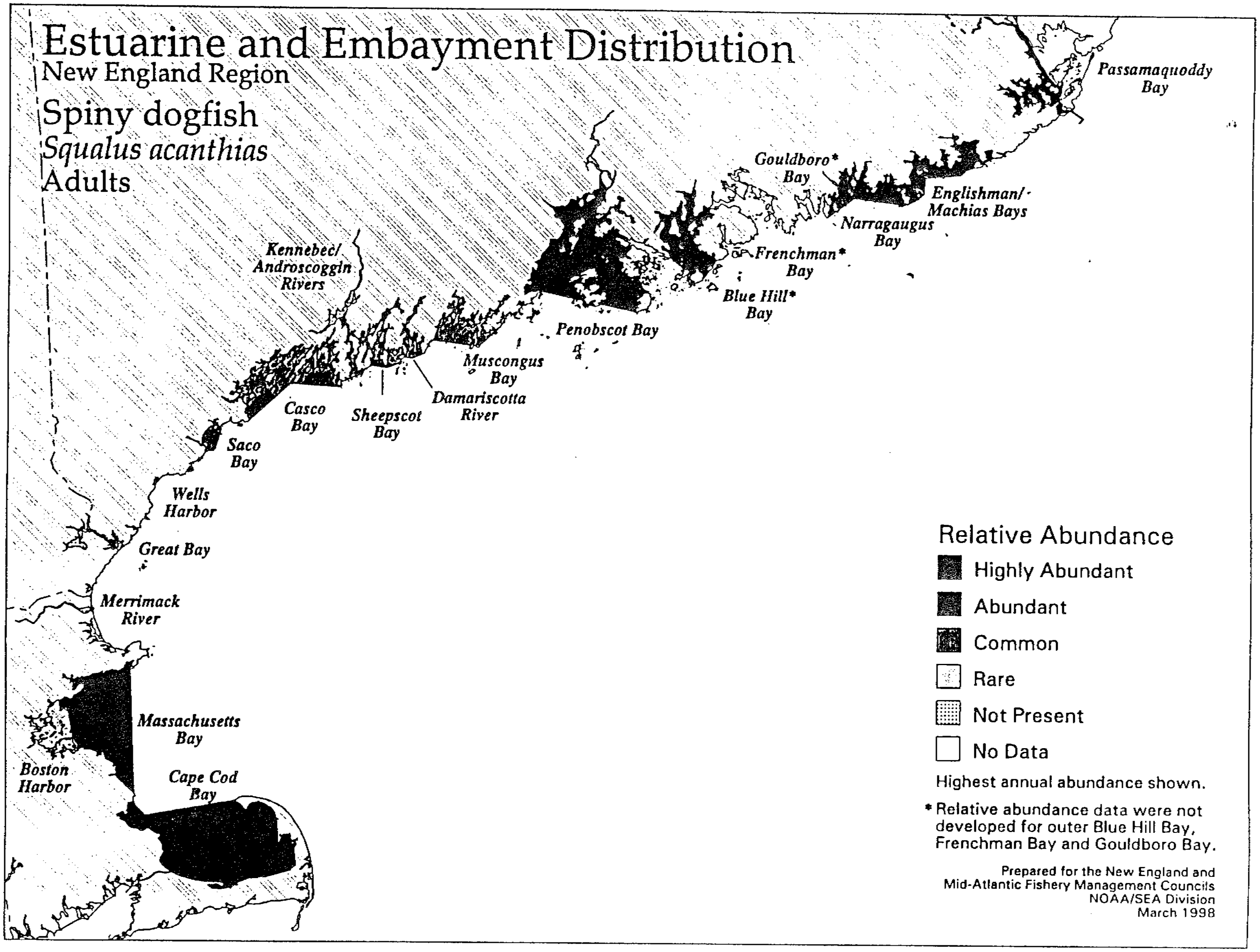


Figure 12. **Relative abundance and distribution of juvenile dogfish in Atlantic coast estuaries. Those estuaries in which juvenile dogfish are classified as abundant or common are designated as EFH.**
Source: ELMR data.

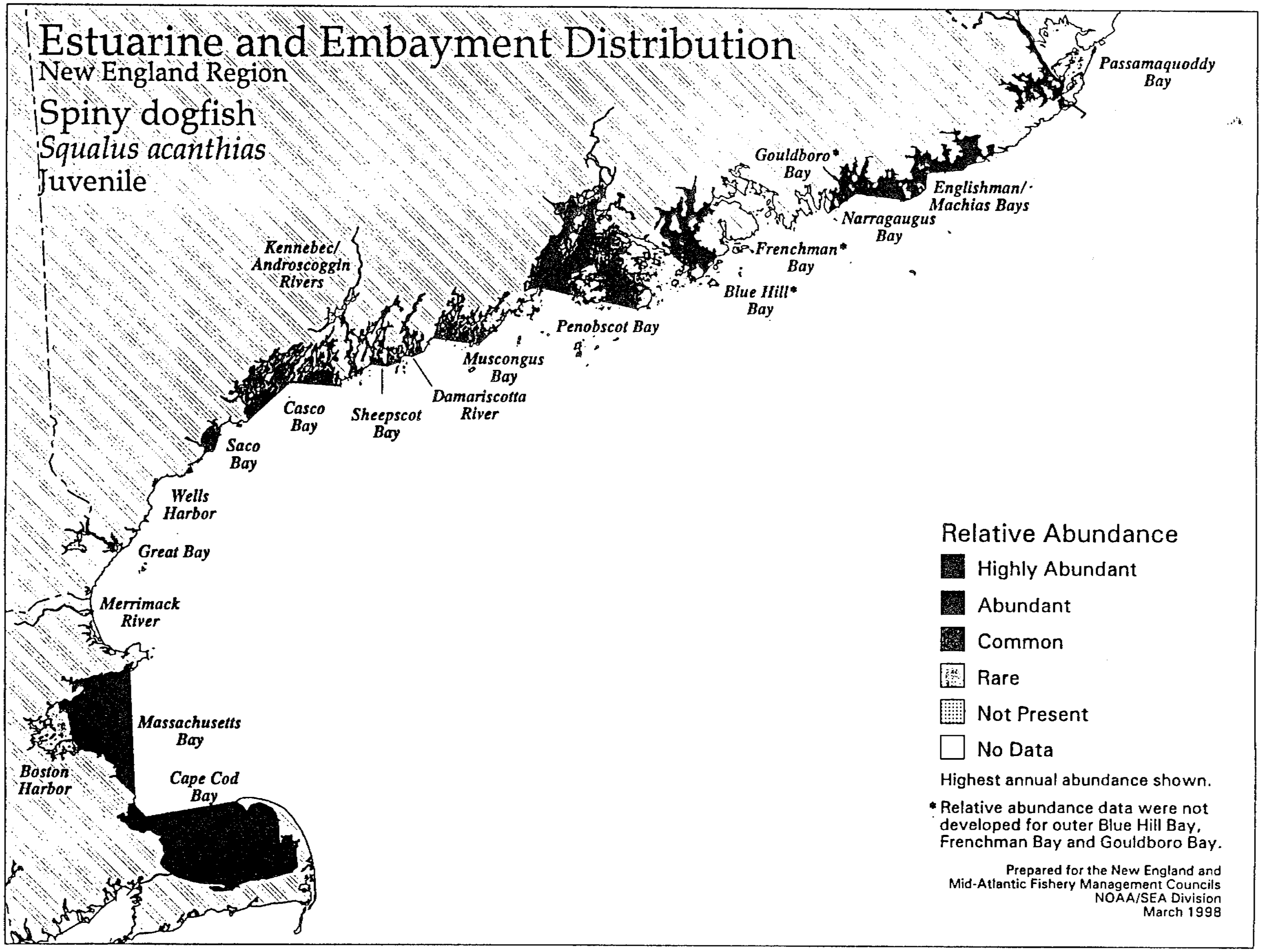


Figure 13. Relative abundance and distribution of adult dogfish in Atlantic coast estuaries. Those estuaries in which adult dogfish are classified as abundant or common are designated as EFH.
Source: ELMR data.

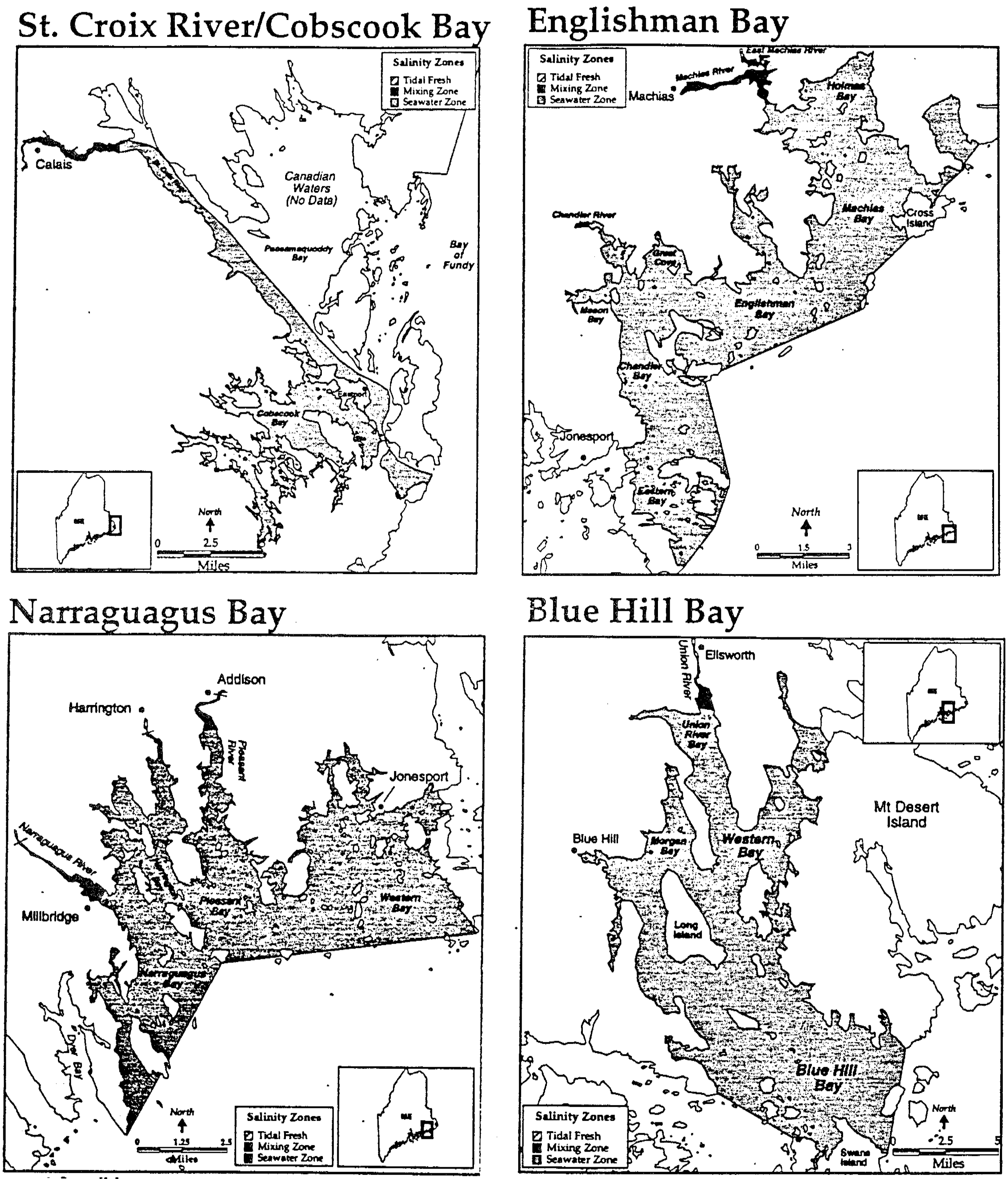


Figure 14. Salinity zone maps for the New England estuaries (to be used with ELMR data.)
Source: NOAA 1996.

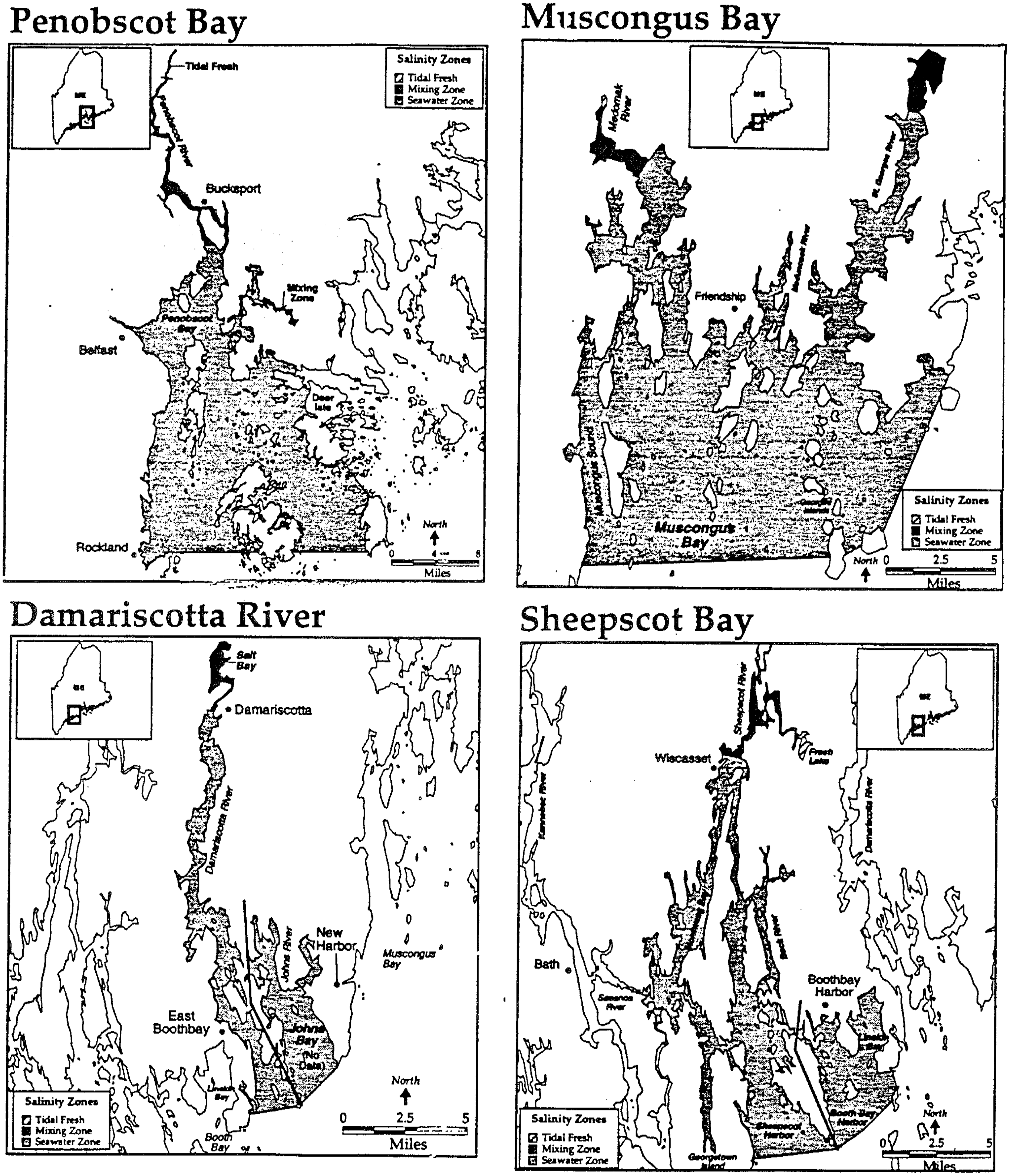
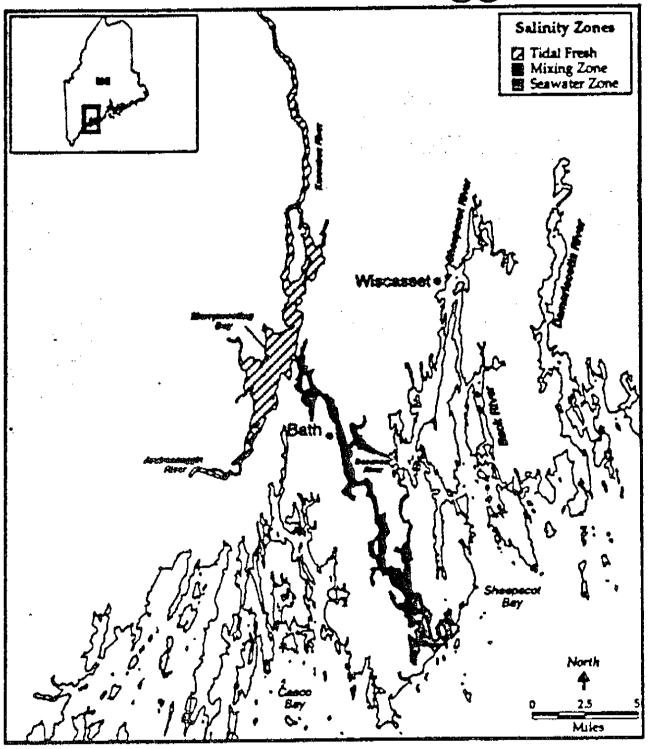
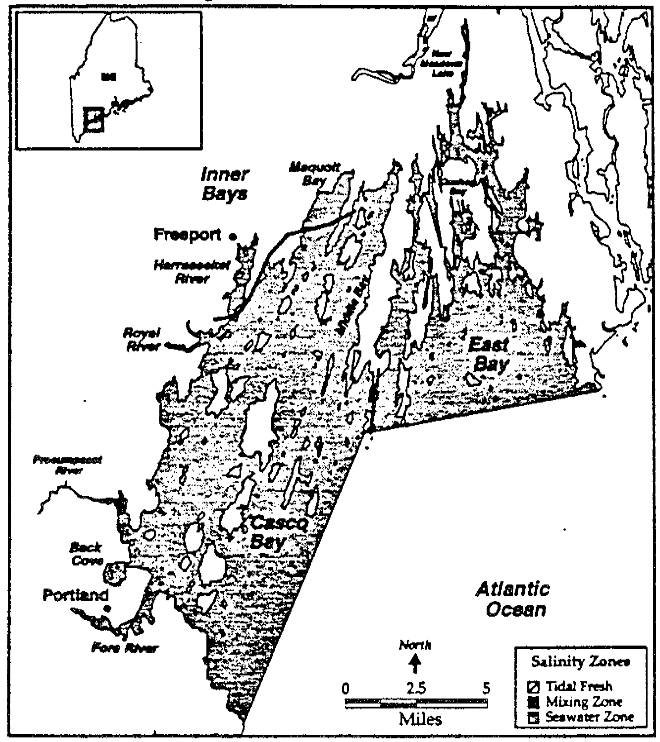


Figure 14 (continued). Salinity zone maps for the New England estuaries (to be used with ELMR data).
Source: NOAA 1996.

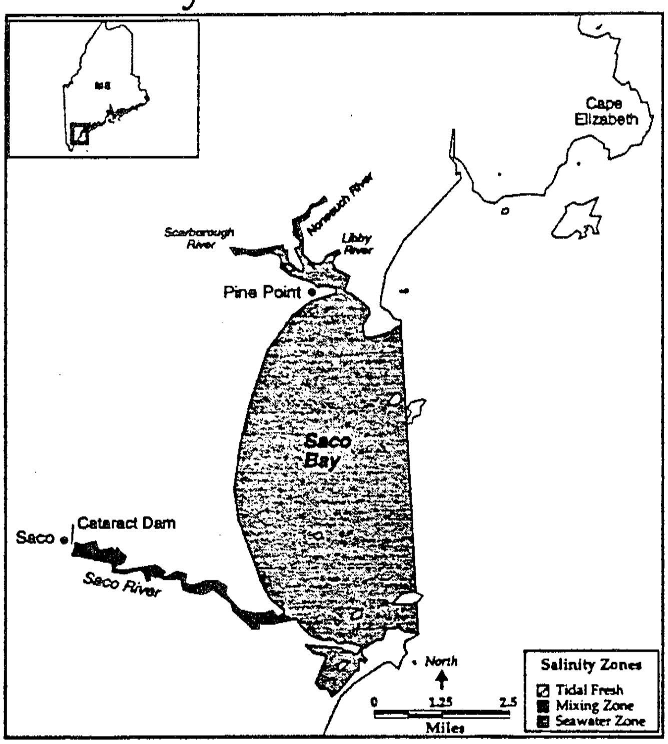
Kennebec/Androscoggin Rivers



Casco Bay



Saco Bay



Great Bay

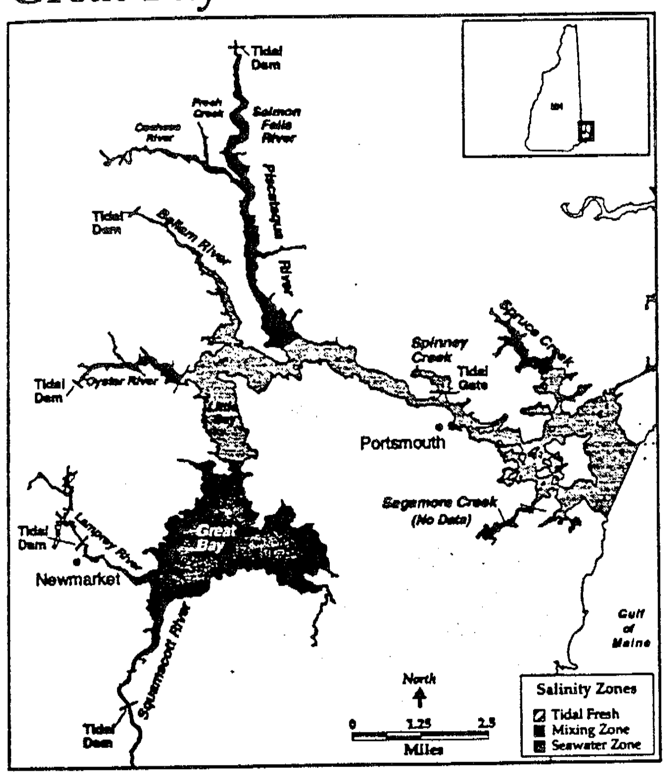


Figure 14 (continued). Salinity zone maps for the New England estuaries (to be used with ELMR data).
Source: NOAA 1996.

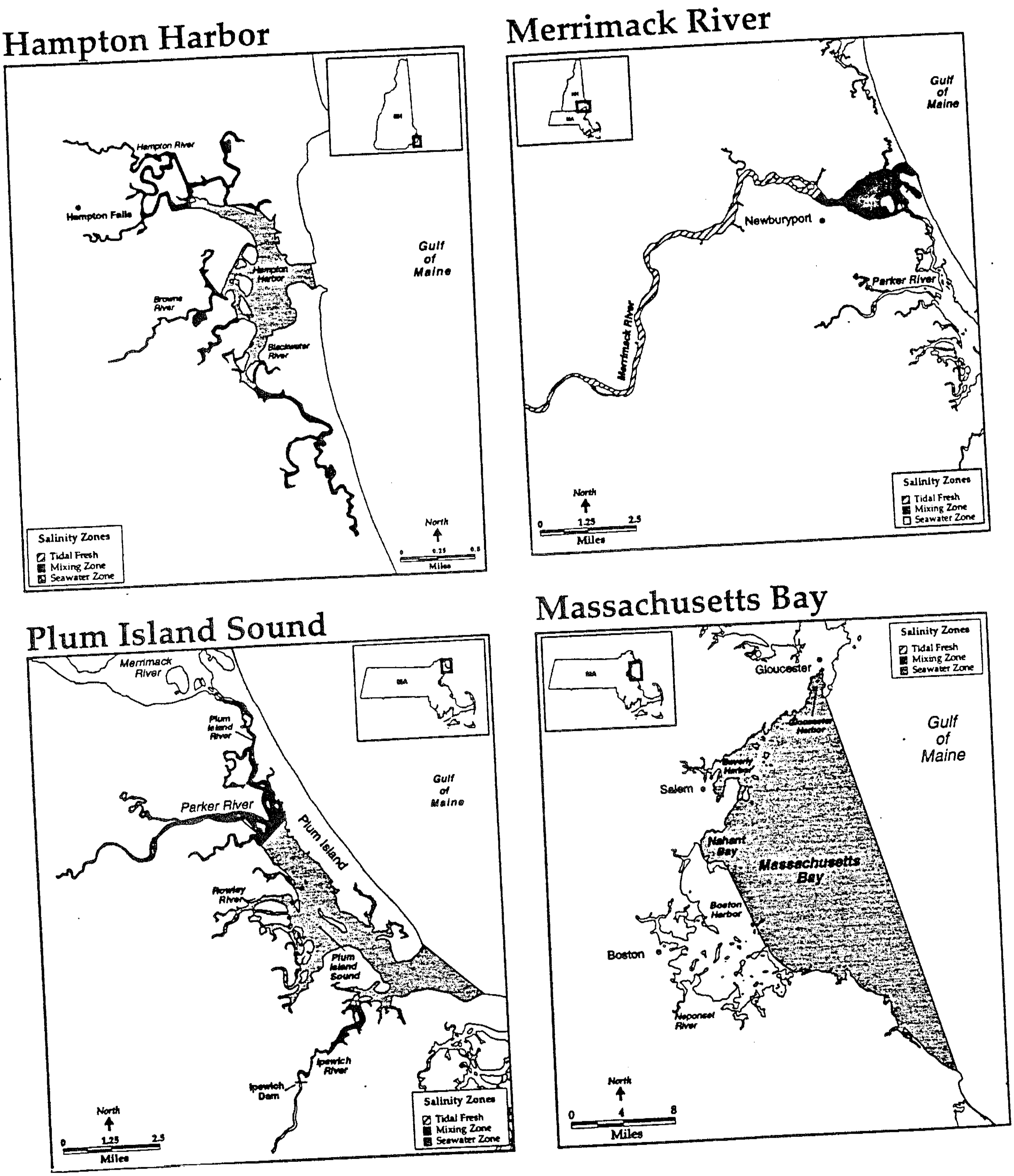
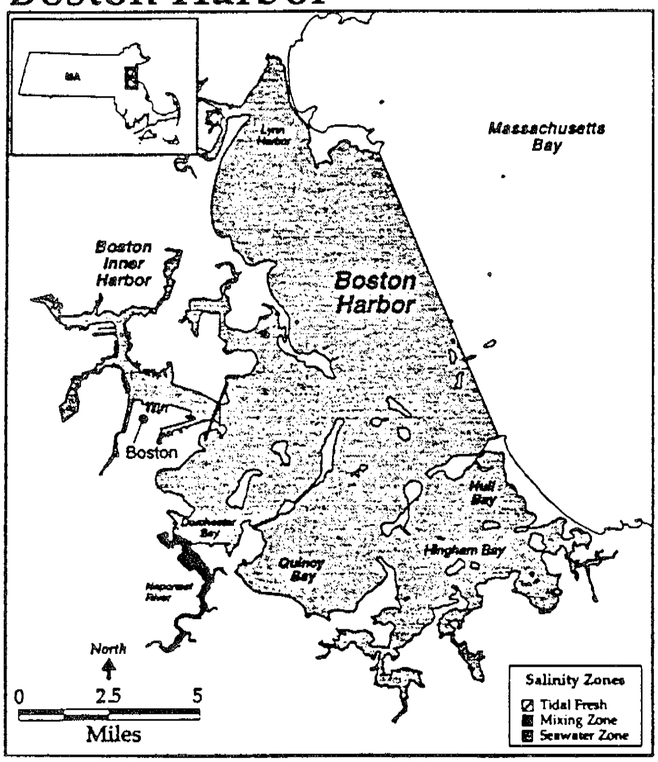


Figure 14 (continued). Salinity zone maps for the New England estuaries (to be used with ELMR data).
Source: NOAA 1996.

Boston Harbor



Cape Cod Bay

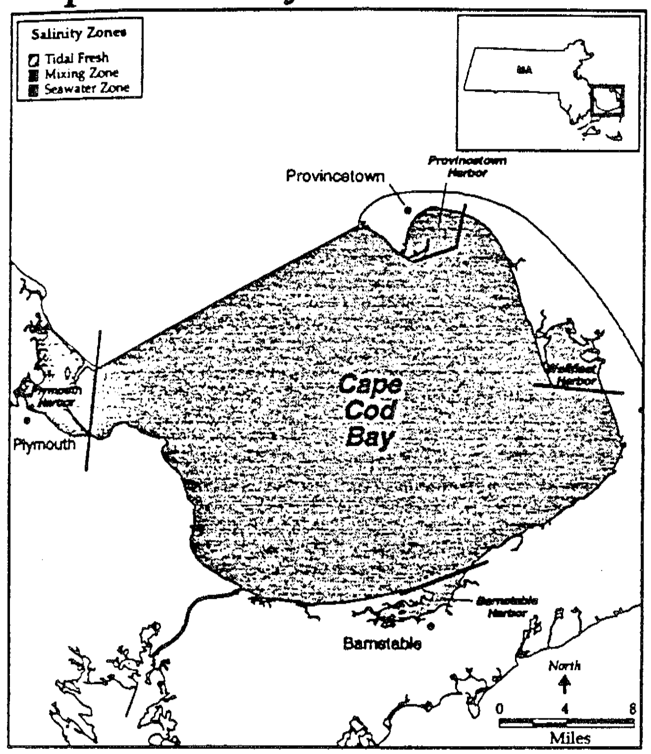


Figure 14 (continued). Salinity zone maps for the New England estuaries (to be used with ELMR data).
Source: NOAA 1996.

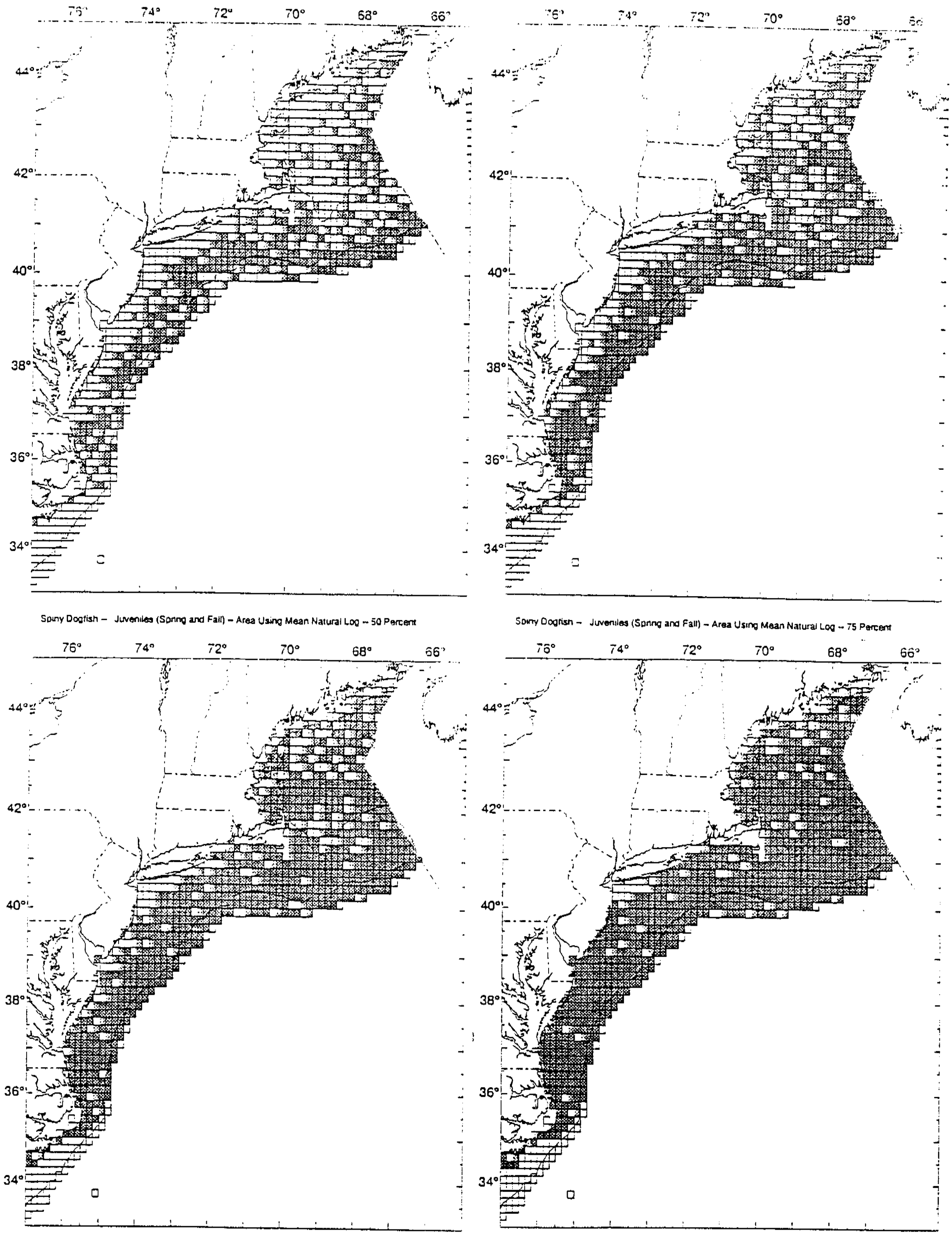


Figure 15a. Four options for designating EFH for juvenile dogfish under Alternative 5, the preferred alternative: 1) the top 50% of the area, 2) the top 75% of the area, 3) the top 90%, and 4) the top 100% of the area where juvenile dogfish were found in the NEFSC trawl survey.
Source: Cross pers. comm.

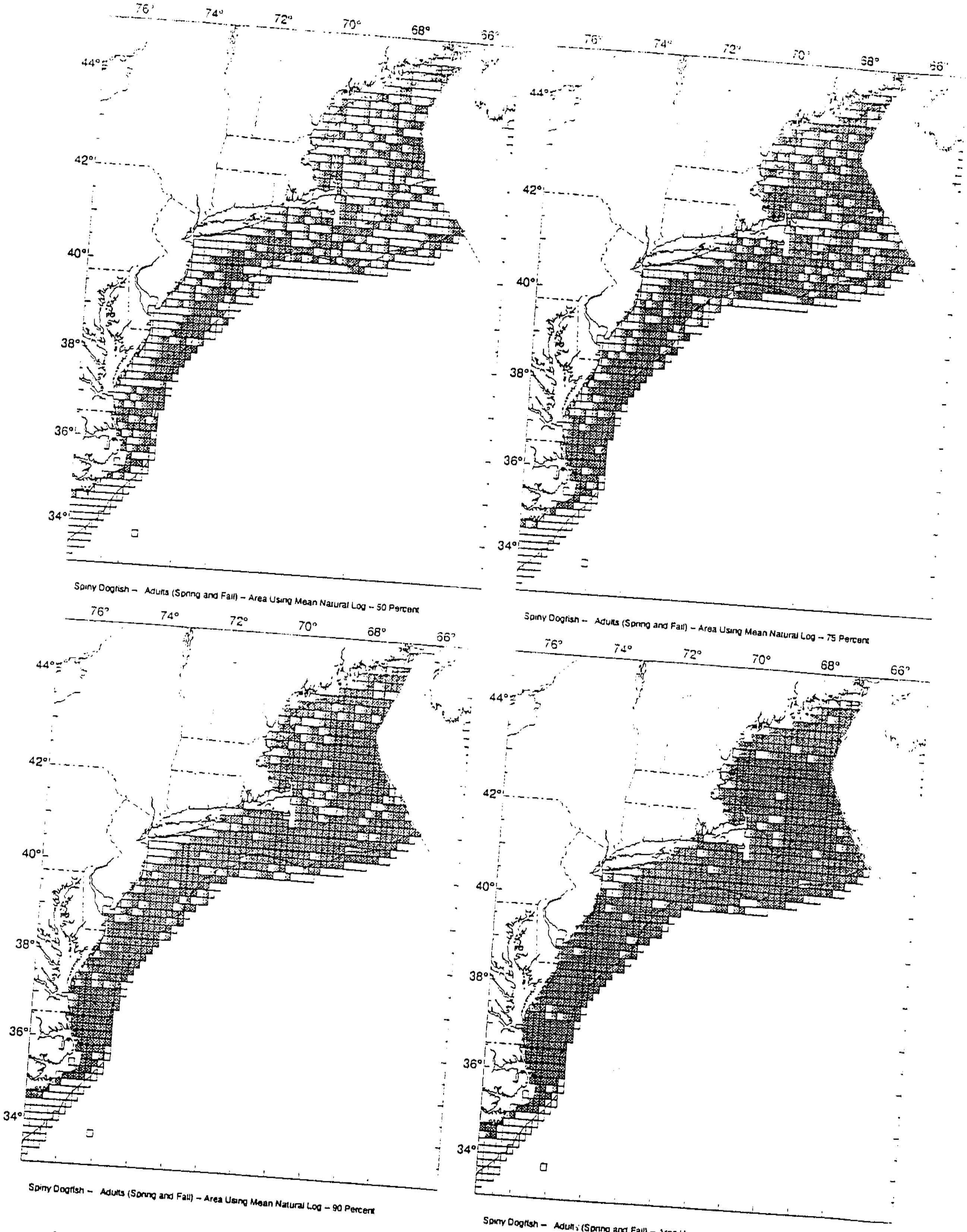


Figure 15b. Four options for designating EFH for adult dogfish under Alternative 5, the preferred alternative: 1) the top 50% of the are, 2) the top 75% of the area, 3) the top 90%, and 4) the top 100% of the area where adult dogfish were found in the NEFSC trawl survey.
Source: Cross pers. comm.

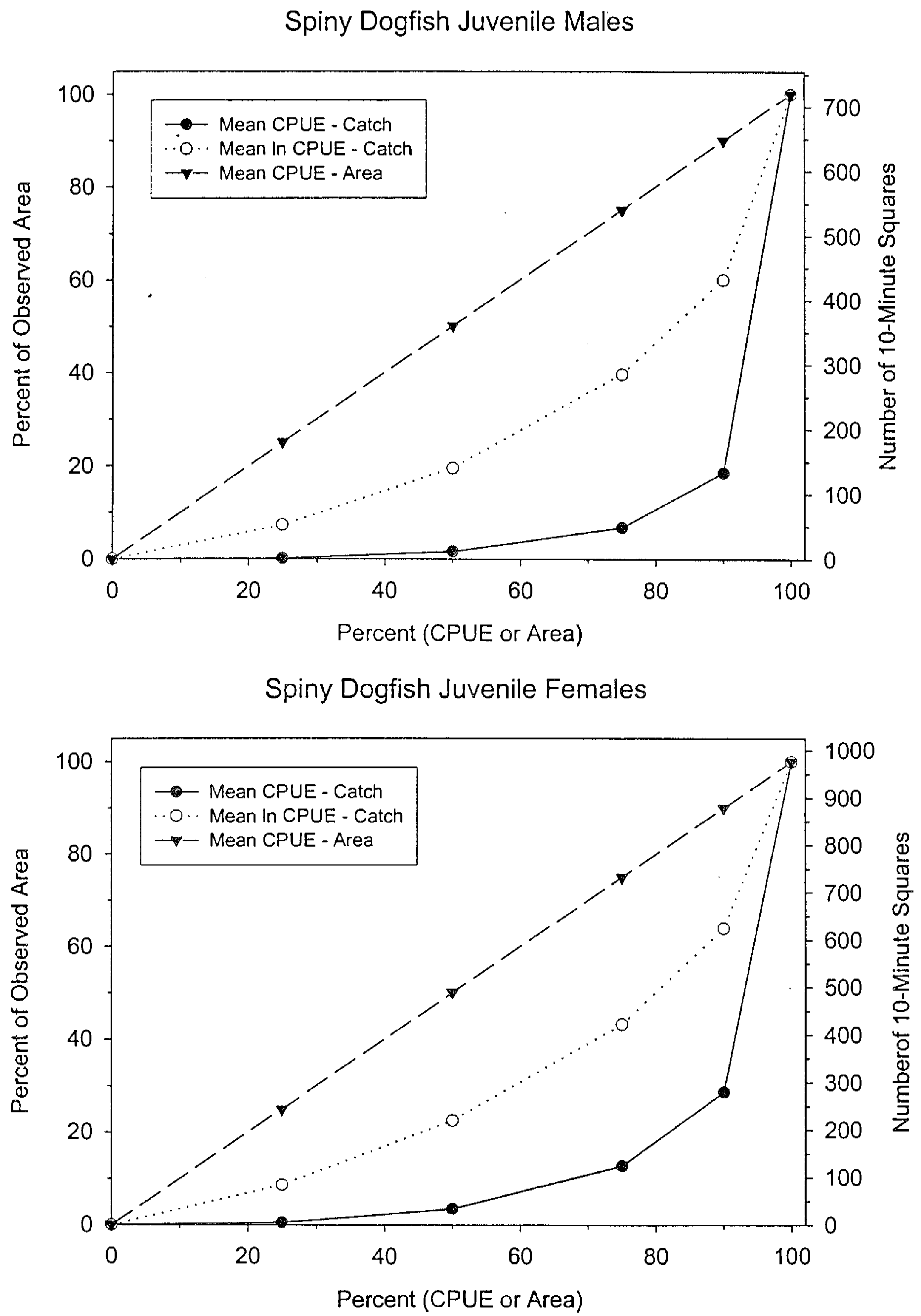
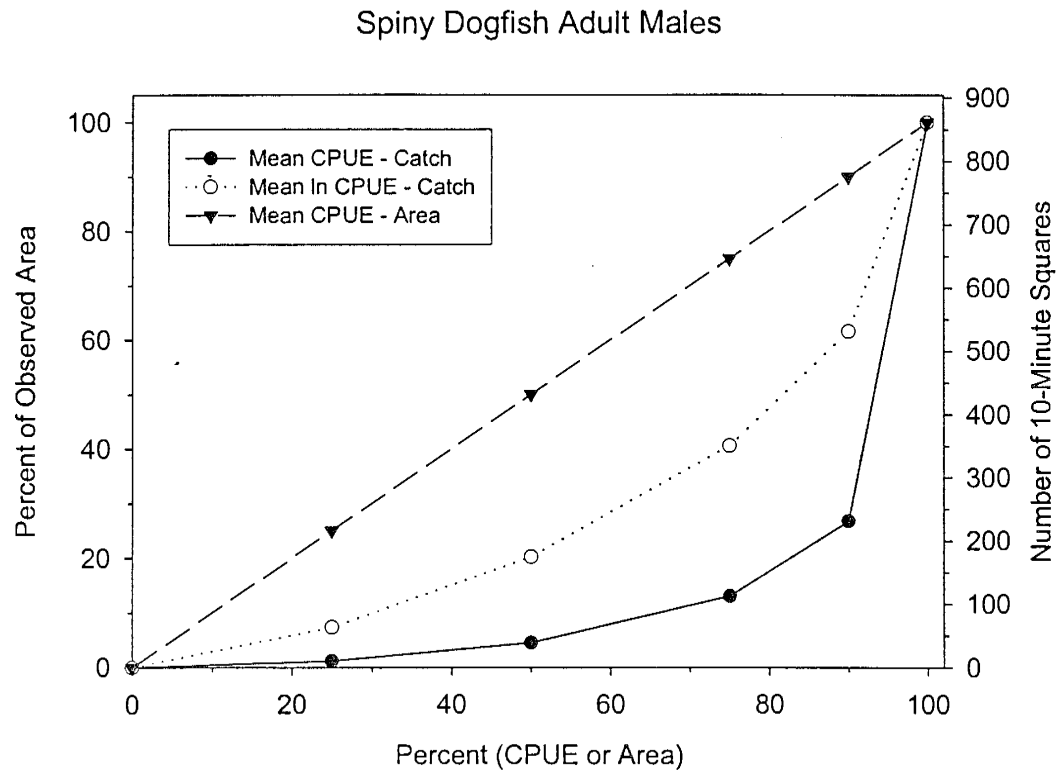


Figure 16a. Graphical representation of percent area and numbers of 10 minute squares encompassed in the a) area analysis, b) logged CPUE analysis, and c) CPUE of female and male juvenile dogfish.
Source: Cross pers. comm.



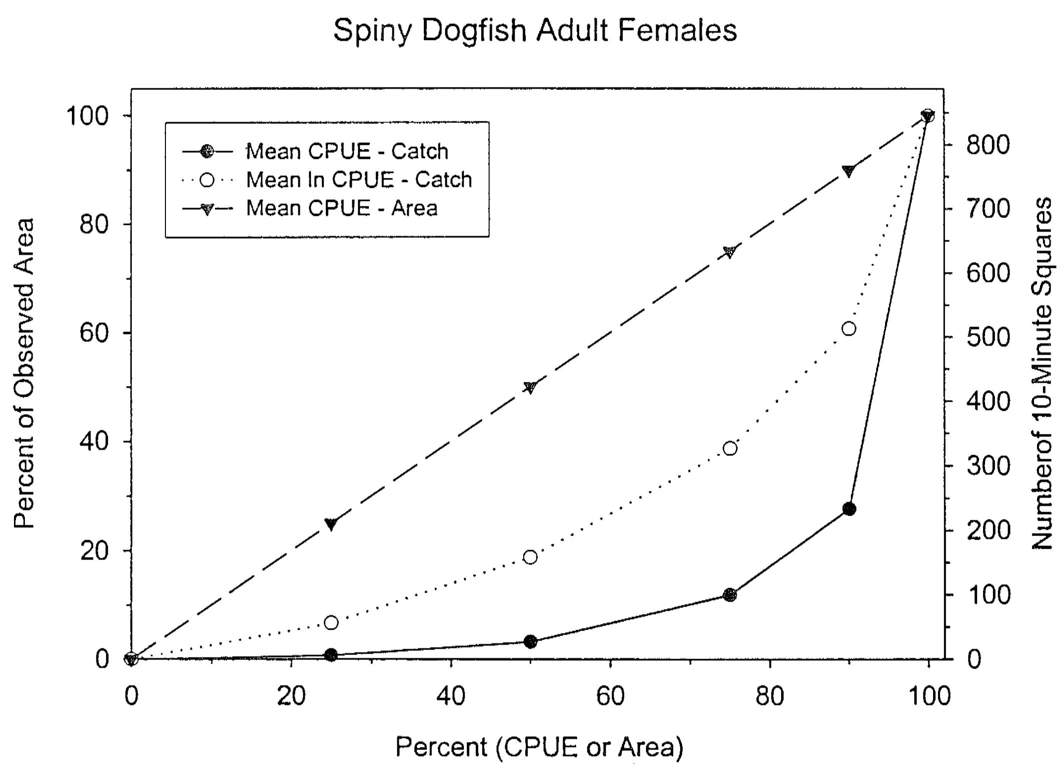


Figure 16b. Graphical representation of percent area and numbers of 10 minute squares encompassed in the a) area analysis, b) logged CPUE analysis, and c) CPUE of female and male adult dogfish.
Source: Cross pers. comm.

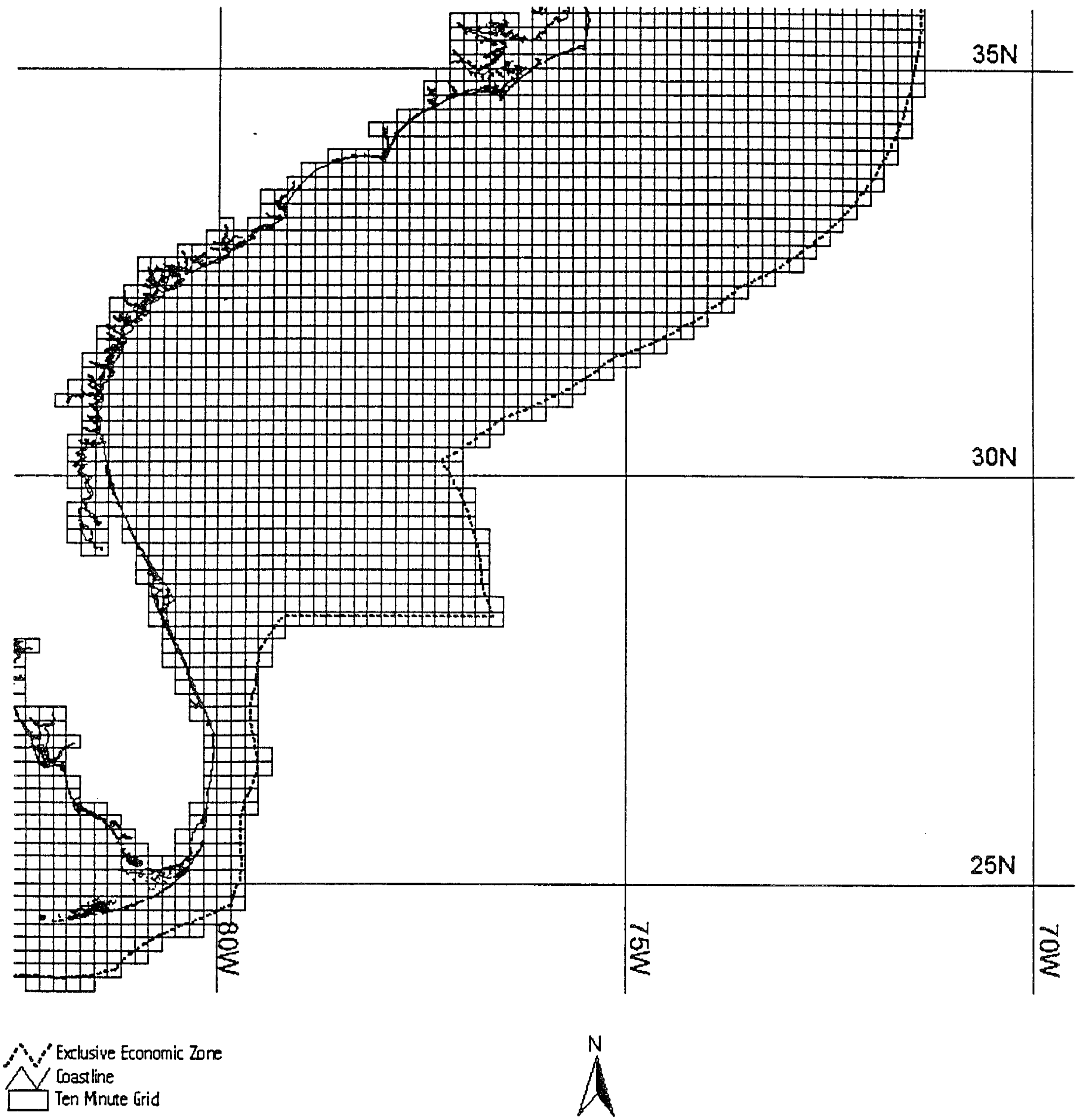
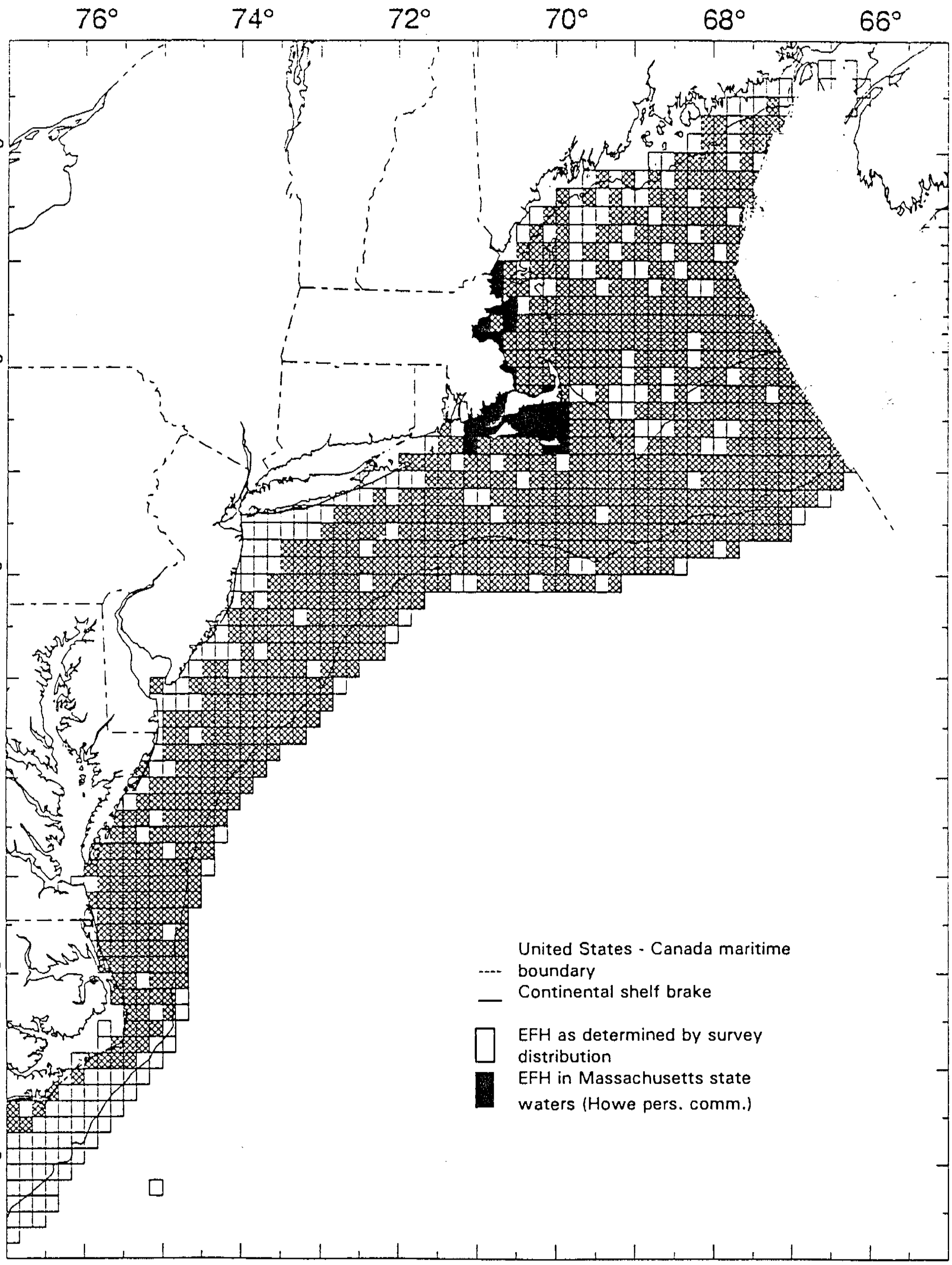
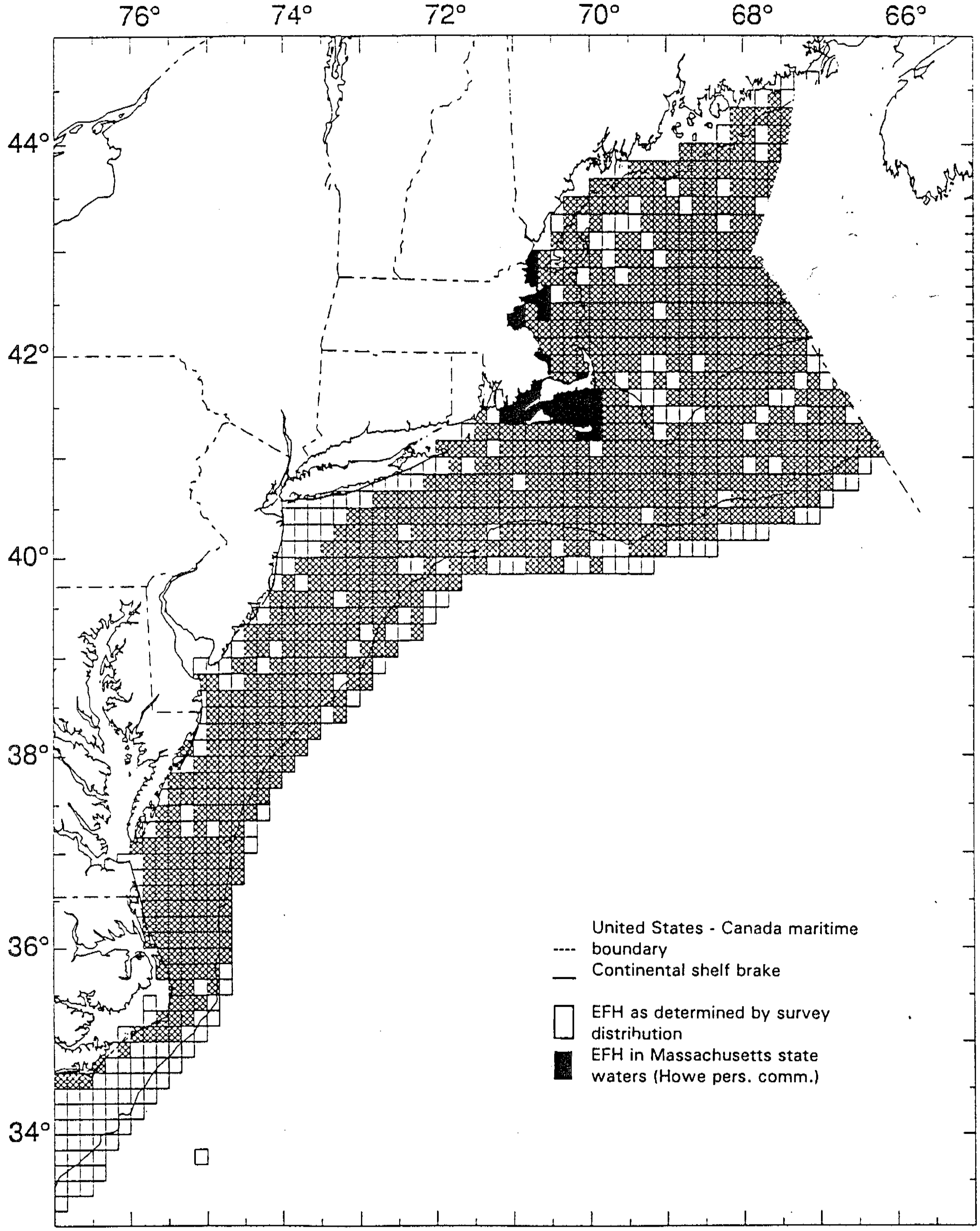


Figure 17. EFH for juvenile and adult dogfish south of Cape Hatteras, 100% of the epibenthic waters over the Continental Shelf (from the offshore boundary of the EEZ) through Florida.
Source: Cross pers. comm.



Spiny Dogfish -- Juveniles (Spring and Fall) -- Area Using Mean Natural Log -- 90 Percent

Figure 18. EFH for juvenile dogfish, areas which encompasses the top 90% of the areas where female and male juvenile dogfish were collected by the NEFSC trawl survey between 1963 and 1966.
Source: Cross pers. comm.



Spiny Dogfish -- Adults (Spring and Fall) -- Area Using Mean Natural Log -- 90 Percent

Figure 19. EFH for adult dogfish, areas that encompass the top 90% of the areas where female and male adult dogfish were collected by the NEFSC trawl survey between 1963 and 1996. Source: Cross pers. comm.

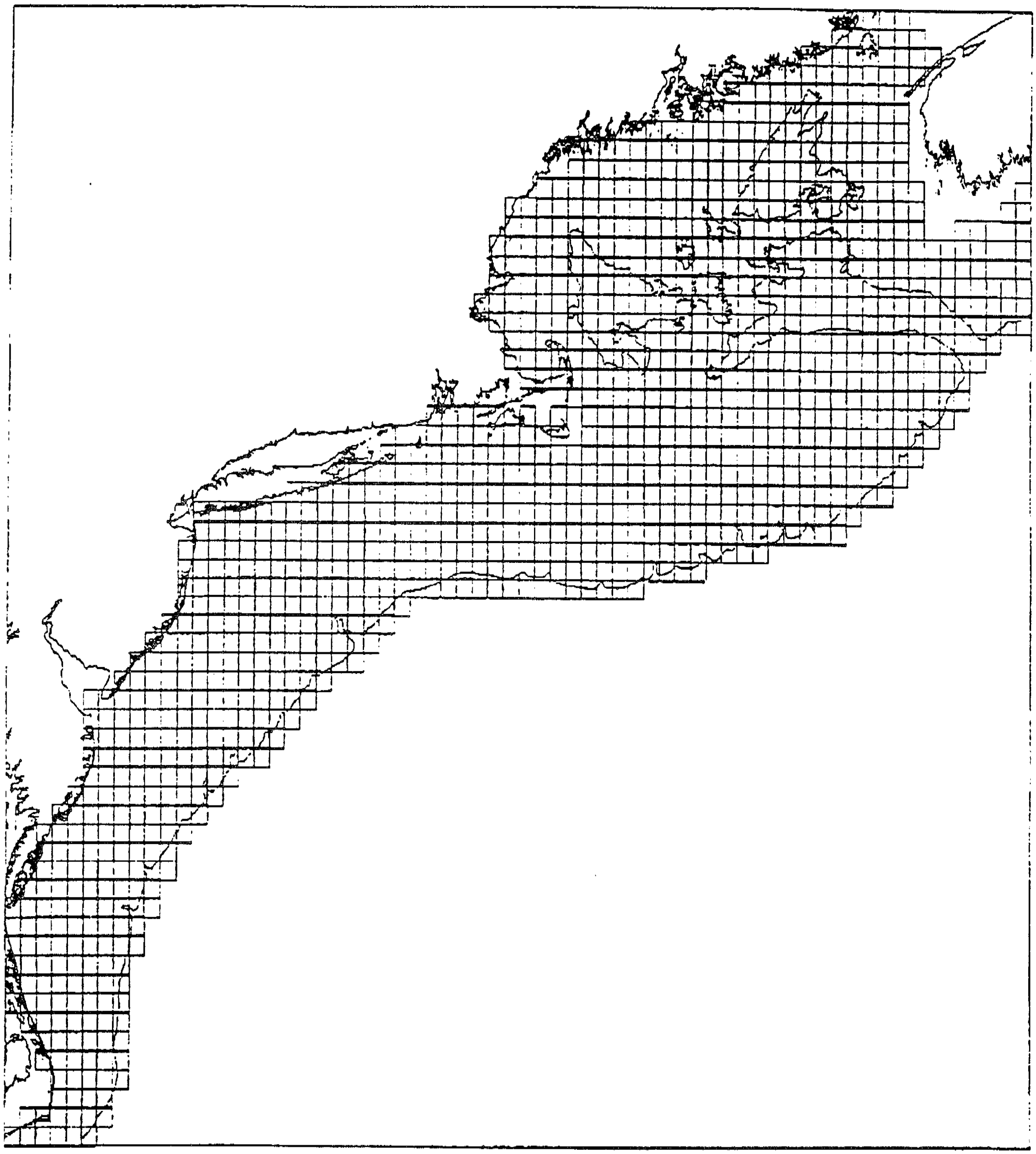


Figure 20. Blank 10 minute grid, north of Cape Hatteras, NC for input by the public on dogfish EFH.

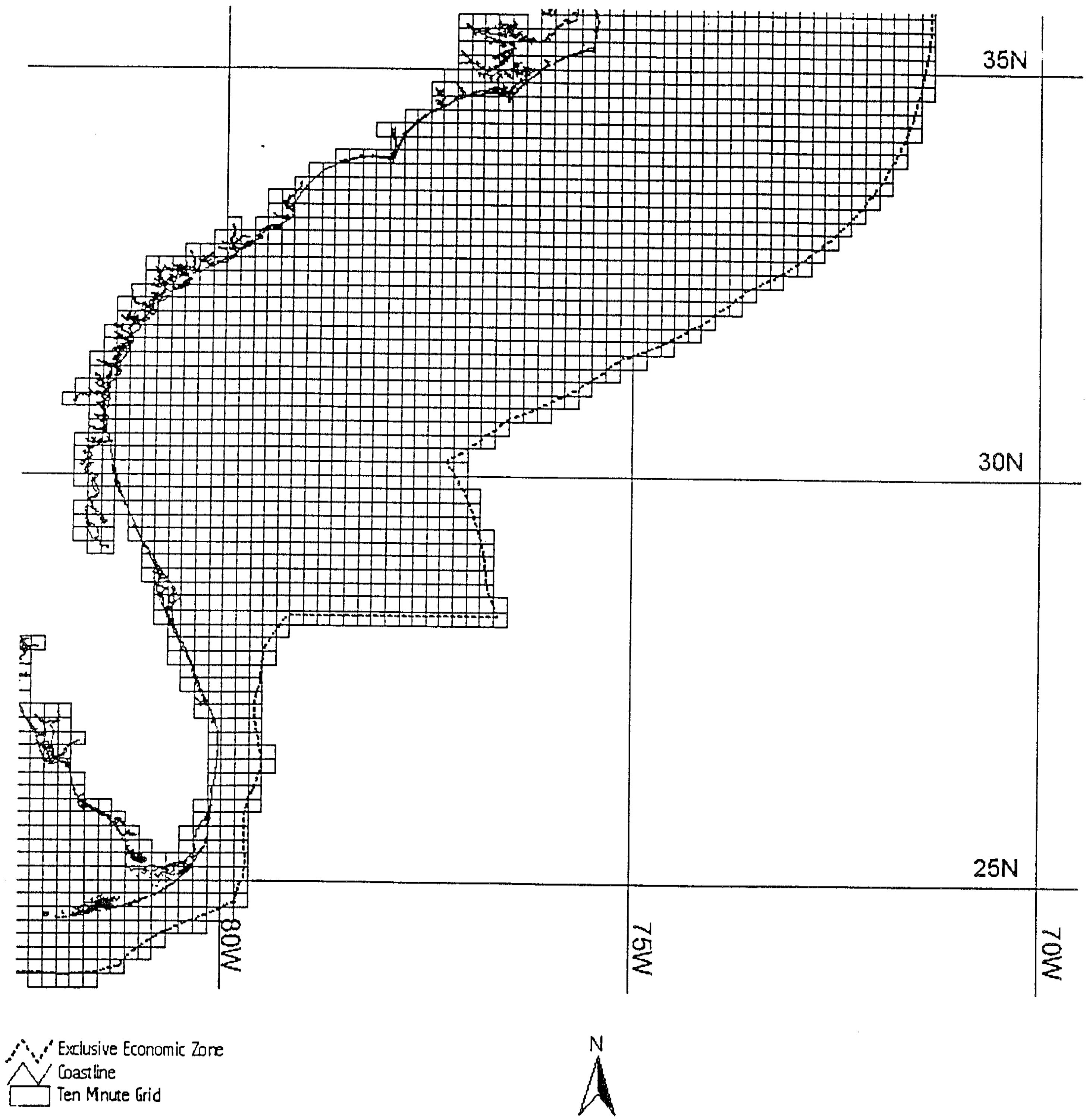


Figure 21. Blank 10 minute grid, south of Cape Hatteras, NC for input by the public on dogfish EFH.

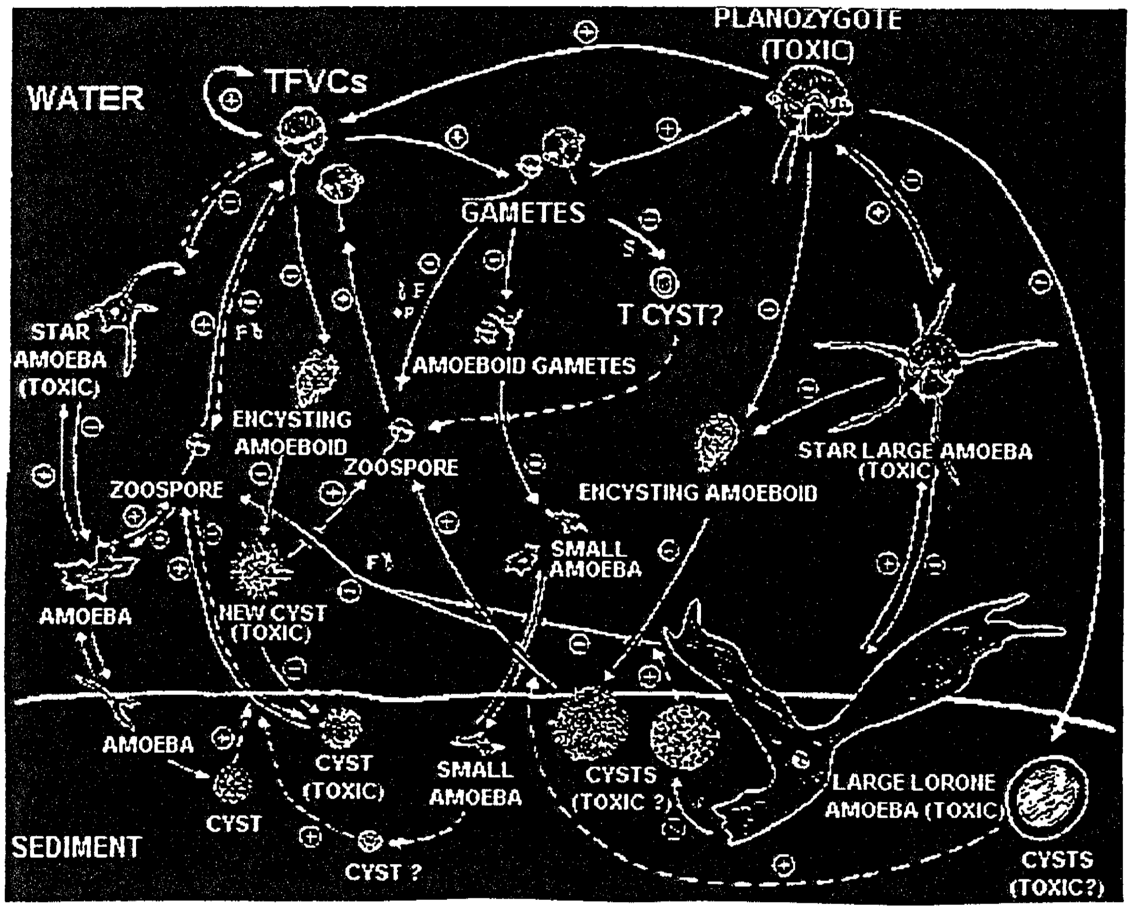


Figure 22. Diagrammatic life history of *Pfiesteria piscicida.*
Source: NCSU 1998.

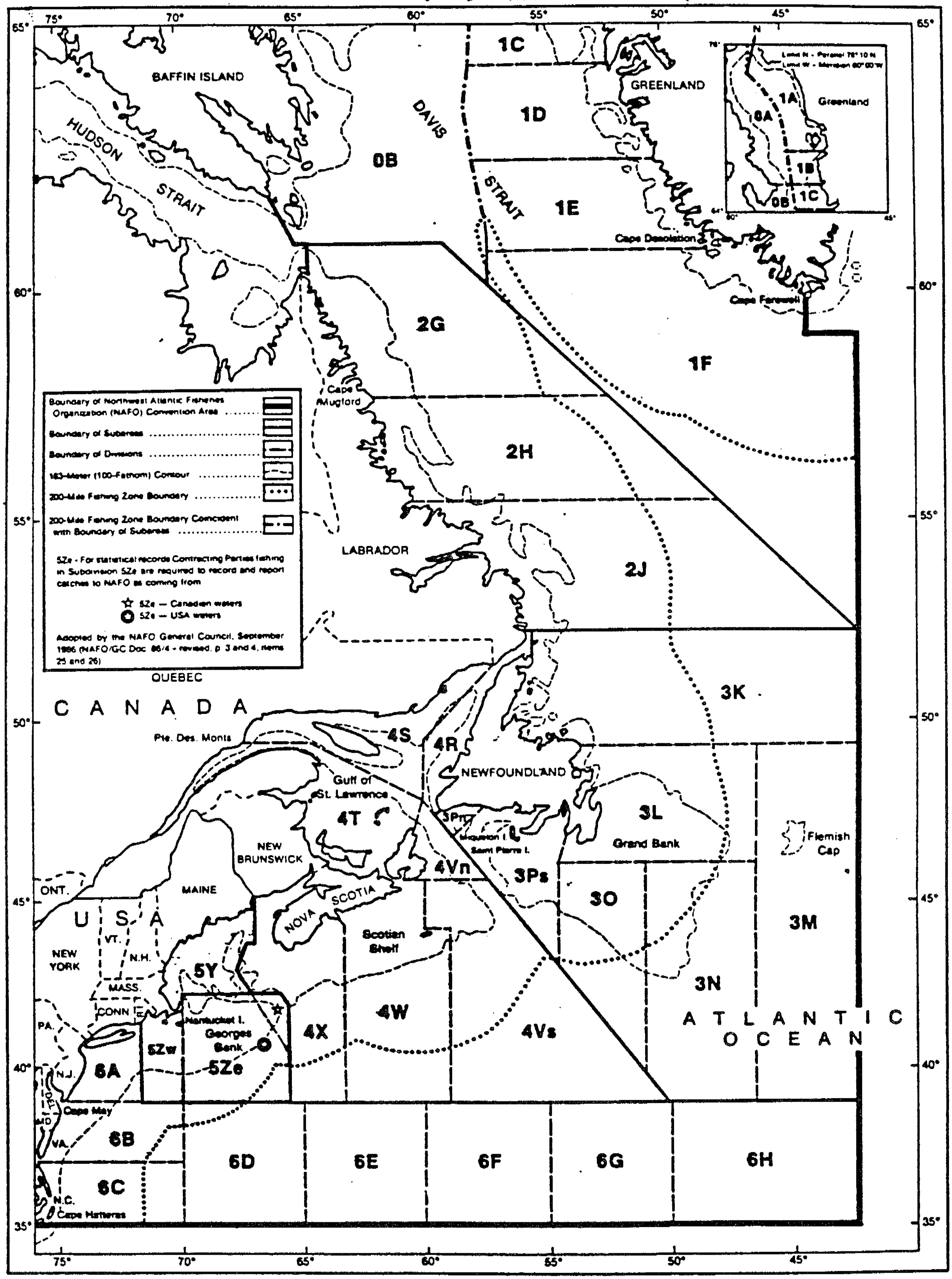


Figure 23. NAFO statistical areas used to report commercial landings in the Northwest Atlantic.

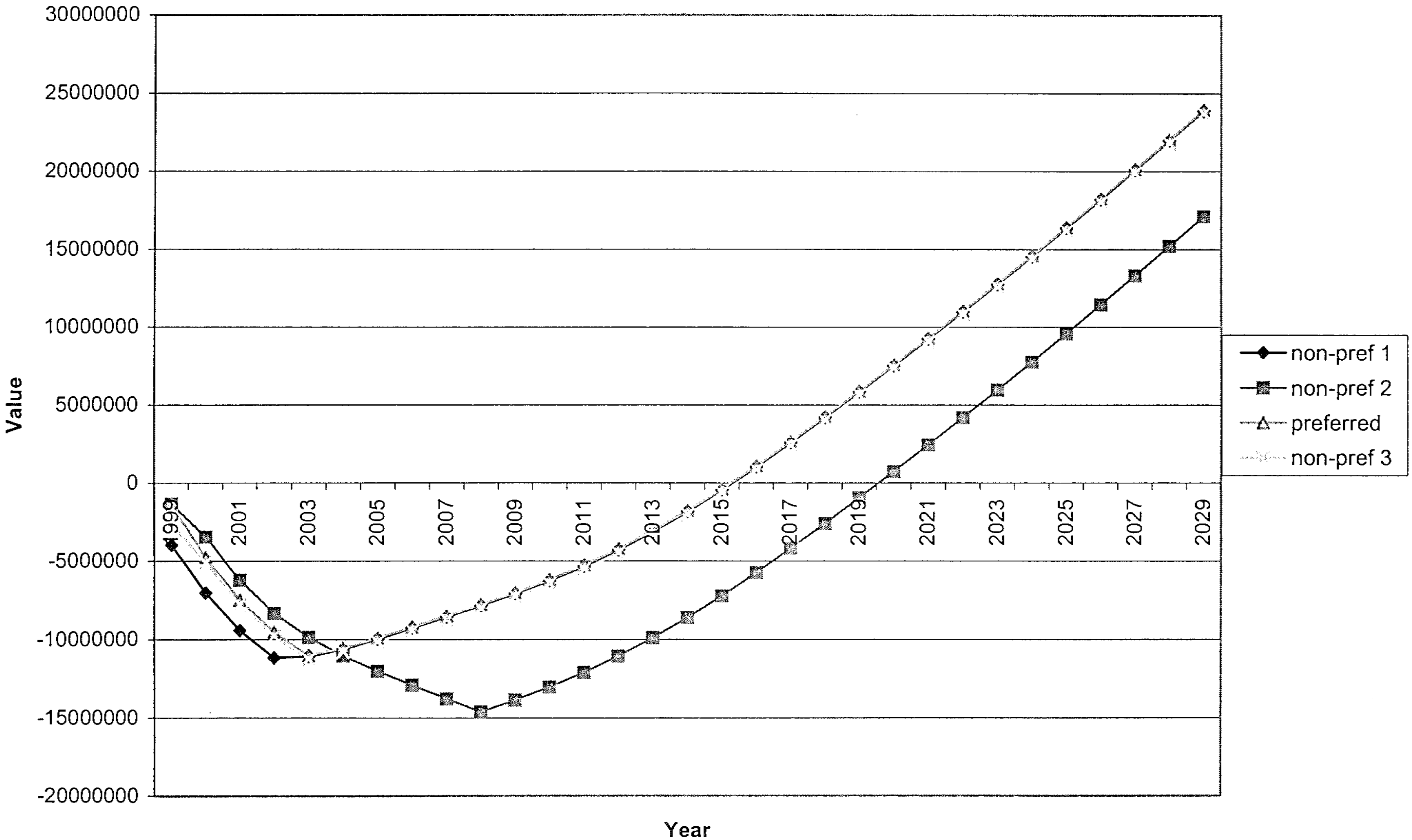


Figure 24. Management options minus status quo (cumulative, no discounting).

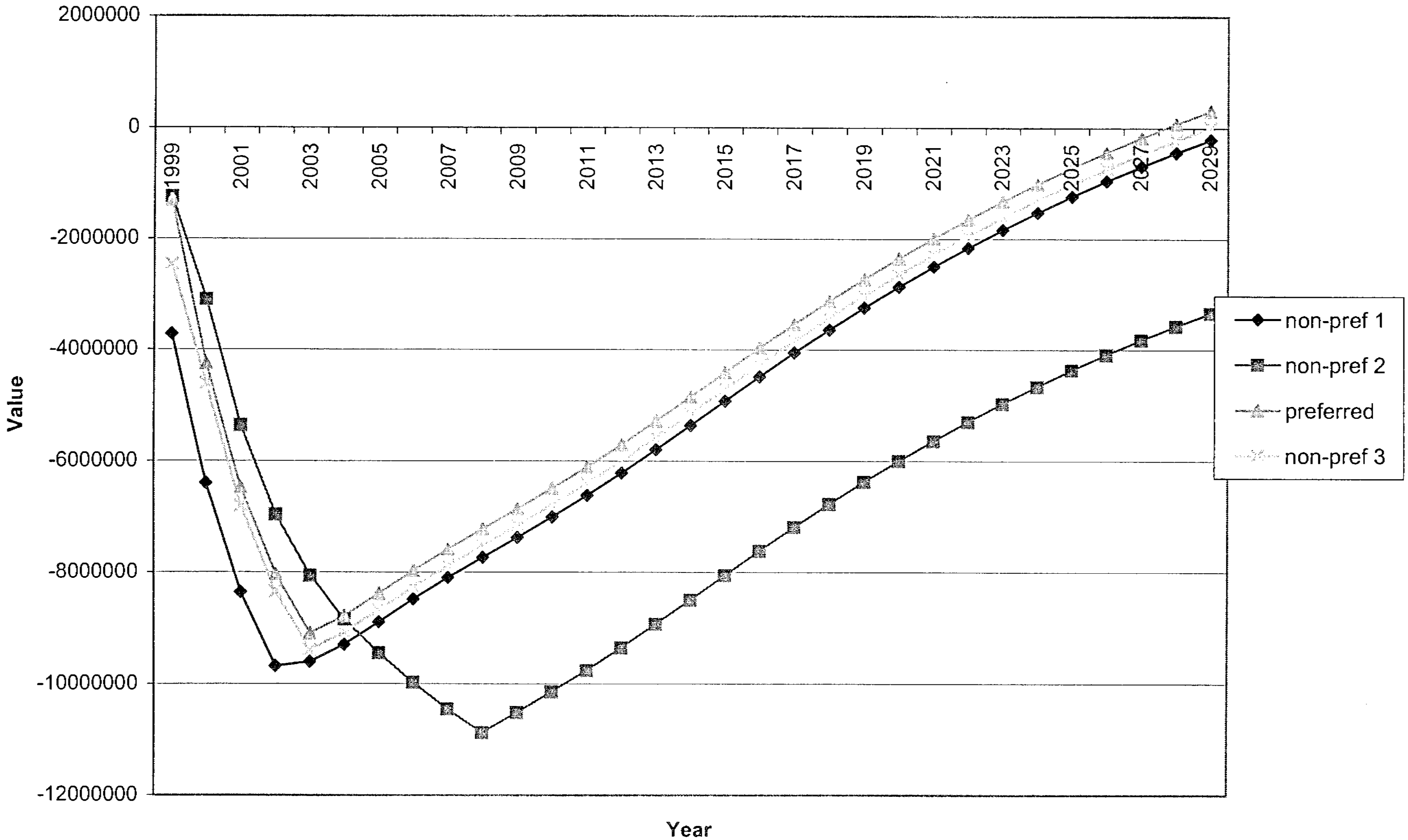


Figure 25. Management options minus status quo (cumulative, disc.=7%).

APPENDIX 1. PUBLIC HEARING SUMMARIES
SPINY DOGFISH FMP

26 OCTOBER 1998, FAIRHAVEN, MA

The hearing was opened by David Pierce, MA Div. of Marine Fisheries at 7:03 PM. There were eight members of the public present. Rich Seagraves, MAFMC staff, presented a summary of the Spiny Dogfish FMP. The hearing was then opened to public comment.

Steve Barndollar, owner/operator of Sea Trade International, stated that his company alone processed 13-14 million pounds of spiny dogfish last year. He is very concerned that this plan is on the fast track. He has some fundamental questions about the Sustainable Fisheries Act. He noted that there is a negative relationship between dogfish and other species that they prey on or compete with. Maintaining dogfish at a very high level of abundance will have a negative effect on other species. The actions proposed in the FMP are precipitous and quick. The Councils should consider phasing the measures in over a longer time frame. Operators in this business made their business decisions based on the designation of this species as an underutilized resource. Now suddenly this plan is being rushed into place. The plan will affect over 500 people in New Bedford directly. He argued that the quota should be phased in a more gradual approach. He favors a gradual phase in over a two or three year period. He suggested a 20,000 mt quota in year one and a 10,000 mt fishery in year 2. Other plans, for example monkfish, have taken years to develop. Why is this plan being developed so fast? There is a lot of variability from year to year in this fishery with respect to the availability of dogfish. The gill netters are using smaller mesh now, which explains why they are catching smaller fish.

Joe Beck stated that this year has been a peculiar year. There is not enough scientific information given in the plan to justify the management actions proposed. Even if you allow a 20 million pound quota there will be no fishery. There are five processors currently active. None of these businesses can be sustained on the quotas that are proposed in this FMP. There is no consideration of the economic problems the plan will create. No one will be around to buy the small amounts of quota proposed in the plan. The market for dogfish is in Europe. We are currently reaching maximum prices. This market will be lost if this plan goes into effect. The SFA is going to kill this fishery. The plan needs better scientific information. No one has ever come to his place and sampled dogfish. The plan is also going to be faced with major enforcement problems. New England is where the major concentration of fishing is.

Henry Gioni stated that New Bedford was not well represented tonight because the draggers for dogfish were out fishing. They will be better represented tomorrow night. He feels they sizes are not available as they used to be but the sizes are still there. These boats can catch 11,000 -14,000 pounds of dogfish per tow. The sizes are still there and the market has a lot to do with it. The draggers in this fishery were the pioneers and can best describe the fishery.

The hearing was closed at 8:03 PM.

27 OCTOBER 1998, HYANNIS, MA

The hearing was opened by David Pierce, MA Div. of Marine Fisheries at 7:00 PM. There were 25 members of the public present. Also present was Andy Applegate, NEFMC staff and Scott Steinback from NMFS. Rich Seagraves, MAFMC staff, presented a summary of the Spiny Dogfish FMP. The hearing was then opened to public comment.

Harvey Mickleson, an attorney representing Atlantic Coast Fisheries, stated that he was very upset with the inability of the Council to handle the economic impact that the proposed plan will have. The plan will destroy the market, both here and overseas. He is also concerned that the plan will not allow the medical applications of the dogfish resource. He stated that the ocean is full of dogfish with no place to go with them. He feels that in the case of dogfish it may be preferable to fish the stock out, why are the Councils protecting them? The harvesters and processors have done a good job developing this fishery. Notwithstanding the SFA mandates, this is one of those fisheries that should be fished down. The plan does not allow a great deal of time to adjust to the management program. The Councils have not investigated other options including gear modifications to allow escapement which may work in the directed fisheries. He does not understand how it could take 4 or 5 years to develop an amendment to the scallop plan and this could be done so fast with no mechanism for review once the plan goes into effect. He wants the Councils to consider delaying the exit fishery for a couple of years. The Councils need to intensely evaluate how this fishery operates. He is not aware of any other FMP with such stringent regulations. The plan is not really based on science. The Councils should be certain that they exhausted all other possible management options including gear modifications and size limits before the fishery is closed. The industry has poured in millions of dollars into the development of this fishery here and abroad to develop this fishery to produce food and other goods. What is the survival rate of discards? The Council needs to consider other alternatives. The Council needs to collect better data from the fishery through at sea observers before they even attempt to manage the fishery. What is needed is a well funded industry/science research study partnership like in the case of scallops. Is there some analysis of what the dogfish population looked like ten years ago? There is an economic insulation present that will protect this stock, when they are fished below a certain level fishing will cease and then they will recover on their own. He doesn't understand what the Councils are worried about.

Frank Avila, F/V Playtime, stated that he worked to get the Nantucket Area opened up to fishing for dogfish as an experimental fishery. What he sees in the ocean does not agree with the findings of the FMP. The biomass that the Councils are considering from ME-NC is a lot of bull. Water temperature is a big factor. The fish leave here and go to the area off Atlantic City. He fishes south and there were a massive number of large fish which showed up. The biomass estimates in the plan are incorrect and the Councils should consider this fact before they put us out of business. He converted his boats to fish for spiny dogfish and now you are going to close down the fishery. There are plenty of females in the ocean, a huge number. The science is no good, the Woods Hole Survey numbers are no good. Once you cut the fishery down you can forget it. France is already looking elsewhere to replace the US product. He is able to fish clean and can reduce the number of small fish that he catches. He can selectively fish for any size fish that he wants. He can shorten his tow times. The dogfish eats valuable groundfish and this needs to be considered. The Councils need to look at this fishery for at least two more years before taking action. The proposals in this plan are crazy. MSY is anything the Councils want it to be. Congress came up with these rules and now the younger fishermen will have no future. Hopefully we can change it. The Councils need to come up with a plan that will allow the fishery to operate as long as possible. There has to be a way around this problem. You can't put us out of business in one year. He does not want to go fishing offshore. The government told him to go fishing for dogfish and now they turn around and are closing the fishery. If you are going with the levels of quota in the plan, don't waste time, just make the cuts immediately. He would like to take the biologists who do the assessments out on his boat. He feels the survival rate of the dogfish is very high.

John Our, Cape Gillnetters, stated that this whole picture is much bigger than dogfish. Amendment 5 said to go out and catch up the dogfish. You state that there are 127,000 mt of dogfish in the ocean, that is nothing. Where did you come up with the recovery level, what is it? This is crazy. These are fish that nobody wants. We should pulse fish these fish into extinction, get rid of the dogfish. We need to continue to fish the dogfish down below levels that currently exist. But the councils want to close down the fishery. You didn't do this with groundfish. When the directed fishery is done in a year, what is everyone going to do? There are over 100 gill netters who fish for dogfish, what will they do? They will be displaced back into groundfishing. This whole thing is bullshit. The best thing to do is keeping fishing the dogfish down. The 80 gill net limit is OK. He agrees with a 6.5 inch mesh and maybe a 10,000 lb trip limit. These fish are everywhere, this does not make any sense. Don't do this to us. This stock is not even close to collapse. If the council does this then there will be 100 more boats chasing groundfish. When these fisheries get closed, show me one example of when they were reopened. My message to the Councils is don't do this to us. What do the scientists think the survival rate of discarded dogfish is?

Joe Avila stated that he has been dogfishing for the last 5 or 6 years. He feels that they have not caught enough of the dogfish. If you want blackbacks to recover, kill the dogfish they are the predators. We need to get the biomass down at half of where it currently is. We have got to get rid of more dogfish. The ocean is full of them, just look how high our catches are and we are only fishing in small areas. He doesn't think there is a problem with the resource. He suggests that we fish them down as far as we can, they will recover on their own. Let us keep fishing the way we have. The discard problem will come from the plan, so the problem is manmade. We have done enough already, get rid of the dogfish. Nobody in the United States wants them. The Councils should change the target biomass to half of what is currently out there. There is no evidence that the dogfish are depleted. When we fish them down there are plenty of small ones so they will recover on their own. The Councils should consider as many other alternatives as possible including trip limits and size limits.

Greg Connors stated that the guys in this room are the traditional dogfish fishermen and they are the ones who will be hurt by this plan. The dogfish are predators of groundfish. There are too many dogfish out there right now, we need to further reduce the population. The Gulf of Maine is full of dogfish, you can't even fish for groundfish there are so many of them.

27 OCTOBER 1998, ELIZABETH CITY, NC

Hearing officer Fentress Munden opened the hearing at 1910 hours. Seven individuals from the public were present. Tom Hoff of MAFMC staff attended.

Willie Etheridge opposed the meeting in Elizabeth City. It was inconvenient for fishermen. The meeting should have been held in Wanchese or Hatteras. He is in opposition to the fishing year beginning on 1 May. Regulations should be fair and equitable to all. There have been two law suits against NMFS on summer flounder where NMFS has lost because of the economics of the fishery and this action will cause considerable economic impacts if the quota is cut by 90%. The fishery needs processing houses and not one of the 10 houses will still be in business. He does not want to have a "gold rush" mentality if the season opens on a specific date. The quota should be fairly distributed by area.

James Fletcher, UNFA, for the record, the document and all the science is based on the minimum population estimates. These are the most restrictive measures that could possibly be exploited. The estimate of 75% is wrong. In 1979-1980, NMFS estimated that 55 million pounds of dogfish could be landed annually. Up until 1976 we had foreigners overfishing. Groundfish have not decreased. This is regulatory mismanagement. The MSY is not stated in pounds. The industry would like to see the MSY in pounds and quota. Bmsy is difficult to understand. "Overfished" is the reason for the plan. The Council should have an independent group review the science. "Overfished" creates jobs for scientists.

Billy Midgette stated that everything is always taken away, but nothing is ever given back. Management is preaching management for other species. This is poor.

Rick Catun, Custon Sound Charters, stated that dogfish were a non-recreational species. Several years ago, dogfish were considered a trash species. Now we have more paperwork, more propaganda, not good data, data from flawed sources. How can this pass? It is a total joke. He agrees with James Fletcher.

Scott Bridges opposes the 90% reduction in the quota. What is the purpose of regulations? My catch has not decreased in recent years. How is it overfished? He has a $100,000 boat and in two years he is history. This is ridiculous. There are too many dogfish. He can not understand how the fishery can be closed.

Eddie Newman is working with East Carolina University and Dr. Roger Rulifson. He was on the Dogfish Advisory Committee and he feels their advice was not useful. NOAA boat is not appropriate. He is very upset with Dr. Jack Musick of VIMS. Gill net fishermen would volunteer their time, and the Council could get a couple of fishermen in each State to provide data. He acknowledged the dogfish are not as big as when the fishery started. He stated that the gill nets should be at least 6.0 inches in mesh and composed of 105 twine. There is an offshore stock of dogfish that is not even fished. Dogfish offshore actually preclude fishing for black sea bass. NMFS is forced to manage because of the threat of a lawsuit from environmental groups. US fishermen should not be penalized by Canadian landings. He is a full time dogfish fisherman from December through June and he lands 500,000 pounds annually.

Tommy Danchise, *FV Handful*, the fishery is set up to screw North Carolina annually.

Jim Fletcher stated the fishermen should be involved at the science level. The inshore dogfish are fished down but the offshore herd (like buffalo) is not touched. Need to change the system to have groups of scientists without financial interest to NMFS review the overfishing definitions. NMFS said they could harvest 50 million pounds per year from the 1980s. Barndollar and Fletcher developed the dogfish fishery in the 1980s. Minimum mesh should be 7 inches. If dogfish landings decrease the fishermen will switch to trout. Council mismanagement upsets the entire switching of industry. Council has only ever restricted.

Eddie Newman recommends to throw this plan out the door. Start with a 6 inch mesh and in four years move to 7 inches. The surviving dogfish will kill lots of trout and croaker. If we are worried about adult females we should use a 5 and a half inch mesh.

Rick Catun said they can live with a mesh size and a length restriction. Biologists data are flawed.

Tommy Danchise stated that NC only had dogs for three and a half months. They fish less than the New England boats so we should let them fish.

Eddie Newman again stated they need a mesh size. A complete closure will upset the economy of coastal communities. If they can not dogfish they will have to fish for croaker. The data are erroneous.

Scott Bridges recommends to throw the plan out the door. Rather than close the fishery, we should use larger mesh size and shorter length nets. Can not phase out in a year or two, but actually needs a five year span.

Jim Fletcher stated that the scientists should look at the foreign data, for how hard they fished and the time it took to rebound. This does not match up. Math doesn't work. There should be separate groups of scientists without any ties to NMFS. There is a 10% rule in society, where 10% of all groups of people cheat. Why has no one from the Council or NMFS ever been fired since we all know that 10% cheat?

Eddie Newman questioned the longevity of dogfish at 50 to 60 years. East Carolina University believes they only live to 36 years.

Willie Etheridge said that the Plan should not be from unrestricted catches to shutting down the fishery. The US government should buy-out the fishermen who are under stress. This plan will cause severe economic hardship.

Tommy Danchise said first we screwed up bluefin tuna, then monkfish, now dogfish. Everything from the North is getting shut down.

Eddie Newman said that in two years the processors will not even open their doors. The fishery is not this bad.

Tommy Danchise went to monkfish and dogfish because they were considered "trash" fish.

Rick Catun said the guys who went to dogs should be thanked because they got off of the recreational fish. Now the trash species are the first to get axed. Monkfish will still be fished by New England vessels.

Jim Fletcher said that not enough information is in the Plan or the RIR about the economic benefits to the Nation.

Rick Catun said that scientists should be made to go with the commercial fishermen and not work on their computers.

Fentress Munden ended the hearing at 2055.

28 OCTOBER 1998, NEWPORT NEWS, VA

Hearing officer Jack Travelstead opened the hearing at 1920 hours. Twenty two individuals from the public were present. Tom Hoff of MAFMC staff attended.

Irving Fass, Int. Sfd. Dist. Inc., made the same remarks he did in Boston. Once the Plan stops directed dogfishing and you are without production for eight years, there will be no market in 10 years. There is no sense in fooling anyone - there will be no market. Recreational fishermen do not like to see dogfish. He does not agree with the scientific analyses.

Marshall Cox, Longr Eastern Shore Waterman Assc., identified the problem of impacts to other fisheries. When we shut down the dogfish fishery, other fishermen will go into other overfished resources.

Rick Robins, Chesapeake Bay Packing, is a Dogfish Advisor. His comments are the same as he made in Philadelphia and Boston. This is a modern day fishery management disaster. The Mid-Atlantic Development Foundation in the 1980s encouraged use of dogfish. Dogfish were not managed until now. That is a shame after there was encouragement of fishermen participation. There is a problem with the economic analysis. It is not a $10 million fishery. There are lots of indirect costs like labor and shipping and really the fishery is worth about $46 million at ex-processor level. The multipliers are 6 to 8 times. Therefore the economic impacts are significant. Dogfish are no utility to the sport sector. They only benefit the commercial. No dogfish plants will exist in 10 years. They must ship frozen container loads. Dogfish compete with striped bass. He was glad to participate in the process but believes it is a disaster.

Darryl Lilliston, Lilliston Seafood, agreed with Rick Robbins. There will be nothing in 10 years. Lots of people will be out of business. There are 50 to 60 dogfish fishermen in Virginia. He is a processor that employs 12 people. Lots of fishermen have let their crab dredge permits go by now.

John Shertenlieb can not go to crabs, or monk, or shad, or striped bass. In the winter time he will be tied up.

William Pruitt said NMFS has an economic responsibility to the fishermen. NMFS should be protecting the fishermen and not the resource. Dogfish fishing is a substantial part of his income. What will he do? Government should buy-out. This FMP will have a big economic impact on the east coast.

Thomas Pruitt said they were already limited by weather. Fishermen put themselves in jeopardy going offshore. When they can work four days a week that is good, generally they can only work three days.

Jonathan Holdgrafer stated the quotas should not be for gill nets and trawls.

Alvin Wimbrough stated that the Council can not take dogfish from them. They can not do anything from December through April. If no dogfish, no fishing.

Doug Reed questioned the stock assessment. He said that dogfish at 3 pounds and 24 inches have lots of animals that are mature. Government is really screwed up on all species stock assessments. Government never gives fisheries back.

Tim Daniels stated that there is a natural cycle on dogfish. Science is a shame. Fishermen need help. The government should buy-out.

Irving Fass stated that this is a disaster. Fishermen do not have anything else. Fishery has been depleted to some extent - maybe 20%. The science is flawed.

Danny McCoughley stated that there has not been a good cold winter which affects dogfish distribution. Dogfish are dragged from the bottom in the night. Stock assessment is crazy. Mild winters do not bring dogfish inshore.

Jonathan Holdgrafer asked what they should do for the next 10 years. He wants a government buy-out. There is discrimination within this plan. Surveys are no good.

Jason Pruitt does not like the stock assessment.

Rick Seary asked about the African dogfish. The stock assessment is shit.

Billy Reed stated the resource is rebuilding. He asked how many stock assessments have been shown to be poor. How can the Council believe the stock assessment? He believes there needs to be some management, but this stock assessment is wrong.

Rick Robins stated that Virginia would benefit if the quota allocation was to start on 15 November. The 1996 statistics yield a fishery value of $46 million and he provided a worksheet to document his calculations (attached). The RIR is really lacking. Jack Travelstead ended the hearing at 2055.

28 OCTOBER 1998, RIVERHEAD, NY

Hearing officer John Mason opened the hearing at 7:40 PM. Rich Seagraves presented a summary of the Spiny Dogfish FMP. One member of the public was present.

Pat Augustine, representing the New York Sportfishing Federation, stated that they support the preferred alternative. If the species is designated as overfished then the Councils should take action. The plan was developed in conjunction with industry advisors so it should be adopted. They are very concerned about the bycatch of striped bass in the spiny dogfish fishery. Relative to the bycatch issue, have the Councils considered adopting a policy that would require fishermen to keep everything that they catch, in other words, a no discard policy? Perhaps this is a system that could be used in US fisheries? He was concerned about bycatch issues in general and suggested the Councils consider some new and innovative approaches to managing the bycatch problem.

The hearing was closed at 8:00 PM.

2 NOVEMBER 1998, CAPE MAY COURTHOUSE, NJ

The hearing was opened at 7:00 PM by hearing officer Charles Bergmann. Staff present included Dan Furlong and Rich Seagraves. Seagraves presented a summary of the Spiny Dogfish FMP. There were nine members of the public present.

Daniel Cohen, Atlantic Cape Fisheries, stated that from a presentation point of view the document was misleading. The document is not clearly explicit that the preferred alternative closes the directed fishery in the second year. The economic impact section of the document is not complete enough, it needs some work. He is not convinced that implementing limited entry in this fishery makes any sense.

Kevin Wark, gill net fisherman from Barnegat Light, NJ stated that he prefers number three as the preferred alternative. He favors a size limit. Which rebuilding schedule that the Councils choose will make little difference since they all have the same effect, eventual closure of the directed fishery. Initially he looked for action from the Councils, but now he is very disappointed. He agrees with all of the Councils numbers and the assessment that females are declining in size and abundance. What upsets him is that if the Councils had taken action a few years ago, none of this would have been necessary. The Councils did not do their job to manage the resource. He supports a size limit but would rather see a mesh restriction. The idea of limited entry in this fishery is meaningless. After the first year, there is no fishery to limit entry into.

Eric Svelling, representing the Native Sun, Inc., questioned the statement that the dogfish fishery is overfished? Have the Councils compared the current fishery to the foreign fishery that occurred in the 1970's? The only difference is that the fishery, including the market, is more Americanized. He is having a boat built that he thought was going to be used in the dogfish fishery. This FMP is like a bomb being dropped. It will have severe economic impacts. He understands that there needs to management of dogfish. He suggests a trip limit be looked at.

The hearing was closed at 7:40 PM.

3 NOVEMBER 1998, PORTLAND, ME

The hearing was opened by hearing officer Chris Finlayson, State of Maine DNR, at 7:15 PM. New England Fishery Management Council members present were John Willamson and Barbara Stevenson. Also present were Andy Applegate (NEFMC staff) and Terry Stockwell (Maine DNR). There were three members of the public in attendance.

Rich Seagraves of MAFMC staff presented a summary of the Spiny Dogfish FMP and then the hearing was opened for public comment.

Barbara Stevenson asked where the administrative record was concerning when the stock is rebuilt. She also questioned how the Councils were defining a directed spiny dogfish fishermen to implement the 80 net limit proposed in the FMP. She stated that she could not read the charts and figures in the EFH section. How can I comment on that which I can't read? She also objected to the inclusion of "any other management measure" on the list of framework measures. She wants this language removed from the FMP. Mesh selectivity studies in the directed fishery needs to be added the list of research needs. In addition the NMFS trawl survey needs to be extended into deeper water. The section of the plan which requires that vessels must take observers when requested must explicitly state that industry is not required to pay for the observers.

Steven Cossar, F/V Hazel E Cresent Corp., stated that he has been a directed dogfish fishermen for 18 years. His overall observation over the last 8-10 years is that the spiny dogfish is in a state of decline. He understands that they can't grow fast enough to keep up with the demands of the fishery. He agrees that something has to be done but he hates to see the drastic measures that are being proposed. He can see that the fish are getting smaller and smaller. The stock is under a lot of pressure. The industry only wants the females and that is a problem. But the reduction called for is too dramatic. The FMP will have ramifications beyond what is discussed in the FMP. The 80 net limit is too high, 40 or 50 nets would be fine. The quota is set at 22 million pounds. The fish are highly migratory, he catches fish that were tagged in NC. They travel great distances. The large schools of dogs eat pogies and herring. The Councils set the quota at 22 million pounds, what happens if the quota is caught before they reach his area. There is no insurance that he will see any share of the quota at all. The reductions in quota are too large, especially in year one. He needs to catch 8,000 - 10,000 pounds per trip. The fishery is large volume so he can't measure every fish. There are times when you get a nice run of fish and the next day in the same area you get whipped up in small male dogs. There is no way to predict from one day to the next what will happen. The time the fish show up in the Gulf of Maine varies from the 10th of May until the 4th of July. It depends on weather and what the cycle of feed is. He usually sees six or seven waves of dogs moving in. He agrees with limited entry. The Councils should go back five years to qualify people. The dogfish he catches in Maine have to be shipped to New Bedford. He is concerned that there will not be a place to sell his fish. He observes that a lot of the dogfish that he catches look like they have been caught before. If the spiny dogfish fishery is closed, he will switch to scallop dragging or lobstering. The way the plan is currently written he has one year to get out of the fishery. This plan does too much, too fast. The discard rate is highly variable. He questioned some of the figures in the plan. He uses 7" mesh but because the fish are smaller people are now using 6" and 6.5" mesh. A minimum mesh size would decrease discards and allow increased escapement. The Councils are trying to do too much in the first year. The goal to rebuild the stock in 10 years is a good time frame but the plan should be phased in gradually.

Terry Stockwell was concerned that the Councils must understand the supplemental nature of the dogfish fishery. A little bit of every thing makes a successful trip. Also if there is no market or outlet for the product the fishermen are out of business.
The hearing was closed at 8:25 PM.

3 NOVEMBER 1998, OCEAN CITY, MD

Hearing officer Bill Outten opened the hearing at 1910 hours. Four individuals from the public were present. Council member Ricks Savage and Tom Hoff of staff attended.

Joe O'Hare noted that on page 69 it is stated that the foreign fishery took all sizes of dogfish and he suggested that we should too. On page 70 it is stated that the recreational fishery is 8% of the catch and he feels that it is not an important part of the overfishing problem. On page 78 he noted that DAH = OY but none of the terms are defined. On page 84 the FMP talks about mesh size and he feels that mesh size should be part of the solution. On page 85, section 3.1.1.12.2, the last two sentences do not make sense. He supports the limited entry concept on page 88 to protect those currently involved in the fishery. On page 90, he stated the post-release mortality is the most important piece of research. On page 94, discards, will be 9 million pounds if have no directed fishery and that is a real problem. On page 118 there is no real analysis of limited entry and it should be cross referenced to the alternatives on pages 85 - 88. The plan should show where the lost income ($7 million) comes from. Where will the fishermen redirect their effort to and how will that impact other fisheries? The recreational fishermen would be willing to release the females. Why is that not an alternative? The FMP should prohibit finning. There should be some research on the recreational release numbers. He does not understand why fishery managers still allow fisheries to crash. Part of the problem is word smithing, where we say on page 94 that discards will be reduced to the extent practicable. He does not think that the approach meets National Standard 9.

Al Wesche, MD DNR, said that the State will provide comments later.

Sonja Fordham, Center for Marine Conservation, stated that CMC will be submitting extensive comments in writing later. It is unfortunate the Council did not implement an FMP years ago. They support the 10 year rebuilding schedule. Fishing in 2000 is too risky. These animals need an especially cautious approach in management. The FMP is too optimistic. The assessment is over a year old, and the FMP will not be implemented until mid 1999. There is a need for State management also. They support the non-preferred alternative 2. They support limited entry. They support a minimum size of at least 32 inches. They urge the Council to work quickly and get the FMP submitted as soon as possible.

Tim O'Connor, Sierra Club, will also submit written comments later. They want protection of all EFH, for example, the main channel of the Delaware River. He inquired as to where the effort will shift from dogfish. They want overfishing to be stopped immediately. The dogfish population should be rebuilt as soon as possible. They support a 32 inch minimum size limit. They support limited entry. They support the creation and effective working of a Monitoring Committee.

Bill Outten ended the hearing at 1945.

4 NOVEMBER 1998, PORTSMOUTH, NH

The hearing was opened by hearing officer (State of New Hampshire) at 7:05 PM. New England Fishery Management Council members present were John Willamson and Eric Anderson. Also in attendance were Andy Applegate (NEFMC staff) and Rick Pearson (NMFS). There were twenty five members of the public in attendance.

Rich Seagraves of MAFMC staff presented a summary of the Spiny Dogfish FMP and then the hearing was opened for public comment.

Eric Anderson, representing the NH Commercial Fishermen's Association questioned how the stock could be managed as a unit. Is the Canadian assessment and survey data incorporated into the minimum biomass estimates or is using the NMFS data just an issue of convenience? The single species nature of the FMP will cause a lot of regulatory problems. In the second year when the directed fishery is closed people are going to redirect their effort. The Councils must recognize that closure of the dogfish fishery is gong cause problems in other fisheries. We don't have hard TAC's in any other fishery in New England, we use target TACs. The hard TAC will cause a major discard problem. This regulatory discard problem will violate National Standard 9. The dogfish committee was forced to come up with a plan under a compressed time frame. A lot of other alternatives are available. He favors a target TAC and the Councils must focus on trip limits for the real dogfish fishery participants. Trip limits will extend the fishery over a greater period of time. The Councils also must consider using a days at sea approach. This approach is not used in the Mid-Atlantic but they have are used to this system in New England. The fishery is a day fishery not a multiple day trip fishery because of the short shelf life of the product. The Councils should look at permit restrictions. The no finning restriction is really not a factor since no one does this. The redirection of fishing effort into other areas is a reality that the Councils must face. A more comprehensive approach must be taken. Single species management is convenient from a management perspective but you only create discards. The Councils should consider a target TAC in conjunction with trip limits and restrictions on days at sea. Under the hard TAC condition he is concerned that NMFS will have the discretion to shut down other fisheries to protect dogfish. This would go beyond the control of the Councils. Trip limits will have a lot of secondary benefits since less gear will be in the water.

Lou Williams, wondered how could NMFS be issuing exemption permits for spiny dogfish and now they are closing the fishery. The government encouraged us to fish for dogs and now after next year there is no fishery. The control date needs to be moved back to 1990. He would like to see some way that the dogfish fishermen be allowed to continue to fish. The proposed plan is unfair. This plan puts us out of business after next year. Dogfish should be regulated in the groundfish plan like monkfish. Put dogfish under days at sea.

Paul Cohan, representing the Gulf of Maine Fishermen's Alliance stated that there was great incentive by the government to go fishing for dogfish. We were given grants to develop the fishery. It is really a kick in the groin to have the fishery closed. He sees the expansion of the fishery occurring in places like North Carolina, not in the traditional fisheries like here and in MA. In MA dogfish were traditionally a component of the groundfish fisheries. The Councils need to draw a line. NMFS wants to establish yet another discard fishery. We have come full circle in the fishery from government subsidy to fish to the government now closing the fishery. When the government pulls stunts like this, fishermen form a negative opinion of the Fisheries Service. The Councils need to look at implementing a mesh size. The selection process for dogfish is different than most other fish. Large dogfish can fit into a small mesh but whale cod won't be caught in 6" mesh. If you increase the mesh size you will see some escapement. North Carolina fishermen are using 5.5" mesh while we use 6.5" to 7.0" gear. The Councils need to reduce the amount of gear being fished and to increase the mesh size. You can't undo the nature of the bycatch and the Councils must realize that. The quota numbers are so small he thinks the Councils should look at individual fishing quotas. The quota will be caught up in certain areas which will cause problems. He questions the use of a hard quota to begin with. This would be the only species in the New England region with a hard TAC, this doesn't make any sense. The Councils need to soften up the TAC. The low quota numbers will eliminate the directed fishery. You are hiding behind the SFA and the SFA is based on unattainable goals. There is no way that all species can be maintained at historically high levels all at the same time. .This plan takes the rug out from underneath hard working people. This plan is ultraconservative and the SFA will be the death of the fisheries. The plan specifies an unrealistically low hard TAC. The small boats and dogfish processors will be eliminated and we are out of business.

Randy Gauron stated that the plan as written will do no good. 1962 should be used as a low year and 1996 as a high year. 1992 was our first big year. We have always caught dogfish, now they are being landed. The plan moves way too quickly. The plan calls for a reduction from 60 million pounds to 22 million in year one and then to around 3 million pounds. The plan needs to go back and be reworked. The Councils should consider mesh sizes and trip limits. The plan should include a target TAC not a fixed TAC which will produce discards.

Dave Marriano supported all the previous speakers. The Councils must be given time to do something right. It doesn't make sense to consider dogfish separate from other species. Separating dogfish management from groundfish is crazy. They all are caught together, so why chop them up? Be careful with trip limits since you may be weeding through cod to keep dogfish. The trip limit needs to be high enough to make money.

John Willamson stated that he was sympathetic to the hard v. soft TAC issue, but the Councils must meet the SFA mandate of stock rebuilding in 10 years. Protection of the females is required for stock rebuilding. We need to husband the remaining stock of medium size dogfish for the stock to rebuild. How can we do this with a soft TAC?

Rick Robins
Oct. 28 1998
Attachment to public Hearing Summary

ECONOMIC IMPACT
DOGFISH FMP

DIRECT IMPACT, EX-VESSEL

	1996	
EXVESSEL LANDINGS	65,000,000	LB
AVG EXVESSEL PRICE/LB	$ 0.18	
EXVESSEL VALUE	$ 11,700,000	

DIRECT IMPACT, PROCESSING	YIELD	POUNDS 1996	AVG PRICE/LB 1996	EXTENSION 1996
BACKS, LG FROZEN	0.021	1,365,000	$ 0.90	$ 1,228,500
BACKS, MED FROZEN	0.084	5,460,000	$ 0.70	3,822,000
BACKS, LG FRESH	0.078	5,070,000	$ 1.80	9,126,000
BACKS, MED FRESH	0.117	7,605,000	$ 1.60	12,168,000
FLAPS, LG FROZEN	0.025	1,625,000	$ 3.30	5,362,500
FLAPS, MED FROZEN	0.04	2,600,000	$ 2.50	6,500,000
FINS	0.014	910,000	$ 2.50	2,275,000
TAILS	0.018	1,170,000	$ 3.50	4,095,000
HEADS	0.21	13,650,000	$ 0.11	1,501,500
TOTAL	0.607	39,455,000		$ 46,078,500

ASSUMPTIONS
1. 65% OF DOGFISH BACKS WERE SOLD FRESH
2. OF THE BACKS SOLD FRESH, 40% WERE LARGE AND 60% WERE MEDIUM
3. 35% OF DOGFISH BACKS WERE SOLD FROZEN
4. OF THE BACKS SOLD FROZEN, 20% WERE LARGE AND 80% WERE MEDIUM

APPENDIX 2. COMMENT LETTERS AND COUNCIL RESPONSE

A total of 94 comment letters were received by the Council on the hearing draft the Spiny Dogfish FMP. Three letters were received from government agencies, three letters came from national associations and 14 letters represented miscellaneous interested parties. Eight letters were received from fishermen; of which three were a form letter and one was signed by 12 individuals. Another form letter was received from 24 individuals. Finally, 42 letters came which focused on a combination of 7 different points; of which one was signed by 74 individuals and one was signed by 8 people representing different organizations.

Comment 1: One respondent suggested that the commercial quota for the last 9 years of the rebuilding period is too low and suggested that it should be about 20 million pounds annually; the respondent felt that dogfish fisherman will not have enough alternatives if the quota is too low.

Council response: The dogfish stock was officially designated as overfished by NMFS in April of 1998. The Sustainable Fisheries Act (SFA) requires that Councils develop and implement a stock rebuilding plan which will allow the fishery to produce MSY on continuing basis. The guidelines for SFA advise that stock rebuilding to the level which will produce MSY should occur as quickly as possible, but not exceed 10 years. The rebuilding strategy proposed in this FMP allows the spiny dogfish stock to be rebuilt in five years. This is achieved through a two step reduction in fishing mortality. The first year allows for a 22 million pound (10,006 mt) quota followed by a major reduction in fishing mortality to achieve rebuilding. Maintaining the fishery at levels in excess of 15-20 million pounds for several more years would severely compromise the Councils ability to achieve stock rebuilding and thus meet the new requirements of the SFA.

Comment 2: Two commenters suggested that the commercial quota be gradually reduced over a three year time period, instead of one.

Council response: As discussed above, the overfished nature of the dogfish stock does not allow for an extended phase down of the directed fishery due to the slow growth and late maturation of the species. Failure to reduce fishing mortality on adult females for several more years will not leave available quota for the unavoidable bycatch which will occur even in the absence of the directed fishery for spiny dogfish. The directed fishery could be phased down in a two or three step process and was proposed as a non-preferred alternative. However, the Councils received repeated testimony from industry advisors from the processing sector that at least 10,000 mt would be required to allow for the maintenance of market share abroad to allow for a profitable domestic processing industry. As a result, a one year exit fishery was chosen as the preferred alternative.

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 four year 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 will allow for the rebuilding of the adult spawning stock in a relatively short period of time and then allow for a sustainable fishery at yield levels of approximately 14 million pounds per year.

Comment 3: One commenter felt that the recreational measures are too strict while the commercial fishery is allowed to continue unchecked.

Council response: The Councils are not currently proposing any recreational management measures, although they are included as framework measures in the FMP.

Comment 4: A total of 69 commenters supported an immediate end to overfishing, either with a very low commercial quota or an immediate closure of the dogfish fishery.

Council response: The Councils recognize in the FMP that the spiny dogfish stock is susceptible to overfishing due to the conservative nature of the species reproductive biology and life history. However, the stock rebuilding strategy chosen does allow stock rebuilding to occur to a level which will support harvests at or near 90% of the MSY level within five years. The preferred alternative will eliminate overfishing and rebuild the spiny dogfish stock through a two step reduction in fishing mortality rate. The first step allows for a one year exit fishery of 22 million lbs (10,006 mt) 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, F will be reduced to 0.2 and then will be reduced to F=0.03 in the remaining four years of the rebuilding plan. This schedule allows for stock rebuilding to the level which will support harvests at or near the 90% of the SSB_{max} level in the year 2003.

Comment 5: Thirty two respondents stated that the plan should have hard number quotas instead of target quotas.

Council response: The Councils adopted a quota based strategy to control fishing mortality in the spiny dogfish fishery as the preferred alternative in this FMP. The quota system proposed is a hard quota in the sense that the fishery will be closed when the quota is reached. The Councils considered but rejected an alternative which included the provisions for a target or "soft" quota.

Comment 6: One respondent felt that the gillnet and commercial quotas should be separate, and that the gillnet quota should be set at the amount that they be restricted to no more gear than they can lift in a day.

Council response: The Councils found no basis to separate the quota by gear type or to limit the amount of gear fished at the current time, although gear limitations are included as framework measures in the FMP. Gear restrictions were included in the preferred alternative in the hearing draft but the Councils removed this measure from the first year management measures because other measures are in place to restrict fishing mortality.

Comment 7: One commenter stated that the gillnet mesh size should be increased to a minimum of 6.5 inches and supported the limitation of 80 nets per boat.

Council response: The Councils concluded that a minimum size limit was not appropriate for the first year of the management program. This conclusion was reached because the Councils were concerned that, given the truncated nature of the size composition of the stock, a minimum size limit would likely cause significant discarding. This would result in mortality in addition to the level of mortality that would result from landing the quota in year one. However, the Councils included the specification of minimum size limits and mesh size restrictions in the list of management measures which can be implemented by framework action. As a result, the Councils could implement a minimum size limit and appropriate mesh restriction through a framework action in the future.

Comment 8: One commenter questioned the management measure which restricts dogfish fisherman to 80 gillnets of 50 fathoms (300 ft) each in that it seems to have no basis and would not prevent dogfish from getting entangled and killed in lost or abandoned gear.

Council response: The Councils chose to eliminate the 80 gill net restriction from the preferred alternative, in part, because the selection of 80 nets was arbitrary. The 80 net limit was based on net limits in other fisheries and was not specific to the dogfish fishery. The Councils removed this measure from the first year management measures because other measures are in place to restrict fishing mortality. The Councils feel that trip limits combined with seasons would be more appropriate measures in controlling fishing mortality.

Comment 9: Three respondents suggested banning or severely limiting the gillnet fishery.

Council response: The Councils found no basis to separate the quota by gear type or to limit the amount of gear fished at the current time, although gear limitations are included as framework measures in the FMP. Gear restrictions were included in the preferred alternative in the hearing draft, but the Councils removed this measure from the first year management measures because other measures are in place to restrict fishing mortality. National Standard 4 requires that " conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges." Banning of gill net gear in the spiny dogfish would likely constitute a violation of National Standard 4.

Comment 10: Five respondents felt that the data used to determine the status of the stocks and the life cycle, age and growth patterns is not accurate. One of the commenters suggested that the upcoming fishing year be used to conduct a more thorough examination of the stocks and that no action be taken until this is done.

Council response: National Standard 2 requires that conservation and management measures developed under the SFA be based upon the best scientific information available. This FMP is based on the best and most recent scientific information available from the most recent stock assessment (NEFSC 1998). Future dogfish research should be devoted toward both data collection and analysis in order to evaluate the effectiveness of this FMP. Future research to determine the level of post-release mortality of spiny dogfish discarded in non-directed fisheries by gear type is of particular importance. The status of spiny dogfish should be reviewed periodically by the NEFSC Stock Assessment Workshop process.

Comment 11: One respondent suggested that another proxy for B_{MSY} be selected because the current proxy is too high.

Council response: The SFA imposed new requirements concerning definitions of overfishing in US fishery management plans. In order to comply with National Standard 1, the SFA requires that each Council FMP define overfishing as a rate or level of fishing mortality that jeopardizes a fisheries capacity to produce maximum sustainable yield (MSY) on a continuing basis and defines an overfished stock as a stock size that is less than a minimum biomass threshold. The SFA also requires that each FMP specify objective and measurable status determination criteria for identifying when stocks or stock complexes covered by the FMP are overfished. To fulfill the requirements of the SFA, status determination criteria are comprised of two components: 1) a maximum fishing mortality threshold and 2) a minimum stock size threshold.

To address the new SFA requirements relative to National Standard 1, an Overfishing Definition Review Panel was convened to review the definitions of overfishing for NEFMC and MAFMC management plans (Applegate *et al.* 1998). The specification of SSB_{max} as a proxy for B_{MSY} was the recommendation of Applegate *et al.* (1998). In addition, the Councils convened a meeting of their respective Scientific and Statistical Committees to evaluate the estimate of SSB_{max} being used in this FMP for spiny dogfish (see Appendix 4). The Joint SSC concluded that SSB_{max} was the appropriate proxy for B_{msy}.

Comment 12 : Four respondents feel that the effect of an increased dogfish population on its prey species was not taken into consideration.

Council response: A major concern raised during the development of this FMP has been the ecological ramifications of a fully rebuilt spiny dogfish stock (i.e., at levels approaching SSB_{max}). Of particular concern were the possible negative consequences on other species (principally groundfish, squid and the pelagic stocks) both through increased competition and/ or predation as spiny dogfish abundance increases. To address this concern, among others, the Councils convened a joint meeting of Mid-Atlantic and New England Fishery Management Council Scientific and Statistical Committees on January 27, 1999 (see Appendix 4).

The Joint Committee concluded the following with respect to this issue: "The committees heard a presentation based on information from the NEFSC food habits data base which included data on 250,000 stomachs collected over a period of 25 years, mostly during spring and autumn. The data included information on spatial overlap between cod and spiny dogfish and showed moderate overlap (30-40%) in spatial co-occurrence of these species in the surveys, yet very low predation rates. While the S&S Committee applauds moves to consider ecosystem approaches to management, it found no compelling reason to consider predation by spiny dogfish on other commercially valuable groundfish in determining its B_{MSY}. The stock of spiny dogfish is a very small part of the ecological community and because of its' opportunistic predatory habits it may have minimal direct and indirect effects on the relationships between different species. It is recognized, however, that dogfish do have effects on other species through predation and competition. It is the Committee's opinion that changing the mature female biomass from 200,000 to

150,000 mt will have a minimal effect on other stocks of groundfish. Because of compensation, and the constantly changing stock sizes, it is not currently possible to predict the degree of or the direction of change in pelagic stocks, in particular, that could be attributed to changes in the spiny dogfish B_{MSY}. The Committee would like to see more efforts to build conceptual models and undertake empirical tests to study ecological relationships relevant to fisheries management. Trying to determine pairwise relationships between one species and a series of others is, however, not currently feasible and development of this area of research would be enlightening as ecosystem-based management develops."

Comment 13 : One respondent felt that the description of habitat requirements was incomplete for this species.

Council response: An exhaustive description of the habitat requirements of spiny dogfish is given in Section 2.2 of this FMP.

Comment 14 : Three respondents stated that the proposed management measures will force dogfish fishermen into other, overcrowded fisheries, which is not an economically viable option. One of these commenters suggested that a buyout, if applied to all permits, would be enough for dogfish fishermen to retire or buy equipment for an alternate fishery.

Council response: The Councils recognize that the directed fishery for spiny dogfish will be closed during the four rebuilding period and that this may result in the redirection of fishing effort from the spiny dogfish fishery into other fisheries. Given that weighout data suggests that there were 595 participants is the spiny dogfish fishery in 1997, these participants will be faced with the choice of either exiting fishing altogether or redirecting their effort into other fisheries.

However, the expansion of the spiny dogfish fishery is a very recent phenomenon which began in 1990. It is unlikely that the new entrants into this fishery since 1990 represent completely new effort or capitalization into the Northeast fisheries. Rather, the escalation of fishing effort into the spiny dogfish has occurred via the transfer of fishing effort from other fisheries into the spiny dogfish fishery, especially the gill net fishery. This rapid increase in effort in this fishery is not sustainable and clearly effort must be dramatically reduced to meet the conservation requirements of the SFA.

Comment 15 : Four commenters felt that the economic impacts of the management measures were not taken into consideration, especially since most of the dogfish market is foreign.

Council response: The economic impacts of the preferred alternative are evaluated in Section 4.4 of the FMP. Changes in gross revenues were estimated relative to the projected status quo levels for each alternative. Impacts were calculated using the projected status quo landings by taking the average 1997 ex-vessel price for spiny dogfish (per pound) and multiplying this value by the proposed change in landings. It is important to note that the ex-vessel price for spiny dogfish, given the proposed reductions in landings, would depend on the elasticity of demand for this species. Since no studies have determined a demand function for spiny dogfish, revenue changes which account for varying levels of demand could not be calculated. In addition, changes in costs and market trends are not reflected in the analysis due to lack of data.

Comment 16 : Three commenters proposed extending the rebuilding period beyond 10 years in order to ease the economic hardship on dogfish fisherman.

Council response: An important requirement of the SFA is that stocks which are identified as overfished must be rebuilt to the level that will produce maximum sustainable yield (B_{MSY}). The SFA guidelines advise that, in most cases, the stock rebuilding period may not exceed 10 years. The most recent stock assessment data presented by NEFSC (1998) and the Dogfish Technical Committee indicate that total adult female spiny dogfish stock biomass is currently about 280 million lbs (127,000 mt), well below the stock biomass target of 397 million lbs (180,000 mt) based on a three year moving average of the most recent NEFSC survey data. As a result, the Councils propose to rebuild the adult female spiny dogfish stock to 180,000 mt (90% of SSB_{max}) over a five year rebuilding period through the implementation of this FMP.

Comment 17 : Three respondents opposed any management measures for the calendar year of 1999.

Council response: Data and analyses in the most recent stock assessment indicate that the spiny dogfish stock in the Northwest Atlantic has declined as a result of the recent increase in exploitation. Recent rapid expansion of the fishery has resulted in a dramatic increase in fishing mortality. Particularly troublesome 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). The SFA requires remedial action by the Councils for stocks designated as overfished. The SFA requires that a management program be developed immediately for this species and that targets and thresholds for stock size and fishing mortality be established.

Comment 18: One respondent proposed a five day catch week to help reduce catches.

Council response: The Councils chose a quota based system to control fishing mortality in the spiny dogfish fishery. Prohibition of fishing on certain days of the week would have to be implemented as part of effort based system of fishing mortality rate control.

Comment 19: One commenter stated that there should be no more entrants into the dogfish fishery.

Council response: The Councils considered limited entry during the development of the FMP and included this as an option in the public hearing draft. The Councils intend to take up the issue of limited entry in the first amendment to the FMP.

Comment 20: A total of 29 commenters favored mandatory permitting and reporting procedures.

Council response: The FMP includes permit and reporting requirements for commercial vessels, operators and dealers. Given the current status of the stocks and the uncertainties regarding discard rates for spiny dogfish, mechanisms which account for all activities in the fishery are necessary to enforce provisions of the FMP and ensure overfishing is prevented. Permits issued to all sectors which harvest, process, or sell spiny dogfish also provide the foundation for effective monitoring and enforcement of regulations. They will help track the quota and therefore reduce the chance that the quota is exceeded, and as such, reduce the chance of overfishing. A commercial permit to sell is essential for a quota based management system. The dealer permitting and reporting requirements are also very important in tracking the quota and forecasting necessary closures.

Comment 21: One commenter stated that inspection of all vessels should be immediately instituted for the benefit of the public.

Council response: This activity does come under the purview of the Magnuson-Stevens Act.

Comment 22: Thirty three respondents supported the establishment of the Dogfish Monitoring Committee.

Council response: The preferred alternative includes a provision that creates a Dogfish Monitoring Committee.

Comment 23: One commenter stated that the Dogfish Monitoring Committee should contain environmentally conscious members of the public so that the public's interests are sufficiently protected.

Council response: The Dogfish Monitoring Committee membership was expanded to include two ex-officio members from industry, one from each Council region.

Comment 24: Twenty eight commenters approved of the framework adjustment procedure.

Council response: The FMP establishes a framework adjustment process which allows for the modification of management measures through a framework adjustment procedure. This adjustment procedure allows the Councils to add or modify management measures through a streamlined public review process.

Comment 25: Sixty three respondents endorsed a minimum size of 32 inches and one respondent suggested a size limit of 28 inches.

Council response: The Councils concluded that a minimum size limit was not appropriate for the first year of the management program. This conclusion was reached because the Councils were concerned that, given the truncated nature of the size composition of the stock, a minimum size limit would likely cause significant discarding. This would result in mortality in addition to the level of mortality that would result from landing the quota in year one. However, the Councils included the specification of minimum size limits and mesh size restrictions in the list of management measures which can be implemented by framework action. As a result, the Councils could implement a minimum size limit and appropriate mesh restriction through a framework action in the future.

Comment 26: A total of 65 commenters approved of the ban on finning.

Council response: During the course of development of this FMP, the issue of finning and discard of the carcass at sea of spiny dogfish has been discussed extensively. Industry advisors testified that this practice occurs only under extremely limited circumstances, therefore the prohibition of finning is primarily a preventative measure to stop the practice when the fishery is reduced in magnitude. The response of the public and industry was overwhelmingly in favor of a prohibition on the practice of finning.

Comment 27: Fifty nine commenters supported submitting a final dogfish fishery management plan to the Secretary of Commerce by the end of 1998 which would immediately implement strict management measures to begin rebuilding the dogfish stock.

Council response: The Councils began the development of this new FMP in January of 1998. A hearing draft of the FMP was developed by the summer of 1998 and seven public hearings were subsequently held from Maine to North Carolina during the fall. The final version of the FMP was adopted by NEFMC and MAFMC in January and February of 1999, respectively. The preferred alternative will eliminate overfishing and rebuild the spiny dogfish stock through a two step reduction in fishing mortality rate.

The first step allows for a one year exit fishery of 22 million lbs (10,006 mt) 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 will be reduced to 0.2 and then will be reduced to F=0.03 in the remaining four years of the rebuilding plan (2000-2003).

Comment 28: Two commenters felt that the FMP is too broad and oversteps the authority congressionally granted to NMFS and the Councils, especially regarding: (a) the EFH definitions which go beyond waters that are "essential" and "necessary" to the species as intended by the Magnuson-Stevens Act and the SFA; (b) that NMFS and the Council have authority to manage fisheries only, and the Amendment transgresses that authority by including non-fishery related measures; and (c) that NMFS and the Council have no authority to extend EFH or any management measures to state managed, inland waters, and that the Amendment should not attempt to include those areas.

Council Response: The Council disagrees with this commenter's belief that this FMP represents a clear departure from the letter of the MSFCMA and the intent of Congress. The Congressional mandate was clear and NMFS has interpreted that mandate and proposed regulations. During the comment period on the EFH regulations, these types of comments should have been raised. Many similar issues were raised during the comment period on the proposed regulations and were addressed by NMFS. The Council is simply working within the NMFS EFH regulations in the identification and description of EFH. Clearly the Congress wanted the NMFS and Councils to have authority of EFH and not simply propagate rules that reduce fishing mortality only.

Comment 29: One respondent stated that the section on Silviculture NPS (section 2.2.5.3.3) does not contain a balanced presentation of data and does not show in what way silviculture activities affect dogfish EFH. Specific objections cover the following points: (a) many of the conservation measures in this section are included in state BMP (best management practices) manuals and do not need to be restated with slight variations in the FMP; (b) guidelines on road construction have no baselines and are too vague; (c) the statements regarding harvesting contain no objective guidelines or standards; (d) that the Amendment cannot enforce water quality standards and should instead defer to the existing guidelines in state programs; and (e) that the comments regarding restoration of upland habitat are too vague and not within the intended jurisdiction of EFH.

Council Response: The Council agrees completely with this commenter's premise that best management practices should be used for all silvicultural NPS issues. All of the description and discussion of silvicultural problems were taken from NMFS (USDC

1997a) and EPA (USEPA 1993) documents. The Council is not proposing any recommendations that are not BMPs as considered by EPA in their *Guidance Specifying Management Measures for Sources on Nonpoint Pollution in Coastal Waters*. The series of recommendations that were attributed to Murphy (1995) have been dropped since they were somewhat duplicative of the EPA recommendations.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
One Blackburn Drive
Gloucester, MA 01930-2298

OCT 26 1998

d/ 11/4/98

~~Daniel~~ Furlong
Executive Director
Mid-Atlantic Fishery Management Council
Room 2115 Federal Building
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong,

Enclosed please find the National Marine Fisheries Service's draft recommendations to the Mid-Atlantic Fishery Management Council regarding essential fish habitat (EFH) for spiny dogfish. Section 305(b)(1)(B) of the Magnuson-Stevens Act requires the Secretary of Commerce to provide recommendations and information to the Council regarding the identification of EFH, threats to EFH, and conservation and enhancement measures to protect EFH. The interim final rule for EFH, 50 CFR 600.815(c), requires NMFS to make its draft recommendations available for public review prior to submitting final EFH recommendations to the Council. To facilitate this public review, I request that you make our recommendations available at the Council's public hearings on the Spiny Dogfish Fishery Management Plan, scheduled for October through November, 1998. NMFS will provide the Council with final EFH recommendations shortly after the public hearings are complete.

NMFS has also revised figures identifying the relative abundance and distribution of spiny dogfish based on analysis of the Northeast Fisheries Science Center's trawl survey, which are enclosed. Technical corrections and editorial suggestions on the EFH information for this species will be transmitted to your staff under separate cover.

With these initial EFH designations, the Council has made a solid start at identifying spiny dogfish EFH and potential threats. We look forward to working with you to build upon this work in the coming months. Should you have any questions about our draft EFH recommendations, please contact Dianne Stephan of my staff at 978-281-9397.

Sincerely,

Jon C. Rittgers
Acting Regional Administrator

RECEIVED
OCT 29 1998
MID-ATLANTIC FISHERY COUNCIL

Enclosures

National Marine Fisheries Service Draft Essential Fish Habitat Recommendations to the Mid-Atlantic Fishery Management Council for Spiny Dogfish

Background

Section 305(b)(1)(B) of the Magnuson-Stevens Fishery Conservation and Management Act requires the Secretary of Commerce to provide recommendations and information to the Council regarding the identification of essential fish habitat (EFH), threats to EFH, and conservation and enhancement measures to protect EFH. The National Marine Fisheries Service (NMFS) has provided substantial background information to assist in the development of the EFH portion of the fishery management plan (FMP) for spiny dogfish (dogfish). NMFS prepared a synthesis report of the life history and habitat requirements of this species, which reviews the relevant scientific literature and includes summaries of data on the distribution and relative abundance of dogfish. NMFS also prepared maps and graphs showing the distribution and relative abundance for each major life history stage, and analyzed these data by ranked ten minute squares of latitude and longitude to show the areas that yielded the highest catches per unit of sampling effort. Additionally, NMFS provided the Council with maps of the relative abundance of this species in estuaries, based on NOAA's Estuarine Living Marine Resources data set. During numerous meetings, NMFS staff discussed these information sources with Council staff and the Council's Habitat Committee and offered guidance and assistance in the designation of EFH.

To supplement the above information, NMFS prepared the following draft EFH recommendations based on a review of the September 22, 1998 public hearing draft of the Spiny Dogfish Fishery Management Plan. Many of these recommendations are similar to those presented previously to the Council for other FMP amendments. Council staff have indicated that they are already in the process of applying these recommendations to the dogfish FMP; however, the earlier recommendations are also included here to avoid any confusion, and to present a complete set of recommendations for public review.

Recommendations

1. <u>Clarify the description and identification of EFH so users of this information can determine the geographic limits of the EFH designation.</u>

(a) The maps of EFH in offshore areas are extremely difficult to read and understand. The final FMP should use larger format maps (e.g., one map per page instead of four for the preferred alternatives), and should include captions that explain that the shaded ten minute squares are EFH. The term "North of Cape Hatteras" for the text EFH descriptions should be reconciled with the figures for EFH, which show shaded squares south of Cape Hatteras. Also, the final maps should not show any EFH in waters beyond the U.S. Exclusive Economic Zone.

(b) The text description of EFH should be improved by refining the geographic references. For example, the southern boundary for EFH south of Cape Hatteras should be made more specific by using a geographic reference point such as Cape Canaveral rather than describing the southern limit of EFH as "Florida."

(c) The designation of EFH south of Cape Hatteras should be refined. Dogfish distribution and relative abundance in offshore waters south of Cape Hatteras should be reviewed using the description of habitat parameters given in the FMP text, consultation with spiny dogfish experts, or some other information source. This information should then be synthesized to identify the specific geographic bounds of EFH. For estuarine EFH designations, the specific "habitat parameters" for estuaries south of Cape Hatteras which are to be compared to those of estuaries designated as EFH in New England and the Mid-Atlantic should be clearly stated. Additionally, the estuaries south of Cape Hatteras that are designated as EFH should be clearly identified (i.e., named). Figures should be included which demarcate EFH south of Cape Hatteras.

(d) Since the Council is designating EFH in estuaries of New England and the mid-Atlantic based on the relative abundance of dogfish within the three salinity zones (seawater, mixing, and freshwater) identified in the Estuarine Living Marine Resources data set, the final FMP should include maps of the salinity zones for each estuary. These maps are available from NMFS if the Council does not have them already. This information is necessary so that readers can understand the delineation of EFH in estuaries.

(e) If the maps identifying EFH and the text description of EFH differ, the text description is ultimately determinative of the limits of EFH [50 CFR Part 600.815(a)(2)(iii)]. Therefore, to avoid any such inconsistencies, the text descriptions of EFH in the final FMP should reference and incorporate the tables and maps of estuaries that are considered EFH, as well as the maps of offshore areas that are considered EFH.

(f) The text descriptions of EFH north of Cape Hatteras should be modified to reflect that EFH is those areas that support the highest density or relative abundance of the managed species, as indicated by the highest X% of catch per unit effort based on an analysis of available survey data. EFH designations developed by the Council for some species have reflected a percentage of area (e.g., a 90% designation represents the top 90% of all the ranked squares), while others have reflected a percentage of catch (e.g., a 90% designation represents the highest ranked ten minute squares that comprise 90% of the catch). Both methods of EFH designation are premised on the assumption that high relative abundance indicates high value habitat. As currently written, it is not clear what the percentages in the EFH descriptions represent.

(g) The first paragraph in Section 2.2.2.2 (i.e., the paragraph immediately preceding the text description of EFH) provides a brief narrative that explains the "general" characteristics of EFH for dogfish. This portion of the document is confusing because it contains an incomplete summary of the written descriptions of EFH that appear below it. It also conflicts with the text descriptions of EFH by stating that the portions of the EFH designations that are based on the survey data are limited to "those areas in federal waters..." that meet certain specifications, whereas the survey data and supporting maps include many areas in state waters. This paragraph should be deleted from the final FMP to avoid confusion over which section is the correct description of the limits of EFH.

2. Refine the discussion of the methodology used to designate EFH.

(a) Sections 2.2.2.1.2 and 2.2.2.1.3 of the FMP discuss options for designating EFH based on the "objective criteria" approach. This approach appears objective because it uses numeric cutoffs. Actually, it is subjective for two reasons: 1) the cutoffs could well have been 40%, 60%, 80% and 100% rather than 50%, 75%, 90% and 100%; and 2) the choice of one particular cutoff for designating EFH is based on the best professional judgments of the people involved. There is no *a priori* reason to choose 50% over 75%, or 90% over 50%. The final FMP should clarify that these thresholds were subjective, but they reflect a reasonable range of designation alternatives.

(b) In Section 2.2.2.1.3 of the draft FMP, remove the descriptor "dredge" from the sentence "Data were assigned to a ten minute square based on the location of the dredge tow sample." The last sentence of this passage should read "Only those squares that had more than three samples and on positive catch, *etc.*"

(c) In the discussion of limitations in Section 2.2.2.1.3, the text states that "The Northeast Fisheries Science Center [NEFSC] trawl survey does not survey everywhere and thus this analyzes (SIC) is constrained and significantly biased low." In fact, it is plausible that the area occupied by the species could be significantly overestimated (i.e., biased high) by the ten minute square analysis. For example, if the species only occurred at depths of 10-75 m, the ten minute squares where the species occurred could contain a high proportion of area >75 m deep. The NEFSC survey does not sample everywhere, but once the data are cast into ten minute squares, without further analyses we do not know if there is bias or its direction.

(d) The same section (2.2.2.1.3) of the draft FMP states that the Council's selected approach for designating EFH is "fraught with limitations and based on major assumptions." While it is appropriate to acknowledge the shortcomings of the selected approach, the final FMP should emphasize that this methodology was adopted because the Council (presumably) determined that it was the best technique available, despite the limitations. Also, the statement that "None of the [state] surveys collect the habitat information that is most needed (habitat type, substrate)" is not accurate. For example, the Long Island Sound survey collects substrate information.

(e) A figure should be provided that indicates which ten minute squares were a part of the NEFSC survey. Otherwise, it is impossible to tell whether an area had a low abundance of dogfish, or was not a part of the dogfish distribution analysis. This is especially true for nearshore state waters.

(f) The dogfish background document (McMillan and Morse 1998) analyzes the NEFSC trawl survey data by gender in order to account for sex-specific growth rates. In order to minimize confusion during NMFS' consultation process on federal activities that may adversely affect EFH, EFH should be designated without regard to gender. The NEFSC has re-analyzed these data to show distribution for combined sexes of both juveniles and adults. Newly created maps are attached, and should be used for designation of dogfish EFH.

3. Revise the discussions of threats from fishing and non-fishing activities to be more specific to dogfish.

(a) The discussion of fishing-related threats in Section 2.2.3 of the draft FMP borrows extensively from the Auster & Langton report, but without sufficiently tailoring the Auster & Langton text to make it pertinent to dogfish or the gears used in relevant fisheries. It would be far more effective for the discussion of fishing-related threats in the FMP to focus on the fishing activities that may affect dogfish EFH, as well as the gears used in the fisheries covered by the FMP.

(b) The discussion of non-fishing threats and associated conservation and enhancement measures in Section 2.2.5 of the draft FMP lists a variety of concerns, but most of these are generalized and do not apply specifically to the EFH of dogfish. The final FMP should highlight the connection between the identified threats and their effect on dogfish EFH. The documents should explain the relevance of the threat to dogfish EFH and discuss how the suggested conservation measures benefit this species. For example, the recommendation to avoid dredging or dredge spoil placement in submerged aquatic vegetation appears in the FMP (Section 2.2.5.4) despite the assertion earlier in the document that dogfish have no strong association to that habitat type (Section 2.2.3.8). The recommendation for the fishing industry to familiarize itself with the potential of sea level rise (Section 2.2.5.14.5) is not germane to EFH at all. Section 2.2.5 of the FMP should be substantially edited and revised to be more relevant to dogfish EFH.

4. <u>The FMP should explain how it meets the requirement to minimize to the extent practicable the adverse effects of fishing on EFH.</u>

(a) The draft FMP does not explain how it addresses the Sustainable Fisheries Act requirement to minimize the effects of fishing on EFH to the extent practicable. Section 2.2.4 of the draft FMP states that all mobile gear coming into contact with the sea floor has a potential impact on EFH, but the amount of fishing effort is unquantified, "and therefore no management measures will be proposed at this time." However, according to 50 CFR Part 600.815(a)(3)(iii), "Councils must act to prevent, mitigate, or minimize any adverse effects from fishing, to the extent practicable, if there is evidence that a fishing practice is having an identifiable adverse effect on EFH *etc.*" The final FMP should specifically address whether fishing activities are having an identifiable adverse effect on dogfish EFH and, if so, what management measures serve to alleviate these impacts.

(b) The final FMP should include a discussion of options for managing the effects of fishing on EFH, including existing management measures that limit effort and may indirectly protect habitat. The final FMP should also explain the strategy and approach the Council intends to use to address this issue over time. The Council is only required to adopt management measures that are practicable, based on the criteria in 50 CFR Part 600.815(a)(3)(iv), but the draft FMP does not indicate whether the Council has determined that existing measures are the only steps that are currently practicable.

5. <u>The FMP should explain why the Council is not proposing to designate any areas as HAPC.</u>

Section 2.2.2.1 of the draft FMP states that the Council is not recommending any areas as HAPC at this time, but does not provide a rationale. The final FMP should explain why (e.g., if the Council determined that available information for the species is inadequate to justify HAPC designations).

6. <u>The research and recommendations section (2.2.7) should include research needs identified in or implied by the text of the document, such as:</u>

- review of state and federal recreational catch data for dogfish distribution
- distribution data from the Gulf of Maine
- research to supplement levels 1 & 2 data with levels 3 & 4 data
- identification of environmental and species distribution relationships
- additional information on threats to EFH, both fishing and nonfishing.

Also, the list of recommendations already given should be shortened by excluding recommendations such as stock assessment research needs that have very little to do with habitat, even indirectly.

7. The framework adjustment process should include designation of EFH and HAPC.

The list of management measures that could be implemented or modified through framework adjustment procedures (Section 3.1.1) should include the designation of EFH and HAPC, which would give the Council flexibility to establish or modify EFH or HAPC designations as supporting information becomes available.

8. The final version of the FMP should be edited thoroughly.

The Council has diligently assembled a tremendous amount of information in the EFH section of the draft FMP and has made a solid start at identifying EFH and potential threats. The final FMP could be strengthened considerably by editing the EFH section to remove superfluous material, correct typographical errors, and clarify the tables and figures. As noted above, some of the material in the non-fishing threats sections (2.2.5) is not germane to the species managed by the FMP, and the maps of offshore EFH are very difficult to read.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
One Blackburn Drive
Gloucester, MA 01930-2298

NOV 20 1998

Alan Weiss, Committee Chair
Mid-Atlantic Fishery Management Council
300 S. New street,
Dover, DE 19904

Dear Alan:

The Northeast Region of the National Marine Fisheries Service (NMFS) has reviewed the September 1998 Spiny Dogfish Fishery Management Plan (FMP), including the draft EIS/RIR, and offers the following comments. For convenience, comments on management issues are separated from the comments on analysis of the document.

Comments Regarding Management Issues in the Document

Although the Councils originally planned for a May 1, 1999, implementation date, the revised schedule for adoption will not allow this to occur. From the beginning of Secretarial review to the effective date, the process requires five to six months for the publication of proposed and final rules, plus a 30 day "cooling-off" period. In addition, new permit and reporting requirements are proposed which require another three to six months to implement. Therefore, the FMP must specifically include provisions for a partial year implementation in Year 1.

A major obstacle to achieving the objective of reducing fishing mortality on spiny dogfish and ensuring that overfishing does not occur relates to the second stated objective of the FMP, which is to promote compatible management with states and with Canada. On page 83, the document indicates that states will be encouraged to close their water when the federal quota is landed. However, because there are no state or ASMFC regulations for spiny dogfish, states will not be required to close their waters when the quota is attained. As a result, there is no mechanism for requiring vessel owners who choose not to obtain a federal permit, or to fish in federal waters, to abide by a closure when a quota has been attained. Vessel owners could relinquish their federal open access permit during a closure, fish in state waters, and then reapply for a federal permit when the fishery reopened. Although it is not certain that this activity would occur to any great extent, this loophole could potentially undermine the FMP. The document should address this issue and provide more information on state water landings (including those south of North Carolina).

A frequent criticism of "hard" quotas is that they contribute to regulatory discards after the quota has been reached and landings are prohibited. National Standard 9 of the Magnuson-Stevens Act requires that "management measures shall, to the extent practicable, minimize bycatch and, to the extent bycatch cannot be avoided, minimize the mortality of such bycatch". This FMP must discuss compliance with National Standard 9. Section 3.1.3.9 indicates that excessive regulatory discards in the future would be minimized through the use of a framework adjustment implementing gear, season or area restrictions. This should be elaborated upon. Also, pages 9 and 93 incorrectly refer to the new national bycatch standard as National Standard 7.

A limit of 80 nets per gillnet vessel is specified in the preferred alternative. The analysis of impacts appears to indicate that since nobody is currently fishing 80 nets, then there will be no adverse effects. The rationale for a limitation to 80 gillnets should be more explicit. If nobody is fishing 80 gillnets, then why should an FMP to rebuild spiny dogfish allow this amount? The document states that limited information currently exists describing the number of nets used by gillnet vessels in the gillnet fishery. Since many of these vessels currently hold a federal permit which requires reporting, the vessel trip report database should contain information on trips in the directed fishery. Also, sea sampling data may provide this information on a more detailed basis.

There is no discussion of the mechanism to implement and enforce a limitation on gillnets. The net limit should be more fully described. Are tags being contemplated? As evidenced in the multispecies fishery, a limit on the number and size of nets is difficult to enforce at sea. Also, compliance costs for industry and government could be sizeable. Is the net limit justifiable, especially when the preferred alternative only specifies a sizeable dogfish fishery for one year? Implementation and enforcement of the net limit is complicated because dogfishing is allowed only when using a multispecies days-at-sea (DAS), or when fishing in a multispecies exemption. If tags are to be used, would separate dogfish tags be required for dogfish nets when using a multispecies DAS, or would multispecies tags be used? Which tags would be required in a multispecies exemption for dogfish?

The FMP specifies that states would submit data on inshore landings on a weekly basis. Under what authority will this be mandated? Many states currently provide NMFS with inshore landings data on a variety of schedules without sufficient timeliness to monitor a quota.

Comments Regarding the Analysis Portion of the Document

Section 4.6 determines that, for the preferred alternative, there will be a significant economic impact on a substantial number of small entities. Therefore, the analytical document should be identified as an Initial Regulatory Flexibility Analysis (IRFA). It should describe alternatives which would minimize any significant economic impacts of the proposed rule on small entities. The Final Regulatory Flexibility Analysis (FRFA) must later contain a statement of factual, policy and legal reasons for selecting the alternative adopted in the final rule and explain why each one of the other alternatives that would affect the impact on small entities was rejected. Do all of the alternatives offer only a "significant" finding?

The 5th paragraph on page 96 essentially summarizes the entire economic analysis, and could be expanded and referred to in Section 4.6. That is, given the low level of landings allowed under all of the alternatives, even if prices rise, because of supply shortages, harvesters, processors and pack-out facilities are not likely to see positive (cumulative) nominal benefits for at least 20 years (Figure 24) nor the more appropriate cumulative net present value of benefits for 30 to 40 years (Figure 25).

The conclusion that the preferred alternative is superior to some of the non-preferred alternatives should be further substantiated. Results of the overall economic analysis of the alternatives indicate that non-preferred alternative 3 is superior to the preferred alternative, at least with respect to the cumulative stream of discounted revenues (Table 37 & Figure 25). Moreover, by using the same basis, non-preferred alternative 4 appears to be quantitatively indistinguishable from the preferred alternative. The document suggests that non-preferred alternative 3 does not meet the ten year rebuilding schedule, yet presents no landing streams for the non-preferred alternatives. Using the revenue streams of Table 37 (and the fixed ex-vessel price assumption of the drafters), it appears that by the tenth year the three rebuilding paths are statistically indistinguishable.

Although the catch stream from the preferred alternative is presented in Table 33, similar information is not presented for the non-preferred alternatives, except in descriptive terms on pages 86 - 87. A complete table of the projected annual catch and F would be appropriate, particularly since associated economic information is presented in disaggregated form. More generally, the organization of the document, with the analysis of non-preferred alternatives in a separate and subsequent section of the draft, makes comparison with the preferred alternative difficult. Integrating the analysis of the alternatives is recommended.

In Section 4.6.1.3, additional quantitative efforts will be required to identify those vessels that may be more heavily impacted than others. An attempt was made to quantify the vessels that land the majority of spiny dogfish, but a further breakdown of those vessels by gear type and size class should be included. Additionally, cumulative impacts of other fishery management measures should be mentioned in the economic analysis including, for example, redirection of effort.

When discussing the impacts of the preferred alternative, the document concludes that there will be no new applications for dealer permits. This is unlikely since a significant amount of dogfish is purchased by companies which do not currently hold a federal dealer permit, but provide data on a voluntary basis. We estimate that there will be approximately 10 - 15 new dealer permit applications.

One of the numbers cited frequently in the document is the "total adult spiny dogfish biomass" of about 127,000 mt. This number does not appear in the SARC 26 document or in the other technical information presented in the document. Presumably, this is the LOWESS smoothed estimate from the point estimates of swept-area biomass and, if so, should be specified.

The document indicates that spiny dogfish are distributed from Labrador to Florida (page 11). The scale of the Canadian fishery and its potential impacts on spiny dogfish rebuilding efforts should be more fully described.

The status-quo analysis assumes that the minimum selection size by the fishery would remain at 70 cm. Given the propensity of this fishery to drop the cull size in the face of declining catch rates of large fish, this may not be a valid assumption and may bias the conclusions from the length-based projection model. This factor should be mentioned accordingly. Also, a technical appendix to the document explaining the length-based projection model in greater detail would be informative.

It appears that there will be major social impacts from the spiny dogfish FMP. Therefore, the document should more fully analyze these impacts. Of the 642 vessels identified as active in the dogfish fishery, no information is provided concerning home port, landing port, or crew sizes. Employment information in the processing sector is not provided, either. It is, therefore, difficult to assess the nature of dependence of communities and fishermen on the resource. Identification of the potentially affected industries by 4-digit SIC code may be possible for those areas dependent upon spiny dogfish. Census data and the IMPLAN software system would likely provide the needed information.

The disproportionality analysis contained in the third paragraph of Section 2.3.4.1 describes the landings of spiny dogfish by port in 1996. This analysis should be updated to reflect 1997 landings by port. In fact, a 1997 disproportionality analysis by port on page 78 implies a significantly different distribution. According to the disproportionality analysis on page 78, only two of the eleven locations described in the section are listed as being extremely dependent on the spiny dogfish fishery in 1997. More consideration should be given to describing the characteristics of the other four ports/counties identified as deriving a large percentage of landings value from spiny dogfish (Plymouth, MA; Wachapreague, VA; Scituate, MA; Dare County, NC).

The MAFMC report by McCay et. al. was compiled in 1993, and, thus, the social data is five years old. The 1996 Aguirre, Inc. report to NMFS on New England and Mid-Atlantic fishing communities is not referenced, nor is the 1996 report by Johnson and Orbach to the NC Marine Fisheries Commission. These should be examined to provide comparative diachronic modeling of changes in fishing communities with the largest proportion of landings of spiny dogfish.

Please reference the comments from NMFS dated October 26, 1998, for information which should be included in the Essential Fish Habitat section of the document.

With regards to the Section 7 consultation for this action under the Endangered Species Act, NMFS Protected Resources has requested that the MAFMC prepare a Biological Assessment by January 1, 1999, for the spiny dogfish FMP. This would include a Description of Project Activities (including primary and secondary management measures), a List of Species Likely to Occur in the Area, an Assessment of Impacts of the Management Measures, and a Conclusion section. The Biological Assessment recently prepared for the monkfish FMP could serve as a model.

We appreciate the opportunity to comment on this document. If you have any questions, please contact Rick Pearson at (978) 281-9279.

Sincerely,

Patricia A. Kurkul, Chief
Sustainable Fisheries Division

c.c. - Sissenwine (NEFSC)
Howard (NEFMC)
Seagraves (MAFMC)
Mantzaris (NERO)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET, SW
ATLANTA, GEORGIA 30303-8909

NOV 9 1998

4EAD/OEA

Christopher M. Moore, Ph.D.,
Acting Director, Mid-Atlantic Fishery Management Council
300 S. New Street
Dover, DE 19904

SUBJECT: Spiny Dogfish Management Plan, Draft Environmental Impact Statement and Regulatory Impact Review.

Dear Dr. Moore:

The Environmental Protection Agency Region 4 (EPA) has reviewed the referenced final environmental impact statement (EIS) and management plan in accordance with EPA's responsibilities under Section 309 of the Clean Air Act and Section 102 (2)(C) of NEPA. The purpose of the proposed action is to introduce management of the spiny dogfish as is required of commercial species by the Sustainable Fisheries Act. The fishery has recently expanded and resulted in dramatic reductions of adult females, and has resulted as this species being classified as being in an overfished condition. Mature female dogfish are targeted because of their large size.

The increase in landings reflect in part development of export markets, particularly Western Europe, where in Great Britain portions of the spiny dogfish are used for fish and chips. Belly flaps with higher fat content are used in Germany and France to produce a cured product called *Schillerlocken*. Some dogfish parts such as fins and skins go to the Pacific Rim counties for production of sharkskin products, and cartilage which is dried and pulverized to be marketed for medicinal purposes.

The document's description of habitat requirements of the spiny dogfish was incomplete and contained little basic information specific for this species. Limited habitat observations were based largely upon dogfish capture data taken from trawling records and observations from fishermen. (The species used to be taken as bycatch from other fisheries employing trawls and gill nets. Among fishermen who target dogfish today, gill nets are most commonly used accounting for an estimated 80 percent of the landings.) This document did not contain the basic scholarship that we have seen in previous fishery habitat/management plans.

One of the preferred management measures was to restrict fishermen targeting dogfish a limit of 80 gill nets, each 50 fathoms (300 feet) in length. What was the basis for this recommendation? While limiting the use of gill nets is a commendable goal, there should be also some recommendations that address the problem of "ghost fishing"? Gill nets create a potential debris problem when lost or abandoned gear continues capturing fish that eventually die entangled in the nets rather than being harvested. Most nets are made from polypropylene twines and monofilament lines that are extremely resistant to degradation. These materials will degrade with sufficient exposure to ultraviolet light, but submerged fishing gear receives little to no exposure to ultraviolet rays, so these materials will persist in the marine environment for long periods of time.

We appreciate the opportunity to review this document and rate it EC-2, environmental concerns; the draft did not contain sufficient information on spiny dogfish habitat for EPA to fully assess impacts to that fishery, and what perturbations should be avoided in order to fully protect the environment supporting the spiny dogfish. If you have any questions about this review, please call John Hamilton at 404-652-9617 for more information.

Sincerely,

Heinz Mueller

Heinz J. Mueller, Chief
Office of Environmental Assessment

The Commonwealth of Massachusetts

PHILIP G. COATES
DIRECTOR

Division of Marine Fisheries
Leverett Saltonstall Office Building
100 Cambridge Street
Boston, Massachusetts 02202
phone: (617)727-3193
Fax: (617)727-7988

Fax transmittal

to: DANIEL FURLONG

fax:

from: DAVID PIERCE

date:

re:

pages: 13

NOTES:

DOGFISH COMMENTS

The Commonwealth of Massachusetts

Division of Marine Fisheries
Leverett Saltonstall State Office Building
100 Cambridge Street
Boston, Massachusetts 02202

PHILIP G. COATES
DIRECTOR

727-3193

November 20 1998

Mr. Paul Howard
Executive Director
New England Fishery Management Council
5 Broadway
Saugus, MA 01906

Mr. Daniel Furlong
Executive Director
Mid-Atlantic Fishery Management Council
Room 2115 Federal Building
300 New South St.
Dover, DE 19904

Gentlemen:

We must comment on the Draft Spiny Dogfish Fishery Management Plan that we feel has missed a very important aspect of needed multispecies management in both the New England and Mid-Atlantic regions. In fact, this aspect is so significant, that we urge the Councils to seek further guidance from the Northeast Fisheries Science Center before adopting this plan that unintentionally ignores scientific advice and warnings given since the early 1990s that are just as germane now (perhaps more so) during these critical stages of decision-making for groundfish rebuilding (e.g., Gulf of Maine cod).

The draft plan alludes to this aspect. On page 14 it states:

"Spiny dogfish are competitors with virtually every marine predator within the Northwest Atlantic Ocean ecosystem. These include a wide variety of predatory fish, marine mammals, and seabirds."

But the plan doesn't adequately describe scientists' concern about this competition or predation. For the Councils' benefit we review that concern since it is the heart of our argument that the Councils need to reconsider the wisdom of rebuilding dogfish to high levels of abundance.

<u>Dogfish as predator and competitor</u>

Refer to a spiny dogfish assessment conclusion made at the 18th SAW (December 1994):

"...Preliminary calculations indicated that the biomass of commercially important species consumed by spiny dogfish was comparable to the amount harvested by man. Accordingly, the impact of spiny dogfish consumption on other species should be considered in establishing harvesting policies for this species (emphasis added)."

Note that Bigelow and Schroeder in their famous text, Fishes of the Gulf of Maine, highlighted dogfish appetite:

"Voracious almost beyond belief, the dogfish entirely deserves its bad reputation. Not only does it harry and drive off mackerel, herring, and even fish as large as cod and haddock, but it destroys vast numbers of them. Again and again fishermen have described packs of dogs dashing among schools of mackerel, and even attacking them within the seines, biting through the net...At one time or another they prey on practically all species of Gulf of Maine fish smaller than themselves, and squid are also a regular article of diet whenever they are found..."

Scott and Scott (Atlantic Fishes of Canada) made a similar point:

"This small predaceous shark is an opportunistic feeder consuming whatever organisms are most readily available, but small fishes usually predominate. Thus the food varies from one place to place and month to month. In a study of food habits of 1171 Newfoundland dogfish, Templeman (1944) found herring, capelin, and cod to be important foods..."

Murawski and Idoine in their 1992 paper, "Multispecies size composition: A conservative property of exploited fishery systems?" cited a conclusion of Grosslein, Langton, and Sissenwine (In "Recent fluctuations in pelagic fish stocks of the Northwest Atlantic, Georges Bank region, in relation to species interactions, 1980"). That conclusion was:

"...Currently the USA catches are dominated by cod (a partial piscivore) and flounders (primarily consuming benthic macrofauna). Given that these species may be selectively extracted from the ecosystem, it is plausible that dogfish and skates have increased in abundance to exploit available food resources, since the dietary overlaps between cod-dogfish and flounders-skates are generally high..."

Murawski and Idoine suggested:

"...Given the current high abundance of skates and dogfish, it may not be possible to increase gadoid and flounder abundance without 'extracting' some of the current standing stock..."

Murawski had made this point in his 1991 paper, "Can we manage our multispecies fisheries?" He stated:

"Whether or not species changes on Georges Bank are due to biological interactions among species or are simply due to differential fishing mortality rates remains conjectural. However, total biomass in the system does seem to have again reached a threshold. The ability to increase the abundance of marketed species may thus be limited by predation from or competition with the elasmobranch species."

In another 1991 paper, "Impact of predatory fish, marine mammals, and seabirds on the pelagic fish ecosystem of the northeastern USA," Overholtz, Murawski, and Foster concluded:

"Piscivorous fish consume the largest share of the total pelagic biomass eaten by three predator groups. Annual consumption by predatory fish was estimated to be about 337,000 tons...Spiny dogfish, because of their large biomass, account for the largest proportion (75%) of consumption by piscivorous fish..."

Other NEFSC notables, Mayo, Fogarty, and Serchuk made a similar point in their 1992 paper, "Aggregate fish biomass and yield on Georges Bank, 1960-87." They concluded:

> "...Recent increases in biomass of elasmobranchs and principal pelagic species (herring and mackerel) have resulted in further shifts in system structure. The biomass of piscivores is currently high and this shift may act synergistically with increasing exploitation rates to cause further declines in biomass of commercially desirable species."
>
> ....
>
> "..the increasing biomass of piscivores of little commercial value, particularly dogfish, mackerel and large skates, may further depress production levels [commercial desirable species] by increasing predation mortality on both the pre-recruits and recruited components of the principal groundfish populations. The synergistic effects of exploitation and predation can affect the stability and resilience of these populations and result not only in lower levels of production but increased probability of a population collapse. It is possible that the observed changes in system structure may not be reversible without manipulation of predator biomass to reduce the dominance of piscivores in the system. Reduction in fishing mortality rates alone on the commercially desirable species may not be sufficient to increase recruitment and overall production (emphasis added)..."

Furthermore, Gabriel in her 1992 paper, "Persistence of demersal fish assemblages between Cape Hatteras and Nova Scotia, Northwest Atlantic" noted:

> "...High relative abundance of spiny dogfish between 1963 and 1969 led to lower levels of diversity during that period. As relative abundance of spiny dogfish dropped in the early-1970s, diversity increased. Subsequent fluctuations in diversity were related primarily to fluctuations in dogfish abundance..."

DMF has its own reference regarding this subject. The "Special Report of the Department of Natural Resources Relative to...the Control and Eradication of Dogfish...," January 1964, written by Fairbanks, Hutton, and Wilbour, was submitted to the Legislature as a response to "An Act authorizing and directing the Division of Marine Fisheries to establish and maintain a dogfish nuisance control and eradication program." One element of the bill was:

> "Said director may contract, subject to appropriation, a schedule of payment rates which may be paid to fishermen as fees or as a bounty for catching and disposing of said dogfish .."

That report began by citing the "Dogfish Problem."

> "The dogfish problem is not a recent one, nor is it confined to Massachusetts waters. Reports attesting to the destructiveness of this pest have come from fishing ports throughout its range, and date well back into the 1800's. During the years when hook and line was the principal method of fishing, a school of dogfish could so entangle gear and mutilate catches, that fishermen were often driven from the grounds. The Annual Report of the Commissioners on Fisheries and Game (Massachusetts) in 1905, reported that fishermen often lost as many as 30 tubs of trawl while fishing in dogfish infested waters. The report assigned a value of $400,000 annually to damage done off the Massachusetts coast alone. With the gradual replacement of this type of gear by the otter trawl, the problem has changed. Dragging in areas where dogfish are concentrated may produce catches heavy enough, due to the high specific gravity of this shark, to tear away the entire net. In other instances, hours and even days of fishing time are wasted freeing, disentangling, and repairing nets..."

Of note, Fairbanks et al. stated:

> "The effects of competition and predation by the dogfish upon stocks of commercially valuable species is not known. While the predator-prey relationship as it exists in marine fisheries has received little study, it is generally agreed among researchers that the abundance of a predator, in this case the dogfish, tends to suppress populations of prey species to some degree."

They recommended:

"Control measures would be limited, with present knowledge, to reduction in dogfish stocks through an intensive, large-scale, fishing effort. The most economically sound approach to dogfish control involves the development of a market demand for dogfish products which would, in turn, create a self-sustaining fishery."

These prescient researchers also suggested:

"The matter [control or eradication] should be of continuing concern to the Atlantic States Marine Fisheries Commission which could be instrumental in instigating a regional approach to the problem once sufficient concern is voiced by the member states. It is tentatively planned to present the dogfish nuisance problem to the 1964 session of ASMFC."

[Note: it took until 1998 for ASMFC to address dogfish, but only because of the Councils' initiative.]

Target of 440 million lbs. (200,000 mt)

Why do the Councils want to rebuild dogfish "competitors and predators" to 440 million lbs. (200,000 mt)? The answer seems simple enough. It's the stock size that supposedly will maximize average recruitment and can be used as a proxy for Bmsy.

According to the Draft Plan, the report of the 26th SAW (March 1998) indicated the total adult spiny dogfish stock in 1997 was at 280 million lbs. (127,000 mt); therefore, the Council is obliged to rebuild dogfish as required by the Sustainable Fisheries Act, and the Council has 10 years to do it. With this proxy, abundance would be somewhat above the minimum biomass threshold of 220 million lbs. (½ 440 million lbs.). However, remember that total biomass (all sizes) in 1997 was high. Total biomass has been stable at about 1,322.2 million lbs. (600,000 mt), according to the 26th SAW.

We now have the irony of having to rebuild adult dogfish to 440 million lbs. even though by doing so we could impact our efforts to rebuild groundfish, especially cod, if we are to rely on NEFSC scientific advice. The draft plan is silent on this issue. It shouldn't be. This is a single species plan with significant multi-species implications. Even the dogfish fishermen who attended the hearings understood this simple fact. After listening at the Mass. public hearings to Council staffer Rich Seagraves state that NMFS had designated spiny dogfish as overfished, one fisherman shook his head and responded:

"My father is rolling over in his grave. He never would have believed I'd be here arguing for a continued dogfish fishery. We were encouraged to fish for dogfish, especially since it meant less pressure on groundfish. Take away our dogfish, and we're back on cod and other groundfish. Besides, don't dogfish eat groundfish and other species? We should be fishing them down."

We suspect Congress never considered the implications of rebuilding all stocks to Bmsy. Ecosystem issues might not have been raised or received enough attention. Furthermore, if Congress ever discussed sharks, it probably did so with the more glamorous sharks in mind, e.g., blues and makos, not dogfish.

Again, why rebuild to 440 million lbs.? Another reason is that the reproductive capacity of the stock has been reduced. The 26th SAW stated:

> "...Since 1990 the median length of mature females has declined from 85 cm to 76 cm in 1997 [3 ½" drop]. Seventy-five percent of the female dogfish biomass in 1997 were below the L50 for maturity (i.e., length at which 50% of females are mature). Hence only half of the 70+ cm population is capable of producing offspring. These results coupled with the nearly 50% reduction in abundance of females (equal to and greater 80 cm, suggest large-scale reductions in the reproductive capacity of the stock."

Is this necessarily a "bad thing?" A large-scale reduction in reproductive capacity could help us regain some of the ecosystem structure we all favor: fewer groundfish predators and competitors. Examine the attached figure D24 from the SAW Report. The biomass of dogfish greater than 31" (79 cm) fluctuates between about 50,000 mt and 200,000 mt. from 1968 through 1980. Then it increased sharply, and scientists' warnings began.

We assume NEFSC scientists still support the statements and conclusions they've made and published in the early 90's? Or have they changed their minds? Note the "Special Comment" in the SARC 1998 report:

> "Commercially-exploited species, including cod, haddock, and yellowtail flounder, appear to be negligible components of the diet of spiny dogfish, based on there incidence in dogfish stomachs collected by the NEFSC. There appears to be little justification to reduce biomass of dogfish solely on the basis of predatory interactions with other species."

This comment seems to conflict with Center past pronouncements. The Center should reconcile these seemingly contradictory conclusions, especially since in August the New England Council decided to add another Plan objective: *"Manage the spiny dogfish fishery so as to minimize the impact of the regulations on the prosecution of other fisheries, to the extent practicable "* We argue that a closure of the dogfish fishery for nine years after the 1-year exit fishery and rebuilding adult dogfish biomass to 440 million lbs. (200,000 mt) likely will impact groundfish fisheries since dogfish are major competitors and predators of groundfish. This strategy will not minimize the impact of dogfish regulations on the prosecution of other fisheries..." Competition/predation will work against groundfish rebuilding, hence, against groundfish fisheries. The Councils should not disregard NEFSC scientists' past advice. We would prefer a lower biomass target.

But first, where did the 440 million lbs. originate? The 440 million lbs. calculation is not in the report of the 26th SAW. It's found in the June 1998 report, "Evaluation of existing overfishing definitions and recommendations for new overfishing definitions to comply with the Sustainable Fisheries Act" (Applegate, Cadrin, Hoenig, Moore, Murawski, and Pikitch).

Note that this report's calculation of 440 million lbs. as the biomass target refers to the target as adult (greater 80 cm) female biomass. The Councils refer to 440 million lbs. of adult males and females. This discrepancy should be explained. The 440 million lbs. was derived from a Ricker stock-recruitment model fitted to spawning stock biomass and recruitment observations from the NMFS spring survey. It is the female biomass estimated to produce the highest average recruitment over time.

Also, keep in mind that dogfish biomass is estimated by a swept-area method. According to the 18th SAW:

> "...Swept-area estimates of stock biomass are considered to be minimum estimates (emphasis added) because vulnerability of the stock to the trawl is not incorporated. Ability to avoid the net and dispersal of the stock above the bottom are two factors that may result in lower overall estimates."

What are the implications of this underestimation of juvenile and adult biomass, inherent in the swept-area technique, on stock-recruitment calculations, and on resulting target SSB for adult females?

Impact on Massachusetts

Is it sensible to do away with a directed fishery for dogfish providing economic benefits to commercial fishermen who are trying to cope with reduced groundfish and the regulations to rebuild depleted stocks? These fishermen will lose their fishery and markets. The plan is quite specific on this point:

> "...Processors have indicated that the ability to process spiny dogfish in a cost effective manner is dependent on volume. The proposed low TAL may cause processors to cease processing spring dogfish and thus cause established U.S. based markets for this species to collapse..." (page 114)

Comment at both Massachusetts public hearings supported this warning. At least one fisherman said:

> "What good will it do to rebuild dogfish to higher abundance when to do so we must close the fishery for nine years [10-year rebuilding schedule]; in the meantime, we lose our markets we worked so hard to establish."

But, as these fishermen lose their markets and the income from dogfish, other fishermen not targeting dogfish still will catch dogfish and discard this bycatch in large amounts. Bycatch and discard of dogfish taken by otter trawlers targeting groundfish (e.g., cod and flounders) exceeds the quota proposed for the directed fishery. According to the draft plan, in 1997 about 17.5 million lbs. of dogfish were discarded (otter trawls and gillnets) with 9.9 million lbs. of this total not surviving. From 1989-1997, the highest discard was 25.6 million lbs. with 14.0 million lbs. not surviving. We argue that this scup-like situation for dogfish justifies our not penalizing dogfish fishermen, especially those who have been willing to get into the fishery and who have been creative in doing so.

According to the Draft FMP, Massachusetts' average annual landings from 1988-97 were 18.9 million lbs. N.C. was second at 5.7 million lbs. We accounted for 53% of total landings. During this 10-year period our landings ranged from a low of 4.9 million lbs. (1989) to 28.8 million lbs. (1995). Landings were 27.0 million lbs. in 1996 and 21.8 million lbs. in 1997. N.C. landed 13.2 million lbs. in 1996 and 7.6 million lbs. in 1997.

The Plan describes the importance of dogfish to Mass. ports in 1997. Plymouth, Scituate, and Chatham were prominent. In Plymouth and Scituate about 75% of total value of landings was from dogfish; about 93% total lbs. Dogfish are trucked to New Bedford for processing. In Chatham dogfish made up 21% of value and 74% of total pounds.

Dogfish have filled a niche in Massachusetts, and we don't want this fishery to be done away with by regulation. We certainly realize there is a need for regulation and resource protection.

Fishing mortality appears to have risen from low values (less than 0.10 or 9% exploitation) to a high value of about 0.40 (32% exploitation) in 1997. Recruitment (dogfish less than 14" or 36 cm) appeared very low in 1997. Nevertheless, the price to pay set by the Plan is too high and unreasonable. We feel this way because:

(1) there is a very large, and increasing biomass of 14-31" (36-79 cm) dogfish "in the wings" (Refer to figure D24);
(2) total biomass is stable at about 1,322.2 million lbs. (600,000 mt) (Refer to figure D23); and
(3) discards in non-directed fisheries are very high with there being no Plan strategy to reduce this discard. Note that the Plan proposes F to be 0.03 for the remaining 9 years which will be unlikely since bycatch/discard is a major problem (e.g., according to 26th SAW, discards from other fisheries, particularly by otter trawlers targeting groundfish, contribute an unknown, but substantial fraction of total mortality: minimum estimate of 55.1 million lbs. was discarded in 1993 with 29.8 million lbs. killed).

If the Councils decide to proceed with their preferred alternatives, then consider the following. The Councils propose that in the first year of the plan (beginning sometime in 1999), the commercial quota for the fishery along the coast will be 22 million lbs., split seasonally with 57.9% for May through October and 42.1% for November through April (1990-1997 record). In Massachusetts our landings rise sharply in May and stay high through October (1988-97 unpublished NMFS weighout data). See table 25 in the draft plan. Note that substantial landings occur in April; therefore, it's likely that Mass. will lose these landings since April is the last month of the Nov-April quota period. Of course, if the plan is adopted as is, this might be a 1-year problem because the first year is the last year for a directed dogfish fishery. The 22 million lbs. is for an "exit" fishery.

Alternative approach

We suggest the Councils adopt another proxy for Bmsy; otherwise, both will be wedded to an ill-advised management approach and rebuilding strategy for all the reasons stated above. Of course, this is the challenge. What options do we have? We have been given only one: 440 million lbs., a figure that has not had SARC review.

We suggest the Councils adopt a quota of somewhere between 15-20 million lbs. for the first three years of the Plan. This range encompass the long-term potential yield for dogfish of 15.5 million lbs. (7,000 mt) that scientists believe can be achieved with F=0.11 at 70 cm size-at-entry (27.5"). The is the Councils' Frep value and the proxy for Fmsy is 0.11. See page 15 of draft plan. F is now estimated to be at 0.30 with age at entry being 70 cm.

This quota represents a significant cut in 1996 commercial landings of 60 million lbs. (27,241 mt). Adult biomass is now at 280 million lbs. At first blush, one would think that 1999 landings of this magnitude (e.g. 20 million lbs.) from a biomass of 280 million lbs. of adults shouldn't have much of an impact. An analysis is in order.

Our position is justified by the very large biomass of prospective recruits (14-31"). This biomass has grown from about 220.4 million lbs. in 1968 to about 881.6 million lbs. in 1997! Our position would be different if future prospects looked poor; they' don't. Witness the stable recruitment from 1986-1996 (figure D24), except for lower values in 1995 and 1997 balanced by recruitment in 1996 and skyrocket recruitment in 1994.

During the first few years of the Plan with annual quotas of perhaps 20 million lbs., we will have an opportunity to sample catches of the directed fishery to obtain biological information for improved assessments and requested by the SARC (research recommendations). The 26th SAW recommended additional work on the stock-recruitment relationship, effects of environmental conditions on survey catch rates, etc. (Refer to SARC March 1998 report). Of note, according to the January 1998 "Advisory Report on Stock Status" for the 26th SAW:

> "...Age compositions of landings and estimates of discarded catch (a major source of fishing mortality) are lacking...Additional sampling, analyis, and research are required to reduce the uncertainty in the population biology, landings, and discard data of the present assessment..."

Center for Marine Conservation

The Center for Marine Conservation (CMC) is championing the cause of dogfish. See the CMC "Tricks and Treats for Atlantic Sharks" news release of October 27. CMC referred to dogfish as "imperiled" and "seriously depleted." CMC also noted the recent ASMFC Jekyll Island decision for member states to implement shark fishing measures compatible with federal regulations. Regarding dogfish, CMC stated,

> "...CMC is pressing for swift implementation of strengthened measures before more damage is done...While the Councils do intend to take draconian cuts that are unfortunately necessary to rebuild dogfish within a decade, their proposal to phase in such measures risks population collapse and delays the ecological and economic benefits of recovery."

The Councils should encourage CMC to temper its position and support our alternative justified by other important "ecological" considerations, i.e., predation and competition. Refer to the CMC November 5 "Ocean Action Alert: Join the Cape Shark Crusade." CMC accuses fisheries managers of "stalling" and proposing a plan that allows for "rampant overfishing to continue for more than another year, risking population collapse."

Another aspect of dogfish management for CMC and the Councils to consider is the ASMFC Horseshoe Crab FMP. According to the ASMFC Plan, horseshoe crabs eggs and larvae are a seasonally preferred food for a variety of invertebrates (such as loggerhead sea turtles) and finfish, including spiny dogfish. Most intriguing is the horseshoe crab's important ecological role in the food web of migrating shorebirds especially in the Delaware Bay Estuary, the largest staging area for shorebirds in the Atlantic Flyway and the second largest site in North America. The Plan cites research indicating that over 1 million migratory shorebirds:

> "converge on the Delaware Bay to feed and rebuild energy reserves prior to flying an additional 4,000 km to complete their northward migration. Migratory shorebirds [e.g., red knot, ruddy turnstone, semipalmated sandpiper, and sanderling] arrive in Delaware Bay and adjacent areas along the Atlantic coast at the peak of horseshoe crab mating in Mid-May through early-June, typically spending two weeks in the area..."

During this staging period, shorebirds acquire 40% or more weight gain largely due to feeding on abundant horseshoe crab eggs uncovered by successive waves of nesting crabs and erosion from storms.

More dogfish might translate as fewer crabs and eggs resulting in less food for migratory shorebirds and endangered sea turtles. The more we learn about marine food webs, the more we realize unintended consequences of our management actions.

Summary

Consider ecosystem structure and ask for NEFSC advice regarding the importance of dogfish predation and competition. The NEFSC has made some powerful statements about impacts of dogfish on groundfish populations (pelagics too). The Council should remember all that has been written and said about the impact of booming elasmobranch populations on commercially important species (perhaps ecologically important horseshoe crabs too).

Declining dogfish abundance should not be viewed with alarm, but as a welcomed assist to the Council's groundfish rebuilding efforts that are becoming increasingly difficult, i.e., Gulf of Maine cod. Remember that we're not talking about a collapsing dogfish stock. Far from it. We have a very large, and increasing biomass of 14-31" (36-79 cm) dogfish; and total biomass is stable at about 1,322.2 million lbs. (600,000 mt). Suffice it to say, we need to be aware of important SARC/SAW conclusions about dogfish stock status, reproductive capacity, etc, and we need to keep a watchful eye with vision made sharper by the collection of critical data for improvements in assessments challenged by dogfish life history.

Be especially sensitive to the scup-like management dilemma both Councils face with dogfish. Discards in non-directed fisheries are very high with there being no Plan strategy to reduce this discard. The Plan proposes fishing mortality to be 0.03 for the remaining 9 years. Achieving this extremely low F will be unlikely since bycatch/discard is a major problem (e.g., minimum estimate of 55.1 million lbs. was discarded in 1993 with 29.8 million lbs. killed).

We argue for a quota of about 20 million lbs. for the directed dogfish fishery for the first three years of the plan. Quotas for the years thereafter can be developed during year 3. During the first few years of the Plan with annual quotas of perhaps 20 million lbs., we will have an opportunity to sample catches of the directed fishery to obtain biological information for improved assessments and requested by the SARC (research recommendations). The 26th SAW recommended additional work on the stock-recruitment relationship, effects of environmental conditions on survey catch rates, etc.

We recognize we haven't suggested any alternative to the Bmsy proposed in the plan. There needs to be more discussion and analyses. Nevertheless, with dogfish, the Councils have an excellent opportunity to delve a bit deeper into ecosystem management and, of course, to give further thought to the true meaning of multispecies management.

Furthermore, we will need a continuing dialogue with NMFS that will have to deal with any joint Council decision to deviate from SFA requirements in the interest of groundfish rebuilding. NMFS should be just as challenged as the Councils especially since its scientific branch (NEFSC) has been so aggressive in its concern about the effects of large populations of elasmobranchs on groundfish populations and groundfish management.

We look forward to discussing our views with the Councils.

Sincerely yours,

Philip G. Coates
Director

cc
Mass. Marine Fisheries Commission
Jack Dunnigan
Sonja Fordham

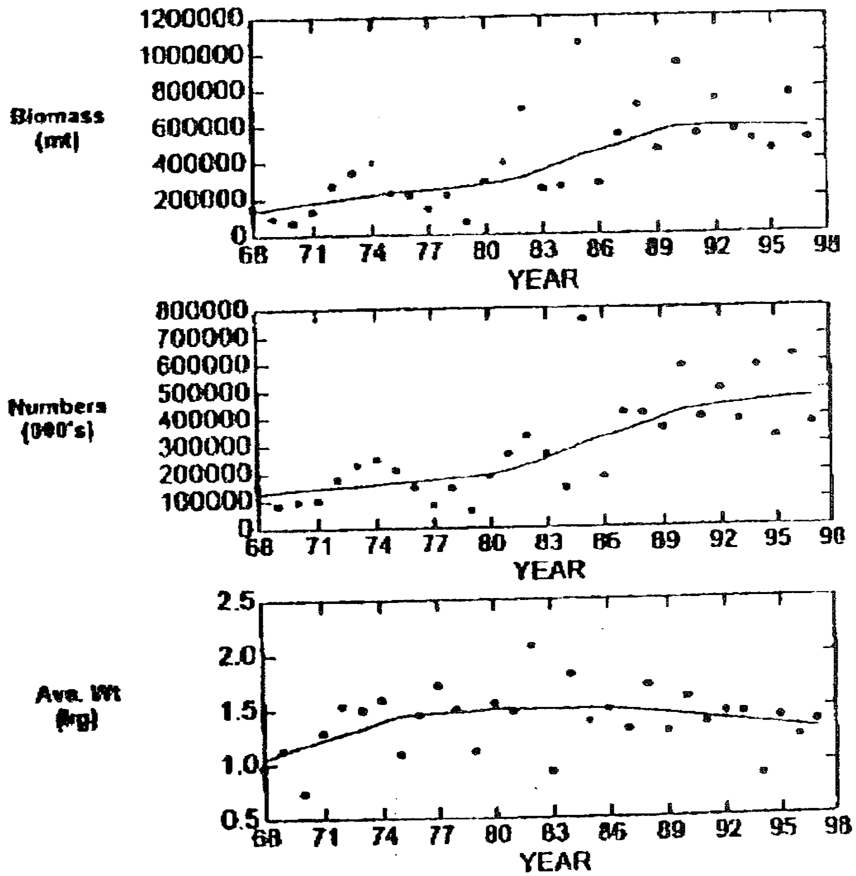


Figure D23. Estimated minimum swept-area biomass (mt), total numbers (thousands), and average weight for spiny dogfish from NEFSC spring trawl surveys, 1968-1997. Lines represent LOWESS smoothed series with tension factor = 0.5.

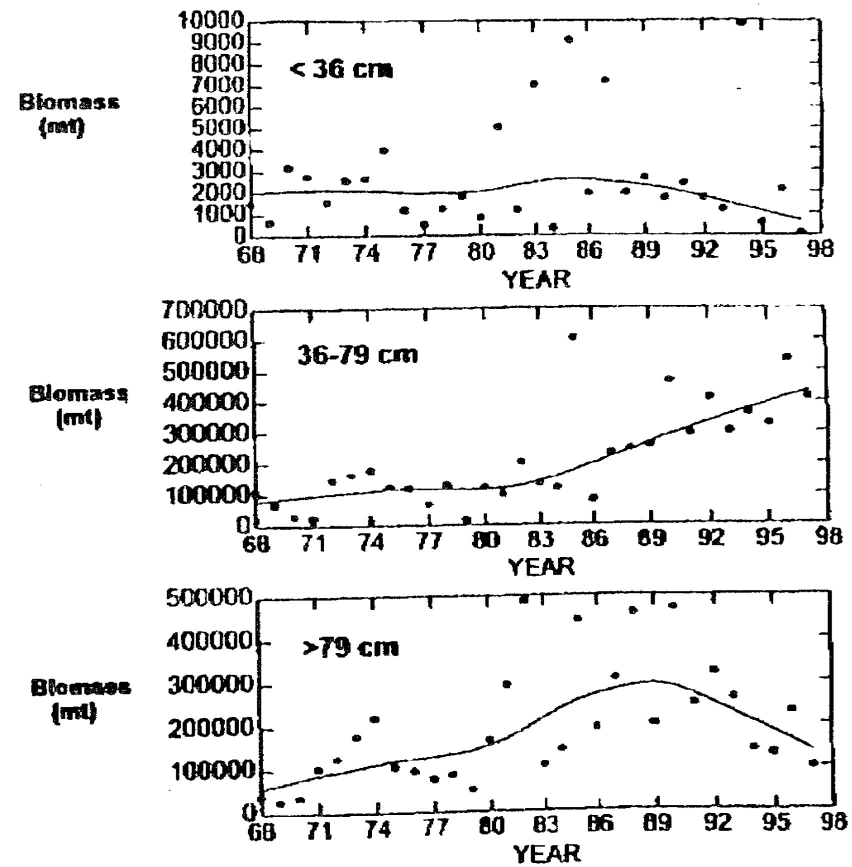
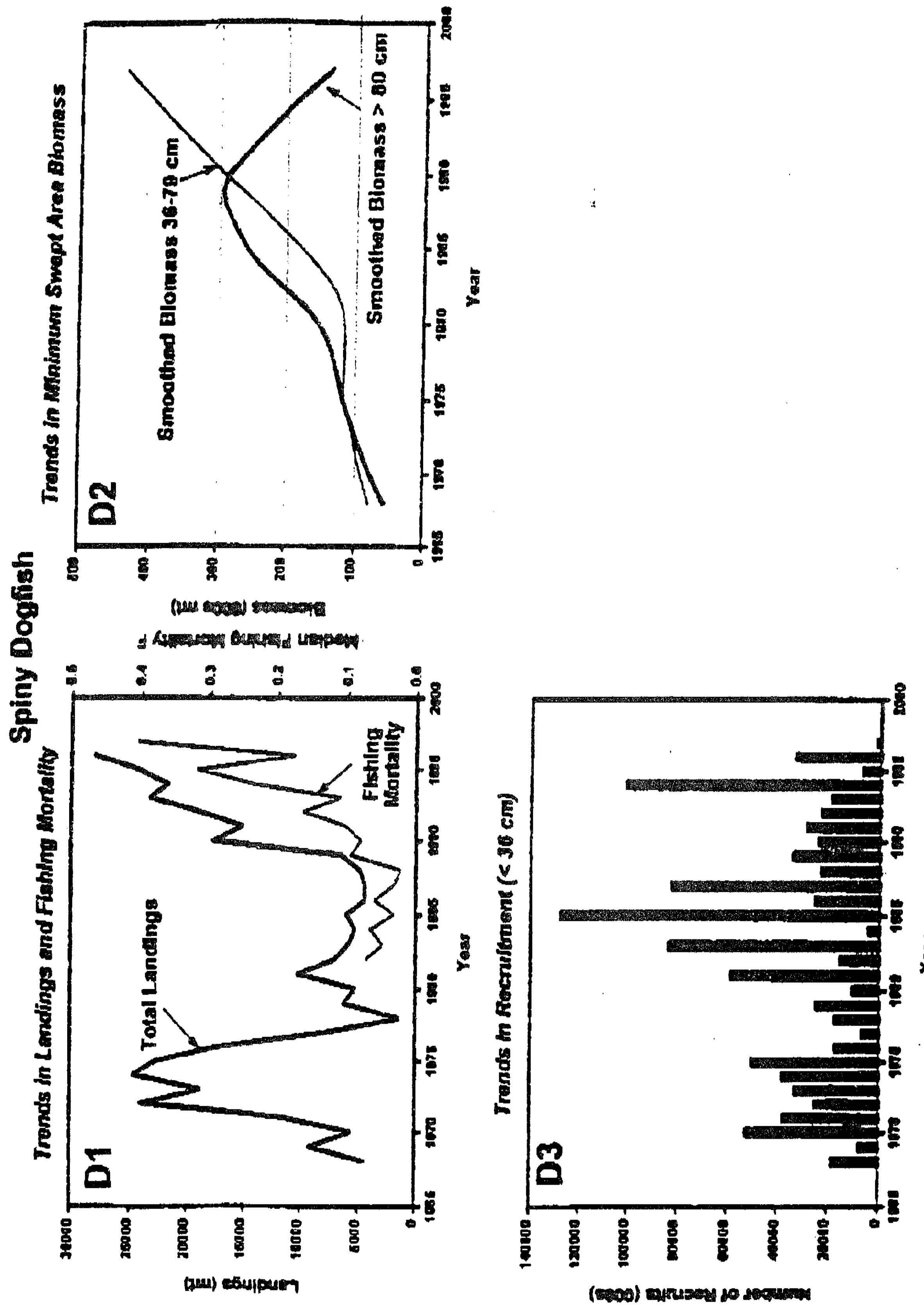


Figure D24. Estimated minimum swept-area biomass (mt) by size group for spiny dogfish from NEFSC spring trawl surveys, 1968-1997. Lines represent LOWESS smoothed series with tension factor = 0.5.


Spiny Dogfish
D1
Trends in Landings and Fishing Mortality
Total Landings
Fishing Mortality
Landings (mt)
Median Fishing Mortality F
Year
D2
Trends in Minimum Swept Area Biomass
Smoothed Biomass 36-79 cm
Smoothed Biomass > 80 cm
Biomass (000s mt)
Year
D3
Trends in Recruitment (< 36 cm)
Number of Recruits (000s)
Year

WWF

November 4, 1998

Mr. Dan Furlong
Executive Director
Mid-Atlantic Fishery Management Council
Federal Building
Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

I am writing on behalf of World Wildlife Fund (WWF) to comment on the draft management plan for spiny dogfish. WWF supports immediate regulation of the dogfish fishery, which has expanded dramatically in recent years. We believe significant catch restrictions are necessary to restore dogfish populations.

The fishery presently targets mature females, a practice that is undermining the long-term sustainability of the dogfish population. Once dogfish populations crash, as they did in the Irish Sea earlier this century, they require decades to recover.

WWF agrees with the Council's plan to require major reductions in the dogfish catch. Such action is long overdue. We oppose, however, the plan to phase-in management measures over the next year. Such delay is inconsistent with the long-term goal of the management plan – the conservation and recovery of dogfish stocks. We urge the Council to **immediately enact** the needed catch reductions so populations can be rebuilt as soon as possible.

We also support the following management measures:

1. Establishment of 32 inch size limits to protect remaining mature females.
2. Enactment of effort limitations in the gillnet fishery.
3. Establishment of mandatory rather than target quotas.
4. Creation of mandatory permit and reporting requirements. This will improve our understanding of the dogfish fishery, and will facilitate future management and stock evaluations.
5. Establishment of a Dogfish Monitoring Committee and a framework process for management adjustments.

World Wildlife Fund
1250 Twenty-Fourth St., NW Washington, DC 20037-1132 USA
Tel: (202) 293-4800 Fax: (202) 293-9211
Affiliated with World Wide Fund for Nature

The life history of the dogfish, coupled with the severe depletion of dogfish populations during recent years, underscore the need to establish a precautionary management regime. We urge you to do so in time to submit a final plan to the Secretary of Commerce by the end of this year.

Sincerely,

Scott Burns
Director
Marine Conservation Program

NATIONAL AQUARIUM IN BALTIMORE.

Pier 3
501 East Pratt Street
Baltimore, Maryland 21202-3194
(410) 576-3800
(410) 576-8238 FAX - Aquarium
(410) 576-8541 FAX - Candler Building Offices

23 November, 1998

Dr. Christopher Moore
Mid-Atlantic Fishery Management Council
300 South New Street
Dover, DE 19904
Fax (302) 674-5399

Dear Dr. Moore:

Conservation is central to the mission of the National Aquarium in Baltimore and we are involved in several conservation efforts. Specifically, the conservation of elasmobranchs is an integral part of our new Ocean Health Initiative including proper management techniques for sharks, skates, and rays. One species in particular, the spiny dogfish, *Squalus acanthias*, is extremely vulnerable to exploitation due to its life history characteristics. These characteristics, common to most elasmobranchs, include: low fecundity, slow growth, delayed sexual maturity, and longevity. There are, as you are aware, historical instances of spiny dogfish fisheries which have collapsed due to overfishing.

The current fishery targets adult females, a practice very detrimental to long-term survival of the stock. The Aquarium supports the development and implementation of a fishery management plan for spiny dogfish. It is hoped that through management practices such as the prohibition of finning, size limits, a limit on gill-netting, and a realistic quota, the spiny dogfish stock will recover to a pre-exploitation level . If there is anything we can do to assist in the conservation of these important animals, please let us know. Thank you for your time and consideration.

Sincerely,

David M. Pittenger
Executive Director

AF&PA®

FAX MEMORANDUM

1111 19th Street, NW, Suite 800
Washington, D.C. 20036
Phone: 202.463.2598
Department Fax: 202.463.2052

DATE: November 23, 1998

TO: **Christopher M. Moore, Ph.D. (302/674-5399)**
Mr. Paul Howard (617/565-8937)

FROM: Christie Prater (202/463-2598)
Coordinator, Legal Department

PAGES: 5 (including cover sheet)

Attached is a copy of the spiny dogfish FMP for your review. Hard copy will follow via mail service. Please do not hesitate to contact Chip Murray directly at 202/463-2582 if you have any questions.

Regards - Christie

AF&PA

AMERICAN FOREST & PAPER ASSOCIATION
Legal Department

November 23, 1998

Dr. Christopher M. Moore, Ph.D.
Acting Executive Director
Mid-Atlantic Fishery Management Council
300 S. New Street
Dover, Delaware 19904

Paul Howard
Executive Director
New England Fishery Management Council
5 Broadway
Saugus, Massachusetts 01906-1036

Re: Amendment to the Spiny Dogfish Fishery Management Plan for Identification of Essential Fish Habitat

Dear Dr. Moore and Mr. Howard:

The American Forest & Paper Association (AF&PA) hereby submits the following comments on the draft amendment to the Spiny Dogfish Fishery Management Plan (FMP) for identification of essential fish habitat (EFH). AF&PA is the national trade association of the forest, pulp, paperboard, and wood products industry. AF&PA represents approximately 250 member companies and related trade associations (whose memberships are in the thousands) which grow, harvest and process wood and wood fiber; manufacture pulp, paper and paperboard products from both virgin and recovered fiber; and produce solid wood products.

While we support the goal of conserving essential fish habitat (EFH), we object to the scope and reach of these amendments. We strongly believe that the amendments represents a clear departure from the letter of the Magnuson-Stevens Fishery Conservation and Management Act and the intent of Congress in adopting the "essential fish habitat" amendments in the 1996 Sustainable Fisheries Act.

The draft amendment for spiny dogfish, which is described as currently overfished, would designate selected estuaries as EFH, based on 90% of the catch, north of Cape Hatteras. South of the Cape, the Councils lacked adequate data and so *inferred* EFH based on what is known about this species north of the Cape. All this for a species which is recognized as not estuarine dependant at page 26 of the draft.

The following comments, similar to previous comments we have filed on other draft FMP amendments to identify EFH on the Atlantic coast, expand on our concerns.

1. The Draft Amendment Is Overly Broad and Exceeds Congressional Intent

At the outset, it should be understood that the 1996 amendments (Sustainable Fisheries Act) to the Magnuson Act do not authorize the promulgation of standards or regulations that affect nonfishing entities. By its terms, the EFH provision is limited to "the description and identification of essential fish habitat in fishery management plans." 16 U.S.C. § 1855(b)(1)(A). This limitation makes it clear that NMFS' authority applies only to "fisheries." There is no basis in the Magnuson Act for the Councils to address nonfishing activities. Hence, the Councils' description of EFH and measures to preserve EFH goes beyond the underlying statutory authority and is invalid.

Further, the Sustainable Fisheries Act provides that:

> The term "essential fish habitat" means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.

16 U.S.C. § 1802(10) (emphasis added).

The draft amendment would appear to go far beyond the statutory understanding of EFH. The Councils' approach to describing EFH is fundamentally at odds with the apparent approach of the Congress in limiting EFH to that which is "essential" or "necessary." EFH should not include any and all habitat nor should it include habitat per se. This approach, on its face, exceeds the authority granted under the Magnuson Act.

1. "Boilerplate" Discussions

The Councils state in the draft amendments that the alternatives for describing EFH were initially developed for the Bluefish FMP amendment. While we do encourage consistent approaches to similar issues, it appears that the Councils also used the same discussion of nonfishing adverse effects with the same suggested conservation and enhancement measures in all four FMP draft amendments, beginning with the Bluefish FMP. We strenuously object to boilerplate descriptions of forestry and other nonfishing adverse impacts, even in the impact priority subsection at 2.2.5.1. Without any connection to the EFH of the species managed under the FMP, these discussions are at best meaningless or, at worst, will cause severe overreaction and overregulation by Council and NMFS staff, not to mention the public.

2. "Silvicultural NPS" - Subsection 2.2.5.3.3 (2.2.5.4.3 in the Clam FMP)

The apparent purpose of the first two paragraphs is to assert that silviculture has significant potential to affect EFH. These paragraphs (a) overstate the importance of silviculture as a nonpoint source of water quality problems and (b) fail to show any connection between silvicultural activities and EFH for any of the species.

The first paragraph of the subsection begins with a sweeping indictment of "Federal land management" for "contributing to the decline of marine and anadramous fish." Various land management activities are identified along with their potential effects on surface waters and fish habitat. Many of the listed activities (e.g., grazing, mining, hydropower development) have nothing to do with silviculture. It is not clear why a subsection on "Silvicultural NPS" includes a general expression of concern about Federal land management activities. Moreover, it is not clear how this general concern connects silviculture with EFH for these species. Most of the Federal forest lands in the eastern U.S. are in mountainous areas many miles from the Atlantic coast. On lands that are near the coast (e.g., Francis Marion National Forest), silvicultural activities are generally focused on wildlife habitat improvement and ecosystem management objectives.

The second paragraph of the subsection comprises carefully selected statements about silvicultural contributions to nonpoint source pollution. The intended message is that managers of EFH should be very concerned about silviculture. These managers should be presented with a more complete and balanced discussion of silvicultural NPS that has some relevance to the particular EFH. It should be noted, for example, that silviculture is a very minor source of NPS pollution in the eastern U.S. compared to agriculture and urban runoff. All states with significant forestry activities have nonpoint source control programs that address silvicultural NPS. Most silvicultural activities are conducted using Best Management Practices (BMP) that are very effective in controlling silvicultural NPS.

Given that localized effects on sediment and temperature in headwaters are the main water quality concerns associated with silviculture, it seems unlikely that silviculture would have any appreciable effects on the EFH for any of the species in these FMP amendments. If there is any evidence to the contrary, it should be included in the particular amendment.

Many of the conservation measures listed in the draft subsection are already included in state BMP manuals. Inclusion of these measures here is potentially confusing to landowners who may receive slightly different versions from various government sources. It would be better to make reference to state BMP manuals than to repeat the information in the FMPs.

Road Construction and Lack of Thresholds. Throughout the documents, no baselines are established to determine whether the stated impact is significant and worthy of addressing or whether it is trivial. For example: "Delivery of sediment from road construction or reconstruction should be reduced." Reduced from and to what levels?

Vague Statements Relating to Harvest Regimes. The documents are altogether vague in places: "Appropriate skid trail location and drainage and proper harvesting in SMAs should be addressed. No guidance is given in the draft Amendments. Standards pertaining to timber harvest can generally be found in federal and state laws, regulations and guidance documents. Generally these statutes, rules and guidelines set forth objective standards. However, here, instead of objective standards from applicable BMPs, the FMP amendments will likely result in a process in which determinations of "appropriate" and "proper" depend on the particular views, values and objectives of the local agency biologist.

Enforcement of Water Quality Standards. The documents suggest that best forestry management practices should be enforced to ensure water quality standards are attained. Generally, federal agencies may not bring enforcement actions based on the failure of a water body to attain articulated water quality standards. The better approach is simply to determine BMPs and implementation through existing state programs.

Restoration of Upland Habitat. The documents speak to the issue of restoring riparian and upland habitat; however, such a recommendation is outside the purview of EFH authority and the documents are too vague to be useful.

3. Conclusions

In summary, we believe the draft amendments are flawed and need reconsideration due to the following:

- the Councils are promoting EFH so as to include all habitat rather than "essential habitat" and without appropriate justification.
- the Councils fail to describe in sufficient detail how the listed nonfishing activities represent a "threat" to EFH and what conservation and enhancement measures NMFS contemplates in addressing these "threats," instead relying on boilerplate descriptions.
- the Councils should indicated with some precision its intent, if any, to extent EFH consultation to areas comprising freshwater and where it is described as EFH.
- the Councils should clarify and elaborate on its views as to what activity would trigger the EFH consultation requirement.
- the Councils should produce a realistic assessment of forestry and recognize existing state BMP programs, rather than introducing vague and confusing measures of their own.

We believe that the amendment before the Councils, if adopted, will violate the spirit and intent of Congress in adopting the EFH amendments. The proposed amendment go beyond the overly broad, complex, and burdensome approach to EFH articulated in the NMFS proposed and interim final EFH regulations.

If you have any questions, please do not hesitate to contact me.

Very truly yours,

William R. Murray

William R. Murray
Natural Resources Counsel
202/463-2782

Dear Christopher Moore,

I am currently an advisor for dogfish. I would like to share some of my thoughts on the management measures. Ido not agree with a ten year stock rebuilding schedule.I believe that three million pounds a year for nine years is too extreme. The large trawlers will catch more than this by accident.The small gillnetters have few options other than dogfishing in the winter months. Most fisheries today have limited entries. I cannot just jump into another fishery. I would like to see acommercial quota spread throughout the year. The small boats could get by with a quota of maybe twenty million pounds annually. The trip limits should be a monthly limit for each boat that qualifies. A daily trip limit is too unpredictable. The fish in the nets are dead, so if you go over your limit there will be too much waste. I also agree with a limited entry. There is no need to add more boats to a fishery that is in need of a quota.

Sincerly Yours,

Albert C. Shelton

609-884-3876

RECEIVED

16 1998

MID-ATLANTIC FISHERY COUNCIL

RECEIVED
OCT 22 1998
MID-ATLANTIC FISHERY COUNCIL

Dear Mr. Moore,

These are my suggestions on the spiny dogfish fisheries.

1. No more entrants
2. Seperate quota's for Commercial + gillnetters
3. Gillnetters should not fish more gear than they can lift in a day.

Explanation of #3. A simple check at the manufacturers would give you a baseline of just how much string these guys leave on the bottom. They don't grapple for lost nets and some don't even bother to lift if there has been a bad storm because it is always rolled up into a ball. So it is easier to write it off and just set new nets. Regulating the amount of nets they can purchas during the year would be a start. Allowing unlimited string is so far beyond a rational approach, your shooting yourself in the foot before you start. I agree with the need for a quota, but it would be necessary to seperate it into an allotment for draggers and an allotment for gillnetters. The reason for this separation is that the gillnetters chase the dogs from Mass all the way to the Carolina's. Draggers (here in Jersey) don't start catching dogs until the fall til the new Year. Thank you for your time and please do look into the supply houses to see just how many shots these guys go through in a year.

Respectfully
Wm. J. Gallagher
F/V Shaun Michael

4914 Flint Drive
Bethesda, MD 20816
October 27, 1998

Dr. Christopher Moore
Mid-Atlantic Fishery Management Council
300 South New Street
Dover, Delaware 19904

Dear Dr. Moore:

Please accept these written comments on the draft Fishery Management Plan for spiny dogfish.

I strongly urge that you STOP overfishing immediately. We need to rebuild populations of spiny dogfish within at least ten years, and to do that you should not just phase in the needed changes. I support the total prohibition on finning, a commercial quota set at a low enough level to allow the sharks to reproduce and rebuild their populations quickly, a seasonal allocation of that quota, and a monitoring committee. In particular, I believe the fishing effort must be cut enormously, perhaps even suspending the directed fishery for a few years as necessary, and requiring recreational fishermen to return all spiny dogfish caught.

As you know, the spiny dogfish fishery exploded after the fishing industry greatly depleted the more lucrative catch of groundfish. The fishery exploded without any regard to the basic population biology of dogfish, which differs markedly from groundfish. This shark has very long gestation periods, late maturation, small numbers of young, and long lifespans. The fishery exploded based on catching large females because they brought more income – yet these are the very individuals who would bring more dogfish if allowed to live.

I have spent a fair bit of time in the Barnegut Light and Harvey Cedars region of New Jersey and have talked with both commercial and recreational fishermen there. These people have made clear their need to fish within clear limits, quotas, and regulations set and enforced by the government. They cannot be expected to voluntarily do the right thing and reduce their catch while their peers still fish irresponsibly. Wise fishermen care about the future of the fish and the ocean, just as wise farmers care for the soil and long-term productivity of the land. But to protect the wide open ocean, government must take an active role.

We must act as soon as possible in the hope that it's not already too late for our ecologically and economically valuable fish to recover. PLEASE, pass and quickly implement the Preferred Management Measures for spiny dogfish.

Sincerely,

Kathy Bricker

Kathy Bricker

RECEIVED
OCT 28 1998
MID-ATLANTIC FISHERY COUNCIL

Mr. and Mrs.Edward T. Smith
7605 Worcester Hwy.
Newark, MD 21841

Oct. 25, 1998

Dear Sirs,

These are our comments regarding the Spiny Dogfish Plan. We are concerned about the economic impact. Many of the fishermen who have been primarily fishing for dogfish the last few years have permits for other fisheries. These fisheries would include; lobster, black sea bass, multispecies, and state permits for crabs, conch, and other species. Many of these permits came with the boats and have not really been used. When these fishermen can no longer go dogfishing, they are going to put enormous pressure on these other fisheries, injuring the resource and the fishermen currently involved in these fisheries.

I think a buy out might be the solution if it would apply to all permits, and the fishermen were paid enough to retire or go into another bussiness. With the last buy out, many fishermen bought new boats.

Sincerely,

Mr. and Mrs. Edward T. Smith

Edward T. Smith

ELIZABETH E. LeCLAIR
532 Spruce Street No. 6
Philadelphia, PA 19106 USA
215.238.0190 Elizabeth.LeClair@mail.tju.edu

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, Delaware 19904-6790

Dear Mr. Furlong,

I am writing on behalf of recent regulatory efforts to halt overfishing of the spiny dogfish or "cape shark" of the Atlantic Coast.

As a scientist who has worked on cartilaginous fishes I am particularly aware that the this animal has one of the most lengthy reproductive cycles for a marine animal. The gestation period is nearly two years long, and only a small number are born to replace population levels.

Thus the dogfish is vulnerable to poor management practices, the most recent being drastic overfishing. A few years ago dogfish were plentiful, but by 1997 the population was declared "overfished", citing dramatic declines in the number and average size of females.

I urge you to begin an *immediate* recovery plan to return dogfish populations to sustainable levels. "Phasing in" tougher fishing quotas over a number of years simply adds to the injury we have caused this fragile population. The current situation is an uncontrolled ecological experiment with unpredictable results. The consequences of further overfishing may be devastating to the species, and obviously it is not possible to "phase in" an organism once we have irresponsibly decimated it to the point of collapse.

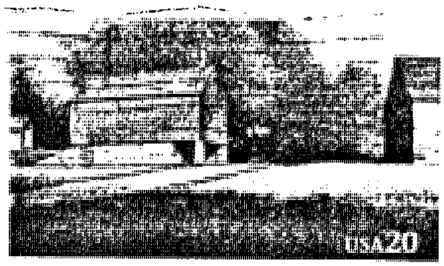
I respectfully ask that you submit a plan with *biologically responsible, mandatory quotas* to the Secretary of Commerce by the end of 1998. Let's not wait another season. I look forward to hearing from you.

Most sincerely,

E. E. LeClair

E. E. LeClair, Ph.D.

Mr. & Mrs. Robert E. Kuehlwein
4992 Mermaid Blvd.
Wilmington, DE 19808



Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Bldg. Room 2115
300 S. New St.
Dover, DE 19904-6790

11/16/98

Dear Mr. Furlong,

I just read about a proposed dogfish management plan to rebuild the population of dogfish, but which permits overfishing to continue for more than another year. My understanding is that such a delay might lead to a collapse of the dogfish population, often requiring decades to recover. It seems clear that a better plan for conserving public fishery resources is needed. I ask that you please favor a plan that reflects this urgency.

That you in advance for your consideration

Sincerely,

Robert E. Kuehlwein

12 Raymond Street
Everett, MA 02149
November 17, 1998

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Dover, Delaware

Dear Sir,

I am writing in regard to the overfishing of the Northwest Atlantic spiny dogfish. It is determined that dogfish catches are 10 times the level needed to rebuild the population within the new legal limit of ten years.

Since the females are at least 13 years old before they can reproduce and the gestation period is two years, it is imperative that legislation for management be passed before the end of 1998.

Please work to quickly submit the final dogfish plan to the Secretary of Commerce before the end of this year.

Thank you for your consideration.

Sincerely,
Mrs. Edward Amoroso

RECEIVED
NOV 19 1998
MID-ATLANTIC FISHERY

Mr. Furlong,

I've read that you and the Mid-Atlantic Fishery Mgmt. Council will soon make decisions regarding the fate of the spiny dogfish; a decision which is long overdue and, from what I read, confuses which species is at risk: Human or piscean. I write to clarify that confusion for those unable or unwilling to distinguish the difference.

A year ago, you received data from scientists studying human predation on the dogfish which found that that predation was 10 times greater than the dogfish's ability to replace the individuals killed. That information would be enough to persuade any reasonable person to stop such predation immediately but apparently, reasonableness is not a strong suit in your council. The fishery should be closed immediately in its entirety and over its entire range; not gradually or at some future date -- and closed for all manner of "takings", including the barbaric practise of "finning". Consideration for the welfare of those who prey on the dogfish should not even enter into a consideration of the issue. They managed to earn their livings killing other things for generations before they seized on the dogfish. Let them go back to killing whatever they used to kill. What's that? You say those other species' numbers have collapsed to the point where these fine specimens of Christian America couldn't make any money from killing them anymore, hence the lowly dogfish now? Gee, what a pity! Maybe that should tell you and them something you and they obviously aren't bright enough to figure out for yourselves: The history of commercial fishing in the Western world is the history of overweaning greed driving one species after another into commercial (and in the case of the Calif. pilchard, nearly literal) extinction. The fishermen's way of life is at risk? So what? The fishermen aren't at risk of literal extinction here, the dogfish is. All the fishermen would lose is a target; the dogfish are losing their lives and the ecosystem is losing a key component in its health. It's long past time that fishermen and those who dance to their tune do things right for a change. That opportunity has past for the spiny dogfish. You and they should have acted years ago. But you can salvage your miserable record by formulating a management plan for the dogfish which rescues it <u>now</u>. Do it. And send that recommendation to the Sect'y of Commerce expeditiously.

Allen Kreger
1733 Pope Ave.
Norfolk, Va. 23509
Nov. 18,1998

P.O. Box 52
Buxton, NC 27920
November 19, 1998

Dr. Christopher M. Moore
Acting Executive Director
Mid-Atlantic Fishery Management Council
300 S. New Street
Dover, DE 19904

Via Fax: 302-674-5399

RE: DRAFT SPINY DOGFISH MANAGEMENT PLAN

1. Page 69: It should be noted that the expansion of the spiny dogfish fishery in North Carolina since 1992 was encouraged by federal and state managers as an alternative fishery for the sink net fleet working out of Hatteras.

2. Page 72: With the possible exception of tuna permits, vessels in the Hatteras sink net fleet do not hold the types of permits listed in Table 32. In addition, it should be noted that, under current NMFS regulations, North Carolina's commercial fishermen have been effectively excluded from participation in the tuna fishery.

3. Page 83: A system to distribute the annual commercial quota on a seasonal basis within the fishing year (May 1 - April30) is essential in order that southern states are treated fairly and equitably.

4. Page 85: Vessels in the Hatteras sink net fleet do not possess Summer Flounder, Northeast Multispecies or Atlantic Sea Scallop permits. Therefore, we will be required to submit an additional logbook report.

5. Page 96: The implication of management upon foreign and domestic markets is not hard to predict. Markets will shrivel up and die.

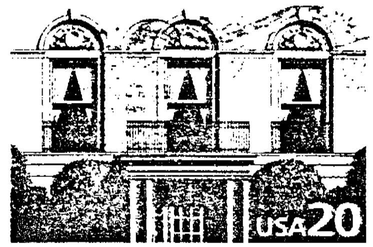
6. Page 121: Fishing for alternative species will not compensate for the loss of revenue to the Hatteras sink net fleet. Quite simply, there are fewer and fewer alternatives available to us.

Sincerely,

Susan B. West

Susan B. West
252-995-4131

Mrs. Catherine K. Mueller
26 Harbour Pointe Common
Buffalo, New York 14202



Kerr Hall Northeastern University 1898-1998

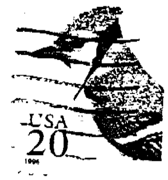
MID-ATLANTIC FISHERY COUNCIL

Dan Furlong, Ex Director
Mid-Atlantic Fishery Manage. Council
300 S. New St.
Dover, Delaware 19904-6790

Dear Mr. Furlong: 1-18-98

It would seem that unless the Council acts immediately, the Atlantic dogfish is doomed. How can fishing ~~the~~ continue to be unrestricted on the largest fish left here. When the females do not reproduce until 13 yrs. old? Haven't we learned from the overfishing of cod, haddock & others? Why do we wait until the last minute to save these fish? The fishing industry is certainly short sighted!! I urge the Council to stop overfishing now. Thank you for your help.

Sincerely,
Catherine K. Mueller



Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
300 South New Street, Rm 2115
Dover, DE 19904-6790

MRS. REYNOLDS GIRDLER _ 10 PILOT ROCK LANE _ RIVERSIDE, CONNECTICUT 06878

Mar. 17, 1998

Dear Mr. Furlong,

You must be very busy these days, keeping up with endangered species! Now it's the spiny dogfish — and you know just what to do. What appalls me most of all is the practice of slicing off the fins and discarding the rest of the shark. Sharks are a truly amazing species, and quite remarkable. Let's keep them around for a while longer!

Best of luck,

Barbara Girdler

CONFIDENTIAL

PRIVILEGED

PERKINS COIE LLP - WASHINGTON, D.C.

FAX NUMBER: (202) 434-1690

IF THERE ARE PROBLEMS WITH THIS TRANSMISSION, PLEASE CALL:

(202) 628-6600

ADDRESSEE Mid-Atlantic FMC — FAX NO. 302-674-5399

Christopher Moore, PhD — Direct Dial

ADDRESSEE New England FMC — FAX NO. 781-565-8937

Paul Howard — Direct Dial

FROM Angela M. Killian — Date November 23, 1998

Pages (Including Cover Sheet) 6 — Client Number 28498-0002

Return to A. Killian / 1656 / 8

NAME EXT. OFFICE LOCATION

MESSAGE:

Sent By

This Fax contains confidential, privileged information intended only for the addressee. Do not read, copy or disseminate it unless you are the addressee. If you have received this Fax in error, please call us (collect) immediately at (202) 628-6600, and mail the original Fax to Perkins Coie, 607 Fourteenth St., N.W., Washington, D.C. 20005-2011.

[FAXCOVER.01]

PERKINS COIE LLP

607 FOURTEENTH STREET, N.W. WASHINGTON, D.C. 20005-2011
TELEPHONE: 202 628-6600 · FACSIMILE: 202 434-1690

November 20, 1998

Christopher M. Moore, Ph.D.
Acting Executive Director
Mid-Atlantic Fishery Management Council
Room 2115 Federal Building
300 South New Street
Dover, DE 19904

Paul Howard
Executive Director
New England Fishery Management Council
5 Broadway
Saugus, MA 01906-1036.

Re: Comments on Spiny Dogfish Fishery Management Plan (Incorporating Provisions Related to "Essential Fish Habitat")

Dear Messrs. Moore and Howard:

This letter is written on behalf of a wide range of nonfishing regulated entities, including agriculture, forest products, hydropower, livestock, mining, real estate, and water supply interests and responds to the Council's request for comments on the proposed Spiny Dogfish Fishery Management Plan ("SDFMP") identifying Essential Fish Habitat ("EFH") for spiny dogfish and related conservation and enhancement recommendations.

While we support the goal of conserving and enhancing essential fish habitat, we object to the scope and reach of the proposed FMP before the Councils. We strongly believe that the draft SDFMP before the Councils represent a clear departure from the letter of the Magnuson-Stevens Fishery Conservation and Management Act ("MSFCMA") and the intent of Congress in adopting the "essential fish habitat" amendments. The following comments expand on our concerns.

[28498-0002/DA983240.058]

1. The SDFMP EFH Identification and Descriptions Are Overly Broad and Exceed Congressional Intent

At the outset, we emphasize that the 1996 Amendments to the MSFCMA do not authorize the promulgation of standards or regulations that affect nonfishing entities. By its terms, the EFH provision is limited to "the description and identification of essential fish habitat in fishery management plans." 16 U.S.C. § 1855(b)(1)(A). This limitation makes it clear that NMFS' authority applies only to "fisheries." There is no basis in the MSFCMA for the Councils to address, through plans, nonfishing activities. Hence, the Councils' definition of EFH goes beyond the underlying statutory authority and is invalid.

Further, the Sustainable Fisheries Act provides that:

> The term "essential fish habitat" means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.

16 U.S.C. § 1802(10) (emphasis added). It appears that the SDFMP describes several identified estuaries in New England and the Mid-Atlantic as spiny dogfish EFH as well as similar but as yet unnamed estuaries south of Cape Hatteras. However, the Councils recognize and clearly state that estuarine habitat is not essential fish habitat for spiny dogfish. Spiny Dogfish FMP at 26 (Sept. 22, 1998 Hearing Draft) ("dogfish are not estuarine dependent"). Without a clear basis for doing so, the Councils should not include estuaries as spiny dogfish EFH.

Moreover, we note that for areas south of Cape Hatteras, North Carolina, the Councils recognized that no consistent data was available to evaluate EFH. Instead the Councils inferred EFH based on what is known about spiny dogfish north of Cape Hatteras. Notably, the Council justified this approach by stating:

> The purpose of identifying a broad [EFH] area south of Cape Hatteras as EFH is so that any [development] project proponents should document the distribution and abundance of dogfish in the areas that may be impacted with their activities.

Id. at 25 (emphasis added). Such a position is unlawful. It is not the duty of private parties to identify EFH. It is up to NMFS and the Councils to identify, based on sound and objective science, habitat that is "essential" to spiny dogfish. Neither the Councils nor NMFS have the legislative authority to place the onus of identifying EFH on private parties. As a matter of law, we believe that identifying EFH as all areas in which spiny dogfish have ever occurred or likely to occur (100 percent) is illegal. The Councils SDFMP suffers from an indiscriminate and overly broad identification of EFH. This approach far exceeds the plain language defining EFH and the intent of Congress in adopting the EFH amendments, essentially writing the term "essential" or "necessary" out of the definition adopted by the Congress.

2. The Proposed EFH Provisions of the SDFMP Include Unjustified Prescriptive Restrictions on a Huge Range of Land Uses and Activities

The recommendations advanced by the Councils contain voluminous passages about the potential effects of nonfishing activities on spiny dogfish EFH and numerous specific recommendations for restricting an extremely broad range of land uses and activities ranging from agriculture to "urbanization." In many instances, no reference is made to support the conservation and enhancement recommendations. Riparian buffer zones, wetlands avoidance, water restrictions on irrigation return flows, prohibitions on road building, and a litany of other measures apparently aimed at minimizing any potential impacts on fish habitat are included in a laundry list style of presentation. E.g. id. at 35-64.

No adequate scientific or other justification is presented in the draft recommendations or amendment for adoption of these numerous and onerous prescriptions as EFH conservation and enhancement measures. Many of the measures would be redundant or potentially in conflict with measures being pursued under other regulatory programs. Such prescriptions require much more study, debate, and revision before being accepted as a valid and warranted constraint on important economic and other activities already subject to extensive water quality and other regulation by federal, state, and local governments. In many instances these conservation and enhancement measures are so vague as to be useless if not confusing. We urge the Council NOT to adopt the EFH provisions as drafted; these recommendations will only provide more fodder for disputes and litigation over a universe of upland and other nonfishing activities.

3. Basis for "Threats" to Spiny Dogfish EFH

We note that the Councils identified EFH largely on the basis of asking knowledgeable Council individuals to identify and prioritize "perceived threats" to EFH. Id. at 34. Then the Council prioritized this list based on comments of "habitat managers and others in the environmental community." Id. To our knowledge none of the nonfishing community was invited to be involved in this process. Moreover, it is exactly this community that has the most knowledge of existing environmental requirements and the burdens (time, personnel and fiscal resources) that are devoted to the panoply of existing environmental laws, regulations and guidelines at the local, state and federal levels. We strongly believe that this approach is ill-advised, wrong, and has resulted in a biased and erroneous document.

The SDFMP also states that project proponents "must demonstrate that project implementation will not negatively affect dogfish, their habitat, or their food sources." Id. at 36. The Councils mistakenly believe that the Magnuson-Stevens Fishery Conservation and Management Act authorizes or mandates such a substantive determination prior to the initiation of projects in or "adjacent" to spiny dogfish EFH. Again, the Councils clearly misapprehend and have exceeded the authority granted under the Act.

4. Lack of NEPA and RIR Documentation

We also note that the Councils have failed to analyze in the context of NEPA, the impact of identifying and describing EFH under any of the five options outlined, nor the EFH conservation and enhancements recommendations in the SDFMP. We also note that the Councils have specified that no enhancement of wildlife may occur in spiny dogfish EFH. Id. at 36 ("Wildlife management projects should not adversely affect dogfish EFH.") In our view, spiny dogfish do not occupy the pinnacle of priority for land use or fish and wildlife management at large. The Council's approach is misguided and fails to adhere to the requirements of NEPA. Similarly, the Councils have failed to address in the context of the Regulatory Impact Review the likely implications of the EFH provisions of the SDFMP on small businesses and has, therefore, not complied with the law.

5. Conclusion

We believe that the proposed SDFMP now before the Councils is misguided and, if adopted, will result in an impractical and burdensome process that will yield few benefits. We believe that the SDFMP draft, if adopted, will violate the spirit and intent of Congress in adopting the EFH amendments as well as NEPA and the Regulatory Flexibility Act. The proposed amendments go beyond the overly broad, complex, and burdensome approach to EFH articulated in the NMFS proposed and interim final EFH regulations. We incorporate by reference our July 8, 1997, and March 19, 1998 comments on the regulations, which have already been submitted to NMFS and are attached hereto.

If you have any questions, please do not hesitate to contact me.

Sincerely,

Guy Martin

Enclosures

(July 8, 1997 and March 19, 1998 comments to NMFS)

Mickelson, Barnet & Associates, P.C.
Counselors At Law
80 Cornell Street
New Bedford, Massachusetts 02740-1709

HARVEY B. MICKELSON
JAY L. HOROWITZ
GREGORY J. KOLOYS*
MARY E. KELLEHER

DAVID S. BARNET
(1937-1994)

* ALSO ADMITTED TO PRACTICE IN CONNECTICUT

TELECOPIER COVER SHEET

DATE: November 23, 1998

TO: [illegible] FROM: Harvey B. Mickelson, Esquire

[illegible] Management Council

RE: American [illegible] Association

TELECOPIER # TRANSMITTING TO: 1-202-[illegible]

WE ARE SENDING A TOTAL OF 4 PAGES IN ADDITION TO THIS COVER SHEET.

COMMENTS:

If you do not receive the indicated number of pages, please call (508) 993-8800 so that we can check on it for you.

**********CONFIDENTIALITY**********

RI:[illegible]

AMERICAN DOGFISH ASSOCIATION
30 CORNELL STREET
NEW BEDFORD, MA 02740

Telephone: (508) 993-8800
Facsimile: (508) 992-8031

November 23, 1998

VIA FACSIMILE
Mr. Daniel Furlong, Executive Director
Mid-Atlantic Fishery Management Council
300 South New Street, Room 2115 Federal Bldg.
Dover, DE 19904-6790

Dear Mr. Furlong:

The American Dogfish Association was recently formed to become the representative for those active in the harvesting, processing and distribution of spiny dogfish, and more particularly, to represent their interest in the current considerations being given by the Mid-Atlantic Fishery Council and the New England Fishery Council to adopt an "Exit" plan for engagement in the Fishery. It is our understanding that the most favored plan being considered, closes down the harvesting and distribution opportunities developed by industry during the preceding years. As you obviously are aware, the spiny dogfish opportunity was developed at the direction of the Councils and National Marine Fishery Service as a specie to be pursued and to be developed to relieve pressure on the more historical fisheries. Needless to say, the pursuit of the Industry has indeed resulted in the substantial and significant harvesting opportunity which has developed consistent with various processors developing and pursuing foreign markets, in addition to, opportunities in medical and other by-products associated with the Dogfish. Mid-Atlantic Fishery Council and the New England Fishery Management Council are engaged in developing a recommendation which would under any of the alternatives under consideration, reduce the harvesting and sales opportunity for dogfish by 90% from its current level and as a practical matter destroys their involvement in the markets.

The option appearing to be the most acceptable to the joint dogfish committee is one in which during the 1999 harvesting season total harvesting would be reduced to ten thousand metric tons, and thereafter for nine consecutive years, the level of harvesting would be minimal.

There is little question that the status of the stock, is one in which there has to be close attention paid to the circumstances that have caused such a substantial reduction in the availability of larger fish, which has an impact on their reproduction and ability to maintain the present stock and lay the basis for improvement, therefore, bringing the stock to a level required by present law.

While industry recognizes the need to attend to the state of the dogfish stock, the action being considered by the joint committee is one that appears to be a knee-jerk reaction to an apparent problem without a complete and exhaustive study of all aspects of alternative gear opportunities, closure of spawning areas, survival rate of discards and the impact of increased dogfish stock on other species.

As a result of current legislation, the councils have concluded that any financial impact on the harvesting and processing sector are not to be considered and, therefore, the decision being made is of particular significance and requires exhaustive study before adoption and implementation, because for all practical purposes the current foreign market developed at the direction of the Department of Commerce will have been permanently destroyed.

It became clear at the hearing that representatives of this organization attended, that the action being recommended by the Councils is being concluded without the same type of effort and consideration that historically has been given to the preparation and imposition of a management plan. It was acknowledged by the council representatives at the hearing that their has not been significant at-sea investigation done on alternative gear restrictions, as has normally been the case prior to and as part of a management plan. It also became clear that the amount of at-sea investigation was not consistent with those areas at those times that the vessels were engaged in the harvesting of product. It also became clear that the status of this stock is such, that the opportunity to investigate all historically acceptable aspects of a stock prior to the imposition of a management plan, would not impact substantially on the long-term outlook for the stock. To my knowledge, this is the first time that a exit plan termed is being considered without consistent and exhaustive study being concluded. Based on the presentation made at the hearing it became clear that there is a substantial biomass of medium to small fish available to develop during the coming year and to guaranty the continuity of a substantial biomass. Small fish are not marketable and therefore would not be harvested as there would be no place for it to be sold.

It is therefore our position that the joint committee recommend to the councils, that an investigation proceed immediately and that no harvesting restrictions be recommended and adopted until completion of their investigation into the following:

(1) Whether there is more than one stock of spiny dogfish, and if there is more than one stock whether the same approach should be made to both stocks.

(2) A clearer answer to the question of discards and survival rates be identified, and the impact of gear alternatives be considered in conjunction with the discard question. There should be several trips with appropriate representatives determining these answers.

(3) Since industry under any circumstances will have to deal with reduced availability, what alternative species have been identified by the joint committee to fill the void left by potential restrictions? Industry has developed a market for this product and will lose that market. Are there alternatives that could allow it to embark on developing an alternative market?

(4) Although there supposedly is not to be any consideration of the financial impact of the restrictions being considered, that impact should be identified, analyzed and reported so that industry might best protect itself from this substantial financial impact.

(5) That the councils do not take any permanent action to close the fishery at the end of a year, and that they immediately recommend the forthcoming fishery year to be used for the purpose of identifying the answers to 1-4 above, with the use of onboard observers taking part in fishing operations on harvesting; vessels under gear; and others immediately developed between industry and fishery agencies.

(6) The state of the entire business is not in jeopardy according to recent discussions at hearings, and there is not any emergency that is not acceptable for a delay of one year, to better investigate and identify the questions that have historically been exhaustively identified in the development of plans.

That during the course of the forthcoming year Industry and NMFS and available Universities such as, Virginia Institute of Marine Science and University of Massachusetts at Dartmouth cooperate in accumulating data which can be considered by the councils as a completed investigation, rather than a decision in an information vacuum and that a report to the various committees be prepared and submitted by industry prior to the end of the forthcoming year, so that a decision responsive to the facts may be the basis for their decision.

Respectfully submitted,

Harvey B. Mickelson
Attorney for the Dogfish Association

HBM/dac
E1/ADAED/4460

FAX 302-674-5399

from B Sachau
973-515-3868 (ph)
(days)

Written Comments - Re Spiny Dogfish
Hearing Due 11/23/98
Spiny Dogfish Monitoring
Committee should include
members of the environ-
mentally conscious public -
NOT JUST STAFF
REPS from bureaus - a
majority of the committee
should be the above. The
public's interest is not
being sufficiently protected!
50 CFR PART 648 - 4(b)
should read first sentence
(take out "unless exempted
from such requirements
under this part":
There should be NO EXEMPTIONS

648.200 Catch quotas b(2)
should read
"Total exclusion on gill nets" instead of restrictions

(c) Inspection of all fishing vessels to monitor what they are catching shall be immediately instituted, for the public's benefit.

648.201 Closures (a) should read
Fishing for spiny dogfish by commercial vessels shall be stopped immediately

648.202 Gear Restrictions
Commercial gill net vessels fishing for Spiny dogfish shall be totally prohibited.

PS It would be helpful if your folks would get the word out on pesticides/herbicides/chemicals to every State DEP with the request that they immediately send out information to county + municipalities where pesticides are routinely killing fish. Thanks for your help.

B Sachau
15 Elm St
Florham Park NJ 07932

Re: Spiny Dogfish Mgt Plan

Via FAX 302-674-5399

There is an immediate need to protect this fish.

① There should be a severe fish equipment restriction.

② There should be a closure of five years on fishing

③ Cut out giving permit applications for development – Just say NO

Are you going to study these factors until the fish are all gone!

NO FISHING UNLESS EVERYTHING you catch is used – if you fish at all.

NO TRAWLERS

38 Pennwood Drive
Ewing, NJ 08638
October 21, 1998

Mid-Atlantic Fishery Management Council
Room 2115
Federal Building
300 South New Street
Dover, Delaware 19904-6790

Dear Sirs:

Why are recreational anglers subjected to such stringent guidelines while the commercial industry is free to rape the ocean of her resources? Is there any real concern for these resources, or only for the financial gain of the commercial interests?

Sincerely,

J Scheid

Concerned recreational angler
Jon Scheid

RECEIVED
- 26 1998
MID ATLANTIC FISHERY
COUNCIL

November 4, 1998

Mid Atlantic Fishery Management Council
Room 2115
Federal Building
Dover, DE 19904

Attn: Dan Furlong

Re: Spiny Dogfish Fishery Management Plan

Dear Mr. Furlong:

With regard to the proposed spiny dogfish management plan I oppose any management measures that might be taken in the calendar year 1999. Has the negative economic impact upon the fishermen and supporting businesses been considered? This should be done before such drastic reduction plans take place. More feedback from the fishermen needs to be taken in order to determine the economic consequences of this management plan.

The ten year plan should be lengthened to make the economic hardship less severe. Fishermen should be allowed to continue to catch spiny dogfish while the conservation measures are put into effect. The plan that is currently proposed is too drastic and would create too much of an economic hardship for those currently fishing for spiny dogfish.

Sincerely,

J D Wootten Jr

November 4, 1998

Mid Atlantic Fishery Management Council
Room 2115
Federal Building
Dover, DE 19904

Attn: Dan Furlong

Re: Spiny Dogfish Fishery Management Plan

Dear Mr. Furlong:

With regard to the proposed spiny dogfish management plan I oppose any management measures that might be taken in the calendar year 1999. Has the negative economic impact upon the fishermen and supporting businesses been considered? This should be done before such drastic reduction plans take place. More feedback from the fishermen needs to be taken in order to determine the economic consequences of this management plan.

The ten year plan should be lengthened to make the economic hardship less severe. Fishermen should be allowed to continue to catch spiny dogfish while the conservation measures are put into effect. The plan that is currently proposed is too drastic and would create too much of an economic hardship for those currently fishing for spiny dogfish.

Sincerely, Capt. Chris LaRocca

117 W. 24th St
Ship Bottom, N.J.

November 4, 1998

Mid Atlantic Fishery Management Council
Room 2115
Federal Building
Dover, DE 19904

Attn: Dan Furlong

Re: Spiny Dogfish Fishery Management Plan

Dear Mr. Furlong:

With regard to the proposed spiny dogfish management plan I oppose any management measures that might be taken in the calendar year 1999. Has the negative economic impact upon the fishermen and supporting businesses been considered? This should be done before such drastic reduction plans take place. More feedback from the fishermen needs to be taken in order to determine the economic consequences of this management plan.

The ten year plan should be lengthened to make the economic hardship less severe. Fishermen should be allowed to continue to catch spiny dogfish while the conservation measures are put into effect. The plan that is currently proposed is too drastic and would create too much of an economic hardship for those currently fishing for spiny dogfish.

Sincerely, Dwight Kaugman

LONG LINER F/V SEAHAWK
E29 INDIAN CABIN RD
GALLOWAY TWNP, 08215

RECEIVED
NOV 16 1998
MID-ATLANTIC FISHERY COUNCIL

WE ARE PROUD OF

FISHERMEN

UNITED NATIONAL FISHERMEN'S ASSOC.

919-473-3287

123 APPLE RD. MANNS HARBOR, N.C. 27953

National Marine
Fishery service
New England fisheries management council
Mid-Atlantic fisheries management council

Comments; spiny dogfish management plan Aug. 1998.

The plan as proposed has many shortcomings, first it is based on a minimum population estimate.(minimun estimates maximun restrictions} The majority of information gathered by the trawl surveys is biased by the type of fishing equipment used in the assement, day and night catch rates are averaged, the biomass estimates are off by a factor of 4 or more. The feeding information is collected from only one type of gear and from only the bottom layer, the predatory nature of this animal was changed by re-wording its feeding habits, yet nothing was done to investigate information supplied by the fishing industry that this fish feeds on commercialy valuable species in large numbers. The sex ratio of the species is assumed of the 50 -- 50 yet the best scientific information shows the sex ratio to the 8 to 1 female to male. This document page 14 predators & competitors does not address the impact of dog fish on weakfish, croakers, spots, summer flounder other flat fish or lobster's. The over-fishing page 9 leads to the assumption that reproduction is not based on food supply and reproductive health this is contary to findings from other countries. POOR SCIENCE!

This plan does not address how the stock re-build after being fished by the Russians and foreign fleets until 1976 so much so that in 1980 {ONLY 4 YEARS OF RECOVERY} National Marine fisheries service estimated that annual landings could be 50 million pounds per year without harming the biomass. And that between 1980 and 1990 the stocks rebuild to six times the largest known biomass. The stock is defined as over fished, yet the method used to define over fishing would classify a unfished stock as over fished isingle species MANAGEMENT CAN NOT BE USED WITH TOTAL HABITAT MANAGEMENT.

This plan does not address the Russell cycle or any other known recurring events, 18.6 lunar cycle, solar cycle, tide cycles, in effect this plan is a carbon copy of other fail fisheries management plans, that were build without information from the commercial fish and industry. Mainly the summer flounder plan, clam plan, sea scallop, and weakfish.

Age and growth information do not reflect best scientific information the document states of the maximum age may be 70 years. Best scientific information from Europe is that dogfish live between 25 and 30 years. MSY cannot be reliably estimated, because of bias science. it should be noted that other species with the same gestation period and similar age at reproduction are not mentioned in this document.

The science in this document leads one to believe that a bias exist. It was stated at a public hearing that regardless of the comments received the plan would not be changed. Thus a question; if public comment cannot change the plan why ask for public comment?

It is suggest that this plan not be implemented and that a survey be done with the commercial fishing industry involved to get decent science. An example, the clam plan, scallop plan, both are showing that the information used was incorrect and therefore the plans that were implemented caused hardship to the fishing industry. Perhaps it is because the science used is based on minimum population estimates, perhaps it is because the attitude of the scientist are biased, through education and training. The discussion of economics in this document does not reflect the export value of dogfish to the balance of trade. The advisers picked to represent the public were not picked because of their knowledge but because of their attitudes. I find it hard to comment on the document that is incorrect and regardless of what is said or written nothing will be changed.
Will fisheries management ever try to manage for maximum production and benefit to commercial fishing industry and the nation such as Japan.?

Sincerely,

James Fletcher, 11/22/98

Pg 1 of 2

Mr Moore
Acting Executive Director
Mid Atlantic Fishery Management Council

Mr. Moore,

I am Ronney Reid, commercial fisherman and fish packer, and will be speaking for myself and 11 other fisherman.

Speaking for myself, 35 to 40% of my income comes from catching and packing dogfish. As you can see, the proposed dog fishing regulation, would be quite a financial burden on me. It would be approximately a 24 to 25% impact on the other 11 fisherman.

This would also force us back into other fisheries that are over crowed as it is. The impact being the expense of getting back into these other fisheries, and the loss of money already put into dog fishing gear. The other thing, would be the loss of income the fisherman already in these other fishers would incur.

We were encouraged to get into dog fishing several years ago and have put a lot of money into to it. There is no recreational value of the dog fish and they are predators of the fish that have already had restrictions put on them or will be in the future. So where does that leave the fisherman?

After talking with other fishermen up and down the coast, we feel there has not been enough data collected to justify this drastic regulation.

I hope what I have said will be considered before anything is done.

I am speaking for:

Ronney Reid
Billy Reid
Doug Reid
Billy Newell
Vince McKamey
Lee Smith
Todd Smith
Danny McCullough
Vernon Haywood
Paul Herrick
Jeffrey Dameron
Scotty Bergman

Sincerely,
Ronney Reid

Chesapeake Bay Packing L.L.C.

Facsimile Cover Sheet

TO:	MID-ATLANTIC FISHERY MANAGEMENT COUNCIL
ATTN:	CHRISTOPHER M. MOORE, Ph.D., ACTING EXECUTIVE DIR.
FAX:	302 674 5399
FROM:	RICK ROBINS
DATE:	NOVEMBER 23, 1998
RE:	DOGFISH FMP

Dear Dr. Moore:

I am writing to express my concerns regarding the proposed spiny dogfish FMP. I believe that the spiny dogfish FMP, as currently proposed by the MAFMC's dogfish committee, when viewed in light of the federal government's role of participation in the promotion and development of the modern spiny dogfish fishery, represents the single greatest disaster in the recent history of fisheries management. As I indicated at the most recent public hearing in Newport News, Virginia, the proposed FMP will effectively eliminate an export-based processing industry with an annual value of $46 MM to U.S. processors and fishermen (written analysis was entered in the public record.)

Throughout the late 1980's and early 1990's, processors and fishermen capitalized and developed the modern U.S. dogfish industry at the direction and encouragement of the NMFS and other government agencies. In 1986 the Mid-Atlantic Fisheries Development Foundation issued a 67-page report entitled "Dogfish Harvesting and Processing: An Examination of Key Economic Factors in the Mid-Atlantic Region" in which authors Ron Grulich and William D. DuPaul use Dr. Musick's biomass analysis to suggest that the Chesapeake Bight alone would "allow an annual harvest of 23,000 metric tons" (reference Exhibit 1.) The report went on to cite a second estimate by Nammack, suggesting that the Northwest Atlantic biomass was capable of supporting a 24,000MT fishery. These figures were believed by the authors to represent 8% of the then current NMFS estimate of the standing stock of 300,000MT. Attracted by the prospects offered in these reports and others like them, processors and fishermen invested heavily in plants, equipment, boats and gear to develop the modern gill net fishery for spiny dogfish.

Chesapeake Bay Packing, L.L.C. - EXPORT DIVISION
703 Jefferson Avenue Newport News, Virginia 23607 USA
Telephone (757) 244.8400 Fax (757) 244.8500

The fact that the first spiny dogfish regulatory initiative promulgated by the MAFMC is tantamount to a complete closure of the spiny dogfish fishery for a period of 9 years is completely unacceptable, and represents an absolute failure on the part of the MAFMC, the NEFMC and the NMFS to effectively manage an emerging fishery. The spiny dogfish fishery was developed by processors and fishermen at the direction and encouragement of the NMFS and others who identified the resource as underutilized, and was prosecuted at levels that were advocated by the NMFS and the Mid-Atlantic Fisheries Development Foundation. If adopted, this FMP will stand as the single greatest blemish in the U.S. history of fisheries management.

In addition to having an unprecedented, $46MM direct economic impact on fishermen and processors, this FMP will have a profound effect on inshore fisheries in Virginia, North Carolina and Maryland. Fishermen currently prosecuting the dogfish fishery in these Mid-Atlantic states will be displaced by the proposed FMP, and will be forced to participate in inshore fisheries that are already strained by current levels of effort. In many cases, displaced dogfish fishermen will be unable to re-enter fisheries they participated in years ago due to the fact that numerous fisheries are restricted at the state or federal level by limited entry management plans (e.g. Virginia's crab dredge fishery, the sea bass fishery, etc.)

I am particularly concerned that the committee is willing to accept a plan that will have such a devastating economic impact in light of the fact that the fishermen who are advisors to the committee have presented testimony about issues such as sexual maturity that conflict with the basic biological assumptions underpinning the SAR's analysis of the biomass and its reproductive dynamics. Throughout the public hearing process, experienced fishermen have conflicted the biological assumptions set forth in the public hearing drafts, while acknowledging that the average size of the spiny dogfish has decreased in recent years.

Dogfish have the greatest social utility as a commercially harvested resource, and the fishery is unique in this respect in that it does not benefit any other user groups. In fact, as apex predators, dogfish compete directly with rockfish and bluefish, which are widely regarded as having far greater social utility than dogfish. The rockfish population in the Chesapeake Bay region is presenting with a rapidly increasing incidence of skin lesions, which have recently been attributed to stress related to undernourishment. The committee should note that these problems will only be exacerbated by an unchecked dogfish population, and the impact of this FMP on other fisheries will likely be profound. I believe that this consideration of the collateral impact on related fisheries clearly fits within the language set forth in Rolland A. Schmitten's letter of 9 October, 1998, in which he states that overfished fisheries must be rebuilt within 10 years, except in cases where "...other environmental conditions... dictate otherwise."

In closing, I believe it is entirely inappropriate for the Council to follow a decade of regulatory inattention to the spiny dogfish fishery with a FMP stipulating a decade-long closure of this fishery. I sincerely hope that I never see another fisheries management failure of this magnitude in the future.

Sincerely,

Rick Robins, Advisor
Chesapeake Bay Packing, LLC

Enclosures: 2

RBR/-

CC:

Exhibit 1

DOGFISH

HARVESTING AND PROCESSING:
An Examination of Key Economic Factors in the Mid-Atlantic Region

RON GRULICH
WILLIAM D. DU PAUL
Sea Grant Marine Advisory Services
Virginia Institute of Marine Science
Gloucester Point, Virginia

MID-ATLANTIC FISHERIES DEVELOPMENT FOUNDATION, INC.

FINAL REPORT
Contract No. 85-21-14957V

MARCH 1986

Virginia Sea Grant College Program

VIMS

This project was supported in part by the Virginia Sea Grant College Program at the Virginia Institute of Marine Science.

Exhibit 1 (continued)

Since dogfish are a relatively long-lived species and require several years to reach sexual maturity, the stocks must be carefully managed to insure that the harvest does not exceed the maximum sustainable yield. To accomplish this management objective, the adult stock must be maintained at a sizeable level. Past work on the heavily exploited Northeast Atlantic spiny dogfish stock has indicated that the maximum sustainable yield may be only about 20% of stock size. In a study by Musick (1980), a standing stock estimate for dogfish in the Chesapeake Bight was estimated to be approximately 115,000 metric tons. If this estimate is considered to be representative, this would allow an annual harvest of 23,000 metric tons in the Chesapeake Bight (50,600,000 lbs.). In a more recent study Nammack (1985), estimates that the spiny dogfish stocks of the entire Northwest Atlantic can only support a 24,000 metric ton fishery. This figure represents 8% of the current NMFS standing stock estimate of 300,000 metric tons.

Harvesting Considerations

Sharks have traditionally been harvested by trawl, longline and gillnets. The optimal method varies with the species sought, local bottom conditions, and the harvesting and processing equipment available to participants in the fishery.

Longlining is a technique used by fishermen whereby baited hooks are placed at regular intervals along the main fishing line which is deployed behind the vessel. The hooks are fished for a suitable period of time depending upon the expected harvesting rate. As the fish are harvested, the hooks are rebaited for the next set. This type of operation can be used by a large vessel with automated equipment as well as a small boat requiring two men and utilizing manual equipment. Longlining is particularly effective for

SEATRADE

Christopher M. Moore, Ph.D.
Acting Executive Director
Mid-Atlantic Fishery Management Council
300. S. New Street
Dover, DE 19904

November 23, 1998

Dear Mr. Moore,

I am a technical advisor to the N.E. and Mid-Atlantic Councils for the Spiny Dogfish Management Plan. I strongly object to the Management Plan proposals being considered whereby the commercial quota will be fixed at 10,000 mt in year one, and 1,300 mt in year II (an initial reduction of 84% from current levels). This Plan will effectively eliminate any viable processing export industry.

The economic impact of this action will be as follows:

1) Next year, five processing plants - one in Virginia, one in Maine, and three plants in Massachussets will be forced to close. The total CIF value of all dogfish products is estimated to be $60million.

2) Most of the small boat in-shore fleet of New England and the Mid-Atlantic vessels, app. 200 fishing boats, which rely on dogfish catches for 30-50% of annual revenues, will be severely impacted.

SEATRADE INTERNATIONAL, INC

105 Bartlett Street • Portsmouth, New Hampshire 03801
Tel: (603) 431-5184 or 431-1656 • Fax: (603) 431-2898

3) European buyers of dogfish will turn to Canadian or West Coast processors, and it will be very difficult to recapture or relaunch this industry after 10 years.

Other factors in the argument against quotas are:

- there is no domestic consumption or sales of dogfish, only export markets.
- dogfish is a predator, and there is no scientific data of the effects a shut down of the harvesting will have on the rebuilding of stocks of groundfish
- the stock assessments and discard rates used int the Hearing Draft of Sept 22,1998 are too narrow and without good scientific basis. The spring otter trawls and NMFS observer data for dogfish are only available for the last 4-5 years, and the discard rates are guesstimates at best.

I propose that a 10-year stock rebuilding plan be implemented to include:

1) a phased reduction from current 30,000 mt harvesting levels to a 20,000 mt quota in year I, and 10,000 mt in year II

2) a consideration of the effects of gear mesh size. Gilnet mesh sizes should be increased to a minimum size of 6 1/2" with no more than 80 nets per boat

3) the dogfish processing industry and unloaders agree to a minimum fish size of 28", nose to tip of tail, length

4) boats and processors will also agree to a 5-day,catch week schedule, thereby eliminating 29% of current catches.

These conservation methods will help to reduce the harvesting of dogfish, particularly juvenile discards. Furthermore, there needs to be much more study and scientific data on the biology of this fish, particularly the size of the biomass south of Cape Hatteras and north of Maine. There is no reliable information about breeding seasons, locations and migrations. Another example of the inaccurate data are NMFS assumption of size, sexing, and discard percentages.

This Management Plan has been drawn up and approved by the Councils in a record nine months. No other fishery, including groundfish under Amendment 7, is facing a total immediate shutdown. It is for the above reasons that I request consideration of my alternative plan.

Sincerely,

Stephen C. Barndollar, President

CENTER FOR MARINE CONSERVATION

Dogfish Head Craft Brewed Ales

336 Culpeper St.
(return address)
Warrenton VA
20186

UNITED STATES POSTAL SERVICE

U.S. POSTAGE
PAID
SHEPHERDSTOWN.WV
25443
NOV 14.'98
AMOUNT
$0.20
00038232-06

0000

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:

- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

Sincerely, Emily Rose Morgan

CENTER FOR MARINE CONSERVATION

Dogfish Head Craft Brewed Ales

(return address)

RECEIVED
NOV 1 8 1998
MID ATLANTIC FISHERY COUNCIL

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:

- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

Sincerely,

CENTER FOR MARINE CONSERVATION

Dogfish Head Craft Brewed Ales

Nina M. Young
1609 B Corcoran St. NW.
Washington, DC 20009

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:

- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year..

Sincerely,

Nina M. Young

CENTER FOR MARINE CONSERVATION

Dogfish Head Craft Brewed Ales

Delores L. Rock
(return address) 4425 Arnold Rd. #204
Suitland MD 20746

RECEIVED NOV 18 1998 MID-ATLANTIC FISHERY COUNCIL

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:

- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

Sincerely,

Delores L. Rock

CENTER FOR MARINE CONSERVATION

Dogfish Head Craft Brewed Ales

5401 15th Ave
(return address) Hyattsville Md.
20782

RECEIVED
NOV 18 1998
MID-ATLANTIC FISHERY COUNCIL

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:

- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

Sincerely, Betty Filber

CENTER FOR MARINE CONSERVATION

Dogfish Head Craft Brewed Ales

M. Donnelly
(return address)
409 Fourth St NE
Wash. DC 20002

USA 23 Mary Cassatt

RECEIVED
NOV 18 1998
MID ATLANTIC FISHERY COUNCIL

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:

- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

Sincerely,

Marydale Donnelly

Do it Now!! PLEASE

CENTER FOR MARINE CONSERVATION

Dogfish Head Craft Brewed Ales

L. Sinclair
Return address 5803 Cherrywood Lane #201
Green Belt MD 20770

RECEIVED
NOV 18 1998
MID-ATLANTIC FISHERY

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:

- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

Sincerely, Linda A. Sinclair

CENTER FOR MARINE CONSERVATION

Dogfish Head Craft Brewed Ales

Kathy Westra
(return address)
405 Mansfield Rd.
Silver Spring, Md 20910

USA 32
Cardinal Honeyeater

RECEIVED
NOV 18 1998
MID ATLANTIC FISHERY COUNCIL

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:

- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

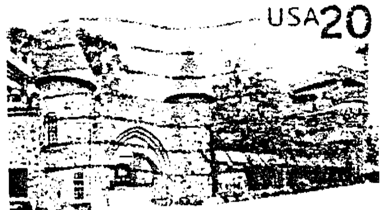
Sincerely,

Kathryn E. Westra

Ms. Dina Paisner
119 Bank St
New York, NY 10014

Season of Tolerance

NEW



RECEIVED
NOV 18 1998
MID-ATLANTIC FISHERY COUNCIL

Mr. Dan Furlong, Exec. Dir/
Mid Atlantic Fishery Mgt. Council
Federal Bldg. [illegible]
[illegible] S. New Street
Dover, Delaware [illegible]

[illegible] Mr. Dan Furlong:

I [illegible] THE
[illegible]. Stop overfishing [illegible] in recovery
[illegible].
[illegible] size of [illegible]
[illegible]

A ban on FISHING!

A [illegible] end of
1998.

Thank you.

Dina Paisner

Dina Paisner

CENTER FOR MARINE CONSERVATION

Dogfish Head Craft Brewed Ales

Jack Sibel
(return address) 4910 Earlston Dr
Bethesda, MD 20816-1752

RECEIVED
NOV 18 1998

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:

- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

Sincerely,

Jack Sibel

PCRM STOP ANIMAL T...
Mr. Walter J. Koehler
9550 85th St. Apt 51A
Jackson Hts, NY 11372-5531

RECEIVED
NOV 1 8 1998
MID-ATLANTIC FISHERY COUNCIL

USA 20
Kerr Hall Northeastern University 1898-1998

Dan Furlong Executive Director
Mid-Atlantic Fishery Management Council
Federal Building Rm. 2115
300 South New Street
Dover, Delaware 19904-6790

Dan Furlong Exec Director November 14, 1998
Mid-Atlantic Fishery Mgmt. Council
Dover, Delaware 19904-6790
Sir: As a member of the Center for Marine Conservation, I urge the Council to adopt a commercial quota that will stop overfishing the dogfish. The catches are now determined to be 10 times the level needed to rebuild the population within the legal limit of 10 years. A dogfish monitoring Committee and framework adjustment process must be implemented. The ocean as a whole has been overfished, notably by Japan and Norway and this species must be preserved for the sake of Conservation. Thank you Sir.
Walter Koehler, N.Y.C., N.Y. 11372

[DOGFISH]

Dan Furlong
Executive Director (M-AFM)

I urge the Council to adopt a commercial quota that will

- Stop over fishing and begin recovery of dogfish immediately (not in the year 2000)
- rebuild the population as quickly as possible.

Thank you
[illegible]

95 Sunny Rd
St. James, N.Y. 11780

Ocean Action Network

Join the Cape Shark Crusade!

Help Fight Proposal to Delay Needed Cuts in Dogfishing

November 5, 1998

Unregulated fishing on spiny dogfish or "cape shark" off the Northeast coast has increased dramatically in recent years, depleting the population of the targeted mature females. After several years of stalling, fishery managers have at last proposed a dogfish management plan that aims to rebuild the population over a decade. Their preferred plan, however, allows rampant overfishing to continue for more than another year, risking population collapse. Your voice is needed in this critical public comment period to counter industry opposition and protect what is left of the population.

A Special Kind of Fish

Spiny dogfish, a type of small shark, exhibit life history characteristics that leave them extremely vulnerable to overfishing. Northwest Atlantic female dogfish do not begin to reproduce until they are at least 13 years old. Their *two-year gestation period* is among the longest of all vertebrates, after which they give birth to an average of *only six* live young. To make matters worse, dogfish school by size and sex, and the market calls for mature females. Targeting schools of adult females, although efficient for the fishermen, greatly affects future generations of dogfish. These factors, along with inadequate management, led to the collapse of the spiny dogfish fishery in the Irish Sea, as well as most large scale shark fisheries of this century. Once collapsed, shark populations often require decades to recover. ... If they recover AT ALL!

A Recipe for Disaster

Over the last two decades, traditional Northeast groundfish (cod, haddock, and flounder) have been decimated by overfishing, and fishermen are left searching for alternative species to pursue. A few years ago, when compared to groundfish, dogfish were plentiful. With no foresight or thought of management, fishermen and politicians teamed up to promote dogfish consumption, giving them the more appetizing name of "cape shark." With the help of a steady European demand, the dogfish experiment quickly grew into a fully-developed fishery that is now in big trouble.

In late 1997, scientists updated their assessment of the Northwest Atlantic spiny dogfish population and declared it "overfished," reporting dramatic declines in both the number and the average size of mature females. Dogfish catches were determined to be ***10 times*** the level needed to rebuild the population within the new legal limit of 10 years. In order to meet that requirement, the directed dogfish fishery must be virtually shut down. Consequently, prompt implementation of a dogfish plan faces tough opposition from some in the fishing industry.

Who's in Charge?

The ultimate responsibility for fish conservation in U.S. waters lies with the Secretary of Commerce. Regional Fishery Management Councils, however, are charged with developing management plans to conserve public fishery resources. Because dogfish migrate long distances along the Atlantic coast, the dogfish plan is a joint project of the Mid-Atlantic and New England Fishery Management Councils, with the Mid-

(Continued on reverse)

An Update on CMC's New Electronic Ocean Action Network:

Many of you have been contacted, either by phone or via our recent action alerts, to join CMC's new electronic Ocean Action Network. We thank those of you who have joined. Because it will be a couple of weeks until our new email system is up and running, we are still using regular mail to reach those of you who have joined the new email system. We appreciate your patience. If you would like to sign up for the electronic network please send an email, including your name, street address and email address to ddickson@dccmc.org.

Atlantic Council taking the lead. The Mid-Atlantic Council is currently accepting comments on a draft dogfish management plan.

While the Councils do intend on taking the draconian cuts that are unfortunately necessary to rebuild dogfish within a decade, their preferred alternative would phase in such measures and ***allow overfishing to continue until well into the year 2000***, risking population collapse. Even initial management measures will likely not be in place before the spring of 1999. In the meantime, the fishery continues unrestricted on the largest fish left. Considering the limited reproductive capacity of dogfish, it is simply too late and too risky to delay necessary cuts in fishing any longer.

How You Can Help

Speak up for the much-maligned dogfish! Because of their unfortunate reputation as pests and "trash fish," dogfish face an uphill battle for management attention. Few fishery managers see dogfish conservation as a priority and many fishermen still oppose development of any dogfish management plan. Your voice is crucial to ensure dogfish fishing controls are enacted before it is too late.

By **November 23**, please write to the Executive Director of the Mid-Atlantic Fishery Management Council and voice your concern for the dogfish.

Most importantly, urge the Council to adopt a commercial quota that will:

- stop overfishing and begin recovery of dogfish ***immediately***; (not in the year 2000); and
- rebuild the population as quickly as possible;

In addition, voice your support for the following proposed measures:

- a size limit of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the more valuable fins and discarding the body);
- "hard" rather than "target" quotas;
- mandatory permitting and reporting requirements;
- a Dogfish Monitoring Committee and framework adjustment process.

Lastly, urge the Council to:

- act in the precautionary manner warranted by such a long-lived animal and
- work swiftly and submit the final spiny dogfish plan to the Secretary of Commerce by the end of the 1998.

Send your letter to:

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building; Room 2115
300 South New Street
Dover, Delaware 19904-6790
Fax: (302) 674-5399

Please send a copy of your letter to your Governors and Members of Congress.

Thank you for your help.

1725 DeSales Street, NW, Suite 600 • Washington, DC 20036 • Phone: (202) 429-5609 • Fax: (202) 872-0619 • Web: www.cmc-ocean.org

CENTER FOR MARINE CONSERVATION
1725 DeSales Street, NW
Suite 600
Washington, DC 20036

Dear Mr. Furlong, Please stop the fishing (of this species) which is alarmingly depleted.

Thank you!
Christine Ostopoff

FIRST CLASS
US POSTAGE
PAID
ROCKVILLE, MD
PERMIT NO. 4889

00281550 G11981
MS. CHRISTINE OSTOPOFF
447 FITZGERALD ST
PHILADELPHIA PA 19148-3912

ACTION ALERT

CENTER FOR
MARINE
CONSERVATION

Dogfish Head
Craft Brewed Ales

Pete Leon & David Hall
2006 Columbia Road, NW
Number 7
Washington, DC 20009

RECEIVED
MID-ATLANTIC FISHERY
COUNCIL

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:
- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

Sincerely,

Pete Leon

CENTER FOR MARINE CONSERVATION

Dogfish Head Craft Brewed Ales

Thomas Palver
6806 Newlight Ct
(return address)
Ft Washington MD 20744

USA 23
Mary Cassatt

RECEIVED
MID-ATLANTIC FISHERY COUNCIL

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:

- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

Sincerely,

Daniel Thomas

CENTER FOR MARINE CONSERVATION

Dogfish Head Craft Brewed Ales

Carl Bauman
(return address)
4201 Mass. Ave, NW #306W
Washington DC 20016

RECEIVED
MID-ATLANTIC FISHERY COUNCIL

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:

- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

Sincerely,

CENTER FOR
MARINE
CONSERVATION

Dogfish Head
Craft Brewed Ales

J. Kraus
(return address)
2251 Pimmit Dr. #503
Falls Church, VA. 22043

USA 20

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:

- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

Sincerely,

Julie M. Kraus

CENTER FOR MARINE CONSERVATION

Dogfish Head Craft Brewed Ales

CHARLOTTE MEYER
(return address)
TAKOMA PARK, MD 20912

RECEIVED 1998 MID ATLANTIC FISHERY COUNCIL

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:

- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

Sincerely, Charlotte Meyer

November 16, 1998

Dear Dan Furlong, Executive Director:

Please take action on this serious matter. Thank you.

- stop overfishing and begin recovery of dogfish ***immediately***; (not in the year 2000); and
- rebuild the population as quickly as possible;
- a size limit of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the more valuable fins and discarding the body);
- "hard" rather than "target" quotas;
- mandatory permitting and reporting requirements;
- a Dogfish Monitoring Committee and framework adjustment process.
- act in the precautionary manner warranted by such a long-lived animal and
- work swiftly and submit the final spiny dogfish plan to the Secretary of Commerce by the end of the 1998.

I couldn't have said this any better.

I support these aims.

Very truly yours

PETA
Rose Cardillo
8330 Vietor Ave Ste 1
Flushing NY 11373

Rose Cardillo

CENTER FOR MARINE CONSERVATION

Dogfish Head Craft Brewed Ales

Wm. Robert Irvin
(return address)
3801 Alberta St.
Olney, MD 20832

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:

- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

Sincerely,

CENTER FOR
MARINE
CONSERVATION

Dogfish Head
Craft Brewed Ales

~~National Coalition~~
~~For Marine Conservation~~
~~Street~~

USA 20

RECEIVED

MID-ATLANTIC FISHERY
COUNCIL

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:

- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

Sincerely,

CENTER FOR MARINE CONSERVATION

Dogfish Head Craft Brewed Ales

G. White
(return address)
[illegible] St #[illegible]
Alexandria VA 22314

[illegible] 1998

MID-ATLANTIC FISHERY COUNCIL

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:

- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

Sincerely,

Geoffrey S. [illegible]

CENTER FOR MARINE CONSERVATION

Dogfish Head Craft Brewed Ales

Don Snovell
(return address)
509 Appletree Dr NE
Leesburg, VA 20176

USA 20

MID-ATLANTIC FISHERY COUNCIL

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:

- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

Sincerely, Yeah, Ruth! Don Snovell

CENTER FOR MARINE CONSERVATION

Dogfish Head Craft Brewed Ales

TARA WOLCOTT
(return address) 13301 TENTH ST.
BOWIE MD 20715

MID-ATLANTIC FISHERY COUNCIL

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

As a patron of Delaware's Dogfish Head Brewery, I am concerned not only with the consumption of fine, hand-crafted ales, but also with the conservation of imperiled ocean species. I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that spiny dogfish are overfished and that targeted mature females have declined dramatically. I am concerned that the Council's intention to phase-in necessary cuts, thereby allowing rampant overfishing to continue into the year 2000, puts the vulnerable dogfish population at unacceptable risk of collapse.

I support:

- a commercial quota that will stop overfishing and begin recovery of dogfish ***immediately***;
- a minimum size of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the fins and discarding the carcass at sea);

I urge you to act in the precautionary manner that is warranted by such a long-lived, slow growing animal. Please work swiftly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

Sincerely, Tara Wolcott

11/14/98

Dear Director Furlong:

I urgently request that you stop the over fishing of dogfish immediately and not wait until year 2000. These fish reproduce extremely slowly and if you wait any recovery will be too late to rebuild the stocks again.

I am strongly in support of a size limit of 32" or more, a ban on the extremely wasteful practice of "finning", specific quotas, mandatory permitting and reporting requirements and the formation of a Dogfish Monitoring Committee.

I strongly urge you to protect this species now and submit the final spiny dogfish plan by the end of 1998.

Stephen A. Jones

Stephen A. Jones
9405 Highlander Blvd
Walkersville, MD 21793

RECEIVED
NOV 16 1998
MID-ATLANTIC FISHERY COUNCIL

JOEL BELLER
115 ARIZONA AVENUE
LONG BEACH, NY 11561-1533
(516) 889 5374

November 16, 1998

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building; Room 2115
300 South New Street
Dover, Delaware 19904-6790

Dear Director Furlong,

I am writing to urge you and the rest of the Council to adapt a commercial quota for spiny dogfish. This should go into effect immediately rather than in the year 2000. In addition, "Finning" should be banned and a size limit of 32 inches be established.

Thank you for considering these proposals.

Sincerely,

Joel Beller

Joel Beller

NOV 13 1998

Dear Mr. Furlong,

I wish to request your help in focusing a large scale effort on behalf of the dogfish population. The time frame proposed to address this issue seems to be too little too late. By the year 2000 unrestricted fishing could be a moot point.

Please help ban "finning" of the dogfish and protect the dwindling mature female population. It would also be prudent to submit a protective plan to the Secretary of Commerce by the end of this year.

Thank you and sincerely,

Laura Parker

Laura Parker
39 Bloomer Rd.
Brewster N.Y.
10509

11-15-98
Lee James Best, Jr.
506 W. Cumberland St.
Dunn, NC 28334-4822

Mr. Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, Delaware 19904-6790

Dear Mr. Furlong,

In keeping with the request of the Center for Marine Conservation and my own concern for the preservation of the world's ocean resources I urge the Council to adopt a commercial quota that will stop over-fishing and begin recovery of dogfish immediately -- not in the year 2000. Please take measures to rebuild the dogfish population as quickly as possible by establishing a size limit of 32 inches or more to protect remaining mature females, put a ban on "finning," have "hard" rather than "target" quotas, make mandatory permitting and reporting requirements, and establish a Dogfish Monitoring Committee and framework adjustment process.

I hope you will agree with me that it is urgent to act in the precautionary manner warranted by the long-lived dogfish and to work swiftly and submit the final spiny dogfish plan to the Secretary of Commerce by the end of 1998.

I would appreciate a reply from you concerning this matter.

Yours truly,

Lee James Best, Jr.

RECEIVED
NOV 18 1998
MID-ATLANTIC FISHERY COUNCIL

Olga M. Rosché
13781 Fish Hill Rd.
South Wales, N.Y. 14139

Nov. 15, 1998

Mr. D. Furlong, Exec Director
Mid-Atlantic Fishery Management Council
Federal Bldg; Room 2115
300 South New St.
Dover, Delaware 19904

RECEIVED
NOV 18 1998
MID-ATLANTIC FISHERY COUNCIL

Dear Mr. Furlong,

I am much concerned about the future of the dogfish off the Northeast coast of North America. The fully-developed fishery is now in trouble due to overfishing.

I suggest the following steps to change this situation:

- stop overfishing and begin recovery of dogfish Immediately!
- rebuild the population as soon as possible
- a size limit of 32" or more to protect the remaining mature females.
- A Dogfish Monitoring committee and framework adjustment process should help.
- Act in a careful manner since this is a long-lived animal.
- Work fast & submit the final spiny dogfish plan to the Secretary of Commerce by the end of 1998. I am very concerned with all fisheries in our country's waters.

Yours truly
Olga Rosche

Elizabeth Terk
230 central park west #9A
New York, NY 10024

November 14, 1998

Dan Furlong, Executive Director Mid-Atlantic Fishery Management Council
Federal Building; Room 2115
300 South New Street
Dover, Delaware 19904-6790

Dear Mr. Dan Furlong:

I am writing you on behalf of the dogfish who are in desperate need of your help. Considering the limited reproductive capacity of the dogfish, it is simply too late and too risky to delay necessary cuts in fishing any longer. I urge the Council to adopt a commercial quota as soon as possible not in year 2000, when there might be hardly any dogfish left to save. This quota should stop over fishing and help rebuild the dogfish population as quickly as possible.

In addition to this quota I believe there should be a size limit of 32 inches or more to protect remaining mature females. A ban on finning, the most grotesque act of slicing off the more valuable fins and discarding the body; similar to the act of skinning an animal alive. There should also be a "hard' rather than "target" quotas, mandatory permitting and reporting requirement, and a Dogfish Monitoring Committee and framework adjustment process. Lastly, I urge the council to act in precautionary manner warranted by such a long-lived animal and work swiftly and submit the final spiny dogfish plan to the Secretary of Commerce by the end of 1998.

If I, a high school junior, can realize the dogfish and other fish's, particularly the shark's, importance to the ecosystem system I hope you can too. On behalf of my generation and the ones to follow, I urge you to begin recovery of the dogfish as soon as possible so they will still be around for years to come.

Sincerely,

Elizabeth Terk

RECEIVED
NOV 18 1998
MID-ATLANTIC FISHERY COUNCIL

November 13, 1998

Mr Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building - Rm 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr Furlong:

I am writing to you as a private citizen and also as a member of the Center for Marine Conservation to express my concern for the Spiny dogfish.

It's apparent from the decline of this species that something has to be done so that it is not "fished to extinction" and that is why I'm writing to you.

I urge the Mid-Atlantic Fishery Management Council, "Council" to take some action protective action.

The Council could stop the overfishing and beging recovery of dogfish right away and not wait until the year 2000. This would help rebuild this species population as soon as possible.

Let's put a limit on the size to be caught, say above 32 inches in order to protect the remaining females.

Also I would like to propose a ban on the practice called "finning" which is slicing off the more valuable fins and then discarding the body.

Rather than having "target" quotas, let's have a defined or hard quota.

To help in the safeguarding of this species let's have mandatory permitting and also have reporting requirements.

I also propose a Dogfish Monitoring Committee.

And as busy as you are, I request the Council to work quickly to submit a final plan to the Secretary of Commerce by the end of this year.

I'm looking forward to the Council's support for this fish. I think it is a very worthwhile cause.

If you don't protect it who will?

I thank you in advance.

Sincerely,

David C. Fenimore

David C. Fenimore

John Kershner, Ph.D. &
Barbara Kershner, M.Ed.
842 Holly Harbor Road
Reedville, VA 22539

November 14, 1998

Dan Furlong, Executive Director
MId-Atlantic Fishery Management Council
Federal Building; Room 2115
300 South New Street
Dover, Delaware 19904-6790

Dear Mr. Furlong:

We urge you to take strong action on DOGFISH MANAGEMENT (cape shark). Specifically , we ask the Council to adopt a commercial quota that will : (1) stop overfishing immediately; and (2) begin rebuilding the population.

In addition, we respectfully urge you to support:

(1) a size limit of at least 32 inches to protect mature females ;
(2) a ban on "finning" ;
(3) an end of "target" quotas ;
(4) mandatory permitting and reporting requirements ;
(5) a Dogfish Monitoring Committee and framework adjustment process ;

Finally, we ask that you act in a precautionary manner but that you act swiftly to submit the final spiny dogfish plan to the Secretary of Commerce before the end of 1998.

Sincerely, John & Barbara Kershner

Barbara Kershner

cc.
John Warner, United States Senate
Charles Robb, United States Senate

Dorothy Davis

12 East 86th Street, Apt. 927
New York, NY 10028
November 15, 1998

Dear Mr. Furlong,

I am very concerned about the serious plight of the Dogfish (recently misnamed the Cape Shark). I urge you to lead the Council in adopting a commercial quota to stop overfishing of this species immediately. You should not wait until the year 2000 to do this. These jeopardized populations must be allowed to begin their recovery as soon as possible. Because of their unusual reproductive cycle the following fishing control measures should also be implemented forthwith: A size limit of 32 inches or more. Outlawing the deplorable practice called "finning" which means the animal's fins are sliced off and the rest of it callously discarded! Quotas should be "Hard" not the lax "target" quotas. Mandatory permitting and reporting requirements. A Dogfish monitoring Committee and a framework adjustment process.

Please take all of these precautionary steps. This treasured long-lived animal warrants this care. I look forward to hearing that you have worked efficiently and expeditiously and that we can greet the New Year with the word that you have submitted the final Spiny Dogfish plan to the Secretary of Commerce by the end of this year, and that it contains all of the above provisions. What a great way to start the New Year that will be!

I look forward to your positive response.

Sincerely yours,

Dorothy Davis

Mr. Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, Delaware 19904-6790

cc: Governor George Pataki
The Hon. Carolyn Maloney

18 West 87th Street/3C
New York, NY 10024

November 15, 1998

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Bldg., Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong: **RE: Spiny dogfish**

I am very concerned, as I have been for years, about over-fishing in so many parts of the world. A case in point is the continuing unregulated fishing on the spiny dogfish or "cape shark" off the Northeast coast, which has resulted in the depletion of targeted mature females. Surely this is most unwise!

I'm relieved to hear that at last fishery managers have proposed a management plan for dogfish. I would therefore urge the Council to adopt a commercial quota that will stop overfishing **immediately** and begin rebuilding the dogfish population as quickly as possible.

I also ask your support for the following measures:

- a size limit of 32" or more to protect remaining mature females;
- a ban on "finning" - such a **disgraceful and wasteful** act;
- "hard" rather than "target" quotas;
- mandatory permitting and reporting (and verifying) requirements;
- a Dogfish Monitoring Committee and framework adjustment process.

Please remember that female dogfish do not begin to reproduce until they are at least 13 years old; their two-year gestation period is one of the longest of all vertebrates and they give birth to an average of only six live young. They are decidedly **not** trash. They are part of **LIFE on this earth.**

Please submit the final spiny dogfish plan to the Secretary of Commerce before the end of the year. Thank you.

Yours sincerely,

Margaret Adams.

cc: Senator Daniel Moynihan
Senator Chuck Schumer

Mr. & Mrs. Paul W. Neal
700 River Rd.
Cos Cob, CT 06807-1907

Nov 4, 1998

Dan Furlong, Exec Dir
Mid Atlantic Fisheries
Dover Del.

Stop Dogfish Overfishing Immediately

Dear Executive Director Furlong

1. This is to urge you & the Council to take strong measures immediately to adopt & commercial quotas to stop overfishing now & begin dogfish recovery. Don't wait for the year 2000! We need to rebuild the fish population from over fishing. Avoid population collapse

2. Support: Size Limits of 32 or more
- Ban finning of dogfish, & other sharks
- Hard quotas
- Mandatory permitting & reporting
- Dogfish Monitoring Committee & framework adjustment process

3. Submit your final plan to Secty of Commerce by 12/98.

Thank you

Paul Neal

RECEIVED
NOV 18 1998
MID-ATLANTIC FISH COUNCIL

cc Gov. Rowland

Impossible ...

Ms. Beverly Greenhow
502 East 79th St., Apt. 6A
New York, NY 10021

November 16, 1998

Mr. Dan Furlong
Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New St.
Dover, DE 19904-6790

Dear Mr. Furlong:

Unregulated fishing on spiny dogfish or "cape shark" off the Northeast coast has increased dramatically in recent years, depleting the population of the targeted mature females. Fishery managers have proposed a dogfish management plan that aims to rebuild the population over a decade but the preferred plan allows rampant overfishing to continue for more than another year, risking population collapse.

In view of this, I urge the Council to adopt a commercial quota on dogfish that will:
* Stop overfishing and begin recovery immediately (not in the year 2000) and,
* rebuild the population as quickly as possible.

Also please propose measures that include a size limit of 32 inches or more to protect remaining mature females;
- there must be a ban on "finning" (slicing off the more valuable fins and discarding the body);
- there must be "hard" rather than "target" quotas;
- there must be mandatory permitting and reporting requirements; and
- there must be a Dogfish Monitoring Committee and framework adjustment process.

Lastly, I urge you to act in the precautionary manner warranted by such a long-lived animal and work swiftly and submit the final spiny dogfish plan to the Secretary of Commerce by the end of 1998.

Sincerely,

Beverly Greenhow

BG/
cc: Senator Daniel Patrick Moynihan
Representative Carolyn Maloney
Governor George Pataki

Ruth A. Jones
R. D. No. 1, Crawford Road
Walton, New York 13856

November 14, 1998

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building: Room 2115
300 South New Street
Dover, Delaware 19904-6790

RECEIVED
NOV 19 1998
MID-ATLANTIC

Dear Mr. Furlong:

As a member of the Center for Marine Conservation I am very concerned about the deteriorating status of the spiny dogfish and urge that the Council immediately adopt a hard (not target) quota that will stop overfishing and enable recovery to start now rather than waiting until the year 2000 when it may be too late to save the species.

I hope that the Council can move rapidly and submit the final dogfish management plan by the end of 1998.

Thank you—for your attention to this matter.

—Sincerely,

Ruth Jones

Innerspace Visions
— Photography —

75-1027 Henry Street • Suite 444
Kailua-Kona • Hawaii 96740-3137 • U.S.A.
tel: 808-329-4253 • fax: 808-329-6659
e-mail: perrine@kona.net

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building; Room 2115
300 South New Street
Dover, Delaware 19904-6790
Fax: (302) 674-5399

Dear Mr. Furlong:

I am writing to voice my support for the immediate implementation of the following measures designed to permit recovery of the spiny dogfish (so-called "cape shark") population in the NW Atlantic:

- either a total ban on fishing for this species, or a quota set low enough to permit an immediate start to recovery of the population, plus the following;
- a size limit of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the more valuable fins and discarding the body);
- "hard" rather than "target" quotas;
- mandatory permitting and reporting requirements;
- a Dogfish Monitoring Committee and framework adjustment process.

Past errors in planning and management and economic hardships are no excuse for inaction which could result in a total population collapse for a species with such a slow reproductive rate that they might not recover in our lifetimes. Effect removal of a once-numerous apex predator from the ecosystem could have important and unknown effects on the entire coastal marine ecosystem, which will not likely be as welcome as some fishermen like to think that they would be. Please consider the great similarities in reproductive biology, natural history, and environmental niche between the spiny dogfish and the harbor porpoise, and manage the dogfish just as you would manage the harbor porpoise.

Thank you.

Sincerely,

Doug Perrine

Doug Perrine
(M.A. Fisheries Biology, U. of Miami)

Jennifer Smith-Brock
995 Sawyer St.
South Portland, ME 04106

November 17, 1998

Mr. Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building; Room 2115
300 South New St.
Dover, DE 19904-6790

Dear Mr. Furlong,

I am very concerned about the overfishing of dogfish. It appears that the plan of the Mid-Atlantic and New England Fishery Management Councils simply will not go into effect soon enough to prevent the collapse of the dogfish population. I therefore urge the Council to adopt a commercial quota that will go into effect immediately.

In addition to immediate action on a quota, I urge the Council to adopt both a size limit of 32 inches or more to protect the remaining mature females and a ban on "finning." Please act by the end of 1998 in order to help this species survive.

Thank you.

Sincerely,

Jennifer Smith-Brock

Jennifer Smith-Brock

275 Greenwich Street #8B
New York, NY 10007
November 16, 1998

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, Delaware 19904-6790

Dear Mr. Furlong

I am writing to you to express my concern for the dogfish and my support for the development of an appropriate management plan.

I would urge the Council to adopt a commercial quota that would stop overfishing now before it is too late. In addition I support a size limit of 32 inches to protect remaining mature females and a ban on "finning!"

Dog fish fishing controls must be enacted before it is too late.

Sincerely,

Jill Weinstein

RECEIVED
NOV 1 9 1998
MID-ATLANTIC FISHERY COUNCIL

Michael Vandermause
2409 Hannon Ct.
Ellicott City, MD 21042
Fax: (410) 461-8374

November 15, 1998

Dan Furlong, Mid-Atlantic Fishery Management Council
Federal Building; Room 2115
300 South New Street
Dover, Delaware 19904-6790
Fax: (302) 674-5399

Dear Mr. Furlong:

It has come to my attention that a type of small shark called the spiny dogfish is in danger of extinction due to the over-fishing of the most desirable adult females. It is very hard for this fish to regenerate its population. It has the longest gestation period of all vertebrae, 2 years. Even then, it only produces about six live young on the average.

That is why the dog-fish need your help in getting their species back on track immediately. Some proposed measures include a size limit of at least 32 inches, a ban on "finning" (cutting off the valuable fins and discarding the body), and mandatory permitting and reporting requirements. I urge you to please work quickly and submit the final spiny dogfish plan by the end of 1998 to stop over-fishing and get the spiny dogfish population on the road to recovery as quickly as possible. Thank you for your time.

Sincerely,

Michael D. Vandermause

Tim Eichenberg
1460 Locust Road, NW
Washington, DC 20012
November 16, 1998

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building; Room 2115
300 South New Street
Dover, Delaware 19904-6790

Dear Mr. Furlong:

I appreciate this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

Dogfish are overfished and mature females (the target of intense, unrestricted fishing) have declined dramatically in number as well as in average size. While I support the Council's proposed cuts in fishing, phasing in reductions will allow rampant overfishing to continue into the year 2000. This puts the vulnerable dogfish population at great, unacceptable risk of collapse.

The Council should adopt a commercial quota that will stop overfishing and begin recovery of dogfish *immediately* (not wait until the year 2000), and rebuild the population as quickly as possible. The Council should also:

- limit the size to 32 inches or more to protect remaining mature females;
- ban "finning" (slicing off the more valuable fins and discarding the carcass at sea);
- require "hard" rather than target quotas; and
- establish a Dogfish Monitoring Committee and framework adjustment process.

Like most sharks, spiny dogfish grow slowly, mature late and produce few young, leaving them especially vulnerable to overfishing. I urge you to act in the precautionary manner to protect such a long-lived animal. Please submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year. Thank you for considering my views.

Sincerely,

T. Eichenberg

Tim Eichenberg

ROSA MARIAN LEDA
2708 Rosemary Court
Adamstown, MD 21710

November 14, 1998

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building; Room 2115
300 South New Street
Dover, DE 19904-6790

Dear Mr. Furlong:

What is mankind trying to do? We have almost decimated the animal population and caused many to be extinct (gone forever). Are we now trying to devoid the oceans of any living life?

I am writing concerning the overfishing of dogfish population in the Mid-Atlantic waters. I urge the Council to adopt a commercial quota that will:

1. stop overfishing and begin recovery of dogfish immediately; (not in the year 2000); and

2. rebuild the population as quickly as possible;

3. a size limit of 32 inches or more to protect remaining mature females;

4. a ban on "fining" (slicing off the more valuable fins and discarding the body);

5. "hard" rather than "target" quotas;

6. mandatory permitting and reporting requirements;

7. a Dogfish Monitoring Committee and framework adjustment process.

Lastly, I urge the Council to:

8. act in the precautionary manner warranted by such a long-lived animal and

9. work swiftly and submit the final spiny dogfish plan to the Secretary of Commerce by the end of 1998.

Thank you very much for your prompt and careful consideration of the above points and actions that will save and protect the dogfish until they are "back on their feet."

Very truly yours,

Rosa Marian Leda

Rosa Marian Leda

cc: Governor Parris Glendenning
Senator Barbara Mikulski
Center for Marine Conservation

35 Ross Avenue
Spring Valley, New York 10977
November 17, 1998

Mr. Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building; Room 2115
300 South New Street
Dover, Delaware 19904

Dear Mr. Furlong:

In late 1997, assessment of the Northwest Atlantic spiny dogfish population, also known as "cape shark", was updated by scientists who reported it "overfished". The report noted dramatic declines in both the number and average size of mature females.

I urge you and the Council to adopt a commercial quota that would stop overfishing and begin recovery of dogfish immediately, as opposed to the year 2000. Northwest Atlantic female dogfish do not begin to reproduce until they are 13 years old. With a 2-year gestation period that is among the longest of all vertebrates, and with an average of only six live young produced, waiting until 2000 is too late and too risky.

I also support the following measures:

- a size limit of 32" or more to protect remaining mature females
- a ban on "finning" (keeping only the more valuable fins)
- "hard" rather than "target" quotas
- mandatory permitting and reporting requirements
- a Dogfish Monitoring Committee and framework adjustment process.

I also urge the Council to act in the precautionary manner warranted by such a long-lived animal and to act swiftly and submit the final spiny dogfish plan to the Secretary of Commerce by the end of 1998.

I thank you, in advance, for your swift action on a plan to rebuild the spiny dogfish population starting <u>now.</u>

Yours truly,

Rhoda Lonow

Rhoda Lonow

copy to:
Governor George Pataki
Senator Daniel Patrick Moynihan
Senator Alphonse D'Amato
Senator-elect Charles Schumer
Representative Benjamin Gilman

November 16, 1998

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building; Room 2115
Dover, Delaware 19904-6790

Dear Mr. Furlong:

I urge you to take the necessary steps to ensure the survival of the spiny dogfish. Due to the limited reproductive capacity of the fish, it is too late and too risky to delay necessary cuts in fishing any longer.

Please adopt a commercial quota that will stop overfishing and begin recovery of the dogfish immediately. This species cannot wait until the year 2000 for the imposition of fishing limits, as it is necessary to rebuild the population as quickly as possible.

Implementation of the following measures would help avoid the destruction of the dogfish population:

* a size limit of 32 inches or more to protect remaining mature females

* a ban on "finning" (slicing off the more valuable fins and discarding the body of the fish) – an offensive, wasteful practice

* "hard" rather than "target" quotas

* formulation of a Dogfish Monitoring committee and framework adjustment process

It is so important that you act in a precautionary manner in this situation. Please work swiftly to submit the final spiny dogfish plan to the Secretary of Commerce by the end of 1998.

Sincerely yours,

Donna DeCostanzo

Donna DeCostanzo
132 Berkeley Place, #3
Brooklyn, NY 11217

205 Third Avenue, 16C
New York, N.Y. 10003
November 17, 1998

Dan Furlong, Executive Drictor
Mid-Atlantic Fishery Management Council
Federal Building: Room 2115
300 S. New St.
Dover, Delaware 19904-6790

Dear Mr. Furlong:

Re. dogfish. I urge the Council to adopt a commercial quota that will stop overfishing and begin recovery of dogfish immediately and rebuild the population as quickly as possible.

In addition, I support the following proposed measures:

- a size limit of 32 inches or more to protect remaining mature females;
- a ban on slicing off the more valuable fins and discarding the body:
- "hard" rather than "target" quotas;
- mandatory permitting and reporting requirements;
- A Dogfish Monitoring Committee and framework adjustment process.

I also urge the Council to act in the precautionary manner warranted by such a long-lived animal and work swiftly and submit the final spiny dogfish plan to the Secretary of Commerce by the end of 1998.

Respectfully,

Joyce Marks

Joyce Marks

LYNN ZIMMERMAN
GEORGE C. THOMAS
8 MONOMOY CREEK ROAD
NANTUCKET, MA 02554

November 17, 1998

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building; Room 2115
300 South New Street
Dover, Delaware 19904-6790

RE: Stop Overfishing of Spiny Dogfish Now

Dear Mr. Furlong:

The list of decimated species continues. I am writing as a citizen now concerned about the stiff decline of spiny dogfish and to strongly urge you not to wait another year to implement protection methods. Stopping the over fishing sooner will better protect the fishery by allowing it to start rebuilding.

Also, it makes sense to support the proposed measures to protect the fish: a size limit of thirty two inches; a ban on "finning;" quotas that are "hard;" and mandatory permitting and reporting requirements.

Please urge the Council to act quickly and get the final spiny dogfish plan to the Secretary of Commerce before the end of 1998.

Thank you for your careful attention to my comments.

Sincerely,

Lynn Zimmerman

Lynn Zimmerman

RECEIVED
NOV 20 1998
MID-ATLANTIC FISHERY COUNCIL

RECEIVED
NOV 20 1998
MID-ATLANTIC FISHERY COUNCIL

Box 144
Mt. Sinai, N.Y.
11766
Nov 17, 1998

Dear Mr. Furlong,

I am writing in reference to the plight of the Northeast coast dogfish.

I am requesting that you adopt a commercial quota that will stop overfishing and begin the immediate recovery of dogfish, not putting it off even another crucial year to 2000. The population must be rebuilt as soon as possible.

I am also supporting the following measures:

1. a size limit of 32 inches or more to protect

remaining mature females
2. a ban on "finning", which is a deplorable practice
3. "hard" ~~rather~~ than "target" quotas -
4. mandatory permitting and reporting requirements.
5. a Dogfish Monitoring Comm. and framework adjustment process

I am requesting that you act in the precautionary manner warranted by such a long-lived animal. Please work swiftly and forward the final spiny dogfish plan to the Secretary of Commerce by the end of 1998.

As a coastal resident, I am extremely concerned about the plummeting populations of fish species due to poor fishery management regulations and overfishing. These concerns must be addressed as soon as possible to halt the further deterioration of our fish populations.

Thank you

Sincerely,

Jane E. Edsall

Joseph McNamara
206 Redbud Ln
Harrisonburg, VA 22801-9126

11/16/98

To: Dan Furlong
Mid-Atlantic Fishery Management Council,
Dover, DE 19904-6790.

Dear Mr. Furlong,

I write to you of my concern for the dogfish.

The Council should stop overfishing and begin recovery now, not in 2000.

In addition, there should be a size limit, a ban on "finning", mandatory reporting requirements, and a monitoring process.

The Council should act in a precautionary manner and work swiftly to submit a plan to the Secretary of Commerce by the end of this year

Yours sincerely,

Joe McNamara

Copies to Gov. Jim Gilmore,
Rep. Robert Goodlatte.

RECEIVED
NOV 20 1998
MID-ATLANTIC FISHERY COUNCIL

18 November, 1998

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building; Room 2115
300 South New Street
Dover, Delaware 19904-6790

Dear Mr. Furlong:

As a U.S. taxpayer with an interest in public natural resources, I am commenting on the Mid-Atlantic Council's draft management plan for spiny dogfish.

Dogfish are overfished and the mature females (the target of intense, unrestricted fishing) have declined dramatically in number as well as in average size. While I commend the Council for proposing the necessary cuts in fishing, I am concerned that phasing in reductions, thereby allowing overfishing to continue into the year 2000, puts the vulnerable dogfish population at great, unacceptable risk of collapse.

I urge the Council to adopt a commercial quota that will:

- stop overfishing and begin recovery of dogfish ***immediately***; (not in the year 2000); and
- rebuild the population as quickly as possible;

In addition, I support the following measures:

- a size limit of 32 inches or more to protect remaining mature females;
- a ban on "finning" (slicing off the more valuable fins and discarding the carcass at sea);
- "hard" rather than target quotas;
- a Dogfish Monitoring Committee and framework adjustment process.

Spiny dogfish (like most sharks) grow slowly, mature late and produce few young, leaving them especially vulnerable to overfishing. I urge you to keep this in mind and act in the precautionary manner that is warranted by such a long-lived animal. Please work quickly and submit a strong, final spiny dogfish plan to the Secretary of Commerce by the end of the year.

Sincerely yours,

David Dickson
1624 S. Nelson St.
Arlington, VA 22204

cc: The Hon. John Warner
The Hon. Chuck Robb

To: Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover Delaware 19904-6790
Fax No (302) 674-5399

Dear Mr Furlong:

I write to comment on a draft dogfish management plan. Please do not allow overfishing to continue well into the year 2000. Considering the limited reproductive capacity of the dogfish, that is too little too late. Please adopt a commercial quota that will:

(1) stop overfishing and begin recovery of dogfish immediately and (2) rebuild the population as quickly as possible.

I also support the following proposed measures:

a size limit of 32" or more to protect remaining mature females;

a ban on finning;

hard rather than "target" quotas;

mandatory permitting and reporting requirements; and

a Dogfish Monitoring Committee and framework adjustment process.

Please urge the Counsel to act in the precautionary manner warranted by such a long-lived animal and to work swiftly and submit the final spiny dogfish plan to the Secretary of Commerce by the end of 1998.

Thank you.

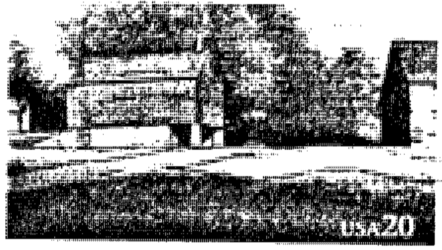
Sincerely,

Irene Cannon-Geary PhD.

Dr Irene Cannon-Geary
65 Prescott Ave
White Plains NY 10605

RECEIVED
NOV 22 1998
MID-ATLANTIC FISHERY COUNCIL

ROBERT CLARK
RR 3, BOX 192
BRIDGTON, ME 04009-
9511



DAN FURLONG, EXEC. DIR
MID-ATLANTIC FISHERY MGMT. COUNCIL
FEDERAL BUILDING, RM 2115
300 S. NEW ST.
DOVER, DELAWARE 19904-6790

11/18/96

Dear Mr. Furlong:

Please begin recovery procedures for the SPINY DOGFISH immediately, not in the year 2000, with the following:

1. size limit of 32"
2. ban on "finning"
3. Hard quotas, not target quotas
4. Mandatory permitting and reporting
5. a DOGFISH monitoring committee and framework adjustment ~~process~~

Please submit plan TO THE SECRETARY OF COMMERCE by the end of 1996.

Sincerely,
Robert H. Clark

November 16, 1998

Victoria Mireles
2915 N. Normandy
Chicago, IL 60634
773.622.2628

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building; Room 2115
300 South New Street
Dover, Delaware 19904-6790

Dear Mr. Furlong:

I am aware that the Mid-Atlantic Fishery Council is currently accepting public comments on a draft dogfish management plan. With this is mind, I would like to add the following to the record:

As Executive Director, you, more than any other individual, is aware of the precarious state of the dogfish. Years of unregulated overfishing in the industry on fecund females have left the population on the brink of collapse. It is apparent that sound management is needed to assure the survival of the dogfish into the 21st century.

To that end, I urge you and the members of the Council to implement dogfish regulations immediately in order to facilitate rebuilding the populations as quickly as possible. These measures would include size limits of at least 32 inches in order to protect the remaining mature females, a ban on the practice of finning and the instillation of a committee to monitor the recovery process.

All we need to do is look at the history of cod fishing to see what happens when a resource is not managed appropriately. The loss of jobs, coupled with the extraordinary cost to both the government and taxpayers, sends a clear signal that we must not wait until the dogfish is past the point of preventing a biological disaster before facilitating a management plan.

Please do not belie the faith I have that you and other Council members will act swiftly and wisely to ensure a healthy and vibrant dogfish population in the years to come. I look forward to your positive response.

Sincerely,

Victoria Mireles

Victoria Mireles

RECEIVED
NOV 23 1998
MID-ATLANTIC FISHERY COUNCIL

NOTE: This letter was damaged during mailing. The points made in the intact section of the letter have been included in the comments.

Dogfish
ncle
12635

Dear
Mid-A-
Council
Federal Building
300 South Street Room
Dover, Delaware 19904-6

Dear Mr Furlong,

I urge the Mid-Atlantic Council to immediately adopt a commercial quota that will stop overfishing and begin rebuilding the population of spiny dogfish (Squalus acanthias).

Measures I would recommend:

— a size limit of 32 inches or more to protect mature females

— a ban on finning i.e. slicing off the more valuable fins and discarding

NOTE: This letter was damaged during mailing. The points made in the intact section of the letter have been included in the comments.

Thank ... plement

and help in ... regional

Fishery Management.

Sincerely,

194 Haverstraw Road,
Suffern, New York 10901

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building; Room 2115
300 South New Street
Dover, Delaware 19904-6790

November 18, 1998

Dear Mr. Furlong,

I'm writing in support of a more aggressive spiny dogfish management plan than the draft plan currently under review by the Council. I applaud the Council for recognizing the need for action to rebuild the severely decimated Northwest Atlantic dogfish populations. However, the timetable proposed in the draft management plan is inappropriate given the life history characteristics of this fish.

The delayed maturity, long gestation period, and low fecundity of dogfish makes them especially vulnerable to overfishing. Restricting the commercial take of dogfish **as soon as possible**, rather than in the year 2000, would reduce the risk of a catastrophic population collapse. I believe the restrictions must be stringent (e.g., a size limit of 32 inches or more, a ban on finning, hard quotas, and mandatory permitting and reporting) if they are to be effective.

I urge the Council to act quickly to finalize the spiny dogfish management plan and submit it to the Secretary of Commerce. Hopefully, the actions in the plan will be sufficient to permit the dogfish population to recover sufficiently to someday support a sustainable commercial fishery.

Respectfully yours,

Fred Immermann

Fred Immermann

WILLIAM A. AND EILEEN M. FAUST

1090 BRIGHTON ROAD
TONAWANDA, NEW YORK
14150-8309
(716) 833-0544
E-MAIL BILAF@AOL.COM

November 18, 1998

Mr. Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover, Delaware 19904-6790

We wish to commend your council for working on development of a management plan for conservation of the spiny dogfish.

To curtail unregulated fishing and further collapse of the population of the spiny dogfish, we believe that your plan should be approved and in force by the end of 1998.

We hope that your plan includes size and well defined catch limits and a ban on the current practice of "finning".

Sincerely,

William A. Faust
Eileen M Faust

William A. and Eileen M. Faust

November 15, 1998

608 Crescent Ave.
Buffalo, N.Y. 14214

Dear Mr. Furlong

I am writing to you today to voice my concern for the spiny dogfish. Unregulated fishing has depleted the population, and unless steps are taken we risk population collapse with this species.

I urge the Mid-Atlantic Fishery Management Council to adopt a commercial quota that will stop overfishing and begin recovery of dogfish immediately, as well as rebuild the population as quickly as possible. I also urge the Council to follow several proposed measures: a size limit of 32 inches or more to protect remaining mature females; a ban on "finning" "hard" rather than "target" quotas; mandatory permitting and reporting requirements; and a Dogfish Monitoring Committee and framework adjustment process. Lastly, I urge the Council to act in the precautionary manner warranted by such a long lived animal and to work swiftly and submit the final spiny dogfish plan to the Secretary of Commerce by the end of 1998.

Thank you for your time.

Sincerely,

Sherri Doherty

Sherri Doherty

Saundra L. Patrick
7 Sixth Street
Barrington RI 02806

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building; Room 2115
300 South New Street
Dover, Delaware 19904-6790

November 19, 1998

Dear Dan Furlong, Executive Director,

I am writing to you to voice my concern for the delay in cutting quotas for dogfishing in the western Atlantic Ocean region. Realizing that fishery management intends to implement much needed controls by the year 2000, I fear their efforts will come too late for this already overfished population. An updated assessment by scientists in late 1997 declared the Northwest Atlantic spiny dogfish population "overfished", reporting a dramatic decline in both the number and average size of mature females. Catches were determined to be 10 times the level needed to rebuild the population within the legal limit of 10 years.

Please, I urge the Council not to delay implementing the much needed controls.

Please, as soon as possible, adopt a commercial quota that will:

- **stop overfishing and begin recovery of the dogfish immediately; (not in the year 2000); and**
- **rebuild the population as quickly as possible.**

Sincerely,

Saundra Patrick

Saundra L. Patrick, BA
Senior Research Assistant
Brown University

November 17, 1998

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building; Room 2115
300 South New Street
Dover, Delaware 19904-6790

Dear Mr. Furlong:

As a resident of the State of Maryland, I am concerned about the health of the marine environment off-shore of the mid-Atlantic states. The long-term productivity of our commercial fisheries is of particular interest to me, and I would like to take this opportunity to comment on the Mid-Atlantic Council's draft management plan for the small coastal shark known as "spiny dogfish."

I understand that dogfish are overfished, a status they have achieved in a strikingly short period of time. Unfortunately, it is the mature females that are the target of the most intense, unrestricted fishing, a fact that ensures the continued rapid decline of the species. Studies show that this portion of the population has declined dramatically in number as well as in average size, seriously reducing reproductive capacity. While I commend the Council for proposing necessary cuts in fishing, I am concerned that phasing in reductions, thereby allowing overfishing to continue into the year 2000, puts the vulnerable dogfish population at great, unacceptable risk of collapse.

I urge the Council to adopt a commercial quota that will stop overfishing and begin recovery of dogfish *immediately*, and rebuild the population as quickly as possible.

To achieve this goal, the plan should include the following measures:

- an increase of the size limit to 32 inches or more;
- a ban on "finning";
- "hard" rather than target quotas; and
- a Dogfish Monitoring Committee and framework adjustment process.

Because of their slow growth, late onset of maturity, and small number of offspring, sharks should be managed in a precautionary manner. Please take this approach to management of the spiny dogfish, and work swiftly and submit a strong, final plan to the Secretary of Commerce by the end of the year.

Thank you for considering my views.

RECEIVED
NOV 23 1998
MID-ATLANTIC FISHERY COUNCIL

Sincerely,

Andrea M. Brock
4400 East-West Highway
#619
Bethesda, Maryland 20814

JUDITH GLEYSTEEN MCENTYRE

Cityside Drive, Unit 74
Montpelier, VT 05602-4248

Fax 802-454-7780
Home Phone 802-229-5154
Email jgmexpos@aol.com

November 20, 1998

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management Council
Federal Building, Room 2115
300 South New Street
Dover DE 19904-6790

Dear Dan Furlong:

Over the last several decades, traditional NE groundfish have been decimated by overfishing. Now dogfish have become an alternative species to catch. It is my understanding that the Spiny dogfish has a long life span and a long gestation period compared to most traditional fishing species. I understand that scientists declared the dogfish overfished by catches 10 times the level needed to rebuild the population within 10 years. To meet that requirement, the directed dogfish fishery must be virtually shut down. However, I understand the Councils do not intend on taking action until well into the year 2000. Considering the limited reproduction capacity of dogfish, that is simply too late and too risky. Please adopt and implement a commercial quota that will:

- stop overfishing and begin recovery of dogfish immediately (not in the year 2000); and
- rebuild the population as quickly as possible.

Please support the following measures:

- a size limit of 32 inches or more to protect remaining mature females;
- a ban on "finning";
- "hard" rather than "target" quotas;
- mandatory permitting and reporting requirements;
- a Dogfish Monitoring Committee and framework adjustment process.

Also, please:

- act in the precautionary manner warranted by such a long-lived animal; and
- work swiftly and submit the final spiny dogfish plan to the Secretary of Commerce by the end of 1998.

Sincerely yours,

Judith G. McEntyre

Judith Gleysteen McEntyre

Miriam Lara Sivak
32 Magnolia Dr.
Dobbs Ferry, NY 10522

11/17/98

Dear Mr Furlong,

I am writing regarding my concern for conditions regarding overfishing of dogfish. I wish to see that it be stopped immediately not in the year 2000, & that the population be allowed to rebuild itself.

I support the following protective measures;

1. a Dogfish monitoring committee & framework adjustment process.
2. a hard" rather than "target" quota.
3. a ban on ~~fishing~~ finning (slicing off the more valuable fins) while discarding the remaining body)
4. manditory permitting & reporting requirements
5. a size limit of 32" or more to protect remaining mature females,

thank again.

Sincerely,
Miriam Sivak

108 Deerlake Dr.
Asheville, NC 28803
11/9/98

Mr. Dan Furlong, Ex. Director
Federal Bldg. Room 2115
300 So. New Street
Dover, Delaware 19904-6790

Dear Mr. Furlong:

My friends asked me to write this letter for them as well as for myself, therefore, please considerthis as many letters, and not just one, and I will enclose herewith, a list of their names.

We are very concerned about the dogfish, and we ask that you do all in your power to help save them. You must stop the overfishing, and begin a redcovery of dogfish IMMEDIATELY, and rebuuld the population as quickly as possible.

In addition, there must be a size limit of 32 inches or more to protect remaining mature females;
a ban on "finning" (slicing off the more valuanble fins and discarding the body)

have "hard" rather than "target" quotas
Mandatory permitting and reporting requirements;
a dogfish monitoring committee and framework adjustment process
AND we urge you to act in the precautionary manner warranted by such a long-lived animal AND
WORK SWIFTLY AND SUBMIT THE FINAL SPINY DOGFISH PLAN TO THE SECRETARY OF COMMERCE BY THE END OF THE 1998.

We, all of us writing this letter, hope that you will do all in your power to help save the dogfish. Thank you.

Sincerely

Lillian Bieber
Mrs. Lillian Bieber

Enc. (list of friends writing this letter with me)

RECEIVED
NOV 23 1998
MID-ATLANTIC FISHERY COUNCIL

Mrs. Helen Fine	Asheville, NC
Mrs. Marion Novin	Floral Park, NY
Mr. Joel N oving	Seattle, Wash.
Dr. Alan Toffler	Great Neck, NY
Mr. & Mrs. L. Asen	Boca Rotan, Fla.
Mrs. M. Bressack	Ont., Canada
Mr. Gerald Roberts	Great Neck, NY
Miss Gloria Thompson	" " "
Mrs. Rita Rosenstein	" " "
Mrs. Ed Novin	Rockwville, MD
Mr. & Mrs. M. Madigan	" "
Mrs. Fran Jones	Arden, NC
Mr. & Mrs. G. Linsky	Glen Head, NY
Mr. & Mrs. T. Douso	Glenwood Landing, NY
Mr. & Mrs. R.Shilston	Asheville, NE
Mrs. F. Lustig	Boca'Raton, Fla.
Mrs. L. Levine	Woodbury, NY
Mrs. B. Levine	Gathersburg, MD
Mr. & Mrs. G. Schiller	Little Neck, NY
Mrs. M. Kass	Asheville, NC
Mrs. Conrad Nagel	Los Angeles, Calif.
Mr. Robert Nagel	San Francisco, "
Mr. & Mrs. F. Lefferman	Ft. Richy. Fla.
Mr. & Mrs. J. O'Connell	Mineola, NY
Mrs. Brenda Bower	Asheville, NC
MRS. Arline Arlington	Arden, NC
Mr. & Mrs. Warren Ponti	Asheville, NC
Mr. John Ponti	" "
Dr. B. Kirwan	Arden, NC
Mrs. Eloise Dukes	" "
Mrs. kE. Kafarae	Pembroke Pines, Fla.
Mr. & Mrs. John Fagmiglette	Glen Head, NY
Mr. Neil Chernick	Boston, Mass.
Mrs. Natalie Friedman	Scarsdale, NY
Mr. & Mrs. C. Mallow	New York, NY
Mr. & Mrs. S. Sands	Kings Park, NY
Mrs. Mollie Cooper	Bradenton, Fla.
Miss Sue Peterson	Atlanta, Ga.
Mrs. Pam Roberts	Asheville, NC
Mrs. Verna Wallin	Fletcher, NC
Mrs. Awilda Frasier	Arden, NC
Mr. & Mrs. Jack Orenzo	Asheville, NC
Mrs. Olga Zeiko	" "
Miss trudi Anders	" "
Mrs. Betty Kuperman	Houston, Tex.
Mr. & Mrs. Carl Rosenberg	Asheville, NC
Mrs. Pat Shirley	" "
Mrs. Sandy Sonner	" "
Mr. Bob Vance	" "
Mr. & MRs. Art (Pat) Reader	Arden, "
Mr. Julius Edward Wiley	Asheville, "
Mr. Danny Johnson	" "
Mrs. Martha Leyitt	Black Mountain, NC
Mr. & Mrs. Tony Tacco	Weaverville, "
Mr. & Mrs. J. Ruhn	Fletcher, "
Mr. & Mrs. Sam Shapiro	Arden, NC
Mrs. Natalie Nachman	" "
Mr. & Mrs. R. Rose	" "
Mrs. Rose Meyers	Silver Springs, MD
Mr. & Mrs. Bob Levine	" " "
Mr. Howard Meyers	" " "

Mr. David Meyers	Baltimore, MD
Mr. Lester Farber	Huntington, NY
Mr. & Mrs. Stan Hafter	Los Angeles, Calif.
Mr. Michael Barrett	Asheville, NC
Mr. & Mrs.Richard Lawrence	W. Palm Beach, Fla.
Miss Jennifer Meyers	Rockville, MD
Mrs. Victoria Levey	Asheville, NC
Mr. &Mrs. R. Kruger	Weaverville, NC
Mrs. J. Hill	Atlanta, Ga.
Mrs. H. Hoffman	Charlotte, NC
Mrs. Lore Shiftan	" "
Mrs. Sandra Stone	Asheville, NC
Mrs. Sonja Schulemson	" "

35 Laurel Lane
Tolland, Ma 01034
November 20, 1998

Dear Mr. Furlong:

Please develop a commercial quota that will stop over-fishing and begin recovery of the dogfish immediately, not in the year 2000. Please protect maturing females, limit size of fishing to 32". Do all you can to save the dogfish from overfishing and extinction.

Natural wildlife must be protected. Let us not destroy by overfishing the existing fish in the Atlantic ocean.

Thank you.

Sincerely,

S. David Ackerman
S. David Ackerman

189 Prairie Street
Concord, MA 01742
November 18, 1998

Dan Furlong, Executive Director
Mid-Atlantic Fishery Management
Council
Federal Building, Room 2115
300 South New Street
Dover, Delaware 19904-6790

Dear Mr. Furlong:

I am very concerned about the imminent threat to the dogfish. Therefore I urge you to direct the Council to enact and enforce dogfishing controls as soon as possible to prevent the total collapse of dogfish population.

I recommend the following steps:

Stopping overfishing immediately;
Rebuilding the population as quickly as possible;
Adopting a size limit of 32 inches or more to protect the remaining mature females;
Totally banning finning;
Setting and enforcing firm quotas; and
Submitting the final spiny dogfish control plan to the Secretary of Commerce by the end of 1998.

I very much appreciate your attention to this matter.

Sincerely,

Evelyn M. Zuk

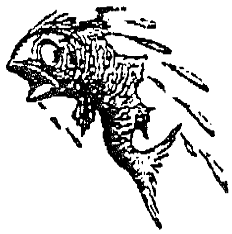
Evelyn M. Zuk

978 369-6668

CENTER FOR MARINE CONSERVATION

725 DeSales Street, NW
Suite 600
Washington, DC 20036
Phone: (202) 429-5609
Fax: (202) 872-0619
Web: www.cmc-ocean.org

(302) 674-5399



FISH FAX

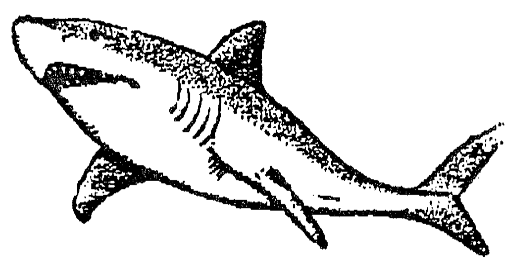
To: Dan Furlong / Rich Seagraves

From: Sonja V. Fordham
Fisheries Conservation Program
sonja@~~cenmarine.com~~ dccmc.org

Date: Nov. 23, 1998

Pages to follow: 3

Remarks: Thank you.



CENTER FOR MARINE CONSERVATION

1725 DeSales Street, NW
Suite 600
Washington, DC 20036
Phone: (202) 429-5609
Fax: (202) 872-0619
Web: www.cmc-ocean.org

November 23, 1998

Dan Furlong
Executive Director
Mid-Atlantic Fishery Management Council
300 South New Street
Dover, Delaware 19904-6790

Dear Mr. Furlong:

The attached co-signed letter expresses the main concerns of the Center for Marine Conservation (CMC) regarding the Councils' draft Fishery Management Plan (FMP) for spiny dogfish. Since these comments were drafted, we have discovered information in the Draft Herring FMP and Environmental Impact Statement (EIS) that heightens our concern about the Councils' ability to minimize dogfish discards in other fisheries and thereby rebuild the dogfish population within the legal time limit of ten years.

The Draft Herring FMP and EIS (still in preparation by the New England Fishery Management Council staff) provides bycatch information from 1997 Maine Department of Natural Resources observer coverage of the herring fishery. While haulbacks of mid-water gear averaged less than 80 pounds of dogfish, haulbacks of purse seine gear resulted in as much as **50,000 pounds of dogfish discards**. While the discard mortality associated with this gear is apparently unknown as of yet, we are concerned that this significant discarding of dogfish has not been accounted for in the Draft Dogfish FMP and has not been addressed in the Herring FMP. The herring fishery is currently unregulated and may continue to expand. At the same time, the Council's preferred alternative for dogfish relies on extremely low fishing mortality (F= 0.03) for the last nine years of rebuilding in order to reach the target spawning stock biomass (SSB) level within a decade.

We would also like to take this opportunity to point out that the Councils have chosen to make minimization of regulation of other fisheries a goal of the Dogfish FMP. Based on last year's assessment, the Dogfish Technical Committee placed the spiny dogfish SSB at 64% of the target and 27,000 metric tons (mt) above the threshold level of 100,000 mt. Coincidentally, fishermen landed 27,000 metric tons of spiny dogfish in 1996. According to the dogfish control law, decline of the SSB below the threshold triggers a fishing mortality rate that rebuilds the fishery within **five** years Such action would certainly impact the large number of fisheries in the region that discard dogfish.

We feel this information bolsters the argument for a more precautionary approach to dogfish management and reiterate our support for non-preferred alternative 2.

Lastly, we would like to remind the Council that spiny dogfish are a public resource as well as the most vulnerable fish within their purview. We urge the Council to be as precautionary as possible when considering final dogfish fishery management measures.

Thank you for considering our views.

Sincerely,

Sonja V. Fordham

Sonja V. Fordham
Fisheries Project Manager

CENTER FOR MARINE CONSERVATION * ENVIRONMENTAL DEFENSE FUND
MOTE MARINE LABORATORY * CENTER FOR SHARK RESEARCH
NATIONAL AUDUBON SOCIETY * NATURAL RESOURCES DEFENSE COUNCIL
OCEAN WILDLIFE CAMPAIGN * SALT WATER SPORTSMAN MAGAZINE
NATIONAL COALITION FOR MARINE CONSERVATION

November 23, 1998

Dan Furlong
Executive Director
Mid-Atlantic Fishery Management Council
300 South New Street
Dover, Delaware 19904-6790

Dear Mr. Furlong:

Our organizations appreciate this opportunity to comment on the Mid-Atlantic and New England Fishery Management Councils' draft Fishery Management Plan (FMP) for spiny dogfish.

We are supportive of the Council's intention to stop overfishing and rebuild the spiny dogfish population within ten years, as mandated by the Sustainable Fisheries Act (SFA). We feel strongly, however, that the Councils' preferred alternative - to phase out the fishery and allow overfishing to continue well into the year 2000 - is unacceptably risk-prone and may jeopardize the stock's ability to rebuild to the target biomass level within the legal time limit.

The life history characteristics of spiny dogfish (slow growth, late maturity, small number of young) warrant an especially cautious management approach. Instead, we feel the Councils' plan is extremely optimistic on several fronts including the smoothed three-year estimation of current fishing mortality as well as the ability to minimize dogfish discards in other fisheries. Other factors, such as record low recruitment in recent years and the complete lack of controls on state dogfish landings, accentuate the risk that the FMP will not meet its rebuilding targets under the SFA. In addition, the plan provides no buffer to account for the fact that the spiny dogfish assessment is now nearly a year old and final regulations will not be in place until mid-1999, ***at the earliest***. In the meantime, intense, unregulated fishing continues on the few remaining good year classes. These year classes represent the only hope for spiny dogfish to recover within a decade.

All these reasons, combined with the inherent vulnerability of this shark, lead us to believe **that the spiny dogfish population warrants the most immediate and precautionary conservation action possible.** We urge the Council to adopt a strategy similar to non-preferred alternative 2, that includes a commercial quota **that ends overfishing and begins stock rebuilding upon implementation.**

In addition, we support:

- a minimum size of ***at least*** 32 inches;
- a ban on finning;
- permitting and reporting requirements;
- a Dogfish Monitoring Committee; and
- a Framework Adjustment Process.

It is important for the Councils to be aware that the U.S. Fish and Wildlife Service has received a proposal to list spiny dogfish on the Convention on International Trade of Endangered Species (CITES). A listing on CITES Appendix II would result in dogfish trade permitting and monitoring; an Appendix I listing would essentially prohibit international trade in spiny dogfish. A similar request was made (by the Ocean Wildlife Campaign) prior to last year's Conference of the Parties to CITES. While the U.S. government decided not to advance a spiny dogfish listing proposal, it did acknowledge that this dogfish stock satisfied the criteria for listing on the CITES appendices based on the lack of management and substantial international trade in the species. The next Conference of the Parties is scheduled for the year 2000.

We strongly urge the Councils to work quickly to adopt and finalize the dogfish fishery management plan and submit it to the Secretary of Commerce by the end of the year.

Thank you for considering our views.

Sonja V. Fordham

Sonja V. Fordham
Fisheries Project Manager
Center for Marine Conservation

Sarah Chasis/SF

Sarah Chasis
Senior Attorney
Natural Resources Defense Council

Robert E. Hueter/SF

Robert E. Hueter, Ph.D.
Senior Scientist & Director
Center for Shark Research
Mote Marine Laboratory

Merry Camhi/SF

Merry Camhi, Ph.D.
Staff Scientist
Living Oceans Program
National Audubon Society

Doug Rader/SF

Doug Rader, Ph.D.
Senior Scientist
Environmental Defense Fund

David Wilmot/SF

David Wilmot
Campaign Director
Ocean Wildlife Campaign

Ken Hinman/SVF

Ken Hinman
President
National Coalition for Marine Conservation

Barry Gibson/SF

Barry Gibson
Editor
Salt Water Sportsman Magazine

November 23, 1998

Mr. Dan Furlong
Mid-Atlantic Fishery Management Council
Federal Building
Room 2115
300 South New Street
Dover, Delaware
19904-6790

Dear Mr. Furlong:

I am writing in relation to the dogfish management plan currently being developed by the Mid-Atlantic Management Council.

Most importantly, I wanted to stress my support for an immediate cessation to the overfishing of dogfish; an immediate stop is vital if we are to have any reasonable hope of rebuilding dogfish stocks in a timely fashion. In contrast, waiting to the year 2000 to initiate the drastic, necessary, albeit painful reductions is to risk catastrophic collapse in dogfish populations.

I also believe the following proposed elements are important and should be included in the Plan:

* a minimum 32 inch size limit to protect females remaining in the population;

* a ban on "finning", an incredibly wasteful practice that simply has no place in modern fisheries management programs;

* real or hard quotas rather than target or flexible quotas;

* mandatory permitting and reporting requirements to ensure accurate collection of necessary data on fishing effort; and

* the establishment of a Dogfish monitoring committee.

If these measures are included in the plan, the Council will have acted in a precautionary manner warranted by this interesting, unique, and long-lived species. In conclusion, I urge you to move with due deliberation and submit the final dogfish management plan to the Secretary of Commerce by the end of 1998.

I appreciate the opportunity to share my perspective with you on this important initiative

Sincerely,

John L. Turner

10 Clark Boulevard
Massapequa Park, NY
11762

APPENDIX 3. PROPOSED REGULATIONS

50 CFR PART 648

Fisheries of the Northeastern United States; Spiny Dogfish Fishery Management Plan

1. The authority citation for part 648 continues to read as follows:

Authority: 16 U.S.C. 1801 et seq.

2. The following would be added to Section 648.2 (Definitions):

Spiny dogfish means *Squalus acanthias*.

Spiny Dogfish Monitoring Committee means a committee made up of staff representatives of the MAFMC, NEFMC, the NMFS Northeast Regional Office, the Northeast Fisheries Science Center, the states and two ex-officio industry members (one from each Council jurisdiction). The MAFMC Executive Director or a designee chairs the committee.

3. Add to Section 648.4 (commercial vessel permits):

(8) spiny dogfish vessels - Any commercial vessel of the United States must have been issued and carry on board a valid vessel permit to fish for, possess, or land spiny dogfish for sale in or from the EEZ.

4. Section 648.4 (Vessel and commercial permits), paragraph b, is revised to read as follows:

(b) *Permit conditions*. Any person who applies for a fishing permit under this section must agree as a condition of the permit that the vessel and the vessel's fishing activity, catch, and pertinent gear (without regard to whether such fishing occurs in the EEZ or landward of the EEZ, and without regard to where such fish or gear are possessed, taken or landed), are subject to all requirements of this part, unless exempted from such requirements under this part. All such fishing activities, catch, and gear will remain subject to all applicable state requirements. Except as otherwise provided in this part, if a requirement of this part and a management measure required by a state or local law differ, any vessel owner permitted to fish in the EEZ for any species managed under this part must comply with the more restrictive requirement. Owners and operators of vessels fishing under the terms of a summer flounder moratorium, scup moratorium, black sea bass moratorium permit or bluefish vessel permit or spiny dogfish vessel permit must also agree not to land summer flounder, scup, black sea bass, bluefish, or spiny dogfish respectively, in any state after NMFS has published a notification in the Federal Register stating that the commercial quota for that state or period has been harvested and that no commercial quota is available for the respective species. A state not receiving an allocation of summer flounder, scup, black sea bass, or bluefish either directly or through a coastwide allocation, is deemed to have no commercial quota available. Owners or operators fishing for surf clams and ocean quahogs within waters under the jurisdiction of any state that requires cage tags are not subject to any conflicting Federal minimum size or tagging requirements. If a surf clam and ocean quahog requirement of this part differs from a surf clam and ocean quahog management measure required by a state that does not require cage tagging, any vessel owners or operators permitted to fish in the EEZ for surf clams and ocean quahogs must comply with the more restrictive requirement while fishing in state waters. However, surrender of a surf clam and ocean quahog vessel permit by the owner by certified mail addressed to the Regional Administrator allows an individual to comply with the less restrictive state minimum size requirement, as long as fishing is conducted exclusively within state waters. If the commercial black sea bass quota for a period is harvested and the coast is closed to the possession of black sea bass north of 35 deg.15.3' N. lat., any vessel owners that hold valid commercial permits for both the black sea bass and the NMFS Southeast Region Snapper-Grouper fisheries may surrender their moratorium Black Sea Bass permit by certified mail addressed to the Regional Administrator and fish pursuant to their Snapper-Grouper permit, as long as fishing is conducted exclusively in waters, and landings are made, south of 35 deg.15.3' N. lat. A moratorium permit for the black sea bass fishery that is voluntarily relinquished or surrendered will be reissued upon the receipt of the vessel owner's written request after a minimum period of 6 months from the date of cancellation.

5. Spiny dogfish would be added to the species identified in section 648.5 (Operator permits), paragraph (a).

6. Spiny dogfish would be added to the species identified in section 648.6 (Dealer/processor permits), paragraph (a).

7. Spiny dogfish dealers would be added to section 648.7 (Record keeping and reporting requirements), paragraph (a)(1)(i) and (a)(2)(i).

8. Vessel owners with a commercial vessel permit for spiny dogfish would be added to section 648.7 (Record keeping and reporting requirements), paragraph (b)(1)(i).

9. Spiny dogfish would be added to the species identified in section 648.7 (Record keeping and reporting requirements), paragraph (c) (3).

10. Spiny dogfish would be added to the species identified in section 648.11 (At-sea sea sampler /observer coverage) (a) and (e).

11. Section 648.12 (Experimental Fishing) is revised to read as follows:

The Regional Administrator may exempt any person or vessel from the requirements of subparts B (Atlantic mackerel, squid, and butterfish), D (sea scallop), E (surf clam and ocean quahog), F (NE multispecies), G (summer flounder), H (scup), I (black sea bass), J (bluefish) or K (spiny dogfish) of this part for the conduct of experimental fishing beneficial to the management of the resources or fishery managed under that subpart. The Regional Administrator shall consult with the Executive Director of the Council regarding such exemptions for the Atlantic mackerel, squid, and butterfish, the summer flounder, the scup, the black sea bass, the bluefish and spiny dogfish fisheries.

12. The following would be added to section 648.14 (prohibition of finning):

Finning, the act of removing the fins of spiny dogfish and discarding the carcass, will be prohibited. Vessels which land spiny dogfish must land fins in proportion to carcasses, with a maximum of 5% fin to carcass ratio, by weight. Fins may not be stored aboard a vessel after the first point of landing.

13. Subpart k (Management measures for the Spiny Dogfish Fishery) would be added as follows:

§ 648.200 Catch quotas and other restrictions.

(a) *Annual review*. The Spiny Dogfish Monitoring Committee will review the following data, subject to availability, on or before February 15 of each year to determine the total allowable level of landings (TAL) and other restrictions necessary to achieve a target fishing mortality rate (F) of 0.2 in 1999-2000; a target F of 0.03 in 2000-2003; and a target F of 0.08 (F not to exceed 0.11 threshold) thereafter: Commercial and recreational catch data; current estimates of fishing mortality; stock status; recent estimates of recruitment; virtual population analysis results; levels of noncompliance by fishermen or individual states; impact of size/mesh regulations; sea sampling data; impact of gear other than otter trawls and gill nets on the mortality of spiny dogfish; and any other relevant information.

(b) *Recommended measures.* Based on this review, the Spiny Dogfish Monitoring Committee shall recommend to the Joint Spiny Dogfish Committee of the MAFMC and NEFMC the following measures to assure that the F specified in paragraph (a) of this section will not be exceeded:

(1) A TAL set from a range of 0 to the maximum allowed to achieve the specified F.

(c) *Seasonal allocation of quota*. The fishing year shall be defined as May 1 - April 30. The annual quota specified in paragraph (a) of this section shall be allocated into two semi-annual quota periods as follows: May 1-October 30 (57.9%) and November 1-April 30 (42.1%).

(d) *Annual fishing measures.* The Joint Spiny Dogfish Committee shall review the recommendations of the Spiny Dogfish Monitoring Committee. Based on these recommendations and any public comment, the Joint Spiny Dogfish Committee shall recommend to the MAFMC and NEFMC (Councils) measures necessary to assure that the applicable specified F will not be exceeded. The Councils shall review these recommendations and, based on the recommendations and any public comment, recommend to the Regional Administrator measures necessary to assure that the applicable specified F will not be exceeded. The Councils recommendations must include supporting documentation, as appropriate, concerning the environmental and economic impacts of the recommendations. The Regional Administrator shall review these recommendations. After such review, the Regional Administrator will publish a proposed rule in the Federal Register by February 15 to implement a coastwide commercial quota for the commercial fishery. After considering public comment, the Regional Administrator will publish a final rule in the Federal Register to implement the measures necessary to assure that the applicable specified F will not be exceeded.

§ 648.201 Closures.

(a) *EEZ closure*. The Regional Administrator shall close the EEZ to fishing for spiny dogfish by federally permitted commercial vessels for the remainder of the semi-annual fishing year by publishing notification in the Federal Register if he/she determines that the specified quota is expected to be exceeded.

§ 648.203 Framework specifications.

(a) *Within season management action*. The Councils may, at any time, initiate action to add or adjust management measures if it finds that action is necessary to meet or be consistent with the goals and objectives of the Spiny Dogfish FMP.

(1) *Adjustment process*. After a management action has been initiated, the Councils shall develop and analyze appropriate management actions over the span of at least two Council meetings. The Councils shall provide the public with advance notice of the availability of both the proposals and the analysis and opportunity to comment on them prior to and at the second Council meeting. The Council's recommendation on adjustments or additions to management measures must come from one or more of the following categories: Minimum fish size; maximum fish size;

gear requirements, restrictions or prohibitions (including, but not limited to, mesh size restrictions and net limits); regional gear restrictions; permitting restrictions and reporting requirements; recreational fishery measures including possession and size limits and season and area restrictions; commercial season and area restrictions; commercial trip or possession limits; fin weight to spiny dogfish landing weight restrictions; onboard observer requirements; commercial quota system including commercial quota allocation procedure and possible quota set asides to mitigate bycatch, conduct scientific research or for other purposes; recreational harvest limit; annual quota specification process; FMP Monitoring Committee composition and process; description and identification of essential fish habitat; description and identification of habitat areas of particular concern; overfishing definition and related thresholds and targets; regional season restrictions (including option to split seasons); restrictions on vessel size (LOA and GRT) or shaft horsepower; target quotas; measures to mitigate marine mammal entanglements and interactions; regional management; any other management measures currently included in the FMP; and measures to regulate aquaculture projects,

(2) *MAFMC and NEFMC recommendation*. After developing management actions and receiving public testimony, the Councils shall make a recommendation to the Regional Administrator. The Council's recommendation must include supporting rationale and, if management measures are recommended, an analysis of impacts and a recommendation to the Regional Administrator on whether to issue the management measures as a final rule. If the Councils recommend that the management measures should be issued as a final rule, they must consider at least the following factors and provide support and analysis for each factor considered:

(i) Whether the availability of data on which the recommended management measures are based allows for adequate time to publish a proposed rule, and whether regulations have to be in place for an entire harvest/fishing season.

(ii) Whether there has been adequate notice and opportunity for participation by the public and members of the affected industry in the development of the Councils recommended management measures.

(iii) Whether there is an immediate need to protect the resource.

(iv) Whether there will be a continuing evaluation of management measures adopted following their implementation as a final rule.

(3) *Regional Administrator action*. If the Councils recommendation includes adjustments or additions to management measures and, after reviewing the Councils recommendation and supporting information:

(i) If the Regional Administrator concurs with the Councils recommended management measures and determines that the recommended management measures should be issued as a final rule based on the factors specified in paragraph (b)(2) of this section, the measures will be issued as a final rule in the Federal Register.

(ii) If the Regional Administrator concurs with the Councils recommendation and determines that the recommended management measures should be published first as a proposed rule, the measures will be published as a proposed rule in the Federal Register. After additional public comment, if the Regional Administrator concurs with the Councils recommendation, the measures will be issued as a final rule in the Federal Register.

(iii) If the Regional Administrator does not concur, the Councils will be notified in writing of the reasons for the non-concurrence.

(b) *Emergency action*. Nothing in this section is meant to derogate from the authority of the Secretary to take emergency action under section 305(e) of the Magnuson-Stevens Act.

APPENDIX 4.

Report of the Mid-Atlantic and New England Fishery Management Council
Joint Scientific and Statistical Committee Meeting
January 19, 1999

The meeting was convened at 10:15 by Chair Ellen Pikitch. Committee members in attendance included Wendy Gabriel, Vaughn Anthony, Rich Langton, Lee Anderson, Saul Saila, Peter Auster, Pat Sullivan, and John Hoenig. Others who attended included Jason Link, Paul Rago, John Williamson, Alan Weiss, James Fletcher, Sonja Fordham, Jim O'Malley, Bill Amaru, and Dave Pierce. Staff that attended included Rich Seagraves and Valerie Whalon.

This meeting was convened to discuss the three terms of reference as listed below.

First Term of Reference

1) *Review and evaluate B_{msy} proxy for spiny dogfish. Evaluate the appropriateness of using Ricker stock-recruitment function for spiny dogfish.*

Based on the biological information available for this species and the relative fit of the curve to the data it seems clear that a dome shaped curve, such as the Ricker stock-recruitment curve, is appropriate for spiny dogfish. This is exemplified most clearly in the stock-recruitment plot showing the data, the Ricker curve, and an empirical smoothed curve. The smoothed curve, which is unaffected by a formal model's structure, indicates the lowest recruitment points occur at lower and higher female biomass levels and the highest recruitment points occur around the middle consistent with the density dependent hypothesis. The fact that the data going into the fit represents a two or three year moving average does not affect this conclusion. Sensitivity analyses indicate that no averaging, or two year or three year averaging all show similar trends. A two year average seems the most appropriate value to use as a midpoint representation of the trends in recruitment and the spawning stock levels. Recruitment does seem to vary over the range of female biomass values, and while annual pup production may be proportional to number of spawners this latter relationship is missing the important factors associated with decreasing female individual weight and the resulting decrease in recruitment individual weight.

Second Term of Reference

2) Evaluate effects of specifying 150,000 mt as a biomass target on quotas and stock rebuilding strategies.

The most appropriate value for B_{msy} based on current information is 200,000 mt. There is no justification that the Committees can see for setting the biomass target at 150,000 mt; it is not a suitable proxy for B_{msy}.

To consider the impact on rebuilding strategies of setting the target biomass level at 150,000 mt, it is necessary to recognize that a target refers to a long-term goal whereas rebuilding strategies refer to short term actions. Thus, it is necessary to consider the current stock status (Figure 1). There is strong justification for concluding that the stock of mature females is depleted, there is a "pulse" of subadults which is about to become mature, and there is a string of poor year classes that will follow. The soon-to-mature subadults could provide the basis for a fishery for a few (perhaps 3) years. However, unless the about-to-mature subadults are protected, there is likely to be poor recruitment following poor recruitment. It appears that strong measures to reduce current fishing mortality are essential to meet reasonable rebuilding schedules.

If the target biomass is set lower, then it may be possible to have higher quotas in the short term and still meet the (now lower) target in a specified (e.g., 10-year) time frame. However, the Committees are concerned about the status of the dogfish stock, and feel the need for an immediate reduction of fishing mortality is clear if a large decline in biomass is to be avoided. Delayed action pending further analysis is not justified.

The Committees also wonders what is the rationale for choosing a target biomass level that is below the best estimate of B_{msy}? (The Committees noted that although the true value of B_{msy} may be below the estimated value it is just as true that the true value may be above the estimate.) Should the target biomass level for any and all species be set at levels that are below the estimated B_{msy}, and if so, then by how much? What are the operative principles for choosing target levels?

Third Term of Reference

3) Evaluate estimates of B_{MSY} for spiny dogfish within an ecological context.

The committees heard a presentation based on information from the NEFSC food habits data base which included data on 250,000 stomachs collected over a period of 25 years, mostly during spring and autumn. The data included information on spatial overlap between cod and spiny dogfish and showed moderate overlap (30-40%) in spatial co-occurrence of these species in the surveys, yet very low predation rates.

While the S&S Committee applauds moves to consider ecosystem approaches to management, it found no compelling reason to consider predation by spiny dogfish on other commercially valuable groundfish in determining its B_{msy}. The stock of spiny dogfish is a very small part of the ecological community and because of its' opportunistic predatory habits it may have minimal direct and indirect effects on the relationships between different species. It is recognized, however, that dogfish do have effects on other species through predation and competition. It is the Committee's opinion that changing the mature female biomass from 200,000 to 150,000 mt will have a minimal effect on other stocks of groundfish. Because of compensation, and the constantly changing stock sizes, it is not currently possible to predict the degree or of the direction of change in pelagic stocks, in particular, that could be attributed to changes in the spiny dogfish B_{msy}.

The Committee would like to see more efforts to build conceptual model and undertake empirical tests to study ecological relationships relevant to fisheries management. Trying to determine pairwise relationships between one species and a series of others is, however, not currently feasible and development of this area of research would be enlightening as ecosystem-based management develops.

Change in Size Composition: ‘88 vs ‘97

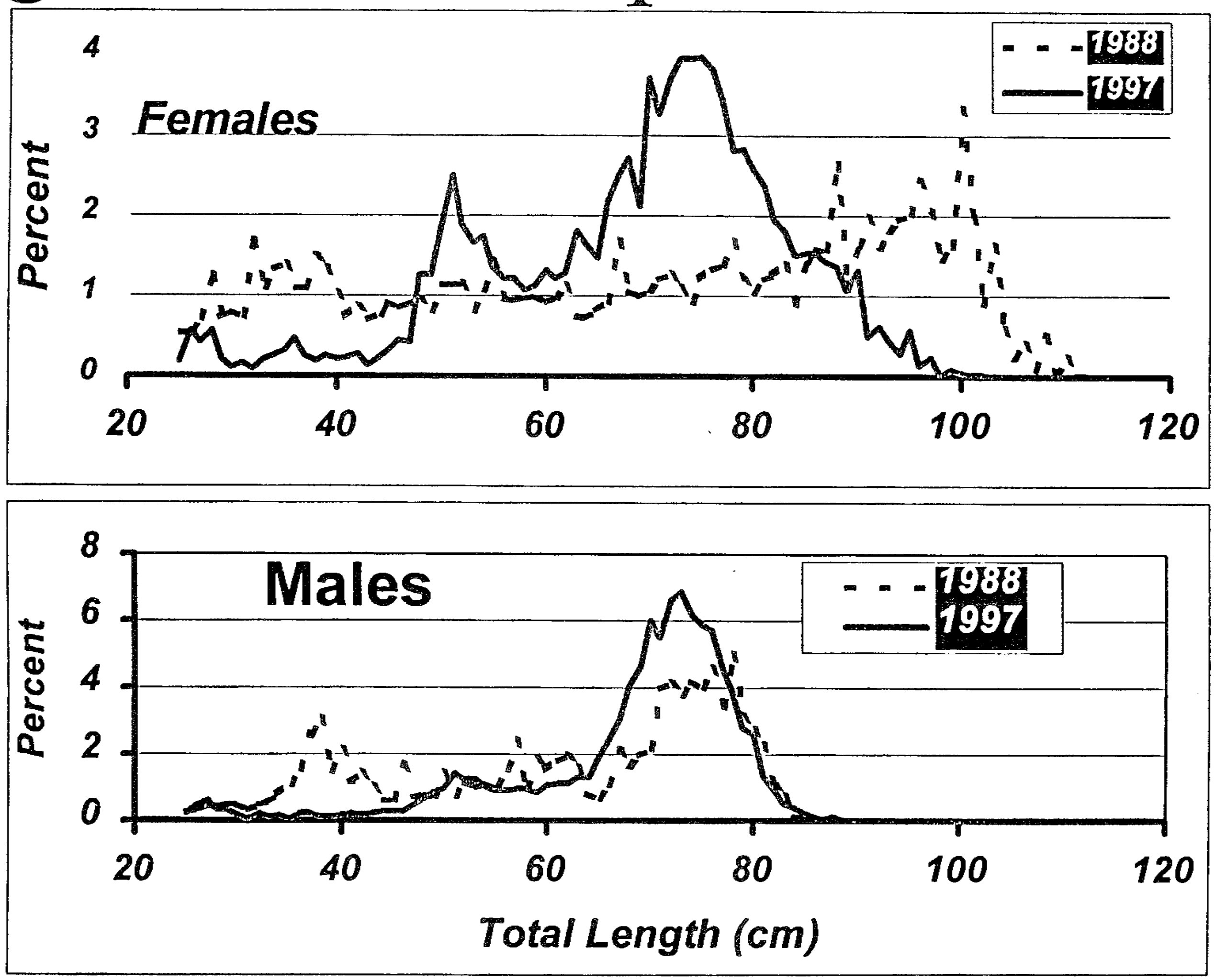


Figure 1.