Atlantic Menhaden Technical Committee
Meeting Summary

July 9, 2008
Norfolk, Virginia

Attendees

Committee Members:

Behzad Mahmoudi, (FL)
Brandon Muffley (NJ)
Alexei Sharov, Chair (MD)
Rob Latour, Vice Chair (VIMS)
Joseph Smith (NMFS)
John Maiolo (NC)
Douglas Vaughan (NMFS)
Trish Murphey (NC)
Jason McNamee (RI)
Brad Spear, Staff (ASMFC)

Guests:

Ken Hinman
Bill Goldsborough
Ben Landry
Jeff Kaelin
Ron Lukens
Derek Orner
Brad O'Bier
Steve Meyers
Rob O'Reilly

Review of 2007 Menhaden Fisheries

Reported coastwide reduction landings for 2007 were 174,445 metric tons. This is up 11% from 2006 and up 5% from the previous 5-year average. The fishery consisted of 10 reduction vessels out of Reedville. In addition, several Virginia bait vessels ('snapper rigs') unloaded menhaden for reduction purposes at the Reedville plant. Most of the reduction landings consisted of age-2 fish. This is further evidence of a strong 2005 yearclass relative to recent yearclasses. However, from a historical perspective the 2005 yearclass might not be qualified as 'strong.' The stock assessment scheduled for 2009 will provide a quantitative analysis of its strength. A majority of catches in 2007 by the Virginia fleet were in the lower part of Chesapeake Bay near the Bay mouth or along the beaches of Virginia's barrier islands of the Eastern Shore.

Reported coastwide bait landings for 2007 were 44,695 metric tons. This is the highest landings in the time series back to 1985. These landings accounted for over 20% of the total coastwide menhaden landings (reduction + bait). The purse-seine fishery for bait consisted of 3 vessels in Virginia, 5-6 vessels in New Jersey, and 2 vessels in New England. For the third year in a row New England saw good catches of adult menhaden and large concentrations of 'peanuts'. Purse seines accounted for 70% of the bait landings.

Bait landings reported for New York remains a problem. New York reports landings from the NMFS commercial fisheries database in addition to landings from its state gill net fishery. It's unclear whether these gill net landings are included in the NMFS number. Virginia has experienced this problem in other fisheries and is working extensively to separate out the 'in shore' only data. The TC recommends to the Board that New York clarify this issue before the next assessment.

The TC discussed whether CPUE data from the bait fishery would be useful and if possible to compile the data for the next assessment. The group agreed that it's a useful exercise for states to conduct. The TC recommends to states, where applicable, to report bait landings and effort, recommend the best measure for CPUE, and report back no later than the data workshop for the 2009 assessment.

Port samples from the reduction fishery and samples from the bait fishery continue to be collected providing age structure of the catch.

Questions were raised again about monitoring of the Chesapeake Bay reduction harvest cap and confidentiality of the landings data. Every week Omega Protein submits its Captain's Daily Fishing Reports to the NMFS Beaufort Lab. The Lab compiles the landings, breaks them out by area (in and outside the Bay) and submits the summary information monthly to Virginia and ASMFC. Omega has requested that the detailed landings information remain confidential and not be circulated publicly. Virginia is responsible for monitoring the landings against the cap and ensuring that its fishery is in compliance with the current ASMFC management measures. However, the TC argued that this data should be available to them to monitor and discuss trends of menhaden catches in Chesapeake Bay.

Amendment 1 established a set of triggers that would trigger an assessment in 'off' years. The first trigger, 'if the CPUE index falls below the 5th percentile for the previous 20 year average,' was not reached (See Table 1). The second trigger, 'if the ratio of ages 2-4 to the total catch of all ages falls below the second standard deviation unit over the last 20 years,' was not reached either (See Table 2).

Cooperative Research Work Group Meeting Summary

A subset of the TC met with representatives from Omega Protein, a spotter pilot from Rhode Island, and others to discuss the possibility of a 'coastwide' aerial survey for Atlantic menhaden. Such a survey would provide a much-needed index of adult abundance. Omega pilots have very little extra time during weeks of the fishing season to participate in activities to support an independent survey. The group discussed an 'ideal' aerial survey provided funding could be found and experienced pilots could be hired. In the meantime, Joe Smith is working with Omega's pilots and Jason McNamee is working with Ark Bait's pilot to report menhaden schools in a more standardized way through spotter pilot log book sheets. The group plans to meet after the fishing season to review the usefulness of the new fishery-dependent data. A more detailed summary of the meeting is attached as Appendix A.

Review of 'Gulf of Mexico Menhaden: Considerations for Resource Management'

In response to a Board request, the TC review Ocean Associates' paper 'Gulf of Mexico Menhaden: Considerations for Resource Management.' The TC focused its discussion on four main points made in the paper:

1) Menhaden are omnivores
2) Increased menhaden abundance could lead to the demise of other species, such as shrimp, red drum, and oysters, because menhaden eat zooplankton (i.e., the larvae of the other species)
3) High abundance of menhaden is part of the water quality problem
4) Bycatch in the menhaden fishery is not a problem

The TC agreed with statements 1) and 4). It concluded there was no scientific evidence to suggest that 2) is possible. Statement 3) is a working hypothesis but there is much scientific

debate on this issue. More research and understanding is needed before definitive statements can be made. See Attachment B for a memo to the Board with a more thorough review of this paper.

NOAA's Webinars on Chesapeake Bay Menhaden Research

In lieu of holding a symposium, the NOAA Chesapeake Bay Office held a series of webinars to reduce travel costs. The four, weekly webinars were based on the four menhaden research priority areas adopted with Addendum II. All of the results presented were preliminary and haven't been thoroughly reviewed.

The first webinar focused on predator-prey interactions. Major findings reported were: menhaden are the most important prey to large striped bass during winter off the coast of VA and NC; in the upper Bay diet composition of 17+ inch striped bass was 98% menhaden by weight; predatory demands of birds on menhaden has grown exponentially over past 30 years.

The second webinar consisted of presentations about population structure and exchange rates of menhaden between water bodies. The main findings reported were: differences in otolith chemistry of juvenile menhaden suggest spatial structure within Chesapeake Bay; there is potential for localized depletion if exchange between regions of the Bay is limited; variability in production of one region offset by variability in another; more study needed for more definitive analysis.

Presentations about recruitment and growth were given for the third webinar. Several of the findings that were reported are as follows: a peak spawning off the Chesapeake Bay region occurs mid-November; distribution and occurrence of larvae at the mouth of Chesapeake Bay are patchy (i.e., no correlation with flow rates, directions); variation in number of larvae yearly (2008 numbers were much higher than previous three years); there is potential for two cohorts of recruits (mid-Atlantic Bight and South Atlantic Bight).

Findings presented about growth included: menhaden growth appears higher in Chesapeake Bay than in Delaware Bay; while striped bass growth appears higher in Delaware Bay than Chesapeake Bay; faster menhaden growth was seen in the upper Chesapeake Bay compared to the lower Bay; temperature, abundance, and food availability have important effects on growth; evidence that a standing stock of phytoplankton is correlated with recruitment potential for YOY menhaden.

Abundance and ecosystem modeling were the topics of the final webinar. The LIDAR was designed to provide menhaden abundance estimates in Chesapeake Bay. The third year of the study was completed in 2007. Limited funding for the 2008 LIDAR survey will result in less area coverage or less frequent coverage of the Bay. To date, the LIDAR survey underestimates number of schools and absolute abundance under certain conditions. Limited depth penetration and lack of sufficient contact affect LIDAR's detectibility. However, high-definition video run side-by-side with LIDAR is well-correlated with estimates of school number/size. Video provides a less expensive and possibly more dependable tool for providing abundance estimates.

Two alternative assessment frameworks were discussed. The TC rejected the use of spatially implicit model designed to produce area-based abundance estimates (e.g., abundance inside Chesapeake Bay versus outside). It is unsuitable for application to menhaden at this time because of the lack of area specific adult indices. The TC also discussed an alternative methodology to assess the coastwide stock of menhaden. The paper describing the alternative

methodology provided specific changes to the current methodology that the group felt warranted further discussion. The TC also briefly heard preliminary results of ecosystem modeling that shows effects of the menhaden quota on menhaden and on striped bass.

Rhode Island Menhaden Management and Population Analysis

Rhode Island is in its second year of a new menhaden management program for Narragansett Bay. The program consists of a daily possession limit, weekend and holiday closures, gear restrictions, and a harvest cap. The harvest cap is determined through the use of a depletion model for open systems, which estimates population present at a given time. The fishery is allowed to harvest up to 50% of the biomass present. Primary depletion model inputs include spotter pilot observations as an index of abundance and daily purse-seine landings. Daily growth and survival parameters are also incorporated into the model. Additional data from the floating trap fishery is used to index movement of menhaden in and out of the Bay; this accounts for the recruitment effect. Rhode Island solicited comments and suggestions from the TC as it further refines the model and its management program.

Stock Assessment Planning

As noted above, the TC is interested in further discussion an alternative assessment methodology before beginning work on the 2009 assessment. Ideally, the Stock Assessment Subcommittee should meet in fall or winter 2008 with the author of the alternative assessment. The data workshop for the 2009 assessment will likely be scheduled for spring 2009.

Table 1: Coastwide CPUE in the Reduction Fishery (1988-2007)

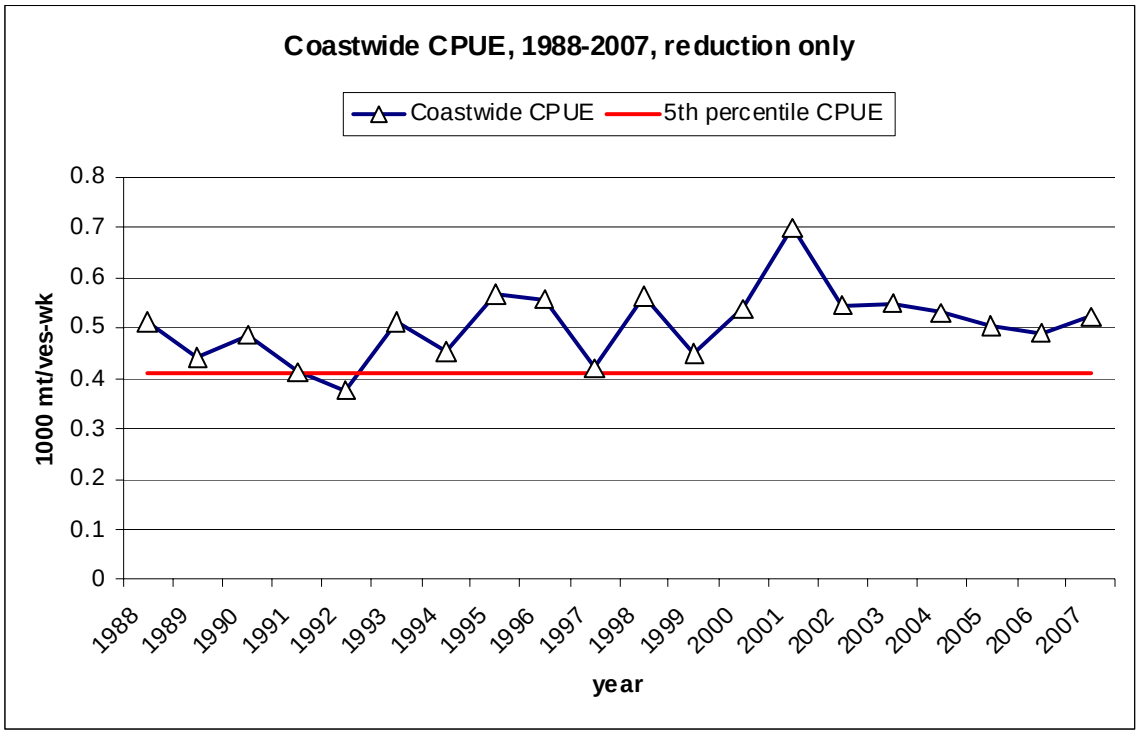
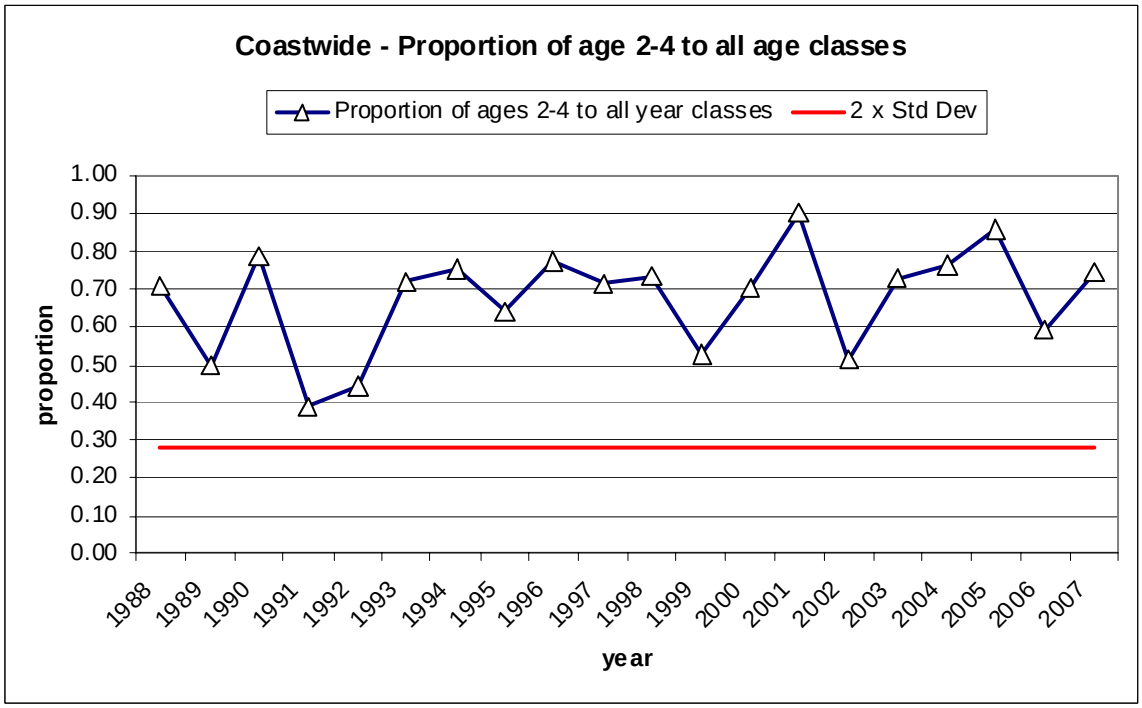


Table 2: Coastwide Proportion of Age 2-4 Atlantic Menhaden to All Ages (1988-2007)



Attachment A

Atlantic Menhaden Cooperative Research Work Group

May 12 – 13, 2008
Irvington, Virginia

Meeting Summary

Attendees
Behzad Mahmoudi (FWC)
Rob Latour (VIMS)
Jeff Kaelin (Omega Protein)
Ben Landry (Omega Protein)
Shaun Gehan (Kelley Drye)
Tom Blencowe (Omega Protein)
Jim Churnside (NOAA)
Joseph Smith (NMFS Beaufort)
Brad O'Bier (NMFS port agent)
John Maiolo (ECU – retired)
Derek Orner (NMFS NCBO)
Alexei Sharov (MD DNR)
Everett Mills (spotter pilot)
Jason McNamee (RI DEM)
Jake Haynie (spotter pilot)
Cecil Dameron (spotter pilot)
Brad Spear (ASMFC)

Meeting Objectives

- Explore the possibility of a 'coastwide' cooperative aerial survey to monitor menhaden abundance
- Develop a plan for moving forward with a pilot aerial survey

Past Aerial Surveys

Several attendees have participated in other cooperative aerial surveys to observe fish abundance. In Tampa Bay, one spotter plane was used to set four purse seine boats targeting a sardine-herring complex. The pilot completed his work for the fishery by 10am and flew two extra hours to conduct a survey. The survey area off Tampa Bay was divided into four blocks with predetermined transect lines. On each sampling day, three to four transects were randomly selected and surveys in each block.

In 2007, Rhode Island DFW and a spotter pilot for menhaden bait boats (Ark Bait Company) conducted a survey within Narragansett Bay. Because of the Bay's small size (approx. 200 square miles), there was no need to devise a sampling design as the spotter pilot could cover the entire Bay on each sampling trip. The pilot indicated that the ideal altitude for fishing is 1,000 feet and for scouting is 2,500 feet. RI DFW also ran a depletion model for open populations to estimate current population size of menhaden in the Bay at a given time. These estimates were compared with observations from the aerial survey, and a management program was developed and promulgated in regulation that capped bait fishery harvest at 50% of the estimated population available in Narragansett Bay. For complete information on the menhaden population estimation program run in RI during the 2007 fishing season, see: http://www.dem.ri.gov/programs/bnatres/fishwild/pdf/menabnnb.pdf

Spotting and Fishing Operations by Omega Protein

Spotter pilots generally follow the same weekly routine once the season starts. Sunday morning up to eight pilots may scout for menhaden schools in Chesapeake Bay (VA portion only) and 'up the beach' to New York and sometimes down to the Carolinas (usually not in summer because most of the fish are within a mile or so of the beach). Along the coast they'll fly from 3 – 12 miles off the coast. There are known hot spots where spotters go to find fish. In the past eight or so years, pilots have seen large schools of large menhaden 10 – 15 miles off the coast of New Jersey. However, it's possible they've always been there and haven't been noticed until recently. On a clear day, with a high altitude, pilots can see schools 10 miles away, if they are bunched up. Pilots may scout for up to five or six hours depending on how far north they fly. Boat captains have access to the pilot reports by 1pm on Sunday afternoon.

When scouting, pilots don't report specifics on every school they see. Each pilot tends to have his own method and terms for reporting. Usually, they will report collective numbers of schools and fish in a general area.

On Sunday afternoon or Monday morning and based on the spotters' report, the boat captains decide which area they will begin fishing on Monday. The captains use the spotters mainly to set the boats on a particular school, but the spotters will also do a little scouting during the fishing day.

Omega's spotter pilots, all on contract with the Reedville facility, are active with the company from mid-May through December. They work Monday through Friday and sometimes on Sunday (if they are scouting). During the week, the pilots are usually setting boats on fish during all daylight hours. The group concluded that pilots have little to no extra flying time to dedicate to a scientifically designed survey.

The best catches tend to be on Monday and Tuesday. During weekends, schools reform after the previous week's fishing, although weekend recreational boating has had a negative effect on menhaden schooling.

Increased fuel prices will affect Omega's decision-making. They will probably fly more to scout for fish and steam the boats less. The boats will likely stay out until they have a full load. Sometimes, captains may decide to avoid schools of younger, smaller fish to catch more, larger, and oilier fish.

Information Needs for the Menhaden Assessment
In order of priority, the Technical Committee needs the following information regarding menhaden:

1. adult abundance index
2. exchange rates between Chesapeake Bay and the ocean
3. absolute biomass in Chesapeake Bay

An aerial survey can help to address the first two and possibly the third priorities. However, the LIDAR project as originally designed was to provide data for the third information need.

Possible Aerial Survey Designs (For Discussion Purposes)
The ideal aerial survey would divide the survey area into blocks. Within each block, up to 10 scientifically based transects would be identified. For each survey day, pilots would fly 3 or 4 random transects within each block. This survey would require spotter pilots working for the industry to dedicate a significant amount of time in the air above the normal time during fishing or scouting.

Another possible survet design relies on spotter pilots to, again, go beyond their normal flying routine. Using a predetermined statistical grid, pilots would, in their downtime, survey certain areas during the week and on Sundays. Some flights would carry observers.

A third possible survey design uses observers during flights throughout the week. Pilots would operate as they normally would (e.g., flying to find fish and recording logs as normal). Observers would record additional data (e.g., number of schools, size, location, search time, etc.) for scientific purposes. Observers could be university students who might use the data for a thesis. Based on Rhode Island's experience, someone can be trained within two months if they have boat experience.

With any of the above designs, a video recording system could easily be installed on the plane to document a portion of the schools seen by the pilot. Video detection of schools within Chesapeake Bay has been demonstrated using a high-definition camera during straight and level

flight. A camera on a spotter plane should probably be mounted differently to cover as much of what the pilot sees as possible.

Next Steps
The group agreed there are opportunities to obtain more information on menhaden abundance along the coast than what we currently have. It came up with two survey designs. The existing Spotter Log Survey costs no money and requires no changes in spotter pilots' routines, but may not produce scientifically defensible menhaden abundance data. The Coastwide Aerial Survey is being designed as an ideal survey to estimate adult menhaden abundance.

The Spotter Log Survey will be implemented during the 2008 fishing season. Joe Smith will develop an area map/log sheet for Chesapeake Bay similar to the one used in Narragansett Bay. The log sheet will include data fields for number of schools, total biomass estimate, area, flight time, sea state, visibility, and tide. Mr. Jake Haynie, chief pilot for Omega, agreed to work with Joe to 1) provide the routine Omega spotter report from the Sunday overflights, and 2) companion data sheets showing spotters' estimates of number of schools and biomass by area (i.e., the nine areas in Chesapeake Bay and VA ocean waters used for the Captains Daily Fishing Report program). No observers will be used. [Industry representatives had reservations about the practicality of observers on the planes. Training might take a long time. Also, Omega spotters swing up to 90 degrees on the plane's wing to see schools, which would give many people motion sickness.] Joe also offered to contact New Jersey spotter pilots to conduct a similar survey in Delaware Bay. The Cooperative Research Work Group would like to get together at the end of the season to evaluate the usefulness of the study and data collected. It would also like to compare the results with those from the LIDAR survey that will be conducted this fall.

The Coastwide Aerial Survey is being designed as a proposal since no money is currently available to fund such a survey. The Work Group estimated a cost of approximately $1 million per year for starting up the survey. This survey will need pilots dedicated to flying and spotting menhaden at specific times within predetermined areas. Current spotter pilots for the bait and reduction industry are unable to fill this role because there is not enough time in the week to do both. However, several names of pilots (some retirees) were identified as possible contractors for the study. Survey spotter pilots would have to be trained and would need boat experience. Industry representatives at the meeting agreed to develop the portion of the proposal to solicit pilots for the survey.

The Work Group discussed a number of preliminary details for the Coastwide Aerial Survey. Estimated cost for a pilot, plane, fuel, etc. is $300 – 400 per hour. The survey would require about 50 hours of flying time per coastwide survey day. The survey would need up to five pilots to cover waters from Maine through North Carolina (and possibly through Florida), including but not limited to Narragansett Bay and Chesapeake Bay. Pilots would fly 2 to 3 days per month. Preferably, the days would be in a row to increase the likelihood that conditions are favorable for at least one day. The survey would run for several months throughout the season.

Other next steps included getting other stakeholders, such as environmental and recreational fishing representatives, involved in discussions of the 'pilot' studies. ASMFC staff will draft a

one-page document for the Coastwide Aerial Survey and circulate it for input from and consensus of interested parties. It can be used as a preliminary proposal to shop around for funding. The Work Group planned to meet again in December 2008 or January 2009.

Attachment B

Letter from the Technical Committee to the Board regarding Ocean Associates paper

July 17, 2008

Atlantic Menhaden Management Board
Atlantic States Marine Fisheries Commission
1444 Eye Street N.W, Sixth Floor
Washington D.C. 20005

Dear Board Members,

In response to your request, the Atlantic Menhaden Technical Committee (TC) reviewed the report dated March 25, 2008 by Ocean Associates, Inc. titled "Gulf of Mexico Menhaden: Considerations for Resource Management." From the report, we identified four main conclusions: 1) menhaden are omnivores, 2) high menhaden population levels lead to a decrease of shrimp and other gamefish abundance, 3) the harvest of menhaden leads to improved water quality, and 4) there is very little bycatch associated with the purse-seine fishery for menhaden. We evaluated each of these conclusions based on whether or not they were consistent with the scientific literature on menhaden trophic interactions, feeding ecology, and associated bycatch of the reduction fishery. A synthesis of our discussion for each conclusion is summarized below.

Menhaden are omnivores
The assertion that menhaden are omnivores is consistent with published research on their trophic interactions and feeding ecology. As indicated in the Ocean Associates' report, this is an important point to clarify since many individuals within the public sector generally believe that menhaden feed exclusively on plant matter (algae and detritus). The TC is in agreement with the conclusion that menhaden have the potential to and likely consume organisms other than phytoplankton (e.g., zooplankton).

High menhaden population levels lead to a decrease of shrimp and other gamefish abundance
In the Preface of the Ocean Associates' report there is a statement that reads, "If Texas restricts its menhaden harvest, the result will quite likely be decreased shrimp and gamefish populations." This conclusion is arrived at by inferring that increased menhaden abundance (as achieved through restricted harvest) would lead to higher consumption of larval organisms and their principle prey (zooplankton). In turn, this increase in plankton consumption would lead to significant declines in abundance of other taxa within the ecosystem (i.e., the aforementioned shrimp and gamefishes). To our knowledge, it has never been documented in the primary literature that predation by menhaden has a negative impact on the population abundance of any other commercially or recreationally important species. Moreover, the author's focus on predation and competition as a means of regulating year-class strength of shrimp and gamefishes tend to represent an overly simplistic view of the early life history of marine organisms; for example, environmental variation and habitat suitability are two other key factors influencing larval survival and subsequent population abundance.

Harvesting menhaden actually improves water quality
The role of menhaden in terms of nutrient dynamics and impacts on water quality in estuarine environments is extremely complicated, precluding the accuracy of any broad-brush generic statements that menhaden have either a positive or negative impact. In the Executive Summary of the Ocean Associates' report there is a statement that reads, "High menhaden abundance is part of the water quality problem, perhaps even leading to red tides and other harmful algal blooms." Based on the available science, it is impossible to state with certainty that menhaden abundance negatively impacts water quality. In addition, a linkage between menhaden abundance and harmful algal blooms has never been established; this statement represents extreme conjecture rather than fact. Fundamental to evaluating the potential impact of menhaden populations on water quality is an understanding of, *i*) the complex ontogenetic development of the feeding apparatus of menhaden, particularly branchiospinule and gillraker spacing, *ii*) the spatial, temporal, and ontogenetic migration and habitat utilization dynamics of menhaden, *iii*) the spatiotemporal variability of plankton abundance, size-, and species-composition, and *iv*) the spatiotemporal interactions of points *i-iii*, and how they manifest (positively or negatively) in terms of water quality impacts within a particular ecosystem. Published studies addressing aspects of points *i-iii* exist and represent valuable scientific contributions; however, the most important issue when attempting to assess the impact of menhaden on water quality is point *iv*. To our knowledge, the type of synoptic study needed to comprehensively evaluate point *iv* has never been conducted.

There is very little bycatch associated with the purse-seine fishery for menhaden
While there are no menhaden purse-seine bycatch studies in the peer-reviewed scientific literature, two grey literature reports from 1994 characterize bycatch of the menhaden fishery in the mid-Atlantic and Gulf of Mexico. Both studies indicated that the amount of bycatch is typically at or below 1% of the target species catch. The TC felt that the Ocean Associates' report accurately described the results of these studies and therefore agree with the conclusion that there is very little bycatch associated with the purse-seine fishery for menhaden.

We hope that our summary of the report Ocean Associates' is helpful and informative. Please feel free to further communicate with the TC should you have additional questions.

Sincerely,

The Atlantic Menhaden Technical Committee