*Atlantic States Marine Fisheries Commission*


***ASMFC Vision Statement*:**
**Healthy, self-sustaining populations for all Atlantic coast fish species or successful restoration well in progress by the year 2015.**

# ADDENDUM II
## TO AMENDMENT 1 TO THE INTERSTATE FISHERY MANAGEMENT PLAN FOR ATLANTIC MENHADEN

**October 2005**

# Executive Summary

**1. Introduction**
Addendum II was initiated by the Atlantic Menhaden Management Board in February 2005 to address two issues: a cap on the Atlantic menhaden harvest and a research program for Atlantic menhaden in Chesapeake Bay.

**2. Cap on the Atlantic Menhaden Harvest**
Addendum II to Amendment 1 of the Atlantic Menhaden Management Plan institutes a harvest cap on Atlantic menhaden by the reduction fishery in Chesapeake Bay at the average landings from 1999-2004. This cap will be in place for the fishing seasons starting in 2006 and going through 2010.

**3. Research Program for Chesapeake Bay**

The Atlantic Menhaden Technical Committee determined the following research priorities to examine the possibility of localized depletion of Atlantic menhaden in the Chesapeake Bay: determine menhaden abundance in Chesapeake Bay; determine estimates of removal of menhaden by predators; exchange of menhaden between bay and coastal systems;  and larval Studies (determining recruitment to the Bay).

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## 1.0 INTRODUCTION

At its February 2005 meeting, the Atlantic Menhaden Management Board approved a motion to initiate the development of Addendum II to Amendment 1 to the Interstate Fishery Management Plan (FMP) for Atlantic menhaden. This motion included limiting the harvest of menhaden in Chesapeake Bay by purse seine to no more than 110,400 metric tons annually in 2006 and 2007, and initiating a research program immediately to determine the status of menhaden populations in Chesapeake Bay. The Management Board considered this action in order to conserve the species while more complete population information is attained to assess whether localized depletion is occurring in Chesapeake Bay. Following the approval of this motion, the Board requested that a range of alternatives for managing the menhaden fishery be included in this document.

The original motion was based on the average landings from the previous five years by the reduction fishery in Chesapeake Bay. At the time the motion was made the latest data available was through 2003. Since that time, the 2004 data has become available. This is the data that is included in this addendum.

This addendum presents the background on the Atlantic States Marine Fisheries Commission's (ASMFC) management of Atlantic menhaden, the addendum process and anticipated timeline, and a statement of the problem.

### 1.1 Background

The Atlantic Menhaden Management Board approved the original Atlantic Menhaden FMP in October 1981. The plan did not recommend any specific management measures, but provided a discussion of options for future considerations. In 1982, the Board recommended seasonal limits as a means to provide long-term benefits to the fishery. This recommendation was approved by the Commission and referred to the states for implementation, however full implementation was not achieved.

The FMP was revised in 1992. The plan revision objectives included public education; continuation of the existing fishery monitoring program; improvement in collection of data on menhaden taken in directed bait fisheries and as bycatch in other fisheries; improvement of the Captain's Daily Fishing Report (CDFR) program; promotion of needed research on biological, economic, sociological, and habitat issues; encouragement of product research; maintenance, and enhancement; and utilization of the best available scientific data as the basis for coordinated management actions (ASMFC, 2001).

After the 1992 revision there were concerns over declines in the Atlantic menhaden recruitment. This decline led the Management Board to recommend that the Commission conduct an external peer review of the menhaden stock assessment. This peer review was completed in November 1998 and provided some major recommendations for improving the assessment and management of menhaden. Upon receiving the report of the Peer Review Panel in January 1999, the Board recommended that a full amendment



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to the FMP be developed and the recommendations of the Peer Review Panel be addressed through the development of the amendment.

Amendment 1 addressed a number of management measures and set up a process for future management of the Atlantic menhaden pursuant to the requirements of the Atlantic Coastal Fisheries Cooperative Management Act. This amendment also adopted a new overfishing definition by which the Management Board can measure the status of the resource. In addition, Amendment 1 requires mandatory reporting from all menhaden purse-seine fisheries (ASMFC, 2001).

Addendum I to Amendment 1 was approved by the Management Board in August 2004. This addendum revised the biological reference points, changed the frequency of stock assessments to every three years, and updated the habitat section (ASMFC, 2004).

**1.2 Status of the Stock**

The status of the Atlantic menhaden stock is considered to be healthy coastwide, based on the recommended benchmarks developed during the latest peer-reviewed assessment (2003 assessment). The Executive Summary of this assessment is included as Appendix A. The entire document can be found at www.asmfc.org. The estimated population fecundity for 2002 (last year assessed) was well above its target and threshold approved in Addendum I. The estimated fishing mortality was slightly above the target, but below the limit or threshold that defines overfishing. Fishing mortality has generally declined since the high values of the 1960s. The abundance of menhaden in Chesapeake Bay cannot be determined at this time due to a lack of data.

In 2004, the Technical Committee reviewed Addendum 1 triggers (i.e. catch per unit effort index and ratio of ages 2-4 to the total catch of all ages) to evaluate whether a stock assessment needed to be conducted before 2006. The Technical Committee concluded that neither trigger had been met. They will meet again in 2005 to reexamine the triggers and other relevant indices and make an assessment recommendation based on the data available.

Recruitment to age-1 was good to excellent in the late 1950's and the mid- 1970's to the early 1990's. Generally low recruitment to age-1 occurred during the mid- to late- 1960's and since 1996. The concern about recent poor recruitment is further substantiated by investigations with state-based juvenile abundance seine indices and development of a coastwide seine index. In February 2005, upon the request of the Management Board, the Technical Committee determined four potential causes for low recruitment including low spawning stock biomass (however, there is no apparent relationship between resident fish in Chesapeake Bay and the recruitment the following year), changes in larval transport resulting in reduced number of larvae brought into Chesapeake Bay, poor survival during the first few months in the Bay due to unfavorable environmental conditions, and predation by fish and invertebrates.

## 2.0 STATEMENT OF THE PROBLEM

### 2.1 Landings

The proportion of the total coastwide reduction fishery landings harvested from Chesapeake Bay has increased 11% from the 1985-1995 period, when landings averaged 47% of the coastwide harvest, to 1996-2004 when 58% was attained.

In 1998, the Atlantic menhaden reduction fishery in Virginia consolidated from two large fish factories in Reedville to one. Simultaneously, the number of menhaden fishing vessels was reduced from 18 to 20 boats in the pre-1998 years, to 13 vessels in 1998, and to 10 vessels since 2000. One major consequence of this decrease in fleet size has been an increase in proportion of landings from inside Chesapeake Bay. For example, between 1985-1997 and before consolidation (n = 13 yrs), reduction catches from within Chesapeake Bay averaged 49% of the total coastwide landings. After consolidation and beginning in 1998 (through 2004, n = 7 yrs), reduction catches inside Chesapeake Bay averaged 60 % of the total coastwide landings.

Despite this relative increase (11%) in the proportion of menhaden reduction removals from Chesapeake Bay over the two time periods, the absolute or actual removals from the Bay have declined over similar time frames. Between 1985 to 1999, when 13 or more vessels fished from the port of Reedville, to 200-2004, when the reduction fleet was pared to 10 vessels, catches for reduction from Chesapeake Bay have decreased by 28%.

### 2.2 Localized Depletion

The potential for localized depletion exists in Chesapeake Bay as a result of this concentrated harvest. Possible outcomes of localized depletion include compromised predator-prey relationships and chronic low recruitment of larval menhaden to the Chesapeake system. Reviews of existing data suggest that predator-prey relationships could currently be compromised and recruitment of larval menhaden has chronically declined during the last two decades.

Atlantic menhaden are an important food source to many predators; but are also one of many prey species available. Increased predation by predatory finfish and recovered seabirds has been raised as one possible cause of depletion of Atlantic menhaden in Chesapeake Bay. In 1995 striped bass stocks were declared fully rebuilt. The abundance of bluefish has also increased over this time period. The ASMFC is developing a multispecies model (MSVPA-X) to explore the relationship between predator and prey species on a coastwide scale. This model will be peer reviewed in the fall of 2005 and may be available for management shortly thereafter.

In February 2005, the Technical Committee reported that catch-at-age data show that fishery removals of age-0 menhaden in Chesapeake Bay is not a potential cause for depletion. There is a lack of reliable data to determine if depletion within season for all ages and annually for ages 1 and 2 Atlantic menhaden is occurring. There is no data to



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support a link between the age 2 and 3 resident menhaden in Chesapeake Bay and the following year's recruitment to the Bay.

Sufficient scientific data are not available to satisfactorily address the potential for localized depletion in the Bay or to identify specific reasons for predator finfish deficiencies or low larval menhaden recruitment. While the cap is in place a comprehensive research agenda will be implemented to assess whether localized depletion of the menhaden population is occurring in Chesapeake Bay.

Since the 1980's, the regulatory trend in state waters regarding Atlantic menhaden has been to prohibit menhaden harvest for reduction by purse seines. These closures were not recommended in the Atlantic Menhaden FMPs, nor were most closures based on the biological condition of the stock (ASMFC 1999). For example, the closure of New Jersey state waters to the reduction fishery was due to user group conflicts. Following New Jersey's prohibition on purse seining for reduction in 2002, the Atlantic menhaden fishery has become essentially a two-state fishery, with effort concentrated in Virginia (Chesapeake Bay and coastal ocean waters) and North Carolina (coastal ocean waters). Renewed access to traditional fishing grounds, now closed to purse-seining north of Virginia, presumably would reduce fishing effort and removals in Virginia and North Carolina waters. Appendix B outlines the history of regulations for each state that affect the menhaden fishery.

## 3.0 Capping the Atlantic Menhaden Harvest

### 3.1 Description of Landings

The Atlantic menhaden fishery is comprised of a purse seine fishery for reduction purposes and bait landings using purse seine and other gears. In 2004, coastwide landings of Atlantic menhaden for reduction amounted to 184,450 metric tons; this was 11% greater than landings for the 2003 fishing season (166,097 mt), and 1% greater than the previous five-year average (182,475 mt). In 2004, ten purse-seine vessels for reduction operated from Reedville, VA, and three vessels fished (mostly November to January) from Beaufort, NC.

A majority of the landings of Atlantic menhaden for bait are from purse-seines, which are fished in Virginia's portion of Chesapeake Bay and New Jersey. Landings of menhaden for bait by purse seine in 2004 amounted to 26,851 mt. In recent years about four purse seine for bait vessels ("snapper rigs") have operated in Virginia, and 3-4 vessels have operated in New Jersey.

In the Maryland portion of Chesapeake Bay a majority of the menhaden for bait are from pound nets (1,644 mt in 2004). Pound nets in Virginia also harvest menhaden for bait (2,585 mt in 2004), as well as in the Potomac River Fisheries Commission (2,454 mt in 2004). The remaining portion of menhaden for bait landings in Chesapeake Bay are made

by miscellaneous gears, such as gill nets. There are also landings of menhaden for bait in other states along the coast including NC, MA, RI, CT, and NY.

For the purposes of this Addendum, Chesapeake Bay is defined as waters inside the Chesapeake Bay Bridge Tunnel (CBBT) at the mouth of the Bay. The reasons for using the CBBT as the line of demarcation are that: a) the CBBT is a well-defined structure at the Bay mouth, and b) vessel log books maintained by the reduction fleet use the CBBT to define catches inside and outside of the Bay; moreover, removals from Chesapeake Bay (since 1985) are estimated based on log book data sets (see Monitoring section below).

**3.2 Description of Monitoring**

Current Monitoring System - The Beaufort Laboratory of the National Marine Fisheries Service (NMFS) collects and maintains most fishery-dependent data for the Atlantic menhaden purse-seine fisheries. With the assistance of several state fisheries agencies, especially the New Jersey Division of Fish and Wildlife (NJDFW), the NMFS since about 1995 has improved the fishery-dependent databases for the menhaden bait fisheries.

*3.2.1 Purse-Seine Reduction Fishery*

- Landings and Fishing Effort - Daily vessel unloads (in thousands of standard fish) are mailed monthly to the Beaufort Laboratory. Data are key-entered and edited shortly after receipt. Final edits are done in February, following cessation of fishing (usually in mid- to late January). Nominal or observed fishing effort is estimated in units of vessel-weeks (one reduction vessel fishing at least one day of a given week = 1 vessel-week). Total nominal fishing effort is estimated in February, after the fishing season ends.

- Age Compositions - NMFS port agents sample purse-seine catches at dockside in Reedville, VA, and Beaufort, NC, throughout the fishing season (usually May through January). Specimen ages are determined (via scales) and data are key-entered at Beaufort. During the fishing season raw age composition data by port are generally available about one to two months after samples are acquired. Raw port samples are merged with landings data by port-weeks at the end of the fishing season to generate the catch-at-age matrix. The matrix is adjusted slightly by area using CDFRs (see below) to account for "topping off' of catches in Chesapeake Bay. The final catch-at-age matrix is usually available in February.

- Removals by Area - Areal removals of Atlantic menhaden by the purse-seine reduction fleet are estimated using the Captains Daily Fishing Reports (CDFRs). CDFRs are deck logbooks maintained by Virginia and North Carolina reduction purse-seine vessels. Fleet compliance is 100% (n = 13 vessels in 2004). Vessel captains complete CDFRs and itemize number of daily purse-seine sets. Among other things, data recorded for each set include time and location of set, distance from shore, and the 'at-sea' estimated catch (in thousands of 'standard' fish).

Fleet CDFRs from the Virginia menhaden plant are collected weekly by plant personnel and mailed on a weekly or bi-weekly basis to the NMFS Beaufort Laboratory. At Beaufort, CDFRs are collated and undergo preliminary edits in one to two month batches, then key-entered into a data base. Although 'in-season' areal removals can be estimated via the CDFRs, lag time from form completion to key-entry is several months. Total removals by area are calculated at the end of the fishing season. 'At sea' catches from the CDFRs are summed by vessel, and compared to total vessel unloads from company catch records. Individual 'at sea' sets are then multiplied by an adjustment factor (company records / 'at sea' estimates). Adjusted catches by set are converted to metric tons, and accumulated by fishing area. Catch totals are reported by ocean fishing areas ([NJ, DE, and MD in the EEZ] and VA and NC), while catches inside and outside Chesapeake Bay are delineated by the Chesapeake Bay Bridge Tunnel.

*3.2.2 Purse-Seine Bait Fishery*

- Landings - Landings of Atlantic menhaden for bait by purse-seine gear occur in Virginia and New Jersey. Since 1998, bait purse-seine vessels in VA (about 4-5 vessels), also called 'snapper rigs', maintain CDFR forms (and as per 2001 Addendum I requirements). CDFRs are accumulated onboard during the fishing season (usually May – November). A NMFS port agent collects the CDFRs for the entire fishing season in late November. CDFR data are key-entered at NMFS Beaufort. Estimates of total catch by Virginia bait vessels are available in February. Estimates of nominal fishing effort by the bait vessels are not made, although number of purse-seine sets is known from the CDFRs.

  Landings of Atlantic menhaden by purse seine for bait in New Jersey are compiled by the NJDFW. All purse seine bait fishermen are permitted and required by regulation to submit monthly harvest reports on forms supplied by NJDFW. The information on the monthly harvest reports include landings each day and the area of State waters from which the fish were harvested. Harvest reports are summarized monthly and seasonally to document landings from pre-defined areas of the State's marine waters and port of landings.

- Age Compositions - A NMFS port agent samples purse-seine catches for bait at dockside in Northern Neck, VA, area throughout the fishing season. In New Jersey, dockside bait samples from purse-seine catches are acquired by NJ F&W personnel. Data are usually mailed to the NMFS Beaufort Laboratory monthly. Specimen ages are determined (via scales) and data are key-entered at Beaufort. During the fishing season raw age composition data by port are generally available about one to two months after samples are acquired. Raw port samples are merged with bait landings data by area to construct a bait catch-at-age matrix, which is only generated during 'stock assessment' years.

- Removals by Area - Purse-seine vessels fishing for bait are generally smaller (< 100 ft long) than the reduction vessels. Therefore, bait vessels range less than the



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reduction vessels; probably due to their smaller size. . Menhaden for bait catches by purse seine in the Virginia portion of Chesapeake Bay are concentrated near Smith Point and the mouth of the Rappahannock River. Since Virginia bait vessels maintain CDFRs, further refinement of catch by area is possible, but not routinely performed. Menhaden for bait catches by purse seine in New Jersey are concentrated in northern New Jersey and around Cape May.

*3.2.3 Atlantic Menhaden for Bait Landings by Other Gears*

- A majority of Atlantic menhaden for bait landings by gear other than purse seines comes from the pound net fisheries of Virginia, Maryland, and the Potomac River. Pound net landings are acquired by various state fisheries agencies, then reported to the NMFS General Canvass Survey. Pound net landings of Atlantic menhaden are generally available in spring after the year in which the landings were made.

- North Carolina accounts for significant bait fishery landings from a variety of gears. Minor quantities of Atlantic menhaden for bait are landed in other East coast states by miscellaneous gears such as gill nets and trawl.

- Menhaden for bait landings by gears other than purse seine are annually compiled from compliance reports and presented to the Technical Committee.

**3.3 Atlantic Menhaden Harvest Cap**

This addendum restricts the annual total allowable landings by the reduction fishery in Chesapeake Bay to no more than the average landings from 1999-2004. Harvest for reduction purposes shall be prohibited when 100% of the cap is landed. This cap will be in place for the fishing seasons starting in 2006 and going through 2010.

## 4.0 Research Program for Chesapeake Bay

In June 2004, The Atlantic Menhaden Technical Committee determined the following research priorities to examine the possibility of localized depletion of Atlantic menhaden in the Chesapeake Bay.

**4.1 Determine menhaden abundance in Chesapeake Bay**

The Technical Committee recommended a two-year pilot study of a LIDAR survey be conducted in Chesapeake Bay to examine feasibility of determining abundance in the bay. This study will be designed to estimate abundance, distribution and biomass of Atlantic menhaden in a region. The study will take place over two years and two seasons, for a total of four surveys. This pilot study will allow the gathering of basic data to shape the procedure for long term monitoring. The long term study would not only include the Chesapeake Bay but should be used as a coast wide survey for use as an index in the single species and multispecies models. The first year of the LIDAR pilot study would include sampling resolution, evaluate gear performance, and ground truthing. During the second year, researchers will design protocol and obtain samples. At least some of the



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surveys should take place while the fishery is operating, to provide some of the ground truthing. Acoustic surveys should run concurrent with the LIDAR survey to provide additional ground truthing data.

**4.2 Determine estimates of removal of menhaden by predators**
The Technical Committee recommended a two-year pilot study using current state and federal Fishery Independent surveys. These surveys should focus on and quantitatively evaluate stomach contents and consumptions of key prey species by predators.

**4.3 Exchange of menhaden between bay and coastal systems**
The Technical Committee believes that the short and long term exchange rates between Bay coastal residents is very important in determining the overall effect of menhaden harvest. They identified three studies, which might aid in determining these exchange rates. These studies include;

- a coded micro wire tagging study
- an otolith microchemistry study
- a tagging study similar to the internal-ferro magnetic tagging study was conducted by NMFS in Beaufort, NC until the 1980's.

Resurrecting these methods may prove useful and cost efficient means of answering this particular issue. Also otolith microchemical analysis was recently conducted on Chesapeake Bay weakfish populations and has proved very useful. NMFS, Woods Hole is currently conducting a Morphometrics study on Atlantic herring to examine mixing between stock components.

The Technical Committee recommends a pilot study to examine otolith microchemistry as a tool; and perhaps longer term research if the technique proves useful.

**4.4 Larval Studies (determining recruitment to the Bay)**
An early juvenile stage index conducted by trawl in low salinity sections of estuaries may be the most prudent and cost effective way to investigate. However, timing is critical. VIMS does larval striped bass survey and there is the potential of adding to existing surveys.

## 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 Addendum, and the procedures that will

govern the evaluation of compliance. Additional details of the procedures in the ASMFC Interstate Fisheries Management Program Charter (ASMFC 2000).

## 5.1 Mandatory Compliance Elements for States

Any state with reduction processing capabilities will be determined to be out of compliance with the provisions of this addendum, according to the terms of the ISFMP Charter if:

- its regulatory and management programs to implement *Section 3.3* have not been approved by the Atlantic Menhaden Management Board; or
- it fails to meet any schedule required by *Section 5.1.2*, or any addendum prepared under adaptive management; or
- it has failed to implement a change to its program when determined necessary by the Atlantic Menhaden Management Board; or
- it makes a change to its regulations required under *Section 3.3* or any addendum prepared under adaptive management, without prior approval of the Atlantic Menhaden Management Board.

### 5.1.1 Mandatory Elements of State Programs

To be considered in compliance with this addendum, all states must include harvest controls on Atlantic menhaden fisheries consistent with the requirements of *Section 3.3*.

#### *5.1.1.1 Regulatory Requirements*

Each state with reduction processing capabilities must submit its required Atlantic menhaden regulatory program to the Commission through the ASMFC staff for approval by the Atlantic Menhaden 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 addendum or contained in current state law. The following lists the specific compliance criteria that a state must implement in order to be in compliance with Addendum II.

- The annual total allowable landings by the reduction fishery in Chesapeake Bay shall be no more than the average landings from 1999-2004. Harvest for reduction purposes shall be prohibited when 100% of the cap is landed. This cap will be in place for the fishing seasons starting in 2006 and going through 2010.

Once approved by the Atlantic Menhaden 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.

### 5.1.2 Compliance Schedule

States must implement Addendum II to the following schedule:

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| January 11, 2006: | States with reduction processing capabilities must submit programs to implement Addendum II for approval by the Atlantic Menhaden Management Board. Programs must be implemented upon approval by the Atlantic Menhaden Management Board. |
| July 1, 2006: | States with reduction processing capabilities must implement Addendum II. States may begin implementing management programs prior to this deadline if approved by the Management Board. Any harvest of Atlantic menhaden from the Chesapeake Bay for reduction purposes prior to this implementation date must be counted towards the 2006 quota. |



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## 6.0 References

Atlantic States Marine Fisheries Commission (ASMFC). 1999. Atlantic Menhaden Stock Assessment Report for Peer Review. Atlantic States Marine Fisheries Commission, Stock Assessment Report No. 99-01 (supplement). 146p p.

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# 7.0 Appendices

## Appendix A: Executive Summary from the 2004 Atlantic Menhaden Stock Assessment Report

Amendment 1 to the Interstate Fishery Management Plan (ISFMP) for Atlantic Menhaden was approved in July 2001. This Amendment replaced the "Atlantic Menhaden Fishery Management Plan, 1992 Revision"

Since the 1992 revision there have been concerns over declines in the Atlantic menhaden population. This decline led the Menhaden Management Board to recommend that the Commission conduct an external peer review of the menhaden stock assessment, which was conducted annually through the Atlantic Menhaden Advisory Committee, or AMAC (ASMFC 1999a). This peer review was completed in November 1998 and provided some major recommendations for improving the assessment and management of menhaden (ASMFC 1999b). Upon receiving the report of the Peer Review Panel in January 1999, the Board recommended that a full amendment to the current FMP be developed and that the recommendations of the Peer Review Panel be addressed through the development of this amendment. Amendment 1 adopted a new overfishing definition by which the Management Board can measure the status of the resource. In addition, Amendment 1 requires mandatory reporting from all menhaden purse seine fisheries (ASMFC 2001). The stock of Atlantic menhaden is scheduled to go through a benchmark assessment to be peer reviewed every five years. In 2003, this benchmark assessment was completed. This document served as the primary source document for the Peer Review Panel.

Atlantic menhaden are found in the continental waters of North America from Nova Scotia to central Florida. Spawning occurs in the ocean, while larvae and juveniles utilize coastal estuarine nursery areas. Atlantic menhaden undergo extensive seasonal migrations north and south along the United States East Coast. Based on tagging studies, the Atlantic menhaden fishery is believed to exploit a single stock or population of fish. The management unit for Atlantic menhaden is the Atlantic coastal and estuarine waters from Maine through Florida.

Atlantic menhaden have supported one of the United States' largest fisheries since colonial times. Native Americans were the first to harvest menhaden, primarily as fertilizer. During the 1940s, the primary use associated with harvest changed to high protein animal feeds and oil production. Following World War II, the industry grew rapidly, reaching peak production during 1953-62. Sharp declines in landings thereafter resulted in factory closings and fleet reductions through the 1960s and into the early 1970s. In 1955, 24 reduction plants operated on the Atlantic coast, with a decline to only two plants in 1998. Since the 1970s, the menhaden industry has experienced major changes in fishery efficiency, processing capacity, resource accessibility, and development of new product markets.



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The Atlantic menhaden fishery consists of two components, the reduction fishery and the bait fishery. The reduction fishery uses steam to cook the raw fish, presses to remove liquid from the cooked fish, and centrifuges to separate oil from water in the liquid fraction. The pressed fish is dried, milled and sold as fishmeal. Fish oil is a significant ingredient in high quality aquaculture feeds and pet foods, as well as being used in the production of paints and cosmetics. Fish solubles, the water-fraction of the processing, are often recombined with the fishmeal to form an 'enriched' meal. Menhaden are taken as bait in almost all Atlantic coast states and are used for bait in crab pots, lobster pots, and hook-and-line fisheries (both recreational and commercial).

Landings and nominal effort (vessel-weeks, measured as number of weeks a vessel unloaded during the fishing year) are available since 1940. Landings rose during the 1940s (from 167,000 to 376,000 tons, t), peaked during the 1950s (high of 712,000 t in 1956), and then declined to low levels during the 1960s (from 576,000 t in 1961 to 162,000 t in 1969). During the 1970s the stock rebuilt (landings rose from 250,000 t in 1971 to 376,000 t in 1979) and then maintained intermediate levels during the 1980s (varying between 238,000 t in 1986 when fish meal prices were extremely low to 418,600 t in 1983). Landings during the 1990s declined from 401,200 t in 1990 to 171,200 t in 1999. Reduction landings in recent years declined further to 167,200 t in 2000, rose to 233,700 t in 2001, and then declined again to 174,000 t in 2002.

The Atlantic menhaden Technical Committee continues to develop and update the reported annual coastal bait landings for all gear types. In recent years, menhaden purse seine fisheries for bait have operated primarily in North Carolina, Virginia, and New Jersey. Purse seine landings in these three states account for about 90% (1998-2002) of the coast wide menhaden bait landings. Small scale directed gill net fisheries for menhaden as bait exist in many states. Additionally, menhaden for bait are taken as an aggregate bycatch in other coastal states by a variety of gears such as gill nets, pound nets and trawls.

Previous stock assessment analyses of Atlantic menhaden have used untuned virtual population analysis (VPA) methods. A forward-projecting model was preferred over the VPA method primarily because of the increased flexibility in formulation and statistical treatment of the data sources.

The forward-projecting statistical age-structured model estimates population numbers at age (0-8) for 1955-2002. From these estimates and growth data, different estimates of population biomass and reproductive capacity can be developed.

Spawning stock biomass (SSB, weight of mature female biomass at start of fishing year) was high in the late 1950s and early 1960s, low in the late 1960s, and generally increasing since then. The largest values of spawning stock biomass were present in 1955 and 1961, resulting from two very strong recruitment events in 1951 and 1958 as noted in earlier stock assessments. The historical time period 1955-2002 produced a median SSB of 76,800 t. Estimates of SSB from 1964 until 1971 were below the 25$^{th}$



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percentile. Since 1972, an estimate of SSB below the 25$^{th}$ percentile occurred only in 1975, 1985, 1992, and 2000. Historically high levels of spawning stock biomass (greater than the 75$^{th}$ percentile) occurred during 1955-1956, 1958-1962, 1987-1988, 1994-1995 and 1997. The estimate for spawning stock biomass in 2002 was 91,900 t, or between the median and 75$^{th}$ percentile.

Similarly, population fecundity (number of maturing or ripe ova) followed a similar pattern to spawning stock biomass. The historical time period 1955-2002 produced a median population fecundity of 30.1 x $10^{12}$ ova. Estimates of fecundity from 1964 through 1971 and 1975 to 1976 were below the 25$^{th}$ percentile. Since 1978, an estimate of population fecundity below the 25$^{th}$ percentile occurred only in 1985 and 1992. Historically high levels of population fecundity (greater than the 75$^{th}$ percentile) occurred during 1955-1956, 1958-1962, 1988, and 1994-1997. The estimate for population fecundity in 2002 was 40.6 x $10^{12}$, again between the median and the 75$^{th}$ percentile.

Recruits of Atlantic menhaden to age-0 and age-1 were high during the late 1950s, especially the 1958 year class. Recruitment was generally poor during the 1960s, with values below the 25$^{th}$ percentile for the recruitment time series. High recruitment occurred during the 1970s to levels above the 75$^{th}$ percentile. Moderate to high recruitment occurred during the 1980s, with generally low recruitment since the mid-1990s. The most recent estimate of recruitment has the greatest uncertainty and the estimate for 2002 is likely to be modified as more data from the cohort (age-1 in 2003, age-2 in 2004, etc.) are added to the analysis. The current estimate of recruits to age-0 in 2002 is between the median and 75$^{th}$ percentiles, while the current estimate of recruits to age-1 in 2002 falls below the 25$^{th}$ percentile.

The Atlantic menhaden Technical Committee is recommending changing from an SSB based target and threshold to a Fecundity based target and threshold. They are also recommending that the Fishing Mortality target and threshold be modified. Based on an overall examination of stock and fishery information, the Technical Committee has concluded that on a coast wide basis, Atlantic menhaden are not overfished and overfishing is not occurring.



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**Appendix B: History of State Fishing Regulations that impact Atlantic Menhaden**

Maine

The Department of Marine Resources (DMR) regulation Chapter 41.01 Menhaden fishing and transportation in Casco Bay became effective May 2, 1982 and expired December 31, 1983. According to the basis statement the regulation was adopted to ensure a steady supply of menhaden bait for the lobster fishing in Casco Bay by establishing a fishing permit, transportation and quantity restrictions for the smaller vessel fleet. See file Ch 41.01.doc/page 4 (Appendix A).

Currently Chapter 41 Menhaden is empty and only contains pointers to Chapter 55.05(C) and (D) Use of purse, drag or stop seines in certain waters prohibited; regulation of fishing therein. Chapter 55.05(D) became effective May 3, 1987 and previously to this date it was effective June 1, 1976. This regulation removed a ban on the taking of menhaden above a line in the St. George River for the purpose of fishing menhaden for lobster bait. Boats have quantitative limits, a permit from the Commissioner is required and fishing may occur from June 1 – December 31. See file Ch 55.05(D).doc/page 2 (Appendix A).

Chapter 55.05(C) is a similar rule to (D) except in the Damariscotta River and effective June 1, 1976. Technically section (C) should be repromulgated to be effective in accordance with the Maine Administrative Procedures Act in 1979, which conflicts with a separate law passed during the same legislative session that converted all DMR "Private and Special Laws" (P&SL) to agency regulations. Both of these regulations were originally established pursuant to PS&L 1959, c. 155, §9. See file PS&Lc155section9.pdf, which pertains to gear restrictions not specific to menhaden.

New Hampshire

State law (RSA 211.49) prohibits the use of mobile gear in New Hampshire state waters. As a result, the New Hampshire fleet does not have any vessels rigged for purse seining or bait seining.

Massachusetts

In Massachusetts State waters, there are restrictions on the use of purse seines, the primary gear used to catch menhaden in State waters. State commercial fishery and regulated fishery endorsement permits are required to fish a purse seine greater than 200 square feet in area and specific areas (mostly nearshore) are closed to fishing year-round.

Rhode Island

The following is a brief synopsis of the regulatory changes to Rhode Island's (RI) marine fishing regulations regarding Atlantic Menhaden. Each change is summarized in the following paragraphs by date and presented in table 1 at the end of the summary.

*December 19, 1978*



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Part 16 to the RI Marine Fisheries Statutes and Regulations titled Menhaden Regulations was established on December 19, 1978 which established Narragansett Bay as a Menhaden Management Area which created areas closed to fishing by a purse seine net within state waters.

*October 10, 1984*
On October 10, 1984 a daily catch trigger was established for closing areas in Narragansett Bay. If the daily catch equaled or exceeded 1 million pounds per day, a list of predetermined areas in Narragansett Bay would close immediately to the taking of menhaden for reduction purposes.

*May 13, 1985 through January 4, 1989*
On May 13, 1985, June 19, 1986, and January 4, 1989 seasons were established for the taking of Menhaden for reduction purposes. The season was established on May 13, 1985 and it was modified on the June 19, 1986 and January 4, 1989 dates.

*June 14, 1991*
On June 14, 1991 the list of closure areas which would be triggered by a 1 million pound per day catch was altered to include more areas within Narragansett Bay.

*June 28, 1994*
On June 28, 1994 the list of areas closed to Menhaden fishing was altered to establish some new areas.

*December 8, 1994*
On December 8, 1994 the trigger for closing the predetermined areas in Narragansett Bay was lowered to 500,000 pounds per day.

*June 16, 1995*
On June 16, 1995 an emergency regulation was filed to close down the predetermined list of areas in Narragansett Bay due to the daily catch limit being exceeded.

*September 13, 1995*
On September 13, 1995 the closure areas for the taking of Menhaden were altered in an effort to alleviate growing user group conflicts.

*August 23, 1999*
On August 23, 1999 the seasonal closures were altered.

*January 9, 2003*
On January 9, 2003 the taking of Menhaden from Narragansett Bay and all of RI's state waters for the purposes of reduction was prohibited. This was done to mirror a state statutory change which had passed the RI legislature to the same effect.



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Overview of RI menhaden regulatory changes.

| DATE | SPECIES | REGULATION PART NUMBER AND DESCRIPTION OF CHANGE |
|---|---|---|
| 19-Dec-78 | MENHADEN | 16 - EST. AREAS CLOSED TO MENHADEN (OR OTHER FINFISH) BY PURSE SEINE |
| 10-Oct-84 | MENHADEN | 16 - TRIGGER (1,000,000 LBS./DAY) CLOSES PRE-DETERMINED AREAS OF NARR BAY |
| 13-May-85 | MENHADEN | 16.2 - PURSE SEINING IN NARRAGANSETT BAY MENHADEN AREAS AND SEASON – 1985 |
| 19-Jun-86 | MENHADEN | 16.1; 16.2 - PURSE SEINING IN NARRAGANSETT BAY MENHADEN AREA AND SEASON - 1986 |
| 4-Jan-89 | MENHADEN | 16.02 - SEASON FOR REDUCTION FISHERY:OPEN 5/1/89-10/1/89; CLOSED 10/1/89-5/1/90 |
| 14-Jun-91 | MENHADEN | 16 - TRIGGER (1,000,000 LBS./DAY) CLOSES AREAS OF NARRAGANSETT BAY |
| 28-Jun-94 | MENHADEN | 16.1 ESTABLISH AREAS CLOSED TO MENHADEN FISHING |
| 8-Dec-94 | MENHADEN | 16.1 REDUCE TARGET POUNDAGE THAT TRIGGERS CLOSURE OF PRE-DETERMINED AREAS OF NARRAGANSETT BAY |
| 16-Jun-95 | MENHADEN | 16.1.1 EMERGENCY CLOSURE TO 13 PREDETERMINED AREAS OF NARRAGANSETT BAY TO REDUCTION FISHERY |
| 13-Sep-95 | MENHADEN | 16.1 ADJUST CLOSED AREAS FOR MENHADEN SEINING TO ALLEVIATE USER-GROUP CONFLICTS |
| 23-Aug-99 | MENHADEN | 16.1.1 - 16.5 - CHANGES SEASON FOR PURSE SEINERS; CLOSURES: certain areas and Sunday/Holiday |
| 9-Jan-03 | MENHADEN | 16.1; 16.2; 16.4 - PROHIBITS the taking of menhaden for reduction purposes from RI waters - [action reflects new RIGL20-4.1-3] |

Connecticut

The use of purse seines to take any species is prohibited by state statute effective April 25, 2000. Menhaden may be taken commercially by gillnets, pound nets, trawl nets, fish pots and by hook, and may be landed by any of these gears, and also by purse seine if legally taken from the waters of a state in which the fishery is allowed. In practice, only gillnets are routinely used. State statutes permit the use of a single gillnet not more than 60 ft in length in marine waters to take menhaden only, for personal use under a Personal Use Gillnet License.



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New York

Historically, New York supported a large and active Atlantic menhaden processing fishery. The importance of this fishery diminished over the period from the early to the mid 1900's. The last remaining menhaden processing plant located in Amagansett on eastern Long Island closed its doors in the mid to late 1960's after the long period of decline. Today, there are several yet relatively small, menhaden fisheries in New York. These include an American Lobster bait gill net fishery, a limited purse seine fishery, a small haul seine fishery for menhaden, a gill net fishery for menhaden, and the local pound net fishery. In addition there is an active cast net fishery which captures menhaden primarily for personnel use as bait. Legislative actions during 1998 reduced the areas in which the large purse seines could operate, thus reducing there presence in New York. A detailed list of New York's regulations can be seen at the end of this appendix.

New Jersey

Presented below is a brief history of the management regimes that have governed the Atlantic menhaden fishery in New Jersey marine waters, specifying major changes that have occurred throughout the designated time period.

- **May 2, 1983,** regulations adopted at N.J.A.C. 7:25-22.1 and 22.2 provide for the purse seining of Atlantic menhaden outside 0.6 nautical miles (nm) from shore. This area restriction applies to the Atlantic Ocean, Delaware Bay, and the Raritan and Sandy Hook Bays and were implemented to avoid spatial conflicts that existed between large scale purse seine operations occurring close to the coast and recreational boaters, anglers and beach users. The season for taking Atlantic menhaden by purse seine for fish meal reduction is defined as occurring from the third Monday in May through the third Friday in October as required by the FMP. There is no limited season for the taking of Atlantic menhaden for bait, chum or purposes other than for fish meal reduction. The regulations further prohibit fishing activity on Saturdays, Sundays, and specified State holidays. All commercial fishing vessel pump outlets shall discharge below the vessel's water line and all discharge from fish pumps must be treated with a United States Coast Guard approved anti-foaming agent. Licensees in this fishery are responsible for any cleanup of fish, fish parts, refuse, litter, or garbage of any kind that is released as a result of a fishing operation.

- **July 17, 1989,** regulations amended at N.J.A.C. 7:25-22.1 and 22.2 and new rules adopted at N.J.A.C. 7:25-22.3 and 22.4 provide for the following management measures:

  Atlantic Menhaden Reduction Fishery- fishing activity is restricted to the Atlantic Ocean only and cannot occur within 1.2 nm from shore. All vessels engaged in the purse seine fishery for Atlantic menhaden must notify the State's enforcement unit both prior to and upon the completion of any fishing in State waters. One of the



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primary purposes of these amendments and new rules is to lessen the continuing conflict between large-scale menhaden purse seining activities and recreational fishermen in the near-shore waters.

Atlantic Menhaden Bait Fishery – under new rules, fishermen with vessels less than 90 feet in length may be permitted to take Atlantic menhaden, under limited conditions, for bait purposes only. Fishermen operating in this bait fishery are prohibited from fishing within 0.6 nm of the shoreline in the Atlantic Ocean and in portions of Delaware Bay, and 0.3 nm of the shoreline in the Raritan and Sandy Hook Bays. Permit tees in this bait fishery are required to submit monthly reports, providing accurate records of the amount and location of Atlantic menhaden harvested. Fishing activity is prohibited on Saturdays, Sundays, and State designated holidays. The removal of fish from the purse seine shall be by brailing or dip net only.

These changes to New Jersey's regulations were to further reduce spatial conflicts and water quality concerns that prevailed in the commercial operation of the purse seine fishery.

Vessel Boarding – a new rule at N.J.A.C. 7:25-22.4 provides for vessel inspection by law enforcement officers for the purpose of enforcing all rules concerning the harvest of Atlantic menhaden.

- **January 3, 2000,** a regulatory amendment at N.J.A.C. 7:25-22.3 increased the fishing restricted area in the Raritan and Sandy Hook Bays to 0.6 nm from shore to be consistent with area restrictions for the bait fishery in the Atlantic Ocean and Delaware Bay. This change was made necessary even with small scale purse seine operations due to spatial conflicts with recreational boaters and anglers.

    - **January 6, 2002,** by action of the 209th Legislature of the State of New Jersey, the taking of Atlantic menhaden in State coastal waters for the purpose of fish meal reduction is prohibited. The licensed taking of Atlantic menhaden for use as bait for commercial or recreational purposes would continue to be permitted.

Delaware

There are presently no management measures in place in Delaware regulating menhaden harvest by gill netters. Commercial purse seine vessels are banned from state waters through legislation passed in 1992. Delaware gill netters are licensed and a mandatory reporting system is in place for all species.

Maryland

Maryland law has prohibited the use of purse seine since 1931: "A person may not catch finfish for any purpose in the tidal waters of the State by use of any gig, gig iron, purse net, beam trawl, otter trawl, trammel net, troll net or drag net" (Annotated Code of

Maryland 4-710. Prohibitions and restrictions of methods of fishing generally). Thus purse seining for Atlantic menhaden for fish meal reduction cannot be prosecuted in Maryland.

Potomac River Fisheries Commission

The menhaden fishery is almost exclusively a pound net fishery. Pound nets have a season of February 15- December 15 each year. All trawling and purse seine nets are prohibited. Gill nets are restricted to a 5" minimum mesh.

Virginia

In the Laws of Virginia Relating to the Marine Resources of the Commonwealth, several of the current statutes pertaining to Atlantic menhaden can be traced back to the early 1900s. The following summary will identify important changes that have occurred in Virginia's Atlantic menhaden laws and regulations.

Chapter 4 in the Code of Virginia includes all laws pertaining to the use of purse nets for taking menhaden.

- **Section 28.2-400. Application for license for resident or nonresident to catch menhaden.** (Existed in 1919 as Statute 3187).

- **In 1978, the courts ruled that there was discrimination against nonresident corporations. The 1978 amendment deleted several sections that required certain statements as to residency in the application. The amendment also deleted language which had restricted application to resident persons, firms or corporations.**

- Section 28.2-401. Service of process for nonresident individuals, foreign corporations, general and limited partnerships. **(Existed in 1919 as Statute 3184).**

- **The 1978 amendment deleted the requirement for nonresidents to only fish for menhaden in the three-mile limit on the seacoast of Virginia during a specified season. The amendment also deleted a proviso for a higher fee for a nonresident. There were additional language changes in this section.**

- **Section 28.2-402. License fee to take menhaden with purse nets.** (Existed in 1919 as part of Statute 3167).

- The 1978 amendments deleted the catchline "Residents" and other language which made special provisions for nonresidents.

- Section 28.2- 403. Action of Commissioner on such application; transfer of license of disabled vessel; delegation of authority; appeals. **(Existed in 1919 as part of Statute 3188).**



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- Section 28.2-404. Appeals from actions of Commissioner. **(Existed in 1919 as part of Statute 3188).**

- Section 28.2-405. Carrying patent tongs, etc., while fishing for menhaden; penalty. **(Existed in 1919 as Statute 3177). Unlawful to carry aboard his vessel . . . "when fishing for menhaden, any scrape, dredge, or patent tongs."**

- Section 28.2-407. Forfeiture of fishing gear. **(Existed in 1919 as Statute 3190).**

- **Section 28.2-408. Food fish not to be taken, bought, or sold; percentage allowable; penalty.** (It appears that this statute existed prior to 1919 as Statute 3176). Unlawful to take by purse seine . . . "food fish in an amount greater than one percent of the whole catch."

- **Section 28.2-409. Menhaden fishing prohibited in certain areas; exception**. (Existed in 1919 as part of Statute 3167).

- The 1966 amendment identified areas of the Piankatank, Rappahannock, York, East, North, Ware and Severn rivers where it was unlawful to fish with purse seines (prohibited areas).

- The 1974 amendment added creeks on the Eastern Shore and Western Shore of the Chesapeake Bay to the list of prohibited areas.

- The 1980 amendment added the Great Wicomico river to the list of prohibited areas. In addition, the amendment added a section that granted vessels under 100 gross tons authorization to fish in additional waters of the Rappahannock river, Dividing, Indian and Dymers creeks.

- **The 1982 amendment substituted "70 gross tons" for "100 gross tons". A season was also established for vessels under 70 gross tons, from the third Monday in May through the third Friday in November.**

- The 1988 amendment revised the beginning date of the fishing season for vessels under 70 gross tons, to the first Monday in May.

- **Section 28.2-410. Closed season for menhaden fishing; forbidden nets; penalty.** (Existed in 1919 as part of Statute 3188). Unlawful for any person to take with a purse net in the waters of this Commonwealth, "menhaden between the Saturday following the third Friday in November and the Sunday preceding the first Monday in May. However, in the waters east of the Chesapeake Bay Bridge Tunnel within the three-mile limit of the Virginia shoreline such prohibition shall be between the Friday before Christmas and the Sunday preceding the first Monday in May. It is also unlawful for any person to use any purse net or other net having a stretched mesh of less than 1 ¾ inches."



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- **The 1962 amendment added a paragraph to this section pertaining to nonresident stockholders and to the employment of nonresidents as commanders and fishermen.**

- **The 1972 amendment changed the beginning of the closed season to twentieth day of December.**

- **The 1976 amendment changed the closed season to "the day following the third Friday of November and the day preceding the third Monday in May."**

- **The 1978 amendment deleted the former first paragraph which pertained to nonresident stockholders and nonresidents employed as commanders and fishermen.**

- **The 1988 amendment changed the closed season and inserted language establishing a season for the waters east of the Chesapeake Bay Bridge Tunnel and within the three mile limit of the Virginia shoreline.**

- Section 28.1-65.1. Season for vessels of less than seventy gross tons to take or catch menhaden for purposes other than use as fish meal or oil. **(Enacted in 1982). "Except from the first Monday in March to, but not including, the first Monday in May, it is unlawful for vessels with a gross weight of less than seventy tons to use purse nets to take or catch menhaden for purposes other than use as fish meal or oil."**

**VIRGINIA MARINE RESOURCES COMMISSION – REGULATIONS**

- Regulation 4VAC20-190-10 et seq. "Pertaining to Measuring Mesh Size of Menhaden Nets". **Effective August 1, 1995. (Originally adopted as Regulation XXV on December 15, 1980 and was effective on February 2, 1981).**

**The purpose of this regulation is to set forth the procedure that will be used for determining compliance with** Section 28.2-410 **of the Code of Virginia. Since the law does not specify how the stretched mesh (mesh size) will be determined, this regulation shall serve to clarify the term stretched mesh and establish a technique for determining the size of the stretched mesh.**

- Regulation 4VAC20-610-10 et seq. "Pertaining to commercial fishing and mandatory harvest reporting". E**ffective August 1, 2002.**

**The purpose of this regulation is to establish the procedures for the registration of commercial fishermen and the manner and form of mandatory harvest reports from fishermen and others.**



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- 4VAC20-610-60. Mandatory harvest reporting. (Section L) **requires the owner of any purse seine vessel or bait seine vessel licensed under the provisions of** Section 28.2-402 **of the Code of Virginia to submit Captain's Daily Fishing Reports to the NMFS.**

North Carolina

- 1955: Purse seines are allowed to fish for non food fish only. Could land bluefish and mackerel if caught within 300 yards of the beach. Could purse seine for striped bass in part of Albemarle Sound from Oct 1- Dec 20 if seine was less than 200 yards.

- 1961: Purse seines allowed only for menhaden.

- 1968: Changed striped bass purse seine season to Sept 1 through Nov 30

- 1972: One percent tolerance of food fish.

Until 1976, the only rules on the books were that purse seines were only allowed for the harvest of menhaden (non food fish). Could catch striped bass in a part of Albemarle Sound in the fall.

- 1976: No purse seines on board when taking Kings and Spanish. No harvest of striped bass

This rule came into effect because fishermen were taking run-a-round gillnets and making a modified purse seine for kings and Spanish (mostly Spanish mackerel) down south.

- 1989: Established a fishing season of May 15-Jan 15 within 1 mile of the beach and in internal waters of Pamlico Sound, mouth of Pamlico/Pungo River, Lower Neuse, Adams Creek, Back Sound, Straits, North River, Newport River, Bogue Sound.

    - Established a fishing season for Core Sound April 1-Jan 15.
    - Ocean greater than 1 mile opened year round.
    - Closed mouth of Cape Fear River.
    - Fishing not allowed on weekends between Memorial Day and Labor Day.
    - Fishing not allowed on Memorial Day, Labor Day or Fourth of July if on weekend..
    - Must report spills.

A number of stakeholder meetings were set up and down the coast to address effects of fishing on tourism, managing for bait, biological issues and economic issues. These meetings resulted in following rules in 1989.

- Fishing season inside 1 mile to address harvest on age 0s. See option 7 in 1981 plan. Allowed juvenile menhaden to migrate down the beach. Also allowed these menhaden to grow and migrate north for NJ to harvest as older fish.



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- Internal waters management to address bait harvest.
- Core sound opened earlier for harvest of crab bait.
- Several menhaden companies also harvested bait (Beaufort Fisheries, Sound and Sea Possessing).

- Mouth of Cape Fear closed because of pressure form recreational fishermen. Weekend closures and holiday closures were due to tourism.

- 1991: Established proclamation authority to allow fishing inside 1 mile between April 1-May 14. Director can set means and methods by area, limits, require data

- 1994: Closed 2 areas off Dare County. Must stay outside of 1.5 nm during May through September. Can fish within .5 nm during Oct-Dec.

South Carolina
Included prohibition of use of purse seines for menhaden in state waters in a general net reform bill approx. 1985.

Georgia
Georgia can allow state waters seaward of the sounds to be opened and closed to purse seine fisheries. Georgia has not opened its waters to purse seining since approximately 1984. Any development of a fishery will be observed via the trip ticket landings program and management measures will be addressed at that time.

Florida
Prohibited purse-seining for menhaden in state waters in a general net ban bill, 1994.

**New York Regulations**

The text of New York's current Environmental Conservation Law (ECL) are presented below:

Section 13-0333. Menhaden; license; prohibited acts.

1. Menhaden (*Brevoortia tyrannus*) from which oil or meal is made, subject to the provisions of section 13-0343, may be taken from the waters of the marine district with a purse seine provided a license is first obtained from the department.

2. Each license shall be issued to cover one vessel and pertinent equipment by which such fish are taken and shall be issued in the name of the owner, lessee or operator of each vessel so used. License fees shall be computed on the basis of gross tonnage of the vessel to be licensed as indicated in the document, certificate of award, register, registration, enrollment or license of such vessel issued by the United States or any state.

3. The license fee shall be: For each vessel:



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| 30 gross tons or less | 25 dollars |
| More than 30 gross tons and less than 200 gross tons | 500 dollars |
| More than 200 gross tons | 2,000 dollars |

All licenses issued under this section shall expire on December 31 following the date of issue.

4. For the purpose of this chapter, commercial menhaden purse seines may not be used or set:

a. in the area of Long Island Sound extending west of an imaginary line from the New York state-Connecticut boundary line (Byram River) extending easterly and southerly to buoy 13 (off Eaton's Neck).

b. In Long Island Sound south of a straight line one-half mile seaward of a straight line between buoy 13 (off Eaton's Neck) and buoy 9 (off Sound Beach).

Distance shall be determined from straight line drawn between the designated buoys and navigational aids.

5. No person shall take menhaden by purse seining except during the period commencing on the Monday following the fourth day of July and ending on the third Friday in October. Nothing in this subdivision shall be construed as legalizing the taking of menhaden by purse seining on weekends or legal holidays during the period provided for in this subdivision.

6. The department shall, in conjunction with the menhaden industry, have the authority to require menhaden purse seine vessels to carry a department approved observer during their operation in New York State waters. Beginning July sixth, nineteen hundred ninety-eight the department shall require menhaden purse seine vessels equal to or greater than two gross tons to carry a department approved observer during their operations in New York State waters. Such observers shall independently note and record information, as directed by the department, on such items as fishing location, menhaden catch, by-catch, and any user conflicts. The license holder for the vessel for which an observer is required will be responsible for the costs of such observer. The department shall promulgate rules and regulations to establish appropriate procedures for the assessment and collection of costs for observers.

7. The operator of a menhaden purse seine vessel shall report to the department twenty- four hours prior to entering the waters of the state and shall submit to the department a regular and timely report of their total harvest. The department shall develop regulations six months from the effective date of this subdivision related to this reporting requirement.

8. The department shall, in cooperation with the Connecticut Department of Environmental Protection and consistent with the Long Island Sound Bi-State committee

resolution regarding commercial menhaden fishing, undertake a water quality assessment of the effect of menhaden vessel hold waste on Long Island Sound water quality. The department shall report back within one year of the effective date of this subdivision thereon to the governor, the temporary president of the senate, the speaker of the assembly and the chairman of the senate and assembly conservation committees with its findings and recommendations for reducing or eliminating the adverse aesthetic, ecological, and water quality impacts of said discharge.

9. Licensees shall b legally and financially responsible for the clean up of fish lost during any fishing or fish handling operations. The department shall establish regulations to enforce this subdivision.

10. The department shall adopt regulations to prohibit or further limit menhaden fishing when required by, and consistent with, the Interstate Fishery Management Plan for Atlantic Menhaden adopted pursuant to the Fishery Conservation and Management Act (16 USC 1800 et seq) and adopted by the Atlantic States Marine Fisheries Commission.

11. The department, in cooperation with the Connecticut Department of Environmental Protection and consistent with the Long Island Sound Bi-state committee resolution regarding commercial menhaden fishing, shall evaluate the appropriateness and effectiveness of establishing a limit on the number of purse seine vessels that may be allowed to fish on Long Island Sound. The department shall, in cooperation with the Connecticut Department of Environmental Protection and consistent with the Long Island Sound Bi-state committee resolution regarding commercial menhaden fishing, evaluate the benefits and benefits and effectiveness of establishing a cap on the quantity of menhaden that can be harvested from Long Island Sound in one year. The department shall, in consultation with the menhaden fishing industry, investigate means of regulating the depth at which menhaden purse seines are set with respect to the depth of the water in their respective locations. The department shall, in cooperation with the Connecticut Department of Environmental Protection and consistent with the Long Island Sound Bi-state committee resolution regarding menhaden fishing, provide a report of its findings and recommendations thereon to the governor, the temporary president of the senate, the speaker of the assembly, and the chairmen of the senate and assembly environmental conservation committees within one year of the effective date of this subdivision.

There are several actions described in the above legislation which were never implemented, primarily because the menhaden purse seine reduction vessels have not returned to New York waters since the enactment of this law. Since the enactment of this law the menhaden purse seine vessels in the more than 200 gross ton category have stopped fishing in New York. The table 1 presents or license sales since 1999.

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