Fishery Management Report No. 43

of the

Atlantic States Marine Fisheries Commission

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

Amendment 1 to the Interstate Fishery Management Plan for Inshore Stocks of Winter Flounder

November 2005

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ATLANTIC STATES MARINE FISHERIES COMMISSION

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Approved: February 10, 2005

Amendment 1 to the Interstate Fishery Management Plan for Inshore Stocks of Winter Flounder

Prepared by

Atlantic States Marine Fisheries Commission
Winter Flounder Plan Development Team

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This Management Plan was prepared under the guidance of the Atlantic States Marine Fisheries Commission's Winter Flounder Management Board, Chaired by David Borden of Rhode Island followed by Pat Augustine of New York. Technical and advisory assistance was provided by the Winter Flounder Technical Committee, the Winter Flounder Stock Assessment Subcommittee, and the Winter Flounder Advisory Panel.

This is a report of the Atlantic States Marine Fisheries Commission pursuant to U.S. Department of Commerce, National Oceanic and Atmospheric Administration Award No. NA04NMF4740186.

EXECUTIVE SUMMARY

1.0 Introduction

The Atlantic States Marine Fisheries Commission (ASMFC) authorized development of a Fishery Management Plan (FMP) for winter flounder (*Pseudopleuronectes americanus*) in October 1988. Member states declaring an interest in this species were the states of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Delaware. During 1989, the purpose of the plan evolved to address: 1) management of inshore stocks of winter flounder; and 2) to prominently consider habitat and environmental quality as factors affecting the condition of the resource.

The Atlantic Coastal Fisheries Cooperative Management Act, established in 1993, mandates that fishery management plans (FMPs) require states to implement and enforce FMPs. Although restrictive fishing regulations were imposed as a result of the original winter flounder fishery management plan in 1992 and subsequent addenda in 1992 and 1998, explicit compliance criteria are not included in the original Interstate Management Plan for Inshore Stocks of Winter Flounder. Addendum II to the FMP required states to develop plans to achieve the target fishing mortality goal for rebuilding (F_{40}) by May 1, 1999.

The purpose of managing winter flounder stocks is to ensure that the winter flounder resource can be utilized throughout its range by current and future generations of the fishing and non-fishing public. Effective management will require controls on mortality due to fishing and habitat degradation, as well as cooperation among the groups responsible for managing different areas utilized by winter flounder.

Historically, NEFMC and ASMFC management plans have chosen different approaches to managing winter flounder stocks. Since the majority of the winter flounder fishery takes place outside state waters, management regimes employed by the NEFMC on the offshore winter flounder fishery has an enormous impact on the populations that return to state waters to spawn. The scientific community feels strongly that consistent measures must be employed in both the EEZ and State waters to give the most benefit to winter flounder stocks.

The most recent stock assessment (SARC 36) indicates the Gulf of Maine (GOM) stock is not overfished and overfishing is not occurring, however, the Southern New England/Mid-Atlantic (SNE/MA) stock complex is overfished and overfishing is occurring.

This amendment revises the biological reference points that the ASMFC applies to both inshore winter flounder stocks and contains management measures designed to achieve the goals and objectives of this amendment.

2.0 Goals, Objectives, Management Unit, Definitions of Overfished and Overfishing

Amendment 1 to the Interstate Fishery Management Plan for Inshore Stocks of Winter Flounder completely replaces all previous Commission management plans for inshore stocks of winter flounder.

The Goals of Amendment 1 to the Interstate Fishery Management Plan for Inshore Stocks of Winter Flounder are:

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

"To promote rebuilding of the inshore and estuarine component of the winter flounder stock."

In support of these goals, the following objectives are recommended for Amendment 1:

1. Manage the fishing mortality rates for Gulf of Maine and Southern New England/Mid-Atlantic Stocks to rebuild the stocks and provide adequate spawning potential to sustain long-term abundance of the winter flounder populations.
2. Manage the winter flounder stocks under an ASMFC rebuilding plan designed to rebuild and then maintain the spawning stock biomass at or near the target biomass levels and restrict fishing mortality to rates below the threshold.
3. Establish an interstate management program that complements the management system for federal waters.
4. Foster a management program for restoring and then maintaining essential winter flounder habitat.
5. Establish research priorities that will further refine the winter flounder management program to maximize the biological, social, and economic benefits derived from the winter flounder population.
6. Restore the winter flounder fishery so that inshore recreational and commercial fishermen can access it throughout its historical range and at the historic age structure.

Specification of Management Unit (*2.4*)
The management area of this amendment shall be the entire coastwide distribution of the resource from the estuaries eastward to the inshore boundary of the EEZ.

Based variability in biology and in current and historical exploitation patterns, inshore winter flounder populations have been split into three stock units for management purposes. The Southern New England/Mid-Atlantic (SNE/MA) and Gulf of Maine (GOM) stocks are managed within state waters by the ASMFC, while the EEZ components of these stocks as well as the offshore Georges Bank stock are managed by the New England Fishery Management Council (NEFMC). The SNE/MA stock includes the waters south of Cape Cod to the Delaware-Maryland Border. While the SNE/MA stock actually extends into the Chesapeake Bay, for management purposes Delaware is the southernmost state with a declared interest in winter flounder management. The GOM stock includes the waters north of Cape Cod. Fishery data currently exist with a historical record at the scale needed for the best possible assessment of the two stocks as currently defined. Operating under the current SNE/MA and GOM stock definitions will be more conducive to coordination of management objectives between the ASMFC and the NEFMC.

Fishing Mortality Target & Threshold (*2.5.1*)
Southern New England/Mid-Atlantic Stock
For the SNE/MA stock, the current estimates set a fishing mortality threshold of F_{msy}=0.32 fully recruited, with a target at 75% of F_{msy}=0.24. The $F_{rebuild}$ under this definition is F_{msy}=0.24. $F_{rebuild}$ is defined as the fishing mortality rate designed to rebuild the stock in 10 years with 50% probability.

Gulf of Maine winter flounder
For the GOM stock, the current estimates set a fishing mortality threshold of F_{msy}=0.43 fully recruited, with a target at 75% of F_{msy}=0.32 fully recruited. No $F_{rebuild}$ is specified for this stock because the assessment did not find that overfishing is occurring on this stock.

Spawning Stock Biomass Target & Threshold (*2.5.2*)
Southern New England/Mid-Atlantic winter flounder
For the SNE/MA stock, the current biomass target estimate is B_{msy}=30,100 mt. The biomass threshold is set at ½SSB_{msy}=15,050 mt SSB.

Gulf of Maine winter flounder
For the GOM stock, the current biomass target estimate is B_{msy}=4,100 mt SSB. The biomass threshold is set at ½SSB_{msy}=2,050 mt SSB.

Stock Rebuilding Targets (2.6.1)
For the SNE/MA winter flounder stock, it is the intent of Amendment 1 to rebuild the spawning stock biomass to B_{msy} within the timeframe established in *Section 2.6.2*.

Should the GOM winter flounder stock be overfished at any time in the future, it is the intent of Amendment 1 to rebuild the spawning stock biomass to B_{msy} within the timeframe established in *Section 2.6.2*.

Stock Rebuilding Schedules (2.6.2)
Southern New England/Mid-Atlantic winter flounder
When the stock size is less than the threshold biomass, the stock is overfished and the fishing mortality rate needed to rebuild the stock ($F_{rebuild}$) will be calculated to rebuild the stock within a period determined by the Board but not to exceed 10 years.

When biomass is below the target but above the threshold, the Board may specify an amount of time that biomass will be allowed to remain between the target and threshold levels. At the end of this time period, action must be taken to reduce fishing mortality below the threshold. This allows a rebuilding fishing mortality rate to be calculated to rebuild to the biomass target within the specified time frame.

Gulf of Maine winter flounder
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Implementation Schedule (*2.8*)
Amendment 1 to the Interstate Fishery Management Plan for Inshore Stocks of Winter Flounder

was approved on February 10, 2005. States are required to submit implementation proposals by March 15, 2005. State proposals will be reviewed for approval during the May 2005 ASMFC Meeting Week. States are required to implement the provisions of Amendment 1 by July 31, 2005, unless a specific alternate date is indicated in the jurisdiction's implementation proposal.

3.0 Monitoring Program Specifications/Elements

The Winter Flounder Technical Committee will meet at least once each year to review the stock assessment and all other relevant data pertaining to stock status. The Technical Committee will report on all required monitoring elements outlined in *Section 3* and forward any recommendations to the Winter Flounder Board. The Technical Committee shall also report to the Management Board the results of any other monitoring efforts or assessment activities not included in *Section 3* that may be relative to the stock status of winter flounder or indicative of ecosystem health and interactions.

The Amendment encourages all state fishery management agencies to pursue full implementation of the Atlantic Coastal Cooperative Statistics Program (ACCSP), which will meet the monitoring and reporting requirements of this FMP. Participation by program partners in the ACCSP does not relieve states from their responsibilities in collating and submitting harvest/monitoring reports to the Commission as required under this Amendment.

Assessment of Annual Recruitment (*3.1*)
The following states are required to continue annual surveys of juvenile recruitment to develop an annual juvenile abundance index for winter flounder: Massachusetts, Rhode Island, New York, and Delaware.

Assessment of Spawning Stock Biomass (*3.2*)
The following state are required to continue annual surveys to develop an index of spawning stock biomass: Massachusetts, Rhode Island, Connecticut, and New Jersey.

4.0 Management Program Elements/Implementation

Recreational Management Measures (*4.1*)
Southern New England/Mid-Atlantic Stock
States in the Southern New England/Mid-Atlantic stock area must implement a 12" minimum size limit and a 10-fish creel limit. Each state in the SNE/MA stock area may have a 60-day open season for recreational winter flounder fishing. In addition, 20 days must be closed to recreational winter flounder fishing during March and April. The 60-day open season can be split into no more than two blocks.

Gulf of Maine Stock
States within the GOM stock must maintain the existing 12" minimum size and adopt an 8-fish creel limit. There are no required recreational closed seasons in the GOM stock area.

Commercial Management Measures (*4.2*)
Southern New England/Mid-Atlantic Stock
States within the Southern New England/Mid-Atlantic stock area must implement a 12" minimum

size limit, a minimum 6.5” square or diamond mesh in the cod-end, and maintain any existing seasonal closures.

The mesh size regulation includes a 100 lb. trip limit for winter flounder if smaller mesh is being used. This 100 lb. “mesh trigger” provides for the landing of a small amount of winter flounder as bycatch in smaller-mesh fisheries.

Gulf of Maine Stock
States within the Gulf of Maine stock area must maintain the existing 12” minimum size limit and remain consistent with the adjacent EEZ mesh size regulations. The current mesh size in the EEZ adjacent to the states in the GOM stock area is a 6.5” diamond or square mesh in the cod-end.

States must maintain existing season closures, including any Federal rolling closures that affect state waters in the GOM stock area.

***De minimis* fishery guidelines** (*4.3.3*)
States may apply for *de minimis* status if, for the preceding three years for which data are available, their average commercial landings or recreational landings (by weight) constitute less than 1% of the coastwide commercial or recreational landings for the same three year period. A state that qualifies for *de minimis* based on their commercial landings will qualify for exemptions in their commercial fishery only, and a state that qualifies for *de minimis* based on their recreational landings will qualify for exemptions in their recreational fishery only.

States that apply for and are granted *de minimis* status are exempted from biological monitoring/sub-sampling activities for the sector for which de minimis has been granted (i.e., commercial de minimis qualifies for a commercial monitoring exemption). States must still report annual landings, comply with recreational and commercial management measures, and apply for *de minimis* on an annual basis.

Recommendations to the Secretary of Commerce (*4.7*)
The Atlantic States Marine Fisheries Commission believes that the SNE/MA stock of the winter flounder resource covered by this fishery management plan continues to be overfished and in need of conservation. It would be inconsistent with this approach to allow any meaningful increase in fishing mortality. Therefore it is important that the federal government maintain the fishing mortality controls that are included in Amendment 13 to the Northeast Multispecies (Groundfish) Fishery Management Plan.

5.0 Compliance

Mandatory Compliance Elements for States (*5.1*)
A state will be determined to be out of compliance with the provisions of this fishery management plan, according to the terms of Section Seven of the ISFMP Charter if:

- Its regulatory and management programs to implement *Section 4* have not been approved by the Winter Flounder Management Board; or
- It fails to meet any schedule required by *Section 5.1.2*, or any addendum prepared under adaptive management (*Section 4.4*); or

- It has failed to implement a change to its program when determined necessary by the Winter Flounder Management Board; or
- It makes a change to its regulations required under *Section 4* or any addendum prepared under adaptive management (*Section 4.4*), without prior approval of the Winter Flounder Management Board.

Regulatory Requirements (*5.1.1.1*)
States may begin to implement Amendment 1 after final approval by the Commission. Each state must submit its required winter flounder regulatory program to the Commission through the ASMFC staff for approval by the Winter Flounder Management Board. During the period from submission, until the Management Board makes a decision on a state's program, a state may not adopt a less protective management program than contained in this management plan or contained in current state law.

The following lists the specific compliance criteria that a state/jurisdiction must implement in order to be in compliance with Amendment 1:

1. All jurisdictions in the SNE/MA stock will implement a 12-inch minimum size limit and a 10-fish creel limit for the recreational fishery. Each state in the SNE/MA stock area may have a 60-day open season for recreational winter flounder fishing. In addition, 20 days must be closed to recreational winter flounder fishing during March and April. The 60-day open season can be split into no more than two blocks.

2. All jurisdictions in the SNE/MA stock area will implement a 12-inch minimum size limit, a minimum 6.5" square or diamond mesh in the cod-end, and maintain any existing seasonal closures for the commercial fishery. The mesh size regulation includes a 100 lb. trip limit for winter flounder if smaller mesh is being used. This 100 lb. "mesh trigger" provides for the landing of a small amount of winter flounder as bycatch in smaller mesh fisheries.

3. All jurisdictions in the GOM stock area will implement a 12-inch minimum size and an eight-fish creel limit for the recreational fishery. There are no required recreational closed seasons in the GOM stock area.

4. All jurisdictions in the GOM stock area will implement a 12-inch minimum size limit and remain consistent with the adjacent EEZ mesh size regulations for the commercial fishery. The current mesh size in the EEZ adjacent to the states in the GOM stock area is a 6.5" diamond or square mesh in the cod-end. States must maintain existing season closures, including any Federal rolling closures that affect state waters in the GOM stock area.

Once approved by the Winter Flounder Management Board, states are required to obtain prior approval from the Board of any changes to their management program for which a compliance requirement is in effect. Other measures must be reported to the Board but may be implemented without prior Board approval. A state can request permission to implement an alternative to any mandatory compliance measure only if that state can show to the Board's satisfaction that its alternative proposal will have the same conservation value as the measure contained in this amendment or any addenda prepared under Adaptive Management (*Section 4.4*). States submitting alternative proposals must demonstrate that the proposed action will not contribute to overfishing of the resource. All changes in state plans must be submitted in writing to the Board and to the Commission either as part of the annual FMP Review process or the Annual Compliance Reports.

Monitoring Requirements (*5.1.1.2*)
All state programs must include the mandatory monitoring requirements contained in Sections *3.1, 3.2,* and *3.3*. States must submit proposals for all intended changes to required monitoring programs which may affect the quality of the data, or the ability of the program to fulfill the needs of the fishery management plan. In the event that a state realizes it will not be able to fulfill its fishery independent monitoring requirements, it should immediately notify the Commission in writing. The Commission will work with the state to develop a plan to secure funding or plan an alternative program to satisfy the needs outlined in Amendment 1. If the plan is not implemented 90 days after it has been adopted, the state may be found out of compliance with Amendment 1.

Compliance Schedule (*5.1.2*)
States must implement Amendment 1 according to the following schedule:

March 15, 2005: States must submit programs to implement Amendment 1 for approval by the Winter Flounder Management Board. Programs must be implemented upon approval by the Management Board.

July 31, 2005: States with approved management programs must implement Amendment 1. States may begin implementing management programs prior to this deadline if approved by the Management Board.

If a jurisdiction cannot implement their winter flounder regulations by the July 31 deadline, the jurisdiction must propose an alternative implementation date in their new proposal. Subsequently, the Management Board must approve the revised implementation date for the jurisdiction.

Reports on compliance must be submitted to the Commission by each jurisdiction annually, no later than November 1, beginning in 2006.

6.0 Management and Research Needs

Amendment 1 contains a list of management and research needs that should be addressed in the future in order to improve the current state of knowledge of winter flounder biology, stock assessment, population dynamics, and habitat issues. These lists of research needs are not all-inclusive, and they will be reviewed and updated annually through the Commission's FMP Review Process.

7.0 Protected Species

The Marine Mammal Protection Act and the Endangered Species Act require the federal government to take certain actions when fishing activities pose potential threats to protected or endangered species. Although many protected species listed above may be found in the general geographical area covered under the winter flounder management plan, not all are affected by the fishery for several reasons. Some protected species may inhabit more inshore or offshore areas than those utilized by winter flounder, prefer a different depth or temperature zone than winter flounder, or may migrate through the area at different times than the species regulated by this fishery management plan. In addition, certain protected species may not be vulnerable to capture or entanglement in certain fishing gear used in the winter flounder fishery.

The otter trawl is the primary commercial gear used in the winter flounder fishery, accounting for over 96 percent of landings. Sink anchor gillnet gear represent approximately 2.5 percent of the landings. Scottish seines, rakes, pound nets, scallop trawls and dredges, Danish seines, fyke nets, traps, and pots are also used in the commercial winter flounder fishery, but only comprise a small percentage of total fishing effort. Hook-and-line is the predominant recreational gear used, with the majority of recreational fishing occurring from private party or charter boats.

There have been marine mammal interactions in the primary fisheries (utilizing otter trawls and gillnets) that target winter flounder, including the North Atlantic bottom trawl fishery; Northeast multi-species sink gillnet; Mid-Atlantic coastal gillnet fishery; Long Island Sound inshore gillnet fishery; and Rhode Island, southern Massachusetts, and New York Bight inshore gillnet fishery. Marine mammal interactions are also known to exist with other minor gear types targeting winter flounder, such as pots, traps, pound nets, and seines. Based on the stock status, the marine mammal stocks of greatest concern in this fishery are the North Atlantic right whale, Gulf of Maine humpback whale, western North Atlantic long-finned and short-finned pilot whales, western North Atlantic coastal and offshore bottlenose dolphins, and Gulf of Maine/Bay of Fundy harbor porpoise. The MMPA 2003 List of Fisheries (LOF) (68 FR 41725) classifies fisheries by the level of serious injury and mortality of marine mammals incidental to each fishery.

Interactions with sea turtles may occur when fishing effort overlaps with sea turtle distribution. Interactions could occur in the summer and fall, as turtles can be found in northeastern waters from June to November. Juvenile and immature Kemp’s ridleys and loggerheads utilize nearshore and inshore waters north of Cape Hatteras during the warmer months and can be found as far north as the waters in and around Cape Cod Bay. Sea turtles are likely to be present off the Virginia, Maryland, and New Jersey coasts by April or May, but do not arrive in great concentrations in New York and northwards until mid-June. Although uncommon north of Cape Hatteras, immature green sea turtles also use northern inshore waters during the summer and may be found as far north as Nantucket Sound. Leatherbacks migrate north in the spring to productive foraging grounds off Nova Scotia. With the decline of water temperatures in late fall, sea turtles migrate south to warmer waters.   When water temperatures are greater than approximately 11˚C, sea turtles may be present in some areas where the winter flounder (multispecies) fishery occurs (which extends from the Canadian border, through the Gulf of Maine and as far south as Cape Hatteras, North Carolina).

The majority of winter flounder landings are by otter trawl (over 96% in federal waters, over 94% in state waters). The next most common gear type is sink, anchored gillnets. There is limited use of scottish seine, rakes, pound nets, scallop trawls, scallop dredges, bottom longlines, fyke nets, danish seines, and traps and pots. The capture of sea turtles could occur in all gear sectors of the fishery, including sink gillnets.

ACKNOWLEDGEMENTS/ FOREWORD

The Atlantic States Marine Fisheries Commission developed this Amendment 1 to the Interstate Fishery Management Plan for Inshore Stocks of Winter Flounder. The Plan Development Team (Team), chaired by Lydia C. Munger, Fishery Management Plan Coordinator, ASMFC, consisted of (in alphabetical order): Anne Mooney, New York Department of Environmental Conservation; Deb Pacileo, Connecticut Department of Environmental Protection; Dr. Robert Pomeroy, University of Connecticut; and Sally Sherman, Maine Division of Marine Resources. The Team worked under the guidance of the Winter Flounder Management Board, chaired by Pat Augustine, Governor's Appointee, New York, and previously by David Borden, Rhode Island Department of Environmental Management, the Advisory Panel, chaired by Harold "Bud" Brown, Maine, and the Technical Committee, chaired by Steve Correia, Massachusetts Division of Marine Fisheries, and the Team wishes to thank these groups for the valuable guidance that they provided.

The Team wishes to thank the Winter Flounder Habitat Subcommittee of the ASMFC Habitat Committee. The Subcommittee consisted of: Chris Powell, Chair, Rhode Island Department of Fish and Wildlife, Sarah Pierce, Rhode Island Department of Fish and Wildlife, Penny Howell, Connecticut Department of Environmental Protection, Karen Chytalo, New York Department of Environmental Conservation, Vin Malkoski, Massachusetts Division of Marine Fisheries, Laura Parent, Rhode Island Department of Fish and Wildlife, and Carrie Selberg, ASMFC.

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1.0 INTRODUCTION

1.1 BACKGROUND INFORMATION

The Atlantic States Marine Fisheries Commission (ASMFC) authorized development of a Fishery Management Plan (FMP) for winter flounder (*Pseudopleuronectes americanus*) in October 1988. Member states declaring an interest in this species were the states of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Delaware. During 1989, the purpose of the plan evolved to address: 1) management of inshore stocks of winter flounder; and 2) to prominently consider habitat and environmental quality as factors affecting the condition of the resource.

The Atlantic Coastal Fisheries Cooperative Management Act, established in 1993, mandates that fishery management plans (FMPs) require states to implement and enforce FMPs. Although restrictive fishing regulations were imposed as a result of the original winter flounder fishery management plan in 1992 and subsequent addenda in 1992 and 1998, explicit compliance criteria are not included in the original Interstate Management Plan for Inshore Stocks of Winter Flounder. Addendum II to the FMP required states to develop plans to achieve the target fishing mortality goal for rebuilding (F_{40}) by May 1, 1999.

1.1.1 Statement of the Problem

The purpose of managing winter flounder stocks is to ensure that the winter flounder resource can be utilized throughout its range by current and future generations of the fishing and non-fishing public. Effective management will require controls on mortality due to fishing and habitat degradation, as well as cooperation among the groups responsible for managing different areas utilized by winter flounder.

Historically, NEFMC and ASMFC management plans have chosen different approaches to managing winter flounder stocks. Since the majority of the winter flounder fishery takes place outside state waters, management regimes employed by the NEFMC on the offshore winter flounder fishery has an enormous impact on the populations that return to state waters to spawn. The scientific community feels strongly that consistent measures must be employed in both the EEZ and State waters to give the most benefit to winter flounder stocks.

The most recent stock assessment (SARC 36) indicates the Gulf of Maine (GOM) stock is not overfished and overfishing is not occurring, however, the Southern New England/Mid-Atlantic (SNE/MA) stock complex is overfished and overfishing is occurring.

This amendment revises the biological reference points that the ASMFC applies to both inshore winter flounder stocks and contains management measures designed to achieve the goals and objectives of this amendment.

1.1.2 Benefits of Implementation

1.1.2.1 Social and Economic Benefits

Maintaining the stability of the overall winter flounder population will enhance the economic and social benefits attributable to this population in the ASMFC member states and the nation. Economic benefits would include use (e.g. consumptive use values related to commercial and recreational fishing, etc.) and non-use values (e.g. existence values, etc.) for current and future generations. The identification of monitoring requirements and research needs important to considering the socioeconomic aspects of winter flounder management at the state and regional levels should increase the likelihood of implementing and/or continuing those monitoring and research tasks.

1.1.2.2 Ecological Benefits

Amendment 1 when fully implemented is designed to minimize the chance of a population collapse due to overfishing, reduce the risk of recruitment failure, and minimize adverse effects on participants in the fishery. This amendment also provides a mechanism for monitoring the health of the winter flounder population and a management regime and structure that is both flexible and broad-based.

1.2 DESCRIPTION OF THE RESOURCE

1.2.1 Species Life History

The following paragraphs are adapted from the Interstate Fishery Management Plan for Inshore Stocks of Winter Flounder. Winter flounder is a common estuarine flatfish found in almost all shoal water habitats along the northwest Atlantic coast. The geographic distribution of winter flounder includes nearshore habitats to offshore fishing banks along the Atlantic coast of North America. Winter flounder are one of the most common demersal fishes in inshore regions from the northern shore of the Gulf of St. Lawrence and south to New Jersey. Smaller populations extend to the Chesapeake Bay. Egg, larval, juvenile, and adult winter flounder populations have been mapped in several estuaries along the Atlantic coastline.

Adult winter flounder seasonal movements consist of two phases; an autumn estuarine immigration prior to spawning, and a late spring/summer movement to either deeper, cooler portions of estuaries or to more offshore areas. This pattern of seasonal distribution may change in the northern extent of the flounder's range. In cold-water areas, winter flounder are abundant in shallow water in the summer; however in warmer areas, flounder migrate from warm shoal areas to cooler, deeper water in the summer.

The annual spawning period for winter flounder varies over its geographic range. Although spawning periods overlap considerably, peak spawning times are earlier in southern locations. Nursery habitat for winter flounder larvae and juveniles includes littoral and sublittoral saltwater coves, coastal salt ponds, estuaries, and protected embayments. Larvae and juveniles have also been found in open ocean areas such as Georges Bank and Nantucket shoals.

Winter flounder spawn during winter and early spring, producing demersal adhesive eggs. The demersal and adhesive quality of winter flounder eggs facilitates retention within spawning grounds. Larvae are predominantly found in the upper reaches of natal estuaries in early spring, moving into the lower estuary later in the season. A number of factors influence larval and juvenile growth and survival, including temperature, salinity, dissolved oxygen, and food availability. Growth rates for adults vary between stock units, with higher growth rates on Georges Bank than those observed in the inshore stocks. Adult winter flounder attain the largest ultimate size on Georges Bank and off the Massachusetts coast east and south of Cape Cod. Maximum size decreases to the north and south of this geographic focus as well as within partially enclosed embayments. Maximum age appears to decline from north to south over the winter flounder's range. Maturity is a variable life history trait, which is confounded by factors such as age, size, and nutritional status.

While most winter flounder populations are primarily found in estuarine and nearshore habitats, they also utilize offshore waters. The clearest example of this situation is the self-sustaining Georges Bank stock, which is managed by the NEFMC. Larval surveys in the coastal waters off the mid-Atlantic Bight suggest spawning may occur in offshore southern waters. Trawl surveys conducted in coastal waters within state jurisdiction in Massachusetts and Connecticut routinely capture YOY winter flounder, although whether or not spawning occurs offshore is uncertain.

Throughout most of their geographic range winter flounder are an essential component of estuarine assemblages. Estuarine habitats provide spawning areas for adults, juvenile nursery habitat, and juvenile and adult foraging area. Although adults may leave the estuary during warm summer months, YOY and juveniles are residents. Therefore, predatory and competitive interactions may occur with other estuarine species. Sources of natural mortality for winter flounder include predation, parasites, disease, and competition.

1.2.2 Stock Assessment Summary

The Winter Flounder Technical Committee met in September 2002 to assess the status of both the SNE/MA and GOM stock units. The assessments for both the SNE/MA and GOM stocks of winter flounder were peer-reviewed at the 36th SAW/SARC in late 2002.

The following information is from the Advisory Report of the 36th SAW/SARC (NEFSC 2003):

> "The current assessment includes estimated total catch including commercial landings, commercial discards, recreational harvest and recreational discards for the period 1981-2001. The assessment uses a Virtual population analysis calibrated with ADAPT VPA calibration model. The assessment was calibrated using NEFSC and state survey indices of abundance through 2002. The VPA provides estimates of fishing mortality and stock size by VPA for 1981-2001/2002. The yield per recruit and stock-recruitment analyses have been updated to include information through 2002. Biological reference points were estimated by yield per recruit and stock-recruitment analyses. Given the stability of the input data and the results of these analyses, the SARC elected to retain the NEFSC (2002) estimates of biological reference points for this assessment."

The following information is from the Advisory Report of the 36th SAW/SARC (NEFSC 2003):

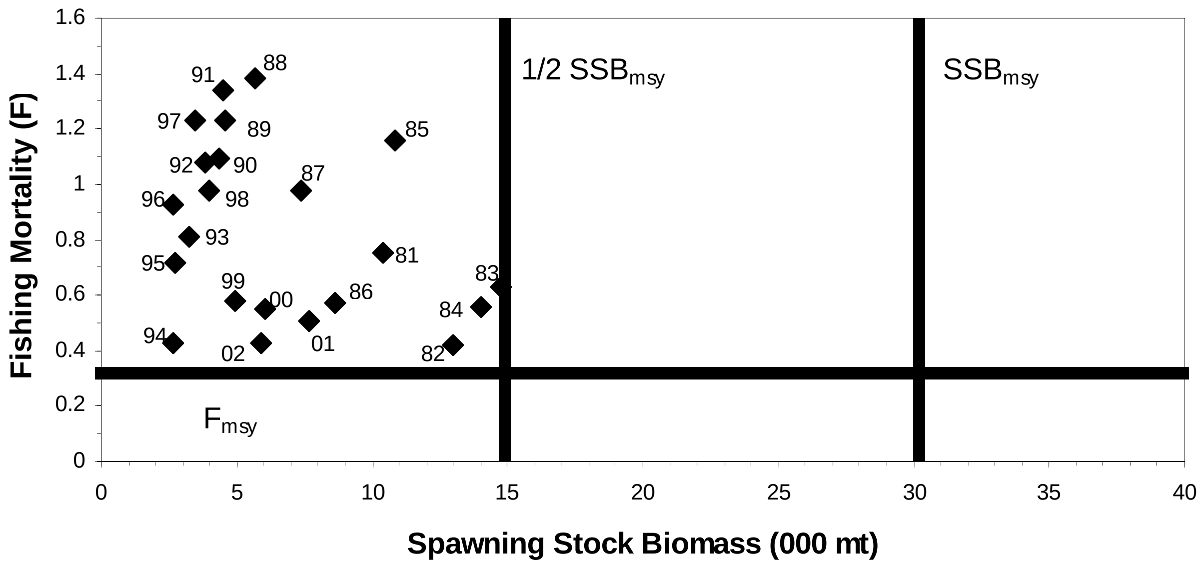
> "The current assessment includes estimated total catch including commercial landings, commercial discards, recreational harvest and recreational discards for the period 1982-2001. The assessment uses a virtual population analysis calibrated with the ADAPT VPA calibration model. The assessment was calibrated using NEFSC and state survey indices of abundance through 2002. The VPA provides estimates of fishing mortality and stock size by VPA for 1981-2001/2002. Biological reference points were estimated by yield per recruit and stock-recruitment analyses."

1.2.3 Abundance and Present Condition

The 2002 assessment (NEFSC 2003) indicates that the SNE/MA winter flounder stock complex is overfished and that overfishing is occurring (Figure 1) based on updated NEFMC overfishing definitions. Fully recruited fishing mortality in 2001 was 0.51 (exploitation rate = 37%), 59% above the Reference Point Working Group (NEFSC 2002) F_{msy} = 0.32 (fully recruited). Spawning stock biomass was estimated to be 7,600 mt in 2001, about 25% of the re-estimate of B_{msy} = 30,100 mt. Spawning stock biomass declined substantially from 13,000-14,000 mt during the early 1980s to only 2,700 mt during 1994-1996, but has increased since the mid-1990s to about 7,600 mt in 2001. Increased biomass occurred in response to the low fishing mortality rates observed since

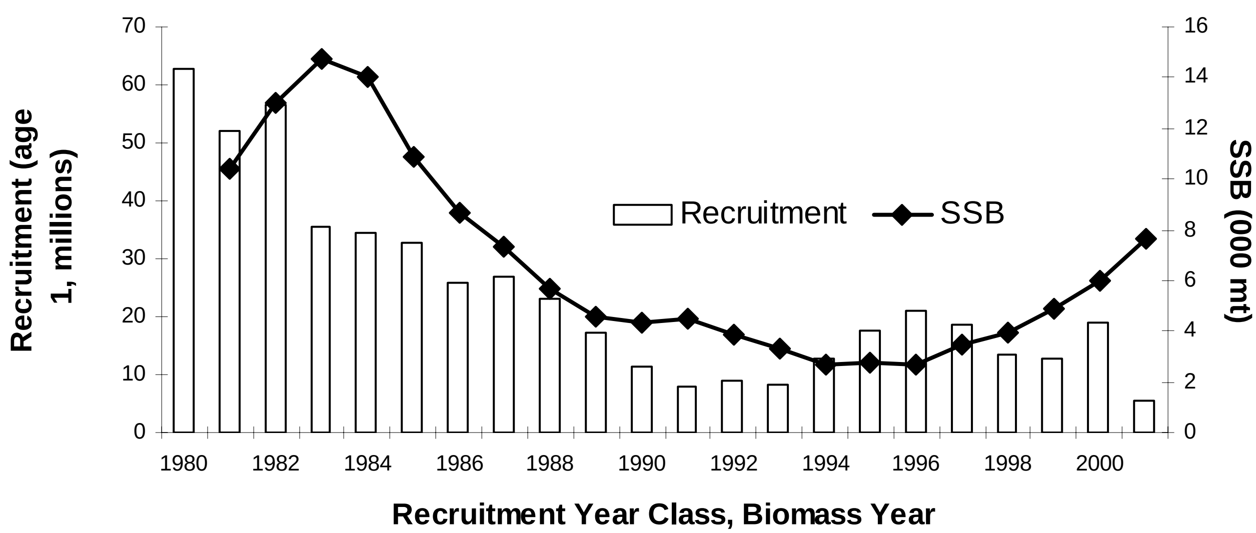
1997 (Figure 2). The average recruitment from 1981 to 2001 is 23.9 million age-1 fish, with a median of 18.9 million fish. Recruitment to the stock has been below average since 1989. The 2001 year class, at only 5.6 million fish, is the smallest in the 22-year VPA time series (Figure 2). With respect to the ASMFC reference points, fishing mortality rates have been above the F25%=0.37 overfishing definition (intermediate target F30%=0.30 and F40% target=0.21) for the entire time series.

Figure 1. SNE/MA Winter Flounder SSB and F



SSB and F for SNE/MA winter flounder. NEFSC (2002) biological reference points (Fmsy=0.32, SSBmsy=30,100 mt) are also shown. From the SARC 36 Advisory Report for SNE/MA Winter Flounder, NEFSC 2002.

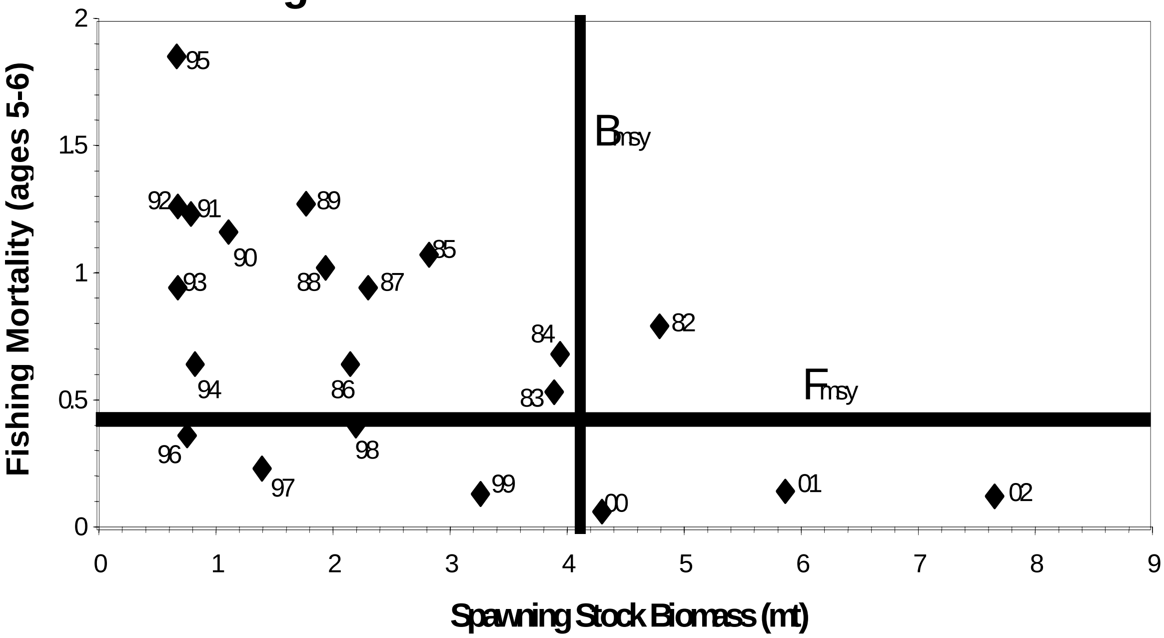
Figure 2. SNE/MA Winter Flounder SSB and Recruitment



Spawning stock biomass (SSB, ages 3-7+, 000 mt) and recruitment (millions of fish at age 1) for SNE/MA winter flounder. From the SARC 36 Advisory Report for SNE/MA Winter Flounder, NEFSC 2002.

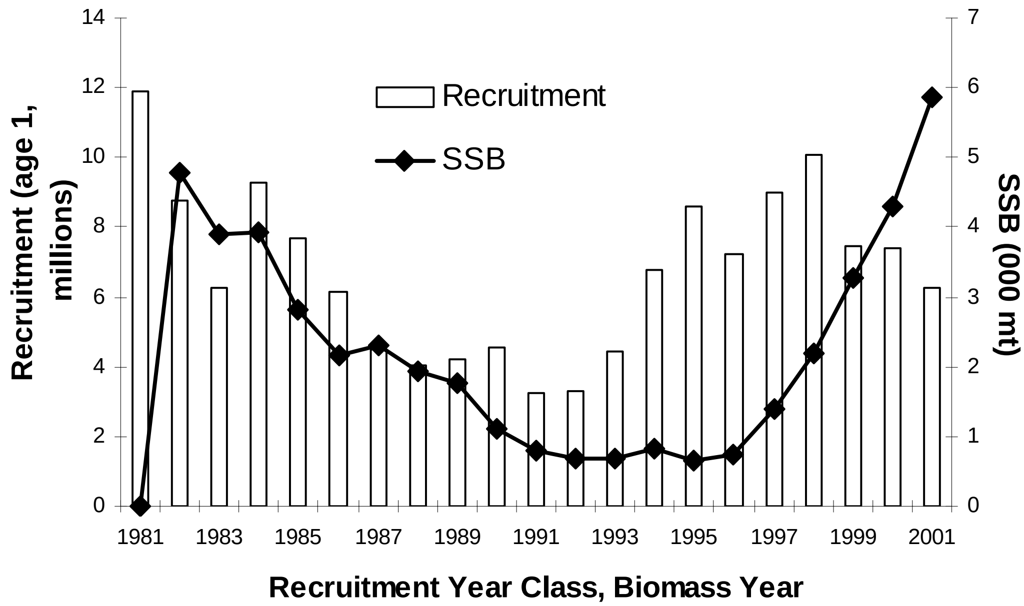
The 2002 assessment (NEFSC 2003) concluded that the GOM winter flounder stock complex is not overfished and that overfishing is not occurring (Figure 3). The fully recruited fishing mortality in 2001 was 0.14, about 67% below the empirical estimate of Fmsy = 0.43. Spawning stock biomass was estimated to be 5,900 mt in 2001, about 44% above the estimate of Bmsy = 4,100 mt (Figure 3). Spawning stock biomass declined substantially from 4,800 mt in 1982 to only 700 mt in 1995, but has increased to about 5,900 mt in 2001 due to reduced fishing mortality rates since 1996. The average recruitment from 1982 to 2001 is 6.7 million age-1 fish. Recruitment to the stock has been above or near average since 1995 (Figure 4). With respect to the ASMFC reference points, fishing mortality has been below the ASMFC's F25% overfishing threshold since 1996, and has been below the F40% target since 1999. Spawning stock biomass has increased since reaching a time series low in 1996.

Figure 3. Gulf of Maine Winter Flounder



SSB and F (ages 5-6) for GOM winter flounder. Biological reference points, calculated from the Beverton-Holt model, are also shown. From the SARC 36 Advisory Report for GOM Winter Flounder, NEFSC 2002.

Figure 4. Gulf of Maine Winter Flounder SSB and Recruitment



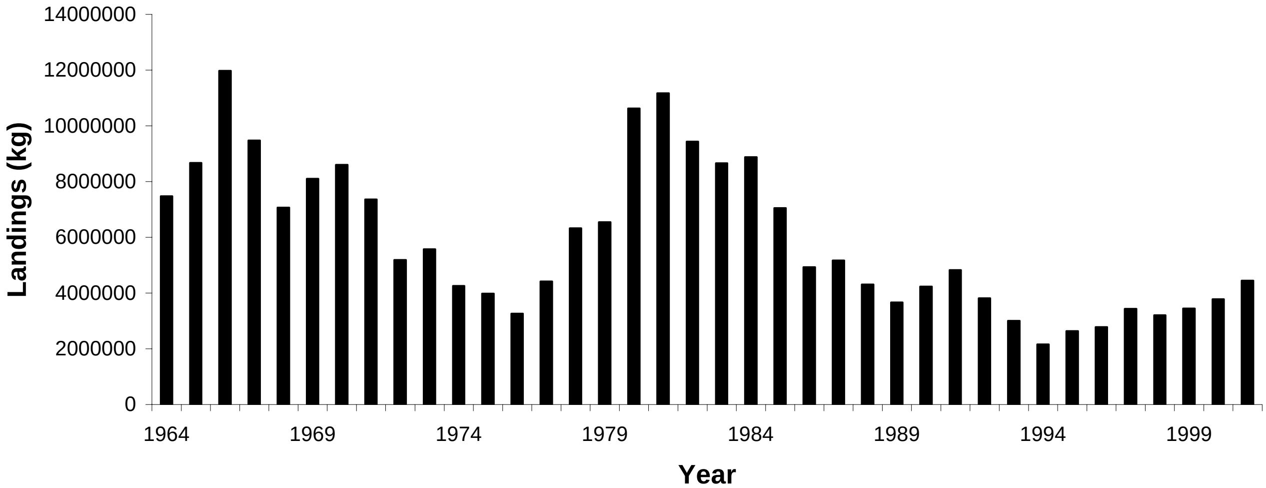
Spawning stock biomass (SSB, '000 mt) and recruitment (millions of fish at age-1) for GOM winter flounder. From the SARC 36 Advisory Report for GOM Winter Flounder, NEFSC 2002.

1.3 DESCRIPTION OF THE FISHERY

1.3.1 Commercial Fishery

Commercial landings from the SNE/MA stock unit averaged 8,500 mt from 1964-1972 before declining to around 4,800 mt throughout the mid- to late 1970s. Commercial landings increased in the early 1980s to a record high of 11,176 mt in 1981 and remained at high levels through 1985. Landings rapidly declined after 1985 and reached a record low of 2,200 mt in 1994 (Figure 5). Commercial landings in 2001 were 4,400 mt. Landings by distance from shore (<3 miles; 3-12 miles; >3 miles) were unavailable for 1994-1996 because of the switch from the NEFSC's weigh-out system to the Vessel Trip Reports (logbooks). Commercial landings from the EEZ (>3 miles) averaged 86% of total commercial landings from 1989-1993, and the 2002 stock assessment notes that the majority of commercial landings from the SNE/MA stock continue to come from offshore areas (>3 miles).

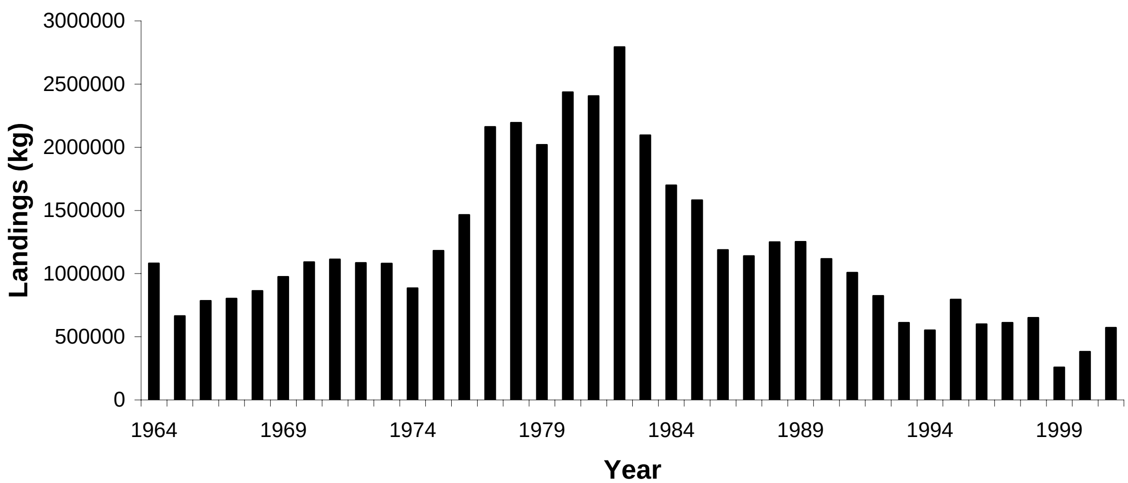
Figure 5. Southern New England/Mid-Atlantic Winter Flounder Commercial Landings, 1964-2001



SNE/MA commercial winter flounder landings, 1964-2001. From the SARC 36 Advisory Report for SNE/MA Winter Flounder, NEFSC 2002.

Commercial landings from the GOM stock fluctuated around 1,000 mt from 1964-1975. Landings rapidly increased to a peak of 2,703 mt in 1982 and then declined to 534 mt in 1994. Landings have increased slightly to approximately 700 mt in 1995-1996 (Figure 6). Landings declined to a time series low of 318 mt in 1999, and have remained near 500 mt in recent years. The low landings in recent years may be attributed to spring and fall groundfish closures in the western Gulf of Maine.

Figure 6. Gulf of Maine Winter Flounder Commerical Landings, 1964-2001

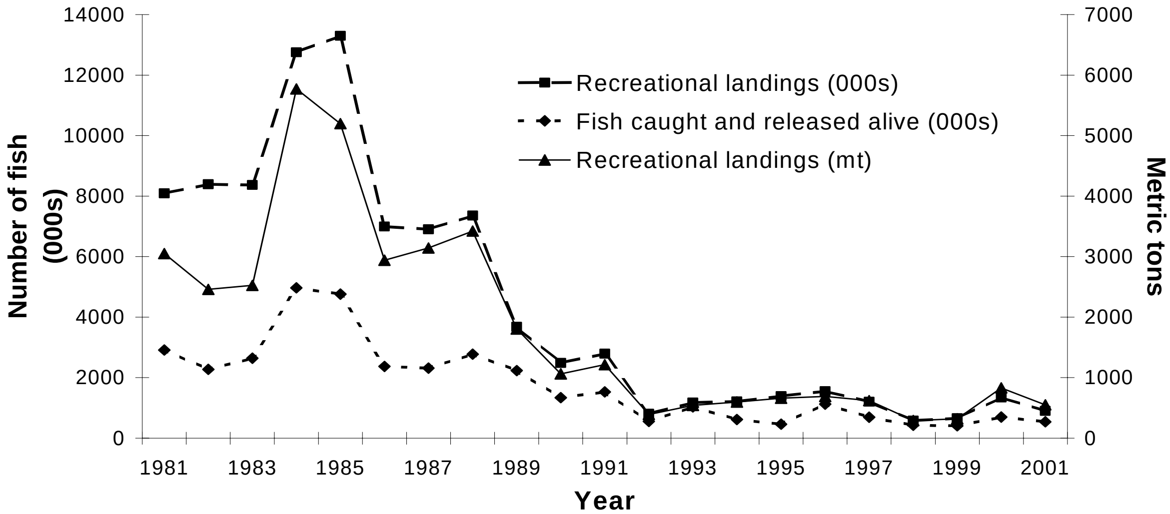


GOM commercial winter flounder landings, 1964-2001. From the SARC 36 Advisory Report for GOM Winter Flounder, NEFSC 2002.

1.3.2 Recreational Fishery

Recreational landings from the SNE/MA stock complex peaked at 5,772 mt in 1984 before declining to 383 mt in 1992 (Figure 7). Since 1992, landings have fluctuated without trend between 290 and 831 mt. In 2001, the recreational landings were estimated at 550 mt. Recreational landings as a percentage of total landings increased from 20% in 1982 to 44% in 1988, then declined to 20% in 1990. Recreational landings as a percentage of total landings have ranged from 10-18% since 1997. On average, recreational landings have comprised 23% of the total landings (1981-2001).

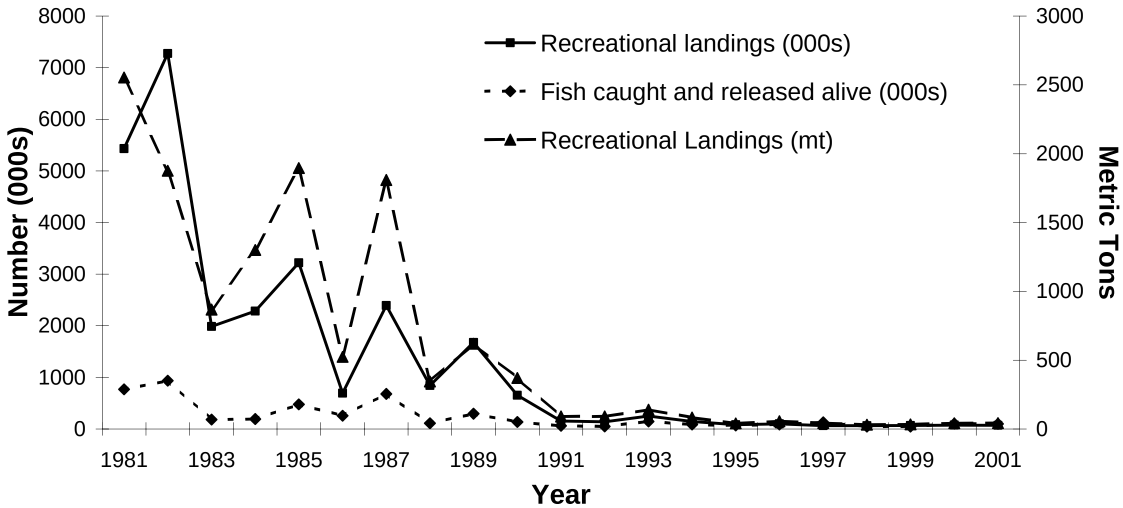
Figure 7. Southern New England/Mid-Atlantic Winter Flounder Recreational Landings and Number of Fish Released Alive



Recreational landings in numbers and metric tons for SNE/MA winter flounder. The number of fish caught and released alive is also shown. From the SARC 36 Advisory Report for SNE/MA Winter Flounder, NEFSC 2002.

Recreational landings from the GOM stock fluctuated around 2,000 mt during the early 1980s before declining to under 100 mt in 1991 (Figure 8). Recreational landings have remained below 100 mt since 1995. On average, recreational landings have comprised 40% (range 25-60%) of the total catch from 1979-90, but since 1991 have comprised only 5-13% of the total landings.

Figure 8. Gulf of Maine Winter Flounder Recreational Landings and Number of Fish Released Alive



Recreational landings in numbers and metric tons for GOM winter flounder. The number of fish caught and released alive is also shown. From the SARC 36 Advisory Report for GOM Winter Flounder, NEFSC 2002.

1.3.3 Subsistence Fishing

Subsistence fishing is often described as catching fish in order to provide necessary food. Often fishing can provide a less expensive alternative to purchasing food. The data describing the exact magnitude of subsistence fishing for winter flounder were not available at the time this Amendment was developed. However, anecdotal information indicates that fishermen, usually fishing from shore, do rely to some degree on fish they catch for food. It is unclear if any of these fishermen target winter flounder, but it is likely that if a winter flounder were caught it would be kept for food.

1.3.4 Non-Consumptive Factors

Hook and release fishing for winter flounder is often considered a non-consumptive use of the winter flounder resource. No information was available at the time Amendment 1 was developed to detail whether fishermen target winter flounder with the intent of releasing all of the fish that are caught.

1.3.5 Interactions with Other Fisheries, Species, or Users

No information to describe the interactions that the winter flounder fishery has with other fisheries, species, or users was available at the time Amendment 1 was developed.

1.4 HABITAT CONSIDERATIONS

1.4.1 Habitat Important to the Stocks

1.4.1.1 Description of the Habitat

The geographic distribution of winter flounder (*Pseudopleuronectes americanus*) includes nearshore habitats to offshore fishing banks along the Atlantic coast of North America. Winter flounder are one of the most common demersal fishes in inshore regions from the northern shore of the Gulf of St. Lawrence south to New Jersey, with smaller populations extending to the

Chesapeake Bay (Bigelow and Schroeder 1953). They have been found as far south as Georgia and occur in brackish river mouths and estuaries, and have been caught in the Susquehanna River, at tributary of the Chesapeake Bay (Bigelow and Schroeder 2002). The northern most geographic limit is Ungava Bay, Labrador (Kendall 1909, Leim and Scott 1966); the southern record is Georgia (Hildebrand and Schroeder 1928). Egg, larval, juvenile, and adult winter flounder populations have been mapped in several estuaries along the Atlantic coast.

It is important to note that winter flounder habitat requirements can vary regionally and therefore it is necessary to look at winter flounder populations on a localized level. Earlier examination of several winter flounder populations showed that there is a consistent pattern in population density across many habitat types (ASMFC 1992). Large flounder populations are associated with large physical structures, which promote larval retention such as bays or an offshore bank and have lower production per unit area. Small populations are associated with small coastal ponds and estuaries and often have higher production per unit area. Historic tagging studies (Lobell 1939, Perlmutter 1947, Saila 1961, Kennedy and Steele 1971, and Howe and Coates 1975Weber and Zawacki 1983a, Scarlett 1988a, NUSCo 1987, Powell 1989) provide evidence that winter flounder make short distance excursions from shallow embayments during the summer and return to the same estuaries, or nearby ones, to spawn the following winter. It is possible then for many spawning groups, especially smaller ones, to gradually diminish from localized habitat degradation without any obvious or large-scale cause (ASMFC 1992).

Based on observations of abundance, tagging studies and feeding ecology, (Van Guelpen and Davis 1979, all authors listed below if not included in above listing) a general hypothesis of winter flounder movements throughout their range has emerged. During summer months, adults remain in shoal areas where temperature is not excessive and food is abundant. McCracken (1963) suggested that summer distribution was related to a temperature preference of 12-15°C. With gonad maturation in the fall and early winter, winter flounder move in or remain in the shallow inshore areas. Spawning commences in the winter in southern locales and spring in northern areas. In northern regions, winter flounder remain inshore in protected sites during the winter but will migrate offshore to avoid turbulence and drifting ice flows. Milder winter water temperature and earlier spawning time in more southerly regions may explain the persistence of flounder in shallow waters in these areas. Initiation of migration appears to be cued by spring and fall water temperature stratification.

A ten-year mark-recapture study of 12,151 winter flounder by the MA Division of Marine Fisheries (Howe and Coates 1975) yielded a recapture rate of 36.5%. Fish were tagged at 21 locations. Post-spawning migrations north of Cape Cod were localized, and for the most part restricted to inshore waters. The average movement was 3.2 miles (range 0.5- 8.9). Flounder tagged east of Cape Cod showed mean travel distance of 7.7 miles (range 6.0-10.1). South of Cape Cod, post-spawned flounder dispersed southeastward from estuarine and coastal tagging sites to beyond the territorial limit. These flounder moved an average of 22.0 miles (range 6.3 - 38.0). Movements appeared to be related to water temperature; as flounder moved back into shoal areas during the fall when temperatures dropped to 15°C.

Saila (1962) studied winter flounder movements within Narragansett Bay, RI, using a transplantation experiment between Mt. Hope Bay and the Sakonnet River. Flounder transferred between tagging sites demonstrated a 36% (Sakonnet River) and 25% (Mt. Hope Bay) recapture rate from the original release site, indicating that winter flounder show fairly strong homing and site fidelity. In Green Hill Pond, RI, data from marked and recaptured flounder were analyzed utilizing a random search model, where all fish were found between the 20 fathom contour and the coastline (Saila 1961). The model assumes that upon reaching the shoreline flounder will search randomly until an inlet is located. Saila concluded that migration with no assumption of orientation from outside stimuli is a reasonable explanation for the flounder's ingress to shore.

A four-year tagging study (1986–1989), conducted by the R I Division of Fish & Wildlife (Powell 1989) is the most extensive work done on winter flounder movement in Narragansett Bay. A total of 6228 legal size (280mm and larger) winter flounder were tagged. Seven hundred sixty-six individuals were recaptured. Results of this study found that pre-spawning adult winter flounder enter Narragansett Bay during the fall by way of the East Passage. Migrants move up the East Passage passing between Conanicut Island and Prudence Island and move north to areas of the upper Bay to spawn. Movement out of the Bay in late winter and spring follows the same migration route.

In a related study (Powell 1991) of Mt. Hope Bay conducted from 1989-1990, 914 legal size (280mm and larger) winter flounder were tagged. Sixty-four individuals were recaptured through the end of 1991. Data from this study indicated that Mt. Hope Bay winter flounder moved into and out of Mt. Hope Bay by way of the East Passage. Timing of this migration is similar to that of the upper Bay populations.

Two tagging studies (NUSCo unpub. data; Weber and Zawacki 1983a) examined winter flounder movements in Long Island Sound. Between 1980-1983, 2,303 flounder were tagged in eastern Long Island Sound (NUSCo, unpub. data). Between 1983 and 2002 the Millstone Environmental Laboratory tagged over 41,000 flounder as part of their monitoring requirements for the Millstone Power Station (NUSCo 2003). Data from these studies have been used to estimate stock size, define movement and have provided other important population parameters. Three thousand flounder were tagged in Huntington and Oyster Bays, western Long Island Sound from 1981-1983 (Weber and Zawacki 1983a). The percent tag returns by season and area indicated limited movement from the original tagging location. During spring and summer periods, tagged fish from both release areas tended to move eastward. The recapture pattern was similar to movements noted in studies carried out in the 1920's and 1930's (Lobell 1939). Less than 20% of recaptured fish were caught outside of Long Island Sound, and only eight fish were taken beyond Block Island Sound (Weber and Zawacki 1983a).

Danila (1980) reported on 971 winter flounder tagged between December 1978 and February 1979 in Barnegat Bay, New Jersey. A total of 108 tagged fish were returned, principally from Barnegat Bay during the spring post-spawning emigration. Later in the season, fish were captured from the Barnegat Inlet and the Intracoastal Waterway. Flounder appeared to move in a northeast direction during the summer. During the winters of 1982-1987, Scarlett (1988a) conducted a tagging of 14,820 winter flounder in the Shark River, Manasquan River, and Barnegat Bay estuarine system. A total of 885 tagged fish were recaptured. Generally, during summer months, flounder were encountered in the Atlantic in an area north and east of the tagging sites. In the fall, flounder moved inshore, many returning to the same estuaries as the year before, and remained until May. Offshore movement began in May and was completed by June. The northeasterly movement of these fish from estuarine areas provides additional evidence of a general migratory pattern for flounder in southern regions.

Bottom temperatures below 15°C and spawning temperatures of 3 – 4°C regulate the life history of winter flounder. Movements onshore and offshore are related to spawning behavior of mature fish (older than age 3). These movements may be a response to increasing water temperature, and are more pronounced in the southern portion of the range and off southern New England where summer temperatures in shoal waters can reach 20° C or greater. Southern New England populations generally migrate in an easterly direction when they exit spawning estuaries. Populations in New Jersey move in a northeasterly direction and appear limited to the 20 fathom (44m) contour. The one documented exception is Georges Bank. This population is the only documented stock of flounder not dependent on near shore estuarine habitats for spawning and nursery areas. In the relatively isothermic environment of the offshore bank, this population does not migrate, has an extremely fast growth rate (Lux 1973) and early maturation age (Morse 1979).

Spawning & Egg Habitat

Spawning areas for winter flounder are difficult to define because eggs are adhesive and demersal in nature. It is these same characteristics, however, that make them valuable in pinpointing spawning grounds. (Pereira 1998) At this time no comprehensive study has been done which examines what substrates winter flounder eggs are and are not found, however, eggs have been reported on various substrates including sand, muddy sand, mud and gravel. However, it is important to note that this should not lead to the conclusion that they are not found on other substrates. Bigelow and Schroeder (2002) (based on Arnold and Rogers 1972) indicate winter flounder spawn in shallow water in all geographic areas, except for Georges Bank, with eggs deposited on algal mats and on firm bottom. Spawning occurs as shallow as 1.8 – 5.4 m to as deep as 45 –72 m off Georges Bank. In Conception Bay, Newfoundland winter flounder spawning occurred in May and June in water as shallow as 6m (Kennedy and Steele 1971). Pearcy (1962) found that winter flounder were spawning at 5m or less in the Mystic River, Connecticut. McCracken (1963) found spawning occurred at 0-9m in Passamaquoddy Bay, New Brunswick. Crawford and Carey (1985) collected winter flounder eggs, attached to algal fronds, during the first week of March from a submerged gravel bar in Point Judith Pond, Rhode Island. In late March they found eggs near Gardner Island “the boundary region of the open/closed hydrodynamic system in this lagoon.”

The annual spawning period for winter flounder varies over its geographic range. Although spawning periods overlap considerably, peak spawning times are earlier in southern locations progressing later in the northern end of the species range.

Underwater observations on Narragansett Bay spawning grounds found flounder eggs were deposited among the filaments of certain mat-formed diatoms (Arnold & Rogers, 1972).
The diatoms associated with flounder eggs are present from mid-November through May, encompassing the spawning season. The report suggested that diatom mats prevent considerable egg clumping after fertilization, thereby reducing mortality of eggs in the center of a clump. The most abundant of these was *Melosira nummeloides* with lesser amounts of *Melosira juergensi* and *Amphipleura rutilous*. During this study eggs were not found in adjacent bare sandy or muddy areas, or among eelgrass (*Zostera marina*), sea lettuce (*Ulva lactuca*) or *Enteromorpha intestinalis*.

In the laboratory, growth and metabolism from hatching through metamorphosis was chiefly influenced by temperature (Laurence 1975). Flounder eggs incubated over a range of conditions had highest hatch viabilities at 3°C over a salinity range of 15-35 ppt (Rogers 1976). Eggs hatch into normal larvae even after sustained exposure (two months) to very low temperature (-1.8°C and 35ppt, Williams 1975).

Laboratory studies (Rogers 1976) indicate that salinity was a significant factor influencing the time of embryo mortality. Salinities of 35-45 ppt caused mortalities at gastrulation and abnormal development of embryos, at all temperatures. Mortality and developmental delays occurred with salinities below 8 ppt. Pearcy (1962) collected various life stages in salinities ranging from 4-30 ppt.

Larvae Habitat

Spawning and nursery areas are thought to be geographically linked or one in the same. Winter flounder eggs and larvae have been found in areas where water flow is restricted, such as small narrow estuaries, where weak swimming larvae can remain in the same area (Crawford and Carey 1985, Monteleone 1992, Pereira et al 1998, Howell and Molnar 1997). Larval distribution is vertically stratified: larvae are more abundant near the substrate than in the water column (Pearcy 1962, Croker 1965, Topp 1967).

Nursery habitat for winter flounder larvae and juveniles includes littoral and sublittoral saltwater coves (Poole 1966b, Briggs and O'Connor 1971), coastal salt ponds (Saila 1961, Crawford and Carey 1985), estuaries (Pearcy 1962, Saucerman 1990), and protected embayments (McCracken 1963, Kennedy and Steele 1971). Larvae and juveniles have also been found in open ocean areas such as Georges Bank and Nantucket shoals.

Several biotic and abiotic factors, such as wind and tidal exchange in spawning areas, affects larval distribution within the estuary (Perlmutter 1947). Late stage benthic larvae may maintain their position in the estuary by taking advantage of the density current system that increases larval potential for retention (Pearcy 1962, Crawford and Carey 1985). A two-year study of four sites in Long Island Sound (Howell et al1999) found winter flounder larvae and juveniles in some numbers at all sites examined, but their distribution varied among sites and between years. Based on the rank order of densities within each year, spawning appears to occur most commonly in the mouth or mid to outer margin of small rivers, and the middle reaches of larger harbors and rivers where tidal and river currents counterbalance each other to create a retention area for the youngest and most vulnerable larval stages. In small rivers, this retention area may extend south of the river proper into near-shore embayments and areas surrounding islands. Such retention areas have been documented as important to the survival of other species with similarly diffuse sub-populations such as Atlantic herring (Sinclair 1988). As winter flounder larvae metamorphose to benthic juveniles, preferred habitat appears to shift from these retention areas to more protected reaches either up river or embayments in the lower estuary.

Exudates from sea lettuce, or its bacterial flora, were found to be toxic to larval winter flounder, killing all larvae in 22 days (MacPhee pers. comm.). However, when sea lettuce and two other algae, *Gracilaria tikvahiae*, a red macroalga; and *Dunaliella tertiolecta*, a green phytoplankter, were used as biological water conditioners in juvenile winter flounder cultures, there was no difference in survival, fish length, or dry weight between treatments. These results indicate sea lettuce may affect larvae and juvenile flounder differentially, and may explain the lack of egg deposition on sea lettuce beds.

Larval winter flounder have been collected in a number of areas with a wide range of salinity and temperatures. In Miramichi Bay, larvae were collected at salinities from 6 to 26 ppt and temperatures from 12.5 to 20.5°C (Locke and Courtenay 1995). In the Navesink and Shrewsbury Rivers in New Jersey, larvae have been located in areas where salinity ranges from 10-22 ppt and temperatures from 2-19.5°C (Scarlett 1991). In the Mystic River Estuary Pearcy (1962) found larvae in salinity ranges from 18 to 22 ppt and temperatures ranging from 3 to 15°C (Pereira et al 1998). Howell and Molnar (1997) found stage-1 larval abundance peaked at 10°C in Connecticut four rivers.

Because larvae are current dependent, one of the reasons concentrations of larvae persist in particular areas is abundance of prey. The first foods of flounder larvae, following yolk absorption up to three weeks of age, are diatoms, followed by small crustaceans (Sullivan 1915). Spring field collection of larvae 2.6-8.0 mm TL (Marine Research, Inc. 1980), showed they fed predominantly on rotifers until approximately 4.0 mm TL, when polychaetes, nauplii, and tintinnids increased in abundance in stomach contents. Although flounder mouth gape differs insignificantly over the size range examined, rotifers may be captured more easily than nauplii due to their slow movement. Polychaete larvae are also relatively slow swimmers but their large size and low densities may reduce their dietary importance to larval flounder. Larval survival rates based on prey availability were studied by Laurence (1977) using a bioenergetics model. Summing over the total larval phase, the critical minimum prey densities ranged from 0.3 to 0.8 nauplius/ml.

<u>Juvenile Habitat</u>
Winter flounder metamorphose and become juveniles at 9 - 13 mm SL. At this time, migration of the eye takes place, the fish becomes pigmented and settle to the bottom. (Able and Fahay 1998). This immature stage lasts for approximately two to three years depending on sex and growth rate.

The monthly catch of winter flounder in Passamaquoddy Bay indicated that YOY and 1+ fish move from depths less than nine meters into deeper water by November (McCracken 1963). Older immature fish were found at this depth continuously. During early winter, Age 1-2 immature fish were most abundant between 10-30 meters, while Age 3 and older were found deeper.

Depth preference may also be regulated by phototaxis. Young YOY juvenile are positively phototaxic, while winter YOY and 1+ individuals avoid light; adults are indifferent to light intensity (Pearcy 1962, McCracken 1963, Casterlin and Reynolds 1982). Light intensity may influence vertical distribution and movements into or out of shoal areas (Pearcy 1962).

Similarly, juveniles were most abundant in upper Narragansett Bay and the Sakonnet River at sites with sandy-mud bottom, regularly interspersed with vegetation, and protected from prevailing winds (Powell 1988). Both attached and floating algae, predominantly sea lettuce (*Ulva lactuca*) and *Codium* sp. were observed at these sites. Meng et. al. (in review) found densities of juveniles were positively correlated with higher percentage of algal cover and mud; and negatively correlated with dissolved oxygen and chlorophyll a. This is partially attributed to their occurrence in highly impacted sites with higher human population densities (Providence River, Greenwich Bay, and Wickford Harbor) where winter flounder spawned historically and continue to spawn

The effect of habitat type on juvenile winter flounder growth rate has been examined in several studies. Growth rates were measured in vegetated and unvegetated substrates at four locations in southern New Jersey (Sogard 1989). Two sites were chosen in natural eelgrass and two on sand flats with mats of sea lettuce. Ten and fifteen day caging experiments demonstrated that YOY flounder grew faster on bare sand substrate at sea lettuce sites than at eelgrass sites. Significantly higher water temperatures in eelgrass beds versus sea lettuce were negatively correlated with observed patterns of growth. Shading from vegetation may be important to juvenile growth in the southern range of this species where temperature may be limiting, Sogard (1989) suggested that differences in site location within an estuary may be more critical in determining habitat quality than vegetation cover. Smaller fish exhibited rapid growth at the time of initial settlement, and larger fish demonstrated decreasing growth (length in mm), regardless of habitat. Phelan et al.(2000) reported similar findings. Sogard (1992) found that YOY winter flounder were more abundant on unvegetated substrates and that their ability to bury in the sediment and change color to match the substrate frees them from dependence on vegetation for refuge from predators. (from Pereira et al. 1998). In a study by Able et al. (1999), winter flounder were found to exhibit faster growth rates in open water sites than under large commercial piers, suggesting that habitats around these types of piers are poor sites for juvenile winter flounder.

Saucerman (1990) sampled YOY winter flounder from different substrates based on both textural classification and organic content in a Massachusetts estuary. Growth rates varied inconsistently with respect to substrate type and sediment organic content among mud, silt, and sand sites over two years. Although density was highest on mud bottoms, growth (total length) was lowest. This may be due to food limitation as warm mud habitats become oxygen deficient. Conversely, high abundance may signal a density dependent mechanism regulating growth.

Saucerman (1990) examined distribution and movement of post-metamorphic YOY winter flounder in different habitat types in Eel Pond, MA, by mark and recapture. The majority of flounder were originally captured near eelgrass beds and were recaptured near these same eelgrass areas. Ninety-eight percent of recoveries were recaptured within 100 M of the release site, with only 1% straying more than 200 M from the release site. Cross channel exchange was negligible (0.73%).

Howell et al. (1999) studied habitat preference by juveniles in shallow embayments along the Connecticut coast. Highest densities most often occurred in mud/shell-litter habitat followed by mud/wood litter and open mud without litter. Sandy sites with or without litter had the lowest densities.

Able and Falay (1998) found that juveniles occur across a variety of habitat types, regardless of sediment and structure. However, most are found in shallower depths (1-3 m) over sandy substrates. They go on to say that very young winter flounder are found over unvegetated substrates associated with macroalgae, as well as being collected in subtidal portions of marsh creeks.

In summary, winter flounder juveniles rely on several different substrate types. Which substrate is the most critical is likely regional and dependant on other limiting factors such as temperature, dissolved oxygen, and food availability,. .

A field study in the Mystic River estuary, CT, showed both juveniles and older flounder are eurythermal, as flounder were found in the estuary at all seasons, from 0 to 25°C. (Pearcy 1962). Supplementary laboratory experiments indicated a minimum lethal temperature in the winter between -1.0 and -1.5°C. The production of antifreeze polypeptides enhances survival in ice-laden seawater (Fletcher et al. 1985). This freezing point was later lowered to about -0.70 C to -0.80°C. (Umminger and Mahoney 1972).

Hoff and Westman (1966) looked at the survival of juvenile winter flounder (<120 mm) at various temperatures. The upper and lower median tolerance limits (the temperature at which 50% of the experimental fish could no longer live for the exposure period) were estimated by interpolation from the known number of survivors. The percent survival of winter flounder acclimated at 7, 14, 21, and 28° C and exposed to low test temperature (1, 2, 4, 6, and 7°C) indicated high survival rates at all temperatures except for acclimation temperatures of 21°C and 28°C, and test temperatures of 4 and 1°C, respectively. These values are in agreement with the range of upper lethal temperatures (29.1-30.4°C for 100 mm fish) reported by Huntsman and Sparks (1924) and Casterlin and Reynolds (1982). These authors reported 'death points' for flounder exposed to high temperature which were related to size: 27.8-29°C for 300 mm fish, and 29.1-30.4°C for 100 mm fish. Another study of the relationship between acclimation temperature and upper lethal temperature indicated that, at acclimation temperatures of 4 and 20° C, 50% of adult flounder could tolerate 19 and 26.5°C, respectively (McCracken 1963). The higher tolerance of small flounder was also observed by Battle (1926) who reported that the tissues of juveniles could withstand 1.0-1.7°C higher temperatures than larger fish.

Juvenile winter flounder are sensitive to reduced levels of dissolved oxygen (D.O.), an important factor determining their distribution during warm summer months in shallow estuarine waters that periodically may become hypoxic. A study assessing habitat quality conducted by Meng et al. (2001) found that some of the lowest oxygen readings they recorded followed heavy rain and were attributed to untreated sewage being released.

To test the effect of low D.O. on local winter flounder abundance, on-board readings of bottom D.O. were paired with concurrent research survey catch information taken throughout western Long Island Sound during the summer of 1989 (Howell and Simpson 1994). Flounder catches were significantly lower at sites with D.O. below 3 mg/l compared with sites with D.O. >3 mg/l. This study concluded that the overall decline in diversity and abundance of all species indicated that hypoxia in open waters more often results in avoidance and chronic effects rather than acute mortality. Further evidence pointing to such chronic effects was the significant decline in mean length of winter flounder with D.O. concentration, varying from 15.1cm where D.O. was less than 2.0 mg/l to 19.0cm where D.O. was 5.0 mg/l or higher. This difference in size by D.O. level indicates either a sorting by size class differentially tolerant to low DO and/or growth depression in resident fish chronically exposed to hypoxia in the first few years of life.

Laboratory studies of prolonged exposure to low oxygen (11-12 wks, 2.2 mg/l) showed that growth of YOY flounder was diminished by half compared to high oxygen (6.7 mg/l) conditions (Bejda et al 1992). Conditions fluctuating daily between high and low D.O. showed intermediate growth depression. Adult flounder have a disproportionately greater oxygen demand than juveniles at high temperatures (Voyer and Morrison 1971). The added energy demands of larger fish could heighten avoidance of low oxygen sites.

Winter flounder juveniles and adults are sight-feeders, and feed during daylight in all seasons; the highest percentage gut fullness occurs during early to mid-morning, (Pearcy 1962, Olla et al. 1969, Frame 1972, Huebner and Langton 1982, Worobec 1984, Bailey 1989). Feeding activity during the day is accompanied by a visual search posture characterized by a raised head directed at individual prey exposed on the surface of the substrate; at night, fish rest on the bottom (Olla et al. 1969, MacDonald 1982). Age 1 and older winter flounder consume less during winter and on cloudy days (Frame 1972). Meng et al. (draft in review) also found juvenile winter flounder to be omnivorous and opportunistic feeders

Pereira et al (1998) in the EFH Source Document summarized the findings of various researchers on the feeding and diet of juvenile winter flounder. The species has been described as omnivorous or opportunistic feeders. Polychaetes and crustaceans (mostly amphipods) generally make up the bulk of the diet (Carlson et al. 1997, Martell and McClelland 1994, Steimle et al. 1993, Macdonald 1983, Hacunda 1981). Winter flounder may modify their diet based on availability of prey. They feed on bivalves (Medcof and MacPhail 1952, Macdonald and Green 1986), capelin eggs (Kennedy and Steele 1971, Frank and Leggett 1983) and fish (Kennedy and Steele 1971). Degradation or improvement of environmental conditions causing shifts in benthic invertebrate populations may also cause shifts in prey selection such as eating the pollution-tolerant annelid *Capitella* (Steimle et al. 1993, Haedrich and Haedrich 1974) or eating the pollution-sensitive amphipod, *Unciola irrorata*, once environmental conditions have improved (Steimle et al 1993). In the winter, winter flounder have been reported to cease feeding (Martell and McClelland 1994, Kennedy and Steele 1971, Van Guelpen and Davis 1979) or reduce their feeding (Frame 1972, Levings 1974).

Stomach evacuation rates for laboratory fed juveniles are inverse to their length (Pearcy 1962). Huebner and Langton (1982) estimated daily food consumption to be 2.4% of body weight on average for all but the largest fish, where it decreased to 1.8% of body weight. Stomach volume was correlated to both fish length and weight. Stomach content (% initial meal) decreased exponentially with time, however the data were highly variable.

Daily food consumption was highest during the warmest months, 2.84% dry body weight June and 3.31% September, and lower for cooler periods, 1.27% April (Worobec 1984). Additionally, food was retained in the stomach during the evening at cooler temperatures, retarding the return of hunger. Adult gastric evacuation, calculated from the rate of hunger return at 6°C, was exponential (Huebner and Langton 1982). Juvenile and adult flounder remaining in shoal waters during summer may have to increase their rate of feeding to compensate for a faster gut evacuation time.

<u>Adult Habitat</u>

Adult winter flounder seasonal movements consist of two phases; an autumn estuarine immigration prior to spawning, and a late spring/summer movement to either deeper, cooler portions of estuaries or to more offshore areas (Merriman and Warfel 1948, Bigelow and Schroeder 2002, Saila 1961, McCracken 1963, Howe and Coates 1975, Powell 1989). This pattern of seasonal distribution may change in the northern extent of the flounder's range. Data from the flounder fishery in Passamaquoddy Bay and St. Mary's Bay in the upper Bay of Fundy indicate that winter flounder leave shoal areas in winter for deeper water (McCracken 1963). In cold-water areas, winter flounder are abundant in shallow water in summer; however in warmer areas, such as Northumberland Strait and Pubnico Harbor regions, flounder migrate from warm shoal areas to cooler, deeper water in the summer.

Adult winter flounder, like juveniles, are opportunistic, omnivorous, benthic feeders. Although euryphagous, prey selectivity may result from seasonal cycles of prey abundance and catchability. Polychaete worms, mollusks, amphipods, and isopod crustaceans provide the essential elements of their diet (Linton 1921, Pearcy 1962, Richards 1963, Mulkana 1966, MacPhee 1969, Kennedy and Steele 1971, Frame 1972, Langton and Bowman 1981, Scarlett 1988a, Langton and Watling 1990). Plant material is regularly present and apparently can be utilized, as well as the hydroid *Obelia genicula* (Wells et al. 1973, Fairbanks et al. 1971). Langton and Watling (1990) found a size-related shift in prey species, reflected in decreased importance of certain crustaceans with increased importance in cerianthods and polychaetes as food for larger fish.

MacPhee (1969) linked the diet of winter flounder to substrate type. Winter flounder living on a coarse, rocky bottom have a more variable diet than those on a soft mud bottom. A regional analysis of prey items (Langton and Bowman 1981) shows that over 52.8% of winter flounder collected from the Middle Atlantic shelf contained Cnidarians. Annelids were important prey items across all regions, comprising 15 to 60% of the diet. The relative percent of annelids in the diet varied geographically, decreasing from Middle Atlantic to Georges Bank. Kennedy and Steele (1971) found that winter flounder from Conception Bay, Newfoundland, commonly fed on fish eggs, their own and capelin. Selective consumption of capelin eggs contributed significantly to recovery of body condition by postspawning flounder and was estimated to result in 23% of annual growth of the fish (Frank and Leggett 1984). Based on dietary overlap, three other fish species, scup (*Stenotomus chrysops*), sea robin (*Prionotus carolinus*), and smallmouth flounder (*Etropus microstomus*), compete for food resources in southern New England (Richards 1963).

Several studies have examined growth rates for adult winter flounder populations along the Atlantic coast (Berry et al. 1965, Poole 1966a, Kennedy and Steele 1971, Lux 1973, Howe and Coates 1975, Gibson 1989a, NUSCo 1987, Scarlett 1988a and b, Howell and Simpson 1994, Witherell et al. 1990). In summary, examination of winter flounder length-at-age over a wide geographic range indicated maximum size occurred at the center of their range. Adult winter flounder attain the largest ultimate size on Georges Bank and off the Massachusetts coast east and south of Cape Cod. Maximum size decreases to the north and south of this geographic focus as well as within partially enclosed embayments.

1.4.1.2 Identification and Distribution of Habitat and Habitat Areas of Particular Concern

Habitat Areas of Particular Concern or HAPCs are discrete areas within an area designated as Essential Fish Habitat (EFH) under the Sustainable Fisheries Act that are particularly critical to the survival of the species. These are areas that provide important ecological functions and/or are especially vulnerable to degradation. HAPCs to satisfy one or more of the following criteria: 1) provide important ecological function; 2) are sensitive to human-induced environmental degradation; 3) are susceptible to coastal development activities; or 4) are considered to be rarer than other habitat types.

Habitat Areas of Particular Concern for estuarine populations of winter flounder fall into two categories: habitats used for spawning and nursery habitat.

Spawning and Nursery HAPC's

Estuarine dependent populations of winter flounder usually spawn in the upper estuary, in suitable coves and river mouths of the estuary. Spawning usually occurs in the shallow (<5 m) areas and has been reported on various substrates including sand, silty sand, mud and gravel However, it is important to note that this should not lead to the conclusion that they are not found on other substrates and which substrate is most critical varies by region. Howell and Molnar (1997) found in a study of winter flounder habitat preference along the Connecticut coast that "based on the rank order of densities within each year, spawning appears to occur most commonly in the "mouth" or mid to outer margin of small rivers and the middle reaches of larger harbors and rivers, where tidal and river currents counterbalance each other to create a "retention area" for the youngest and most vulnerable larval stages." They also found that "in small rivers, this retention area may extend south of the river proper into near-shore embayments and areas surrounding islands. They felt that identification and conservation of these retention areas is important to the survival of winter flounder. In another study Crawford and Carey (1985) collected winter flounder eggs, attached to algal fronds from a submerged gravel bar in Point Judith Pond, Rhode Island. They also found eggs in the boundary region of the open/closed hydrodynamic system in this lagoon.

Nursery habitats (eggs, larvae, and juveniles through Age I habitats) are usually in or near spawning and settlement areas. Vegetated habitat like Submerged Aquatic Vegetation (SAV) SAV and macroalgal beds also provide important nursery habitat for juveniles. Howell and Molnar (1997) suggest that when "larvae metamorphose to benthic juveniles the preferred habitat appears to shift from the river mouth up river." They also found a positive relationship between juvenile density and mud sediments, especially those having bivalves (Howell et al. 1999). Goldberg et al (2002) looked at habitat preference in three estuaries, one in Connecticut and two in New Jersey and found highest densities of young-of-the-year (YOY) in unvegetated areas adjacent to eelgrass in the two NJ estuaries. In the CT estuary highest densities were found in eelgrass. Curren and Able (2002) found that shallow coves near ocean inlets are important settlement areas, with newly settled juveniles moving into other habitats shortly after settlement indicating that settlement habitats are only used temporarily before moving to nursery habitats.

Identifying HAPCs for adult winter flounder is more problematic. Habitat used by adult winter flounder moving into and out of the estuary to spawn and for post spawning foraging may also be considered an HAPC. Movement into and out of the estuary is regulated water temperature less than 15° C (MacPhee 1978). A tagging study by Powell (1988) found that migrating flounder move into Narragansett Bay by way of the deep channels. The study also found that spawning adults "hold" in deep channels and depressions prior to moving into the shoal areas to spawn.

The areas described above may be considered Habitat Areas of Particular Concern for egg, larval, juvenile and adult stages of winter flounder and are based on a limited number of studies found in the literature. Future studies may show other areas in a particular estuary to be HAPCs for winter flounder.

In summary, many HAPC's for various life history stages of winter flounder are found in portions of the estuary where the highest anthropogenic impacts from human induced environmental degradation and coastal development are found. The loss or degradation of these habitats will have detrimental impacts on winter flounder populations in the estuaries.

Data from ASMFC member States that have identified and/or mapped HAPCs for winter flounder is provided in Appendix A.

1.4.1.3 Present Condition of Habitats and Habitat Areas of Particular Concern

Status of the Habitat – Three activities have been identified that exert long term deleterious effects on winter flounder and their habitat especially habitat areas of particular concern:

1. Near-shore water quality degradation
2. Suspended sediments
3. Entrainment and impingement from Power plants and other activities

Winter flounder stage I larvae appear to be the most sensitive life stage to environmental perturbations. Each of these activities can exert potentially large-scale losses, either through acute mortality or chronic decline in production.

<u>Near-shore Water Quality Degradation</u>

There are three major activities that adversely impact nearshore water quality: habitat alteration, nutrient enrichment and introduction of toxic compounds.

Habitat alteration caused by activities such as dredging, filling, point and non-point source runoff, construction of in- water and shoreline structures all contribute to water quality degradation. These activities and the associated changes in water quality have a range of impacts that may be specific to different life stages of winter flounder. The severity of impact will depend upon the spatial and temporal extent of the alteration.

Nutrient enrichment can lead to eutrophication in all or parts of the estuary. Under specific environmental conditions eutrophication may lead to hypoxic and anoxic conditions in all or a portion of the water column. It can also lead to ammonia and hydrogen sulfide releases in the sediment. This often causes extensive mortality of marine life, especially in protected harbors and coves where there is little circulation. Depending on the life history stage involved, these events can have severe impacts on localized winter flounder populations. Human activities that cause nutrient enrichment of our estuaries are combined sewer overflows (CSO), wastewater treatment plants, atmospheric deposition, individual sewage disposal systems (ISDS), lawn fertilizers, agricultural and horticultural runoff and some activities associated with boating like soaps used in boat washing or soaps found in grey water discharged by boats.

Toxic substances entering the estuarine environment may have both lethal and sublethal effects on all life history stages of winter flounder. These substances originate from both point source and non point source discharges. Industrial activity and municipal wastewater treatment plants are the primary point source of discharges to the estuary. The advent of mandatory pretreatment requirements of waste discharges to our waterways has significantly reduce the amount of chemicals and metals entering many estuaries. Highways and certain types of land use are also a major source of non-point pollution impacting our estuaries.

Throughout the geographic range of winter flounder, some level of contamination from human activities has been identified, both in harbors and offshore. However, the greatest contaminant levels in U.S. marine waters have been found in the core of this species' range, namely sites off the Atlantic coast from Massachusetts to New Jersey. Areas especially impacted by urban development include the greater Boston Harbor area, upper Narragansett Bay (including Mt. Hope Bay), western Long Island Sound, the Hudson-Raritan estuary and the New York Bight.

Suspended Sediments

While suspended sediments are an aspect of water quality, due to importance as a mortality factor to early stage winter flounder it has been included in its own section. The re-suspension of sediments in an estuary may be caused by a number of human activities. Probably the most deleterious is caused during dredging and dredge spoil disposal activities that occur during spawning periods. Suspended sediments carried into the estuary through point source or non-point source runoff may also impact various early life history stages. Vessel prop wash and bottom tending fishing gear may also re-suspend sediments in spawning areas. Other human activities (eg: trawling activity, submarine utility installation, shellfish dredging), may also contribute to increased suspended sediment loads in the estuary.

Depending upon a number of factors including particle size, concentration and duration, suspended sediments can have a number of acute and chronic impacts on various life history stages of winter flounder. Suspended sediments settling out of the water column onto winter flounder eggs may cause direct mortality from suffocation, delayed hatching or reduced viable hatch. Larvae may be subjected to lethal and sublethal effects from suspended sediments in the water column. These effects range from mortality due to ingestion, clogging of the gills hindering respiration, to reducing the ability to search and capture prey. The effects by suspended sediment on juveniles and adult winter flounder will depend on characteristics of the suspended sediment plume and the flounder's ability to leave or avoid the impacted area.

Entrainment and impingement from Power plants and other activities

Several extensive studies have been done on the impact of coastal power plants on winter flounder. Historically, many of these plants have been sited in the upper reaches of the estuaries where many winter flounder populations spawn and nursery. Power plant losses through entrainment and impingement of different life history stages are directly related to several factors: the location of the plant on the estuary, the type of system used for cooling the plant, volume of water used in cooling, and the type of technology employed to reduce mortality. Entrainment impacts are usually associated with egg, larval and juvenile life stages where individuals are small enough to pass through the intake screens and subsequently through the plant. Impingement affects mostly the adult stage, or the individuals large enough to be caught on the intake screens. Impingement mortality is typically lower as technologies have been developed and implemented to allow fish to be diverted from the cooling water and returned to the estuary alive. Mandatory monitoring programs required of the industry to assess the impact these plants have on fisheries resources and the estuarine environment have provided valuable data on winter flounder populations and have led to the development of new technologies to reduce power plant mortality on estuarine species. There are other types of activities that potentially have similar impacts such as desalinization and water treatment plants.

1.4.1.4 Ecosystem Considerations

There are increasing attempts to incorporate ecosystem management into fisheries management. Ecosystem management can be interpreted as (a) the incorporation of the protection and enhancement of habitat features that contribute to fish production into the fishery management process, and (b) the consideration of how the harvest of one species might impact other species in an ecosystem and incorporating hat relationship in management decisions. The process of considering more than one species in fisheries management decisions is also called multispecies management. The New England Fishery Management Council manages winter flounder as part of their Multispecies FMP for Groundfish.

1.5 IMPACTS OF THE FISHERY MANAGEMENT PROGRAM

1.5.1 Biological and Environmental Impacts

Amendment 1 implements a fishing mortality target that is slightly more conservative than the previous management program for winter flounder. Prior to Amendment 1, winter flounder did not have a biomass target or threshold under the ASMFC plan. A biomass target and threshold provide the Management Board with an additional reference point to evaluate the status of the winter flounder resource and management program.

The management measures imposed by Amendment 13 to the NEFMC Multispecies Plan for Groundfish are expected to accomplish the bulk of the reductions in fishing mortality in the SNE/MA stock called for in the most recent stock assessment. The complementary management measures in Amendment 1 are designed to continue inshore what Amendment 13 is designed to accomplish in the EEZ. For the SNE/MA stock, the intent is to reduce fishing mortality to a level that will allow rebuilding of the SNE/MA stock. For the GOM stock, the intent is to maintain fishing mortality below the target and spawning stock biomass above the target.

1.5.2 Other Resource Management Efforts

Other resource management efforts are described in detail by the New England Fishery Management Council in Amendment 13 to the Northeast Multispecies (Groundfish) Fishery Management Plan.

1.6 LOCATION OF TECHNICAL DOCUMENTATION FOR AMENDMENT 1

1.6.1 Review of Resource Life History and Biological Relationships

Information about the life history of winter flounder, *Pseudopleuronectes americanus*, can be found in the Interstate Fishery Management Plan for Inshore Stocks of Winter Flounder (ASMFC 1992).

1.6.2 Stock Assessment Document

The most recent stock assessments for SNE/MA and GOM winter flounder were reviewed by the Stock Assessment Review Committee in 2002 (NEFSC 2002). The SNE/MA and GOM winter flounder stocks are scheduled to undergo another full assessment in 2007.

1.6.3 Law Enforcement Assessment Document

ASMFC’s Law Enforcement Committee has prepared a document entitled Guidelines for Resource Managers on the Enforceability of Fishery Management Measures (October 2000), which can be used to evaluate the effectiveness of enforcing fishery management measures.

2.0 GOALS AND OBJECTIVES

2.1 HISTORY AND PURPOSE OF THE PLAN

2.1.1 History of Prior Management Actions

The ASMFC authorized development of a Fishery Management Plan for Winter Flounder (*Pleuronectes americanus*) in October 1988. Member states declaring an interest in this species were the states of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Delaware. During 1989, the purpose of the plan evolved: 1) to address management of inshore stocks of winter flounder; and 2) to prominently consider habitat and environmental quality as factors affecting the condition of the resource.

The decision to consider only inshore stocks of winter flounder was deliberate, based upon the principal focus of the ASMFC on fisheries in nearshore waters, and the differences in the biological characteristics of the offshore (Georges Bank) stock. Two inshore management units are identified: Gulf of Maine (GOM) – waters north of Cape Cod, and Southern New England/Mid-Atlantic (SNE/MA) – waters south of Cape Cod to the Delaware-Maryland Border.

The original FMP and Addendum I called for reductions in fishing mortality on winter flounder and allowed states the flexibility to achieve those reductions based on the life history characteristics of the individual stocks inhabiting each region. Implementation of the plan has required the interaction and cooperation of state fishery management agencies, the New England Fishery Management Council (NEFMC), the National Marine Fisheries Service, and the ASMFC.

Although a large percentage of winter flounder landings are presently taken from federal waters, the possibility of tightening state regulations remains. This possibility depends on the success or failure of current state and federal regulations. The overall winter flounder stock is composed of smaller, localized spawning populations that return to inshore waters each year. Increased fishing mortality on localized spawning populations in state waters will have a direct effect on the status of these local populations and on the entire GOM and SNE/MA stock complexes.

In February 1998, the Winter Flounder Management Board approved Addendum II to the FMP. Addendum II adjusts the implementation schedule for management measures by the participating states. Addendum II called for plans to reach the target fishing mortality goal for rebuilding (F_{40}) to be developed and submitted to the Board for approval by August 1998. The deadline for implementation of these plans was set for May 1, 1999, in contrast to the original date of January 1999 as stipulated in Addendum 1 to the winter flounder FMP.

As documented in the 2003 review of the Fishery Management Plan, all states were initially required to have implemented measures to achieve F25 and achieve this goal one year after adoption of the Plan. By January 1, 1995 measures to achieve F30 were to be in place, and by January 1, 1999, the Plan required that F40 be achieved. All states currently have plans that were approved by the Winter Flounder Management Board in 1995, however, results from a stock assessment in 1995 concluded that none of the states were achieving a fishing mortality rate corresponding to F30 at that time. Subsequent analyses in early January 1997 indicated that fishing mortality on a coastwide basis was slightly higher than the F30 target for the SNE/MA stock complex. Fishing mortality in the GOM stock was presumed to be higher and the spawning stock biomass at a low level, indicating that the GOM unit might be in greater need of rebuilding than the SNE/MA unit.

2.1.2 Purpose and Need for Action

In May 1999, the Winter Flounder Management Board of the Atlantic States Marine Fisheries Commission (ASMFC) acknowledged that it was necessary to update winter flounder management through an amendment to the original Interstate Fishery Management Plan for Inshore Stocks of Winter Flounder (FMP). This update was necessary since the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA) was not established until 1993, after the approval of the original winter flounder FMP. The ACFCMA governs preparation and adoption of interstate fishery management plans to provide for the conservation of coastal fishery resources, and requires states to implement and enforce FMPs. Since the original winter flounder FMP was developed before the ACFCMA was implemented, it is necessary to update the winter flounder FMP to reflect the goals and objectives of the ACFCMA.

Also in May 1999, the Winter Flounder Management Board noted the upcoming stock assessment and realized that, based on the results of that stock assessment, an update to the winter flounder FMP would likely be necessary. The stock assessment was completed in late 2002, and in February 2003 the Winter Flounder Management Board began the process for development of Amendment 1 to the Interstate Fishery Management Plan for Inshore Stocks of Winter Flounder.

Amendment 1 to the Interstate Fishery Management Plan for Inshore Stocks of Winter Flounder completely replaces all previous Commission management plans for inshore stocks of winter flounder.

2.2 GOALS

The goals of Amendment 1 to the Interstate Fishery Management Plan for Inshore Stocks of Winter Flounder are:

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

To promote rebuilding of the inshore and estuarine component of the winter flounder stock.

2.3 OBJECTIVES

In support of this goal, the following objectives are recommended for Amendment 1 to the Interstate Fishery Management Plan:

1. Manage the fishing mortality rates for the Gulf of Maine and Southern New England/Mid-Atlantic Stocks to rebuild the stocks and provide adequate spawning potential to sustain long-term abundance of the winter flounder populations.
2. Manage the winter flounder stocks under an ASMFC rebuilding plan designed to rebuild and then maintain the spawning stock biomass at or near the target biomass levels and restrict fishing mortality to rates below the threshold.
3. Establish an interstate management program that complements the management system for federal waters.
4. Foster a management program for restoring and maintaining essential winter flounder habitat.

5. Establish research priorities that will further refine the winter flounder management program to maximize the biological, social, and economic benefits derived from the winter flounder population.
6. Restore the winter flounder fishery so that inshore recreational and commercial fishermen can access it throughout its historical range and at the historic age structure.

2.4 SPECIFICATION OF MANAGEMENT UNIT

The management unit for winter flounder is defined as the range of the winter flounder resource within the US waters of the Northwest Atlantic Ocean. A relatively large variability in growth and maturity exists among stocks along the northwest Atlantic coast. The variability in biology, as well as current and historical exploitation patterns, necessitate the delineation of the range of winter flounder into stock units where growth, seasonal movement, and female maturity schedules are similar enough to be modeled as one group. Within these stock groups, winter flounder move across state boundaries and between state waters and the EEZ. The extent to which winter flounder move between estuaries or inshore/offshore systems has not been fully documented.

Based on these criteria, inshore winter flounder populations have been split into three stock units for management purposes. The Southern New England/Mid-Atlantic (SNE/MA) and Gulf of Maine (GOM) stocks are managed within state waters by the ASMFC, while the EEZ components of these stocks as well as the offshore Georges Bank stock are managed by the New England Fishery Management Council (NEFMC). The SNE/MA stock includes the waters south of Cape Cod to the Delaware-Maryland Border. While the SNE/MA stock actually extends into the Chesapeake Bay, for management purposes Delaware is the southernmost state with a declared interest in winter flounder management. The GOM stock includes the waters north of Cape Cod.

The current stock definitions represent observed biological differences between the SNE/MA and GOM stocks as currently defined. Fishery data currently exist with a historical record at the scale needed for the best possible assessment of the two stocks as currently defined. Operating under the current SNE/MA and GOM stock definitions will be more conducive to coordination of management objectives between the ASMFC and the NEFMC.

2.4.1 Management Areas

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

2.5 DEFINITION OF OVERFISHED AND OVERFISHING

In fisheries management, a control rule is used to evaluate the need for management action. The control rule is an indicator of stock status and is based on 1) the level of exploitation or the fishing mortality rate (F), and 2) the level of stock biomass. Overfishing is defined as the relative rate of removals from the population and is determined by the fishing mortality on the stock. The level of spawning stock biomass, as the result of the fishing mortality rate, is the basis for determining if a stock has become overfished. A biomass target or threshold determines the desired condition of the stock whereas the target mortality rate determines how fast the population is moving toward achieving the appropriate level of biomass.

Fishing mortality-based reference points are designed to prevent F from reaching a level that could result in a subsequent decline in the population because individuals are being removed at a rate that is too fast for the stock to replace. Spawning stock biomass (SSB)-based reference points are designed to prevent SSB from getting too low and compromising the ability of the stock to replenish itself. Both fishing mortality rate and spawning stock biomass levels are used simultaneously to characterize the status of the stock (Figure 10).

The intent of this Amendment is to establish a control rule to accurately categorize the status of the stock by considering both fishing mortality and spawning stock biomass simultaneously. This control rule establishes a target and threshold for spawning stock biomass and a target and threshold fishing mortality rate. The management program developed through this amendment is designed to achieve the target F and spawning stock biomass levels.

Each winter flounder stock will be considered overfished when the spawning stock biomass level falls below the threshold spawning stock biomass level established in this Amendment. Overfishing of a winter flounder population will occur at any time when the fishing mortality threshold is exceeded.

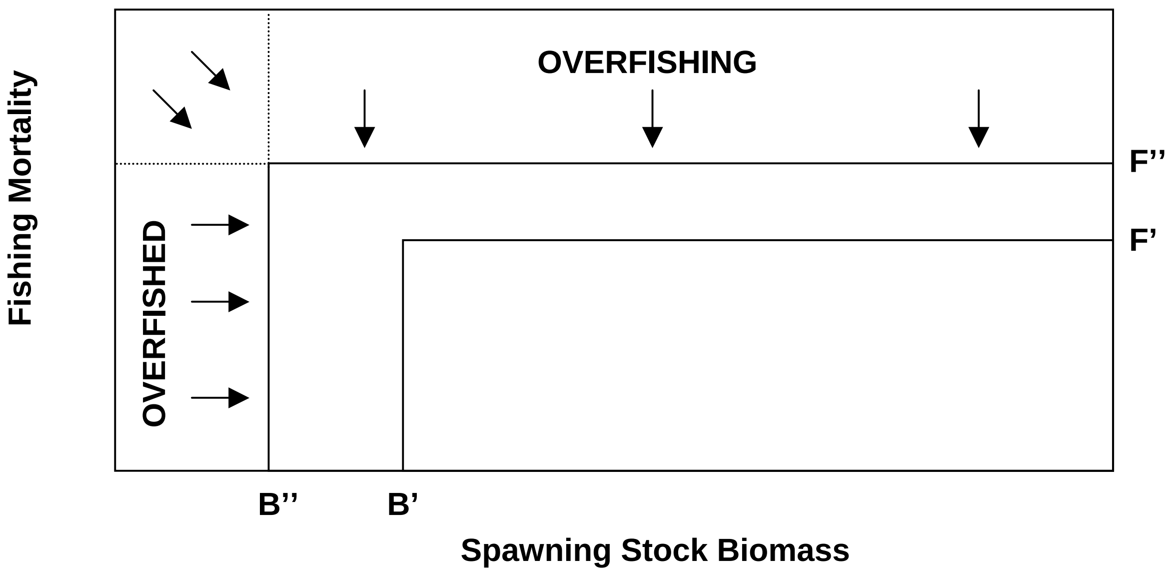


Figure 9. Generalized Representation of the Overfishing Definition utilizing both spawning stock biomass (B', B") and fishing mortality (F', F") targets and thresholds (modified from Mace et al., 1996).

2.5.1 Fishing Mortality Target and Threshold

The Winter Flounder Management Board approved the parameters used to obtain estimates for fishing mortality (F) in the SARC 36 review of the winter flounder stock assessment (NEFSC 2002). This assessment uses fully recruited fishing mortality estimates. Fully recruited fishing mortality describes the mean of the fishing mortality on all the age classes that are fully recruited, or equally vulnerable, to the fishery.

Southern New England/Mid-Atlantic Stock

For the SNE/MA stock, the current estimates set a fishing mortality threshold of F_{msy}=0.32 fully recruited, with a target at 75% of F_{msy}=0.24. The $F_{rebuild}$ under this definition is F_{msy}=0.24. $F_{rebuild}$ is defined as the fishing mortality rate designed to rebuild the stock in 10 years with 50% probability.

Gulf of Maine winter flounder
For the GOM stock, the current estimates set a fishing mortality threshold of F_{msy}=0.43 fully recruited, with a target at 75% of F_{msy}=0.32 fully recruited. No $F_{rebuild}$ is specified for this stock because the assessment did not find that overfishing is occurring on this stock.

2.5.2 Spawning Stock Biomass Target and Threshold
The Winter Flounder Management Board approved the parameters used to obtain estimates for spawning stock biomass (SSB) in the SARC 36 review of the winter flounder stock assessment (NEFSC 2002).

Southern New England/Mid-Atlantic winter flounder
For the SNE/MA stock, the current biomass target estimate is B_{msy}=30,100 mt. The biomass threshold is set at ½SSB_{msy}=15,050 mt SSB.

Gulf of Maine winter flounder
For the GOM stock, the current biomass target estimate is B_{msy}=4,100 mt SSB. The biomass threshold is set at ½SSB_{msy}=2,050 mt SSB.

2.6 STOCK REBUILDING PROGRAM
According to the 2002 stock assessment and the control rules approved by the Winter Flounder Board, the Southern New England/Mid-Atlantic winter flounder stock is overfished and overfishing is occurring. Amendment 1 to the Winter Flounder FMP seeks to restore the Southern New England/Mid-Atlantic winter flounder stock to the target spawning stock levels within the timeframe explained in Section 2.6.2. This restoration is expected to result from the application of conservation and management measures contained in *Section 3 and 4*. Modifications may be made as necessary according to the adaptive management procedures contained in Section 4.5, if ongoing monitoring indicates that the modifications are necessary to meet the Amendment goals, objectives, and rebuilding targets.

According to the 2002 stock assessment, the Gulf of Maine winter flounder stock is not overfished and overfishing is not occurring. Therefore, no rebuilding is needed for the Gulf of Maine winter flounder stock at this time. If the Gulf of Maine winter flounder stock is determined to be overfished and/or overfishing is found to be occurring in the future, the Winter Flounder Management Board would then develop an addendum to establish a rebuilding goal and timeline for the Gulf of Maine stock.

2.6.1 Stock Rebuilding Targets
For the SNE/MA winter flounder stock, it is the intent of Amendment 1 to rebuild the spawning stock biomass to B_{msy} within the timeframe established in *Section 2.6.2*.

Should the GOM winter flounder stock be overfished at any time in the future, it is the intent of Amendment 1 to rebuild the spawning stock biomass to B_{msy} within the timeframe established in *Section 2.6.2*.

2.6.2 Stock Rebuilding Schedules

Southern New England/Mid-Atlantic winter flounder

When the stock size is less than the threshold biomass, the stock is overfished and the fishing mortality rate needed to rebuild the stock ($F_{rebuild}$) will be calculated to rebuild the stock within a period determined by the Board but not to exceed 10 years.

When biomass is below the target but above the threshold, the Board may specify an amount of time that biomass will be allowed to remain between the target and threshold levels. At the end of this time period, action must be taken to reduce fishing mortality below the threshold. This allows a rebuilding fishing mortality rate to be calculated to rebuild to the biomass target within the specified time frame.

Gulf of Maine winter flounder

When the stock size is less than the threshold biomass, the stock is overfished and the fishing mortality rate needed to rebuild the stock ($F_{rebuild}$) will be calculated to rebuild the stock within a period determined by the Board but not to exceed 10 years.

When biomass is below the target but above the threshold, the Board may specify an amount of time that biomass will be allowed to remain between the target and threshold levels. At the end of this time period, action must be taken to reduce fishing mortality below the threshold. This allows a rebuilding fishing mortality rate to be calculated to rebuild to the biomass target within the specified time frame.

2.6.3 Maintenance of Stock Structure

The Winter Flounder Technical Committee will complete stock assessments according to the timeline set forth by the ASMFC Stock Assessment Committee. If an individual stock exceeds threshold limits for exploitation or falls below the threshold limits for biomass, the Board should consider management changes for that stock.

2.8 IMPLEMENTATION SCHEDULE

Amendment 1 to the Interstate Fishery Management Plan for Inshore Stocks of Winter Flounder was approved on February 10, 2005. States are required to submit implementation proposals by March 15, 2005. State proposals will be reviewed for approval during the May 2005 ASMFC Meeting Week. States are required to implement the provisions of Amendment 1 by July 31, 2005, unless a specific alternate date is indicated in the jurisdiction's implementation proposal.

3.0 MONITORING PROGRAM SPECIFICATIONS/ELEMENTS

The Winter Flounder Technical Committee will meet at least once each year to review the stock assessment and all other relevant data pertaining to stock status. The Technical Committee will report on all required monitoring elements outlined in *Section 3* and forward any recommendations to the Winter Flounder Board. The Technical Committee shall also report to the Management Board the results of any other monitoring efforts or assessment activities not included in *Section 3* that may be relative to the stock status of winter flounder or indicative of ecosystem health and interactions.

The Winter Flounder Advisory Panel will meet as necessary to review the stock assessment and all other relevant data pertaining to stock status. The Advisory Panel will forward its report and any recommendations to the Management Board.

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

The Amendment encourages all state fishery management agencies to pursue full implementation of the Atlantic Coastal Cooperative Statistics Program (ACCSP), which will meet the monitoring and reporting requirements of this FMP. The Board recommends a transition or phased-in approach be adopted to allow for full implementation of the ACCSP. Until such time as the ACCSP is implemented, the Board encourages state fishery management agencies to initiate implementation of specific ACCSP modules, and/or pursue pilot and evaluation studies to assist in development of reporting programs to meet the ACCSP standards. The ACCSP partners are the 15 Atlantic coastal states (Maine - Florida), the District of Columbia, the Potomac River Fisheries Commission, the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, the three fishery management Councils, and the Atlantic States Marine Fisheries Commission. Participation by program partners in the ACCSP does not relieve states from their responsibilities in collating and submitting harvest/monitoring reports to the Commission as required under this Amendment.

3.1 ASSESSMENT OF ANNUAL RECRUITMENT

Annual juvenile recruitment (appearance of juveniles in the ecosystem) of winter flounder, which comprise the Atlantic Coast migratory stocks, is measured in order to provide an indication of future stock abundance. When low numbers of juvenile fish (age 0) are produced in a given year, recreational and commercial catches from that year class may be lower when surviving fish become available to the fisheries. Recruitment is measured by sampling current year juvenile fish abundance in nursery areas. Currently, juvenile abundance indices are determined annually in Massachusetts, Rhode Island, New York and Delaware. These states will be required to continue these surveys to develop an annual juvenile abundance index for winter flounder. The details of the surveys are included in the following table.

Responsible State and Agency	Survey Detail
Massachusetts: *Division of Marine Fisheries*	Annual juvenile seine survey
Rhode Island: *Division of Fish and Wildlife*	Juvenile finfish beach seine survey
New York: *Department of Environmental Conservation*	Peconic Bay small mesh survey
Delaware: *Division of Fish and Game*	Small mesh otter trawl survey

3.2 ASSESSMENT OF SPAWNING STOCK BIOMASS

In order to assess the spawning stock biomass of winter flounder, a series of state surveys are conducted annually. These surveys are conducted in Massachusetts, Rhode Island, Connecticut, and New Jersey. Under this amendment these states would be required to annually develop an index of spawning stock biomass. The required surveys are detailed in the following table.

Responsible State and Agency	Survey Detail
Massachusetts: Division of Marine Fisheries	Spring trawl survey
Rhode Island: Division of Fish and Wildlife	Annual trawl surveys
Connecticut: *Department of Environmental Protection*	Long Island Sound Trawl Survey
New Jersey: *Division of Fish, Game and Wildlife*	Bottom trawl survey

3.3 ASSESSMENT OF FISHING MORTALITY TARGET AND MEASUREMENT

The Atlantic States Marine Fisheries Commission's Stock Assessment Committee is currently developing a recommended frequency for stock assessment updates and peer reviews. This information will be forwarded to the ISFMP Policy Board for consideration. The status of the winter flounder stocks and fishing mortality rates will be estimated based on the schedule approved by the Policy Board.

3.4 SUMMARY OF MONITORING PROGRAMS

This Amendment is not requiring any additional monitoring programs at this time. The monitoring and reporting programs will be developed based on the states' implementation of the ACCSP.

3.4.1 Catch and Landings Information

<u>Commercial Catch and Effort Data Collection Programs</u>

The ACCSP commercial data collection program will be a mandatory, trip-based system, with all fishermen and dealers required to report a minimum set of standard data elements (refer to the ACCSP Program Design document for details). Submission of commercial fishermen and dealer reports will be required by the 10th of each month.

Any marine fishery products landed in any state must be reported by a dealer or a marine resource harvester acting as a dealer in that state. Any marine resource harvester or aquaculturist who sells, consigns, transfers, or barters marine fishery products to anyone other than a dealer would themselves be acting as a dealer and would therefore be responsible for reporting as a dealer.

<u>Recreational Catch and Effort Data Collection Programs</u>

The ACCSP recreational data collection program for private/rental and shore modes of fishing will be conducted through a combination telephone and intercept survey. Recreational effort data will be collected through a telephone survey with random sampling of households until such time as a more comprehensive universal sampling frame is established. Recreational catch data will be collected through an access-site intercept survey. A minimum set of standard data elements will be collected in both the telephone and intercept surveys (refer to the ACCSP Program Design document for details). The ACCSP will implement research and evaluation studies to expand sampling and improve the estimates of recreational catch and effort data.

For-Hire Catch/Effort Data Collection Programs
The ACCSP is conducting an evaluation study to determine the best method(s) of data collection for for-hire fisheries. A minimum set of standard data elements will be collected in all for-hire catch/effort surveys (refer to the ACCSP Program Design document for details).

3.4.2 Biological Information
The ACCSP will require the collection of baseline biological data on commercial, for-hire, and recreational fisheries. Biological data for commercial fisheries will be collected through port sampling programs and at-sea observers. Biological data for recreational fisheries will be collected in conjunction with the access-intercept survey. Biological data for for-hire fisheries will be collected through existing surveys and at-sea observer programs. A minimum set of standard data elements will be collected in all biological sampling programs (refer to the ACCSP Program Design document for details). Priorities and target sampling levels will be determined by the ACCSP Biological Review Panel, in coordination with the Discard/Release Prioritization Committee.

3.4.3 Social and Economic Information
Commercial Fisheries
The ACCSP will require the collection of baseline social and economic data on all commercial fisheries (refer to the ACCSP Program Design document for details). A minimum set of standard data elements will be collected by all social and economic surveys (refer to the ACCSP Program Design document for details).

Recreational Fisheries
The ACCSP will require the collection of baseline social and economic data on all recreational fisheries through add-ons to existing recreational catch/effort surveys (refer to the ACCSP Program Design document for details). A minimum set of standard data elements will be collected in all for-hire catch/effort surveys (refer to the ACCSP Program Design document for details).

3.4.4 Discard, Release and Protected Species Interactions Monitoring Program
The ACCSP will require a combination of quantitative and qualitative methods for monitoring discard, release, and protected species interactions in commercial, recreational, and for-hire fisheries. Commercial fisheries will be monitored through an at-sea observer program and several qualitative programs, including strandings, entanglements, trend analysis of logbook reported data, and port sampling. Recreational fisheries will be monitored through add-ons to existing intercept surveys and additional questions added to the telephone survey. For-hire fisheries will be monitored through an at-sea observer program and several qualitative programs (refer to the ACCSP Program Design for details).

3.4.5 Observer Programs
The ACCSP at-sea observer program is a mandatory program. As a condition of state and/or federal permitting, vessels should be required to carry at-sea observers when requested. A minimum set of standard data elements will be collected through the ACCSP at-sea observer program (refer to the ACCSP Program Design document for details). Specific fisheries priorities will be determined by the Discard/Release Prioritization Committee.

3.5 HABITAT PROGRAM

This Amendment is not requiring any additional habitat monitoring programs at this time. Recommendations on monitoring of habitat can be found in Section 5.3.

4.0 MANAGEMENT PROGRAM IMPLEMENTATION

Amendment 13 to the New England Fisheries Management Councils Multispecies Plan for Groundfish (Amendment 13) contains a number of management measures for reducing fishing mortality on the SNE/MA winter flounder stock. These include restrictions on days at sea as well as closed areas, rolling closures, and other measures. For the SNE/MA commercial winter flounder fishery, more than 80% of the landings each year are taken from the EEZ, where the fishery is regulated by Amendment 13. The reductions imposed under Amendment 13 are expected to account for the majority of the reductions determined necessary by the current stock assessment. In response to concerns over a potential shift of effort inshore due to the restrictions imposed by Amendment 13, the ASMFC elected to initiate stock area-specific management measures for both the GOM and SNE/MA stock.

An analysis of the number of non-federal permit holders commercially fishing for winter flounder in state waters and the impact of this fishery on the SNE/MA stock complex was not possible given the lack of data to support such an analysis. Complexities in determining the number of individuals bound only by ASMFC regulations make this precise evaluation difficult. While some states are able to develop an estimate of this number, the estimates range from fewer than 100 to more than 1000 individuals per state. Issues expressed by Technical Committee members include the fact that federal permits are issued to vessels while state permits are issued to individuals, as well as the fact that federal permits may be renewed at any time during the year, allowing individuals to fish under their state license (and therefore not subject to the more restrictive federal regulations) for a part of the year until the federal license is renewed.

The Winter Flounder Management Board elected to use stock area-specific fisheries management measure for both the recreational and commercial sectors of the winter flounder fishery that are part of the management units for the ASMFC draft Amendment 1 to the Interstate Fishery Management Plan for Inshore Stocks of Winter Flounder (FMP). Selection of this option means that management measures will be the same throughout the stock – all states within the SNE/MA stock will have the same recreational and commercial management measures and all states within the GOM stock will have the same recreational and commercial management measures.

According to the reference point parameters selected by the Management Board, a reduction in fishing mortality is necessary for the SNE/MA stock of winter flounder. No reduction in fishing mortality is necessary for the GOM stock of winter flounder. In order to harmonize management measures within the GOM stock and to prevent future overexploitation, management measures were changed in the GOM stock area.

SECTION 4.1: RECREATIONAL FISHERIES MANAGEMENT MEASURES

Southern New England/Mid-Atlantic Stock

States in the Southern New England/Mid-Atlantic stock area must implement a 12” minimum size limit and a 10-fish creel limit. Each state in the SNE/MA stock area may have a 60-day open season for recreational winter flounder fishing. In addition, 20 days must be closed to recreational winter flounder fishing during March and April. The 60-day open season can be split into no more than two blocks.

Gulf of Maine Stock

States within the GOM stock must maintain the existing 12” minimum size and adopt an 8-fish creel limit. There are no required recreational closed seasons in the GOM stock area.

SECTION 4.2: COMMERCIAL FISHERIES MANAGEMENT MEASURES

Amendment 13 is expected to contribute the bulk of the necessary reduction for the SNE/MA stock, as the portion of the fishery regulated by Amendment 13 is responsible for the largest portion of winter flounder landings from the SNE/MA stock. The expected reduction in fishing mortality for SNE/MA winter flounder due to the provisions of Amendment 13 is between 37 and 49%. Amendment 13 regulates winter flounder fisheries through Days-At-Sea (DAS) allowances, mesh requirements, rolling season closures, and a closed habitat area. The management measures included in this Amendment are designed to work in conjunction with the measures imposed by Amendment 13 with a focus on the inshore component of the SNE/MA stock area.

Southern New England/Mid-Atlantic Stock

States within the Southern New England/Mid-Atlantic stock area must implement a 12” minimum size limit, a minimum 6.5” square or diamond mesh in the cod-end, and maintain any existing seasonal closures.

The mesh size regulation includes a 100 lb. trip limit for winter flounder if smaller mesh is being used. This 100 lb. “mesh trigger” provides for the landing of a small amount of winter flounder as bycatch in smaller-mesh fisheries.

Gulf of Maine Stock

States within the Gulf of Maine stock area must maintain the existing 12” minimum size limit and remain consistent with the adjacent EEZ mesh size regulations. The current mesh size in the EEZ adjacent to the states in the GOM stock area is a 6.5” diamond or square mesh in the cod-end.

States must maintain existing season closures, including any Federal rolling closures that affect state waters in the GOM stock area.

4.3 ALTERNATIVE STATE MANAGEMENT REGIMES

Once approved by the Winter Flounder Management Board, states are required to obtain prior approval from the Board of any changes to their management program for which a compliance requirement is in effect. Other non-compliance measures must be reported to the Board but may be implemented without prior Board approval. States may implement more conservative measures at any time without prior approval, but must report such changes to the Board. A state can request permission to implement an alternative to any mandatory compliance measure only if that state can show to the Board's satisfaction that its alternative proposal will have the same conservation value as the measure contained in this amendment or any addenda prepared under Adaptive Management (*Section 4.6*). States submitting alternative proposals must demonstrate that the proposed action will not contribute to overfishing of the resource. All changes in state plans must be submitted in writing to the Board and to the Commission either as part of the annual FMP Review process or the Annual Compliance Reports.

4.3.1 General Procedures

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

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

The Winter Flounder Management Board will decide whether to approve the state proposal for an alternative management program if it determines that it is consistent with the "target fishing mortality rate applicable", and the goals and objectives of this amendment.

4.3.2 Management Program Equivalency

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

4.3.3 *De minimis* Fishery Guidelines

The ASMFC Interstate Fisheries Management Program Charter defines *de minimis* as "a situation in which, under the existing condition of the stock and scope of the fishery, conservation, and enforcement actions taken by an individual state would be expected to contribute insignificantly to a coastwide conservation program required by a Fishery Management Plan or amendment" (ASMFC 2000).

States may petition the Winter Flounder Management Board at any time for *de minimis* status. Once *de minimis* status is granted, designated states must submit annual reports including commercial and recreational landings to the Management Board justifying the continuance of *de minimis* status. States must include *de minimis* requests as part of their annual compliance reports.

States may apply for *de minimis* status if, for the preceding three years for which data are available, their average commercial landings or recreational landings (by weight) constitute less than 1% of the coastwide commercial or recreational landings for the same three year period. A state that qualifies for *de minimis* based on their commercial landings will qualify for exemptions in their commercial fishery only, and a state that qualifies for *de minimis* based on their recreational landings will qualify for exemptions in their recreational fishery only.

States that apply for and are granted *de minimis* status are exempted from biological monitoring/sub-sampling activities for the sector for which de minimis has been granted (i.e., commercial *de minimis* qualifies for a commercial monitoring exemption). States must still report annual landings, comply with recreational and commercial management measures, and apply for *de minimis* on an annual basis.

4.4 ADAPTIVE MANAGEMENT

The Winter Flounder Management Board may vary the requirements specified in this amendment as a part of adaptive management in order to conserve the winter flounder resource. Specifically, the Management Board may change target fishing mortality rates and harvest specifications, or other measures designed to prevent overfishing of the stock complex or any spawning component. Such changes will be instituted to be effective on the first fishing day of the following year, but may be put in place at an alternative time when deemed necessary by the Management Board. These changes should be discussed with the appropriate federal representatives and Councils prior to implementation in order to be complementary to the regulations for the EEZ.

4.4.1 General Procedures

The Plan Review Team will monitor the status of the fishery and the resource and report on that status to the Winter Flounder Management Board annually, or when directed to do so by the Management Board. The Plan Review Team will consult with the Technical Committee, the Stock Assessment Committee, and the Advisory Panel, if any, in making such review and report. The report will contain recommendations concerning proposed adaptive management revisions to the management program.

The Winter Flounder Management Board will review the report of the Plan Review Team, and may consult further with Technical Committee, the Stock Assessment Committee or the Advisory Panel. The Management Board may direct the PRT to prepare an addendum to make any changes it deems necessary. The addendum shall contain a schedule for the states to implement its provisions.

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

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

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

4.4.2 Circumstances Under Which Change May Occur

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

4.4.3 Measures Subject to Change

The following measures are subject to change under adaptive management upon approval by the Winter Flounder Management Board:

1. Fishing year and/or seasons;
2. Area closures;
3. Overfishing definition, MSY and OY;
4. Rebuilding targets and schedules;
5. Catch controls, including bag and size limits;
6. Effort controls;
7. Reporting requirements;
8. Gear limitations;
9. Measures to reduce or monitor bycatch;
10. Observer requirements;
11. Management areas;
12. Recommendations to the Secretaries for complementary actions in federal jurisdictions;
13. Research or monitoring requirements;
14. Stock enhancement protocols;
15. Penalties to address delays in implementation of Amendment 1; and
16. Any other management measures currently included in Amendment 1, including trip limits, changes in mesh size regulations, a stockwide catch or effort quota, changes to the minimum size limit, establishing a maximum size limit, imposing season and/or area restrictions, and implementing vessel size or other gear restrictions.

4.5 EMERGENCY PROCEDURES

Emergency procedures may be used by the Winter Flounder Management Board to require any emergency action that is not covered by or is an exception or change to any provision in Amendment 1. Procedures for implementation are addressed in the ASMFC Interstate Fisheries Management Program Charter, Section Six (c)(10) (ASMFC 2000).

4.6 MANAGEMENT INSTITUTIONS

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

4.6.1 ASMFC and the ISFMP Policy Board

The ASMFC (Commission) and the ISFMP Policy Board are generally responsible for the oversight and management of the Commission's fisheries management activities. The Commission must approve all fishery management plans, and amendments, including this Amendment 1; and must also make all final determinations concerning state compliance or noncompliance. The ISFMP

Policy Board reviews any non-compliance recommendations of the various Management Boards and Sections and, if it concurs, forwards them on to the Commission for action.

4.6.2 Winter Flounder Management Board

The Winter Flounder Management Board was established under the provisions of the Commission's ISFMP Charter (Section Four [b]) and is generally responsible for carrying out all activities under this amendment (ASMFC 2000).

The Winter Flounder Management Board (Board) establishes and oversees the activities of the Plan Development or Plan Review Team, the Technical Committee and the Stock Assessment Subcommittee; and requests the establishment of the Commission's Winter Flounder Advisory Panel. Among other things, the Board makes changes to the management program under adaptive management and approves state programs implementing the amendment and alternative state programs under *Sections 4.5* and *4.6*. The Board reviews the status of state compliance with the FMP or amendment at least annually, and if it determines that a state is out of compliance, reports that determination to the ISFMP Policy Board under the terms of the ISFMP Charter.

4.6.3 Winter Flounder Plan Development / Plan Review Team

The Winter Flounder Plan Development Team (PDT) and the Winter Flounder Plan Review Team (PRT) will be composed of a small group of scientists and/or managers whose responsibility is to provide all of the technical support necessary to carry out and document the decisions of the Winter Flounder Management Board. Both are chaired by an ASMFC FMP Coordinator. The Winter Flounder PDT/PRT is directly responsible to the Board for providing information and documentation concerning the implementation, review, monitoring and enforcement of Amendment 1. The Winter Flounder PDT/PRT shall be comprised of personnel from state and federal agencies who have scientific and management ability and knowledge of winter flounder. The PDT will be responsible for preparing all documentation necessary for the development of Amendment 1, using the best scientific information available and the most current stock assessment information. The PDT will either disband or assume inactive status upon completion of Amendment 1. Alternatively, the Board may elect to retain PDT members as members of the PRT or appoint new members. The PRT will provide annual advice concerning the implementation, review, monitoring, and enforcement of Amendment 1 once it has been adopted by the Commission.

4.6.4 Winter Flounder Technical Committee

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

4.6.5 Winter Flounder Stock Assessment Subcommittee

The Winter Flounder Stock Assessment Subcommittee shall be appointed by the Technical Committee at the request of the Management Board, and will consist of scientists with expertise in the assessment of the winter flounder population. Its role is to assess the winter flounder population and provide scientific advice concerning the implications of proposed or potential management alternatives, or to respond to other scientific questions from the Board, Technical Committee, PDT or PRT. The Stock Assessment Subcommittee will report to the Technical Committee.

4.6.6 Winter Flounder Advisory Panel
The Winter Flounder Advisory Panel was established according to the Commission's Advisory Committee Charter. Members of the Advisory Panel are citizens who represent a cross-section of commercial and recreational fishing interests and others who are concerned about winter flounder conservation and management. The Advisory Panel provides the Board with advice directly concerning the Commission's winter flounder management program.

4.6.7 Federal Agencies
4.6.7.1 Management in the Exclusive Economic Zone (EEZ)
Management of winter flounder in the EEZ is currently under the jurisdiction of the New England Fishery Management Council under the Magnuson-Stevens Act (16 U.S.C. 1801 et seq.). In the absence of a Council Fishery Management Plan, management would be the responsibility of the NMFS as mandated by the Atlantic Coastal Fisheries Conservation and Management Act (16 U.S.C. 5105 et seq.)

4.6.7.2 Federal Agency Participation in the Management Process
The Commission has afforded the United States Fish and Wildlife Service (USFWS) and the NMFS voting status on the ISFMP Policy Board and the Winter Flounder Board in accordance with the Commission's ISFMP Charter. The NMFS also participates on the Winter Flounder Technical Committee and Stock Assessment Subcommittee.

4.6.7.3 Consultation with Fishery Management Councils
In carrying out the provisions of Amendment 1, the states, as members of the Winter Flounder Management Board, shall closely coordinate with the New England Fishery Management Council in order to cooperatively manage the Atlantic coast winter flounder population. In accordance with the Commission's ISFMP Charter, a representative of the New England Fishery Management Council may be invited to participate as a full member of the Winter Flounder Board.

4.7 RECOMMENDATIONS TO THE SECRETARIES FOR COMPLEMENTARY ACTIONS IN FEDERAL JURISDICTIONS
The Atlantic States Marine Fisheries Commission believes that the SNE/MA stock of the winter flounder resource covered by this fishery management plan continues to be overfished and in need of conservation. It would be inconsistent with this approach to allow any meaningful increase in fishing mortality. Therefore it is important that the federal government maintain the fishing mortality controls that are included in Amendment 13 to the Northeast Multispecies (Groundfish) Fishery Management Plan.

4.8 COOPERATION WITH OTHER MANAGEMENT INSTITUTIONS
At this time, no other management institutions have been identified that would be involved with management of winter flounder on the Atlantic Coast. Nothing in Amendment 1 precludes the coordination of future management collaboration with other management institutions should the need arise.

5.0 COMPLIANCE

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

5.1 MANDATORY COMPLIANCE ELEMENTS FOR STATES

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

- its regulatory and management programs to implement *Section 4* have not been approved by the Winter Flounder Management Board; or
- it fails to meet any schedule required by *Section 5.1.2*, or any addendum prepared under adaptive management (*Section 4.4*); or
- it has failed to implement a change to its program when determined necessary by the Winter Flounder Management Board; or
- it makes a change to its regulations required under *Section 4* or any addendum prepared under adaptive management (*Section 4.4*), without prior approval of the Winter Flounder Management Board.

5.1.1 Mandatory Elements of State Programs

To be considered in compliance with this fishery management plan, all state programs must include harvest controls on winter flounder fisheries consistent with the requirements of *Sections 4.1, 4.2* and *4.3*; except that a state may propose an alternative management program under *Section 4.3.2*, which, if approved by the Management Board, may be implemented as an alternative regulatory requirement for compliance.

5.1.1.1 Regulatory Requirements

States may begin to implement Amendment 1 after final approval by the Commission. Each state must submit its required winter flounder regulatory program to the Commission through the ASMFC staff for approval by the Winter Flounder Management Board. During the period from submission, until the Management Board makes a decision on a state's program, a state may not adopt a less protective management program than contained in this management plan or contained in current state law.

The following lists the specific compliance criteria that a state/jurisdiction must implement in order to be in compliance with Amendment 1:

1. All jurisdictions in the SNE/MA stock area will implement a 12" minimum size limit and a 10-fish creel limit. Each state in the SNE/MA stock area may have a 60-day open season for recreational winter flounder fishing. In addition, 20 days must be closed to recreational winter flounder fishing during March and April. The 60-day open season can be split into no more than two blocks.
2. All jurisdictions in the GOM stock area will maintain a 12" minimum size limit and implement an 8-fish creel limit. There are no required recreational closed seasons in the GOM stock area.
3. All jurisdictions in the SNE/MA stock area will implement a 12" minimum size limit, a minimum 6.5" square or diamond mesh in the cod-end, and maintain any existing seasonal closures. The mesh size regulation includes a 100 lb. trip limit for winter flounder if smaller mesh is being used. This 100 lb. "mesh trigger" provides for the landing of a small amount of winter flounder as bycatch in smaller-mesh fisheries.
4. All jurisdictions in the GOM stock area will maintain the existing 12" minimum size limit and remain consistent with the adjacent EEZ mesh size regulations. The current mesh size in the EEZ adjacent to the states in the GOM stock area is a 6.5" diamond or square mesh in the cod-end. States must maintain existing season closures, including any Federal rolling closures that affect state waters in the GOM stock area.

Once approved by the Winter Flounder Management Board, states are required to obtain prior approval from the Board of any changes to their management program for which a compliance requirement is in effect. Other measures must be reported to the Board but may be implemented without prior Board approval. A state can request permission to implement an alternative to any mandatory compliance measure only if that state can show to the Board's satisfaction that its alternative proposal will have the same conservation value as the measure contained in this amendment or any addenda prepared under Adaptive Management (*Section 4.4*). States submitting alternative proposals must demonstrate that the proposed action will not contribute to overfishing of the resource. All changes in state plans must be submitted in writing to the Board and to the Commission either as part of the annual FMP Review process or the Annual Compliance Reports.

5.1.1.2 Monitoring Requirements
All state programs must include the mandatory monitoring requirements contained in Sections *3.1, 3.2,* and *3.3*. States must submit proposals for all intended changes to required monitoring programs which may affect the quality of the data, or the ability of the program to fulfill the needs of the fishery management plan. In the event that a state realizes it will not be able to fulfill its fishery independent monitoring requirements, it should immediately notify the Commission in writing. The Commission will work with the state to develop a plan to secure funding or plan an alternative program to satisfy the needs outlined in Amendment 1. If the plan is not implemented 90 days after it has been adopted, the state may be found out of compliance with Amendment 1.

5.1.1.3 Research Requirements
The PDT and Technical Committee will prioritize the research needs for winter flounder. Appropriate programs for meeting these needs may be implemented under *Section 4.4* (Adaptive Management) through the Commission's addendum process including the opportunity for public comment.

5.1.1.4 Law Enforcement Requirements
All state programs must include law enforcement capabilities adequate for successfully implementing that state's winter flounder regulations. The adequacy of a state's enforcement activity will be monitored annually by reports of the ASMFC Law Enforcement Committee to the Winter Flounder Plan Review Team. The first reporting period will cover the 2005 fishing year.

5.1.1.5 Habitat Requirements
There are no mandatory habitat requirements for winter flounder. See *Section 5.3* for Habitat Recommendations.

5.1.2 Compliance Schedule
States must implement Amendment 1 according to the following schedule:

March 15, 2005: States must submit programs to implement Amendment 1 for approval by the Winter Flounder Management Board. Programs must be implemented upon approval by the Management Board.

July 31, 2005: States with approved management programs must implement Amendment 1. States may begin implementing management programs prior to this deadline if approved by the Management Board.

If a jurisdiction cannot implement their winter flounder regulations by the July 31 deadline, the jurisdiction must propose an alternative implementation date in their new proposal. Subsequently, the Management Board must approve the revised implementation date for the jurisdiction.

Reports on compliance must be submitted to the Commission by each jurisdiction annually, no later than **November 1** of each year**,** beginning in 2006.

5.1.3 Compliance Report Content
Each state must submit an annual report concerning its winter flounder fisheries and management program for the previous calendar year. A standard compliance report format has been prepared and adopted by the ISFMP Policy Board. States should follow this format in completing the annual compliance report.

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

In brief, all states are responsible for the full and effective implementation and enforcement of fishery management plans in areas subject to their jurisdiction. Written compliance reports as specified in the Plan or Amendment must be submitted annually by each state with a declared interest. Compliance with Amendment 1 will be reviewed at least annually. The Winter Flounder Management Board, ISFMP Policy Board or the Commission, may request the Winter Flounder Plan Review Team to conduct a review of plan implementation and compliance at any time.

The Winter Flounder Management Board will review the written findings of the PRT within 60 days of receipt of a State's compliance report. Should the Management Board recommend to the Policy Board that a state be determined out of compliance, a rationale for the recommended non-compliance finding will be included addressing specifically the required measures of Amendment 1 that the state has not implemented or enforced, a statement of how failure to implement or enforce the required measures jeopardizes winter flounder conservation, and the actions a state must take in order to comply with Amendment 1 requirements.

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

The Commission shall consider any Amendment 1 non-compliance recommendation from the Policy Board within 30 days. Any state which is the subject of a recommendation for a non-compliance finding is given an opportunity to present written and/or oral testimony concerning whether it should be found out of compliance. If the Commission agrees with the recommendation of the Policy Board, it may determine that a state is not in compliance with Amendment 1, and specify the actions the state must take to come into compliance.

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

5.3 RECOMMENDED (NON-MANDATORY) MANAGEMENT MEASURES

The Winter Flounder Board, through Amendment 1, requests that those states outside the management unit (Maryland and Virginia) implement complementary regulations to protect the overfished winter flounder spawning stock.

The recommendations included below correspond to the threats to habitat areas of particular concern outlined in Section 1.4.1 above. State fishery agencies should actively intervene to the extent of their authority to ensure that federal, state, and local permitting agents are aware of the loss in winter flounder productivity associated with water quality degradation and habitat loss and give full consideration to the following recommendations.

1. **Recommendations to address concerns regarding *suspended sediments* (through dredging and other activities):**
   - Establish and enforce strict timeframes when sediment dredge activities should be prohibited or minimized in spawning and nursery areas
   - For all projects that cause a resuspension of sediments (e.g., navigational dredging), the following should be undertaken:
     - Assess and minimize risks to winter flounder from suspended sediments and potential toxic contaminants released to the water column from the resuspended sediments by examining the duration of the activity (e.g., one day, one year), repetitiveness of the activity (e.g., daily, weekly, annual event), sequencing of the activity, spatial extent, and timing (e.g., winter).

- Establish strict time frames when sediment resuspension activities should be prohibited or minimized in spawning and nursery habitats and link to ambient water temperatures.
- Develop and use sediment toxic contamination level guidelines/criteria to assess potential acute and chronic toxicity to winter flounder. Remediate in-place sediments where acute levels are exceeded. If acutely toxic sediments are proposed to be re-suspended through some activity, employ measures to reduce and control toxicity levels spatially and over time.

➢ Utilize all state authorities under the Clean Water Act to minimize impairments to winter flounder and their habitats by issuing 401 water quality certifications that minimize sediment resuspension, especially in winter flounder spawning habitats.

2. **Recommendations to address concerns regarding *degradation of near shore waters by habitat alteration, nutrient enrichment, and toxics:***

➢ Implement protective land use practices such as establishing substantial buffer zones around productive nursery grounds

➢ Implement effective oil and toxic chemical spill prevention and control programs to prevent accidental release and prioritize cleanup plans to protect areas where winter flounder are known to concentrate for spawning. Incorporate spawning and nursery maps in Oil Spill Contingency Plans

➢ Establish and enforce no-vessel-discharge zones and promote education of recreational boaters to reduce their contamination of inshore waters from chronic vessel fuel spills, waste disposal, and gray water discharge.

➢ Physical alteration of known nursery habitat, such as sediment removal by dredging, bulkheading, and channelization, must be considered in terms of impacts to winter flounder production for all permitting decisions. If adverse impacts are identified, then the proposed project should be modified, denied or mitigated. Spawning and nursery maps should be provided to all regulatory agencies and incorporated into state coastal zone management plans,

➢ Assess the cumulative effects of all existing and proposed docks, piers, platforms, and other physical structures impinging winter flounder spawning areas.

➢ Utilize all state authorities under the Clean Water Act to minimize impairments to winter flounder and their habitats by:

- Meeting water quality standards, especially for dissolved oxygen, suspended solids, ammonia, and toxic contaminants;
- Developing TMDLs for all 303(d) listed waters, where the above water quality standards are not met;
- Developing and implementing Section 319 Non-point Source Management Plans, Coastal Non-point Pollution Control Plans and Stormwater Management Programs that consider potential adverse impacts to winter flounder habitats, especially spawning habitats;
- Performing whole effluent toxicity tests at wastewater treatment plants where toxic effluent levels are exceeded in the discharge;
- Enforcing PDES (Pollution Discharge Elimination System) permit effluent limits and ensuring proper maintenance and operation of domestic septic systems;
- When waters are classified or reclassified for best uses, incorporate winter flounder spawning and nursery area information

3. **Recommendations to address concerns regarding Impacts by *Power Plants* (in addition water intake from desalinization plants, and water treatment plants):**
   - Either encourage closed system plants or assist industrial siting councils in siting new plants to avoid winter flounder spawning areas
   - When existing plants renew their permits or upgrade their technology, encourage closed system plants or other best available technology to minimize plant induced mortality
   - Assess cooling water entrainment/impingement mortality at existing plants on a stage-specific basis for both local and regional flounder populations and use this information to address these impacts.

5.4 ANALYSIS OF ENFORCEABILITY OF PROPOSED MEASURES

The ASMFC Law Enforcement Committee reviewed all of the options approved for the Amendment 1 draft for public comment for the degree of enforceability. The LEC determined that stock area-specific management measures are enforceable in that the current stock definitions (Section 2.4) are large and cover many jurisdictions. This creates consistent regulations throughout a region. The enforcement concern is based on the fact that one state has a two-stock overlap, causing the state to only enforce one set (presumably the least restrictive) of management measures within their jurisdiction. This concern could be decreased if states that are at the boundary of adjacent stock areas enforce the more restrictive set of management measures.

6.0 MANAGEMENT AND RESEARCH NEEDS

The following list of research needs have been identified in order to enhance the state of knowledge of the winter flounder resource, population dynamics, ecology, and the various fisheries for winter flounder. The Technical Committee, Advisory Panel, and Management Board will review this list annually and an updated prioritized list will be included in the Annual Winter Flounder FMP Review.

6.1 STOCK ASSESSMENT AND POPULATION DYNAMICS

Coastwide

- Expand sea sampling for estimation of commercial discards.
- Conduct gear study to determine selectivity of diamond and square mesh sizes larger than 6 inches on winter flounder (and other groundfish species).
- Focus research on quantifying mortality associated with habitat loss and alteration, contamination by toxics and power plant entrainment and impingement.
- Research studies should be designed to provide reliable estimates of anthropogenic mortality from sources other than fishing. Both mortality sources should then be incorporated into fisheries yield/recruit models to simultaneously evaluate these dual mortality factors.

Southern New England - Mid-Atlantic Stock Complex

- Maintain or increase sampling levels and collect age information from MRFSS samples.
- Expand sea sampling for estimation of commercial discards.
- Develop a geographically more comprehensive data set to calculate maturity at age, reflecting any differential availability of mature fish to inshore and offshore surveys. Re-examine the maturity ogive to incorporate any recent research results.
- Further examine the comparability of age length keys from different areas within the stock

(current comparisons are based on two years and three ages). Conduct an age structure comparison between NEFSC, CT DEP, and MA DMF to ensure consistency in ageing protocol (work in progress).

- Compile NEFSC Winter Survey abundance indices for winter flounder and evaluate their activity.
- Evaluate the utility of MA DMF sea sample data for winter flounder.
- Revise the recreational fishery discard estimates by applying a consistent method across all years, if feasible (i.e., the Gibson 1996 method).
- Age archived MA DMF survey age samples for 1978-1989.
- Examine the implications of anthropogenic mortalities caused by pollution and power plant entrainment in estimation of yield per recruit, if feasible.
- Estimate/evaluate effects of catch-and-release components of recreational fishery on discard at age (i.e. develop mortality estimates from the American Littoral Society tagging database, if feasible).
- Explore the feasibility of stratification of commercial fishery discard estimation by fishery (e.g., mesh, gear, area).

Gulf of Maine Stock

- Process archived age samples from surveys and commercial landings, and develop analytical age based assessment.
- Improve sampling for biological data (particularly hard parts for ageing) of commercial landings of winter flounder.
- Expand sea sampling in order to validate commercial discard estimates from Vessel Trip Reports (logbooks).
- Maintain or increase sampling levels and collect age information from MRFSS samples.
- Update age-based biological reference points for the GOM stock and examine other biological reference points and rebuilding strategies in projection models.
- Update or conduct regional maturity studies. This may require a maturity workshop to ensure the use of standardized criteria among regional studies.
- Evaluate size-selectivity performance of survey gear compared to typical commercial gear, and implications for estimation of commercial discards from research survey length frequency information.
- Evaluate the feasibility of virtual population analysis based only on ages fully recruited to landings (i.e. no discards).
- Examine growth variations within the Gulf of Maine, using results from the Gulf of Maine Biological Sampling Survey (1993-94).
- Evaluate effects of smoothed length-frequency distributions on the relationship between survey and commercial catches at length.
- Further examine the stock boundaries to determine if Bay of Fundy winter flounder should be included in the Gulf of Maine stock complex.
- Estimate/evaluate the effects of catch-and-release components of the recreational fishery on discard at age.

6.2 RESEARCH AND DATA NEEDS

6.2.1 Biological

- Examine the implications of stock mixing from data from the Great South Channel region.

- Conduct studies to delineate all major substocks in terms of geographic spawning area and seasonal offshore movements (e.g. exposure to fishing pressure).
- Conduct studies to identify major predators (such as seals, cormorants or striped bass) of winter flounder and quantify their potential impact on winter flounder stocks. Special emphasis may be warranted on local spawning populations of winter flounder.

6.2.2 Social

- Conduct studies on social impacts of selected management options on commercial fishermen and fishing communities

6.2.3 Economic

- Conduct studies on the costs and returns of commercial fishermen
- Conduct studies on the expenditures of recreational fishermen
- Conduct studies on economic impacts of selected management options on commercial fishermen
- Conduct studies on the economic value of recreational fishing
- Conduct studies on the marketing arrangements for winter flounder

6.2.4 Habitat

Further study of winter flounder populations in both impacted and un-impacted areas is required to fully quantify physiological adaptation to habitat alteration, and synergistic effects on the individual and population level. Assessment of each population's exposure to inshore habitat degradation will require delineation of the population's spawning and nursery areas. States should identify these areas so that essential spawning and nursery grounds can be protected.
Research studies should also be designed to provide reliable estimates of anthropogenic mortality (Mp) from sources other than fishing. Both mortality sources should then be incorporated into fisheries yield/recruit models to simultaneously evaluate these dual mortality factors.

Data needs concerning the relationship between various life history stages of winter flounder and their associated habitat can be divided into four broad categories. Specific tasks associated with these broad research needs are listed below:

1. **Quantify Habitat by Type** – Habitat types contribute specific functions and values to the winter flounder populations. Identification and quantification of each type will aid in the protection of the most valuable areas.
   High Research Priority:
   - Identify and map spawning, nursery and juvenile habitat in each state using a standardized GIS methodology. Develop high resolution mapping of all habitat types.
   - Enhance biological sampling to complete life history distribution and abundance information among habitat types and in regions not currently covered by state or federal surveys. Expand analysis of existing data sets, such as egg and larval data from impact assessment surveys, in order to identify/verify inshore distribution and abundance of all life stages.
   - **Describe different components of the winter flounder "stock complexes" and their habitat preferences. A comprehensive effort using techniques, such as microsatelite DNA, should be undertaken over the entire range of the species.**
   - Improve/establish comparability of local/state/federal surveys of abundance;

2. **Determine the Functional Role of Each Habitat Type** - The mechanisms by which habitat influences winter flounder survivorship, growth and reproduction are only partially understood. Better understanding of these functions provides a valuable assessment tool. Full understanding of the apparent log-relationship between habitat quantity and fish stock size is particularly critical.

   High Research Priority:
   - Develop life-history/stage-specific information describing optimal habitat conditions for growth and survival;

   Medium Research Priority:
   - Develop and test laboratory and field techniques to measure habitat-specific survival, growth, reproduction, and production rates
   - Identify primary cues used by larvae and juveniles for recruitment from spawning and nursery areas to other estuarine habitats;
   - Determine the relationship between SAV habitat and winter flounder production.
   - Determine the relationship between shell habitat and winter flounder production.

   Low Research Priority:
   - Determine if there is a link between spawning and juvenile habitat. Does the loss of one impact the other.

3. **Determine the Effect of Oceanographic and Climatic Processes –** Long-term climatic changes, water mass characteristics and movement appear to affect the distribution, abundance and productivity of winter flounder at both large and small scales. Understanding these processes would provide for better predictive capabilities for managing this species.

   High Research Priority:
   - Determine the effect of average surface water temperature change (large-scale climate change) on winter flounder abundance and habitat utilization.

   Medium Research Priority:
   - Use coastal change analyses to document trends in habitat loss/gain and determine impacts on each life history stage.

4. **Determine the Extent and Degree of Anthropogenic Impacts on Habitat Functions and Values –** Human impacts on habitat can eclipse the effect of fishing on an estuarine- dependant species such as winter flounder. Very few of these non-fishing impacts have been quantified, and none on a regional or stock-wide scale.

   High Research Priority:
   - Quantify mortality associated with habitat loss and alteration.
   - <u>**Determine the population level effects of impingement and entrainment from water intake structures.**</u>
   - <u>**Investigate the potential for toxicity and/or bioaccumulation of contaminants on all life history stages from in-situ sediments and relocated marine sediments prior to dredging and after disposal.**</u>
   - Evaluate the effectiveness of temporal dredging windows, establish windows and dredge sequencing for minimization of adverse effects.
   - Determine the effects of turbidity plumes on each life history stage.
   - Determine the impacts of various fishing gears on critical spawning and nursery habitat.

Medium Research Priority:

- Evaluate the effectiveness of "marine reserves" relative to stock enhancement efforts and other management techniques for habitat conservation and protection.
- Quantify mortality associated with toxic contamination, including effluent chlorination, PAHs and PCBs .
- **Analyze egg and larval data from power plant surveys in order to identify/verify inshore distribution and abundance of these life stages.**
- Investigate/develop fishing gear with less impact, e.g. raised foot rope trawl

Low Research Priority:

- Determine the impacts of harmful algal blooms and low dissolved oxygen events.
- Determine the population level effects of freshwater inflow to estuaries.
- Determine the effects of open-ocean waste disposal on feeding grounds and migration
- Determine impacts of non-indigenous species.

7.0 PROTECTED SPECIES

In the fall of 1995, Commission member states, the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) began discussing ways to improve implementation and enforcement of the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA) in state waters. In November 1995, the Commission, through its Interstate Fisheries Management Program (ISFMP) Policy Board, approved an amendment of its ISFMP Charter (section 6(b)(2)) so that protected species and their interactions with ASMFC managed fisheries are addressed in the Commission's fisheries management planning process. Specifically, the Commission's fishery management plans (FMP) will describe impacts of state fisheries on certain marine mammals and endangered species (collectively termed "protected species"), and recommend ways to minimize these impacts. The following section outlines: (1) the federal legislation that guides protection of marine mammals and sea turtles, (2) the protected species with potential fishery interactions; (3) the specific type(s) of fishery interaction; (4) population status of the affected protected species; and (5) potential impacts to Atlantic coastal state and interstate fisheries.

7.1 MARINE MAMMAL PROTECTION ACT (MMPA) REQUIREMENTS

The 1994 amendments to the MMPA established both short- and long-term goals for reduction of incidental mortality and serious injury, or bycatch, of marine mammals incidental to commercial fisheries. The amendments also established take reduction plans (TRPs) and stakeholder-based take reduction teams (TRTs) as the mechanisms for achieving these goals. The MMPA requires NMFS to convene TRTs to develop TRPs for each strategic stock that interacts with a Category I or II fishery, fisheries with "frequent" or "occasional" marine mammal bycatch, respectively. (Fisheries that have a remote likelihood of or no known bycatch of marine mammals are Category III fisheries.) A strategic stock is defined as a stock: (1) for which the level of direct human-caused mortality exceeds the potential biological removal (PBR)[1] level; (2) which is declining and is likely to be listed under the ESA in the foreseeable future; or (3) which is listed as a threatened or endangered species under the ESA or as a depleted species under the MMPA. In the short-term

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

(within six months of implementation), TRPs must reduce marine mammal bycatch to levels below a marine mammals stock's potential biological removal level. In the long-term (within five years of implementation), TRPs must reduce marine mammal bycatch to insignificant levels approaching a zero mortality and serious injury rate taking into account the economics of the fishery, the availability of existing technology, and existing state or regional fishery management plans.

The 1994 amendments also required fishermen in Category I and II fisheries to register under the Marine Mammal Authorization Program (MMAP), the purpose of which is to provide an exception for commercial fishermen from the general taking prohibitions of the MMPA; to take on board an observer if requested to do so by the Secretary of Commerce; and to comply with any applicable TRP or emergency regulations. All commercial fishermen, regardless of the category of the fishery in which they participate, must report all marine mammal bycatch.

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

7.2 ENDANGERED SPECIES ACT (ESA) REQUIREMENTS

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

7.3 PROTECTED SPECIES WITH POTENTIAL FISHERY INTERACTIONS

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

Listed below are protected species found in coastal and offshore waters of the Northwest Atlantic

Ocean. Species of Concern are also listed, but do not carry any procedural or substantive protections under the ESA.

Endangered

Right whale	(*Eubalaena glacialis*)
Humpback whale	(*Megaptera novaeangliae*)
Fin whale	(*Balaenoptera physalus*)
Sperm whale	*(Physeter macrocephalus)*
Blue whale	*(Balaenoptera musculus)*
Sei whale	*(Balaenoptera borealis)*
Green turtle2	*(Chelonia mydas*)
Leatherback turtle	(*Dermochelys coriacea*)
Kemp's ridley turtle	(*Lepidochelys kempii*)
Hawksbill turtle	*(Eretmochelys imbricata)*
Shortnose sturgeon	(*Acipenser brevirostrum*)
Atlantic Salmon 3	(*Salmo salar*)

Threatened

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

MMPA

Includes all marine mammals above in addition to:

Minke whale	(*Balaenoptera acutorostrata*)
Long-finned pilot whale	(*Globicephala melas*)
Short-finned pilot whale	(*Globicephala macrorhynchus*)
Killer whale	(*Orcinus orca*)
False killer whale	(*Pseudorca crassidens*)
Cuvier's beaked whale	(*Ziphius cavirostris*)
Mesoplodon beaked whale	(*Mesoplodon* spp.)
Dwarf sperm whale	(*Kogia simus*)
Pygmy sperm whale	(*Kogia breviceps*)
Pantropical spotted dolphin	(*Stenella attenuata*)
Risso's dolphin	(*Grampus griseus*)
Spotted dolphin	(*Stenella attenuata*)
Common dolphin	(*Delphinus delphis*)
White-sided dolphin	(*Lagenorhynchus acutus*)
Striped dolphin	(*Stenella coeruleoalba*)
Bottlenose dolphin	(*Tursiops truncatus*)
Harbor porpoise	(*Phocoena phocoena*)
Harbor seal	(*Phoca vitulina*)
Grey seal	(*Halichoerus grypus*)

2 The breeding populations of green turtles in Florida and on the Pacific coast of Mexico are listed as endangered, the remainder of the population is listed as threatened.

3 The Gulf of Maine distinct population segment (DPS) of Atlantic salmon is endangered, while all other Atlantic salmon is considered a species of concern.

Harp seal	(*Phoca groenlandica*)

Species of Concern

Dusky shark	(*Carcharhinus obscurus*)
Sand tiger shark	(*Odontaspis Taurus*)
Night shark	(*Carcharinus signatus*)
Thorny skate	(*Raja radiata*)
Atlantic sturgeon	(*Acipenser oxyrinchus oxyrinchus*)
Atlantic salmon	(*Salmo salar*)
Rainbow smelt	(*Osmerus mordax*)
Cusk	(*Brosme brosme*)
Atlantic wolfish	(*Anarhichas lupus*)
White marlin	*(Tetrapturus albidus*)
Atlantic halibut	(*Hippoglossus hippoglossus*)
Warsaw grouper	(*Epinephelus nigritus*)

7.4 PROTECTED SPECIES WITH EXISTING FISHERIES

Although all of the protected species listed above may be found in the general geographical area covered under the winter flounder management plan, not all are affected by the fishery for several reasons. Some protected species may inhabit more inshore or offshore areas than those utilized by winter flounder, prefer a different depth or temperature zone than winter flounder, or may migrate through the area at different times than the species regulated by this fishery management plan. In addition, certain protected species may not be vulnerable to capture or entanglement in certain fishing gear used in the winter flounder fishery.

Winter flounder inhabit estuaries, coastal and offshore waters from Maine to Georgia, and support both commercial and recreational fisheries from Maine to Delaware. In 2001, commercial landings in the Mid-Atlantic and southern New England stock were 4,400mt, and recreational landings were approximately 550mt. From 1981 to 1996, recreational landings comprised on average 27% of the total landings of winter flounder in this stock. In the Gulf of Maine stock since 1999, commercial landings of winter flounder have remained near 500mt. Since 1995, recreational landings in this stock have remained below 100mt and comprised between 5-13% of the total landings since 1991.

The otter trawl is the primary commercial gear used in the winter flounder fishery, accounting for over 96 percent of landings. Sink anchor gillnet gear represent approximately 2.5 percent of the landings. Scottish seines, rakes, pound nets, scallop trawls and dredges, Danish seines, fyke nets, traps, and pots are also used in the commercial winter flounder fishery, but only comprise a small percentage of total fishing effort. Hook-and-line is the predominant recreational gear used, with the majority of recreational fishing occurring from private party or charter boats.

7.4.1 Marine Mammals

There have been marine mammal interactions in the primary fisheries (utilizing otter trawls and gillnets) that target winter flounder, including the North Atlantic bottom trawl fishery; Northeast multi-species sink gillnet; Mid-Atlantic coastal gillnet fishery; Long Island Sound inshore gillnet fishery; and Rhode Island, southern Massachusetts, and New York Bight inshore gillnet fishery. Marine mammal interactions are also known to exist with other minor gear types targeting winter flounder, such as pots, traps, pound nets, and seines. Based on the stock status, the marine mammal stocks of greatest concern in this fishery are the North Atlantic right whale, Gulf of Maine humpback whale, western North Atlantic long-finned and short-finned pilot whales, western North Atlantic coastal and offshore bottlenose dolphins, and Gulf of Maine/Bay of Fundy harbor porpoise. The MMPA 2003 List of Fisheries (LOF) (68 FR 41725) classifies fisheries by the level of serious injury and mortality of marine mammals incidental to each fishery. Table 1 lists the predominant fisheries that target winter flounder and the marine mammals known to interact with those fisheries.

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

Table 1. Commercial Fisheries Taking Winter Flounder in the Atlantic Ocean (LOF 2003).

Fishery Description	Marine Mammal Species Incidentally Killed/Injured
CATEGORY I	
Northeast sink gillnet	North Atlantic right whale, Humpback whale, Minke whale, Killer whale, White-sided dolphin, Bottlenose dolphin, Harbor porpoise, Harbor seal, Gray seal, Common dolphin Fin whale, Spotted dolphin, False killer whale, Harp seal
Mid-Atlantic coastal gillnet	Humpback whale, Minke whale, Bottlenose dolphin, Harbor porpoise, Harbor seal, Harp seal, Long-finned pilot whale, Short-finned pilot whale, Common dolphin
CATEGORY III	
North Atlantic bottom trawl	Long-finned pilot whale, Short-finned pilot whale, Common dolphin, White-sided dolphin, Striped dolphin, Bottlenose dolphin
Long Island Sound inshore gillnet	Humpback whale, Bottlenose dolphin, Harbor porpoise
RI, southern MA, and NY Bight inshore gillnet	Humpback whale, Bottlenose dolphin, Harbor porpoise
Mid-Atlantic mixed species trawl	None documented
Gulf of Maine Mid-Atlantic sea scallop trawl	None documented
Gulf of Maine Mid-Atlantic sea scallop Dredge	None documented

7.4.1.1 Gillnets

Bottlenose Dolphin

Offshore stock

Serious injury and mortality of the western North Atlantic offshore stock of bottlenose dolphins has been observed in the Northeast multi-species sink gillnet fishery. This fishery consists of approximately 341 vessels covering the Gulf of Maine and southern New England. Additional vessels are reported to occasionally fish with gillnets in the Gulf of Maine for bait or personal use; however, these vessels are not covered by the NMFS observer program for this fishery. The first observed mortality of the offshore stock of bottlenose dolphin was recorded in 2000, which prompted NMFS to estimate an annual fishery-related serious injury and mortality for this fishery of 132 bottlenose dolphins in 2000. Due to takes in the sink gillnet fishery, from 1996 to 2000 the mean annual mortality for this stock of bottlenose dolphins in the sink gillnet fishery was 26 animals per year.

Serious injury and mortality of the offshore stock of bottlenose dolphins was also observed in the Mid-Atlantic coastal gillnet fishery. In 1998, one mortality was observed, leading to an estimated mortality of four animals for 1998. From 1996 to 2000, NMFS estimated the mean annual mortality for the offshore stock of bottlenose dolphin caused by the Mid-Atlantic coastal gillnet fishery as one dolphin per year.

Coastal stock

Gillnet gear has a documented history of interactions with bottlenose dolphins, plus the geographic distribution of winter flounder fisheries overlaps with that of the coastal bottlenose dolphin stock, thus making interactions highly probable. The Mid-Atlantic coastal gillnet fishery extends from North Carolina to New York, and is a combination of small vessel fisheries that target a variety of fish species in addition to winter flounder, including bluefish, croaker, spiny and smooth dogfish, kingfish, Spanish mackerel, spot, striped bass, and weakfish (Steve *et al.* 2001). The fishery operates in different seasons targeting various species in different states throughout the range of coastal bottlenose dolphins.

For the North Atlantic coastal stock of bottlenose dolphins, serious injury and mortality has also been observed in several coastal gillnet fisheries. From 1996 to 2000, a total of 12 coastal bottlenose dolphin interactions were observed in the Mid-Atlantic coastal gillnet fishery. Three of these interactions were observed for the summer Northern Migratory Management Unit (see section 7.5.1.1), which overlaps geographically with winter flounder catch. From the three observed takes, NMFS estimated an average annual fishery-related mortality and serious injury as 30 dolphins per year. NMFS also estimated mean annual mortalities for the Summer Northern Migratory, Summer Northern North Carolina, and Winter Mixed Management Units (see section 7.5.1.1) as 233 dolphins per year (NMFS 2002).

Other inshore gillnet fisheries that harvest winter flounder have documented interactions with the coastal bottlenose dolphin stock, including the Long Island Sound inshore gillnet and the Rhode Island/southern Massachusetts/New York Bight inshore gillnet fisheries. However, little or no information is available to accurately assess overall marine mammal interactions with these fisheries.

Harbor Porpoise

Before 1998, most interactions between harbor porpoises and U.S. commercial fisheries were documented in the Northeast sink gillnet fishery. In the mid-1980s, using rough estimates of fishing effort, NMFS estimated that a maximum of 600 harbor porpoises were killed annually in this fishery. Between 1990 and 2000, NMFS Sea Sampling Program observed 452 harbor porpoise mortalities related to this fishery, with estimates of annual bycatch ranging from 2,900 animals in 1990 to 270 and 507 animals in 1999 and 2000, respectively (NMFS 2002). Prior to implementation of the Harbor Porpoise Take Reduction Plan (HPTRP) in 1999, average estimated harbor porpoise mortality and serious injury in the Northeast sink gillnet fishery from 1994-1998 was 1,163 animals. Due to the HPTRP, which instituted pinger (acoustic deterrent device) requirements and time/area closures, and several groundfish management plans, fishing practices were changed and subsequent average annual harbor porpoise mortality and serious injury was 388 animals in the Northeast sink gillnet fishery from 1999-2000.

Harbor porpoise interactions also occur with the Mid-Atlantic coastal gillnet fishery. In July 1993, NMFS initiated an observer program in this fishery. Some of the vessels operate right off the beach, while some use drift nets and others use sink nets. From 1995 to 2000, 114 harbor porpoise interactions were observed (NMFS 2002). During that time, fishing effort was scattered between New York and North Carolina, extending from the beach to 50 miles from shore. After 1995, documented bycatch was observed from December to May. Annual average estimated harbor porpoise mortality and serious injury from the Mid-Atlantic coastal gillnet fishery before implementation of the HPTRP (1995-1998) was 358 animals. Following implementation of the HPTRP and other fishery management plans for groundfish in 1998/1999, fishing practices changed, resulting in a decrease in estimated annual average harbor porpoise mortality and serious injury to 37 animals per year (1999 and 2000).

Other inshore gillnet fisheries that harvest winter flounder are also known to interact with harbor porpoises, such as the Long Island Sound inshore gillnet and the Rhode Island/Southern Massachusetts/New York Bight inshore gillnet fisheries. Gillnet gear has a demonstrated history of interacting with harbor porpoises. The geographic distribution of these winter flounder fisheries overlaps with the distribution of harbor porpoises, thus making interactions highly probable. In 1999 and 2000, NMFS and the New England Aquarium stranding and entanglement database recorded 19 deaths and one stranding of harbor porpoises due to interactions with unknown gillnet fisheries. The resultant average annual harbor porpoise mortality and serious injury in this unknown gillnet category from 1999-2000 is ten animals per year.

Pilot Whale

Interactions between both short-finned and long-finned pilot whales and the Mid-Atlantic coastal gillnet fishery have been documented. These two species are difficult to distinguish at sea as separate species and, therefore, abundance estimates, PBR, and bycatch estimates are combined into one listing for pilot whales. The 2003 LOF lists the number of vessels/participants in this fishery as greater than 655, however, the exact number is unknown since records are held by both state and Federal agencies and have not been centralized or standardized. No pilot whale interactions were observed in this fishery from 1993 to 1997, one pilot whale interaction was observed in 1998, and none were observed in 1999 and 2000. The estimated annual mortality in this fishery in 1998 was seven pilot whales. Average annual estimated fishery-related mortality attributable to this gillnet fishery during 1996-2000 was one pilot whale per year.

North Atlantic Right Whale

Right whales may be adversely affected by habitat degradation, habitat exclusion, acoustic trauma, harassment, or reduction in prey resources as the result of a variety of activities including the operation of commercial fisheries. However, the major known sources of mortality and serious injury of right whales clearly are ship strikes and entanglement in commercial fishing gear, such as the sink gillnet gear used to catch winter flounder.

Based on photographs of catalogued animals from 1959 to 1989, Kraus (1990) estimated that 57% of right whales exhibited scares from entanglement and 7% from ship strikes (propeller injuries). Hamilton et al. (1998) updated this study using data from 1935 through 1995. The new study estimated that 61.6% of right whales exhibit injuries caused by entanglement and 6.4% exhibit signs of injury from vessel strikes. These data may be misleading, as a ship strike may be less of a "recoverable" event than entanglement in fishing gear. Also, several whales have apparently been entangled on more than one occasion, and some right whales that have been entangled were subsequently involved in ship strikes. Furthermore, these numbers are based on sightings of free-swimming animals that initially survive the entanglement or ship strike. Therefore, the actual number of interactions may be higher as some animals are likely drowned or killed immediately, and the carcass never recovered or observed.

Consequently, assessing the level of interactions between right whales and fisheries has been difficult to measure and is derived from two primary sources -- observed takes and non-observed fishery entanglement records, including strandings records. There has been only one documented case of an observed take of a right whale, which occurred in a pelagic drift gillnet in 1993 (NMFS 2002). Subsequent re-examination of this interaction, combined with information on additional entanglement reports on this whale, concluded that the suspected mortality of this whale was due to entanglement in lobster pot gear.

All other indications of fishery-related interactions have been derived from entanglement records. Entanglement records maintained by the NMFS' Northeast Regional Office (NMFS, unpublished data) from 1970 through 2000, included at least 72 right whale entanglements or possible entanglements, including right whales in weirs, entangled in gillnets, and trailing line and buoys (NMFS 2002). From 1996 through 2000, five to nine records of mortality or serious injury (including records from both U.S. and Canadian waters) involved entanglement or fishery interactions. Unfortunately, most of these records do not contain the detail necessary to assign entanglements to a particular fishery or location.

Entanglements in groundfish gillnet gear, cod traps, and herring weirs in waters of Atlantic Canada and the U.S. East Coast were summarized by Read (1994). In six records of right whales entangled in groundfish gillnet gear in the Bay of Fundy and the Gulf of Maine between 1975 and 1990, the right whales were either released or escaped on their own, although several whales have been observed carrying net or line fragments (NMFS 2002). For all areas, specific details of right whale entanglement in fishing gear are often lacking. When direct or indirect mortality occurs, some carcasses come ashore and are subsequently examined, or are reported as "floaters" at sea; however, the number of unreported and unexamined carcasses is unknown, but may be significant in the case of floaters. More information is needed on fisheries interactions, specifically the location of the interaction and types of gear involved.

Humpback Whale

As with right whales, assessing the level of interactions between humpback whales and fisheries has been difficult and is derived from two primary sources -- observed takes and non-observed fishery entanglement records, including strandings records. Between 1996 and 2000, there were 14 documented humpback whale interactions with fishing gear (two mortalities and 12 serious injuries). Two of the 12 seriously injured humpbacks were observed entangled in gillnet gear in the

Bay of Fundy, Canada. Unfortunately, most of the records do not contain the detail necessary to assign entanglements to a particular fishery or location. More information is needed on fisheries interactions with humpback whales, specifically the location of the interaction and types of gear involved.

7.4.1.2 Otter Trawl

Bottlenose Dolphin

There are no documented interactions (either observed or through entanglement/stranding records) between coastal bottlenose dolphins and otter trawl fisheries. For the western North Atlantic offshore bottlenose dolphin stock, one mortality was recorded in the North Atlantic bottom trawl fishery in 1991. In 1991, NMFS estimated total mortality for this fishery at 91 bottlenose dolphins. Since 1992, there have been no observed bottlenose dolphin mortalities in this trawl fishery.

Harbor Porpoise

There was one observed harbor porpoise mortality documented in the North Atlantic bottom trawl fishery from 1989-2000. The interaction occurred in February 1992 off the coast of New Jersey. Since the animal was clearly dead prior to being taken by the trawl, the estimated bycatch for the fishery was zero.

Pilot Whale

Bycatch of both short-finned and long-finned pilot whales has been observed in the North Atlantic bottom trawl fishery. This fishery is comprised of approximately 1,052 full and part time vessels and is active in New England in all seasons. One pilot whale interaction was recorded in 1990 while another was released alive and uninjured in 1993. The estimated fishery-related mortality of pilot whales attributable to this fishery was 0 for 1994-1998, 228 in 1999, and 0 in 2000. Between 1996 and 2000, NMFS estimated the average annual mortality of pilot whales at 46 per year. Observer coverage of this fishery is extremely low, less than one percent, and estimates should be viewed with caution.

North Atlantic Right Whale and Humpback Whale

No mortalities or serious injuries of right or humpback whales have been documented in trawl fisheries monitored by NMFS. For a discussion of other gear entanglements see section 7.4.1.1.

7.4.2 Sea Turtles

Interactions with sea turtles may occur when fishing effort overlaps with sea turtle distribution. Interactions could occur in the summer and fall, as turtles can be found in northeastern waters from June to November. Juvenile and immature Kemp's ridleys and loggerheads utilize nearshore and inshore waters north of Cape Hatteras during the warmer months and can be found as far north as the waters in and around Cape Cod Bay. Sea turtles are likely to be present off the Virginia, Maryland, and New Jersey coasts by April or May, but do not arrive in great concentrations in New York and northwards until mid-June. Although uncommon north of Cape Hatteras, immature green sea turtles also use northern inshore waters during the summer and may be found as far north as Nantucket Sound. Leatherbacks migrate north in the spring to productive foraging grounds off Nova Scotia. With the decline of water temperatures in late fall, sea turtles migrate south to warmer waters. When water temperatures are greater than approximately 11˚C, sea turtles may be present in some areas where the winter flounder (multispecies) fishery occurs (which extends from the Canadian border, through the Gulf of Maine and as far south as Cape Hatteras, North Carolina).

The majority of winter flounder landings are by otter trawl (over 96% in federal waters, over 94% in state waters). The next most common gear type is sink, anchored gillnets. There is limited use of scottish seine, rakes, pound nets, scallop trawls, scallop dredges, bottom longlines, fyke nets, danish seines, and traps and pots. The capture of sea turtles could occur in all gear sectors of the fishery, including sink gillnets.

7.4.2.1 Gillnets

Sink gillnets have the potential to take listed sea turtles. This sector of the fishery would be most likely to interact with loggerhead, Kemp's ridley, and green sea turtles as these species are more likely to be found near the bottom. Sea turtles may become entangled in either the buoy lines of the gillnets at the surface or at depth or the nets themselves at depth. Turtles are unlikely to be able to break off sections of the gear and will probably not be able to stay at the surface while entangled. While turtles are vulnerable to forced submergence, some turtles have been recovered alive from sink gillnet gear.

From 1994 to 1999, there were two loggerheads observed taken in the Northeast sink gillnet fishery, but these takes did not occur in the multispecies fishery which includes winter flounder. In May 1995, a dead loggerhead was observed in a 6.5 inch mesh gillnet targeting smooth dogfish off Virginia Beach, Virginia. In November 1995, a live loggerhead was taken off Ocean City, Maryland, in a 6.5-7.0 inch mesh targeting striped bass. There was 5% observer coverage in the sink gillnet fishery when these takes occurred. The Northeast sink gillnet fishery was also adequately observed in other years, with 7% coverage in 1994, 4% in 1996, 6% in 1997, and 5% in 1998, but no turtle takes were documented. Additionally, in 1999 and 2000, nine sea turtles were observed taken in sink gillnets off the coasts of North Carolina and Virginia. While none of these takes were by trips targeting multispecies, it does exemplify that sea turtle takes could occur with similar gillnet gear depending on time of year and location fished.

Stranded sea turtles (e.g. loggerhead and Kemp’s ridley) have been documented partially or completely entangled in this type of gear. Data on sea turtle strandings and incidental takes along the Atlantic coast by fisheries from 1980 to 1996 compiled by the NMFS Southeast Fisheries Science Center has strongly implicated Atlantic gillnet fisheries in incidental capture and strandings of sea turtles. Included in the stranding data were strandings with netting gear still attached to the turtle, or that showed constriction wounds and abrasions indicative of entanglement. Spring and fall gillnet operations have been strongly implicated in coincident sea turtle stranding events from North Carolina through New Jersey. In 2000, large-mesh gillnets were determined to be the most likely cause of significant increases in the stranding of sea turtles along the eastern coast of North Carolina, resulting in a closure of gillnet fisheries using stretched mesh size of 6 inches or greater in an area along North Carolina and Virginia in order to protect sea turtles.

7.4.2.2 Otter Trawl

Incidental takes of sea turtles in otter trawls have been documented extensively by NMFS, though little is known about incidental takes of sea turtles in bottom otter trawls targeting winter flounder specifically. From 1995 through 2002, NMFS observer coverage for large and small mesh bottom trawls targeting various species has averaged less than 1% for trips in the Northeast, and approximately 1% of days fished in the Mid-Atlantic. Coverage in the Northeast has been year-round, and no turtle takes were documented. For the Mid-Atlantic, 22 alive and 21 dead turtles (including leatherback, Kemp's ridley and loggerhead) were documented to be incidentally caught in bottom trawls (NEFSC, unpublished data).

Incidental takes of Kemp's ridleys and loggerheads have been reported in summer flounder trawl operations occurring from Virginia to North Carolina and in the shrimp trawl fishery in the southeastern U.S. In the winter of 1991/1992, a total of 2,711 hours of summer flounder trawl fishing were observed. Eighty-three sea turtles were captured including 50 loggerheads, 29 Kemp's ridleys, two greens, one hawksbill, and one unidentified turtle. Takes were more abundant south of Cape Hatteras and no takes were observed north of Cape Charles, Virginia. Consequently, since 1992, turtle excluder devices (TEDs) have been required in the summer flounder fishery south of Cape Charles. From 1995-2002, 30 turtles were observed in trawls targeting summer flounder. Twenty-six of these were loggerheads, 2 were Kemp Ridleys, and 2 were unidentified to species. Seventeen (65%) loggerheads were released alive, 5 (19%) were dead, 3 (12%) were injured, and 1 (4%) was resuscitated.

Turtle takes have also been observed in squid trawl fisheries. Three loggerhead turtles and one unidentified species were observed in the long-finned squid bottom trawl fishery during the period of 1995-2002. Two of these loggerheads were released alive, and 1 was dead. A live leatherback turtle was also taken in this fishery in 2001 and released alive. A live loggerhead turtle was also observed taken in trawls targeting short-finned squid in 1995.

Observers have also documented takes of turtles in trawls targeting croaker and groundfish. Four loggerheads and 1 unidentified to species were taken in trawls targeting croaker between 1996-1998. Two of the loggerheads were dead, 1 was alive, and 1 was injured. The unidentified turtle was released alive. In 1996, two loggerheads were taken in trawls targeting groundfish, 1 of which was alive, and 1 was injured.

The shrimp fishery, which uses a bottom otter trawl and operates from mainly south of Virginia, is estimated to incidentally take each year 19,000 greens, 167,100 loggerheads, 160,000 Kemp's ridleys, and 3,100 leatherbacks (NMFS 2002). These estimates represent multiple captures and the vast majority are nonlethal given TEDs are also required for this fishery.

7.4.3 Seabirds

Like marine mammals and sea turtles, seabirds are vulnerable to entanglement in commercial fishing gear. Along with commercial fishing, human activities such as coastal development, habitat degradation and destruction, and the presence of organochlorine contaminants are considered to be major threats to some seabird populations.

The otter trawl is the primary commercial gear used in the winter flounder fishery, accounting for over 96 percent of landings. Otter trawls do not appear to be a significant source of incidental seabird takes.

7.4.3.1 Gillnets

Sink anchor gillnet gear, which is used to harvest approximately 2.5 percent of winter flounder landings, is one type of commercial fishing gear that has documented incidental takes of seabirds. Diving birds, which pursue fish underwater or feed on benthic invertebrates, are especially vulnerable to drowning in gillnets. Due to the fact that gillnet use comprises such a minimal portion of the fishing effort in the winter flounder fishery, it is not expected that this fishery has a significant impact on seabirds.

7.5 POPULATION STATUS REVIEW OF RELEVANT PROTECTED SPECIES

Five marine mammal species are known to become entangled in gear used by the Atlantic winter flounder fishery, namely, bottlenose dolphin, harbor porpoise, pilot whale, North Atlantic right whale, and humpback whale. Except for harbor porpoise, these species are all classified as strategic stocks under the MMPA. Both the right whale and the humpback whale are listed as endangered. The species of greatest concern is the right whale as it is one of the most endangered species in the world, numbering only around 300 animals (NMFS 2002).

The status of these and other marine mammal populations inhabiting the northwest Atlantic Ocean has been discussed in great detail in the annual U.S. Atlantic Marine Mammal Stock Assessment Report. The reports present information on stock definition, geographic range, population size, productivity rates, potential biological removal levels (PBR – the number of human-caused deaths the stock can withstand annually and still reach and maintain an optimum population level), and fishery-specific mortality estimates and also compares the PBR to estimated human-caused mortality for each stock. To access the stock assessment report, see the NMFS website at http://www.nmfs.noaa.gov/prot_res/PR2/Stock_Assessment_Program/sars.html.

7.5.1 Marine Mammals

7.5.1.1 Bottlenose Dolphin, *Tursiops truncatus*

<u>Coastal stock</u>

Under the MMPA, the western North Atlantic coastal bottlenose dolphin stock is listed as depleted, and therefore strategic, due to several large mortality events in the past 20 years. There are insufficient data to determine a population trend for this stock. The species ranges along the Atlantic coast from New Jersey south to central Florida (NMFS 2002), and is known to stay within 12 km from shore north of and 27 km from shore south of Cape Hatteras, North Carolina (Garrison 2001). Data suggest that the population maintained historically high levels immediately prior to a 1987-88 mortality event (Keinath and Musick 1988), which was estimated to have decreased the population by as much as 53%. The stock is also considered strategic because human-caused mortality currently exceeds PBR for the stock. To address bottlenose dolphin bycatch, NMFS convened the Bottlenose Dolphin Take Reduction Team (BDTRT) in November 2001.

Within the western North Atlantic, the stock structure of coastal bottlenose dolphins is complex (NMFS 2002). The maintained hypothesis has been that there is a single coastal migratory stock, ranging seasonally from as far north as Long Island, New York to as far south as central Florida. Recent studies, however, suggest this hypothesis is incorrect and there is likely a complex mosaic of stocks. Evidence to support this hypothesis includes observed geographic distribution, recent genetic analyses, photo-identification studies, satellite telemetry, and stable isotope studies. The most recent data pertain to stocks in the waters off North Carolina, but fewer data are available for bottlenose dolphins south of North Carolina, and the theory of stock separation in this area is tentative. Stock affiliation for coastal animals in inland waters (e.g., estuaries, bays, sounds) is also poorly understood.

As a result of these findings, and for the purposes of developing the Bottlenose Dolphin Take Reduction Plan (BDTRP), NMFS subdivided the known migratory coastal stock into eight different management units, partitioned geographically and seasonally. These management units include the: (1) summer Northern migratory (NJ/NY border to NC/VA border), (2) summer Northern North Carolina (VA/NC border to Cape Lookout, NC), (3) winter Mixed (NC coastwide), (4) summer Southern North Carolina (Cape Lookout, NC to Murrell's Inlet, SC), (5) South Carolina annual (Murrell's Inlet, SC to SC/GA border), (6) Georgia annual (coastwide, including estuarine waters), (7) Northern Florida annual (FL/GA border to Indian/Banana River Lagoon), and (8) Central Florida (Indian/Banana River Lagoon south). It is important to note that while there are eight seasonal management units described for the purposes of generating the BDTRP, there are currently only seven distinct bottlenose dolphin management units identified -- Northern migratory, Northern North Carolina, Southern North Carolina, South Carolina, Georgia, Northern Florida, and Central Florida. The Mixed Winter management unit represents the winter abundance estimate for the Northern Migratory, Northern North Carolina and Southern North Carolina management units when these three management units overlap in the same geographic region.

Abundance estimates for each management unit are outlined in Table 2. The abundance estimates were derived from surveys conducted during the summer and winter of 2002 in order to update previous abundance estimates from 1995. Current estimates are confounded somewhat by an overlap in distribution between the coastal and offshore bottlenose dolphin stocks, and the difficulty of distinguishing between the two stocks while surveying. However, these estimates are considered more robust than previous abundance estimates conducted in 1995 due to improved experimental design.

Table 2. 2002 Abundance Estimates, Coefficient of Variation (CV), and Minimum Population Estimate (Nmin) for each management unit of the Western North Atlantic Coastal Bottlenose Dolphins (taken from Garrison *et al.* 2003)

Stock	Abundance	CV	Nmin
Summer (May - October)			
Northern Migratory	17,466	19.1	14,621
Northern North Carolina			
Oceanic	6,160	51.9	3,255
Estuary	919	12.5	828
Both	7,079	45.2	4,083
Southern North Carolina			
Oceanic	3,646	111	1,863
Estuary	141	15.2	124
Both	3,787	106.9	1,987
Winter (November - April)			
Mixed Stock*	16,913	23	13,558
ALL YEAR			
South Carolina	2,325	20.3	1,963
Georgia	2,195	29.9	1,716
Northern Florida*	448	38.4	328
Central Florida*	10,652	45.8	7,377

* Winter Mixed stock represents the winter abundance estimate for the Northern Migratory, Northern North Carolina and Southern North Carolina populations combined. Northern Florida estimates are derived from the winter 1995 and summer 2002 surveys. Central Florida estimates are derived from the winter 1995 survey.

Offshore stock

The status of the western North Atlantic offshore bottlenose dolphin stock relative to its optimum sustainable population is unknown. The offshore stock is not listed as depleted nor is it considered a strategic stock. Data are currently insufficient to determine population trends for the offshore stock of bottlenose dolphin. The offshore stock range in the western Atlantic Ocean extends offshore along the entire continental shelf break from Georges Bank to Cape Hatteras, North Carolina. Recent data suggest that the range of the offshore stock may include waters beyond the continental slope, and that offshore bottlenose dolphins may move between the Atlantic and Gulf of Mexico (Wells *et al.* 1999). Based on survey sightings, the offshore stock has a somewhat seasonal distribution pattern, with more southern sightings during the fall and winter, although sightings still occurred as far north as the southern edge of Georges Bank.

Abundance estimates for the offshore stock of bottlenose dolphins were derived from aerial and shipboard line transect sighting surveys. The minimum population estimate for this stock in 2002 is 24,897 dolphins. The best estimate of abundance is 30,633 dolphins.

7.5.1.2 Harbor Porpoise, *Phocoena phocoena*

The Gulf of Maine harbor porpoise was proposed to be listed as threatened under the ESA on January 7, 1993 (NMFS 1993), but NMFS determined this listing was not warranted (NMFS 1999). NMFS removed this stock from the ESA candidate species list in 2001. The PBR for the harbor porpoise is 747 animals (NMFS 2002). The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR level, which means the human-induced mortality is not approaching a zero mortality and serious injury rate. This is not a strategic stock because average annual fishery-related mortality and serious injury has not exceeded the PBR level for the past three years.

Harbor porpoises range from Labrador to North Carolina. The southern-most stock of harbor porpoise is referred to as the Gulf of Maine/Bay of Fundy stock and generally spends its winters in the Mid-Atlantic region. Harbor porpoises are generally found in coastal and inshore waters, but will also travel to deeper, offshore waters. The status of the harbor porpoise stock in U.S. waters relative to the optimum sustainable population is unknown. There are insufficient data to determine population trends for this species because harbor porpoises are widely dispersed in small groups, spend little time at the surface, and distribution varies unpredictably from year to year depending on environmental conditions (NMFS 2002).

Shipboard line transect sighting surveys have been conducted to estimate population size of the harbor porpoise stock. The best estimate of abundance for the Gulf of Maine/Bay of Fundy harbor porpoise stock is 89,700. The minimum population estimate is 74,695 individuals (NMFS 2002).

7.5.1.3 Pilot Whale, *Globicephala melas, Globicephala macrorynchus*

The two species of pilot whales in the Atlantic, long-finned and short-finned pilot whales, are difficult to distinguish to the species level at sea. The species tend to overlap from New Jersey to Cape Hatteras, North Carolina. Sightings north of this overlapping area are likely to be long-finned pilot whales, while sightings south of this area are more likely to be short-finned pilot whales.

Both long-finned and short-finned pilot whale abundance may have been affected by reduction in foreign fishing, curtailment of the Newfoundland drive fishery for pilot whales in 1971, and increased abundance of herring, mackerel, and squid stocks. The total number of long-finned and short-finned pilot whales off the eastern U.S. is unknown. Because long-finned and short-finned pilot whales are difficult to identify at sea, seasonal abundance estimates were reported for *Globicephala* species as a whole. The best abundance estimate for pilot whales (*Globicephala sp.*) is 14,524 and the minimum population estimate is 11,343 individuals.

Long-finned pilot whale
The status of long-finned pilot whales, *Globicephala melas*, relative to their optimum sustainable population is unknown, and there are insufficient data to determine a population trend for this species. Long-finned pilot whales are not listed under the ESA, but are considered a strategic stock because the 1996-2000 estimated average annual fishery-related mortality exceeds the PBR level (108) for this species.

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

Short-finned pilot whales
The status of short-finned pilot whales, *Globicephala macrorynchus*, relative to their optimum sustainable population, is unknown, and there are insufficient data to determine a population trend for this species. Short-finned pilot whales are not listed under the ESA, but are considered a strategic stock because the 1996-2000 estimated average annual fishery-related mortality exceeds the PBR level (108) for this species.

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

7.5.1.4 North Atlantic Right Whale, *Eubalaena glacialis*
North Atlantic right whales are listed as endangered under the ESA and are strategic under the MMPA. Presently, the North Atlantic right whale population is considered one of the most critically endangered populations of large whales in the world. Three centuries of commercial whaling initially decimated the population, which has only minimally recovered since international protection from the League of Nations in 1935. Right whales have been protected from commercial whaling under legislation of the International Whaling Commission since 1949.

In the summer, right whales occur in coastal waters off the northeastern U.S. and northward to the Bay of Fundy and the Scotian Shelf (NMFS 2002). During the winter, a segment of the population, consisting mainly of pregnant females, migrates southward to calving grounds off the southeastern U.S. Right whales use coastal Mid-Atlantic waters as a migratory pathway between their summer feeding grounds and winter calving grounds. The extent to which right whales occur in offshore waters is unknown.

Based on photo-identification techniques, the North Atlantic right whale population size was estimated at 291 individuals in 1998 (Kraus *et al.* 2001). The population growth rate estimated for this population during the late 1980s through the early 1990s suggested the stock was slowly recovering (Knowlton *et al.* 1994). However, a review of work conducted in 1999 indicated that the survival rate of right whales had declined during the 1990s (Waring *et al.* 2000). One reason for this decline may be the apparent increase in calving interval. The mean calving interval pre-1992 was estimated at 3.67 years. An updated analysis using data through the 1997-1998 season indicated that mean calving interval had increased to more than five years (Kraus *et al.* 2001). Reasons currently being explored for this increase in calving interval include contaminants, biotoxins, nutrition/food limitation, disease, and reduced genetic diversity.

The primary sources of human-caused mortality and serious injury of right whales are entanglement in fishing gear and vessel strikes. A recent study estimated that 61.6% of right whales show injuries consistent with entanglement in gear while 6.4% exhibited signs of injury from vessel strikes (Hamilton *et al.* 1998). With the small population size and low annual reproductive rate, human-caused mortalities have a greater impact on this species relative to other marine mammals. Therefore, the PBR level, as defined in the MMPA, is set at zero for right whales. The Atlantic Large Whale Take Reduction Plan (ALWTRP) established measures that attempt to reduce right whale bycatch. This is discussed in further detail in section 7.6.1.4.

7.5.1.5 Humpback Whale, *Megaptera novaeangliae*

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

The Gulf of Maine stock of humpback whales spends the spring, summer, and fall seasons feeding in the Gulf of Maine. In the winter, most humpbacks migrate to the West Indies to mate and breed, while others have been observed at higher latitudes in the waters off the Mid-Atlantic and southeast U.S.

Between 1992 and 1999, three approaches were used to estimate abundance of the Gulf of Maine stock of humpback whales: 1. Mark-recapture (652), 2. Minimum number known to be alive in a given year (497), and 3. Line transect (902). Although each approach has limitations, NMFS chose to use the line transect method as the best estimate for the Gulf of Maine stock of humpbacks (NMFS 2002). Therefore, the minimum population estimate for this stock is 647.

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

7.5.2 Sea Turtles

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

NOAA Fisheries recognizes five loggerhead subgroups within the western Atlantic including two primary subpopulations: (1) a northern nesting subpopulation that occurs from North Carolina to northeast Florida, about 29ºN (approximately 7,500 nests in 1998); (2) a south Florida nesting subpopulation, occurring from 29ºN on the east coast to Sarasota, Florida on the west coast (mean of 73,751 nests each year). The status of the northern population based on the number of loggerhead nests has been classified as stable or declining (TEWG 2000). Data from all beaches within the south Florida subpopulation where nesting activity has been recorded indicate substantial increases when data are compared over the last 25 years. However, an analysis limited to nesting data from the statewide sea turtle Index Nesting Beach Survey program from 1989 to 2002, a period encompassing index surveys that are more consistent and more accurate than surveys in previous years, has shown no detectable trend (Blair Witherington, Florida Fish and Wildlife Conservation Commission (FFWCC), pers. comm., 2002).

The Kemp’s ridley is one of the most endangered of the worlds sea turtle species. The only major nesting site for ridleys is a single stretch of beach near Rancho Nuevo, Tamaulipas, and Mexico. Estimates of the adult female nesting population reached a low of 300 in 1985. Conservation efforts by Mexican and U.S. agencies have aided this species by eliminating egg harvest, protecting eggs and hatchlings, and reducing at-sea mortality through fishing regulations. From 1985 to 1999, the number of nests observed at Rancho Nuevo, and nearby beaches increased at a mean rate of 11.3% per year (TEWG, 1998). Current totals exceed 8,000 nests per year, allowing cautious optimism that the population is on its way to recovery.

Recent population estimates for green sea turtle in the western Atlantic area are not available. However, the pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the ten years of regular monitoring since establishment of index beaches in 1989.

Leatherback populations in the eastern Atlantic (*i.e.*, off Africa) and Caribbean appear to be stable, but there is conflicting information for some sites (Spotila, pers. comm) and it is certain that some nesting populations (*e.g.*, St. John and St. Thomas, U.S. Virgin Islands) have been extirpated (NMFS and USFWS 1995). Data collected in southeast Florida clearly indicate increasing numbers of nests for the past twenty years (9.1-11.5% increase), although it is critical to note that there was also an increase in the survey area in Florida over time (NOAA Fisheries SEFSC 2001).

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

7.6.1 Marine Mammals

7.6.1.1 Bottlenose Dolphin

From November 2001 through May 2002, NMFS convened the Bottlenose Dolphin Take Reduction Team (BDTRT) to develop consensus recommendations to reduce the incidental serious injury and mortality of western North Atlantic coastal bottlenose dolphins in relevant Category I and II fisheries. As previously stated, for the purposes of the BDTRT's deliberations, NMFS subdivided the coastal migratory stock into eight different management units, partitioned geographically and seasonally (see section 7.5.1.1). These management units are: (1) Northern migratory summer (NJ/NY border to NC/VA border), (2) Northern North Carolina summer (VA/NC border to Cape Lookout, NC), (3) North Carolina mixed winter (NC coastwide), (4) Southern North Carolina summer (Cape Lookout, NC to Murrell's Inlet, SC), (5) South Carolina annual (Murrell's Inlet, SC to SC/GA border), (6) Georgia annual (coastwide, including estuarine waters), (7) Northern Florida annual (FL/GA border to Indian/Banana River Lagoon), and (8) Central Florida (Indian/Banana River Lagoon south). Each management unit was further assigned estimates for stock abundance, PBR, and bycatch (Table 3).

Table 3. Estimates of abundance, PBR and bycatch for each management unit of the Western North Atlantic Coastal Bottlenose Dolphins (taken from reports by Palka and Rossman 2003 and 2004; Palka 2003; Garrison 2001 and 2003)

Management Unit	Abundance Estimate	PBR	Bycatch Estimate
Northern Migratory summer (May – October)	17,466	73.1	30
Summer Northern North Carolina (May – October)	**7,079**	**20.4**	**29**
Summer Southern North Carolina (May – October)	3,787	9.9	0[1]
***Winter Mixed (November – April)**	**16,913**	**67.8**	**151**
South Carolina (annual)	2,325	20	unknown
Georgia (annual)	2,195	17	unknown
Northern Florida (annual)	448	3.3	0
Central Florida (annual)	10,652	74[2]	4

*Winter Mixed represents the winter abundance estimate for the Northern Migratory, Northern North Carolina and Southern North Carolina populations combined.
[1]No takes were officially recorded via the NMFS observer program, but stranding data indicate takes do occur
[2]The PBR for central Florida is based on the 1995 survey estimates, as no 2002 data is available.

PBR is calculated by multiplying "the minimum population estimate" by "½ stock's net productivity rate" by "a recovery factor ranging from 0.1 for endangered species to 1.0 for healthy stocks." These numbers are gauged against annual bycatch estimates for the management units to determine whether management actions are effective in reducing bycatch below PBR levels, with the ultimate goal of attaining insignificant levels approaching a zero mortality and serious injury rate.

The highlighted management units above represent the management units (MU) on which the BDTRT focused the greatest amount of effort, since for each of these MU, estimated bycatch in commercial fisheries exceeded the allocated PBR for that MU (Table 3). Total bycatch is defined as the product of the bycatch rate, takes per unit effort (estimated from a sample of the fishery), and the total fishery effort. The BDTRT's May 7, 2003 Consensus Recommendations for these MUs included gear-tending requirements (i.e., proximity rule), prohibitions on overnight sets, and gear marking requirements.

Following submission of the BDTRT's Consensus Recommendations, NMFS released a notice of its intent to develop an Environmental Impact Statement (EIS) (67 FR 47772). Due to additional abundance information collected on the bottlenose dolphin stock in winter 2002, including adjusted higher levels for PBR for many management units, NMFS determined that preparing an EIS was not warranted and an environmental assessment (EA) was more appropriate. NMFS published the notice to prepare an EA in July 2003. The BDTRT reconvened in April 2003 to review the updated bottlenose dolphin abundance information and to revisit its Consensus Recommendations to ensure that they would meet the statutory goals of the MMPA. A proposed rule to implement the BDTRP is forthcoming.

For additional information, please contact the National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division F/SER3 at 9721 Executive Center Drive North, St. Petersburg, FL 33702 or http://caldera.sero.nmfs.gov/.

7.6.1.2 Harbor Porpoise

On December 1, 1998, NMFS published a final rule to implement the Harbor Porpoise Take Reduction Plan for the Gulf of Maine and the Mid-Atlantic coastal waters. The Northeast sink gillnet and Mid-Atlantic coastal gillnet fisheries are the two fisheries regulated by the HPTRP (63 FR 66464, December 2, 1998; also defines fishery boundaries). Among other measures, the HPTRP uses time/area closures in combination with acoustical devices (e.g., pingers) in Northeast waters, and time/area closures along with gear modifications for both small mesh (greater than 5 inches (12.7 cm) to less than 7 inches (17.78 cm)) and large mesh (greater than or equal to 7 inches (17.78 cm) to 18 inches (45.72 cm)) gillnets in Mid-Atlantic waters. Although the HPTRP predominately impacts spiny dogfish and monkfish fisheries due to high rates of porpoise bycatch, other gillnet fisheries are also affected.

Copies of the final rule are available from the Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910-3226. Additional information regarding the rule and its changes can also be accessed via the Internet at http://www.nero.nmfs.gov/porptrp/.

7.6.1.3 Pilot Whale

There are no take reduction measures currently in place for pilot whales in the Atlantic Ocean. However, NMFS plans to convene two new take reduction teams in 2005 and 2006 to address incidental takes of pilot whales in Atlantic longline and trawl fisheries.

7.6.1.4 North Atlantic Right Whale and Humpback Whale

The Atlantic Large Whale Take Reduction Plan (ALWTRP) (64 FR 7529; February 16, 1999) addresses bycatch of large baleen whales, specifically North Atlantic right, humpback, and fin whales, in several fixed gear fisheries, including the Northeast sink gillnet and Mid-Atlantic coastal gillnet fisheries. As stated earlier, the PBR level is set at zero for right whales. PBR for humpback and fin whales is 1.3 and 4.7, respectively. In 2000, there were eight observed entangled right whales (7 live, one dead) and 19 entangled humpback whales (14 live, 5 dead) (NMFS 2003). In light of these recent entanglements, NMFS reconvened the Atlantic Large Whale Take Reduction Team to solicit recommendations for reducing interactions between large whales and commercial fisheries; the ALWTRP is currently under revision.

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

The SAM program was established to protect predictable annual aggregations of right whales in waters off Cape Cod, MA and in the EEZ. The SAM program incorporates two zones, SAM West and SAM East. SAM West requirements are effective March 1 through April 30 of each year while SAM East requirements are effective May 1 through July 31 of each year. Fishermen setting gear in SAM areas must modify their gear according to ALWTRP regulations, e.g., they must use sinking or neutrally buoyant groundline and weak links.

The DAM program was established to protect unpredictable aggregations of right whales in waters north of 40°N latitude. A DAM action is triggered by a reliable report of a congregation of at least three right whales within 75 square nautical miles such that density of whales is greater than 0.04 right whales per nautical mile. Once the DAM zone is defined, NMFS has three options: 1. Require all anchored gillnet and lobster trap/pot fishermen to remove their gear from the zone and not set additional gear; 2. Require all anchored gillnet and lobster trap/pot fishermen to modify their gear accordingly in order to continue fishing within the DAM zone; or 3. Encourage all anchored gillnet and lobster trap/pot fishermen to voluntarily remove their gear from the DAM zone. The DAM zone is effective two days after publication of a notice in the *Federal Register* and remains in effect for 15 days.

Copies of various regulations regarding interactions between right whales and commercial fisheries are available from the Protected Resources Division, National Marine Fisheries Service, Northeast Regional Office, One Blackburn Drive, Gloucester, MA 01930. Additional information on the ALWTRP is also available on the Internet at http://www.nero.nmfs.gov/whaletrp/.

7.6.2 Sea Turtles

Under the ESA, and its implementing regulations, taking sea turtles – even incidentally – is prohibited, with exceptions identified in 50 CFR 223.206. The incidental take of endangered species may only legally be authorized by an incidental take statement or an incidental take permit issued pursuant to section 7 or 10 of the ESA.

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

7.6.3 Seabirds

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

7.7 POTENTIAL IMPACTS TO ATLANTIC COASTAL STATE AND INTERSTATE FISHERIES

Regulations under all three take reduction plans for Atlantic large whales, harbor porpoise, and bottlenose dolphin (still pending) have the potential to impact gillnet fisheries that harvest winter flounder. By far, the plan with the greatest impact is the Bottlenose Dolphin Take Reduction Plan (not yet in effect) because of high levels of observed interactions and estimated bycatch that have previously occurred.

7.8 IDENTIFICATION OF CURRENT DATA GAPS AND RESEARCH NEEDS

Given the significant impact of the pending BDTRP, priority areas for data and research are listed as follows for bottlenose dolphins in an effort to highlight the current needs for this species.

7.8.1 Bottlenose Dolphin Research Needs

Stock Identification and Status

- Continued research on stock structure to confirm existing stock delineations and incorporate dolphins in inland waters for improved stock identification.
- Precise abundance estimates extending throughout the range of the coastal stock from southern

Florida to the New York/New Jersey border, including estuaries, during winter and summer.

Improving Assessment of Bycatch Levels

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

Gear Modification Research

- Research the effectiveness of reflective nets for catching fish, as well as for reducing takes of *Tursiops truncatus*.
- Research comparing the behaviors of captive and wild dolphins around gillnets with and without acoustically reflective webbing.
- Research lowering the floatline of floating gillnets and reducing the depth of the net to investigate possible reductions of marine mammal interactions.
- Investigate the effects of twine stiffness and acoustically reflective webbing on dolphin bycatch.
- Investigate bridle alterations to prevent collapsing of the net and elimination of bridles on anchored gillnet gear with respect to their potential effects on the likelihood of bottlenose dolphin interactions.
- Investigate the behavior of anchored gillnet gear with regard to likelihood of entanglement a) when net panels are laced together and b) when they are not laced together, leaving gaps between nets.
- Investigate the level of occurrence of crab pot tipping by bottlenose dolphins and determine if research is necessary to scientifically validate the use of inverted bait wells.
- Investigate the effects of different string designs (i.e., shallower net depth, hung in different parts of the water column) to determine if the amount of webbing can be reduced without affecting catch for different fisheries (especially small mesh in coastal waters).
- Investigate reducing slack in the webbing of pound nets that interact with bottlenose dolphins.
- Investigate floatation modification of nets used within North Carolina federal and state waters.
- Determine if dolphins that appear to be attracted to boats or nets in North Carolina waters are interacting with gillnet gear, attempt to identify such dolphins, and investigate their behavior and mortality rate.
- Investigate the importance of time of day and time of set with respect to when dolphins are caught in gear, based on carcass temperature and soak times.

7.8.6 Sea Turtle Research Needs

- Research into gear development/deployment for gillnets and trawls used in this fishery should be conducted to ensure minimal impact on sea turtles.

- Fishermen should be instructed on handling and resuscitation procedures for turtles encountered in the course of fishing.

- In order to better understand sea turtle populations and the impacts of incidental take in winter flounder fisheries, ASMFC and the affected states should support (i.e. fund, advocate, promote) in-water abundance estimates of sea turtles to achieve more accurate status assessments for these species and improve our ability to monitor them.

- ASMFC and the affected states should consider a monitoring program to document incidental take of sea turtles in the winter flounder fishery.

7.8.6 Sea Bird Research Needs

- An analysis of existing bird bycatch data for this fishery should be conducted and summarized for the plan.

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9.0 APPENDICES

Appendix A: Winter flounder spawning areas in Connecticut

Each cove or harbor area along the Connecticut coast is delineated upstream by an average seasonal bottom salinity of 10 ppt, and seaward by a line connecting to adjacent headlands. Coves and harbors with contiguous water areas are combined into one system. Systems are listed east to west, and ranked qualitatively based on the available data.
*Data availability: *** = full fisheries survey, ** = juvenile survey, * = other surveys (seine), x = none*
Spawning Area Rank: 1 = Primary, 2 = Secondary, 3 = Marginal, 4 = Unknown

System Name	Coves and Harbors Included	Area (km^2)	Rank	Data
Pawcatuck	Lower Pawcatuck River to RI state line	1.52	4	x
Wequetequock	Wequetequock Cove, Davis Marsh, Barn Island	1.09	4	x
Stonington	Stonington Harbor, Quambaug Cove	1.79	2	x
Mystic	Mystic River, Beebe Cove, Palmer Cove	4.03	1	*
Mumford Cove		1.32	4	x
Poquonock River	Poquonock River, Baker Cove	1.71	3	(*)
Thames River	Thames River and contiguous coves	16.66	1	***
Goshen Cove	Goshen Cove, Seaside, Alewife Cove	0.28	4	x
Jordan Cove		1.66	2	*
Niantic River		3.38	1	**(*)
Pattagansett	Pattagansett River, Bride Brook, 3-Mile River, 4-Mile River	0.70	4	x
Connecticut River	Lower Connecticut River (south of Baldwin Bridge)	9.20	1	**(*)
Westbrook	Oyster River, Menunketesuck River, Patchogue River	0.57	2	***
Clinton Harbor	Hammonassett River, Hammock River, Indian River	2.86	2	***(*)
Guilford Harbor	East River, West River	2.07	2	***
Joshua Cove	Joshua Cove, Sachem Head	1.90	4	x
Stoney Creek	Stoney Creek, Leetes Island Marsh, Thimble Islands	1.76	4	x
Branford Harbor	Branford River	2.24	2	x
Farm River	Farm River, Pages Cove	1.09	4	x
New Haven Harbor	New Haven Harbor, Quinnipiac River, Cove River, Oyster River	9.67	1	**(*)
Milford Harbor	Milford Harbor, Gulf Pond	0.71	3	**(*)
Housatonic River	Lower Housatonic River (South of Merritt Parkway)	2.58	3	**(*)
Bridgeport Harbor	Bridgeport Harbor, Lewis Gut, Yellow Mill River	3.44	2	*
Black Rock Harbor	Black Rock Harbor, Ash Creek, Pine Creek	1.69	3	*
Southport Harbor	Southport Harbor, Sasco Beach	1.00	4	x
Saugatuck River	Saugatuck River, Sherwood Millpond, Campo Cove, Canfield Island	3.12	2	*
Norwalk Harbor	Norwalk Harbor, Village Creek, Sheffield Harbor, Wilson Cove, Farm Creek, Fivemile River	3.26	2	*
Scott Cove		1.35	3	*
Darien River	Darien River, Goodwives River, Gorham River	0.52	4	x
Holly Pond	Holly Pond, Cove Harbor	0.82	4	x
Wescott Cove		0.87	4	x
Stamford Harbor		3.26	3	*
Greenwich Cove		2.18	4	x
Cos Cob Harbor	Cos Cob Harbor, Mianus River, Indian Harbor, Greenwich Harbor, Byram River	2.56	1	(*)

Appendix B: Narragansett Bay Juvenile Winter Flounder Habitat Quality

The following table summarizes habitat data for all eighteen stations sampled during the R.I. Division of Fish & Wildlife's Narragansett Bay Juvenile Finfish Survey from 1995 to 2003. These data were analyzed along with juvenile winter flounder abundance data collected during that period in order to rank the habitat value of each station for the juvenile life stage. Habitat quality is ranked into three categories: Low, Medium & High.

Station Number	Station Name	Mean Salinity	Substrate Type*	Macro-algae	Other Features	Habitat Rank
1	Gaspee Point	25.4 ppt	Granite Sand Some Gravel	Low	Scattered Shell hash	High
2	Conimicut Point	26.1 ppt	Granite Sand Some Gravel	Low		High
3	Chepiwanoxet	29.0 ppt	Sand Silt Some Gravel	Moderate to Heavy		High
4	Pojac Point	28.7 ppt	Sand Silt Gravel	Moderate to Heavy	Scattered Shell hash	Medium
5	Patience Island	30.2 ppt	Sand/ Silt Some gravel & Stone	Low to Moderate		High
6	Sand Point	31.1 ppt	Gravel/Cobble Coarse sand	Low	Some Sub Tidal Peat	Low
7	Dutch Island	31.5 ppt	Silt/Sand Cobble/ Stone	Low		Low
8	Potters Cove	29.7 ppt	Sand/Silt Gravel	None Observed	*Crepidula* Beds	Medium
9	Hog Island	29.9 ppt	Silt/Sand Gravel	Low to Moderate	*Crepidula*, *Mytilus* Beds	High
10	Rose Island	32.0 ppt	Coarse Sand/ Cobble	Low to Moderate	Eelgrass Bed	Low
11	Kickimuit River	28.2 ppt	Silt/Sand Gravel	Low to Moderate	Scattered Shell hash	Medium
12	Spar Island	30.6 ppt	Cobble/Stone	Low to Moderate	Sponge *Crepidula* *Mytilus*	Low
13	Spectacle Cove	30.6 ppt	Silt/Sand Some Cobble	Low to Moderate	*Crepidula* Shell hash	Medium
14	Fogland	31.2 ppt	Cobble/Silt/ Sand	Low to Moderate	Sponge *Crepidula* Shell hash	Low
15	Third Beach	31.8 ppt	Fine Sand	Low		Medium
16	Dyer Island	29.2 ppt	Silt/Sand/ Cobble	Low	Shell hash	Low
17	Warren River	29.2 ppt	Cobble/ Silt/ Sand	Low	Some Shell hash	Low
18	Wickford	31.1 ppt	Granite Sand	None Observed		High

*

Substrate Type was determined visually from photographs and knowledge of the site. Granite sand is orange/brown in color and generally more coarse than gray sand.
Gravel is 2mm – 64mm, Cobble is 64mm – 256mm, Stone is >264mm.
Definitions from: *Glossary Aquatic Habitat Inventory Terminology*. 1998. Neil B. Armantrout – Compiler, American Fisheries Society. 136p.

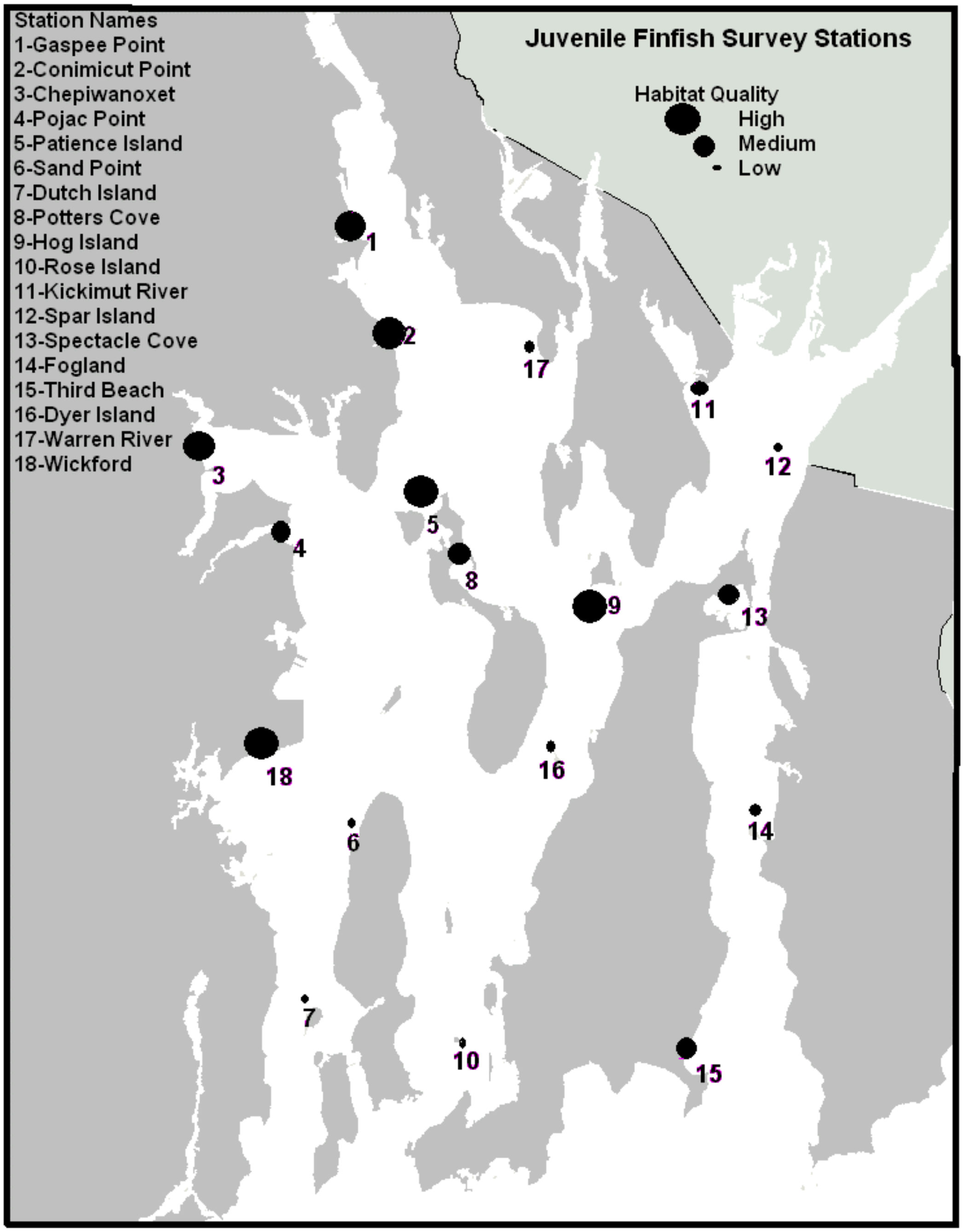

Figure B1. Map of the eighteen stations sampled during the R.I. Division of Fish & Wildlife's Narragansett Bay Juvenile Finfish Survey from 1995 to 2003.

Appendix C: Life History/Habitat Matrix for Winter Flounder, *Pseudopleuronectes americanus**

Life History Stage	Depth	Temperature		Salinity		Dissolved Oxygen	Habitat	Comments
		Range	Optimum	Range	Optimum			
Egg	1.8-5.4m; [13] 0-9m [14]	-1.8-15°C [21]	3°C; [19] 0-10°C [21]	10-35 ppt [19]	15-35 ppt [19]	Found at 11.1-14.2 mg/L [16]	Estuarine demersal;[15, 17] may attach to sand, mud or gravel substrates; or to algal mats,[7] or diatom mats[1]	Hatch in 15-18 days at 3 °C; [3] non buoyant, adhesive [15]
Larvae	0-37m [13]	New Brunswick: 12.5- 20.5 °C;[12] Connecticut: 3-15°C [16] New Jersey: 2-19 °C; [20] Maryland: 4-13 °C; [8]		New Brunswick: 6-26ppt; [12] Connecticut: 18-22ppt; [15] New Jersey: 10-22ppt; [20] Maryland: 6-14 ppt [8]		Found at 10.0-16.1 mg/L [16]	Estuarine; mixed pelagic-benthic [15]	Metamorphose in 2.5 –3.5 months;[3] non buoyant, poor swimmers[17]
YOY	Summer: 0-9m [14] Winter: 11-18m [14]	8-27°C [6]	16-19°C [5]	4-30 ppt [15]	5-20 ppt [9]	<2.2mg/L : declined growth rates[2]	Shallow estuarine, benthic; sandy mud substrate[18]	Can be found in marsh creeks, eelgrass, macroalgae and unvegetated areas adjacent to these;[10] photophilic[6]
Juvenile 1+, 2+	Summer: 11-18m [14] Winter: 10-30m [13]	0-25°C [17]	12-16°C [9]	4-30 ppt [15]	5-20 ppt [9]	2-13 mg/L [16]	Shallow estuarine, benthic; sandy mud substrate[18]	Nocturnally active; [6] photophobic[6, 14, 15]
Adult	1.8-44m [14]	0-25°C [17]	12-15°C [14]	15-35 ppt [14]		2-13mg/L; [16] <2mg/L: sharp decline in abundance[11]	Estuarine nearshore, benthic; mud or grassy substrate [3]	Diurnally active, sight feeders;[17] seasonal depth distribution[14]
Spawning	1.8-5.4m; [13] 0-9m [14]	1-10°C [13]	3-4°C; [13] 2-5°C [3]	11.4-33 ppt [3,13,17]	11.4-33 ppt [3,13,17]		Shallow estuarine, benthic; algal mats, sand/silt substrate [13]	Occurs from Mid-December to May;[15] ovulation does not occur above 6°C[13]

*Inshore populations only (excluding Georges Bank population)

- 1. Arnold, *et al*, 1972. 2. Bejda, *et al*, 1992. 3. Bigelow, *et al*, 2002. 4. Buckley, 1989. 5. Buckley, *et al*, 1990. 6. Casterlin, *et al*, 1982. 7. Crawford, *et al*, 1985. 8. Dovel, 1971. 9. Frame, 1973. 10. Goldberg, *et al*, 2002. 11. Howell, *et al*, 1994. 12. Locke, *et al*, 1995. 13. Martin, *et al*, 1978. 14. McCraken, 1963. 15. Pearcy, 1962. 16. Pereira, *et al*, 1999. 17. Perlmutter, 1947. 18. Powell, 1988. 19. Rogers, 1976. 20. Scarlett, 1991. 21. Williams, 1975.

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